Operating Manual

R&S Coverage Measurement System

R&S® ROMES 4

1117.6885.04

Version 4.10 / SP1

ROHDE&SCHWARZ
Test and Measurement Division

1171.6415.12-02

Dear Customer,

throughout this manual, ROMES is generally used as an abbreviation for the coverage measurement system R&S® ROMES.

Tabbed Divider Overview

Safety Instructions
Certificate of Quality
Address List
Support-Center Address

Tabbed Divider

Grouped Safety Messages

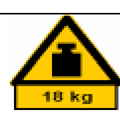
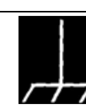
Make sure to read through and observe the following safety instructions!

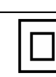
All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standard of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment required for them are designed and tested in accordance with the relevant safety standards. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards. To maintain this condition and to ensure safe operation, observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, the Rohde & Schwarz group of companies will be happy to answer them.

Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or, if expressly permitted, also in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for an intention other than its designated purpose or in disregard of the manufacturer's instructions. The manufacturer shall assume no responsibility for such use of the product.

The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and a basic knowledge of English. It is therefore essential that only skilled and specialized staff or thoroughly trained personnel with the required skills be allowed to use the product. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation. Keep the basic safety instructions and the product documentation in a safe place and pass them on to the subsequent users.

Symbols and safety labels

							
Observe product documentation	Weight indication for units >18 kg	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Attention! Electrostatic sensitive devices

					
Supply voltage ON/OFF	Standby indication	Direct current (DC)	Alternating current (AC)	Direct/alternating current (DC/AC)	Device fully protected by double/reinforced insulation

Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before putting the product into operation. It is also absolutely essential to observe the additional safety instructions on personal safety that appear in relevant parts of the product documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by the Rohde & Schwarz group of companies, including instruments, systems and all accessories.

Tags and their meaning

DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	NOTICE indicates a property damage message.
	In the product documentation, the word ATTENTION is used synonymously.

These tags are in accordance with the standard definition for civil applications in the European Economic Area. Definitions that deviate from the standard definition may also exist in other economic areas or military applications. It is therefore essential to make sure that the tags described here are always used only in connection with the related product documentation and the related product. The use of tags in connection with unrelated products or documentation can result in misinterpretation and thus contribute to personal injury or material damage.

Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
   prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude 2000 m above sea level, max. transport altitude 4500 m above sea level.
   A tolerance of ±10% shall apply to the nominal voltage and of ±5% to the nominal frequency.
2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the product must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens, e.g. nickel) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.
4. If products/components are mechanically and/or thermically processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.

5. If handling the product yields hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation.
6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer/operator is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.
7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.
8. Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.
10. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.
12. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.
13. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, this can result in sparks, fire and/or injuries.
15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
16. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.
18. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
19. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a license electrician.

20. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.
21. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.
22. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.
23. Rohde & Schwarz products are not protected against penetration of liquids, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock for the user or damage to the product, which can also lead to personal injury.
24. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.
25. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.
26. Do not place the product on heat-generating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.
27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. Do not short-circuit batteries and storage batteries.
    If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries must be recycled and kept separate from residual waste. Batteries and storage batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.
28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.
29. The product can be very heavy. Be careful when moving it to avoid back or other physical injuries.
30. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves).
31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.
32. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. The driver is always responsible for the safety of the vehicle. The manufacturer assumes no responsibility for accidents or collisions.
33. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the product documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.
34. Prior to cleaning, disconnect the product from the AC supply. Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluent for cellulose lacquers.

Informaciones elementales de seguridad

¡Es imprescindible leer y observar las siguientes instrucciones e informaciones de seguridad!

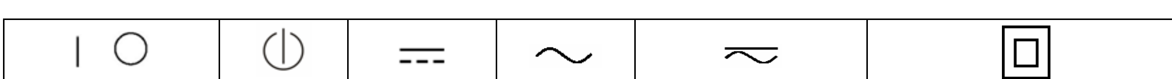
El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los estándares de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestra sección de gestión de la seguridad de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el comprobante de conformidad adjunto según las normas de la CE y ha salido de nuestra planta en estado impecable según los estándares técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las indicaciones, informaciones de seguridad y notas de alerta. El grupo de empresas Rohde & Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda sufrir daño. El uso del producto fuera de sus fines definidos o despreciando las informaciones de seguridad del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del mal uso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado dentro de las instrucciones de la correspondiente documentación de producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto hace necesarios conocimientos profundos y conocimientos básicas del idioma inglés. Por eso se debe tener en cuenta que el producto sólo pueda ser operado por personal especializado o personas minuciosamente instruidas con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de R&S, encontrará la información debida en la documentación del producto en el capítulo correspondiente. Guarde bien las informaciones de seguridad elementales, así como la documentación del producto y entréguela a usuarios posteriores.

Símbolos y definiciones de seguridad

Ver documen-tación de producto	Informaciones para maquinaria con un peso de > 18kg	Peligro de golpe de corriente	¡Advertencia! Superficie caliente	Conexión a conductor protector	Conexión a tierra	Conexión a masa conductora	¡Cuidado! Elementos de construcción con peligro de carga electroestática



Potencia EN MARCHA/PARADA	Indicación Stand-by	Corriente continua DC	Corriente alterna AC	Corriente continua/-alterna DC/AC	El aparato está protegido en su totalidad por un aislamiento de doble refuerzo

Tener en cuenta las informaciones de seguridad sirve para tratar de evitar daños y peligros de toda clase. Es necesario de que se lean las siguientes informaciones de seguridad concienzudamente y se tengan en cuenta debidamente antes de la puesta en funcionamiento del producto. También deberán ser tenidas en cuenta las informaciones para la protección de personas que encontrarán en el capítulo correspondiente de la documentación de producto y que también son obligatorias de seguir. En las informaciones de seguridad actuales hemos juntado todos los objetos vendidos por el grupo de empresas Rohde & Schwarz bajo la denominación de „producto“, entre ellos también aparatos, instalaciones así como toda clase de accesorios.

Palabras de señal y su significado

PELIGRO	Identifica un peligro directo con riesgo elevado de provocar muerte o lesiones de gravedad si no se toman las medidas oportunas.
ADVERTENCIA	Identifica un posible peligro con riesgo medio de provocar muerte o lesiones (de gravedad) si no se toman las medidas oportunas.
ATENCIÓN	Identifica un peligro con riesgo reducido de provocar lesiones de gravedad media o leve si no se toman las medidas oportunas.
AVISO	Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo.
	En la documentación del producto se emplea de forma sinónima el término CUIDADO.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación de producto y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a malinterpretaciones y tener por consecuencia daños en personas u objetos.

Informaciones de seguridad elementales

1. El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S válido lo que sigue:
   como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4.500 m sobre el nivel del mar.
   Se aplicará una tolerancia de ±10% sobre el voltaje nominal y de ±5% sobre la frecuencia nominal.
2. En todos los trabajos deberán ser tenidas en cuenta las normas locales de seguridad de trabajo y de prevención de accidentes. El producto solamente debe de ser abierto por personal especializado autorizado. Antes de efectuar trabajos en el producto o abrirlo deberá este ser desconectado de la corriente. El ajuste, el cambio de partes, la manutención y la reparación deberán ser solamente efectuadas por electricistas autorizados por R&S. Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de la corriente conductora, control de funcionamiento).

3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el níquel). Si se producieran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averiguar los motivos de estas reacciones.
4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes al tratamiento de materias residuales.
5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberán ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.
6. Ciertos productos, como por ejemplo las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética. El empresario/usuario está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo aumentado de exposición a radiaciones para evitar riesgos.
7. La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.
8. Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la del la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dabo cambiar los fusibles correspondientes del producto.
9. Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.
10. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto. Puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro que es controlado su estado técnico de seguridad.
11. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (según la medida del cable de distribución, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en bastidores o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

12. No utilice nunca el producto si está dañado el cable eléctrico. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.
13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A (utilización de fusibles de mayor amperaje sólo previa consulta con el grupo de empresas Rohde & Schwarz).
14. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.
15. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.
16. En las mediciones en circuitos de corriente con una tensión de entrada de $U_{eff} > 30$ V se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos del estándar IEC950/EN60950.
18. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar heridas, fuego o daños en el producto.
19. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, el circuito de suministro de corriente deberá estar protegido de manera que usuarios y productos estén suficientemente protegidos.
21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir cortocircuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.
22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.
23. Los productos R&S no están protegidos contra líquidos si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente para el usuario o de daños en el producto lo cual también puede llevar al peligro de personas.
24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.
25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.
26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. No cortocircuitar baterías ni acumuladores. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención células de litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Las baterías y acumuladores deben reutilizarse y no deben acceder a los vertederos. Las baterías y acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de evacuación y reciclaje.
28. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.
29. El producto puede poseer un peso elevado. Muévalo con cuidado para evitar lesiones en la espalda u otras partes corporales.
30. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).
31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean observadas. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.
32. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo. El fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
33. Dado el caso de que esté integrado un producto de láser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación de producto. De otra manera pondrá en peligro su salud, ya que el rayo láser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo láser.
34. Antes de proceder a la limpieza, desconecte el producto de la red. Realice la limpieza con un paño suave, que no se deshilache. No utilice de ninguna manera agentes limpiadores químicos como, por ejemplo, alcohol, acetona o nitrodiluyente.

Certified Quality System

DIN EN ISO 9001 : 2000
DIN EN 9100 : 2003
DIN EN ISO 14001 : 2004

DQS REG. NO 001954 QM UM

QUALITÄTSZERTIFIKAT

Sehr geehrter Kunde,
Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Managementsystems entwickelt, gefertigt und geprüft.
Das Rohde & Schwarz Managementsystem ist zertifiziert nach:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:2004

CERTIFICATE OF QUALITY

Dear Customer,
you have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards.
The Rohde & Schwarz quality management system is certified according to:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:2004

CERTIFICAT DE QUALITÉ

Cher Client,
vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité.
Le système de gestion qualité de Rohde & Schwarz a été homologué conformément aux normes:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:2004

ROHDE&SCHWARZ

1171.0200.11-03.00

PD 5213.8744.99 · V 01.00 · May 2007

Address List

Headquarters, Plants and Subsidiaries

Headquarters

ROHDE&SCHWARZ GmbH & Co. KG
Mühldorfstraße 15 · D-81671 München
P.O.Box 80 14 69 · D-81614 München
Phone +49 (89) 41 29-0
Fax +49 (89) 41 29-121 64
info.rs@rohde-schwarz.com

Plants

ROHDE&SCHWARZ Messgerätebau GmbH
Riedbachstraße 58 · D-87700 Memmingen
P.O.Box 16 52 · D-87686 Memmingen
Phone +49 (83 31) 1 08-0
+49 (83 31) 1 08-1124
info.rsmb@rohde-schwarz.com

ROHDE&SCHWARZ GmbH & Co. KG
Werk Teisnach
Kaikenrieder Straße 27 · D-94244 Teisnach
P.O.Box 11 49 · D-94240 Teisnach
Phone +49 (99 23) 8 50-0
Fax +49 (99 23) 8 50-174
info.rsdts@rohde-schwarz.com

ROHDE&SCHWARZ závod
Vimperk, s.r.o.
Location Spidrova 49
CZ-38501 Vimperk
Phone +420 (388) 45 21 09
Fax +420 (388) 45 21 13

ROHDE&SCHWARZ GmbH & Co. KG
Dienstleistungszentrum Köln
Graf-Zeppelin-Straße 18 · D-51147 Köln
P.O.Box 98 02 60 · D-51130 Köln
Phone +49 (22 03) 49-0
Fax +49 (22 03) 49 51-229
info.rsdc@rohde-schwarz.com
service.rsdc@rohde-schwarz.com

Subsidiaries

R&S BICK Mobilfunk GmbH
Fritz-Hahne-Str. 7 · D-31848 Bad Münder
P.O.Box 20 02 · D-31844 Bad Münder
Phone +49 (50 42) 9 98-0
Fax +49 (50 42) 9 98-105
info.bick@rohde-schwarz.com

ROHDE&SCHWARZ FTK GmbH
Wendenschloßstraße 168, Haus 28
D-12557 Berlin
Phone +49 (30) 658 91-122
Fax +49 (30) 655 50-221
info.ftk@rohde-schwarz.com

ROHDE&SCHWARZ SIT GmbH
Am Studio 3
D-12489 Berlin
Phone +49 (30) 658 84-0
Fax +49 (30) 658 84-183
info.sit@rohde-schwarz.com

R&S Systems GmbH
Graf-Zeppelin-Straße 18
D-51147 Köln
Phone +49 (22 03) 49-5 23 25
Fax +49 (22 03) 49-5 23 36
info.rssys@rohde-schwarz.com

GEDIS GmbH
Sophienblatt 100
D-24114 Kiel
Phone +49 (431) 600 51-0
Fax +49 (431) 600 51-11
sales@gedis-online.de

HAMEG Instruments GmbH
Industriestraße 6
D-63533 Mainhausen
Phone +49 (61 82) 800-0
Fax +49 (61 82) 800-100
info@hameg.de

Locations Worldwide

Please refer to our homepage: www.rohde-schwarz.com

- Sales Locations
- Service Locations
- National Websites

Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

USA & Canada

Monday to Friday (except US public holidays)
8:00 AM – 8:00 PM Eastern Standard Time (EST)

Tel. from USA 888-test-rsa (888-837-8772) (opt 2)
From outside USA +1 410 910 7800 (opt 2)
Fax +1 410 910 7801

E-mail CustomerSupport@rohde-schwarz.com

East Asia

Monday to Friday (except Singaporean public holidays)
8:30 AM – 6:00 PM Singapore Time (SGT)

Tel. +65 6 513 0488
Fax +65 6 846 1090

E-mail CustomerSupport@rohde-schwarz.com

Rest of the World

Monday to Friday (except German public holidays)
08:00 – 17:00 Central European Time (CET)

Tel. from Europe +49 (0) 180 512 42 42*
From outside Europe +49 89 4129 13776
Fax +49 (0) 89 41 29 637 78

E-mail CustomerSupport@rohde-schwarz.com

* 0.14 €/Min within the German fixed-line telephone network, varying prices for the mobile telephone network and in different countries.

ROHDE&SCHWARZ

Contents

1 General Description

This chapter gives a general introduction to the Coverage Measurement System R&S ROMES with all its components. It describes the measurement principle, the basic system modules and available options, the measurement process, the file types used and the handling of BTS information stored in the internal database.

For a practical introduction to R&S ROMES refer to chapter 2, *Getting Started*. In this chapter a sample session is recorded including the basic configurations, a typical measurement and the essentials for evaluating and interpreting the measurement results.

The reference part describing all menus and functions in detail is split into several chapters: Chapter 3 gives a systematic overview of the user interface and all menu commands, chapter 4 describes the basic views and view configurations. The following chapters explain the system and hardware driver settings and the options for data export. Technical aspects and background information are relegated to chapters 8 and 9.

System Requirements

R&S ROMES runs under the *MS Windows XP* (SP3) operating system. A PC with the following characteristics will ensure full functionality:

- 2 GHz CPU clock
- 512 MB RAM or more
- Intel Pentium 4, Pentium M or multicore CPU (Core 2 Duo or Core 2 Quad)

R&S ROMES supports multicore architecture, so for high-performance systems a Core 2 Duo or Core 2 Quad CPU is recommended.

Introduction to R&S ROMES

Due to its modular concept, R&S ROMES is a perfect solution for every coverage measurement task. *Rohde & Schwarz* offers various options which can be combined with R&S ROMES, e.g. the options for measuring digital mobile phone networks, for digital audio broadcasting, or analog signal strength measurement in almost every relevant frequency range. The latter can be used as a stand-alone solution or in combination with R&S ROMES.

Depending on the used devices, the complete system is either installed in a portable case or in a van.

The following picture gives an overview of the basic steps taken in a measurement tour.

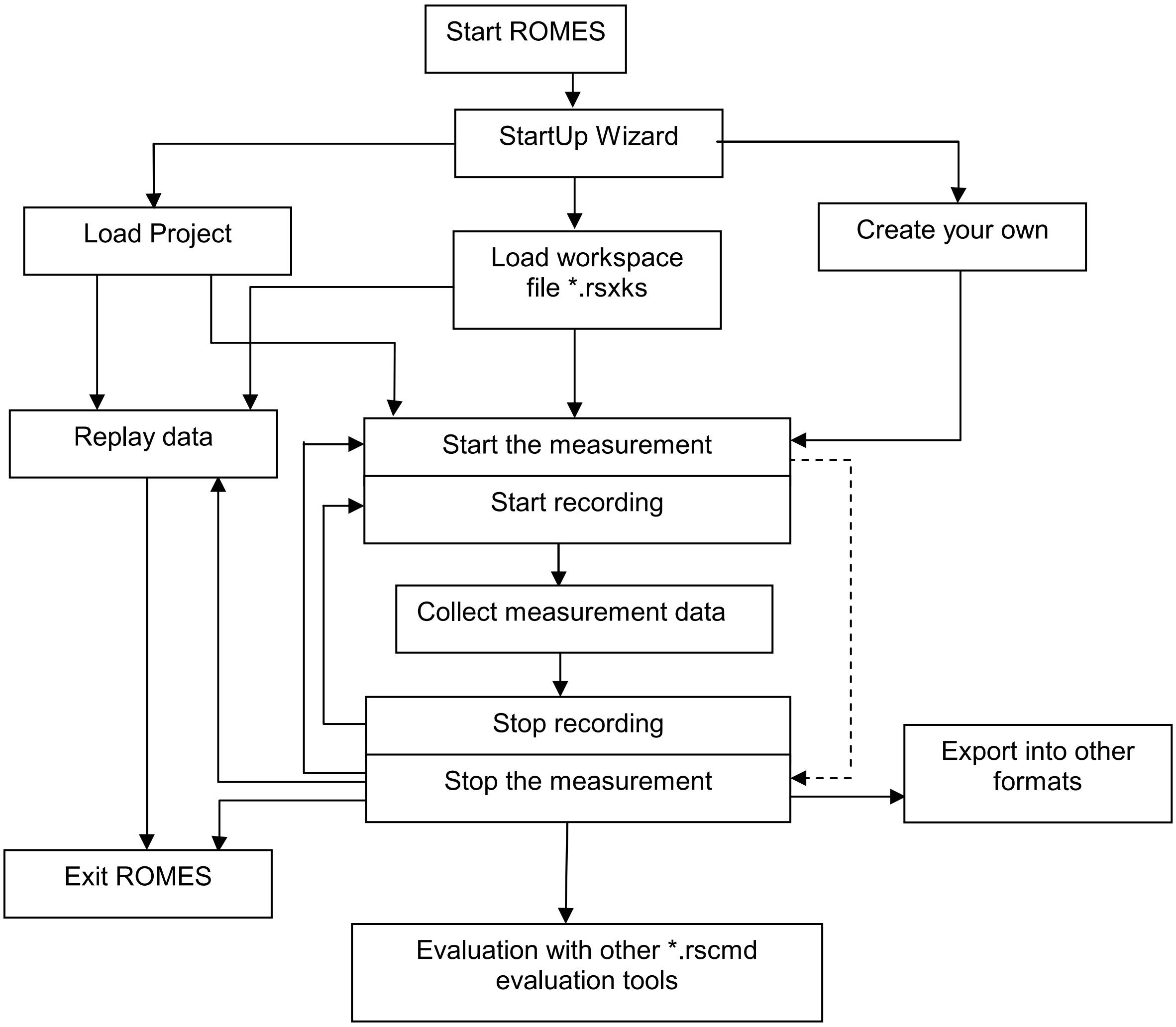
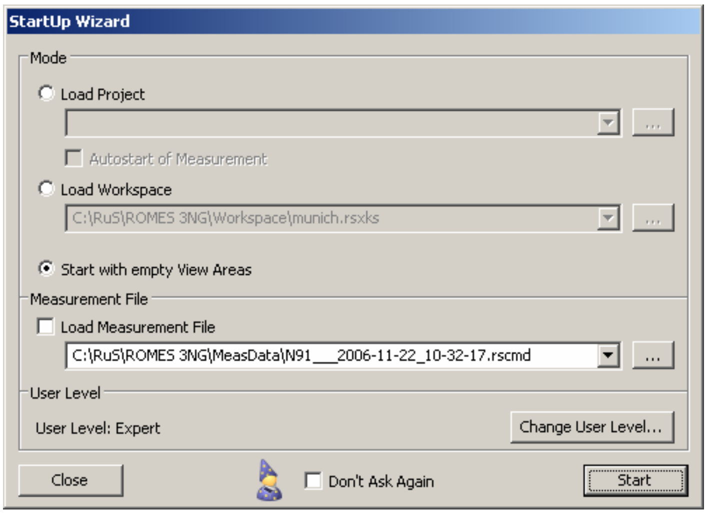


Fig. 1-1 Overview of a measurement tour

The *Replay* mode is an additional feature for pre-evaluation purposes. Replay means that you can load and analyze the stored measurement data after the measurement tour, using the different views that R&S ROMES provides for display and evaluation. You can pause the replay at points of special interest in order to analyze the data replayed so far, print the view contents or copy screen shots to the clipboard using the *Copy to Clipboard* item in the context menu of the view, or *ALT+PrtSc* (for capturing the active window) or *PrtSc* (for the whole screen).

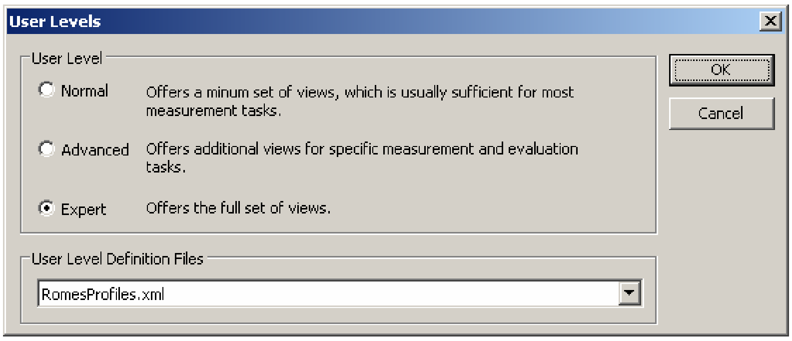
StartUp Wizard

The StartUp Wizard allows choosing how R&S ROMES will start. The user can select between starting with a predefined workspace or project and an empty R&S ROMES workspace. Additionally a measurement file can be selected, which will be opened immediately after booting. The dialog can be suppressed for the future by checking “Don’t Ask again” (it may be enabled again in the Preferences Dialog of R&S ROMES).



Mode	*Load Project*	This option requires an R&S ROMES project file. A project loads only the specified modules and creates only the specified views. The measurement can be started automatically, by checking the “Auto start of Measurement” option. In this case no Measurement File can be opened, and the User Level cannot be changed.
	Load Workspace	A predefined workspace will be loaded after booting R&S ROMES.
	Start with empty View Areas	R&S ROMES will start without any preconfiguration.
Measurement File	*Load Measurement File*	The user can select a Measurement File, which will be opened automatically after booting R&S ROMES.
Close		Click on this button will abort the start of R&S ROMES.
User Level	*Change User Level*	The User Level can be changed by pressing the “Change User Level…” button. *Normal* Offers a minimum set of views, which is usually sufficient for most measurements tasks. *Advanced* Offers additional views for specific measurement and evaluation tasks.

	Expert	Offers the full set of views.
User Level Definition Files	It is also possible to load *User Level Definition Files* created by the user.	



Performing a Measurement with R&S ROMES

With R&S ROMES, the current measurement and the evaluation of results can be configured and carried out independently:

- The hardware driver settings determine how the measurement is performed
- The display configuration settings determine how the results are analyzed and viewed

The data can be viewed during the measurement without being stored (*measurement* mode), they can be viewed and stored at the same time (*recording* mode), or data recorded before can be loaded from a measurement file and analyzed (*replay* mode).

The *result file (measurement file)* contents depend on the kind of drivers and their settings, not on the display configuration. In particular, the parameter selections and settings in the *Tools – Modules Configuration...* menu generally don't have any influence on the *.rscmd file.

Information about user name, test vehicle and vehicle ID which is saved with the *.rscmd file is editable over *Tools – Preferences* tab *General*.

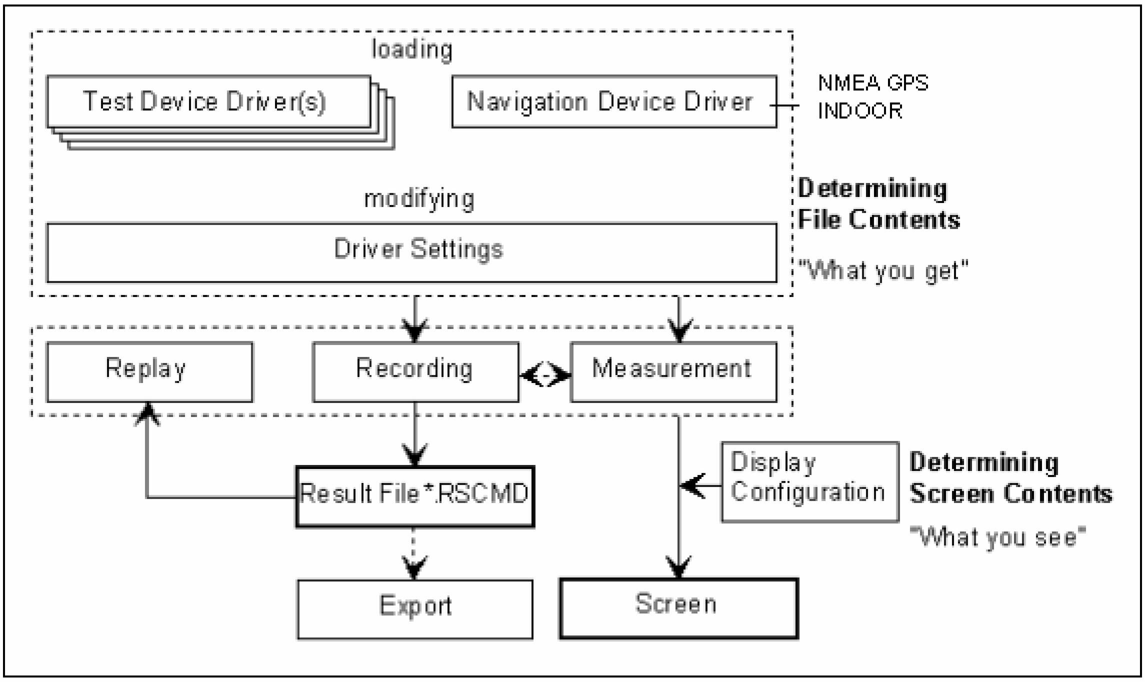


Fig. 1-2 Principle of a measurement

Basic Concepts of R&S ROMES

The following section is to make you familiar with R&S ROMES basic operating concept, the representation of measurement data, and the file formats used. It also defines frequently encountered terms of the R&S ROMES user interface.

Workspace and Measurement Files

In the lower part of the *File* menu, R&S ROMES indicates the workspace (*.rsxks) and measurement (*.rscmd) files used in the previous sections. The data in these two file types are complementary: Measurement files (*.rscmd) contain the measured data, the workspace (*.rsxks) controls their visualization. R&S ROMES is able to handle also measurement with extension *.cmd from version 3.60 and older, only if the technology is support by the current R&S ROMES version.

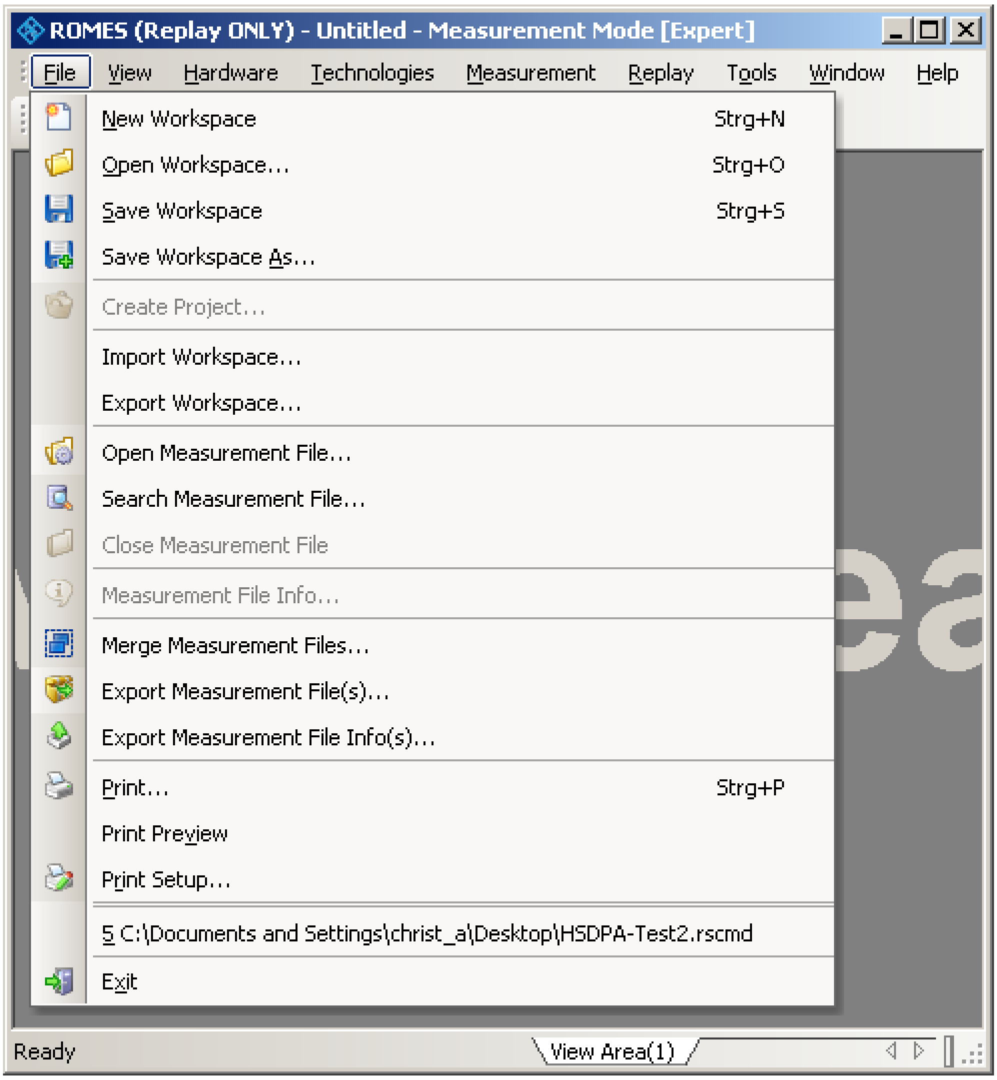


Fig. 1-3 Workspace and measurement files

Workspace

A workspace contains the device driver and screen settings for an R&S ROMES session, including the type, size, and position of all opened view windows, parameter types to be viewed in each view type (if applicable), and a bitmap archive for *Route Track Views*, if defined.

The signal configurations defined in the *Preferences* menu (see section *Signal Configuration* in chapter 3) are stored in the Windows registry by default but can be alternatively included in the workspace.

During an R&S ROMES session, exactly one or no workspace is active. If R&S ROMES runs without any loaded workspace the default R&S ROMES settings are used for the current session.

User-defined workspaces can be stored to a workspace file <file-name>.rsxks and recalled in later sessions. So, for each kind of measurement the matching control windows can be easily set, and each operator can save and reuse his favorite constellations.

The default directory for saving Workspaces is defined in tab *General* of the *Preferences* menu, opened via the *Tools - Preferences* command.

Workspace-related menu commands (see chapter 3):

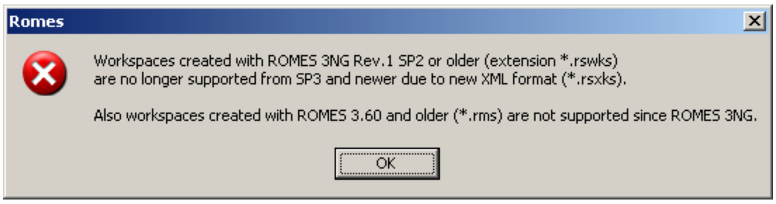
New Workspace
Create a new workspace

Open Workspace
Load an existing workspace file

Save Workspace
Save current workspace with its current name

Save Workspace As...
Save current workspace with a new name

Note:
*Since Version R&S ROMES 3NG Rev.1 SP3 the format of the workspace is changed. You cannot use old workspace *.rswks. If you load an old workspace a failure message will appear.*



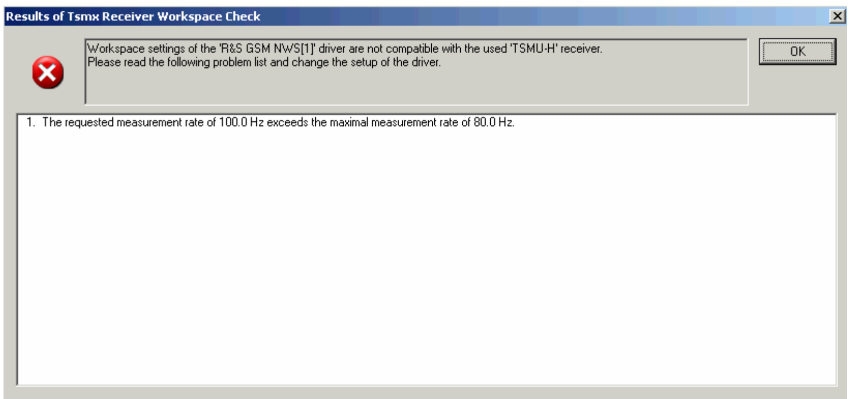
TSMx Receiver Workspace Check

The TSMx receivers have different limits for setup parameters and this varies also for different technologies like GSM/UMTS/CDMA/CW.

When using a TSMQ workspace with a TSML for example, the maximum measurement rate may be exceeded.

The new function checks the relevant parameters like measurement rate, measurement mode and frequency range (if applicable) and gives a problem report for the user without changing the values.

The function will be called after choosing a TSMx device. It is expected that the user will manually change the setup to be compatible with the current TSMx receiver. The setup pages will help the user to set valid parameters, because they will not allow storing invalid parameters and will show the valid range.



Also the values will always be checked at start of measurement and if the problem still exists (the user did not correct the problems), the problem report will be shown again and the measurement start will be aborted.

Measurement Data

As explained in section Performing a Measurement with R&S ROMES on page 1.4, a measurement file (*.rscmd) contains the complete measurement data acquired on a tour.

During an R&S ROMES session, no measurement file needs to be open because many actions (such as view configurations and *Export*) are independent of the measurement data. A measurement file must be open if data is recorded or replayed. The corresponding commands (see below) take into account whether a measurement file is already open or not:

- If a measurement file is open already, the action is performed using the current measurement file *(Replay),* or the current measurement file is proposed as a default file for the action *(Recording).*
- If no measurement file is open yet, a *File Open* dialog is opened first. In this dialog, a measurement file can be created or selected.

Measurement file-related menu commands (see chapter 3):

Open Measurement File
Open a measurement file.

Close Measurement File
Close the current measurement file.

Export Measurement File
Export the rscmd file contents.

Start Recording
Start a measurement and write the results to a measurement file.

R&S ROMES Project

A project file (*.rsproj) stores all information about the necessary modules and views for a certain measurement or evaluation task to improve the performance of R&S ROMES and the clarity of its GUI. By loading a Project only these modules and view will be used within R&S ROMES.

Note:
Message View will be created in any case

- To load a project it has to be defined while starting R&S ROMES. Thus the only possibility to load a project is the StartUp Wizard (see StartUp Wizard on p. 1.3).
- A R&S ROMES project can be loaded also by defining the switch ‘p’ at the command line:

```
Romes.exe –p C.\whereever\bestproject.rsproj
```

Note:
A project is always protected by a password. However, an empty password is allowed. The project can be loaded without password, but it is required to overwrite it.

Project-related menu commands (see chapter 3):
Create Project
Create a new project

Data Selection

In the configuration menus used to select data for viewing and exporting, the data of a measurement file is presented in hierarchical trees. The trees give a graphical representation of the correlation between the data that originates from different devices and technologies.

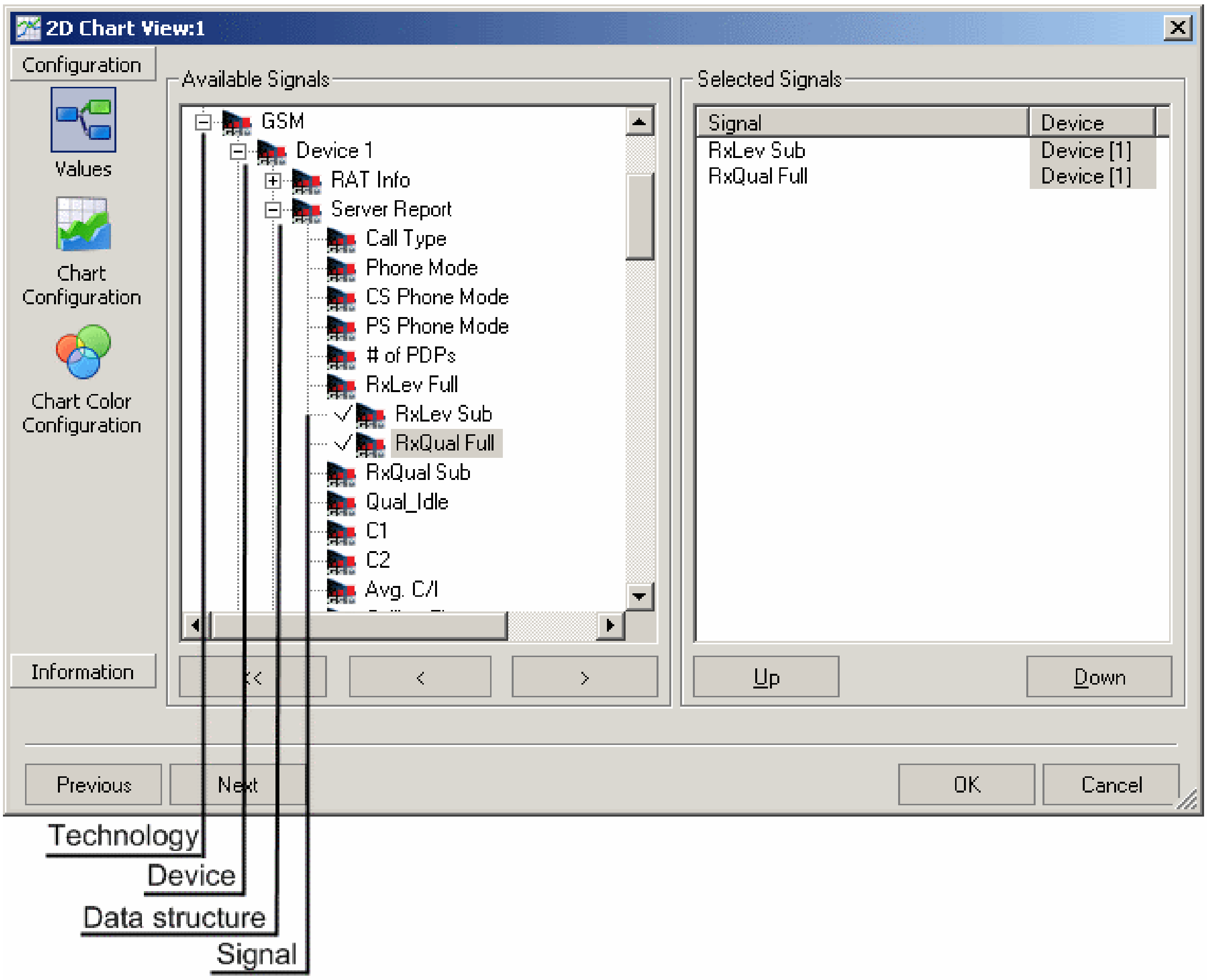


Fig. 1-4 Data tree and data selection

Use

The figure above shows the default data tree as is used in the view configuration menus as long as no measurement (*.rscmd) file is open.

If a measurement file is open, the data tree is adapted to the file contents, the classifiers Device 1 to Device 4 being replaced by the current device names (e.g. U700[1], U700[2] ...). Branches that are not occupied because the corresponding technologys, devices etc. are not available are truncated. This is to make sure that any signal shown in the data is actually available in the current measurement data.

The data tree shown in the *Preferences* menus (opened via the *Tools – Preferences* command) don't show the device hierarchy level, because devices are selected elsewhere.

Available Signals

All signals (hierarchy level 4) of the data tree can be selected for display:

- To select a single signal for display, left-click this parameter (which will be highlighted in inverse video) and click the > button. Alternatively, double-click the parameter.
- To select all available signals at once, click the >> button.

Selected Signals

List of all signals selected for display.

- To remove a single signal from the list, left-click this parameter (which will be highlighted in inverse video) and click the < button. Alternatively, double-click the parameter.
- To remove all parameters at once, click the << button.

The order of the list can be changed using the two buttons below:

Up

Interchange the position of the selected signal with the signal located directly above. The first signal in the list can not be moved upwards.

Down

Interchange the position of the selected signal with the signal located directly below. The last signal in the list can not be moved downwards.

File Formats

Besides the measurement files and workspace files described in section *Workspace and Measurement Files* on page 1.5, R&S ROMES uses the following file formats:

Export formats

Data stored in a measurement (*.rscmd) file can be exported to files with special data formats in order to be used in other applications. Several ASCII and other export formats (*.txt, *.asc, *.cox, *.f2l, *.mif, *nqa, *.nq2, *.pcap, *.csv) are available, depending on the system configuration. Moreover, it is possible to export the layer 3 messages stored in a measurement file during replay.

A detailed description of file export and export formats can be found in chapter 7 Data Processing.

View result export format (*.csv)

Several views support the export of the displayed data to a *.csv (comma-separated values) file that can be opened and processed by MS Excel. The contents of the Excel lists and the delimiters (commas, semicolons etc.) are view-dependent. To adjust Excel to the current delimiters of the *.csv file use the MS Excel *Data – Text to Columns…* wizard.

Image files

In the *Route Track* window, arbitrary bitmap files (*.jpg, *.bmp, *.pcx, *.png, *.tif, *.gif) can be loaded and superimposed to a background world map. The bitmaps can be positioned onto the world map by means of a set of coordinates which are stored in a *.tab file, a short text file assigned to the bitmap.

A detailed description of bitmap positioning can be found in chapter 4 Display and Evaluation of Results.

Bitmap archive

Bitmap archive files (*.arc) created in earlier R&S ROMES versions (TS51-K1 / TS55-K1 V2.x) can be imported and converted to *.tab files. In contrast to a *.tab file, the *.arc files generally contain the positioning information for several bitmaps. Consequently, when an archive consisting of several bitmaps and one *.arc file is imported, an equal number of *.tif bitmaps and *.tab files is created.

For further information refer to the description of the *Route Track* view in chapter 4.

Wave file

R&S ROMES allows to use wave (*.wav) files to announce an event by an acoustic signal. The wave files can be selected in the *Available Events* tab of the *Event configuration* menu, see chapter 3.

BTS list files, Network data base

Base station data provided by the network operator can be imported from BTS list (*.txt) or ASCII table description (*.atd) files with definite file formats (see chapter 7 Data Processing), and information on the base stations can be indicated in the *Alphanumeric View, GSM Measurement Report,* or *Route Track* views (see chapter 4). The base station lists are selected via the *BTS Database* menu items of the *Database*

To be used internally the information on GSM base stations is imported to a Network Data Base (*.ndb) file. It is possible to edit the data within a network data base and export data to a new BTS list (*.txt).

Information on Node B BTSs for UMTS base stations is imported to Node B Data Base (*.nbdb) files.

Information on CDMA base stations is imported to a CDMA data base (*.cndb) file.

Information on WiMAX base stations is imported to a WiMAX data base (*.wmdb) file.

Note:
The R&S ROMES root program directory contains a program file named BTSListGenerator.exe. This software tool uses a GSM measurement (.rscmd or *.cmd) file to generate a dummy BTS list (*.txt) file that can be imported into R&S ROMES for demo purposes and to visualize measurement data.*
*The list generator can also generate Node B and CDMA database files from suitable *.rscmd measurement files.*
The use of the tool is self-explanatory.

SC color files

In some of the *UMTS PNS* views a color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

ASCII Export Configuration File

When exporting measurement data to an ASCII file (see chapter 7), the export configurations can be stored to a *.rma file and reused later.

Profile files

To improve the system performance, it is possible to disable R&S ROMES program components using the *ROMES Configurator* (see chapter 8). A particular configuration consisting of a list of all enabled and disabled components can be stored to a profile file (*.profile) and re-used later.

Other files are for internal use only.

Third Party Software for R&S ROMES

R&S ROMES uses the following third-party utility:

MapX 5 *Map projection in the Route Track view*

R&S ROMES needs an installed MS Internet Explorer version 6.0 or higher and is distributed and tested with the following shared files:

File	Directory	OS	Version	Manufacturer	Remark
TVICPORT.VXD	Windows\System32	Win95/98	-	-	Parallel Port Access
TVICPORT.SYS	Windows\System32\Drivers	WinNT/2000	-	-	Parallel Port Access
SHLWAPI.DLL	Windows\System32	All	4.70.0.1215	Microsoft	Shell Light-weight Utility Library
URLMON.DLL	Windows\System32	All	4.70.0.1300	Microsoft	OLE32 Extensions for Win32
WININET.DLL	Windows\System32	All	4.70.0.1300	Microsoft	Internet Extensions for Win32
MGMTAPI.DLL	Windows\System32	All	5.0.2195.5349	Microsoft	Microsoft SNMP Manager API
WSNMP32I.DLL	Windows\System32	All	5.0.2195.5349	Microsoft	Microsoft WinSNMP v2.0 Manager API
SNMPAPI.DLL	Windows\System32	All	5.0.2195.4874	Microsoft	SNMP Utility Library
MFC42.DLL	Windows\System32	All	6.0.8665.0	Microsoft	MFCDLL Shared Library - Retail Version
MFC70.DLL	Windows\System32	All	7.0.9466.0	Microsoft	MFCDLL Shared Library - Retail Version
MSVCIRT.DLL	Windows\System32	All	6.0.8637.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCP50.DLL	Windows\System32	All	5.0.0.7051	Microsoft	Microsoft (R) C++ Runtime Library
MSVCP60.DLL	Windows\System32	All	6.0.8972.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCP70.DLL	Windows\System32	All	7.0.9466.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCRT.DLL	Windows\System32	All	6.1.9359.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCI70.DLL	Windows\System32	All	7.0.9466.0	Microsoft	Microsoft (R) C++ Runtime Library
MSVCR70.DLL	Windows\System32	All	7.0.9466.0	Microsoft	Microsoft (R) C++ Runtime Library

Contents

2 Getting Started

The following chapter presents a sample session with R&S ROMES. It is intended to provide a quick overview of the most important functions and configurations.

The tests reported below include

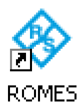
- Preparations (i.e. startup of the system, configuration of the hardware drivers, loading a database containing system and network data),
- Evaluating the measurement results.

The steps to perform are explained with the menus required and the results obtained on the screen. We also point out alternative settings and related measurements which could not be reported in detail.

Section *Short Measurement Examples* on p. 2.4 ff. contains short operating sequences from various R&S ROMES applications.

Preparations

R&S ROMES is an application that runs under *MS Windows XP* with SP3. The recommended system controller for a 19'' rack is the R&S TSPC4.



➢ Double-click the icon on your desktop to start R&S ROMES.

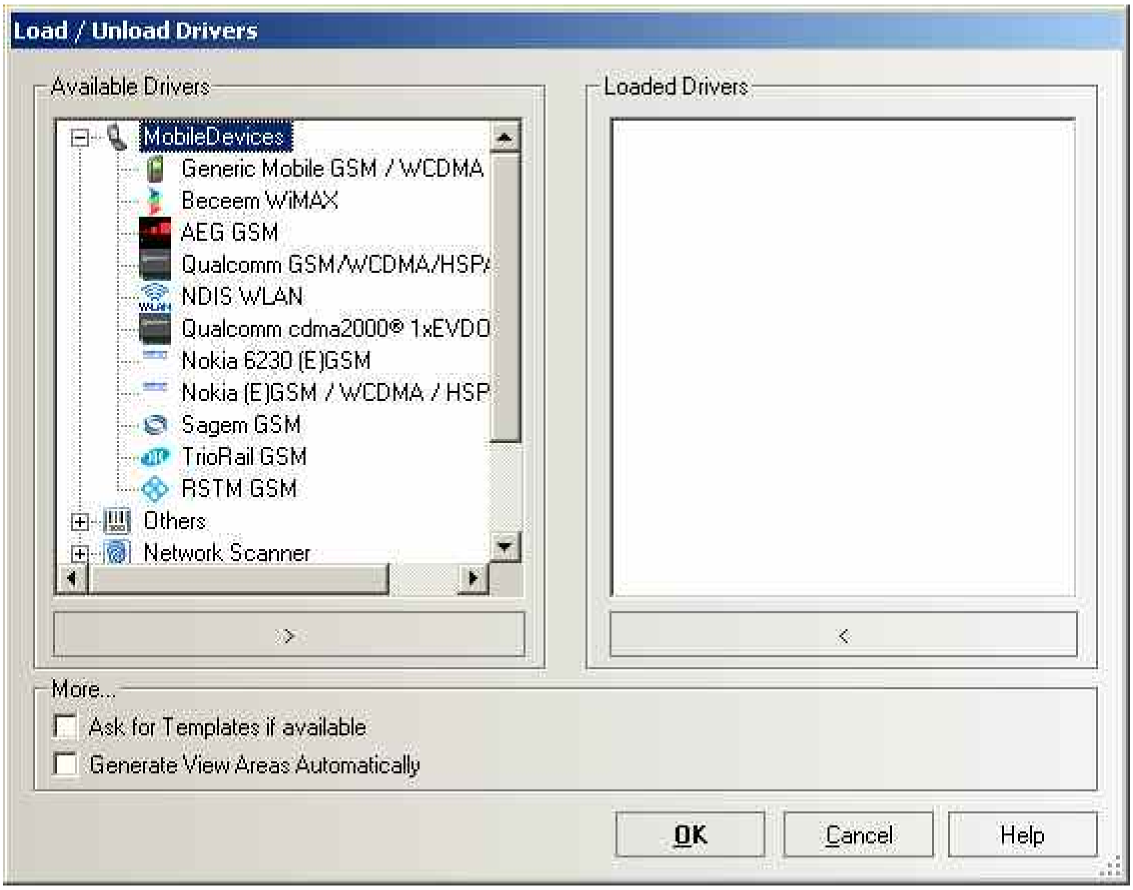
Loading Hardware Drivers

The hardware device drivers for your mobile phone(s) as well as for the positioning system must be loaded and installed before the measurement is started.

In our example we use a Sagem OT-260 mobile for the GSM900 network connected to COM port 1 and a GPS receiver with NMEA interface connected to COM port 2 of the controller. If you have different equipment, the steps can be performed in an analogous way.
To load the hardware drivers, perform the following steps:

➢ Click *Hardware - Add/Remove ...* on the toolbar menu.

The *Load/Unload Drivers* window opens.



The *Load/Unload Drivers* window shows a list of all devices and hardware drivers available (the list varies according to the options of the coverage measurement system chosen).

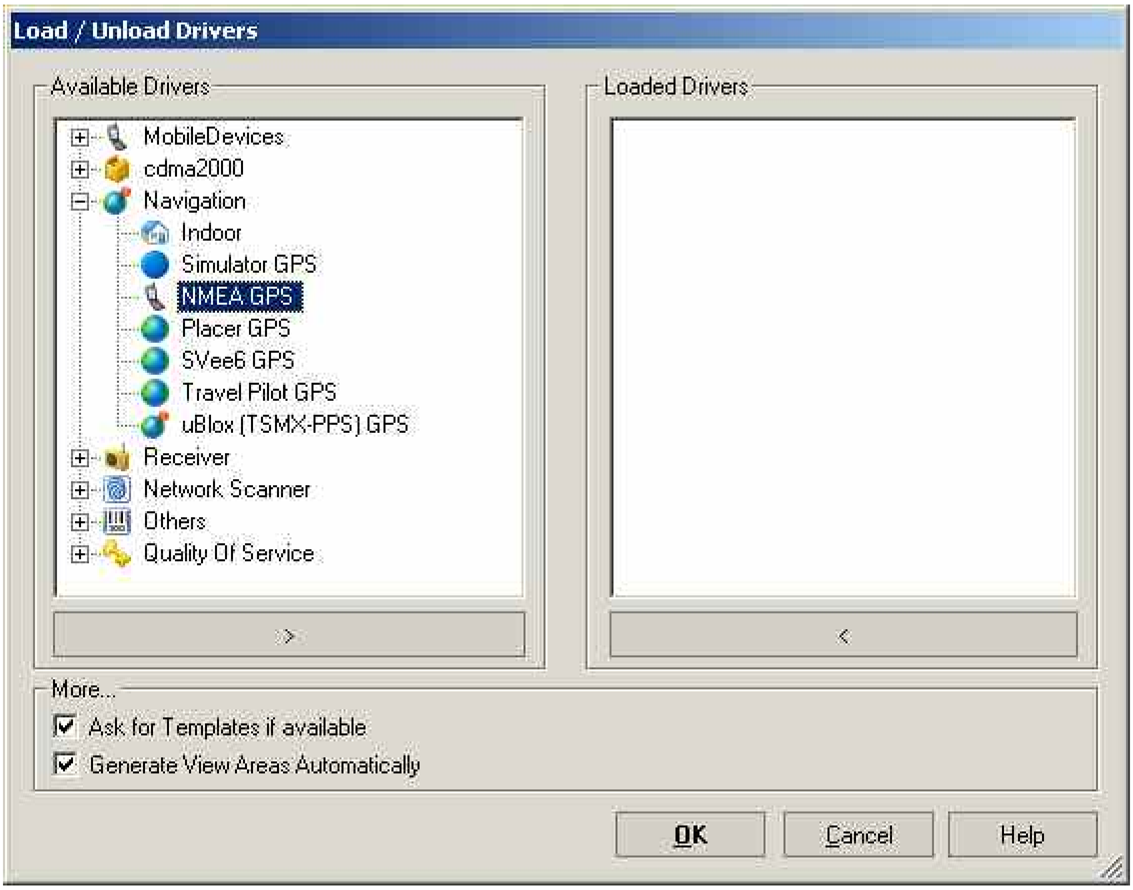
- For the mobile driver select (click) the device class *MobileDevices*.
- Select the manufacturer of your mobile phone.
- Click the  button to initiate the installation.

The *Assign Serial Port* window shows the COM Port assigned to the mobile driver. Port 1 must be set.

- If the COM port 1 is not set, select it from the Combo box.
- Press *OK*.

A progress bar showing the initialization of the mobile appears.

➢ Click *Navigation* and select *NMEA* from the list of *Available drivers*.



➢ Click the  button and proceed as described above to load the driver and assign it to COM port 2.

➢ Load the driver.

➢ Click *OK* to confirm your choice and close the *Load/Unload Drivers* dialog.

Short Measurement Examples

The following sections are intended as a quick introduction to typical measurement tasks, listing the steps necessary to set up the drivers, obtain, display and interpret the basic results. The examples are taken from different R&S ROMES options and technologies.

Data Quality Tester

The purpose of the Data Quality Tester (DQA, option R&S ROMES4DQA) measurement is to evaluate the Quality of Service (QoS) of any kind of data transfer connection. Configuration of the driver is described in detail in chapter 6, section *UMTS PN Scanner Driver.* The *QoS Views* are described in chapter 4 Display and Evaluation of Results.

Setting up a Connection

The DQA driver provides various jobs to define and establish a connection to a network provider or remote server. The procedure of setting up the connection is analogous for all jobs. In the following example an *FTP Download* connection to a remote server is set up.

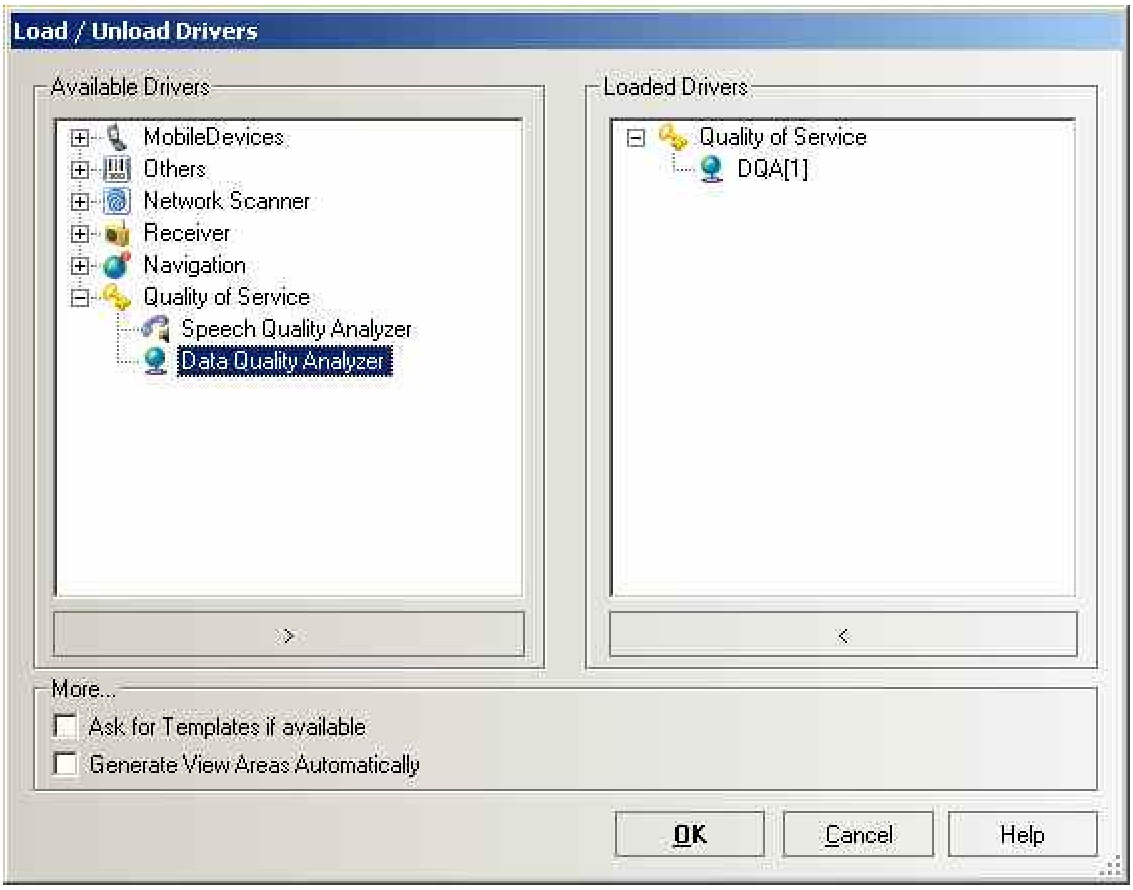
Suppose that your local computer contains an R&S ROMES installation including the Data Quality Tester, that it is configured for ftp file transfer with a remote server (in case of doubt refer to your Windows help), and that a remote server can be accessed. To set up and test the *FTP Download* connection with R&S ROMES, perform the following steps:

➢ Click *Hardware - Add/Remove ...* on the toolbar menu.

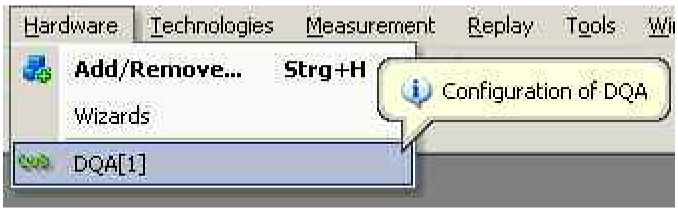
The *Load/Unload Drivers* window opens.

➢ Expand the *Quality Of Service* driver section (click the + node) and double-click *Data Quality Analyzer* to load the driver.

➢ Click OK to close the *Load/Unload Drivers* dialog.

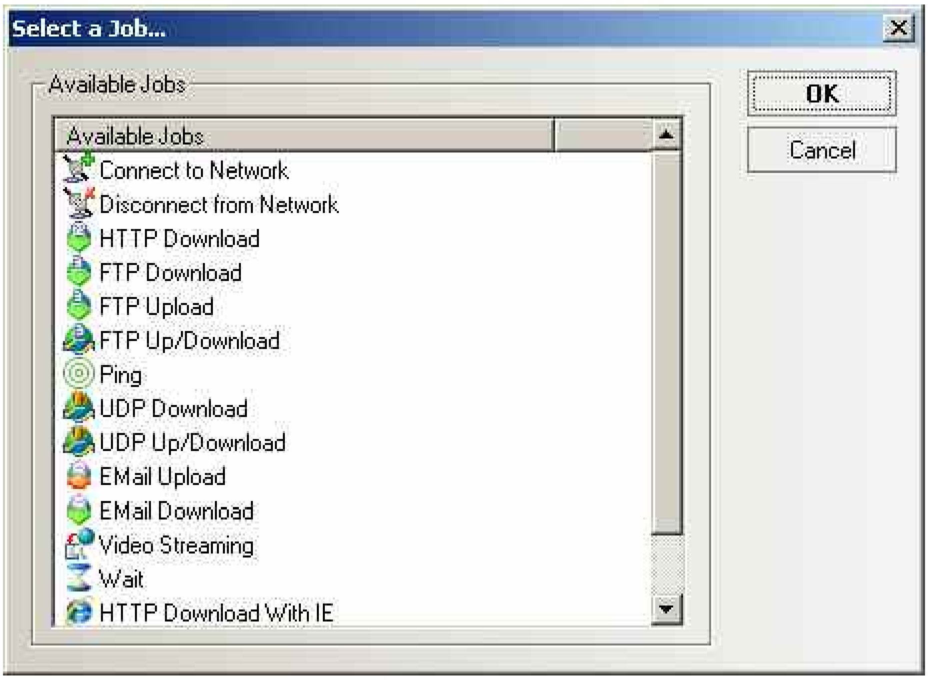


➢ In the *Hardware* menu, select the *DQA[1]* command to open the DQA driver configuration menu.

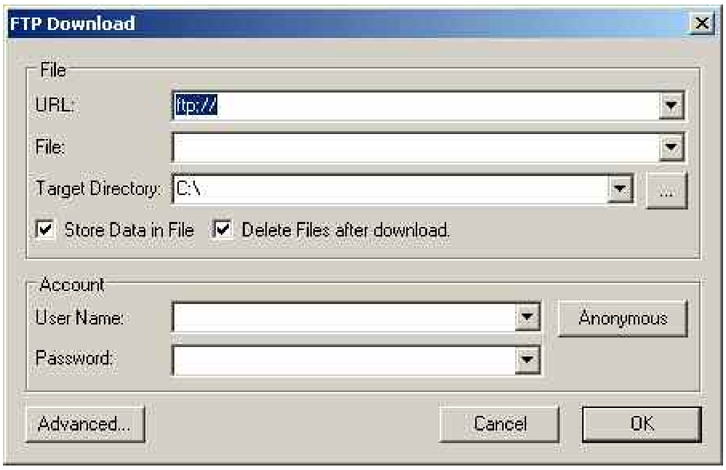


➢ Select the DQA Settings tab and click *Add* to open the list of available jobs. Select an *FTP Download* job.

➢ Double-click the selected FTP Download job or confirm with OK to open the FTP Download configuration menu.

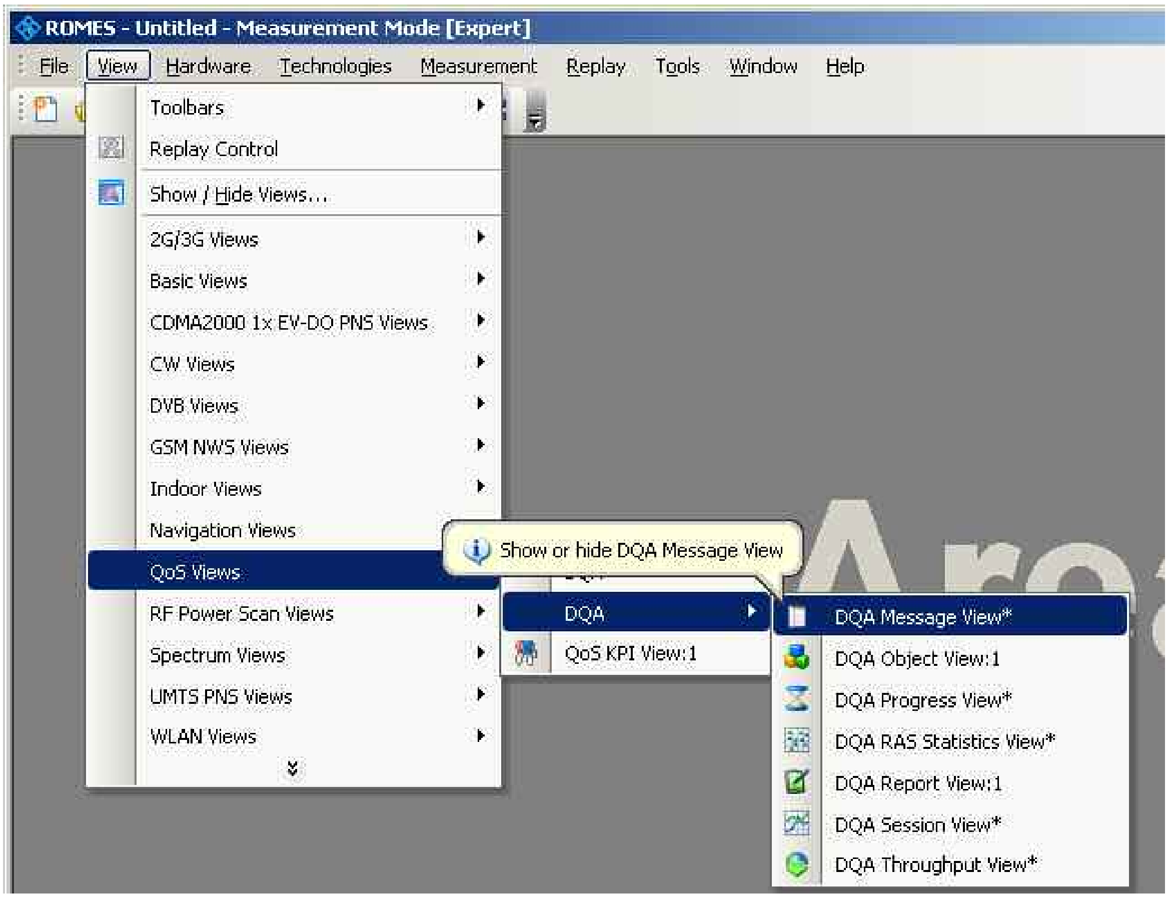


- In the configuration menu, enter the URL of the remote server (IP address as shown in the example or host name) and the name and directory of a file located on the remote server. Complete the settings as shown in the example. If the access is password-protected, specify the user name and password for your account. Open the *Advanced…* settings dialog if needed.



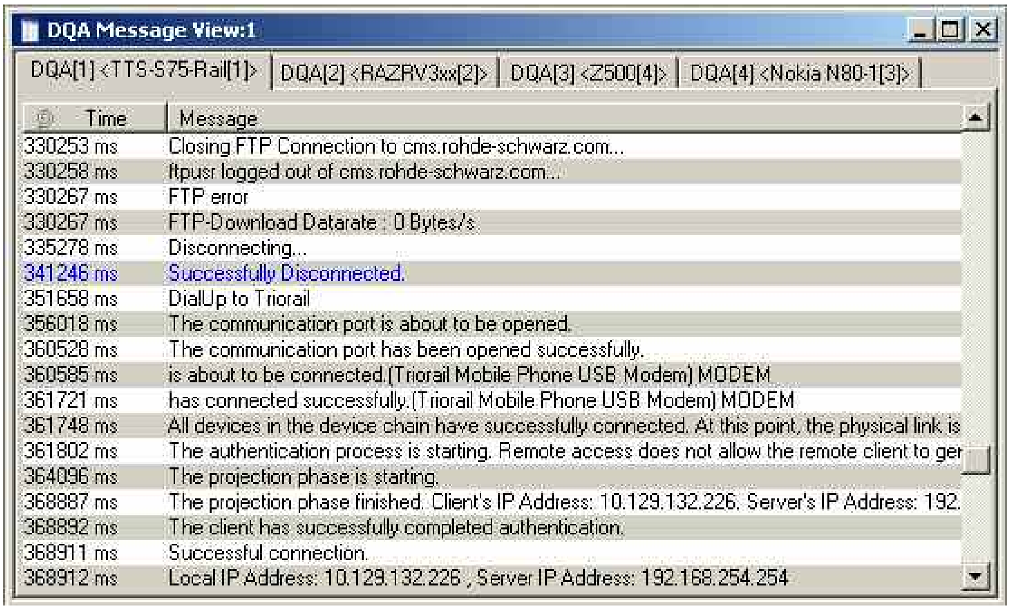
- Press *OK* to confirm your settings, close the *FTP Download* menu and return to the *DQA Settings* tab of the DQA configuration menu. Press *OK* again to close this menu.

- In the *View* menu, select the *QoS Views – DQA – DQA Message View*.



➢ Click the icon to start the DQA measurement.

The *DQA Message View* indicates the progress of the measurement.



The DQA measurement consists of opening the FTP connection to the remote server, downloading the file specified in the *FTP Configuration* menu, and closing the connection without keeping a copy of the downloaded file. As the session continues the job will be executed repeatedly until the DQA measurement is stopped, e.g. by clicking the icon.

UMTS PN Scanner

An UMTS PNS (Pseudo Noise Scanner) measurement consists of performing alternate PN scans and spectrum measurements using the R&S UMTS PN Scanner driver. The driver controls R&S FSP spectrum analyzer, an R&S ESPI test receiver, or an R&S TSMQ/TSMU/TSML-W radio network analyzer. Configuration of the driver is described in detail in chapter 6, section *UMTS PN Scanner Driver.* The *UMTS PNS Views* are described in chapter 4 Display and Evaluation of Results.

In the following examples we suppose that an R&S TSMx is available and properly connected to your PC as described in chapter 6 Hardware Components. The first step for any PN Scan measurement is then to load the driver and set the address of your test device.

To load the driver...

➢ Click the *Hardware* -> Add/Remove …in the menu bar to open the *Load/Unload Drivers* dialog.

➢ In the list of *Available Drivers,* expand the *Network Scanner* section (click the + node) and double-click *TSMx WCDMA.*

➢ Select the desired PN Scanner and click *Select* to load the driver.

➢ Click *OK* to close the *Load/Unload Drivers* dialog.

To set the device address…

➢ In the *Hardware* menu, select the *R&S UMTS PNS[1]* command to open the *R&S UMTS PNS* driver configuration menu.

➢ Click the *Receiver* tab and set the IEC/IEEE bus address (for a connection via IEC/IEEE-bus interface) or IP address (for a connection via Ethernet/LAN interface) of your test device.

Performing a Spectrum Measurement

The spectrum measurement consists of a frequency sweep over a specified range to detect arbitrary UMTS downlink and uplink signals. Like any other R&S ROMES measurement, the spectrum measurement requires to load the hardware driver and set the driver parameters before you can start the measurement and evaluate the results. In the following example we suppose that these steps have been taken as described in section *UMTS PN Scan* on p. 2.8 and that the driver configuration menu is still open.

Measurement task:

Measure the power in the nominal UMTS uplink and downlink bands. Set the test device to provide the maximum amount of data possible and view the downlink and uplink spectrum.

To set the test device parameters...

➢ In the *R&S UMTS PNS* driver configuration menu click the *Measurements* tab and check the settings in the *Uplink* and *Downlink* section of the *Spectrum* panel:

- To repeat the spectrum measurements as quickly as possible, set the *Measurement Rate* to its maximum (20).
- To speed up the individual spectrum measurements, ensure that a *Bandwidth* of 100 kHz is selected.
- In the *Downlink* section, set the *Start* and *Stop* frequencies to 2110 MHz and 2170 MHz, respectively. In the *Uplink* section, set the *Start* and *Stop* frequencies to 1920 MHz and 1980 MHz, respectively.

➢ Click the *Receiver* tab and select one UMTS PN scan frequency in the *Frequency Table.*

The UMTS PN scan frequency is irrelevant for the current measurement task. However, R&S ROMES always performs a combination of spectrum measurements and UMTS PN scans and requires at least one scan frequency to be defined.

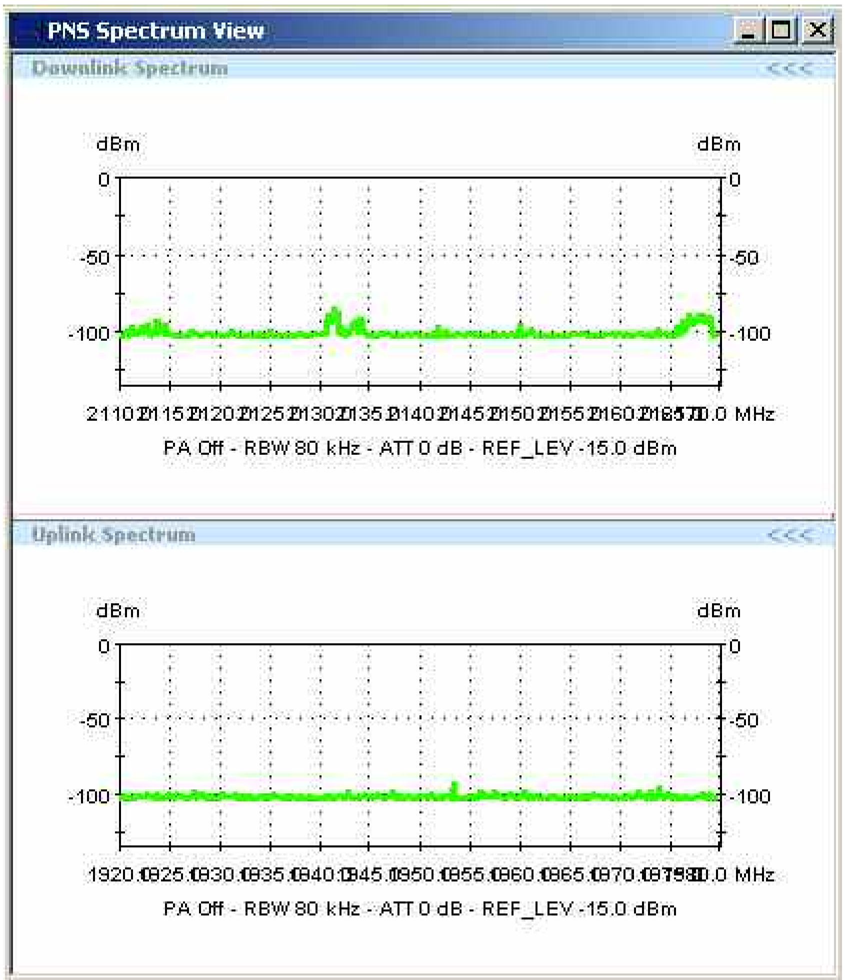
➢ Click *OK* to apply the settings and close the driver configuration menu.

To open the views and perform the measurement...

➢ In the *View* menu, click *UMTS PNS Views – PNS Spectrum View* to open the PNS Spectrum View.

➢ In the *Measurement* menu, click *Start Recording* to initiate the measurement.

As R&S ROMES starts measuring, the downlink and uplink spectrum is displayed in the two sub diagrams of the *PNS Spectrum View.* Below each diagram, the settings at the test device are displayed. With the exception of the resolution bandwidth (RBW) which is identical with the *Bandwidth* set in the driver configuration menu, all parameters are set automatically according to the conditions of the measurement.



To terminate the measurement...

➢ In the *Measurement* menu, click *Stop Recording*.

➢ In the Comment dialog opened, briefly describe your measurement for later evaluations and confirm with OK.

R&S ROMES terminates the measurement. The measurement data including the comment is stored in a measurement file named <current date>-<time>.rscmd, e.g. __2006-07-15_12-36-44.rscmd.

Performing an UMTS PN Scan

In an UMTS PN scan, the test device measures and identifies all UMTS downlink (Node B) signals in the air. The main purpose of this measurement is to test the receiving conditions of a mobile in an UMTS network and to analyze possible interferences. Like any other R&S ROMES measurement, the UMTS PN scan requires to load the hardware driver and set the driver parameters before you can start the measurement and evaluate the results. In the following example we suppose that these steps have been taken as described in section *UMTS PN Scan* on p. 2.8 and that the driver configuration menu is still open.

Measurement task:

Perform a comprehensive analysis of all Node B signals on UTRA ARFCN 10561 that can be received along a measurement tour, including multiple signals caused by reflections (and possible sources of interference). Set the test device to provide the maximum amount of PN scan data possible and operate at maximum speed. View the signals with their power and relative timing.

To set the test device parameters...

➢ In the *R&S UMTS PNS* driver configuration menu click the *Receiver* tab and select the *Frequency* of your selected UMTS network provider (click the checkbox), corresponding to ARFCN 10561. Deselect all other frequencies, if necessary.

➢ Click the *Measurements* tab and check the settings in the *Uplink* and *Downlink* section of the *Spectrum* panel. To repeat the spectrum measurements as rarely as possible, reserving the system resources for the PN scan, set the *Measurement Rate* to its minimum (0.1).

➢ Select *High Speed* in the *Measurement Mode* panel.

➢ To ensure that the system scans all signals, even those that are only received for a short time, set the *Synchronization Rate* to its maximum (20).

➢ To limit the size of the measurement file, reduce the *Update Rate for P-SCH View.*

➢ Click *OK* to apply the settings and close the driver configuration menu.

To open the views and perform the measurement...

➢ In the *View* menu, click *UMTS PNS Views – PNS CPICH View:1* to open the PNS Spectrum View.

➢ In the *Measurement* menu, click *Start Recording* to initiate the measurement.

As R&S ROMES starts measuring, the average power of the P-CPICHs of all received signals with their relative timing is displayed in the *CPICH CIR Chart.* The table below contains a comprehensive list of properties for each measured signal.

To analyze the results...

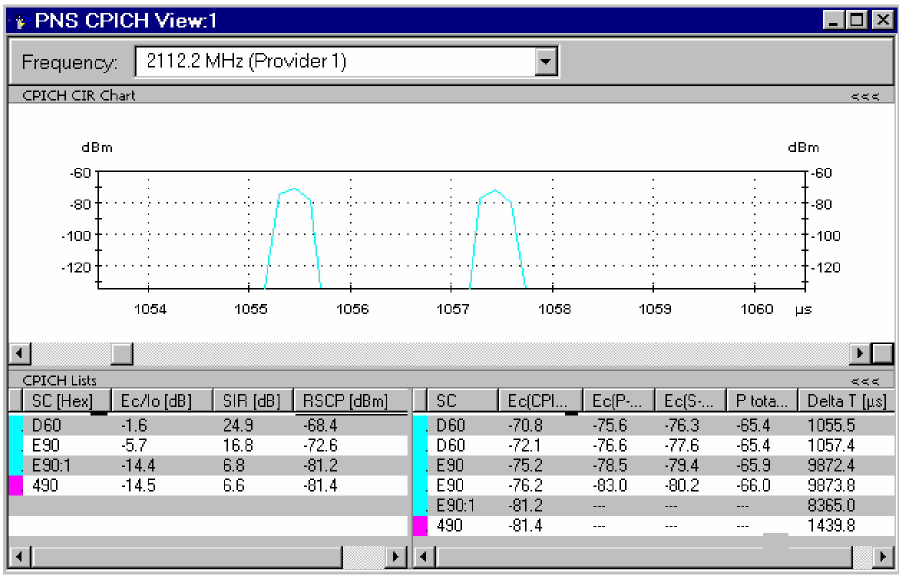
➢ Mark a time delay range in the *CPICH CIR Chart* while the left mouse button is pressed to magnify the diagram in x-direction and separate the different peaks with a common scrambling code.

➢ Right-click on a point inside the view to open the context menu; click *Configure...* to call up the view configuration menu.

➢ Click the *CPICH View* tab to adjust the *Dynamic Range* to the signals in the *CPICH CIR Chart.*

➢ In the *Node B List Columns* and *Peak List Columns* selection tables, deselect the quantities to be omitted in the *CPICH Lists.*

➢ Click *OK* to confirm your settings and close the configuration menu.



To interpret the results...

The figure above shows a typical result of an UMTS PN scan analyzed in the *CPICH View:*

- The *CPICH CIR Chart* shows two reflections with the same scrambling code (SC = D60), i.e. originating from the same Node B, and almost the same signal power, separated by a relative time delay of approx. 2 µs.
- The *CPICH List* shows that the system is currently able to identify signals from 4 different Node Bs. Of these 4 Node Bs, two use the same scrambling codes (namely E90; the signals are labeled E90 and E90:1) but the signals are received at different time delays.
- The signals from the Node Bs using SC = D60 and SC = E90 are each split into 2 reflections.

Some of the signal contributions of SC = E90:1 and SC = 490 are too weak to be accurately received: The left table shows invalid results.

To terminate the measurement...

➢ In the *Measurement* menu, click *Stop Recording*.

➢ In the *Comment* dialog opened, briefly describe your measurement for later evaluations and confirm with *OK*.

R&S ROMES terminates the measurement. The measurement data including the comment is stored in a measurement file named <current date>-<time>.rscmd, e.g. __2006-07-15_12-36-44.rscmd.

Using a Top N Pool

A top N pool contains up to N Node Bs with specific characteristics providing the strongest P-CPICH level at a given position and time. A top N pool can be used in the framework of an UMTS PN scan. It requires loading the hardware driver and setting the driver parameters before you can start the measurement and evaluate the results. In the following example we suppose that these steps have been taken as described in section *UMTS PN Scan* on p. 2.8 and that the driver configuration menu is still open.

Measurement task:

Monitor and compare the properties of the three strongest signals on UTRA ARFCN 10561 along a measurement tour as accurately as possible, discarding the information about all other signals.

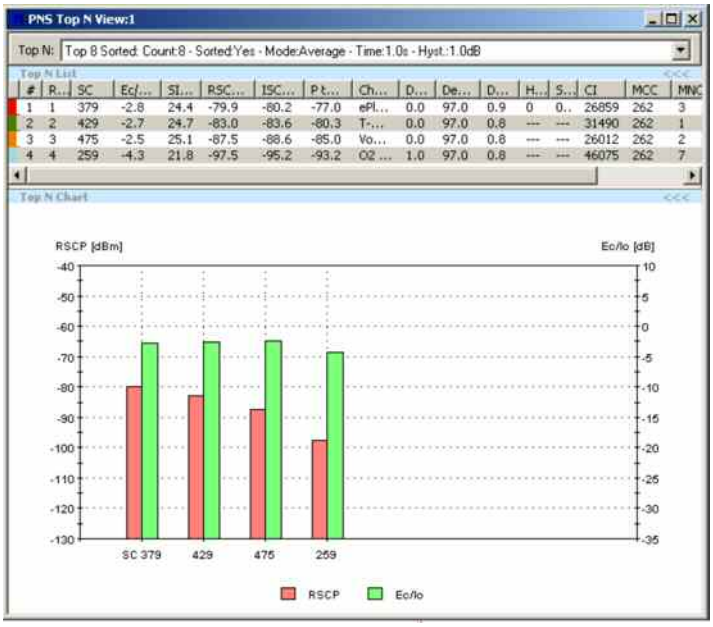
To set the test device parameters...

- In the *R&S UMTS PNS* driver configuration menu click the *Receiver* tab and select a valid UMTS provider frequency (in this example: 2112.2 MHz, corresponding to ARFCN 10561). Deselect all other frequencies, if any of them are checked.
- Click the *Measurements* tab and check the settings in the *Uplink* and *Downlink* section of the *Spectrum* panel. To repeat the spectrum measurements as rarely as possible, reserving the system resources for the PN scan, set the *Measurement Rate* to its minimum (0.1).
- Select *High Dynamic* in the *Measurement Mode* panel.
- To improve the system performance, set the *Synchronization Rate* to a rather small value, e.g. 0.1.
- To limit the size of the measurement file, reduce the *Update Rate for P-SCH View.*
- Select the *Top N* tab and click the *Add* button to generate a customized top N pool:
  - In the *Count* select field, limit the number of Node Bs that are member of the pool to 3.
  - Uncheck the *Sort* box to ensure that the pool members keep their rank within the pool until they are replaced by a new pool member.
- Click *OK* twice to confirm the settings and close the driver configuration menu.

To open the views and perform the measurement...

- In the *View* menu, click *UMTS PNS Views – PNS Top N View:1* to open the PNS Top N View.
- In the *Measurement* menu, click *Start Recording* to initiate the measurement.

As R&S ROMES starts measuring, the *Top N Chart* displays the Received Signal Code Power (RSCP) and the average Ec/Io of the P-CPICHs of the four top N signals. The table above contains a comprehensive list of properties for the four top N signals.



To analyze the results further ...

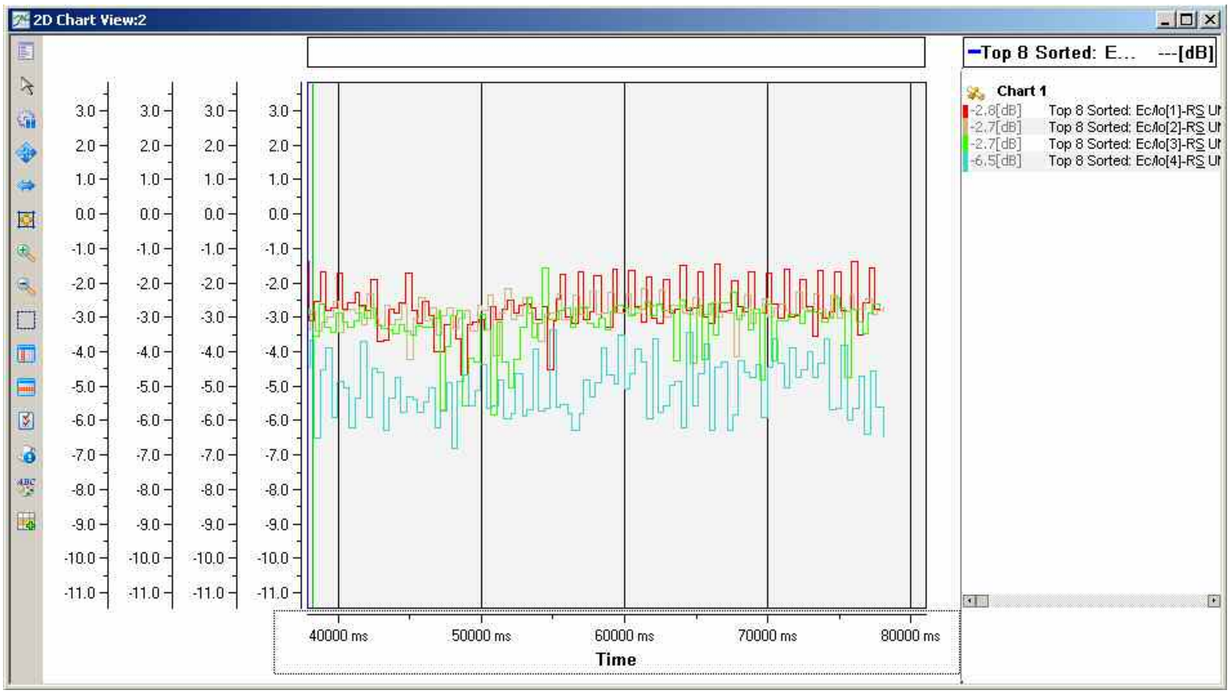
Besides the UMTS PNS views you can also use other R&S ROMES views to analyze the results of an UMTS PN scan. We pick just one example, plotting the average Ec/Io of the four top N signals as a function of the time.

➢ In the *View* menu, click *Basic Views – 2D Chart View* to open a *2D Chart View*.

➢ Right-click inside the view and select *Configure...* to open the configuration menu. In the *Values* tab expand the data tree and select the signals *Top 8 Sorted: Ec/Io[1], Top 8 Sorted: Ec/Io[2], Top 8 Sorted: Ec/Io[3]* and *Top 8 Sorted: Ec/Io[4]* to be displayed.

➢ Click *OK* to confirm the selection and close the configuration menu.

The *2D Chart View* displays the four top N signals as a function of time. In the figure below the broad line, corresponding to *Top 3: Avg. Ec/Io[1]* is not always the strongest signal, which is due to the fact that the considered pool is unsorted.



To terminate the measurement...

- ➢ In the *Measurement* menu, click *Stop Recording*.
- ➢ In the *Comment* dialog opened, briefly describe your measurement for later evaluations and confirm with *OK*.

R&S ROMES terminates the measurement. The measurement data including the comment is stored in a measurement file named <current date>-<time>.rscmd, e.g. __2006-07-15_12-36-44.rscmd.

Contents

3 User Interface

This chapter describes R&S ROMES interface elements and their use. When the program is started, it opens the main window with all its working components. These components will activate depending on the loaded workspace.

Menus and Commands

The R&S ROMES main application window consists of the main elements listed below.

Tools to configure the different active elements of the main window and the views are provided in the *View Menu* on p. 3.24 ff.

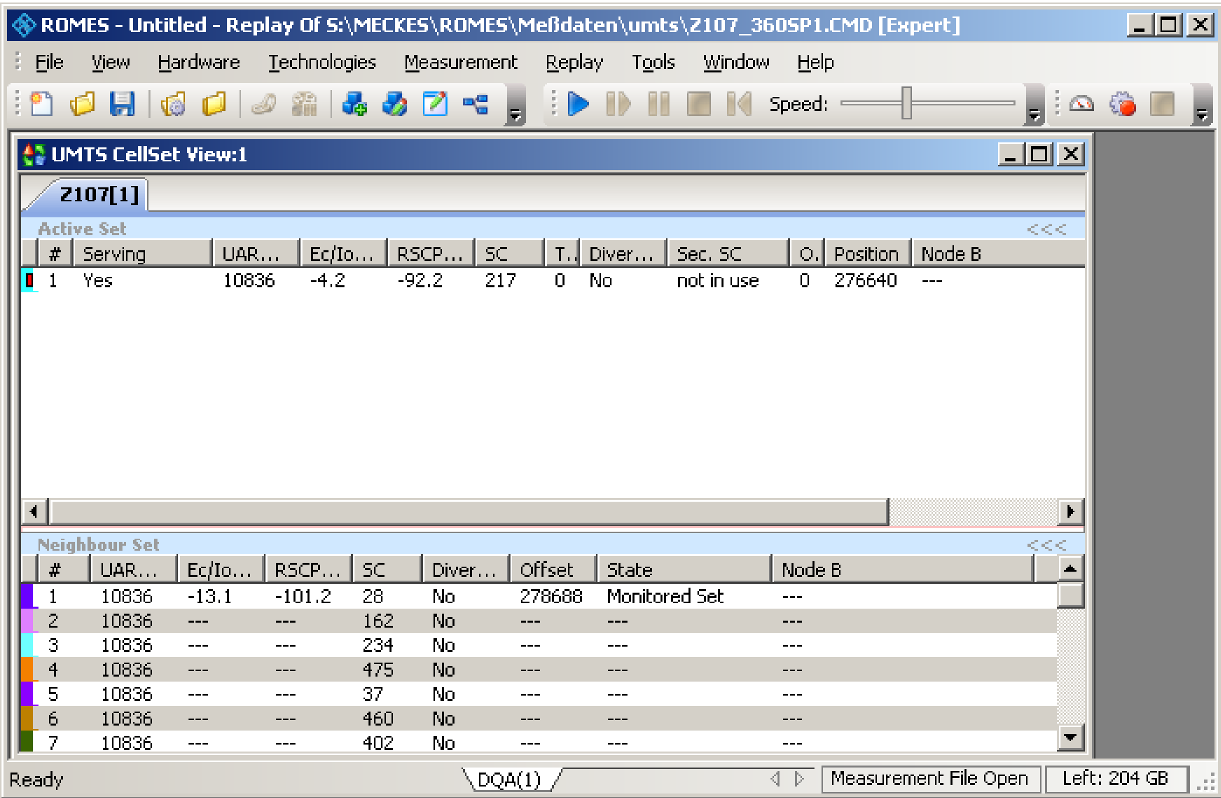


Fig. 3–1 R&S ROMES main window

Menu Bar

Below the title bar along the top of the screen, the program displays a menu bar with a variety of menu titles. Selecting a command from one of these menus either performs an action or displays a submenu or dialog. The menus – including dialogs that call for an explanation – are described in the following sections in this chapter.

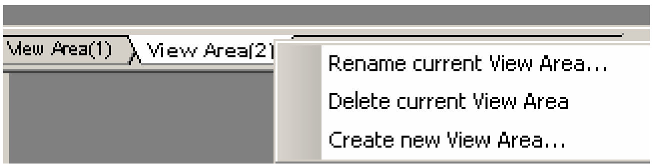
Toolbar / Measurement bar

Directly below the menu bar is a bar with an array of buttons that provide access to the most commonly-used commands. The left part of the bar is to access the functions in the *File* and *Help* menu *(Toolbar);* the right part controls a *Measurement*. Toolbar and Measurement bar can be hidden or displayed separately; see *View Menu* on p. 3.24 ff.

View Area

When the program is started with default settings, the view area within the program window is empty (except for the *view area* name displayed in the center) and may be filled with one or several views (see *View Menu* on p. 3.24 ff.). One of the views is always active and displayed with a highlighted title bar so it is possible to customize the view and work with it.

The view area can be divided into different superimposed view areas in order to gain more space and arrange the views in different groups. Each view area has a name and is accessible by clicking the associated tab in the status bar below the view area. A right-click on one of the tabs opens a context menu with self-explanatory entries:



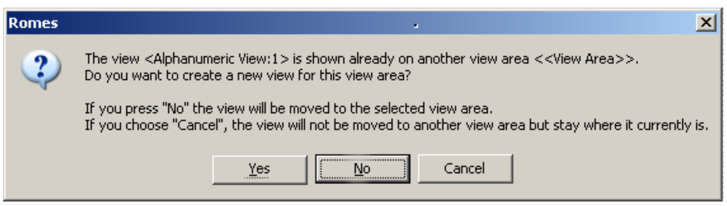
(Complete list of views, see section *View Menu* on p. 3.24 ff.)

Moving views between different view areas
Suppose that a view area contains a view of a view type that can be opened several times (e.g. the UMTS CellSet View:1 shown below*).*

➢ To move the view from the current area to a target area, use one of the following methods:

- Right-click the view and click *Move to – <Target View Area>* in the context menu.

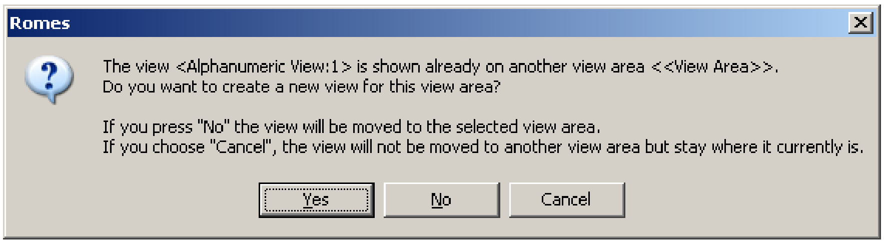
- Open the target view area and select the view type (e.g. *Alphanumeric View:1)* in the *View* menu. In the message box opened, click *No*.



➢ To create a new view of the same type (e.g. *Alphanumeric View:2)* in another view area, use one of the following methods:

- Right-click the existing view to open the context menu, click *New View*, then move the new view to the target view area.

- Open the target view area and select the view type (e.g. *Alphanumeric View:1)* in the *View* menu. In the message box opened, click *Yes*.



Saving and loading view areas
You can save your view area with all views and their settings to a file and re-use it in a later session. You can also save one or more default view areas that will be loaded automatically when R&S ROMES is started; see *View Areas on p.3.30.*

Tools for configuring the different working elements of the main window and the views are provided in the *Window Menu* (see p .3.129 ff.).

Title bar

Menu bar

Toolbar and Measurement bar

Work area with active view, divided into several view areas

Status bar

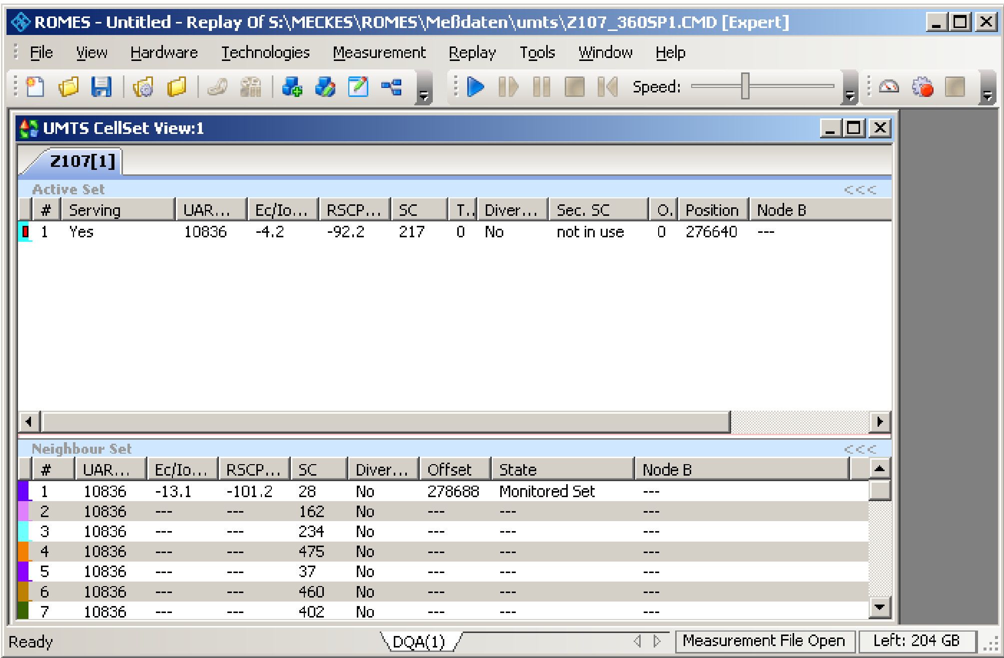
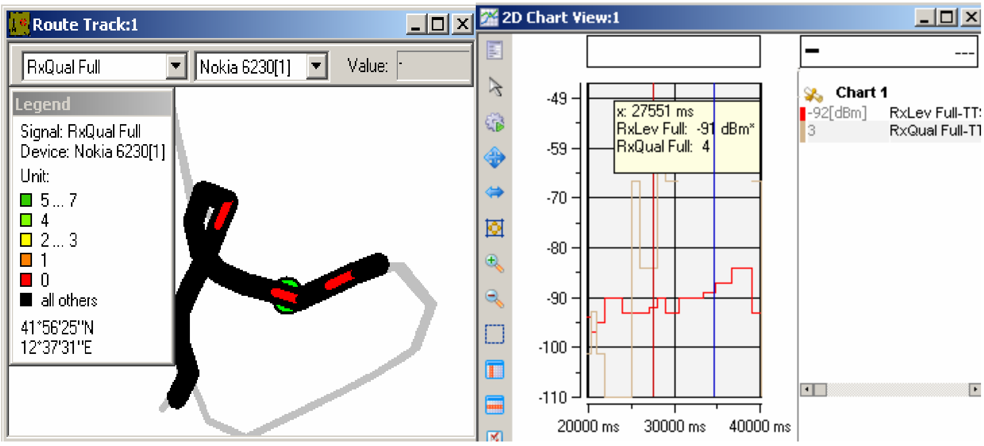


Fig. 3–2 R&S ROMES view window

Coupled Focus

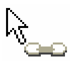
Many views provide graphical tools to highlight special areas and read a particular result. Examples are the marker line and the info field for the *2D Chart View* and the circular focus in the *Route Track* view shown below. The focus in several views can be coupled, which makes it easier to analyze different aspects of a coverage measurement at a particular position using a set of appropriate views.

In the example below, a local maximum of the *RxLevFull* reported by the test mobile is located in the *2D Chart View,* and the value (41) is read. The *Route Track* view shows the corresponding geographical position.



The following tools control the coupled focus:

- *Alt* plus a double-click inside a view activates the coupled focus.

  The cursor changes to . Views without focus indicate *not synchronized.*

- The mouse cursor or the arrow keys move the focus within the view. To obtain different step widths you can combine the arrow keys with the *<SHIFT>* and the *<CTRL>* keys.

- The *Coupled Focus* settings in the *Preferences* dialog (see p. 3.85 ff.) specify which views are synchronized if the coupled focus is active and define the effect of the arrow keys.

- The *Release Coupled Focus* button  in the measurement bar or (equivalently) the menu command *Measurement – Release Coupled Focus* releases the coupled focus.

If no coupled focus is available for a view, the message <<*not synchronized*>> is displayed in the title bar, e.g.:

Menus and Commands

R&S ROMES provides nine menus opened by clicking one of the items in the menu bar on top of the main application window. The menus are used to access the functions and windows configuring and controlling the measurement and evaluation of results:

File Menu
: Opens and saves workspace and measurement files, exports and prints data and closes the application.

View Menu
: Customizes the main application window and offers the view windows used to visualize and evaluate measured data.

Hardware Menu
: Installs the hardware drivers necessary for a measurement.

Technologies Menu
: Displays information on the installed technology modules. For several technologies the menu contains particular configuration panels.

Measurement Menu
: Starts and stops a measurement and displays the list of event settings.

Replay Menu
: Starts and stops the replay of a measurement file and allows setting device filters.

Tools Menu
: Customize the displays and defines directories for the different types of files used by the measurement system. Furthermore it customizes the internal database for GSM/UMTS data and Carrier to Interference (C/I) analysis.

Window Menu
: Arranges and handles the different view windows.

Help Menu
: Provides online help and general information on the coverage measurement system.

File Menu

The *File* menu opens and saves workspace and measurement files, exports and prints data and closes the application.

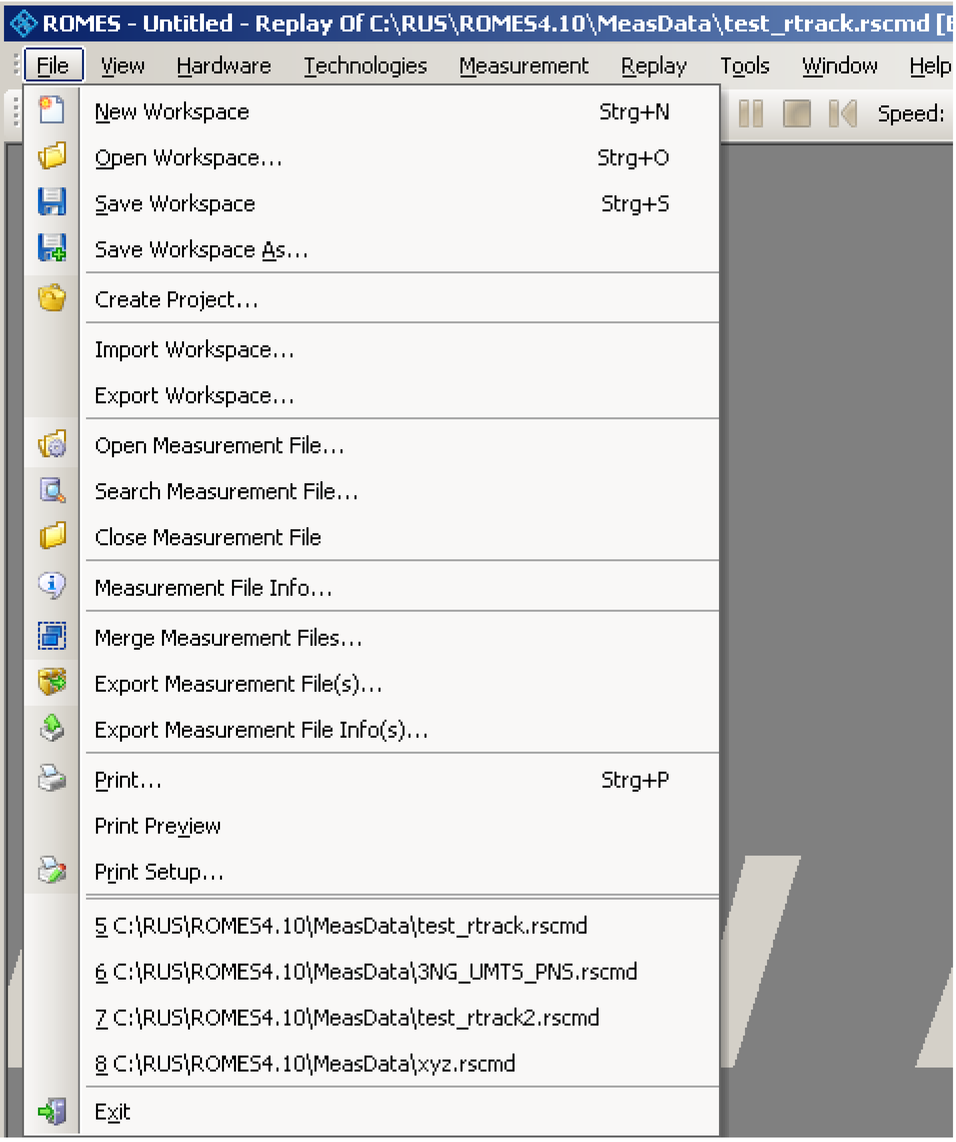


Fig. 3–3 File menu

New Workspace

Ctrl+N

Creates a new workspace.

A workspace contains the device driver and screen settings for a R&S ROMES session, including the type, size, and position of all opened view windows, parameter types to be viewed in each view type (if applicable), and a bitmap archive for *Route Track Views*, if defined. A workspace must contain at least one view of every type. Data to be viewed are not part of the workspace.

The workspace opened when R&S ROMES is started depends on the setting in the *General* tab of the *Preferences* menu. R&S ROMES uses either the last workspace used in the previous session or the following default workspace: a view window of each type is opened, all windows are tiled across the main window. The main application window size of the previous session is preserved.

User-defined workspaces can be stored to a workspace file <filename>.rsxks and recalled in later sessions. So, for each kind of measurement the matching control windows can be easily set, and each operator can save and reuse his favorite constellations.

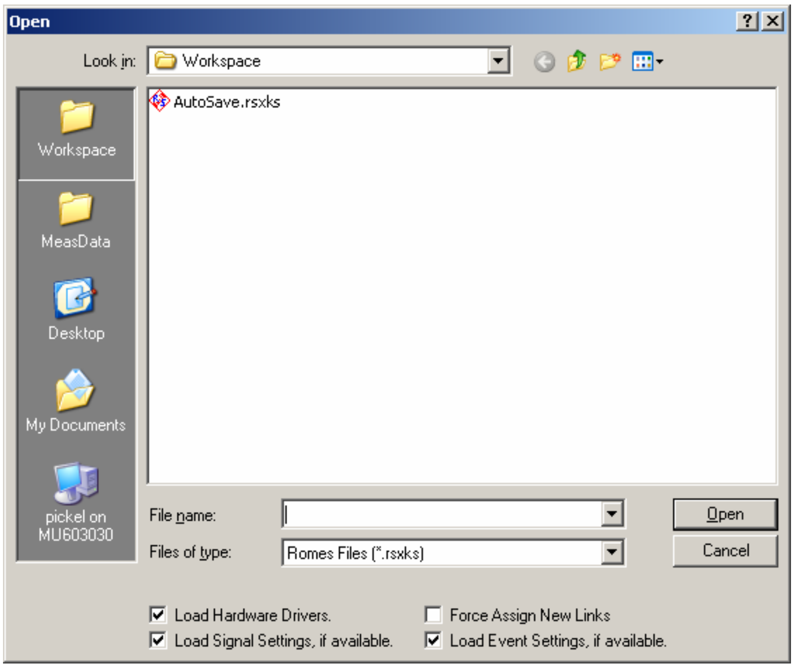
For a definition of the workspace see chapter 1.

Open Workspace

Ctrl+O

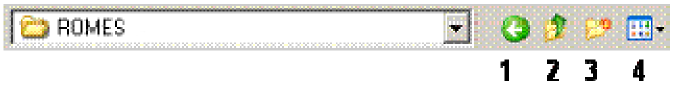
Loads an existing workspace from an *.rsxks or a *.rscmd file.

The *Open* command calls up the *Open* dialog box.



Look in:

The *Look in:* pull-down directory window is used to search the directories accessible from your computer for workspace files.



The icons at the right side of the pull-down window form a simple file manager:

1 Go to last visited folder

2 Move up one level in the directory tree

3 Create a new directory

4 Show directory and file list as thumbnails, tiles, icons, list, or as detailed list

Files and directories may be selected and deleted using the *Delete* key of your keyboard.

File list

The file list shows all files within the current directory with the extension (*.rsxks or *.rscmd) selected under *Files of type* .

➢ Click one of the files in the list to enter it in the *File name* window.

File name:

A file selected from the file list is entered in this field. Alternatively, a file name may be entered manually.

The *Open* button opens and loads a workspace. Equivalently, a workspace file may be double-clicked in the file list.

The *Cancel* button discards the file selection.

Open button:

The *Open* button opens and loads a workspace. Equivalently, a workspace file may be double-clicked in the file list.

During the workspace loading process, R&S ROMES checks for the availability of the associated files. R&S ROMES will search for all files not found at the specified location, within the R&S ROMES directory. The resulting dialog pops up with a list of these files. The user can opt to use the proposed files, or browse manually for the new location of the file.

Cancel button:

The *Cancel* button discards the file selection.

Files of type:

Only files of the type selected in this field will be shown in the file list. The following file types may be selected:

Workspace files (*.rsxks)
Standard workspace file type, contains the workspace but no measurement data.

Measurement files (*.rscmd)
Measurement file created with an R&S ROMES version ≥ 3NG containing the workspace at the time when the file was recorded *(Start Recording)*.

All workspaces and templates created with R&S ROMES 3NG Rev.1 SP1 or higher contain the name of the device, with which the setup was created. If a template was created with another device than currently connected to the corresponding R&S ROMES driver, a warning will pop up. Some drivers (Qualcomm, Nokia) will also check for the device, and if it is not connected a warning is displayed during the loading of the workspace.

Load Hardware Drivers

A workspace can be loaded with or without the hardware drivers required for the measurement. Loading without hardware drivers is faster and sufficient, e.g. for replay sessions.

Force Assign New Links

An additional option in the load workspace file dialog allows the user specifying new physical driver links for each device during the load process. This is helpful, if the workspace was transferred from another computer with other physical driver link.

An example: A field setup of R&S ROMES has a Sagem x6 connected to COM 3 and GPS is connected to COM 5. The related workspace is copied to another R&S ROMES system where the Sagem driver is mapped to COM 2 and GPS is connected to COM 1, causing a loading failure of the drivers. Up to R&S ROMES V3.60 the loading of the drivers had to be cancelled, which was very tedious for mobiles with custom settings.

Now only the new link (the COM port) is changed and the workspace is loaded completely.

Load Signal Settings, if available

Once checked, the available signal settings for the workspace are loaded.

Load Event Settings, if available

Once checked, the available event settings for the workspace are loaded.

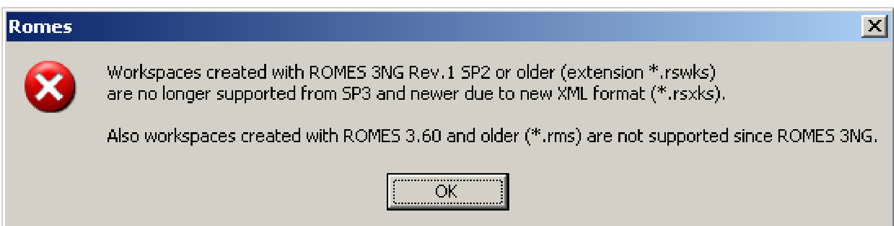
As only one workspace configuration can be active at one time, the current workspace is closed before a new one is opened. Before closing the workspace, R&S ROMES displays a message:

- The *Yes* button saves changes and closes the current configuration.
- The *No* button closes the current configuration without saving.
- The *Cancel* buttons returns to the current configuration.

Notes on older workspace files:

*The *.rms and *.rsxwks workspace files of measurement software versions 3.0 to 3NG Rev.1 SP2 cannot be used in newer R&S ROMES versions as their format is completely different.*

If an old workspace (.rms and *.rsxwks) is loaded into* R&S ROMES*, the system responds with an error message.*



Save Workspace

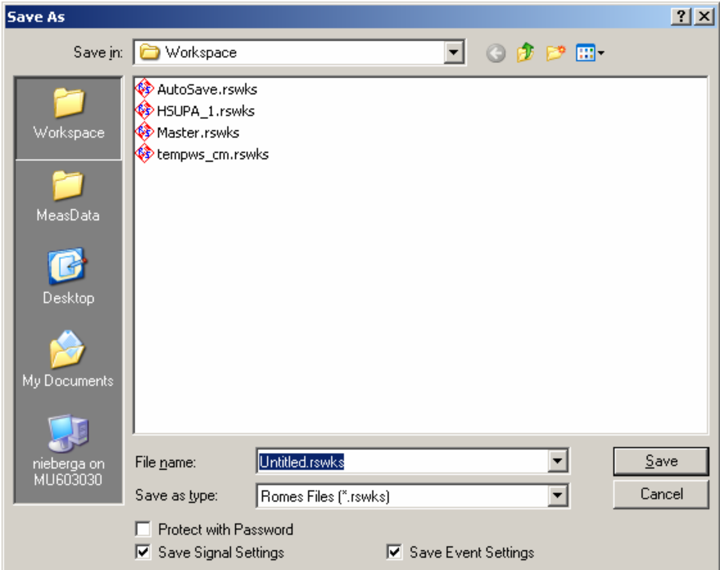
Ctrl+S

Save a workspace file with its current name.

Save Workspace As...

Save a workspace file with a new name and directory.

The *Save Workspace As...* command calls up the *Save As...* dialog.



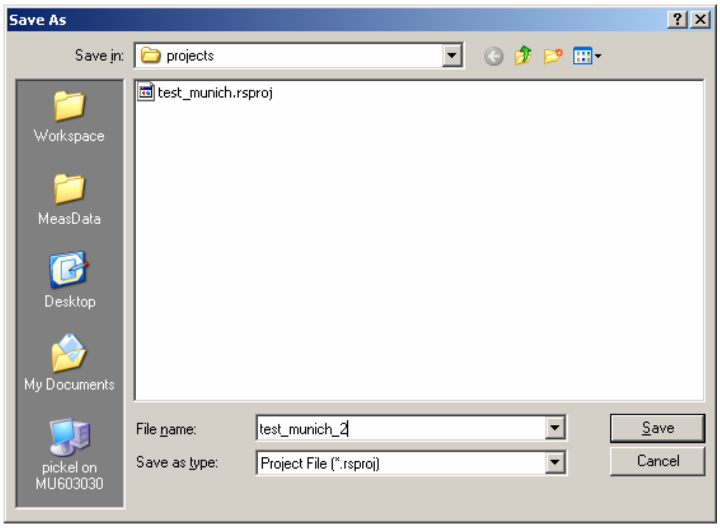
This dialog is analogous to the *Open* dialog, see above.

➢ Choose a file name with the extension *.rsxks and a directory of your choice to save the current workspace for later use. If a file name is entered manually without extension, *.rsxks is appended automatically.

Create Project

To create an R&S ROMES Project, just configure R&S ROMES for your task. Load all drivers and open all views, which are necessary. Then create the project and choose a location where to put the Project File. R&S ROMES will automatically create a Project file (*.rsproj), which contains:

- All loaded drivers
- All views which are open on any View Area
- All technologies, which are used by the loaded drivers



Note:

If only a subset of views, technologies and drivers shall be available in the R&S ROMES, then such a setup can be created using the "Create Project" action in the File menu. Such a project reduces the amount of modules that ROMES loads during startup, therefore minimizing the overall startup time and the complexity of the menus/dialog filled with information regarding such modules.

Import / Export Workspace

R&S ROMES allows the creation of a *.zip file containing the Workspace and all related files.

The exported workspace always contains the complete R&S ROMES signal description.

The import will create a new directory which has the name of the zip file. In this directory the workspace *.rsxks will be stored. All files located in the R&S ROMES directory branch will be stored at the same file location on the target system. All other files will be copied into subdirectories in the created workspace directory.

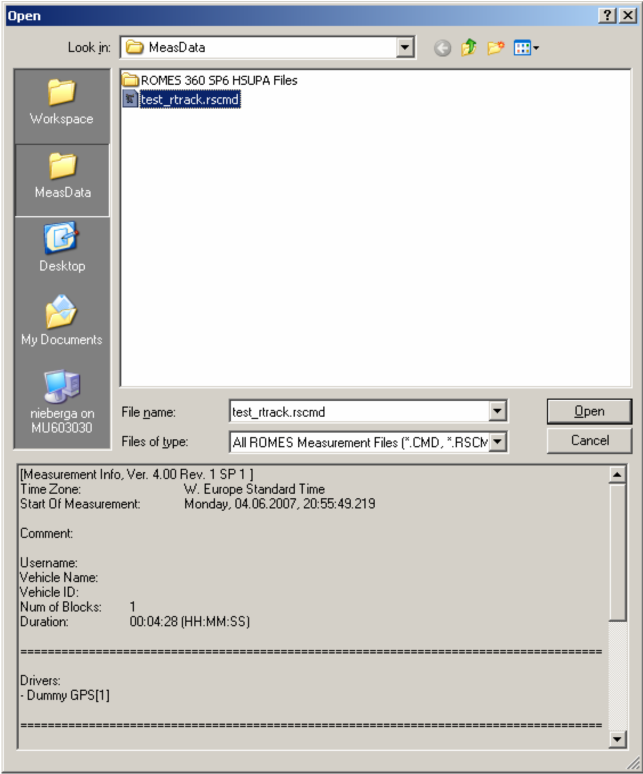
Open Measurement File...

Ctrl+S

Open a new measurement file.

The currently open measurement file is replayed when the *Start Replay* command in the *Measurement* menu (p. 3.66 ff.) is executed. It is also used as a default file to be exported (see *Export Measurement File* command below).

The *Open Measurement File...* command calls up an extended *Open* dialog.



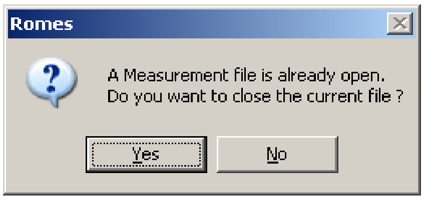
The upper part of the menu is analogous to the dialog used to open a workspace file (see above, *Open* command *Open Workspace*).

Files of type

Only files of the type selected in this field will be shown in the file list. The following file types may be selected:

- Measurement files R&S ROMES 3NG and 4 (*.rscmd)
- Measurement files R&S ROMES 3 and before (*.cmd)

Only one measurement file can be open at one time. If the *Open Measurement File* command is used while a measurement file is open, R&S ROMES prompts with a message:



➢ Click Yes to close the current workspace and open the selected one.

➢ Click No to return to the current measurement menu.

Open as read-only

If the *Open as read-only* switch is checked, the measurement file opened is protected so that the file contents can not be overwritten.

File Info

In the lower half of the *File Open* dialog, information stored with the measurement data of the selected file is displayed. See description of Measurement File Info command below.

File scan

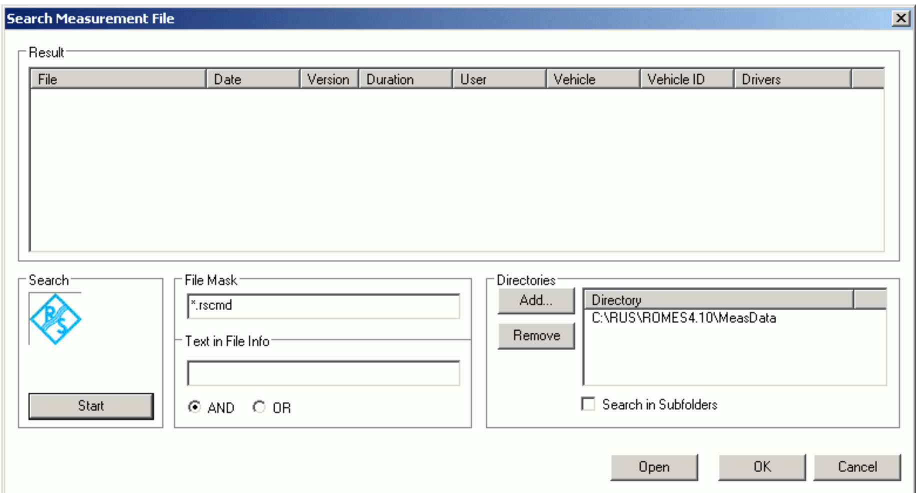
When opening a measurement file, R&S ROMES automatically scans the data, sorting the timestamps and extracting geographical information. After the scan, the entire measurement route can be displayed in the *Route Track* view.

To disable the file scan, you can either press the *Ctrl* key while opening the file or disable measurement file scanning in the *General* tab of the *Preferences* menu (see section *General Settings* on p. 3.76 ff.). This can be necessary for older measurement files recorded with TS51-K1 or TS55-K1.

Search Measurement File...

Search for a particular measurement file stored on your file system.

Search Measurement File... calls up a dialog.



The dialog is subdivided into three different panels:

Result

Contains a list of all measurement files in the selected *Directories,* meeting the search criteria defined in *Search in File Header.*

File Mask

Defines search criteria to find a particular file from an extensive list. The following criteria are provided:

A condition for the file name *(File Mask)*

A condition for *Text* stored in the *File Info,* complemented by a logical condition for the text elements/words *(AND* for a file info containing all words, *OR* for a file info containing at least one of the words).

Directories

Contains a list of all search directories, adds and removes directories. The checkbox provides a decision whether or not to include all subfolders of the selected directory in the search.

Open & Close

Closes the current measurement file, if applicable, and opens the selected measurement file from the search result.

Searching a file

To search a measurement file proceed as follows:

- In the *Directories* panel, click *Add* to open a *Browse for Folder* dialog and select the directory for your measurement files.
- Specify whether R&S ROMES should also search the subfolders of the selected directory.
- Click Start.
- If the result list is too long, specify a file mask or a search text in the file info and repeat the search.
- Right click a measurement file in the list to display the *File Info,* double click to open it; see *Open Measurement File...* on p. 3.12.

Close Measurement File...

Close the current measurement file.

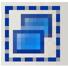
Measurement File Info

Display the file information of the current measurement file.

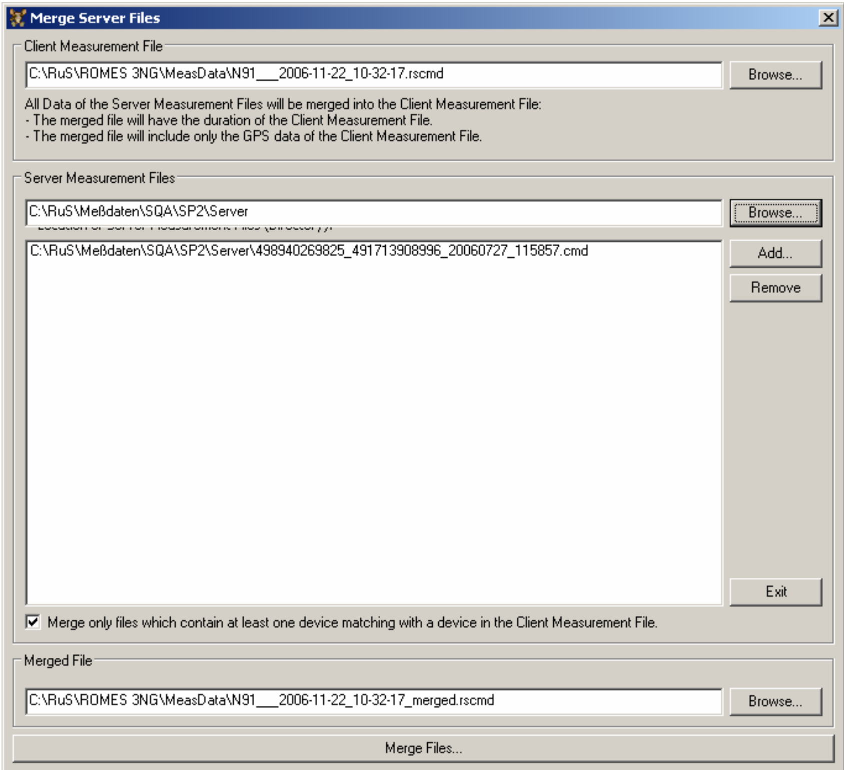
The file information is identical with the information displayed when a measurement file is opened (see above, *Open Measurement File* command). It includes:

- Date and time of the measurement.
- A user-defined comment.
- User name, vehicle type and ID, the file length in blocks, and the duration of the measurement.
- The drivers used and the most important driver settings made before the measurement was started (see chapter 6). Driver settings such as the Meas. Mode of a mobile or the frequency and trigger settings of a test receiver are essential for the type of data recorded and the available views.
- Uplink Interference information in the BCH Demodulator part. These lines are omitted, if “Uplink Interference Measurement” has not been selected.

Merge Measurement Files...



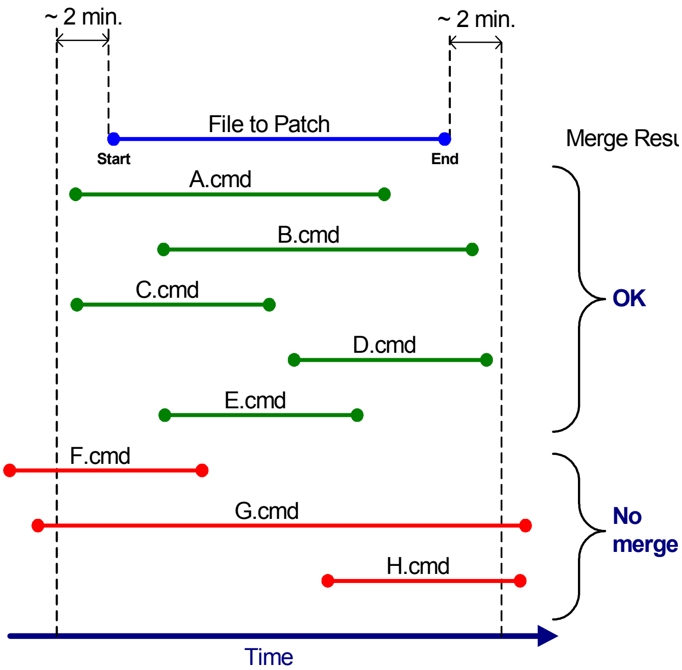
The *Merge Measurement Files...* function is available for speech quality measurements (SQA), where uplink and downlink data is measured simultaneously on separate hosts (stationary server for test data generation, and receiving mobile). The resulting client and server-side measurement files can be merged using the *Merge Server Files* dialog.



The buttons on the right side of the dialog control the file merger:

Command	Description
Client Measurement File...	Open a selection dialog window for the first measurement file to be merged. This file contains the GPS and time-related data, which defines the location(s) and the master time frame for all associated files to be merged.
Server Measurement Files...	Open a selection dialog window for the directory of the next measurement file.
Add	Show the available measurement files in the specified directory of the *Directory Server Files*. Note that the file to be merged with the *Input Files* must be within a similar time frame, otherwise the merger is refused with the following error message:

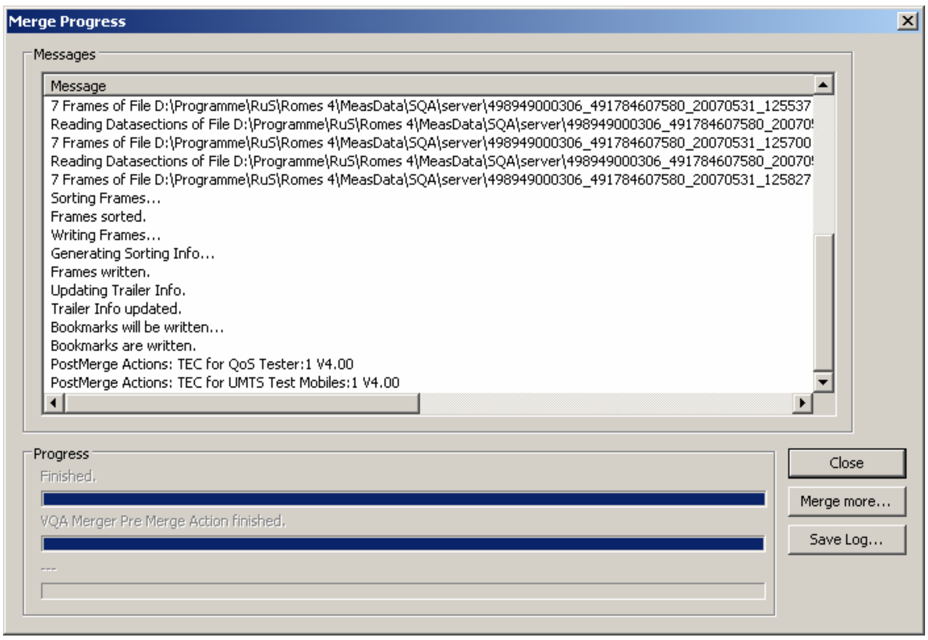
The allowed time frames of the measurement files for merges are shown in the following diagram:



Remove
: Remove the previously selected measurement file from the list box.

Merge Files...
: Perform the file merge of the selected measurement files (the button becomes active when all required merge file information is provided, otherwise it is grayed).

The progress of the file merger is displayed in a separate *Merge Progress* dialog, along with the log of the merge:



	Once the measurement file merger is completed, the dialog offers: • *Close* button, which closes the dialogs related to the file merger, • Merge more... button, which returns to the *Merge Server Files* dialog, and • *Save Log...* button, which opens a *Save File* dialog to define a name and storage location for the file merge log.
Merged Files - Browse ...	Browse for Target File: Open a dialog window for the target file name and storage directory.

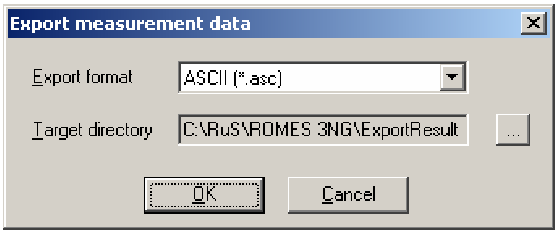
Please note that only the time frame of the files to be merged is checked for plausibility and that this function is only intended for SQA measurements. All kinds of other measurement data combinations within the merged files are possible, but not necessarily useful.

An example: It is not possible to activate more than one UMTS PNS TSMU driver at a time, which is the basis for multiple UMTS views. Now if two measurements are performed simultaneously with two different R&S TSMU drivers and the resulting measurement files are merged, then the R&S ROMES system replaying the merged file has a very high probability to hang or terminate.

Export Measurement File ...

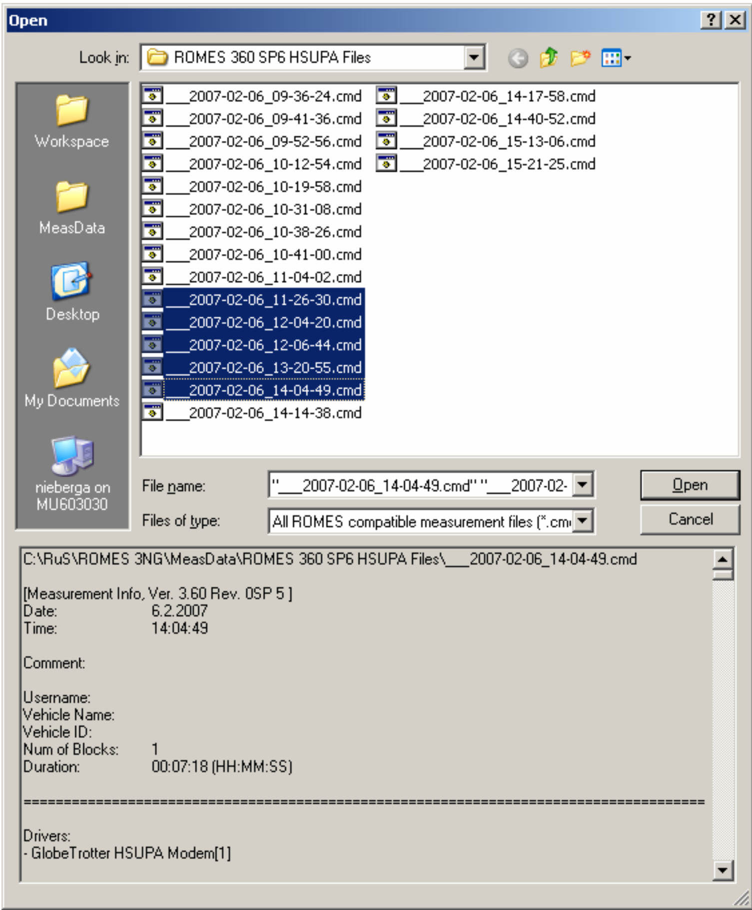
Export and save measurement data for later evaluation, e.g. with another application.

➢ The *Export Measurement File Info(s)* command first opens a dialog to select the export format and the target directory:

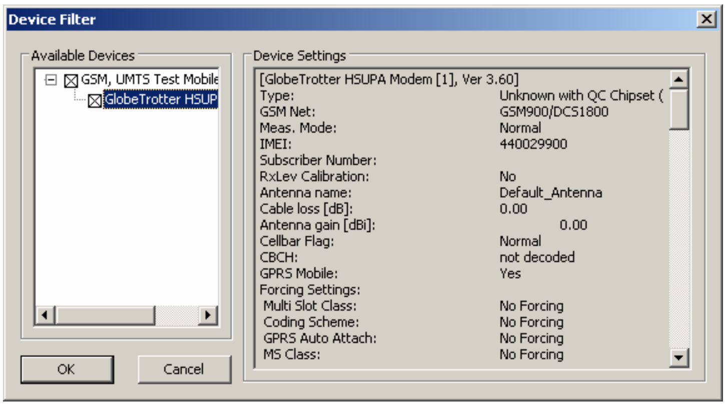


The measurement data may be stored to a file in a *target directory* and with one of the *export formats* offered. For more information on data export and the corresponding file formats exporting refer to chapter *7 Data Processing*.

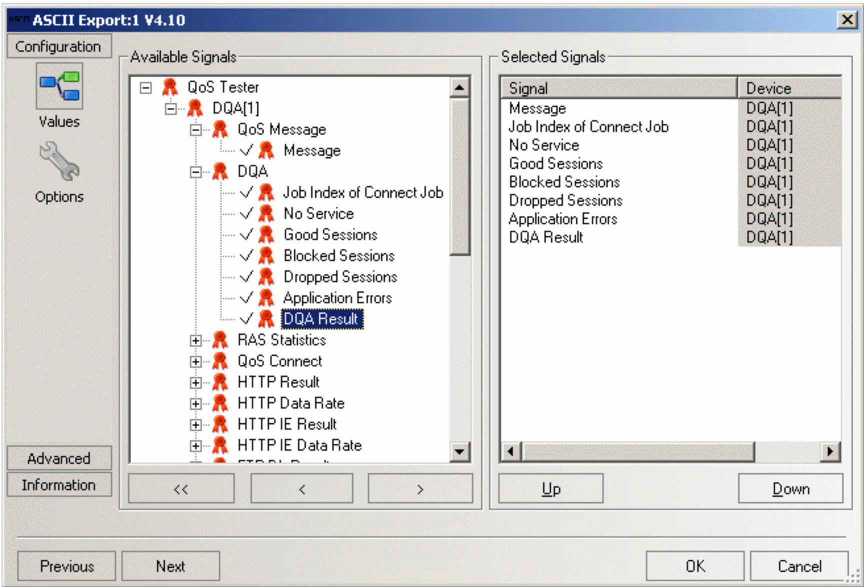
➢ When the export format and target directory is selected, a file *Open* dialog to select the measurement files for export is shown:



- After the measurement files are selected, a Device Filter dialog is displayed (only if several measurement devices are detected).



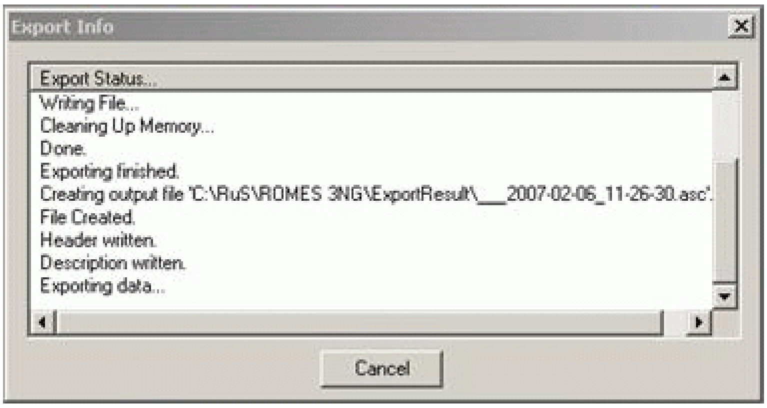
- Once the device(s) to be exported are selected, the related signals to be exported must be selected.



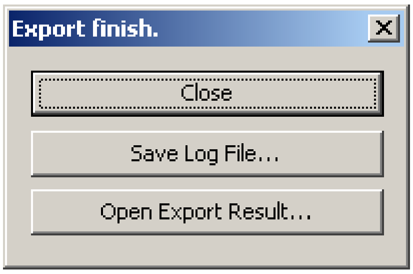
The signal selection has to be repeated for each of the selected measurement files, which is done analogous to the measurement signal selection described in section Signal Configuration on p. 3.78.

Additional information is available in chapter 7.

➢ The progress of the current export is shown as a bar graph in the status line of the workspace and relevant status messages are displayed in the Export Info dialog.



➢ When all selected measurement file are successfully exported, the following dialog is displayed.



Close finishes the export dialog windows and returns to the workspace.

Save Log File... opens a *Save* file dialog where the contents of the *Export Info* dialog can be stored in a file.

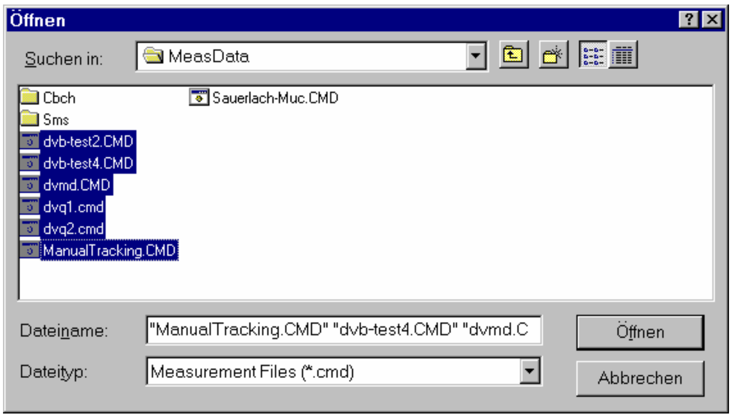
Open Export Result opens the export result file(s) in an ASCII text editor, where the results can be viewed and modified, if needed. When the text editor is closed, the user is returned to the workspace.

Export Measurement File Info(s)

Write the file information of several measurement files to a single text file.

The file information is identical with the information displayed when a measurement file is opened (see above, *Measurement File Info* command). It is exported in two steps:

➢ The *Export Measurement File Info(s)* command opens a file *Open* dialog to select the measurement files:



➢ After file selection, the *Open* button calls up a *Save As...* dialog to select a file name (*.txt) and a directory for the file information.

In the *.txt file, the file information of the individual files form separate consecutive sections. Each section starts with the name and path of the measurement file, e.g.:

************`D:\RuS\Romes\MeasData\dvb-test4.CMD`**********

If an R&S ROMES measurement file is exported, the file extension is *.rscmd, older measurement files keep the *.cmd extension.

The text file can be regarded as a catalog providing an overview of a whole archive of measurement files. If it is viewed with a suitable text editor using functionality such as the text search function.

Print...

 Ctrl + P

Print the contents of the active view.

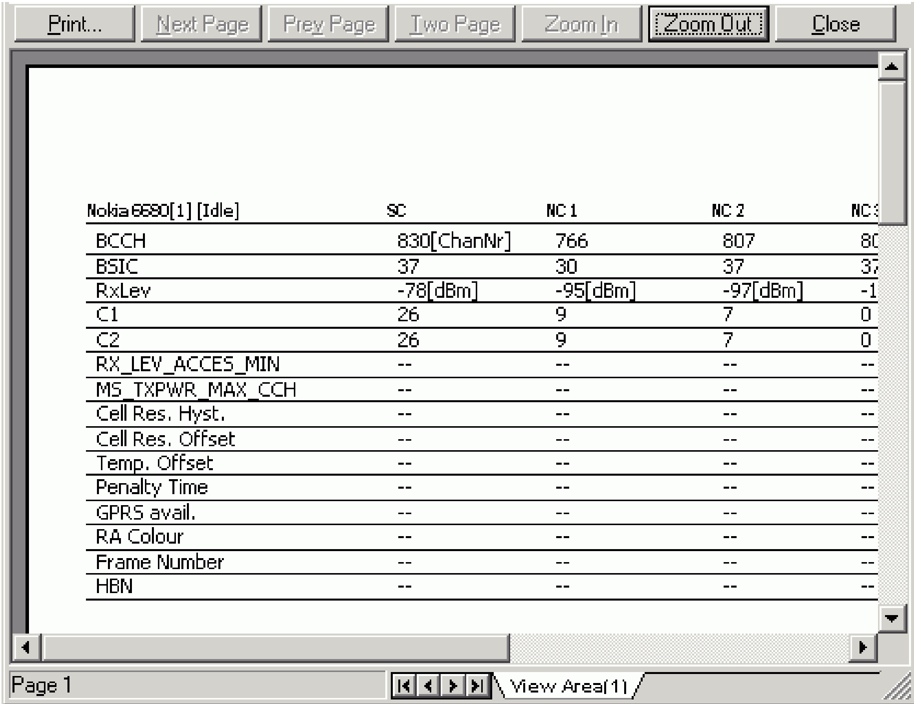
The *Print* option is an alternative to taking screenshots via the clipboard (see chapter 7). R&S ROMES uses the standard *Print* menu familiar from other MS Windows applications. Printing to a file or a configurable printer with selectable page numbers is possible. For details use the context-sensitive help.

To control the appearance of the hardcopy, a preview option is provided, see *Print Preview* below.

Print Pre<u>v</u>iew

Show a preview of the hardcopy to be created.

The *Print preview* command opens a window showing one page (our example shows a section of such a page):



The buttons below the title bar of the window control the preview and printout:

Command	**Description**
Print	Print the previewed file with the current printer settings
Next Page	Show next page (if applicable, otherwise grayed)
Previous Page	Show previous page (if applicable, otherwise grayed)
Two Pages	Show two pages (if applicable, otherwise grayed)
Zoom In	Magnify current page by a factor of 2 (2 steps possible)
Zoom Out	Reduce scale of current page by a factor of 2 (2 steps possible)
Close	Close the window without printing

P<u>r</u>int Setup...

Modify the printer settings.

R&S ROMES uses the standard *Print Setup* menu familiar from other MS Windows applications. For details use the context-sensitive help.

<u>1</u> C:\...*.rsxks

Open one of the workspace files saved before.

A maximum of four workspace files numbered 1 to 4 are listed in this field.

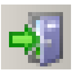
5 C:\...*.rscmd (or *.cmd)

Open one of the measurement files used before.

A maximum of four measurement files numbered 5 to 8 are listed in this field.

The currently open measurement file is replayed when the *Start Replay* command in the *Measurement* menu (p. 3.66 ff) is executed. It is also used as a default file to be exported (see *Export Measurement File* command above).

Exit



Close the application.

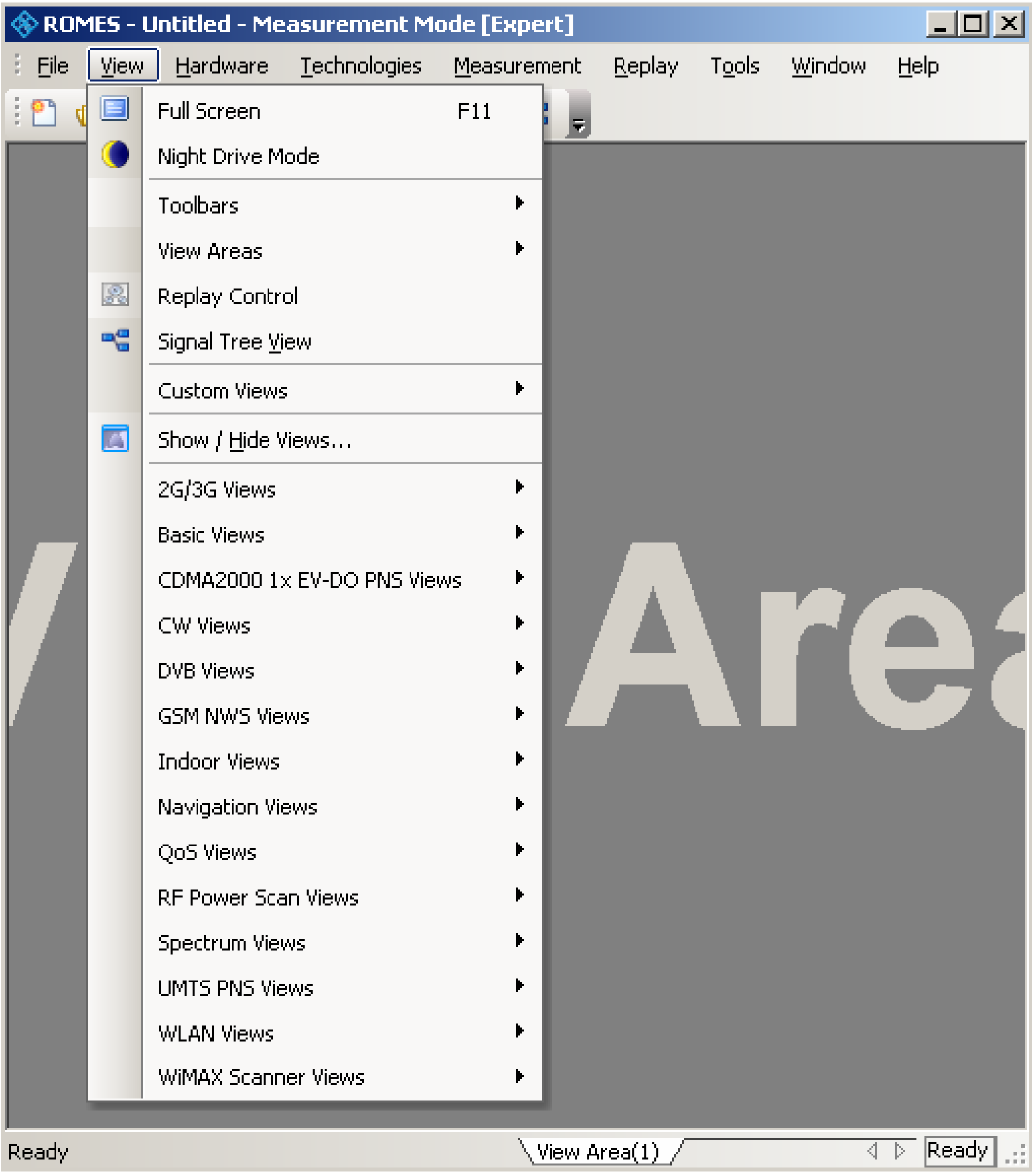
Before closing, R&S ROMES issues a warning if there are unsaved changes to the currently active workspace.

View Menu

The *View* menu customizes the main application window and offers the view windows used to visualize and evaluate measured data.

Note:

The selection of view windows is determined while R&S ROMES is installed, depending on the system configuration and the available options. Fig. 3–4 below shows the maximum number of views possible. If a view is not already loaded it will be indicated by an asterisk.



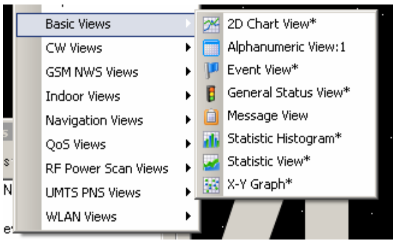
Toolbar and measurement bar

Status bar with worksheet(s)

Fig. 3–4 View menu

Lazy Views

Up to ROMES 3NG Rev.1 SP3, all available views in the R&S ROMES application were created during start-up of the application and each time a workspace was loaded or newly created. This has been changed to improve start-up and replay performance considerably. Only a subset of views is now created during start-up. The views that are not created can be identified in the View menu; they have an asterisk next to their name.



Views that are not created upfront so-called *Lazy Loaded Views* do not retrieve any measurement data until they are displayed. That means that it is a good practice to open the Views required in measurement mode before starting the measurement. Some views that display more data than recently measured like chart views might not display all information otherwise, but start displaying measurement data once they are visible.

During Replay and File Scanning, the Views can be created at any time. Data is delivered to those views to fill them correctly. This might require a rescan of the file. If it is necessary to display more views at a time, use the Show/Hide Views dialog (available in the View menu) to create a set of views in one row.

By using the XML profile files, it is possible to change the Lazy Loading strategy for each view. For example, if one wants to make the 2G/3G Overview View automatically created (but not displayed), change in the RomesProfiles.xml file the line

```
<RomesView Name="UMTS/GSM Overview View" MinProfile="1"
Tec="GSM"/>
```

to

```
<RomesView Name="UMTS/GSM Overview View" MinProfile="1"
Tec="GSM" DelayLoad="false" />
```

.

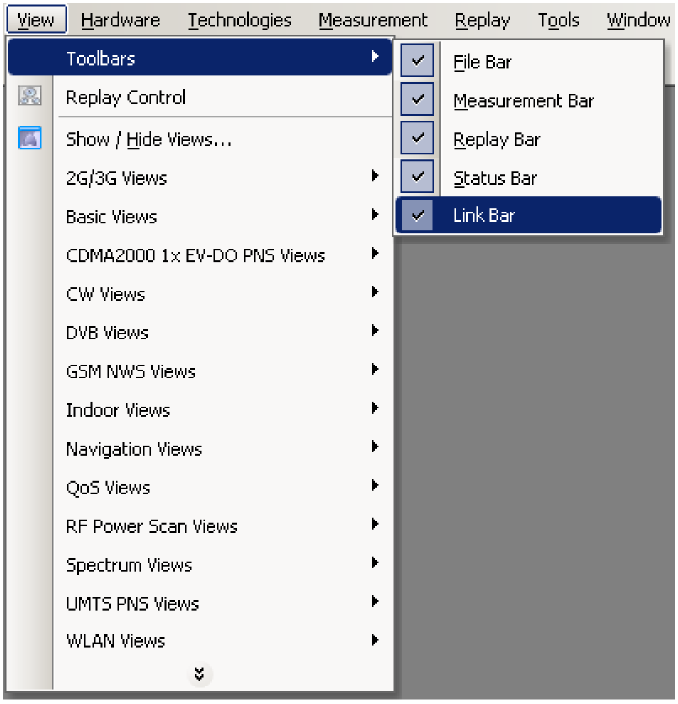
Full Screen

Maximize the main application window to full screen size.

The toolbar, the measurement bar and the status bar are hidden in full screen mode.

Toolbars

All available toolbars can be display or hide over the menu *View – Toolbars*.



File Bar Display and hide the toolbar of the main application window.

The toolbar forms the left part of the upper margin of the main window and offers controls for the most common program tasks, otherwise offered in the *File* and *Help* menu and in the context menu of the main application window (see section **User Interface** on p. **3.1** ff.)

Control	Menu command	Shortcut
1	New workspace	Ctrl N
2	Open workspace	Ctrl O
3	Save workspace	Ctrl S
4	Open measurement file	
5	Close measurement file	
6	Toggle Coupled Focus	
7	All views on hold (stops the measurement display for closer examination without stopping the measurement)	
8	Add/Removes Hardware Modules	
9	Configuration of Modules	
10	Configuration of active Views	
11	Show/Hide the Signal Tree View (see p. 3.4)	
12	Context menu to customize the all toolbars	

The toolbar may be hidden together with the measurement bar in order to enlarge the main window. A checkmark next to the menu item shows that the toolbar is displayed (see Fig. 3–4).

Measurement Bar

Display and hide the measurement bar of the main application window.

The measurement bar forms the right part of the upper margin of the main window and offers controls for the most common program tasks, otherwise offered in the *Measurement* Menu (see p. 3.66 ff.).

Control	Menu command
1	Start Measurement
2	Toggle Recording (Start/Stop Recording)
3	Stop
4	Context menu to customize the all toolbars

Replay Bar

Display and hide the replay bar of the main application window. The replay bar disappears during measuring tasks. If the measurement task is stopped, the replay bar is again visible.

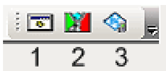
The replay bar forms the right part of the upper margin of the main window and offers controls for the most common program tasks, otherwise offered in the *Replay* Menu (see p. 3.66 ff.). Many of the icons are also available in the *Replay Control* dialog described on p. 3.29.

Control	Menu command
1	Start Replay
2	Step One Data Set Forward
3	Pause Replay
4	Stop Replay
5	Restart Replay
6	Replay Speed
7	Context menu to customize the all toolbars

Link Bar

Display and hide the link bar of the main application window.

The link bar shows additional software applications available for R&S ROMES. Otherwise these tools are accessible via the submenu *Tools* of the R&S ROMES program menu.



Control	Menu command
1	Start the tool R&S Device Manager
2	Start the tool R&S File Merge/Splitter
3	Start the Tool Dial up Wizard

Status Bar Display and hide the status bar of the main application window.

The status bar forms the lower margin of the main window and is divided into three different areas (see Fig. 3–4):

1. In the left-hand part of the status bar, a short explanation of the function of control elements appearing in the main window is given. This includes

- Menu items selected by the pointer or the cursor keys or click
- Toolbar buttons, either selected by the pointer (arrow points to the button) or clicked with the left mouse button

2. The next field of the status bar indicates the free disc space available for storing measurement data. During a measurement or during recording, the time elapsed since the start of the measurement and the data rate which is being written to the measurement file (during recording) is indicated in addition.

3. The next field of the status bar gives the status of data processing, i.e. it indicates the status of the current *temporary working data* set. Possible messages are:

Message	Description
Ready	Ready for measuring or data processing
Replay	Data measured before and stored to a measurement file are being processed and loaded
Replay – Pause	Replay process paused
Measurement file open	A measurement (*.rscmd or *.cmd) file is open and ready to be replayed or exported
Load Drivers	Drivers being loaded
Measuring	Measurement running (without data recording)
Recording	Measurement and data recording running

The view area tab control allows changing the order of the different views simply by drag & drop. Just click on the tab of the view you want to move, and drag the mouse, keeping the left button pressed, to the place where you like to insert the view area.

Additionally, the names of the view areas can be edited in the tab control. Just make a double click on the tab and enter the new name.

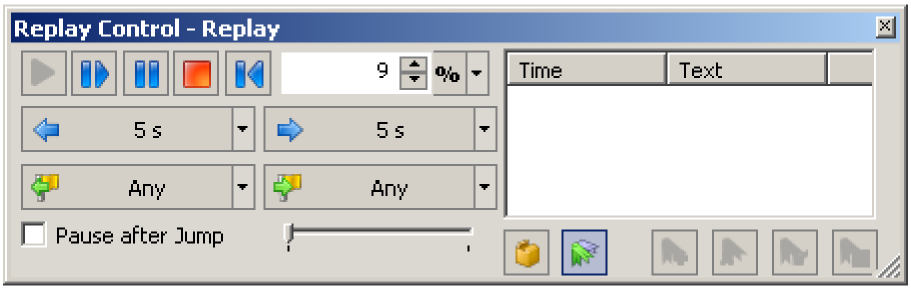
4. The fields in the right-hand part of the status bar indicate which of the following keys are latched:

Indicator	Description
CAP	The Caps Lock key is latched
NUM	The Num Lock key is latched
SCRL	The Scroll Lock key is latched

The status bar may be hidden in order to enlarge the main application window. A check mark left of the menu item indicates that the status bar is currently displayed.

Replay Control

Open or close a dialog to control the replay of a measurement file.



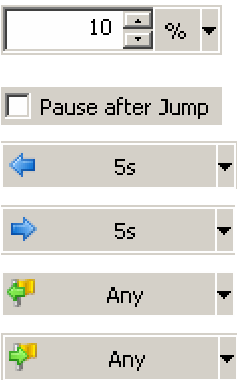
The *Replay Control* dialog is opened automatically each time a measurement file is replayed if *Show Replay Control Dialog Automatically...* is selected in the *Preferences dialog*; see section *General Settings* on p. 3.76 ff.

Basic Functionality

The *Replay Control* menu contains the replay control icons of the *replay bar;* Those icons correspond to the following *Replay Menu* commands (see p. 3.66 ff.):

Start Replay	Step One Data Set Forward
Pause Replay	Stop
Step One Data Set Backward	

Replay Jump



The control element to the right of the measurement bar icons defines by which amount R&S ROMES can jump forward and back within the measurement file. Together with the *Pause after Jump* checkbox, it corresponds to the *Jump* dialog (described on p. 3.72).

The two buttons below the measurement bar icons initiate a replay jump by a selectable amount of time.

The two buttons below initiate a replay jump to the previous or next event. The pull-down lists select the relevant events; they give access to the list of available events in the *Preferences* menu; see section *Event Configuration* on p. 3.81 ff.

Block Mode

The *Show Block List* icon in the right half of the dialog displays the blocks in the measurement file and initiates a replay jump to the next block; if the file contains several blocks. The blocks are listed in the table above the icon; see *Replay Jump to Block* on p. 3.74. A double click on the block initiates a jump to the selected block.

Bookmark Mode

The *Show Bookmark List* icon in the right half of the dialog displays the bookmarks in the measurement file and initiates a replay jump to the next bookmark; if the file contains several bookmarks. The bookmarks are listed in the table above the icon. A double click on the bookmark initiates a jump to the selected bookmark.

Bookmarks can be added or manipulated in the *replay pause* state. The following buttons are related to bookmarks in measurement files:

Add a bookmark	Remove the selected bookmark
Edit selected bookmark	Save bookmark list to meas. file.

View Areas

Open a submenu to rename, create, delete, load and save view areas.

The submenu contains the entries in the context menu in the work area; see description on p. 3.2. In addition, it provides commands for saving and reusing view areas:

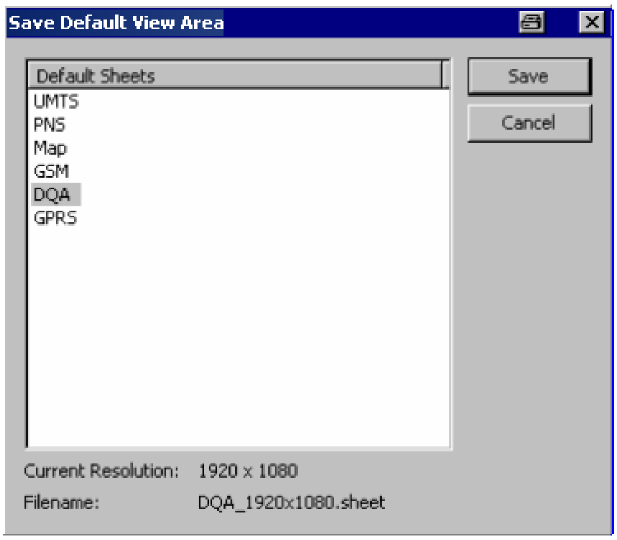
TIP

To reuse a default sheet after a change of the screen resolution, load it (Load View Area…) and save it again under a file name containing the new resolution.

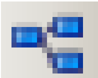
Load View Area… Calls up an Open dialog box to select and load a worksheet file saved before. Worksheet files are ASCII files with the extension *.sheet containing the sheet name, the current screen resolution, and information on all views in the sheet together with their size, position, and special configuration settings. A selection of standard view area files for typical measurement tasks and screen resolutions is available in the *Sheets* subdirectory of the R&S ROMES program directory.

Save View Area… Calls up a *Save As…* dialog to save the current view area with its views in a worksheet file (*.sheet).

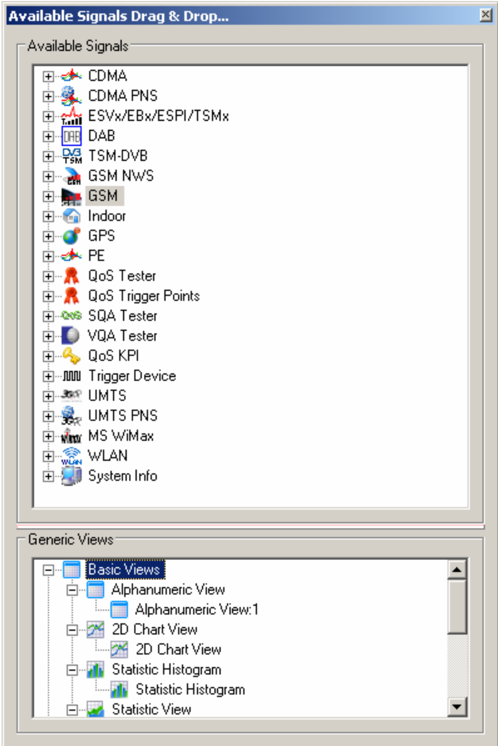
Save View Area as Default… Save the current view area as default sheet, to be opened automatically when R&S ROMES is started, provided that this is selected as an option in the Preferences dialog (see section *General Settings* on p. 3.76 ff.) and that the screen resolution is left unchanged. The file name of the default view area is assigned automatically according to the main technology and the current screen resolution. A separate default view area can be created for each technology.



Signal Tree View



Call up the *Available Signals Drag & Drop...* menu.



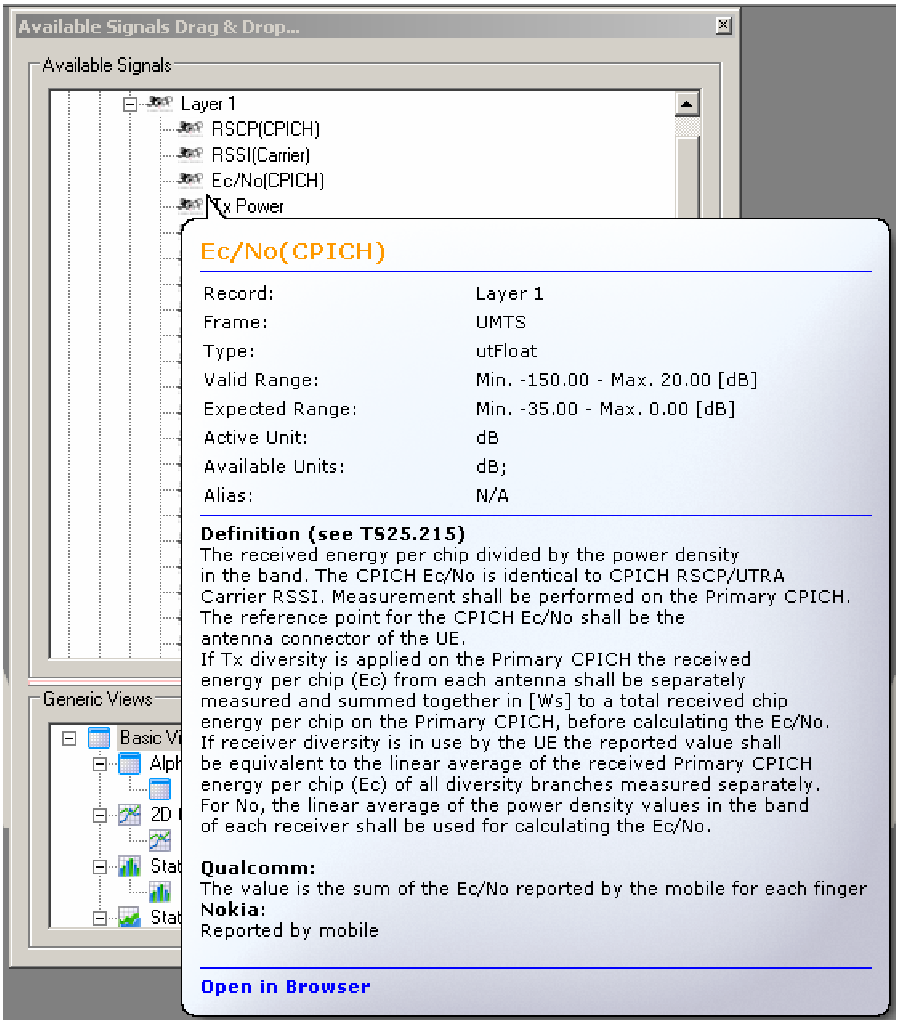
The menu displays the branches of the data tree that are actually available in the current measurement file. The complete data tree (see chapter Data Selection) is displayed in the view configuration menus (e.g. *Route Track View, Alphanumeric View, 2D Chart View, Statistic Histogram View,* see chapter 4). The signal tree view is a fast alternative for selecting a signal or a group of signals to be viewed without opening the view configuration menu:

- A click on a single signal selects the signal to be viewed.
- A click on several signals with pressed shift or control key selects a group of signals.
- A click on a technology, device, or data structure node selects all signals below the node.

After dragging and dropping the selected signal(s) into the view area, they appear in the *Selected Parameter* list and in the list of *Selected Signals* in the *Values* tab of the view configuration menu. They can be removed by means of the context menu or the view configuration menu.

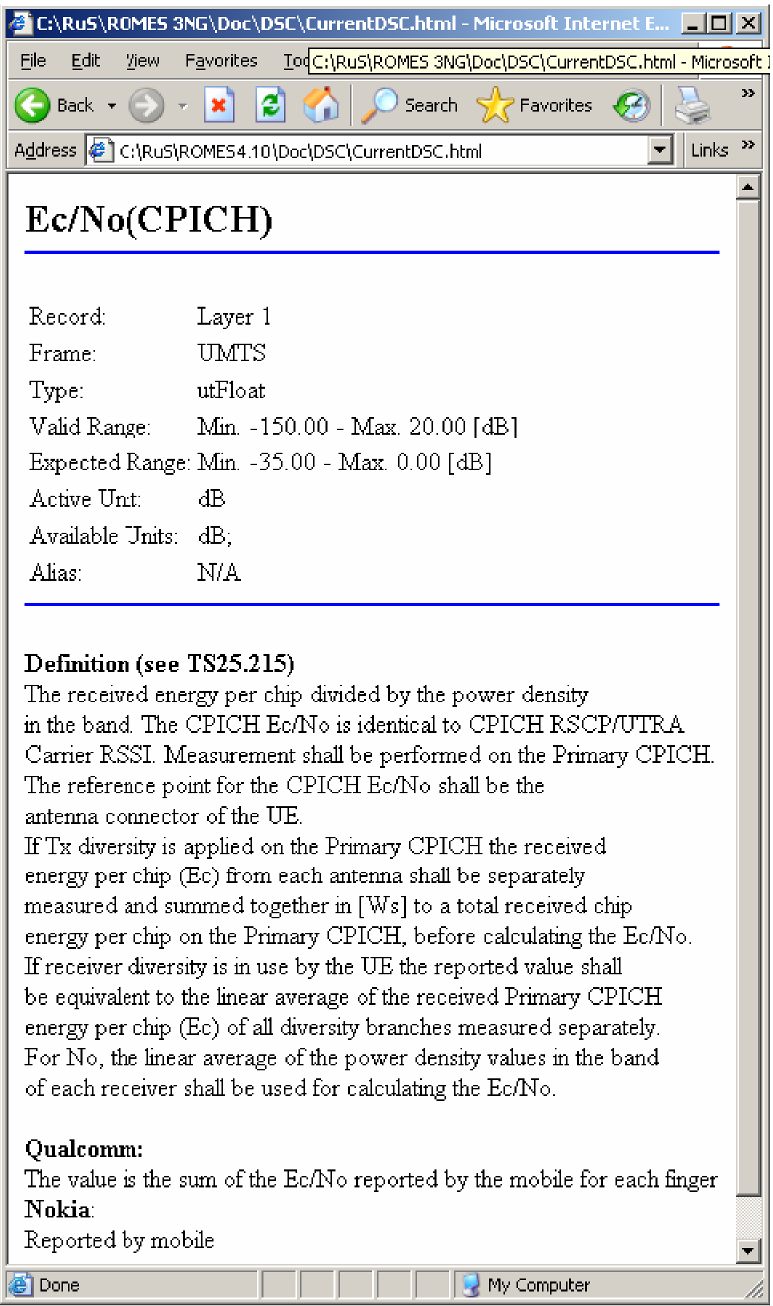
ToolTips for ROMES Signals

The Drag&Drop Tree offers a ToolTip which shows the most important attributes of the selected signal:



R&S ROMES can compile a single document, which contains all descriptions. (Menu Help->Create Signal Description Document...). The result is an HTML file, which can be displayed in the Internet Explorer and printed as PDF document, if desired.

Open in Browser A click on *Open in Browser* shows the text in the default browser. While the first and second section of the information is taken directly from the technologies, the third part is taken from a description file. These files can be found in the *Doc\DSC Directory*. The names of the files are composed by the frames, records and signals name.



Ec/No(CPICH)

Record:	Layer 1
Frame:	UMTS
Type:	utFloat
Valid Range:	Min. -150.00 - Max. 20.00 [dB]
Expected Range:	Min. -35.00 - Max. 0.00 [dB]
Active Unit:	dB
Available Units:	dB;
Alias:	N/A

Definition (see TS25.215)
The received energy per chip divided by the power density in the band. The CPICH Ec/No is identical to CPICH RSCP/UTRA Carrier RSSI. Measurement shall be performed on the Primary CPICH. The reference point for the CPICH Ec/No shall be the antenna connector of the UE.
If Tx diversity is applied on the Primary CPICH the received energy per chip (Ec) from each antenna shall be separately measured and summed together in [Ws] to a total received chip energy per chip on the Primary CPICH, before calculating the Ec/No.
If receiver diversity is in use by the UE the reported value shall be equivalent to the linear average of the received Primary CPICH energy per chip (Ec) of all diversity branches measured separately.
For No, the linear average of the power density values in the band of each receiver shall be used for calculating the Ec/No.

Qualcomm:
The value is the sum of the Ec/No reported by the mobile for each finger
Nokia:
Reported by mobile

R&S Romes can compile a single document, which contains all descriptions (see Menu Help->Create Signal Description Document...). The result is an HTML file, which can be displayed in the Internet Explorer and printed as PDF document, if desired.

Generic Views

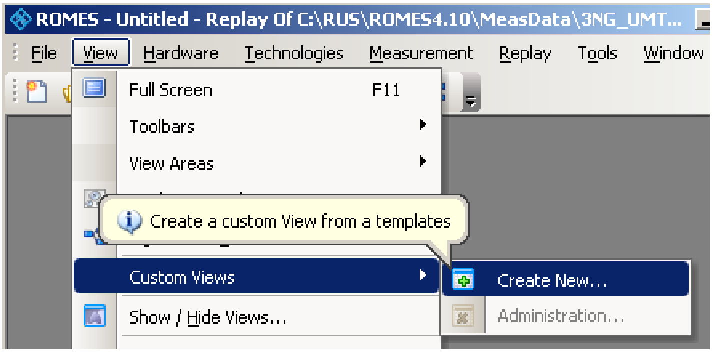
The lower part of the dialog shows a selection of views that are not specifically designed for a particular technology. In general, these generic, general purpose views can be used for arbitrary signals, irrespective of the selected measurement file.

➢ To display one or several signals in a generic view, select the signal(s) in the upper part of the dialog, drag and drop them to a generic view type icon.

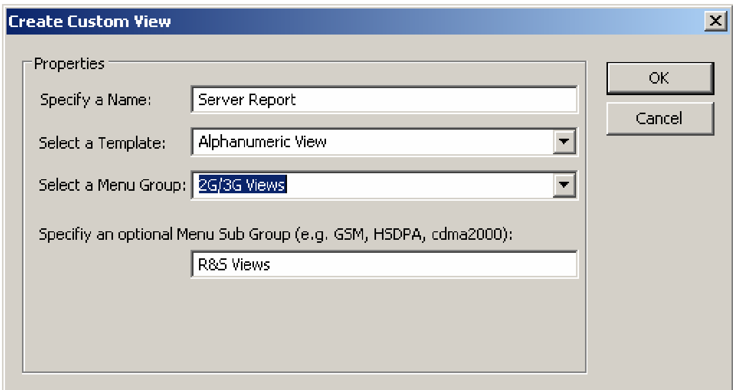
Custom Views

R&S ROMES allows to specify custom views, based on templates. The following templates are currently available;

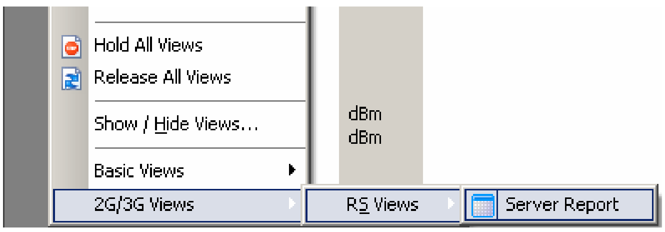
- 2D Chart
- Alphanumeric View
- Histogram View
- X-Y Graph
- Statistic View



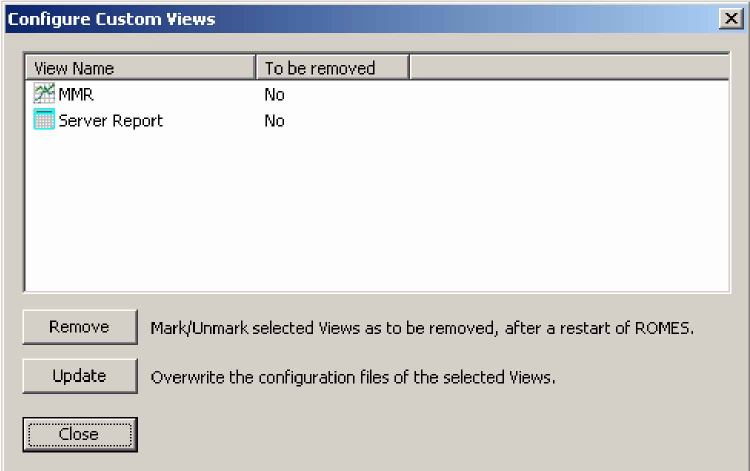
Create New In the dialog select a unique name for the view, a template and a menu group, where the new view shall appear. Optionally a sub group can be specified.



After leaving the dialog by pressing OK, the view will be created and the configuration dialog pops up to do the configuration of the view. This view now appears in the menu, and will be created each time R&S ROMES start as another view.



Administration The specified custom views can be administrated



Remove The *Remove* button allows to toggle the value of the “to be removed” column. If the column shows yes, the view will be removed when R&S ROMES shuts down.

Update The *Update* button allows overwriting the configuration file of the view. This means, that the next time the view will appear as it is currently configured.

Note:
Both buttons have effect to the selected items in the list.

Configuration Files

The list of the custom views is stored in the file

<ROMES_DIR>\Configuration\UserDefinedViews.xml

The views configurations are stored is separate files per view. They have the following path:

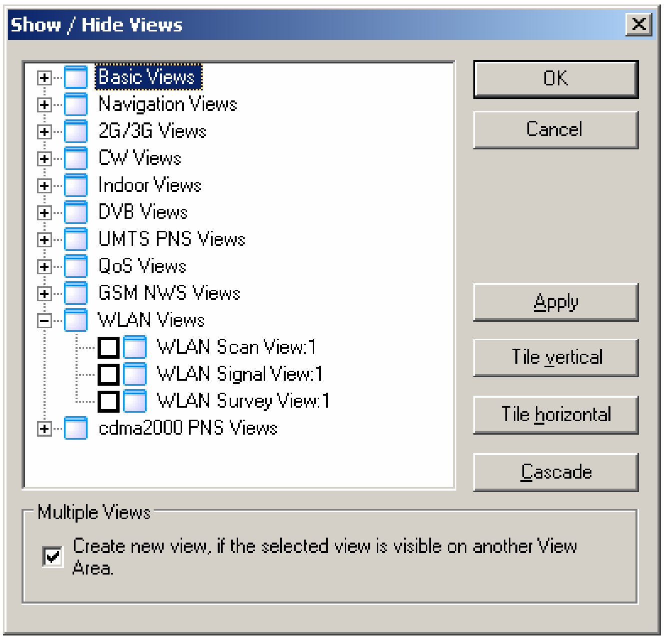
<ROMES_DIR>\Configuration\UDViews\<ViewName>.xml

Note:
The files shouldn’t be changed manually!

Show/Hide Views...

Show (open) and arrange or hide the individual R&S ROMES view windows.

The *Show/Hide Views* command opens a dialog with the same name:



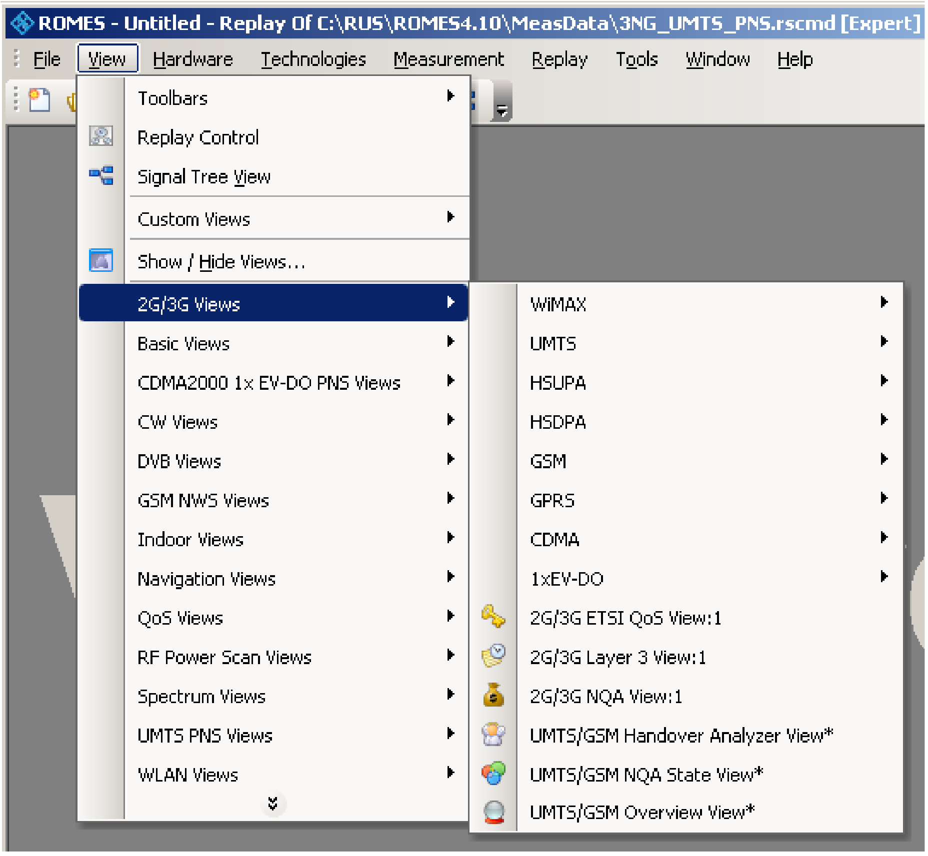
Note:
A view hidden by means of the Show/Hide Views window is temporarily removed from the main window and can be recalled any time. The R&S ROMES workspace contains at least one view of every type. All views can be hidden but only multiple views of the same type (if available) can be destroyed, i.e. permanently removed.

Tree view	List of all view windows provided. A view is shown/opened if it is selected in the corresponding checkbox.
OK	Apply the current settings and close the *Show/Hide Views* dialog.
Cancel	Discard the current settings and close the *Show/Hide Views* dialog.
Apply	Apply (preview) the current settings without closing the *Show/Hide Views* dialog.
Tile vertical / horizontal	The selected views are tiled, i.e. placed side by side so they do not overlap (see also *Window Menu* on page 3.1 ff.)
Cascade	The selected views are superimposed such that all title bars are visible
Multiple Views	If *“Create new view…”* is selected, then R&S ROMES always creates new views on the current sheet and does not affect the views on the other sheets. Otherwise views from other sheets will be moved to the current sheet.

2G/3G Views

Offers a selection of views to show GSM and UMTS data.

The *2G/3G Views* are divided into several groups, depending on the selected *User Level*. One group of views is for WiMAX data (see p.3.46), one for HSDPA data (see p. 3.43), one for HSUPA (see p.3.44),one for UMTS data (see p. 3.45), one for 1xEV-DO data (see p. 3.38), one for CDMA data (see p. 3.39), one for GPRS data (see p. 3.40), and another one for GSM data (see p. 3.41). The views in the last possible group are labeled *UMTS/GSM* or *2G/3G* to indicate that they can be used for both technologies.

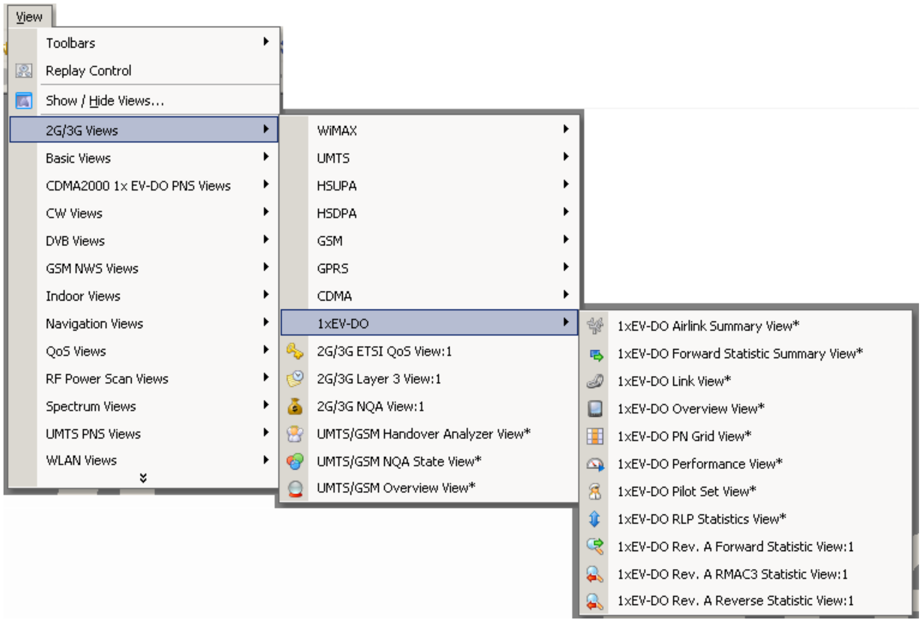


A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously.

UMTS/GSM NQA State View	Detailed analysis of the NQA states and state transitions of each call.
UMTS/GSM Overview View	Summary of the test mobile state, power/quality, active set and system parameters, and, if applicable, results from a connected UMTS PN scanner.
UMTS/GSM Handover Analyzer View	Complete list of the handover procedures attempted by UMTS or GSM mobile phones and statistical evaluation.
2G/3G Layer 3 View	GSM Layer 3 messages, GPRS RLC/MAC control messages and UMTS RRC messages recorded.
2G/3G NQA View	Call statistics (percentage of Good, Blocked, Dropped and No Service calls) of each GSM or UMTS mobile.
2G/3G ETSI QoS View	NQA classification for each UMTS or GSM call and Quality of Service parameters defined in the IREG specifications.

1xEV-DO

Offers a selection of views for 1xEV-DO data.
1xEV-DO views may be opened any time, however, they are empty unless 1xEV-DO data are available.



A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the 1xEV-DO views refer to chapter 4, section 1xEV/DO view.

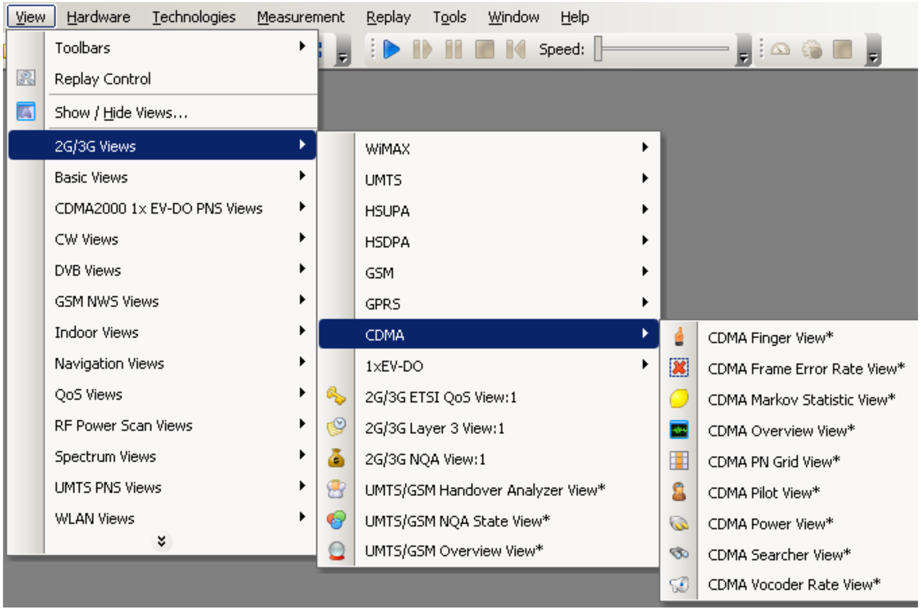
1xEV-DO Pilot Set View	List and bar graph showing the pilot channel signal strength from the active and several neighbor base stations.
1xEV-DO Overview View	A summary of the test mobile state, power/quality, sector, airlink quality results, and, if applicable, results from a connected 1xEV-DO PN scanner.
1xEV-DO Link View	Information about access, connection and session attempts.
1xEV-DO Performance View	Transmission performance parameters, given in terms of the requested or achieved data throughput.
1xEVDO Airlink Summary View	The signals shown in these three preconfigured 2D charts are the pilot energy, the requested throughput, and the PER over the measurement time.
1xEV-DO Forward Statistic Summary. View	Shows the CRC success rates on the measured forward traffic and forward control channel slots.
1xEV-DO PN Grid View	Shows the forward channel PN offsets 0 to 511 as a matrix with 16 offsets in a row. Within this grid, the PN offsets in the currently active set, in the candidate set, and in the neighbor set are marked in different color shades.
1xEV-DO RLP Statistics View	Displays the parameters describing the reverse link performance during the measurement.
1xEV-DO Rev. A Forward Statistic View	Displays the statistic of the CRC Success Rate and needed slot to transmit over all possible DRCs on the forward channels.

1xEV-DO Rev. A RMAC3 Statistic View	This view gives a statistic on RTCMAC Subtype 3 parameters.
1xEV-DO Rev. A Reverse Statistic View	Displays the statistic of the CRC Success Rate and needed slots to transmit over all possible transmission formats on the reverse channels.

CDMA

Offers a selection of views for CDMAone (IS-95) measurements.

CDMA views may be opened any time, however, they are empty unless a CDMA measurement is performed.



A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section *CDMA Views*.

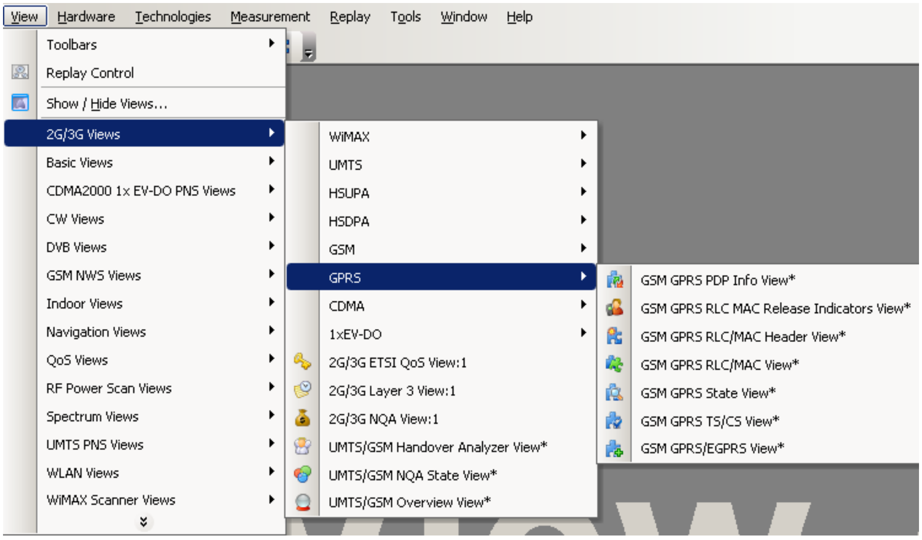
CDMA OverviewView	Displays a summary of the test mobile state, power/quality, active set and system parameters, and, if applicable, results from a connected CDMA PN scanner.
CDMA Pilot View	List and bar graph showing the pilot channel signal strength from the active and several neighbor base stations.
CDMA Finger View	Relative strength of the different multipath signals of the pilot signal detected by the RAKE receiver of the CDMA mobile.
CDMA Power View	Relative TX and RX power at the CDMA mobile and related power levels as a function of time.
CDMA Searcher View	Relative strength of the different multipath signals of the pilot as a function of their time offset.
CDMA Frame Error Rate View	Percentage of erroneous CDMA frames detected and reported by the CDMA mobile station.
CDMA Vocoder Rate	Date rate generated and received by the voice coders of the CDMA mobile station vs. time.

CDMA Markov Statistic View	Statistical evaluation of the call provided by the mobile.
CDMA PN Grid View	Forward channel PN offsets 0 to 511 as a matrix with 16 offsets in a row. Within this grid, the PN offsets in the currently active set, in the candidate set, and in the neighbor set are marked in different colors.

GPRS

Offers a selection of views for GPRS data.

GPRS views may be opened any time, however, they are empty unless GPRS data are available.



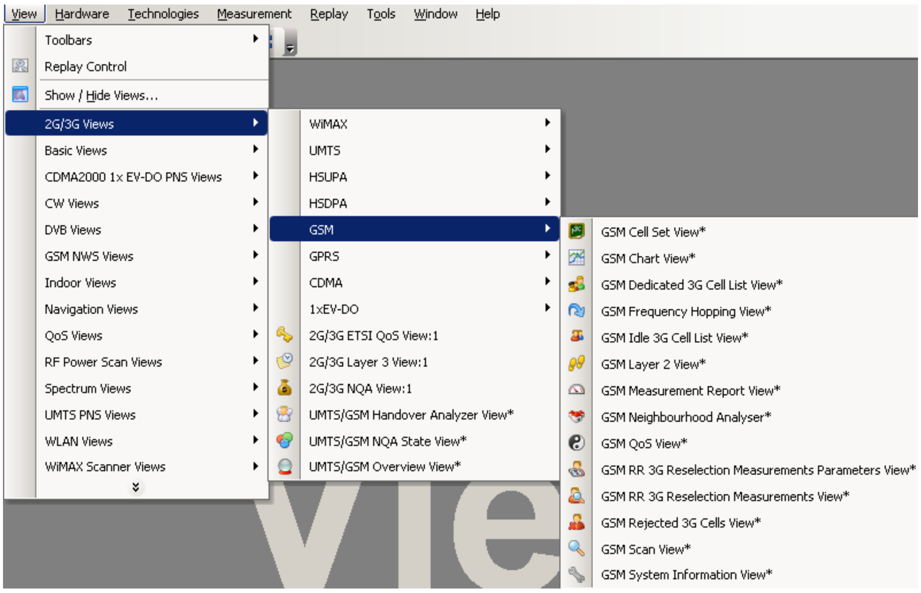
A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section GPRS views.

GSM GPRS State View	List of parameters characterizing the operating state of mobile phones supporting GPRS.
GSM GPRS PDP Info View	List of important Packet Data Protocol (PDP) parameters of mobile phones supporting GPRS.
GSM GPRS RLC/MAC View	Overview of important Radio Link Protocol/Medium Access Control parameters of mobile phones supporting GPRS.
GSM GPRS TS/CS View	Statistical evaluation of the number of timeslots *(TS)* that are active in the connection and the Coding Scheme *(CS)* that is used for the transmission of radio blocks.
GSM GPRS RLC/MAC Header View	List of the exchanged RLC/MAC block header information.
GSM GPRS/EGPRS View	Control and physical parameters of a GPRS and EGPRS connection.
GSM GPRS RLC MAC Release Indicators View	Control and physical parameters of the connection release information, such as the cause of the release, statistical parameters and the release indicator description, if supplied.

GSM

Offers a selection of views for GSM data.

GSM views may be opened any time, however, they are empty unless GSM data are available.



A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section *GSM Views*.

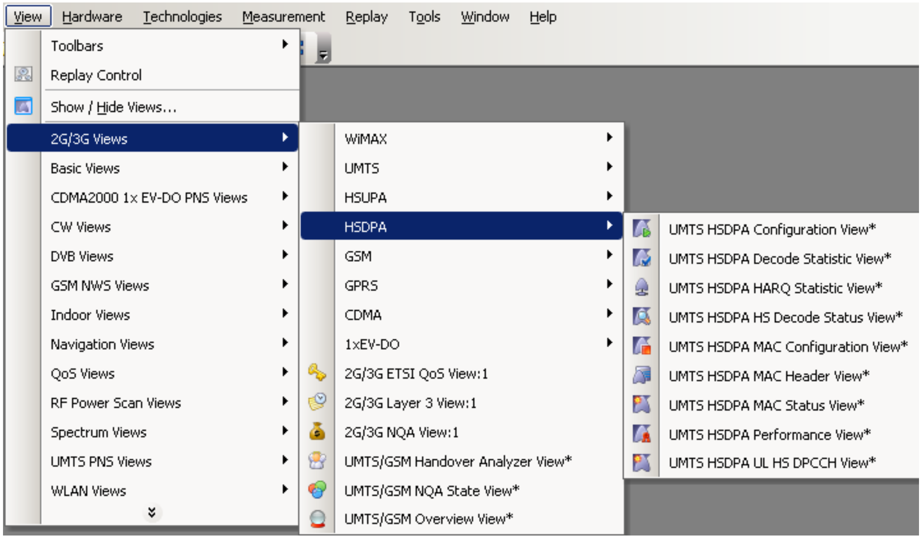
GSM Layer 2 View	List of all layer 2 messages, scrolled during measurement or replay.
GSM Measurement Report View	Bar graphs and tabular overview of the MS measurement reports. Several *Measurement Report Views* corresponding to different connected mobile stations can be opened simultaneously.
GSM System Information View	List of the GSM parameters in the Layer 3 messages *System Information Type 1 to 6* sent by the BTS.
GSM Frequency Hopping View	List of the frequency hopping parameters of GSM mobile phones.
GSM Scan View	2D-chart displaying the signal strength of GSM channels.
GSM Dedicated 3G Cell List View	Overview of the measured dedicated 3G cell parameters.
GSM Idle 3G Cell List View	Overview of the measured idle 3G cell parameters.
GSM RR 3G Reselection Measurements View	An overview of the Radio Resource 3G reselection measurement results.
GSM Rejected 3G Cells View	Overview of the determined 3G cell parameters for rejected cells.
GSM RR 3G Reselection Meas. Param. View	An overview of the Radio Resource 3G reselection measurement parameters.
GSM Neighbourhood Analyser	This view shows the results of the neighborhood analysis of option ROMES3HOA. The aim of this

	analysis is to reveal possible conflicts between the current best server and the transmitters in the neighborhood in order to assess the general condition of a UMTS / GSM network. To this end the neighborhood analyzer post-processes PN scanner, UMTS test mobile, and/or GSM scanner data and compares them with the information stored in a Node B and BTS data base (see description of ATD files in chapter 7, in particular the neighbor cell columns 2GNC and 3GNC). In case of a mismatch between the detected Node Bs and the Node Bs in the data base, an alarm is generated. The same holds if a missing neighbor of the best server or a potential interferer is found.
GSM Cell Set View	This view shows the current configuration of the mobile, concerning Serving Cell and its neighbors
GSM Chart View	Display of GSM layer 1 parameters in a 2D chart.
GSM QoS View	Statistical evaluation of important layer 3 (*Location Update, GSM Handover),* mobility management *(GPRS Attach/Detach, Routing Area Update)* and packet routing *(Activate/Deactivate PDP Context)* procedures performed by mobile phones supporting GPRS.

HSDPA

Offers a selection of views for UMTS HSDPA data.

HSDPA views may be opened any time, however, they are empty unless HSDPA data are available.



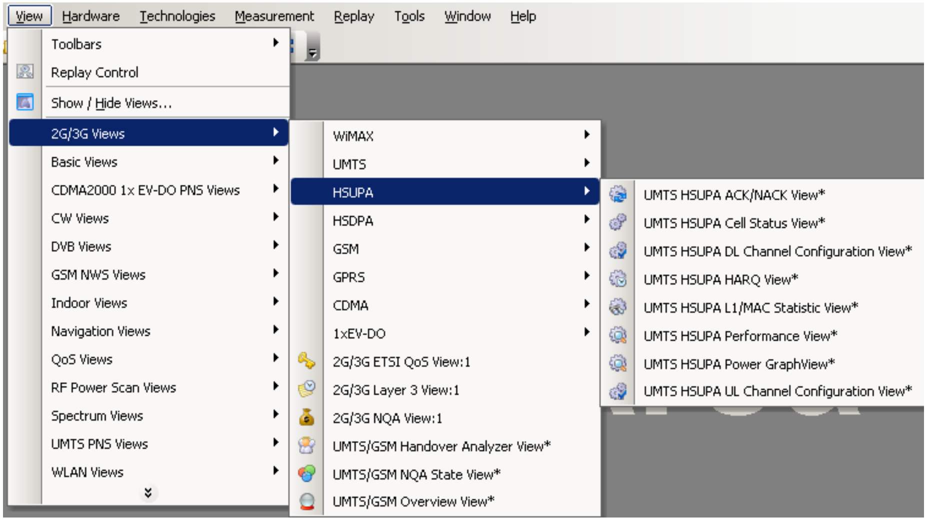
A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the UMTS HSDPA views refer to chapter 4, section UMTS HSDPA view.

UMTS HSDPA UL HS DPCCH View	CQI values reported by the test mobile in the last 100 HSDPA subframes.
UMTS HSDPA HS Decode Status View	Status of the HS-SCCH demodulation and the decoded HS-SCCH information.
UMTS HSDPA HARQ Statistic View	Characteristics of all HARQ processes of the test mobile.
UMTS HSDPA Configuration View	Configuration of the DL HSDPA channels received by the test mobile, the UL HS-DPCCH, and information related to the finger configuration command, the DL HS-SCCHs, and the active HARQ processes.
UMTS HSDPA MAC Configuration View	Configuration of the MAC-hs that the test mobile receives from the network.
UMTS HSDPA MAC Status View	Overview of the status of the reordering entity in the mobile receiver.
UMTS HSDPA MAC Header View	Mobile-specific subframe number and the corresponding (HS-DSCH) MAC-hs headers as defined in standard 2GPP TS 25.321.
UMTS HSDPA Performance View	Transmission performance parameters, given in terms of the requested or achieved data throughput.
UMTS HSDPA Decode Statistic View	Statistical evaluation of the received DL HS-DSCH transport blocks, together with the block error rate and the number of retransmissions needed to successfully decode the blocks of each size.

HSUPA

Offers a selection of views for UMTS HSUPA data.

HSUPA views may be opened any time, however, they are empty unless HSUPA data are available.



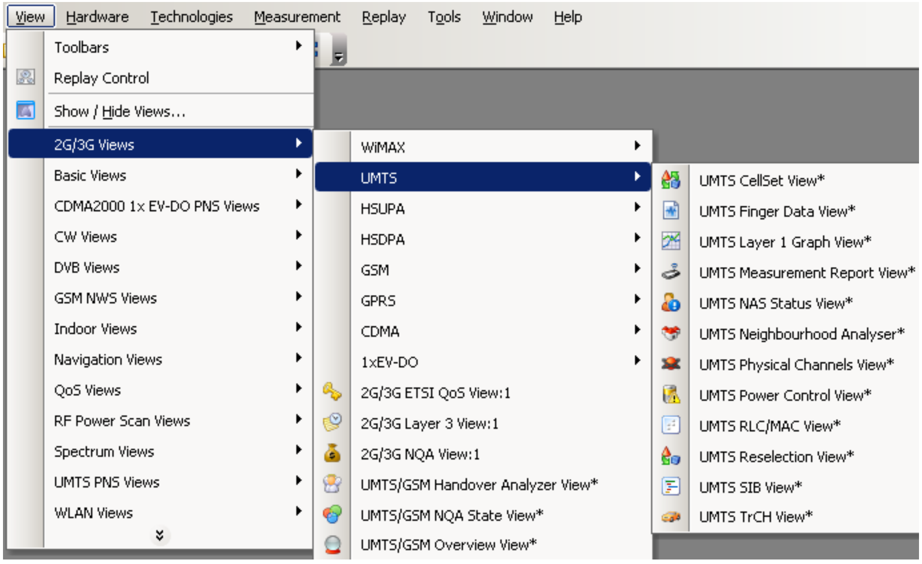
A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the UMTS HSUPA views refer to chapter 4, section UMTS HSUPA view.

UMTS HSUPA Cell Status View	Shows events per TTI for HICH, RGCH, and AGCH for the mobile, serving cell and non-serving cells of the mobile.
UMTS HSUPA Performance View	Four preconfigured 2D charts showing signals related to the transmission performance in terms of the requested or achieved data throughput.
UMTS HSUPA DL Channel Configuration View	DL parameters of the active HSUPA connections, which were transmitted in the corresponding RRC messages. The power offset table shows the basic information on which the transmit power calculation of the mobile is based on.
UMTS HSUPA UL Channel Configuration View	UL parameters of the active HSUPA connections, which were transmitted in the corresponding RRC messages. The power offset table shows the basic information on which the transmit power calculation of the mobile is based on.
UMTS HSUPA L1/MAC Statistic View	Shows a configurable selection of the statistics parameters provided by the mobile itself.
UMTS HSUPA ACK/NACK View	Shows the used transport block sizes per TTI. The y-axis shows the TBS and the x-axis represents the TTIs.
UMTS HSUPA HARQ View	Shows the characteristics of all HARQ processes of the test mobile, and a statistical evaluation of the received UL E-DCH transport blocks.
UMTS HSUPA Power Graph View	Shows the most important absolute and relative power values for the HSUPA session.

UMTS

Offers a selection of views for UMTS data.

UMTS views may be opened any time; however, they are empty unless UMTS data are available.

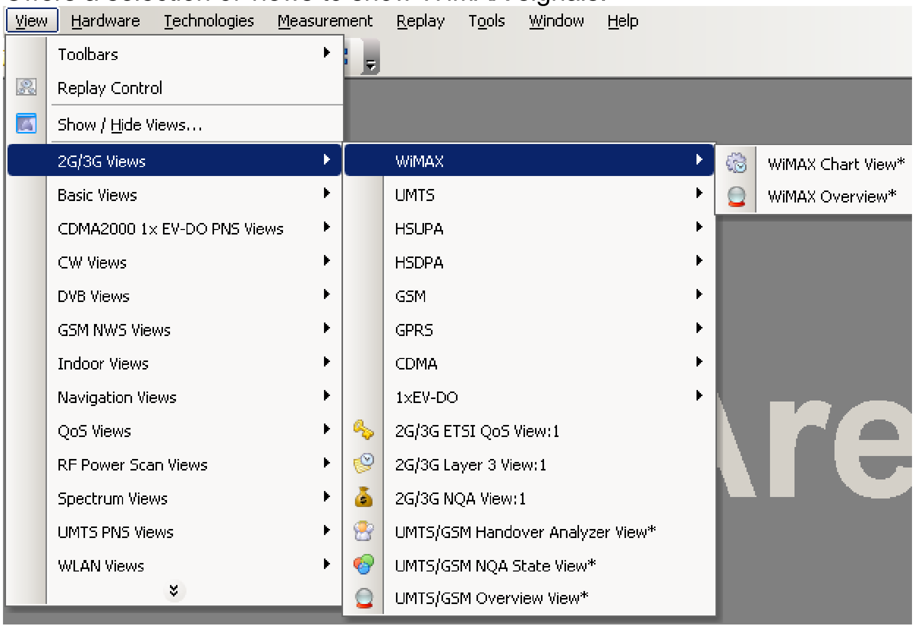


A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the UMTS views refer to chapter 4, section UMTS views.

UMTS Finger Data View	Layer 1 parameters characterizing the different downlink WCDMA signals received by the mobile, captured with the different branches (fingers) of the test mobile UMTS RAKE receiver.
UMTS CellSet View	Layer 1 parameters of the serving cell and the neighbor cells.
UMTS NAS Status View	Higher-layer (Non-Access Stratum, NAS) parameters of the serving cell and the connection.
UMTS TrCH View	Channel coding parameters in the downlink and uplink Transport Channels (TrCHs).
UMTS Physical Channels View	Physical channel parameters in the downlink and uplink WCDMA signals.
UMTS SIB View	Tree view of the exchanged System Information Blocks.
UMTS RLC/MAC View	Display of important Radio Link Control/Medium Access Control parameters of UMTS mobile phones.
UMTS Measurement Report View	Intra-frequency measurement results that the test mobile sends to the network in a Measurement Report RRC message.
UMTS Reselection View	Display of parameters that are used for cell reselection of UMTS mobile phones.
UMTS Power Control View	Transmitter output power and closed loop power control parameters of a Nokia UMTS mobile.
UMTS Layer 1 Graph View	Display of UMTS or GSM layer 1 parameters in a 2D chart.
UMTS Neighborhood Analyzer	Results of the neighborhood analysis of option ROMES4HOA.

WiMAX Views

Offers a selection of views to show WiMAX signals.

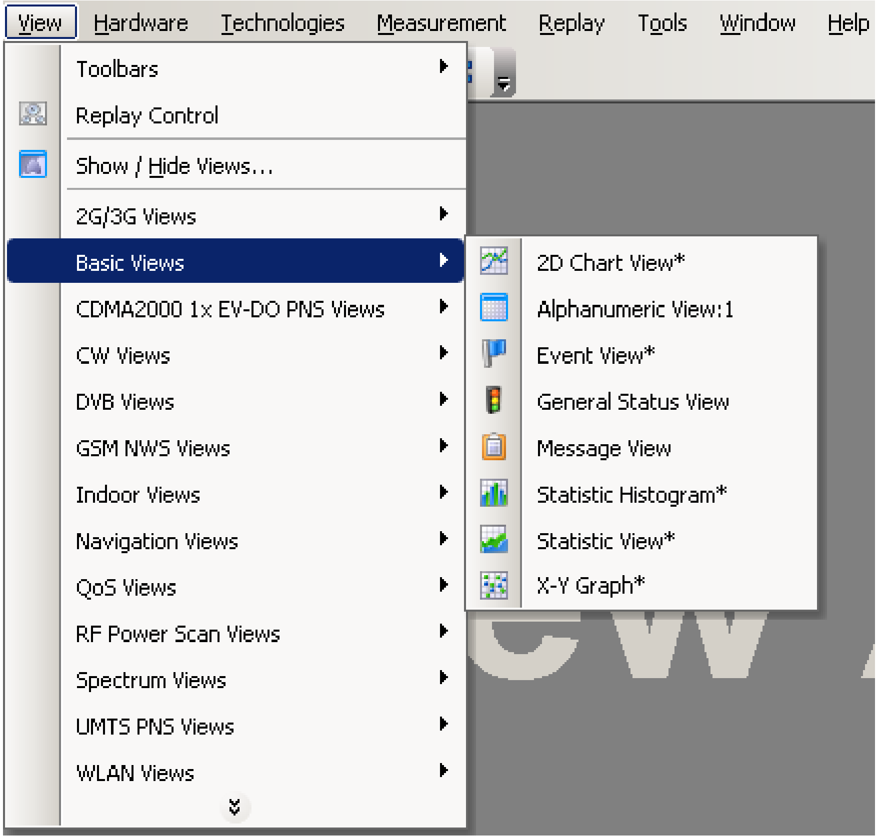


A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section WiMAX views.

WiMAX Chart View	Shows the current measurement like Tx and Rx Power and Error Rates as a function of time in a pre-defined 2D chart.
WiMAX Overview	Shows the most important parameters.

Basic Views

Offers a selection of views to show information from any technology.

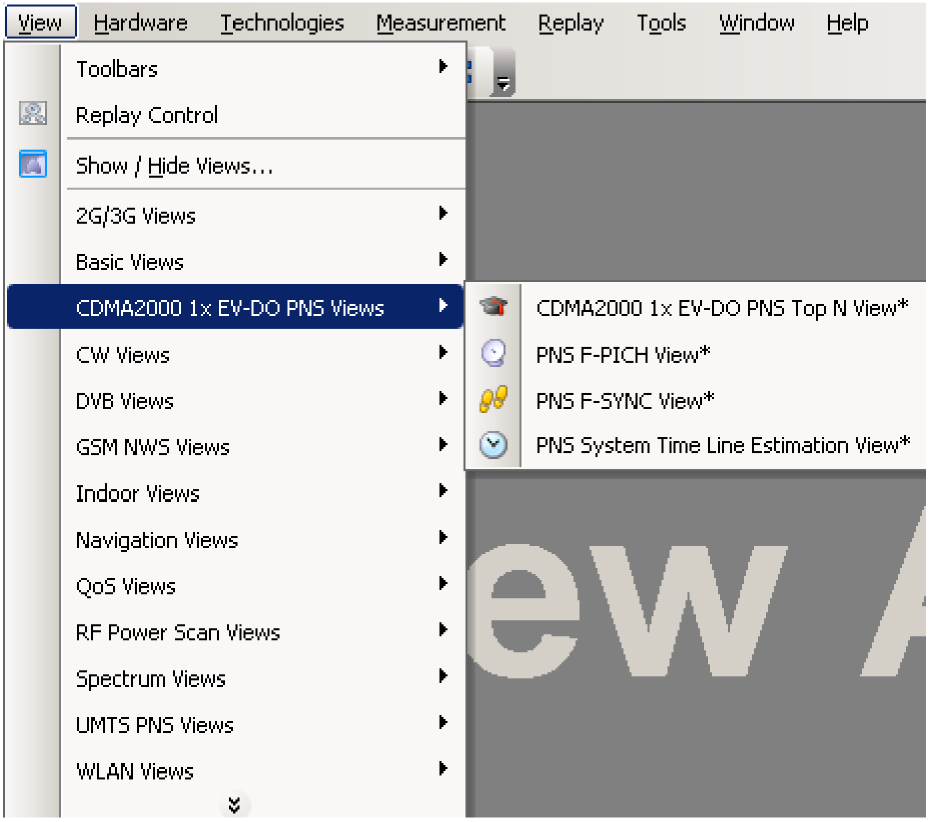


A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the basic views refer to chapter 4, section *Basic Views.*

Alphanumeric View	List offering information about the selected parameters. Several *Alphanumeric Views* corresponding to different connected mobile stations can be opened simultaneously.
2D Chart View	2D-chart showing the current measurement data as a function of time. In practice, an unlimited number of 2D-charts can be defined simultaneously.
Statistic Histogram	Collection of several diagrams to show a statistical evaluation of a signal.
Event View	List of all events that occurred during the measurement
Message View	Detailed, chronological list of the system messages generated during the measurement
General Status View	List of device messages of general interest.
X-Y Graph	The X-Y graph (or scatter plot) can be used to set two signals in correlation to each other. That is, the value of one signal is used as x value, the value of another signal as y value.
Statistic View	Display the most common statistical key indicators of any R&S ROMES signal.

CDMA2000 1xEv-DO PNS Views

Offers a selection of views to show CDMA2000 or 1x Ev-Do Pseudo Noise Scanner data.

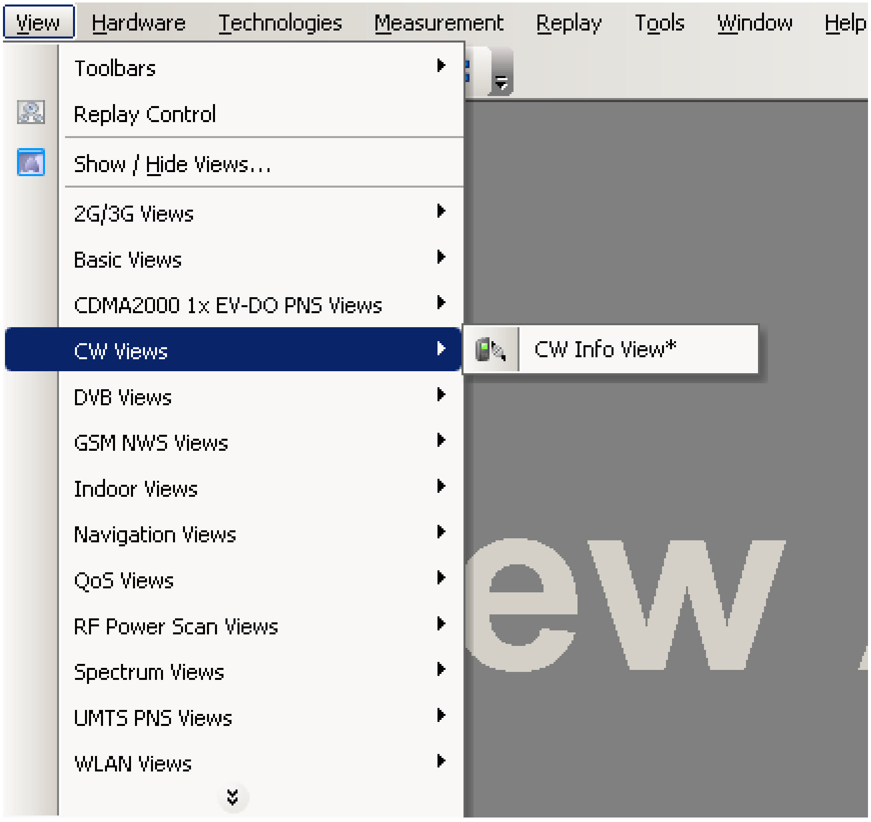


A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section CDMA2000 PNS views.

PNS F-PICH View	Average signal power of the received Forward Pilot Channels (F-PICHs) and analysis of the properties of all DL signals received in the CDMA2000 PN or 1x Ev-DO scan.
PNS F-SYNC View	Information that the TSMU decoded from the Forward Synchronization Channel (F-SYNC).
PNS System Time Line Estimation View	Shows the parameters used for the GPS-signal based CDMA system time line.
CDMA2000 1x EV-DO PNS Top N View	List of the properties of the signals from the base transceiver stations that are elements of the *Top N Pools.*

CW Views

Offers a view to monitor a CW measurement using a test receiver.



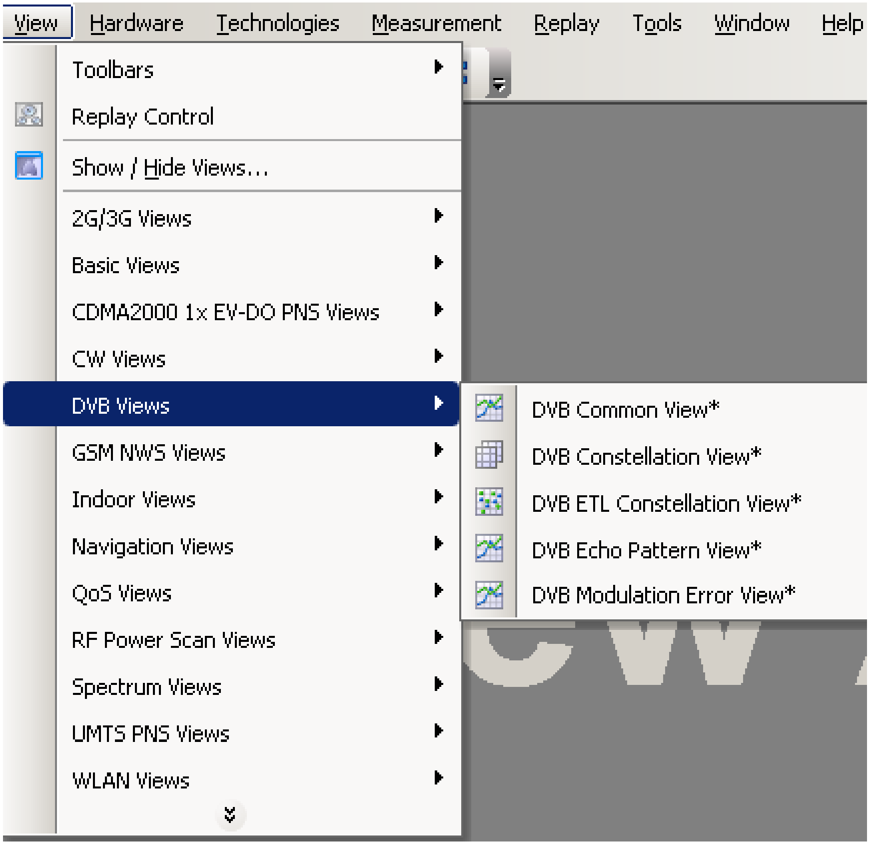
For detailed information about the *CW Info View* refer to chapter 4, section *CW Info View*.

CW Info View Measurement frequency of a CW receiver that operates in *Manual Tracking* mode.

DVB Views

Offers a selection of views for DVB (Digital Video Broadcasting) measurements.

DVB views are empty if no DVB measurement is performed, or if the measurement file replayed contains no DVB data.



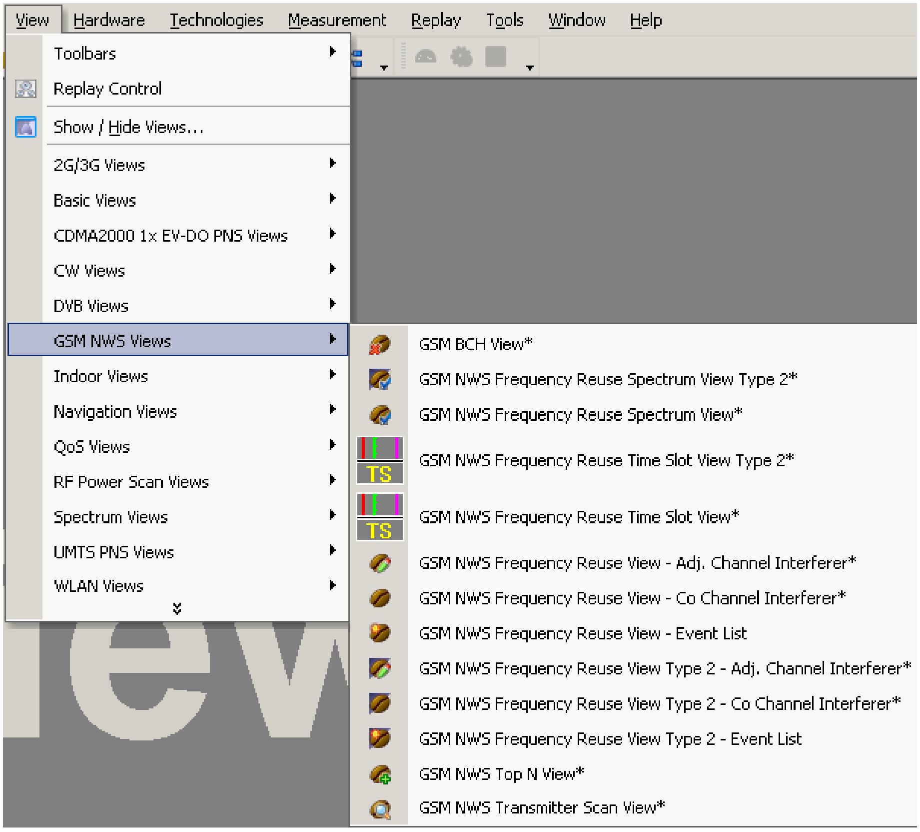
A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section *DVB Views*.

DVB Common View	Displays the DVB parameters in a 2D chart.
DVB Constellation View	Shows the results as the measurement is done with the new TSM-DVB var.10.
DVB Echo Pattern View	This measurement shows the echo profile of the transmission channel.
DVB ETL Constellation View	Displays the constellation diagram of the demodulated signal. Amplitude imbalance, quadrature error and carrier leakage are still present in the used data.
DVB Modulattion Error View	The frequency response of the modulation error (MER) can be calculated.

GSM NWS Views

Offers a view to visualize GSM network scan data.

GSM network scans require option ROMES3T13, *GSM Network Scanner.*



A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section *GSM NWS* View.

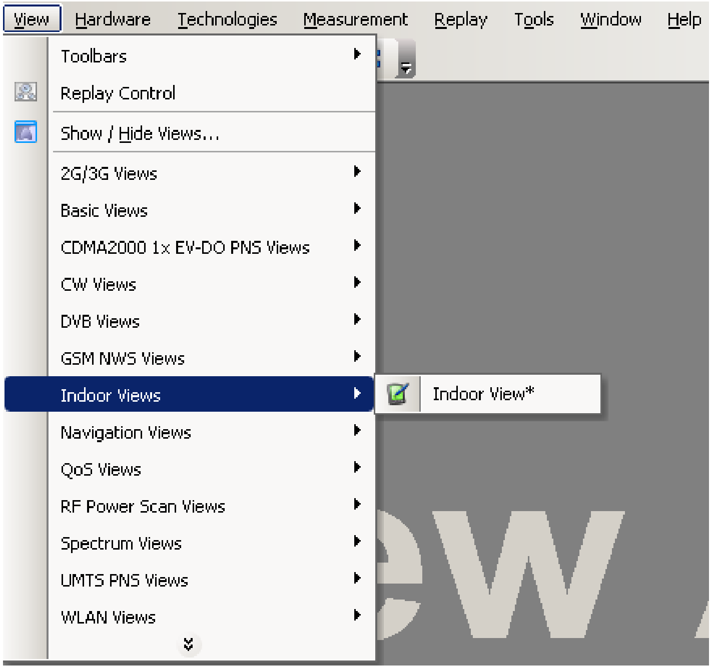
GSM NWS Transmitter Scan View	GSM data measured by the R&S TSMU radio network analyzer during the GSM Network Scan and demodulated.
GSM NWS Frequency Reuse View – Co Channel Interferer	Information about the serving cell, the potential co-channel interferers, and the characteristics of the interference situations.
GSM NWS Frequency Reuse View – Adj. Channel Interferer	Information about the serving cell, the potential adjacent channel interferers, and the characteristics of the interference situations.
GSM NWS Frequency Reuse View – Event List	List of alarm messages generated according to the settings in the *Threshold Values* menu in the *Frequency Reuse View* configuration menu. These settings define when an alarm is triggered (e.g. C/I or RxLev/RxQual values) which are added to the event list.
GSM NWS Top N View	List of the properties of the signals from the base transceiver stations that are elements of the *Top N Pools.*
GSM NWS Frequency Reuse View Type 2– Co-Channel	Information about the serving cell, the potential co-channel interferers, and the characteristics of the interference situations. Type 2 is

Interferer	enhanced to include the sequence of serving cells in the contained charts. It also has a different source for the SC (member of Top N pool/fixed SC) and the QI is used instead of RxLev/RxQual/CtoI as measurement value from the GSM network scanner.
GSM NWS Frequency Re-use View Type 2 – Adj. Channel Interferer	Information about the serving cell, the potential adjacent channel interferers, and the characteristics of the interference situations. Type 2 is enhanced to include the sequence of serving cells in the contained charts. It also has a different source for the SC (member of Top N pool/fixed SC) and the QI is used instead of RxLev/RxQual/CtoI as measurement value from the GSM network scanner.
GSM NWS Frequency Re-use View Type 2– Event List	List of alarm messages generated according to the settings in the *Threshold Values* menu in the *Frequency Reuse View Type 2* configuration menu. These settings define when an alarm is triggered (e.g. QI values) which are added to the event list.
GSM NWS Frequency Re-use Spectrum View	Displays the spectrum of the channels (BCCH and TCHs) of the serving cell (DL and/or UL) and optional also the spectrum of the adjacent channels.
GSM NWS Frequency Re-use Spectrum View Type	Displays the spectrum of the channels (BCCH and TCHs) of the serving cell (DL and/or UL) and optional also the spectrum of the adjacent channels. Type 2 is enhanced to include the sequence of serving cells in the contained charts.
GSM BCH View	System Information (SI) decoded from the GSM BCH with their full contents.
GSM NWS Frequency Re-use Time Slot View Type 2	Displays the result of the power measurement for the time slot and the channel. TopN members or fixed stations are used as source for the serving cells.
GSM NWS Frequency Re-use Time Slot View	Displays the results of the power measurement for the time slot and the channel. Mobiles are used as source for the serving cells.

Indoor Views

Offers a view to show data recorded with the Indoor navigation driver.

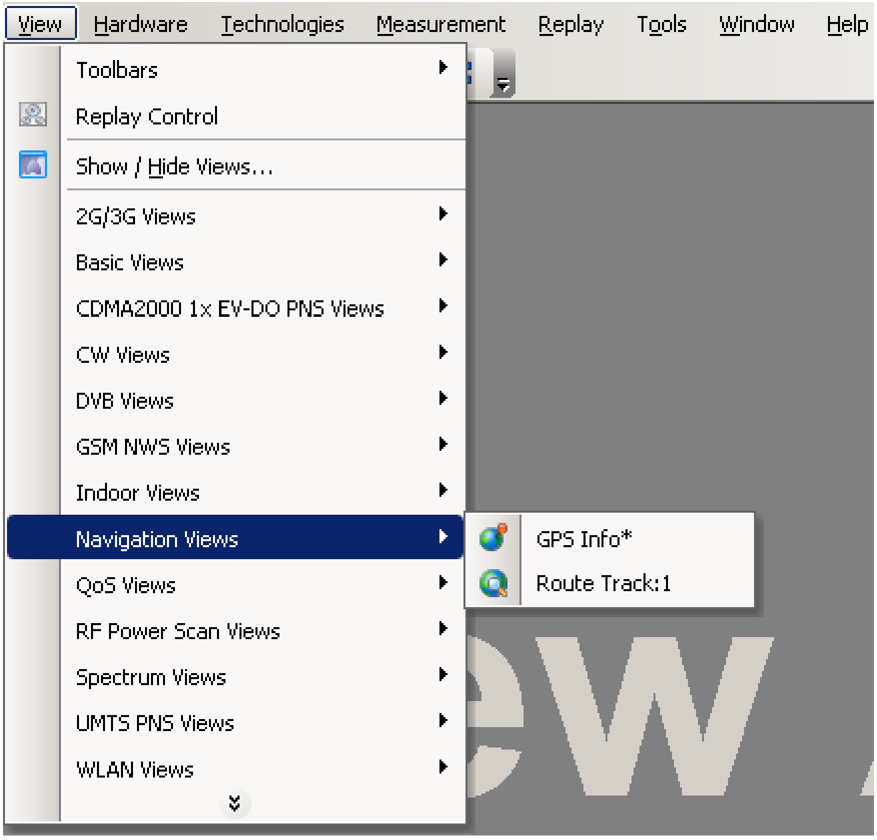
For detailed information refer to chapter 4, section *Indoor Views*.



Navigation Views

Offers a selection of views to display data in a map.

The Geographic PositioningSystem (GPS) is used to visualize data with valid geographical information (longitude/latitude parameters) in a map or to retrieve geographic information assigned to the data points.



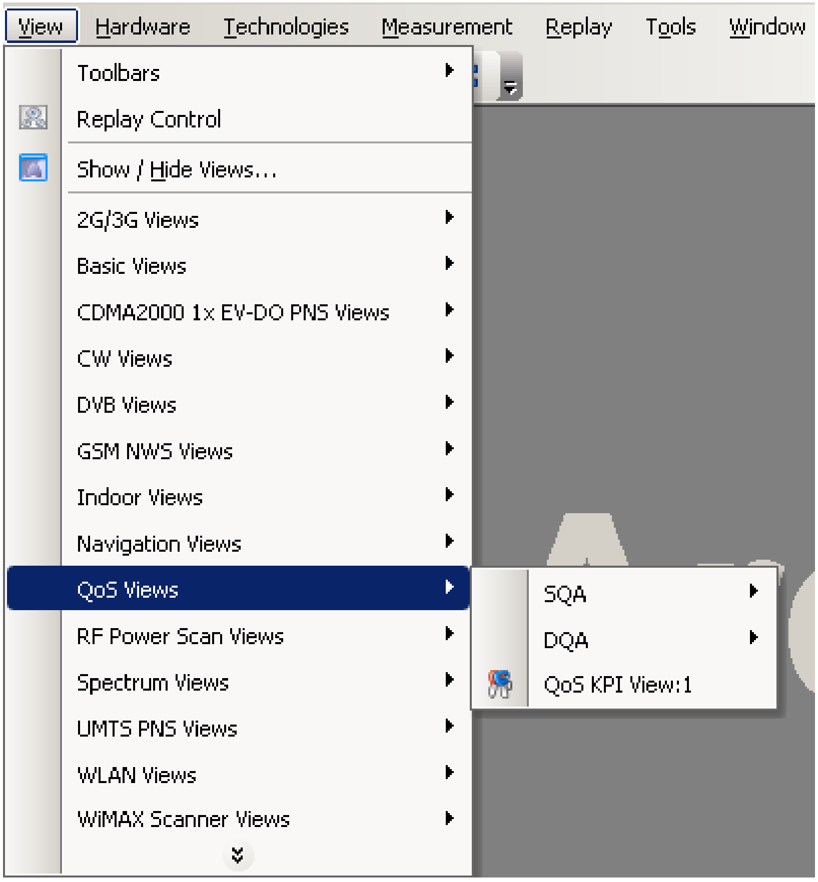
A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the GPS views refer to chapter 4, Section *Navigation Views.*

GPS Info	List of the geographical coordinates and other information about a particular test point.
Route Track	Map view showing measured data and various other information.

QoS Views

Offers a selection of views to evaluate the Quality of Service of a data connection measured with the available Quality Testers (xQA).

The *QoS Views* are divided into several groups, depending on the selected *User Level.* One group of views is for for SQA data (see p. 3.45), and one for DQA data, if activated (see p. 3.38):



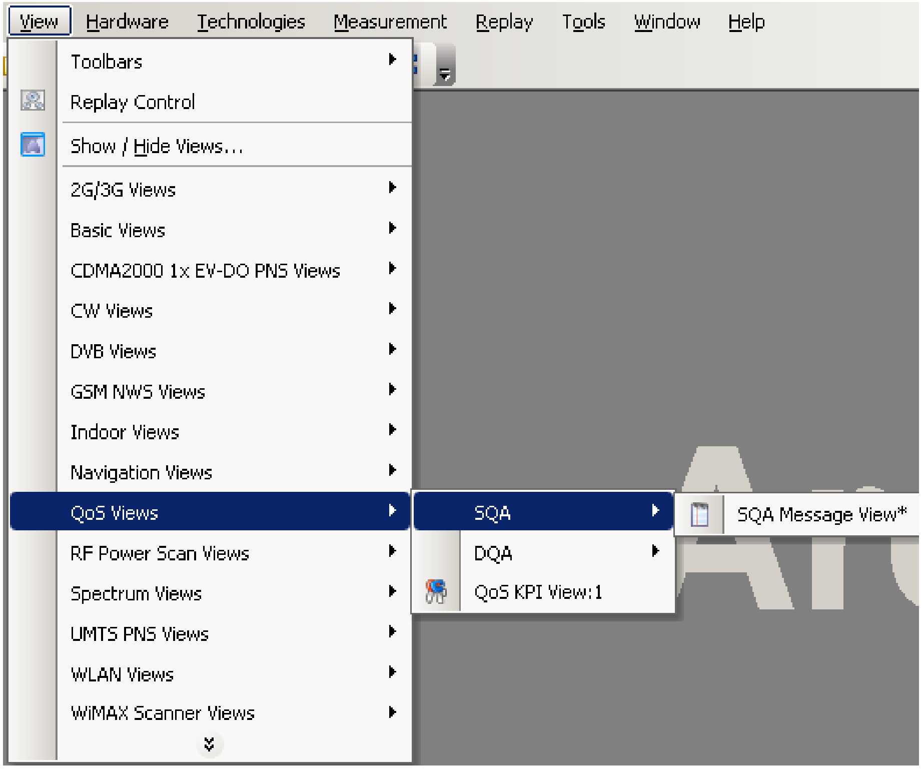
A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section QoS Views.

QoS KPI View	Shows Key Performance Indicators (KPIs) for the DQA jobs FTP (up-/download), HTTP (up-/download), HTTP Download With IE, VLC Video Streaming and e-mail (up-/ download).

SQA

Offers a selection of views for QoS SQA data.

SQA views may be opened any time, however, they are empty unless SQA data are available.



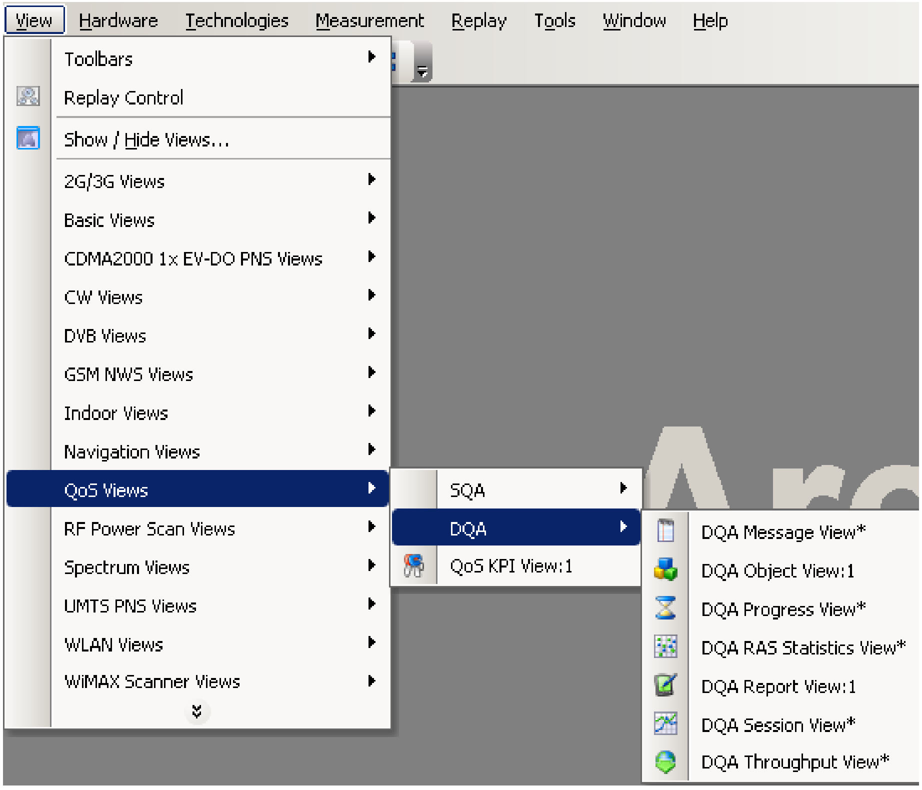
A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the SQA views refer to chapter 4, section QoS SQA Views.

SQA Message View	Result of the Speech Quality Analysis (SQA, with option ROMES3SQA, Voice Quality PESQ).

DQA

Offers a selection of views for QoS DQA data.

DQA views may be opened any time, however, they are empty unless DQA data are available.

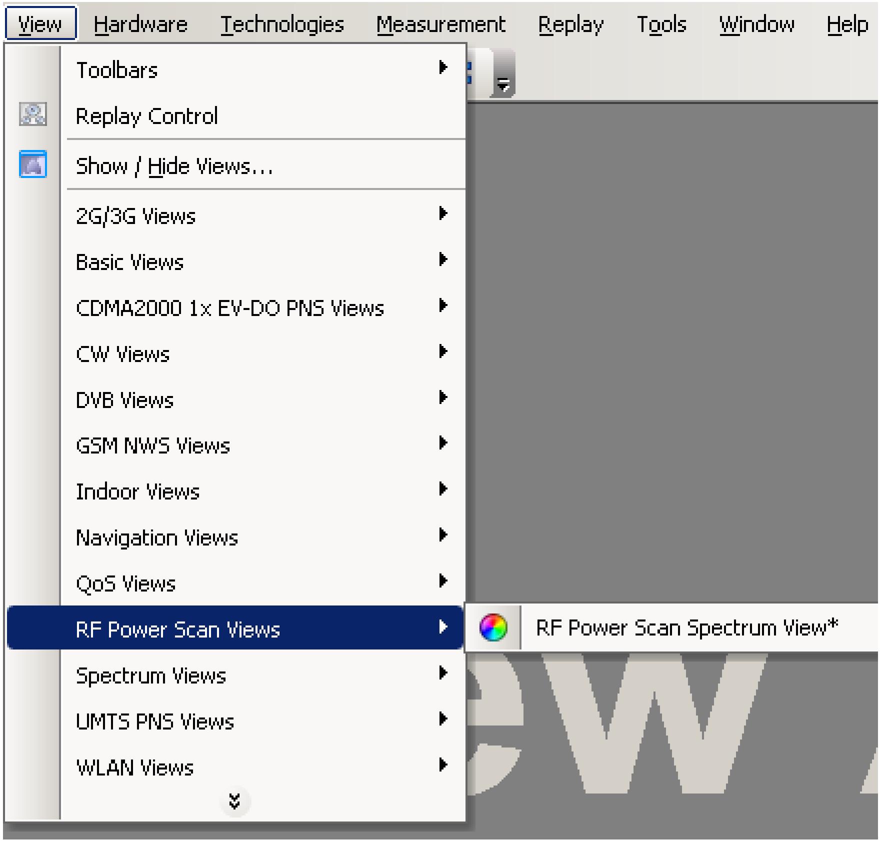


A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information about the QoS DQA views refer to chapter 4, section QoS DQA views.

DQA Message View	Chronological record of all actions of the current job.
DQA Progress View	Bar graph and display of parameters to monitor the progress and the status of the current DQA job.
DQA Session View	Bar graph to monitor the percentage of *Good*, *Blocked* and *Dropped* data transfer jobs in the current session.
DQA Report View	Bar graph and display of parameters to monitor the jobs in the current session.
DQA Throughput View	Bar graphs to monitor the current and average data rate in upload and download direction.
DQA RAS Statistics View	Record of parameters describing the network traffic during the measurement.
DQA Object View	Tabular overview of the QoS actions performed with their duration and result for DQA.

RF Power Scan Views

Offers a selection of views to show RF Power Scan data.

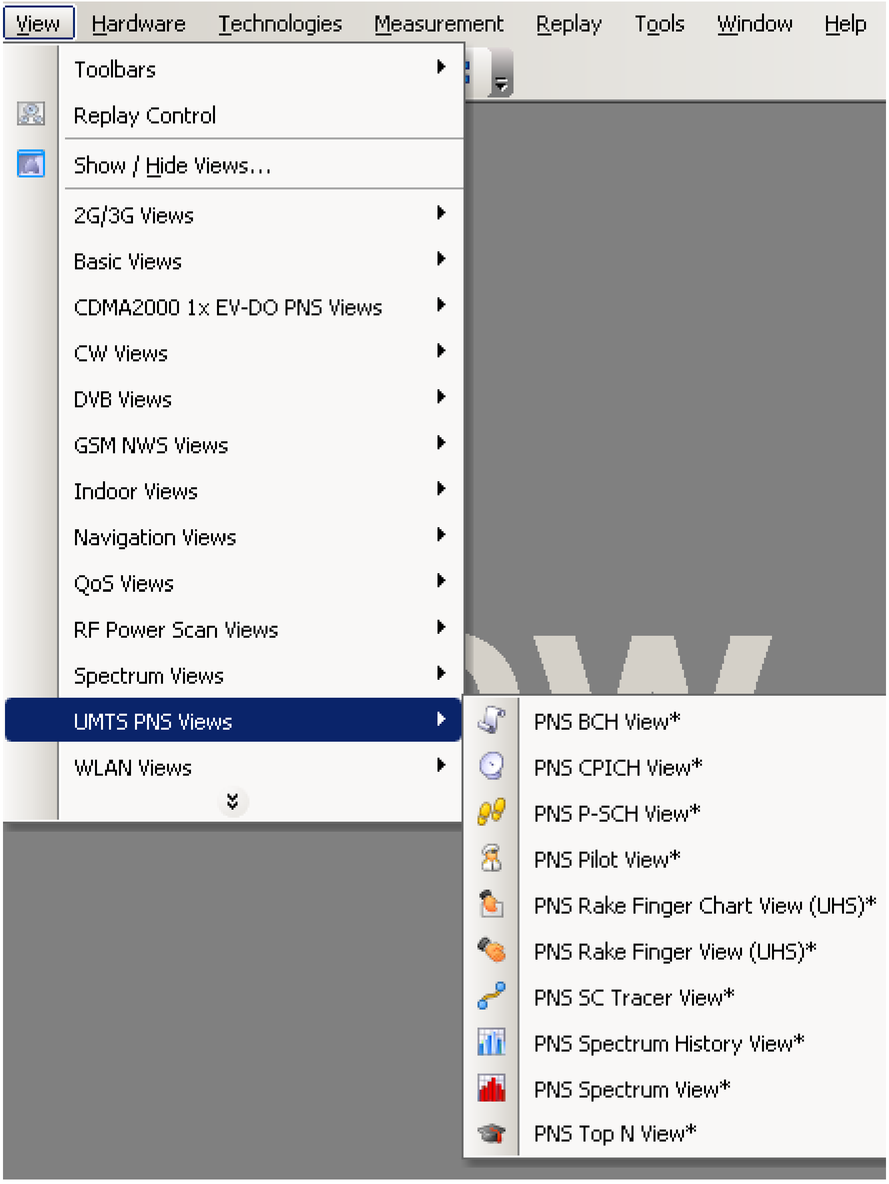


A *:1* is displayed behind the view type, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section WLAN views.

RF Power Scan Spectrum View	The RF Power scan allows elementary spectrum measurement and analysis.

UMTS PNS Views

Offers a selection of views to show UMTS Pseudo Noise Scanner data.



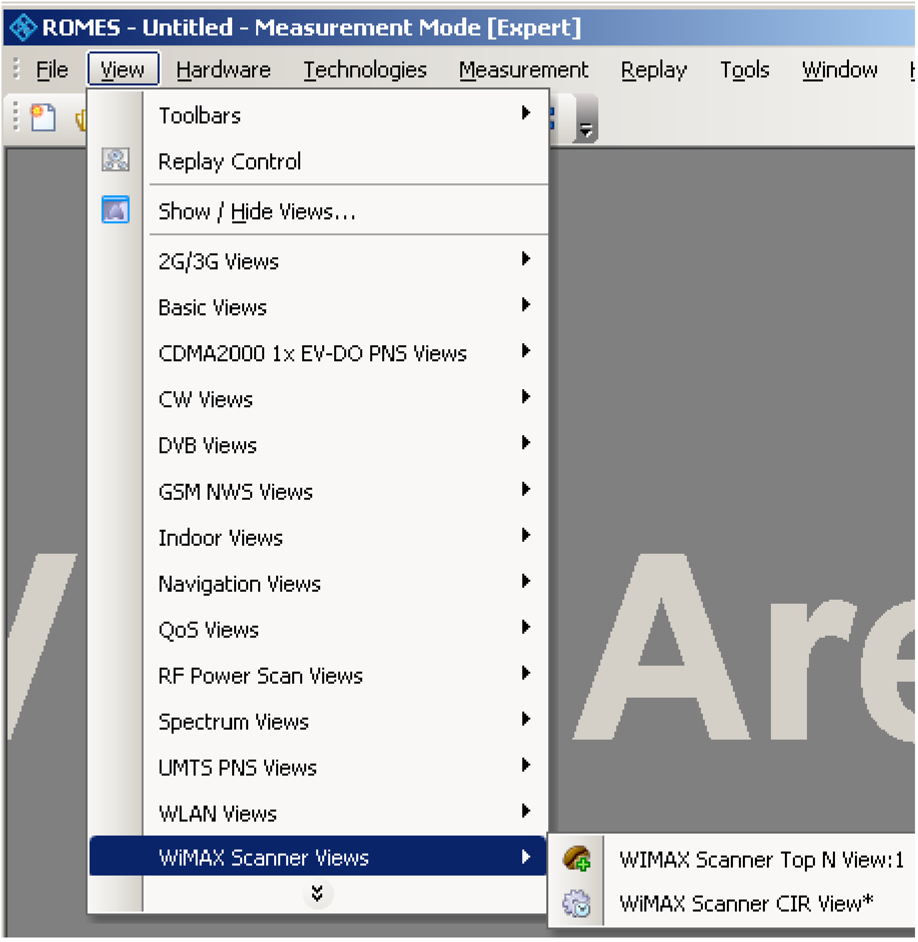
A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information views refer to chapter 4, section UMTS PNS Views.

PNS P-SCH View	Properties of the Primary Synchronization Channel in the DL UMTS signal.
PNS CPICH View	Average signal power of the received P-CPICHs and a comprehensive analysis of the properties of all DL signals received in the UMTS PN scan.
PNS Spectrum View	Measured UMTS signal strength in two different frequency ranges.
PNS Spectrum History View	Evolution in time of the measured UMTS signal strength in a specified frequency range.
PNS SC Tracer View	Evolution of the delay time of a single CPICH relative to the frame boundary. Several *PNS SC*

	Tracer Views with different configurations can be opened simultaneously.
PNS Pilot View	Received Signal Code Power (RSCP) of the Common Pilot Channels (CPICHs) together with their scrambling codes. Several *PNS Pilot Views* with different configurations can be opened simultaneously.
PNS Top N View	Properties of the signals from the Node Bs that are elements of the *Top N Pools* defined in the driver configuration menu.
PNS Rake Finger View (UHS)	Power and timing of multiple echoes of the Node B signal received with the rake receiver of an R&S TSMU operating in ultra-high speed mode.
PNS Rake Finger Chart View (UHS)	Evolution in time of the power of multiple echoes of the Node B signal.
PNS BCH View	System Information Blocks (SIBs) and Master Information Blocks (MIBs) decoded from the UMTS BCH with their full contents.

WiMAX Scanner Views

Offers a selection of views to show WiMAX Scanner data.

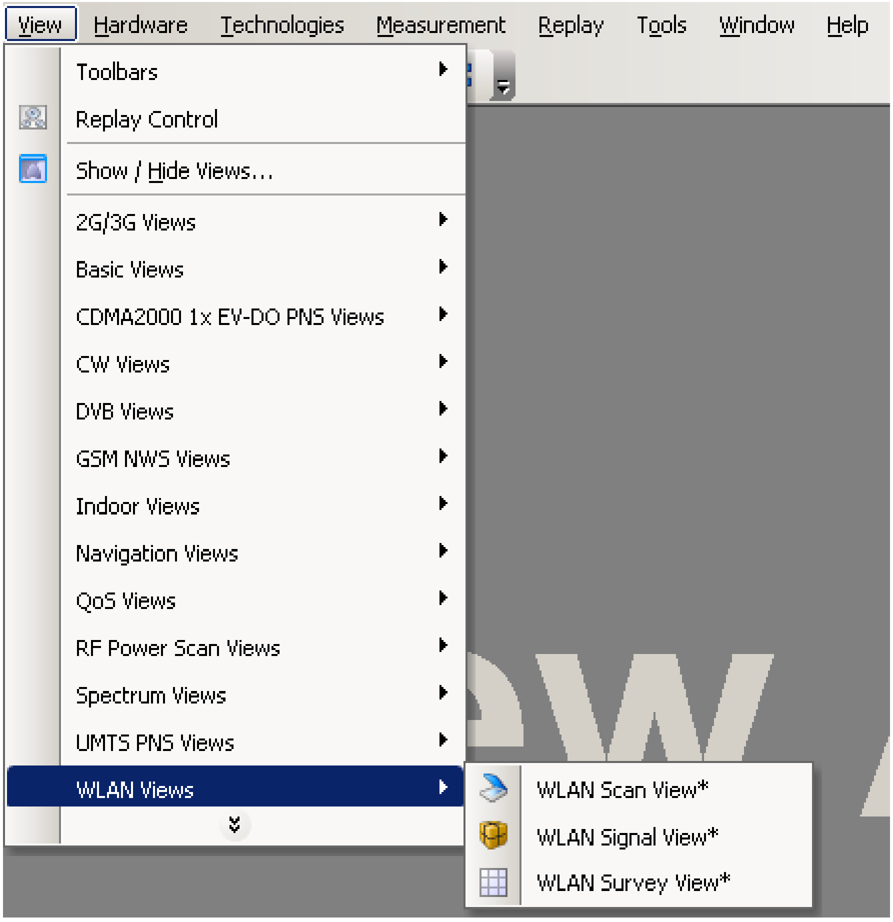


A *:1* is displayed behind each of the view types, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information views refer to chapter 4, section WiMAX Scanner Views.

WiMAX Scanner View	Shows the channel impulse response of the Wi-MAX signals.
WiMAX Scanner CIR-View	Shows the properties of the signals from the base transceiver stations that are elements of the Top N Pools defined in the technology configuration.

WLAN Views

Offers different views to analyze the WLAN information obtained in the network scans performed by a WLAN adapter in regular intervals.



A *:1* is displayed behind the view type, indicating that several views of the same type with different configurations can be opened simultaneously. For detailed information refer to chapter 4, section WLAN Views.

WLAN Scan View:	Basic information acquired in a WLAN network scan (WLAN BSSID list information).
WLAN Signal View	RSSI of all received signals in a 3-dimensional bar graph.
WLAN Survey View	Statistical evaluation of the results in the other WLAN views.

Hardware Menu

The *Hardware* menu installs the hardware drivers necessary for a measurement.

Driver Installation (Hardware)

The *Hardware – Add / Remove...* command installs the hardware drivers necessary for a measurement.

Hardware drivers are required for the system and the different types of mobile phones before a measurement is started. They can be provided in two different ways:

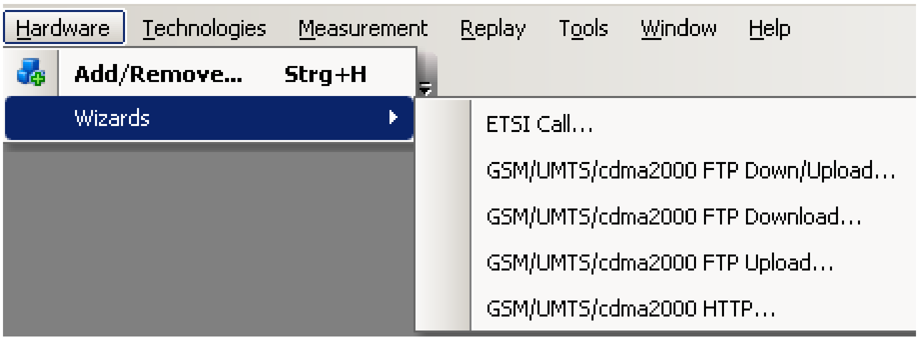
- Implicitly, by loading a workspace file
- Explicitly, via the *Hardware* command

The installation process is menu-guided. For further information refer to chapter 6, *Hardware Components.*

Note:
It is not necessary to install drivers for evaluating data in the replay mode. On the other hand, the Hardware... command is disabled as long as a measurement file is open.

Wizards

Wizards simplify the setup of a measurement task. Available Wizards can be found in the menu *Hardware – Wizards*.... Currently five different Wizards are available. Select a Wizard from the menu and follow the instructions on the screen.



Steps to configure the Wizards

- Select the device you want to use.
- Choose the country and the network provider for the data connection.
- Specify the ftp server by ip address or name.
- Specify the file to download.
- Enter password and name if necessary. If you press the Button *Anonymous* password and name will be generated automatically.
- Verify the data you entered and press *Finish*

After finishing the Wizard, all necessary drivers are loaded and configured automatically. Just start the measurement.

Technologies Menu

The *Technologies* menu displays technology-specific settings on the installed technology modules. For several technologies the menu contains particular configuration panels. In particular concerning the GSM BTS data base, UMTS Node B list, and the UMTS PNS and CW signals in the data tree.

Additionally all settings are also accessible via *Tools – Modules Configuration... – Tecs.*

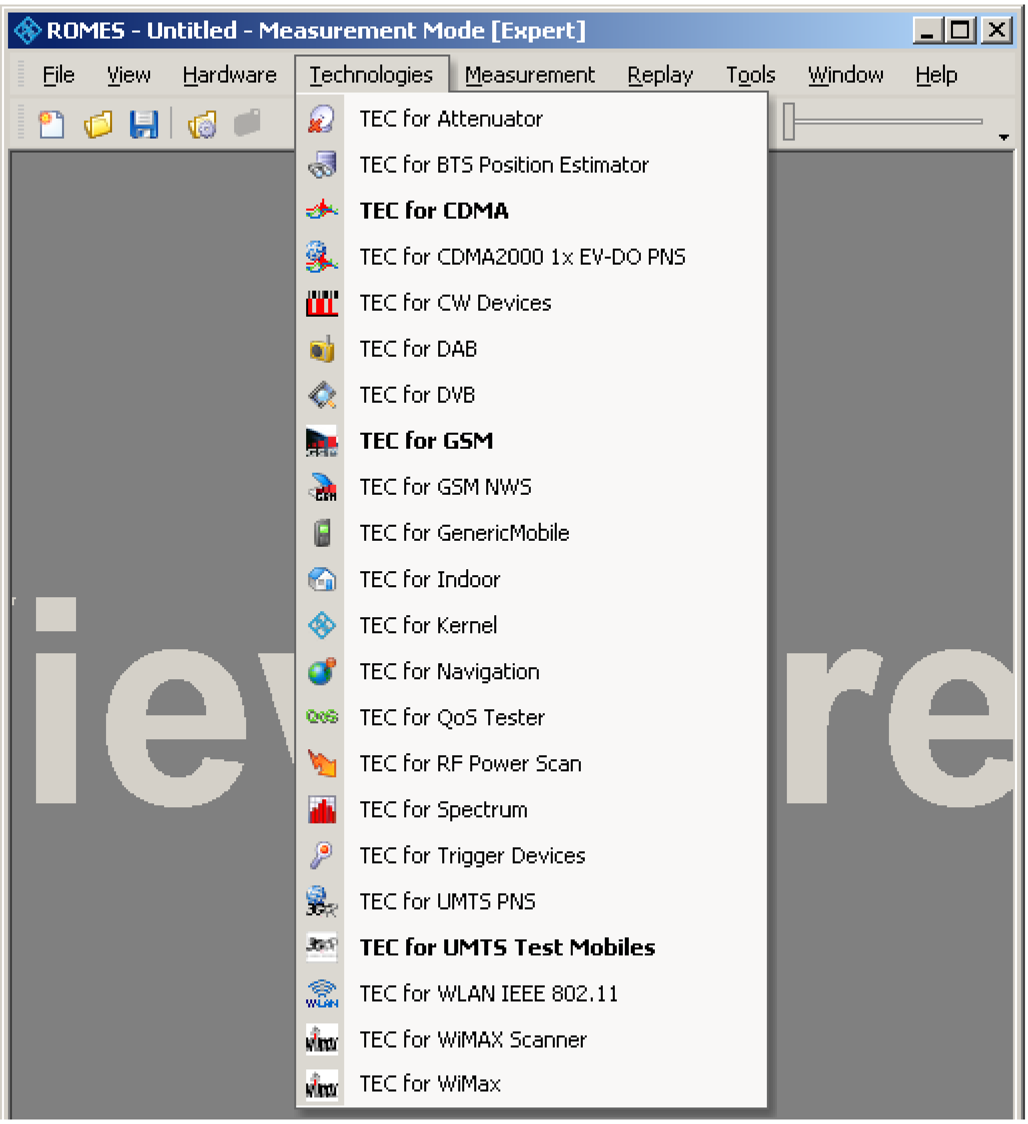


Fig. 3–5 Technologies menu

The *Technologies* menu contains following entries which allows configuring the settings:

TEC for CDMA Open the *CDMA BTS List Database* tab; see section *CDMA Technology* on p. 3.116 ff.

TEC for CDMA2000 1x EV-DO PNS Select the *CDMA PNS Settings* tab; see section *TEC for CDMA2000 1x* Ev-DO PNS on p. 3.100 ff.

TEC for CW Devices Select the *CW Technology* tab; see section *TEC for CW Devices* on p. 3.118 ff.

TEC for GSM	Selects the *GSM BTS List Database* tab; see section *GSM Technology* on p. 3.104 ff.
TEC for GSM NWS	Selects the *GSM NWS Settings* tab; see section *TEC for GSM NWS* on p. 3.94 ff.
TEC for UMTS PNS	Selects the *UMTS Technology Settings* tab; see section *TEC for UMTS PNS* on p. 3.117 ff.
TEC for UMTS Test Mobiles	Selects the *UMTS Node B List Database* tab; see section *UMTS Technology* on p. 3.112 ff.
TEC for WiMAX Scanner	Selects the *WiMAX Scanner TopN Settings* tab; see section *Tec for WiMAX Scanner* on p. *3.121* ff.
TEC for WiMAX	Selects the *WiMAX BTS Database* tab panel; see section *WiMAX Technology* on p. *3.119* ff.

Measurement Menu

The *Measurement* menu starts and stops a measurement and displays the list of event settings.

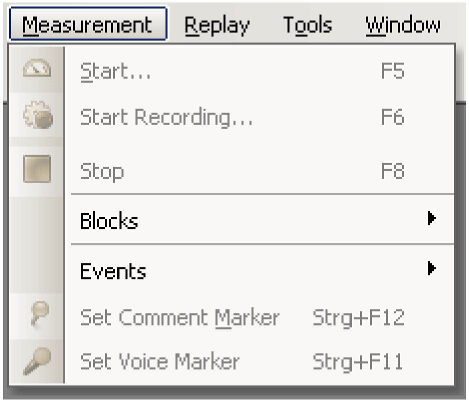


Fig. 3–6 Measurement menu

Start ...

Starts the measurement without writing the data to a file.

A measurement can also be started with the *Start measurement* button on the measurement bar.

> **Note:**
> *The Start Measurement command is disabled unless at least one device driver has been loaded using the Hardware – Add/Remove ... command.*

Before the measurement starts, a temporary *measurement file* (extension *.cmd or *.rscmd) must be defined. To this end, the *Open* window (see *Open Workspace* command) pops up and offer a list of already existing data files.

- Select one of the existing files to overwrite previous measurement data.
- Define a new measurement file if you do not want to overwrite any existing data.
- Press the *Open* button to open the selected/defined file for writing and return to the measurement, which will now start immediately.

With a temporary *.rscmd (or *.cmd file) it is possible to switch over to *Recording* without delay while a measurement is running (see *Start Recording* command below). Otherwise, nothing is recorded and the temporary *.rscmd (or *.cmd) file will be deleted after the end of the measurement.

Start Recording

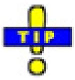
Starts the measurement (if not yet running) and writes the data to a measurement file so that a replay of the results is possible later.

Data recording can also be started the *Start recording* button on the measurement bar. A measurement file (not temporary this time) must be defined as explained in the *Start measurement* command.

Note:

The Start Recording command is disabled unless at least one device driver has been loaded using the Hardware – Add/Remove ... command.

Start Recording creates a new block in the measurement file; see *Replay Jump To Block* on p. *3.74*..



For ROMES versions ≥ V3.50 the current workspace settings are stored with the measurement file. A workspace recorded in an *.rscmd (or *.cmd) file can be re-loaded using *Open Workspace* in the *File* menu.

Data recording rate:

The data recording rate depends on the number and kind of used devices and on the measurement settings.

Example:

A system with two GSM mobiles in Normal *mode, using both the* Autodial *and* NQA *function, will roughly estimated generate 1 MB of data in about 20 minutes.*

Note:

An exception is the time-triggered CW measurement recording raw data. Here, especially when only one channel is measured, the rate may rise up to 20 MB to 30 MB per hour. So take care of your disk storage capacity if you use a test receiver, and slow down the recording rate if possible without violating the test criterions - see also section Test receiver driver ESVx in chapter 6.

Measurement file

The *Start Recording* command overwrites the current measurement (*.rscmd or *.cmd) file, i.e. the file opened via the *File – Open Measurement File...* command (see section *File Menu* on page 3.6 ff). If no measurement file has been selected yet, the *Open CMD File..* command is executed first, i.e. an *Open* window is called up.

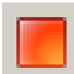
Stop Recording

Stops data recording without stopping the measurement.

Data recording can also be stopped with the *Stop recording* button on the measurement bar.

Stop Recording terminates the current block in the measurement file; see *Replay Jump To Block* on p. *3.74*..

Stop



Stops the measurement and data recording or the replay.

An ongoing measurement or replay can also be stopped with the *Stop* button on the measurement bar.

If *Ask for Comment after the Measurement* is enabled in the *Preferences* dialog (see section General Settings on p. 3.76 ff.), a user-defined comment can be stored with the measurement file header.

Status of the measurement

The measurement bar indicates the current status of the measurement:

Measurement disabled

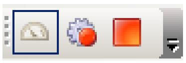
All icons are grayed. You have to load and configure your device drivers first.

This status is always active after starting R&S ROMES.

Waiting for measure-ment

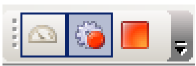
Buttons 1 and 2 are enabled because no measurement is running. Click one of these icons to start a measurement and/or recording.

Measurement without recording



The measurement is running, as button 1 is disabled. As button 2 is still active, no recording has started yet. You can either start recording or stop the measurement.

Recording data



Finally recording has started. Click button 2 to stop the recording or button 3 to stop recording *and* measurement.

Blocks

Opens a submenu to define blocks within a measurement file.

The *Blocks* submenu is enabled only while a measurement is running. The menu commands *Start Block* and *Close Block* define the start and end of a block, respectively. *Discard Current Block* is enabled after *Start Block.*

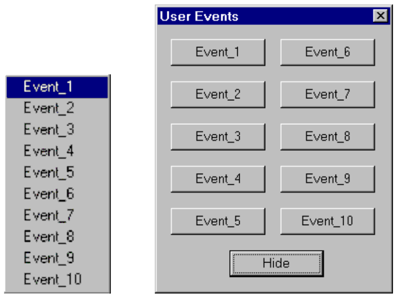
Blocks represent a useful navigation tool within the replayed measurement file; see *Replay Jump To Block* on p. *3.74*.

Events

Triggers a user-defined event which is stored in the measurement file currently recorded.

A list of up to 10 user event types is shown in a pop-up list displayed on the right of the *Measurement* menu as soon as the cursor is placed on the *Events* command line. This menu is equivalent to the *User Events* menu opened via the corresponding icon in the measurement bar. Both menus are enabled only during measurement recording. The event names *Event_1* to *Event_10* can be changed via the *Tools – Preferences* command, see *Event Configuration* on p. 3.81 ff.

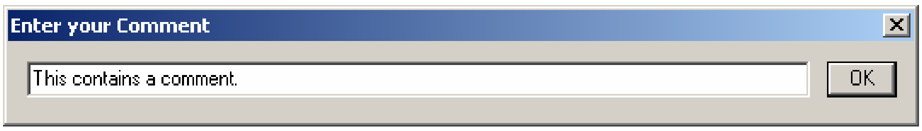
Event_1 Triggers an event of type Event_1 and includes it in the measurement data.



Set Comment Marker

Triggers a comment marker event to be included in the measurement file.

The purpose of the comment marker event is to include a written comment into the measurement file that is related to the particular time (or position) when the *Set Comment Marker* was triggered. After *Set Comment Marker* is activated, a comment entry dialog is shown:



At the end of the comment, click *OK* to continue the measurement. *Set Comment Marker* is enabled after *Start Recording.* For *Comment Event* configuration refers to p. 3.84.

Please note that the measurement recording cannot be stopped unless the Comment Marker is closed or disabled.

Set Voice Marker

Triggers or stops a voice marker event to be included in the measurement file.

The purpose of the voice marker event is to include a spoken comment into the measurement file that is related to a particular time or position. After *Set Voice Marker* is activated, the *On Air* message in the status bar indicates that R&S ROMES is ready for recording the comment spoken into a connected microphone:

At the end of the comment, click *Set Voice Marker* again to continue the measurement. *Set Voice Marker* is enabled after *Start Recording.* For *Voice Marker Event* configuration refers to p. 3.84.

Please note that the measurement recording cannot be stopped unless the Voice Marker is closed or disabled.

Replay Menu

The *Replay* menu starts and stops the replay of a measurement file..

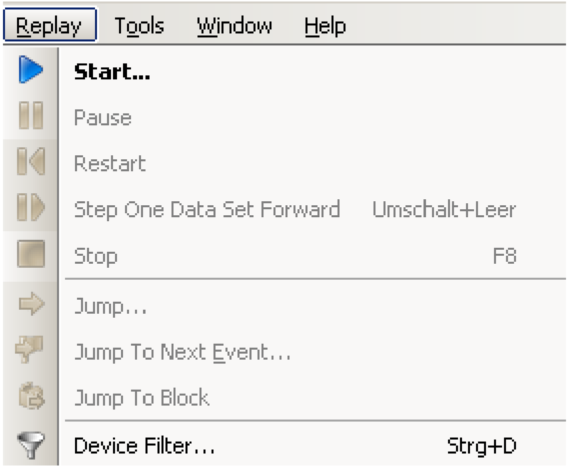
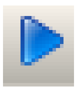


Fig. 3–7 Replay menu

Start Replay



Loads a measurement file and replays it on the screen.

The replay mode can also be started with the *Start Replay* button on the measurement bar. If *Show Replay Control Dialog Automatically...* is selected in the Preferences dialog (see section *General Settings* on p. 3.76 ff.), *Replay* also opens the *Replay Control* dialog described on p. 3.29.

Hardware drivers

To replay a file, it is not necessary to load any device drivers. You only have to configure the desired views. The number of devices in the replayed file must not exceed the *Maximum Number of Devices* set in the *Advanced Settings* tab of the *Preferences* menu (see p. 3.90).

Measurement file

The *Replay* command replays the current measurement (*.rscmd or *.cmd) file, i.e. the file opened via the *File – OpenMeasurement File...* command (see section *File Menu* on page 3.6 ff). If no measurement file has been selected yet, the *Open CMD File...* command is executed first, i.e. an *Open* window is called up.

Note:
A replayed measurement file must not have the file attribute Read Only. To replay files from a CD-ROM or DVD-ROM the files must be copied to the hard disk or another appropriate medium and the file attributes must be changed.

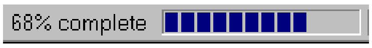
Monitoring the replay process

Two different tools are indicated while the measurement file is replayed:

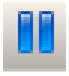
- In the measurement bar, next to the icons controlling the replay mode, the *Replay Speed* is indicated on a marker bar with an arrow symbol:

By default the measurement file is loaded at *Min* speed (arrow at the left end of the scale. The replay speed may be enhanced by dragging and dropping the arrow symbol on the marker bar to the right. Minimum and maximum speed depends on your system resources.

- In the left-hand part of the status bar a bar graph indicates the progress of the replay, i.e. the percentage of data already loaded.



Pause Replay



Pauses (interrupts) the replay process.

A pause can also be initiated with the *Pause* button on the measurement bar. This function is available irrespective of the replay speed set. The replay process is resumed by pressing *Pause* again.

Status of the replay process

The measurement bar indicates the current status of the replay process.

No replay active

All icons are grayed except the *Start replay* icon. This is the status after starting the measurement system or after a replay was completed or stopped.

Replay running or paused

A measurement file is being replayed. You can now pause, jump to another position in the file, pause, or stop the replay. A paused replay can be continued by clicking the *Pause* icon again or stopped.

Step One Data Set Forward

Pauses (interrupts) the replay process after the next data frame.

A pause after the next data frame (i.e. the next time when data were recorded) can also be initiated with the *Step One Data Set Forward* button on the measurement bar. This function is available while a measurement file is being replayed. If applied repeatedly, it can be used to step through the measurement file and monitor the individual data frames recorded.

Restart Replay

Stops and re-starts the current replay process.

A restart can also be initiated with the *Restart Replay* button on the measurement bar. This function is available while a measurement file is being replayed. It corresponds to the command sequence *Stop – Start Replay.*

Device Filter

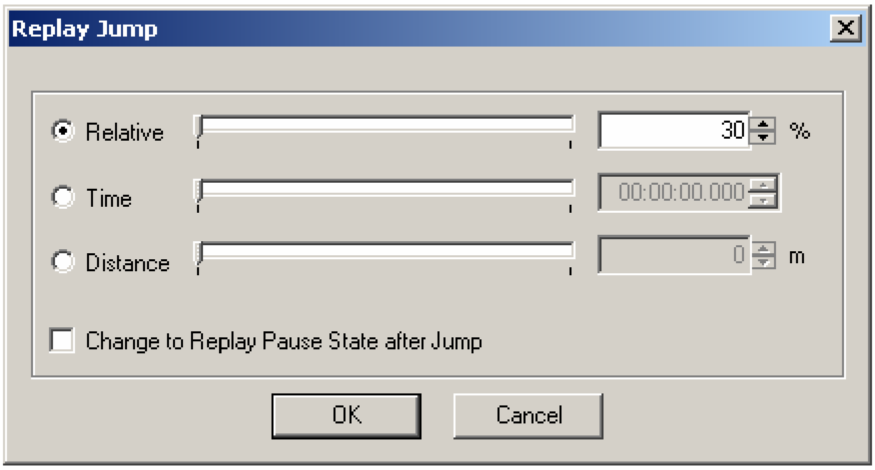
Opens the *Replay Device Filter* dialog for the test devices in the replayed file.

The *Replay Device Filter* shows the test devices of the currently replayed measurement file. If no measurement file is open, it shows the devices of the last file replayed. Measurement data from unchecked devices is excluded from the replay. The dialog is updated each time a new measurement file is loaded.

Jump

Jumps forward and backward in the measurement file.

Click the Jump icon and the Replay Jump window is opened :



The current position within the measurement file, the current measurement time, and the current driven distance is indicated in the three fields to the right of the *Relative/Time/Distance* radio buttons. The position of the arrows on the marker bar corresponds to the relative time needed to replay the file up to this position/the time relative to the total measurement time/the current distance relative to the total distance.

After selecting one of the three parameters *Relative/Time/Distance,* the current position in the measurement file can be changed by overwriting the value in the field, by incrementing/decrementing the indicated value with the up/down buttons on the right side, or by dragging the arrow across the marker bar.

Measurement files are recorded such that a later measurement time corresponds to a later file position of the measurement data. The *Replay Jump* function can therefore be used to select a particular stage of the measurement tour.

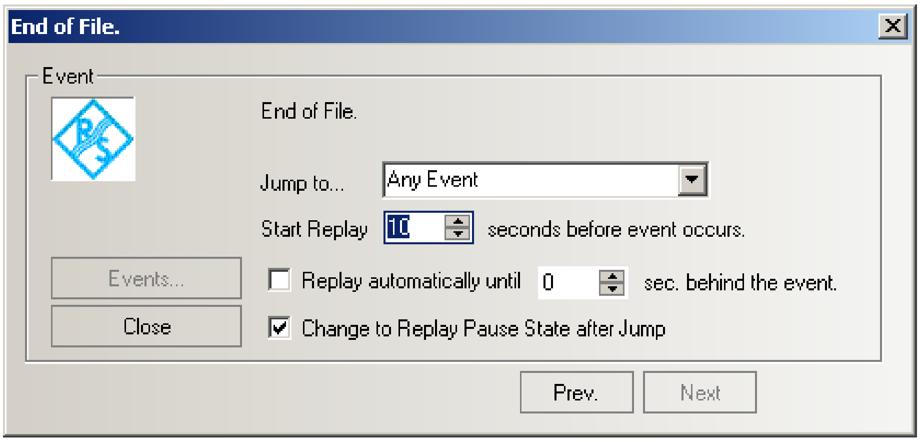
If the *Change to Replay Pause State after Jump* box is checked, the replay is paused after the jump; otherwise, it will be continued.

Hint:

Replay Jump To Next Event

Jumps forward to the next event in the measurement file.

The *Jumping... Event found* window is opened:



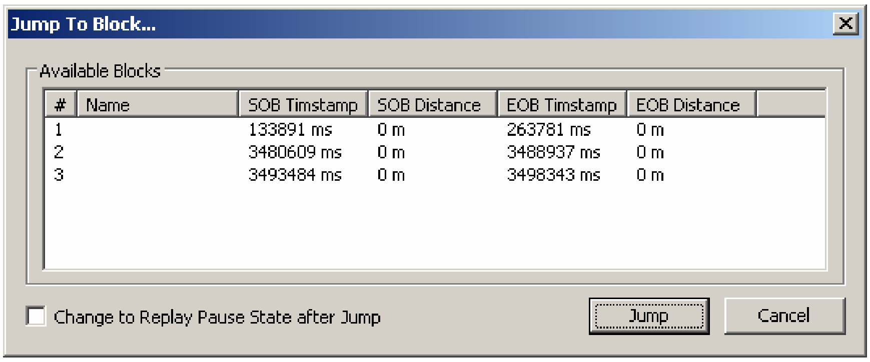
The events to be searched for must be defined in the *Available Events* tab of the *Preferences* menu (see section *Event Configuration* on p. 3.81 ff.) before the replay is started. The event found is indicated in the *Event* panel, together with its time stamp in the measurement file and the name of the measuring device.

Jump to	List of events, according to the current Event Configuration.
Start Replay…	Defines the start time of the replay to be initiated after a particular event is found.
Replay	Closes the Event found window and resumes the replay session, refreshing the contents of all views. The replay is paused or re-started at the *Start Replay…* time, depending on whether *Change to Replay Pause…* is enabled or disabled. At the end of the file, the *Replay* button is replaced by *Close*, the title bar of the window indicates "End of File".
Prev. / Next	Jumps to the previous or to the next event in the measurement file. This button is disabled if no event is found.
Events...	Opens the *Available Events* tab of the *Preferences menu* to change the current event selection. This button is disabled if no event is found.

Replay Jump To Block

Jumps to a block in the measurement file.

Recording is interrupted and the *Jump to Block* dialog is opened:



Note:

Replay Jump to Block is only enabled if a measurement file recorded with R&S ROMES V3.22 or higher containing several blocks is replayed. The blocks must be defined during the measurement using the Blocks submenu; see below. A new block is defined each time that recording is started (Start Recording). Stop Recording closes the current block. A name can be assigned to each block if this feature is enabled in the Preferences dialog; see section *General Settings on p. 3.76 ff.*
The blocks in a measurement file can be exported separately; see description of data export in chapter 8.

The *Jump to Blocks* dialog displays a complete list of the blocks in the replayed measurement file. Each block is characterized by the timestamp for the start (SOB) and end of the block (EOB). An SOB and EOB distance is available in addition if the *Trigger Box* is used for the measurement (see chapter 6).

Jump Jumps to the selected block and closes the dialog. The replay is resumed or pauses at the start of the selected block, depending on whether Change to Replay Pause State after Jump box is checked. Jump is disabled if no block is selected in the list.

Cancel Closes the dialog without any further action.

Tools Menu

The *Tools* menu configures the display and defines directories for the different types of files used by the measurement system.

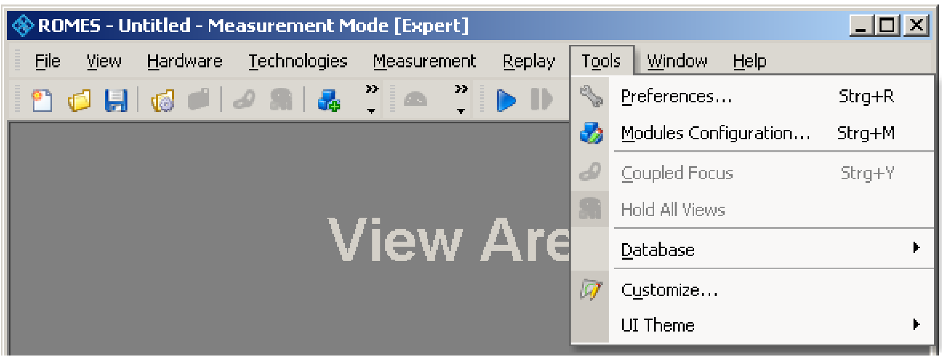


Fig. 3–8 Tools menu

System Configuration (Preferences)

Tools – Preferences opens the *Preferences* menu with the following settings:

- General system and measurement settings *(General*)
- Configuration of measured signals *(Available Signals)*
- Selection and definition of events *(Available Events)*
- Configuration of measurement file scanning and replay filter *(File Scanning)*
- Selection of Autostart Settings *(Auto-/Restart)*
- Definition of shortcuts for common program tasks *(Shortcuts)*
- Maximum number of devices and registry entries *(Advanced Settings)*

The signal configuration and the event definitions can be stored to the current workspace. Some of the tabs in the *Preferences* menu are not available during a measurement or a replay.

General Settings

The *General* tab in the *Preferences - Basic* menu offers general measurement and system settings.

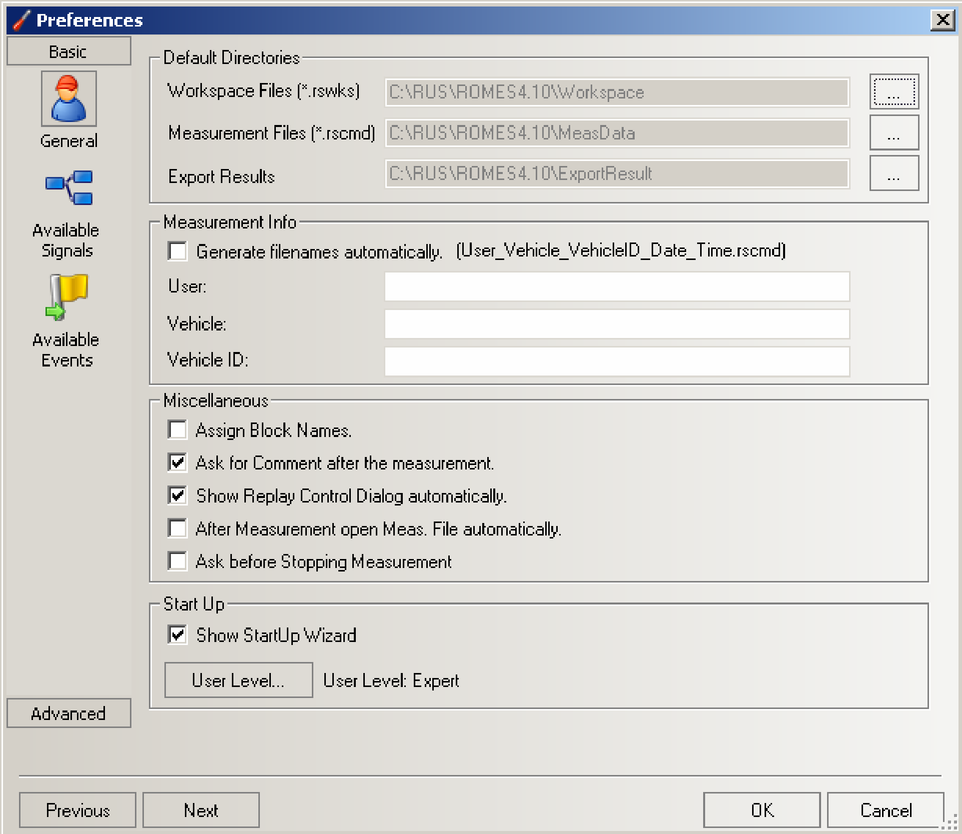


Fig. 3–9 Preferences – General

Default Directories The *Default Directories* panel indicates the current default directories for measurement (*.rscmd or *.cmd), workspace (*.rsxks), and exported data files (see chapter 7). The directories can be changed in a *Look for Directory* dialog which is opened on clicking the browse (...) buttons.

Measurement Info The *Measurement Info* panel contains three entry fields for the user name, the vehicle used for the measurement tour, and the vehicle ID. The entries are stored in the measurement file and displayed when a measurement file is opened (see *Open Measurement File...* command in section File Menu on p. 3.6 ff.).

Generate filenames automatically

If the *Generate filenames automatically* box for recording is checked, R&S ROMES automatically assigns a file name (User_Vehicle_VehicleID_Date_Time.rscmd) to any measurement file created on executing the *Start Measurement* or *Start Recording* commands. Otherwise, the two commands first open a dialog window to select the directory and define the name of the measurement file.

Miscellaneous The *Miscellaneous* panel contains several settings to control the recording of measurement files.

Assign Block Names

If the box is checked, a block name can be assigned every time that a new block in a measurement file is generated; see Replay Jump To Block on p. 3.74.

Ask for Comment after the Measurement

If the box is checked, a user-defined comment can be entered before the measurement file is closed on executing the Stop Measurement command.

Show Replay Control Dialog automatically

If the box is checked, the Replay Control dialog is opened each time that a measurement file is replayed. Alternatively, the dialog can be opened using *View – Replay Control* (see p. 3.29).

After Measurement open Meas. file automatically…

If the box is checked, the measurement file from the last recorded measurement is opened automatically. Alternatively, the measurement file can be opened manually using the *Open Measurement File...*dialog*l* (see p. 3.12)..

Ask before Stopping Measurement

If the box is checked, the system ask if the measurement should be really stopped or not.

Start Up

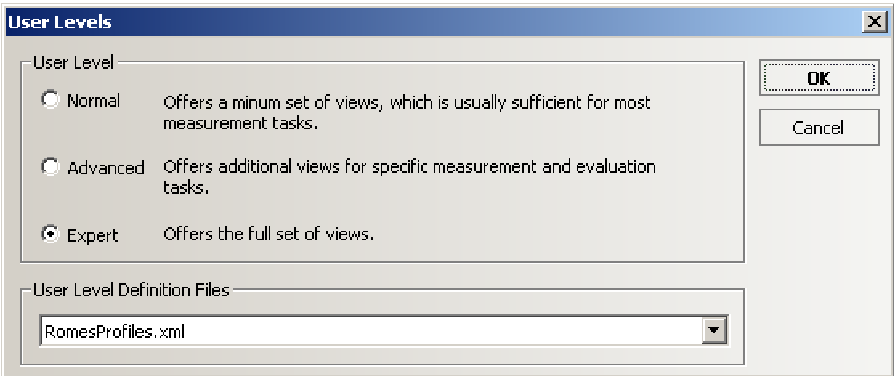
Defines the workspace and measurement file to be loaded when R&S ROMES is started.

Show StartUp Wizard

The StartUp Wizard allows choosing how R&S ROMES will start. Before the application starts the user can select between starting with a predefined workspace or project and an empty R&S ROMES. Additional a measurement file can be selected, which will be open end immediately after booting of R&S ROMES. R&S ROMES only loads those modules that are supported by the available licenses and resolved dependencies during start-up automatically.

User Level

Opens a dialog to define the user level:



The set of R&S ROMES views and signals can be configured for three different user levels. Which view is shown for which user level can be configured in different XML files, which have to stored in the directory "<ROMES directory>\UserLevelDefinitions".

R&S ROMES has to be restarted after changing the user level. Alternatively, the <CTRL> key can be presses during the start-up of R&S ROMES to set a new user level.

To change or create new user level definition XML file, please refer to the comments in the delivered XML file.

Less views and signals will speed up R&S ROMES, and the full set of views and signals with the “Expert” level slows R&S ROMES down.

It is recommended to adapt the XML file for certain user levels. The “Normal” user level can be used for measurement, and the “Advanced” or “Expert” levels should only be used for investigation.

If different technologies are measured, use the “ExcludedTec” feature of the XML file and create different XML files in which all unnecessary technologies are disabled.

Note: *The previous feature of deselecting different views (Advanced Tab) has been removed. This is covered by the user level definition files now.*

Signal Configuration

The *Available Signals* tab in the *Preferences – Basic* menu displays and configures the signals available for viewing.

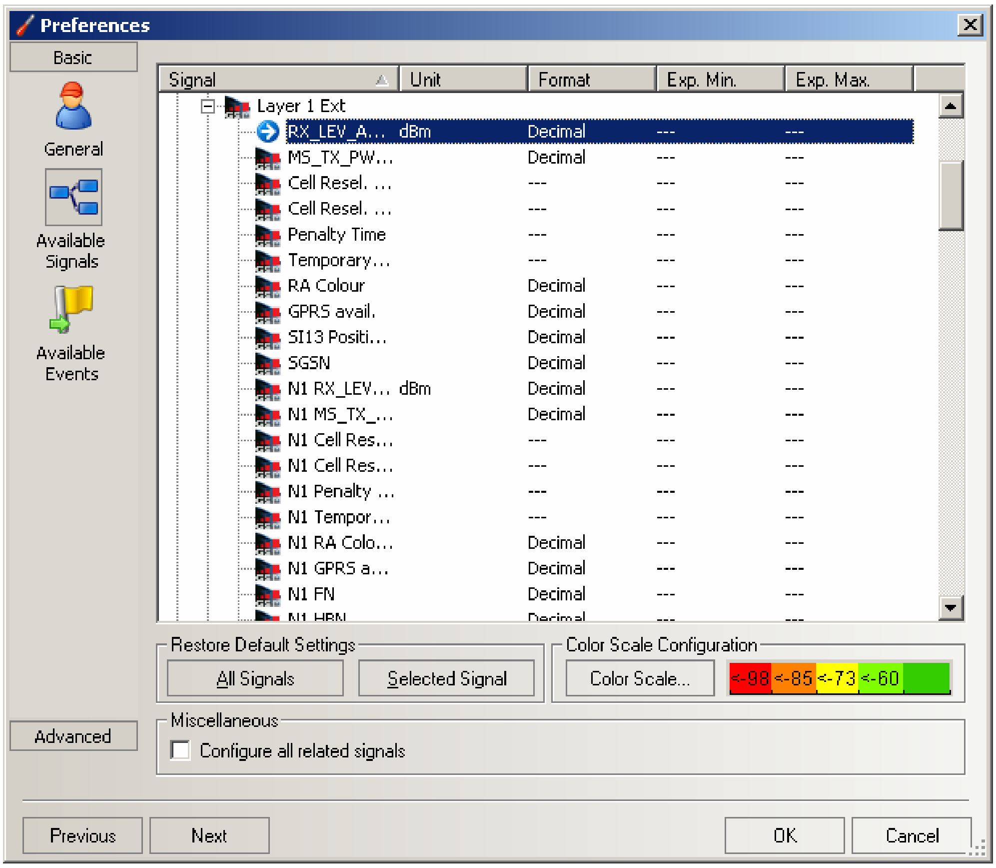


Fig. 3–10 Preferences – Available Signals

Data tree The data tree shows all signals available for viewing. By double-clicking the entries in the corresponding columns, the unit, display format, and the range of values to be displayed in the views (expected minimum and maximum) can be modified.

TIP

Exp. Min and Exp. Max define the total y-axis scale of several views (e.g. the 2D Chart View). Manual scaling of the y-axis is particularly useful if the actual value range of a signal (or its range of interest) is considerably smaller than its "natural" scale (e.g. if only small GSM signal levels are measured so that the entire RxLev scale between 0 and 63 is not needed).

Restore Default Settings

The two buttons in the *Restore Default Settings* panel reset the unit, format, and the expected minimum and maximum to default.

All Signals

Default settings for all signals

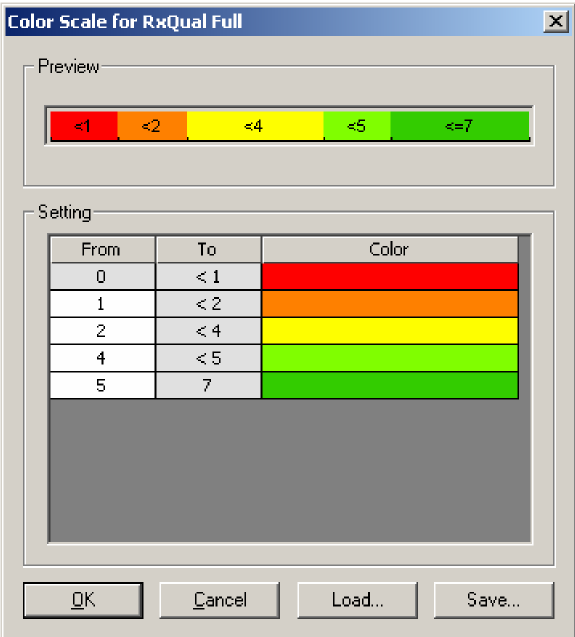
Selected Signal

Default settings for selected signal only

Color Scale Configuration

The *Color Scale* button determines in which way the current signal parameter is visualized in an *Indoor* or *Route Tracking* view. If no meaningful scale can be assigned to the selected signal, the button is disabled (grayed), and *Not Available* is indicated instead of a color scale.

The *Color Scale* button opens the *Color Scale for...* menu assigning display colors to five sub ranges of the selected parameter range.



Preview

Preview of the current color configuration

Setting

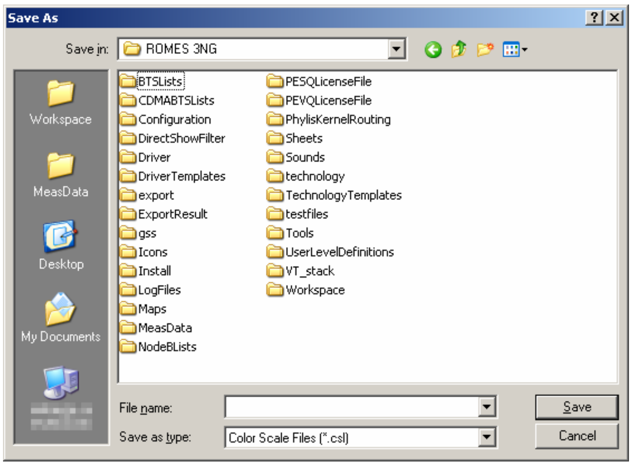
Tabular overview of the five sub ranges and associated colors. The lower limits (From) can be changed (double-click the white table fields and overwrite the entry) but must remain in ascending order. The colors can be changed in the Colors menu opened on double-clicking a color field. Refer to the context-sensitive help for information on the Colors menu.

Load

Opens a *File Open* dialog to load a color configuration from a color scale file defined previously. Color scale files are ASCII text files with the extension *.csl.

Save

Opens a file *Save As...* dialog to select a directory and define a file name for the current color configuration.



Color scale files are ASCII text files with the extension *.csl. They contain the defined colors and the corresponding ranges, e.g.:

```
[Col]
NumberOfEntries=3
RangeMin=0.000000
RangeMax=33.000000
Type=0
Color_0=255
Value_0=0.000000
Color_1=33023
Value_1=12.000000
Color_2=65535
Value_2=25.000000
```

Miscellaneous

The *Miscellaneous* settings can be activated in order to configure related signals simultaneously and to save the signal configuration to the workspace.

Configure all related signals

Changing the properties of a signal affects the properties of all other related signals. Related signals contain the same type of measurement data but differ in one or more parameters so that they can be measured and displayed separately. In the data tree, related signals can belong to the same or to different parent nodes. Checking this function is useful especially for large groups of related signals; see examples below.

Examples for related signals

- GSM parameters such as *RxLev* are measured not only for the serving cell but also for up to 6 neighbor cells N1 to N6. All signals of the same parameter originating from different cells are related signals.
- The *UMTS – Finger Info* data structure contains signals for the *Scrambling Code (SC)*, E_c/I_0 and *Time Offset* of the signals captured with the different fingers of an UMTS RAKE receiver. All *SC*, E_c/I_0 and *Time Offset* signals are related signals.
- Part of the *UMTS PNS* data is arranged according to the different Top N Pools defined in the UMTS PNS driver configuration menu and their elements. Signals from different pools and elements containing the same type of data *(Rank, Power, SC, ...)* are related signals.
- The optional *CIR…* signals for different frequencies and downlink scrambling codes (see section *TEC for UMTS PNS* on p. 3.117 ff.) are all related signals.

Event Configuration

The *Available Events* tab in the *Preferences - Basic* menu selects the signal events to be recorded during the measurement and configures additional *User Events* and *Comment Events*.

- Signal events are automatically generated by the test system, according to the properties of a measured signal and the configuration settings made in the *Available Events* tab. Examples for signal events are sudden changes of a numeric signal value (e.g. a drop of the measured signal power, a channel change), or recorded actions (e.g. the start of a call or a handover).
- User and comment events must be both triggered manually during the measurement. They can be used to include information into the measurement file that is not automatically recorded but helps to interpret the measurement data.

If an event is activated, the Event symbols can be displayed in many general purpose and other view types, e.g. in a *Route Track,* in an *Indoor,* or in a *2D Chart* view. The *Event View* displays a chronological record of all events that occurred during the measurement.

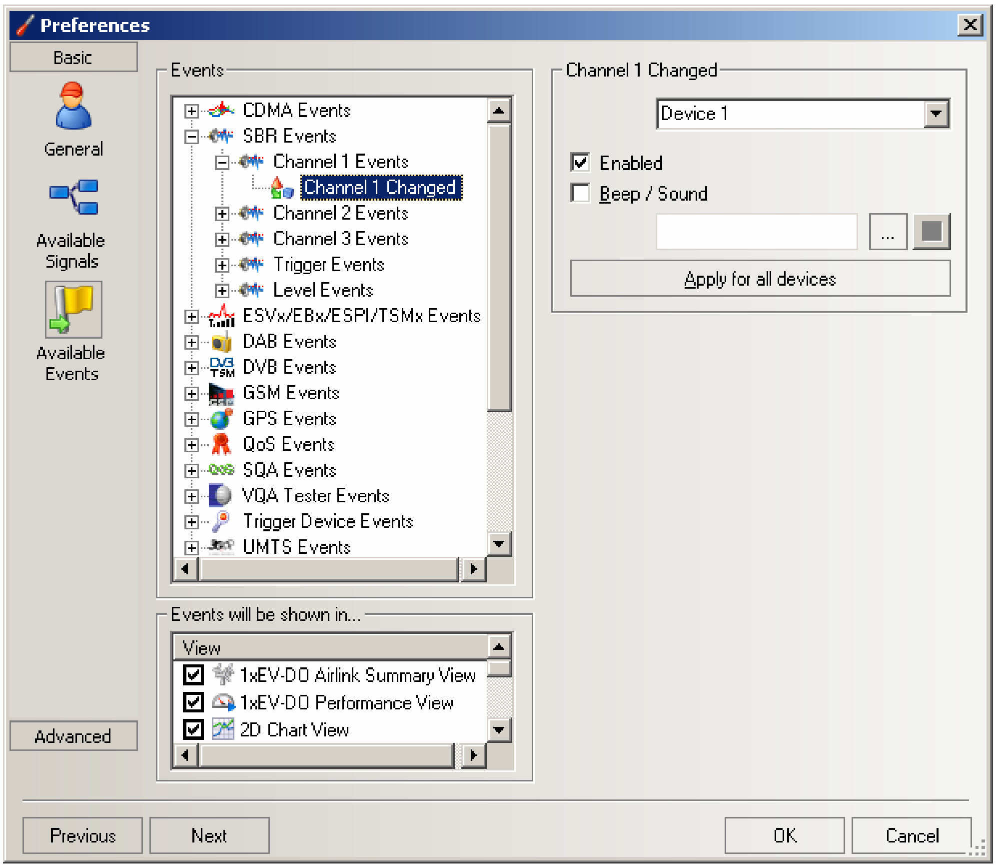


Fig. 3–11 Preferences – Available Events

Events tree The *Events* tree shows all events that can be generated by R&S ROMES together with their display symbols in the general purpose views. Selecting an event opens a specific configuration section in the right half of the menu.

Events are activated to be recorded by double-clicking; an activated event is preceded by a checkmark and indented.

<Event> Depending on the selected (clicked) event, various settings are offered on the right side of the *Available Events* tab.

Device

Events can be generated for only one or for all devices used.

Enabled

Event recording is enabled for the selected device, provided that event recording is generally enabled in the event tree (the event is double-clicked, its symbol is preceded by a checkmark)

Beep/Sound

If the box is checked, a configurable sound announces that an event was triggered, see below.

On All Changes

If the box is checked, an event is selected whenever the value of the selected parameter changes. This function is useful, e.g., to indicate the change of channels, modes etc. It should not be used for measurement parameters that continuously vary in time, like RxLev etc.

Apply for all devices

If the button is clicked (and the label appears in a dashed frame), the event settings are valid for all devices used, not just to the device indicated in the Device field.

Finally, the user events *Event_1* to *Event_10* can be renamed for later identification in the <Event> panel.

Events will be shown in…

List of all open views which are capable of displaying events. The events appear in all selected views.

Positive Slope / Negative Slope

An event can be triggered when a signal parameter passes a given threshold in upward or downward direction (positive/negative slope). This feature is provided for numeric parameters that cover a range of (continuous or discrete) values, e.g. RxLev, FER etc.

Activate

If the box is checked, the positive or negative slope event is triggered, respectively.

Threshold

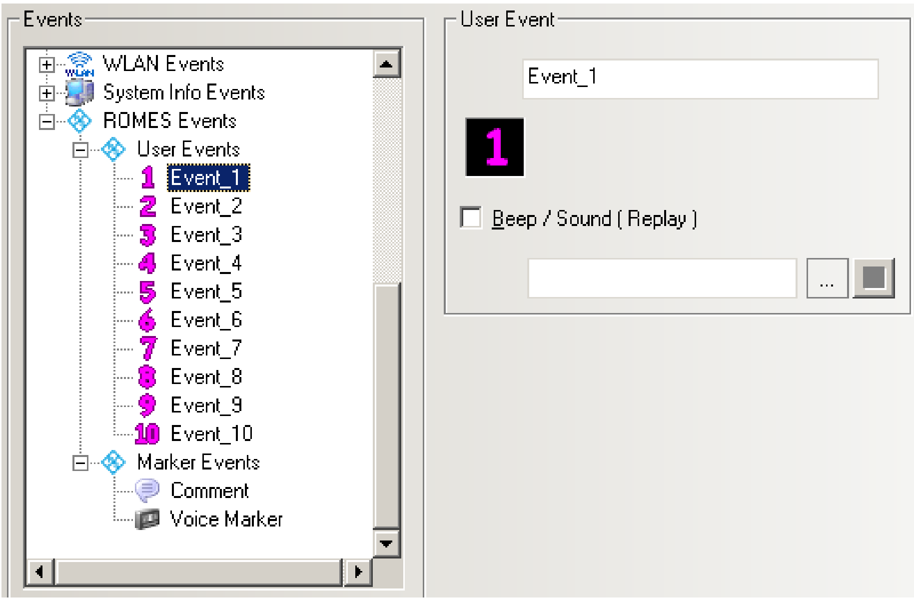
Entry of the positive/negative threshold. The units of the signal are selected automatically.

Sound

A sound to announce the event is activated by loading a *.wav file which can be selected via the browse (…) button. The selected *.wav file is indicated in the Sound window; at the same time, the gray square icon on the right side changes to an icon showing a megaphone. R&S ROMES provides a selection of *.wav files in the *Sounds* sub-directory of its program directory.

User Events

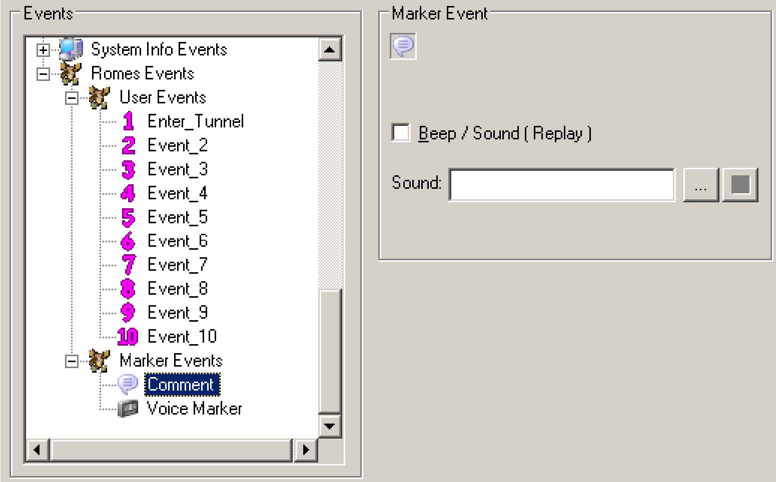
User events is located below the *Romes Events – User Events* node of the event tree. Their name can be changed for later identification (use names such as *Enter_tunnel*, *Leave_tunnel* etc. instead of the default event names *Event_1* to *Event_10*).



The new event names will show in the *User Events* list opened by the *Events* command in the *Measurement* menu or by the corresponding icon in the toolbar. To make event handling easier, shortcuts can be used to trigger the individual user events, see next section. The default shortcuts for user events no. 1 to 10 are the F1 to F10 keys.

Comment Event

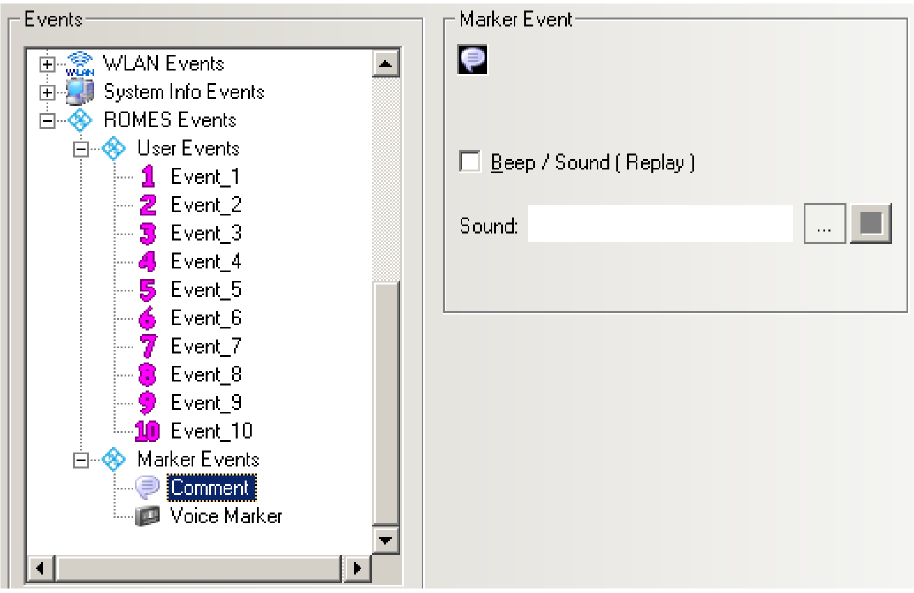
The comment events is located below the *Romes Events – Marker Events* node of the event tree.



The purpose of the comment event is to include written information into the measurement file that is related to a particular time or position. When recording measurement data *(Measurement – Start Recording)*, you can trigger events using the *Set Comment Marker* command in the *Measurement* menu (see p. 3.69) or using a shortcut assigned in the *Assignment of Shortcuts* tab (default: *Ctrl + F12)*. After pressing the shortcut, you can enter the comment into a popup window. In the measurement file the comment is associated with the time when the event was triggered.

Voice Marker Event

The *Voice Marker* events is located below the *Romes Events – Marker Events* node of the event tree.



The purpose of the voice marker event is to include a spoken comment into the measurement file that is related to a particular time or position. When recording measurement data *(Measurement – Start Recording)*, you can trigger voice marker events using the *Set Voice Marker* command in the *Measurement* menu (see p. 3.69) or using a shortcut assigned in the *Assignment of Shortcuts* tab (default: *Ctrl + F11)*. After pressing the shortcut, you can speak your comment into a connected microphone. In the measurement file the comment is associated with the time when the event was triggered.

Coupled Focus

The *Coupled Focus* tab in the *Preferences – Advanced* menu specifies which views are synchronized if the coupled focus (see p. 3.4) is active.

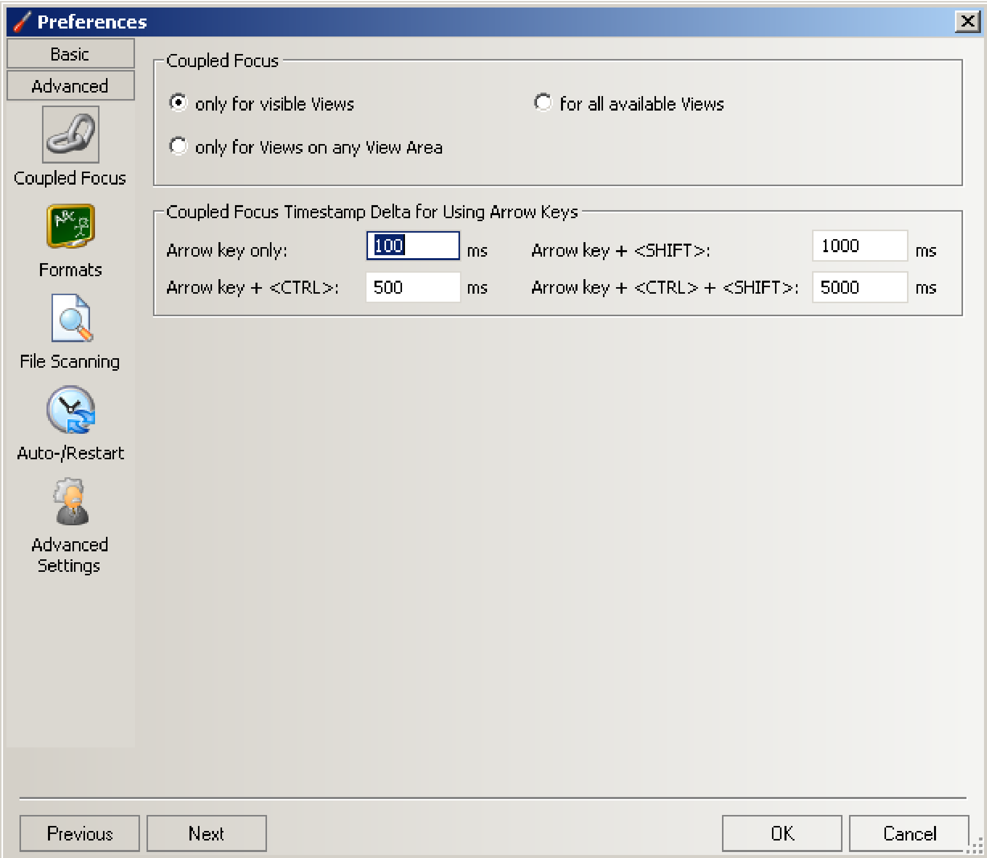


Fig. 3–12 Preferences – Coupled Focus

Coupled Focus

Only for visible Views

Synchronize the views in the current view area, leaving the views in other view areas unsynchronized.

Only for Views on any View Area

Synchronize all views within the same view area, leaving the views in different view areas unsynchronized.

For all available Views

Synchronize all views, irrespective of the view area.

Coupled Focus Time-stamp Delta…

The entries in the *Coupled Focus…* panel specify the effect of the arrow keys on the coupled focus (see p. 3.4). The larger the values the faster the focus moves when the arrow keys are pressed. To gain flexibility it is advisable to assign different timestamp intervals to the different key combinations.

Formats Settings

The *Formats* tab in the *Preferences – Advanced* menu specifies formats.

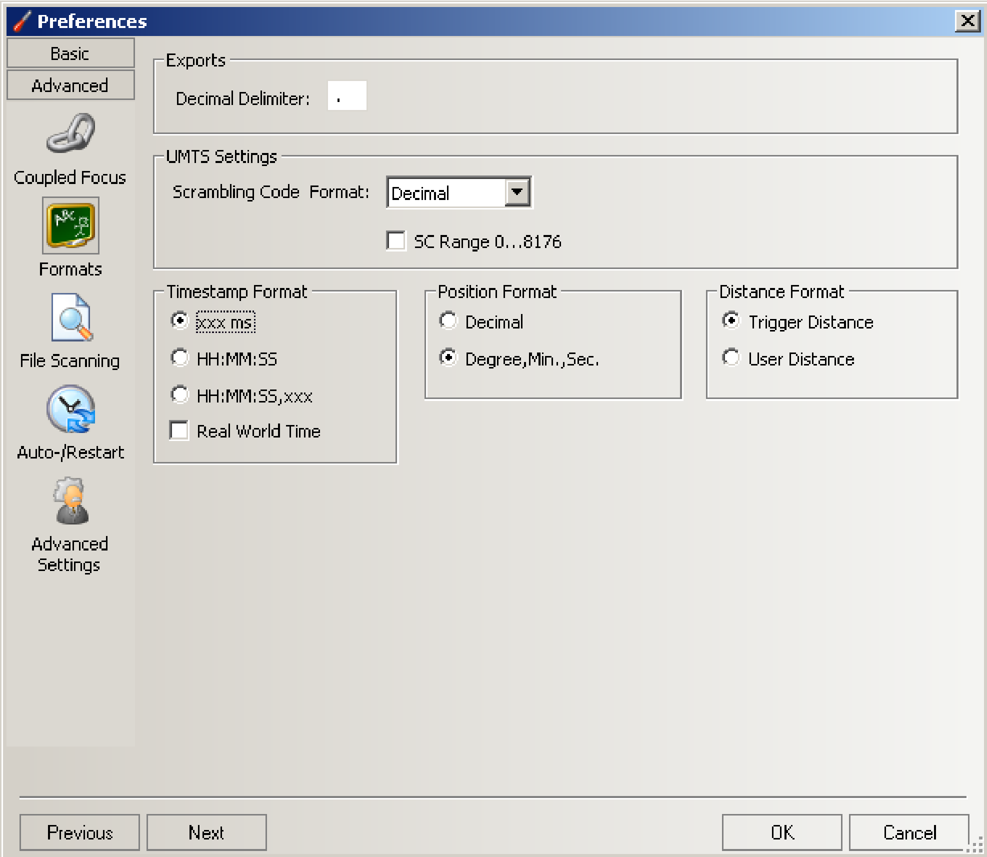


Fig. 3–13 Preferences – Formats

Exports

Decimal Delimiter

This character separates the values of two signals in the export file.

UMTS Settings

Scrambling Code Format

SC Format opens a drop-down list to select whether the Primary Scrambling Code in the signals and in the views (e. g. the PNS CPICH) is displayed in decimal, octal, Hex small or Hex big format.

SC Range 0...8176

According to standard 3GPP TS 35.213, the primary scrambling codes are numbered n = 16*i (i = 0 to 512), whereas the 15*512 numbers n = 16*i + k (i = 0 to 512, k = 1 to 15) are reserved for the optional secondary scrambling codes. This convention is used if SC Range 0 … 8176 is checked. In the alternative convention, the Primary Scrambling Codes numbers are divided by 16 and cover the range 0 to 511.

Timestamp Format

The *Timestamp Format* panel defines the format of the *Timestamp* signal to be included in the measurement file. A timestamp of 36.123 s is displayed as follows:

xxx ms	36123
HH:MM:SS	00:00:36
HH:MM:SS, xxx	00:00:36,123

If *Real World Time* is activated, the current time is used as timestamp, e.g. "14:26:36".

Position Format The *Position Format* panel defines whether the position coordinates used in the views are displayed in decimal or degree/minute/second format.

Distance Format The *Distance Format* panel defines whether the trigger distance or a user-defined distance scale is used in the views, (e.g. in the *Event Views* see chapter 4). The *User Distance* is a generalized distance signal available with the *Trigger Box;* see chapter 6.

File Scanning Settings

The *File Scanning* tab in the *Preferences – Advanced menu* controls the views and the measurement file scanning behavior as well as the replay device filtering for new or opened measurement files.

If the *Enable File Scanning* box is checked, R&S ROMES performs a file scan (see p. 3.13) when opening a measurement file. After the scan, the entire measurement data is immediately visible in the active views.

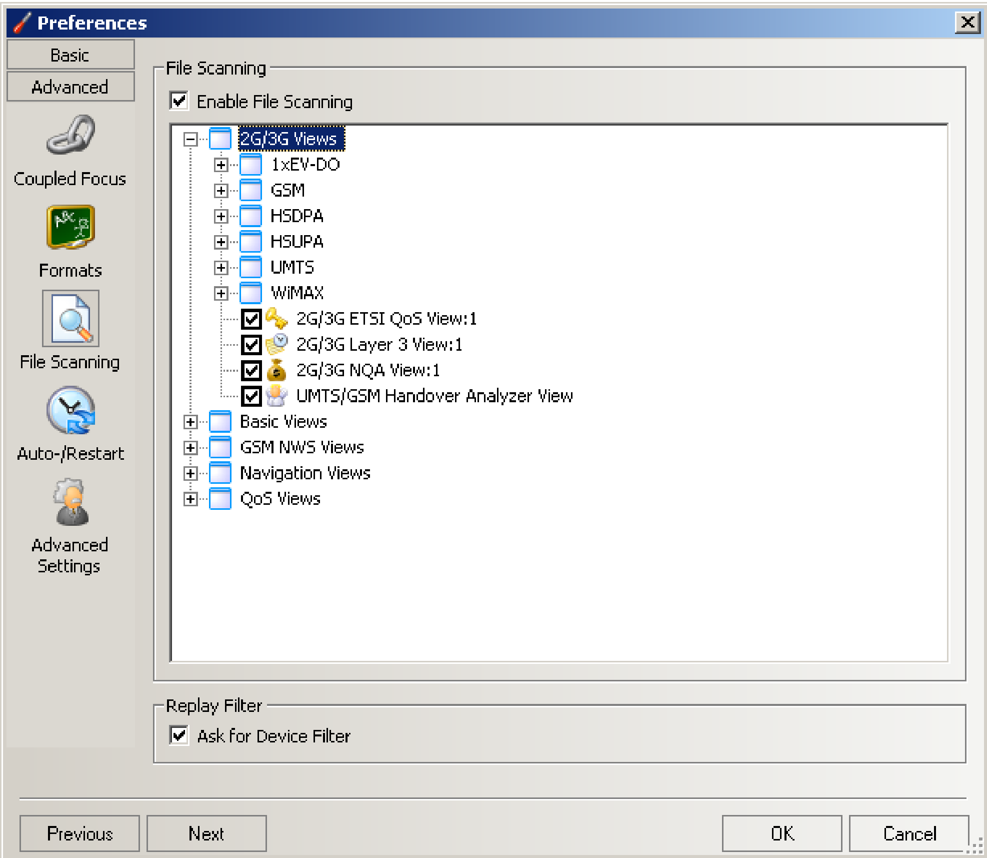


Fig. 3–14 Preferences – File Scanning

If the *Ask for Device Filter* box is checked, the *Open Measurement File...* action (see p. 3.12) opens the *Device Filter* selection dialog.

Note:

If a measurement file is scanned for the first time, the device filter dialog is not shown. The first file scan has to be a complete scan, so that the user-defined device filter setting becomes active only after the first complete measurement file scan has been performed. After that, the device filter is dialog shown according to the Replay Filter setting (see figure above).

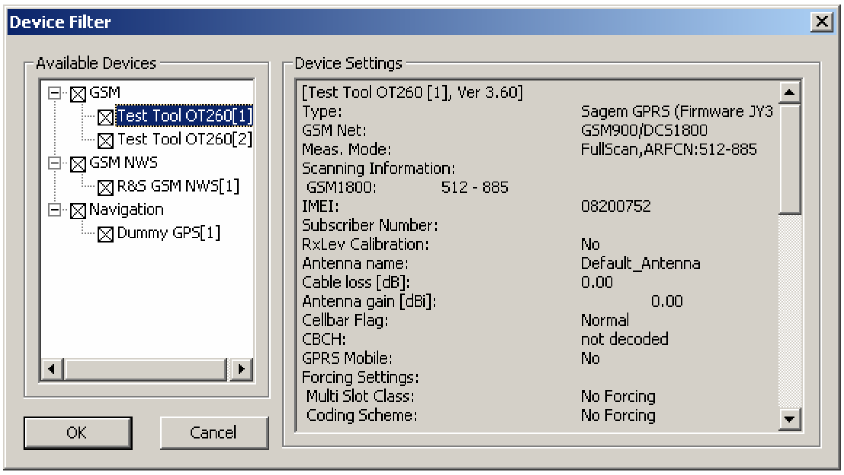


Fig. 3–15 Preferences – Device Filter

The *Device Filter,* like the *Device Filter* (see p. 3.71) shows the test devices of the currently active measurement file. If no measurement file is open, it shows the devices of the last file replayed. Measurement data from unchecked devices is excluded from the replay. The dialog is updated every time a new measurement file is loaded.

Auto-/Restart Settings

Autostart

The Autostart option allows starting the measurement automatically. A workspace has to be defined, which shall be used for the measurement. When the measurement cycle elapses, the measurement will be stopped and restarted automatically. Depending on the "*Continue Measurement*" option, the measurement file will be continued or a new file will be created.

If desired, R&S ROMES will wait n seconds before starting the first measurement. If the user stops the measurement, the "*Autostart*" mode is switched off, but not written into the registry i.e. ROMES will behave as normal, but if you restart R&S ROMES the "*Autostart*" option gets active again. To disable the "*Autostart*" go to the "*Auto-Restart*" page and confirm the switched off mode.

Restart

The "*Restart*" option can be used only, if autostart is disabled. These options force a restart of the measurement, if the specified condition is satisfied. Optionally a countdown dialog can be displayed, before the restart of the measurement will take place. Therefore the check box "Show Countdown ..." has to be activated.

The names of the created files get an appendix of three digits, identifying the index. E.g. if the measurement file was named "Meas.rscmd", the automatically created files will be named as follows:

- Meas_001.rscmd
- Meas_002.rscmd

- ...

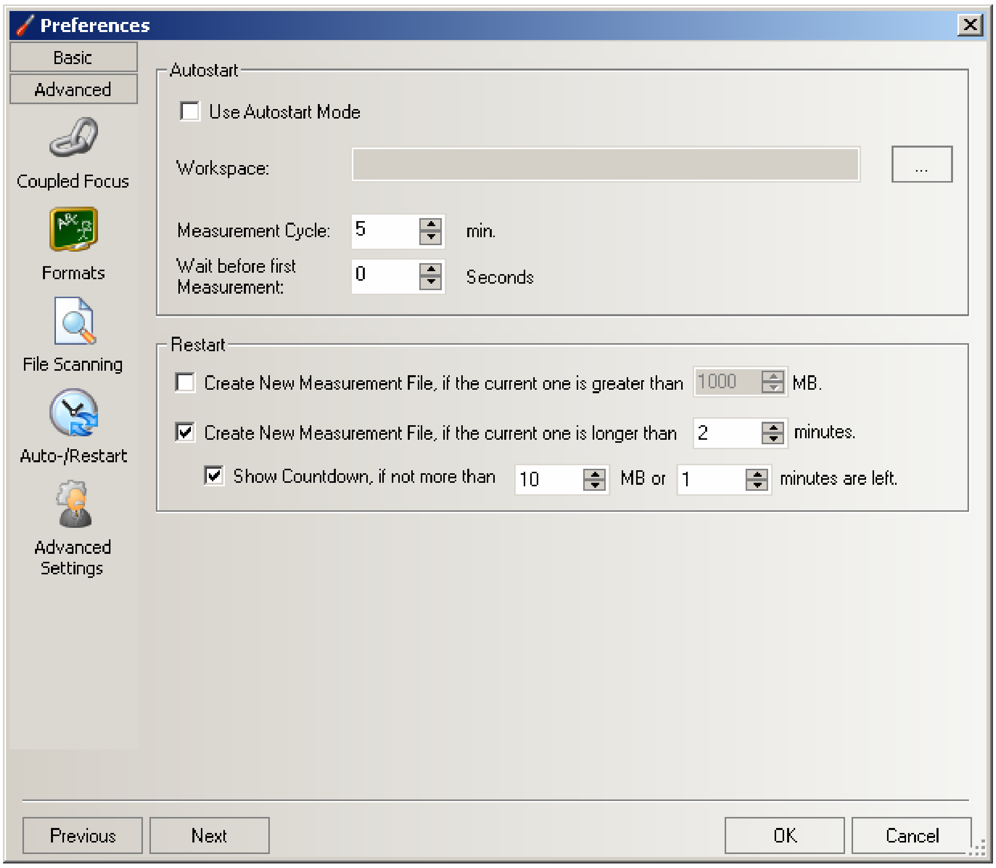


Fig. 3–16 Preferences – Auto-/Restart

Advanced Settings

The *Advanced Settings* tab in the *Preferences - Advanced* menu defines the maximum number of devices that can be used for each technology and reset registry entries concerning the workspace.

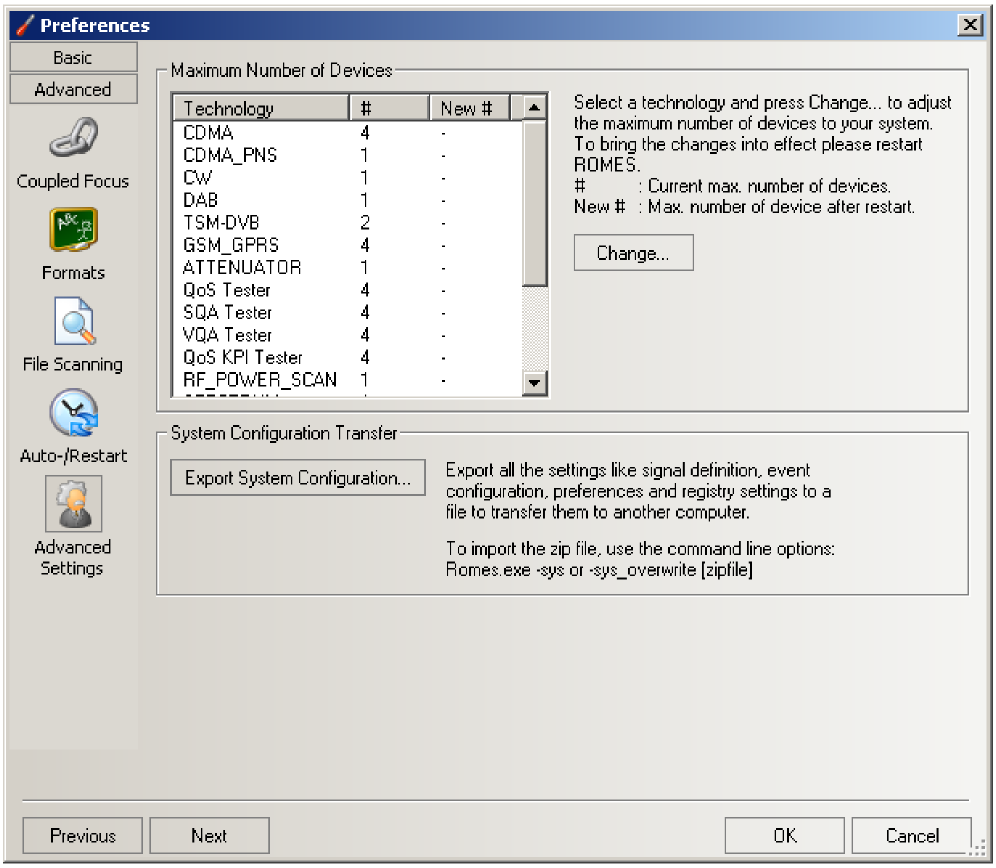


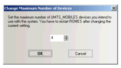
Fig. 3–17 Preferences – Advanced Settings

Max. Number of Devices

The available technologies are listed in the *Technology* column of the *Max. Number of Devices* table together with the current number of devices (# column) and the changed max. number of devices *(New #* column, see below). To change the current number of devices for a technology, select the technology in the table and press the *Change* button.

Change

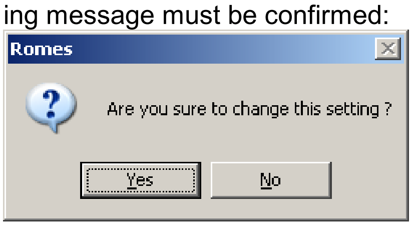
The *Change* button opens a popup window to change the current maximum number of devices assigned to the selected technology. It is possible to overwrite the number or increment/decrement it by clicking on the arrow buttons. Numbers between 1 and 32 are allowed for each technology.



In practice, the maximum number of devices will be limited by the number of interfaces (COM ports etc., see chapter 6) available. Also, a driver license is required for each device used. Increasing the maximum number of drivers is necessary, e.g., if additional licenses are purchased to extend the measurement system, or if measurement data acquired on a different system with more interfaces are replayed. Otherwise, it is recommended to keep the default settings in order to ensure optimum system performance.

OK

Change the current setting. Before this can be done, the following message must be confirmed:



On pressing OK, R&S ROMES reminds you that it must be restarted to bring the changes into effect:

Cancel

Discard the changes made and return to the Advanced Settings tab.

System Configuration Transfer

R&S ROMES allows to export the system configuration and to import it on another R&S ROMES installation on a different computer.

- The *Export System Configuration* button first requests an archive file name, and then saves the current R&S ROMES configuration in a zipped archive.

The system configuration zip file contains all files defined in *SystemStatus.XML*. It also contains an *rsreg* file with all relevant MS Windows registry entries. Which registry entries belong to the R&S ROMES system configuration can be defined in the *SystemStatus.XML* file, which is located in the Configuration directory.

On the other computer, the zip file has to be imported by using command line switches. Two different switches can be used:

```
Romes.exe –sys [file]
```

or

```
Romes.exe –sys_overwrite [file]
```

where

`-sys`	Ask before overwriting any file on the target computer
`-sys_overwrite`	Overwrites all files on the target computer without asking.
`[file]`	the name of the zip file (optional). If it is not defined a file selection dialog will appear.

The *SystemStatus.XML* file can contain two different XML tags, which both have the attribute Name.

- RegKey:
  The only attribute is *Name*, which specifies the sub branch of the R&S ROMES (HKEY_LOCAL_MACHINE\SOFTWARE\Rohde & Schwarz\%ROMES_DIR%) branch in the registry.

  RegKey Example 1:

  ```
  <RegKey Name="General\UMTS_PNS_SETTINGS\*"/>
  ```

  Copies all keys of the branch HKEY_LOCAL_MACHINE\SOFTWARE\Rohde & Schwarz\%ROMES_DIR%\General\UMTS_PNS_SETTINGS and its sub branches. (“*” is the wildcard for all below the specified branch)

  RegKey Example 2:

  ```
  <RegKey Name="General\ReplayOnlyVersion"/>
  ```

  Copies only one key HKEY_LOCAL_MACHINE\SOFTWARE\Rohde & Schwarz\%ROMES_DIR%\General\ReplayOnlyVersion

- FileKey
  Analogous to the *RegKey* tag, the *FileKey* tag specifies files to be transferred.

  FileKey Example 1:

  ```
  <FileKey Name="DriverTemplates\*"/>
  ```

  Copies all files in the %ROMES_DIR%\DriverTemplates and its subdirectories

  FileKey Example 2:

  ```
  <FileKey Name="Driver\QualcommMobiles.xml"/>
  ```

  Copies only the file %ROMES_DIR%\Driver\QualcommMobiles.xml

Overview of Settings (Configuration of Software Modules)

The *Tools – Modules Configuration...* command selects the data to be displayed in the different types of views, shows the driver configuration and retrieves detailed information on the installed software modules. The *Modules Configuration...* command calls up the *Configuration of Software Modules* menu:

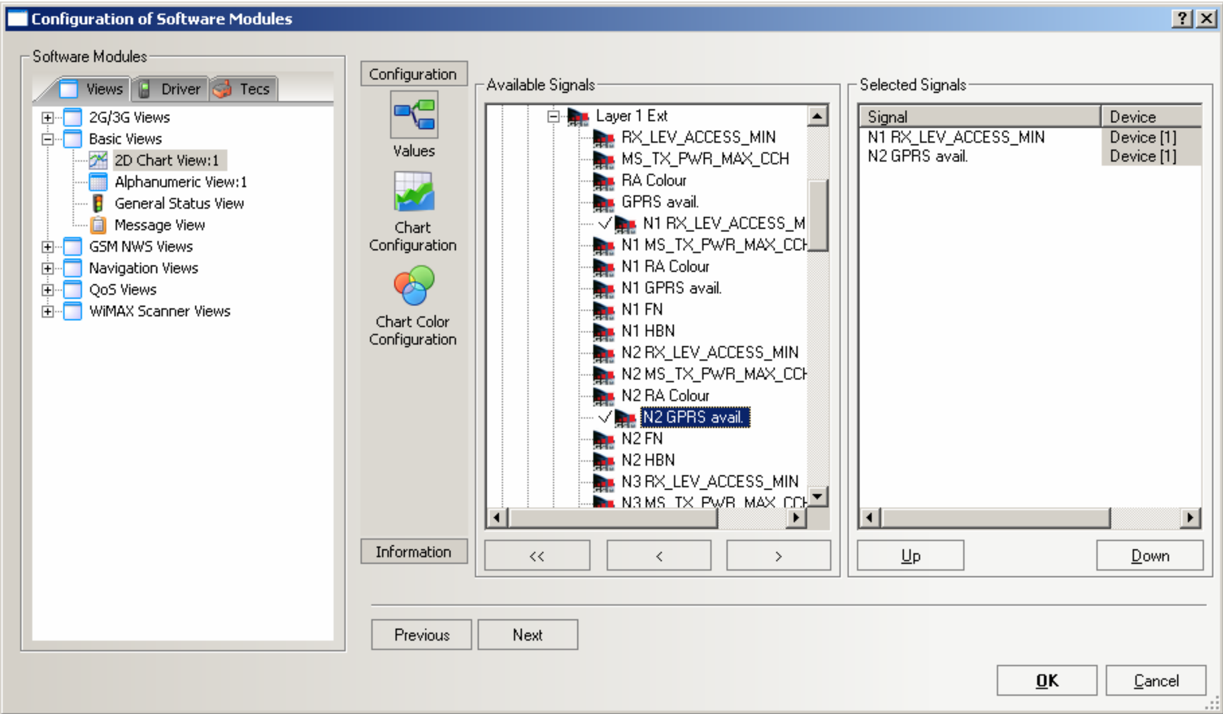


Fig. 3–18 Configuration of Software Modules – Views

The *Configuration of Software Modules* menu is divided into three tabs:

Views

The *Views* tab configures the different types of views used to visualize the measurement data. The data structure is generally shown in a tree view *(Available Signals;* for an explanation of data selection in trees refer to chapter 1, Data Selection) from which one or several nodes can be selected *(Selected Signals)*. Alternatively, some classes of output parameters can be selected from lists. The view configuration menus are also accessible from the individual view menus (click the right mouse button and select *Configure...* from the popup window). They are explained in chapter 4, Section *Display and Evaluation of Results* together with the corresponding view windows.

Note:

According to performance reasons only views which are really loaded are shown here i.e. basic views and views selected by the user. In the View Menu views which are not already loaded are indicated with a star.

Driver

The *Driver* tab shows the configuration of the different hardware drivers installed. It is identical with the *Serial Port Driver Info* tab of the driver configuration menus described in chapter 6. If no hardware drivers are installed, the menu is empty.

Tecs

The *Tecs* tab displays information on the installed technology modules. Besides, the *Tecs* tabs for several technologies contain particular configuration panels that are described in the following sections.

TEC for GSM/UMTS/CDMA Test Mobiles

The GSM, UMTS, and CDMA technologies each use a *BTS/Node B List Data Base* which can be loaded and modified in the corresponding panel as soon as one of the entries *TEC for GSM, TEC for UMTS Test Mobiles* or *TEC for CDMA* is selected. The data bases are completely independent from each other so that different measurements can be performed simultaneously using separate databases.

BTS/Node B data-bases

A BTS or Node B database contains the operator list (BTS list) including all information about the sectors and base stations in a particular area provided by the network operator. This information can be used in several view types; see e.g. description of *GSM Measurement Report View, GSM Frequency Hopping View, GSM Handover View, Alphanumeric View, Route Track View* in chapter 4.

TEC for GSM NWS

Clicking *TEC for GSM NWS* on the *Technologies* menu opens a panel with three tabs for the GSM NWS Top N Settings, the GSM NWS Scan Signal Settings, and for GSM NWS driver Info.

Note:
The TEC for GSM NWS tabs are also accessible from the Tools – Modules Configuration ... – Tecs.

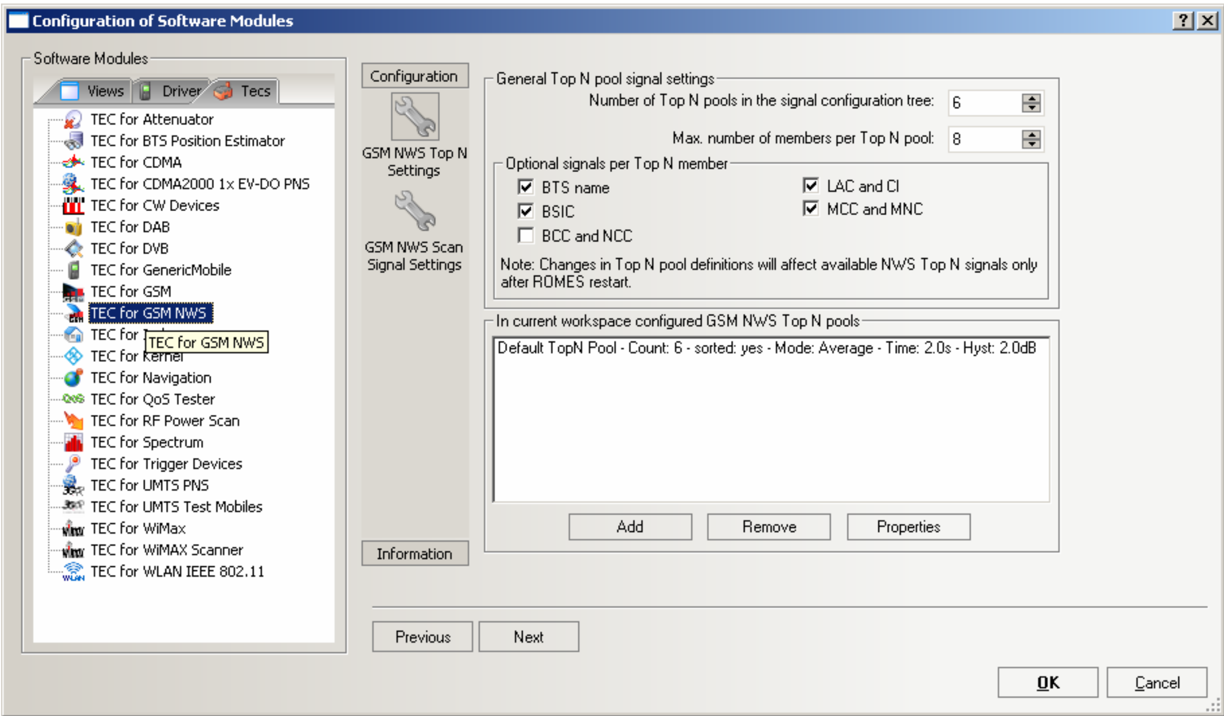


Fig. 3–19 Configuration of Software Modules – TEC for GSM NWS

GSM NWS Top N Settings

The *GSM NWS Top N Settings tab* is divided in an upper panel *(General Top N pool signal settings)* to set preferences for the General Top N pool signals and a lower panel *(In current workspace configured GSM NWS Top N pools)* to administrate the Top N pools of the current workspace.

General Top N pool signal settings

The changes in Top N pool definitions made on this panel will affect available NWS Top N signals only after ROMES is restarted:

Number of Top N pools in the signal configuration tree

Defines the maximum number of Top N pools in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.).

Max. Number of members per Top N pool

Defines the maximum members per pool in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.).

Optional signals per Top N member

BTS Name

Name of the BTS, taken from the GSM BTS database (if available).

BSIC

Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the Available Signals tab of the Preferences menu (octal/decimal/hex).

BCC and NCC

BTS Color Code (BCC) and Network Color Code (NCC)

LAC and CI

Location Area Code (LAC) and Cell Identity (CI)

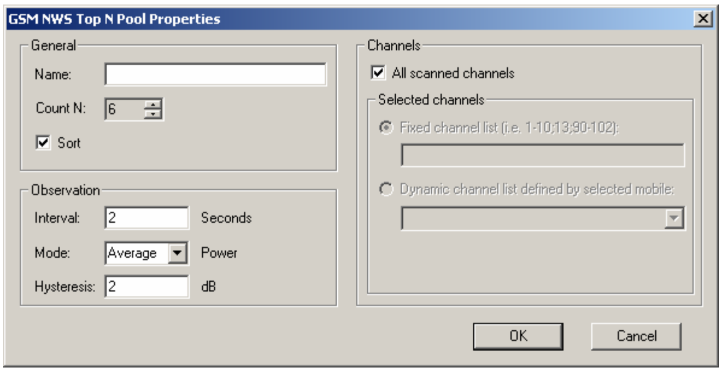
MCC and MNC

Mobile Country Code (MCC) and Mobile Network Code (MNC)

In current workspace configured GSM NWS Top N pools

This panel shows a list box with the GSM MWS Top N pools configured in the current workspace. The Top N pool list can be amended using the *Add* button, list items can be deleted using the *Remove* button, and the list entry properties can be viewed or modified using the *Properties* button:

Add Adds a user-defined Top N pools in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.).



The *Add* dialog contains the following panels:

General

Name Name of the GSM NWS Top N pool.

Count N Number of pool elements (range 1 to 16). The display of pool elements in the in the list of *Available Signals* is limited to the *Max. Number of members per Top N pool.*

Sort If this is checked, the initial Top N View list is sorted by the averaged measured signal power during the observation in the Top N pool.

Observation

Interval Measurement interval in seconds (range 0 to 300)

Mode The measured power value defines the sort order for the Top N View. The sort mode can be set to Average/Max./Min./Last power values, which is not shown in the Top N View.

Hysteresis The hysteresis parameter (in dB) is used for FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No.

Channels / Selected Channels A list of RF channels to be displayed in the Top N list can be entered manually. In the channel list the absolute RF channel numbers are placed in increasing order of ARFCN.

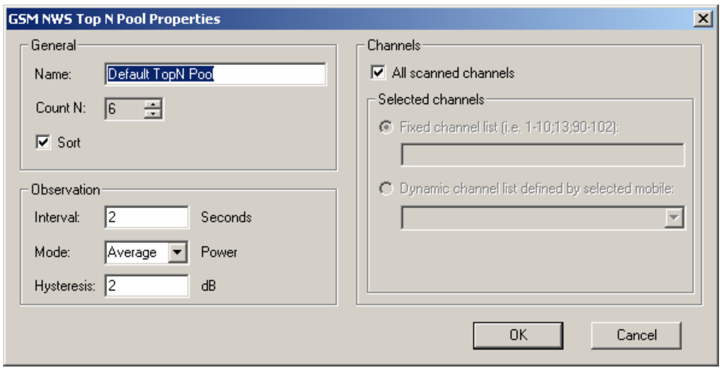
All scanned channels All scanned BCCH channels are displayed in the Top N list.

Selected channels *Fixed Channel list* allows the manual entry of the RF channel numbers to be displayed in the Top N list. The channels or channel ranges for the scan signals are set separated by commas (e.g. 1-10,13,90-102)

Dynamic channel list defined by selected mobile: The displayed channels are defined by the configured test mobile.

Remove Deletes the selected GSM NWS Top N pool from the list, after the following dialog is confirmed.

Properties Allows the modification of the properties for the selected Top N pool.



The *Properties* dialog contains the same panels as the *Add* dialog, all field descriptions are defined there:

GSM NWS Scan Signal Settings

The *GSM NWS Scan Signal Settings tab* is divided into four panels *(General, Optional Signals per channel, Optional signals (per measurement station), and Channel assignment)* to administrate the scan signal settings of the current workspace.

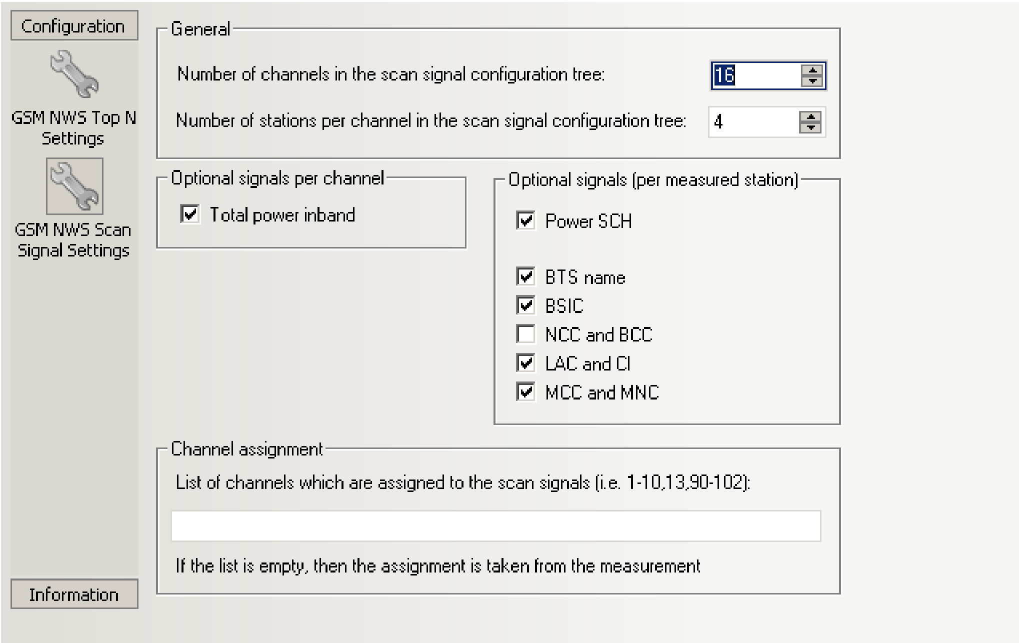


Fig. 3–20 Configuration of Software Modules – TEC for GSM NWS – GSM NWS Scan Signal Settings

General panel

The changes in scan signal settings made on this panel will affect available NWS scan signals only after R&S ROMES is restarted:

Number of channels in the scan signal configuration tree

Defines the maximum number of channels in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.).

Number of stations per channel in the scan signal configuration tree

Defines the maximum number of stations per channel. This is e.g. the case if several stations are found on a given channel; a default of 4 stations can be shown by parameters.

Optional signals per channel panel

Total power inband

Total inband power (if available).

Optional signals (per measurement station) panel

Power SCH

Code power of the SCH (Synchronization Channel)

BTS Name

Name of the BTS, taken from the GSM BTS database (if available).

BSIC

Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the Available Signals tab of the Preferences menu (octal/decimal/hex).

NCC and BCC

BTS Color Code (BCC) and Network Color Code (NCC).

LAC and CI

Location Area Code (LAC) and Cell Identity (CI)

MCC and MNC

Mobile Country Code (MCC) and Mobile Network Code (MNC)

Channel assignment

This panel allows to enter a list of channels which are assigned to the scan signals. After assignment, e.g. 16 signal parameters are available for each channel in the tree view. If the channel assignment field is left blank, these are assigned to the first 16 found channels at run-time (e.g. 1, 2, 3, .., 16 for GSM900 or 512, 513, 514, ... for GSM1800). The channel assignment field s or channel ranges for the scan signals are set, separated by commas (e.g. 1-10,13,90-95). If the channel assignment field is filled, the available signal parameters are assigned to the entered channels. The signal parameters can be displayed in the *Alphanumeric View,* for example.

Templates tab

The *Information - Templates* tab is divided in an upper panel *(Available Templates)* to load or delete a user-defined template for the TEC for GSM NWS and a lower panel *(Save current settings as Template)* which allows the entry of a brief template description before saving the current settings defined in the TEC for GSM NWS tabs.

The *Save* button opens a *Save As...* dialog for the template file.

Info tab

The *Information - Info tab* is divided in an upper panel *(Custom Name)* to set a user-defined name of the TEC for GSM NWS and a lower panel *(File Version)* which shows the GSM TEC for GSM NWS link library properties.

The *Info* panel shows file information of the dynamic link library which implements the selected TEC.

The *Info* tab includes the *Custom Name* field, which has no function in a view context. It is only useful in a driver context, where different connected devices can be associated with different custom names, e.g. for separate mobiles in different networks, or when simultaneously operated mobiles perform different tasks.

TEC for CDMA2000 1x Ev-DO PNS

Clicking *TEC for CDMA2000 1x Ev-DO PNS* on the *Technologies* menu opens a panel with three tabs for the *CDMA PNS Top N Settings*, the *CDMA PNS Top N Settings in the Registry*, and for CDMA PNS driver *Information*.

Note:
The TEC for CDMA2000 1x EV-DO PNS tabs are also accessible from the Tools – Modules Configuration ... – Tecs menu.

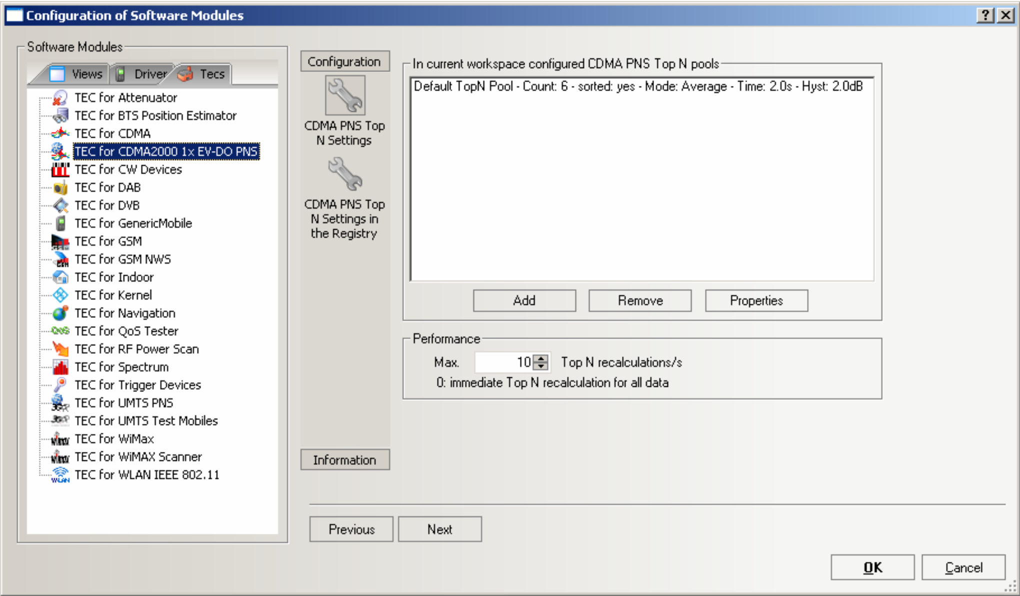


Fig. 3–21 Configuration of Software Modules – TEC for CDMA2000 1x EV-DO PNS

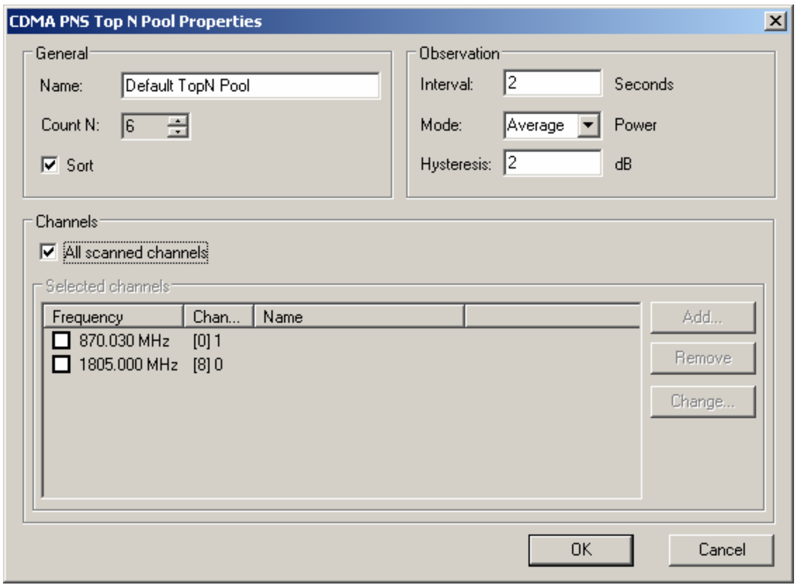
CDMA PNS Top N Settings

The *CDMA PNS Top N Settings tab* is divided in an upper panel *(In current workspace configured CDMA PNS Top N pools)* to administrate the Top N pools of the current workspace and a lower panel *(Performance)* to set the number of Top N recalculations per second.

In current workspace configured CDMA PNS Top N pools

This panel shows a list box with the CDMA PNS Top N pools configured in the current workspace. The Top N pool list can be amended using the *Add* button, list items can be deleted using the *Remove* button, and the list entry properties can be viewed or modified using the *Properties* button:

Add Adds user-defined Top N pools in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.).



The *Add* dialog contains the following panels:

General

Name — Name of the CDMA PNS Top N pool.

Count N — Number of pool elements (range 1 to 16). The display of pool elements in the in the list of *Available Signals* is limited to the *Max. Number of members per Top N pool.*

Sort — If this is checked, the initial Top N View list is sorted by the averaged measured signal power during the observation in the Top N pool.

Observation

Interval — Measurement interval in seconds (range 0 to 300)

Mode — The measured power value defines the sort order for the Top N View. The sort mode can be set to Average/Max./Min.power values, which is not shown in the Top N View.

Hysteresis — The hysteresis parameter (in dB) is used for FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No.

Channels / Selected Channels — A list of RF channels to be displayed in the Top N list can be entered manually. In the channel list the absolute RF channel numbers are placed in increasing order of ARFCN.

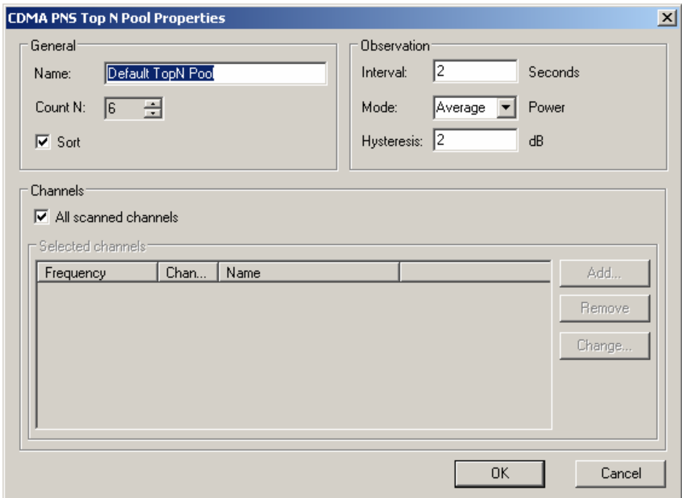
All scanned channels — All scanned BCCH channels are displayed in the Top N list.

Selected channels — *Fixed Channel list* allows the manual entry of the RF channel numbers to be displayed in the Top N list. The channels or channel ranges for the scan signals are set separated by commas (e.g. 1-10,13,90-102)

Dynamic channel list defined by selected mobile: The displayed channels are defined by the configured test mobile.

Remove Deletes the selected CDMÁ PNS Top N pool from the list, after the following dialog is confirmed.

Properties Allows the modification of the properties for the selected Top N pool.



The *Properties* dialog contains the same panels as the *Add* dialog, all field descriptions are defined there:

CDMA PNS Top N Settings in the Registry

The *CDMA PNS Top N Settings in the Registry* is divided into two panels *(General, Optional Signals per Top N member). It administrates the scan signal settings of the current workspace.*

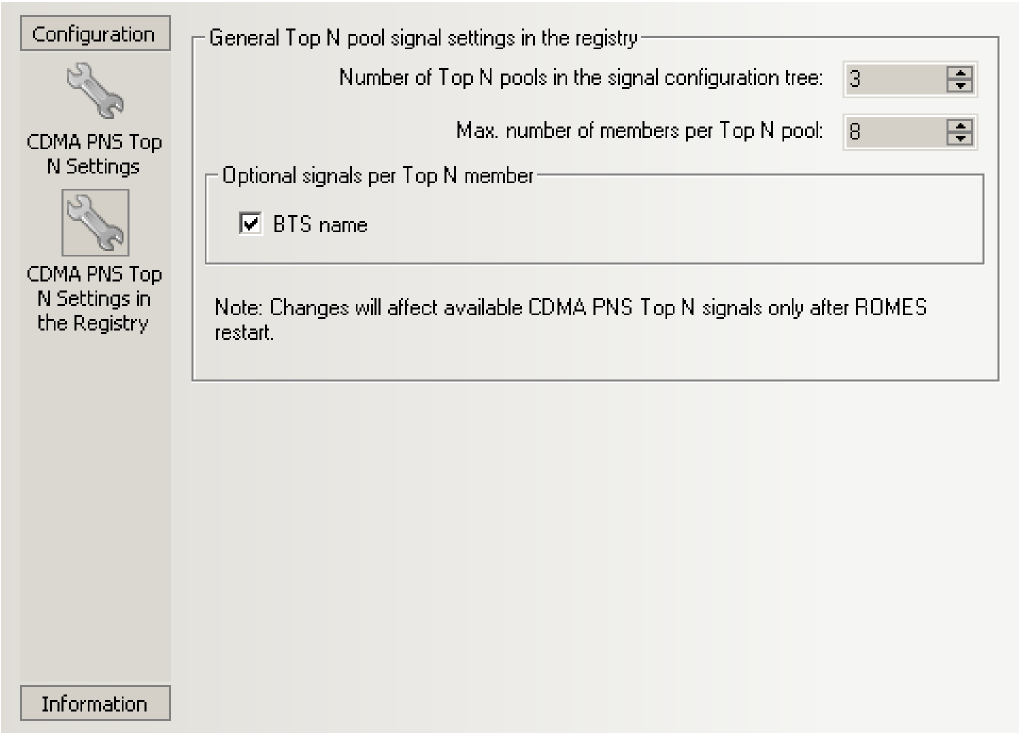


Fig. 3–22 Configuration of Software Modules – CDMA PNS Top N

General panel

Number of Top N pools in the signal configuration tree

Defines the maximum number of Top N pools in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.).

Max. Number of members per Top N pool

Defines the maximum number of members per pools in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.).

Optional signals per Top N member panel

BTS Name

Name of the BTS, taken from the GSM BTS database (if available).

Templates tab

The *Information - Templates* tab is divided in an upper panel *(Available Templates)* to load or delete a user-defined template for the TEC for CDMA PNS and a lower panel *(Save current settings as Template)* which allows the entry of a brief template description before saving the current settings defined in the TEC for CDMA PNS tabs.

The *Save* button opens a *Save As...* dialog for the template file.

Info tab

The *Information - Info tab* is divided in an upper panel *(Custom Name)* to set a user-defined name of the TEC for CDMA PNS and a lower panel *(File Version)* which shows the TEC for CDMA PNS link library properties.

The *Info* panel shows file information of the dynamic link library which implements the selected TEC.

The *Info* tab includes the *Custom Name* field, which has no function in a view context. It is only useful in a driver context, where different connected devices can be associated with different custom names, e.g. for separate mobiles in different networks, or when simultaneously operated mobiles perform different tasks.

GSM Technology

Clicking *TEC for GSM* opens the *GSM BTS List Database* tab to create, select or modify the GSM BTS database, and to extend it by adding files.

The information of the GSM BTS data base must be stored in an .ndb (network data base) file to be used internally. Data from the .ndb file can be exported to an ASCII BTS list file (*.txt); on the other hand it is possible to import BTS data from BTS list files in one of the formats (*.txt, *.atd) described in chapter 7.

Note:
The GSM BTS List Database tab is also accessible from the Database – GSM BTS Database menu.

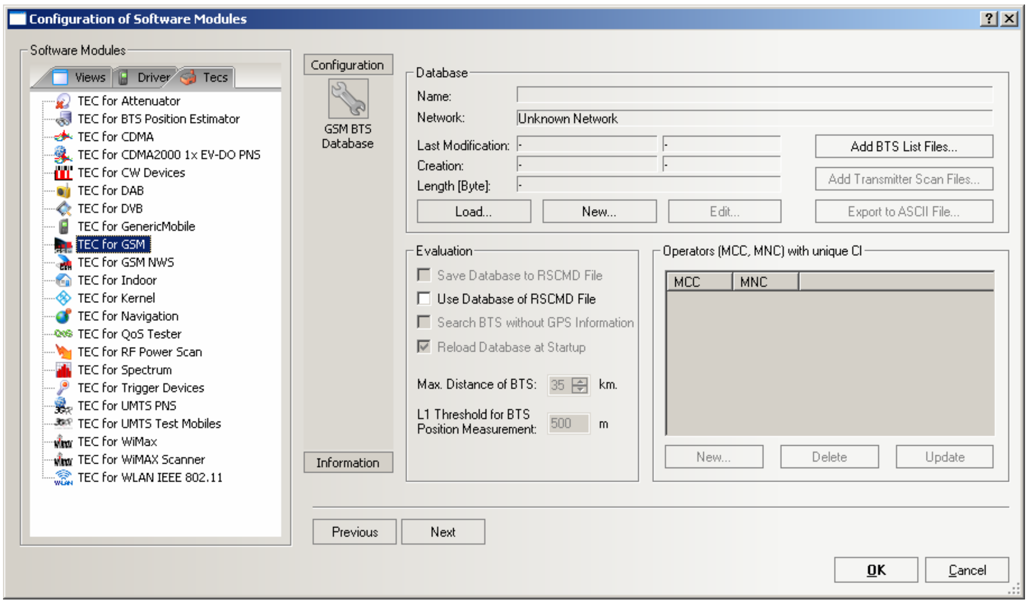


Fig. 3–23 Configuration of Software Modules – TEC for GSM

Creating a Database File

To create a new database file (*.ndb),

- In the *Database* panel, click *New* to open the *Create Database* dialog.
- Select your network from the *Network* pull-down list. For data bases containing both GSM900 and GSM1800 base stations, select *GSM Dualband*.

The selected network acts as a filter when the BTS data is imported into the data base file. If a particular GSM band is selected, data from all other bands will not be imported into the data base.

- Selecta directory and enter a file name. The extension *.ndb will be appended automatically.
- Click *Open* to create the file and close the *Create Database* dialog.

See also *Importing a BTS List File into the Database* below.

Importing a BTS List File into the Database

To import an existing BTS list file (*.atd, *.buf, *.txt, *.vig) into the database,

- Ensure that an empty or non-empty database file (*.ndb) is available or create a *.ndb file (see

Creating a Database File).

- If your BTS list file contains valid MCC and MNC information go to item no. 4. Otherwise click *New* in the Operators (MCC, NCC) with unique CI panel to open the *Add Network...* dialog box and enter your Mobile Country Code (MCC, e.g. 262 for Germany) and Mobile Network Code (MNC). Click *OK* to confirm your entries and close the dialog box.
- Click *Update* to confirm the new entries and update the *MCC/MNC* list.
- In the *Database* panel, click *Add BTS List Files...*.
- In the message box Do you want to create a new database? opened, click No.
- In the file selection dialog opened, select the BTS list file. If your BTS list file contains valid MCC and MNC information go to item no. 7. Otherwise check the *MCC* and *MNC* boxes and enter your MCC and MNC into the input fields.
- Click *Open* import the BTS list file.

The file import is terminated after you confirm the *BTS list successfully imported* message box. The new data extends the previous data base file.

Database Management

Database

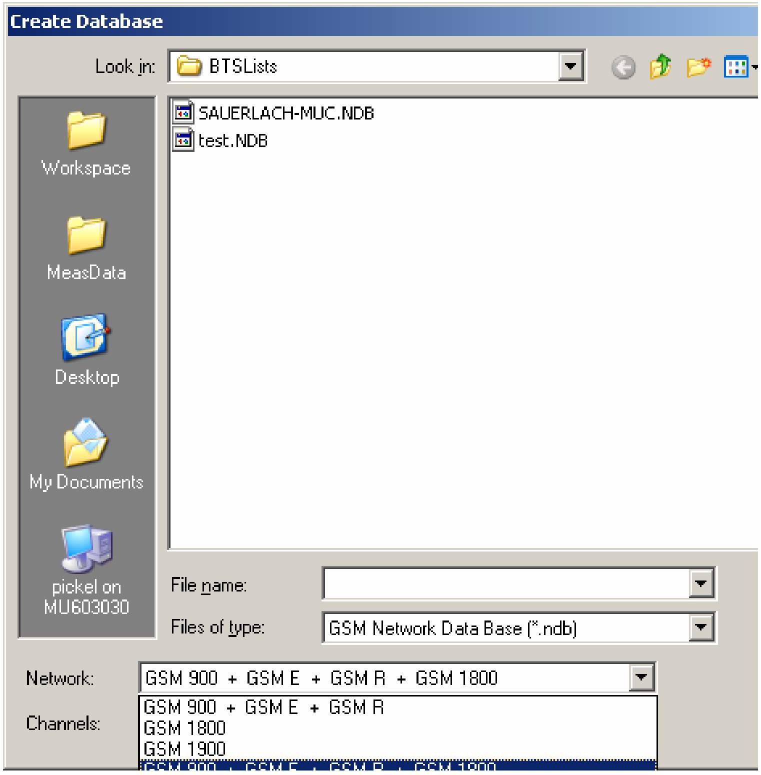
The *Database* panel shows the current *.ndb (network database) file with its properties and contains buttons to load, create or modify *.ndb files.

Load

Opens a dialog to select an existing database (*.ndb) file.

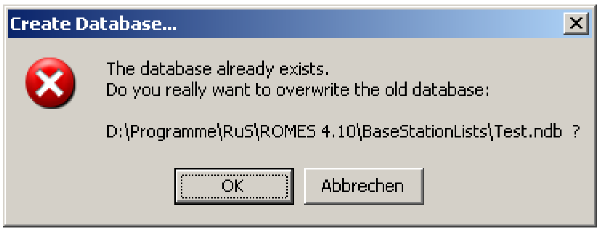
New

Opens a *Create Database* dialog to select a directory and define the file name of a new database file.



The Network pull-down list defines the GSM hyperband for the created BTS data base file. Band selection acts as a filter: BTSs from other bands will not be imported into the data base. Therefore, for data bases containing both GSM900 and GSM1800 base stations, GSM 900 +GSM E + GSM R + GSM 1800 must be selected.

Open creates the new (empty) data base file and closes the Create Database dialog. If the selected data base file already exists in the directory, R&S ROMES displays a message box:



OK deletes all entries in the old data base file and closes the message box. Cancel closes the box without overwriting the old data base file.

Edit

Opens the *BTS List Editor* dialog to modify the entries in the current data base file; see description on p. 3.111.

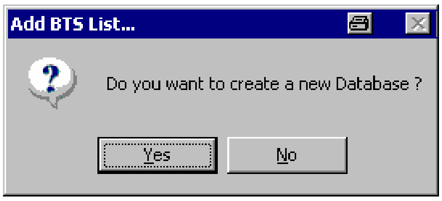
Database – Importing/Exporting data

The three buttons on the right side of the *Database* panel import data from a file into the data base or export the information stored in the data base to a file.

Add BTS List Files

Add BTS List Files

Imports data from an existing BTS list file into the BTS data base. Clicking the button first opens a message box:

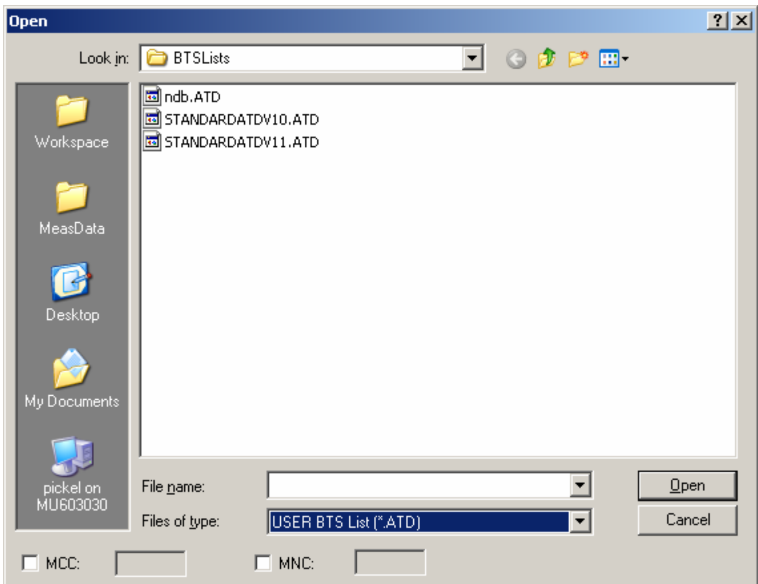


Yes

Opens the *Create Database* dialog to create a new *.ndb file (see above).

No

Opens a dialog to select the BTS list file to be imported and specify filter conditions:



Files of Type

Pull-down list providing all supported data formats for BTS list files (*.atd, *.buf, *.txt, *.vig; see description of data formats in chapter 7).

MCC/MNC

Check boxes with associated input fields assigning a specific Mobile Country Code (MCC) and Mobile Network Code (MNC) to the imported BTS data. They must be checked unless the MCC and MNC information is explicitly included in the BTS list file. In this case the MCC and MNC values must correspond to one of the MCC/MNC pairs defined in the Operators (MCC, MNC)... panel; see below.

Open

Starts the import of data from the selected file. An error message may be displayed if
The imported file contains a syntax error (see chapter 7)
The MCC/MNC is missing or invalid; see Operators (MCC, MNC)... panel below
Otherwise a message indicates that the BTS list was successfully imported.

Adding or replacing BTS sectors

When a BTS list is imported into an existing database, base stations that are already included in the database are replaced, and new base stations are added to the database. Two BTSs are considered to be identical if both their geographical position and the clock codes of their sectors match. For more information see section *BTS List Formats* in chapter 7.

Add Transmitter Scan Files

Add a file containing data acquired within the framework of a transmitter scan data).

This feature can be used to include TS files taken by another measurement system or to add former TS data with improved position estimates to the database, see *L1 Threshold for BTS Position Measurement* below. The added TS-file is displayed in the *Message View* window (see section *Basic Views* in chapter 4).

Export to ASCII File

Exports all data in the current data base (*.ndb) file to an ASCII BTS list file (*.txt) including a header describing the different columns and additional columns (e.g. MCC/MNC) generated when the data base file was created or edited. This additional information means that the two actions *Add BTS List Files...* and *Export to ASCII File* are not simply inverse to each other.

Evaluation

The *Evaluation* panel specifies how R&S ROMES exploits the information in the GSM BTS data base during a measurement or replay. All settings come into effect when the next measurement is started using the *Measurement – Start Measurement* command.

Save Database to RSCMD File

The current BTS data base is included into the measurement file (*.rscmd) created for the next measurement.

Use Database of RSCMD File

The next replay does not use the current BTS data base but the BTS information included in an existing measurement file (*.rscmd or *.cmd).

Search BTS without GPS information

In the default case where the option is deselected, R&S ROMES checks each BTS for valid GPS information (geographical coordinates) and omits all BTSs without GPS information from the data base. Otherwise, no GPS plausibility checks are carried out and all BTSs are included in the data base.

Reload Database at Startup

The current BTS data base is stored and automatically loaded when R&S ROMES is started for the next time. If the option is deselected, R&S ROMES starts without loading the data base.

Max. Distance of BTS

Assume that only BTSs within a definite radius around the measurement position have any influence. Excluding distant base stations saves processing time. The maximum GSM cell radius of approx. 35 km is a good estimate for the maximum distance.

L1 Threshold for BTS Position Measurement

Estimated accuracy of the BTS position determined in a transmitter scan. The BTS position is determined by the time delays of the T51 at different measurement locations. The calculation is based on an iterative algorithm which stops once the standard deviation of the position falls below the *L1 Threshold ...* The threshold must assume a value between 50 m and 1 km.
If the accuracy can not be reached with the current TS data, the position estimate is continued as soon as there are more data available, either during the same measurement or even in a later one. For that purpose the necessary TS data can be stored in the network database; see *Add Transmitter Scan Files* button above.
For enhanced performance during measurement it is recommended to use a larger *L1 Threshold ...* while the measurement is running. A better estimate of the position can then be obtained by adding the same TS file offline, using small values for the *L1 Threshold ...*

Operators (MCC, MNC) with unique CI

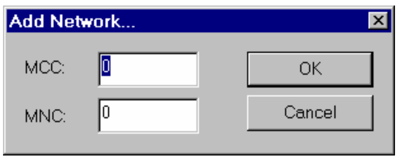
This panel defines pairs of Mobile Country Code (MCC) and Mobile Network Code (MNC) values to be assigned to the entries in the BTS database. The values are imported into the database together with the BTS list files; they are not needed for BTS list files that already contain MCC and MNC values.

The MCC and MNC are required to identify the base stations together with their Cell Identity (CI). The CI is usually unique within a country and a given network; however, providers assign the same CIs in different countries and networks. Only the combination of the CI, the MCC and the MNC is a unique identifier for any base station worldwide.

There are some exceptions where a CI occurs repeatedly within the same country and network. In those cases the Location Area Code (LAC) is required as a fourth identifier. This code number must be included in the BTS list file or entered in the BTS database by means of the *BTS List Editor* dialog; see p. 3.111.

New

Opens the Add Network... dialog box to define a new pair of MCC and MNC values:



OK closes the box and enters the two values in the MCC/MNC list. The list may contain several pairs of values.

Delete

Deletes a pair of values selected in the MCC/MNC list.

Update

Confirms the new entries and update the list: All MCC/MNC values are now available to be imported together with BTS list files.

BTS List Editor

The *BTS List Editor* dialog modifies the entries in the current GSM database file. It is opened by means of the *Edit* button in the *GSM BTS List Database* tab.

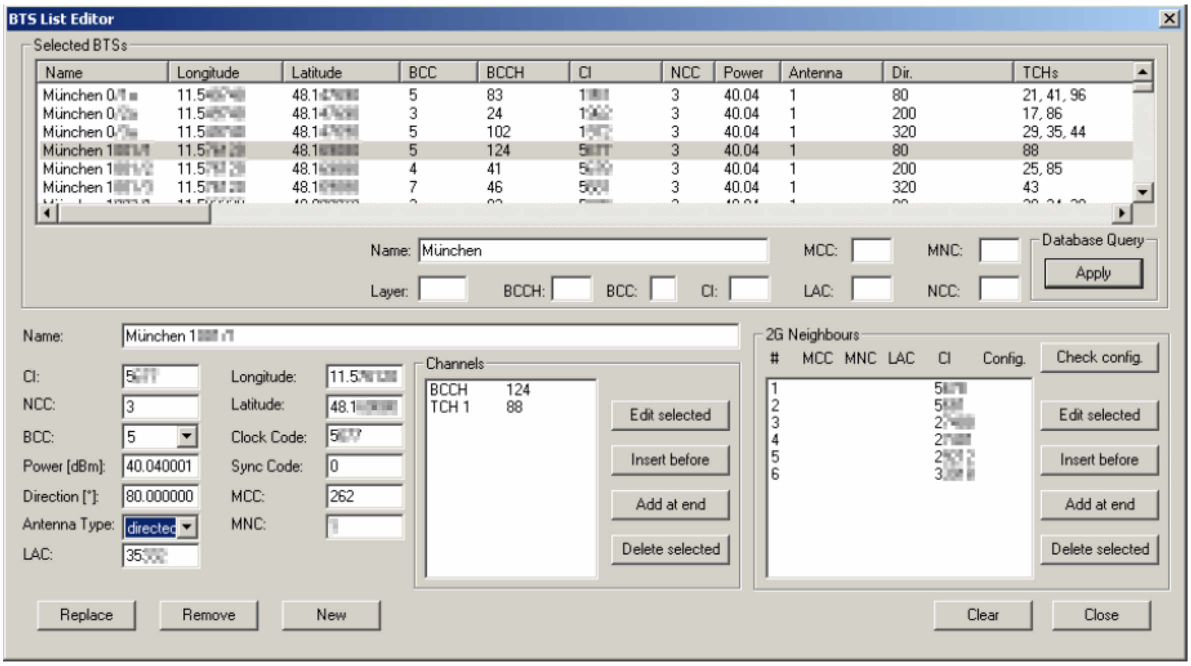


Fig. 3–24 BTS List Editor

The *BTS List Editor* is divided in an upper panel *(Selected BTSs)* to sort and select BTS sectors and a lower panel *(Edit BTS Sector)* to modify a particular entry.

Selected BTSs

The *Select BTSs* panel contains a table listing the base stations in the current data base file.

The input fields below the table restrict the BTS selection in the table to BTSs with a particular *Name, MCC, MNC* etc. or BTSs fulfilling a combination of filter conditions. With no entries made, all base stations in the current database file are displayed. The *Apply* button in the *Database Query* area updates the contents of the table according to the current filter condition.

The table remains empty if no database file is selected or if the current data base file contains no valid BTS sectors (e.g. because the import of a BTS list file failed).

Edit BTS Sector

The *Edit BTS Sector* panel modifies a particular sector (= table row) of the *Selected BTSs* table. Double-clicking the BTS sector copies it into the input fields in the *Edit BTS Sector* panel where the individual values can be edited. A dash "–" in an input field indicates that the parameter is currently undefined.

Replace

Copy the current BTS sector back into the *Selected BTSs* table. Sectors with identical clock code and position (lat./lon.) are internally grouped, such that a modification of the parameters latitude, longitude or clock code and then clicking "Replace" will modify all sectors of the group.

Remove

Removes the current BTS sector from the table. The action must be confirmed in a message box.

New

Copy the current BTS sector into the *Selected BTSs* table as a new BTS sector. If the parameters of the current BTS sector are inconsistent, the sector is not added to the data base but an error message is displayed in the in the *Message View* (see *Basic Views – Message View* in chapter 4).

Clear

Deletes all entries in the *Edit BTS Sector* panel.

Close

Close the *BTS List Editor* dialog.

UMTS Technology

Clicking *TEC for UMTS Test Mobiles* opens the *UMTS Node B List Database* tab to create, select or modify the UMTS Node B database, and to extend it by adding files.

The information of the UMTS Node B data base must be stored in an .nbdb (Node B database) file to be used internally. Data from the .nbdb file can be exported to an ASCII BTS list file (*.txt); on the other hand it is possible to import Node B data from Node B list files in one of the formats (*.txt, *.atd, *asc) described in chapter 7.

Note:

The UMTS Node B List Database tab is also accessible from the Database – UMTS Node B Database menu.

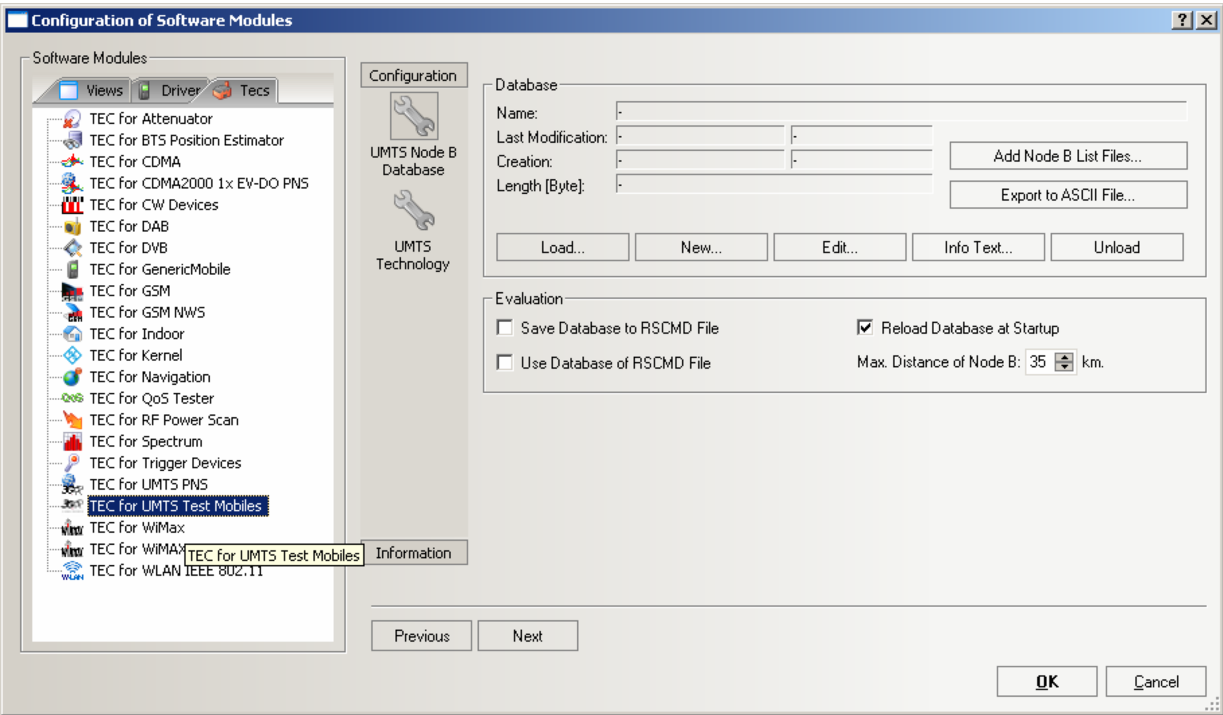


Fig. 3–25 TEC for UMTS Test Mobiles– Node B List Database

The data base is handled in analogy to the GSM data base described in section *Importing a BTS List File into the Database* on p. 3.105. In particular, the function of all controls in the *UMTS Node B List Database* dialog is identical to the corresponding GSM controls.

The *Information - Info Text…* button opens a dialog to assign an alias text to the different parameters that characterize the Node Bs the columns in the *Tx Database Editor;* (*see below)* and to select them for the Node B info field in the UMTS layer of the *Route Track* view.

The Node B info field is displayed by clicking the hot zone around a Node B sector symbol in the *Route Track* view. The info field indicates all selected parameters with their alias names and current values.

Creating a Database File

To create a new database file (*.nbdb),

- In the *Database* panel, click *New* to open the *Create Database* dialog.
- Select a directory and enter a file name. The extension *.nbdb will be appended automatically.
- Click *Open* to create the file and close the *Create Database* dialog.

See also *Importing a BTS List File into the Database* below.

Importing a Node B List File into the Database

To import an existing Node B list file (*.atd, *.buf, *.txt, *.vig) into the database,

- Ensure that an empty or non-empty database file (*.nbdb) is available or create a *.nbdb file (see *Creating a Database File).*
- In the *Database* panel, click *Add Node B Files...*.
- In the file selection dialog opened, select the Node B list file.
- Click *Open* import the Node B list file.
- In the message box *Do you want to create a new database?* opened, click *No*.

The file import is terminated after you confirm the *Node B list successfully imported* message box. The new data extends the previous data base file.

Tx Database Editor

The *Tx Database Editor* dialog displays and modifies the entries in the current Node B list database. It is opened by means of the *Edit* button in the *UMTS Node B List Database* tab.

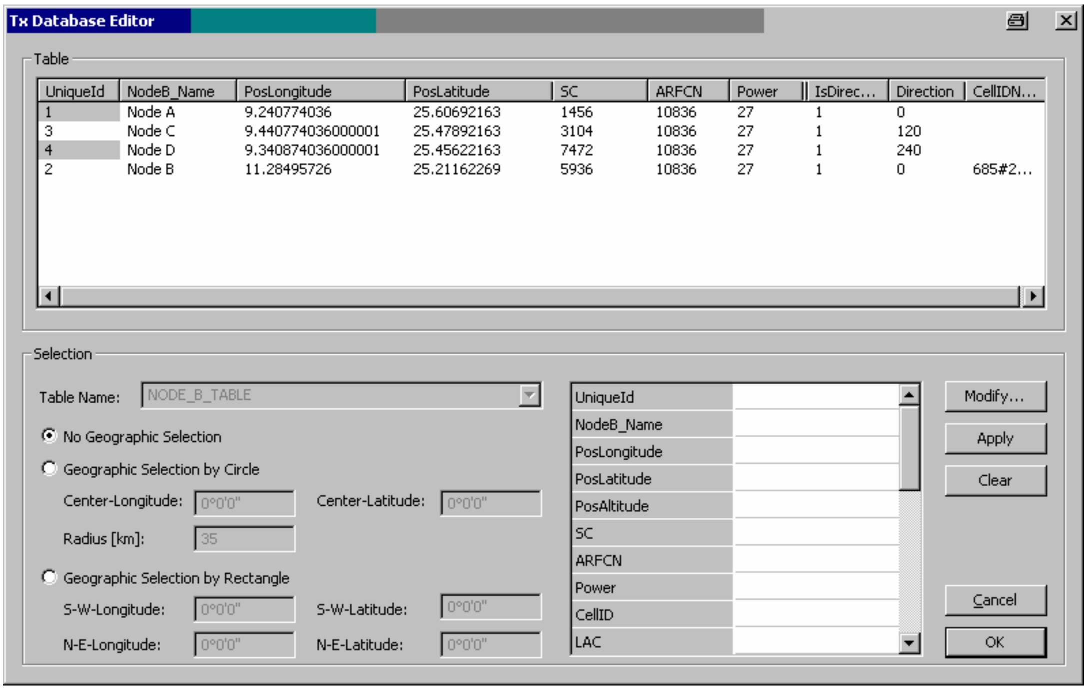


Fig. 3–26 Tx Database Editor

The *Tx Database Editor* is divided in an upper panel *(Table)* to sort and select Node B sectors and a lower panel *(Selection)* to modify a particular entry.

Table

The table in the upper part of the dialog lists the Node B sectors in the current data base file. The format of the SC depends on the settings made in the *UMTS Technology Settings* tab (see p. 3.115).
The table remains empty if no data base file is selected or if the current data base file contains no valid Node B sectors (e.g. because the import of a Node B list file failed).

Selection

The input fields below the table restrict the Node B selection in the table to Node Bs with a particular *UniqueID, NodeB:Name, PosLongitude* etc. or Node Bs in a particular geographic area. With no entries made, all Node Bs in the current data base file are displayed.

The buttons on the right side initiate the following actions:

Modify…

Open a dialog to edit the properties of the Node B selected in the upper table. The modifications update the Node B data base. As an alternative, it is possible to double click a line in the table.

Apply

Update the contents of the upper table according to the current filter condition.

Clear

Clear the current filter conditions.

Cancel

Discard all changes made and close the Tx Database Editor.

OK

Store all changes to the Node B data base and close the editor.

UMTS Technology Settings

The *UMTS Technology Settings* dialog defines the data format for the scrambling code. It is opened by means of the *Edit* button in the *GSM Node B List Database* tab.

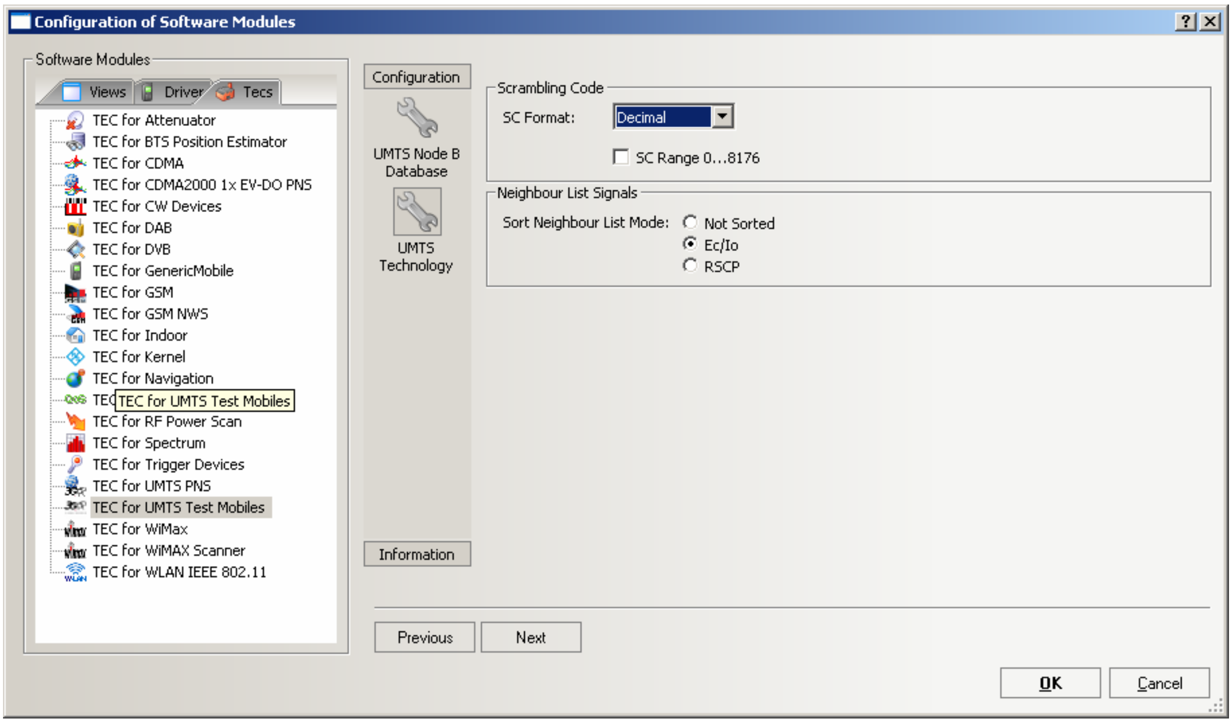


Fig. 3–27 TEC for UMTS Test Mobiles – UMTS Technology Settings

The settings for the *Scrambling Code* are analogous to the settings in the *TEC for UMTS PNS* tab (see *SC Format and SC Range* on p. 3.118), however, the SC format applies to the representation in the *Tx Database Editor*.

The settings for *Neighbor List Signals* will define how the neighbors of the serving cell are sorted. Three options are available:

- Not Sorted
- Ec/Io (default)
- RSCP

CDMA Technology

Clicking *TEC for CDMA* opens the *CDMA BTS List Database* tab to create, select or modify the *CDMA BTS List Database*, and to extend it by adding files.

The information of the *CDMA BTS List Database* must be stored in a .cndb (CDMA data base) file to be used internally. Data from the .cndb file can be exported to an ASCII BTS list file (*.txt); on the other hand it is possible to import Node B data from Node B list files in one of the formats (*.txt, *.atd, *asc) described in chapter 7.

Note:

The CDMA BTS List Database tab is also accessible from the Database – CDMA BTS Database menu.

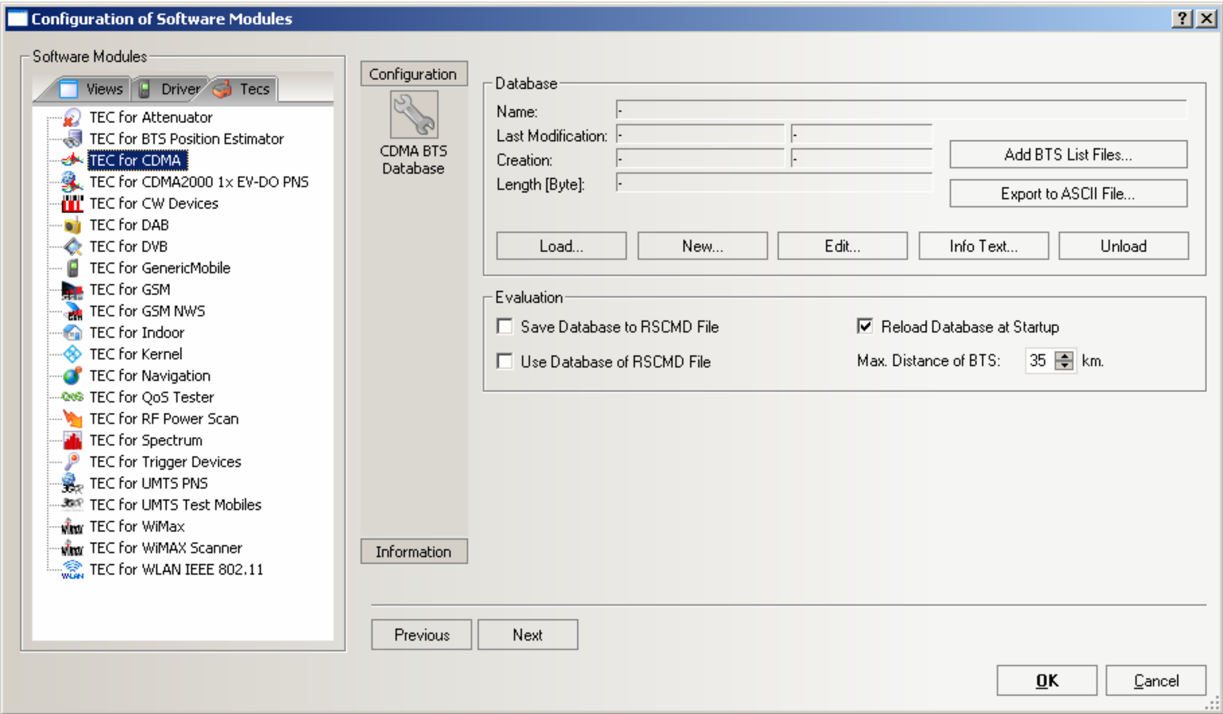


Fig. 3–28 TEC for CDMA – CDMA BTS List Database

The data base is handled in analogy to the UMTS database described in section *UMTS Technology* on p. 3.112. In particular, the function of all controls in the *CDMA BTS List Database* dialog is identical to the corresponding UMTS controls.

TEC for UMTS PNS

The *UMTS Technology Settings* tab in the *TEC for UMTS PNS* dialog selects the number of signals that are displayed in the data trees and the data format of the scrambling code.

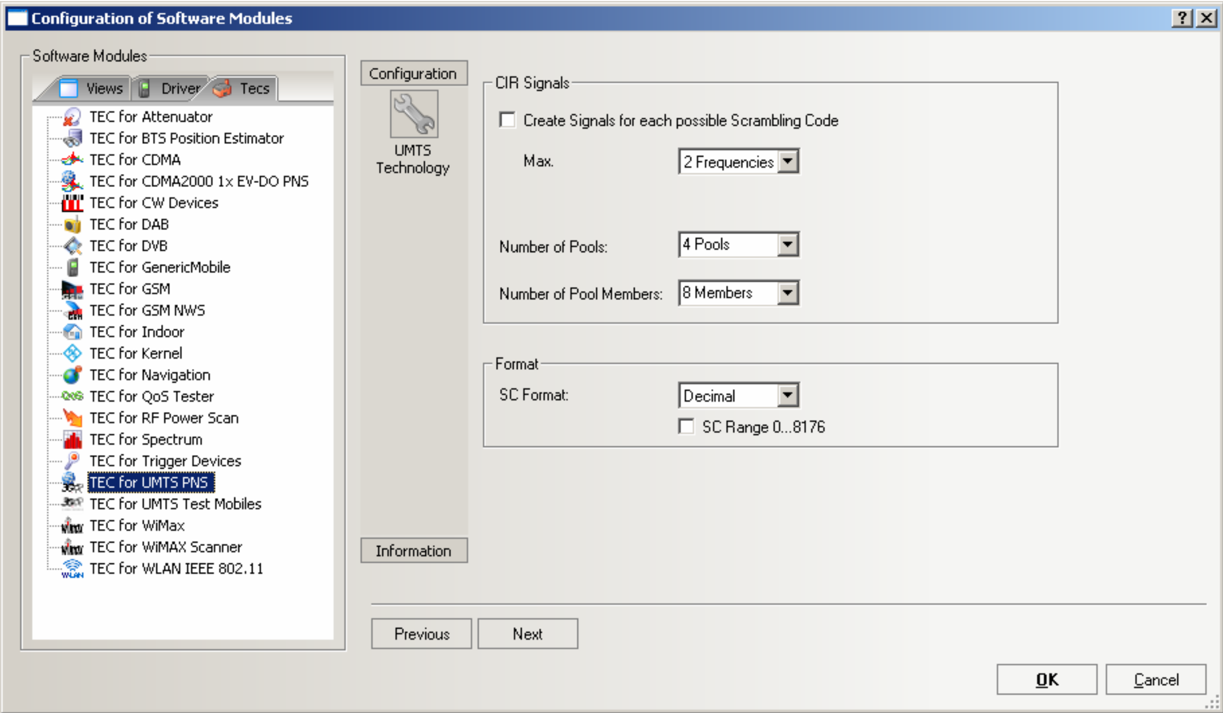
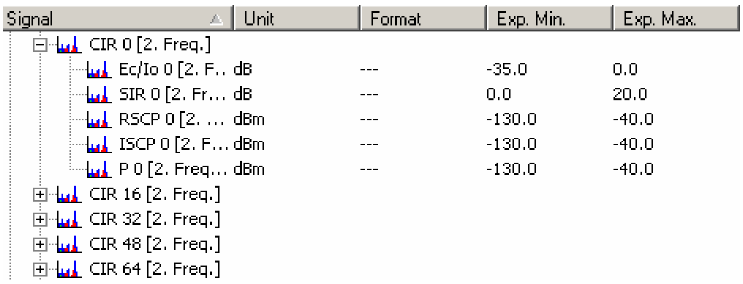


Fig. 3–29 Configuration of Software Modules – TEC for UMTS PNS

Create Signals for each Possible SC

If *Create Signals…* is checked, R&S ROMES creates a signal for each of the 512 Primary Scrambling Codes allowed for the downlink UMTS signal and for the number of frequencies selected in the *Max.* drop-down list. The number of created signals is 512*n, where n denotes the selected number of frequencies.

The signals can be configured in the *Available Signals* tab of the *Preferences* menu (see p. 3.78 ff.) and analyzed in many generic views, e. g. the *2D Chart* view. The signals are displayed as follows:



Signal	Unit	Format	Exp. Min.	Exp. Max.
CIR 0 [2. Freq.]				
Ec/Io 0 [2. F..	dB	---	-35.0	0.0
SIR 0 [2. Fr…	dB	---	0.0	20.0
RSCP 0 [2. …	dBm	---	-130.0	-40.0
ISCP 0 [2. F…	dBm	---	-130.0	-40.0
P 0 [2. Freq…	dBm	---	-130.0	-40.0
CIR 16 [2. Freq.]				
CIR 32 [2. Freq.]				
CIR 48 [2. Freq.]				
CIR 64 [2. Freq.]				

CIR stands for the Carrier to Interference Ratio and the numbers 0, 16, 32, …, 8176 denote the SC. The signals are filled with data as soon as a measurement or replay session is started.

➢ To view signals conveniently, use the *Available Signals Drag & Drop* dialog described on p. 3.31.

> **Note:**
> *To activate a changed signal configuration, R&S ROMES must be closed and re-started.*

Practical considerations

The number of signals leaves the test receiver driver configuration and the enabled options unchanged and therefore do not affect the measurement. In the replay session, however, a small number of displayed signals has several advantages:

- The data tree is easier to handle as unwanted signals are omitted.
- The performance is improved as less system resources are needed.

Omitting the CIR signals does not affect the functionality of the *UMTS PNS Views* described in Chapter 4.

Top N Signals

Defines the maximum no. of Top N pools and max. members per pool in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.). the setting limits the signals that are available for display but has no impact on the Top N pools defined in the driver configuration menu.

SC Format

SC Format opens a drop-down list to select whether the Primary Scrambling Code in the signals and in the views (e. g. the *PNS CPICH View* described in Chapter 4) is displayed in decimal, octal, Hex small or Hex big format.

SC Range

According to standard 3GPP TS 35.213, the primary scrambling codes are numbered n = 16*i (i = 0 to 512), whereas the 15*512 numbers n = 16*i + k (i = 0 to 512, k = 1 to 15) are reserved for the optional secondary scrambling codes. This convention is used if *SC Range 0 … 8176* is checked.

In the alternative convention, the Primary Scrambling Codes numbers are divided by 16 and cover the range 0 to 511.

TEC for CW Devices

The *Number of Signals* panel in the *TEC for CW Devices* tab selects the number of CW test receiver signals that are displayed in the data trees (e.g. in the *Values* tab of the *2D Chart* configuration menu). This number leaves the test receiver driver configuration and the enabled options unchanged and do not affect the measurement. The maximum defined number of CW signals is 100. In the replay session, however, a small number of displayed signals have several advantages:

- The data tree is easier to handle as unwanted signals are omitted.
- The performance is improved as less system resources are needed.

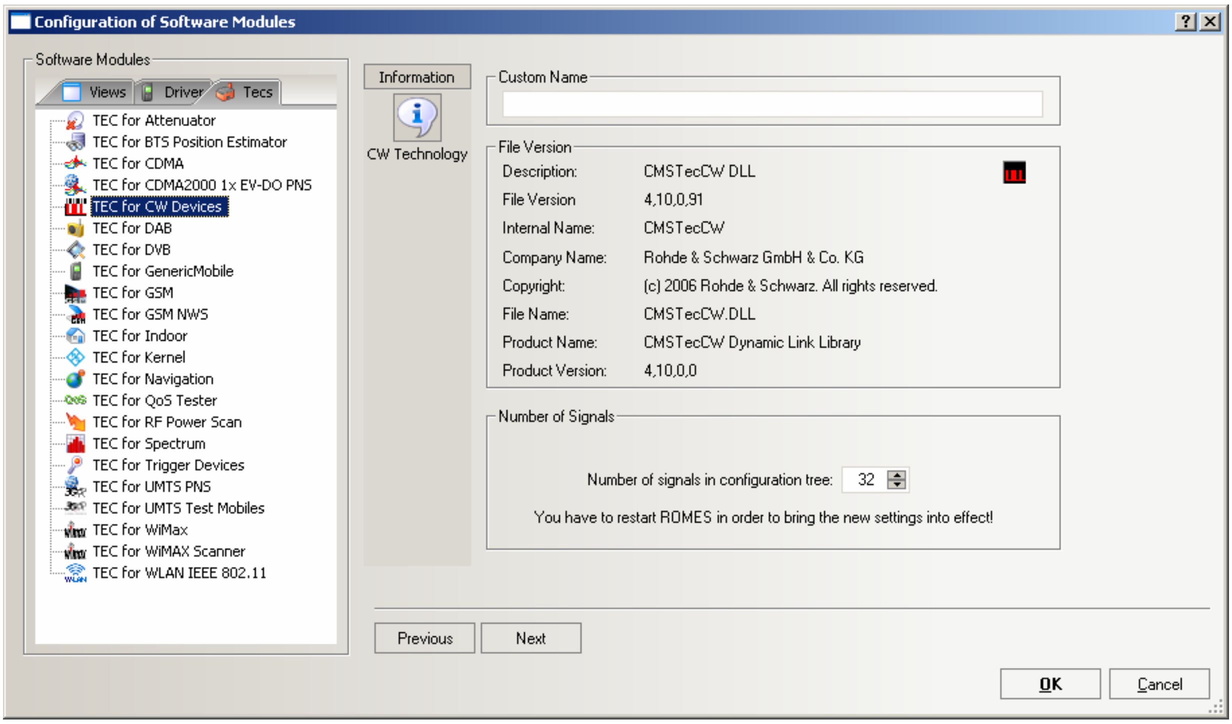


Fig. 3–30 Configuration of Software Modules – TEC for CW Devices

WiMAX Technology

Clicking *TEC for WiMAX* opens the *WiMAX BTS Database* tab to create, select or modify the WiMAX BTS database, and to extend it by adding files.

The information of the WiMAX BTS database must be stored in a *.wmdb (WiMAX data base). Data from the *.wmdb file can be exported to an ASCII BTS file (*.txt); on the other hand it is possible to import BTS data from BTS list files in one of the formats (*.txt, *.atd, *.asc) described in chapter 7.

Note:
The WiMAX BTS Database tab is also accessible from the Tools – Database – WiMAX BTS Database menu.

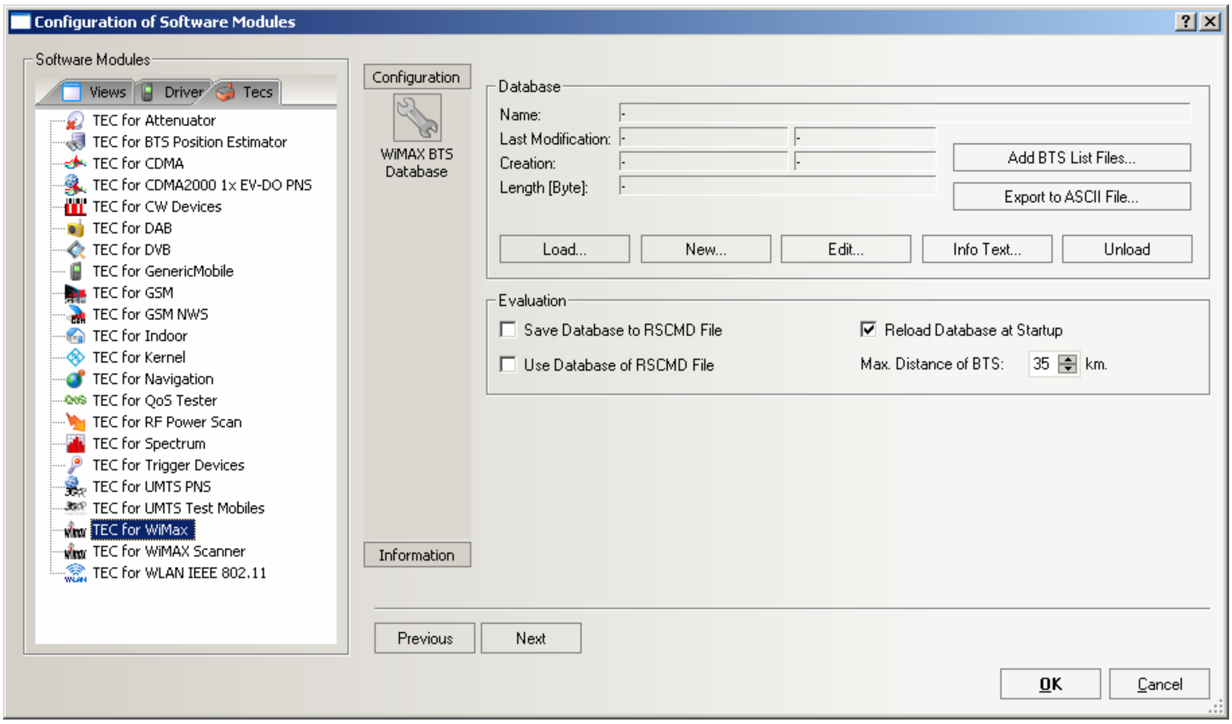


Fig. 3–31 TEC for WiMAX – WiMAX BTS Database

The data base is handled in analogy to the UMTS database described in section *UMTS Technology* on p. 3.112. In particular, the function of all controls in the WiMAX BTS List Database dialog is identical to the corresponding UMTS controls.

Tec for WiMAX Scanner

Clicking *TEC for WiMAX Scanner* on the *Technologies* menu opens a panel with three tabs for the *Wi-MAX Scanner TopN Settings*, the *Templates* and Info tab.

Note:
The TEC for WiMAX Scanner tabs are also accessible from the Tools – Modules Configuration ... – Tecs menu.

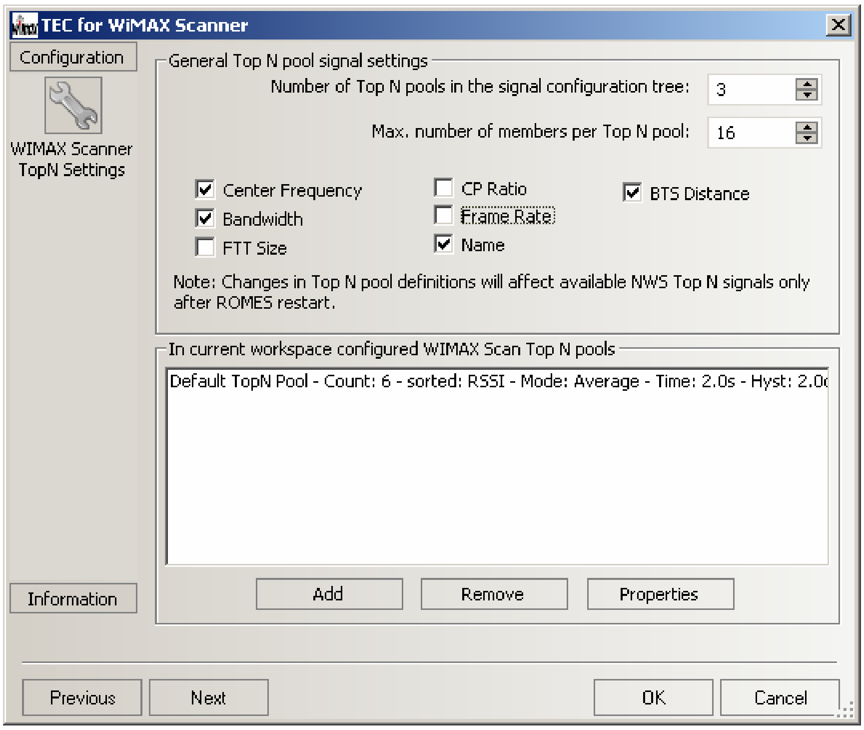


Fig. 3–32 TEC for WiMAX Scanner – WiMAX Scanner TopN Settings

WiMAX Scanner TopN Settings

In the technology WIMAX Scanner the TopN Settings can be set.

The *WIMAX Scan Top N Settings* tab is divided in an upper panel (*General Top N pool signal settings*) to set preferences for the General Top N pool signals and a lower panel (*In current workspace configured WiMAX Scan Top N pools*) to administrate the Top N pools of the current workspace.

General Top N pool signal settings

The changes in Top N pool definitions made on this panel will affect available Top N signals only after R&S ROMES is restarted.

Number of Top N pools in the signal configuration tree

Defines the maximum number of Top N pools in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.).

Max. Number of members per Top N pool

Defines the maximum members per pool in the list *of Available Signals*(see section Signal Configuration on p. 3.78 ff.).

Optional signals per Top N member:

Center Frequency

Center frequency of the used channel. According to standard IEEE 802.16.

Bandwidth

For WiMAX different bandwidths are possible according to standard IEEE 802.16.

FFT Size

Fast Fourier Transformation*CP Ratio*
Cyclic Prefix Ratio*Frame*Frame Rate

Name (of BTS)

WiMAX base station name.

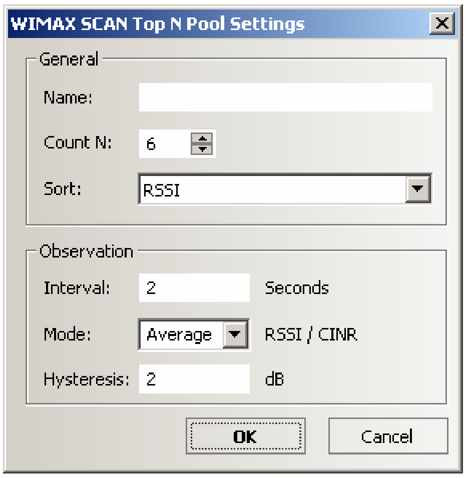
Distance (to BTS in km)

Distance to the BTS.

In current workspace configured WiMAX Scan Top N pools

This panel shows a list box with the Top N pools configured in the current workspace. The Top N pool list can be amended using the Add button, list items can be deleted using the Remove button, and the list entry properties can be viewed or modified using the Properties button.

Add Adds a user-defined Top N pools in the list of *Available Signals* (see section Signal Configuration on p. 3.78 ff.).



The *Add* dialog contains the following panels:

General

Name Name of the WiMAX Scan Top N pool.

Count N Number of pool elements (range 1 to 16). The display of pool elements in the in the list of *Available Signals* is limited to the *Max. Number of members per Top N pool.*

Sort The Top N View list can be sorted by RSSI and CINR or not sorted.

Observation

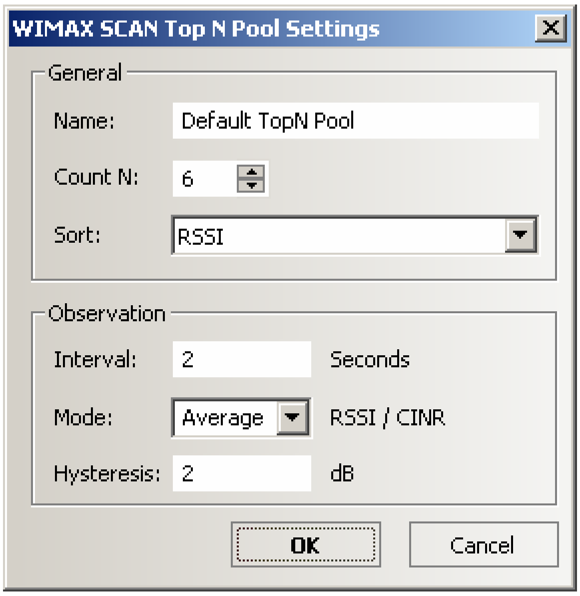
Interval Measurement interval in seconds (range 0 to 300)

Mode The measured RSSI and CINR power value defines the sort order for the Top N View. The sort mode can be set to Average/Max./Min./Last power values.

Hysteresis Measurement interval in seconds (range 0 to 300).

Remove Deletes the selected WiMAX Scan Top N pool from the list, after the following dialog is confirmed.

Properties Allows the modification of the properties for the selected Top N pool.



The *Properties* dialog contains the same panels as the *Add* dialog, all field descriptions are defined there:

Templates tab

The *Information - Templates* tab is divided in an upper panel *(Available Templates)* to load or delete a user-defined template for the TEC for CDMA PNS and a lower panel *(Save current settings as Template)* which allows the entry of a brief template description before saving the current settings defined in the TEC for CDMA PNS tabs.

The *Save* button opens a *Save As...* dialog for the template file.

Info tab

The *Information - Info tab* is divided in an upper panel *(Custom Name)* to set a user-defined name of the TEC for CDMA PNS and a lower panel *(File Version)* which shows the TEC for CDMA PNS link library properties.

The *Info* panel shows file information of the dynamic link library which implements the selected TEC.

The *Info* tab includes the *Custom Name* field, which has no function in a view context. It is only useful in a driver context, where different connected devices can be associated with different custom names, e.g. for separate mobiles in different networks, or when simultaneously operated mobiles perform different tasks.

Coupled Focus

Enabled or disabled the coupled focus between several views (see p. 3.4).

Hold All Views

"Freezes" the current measurement display for all views for examination purposes without stopping the measurement.

Database Menu

The *Database* menu offers commands for creating or modifying cell databases for CDMA, GSM, UMTS and WiMAX.

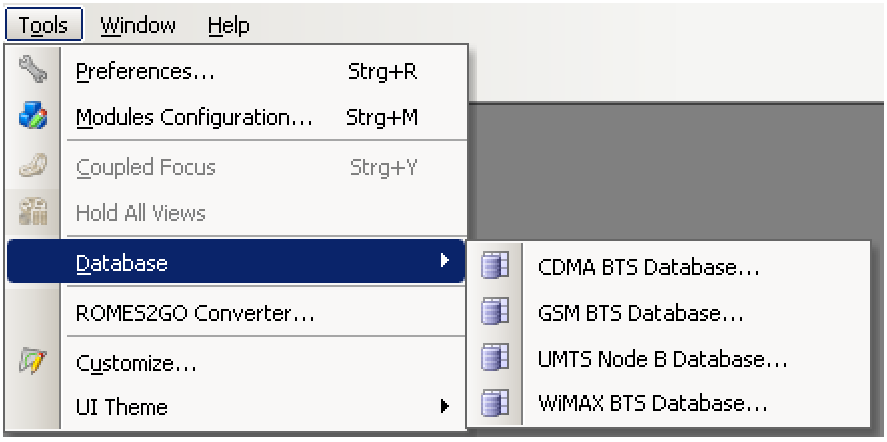


Fig. 3–33 Database menu

CDMA BTS Database

Open the TEC for CDMA dialog.

The TEC for CDMA dialog is used to create or modify a CDMA BTS List data base. It is identical with the dialog opened by means of the *Tools – Modules Configuration ...* command; see section *CDMA Technology* on p. 3.116.

GSM BTS Database

Open the TEC for GSM dialog to create or modify a GSM BTS data base.

The TEC for GSM dialog is identical with the dialog opened by means of the *Tools – Modules Configuration ...*command; see section *GSM Technology* on p. 3.104.

UMTS Node B Database

Open the TEC for UMTS Test Mobiles dialog.

The TEC for UMTS Test Mobiles dialog is used to create or modify a UMTS Node B data base. It is identical with the dialog opened by means of the *Tools – Modules Configuration ...*command; see section *UMTS Technology* on p. 3.112.

WiMAX BTS Database

Open the TEC for WiMAX dialog.

The TEC for WiMAX dialog is used to create or modify a WiMAX BTS data base. It is identical with the dialog opened by means of the *Tools – Modules Configuration ...*command; see section WiMAX Technology on p. 3.119.

ROMES2GO Converter

The menu item *ROMES2Go Converter* opens the GUI Application *Conv2RSCMD Starter.* It allows converting R&S ROMES2GO measurement files into R&S ROMES RSCMD file format.

R&S ROMES2GO is a hand held drive test tool which runs on a mobile and is sold as separate product. For details about the R&S ROMES2Go Converter see section ROMES2Go Converter in chapter 7.

Customize R&S ROMES

The *Customize* dialog box is the place to start for all toolbar and menu customizations. It can be opened from the *Tools – Customize* menu. As you can see in the picture on the left, the Customize dialog box has four tabs. One is for toolbars, one for commands and menus, one for shortcuts and the fourth has all the remaining customization options. Not only is it the place to change or create toolbars and menus, it's also the place to reset or delete them.

When the dialog box is open, menus and toolbars become editable and do not work.

Toolbars

Use the *Toolbars* tab to show, hide or create new toolbars.

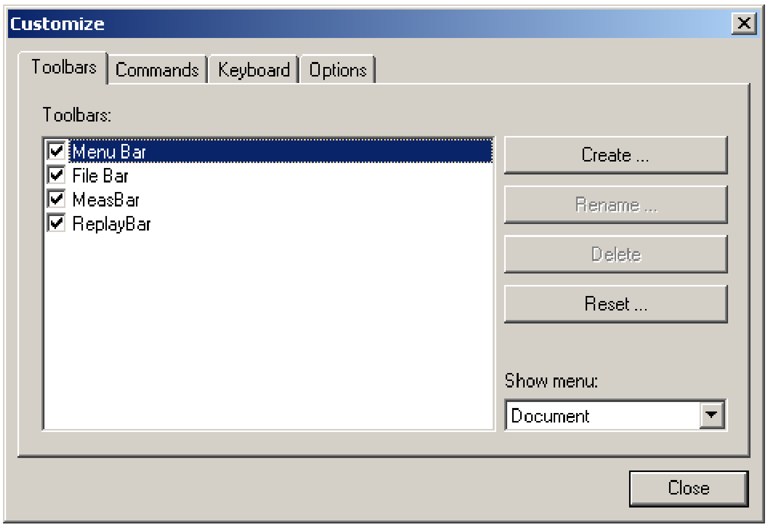


Figure 3-1: Customize - Toolbars tab

Toolbars	To show a toolbar, select the box to the left of its name. To hide a toolbar, clear the box.
Create	Create a new toolbar.
Rename	Rename an existing toolbar.
Delete	Delete an existing toolbar.
Reset	Restore the default layout of the selected toolbar.
Show menu	Switch between default and R&S ROMES specified menu bar layout.

Commands

Use the *Commands* tab to add a button to a toolbar and to create a new entry to the menu bar.

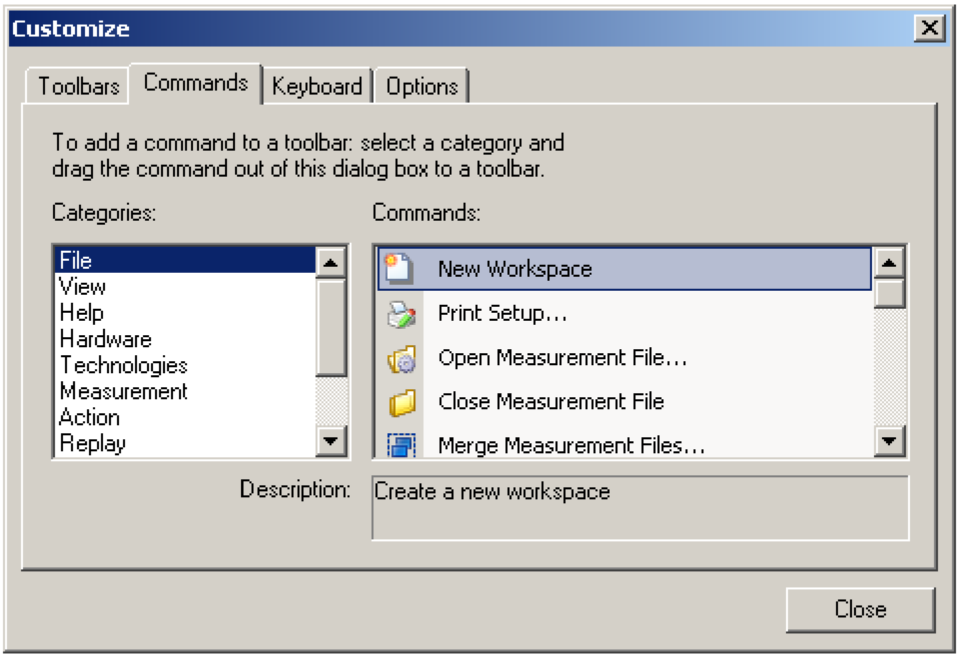


Figure 3-2: Customize - Commands tab

Categories Show the different group of commands.

Commands Show the commands of a selected category.
To include an action as a command on a menu, simply drag it from the dialog box onto the menu. And if you want it as a button on a toolbar, drag it into position on your chosen toolbar.

> ***Note:***
> *In the Commands window appears commands with prefix "_DYNMENU_". Please do not drag and drop this commands. .These commands are only for internal use.*

Add commands and buttons

- Click the *Commands* tab of the *Customize* dialog box.
  The various types of commands are listed in the Categories list. The categories are divided up by the traditional menu and toolbar structure.
- Once you have identified which category you are interested in, you can look for a specific action in the Commands list. To include that action as a command on a menu, simply drag it from the dialog box onto the menu.
- If you want it as a button on a toolbar, drag it into position on your chosen toolbar.
  Some commands have an icon associated with them. This icon is the button that will show on the toolbar. If you choose to put a command without an icon on a toolbar, it will appear as a button with text written on it.

Create a new menu

- Click the *Commands* tab in the *Customize* dialog box.
- In the Categories list, click New Menu.
- From the Commands list, drag a command to the desired position. You can then rename the menu to whatever you desire. A new menu will not have any commands on it; it will be completely empty. You need to add commands to it as described above in *Add commands and buttons*.

Keyboard

The *Keyboard* tab in the *Customize* menu assigns a shortcut (a combination of keys) to the user events and to the most common commands in the *Measurement* menu. Applying the shortcut (pressing the key combination) is then equivalent to triggering a user event and writing it to the measurement data or to executing a command. The default shortcuts for the *File* menu commands can not be changed.

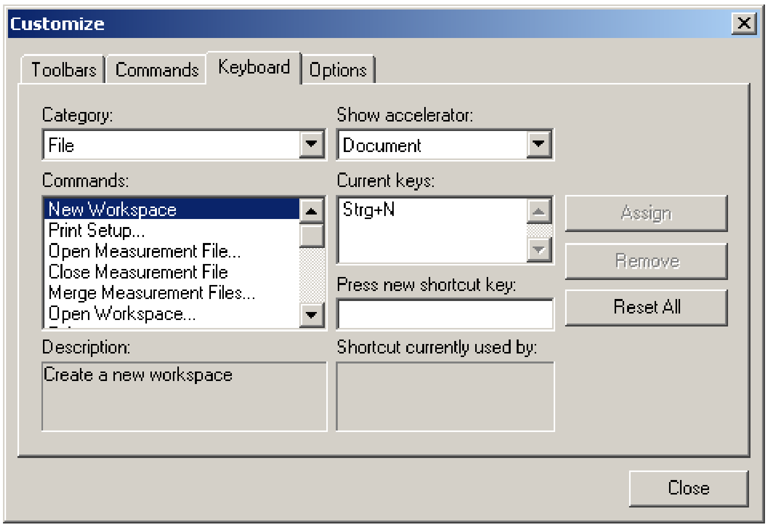


Figure 3-3: Customize - Keyboard, Shortcut tab

Options

Use this tab to control menu and toolbar behavior.

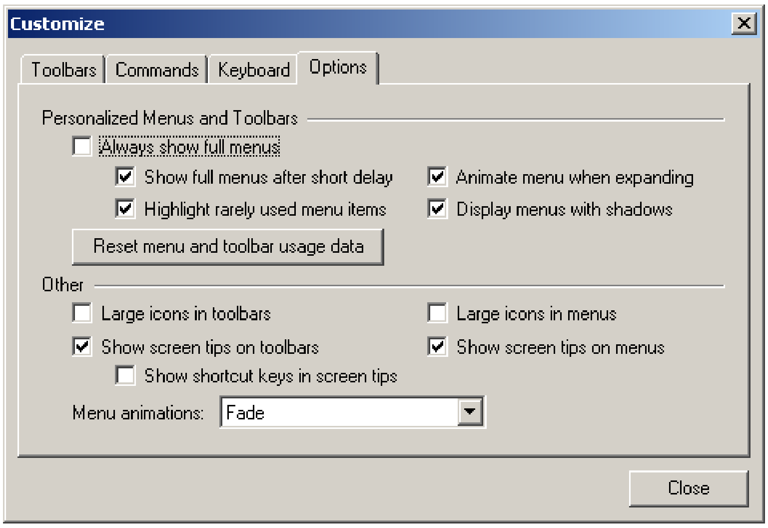


Figure 3-4: Customize - Options tab

UI Theme Menu

R&S ROMES offers differences color scheme for the user interface of R&S ROMES. As default the blue color scheme is activated.

➢ To change the color scheme in R&S ROMES, click *Tools – UI Theme* and select the desired new color scheme for the user interface.

The new selected color scheme is recognized until it is changed again over the menu *Tools – UI Theme*.

Window Menu

The *Window* menu offers commands for arranging and handling the view windows and shows a list of all open views.

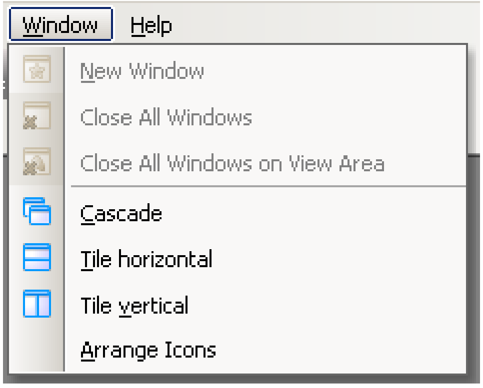


Fig. 3–34 Window menu

New Window

Create a new view of the same type as the active window.

The *New Window* command is enabled for multiple view types. Those types are characterized by a current number behind the view title (e.g. *Measurement Report View: 1).* The *New Window* is also available in the context menu associated to multiple views.

Close All Windows

Close all windows on all worksheets.

Close All Windows on <S>

Close all windows on the worksheet named <S>.

Cascade

Superimpose all open view windows showing each one's title bar. The active window is placed in the foreground.

Tile horizontal / vertical

Place all open view windows side by side (or stacked vertically) so that they don't overlap.

Arrange Icons

Arrange the minimized views to the bottom of the visible view area.

Help Menu

The *Help* menu provides online help and general information about the measurement system.

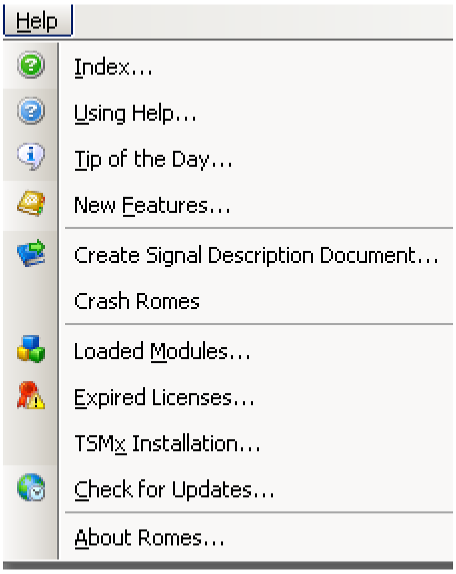


Fig. 3–35 Help menu

Index

Opens the online help.

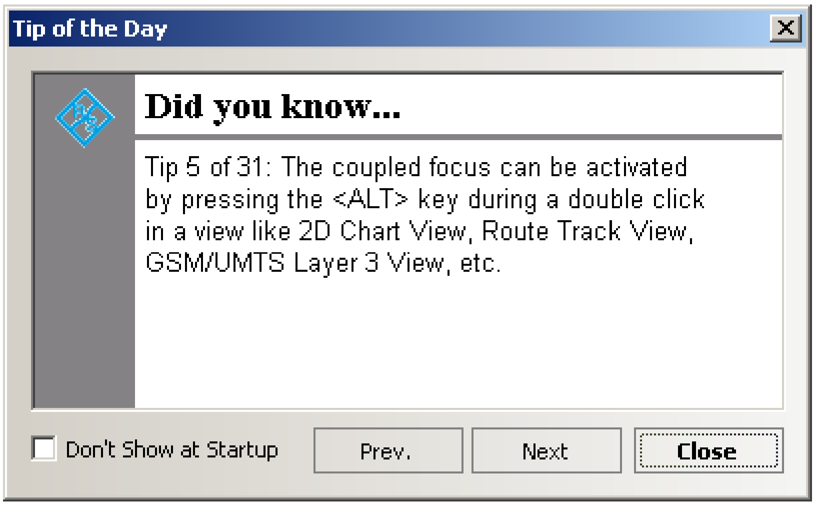
From the opening screen, navigation tools such as a table of contents, index of keywords, and hyperlinks will help you quickly find all information needed for using the measurement system.

Using Help

Opens a help topic on the online help. The online help system itself is accessible from the help page.

Tip of the Day

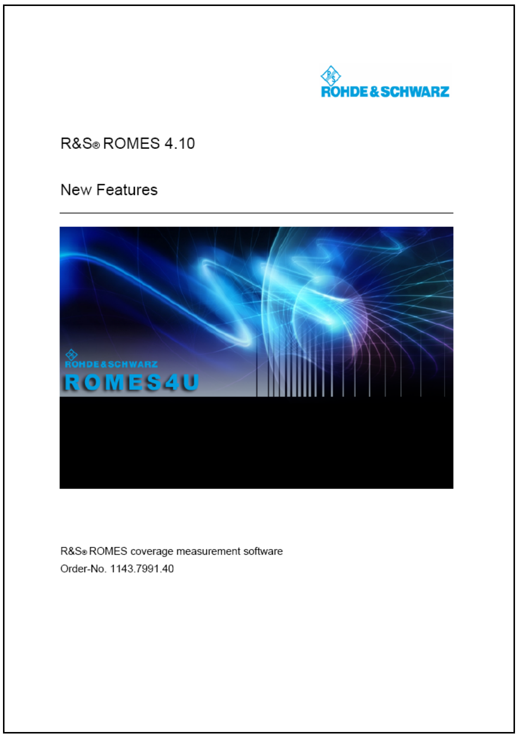
Opens the *Tip of the Day* window.



The *Tip of the Day* is a small window that displays a new tip each time R&S ROMES is started. These tips are a convenient way to learn more about what you can do in the program. If you do not want the *Tip of the Day* to display the next time you start the program, select the *Don't Show at Startup* check box.

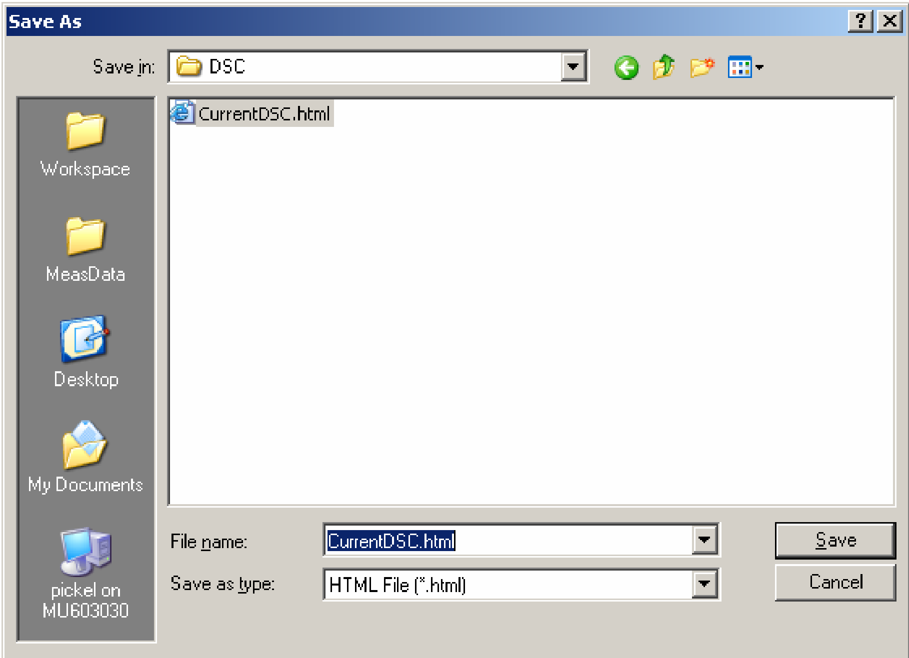
New Features

*S*hows the last Overview Sheet about the new features. All changes from the previous release will be described here.



Create Signal Description Document

R&S ROMES can compile a single document, which contains all signal descriptions. The result is an HTML file, which can be displayed in the Internet Explorer and printed as PDF document, if desired.



Loaded Modules

Opens the *Loaded Modules* dialog showing all software modules available in the current R&S ROMES installation.

Detailed information on the modules can be obtained by clicking on a module name.

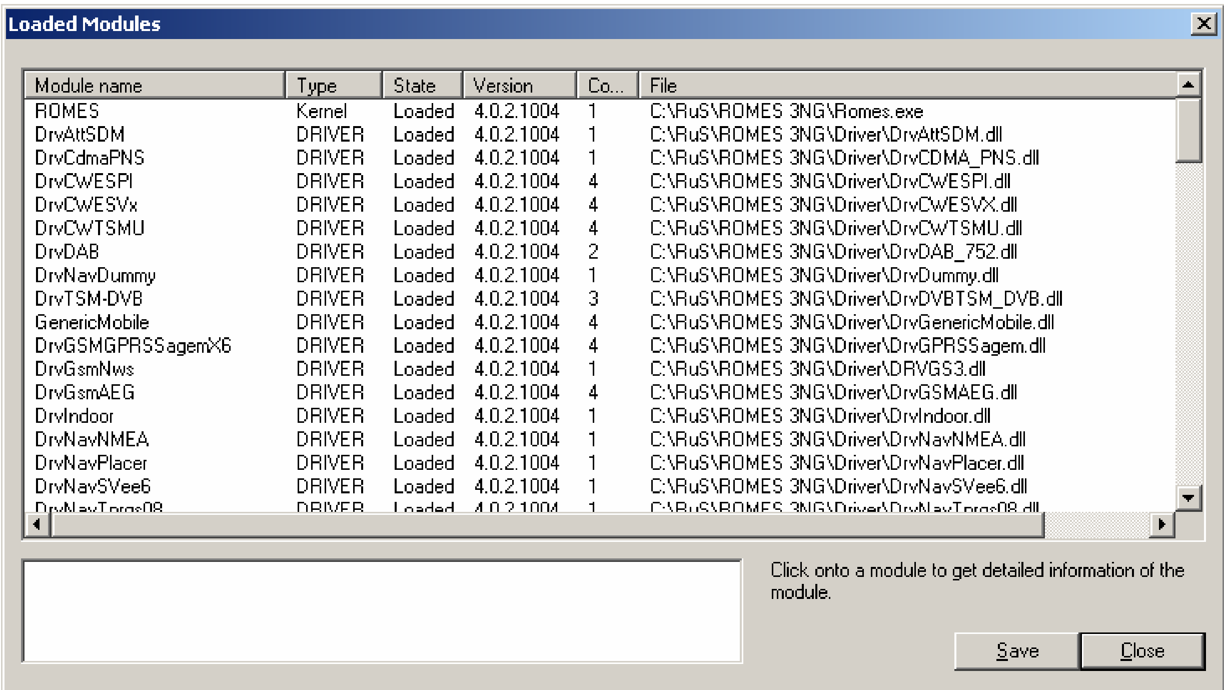


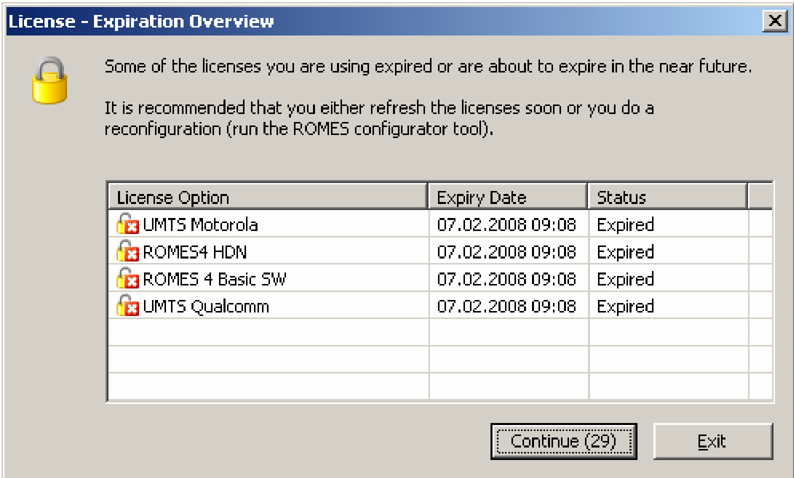
Fig. 3–36 Loaded Modules dialog

Save Writes the module list shown in the *Loaded Modules* dialog to a text file. The name and directory of the file are shown in a popup window.

Close Closes the *Loaded Modules* dialog.

Expired Licenses

R&S ROMES is able to warn the user when licenses stored on the HASP Hardlock expire in the next two days or have expired. If at least one license option fulfils one of those two criteria, a dialog similar to one shown below is displayed when R&S ROMES starts up and runs the initial license check:



The dialog shows which licenses are about to expire or already got invalid since their lifetime elapsed. There are two options available: Continue the start of R&S ROMES or exit the application. If R&S ROMES is started with no changes, some functionality might not work as before, since the licensed features that expired are disabled. To enable them again, reload the licenses on the Hardlock again.

The dialog is shown only once for each license and status. In other words, if R&S ROMES is started again after the license expiration has been shown, the dialog will not come up again unless there is new expiration information available.

Note:
Information about license handling will be explained in the User Manual for ROMES License Server and Client on the ROMES DVD in the folder \Doc\.

TSMx Installation Opens the *TSMx Installation* dialog showing all TSMx-related software modules available in the current R&S ROMES installation.

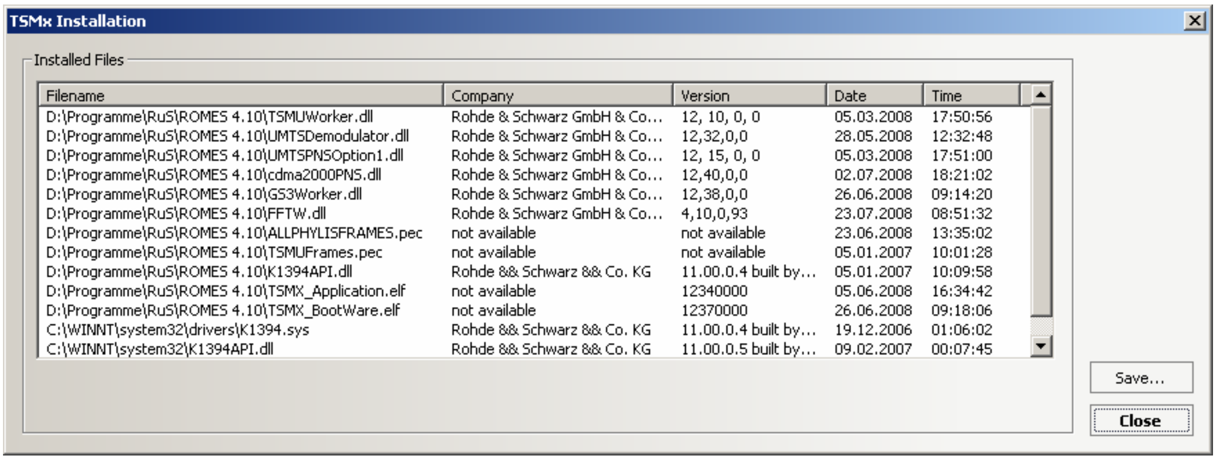


Fig. 3–37 TSMx Installation dialog

Save Writes the module list shown in the *TSMx Installation* dialog to a text file. The name and directory of the file are shown in a popup window.

Close Closes the *TSMx Installation* dialog.

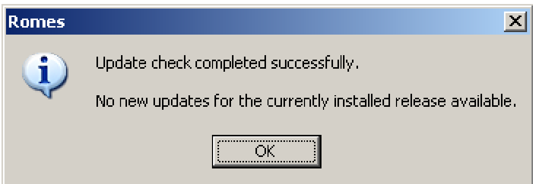
About ROMES

Displays the R&S ROMES startup window indicating the name and version number of your R&S ROMES copy.
In addition the window provides a selection of useful URL links.

Check for Updates

ROMES offers the ability to check for newly available service packs, patches and upgrades.

The result of the check is a feedback what kind of update is available. If there is an update available, please contact the Rohde & Schwarz support to get information on how to receive the update.



Note:
The PC must be able to connect to the Rohde & Schwarz CMS FTP Server. If no connection can be opened, the check cannot be performed. If the Windows firewall tells you, the connection attempt was blocked the check will be done anyway.

Contents

4 Display and Evaluation of Results

This chapter describes how to display and analyze the data measured or stored in a measurement file and replayed. Data selection and configuration of the view properties is performed in the *Configuration of Software Modules* menu opened via the *Modules Configuration…* command in the *Tools* menu. The view configuration menus are also accessible from the individual view menus (click the right mouse button and select *Configure...* from the popup window). The view windows can be called up in the *View* menu.

For an overview of all menus and menu commands refer to chapter 3.

General View Properties

The views are optimized for different data types from different sources and therefore vary in appearance and functionality. In spite of the differences, some properties are common to many or all views.

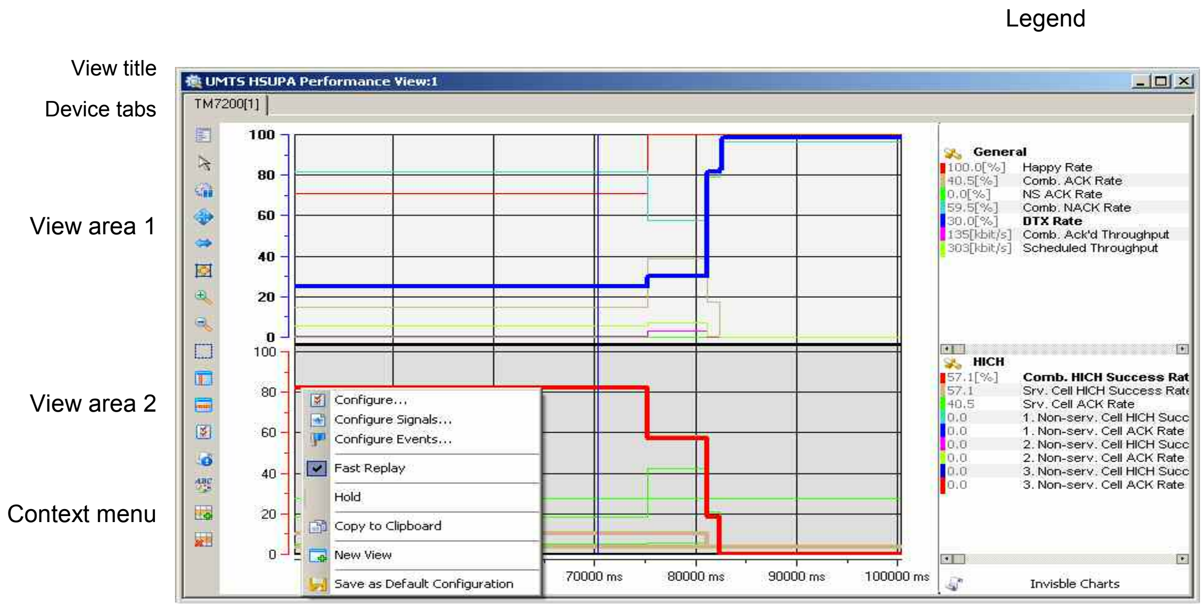


Fig. 4-1 General view properties

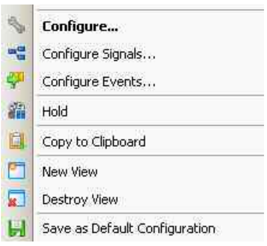
View title The title bar contains the name of the view and three icons to minimize, maximize and close the view. A sequence number *(: 1)* behind the name indicates that it is allowed to open several views of the same type.

Device tabs Many views are divided into separate tabs to display the data originating from different test devices (e.g. different test mobiles, receivers etc.). A mouse click on a tab places it into the foreground.

The device tabs in all open views are coupled: Selecting a device tab in any one view activates the same tab in all other views. The *Control* key disables this coupling mechanism.

Context menu

Most views provide a context menu to access typical configurations and perform actions. A right click on a point anywhere in the view area opens the context menu. The following context menu commands are often used:



Print ...	Opens the Print menu to print the contents of the view or a part of it. A preview of the pages to be printed is accessible via the Print preview command in the File menu, see chapter 3.
Configure…	Opens the configuration menu associated with the view; see below.
Configure Signals	Opens the *Available Signals* tab of the R&S ROMES Configuration menu (see chapter 3) to configure the signals available for viewing.
Configure Events	Opens the *Available Events* tab of the R&S ROMES Configuration menu (see chapter 3) to select the signal events to be recorded during the measurement and configure additional *User Events* and *Comment Events*.
Hold	This function "freezes" the current measurement display for examination purposes without stopping the measurement. A view on hold can be released, which updates the view to reflect the actual measurement status.
Copy to Clipboard	Copy a screenshot of the current view to the clipboard in order to paste it into another application.
New View...	Opens an additional view of the same type. A practically unlimited number of views can be opened at the same time. Views of the same type are distinguished by the current number in the title bar (e.g. the 1 in the above figure) indicating the order in which they have been created.
Destroy View...	Deletes the active view with its contents. New View can not restore a deleted view. A workspace must contain at least one view of each type, so *Destroy View*... is disabled for the last view of each type. R&S ROMES generates a warning:

Save as Default Configuration	Save the current configuration of the view to an ASCII file named *Master.rms* in the Workspace subdirectory of R&S ROMES program directory. The configuration comprises everything that is defined in the configuration menu associated with the view, including the selected signals. The default view configuration is used whenever a new view of the same type is created, irrespective of the current workspace. It is changed when a new default configuration is saved; it is reset by deleting the configuration file *Master.rms*.
Move to	Move the view to one of the worksheets to be selected in the submenu (see description of worksheets at the beginning of chapter 3). This command is not available if the current workspace contains only one sheet.
Remove Signals	Opens a secondary context menu with all signals selected to be displayed. Clicking a signal removes it from the *Selected Param.* list. *Remove Signal* is not shown when the *Selected Param.* list is empty.

Configuration menu

Most views are associated with a configuration menu that can be opened from the context menu. The configuration menus provide view-specific settings.

Each configuration menu contains an *Info* tab listing information on the current view version.

The *Info* tabs include the *Custom Name* field, which in a view context changes the name in the view title section of the active view. In a driver context, it is used where different connected devices can be associated with different custom names, e.g. for separate mobiles in different networks, or when simultaneously operated mobiles perform different tasks.

The *Info* tabs are analogous for all view types and will be omitted in the following.

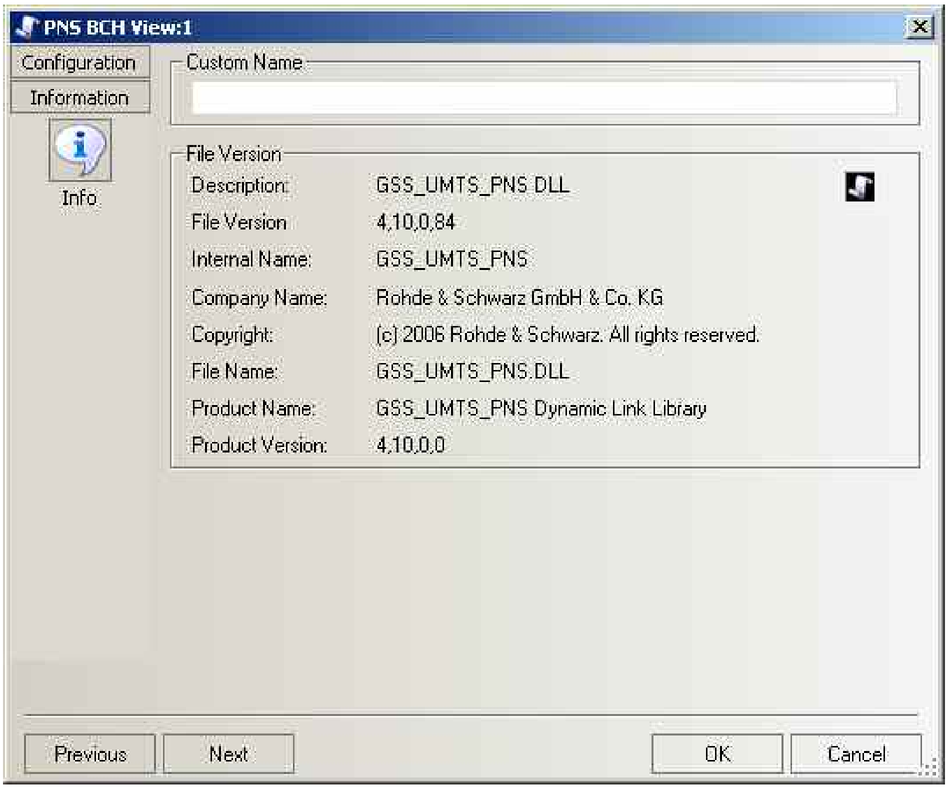


Fig. 4-2 Info tab

Replay jump to timestamp

In many views (e.g. the *GSM/UMTS Layer 3 View, 2D Chart View, Route Track View etc.)*, it is possible to initiate a replay jump to a particular message, event, or characteristic position spotted in the view (in general, to a particular time-stamp in the message file). This type of replay jump must be initiated during a replay pause. The replay is continued at the selected timestamp.

To initiate a replay jump to a timestamp (e.g. in the *GSM/UMTS Layer 3 View)*, proceed as follows:

1. Open the view, replay a measurement file *(Measurement – Replay* or ) and pause the replay *(Measurement – Replay Pause* or ).
2. Keep the *Ctrl* key on your keyboard pressed.

A clock symbol is added to the cursor icon.

3. Double-click a particular message.

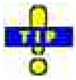
The screen is refreshed. After clicking *Measurement – Replay Pause* or  again, the replay starts with the message selected in the last step.

Coupled Focus

Many views provide graphical tools to highlight special areas and read a particular result. The focus in several views can be coupled, which makes it easier to analyze different aspects of a coverage measurement at a particular position using a set of appropriate views. For details see description of the coupled focus at the beginning of chapter 3.

Basic Views

The *Basic Views* can be used to analyze data from various sources. Basic views are available irrespective of the kind of measurement performed or of the type of measurement data replayed.



Click the  icon in the file bar and use the *Available Signals Drag & Drop..* dialog to display signals in the basic views.

The *Basic Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *Basic Views*.

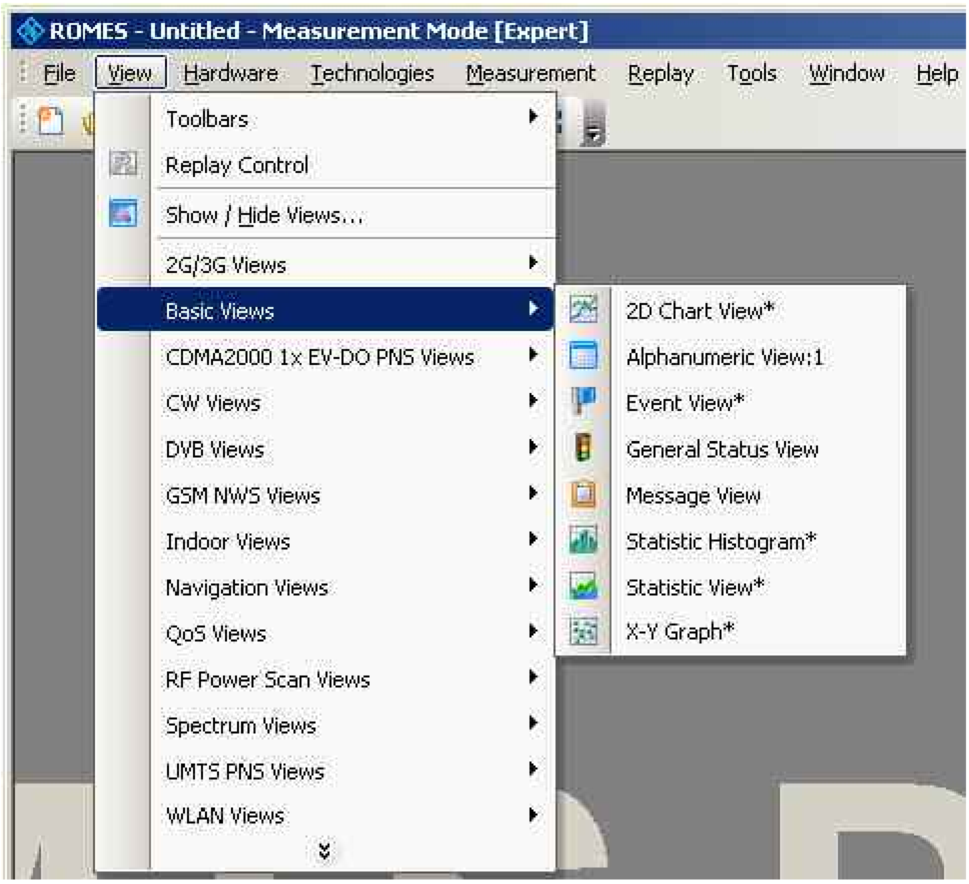


Fig. 4-3 View – Basic menu

Alphanumeric View

The *Alphanumeric View* displays current values of the signals selected in the corresponding configuration menu. The values are continuously updated while the measurement or replay session is going on.

Example for several devices:

Alphanumeric View:1

Parameter	[Unit]	TSMU CW[1]	TSMU CW[2]	TSMU CW[3]
Ch1[935.2000 MHz/1849.2000 MHz/1827.2000 MHz]	dBm	-98.51	-101.56	-99.45
Ch2[935.4000 MHz/1849.4000 MHz/1827.4000 MHz]	dBm	-93.10	-107.85	-102.60
Ch3[935.6000 MHz/1849.6000 MHz/1827.6000 MHz]	dBm	-81.65	-102.72	-107.41
Ch4[935.8000 MHz/1849.8000 MHz/1827.8000 MHz]	dBm	-68.84	-90.56	-97.83
Ch5[936.0000 MHz/1850.0000 MHz/1828.0000 MHz]	dBm	-95.91	-73.65	-104.88
Ch6[936.2000 MHz/1850.2000 MHz/1828.2000 MHz]	dBm	-95.92	-95.09	-105.41
Ch7[936.4000 MHz/1850.4000 MHz/1828.4000 MHz]	dBm	-95.33	-107.23	-94.78
Ch8[936.6000 MHz/1850.6000 MHz/1828.6000 MHz]	dBm	-79.82	-103.38	-104.74
Ch9[936.8000 MHz/1850.8000 MHz/1828.8000 MHz]	dBm	-94.15	-104.10	-107.05
Ch10[937.0000 MHz/1851.0000 MHz/1829.0000 MHz]	dBm	-94.22	-96.36	-96.66
Ch11[937.2000 MHz/1851.2000 MHz/1829.2000 MHz]	dBm	-82.73	-107.60	-88.59
Ch12[937.4000 MHz/1851.4000 MHz/1829.4000 MHz]	dBm	-80.60	-103.26	-105.34
Ch13[937.6000 MHz/1851.6000 MHz/1829.6000 MHz]	dBm	-99.86	-104.60	-98.79
Ch14[937.8000 MHz/1851.8000 MHz/1829.8000 MHz]	dBm	-91.50	-98.[illegible] TSMU CW[2]: -103.26	-92.00
Ch15[938.0000 MHz/1852.0000 MHz/1830.0000 MHz]	dBm	-94.49	-102.99	-106.69
Ch16[938.2000 MHz/1852.2000 MHz/1830.2000 MHz]	dBm	-92.00	-80.98	-108.65
Ch17[938.4000 MHz/1852.4000 MHz/1830.4000 MHz]	dBm	-93.84	-66.26	-105.41
Ch18[938.6000 MHz/1852.6000 MHz/1830.6000 MHz]	dBm	-93.74	-85.74	-91.33
Ch19[938.8000 MHz/1852.8000 MHz/1830.8000 MHz]	dBm	-86.95	-71.08	-104.71
Ch20[939.0000 MHz/1853.0000 MHz/1831.0000 MHz]	dBm	-98.96	-91.48	-94.47

Fig. 4-4 Alphanumeric View

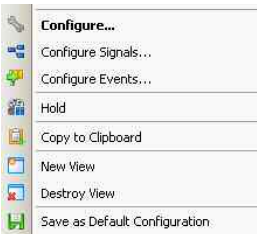
In the *Alphanumeric View,* signals from different measurement devices (e.g. from different GSM or CDMA devices) are displayed in different columns. If only mobile phone parameters are viewed, the device name for each column is unambiguous and therefore indicated in the table heading.

Device parameters from other technologies, e.g. from test receivers or GPS receivers, are always displayed in the first column. If the first column contains parameters from several devices, the table headings read *Device [1], Device [2]* etc. The device for each parameter value can still be obtained: It is indicated in a yellow popup window as soon as the pointer is placed on the parameter value; see figure above.

After clicking a parameter (or selecting a group of parameters using the shift or control keys), it is possible to change the order or remove the parameters from the view.

Note that the *Serving Cell* name can only be displayed if a correct BTS list is provided. In this case, also the distance to the BTS will be displayed (example: BTS1 (2.6 km)).

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration as default, or move to another worksheet; see Context menu description on p. 4.2.

Alphanumeric View Configuration

The *Alphanumeric View* configuration menu defines the signals to be viewed, sets the display colors, and shows information on the current view version. It is opened via a right mouse click on a point inside *Alphanumeric View* or via the *Tools - Modules Configuration...* command (see chapter 3).

UL Interference Signals have been added to the Top N signals and to the CIR signals (which must be activated to be used).

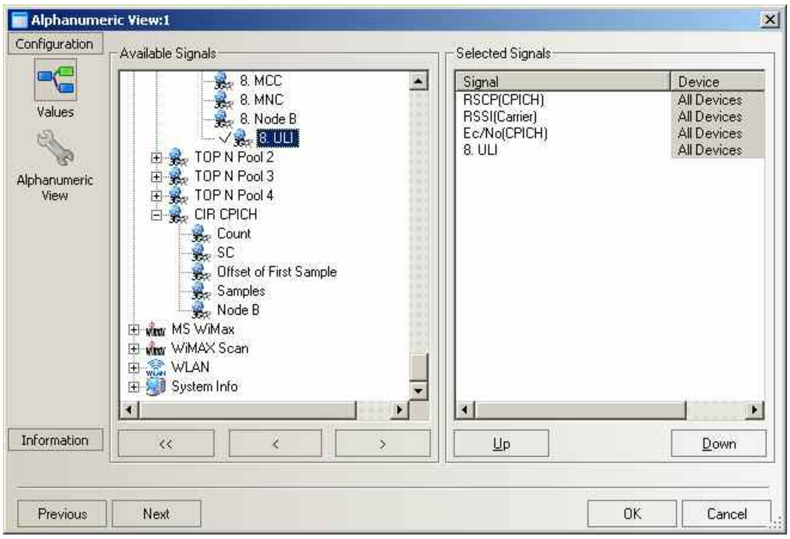


Fig. 4-5 Alphanumeric View: Configuration

The *Values* tab is analogous to the *Values* tab of the *2D Chart View* configuration menu, see figure on p 4.15. The devices for many signals are also indicated in the *Selected Signals* list.

The *Alphanumeric View* tab defines the colors for the text and the background. A colored background or text makes it easier to distinguish when a signal value changes. The color is set under *Tools – Modules Configuration...- Basic Views – Alphanumeric View – Alphanumeric View (*refer to chapter 3 *Signal Configuration).*

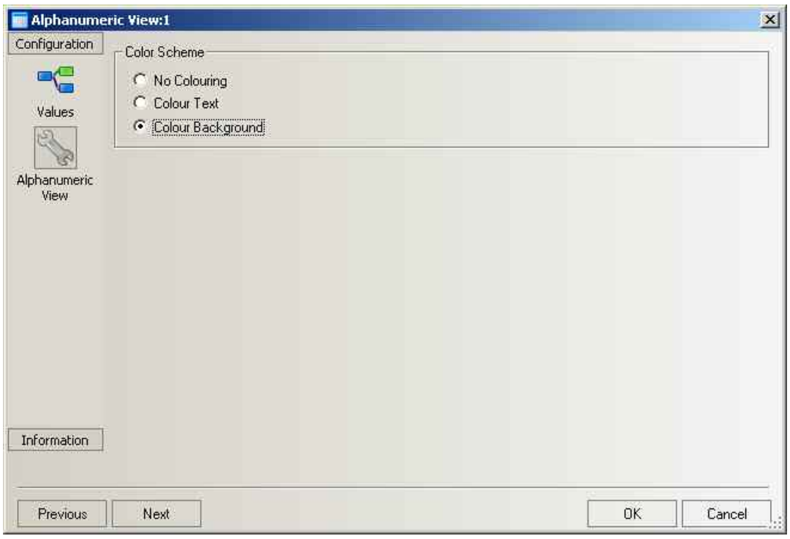


Fig. 4-6 Alphanumeric View: Configuration

2D Chart View

A *2D Chart View* contains a Cartesian diagram showing one or several signals as a function of time or covered distance. If a signal for which no data is available is selected (e.g. RxQual while the mobile is in *Scan(ning)* mode), no trace is plotted. As an alternative to superimposing many quantities in the same diagram, R&S ROMES allows to open several independent diagrams simultaneously.

To complement the *2D Chart View*, the Statistic Histogram View on p. 4.19 provides a statistical evaluation of a signal.

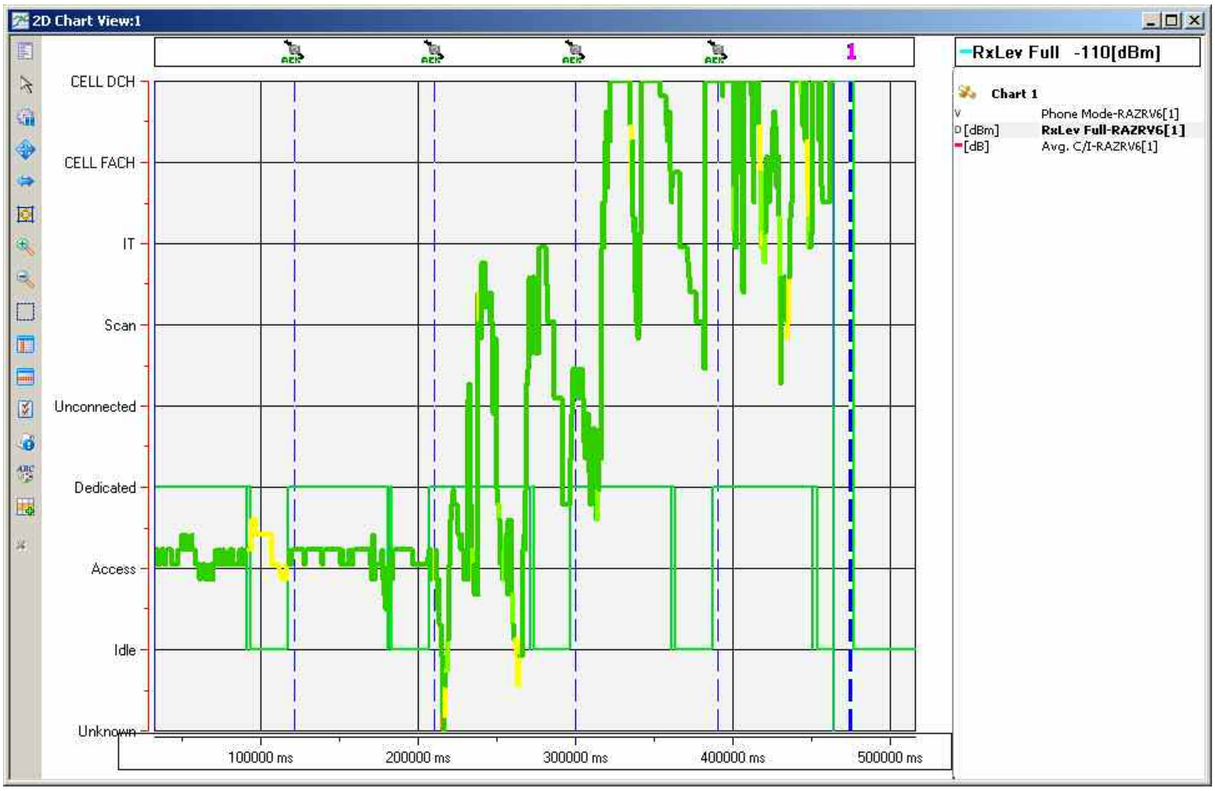


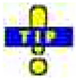
Fig. 4-7 2D Chart View

Diagram

The diagram may contain a selected curve (the signal, the mobile type, and the current value is shown in the legend to the right of the diagram) plus a practically unlimited number of secondary curves. The curves are step functions with different line colors; the selected curve is distinguished by its line width. In addition to the curves, events (represented by the icons shown in the Available Events tab of the R&S ROMES configuration menu, see chapter 3) can be displayed.

The time information stored in the measurement file provides the x-axis scaling. If the measurement data is recorded with a trigger device (see section *Test Receiver Drivers* in chapter 6), it is possible to select the distance driven between the individual data points as x-axis scale. This is done in the *Chart Configuration* tab of the configuration menu, see figure on page 4.16.

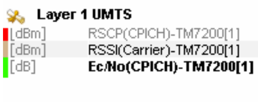
The y-axis is scaled by the value range of the selected curve (many signals provide a "natural" scale, e.g. the RxLev step scale of a GSM mobile is between 0 and 63). To display the scale of a secondary curve, this curve can be selected in the legend.



To change the y-axis scale manually, you can use the tools across the left diagram edge. Alternatively, open the *Available Signals* tab in the *Preferences* menu *(Tools – Preferences* or *Configure Signals…* in the context menu) and adjust the expected minimum and maximum value *(Exp. Min, Exp. Max)* of the signal. Manual scaling is particularly useful if the actual value range of a signal (or its range of interest) is considerably smaller than its "natural" scale (e.g. if only small signal levels are measured).

The curves are plotted from the left to the right at the pace of the measurement or replay. If the end of the display range is reached while the measurement or replay is still going on, the whole diagram is shifted to the left so the curves can be continued. This may occur repeatedly until the end of the measurement file is reached.

Legend



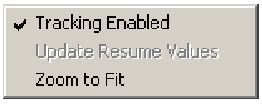
Each chart gets its own legend on the right hand side. The legend has the name “Chart n” by default. You can change this name by a double click on it, change the name and click into the legend outside the edit box.

The legend displays the color of the signal on the left side, followed of the current value of each the signal. Behind the value, the name of the signal is displayed.

The signals position in the legend can be changed by drag & drop.

The legend can be hidden/shown with the corresponding button on the button bar. The width of the legend can be changed by moving the slider between the legend and the chart area.

Context menus for the axes



The context menus of the axes (opened upon a right-click) provide additional scaling options for the diagram:

- *Tracking* means that the axes are dynamically scaled so that the current measurement results fit into the diagram. See also *Signal Tracking* on p. 4.17.
- *Zoom to Fit* adjusts the scale of the axes so that the entire measurement curve fits into the diagram.

Signals

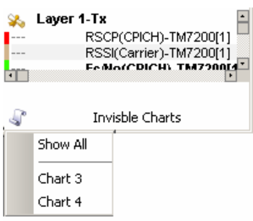
To add signals to a certain chart, just drop the signal into the desired chart area. The signal can be taken from the ROMES Signal tree, or from the legend of another chart.

Signals which are selected on the Configuration Page will go to the upper chart, always.

Events and Title

The two fields above the diagram and the legend show the displayed events and the signal and current value of the selected curve, respectively.

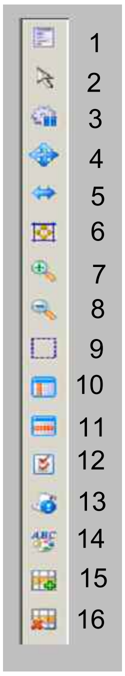
Hide/Show Charts



By clicking the icon on the left of the charts title, the chart will be hidden.

If one chart is hidden, on the right bottom, a button appears which allows enabling the charts again. Press the button and select the desired chart or a “Show All” in the displayed menu.

Button Bar



The Button bar to the left of the diagram provides scaling tools for the diagram, displays or hides the marker line, opens the configuration menu, displays or hides the headings and the legend and adds or removes a Chart Group.

1 Context Menu

2 Select Tool

3 Hold/Release X-Axis

4 Axis Scroll Mode

5 Axis Zoom Mode

6 Reset Y-Axis

7 Zoom In

8 Zoom Out

9 Zoom to a rect

10 Show/Hide Marker

11 Limit Lines

12 Open Configuration

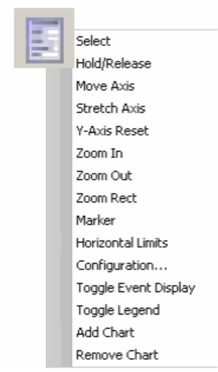
13 Toggle Events

14 Toggle Legend

15 Add Chart Group

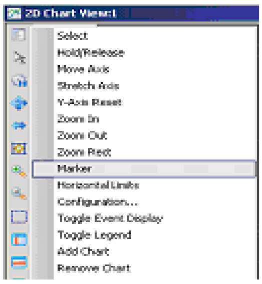
16 Remove Chart Group

Context Menu



The symbol on top of the Button bar opens a context menu with a short description of each icon.

Marker



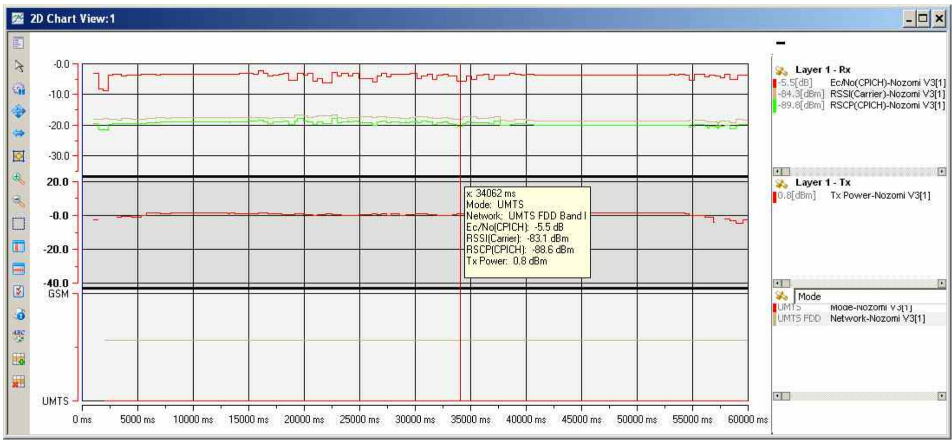
You can create a marker by selecting the *Context Menu* in the *Button Bar* and click "*Marker*", a marker line and an info field is displayed. The marker line and the info field can be shifted horizontally and vertically using a drag and drop mechanism.

With the button "Show/Hide Marker" it is possible to switch on and off the marker in the diagram.

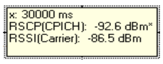
Marker-Coupled Focus

The Marker shows the value of all signals. The values of the marker are taken from the chart, and are interpolated between two measurement points. This may lead to slightly different values as are shown in other views during the Coupled Focus Mode.

However, during Coupled Focus Mode, the values of all signals are shown in the legend on the right hand side. The former “Current Value” on the right top of the view reflects now the active value of the active chart.



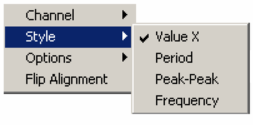
Info Field



In the default configuration the info field shows the plotted signal of the selected curve, the marker position, and the signal value. The contents and position of the info field can be changed in the associated context menu (right-click):

Context Menu

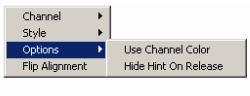
With right click on the marker you have following options:



Channel selects one of the displayed signals for the color of the curser and *Info Field.* This option is only active if *Use channel color* is selected under the topic *Options.* If you click again on any of the signals in the *Legend*, that one will be selected and also marked under Channel. Always the selected channel has an asterisk in the *Info Field*.

Style selects the marker style (single line for absolute marker values, two lines for ranges) and the displayed values (x, y, distances, and frequencies within an interval).

Value X	The tool tip window of the marker shows the current position on the X-Axis and the interpolated values of all signals.
Period	The tool tip window shows the position and the delta of the two lines of the marker. The interpolated values of all signals at both positions are displayed
Peak-Peak	The cursor changes into a horizontal position. Delta values for all signals are displayed.
Frequency	Same as X Delta Value, but the delta is given in Hz or 1/m.

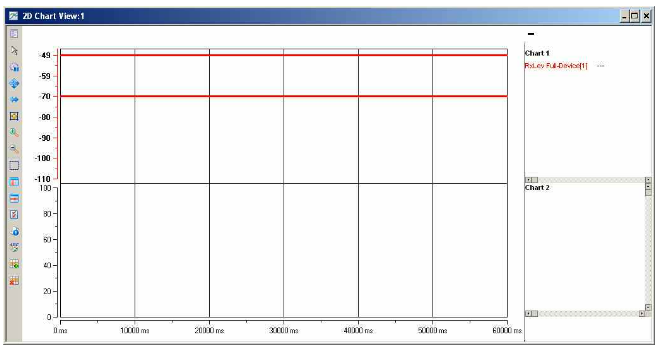


Options configure the display options (color, visibility only while the marker line is clicked).

Use Channel Color	The tool tip windows frame will be drawn with the selected signals colour.
Hide Hint on Release	Select this option to hide the tool tip window.
Flip Alignment	This option allows changing the position of the tool tip window.

Limits

Two horizontal lines may be displayed in the active chart on request. Press the Limit button on the left bar, and two red lines will appear in the active chart. The line can be moved while the chart in Select Mode.

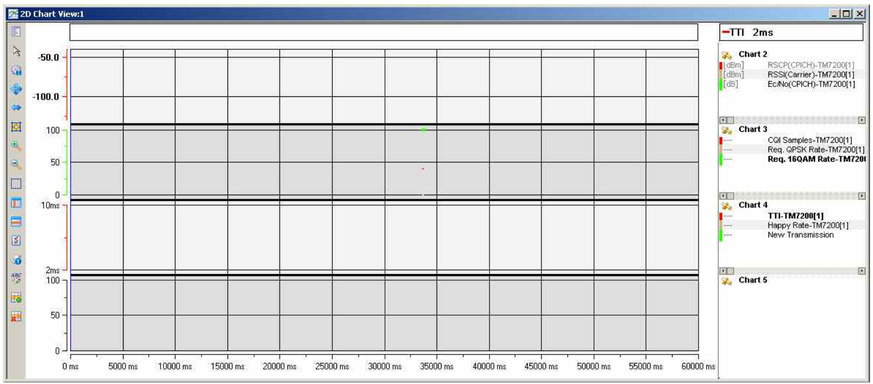


If the lines have disappeared, just press twice the button Limit and the lines will show up again in the active chart.

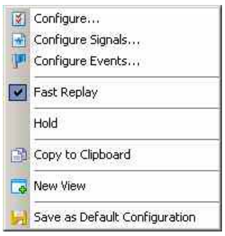
Add/Remove Charts

The 2D Chart allows stacking several charts vertically. Press the button “Add Chart” and a new chart will appear on the bottom. Up to 16 charts can be handled in one view. If more than one chart is configured, the active charts y-axe is drawn in bold letters. To change the active chart, just click into the chart you want to activate.

The positions of chart can be exchanged by drag & drop. Just take a chart and move it onto another one, and the two selected charts will exchange their positions.



Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration as default, move to another worksheet, or remove signals; see *Context menu* description on p. 4.2.

Phone Mode of a GSM or UMTS mobile in a 2D chart view

The *Phone Mode* signal shows the GSM RR (Radio Resource) modes and the UMTS RRC (Radio Resource Control) states of a mobile phone. It is convenient to view the phone mode in a 2D chart view, e.g. to monitor the periodic attempts to set up a connection while the test mobile operates in *Autodial* mode. The phone mode can be selected from the *GSM – <device> – Server Report* branch of the signal tree. The *CELL DCH* RRC state corresponds to the GSM *Dedicated* state.

In addition, a multi-RAB feature was introduced to allow the use of the mobile autodialer and DQA simultaneously (as long as this is supported by the mobile port configuration).

The phone mode is also displayed in the *UMTS/GSM NQA State View* described on p. 4.318.

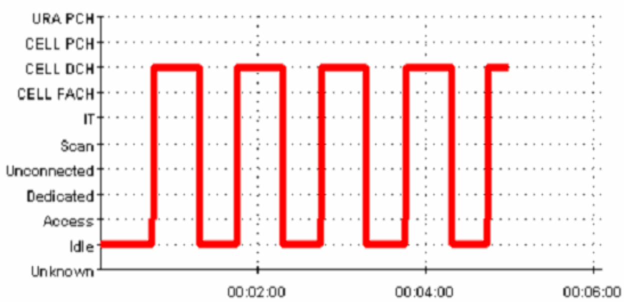


Fig. 4-8 UMTS phone mode during autodial

2D Chart View Configuration: Values Tab

The *2D Chart View* configuration menu defines the signals to be viewed and shows information on the current view version. It is opened via a right mouse click on a point inside *2D Chart View* or via the *Tools – Preferences* command (see chapter 3).

The *Values* tab selects the signals to be displayed.

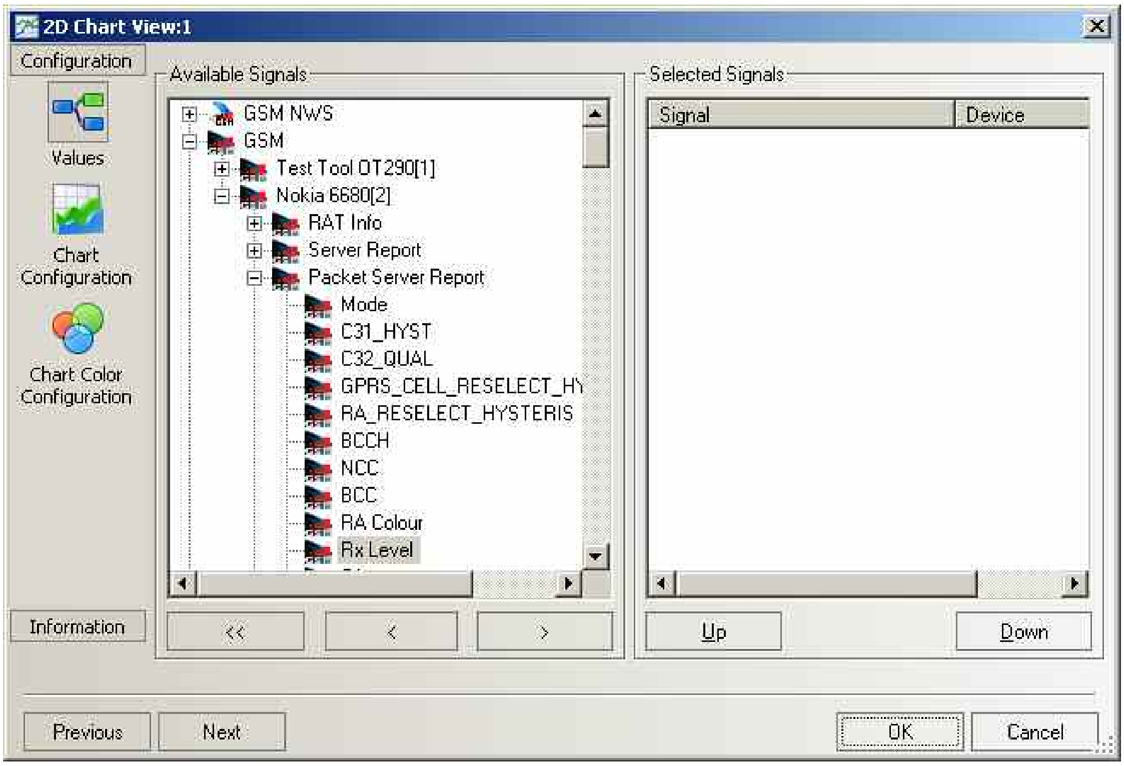


Fig. 4-9 2D Chart View: Parameter selection

Available Signals Data tree (see chapter 1) showing all available signals (hierarchy level 4 of the data tree).

➢ To select a single signal for display, left-click this signal (which will be high-lighted in inverse video) and click the > button. Alternatively, double-click the signal.

➢ Select a parent node of higher hierarchy level (level 1, 2, or 3) and click > if you wish to select all signals below the node.

Selected Signals List of all signals selected for display.

➢ To remove a single signal from the list, left-click this signal (which will be high-lighted in inverse video) and click the < button. Alternatively, double-click the signal or use the *Remove Signal* command in the view context menu.

➢ To remove all signals at once, click the << button.

The order of the list can be changed using the two buttons below. This order is relevant especially if the list contains more signals than can be displayed in the 2D Chart View, see *2D Chart View* tab below.

2D Chart View Configuration: Chart Configuration Tab

The *Chart Configuration* tab scales the axes of the chart and defines its contents and its appearance.

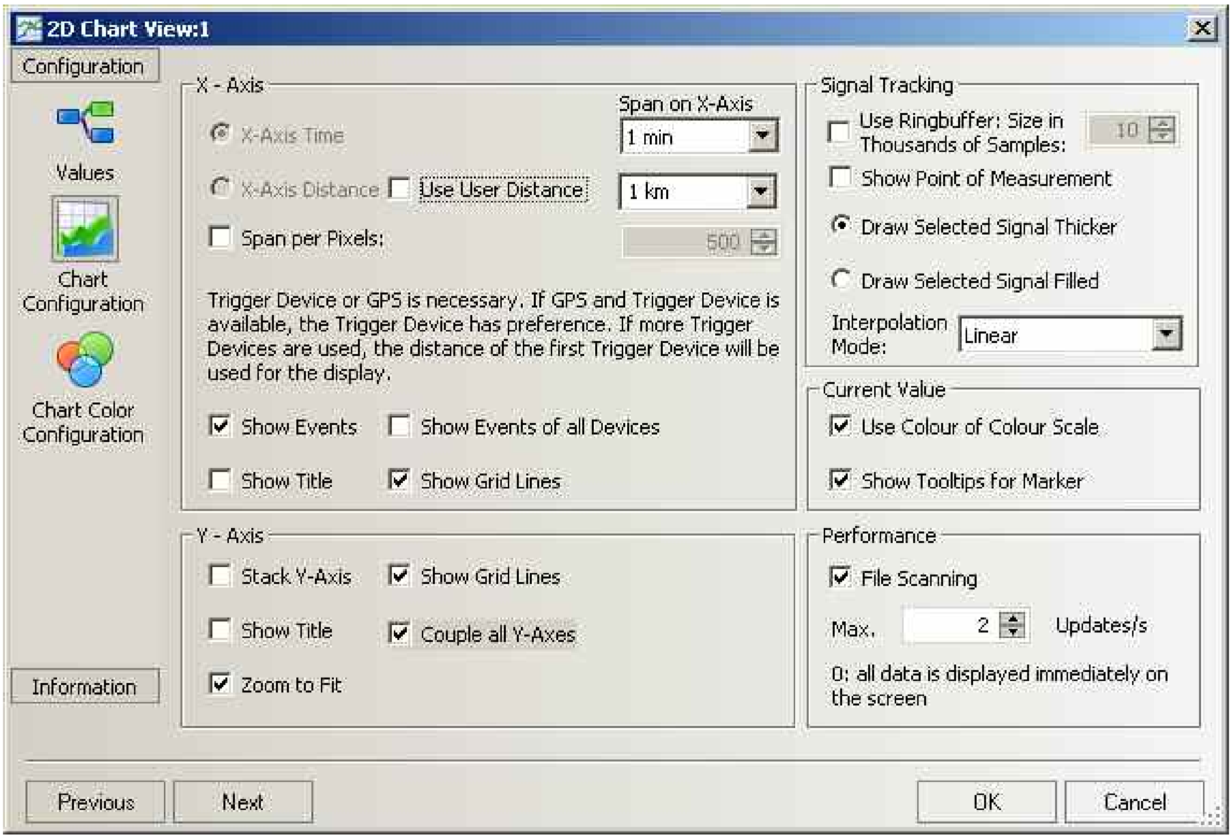


Fig. 4-10 2D Chart View: Chart Configuration

X-Axis: Time/Distance/ Pixels

The *X-Axis* panel contains two alternative option buttons to scale the x-axis by the time or distance information stored with the measurement data. Distance information is available only if the measurement data is recorded with a trigger device (see section *Test Receiver Drivers* in chapter 6). If *X-Axis Distance* is selected but no trigger is available, R&S ROMES will not generate the *2D Chart View* but display the message:

As soon as the measurement or replay is started.

The *User Distance* is a generalized distance signal with a finite number of marker points where the distance values may jump and/or change their direction. Unlike the real distance the *User Distance* is a composite signal that globally does not have to be continuous and monotonically increasing or decreasing. For test receivers, user distance signals can be generated using the options in the driver configuration menus (see chapter 6).

The time interval or distance corresponding to the full x-axis scale of the *2D Chart View* can be selected from the two pull-down lists *Span on X-Axis* located in the right half of the *X-Axis* panel.

Span per Pixels sets the diagram width to a fixed number of pixels.

Event and title display

- *Show Events* and *Show Events of all Devices* display or hide the events above the diagram (equivalent to the *Toggle Events* icon in the toolbar).
- *Show Title* shows or hides the x-axis title (only visible if the view is high enough).

Y-Axis

- *Stack Y-Axis* displays the y-axis scales for all selected signals. This setting is effective only if more than one signal is selected.
- *Show Title* shows or hides the y-axis title (only visible if the view is high enough).
- *Show Grid Lines* will show or hide the horizontal lines in the diagram.
- *Couple all Y-Axes* can be used to synchronize the scrolling of stacked y-axes. This means that if one y-axis is scrolled, the other y-axes move in a similar way through their range of values. The movements are relative to the defined signal range. That means that if one signal has a range from 0 to 100 and a second one from 0 to 10, a scrolling action on the first signal to display 10 to 110 would lead to a range of 1 to 11 on the second signal. The same applies to zoom activities on one y-axis when the *Couple all Y-Axes* option is active. The zoom also calculates the relative change on the zoomed axis and applies this to all other visible y-axes.
- *Zoom to Fit* the view is zoomed in and out and centred so it fit the 2D Chart. By default it is activated

Signal Tracking

The *Signal Tracking* settings modify the display of the measurement curve:

- The *Ring Buffer* can be used to limit the number of samples to be displayed in the view. The ring buffer size defines a moving window with a definite number of values. Clear the check box to display the entire set of measurement data.
- *Show Point of Measurement* displays a dot at the position of each measurement point on the curve.
- *Draw Selected Signal Thicker* increases the line width of the selected curve.
- *Draw Selected Signal Filled* fills the area below the selected curve with the color of the curve.

The *Interpolation Mode* for the selected signal can be specified using the list box with supported interpolation modes. Possible modes are *Line(default)*, *Cubic Spline*, *Differential*, and *Differential Terminated* .

Current Value

- *Use Colour of Color Scale* If the check box is on, the current value of the selected curve above the diagram is displayed with the colors of the color scale. If the check box is cleared the current value is black.
- *Show Tooltips of Marker* If the check box is on, tool tips appear when hovering over the markers.

Performance

Limits the maximum update rate of the view results. An update rate of 0 means that every new result causes an immediate update of the view (not recommended for performance reasons).

OK

Apply all *2D Chart View* settings and close the configuration menu.

Cancel

Discard all *2D Chart View* settings and close the configuration menu.

2D Chart View Configuration: Chart Color Configuration Tab

The *Chart Color Configuration* tab defines the color of the signals. It is possible to change the color of the signal in subject to the own signal-values or the signal-values of a selectable dependency-signal.

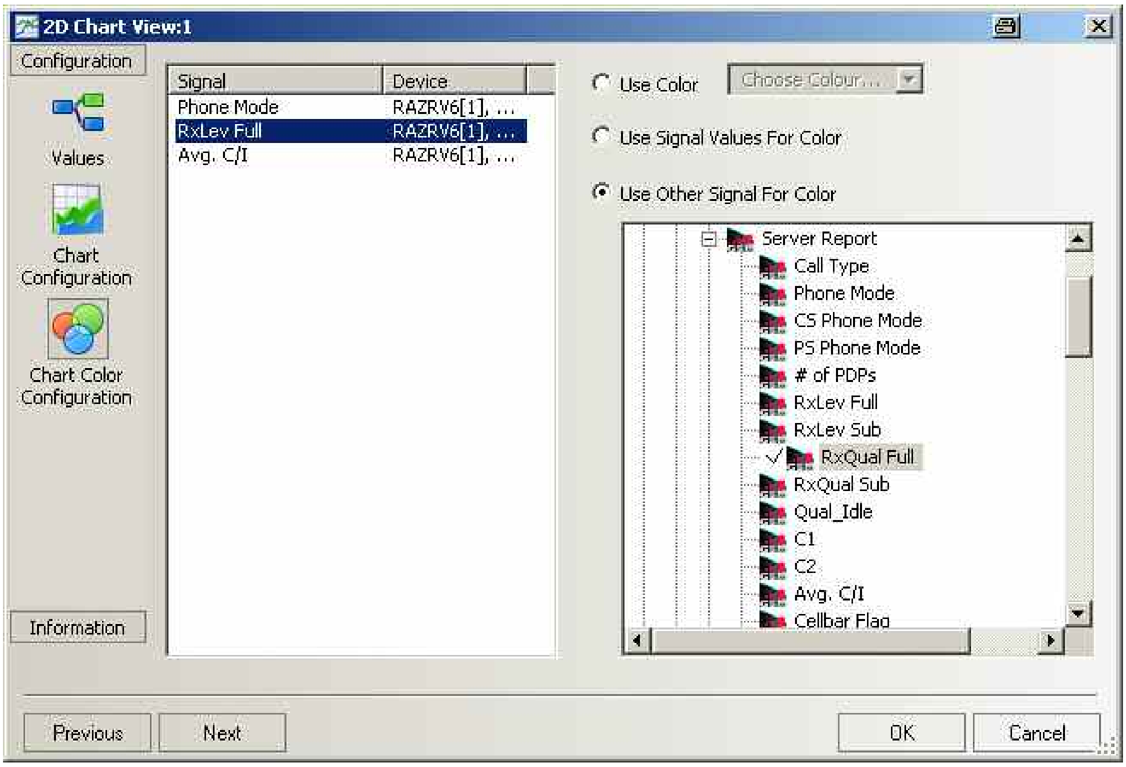


Fig. 4-11 Chart View: Chart Color Configuration

Use Color

This is the default color mode.
The colors of up to 699 signal curves can be defined in the *Colors* menu opens by clicking the Choose Colour field. The *Automatic* button resets the color to default value.

Use Signal Values For Color

In this color-mode the graph which present the signal, change its color in dependency of the current signal-value.

Note:
This color mode works only when the interpolation mode "Linear" is active. The interpolation mode is selected in tab Chart Configuration.

Use Other Signal For Color

Select a dependency-signal in the dedicated signal-tree. The graph-color depends on the current signal-value of the selected dependency-signal.

Note:
This color mode works only when the interpolation mode "Linear" is active. The interpolation mode is selected in tab Chart Configuration.

Statistic Histogram View

A *Statistic Histogram View* provides several diagrams to show a statistical evaluation of a signal. If an invalid signal is selected (e.g. RxQual while the mobile is in *Scan(ning)* mode), the diagrams remain empty. R&S ROMES allows to open several independent *Statistic Histogram Views* simultaneously.

The *Statistic Histogram View* is a complement to the *2D Chart View* (see p. 4.9*)* where the actual values of different signals are displayed.

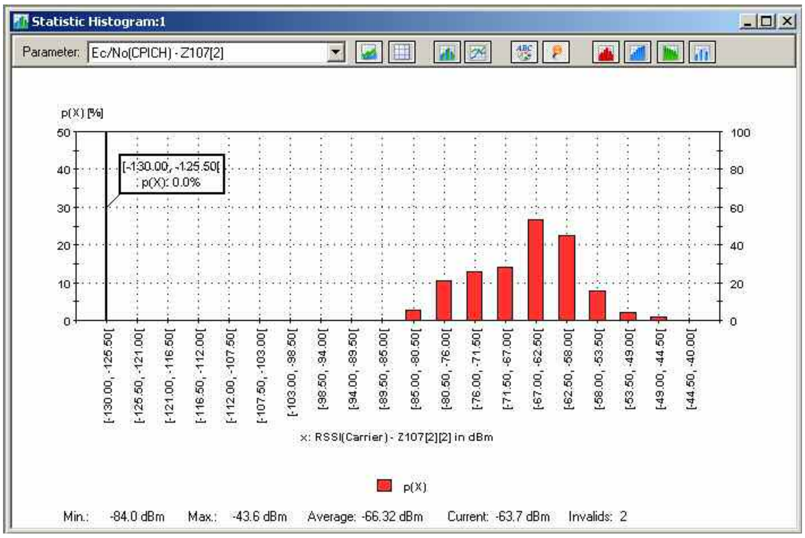
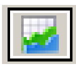


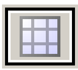
Fig. 4-12 Statistic Histogram View

Diagram / Table

The diagram or table shows the distribution of the signal values. The available signals appear in the *Parameter* pull-down list after they have been selected in the configuration menu. The two icons to the right of the *Parameter* list choose between a diagram or a table:



The values are displayed in a diagram

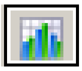


The values are displayed in a table. The following table corresponds to the bars in the figure above:

	Z107[2]	
RSSI(Carrier) in dBm	%	#
[-130.00, -125.50[	0.0%	0
[-125.50, -121.00[	0.0%	0
[-121.00, -116.50[	0.0%	0
[-116.50, -112.00[	0.0%	0
[-112.00, -107.50[	0.0%	0
[-107.50, -103.00[	0.0%	0
[-103.00, -98.50[	0.0%	0
[-98.50, -94.00[	0.0%	0
[-94.00, -89.50[	0.0%	0
[-89.50, -85.00[	0.0%	0
[-85.00, -80.50[	2.9%	141
[-80.50, -76.00[	11.0%	543
[-76.00, -71.50[	13.8%	678
[-71.50, -67.00[	14.1%	695
[-67.00, -62.50[	24.9%	1225
[-62.50, -58.00[	23.4%	1151
[-58.00, -53.50[	7.3%	358
[-53.50, -49.00[	1.8%	89
[-49.00, -44.50[	0.8%	37
[-44.50, -40.00[	0.0%	2

Diagram types

The remaining icons are enabled only if a diagram is selected. The next two icons select the diagram types:



The values are displayed in a bar chart

The values are displayed in a 2D-chart with a continuous (polygonal) curve

Legend and marker

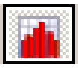
The next two icons show or hide the legend and marker:

Displays or hides the legend on the right side of the diagram

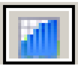
Displays or hides the marker line and an info field. The info field shows the x-axis variable and the value of the relative and accumulated bars/curves (if activated) at the marker line. The marker line can be shifted to the left and to the right by means of the corresponding cursor keys. Besides a double click places the marker to the desired position.

Accumulated bars

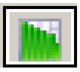
The following icons display or hide the bars or curves for the relative or accumulated frequency of each value. Several types of bars/curves may be active at the same time:



Displays the relative frequency of all values in percent (p(X) in the figure above:).

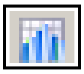


Displays the accumulated frequency in ascending order, i.e. the sum of the frequencies of all signal values below the current value (P(X<x) in the figure above:).



Displays the accumulated frequency in descending order, i.e. the sum of the frequencies of all signal values above and including the current value (P(X>=x) in the figure above:). The first bar/first value of the curve always starts at 100%. The sum of the accumulated frequencies equals to 100% for all signal values:

$$P(X<x) + P(X>=x) = 100\% \quad \text{for all } X$$



Shows or hides the device name in the legend and the marker.

The colors of the bars or curves and the scale of the y-axis are set in the *Settings* tab of the configuration menu.

Scaling

The x-axis is scaled by the expected value range of the analyzed signal. The expected range is set automatically for each signal but can be changed in the *Available Signals* tab of the *Preferences* menu (opened via *Tools – Preferences*; see chapter 3). In this tab, *Exp. Min.,* and *Exp. Max.* define the first and last value of the x-axis.

The intermediate x-axis values depend on the nature of the analyzed signal:

Many signals are defined on a step scale with a fixed number of discrete values, e.g. the RxLev of a GSM mobile is an integer number between 0 and 63. For those signals, *Step* is displayed in the legend below the diagram; the x-axis is labeled by all values between the minimum and the maximum expected value. Each step represents a class for the statistical evaluation, i.e. it is represented by a single bar or point on the view curve.

For continuous signals, classes are defined by dividing the expected value range by an integer number *(Number of Classes)* set in the *Settings* tab of the configuration menu. The classes are thus intervals of equal width; the center values of each interval labels the x-axis.

Legends

The diagram displays two types of legends:

On the right side, the types of bars/curves are indicated together with their colors.

Across the bottom of the diagram, the statistical parameters of the current signal are displayed: Minimum and maximum value ever measured or replayed *(Min. / Max.),* arithmetic means value of all values ever measured *(Average); Current* value, and number of invalid values in the signal *(Invalid)*. The invalid values are excluded from the diagram; the sum of all individual frequencies p(X) always amounts to 100%.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, move to another worksheet, or remove signals; see *Context menu* description on p. 4.2.

Statistic Histogram View Configuration

The *Statistic Histogram View* configuration menu defines the signals to be viewed, configures the diagram and shows information on the current view version. It is opened via a right mouse click on a point inside *Statistic Histogram View* or via the *Tools – Modules Configuration...* command (see chapter 3).

The *Values* tab selects the signals to be displayed. The figure below shows the signals provided by a GSM mobile phone. For an explanation of the signals refer to section *GSM Abbreviations* in chapter 8.

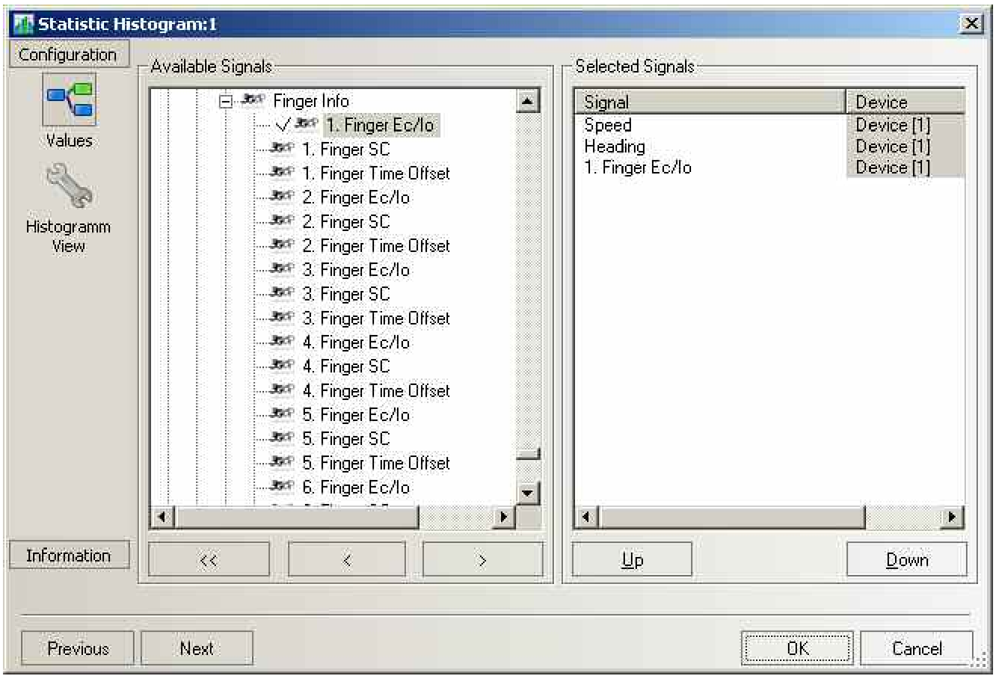


Fig. 4-13 Statistic Histogram View: parameter selection

The *Values* tab is analogous to the *Values* tab of the 2D Chart View configuration menu, see figure on page 4.15.

Available Signals Data tree showing all available signals (hierarchy level 4 of the data tree).

- To select a single signal for display, left-click this signal (which will be highlighted in inverse video) and click the > button. Alternatively, double-click the signal.
- Select a parent node of higher hierarchy level (level 1, 2, or 3) and click > if you wish to select all signals below the node.

Selected Signals List of all signals selected for display.

- To remove a single signal from the list, left-click this signal (which will be highlighted in inverse video) and click the < button. Alternatively, double-click the signal or use the *Remove Signal* command in the view context menu.
- To remove all signals at once, click the << button.

The order of the list can be changed using the two buttons *Up* and *Down*. This order is relevant especially if the list contains more signals than can be displayed in the *Static Histogram View*.

The *Histogram View* tab defines how many classes are created to evaluate a continuous signal and selects the bar types/curves to be displayed, the display colors and the y-axis scale.

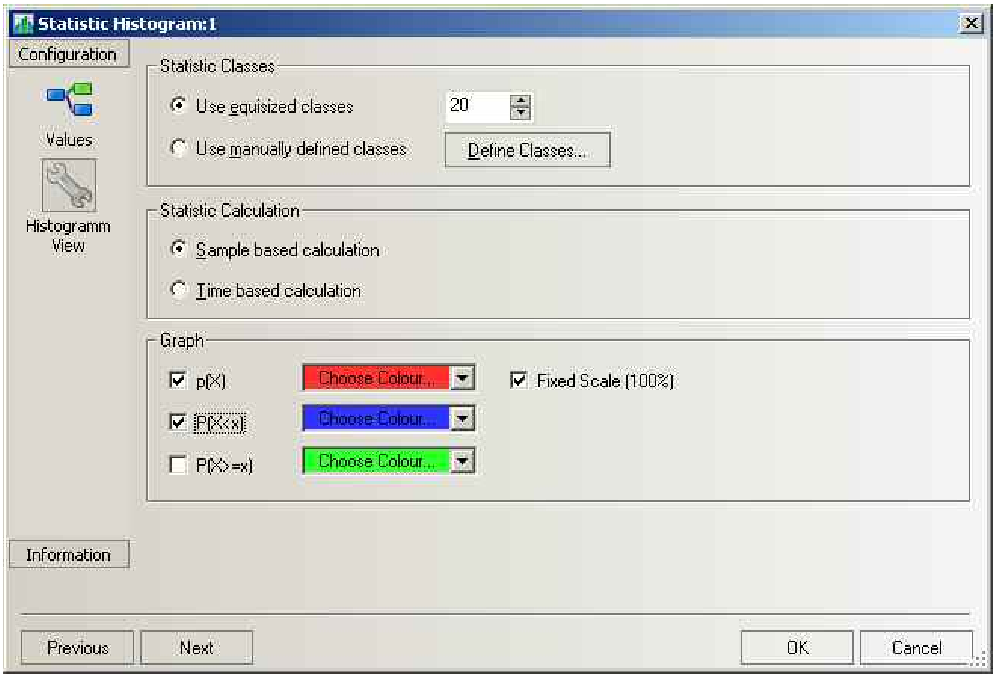
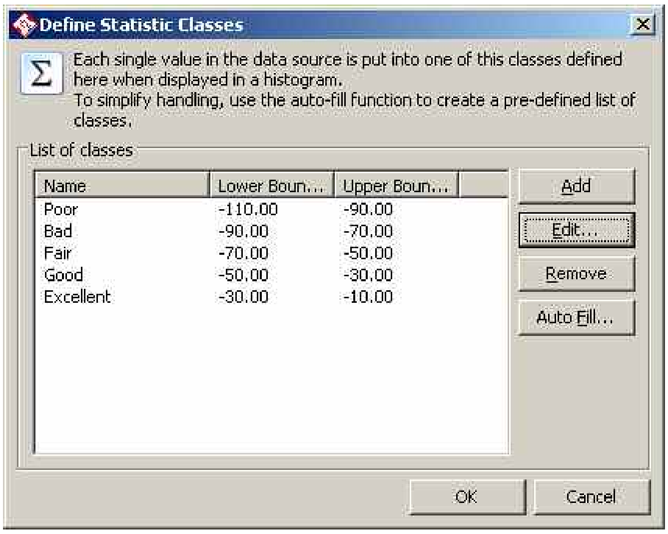


Fig. 4-14 Statistic Histogram View: Configuration

Statistic Classes

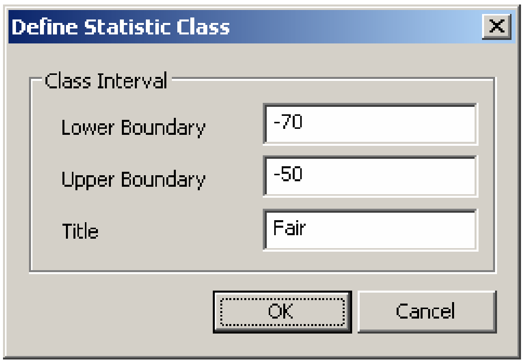
If *Use equisized classes* is checked, a number of 2 to 256 classes for the statistical evaluation of a continuous signal can be selected. The classes are obtained by dividing the expected total value range of the signal by the entered *Number of Classes;* they correspond to intervals of the signal value of equal width. The intervals label the x-axis.

Use manually defined classes allows the definition of a number of classes that have different sizes, which are configured using the *Define Classes* button:

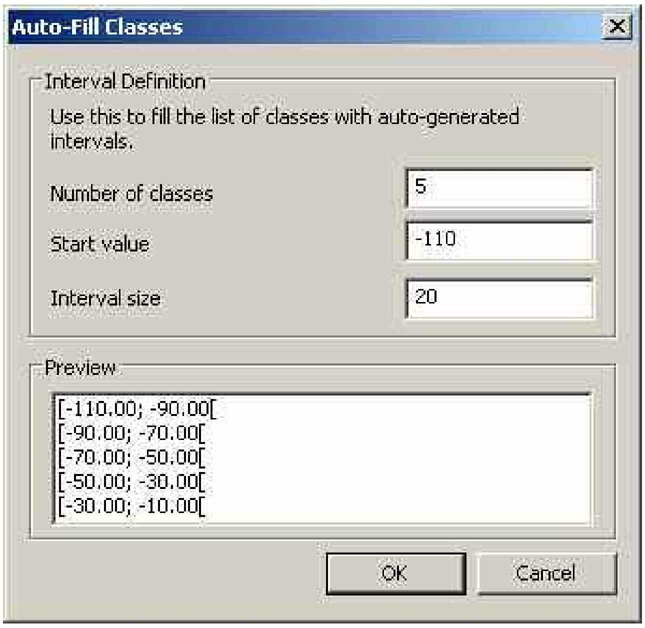


Each histogram class has a lower and an upper boundary, where the lower boundary is inclusive, the upper one exclusive. A title that is displayed on the histogram x axis can be defined optionally.

The classes can be created, modified and deleted using the *Add, Edit*, and *Remove* buttons on the right side of the class table. The *Add* and *Edit* dialogs are identical:



To simplify the process of manual definition of the individual classes, the dialog provides an Auto-Fill function. When the button is pressed, a new dialog is opened:



Here a whole set of (equally-sized) class can be created by specifying the number of classes, the first lower boundary and the interval size. The i-th class has then a range from

`StartValue + i*InterValSize`

up to

`StartValue + (i+1)*InterValSize`, excluded.

The generated classes can then be modified to suit the measurement purpose.

Statistic Calculation

The height of the bars can be calculated in two alternative ways:

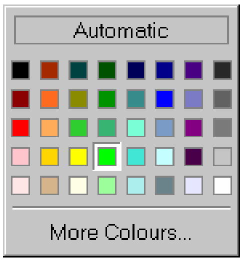
If *Sample based calculation* is selected the height of each bar is proportional to the number of samples in the class.

If *Time based calculation* is selected the height of each bar is proportional to the amount of time that the signal values fall inside the class.

The *Number of Classes* is ignored for step parameters.

Graph

Selects the bar types/curves to be displayed, the display colors and the y-axis scale. The three checkboxes *p(X), P(X<x) and P(X>=x)* show (if checked) or hide the bar graphs or curves for the relative frequency of the values per class and the accumulated frequencies; they are equivalent to the corresponding icons in the *Statistic Histogram View* (see above). The *Choose Color* pull-down lists select the display color for each bar graph or curve:



The *More Colors* button calls up the *Colors* menu described on p. 4.392.

The *Fixed Scale* checkbox fixes (if checked) the y-axis scale of the diagram to the range between 0% and 100%, irrespective of the range of displayed values. Otherwise the p(X) scale is adapted to the largest displayed value. The value range and thus the scale for the accumulated frequencies P(X<x) and P(X>=x) is always fixed to the range between 0% and 100%.

OK

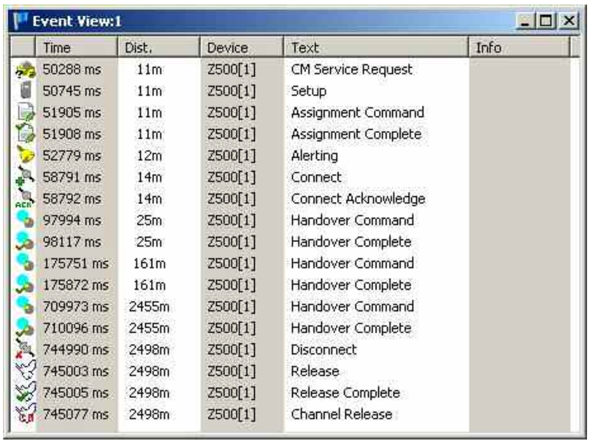
Apply all *Statistic Histogram View* settings and close the configuration menu.

Cancel

Discard all *Statistic Histogram View* settings and close the configuration menu.

Event View

The *Event View* displays a chronological record of all events that occurred during the measurement. What represents an event is defined in the *Available Events* tab of the *Preferences* menu, see chapter 3.



Time	Dist.	Device	Text	Info
50288 ms	11m	Z500[1]	CM Service Request	
50745 ms	11m	Z500[1]	Setup	
51905 ms	11m	Z500[1]	Assignment Command	
51908 ms	11m	Z500[1]	Assignment Complete	
52779 ms	12m	Z500[1]	Alerting	
58791 ms	14m	Z500[1]	Connect	
58792 ms	14m	Z500[1]	Connect Acknowledge	
97994 ms	25m	Z500[1]	Handover Command	
98117 ms	25m	Z500[1]	Handover Complete	
175751 ms	161m	Z500[1]	Handover Command	
175872 ms	161m	Z500[1]	Handover Complete	
709973 ms	2455m	Z500[1]	Handover Command	
710096 ms	2455m	Z500[1]	Handover Complete	
744990 ms	2498m	Z500[1]	Disconnect	
745003 ms	2498m	Z500[1]	Release	
745005 ms	2498m	Z500[1]	Release Complete	
745077 ms	2498m	Z500[1]	Channel Release	

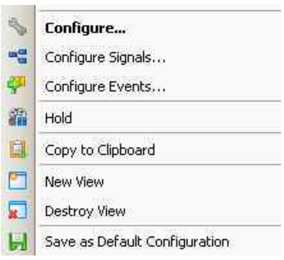
Fig. 4-15 Event View

View table

The events are displayed in tabular form:

Event symbol	Graphical symbol for the event, also used in the *Available Events* tab to configure event selection.
Time	Time of the event, the scale is relative to the start time of the measurement.
Distance	The traveled distance between the shown events.
Device	Device (mobile phone type, fax terminal, test receiver etc.) that triggered the event.
Text	Event type
Info	Additional event information, e.g. the entered event comment.

Context menu



A right mouse click on any point in the view opens the context menu to access the *Configure Events* dialog (see chapter 3), put the view on hold, copy the current view to the clipboard, create or delete views, or move to another view area; see *Context menu* description on p. 4.2.

Event View Configuration

The *Event View* configuration menu defines the device events to be viewed, and shows information on the current view version. It is opened via a right mouse click on a point inside *Event View* or via the *Tools – Modules Configuration...* command (see chapter 3).

The *Event View Configuration* tab selects the devices of which the events are displayed.

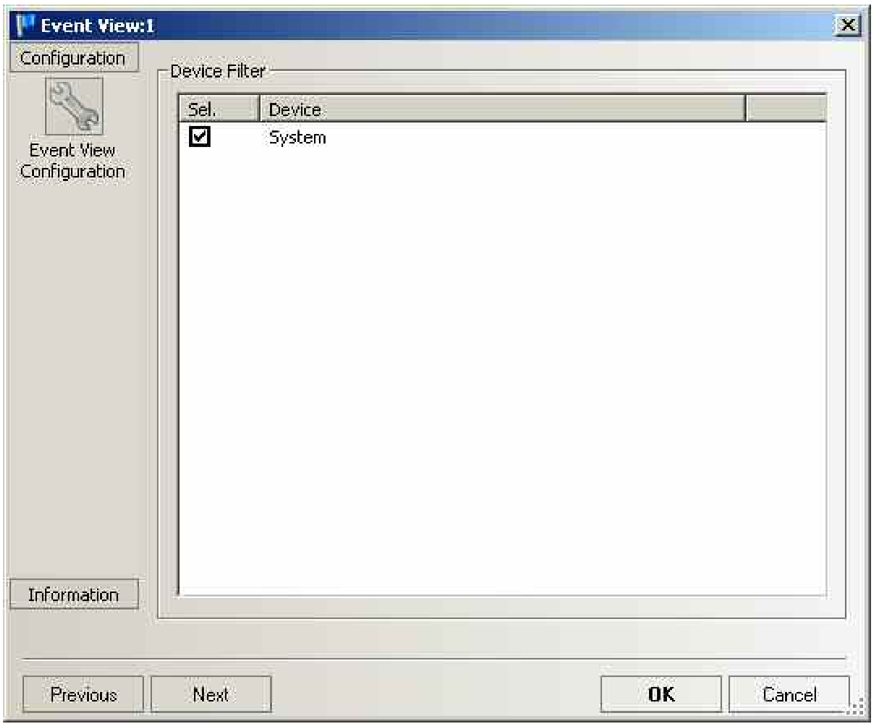


Fig. 4-16 Event View: Device Filter selection

The *Info* tab can be accessed via the *Tools – Modules Configuration...* command.

Message View

The *Message View* displays a detailed chronological record of the system messages generated during the measurement.

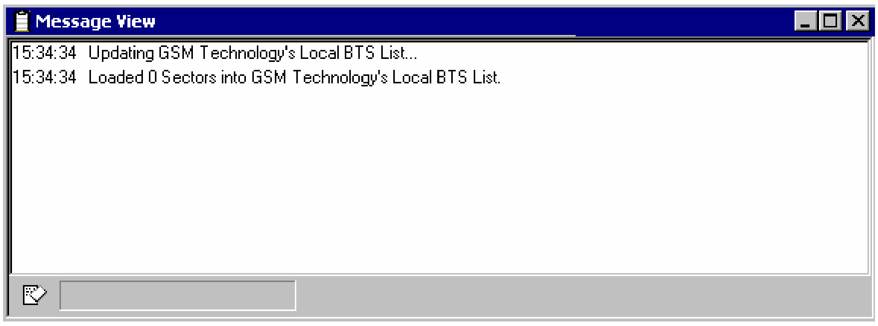
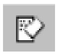


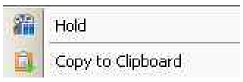
Fig. 4-17 Message View

View contents The messages are displayed in consecutive lines together with the time when they were recorded. In general all messages are self-explanatory.



Clicking the icon in the lower left corner of the view deletes all messages in the view and clears a space for new messages.

Context menu A right mouse click on any point in the view opens the context menu to put the view on hold, or to copy the current view to the clipboard, see *Context menu* description on p. 4.2.



The *Message View* has no configuration menu. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

C:\RuS\ROMES\D1026T17.58 created

A new Transmitter Scan file with the given name was created.

BTS appended

A BTS was appended successfully to the database. This message occurs only when the BTS was appended via the BTS edit function.

BTS deleted

Indicates that a BTS was deleted successfully from the database.

BTS time offset evaluation started

Starts the update of the database.

COX export finished

The GSM NWS measurement data export to a *.cox file is completed successfully.

Database updated

This message shows the update of the database, which usually occurs every two minutes.

Frequency correction started

In regular time intervals, the system performs a frequency correction to the R&S ESVD. Especially, if the R&S ESVD was cold at the beginning of the measurement, this correction is very important and can take larger values.

Frequency correction = ... Hz

The result of this frequency correction.

Frequency correction stopped

The frequency correction is calculated with help of at least 4 sectors. If less than 4 sectors are available, the frequency correction could not be performed and this message appears.

Just ... MB memory left

In order to be able to run the software there must be at least 80 MByte of free disk space available. If this message occurs, check your free disk space and verify that the disk is not fragmented.

Sector skipped: (Reason)

After reading a sector from the base station text file, the program checks, whether all entries have consistent values. E.g. if there is a sector in the GSM band with channel 1283, the sector is not taken into the database.

Skip sector

During reading a base station text file, a sector did not have all mandatory entries. The corresponding sector is skipped and the program continues with reading the next sector.

Start COX export of file ...

The GSM Network Scanner measurement data is capable to export the measurement data to a GSM NWS *.cox export file. Detailed export-related messages are available in the Message View, which show more details than the usual log files.

System nonlinear to network

One or more BTS have a drift beyond the allowed range. In this case, a new Transmitter Scan file is created.

Transmitter Scan Overlap: m Sectors, n Identified Sectors

When a new Transmitter Scan file is opened, m recently measured BTS are also taken in the new file in order to avoid a loss of overlap. On n of these sectors the CI could be identified.

TS File ... added to database

Every Transmitter Scan file which is manually added to the database is shown.

General Status View

The *General Status View* displays text messages of general interest, e.g. application events reported during the measurement. NQA messages can be displayed in the *General Status View* if the *NQA monitoring active* option in the *NQA* tab of the GSM driver configuration menu is enabled (see chapter 6).

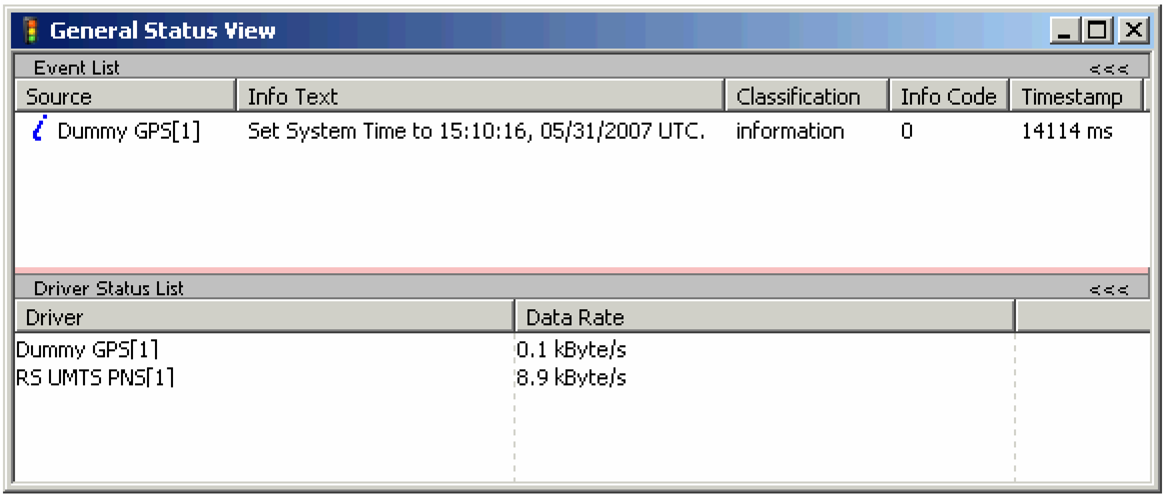


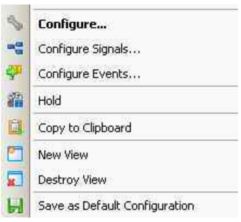
Fig. 4-18 General Status View

During all measurements, the amount of generated data per driver is logged. Every ten seconds the average amount of data is calculated and stored to the measurement file. These numbers are displayed in the *Driver Status List* of the *General Status View*. The view is divided in two parts. The upper part is the former view, and the lower part now shows the amount of produced data per driver. If a driver does not produce any data, the corresponding line is marked red. However, this is just an indication for a possible problem (e.g. the Indoor driver will not generate data, unless you reach a new waypoint).

Note:

Events will show in the General Status window during recording and replay only, not during the measurement. If the measurement runs without problems, no messages might appear for an extended period.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, to put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default ; see *Context menu* description on p. 4.2.

General Status View Configuration

The *General Status View* configuration activates the remote display and shows information on the current view version. It is opened via a right mouse click on a point inside the *General Status* or via the *Tools - Modules Configuration...* command (see chapter 3).

The remote display R&S TS95-RD makes it easier to monitor the process of data recording. It is simply connected to the measurement system via a printer connector. During the measurement tour, the LEDs of the remote display inform the driver whether the measurement yields valid data, a warning, or an error.

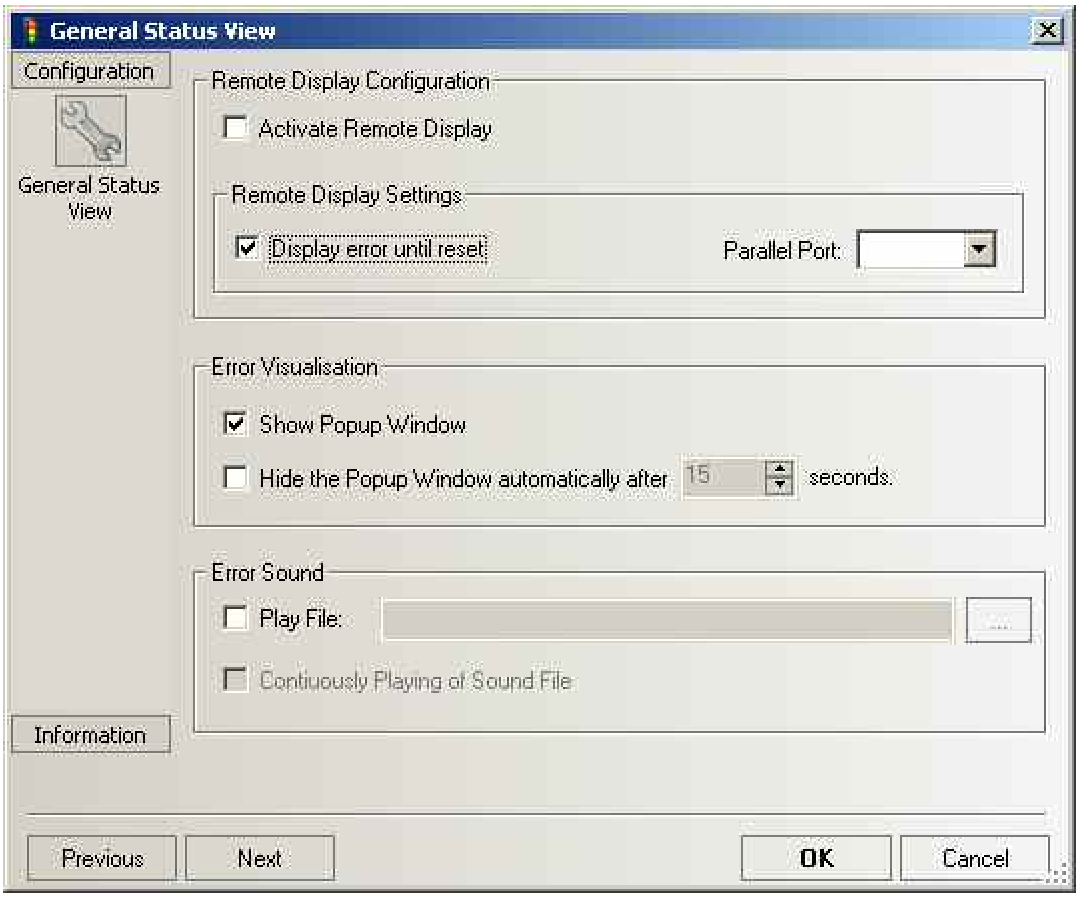


Fig. 4-19 General Status View: Configuration

Activate Remote Display The *Activate Remote Display* switch activates (box checked) or deactivates the remote display. If the box is checked the *Remote Display Settings* are enabled.

Remote Display Settings The *Remote Display Settings* panel configures the remote display and assigns it to a printer connector.

Display error... If this box is checked and an error is detected, the error LED lights and an acoustic signal sounds until an explicit reset via the *Acknowledge* key of the remote display. Otherwise, the error LED goes out as the measurement continues.

Parallel port Parallel port used to connect the remote display

Error Visualization For each error detected, an error message can be displayed in a popup window that will either remain on screen or be automatically closed after a definite time (option *Hide the Popup...* checked). The display time of the popup is set in the *after...seconds* field.

Error Sound For each error detected, an error sound is played if the *Play File* box is checked. A wave file (*.wav) can be selected by means of the "..." button If the *Continuously Playing...* option is checked the sound is continuously repeated.

X-Y Graph View

The X-Y Graph (or scatter plot) can be used to set two selectable signals in correlation to each other, i.e. the value of one signal is used as x value, the value of another signal as y value.For example, the correlation between RxQual and RxLev may be of interest. This configuration is shown in the figure below.

Note that the quantity of an x-y-pair is shown using the color and the radius of the circle. The larger the radius, the more samples have been found for that pair. Same applies to the darkness of the color: The darker the color, the more pairs were detected.

To calculate these indicators, all pairs found are set in relation to each other, i.e. their quantity is normalized.

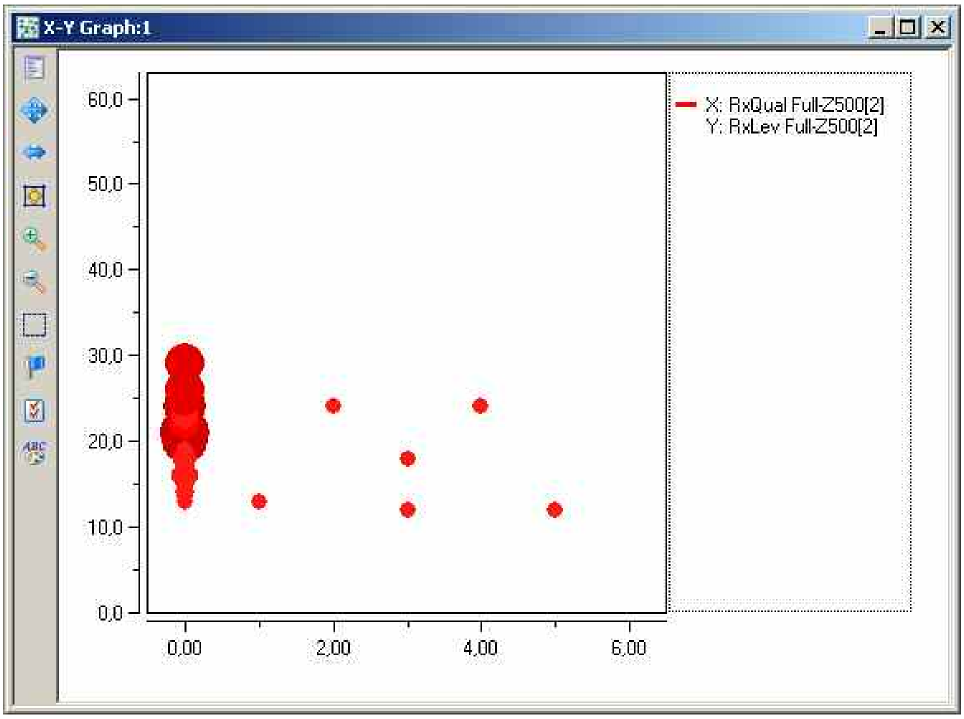
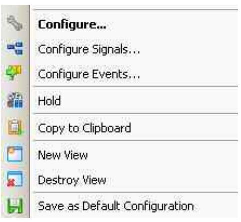


Fig. 4-20 X-Y Graph View

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, to put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

X-Y Graph View Configuration

The *X-Y Graph View* configuration selects and controls the signals to be displayed and shows information on the current view version. It is opened via a right mouse click on a point inside the *X-Y Graph View* or via the *Tools - Modules Configuration...* command (see chapter 3).

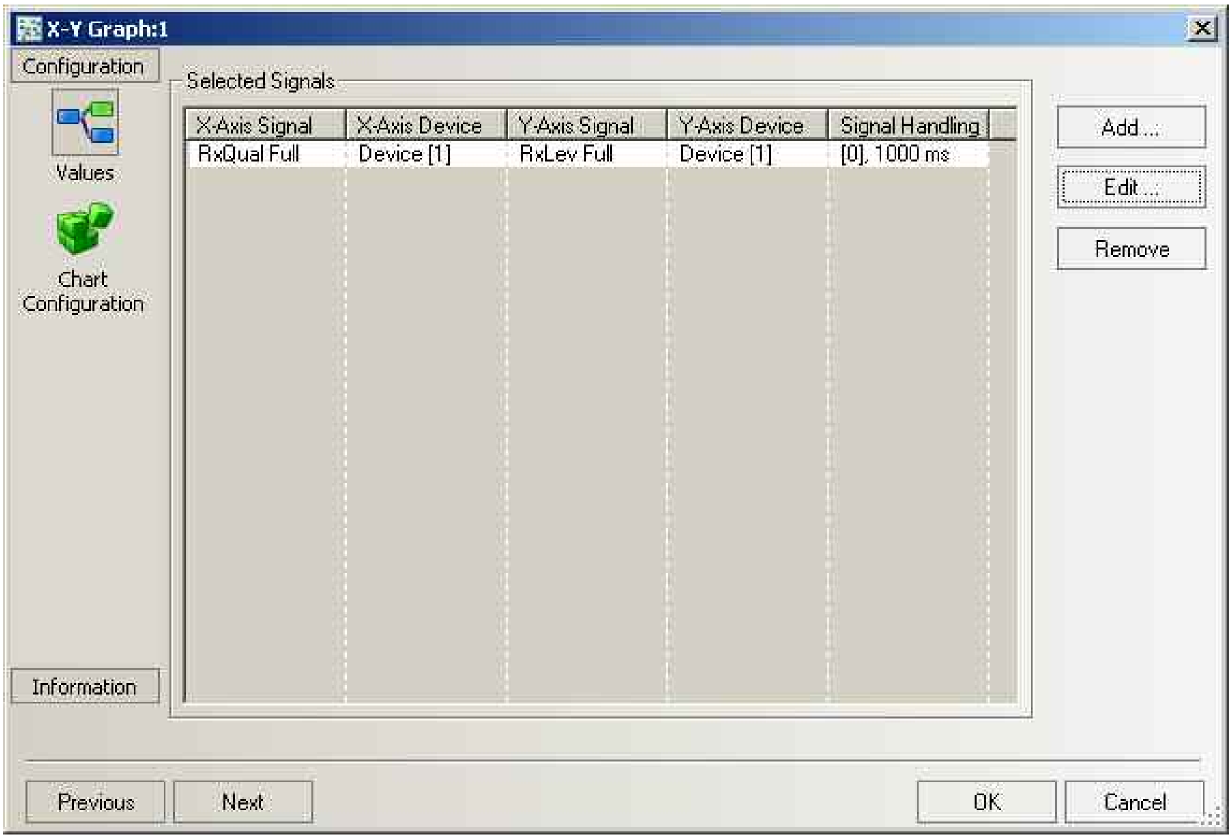


Fig. 4-21 X-Y Graph View: Configuration - Values

Selected Signals The *Selected Signals* table on the *Values* panel shows the configured signals and associated devices of the scatter plot axes

X-Axis Signal	List of all signals selected for display on the X-axis.
X-Axis Device	Associated device of the signal selected for display on the X-axis.
Y-Axis Signal	List of all signals selected for display on the Y-axis.
Y-Axis Device	Associated device of the signal selected for display on the Y-axis.
Signal Handling	This column shows the plot mode number ant the selected timeslot (see description below).

Available Signals

Add... This button opens a menu to add the signals available for the X and Y-axes.

Edit... This button opens a menu to modify the signals available for the X and Y-axes.

Remove Removes the complete signal row from the table

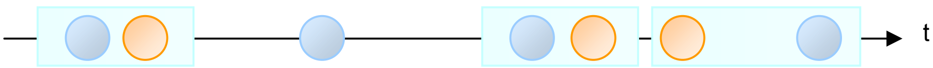
Signal Handling

Since many signals cannot be matched directly because they are measured/reported at different points in time, the scatter plot can be configured how to match an x-y pair.

These signal handling modes are available:

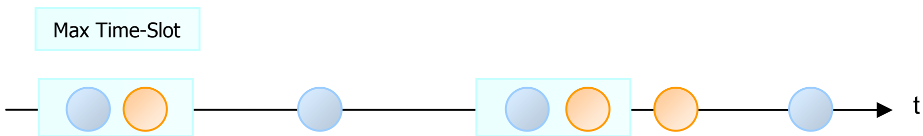
Last Value [0]:

X, Y values are matched without the need of any time-constraint; the time slice is preset to 1s. Once an x-y pair is available it is displayed by the graph:



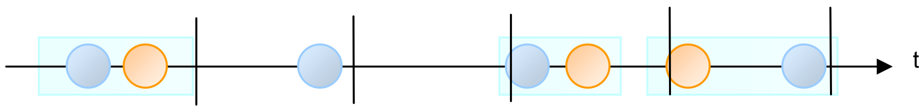
Time Slots [1]:

X, Y values are matched if both occur within a given time interval, i.e. if one signal has a valid value, then a pair is built if the other signal reports a valid value within a specified time range.



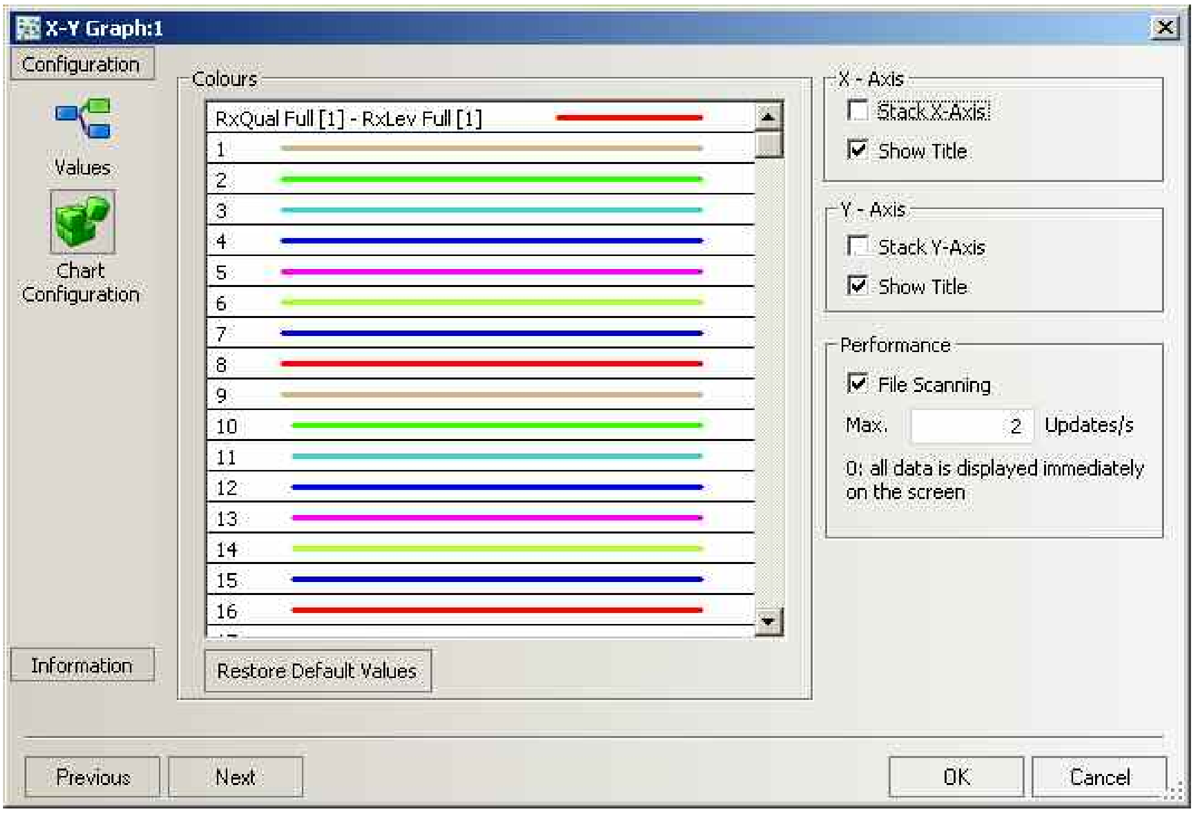
Equidistant Time Slices (last value)[2]:

The time axis is split in time-slots of the same size. If in each time-slot at least one value for each X and Y signal is found, then this pair is used as input for the graph. Only one pair per time-slot is built and the most-recent values for each signal are used. The length of the time slot is defined by the time slice value entry field.



Equidistant Time Slices (average value)[3]:

Similar to the mode [2] above, but all reported values in a time-slot for one signal are averaged. The length of the time slot is defined by the time slice value entry field.



Colors

The colors of up to 199 signal curves can be defined in the *Colors* menu opened on double-clicking a field in the *Colors* panel (see p. 4.392). The *Set default* button resets all colors to their default values.

X-Axis

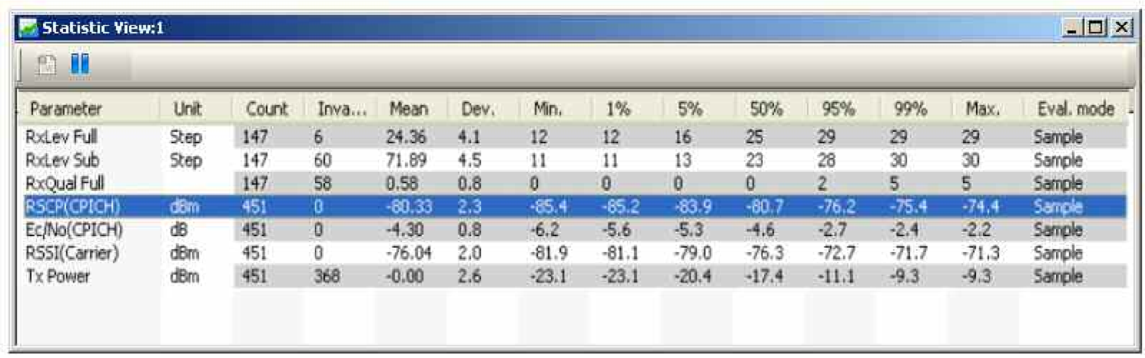
- *Stack X-Axis* displays the x-axis scales for all selected signals. This setting is effective only if more than one signal is selected.
- *Show Title* shows or hides the x-axis title (only visible if the view window is high enough for the title display).

Y-Axis

- *Stack Y-Axis* displays the y-axis scales for all selected signals. This setting is effective only if more than one signal is selected.
- *Show Title* shows or hides the y-axis title (window is high enough for the title display).

Statistic View

The *Statistic View* displays the most common statistical key indicators of any R&S ROMES signal. The view is available as basic view and can therefore be configured per drag & drop similar to e.g. the chart and alphanumeric views.



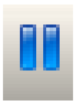
Parameter	Unit	Count	Inva...	Mean	Dev.	Min.	1%	5%	50%	95%	99%	Max.	Eval. mode
RxLev Full	Step	147	6	24.36	4.1	12	12	16	25	29	29	29	Sample
RxLev Sub	Step	147	60	71.89	4.5	11	11	13	23	28	30	30	Sample
RxQual Full		147	58	0.58	0.8	0	0	0	0	2	5	5	Sample
RSCP(CPICH)	dBm	451	0	-80.33	2.3	-85.4	-85.2	-83.9	-80.7	-76.2	-75.4	-74.4	Sample
Ec/No(CPICH)	dB	451	0	-4.30	0.8	-6.2	-5.6	-5.3	-4.6	-2.7	-2.4	-2.2	Sample
RSSI(Carrier)	dBm	451	0	-76.04	2.0	-81.9	-81.1	-79.0	-76.3	-72.7	-71.7	-71.3	Sample
Tx Power	dBm	451	368	-0.00	2.6	-23.1	-23.1	-20.4	-17.4	-11.1	-9.3	-9.3	Sample

Fig. 4-22 Statistic View

Table

The diagram or table shows the statistical key indicators of the signal values. The available signals appear in the *table* after they have been selected in the configuration menu. The two icons above the *Parameter* list control the update behavior of the view.

 During a measurement, this icon resets the view content.

 This icon enables or disables (pauses) the update of the view when new data is obtained.

These statistical indicators are calculated:

- Number of Samples (Valid & Invalid)
- Number of invalid Samples
- Mean
- Standard Deviation
- Minimum and Maximum
- Percentiles (1%, 5%, 50%, 95%, 99%)

Analyzer

For each configured signal, a specialized analyzer window can be opened that provides additional views on the signal data.

A double click on a signal table row opens the analyzer tab panel. Alternatively, a single mouse click on the row and a right click with the *Open Analyzer* item of the context menu also opens the analyzer:

Analyzer *Stat* panel:

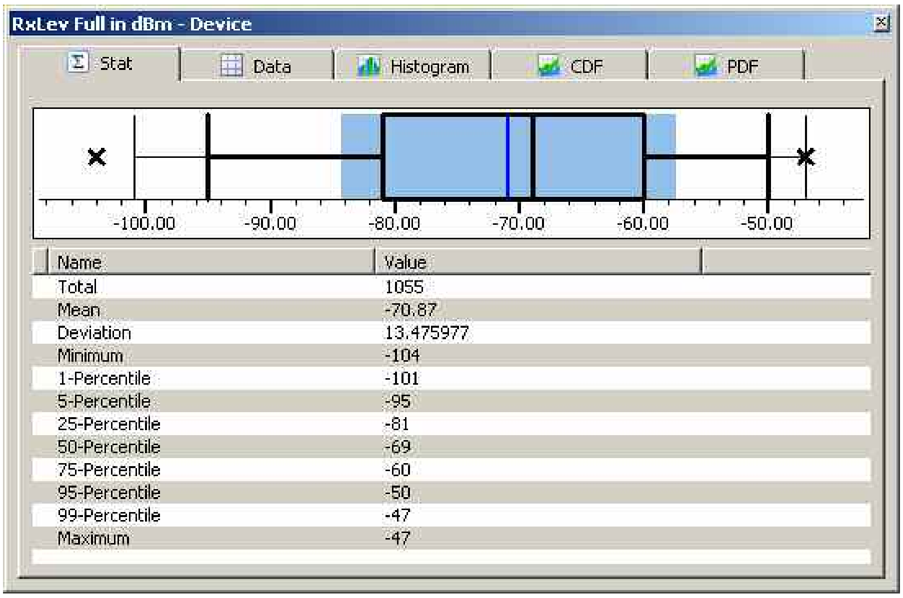
The upper part of the *Stat* panel shows a boxplot and the lower part shows the associated indicators in a table.

A boxplot shows in a graphical way of summarizing the distribution of the scores of a group of numerical data.

The blue box in the boxplot shows the median score as a line and the first (25th percentile) and third quartile (75th percentile) of the score distribution as the lower and upper parts of the box.

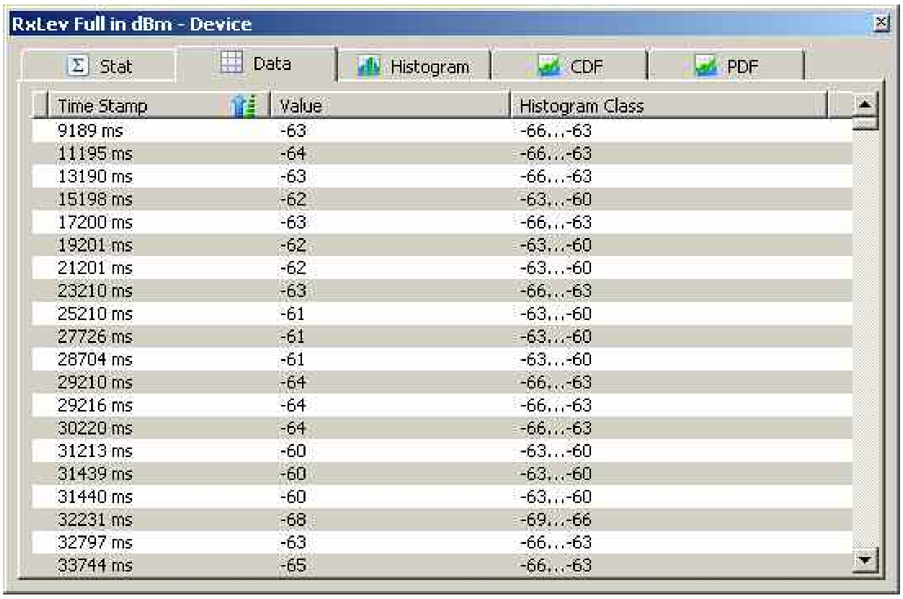
The median is the score at the 50% percentile: half of all numerical data get a score higher than the median, and 50% get a score lower. It is the middle point in the distribution of scores.

The 25th percentile is the point at which 25% of the numercial data score lower (and 75% score higher). The 75th percentile is the point at which 75% of the numerical data score lower (and 25% score higher). Thus, the area in the "box" represents the middle 50% of the patients.



Analyzer *Data* panel:

The *Data* panel displays the time stamps of the related signal, the value of the statistical parameter and the label of the class the parameter value belongs to.



Time Stamp	Value	Histogram Class
9189 ms	-63	-66…-63
11195 ms	-64	-66…-63
13190 ms	-63	-66…-63
15198 ms	-62	-63…-60
17200 ms	-63	-66…-63
19201 ms	-62	-63…-60
21201 ms	-62	-63…-60
23210 ms	-63	-66…-63
25210 ms	-61	-63…-60
27726 ms	-61	-63…-60
28704 ms	-61	-63…-60
29210 ms	-64	-66…-63
29216 ms	-64	-66…-63
30220 ms	-64	-66…-63
31213 ms	-60	-63…-60
31439 ms	-60	-63…-60
31440 ms	-60	-63…-60
32231 ms	-68	-69…-66
32797 ms	-63	-66…-63
33744 ms	-65	-66…-63

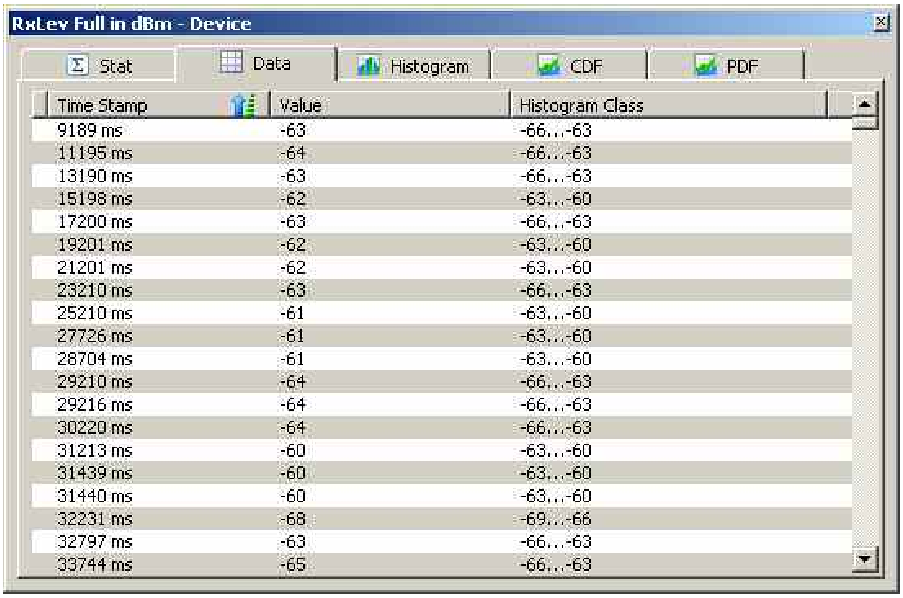
The number of the most recent values displayed can be configured using the Performance configuration, see p. 4.44.

Analyzer *Histogram* panel:

The *Histogram* panel shows the signal parameter values as bar charts, where the diagram types, the legend, and the accumulated bars are analogous to the Statistic Histogram View described on p. 4.19.

Analyzer *CDF* panel:

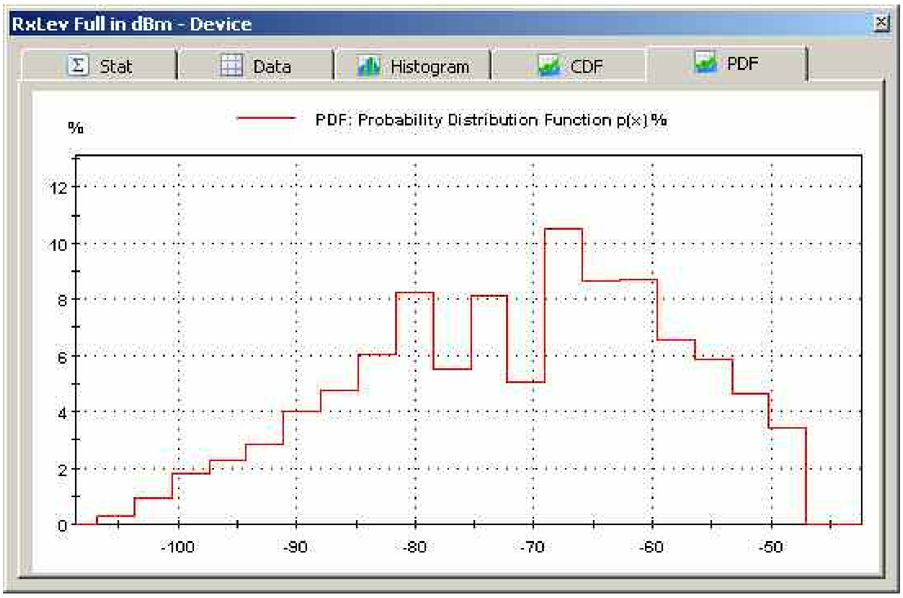
This panel displays the *Cumulative Distribution Function* (CDF) of the selected signal data.



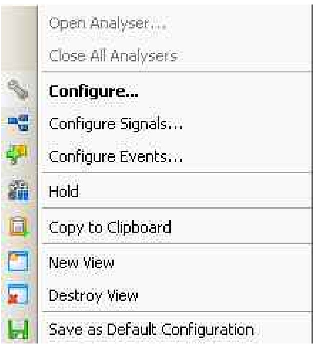
Time Stamp	Value	Histogram Class
9189 ms	-63	-66…-63
11195 ms	-64	-66…-63
13190 ms	-63	-66…-63
15198 ms	-62	-63…-60
17200 ms	-63	-66…-63
19201 ms	-62	-63…-60
21201 ms	-62	-63…-60
23210 ms	-63	-66…-63
25210 ms	-61	-63…-60
27726 ms	-61	-63…-60
28704 ms	-61	-63…-60
29210 ms	-64	-66…-63
29216 ms	-64	-66…-63
30220 ms	-64	-66…-63
31213 ms	-60	-63…-60
31439 ms	-60	-63…-60
31440 ms	-60	-63…-60
32231 ms	-68	-69…-66
32797 ms	-63	-66…-63
33744 ms	-65	-66…-63

Analyzer *PDF* panel:

This panel displays the *Probability Distribution Function* (PDF) of the selected signal data.



Context menu



A right mouse click on any point in the view opens the context menu to open or close the Analyzer view, to access the configuration menus, to put the view on hold, copy the current view to the clipboard, create or destroy views, save the current configuration as default, or remove signals; see *Context menu* description on p. 4.2.

Statistic View Configuration

The *Statistic View* configuration selects and controls the signals to be displayed and shows information on the current view version. It is opened via a right mouse click on a point inside the *Statistic View* or via the *Tools - Modules Configuration...* command (see chapter 3).

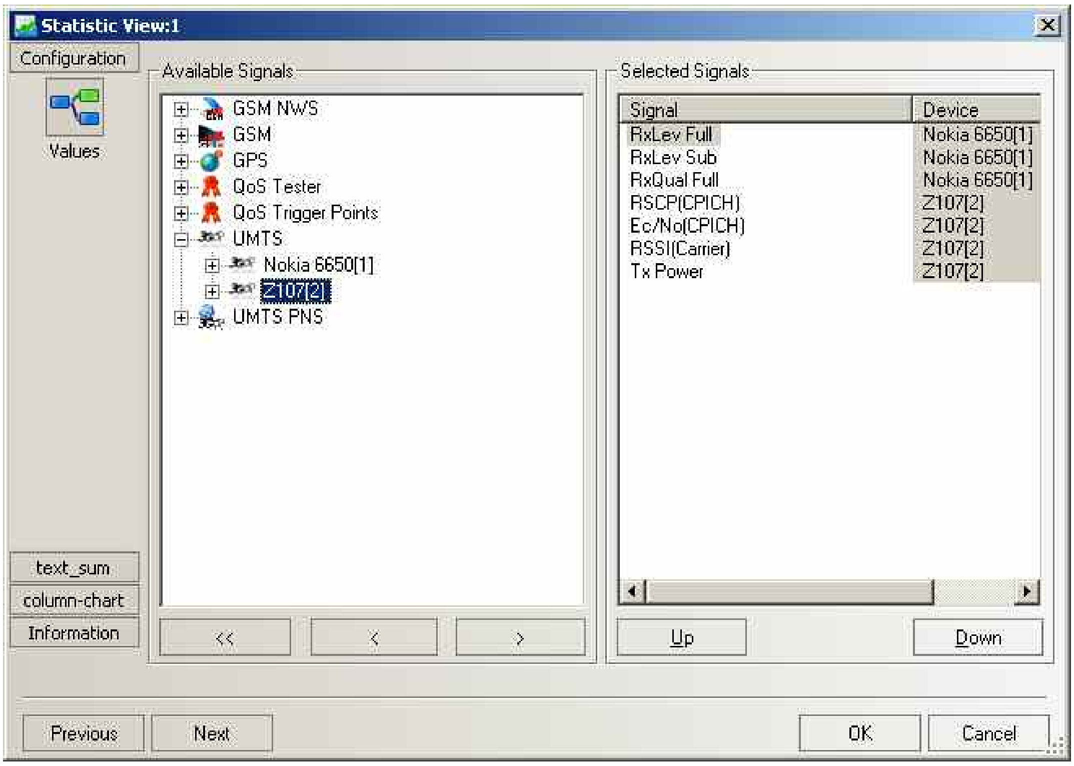


Fig. 4-23 Statistic View: Configuration - Values

The *Values* tab is analogous to the *Values* tab of the *2D Chart View* configuration menu, see figure *Fig. 4-10* on p.4.16 .

Available Signals Data tree (see chapter 1) showing all available signals (hierarchy level 4 of the data tree).

- ➢ To select a single signal for display, left-click this signal (which will be highlighted in inverse video) and click the > button. Alternatively, double-click the signal.
- ➢ Select a parent node of higher hierarchy level (level 1, 2, or 3) and click > if you wish to select all signals below the node.

Selected Signals List of all signals selected for display.

- ➢ To remove a single signal from the list, left-click this signal (which will be highlighted in inverse video) and click the < button. Alternatively, double-click the signal or use the *Remove Signal* command in the view context menu.
- ➢ To remove all signals at once, click the << button.

The order of the list can be changed using the two buttons *Up* and *Down*. This order is relevant especially if the list contains more signals than can be displayed in the *Statistic View*.

The *Statistic View Configuration tab* defines the colors associated with upper and lower threshold signal values, the signal evaluation mode and the number of stored signal values for performance control purposes.

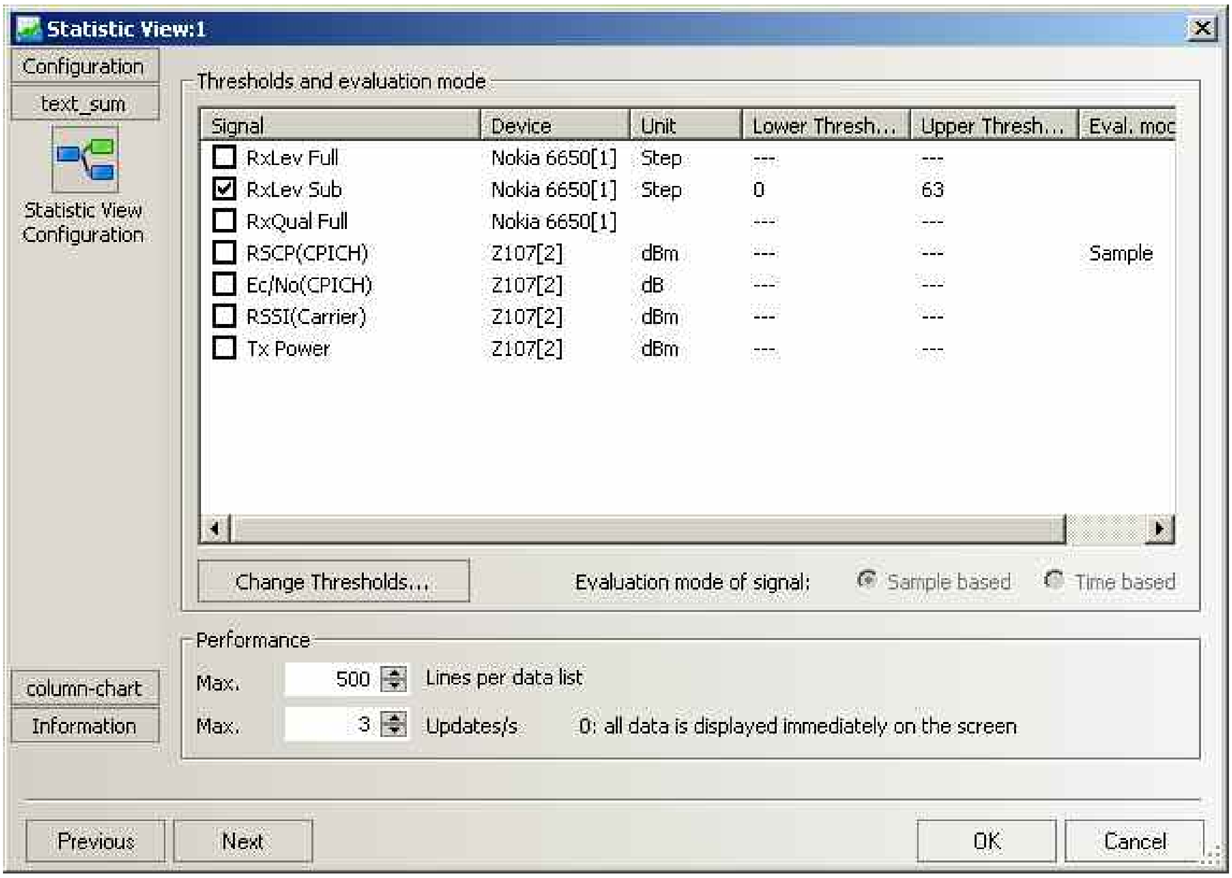
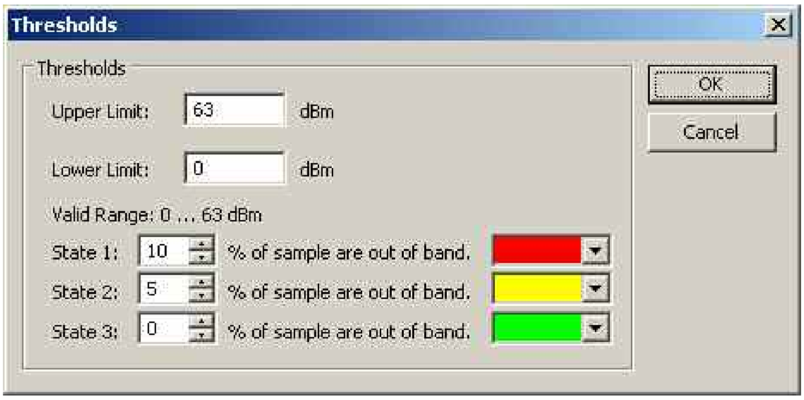


Fig. 4-24 Statistic View: Configuration - Statistic View Configuration

Thresholds and evaluation mode

When the checkbox of the signal is checked, the corresponding signal thresholds can be defined with the dialog opened by a click on the *Change Thresholds..* button:



The *Upper* and *Lower Limits* must be within the valid range that is displayed for the signal. The signal states and the state indicating colors can be defined using the percentiles and the color selection list boxes below the limit entry fields.

The Evaluation mode of the signal can either be defined as *Sample based*, where the number of samples in the measurement is used, or as *Time based*, where the amount of time determines the number of samples.

Performance

The number of *Lines per data list* limits the stored results shown in the Analyzer *Data* panel (see p. 4.39). The *Updates/s* field defines the refresh rate of the signal display, where a value of "0" means that the signal data is displayed immediately (i.e. as soon as the data is available).

OK

Apply all *Statistic View* settings and close the configuration menu.

Cancel

Discard all *Statistic View* settings and close the configuration menu.

Help

Opens the online help for R&S ROMES.

The *Histogram View* tab defines how many classes are created to evaluate a continuous signal and selects the bar types/curves to be displayed, the display colors and the y-axis scale.

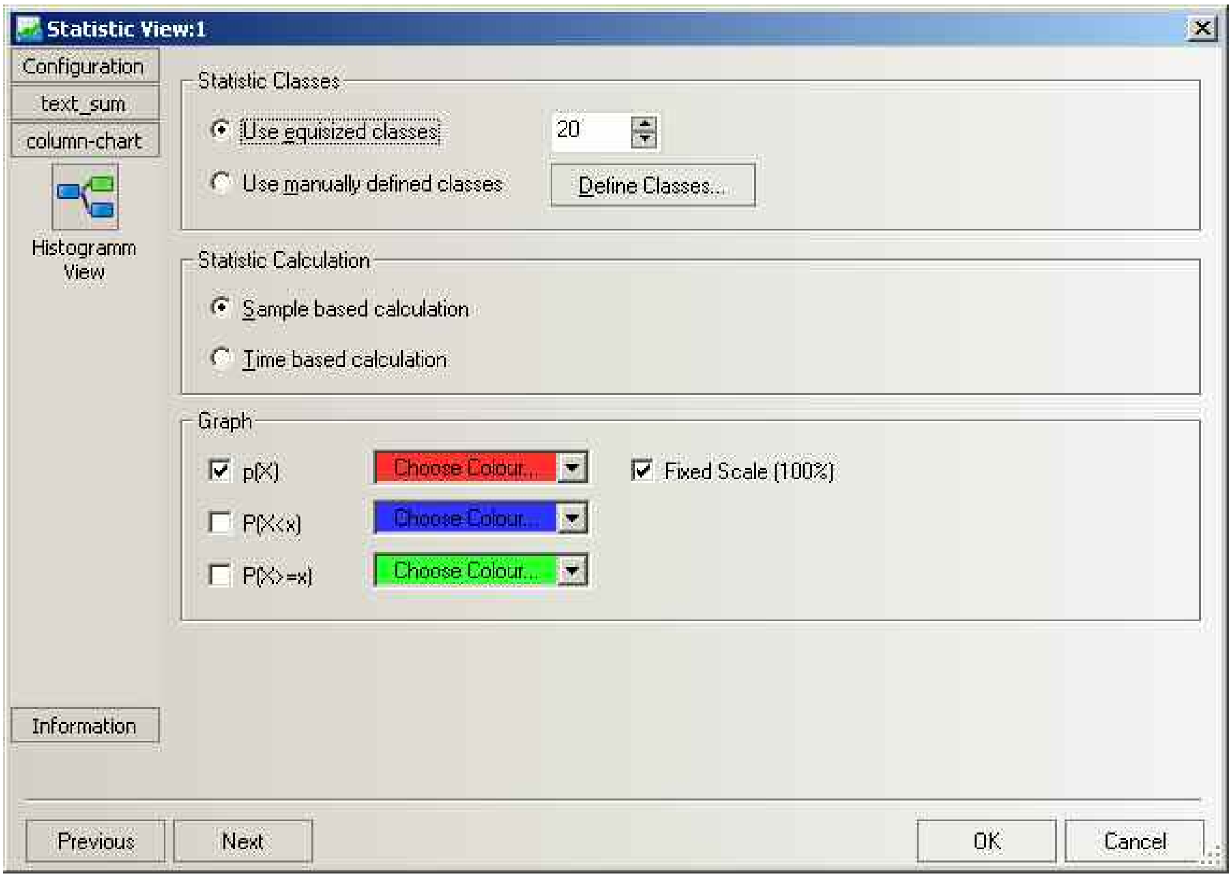
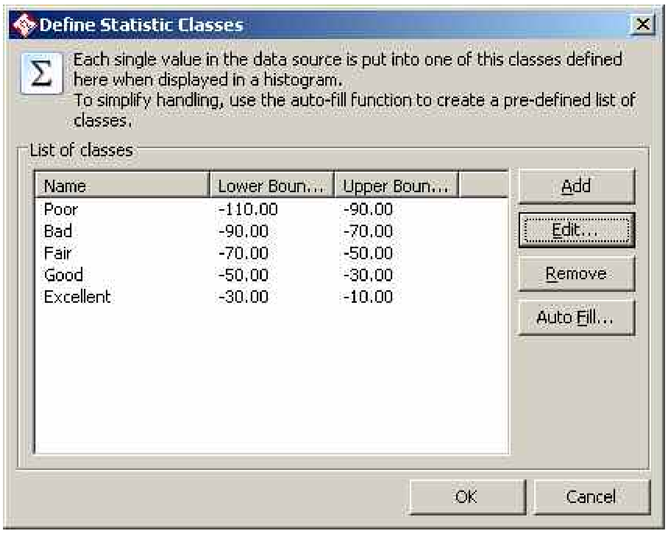


Fig. 4-25 Statistic View: Configuration - Histogram View

Statistic Classes

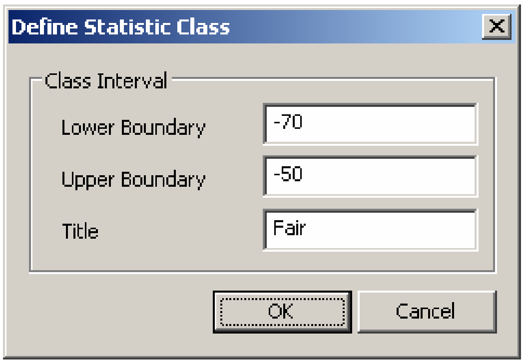
If *Use equisized classes* is checked, a number of 2 to 256 classes for the statistical evaluation of a continuous signal can be selected. The classes are obtained by dividing the expected total value range of the signal by the entered *Number of Classes;* they correspond to intervals of the signal value of equal width. The intervals label the x-axis.

Use manually defined classes allows the definition of a number of classes that have different sizes, which are configured using the *Define Classes* button:

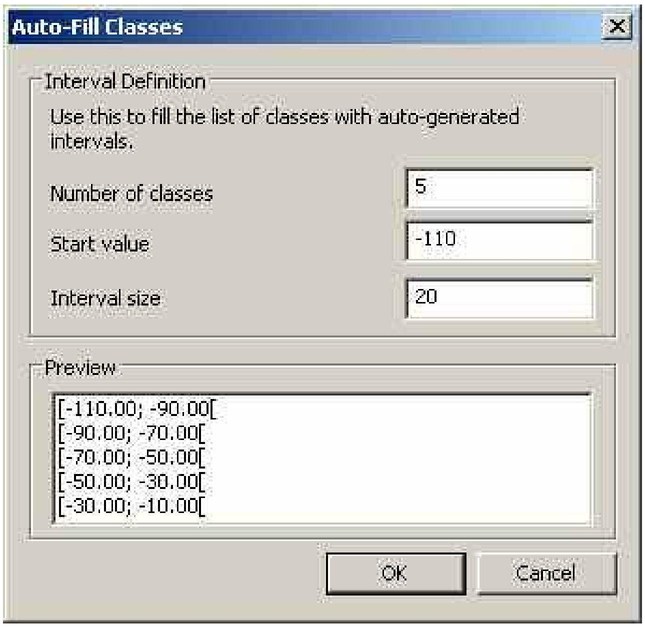


Each histogram class has a lower and an upper boundary, where the lower boundary is inclusive, the upper one exclusive. A title that is displayed on the histogram x axis can be defined optionally.

The classes can be created, modified and deleted using the *Add, Edit*, and *Remove* buttons on the right side of the class table. The *Add* and *Edit* dialogs are identical:



To simplify the process of manual definition of the individual classes, the dialog provides an Auto-Fill function. When the button is pressed, a new dialog is opened:



Here a whole set of (equally-sized) class can be created by specifying the number of classes, the first lower boundary and the interval size. The i-th class has then a range from

`StartValue + i*InterValSize`

up to

`StartValue + (i+1)*InterValSize`, excluded.

The generated classes can then be modified to suit the measurement purpose.

Statistic Calculation

The height of the bars can be calculated in two alternative ways:

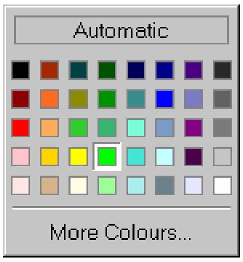
If *Sample based calculation* is selected the height of each bar is proportional to the number of samples in the class.

If *Time based calculation* is selected the height of each bar is proportional to the amount of time that the signal values fall inside the class.

The *Number of Classes* is ignored for step parameters.

Graph

Selects the bar types/curves to be displayed, the display colors and the y-axis scale. The three checkboxes *p(X), P(X<x) and P(X>=x)* show (if checked) or hide the bar graphs or curves for the relative frequency of the values per class and the accumulated frequencies; they are equivalent to the corresponding icons in the *Statistic Histogram View* (see above). The *Choose Color* pull-down lists select the display color for each bar graph or curve:



The *More Colors...* button calls up the *Colors* menu described on p. 4.392.

The *Fixed Scale* checkbox fixes (if checked) the y-axis scale of the diagram to the range between 0% and 100%, irrespective of the range of displayed values. Otherwise the p(X) scale is adapted to the largest displayed value. The value range and thus the scale for the accumulated frequencies P(X<x) and P(X>=x) is always fixed to the range between 0% and 100%.

OK

Apply all *Statistic Histogram View* settings and close the configuration menu.

Cancel

Discard all *Statistic Histogram View* settings and close the configuration menu.

The *Info* tab can be accessed via the *Tools - Modules Configuration...* command; see p. 4.4.

Navigation Views

The *Navigation Views* can be used to visualize measured quantities with valid geographic coordinates and to retrieve the geographic coordinates of an individual measured value.

Click the icon in the measurement bar and use the *Available Signals Drag & Drop...* dialog to display signals in the *Navigation Views*.

The navigation views can be selected from a submenu displayed to the right of the *View* menu when the mouse pauses over *Navigation Views*.

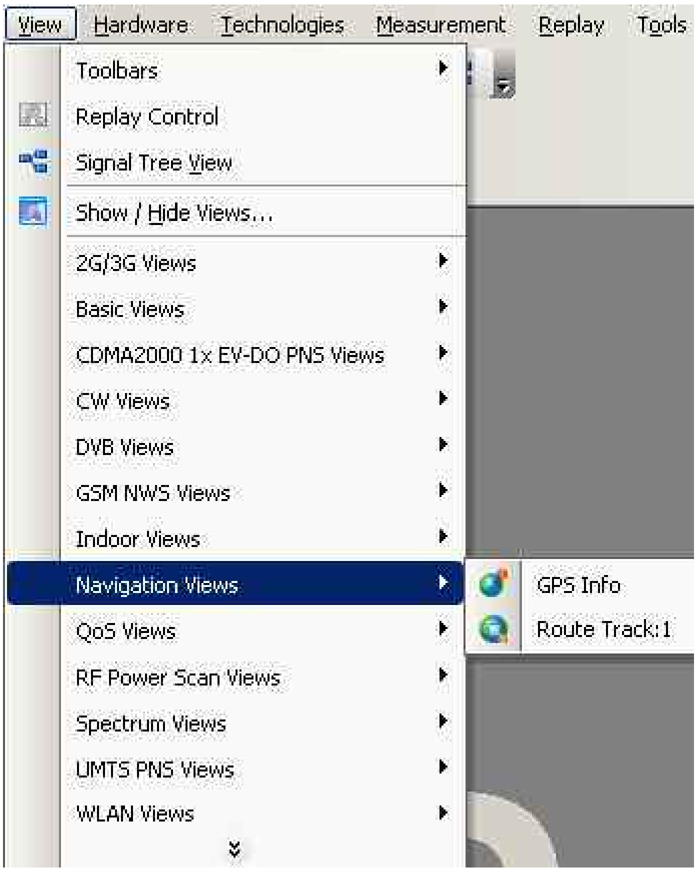


Fig. 4-26 Navigation Views

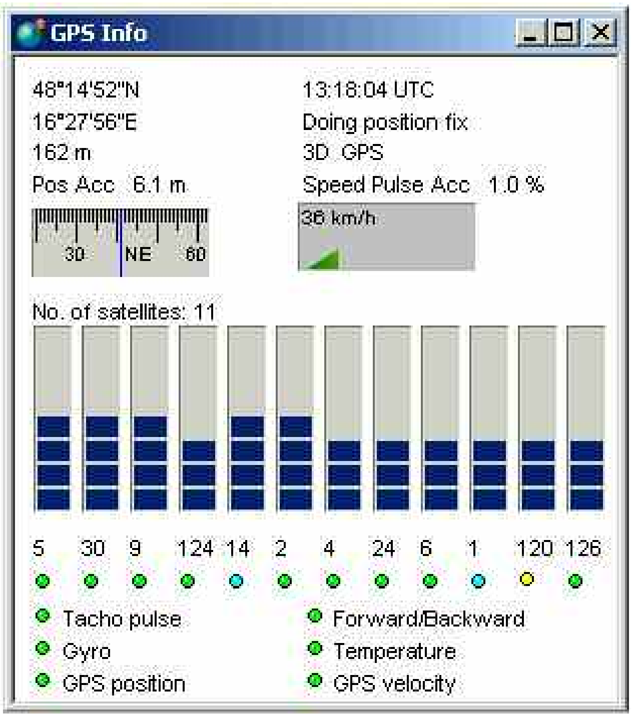
GPS Info

The *GPS Info* window shows the recorded GPS information and the calculated direction and speed of the test vehicle. Compass heading and speed are displayed in a compass and speedometer if the GPS receiver provides these quantities.

The detected GPS satellites are shown with their IDs. The bar graphs show the relative quality of the received GPS signals.

If the R&S ROMES measurement setup is equipped with a U-BLOX GPS receiver, additional car sensor information is shown in the *GPS Info* window, if available.

Latitude
Longitude
Altitude
Position Accuracy
Compass
Satellite Information
Car Sensor Info
(U-BLOX GPS only)



Time
Health
Validity
Speed Pulse Accuracy
(U-BLOX GPS only)
Speedometer

Fig. 4-27 GPS Info view

Latitude/Longitude/ Altitude The left column of the view shows the geographic coordinates of the current measurement point.

Time The first entry in the right column represents the Universal Time Coordinated (UTC) of the current measurement point.

Health The second entry in the right column describes the operating conditions of the GPS receiver. The *GPS Info* view displays messages such as *Doing position fix, No usable satellite, Only 1 satellite*, ...

Validity

The third entry in the right column describes the validity of the current results. The following status messages are possible:

2D GPS	Data with valid longitude and latitude coordinates
3D GPS	Data with valid longitude and latitude and altitude coordinates
2D DGPS	Data with valid longitude and latitude coordinates, only with DGPS (differential GPS) receiver
3D DGPS	Data with valid longitude and latitude and altitude coordinates, only with DGPS (differential GPS) receiver
DR	Dead Reckoning, only Trimble Placer or GINA by Rohde & Schwarz.

Compass and Speedometer

Display of the compass and speedometer is optional; see configuration menu below. Only GPS receivers supporting the RMC protocol ($GPRMC) provide the direction and speed of the test vehicle. The default value range for the speedometer scale is 0-150 km/h, possible is max. 1500 km/h settable in *Tools - Preferences - Available Signals > GPS*.

Satellite Information

These bar graphs show the relative signal quality of up to 12 satellites within range of the GPS receiver. The satellite ID numbers are displayed below the associated bar graph.

The state of the satellite will be indicated by the color:

Green: Code and carrier locked, receiving 50 bps data

Cyan: Code and Carrier locked

Blue: Code locked

Yellow: Signal detected but unusable

Red: Idle or searching

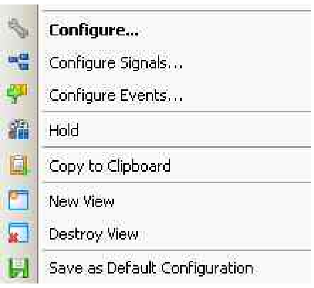
***Note**:*

This information is only available if this is supported by the used GPS receiver.

Car Sensor Info

The Car Sensor Info is only available with an installed U-BLOX GPS receiver unit. This unit is supported, but it is not available from Rohde & Schwarz.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, to put the view on hold, create or delete views, or to copy the current view to the clipboard, see *Context menu* description on p. 4.2.

GPS Info Configuration

The *GPS Info* configuration menu shows or hides the compass and speedometer, the satellite information, and the car sensor info described in the *GPS Info* menu. It is opened via a right mouse click on a point inside the *GPS Info* or via the *Tools - Modules Configuration...*command (see chapter 3).

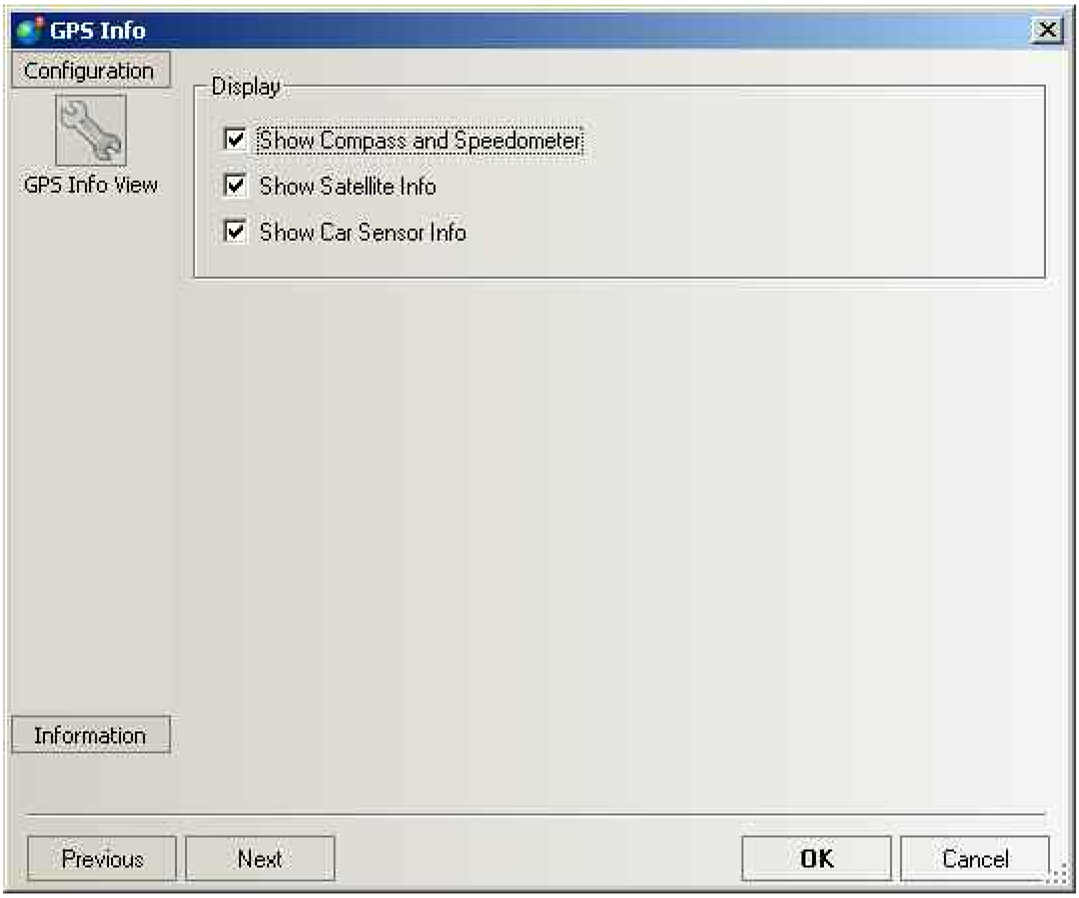


Fig. 4-28 GPS Info configuration

Route Track

The *Route Track* diagram visualizes a measurement tour and the behavior of the measured signals using a projection onto a background map that can be loaded and positioned into the view.

In addition to the signal, the events recorded along the route and the base station located in the vicinity can be displayed.

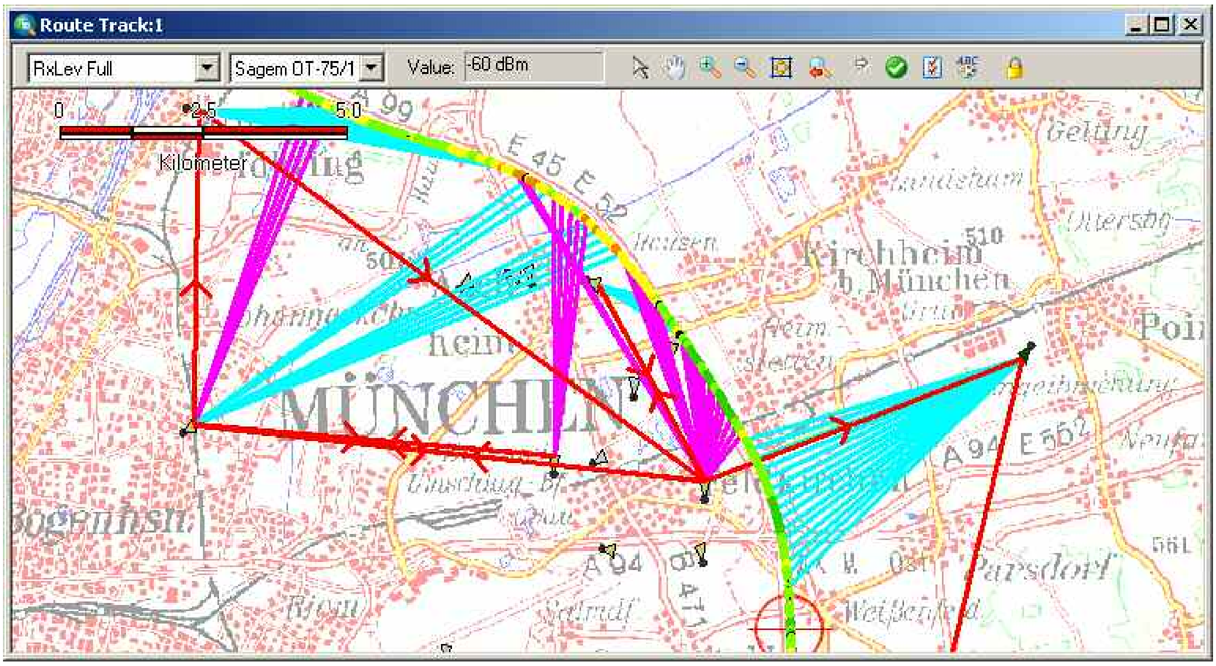


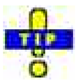
Fig. 4-29 Route Track

Diagram

By default, the diagram shows a (vector) background map of the whole world together with a length scale. The signals along a measurement tour, event symbols, base stations, and arbitrary bitmaps of the explored area can be projected onto the background map.

Measurement curve

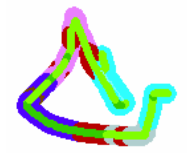
Polygonal curve connecting the individual measurement points projected onto the background map. The color of the curve indicates the signal value as explained in the legend. The signal plotted, the device type and number, and the signal value of the current measurement point is indicated above the diagram. In the legend, the geographic coordinates of the current measurement point are displayed.



You can display the entire measurement route stored in a measurement (*.rscmd or *.cmd) file immediately when opening the file, provided that measurement file scanning is enabled in the *General* tab of the *Preferences* menu.

Scrambling Code indication

Curves obtained by means of UMTS equipment (UMTS test mobiles or UMTS PN scanner) are displayed with a colored frame.



The frame color indicates the primary scrambling code(s) connected with the signal:

- A measurement curve obtained in a PN scan shows the primary SC of the 1st top N element (the strongest signal measured). The color scheme is defined in the configuration menus of the *PNS* views. If the measurement contains also UMTS test mobile data, a second frame shows the SC of the serving cell.
- A measurement curve of a UMTS test mobile parameter shows the primary SC of the serving cell. The color scheme is defined in the configuration menus of the *UMTS* views. If the measurement contains also PNS data, a second frame shows the SC of the 1st top N element.

In areas where the serving cell does not provide the strongest signal, the PNS and UMTS SCs are different. Display of the SC frames can be switched off in the *PNS Settings* and *Mobile Settings* tabs of the *UMTS Layer* configuration menu. Moreover, it is possible to qualify which of the frames lay over the other (see *General Settings* tab of the *UMTS Layer* configuration menu).

Bitmap

Map of the explored area loaded as a file in one of the standard bitmap formats. Several overlapping or non-overlapping bitmaps can be collected in an archive and loaded simultaneously, see *Archive* tab in the configuration menu. When loaded for the first time, a bitmap must be positioned onto the world map using one of the methods described below (see section *Bitmap Handling and Positioning (Calibration)* on page 4.62.

Toolbar

The toolbar offers the selected signal and device list, shows the signal value at the current measurement point, and provides the map tools.

Parameters — Pull-down list of all signals selected in the configuration menu, see p. 4.56. The current signal is visualized in the diagram.

Devices — Pull-down list of all devices measured or contained in the measurement file replayed. The measurement curve in the diagram shows the signal for the current device.

Signal value — Value of the current signal and device at the current measurement point.

Icons

1 2 3 4 5 6 7 8 9 10 11

1 – 4 The icons set the view tools are described in section *Bitmap Handling and Positioning (Calibration)* on page 4.62 ff.

5 *Show/Hide Layer Mover* opens or closes the *Layer Mover* dialog as described on p. 4.55.

6,7 *Restore/Redo last bounds* resets or repeats the last zoom or move actions.

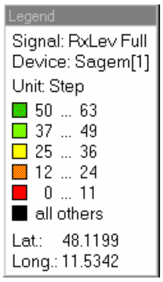
8 Enables or suppresses the display of the measurement curve.

9 Calls up the configuration dialog (see section *Route Track Configuration* on p. 4.56)

10 Shows the legend of the measurement curve (see below)

11 If this icon is enabled (as shown above), the view follows the geographical measurement position so that the current location is always visible.

Legend

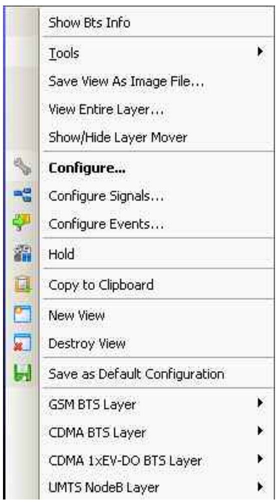


The legend window explains the signal ranges symbolized by the different colors of the measurement curve. Up to seven colors can be defined via the *Route Tracking* tab of the configuration menu, see section *Route Track Configuration* on p. 4.56.

The current signal and device is indicated above the color legend.

Below the color legend, the geographic coordinates of the current measurement point are indicated. More detailed information on this point can be retrieved via the *GPS Info* menu, see p. 4.49.

Context menu

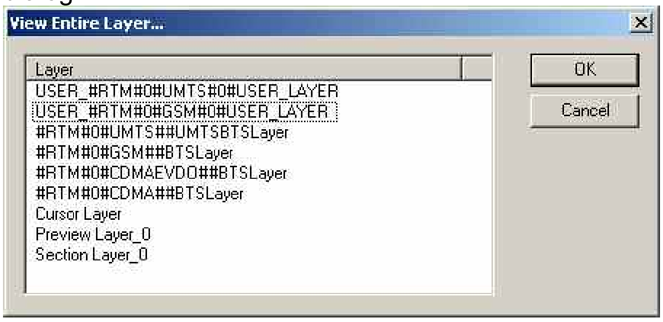


A right mouse click on any point in the view opens the context menu to access the configuration menus, to put the view on hold, to copy the current view to the clipboard, create or delete views, save the current configuration as default, move to another worksheet, or remove a signal; see *Context menu* description on p. 4.2. In addition the context menu provides the following commands:

Tools Opens a submenu providing tools for customizing the current view. The map tools are also accessible via the *Calibration* menu, see section *Bitmap Handling and Positioning (Calibration)* on page 4.62.

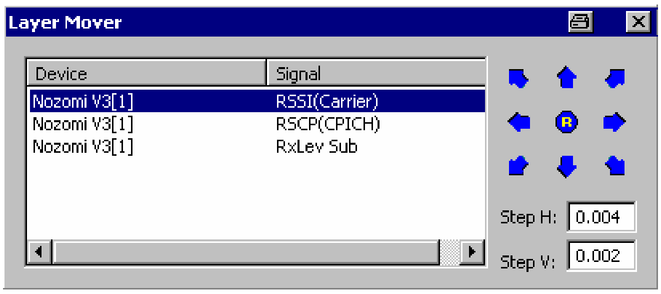
Save View As... Opens a standard dialog to save the current view to an image file. The dialog defines the file name and directory and selects a standard bitmap format (*.tif, *.bmp, *.pcx, *.png, *.gif) for the file. A *.tab file defining the geographic coordinates of the image is created together with the bitmap file; see *Raster image map* on p. 4.64. This means that the image can be re-used as a background map in later sessions; see section *Bitmap Handling and Positioning (Calibration)* on p. 4.62.

View Entire Layer Zooms the *Route Track* view to a size where one of the layers is displayed entirely. The layer to be viewed must be selected in a dialog:

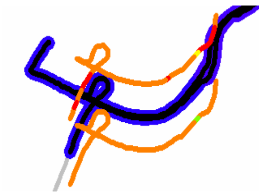


Show/Hide Layer

Mover Opens or closes the *Layer Mover* dialog. This dialog contains all signals selected in the *Values* tab of the *RouteTrack* configuration dialog.



This dialog can be used to display different signals along a route with a relative offset so that the signal values can be “read” simultaneously. Simply select a signal in the list and click the arrow buttons. Click  to reset (superimpose) the signals.



GSM BTS Layer Opens a submenu used to select the GSM base stations located in the vicinity of the measurement route and set their display options; see section *GSM BTS Layer Configuration* on page 4.68.

UMTS Layer Opens a submenu used to select the UMTS Node Bs located in the vicinity of the measurement route, select UMTS mobile and PNS scanner data, and set display options; see section *UMTS NodeB Layer* Configuration on p. 4.74.

CDMA BTS Layer	Opens a submenu used to select the CDMA base stations located in the vicinity of the measurement route and set their display options; see section *CDMA BTS Layer Configuration* on page 4.82 .
CDMA 1xEV-DO BTS Layer	Opens a submenu used to select the 1xEV-DO base stations located in the vicinity of the measurement route and set their display options; see section *CDMA 1xEV-DO BTS Layer Configuration* on page 4.89 .

Route Track Configuration

The *Route Track* configuration menu defines the signals to be viewed and shows information on the current view version. It is opened via a right mouse click on a point inside *Route Track* or via the *Tools - Modules Configuration...* command (see chapter 3).

Route Track Configuration: Values Tab

The *Values* tab selects the signals to be displayed.

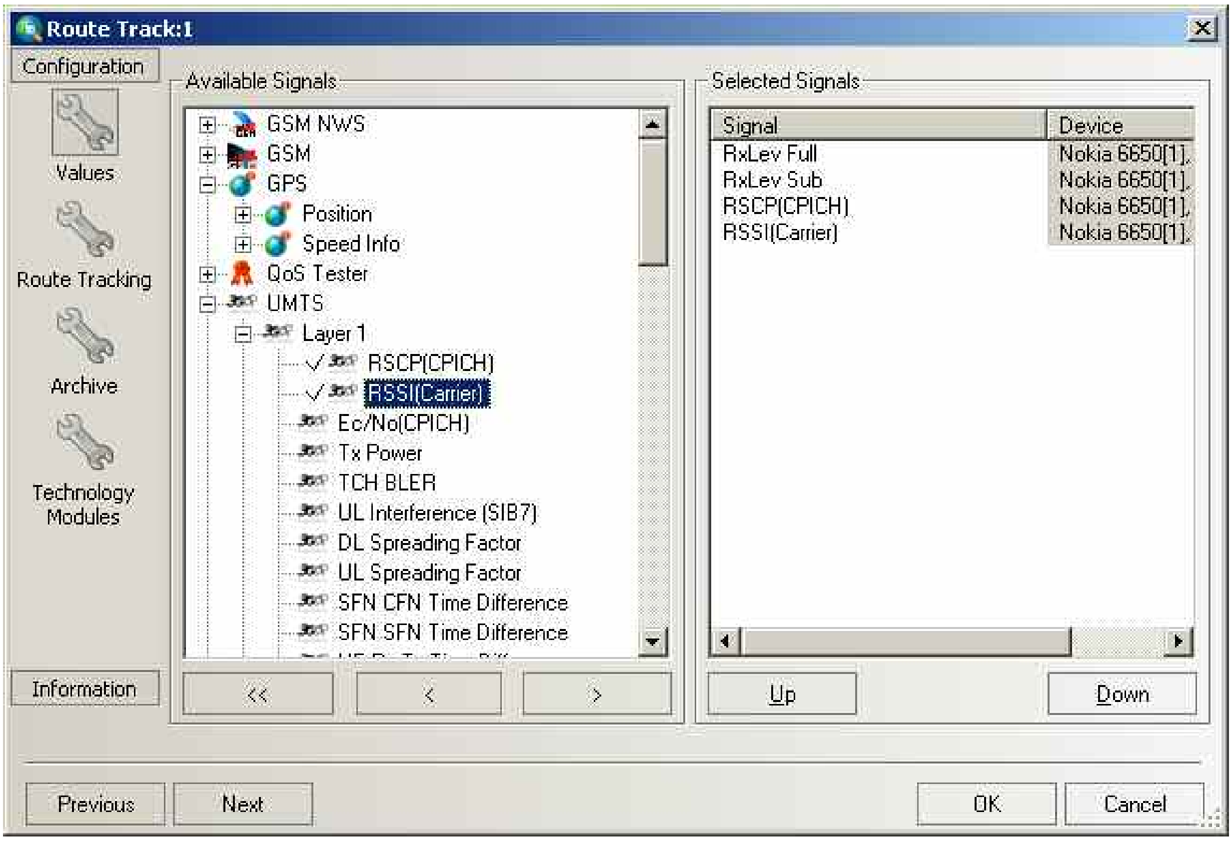


Fig. 4-30 Route Track configuration: Values

The *Values* tab is analogous to the *Values* tab of the *2D Chart View* configuration menu, see figure *Fig. 4-10* on p 4.16.

Route Track Configuration: Route Tracking Tab

The *Route Tracking* tab configures the map and opens the menu for loading and positioning raster images (e.g. background maps).

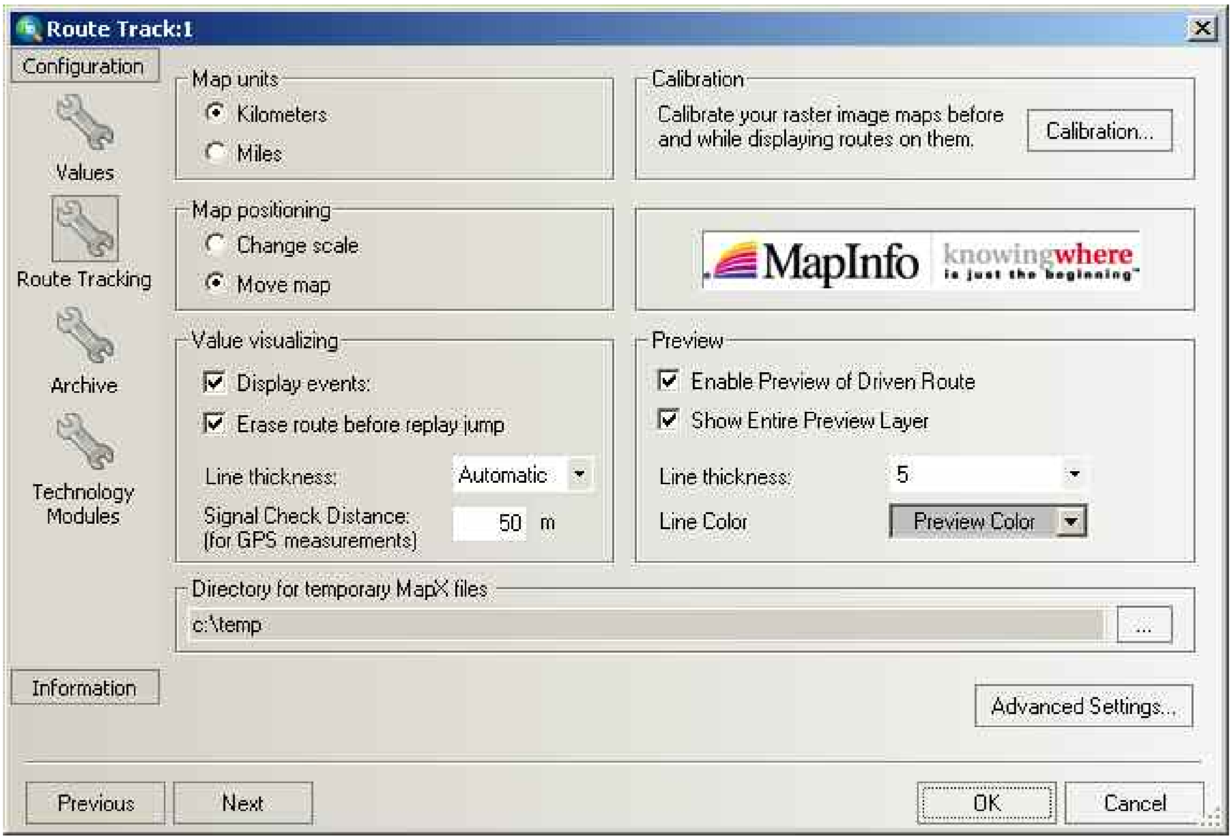


Fig. 4-31 Route Track configuration: Route Tracking

Map units

In the *Map units* panel, the length units for the *distance tool* (see section *Bitmap Handling and Positioning (Calibration)* on page 4.62) can be selected (kilometers or miles).

Map positioning

The *Map positioning* panel defines how the *Route Track* view is updated when a measurement point falls outside the viewed area. Both settings are valid only while the measurement/replay is running. In this case, they replace the map tools *Zoom In, Zoom Out,* and *Pan:*

Change scale

The scale of the diagram is reduced such that the whole measurement tour can be viewed.

Move map

The map is shifted at constant scale such that the area currently measured/replayed can be viewed.

Value visualizing

The *Value visualizing* panel determines in which way events and signals are visualized in the *Route Track* view. The settings must be defined before a diagram is generated:

Display events
: *If the box is checked, the events selected in the* Available Events *tab of the* Tools – Preferences *menu (see chapter 3) are displayed along the measurement tour.*

Erase route…
: *Clears the lines for the displayed signals before the replay restarts at a new position. The view shows the signal values between two consecutive jumps only. If* Erase route… *is cleared, the view always shows the signal values from the beginning of the measurement.*

Line thickness
: *Sets the line thickness of the polygonal curve along the measurement tour on a scale between 1 (thin line) and 7 (thick line). With* Automatic *setting, the line width is adapted to the shape of the curve.*

Signal Check Distance
: *GPS distance after which a position point is drawn in the* Route Track *view, even if no valid result is available for the current parameter (e.g. if no UMTS signal from a particular cell/with a particular scrambling code can be detected in an area that is far away from the transmitting Node B). Invalid results are indicated with black color.*

Calibration

The Enter Calibration Mode button opens the menu for bitmap handling and positioning, see p. 4.62.

Preview

The *Preview* panel configures the appearance of the preview of the driven route in the *Route Track* view. The preview is a curve with configurable thickness and color which is opened at the beginning of the replay.

Enable Preview…
: *Must be selected in order to obtain a preview*

Show Entire Preview…
: *Rescales the view when a measurement file is opened so that the view area can show the complete measurement route.*

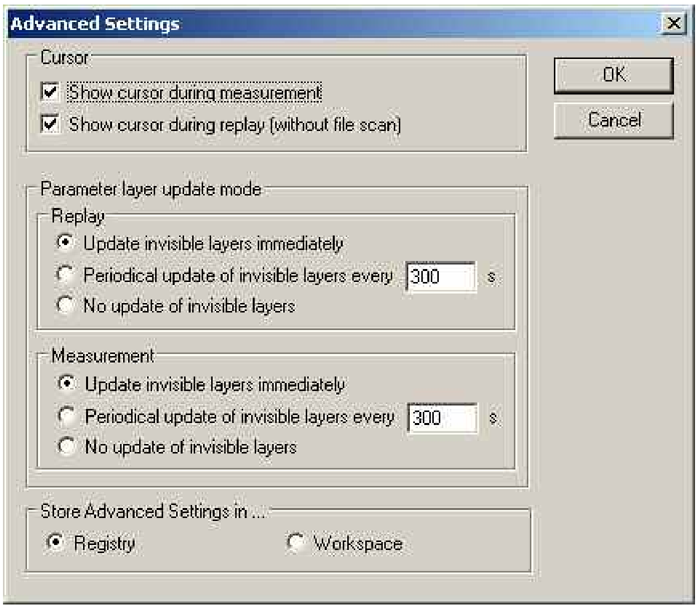
The color scale for the individual signals can be modified in the *Color Scale* menu which is opened via the *Preferences – Available Signals* tab; see chapter 3.

Directory for temporary MapX files

The Directory for temporary MapX files panel indicates the directory used to store temporary MapX files. Another directory can be selected by pressing the "..." button. This is particularly important if the MapX files are stored to a RAM disk in order to improve the system performance.

Advanced Settings

The *Advanced Settings* button opens a menu to control the display of the invisible layers, i.e. the signals that have been selected in the *Values* tab but are not currently viewed.



The cursor shows the current position during replay when file scan is enabled and the whole track is shown immediately.

Show cursor during measurement:
The cursor will show the current position during measurement. This is most useful if the tracks overlap in one measurement, for example because the same road is used in both directions or a route is used repeatedly.

Show cursor during replay (without file scan):
The cursor will show the current position during replay. The same advantage as above.

The invisible layers are controlled separately for replay and measurement sessions:

Update immediately
All layers are permanently updated, so switchover between the layers by means of the signal or device pull-down lists in the toolbar of the Route Track *view is possible any time without delay.*

Periodical update
The invisible layers are updated after a fixed period of time set in the input field (in s).

Periodical update
The invisible layers are not updated unless they are selected as current layers. This implies a delay time on switchover to an invisible layer but saves system resources if only a single layer is viewed.

Store ... settings in
The advanced settings can be stored in the system registry (in the General *subdirectory of your R&S ROMES directory) or in the current workspace. Settings stored in the registry represent default settings for all R&S ROMES workspaces; they are superseded by explicit settings stored in a given workspace.*

Route Track Configuration: Archive Tab

The *Archive* tab configures a bitmap archive containing an arbitrary number of bitmap files with valid information on their geographic position.

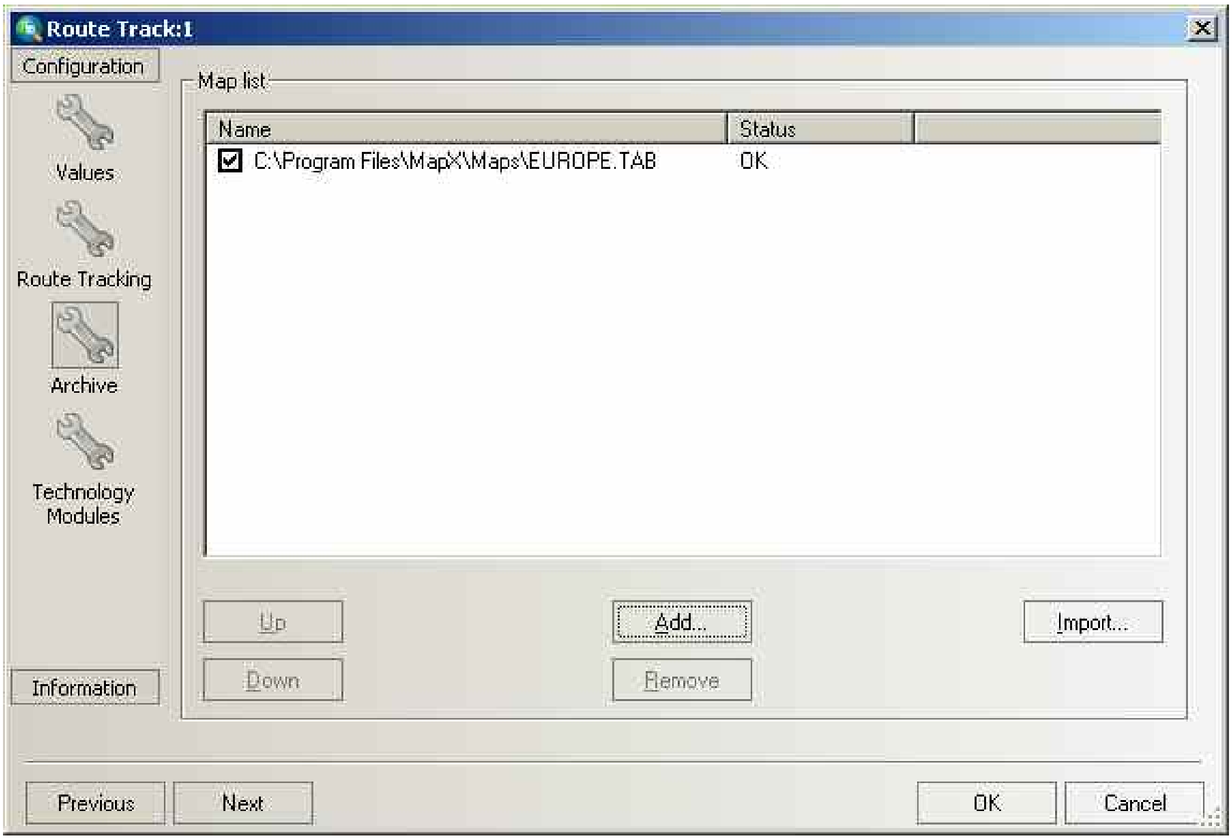


Fig. 4-32 Route Track configuration: Archive

Map list

The *Map list* shows all files belonging to the archive together with their display and status information. An archive map is shown in the *Route Track* view if the corresponding box is checked. The position and scale of an archive file can not be changed. The map list is part of the workspace configuration.

Up

Interchanges the selected (clicked) archive bitmap with the previous one in the list. In the Route Track *view, bitmaps are superimposed to all bitmaps with a lower position in the list.*

Down

Interchanges the selected (clicked) archive bitmap with the next one in the list.

Add

*Add a new bitmap file (a *.tab file or one of the standard bitmap formats) to the archive using an* Open file *dialog.*

Remove

Remove the selected (clicked and highlighted) bitmap file from the archive.

Import

Import a bitmap archive (.arc) created in an earlier version of R&S ROMES to the current application.*

Route Track Configuration: Technology Modules Tab

The *Technology modules* tab provides a list of the technology modules loaded and information on each module.

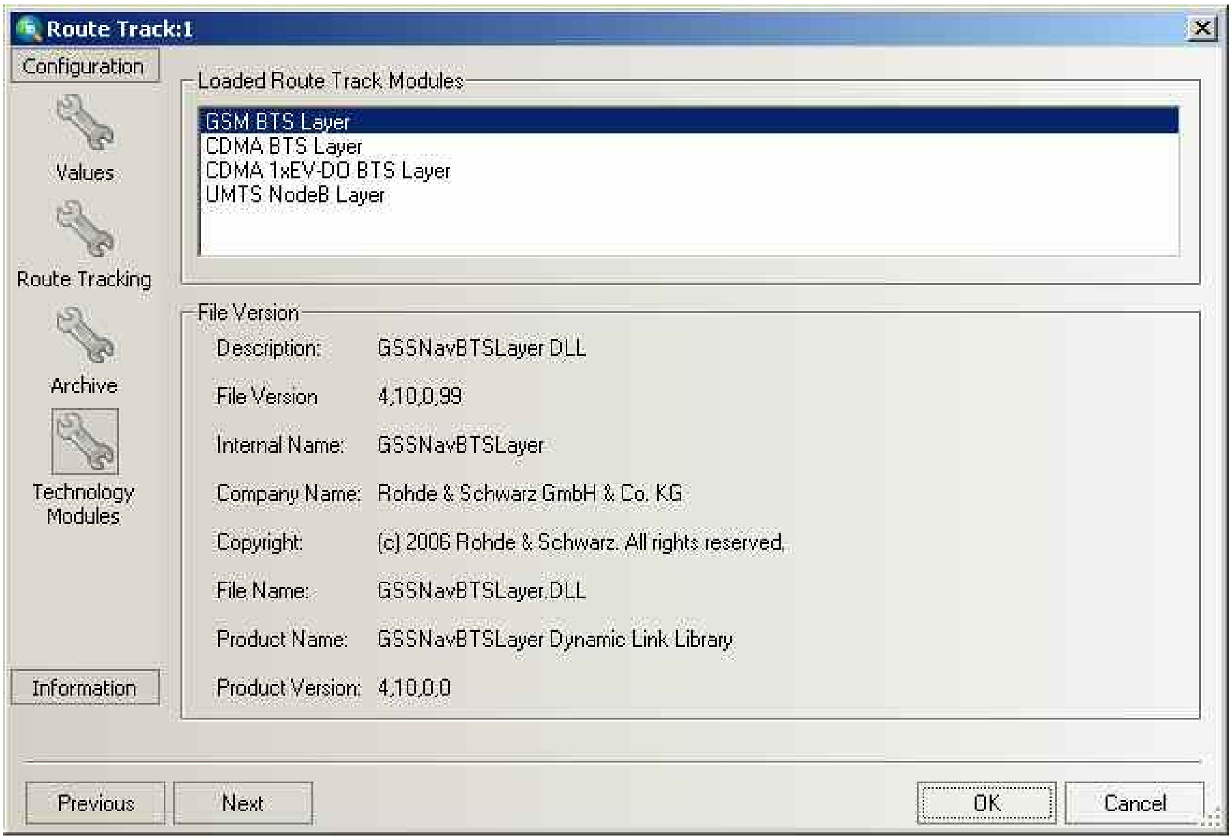


Fig. 4-33 Route Track configuration: Technology modules

To use the *GSM* or *CDMA BTS Layer*, a valid base station list must be imported and a BTS data base created. This is done in the *TEC for GSM/CDMA* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3.

- GSM BTS layer configuration is described in section *GSM BTS Layer Configuration* on p. 4.68.
- CDMA BTS layer configuration is described in section *CDMA BTS Layer Configuration* on p. 4.82.
- CDMA 1xEV-DO BTS layer configuration is described in section *CDMA 1xEV-DO BTS Layer Configuration* on p. 4.89.
- UMTS layer configuration is described in section *UMTS NodeB Layer Configuration* on p. 4.74.

Bitmap Handling and Positioning (Calibration)

The *Calibration* submenu offers the functions for loading, positioning, saving, and closing a bitmap file. Besides, it selects the map tools that are also accessible via the context menu in the *Route Track* view.

The *Calibration* menu is opened via the *Enter calibration mode* button in the *Route Tracking* tab of the *Route Track* calibration menu. Control elements used to interact with the current image map (cursor modes, tools for bitmap positioning) are active only after the calibration menu is closed.

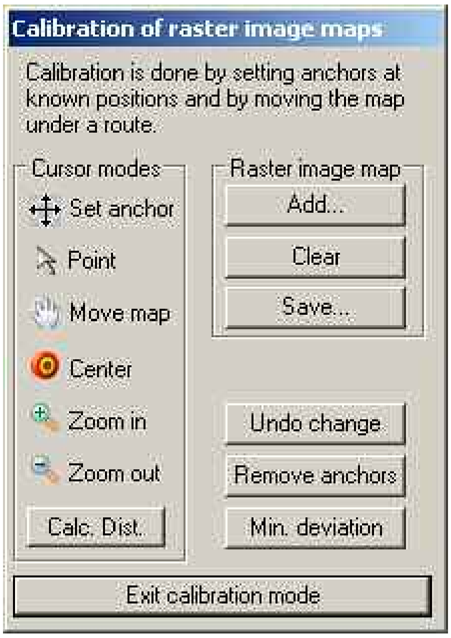


Fig. 4-34 Route Track configuration: Calibration of raster image maps

Cursor modes

The *Cursor modes* panels offers tools used to customize the map view. By clicking one of the symbols, the cursor takes the corresponding shape; at the same time, the following actions can be carried out:

Set anchor
: *Shift a loaded bitmap relative to the world map and the measurement curve. This tool is also used to re-scale the map using its position frame.*

Point
: *Select a single object on the map. The pointer coordinates are indicated in the legend.*

Move map
: *Shift the entire map, i.e. the world map including loaded bitmaps and measurement curves. When moved, a loaded bitmap appears with a shaded pattern which is removed when the* Set anchor *tool is set.*

Center
: *Shift the entire map to place the selected point to the center of the view. When centered, a loaded bitmap appears with a shaded pattern which is removed when the* Set anchor *tool is set.*

Zoom in
: *Magnify the entire map. When zoomed, a loaded bitmap appears with a shaded pattern which is removed when the* Set anchor *tool is set. The following two options are available:*

a. Put the Zoom in *icon to the center of the area you want to magnify. The map will be magnified by a factor of 2, the position of the icon becoming the center of the magnified map window.*

b. Left-click a point on the map, keep the mouse button pressed and move to another point to draw a rectangle. On releasing the mouse button, the border of the rectangle becomes the border of the magnified map window.

Zoom out
: *Scale down the entire map. When zoomed, a loaded bitmap appears with a shaded pattern which is removed when the* Set anchor *tool is set. Proceed as follows:*

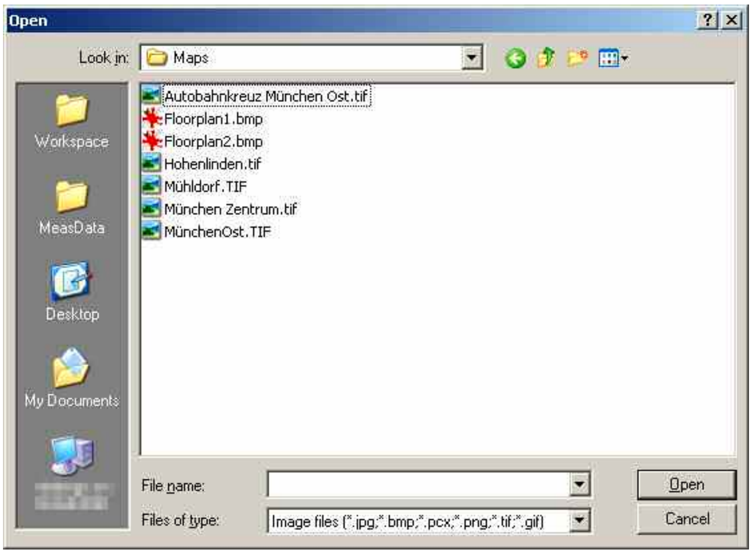
Put the Zoom in *icon to the center of the area you want to make smaller. The map will be scaled down by a factor of 2, the position of the icon becoming the center of the scaled down map window.*

Calc. Dist.
: *Set the distance tool. This tool calculates the distance along a polygonal curve to be marked on the map by repeated left-click. The distance is indicated in the view legend; the length unit (km or miles) can be set in* the Route Tracking *tab of the configuration menu.*

Raster image map

The three buttons in the *Raster image map* panel are used to load, save, and close (clear) a bitmap file:

Add
Calls up an *Open* file dialog to load a bitmap file. Valid bitmaps are in a standard bitmap format (see figure below). The geographic positioning information assigned to a bitmap is stored in a TAB file, i.e. a text file with the same name but with the extension (*.tab). Instead of being added individually, several TAB files and the corresponding bitmaps can be stored in an archive and loaded together (see *Archive* tab in the configuration menu).



Clear Removes the current bitmap file from the *Route Track* view. Archive files must be cleared in the *Archive* tab of the configuration menu.

Save Saves the positioning information of the current bitmap in a TAB file.

Example of a TAB file defining four anchor positions:

```
!table
!version 300
!charset WindowsLatin1
Definition Table
  File "München Zentrum.tif"
  Type "RASTER"
  (11.612009,48.125907) (414,518) Label "Anchor1",
  (11.615401,48.136615) (434,443) Label "Anchor2",
  (11.615547,48.128851) (440,468) Label "Anchor3",
  (11.678717,48.137394) (705,446) Label "Anchor4"
  CoordSys Earth Projection 1, 0
  Units "degree"
```

Positioning softkeys

The three remaining buttons on the right side of the *Calibration* menu are used to position the bitmap file:

Undo change

Undoes the last change made to the current bitmap. The Undo *function may be used several times in a row to undo several changes made.*

Remove anchors

Remove all anchors set to project the bitmap onto the background map, see below.

Min. deviation

Shifts and re-scales the bitmap such that the sum of the deviations of all anchor points is minimized, see below.

Bitmap positioning

The position and scale of a bitmap which is not an archive file can be adjusted in three different ways:

- Shift and scale the bitmap manually using its position frame
- Enter the known geographic coordinates of several objects marked in the bitmap
- Place the bitmap onto a known measurement tour

For each of these methods, the *Set anchor* cursor mode must be selected.

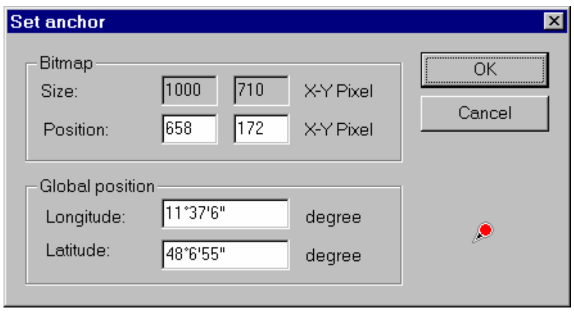
Entry of coordinates

One or several objects with known geographic position can be used to anchor the bitmap onto the background map. An anchor links one point on the bitmap to one point of the background map.

➢ Select the *Set anchor* cursor mode.

➢ To set an anchor for a known object, double-click the desired position on the bitmap.

The *Set Anchor* dialog indicating the bitmap coordinates and the geographic (global) coordinates of the anchor is opened.



Bitmap

Size of the whole bitmap in pixel units and current position of the anchor on the bitmap. The current position can be adjusted by overwriting the two Position *input fields.*

Global position

Current geographic coordinates of the anchor (according to the position of the bitmap relative to the background map). The actual geographic coordinates of the anchor must be entered here. Double-clicking the coordinate input field's toggles between decimal and degree/minute/second format display of the coordinate.

Cancel

Discard the entries and close the Set Anchor *dialog. No anchor point is created.*

OK

Link the anchor point to its global position and close the Set Anchor *dialog.*

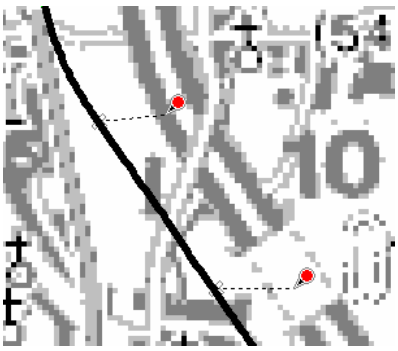
The anchor displayed in the *Route Track* view consists of a pin linked to a cross. The pin marks the position on the bitmap, the cross marks the corresponding global position.

An arbitrary number of anchors can be set. Ideally, if the bitmap is correctly positioned and all anchors are accurately defined, the deviation of the anchors should be zero, i.e. the pins and the crosses should coincide. The *Deviation min.* command in the *Map* submenu (see above) sets the scale and position of the bitmap such that the sum of the deviations of all anchors is minimized.

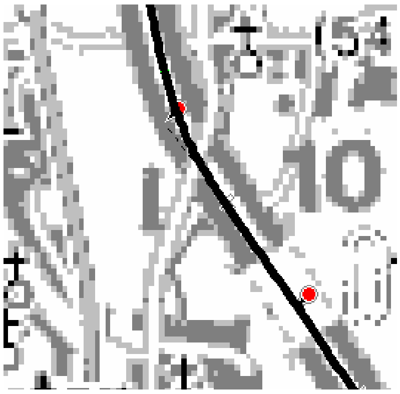
Identifying a measurement tour

A known measurement tour can be used to anchor the bitmap onto the background map. The role of the anchors is as in the previous method of bitmap positioning:

- Select the *Set anchor* cursor mode.
- To set an anchor for a measurement tour, press the *Ctrl* key and double-click a point on the measurement curve.
- Move to the corresponding point on the bitmap and click to set the anchor.
- Repeat the procedure for the next point.



Again, an arbitrary number of anchors can be set. The *Deviation min.* command in the *Map* submenu (see above) sets the scale and position of the bitmap such that the sum of the deviations of all anchors is minimized. In the example above using 2 anchors the following result is obtained:



The map is positioned with an offset which makes it easier to identify the streets and the position of areas with equal signal values.

Minimization of the deviation

To position the bitmap, R&S ROMES varies the overall position and a scaling factor which is the same in x and y direction (see *Deviation min.* command in the *Map* submenu). This means that three coordinates are varied at maximum; the mathematical problem to solve depends on the number of anchors used:

- If only one anchor is defined, the scaling factor of the bitmap is preserved, the bitmap is shifted such that the anchor point coincides with its geographic position. The deviation is zero.
- If two or more anchors are used, the scaling factor of the bitmap is varied as well, however, it is generally not possible to achieve zero deviation of all anchors.

GSM BTS Layer Configuration

The submenu of the *GSM BTS Layer* command in the *Route Track* context menu provides display settings for the GSM base stations in the view.

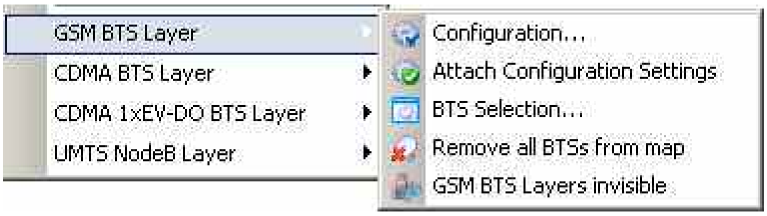


Fig. 4-35 GSM BTS Layer submenu

Note:

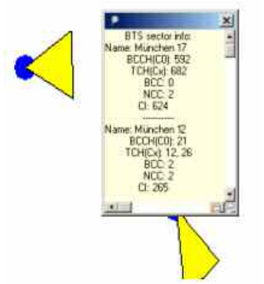
Before any configurations can be made, a valid base station list must be imported and a BTS data base created. For GSM base stations, this is done in the TEC for GSM tab of the Configuration of Software Modules menu; refer to section Configuration Menu in chapter 3.

BTS display

In the *Route Track view*, the position and transmission characteristics of the base stations in the view area are indicated with colored symbols. A BTS with an omnidirectional antenna is symbolized by a circle; a BTS with directed antennas is symbolized by a dot with up to three triangles indicating the sectors with their maximum transmission directions. The color and size of the BTS symbols can be modified in the *GSM BTS Layer* dialog, see *GSM BTS Layer* on page 4.69.

Info field

A click with the left mouse button into the hot zone around a sector symbol (triangle) opens an info field. For GSM base stations, this field indicates the sector name, the BCCH channel number, the BTS color code (BCC), the network color code (NCC), and the cell identity (CI). The radius of the hot zone can be configured in the *GSM BTS Layer* dialog.



Note:

If there are two sectors exactly on top of each other e.g. GSM and UMTS the content of both info fields will be displayed.

The detailed information window is totally independent of the view, so you can move, resize and scroll it as you like. Click the printer symbol in the lower right corner to generate a hardcopy of the detailed information.

Configuration Opens the *GSM BTS Layer* dialog to set the BTS display options.

The *Settings* tab of the *GSM BTS Layer* dialog selects the serving cell lines to be drawn and defines their display options.

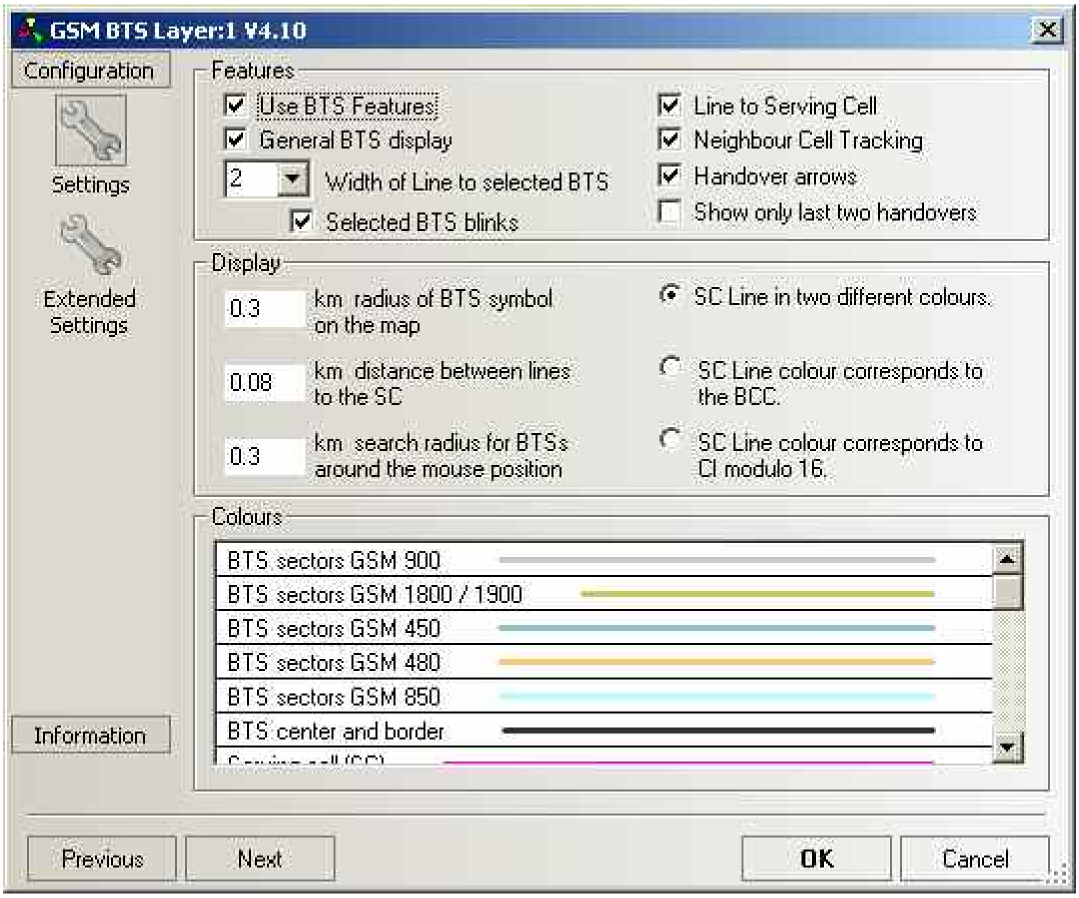
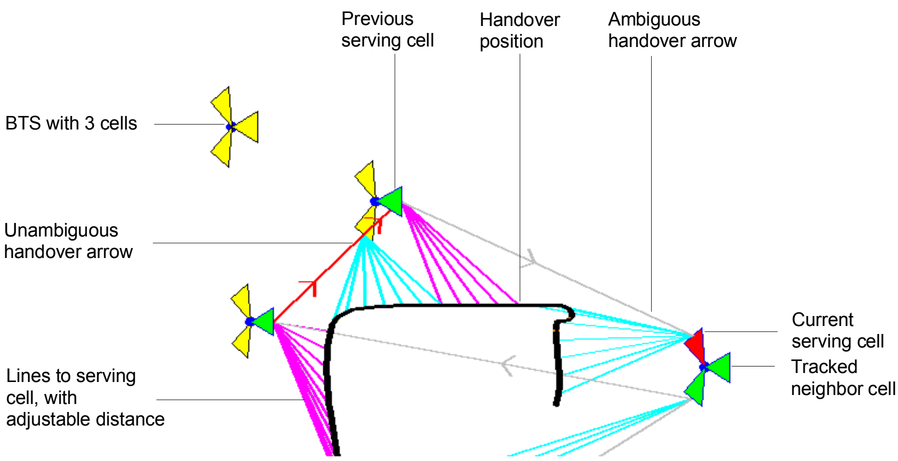


Fig. 4-36 GSM BTS Layer dialog: Settings

Example for BTS display The dialog provides different display options for GSM networks. They are best explained with an example.



Features (GSM)

In the *Features* panel the following display elements can be switched off individually or altogether *(Use BTS Features* cleared):

- General display of the BTS symbols, leaving only the symbols for the serving cells and for the cells being tracked
- Enables or disables the automatic scan for GSM-related data in the active measurement file.
- All lines to the serving cells
- The indication of cells being tracked
- All handover arrows
- All handover arrows except for the last two

Display and Colors (GSM)

In the *Display* panel the size of the BTS symbols, the distance between the serving cell lines and the radius of the hot zone that can be clicked to open an info field can be adjusted. The option buttons in the right half of the panel provide three alternative options for drawing the Serving Cell (SC) lines.

The *Colors* panel changes the colors of all display elements. Double-clicking an element of the list opens the *Colors* dialog (see p. 4.392) to modify the current display color.

Note:
A distinction is made between unambiguous and ambiguous handovers. A handover is classified ambiguous if the change of two signals characterizing the serving cell is reported with a time delay exceeding a fixed limit.

The *Extended Settings* tab of the *GSM BTS Layer* dialog selects the serving cell lines to be drawn and defines their display options.

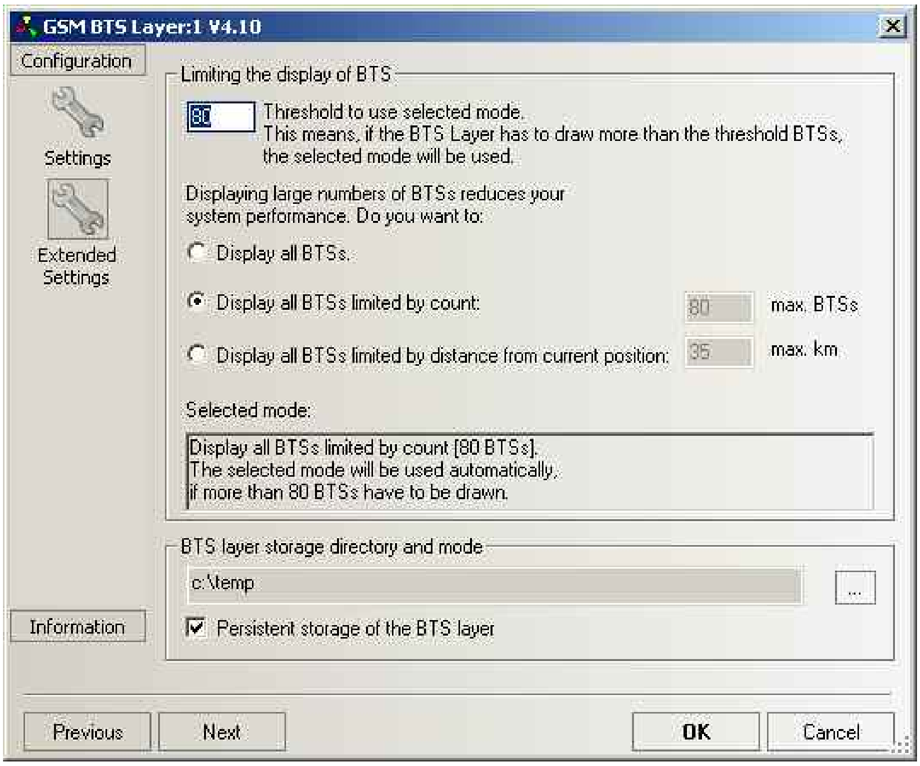


Fig. 4-37 GSM BTS Layer dialog: Extended Settings

BTS display limit

The Limiting the display of BTS panel contains an input field to limit the number of BTS symbols displayed in the Route Track view. A small number of BTS symbols improve the system performance.

R&S ROMES counts the number of BTS symbols to be drawn. A limiting condition is imposed as soon as this number exceeds the threshold set in the input field. Below the threshold, all symbols all drawn.

Display all BTSs
: *All BTS symbols displayed, i.e. no limiting condition set*

Display ... limited by count
: *Only a fixed number of BTS symbols around the current position is displayed. The fixed number is equal to the threshold value for the limiting condition.*

Display ... limited by distance
: *Only the BTS symbols within a given radius (between 1 km and 1000 km) around the current position is displayed.*

The limit settings are valid after an update of the BTS layer. R&S ROMES indicates the limiting condition set when updating the BTS layer.

BTS layer storage directory and mode

If the Persistent storage of the BTS layer box is checked, R&S ROMES stores the current BTS layer (containing all information on the BTS symbols to be displayed in the current view) to the directory indicated in the (unavailable) input field. This avoids reloading of the BTS list and recalculating of the layer when the workspace with the current *Route Track* view is opened for the next time.

The directory can be changed using the "..." button. This is particularly important if the BTS layer is stored to a RAM disk in order to improve the system performance.

Attach Configuration Settings

Includes the current GSM BTS layer configuration in the measurement file.

The attached configuration settings can be re-used in a later replay session.

BTS Selection

Opens the *BTS Selection* dialog to select BTSs with particular properties.

The *BTS Selection* dialog offers a variety of options to select a subset of base stations in the BTS list with particular properties or position.

BTS Sectors: GSM

For GSM networks *BTS Selection* opens the following dialog:

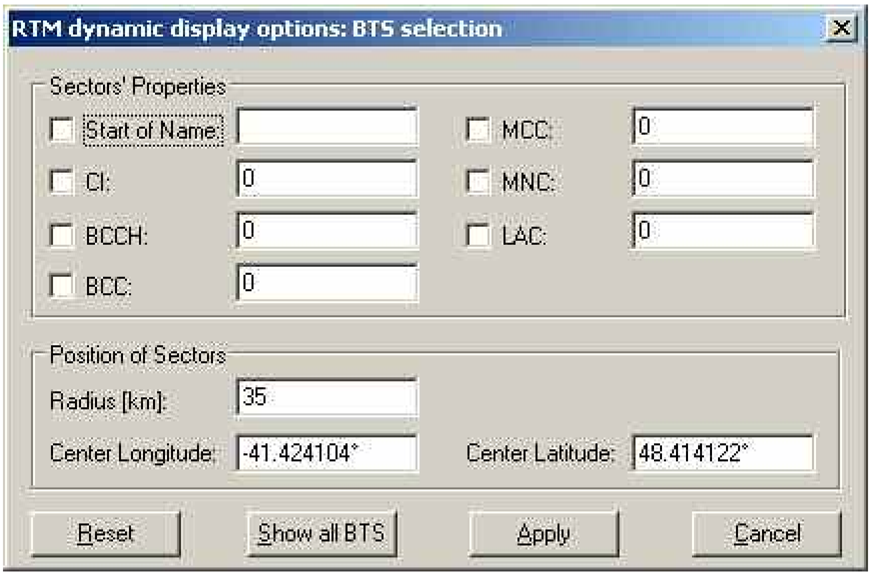


Fig. 4-38 BTS Selection dialog (GSM networks)

Sectors' Properties

In the *Sectors' Properties* panel one or several of the following conditions can be set (click one of the option buttons and enter the desired value (name or integer number) in the input field on the right side):

Start of Name	Select BTS with a particular name or with a name starting with a particular combination of characters
CI	Select BTS with a particular Cell Identity
BCCH	Select BTS transmitting on a particular Broadcast Control Channel
BCC	BTS Color Code
MNC	Mobile Network Code
MCC	Mobile Country Code
LAC	Location Area Code

Position of Sectors

The Position of Sectors panel defines a circle of variable size and position to limit the number of BTS symbols displayed in the *Route Track* view. BTSs outside the circle are not displayed. A small number of BTS symbols improve the system performance.

The size of the circle is defined by the *Radius [km]*. Its position is defined by the longitude and latitude coordinates of the center *(Center Longitude, Center Latitude)*. The default *Center Longitude* and *Center Latitude* are the coordinates of the pointer on the *Route Track* view when the context menu and the *BTS Selection* dialog were called up. The default radius corresponds to the maximum GSM cell radius.

Reset

Reset the current display in the *Route Track* view; delete all BTS displayed (disabled during a measurement or replay).

Show all BTS in this area

Show all BTS from the BTS list in the *Route Track* view. With this button, the BTS can be viewed without starting a measurement or a replay session (disabled during a measurement or replay).

Apply selection

Apply the current condition.

Remove all BTS from map

Removes all BTS symbols currently displayed.

A warning message must be confirmed before this command is executed. The function is disabled during a measurement or replay.

GSM Layers Invisible

Temporarily hide the entire BTS layer currently displayed.

A checkmark before the command indicates that a GSM BTS layer is currently available, but hidden. The layer reappears if the command is clicked for the second time.

GSM Layers Invisible is disabled if the current view contains no GSM BTS layer.

UMTS NodeB Layer Configuration

The submenu of the *UMTS Layer* command in the *Route Track* context menu provides display settings for base stations and UMTS or PNS signals.

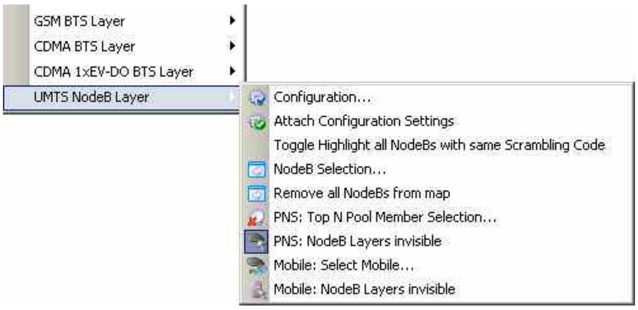


Fig. 4-39 UMTS Layer submenu

Note:
Before any configurations can be made, a valid base station list must be imported and a BTS data base created. For UMTS base stations, this is done in the TEC for UMTS tab of the Configuration of Software Modules menu; refer to section Configuration Menu in chapter 3.

NodeB display UMTS NodeBs are displayed in analogy to GSM or CMDA base stations; see section *GSM BTS Layer Configuration* on p. 4.68.

Configuration Opens the *UMTS Layer* dialog to set the display options.

The *PNS Settings* tab of the *UMTS Layer Configuration* dialog selects the display options for PN scanner data.

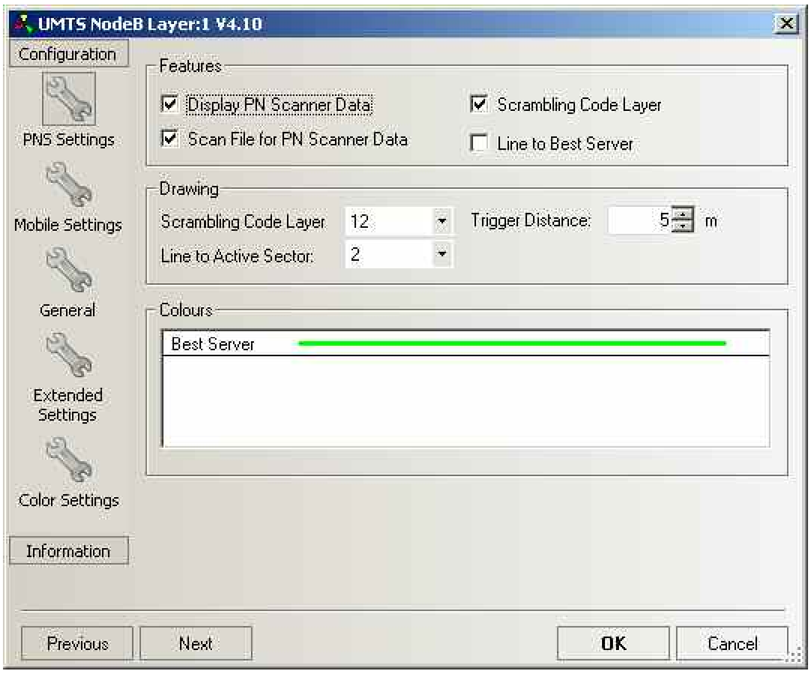


Fig. 4-40 UMTS NodeB Layer1 dialog: PNS Settings

The *PNS Settings* are analogous to the BTS layer configurations for GSM, see *Example for BTS display* on p. 4.69.

Features The following checkboxes select the displayed PN scanner information:

Display PN Scanner Data
: *Show the best server, i.e. the 1st top N element, using the color selected below. The following display options are only effective if the PN scanner data is displayed.*

Scan File for PN Scanner Data
: *Enable or disable the automatic scan for UMTS PNS data in the active Measurement file.*

SC Layer
: *Show the scrambling codes of the serving cell using the color codes of the* Color Settings *tab. The scrambling codes are visualized by means of a colored frame around the measurement curve; see* *Scrambling Code indication on p. 4.53.*

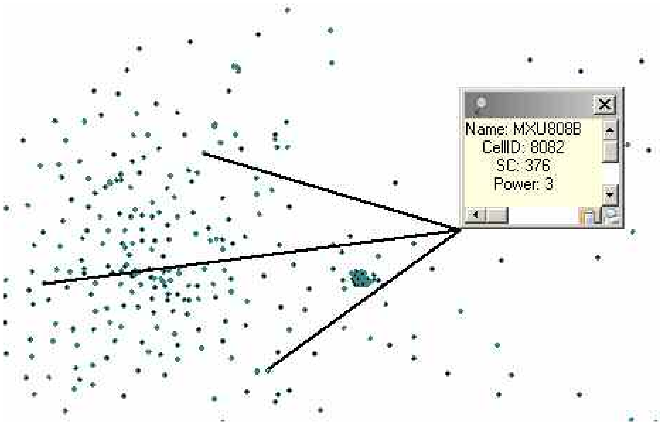
Line to Best Server
: *Draw lines between the measurement position and the active sector (best server).*

Drawing Line thickness of the signal route and of the lines between the signal route and the active sector. *Trigger Distance* is the distance between two consecutive drawn results on the signal route.

Colors Color of the best server in the active sector.

Toggle Highlight all NodeBs with same Scrambling Code

The standard info window about the selected NodeB near the mouse position will be shown automatically, so that the selected scrambling code can be checked by the user.



All NodeBs on the *Route Track View* with the same scrambling code will be highlighted in a configurable color and lines will be drawn from the mouse position to all highlighted NodeBs.

For even better visibility the lines and NodeB will be blinking (can be switched off by configuration)

If the function is clicked again on the same NodeB, then the highlighting will be switched off.

If the function is clicked on another NodeB, then the old highlighting will be replaced by the new highlighting.

The *PNS Settings* tab of the *UMTS Layer Configuration* dialog selects the display options for PN scanner data.

The *Mobile Settings* tab of the *UMTS Layer* dialog selects the display options for UMTS mobile data.

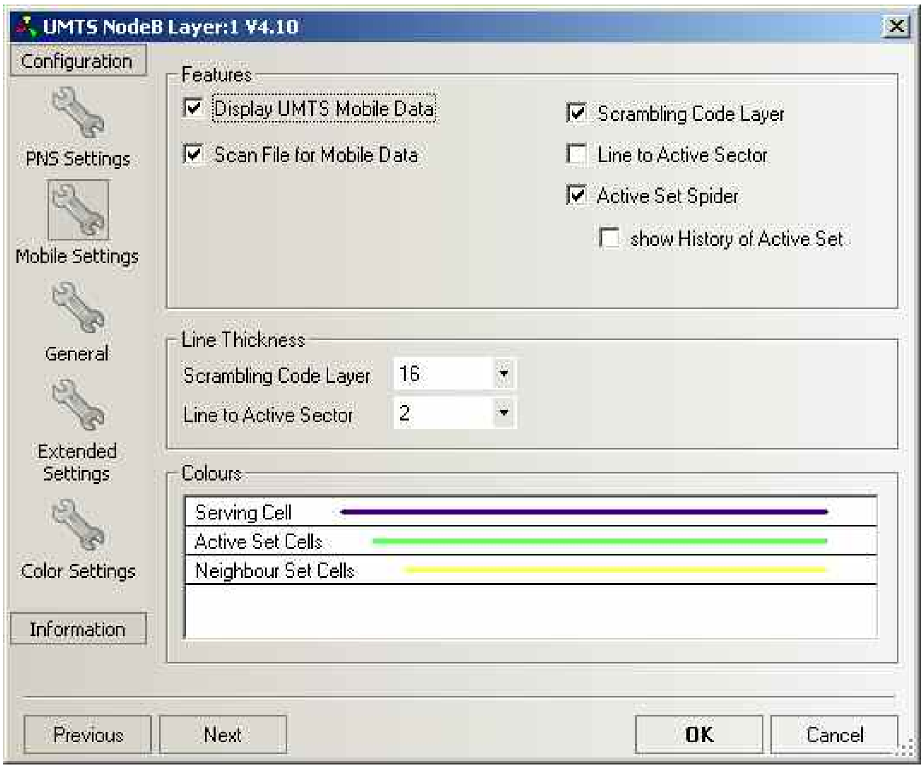


Fig. 4-41 UMTS NodeB Layer1 dialog: Mobile Settings

The *Mobile Settings* are analogous to the BTS layer configurations for GSM, see *Example for BTS display* on p. 4.69.

Features The following checkboxes select the displayed mobile information:

Display UMTS Mobile Data
Show the serving cell, the active cell set and the neighbor cell set reported by the mobile using the colors selected below for the Node B sectors. The following display options are only effective if the mobile data is displayed.

Scan File for Mobile Data
Enables or disables the automatic scan for UMTS mobile data in the active measurement file.

Line to Active Sector
Draw lines between the mobile position and the active Node B sectors.

SC Layer
Show the scrambling codes of the serving cell using the color codes of the Color Settings *tab. The scrambling codes are visualized by means of a colored frame around the measurement curve; see Scrambling Code indication on p. 4.53.*

Active Set Spider
Draw temporary lines between the mobile position and the cell sectors in the active set. If Show History of Active Set *is active, the lines are no longer removed as the active set changes.*

Line Thickness Line thickness of the SC layer around the signal route and of the lines between the signal route and the active sector.

Colors Color of the serving cell, the cells in the active cell set and the cells in the neighbor cell set.

The *General Settings* tab of the *UMTS Layer* dialog selects display options that are either independent of the test device data or concern both the PNS and the mobile data.

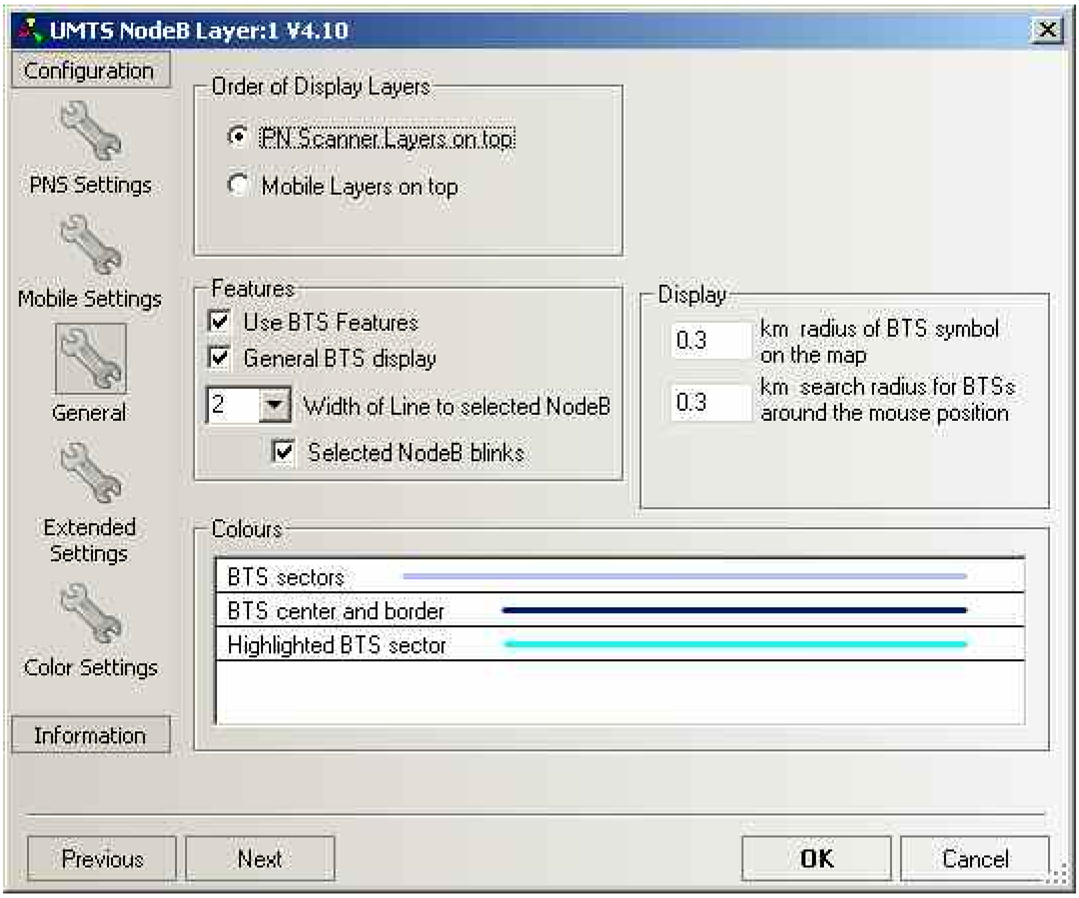


Fig. 4-42 UMTS NodeB Layer1 dialog: General Settings

Most of the *General Settings* are also provided for GSM layers; see figure on p. 4.69. The following settings are UMTS-specific:

Order of Display Layers Defines which one of the frames indicating the PNS and UMTS scrambling codes is laid over the other; see description of SC indication on p. 4.53.

Width of Line to selected NodeB If 0 (zero) is chosen, then no line will be drawn.

Selected NodeB blinks This feature can be switched on and off. Also the line will blink.

Color of Highlighted BTS sector Double click on the line in the list to change the color

The *Extended Settings* tab of the *UMTS Layer* dialog selects the serving cell lines to be drawn and defines their display options. It is identical to the *Extended Settings* tab of the *GSM BTS Layer* configuration menu; see Fig. 4-37 on p. 4.70. If *Display BTS Labels* is checked, every cell sector is labeled with its scrambling code (use e.g. *Attach Configuration Settings* to update the screen display).

The *Color Settings* tab of the *UMTS Layer* dialog is analogous to the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378. The dialog defines the colors of the SC frame around the measurement curve; see Scrambling Code indication on p. 4.53.

Attach Configuration Settings

Includes the current UMTS layer configuration in the measurement file.

The attached configuration settings can be re-used in a later replay session.

BTS Selection

Opens the *BTS Selection* dialog to select BTSs with particular properties.

The *BTS Selection* dialog offers a variety of options to select a subset of base stations in the BTS list with particular properties or position.

BTS Sectors: UMTS

For UMTS networks *BTS Selection* opens the following dialog:

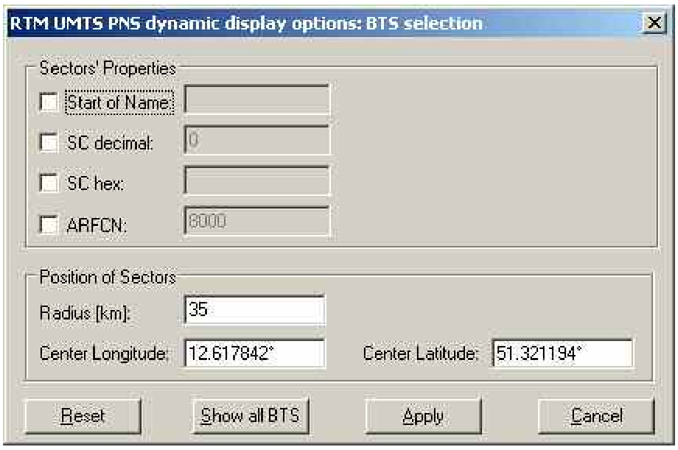


Fig. 4-43 BTS Selection dialog (UMTS networks)

Sectors' Properties

In the *Sectors' Properties* panel one or several of the following conditions can be set (click one of the option buttons and enter the desired value (name or integer number) in the input field on the right side):

Start of Name
: *Select BTS with a particular name or with a name starting with a particular combination of characters*

SC decimal
: *Select BTS sectors using a particular Primary Scrambling code (to be entered in decimal notation)*

SC hex
: *Select BTS sectors using a particular Primary Scrambling code (to be entered in hexadecimal notation)*

ARFCN
: *Absolute Radio Frequency Channel Number of the received DL signal. The carrier frequency is equal to* f = 0.2 MHz * ARFCN.

Note:
SC decimal and SC hex are alternative options and should not be activated at the same time.

Position of Sectors

The *Position of Sectors* panel defines a circle of variable size and position to limit the number of BTS symbols displayed in the *Route Track* view. BTSs outside the circle are not displayed. A small number of BTS symbols improve the system performance.

The size of the circle is defined by the *Radius [km]*. Its position is defined by the longitude and latitude coordinates of the center *(Center Longitude, Center Latitude)*. The default *Center Longitude* and *Center Latitude* are the coordinates of the pointer on the *Route Track* view when the context menu and the *BTS Selection* dialog were called up. The default radius corresponds to the maximum UMTS cell radius.

Reset

Reset the current display in the *Route Track* view; delete all BTS displayed (disabled during a measurement or replay).

Show all BTS in this area

Show all BTS from the BTS list in the *Route Track* view. With this button, the BTS can be viewed without starting a measurement or a replay session (disabled during a measurement or replay).

Apply

Apply the current condition.

Remove all BTSs from map

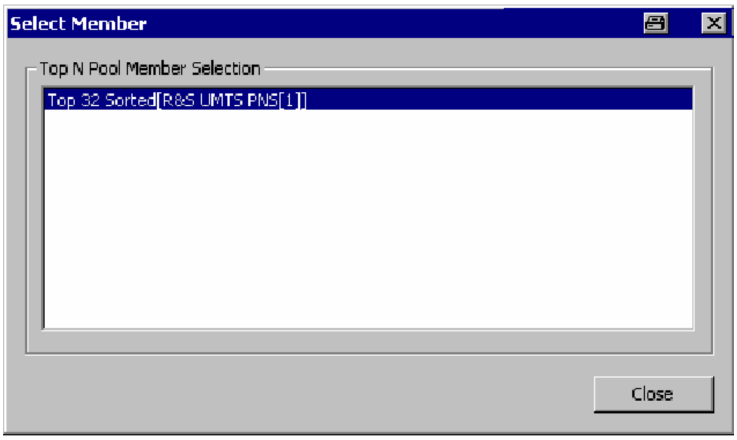
Removes all BTS symbols currently displayed.

A warning message must be confirmed before this command is executed. The function is disabled during a measurement or replay.

PNS: Top N Pool Member **Selection...**

Selects a member of the top N pool defined in the driver configuration menu.

The command opens a dialog with a list of all top N pool members available. The selected member is activated on closing the dialog. The scrambling code displayed in the PNS layer is the SC of the first element in the selected top N member.



PNS: Layers Invisible

Temporarily hide the entire PNS layer.

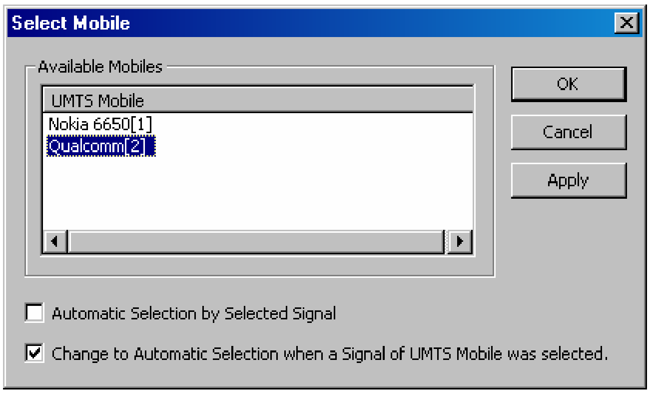
A checkmark before the command indicates that a PNS layer is currently available, but hidden. The layer reappears if the command is clicked for the second time.

Definition:
The PNS layer contains the frames around the signal tour for SC indication and the lines to the active sector but not the signal tour itself. The Node Bs are only displayed if either the PNS layer or the mobile layer (or both) are visible.
PNS Layers Invisible is disabled if the current view contains no PNS layer.

Mobile: Select Mobile

Select the mobile for which the mobile layer is displayed.

The *Select Mobile* dialog contains a list of all mobiles available in the current measurement.



The mobile layer indicates the serving cell for a mobile along the measurement tour; see *Mobile: Layers invisible* below. The checkmarks below the mobile list can be used to select one of the following alternative modes:

- *Automatic mobile layer selection* (upper box checked, lower box unavailable): The mobile layer always corresponds to the mobile that provided the selected signal. While a PNS signal is selected, the mobile layer is invisible so that the PNS layer can be displayed.
- *Automatic mobile layer selection while mobile signals are viewed* (upper box cleared, lower box checked): The mobile layer of the mobile selected in the list of *Available Mobiles* is displayed. This mobile layer is maintained if a PNS signal is selected. Selecting a signal from a UMTS mobile switches back to automatic mobile selection, so there can be no mismatch between a UMTS mobile signal an the mobile layer displayed in the *Route Track* view.
- *Fixed mobile layer* (upper and lower box cleared): The mobile layer of the mobile selected in the list of *Available Mobiles* is displayed, irrespective of the PNS or UMTS mobile signal selection.

Mobile: Layers Invisible

Temporarily hide the entire mobile layer.

A checkmark before the command indicates that a mobile layer is currently available, but hidden. The layer reappears if the command is clicked for the second time.

Definition:

The mobile layer contains the frames around the signal tour for scrambling code indication and the lines to the active sector but not the signal tour itself. The Node Bs are only displayed if either the PNS layer or the mobile layer (or both) are visible.
Mobile Layers Invisible is disabled if the current view contains no mobile layer.

CDMA BTS Layer Configuration

The submenu of the *CDMA BTS Layer* command in the *Route Track* context menu provides display settings for the CDMA base stations in the view.

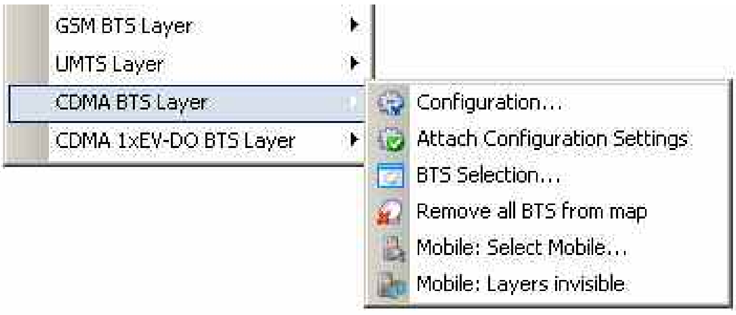


Fig. 4-44 CDMA BTS Layer submenu

Note:

Before any configurations can be made, a valid base station list must be imported and a BTS data base created. For CDMA base stations, this is done in the TEC for CDMA tab of the Configuration of Software Modules menu; refer to section Configuration Menu in chapter 3.

BTS display CDMA base stations are displayed in analogy to GSM or UMTS base stations; see section *GSM BTS Layer Configuration* on p. 4.68.

Configuration Opens the *CDMA BTS Layer* dialog to set the BTS display options.

The *cdma Settings* tab of the *CDMA BTS Layer* dialog defines the display options for CDMA and 1xEV-DO scanner data.

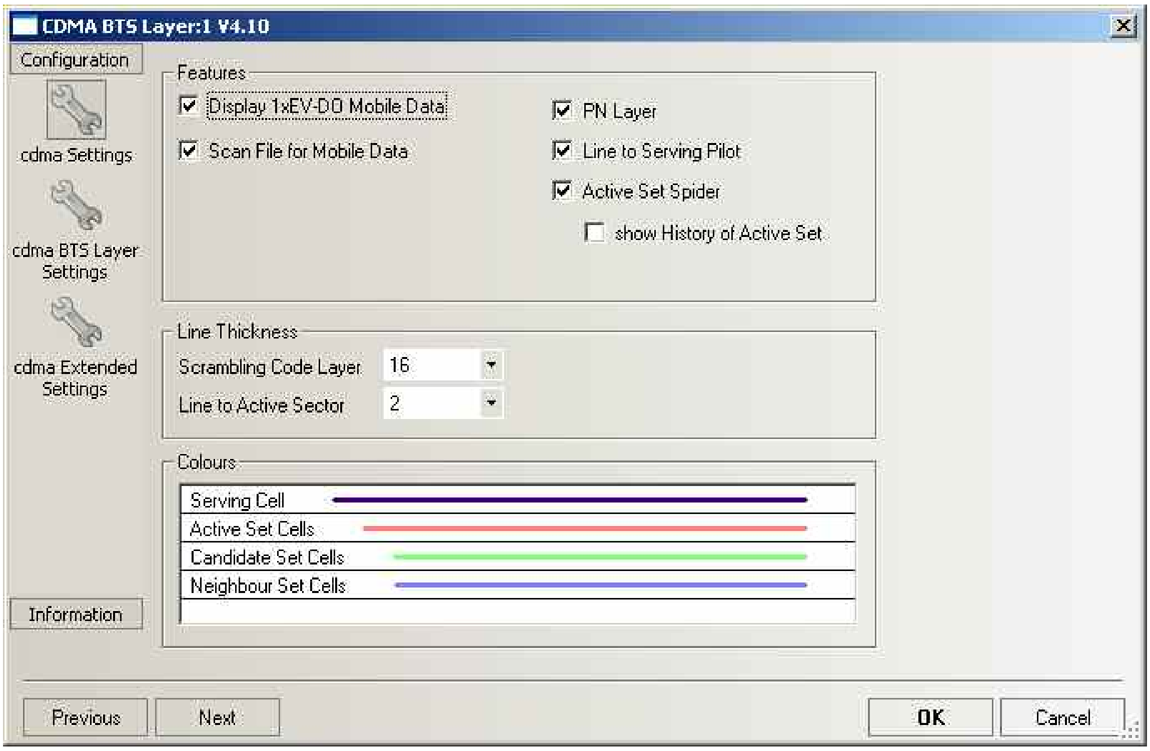
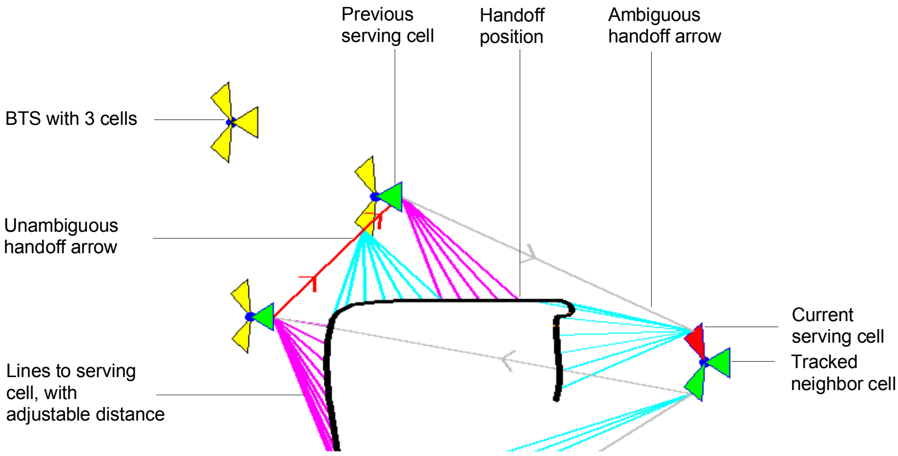


Fig. 4-45 CDMA BTS Layer dialog: cdma Settings

Example for BTS display

The dialog provides different display options for CDMA networks. They are best explained with an example.



The *cdma Settings* are analogous to the BTS layer configurations for GSM, see *Example for BTS display* on p. 4.69.

Features To improve the stability of the radio connection and the handoff procedures, a CDMA mobile may be connected to several base stations or BTS sectors at the same time (soft handoff). However, only the connecting lines to the current (i.e. the most recently connected) BTS sector are drawn. Due to this simplification, the visualization of a CDMA route track is similar to GSM.

The following display elements can be switched off individually or altogether:

Display 1xEV-DO Mobile Data
: *General display of the 1xEV-DO symbols, leaving only the symbols for the serving cells and for the cells being tracked.*

Scan File for Mobile Data
: *Enable or disable the automatic scan for mobile data in the active Measurement file.*

PN Layer
: *Hide or show the PN layer.*

Line to Serving Pilot
: *Draw lines to the current cell (serving pilot cells)*

Active Set Spider
: *Draw temporary lines between the mobile position and the cell sectors in the active set. If Show History of Active Set is active, the lines are no longer removed as the active set changes.*

Line Thickness Line thickness of the scrambling code layer and of the lines between the signal route and the active sector.

Colors Color of the active sector.

The *cdma BTS Layer Settings* tab of the *CDMA BTS Layer* dialog defines the general options for the BTS layer data.

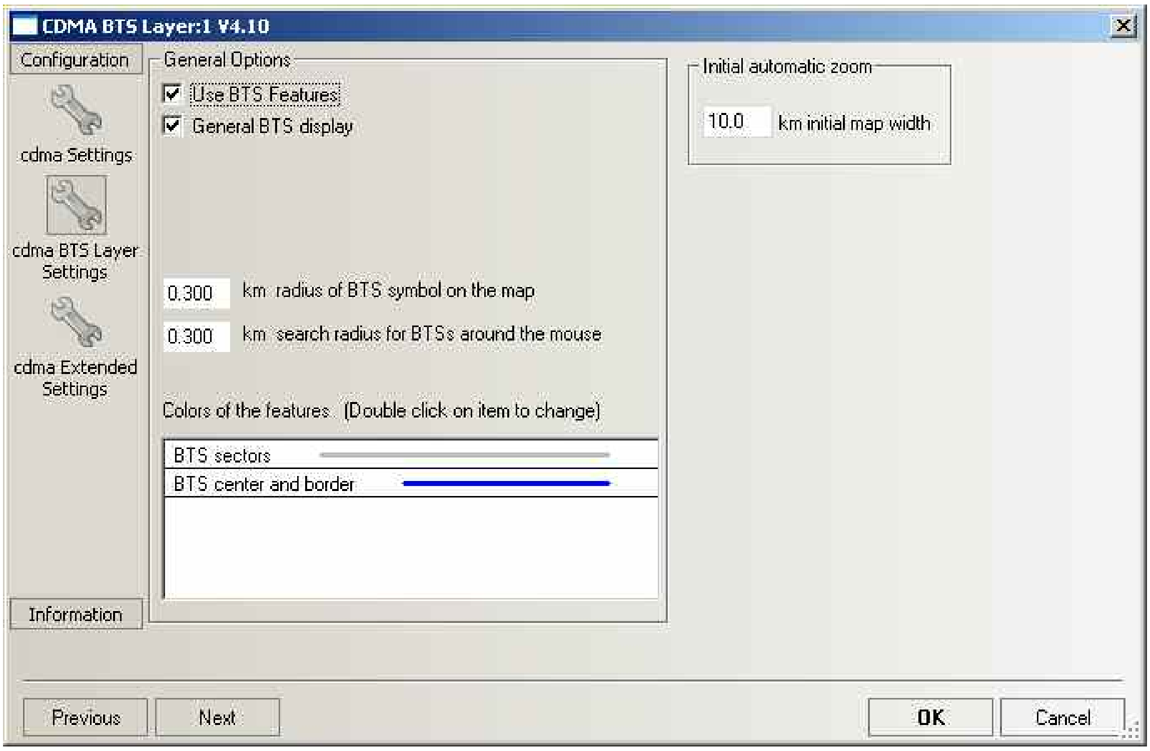


Fig. 4-46 CDMA BTS Layer dialog: cdma BTS Layer Settings

General Options In the *Features* panel the following display elements can be switched off individually or altogether *(Use BTS Features* cleared):

General BTS display
Enables or disables the general display of the BTS symbols, leaving only the symbols for the serving cells and for the cells being tracked

Radius of BTS symbol on the map
The size of the BTS symbol on the displayed map can be adjusted by entering a proportional symbol radius here. This is useful in measurement areas with a high BTS density to avoid symbol overlapping.

Search radius for BTSs around the mouse
The radius of the hot zone that can be clicked to open an info field can be adjusted.

Colors of the features The *Colors* panel changes the colors of the display elements. Double-clicking an element of the list opens the *Colors* dialog (see p. 4.392) to modify the current display color.

Initial automatic zoom The Initial automatic zoom panel contains an input field for the width of the Route Track view window. This setting is applied in a measurement session as soon as R&S ROMES receives the first position coordinates. The first measurement point also marks the center of the map.

The *cdma Extended Settings* tab of the *CDMA BTS Layer* dialog selects the cell lines to be drawn and defines their display options.

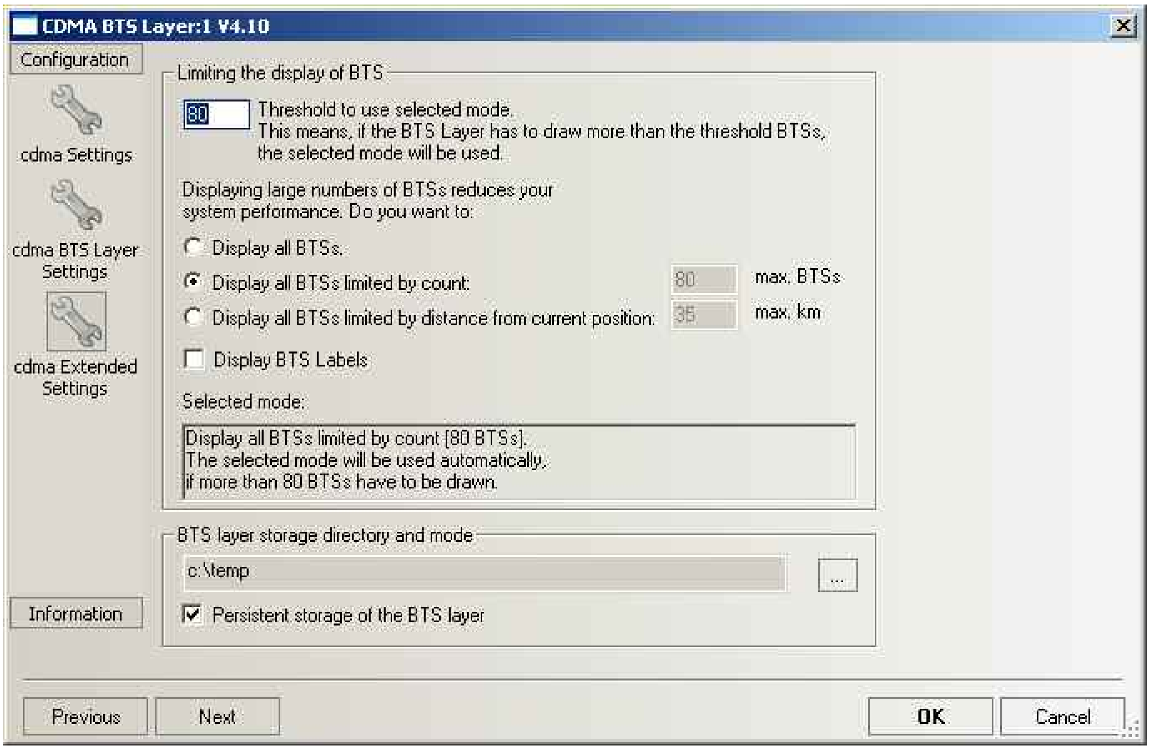


Fig. 4-47 CDMA BTS Layer dialog: cdma Extended Settings

BTS display limit

The Limiting the display of BTS panel contains an input field to limit the number of BTS symbols displayed in the Route Track view. A small number of BTS symbols improves the system performance.

R&S ROMES counts the number of BTS symbols to be drawn. A limiting condition is imposed as soon as this number exceeds the threshold set in the input field. Below the threshold, all symbols all drawn.

Display all BTSs
: *All BTS symbols displayed, i.e. no limiting condition set*

Display ... limited by count
: *Only a fixed number of BTS symbols around the current position are displayed. The fixed number is equal to the threshold value for the limiting condition.*

Display ... limited by distance
: *Only the BTS symbols within a given radius (between 1 km and 1000 km) around the current position are displayed.*

The limit settings are valid after an update of the BTS layer. R&S ROMES indicates the limiting condition set when updating the BTS layer.

BTS layer storage directory and mode

If the *Persistent storage of the BTS layer* box is checked, R&S ROMES stores the current BTS layer (containing all information on the BTS symbols to be displayed in the current view) to the directory indicated in the (unavailable) input field. This avoids reloading of the BTS list and recalculating of the layer when the workspace with the current *Route Track* view is opened for the next time.

The directory can be changed using the "..." button. This is particularly important if the BTS layer is stored to a RAM disk in order to improve the system performance.

Attach Configuration Settings

Includes the current CDMA BTS layer configuration in the measurement file.

The attached configuration settings can be re-used in a later replay session.

BTS Selection

Opens the *BTS Selection* dialog to select BTSs with particular properties or position.

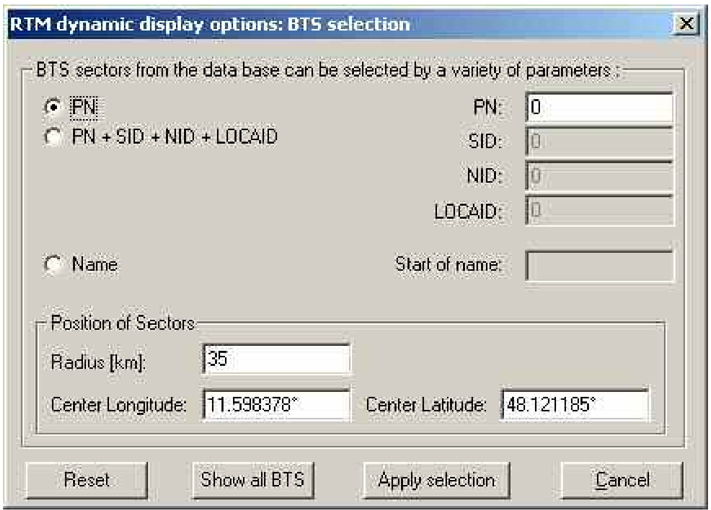


Fig. 4-48 BTS Selection dialog (CDMA networks)

Sector Properties

In the upper part of the dialog one or several of the following conditions can be set (click one of the option buttons and enter the desired value (name or integer number) in the input field on the right side):

PN
: *Select BTS with a particular pilot number*

PN+SID+NID+LOCAID
: *Pilot number plus system identity plus network identity plus location area identity*

Name
: *Select BTS with a particular name or with a name starting with a particular combination of characters*

Position of Sectors

The Position of Sectors panel defines a circle of variable size and position to limit the number of BTS symbols displayed in the Route Track view. BTSs outside the circle are not displayed. A small number of BTS symbols improves the system performance.

The size of the circle is defined by the *Radius [km]*. Its position is defined by the longitude and latitude coordinates of the center *(Center Longitude, Center Latitude)*. The default *Center Longitude* and *Center Latitude* are the coordinates of the pointer on the *Route Track* view when the context menu and the *BTS Selection* dialog was called.

Reset

Resets the current display in the *Route Track* view; delete all BTS displayed (disabled during a measurement or replay).

Show all BTS

Shows all BTS from the BTS list in the *Route Track* view. With this button, the BTS can be viewed without starting a measurement or a replay session (disabled during a measurement or replay).

Apply Selection

Apply the current condition.

Remove all BTS from map

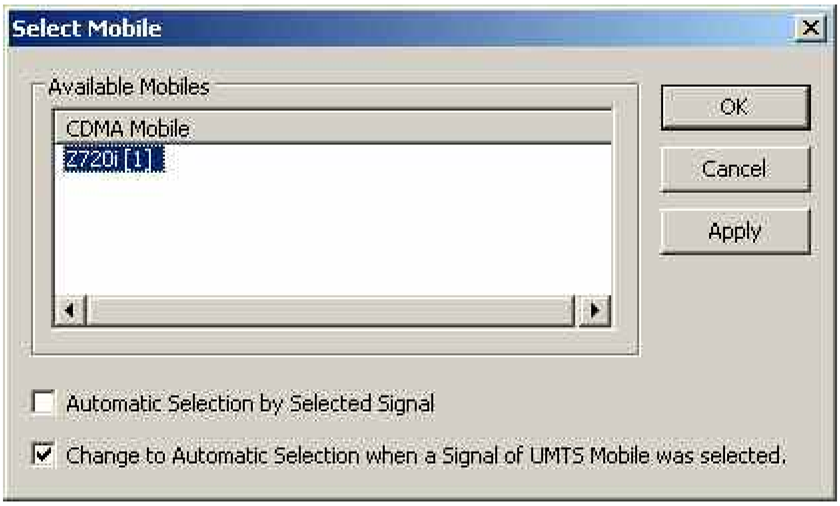
Removes all BTS symbols currently displayed.

A warning message must be confirmed before this command is executed. The function is disabled during a measurement or replay.

Mobile: Select Mobile...

Select the mobile for which the mobile layer is displayed.

The Select Mobile dialog contains a list of all mobiles available in the current measurement.



The mobile layer indicates the serving cell for a mobile along the measurement tour; see *Mobile: Layers invisible* below. The checkmarks below the mobile list can be used to select one of the following alternative modes:

Automatic Selection by Selected Signal

(upper box checked, lower box unavailable): The mobile layer always corresponds to the mobile that provided the selected signal. While a PNS signal is selected, the mobile layer is invisible so that the PNS layer can be displayed.

Change to Automatic Selection when a Signal of UMTS Mobile was selected
(upper box cleared, lower box checked): The mobile layer of the mobile selected in the list of Available Mobiles *is displayed. This mobile layer is maintained if a PNS signal is selected. Selecting a signal from a UMTS mobile switches back to automatic mobile selection, so there can be no mismatch between a UMTS mobile signal an the mobile layer displayed in the* Route Track *view.*

Fixed Mobile Layer
(upper and lower box cleared): The mobile layer of the mobile selected in the list of Available Mobiles *is displayed, irrespective of the mobile signal selection.*

Mobile: Layers invisible

Temporarily hide the entire BTS layer currently displayed.

A checkmark before the command indicates that a CDMA BTS layer is currently available, but hidden. The layer reappears if the command is clicked for the second time.

Layers Invisible is disabled if the current view contains no CDMA BTS layer.

CDMA 1xEV-DO BTS Layer Configuration

The submenu of the *CDMA 1xEV-DO BTS Layer* command in the *Route Track* context menu provides display settings for the *1xEV-DO* base stations in the view.

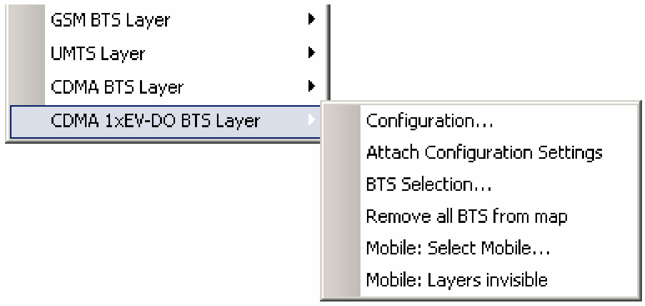


Fig. 4-49 CDMA 1xEV-DO BTS Layer submenu

Note:
Before any configurations can be made, a valid base station list must be imported and a BTS data base created. For CDMA base stations, this is done in the TEC for CDMA tab of the Configuration of Software Modules menu; refer to section Configuration Menu in chapter 3.

Configuration Opens the *CDMA 1xEV-DO BTS Layer* dialog to set the BTS display options.

The *cdma/1xEV-DO Settings* tab of the *CDMA BTS Layer* dialog defines the display options for 1xEV-DO scanner data.

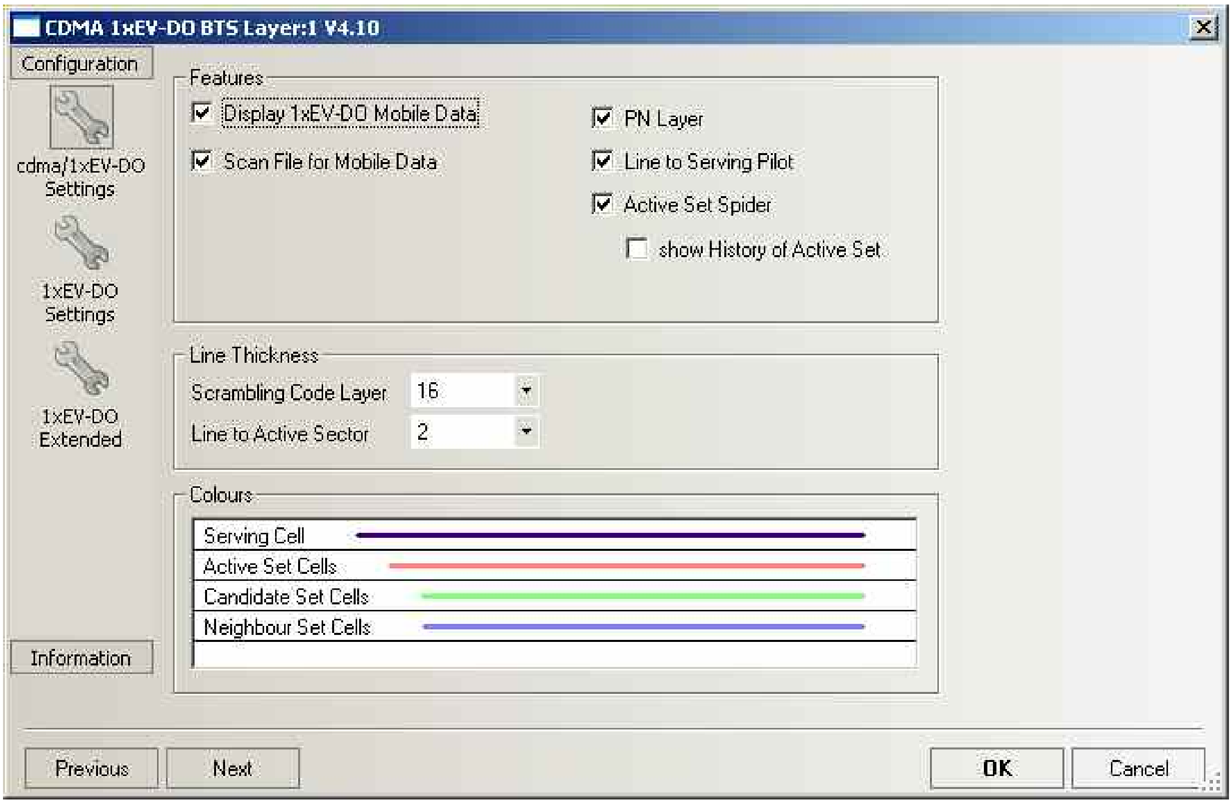


Fig. 4-50 CDMA 1xEV-DO BTS Layer dialog: cdma/1xEV-DO Settings

The *cdma/1xEV-DO Settings* are analogous to the BTS layer configurations for cdma BTS as described above:

Features To improve the stability of the radio connection and the handoff procedures, a 1xEV-DO mobile may be connected to several base stations or BTS sectors at the same time (soft handoff). However, only the connecting lines to the current (i.e. the most recently connected) BTS sector are drawn. Due to this simplification, the visualization of a CDMA/1xEV-DO route track is similar to GSM.

The following display elements can be switched off individually or altogether:

Display 1xEV-DO Mobile Data
General display of the 1xEV-DO symbols, leaving only the symbols for the serving cells and for the cells being tracked.

Scan File for Mobile Data
Enables or disables the automatic scan for mobile data in the active Measurement file.

PN Layer
*Hide or show the PN layer.*Line to Serving Pilot
Draw lines to the current cell (serving cells)

Active Set Spider
Draw temporary lines between the mobile position and the cell sectors in the active set. If Show History of Active Set *is active, the lines are no longer removed as the active set changes.*

Line Thickness Line thickness of the scrambling code layer and of the lines between the signal route and the active sector.

Colors Color of the active sector.

The *1xEV-DO Settings* tab of the *CDMA 1xEV-DO BTS Layer* dialog defines the general options for the BTS layer data.

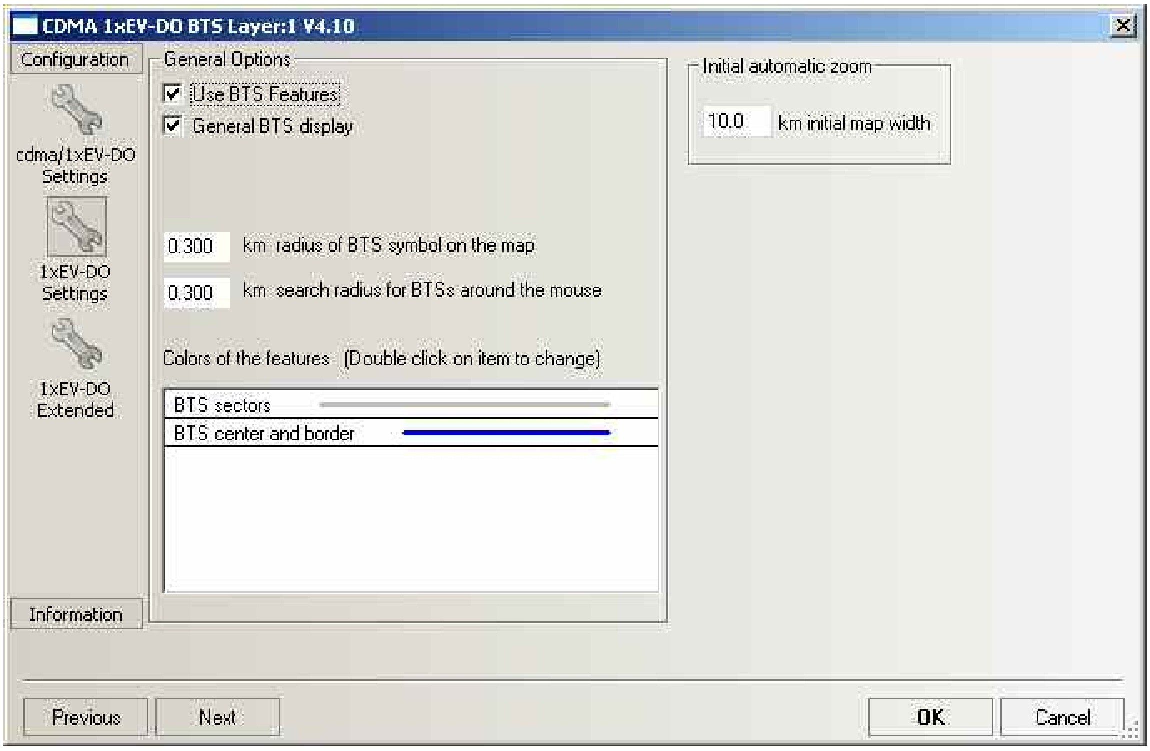


Fig. 4-51 CDMA 1xEV-DO BTS Layer dialog: 1xEV-DO Settings

General Options

In the *Features* panel the following display elements can be switched off individually or altogether *(Use BTS Features* cleared):

General BTS display
: *Enables or disables the general display of the BTS symbols, leaving only the symbols for the serving cells and for the cells being tracked*

Radius of BTS symbol on the map
: *The size of the BTS symbol on the displayed map can be adjusted by entering a proportional symbol radius here. This is useful in measurement areas with a high BTS density to avoid symbol overlapping.*

Search radius for BTSs around the mouse
: *The radius of the hot zone that can be clicked to open an info field can be adjusted.*

Colors of the features

The *Colors* panel changes the colors of the display elements. Double-clicking an element of the list opens the *Colors* dialog (see p. 4.392) to modify the current display color.

Initial automatic zoom

The Initial automatic zoom panel contains an input field for the width of the Route Track view window. This setting is applied in a measurement session as soon as R&S ROMES receives the first position coordinates. The first measurement point also marks the center of the map.

The *1xEV-DO Extended Settings* tab of the *CDMA 1xEV-DO BTS Layer* dialog selects the cell lines to be drawn and defines their display options.

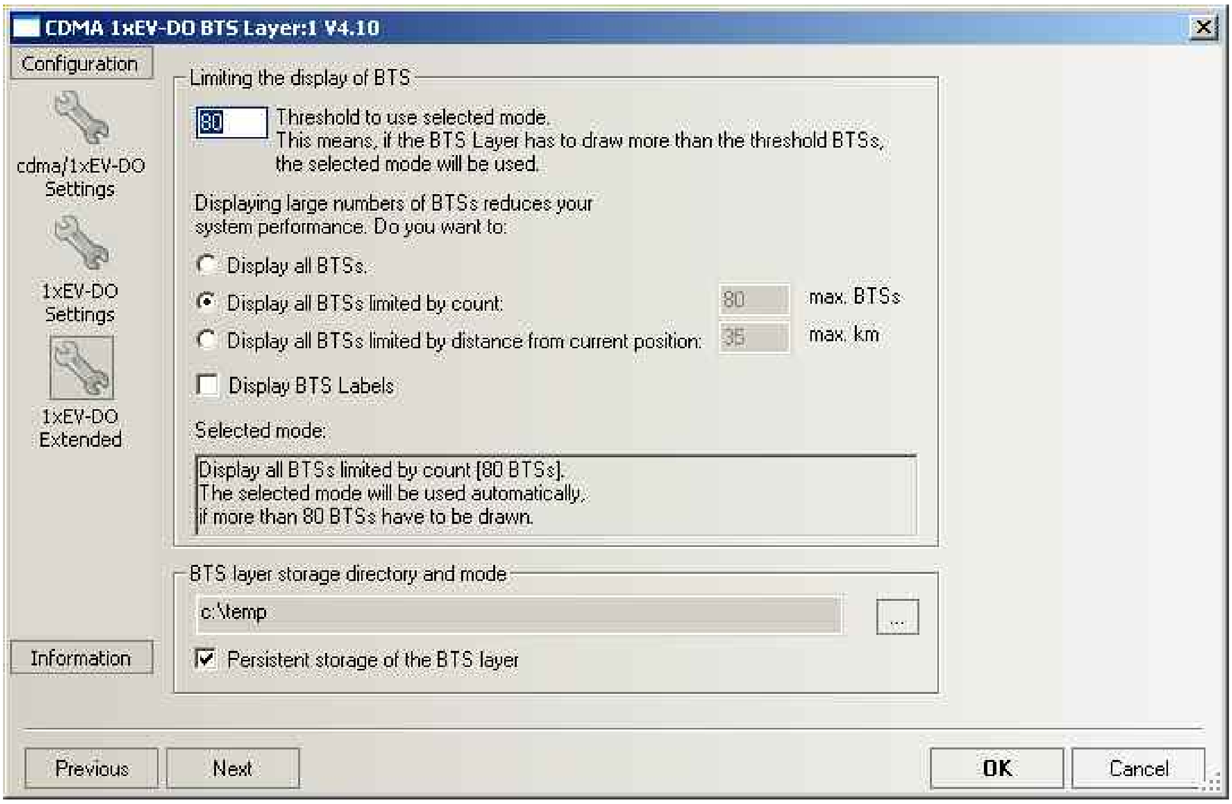


Fig. 4-52 CDMA 1xEV-DO BTS Layer dialog: 1xEV-DO Extended Settings

BTS display limit

The Limiting the display of BTS panel contains an input field to limit the number of BTS symbols displayed in the Route Track view. A small number of BTS symbols improves the system performance.

R&S ROMES counts the number of BTS symbols to be drawn. A limiting condition is imposed as soon as this number exceeds the threshold set in the input field. Below the threshold, all symbols all drawn.

Display all BTSs
: *All BTS symbols displayed, i.e. no limiting condition set*

Display ... limited by count
: *Only a fixed number of BTS symbols around the current position are displayed. The fixed number is equal to the threshold value for the limiting condition.*

Display ... limited by distance
: *Only the BTS symbols within a given radius (between 1 km and 1000 km) around the current position are displayed.*

The limit settings are valid after an update of the BTS layer. R&S ROMES indicates the limiting condition set when updating the BTS layer.

BTS layer storage directory and mode

If the *Persistent storage of the BTS layer* box is checked, R&S ROMES stores the current BTS layer (containing all information on the BTS symbols to be displayed in the current view) to the directory indicated in the (unavailable) input field. This avoids reloading of the BTS list and recalculating of the layer when the workspace with the current Route Track view is opened for the next time.

The directory can be changed using the "..." button. This is particularly important if the BTS layer is stored to a RAM disk in order to improve the system performance.

Attach Configuration Settings

Includes the current CDMA 1xEV-DO BTS layer configuration in the measurement file.

The attached configuration settings can be re-used in a later replay session.

BTS Selection

Opens the *BTS Selection* dialog to select BTSs with particular properties or position.

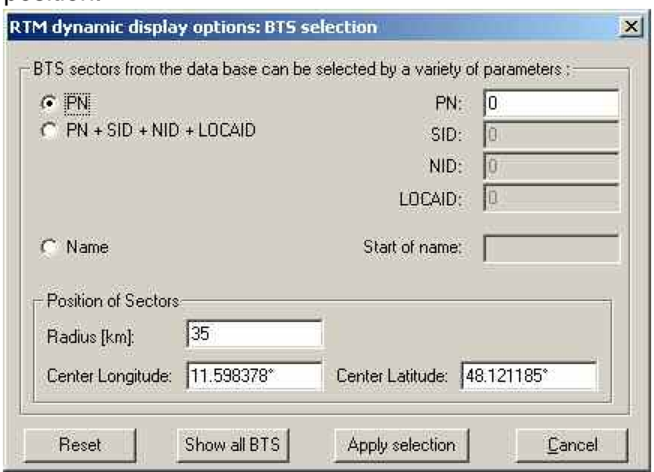


Fig. 4-53 BTS Selection dialog (CDMA 1xEV-DO networks)

Sector Properties

In the upper part of the dialog one or several of the following conditions can be set (click one of the option buttons and enter the desired value (name or integer number) in the input field on the right side):

PN
Select BTS with a particular pilot number

PN+SID+NID+LOCAID
Pilot number plus system identity plus network identity plus location area identity

Name
Select BTS with a particular name or with a name starting with a particular combination of characters

Position of Sectors

The *Position of Sectors* panel defines a circle of variable size and position to limit the number of BTS symbols displayed in the *Route Track* view. BTSs outside the circle are not displayed. A small number of BTS symbols improves the system performance.

The size of the circle is defined by the *Radius [km]*. Its position is defined by the longitude and latitude coordinates of the center *(Center Longitude, Center Latitude)*. The default *Center Longitude* and *Center Latitude* are the coordinates of the pointer on the *Route Track* view when the context menu and the *BTS Selection* dialog was called up.

Reset

Resets the current display in the *Route Track* view; delete all BTS displayed (disabled during a measurement or replay).

Show all BTS

Shows all BTS from the BTS list in the Route Track view. With this button, the BTS can be viewed without starting a measurement or a replay session (disabled during a measurement or replay).

Apply Selection

Applies the current condition.

Remove all BTS from map

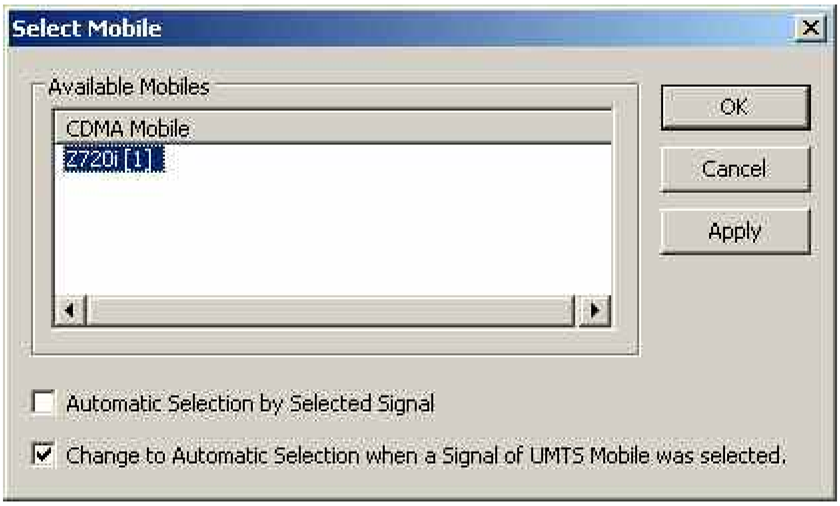
Removes all BTS symbols currently displayed.

A warning message must be confirmed before this command is executed. The function is disabled during a measurement or replay.

Mobile: Select Mobile...

Selects the mobile for which the mobile layer is displayed.

The Select Mobile dialog contains a list of all mobiles available in the current measurement.



The mobile layer indicates the serving cell for a mobile along the measurement tour; see *Mobile: Layers invisible* below. The checkmarks below the mobile list can be used to select one of the following alternative modes:

Automatic Selection by Selected Signal
: *(upper box checked, lower box unavailable): The mobile layer always corresponds to the mobile that provided the selected signal. While a PNS signal is selected, the mobile layer is invisible so that the PNS layer can be displayed.*

Change to Automatic Selection when a Signal of UMTS Mobile was selected
: *(upper box cleared, lower box checked): The mobile layer of the mobile selected in the list of* Available Mobiles *is displayed. This mobile layer is maintained if a PNS signal is selected. Selecting a signal from a UMTS mobile switches back to automatic mobile selection, so there can be no mismatch between a UMTS mobile signal an the mobile layer displayed in the* Route Track *view.*

Fixed Mobile Layer
: *(upper and lower box cleared): The mobile layer of the mobile selected in the list of* Available Mobiles *is displayed, irrespective of the mobile signal selection.*

Mobile: Layers invisible

Temporarily hide the entire BTS layer currently displayed.

A checkmark before the command indicates that a CDMA 1xEV-DO BTS layer is currently available, but hidden. The layer reappears if the command is clicked for the second time.

Layers Invisible is disabled if the current view contains no CDMA 1xEV-DO BTS layer.

2G/3G Views

2G/3G views can be used to view 2G (GSM) as well as 3G (UMTS) data. Some of the views evaluate processes that are independent of the technology (e.g. the NQA call statistics), others show information that is exchanged between the 3G and 2G systems to ensure interoperability (e.g. the layer 3 messages).

The 2G/3G *Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over 2G/3G *Views*.

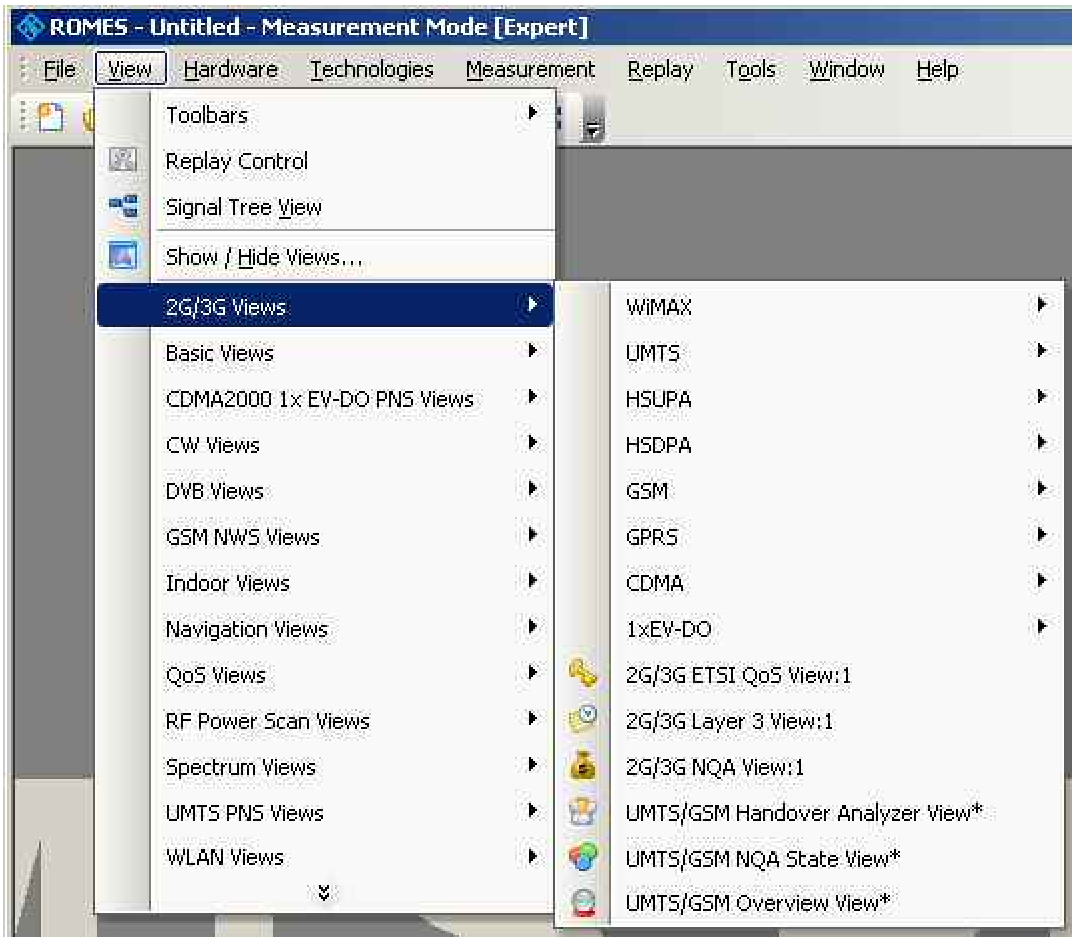


Fig. 4-54 2G/3G Views

UMTS HSUPA Views

The *UMTS HSUPA Views* display High Speed Uplink Packet Access (HSUPA)-specific information acquired with a UMTS test mobiles or data cards supporting HSUPA and using the UMTS driver. HSUPA measurements require option R&S ROMES3HUQ (Qualcomm). In general, recording of the different message types shown in the *UMTS Views* must be explicitly activated in the driver configuration menu:

- Enable UMTS HSUPA in the Configuration tab.
- Select the HSUPA node in the Expert Mode tab.

R&S ROMES supports the HSUPA test mobile TM7200 and data card prototypes.

The HSUPA views can be selected from a submenu displayed on the right side of the *View* menu when the mouse cursor hovers over *HSUPA*.

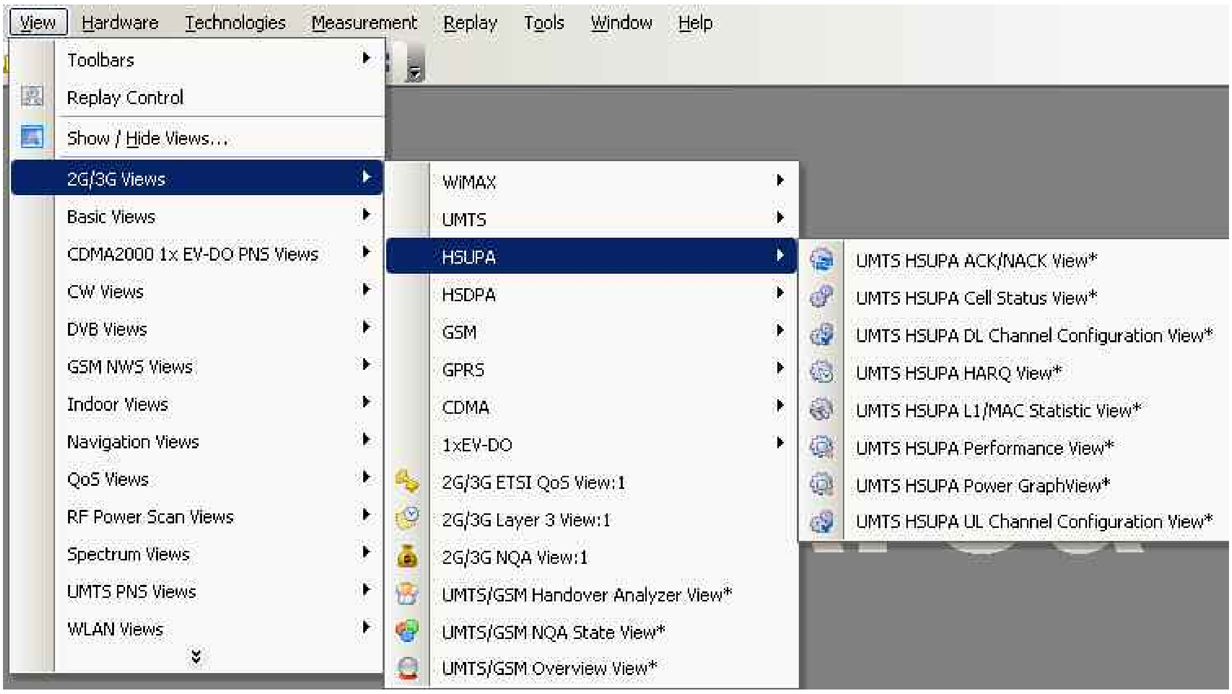


Fig. 4-55 UMTS HSUPA views

UMTS HSUPA Cell Status View

The Cell Status views show the events per TTI. Each column reflects one TTI. The background color corresponds to the Happy Bit (green = happy, red = unhappy, all other colors = DTX).

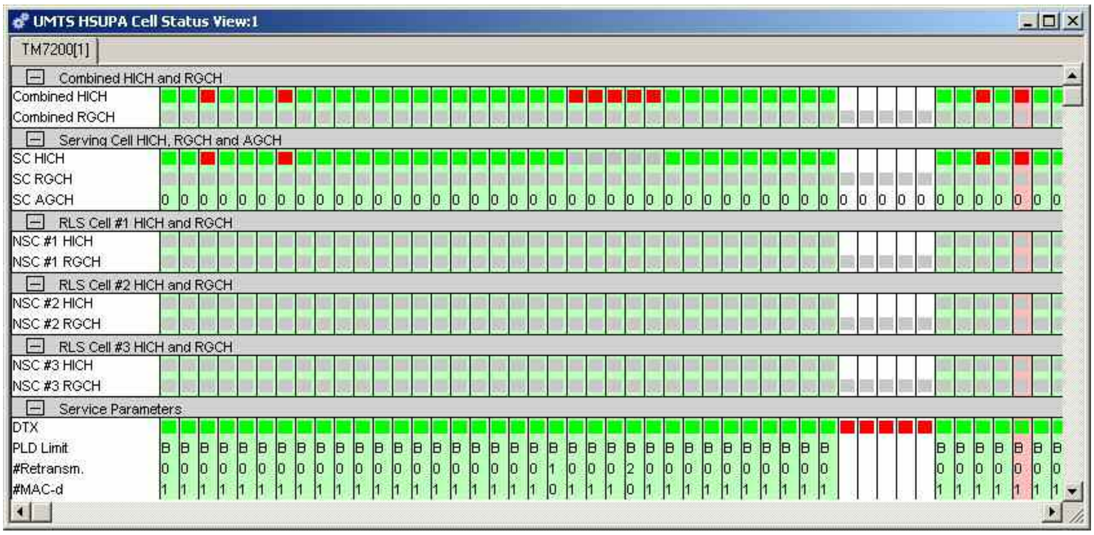


Fig. 4-56 UMTS HSUPA Cell Status View

The first two rows show the result of the combination of the received HICH and RGCH.

Combined HICH and RGCH

Each row of the sub-diagram shows one TTI. The chart contains the following results:

Combined HICH

The first row shows the result of the combination of the received Hybrid ARQ Indicator Channel (HICH).
The color of a square in the TTI data row shows the type of TTI data:

- Green ACK
- Red NACK
- Yellow DTX

The background color of the column represents the Happy Bit.

- Light green Happy Bit true
- Pink Happy Bit false
- White Happy Bit not set

This parameter shows whether or not the mobile is "happy". The mobile is considered happy if it can transmit the currently available data within a certain time frame signalled by an RRC message.

Combined RGCH

The second row shows the result of the combination of the received Relative Grant Channel (RGCH), where the color of the square indicates:

- Green: Up
- Red Down
- Yellow Hold
- Gray no RGCH received

Serving Cell HICH, RGCH and AGCH

The sub-diagram shows the same values and colors described for the Combined HICH and RGCH on a cell basis, in this case for the serving cell (SC).

The chart contains the following results:

SC HICH
: *The background and square colors are identical to those described for* Combined HICH *above.*

SC RGCH
: *The background and square colors are identical to those described for* Combined RGCH *above.*

SC AGCH
: *This additional row shows the Absolute Grant channel (AGCH) values which were transmitted in a certain TTI.*

RLS Cell #<nr.> HICH and RGCH

The sub-diagram shows the same values and colors described for the Combined HICH and RGCH on a cell basis, in this case for a non-serving cell (NSC), where #<nr.> could be #1, #2, or #3.

The chart contains the following results:

NSC #<nr.> HICH
: *The background and square colors are identical to those described for* Combined HICH *above.*

NSC #<nr.> RGCH
: *The background and square colors are identical to those described for* Combined RGCH *above.*

Service Parameters

The last sub-diagram shows additional parameters for the given TTIs.

The chart contains the following results:

DTX
: *Discontinuous transmission (green = true, red = false)*

PLD Limit
: *Reason for the limitation of the throughput as described for the* Payload Limit *of the* UMTS HSUPA Performance View. *(P = Power Rate, S = Serving Grant limit, B = Buffer Occupancy, M = MUX restricted, H = HARQ restricted).*

Retransmissions
: *The number of retransmissions.*

 # MAC-d
: *The number of Medium Access Control entities handling dedicated transport channels*

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, to put the view on hold, create or delete views, or to copy the current view to the clipboard, or move to another worksheet; see *Context menu* description on p. 4.2.

The *UMTS HSUPA Cell Status View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

UMTS HSUPA Performance View

The *UMTS HSUPA Performance View* contains four preconfigured 2D charts. The signals in these charts are related to the transmission performance, given in terms of the requested or achieved data throughput.

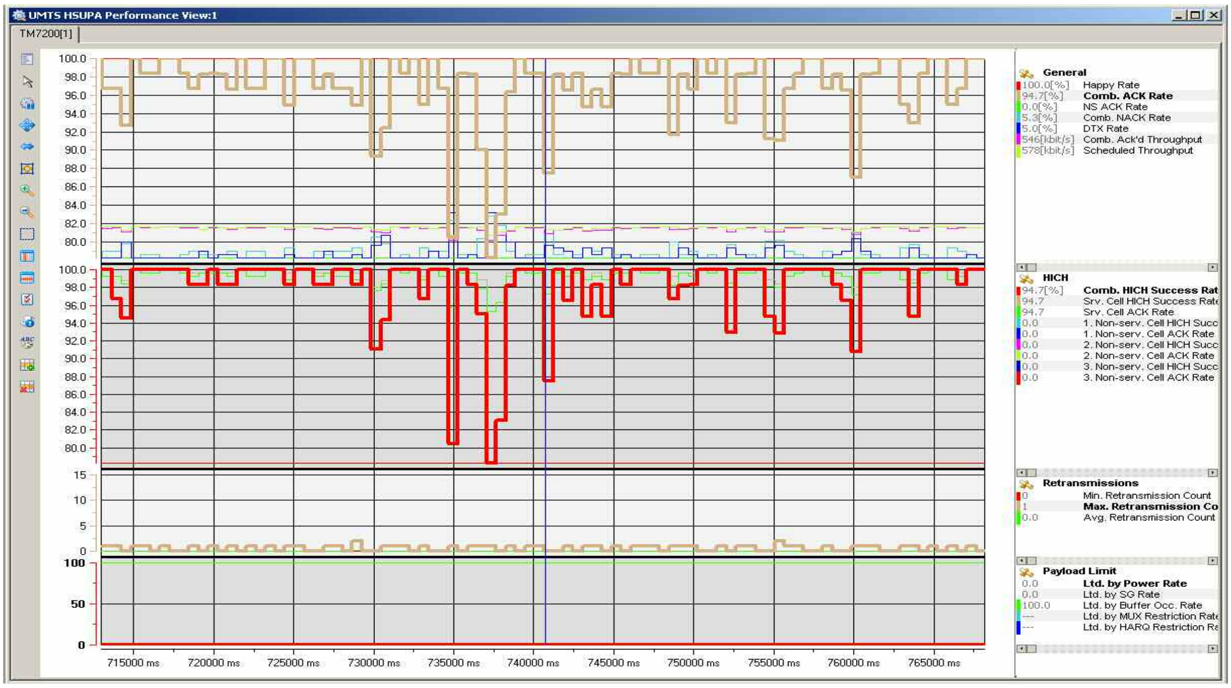
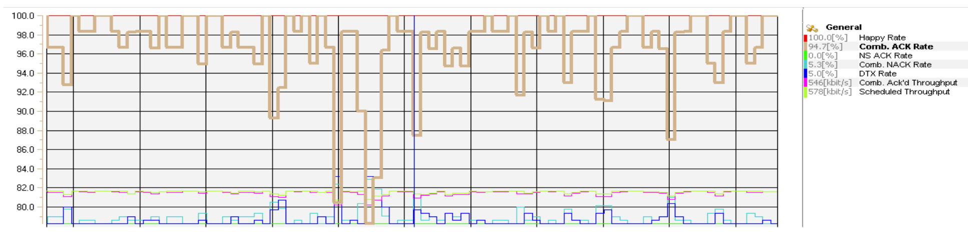


Fig. 4-57 UMTS HSUPA Performance View

A double-click on the title bars of the sub-diagrams opens or closes them in the performance view. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.9, however, an additional *Plot* dialog (see below) provides additional settings to control the diagram content and appearance.

General

The *General sub*-diagram shows the most important parameters regarding throughput.



The chart contains the following results:

Happy Rate

This parameter shows whether or not the mobile is "happy". The mobile is considered happy if it can transmit the currently available data within a certain time frame signaled by an RRC message.

Comb. ACK Rate

The rate of acknowledged TTIs. A TTI is counted as acknowledged when the corresponding combination of the different HICH of the radio link set results in an ACK.

NS ACK Rate

The rate of TTIs which were acknowledged by "other cell", which are not belonging to the radio link set.

Comb. NACK Rate

The combined NACK rate is calculated as
`100% - Comb. ACK Rate`

DTX Rate

Rate of TTIs in which no data was transmitted.

Comb. ACK'd Throughput

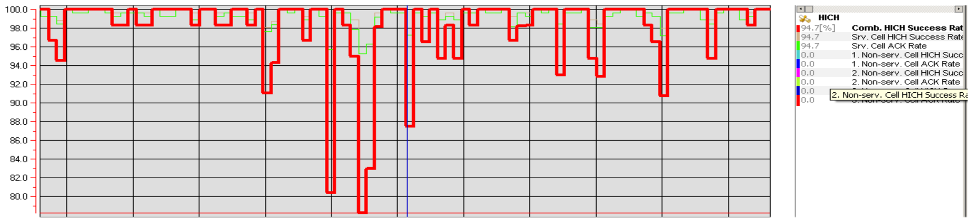
Data throughput based on the transport block sizes of the acknowledged TTIs.

Scheduled Throughput

Data throughput based on the transport block sizes of sent TTIs.

HICH

The *HICH sub*-diagram shows information about the Hybrid ARQ Indicator Channel (HICH) of the related cells in the radio link set.



The chart contains the following results:

Comb. HICH Success Rate

Rate of the successful reception of HICH information of one of the cells, which belong to the radio link set.

Srv. Cell HICH Success Rate

Rate of the successful reception of HICH information of the serving cell.

Srv. Cell ACK Rate

Rate of the successful reception of acknowledged TTIs of the serving cell.

1. Non-serv. Cell HICH Success Rate

Rate of the successful reception of HICH information of the first non-serving cell.

1. Non-serv. Cell ACK Rate

Rate of the successful reception of acknowledged TTIs of the first non-serving cell.

2. Non-serv. Cell HICH Success Rate

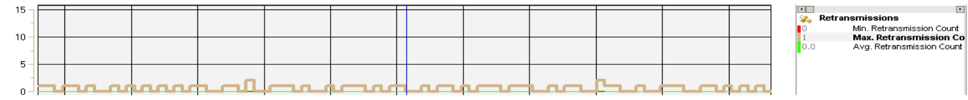
Rate of the successful reception of HICH information of the second non-serving cell.

2. Non-serv. Cell Rate

Rate of the successful reception of acknowledged TTIs of the second non-serving cell.

Retransmissions

The *Retransmissions* sub-diagram shows the minimum, average, and maximum number of retransmissions within the update rate.



The chart contains the following results:

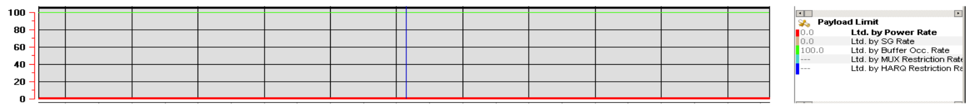
Min. Retransmission Count
: *Counter for the minimum number of retransmissions.*

Max. Retransmission Count
: *Counter for the maximum number of retransmissions.*

Avg. Retransmission Count
: *Calculated average number of retransmissions.*

Payload Limit

The *Payload Limit sub*-diagram shows information about the reasons of the throughput limitation. Qualcomm specified the values 0, 1, 2, 3 and 4.



The chart contains the following results:

Ltd. by Power Rate
: *The max. allowed transmit power limits the throughput.*

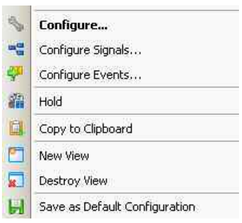
Ltd. by SG Rate
: *The current serving grant limits the throughput.*

Ltd. by Buffer Occ. Rate
: *The data buffer in the mobile is empty. There is no more data to transmit.*

Ltd. by MUX
: *The current multiplexer limits the throughput.*

Ltd. by HARQ
: *The current HARQ process limits the throughput.*

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, to put the view on hold, to copy the view contents to the clip-board, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

UMTS HSUPA Performance View Configuration

The *UMTS HSUPA Performance View* configuration menu scales the axes of the chart and defines its contents and its appearance. All controls are also available in the *Chart Configuration* tab of the *2D Chart Configuration* menu and have the same effect; see figure on p. 4.16.

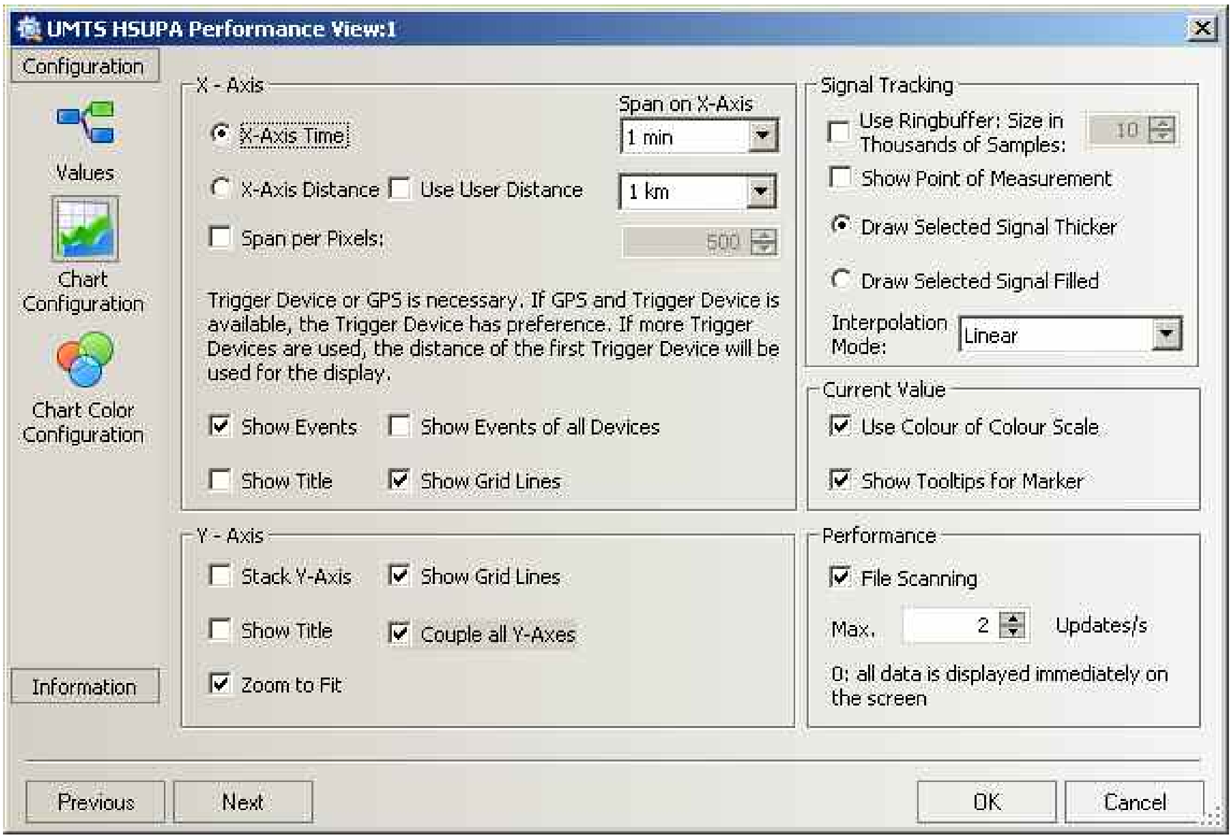


Fig. 4-58 UMTS HSUPA Performance View - Configuration

UMTS HSUPA DL Channel Configuration View

The *UMTS HSUPA DL Channel Configuration View* shows the most important DL parameters of the active HSUPA connections, which were transmitted in the corresponding RRC messages. The power offset table shows the basic information on which the transmit power calculation of the mobile is based on. For detailed information please refer to TS25.331 and TS25.212.

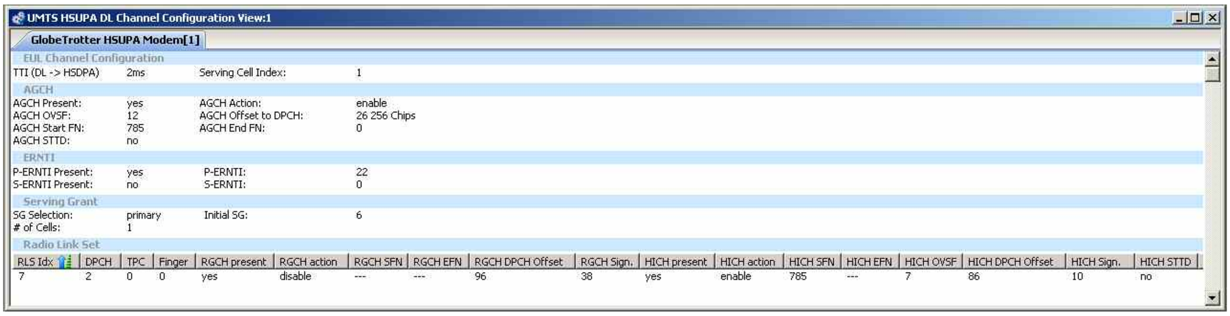


Fig. 4-59 UMTS HSUPA UL Channel Configuration View

The channel configuration data is displayed in different panels.

EUL Channel Configuration

The following EUL (Enhanced Uplink) channel information is displayed in the view:

TTI (DL -> HSDPA)
Transmission Time Interval for the E-DCH. The standard 3GPP TS 25.321 allows a TTI of e.g. 2 ms.

Serving Cell Index
Serving cell index in the range 0 to 7.

AGCH

The following information is related to the Absolute Grant Channel (AGCH). This channel carries the absolute grants for uplink DCH scheduling.

AGCH Present
Indicates the presence of the Absolute Grant Channel

AGCH Action
Enabled or disabled

AGCH OVSF
Orthogonal Variable Spreading Factor of the Absolute Grant Channel

AGCH Offset to DPCH
The offset (in chips) between AGCH and the Dedicated Physical Channel

AGCH Start FN
Frame number of the AGCH start frame

AGCH End FN
Frame number of the AGCH end frame

AGCH STTD
Space/Time Transmit Diversity scheme used for the AGCH

ERNTI

The following information is related to the primary and secondary Enhanced Radio Network Temporary Identity (P-ERNTI and S-ERNTI).

P-ERNTI Present
Indicates the presence of the primary ERNTI

P-ERNTI
Primary ERNTI number

S-ERNTI Present
Indicates the presence of the secondary ERNTI

S-ERNTI
Secondary ERNTI number

SG Selection
Indicates the use of the primary or secondary serving grant

Initial SG
Identifier of the initial service grant

# of Cells
Number of cells

Radio Link Set

The *Radio Link Set* panel contains a table with information related to RLS and the relative grant channel:

RLS Idx
: *Radio Link Set (RLS) index*

DPCH
: *DPCH channel*

TPC
: *TPC Index*

Finger
: *Reference Finger*

RGCH present
: *Relative Grant Channel (RGCH) is present (yes/no)*

RGCH action
: *RGCH action is enabled or disabled*

RGCH SFN
: *RGCH Start Frame Number (SFN)*

RGCH EFN
: *RGCH End Frame Number (EFN)*

RGCH DPCH Offset
: *Relative Grant Channel DPCH Offset*

RGCH Sign.
: *Relative Grant Channel Signature*

HICH present
: *Hybrid Indicator Channel (HICH) is present (yes/no)*

HICH action
: *Hybrid Indicator Channel action is enabled or disabled*

HICH SFN
: *HICH Start Frame Number (SFN)*

HICH EFN
: *HICH End Frame Number (EFN)*

HICH OVSF
: *Orthogonal Variable Spreading Factor of the Hybrid Indicator Channel*

HICH DPCH Offset
: *Hybrid Indicator Channel DPCH Offset*

HICH Sign.
: *Hybrid Indicator Channel Offset*

HICH STTD
: *Hybrid Indicator Channel Space/Time Transmit Diversity scheme*

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, to put the view on hold, copy the view contents to the clipboard, create new views, or save the current configuration; see *Context menu* description on p. 4.2.

UMTS HSUPA DL Channel Configuration View Configuration

The UMTS HSUPA DL Channel Configuration View configuration menu defines the list elements for the Radion Link Set (RLS) table and shows information on the current view version. It is opened via a right mouse click on a point inside the UMTS HSUPA DL Channel Configuration View or via the *Tools - Modules Configuration...* command (see chapter 3).

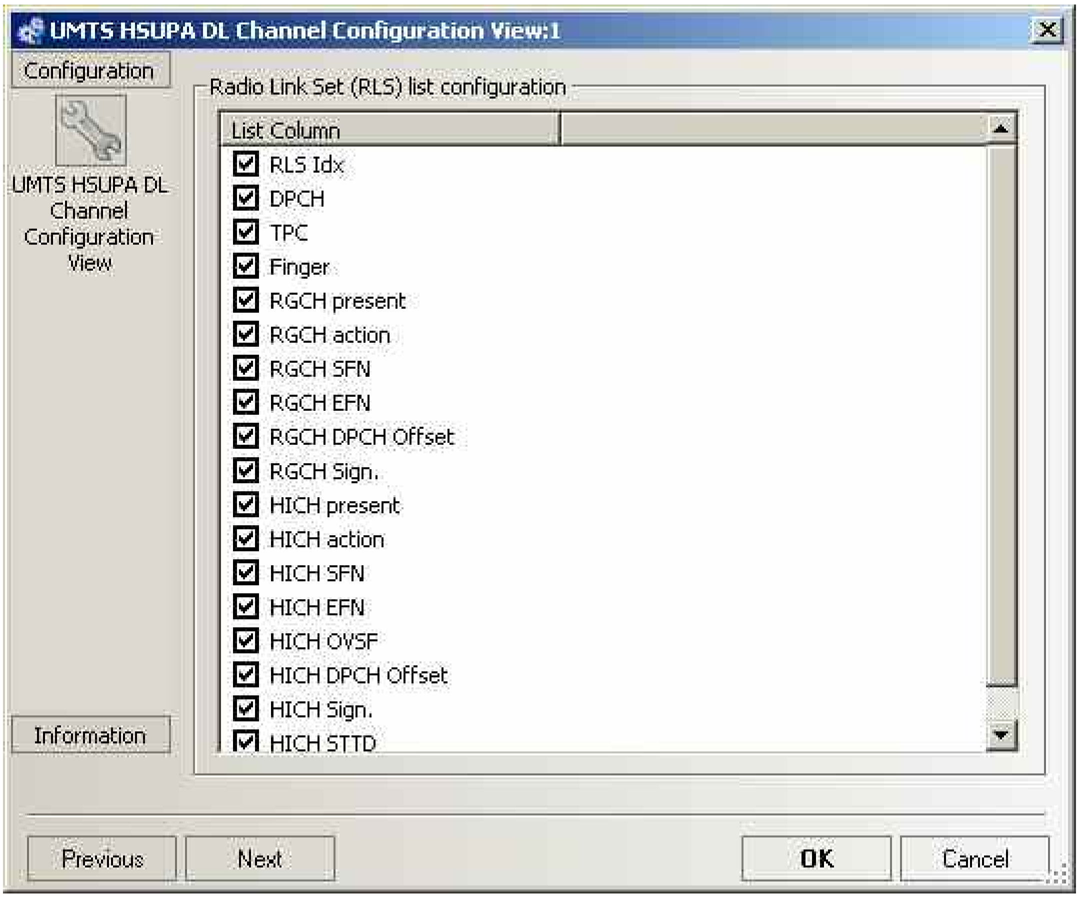


Fig. 4-60 UMTS HSUPA DL Channel Configuration View - Configuration

The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

UMTS HSUPA UL Channel Configuration View

The *HSUPA UL Channel Configuration View* shows the most important UL parameters of the active HSUPA connections, which were transmitted in the corresponding RRC messages. Configuration of MAC-e and MAC flows is included in the view. The power offset table shows the basic information on which the transmit power calculation of the mobile is based on. For detailed information please refer to TS25.331 and TS25.212.

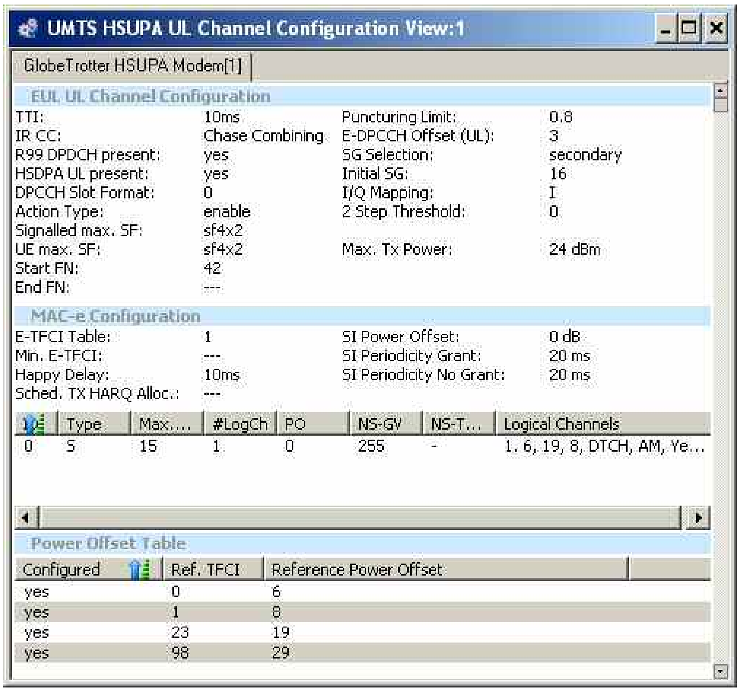


Fig. 4-61 UMTS HSUPA UL Channel Configuration View

The channel configuration data is displayed in different panels.

EUL ULChannel Configuration

The following EUL (Enhanced Uplink) UL channel information is displayed in the view:

TTI
: *Transmission Time Interval for the E-DCH. The standard 3GPP TS 25.321 allows a TTI of e.g. 2 ms, which is one HSUPA sub frame comprising 3 slots*

Puncturing Limit
: *Uplink puncturing limit, limits the amount of puncturing that can be applied in order to minimize the number of physical channels.*

IR CC
: *Incremental Redundancy (IR) or Chase Combining (CC) shows the HARQ combining scheme.*

E-DPCCH Offset (DPCCH)
: *E-DPCCH power offset in dB.*

R99 DPDCH present
: *Indicates the presence of Release 99 DPDCH.*

SG Selection
: *Indicates a primary (or other) service grant.*

HSDPA UL present
: *Indicates the presence of an HSDPA uplink channel*

Initial SG
Identifier of the initial service grant

DPCCH slot format
Shows the DPCCH slot format (0 to 3)

I/Q Mapping
1 for I, 0 for Q

Action type
Shows whether or not the action type is enabled

2 Step Threshold
Value of 2-index-step threshold to set the serving grant.

Signaled max. SF
Max. spreading factor of the channel.

UE max. SF
Max. spreading factor of the UE

Max. Tx Power
Maximum transmission power in dBm

Start FN
Frame number of the start frame

End FN
Frame number of the AGCH end frame

MAC-e Configuration

Following information is displayed in the MAC-e Configuration:

E-TFCI Table
Transport Format Combination Indicator Table for E-DCH.

Min. E-TFCI
Minimum E-TFCI

Happy Delay
Time until the UE sends a Happy Bit.

Sched. TX HARQ Alloc.
Scheduled TX HARQ Process Allocation

SI Power Offset
Power of Scheduling Information

SI Periodicity Grant
Scheduling Information periodicity if Grant is available

SI Periodicity No Grant
Scheduling Information periodicity if No Grant is available

The table in the MAC-e configuration displays following Logical Channel information

ID
: Mac Flow Id

Type
: Grant Type (S: Scheduled, NS: Non-scheduled*)*

Max.ReTx
: Maximum number of retransmissions

#LogCh
: Number of Logical Channels

PO
: E-DCH MAC Power Offset

NS_GV
: Non scheduled Grant Value (Value range: 0 -19982)

NS-TX-H-A
: Non scheduled TX HARQ process allocation

Logical Channels
: Radio Bearer ID, LogCh ID, Priority, Type, RLC Mode, Incl. in SI, # of PDU Sizes

Power offset table The *Power offset table* contains the measured TCFI power offset data for the available E-TCFIs.

Configured
: *Indicates whether or not the related Reference E-TFCI is configured.*

Ref. TFCI
: *Reference E-TFCI number.*

Reference Power Offset
: *Ref. Power Offset (in dBm).*

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, to put the view on hold, copy the view contents to the clipboard, create new views, or save the current configuration; see *Context menu* description on p. 4.2.

UMTS HSUPA UL Channel Configuration View Configuration

The UMTS HSUPA UL Channel Configuration View configuration menu defines the list elements for the Radion Link Set (RLS) table and shows information on the current view version. It is opened via a right mouse click on a point inside the UMTS HSUPA UL Channel Configuration View or via the *Tools - Modules Configuration...* command (see chapter 3).

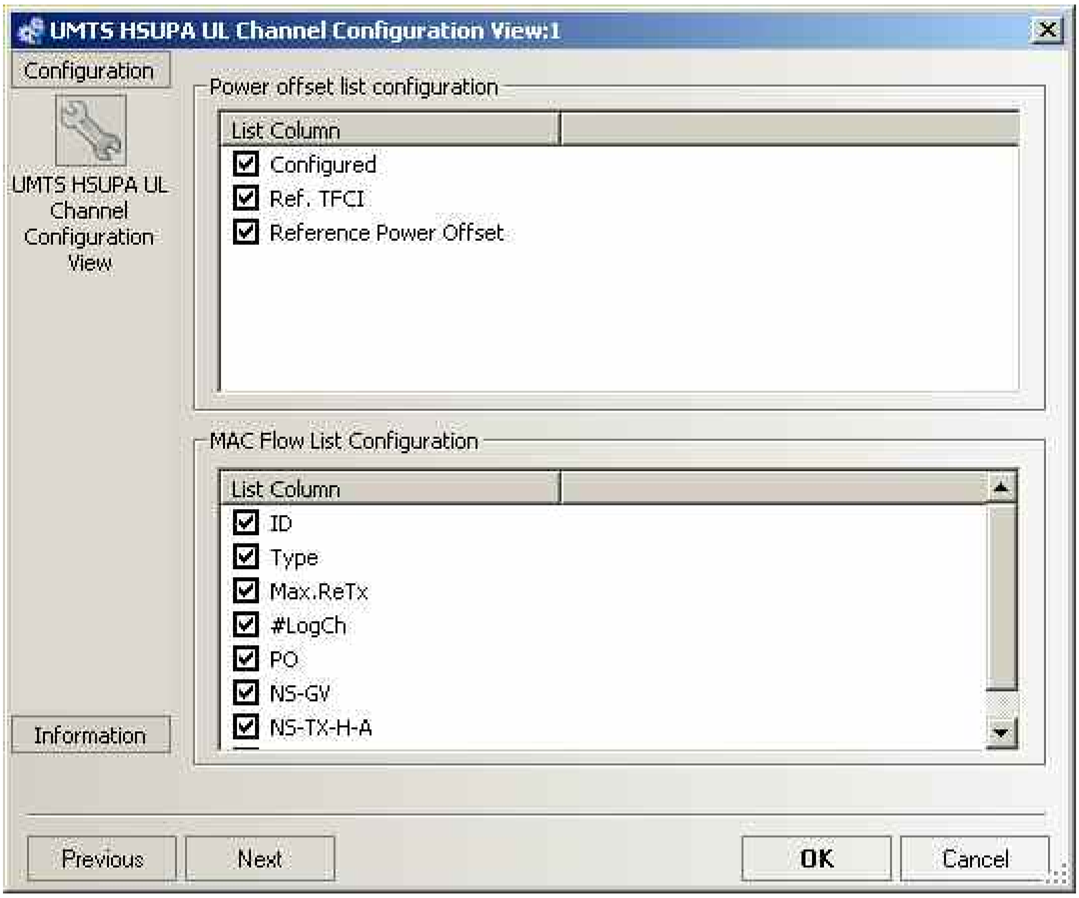
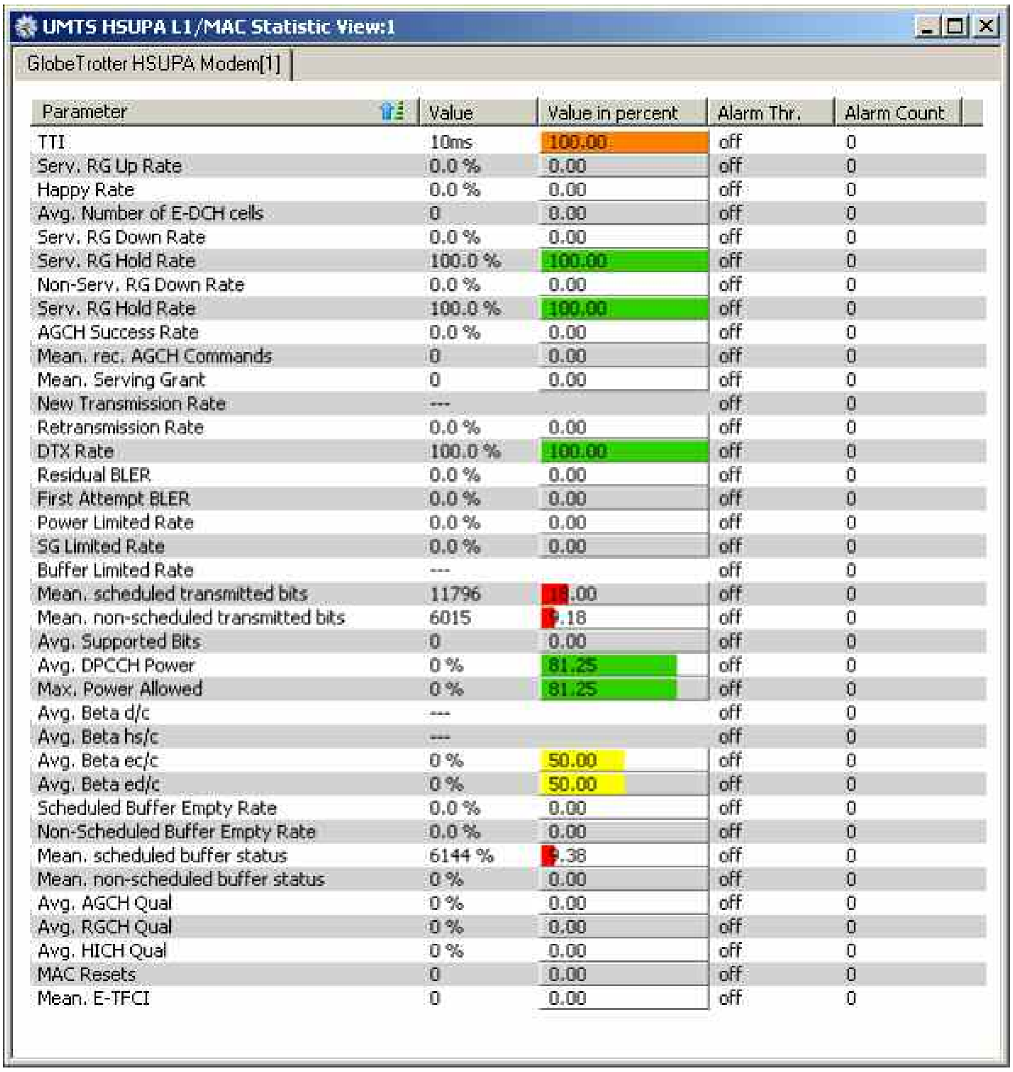


Fig. 4-62 UMTS HSUPA UL Channel Configuration View - Configuration

The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

UMTS HSUPA L1/MAC Statistic View

The *UMTS HSUPA L1/MAC Statistic View* shows a configurable selection of the statistics parameters provided by the mobile itself.



UMTS HSUPA L1/MAC Statistic View:1

GlobeTrotter HSUPA Modem[1]

Parameter	Value	Value in percent	Alarm Thr.	Alarm Count
TTI	10ms	100.00	off	0
Serv. RG Up Rate	0.0 %	0.00	off	0
Happy Rate	0.0 %	0.00	off	0
Avg. Number of E-DCH cells	0	0.00	off	0
Serv. RG Down Rate	0.0 %	0.00	off	0
Serv. RG Hold Rate	100.0 %	100.00	off	0
Non-Serv. RG Down Rate	0.0 %	0.00	off	0
Serv. RG Hold Rate	100.0 %	100.00	off	0
AGCH Success Rate	0.0 %	0.00	off	0
Mean. rec. AGCH Commands	0	0.00	off	0
Mean. Serving Grant	0	0.00	off	0
New Transmission Rate	---		off	0
Retransmission Rate	0.0 %	0.00	off	0
DTX Rate	100.0 %	100.00	off	0
Residual BLER	0.0 %	0.00	off	0
First Attempt BLER	0.0 %	0.00	off	0
Power Limited Rate	0.0 %	0.00	off	0
SG Limited Rate	0.0 %	0.00	off	0
Buffer Limited Rate	---		off	0
Mean. scheduled transmitted bits	11796	18.00	off	0
Mean. non-scheduled transmitted bits	6015	9.18	off	0
Avg. Supported Bits	0	0.00	off	0
Avg. DPCCH Power	0 %	81.25	off	0
Max. Power Allowed	0 %	81.25	off	0
Avg. Beta d/c	---		off	0
Avg. Beta hs/c	---		off	0
Avg. Beta ec/c	0 %	50.00	off	0
Avg. Beta ed/c	0 %	50.00	off	0
Scheduled Buffer Empty Rate	0.0 %	0.00	off	0
Non-Scheduled Buffer Empty Rate	0.0 %	0.00	off	0
Mean. scheduled buffer status	6144 %	9.38	off	0
Mean. non-scheduled buffer status	0 %	0.00	off	0
Avg. AGCH Qual	0 %	0.00	off	0
Avg. RGCH Qual	0 %	0.00	off	0
Avg. HICH Qual	0 %	0.00	off	0
MAC Resets	0	0.00	off	0
Mean. E-TFCI	0	0.00	off	0

Fig. 4-63 UMTS HSUPA L1/MAC Statistic View

Diagram

Each parameter is shown in one row, and the alarm thresholds can be configured separately for each parameter. The following parameter properties are shown by default, the list columns can be configured using the *List format* tab of the configuration dialog as described on p. 4.115.

Parameter
: *Name of the HSUPA L1/MAC statistic parameter.*

Value
: *Absolute value of the HSUPA L1/MAC statistic parameter.*

Value in percent
: *The percent Value visualized as a bar diagram. The minimum and maximum of the value range are as defined in the definition of the signal. The color of the bar is defined as:*

- Green
- Red
- Orange
- Yellow

Alarm Thr.
: *The value of the alarm threshold (or* Off*).*

Alarm Count
: *The count of processed values in alarm state On.*

The L1/MAC statistic parameters comprise the following values, which can be configured using the *Parameters* tab of the configuration dialog as described on p. 4.115:

TTI
: *Transmission Time Interval for the E-DCH. The standard 3GPP TS 25.321 allows a TTI of 2 ms, which is one HSUPA sub frame comprising 3 slots. The valid range is 0 to 1, alarm threshold default is 0.5.*

Serv. RG Up Rate
: *The valid range is 0 to 100%, alarm threshold default is 50.*

Happy Rate
: *The valid range is 0 to 100%, alarm threshold default is 50.*

Avg. Number of E-DCH cells
: *The valid range is 0 to 254, alarm threshold default is 127.*

Serv. RG Down Rate
: *The valid range is 0 to 100%, alarm threshold default is 50.*

Serv. RG Hold Rate
: *The valid range is 0 to 100%, alarm threshold default is 50.*

AGCH Success Rate
: *The valid range is 0 to 100%, alarm threshold default is 50.*

Mean rec.AGCH Commands
: *The valid range is 0 to 65534, alarm threshold default is 32767.*

Mean Serving Grant
: *The valid range is 0 to 37, alarm threshold default is 18.5.*

New Transmission Rate
: *The valid range is 0 to 100%, alarm threshold default is 50.*

Retransmission Rate

The valid range is 0 to 100%, alarm threshold default is 50.

DTX Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Residual BLER

The valid range is 0 to 100%, alarm threshold default is 50.

First Attempt BLER

The valid range is 0 to 100%, alarm threshold default is 50.

Power Limited Rate

The valid range is 0 to 100%, alarm threshold default is 50.

SG Limited Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Buffer Limited Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Mean scheduled transmitted bits

The valid range is 0 to 65534, alarm threshold default is 32767.

Mean non-scheduled transmitted bits

The valid range is 0 to 65534, alarm threshold default is 32767.

Avg. Supported Bits

The valid range is 0 to 65534, alarm threshold default is 32767.

Avg. DPCCH Power

The valid range is –130 to +30 dBm, the alarm threshold default is –50.

Max. Power allowed

The valid range is –130 to +30 dBm, the alarm threshold default is –50.

Avg. Beta d/c

The valid range is –30 to +30, the alarm threshold default is 0.

Avg. Beta hs/c

The valid range is –30 to +30, the alarm threshold default is 0.

Avg. Beta ec/c

The valid range is –30 to +30, the alarm threshold default is 0.

Avg. Beta ed/c

The valid range is –30 to +30, the alarm threshold default is 0.

Scheduled Buffer Empty Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Non-Scheduled Buffer Empty Rate

The valid range is 0 to 100%, alarm threshold default is 50.

Mean scheduled buffer status

The valid range is 0 to 65534, alarm threshold default is 32767.5.

Mean non-scheduled buffer status

The valid range is 0 to 65534, alarm threshold default is 32767.5.

Avg. AGCH Qual.

The valid range is 0 to 65534, alarm threshold default is 32767.

Avg. RGCH Qual.
The valid range is 0 to 65534, alarm threshold default is 32767.

Avg. HICH Qual.
The valid range is 0 to 65534, alarm threshold default is 32767.

MAC Resets
The valid range is 0 to 254, alarm threshold default is 127.

Mean E-TFCI
"Transport Format Combination Indicator". The valid range is 0 to 254, alarm threshold default is 127

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, to put the view on hold, copy the view contents to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

UMTS HSUPA L1/MAC Statistic View Configuration

The *UMTS HSUPA L1/MAC Statistic View* configuration menu defines the list parameters and alarm threshold settings, the list format options and shows information on the current view version. It is opened via a right mouse click on a point inside the *UMTS HSUPA L1/MAC Statistic View* or via the *Tools - Modules Configuration...* command (see chapter 3).

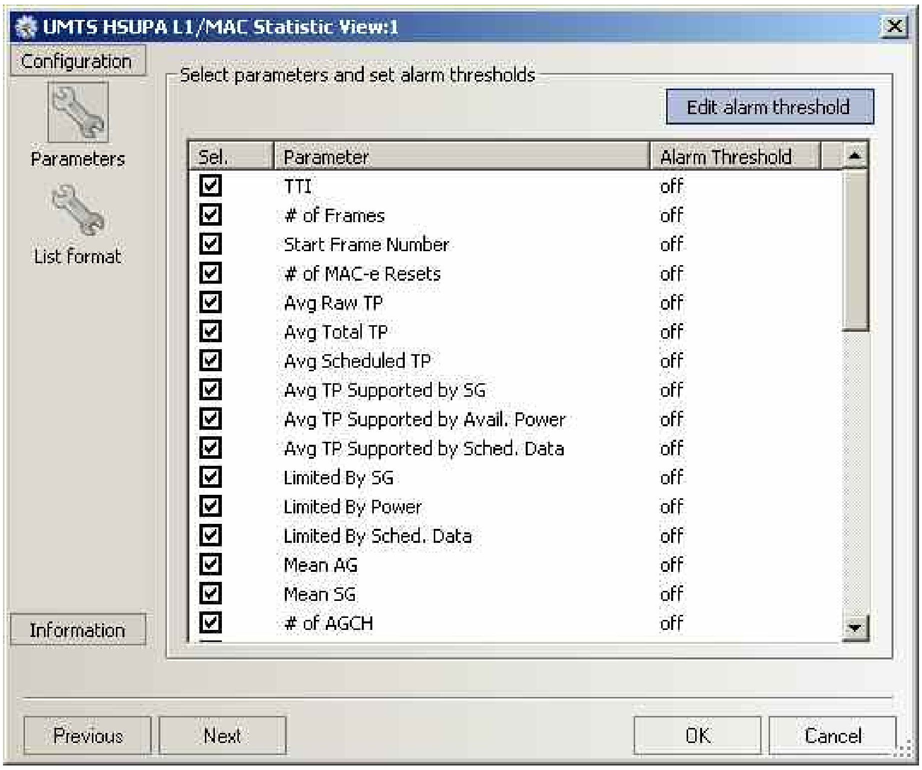
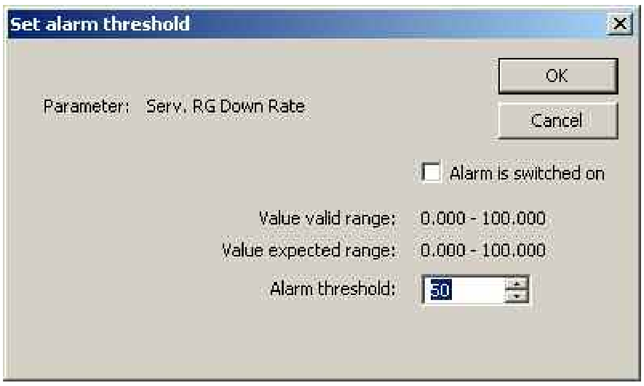


Fig. 4-64 UMTS HSUPA L1/MAC Statistic View configuration: Parameters

Parameters The *Parameters* panel offers checkboxes to select the elements displayed in the *UMTS HSUPA L1/MAC Statistic View*.

Edit Alarm Threshold With the *Edit Alarm Threshold* button the setting of an alarm can be defined for each selected parameter:



The valid and expected value ranges for each parameter of the mobile is shown on the dialog.

Alarm is switched on.
This checkbox toggles the state of the alarm between On *and* Off*.*

Alarm threshold
Defines the actual threshold value above / below which an alarm event is triggered. The valid value range of the threshold is shown above the entry field.

OK
Stores the alarm threshold setting and the alarm state.

Cancel
Aborts the current alarm threshold setting action and closes the dialog.

The *List format* tab of the *UMTS HSUPA L1/MAC Statistic View* configuration menu selects the information to be displayed.

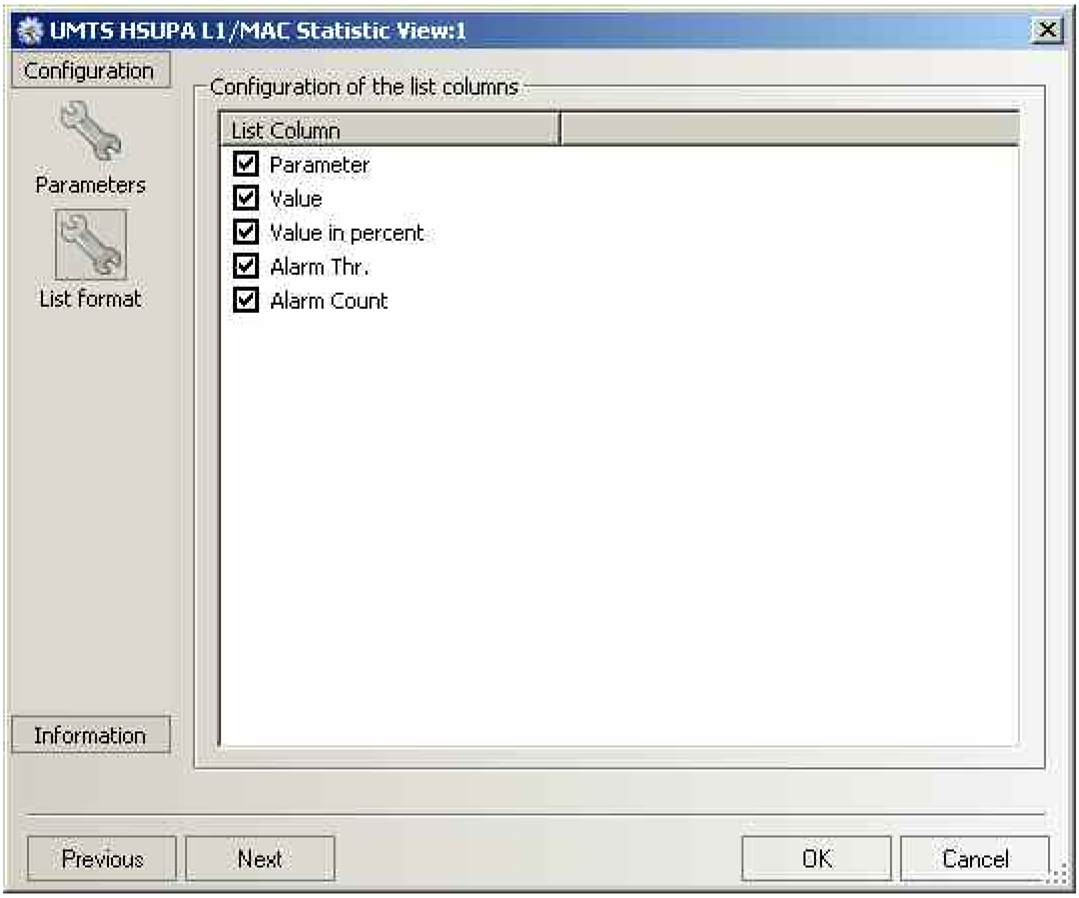


Fig. 4-65 UMTS HSUPA L1/MAC Statistic View configuration: List format

List Column The *List Column* offers checkboxes to select the columns displayed in the *UMTS HSUPA L1/MAC Statistic View*.

UMTS HSUPA ACK/NACK View

The *UMTS HSUPA ACK/NACK View* shows the used transport block sizes per TTI. The Y-axis shows the TBS and the X-axis represents the TTIs.

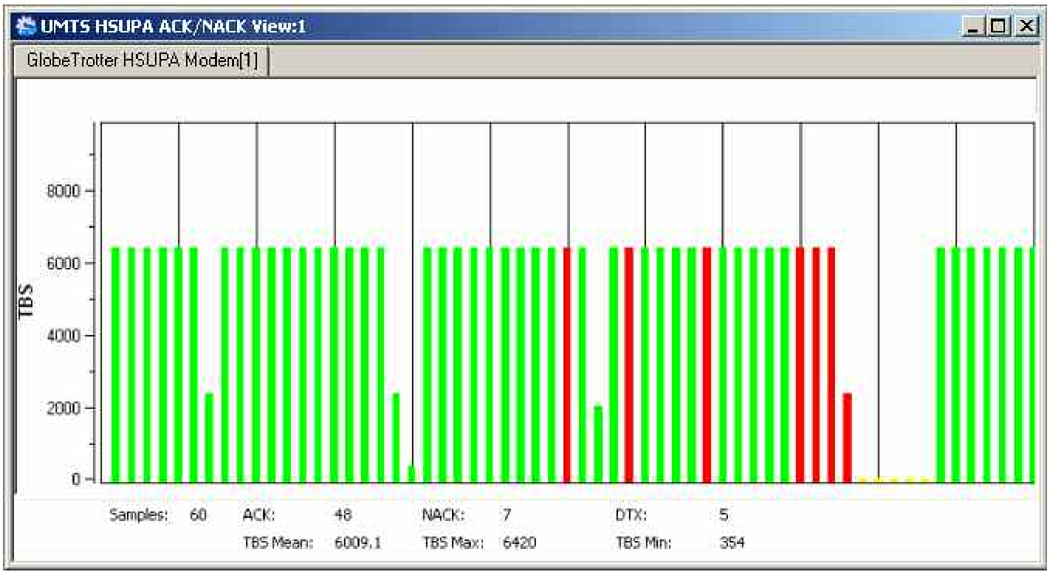


Fig. 4-66 UMTS HSUPA ACK/NACK View

Diagram

The view shows a bar graph with fixed scale. Each bar corresponds to a TTI value reported by the mobile.

- A green bar denotes an acknowledged TTI
- A red bar denotes an unacknowledged TTI
- A yellow bar denotes a sub frame that was neither acknowledged nor unacknowledged: no answer was received from the mobile

TIP Use the UMTS HSUPA Cell Status View (see p. 4.97) to analyze the cause for an unacknowledged or DTX frame.

Statistical Results

Below the diagram the view shows the most important values per update cycle (Samples) in the diagram and the number of ACK, NACK, and DTX sub frames (see above; ACK + NACK + DTX = Samples).

The arithmetic mean value of the displayed TBS values, the maximum, and the minimum TBS values are displayed below.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

UMTS HSUPA HARQ View

The *UMTS HSDPA HARQ View* shows the characteristics of all HARQ processes of the test mobile. The View shows a statistical evaluation of the received UL E-DCH transport blocks, together with the block error rate and the number of retransmissions needed to successfully decode the blocks of each size. The transport block size depends on the allocated power for the mobile. Depending on TTI Duration up to 8 parallel HARQ processes can be active per mobile.

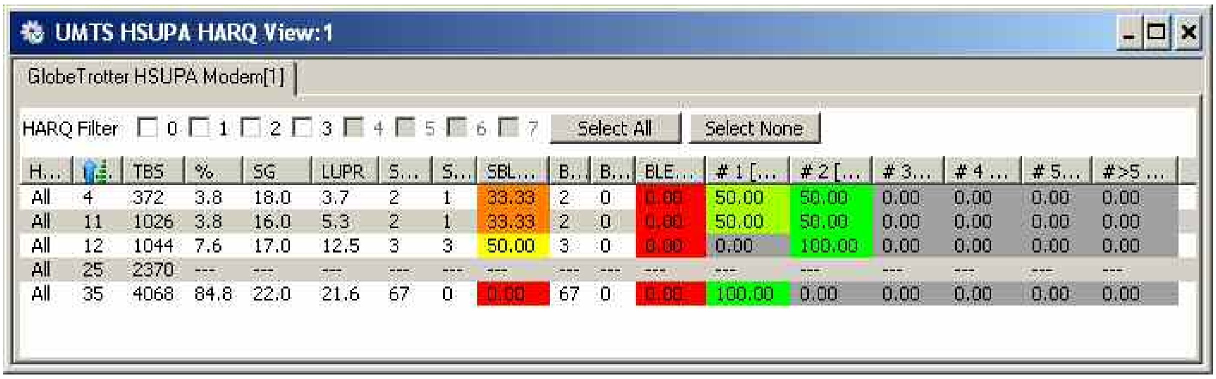


Fig. 4-67 UMTS HSUPA HARQ View

Table

The Header of the table defines which of the HARQ Processes are displayed

HARQ Filter

Each Flag represents one HARQ process. For a TTI of 2 ms the maximum number is 8 and for a TTI of 10 ms the maximum number of HARQ processes is 4.Setting this flags will display or hide the specific HARQ process. By default the filter is disabled and only the sum of all HARQ processes is displayed

Select All

Click on this button will set the flags for all HARQ processes.

Select None

Click on this button will remove the flags for HARQ processes

Each row reflects an E-TFCI and displays the following values

HARQ ID

Identifier of the HARQ process is displayed

Sum *indicates the values, which are listed below, depending on the*

Transport Block Size

ETFCI

Transport Format Combination Identifier for E-DCH

TBS

Transport block size in bits

%

Percentage of usage of this E-TFCI

SG

Average Serving Grant

LUPR

Average Last Used Power Ration

SB+

Number of successfully decoded sub-blocks. A sub-block is a mobile specific unit comprising the HS-DSCH data of one sub frame.

SB++

Number of duplicated Sub Block Number of duplicate sub-blocks. Duplicate sub-blocks are sub-blocks that the network retransmitted although they were received correctly (usually because no ACK message was received from the mobile).

SB-

Number of sub-blocks which could not be decoded successfully has to be retransmitted. These blocks contribute to the SBLER but not necessarily to the BLER; see below.

SBLER [%]

Sub-block error rate, SBLER = SB– / (SB+ SB–).

BL+

Number of successfully decoded blocks

BL–

Number of blocks which could not be decoded successfully until the maximum number of retransmissions was reached. Number of successfully decoded blocks

BLER [%]

Block error rate, BLER = BL– / (BL+ BL–). The BLER is usually smaller than the SBLER because it counts only the blocks that could not be decoded until the end of the HARQ process (until the maximum number of retransmissions was reached).

[%]

Number of blocks successfully decoded without retransmission.

n [%]

Number of blocks successfully decoded after one initial transmission and (n–1) retransmissions.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

UMTS HSUPA HARQ View Configuration

The UMTS HSUPA HARQ View configuration menu selects the information to be displayed.

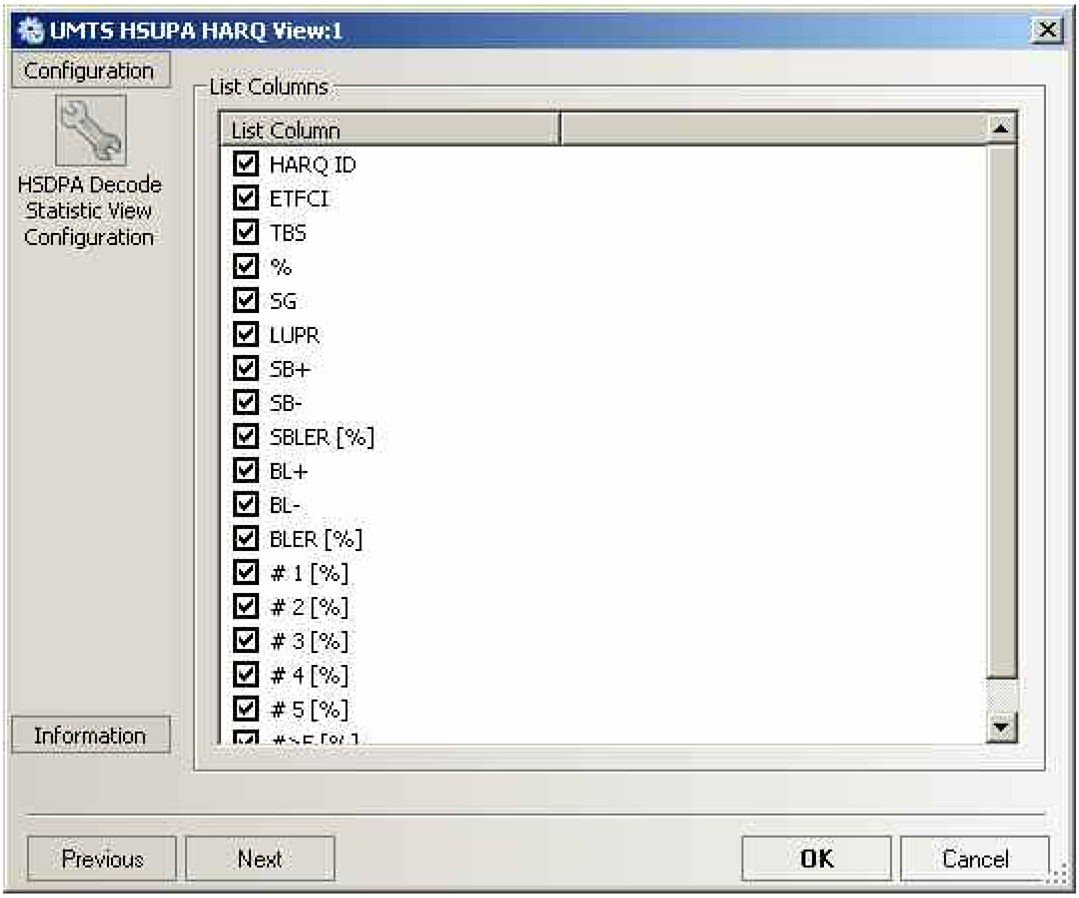


Fig. 4-68 UMTS HSUPA HARQ Configuration

UMTS HSUPA Power Graph View

This View displays the most important power values for the HSUPA session in a 2D Chart. The upper chart displays the “Max. Allowed Tx Power” and the currently used power for the DPCCH. The second graph displays all relative power, calculated by the mobiles using the given Beta Factors. The third graph displays the SG and the last graph the UE Power Headroom.

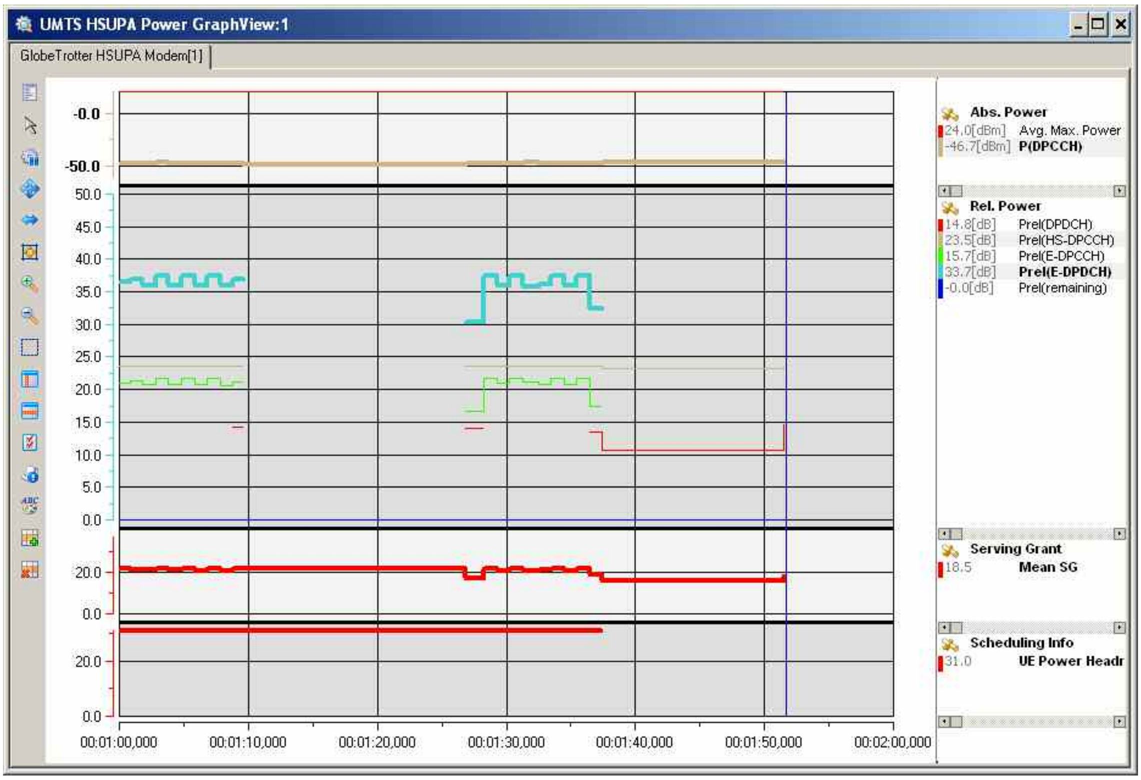


Fig. 4-69 UMTS HSUPA Power Graph View

A double-click on the title bars of the sub-diagrams opens or closes them in the power graph view. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.9.

Absolute Power

The Absolute Power *sub-diagram shows the average of the “Maximum Allowed Transmission Power” in Uplink and the power of the associated “Dedicated Physical Control Channel” in absolute values.*

Relative Power

This sub-diagram shows the Power of certain Physical Channels relative to the DPCCH.

The chart contains the following results:

Prel(DPDCH)
Rel. Power of the “Dedicated Physical Data Channel” (R.99 Channel).

Prel(HS-DPCCH)
Rel. Power of the “High-Speed Dedicated Physical Control Channel” (HSDPA Channel).

Prel(E-DPCCH)
Rel. Power of the “Enhanced Dedicated Physical Control Channel” (HSUPA Channel).

Prel(E-DPDCH)
Rel. Power of the “Enhanced Dedicated Physical Data Channel” (HSUPA Channel).

Prel(remaining)
Remaining Power in UL.

Serving Grant

Mean SG
Average Value of the Serving Grant.

Scheduling Info

UE Power Headroom
Indicates the Power Status of the UE, means how much the UE is able to power up.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or to save the current configuration as default, or move to another worksheet; see *Context menu* description on p. 4.2.

UMTS HSUPA Power Graph View Configuration

The *UMTS HSUPA Power Graph View* configuration menu scales the axes of the chart and defines its contents and its appearance. All controls are also available in the *Chart Configuration* tab of the *2D Chart Configuration* menu and have the same effect; see figure on p. 4.16.

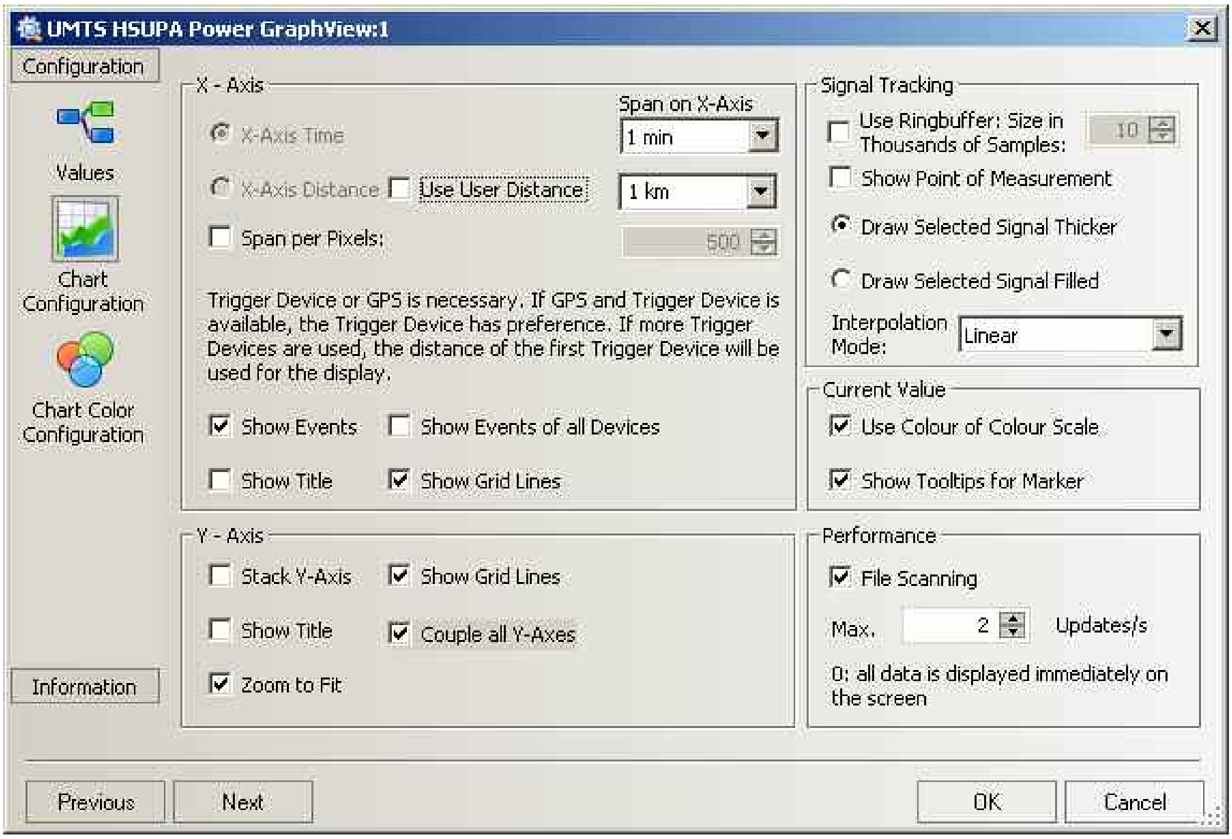


Fig. 4-70 UMTS HSUPA Performance View - Configuration

UMTS HSDPA Views

The *UMTS HSDPA Views* display HSDPA-specific information acquired with an UMTS test mobile supporting HSDPA and using the UMTS driver. HSDPA measurements require option R&S ROMES4HUQ (Qualcomm). In general, recording of the different message types shown in the *UMTS Views* must be explicitly activated in the driver configuration menu:

- ➢ Enable UMTS HSDPA in the Configuration tab.
- ➢ Select the HSDPA node in the Expert Mode tab.

R&S ROMES supports HSDPA test mobiles based on the Qualcomm 6275 chipset.

The HSDPA views can be selected from a submenu displayed on the right side of the *View* menu when the mouse cursor hovers over *HSDPA*.

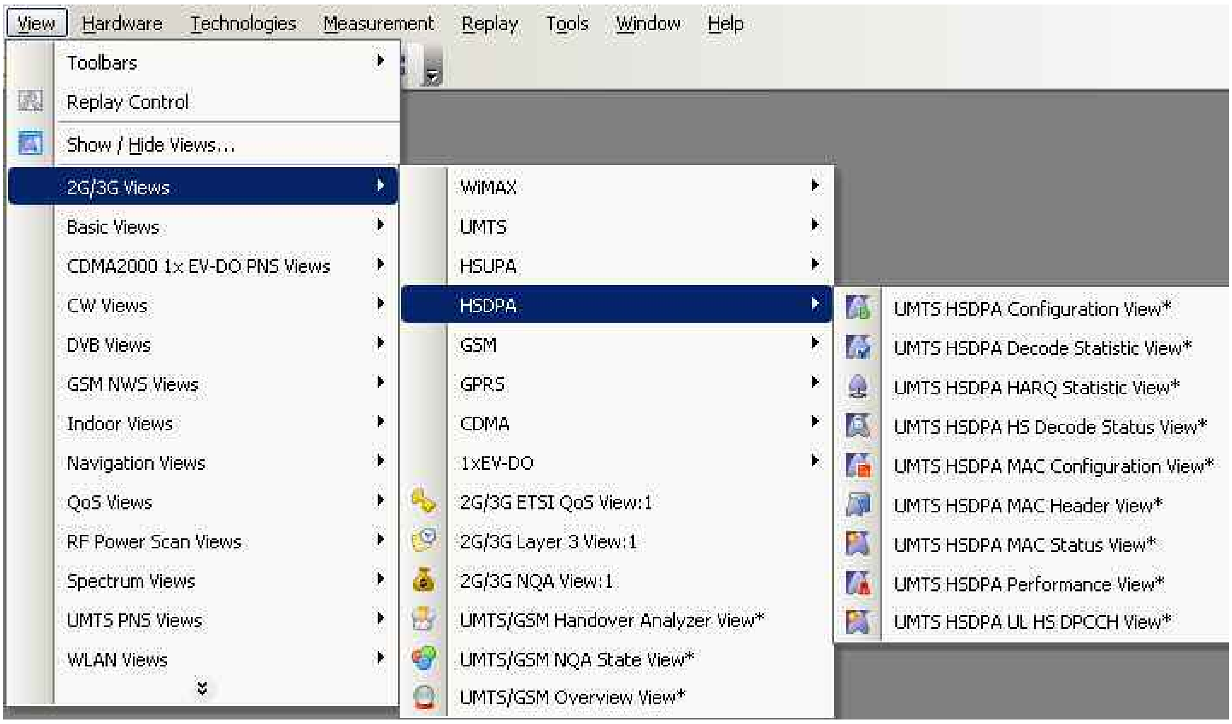


Fig. 4-71 UMTS HSDPA views

In addition to the *HSDPA Views* described in this section, R&S ROMES provides an extensive selection of HSDPA signals. These signals appear below the *UMTS* node of the data tree *(Tools – Preferences – Available Signals)* and can be analyzed in the appropriate *Basic Views* (see p. 4.6) and exported to ASCII files (see chapter 7). Many signals are also displayed in the *HSDPA Views.*

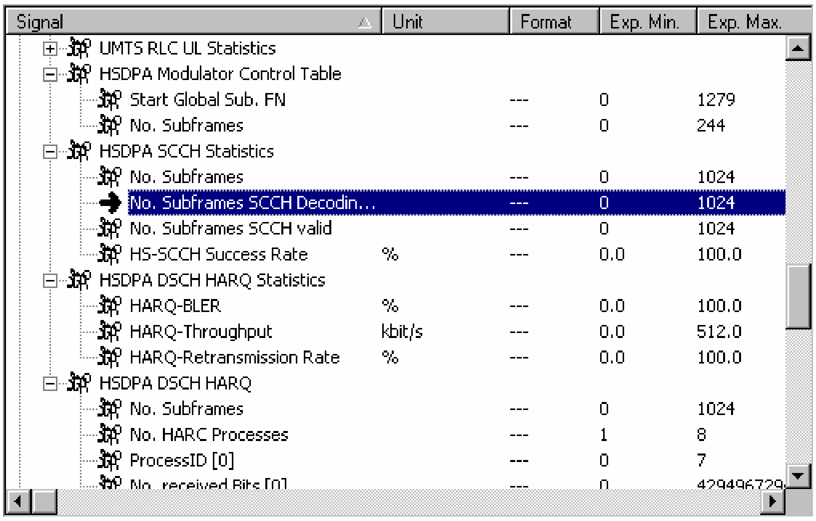


Fig. 4-72 HSDPA signals

In addition to the HSDPA views described in this section the following views can display HSDPA data: *UMTS/GSM Handover Analyzer View, UMTS Finger Data View.* HSDPA-related information in these views is only available with option R&S ROMES4HUQ (Qualcomm).

UMTS HSDPA UL HS-DPCCH View

The *UMTS HSDPA UL HS-DPCCH View* shows the CQI values reported by the test mobile in the last 100 HSDPA sub frames. In the network, the Channel Quality Indicator (CQI) is transmitted on the UL High Speed Dedicated Physical Control Channel (HS-DPCCH), which is a fixed rate channel with a spreading factor of 256. The first slot of each UL HS-DPCCH sub frame contains the ACK/NACK messages; the following two slots carry the CQI. The frame structure of the uplink HS-DPCCH is shown in the figure below.

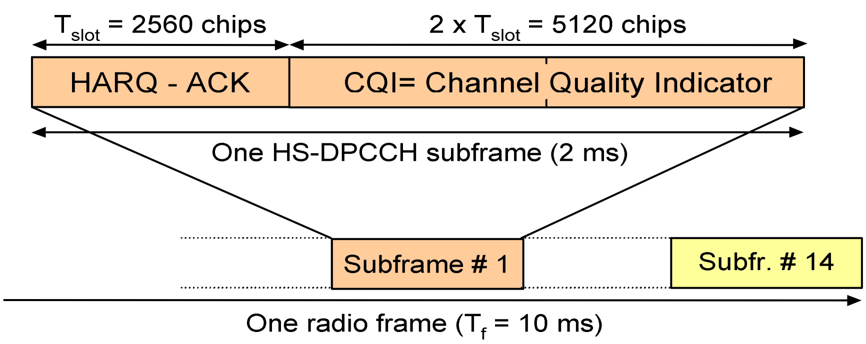


Fig. 4-73 HS-DPCCH frame structure

The CQI values are integer numbers between 0 and 30; see CQI mapping tables in standard 3GPP TS 25.214. Large CQI numbers denote a good channel quality and a high potential DL data throughput.

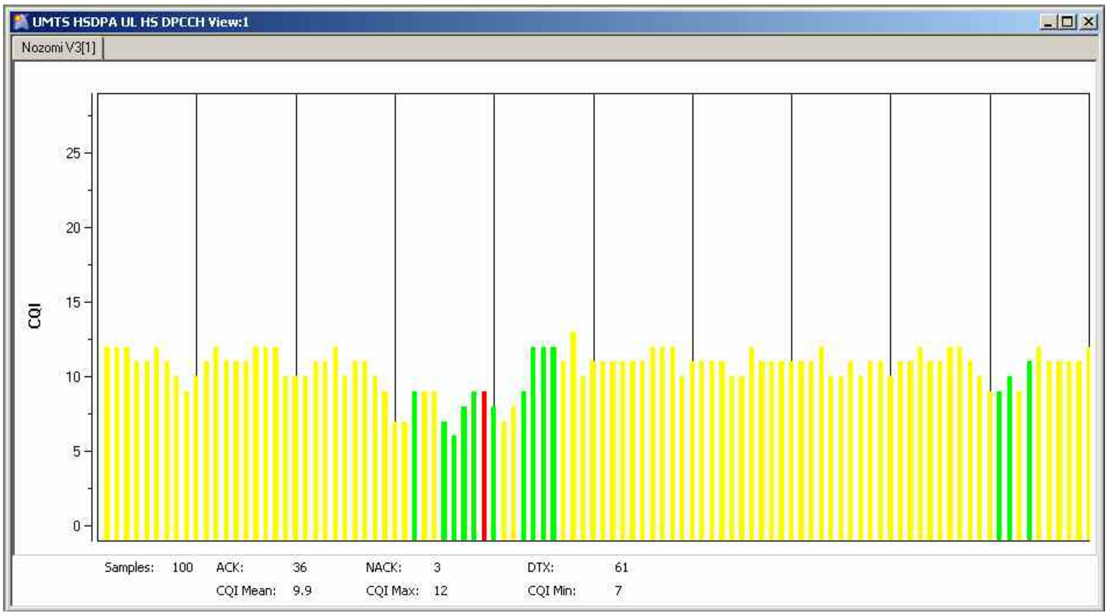


Fig. 4-74 UMTS HSDPA UL HS-DPCCH View

Diagram

The view shows a bar graph with fixed scale. Each bar corresponds to a CQI value reported by the mobile. The colors of the bars distinguish between the messages transmitted in the first (HARQ-ACK) slot of the HS-DPCCH sub frame that carried the CQI value:

- A green bar denotes an acknowledged sub frame: The mobile sends an *ACK* message after a successful CRC check of a received HS-DSCH packet.
- A red bar denotes an unacknowledged sub frame: The mobile sends a *NACK* message after a failed CRC check.
- A yellow bar denotes a sub frame that was neither acknowledged nor unacknowledged: no answer was received from the mobile. This is most likely because the mobile could not correctly demodulate the downlink HS-SCCH. Note that the mobile can use DTX independently in the ACK/NACK and CQI slots.

NOTE: With a *CQI Feedback Cycle* of more than 1 sub frame, the CQI information is no longer available in all sub frames. ACK/NACK messages can still be transmitted. In the HS-DPCCH view, small colored bars of length 0 are used to visualize the ACK/NACK message content of sub frames without CQI information.

TIP: Use the UMTS HSDPA HS Decode Status View (see p. 4.128) to analyze the cause for an unacknowledged or DTX frame.

Statistical Results

Below the diagram the view shows the total number of CQI bars (Samples) in the diagram and the number of ACK, NACK, and DTX sub frames (see above; ACK + NACK + DTX = Samples).

The arithmetic mean value of the displayed CQI values, the maximum, and the minimum CQI values are displayed below.

Context menu

A right mouse click on any point in the view opens the context menu to put the view on hold, copy the view contents to the clipboard, or to create or delete views, or move to another worksheet; see *Context menu* description on p. 4.2.

The *UMTS HSDPA UL HS-DPCCH View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

UMTS HSDPA HS Decode Status View

The *UMTS HSDPA HS Decode Status View* shows the status of the HS-SCCH demodulation and the decoded HS-SCCH information. The view contains a table with up to 100 of the newest samples (sets of results) provided by the test mobile.

The HS-SCCH is a downlink physical channel used to carry downlink signaling information related to HS-DSCH transmission. This includes the channelization code set, the modulation scheme, the transport block size and HARQ related information (see standard 3GPP TS 25.212).

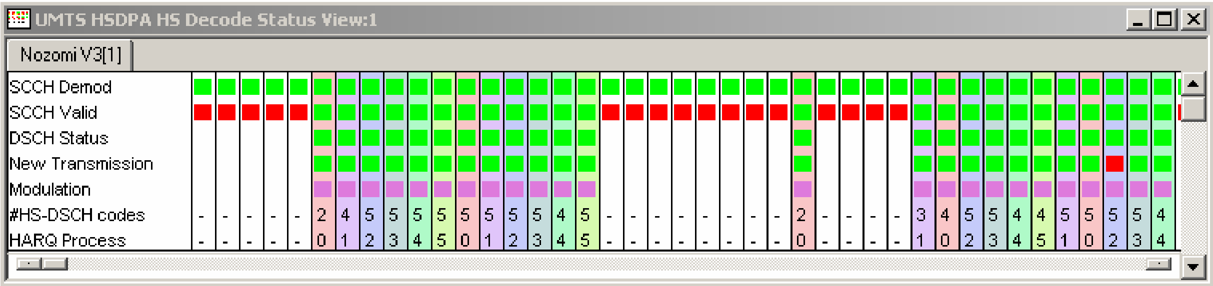


Fig. 4-75 UMTS HSDPA HS Decode Status View

Diagram The view shows a table with fixed scale. Each column corresponds to a HS-SCCH sample comprising the following information:

SCCH Demod
: *Indicates whether the mobile attempted to demodulate the HS-SCCH*

SCCH Valid
: *Indicates whether the mobile was able to decode consistent signaling information from the demodulated HS-SCCH*

DSCH Status
: *Status of the CRC check for the transmitted and decoded HS-DSCH packet:* CRC pass *(successful transmission) causes an ACK message in the UL HS-DPCCH,* CRC fail *causes a NACK message, no CRC check (because no valid HS-SCCH information could be obtained) causes DTX. See also* UMTS HSDPA UL HS-DPCCH View *on p. 4.126**.*

New Transmission
: *Transmission of a new HS-DSCH packet or retransmission of a packet transmitted earlier.*

Modulation
: *Modulation scheme* (QPSK *or* 16QAM)

#HS-DSCH Codes
: *Number of HS-(P)DSCH channelization codes in the range between 1 and 15. The HS-PDSCH is a fixed rate (SF = 16) physical channel with channelization code numbers ranging from 1 to 15 (ch. code $C_{16,0}$ is barred because the channelization codes $C_{256,0}$ and $c_{256,1}$ are reserved for the P-CPICH and P-CCPCH, respectively). The HS-PDSCH channelization codes are allocated contiguously starting from the first code.*

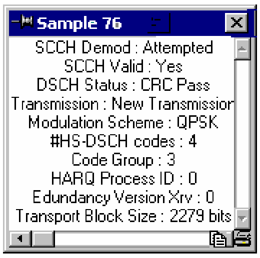
HARQ Process
: *HARQ Process ID, number of the HARQ process that the transmission belongs to (range 0 to 7). The HARQ process ID defines the background color of the column.*

The meaning of the colors in the diagram is listed in the table below. Note that a red square will often cause red or white squares in the cells below (e.g. a failed SCCH demodulation means that the mobile cannot start receiving the HS-DSCH, so all the following cells are white).

Table 1 Color codes in the UMTS HSDPA HS Decode Status View

Decoding Stage	Green	Red	White
SCCH Demod	Attempted	Not attempted (because the SCCH did not carry the proper UE ID)	n/a
SCCH Valid	Yes	No	n/a
DSCH Status	CRC Pass	CRC Fail	n/a
New Transmission	New Transmission	Retransmission	n/a
Modulation	16QAM	QPSK (violet)	n/a

Details Window



A double-click on any of the table columns opens a details window for the corresponding sample. The window repeats the information in the table and contains the following additional entries :

HARQ Process ID
Value of the HARQ process identifier (0 to 7)

Redundancy Version
Value X_{rv} in the range 0 to 7. X_{rv} jointly codes the redundancy version (RV) parameters r, s and the constellation version parameter b.

Transport Block Size
Size of the HS-DSCH transport blocks in bit, calculated from the 6-bit transport block size index; see 3GPP TS 25.321.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

The *UMTS HSDPA HS Decode Status View* configuration menu contains a single *Info* tab; see p. 4.4.

UMTS HSDPA HARQ Statistic View

The *UMTS HSDPA HARQ Statistic View* shows the characteristics of all HARQ processes of the test mobile. HARQ processes control the transmission and (possibly) retransmission of data blocks. Up to 8 parallel HARQ processes can be active per mobile.

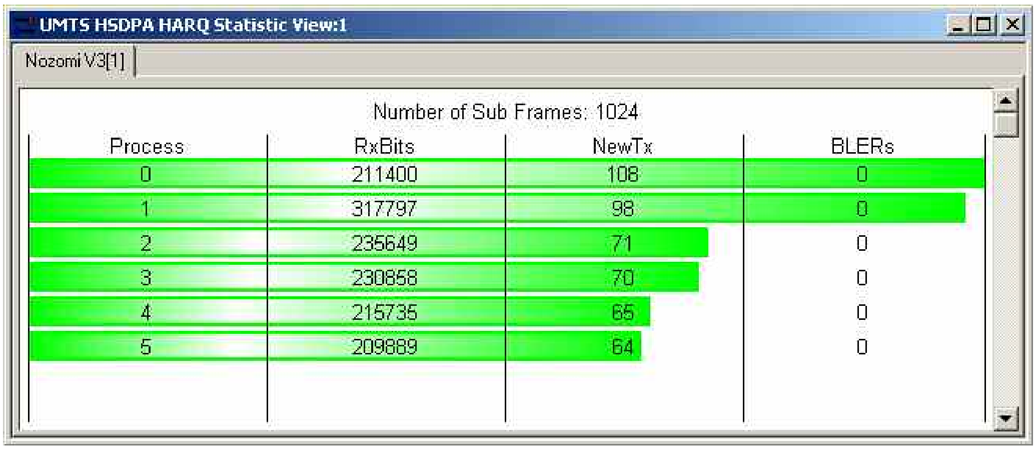


Fig. 4-76 UMTS HSDPA HARQ Statistic View

Diagram

The view shows a list of the different HARQ processes of the test mobile. The following information is displayed:

Number of Sub Frames
: *Averaging length for the statistical results, mobile-specific parameter.*

Process
: *HARQ process identifier. The list is sorted so that the identifiers are in the range 0 to n (n $\leq$ 7).*

RX Bits
: *Number of received bits per process.*

New Tx
: *New data indicator; the number of new data blocks transmitted within the HARQ process (not counting retransmissions, i.e. data blocks received in error).*

BLERs
: *Block errors, the number of blocks received in error.*

Either the *BLERs* (red) or the *New TX* (green) can be visualized with horizontal, colored bars. The selection of bars and the scales are defined in the configuration menu.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or to save the current configuration as default, or move to another worksheet; see *Context menu* description on p. 4.2.

UMTS HSDPA HARQ Statistic View Configuration

The *UMTS HSDPA HARQ Statistic View* configuration menu selects and scales the colored *BLER* or *New Tx* bars in the diagram.

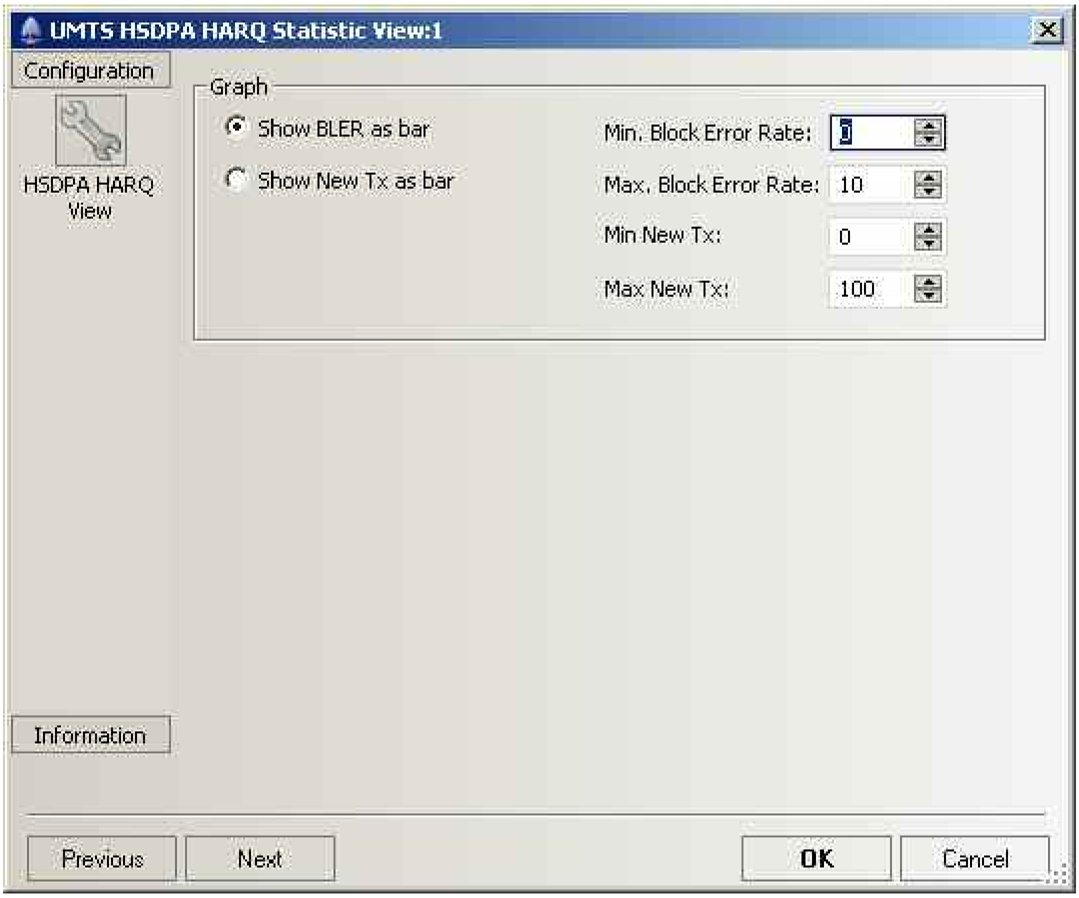


Fig. 4-77 UMTS HSDPA HARQ Statistic View Configuration

Graph *Show BLER as bar* or *Show New TX as bar* select the visualized quantity. The input fields on the right side set the scale of the bars.

UMTS HSDPA Configuration View

The *UMTS HSDPA Configuration View* shows the configuration of the DL HSDPA channels received by the test mobile, the UL HS-DPCCH, and information related to the finger configuration command, the DL HS-SCCHs, and the active HARQ processes. This configuration data is generated whenever there is a L1 reconfiguration related to HSDPA.

Most of the displayed information is mobile-specific and primarily intended for monitoring the status of the test mobile.

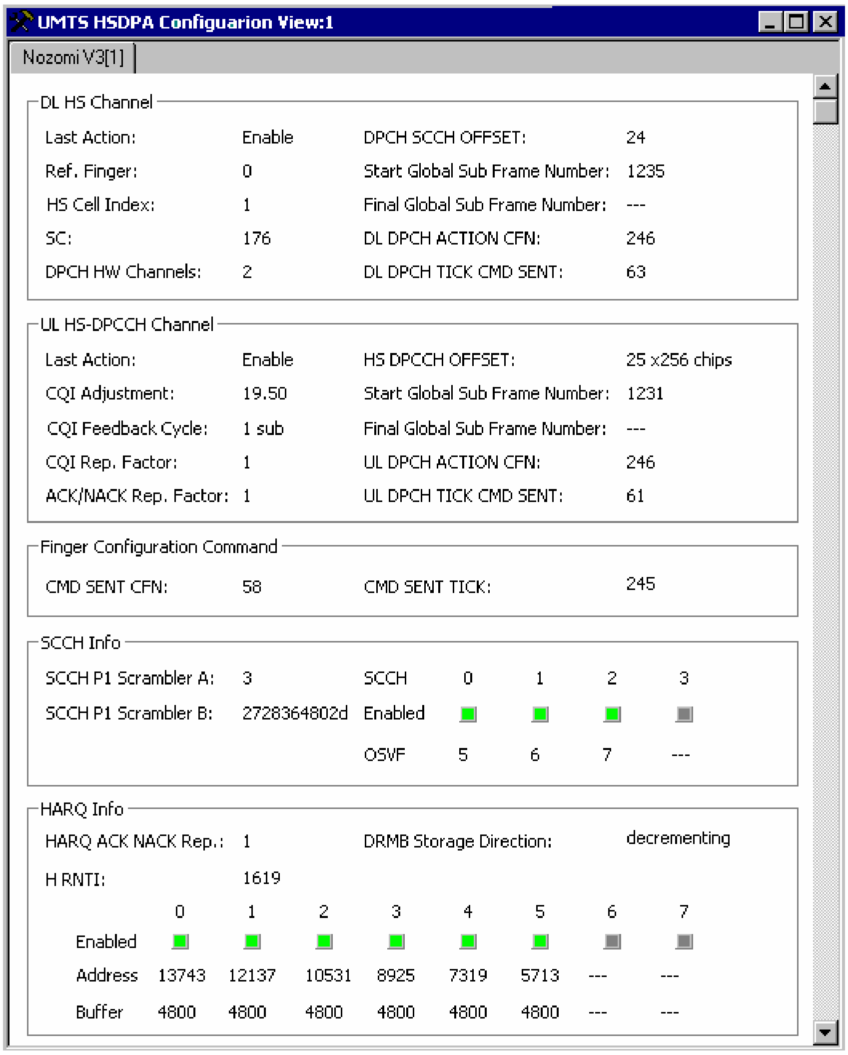


Fig. 4-78 UMTS HSDPA Configuration View

The configuration data is displayed in different panels:

DL HS Channel

The following information is related the DL High Speed Channels (HS-DPCH and HS-SCCH):

Last Action
: *Status of the DL transmission.* Enable, Disable, *or* Reslam.

Ref. Finger
: *Reference finger (values 0 to 11).*

HS Cell Index
: *High speed cell index in the range 0 to 7.*

SC
: *Common scrambling code for all DL HSDPA channels.*

Use the UMTS Finger Data View *(see p. 4.150*) to view the preceding parameters together with the time offset and Ec/Io of all signals captured by the different fingers of the mobile receiver.

DPCH HW Channels
: *Values 0 to 3.*

DPCH SCCH Offset
: *Corresponds to starting global sub frame number, values 0 to 149 (256 chip periods).*

Start Global Sub Frame Number
: *Mobile-specific sub frame no. in the range 0 to 1279.*

Final Global Sub Frame Number
: *Mobile-specific sub frame no. in the range 0 to 1279, only relevant for* Last Action: Reslam.

DL DPCH ACTION CFN
: *Mobile-specific parameter, 0 to 255.*

DL DPCH TICK CMD SENT
: *Mobile-specific parameter, 0 to 149.*

UL HS-DPCCH Channel

The following information is related the UL HS-DPCCH. This channel carries the ACK/NACK and CQI messages that the mobile reports to the network; see *UMTS HSDPA UL HS-DPCCH View* on p. 4.126:

Last Action
: *Status of the UL transmission.* Enable, Disable, *or* Reslam.

CQI Adjustment
: *Adjustment applied to SIR measurement before quantization. CQI Adjustment = [12.04 + DSCH to CPICH offset (signaled to the mobile) + SNR to CQI offset (constant for a software build, e.g. 4.0].*

CQI Feedback Cycle
: *Time (in multiples of HSDPA sub frames with a length of 2 ms) after which the mobile repeats the transmission of CQI symbols on the HS-DPCCH. Possible values are 0, 1, 2, 4, 5, 10, 20, 40, 80.*

CQI Rep. Factor
: *Number of repeated CQI transmissions (1 to 4).*

ACK/NACK Rep.

Factor *Number of repeated ACK/NACK transmissions (1 to 4).*

HS-DPCCH Offset

Corresponds to starting global sub frame number, values 0 to 149 (256 chip periods).

Start Global Sub Frame Number

Mobile-specific sub frame no. in the range 0 to 1279.

Final Global Sub Frame Number

Mobile-specific sub frame no. in the range 0 to 1279, only relevant for Last Action: Reslam.

UL DPCH ACTION CFN

Mobile-specific parameter, 0 to 255.

UL DPCH TICK CMD SENT

Mobile-specific parameter, 0 to 149.

Finger Configuration Command

The following information is mobile-specific.

CMD SENT CFN

Counter in the range 0 to 255.

CMD SENT TICK

Counter in the range 0 to 149.

SCCH Info

The *SCCH Info* field provides information about the channels in the HS-SCCH set which is allocated to the mobile. A HS-SCCH set is a set of 1 to 4 HS-SCCHs. The mobile continuously monitors all the HS-SCCHs in the allocated set.

The panel shows the number of enabled SCCHs together with their channelization codes *(OSVF)*. The SCCHs are fixed rate channels (SF = 128) with code numbers ranging from 1 to 127.

The remaining information is mobile-specific.

HARQ Info

The *HARQ Info* field provides information about the active HARQ processes together with the internal address and the size of the physical buffer associated with each process. In addition the following information is displayed:

HARQ ACK/NACK Rep.

Mobile-specific parameter.

DRMB Storage Direction

Mobile-specific parameter.

H RNTI

HS-DSCH RNTI, 16-bit identity, identifies the mobile for which data is transmitted in the corresponding HS-DSCH TTI.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or to save the current configuration as default, or move to another worksheet; see Context menu description on p. 4.2.

UMTS HSDPA MAC Configuration View

The *UMTS MAC Configuration View* shows the configuration of the MAC-hs that the test mobile receives from the network. The MAC-hs is the MAC entity that handles the high speed downlink shared channel (HS-DSCH); see standard 3GPP TS 25.321. The view is updated every time the MAC-hs is reconfigured.

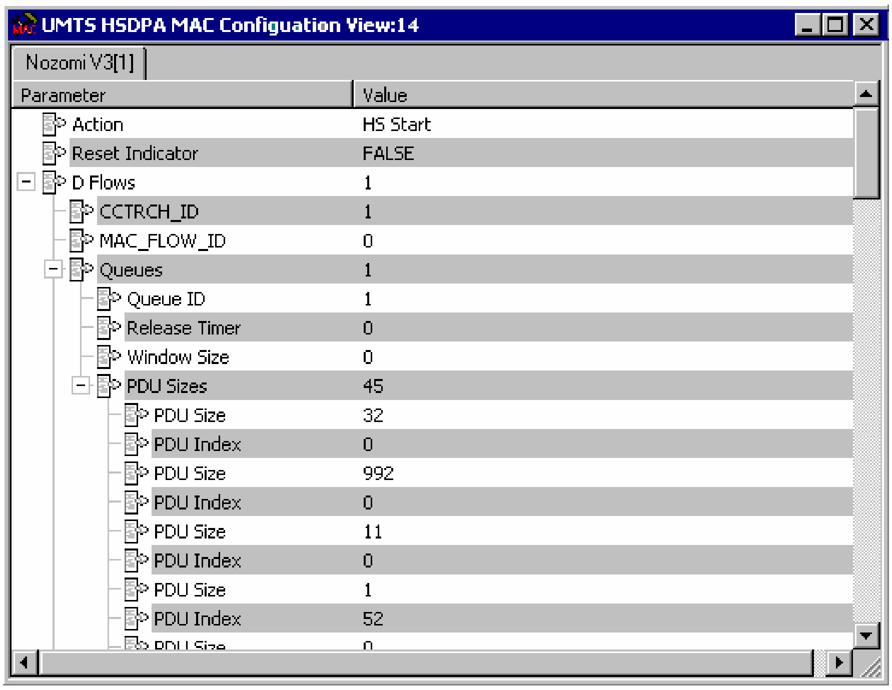


Fig. 4-79 UMTS MAC Configuration View

Diagram The view shows the following Mac-hs parameters with their values:

Action
: *Indicates the last action that the MAC-hs entity was requested to perform by upper layers:* Start, Stop*, or* Reconfigure*.*

Reset Indicator
: *TRUE indicates that a reset of the MAC-hs entity has been requested.*

CCTRCH_ID
: *Unambiguous identifier for the Coded Composite Transport Channel (CCTrCH) inside the radio link (range 0 to 7).*

MAC_FLOW_ID
: *Mobile-specific parameter, range 1 to 8.*

Queue / Queue ID
: *The Queue ID provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues (range 1 to 8).*

Release Timer
: *Value of the reordering release timer (T1). The release timer controls the stall avoidance in the mobile's reordering buffer; see 3GPP TS 25.321, section 11.6.2.3.2. Possible values are 10, 20, 30 … 100, 120, 140, 160, 200, 300, 400.*

Window Size
: *Size of the receiver window, given in terms of a TSN range*

PDU Size
: *Size of the Protocol Data Units (PDUs) that can be transferred to MAC within a transmission time interval in the range 0 to 5000 (bits).*

PDU Index
: *MAC PDU Size Index in the range 0 to 7*

Logical Channel / RLC ID
: *Mobile-specific parameter, range 0 to 17.*

Type
: *Channel type: BCCH, PCCH, CCCH, DCCH, CTCH, or DTCH.*

Mode
: *Channel Mode: Transparent mode* (TM)*, Unacknowledged mode (UM), or Acknowledged mode (AM)*

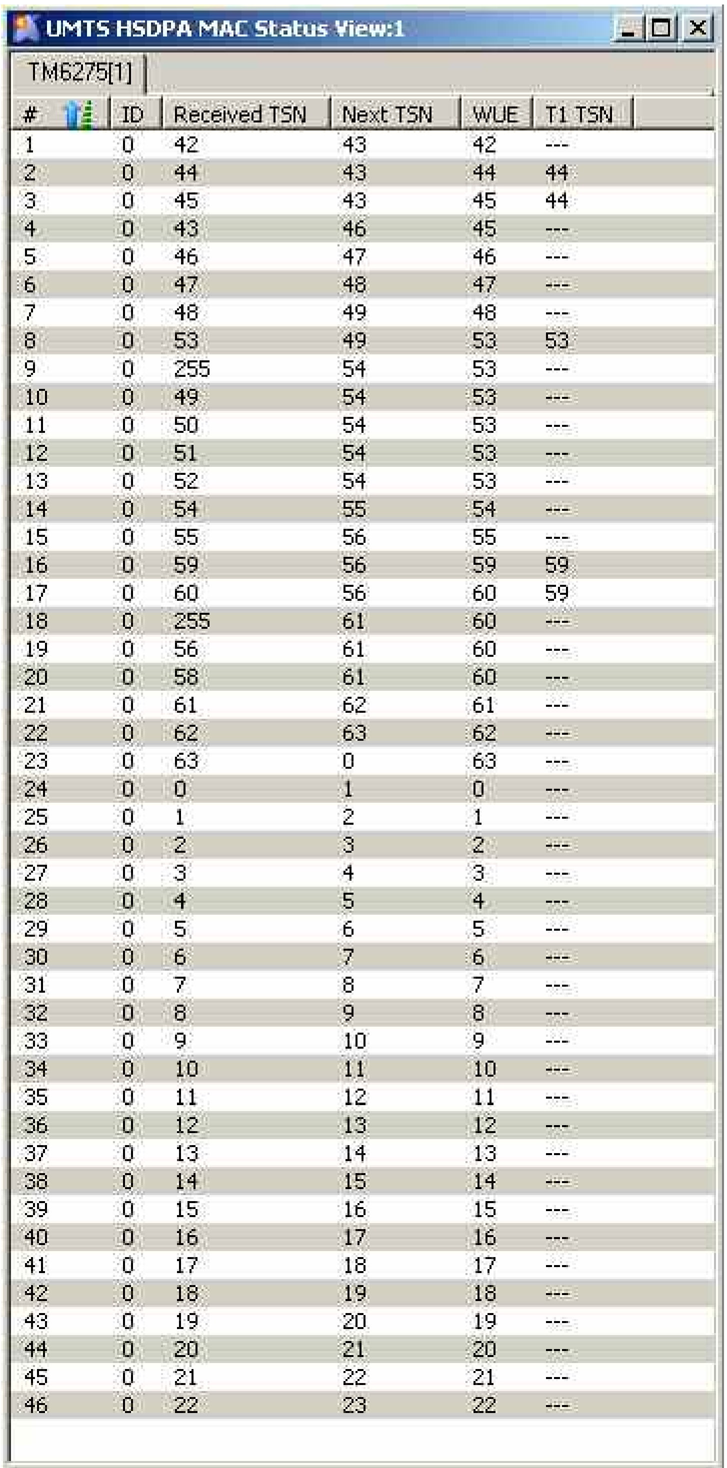
Context menu

A right mouse click on any point in the view opens the context menu to print the view, put the view on hold, copy the view contents to the clipboard, create or delete views, or move to another worksheet; see *Context menu* description on p. 4.2.

The *UMTS MAC Configuration View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

UMTS HSDPA MAC Status View

The *UMTS MAC Status View* gives an overview of the status of the reordering entity in the mobile receiver. The different state variables are described in standard 3GPP TS 25.321. The mobile collects this information in up to 100 consecutive samples which are displayed in a table.


UMTS HSDPA MAC Status View:1

TM6275[1]

#	ID	Received TSN	Next TSN	WUE	T1 TSN
1	0	42	43	42	---
2	0	44	43	44	44
3	0	45	43	45	44
4	0	43	46	45	---
5	0	46	47	46	---
6	0	47	48	47	---
7	0	48	49	48	---
8	0	53	49	53	53
9	0	255	54	53	---
10	0	49	54	53	---
11	0	50	54	53	---
12	0	51	54	53	---
13	0	52	54	53	---
14	0	54	55	54	---
15	0	55	56	55	---
16	0	59	56	59	59
17	0	60	56	60	59
18	0	255	61	60	---
19	0	56	61	60	---
20	0	58	61	60	---
21	0	61	62	61	---
22	0	62	63	62	---
23	0	63	0	63	---
24	0	0	1	0	---
25	0	1	2	1	---
26	0	2	3	2	---
27	0	3	4	3	---
28	0	4	5	4	---
29	0	5	6	5	---
30	0	6	7	6	---
31	0	7	8	7	---
32	0	8	9	8	---
33	0	9	10	9	---
34	0	10	11	10	---
35	0	11	12	11	---
36	0	12	13	12	---
37	0	13	14	13	---
38	0	14	15	14	---
39	0	15	16	15	---
40	0	16	17	16	---
41	0	17	18	17	---
42	0	18	19	18	---
43	0	19	20	19	---
44	0	20	21	20	---
45	0	21	22	21	---
46	0	22	23	22	---

Fig. 4-80 UMTS HSDPA MAC Status View

Diagram

The view displays the following information elements:

#

Current number of the sample, assigned in the range 1 to 100.

ID *Queue ID (0 to 7).*

The Queue ID provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues.

Received TSN

Transmission Sequence Number (TSN, 0 to 63) of the last received (HS-DSCH) MAC-hs PDU.

Next TSN

Next expected TSN. The TSN following the R&S TSMx of the last in-sequence MAC PDU received.

WUE

WUE (Window Upper Edge) represents the TSN at the upper edge of the receiver window. While timer T1 is active, the number is equal to the Received TSN. *Otherwise it is invalid.*

T1 TSN

TSN used in the reordering procedure. The TSN of the latest MAC-hs PDU that cannot be delivered to the disassembly entity, when the timer T1 is started.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

UMTS HSDPA MAC Status View Configuration

The *UMTS HSDPA MAC Status View* configuration menu selects the information to be displayed.

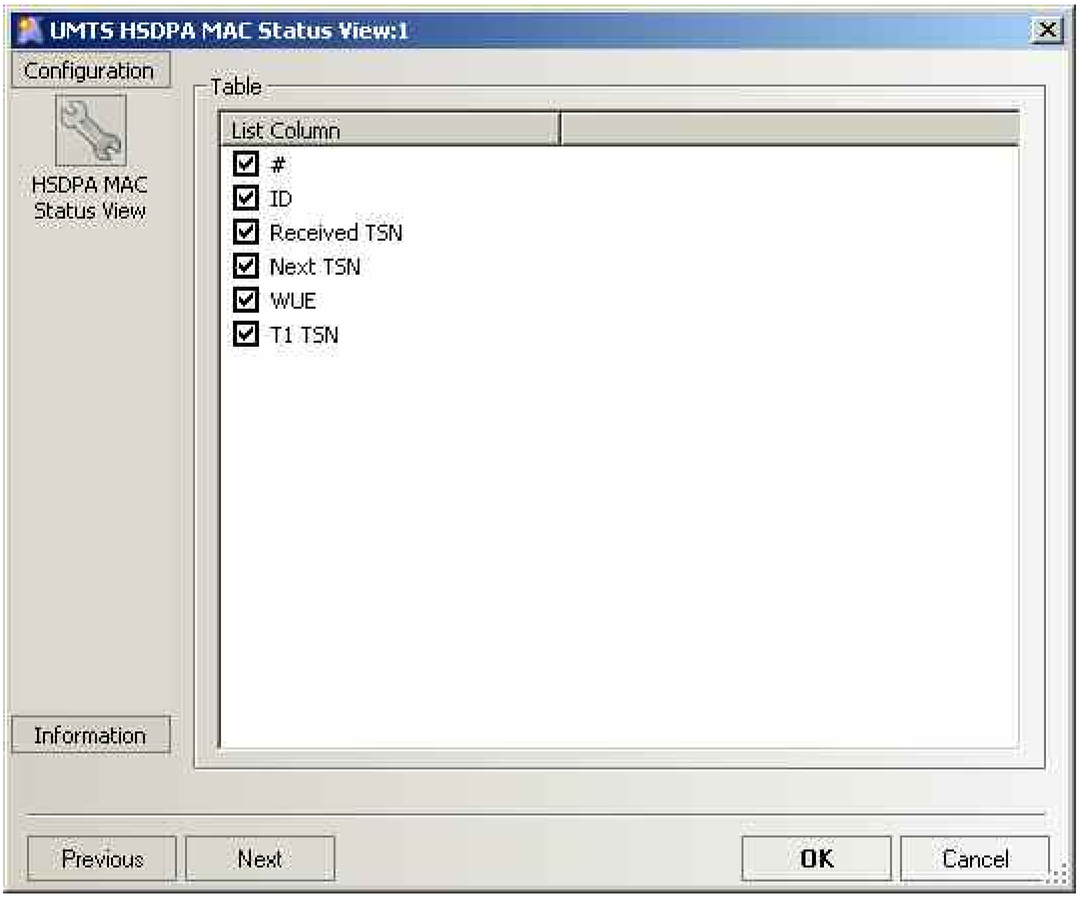


Fig. 4-81 UMTS HSDPA Status View Configuration

UMTS HSDPA MAC Header View

The *UMTS MAC Header View* shows the mobile-specific sub frame number and the corresponding (HS-DSCH) MAC-hs headers as defined in standard 2GPP TS 25.321, sections 9.1.4 and 9.2.2.

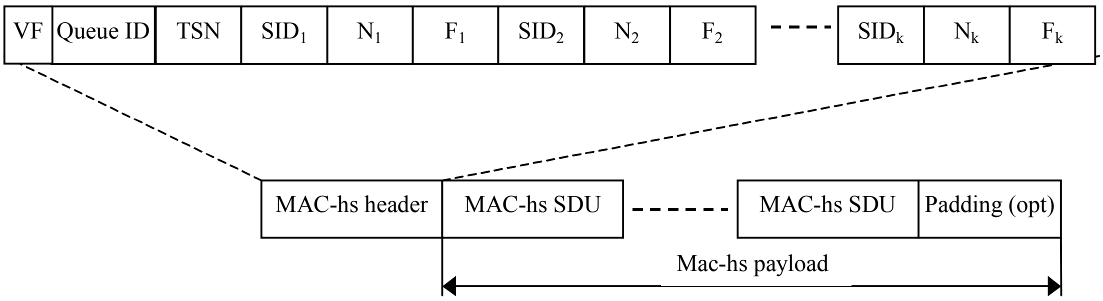
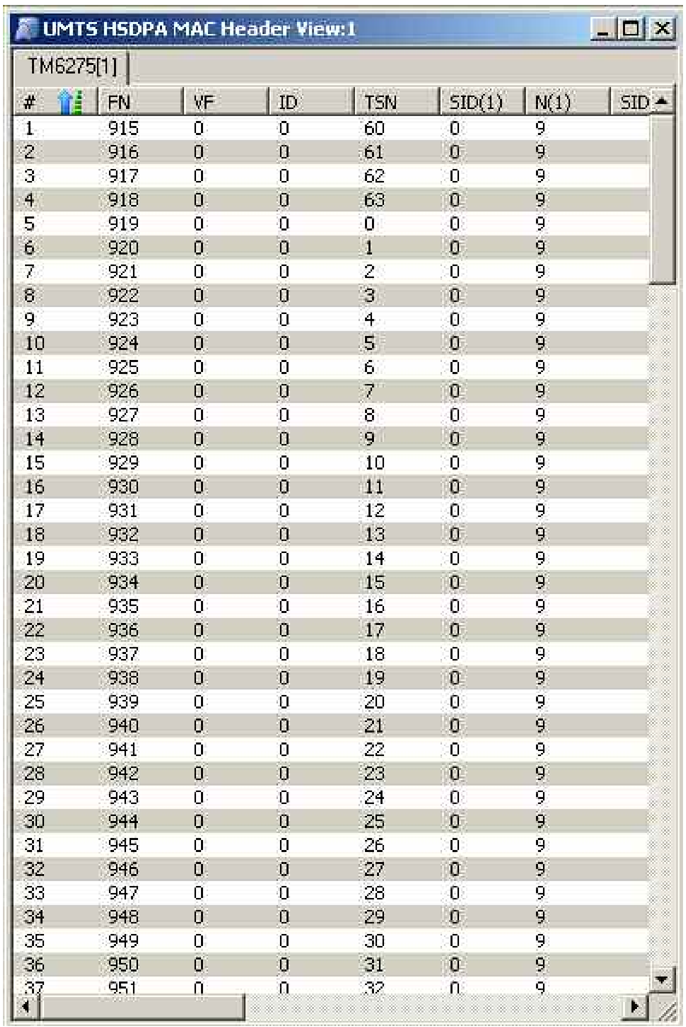


Fig. 4-82 UMTS MAC-hs PDU

For an overview of the last 100 MAC-hs PDUs use the UMTS HSDPA MAC Status View (see p. 4.137).



#	FN	VF	ID	TSN	SID(1)	N(1)	SID
1	915	0	0	60	0	9	
2	916	0	0	61	0	9	
3	917	0	0	62	0	9	
4	918	0	0	63	0	9	
5	919	0	0	0	0	9	
6	920	0	0	1	0	9	
7	921	0	0	2	0	9	
8	922	0	0	3	0	9	
9	923	0	0	4	0	9	
10	924	0	0	5	0	9	
11	925	0	0	6	0	9	
12	926	0	0	7	0	9	
13	927	0	0	8	0	9	
14	928	0	0	9	0	9	
15	929	0	0	10	0	9	
16	930	0	0	11	0	9	
17	931	0	0	12	0	9	
18	932	0	0	13	0	9	
19	933	0	0	14	0	9	
20	934	0	0	15	0	9	
21	935	0	0	16	0	9	
22	936	0	0	17	0	9	
23	937	0	0	18	0	9	
24	938	0	0	19	0	9	
25	939	0	0	20	0	9	
26	940	0	0	21	0	9	
27	941	0	0	22	0	9	
28	942	0	0	23	0	9	
29	943	0	0	24	0	9	
30	944	0	0	25	0	9	
31	945	0	0	26	0	9	
32	946	0	0	27	0	9	
33	947	0	0	28	0	9	
34	948	0	0	29	0	9	
35	949	0	0	30	0	9	
36	950	0	0	31	0	9	
37	951	0	0	32	0	9	

Fig. 4-83 UMTS HSDPA MAC Header View

Diagram

The MAC-hs header contains the following information elements:

FN

Internal sub frame number, range 0 to 1279.

VF

Version flag, at present set to zero.

ID

Queue ID (0 to 7). The Queue ID provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues.

TSN *Transmission*

Sequence Number (TSN, 0 to 63) on the HS-DSCH. The TSN field is used for reordering purposes to support in-sequence delivery to higher layers.

SID(n)

Size Index Identifier (0 to 7), identifies the size of a set of consecutive MAC-d PDUs. The MAC-d PDU size for a given SID is configured by higher layers and is independent for each Queue ID.

N(n)

Number of MAC-D PDUs (0 to 63), the number of consecutive MAC-d PDUs with equal size.

The flag fields *(F)* in the figure above indicate whether the MAC-hs header contains additional *SID* and *N* fields. They are not relevant for the *MAC Header View* because the number of columns in the table is selected in the configuration menu.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, save the current configuration as default, or move to another worksheet; see *Context menu* description on p. 4.2.

UMTS HSDPA MAC Header View Configuration

The *UMTS HSDPA MAC Header View* configuration menu selects the information to be displayed.

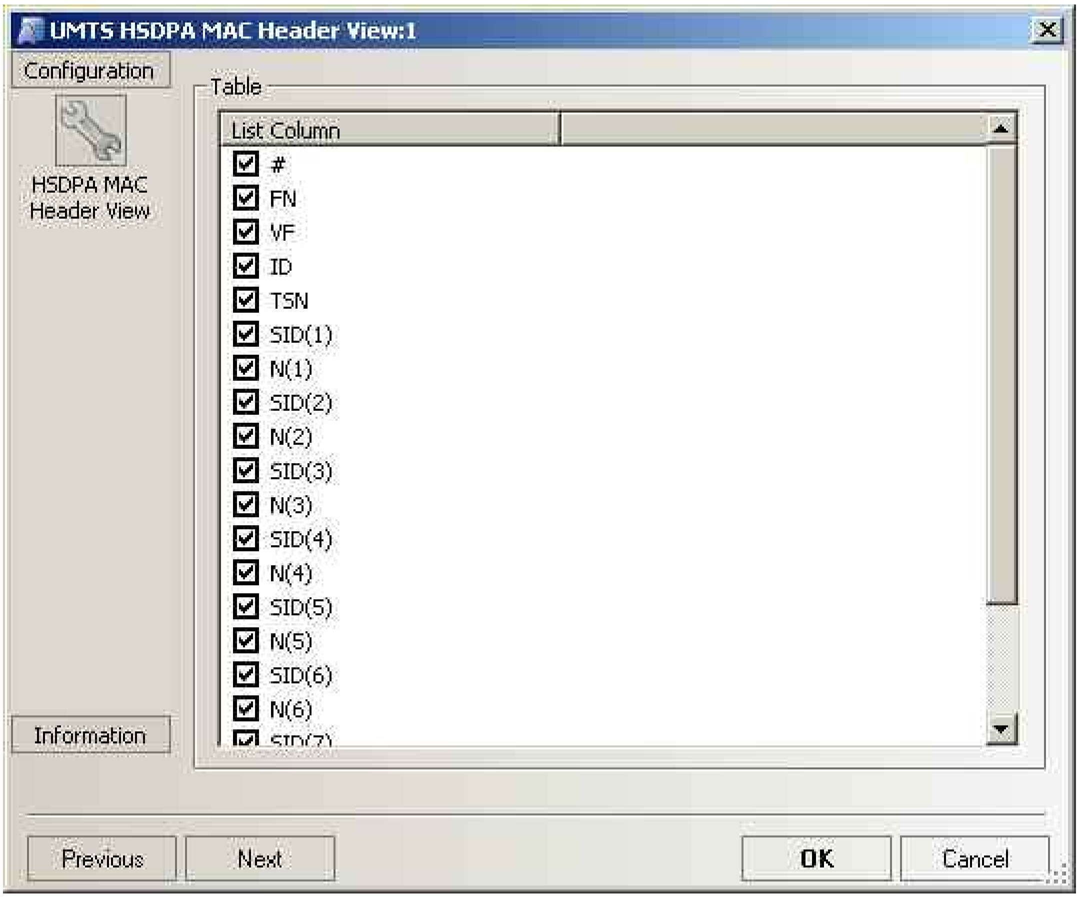


Fig. 4-84 UMTS HSDPA Header View Configuration

UMTS HSDPA Performance View

The *UMTS HSDPA Performance View* contains five preconfigured 2D charts. The signals in these charts are related to the transmission performance, given in terms of the requested or achieved data throughput.

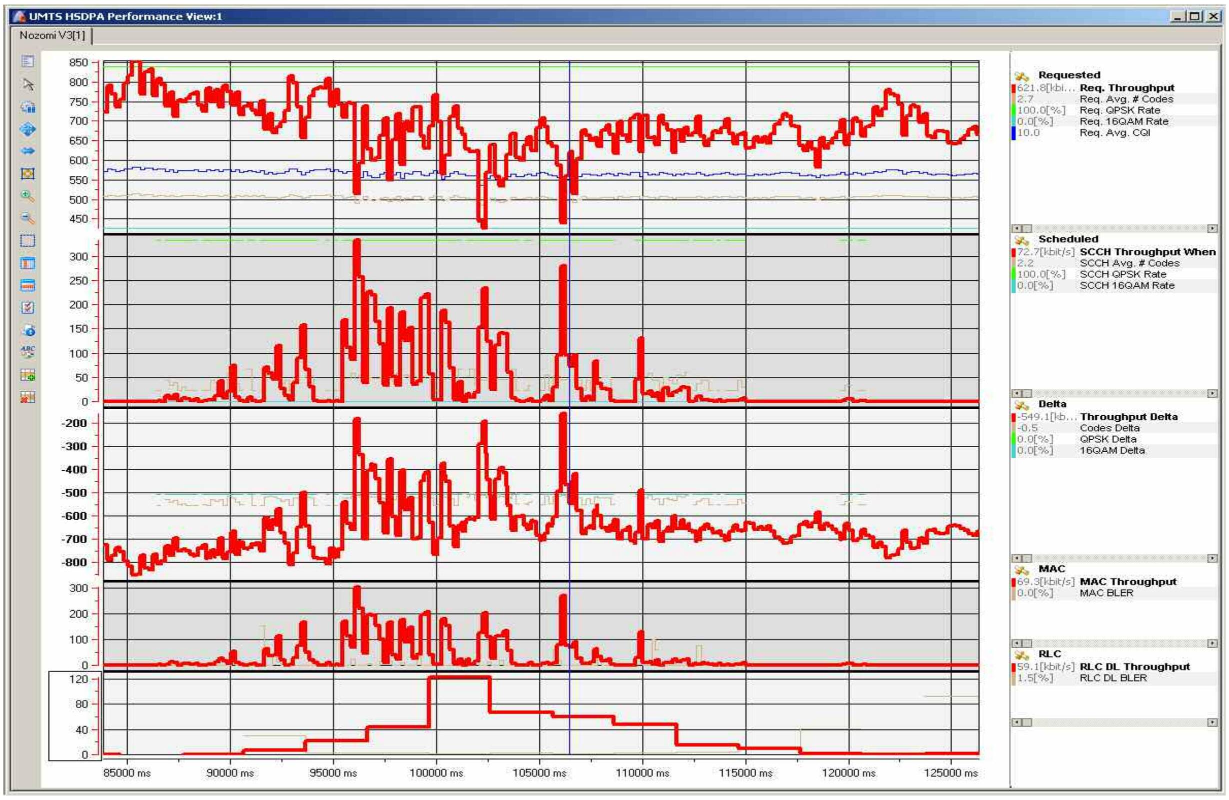


Fig. 4-85 UMTS HSDPA Performance View

A double-click on the *Requested, Scheduled,* title bars opens or closes the sub-diagrams in the performance view. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.9, however, an additional *Plot* dialog (see below) provides additional settings to control the diagram content and appearance.

Requested

The *Requested* throughput (see figure above) is the data throughput that the mobile requests according to the measured channel quality. The requested throughput is calculated from the CQI messages that the mobile transmits on the UL HS-DPCCH; see *UMTS HSDPA UL HS-DPCCH View* on p. 4.126. The results are averaged over the number of sub frames (100) shown in the *UMTS HSDPA HS-DPCCH* view.

The chart contains the following results:

Req. Throughput
: *Requested total throughput*

Req. Avg. # Codes
: *Number of HS-(P)DSCH channelization codes in the range between 1 and 15. See* UMTS HSDPA HS Decode Status View *on p. 4.128.*

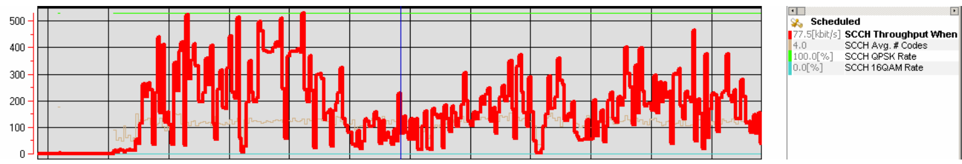
Req. QPSK Rate
: *Percentage of the requested throughput that should be transferred on QPSK-modulated data blocks.*

Req. 16QAM Rate
: *Percentage of the requested throughput that should be transferred on 16QAM-modulated data blocks.*

Req. Avg. CQI
: *Average CQI value received from the mobile.*

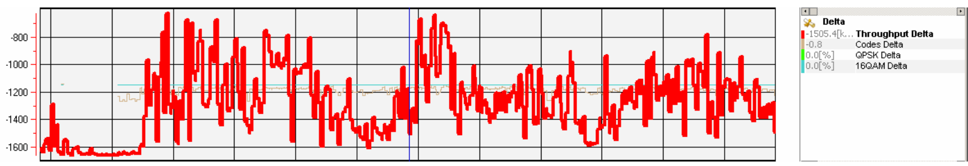
Scheduled

The *Scheduled* throughput is the data throughput that the network uses according to the requests (CQI messages) from the mobile. The results are analogous to the *Requested Throughput* results.



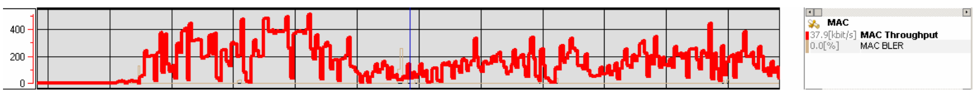
Delta

The *Delta* throughput is the difference between the scheduled and the requested throughputs. The results are analogous to the *Requested Throughput* results. If there is no network congestion, the delta results are close to zero.



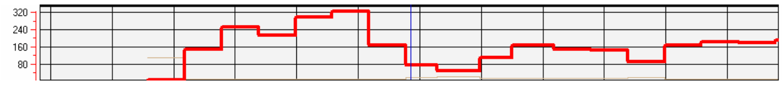
MAC Layer

The hs-*MAC Layer* throughput is the actual DL data throughput achieved. The MAC throughput depends on the scheduled throughput and the percentage of data blocks that the network has to re-transmit *(HARQ Retransmission Rate) :* The *RLC DL BLER* is the percentage of RLC blocks that the UE received in error. The larger the Block Error Rate, the higher the number of retransmissions and the smaller the MAC Throughput.



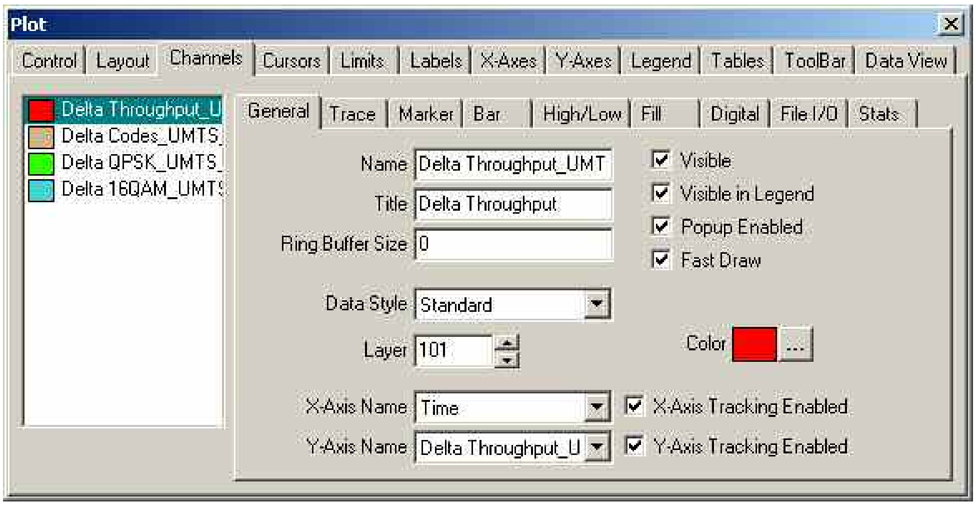
RLC Layer

The *RLC Layer* throughput is the data throughput of the RLC blocks that the mobile receives from the network. The *RLC DL BLER* is the percentage of RLC blocks that the UE received in error.



View Configuration

The *Plot* dialog provides additional settings to control the diagram content and appearance. The dialog is opened from a context menu; this menu appears after a right-click on the y-axis labels or on one of the curves in the diagram.



Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

UMTS HSDPA Performance View Configuration

The *UMTS HSDPA Performance View* configuration menu scales the axes of the chart and defines its contents and its appearance. All controls are also available in the *Chart Configuration* tab of the *2D Chart Configuration* menu and have the same effect; see figure on p. 4.16.

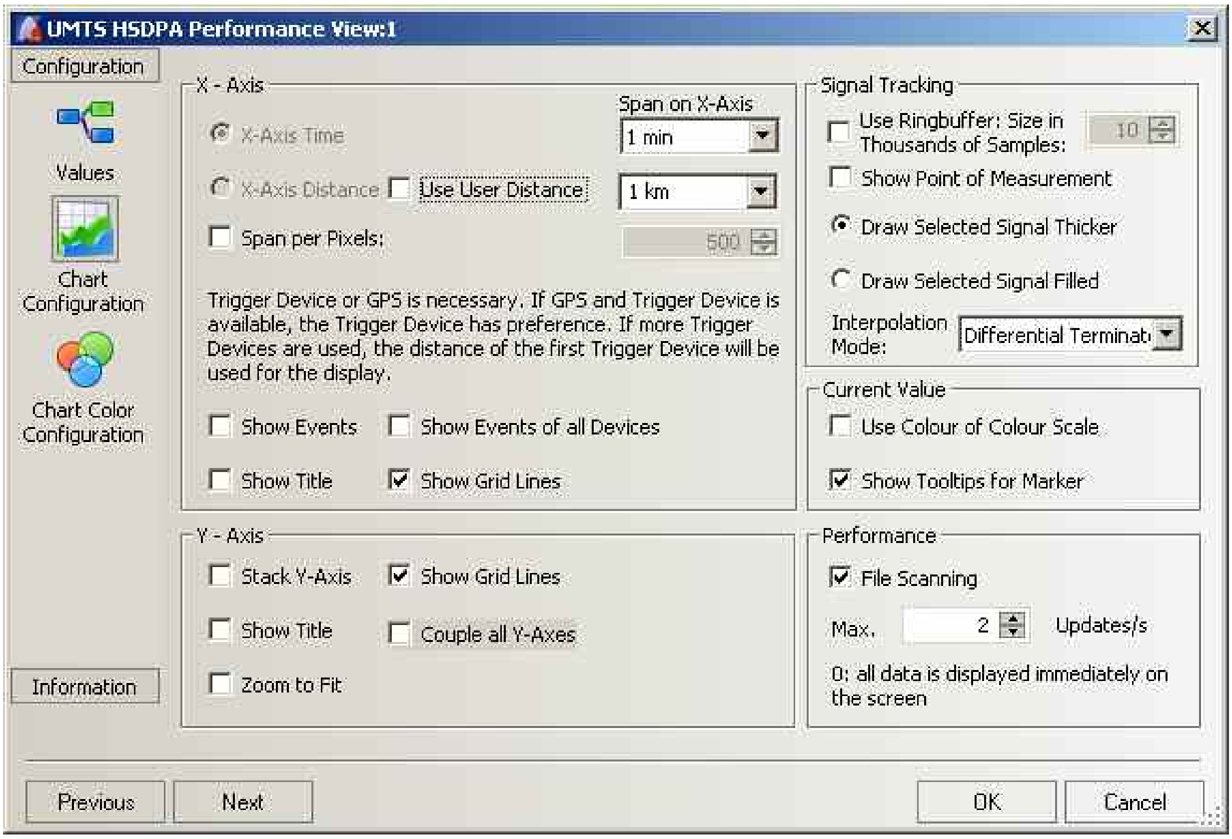


Fig. 4-86 UMTS HSDPA Performance View Configuration

Graph *Show BLER as bar* or *Show New TX as bar* select the visualized quantity. The input fields on the right side set the scale of the bars.

UMTS HSDPA Decode Statistic View

The *UMTS Decode Statistic View* shows a statistical evaluation of the received DL HS-DSCH transport blocks, together with the block error rate and the number of retransmissions needed to successfully decode the blocks of each size. The transport block size depends on the CQI values that the mobile reported to the network; see standard 2GPP TS 25.214 and section *UMTS HSDPA UL HS-DPCCH View* on p. 4.126. The results are averaged over the number of sub frames (100) shown in the *UMTS HSDPA HS-DPCCH* view.

UMTS HSDPA Decode Statistic View:1

Nozomi V3[1]

TBS	SB+	SB++	SB-	SBLER [%]	BL+	BL-	BLER [%]	# 1 [%]	# 2 [%]	# 3 [%]	# 4 [%]	# 5 [%]	# >5 [%]
93	---	---	---	---	---	---	---	---	---	---	---	---	---
377	3	0	0	0.00	3	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
461	---	---	---	---	---	---	---	---	---	---	---	---	---
650	1	0	0	0.00	1	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
792	10	0	0	0.00	10	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
931	5	0	0	0.00	5	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
1262	24	0	0	0.00	24	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
1405	---	---	---	---	---	---	---	---	---	---	---	---	---
1483	23	0	0	0.00	23	0	0.00	100.00	0.00	0.00	0.00	0.00	0.00
1742	21	0	2	8.70	21	0	0.00	90.48	9.52	0.00	0.00	0.00	0.00
2279	25	0	5	16.67	25	1	3.85	78.26	21.74	0.00	0.00	0.00	0.00
2583	35	0	8	18.60	35	0	0.00	75.00	25.00	0.00	0.00	0.00	0.00
3440	97	0	25	20.49	97	0	0.00	75.79	23.16	1.05	0.00	0.00	0.00

Fig. 4-87 UMTS HSDPA Decode Statistic View

Diagram The table contains the following columns:

TBS

Transport block size in bits, in ascending order. The results in each row are relating to blocks of the same size.

SB+

Number of successfully decoded sub-blocks. A sub-block is a mobile-specific unit comprising the HS-DSCH data of one sub frame.

SB++

Number of duplicate sub-blocks. Duplicate sub-blocks are sub-blocks that the network retransmitted although they were received correctly (usually because no ACK message was received from the mobile).

SB–

Number of sub-blocks which could not be decoded successfully and had to be retransmitted. These blocks contribute to the SBLER *but not necessarily to the* BLER; *see below.*

SBLER

Sub-block error rate, SBLER = SB– / (SB+ SB–).

BL+

Number of successfully decoded blocks

BL–

Number of blocks which could not be decoded successfully until the maximum number of retransmissions was reached.

BLER

Block error rate, BLER = BL– / (BL+ BL–). The BLER is usually smaller than the SBLER because it counts only the blocks that could not be decoded until the end of the HARQ process (until the maximum number of retransmissions was reached).

1 [%]
Number of blocks successfully decoded without retransmission.

n [%]
Number of blocks successfully decoded after one initial transmission and (n–1) retransmissions.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, save the current configuration as default, or move to another worksheet; see *Context menu* description on p. 4.2.

UMTS HSDPA Decode Statistic View Configuration

The *UMTS HSDPA Decode Statistic View* configuration menu selects the information to be displayed.

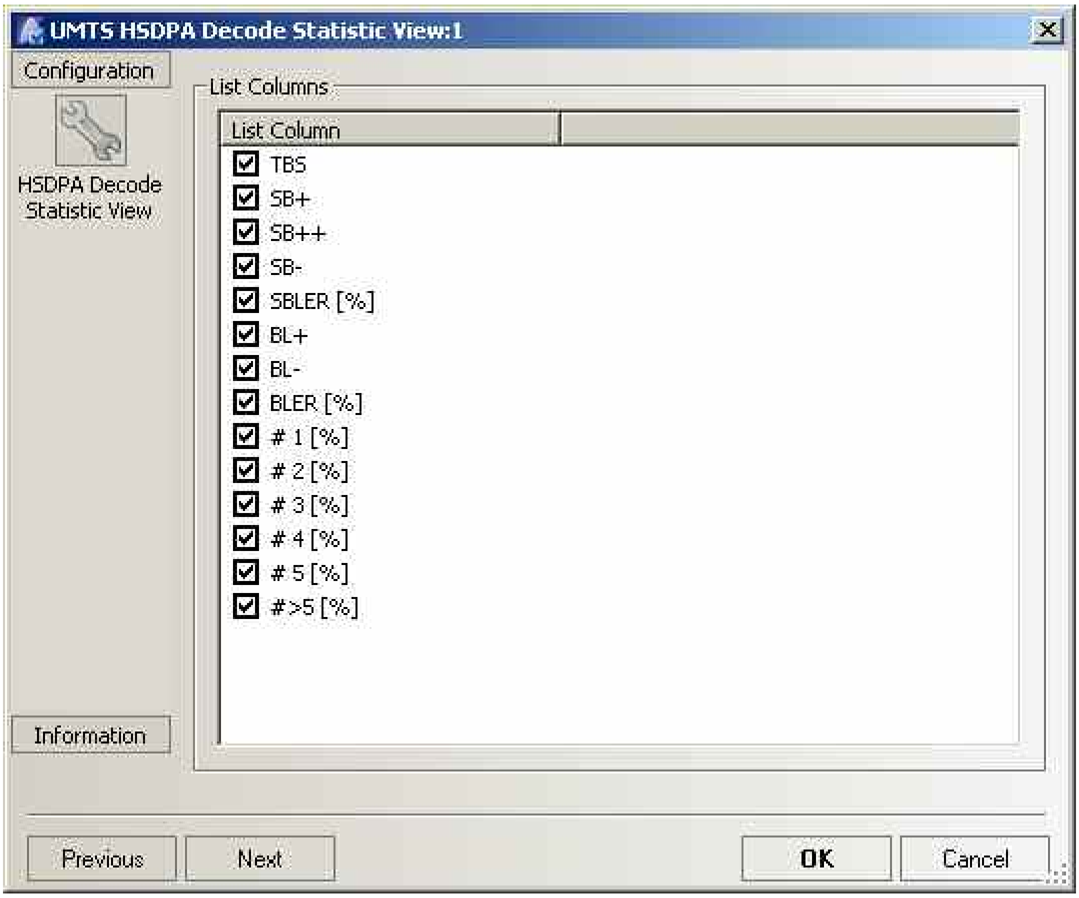


Fig. 4-88 UMTS HSDPA Decode Statistic View Configuration

UMTS Views

The *UMTS Views* display UMTS-specific information acquired with an UMTS test mobile and using the UMTS driver. In general, recording of the different message types shown in the *UMTS Views* must be explicitly activated in the *Configuration* and *Expert Mode* tabs of the driver configuration menu; refer to the relevant description in chapter 6.

The UMTS views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *UMTS*.

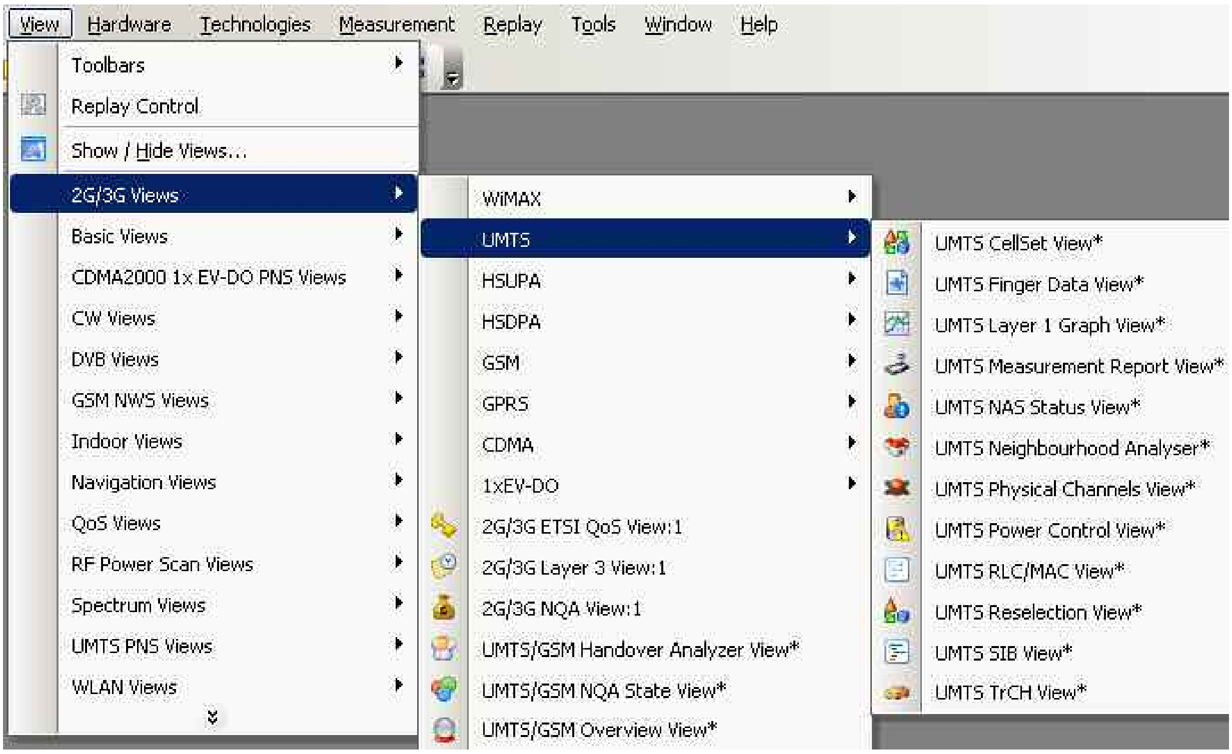


Fig. 4-89 UMTS views

UMTS Finger Data View

The *UMTS Finger Data View* shows the most important layer 1 parameters characterizing the different downlink WCDMA signals received by the mobile, captured with the different branches (fingers) of the test mobile UMTS RAKE receiver. The value of the critical quantity E_c/I_o for each signal is visualized in addition by horizontal bars. A mobile with a Qualcomm chipset must be used to record the data.

The view is empty unless the test mobile is configured to record the *WCDMA Finger Info;* see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

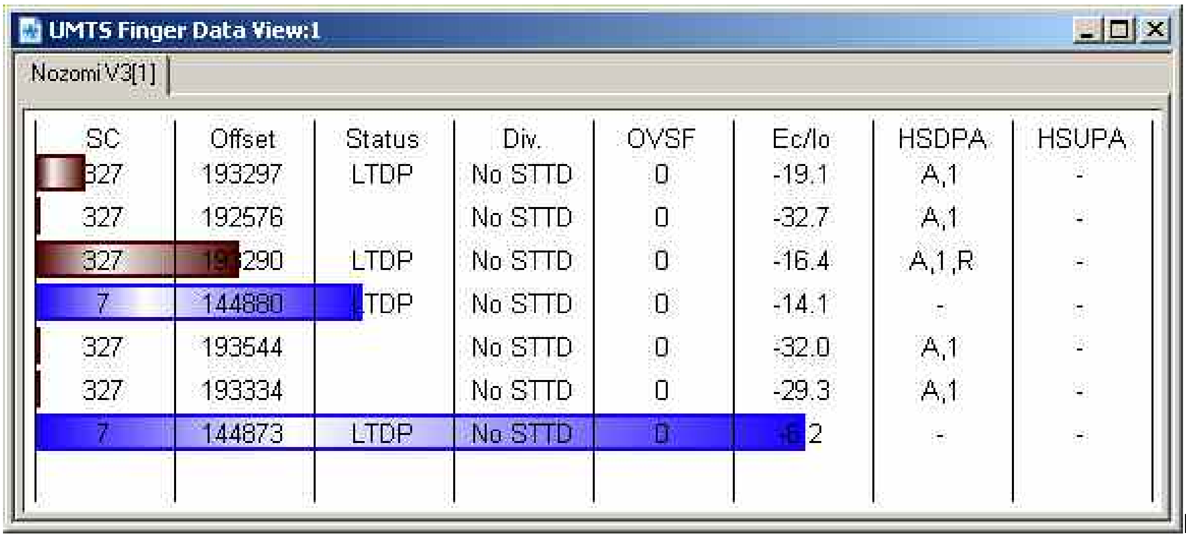


Fig. 4-90 UMTS Finger Data View

The results for each mobile are arranged in a separate tab.

Results Table of the most important layer 1 parameters of the captured downlink WCDMA signals. Each table row represents a signal. The maximum number of rows/signals can be set in the configuration menu. The signals are sorted according to the signal-to-noise ratio Ec/Io, the strongest signal appears on top of the list.

SC Primary scrambling code of the signal in the format selected in the *TEC for UMTS Test Mobiles* tab of the *Configuration of Software Modules* menu; refer to section *Configuration Menu* in chapter 3.. The primary SC is used to identify the cell.

Offset Time offset of the signal in 1/8-chip units relative to the system time (hardware-dependent). The difference between the offsets of different signals provides important information: Two signals with equal *SC, Status, Div.,* and *OVSF* but different offset and E_c/I_o originate from the same source but propagated along different paths.

Status	Status of the receiver fingers; one or several of the following characters:
	L (Lock Detection State) — This shows whether the finger RSSI is > high threshold regardless of whether the given type of lock is enabled
	T (Time Tracking Lock) — This shows when time tracking lock is enabled, that the finger RSSI > upper lock threshold
	D (Data Combining Lock) — This shows when the data combining lock is enabled, that the finger RSSI > upper lock threshold
	P (Power Control Bit Lock) — This shows when the data combining lock is enabled, that the finger RSSI > power control bit threshold.
Div.	Downlink transmit diversity scheme for the CPICH: *STTD* (Space Time Transmit Diversity)*, TSTD* (Time Switched Transmit Diversity), *SSDT* (Site Selection Diversity Transmit Power Control), or *No Diversity*
OVSF	Orthogonal Variable Spreading Factor, code number of the signal
E_c/I_o	Ratio of the received energy per PN chip for the signal to the total received power spectral density at the mobile antenna connector. E_c/I_o is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.

The SC, Offset, *and* Ec/Io *values for each finger generate signals in the* UMTS – <Device> – Finger Info *branch of the data tree.*

HSDPA results

The HSDPA-related results are available with option R&S ROMES4HUQ (Qualcomm). They are closely related to the *Last Action, Ref. Finger,* and *HS Cell Index* parameters in the *UMTS HSDPA Configuration View* (see p. 4.132). Note that signals from the same source (equal SC) have the same *HSDPA* status and *HS Cell Index,* but only a single signal can be the reference signal.

The results are comma delimited in the following order:

"A" (or "–")	Active (or not)
1 .. n	Cell index in the range 0 to 7
R	Reference finger

HSUPA results

The HSUPA-related results are available with option R&S ROMES4HUQ (Qualcomm). Note that signals from the same source (equal SC) have the same *HSUPA* status and *Cell Index,* but only a single signal can be the reference signal.

The results are comma delimited in the following order:

"A" (or "–")	Active (or not)
1 .. 7	Radio link set in the range 0 to 7
R	Reference finger
SC	Serving Cell

Ec/Io bars

A colored bar overlaid to each table row shows the signal strength, expressed by its Ec/Io. The scale of the Ec/Io bars is defined in the configuration menu, the colors denote the SCs of the different signals; they can be customized in the Colors tabs of the UMTS view configuration menus (e.g. the one linked to the UMTS Cell Set View). If the signal strength falls below the selected minimum, the bar is replaced by a narrow line at the left edge of the diagram.

The SC color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.53.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

UMTS Finger Data View Configuration

The *UMTS Finger Data View* configuration menu defines the maximum number of table rows in the *UMTS Finger Data View* and the scale the E_c/I_o bars and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS Finger Data View* or via the *Tools - Modules Configuration...* command (see chapter 3).

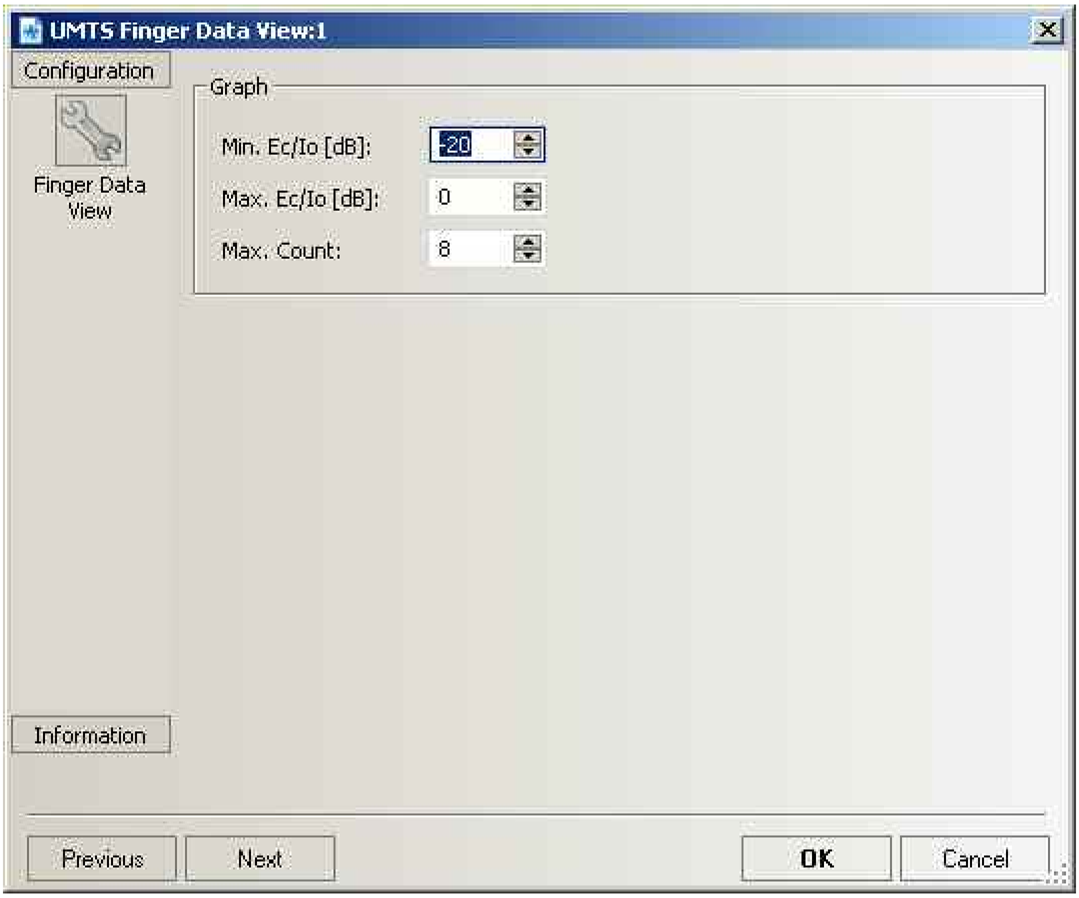


Fig. 4-91 UMTS Finger Data View: Finger Data View Configuration

Graph

The *Graph* panel in the *Finger Data View Configuration* tab contains three input fields:

Min. Ec/Io [dB]

Value of E_c/I_o at the left edge of the diagram. The length L of the bars increases with the value of Ec/Io, it is given by the linear formula:

$$L = L_{\max} \cdot \frac{E_c / I_0 - \min(E_c / I_0)}{\max(E_c / I_0) - \min(E_c / I_o)}; \quad 0 \le L \le L_{\max}$$

where L_{max} *denotes the diagram width.*

Max. Ec/Io [dB]

Value of E_c/I_o at the right edge of the diagram; see above.

Max. Count

Maximum number of signals displayed in the view (= maximum number of table rows). The signals are sorted according to their E_c/I_o, so a small number eliminates weak signals that may be of minor interest.

UMTS CellSet View

The *UMTS CellSet View* shows an overview of the layer 1 parameters of the serving cell and the neighbor cells.

The view is empty unless the test mobile is configured to record the *WCDMA Active Set,* the *WCDMA Neighbor Set,* or the *WCDMA List Searcher* parameters*;* see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

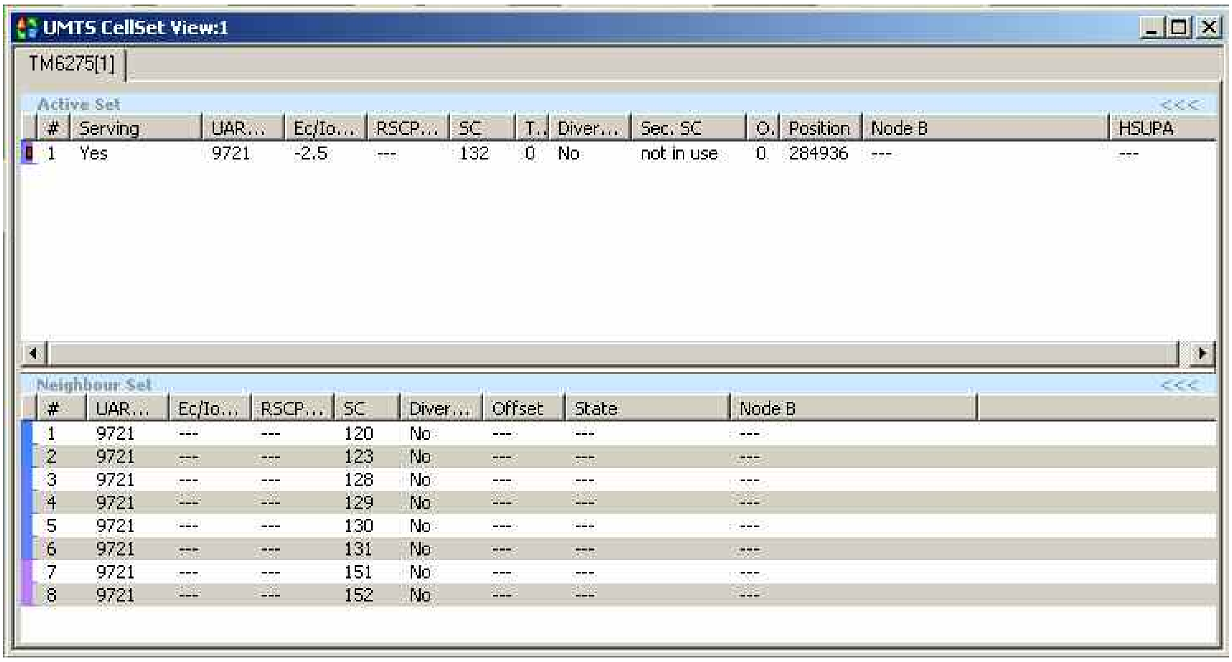


Fig. 4-92 UMTS CellSet View

The results for each mobile are arranged in a separate tab.

View area

The entire view area is horizontally split to accommodate two different tables for the *Active (Cell) Set* and the *Neighbor Set*.

A click on the *Active Set* or *Neighbor Set* title bars compresses and expands the corresponding table. A compressed table leaves more space for the other table. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

The contents of both tables can be selected in the configuration menu.

Active Set

Table of the most important parameters of the downlink WCDMA signals from the UTRAN cells in the active cell set. The active set comprises the serving cell and all other cells that are currently used for the connection; its members are permanently monitored and updated by the network.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the Colors *tab of the configuration menu. The SC color codes are also shown in the* Route Track *menu; see paragraph on scrambling code indication on p.* *4.53*.

#

Sequence number for the cell, assigned in chronological order and always starting with 1.

Serving

Indication whether or not the cell is the serving cell (Yes/No).

UARFCN

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal. The carrier frequency is equal to f = 0.2 MHz * UARFCN

E_c/I_o

Ratio of the received energy per PN chip for the signal to the total received power spectral density at the mobile antenna connector. E_c/I_o *is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.*

RSCP

CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.

SC

Primary scrambling code of the signal in the format selected in the TEC for UMTS Test Mobiles *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. The primary SC is used to identify the cell.*

TPC

Cell Transmission Power Control value in the range 0 to 5.

Diversity

Downlink transmit diversity scheme for the CPICH: STTD *(Space Time Transmit Diversity)*, TSTD *(Time Switched Transmit Diversity),* SSDT *(Site Selection Diversity Transmit Power Control), or* No Diversity

2^{nd} SC

Secondary Scrambling code number. "Not in use" is displayed if the cell uses only primary scrambling codes.

OVSF

Orthogonal Variable Spreading Factor, code number of the signal.

Position

Active cell position

Node B

Name of the node B, taken from the UMTS Node B database (if available).

HSUPA

In case of HSUPA is active, this column shows which EUL set the Node B *belongs to:*

SC	*Serving Cell*
RLS	*Radio Link Set*
Other	*other cells*

The SC *and* E_c/I_o *values for each active set element generate signals in the* UMTS – <Device> – Active Set *branch of the data tree.*

Neighbor Set

Table of the most important parameters of the downlink WCDMA signals from all UTRAN cells that are in the neighbor set and not currently used for the connection. The members of the neighbor set are permanently monitored and updated by the network. Most of the parameters are also available for the Active Set; see above. Besides the following information is displayed:

State

Indication whether the neighbor cell is Monitored, Detected, Undetected, Not Listed or Detected.

Offset

Time offset of the signal in 1/8-chip units relative to the system time (hardware-dependent).

A Qualcomm mobile must be used to record the neighbor set data.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

UMTS CellSet View Configuration

The *UMTS CellSet View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS CellSet View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Cell Set List Configuration* tab displays the complete parameter set to be displayed in the *Active Set* and *Neighbor Set* tables (see description in the *Active Set* paragraph on p. 4.154). Clearing a parameter hides the column in the table.

Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

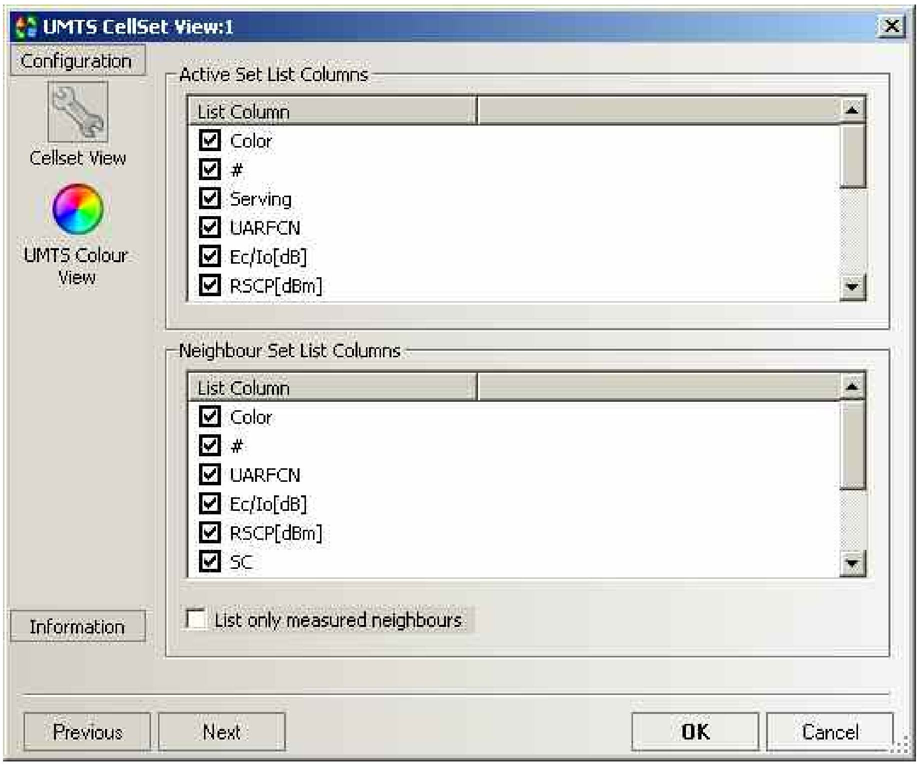


Fig. 4-93 UMTS CellSet View: CellSet List Configuration

The *CellSet View* tab of the *UMTS CellSet View* dialog selects the list information to be displayed in the active and neighbor sets.

Neighbor Set List Columns

The checkbox selects the neighbors to be displayed:

If List only measured neighbors *is activated, then only measured neighbor cells are displayed, otherwise all neighbors from the Node B database are shown.*

The *UMTS Color View tab* of the *UMTS CellSet* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

UMTS NAS Status View

The *UMTS NAS Status View* shows an overview of higher-layer (Non-Access Stratum, NAS) parameters of the serving cell and the connection. A Qualcomm mobile must be used to record the data (the Nokia test mobile only provides the *Cell ID* and *Name* of the serving cell).

The view is empty unless the test mobile is configured to record the *UMTS NAS GMM State, UMTS NAS MM State, UMTS NAS REG State,* or *UMTS NAS MM Characteristics* data*;* see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

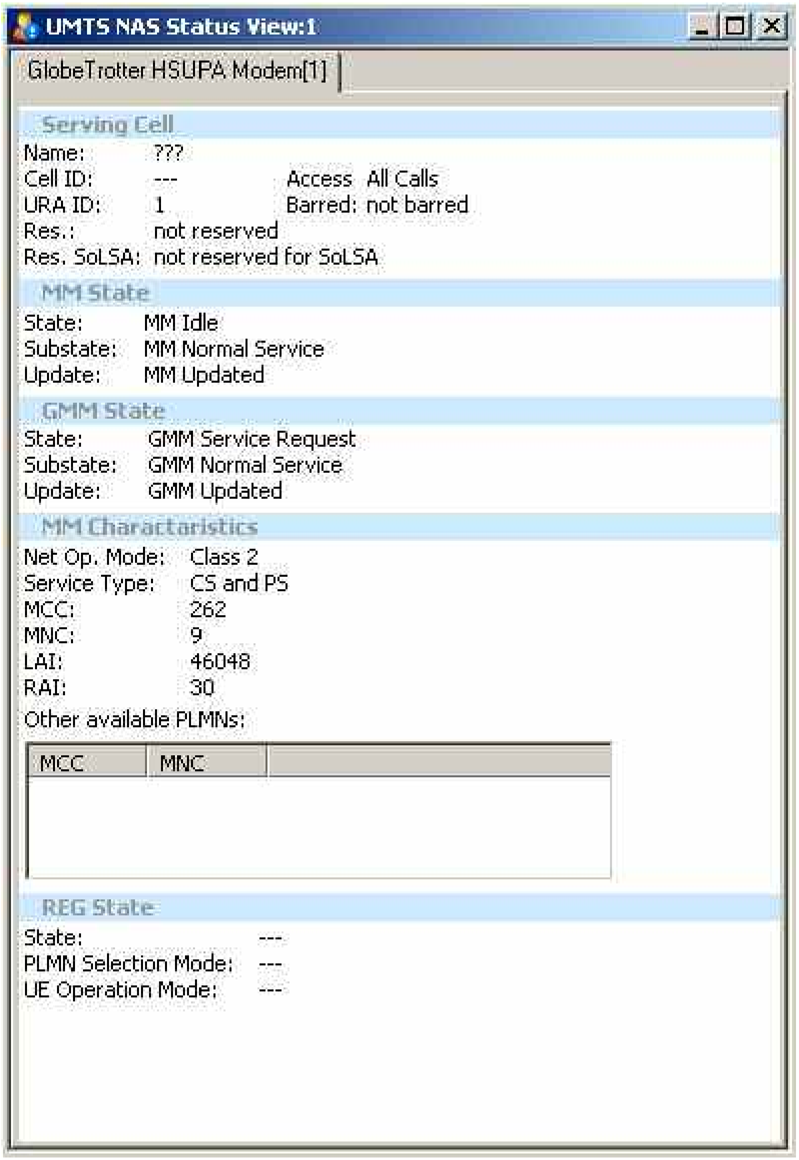


Fig. 4-94 UMTS NAS Status View

The results for each mobile are arranged in a separate tab. Each tab consists of several panels.

Serving Cell

Table of the most important higher layer (NAS) parameters of the serving cell.

Name
: *Name of the serving cell Node B, taken from the UMTS Node B database (if available).*

Cell ID
: *Cell Identity of the serving cell.*

URA ID
: *UTRAN Registration Area*

Res.
: *Cell totally reserved or not reserved*

Res. SoLSA
: *Cell reserved for Support of Localized Service Area*

Access
: *Indication of possible cell access restrictions: Access for* All Calls *or* Emergency Calls Only

Barred
: *Indication whether the cell is barred (for all calls, including emergency calls) or not barred*

MM / GMM State

Overview of the current Mobility Management (MM) and GPRS Mobility Management (GMM) states, substates and updates of the mobile. The GMM results are available for test mobiles supporting GPRS functionality (which is true for most test mobiles). MM and GMM are described in standard 3GPP TS 24.008.

MM Characteristics

Table of additional MM parameters:

Net Op. Mode
: *Network operation mode Class I, II or III, see standard 3GPP TS 123 060. The operation mode is indicated as system information to the mobile.*

Service type
: *Circuit switched service* (CS)*, packet switched service* (PS) *or both* (CS and PS) *or* Limited Service

MCC
: *Mobile Country Code*

MNC
: *Mobile Network Code*

LAI
: *Location Area Identity*

RAI
: *Routing Area Identity*

Other available PLMNs
: *MCC and MNC of other networks detected by the mobile*

The *NAS* values generate signals in the *UMTS – <Device> – NAS State* branch of the data tree.

REG State

Table of registration information in the network

State

Identifies the state of the UE:

- Not registered and the UE is not currently searching a new operator to register to.
- Registered in home network.
- Not registered, but UE is currently searching a new operator to register to.
- Registration denied.
- Unknown
- Registered under roaming conditions.

PLMN Selection Mode

Identifies how the UE selects the network:

- Automatic
- Manual
- Deregister from network.
- Manual/automatic; if manual selection fails, automatic mode is entered.

UE Operation Mode

An UE in class-A mode of operation involved in a CS connection makes only RA updates and no combined RA/LA updates to the SGSN.
An UE in class-B mode of operation involved in a CS connection does not make any updates during the CS connection.
An UE in class-C mode of operation never makes combined RA/LA updates.

Context menu

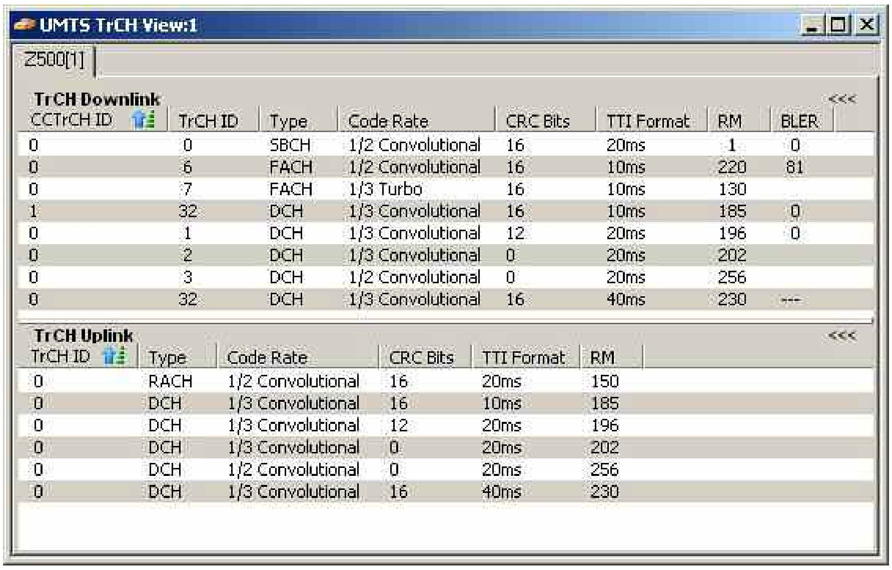
A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration as default, or move to another worksheet; see *Context menu* description on p. 4.2.

The configuration menu displays information about the view version.

UMTS TrCH View

The *UMTS TrCH View* shows an overview of the channel coding parameters in the downlink and uplink Transport Channels (TrCHs). A Qualcomm mobile must be used to record the data.

The view is empty unless the test mobile is configured to record the *WCDMA TrCH Downlink* or the *WCDMA TrCH Uplink* parameters; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.


UMTS TrCH View:1

Z500[1]

TrCH Downlink <<<

CCTrCH ID	TrCH ID	Type	Code Rate	CRC Bits	TTI Format	RM	BLER
0	0	SBCH	1/2 Convolutional	16	20ms	1	0
0	6	FACH	1/2 Convolutional	16	10ms	220	81
0	7	FACH	1/3 Turbo	16	10ms	130	
1	32	DCH	1/3 Convolutional	16	10ms	185	0
0	1	DCH	1/3 Convolutional	12	20ms	196	0
0	2	DCH	1/3 Convolutional	0	20ms	202	
0	3	DCH	1/2 Convolutional	0	20ms	256	
0	32	DCH	1/3 Convolutional	16	40ms	230	---

TrCH Uplink <<<

TrCH ID	Type	Code Rate	CRC Bits	TTI Format	RM
0	RACH	1/2 Convolutional	16	20ms	150
0	DCH	1/3 Convolutional	16	10ms	185
0	DCH	1/3 Convolutional	12	20ms	196
0	DCH	1/3 Convolutional	0	20ms	202
0	DCH	1/2 Convolutional	0	20ms	256
0	DCH	1/3 Convolutional	16	40ms	230

Fig. 4-95 UMTS TrCH View

The results for each mobile are arranged in a separate tab.

View area

The entire view area is horizontally split to accommodate two different tables for the *TrCH Downlink* and the *TrCH Uplink*.

A click on the *TrCH Downlink* or *TrCH Uplink* title bars compresses and expands the corresponding table. A compressed table leaves more space for the other table. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

The contents of both tables can be selected in the configuration menu.

TrCH Downlink

Table of the channel coding parameters of the downlink TrCHs received by the test mobile.

Each table row represents a single transport channel that has been added during the measurement (and possibly removed). A new table row is created each time that a new transport channel is added. On the other hand, a table row for a removed transport channel is deleted after the *Time Window for DL/UL* set in the configuration menu.

Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

CCTrCH ID

Composite Coded Transport Channel ID in the range 0 to 15, identifies unambiguously a CCTrCH inside a Radio Link.

TrCH ID

Transport channel number assigned to L1 by L2. Transport channels are multiplexed to the CCTrCH in the ascending order of these IDs.

Type

Transport channel type, e.g. Paging Channel (PCH), Slow Broadcast Channel (SBCH), Random Access Channel (RACH), Dedicated Channel (DCH), Downlink Shared Channel (DSCH), Forward Access Channel (FACH)

Code Rate

Coding rate and type of error protection/channel coding (convolutional coding, turbo coding)

CRC Bits

Number of CRC bits per transport block.

TTI Format

Length of the Transmission Time Interval in ms.

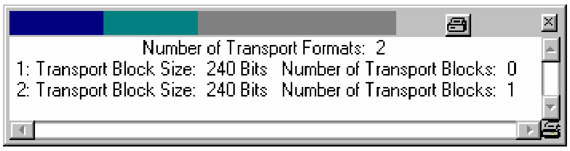
RM

Rate matching attribute, assigned by higher layers and used when the number of bits to be repeated or punctured is calculated.

BLER

Estimation of the transport channel block error rate (BLER) based on evaluating the CRC on each transport block.

A double-click on a table row opens a popup window with detailed information about the transport block format:



TrCH Uplink

Table of the most important parameters of the uplink WCDMA TrCHs transmitted by the test mobile. The parameters are a subset of the TrCH Downlink parameters. Uplink transport channel types are Dedicated Channel (DCH), Random Access Channel (RACH), and Common Packet Channel (CPCH).

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

UMTS TrCH View Configuration

The *UMTS TrCH View* configuration menu selects the columns in the view tables, defines the time window and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS TrCH View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *TrCH View Configuration* tab displays the complete parameter set to be displayed in the *TrCH Uplink* and *TrCH Downlink* tables (see description in the *TrCH Downlink* paragraph on p. 4.161). Clearing a parameter hides the column in the table.

TIP Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

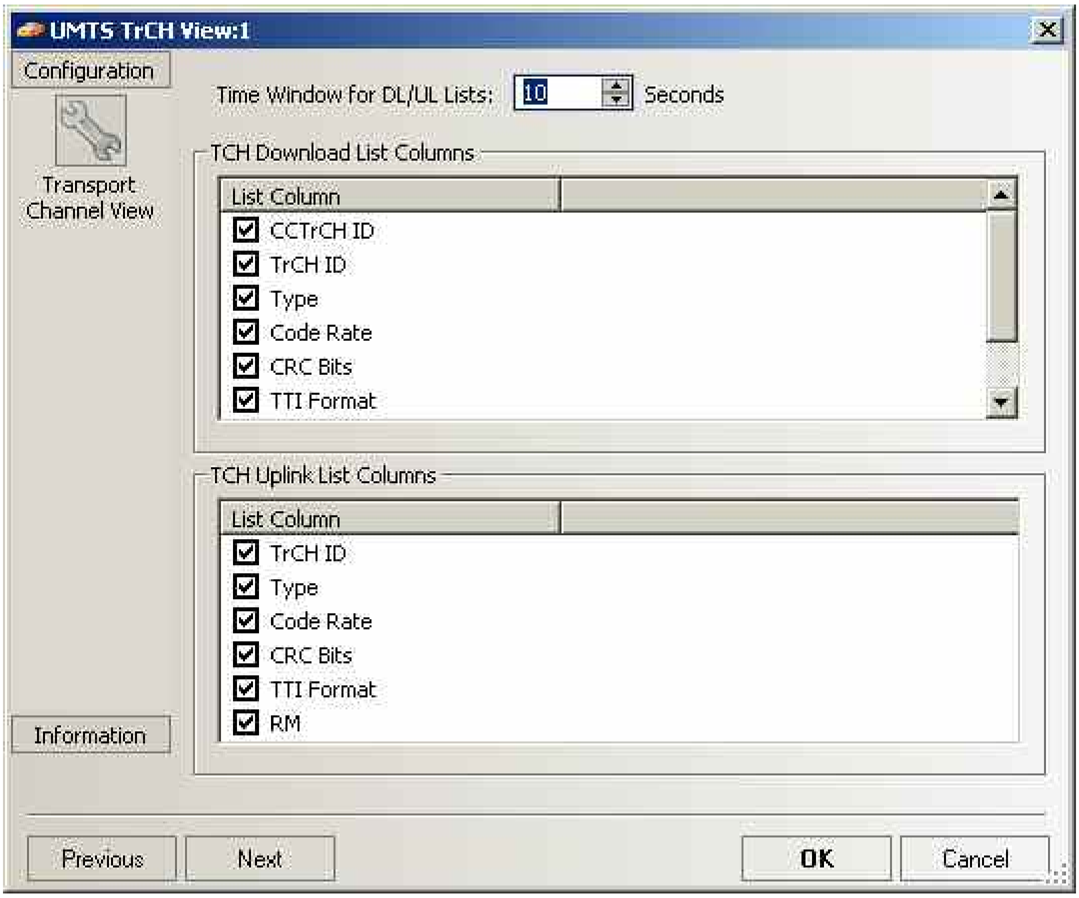


Fig. 4-96 UMTS TrCH View: TrCH List Configuration

Time Window for DL/UL Time after which a table row for a removed TrCH channel is cleared in the *TrCH View* tables. Cleared table rows leave room for new entries.

UMTS Physical Channels View

The *UMTS Physical Channels View* shows an overview of the physical channel parameters in the downlink and uplink WCDMA signals. A Qualcomm mobile must be used to record the data.

The view is empty unless the test mobile is configured to record the *WCDMA Common Physical Channels Downlink, WCDMA Dedicated Physical Channels Downlink, WCDMA Physical Channels Uplink,* or *WCDMA PRACH* parameters; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

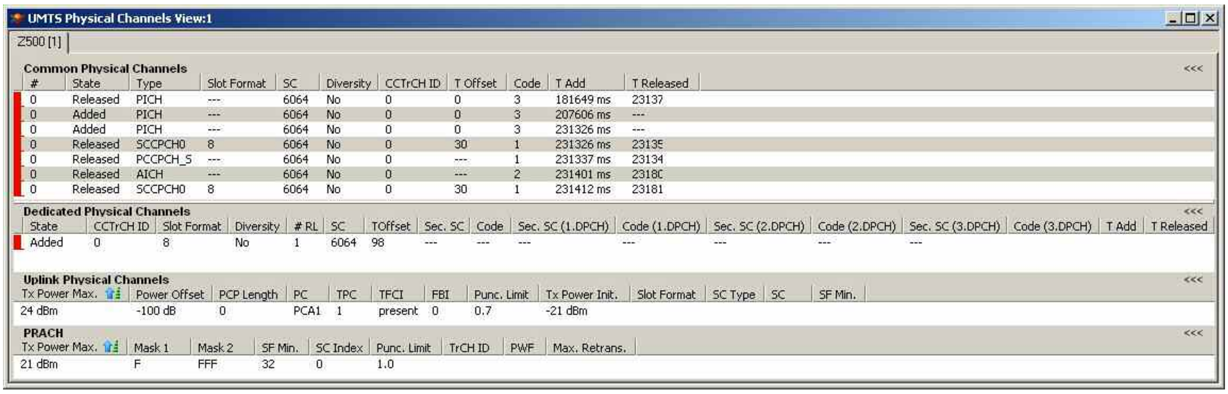


Fig. 4-97 UMTS Physical Channels View

The results for each mobile are arranged in a separate tab.

View area The entire view area is horizontally split to accommodate four different tables for the *Common Physical Channels* (downlink), *Dedicated Physical Channels* (downlink), *Uplink Physical Channels,* or *PRACH*.

A click on one of the title bars compresses and expands the corresponding table. A compressed table leaves more space for the other tables. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

The contents of both tables can be selected in the configuration menu.

Common Physical Channels

Parameters of the downlink common physical channels.

Each table row represents a single physical channel that has been added during the measurement (and possibly removed). A new table row is created each time that a new physical channel is added. On the other hand, a table row for a removed physical channel is deleted after the *Time Window for DL/UL* set in the configuration menu.

Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

#
: *Color scheme to distinguish channels with different scrambling codes and sequence number*

State
: *Physical channel state:* Added *(allocated) or* Released

Type
: *Physical channel type: PICH, AICH, DPCH, PDSCH, SCCPCH0, SCCPCH1 (on FACH), AICH, PCCPCH_S(serving), PCCPCH_N(eighbor),*

Slot Format
: *Slot format of the SCCPCH in the range 0 to 16*

SC
: *Primary scrambling code of the signal in the format selected in the* TEC for UMTS Test Mobiles *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. The primary SC is used to identify the cell.*

Diversity
: *Downlink transmit diversity scheme for the CPICH:* STTD *(Space Time Transmit Diversity)*, TSTD *(Time Switched Transmit Diversity),* SSDT *(Site Selection Diversity Transmit Power Control), or* No Diversity

CCTrCH ID
: *Composite Coded Transport Channel ID in the range 0 to 15, identifies unambiguously a CCTrCH inside a Radio Link.*

T Offset
: *Time offset of the channel relative to the frame boundary, in 156-chip units (corresponding to 1/10 slot or 1/150 frame).*

Code
: *Channelization code number assigned to the channel*

T Add
: *Time when the physical channel was added*

T Released
: *Time when the channel was removed/released*

Dedicated Physical Channels

Parameters of the downlink dedicated physical channels (DPCHs). In addition of the parameters for the Common Physical Channels, the table contains the following entries:

#RL
: *Sequence number for the radio links that the test mobile establishes to the network*

2^{nd} SC
: *Secondary Scrambling code number. "---" or "0" is displayed if a primary scrambling code is used.*

Uplink Physical Channels

Parameters of the uplink physical channels (DPCCH/DPDCH). The table contains the following entries:

Tx Power Max
: *Maximum transmit power of the test mobile (+33 dBm, +27 dBm, +24 dBm or +21 dBm for power class 1, 2, 3, or 4 mobiles)*

Power Offset
: *DPCCH power offset in dB. The DPCCH power offset is a reference value for the initial DPCCH power:*

P_{DPCCH} = Power Offset – CPICH_RSCP

PCP Length
: *Length of the Power Control Preamble in slots*

PC
: *Power control algorithm (PCA1 or PCA2)*

TPC
: *Transmit Power Control step size in dB*

TFCI
: *Presence of the optional Transport Format Combination Indicator*

FBI
: *Number of Feedback Information bits (0 to 2)*

Punc. Limit
: *Uplink puncturing limit, limits the amount of puncturing that can be applied in order to minimize the number of physical channels.*

TX Power Init.
: *Initial TX power of the test mobile*

Slot Format
: *UL DPCCH slot format*

SC Type
: *Scrambling code type (Long or Short)*

SC
: *UL scrambling code number*

SF Min.
: *Minimum allowed spreading factor*

PRACH

Parameters of the uplink Physical Random Access Channel (PRACH), relevant for the physical random access procedure of the test mobile (3GPP TS 25.214). Some of the parameters are analogous to the Uplink Physical Channel parameters. Besides the table contains the following entries:

Mask 1
: *PRACH preamble signature in the range 0 to 15*

Mask 2
: *PRACH subchannel in the range 0 to 11; see 3GPP TS 25.216.*

SC Index
: *PRACH scrambling code index*

TrCH ID
: *Transport channel number assigned to L1 by L2. Transport channels are multiplexed to the CCTrCH in the ascending order of these IDs*

PWF
: *PRACH preamble power step size, transmit power difference between two consecutive PRACH preambles*

Max. Retrans.
: *Maximum number of preambles to be transmitted before a single preamble cycle is terminated.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, and to save the current configuration as default; see *Context menu* description on p. 4.2.

UMTS Physical Channels View Configuration

The *UMTS Physical Channels View* configuration menu selects the columns in the view tables, defines the time window and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS Physical Channels View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Physical Channel View* tab displays the complete parameter set to be displayed in the view tables (see description in the *Dedicated Physical Channels* paragraph on p. 4.166). Clearing a parameter hides the column in the table.

Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

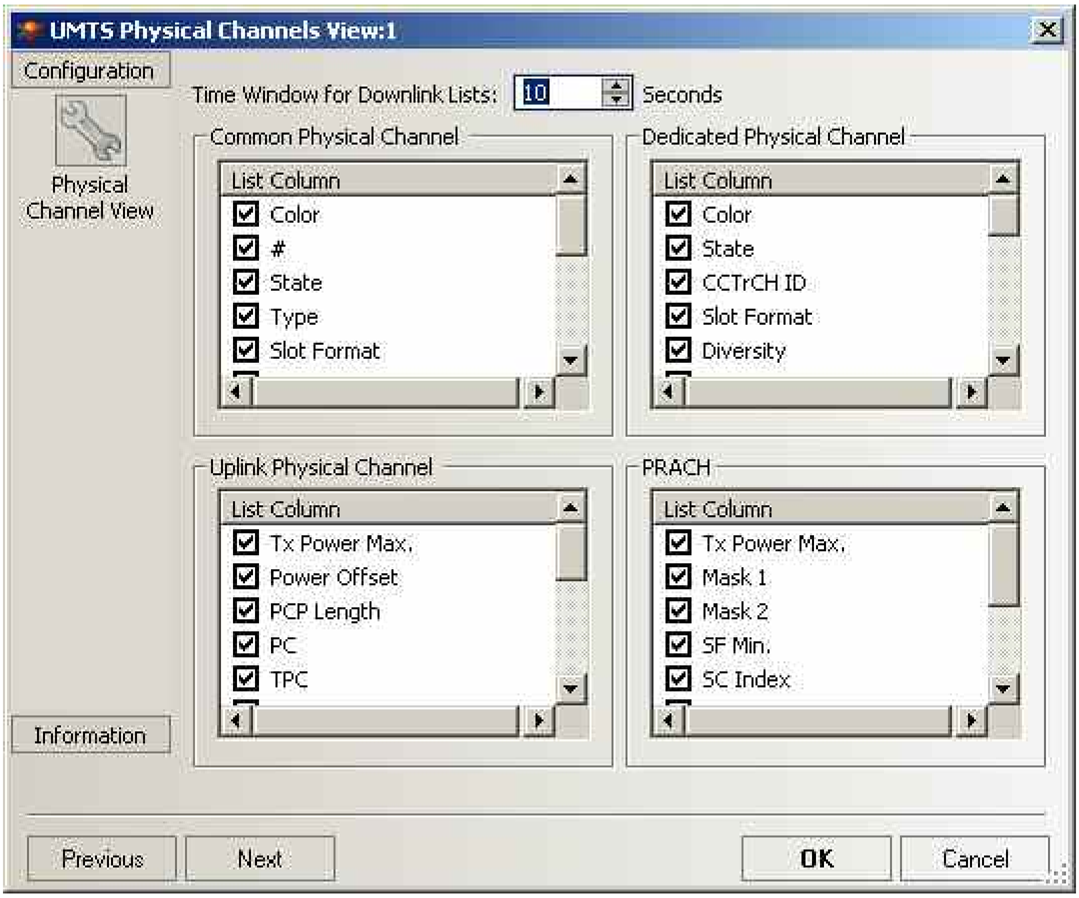


Fig. 4-98 UMTS Physical Channels View: Physical Channel View

Time Window for Downlink Lists Time after which a table row for a removed physical channel is cleared in the *Common Physical Channel* and *Dedicated Physical Channel* tables. Cleared table rows leave room for new entries.

UMTS SIB View

The *UMTS SIB View* shows a tree view of the exchanged System Information Blocks. The block type *(Master Information Block, Scheduling Block 1 and 2, System Information Block type 1 to 18)* can be selected from a pull-down list. The SIB types and their information elements are described in standard 3GPP TS 25.331.

The view is empty unless the test mobile is configured to record the *Layer 3 – WCDMA RRC Signaling Messages;* see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

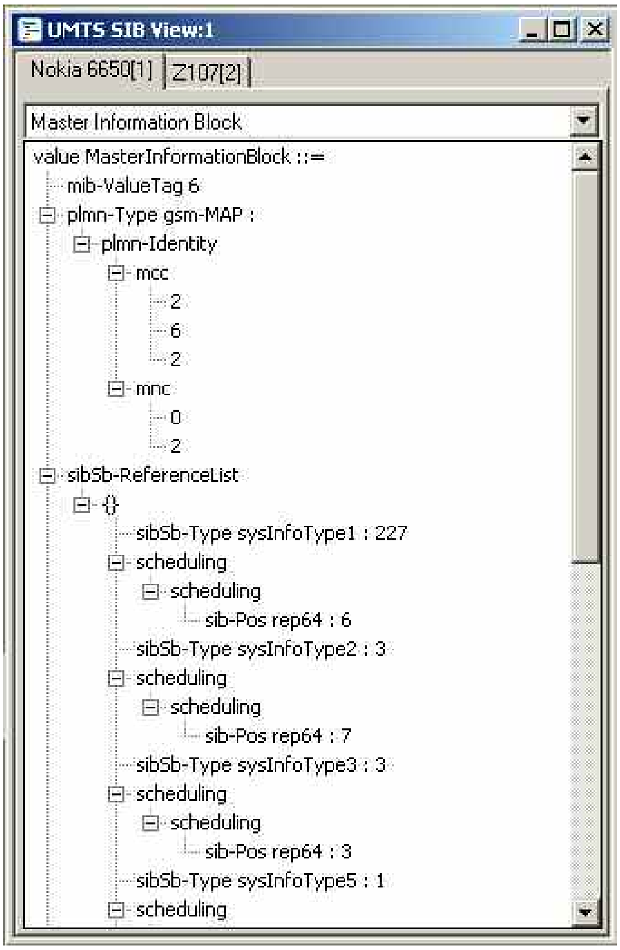


Fig. 4-99 UMTS SIB View

The results for each mobile are arranged in a separate tab.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see Context menu description on p. 4.2. The context menu contains the following additional command:

Export <Device>

Opens a Save As… *dialog to export the contents of the view to a file. The export file is an ASCII file in *.txt format. In the* Save As… *dialog R&S ROMES suggests a default file name and directory* (ExportResult).

The configuration menu displays information about the view version.

UMTS RLC/MAC View

The *UMTS RLC/MAC View* displays important Radio Link Control/Medium Access Control parameters of UMTS mobile phones. To record the RLC/MAC parameters, a Qualcomm test mobile must be used and recording of all layer 2 RLC and MAC messages must be enabled in the driver configuration menu (see chapter 6).

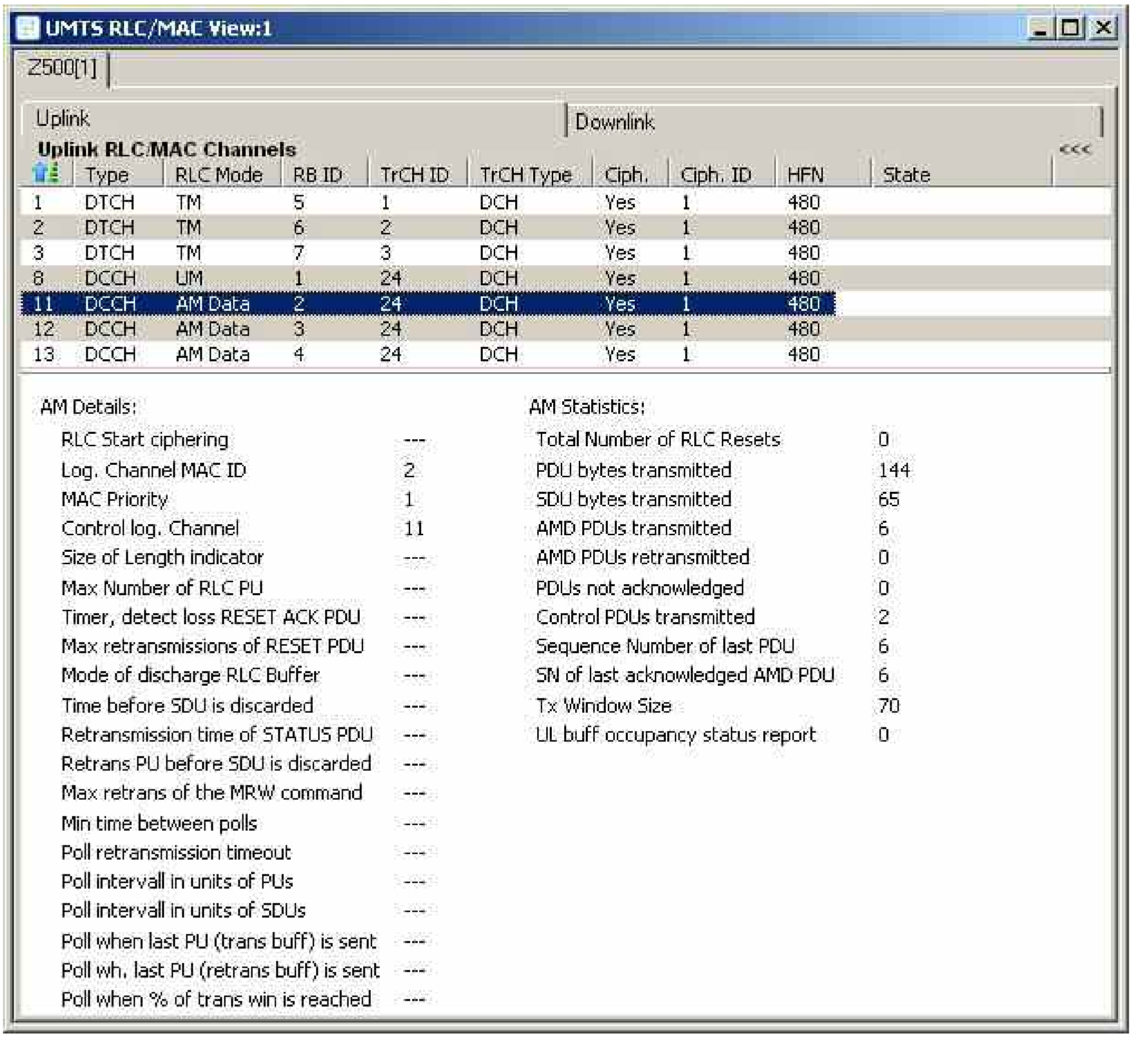


Fig. 4-100 UMTS RLC/MAC View

View The RLC/MAC parameters for each mobile and for the uplink and downlink are arranged in separate tabs. Each tab is divided into a RLC/MAC channel list in the upper part plus a detailed message section in the lower part.

A click on the *Uplink (Downlink) RLC/MAC Channels* title bar shows or hides the RLC/MAC channel list. A hidden list leaves more space for the detailed message section. A hidden list is characterized by the symbol >>> (instead of <<<) in the title bar. On pausing on the title bar, the cursor displays a compress symbol.

The contents of the RLC/MAC channel list can be selected in the configuration menu.

RLC/MAC Channels

The channel lists monitor the RLC/MAC channels in uplink (mobile station towards base station) and downlink (base station towards mobile station) direction, respectively. The MAC and RLC protocols are specified in standards 3GPP TS 25.321 / TS 25.322 and related standards.

ID
: *Logical channel identifier.*

Type
: *Logical channel type:* CCCH, SHCCH, DCCH *or* DTCH *in uplink direction,* BCCH, PCCH, SHCCH, CCCH, DCCH, DTCH, CTCH *in downlink direction. The logical channels depend on the* RLC Mode.

RLC Mode
: *Type of service that the RLC provides to higher layers:* AM Data (Acknowledged Mode Data transfer), TM (Transparent Mode data transfer), UM (Unacknowledged Mode data transfer).

RB ID
: *Radio Bearer identity, required by RLC for ciphering.*

TrCH ID
: *Transport Channel identity of the TrCH on which the MAC operates.*

TrCH Type
: *Transport Channel type:* DCH, DSCH, FACH, RACH, PCH, BCH, (in FDD: CPCH, USCH).

Ciphering
: *Ciphering mode: Information whether or not ciphering is used in RLC.*

Ciph. ID
: *Ciphering key*

HFN *RLC*
: *Hyper Frame Number* (RLC AM HFN *or* RLC UM HFN)

State
: *RLC state, protocol state for RLC modes AM Data and TM (AM/TM Data Transfer Ready, Null State)*

Detailed Messages

The detailed message section is filled when a RLC/MAC channel is selected in the list. The detailed messages depend on the *RLC Mode* and the signal direction (uplink/downlink). An example is shown in the figure above.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

UMTS RLC/MAC View Configuration

The *UMTS RLC/MAC View* configuration menu selects the columns in the view tables and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS RLC/MAC View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *RLC/MAC View* tab displays the complete parameter set to be displayed in the RLC/MAC channel lists (see description in the *RLC/MAC Channels* paragraph on p. 4.171). Clearing a parameter hides the column in the table.

Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

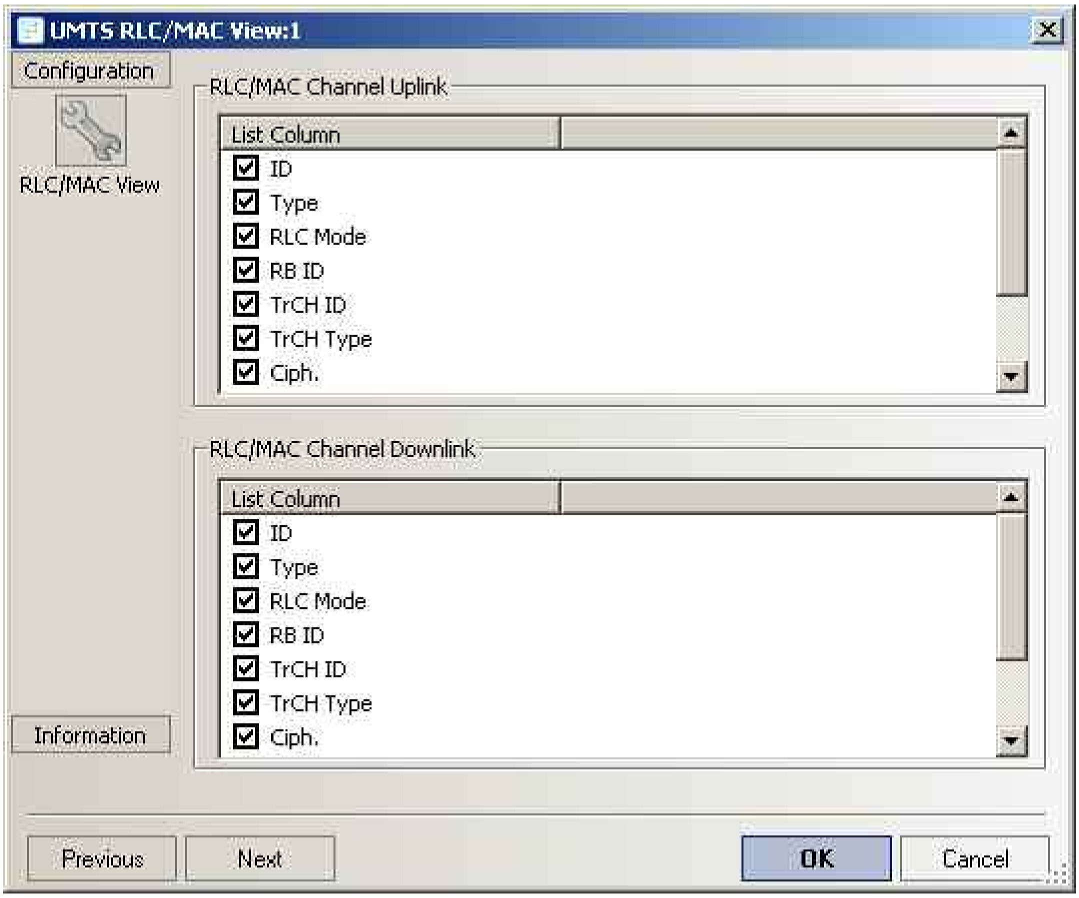


Fig. 4-101 UMTS RLC/MAC View Configuration: RLC/MAC View

UMTS Measurement Report View

The *UMTS Measurement Report View* shows the intra-frequency measurement results that the test mobile sends to the network in a *Measurement Report* RRC message. The message contents are described in standard 3GPP TS 34.108.

The view is empty unless the test mobile is configured to record the *Layer 3 – WCDMA RRC Signaling Messages;* see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

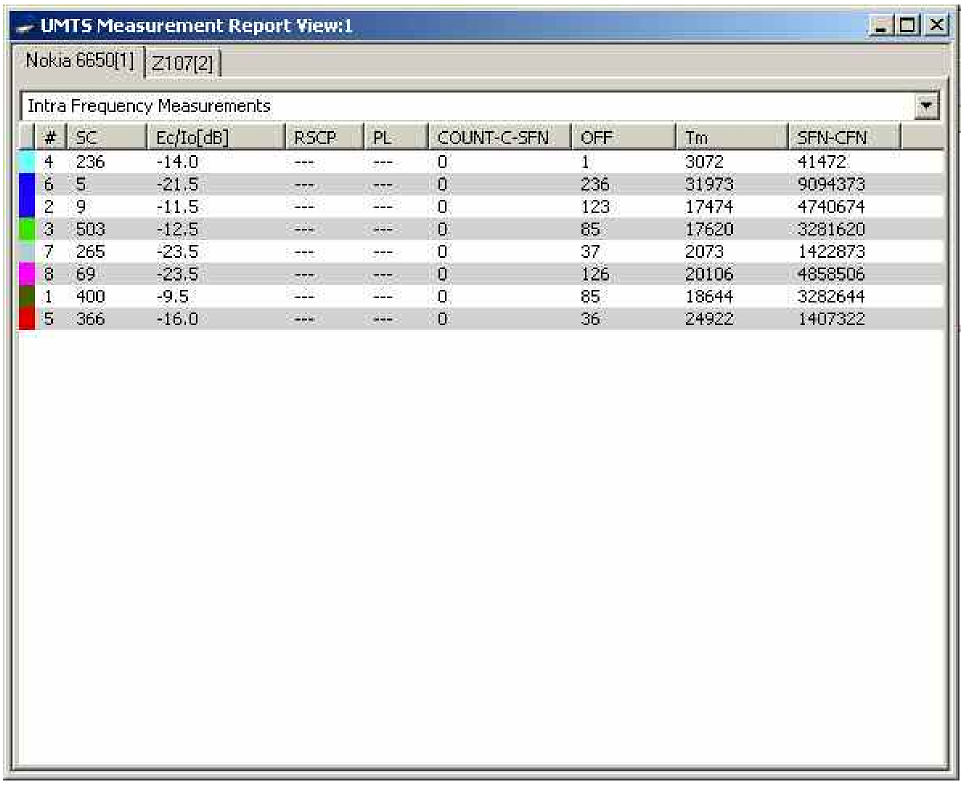


Fig. 4-102 UMTS Measurement Report View

The results for each mobile are arranged in a separate tab.

Intra Frequency Measurements

Parameters of the downlink common physical channels.

Each table row represents a physical channel of a definite channel type that has been allocated without interruption. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

#

Color scheme to distinguish channels with different scrambling codes and sequence number

SC

Primary scrambling code of the signal in the format selected in the TEC for UMTS Test Mobiles *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. The primary SC is used to identify the cell.*

E_c/I_o [dB]

Ratio of the received energy per PN chip for the signal to the total received power spectral density at the mobile antenna connector. E_c/I_o *is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted off.*

RSCP
: *CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.*

PL
: *Downlink pathloss: P-CPICH power reported by the Node B minus RSCP.*

COUNT-C-SFN
: *Value of the* COUNT-C-SFN high *parameter transmitted in the* cell synchronization information; *see standard 3GPP TS 25.331, section 10.3.7.6. The value is an integer number of frames between 0 and 3840.*

OFF
: *Value of the* OFF *parameter transmitted in the* cell synchronization information; *see standard 3GPP TS 25.331, section 10.3.7.6. The value is an integer number of frames between 0 and 255.*

Tm
: *Value of the* Tm *parameter transmitted in the* cell synchronization information; *see standard 3GPP TS 25.331, section 10.3.7.6. The value is an integer number of frames between 0 and 38399.*

SFN-CFN
: System Frame Number (SFN) – Connection Frame Number (CFN) *observed time difference in chips, given by*
SFN-CFN = OFF*38400 + Tm

See standard 3GPP TS 25.215, section 5.1.8.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

The configuration menu displays information about the view version.

UMTS Reselection View

The *UMTS Reselection View* shows parameters that are used for cell reselection of UMTS mobile phones. The reselection process and the parameters are described in standard 3GPP TS 25.304. To record the parameters, *Cell Reselection* must be enabled in the *Expert Mode* tab of the UMTS mobile driver configuration menu (see chapter 6).

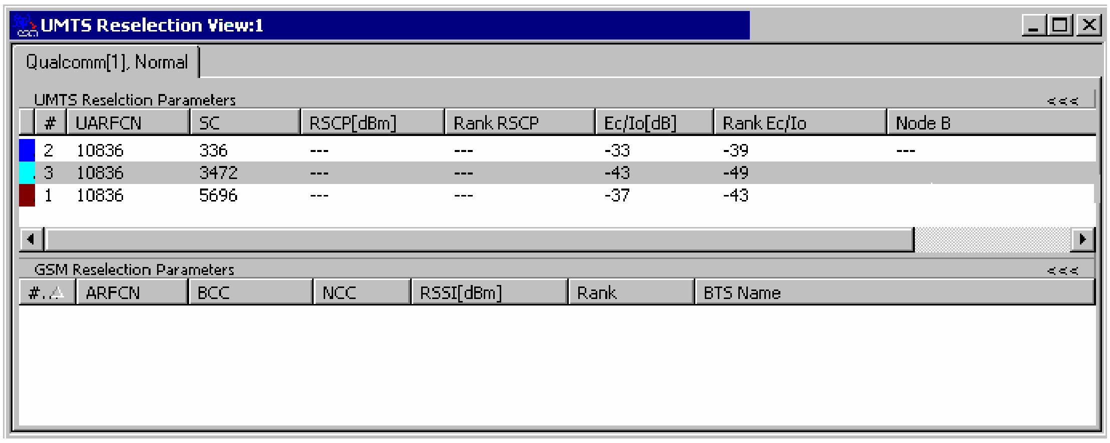


Fig. 4-103 UMTS Reselection View

View The view is divided into a UMTS cell list in the upper part plus a GSM neighbor cell list in the lower part.

A click on the *UMTS (GSM) Reselection Channels* title bar shows or hides the corresponding cell list. A hidden list leaves more space for the other list. A hidden list is characterized by the symbol >>> (instead of <<<) in the title bar. On pausing on the title bar, the cursor displays a compress symbol.

The contents of the cell lists can be selected in the configuration menu.

UMTS Reselection Parameters

The UMTS cell list shows the reselection parameters of the UMTS cells, listed in the order they are detected and reported by the mobile.

Color Symbol
: *Color code for the Primary SC as defined in the* Colors *tab of the configuration menu. The SC color codes are also shown in the* Route Track *view; see paragraph on scrambling code indication on p.* *4.53*.

#
: *Sequence number for the cell, assigned in chronological order and always starting with 1.*

UARFCN
: *UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal. The carrier frequency is equal to* f = 0.2 MHz * UARFCN

SC
: *Primary scrambling code of the signal in the format selected in the* TEC for UMTS Test Mobiles *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. The primary SC is used to identify the cell.*

RSCP
: *CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.*

Rank RSCP
: *Cell reselection criterion (cell ranking) Rs or Rn for serving cell or neighbor cell, computed as per 3GPP TS 25.304. Range 0 to 200 or '---' if ranking is not done.*

E_c/I_o
: *Ratio of the received energy per PN chip for the signal to the total received power spectral density at the mobile antenna connector.* E_c/I_o *is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted off.*

Rank E_c/I_o
: *Cell reselection criterion (cell ranking) Rs or Rn for serving cell or neighbor cell, computed as per 3GPP TS 25.304. Range 0 to 200 or '---' if ranking is not done.*

Node B
: *Name of the node B, taken from the UMTS Node B database (if available).*

GSM Reselection Parameters

The GSM cell list shows the reselection parameters of the GSM neighbor cells, listed in the order they are detected and reported by the mobile.

#
: *Sequence number for the cell, assigned in chronological order and always starting with 1.*

ARFCN
: *Absolute Radio Frequency Channel Number of the received GSM neighbor cell signal.*

BCC
: *BTS Color Code*

NCC
: *Network Color Code*

RSSI
: *Received Signal Strength Indicator, the received GSM channel power in dBm.*

Rank
: *Determines how much better is the neighbor cell relative to the serving cell (range 0 to 200).*

BTS Name
: *Name of the BTS, taken from the GSM BTS database (if available).*

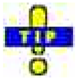
Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

UMTS Reselection View Configuration

The *UMTS Reselection View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS Reselection View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Reselection View* tab displays the complete parameter set to be displayed in the reselection parameter lists (see description in the *UMTS Reselection Parameters* paragraph on p. 4.176). Clearing a parameter hides the column in the table.



Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

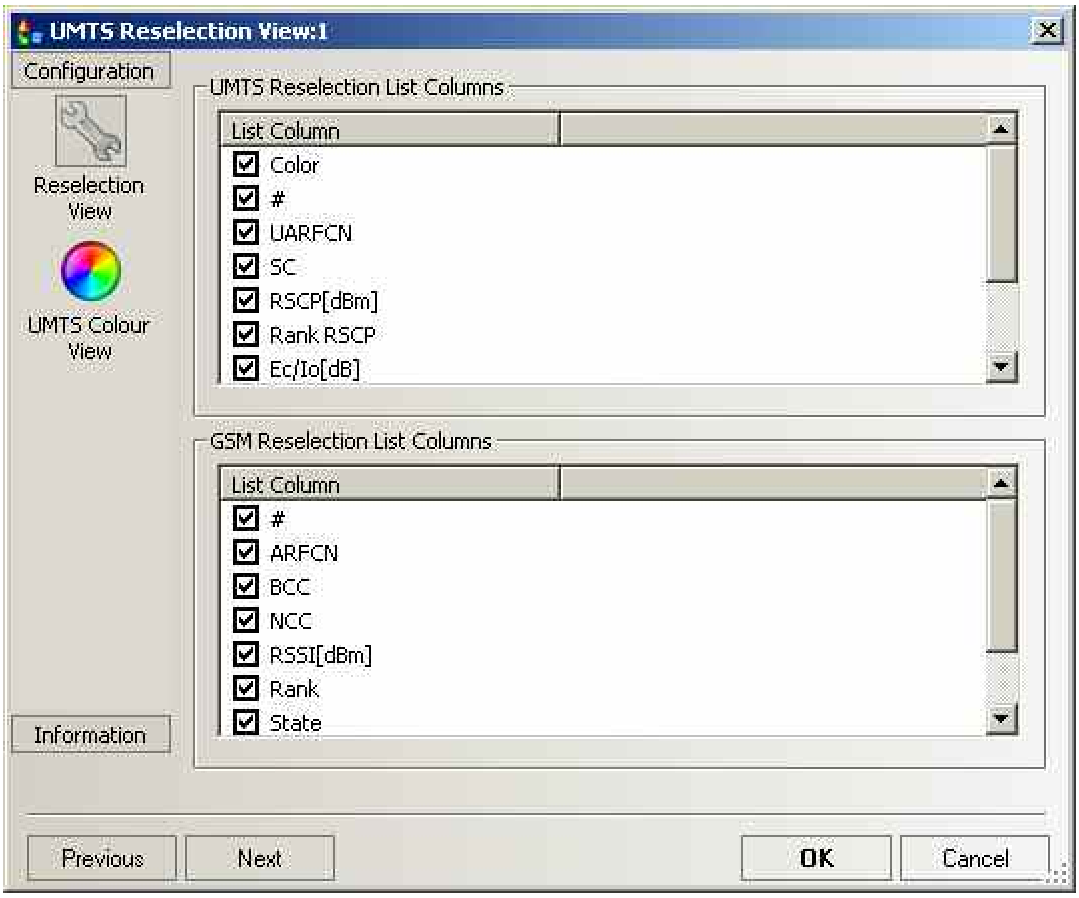


Fig. 4-104 UMTS Reselection View: Reselection View Configuration

The *Color Settings* tab of the *UMTS Reselection* configuration menu is analogous to the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

UMTS Power Control View

The *UMTS Power Control View* shows the transmitter output power of a Nokia UMTS mobile and the parameter that the network uses for closed loop power control.

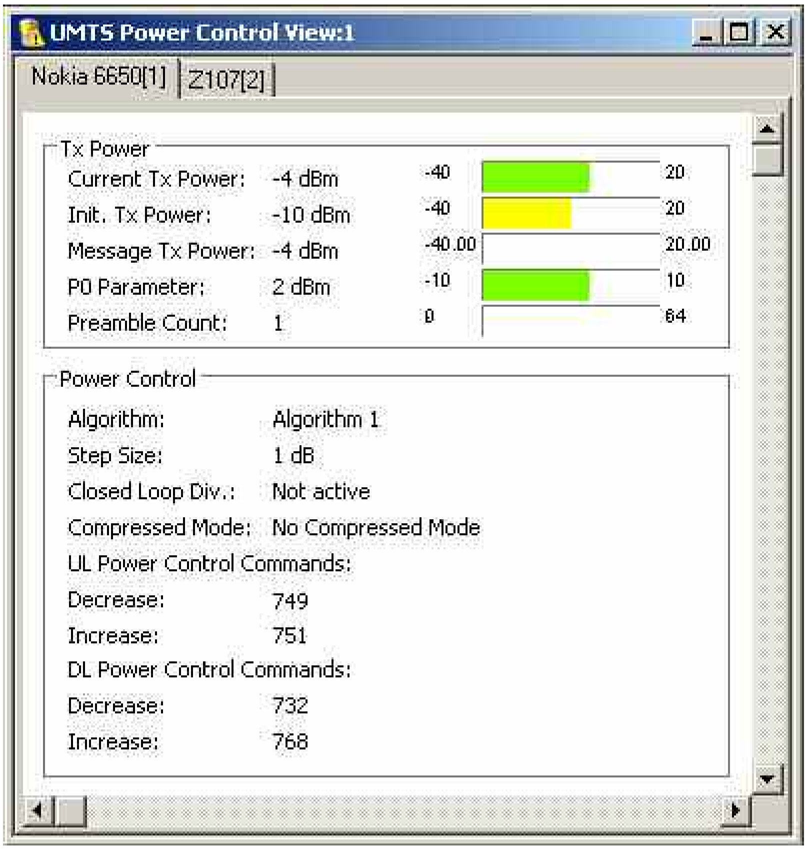


Fig. 4-105 UMTS Power Control View

The results for each mobile are arranged in a separate tab. Each tab consists of two panels.

Tx Power Series of bar graphs showing the transmitter output power parameters of the UMTS mobile during its last random access procedure. The parameters are updated after each random access procedure.

Current Tx Power
Current Tx power of the mobile in dBm.

Init. Tx Power
1st PRACH preamble power

Message Tx Power
Tx power after the end of the preamble sequence, used for transmission of the RACH message part.

P0 Parameter
Optional downlink power control parameter. If P0 is not present, then downlink power control is not used.

Preamble Count
Number of PRACH preambles transmitted by the test mobile

Power Control

Table of closed loop power control parameters. The parameters are updated while a connection is maintained.

Algorithm
: *Power control algorithm used to control the uplink power. Algorithm 1 means that the mobile power changes after each slot by the* Step Size. *Algorithm 2 means that the mobile power only changes if the same Transmit Power Control (TPC) command is received in a group of 5 consecutive slots.*

Step Size
: *Power step that the mobile transmitter performs according to the received TPC pattern and the power control algorithm.*

Close Loop Div.
: *Information whether the mobile uses closed loop mode transmit diversity.*

Compressed Mode
: *Information whether the mobile operates in compressed mode. In compressed mode the mobile transmitter is switched off in periodic gaps so that the mobile can monitor UMTS and GSM neighbor cells.*

UL/DL Power Control Commands
: *Total number of power-down (decrease) and power-up (increase) commands among the last 1500 transmit power control (TPC) commands. If power control algorithm 1 is active, the difference between both DL numbers indicates the net power change of the mobile.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, put the view on hold, copy the current view to the clipboard, or to create or delete views; see *Context menu* description on p. 4.2.

The UMTS Power Control View has no configuration menu assigned. The Info tab can be accessed via the *Tools - Modules Configuration...* command.

UMTS Layer 1 Graph View

The *UMTS Layer 1 Graph View* contains a Cartesian diagram to display UMTS or GSM layer 1 parameters as a function of time. It corresponds to the *2D Chart View* (described on p. 4.9) with a special selection of signals in the configuration menu. The controls in the view, in the context menu, and in the configuration menu are identical with the *2D Chart View.*

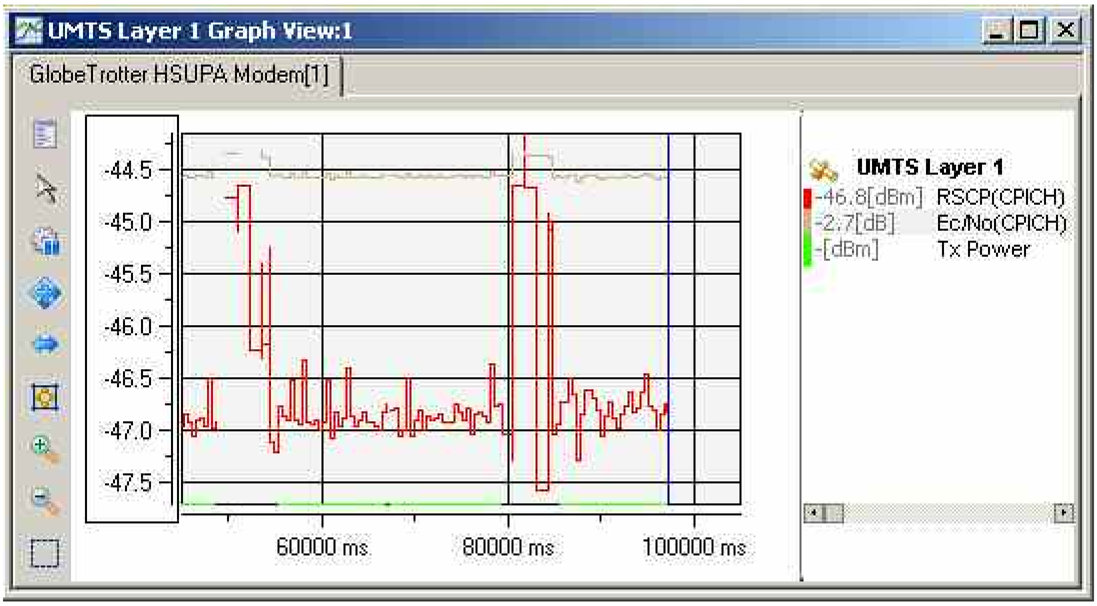


Fig. 4-106 UMTS Layer 1 Graph View

UMTS Neighbourhood Analyser View

The *UMTS Neighbourhood Analyser View* shows the results of the neighborhood analysis of option R&S ROMES4HOA. The aim of this analysis is to reveal possible conflicts between the current best server and the transmitters in the neighborhood in order to assess the general condition of a UMTS / GSM network. To this end the neighborhood analyzer post-processes PN scanner, UMTS test mobile, and/or GSM scanner data and compares them with the information stored in a Node B and BTS data base (see description of ATD files in chapter 7, in particular the neighbor cell columns 2GNC and 3GNC). In case of a mismatch between the detected Node Bs and the Node Bs in the data base, an alarm is generated. The same holds if a missing neighbor of the best server or a potential interferer is found.

The neighborhood analysis requires option R&S ROMES4HOA, *Handover and Neighbourhood Analysis.* PN scanner data recorded with an R&S TSMx ; moreover eSIB Decoding enabled in order to decode the SIB type 11 blocks received from the UMTS node Bs (see description of the UMTS PNS driver configuration menu in chapter 6). Data from a UMTS test mobile and GSM scanner data can be used in addition to refine and extend the analysis.

The neighborhood analyzer is a performance-critical tool which must be activated explicitly in the *UMTS/GSM Neighbourhood Analyzer View* configuration menu.

TIP The UMTS/GSM Handover Analysis, which is also part of option R&S ROMES4HOA, is evaluated in the UMTS/GSM Handover Analyzer View; see p. 4.325.

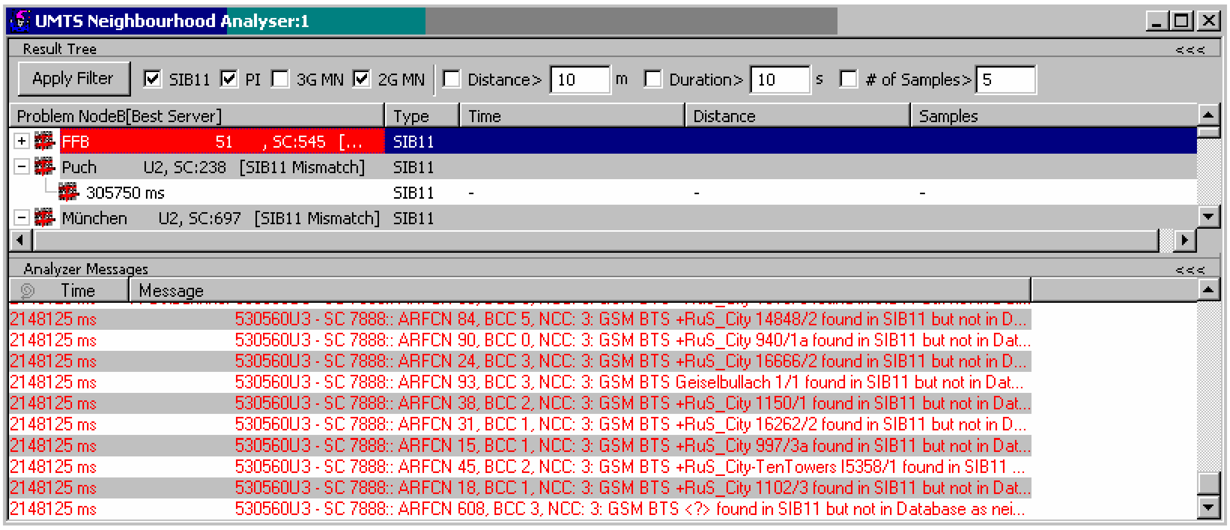


Fig. 4-107 UMTS Neighbourhood Analyser View

Neighborhood analysis

The PN scanner results for a particular top N pool (configured in the UMTS PNS driver configuration menu and selected for the neighborhood analysis using the *UMTS Neighbourhood Analyser View)* provide the essential data for the neighborhood analysis. The analysis involves several steps:

1. The top N pool member with the strongest CPICH level (1st top N member) is rated as the best server; it's UARFCN, SC, and geographical position (and CI, if the PN scanner is able to decode the SIB3) is compared with the entries in the node B data base.

2. If possible, the SIB11 of the best server is decoded, and the neighbors list is compared with the neighbors list in the node B data base.

3. For the remaining top N members the analyzer checks whether they are missing neighbors or potential interferers; see below.

The results are updated whenever the top N pool members change. R&S ROMES creates one of the events described below whenever a problem is detected. The conditions for the analysis can be modified in the *UMTS Neighbourhood Analyser View.*

Node B not found

NodeB/BTS not found in database

A *Node B not found in database* event can be generated in step 1 of the analysis: The detected best server is not listed in the node B data base.

SIB11 mismatch

Node B List differs from SIB11

An SIB11 mismatch can be detected in step 2 of the analysis: A particular node B is found in the data base but not in the SIB11 or vice versa.

Missing neighbor/ Potential interferer

Potential Interferer
Missing Neighbour

Node Bs that are detected with sufficient signal strength but not listed as neighbors can be missing neighbors or potential interferers. They are detected in step 3 of the analysis. The conditions for potential interferers and missing neighbors are defined in the view configuration menu; see description of the *Active Set Parameters* on p. 4.188.

View

The view is divided into an upper *Result Tree* and a lower *Analyzer Messages* section. A click on one of the title bars shows or hides the corresponding section. A hidden section leaves more space for the other section. A hidden section is characterized by the symbol >>> (instead of <<<) in the title bar. On pausing on the title bar, the cursor displays a compress symbol.

Result tree: Filter

The checkboxes across the top of the result tree define filter conditions for the problem nodes displayed in the result tree. E.g. if *SIB11* is cleared, all problem nodes of type *SIB11* mismatch are not displayed in the tree.

Apply Filter updates the result tree in accordance with the current filter conditions.

Result tree

The result tree consists of the following columns:

Problem Node B [Best Server]
: *Name of the best server for which a problem occurred together with the scrambling code (SC, for UMTS node Bs) and description of the problem. GSM base stations (if available) are listed with their name, BCCH, and BSIC. Detailed information (e.g. the time when the problem node was detected) is listed below the problem node. It is possible to expand or collapse the detailed information for a single problem node (click the + / – symbols or double-click the line) or all handovers (use the context menu).*

Type
: *Short description of the problem type, e.g.* SIB11 *for SIB11 mismatch.*

The remaining columns are used for missing neighbors and potential interferers:

Time
: *Time during which a neighbor was classified as a missing neighbor or potential interferer. The accuracy depends on the tome and distance trigger settings in the view configuration menu; see below.*

Distance
: *Covered distance during which a neighbor was classified as a missing neighbor or potential interferer. The accuracy depends on the tome and distance trigger settings in the view configuration menu; see below.*

Samples
: *Number of samples acquired while a neighbor was classified as a missing neighbor or potential interferer.*

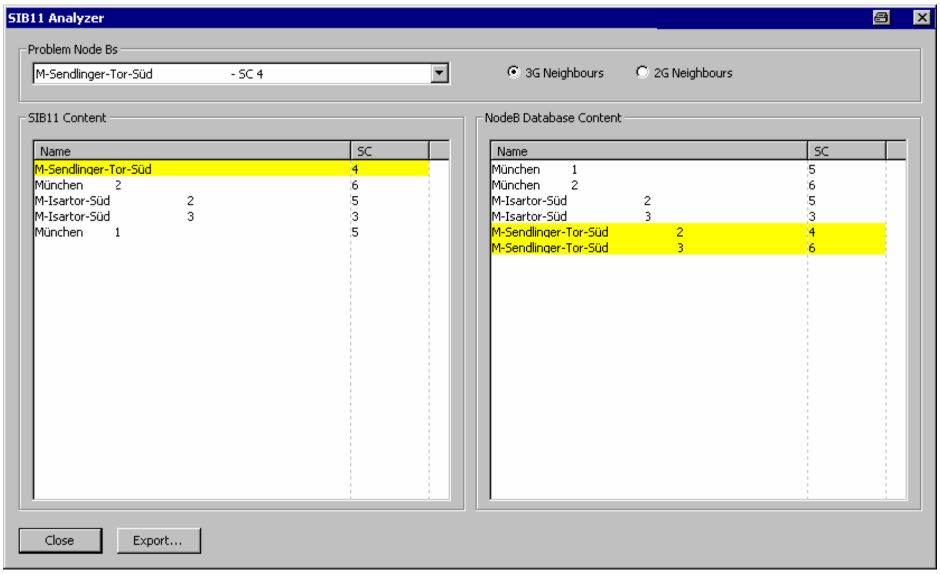
Analyzer Messages

The Analyzer Messages section shows the problem report in chronological order (Time). A Message is generated whenever a problem is detected.

- For a *Node B not found* event, the name, UARFCH, and SC of the node B is listed.
- For the other events, a pair of best server and neighbor (2^{nd} to N^{th} element of the top N pool) is displayed.

Further analysis

The *SIB11 Analyzer…* command in the context menu (see below) opens an overview of all node Bs / base stations decoded from the SIB11 of the best server, and all node Bs / base stations in the Bs / BTS data bases. Node Bs and base stations that are not listed in both the SIB11 and the data base appear on a colored background.



The *SIB11 Analyzer* dialog provides the following control elements:

Problem Node Bs

Selects the best server for which the neighbors are shown.

3G / 2G Neighbors

Changes between Node B and GSM BTS display in the SIB11 Content *and* Node B Database Content *lists.*

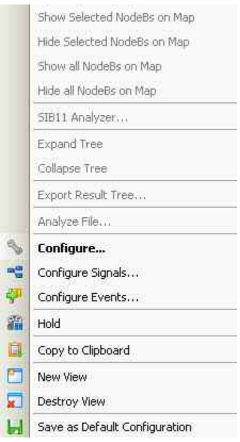
Export

Selects a file for exporting the contents of the SIB11 Analyzer*. The export file is an ASCII table in *.csv format that can be opened and processed by Excel. The table contains all problem node Bs together with the corresponding* SIB11 Content *and* Node B Database Content. *Node Bs and base stations that are not listed in both the SIB11 and the data base are preceded by* !!!!.

A shorter export file can be generated from the context menu; see below.

It is also instructive to monitor the measurement route and the node Bs / base stations in the *Route Track* view (see p. 4.52). Best servers, potential interferers, and missing neighbors can be displayed with different colors using the Show Node Bs/BTSs on Map command in the context menu The color code can be configured in the UMTS/GSM Neighbourhood Analyser View configuration menu; see below.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2. The context menu provides the following additional, view-specific commands:

Show Node B…

Use the color code defined in the UMTS/GSM Neighbourhood Analyser View *configuration menu (see below) to visualize the best servers, potential interferers, and missing neighbors in the* Route Track *view. This feature is only available while a best server is selected in the result tree. The UMTS layer / GSM BTS layer in the* Route Track *view must be visible to use this feature.*

Hide Node B…

Remove the previous action, display the selected cell symbol with standard colors.

Show all Node B...

Display all cell symbols with the color code defined in the UMTS/GSM Neighbourhood Analyser View *configuration menu.*

Hide all Node B…

Display all cell symbols with standard colors.

SIB 11 Analyzer…

Open the SIB11 Analyzer *dialog described above.*

Expand/Collapse Tree

Show or hide the additional information for each best server in the Results Tree.

Export…

*Export the information in the result tree or in the message list to a *.csv export file that can be opened and processed by Excel. An extended export file can be generated from within the* SIB11 Analyzer *dialog; see above.*

Analyze File ...

With an active Missing Neighbors list, the measurement data in the current CMD file is analyzed and the results are displayed.

UMTS/GSM Neighbourhood Analyser View Configuration

The *UMTS/GSM Neighbourhood Analyser View* configuration menu enables the neighborhood analyzer, defines criteria for the analysis, and specifies the color scheme for the Node B / BTS symbols in the *Route Track* view. It is opened via a right mouse click on a point inside *UMTS/GSM Neighbourhood Analyser View* or via the *Tools - Modules Configuration...* command (see chapter 3).

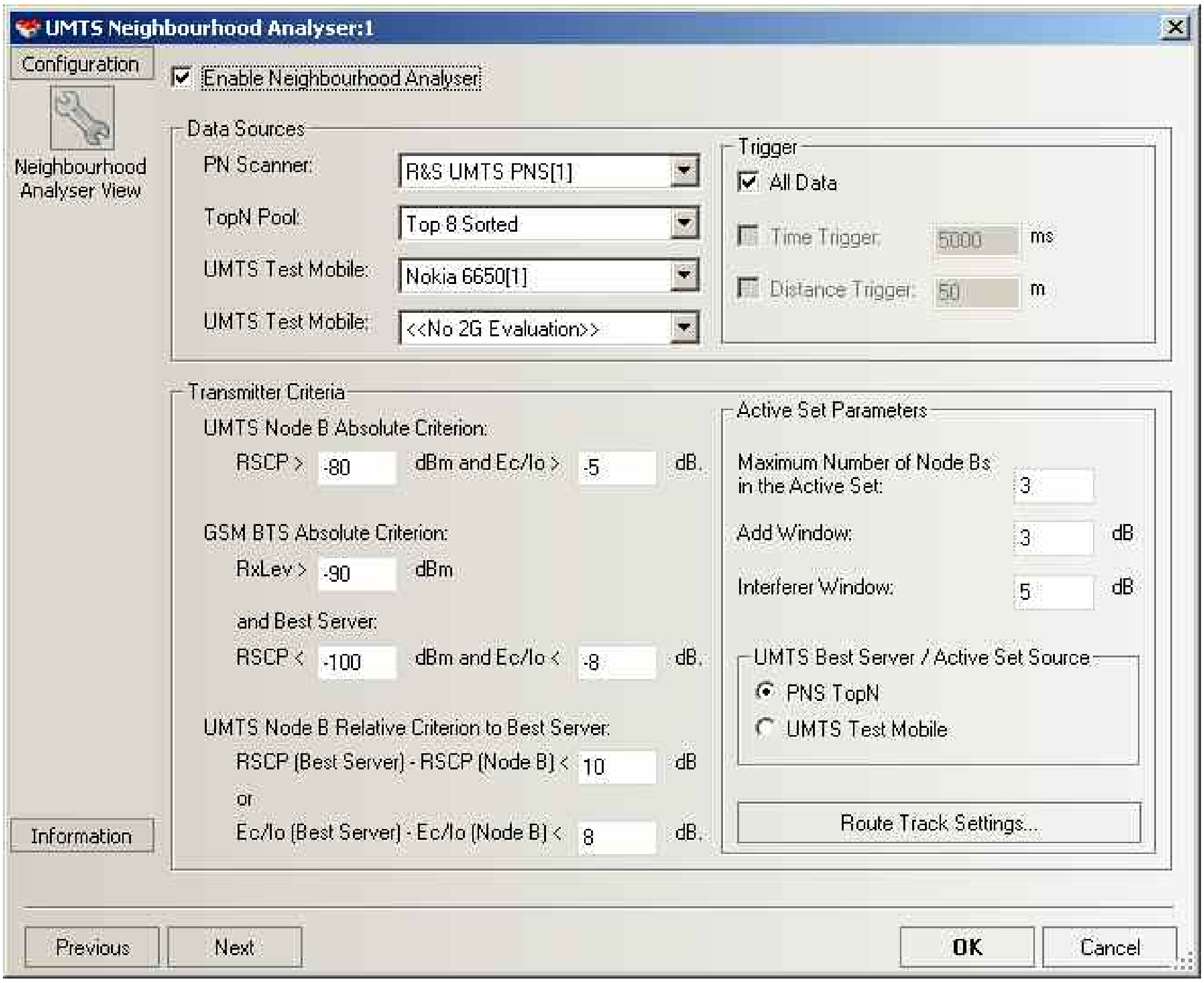


Fig. 4-108 UMTS/GSM Neighbourhood Analyser View: Configuration

Enable Neighbor-hood Analyzer

The neighborhood analyzer must be enabled explicitly in order to post-process the measured data and obtain the results in the *UMTS Neighbourhood Analyser View.*

For this option a separate license is required, otherwise it cannot be enabled.

This holds for the data viewed during the measurement tour as well as for re-played measurement files. The *UMTS Neighbourhood Analyser View* is empty if the neighborhood analyzer is disabled.

The necessary hardware drivers must be loaded or a measurement (*.rscmd or *.cmd) file must be open in order to enable the neighborhood analyzer, select the data sources, or define the criteria for the analysis. After starting up R&S ROMES, only the *Route Track Settings* are accessible.

Data Sources

The four drop-down lists in the *Data Sources* panel contain all UMTS and GSM test devices involved in the measurement. The lists are populated when the device drivers are loaded or when a measurement file is opened for replay.

Note:
The neighborhood is automatically disabled when the selected data sources are no longer available, e.g. because a new measurement file is loaded.

PN Scanner *and* Top N Pool
The neighborhood analysis requires a PN scanner with a Top N *pool containing the N observed Node Bs with the strongest signal level. The top N pools can be configured in the* UMTS PNS *driver configuration menu as described in chapter 6.*

UMTS Test Mobile
Use of an UMTS test mobile in addition to the PN scanner is optional. The test mobile can be used to determine (and possibly replace) the best server and the cells in the active set otherwise determined by the PN scanner; see UMTS Best Server / Active Set Source *below.*

GSM Scanner
A GSM scanner is only required if GSM base stations are to be included in the neighborhood analysis. GSM scanner data can be provided by a GSM test mobile in Scan *mode or by a GSM network scanner.*

Note:
In addition to the measured data the neighborhood analysis requires a node B list and a (separate) GSM BTS list with included neighbor cell information (see description of ATD files in chapter 7). For a unique identification of the node Bs the list must contain the columns named 2GNC (for GSM BTS lists) and 3GNC (for UMTS BTS lists). The column 2GNC must contain the LAC, MNC, and MCC of each GSM BTS. The column 3GNC must contain MNC, MCC, CI, and LAC. The import of node B and BTS list files is described in chapter 3.

Trigger

The PN scanner provides the top N pool data in periodic intervals (up to once per second for the R&S TSMx). Trigger settings can reduce the amount of data considered and speed up the analysis.

All
Evaluate all top N data sets provided by the PN scanner.

Time Trigger
Evaluate a new top N data set only after the specified time has elapsed.

Distance Trigger
Evaluate a new top N data set only after the test vehicle has covered the specified distance.

Transmitter Criteria

To limit the amount of data processed, UMTS node Bs or GSM base stations are only considered if their signal strength exceeds a specified limit. R&S ROMES provides absolute criteria that every node B and BTS must fulfill and relative criteria for the elements no. 2, …, N of the top N pool.

UMTS Node B Absolute Criterion
: *Minimum Received Signal Code Power of the DL P-CPICH* (CPICH RSCP) *and minimum ratio of the received energy per PN chip of the DL P-CPICH to the total transmit power spectral density (*Ec/Io*).*

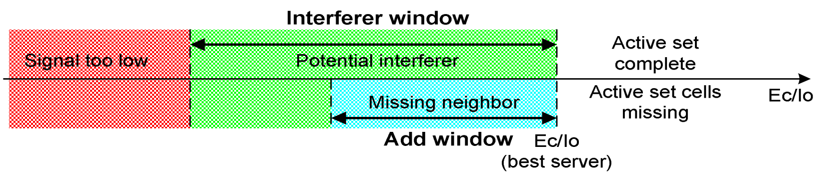
GSM BTS Absolute Criterion
: *Minimum received signal level (RxLev) at the GSM test mobile. An additional condition is that the best UMTS server is so weak that a GSM handover is likely to occur.*

UMTS Node B Relative Criterion to Best Server
: *Maximum difference between the best server* RSCP *or* Ec/Io *and the* RSCP *or* Ec/Io *of any other node B in the top N pool. If both limits are exceeded the signal strength of the node B is deemed too low so that the node B is excluded from the analysis.*

Active Set Parameters

The *Active Set Parameters* provide the criteria for classifying the node Bs no. 2, ..., N of the top N pool. Each of these node Bs can be a *missing neighbor* or a *potential interferer,* provided it is detected with a sufficient signal strength (i.e. it meets the *Transmitter Criteria* described above) and is **not** listed as a neighbor in the node B data base.

- A UMTS cell is a *missing neighbor* if its CPICH Ec/Io is within the *add window* **and** if the number of cells in the active set is below a specified *maximum number.*
- A cell is a *potential interferer* if it does not meet the criteria for a *missing neighbor* and if its CPICH Ec/Io is within the *interferer windoww.* GSM cells can be potential interferers but no missing neighbors.



Maximum Number of Node Bs…
: *Size of the active set. If the actual number of Node Bs in the active set is below this maximum number, a node B which is of listed in the SIB11 can be a* missing neighbor.

Add Window
: *Size of the* add window *in dB; see figure above.*

Interferer Window
: *Size of the* interferer window *in dB; see figure above.*

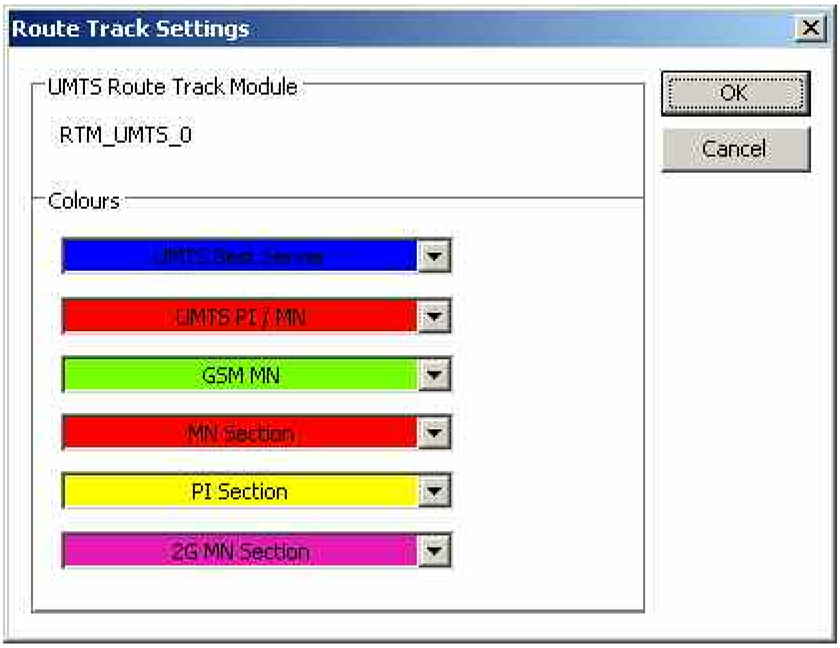
UMTS Best Server / Active Set Source

The best server and the cells in the active set are usually determined by the PN scanner. The best server corresponds to the first element of the top N pool.

As an alternative, it is possible to use the best server and active set determined by a UMTS test mobile. This can be desirable e.g. if the test mobile is suspected to assess the network conditions more realistically.

Route Track Settings

The *Route Track Settings…* button opens a dialog to define the color scheme for the Node B / BTS symbols in the *Route Track View*.



The *UMTS Route Track Module* panel is reserved for future extensions. The *Colors* distinguish the following UMTS Node Bs and GSM base stations:

UMTS Best Server
: *UMTS best server*

UMTS PI/MN
: *UMTS potential interferers and missing neighbors*

GSM MN
: *GSM missing neighbors*

The remaining color codes are used for the sections of the route that correspond to the problem node B selected in the *Problem Node (Best Server)* list.

WiMAX Views

The *WiMAXViews* display WiMAX-specific information acquired with an WiMAX test mobile and using the WiMAX driver. In general, recording of the different message types shown in the *WiMAX Views* must be explicitly activated in the *Configuration* and *Expert Mode* tabs of the driver configuration menu; refer to the relevant description in chapter 6.

The WiMAX views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *WiMAX*.

Message details about WIMAX MAC Management Payload decoding are available for all MAC Management Messages (all MAC Management Messages, except UL-MAP and DL-MAP) displayed in the Layer 3 View: For further information about 2G/3G Layer 3 View see chapter 2G/3G Layer 3 View on page 4.332.

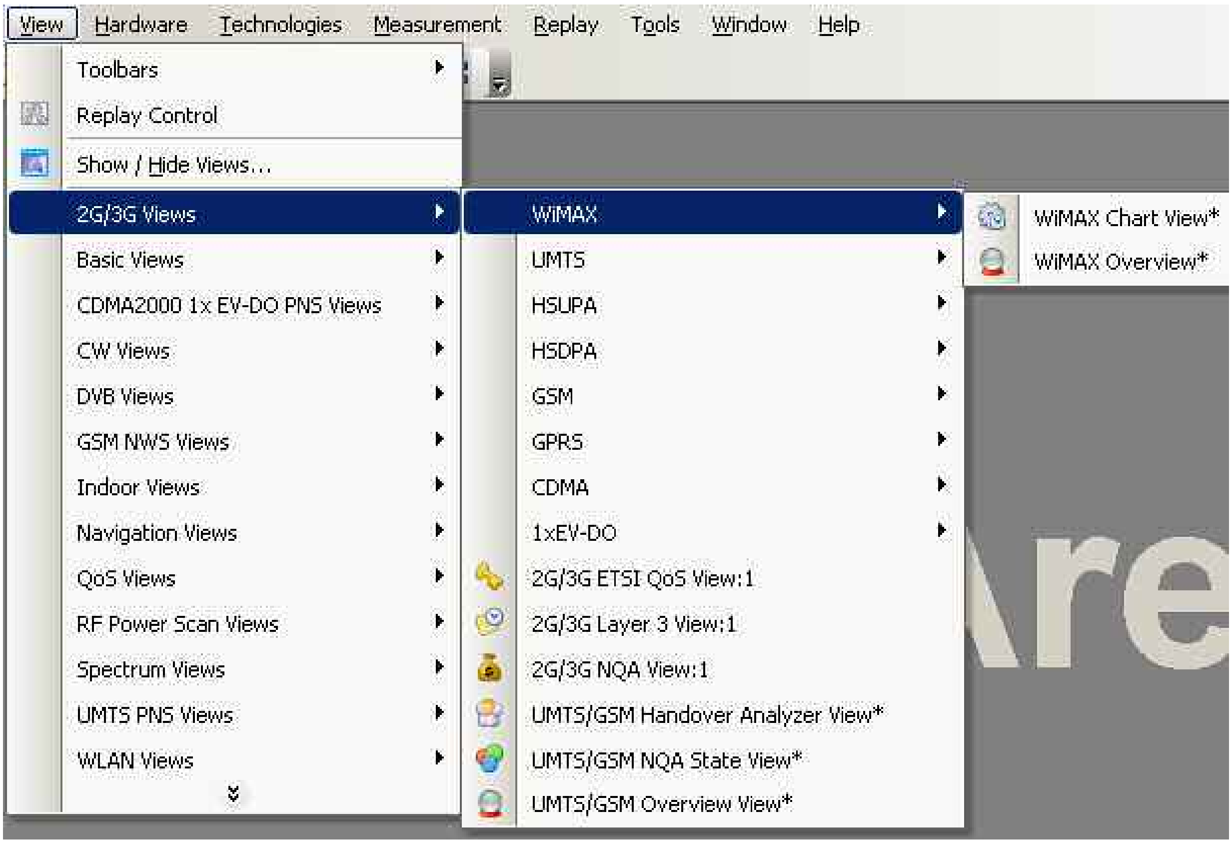


Fig. 4-109 WiMAX views

WiMAX Overview View

The *WiMAX Overview View* displays the most important parameters. In the upper part, power and quality parameters are displayed. The Serving Cell section displays the most important information concerning the transmitter, the mobile is connected to. The DL/UL Statistic displays the current distribution of the AMC. The lower panel displays all top N pools defined in the Top N tab of the technology configuration.

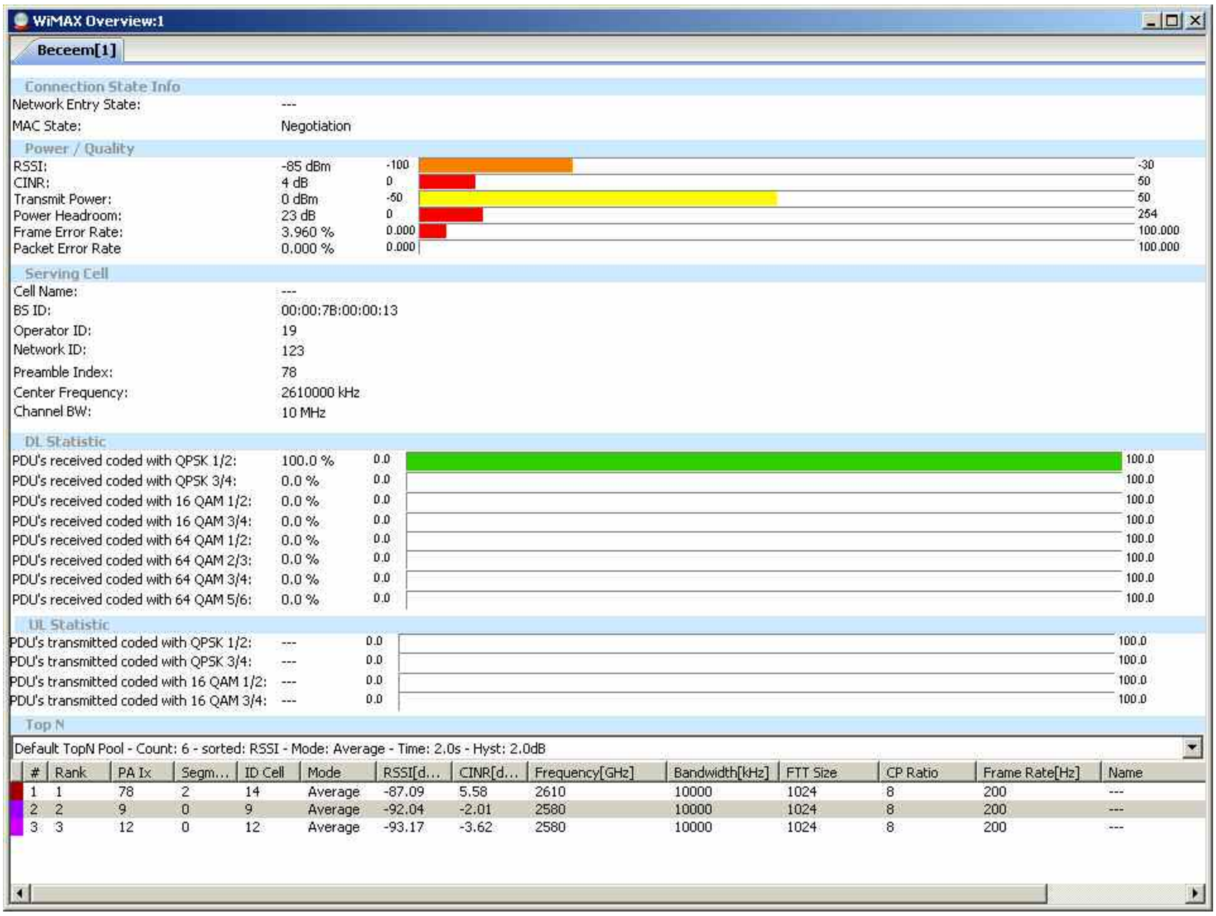


Fig. 4-110 WiMAX Overview View

Power/ Quality

RSSI

The received signal strength indicator is the received wide band power in dBm, including thermal noise and noise generated in the receiver.

CINR

Ratio of carrier/interference plus noise.

Transmit Power

WiMAX transmit power during the call.

Power Headroom

Maximum transmit power minus the normal clear sky transmit power, can also be thought of as additional fade margin that can be used to respond to rain and other fading events.

Frame Error Rate

Percentage of erroneous WiMAX frames detected and reported by the WiMAX mobile station

Packet Error Rate

Packet errors are calculated as the difference between the sent and received packets, but they ignore lost packets at a data rate of 0.0 kBit/s. The advantage of this approach is that the overall PER will not be influenced by these "lost" packets, since this is a valid and normal condition.

Serving Cell

Cell Name

Cell name, if applicable. If no name is available, "---" is shown.

BS ID

WiMAX Base Station Identifier

Preamble Index

Downlink preamble Index

Center Frequency

Center frequency of the used channel. According to standard IEEE 802.16.

Channel BW

A measure of the information carrying capacity of a signal, expressed as the width of the spectrum of that signal (frequency domain representation) in Hertz.

UL and DL Statistic

Adaptive modulation allows the WiMAX system to adjust the signal modulation *and Code Rate* depending on the CINR condition of the radio link *in Uplink and Downlink.*

Uplink

- PDU's transmitted coded with QPSK 1/2
- PDU's transmitted coded with QPSK 3/4
- PDU's transmitted coded with 16 QAM 1/2
- PDU's transmitted coded with 16 QAM 3/4

Downlink

- PDU's transmitted coded with QPSK 1/2
- PDU's transmitted coded with QPSK 3/4
- PDU's transmitted coded with 16 QAM 1/2
- PDU's transmitted coded with 16 QAM 3/4
- PDU's transmitted coded with 64 QAM 1/2
- PDU's transmitted coded with 64 QAM 2/3
- PDU's transmitted coded with 64 QAM 3/4
- PDU's transmitted coded with 64 QAM 5/6

Connection State Info

Network Entry State

In general following Network Entry States are existing:

- Downlink Channel Synchronization
- Initial Ranging
- Exchanging Capabilities
- Authentication:
- Registration
- IP Connectivity
- Connection Creation

MAC State

The 802.16 MAC also defines three types of MAC management connections that are used to exchange control messages between the BS and SS. These connections specify different QoS requirements, needed at different management levels.

- The basic connection is used to transfer short, time-critical MAC and Radio Link Control (RLC) messages.
- The primary management connection transfers long and delay tolerant messages related to authentication and connection setup.
- The secondary management connection is used to transfer standards-based messages like Dynamic Host Configuration Protocol (DHCP), Trivial File Transfer Protocol (TFTP) and Simple Network Management Protocol (SNMP).

Top N List

The *Top N list* contains all top N pools defined in the *Top N* tab of the technology configuration. The *Top N List* gives an overview of the received signals in the current top N pool together with their measured power parameters, frequency and timing information.

The TopN pools configuration is done in the WIMAX Scan Technology component.
In the view configuration menu, it is possible to show or hide each individual table column. Up to 3 different named pools can be configured in the default setup.
Each pool has several configurable parameters.

On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. The *Top N List* contains the following columns:

#
: Number of the measured Cell and Preamble Index within the Top N pool.

Rank
: Current rank within the TopN Pool.

Preamble Index
: Downlink preamble Index.

Segment
: A cell site can be divided up into three different segments. Thus segment number can be 0, 1, or 2.

ID Cell
Cell name, if applicable. If no name is available, "---" is shown.

Mode (Average / Max)
Mode (Average / Max)
Valuation Method (Average/Max/Min)

RSSI
The received signal strength indicator is the received wide band power in dBm, including thermal noise and noise generated in the receiver. Total Inband Power Doppler Frequency.

CINR
Ratio of carrier/interference plus noise.

Center Frequency
Center frequency of the used channel. According to standard IEEE 802.16.

Bandwidth
For WiMAX different bandwidth are possible according to standard IEEE 802.16.

FFT Size
Fast Fourier Transformation

CP Ratio
Cyclic Prefix Ratio

Frame
Frame Rate

BTS Name
WiMAX base station name.

Distance (to BTS)
Distance to the BTS.

Diagram

Below the table, the *Top N Chart* shows the RSSI and CINR for all cells in the current top N measurement as a bar chart. In the configuration menu, it is also possible to select the upper and lower RSSI und CINR levels for the y-axis of the chart.

WiMAX Overview View Configuration

The *WiMAX Overview View* configuration menu defines the list information to be viewed. It is opened via a right mouse click on a point inside *WiMAX Overview View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Color Settings* tab sets the color scale for the Preamble Index.

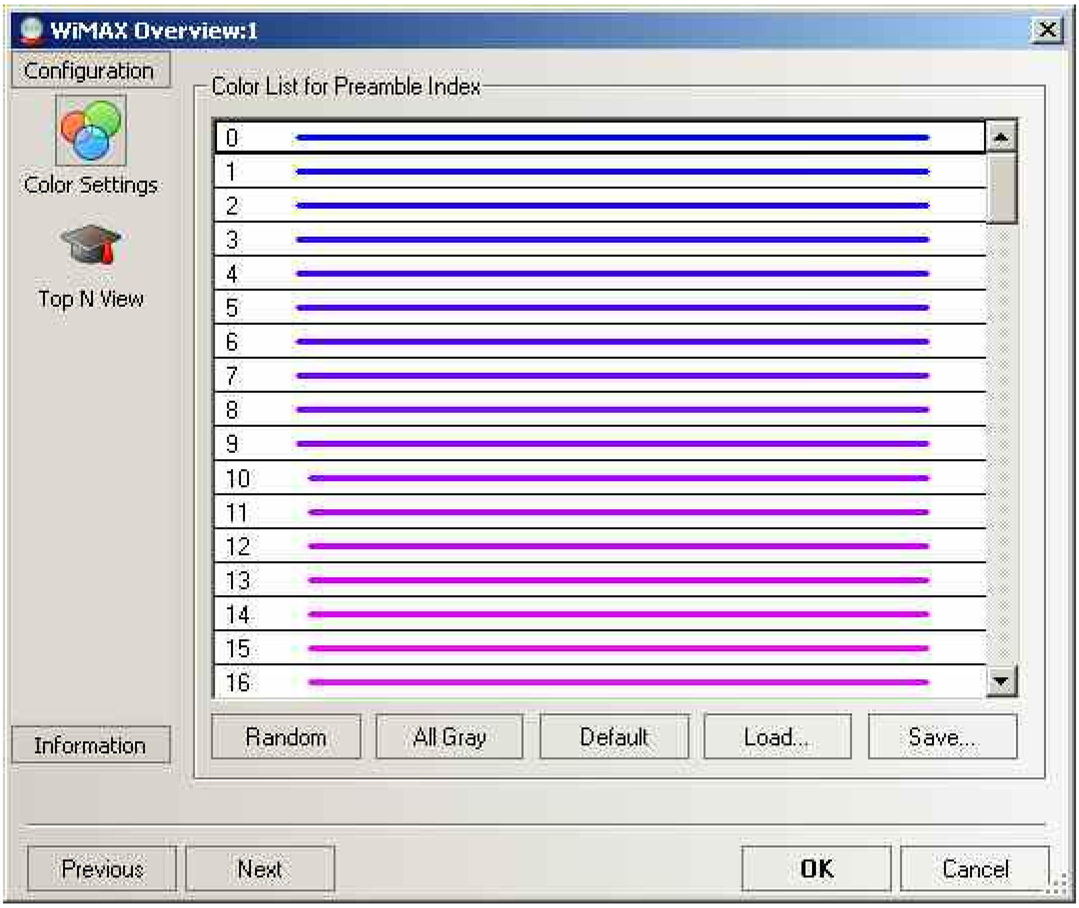


Fig. 4-111 WiMAX Overview configuration: Color Settings

Random	No ordering; colors are assigned to the preamble index at random.
All Gray	Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single peamble index (or a small number of preamble index), colored different, from all other index, colored gray.
Default	Predefined color scale: Colors change continuously as the preamble index.
Load/Save	A color scale can be loaded from a preamble index color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

The *Top N View* tab in the configuration menu defines scale, the minimum *RSSI / CINR [dBm]* and the maximum *RSSI / CINR [dBm])* level to be displayed in the *WIMAX Overview View* and selects the contents of the table.

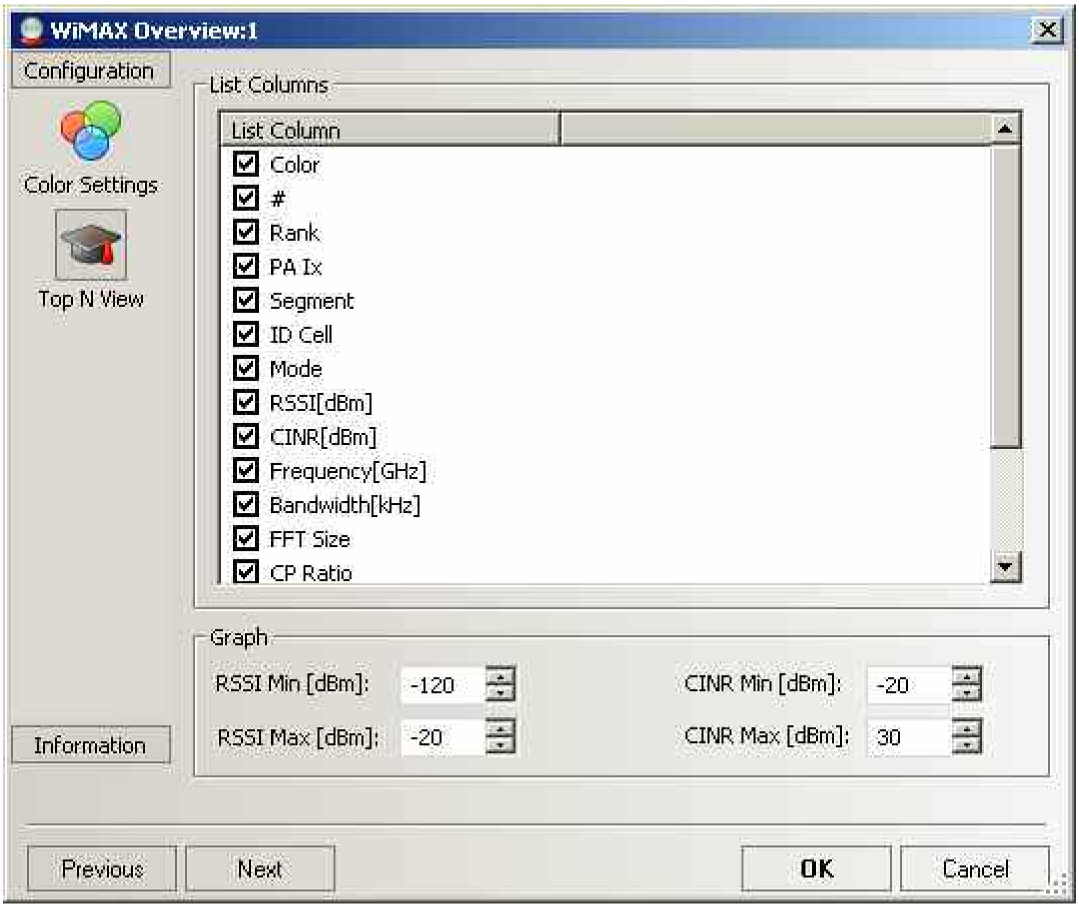


Fig. 4-112 WiMAX Overview View configuration Top N View

Graph	*RSSI Min/Max [dBm]*	Sets the upper and lower RSSI levels for the scale of the chart.
	CINR Min/Max [dBm]	Sets the upper and lower CINR levels for the scale of the chart.

WiMAX Chart View

The *WiMAX Chart View* displays Tx and Tx Powers and Error Rates in a predefined 2D Chart.

Fig. 4-113 WiMAX Chart View

Tx Chart

Cur. Tx Power
: *Current transmit Power*

Tx Pwr Headroom
: *Current transmission Power Headroom*

Rx Chart

Cur. RSSI
: *Current RSSI*

Cur. CINR
: *Current CINR*

Quality Chart

DL Packet Error Rate
: *see above*

DL Frame Error Rate
: *see above*

WiMAX Chart View Configuration

The *WiMAX Chart View Configuration* menu defines the list information to be viewed. It is opened via a right mouse click on a point inside *WiMAX Overview View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Color Settings* tab sets the color scale for the Preamble Index.

The *Color Settings* tab of the *WiMAX Chart View* configuration menu corresponds to the same tab in the *WiMAX Overview View* configuration menu; see *WiMAX Overview View Configuration* on p. *4.195.*

1xEV-DO Views

The *1xEV-DO Views* show 1xEV-DO-specific information included in the measurement data of 1xEV-DO mobiles. 1xEV-DO data can be acquired using one of the CDMA2000/1xEV-DO drivers described in chapter 6. Before a measurement is recorded, data acquisition for most views must be explicitly enabled in the *Define Measuremen*t tab of the CDMA2000 configuration menu (for an overview see chapter 6).

The 1xEV-DO views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *1xEV-DO Views*.

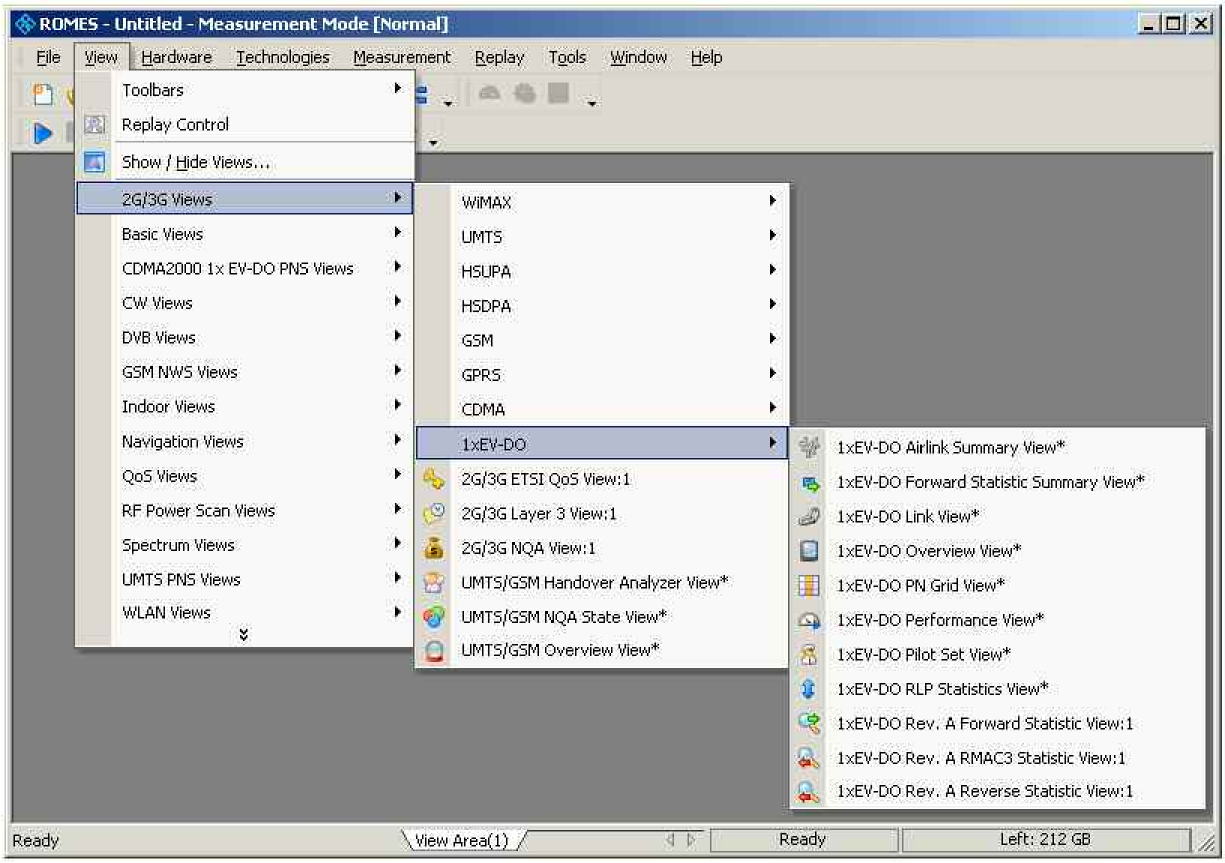


Fig. 4-114 1xEV-DO views

1xEV-DO Pilot Set View

The *1xEV-DO Pilot Set View* contains a list and a bar graph showing the pilot channel signal strength from the active and several neighbor base stations. The diagram is empty unless the *Pilot Sets* check-box in the *Define Measurement* tab of the Expert Mode tab of the corresponding Qualcomm Driver (e.g. for the Z720) menu is enabled.

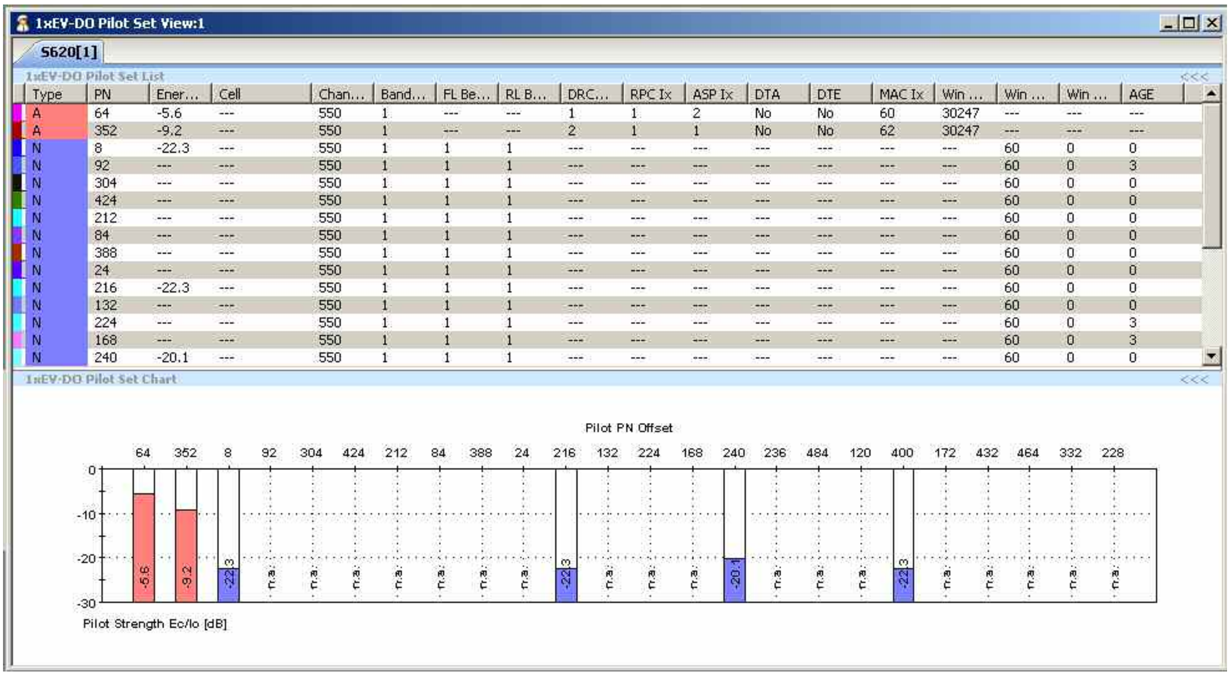


Fig. 4-115 1xEV-DO Pilot Set View

Pilot Set List The 1xEV-DO Pilot Set List panel displays the following information:

Type
: *Cell type as detected by the test mobile: active (A), neighbor (N), or candidate (C).*

PN
: *The pilot PN sequence offset for the current sector in units of 64 PN chips.*

Energy (dB)
: *Measured strength of the pilot per chip (in dB).*

Cell
: *Name of the cell.*

Channel
: *1xEV-DO pilot channel number.*

BandClass
: *The band class number corresponding to the frequency assignment of the specified channel.*

FL Best ASP
: *Percentage of time, at which the corresponding AN transmitted to the AT (Rev. A only).*

RL Best ASP
: *RL Best AS: Percentage of time, at which the AT transmitted to the corresponding AN (Rev. A only).*

DRCCover
: *Index of the DRC cover associated with the measured sector used to transmit DRC.*

RPC Ix
: *Reverse Power Control Index*

ASP Ix
: *Active Set Pilot Index*

DTA
: *The drop timer is activated whenever the measured pilot strength becomes less than the value threshold of the plot drop. If the strength of the pilot returns above the pilot drop threshold before the timer expires, the pilot drop timer is reset. DTA (Drop Timer Active) indicates whether or not the drop timer is active.*

DTE
: *(Drop Timer Expired) indicates whether or not the drop timer is expired.*

MAC Ix
: *The 7-bit MAC Index for each pilot in the active set, ranging from 0 to 127.*

Win Center
: *For the active set, the search window is centered around the earliest usable multipath component for pilots.*
For neighbor sets, the search window is centered around the pilot PN sequence offset plus the search window offset.

Win Size
: *The search window size is specified by attribute for pilots in the active set and candidate set. For each pilot in the neighbor set, the search window size specified by the corresponding neighbor structure in the route update neighbor list is shown.*

Win Offset
: *The displayed search window offset is defined by the corresponding neighbor structure in the route update neighbor list.*

AGE
: *Maximum AGE value beyond which members from the neighbor set are dropped*

<<< A click on the arrows in the title row of the *Pilot Set List* closes the display panel of the list.

Pilot Set Chart

The diagram is a bar graph showing the relative strength of a variable number of pilot, candidate and neighbor cell signals. The 1xEV-DO channel numbers of the signals are indicated above the bars. The channel strength is expressed as the ratio *Ec/Io* in dB where E_c denotes the chip energy of the pilot signal, I_0 denotes the noise level. The diagram has a fixed y-axis scale of –30 dB to –0 dB.

The update rate of the diagram and the number of signals displayed depend on the mobile station and its operating conditions.

A click on the arrows in the title row of the *Pilot Set Chart* closes the display panel of the diagram.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clip-board, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

1xEV-DO Pilot Set View Configuration

The *1xEV-DO Pilot Set View* configuration menu defines the list settings, chart cell colors and shows information on the current view version. It is opened via a right mouse click on a point inside the *1xEV-DO Pilot Set View* or via the *Tools - Modules Configuration...* command (see chapter 3).

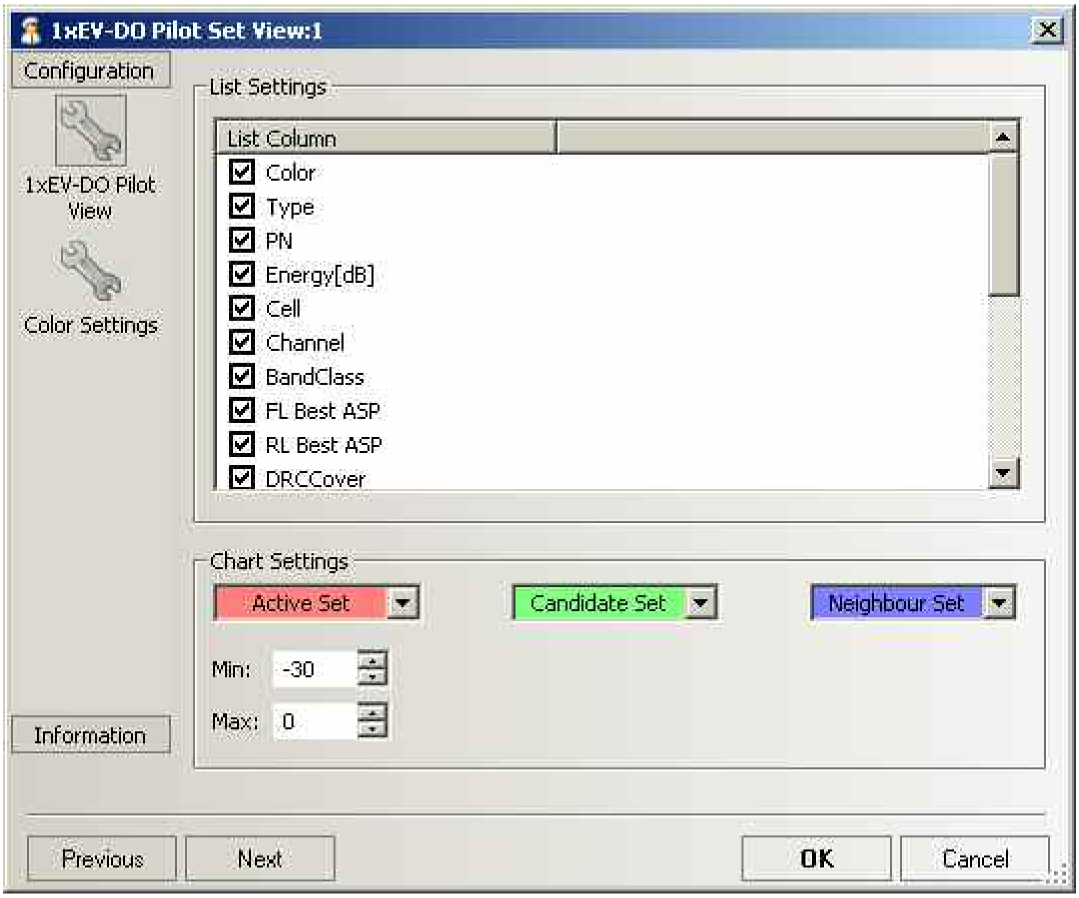


Fig. 4-116 1xEV-DO Pilot Set View configuration: Pilot View

List Settings The *List Settings* panel offers checkboxes to select the elements displayed in the Pilot Set view.

Chart Settings With the *Chart Settings* panel the colors for the pilot set cell types (active, candidate, neighbor) can be defined.

Min./Max.
With the Min./Max. *selection field the y-axis scale of the 1xEV-DO pilot set chart can be defined within the range between –30 dB to – 0 dB.*

The *Color Settings* tab sets the color scale for the possible PN offsets.

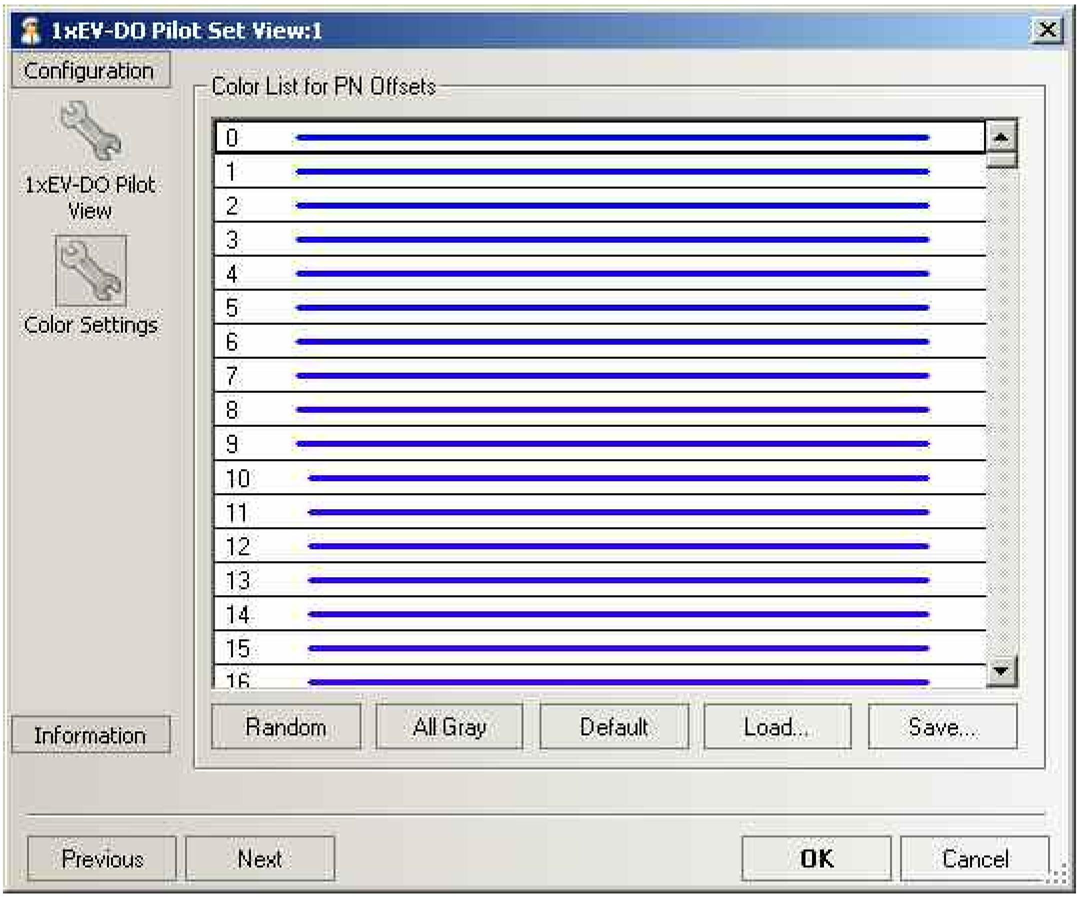


Fig. 4-117 1xEV-DO Pilot Set View configuration: Color Settings

The colors are displayed in the diagram (power peaks) and in the first table column (pilot set list). A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.392) to change the current display color.

Random No ordering; colors are assigned to the PN offsets at random.

All Gray Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single PN offset (or a small number of PN offsets), colored different, from all other codes, colored gray.

Default Predefined color scale: Colors change continuously as the PN offsets increase.

Load/Save A color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

1xEV-DO Overview View

The 1xEV-DO Overview view displays a summary of the test mobile state, power/quality, sector, airlink quality results, and, if applicable, results from a connected 1xEV-DO PN scanner.

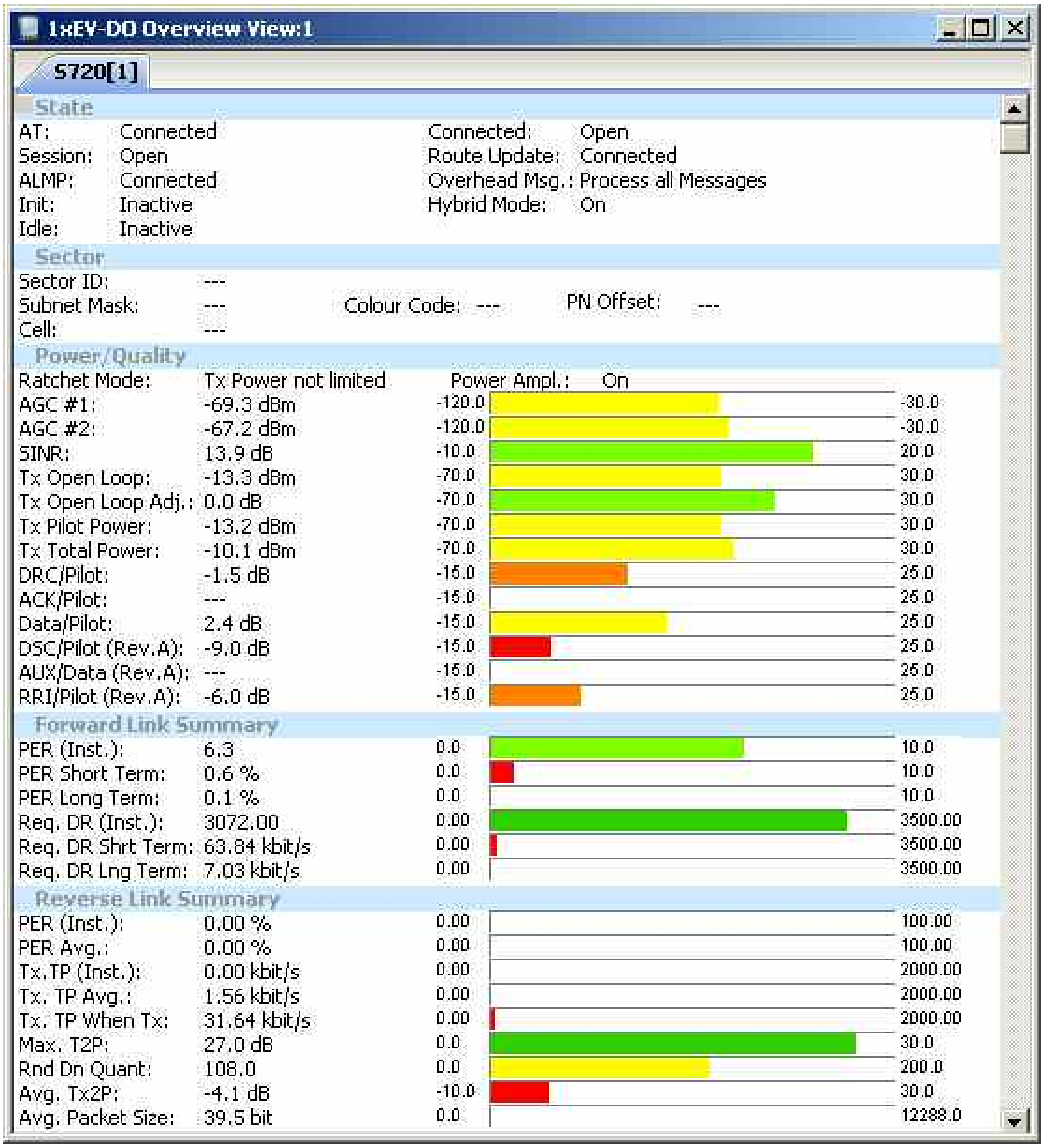


Fig. 4-118 1xEV-DO Overview View

The 1xEV-DO PN Scanner field group is only filled if an actual scanner is configured and running.

State

The 1xEV-DO state parameters of the access terminal and the traffic session on the connection layer are arranged in a field with 2 columns: Some of the parameters may not be provided by all test mobiles.

AT
: *Signaling state of the access terminal.*

Session
: *State of the current session.*

ALMP
: *The Air Link Management protocol (ALMP) maintains the overall connection state in the AT and the AN. The protocol can be in one of three states, corresponding to whether the AT has yet to acquire the network (Initialization State), has acquired the network but the connection is closed (Idle State), or has an open connection with the AN (Connected State).*

Init
: *The Initialization State Protocol provides the procedures that an AT follows to acquire a network and that an AN follows to support network acquisition. It has the possible states* Inactive*,* Network Determination*,* Pilot Acquisition*, or* Synchronization

Idle
: *In the Idle State, the AT autonomously maintains the Active Set. Route update messages from the AT to the AN are based on the distance between the current serving sector of the AT and the serving sector at the time the AT last sent an update. It has the possible states* Inactive, Sleep, Monitor, *and* Connection Setup*.*

Connected
: *State of the Connected State protocol (ALMP) of the radio link between mobile and access terminal (Open / Inactive/ Close).*

Route Update
: *State of the Route Update Protocol, which performs the actions associated with keeping track of an AT location and maintaining the radio link between the AT and the AN (.Connected / Idle / Inactive).*

Overhead Msg.
: *This protocol performs supervision on the messages necessary to keep the Connection Layer functioning. It can be in two states:* Wait for link *(Inactive) or* Process all Messages *(Active).*

Hybrid Mode
: *If the mobile station is able to support services on both the IS-2000/IS-95 (CDMA) and IS-856 (1xEV-DO) systems, a hybrid mode MS/AT can connect services available on either system. This is useful to e.g. to monitor voice calls when in a 1xEV-DO data connection.*

Power / Quality

The field group displays a summary of power and quality measurement-related results:

Ratchet Mode
The RatchetMode register shows the state of the Tx power limiting:

0 – Tx power not limited
1 – Tx power is limited

Power Ampl.
Power amplification (On/Off)

AGC #1/2
Automatic Gain Control, the field shows the total receive power as seen by antenna 1/2

Tx Open Loop
The Tx power determined by the open loop adjust mechanism (range is –70 to +30 dBm)

Tx Open Loop Adj,
Open loop adjustment value (dB).

Tx Pilot Power
The Tx power determined by the closed loop adjust mechanism (range is –70 to +30 dBm). The value represents the pilot power that is transmitted over the pilot channel; this is calculated based on the Tx Open Loop power and the Tx Closed Loop Adjustment.

Tx Total Power
Tx Total Power holds the total Tx power as determined by the entire Tx AGC mechanism (range –70 to +30 dBm).

DRC/Pilot
DRC channel gain

ACK/Pilot
ACK channel gain

Data/Pilot
Data channel gain

DSC/Pilot
DSC channel gain

AUX/Data
Auxiliary channel gain

RRI/Pilot
Reverse Rate Indicator channel gain

Sector

The measured 1xEV-DO sector data and sector-related settings are displayed in this field group:

Sector ID

This field displays the 128-bit sector address of the serving sector

Subnet Mask

The sector subnet identifier (default 104). The AN sets this field to the number of consecutive 1's in the subnet mask of the subnet to which the corresponding sector belongs.

Cell

Number of cells in the active set.

Color Code

The color code corresponding to the related sector.

PN Offset

PN Offset *sets the offset of the PN sequence. Changing the PN offset (default 0) changes the timing of the short code spreading, the contents of the Sync message on the Control Channel.*

Forward Link Summary

The field group shows the receiver quality-related measurement information:

PER (Inst.)

Current Packet Error Rate

PER Short Term

Short-term Packet Error Rate

PER Long Term

Long-term Packet Error Rate

Req. DR (Inst.)

Currently requested Data Rate

Req. DR Shrt Term

Short-term Data Rate as defined by Qualcomm

Req. DR Lng Term

Long-term Data Rate as defined by Qualcomm

Part of the information on this view is also displayed in the *1xEV-DO Airlink Summary View;* see p. 4.216 .

Reverse Link Summary

The field group shows the receiver quality-related measurement information:

PER (Inst.)
: *Current Packet Error Rate*

PER AVG
: *Average value of PER.*

Tx.TP (Inst.)
: *Current Transmitted Throughput.*

Tx. TP When TX
: *Transmitted Throughput during transmission.*

Max. T2P
: *Max. Traffic Channel Power to Pilot Channel Power Ratio = P[Tr.Ch.] / P[Pilot Ch.]*

Rnd DN Quant
: *Round Down Quantum*
Smallest unit of data allotted to a flow in the round-down algorithm.

Avg. TxT2P
: *Average T2P of packet currently being transmitted over the air.*

Avg. Packet Size
: *Average packet size.*

Scanner TopN

If a 1xEV-DO PN scanner is configured and running, this panel displays the Top Ns of the scanner.

The *1xEV-DO Overview* view has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

1xEV-DO Link View

The *1xEV-DO Link View* shows the attempt-related information for access, connection and session attempts.

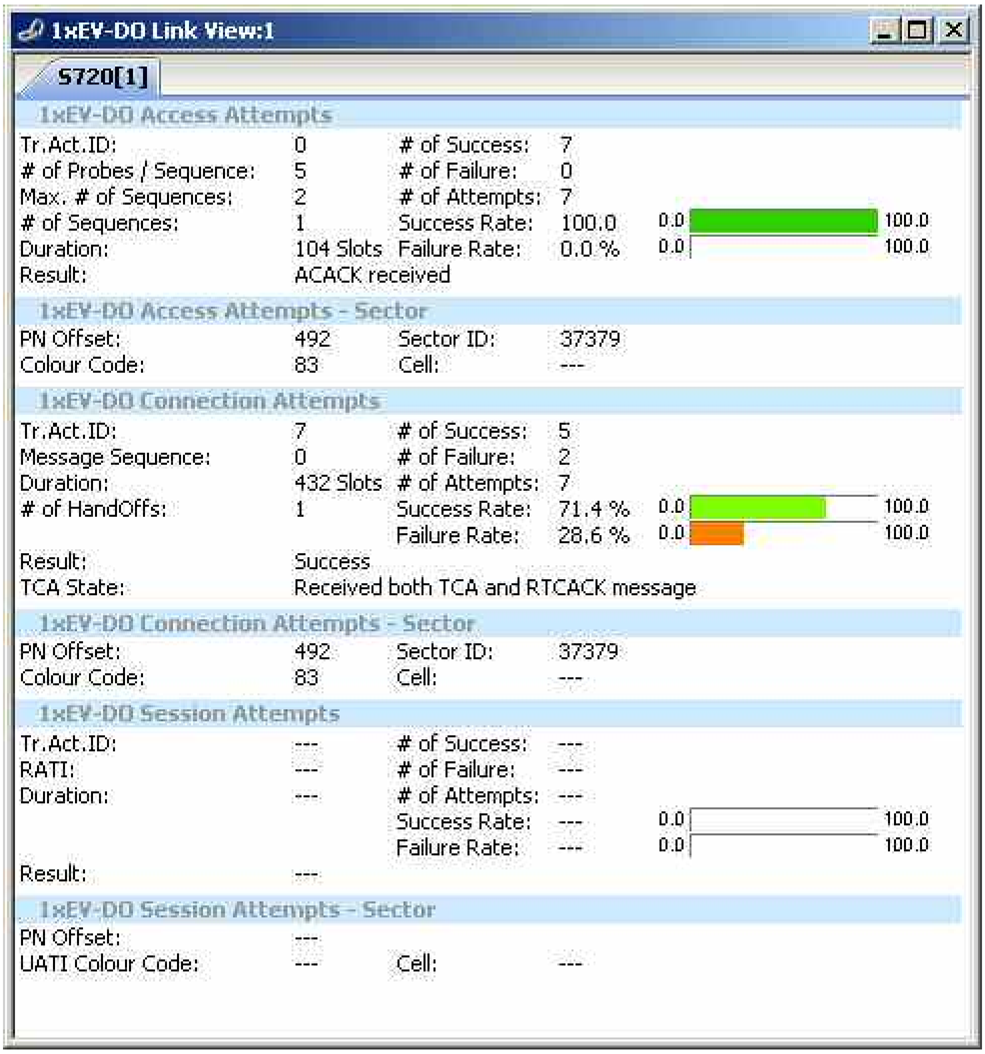


Fig. 4-119 1xEV-DO Link View

The measurement results for each attempt are arranged in a separate panel. The panels show the attempt information first, and then the relevant sector parameters are appended.

1xEV-DO Access Attempts

The *1xEV-DO Access Attempts* panel display the summary of the access attempt-related measurement results:

Tr.Act.ID
: *Transaction ID of the connection request sent by the AT.*

# of Probes / Sequence
: Access Probes *allow the setting of the AN to ignore or acknowledge the access probes from the AT, where "Acknowledge" is the default value. The AT transmits access probes during its power on cycle, at the AN timer based registration setting and when the AT initiates a call. This column shows the number of probes in the current measurement sequence.*

Max. # of Sequences
: *Maximum number of test sequences.*

# of Sequences
: *Number of actually transmitted access test sequences.*

Duration
: *Indication of the time needed for successful access attempts.*

Result
: *Result indication of the access attempt:*
0 – ACAck not received
1 – ACAck received
2 – TCA message received
3 – Probe Interrupted

Other values are reserved

# of Success
: *Number of successful access attempts.*

# of Failure
: *Number of unsuccessful access attempts.*

# of Attempts
: *Total number of access attempts.*

Success Rate
: *Percentage of successful access attempts relative to the total number of access attempts. The success rate percentage is also shown as a histogram chart which is colored according to the rate result.*

Failure Rate
: *Percentage of successful access attempts relative to the total number of access attempts. The failure rate percentage is also shown as a histogram chart which is colored according to the rate result.*

Sector – PN Offset
: *PN of the sector that sends the ACAck or the TCA message. If the* Result *field equals 0 or 3, then this field is reserved.*

Sector – Colour Code
: *Sector Colour Code on which the access probe was sent.*

Sector – Sector ID
: *Sector ID on which the access probe was sent.*

Sector – Cell
: *Number of the active cell.*

1xEV-DO Connection Attempts

The *1xEV-DO Connection Attempts* panel display the summary of the connection attempt-related measurement results:

Tr.Act.ID

Transaction ID associated with the ConnectionDeny *message. If there is no response from the AN or a* ConnectionDeny *message is not received, this field represents the Transaction ID that was used to send the* ConnectionRequest *message.*

Message Sequence

The message sequence present in the received TCA message. This field is valid only if a TCA message is actually received, that is, if the most significant nibble of result field equals 1 or 2.

Duration

Time (in slots) needed to complete the attempt

# of Handoffs

Number of handoffs during the connection attempt analysis.

Result

The least significant nibble of this field indicates the following possible connection attempt outcomes:

0 – ConnectionDenyReceived with DenyReason "General"
1 – ConnectionDenyReceived with DenyReason "Network Busy"
2 – ConnectionDenyReceived with DenyReason "Authentication or billing failure"
3 – Maximum access probes
4 – System lost (supervision failures)
5 – Not preferred (SD told OVHD to switch systems, QC redirect, Access network ID)
6 – Redirect (ALMP received a redirect message)
7 – Connection setup timeout
8 – PowerDownReceived
9 – OfflineReceived
A – NAMChangeReceived
B – UserAbort
C – AccessHandoff
D through E – Reserved
F – Success

The most significant nibble of this field indicates the following reception status of the TCA and RTCACK messages:

0 – Not received either TCA or RTCACK message
1 – Received TCA message but not received RTCACK message
2 – Received both TCA and RTCACK messages

TCA State

The most significant nibble of this field indicates the following reception status of the TCA and RTCACK messages:

0 – Received neither TCA nor RTCACK message
1 – Received TCA message but not RTCACK message
2 – Received both TCA and RTCACK messages

# of Success
Number of successful connection attempts.

# of Failure
Number of unsuccessful connection attempts.

# of Attempts
Total number of connection attempts.

Success Rate
Percentage of successful connection attempts relative to the total number of connection attempts. The success rate percentage is also shown as a histogram chart which is colored according to the rate result.

Failure Rate
Percentage of successful connection attempts relative to the total number of connection attempts. The failure rate percentage is also shown as a histogram chart which is colored according to the rate result.

Sector – PN Offset
If the Result *field indicates that a* ConnectionDeny *message was received then the PN Offset represents the PN of the sector that sent the* ConnectionDeny *message. If the* Result *field indicates that a TCA message was received then it represents the PN of the sector that sent the TCA message. For all other cases, it represents the PN of the sector at the time when the connection setup failed.*

Sector – Color Code
Sector Colour Code on which the access probe was sent.

Sector – Sector ID
Sector ID on which the access probe was sent.

Sector – Cell
Number of the active cell.

1xEV-DO Session Attempts

The *1xEV-DO Session Attempts* panel display the summary of the session attempt-related measurement results:

Tr.Act.ID
Transaction ID associated with the UATI request message

RATI
Random Access Terminal Identifier

Duration
Time (in slots) needed to complete the attempt

Result
Result indication of the session attempt:

0 – Received UATI Assignment message
1 – Did not receive UATI Assignment message

# of Success
Number of successful session attempts.

# of Failure
Number of unsuccessful session attempts.

# of Attempts
Total number of session attempts.

Success Rate
Percentage of successful session attempts relative to the total number of session attempts. The success rate percentage is also shown as a histogram chart which is colored according to the rate result.

Failure Rate
Percentage of successful session attempts relative to the total number of session attempts. The failure rate percentage is also shown as a histogram chart which is colored according to the rate result.

Sector – PN Offset
PN of the sector that sent the UATI assignment message.

Sector – UATI Color Code
Color code of the Unicast Access Terminal Identifier

Sector – Cell
Number of the active cell.

Context menu

A right mouse click on any point in the view opens the context menu to print the view data, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

The *1xEV-DO Link View* has no specific context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

1xEV-DO Performance View

The *1xEV-DO Performance View* contains four preconfigured 2D charts. The signals in these charts are related to the transmission performance, given in terms of the requested or achieved data throughput.

Fig. 4-120 1xEV-DO Performance View

A double-click on the *Forward Summary, Data Rate Control Channel, ARQ, or Reverse Summary* title bars opens or closes the sub-diagrams in the performance view. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.9, however, an additional *Plot* dialog (see below) provides additional settings to control the diagram content and appearance.

Forward Summary The total throughput (see figure above) of the forward channel is the data throughput that the mobile receives according to the measured forward channel quality.

The forward throughput is calculated from the the FTAP MAC layer packets transmitted on the forward traffic channel that the mobile could receive successfully. This includes the information about the forward channel frame counts. It contains the good and bad CRC counters for Control and Traffic Channel packets. It also contains the number of forward link traffic channel and control channel packets received at various rates. These values are updated if the CRC has passed for the decoded packets. Each rate counter name also includes the SlotsDecoded part that indicates the number of slots taken to decode the particular rate packet.

The chart contains the following results:

Throughput (1 sec)
: *The throughput during the last second of the measurement is displayed [kBit/s]*

Throughput (Session)
: *The averaged throughput for the current AT session.*

Throughput when Served
: *The* Throughput when Served *is calculated from a Qualcomm-specific formula when the AT is actually receiving data.*

The most recent *1 sec, session,* and *when served* throughput values are displayed in the legend above the diagrams. Selecting one of the items in the legend will highlight the corresponding curve.

Data Rate Control Channel

The DRC Channel is used by the access terminal to indicate to the access network the requested Forward Traffic Channel data rate and the selected serving sector on the Forward Channel.

The requested throughput (see figure above:) by the DRC channel is shown together with the corresponding ACK rate:

Requested Throughput
: *Requested data rate as determined from the reverse DRC channel.*

ACK Rate
: *The percentage of ACKnowledged data rate requests.*

ARQ

Each sector of an access network transmits a positive acknowledgment (ACK) or a negative acknowledgment (NAK) in response to a physical layer packet using the ARQ Channel, which is a part of the reverse MAC channel.

The chart contains the following results:

Effective Throughput
: *The effective receive rate (throughput) is calculated as:*
$RateDecoded * Slots_{alloted}/Slots_{required}$
*For example, if a 38.4 kbps packet needs 8 slots to decode instead of the allotted 16 slots, then the effective rate is 38.4 * 2 = 76.8 kbps.*

CRC Rate
: *The percentage of successful CRCs for the ARQ channel throughput.*

Reverse Summary

The total throughput (see figure above) of the reverse channel is the data throughput that the access network receives according to the measured reverse channel quality.

Data rate per unit of time (in kBit/s) of the RTAP RTC MAC packets from the mobile that the R&S CMU could receive successfully

The chart contains the following results:

Throughput
: *The throughput during the last second of the measurement is displayed [kBit/s]*

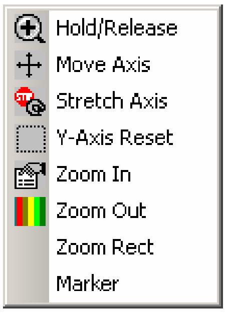
Throughput (Session)
: *The averaged throughput for the duration of the current AT session is shown.*

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, save the current configuration as default, or move to another worksheet; see *Context menu* description on p. 4.2.

View Configuration

The *Edit...* dialog provides additional settings to control the diagram content and appearance. The dialog is opened from a context menu; this menu appears after a right-click on the y-axis labels or on one of the curves in the diagram.



Hold/Release	This option pauses and resumes the display of the resulting measurement output.
Axes Move	Here the axes of the chart can be scrolled by panning the mouse cursor over the axis area of the chart.
Axes Stretch	This option enables the dynamic increase or decrease of the axis scale
Y-Axis Reset	This option resets the y-axis scale to its default value, which resets all previous zooming, stretching or moving y-axis activities
Zoom In	Zoom into the graph by positioning and clicking the looking-glass cursor.
Zoon Out	Zoom out of the graph by positioning and clicking the looking-glass cursor.
Zoom Rect	Select a rectangle within the graph to be zoomed.
Marker	This option creates a vertical line with an associated information dialog which shows the associated absolute values of the selected measurement curve.

1xEV-DO Performance View Configuration

The *Chart Configuration* tab of the *1xEV-DO Performance View Configuration* dialog is analogous to the *Chart Configuration* tab of the *2D Chart View* configuration menu, see figure on p.4.16 .

1xEV-DO Airlink Summary View

The *1xEV-DO Airlink Summary View* contains three preconfigured 2D charts. The signals in these charts are the pilot energy, the requested throughput, and the PER over the measurement time.

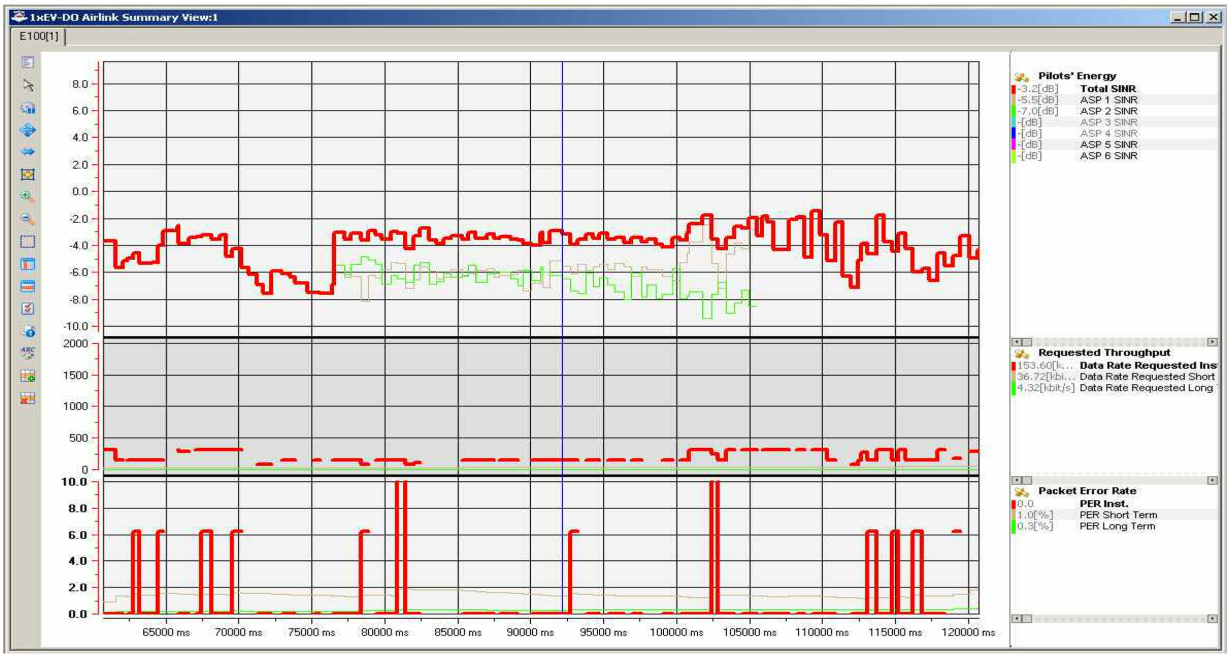


Fig. 4-121 1xEV-DO Airlink Summary View

A double-click on the *Pilots' Energy, PN Offsets, Requested Throughput, or Packet Error Rate* title bars opens or closes the sub-diagrams in the airlink summary view. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.9, however, an additional *Edit* dialog (see below) provides additional settings to control the diagram content and appearance.

Pilot's Energy The chart contains the following results:

Total SINR [dB]	Signal-to-Interference-plus-Noise Ratio. When the mouse cursor is located over the y-axis, it changes its shape to a hand. The scroll wheel or dragging the hand cursor shifts the y-axis left or right, depending on the direction of dragging or scrolling.
ASP 1 to 6 SINR [dB]	Signal-to-Interference-plus-Noise Ratio of the Active Set Pilots 1 through 6.
Time	Timeline of the measurement. When the mouse cursor is located over the time axis, it changes its shape to a hand. The scroll wheel or dragging the hand cursor shifts the time axis left or right, depending on the direction of dragging or scrolling.

PN Offsets The chart shows the following settings:

ASP 1 to ASP 6	Active Set Pilots PN Offset

Requested Throughput

The *Requested* throughput (see figure above) is the data throughput that the mobile requests according to the measured channel quality.

The chart contains the following results:

Data Rate Requested Inst.	The currently requested data rate as determined from the reverse DRC channel.
Data Rate Requested Long Term	The requested data averaged over the long term as calculated using Qualcomm specifications.
Data Rate Requested Short Term	The requested data averaged over the short term as calculated using Qualcomm specifications.
Time	Timeline of the measurement. When the mouse cursor is located over the time axis, it changes its shape to a hand. The scroll wheel or dragging the hand cursor shifts the time axis left or right, depending on the direction of dragging or scrolling.

Packet Error Rate

The *Packet Error Rate* panel shows the PER-related measurement results with the packet errors instead of the received packets, as the standard specifies. Packet errors are calculated as the difference between the sent and received packets, but they ignore lost packets at a data rate of 0.0 kBit/s. The advantage of this approach is that the overall PER will not be influenced by these "lost" packets, since this is a valid and normal condition.

The chart contains the following results:

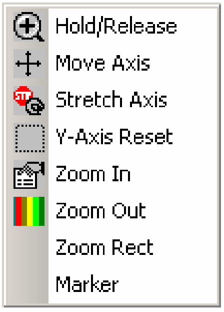
PER Inst.	Current Packet Error Rate
PER Long Term	Long-term Packet Error Rate as defined by Qualcomm
PER Short Term	Short-term Packet Error Rate as defined by Qualcomm
Time	Timeline of the measurement session. When the mouse cursor is located over the time axis, it changes its shape to a hand. The scroll wheel or dragging the hand cursor shifts the time axis left or right, depending on the direction of dragging or scrolling.

Context menu

A right mouse click on any point in the view opens the context menu toprint the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

View Configuration

The *Edit...* dialog provides additional settings to control the diagram content and appearance. The dialog is opened from a context menu; this menu appears after a right-click on the y-axis labels or on one of the curves in the diagram.



Hold/Release This option pauses and resumes the display of the resulting measurement output.

Axes Move Here the axes of the chart can be scrolled by panning the mouse cursor over the axis area of the chart.

Axes Stretch This option enables the dynamic increase or decrease of the axis scale

Y-Axis Reset This option resets the y-axis scale to its default value, which resets all previous zooming, stretching or moving y-axis activities

Zoom In Zoom into the graph by positioning and clicking the looking-glass cursor.

Zoon Out Zoom out of the graph by positioning and clicking the looking-glass cursor.

Zoom Rect Select a rectangle within the graph to be zoomed.

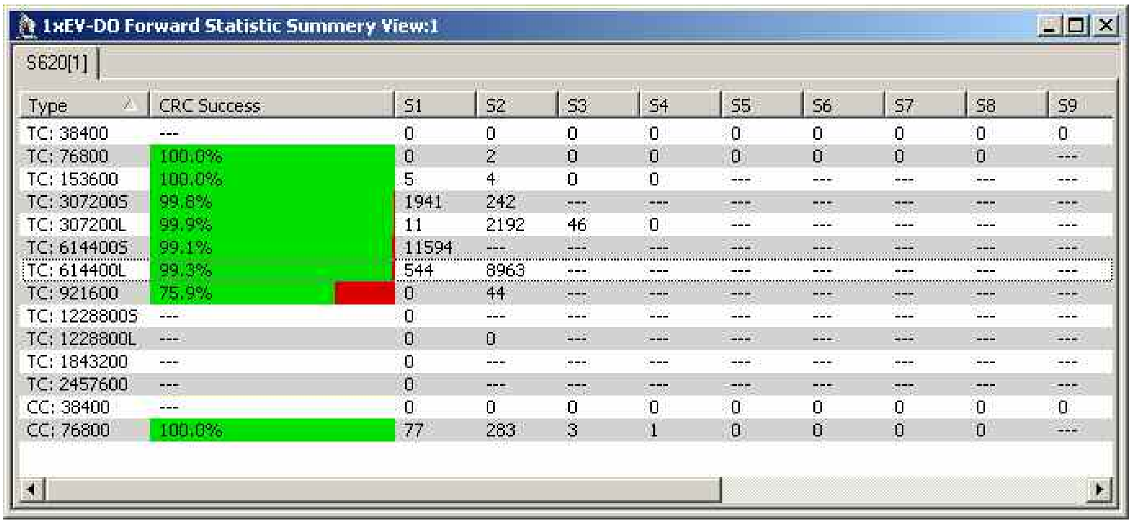
Marker This option creates a vertical line with an associated information dialog which shows the associated absolute values of the selected measurement curve.

1xEV-DO Airlink Summary View Configuration

The *Chart Configuration* tab of the *1xEV-DO Airlink Summary View Configuration* dialog is analogous to the *Chart Configuration* tab of the *2D Chart View* configuration menu, see figure on p. 4.16.

1xEV-DO Forward Statistic Summary View

The *1xEV-DO Forward Statistic Summary View* shows the CRC success rates on the measured forward traffic and forward control channel slots.



Type	CRC Success	S1	S2	S3	S4	S5	S6	S7	S8	S9
TC: 38400	---	0	0	0	0	0	0	0	0	0
TC: 76800	100.0%	0	2	0	0	0	0	0	0	---
TC: 153600	100.0%	5	4	0	0	---	---	---	---	---
TC: 307200S	99.8%	1941	242	---	---	---	---	---	---	---
TC: 307200L	99.9%	11	2192	46	0	---	---	---	---	---
TC: 614400S	99.1%	11594	---	---	---	---	---	---	---	---
TC: 614400L	99.3%	544	8963	---	---	---	---	---	---	---
TC: 921600	75.9%	0	44	---	---	---	---	---	---	---
TC: 1228800S	---	0	---	---	---	---	---	---	---	---
TC: 1228800L	---	0	0	---	---	---	---	---	---	---
TC: 1843200	---	0	---	---	---	---	---	---	---	---
TC: 2457600	---	0	---	---	---	---	---	---	---	---
CC: 38400	---	0	0	0	0	0	0	0	0	0
CC: 76800	100.0%	77	283	3	1	0	0	0	0	---

Fig. 4-122 1xEV-DO Forward Statistic Summary View

Forward Statistic Summary View

The 1xEV-DO Forward Statistic Summary View measurement results are shown as a list panel displaying the following information:

Type — *This column shows the channel type (TC = traffic channel, CC = control channel) and the channel rate (in bit/s). An S or L after the rate denotes Short or Long.*

CRC Success — *This column shows the CRC success rate calculated as [Good / (Good + Bad)]. The field backgrounds also contain a relative bar graph showing the* CRC Success *rate colored green and red.*

S1 to S16 — *These columns contain the information about the forward channel frame counts, the good and bad CRC counters for Control and Traffic Channel packets, and the number of forward link traffic channel/control channel packets received at various rates for the 16 available channel slots. These values are updated if the CRC has passed for the decoded packets. Each rate counter name also includes the SlotsDecoded part that indicates the number of slots taken to decode the particular rate packet. Data for this packet is both sampled and logged every second.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

The *1xEV-DO Statistic Summary View* configuration menu contains an *Info* tab as described on p. 4.4.

1xEV-DO Forward Statistic Summary View Configuration

The *1xEV-DO Forward Statistic Summary View Configuration* menu defines the list information to be viewed and selects the data set displayed for the current view. It is opened via a right mouse click on a point inside *1xEV-DO Forward Statistic Summary View* or via the *Tools - Modules Configuration...* command (see chapter 3).

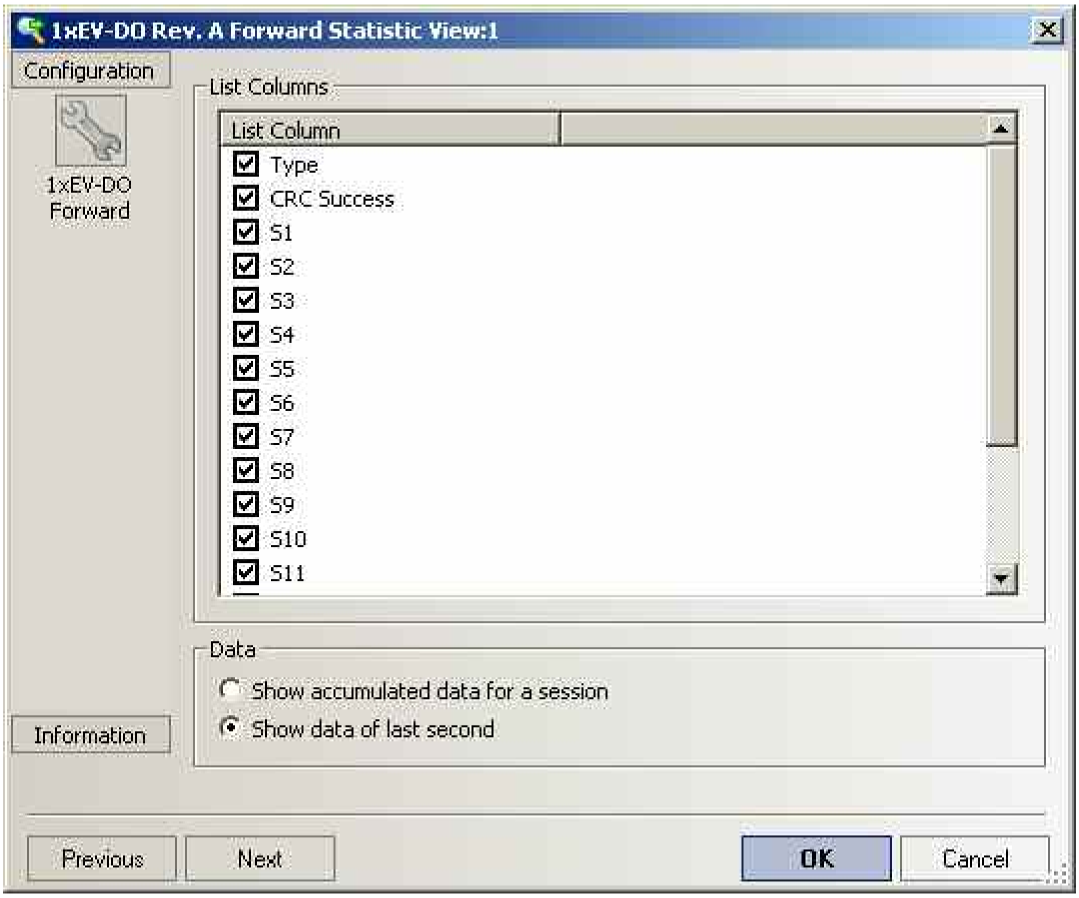


Fig. 4-123 1xEV-DO Forward Statistic Summary View Configuration

List Columns The checkbox selects the summary view elements to be displayed on the list panel:

Data The radio buttons select whether the accumulated data of the current session is displayed or just the data from the last second of the measurement.

1xEV-DO PN Grid View

The *1xEV-DO PN Grid View* shows the forward channel PN offsets 0 to 511 as a matrix with 16 offsets in a row. Within this grid, the PN offsets in the currently active set are marked in shades of pink (default), the candidate set is marked in shades of green (default) and the neighbor set is marked in shades of blue (default).

Depending on the defined energy limits of the sets, the darker color shade is defined per default to show limit shortfalls, the lighter color shade shows limit exceedance.

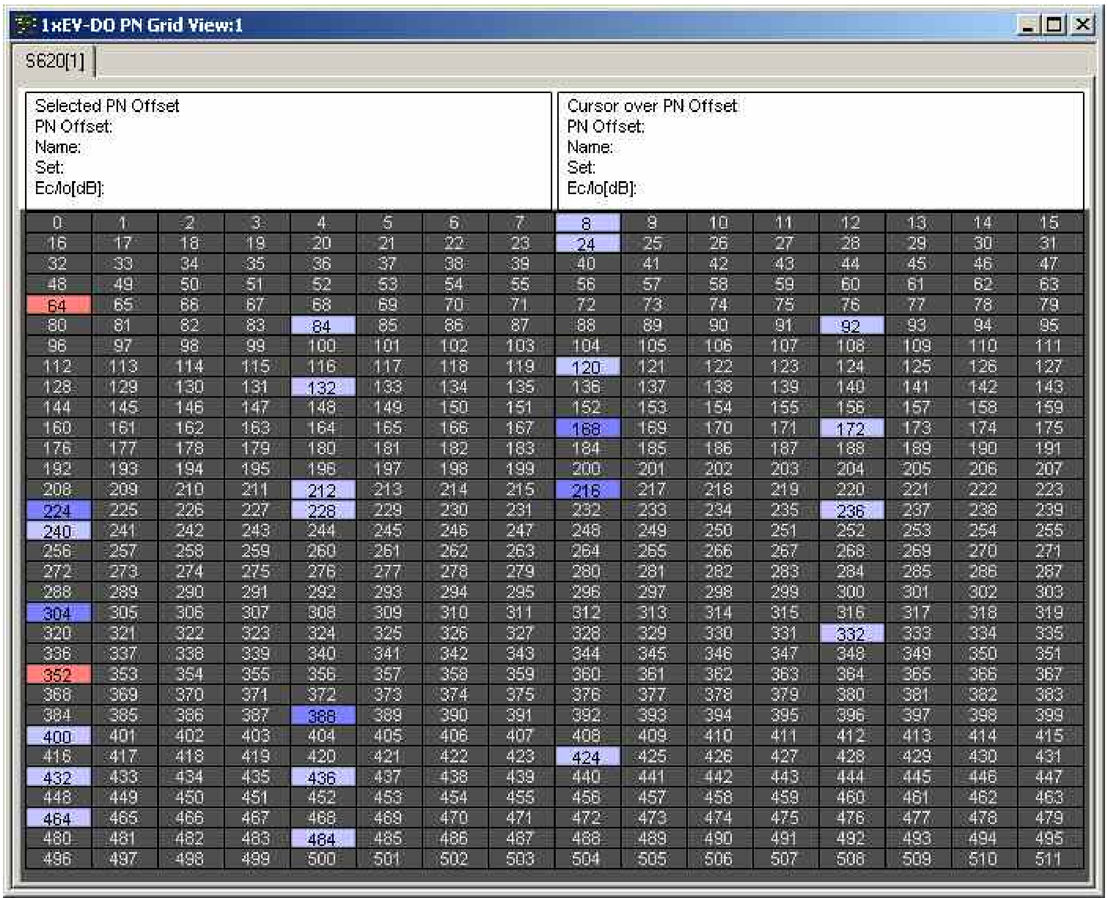


Fig. 4-124 1xEV-DO PN Grid View

Grid Header The header above the grid is divided into two halves, the first one displaying information of the currently selected PN offset grid element. Any grid element can be selected by clicking on it. The other half shows the corresponding information of the grid element over which the mouse cursor is currently hovering, which allows the direct comparison between any two PN offset grid elements.

PN Offset The number of the current grid element is displayed.

Name Here the name of the current grid element is displayed, if applicable. If no name is available, "---" is shown. In some cases, this field also displays auxiliary information, e.g. "No GPS" if this is the case during the measurement.

Set The current set (active / candidate / neighbor) of the selected PN offset grid element is shown.

Ec/Io [dB] The ratio of the average power of the forward channel to the total power comprised of signal plus interference, within the signal bandwidth. It is expressed in dB units.

PN Offset Grid

The PN Offsets from 0 to 511 are arranged as a grid with 16 elements in a row. With the corresponding grid cell background colors for active, candidate, and neighbor set energy limits it is quickly possible to see the related sets of the individual PN offsets.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

1xEV-DO PN Grid View Configuration

The *1xEV-DO PN Grid View configuration* menu sets the energy limits for the active, candidate, and neighbor sets for the PN offsets displayed in the PN grid view.

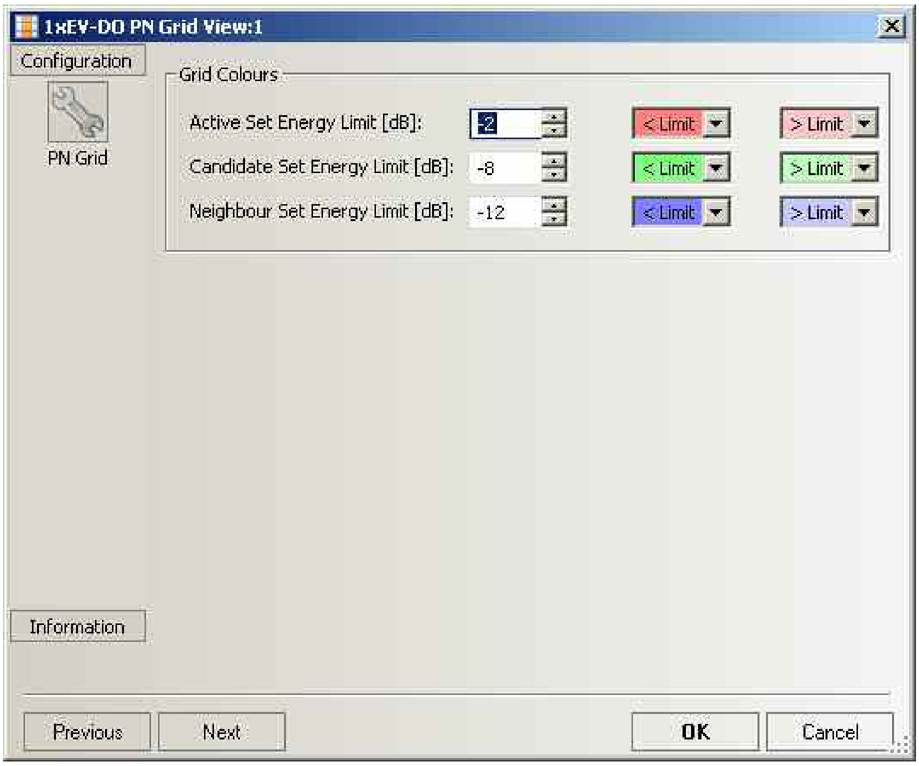


Fig. 4-125 1xEV-DO PN Grid View: Configuration

Grid Colors

The *Grid Colors* option fields define the energy limits and the corresponding background colors for the PN offsets of the cell sets in the grid view.

Active / Candidate / Neighbor Set Energy Limit [dB]

These list boxes allow the definition of the energy limits for the grid display of the active, candidate, and neighbor sets in a range from –20 to +20 dB. The default values are:

–2 dB for the Active Set,
–8 dB for the Candidate Set, and
–12 dB for the Neighbor Set.

< Limit

Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit falls short of the defined value.

> Limit

Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit exceeds the defined value.

1xEV-DO RLP Statistics View

The *1xEV-DO RLP Statistics View* displays important parameters describing the reverse link performance during the measurement.

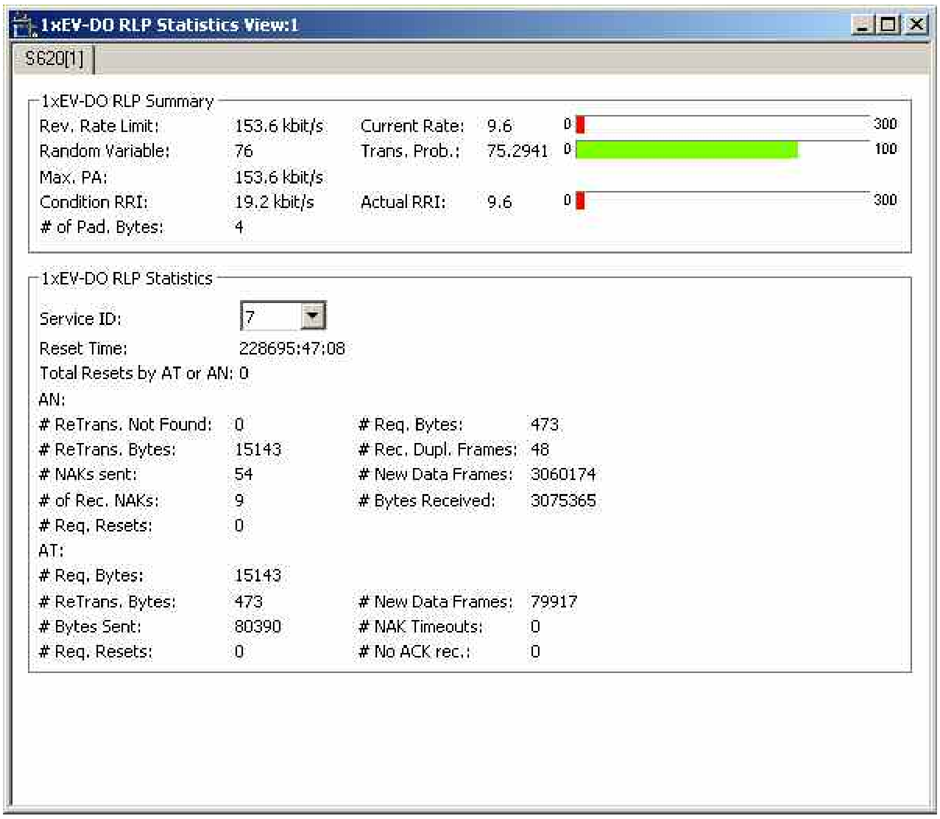


Fig. 4-126 1xEV-DO RLP Statistics View

1xEV-DO RLP Summary

The 1xEV-DO RLP Summary panel displays several parameters describing the measured reverse link performance.

Rev. Rate Limit The theoretically possible data rate for the reverse traffic channel is shown. Possible values are 9.6, 19.2, 38.4, 76.8, or 153.6 kbit/s

Current Rate The measured data rate for the reverse traffic channel is displayed as an absolute value and as a bar graph showing the percentage relative to the *Rev. Rate Limit.*

Random Variable Value of the random variable used to calculate the new reverse rate; it is multiplied by a factor of 255 to produce a value from 0 to 255

Trans. Prob. Transition probability used to calculate the new reverse rate; it represents the probability that satisfies the condition specified in section 8.5.6.1.5.2 of standard IS-856.

Max. PA The maximum PA headroom at which the AT is restricted to transmit (in kbit/s)

Condition RRI The RRI channel is only active for 1/8 of a slot, which results in the *Condition RRI* of one eighth of the Reverse Rate Limit.

Actual RRI	The measured reverse traffic data rate from the Reverse Rate Indicator (RRI) channel that is used by the AT to indicate the data rate at which the reverse traffic channel is transmitted.
# of Pad. Bytes	Number of pad bytes included in the reverse link packets.

1xEV-DO RLP Statistics

The *1xEV-DO RLP Summary* panel displays the RLP Statistics measurement parameters and results. The RLP procedures and frame types are described in standard 3GPP2 C.S0017-0-2.10.

Service ID		Service identification number which identifies the RLP service
Reset Time		Time stamp when statistics were last reset to 0.
Total Resets by AT or AN		Sum of performed resets by AT and AN
AN:	*# ReTrans. Not Found*	Number of retransmitted frames not found
AN:	*# Req. Bytes*	Number of bytes requested by the AN for re-transmission
AN:	*# ReTrans Bytes*	Number of bytes transmitted.
AN:	*# Rec. Dupl. Frames*	Number of received duplicate frames
AN:	*# NAKs sent*	Number of NAK messages sent
AN:	*# New Data Frames*	Number of new data frames received
AN:	*# Req. NAKs*	Number of NAK bytes requested by the AT for re-transmission
AN:	*# Bytes Received*	Number of new data frames received
AN:	*# Req. Resets*	Number of times the reset was requested by the AN
AT:	*# Req. Bytes*	Number of bytes requested for retransmission from AN
AT:	*# ReTrans Bytes*	Number of transmitted retransmitted bytes
AT:	*# New Data Frames*	Number of new data frames received
AT:	*#Bytes Sent*	Total number of bytes transmitted
AT:	*# NAK Timeouts*	Nak timeouts or aborts
AT:	*# Req. Resets*	Number of resets requested by the AT
AT:	*# No ACK rec.*	Number of ACKs received from the AN

The *1xEV-DO RLP Statistics View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

1xEV-DO Rev. A Forward Statistic View

The *1xEV-DO Rev. A Forward Statistic View* shows the statistics of the CRC Success Rate and needed slots to transmit over all possible DRCs on the forward channels. The early termination effect of the transmission can be observed in this view. The view will be updated only, if the necessary logs are enabled.

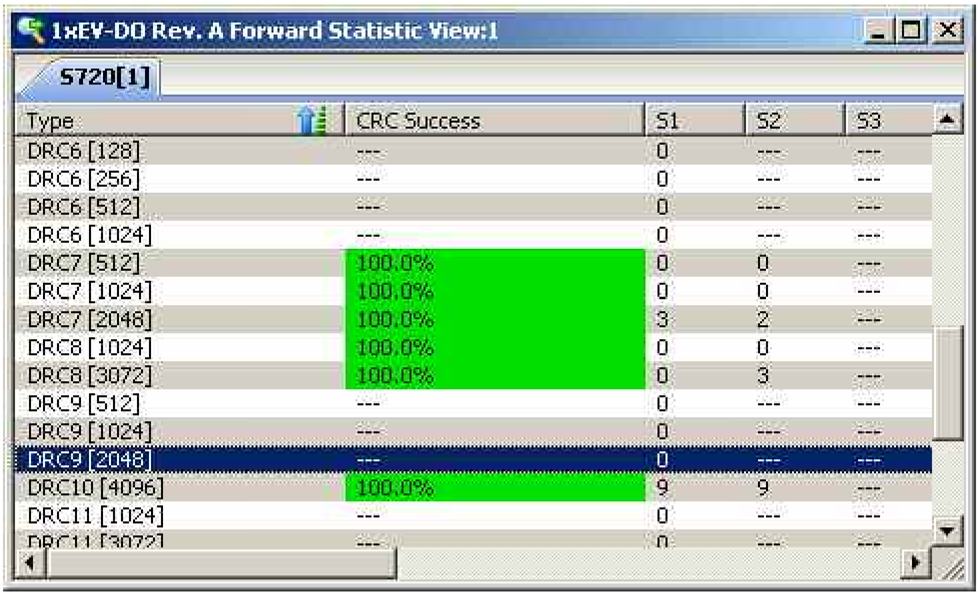


Fig. 4-127 1xEV-DO Rev. A Forward Statistic View

Rev. A Forward Statistic View

The 1xEV-DO Rev. A Forward Statistic View measurement results are shown as a list panel displaying the following information:

Type *This column shows the channel type (TC = traffic channel, CC = control channel) and the channel rate (in bit/s). An S or L after the rate denotes Short or Long.*

CRC Success *This column shows the CRC success rate calculated as [Good / (Good + Bad)]. The field backgrounds also contain a relative bar graph showing the* CRC Success *rate colored green and red.*

S1 to S16 *These columns contain the information about the forward channel frame counts, the good and bad CRC counters for Control and Traffic Channel packets, and the number of forward link traffic channel/control channel packets received at various rates for the 16 available channel slots. These values are updated if the CRC has passed for the decoded packets. Each rate counter name also includes the Slots Decoded part that indicates the number of slots taken to decode the particular rate packet. Data for this packet is both sampled and logged every second.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

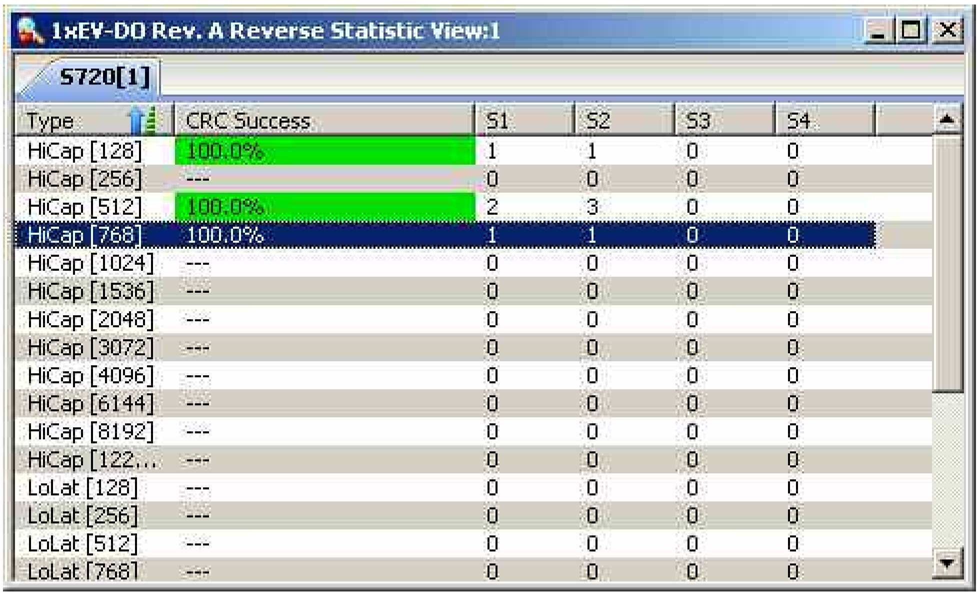
1xEV-DO Rev. A Forward Statistic View Configuration

The *1xEV-DO Rev. A Forward Statistic View Configuration* menu defines the list information to be viewed and selects the data set displayed for the current view. It is opened via a right mouse click on a point inside *1xEV-DO Rev. A Forward Statistic View* (see chapter 3).

The *1xEV-DO Rev. A Forward Statistic View Configuration* is analogous to the *1xEV-DO Rev. A Forward Statistic Summary View Configuration.* For description see 1xEV-DO Forward Statistic Summary View Configuration on p. 4.220.

1xEV-DO Rev. A Reverse Statistic View

The *1xEV-DO Rev. A Reverse Statistic View* shows the statistics of the CRC Success Rate and needed slots to transmit over all possible transmission formats on the reverse channels. The early termination effect of the transmission can be observed in this view. The view will be updated only, if the necessary logs are enabled.



Type	CRC Success	S1	S2	S3	S4
HiCap [128]	100.0%	1	1	0	0
HiCap [256]	---	0	0	0	0
HiCap [512]	100.0%	2	3	0	0
HiCap [768]	100.0%	1	1	0	0
HiCap [1024]	---	0	0	0	0
HiCap [1536]	---	0	0	0	0
HiCap [2048]	---	0	0	0	0
HiCap [3072]	---	0	0	0	0
HiCap [4096]	---	0	0	0	0
HiCap [6144]	---	0	0	0	0
HiCap [8192]	---	0	0	0	0
HiCap [122...	---	0	0	0	0
LoLat [128]	---	0	0	0	0
LoLat [256]	---	0	0	0	0
LoLat [512]	---	0	0	0	0
LoLat [768]	---	0	0	0	0

Fig. 4-128 1xEV-DO Rev. A Reverse Statistic View

Rev. A Reverse Statistic View

The 1xEV-DO Rev. A Forward Statistic View measurement results are shown as a list panel displaying the following information:

Type — *This column shows the channel type (TC = traffic channel, CC = control channel) and the channel rate (in bit/s). An S or L after the rate denotes Short or Long.*

CRC Success — *This column shows the CRC success rate calculated as [Good / (Good + Bad)]. The field backgrounds also contain a relative bar graph showing the* CRC Success *Rate colored green and red.*

S1 to S46 — *These columns contain the information about the reverse channel frame counts, the good and bad CRC counters for Control and Traffic Channel packets, and the number of reversed link traffic channel/control channel packets received at various rates for the 4 available channel slots. These values are updated if the CRC has passed for the decoded packets. Each rate counter name also includes the Slots Decoded part that indicates the number of slots taken to decode the particular rate packet. Data for this packet is both sampled and logged every second.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

1xEV-DO Rev. A Reverse Statistic View Configuration

The *1xEV-DO Rev. A Reverse Statistic View Configuration* menu defines the list information to be viewed and selects the data set displayed for the current view. It is opened via a right mouse click on a point inside *1xEV-DO Rev. A Reverse Statistic View* (see chapter 3).

The *1xEV-DO Rev. A Reverse Statistic View Configuration* is analogous to the *1xEV-DO Rev. A Forward Statistic Summary View Configuration.* For description see 1xEV-DO Forward Statistic Summary View Configuration on p. 4.220.

1xEV-DO Rev. A RMAC3 Statistic View

The *1xEV-DO Rev. A RMAC3 Statistic View* gives a statistic on RTCMAC Subtype 3 parameters.

The view will be updated only, if the necessary logs are enabled.

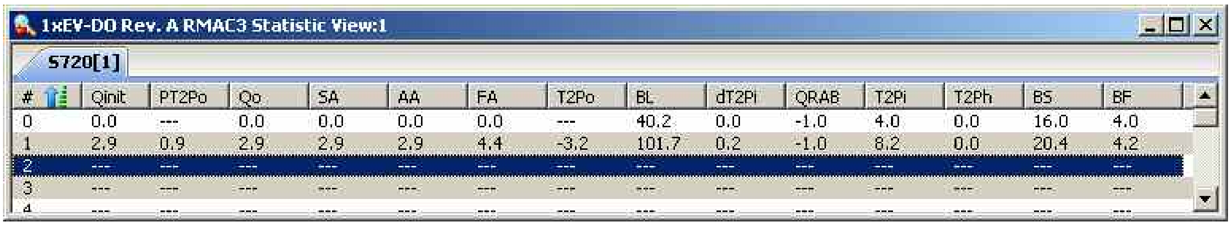


Fig. 4-129 1xEV-DO Rev. A RMAC3 Statistic View

Rev. A RMAC3 Statistic

The *1xEV-DO Rev. A RMAC3 Statistic* List panel displays the following information:

Qinit
: *Initial queue size queried from PCP in bytes.*

PT2Po
: *Raw value of potential T2P outflow from the bucket of this flow.*

Qo
: *Maximum number of bytes allowed to be deducted from bucket.*

SA
: *Suggested flow allocation (in bytes) as decided by RTC MAC algorithm.*

AA
: *Current flow allocation (in bytes) as decided by PCP.*

FA
: *Average flow allotment.*

T2Po
: *Average T2P outflow.*

BL
: *Average Bucket level.*

dT2Pi
: *Average Delta T2P Inflow.*

QRAB
: *Average QRAB.*

T2Pi
: *Average Inflow.*

T2Ph
: *Average hold time.*

BS
: *Average Bucket Saturation Level.*

BF
: *Average Bucket Factor.*

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

1xEV-DO Rev. A RMAC3 Statistic View Configuration

The *1xEV-DO Rev. A RMAC3 Statistic View* configuration menu defines the list settings and shows information on the current view version. It is opened via a right mouse click on a point inside the *1xEV-DO Rev. A RMAC3 Statistic View* (see chapter 3).

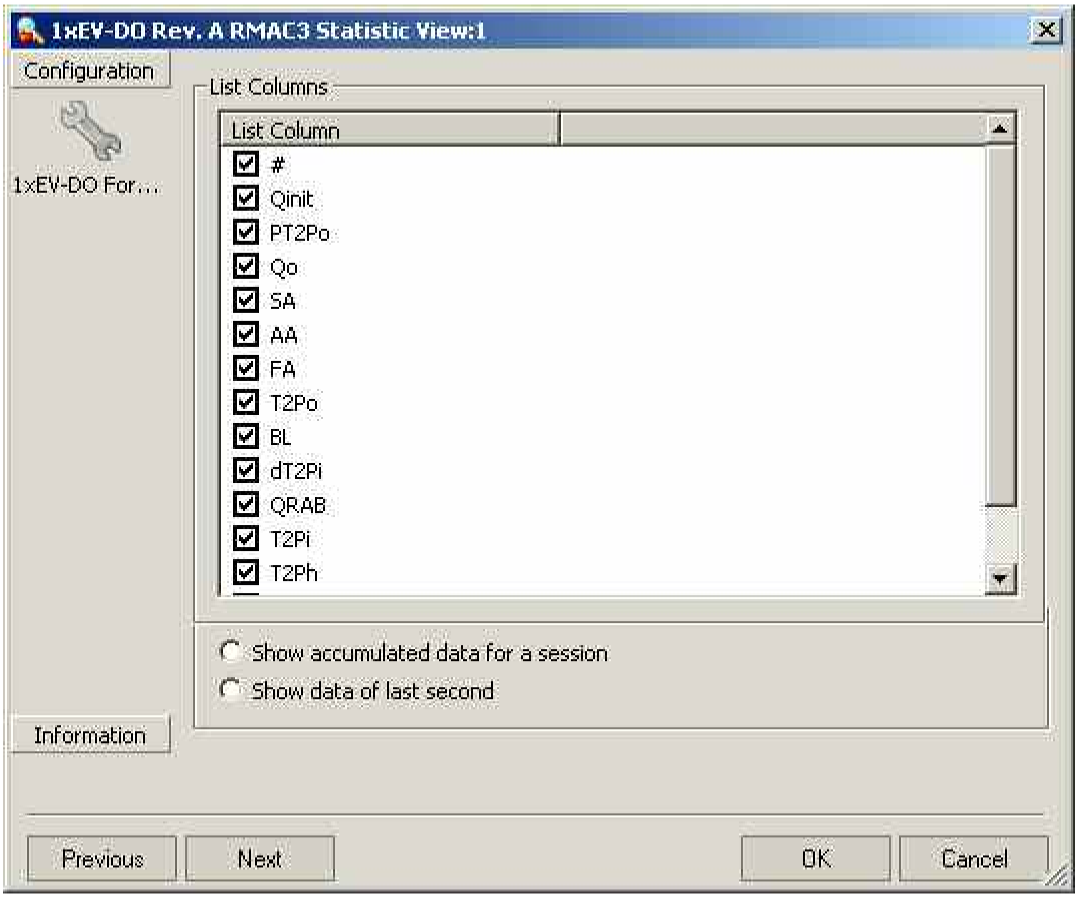


Fig. 4-130 1xEV-DO Rev. A RMAC3 Statistic View configuration: 1xEV-DO Rev. A RMAC3 Statistic View

List Columns The *List Columns* panel offers checkboxes to select the elements displayed in the Pilot Set view.

CDMA Views

The *CDMA Views* show CDMA-specific information included in the measurement data of cdma2000 as well as CDMA (IS-95) mobiles. CDMA data can be acquired using one of the CDMA drivers described in chapter 6. Before a measurement is recorded, data acquisition for most views must be explicitly enabled in the *Define Measurement* tab of the CDMA configuration menu (for an overview see chapter 6).

Due to the different measurement data result sets returned by cdma2000 and CDMA (IS-95) mobiles, some fields of the described views may be empty.

The CDMA views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *CDMA Views*.

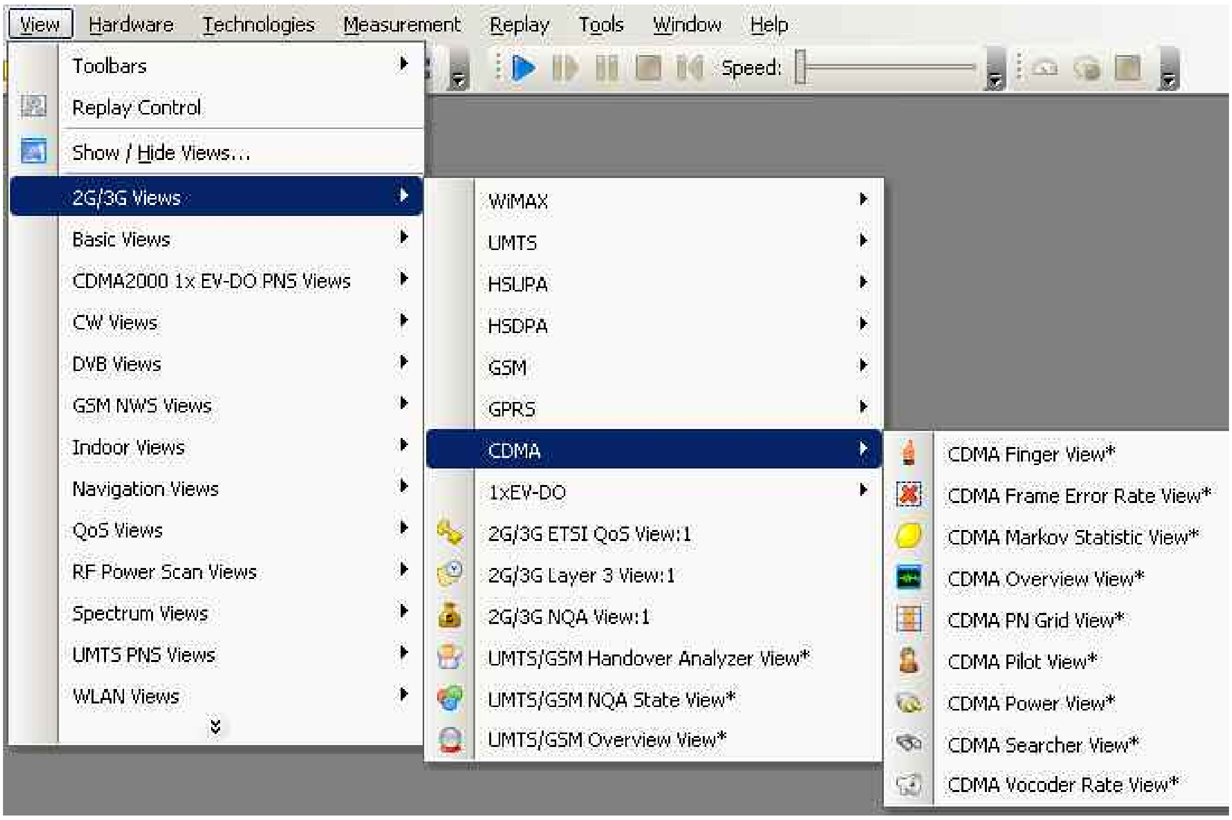


Fig. 4-131 CDMA views

Important Note on CDMA Measurements:
The CDMA Test Mobile ***Kyocera QCP3035A-B*** *is allowed only for use outside Europe.*
It is not allowed to put this mobile into operation inside Europe.

CDMA Overview View

The *CDMA Overview View* displays a summary of the test mobile state, power/quality, active set and system parameters, and, if applicable, results from a connected CDMA PN scanner.

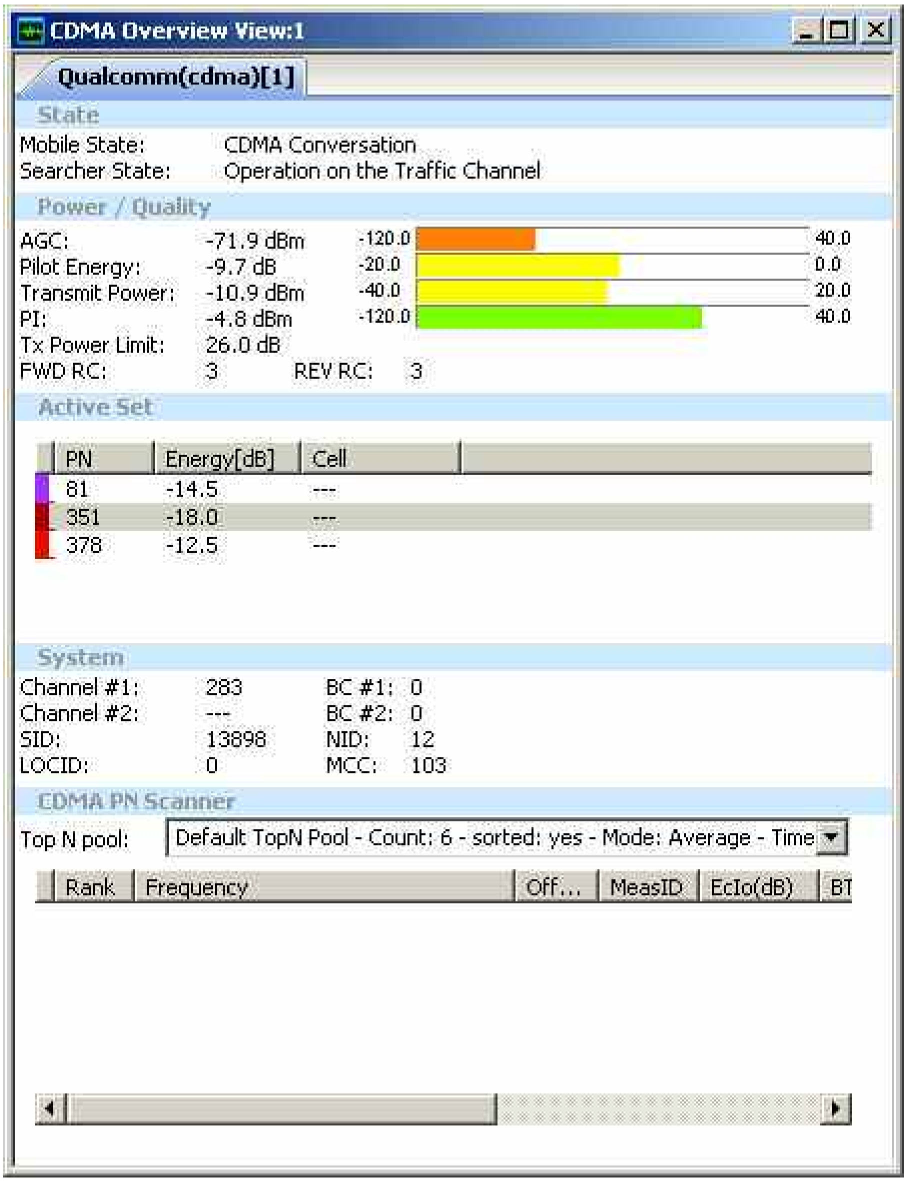


Fig. 4-132 CDMA Overview View

The *CDMA PN Scanner* field group is only filled if an actual scanner is configured and running.

State This field group contains the mobile state and the CDMA mobile searcher state.

Mobile State Possible CDMA of the mobile are:

0x81 – Initialization
0x82 – Idle
0x83 – Voice channel initialization
0x84 – Waiting for order
0x85 – Waiting for answer
0x86 – Conversation
0x87 – Release
0x88 – Update overhead information
0x89 – Mobile station origination attempt
0x8a – Page response
0x8b – Order/message response
0x8c – Registration access
0x8d – Message transmission
0x8E – Use subsystem cmd 75 (subsys 30, cmd_code 2) to obtain detailed state information 1xEV (HDR) states:
0x10 – Phone is offline
0x11 – Phone is offline HDR
0x12 – Phone is offline analog
0x13 – Reset ! 0x14 – Powerdown
0x15 – Powersave
0x16 – Powerup
0x17 – Low Power mode
0x18 – Dedicated System Measurement mode (searcher)
0x40 – 1xEV mode

Searcher State The state of the CDMA mobile searcher component which measures the relative strength of the different multipath components of the pilot signal as a function of their time offset. Possible searcher states are:

0 – Raw initialization state
1 – Deep sleep in start state
2 – Initial state for CDMA operation
3 – Acquisition of the pilot channel
4 – Reception of the sync channel
5 – Transition from sync to paging channel (slew)
6 – Operation on the paging channel
7 – Slotted mode sleep state
8 – Operation on the traffic channel
9 – Return from paging or traffic to sync channel (unslew)
10 – Operation in PCG state
11 – Powerup state

The mobile states correspond to the Phone Mode signal; see p. *4.14*.

Power / Quality

The Power/Quality panel displays several parameters describing the signal power and quality reported by the test mobile (see standard 3GPP TS 25.225).

AGC	Automatic Gain Control (range –120 to +40 dBm)
Pilot Energy	*Received pilot energy per chip (Ec, energy per modulating bit, range –20 to +0 dBm)*
Transmit Power	*CDMA transmit power during the call. (range –20 to +0 dBm)*
PI	*Problem Indicator*
Tx Power Limit	*Max. transmitted power of the mobile during the call.*
FWD RC	*Forward Radio Configuration*
REV RC	*Reverse Radio Configuration*

The power results are obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.

Active Set

The Active Set panel shows information of the PN Offsets which are currently in the active, candidate, or neighbor set of the test mobile.

Pilot PN Offset Color Code	The coloring of the first row element is defined in the *Chart Settings* panel of the *CDMA Pilot View Configuration* described on p. 4.240. By default, the Active Set is marked orange, the Candidate Set is marked green, and the Neighbor Set is marked blue.
PN	Pilot PN Offset number (range 0 to 511)
Energy [dB]	Measured Pilot Energy in dB
Cell	Cell name, if applicable. The field also contains auxiliary information (e.g. "No GPS")**...**

System

The System panel shows network-related parameters of the test mobile.

Channel #1	First CDMA Channel
BC #1	Band Class of the first CDMA channel
Channel #2	Second CDMA Channel
BC #2	Band Class of the second CDMA channel
SID	System ID communicated to the mobile under test.
NID	16-bit Network Identification number communicated to the mobile under test.
LOCID	Location ID
MCC	Mobile Country Code

CDMA PN Scanner

If a CDMA PN scanner is configured and running, this panel displays the Top Ns of the scanner. The *Top N List* gives an overview of the received signals in the current top N pool together with their scrambling codes, different power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. Most of the results in the *Top N List* are also displayed in the *Peak List* in the *PNS CPICH View.*

For a detailed explanation of the parameters refer to section *PNS CPICH View* on p. 4.378, or to the *CDMA2000 1x EV-DO PNS Top* N View on p. 4.527.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

CDMA Overview View Configuration

The *CDMA Overview View Configuration* menu defines the list information to be viewed. It is opened via a right mouse click on a point inside *CDMA Overview View* or via the *Tools - Modules Configuration...* command (see chapter 3).

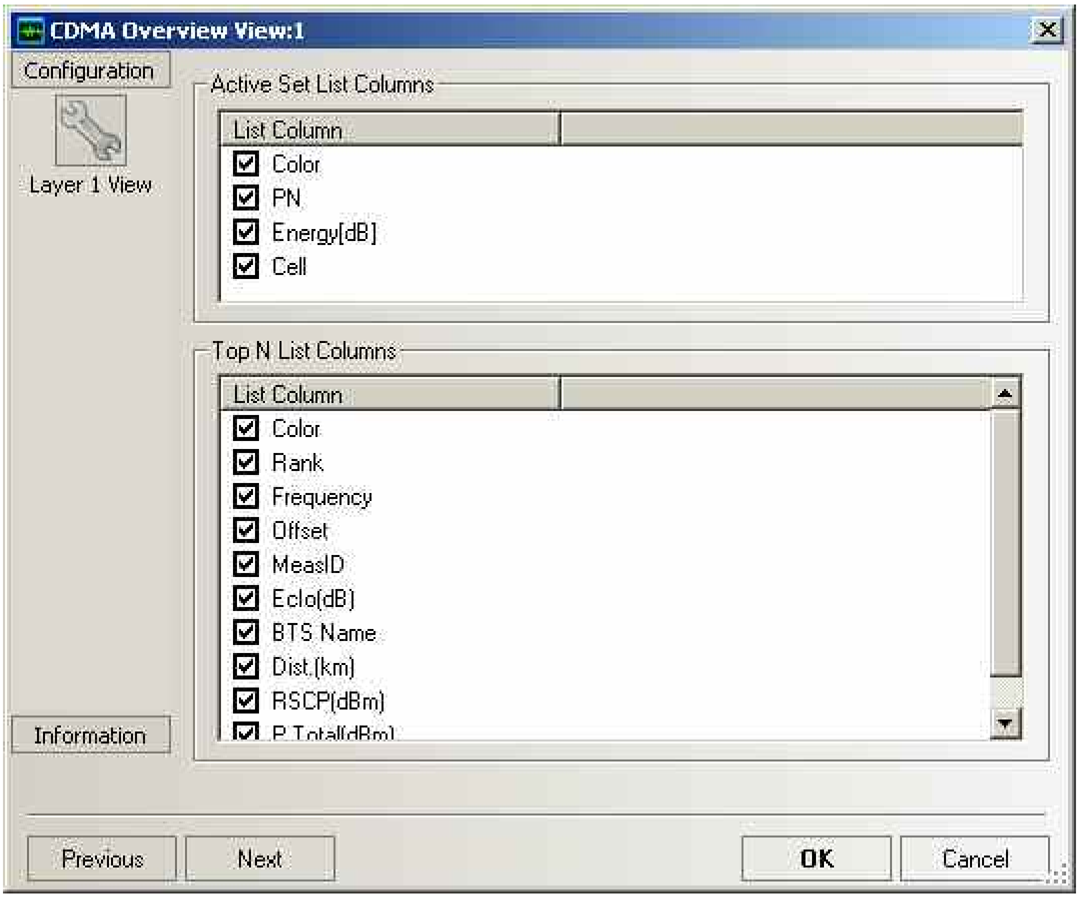


Fig. 4-133 CDMA Overview View: Layer 1 View Configuration

Active Set List Columns The checkboxes select the view list elements to be displayed on the list panel:

PN	Pilot PN Offset number (range 0 to 511).
Energy [dB]	Measured Pilot Energy in dB
Cell	Cell name, if applicable. If no name is available, "---" is shown. In some cases, this field also displays auxiliary information, e.g. "No GPS" if this is the case during the measurement.

Top N List Columns The checkboxes select the view list elements to be displayed on the list panel.

For a detailed explanation of the parameters refer to section *PNS CPICH View* on p. 4.378, or to the *CDMA2000 1x EV-DO PNS Top* N View on p. 4.527.

CDMA Pilot View

The *CDMA Pilot View* contains a list and a bar graph showing the pilot channel signal strength from the active and several neighbor base stations. The diagram is empty unless the *Pilot Sets* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

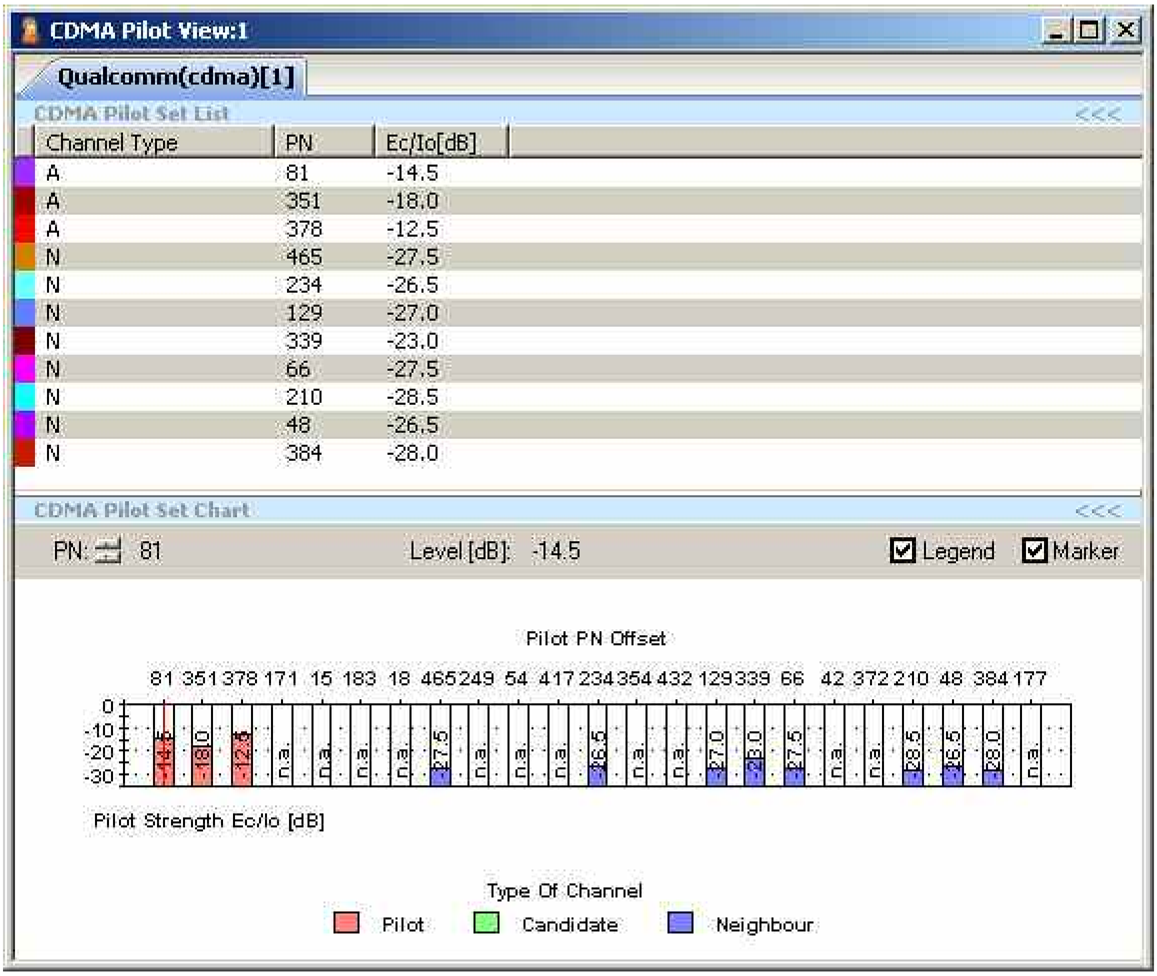


Fig. 4-134 CDMA Pilot View

CDMA Pilot Set List The CDMA Pilot Set List panel displays several parameters of the current PN offset-related sets

Channel Type	*The type of channel associated with the PN Offset (A = Active, C = Candidate, N = Neighbor)*
PN	*Pilot PN Offset number (range 0 to 511)*
Ec/Io [dB]	*The pilot energy is expressed as the ratio* Ec/Io *in dB where* E_c *denotes the energy density of the pilot signal,* I_0 *denotes the noise level.*

The power results are obtained in an unbiased measurement.

CDMA Pilot Set Chart

The diagram is a bar graph showing the relative strength of a variable number of pilot, candidate and neighbor cell signals. The CDMA channel numbers of the signals are indicated above the bars. The channel strength is expressed as the ratio *Ec/Io* in dB where E_c denotes the chip energy of the pilot signal, I_0 denotes the noise level. The diagram has a fixed y-axis scale of –35 dB to –0 dB.

The update rate of the diagram and the number of signals displayed depend on the mobile station and its operating conditions.

Device

The pull-down list on the left side above the diagram shows all mobiles measured. The pilot strength of the selected mobile is shown in the diagram.

PN / Level [dB]

The fields to the right of the device list show the current pilot channel number and the corresponding relative level (strength) of the current signal. If a marker is switched on, it is placed to the current signal.

Marker

If the box is checked, a marker line is displayed in the diagram. The PN and the strength of the marked signal are indicated in the corresponding fields in the toolbar. The marker line can be shifted to the left and to the right by means of the cursor keys or by varying the channel number in the toolbar. Besides, a double click places the marker on a particular bar.

Legend

If the box is checked, a legend showing the different channel types and the associated colors is displayed below the diagram:

Pilot	*Active pilot channel, available in the dedicated mode only (during a call)*
Candidate	*Channel considered as a possible future pilot channel*
Neighbor	*Neighbor cell channel*

The number of *Pilots* and *Candidates* depends on the operating mode of the mobile station.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

CDMA Pilot View Configuration

The *CDMA Pilot View Configuration* menu defines the list information to be viewed and the set colors for the pilot view chart. It is opened via a right mouse click on a point inside *CDMA Pilot View* or via the *Tools - Modules Configuration...* command (see chapter 3).

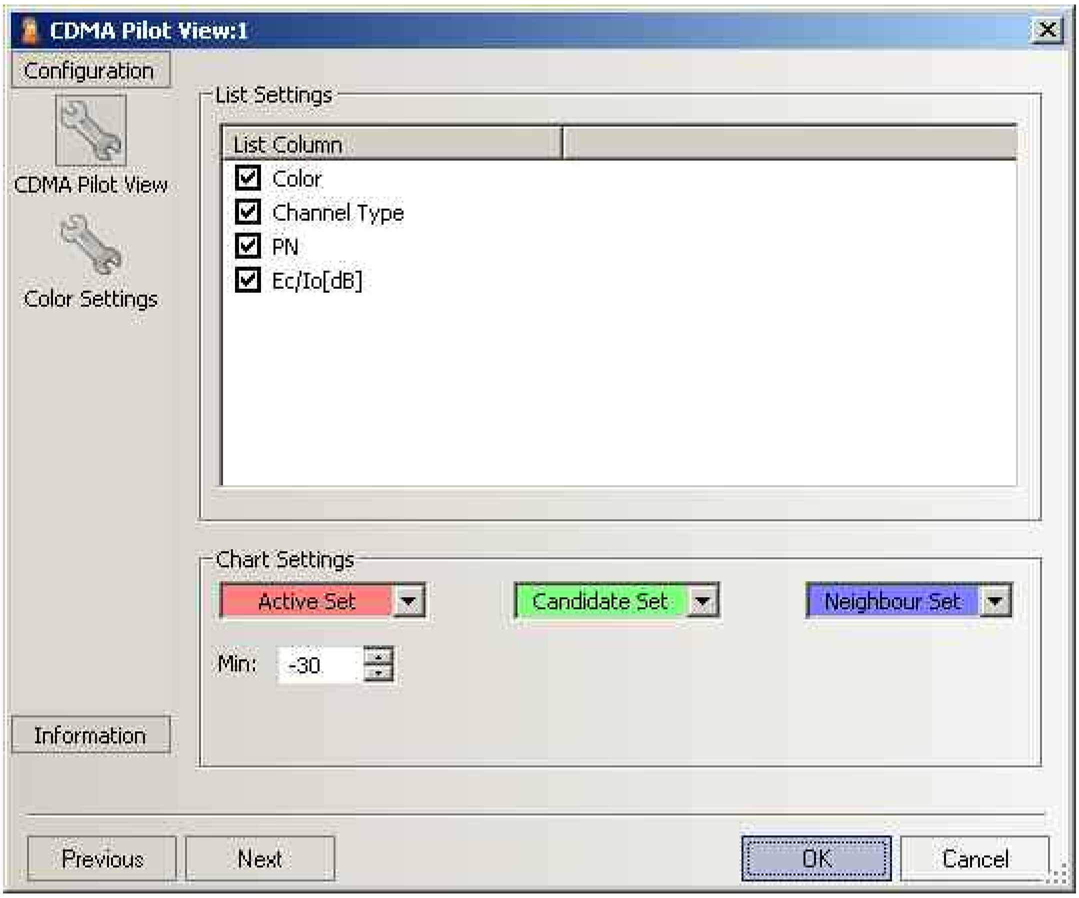


Fig. 4-135 CDMA Pilot View: Layer 1 View Configuration

List Settings

The *CDMA Pilot View List Settings* panel selects the channel-related list elements:

Channel Type	*The type of channel associated with the PN Offset (A = Active, C = Candidate, N = Neighbor)*
PN	*Pilot PN Offset number (range 0 to 511)*
Ec/Io [dB]	*The channel strength is expressed as the ratio* Ec/Io *in dB where* E_c *denotes the energy density of the pilot signal,* I_0 *denotes the noise level.*

The power results are obtained in an unbiased measurement.

Chart Settings

The colors distinguish the following sets:

Active Set / Candidate Set / Neighbor Set — Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit exceeds the defined value.

Min. — Least value of channel strength Ec/Io (dB)

The list box backgrounds for the sets display the currently active color selection.

The *Color Settings* tab sets the color scale for the PN Offsets 0 to 511.

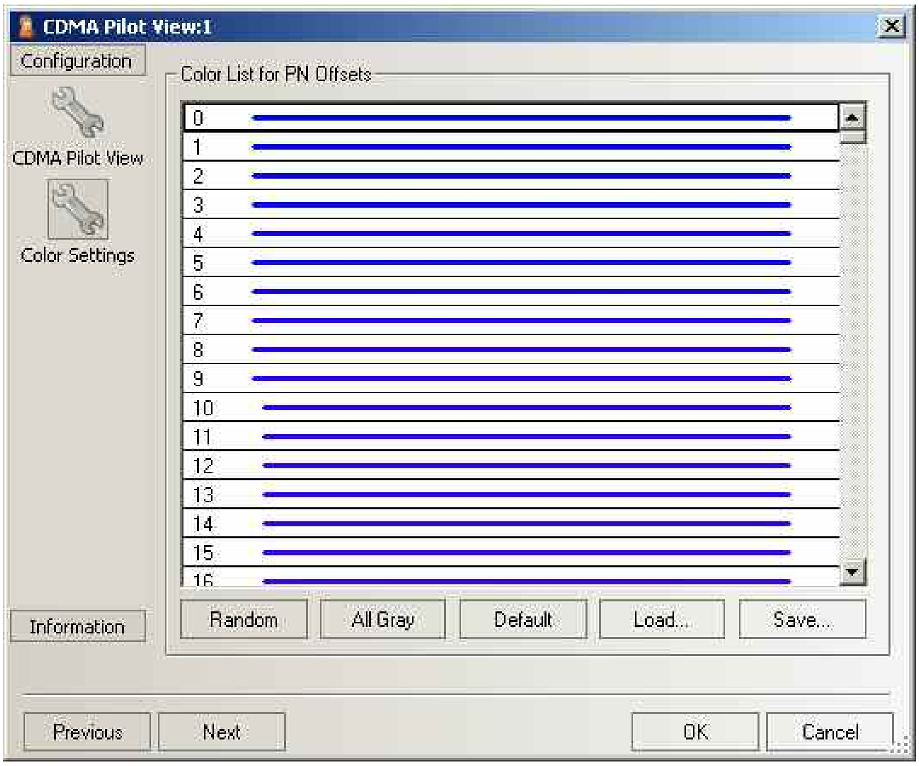


Fig. 4-136 CDMA Pilot View Configuration: Color Settings

The colors are displayed in the diagram (power peaks) and in the first table row (current set of the PN Offset). A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.392) to change the current display color.

Random — No ordering; colors are assigned to the scrambling codes at random.

All Gray — Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single scrambling code (or a small number of scrambling codes), colored different, from all other codes, colored gray.

Default — Predefined color scale: Colors change continuously as the scrambling codes increase.

Load/Save — A color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

CDMA Finger View

The *CDMA Finger View* shows the finger info, i.e. the relative strength of the different multipath components of the pilot signal detected by the RAKE receiver of the CDMA mobile. The diagram is empty unless the *Finger info* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

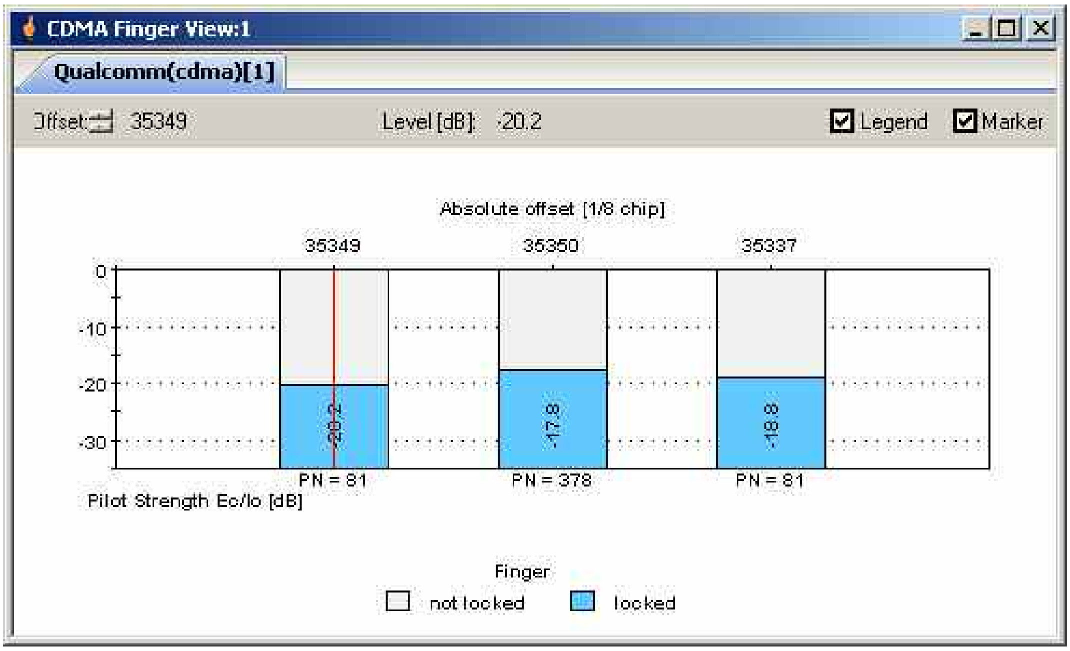


Fig. 4-137 CDMA Finger View

Diagram The diagram is a bar graph showing the relative strength of the multipath components the number of which is given by the fingers of the mobile station RAKE receiver. The signals are detected with different time offsets that are indicated above the bars as an absolute multiple of 1/8 chip periods. The pilot channel number for the signals is displayed below the x-axis. The channel strength is expressed as the ratio *Ec/Io* in dB where E_c denotes the energy density of the pilot signal, I_0 denotes the noise level. The diagram has a fixed y-axis scale of –35 dB to –0 dB. The update rate of the diagram depends on the mobile.

Offset / Level [dB] The fields to the right of the device list show the current time offset and the corresponding strength of the current signal. If a marker is switched on, it is placed to the current signal.

Marker If the box is checked, a marker line is displayed in the diagram. The time offset and the strength of the marked signal is indicated in the corresponding fields. The marker line can be shifted to the left and to the right by means of the cursor keys or by varying the Offset in the toolbar. Besides, a double-click places the marker on a particular bar.

Legend If the box is checked, a legend showing the colors denoting locked and unlocked fingers is displayed below the diagram. A locked finger means that a distinct multipath component could be unambiguously detected.

The *CDMA Finger View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

CDMA Power View

The *CDMA Power View* shows the (relative) TX and RX power at the CDMA mobile and related power levels as a function of time. The diagram is empty unless the *Sparse ACP power control* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

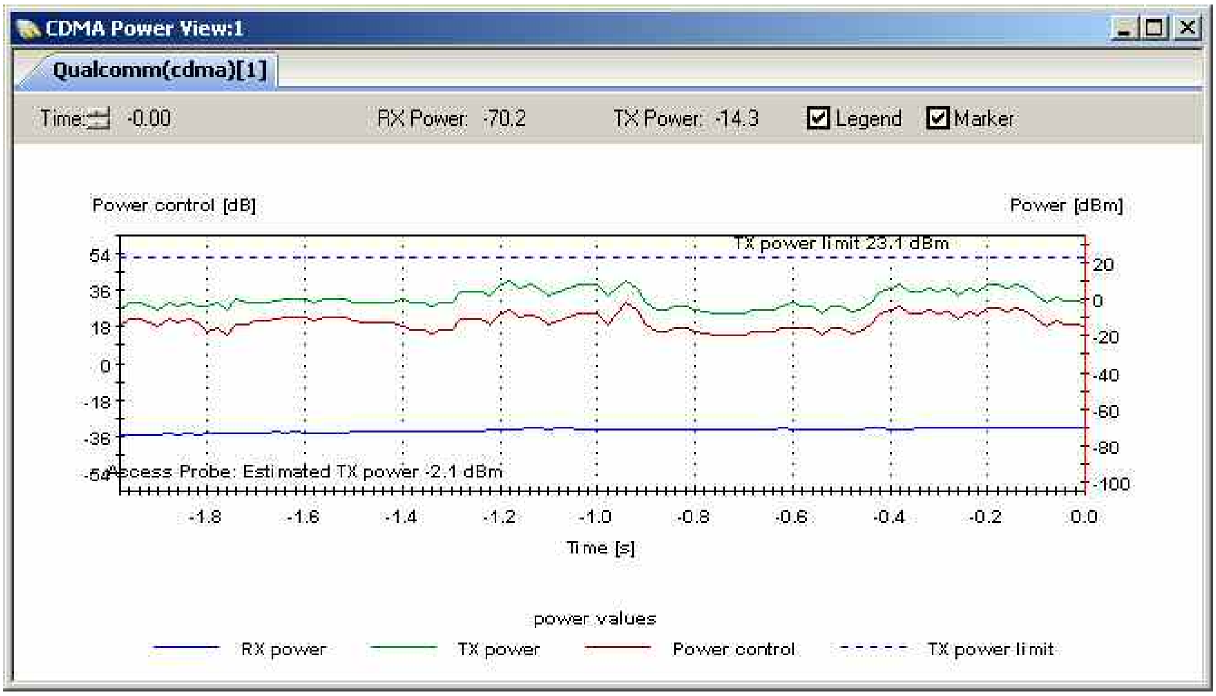


Fig. 4-138 CDMA Power View

Diagram

The diagram shows three traces, representing the evolution in time of three different quantities:

RX power	Absolute received power at the CDMA mobile (in dBm)
TX power	Absolute output power of the CDMA mobile (in dBm)
Power control	Information on the dynamic power control of the CDMA mobile (in dB; accumulated power control bits). If power control works correctly, the shape of the power control curve is similar to the TX power curve.

In addition, the diagram shows the (absolute) maximum output power that the mobile is allowed to transmit under its current operating conditions (closed loop power control, *TX power limit)* and the allowed output power that the mobile estimates from its RX power (open loop control, *Access Probe: Estimated TX power;* this quantity is available only if the *Access probe info* box in the *Define Measurement* tab of the CDMA configuration menu is checked).

The time display range is –2 s to 0 s. The update rate of the diagram depends on the mobile.

Time / RX Power / TX Power The fields below the tab of the diagram show the current x-axis value (time) and the current RX and TX power of the mobile. If a marker is switched on, it is placed to the current x-axis value.

Marker If the box is checked, a marker line is displayed in the diagram. The time and the mobile RX and TX power at the marker position are indicated in the corresponding fields. The marker line can be shifted to the left and to the right by means of the cursor keys or by incrementing/decrementing the value in the Time field. Besides a double click places the marker to the desired position.

Legend If the box is checked, a legend showing the indicated powers together with the line colors is displayed below the diagram.

The *CDMA Power View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

CDMA Searcher View

The *CDMA Searcher View* shows the CDMA mobile searcher information, i.e. the relative strength of the different multipath components of the pilot signal as a function of their time offset. The diagram is empty unless the *Searcher info* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

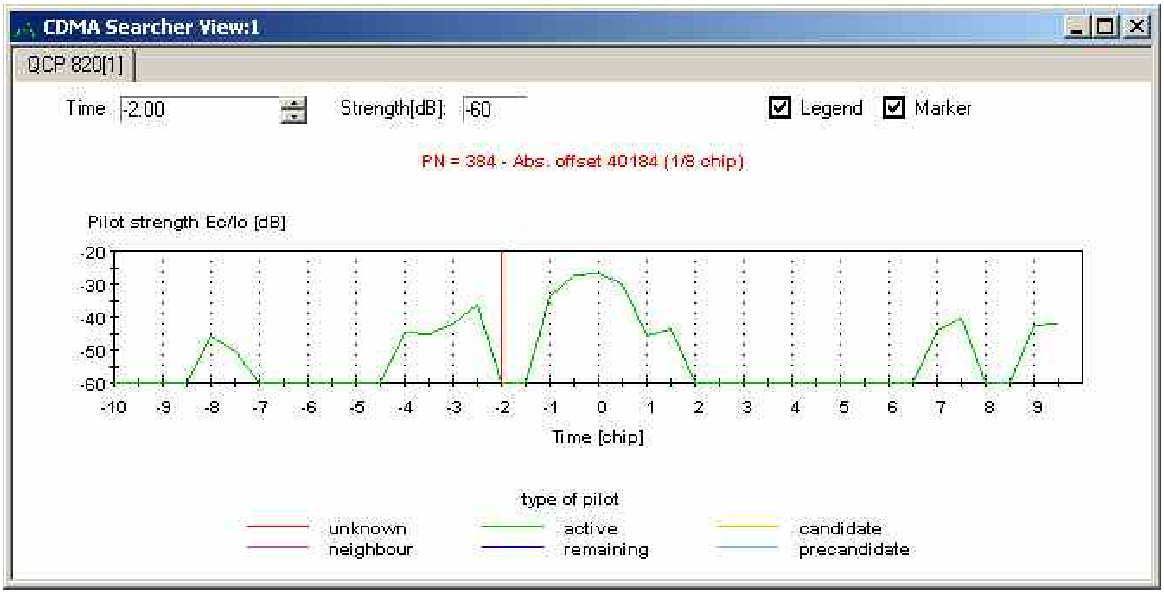


Fig. 4-139 CDMA Searcher View

Diagram

The diagram shows the strength of the different components of the pilot signal as a function of their time offset. The time offset is expressed in units of chip periods; its display range depends on the mobile. The center of the x-axis (Time (chip) = 0) corresponds to the strongest component (maximum signal power). The pilot strength is expressed as the ratio *Ec/Io* in dB where E_c denotes the energy density of the pilot signal, I_0 denotes the noise level. The diagram has a fixed y-axis scale of –60 dB to –20 dB. The update rate of the diagram depends on the mobile.

Diagram header

The current pilot number *(PN)* and the corresponding absolute offset time are indicated in the diagram header. After the *PN* means that the timing information, which is equivalent to the PN, is questionable.

Time / FER

The fields below the diagram tab show the current x-axis value (time) and the current pilot strength rate. If a marker is switched on, it is placed to the current x-axis value.

Marker

If the box is checked, a marker line is displayed in the diagram. The time and the frame error rate at the marker position are indicated in the corresponding fields in the toolbar. The marker line can be shifted to the left and to the right by means of the cursor keys or by incrementing/decrementing the value in the Time field. Besides a double click places the marker to the desired position.

Legend

If the box is checked, a legend showing the different possible types of pilot channels together with the line colors is displayed below the diagram:

unknown
: *Not identified*

active
: *Pilot channel of a current serving cell*

(pre)candidate
: *Channel considered as a possible future pilot*

neighbor
: *Neighbor cell channel*

remaining
: *Channel fits in none of the previous categories.*

The *CDMA Searcher View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

CDMA Frame Error Rate View

The *CDMA Frame Error Rate View* shows the frame error rate, i.e. the percentage of erroneous CDMA frames detected and reported by the CDMA mobile station. The diagram is empty unless the *Temporal Analyzer* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

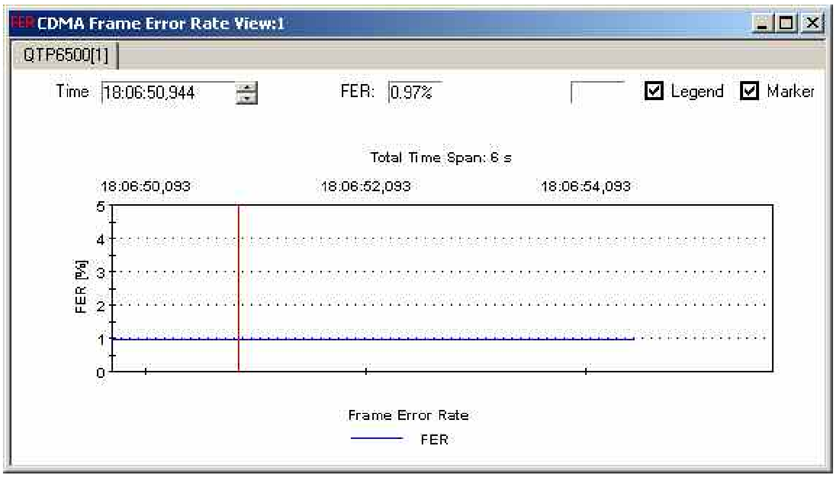


Fig. 4-140 CDMA Frame Error Rate View

Diagram The diagram shows the CDMA frame error rate as a function of time. The time information stored in the measurement file provides the x-axis scaling. The total time span of the diagram (i.e. the x-axis display range) can be changed in the configuration menu; see below.

The curves are plotted from the left to the right at the pace of the measurement or replay. If the end of the display range is reached while the measurement or replay is still going on, the whole diagram is shifted to the left by one full time span so the curves can be continued. This may occur repeatedly until the end of the measurement (file) is reached.

Time / FER The fields above the diagram show the current x-axis value (time) and the current frame error rate. If a marker is switched on, it is placed to the current x-axis value.

Marker If the box is checked, a marker line is displayed in the diagram. The time and the frame error rate at the marker position are indicated in the corresponding fields in the toolbar. The marker line can be shifted to the left and to the right by means of the cursor keys or by incrementing/decrementing the value in the *Time* field. Besides a double click places the marker to the desired position.

Legend If the box is checked, a legend showing the two displayed curves together with the line colors is displayed below the diagram.

Context menu A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

The configuration menu is analogous to *the CDMA Vocoder Rate View Configuration* menu described on page 4.250.

CDMA Vocoder Rate View

The *CDMA Vocoder Rate View* shows the data rate (full rate, ½ rate, ¼ rate, or $^1/_8$ rate) generated and received by the voice coders (vocoders) of the CDMA mobile station vs. time. The diagram is empty unless the *Temporal Analyzer* checkbox in the *Define Measurement* tab of the CDMA configuration menu is enabled.

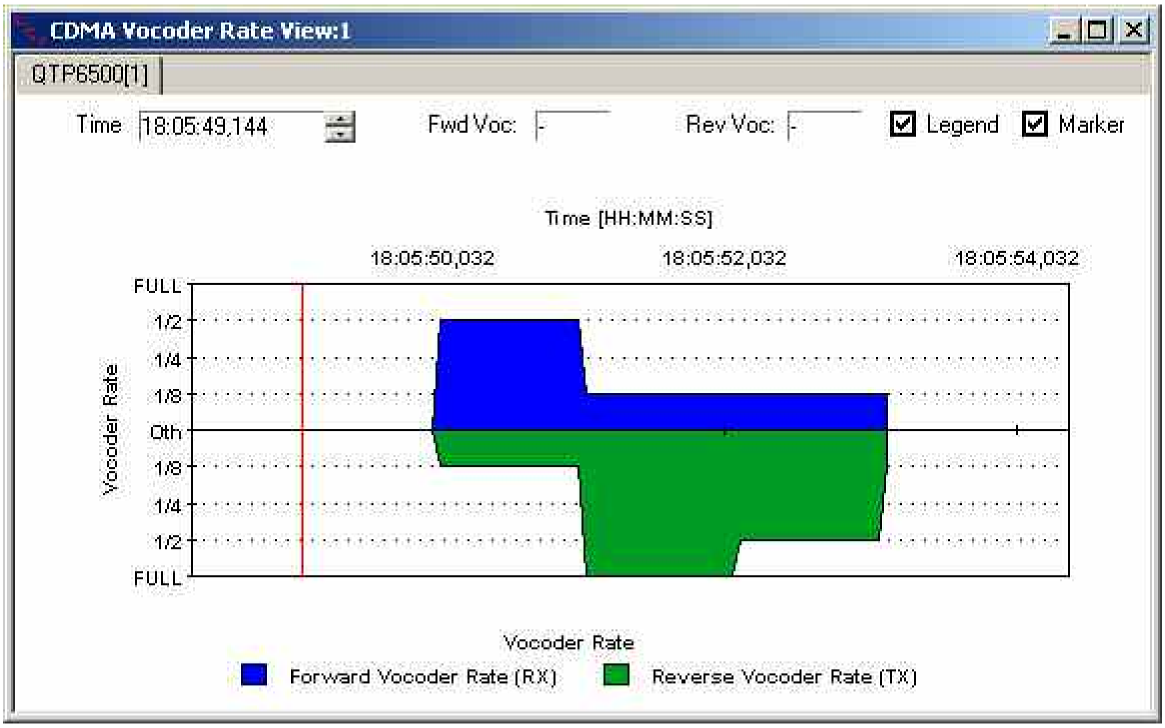


Fig. 4-141 CDMA Vocoder Rate View

Diagram

The diagram is split into an upper and a lower part, showing the vocoder rate in the forward channel (mobile station receiver) and in the reverse channel (mobile station transmitter), respectively. The time information stored in the measurement file provides the x-axis scaling. The total time span of the diagram (i.e. the x-axis scale) can be changed in the configuration menu; see below. While the vocoders encode/decode a particular channel (full rate, ½ rate, ¼ rate, or $^1/_8$ rate), the curves are at the corresponding level. Level 0^{th} (or no curve) denotes that the vocoder is not active.

The curves are plotted from the left to the right at the pace of the measurement or replay. If the end of the display range is reached while the measurement or replay is still going on, the whole diagram is shifted to the left by one full time span so the curves can be continued. This may occur repeatedly until the end of the measurement (file) is reached.

Time / Fwd Voc / Rev Voc

The fields below the diagram tab show the current x-axis value (time) and the current forward and reverse vocoder rates. If a marker is switched on, it is placed to the current x-axis value.

Marker

If the box is checked, a marker line is displayed in the diagram. The time and the two vocoder rates at the marker position are indicated in the corresponding fields in the toolbar. The marker line can be shifted to the left and to the right by means of the cursor keys or by incrementing/decrementing the value in the *Time* field. Besides a double click places the marker to the desired position.

Legend

If the box is checked, a legend showing the two displayed curves together with the line colors is displayed below the diagram.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration; see *Context menu* description on p. 4.2.

CDMA Vocoder Rate View Configuration

The *CDMA Vocoder Rate View* configuration menu defines the time span of the diagram and shows information on the current view version. It is opened via a right mouse click on a point inside the *CDMA Vocoder Rate View* or via the *Tools - Modules Configuration...* command (see chapter 3).

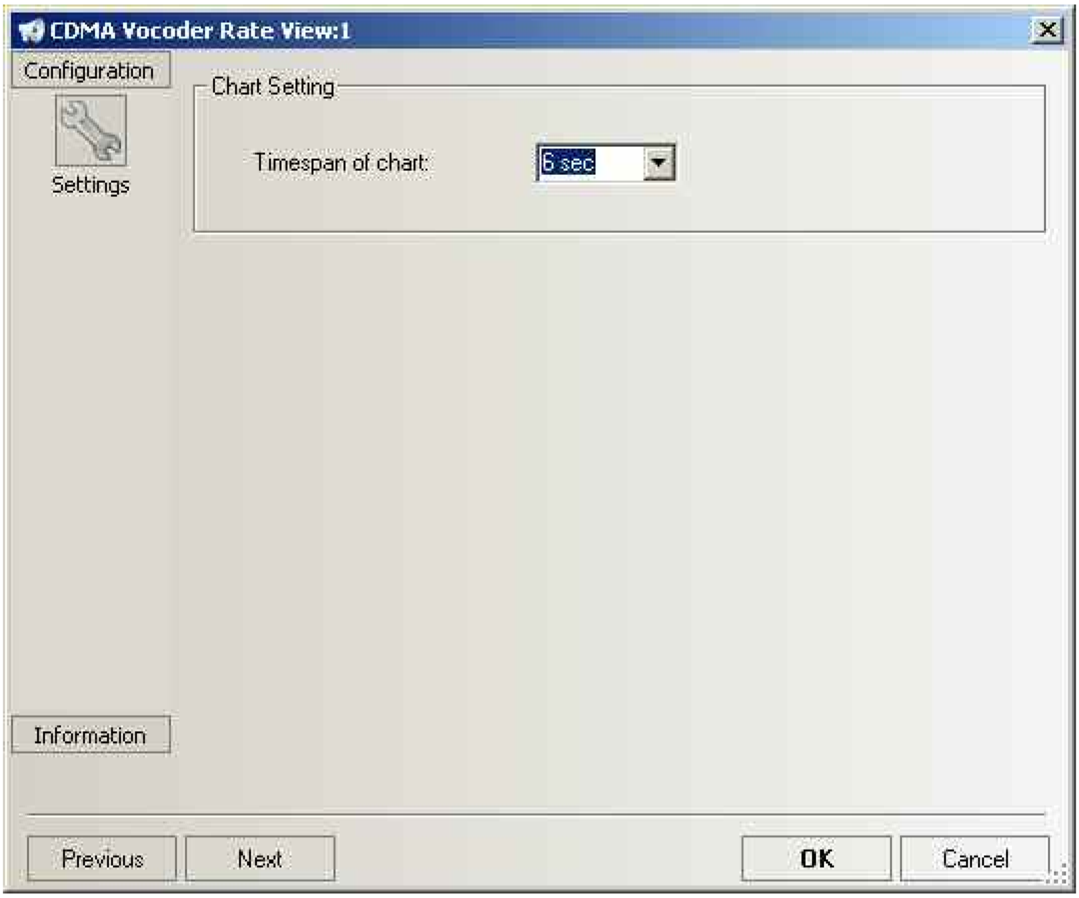


Fig. 4-142 CDMA Vocoder Rate View configuration

Timespan of chart The *Timespan ...* input field defines the total time span of the *Vocoder Rate View*, i.e. the time interval corresponding to the full diagram width. Either 6 s or 1 minute can be selected from the pull-down list.

CDMA Markov Statistic View

The *CDMA Markov Statistic View* displays a statistical evaluation of the call provided by the mobile. The diagram is empty unless an appropriate *Service Option* is set in the *Define Measurement* tab of the CDMA configuration menu; see chapter 6.

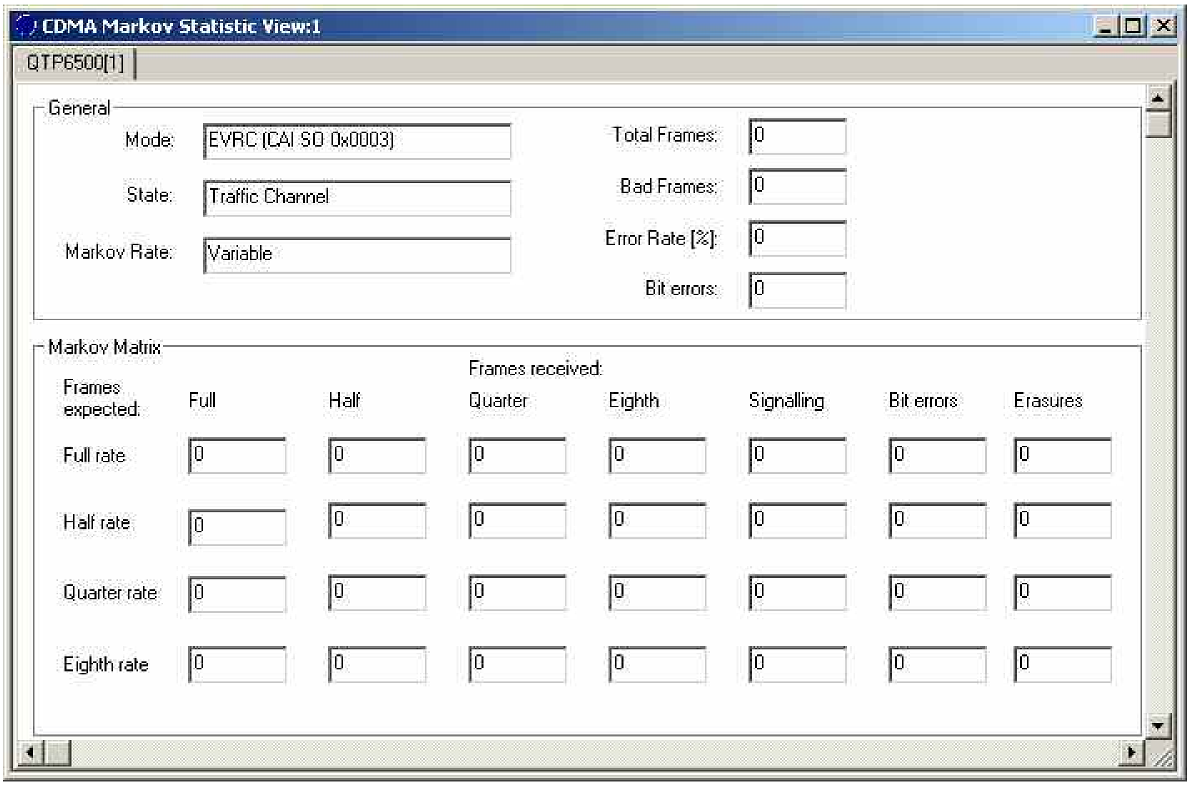


Fig. 4-143 CDMA Markov Statistic View

General

The General output fields indicate the following information describing the Markov statistics evaluation:

Mode
: *RX software mode (service option)*

State
: *Receive task state*

Markov Rate
: *Rate for Markov processing*

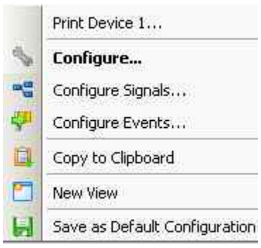
Total Frames
: *Total number of Markov frames*

Bad Frames
: *Total number of bad frames (erasures and full rate with bit errors)*

Error Rate [%]
: *Percentage of wrong bits*

Bit errors
: *Total number of bit errors*

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, copy the current view to the clipboard, create new views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2.

The *CDMA Markov Statistic View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

CDMA PN Grid View

The *CDMA PN Grid View* shows the forward channel PN offsets 0 to 511 as a matrix with 16 offsets in a row. Within this grid, the PN offsets in the currently active set are marked in shades of pink (default), the candidate set is marked in shades of green (default) and the neighbor set is marked in shades of blue (default).

Depending on the defined energy limits of the sets, the darker color shade is defined per default to show limit shortfalls, the lighter color shade shows limit exceedance.

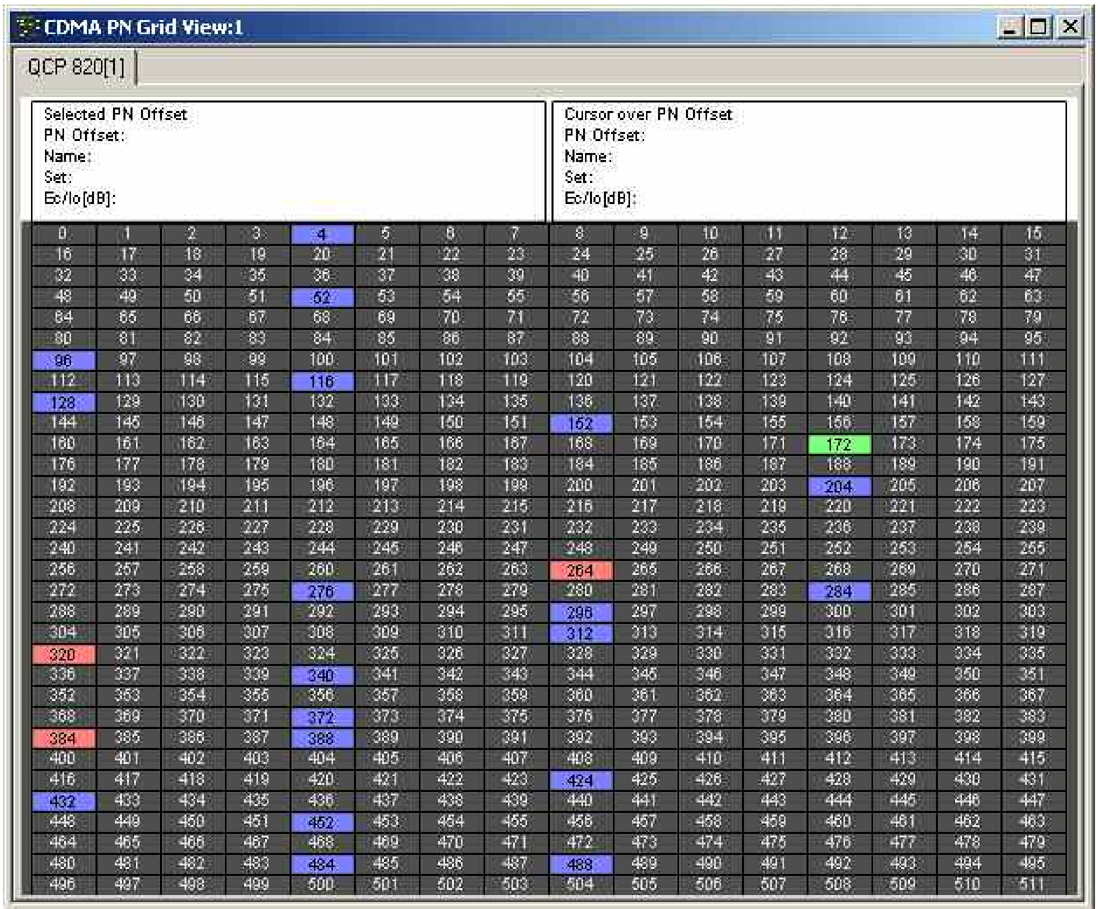


Fig. 4-144 CDMA PN Grid View

Grid Header

The header above the grid is divided into two halves, the first one displaying information of the currently selected PN offset grid element. Any grid element can be selected by clicking on it. The other half shows the corresponding information of the grid element over which the mouse cursor is currently hovering, which allows the direct comparison between any two PN offset grid elements.

PN Offset	The number of the current grid element is displayed.
Name	Here the name of the current grid element is displayed, if applicable. If no name is available, "---" is shown. In some cases, this field also displays auxiliary information, e.g. "No GPS" if this is the case during the measurement.
Set	The current set (active / candidate / neighbor) of the selected PN offset grid element is shown.
Ec/Io [dB]	The ratio of the average power of the forward channel to the total power comprised of signal plus interference, within the signal bandwidth. It is expressed in dB units.

PN Offset Grid

The PN Offsets from 0 to 511 are arranged as a grid with 16 elements in a row. With the corresponding grid cell background colors for active, candidate, and neighbor set energy limits it is quickly possible to see the related sets of the individual PN offsets.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

CDMA PN Grid View Configuration

The *CDMA PN Grid View configuration* menu sets the energy limits for the active, candidate, and neighbor sets for the PN offsets displayed in the PN grid view.

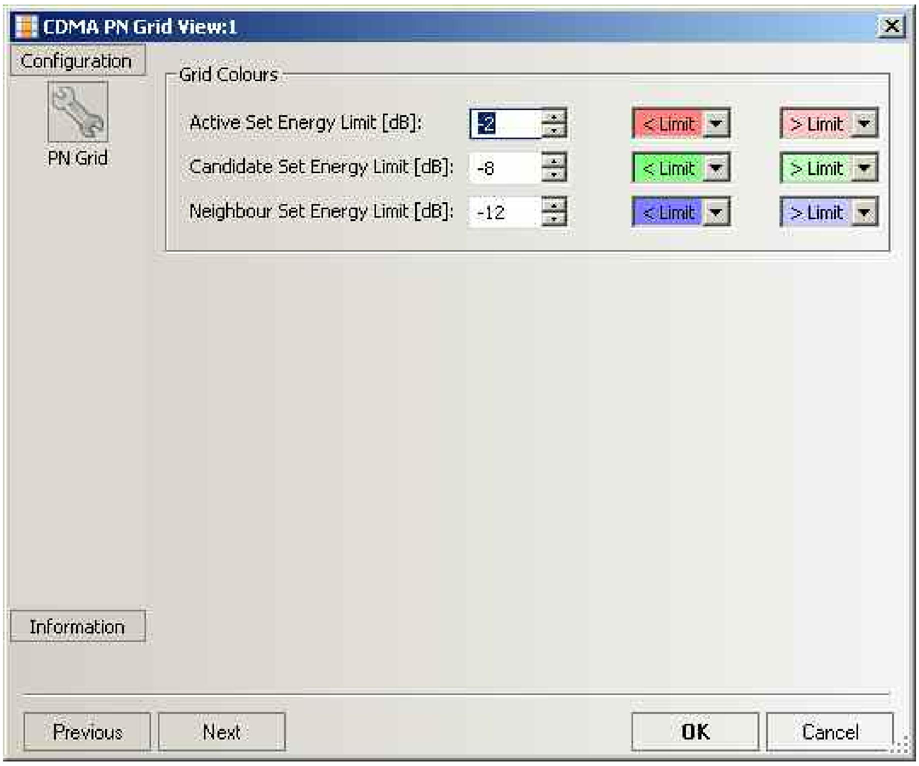


Fig. 4-145 CDMA PN Grid View: Configuration

Grid Colors

The *Grid Colors* option fields define the energy limits and the corresponding background colors for the PN offsets of the cell sets in the grid view.

Active / Candidate / Neighbor Set Energy Limit [dB]

These list boxes allow the definition of the energy limits for the grid display of the active, candidate, and neighbor sets in a range from –20 to +20 dB. The default values are:

–2 dB for the Active Set,
–8 dB for the Candidate Set, and
–12 dB for the Neighbor Set.

< Limit

Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit falls short of the defined value.

> Limit

Opening this list box shows a color selection dialog, where a background color for the PN Offset grid elements can be selected. The grid cell will show the background color defined here when the measured active / candidate / neighbor set energy limit exceeds the defined value.

GPRS Views

The *GPRS Views* display parameters of the operating state of GPRS-supporting mobile phones, related parameters contained in the layer messages, Packet Data Protocol (PDP) parameters, Radio Link Control/Medium Access Control parameters, a statistical evaluation of the number of timeslots (TS) that are active in the connection, exchanged RLC/MAC block header information, control and physical parameters of a GPRS/EGPRS connection, and the RLC or MAC Release indicators,

The GPRS views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *GPRS Views*.

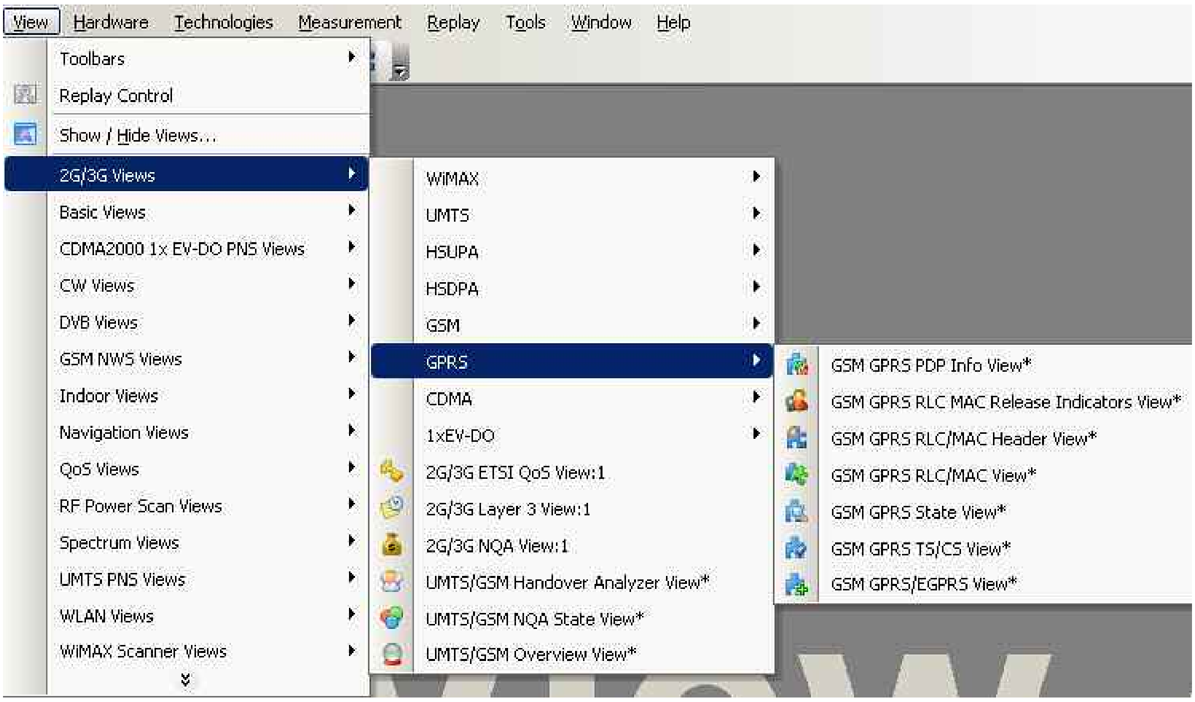


Fig. 4-146 GPRS views

Mobiles to provide GPRS Parameters

The GPRS views described in this section require corresponding mobiles. The following test mobiles are known to provide GPRS parameters (but no EGPRS parameters):

- SAGEM (OT 96-M GPRS, OT190 GPRS, OT 290 GPRS) and Siemens (S55, S55-R) mobiles must be used in *Data/Trace* mode and the splitter box must be connected to provide two COM ports (see chapter 6).
- Nokia test mobiles , Qualcomm test mobiles , and Qualcomm-compatible test mobiles such as Samsung are connected via USB interface.
- TrioRail TTS-S75 is also connected via USB interface

GSM GPRS State View

The *GSM GPRS State View* displays parameters characterizing the operating state of mobile phones supporting GPRS. The parameters are shown for all mobiles that are used in the current measurement or recorded in the replayed measurement file.

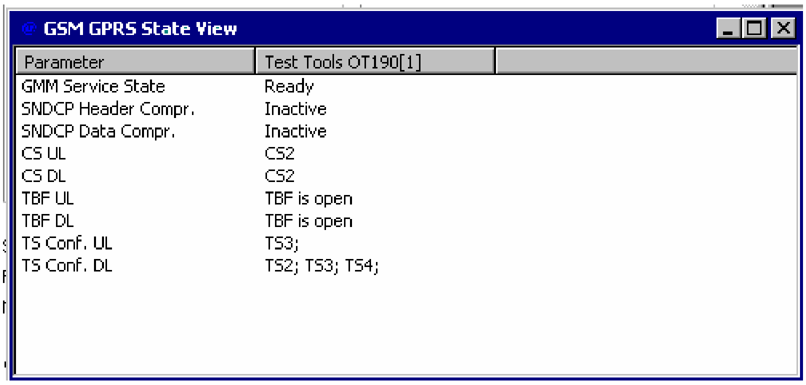


Fig. 4-147 GSM GPRS State View

For each mobile, the state parameters are arranged in a table with 2 columns. The width of the columns can be varied with a drag-and-drop mechanism in the header of the table. Part of the information is also displayed in the *GSM GPRS RLC/MAC View;* see p. 4.259.

GMM Service State GPRS Mobility Management service state: Ready, Idle or Stand-by.

SNDCP Header Compr. Compression information from the Subnetwork Dependent Convergence Protocol: Header compression *Used* or *Not used*.

SNDCP Data Compr. Compression information from the Subnetwork Dependent Convergence Protocol. Data compression *Used* or *Not used.*

CS UL / CS DL Channel coding scheme (CS1 to CS4) used in uplink (UL) and downlink (DL) direction.

TBF UL / TBF DL Status of the Temporary Block Flow (TBF) in uplink (UL) and downlink (DL) direction: open (during data transfer) or closed.

TS Conf. UL / DL Timeslot configuration in uplink (UL) and downlink (DL) direction.

The *GSM GPRS State View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

GSM GPRS PDP Info View

The *GSM GPRS PDP Info View* displays important Packet Data Protocol (PDP) parameters of mobile phones supporting GPRS. The parameters are shown for all mobiles that are used in the current measurement or recorded in the replayed measurement file.

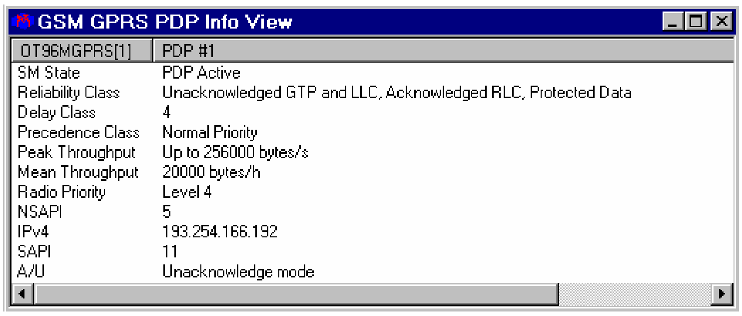


Fig. 4-148 GSM GPRS PDP Info View

For each mobile, the PDP parameters are arranged in a table with 2 columns. The width of the columns can be varied with a drag-and-drop mechanism in the header of the table.

SM State One of the four values PDP Active, PDP Active Pending, PDP Inactive, PDP Inactive Pending. If SM State = PDP Inactive or PDP Active Pending, then some of the other parameters of the view are invalid.

The following five parameters indicate the Quality of Service (QoS) of the PDP:

Reliability Class The reliability class indicates the probability of loss, duplication, mis-sequencing or corruption of Service Data Units (SDU). This translates into the transmission characteristics that are required by an application. The reliability classes are as specified in GSM 04.08:

Acknowledged GTP, LLC, and RLC, Protected data

Unacknowledged GTP, Acknowledged LLC and RLC, Protected data

Unacknowledged GTP and LLC, Acknowledged RLC, Protected data

Unacknowledged GTP, LLC and RLC, Protected data

Unacknowledged GTP, LLC and RLC, Unprotected data

Delay Class Defines the maximum delay to be incurred by the transfer of data through the GPRS network. Four delay classes 1 (smallest delay) to 4 (largest delay; maximum delay not specified) are defined.

Precedence Class

Indicates the relative priority of maintaining the service. The following three precedence classes are defined:

High Priority
: *Service commitments will be maintained ahead of all other priority levels.*

Normal Priority
: *Service commitments will be maintained ahead of low priority users.*

Low Priority
: *Service commitments will be maintained after the high and normal priority commitment have been fulfilled.*

Peak Throughput

Maximum user data throughput (bit rate) requested by the user.

Mean Throughput

Mean user data throughput (bit rate) requested by the user, including periods in which no data is transmitted.

Radio Priority

Radio priority of the requested TBF; one of the levels between *Level 1* (highest priority) and *Level 4* (lowest priority, corresponding to the highest throughput).

NSAPI

Network layer Service Access Point Identifier; integer number that, together with the Temporary Logical Link Identity (TLLI), is used for network layer routing.

IPv4

Internet Protocol address according to the IETF convention.

SAPI

Network Service Access Point Identifier. An integer value in the range [0; 15], identifying a PDP context belonging to a specific MM Context ID.

A/U

Acknowledge mode or *Unacknowledge mode*.

Context menu

A right mouse click on any point in the view opens the context menu copy the current view to the clipboard, or to hold the view; see *Context menu* description on p. 4.2.

The *GSM GPRS PDP Info View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

GSM GPRS RLC/MAC View

The *GSM GPRS RLC/MAC View* displays important Radio Link Control/Medium Access Control parameters of mobile phones supporting GPRS and EDGE. The parameters are shown for all mobiles that are used in the current measurement or recorded in the replayed measurement file.

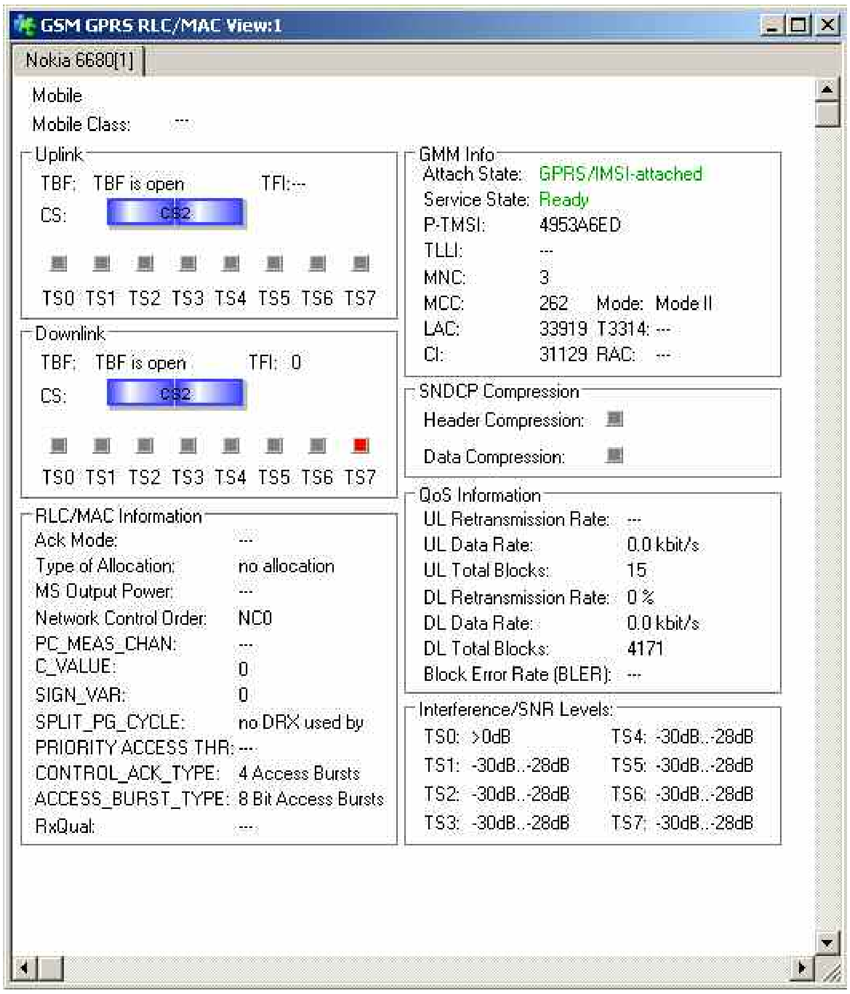


Fig. 4-149 GSM GPRS RLC/MAC View

For each mobile, the RLC/MAC parameters are arranged in six panels. The mobile type and its power class are indicated above the *Uplink* panel.

Uplink / Downlink

The *Uplink* and *Downlink* panels monitor the Temporary Block Flow (TBF) in uplink (mobile station towards base station) and downlink (base station towards mobile station) direction, respectively. The TBF is a temporary physical connection between the mobile and the base station that is maintained only for the duration of the data transfer.

TBF
: *Status of the TBF: open (during data transfer) or closed.*

TFI
: *Temporary Flow Identity. Together with the direction (uplink or downlink), the TFI uniquely identifies a RLC data block.*

CS
: *GPRS channel coding scheme (CS1 to CS4) or EDGE modulation and coding scheme (MCS1 to MCS9). A diagram makes it easy to notice changes of the coding scheme. In the configuration menu, it is possible to adjust the diagram for GPRS or EDGE coding schemes.*

TS
: *Timeslot used for the TBF. The LED symbols light while the TBF occupies one or several of the timeslots 0 to 7.*

RLC/MAC Information

The *RLC/MAC Information* panel displays the following information:

Ack Mode
: *RLC mode: Acknowledge mode or Unacknowledge mode.*

Type of Allocation
: *MAC mode; medium access method to be used during the TBF:* Dynamic allocation*,* Fixed allocation *or* No allocation

MS
: *Output Power Output power of the mobile station in dBm.*

Netw. Control Order
: *Current value of the NETWORK_CONTROL_ORDER parameter defined in GSM 05.08. This parameter controls the measurement reports provided by the mobile and its cell re-selection. Possible values are:*

NC0	*Normal MS control: MS performs autonomous cell re-selection*
NC1	*Normal MS control with measurement reports*
NC2	*Network control. MS sends measurement reports but does not perform autonomous cell re-selection*

RESET
: *The MS returns to the broadcast parameters. Only sent on PCCCH or PACCH*

PC_MEAS_CHAN
: *Channel where the measurements for power control are made: BCCH or PDCH.*

C_VALUE
: *Value of the C parameter calculated by the mobile station; relevant for the channel quality report.*

SIGN_VAR
: *Value of the signal variance parameter calculated by the mobile station; relevant for the channel quality report.*

SPLIT_PG_CYCLE
: *Optional parameter specified in GSM 05.08 controlling the occurrence of paging blocks on CCCH or PCCCH belonging to the mobile station in DRX (Discontinuous Reception) mode.*

PRIORITY_ACCESS_THR
: *Control parameter indicating whether packet access is allowed and for which priority level it is allowed.*

CONTROL_ACK_TYPE
: *Default format of the PACKET CONTROL ACKNOWLEDGMENT message: either* 4 Access Bursts *or* RLC/MAC Control Block.

ACCESS_BURST_TYPE
: *Access burst format:* 8 Bit Access Bursts *or* 11 Bit Access Bursts.

RxQual
: *Received signal quality reported by the mobile; see section* GSM Measurement Report View *on page* *4.277*.

GMM Info The *GMM Info* panel displays the following GPRS Mobility Management information:

Attach State
: *GPRS operating mode of the mobile: – (not available), Attached, IMSI Attached, Combined Attached, Not Attached*

Service State
: *GPRS operating mode of the mobile: – (idle/not available), Stand By or Ready.*

P-TMSI
: *Packet TMSI of the mobile, transferred to the network during a GPRS attach.*

TLLI
: *Temporary Logical Link Identity, code number to identify the mobile at the RLC/MAC layer.*

MNC
: *Mobile Network Code*

MCC
: *Mobile Country Code*

LAC
: *Location Area Code*

CI
: *Cell Identity*

Mode
: *Network mode of operation 1, 2, or 3.*

T3314
: *Ready timer used in the MS and in the network for each assigned P-TMSI to control the cell updating and paging process.*

RAC
: *Routing Area Code; fixed length code (of 1 octets) identifying a routing area within a location*

SNDCP Compression

The *SNDCP Compression* panel indicates whether or not the mobile uses compression of the Subnetwork Dependent Convergence Protocol (SNDCP) information (GSM 04.65). Protocol control information compression is an optional SNDCP feature that helps to improve channel efficiency.

The TCP/IP *Header Compression* and *Data Compression* are indicated in separate boxes. A red box indicates that compression is enabled.

QoS Information

The *QoS Information* panel indicates parameters describing the user data throughput and reliability of the GPRS connection. The parameters characterize the quality of service (QoS); see GSM 02.60.

UL Retransmission Rate
: *Number of unacknowledged uplink (UL) frames that the mobile had to retransmit for error recovery*

UL Data Rate
: *UL data rate in bytes/s*

UL Total Blocks
: *Total number of UL data blocks transferred*

DL Retransmission
: Rate *Number of unacknowledged downlink (DL) frames that the base station had to retransmit for error recovery*

DL Data Rate
: *DL data rate in bytes/s*

DL Total Blocks
: *Total number of DL data blocks transferred*

Block Error Rate
: *Ratio of blocks received in error at the mobile to total number of received blocks (GSM 11.10).*

Interference Levels

Carrier-to-Interference ratio C/I in dB and for each timeslot (TS0 to TS7) provided by the mobile. The result is invalid (---) if the mobile does not provide any C/I result or if the timeslot is not active. The *C/I* is only provided by the Sagem test mobile OT190 and newer types.

The source of the content of the *Interference Level* box is slightly different between the Nokia and Qualcomm based mobiles. The Nokia reports ranges of Interferences Levels, which are displayed in this box. The Qualcomm based mobiles report the SNR values per ARFCN / timeslot pair (see *GSM GPRS/EGPRS View*). The value, which is display in the box, is the average of the reported values for the corresponding timeslot over all ARFCNs.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2.

The *GSM GPRS RLC/MAC View* has no specific configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

GSM GPRS TS/CS View

The *GSM GPRS TS/CS View* provides a statistical evaluation of the number of timeslots *(TS)* that are active in the connection and of the Coding Scheme *(CS)* that is used for the transmission of radio blocks. EDGE MCS statistics are also supported. All parameters are shown for the uplink and downlink.

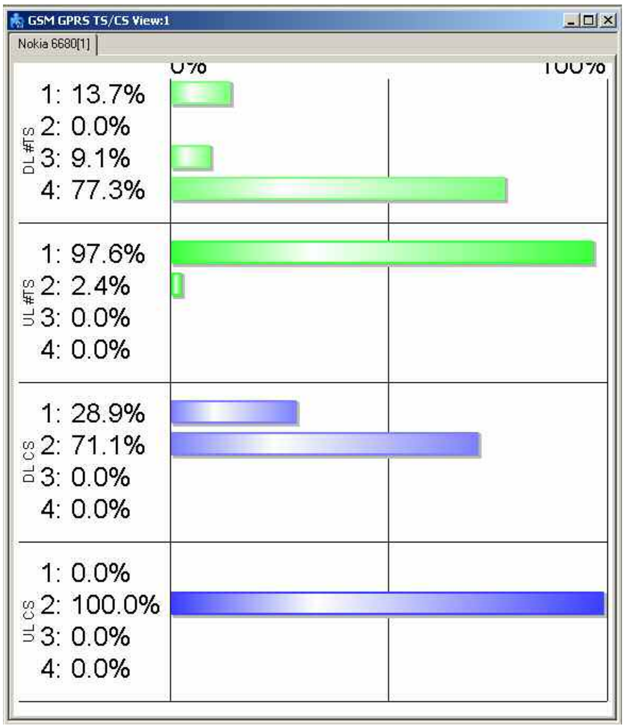


Fig. 4-150 GSM GPRS TS/CS View

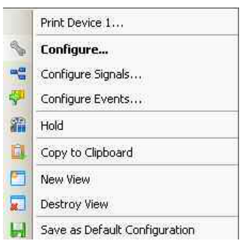
UL TS / DL TS Distribution in time of the number of timeslots used in the connection: Ratio of the time during which each number of timeslots is active to the total connection time. The ratios are expressed as percentages and visualized with colored bars. The length of the bars is proportional to the percentages; the sum of all percentages adds up to 100 %.

The maximum number of timeslots displayed can be selected in the configuration menu.

UL CS / DL CS Distribution in time of the coding scheme used in the connection: Ratio of the time during which each coding scheme is used to the total connection time. The ratios are expressed as percentages and visualized with colored bars. The length of the bars is proportional to the percentages; the sum of all percentages adds up to 100 %.

The maximum CS number displayed can be selected in the configuration menu.

Context menu A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration as default, or move to another worksheet; see *Context menu* description on p. 4.2.



GSM GPRS TS/CS View Configuration

The *GSM GPRS TS/CS View Configuration* tab of the configuration menu defines the contents of the view.

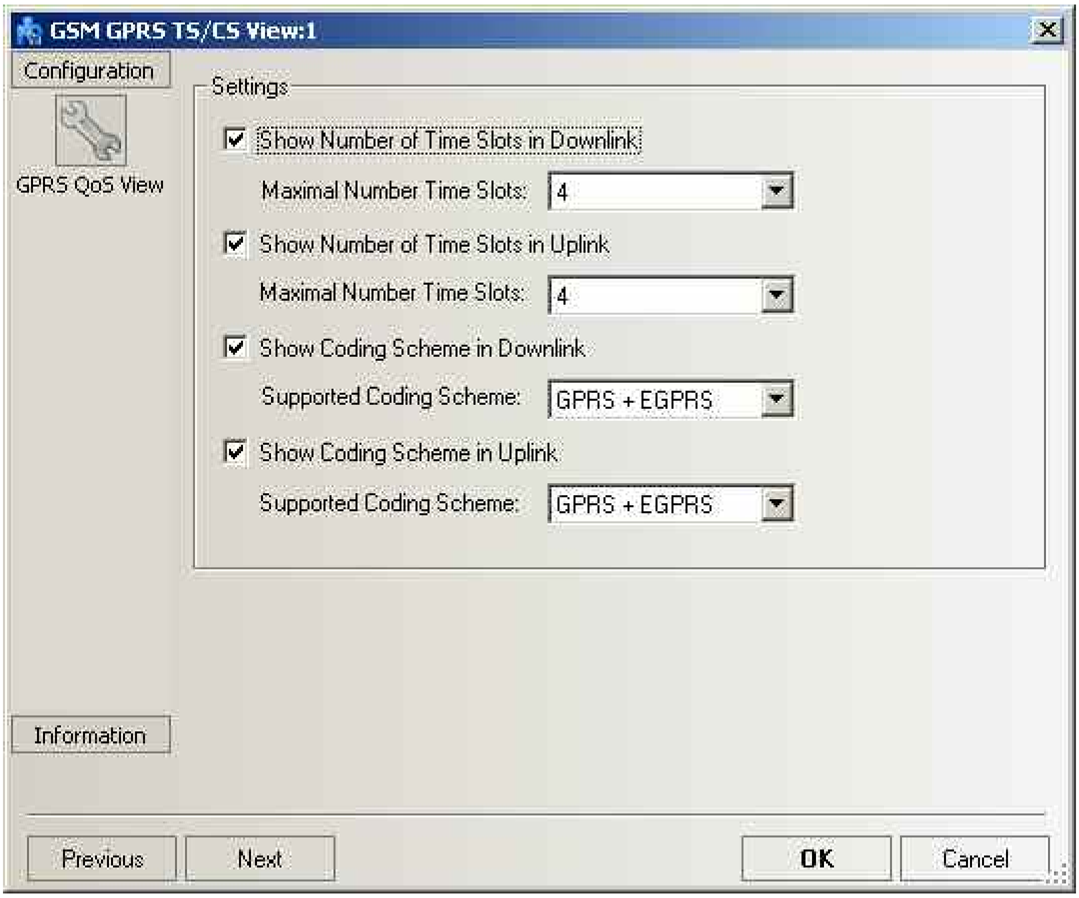


Fig. 4-151 GSM TS/CS View: GPRS TS/CS View Configuration

Settings

Clearing one of the *Show Number of Time Slots…* or *Show Coding Scheme…* boxes entirely hides the corresponding diagram in the view.

In addition, it is possible to simplify the diagrams by restricting the maximum number of time slots to less than 8 or the coding scheme number to less than 4. This makes it easier to read the diagram, especially if the maximum number of TS and maximum CS is known.

The *Supported Coding Schemes* list boxes offer the options for GPRS or GPRS + EGPRS coding scheme statistic graphs.

GSM GPRS RLC/MAC Header View

The *GSM GPRS RLC/MAC Header View* shows the exchanged RLC/MAC block header information. The RLC/MAC header contents depend on the transmission direction (UL/DL); they are described in standard 3GPP TS 44.060.

Moreover, recording of the *RLC/MAC Headers* must be enabled in the *General Settings* tab of the SAGEM x6 driver configuration menu.

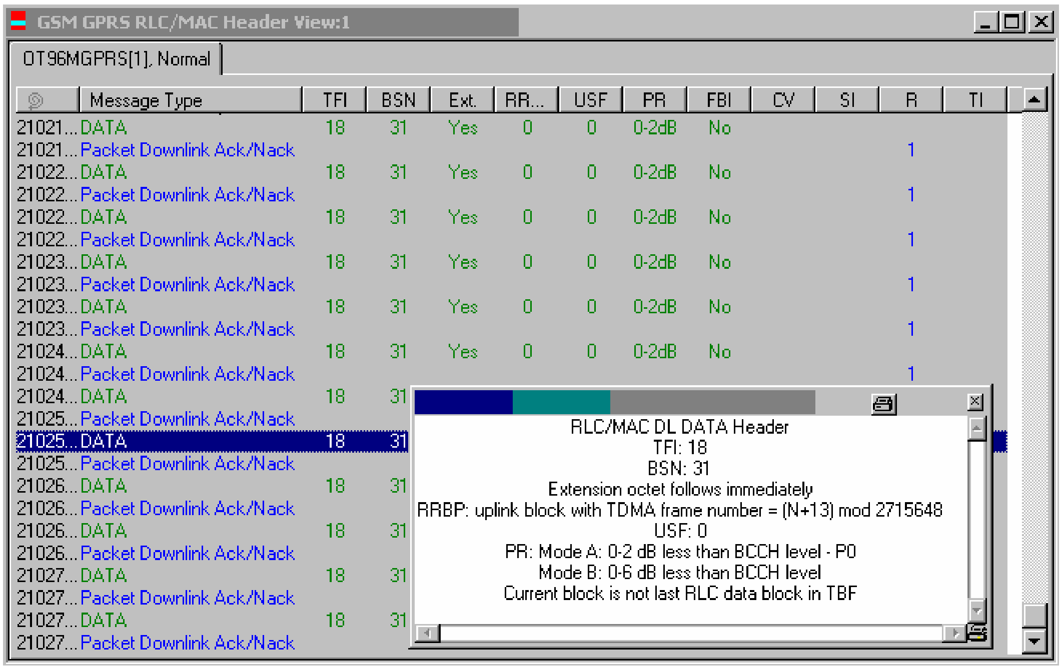


Fig. 4-152 GSM GPRS RLC/MAC Header View

For each mobile, the RLC/MAC header information is arranged in a table. The width of the columns can be varied with a drag-and-drop mechanism in the header of the table.

Table entries

Each RLC/MAC header forms a table row with the entries described below. Some of the values are only available for a particular direction (uplink or downlink).

@	Timestamp assigned to the header
Message Type	Data block or message type transmitted in the RLC/MAC block
TFI 5-bit	Temporary Flow Identity identifies the Temporary Block Flow (TBF) to which the RLC data block belongs.
BSN	Block Sequence Number, carries the sequence absolute Block Sequence Number (BSN) modulo Sequence Number Space (SNS) (128 in GPRS and 2 048 in EGPRS) of each RLC data block within the TBF.
Ext.	Extension bit indicates the presence of an optional octet in the RLC data block header (0: Extension octet follows immediately; 1: No extension octet follows).
RRBP	Relative Reserved Block Period specifies a single uplink block in which the mobile station shall transmit either a PACKET CONTROL ACKNOWLEDGEMENT message or a PACCH block to the network.
USF	Uplink State Flag, sent in all downlink RLC/MAC blocks, indicates the owner or use of the next uplink radio block on the same timeslot.
PR	Power Reduction field, indicates the power level reduction of the current RLC block.
FBI	Final Block Indicator indicates whether the downlink RLC data block is the last RLC data block of the downlink TBF.
CV	4-bit Countdown Value, sent by the mobile station to allow the network to calculate the number of RLC data blocks remaining for the current uplink TBF.
SI	Stall Indicator bit, indicates whether the mobile's RLC transmit window can advance (i.e. is not stalled, value 0) or can not advance (i.e. is stalled, value 1).
R	Retry bit, indicates whether the mobile station transmitted the CHANNEL REQUEST message, PACKET CHANNEL REQUEST message, or EGPRS PACKET CHANNEL REQUEST message one time or more than one time during its most recent channel access.
TI	TLLI Indicator bit indicates the presence of an optional TLLI field within the RLC data block.

Detailed information

An upper case D appears to the right of the cursor arrow when it is placed in the active (gray) zone of the view. This symbol indicates that there is detailed information to be retrieved for the current RLC/MAC header. A double-click opens the detailed information window; see *Fig. 4-152* on p. 4.265.

The detailed information window is totally independent of the GSM GPRS RLC/MAC Header View, so you can move, resize and scroll it as you like. Click the printer symbol in the lower right corner to generate a hardcopy of the detailed information. Alternatively, you can write the detailed information into the table (e.g. if you wish to create a hardcopy), see the …Messages tabs of the configuration menu.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, put the view on hold, copy the current view to the clipboard, and to create or delete views; see *Context menu* description on p. 4.2.

The *GSM GPRS RLC/MAC Header View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

GSM GPRS/EGPRS View

The *GSM GPRS/EGPRS View* shows control and physical parameters of a GPRS and EGPRS connection.

Note:
If this view is used with an EDGE-enabled test mobile (e.g. Triorail-S75 with FW 33 or higher) and with option ROMES3EDG, it also displays EDGE-parameters.

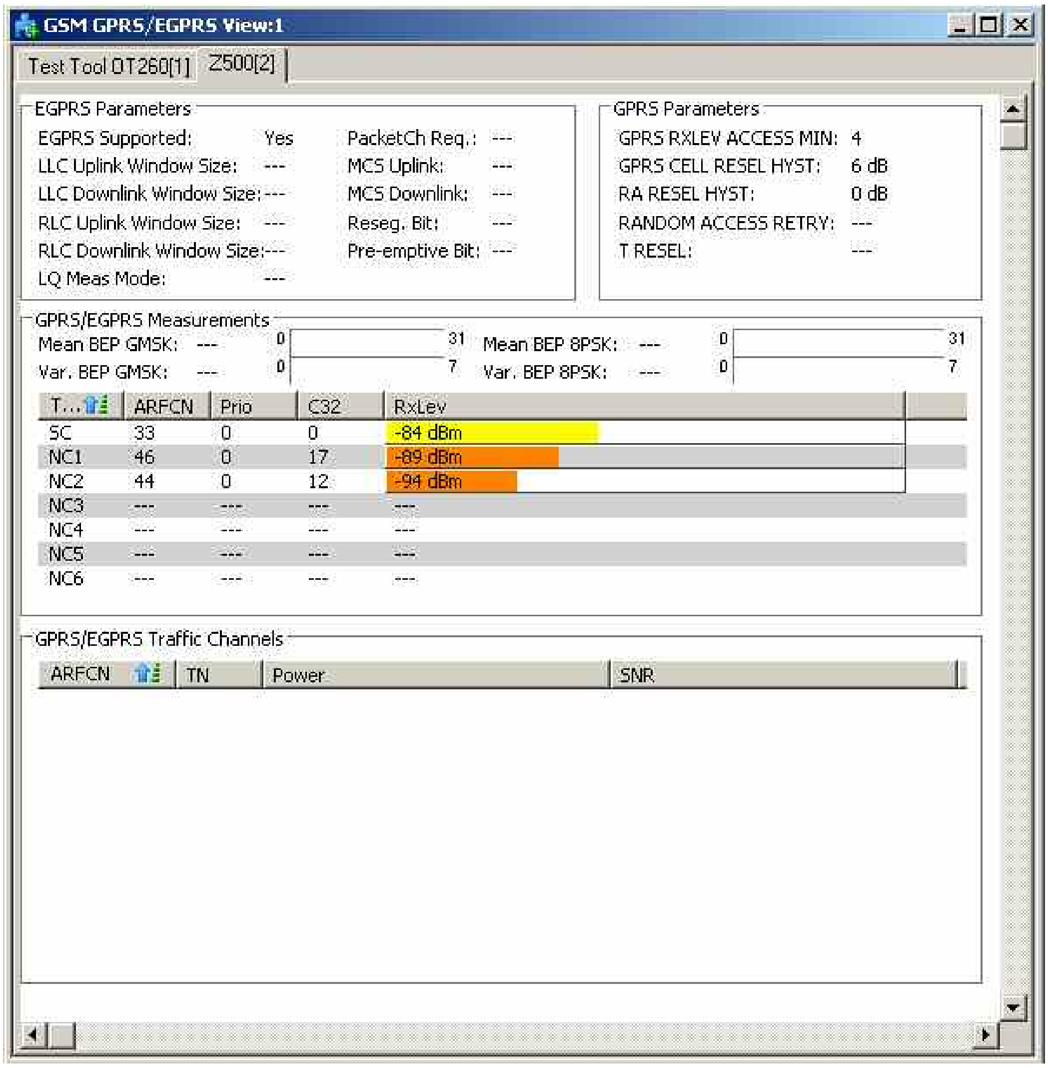


Fig. 4-153 GSM GPRS/EGPRS View

For each mobile, the GPRS and EGPRS parameters are arranged in two panels and two tables below.

EGPRS Parameters

The upper left panel shows the following EGPRS-related control parameters:

EGPRS Supp.
: *EGPRS capability of the mobile phone* (Yes *or* No). *Most of the following parameters are only available if EGPRS is supported.*

LLC Uplink/Downlink Window Size
: *LLC window size, i.e. the maximum number of sequentially-numbered uplink/downlink I frames that may be outstanding at any time. The window size is in the range 1 through 255 (see standard 3GPP TS 04.64).*

RLC Uplink/Downlink Window Size
: *RLC window size (no. of RLC data blocks) that the network selects for the uplink/downlink, depending on the number of timeslots allocated (see standard 3GPP TS 44.060). For GPRS, a fixed window size of 64 is used.*

LQ Meas. Mode
: *Link Quality Measurement Mode (0 to 3), see standard GPP TS 04.60, sub clause 11.2.7.2.*

PacketCh Req.
: *EGPRS packet channel request supported in serving cell (Yes/No).*

MCS Uplink/Downlink
: *GPRS channel coding scheme (*CS1 to CS4) *or EGPRS modulation and coding scheme* (MCS1 to MCS9) *used in the uplink and downlink.*

Reseg. Bit
: *Value of the resegment bit sent in the PACKET UPLINK ACH/NACK message, indicating whether or not the transmitted RLC blocks shall be resegmented (see standard 3GPP TS 51.010).*

Pre-emptive Bit
: *Value of the pre-emptive transmission bit sent in the PACKET UPLINK ACH/NACK message, indicating whether or not pre-emptive transmission shall be used.*

GPRS Parameters

The upper left panel shows a list of GPRS-related control parameters. The parameters are relevant for cell reselection and described in standard 3GPP TS 04.60 and related standards.

GPRS RXLEV ACCESS MIN
: *Minimum received signal level at the MS required for access to the system (value range: 0 to 63).*

GPRS CELL RESEL HYST
: *Additional hysteresis applied in* Ready *state for cells in the same Routing Area (value range: 0 dB, 2 dB,..., 14 dB).*

RA RESEL HYST
: *Additional hysteresis applied for cells in different Routing Areas (value range: 0 dB, 2 dB,..., 14 dB).*

RANDOM ACCESS RETRY

1-bit value, if set to 1, it indicates that the mobile station is allowed to try to access another cell if available.

T RESEL

Delay time before a mobile is allowed to reselect a cell after an abnormal release of the connection to this cell. T RESEL *can be set to 8 discrete values between 5 seconds and 300 seconds.*

GPRS/EGPRS Measurements

Below the parameter panels of the *GSM GPRS/EGPRS View* presents an evaluation of physical parameters of the GPRS/EGPRS connection that the mobile reports to the network (see standard 3GPP TS 04.60 and related standards).

Mean BEP

Mean value of the Bit Error Probability of the channel averaged over all timeslots in the TBF. Two different values are calculated – one for GSMK (CS1-CS4, MCS1-MCS4) and one for 8PSK (MDC5-MCS9). Range is 0 to 31; see 3GPP TS 04.60 and 3GPP TS 05.08.

Var BEP

Variation coefficient for the Bit Error Probability averaged over all time slots of the TBF. Two different values are calculated – one for GSMK (CS1-CS4, MCS1-MCS4) and one for 8PSK (MDC5-MCS9). Range is 0 to 7; see 3GPP TS 05.08.

Type

The table shows results from the serving cell (SC) *and up to six neighbor cells* (NC1, …, NC6), *if available.*

ARFCN

Absolute Radio Frequency Channel Number used in the serving cell and the neighbor cells.

Prio

GPRS priority class, 3-bit value to indicate the HCS priority for the call.

C32

Flag indicating an exception rule for GPRS_RESELECT_OFFSET according to 3GPP TS 05.08.

RxLev

RxLev of the serving cell and the neighbor cells

GPRS/EGPRS Traffic Channels

The last part of the *GSM GPRS/EGPRS View* presents traffic channel related information (for Qualcomm only):

ARFCN

Absolute Radio Frequency Channel Number used in the serving cell and the neighbor cells.

TN

Time Slot

Power

Received Power (in dBm)

SNR

Signal-to-Noise ratio (in dB)

The mobile reports an *SNR* value and a *Power* value per ARFCN / timeslot pair.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

GSM GPRS RLC MAC Release Indicators View

The *GSM GPRS RLC MAC Release Indicators View* shows control and physical parameters of the connection release information, such as the cause of the release, statistical parameters and the release indicator description, if supplied.

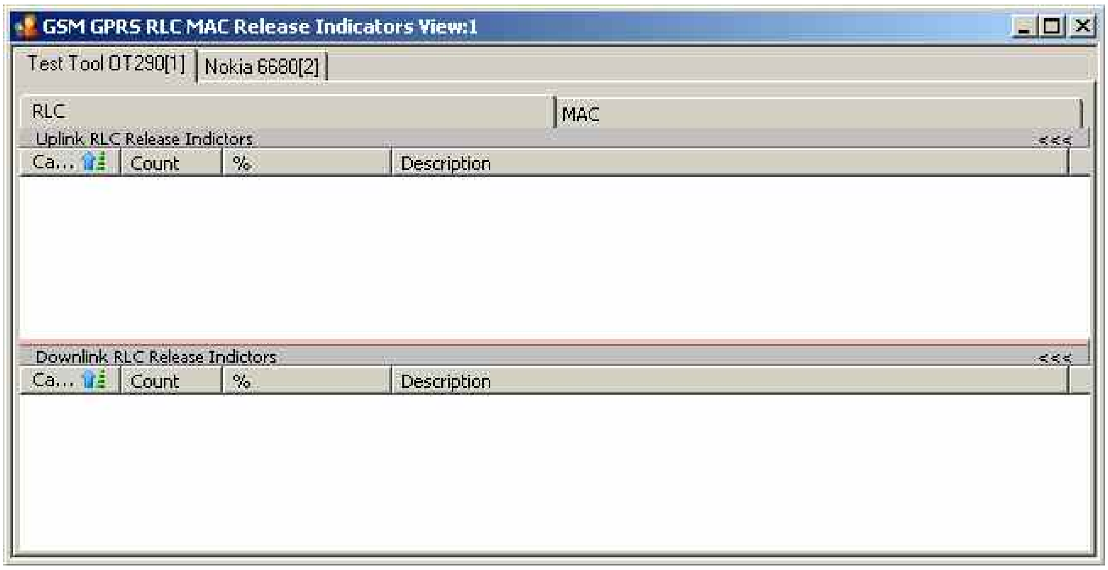


Fig. 4-154 GSM GPRS RLC MAC Release Indicators View

For each mobile, the RLC or MAC Release indicators are arranged in two lists. The width of the columns can be varied with a drag-and-drop mechanism in the header of the table.

Uplink / Downlink Table entries

Each RLC or MAC release indicator forms a table row with the entries described below.

Cause
: *The cause of the RLC/MAC release.*

Count
: *The number of measured release indicators of the current session.*

%
: *Percentage of the related cause*

Description
: *Release indicator description*

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

GSM GPRS RLC MAC Release Indicators View Configuration

The *GSM GPRS RLC MAC Release Indicators View Configuration* tab of the configuration menu defines the contents of the view.

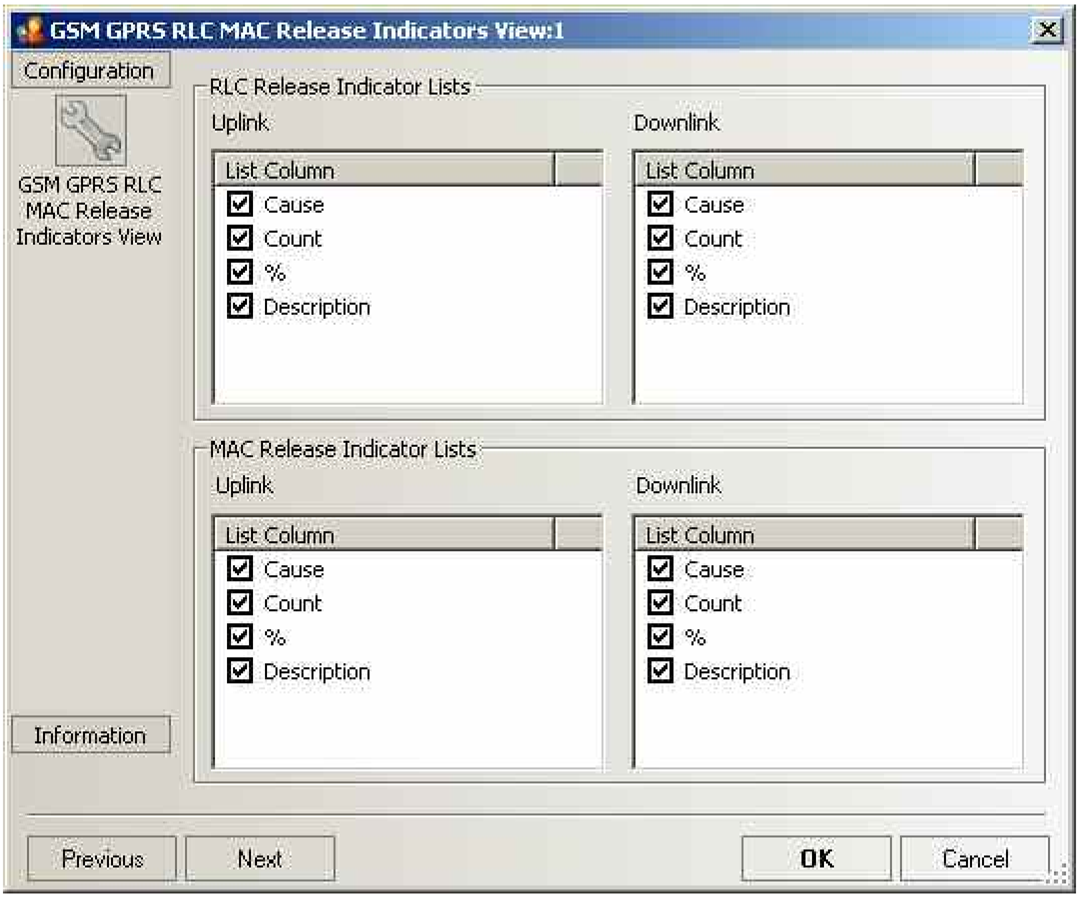


Fig. 4-155 GSM GPRS RLC MAC Release Indicators View: Configuration

RLC/MAC Release Indicator Lists The *Release Indicators Lists Settings* panel offer checkboxes to select the elements displayed in the release indicator view tables.

GSM Views

The *GSM Views* display GSM-specific information included in the measurement data. GSM data can be acquired using one of the GSM drivers described in chapter 6. Some of the views require a particular measurement mode or a GSM mobile supporting special features (e.g. GPRS).

The GSM views can be selected from a submenu displayed on the right side of the *View* menu when the mouse hovers over *GSM*.

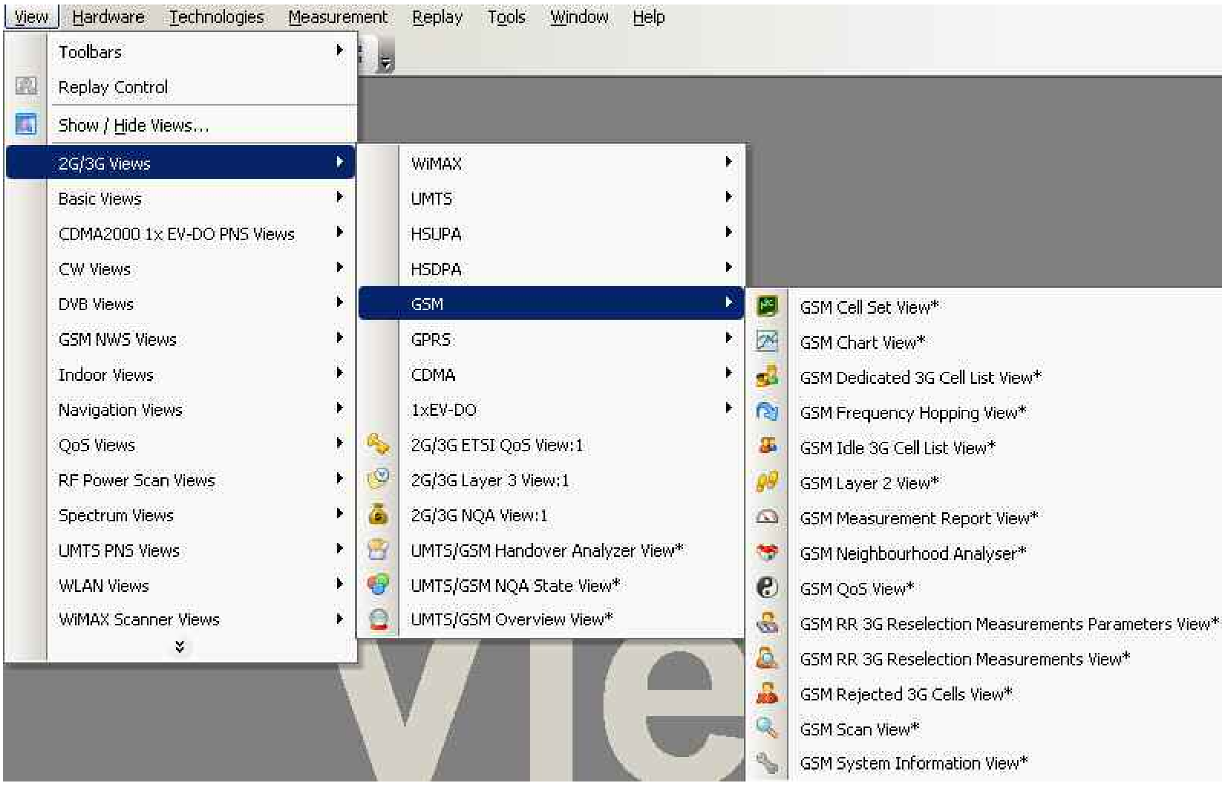


Fig. 4-156 GSM views

GSM Layer 2 View

The *GSM Layer 2 View* displays all layer 2 messages contained in the recorded data. The messages can not be configured; furthermore, recording must be enabled in the *Measurement Mode* or *General Settings* tab of the *Driver Configuration* menu (*Layer 2 messages* box, see section *GSM Mobile Drivers* in chapter 6).

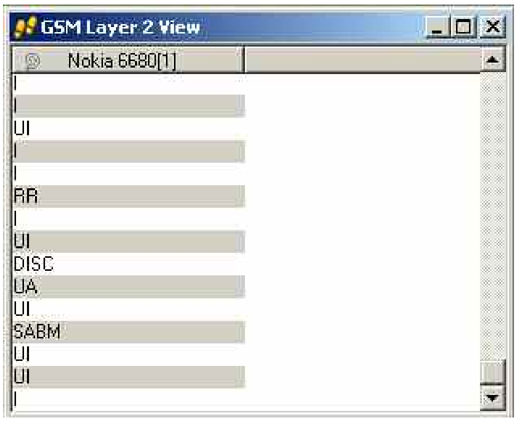


Fig. 4-157 GSM Layer 2 View

For each mobile, the layer 2 messages are arranged in its own table containing a maximum of 100 lines. After this limit is reached, every new message added deletes the oldest message in the table. The width of the individual tables can be varied with a drag-and-drop mechanism.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2.

GSM Layer 2 View Configuration

The *GSM Layer 2 View* configuration menu switches the auto scroll mechanism on or off and shows information on the current view version. It is opened via a right mouse click on a point inside the *GSM Layer 2 View* or via the *Tools - Modules Configuration...* command (see chapter 3).

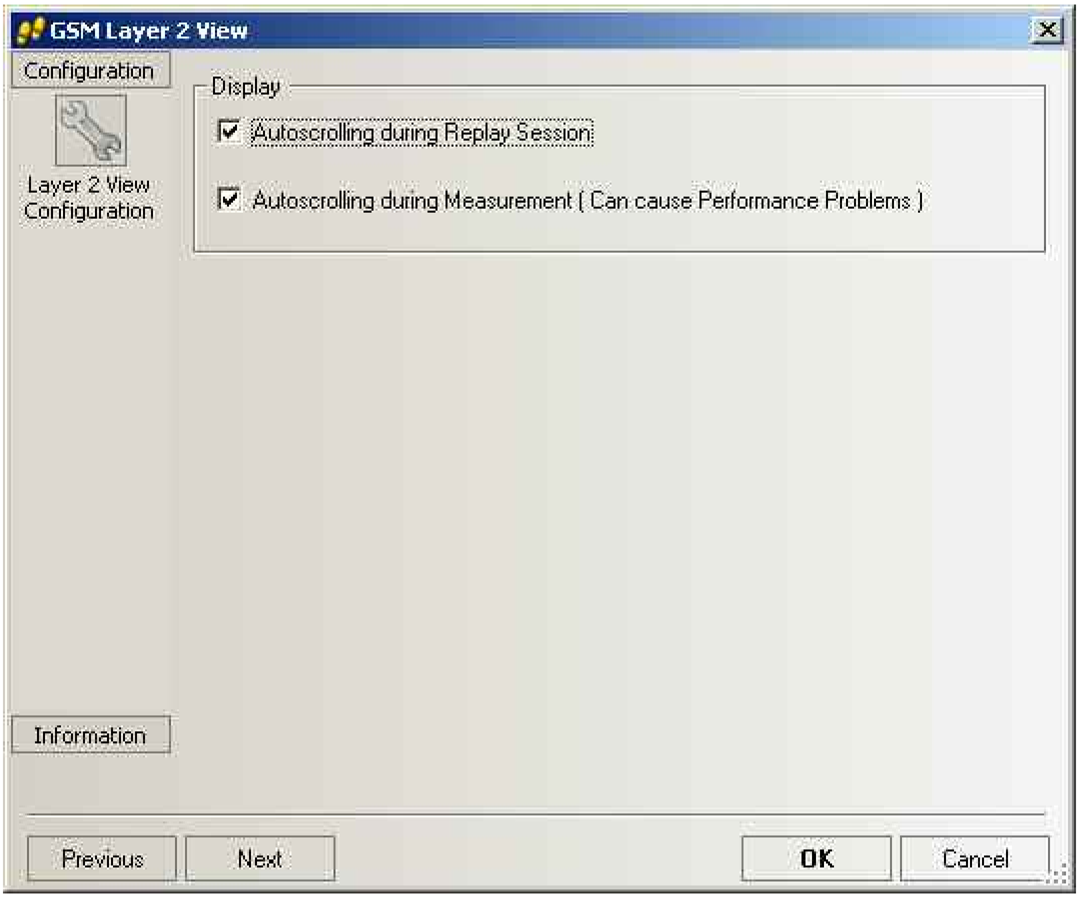


Fig. 4-158 GSM Layer 2 View configuration

Autoscrolling If the boxes are checked, the *GSM Layer 2* tables are scrolled down automatically as soon as the bottom of the view window is reached. Otherwise, the scrollbar can be used to move up and down in the table. Autoscrolling can be enabled/disabled separately for replay and measurement sessions.

GSM Measurement Report View

The *GSM Measurement Report View* gives an overview of the receiver reports of all used mobiles, i.e. the values of *RxQual* and *RxLev.* The number of the BCCH, the BSIC, the C1 and C2 parameters, and the name of the base station are displayed in addition. The data are shown for the serving cell and (except for RxQual) up to 6 neighbor cells N1 to N6. R&S ROMES allows opening several independent *GSM Measurement Report Views* simultaneously.

Display of most results in the *GSM Measurement Report View* is optional; they can be switched off in the configuration menu.

TIP You can display some of the values also in a preconfigured 2D Chart: "GSM Chart View" on page 4.316.

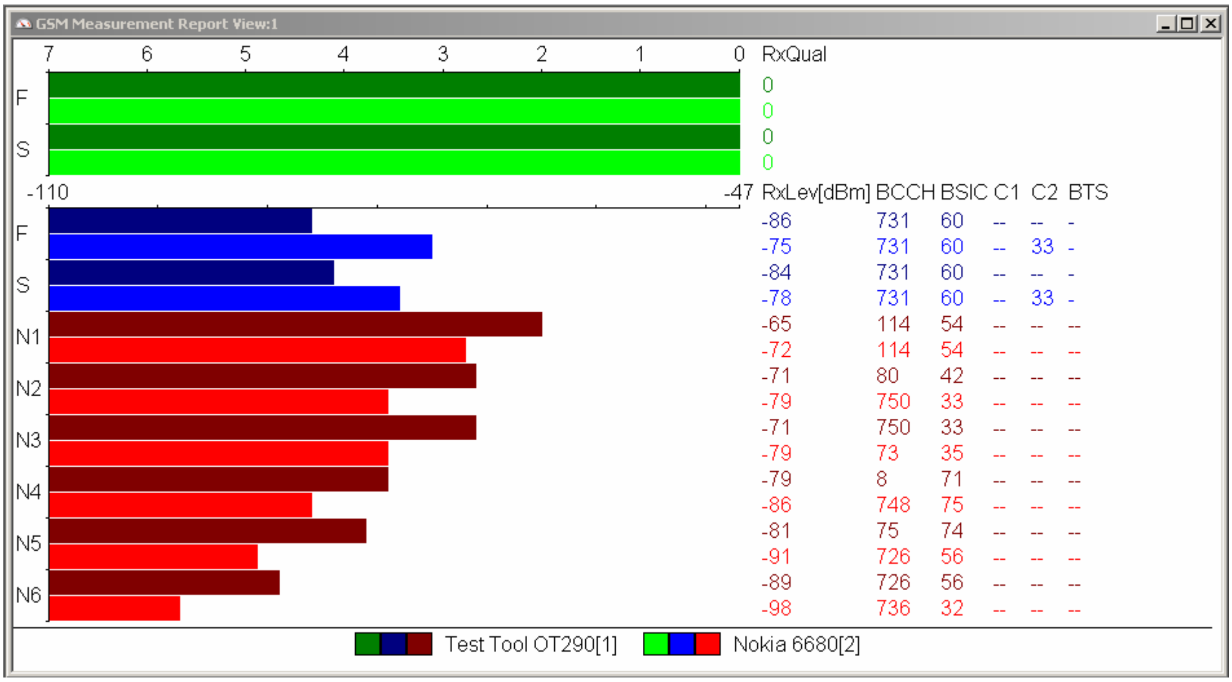


Fig. 4-159 GSM Measurement Report (for 2 test mobiles)

RxQual

The first group of bars represents the values of RxQual in the serving cell:

F

RXQUAL_FULL, assessed over the full range of TDMA frames within a SACCH block

S

RXQUAL_SUB, assessed over a subset of 12 TDMA frames

By definition, the RxQual values range from 0 to 7, 0 corresponding to the best received signal quality (see table in chapter 8). If the inverse scale is used to represent the values for RxQual a longer bar corresponds to a better signal quality (see *Show good RxQual* in the GSM measurement report configuration menu). The numeric values of RxQual are listed to the right of the bars. The scale can be inverted in the configuration menu, see below.

Downlink and uplink

DTX mode

A large difference between the RXQUAL_FULL and RXQUAL_SUB values indicates that the BTS (downlink) signal shows strong variations in time. One possible reason is that the BTS uses discontinuous transmission (DTX). In the DTX mode, the BTS transmitter is switched off during time periods where no information needs to be transferred. The relevant received signal quality is given by RXQUAL_SUB; the averaged parameter RXQUAL_FULL is generally larger (in extreme cases, RXQUAL_FULL can be equal to 7 while RXQUAL_SUB is equal to 0!) and underestimates the signal quality.

The current DTX mode of the GSM mobile station (uplink DTX) can be indicated in the *Alphanumeric View (used* or *not used)*. The *GSM System Information View* and the detailed information in the *2G/3G Layer 3* view show the DTX mode that the network commands the mobile station to use *(shall* or *shall not* or *may use DTX)*.

RxLev

The second group of bars represents the values of RxLev in the serving cell:

F
: *RXLEV_FULL, assessed over the full range of TDMA frames within a SACCH block*

S
: *RXLEV_SUB, assessed over a subset of 12 TDMA frames*

By default, the RxLev values range from 0 to 63, 63 corresponding to the highest received signal level (see table in chapter 8). This means that a longer bar corresponds to a better signal quality. The numeric values of RxLev are listed to the right of the bars. The RxLev values can be converted to absolute power units (dBm), see *Romes configuration – Available Signals* tab in chapter 3.

The received signal levels of neighbor cells 1 to k are labeled N1 to Nk. The total number k of neighbor cells displayed is set in the *Graph* panel of the configuration menu *(Number of shown neighbor cells)*.

BCCH

Number of the broadcast control channel of the cell and mobile.

BSIC

Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the *Available Signals* tab of the *Preferences* menu (octal/decimal/hex).

C1

C1 parameter, relevant for cell selection.

C2

C2 (reselect) parameter, relevant for cell selection (GSM phase II).

BTS

Name of the base station. This parameter is displayed if a valid BTS list is available. Detailed information can be obtained by double-clicking the BTS name.

Note:
R&S ROMES uses the BCCH and the BSIC to identify the BTS name. If the BTS assignment is ambiguous because several BTS with the same BCCH and BSIC are encountered, then a plus "+" sign precedes the BTS name.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

GSM Measurement Report Configuration

The *GSM Measurement Report* configuration menu defines the parameters to be viewed and shows information on the current view version. It is opened via a right mouse click on a point inside *GSM Measurement Report View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Configuration* tab selects the devices and their parameters to be displayed.

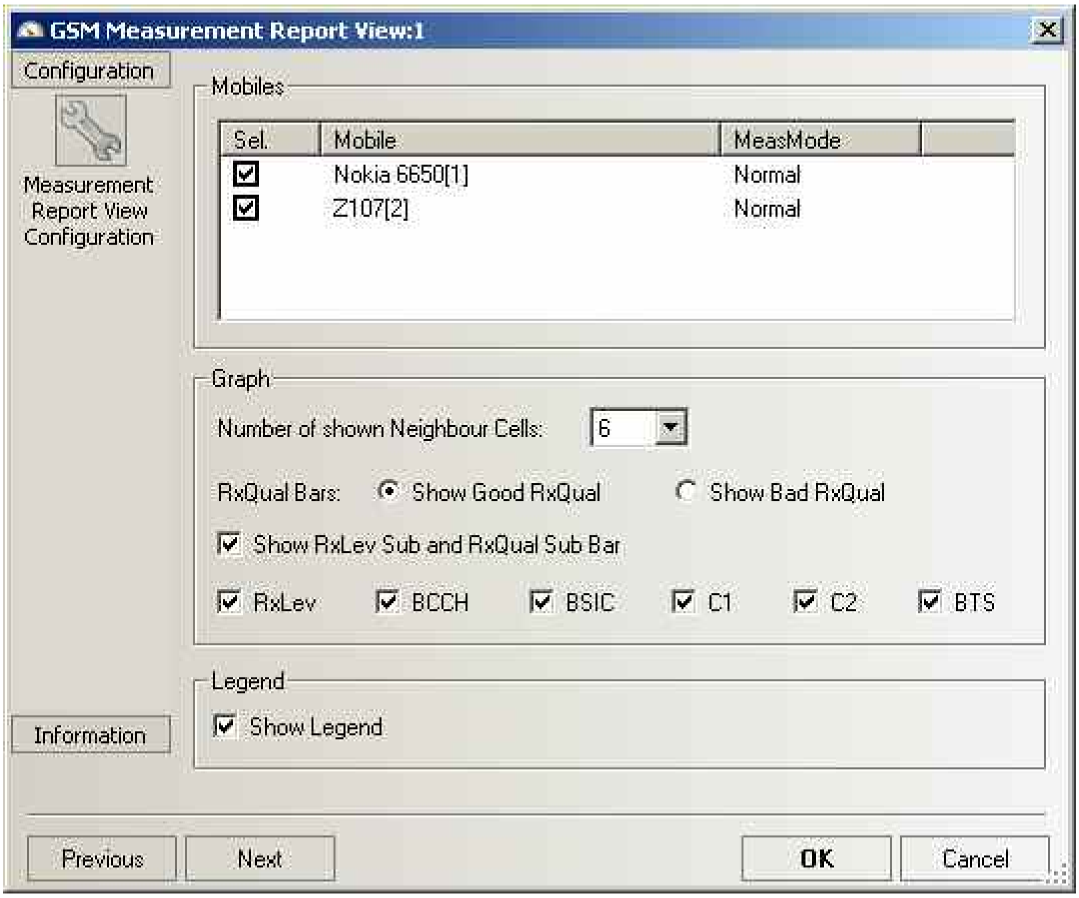


Fig. 4-160 GSM Measurement Report View: Configuration

Mobiles List of all mobiles measured with their measurement mode. An arbitrary number of mobiles can be selected from the list (click checkboxes). Only the receiver reports for selected mobiles are displayed in the *GSM Measurement Report View*.

Graph The *Graph* panel controls which type of measurement results are displayed. The number of neighbor cells must be in the range between 0 and 6. The *Show Bad RXQual* option button inverts the RxQual scale such that a long bar corresponds to a bad signal quality (0 is left, 7 is right). The checkboxes below switch the display of the corresponding measurement results on and off.

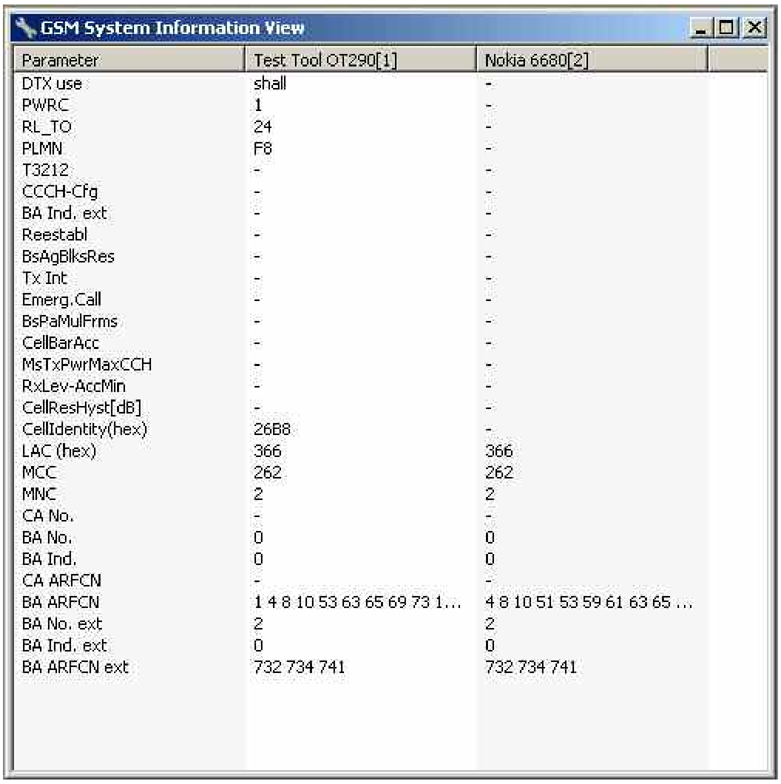
Legend To enlarge the diagram space, the legend below can be switched off.

OK Apply all *GSM Measurement Report View* settings and close the configuration menu.

Cancel Discard all *GSM Measurement Report View* settings and close the configuration menu.

GSM System Information View

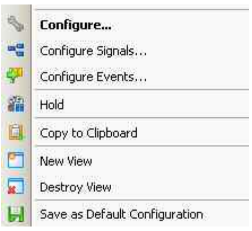
The *GSM System Information View* displays a selection of GSM parameters contained in the layer 3 messages *System Information Type 1* to *6* sent by the BTS, according to GSM recommendation 04.08. The values are shown for all mobiles used.



Parameter	Test Tool OT290[1]	Nokia 6680[2]
DTX use	shall	-
PWRC	1	-
RL_TO	24	-
PLMN	F8	-
T3212	-	-
CCCH-Cfg	-	-
BA Ind. ext	-	-
Reestabl	-	-
BsAgBlksRes	-	-
Tx Int	-	-
Emerg.Call	-	-
BsPaMulFrms	-	-
CellBarAcc	-	-
MsTxPwrMaxCCH	-	-
RxLev-AccMin	-	-
CellResHyst[dB]	-	-
CellIdentity(hex)	26B8	-
LAC (hex)	366	366
MCC	262	262
MNC	2	2
CA No.	-	-
BA No.	0	0
BA Ind.	0	0
CA ARFCN	-	-
BA ARFCN	1 4 8 10 53 63 65 69 73 1...	4 8 10 51 53 59 61 63 65 ...
BA No. ext	2	2
BA Ind. ext	0	0
BA ARFCN ext	732 734 741	732 734 741

Fig. 4-161 GSM System Information View

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

GSM System Information Configuration

The *GSM System Information View* configuration menu defines the parameters to be viewed and shows information on the current view version. It is opened via a right mouse click on a point inside the *GSM System Information View* or via the *Tools - Modules Configuration...* command (see chapter 3).

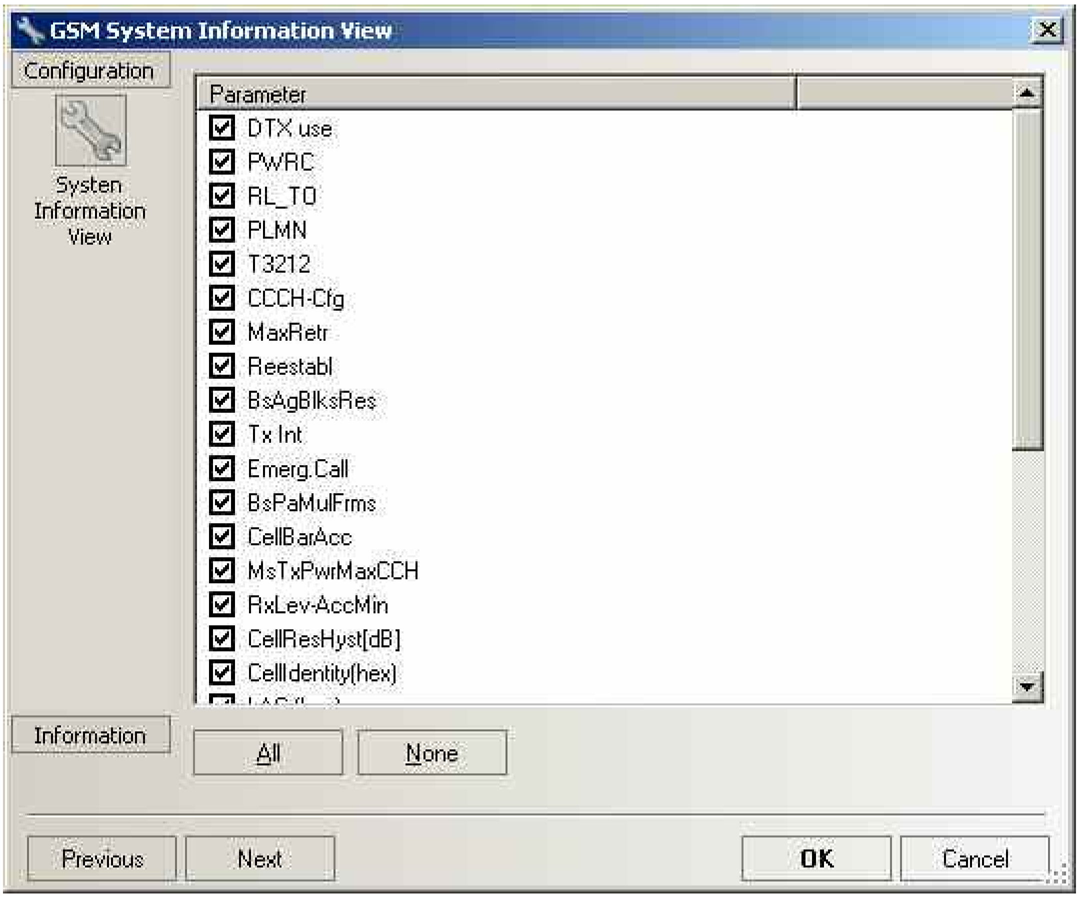


Fig. 4-162 GSM System Information View configuration: parameter list

In the *Parameters* list, the different types of information conveyed via layer 3 messages *System Information Type 1* to *6* can be selected by clicking the corresponding checkboxes.

The list contains all parameters listed in the following table:

Table 4-2 GSM System Information Type 1 to 6 parameters

DTX	Discontinuous Transmission	**RxLev-AccMin**	Min. received signal level at a MS for access to a cell
PWRC	Power Control Indicator	**CellResHyst [dB]**	RxLev hyster. required for Cell Reselection
RL_TO	Radio Link Timeout	**CellIdentity [hex]**	Cell Identity code
PLMN	Public Land Mobile Network	**LAC [hex]**	Location Area Code
T3212	Timeout Value	**MCC**	Mobile Country Code
Reestabl	Reestablishment Indicator	**MNC**	Mobile Network Code
BsAgBlksRes	No. of blocks on each CCCH reserved for access grant messages	**CA No.**	RF channel number in a particular cell (Numbering in a Cell Allocation)

CCCH-Config	Common Control Channel Configuration	**BA No.**	BCCH Allocation Number
Tx Int	Number of slot to spread transm.	**BA Ind.**	BCCH Allocation sequence number indication
Emerg.Call	Emergency call permission	**CA ARFCN**	Cell Allocation ARFCN
BsPaMulFrms	Transmisson of the same paging messages to MSs of the same paging group	**BA ARFCN**	BCCH Allocation ARFCN
CellBarAcc	Cell Access Barred	**BA No. ext**	extended BCCH Allocation Number
MsTxPwrMaxCCH	Max. allowed transmitted RF power	**BA Ind. ext**	extended BCCH Allocation sequence number indication
		BA ARFCN ext	extended BCCH Allocation ARFCN

See also GSM abbreviations in chapter 8. The extended BA parameters are relevant for network operators who work with two GSM bands (GSM900 and GSM1800) identified by two parameter sets, respectively.

GSM Frequency Hopping View

The *GSM Frequency Hopping View* shows the channel information of a GSM (or GPRS) connection that may or may not be operated in frequency hopping mode. The parameters are shown for all mobiles that are used in the current measurement or recorded in the replayed measurement file.

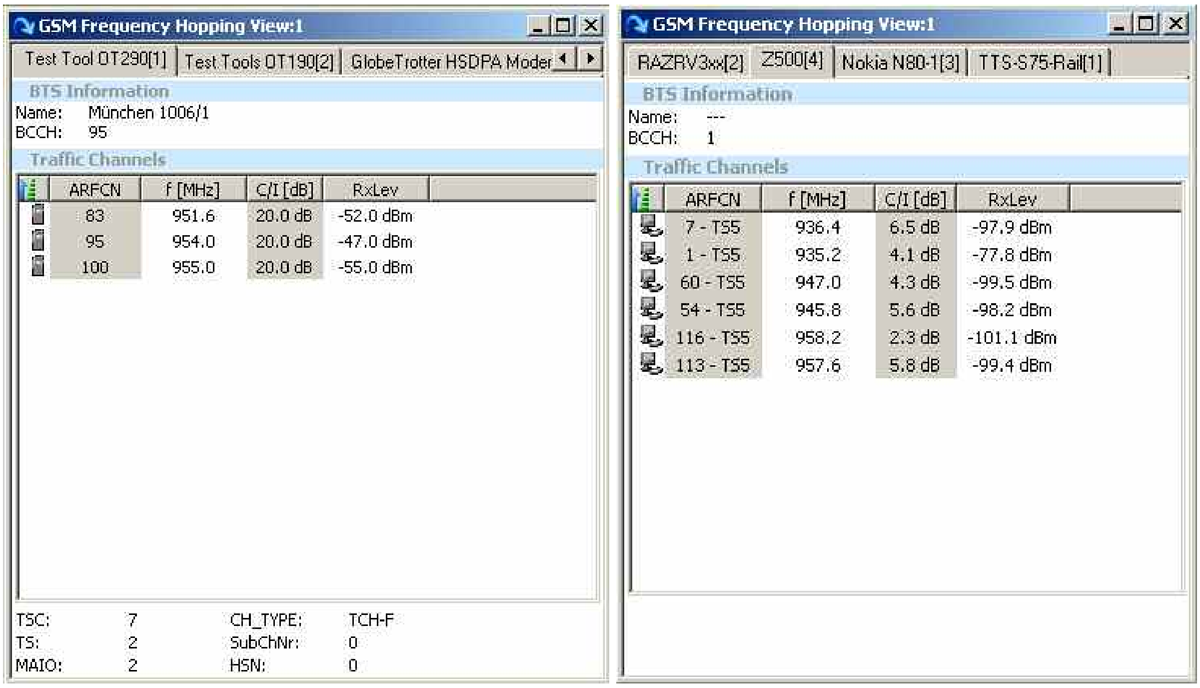


Fig. 4-163 GSM Frequency Hopping View

The hopping information provided by each mobile is displayed in a separate tab. Each tab is divided into two panels showing the properties of the BTS and the channel parameters of the RF connection, respectively.

BTS Information The upper panel indicates the channel number of the Broadcast Control Channel BCCH) plus the base station name, if a BTS list is available.

Traffic Channels *The panel below* BTS Info *shows the parameters of the RF connection.*

Channel list The channel list shows the sequence of GSM channel numbers *(ARFCN)* and frequencies used, together with the carrier-to-interference ratio *(C/I)* and RxLev value for each hopping frequency. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A blue arrow in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Some of the parameters may not be provided by all test mobiles. The *C/I* is provided by various test mobiles. The icons and denote what kind of service is used - CS Circuit Switched (mobile) and PS Packet Switched (PC). In case of a PS connection additionally the timeslot is provided. If frequency hopping is off, the list shows only one traffic channel. The list is empty if the mobile is in Idle mode.

Parameter list

The parameter list below the hopping channel list shows the properties of the dedicated connection. It is not shown while the connection is *Idle.* Some of the parameters may not be provided by all test mobiles.

TSC

Training sequence code of the RF channel.

TS

Traffic channel timeslot number of the connection.

MAIO

Mobile Allocation Index Offset in the range 0 to 63. The MAIO is only displayed if frequency hopping is on.

CH_Type

Channel type allocated for the connection: TCH-F *(full-rate traffic channel),* TCH-H *(half-rate traffic channel),* SDCCH/4 *or* SDCCH/8.

SubChNr

SDCCH sub-channel number as defined in section 7, tables 3 and 4 of standard 3GPP TS 05.02.

HSN

Hopping Sequence Number in the range 0 to 63. The HSN is only displayed if frequency hopping is on.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, put the view on hold, copy the current view to the clipboard, or to create or delete views; see *Context menu* description on p. 4.2.

The *GSM Frequency Hopping View* has no configuration menu. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

GSM Scan View

The *GSM Scan View* contains a diagram showing the signal level of every mobile in all GSM channels measured. The channel range depends on the mobile type (GSM900/E-GSM/GSM1800/GSM1900; see channel tables in chapter 8, *GSM Channels and Power Classes)* and of a possible restriction made in the *Measurement Mode* menu – see section *GSM Mobile Drivers* in chapter 6.

Note:

This control window is only useful in the Scan(ning) mode where the signal level in each channel but no other information is recorded. The GSM Scan View is empty for mobiles which are not set to Scan(ning) mode. On the other hand, a mobile in Scan(ning) mode does not contribute any information to be viewed in the 2G/3G Layer 3 View or 2G/3G NQA View.

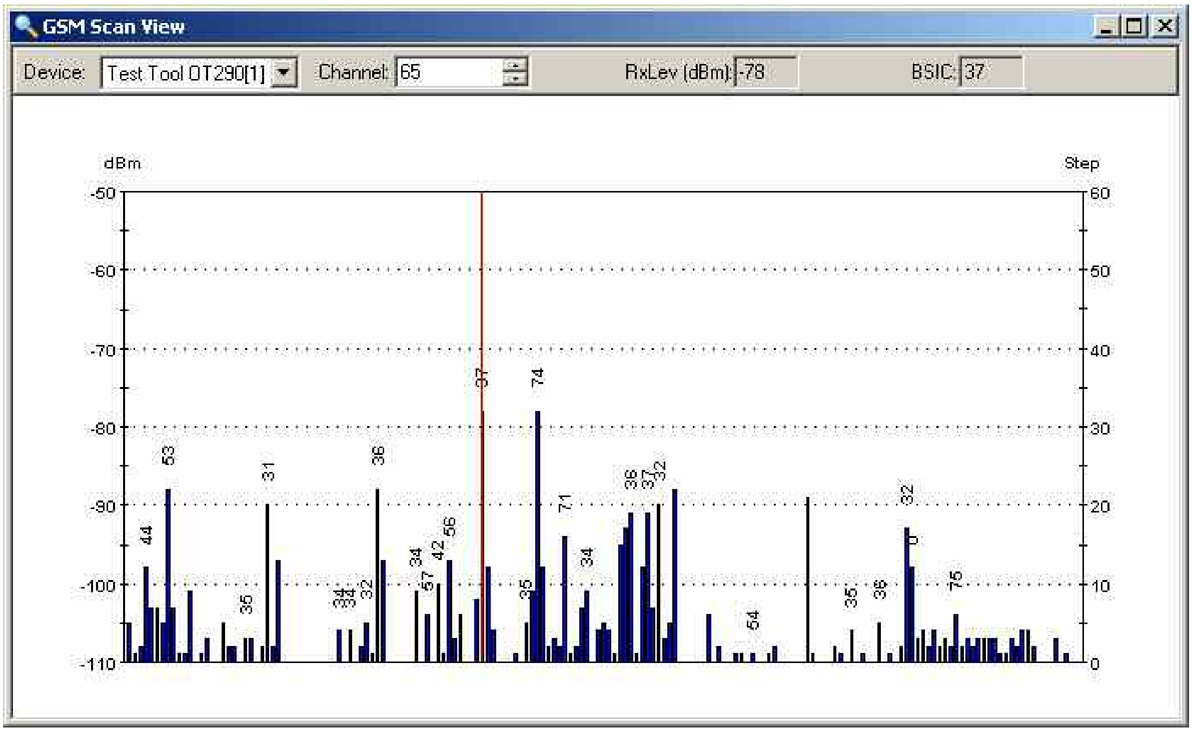


Fig. 4-164 GSM Scan View

Diagram

The diagram shows a colored bar for each channel and for the mobile indicated above. The channels are arranged in ascending order from the left to the right of the diagram; the length of each line corresponds to the signal strength recorded in the channel. The ordinate on the left side is labeled with a linear dBm scale defined in the configuration menu, the right ordinate with an inverse, linear step scale, 0 corresponding to –110 dB, 100 corresponding to –10 dB.

A red, vertical line marks the channel selected in the *Channel* input field above the diagram. The corresponding signal level is indicated in the *RxLev (dBm)* field. If available, the BSIC of the base station transmitting on the channel is indicated above the level bar.

Device list

The pull-down list on the left side above the diagram shows all mobiles measured. The signal power of the selected mobile is shown in the diagram.

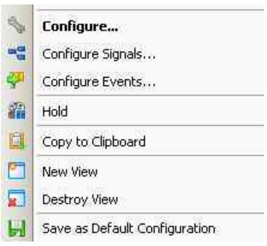
Channel

The *Channel* field to the right of the mobile list is used to select a single channel the level of which will be displayed in the *RxLev (dBm)* field. The channel position in the diagram is marked with a red, vertical line.

BSIC

The BSIC of the transmitting BTS can be decoded from each channel and displayed in the diagram (integer numbers on top of the bars). The BSIC of the selected channel is shown in the BSIC output box. This feature is available with OT1xx, and Sagem OT2xx test mobiles provided that BCCH Scan (Sagem) is selected in the Measurement Mode tab of the driver configuration menus (see chapter 6).

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration; see *Context menu* description on p. 4.2.

GSM Scan View Configuration

The *GSM Scan View* configuration menu defines the y-axis scale, i.e. the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *GSM Scan view*. It is opened via a right mouse click on a point inside the *GSM Scan View* or via the *Tools - Modules Configuration...* command (see chapter 3).

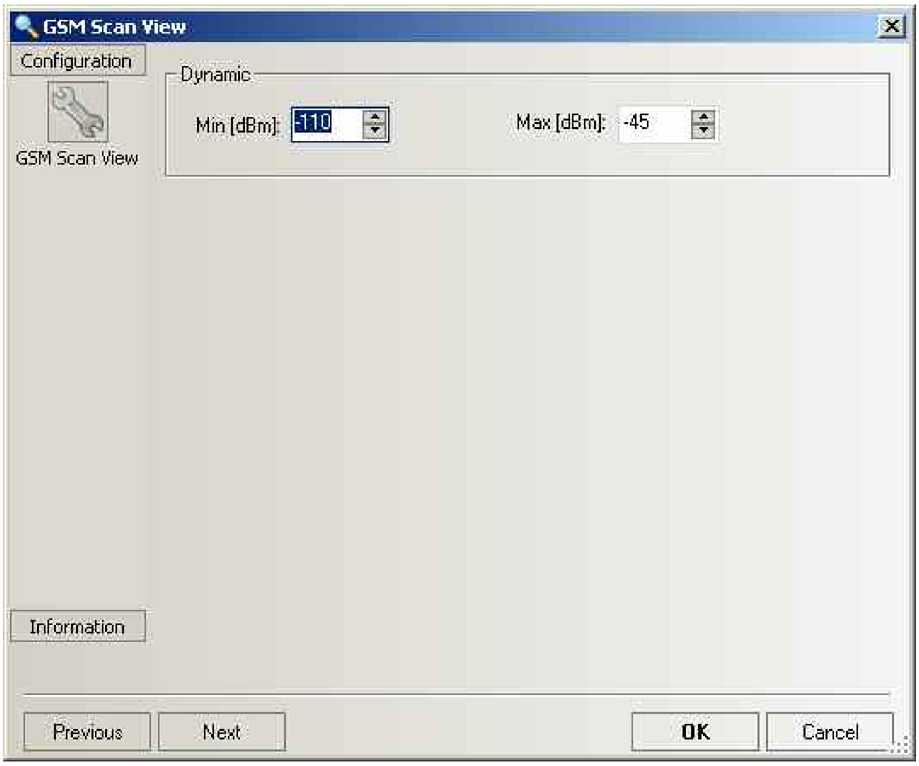


Fig. 4-165 GSM Scan View configuration: parameter list

GSM QoS View

The *GSM QoS View* displays a statistical evaluation of important layer 3 (*Location Area Update, GSM Handover),* mobility management *(GPRS Attach/Detach, Routing Area Update)* and packet routing *(Activate/Deactivate PDP Context)* procedures performed by mobile phones supporting GPRS. The procedures are described in standard 3GPP TS 23.060.

The statistical evaluation is a measure for the Quality of Service of a packet data connection. It is made for all mobiles that are used in the current measurement or recorded in the replayed measurement file. Several types of GSM test mobiles provide GSM QoS data, refer to Mobiles to provide GPRS Parameters on p.4.255.

In the *QoS Tests* tab of the SAGEM x6 driver configuration menu, GPRS attach/detach, PDP context activate/deactivate and location area update can be set to be initiated periodically.

The QoS parameters describing the data throughput of a GPRS connection can be displayed in other views; see e.g. section *GSM GPRS RLC/MAC View* on p. 4.259.

Fig. 4-166 GSM QoS View

Only actions that actually occur during the measurement are shown in the view (e.g. if no GSM handover is done, then the *GSM Handover* section is not displayed). Moreover, the view contents and the diagram size can be selected in the configuration menu.

The evaluation is analogous for all actions. The results are displayed in a diagram area and a table comprising three rows:

Diagrams

The diagram area is divided into two sections:

- The left diagram shows the total number of actions attempted by the GPRS mobile or the network *(blue, question mark),* the number of successful actions *(green, checkmark),* and the number of failed actions *(red, cross)*. In each category, the time statistics is visualized by means of a bar: The minimum, average, and maximum time needed to perform the actions corresponds to the bottom, the black horizontal line and the top of the bar. The time for mobile-initiated actions is measured from the time the mobile transmits the *... REQUEST* message to the time it receives the response from the network.
- The right diagram represents a pie chart showing the relative numbers of *Success* and *Failed* actions.

Short times indicate a good Quality of Service. The number of attempted actions *(Count)* equals to the sum of *Success, Failed* and *No Response* actions; see below.

Success

Number of actions that could be successfully terminated, together with the minimum *(Min. Time)*, average *(Avg. Time),* and maximum time *(Max. Time)* of all these actions, expressed in ms. A large percentage of actions in this category indicates a good Quality of Service.

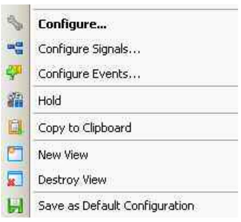
Failed

Number of actions that were started but had to be unsuccessfully terminated, together with the minimum *(Min. Time)*, average *(Avg. Time),* and maximum time *(Max. Time)* of all these actions, expressed in ms.

No Response

Number of actions that failed because the mobile could not get any response from the network.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

GSM QoS View Configuration

The *GSM QoS View Configuration* tab of the configuration menu selects the actions to be evaluated in the view and defines the size of the diagrams. It is opened via a right mouse click on a point inside the *GSM QoS View* or via the *Tools - Modules Configuration...* command (see chapter 3).

Clearing a procedure in the *Available QoS Actions* list hides the corresponding section in the view.

Restricting the viewed actions makes it easier to read the view if only a subset of the available actions is needed. To restrict the number of actions measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

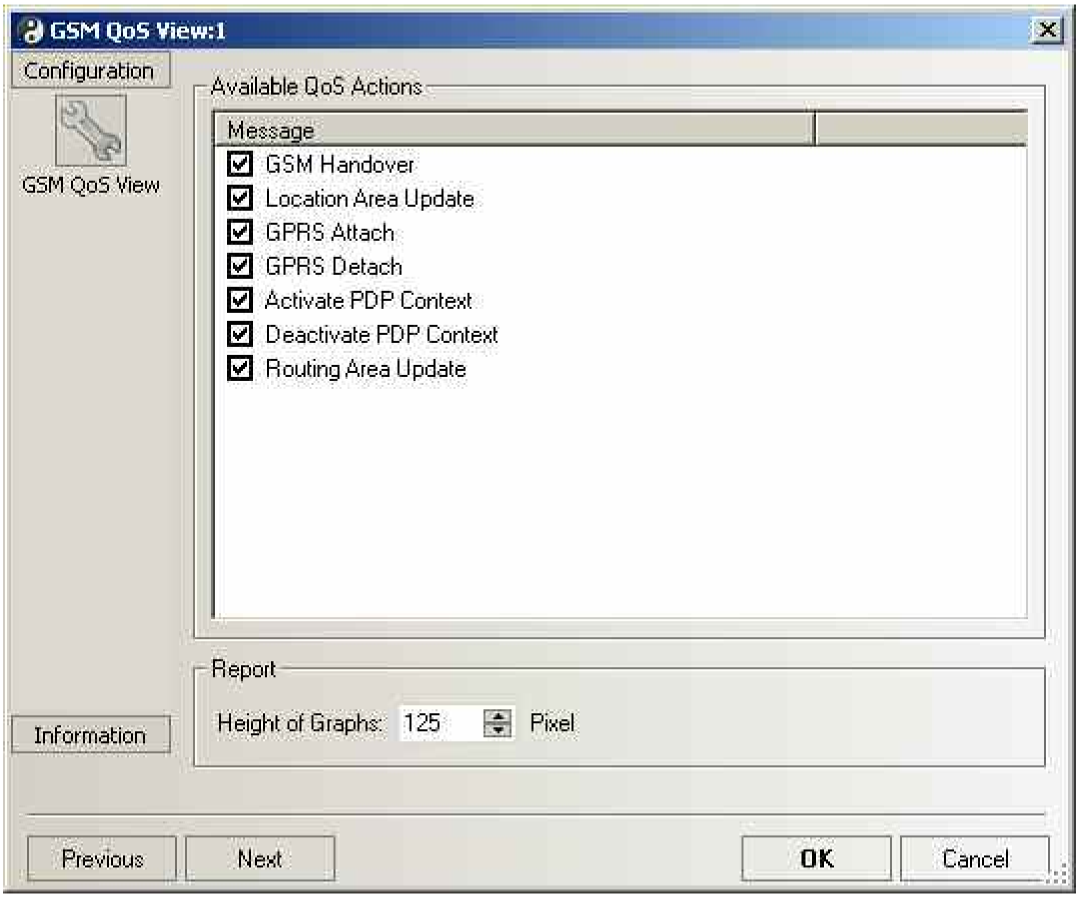


Fig. 4-167 GSM QoS View: GSM QoS View Configuration

Report - Height of Graphs Height of each graph in the range between 100 and 1000 pixels. The view can be scrolled if the height of the graphs and their number is increased.

GSM Dedicated 3G Cell List View

The *GSM Dedicated 3G Cell List View* shows an overview of the measured 3G cell parameters.

The view is empty unless the test mobile is configured to record the GSM 3G cell-related messages; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

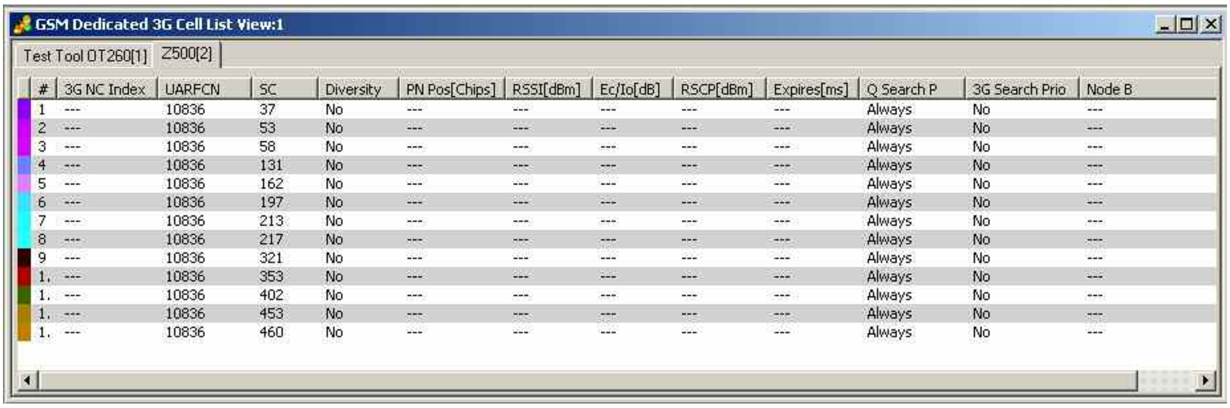


Fig. 4-168 GSM Dedicated 3G Cell List View

The results for each mobile are arranged in a separate tab.

Cell List

The cell list comprises the most important parameters of the serving cell and all other cells that are currently used for the connection; its members are permanently monitored and updated by the network.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the Colors *tab of the configuration menu. The SC color codes are also described in the paragraph on scrambling code indication on p. 4.53.*

#

Sequence number for the cell, assigned in chronological order and always starting with 1.

3G NC Index

Index of the cell in the 3G Neighborhood Cell List.

UARFCN

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal.
The carrier frequency is equal to f = 0.2 MHz * UARFCN

SC

Primary scrambling code of the signal in the format selected in the TEC for UMTS Test Mobiles *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. The primary SC is used to identify the cell.*

Diversity

Downlink transmit diversity scheme for the CPICH: STTD *(Space Time Transmit Diversity)*, TSTD *(Time Switched Transmit Diversity),* SSDT *(Site Selection Diversity Transmit Power Control), or* No Diversity

PN Pos. [Chips]

PN position in Chips, ranging from 0 to 38399.

RSSI [dBm]

The received signal strength indicator of the cell on the forward traffic channel, ranging from –109 to –21 dBm.

E_c/I_o [dB]

Ratio of the received energy per PN chip for the signal to the total received power spectral density on the P-CPICH. E_c/I_o *is obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.*

RSCP

CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.

Expires [ms]

Time until this cell loses its known status.

Q Search P

Quality threshold for reselection. L1 searches for 3G cells if the signal level is below or above the threshold value.

3G Search Prio

Flag indicating if the idle frames in dedicated or packet transfer mode can be used with priority for 3G measurements, when BSIC decoding is required.

Node B

Name of the node B, taken from the UMTS Node B database (if available).

The SC *value for each active set element generates signals in the* UMTS – <Device> – Active Set *branch of the data tree.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration; see *Context menu* description on p. 4.2.

GSM Dedicated 3G Cell List View Configuration

The *GSM Dedicated 3G Cell List View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *GSM Dedicated 3G Cell List View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *GSM Dedicated 3G Cell List View* tab displays the complete parameter set to be displayed in the *cell list* Clearing a parameter hides the column in the table.

TIP Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

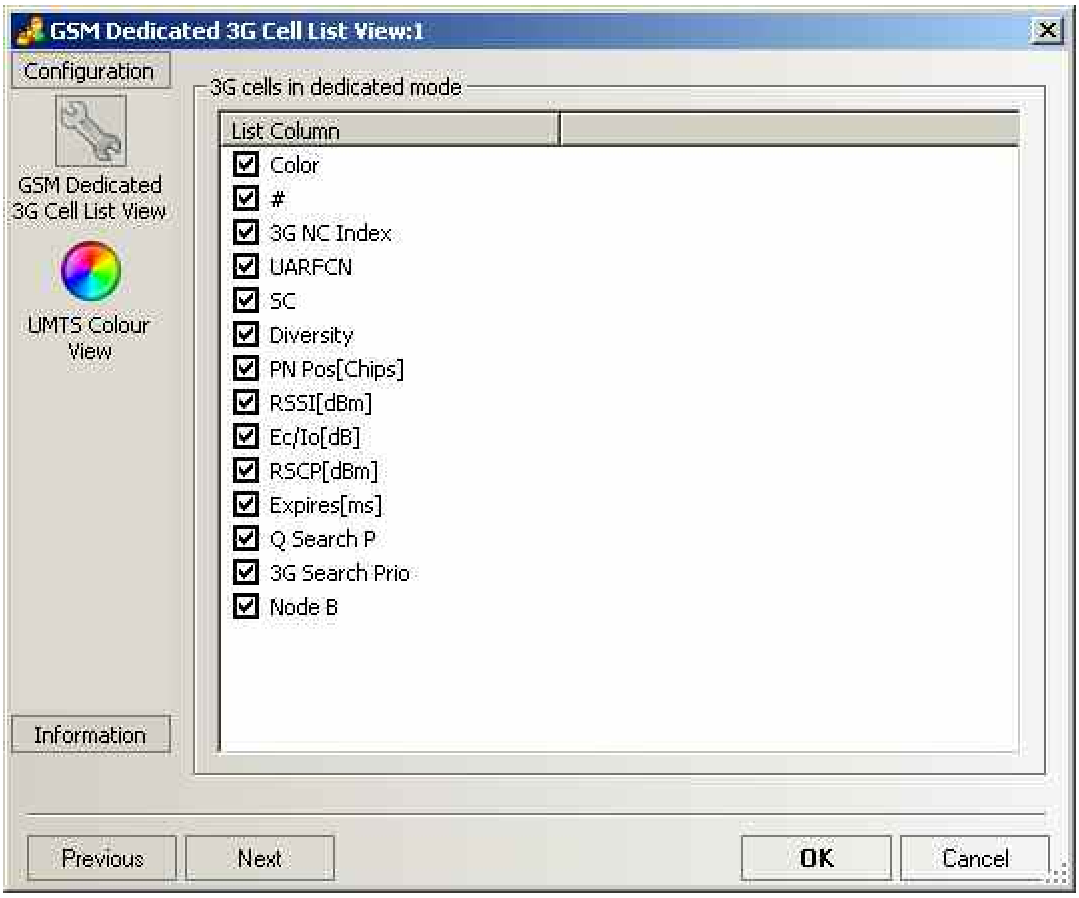


Fig. 4-169 GSM Dedicated 3G Cell List View: Configuration

The *GSM Dedicated 3G Cell List View* tab selects the list information to be displayed in the cell list.

The *UMTS Color View* tab of the *GSM Dedicated 3G Cell List View* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section PNS CPICH View on p. 4.378.

GSM Idle 3G Cell List View

The *GSM Idle 3G Cell List View* shows an overview of the 3G cell parameters for measured idle cells.

The view is empty unless the test mobile is configured to record the GSM 3G idle cell-related messages; see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

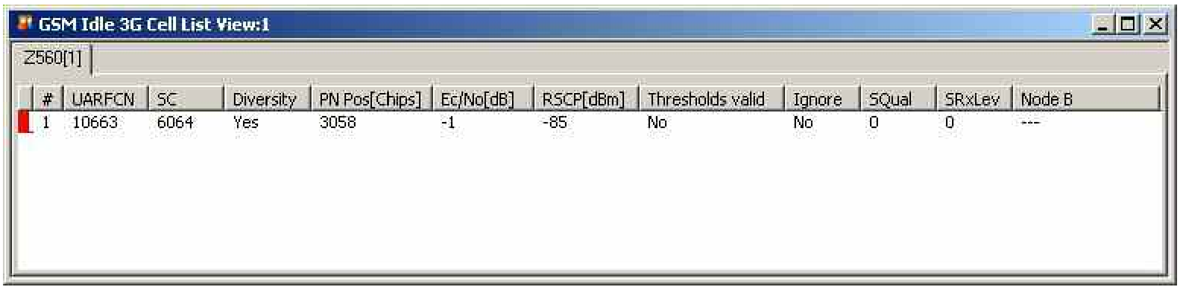


Fig. 4-170 GSM Idle 3G Cell List View

The results for each mobile are arranged in a separate tab.

Cell List

The cell list comprises the most important parameters of the 3G cells that are currently available for the connection; its members are permanently monitored and updated by the network.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the Colors *tab of the configuration menu. The SC color codes are also described in the paragraph on scrambling code indication on p. 4.53.*

#

Sequence number for the cell, assigned in chronological order and always starting with 1.

UARFCN

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal.
The carrier frequency is equal to f = 0.2 MHz * UARFCN

SC

Primary scrambling code of the signal in the format selected in the TEC for UMTS Test Mobiles *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. The primary SC is used to identify the cell.*

Diversity
: *Downlink transmit diversity scheme for the CPICH:* STTD *(Space Time Transmit Diversity)*, TSTD *(Time Switched Transmit Diversity),* SSDT *(Site Selection Diversity Transmit Power Control), or* No *Diversity*

PN Pos. [Chips]
: *PN position in Chips, ranging from 0 to 38399.*

E_c/N_o [dB]
: *Ratio of the received energy per chip to the total received power density in the band.*

RSCP [dBm]
: *Unbiased Integral Received Signal Code Power for all measured peaks in dBm.*

Thresholds valid
: *Indicates if GSM L1 should apply cell reselection criterion S to be reported to the RR layer (see standard 3GPP TS 25.304).*

Ignore
: *Indicates if GSM L1 is not supposed to report this cell to the RR layer.*

SQual
: *Cell Selection Quality quality value, this parameter is used in the cell reselection criterion S.*

SRxLev
: *Cell Selection RxLevel value, this parameter is used in the cell reselection criterion S.*

Node B
: *Name of the closest node B with the corresponding SC and ARFCN.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, copy the current view to the clipboard, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

GSM Idle 3G Cell List View Configuration

The *GSM Dedicated 3G Cell List View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *GSM Dedicated 3G Cell List View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *GSM Dedicated 3G Cell List View* tab displays the complete parameter set to be displayed in the *cell list* Clearing a parameter hides the column in the table.

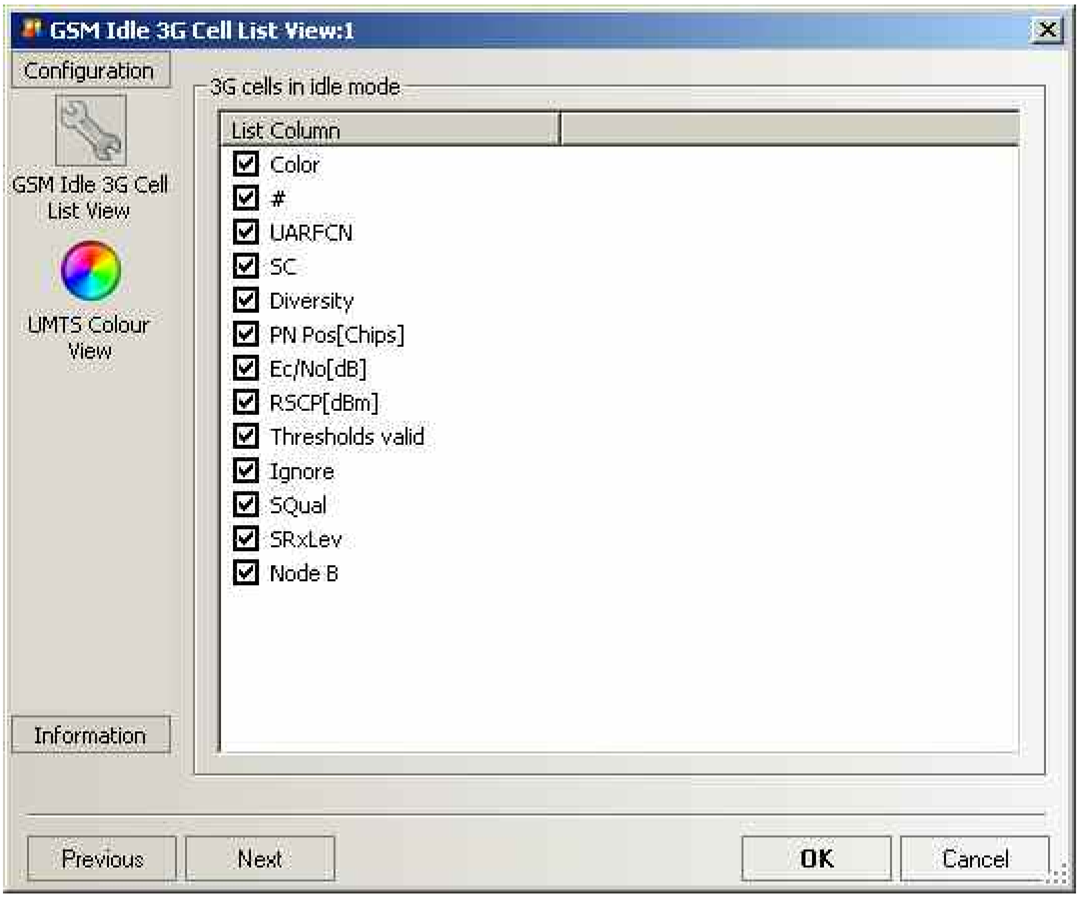


Fig. 4-171 GSM Idle 3G Cell List View: Configuration

The *GSM Idle 3G Cell List View* tab selects the list information to be displayed in the cell list.

The *UMTS Color View* tab of the *GSM Idle 3G Cell List View* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

GSM RR 3G Reselection Measurements View

The *GSM RR 3G Reselection Measurements View* shows an overview of the measured Radio Resource 3G reselection parameters.

The view is empty unless the test mobile is configured to record the GSM RR-related messages*;* see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

Fig. 4-172 GSM RR 3G Reselection Measurements View

The results for each mobile are arranged in a separate tab.

Cell List

The cell list comprises the most important parameters of the 3G cells that are involved in layer 3 RR reselection measurements.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the Colors *tab of the configuration menu. The SC color codes are also described in the paragraph on scrambling code indication on p. 4.53.*

#

Sequence number for the cell, assigned in chronological order and always starting with 1.

UARFCN

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal.
The carrier frequency is equal to f = 0.2 MHz * UARFCN

SC

Primary scrambling code of the signal in the format selected in the TEC for UMTS Test Mobiles *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. The primary SC is used to identify the cell.*

Diversity

Downlink transmit diversity scheme for the CPICH: STTD *(Space Time Transmit Diversity)*, TSTD *(Time Switched Transmit Diversity),* SSDT *(Site Selection Diversity Transmit Power Control), or* No *Diversity*

RSCP [dBm]
: *Unbiased Integral Received Signal Code Power for all measured peaks in dBm.*

5s Timer State
: *State of the 5s Timer (Stopped / Running / Expired)*

Node B
: *Name of the closest node B with the corresponding SC and ARFCN.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default, or move to another worksheet; see *Context menu* description on p. 4.2.

GSM RR 3G Reselection Measurements View Configuration

The *GSM RR 3G Reselection Measurements View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *GSM RR 3G Reselection Measurements View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *GSM RR 3G Reselection Measurements View tab* displays the complete parameter set to be displayed in the cell list Clearing a parameter hides the column in the table.

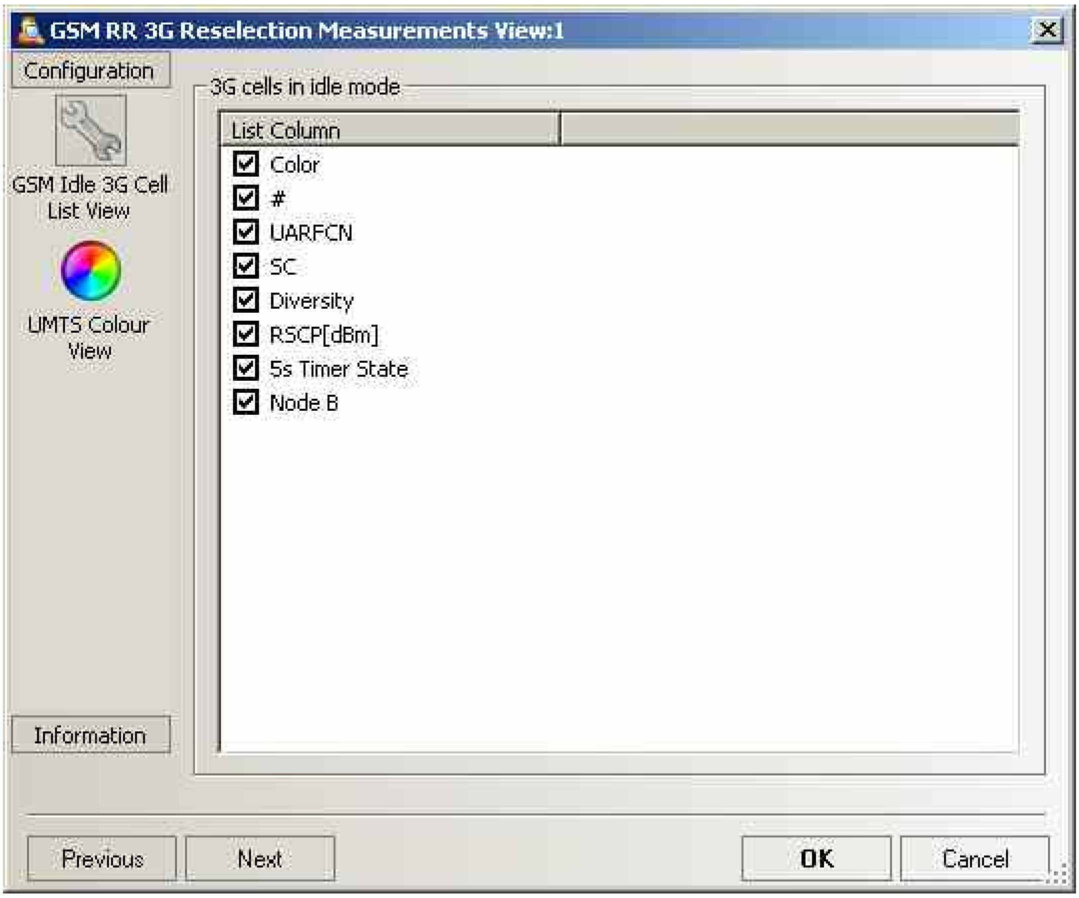


Fig. 4-173 GSM RR 3G Reselection Measurements View: Configuration

The *GSM RR 3G Reselection Measurements View* tab selects the list information to be displayed in the cell list.

The *UMTS Color View tab* of the *GSM RR 3G Reselection Measurements View* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

GSM Rejected 3G Cells View

The *GSM Rejected 3G Cells View* shows an overview of the determined 3G cell parameters for rejected cells.

The view is empty unless the test mobile is configured to record the GSM L3 RR 3G rejected cell-related messages*;* see description of the *Expert Mode* tab of the driver configuration menu in chapter 6.

Fig. 4-174 GSM Rejected 3G Cells View

The results for each mobile are arranged in a separate tab.

Cell List

The cell list comprises the most important parameters of the 3G cells that have a registration result of "rejected"; its members are permanently monitored and updated by the network.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Color Symbol

Color code for the Primary SC as defined in the Colors *tab of the configuration menu. The SC color codes are also described in the paragraph on scrambling code indication on p. 4.53.*

#

Sequence number for the cell, assigned in chronological order and always starting with 1.

UARFCN

UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal.
The carrier frequency is equal to f = 0.2 MHz * UARFCN

SC

Primary scrambling code of the signal in the format selected in the TEC for UMTS Test Mobiles *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. The primary SC is used to identify the cell.*

Diversity
: *Downlink transmit diversity scheme for the CPICH:* STTD *(Space Time Transmit Diversity)*, TSTD *(Time Switched Transmit Diversity),* SSDT *(Site Selection Diversity Transmit Power Control), or* No *Diversity*

Type
: *Reject type as defined by Radio Resource Control (RRC):* Threshold *(RRC delivered a threshold) or* Timer *(RRC delivered a timer value)*

Reason
: *Reason for the rejection. Possible reasons include: NONE, INVALID_STATE, CELL_BARED, PLMN_MISMATCH, LOW_S_VALUE, AQUISITION_FAIL, SIBS_FAILED_LOWER_LAYERs, INVALID_SIBS, SIBS_TIMEOUT, SIBS_FAILED_OTHER, FORBIDDEN_LA, CELL_QUAL_FAILURE, CELL_NOT_SUITABLE, CELL_NOT_EVALUATED, or CELL_CHANGE_FAILURE*

Timer Value
: *Time (in seconds) when the same cell should be reconsidered.*

SQual min.
: *Minimum Cell Selection Quality value [dB], the parameter is used in the cell reselection criterion S for FDD cells.*

RxLev min.
: *Threshold value [dBm] to be applied to Ec/No measurements*

Node B
: *Name of the closest node B with the corresponding SC and ARFCN.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

GSM Rejected 3G Cells View Configuration

The *GSM Rejected 3G Cells View* configuration menu selects the columns in the view tables, defines the SC color scheme and displays information about the view version. It is opened via a right mouse click on a point inside *GSM Rejected 3G Cells View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *GSM Rejected 3G Cells View tab* displays the complete parameter set to be displayed in the cell list Clearing a parameter hides the column in the table.

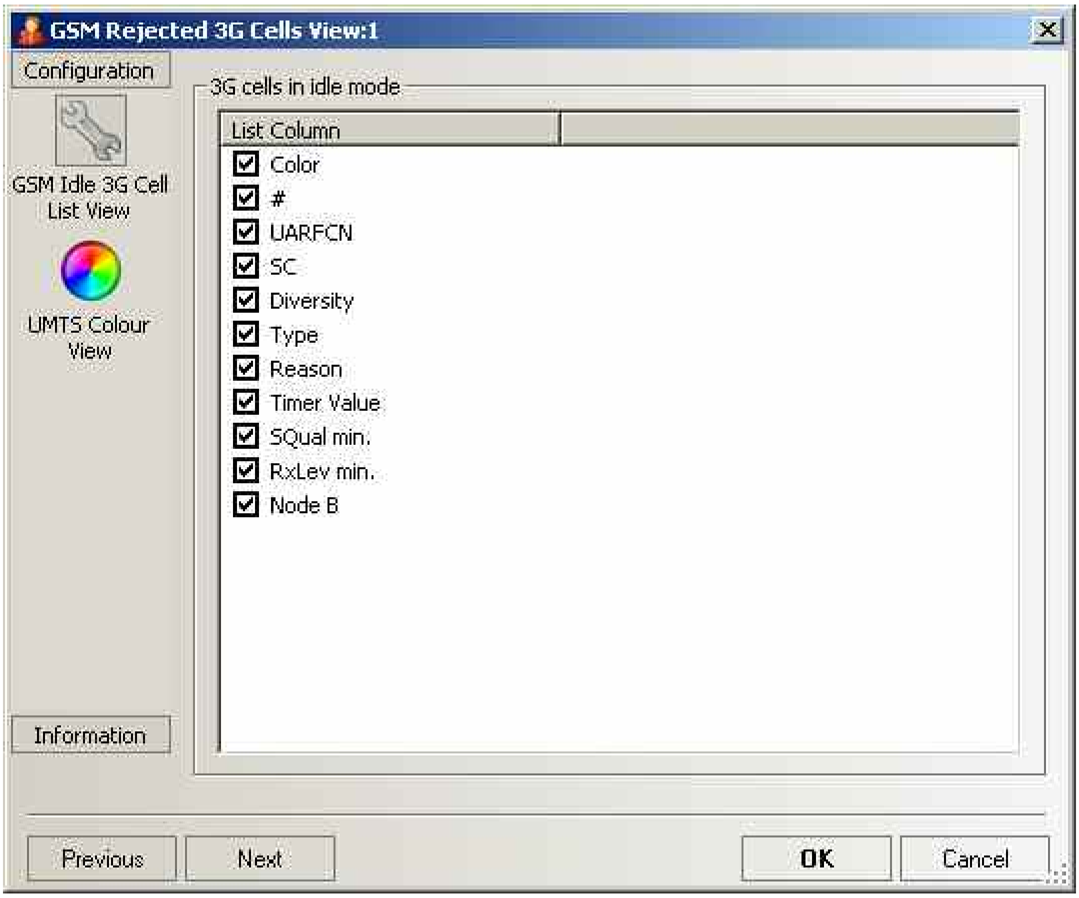


Fig. 4-175 GSM Rejected 3G Cells View: Configuration

The *GSM Rejected 3G Cells View* tab selects the list information to be displayed in the cell list.

The *UMTS Color View* tab of the *GSM Rejected 3G Cells View* configuration menu is analogous to the *Color Settings* tab of the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

GSM RR 3G Reselection Measurements Parameters View

The *GSM RR 3G Reselection Measurements Parameters View* shows the parameters used for the Radio Resource 3G Reselection measurements described in the previous sections.

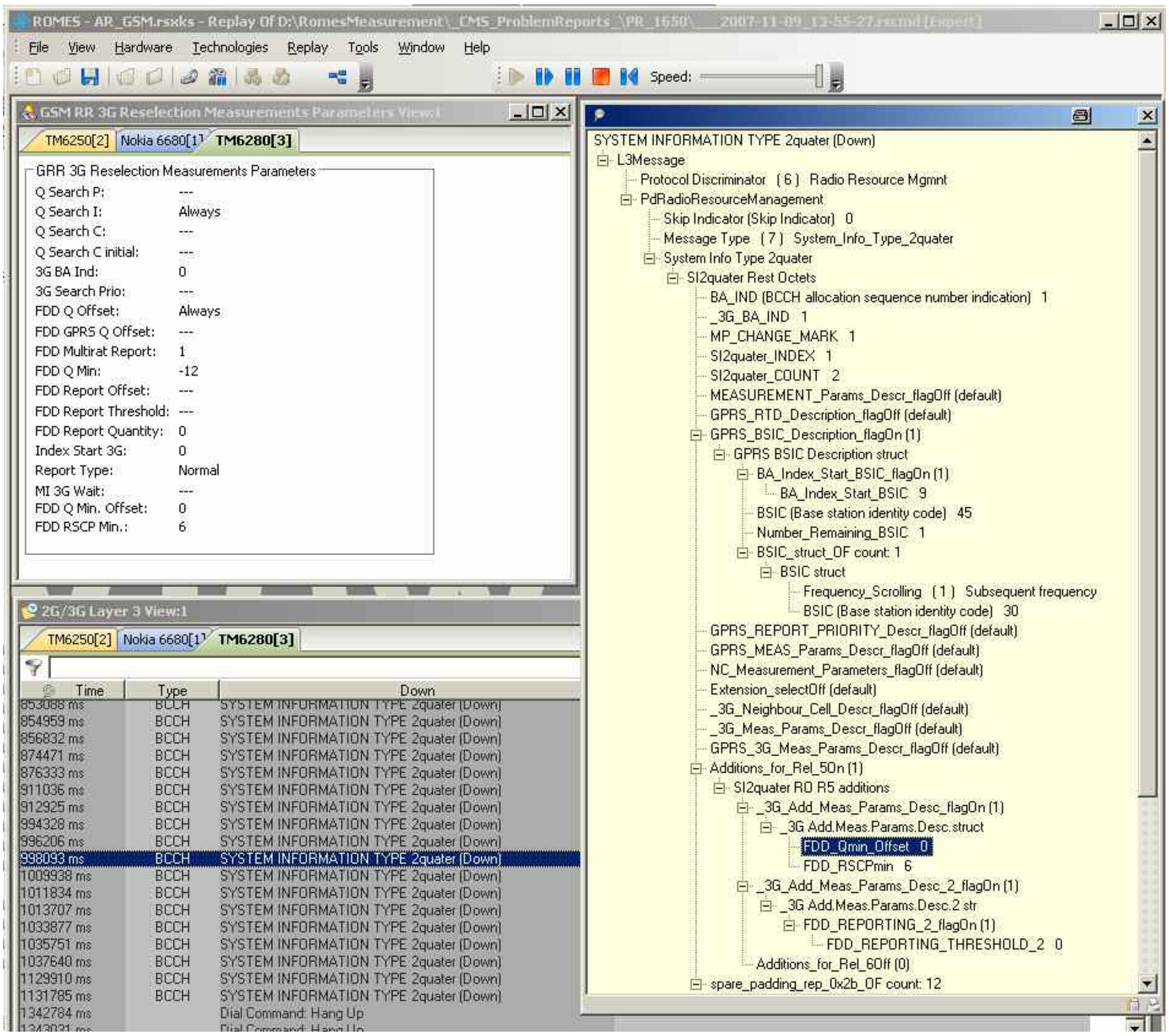


Fig. 4-176 GSM RR 3G Reselection Measurements Parameters View

GSM 3G Reselection Measurement Parameters

The GSM RR 3G Reselection Measurements Parameters View panel displays the parameters used for the Radio Resource 3G Reselection measurements described above. Additional information on these parameters is available in standard 3GPP TS 51.010.

Q Search P Q Search P defines a threshold and also indicates whether these measurements shall be performed when RLA_P of the serving cell is below or above the threshold.

Q Search I For a multi-RAT MS, cells or frequencies with other radio access technologies may be included in 3G Cell Reselection list (see 3GPP TS 04.18). The network controls the measurements for reselection of idle cells by the parameter Qsearch_I broadcast on BCCH.

	Qsearch_I defines a threshold and also indicates whether these measurements shall be performed when RLA_C of the serving cell is below or above the threshold. The value of 7 indicates to always search for neighboring 3G cells, a value of 15 disables the search. Search for 3G cells if signal level is below (0-7) or above (8-15) threshold 0 = - 98 dBm, 1 = - 94 dBm, … , 6 = - 74 dBm, 7 = ∞ (always), 8 = - 78 dBm, 9 = - 74 dBm, … , 14 = - 54 dBm, 15 = ∞ (never). Default value = ∞ (never).
Q Search C	As defined in 3GPP TS 45.008, the Q Search C parameter defines a threshold and also indicates whether the mobile measures 3G cells when the average signal level (RxLevel) of the BCCH carrier is below (0-7) or above the threshold (8-15). The value of 7 indicates to always search for neighboring 3G cells, a value of 15 disables the search. Search for 3G cells if signal level below threshold (0-7): - 98, - 94, … , - 74 dBm, ∞(always) or above threshold (8-15): - 78, - 74, … , - 54 dBm, ∞(never)
Q Search C initial	Indicates the Q Search Cvalue to be used in connected mode before Q Search C is received, 0 = use Q Search I, 1 = ∞(always). Default value = use Q Search I.
3G BA Ind.	The 3G_BA_IND message type parameter is needed to identify set of 3G Neighbor Cell information used for reporting in dedicated mode. The value received is reflected in the Measurement Report and Enhanced Measurement Report messages as described in standard 3GPP TS 04.18.
3G Search Prio	This parameter indicates if 3G cells may be searched when BSIC decoding is required. With 3G Search Prio set to On, the MS attempts to demodulate the SCH on the BCCH carrier of as many surrounding cells as possible, and to decode the BSIC as often as possible, as a minimum at least once every 10 seconds. A multi-RAT MS is allowed to extend this period to 13 seconds, if the neighbour cell list contains cells from other RATs. With 3G Search Prio set to Off, the BSIC is also decoded, but only 2G neighbor cells are monitored.
FDD Q Offset	*FDD Q min*, *FDD Q Offset* and optionally *FDD RSCP min* and *FDD Qmin Offset* are broadcast on BCCH of the serving cell. *FDD Q Offset* applies an offset to *FDD Q min* value: 0 = 0 dB, 1 = 2 dB, 2 = 4 dB, 3 = 6 dB, 4 = 8 dB, 5 = 10 dB, 6 = 12 dB, 7 = 14 dB. Default value = 0 dB.
FDD GPRS Q Offset	Applies an offset to RLA_P for cell re-selection to access technology/mode: default is –12dB.
FDD MultiRAT	The parameter *FDD MultiRAT Report* indicates a num-

Report	ber of cells to be reported in a measurement, e.g. "1" (one cell) report message and does not include the number of places taken by RSSI reporting in the measurement report message. If no measurements have been performed on a cell since last report, the cell shall not be included in the report. The *FDD MultiRAT Report* parameter is broadcast on BCCH and PBCCH. An MS attached to GPRS uses the parameter broadcast on PBCCH if it exists. In all other cases, the MS uses the parameters broadcast on BCCH.
FDD Q Min.	*FDD Q min* is defined as the minimum threshold for Ec/No for UTRAN FDD cell reselection, its default value is -12 dB.
FDD Report Offset	The *FDD Report Offset* parameter applies an offset to the reported value when prioritising the cells for reporting for GSM frequency band or access technology/mode FDD. Possible values are: 0 (0 dB), 1 (6 db), … , 7 (42 dB). The default value is 0 dB.
FDD Report Threshold	The *FDD Report Threshold* parameter applies priority reporting if the reported value is above the thus defined threshold for GSM frequency band or access technology/mode FDD. The default value is "always"
FDD Report Quantity	The parameter FDD Report Quantity is used to specify whether the MS reports the results of the P-CPICH level measurement of the neighboring 3G cells as RSCP or as E_c/N_o. e.g. 0 = RSCP, 1 = E_c/N_o
Index Start 3G	Each 3G Neighbour Cell Description received is added to the 3G Neighbour Cell list, starting with the index equal to the parameter *Index Start 3G*. If this parameter is not present then the value 0 is used. For each 3G Neighbour Cell Description, the cells are indexed in the following order: 1) UTRAN FDD cell ARFCNs are indexed in the order of occurrence in the 3G Neighbour Cell description. Then, for each FDD ARFCN, the cells are indexed in the order of increasing values of the decoded FDD_CELL_INFORMATION parameters. 2) UTRAN TDD cell ARFCNs are indexed in the order of occurrence in the 3G Neighbour Cell description. Then, for each TDD ARFCN, the cells are indexed in the order of increasing values of the decoded TDD_CELL_INFORMATION parameters. 3) CDMA 2000 cells are indexed in the order of occurrence in the 3G Neighbour Cell description.
Report Type	The condition for sending the Packet Enhanced Measurement Report message instead of the Packet Measurement Report message is based on the *Report Type* parameter and if the MS has received BSIC information for all cells.
MI 3G Wait	The 3G Neighbour Cell list (either from SI2quater or from PSI3quater) is used for reporting when the MS enters dedicated mode, until the MS has received a

given number of instances of Measurement Information (MI) messages that contain 3G Neighbour Cell Description. This number of instances is defined by the *MI 3G-Wait* parameter.

FDD Q Min. Offset — *FDD Q Min. Offset* is extracted from the Layer 3 message SI2quater. The parameter applies an offset to the minimum threshold for Ec/No for UTRAN FDD cell reselection.

FDD RSCP Min. — FDD RSCPA Min. is extracted from the Layer 3 message SI2quater. The parameter defines the minimum value for Received Signal Code Power (RSCP) for FDD.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration; see *Context menu* description on p. 4.2*.*

The *GSM RR 3G Reselection Measurements Parameters View* has no specific configuration menu. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

GSM Neighbourhood Analyser View

The *GSM Neighbourhood Analyser View* shows the results of the neighborhood analysis of option R&S ROMES3HOA. The objective of this analysis is to reveal possible conflicts between the current serving cell and the transmitters in the neighborhood in order to assess the general condition of a UMTS / GSM network. To this end the neighborhood analyzer post-processes GSM test mobile, and GSM scanner data (e.g. TopN data) and compares them with the information stored in a BTS database (see description of ATD files in chapter 7, in particular the neighbor cell column 2GNC). In case of a mismatch between the detected BTSs and the BTSs in the database, an alarm is generated. The same holds if a missing neighbor of the serving cell is found.

The neighborhood analysis requires option R&S ROMES3HOA, *Handover and Neighborhood Analysis.* PN scanner data recorded with an R&S TSMx are needed. Data from a UMTS test mobile and GSM scanner data can be used in addition to refine and extend the analysis.

The neighborhood analyzer is a performance-critical tool which must be activated explicitly in the *GSM Neighbourhood Analyser View* configuration menu.

Normally it is expected that the serving cell and the configured neighbors are in the TopN list of strongest stations.

Any differences (missing neighbours) can be used for optimization of the neighbour configuration.

The *GSM Neighbourhood Analyzer* uses information from three sources:

- Measurement results from the GSM Network Scanner
- Measurement results from GSM test mobiles in dedicated mode
- Configuration information from the GSM BTS database

TIP The UMTS/GSM Handover Analysis of inter-RAT handovers, which is also part of option R&S ROMES3HOA, is evaluated in the UMTS/GSM Handover Analyzer View; see p. 4.325.

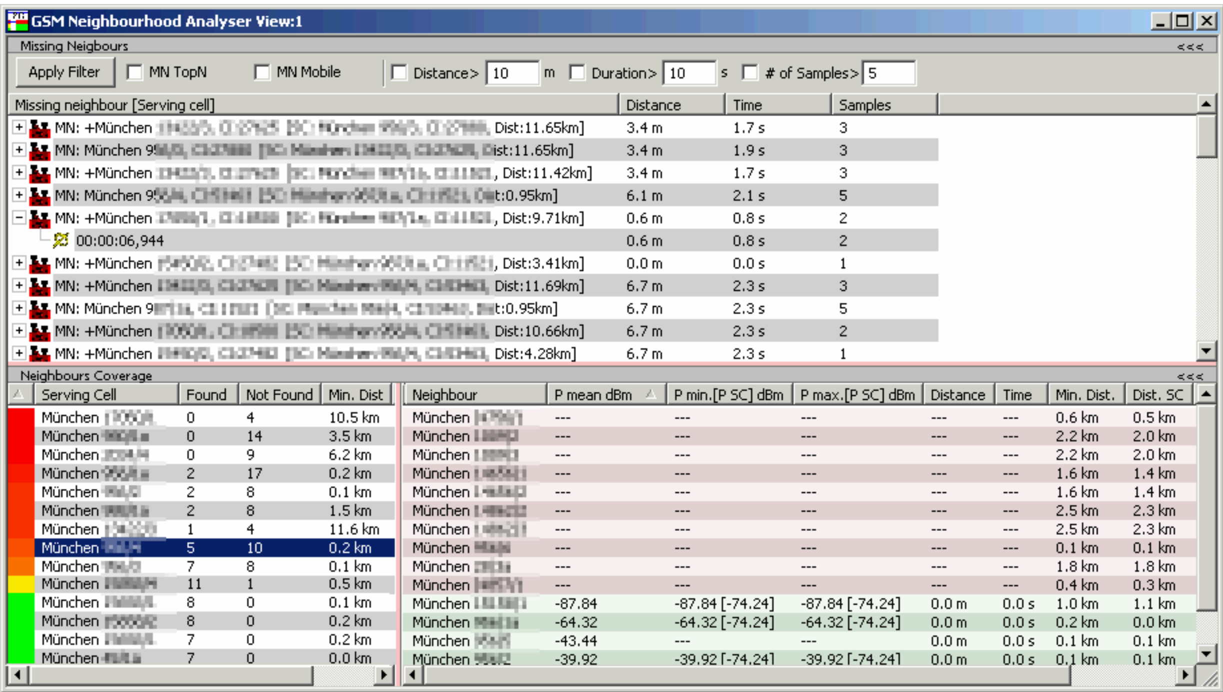


Fig. 4-177 GSM Neighbourhood Analyser View

Neighborhood analysis

The PN scanner results for a particular top N pool (configured in the GSM PNS driver configuration menu and selected for the neighborhood analysis using the *GSM Neighbourhood Analyser View)* provide the essential data for the neighborhood analysis. The analysis involves several steps:

- The top N pool member with the strongest PSCH level (1st top N member) is rated as the best server; its ARFCN, SC, and geographical position (and CI, if the PN scanner is able to decode it) is compared with the entries in the BTS database.
- If possible, the best server is determined, and the neighbors list is compared with the neighbors list in the BTS database.
- When a Top N serving cell is removed from the pool, the related missing neighbor conditions are dropped. For the remaining top N members the analyzer checks the related neighbor coverage; see below.

The results are updated whenever the top N pool members change. R&S ROMES creates one of the events described below whenever a problem is detected. The conditions for the analysis can be modified in the *GSM Neighbourhood Analyser View.*

View

The view is divided into an upper *Missing Neighbors* and a lower *Neighbors Coverage* section. A click on one of the title bars shows or hides the corresponding section. A hidden section leaves more space for the other section. A hidden section is characterized by the symbol >>> (instead of <<<) in the title bar. On pausing on the title bar, the cursor displays a compress symbol.

Filter

The checkboxes across the top of the result tree define filter conditions for the missing neighbors displayed in the result tree.

Apply Filter updates the result tree in accordance with the current filter conditions.

Missing Neighbors

The missing neighbor result tree consists of the following columns:

Missing Neighbor [Serving Cell]
: *Name of the serving cell for which a missing neighbor was detected. GSM base stations are listed with their name, BCCH, and BSIC. Detailed information (e.g. the time when the missing neighbor was detected) is listed below the missing neighbor. It is possible to expand or collapse the detailed information for a single missing neighbor (click the + / – symbols or double-click the line) or all missing neighbors (use the context menu).*

Distance
: *Covered distance during which a neighbor was classified as a missing neighbor. The accuracy depends on the time and distance trigger settings.*

Time
: *Time during which a neighbor was classified as a missing neighbor. The accuracy depends on the time and distance trigger settings.*

Samples
: *Number of samples acquired while a neighbor was classified as a missing neighbor.*

Every row in the Missing Neighbors *list has a starting time which can be used with the* Coupled Focus *functionality (see chapter 3) to synchronize with other views, e.g. with the* GSM NWS Top N View *and the* GSM Measurement Report View.

Neighbors Coverage

The Neighbors Coverage panel is divided in two lists:

- The list on the left half of the panel shows a color code (ranging from red to green, depending on the ratio of measured to total neighbors), the related serving cell, the number of found neighbors (from the measurement) the number of neighbors not found (front comparison with the BTS database) and the minimum distance of the Serving cell from the measurement route. A click on a row fills the Neighbor detail list on the right side, a double-click (when a Tooltip-"D" is visible on the mouse cursor) shows a popup window with the BTS cell information from the BTS database.
- The list on the right half of the panel shows all neighbor cells of the selected serving cell. The neighbors which were not found have a pale pink row background, the found neighbors have a pale green row background. The following values are displayed, if they were measured:

Neighbor
: *Name of the neighbor GSM base station.*

P mean [dBm]
: *Averaged RxLev of the serving cell, calculated from the PNS scanner data.*

P min [P SC] dBm
: *Minimum measured RxLev of the serving cell at the current route position.*

P max [P SC] dBm
: *Maximum measured RxLev of the serving cell at the current route position.*

Distance
: *Covered distance during which a neighbor was classified as a missing neighbor.*

Time
: *Time during which a neighbor was classified as a missing neighbor. The accuracy depends on the time and distance trigger settings.*

Min. Dist.
: *Minimum distance between the cell and the route.*

Dist. SC
: *Distance between the serving cell and the route.*

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, to put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2. The context menu provides the following additional, view-specific commands:

Show Selected BTS…

Use the color code defined in the GSM Neighbourhood Analyser View *configuration menu (see below) to visualize the best servers, potential interferers, and missing neighbors in the* Route Track *view. This feature is only available while a best server is selected in the result tree. The GSM BTS layer in the* Route Track *view must be visible to use this feature.*

Hide Selected BTS…

Remove the previous action, display the selected cell symbol with standard colors.

Show all BTS...

Display all cell symbols with the color codes defined in the GSM Neighbourhood Analyser View *configuration menu.*

Hide all BTS…

Display all cell symbols with standard colors.

Expand/Collapse Tree

Show or hide the additional information for each serving cell in the Results Tree*.*

Export…

*Export the information in the result tree or in the message list to a *.csv export file that can be opened and processed by MS Excel.*

Analyze File...

With an active Missing Neighbors *list, the measurement data in the current CMD file is analyzed and the results are displayed.*

GSM Neighbourhood Analyser View Configuration

The *GSM Neighbourhood Analyser View* configuration menu enables the neighborhood analyzer, defines criteria for the analysis, and specifies the color scheme for the BTS symbols in the *Route Track View*. It is opened via a right mouse click on a point inside *GSM Neighbourhood Analyser View* or via the *Tools - Modules Configuration...* command (see chapter 3).

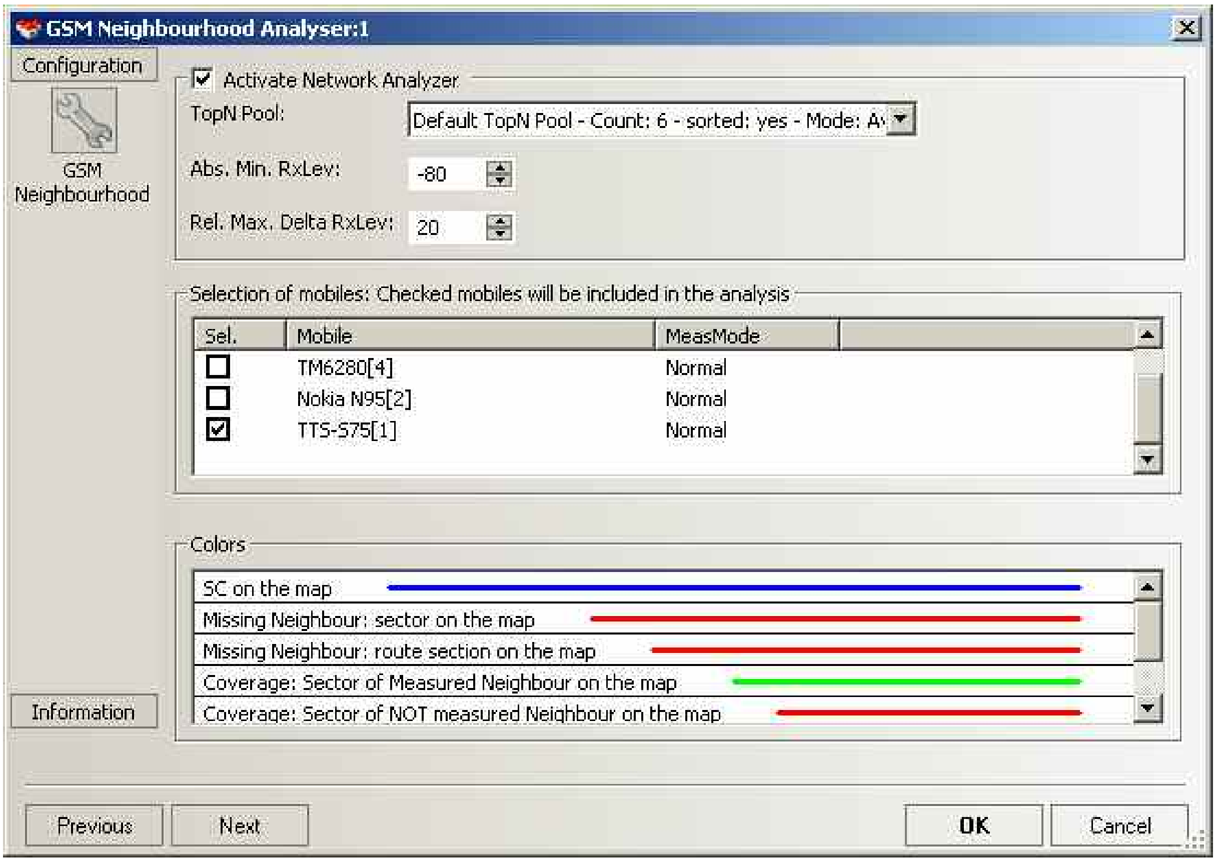


Fig. 4-178 GSM Neighbourhood Analyser View: Configuration

Activate Network Analyzer

The network analyzer must be enabled explicitly in order to post-process the measured data and obtain the results in the *GSM Neighbourhood Analyser View.* This holds for the data viewed during the measurement tour as well as for replayed measurement files. The *GSM Neighbourhood Analyser View* is empty if the neighborhood analyzer is disabled.

The necessary hardware drivers must be loaded or a measurement (*.rscmd or *.cmd) file must be open in order to enable the network analyzer, select the data sources, or define the criteria for the analysis. After starting up R&S ROMES, only the *Route Track Settings* are accessible.

GSM Sources

The drop-down list in the *GSM Sourcs* panel contain all GSM test devices involved in the measurement. The list is populated when the device drivers are loaded or when a measurement file is opened for replay.

Note:
The neighborhood is automatically disabled when the selected data sources are no longer available, e.g. because a new measurement file is loaded.

Top N Pool
The neighborhood analysis requires a PN scanner with a Top N *pool containing the N observed BTSs with the strongest signal level. The top N pools can be configured in the* GSM PNS *driver configuration menu as described in chapter 6.*

Abs. Min. RxLev
BTSs measured with values below the defined Abs. Min. RxLev *threshold are not considered in the neighborhood analysis scan.*

Rel. Max. Delta RxLev
For every evaluated BTS serving cell it is checked whether or not the other members of the Top N pool as neighbors yield a better Delta RxLev than defined here. If such a BTS is found which is not declared as a neighbor cell, a list entry with al relevant data is created (similar to the entry of a problem Node B in the UMTS neighborhood analysis).

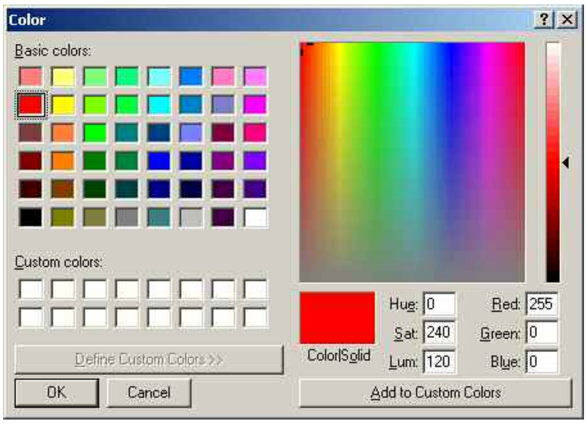
Note:
In addition to the measured data the neighborhood analysis requires a separate GSM BTS list with included neighbor cell information (see description of ATD files in chapter 7). The column 2GNC must contain the LAC, MNC, and MCC of each GSM BTS. The import of BTS list files is described in chapter 3.

Selection of mobiles

List of all mobiles measured with their measurement mode. An arbitrary number of mobiles can be selected from the list (click checkboxes). Only the measurement reports for selected mobiles are displayed in the *GSM Neighbourhood Analyser View*.

Colors

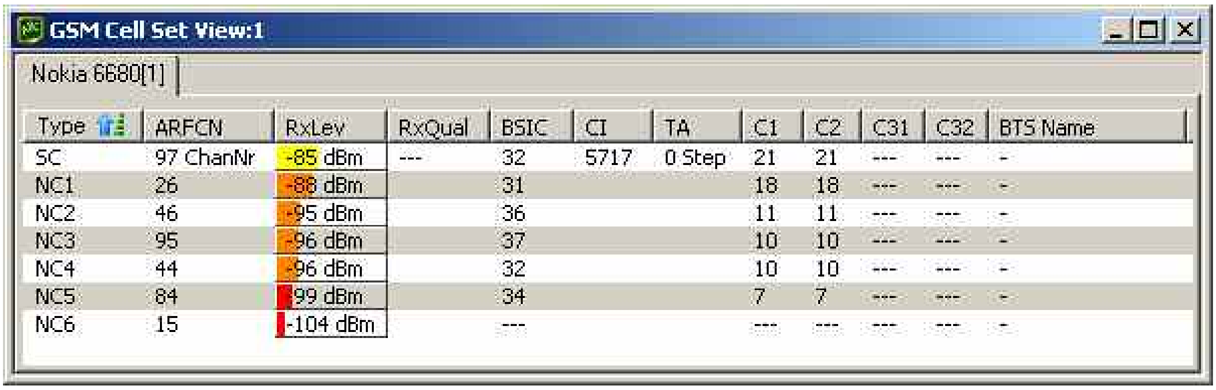
The *Colors* panel changes the colors of all display elements. Double-clicking an element of the list opens the *Colors* dialog (see p. 4.392) to modify the current display color.



The resulting elements are then colored accordingly in the related *Route Track* view (see p. 4.52).

GSM Cell Set View

The G*SM Cell Set View* shows an overview of the the current mobile parameters of the serving cell and its neighbor cells.



Type	ARFCN	RxLev	RxQual	BSIC	CI	TA	C1	C2	C31	C32	BTS Name
SC	97 ChanNr	-85 dBm	---	32	5717	0 Step	21	21	---	---	-
NC1	26	-88 dBm		31			18	18	---	---	-
NC2	46	-95 dBm		36			11	11	---	---	-
NC3	95	-96 dBm		37			10	10	---	---	-
NC4	44	-96 dBm		32			10	10	---	---	-
NC5	84	-99 dBm		34			7	7	---	---	-
NC6	15	-104 dBm		---			---	---	---	---	-

Fig. 4-179 GSM CellSet View

The results for each mobile are arranged in a separate tab.

View area

The most important parameters of the downlink signals from the UTRAN cells in the active cell set are shown. The active set comprises the serving cell and all other neighboring cells that are currently used for the connection; its members are permanently monitored and updated by the network.

Each table row represents a cell. Clicking an entry in the table heading sorts the cells according to the corresponding parameter. A gray triangle in the heading pointing upward (downward) indicates that the table is sorted in ascending (descending) order.

Type

The table shows results from the serving cell (SC) *and up to six neighbor cells* (NC1, …, NC6), *if available.*

ARFCN

Absolute Radio Frequency Channel Number, the GSM channel number of the measured SCH.

RxLev

RxLev of the serving cell and the neighbor cells.

RxQual

Received signal quality reported by the mobile for the serving cell and the neighbor cells.

BSIC

Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the Available Signals *tab of the* Preferences *menu (octal/decimal/hex).*

CI

Cell Identity (16 bit)

TA

Timing Advance

C1

C1 parameter, relevant for cell selection.

C2

C2 (reselect) parameter, relevant for cell selection (GSM phase II).

C31

C31 cell reselection criteria

C32

Flag indicating an exception rule for GPRS_RESELECT_OFFSET according to 3GPP TS 05.08.

BTS Name

Name of the base station. This parameter is displayed if a valid BTS list is available. Detailed information can be obtained by double-clicking the BTS name.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

GSM Cell Set View Configuration

The *GSM Cell Set View* configuration menu selects the columns in the view tables and displays information about the view version. It is opened via a right mouse click on a point inside *GSM Cell Set View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Cell Set List Configuration* tab displays the complete parameter set to be displayed in the *Cell Set* tables. Clearing a parameter hides the column in the table.

TIP Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

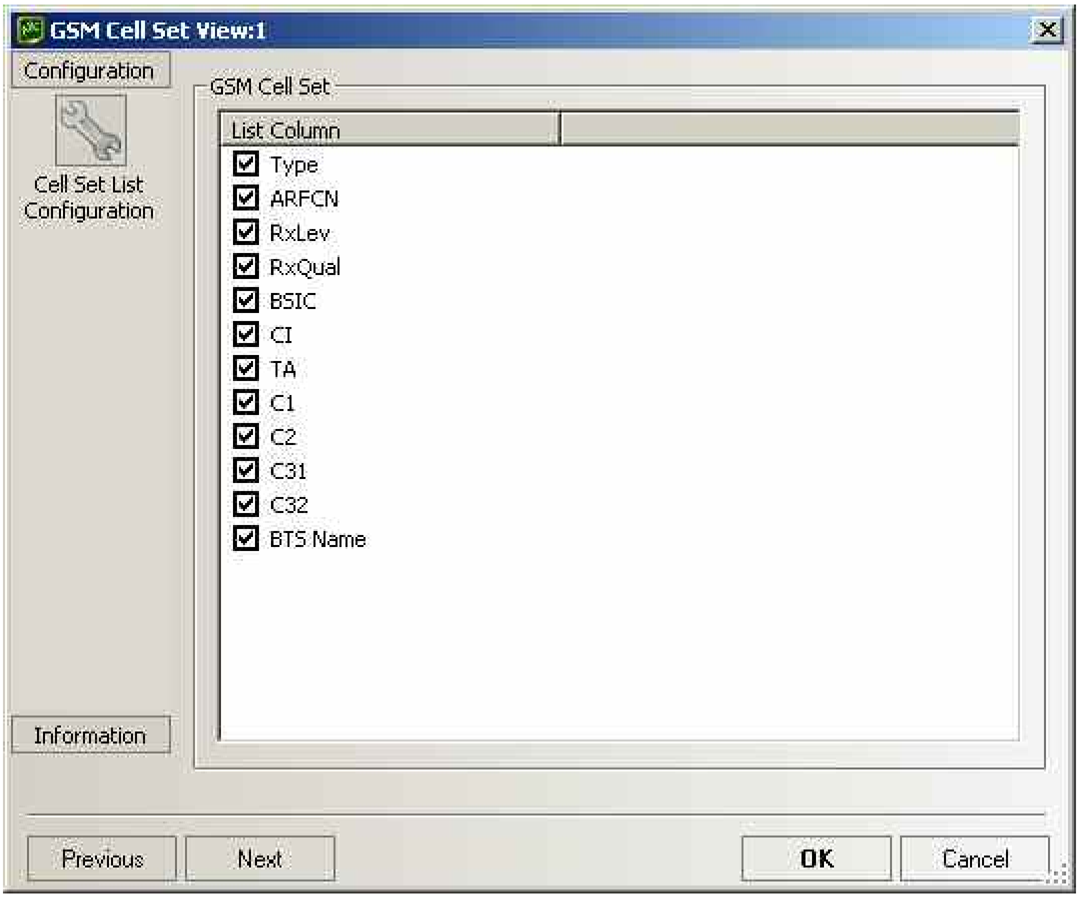


Fig. 4-180 GSM Cell Set View: Cell Set List Configuration

The *GSM Cell Set* tab of the *GSM Cell Set View* dialog selects the list information to be displayed in the cell set table.

GSM Cell Set List Columns The checkbox selects the data columns to be displayed:

GSM Chart View

The *GSM Chart View* displays *RxLev* of the serving cell and of up to 6 neighbor cells N1 to N6 in a 2D Chart. Additionally *RxQual* and *Frame Erasure Rate* of the serving cell are shown. The values are taken from the *Measurement Report,* for detailed description of the parameters please refer to *GSM Measurement Report View* described on p. 4.277 .

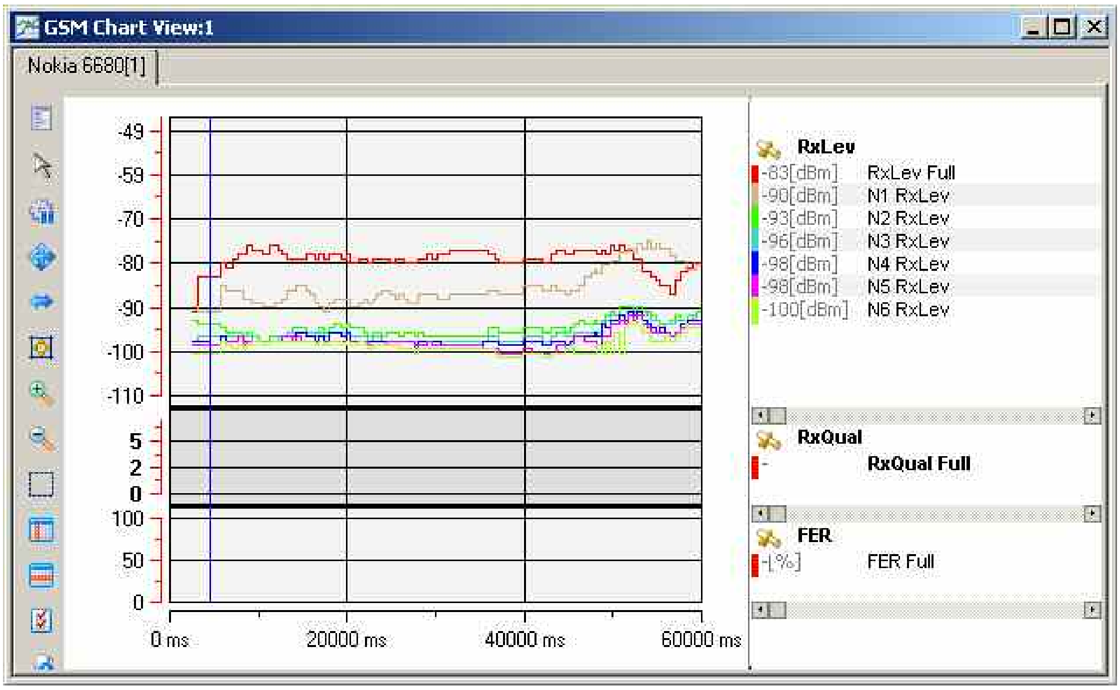


Fig. 4-181 GSM Chart View

A double-click on the title bars of the sub-diagrams opens or closes them in the GSM Chart View. The functionality of all sub-diagrams is analogous to the *2D Chart View* described on p. 4.9.

RxLev

RxLev Full

Received Signal Level assessed over the full range of TDMA frames within a SACCH block.

N1-N6 RxLev

Received Signal Level of the neighbor cells.

RxQual

RxQual Full

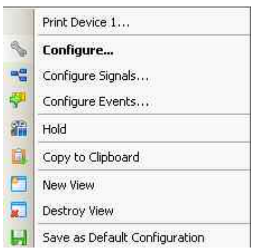
Received Quality assessed over the full range of TDMA frames within a SACCH block.

FER

FER Full

Frame Erasure Rate assessed over the full range of TDMA frames within a SACCH block

Context menu



A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the view contents to the clipboard, create or delete views, or save the current configuration as default, or move to another worksheet; see *Context menu* description on p. 4.2.

GSM Chart View Configuration

The *GSM Chart View* configuration menu scales the axes of the chart and defines its contents and its appearance. All controls are also available in the *Chart Configuration* tab of the *2D Chart Configuration* menu and have the same effect; see figure on p. 4.16.

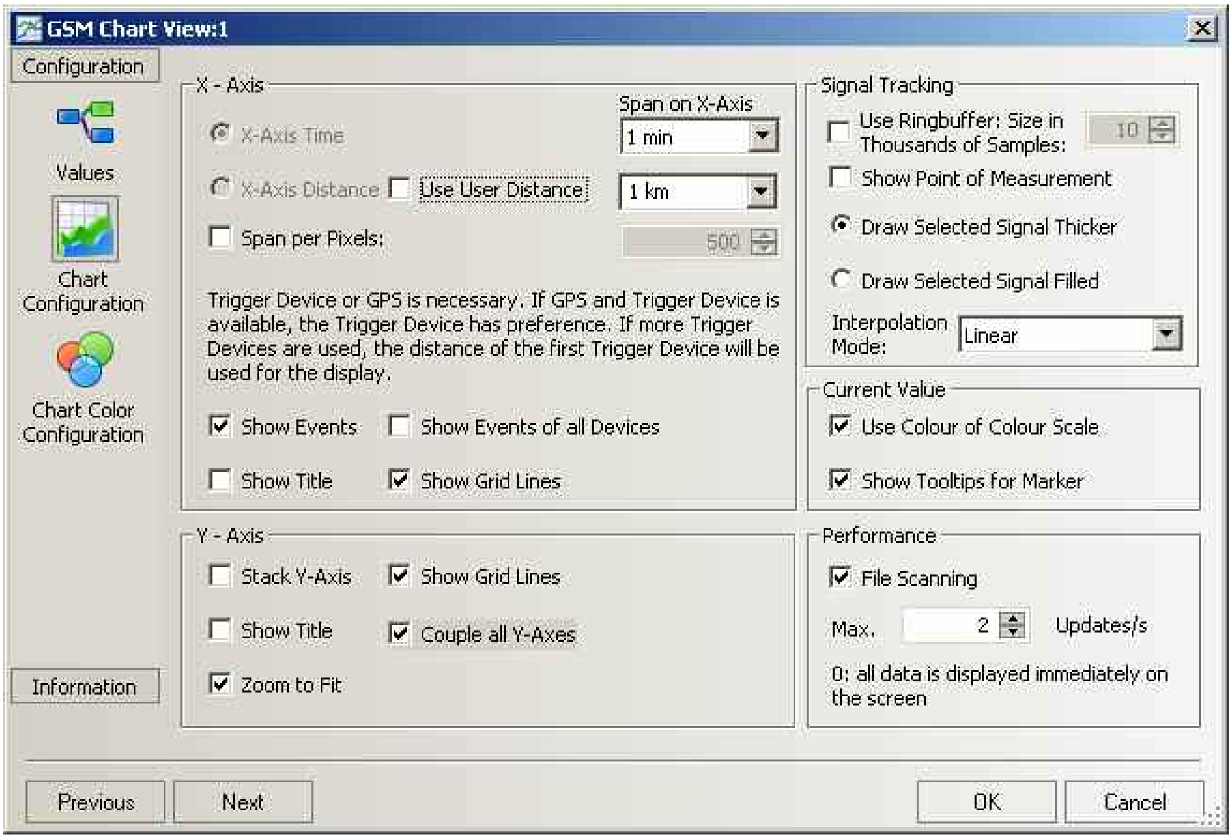


Fig. 4-182 GSM Chart View - Configuration

UMTS/GSM NQA State View

The *UMTS/GSM NQA State View* tracks the NQA states and state transitions of each call in detail.

The view is empty unless the *Network Quality Analysis (NQA)* was active during recording. Moreover, it requires one of the measurement modes *NORMAL* or *CAMP* to be set and the *Autodial* function to be active. To obtain the complete information, a *Constant Call Pattern (ETSI Specification)* must be selected in the *Autodialing* tab of the driver configuration menu and the data must be recorded with a R&S ROMES version V3.25 or higher. All driver settings and call classes are explained in chapter 6.

The *UMTS/GSM NQA State View* is complemented by the *2G/3G NQA View* (see p. 4.349), representing the call statistics during the entire measurement.

The UMTS/GSM NQA State View supports R&S ROMES coupled focus (see p. 4.5).

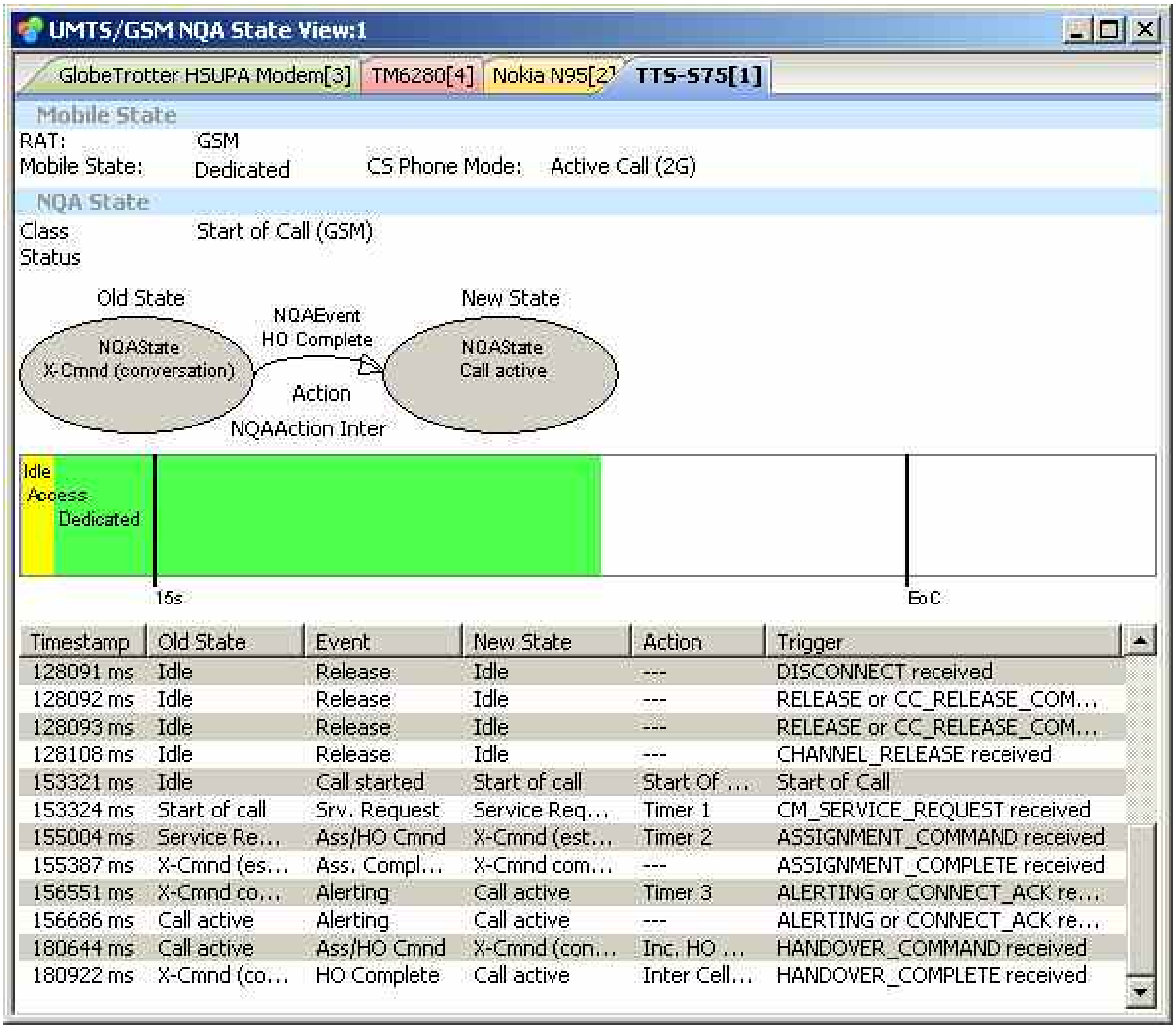


Fig. 4-183 UMTS/GSM NQA State View

Example:

Two mobile are connected to the system. One is the originating the other one the terminating part. Content of the UMTS/GSM NQA State View will be inserted only for the mobile which sets up the call. The tab for the second mobile is included in the view but there is no information displayed.

State

Current Radio Access Technology (RAT, either UMTS or GSM) and mobile state.

The mobile states correspond to the Phone Mode signal; see p. 4.14.

NQA State Diagrams

Call class of the current call *(Start of Call, Good Call, Dropped Call, Blocked Call, No Service Call;* see description of NQA driver settings in chapter 6) and status (no indication or *Noisy).*

The upper diagram displays the previous NQA state *(Old State)*, the NQA event that caused a state transition, and the current NQA state *(New State).* The contents of the diagram change after each mobile state transition.

The lower diagram shows the evolution in time of the current call. The consecutive mobile states are plotted with different colors. The timing parameters are defined in the *Autodialing* tab of the driver configuration menu:

Time zero	*Start of the call*
First vertical line	Max. Access Time
Second vertical line	*Expected end of the call = actual access time* + Call Duration
Diagram width	*Duration of the* Call Window.

NQA State Table

All state transitions are listed in the table below the NQA state diagrams. Each table row describes one state transition. In addition to the information in the NQA state diagrams, the list also displays the exact reason for the state transition *(Action* and *Trigger* columns).

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, to put the view on hold, copy the current view to the clipboard, or to create or delete views; see *Context menu* description on p. 4.2.

The *UMTS/GSM NQA State View* has no configuration menu. The *Info* tab can be accessed via *Tools – Modules Configuration...* command.

UMTS/GSM Overview View

The *UMTS/GSM Overview View* displays a summary of the test mobile state, power/quality, active set and system parameters, and, if applicable, results from a connected UMTS PN scanner.

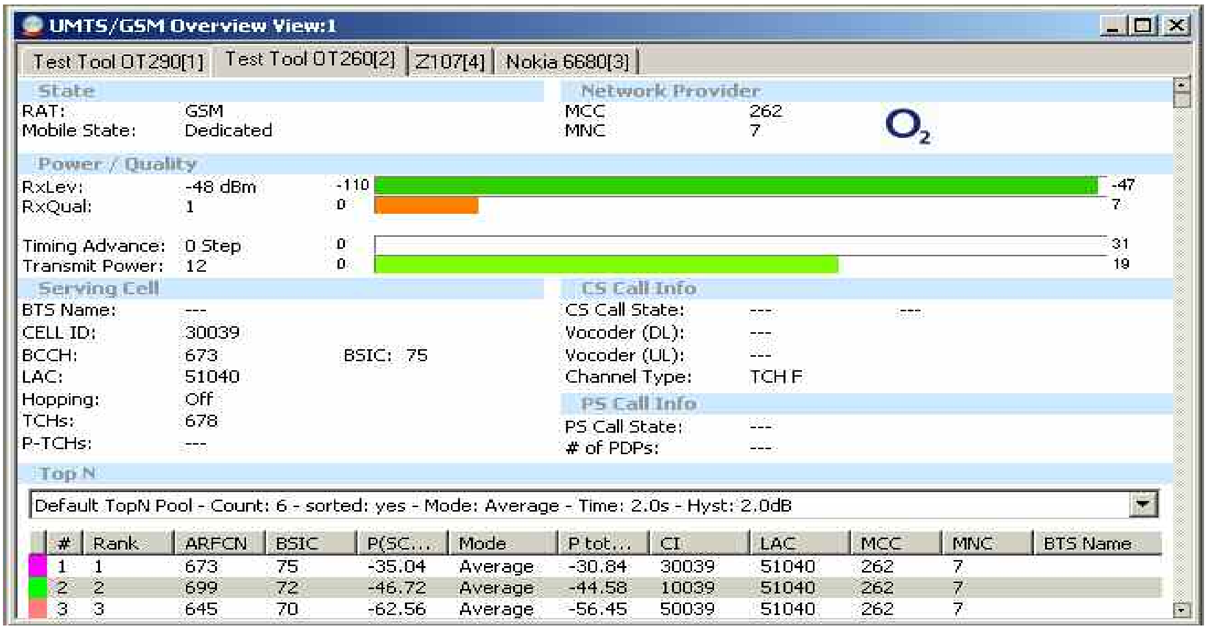


Fig. 4-184 UMTS/GSM Overview View - GSM call

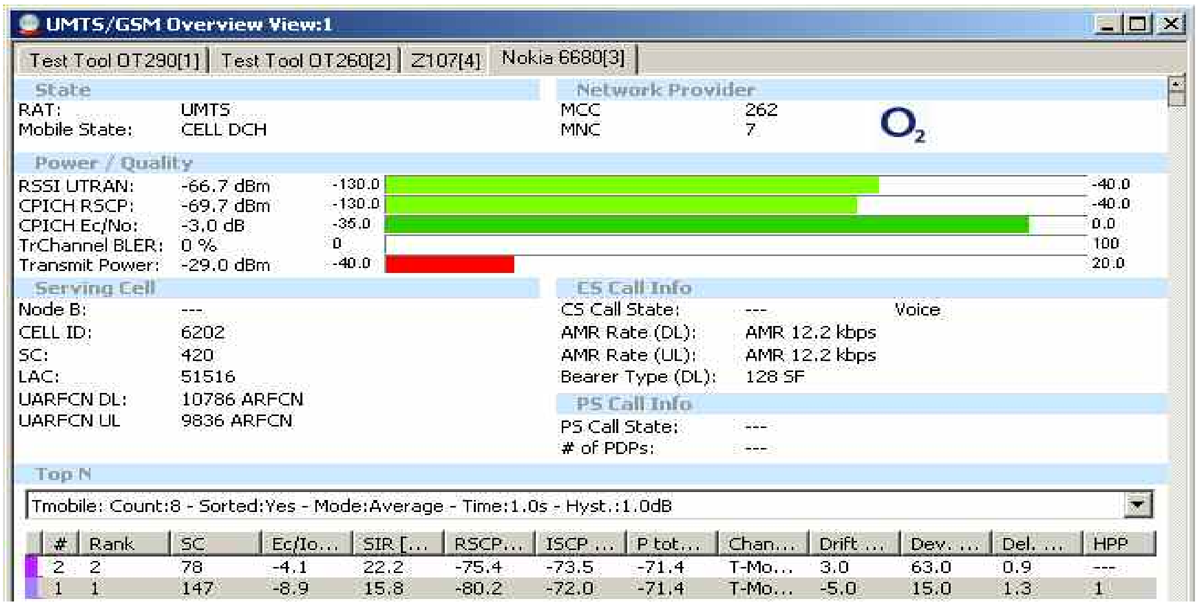


Fig. 4-185 UMTS/GSM Overview View - UMTS call

The *Top N Scanner* field group is only filled if an actual scanner is configured and running.

State

This field group contains the mobile state, the mobile searcher state and the PLMN-ID.

RAT Current Radio Access Technology (either UMTS or GSM)

Mobile State Possible states of the mobile are:

Unknown	No network available
Idle	Registered in standby mode (no active call)
Access	Call is set up
Dedicated	Call in GSM network
Unconnected	Mobile is not connected
Scan	Mobile is in Scan mode
IT	Interims Transmitter Mode (only AEG)
CELL FACH	UMTS mode
CELL DCH	Call in UMTS network
CELL PCH	UMTS mode
URA PCH	UMTS mode

The mobile states correspond to the Phone Mode signal; see p. *4.14*.

MCC Mobile Country Code identifies the Country of the network.

MNC Mobile Network Code identifies the operator.

Power / Quality

The Power/Quality panel displays several parameters describing the signal power and quality reported by the test mobile (see standard 3GPP TS 25.225).

RSSI UTRAN
: *The received wide band power in dBm, including thermal noise and noise generated in the receiver.*

CPICH RSCP
: *CPICH Received Signal Code Power in dBm; the received power on one code, measured on the Primary CPICH.*

CPICH Ec/No
: *The received energy per chip divided by the power density in the band. The* CPICH Ec/No *is identical to* CPICH RSCP *divided by the* RSSI UTRAN.

TrChannel BLER
: *Estimation of the transport channel block error rate (BLER) based on evaluating the CRC on each transport block.*

Transmit Power
: *Total mobile transmitted power on one carrier in dBm.*

The power results are obtained in an unbiased measurement, i.e. the contribution of the noise floor to the powers is subtracted.

Serving Cell

The Serving Cell panel displays the following parameters describing the serving cell:

Node B
Name of the node B, taken from the UMTS Node B database (if available).

Cell ID
Cell Identity of the serving cell.

SC
Primary scrambling code of the cell in the format selected in the TEC for UMTS Test Mobiles *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. The primary SC is used to identify the cell.*

LAC
Location Area Code

UARFCN DL
UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the received DL signal. The carrier frequency is equal to

f = 0.2 MHz * UARFCN.

UARFCN UL
UTRAN Absolute Radio Frequency Channel Number (ARFCN) of the transmitted UL signal

Hopping *(for GSM)*
If hopping is On*, the Mobile Allocation Index Offset (MAIO) and the Hopping Sequence Number (HSN) are displayed.*

TCHs *(for GSM)*
Shows the list of currently active traffic channels.

P-TCHs *(for GSM)*
Shows the list of active traffic channels for GPRS (Qualcomm driver only).

CS Call Info

The Call Info panel displays the following parameters describing the serving cell:

CS Call Type
Circuit-switched Voice or Data call

AMR DL/UL Rate *(for UMTS)*
Downlink/Uplink Voice Encoder for UMTS, always AMR (Adaptive Multi Rate)
The currently selected rate is also shown.

Vocoder D*AMR Adaptive Multi Rate*

HR	*Half Rate*
FR	*Full Rate*
EFR	*Enhanced Full Rate*

Bearer Type (DL) *(for UMTS)*
Indicates the Spreading Factor (SF)

PS Call Info

The PS Call Info panel displays the following parameters reflecting the current state of the Test UE regarding PS connections:

PS Call State
: *identifies the PS Phone Mode indicates if a PDP Context is established or not*

# of PDPs
: *Number of established PDPs*

Top N

The Top N panel displays UMTS PNS scanner data recorded by the UMTS PN scanner driver. It shows the properties of the signals from the Node Bs that are elements of the current Top N Pools. The data is also displayed in the PNS Top N View described on p. 4.401.

Depending of the currently used RAT of the mobile, the list is shown for UMTS or for GSM.

Context menu

A right mouse click on any point in the view opens the context menu to print the view, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

UMTS/GSM Overview View Configuration

The *UMTS/GSM Overview View Configuration* selects the columns in the Top N table and displays information about the view version. It is opened via a right mouse click on a point inside *UMTS Layer 1 View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The ***TOP N List Configuration*** tab displays the complete parameter set to be displayed in the *Top N* table (see description in the *PNS Top N View* section on p. 4.401). Clearing a parameter hides the column in the table.

Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed. To restrict the number of parameters measured and enhance the system performance, use the settings in the driver configuration menu (see chapter 6).

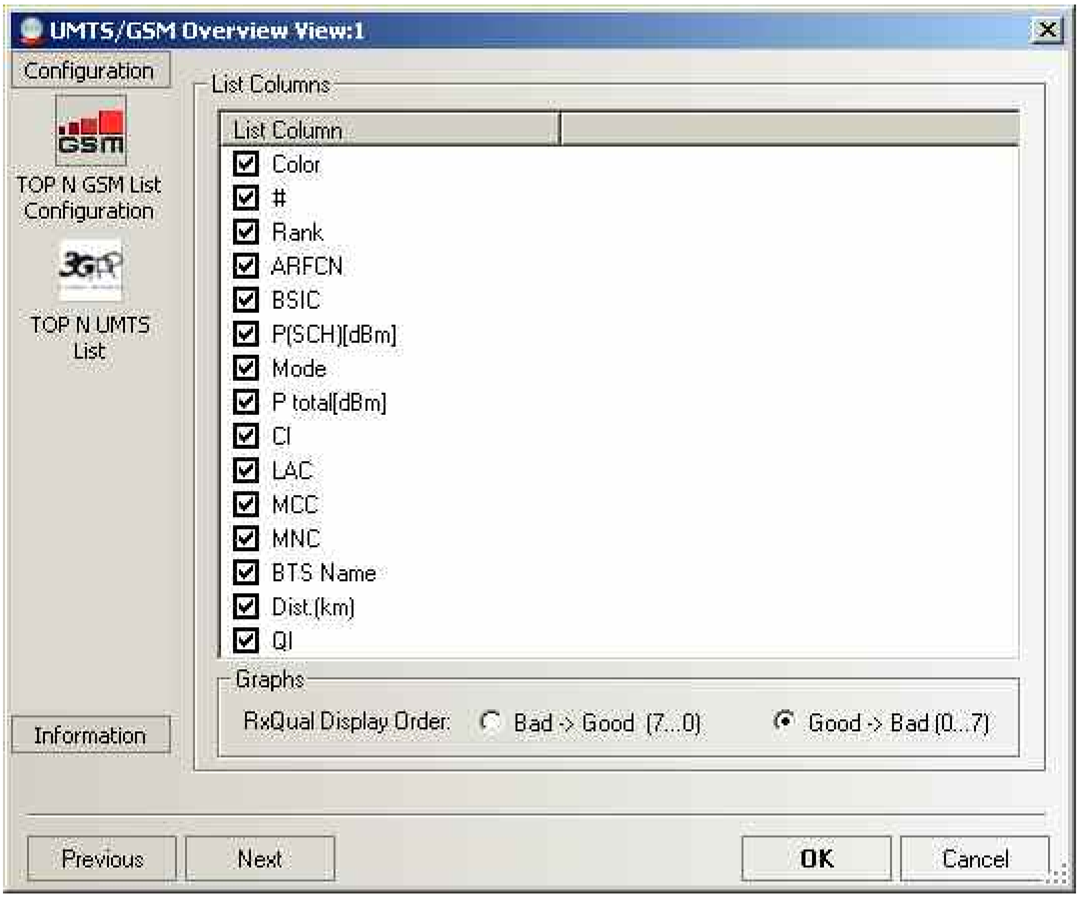


Fig. 4-186 UMTS/GSM Overview View: Configuration

Top N List Columns

The checkboxes select the view list elements to be displayed on the Top N list panel.

For a detailed explanation of the parameters refer to section *PNS CPICH View* on p. 4.378, or to the *PNS Top N View* on p. 4.401.

Graphs

For GSM it can be configured if the RXQual Scale is shown from good to bad or the other way round.

UMTS/GSM Handover Analyzer View

The *UMTS/GSM Handover Analyzer View* shows a list of the UMTS (3G –> 3G), GSM (2G –> 2G), and inter-RAT (3G –> 2G) handover procedures attempted by UMTS or GSM mobile phones and provides a statistical evaluation. The list and the statistics are displayed in two alternative views. It is possible to open several *UMTS/GSM Handover Analyzer Views* simultaneously in order to observe the list and the statistical views in parallel.

The handover analysis requires option R&S ROMES3HOA, *Handover and Neighborhood Analysis.* The view is empty unless the test mobile records the *Layer 3 Messages*; see description of the *Expert Mode* or *Nokia Settings* tabs in the UMTS mobile driver configuration menus. Moreover, the handover analysis must be activated in the *HOA* tab of the driver configuration menu.

The *UMTS/GSM Handover Analyzer View* shows the handover types that can occur between GSM cells and between GSM and UTRAN cells.

The UMTS Neighborhood Analysis, which is also part of option R&S ROMES3HOA, is evaluated in the *UMTS Neighbourhood Analyser View*; see p. *4.181*.

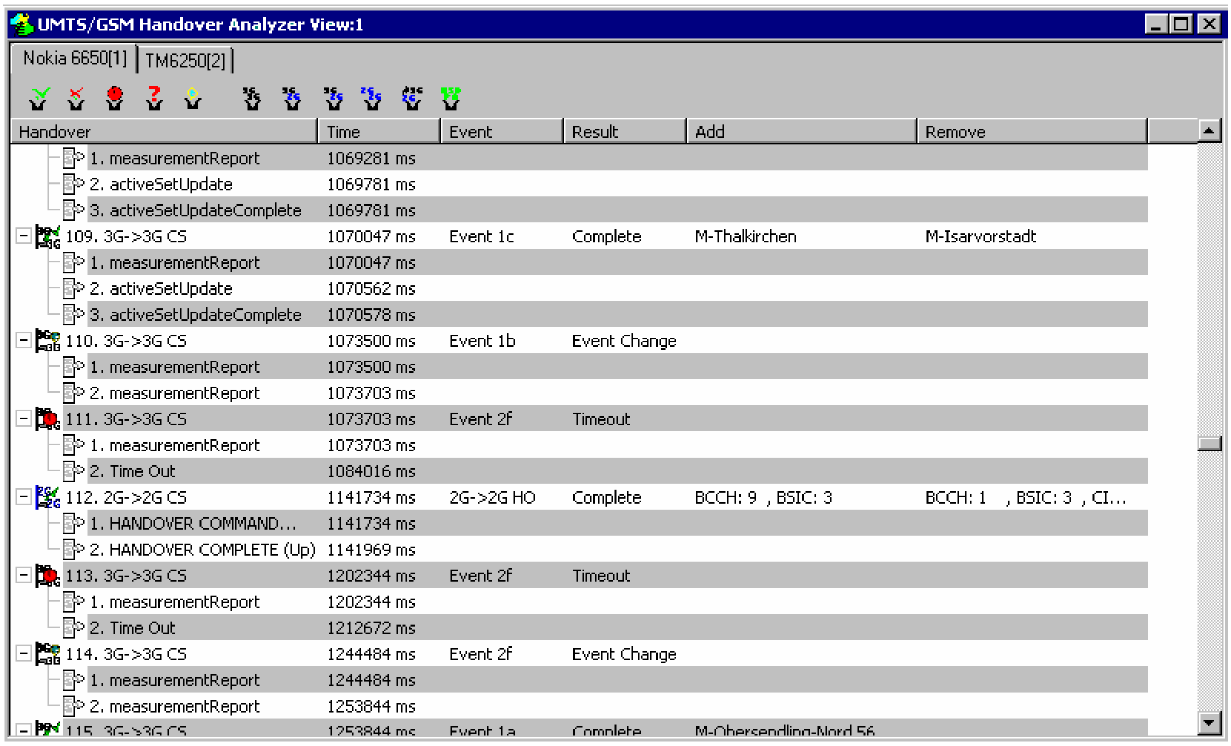


Fig. 4-187 UMTS/GSM Handover Analyzer View (list)

The complete list of the recorded handovers is selected via *Show List* in the context menu.

Handover List The handover list consists of the following columns:

Handover

Current number and handover type. The handover analyzer reports GSM (2G –> 2G), UMTS (3G –> 3G soft/softer handover) and inter-RAT (3G –> 2G) handovers. CS and PS denote the circuit switched and packet switched domains, respectively. 3G –> 3G hard handovers and 2G – > 3G handovers are not recorded in the current software version.
The following layer 3 messages which are relevant for the handover process are listed below the handover event:

3G –> 3G handovers (CS):
Measurement report with one of the events (1a, 1b, …, uplink) described below,
ACTIVE SET UPDATE (downlink),
ACTIVE SET UPDATE COMPLETE (uplink)

3G –> 3G handovers (PS):
CELL UPDATE (downlink),
CELL UPDATE CONFIRM (uplink)

3G –> 2G handovers (CS):
Measurement report with event 3a described below (uplink) or Cancel event,
HANDOVER FROM UTRAN COMMAND (to GSM, downlink),
HANDOVER COMPLETE (uplink)

2G –> 2G handovers (CS):
GSM HANDOVER COMMAND (downlink),
HANDOVER COMPLETE (uplink)
3G –> 3G handovers (HSDPA):
TRANSPORT CHANNEL RECONFIGURATION REQUEST / ACCEPT
The analysis of HSDPA handovers requires option R&S ROMES4HUQ (Qualcomm).
It is possible to expand or collapse the messages for a single handover (click the + / – symbols or double-click the line) or all handovers (use the context menu). Double-click for a detailed analysis of the layer 3 messages. For a complete list of layer 3 messages use the 2G/3G Layer 3 View *described on p. 4.332.*

Time

Handover start time, the time of the first layer 3 message (see above) which initiated the handover report.

Event

Handover type or one of the measurement reporting events that the UMTS test mobile received from the network. The events are used to notify a UMTS UE in which instance it should transmit a measurement report. They described in standard 3GPP TS 25.331:
Event 1a (for intra-frequency measurements: a primary CPICH enters the reporting range)

Event 1b (a primary CPICH leaves the reporting range)
Event 1c (a non-active primary CPICH becomes better than an active primary CPICH)
Event 1e (a primary CPICH becomes better than an absolute threshold)
Event 1f (a primary CPICH becomes worse than an absolute threshold)
Event 2d (for inter-frequency measurements: the estimated quality of the currently used frequency is below a certain threshold)
Event 2f (the estimated quality of the currently used frequency is above a certain threshold)
Event 3a (for inter-RAT measurements: the estimated quality of the currently used UTRAN frequency is below a certain threshold and the estimated quality of the other system is above a certain threshold)

Result

Status of the handover attempt: Start, Pending, Complete *for successful handovers*. Timeout *indicates that the handover time exceeded the timeout specified in the* HOA *tab of the UMTS mobile driver configuration menu (see chapter 6).* Event Change *indicates that the network changed the measurement reporting event during the handover.*

Add

GSM: BCCH and BSIC of the source base station.
UMTS: Name of a UTRAN cell added to the active set, taken from the node B database (if available). To monitor the complete active set and neighbor set, use the UMTS CellSet View (see p. 4.154).

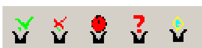
Remove

GSM: BCCH, BSIC, CI, and LAC of the target BTS and cell.
UMTS: Name of a UTRAN cell removed from the active set, taken from the node B database (if available).

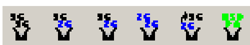
Filter options

The icons in the toolbar above the list display or hide handovers with specific results and handovers of different type. A colored icon means that the handover events are shown in the list, an unavailable icon means that they are hidden.

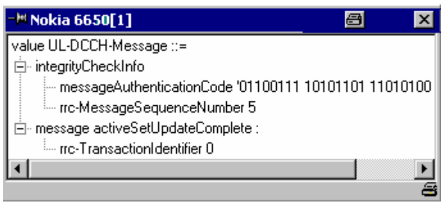
- The icons in the first group denote handovers with the following results: *Complete, Failed, Timeout, Error, Event Change.*



- The icons in the second group denote handovers of the following types: *3G –> 3G CS, 3G –> 2G CS, 3G –> 2G PS, 2G –> 2G CS, 2G –> 3G Reselection, 3G –> 3G HSDPA.*



Further analysis An upper case D appears to the right of the cursor arrow when it is placed on a layer 3 message. This symbol indicates that there is detailed information to be retrieved for the current layer 3 message. The detailed information window is opened by double-clicking on the message, e.g.:



It is also instructive to monitor the measurement route and the node Bs / base stations in the *Route Track* view (see p. 4.52). The cells in the Add and Remove columns can be displayed with different colors using the *Show Node Bs/BTSs* on Map command in the context menu. The color code can be configured in the *UMTS/GSM Handover Analyzer View* configuration menu; see below.

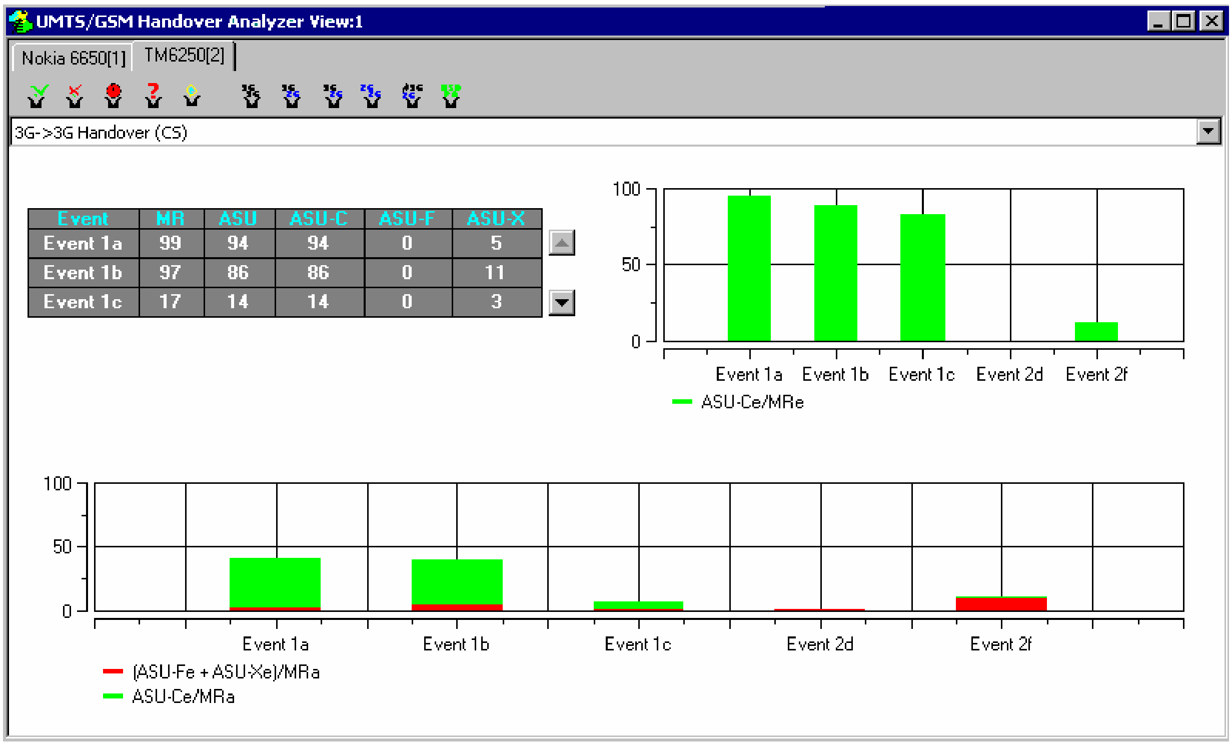


Fig. 4-188 UMTS/GSM Handover Analyzer View (statistics, 3G –> 3 G handover)

The statistical evaluation of the recorded handovers is selected via *Show Statistics* in the context menu. There are three versions of the statistics tab, corresponding to the three handover types *3G –> 3 G*, *3G –> 2G* (inter-RAT), *2G –> 2 G.* The versions are selected in the drop-down list across the top of the view.

The *3G –> 3 G Handover* tab shows the following results:

Event table

The table lists the total number of detected handovers with their measurement reporting event class and the handover result.

- Handovers with the same active event appear in the same row. The last row *(All)* shows the sum of all previous rows. *Event Change* handovers are classified according to the event at the start of the handover.
- Handovers with the same result appear in the same column. The following categories are defined: *MR* (Measurement Report; the sum of the *ASU, ASU-F,* and *ASU-X* columns), *ASU* (Active Set Update, handovers with an update of the active cell set), *ASU-C* (Active Set Update Complete, ASU handovers that could be completed without error), *ASU-F* (Active Set Update Failure, ASU handovers that failed before the timeout), *ASU-X* (all other handovers, e.g. the *Timeout* or *Event Change* handovers).

Overview of the GSM handovers and handovers between different Radio Access Technologies (inter-RAT handovers, 3G/UMTS –> 2G (GSM) and 2G (GSM) –> 3G/UMTS).

SR

Success Rate, ratio of the successful handover attempts (Result: OK) *to the total number of handover attempts for each handover type. A handover is classified successful if it could be achieved before the* Handover Timeout *defined in the configuration menu elapsed.*

Attempts

Total number of handover attempts for each handover type.

The distribution of the duration of the handover procedures (i.e. the time between a HO command and a HO response) is shown in two bar graphs:

GSM Handover [s]

Time for GSM handovers.

Inter-RAT Handover [s]

Time for inter-RAT handovers including 3G –> 2G and 2G –> 3G handovers.

The diagram scales and the number of classes (bars) are fixed.

Successful handover distribution

The upper bar graph shows the percentage of successful (completed) handover attempts for each event class, i.e. the number of *ASU-C* handovers divided by the number of *MR* handovers. In the example of the figure above, all *Event 1a* and *Event 1b* handovers but none of the *Event 2f* handovers were successful.

The diagram scales and the number of classes (bars) are fixed.

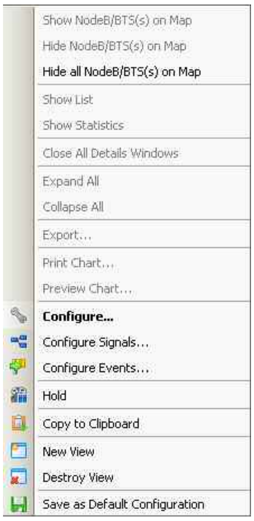
General handover distribution

The lower bar graph shows the percentage of (completed and failed) handover attempts for each event class. The red portion of each bar corresponds to the failed, the green portion to the successful attempts. The added length of all bars is 100%.

The *3G –> 2 G Handover* and *2G –> 2 G Handover* tabs are similar to the previous one. The following properties of the network standard simplify the tables and diagrams:

- An inter-RAT handover can only occur while the measurement reporting event 3a is active, so the *3G –> 2 G Handover* view only shows the percentage of successful and failed handovers within the event class 3a.
- No reporting events are defined for GSM (2G) networks, so the *2G –> 2 G Handover* view only shows the percentage of successful and failed handovers.

Context menu



A right mouse click on any point in the view opens the context menu to print or preview the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or move to another worksheet; see Context menu description on p. 4.2. The context menu provides the following additional, view-specific commands:

Show Node B…

Use the color code defined in the UMTS/GSM Handover Analyzer View *configuration menu (see below) to mark the UMTS/GSM cell for the selected handover in the* Route Track *view. This feature is only available while a handover process is selected in the handover list. The colored cells are the ones listed in the* Add *and* Remove *columns, respectively. The UMTS layer / GSM BTS layer in the* Route Track *view must be visible to use this feature.*

Hide Node B…

Reverse the previous action, display the selected cell symbol with standard colors.

Hide all Node B…

Display all cell symbols with standard colors.

Show List/Statistics

Toggle between the list of the recorded handovers and the statistical evaluation.

Close all Details…

Remove all open details windows from the view. This action is convenient for removing several open windows pinned over the view; see section *General View Properties on p. 4.1.*

Expand/Collapse All

Show or hide the layer 3 messages for each handover in the list.

Export

*Export the handover analyzer data to a *.csv export file that can be opened and processed by Excel. The file contains the information in the statistics view.*

Print/Preview Chart

Show a print preview or print the Show Statistic view.

UMTS/GSM Handover Analyzer View Configuration

The *UMTS/GSM Handover Analyzer View* configuration menu defines the CMD file scanning behavior and the color scheme for the Node B / BTS symbols in the *Route Track View*. It is opened via a right mouse click on a point inside *UMTS/GSM Handover Analyzer View* or via the *Tools - Modules Configuration...* command (see chapter 3).

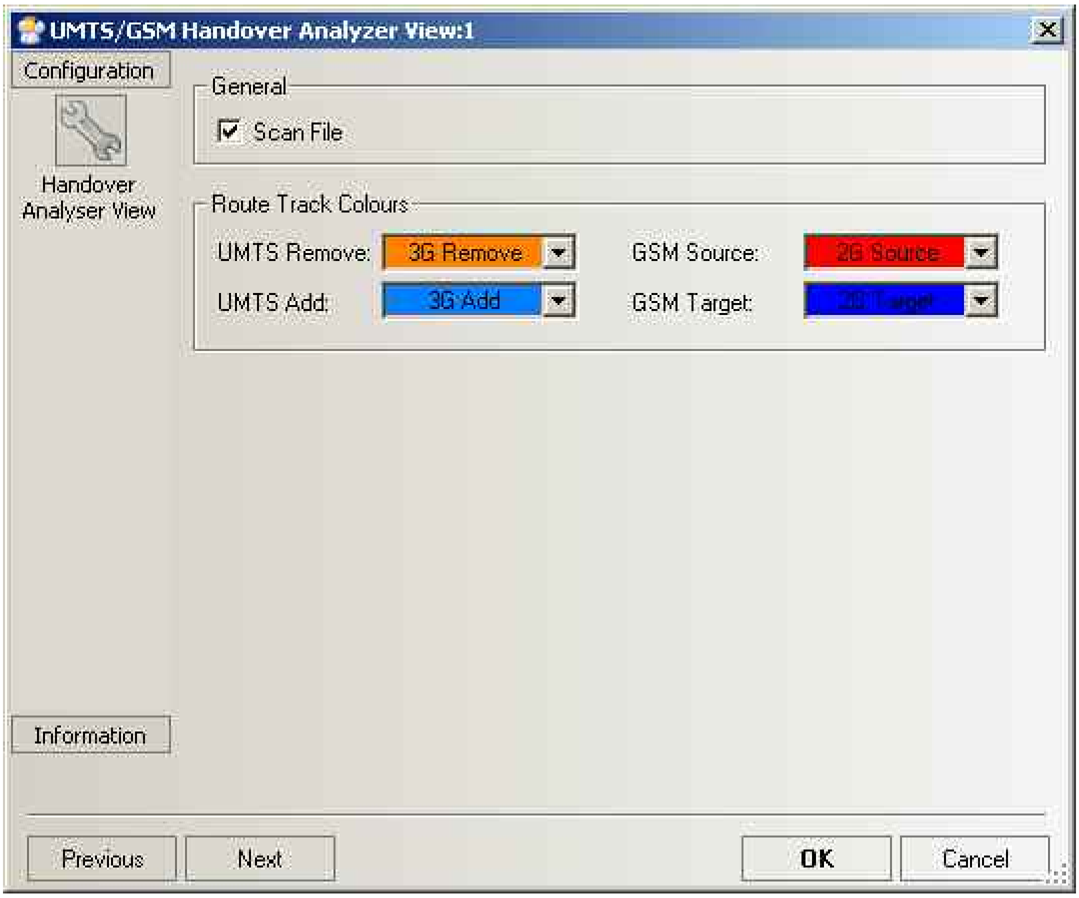


Fig. 4-189 UMTS/GSM Handover Analyzer View Configuration

General

The *Scan File* checkbox enables or disables the automatic scan for 2G/3G-related handover data in the active Measurement file.

Route Track Colors

The colors distinguish the following UMTS Node Bs and GSM base stations:

UMTS Remove
: *UTRAN source cell of the handover*

UMTS Add
: *UTRAN target cell of the handover*

GSM Source
: *GSM target cell of the handover*

GSM Target
: *GSM target cell of the handover*

2G/3G Layer 3 View

The *2G/3G Layer 3 View* displays the recorded GSM Layer 3 messages, the GPRS RLC/MAC control messages, and the UMTS RRC messages. The messages are shown for all mobiles used. The messages are not available in *Scan* mode; the mobile must be in *Normal, Camp,* or *Test Transmitter* mode.

The *2G/3G Layer 3 View* shows AT commands and responses for mobiles configured with the generic mobile driver. Additional NQA messages are shown with the postfix MTC or MOC (for detailed description concerning refer to chapter 7 Call Class and Status).

The *2G/3G Layer 3 View* shows message details about WIMAX MAC Management Payload decoding which are available for all MAC Management Messages (except UL-MAP and DL-MAP).

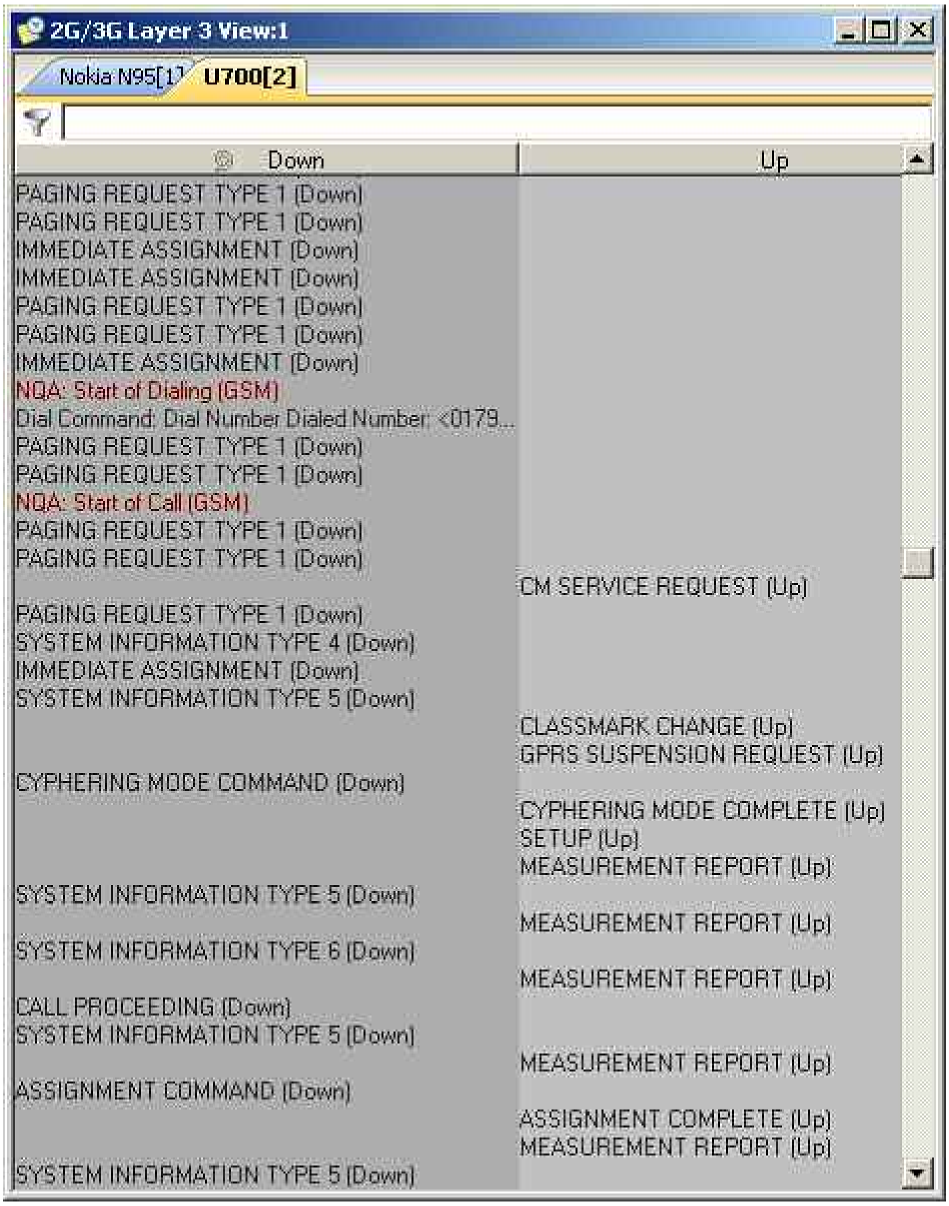


Fig. 4-190 2G/3G Layer 3 View

The layer 3 messages for each mobile are arranged in a separate list. Moreover, uplink and downlink messages appear in separate columns unless this feature is switched off in the configuration menu (see

Separate *Up/Downlink Columns* parameter on page 4.339). The width of the individual lists can be varied with a drag-and-drop mechanism in the header of the table.

Note:

If this view is used with an EDGE-enabled test mobile (e.g. Triorail-S75 with FW 33 or higher) and with option ROMES3EDG, it also displays EDGE parameters.

<Mobile type and number>

List of the layer 3 messages of an individual mobile. The message types are selected in the *Layer 3 Messages* tab of the configuration menu, see below.

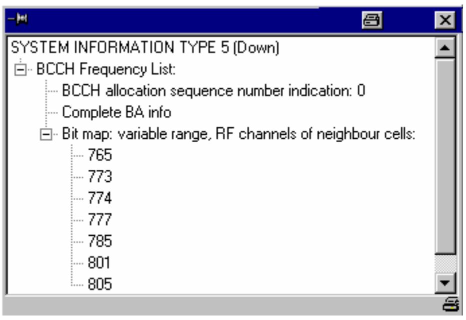
Find dialog

The following keys can now be used directly in the Layer 3 View:

- Ctrl+F: Opens the *Find* Dialog
- F3: continues a previous search, searching from *top to bottom* for the next occurrence of the search string
- Shift+F3: continues a previous search, searching from *bottom to top* for the next occurrence of the search string

Detailed information:

An upper case D may appear to the right of the cursor arrow when it is placed on a layer 3 message. This symbol indicates that there is detailed information to be retrieved for the current layer 3 message. The detailed information window is opened by double-clicking on the message, e.g.:



The detailed information window is totally independent of the 2G/3G Layer 3 View, so you can move, resize and scroll it as you like. Click the printer symbol in the lower right corner to generate a hardcopy of the detailed information. Alternatively, you can write the detailed information into the table (e.g. if you wish to create a hardcopy), see the …Messages tabs of the configuration menu.
A click on the pin symbol in the title bar of the detailed information window fixes the window so that you can open several windows at the same time.

Stop display:

Each individual list of layer 3 messages can be stopped and released at any time by left-clicking on its title bar. A stopped list is indicated by a red *STOP* symbol left of the mobile type.

Note:

Detailed messages are only displayed during a Replay session because of performance requirements during the measurement and during recording.

On the other hand switching between different L3 messages is also possible during Pause and even after Stop.

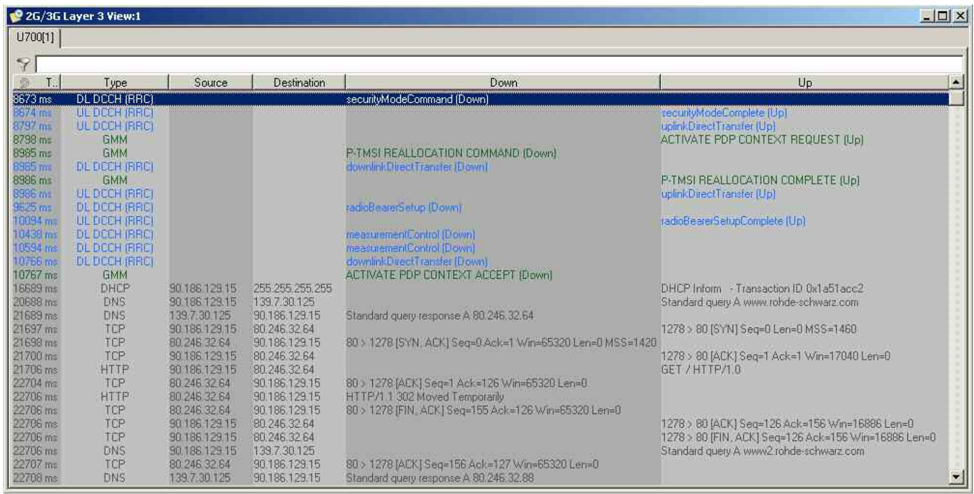
Text Filter

The text filter on top of the 2G/3G Layer 3 View, filters the content of the view immediately. Only lines will be shown, which contain the specified text after the filter symbol is clicked. To recover all messages the description field must be kept blank, when clicking the filter button.

IP Tracer Results

The IP Tracer option enables capturing and decoding network traffic for the ROMES software. This functionality is provided via a link layer network access and a comprehensive decoding engine, based on the well known Wireshark packet analyzer.

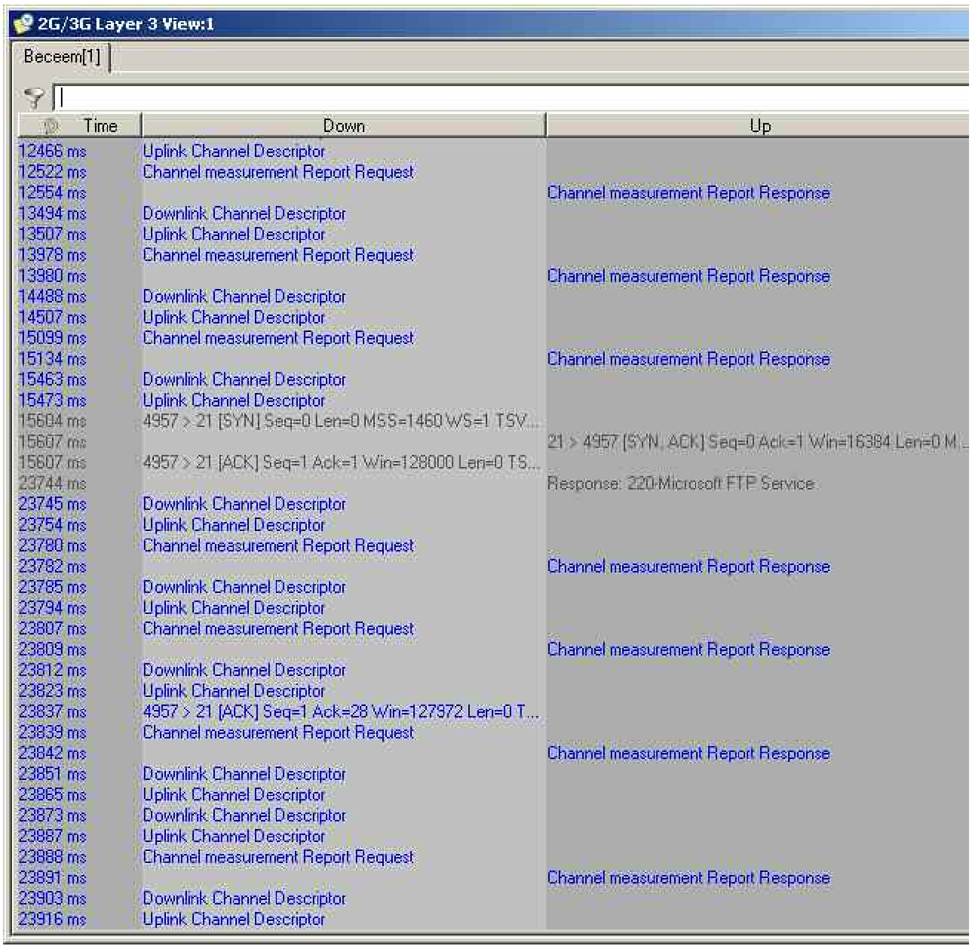
The Protocol is shown in column “Type” and the messages in the “Up” and “Down” Columns. Source and Destination IP Address are shown in additional Columns.



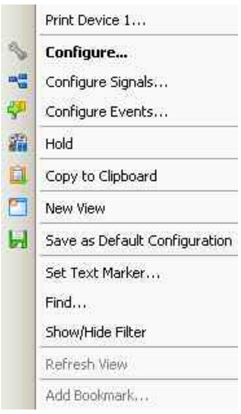
IP Tracer results are only visible, if the IP Tracer is configured in the DQA Connect to Network Job and the option ROMES3IPT is available.

MAC Management Messages

The MAC Management Messages can be analyzed in the Layer 3 View. It displays the messages together with the IP Traces, if measured. The details of the messages are currently not available.



Context menu



A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, to refresh the view, or to add a bookmark; see *Context menu* description on p. 4.2. In addition the context menu provides the following menu commands:

Set Text Marker…

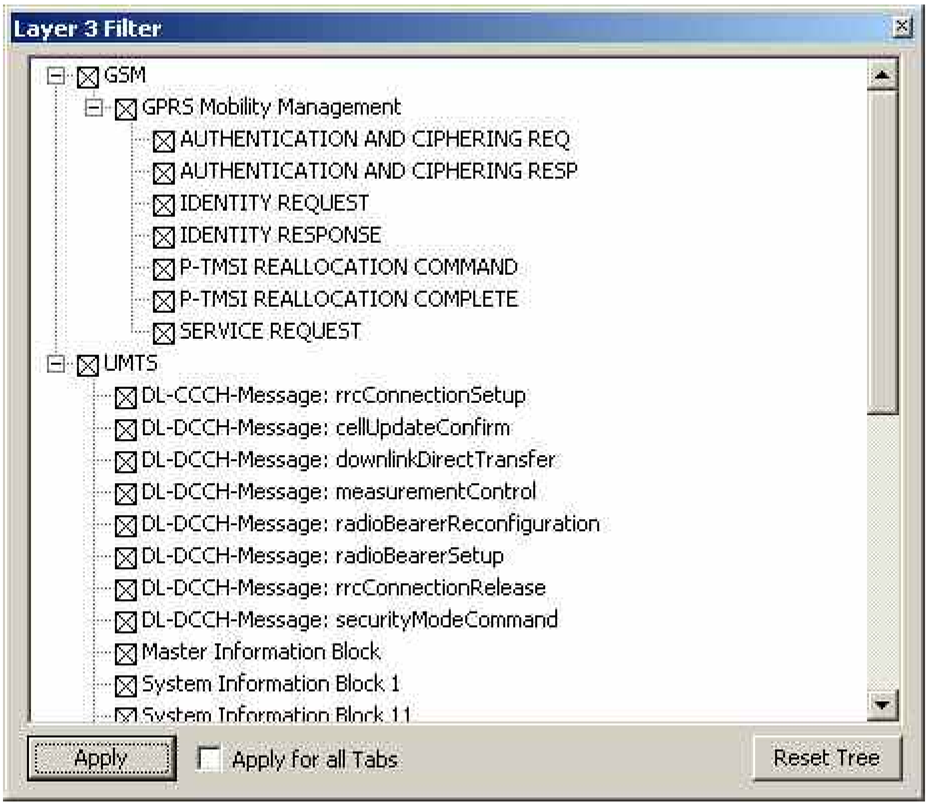
Opens a dialog to define a text marker using the selected message as a search text; see Text Markers *on p. 4.340.*

Find…

Opens a standard Windows Find *dialog to search the entire message list for a keyword or an expression.*

Layer 3 Filter

This filter allows filtering depending on the message type. The filter can be opened using the context menu. After the start of ROMES the filter is empty. It will be filled during the measurement or replay with the displayed messages.



A messages or groups of messages can be deselected. After pressing the “Apply” button, the view will be updated.

2G/3G Layer 3 View Configuration

The *2G/3G Layer 3 View* configuration menu selects the messages to be viewed or exported and shows information on the current view version. It is opened via a right mouse click on a point inside *2G/3G Layer 3 View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Display* tab defines the display mode of the GSM L3, GPRS RLC/MAC, and UMTS RRC messages and controls the text markers and the detail filter.

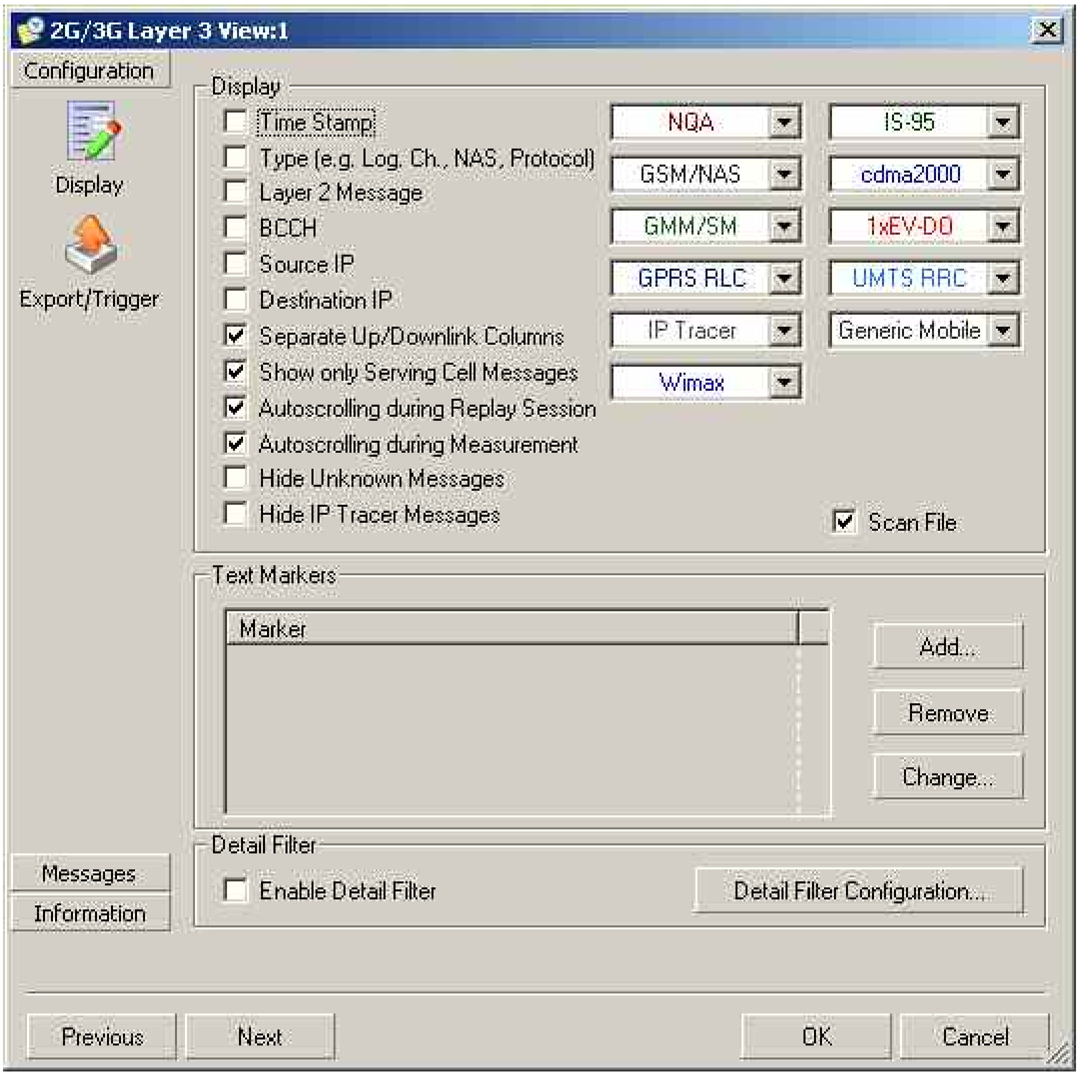


Fig. 4-191 2G/3G Layer 3 View Configuration: Display

Display The controls in the *Display* panel define which type of information is displayed in the *2G/3G Layer 3 View* and how the messages are displayed.

Time Stamp

If the box is checked, the time stamp associated with the message occupies the first column of the 2G/3G Layer 3 View *tables.*

Logical Channel

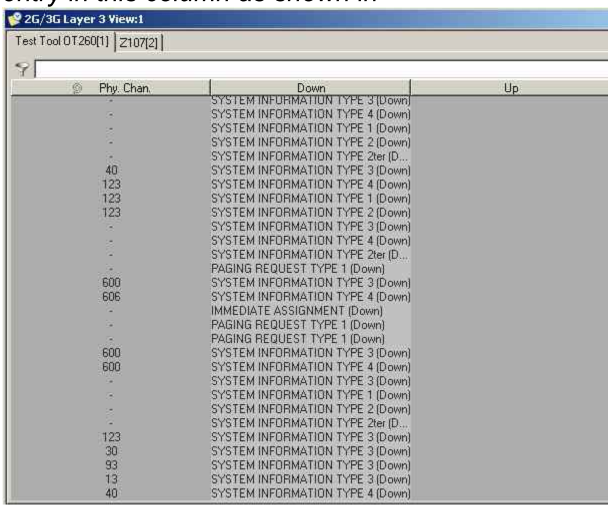
If the box is checked, the logical channel associated with the message occupies the second column of the 2G/3G Layer 3 View *tables.*

Layer 2 Message

If the box is checked, layer 2 messages associated with the layer 3 message are displayed in an additional column of the 2G/3G Layer 3 View *tables. Only some SAGEM devices are capable of recording layer 2 messages. Recording must be enabled in the* Measurement Mode *or* General Settings *tab of the* Driver Configuration *menu.*

BCCH

If the box is checked, the 2G/3G Layer 3 View table displays the additional column Physical Channel. Usually you will see only messages from the serving cell, the cell the mobile is connected to. Some mobiles are able to receive information from one or more neighbor cells in the same time. In this case the associated BCCH channel number is shown. Messages from the serving cell have no entry in this column as shown in



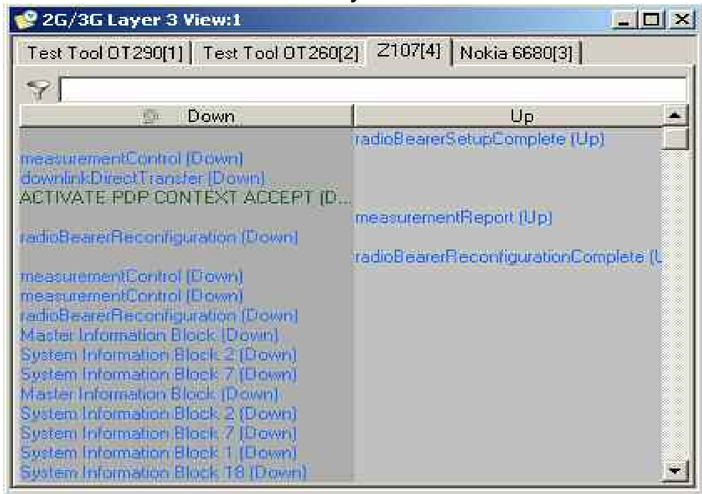
If you switch off this column, it's not possible to distinguish between messages from the own and the neighbor cell. If the box Show only Serving Cell Messages *is checked the view will display only messages which belong to the serving cell.*

Source/Destination Ip

If the IP Tracer is enabled and this box is checked the Source and Destination IP Address will be displayed in own columns.

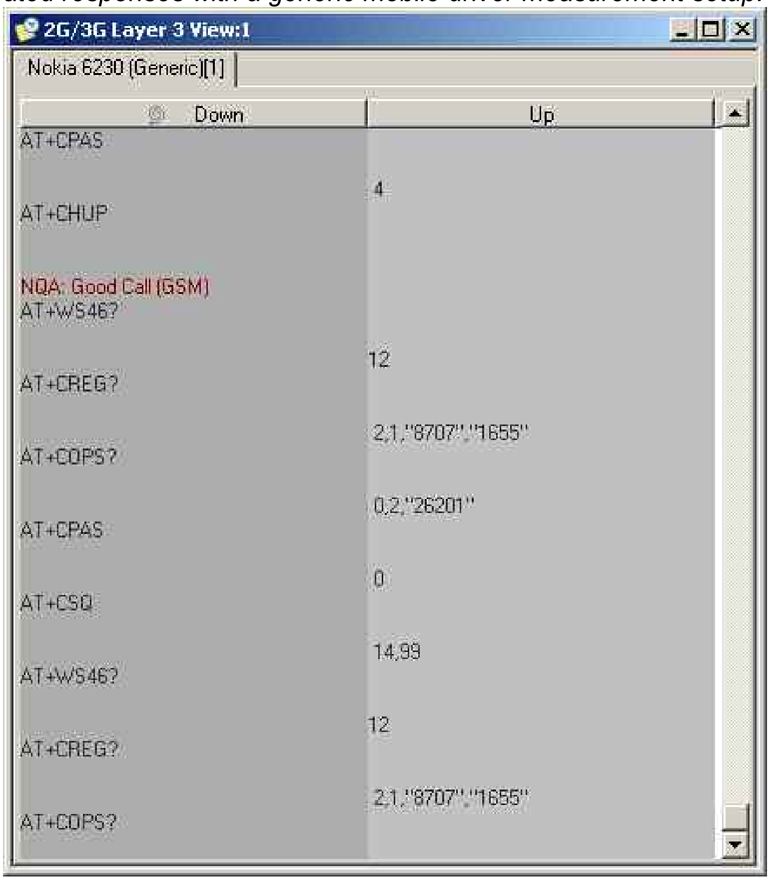
Separate Up/Downlink Columns

If the box is checked, uplink and downlink messages appear in separate columns of the 2G/3G Layer 3 View as shown in



Otherwise, all messages from one mobile are written in a single column in chronological order. An (Up) *or* (Down) *identifier after each message indicates which transmission direction the message belongs to.*

This is useful for e.g. the display of the AT commands and associated responses with a generic mobile driver measurement setup:



Show only Serving Cell Messages

If the box is checked, layer 3 messages exchanged with the serving cell are displayed only. Otherwise, the 2G/3G Layer 3 View *shows all layer 3 messages recorded.*

Autoscrolling

If the boxes are checked, the 2G/3G Layer 3 View *tables are scrolled down automatically as soon as the bottom of the view window is reached. Otherwise, the scrollbar can be used to move up and down in the table. Autoscrolling can be enabled/disabled separately for re-play and measurement sessions.*

Scan File

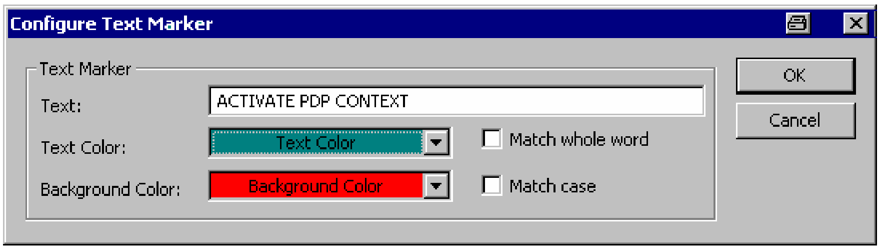
The Scan File *checkbox enables or disables the automatic scan for* 2G/3G Layer 3-related QoS *data in the active Measurement file.*

Color Scheme

The different message types *(NQA, GSM/NAS, GMM/SM, GPRS RLC, IS-95, cdma2000, 1xEV-DO, UMTS RRC, IP Tracer, Generic Mobile)* can be displayed with different colors to be more easily distinguished. Each of the pull-down lists opens a *Colors* dialog; see p. 4.392.

Text Markers

The controls in the *Text Markers* panel define markers that can be used to high-light keywords or expressions in the list of displayed messages. *Add…* opens the following dialog:



The *Configure Text Marker* can be opened from the context menu of the *2G/3G Layer 3 View.* A text marker highlights the search text entered in the *Text* input field using the selected *Text Color* and *Background Color.* The options *Match whole word* and *Match case* refine the text selection.

It is possible to define several text markers with different attributes, *Remove* or *Change* a text marker.

Detail Filter

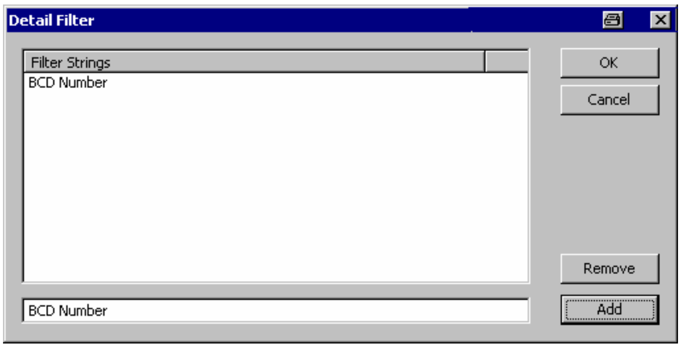
The detail filter filters the detailed information displayed in the view and can be used to limit the amount of information displayed and search for particular information types. To activate the filter, proceed as follows:

1. In one of the *Messages* tabs of the configuration menu, enable the details for a particular message (select *Yes* in the *Details* column, e.g. for the SETUP message in the *GSM L3 Messages* tab).

2. Replay the *(Measurement – Replay* or) measurement file and pause the replay *(Measurement – Replay Pause* or *)* as soon as the message details are displayed for the first time.

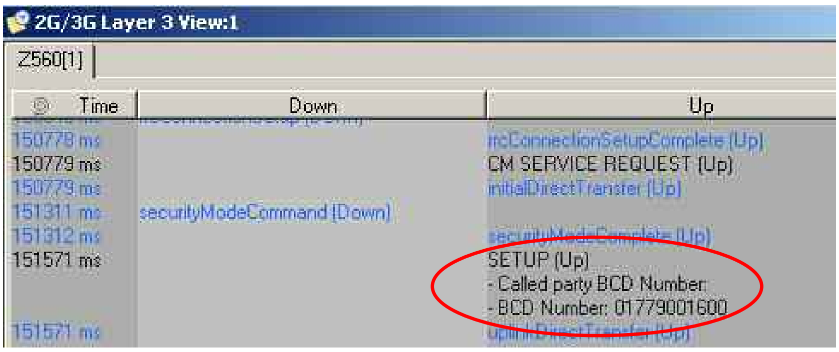
3. Open the *Display* menu of the configuration menu and press *Detail Filter Configuration.*

4. Enter the detailed information you wish to display into the dialog opened, e.g. type *BCD Number* into the line across the bottom and click *Add.*



5. Click *OK* to close the *Detail Filter* dialog, then click *Enable Detail Filter* and *OK* to close the configuration menu.

6. Continue the replay *(Measurement – Replay Pause* or). The next SETUP message is displayed with the *BCD Number* information only*.*



The *Export/Trigger* tab controls the export of data during a replay session and defines the trigger for selecting a range of messages to be displayed.

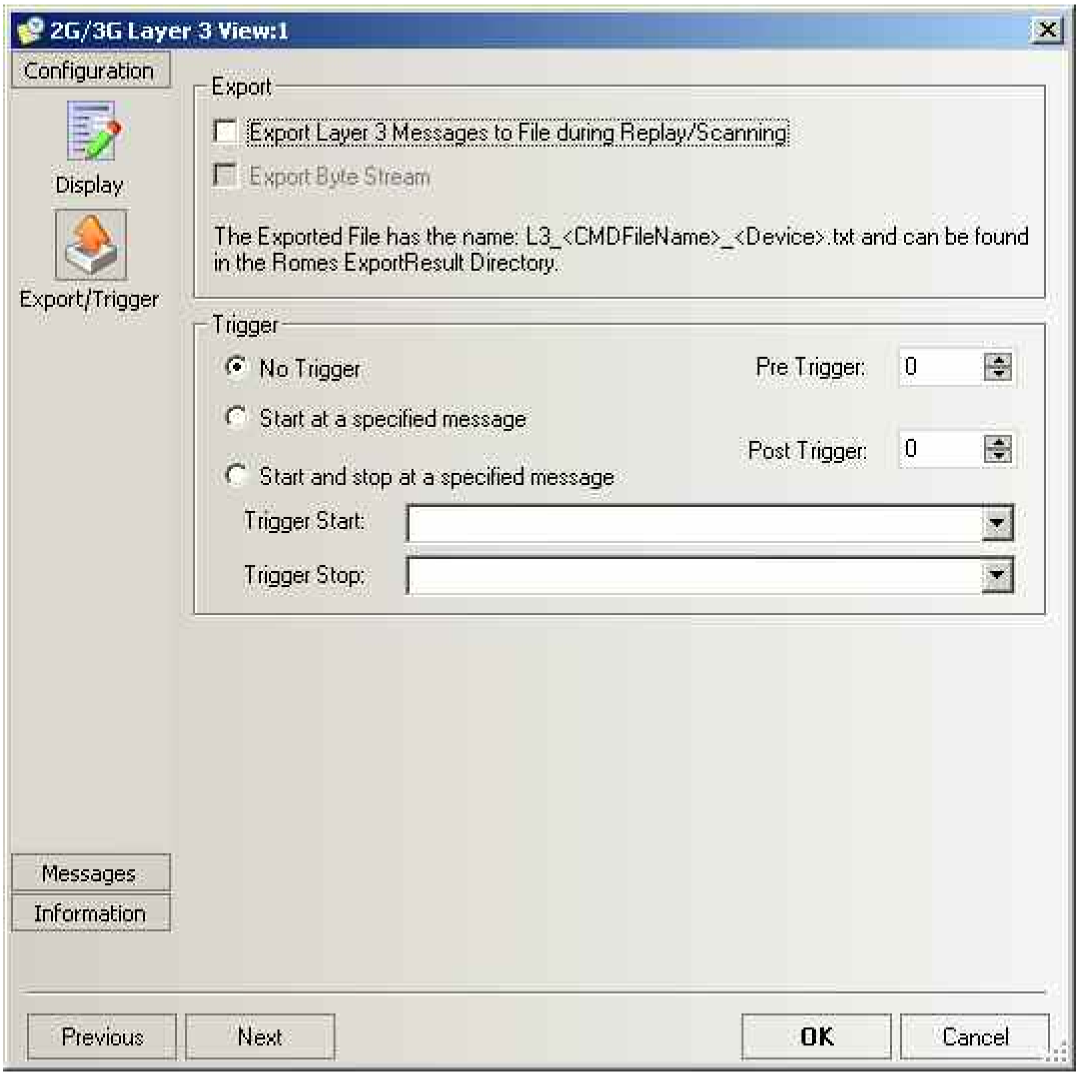


Fig. 4-192 2G/3G Layer 3 View Configuration: Export / Trigger

Export

The three checkboxes in the *Export* panel select one of the following export modes:

- No data export (upper box cleared, lower box unavailable): Data export during replay disabled.
- Export messages only (upper box checked, lower box cleared): A quasi-chronological record of the layer 3 messages is written to an ASCII text file named *L3_<CMDFileName>_<Device>*, located in the *ExportResult* subdirectory of the R&S ROMES program directory.

```
2844 ms ; measurementControl (Down)
3719 ms ; IDENTITY REQUEST (Down)
3188 ms ; measurementReport (Up)
3203 ms ; securityModeCommand (Down)
3203 ms ; securityModeComplete (Up)
3500 ms ; measurementReport (Up)
3719 ms ; downlinkDirectTransfer (Down)
3750 ms ; IDENTITY RESPONSE (Up)
```

- Export messages and byte stream (upper and lower box checked): The export file also contains the raw bytes encoding the messages and their information elements.

```
2844 ms ; measurementControl (Down)
          HEX: 0x01ff09010d00208e81a01414220240ae231620
3719 ms ; IDENTITY REQUEST (Down)
          HEX: 0x0f0000000000032701000b00051803
3188 ms ; measurementReport (Up)
          HEX: 0x02ff090213002250025001920045 2d05001940046cc8000528
3203 ms ; securityModeCommand (Down)
          HEX: 0x01ff11011000d08a2c110c0600018001481c300e6018
3203 ms ; securityModeComplete (Up)
          HEX: 0x02ff15020900d66707718d21000000
3500 ms ; measurementReport (Up)
          HEX: 0x02ff090218009a4dda771225a025001920045 2ce5001940046cca0005280
3719 ms ; downlinkDirectTransfer (Down)
          HEX: 0x01ff06010b00f11c5f0e89400040a30060
```

Export files are overwritten when the replay is repeated.

TIP: Use the Details button in the GSM L3 Messages, GPRS RLC/MAC Messages or UMTS RRC Messages tabs to include the message details in the export file.

Layer 3 Message Trigger

Instead of listing all messages of a given type recorded during the measurement, it is possible to select a range of messages:

No trigger
: *All messages recorded are displayed*

Start at ...
: *Display starts when the first* Trigger Start *message is detected and continues until the end of the measurement*

Start and stop ...
: *Display starts when the first* Trigger Start *message is detected and stops at the first* Trigger Stop *message*

Trigger Start
: *Pull-down list to select the message type triggering the start of the display*

Trigger Stop
: *Pull-down list to select the message type triggering the stop of the display*

PreTrigger
: *Number of messages displayed before the* Trigger Start *message*

PostTrigger
: *Number of messages displayed after the* Trigger Stop *message*

The *GSM/NAS Messages tab* selects the GSM/NAS layer 3 messages to be displayed.

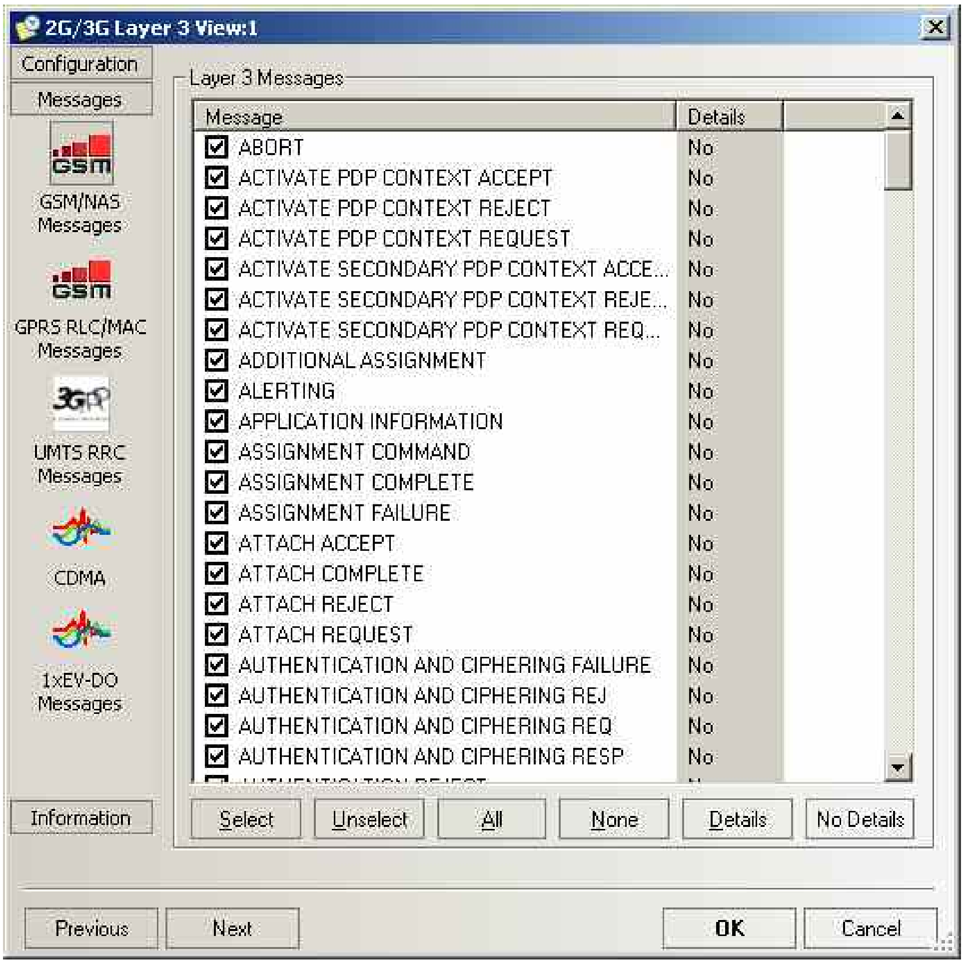


Fig. 4-193 2G/3G Layer 3 View Configuration: GSM/NAS Messages

Message list

List of all layer 3 message types defined in GSM/NAS. The second column of the table indicates whether the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

Select

Displays the selected, highlighted message type (left-click) in the 2G/3G Layer 3 *view. As an alternative, the box on the left of the message type can be checked (left-click).*

Unselect

Hides the selected, highlighted message type (left-click) in the Layer 3 *view. As an alternative, the box on the left of the message type can be cleared (left-click the checked box).*

All

Display all layer 3 messages in the 2G/3G Layer 3 *view.*

None

Display no layer 3 messages in the 2G/3G Layer 3 *view.*

Details

Displays the detailed information concerning the selected message type in the 2G/3G Layer 3 *view from where it can be printed.*

No Details

Removes the detailed information from the 2G/3G Layer 3 *view so that it can not be printed. The detailed information can still be retrieved on screen by double clicking an individual message.*

TIP Details selected for display will also be included in an export file generated during a replay; see Fig. 4-191 on p. 4.337 .

The *GPRS RLC/MAC Messages tab* selects the RLC/MAC control messages to be displayed.

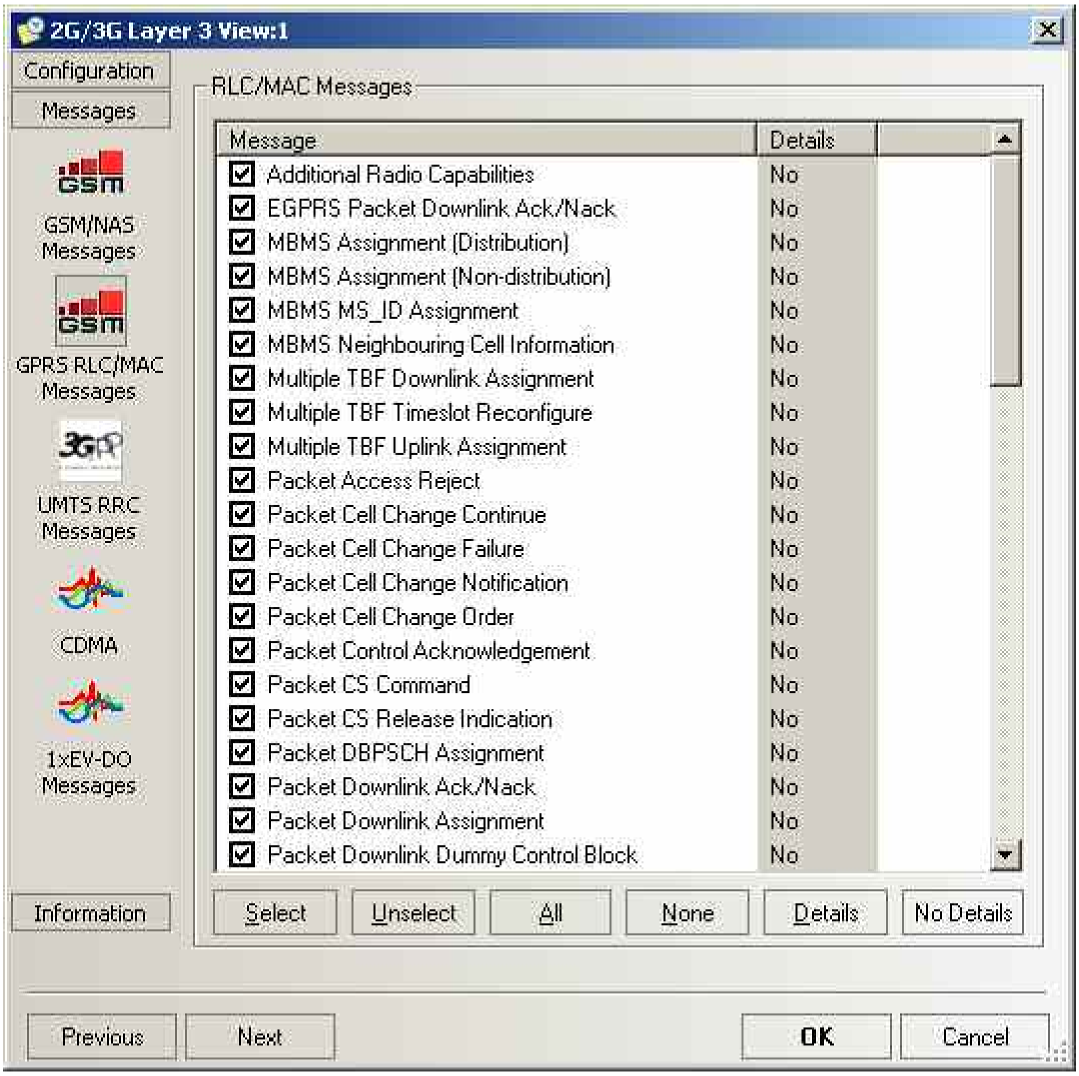


Fig. 4-194 2G/3G Layer 3 View Configuration: GPRS RLC/MAC Messages

Message list

List of all RLC/MAC (Radio Link Protocol/Medium Access Control) control message types defined for GPRS. The second column of the table indicates whether or not the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

The buttons below the table are the same as in the *GSM L3 Messages* tab; see above.

The *UMTS RRC Messages tab* selects the UMTS RRC control messages to be displayed.

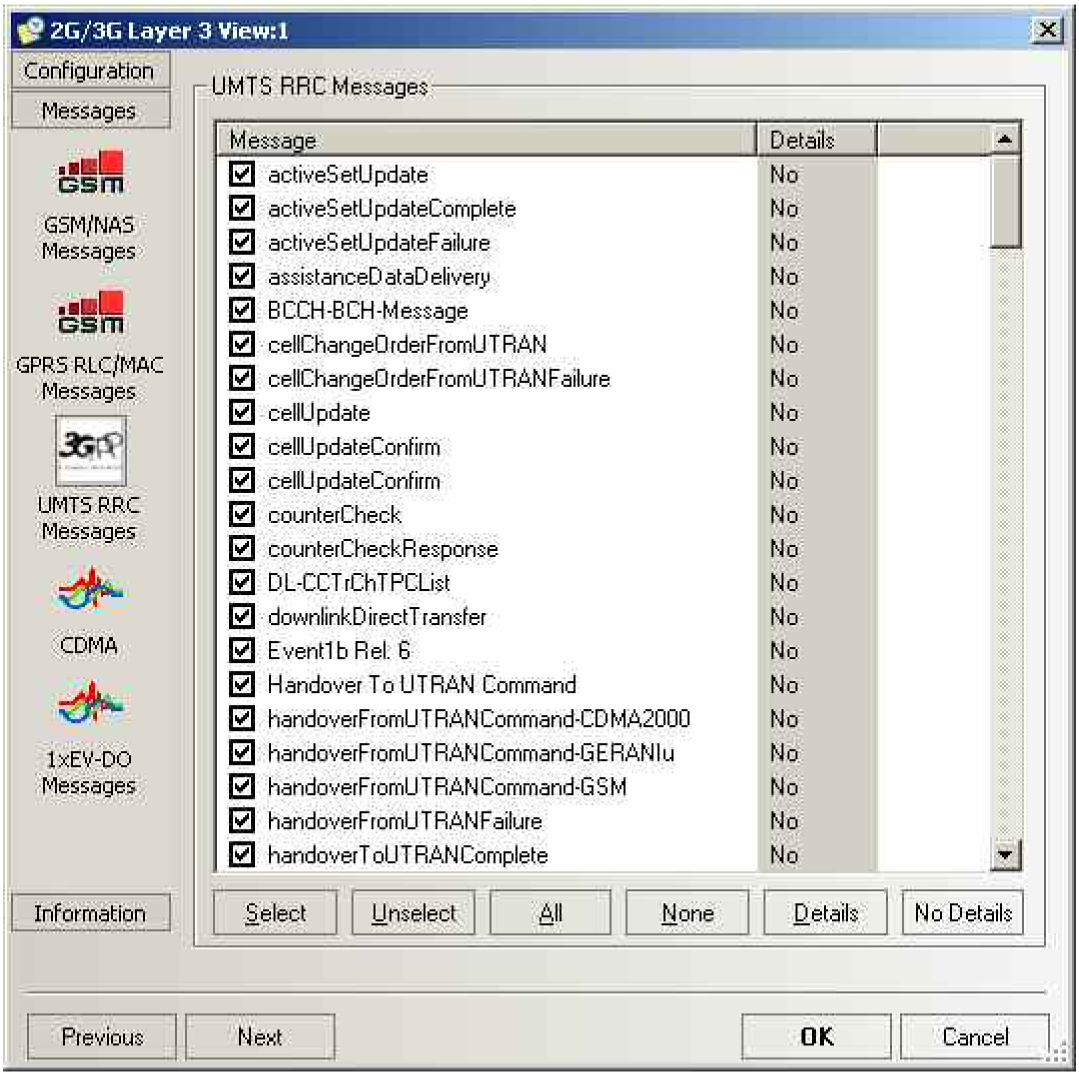


Fig. 4-195 2G/3G Layer 3 View Confguration: UMTS RRC messages

Message list

List of all RRC (Radio Resource Control) message types defined for UMTS. The second column of the list indicates whether or not the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

The buttons below the list are the same as in the *GSM L3 Messages* tab; see above.

The *CDMA Messages tab* selects the cdma2000 messages to be displayed.

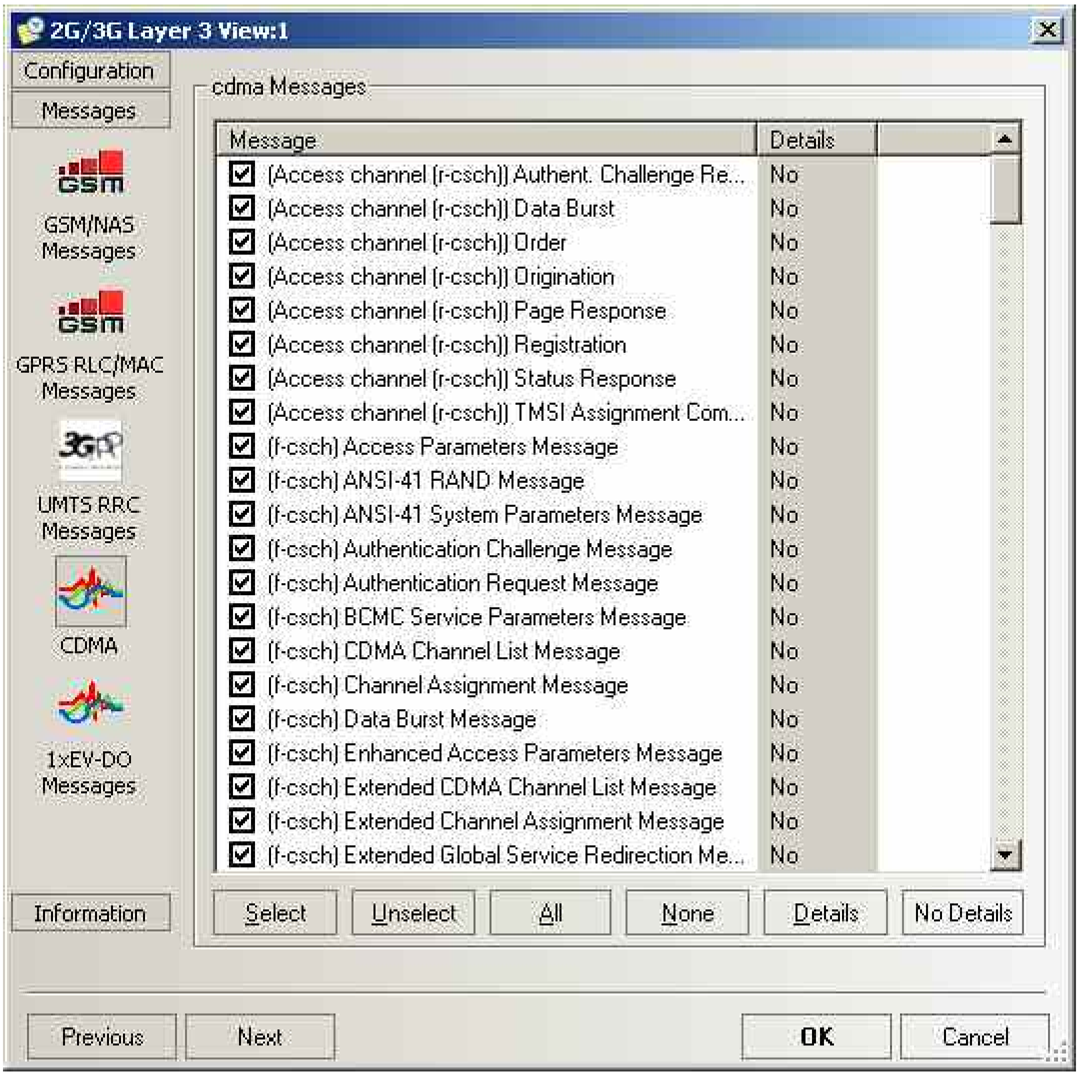


Fig. 4-196 2G/3G Layer 3 View Configuration: CDMA Messages

Message list

List of all cdma2000 control message types defined for CDMA. The second column of the table indicates whether or not the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

The buttons below the table are the same as in the *GSM L3 Messages* tab; see above.

The *1xEV-DO Messages tab* selects the 1xEV-DO messages to be displayed.

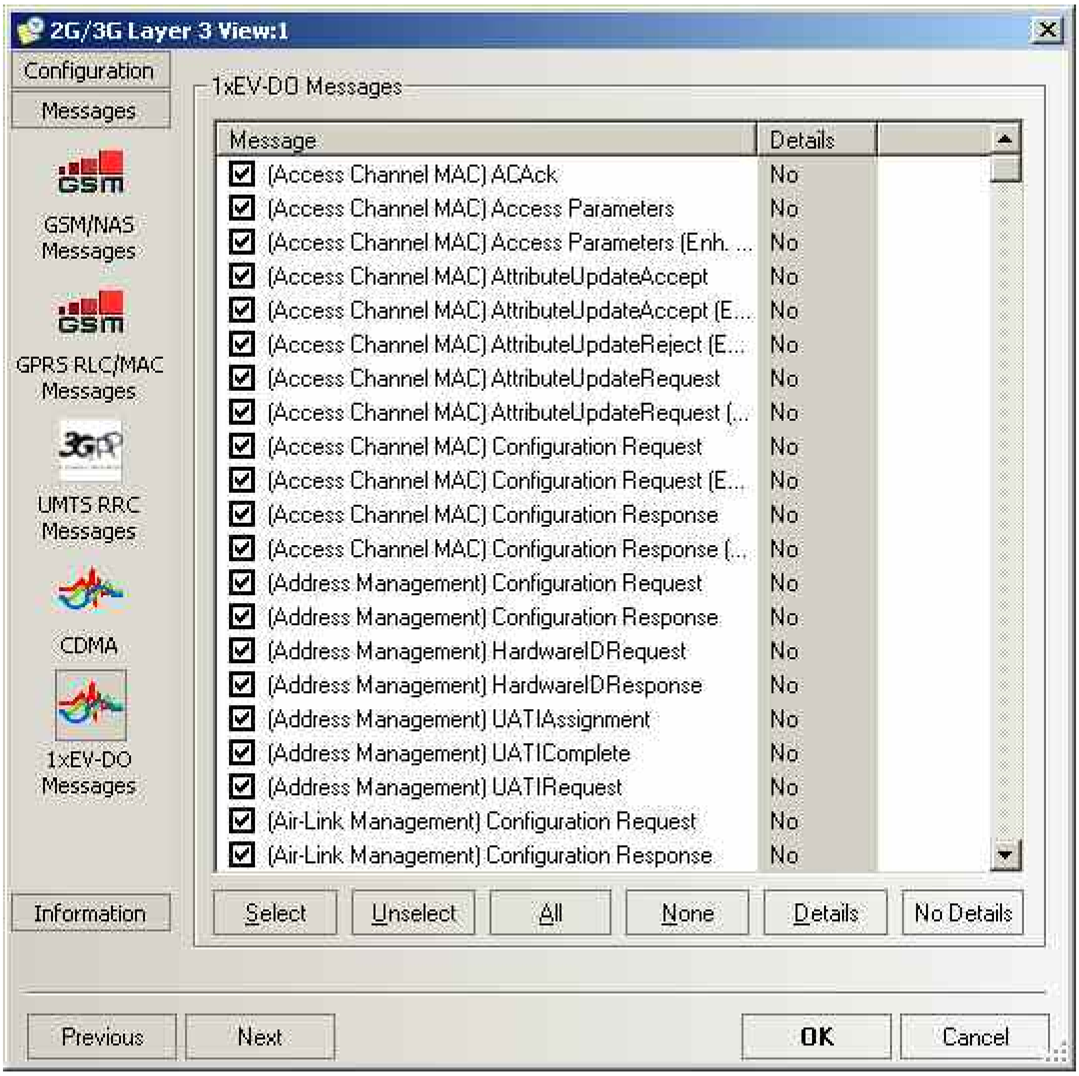


Fig. 4-197 2G/3G Layer 3 View Configuration: 1xEV-DO Messages

Message list List of all defined 1xEV-DO control message types. The second column of the table indicates whether or not the detailed information concerning a message type is displayed in the *2G/3G Layer 3* view.

The buttons below the table are the same as in the *GSM L3 Messages* tab; see above.

2G/3G NQA View

The *2G/3G NQA View* shows a bar graph representing the call statistics for Mobile Originating and Mobile Terminating Calls (MOC and MTC), i.e. the number of *Good, Blocked, Dropped*, and *No service* calls of each GSM or UMTS mobile used. The absolute number of calls is displayed on the bars.

The view is empty unless the *Network Quality Analysis (NQA)* is active. Moreover, it requires one of the measurement modes *NORMAL* or *CAMP* to be set and the *Autodial* function to be active. All driver settings and call classes are explained in chapter 6.

To complement the *2G/3G NQA*, the *UMTS/GSM NQA State View* (see p. 4.318*)* tracks the NQA states and state transitions of each call in detail.

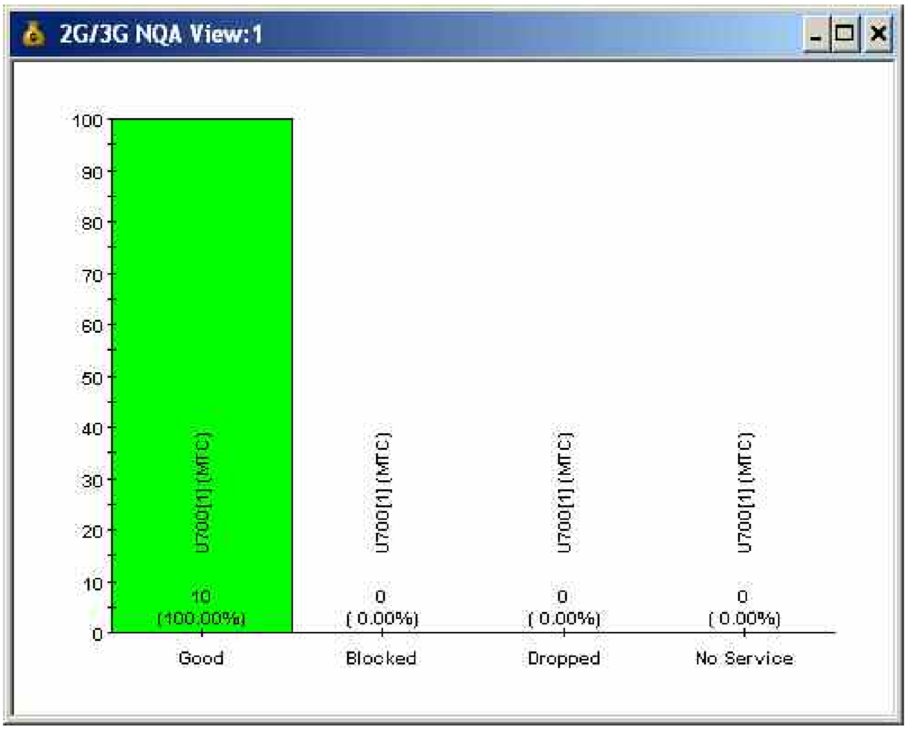
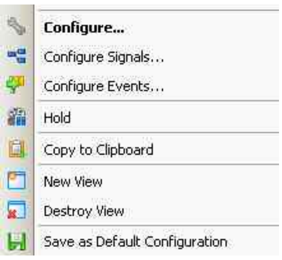


Fig. 4-198 2G/3G NQA View (for 1 mobile)

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see *Context menu* description on p. 4.2*.*

The *2G/3G NQA View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

2G/3G NQA View Configuration

The *2G/3G NQAView* configuration menu selects the devices to be viewed. It is opened via a right mouse click on a point inside *2G/3G NQA View* or via the *Tools - Modules Configuration...* command (see chapter 3).

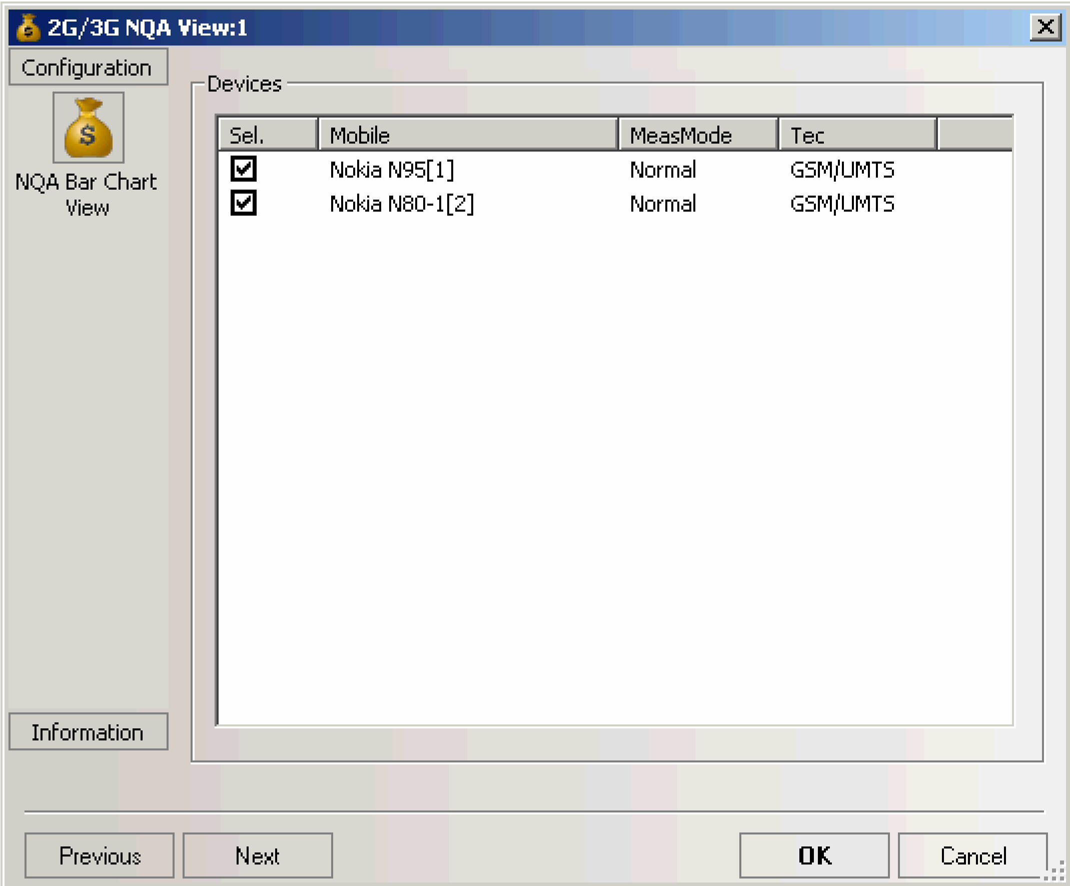


Fig. 4-199 2G/3G Layer 3 View Configuration: Display

Devices The checkboxes select the mobile devices to be displayed in the NQA Bar Chart.

2G/3G ETSI QoS View

The *2G/3G ETSI QoS View* shows the NQA classification for each 3G (UMTS) or 2G (GSM) originating or terminating call *(Good, Blocked, Dropped*, and *No service*). Furthermore a NQA recognizes if the B-Party hangs up during a call. The result is displayed in the ETSI QoS View and is counted as dropped. In addition to the above listed information the *2G/3G ETSI QoS View* displays a set of Quality of Service parameters defined in the ETSI/IREG specifications.

IREG is an ETSI committee developing specifications for the Quality of Service evaluation. Quality of Service (QoS) is a general notion, defined as “the collective effect of service performance which determines the degree of satisfaction of a user”. A critical technical aspect related to QoS is Network Performance (NP), i.e. “the ability of a network portion to provide the functions related to communication between users”.

Parameters to assess the QoS of various services are defined in document TS 102.250-3 (formerly: PRD IR.42) and related documents.

The view is empty unless the *Network Quality Analysis (NQA)* is activated in the driver configuration menu. Moreover, it requires one of the measurement modes *NORMAL* or *CAMP* (GSM) to be set and the *Autodial* function to be active. All driver settings and call classes are explained in chapter 6.

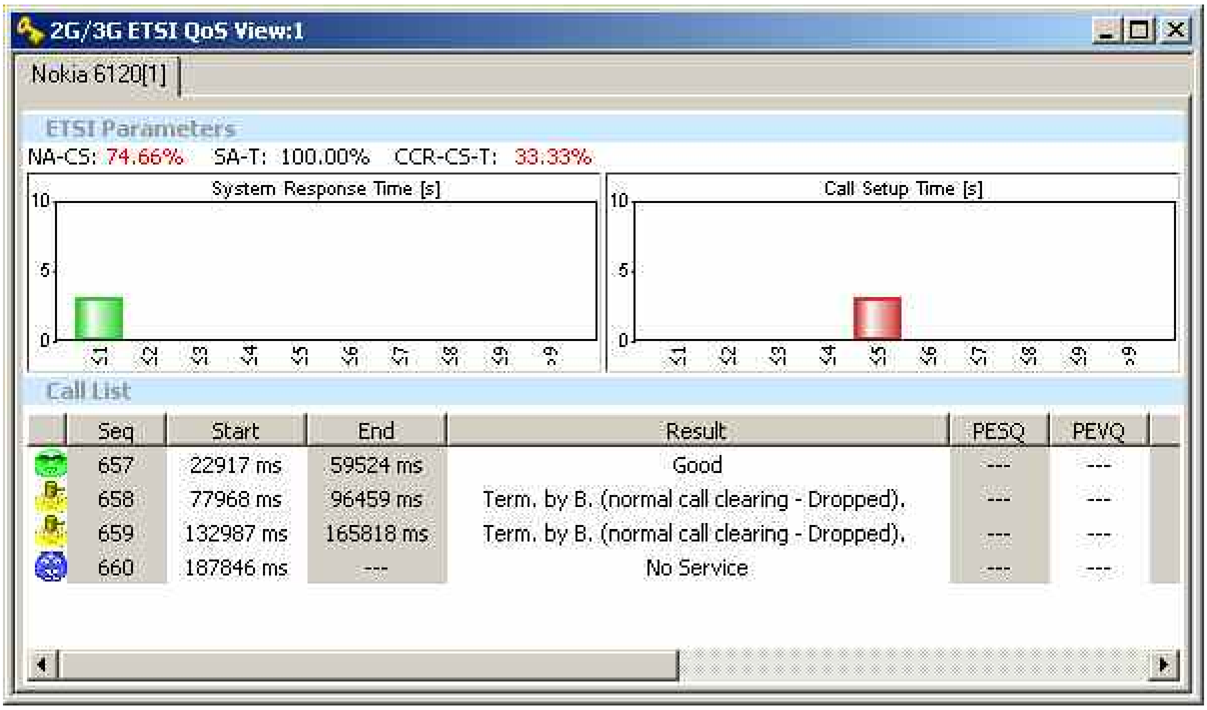


Fig. 4-200 2G/3G ETSI QoS View

The measurement results for each mobile are arranged in a separate tab. The tabs are divided into two panels. The upper panel provides a statistical evaluation of the whole measurement *(IREG IR.42 Parameters)*, the lower panel a list with the results of each individual call *(Generated Calls)*. The list can be replaced by the *Call Details* for a selected call.

IREG IR.42 Parameters

Overview of QoS service-independent and telephony-related parameters defined in TS 102.250-3 (formerly: PRD IR.42) and statistical evaluation of the timing parameters. The following values are displayed in percent:

NA-CS
: *Network Accessibility Circuit Switched, ratio of the number of successful GSM network access attempts to the total number of network access attempts. The criterion for successful network access is that the path loss criterion parameter C1 is larger than 0 (see standard 3GPP TS 05.08).*

NA-PS
: *Network Accessibility Circuit Switched, ratio of the number of successful GPRS network access attempts (with GPRS enabled for cell) to the total number of network access attempts. The criterion for successful network access is that the path loss criterion parameter C1 is larger than 0.*

SA-T
: *Service Accessibility Telephony, ratio of the number of successful call attempts (after successful network access) to the total number of call attempts.*

CCR-CS-T
: *Call Completion Rate Circuit Switched Telephony, ratio of the number of intentionally terminated telephony calls to the number of successful telephony calls.*

The larger the four values, the better the QoS. The values turn red if they fall below the limits defined in the configuration menu.

The distribution of the following timing parameters is shown in two bar graphs:

System Response Time
: *Time between the start of a call attempt and indication of successful network access.*

Call Setup Time
: *Time between the start of a call setup attempt (after successful network access) and indication of call setup success.*

Short times indicate a good QoS. The diagram scales and the number of classes are defined in the configuration menu.

Generated Calls

List of all calls with their characteristics and QoS parameters. The table contains the following rows:

Colored symbols to distinguish the Good, Dropped, Blocked *and* No Service *calls*

Start/End

Start and end time of the call

Result

Call class: Good, Dropped, Blocked *and* No Service *call; see description of* NQA *tab of the driver configuration menu in chapter 6.*

Quality

Call quality according to the settings in the NQA tab: OK, Noisy, Excessive HO, Delayed Call.

Tx

Maximum transmit power of the mobile during the call

S-RT, C-ST

System response time and call setup time, see above

MCC, MNC

Mobile Country Code and Mobile Network Code

Mode

Call mode: GSM or UMTS

Call Details

A double-click on a row in the *Generated Calls* table opens the Call Details, providing the entries in the Generated Calls table plus three bar graphs to assess the distribution of the following parameter values:

RxQual/BLER

Indication of the Bit Error Rate (GSM) or Block Error Rate (UMTS)

RxLev/Ec/Io

Indication of the downlink signal strength received by the mobile

Handover Duration

Indication of the time needed for successful handover attempts

The handover statistics (number of *Handover Attempts* and *Successful Intracell/Intercell HOs)* is indicated in addition.

With SQA measurements, there is also a KPI window available, which allows the replay of speech quality files, if applicable:

Select a Speech Quality entry in the KPI window and click on the *Player…* button to replay the file on the standard sound card. This function is also available during measurements with recording. The measurement must be set up with other soundcards to avoid a distortion.

Clicking  closes the *Call Details* and displays the *Generated Calls* table.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or destroy views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

2G/3G ETSI QoS View Configuration

The *2G/3G ETSI QoS View* configuration menu defines limits for the QoS parameters and configures the bar graphs. It is opened via a right mouse click on a point inside *2G/3G ETSI QoS View* or via the *Tools - Modules Configuration...* command (see chapter 3).

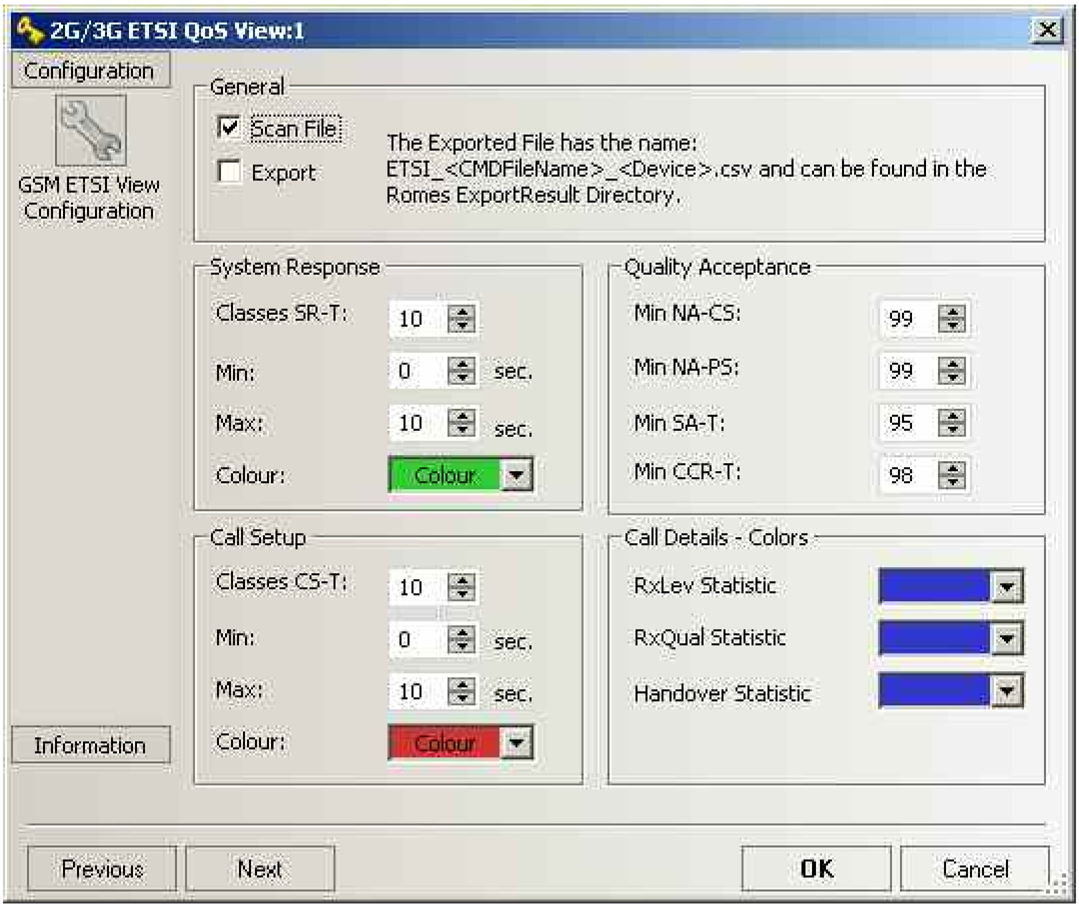


Fig. 4-201 2G/3G ETSI QoS View: Configuration

General

The *Scan File* checkbox enables or disables the automatic scan for *ETSI-related QoS* data in the active Measurement file.

Select the *Export* option to export the results of the *Generated Calls* table to a *.csv export file that can be opened and processed by Excel, e.g.:

```
Start;End;Result;Quality;Tx;S-RT[s];C-ST[s];CI(Start);CI(End);
                                                        MCC;MNC;Mode;Type
63813 ms;132000 ms;Good;OK;-6.0 dBm;0.44;6.55;-;-;262;1;UMTS;---
```

System Response / Call Setup

The *System Response / Call Setup* panel defines the number of classes (i.e. the maximum number of bars) in the *System Response Time* and *Call Setup Time* diagrams, sets the scale of the y-axis and the colors of the bars.

With a number n of classes and a SR or CS time interval between *Min* and *Max* seconds, the classes correspond to the following sub-intervals:

Class 1	[0 s, (Max – Min) / n]
Class k	[(k – 1)*(Max – Min) / n, k*(Max – Min) / n] , 2 ≤ k ≤ (n – 1)
Class n	[(n – 1)*(Max – Min) / n, ∞ s]

The sub-interval width (Max – Min) / n must be equal to or larger than 1 s.

Quality Acceptance

The four input fields in the *Quality Acceptance* panel contain lower limits for the QoS Parameters displayed in the *IREG IR.42 Parameters* panel. A measurement result turns red if it is below the limits.

Call Details - Colors

The *Call Details* panel sets the colors of the bars in the *RxQual/BLER Distribution, RxLev/Ec/Io Distribution* and *Handover Duration* diagrams.

CW Views

The *CW Info View* shows the measurement frequency of a test receiver *(R&S ESVx*, *R&S ESPI, R&S TSMx, TS55-R2, EB200),* see test receiver driver description in chapter 6) that operates in *Manual Tracking* mode.

The *CW Info View* can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *CW Views*.

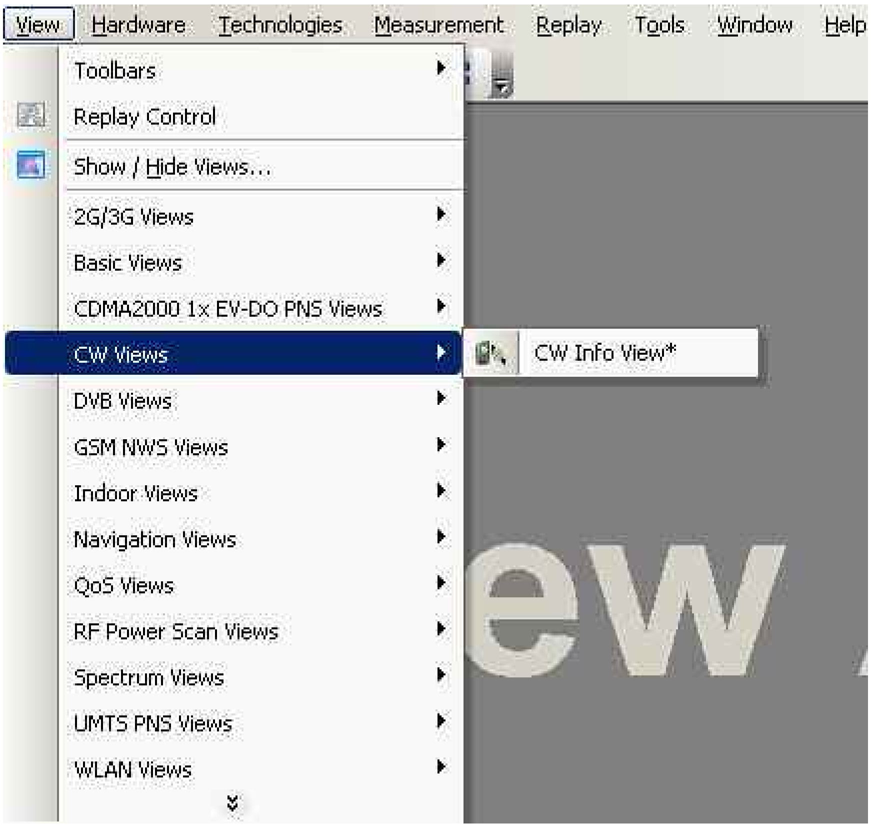


Fig. 4-202 CW views

CW Info View

The *CW Info View* shows the measurement frequencies of a test receiver that operates in *Manual Tracking* mode. To perform a measurement, the appropriate test receiver driver must be loaded and *Manual Tracking* must be enabled as explained in chapter 6.

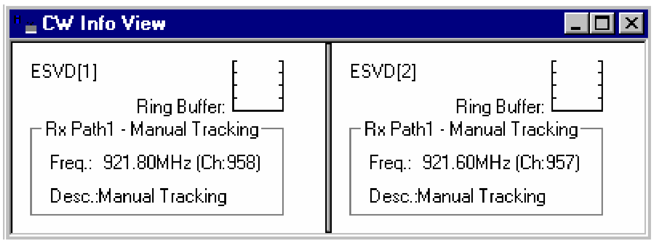


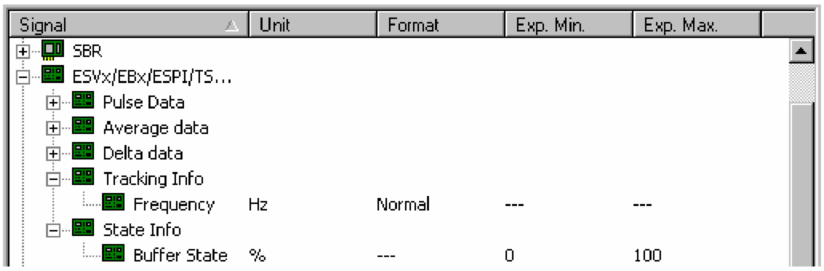
Fig. 4-203 CW Info View

Diagram

The diagram shows all connected test receivers together with the loading of the ring buffer, the current measurement frequencies and a description.

The ring buffer is an intermediate memory used to store measurement data before they are further processed. The scale of the ring buffer diagram ranges from 0% (buffer empty) to 100% (buffer full). An overflow of the buffer may cause data loss and decrease the system performance.

The frequency in tracking mode and the buffer state are also available in the *Available Signals* data tree *(Tools – Preferences;* see section *Signal Configuration* in chapter 3).



The *CW Info View* has no context menu for configurations assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

Indoor Views

The *Indoor View* shows measurement results recorded using the *INDOOR* navigation driver. This driver is suitable in areas where no GPS navigation signal is available, in particular inside buildings.

Click the icon in the measurement bar and use the *Available Signals Drag & Drop...* dialog to display signals in the Indoor View.

The *Indoor View* can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *Indoor Views*.

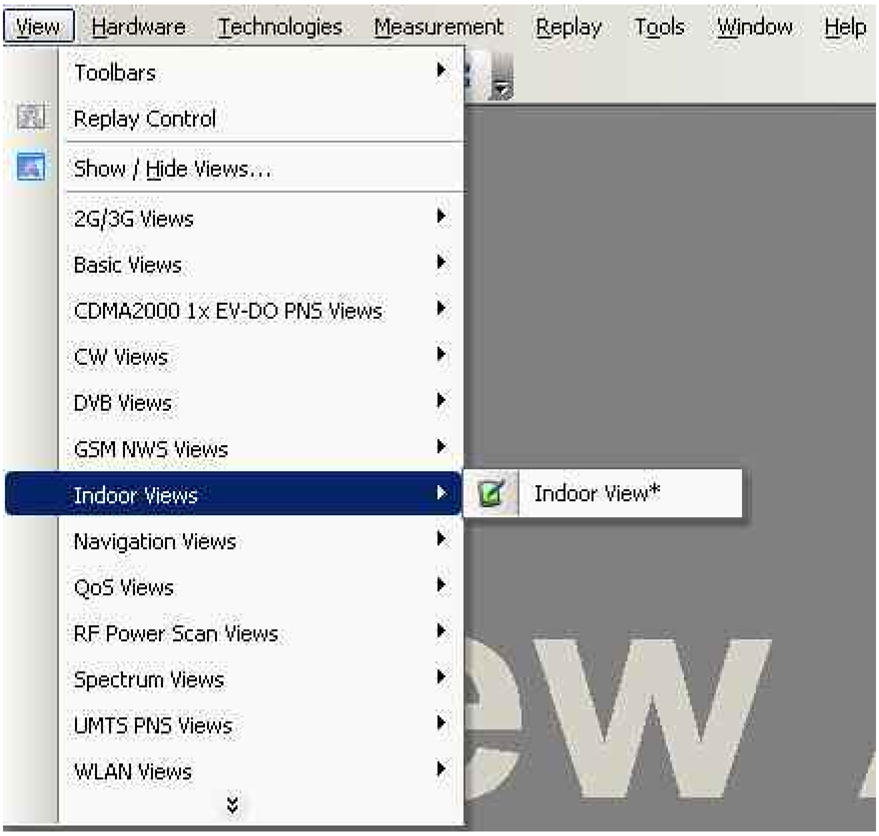


Fig. 4-204 Indoor views

Indoor View

The *Indoor View* visualizes a measurement which is performed at a set of points located on a background map. To perform a measurement, the Indoor navigation driver must be loaded as explained in chapter 6. In addition, a background map must be loaded and assigned geographical coordinates via the *Indoor Navigation* configuration menu (see section *Indoor Navigation Driver INDOOR* in chapter 6). The measurement points can be defined in the configuration menu *(Waypoints* navigation mode) or during the measurement *(Stream input* navigation mode).

Measured indoor results can be recorded in a file together with the configuration settings and replayed later. In this case, there is no need to load a driver; the configuration of the background map is part of the measurement file.

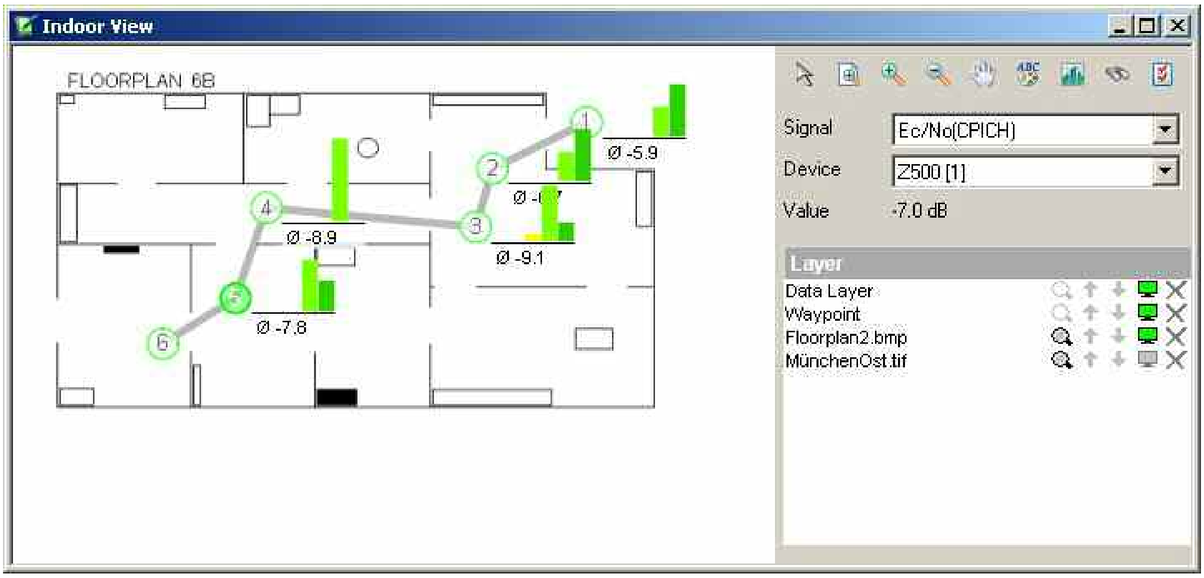


Fig. 4-205 Indoor View

Diagram

The diagram shows the loaded background map where measurement points are placed as defined in the *Indoor View Configuration* menu.

Depending on the *measurement mode* selected in the configuration menu the measurement results are either indicated at fixed points (hot spots, see Fig. 4-205) or visualized along the way between the waypoints with a user-defined color scale (continuous measurement). For more information see section *Measurement Mode* in chapter 6.

The *Indoor View* now supports R&S ROMES coupled focus (see p. 4.5). The focus indicator for continuous measurement mode is a red rectangle.

Control field

The control field of the Indoor view contains icons for the pointer tool, to fit the map to the size of the display, to zoom in/out and to move the map, to toggle the legend and diagram data display, it contains information about the displayed signal and the measurement device and it contains the layer management list.

The control field itself can be activated/deactivated using the *Show Info...* item in the context menu of the diagram.

To set positions or to activate waypoints in the Indoor Control map display, the pointer tool cursor must be active.

A click on this icon resizes the current map to fit into the current map display area.

To zoom into the map, click this icon and mark a rectangle in the diagram to define the area to zoom. The marking of a rectangle is done by keeping the left mouse key pressed while moving from top left to down right. Different from the *Route Track View*, **a single click is not working**.

To reset the map scale after zooming, click the reset icon in the Layer management field.

To zoom out of the map, click this icon and single click on the diagram.

To reset the map scale after zooming, click the reset icon in the Layer management field.

To move the map, click this icon, click on a starting point on the background map and then move to the end point of the desired map scroll. After the starting point on the map is clicked, the scroll is shown by a thick line between the mouse cursor and the starting point.

Once the end point of the desired scroll is clicked, the map is scrolled accordingly.

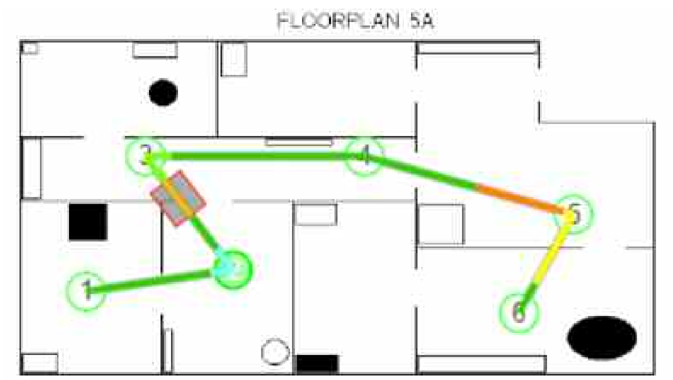
To reset the map position after scrolling, click the reset icon in the Layer management field.

This icon toggles the display of the legend in the diagram view area.

or

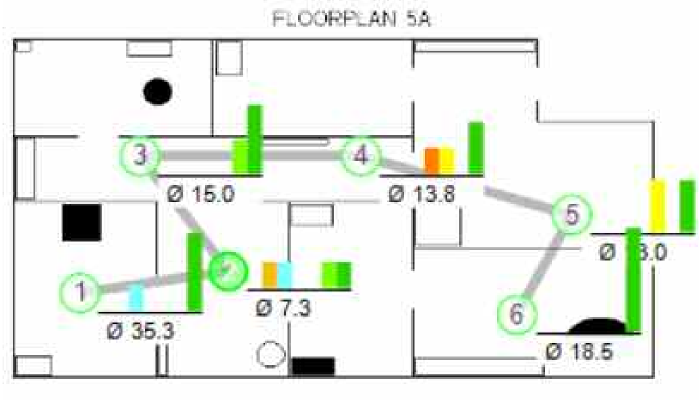
This icon toggles the measurement result display format type in the diagram.

Clicking on switches to interpolation mode display:



In interpolation mode, the icon changes to .

Clicking on switches to histogram mode display:



Now the icon has changed back to .

The availability of both modes is **independent** from the selected measurement mode (Hot Spot or Continuous).

 or 

This icon toggles the tracking of waypoints on or off.

This icon opens the Indoor View *Configuration* dialog analogous to the *Configure...* option in the *Context Menu*.

Signal This field group shows the active device and signal data:

Device

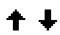
Value

The *Device* pull-down list below the *Signal* field shows all mobiles measured. The selected *Signal* of the *Device* is displayed in the diagram.

When a waypoint or a segment of the measurement path is clicked, the *Value* field shows the measured data value at this point.

Layer This layer management field displays all loaded layer names or map filenames and offers a series of icons for layer display:

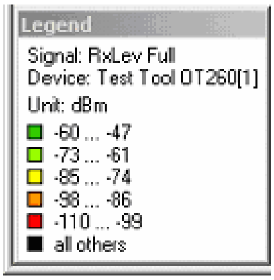
 A click on this icon resets the effects from the last map zoom or map scroll action. This icon is only active for background map layers, for other layers the icon is disabled ().

 Single-clicking on these icons moves the correspond-ing layer one level up or down. With background map layers, only the top active map layer is visible.

 This icon shows that the corresponding layer is active. To disable the layer, click on the icon. The icon is greyed () and the corresponding layer becomes invisible. If the top map layer is disabled, the next map layer becomes visible, if defined.

Clicking on this icon removes the corresponding layer from view and list.

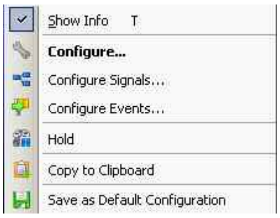
Legend



The legend window explains the signal ranges symbolized by the different colors of the measurement curve. Up to seven colors can be defined via the *Indoor Configuration* tab of the configuration menu, see *Available Signals* data tree *(Tools – Preferences;* in section *Signal Configuration* in chapter 3).

The current signal and device is indicated above the color legend.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see *Context menu* description on p. 4.2*.* The following additional menu commands are available:

Show Info

Activates/deactivates the display of the control field of the Indoor View

Indoor View Configuration

The *Indoor View* configuration menu offers the selection of the Indoor measurement file directory, because if R&S ROMES is configured as ‘Replay Only’ (no dongle required), the Indoor driver menu is not available. It is opened via click on the  icon of the control field, via right mouse click on a point inside the *Indoor View* or via the *Tools - Modules Configuration...* command (see chapter 3).

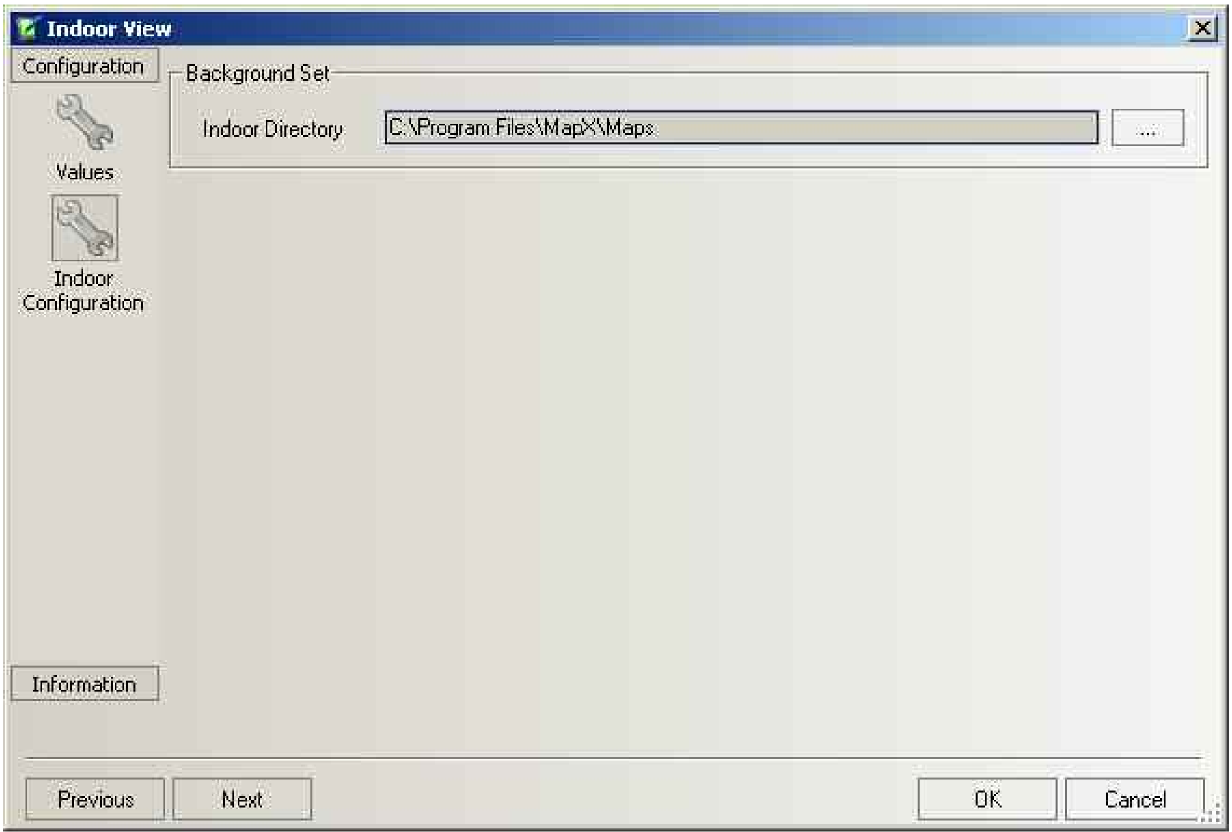


Fig. 4-206 Indoor View configuration: Configuration tab

The *Values* tab is analogous to the *Values* tab of the 2D Chart View configuration menu, see figure on p.4.16 .

Indoor Measurement Control

When an indoor measurement is started, the new **Indoor Control** view pops up, additionally to the Indoor view:

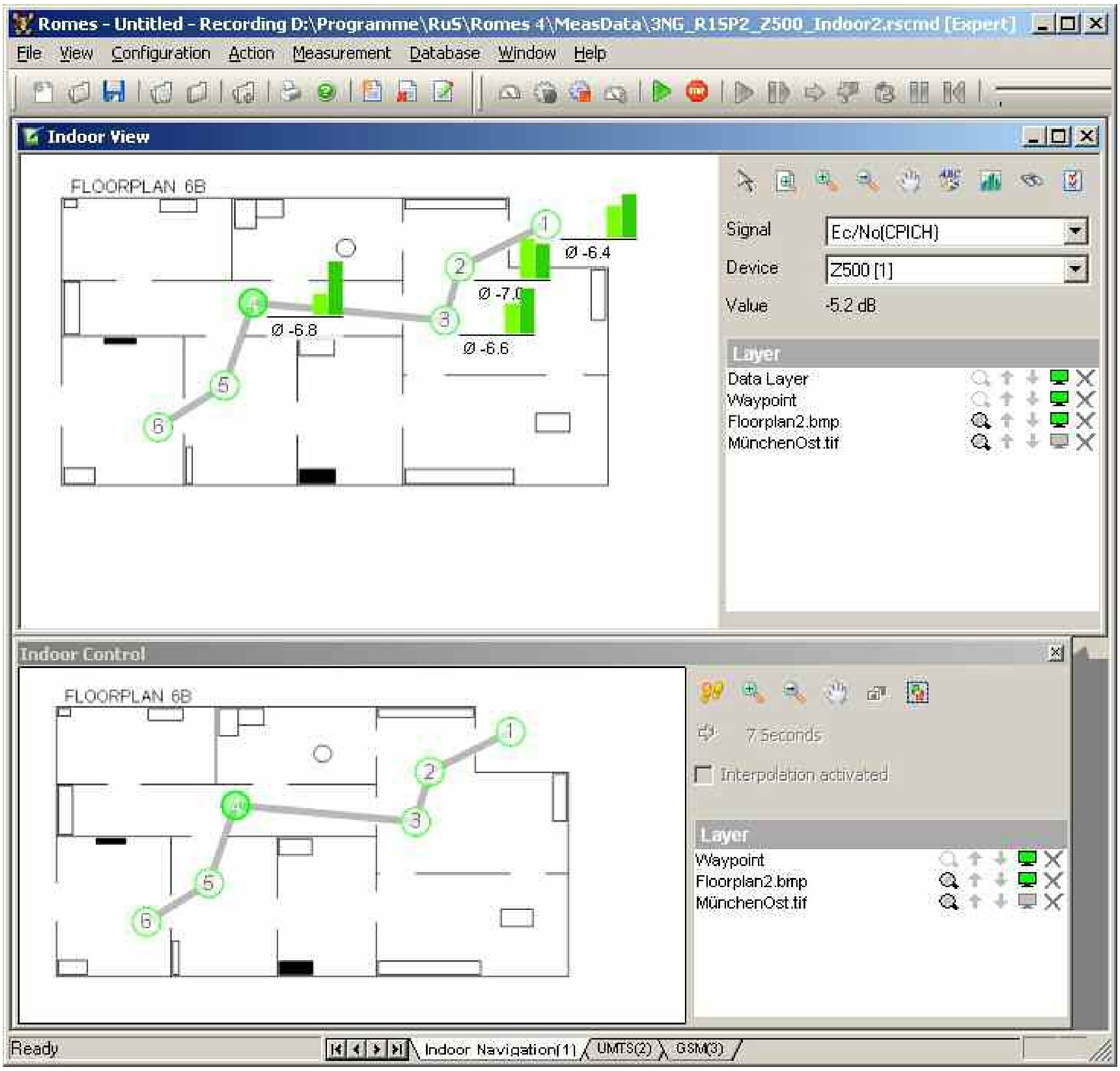


Fig. 4-207 Indoor Measurement: Indoor Control view

The *Indoor Control* view contains a control field which is different from the Indoor view:

Control field The control field of the Indoor view contains buttons to zoom in/out and to move the map, to toggle the legend and diagram data display, it contains information about the displayed signal and the measurement device and it contains the layer management list.

The control field itself can be activated/deactivated using the *Show Info...* item in the context menu of the diagram or by using <Ctrl-T>.

To set positions or to activate waypoints in the Indoor Control map display, the arrow mouse cursor must be active.

To zoom into the map, click this button and mark a rectangle in the diagram to define the area to zoom. The marking of a rectangle is done by keeping the left mouse key pressed while moving from top left to down right. Different from the *Route Track View*, **a single click is not working**.

To reset the map scale after zooming, click the reset icon in the Layer management field.

To zoom out of the map, click this button and single click on the diagram.

To reset the map scale after zooming, click the reset icon in the Layer management field.

To scroll the map, click this button, click on a starting point on the background map and then move to the end point of the desired map scroll. After the starting point on the map is clicked, the scroll is shown by a thick line between the mouse cursor and the starting point.

Once the end point of the desired scroll is clicked, the map is scrolled accordingly.

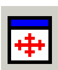
To reset the map position after scrolling, click the reset icon in the Layer management field.

If there is more than one map layer defined in the Geoset, the measurement always starts with the top layer map.

Waypoint navigation mode measurements continue to measure up to the last defined waypoint on the top layer map, then the active layer will automatically switch to the next one down, and the measurement continues with the first waypoint on that layer.

Stream input mode measurements stop at the end of the top layer measurement route, the switch to the next layer has to be done manually using the arrow button.

The order is **always from the highest to the lowest layer**, for both Waypoint navigation and Stream input.



To toggle the map display of the Indoor Control View on or off, this is useful to save space in the view area.

Waypoint

The waypoint flag is either greyed out or active (

), depending on the measurement mode (see chapter 6).

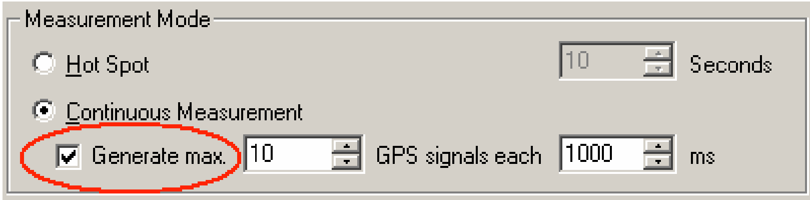
When the button is active (during all modes except **Continuous mode** with **Stream navigation mode**) it can be clicked to trigger a new measurement for the predefined time period While the measurement is performed, the flag is greyed and a countdown is visible instead of the normal button caption:

During the countdown it is not possible to activate other waypoints.

Interpolation activated

To activate the interpolation of position data (in **Continuous mode** and **Waypoint navigation** only), select the according click box in the

Indoor driver menu:



Then the *Indoor Control* view has an activated interpolation check-box (where it can be temporarily deactivated again):

Layer This field displays all loaded layer names or map filenames and offers a series of icons for layer display:

- A click on this icon resets the effects from the last map zoom or map scroll action. This icon is only active for background map layers, for other layers the icon is disabled ( ).
- Single-clicking on these icons moves the corresponding layer one level up or down. With background map layers, only the top active map layer is visible.
- This icon shows that the corresponding layer is active. To disable the layer, click on the icon. The icon is greyed ( ) and the corresponding layer becomes invisible. If the top map layer is disabled, the next map layer becomes visible, if defined.
- Clicking on this icon removes the corresponding layer from view and list.

DVB Views

The *DVB Views* show Digital Video Broadcasting (DVB) specific information included in the measurement data. DVB data can be acquired using the DVB driver described in chapter 6.

The R&S TSM-DVB data of R&S TSM-DVB model var. 02 is not displayed in the DVB Views. R&S TSM-DVB model var. 10 data is displayed. To analyze R&S TSM-DVB data of all R&S TSM-DVB models and the ETL TV Signaling Analyzer use the basic views (Alphanumeric View, 2D Chart View…). The ETL is not capable to do the different measurements simultaneously. The measurement mode has to be chosen prior the start of the measurement.

Due to internal setup procedure of the ETL, the start of a measurement can take a few seconds. This time depends on the firmware version of the ETL. The current version 1.73 takes up to 30 seconds to start measurement. Since the measurement of R&S ROMES starts anyway the first seconds of a measurement can be useless. All measurement modes except for constellation measurement have a typical update rate of twenty measurements per second. The constellation measurement is done three times per second.

The DVB views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *DVB Views*.

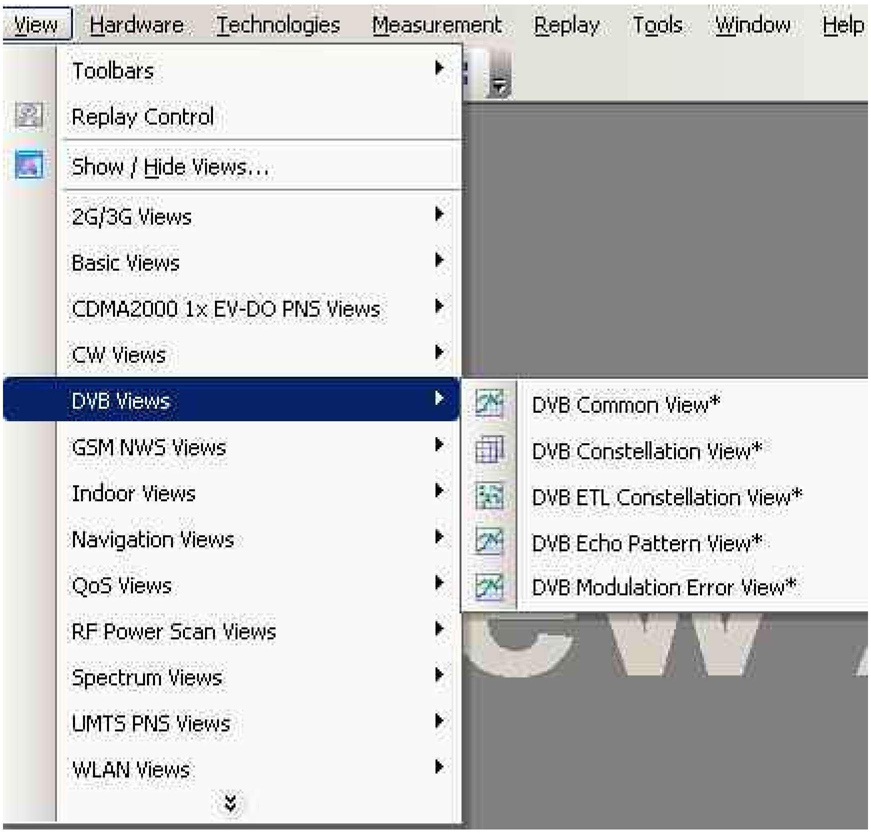
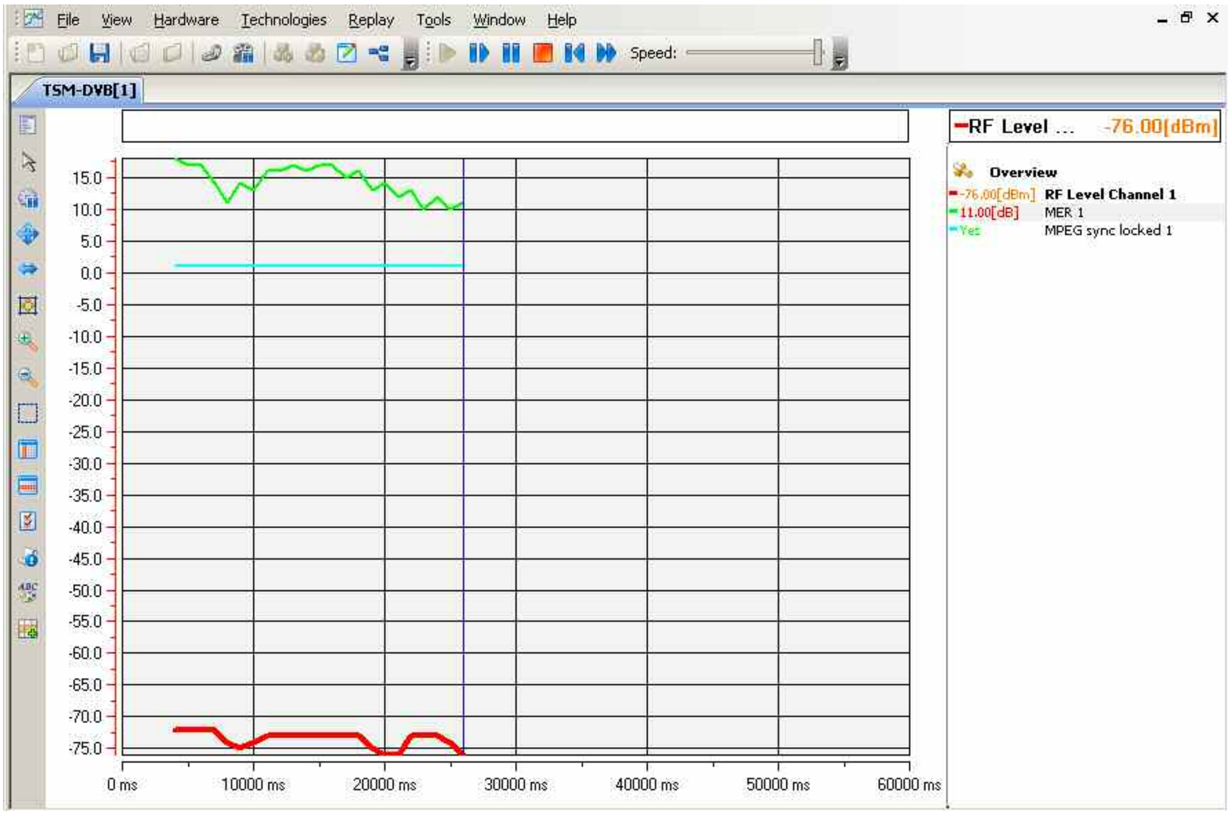


Fig. 4-208 DVB views

DVB Common View

The DVB Common View gives an overview of the general DVB parameters. With this information it is possible to evaluate the quality of the received television frames.



RF Level Channel 1 Display the RF level in dBm.

MER 1 Modulation Error Rate.

MPEG sync locked 1 MPEG synchronized locked

Show the status of synchronization of receiver with signal.

Context menu

A right mouse click on any point in the view opens the context menu to copy the current view to the clipboard, hold the view or to remove signals from the current view.

The *DVB Common View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

DVB Constellation View

The *DVB Constellation View* shows the results from DVB-T and DVB-H signal measurement as configured with the new R&S TSM-DVB. Only the new version of the R&S TSM-DVB model var. 10 can display the signals (see chapter 6).

The device driver allows setup with 4K mode and bandwidth of 5 MHz. The following new signals are available:

- DVB-H signaling preformed/not preformed
- Time slicing is used/not used on HP/LP stream
- MPE-FEC is used/not used on HP/LP stream

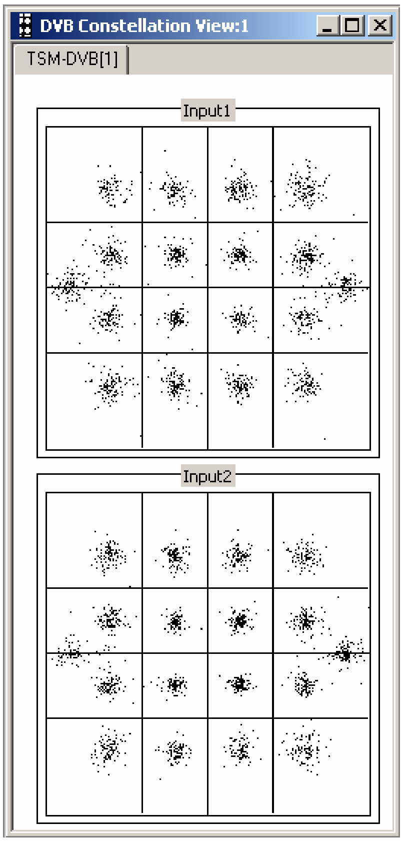


Fig. 4-209 DVB Constellation View

Input1 Shows the signal matrix (QPSK, 16-QAM or 64 QAM, if applicable) of *Input 1.*

Input2 Shows the signal matrix (QPSK, 16-QAM or 64 QAM, if applicable) of *Input 2.*

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

The DVB Constellation View *has no configuration menu assigned. The* Info *tab can be accessed via the* Tools - Modules Configuration... *command.*

DVB Echo Pattern View

The *DVB Echo Pattern View* shows the results from the R&S ETL TV Analyzer. This measurement shows the echo profile of the transmission channel. Echoes may be caused by reflections on buildings, for example. Other transmitters within a single-frequency network may also be interpreted as echoes and displayed referenced to the time a reference signal was received.

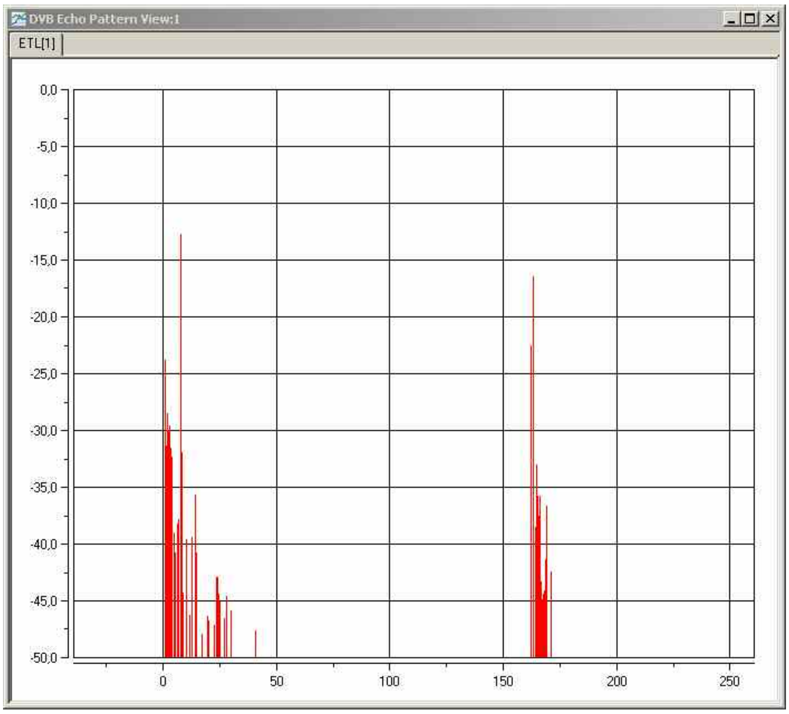
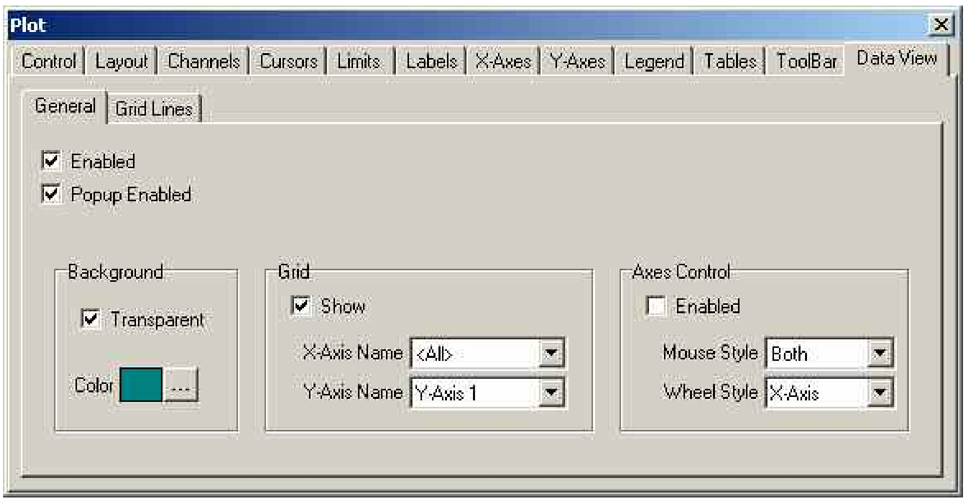


Fig. 4-210 DVB Echo Pattern View

Edit menu

A right mouse click on any point in the view opens the Edit menu, where you can make changes for general and layout settings.



DVB ETL Constellation View

The *DVB ETLConstellation View* shows the results from the R&S ETL TV Analyzer.

This measurement displays the constellation diagram of the demodulated signal. Amplitude imbalance, quadrature error and carrier leakage are still present in the used data.
The ETL sends the constellation diagram to R&S ROMES as a hardcopy of the display. This fact has got an extensive affect on the whole measurement:

- Measurement mode is considerably slower than the other modes, in best case there are three measurements per second possible.
- Update rate of the overview parameters is as slow as the constellation diagram.
- Huge amount of data is stored in the measurement file, about 300kB/s, which is almost 1GB per hour!
- The probability of occurrence of points in the complex I/Q plane is not anymore represented by different colors.
- ROMES displays the constellation diagram and some further information of the ETL screen.

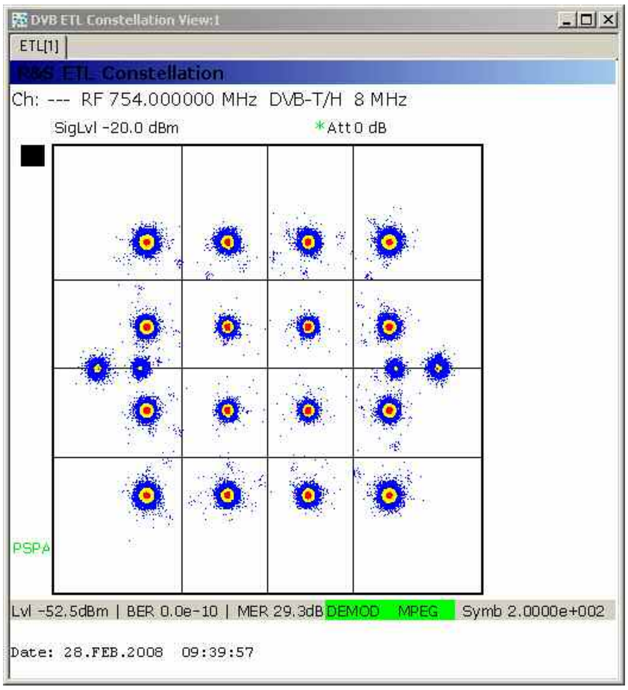


Fig. 4-211 DVB ETL Constellation View

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for hold, copy the current view to the clipboard, create new views, or to save the current configuration; see *Context menu* description on p. 4.2.

The DVB Constellation View *has no configuration menu assigned. The* Info *tab can be accessed via the* Tools - Modules Configuration... *command.*

DVB Modulation Error View

The *DVB Modulation Error View* shows the results from the R&S ETL TV Analyzer. The frequency-dependent curve of the modulation error (MER) can be calculated with the ETL and recorded by R&S ROMES. For calculation of the parameters, all pilots (TPS, continual, and scattered pilots) are automatically removed from the data material.

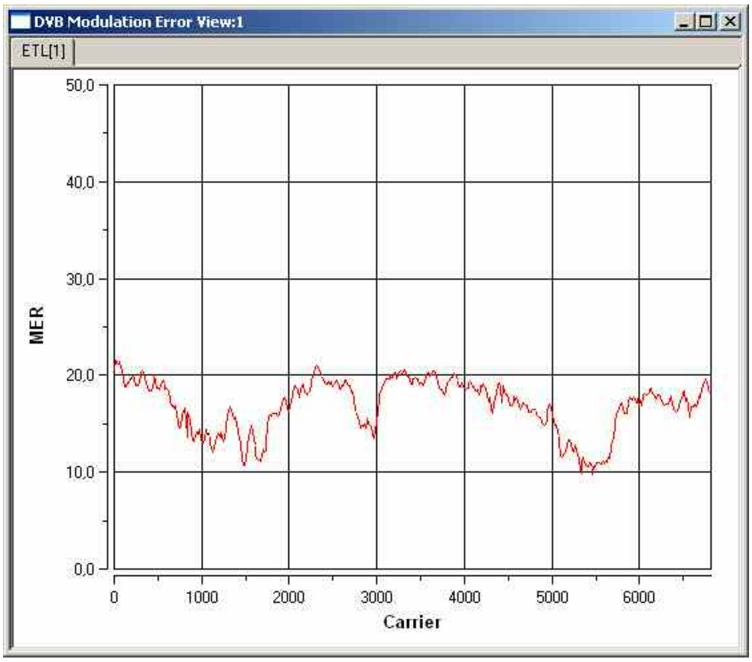
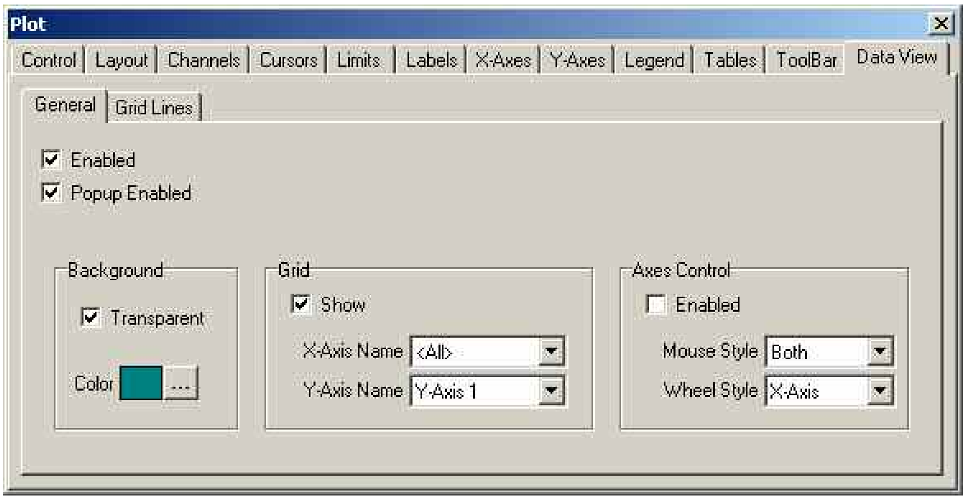


Fig. 4-212 DVB Modulation Error View

Edit menu

A right mouse click on any point in the view opens the Edit menu, where you can make changes for general and layout settings.



UMTS PNS Views

The *UMTS PNS Views* display information about UMTS Pseudo Noise (PN) data. UMTS PNS measurements are performed using the UMTS PN Scanner driver R&S PNS (see chapter 6). The driver controls an R&S FSP spectrum analyzer, an R&S ESPI test receiver, or an R&S TSMx radio network analyzer in order to alternate between UMTS Pseudo Noise (PN) scans and a spectrum analysis. Most of the results obtained with the different test instruments are equivalent.

- In an UMTS PN scan, the test device measures and identifies all UMTS downlink (Node B) signals in the air. The main purpose of this measurement is to test the receiving conditions of a mobile in an UMTS network and to analyze possible interferences. Results of the UMTS PN scans are displayed in all PNS views except the *PNS Spectrum View* and in the *PNS Spectrum History View.*
- The spectrum analysis consists of a frequency sweep over a specified range to detect arbitrary UMTS downlink and uplink signals. Results of the UMTS PN scans are displayed in all PNS views except the *PNS Spectrum View* and in the *PNS Spectrum History View.*

Many of the UMTS PN Scanner results can also be displayed in other R&S ROMES views, e.g. in the *Alphanumeric View*, the *2D Chart View*, the *Route Track View,* and the *Statistic Histogram View*. Some measurement examples using the UMTS PN Scanner are outlined in chapter 2.

The UMTS PNS views can be selected from a submenu displayed on the right side of the *View* menu when the mouse hovers over *UMTS PNS Views*.

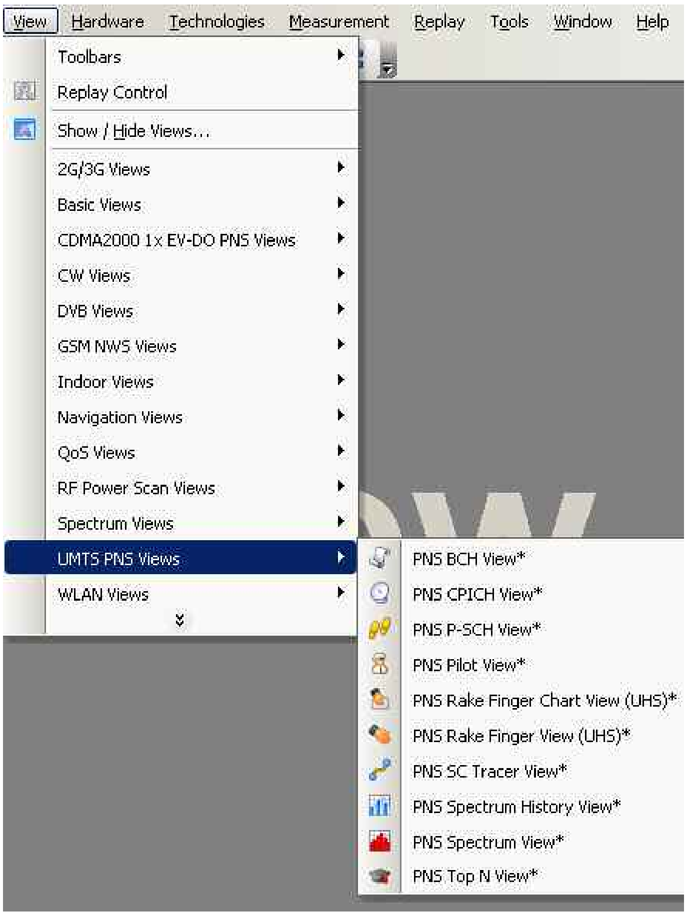


Fig. 4-213 View – UMTS PNS menu

PNS P-SCH View

The *PNS P-SCH View* displays the signal power of the Primary Synchronization Channel of all recorded DL UMTS signals. Additional information is displayed in a table below the diagram.

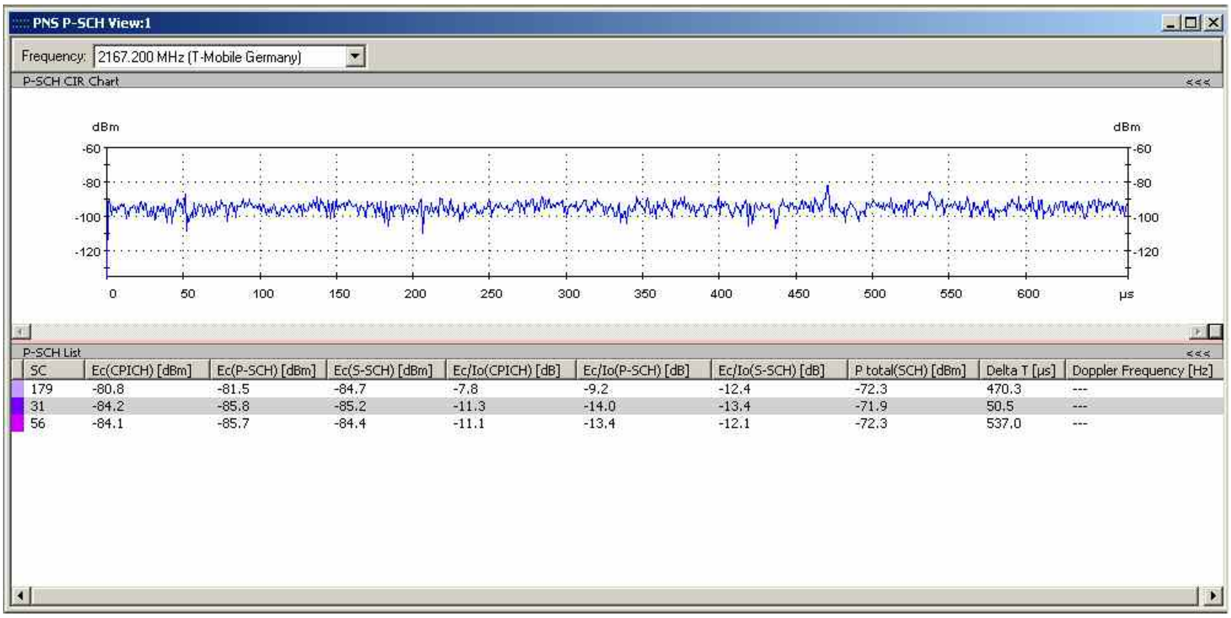


Fig. 4-214 PNS P-SCH View

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS CPICH View, PNS Pilot View* and *PNS SC Tracer View.*

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

View area

The entire view area is horizontally split to accommodate a chart and a table/list. The *P-SCH CIR Chart* shows the power of the received P-SCs in all recorded DL UMTS signals over the time. This power is measured when the system correlates to the P-SCs (1st synchronization step; see section *PNS CPICH View* on p. 4.378.) and therefore always available. The *P-SCH List* below shows only the signals to which the system could synchronize in order to determine the SC. Typically the tallest peaks of the diagram correspond to the values of *Ec (P-SCH)* displayed in the table.

A click on the *P-SCH CIR Chart* or *P-SCH Lists* title bars compresses and expands the 2D-chart or table. A compressed chart leaves more space for the table and vice versa. Moreover, the tables appear in several PNS views so that compressing them can help to avoid redundancies. A compressed sub diagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Diagram scale

The diagram is opened with a default x-axis scale of one UMTS slot (2/3 ms ≈ 666 µs). If placed inside the diagram area the cursor takes the shape of a zoom-in icon (a magnifying glass with a '+' inside), and a vertical line is displayed at the cursor position.

A left mouse click magnifies the diagram in x-direction around the cursor position, *Ctrl* plus left mouse click causes the opposite. An area to become the new x-axis range (e.g. the area around a peak) can be marked while the left mouse button is pressed. *Reset Zoom* in the context menu restores the default scale. A scrollbar is provided to move the magnified diagram to the right or left.

The scale of the y-axis (power in dBm) can be set in the configuration menu.

Table

Below the diagram, the *P-SCH List* gives an overview of the received signals together with their scrambling codes, different power parameters, frequency and timing information. On mouse hover-over, each cell in the table header provides a short explanation of the corresponding column. The *P-SCH List* is identical with the *Peak List* in the *PNS CPICH View.* For a detailed explanation of the parameters refer to section *PNS CPICH View* on p. 4.378.

In the configuration menu, it is possible to show or hide each individual table row.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see *Context menu* description on p. 4.2.

The context menu provides the following additional commands:

Reset Zoom	Resets the x-axis scale to 0 ms to 2/3 ms.

PNS P-SCH View Configuration

The *PNS P-SCH View* configuration menu defines the y-axis scale, i.e. the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *PNS P-SCH View,* and the contents of the table. It is opened via a right mouse click on a point inside the *PNS P-SCH View* or via the *Tools - Modules Configuration...* command (see chapter 3).

All settings are analogous to the settings in the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

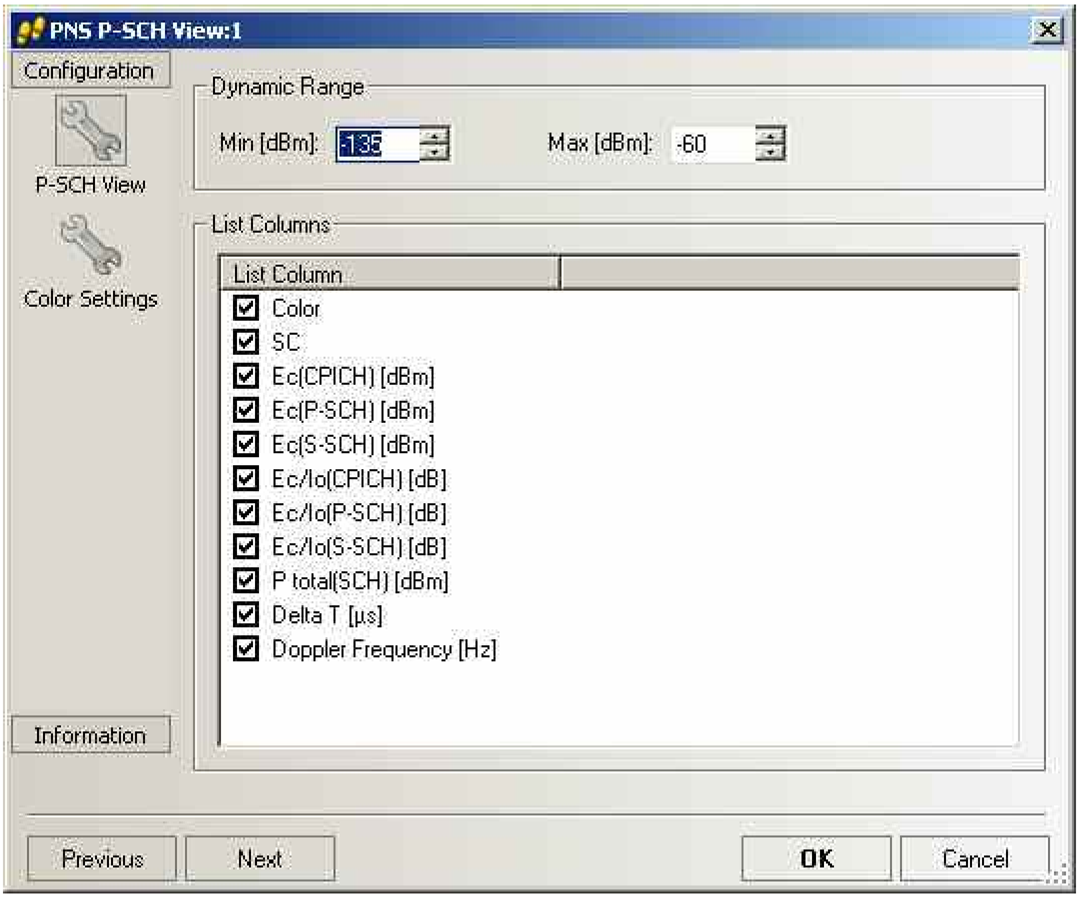


Fig. 4-215 PNS P-SCH View configuration: P-SCH View

The *Color Settings* tab of the *PNS P-SCH* configuration menu is analogous to the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

PNS CPICH View

The *PNS CPICH View* shows the average signal power of the received P-CPICHs and a comprehensive analysis of the properties of all DL signals received in the UMTS PN scan.

Different signals are distinguished by their slot timing (the beginning of the slot detected by the receiver of the test instrument). Signals from different Node Bs are distinguished by their primary scrambling codes (SC), transmitted over the CPICH. Signals with different slot timing but equal SC originate from the same Node B but propagated along different paths. A comparison of those signals provides important information on reflections and possible interferences.

The analysis requires synchronization to each received signal, which is performed in a 3-step process:

1. The test device searches for the Primary Synchronization Channel (P-SCH) to obtain the slot timing. The start of the P-SCH marks the beginning of the slot.
2. The Secondary Synchronization Channel (S-SCH) is analyzed to obtain the scrambling code group (CG) and the frame timing.
3. The SC within the CG is determined by correlating with the pilot bits of the CPICH.

Steps 2 and 3 are modified if *High Speed* is selected in the *Measurements* tab of the driver configuration menu (see chapter 6). This tab also defines the *Synchronization Rate.*

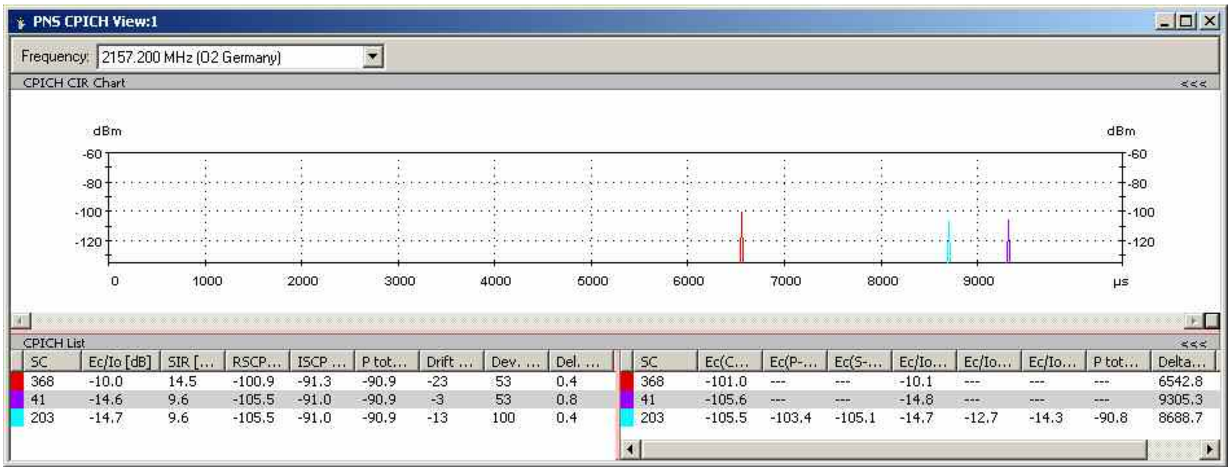


Fig. 4-216 PNS CPICH View

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS P-SCH View, PNS Pilot View* and *PNS SC Tracer View.*

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

View area

The entire view area is horizontally split to accommodate a chart and a table/list. The *CPICH CIR Chart* (Carrier to Interference Ratio) shows the average signal power of the P-CPICHs of all received signals over the time. The displayed powers and times correspond to the *Ec (CPICH) [dBm]* and *Delta T[μs]* values listed in the *Peak List* (right-hand part of the *CPICH List)*.

A click on the *CPICH CIR Chart* or *CPICH Lists* title bars compresses and expands the 2D-chart or table. A compressed chart leaves more space for the table and vice versa. Moreover, the tables appear in several PNS views so that compressing them can help to avoid redundancies. A compressed sub diagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Diagram scale

The diagram is opened with a default x-axis scale of little more than one UMTS frame (10 ms). If placed inside the diagram area the cursor takes the shape of a zoom-in icon (a magnifying glass with a '+' inside), and a vertical line is displayed at the cursor position.

A left mouse click magnifies the diagram in x-direction around the cursor position, *Ctrl* plus left mouse click causes the opposite. An area to become the new x-axis range (e.g. the area around a peak) can be marked while the left mouse button is pressed. *Reset Zoom* in the context menu restores the default scale. A scrollbar is provided to move the magnified diagram to the right or left.

The scale of the y-axis (power in dBm) can be set in the configuration menu.

Table entries

Below the diagram, the *CPICH Lists* give an overview of the received signals together with their scrambling codes, different power parameters, frequency and timing information. On mouse hover-over, each cell in the table header provides a short explanation of the corresponding column.

The entire table is divided into the *CPICH List* and the *Peak List.* In the configuration menu, it is possible to show or hide each individual table row in both lists

CPICH List

The *CPICH List* (left-hand part of the *CPICH Lists)* provides a general description of the received CPICH signals from each Node B. Each signal is characterized by its SC, corresponding to the transmitting Node B, and includes all possible peaks (reflections) indicated in the *Peak List* on the right-hand side. The list can contain the following CPICH-related values (see also standard 3GPP TS 25.215 and related standards. All power results in the CPICH List and Peak List are obtained in an unbiased measurement: The contribution of the noise floor to the powers is subtracted.):

SC [Hex]

Primary scrambling code no. of the CPICH signal in the format selected in the TEC for UMTS PNS *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. In decimal representation, the primary scrambling code numbers are multiples of 16: SC[dec] = 16*i where i=0 to 511, so the least significant digit of the hex numbers is always 0 (see also* PNS SC Tracer View *on p. 4.393). Sequence numbers* :1, :2 *behind a code distinguish multiple reflections.*
Each SC is identified by a color, to be customized in the configuration menu. The SC color codes are also shown in the Route Track *menu; see paragraph on scrambling code indication on p. 4.53.*

Signal power

Ec/Io [dB]

Ratio of the received energy per PN chip of the CPICH and of the entire Node B signal to the total transmit power spectral density. The value equals to the sum of the Ec/Io (CPICH) [dB] *values of all individual peaks of the same SC displayed in the* Peak List; *see below.*

SIR [dB]

*Signal-to-Interference Ratio of the CPICH, RSCP/ISCP*256 where 256 is the CPICH spreading factor.*

RSCP [dBm]

CPICH Received Signal Code Power; sum of the received powers of all peaks on one code, measured on the pilot bits of the Primary CPICH.

ISCP [dBm]

Interference Signal Code Power, the interference on the received signal measured on the pilot bits. Both the orthogonal and the non-orthogonal parts of the interference are included in the measurement.

P total [dBm]

Total received wide-band power in the channel, measured within the correlation sections of the P-CPICH. The observed signal section is the same for all signals, so P total *is the same for all Node Bs.* P total *is equal to Io during the CPICH chips so that the following relation holds:*

P total + Ec/Io = RSCP

Signal timing

Drift [ns/s] *Averaged change of the time delay of the CPICH peaks of a Node B signal over the time. A drift translates into a lateral deviation of the signal in the* PNS SC Tracer View *(see p. 4.393). It may be due to one or several of the following effects:*

- Doppler Effect due to a relative movement of the test vehicle and the Node B.
- Drift of the system time compared to the nominal UMTS timing
- Drift of the Node B timing compared to the nominal UMTS timing

A measurement at fixed position eliminates the Doppler effect and thus allows to isolate and assess the two other effects. To disentangle system time and Node B drift it is sufficient to compare signals from several Node Bs: If several signals are measured with the same drift this common drift is very likely to be due to the system time. After subtraction of this common system time drift, one is left with the drift of the individual Node Bs.

Dev. Drift [ns/s]

90% confidence interval width of the average time drift. A small value indicates that the drift measurement is estimated to be relatively accurate.

Note:
The accuracy of the drift measurement increases with the number of measured values. Consequently, the Dev. Drift values (and often also the Drift values) typically decrease as the measurement progresses.

Del. Spread [Chip]
RMS delay spread in chip periods: Standard deviation of the time delay Delta T *at all CPICH measurement points weighted with the measured powers* Ec (CPICH)*. A small delay spread indicates that the individual CPICH peaks of the Node B signal are relatively close or that the power of peaks with different time delay is very low.*

The *CPICH List* is also displayed in the *PNS Top N View.*

Peak List

The rows of the *Peak List* (right-hand part of the *CPICH Lists)* describe the single peaks (reflections) that contribute to the different Node B signals. The list can contain the following values (see also standard 3GPP TS 25.215 and related standards):

SC [Hex]
Primary scrambling code no. of the CPICH in the format selected in the TEC for UMTS PNS *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3.*

Signal power

Ec (<Ch>) [dBm]
Average energy per transmitted PN (Pseudo Noise) chip for channel <Ch>, divided by the chip period and thus converted into an average received signal power (in dBm). Ec is displayed for the (Primary) CPICH, P-SCH and S-SCH.

Ec/Io (<Ch>) [dB]
Ratio of the received energy per PN chip for channel (<Ch>) to the total transmit power spectral density. Ec/Io *is displayed for the (Primary) CPICH, P-SCH and S-SCH.*

P total (SCH)...
Total averaged received signal power for the duration of the SCH. P total *contains the contributions of all channels during the observation period and is therefore always greater than* Ec (P-SCH) *or* Ec (S-SCH)*. The following relations hold:*
P total + Ec/Io (P-SCH) = Ec (P-SCH)
P total + Ec/Io (S-SCH) = Ec (S-SCH)

Signal timing

Delta T [µs]

Time delay of the signal's slot timing relative to the system time or GPS time (hardware-dependent). The reference time (left edge of the diagram) is of minor importance as the diagram extends over more than one frame, which is enough to display and separate all received signals.

Doppler Freq.

Frequency offset of the measured P-CPICH carrier frequency compared to the nominal UMTS channel frequency. In a coverage measurement on a moving test vehicle, an important source of frequency offsets is the Doppler shift due to the speed of the receiver relative to the transmitter. Constant frequency offsets do not originate from the Doppler shift and can be corrected in the configuration menu.
The Doppler Frequency *is available only if* High Dynamic *is selected in the* Measurements *tab of the driver configuration menu (see chapter 6).*

The *Peak List* is also displayed in the *PNS P-SCH View.*

Special table entries

Depending on the conditions of the measurement the tables may show some particular results:

- An invalid result "---" denotes that a peak or the entire Node B signal was too weak to be accurately measured. Selecting *High Dynamic* mode in the measurements tab of the driver configuration menu generally reduces the number of invalid results.

- A number *(:1, :2* etc., e.g. the *E90:1* in the figure above) behind the scrambling code denotes that signals with the same scrambling code but with a significant difference in their time delays were received. Two different scenarios can cause multiple scrambling codes:

  - If several of those signals occur at the same time, they are likely to belong to different Node Bs that accidentally use the same SC.

  - Two signals with different numbers behind their scrambling codes that are received at different times can belong to the same Node B but actually indicate a strong time drift.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration; see *Context menu* description on p. 4.2.

The context menu provides the following additional commands:

Reset Zoom Resets the x-axis scale to 0 ms to approx. 10.5 ms.

PNS CPICH View Configuration

The *PNS CPICH View* configuration menu customizes the diagram in the *PNS CPICH View* and the contents of the table. It is opened via a right mouse click on a point inside the *PNS CPICH View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *CPICH View* tab sets the y-axis scale of the *PNS CPICH View*, selects the information to be displayed in the table and corrects the Doppler frequency.

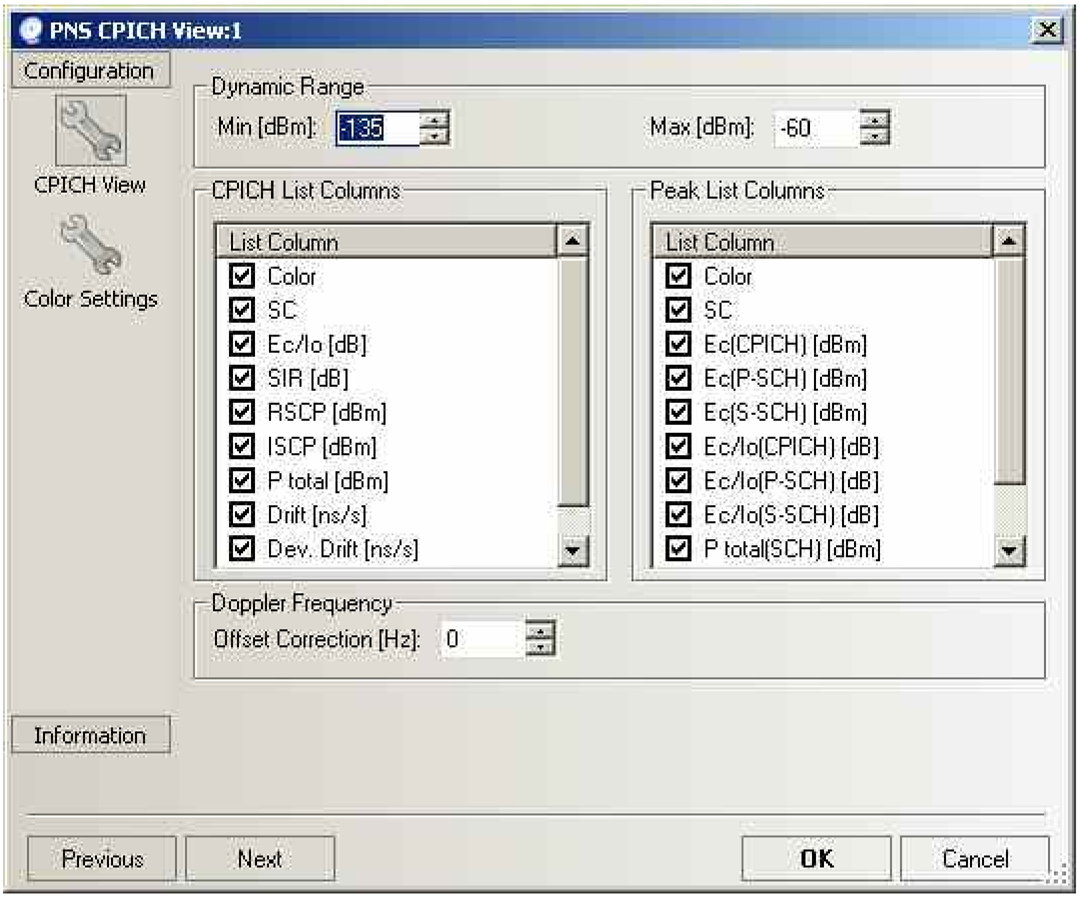


Fig. 4-217 PNS CPICH configuration: CPICH View

Dynamic Range The two input fields in the *Dynamic Range* panel define the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *PNS CPICH View.*

CPICH List

Peak List

The *CPICH List* and *Peak List* panels select which information is displayed in the tables below the *PNS CPICH* diagram (see the figure above). Clearing a box hides the corresponding row in the diagram

Doppler Frequency

The *Doppler Frequency* panel provides an input field to correct the *Doppler Frequency* displayed in the *Peak List*. The purpose of the correction is to subtract out constant frequency offsets that can not originate from the speed of the test vehicle relative to the signal source.

Possible sources of constant frequency offsets are de-tuned Node B transmitters and test device receivers.

TIP

A measurement at fixed position eliminates the Doppler effect and thus allows to assess the frequency offset of the test device receiver and the different Node Bs. A de-tuned receiver causes the same frequency offset on signals from different Node Bs. Therefore, if several Node B signals are measured with the same Doppler frequency in a fixed-position measurement, the Doppler frequency measured is due to the receiver. If this common frequency offset is entered as an *Offset Correction*, the CPICH View table indicates the frequency offset of the individual Node Bs.

The *Color Settings* tab sets the color scale for the scrambling codes. The SC color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.53.

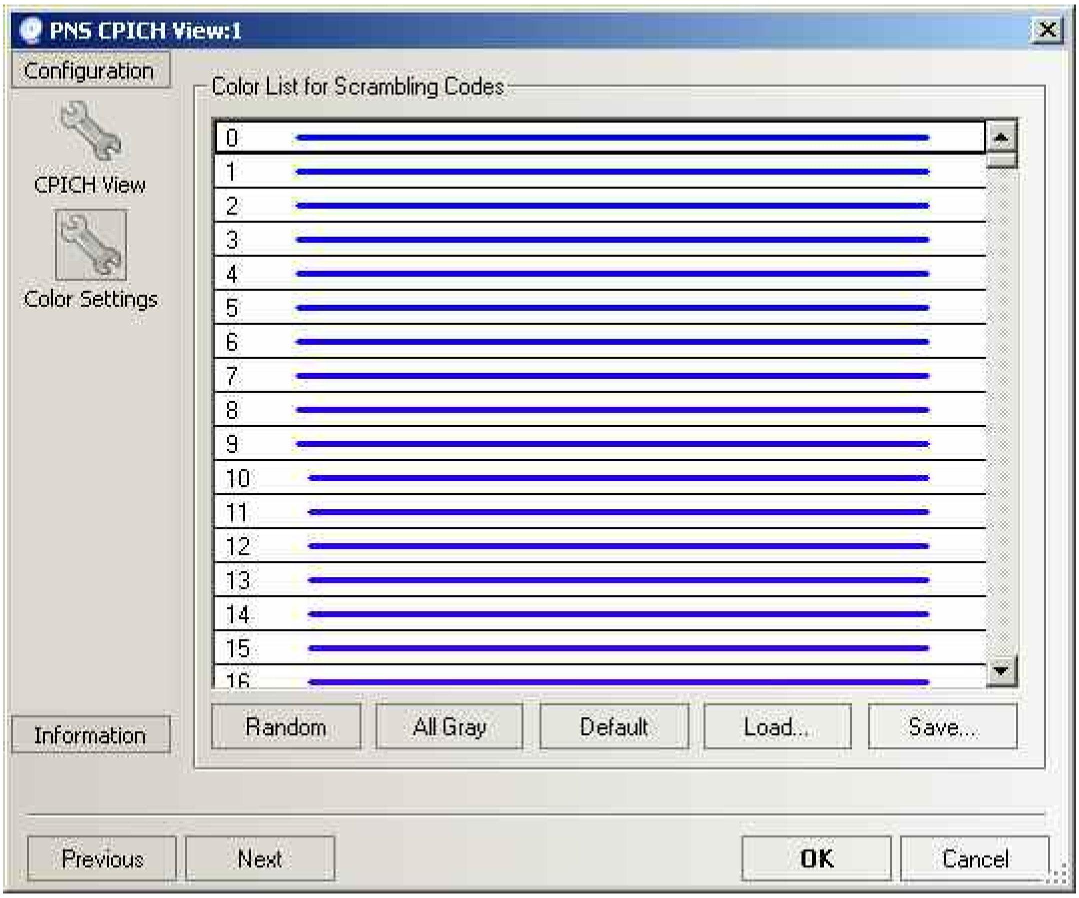


Fig. 4-218 PNS CPICH configuration: Color Settings

The colors are displayed in the diagram (power peaks) and in the first table row (scrambling code scale). A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.392) to change the current display color.

Random No ordering; colors are assigned to the scrambling codes at random.

All Gray Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single scrambling code (or a small number of scrambling codes), colored different, from all other codes, colored gray.

Default Predefined color scale: Colors change continuously as the scrambling codes increase.

Load/Save A color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

PNS Spectrum View

The *PNS Spectrum View* displays the total signal power in two different frequency ranges. By default the frequency ranges comprise the entire nominal UMTS uplink and downlink band, exceeding the nominal UMTS carrier spacing of 5 MHz. The representation allows to analyze several channels/networks or adjacent channel contributions in the uplink and downlink band at the same time.

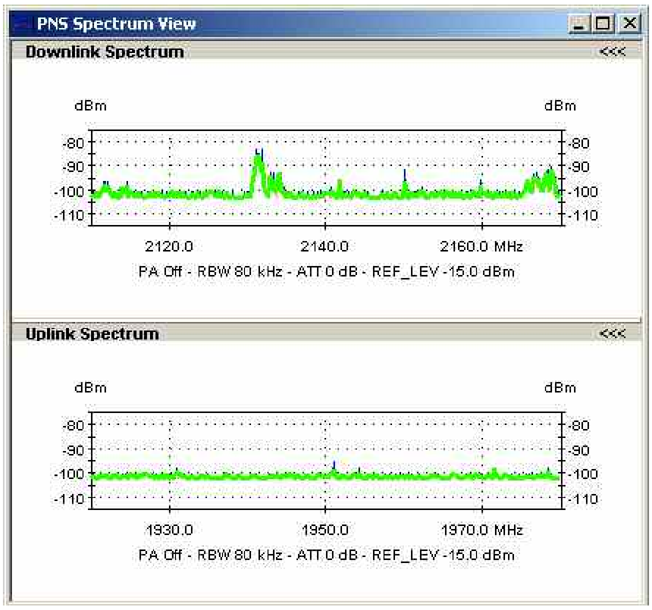


Fig. 4-219 PNS Spectrum View

View area The entire view area is horizontally split to accommodate two different 2D-charts for the received downlink and uplink signals, respectively. The 2D-charts show the received UMTS signal strength as a function of the frequency. The diagrams are separately updated with the *Measurement Rates* set in the *Measurements* tab of the driver configuration menu:

X-axis (frequency)
Measured uplink or downlink frequency range. In the driver configuration menu, the measurement range for uplink and downlink signals is set independently, so the scales of the two 2D-charts can be different.

Y-axis (power)
Received total signal power. The result is a function of the Spectrum *analyzer settings specified in the driver configuration menu. A common scale* (Dynamic Range) *for both 2D-charts can be set in the configuration menu; see below.*

A click on the *Downlink Spectrum* or *Uplink Spectrum* title bars compresses and expands the corresponding 2D-charts. A compressed downlink chart leaves more space for the uplink chart and vice versa. A compressed chart is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Diagram subtitles

The parameters displayed below the downlink and uplink spectrum diagrams represent test device settings that are important for the interpretation of the results.

PA

Setting of the preamplifier (On *or* Off). *The preamplifier is automatically set at the test device.*

RBW

Resolution bandwidth of the measurement (IF) filter of the test device as set in the driver configuration menu. The wideband signal power measured by a spectrum analyzer is a function of the RBW.

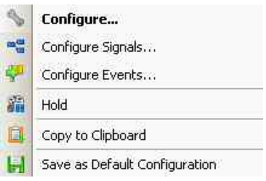
ATT

Setting of the receiver attenuator; a large attenuation factor (i.e. a low mixer level) suppresses distortions but increases the noise level and reduces the dynamic range.

REF_LEV

Reference level of the test device: Input signals will not overload the input path of the receiver as long as they are below the reference level.

Context menu



A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, or to save the current configuration; see *Context menu* description on p. 4.2.

PNS Spectrum View Configuration

The *PNS Spectrum View* configuration menu defines the y-axis scale, i.e. the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *PNS Spectrum View*. It is opened via a right mouse click on a point inside the *PNS Spectrum View* or via the *Tools - Modules Configuration...* command (see chapter 3).

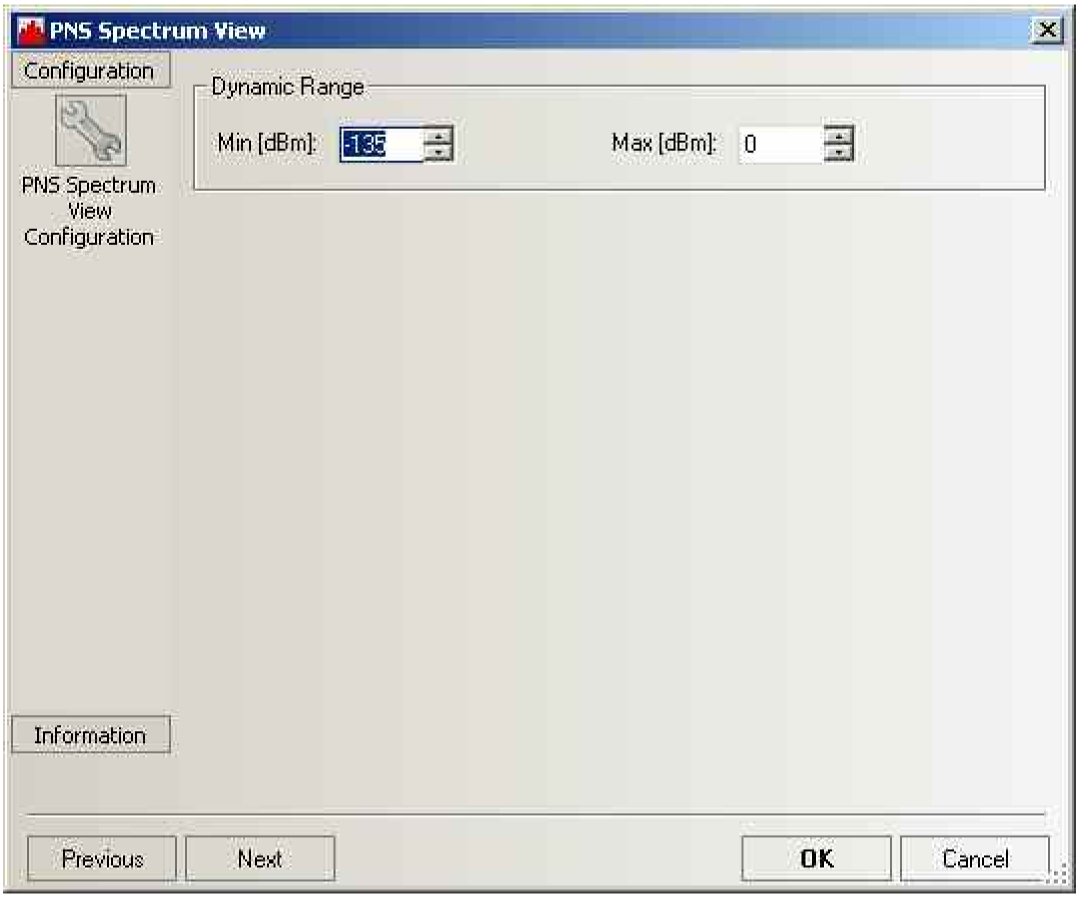


Fig. 4-220 PNS Spectrum View configuration

Dynamic Range The two input fields in the *Dynamic Range* panel define the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *PNS Spectrum View.*

PNS Spectrum History View

The *PNS Spectrum History View* displays the evolution in time of the total signal power in one of two specified frequency ranges. By default the frequency ranges comprise the entire nominal UMTS uplink and downlink band, exceeding the nominal UMTS carrier spacing of 5 MHz. The representation allows to analyze several channels/networks or adjacent channel contributions in the uplink and downlink band at the same time.

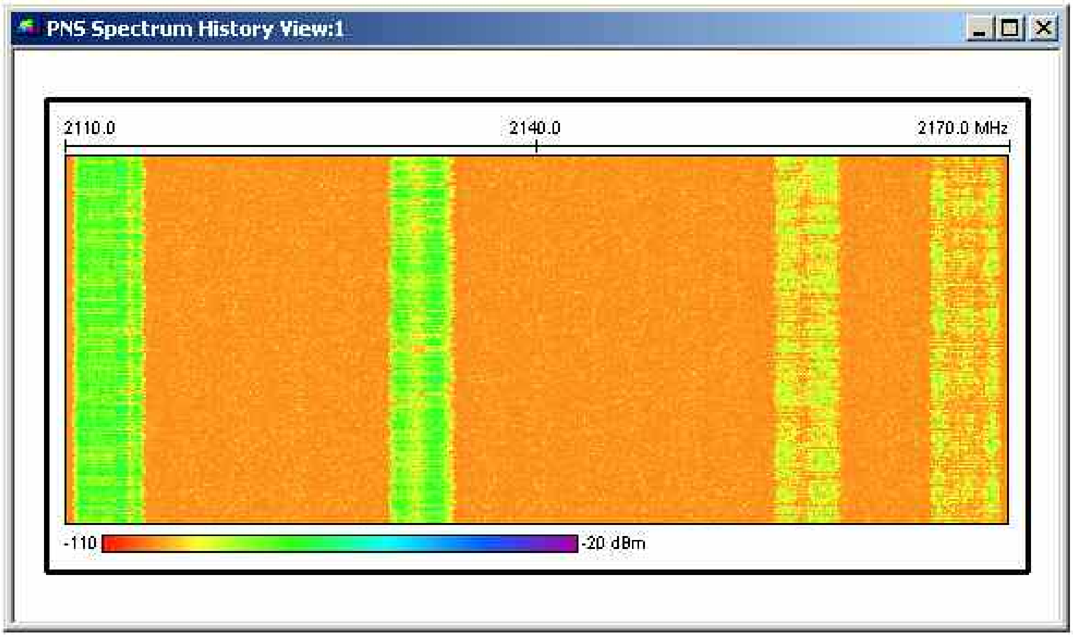


Fig. 4-221 PNS Spectrum History View

View area

The colored rectangular diagram shows the total signal power received in consecutive frequency sweeps. The result is a function of the *Spectrum* analyzer settings specified in the *Measurements* tab of the driver configuration menu. The signal power is displayed as a function of the frequency and time using the color scheme defined in the configuration menu. The configuration menu also defines which of the two frequency ranges (termed uplink or downlink) are displayed. The rectangular view area represents the time/frequency plane:

X-axis (frequency)

Measured uplink or downlink frequency range as defined in the driver configuration menu. If the view window is narrower than the diagram width, a scrollbar appears across the bottom of the diagram.

If the PNS spectrum is measured with an R&S TSMx test receiver, the number of measurement points per sweep and thus the diagram width can be varied; see description of the *Measurements* tab of the *R&S UMTS PNS* driver configuration menu in chapter 6.

Y-axis (time)

Linear time scale of the measurement. The diagram consists of 100 to 800 lines, arranged from top to bottom. Each line shows the result of a single sweep across the specified frequency range. The diagram is continuously updated during the measurement or replay by adding new lines. It is automatically scrolled as soon as a line reaches the bottom of the diagram.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2.

PNS Spectrum History View Configuration

The *PNS Spectrum History View* configuration menu defines the number of lines, selects the frequency range and sets the colors in the *PNS Spectrum History View*. It is opened via a right mouse click on a point inside the *PNS Spectrum History View* or via the *Tools - Modules Configuration...* command (see chapter 3).

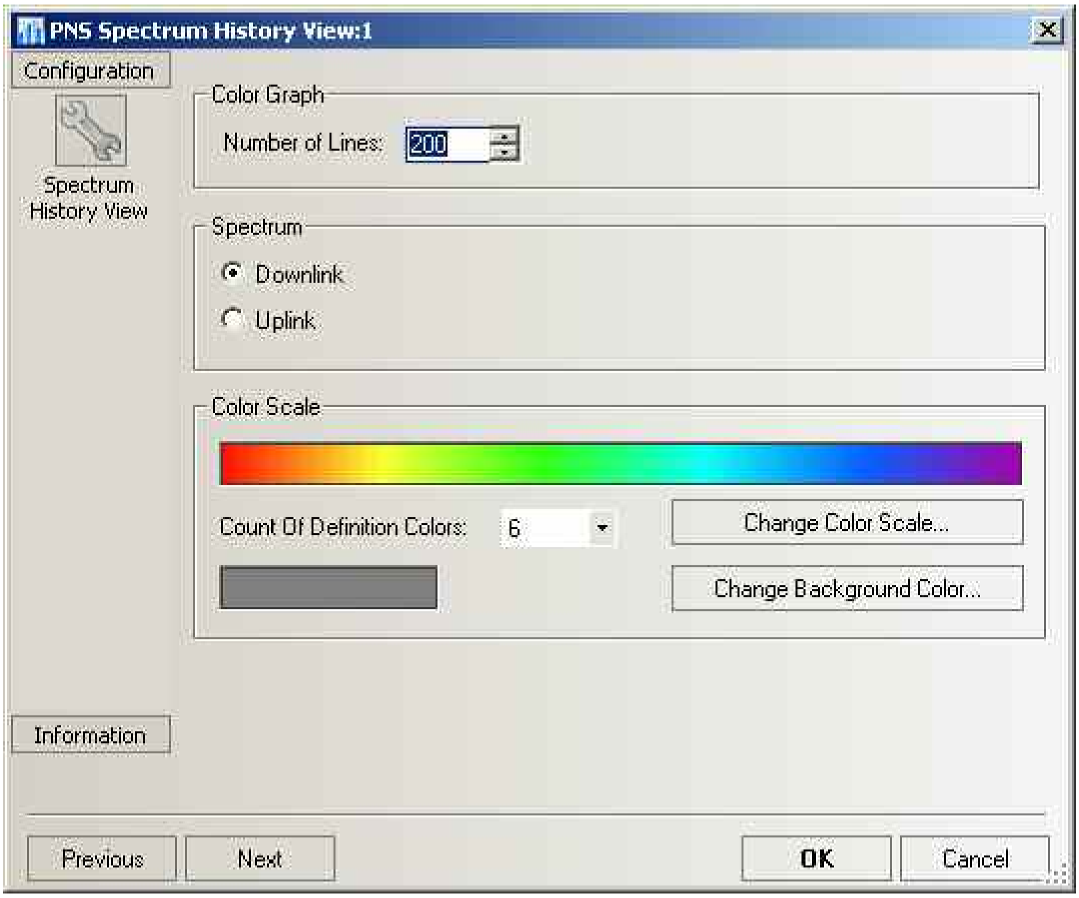


Fig. 4-222 PNS Spectrum History View configuration

Color Graph

The *Color Graph* panel defines the *Number of Lines* to be displayed in the *PNS Spectrum History View*. A line corresponds to a single frequency sweep. The corresponding frequency range and the measurement rate are set in the *Measurements* tab of the driver configuration menu. The *Number of Lines* parameter defines the height of the *PNS Spectrum History View*.

Spectrum

The *Spectrum* panel contains two option buttons to select either the downlink or the uplink spectrum to be displayed. The downlink and uplink frequency ranges are defined in the driver configuration menu. They are measured simultaneously and recorded in a common measurement file; however, they can be analyzed separately in the *UMTS PNS Spectrum* view.

Color Scale

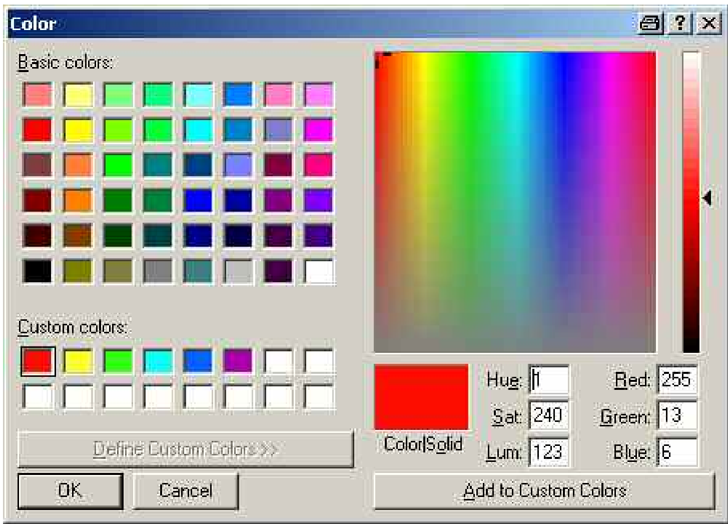
The *Color Scale* panel defines a color scale for the lines in the *PNS Spectrum History View* and for the background. The scale is derived from 2 to 16 *definition colors*. The definition colors are entered at equidistant positions on the color scale, the first and last color defining the beginning and the end of the scale. Between the definition colors, the hue changes continuously.

Count of Definition Colors

Pull-down list to select the number of definition colors in the range 2 to 16.

Change Color Scale

Opens the Colors *dialog to select or define the definition colors.*



The current definition colors are displayed in the Custom Colors section. The F1 function key provides help about the remaining control elements in the dialog.

Change Background Color

Opens the Colors dialog to select or define a background color for the diagram; see above.

PNS SC Tracer View

The *PNS SC Tracer View* shows the evolution in time of the time delay and CPICH signal power of all received UMTS peaks with a particular primary scrambling code (SC) or a particular rank in a top N pool.

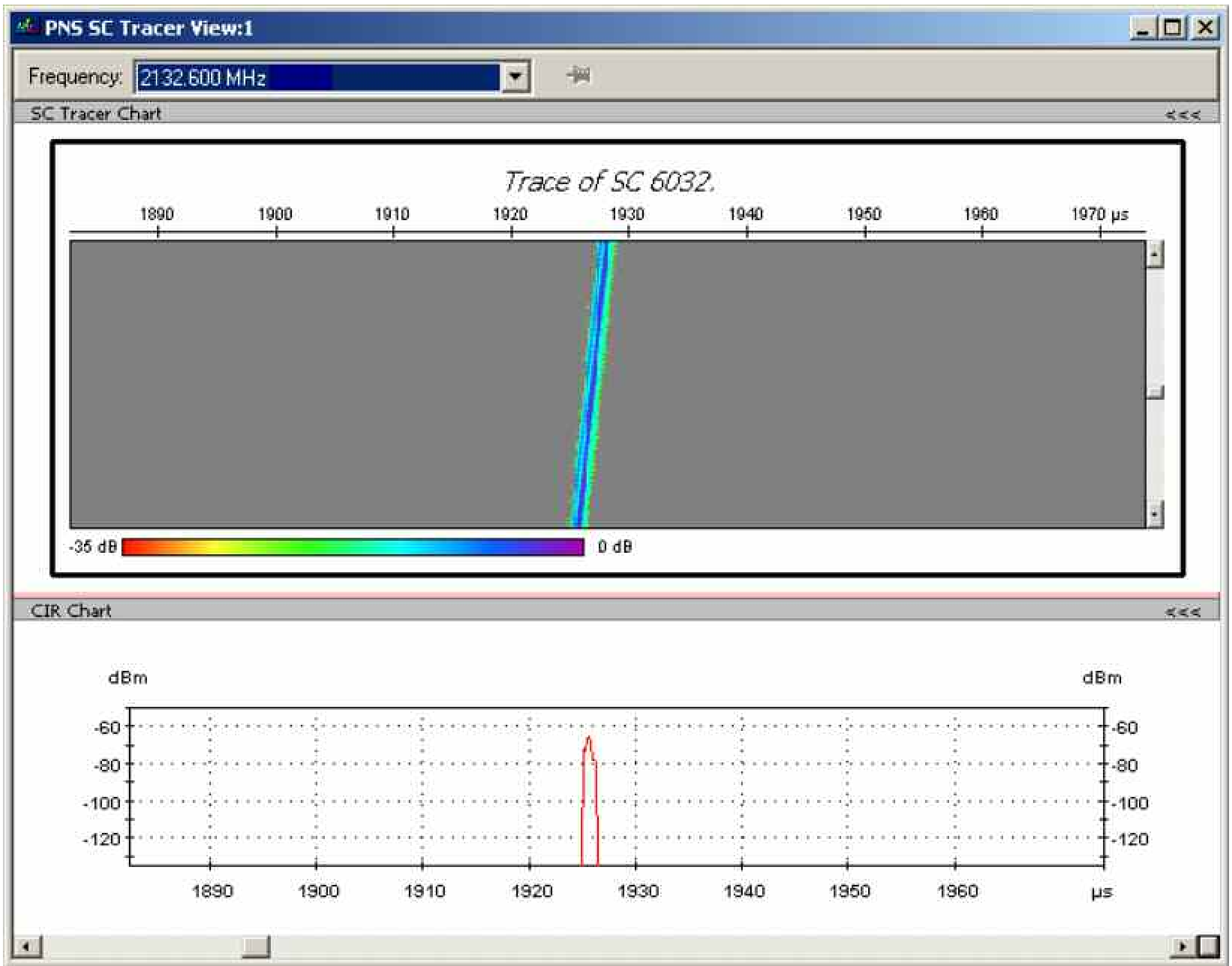


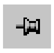
Fig. 4-223 PNS SC Tracer View

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS P-SCH View, PNS Pilot View* and *PNS CPICH View.*

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

Fix current scrambling code



The pin icon to the right of the *Frequency* list forces the system to trace the current scrambling code, even if *Trace Top N Element* is selected in the configuration menu. In fixed SC mode the icon is crossed out with red color and *Fixed Top N...* is indicated in the title of the *SC Trace Chart.*

Clicking the crossed-out icon again releases the fixed SC: The system continues tracing the selected top N element. If *Trace a Fixed SC* is selected in the configuration menu the pin icon has no effect.

View area

The entire view area is horizontally split to accommodate two different charts.

A click on the *SC Tracer Chart* or *CIR Chart* title bars compresses and expands the corresponding chart. A compressed chart leaves more space for the other chart. A compressed chart is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

SC Tracer Chart

The colored rectangular diagram shows the evolution in time of the power *Ec (CPICH) [dBm]* and the time delay *Delta T[µs]* using the color scheme defined in the configuration menu. *Ec (CPICH) [dBm]* and *Delta T[µs]* are listed in the *Peak List* in the *PNS CPICH View* (see 4.378). The rectangular diagram area represents the time/delay time plane.

In this plane, the signals with the same SC form one or several traces that change their slot timing (horizontal position) and strength (color). All signals can be assumed to originate from the same Node B (see explanation at the beginning of section *PNS CPICH View* on p. 4.378); multiple traces indicate multiple signals with different timing but the same SC and thus reflections. The example of the figure above shows a single (direct) signal. The time delay of the signal decreases (increases) while the test vehicle approaches (goes away from) the transmitting Node B; the signal strength can be expected to reach its maximum where the distance to the Node B is close to its minimum. The slope of the trace corresponds to the *Drift* which is also displayed in the *PNS CPICH View.*

X-axis (del. time)
: *Symmetric range centered around the first relative slot timing measured. The delay time span is fixed and equals to 90 µs (13.5% of a slot).*

Y-axis (time)
: *Linear time scale of the measurement. The diagram consists of 100 to 800 lines, arranged from top to bottom. Each line shows the result of a single scan or sweep with a frequency range of 5 MHz. The diagram is continuously updated during the measurement or replay by adding new lines. It is scrolled and a scrollbar is added along the right border as soon as a line reaches the bottom of the diagram.*

Display line
: *On moving across the* SC Tracer Chart *area, the cursor displays a black, horizontal line. A left mouse click on the chart updates the* CIR Chart *which now displays the peaks at the time corresponding to the position of the display line.*

CIR Chart

The *CIR Chart* (Carrier to Interference Ratio) shows the average signal power of the P-CPICHs of all received peaks over the time. The displayed powers and times correspond to the *Ec (CPICH) [dBm]* and *Delta T[µs]* values listed in the *Peak List* in the *PNS CPICH View* (see 4.378).

The diagram is opened with a default x-axis scale of 90 µs (13.5% of a slot). If placed inside the diagram area the cursor takes the shape of a zoom-in icon (a magnifying glass with a '+' inside), and a vertical line is displayed at the cursor position.

A left mouse click magnifies the diagram in x-direction around the cursor position, *Ctrl* plus left mouse click causes the opposite. An area to become the new x-axis range (e.g. the area around a peak) can be marked while the left mouse button is pressed. *Reset Zoom* in the context menu restores the default scale. A scrollbar is provided to move the magnified diagram to the right or left.

The scale of the y-axis (power in dBm) can be set in the configuration menu.

By default the diagram shows current results, corresponding to the last line in the *SC Tracer Chart.* To select a previous result for viewing, the display line in the *SC Tracer Chart* can be used; see above.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, to put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2. The context menu provides the following additional commands:

Select SC...

Opens a dialog box to select the primary scrambling code associated with the signal to be viewed.

The scrambling code is defined in the format selected in the TEC for UMTS PNS *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3.* Select SC… *is unavailable if a particular top N element is traced; see description of the configuration menu.*

Reset Zoom

Resets the x-axis scale.

PNS SC Tracer View Configuration

The *PNS SC Tracer View* configuration menu selects the signals displayed in the *PNS SC Tracer View,* scales the diagrams and defines the colors in the view. It is opened via a right mouse click on a point inside the *PNS SC Tracer View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *SC Tracer Target Selection* tab selects the signals displayed in the *PNS SC Tracer View*.

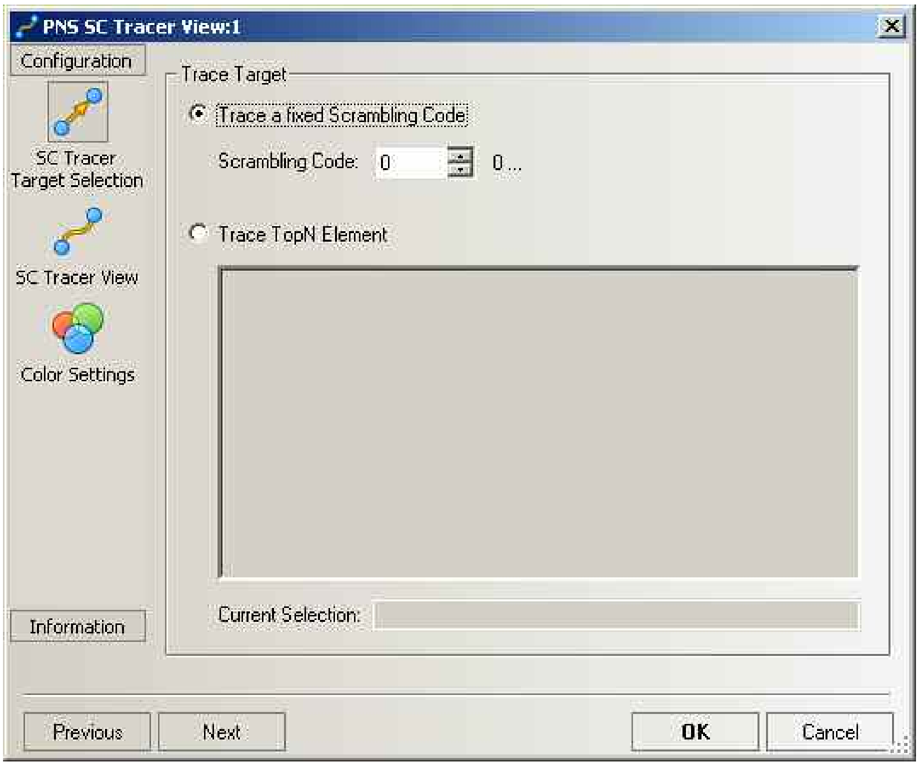


Fig. 4-224 PNS SC Tracer View configuration – SC Tracer Target Selection

Trace Target The *Trace Target* option buttons select either a signal with a definite scrambling code or a particular top N element to be traced.

Fixed SC

The scrambling code is defined in the format selected in the TEC for UMTS PNS *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. In decimal representation, the primary scrambling codes are multiples of 16: SC[dec] = 16*i where i=0 to 511, so the least significant digit of the hex numbers must be 0, preceded by a hex value between 0 and 1FF.*
If a scrambling code that is not assigned to any measured signal is selected the PNS SC Tracer View *remains empty.*

Top N Element

List of all top N pools defined in the driver configuration menu (see chapter 6). The current top N pool selection is indicated below the list.

The *SC Tracer View* tab scales the diagrams and defines the colors in the view.

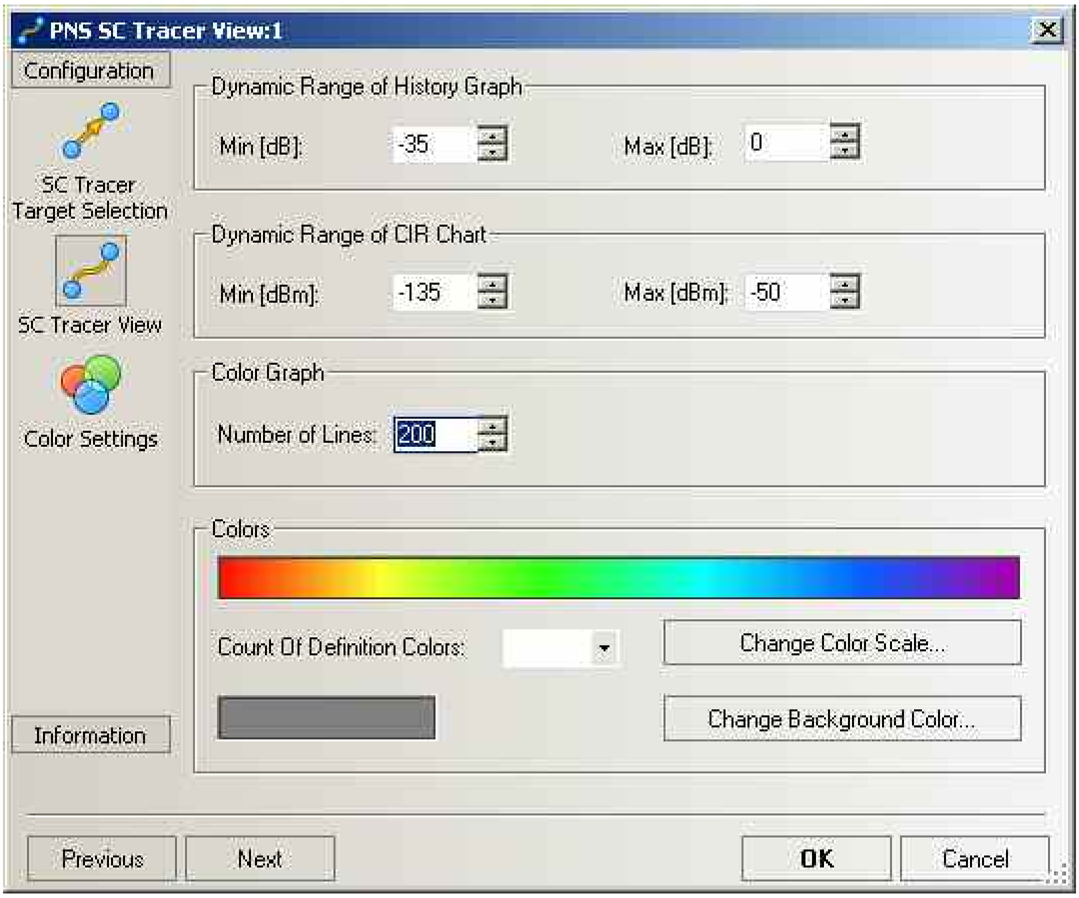


Fig. 4-225 PNS SC Tracer View configuration – SC Tracer View

Dynamic Range... The input fields in the *Dynamic Range...* panels define the minimum *(Min [dBm])* and the maximum *(Max [dBm])* signal level displayed in the diagrams of the *PNS SC Tracer View.* Signals exceeding the dynamic range will not be displayed.

Colors The color settings in the remaining panels of the configuration menu are identical with the *PNS Spectrum History View* color settings; see section *PNS Spectrum History View* on p. 4.389.

The *Color Settings* tab of the *PNS Top N* configuration menu is analogous to the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

PNS Pilot View

The *PNS Pilot View* displays the Received Signal Code Power (RSCP) of the Common Pilot Channels (CPICHs) together with their scrambling codes.

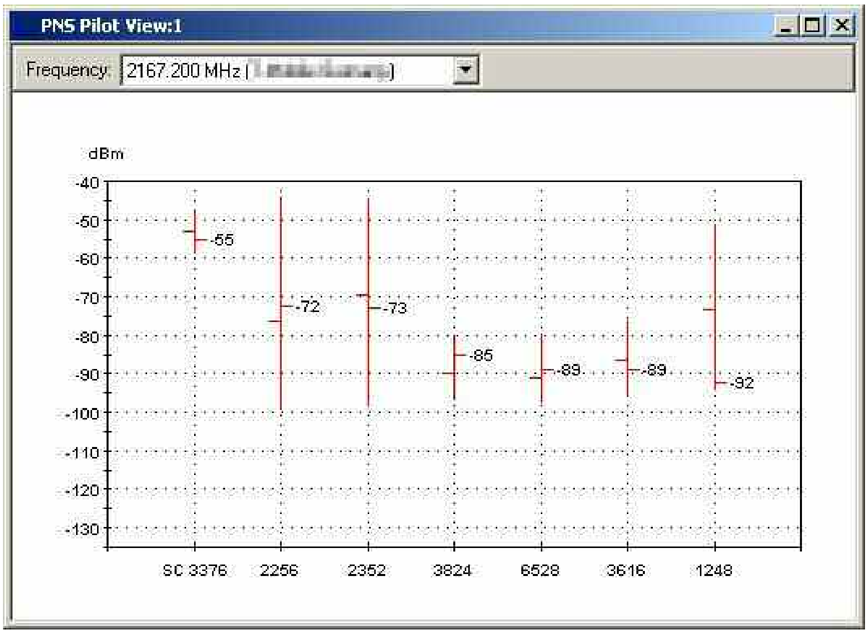


Fig. 4-226 PNS Pilot View: Min - Max - Average - Current Graph

Frequency Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS P-SCH View, PNS CPICH View* and *PNS SC Tracer View.*

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

View area The view contains a pull-down list to select one of the receiver frequencies selected in the *Receiver* tab of the driver configuration menu and a chart.

The chart shows the CPICH Received Signal Code Power; i.e. the received signal power measured on the pilot bits of a Primary CPICH which is identified by its primary scrambling code. The x-axis shows the primary scrambling code (SC) numbers; the scale of the y-axis (power in dBm) can be set in the configuration menu.

In the default configuration the diagram represents a Min.-Max.-Average-Current chart: Each signal generates a vertical bar with a marking to the right and to the left. The lower and upper ends of the bar indicate the minimum and maximum RSCP of the signal ever measured, the marking to the left the average RSCP since the start of the measurement and the marking to the right (with numeric value) the current RSCP. All four values are constantly updated while the measurement or replay is running.

In the configuration menu the diagram can be converted to a bar chart.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, save the current configuration, or move to another worksheet; see *Context menu* description on p. 4.2. The context menu provides the following additional commands:

Export

Opens a Save As *dialog to export the current RSCP values to a text file; see below. This function is unavailable while a measurement or replay is running; it can be activated after* Stop, Stop Recording *or* Pause Replay. *The export function is not affected by a change of the chart type.*

Export file format

The export file is an ASCII table in *.csv format that can be opened and processed by Excel. The table headings form the first line of the file. Each of the following lines corresponds to a single signal with definite SC. The values in the lines are separated by semicolons.

The file contains current measurement values as indicated in the Min.-Max.-Average-Current chart. The values form the following columns:

SC

Primary scrambling code of the signal in the format selected in the TEC for UMTS PNS *tab of the* Configuration of Software Modules *menu; refer to section* Configuration Menu *in chapter 3. Sequence numbers* :1, :2 *behind a code distinguish multiple reflections.*

RSCP…

Minimum, maximum and average RSCP in dBm

The last four columns contain the timestamps describing the recording history of each signal.

Tfirst

Time when the signal was detected for the first time. This can coincide with the beginning of the measurement.

Tlast

Time when the signal was detected for the last time. This can coincide with the time when recording or replay was stopped.

Tmin/Tmax

Time when the minimum/maximum RSCP was measured

SC	RSCPmin[dBm]	RSCPavg[dBm]	RSCPmax[dBm]	Tfirst	Tlast	Tmin	Tmax
233:01:00	-81.3	-71.4	-63.0	214188	312740	214188	312740
190	-85.8	-74.3	-63.4	214188	312740	214188	312740
318:01:00	-82.6	-74.5	-64.0	224433	312740	224433	312740
214	-82.6	-71.8	-61.8	11437	284900	284900	174652
233	-88.6	-70.4	-61.1	11437	274645	274645	140913
73	-93.2	-69.2	-58.5	11437	274645	269859	102748

To ensure that the export file contains all signals ever recorded in the measurement, deactivate the *History* parameter in the configuration menu.

PNS Pilot View Configuration

The *PNS Pilot View* configuration menu defines the y-axis scale, i.e. the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *PNS Pilot View,* and the diagram type *(Graph)*. It is opened via a right mouse click on a point inside the *PNS Pilot View* or via the *Tools - Modules Configuration...* command (see chapter 3).

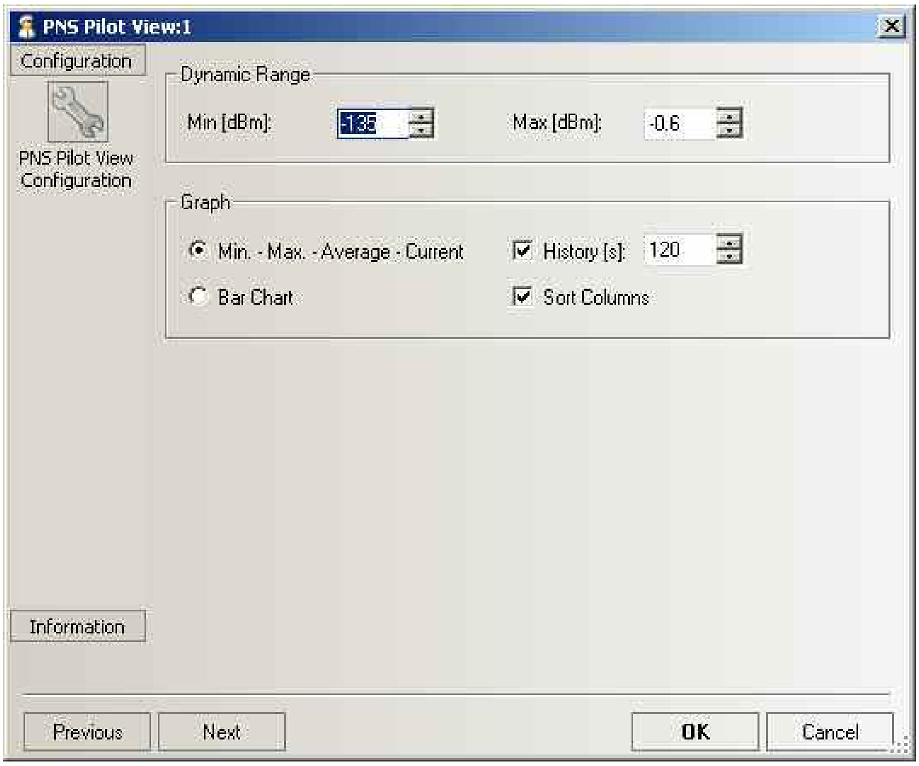


Fig. 4-227 PNS Pilot configuration

Dynamic The two input fields in the *Dynamic* panel define the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *PNS Pilot View.*

Graph The *Graph* panel selects the diagram type. The two alternative graphs *Min-Max.-Average-Current* and *Bar Chart* are described above (see View area on p. 4.398).

History [s]

Excludes all results that are older than the specified number of seconds from the statistical evaluation in the Min-Max.-Average-Current *view. The history time is not used in a bar chart. Clearing this parameter corresponds to an infinite history time; this ensures that all signals ever recorded in the current measurement are displayed in the view and can be exported to an ASCII table.*

Sort Columns

Sorts the bars/columns according to their RSCP: The strongest signal is displayed on the left side, the weakest on the right side. If the box is cleared, the signals and SC numbers keep their position irrespective of the evolution of their signal power.

PNS Top N View

The *PNS Top N View* displays the properties of the signals from the Node Bs that are elements of the *Top N Pools* defined in the driver configuration menu. A Top N Pool contains up to N Node Bs with specific characteristics providing the strongest P-CPICH level at a given position and time; for more information refer to the description of the driver configuration menu in chapter 6.

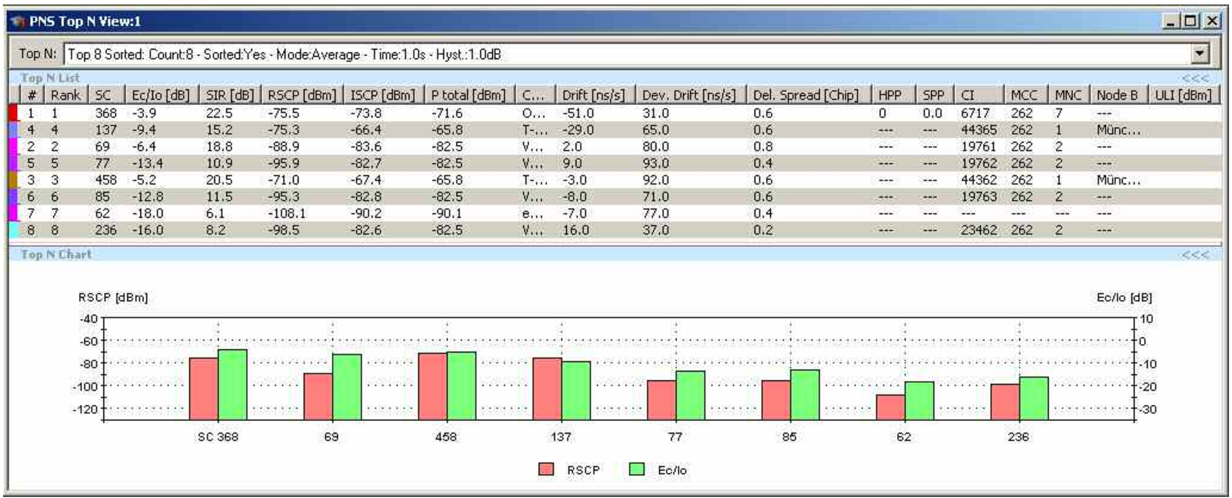


Fig. 4-228 PNS Top N View

View area The entire view area is horizontally split to accommodate a pull-down list with all defined *Top N* measurements, a table and a bar chart.

A click on the *Top N List* or *Top N Chart* title bars compresses and expands the table or chart. A compressed chart leaves more space for the table and vice versa. Moreover, most of the information in the table is also displayed in the *PNS CPICH View* (see p. 4.378) so that compressing it can help to avoid redundancies. A compressed sub diagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Top N Below the view title, the *Top N* pull-down list contains all top N pools defined in the *Top N* tab of the driver configuration menu. The results in the table and the *Top N Chart* refer to the top N pool selected in the list.

Table

The *Top N List* gives an overview of the received signals in the current top N pool together with their scrambling codes, different power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. Most of the results in the *Top N List* are also displayed in the *Peak List* in the *PNS CPICH View.* For a detailed explanation of the parameters refer to section *PNS CPICH View* on p. 4.378. The *Top N List* contains the following additional columns:

#
: *Current number of a Node B within the measurement. Node Bs are numbered in ascending order, according to the time when they enter the top N pool. This means that the current numbers tend to increase as the measurement progresses.*

Rank
: *Current rank of a Node B within the pool, according to its average or maximum Ec/Io (see driver configuration menu). The ranks are reassigned every time the pool is updated; they are in the range* 1 ≤ Rank ≤ N.

Channel
: *Name of the channel and channel frequency of the Node B*

HPP
: *Hard Pilot Pollution of the Node B signal as defined in the driver configuration menu (see chapter 6)*

SPP
: *Soft Pilot Pollution of the Node B signal as defined in the driver configuration menu*

The following information is available only if the PN scanner data are recorded with *BCH Demodulation* (minimum SIB3 decoding) enabled (see description of the UMTS PNS driver configuration menu in chapter 6), and if SIB3 decoding is enabled.

CI	*Cell Identity*
MCC	*Mobile Country Code*
MNC	*Mobile Network Code*
ULI [dbm]	*Uplink Interference*

In the view configuration menu, it is possible to show or hide each individual table row.

Diagram

Below the table, the *Top N Chart* shows the ratio *Ec/Io* and the Received Signal Code Power *(RSCP)* for all Node B signals in the current top N measurement (see section *PNS CPICH View* on p. 4.378).

Signals from different Node Bs are distinguished by their primary scrambling codes (SC), displayed along the x-axis. The scales for the two parameters RSCP and Ec/Io are displayed on the left and right edge of the diagram. Both y-axis scales (RSCP in dBm and Ec/Io in dB) can be set independently in the configuration menu.

In the configuration menu, it is also possible to select the display colors for the RSCP and Ec/Io bars and to choose whether the pilot pollution limits are displayed in the diagram. The pilot pollution limits are displayed as two horizontal lines across all Node B bars except the ones with the highest rank (1).

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see *Context menu* description on p. 4.2.

PNS Top N View Configuration

The *PNS Top N View* configuration menu defines the y-axis scale, i.e. the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *PNS Top N View,* defines the display colors for the RSCP and Ec/Io bars, shows or hides the pilot pollution limits, and selects the contents of the table. It is opened via a right mouse click on a point inside the *PNS Top N View* or via the *Tools - Modules Configuration...* command (see chapter 3).

All RSCP settings are analogous to the settings in the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378. The pilot pollution limits are identical with thresholds providing the criteria for HPP and SPP (see description of the driver configuration menu in chapter 6).

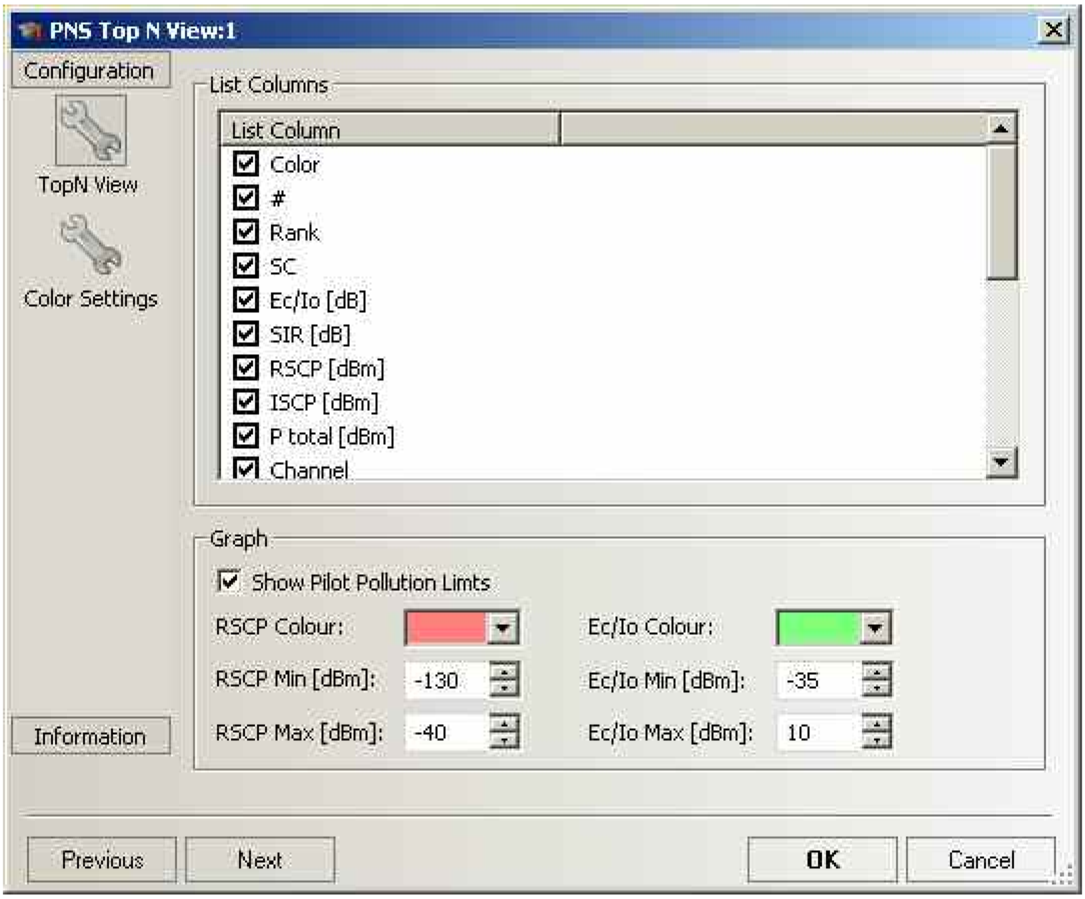


Fig. 4-229 PNS Top N View configuration: TopN View

The *Color Settings* tab of the *PNS Top N* configuration menu is analogous to the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

UL Interference signals and Top N values are reset, if not updated during a certain time period. For each frequency, this period is calculated as fife times the time interval for UL Interference measurement, but at least 3 seconds.

PNS Rake Finger View

The *PNS Rake Finger View* displays the power and timing of several multipath echoes of a single Node B signal captured with the rake receiver of an R&S TSMU or TSMQ operating in ultra high speed mode. Ultra High Speed Mode is available for the TSMU and TSMQ. It must be enabled explicitly in the UMTS PNS driver configuration menu; see description in chapter 6.

TIP The *PNS Rake Finger View* is complemented by the PNS Rake Finger Chart View (see p. 4.408) showing the evolution in time of the signal powers.

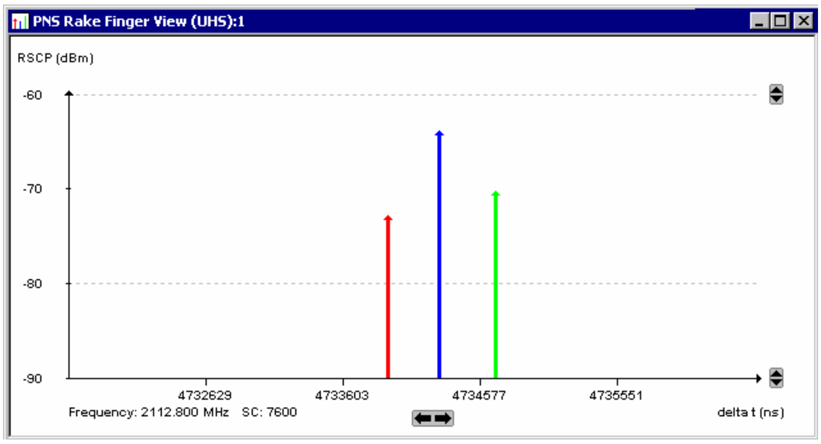


Fig. 4-230 PNS Rake Finger View

Diagram

The diagram shows the power and timing of the different multipath echoes of a Node B signal. The carrier frequency/UTRAN channel and scrambling code (SC) of the cell are displayed below the diagram; they must be selected in the UMTS PNS driver configuration menu (see chapter 6).

Each captured echo generates a vertical arrow. The length of the arrows corresponds to the signal power (RSCP in dBm); their horizontal position corresponds to the timing. The time scale is relative to the (P-CPICH) frame timing of the received DL signal, so it is 10 ms-periodic. The color scale for the arrows is defined in the *PNS Rake Finger View* configuration menu.

The maximum number of captured signals is limited by the properties of the R&S TSMx rake receiver (maximum number of rake fingers) and depends on the measurement rate. It is 4 for a 333 Hz measurement rate, 8 for 250 Hz, and 12 for all other rates.

Diagram scaling

The diagram can be scaled vertically using the buttons. A mouse click or a rectangle drawn with the cursor zooms in on the diagram, *Ctrl* plus a mouse click into the view zooms out. shifts the diagram in vertical direction. Additional scaling options are provided in *PNS Rake Finger View* configuration menu described below.

The relative timing offset for different echoes is due to propagation paths of different lengths. For typical multipath propagation conditions, horizontal diagram divisions of approx. 1 µs are appropriate.

R&S ROMES generates a warning *Not all data is in visible area!* if one of the captured signals is outside the diagram area.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or destroy new views or save the current configuration as default; see *Context menu* description on p. 4.2.

PNS Rake Finger View Configuration

The *PNS Rake Finger View* configuration menu sets zoom options and define the color scheme for the signal arrows in the *PNS Rake Finger View*. It is opened via a right mouse click on a point inside the view or via the *Tools - Modules Configuration...* command (see chapter 3).

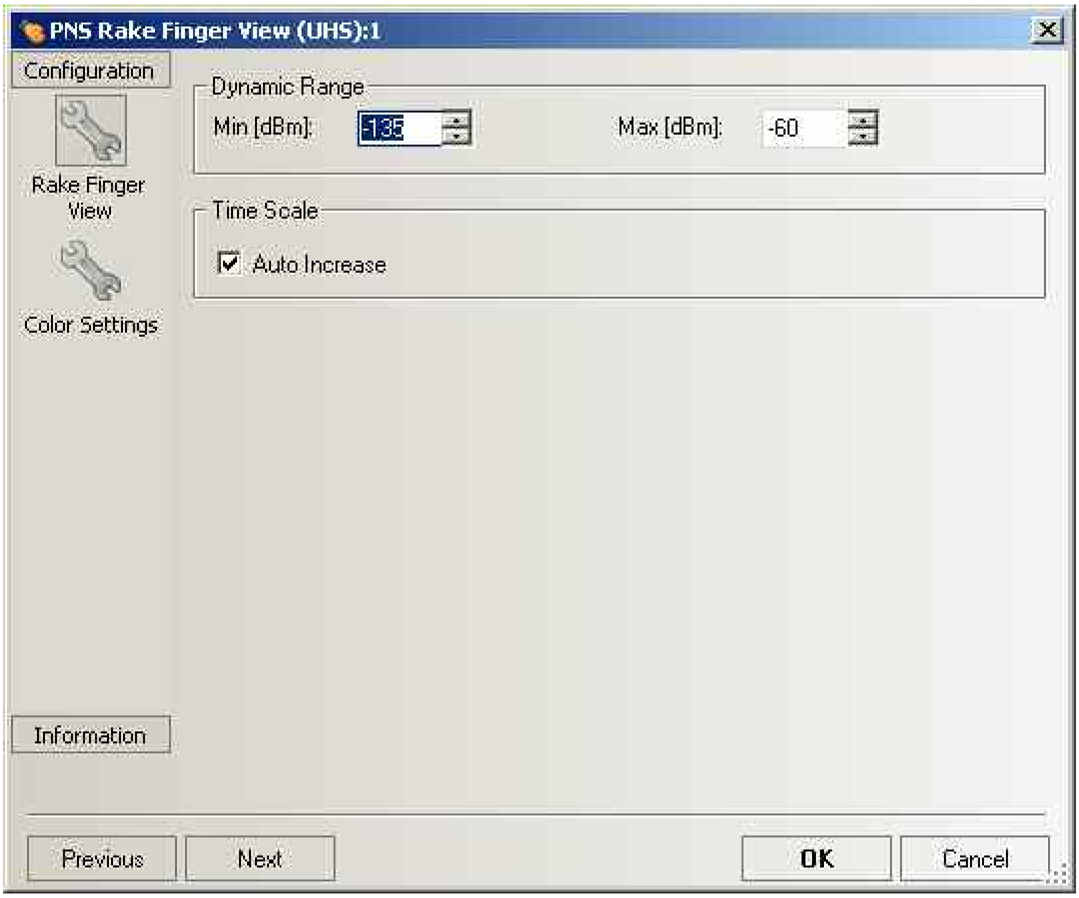


Fig. 4-231 PNS Rake Finger View Configuration

Dynamic Range Defines the scale of the vertical (RSCP) axis, i.e. the minimum and maximum RSCP for a single echo.

Time Scale Modifies the scaling mechanism for the time axis. If *Auto Increase* is on (recommended) the diagram can be scaled as described in the view description.

The *Color Settings* tab of the *PNS Rake Finger View* configuration menu is analogous to the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378. Note that the colors are assigned to rake fingers rather than to a particular echo. A changed color in the view may indicate a finger exchange (see p. 4.405).

PNS Rake Finger Chart View

The *PNS Rake Finger Chart View* displays the evolution in time of the RSCP and Ec/Io of several multipath echoes of a single Node B signal. The signals must be captured with the rake receiver of an R&S TSMU or TSMQ operating in ultra high speed mode. Ultra High Speed Mode is available for the TSMU and TSMQ. It must be enabled explicitly in the UMTS PNS driver configuration menu; see description in chapter 6.

TIP The *PNS Rake Finger Chart View* is complemented by the *PNS Rake Finger View* (see p. 4.405) showing the timing and power of the signals at a fixed time.

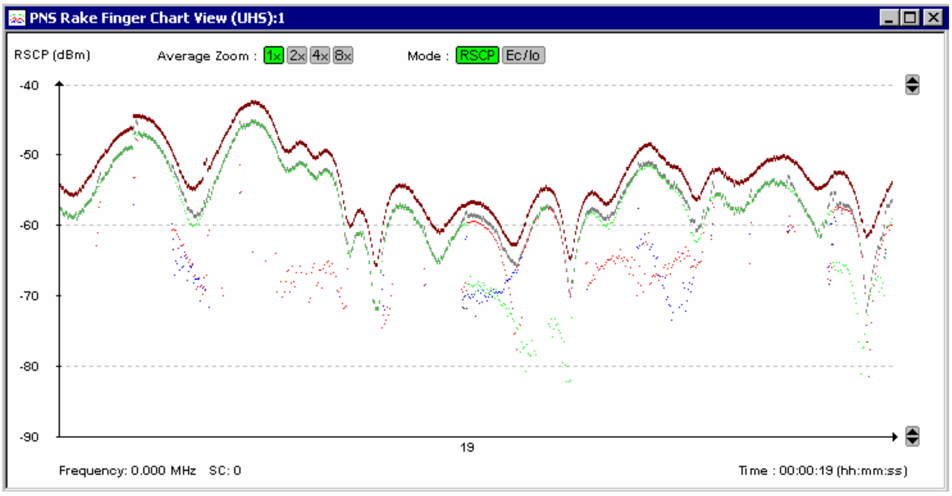


Fig. 4-232 PNS Rake Finger Chart View

Diagram

The diagram shows the Received Signal Code Power (RSCP) or the ratio of the received energy per PN chip of the CPICH to the total transmit power spectral density (Ec/Io) as a function of time. The results are displayed for the different multipath echoes of a Node B signal and for the complete signal:

- The upper (brown) trace represents the total received power on all channels, including the data channels.
- The second (gray) trace represents the aggregated P-CPICH power, i.e. the CPICH code power of all individual echoes captured by the different rake fingers. The aggregated power is not exactly equal to the sum of the individual measured CPICH code powers because a correction for each pair of signals with similar timing is taken into account.
- The remaining traces represent the CPICH power of the individual echoes. The color scale for these signals is defined in the *PNS Rake Finger Chart View* configuration menu.

Diagram settings

The carrier frequency/UTRAN channel and scrambling code (SC) of the cell are displayed below the diagram; they must be selected in the UMTS PNS driver configuration menu (see chapter 6).

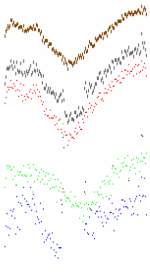
The signal powers are displayed as dots. The vertical position of the dots corresponds to the power (RSCP in dBm or Ec/Io, depending on the Mode : RSCP Ec/Io selection); their horizontal position corresponds to the measurement time. The horizontal spacing between the dots depends on the *Display Update Rate* defined in the *Measurements* tab of the *R&S UMTS PNS* driver configuration menu. The *Average Zoom* buttons 1x 2x 4x 8x smooth the traces, replacing the raw signal powers by the arithmetic mean value of 2, 4, or 8 consecutive powers. If an average is calculated, then the individual echo traces are all gray to avoid misleading results in the case of rake finger exchanges (see p. 4.409).

The maximum number of captured signals is limited by the properties of the R&S TSMx's rake receiver (maximum number of rake fingers) and depends on the measurement rate. It is 4 for a 333 Hz measurement rate, 8 for 250 Hz, and 12 for all other rates.

Diagram scaling

The diagram can be scaled vertically using the buttons. Additional scaling options are provided in *PNS Rake Finger Chart View* configuration menu described below.

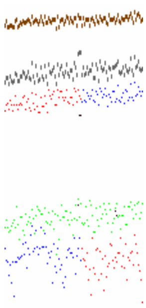
Interpreting the traces



Lost echoes

A dip in the traces indicates a temporary decrease of the RF channel quality. In such a situation, some of the rake fingers may no longer be able to trace their echo.

In the example to the left, the weakest (blue) echo was lost when the RSCP suddenly decreased. As a result of the missing contribution one the difference between the total received power (brown trace) and the aggregated CPICH power (gray trace).



Finger exchange

The colors of the echo traces are assigned to rake fingers rather than to individual signals. A changed trace color therefore indicates that the signal was received by another finger.

Typically the fingers for two signals with a small relative timing delay are simply exchanged. In the example to the left this happened for the blue and red traces.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or destroy new views or save the current configuration as default; see *Context menu* description on p. 4.2.

PNS Rake Finger Chart View Configuration

The *PNS Rake Finger Chart View* configuration menu sets zoom options and define the color scheme for the traces in the *PNS Rake Finger Chart View*. It is opened via a right mouse click on a point inside the view or via the *Tools - Modules Configuration...* command (see chapter 3).

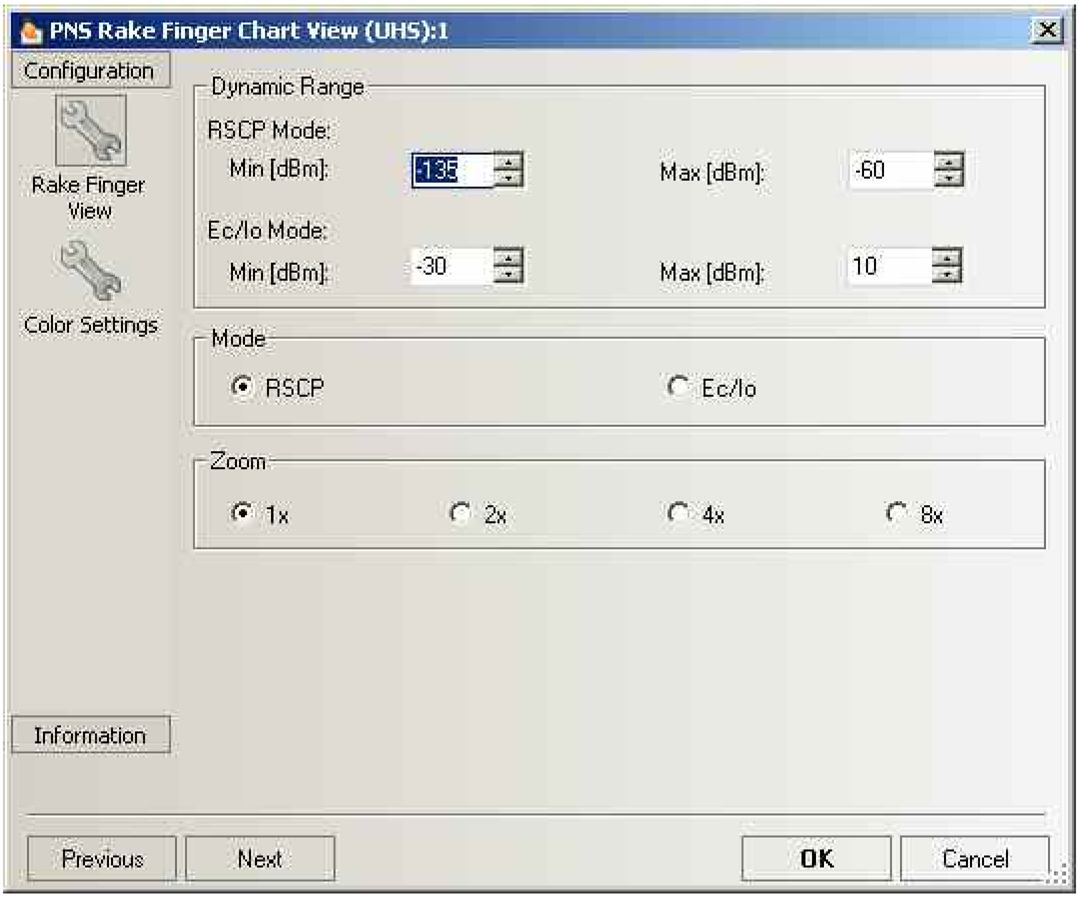


Fig. 4-233 PNS Rake Finger Chart View Configuration

Dynamic Range *Defines the scale of the vertical (RSCP or Ec/Io) axis, i.e. the minimum and maximum RSCP or Ec/Io displayed.*

Mode *Selection of the diagram scaling in terms of either the RSCP or the Ec/Io. The two option buttons are equivalent to the* Mode : RSCP Ec/Io *buttons in the diagram.*

Zoom *Selection of a factor for smoothing the curves in the diagram. The four option buttons are equivalent to the* 1x 2x 4x 8x *buttons in the diagram.*

The *Color Settings* tab of the *PNS Rake Finger Chart View* configuration menu is analogous to the *PNS CPICH* configuration menu; see section PNS CPICH View on p. 4.378. Note that the colors are assigned to rake fingers rather than to a particular echo. A changed color in the view may indicate a finger exchange (see p. 4.409).

PNS BCH View

The *PNS BCH View* shows a list of all System Information Blocks (SIBs) and Master Information Blocks (MIBs) decoded from the UMTS BCH. The contents of each block appear in a tree view as soon as the block is selected. The SIB types and their information elements are described in standard 3GPP TS 25.331.

The view accumulates the SIBs acquired and displays them in the left part of the view, grouped by network provider, i.e. by MNC and MCC.

Each second level node of the data tree shown represents an UMTS NodeB Sector identified by MCC, MNC and CI. If it can be found in the UMTS NodeB Database loaded, the corresponding name is shown, e.g. MXU811A. Otherwise the name is composed as follows:

S<MNC>_<MCC>_<CI>

with

<MNC> decimal MNC value, 3 digits

<MCC> decimal MCC value, 3 digits

<CI> decimal CI value, 5 digits

e.g.: S262_001_09814.

Some parameters (SC, CI, position) are appended to the NodeB name. If the NodeB has been retrieved from the database, the position is displayed as Lon <value> Lat <value>. If the NodeB has been generated from SI3 measurement without a corresponding database entry, the position is displayed as Lon *<value> Lat *<value>. The format of the position values depend on the corresponding global ROMES setting.

The SIB and MIB information is available only if the PN scanner data are recorded with *BCH Demodulation* enabled. Decoding of each SIB type must be enabled explicitly in the UMTS PNS driver configuration menu; see description in chapter 6.

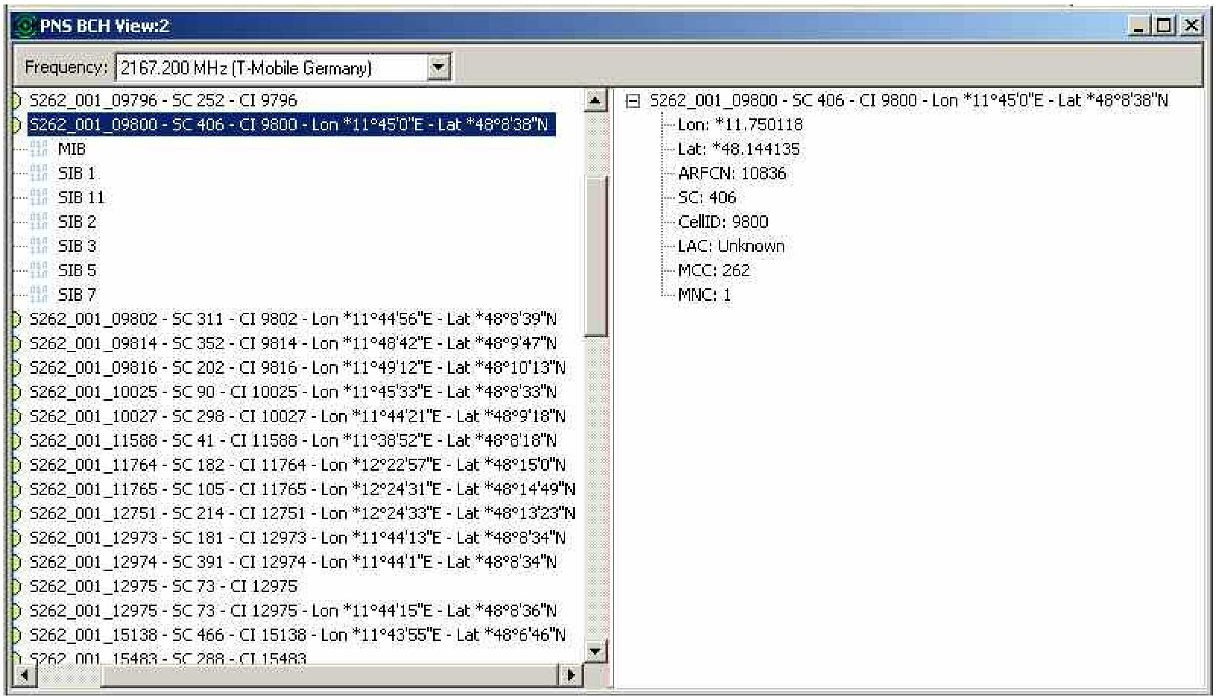


Fig. 4-234 PNS BCH View - NodeB parameters

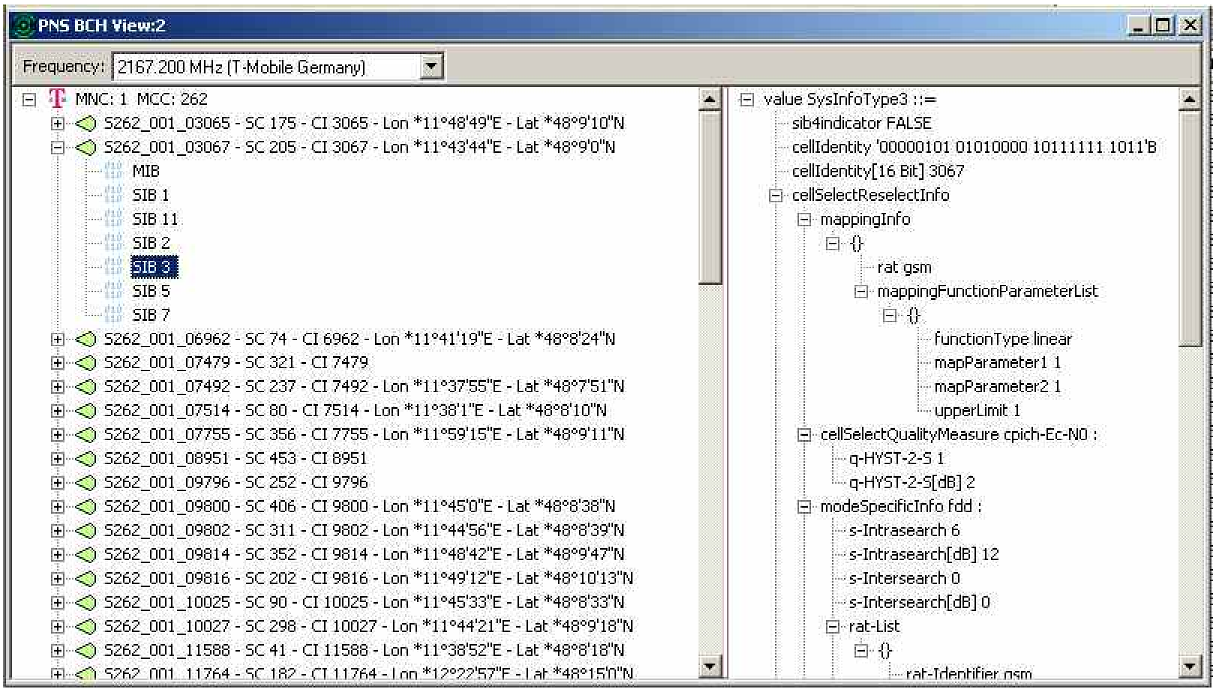


Fig. 4-235 PNS BCH View - SIB content

Note:

In the tree view the scrambling code is always displayed in decimal format, irrespective of the format settings made in the TEC for UMTS PNS tab of the R&S ROMES Configuration menu.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or destroy views, or save the current configuration as default; see *Context menu* description on p. 4.2. The context menu provides the following additional, view-specific commands:

Show Node B …
: *Use the color selected in the* PNS BCH View *configuration menu (see below) to mark the selected UMTS cells in the* Route Track *view. This feature is only available while a cell is selected in the view. The UMTS layer / GSM BTS layer in the* Route Track *view must be visible to use this feature.*

Hide Node B…
: *Hide the selected UMTS cell in the* Route Track *view.*

Hide all Node Bs…
: *Hide all selected UMTS cells in the* Route Track *view.*

Generate BTS List
: *The BTS list can also be generated after the complete file has been replayed and ROMES has been stopped.*

Export Sys Info
: *The System Information can be exported to an ASCII file in the EXPORT directory of ROMES.*

Export System Information

If the export has been started before measurement or replay has been stopped, the file contains all System Information starting from the selected node in the BCH tree, i.e. all SIBs of the selected NodeB or all SIBs belonging to all NodeBs of one provider (MCC, MNC).

If the export has been started after measurement or replay has been stopped, the file contains all SIBs belonging to all NodeBs of the UMTS BCH View.

The System Information can be exported to an ASCII file in the EXPORT directory of ROMES. The export file is named:

UMTS_SysInfo_<measurement filename>.txt

Content Export File

```
Provider MNC: 2  MCC: 262
NodeB MXUW70C - SC 432 - CI 32703 - Lon 11°26'18"E - Lat
48°8'20"N
Master Information Block
value MasterInformationBlock ::=
{
  mib-ValueTag 7,
  plmn-Type gsm-MAP :
  {
    plmn-Identity
    {
      mcc
      {
        2,
        6,
        2
      },
      mnc
      {
        0,
        2
      }
    }
  },
  sibSb-ReferenceList
  {
    {
      sibSb-Type sysInfoType1 : 229,
      scheduling
      {
        scheduling
        {
          sib-Pos rep32 : 2
        }
      }
    },
    {
      sibSb-Type sysInfoType2 : 3,
      scheduling
      {
        scheduling
        {
          sib-Pos rep64 : 6
        }
      }
    },
```

Position Estimation

If Position Estimation is active (see Position Estimation Driver), the estimated positions are added to the Node B entries. Estimated positions are marked by an asterisk.

After stopping the measurement, the view automatically generates a BTS list import files with an entry for every estimated BTS position.

Files

Two files are generated for each *.rscmd measurememnt file.

GSM_BTS_LIST<measurement filename>.ATD	Contains the database definition.
GSM_BTS_LIST<measurement filename>.TXT	Contains the BTS data.

Note:
The NodeB List files are stored in the ROMES measurement directory. After the replay of the measurement file has been stopped the same NodeB List can be created via the view's context menu "Generate NodeB List" option.

Example

Measurement file:	zgb-muc.rscmd
Generated files:	UMTS_BTS_LIST_ zgb-muc.ATD
	UMTS_BTS_LIST_zgb-muc

Content *.ATD and *.TXT file

For a detailed example refer to *Export System* Information

If the export has been started before measurement or replay has been stopped, the file contains all System Information starting from the selected node in the BCH tree, i.e. all SIs of the selected BTS or all SIs belonging to all BTSs of one provider (MCC, MNC).

If the export has been started after measurement or replay has been stopped, the file contains all SIs belonging to all BTSs of the GSM BCH View.

The System Information can be exported to an ASCII file in the EXPORT directory of ROMES. The export file is named:

GSM_SysInfo_<measurement filename>.txt

Content Export File

```
Provider MNC: 2  MCC: 262
BTS MXBW70A - ARFCN 4 - CI 32701 - Lon 11°26'18"E - Lat
48°8'19"N


SYSTEM INFORMATION TYPE 3 (Down)
L3Message
->
Protocol Discriminator   ( 6 )   Radio Resource Mgmnt
PdRadioResourceManagement
->
Skip Indicator (Skip Indicator)   0
Message Type   ( 27 )   System_Info_Type_3
System Info Type 3
->
Cell Identity
->
CI (Cell identity value)   32701
<-
Location Area ID
->
Mobile Country Code: 2 6 2
Mobile Network Code: 0 2
Location Area Code:  893, 0x037D
<-
Control Channel Description
->
MSCR   ( 1 )   MSC is Release '99 onwards
ATT   ( 1 )   MSs in cell should apply
BS AG BLKS RES (Value depends on CHAN CONF)   1
CCCH CONF   ( 0 )   1 channel, not with SDCCHs
Spare 1 (1 spare bit)   0
CBQ3   ( 0 )   Iu mode not supported
Spare 2 (2 spare bits)   0
BS PA MFRMS   ( 4 )   6 multiframes for TX
T3212 (Timeout value in decihours)   10
<-
Cell Options BCCH
->
DN-IND   ( 0 )   Dynamic ARFCN mapping not used
PWRC   ( 0 )   PWRC is not set
```

Position Estimation on p.4.488 in the chapter *GSM BCH View.*

PNS BCH View Configuration

The *PNS BCH View* configuration menu defines the color for the selected Node B / BTS symbols in the *Route Track View* and defines the a filter for Node B / BTS list generating. It is opened via a right mouse click on a point inside the *PNS BCH View* (see chapter 3).

The *Configuration* tab defines the color for the selected Node B / BTS symbols in the *Route Track View*.

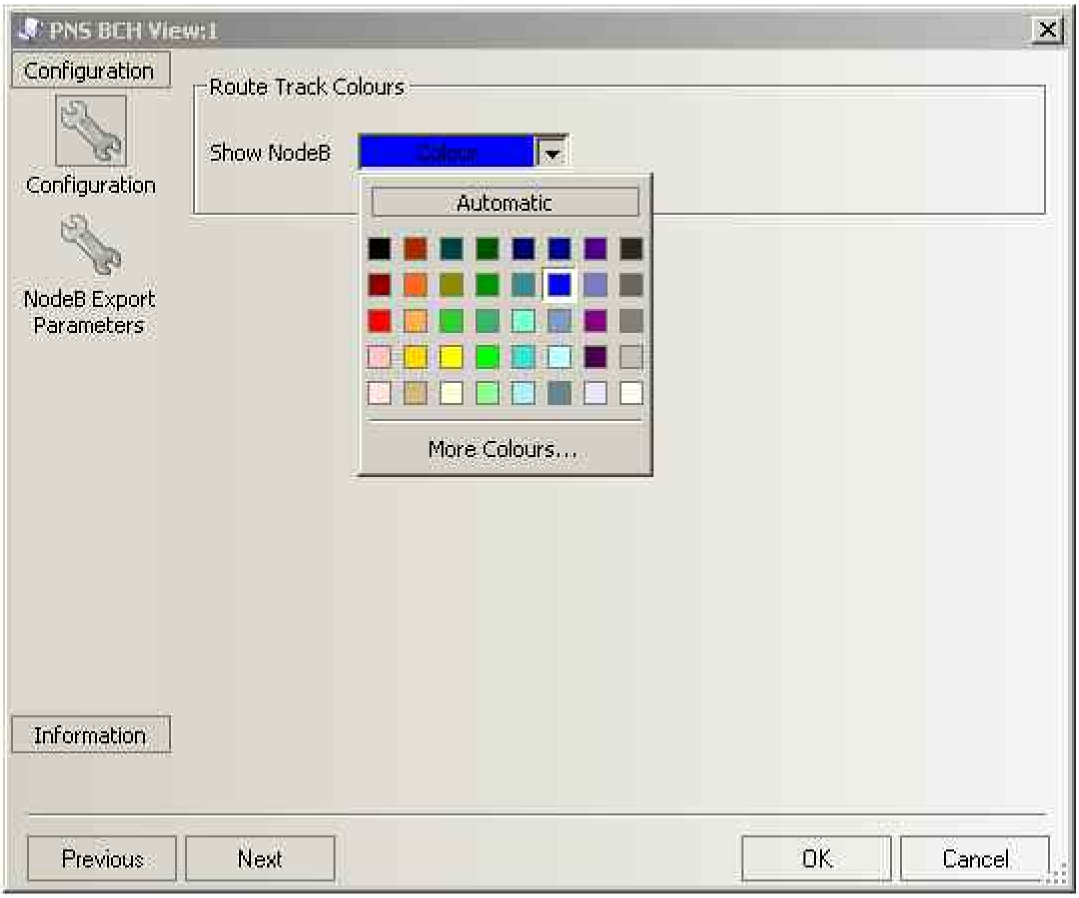


Fig. 4-236 PNS BCH View - Configuration

The *BTS Export Parameters* tab defines a filter for Node B / BTS list generating.

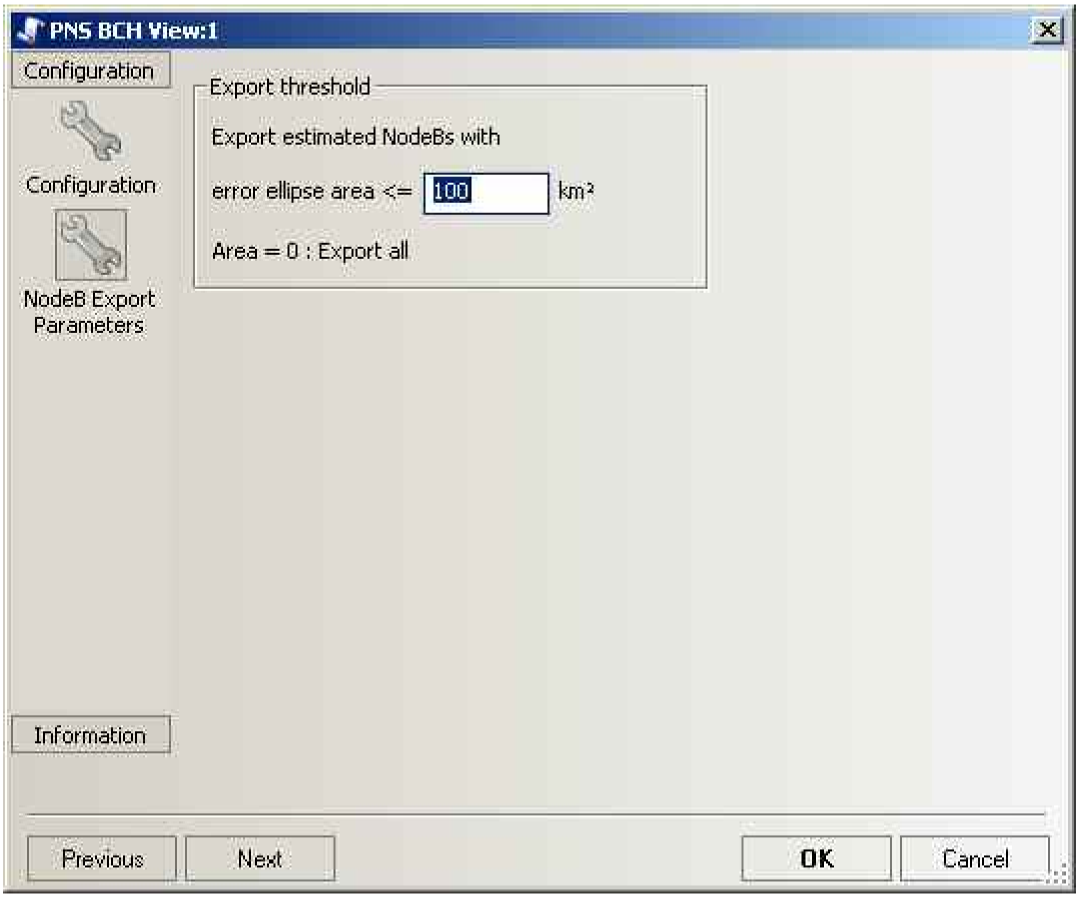


Fig. 4-237 PNS BCH View - BTS Export Parameters

Export estimated BTS with …

The filtering is done by a threshold value for the error ellipse area of the estimated position. If this value is 0, all BTS entries with estimated position will be exported. Otherwise, only entries whose error ellipse area is less than the threshold value will be exported via the BCH View's "Generate BTS (NodeB) List" context menu item.

The error ellipse area A_ε can be calculated from the position error values:

$$A_\varepsilon = PosErr1 * PosErr2 * \pi$$

QoS Views

The *QoS Views* display the results of the Data Quality Tester (DQA) R&S ROMES3DQA. The purpose of the DQA measurement is to evaluate the Quality of Service (QoS) of any kind of data transfer connection.

DQA measurements are performed using the DQA driver (see chapter 6, Hardware Components). Loading the driver does not require any hardware or additional test devices. An example procedure for setting up and testing a connection is described in chapter 2; see section *Data Quality Tester*.

Many of the QoS results can also be displayed in other R&S ROMES views, e.g. in the *Alphanumeric View*, the *2D Chart View*, and in the *Route Track View*.

The QoS views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *QoS Views*.

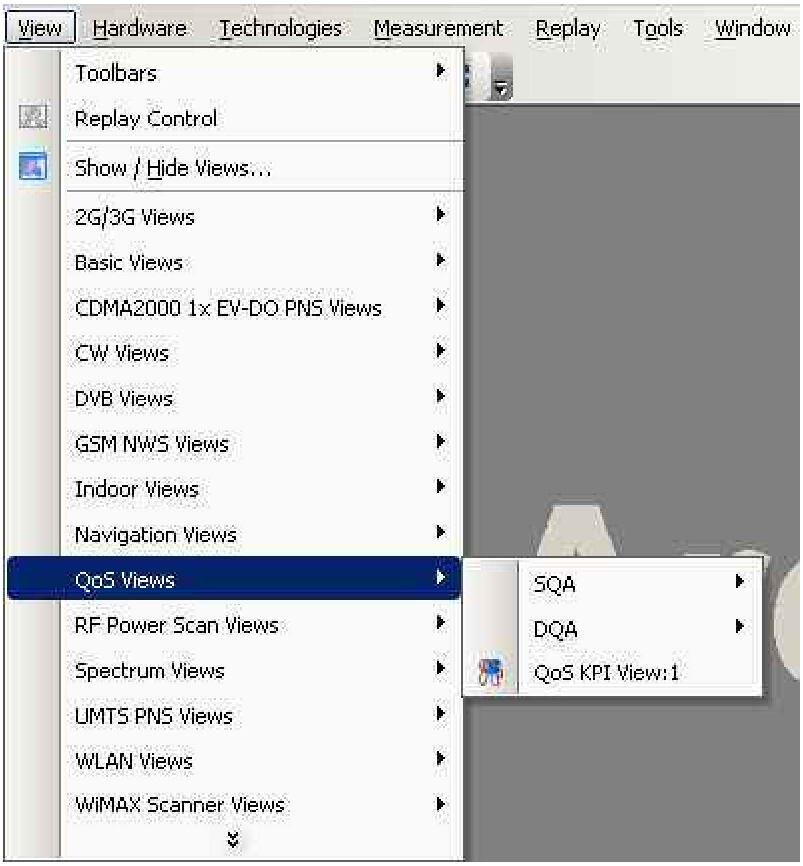


Fig. 4-238 QoS views

QoS SQA Views

The *QoS SQA Views* currently only contain the SQA Message View, which displays the result of the Speech Quality Analysis (SQA, with option R&S ROMES3SQA, *Voice Quality PESQ)*.

The QoS SQA views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *SQA*.

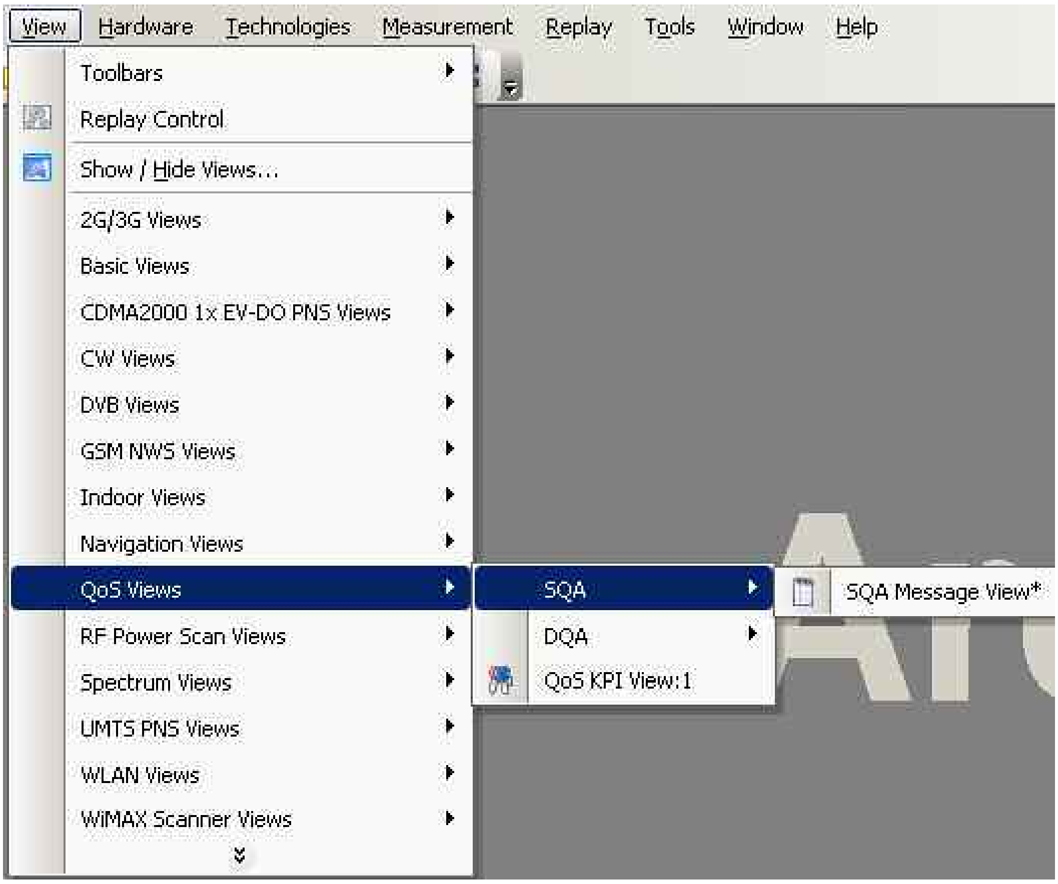


Fig. 4-239 QoS SQA views

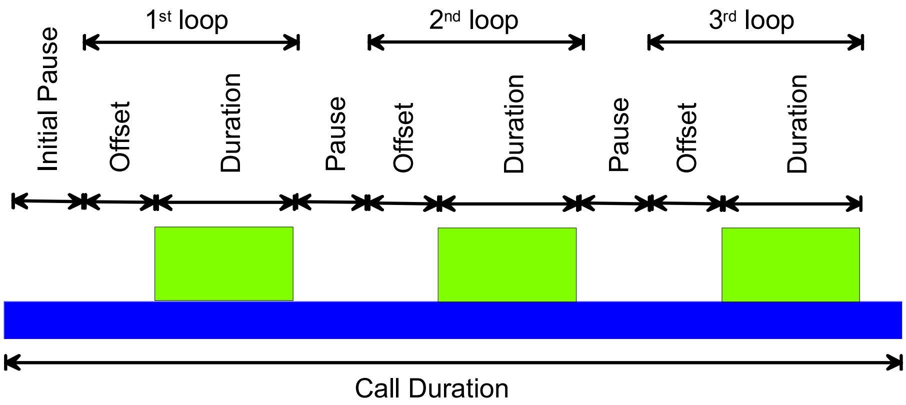
SQA Message View

To obtain results for the *SQA Message View*, the SQA must be enabled and configured using the *Speech Quality* tab of the test mobile drivers. For a detailed description of the driver configuration, the SQA procedure, and the test setup refer to chapter 6. SQA is provided for many mobile types and technologies (GSM, GPRS, UMTS, cdmaOne/IS-95, CDMA2000).

TIP In addition to the results in the *SQA Message View,* R&S ROMES generates a wide range of SQA signals. The signals are under the *SQA Tester* node of the data tree (*Tools – Preferences – Available Signals*). You can analyze the signals in one of the basic views, e.g. you can display the PESQ score in a series of consecutive loops and calculate average, minimum and maximum values using the *Statistic Histogram* view.

Fig. 4-240 SQA Message View

SQA measurement An SQA measurement consists of a specified number of test loops. In each test loop, R&S ROMES uploads or downloads voice data for a specified duration and calculates the PESQ score according to ITU-T recommendation P.862. An offset time precedes each data transfer. Moreover the individual loops are separated by a pause time. All timing parameters can be set in the driver configuration menu.



SQA messages

The *SQA Message View* contains a chronological record of the generated SQA messages. An SQA message either describes an event (i.e. the beginning of a particular stage of the measurement), a measurement result, or an error. The messages depend on the measurement mode (download, upload). The basic events and results are repeated for each loop.

Degraded voice samples are stored in the *.rscmd measurement file if selected in the SQA configuration. When the voice sample was stored in the *.rscmd file the line with the measurement value is marked blue. For a replay of the voice sample mark the line, open the context menu and select *Play degraded wav file*.

Events and Results: Downlink

Entering loop <nr>

Start time of the loop, beginning of the transferred file. The actual data transfer starts after the Offset *defined in the configuration menu. The system waits until enough data have been transferred to start the PESQ evaluation.*

Performing pesq evaluation

Start time of the PESQ evaluation in the current loop.

Resulting delays: ...

Time delay between reference file and acquired sample in ms. The speech codec can introduce variable delays within the sample, therefore the PESQ result contains the minimum, average, and maximum delay. If the average delay exceeds 30 ms, the system corrects the timing and repeats the PESQ evaluation.

PESQ Result

Offset *between the start of the loop and the calculation of the result. The offset includes the transmission time through the communication system; it is not identical to the offset defined in the driver configuration menu. The* PESQ P862.1 *result is the calculated PESQ score which is converted to a scale between 1 and approx. 4.55; see Table 3 and the following background information.*

Searching for next valid sample data

The PESQ evaluation failed or crashed in a first attempt, however, the system tries to repeat the evaluation in the current loop with a shifted evaluation interval.

Repeating this sample using new delay information

The PESQ evaluation failed or crashed in a first attempt, the delay between the acquired sample and the reference file was larger than 30 ms. The system tries to repeat the evaluation in the current loop with a shifted evaluation interval.

Using new delay information for next sample

The delay between the acquired sample and the reference file was larger than 30 ms, the evaluation of the current sample cannot be repeated (e.g. because the beginning of the sample was lost). The system tries to synchronize to the next sample (next loop) using the delay information; the PESQ result in the current loop is omitted.

Waiting till data threshold is reached

Audio data is acquired (recorded) until the length of the recorded sample is identical to the length of the reference sample.

Events and Results: Uplink

Playing initial silence

Initial pause before the start of the first loop (loop 0). The length of the initial pause is defined in the driver configuration menu.

Playing sample

The loop was started; the sample file (play file) is being played.

Playing silence between samples

Pause time between two consecutive loops of the sample file (play file).

Errors: Downlink

PESQ evaluation failed

The system could not determine a PESQ result, e.g. because the delay between the acquired sample and the reference file was too big, or because the two files were hardly correlated. The PESQ evaluation is repeated with a shifted evaluation interval until the end of the loop is reached.

PESQ evaluation crashed…

The system crashed during the PESQ evaluation (possible reason see above). The PESQ evaluation is repeated with a shifted evaluation interval until the end of the loop is reached.

Abort requested

The measurement was aborted.

Errors: Uplink

Abort requested

The measurement was aborted.

Table 3 ITU P.800 PESQ scale

PESQ 826.1	Speech Quality	Impairments
5	Excellent	Imperceptible
4	Good	Perceptible, but not annoying
3	Fair	Slightly annoying
2	Poor	Annoying
1	Bad	Very annoying

Mapping of PESC score and ITU P.800 values

The PESC score according to ITU-T recommendation P.862 expresses the speech quality on a scale between –0.5 and +4.5. The PESC score values can be mapped to the ITU P800 scale of the table above; an appropriate conversion formula has been standardized by the ITU in P.862.1. The conversion formula maps the PESQ score values to a range between approx. +1 and +4.55; R&S ROMES displays the converted values as *PESQ P862.1* results.

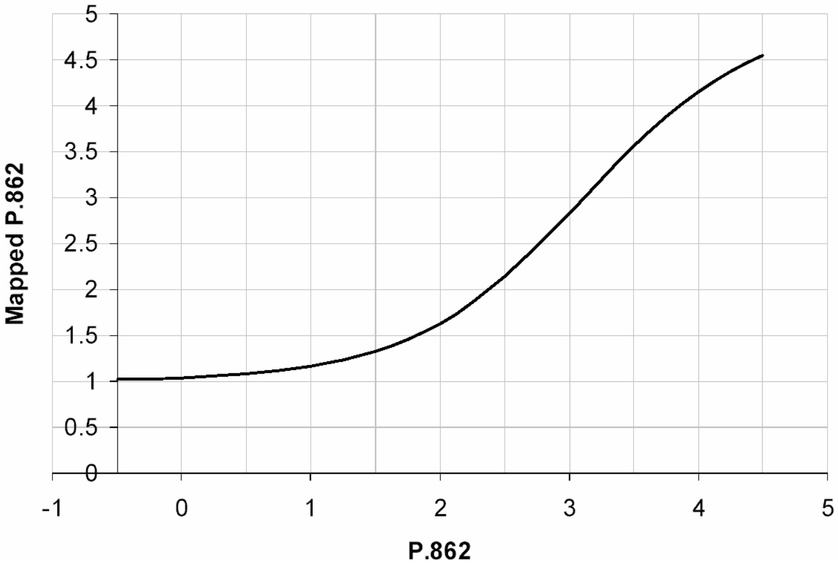


Fig. 4-241 Mapping of PESC score (P862) and ITU P.800 values according to ITTU P862.1

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents put the view on hold, copy the current view to the clipboard, create or delete views; see *Context menu* description on p. 4.2.

Degraded voice samples are stored in the rscmd measurement file if selected in the SQA configuration. It is possible to play or export this degraded wav file. Exporting is useful to analyze the degraded voice sample with external audio tools. When the voice sample was stored in the rscmd file the line with the measurement value is marked blue. To export the voice sample mark the line, open the context menu and select *"Export degraded wav file".* This function is also available during measurement with recording.

The *SQA Message View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

QoS DQA Views

The *QoS DQA Views* display the result of the Data Quality Analysis (DQA, with option R&S ROMES3DQA, *Voice Quality PESQ)*.

The QoS DQA views can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *DQA*.

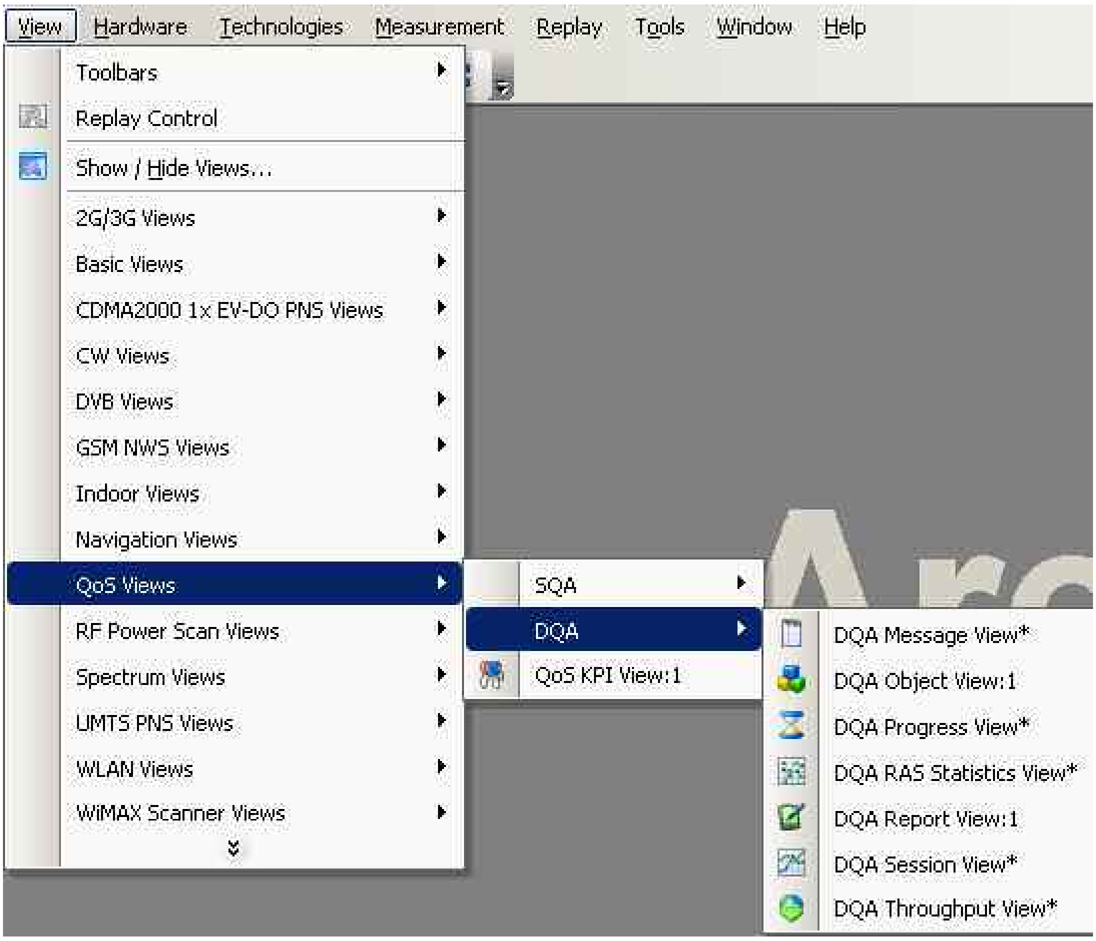


Fig. 4-242 QoS DQA views

DQA Message View

The *QoS DQA Message View* monitors all actions of the current job. Each action is described with a message and the associated time. The causes of possible errors are reported with the messages.

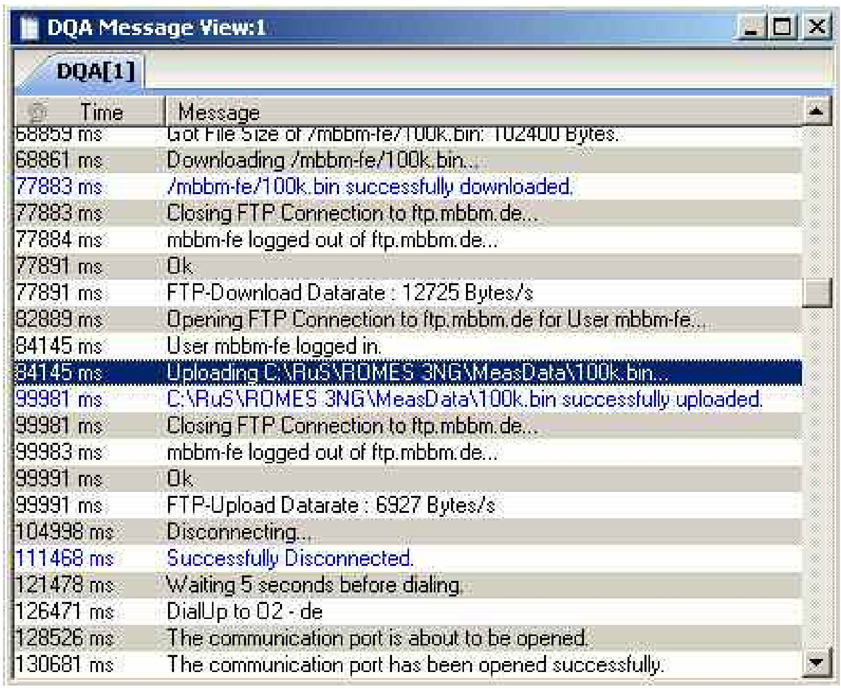


Fig. 4-243 QoS DQA Message View: FTP upload

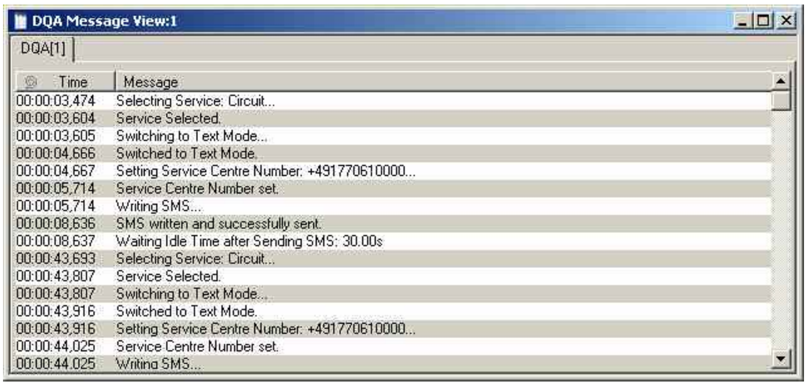


Fig. 4-244 QoS DQA Message View: Send SMS

View contents

The messages depend on the job that is being executed but are all self-explanatory. The figure above shows the messages generated during a *Connect to Network* job with the download of an image file.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, put the view on hold, copy the current view to the clipboard, or to create or delete views; see *Context menu* description on p. 4.2.

The *QoS DQA Message View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

QoS DQA Progress View

The *QoS DQA Progress View* monitors the progress and the status of the current job. The view contents depend on the job that is being executed.

For more information refer to the description of the DQA driver configuration menu in chapter 6.

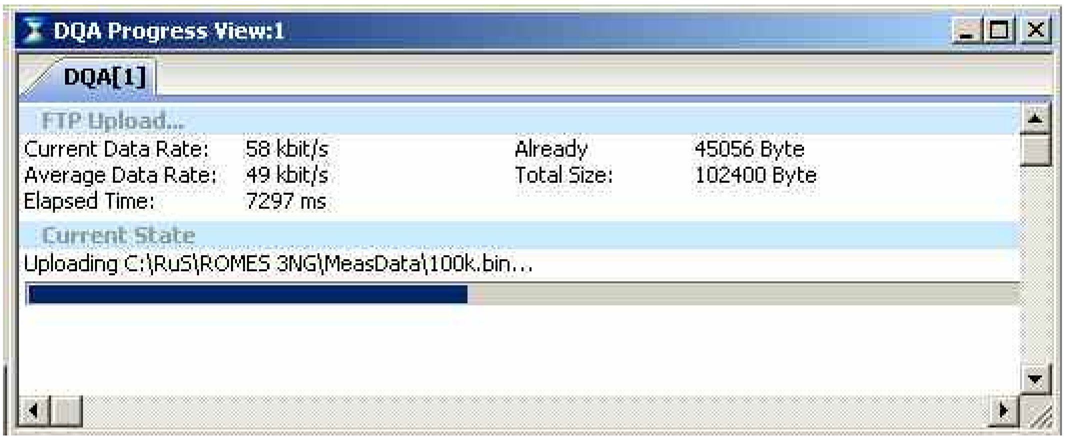
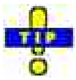


Fig. 4-245 QoS DQA Progress View (FTP upload)

View contents

The job name forms the heading of the upper panel, which also shows the most important properties of the job and its current state.

A detailed list of the different actions involved in the job is given in the *Trigger Points* table. The entries in the table are self-explanatory. In particular, the table contains the duration of each action and the number of transmitted and received bytes.



An alternative record of the actions of all jobs in the measurement including detailed timing information is provided in the QoS DQA Object View; see section DQA Object View on p. 4.435.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, see *Context menu* description on p. 4.2.

The *QoS DQA Progress View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

DQA Session View

The *QoS DQA Session View* shows a bar graph to monitor the percentage of *Good*, *Blocked*, and *Dropped* data transfer jobs in the current session. Only connections that the system sets up to a remote network are evaluated. In principle a remote network connection can be a radio link to a network established by means of test mobiles or a connection via dial-up network. At present the *Session* tab evaluates the *Connect to Network/Disconnect from Network* jobs; it is empty for all other jobs.

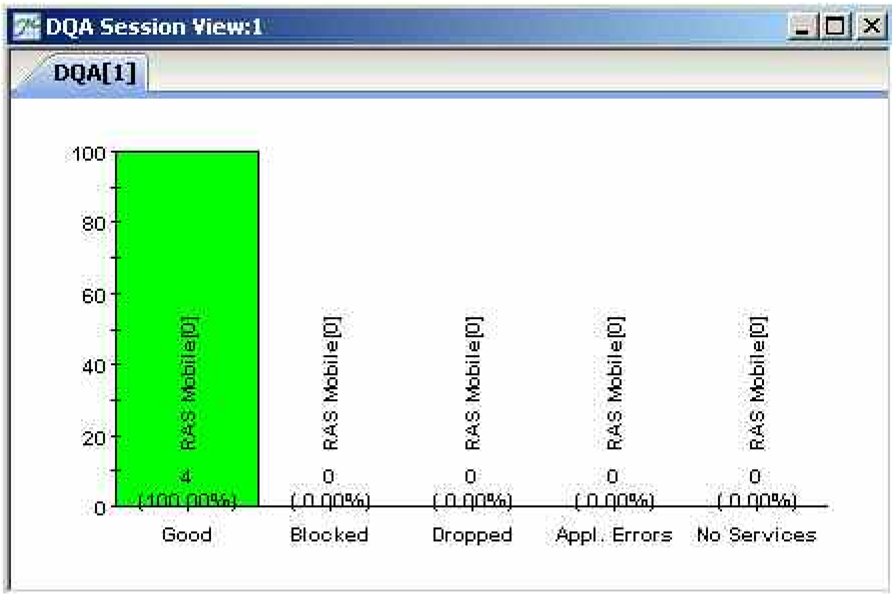


Fig. 4-246 QoS DQA Session View

The definition of *Good Sessions, Blocked Sessions*, *Dropped Sessions* and *No Services* is analogous to the call classes in the GSM Network Quality Analysis (NQA); see chapter 6. *No Services* and *Application Error* are similar; they both mean that the remote network was out of service:

- *No Services* counts the failed connection setups via a radio link.
- *Application Error* counts the failed connection setups due to problems with other system components (e.g. because a wrong e-mail address was used, authentication failed, an addressed server was out of service).

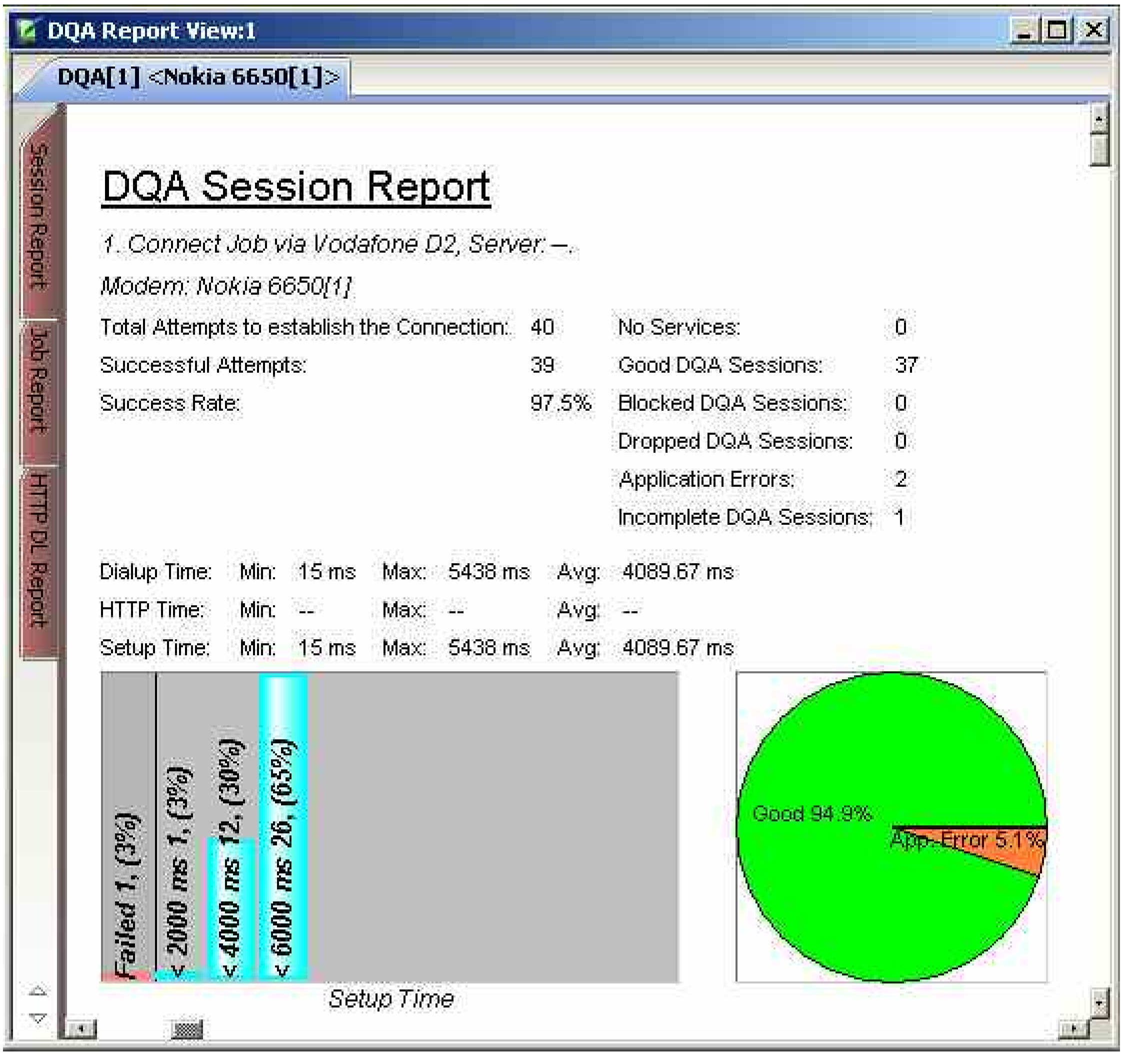
Context menu

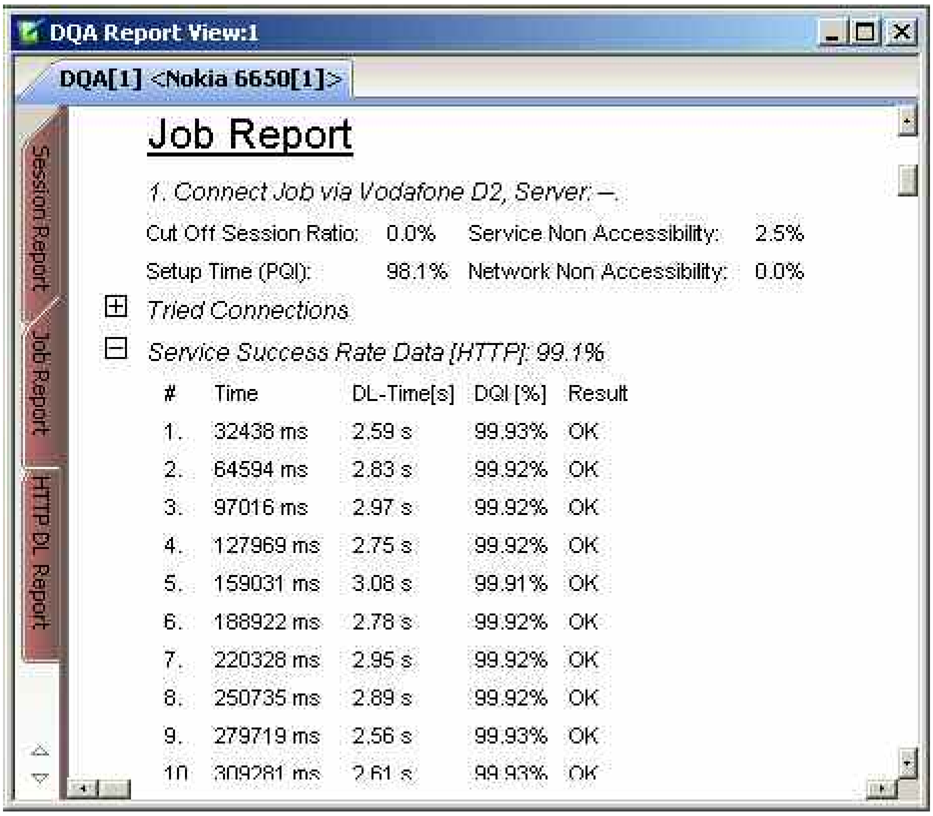
A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for hold, copy the current view to the clipboard; see *Context menu* description on p. 4.2.

The *QoS DQA Session View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

DQA Report View

The *QoS DQA Report View* contains several tabs to separately monitor the jobs in the current session.





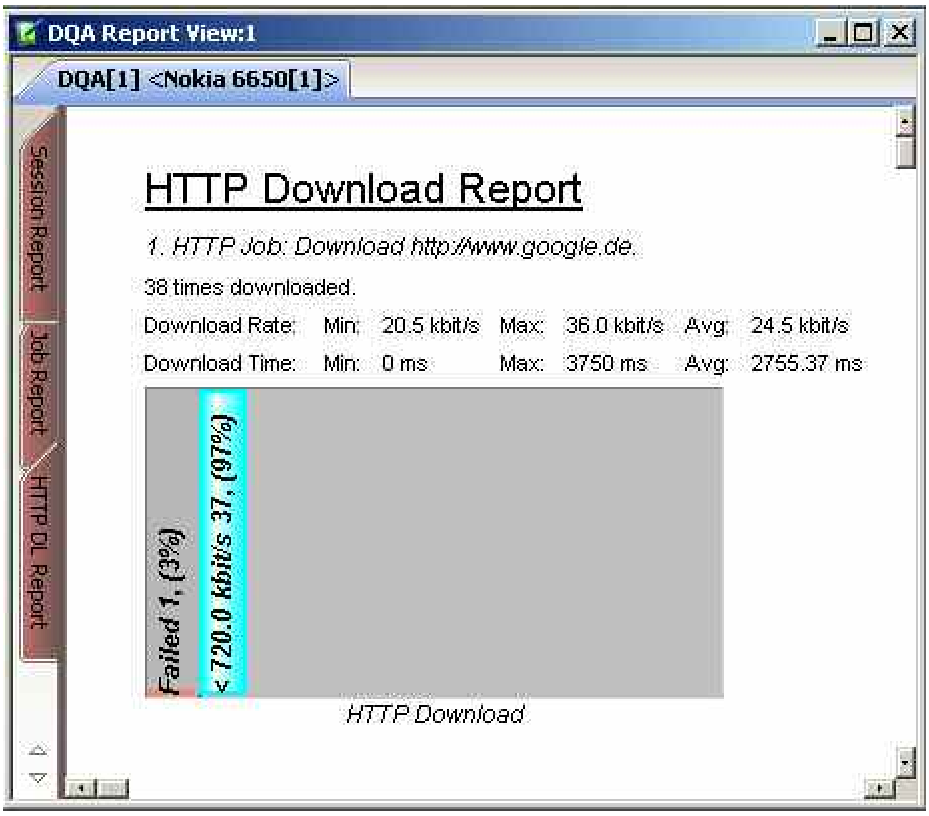


Fig. 4-247 QoS DQA Report View – Session, Job Report, and HTTP Download

View contents: Session Report

The *Session Report* tab (see figure above) monitors the statistics of a connection that the system sets up to a remote network. This can be a radio link to a network established by means of test mobiles or a connection via dial-up network. At present the *Session Report* tab evaluates the *Connect to Network/Disconnect from Network* jobs. Connections via existing links, e.g. for *FTP Download* from a local network server, can be monitored in the other tabs.

The view shows the name of the job as set in the driver configuration menu, an overview of the attempted connections and the time statistics of the connections. The definition of *No Services, Application Errors, Good Sessions, Blocked Sessions* and *Dropped Sessions* is analogous to the call classes in the GSM Network Quality Analysis (NQA); see chapter 6 and section *DQA Session View* on p. 4.427.

The *Session Report* tab contains a bar graph showing the percentage of good, blocked, failed and no service/application error sessions classified according to their time. The percentage of the session classes is also visualized in a pie chart. A bar graph corresponding to the pie chart is shown in the *DQA Session View*; see p. 4.427.

View Contents: Job Report

The *Job Report* monitors the success rate of the HTTP, HTTP Download With IE, FTP, or UDP connection that the system attempts to a remote network. For network connections the *Job Report* shows a weighted evaluation of the success rate.

R&S ROMES uses a model where the success rate is described by a single percentage depending on the criteria *Cut-off Session Ratio, Service Non Accessibility, Set-up Time, Network Non Accessibility*, and *Data Quality* displayed in the *Job Report*. Each criterion enters into the calculation of the success rate with a coefficient or weighting factor between 0% (criterion does not influence the success rate) and 100% (criterion fully contributes to the success rate). The coefficients can be set in the *QoS Report View* configuration menu; refer to this section for more information.

View Contents: Local Network connections

The tabs for the *Ping, HTTP Download, HTTP IE Download, FTP and UDP Upload* and *Download, E-Mail Upload* and *Download* jobs show an overview of the attempted local connections and the time statistics. A bar graph shows the successful and failed connections together with their time statistics.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for hold, copy the current view to the clipboard, access the configuration menus, create or delete views, save the current configuration as default; see *Context menu* description on p. 4.2.

DQA Throughput View

The *QoS DQA Throughput View* monitors the current, maximum and mean/average data rate in uplink/upload and downlink/download direction. To obtain valid results, the option *Record the computer network throughput* must be enabled in the *Connection Statistics* tab of the DQA driver configuration menu (see chapter 6). The data is recorded and displayed with the update rate selected in the driver configuration menu.

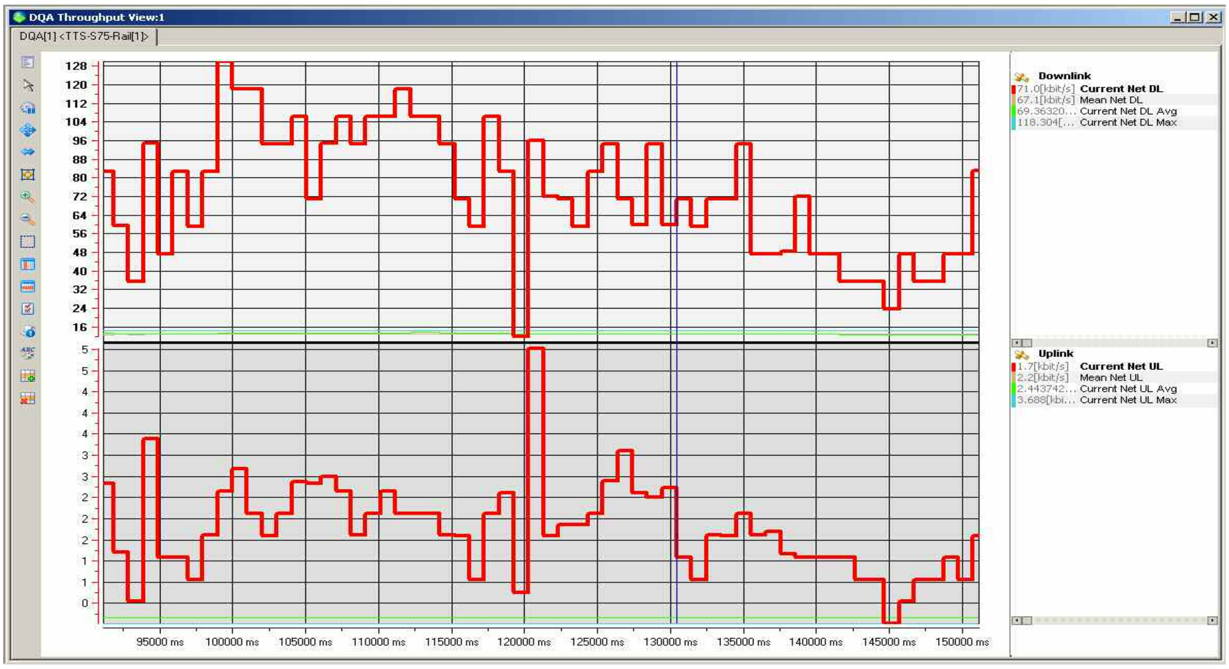


Fig. 4-248 QoS DQA Throughput View

View contents

The uplink and downlink data rate is shown in two 2D charts. The scale and appearance of the two diagrams (downlink and uplink throughput) can be modified using the configuration menu and various context menus. The diagram configuration is analogous to the *2D Chart View* described on p. 4.9.

In the diagrams, the most recent data rates are always displayed at the right edge of the diagram. Each diagram contains four curves, corresponding to the following results:

- The *Current* curve shows the net throughput vs. time.
- The *Mean* curve shows the average throughput since the beginning of the current job, DQA session, or measurement session, depending on the *Throughput View Configuration* settings in the configuration menu.
- The *Job Max.* curve shows the maximum throughput since the beginning of the current job.
- The *Job Max.* curve shows the average throughput since the beginning of the current job.

The most recent *Current, Mean, Job Max,* and *Job Avg* values are displayed in the legend above the diagrams. Selecting one of the items in the legend will highlight the corresponding curve.

In the configuration menu, it is possible to modify the *Mean* calculation and the appearance of the diagram.

Note:

The DQA Throuput View works also with network adapters. While working with network adapters it is important to check "Use Gateway for Routing" in connection's "Advanced Settings" in the DQA "Connect to Network Job" to establish correct network connections.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, put the view on hold, copy the current view to the clipboard, access the configuration menus, create or delete views, save the current configuration as default; see *Context menu* description on p. 4.2.

DQA Throughput View Configuration

The *QoS DQA Throughput View* configuration menu selects the range for the average calculation, modifies the appearance of the diagrams, and provides information about the view version. It is opened via a right mouse click on a point inside the *QoS DQA Throughput View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Throughput View Configuration* tab selects the range for the average calculation.

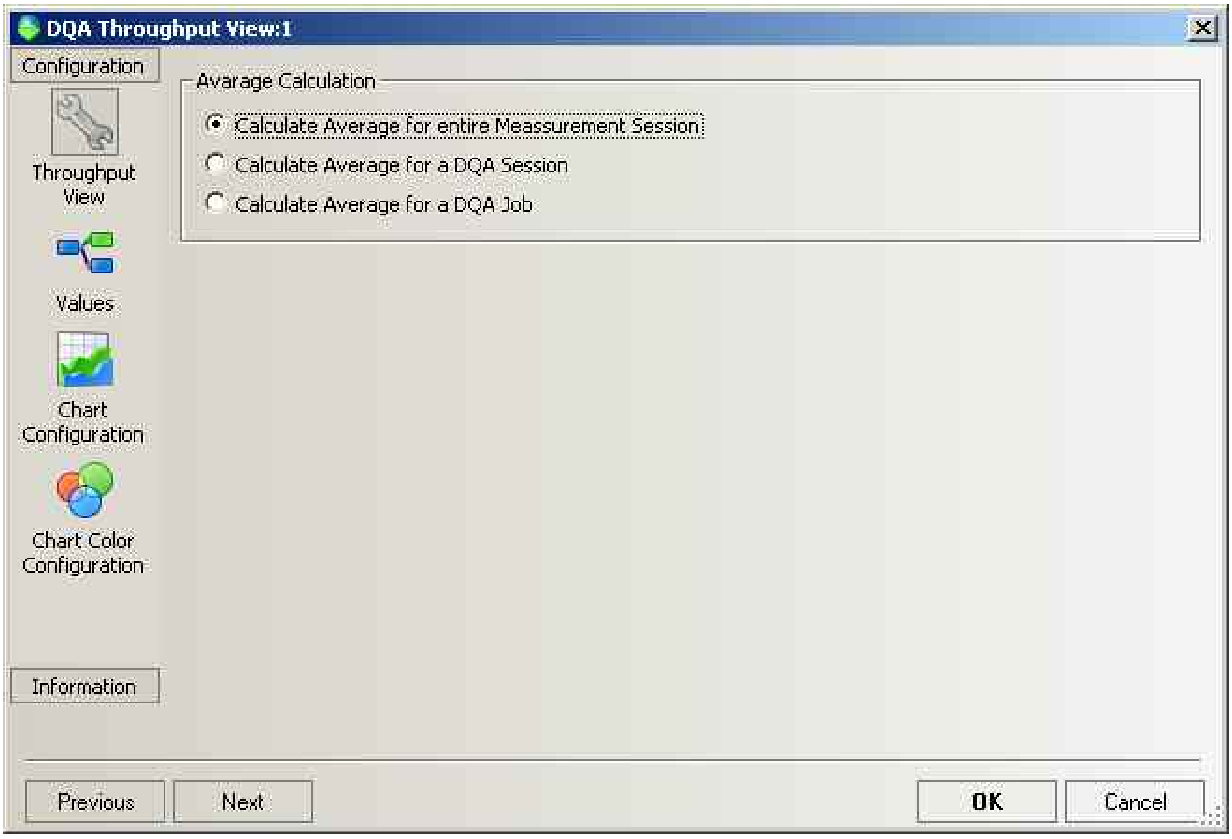


Fig. 4-249 QoS DQA Throughput View configuration

Average Calculation Defines whether the *Mean* curves in the *QoS Throughput View* are calculated over the entire measurement session or over a shorter time interval (DQA session or single DQA job). A measurement session consists of an arbitrary number of periodically repeated DQA sessions, each DQA session contains one or more DQA jobs; see description of the Data Quality Tester driver in chapter 6.

The *Chart Configuration* tab scales the axes of the chart and defines its contents and its appearance. All controls are also available in the *Chart Configuration* tab of the *2D Chart Configuration* menu and have the same effect; see figure on p.4.16 .

DQA RAS Statistics View

The *QoS RAS Statistics View* displays important parameters describing the network traffic during the measurement. To obtain valid results, the option *Record the connection statistics* must be enabled in the *Connection Statistics* tab of the DQA driver configuration menu (see chapter 6). The data is recorded and displayed with the update rate selected in the driver configuration menu.

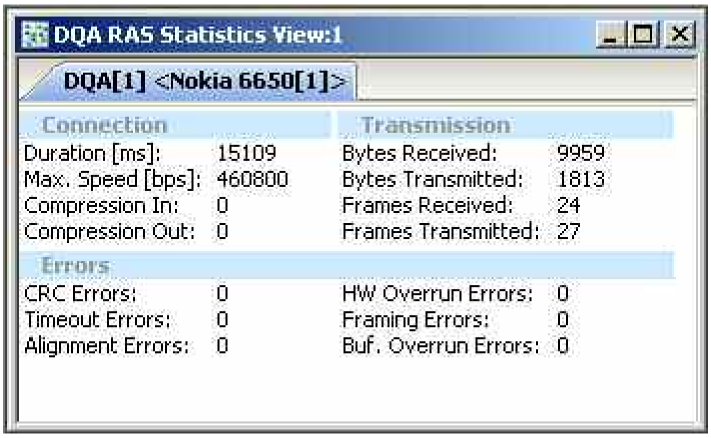


Fig. 4-250 QoS DQA RAS Statistics View

The Remote Access Service (RAS) parameters are grouped together in three panels, describing the characteristics of the *Connection,* the data traffic *(Transmission),* and the data quality *(Errors).*

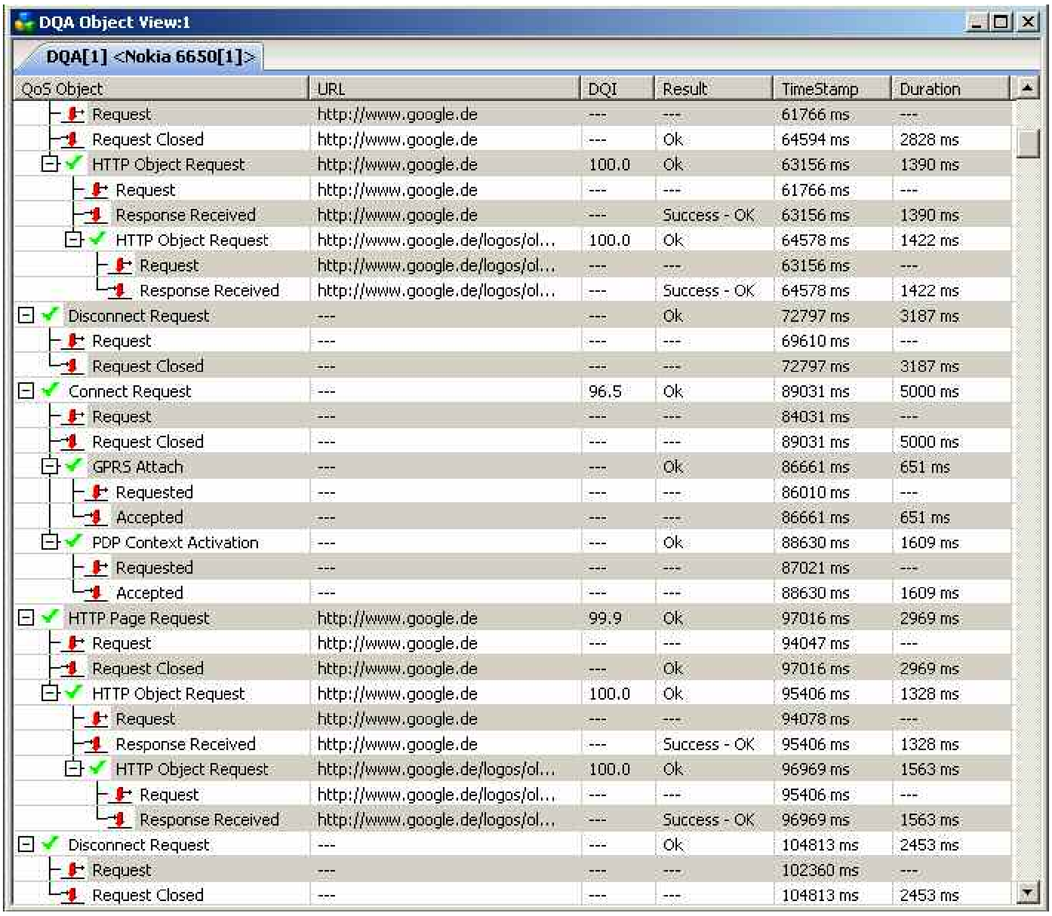
Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, (de-)select the view for hold, copy the current view to the clipboard, create or delete views; see *Context menu* description on p. 4.2.

The *QoS DQA RAS Statistics View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

DQA Object View

The *QoS Object View* displays a record of the different actions involved in all DQA jobs of the measurement.



QoS Object	URL	DQI	Result	TimeStamp	Duration
Request	http://www.google.de	---	---	61766 ms	---
Request Closed	http://www.google.de	---	Ok	64594 ms	2828 ms
HTTP Object Request	http://www.google.de	100.0	Ok	63156 ms	1390 ms
Request	http://www.google.de	---	---	61766 ms	---
Response Received	http://www.google.de	---	Success - OK	63156 ms	1390 ms
HTTP Object Request	http://www.google.de/logos/ol...	100.0	Ok	64578 ms	1422 ms
Request	http://www.google.de/logos/ol...	---	---	63156 ms	---
Response Received	http://www.google.de/logos/ol...	---	Success - OK	64578 ms	1422 ms
Disconnect Request	---	---	Ok	72797 ms	3187 ms
Request	---	---	---	69610 ms	---
Request Closed	---	---	---	72797 ms	3187 ms
Connect Request	---	96.5	Ok	89031 ms	5000 ms
Request	---	---	---	84031 ms	---
Request Closed	---	---	---	89031 ms	5000 ms
GPRS Attach	---	---	Ok	86661 ms	651 ms
Requested	---	---	---	86010 ms	---
Accepted	---	---	---	86661 ms	651 ms
PDP Context Activation	---	---	Ok	88630 ms	1609 ms
Requested	---	---	---	87021 ms	---
Accepted	---	---	---	88630 ms	1609 ms
HTTP Page Request	http://www.google.de	99.9	Ok	97016 ms	2969 ms
Request	http://www.google.de	---	---	94047 ms	---
Request Closed	http://www.google.de	---	Ok	97016 ms	2969 ms
HTTP Object Request	http://www.google.de	100.0	Ok	95406 ms	1328 ms
Request	http://www.google.de	---	---	94078 ms	---
Response Received	http://www.google.de	---	Success - OK	95406 ms	1328 ms
HTTP Object Request	http://www.google.de/logos/ol...	100.0	Ok	96969 ms	1563 ms
Request	http://www.google.de/logos/ol...	---	---	95406 ms	---
Response Received	http://www.google.de/logos/ol...	---	Success - OK	96969 ms	1563 ms
Disconnect Request	---	---	Ok	104813 ms	2453 ms
Request	---	---	---	102360 ms	---
Request Closed	---	---	---	104813 ms	2453 ms

Fig. 4-251 QoS DQA Object View

The entries in the table are self-explanatory. In particular, the table contains detailed timing information about each action. The Data Quality Indicator (DQI) is a measure for the quality of the transmission, calculated in analogy to the success rate; it is in the value range between 0 and 100.

TIP An alternative record of the actions in a particular job including the number of exchanged bytes is displayed in the QoS Progress View; see section QoS DQA Progress View on p. 4.426.

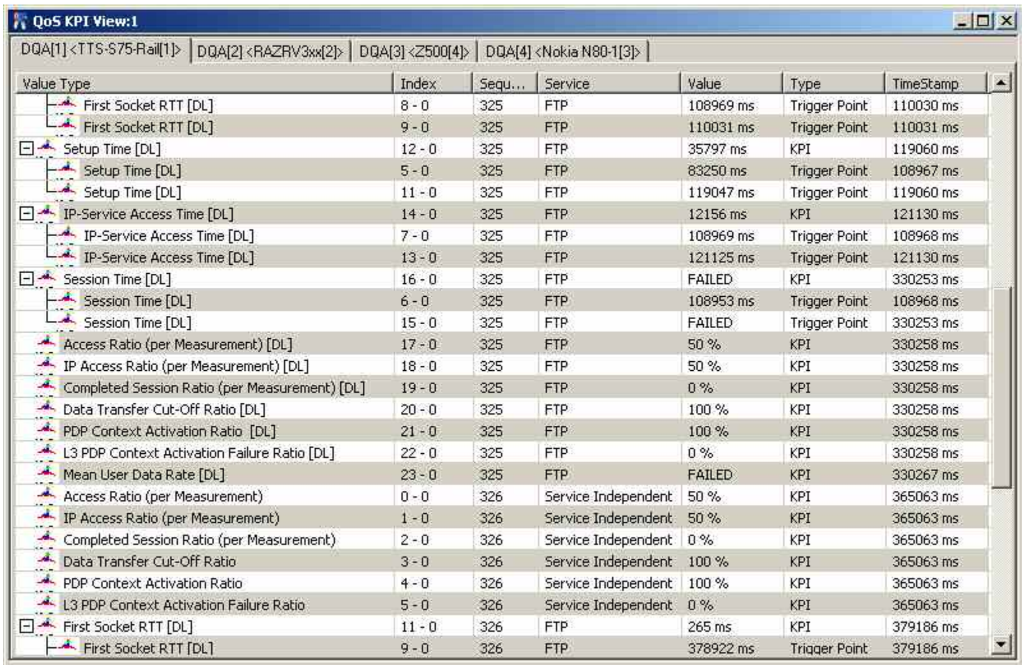
Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default; see *Context menu* description on p. 4.2.

The *QoS DQA Object View* has no configuration menu assigned. The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

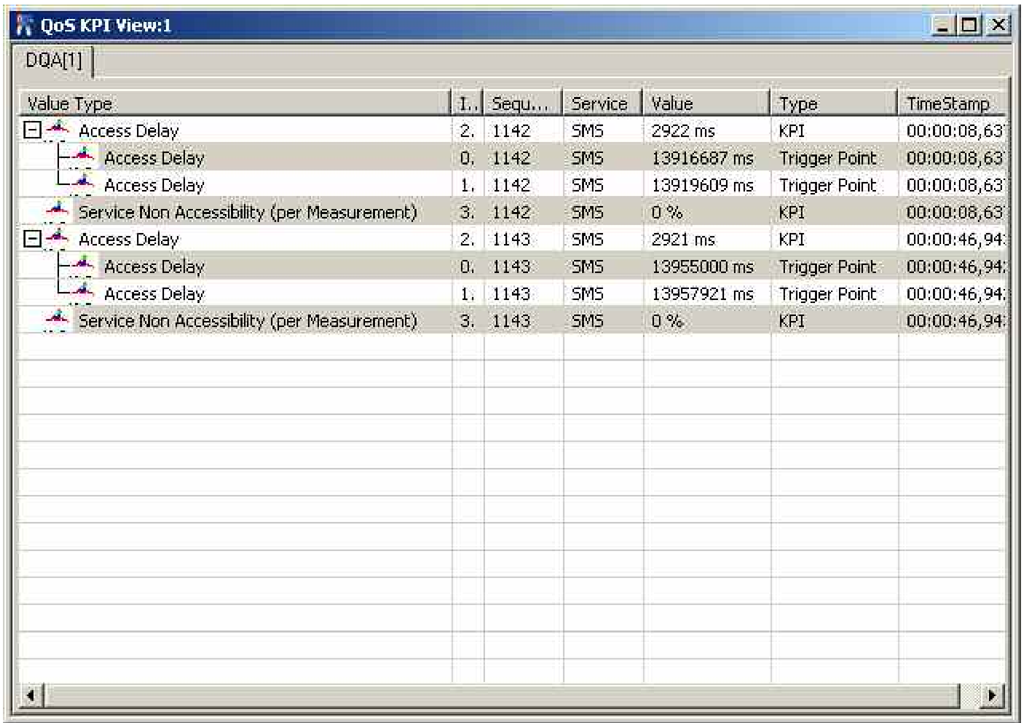
QoS KPI View

The Key Performance Indicators (KPIs) for the DQA jobs FTP (up-/download), HTTP, HTTP Download With IE, VLC Video Streaming and E-mail (up-/ download) and Send SMS are shown in the KPI View.



Value Type	Index	Sequ...	Service	Value	Type	TimeStamp
First Socket RTT [DL]	8 - 0	325	FTP	108969 ms	Trigger Point	110030 ms
First Socket RTT [DL]	9 - 0	325	FTP	110031 ms	Trigger Point	110031 ms
Setup Time [DL]	12 - 0	325	FTP	35797 ms	KPI	119060 ms
Setup Time [DL]	5 - 0	325	FTP	83250 ms	Trigger Point	108967 ms
Setup Time [DL]	11 - 0	325	FTP	119047 ms	Trigger Point	119060 ms
IP-Service Access Time [DL]	14 - 0	325	FTP	12156 ms	KPI	121130 ms
IP-Service Access Time [DL]	7 - 0	325	FTP	108969 ms	Trigger Point	108968 ms
IP-Service Access Time [DL]	13 - 0	325	FTP	121125 ms	Trigger Point	121130 ms
Session Time [DL]	16 - 0	325	FTP	FAILED	KPI	330253 ms
Session Time [DL]	6 - 0	325	FTP	108953 ms	Trigger Point	108968 ms
Session Time [DL]	15 - 0	325	FTP	FAILED	Trigger Point	330253 ms
Access Ratio (per Measurement) [DL]	17 - 0	325	FTP	50 %	KPI	330258 ms
IP Access Ratio (per Measurement) [DL]	18 - 0	325	FTP	50 %	KPI	330258 ms
Completed Session Ratio (per Measurement) [DL]	19 - 0	325	FTP	0 %	KPI	330258 ms
Data Transfer Cut-Off Ratio [DL]	20 - 0	325	FTP	100 %	KPI	330258 ms
PDP Context Activation Ratio [DL]	21 - 0	325	FTP	100 %	KPI	330258 ms
L3 PDP Context Activation Failure Ratio [DL]	22 - 0	325	FTP	0 %	KPI	330258 ms
Mean User Data Rate [DL]	23 - 0	325	FTP	FAILED	KPI	330267 ms
Access Ratio (per Measurement)	0 - 0	326	Service Independent	50 %	KPI	365063 ms
IP Access Ratio (per Measurement)	1 - 0	326	Service Independent	50 %	KPI	365063 ms
Completed Session Ratio (per Measurement)	2 - 0	326	Service Independent	0 %	KPI	365063 ms
Data Transfer Cut-Off Ratio	3 - 0	326	Service Independent	100 %	KPI	365063 ms
PDP Context Activation Ratio	4 - 0	326	Service Independent	100 %	KPI	365063 ms
L3 PDP Context Activation Failure Ratio	5 - 0	326	Service Independent	0 %	KPI	365063 ms
First Socket RTT [DL]	11 - 0	326	FTP	265 ms	KPI	379186 ms
First Socket RTT [DL]	9 - 0	326	FTP	378922 ms	Trigger Point	379186 ms

Fig. 4-252 QoS KPI View: FTP Job



Value Type	I..	Sequ...	Service	Value	Type	TimeStamp
Access Delay	2.	1142	SMS	2922 ms	KPI	00:00:08,63
Access Delay	0.	1142	SMS	13916687 ms	Trigger Point	00:00:08,63
Access Delay	1.	1142	SMS	13919609 ms	Trigger Point	00:00:08,63
Service Non Accessibility (per Measurement)	3.	1142	SMS	0 %	KPI	00:00:08,63
Access Delay	2.	1143	SMS	2921 ms	KPI	00:00:46,94
Access Delay	0.	1143	SMS	13955000 ms	Trigger Point	00:00:46,94
Access Delay	1.	1143	SMS	13957921 ms	Trigger Point	00:00:46,94
Service Non Accessibility (per Measurement)	3.	1143	SMS	0 %	KPI	00:00:46,94

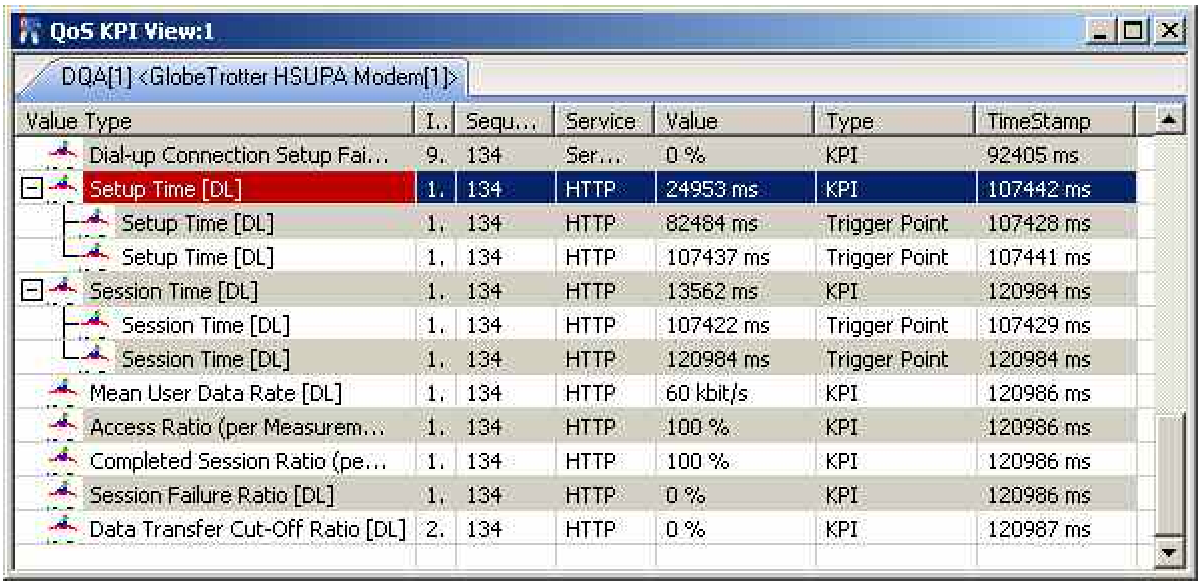


Fig. 4-253 QoS KPI View: ETSI HTTP KPIs

View contents

The displayed values depend on the job that is being executed but are all self-explanatory. The figure above shows the messages generated during a *Connect to Network* job with the download of an image file. Following short keys can be used:

Ctrl+F	Opens the Find Dialog.
F3	Continues a previous search, searching from *top to bottom* for the next occurrence of the search string.
Shift+F3	Continues a previous search, searching from *bottom to top* for the next occurrence of the search string

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, put the view on hold, copy the current view to the clipboard, or to create or delete views, save the current configuration as default; see *Context menu* description on p. 4.2.

The *Info* tab can be accessed via the *Tools - Modules Configuration...* command.

QoS KPI View Configuration

The *KPI View* configuration menu customizes the table contents in the *QoS KPI View.* It is opened via a right mouse click on a point inside the *QoS KPI View* or via the *Tools - Modules Configuration...* command (see chapter 3).

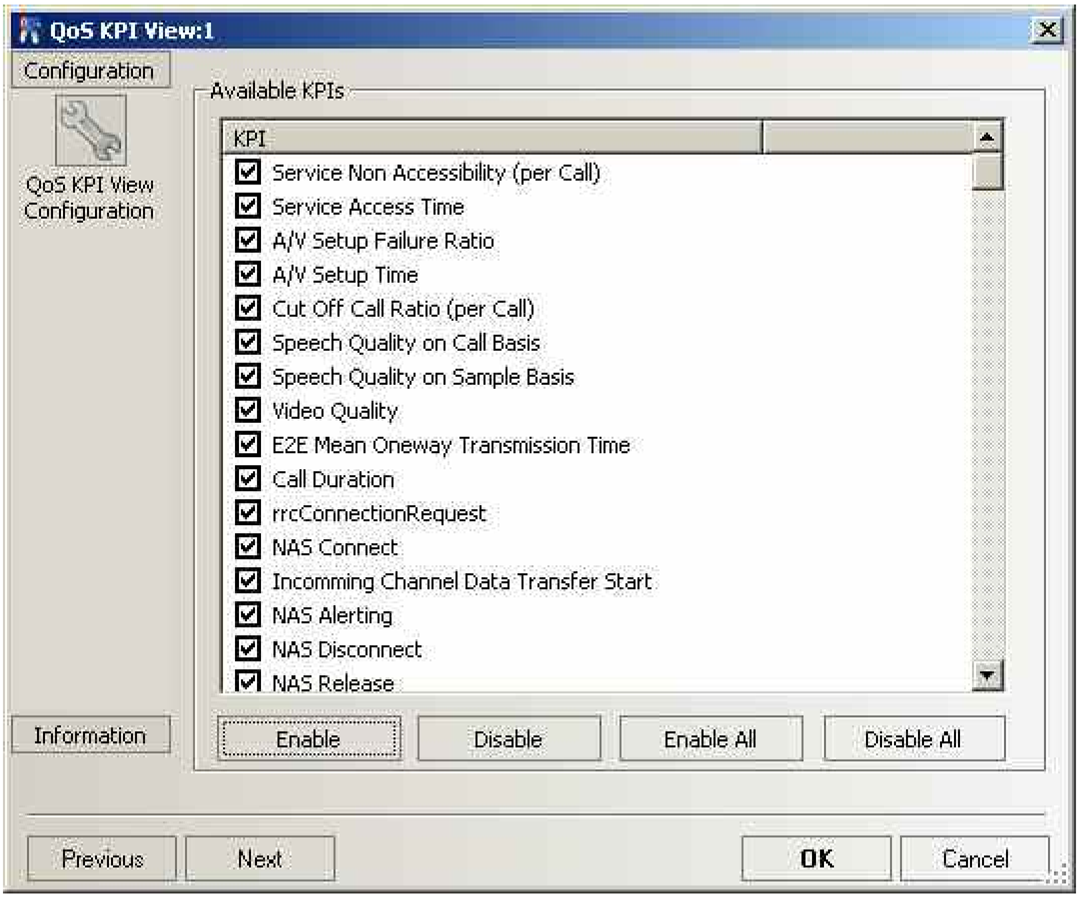


Fig. 4-254 QoS KPI View configuration: Available KPIs

Available KPIs The *Available KPIs* panel defines which indicators are displayed in the table of the *QoS KPI View* (see figure above). Clearing a box hides the corresponding row in the diagram.

The available KPIs are also included in the signal tree, which can be accessed via *Configure Signals...* in the context menu of the KPI view.

The following example shows the available KPIs displayed in the *Statistic View* (see p. 4.38)

First, select the KPIs in the *Values* panel of the Statistic View configuration:

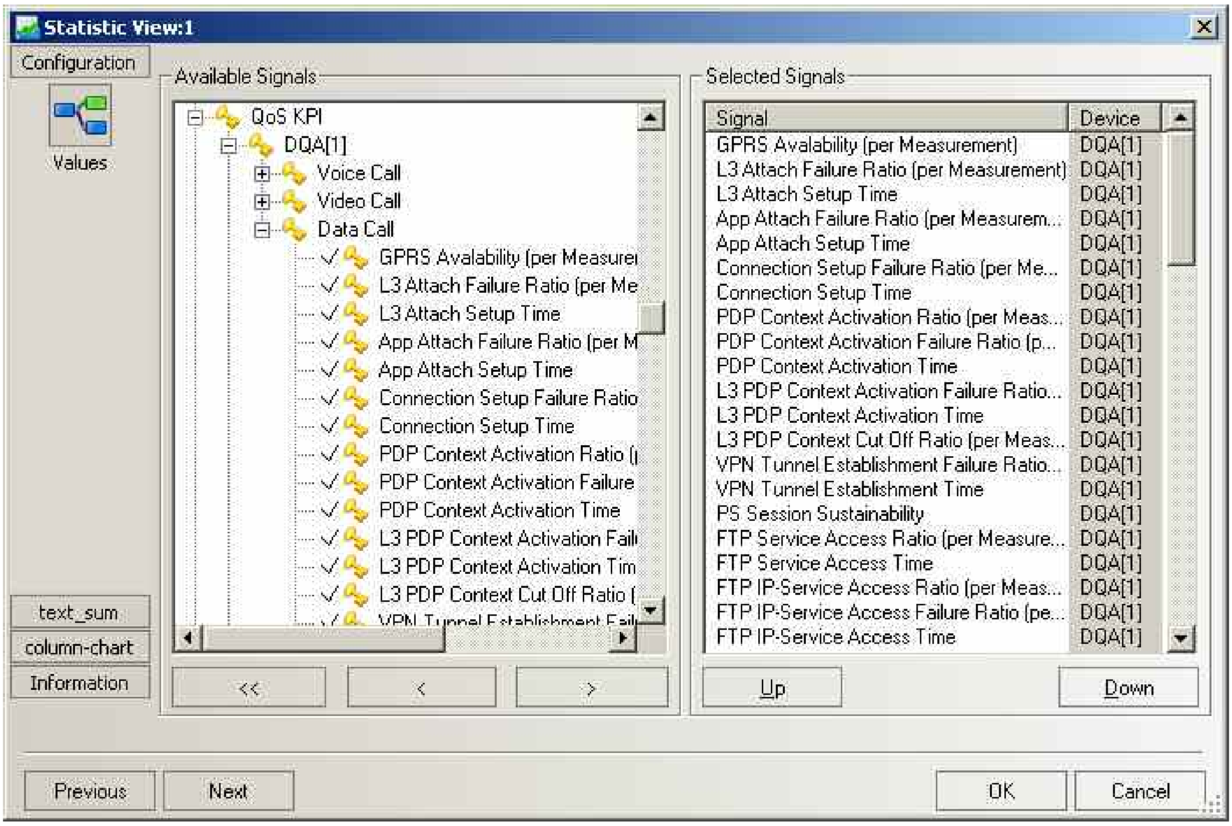


Fig. 4-255 Statistic View configuration: Available DQA KPIs

The QoS DQA KPIs are then displayed for the selected measurement file in the Statistic View:

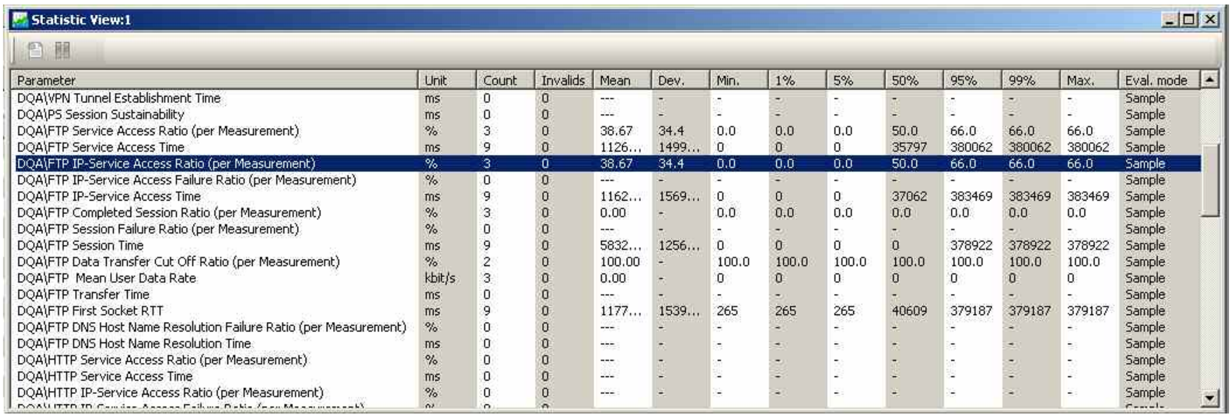


Fig. 4-256 Statistic View: Available DQA KPIs

The signal names displayed in the *Parameters* column above can be modified in the XML file CMSTecQoS.XML, which can be ordered from Rohde & Schwarz.

GSM NWS Views

The *GSM NWS Views* shows the GSM information obtained in the GSM network scans performed by an R&S TSMx radio network analyzer (e.g. R&S TSML-G, or R&S TSMU with option TSMU-K13/ROMES3T13, or R&S TSMQ). The GSM Network Scanner driver is described in chapter 6.

The *GSM NWS Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse hovers over *GSM NWS Views*.

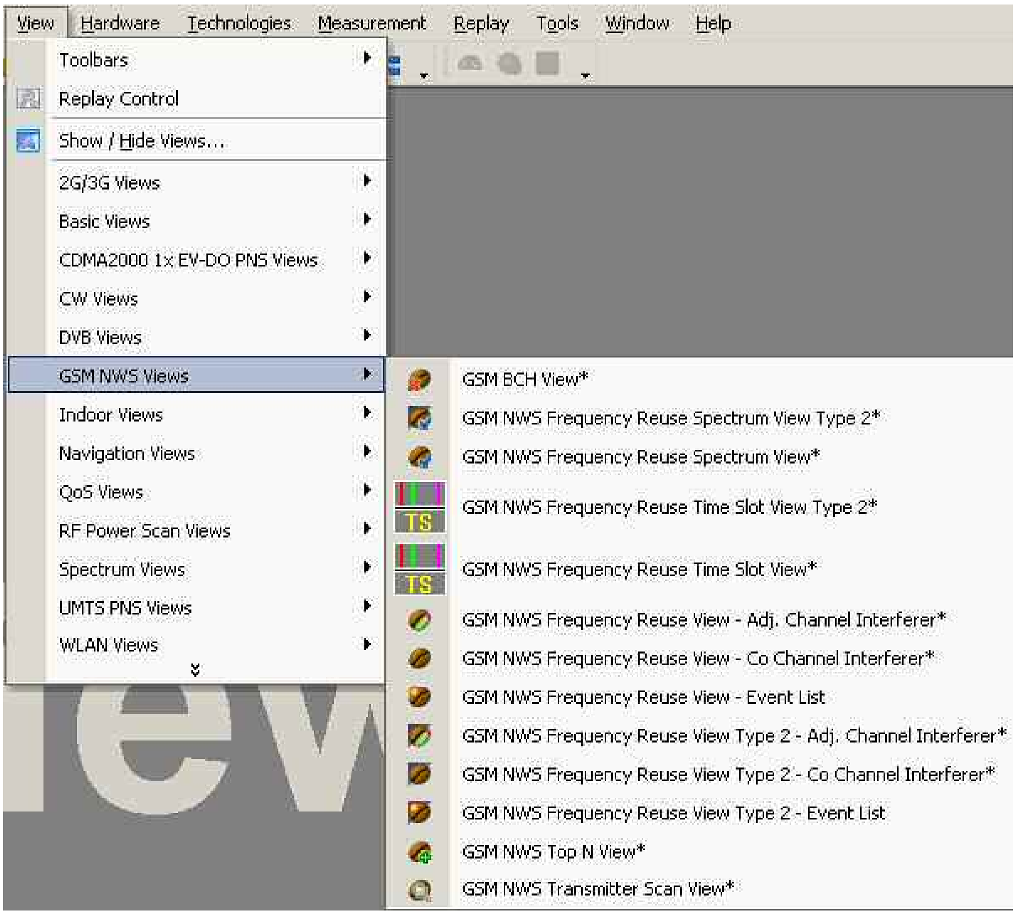
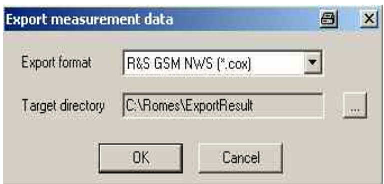


Fig. 4-257 GSM NWS views

NOTE

The GSM network scan data can be exported to a C0 scan export file; see description in chapter 7. To export the data, use the *File – Export CMD File(s)…* command and select the appropriate file format:

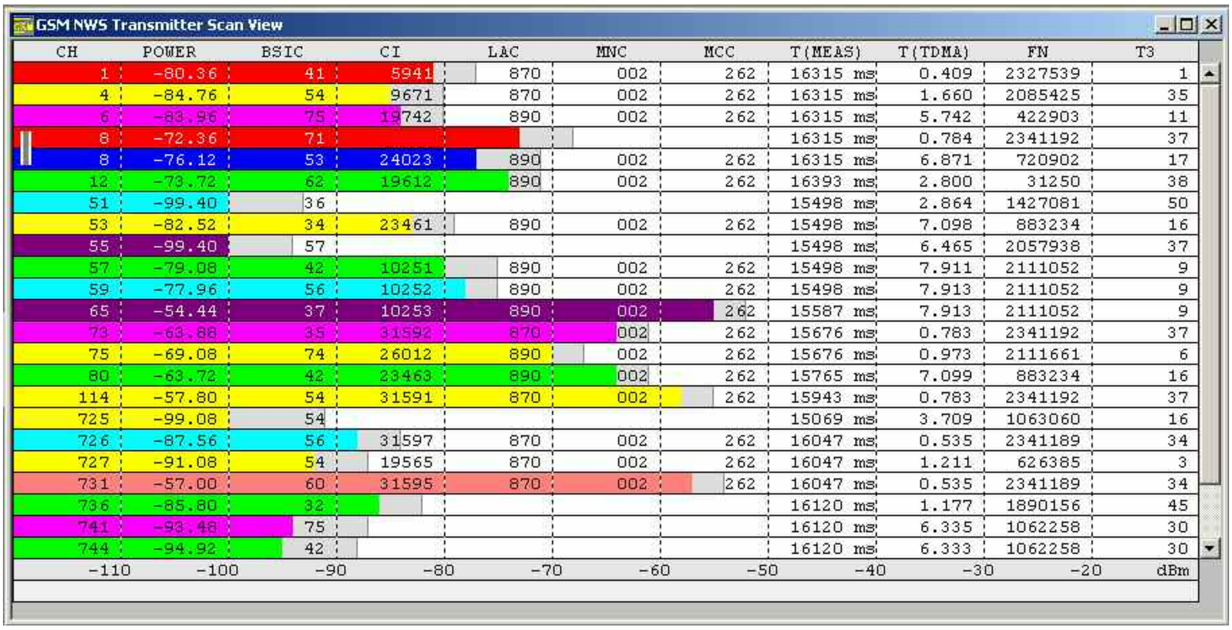


Note that a *GSM BTS List Database* must be loaded in order to export scan data. The database does not have to contain any BTS entries, it is recommended to load an empty database. For this export to a C0 scan export file it is also recommended to open an instance of the Message View, which contains useful information in case of problems.

GSM NWS Transmitter Scan View

The *GSM NWS Transmitter Scan View* displays the demodulated data acquired by the R&S TSMx radio network analyzer during the GSM Network Scan. The data also contains information transmitted on the Synchronization Channel (BSIC and TDMA frame number) and the *System Information Type 3* of the BCCH.

The measured and detected sectors in the air are displayed, sorted and updated in different rows:



CH	POWER	BSIC	CI	LAC	MNC	MCC	T(MEAS)	T(TDMA)	FN	T3
1	-80.36	41	5941	870	002	262	16315 ms	0.409	2327539	1
4	-84.76	54	9671	870	002	262	16315 ms	1.660	2085425	35
6	-83.96	75	19742	890	002	262	16315 ms	5.742	422903	11
8	-72.36	71					16315 ms	0.784	2341192	37
8	-76.12	53	24023	890	002	262	16315 ms	6.871	720902	17
12	-73.72	62	19612	890	002	262	16393 ms	2.800	31250	38
51	-99.40	36					15498 ms	2.864	1427081	50
53	-82.52	34	23461	890	002	262	15498 ms	7.098	883234	16
55	-99.40	57					15498 ms	6.465	2057938	37
57	-79.08	42	10251	890	002	262	15498 ms	7.911	2111052	9
59	-77.96	56	10252	890	002	262	15498 ms	7.913	2111052	9
65	-54.44	37	10253	890	002	262	15587 ms	7.913	2111052	9
73	-63.88	35	31592	870	002	262	15676 ms	0.783	2341192	37
75	-69.08	74	26012	890	002	262	15676 ms	0.973	2111661	6
80	-63.72	42	23463	890	002	262	15765 ms	7.099	883234	16
114	-57.80	54	31591	870	002	262	15943 ms	0.783	2341192	37
725	-99.08	54					15069 ms	3.709	1063060	16
726	-87.56	56	31597	870	002	262	16047 ms	0.535	2341189	34
727	-91.08	54	19565	870	002	262	16047 ms	1.211	626385	3
731	-57.00	60	31595	870	002	262	16047 ms	0.535	2341189	34
736	-85.80	32					16120 ms	1.177	1890156	45
741	-93.48	75					16120 ms	6.335	1062258	30
744	-94.92	42					16120 ms	6.333	1062258	30

Fig. 4-258 GSM NWS Transmitter Scan View

Each table row corresponds to a GSM downlink signal received from one BTS. It is underlined with a gray or colored bar, where the color denotes the measured BCC (the second digit of the octal BSIC), where the color denotes the measured BCC of the signal in this channel. If no color code could be measured an empty bar is drawn. Gray bars and brackets in the table row characterize how complete or how recent the displayed results are; refer to the description of the *Info Levels below*. The length of this bar corresponds to the received SCH power, according to the dBm scale displayed across the bottom of the view.

The new quality indicator (QI) is shown as grey tip of the power bars. It gives an indication of the interference which was calculated during the SCH power measurement. The smaller the grey bar, the better the power measurement quality.

The QI measurement consists of code domain power and total power measurement. They are performed either on an extended Training Sequence of the SCH or the whole SCH slot.

The calculation for QI is total power of the SCH timeslot divided by the code domain power in the strongest path of the channel impulse response, which is, under ideal conditions, almost (I+C)/C:

$$QualityIndicator = \frac{P_{total}}{P_{Code}} \approx \frac{I+C}{C}$$

P_{total} = *Total Power of SCH timeslot*

P_{Code} = *Code domain power in the strongest path of the channel impulse response*

I = *Interference*

C = *Carrier Power*

Quality Indicator is very useful to estimate the signal quality, but we come not close enough to declare this as a C/I measurement because of following reasons:

- *Fading within a burst*
- *Reflexions*
- *Slight BTS dependency in case of filled up Guard Period or power ramping between the time slots of the C0 carrier.*
- *TSMx receiver characteristics*

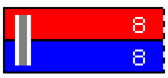
The QI is also available as a separate parameter in the *GSM NWS Top N View* or as a general exportable signal parameter (GSM NWS - TopN Pool - TopN Element - BTS Dist. - QI) which can be displayed in the basic views such as e.g. the *Alphanumeric View*.

The power bars in the GSM NWS Transmitter Scan *view indicate the power on the Synchronization Channel (SCH). This power generally differs from the GSM downlink signal power obtained in a CW measurement.*

Several BTSs can be measured on the same channel, provided that their signal power does not differ by more than a few dB so that the R&S TSMx can still decode the data. Signals with the same channel number but different BSIC are marked with a vertical gray bar (e.g. the two signals with channel no. 8 in the figure above)

The columns contain the following information:

CH The number of the measured channel. If two or more consecutive lines are measurements on the same channel, they are marked with a vertical bar:



POWER The SCH power of the signals is displayed in the second column, with a dynamic range from –120 dBm to 0 dBm.

BSIC BSIC in octal representation. The first digit denotes the NCC, the second the BCC.

CI Cell Identity.

LAC Location Area Code (decimal).

MNC Mobile Network Code (decimal).

MCC Mobile Country Code (decimal).

The four preceding elements uniquely identify a BTS worldwide. So this set of information is especially useful in border regions where two network operators may share the same frequency range, to identify a BTS of a network when there is no base station list available.

T(MEAS) Time (hh:mm:ss) indicating the last measurement update of the displayed line. The time is counted from the start of the measurement. Although *T(MEAS)* is displayed in seconds it is internally stored in µs. This is important when *T(MEAS)* is used for sorting, see *Sort Sequence* on page 4.447.

T(TDMA) Time offset of the correlated burst. This time is given by *T(MEAS)* modulo one TDMA frame. The unit is the length of one time slot, so the range is 0 ≤ T(TDMA) < 8.

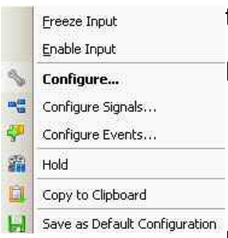
FN TDMA frame number of the correlated burst in the range 0 to FN_MAX where FN_MAX = (26 x 51 x 2048) -1 = 2715647 (one hyperframe length) as specified in GSM 05.02. The FN is obtained from the measured Synchronization Channel (SCH). The *FN* column shows the FN at T(TDMA) which is calculated from the FN at the SCH time T(SCH) and the time offset between T(SCH) and T(TDMA); see figure below.

T3 Frame number FN modulo 51 (one multiframe length).

Notes:

In case those two sectors are synchronized, both values T3 and T(TDMA), are identical up to a measurement error. Synchronization can be checked this way. For the interference analysis identical values of T3 and T(TDMA) imply that the signals in the interference diagram are on identical positions and cannot be distinguished.

Context menu A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, or move to another worksheet; see context menu description at the beginning of chapter 4. The context menu contains the following additional commands:



Freeze Input

Additional input from the measurement or replay is not displayed. Meanwhile, the data is still stored during measurement. Sorting of the data and changes in the parameter settings are possible during input freezing.

Enable Input

Terminates the input freezing.

Frame Timing

The values *T(MEAS), T(TDMA)* and *FN* are visualized in the following figure:

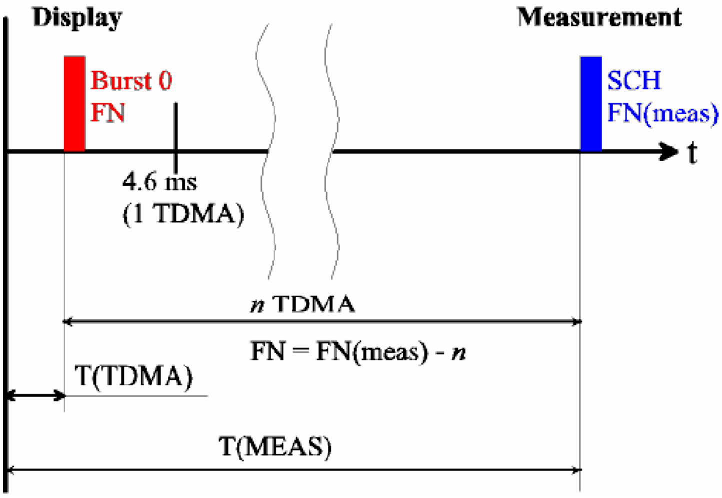


Fig. 4-259 Display of the GSM NWS Transmitter Scan View time measurements

The start of the measurement is shown as a vertical bar on the left side of the diagram. At *T(MEAS)* a SCH is detected and demodulated, giving the information about the BSIC and the TDMA frame number *FN(MEAS)*. *T(MEAS)* is shifted back to the time period of the first TDMA frame after the start of the measurement by subtracting the duration of *n* TDMA frames. This yields the value *T(TDMA)*. In the same way, the demodulated frame number is reduced by *n* (modulo 2715648). So, both values, *T(TDMA)* and *FN* denote the measurement time and frame number of a BTS if it would have been measured within the first TDMA frame period after the start of the measurement assuming no drift of both the BTS and the test receiver and assuming no timing advance due to different measurement locations.

The advantage of this definition of frame numbers and measurement times is that the values for one BTS are approximately constant with only small changes produced by:

- Drift of the BTS
- Drift of the test receiver
- Time shift on different measurement locations due to the finite speed of light
- Different offset times when repeater signals are received
- Additional time delay produced by reflections

Info Levels

The Transmitter Scan distinguishes three different info levels, depending on the amount of information that could be extracted from the received signal. At level 3 the most complete information is available.

Info level 1 A C0 channel of a BTS could be identified by correlating the FCCH and the extended training sequence of a SCH burst. As a result, the C0 channel number, the measured power of the BCCH signal and the frame synchronization time are known.

Info level 2 This info level is reached when the SCH could be reliably demodulated. The validity of the demodulated data is checked with the 10 parity bits available, so the probability that an error is not detected is about 1/1000. However, as the values have restricted ranges, this probability can be improved to an estimated 1/3000.

Because this probability is still too high, the data is only considered to be reliable if there are at least two independent SCH demodulations of one BTS reducing the error rate to a negligible value. The probability that an error is not detected is reduced to less than the factor (1/3000)^2, because the comparison of the SCH content of both signals provides an additional constraint.

The additional information obtained at this info level is the BCC, NCC and frame number. As soon as this info level is reached, the bars showing the measured power become colored.

Info level 3 The info level 3 is reached when the system information type 3 on the BCCH channel could be demodulated. The additional information obtained is the Cell Identity (CI), Location Area Code (LAC), Mobile Network Code (MNC) and Mobile Country Code (MCC).

By default, every new measurement result is compared with those already shown in the list. The values of a measurement in the list matching with the new one are updated. If the older measurement had a higher info level, the old values missing in the new measurement are kept in the display, indicated by values in brackets. This behavior can be changed in the configuration menu; see description of *Matching Entries: Action* panel on p. 4.448. The decision algorithm for two measurements belonging to the same BTS is described on p. 4.449.

GSM NWS Transmitter Scan View Configuration

The *GSM NWS Transmitter Scan* configuration menu defines criteria for the Transmitter Scan, sets conditions to decide whether two measurements belong to the same BTS and shows information on the current view version. It can be accessed via right mouse click at a point inside *GSM NWS Transmitter Scan* or via the *Tools - Modules Configuration...* command (see chapter 3).

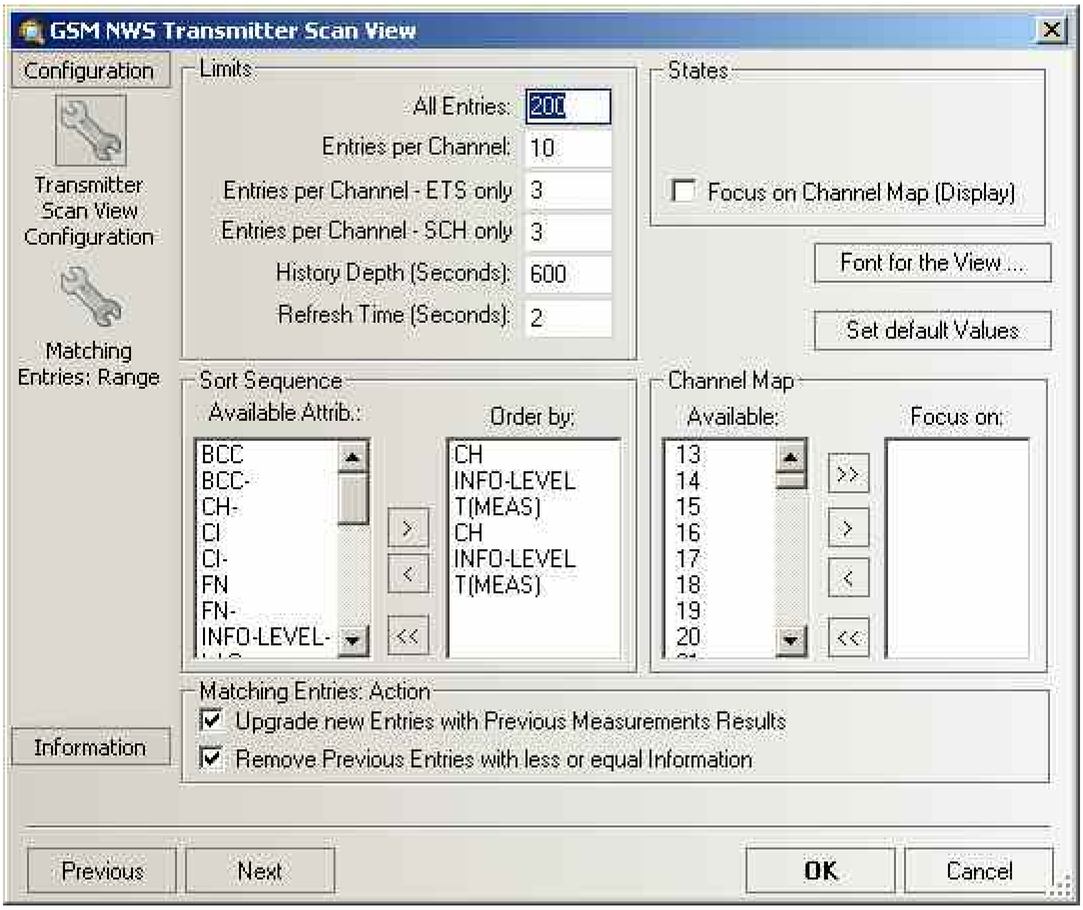


Fig. 4-260 Transmitter Scan View Configuration

This configuration dialog contains the following panels:

Limits Limits the displayed data. The entries denote the following limitations:

- All Entries: The maximum number of signals displayed.
- Entries per Channel: The maximum number of signals displayed for each channel.
- Entries per Channel – ETS only: The maximum number of entries per channel which only have reached info level 1 (ETS: Extended Training Sequence).
- Entries per Channel – SCH only: The maximum number of entries per channel which only have reached info level 2.
- History depth (Minutes): Entries which have not been updated during the given amount of time are discarded from the display.
- Refresh Time (Seconds): The display is refreshed every time the Refresh

Time has passed. Using higher values avoids the flickering of the diagram.

When the number of measurement data exceeds the above limitations, the oldest entries are discarded in the view.

Sort Sequence

Specifies the criteria how the lines in the display are sorted.

Available Attrib.

List of available criteria (attributes). Any attribute can be selected to be appended to the end of Order by: *list; see description of buttons below.*

Order by

Specifies how the lines are sorted. In the example of above the list is sorted according to channel numbers, all lines with the same channel number are sorted according to their info level, and so on. Sorting is always in ascending order.

The buttons between the two lists move a selected entry from one list to the other:

`>>`	Removes the elements from the *Order by:* list and loads the default values.
`>`	A selected element in the Available Attributes list is moved to the end of the *Order by:* list. Alternatively, the element can be double clicked.
`<`	A selected element in the *Order by:* list is moved to the *Available Attrib*. list. Alternatively, the element can be double clicked.
`<<`	Empties the *Order by:* list.

Note:

The measurement time T(MEAS) *is stored internally in microseconds, although it is displayed in seconds. So it is recommended to use* T(MEAS) *only as a last sorting criterion in the* Order by: *list.*

States

The *States* panel can be used to restrict the measurement (and display) range. Note that these restrictions can be changed even during a running measurement.

Focus on Channel Map (Display)

Restricts the displayed channels to those on which the focus is set in the Channel Map *panel (see below).*

Channel Map

The *Channel Map* is used to select the channels on which a focus can be set in the *States* panel (see above). It consists are two lists: The list with the available channels, and a list of channels specifying the focus when a corresponding item in the *States* field is selected.

The buttons between the two lists move a selected entry from one list to the other; see *Sort Sequence* above.

Matching Entries: Action

The *Matching Entries: Action* panel determines how a new entry to the *GSM NWS Transmitter Scan* view is displayed if it matches with one that was recorded before.

Upgrade new Entries with Previous Measurement Results

If this box is checked the entries in the old measurement are updated even if the new measurement has reached a lower info level. The missing entries in the new measurement result are taken over from the old entry and displayed in brackets. If the box is not checked, a new measurement with a lower info level is displayed in a separate line.

Remove Previous Entries with less or equal Information

A new measurement only updates the old one if this item is selected, otherwise it is displayed in a separate line. Deselecting this item allows e.g. to investigate the drift behavior of a BTS.

Matching Entries: Range

For the decision whether two measurement results originate from the same BTS the following criteria apply:

- The decoded information available in both signals (info level 2 or 3) must correspond.
- The offset times of both bursts must match to some measurement error.

The *Matching Entries: Range* tab sets the criteria for the allowed measurement error in order to decide whether criterion 2 is fulfilled. In case of doubt it is recommended to keep the default values.

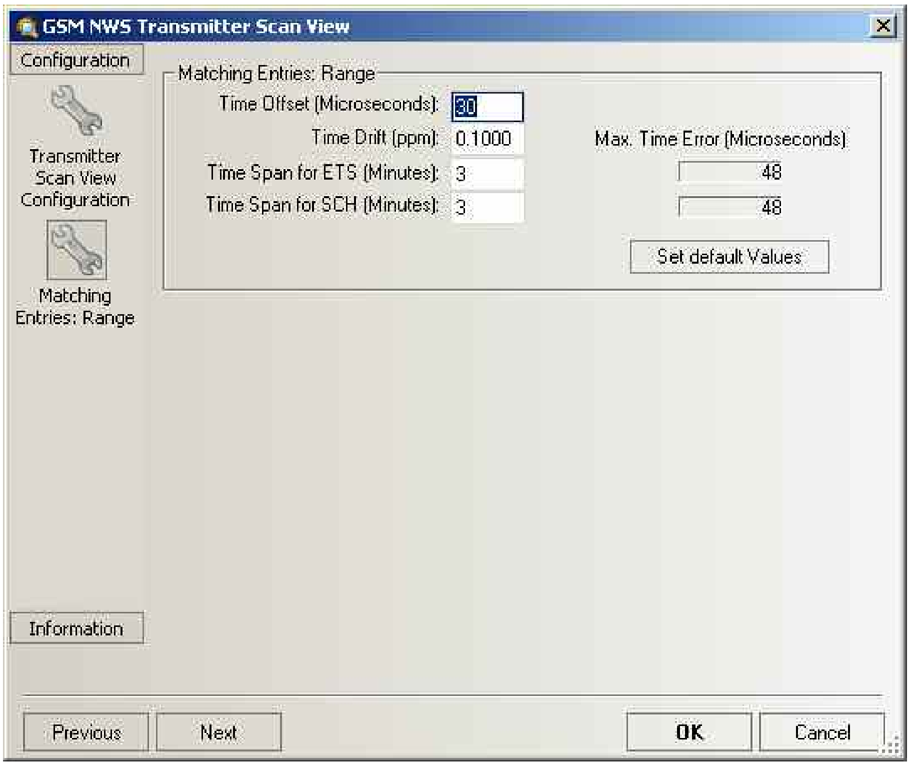


Fig. 4-261 GSM NWS Scan View Configuration: Matching Entries: Range

The matching entries are illustrated in the following figure:

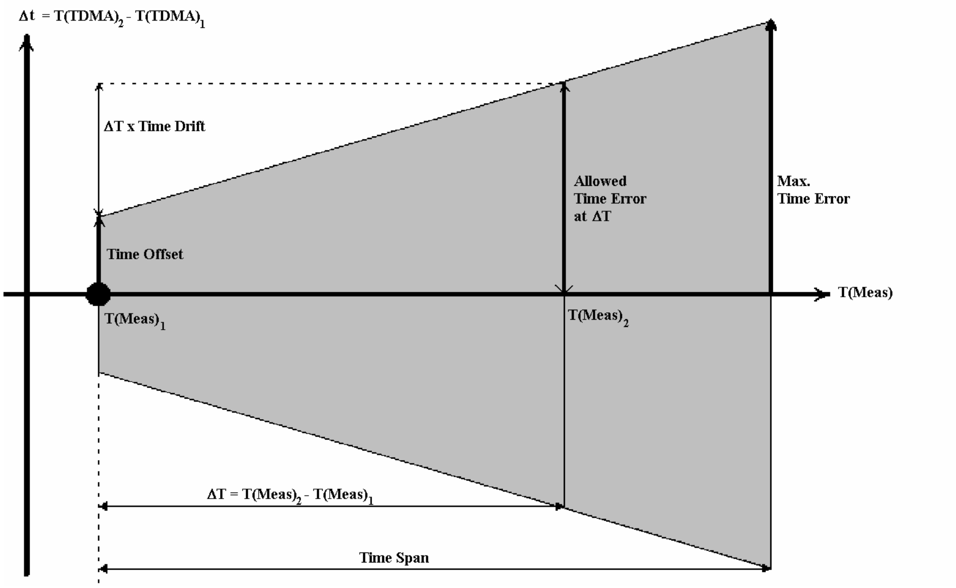


Fig. 4-262 Matching Entries: Range Parameter Explanation

The decision whether two detected signals originate from the same BTS is based on a comparison of the measurement times T(Meas) for both signals and of their measured time offsets T(TDMA). The figure above shows the matching entries in the T(Meas)-T(TDMA)-plane: If the large dot at $T(Meas)_1$ corresponds to the measurement result for signal 1 and the result for signal 2 is within the shaded area, then the two signals are considered to originate from the same BTS. If both signals contain at least info level 2, then the TDMA frame number is compared in addition, which extremely enhances the accuracy.

Matching Area The shaded matching area is bordered by the measurement time of the first signal detected $T(Meas)_1$, the measurement time $T(Meas)_1$ plus the *Time Span,* and the straight lines parameterized by the equations

$$\Delta t = \pm (<\textit{Time Offset}> + <\textit{Time Drift}> \times [T(Meas) - T(Meas)_1]) \text{ . (Equation 1)}$$

The *Time Offset, Time Drift,* and *Time Span* can be entered in the input fields in the *Matching Entries: Range* tab. They provide estimates for possible errors from different sources that might cause the measured time offsets T(TDMA) for two signals from the same BTS to be different.

Time Offset Difference of the measured time offsets T(TDMA) for two signals due to measurement inaccuracies, e.g. caused by reflections.

Time Drift Drift of T(TDMA) in time, caused by the BTS, the receiver, or a time delay due to a location update.

Time Span for... Maximum difference of the measurement time beyond which two signals are generally considered to be different. The *Time Span* can be set independently for the case that at least one signal has only reached info level 1 (*Time Span for ETS)* and for the case that both signals have reached at least info level 2 (*Time Span for SCH)*. In the latter case, higher values for the *Time Span* are reasonable, because the inclusion of the TDMA frame number minimizes the accidental time offset coincidences considerably.

Max. Time Error Maximum time error allowed calculated according to Equation 1 above, where T(Meas) = Time Span; for information only.

GSM NWS Frequency Reuse Views

Interference in Mobile Networks is either caused by co-channel or adjacent channel, broadcast control channel or traffic channel Interference, or other sources like spurious emissions and intermodulation.

The *GSM NWS Frequency Reuse View* is an analysis tool for the interference situations detected with a GSM test mobile and with an R&S TSMx radio network analyzer (GSM network scanner).

The scanner continuously measures the bands and delivers the base data for the interference process when a potential interference situation has been reported from the mobile. This can be either specific RxLev/RxQual combinations or exceed C/I thresholds on C0 and Cx of the serving cell.

When this is the case, the interference analysis process accesses the scanner data and combines it with the Test Mobile data and the Base Station database, so that an immediate picture on the interference situation on co-channel and adjacent channels is given. This way interference on C0/C0, C0/Cx, Cx/C0 and Cx/Cx can be detected, the source of interference analyzed and possibly eliminated.

The GSM network scanner-based interference analysis with option R&S ROMES3T13 is different from the interference analysis described for R&S ROMES V3.60. Details and an example for the interference analysis are available in the R&S newsletter ***No. 190 - 2006/II****.*

The *GSM NWS Frequency Reuse View* lists all events during interference analysis, which include time-stamp, details of the interference event, description of the serving cell, channel / frequency hopping, C/I value from the test mobile (if available), and the test mobile triggering the interference analysis.

R&S ROMES provides six different versions of the *GSM NWS Frequency Reuse View*, named *Co Channel Interferer, Co Channel Interferer Type 2, Adj. Channel Interferer, Adj. Channel Interferer Type 2, Event List, Event List Type 2, Time Slot and Time SlotType 2.*

GSM NWS Frequency Reuse View – Co Channel Interferer

The *GSM NWS Frequency Reuse View – Co Channel Interferer* provides detailed information about the serving cell, the potential co-channel interferers, and the characteristics of the interference situations encountered during the measurement tour.

A co-channel interferer is a neighbor cell that has a C0 channel (BCCH, SCH…) or a Cx channel (TCH) in common with one of the channels of the serving cell. To analyze possible adjacent channel interferers use the *GSM NWS Frequency Reuse View – Adj. Channel Interferer* described on page 4.460.

The *GSM NWS Frequency Reuse View – Co Channel Interferer* visualizes the results of the Frequency Reuse Analysis for co channel interference which takes as input:

- Measurement results from the GSM Network Scanner
- Measurement results from GSM test mobiles in dedicated mode
- Configuration information from the GSM BTS database

The analysis can be done for several test mobiles in parallel. Each test mobile connects during the drive test to a sequence of serving cells and continuously measures the transmission quality in terms of RxLev and RxQual.

The Sagem test mobiles can additionally provide C/I measurements of individual traffic channels.

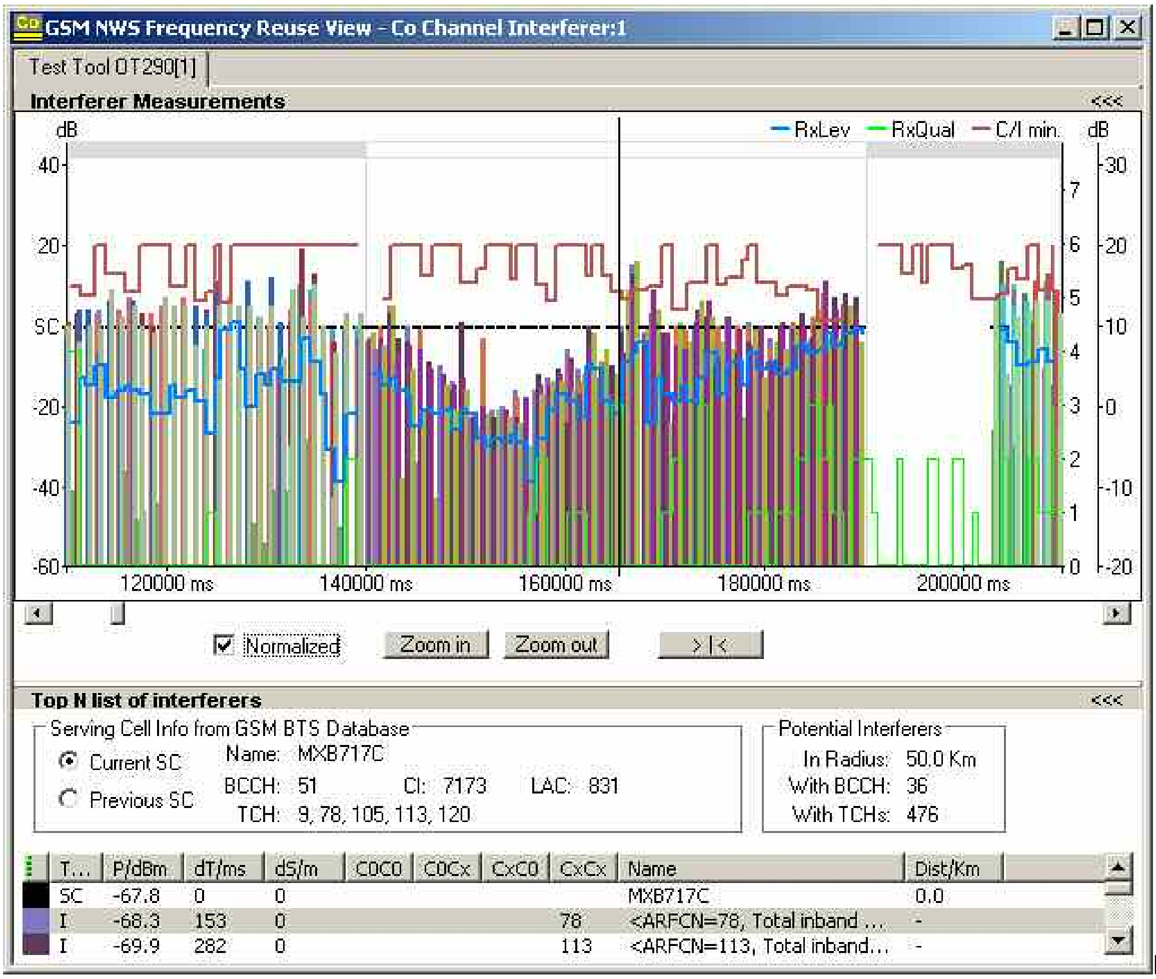


Fig. 4-263 GSM NWS Frequency Reuse View: Co Channel Interferer

View area

The entire view area is horizontally split to accommodate a 2D chart *(Interferer Measurements)* and different tables with detailed information about the current serving cell and interference situation.

A click on the upper *(Interferer Measurements)* or lower title bar compresses and expands the corresponding section in the view area. A compressed section leaves more space for the other section. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Various settings in the configuration menu control the contents and the appearance of the view areas.

2D Chart (Interferer Measurements)

The diagram in the upper view section shows the changes of the interference situation over time. The diagram contains measurement curves with the following mobile data:

The horizontal grey bar at the very top has alternate sections filled with grey or white, which show the handovers between serving cells. This feature adds more overview for the critical handover conditions, especially in combination with the feature *Full history of current and previous SC* described below.

- Carrier-to-Interference ratio *C/I* measured by the mobile in dedicated mode. This value is only measured by Sagem test mobiles. In frequency hopping mode, the minimum C/I value of all channels is displayed.
- *RxLev* and *RxQual* values from the mobile measurement reports, measured in dedicated mode.

In addition, colored bars show the following R&S TSMx network scanner data:

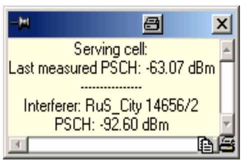
- Measured SCH power of the serving cell in dBm (horizontal, black bars).
- Measured SCH power of the potential interferers in dBm (vertical, colored bars). The colors distinguish between the different interferers; they are also used in the top N list below.

The *Normalized* checkbox displays normalized power values, as shown in the figure *above* . This new option shows normalized power values relative to the measured Serving Cell power, which is indicated by a dotted horizontal line in the graph.

Because the normalization depends on the SC power, no values are shown before the first SC measurement for the serving cell.

This normalization promotes a better overview for signal quality conditions which depend more on relative than on absolute power values.

The *Zoom In* and *Zoom out* buttons shrink or enlarge the chart. If *Scan File* is activated, the "> | <" button restores the original view scale.



Clicking a colored interferer bar opens a window with the SCH power of the serving cell, the name of the interferer, and the exact SCH power result. The view also supports the coupled focus (use *ALT* plus double-click inside the view). A BTS data base is required to obtain these results.

Serving Cell Info

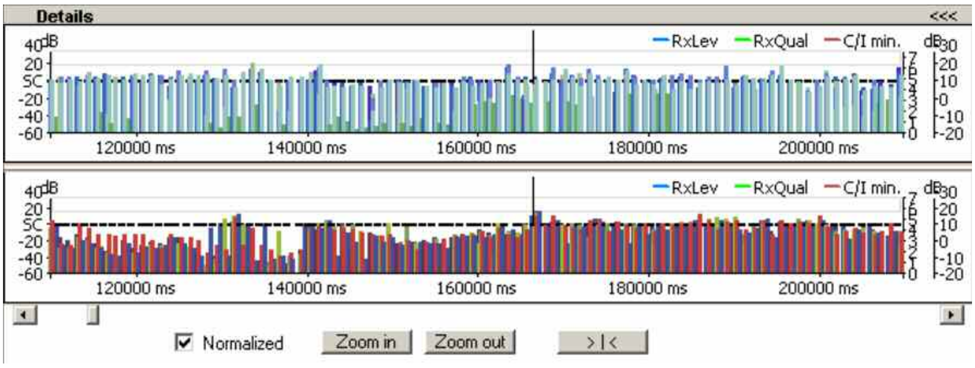
The *Serving Cell Info…* panel shows the parameters of the current or previous serving cell extracted from the GSM BTS database: serving cell name *(Name)*, *BCCH* channel number, *TCH* channel number, cell identity *(CI)*, Location Area Code *(LAC).* The parameters are not available if no BTS data base is provided.

The SC Info is shown for the current or previous service cell depending on the selection with the *Current SC / Previous SC* radio buttons.

Full history of current and previous SC:

This feature is enabled in the view configuration.

Two additional charts below the main chart show the continuous values for the previous and the current serving cell for detailed analysis of the handover conditions:



Potential Interferers

The *Potential Interferers…* panel shows the number of the potential interferers in the vicinity of the serving cell. Potential interferers are extracted from the network data base:

In Radius Maximum distance between the current position and the potential interferer as specified in the *Threshold Values* tab of the configuration menu.

BCCH Number of neighbor base stations using the same BCCH as the serving cell.

TCH Number of neighbor base stations using one or more TCH in common with the serving cell.

The parameters are not available if no BTS data base is provided.

Top N List

The table below the *Serving Cell Info* and the *Potential Interferers* panels shows the parameters of the serving cell and the strongest neighbor cells (Top N pool), sorted according to their SCH power *(P/dBm)*. In contrast to the information above, the values are measured by the test mobile and the R&S TSMx network scanner. The contents of the list, in particular the number of displayed cells, can be configured in *Threshold Values* tab of the configuration menu.

Type Cell type as detected by the test mobile: SC (serving cell) or *I* (interferer)

P/dBm Measured SCH power in dBm. The top N pool for the *GSM NWS Frequency Reuse View* contains the cells with the strongest SCH power.

dT/ms BCCH time offset of the interferers relative to the serving cell, obtained by the network scanner.

dS/m Distance between the measurement position of the SC and the interferer. 0 means that both cells were measured in the same network scan.

C0C0 A channel number (ARFCN) indicates a C0C0 interference: The BCCH numbers of the interferer and the serving cell are equal.

C0Cx A channel number (ARFCN) indicates a possible C0Cx interference: One of the TCH channel numbers of the interferer is equal to the BCCH number of the serving cell.

CxC0 A channel number (ARFCN) indicates a possible CxC0 interference: One of the TCH channel numbers of the serving cell is equal to the BCCH number of the interferer.

CxCx A list of channel numbers (ARFCNs) indicates possible CxCx interferences: One or more of the TCH numbers of the interferer and the serving cell are equal.

Name BTS name and sector number from the BTS data base.

Dist./km Distance between the potential interferer and the serving cell in km, calculated from the BTS data base. 0 km means that the interferer is a different sector of the same BTS.

A click on an interferer highlights the SC and the interferer in the *Route Track* view. A click on a SC highlights this SC.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default, see *Context menu* description on p. 4.2.

Analyze File...

Start again the analysation of the current open measurement file.

GSM NWS Frequency Reuse View – Co Channel Interferer Configuration

The *GSM NWS Frequency Reuse View – Co Channel Interferer* configuration menu selects the contents of the view tables, sets general view options, and defines conditions for the generated alarm messages and the displayed potential interferers. It is opened via a right mouse click on a point inside *GSM NWS Frequency Reuse View – Co Channel Interferer* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Frequency Reuse View Configuration* tab selects the contents of the view tables and sets general view options

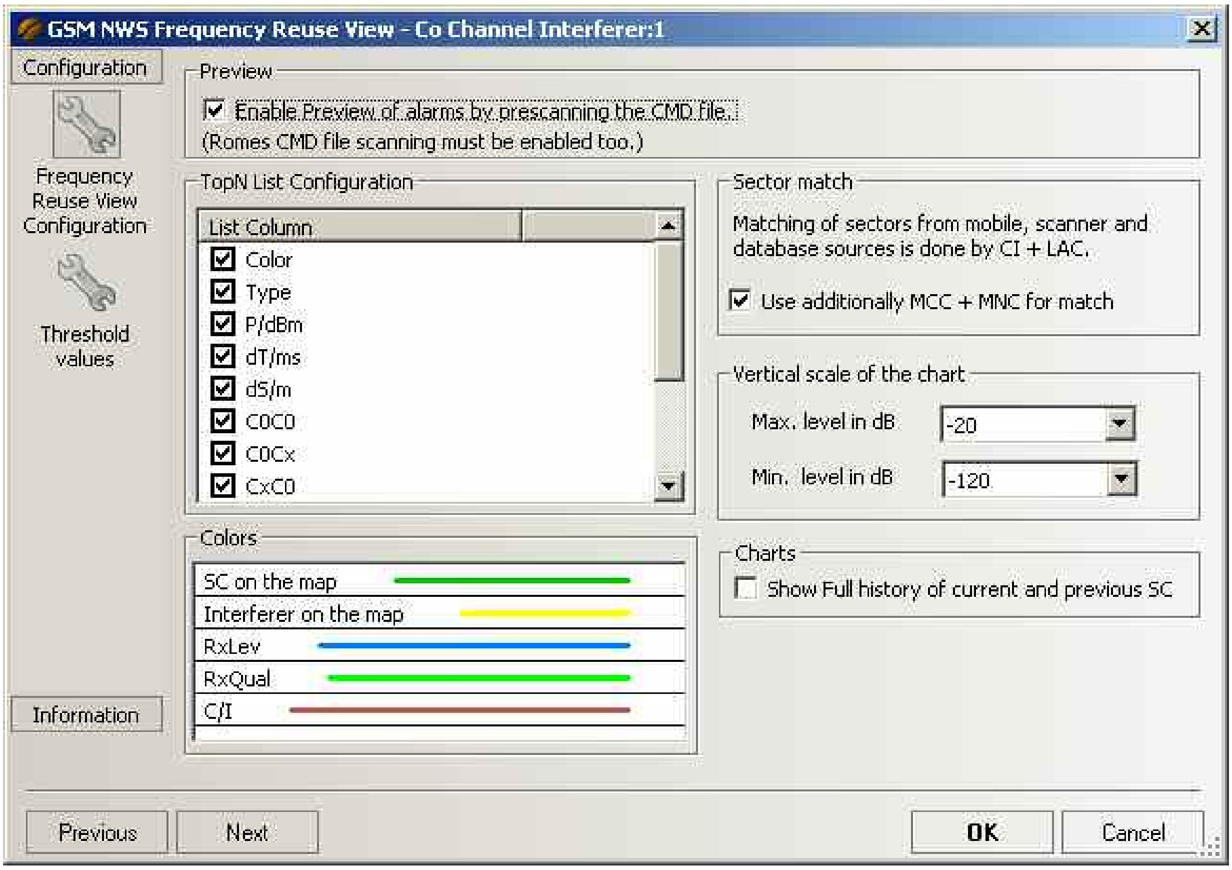


Fig. 4-264 GSM NWS Frequency Reuse View: Configuration

Preview

Enables a prescan of the CMD file at the beginning of the replay session in order to display all alarm messages in the *GSM NWS Frequency Reuse View – Event List*. As a precondition, *Enable CMD File Scanning* must be enabled in the *General* tab of the *Preferences* menu *(Tools – Preferences)*.

An alarm is created if the conditions specified in the *Threshold Values* tab are met. The coupled focus can be used to place the marker line in the diagram to the time of the alarm and study the top N table for a detailed analysis of the interferer situation.

Top N list configuration

All results selected as *List Columns* are displayed in the top N list in the lower section of the view. Cleared results are omitted.

Restricting the viewed results makes it easier to read the tables if only a subset of the available parameters is needed; it also saves system resources required for post-processing of measured data. To restrict the number of parameters measured and enhance the system performance during the measurement, use the settings in the driver configuration menus (see chapter 6).

Colors

Selects the color scheme for the displayed elements in the *Interferer Measurements* chart.

Sector match

Defines the way R&S ROMES assigns a measured signal to a BTS sector in the GSM BTS database:

- If the MCC and MNC are not considered, the assignment is based on a matching Cell Identity (CI) and Location Area Code (LAC). This may result in ambiguities because providers assign the same CIs in different countries and networks.
- If the MCC and MNC are considered in addition, the assignment is unambiguous; however, the BTS database must contain the MCC and MNC information.

Vertical scale of the chart

The Max./Min. entry fields set the y-axis scale of the Interferer Measurement chart.

Charts

If the *Full history of current and previous SC* checkbox is activated, two additional *Detail* charts below the main chart are shown. They display the continuous values for the previous and the current serving cell for detailed analysis of the handover conditions:

The *Threshold Values* tab sets conditions for the generated alarm messages and the displayed potential interferers.

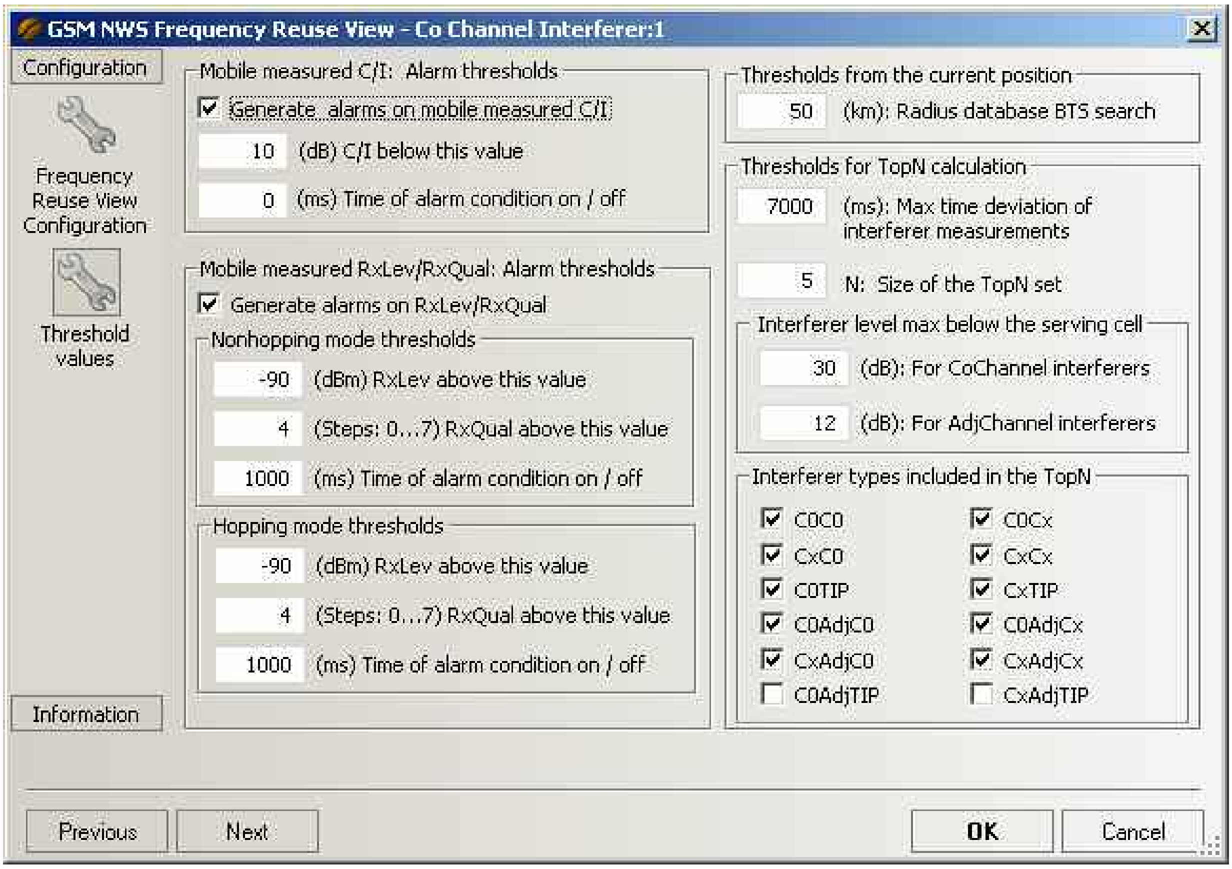


Fig. 4-265 GSM NWS Frequency Reuse View: Threshold Values

Alarm thresholds

Depending on the parameters for the reception quality that the mobile provides in its measurement reports, R&S ROMES can generate two different and independent alarm types:

- A C/I alarm can be generated if the reported C/I values fall below a specified threshold. C/I alarms requires C/I values provided by the test mobile.
- A dedicated mode alarm can be generated if the reported RxQual is above a specified value (i.e. the bit error rate is high) although RxLev is sufficiently high (see definition of RX Level and RX Quality in chapter 8). A bad RxQual at high RxLev is likely to be caused by interfering signals.

For both alarm types it is possible to specify a minimum time interval during which the alarm conditions must be met. A zero time of alarm means that the alarm is already generated if the alarm conditions are met in a single measurement.

Events are generated by the analysis if the quality values exceed the configured threshold values. The alarm events are displayed in the *GSM NWS Frequency Reuse View – Event List.* The list remains empty while no alarm situation is detected.

Thresholds from the current position

The BTS search threshold limits the database search for potential interferers to a circle around the current position with specified radius. Base stations outside this radius are not considered as Potential Interferers. They are also discarded for the top N list in the lower part of the NWS Frequency Reuse View.

Thresholds for top N calculation

The values in this panel limit the number of entries in the top N list in the lower part of the NWS Frequency Reuse View.

Max. time dev.*…*

Maximum time offset between 0 and 60 s. The selected value should at least cover a measurement cycle.

Size of the Top N set

Maximum number of entries (BTS sectors) in the top N list.

Interferer level…

Minimum interferer level relative to the carrier level. In general there is no need to analyze very weak interfering signals. The effect of adjacent channel interferers is due to their out-of-channel emissions, so it makes sense to select a larger threshold for them.

Interferer Types…

Restriction of the top N lists to interferers of specific types (see description of the top N lists). The interferer types for co-channel and adjacent channel interferers can be selected independently.

Interferer types included in the TopN

Configuration information from the GSM BTS database is used to define a set of potential interferer BTS of the channels of the serving cell (C0C0, C0CX, CXC0, CXCX) in a radius around the measurement location.

The GSM NWS delivers C0 measurements (SCH power) of BTS, identified by channel and BSIC or channel and CI/LAC/MCC/MNC.

If the C0 of a potential interferer (as defined above) can be measured and exceeds a configurable threshold, then the C0 power is used directly in case of C0C0 and CXC0 measurements or as proxy for the CX power in the C0CX and CXCX cases and will be displayed in the view as interferer.

GSM NWS Frequency Reuse View – Adj. Channel Interferer

The *GSM NWS Frequency Reuse View – Adj. Channel Interferer* provides detailed information about the serving cell, the potential adjacent channel interferers, and the characteristics of the interference situations encountered during the measurement tour.

An adjacent channel interferer is a neighbor cell that has a C0 channel (BCCH, SCH…) or a Cx channel (TCH) adjacent to one of the channels of the serving cell (the channel numbers differ by ±1). To analyze possible co-channel interferers use the *GSM NWS Frequency Reuse View – Co Channel Interferer* described on page 4.452.

The view contents of the *Adj. Channel Interferer* view are analogous to the *Co Channel Interferer* view. Both views use the same configuration menu (i.e. all configuration settings are valid for both views).

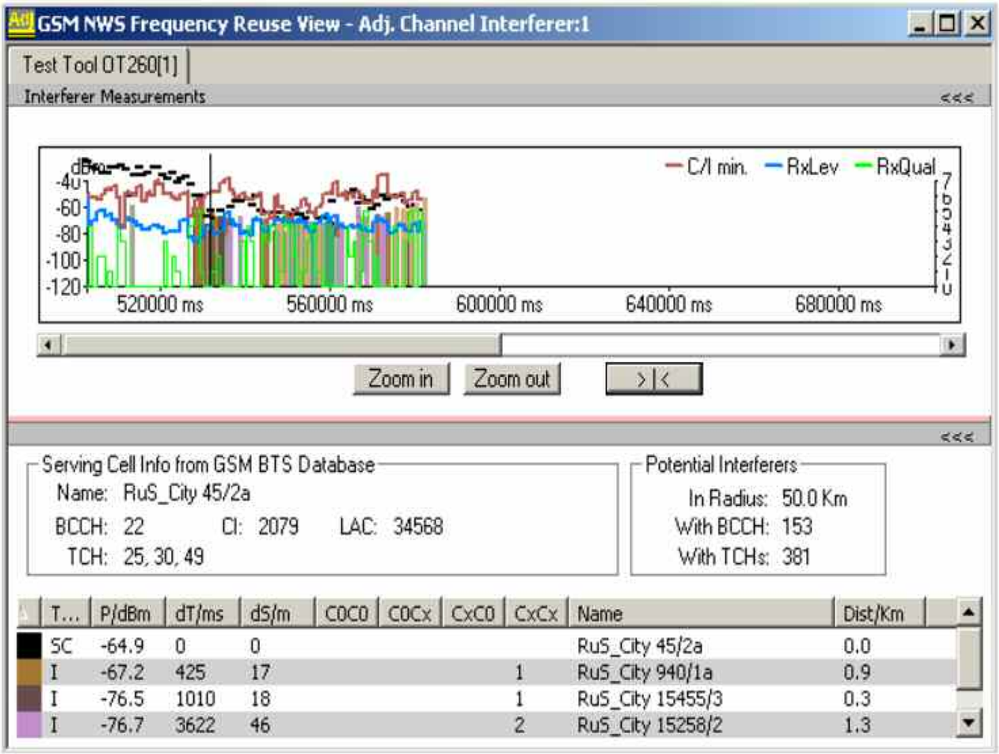
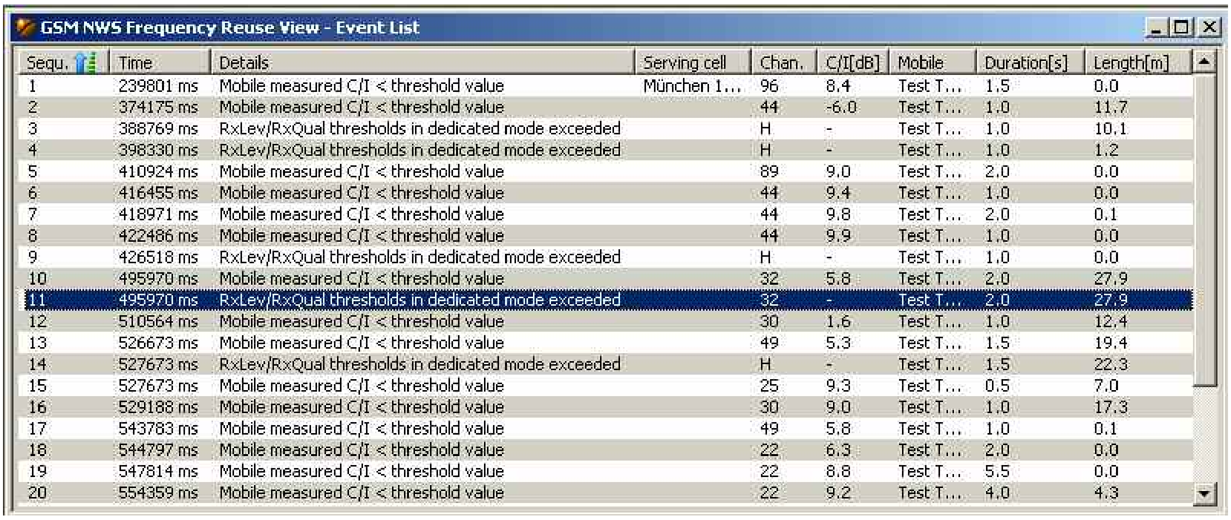


Fig. 4-266 GSM NWS Frequency Reuse View: Adj. Channel Interferer

GSM NWS Frequency Reuse View – Event List

The *GSM NWS Frequency Reuse View – Event List* contains a list of alarm messages generated according to the C/I and RxQual values measured by the test mobile. Conditions for alarm messages (alarm thresholds) can be set in the *Thresholds* tab of the *Co Channel Interferer* configuration menu; see *Fig. 4-265* on p.4.458 . Therefore, the contents of the *Event List* are not fixed for a given measurement file but vary depending on the alarm thresholds.

Activate the preview feature in the *Frequency Reuse View Configuration* tab of the co-channel or adjacent channel interferer configuration menu (see Fig. 4-264 *on p. 4.456*) if you want to prescan the *.rscmd or *.cmd file in order to display all alarm messages at the beginning of the replay session.



GSM NWS Frequency Reuse View - Event List

Sequ.	Time	Details	Serving cell	Chan.	C/I[dB]	Mobile	Duration[s]	Length[m]
1	239801 ms	Mobile measured C/I < threshold value	München 1...	96	8.4	Test T...	1.5	0.0
2	374175 ms	Mobile measured C/I < threshold value		44	-6.0	Test T...	1.0	11.7
3	388769 ms	RxLev/RxQual thresholds in dedicated mode exceeded		H	-	Test T...	1.0	10.1
4	398330 ms	RxLev/RxQual thresholds in dedicated mode exceeded		H	-	Test T...	1.0	1.2
5	410924 ms	Mobile measured C/I < threshold value		89	9.0	Test T...	2.0	0.0
6	416455 ms	Mobile measured C/I < threshold value		44	9.4	Test T...	1.0	0.0
7	418971 ms	Mobile measured C/I < threshold value		44	9.8	Test T...	2.0	0.1
8	422486 ms	Mobile measured C/I < threshold value		44	9.9	Test T...	1.0	0.0
9	426518 ms	RxLev/RxQual thresholds in dedicated mode exceeded		H	-	Test T...	1.0	0.0
10	495970 ms	Mobile measured C/I < threshold value		32	5.8	Test T...	2.0	27.9
11	495970 ms	RxLev/RxQual thresholds in dedicated mode exceeded		32	-	Test T...	2.0	27.9
12	510564 ms	Mobile measured C/I < threshold value		30	1.6	Test T...	1.0	12.4
13	526673 ms	Mobile measured C/I < threshold value		49	5.3	Test T...	1.5	19.4
14	527673 ms	RxLev/RxQual thresholds in dedicated mode exceeded		H	-	Test T...	1.5	22.3
15	527673 ms	Mobile measured C/I < threshold value		25	9.3	Test T...	0.5	7.0
16	529188 ms	Mobile measured C/I < threshold value		30	9.0	Test T...	1.0	17.3
17	543783 ms	Mobile measured C/I < threshold value		49	5.8	Test T...	1.0	0.1
18	544797 ms	Mobile measured C/I < threshold value		22	6.3	Test T...	2.0	0.0
19	547814 ms	Mobile measured C/I < threshold value		22	8.8	Test T...	5.5	0.0
20	554359 ms	Mobile measured C/I < threshold value		22	9.2	Test T...	4.0	4.3

Fig. 4-267 GSM NWS Frequency Reuse View: Event List

Alarm List

The event list indicates all alarm events during the measurement. The alarm messages are displayed together with a timestamp, the serving cell name (if a BTS data base is available), and the name of the test mobile. For C/I alarms, the channel number and the C/I value in dB is displayed in addition.

The test mobile and PN scanner can generate the C/I and RxQual alarm types described on p. 4.458 (see paragraph on *Alarm thresholds*).

The user can use the general “coupled cursor” function of R&S ROMES to jump to the timestamps in the list and to review the details of the event in all available and coupled R&S ROMES views like for example the *Route Track View*, the *GSM NWS TopN View*, the *GSM Measurement Report View*, the *Layer 3 View* or the *GSM Frequency Hopping View*.

Export of the event list

The Export process is started with choosing the Context Menu option “Export …” in the Event List view.

A file name will be automatically derived from the current *.rscmd file and can be chosen in the following File Chooser Dialog. After this the export file will be generated in the chosen directory and with the given name.

The export process ends with a dialog which gives the option to open the export file with an editor for evaluation. Structure and content of the export file is described below.

*The Precondition of the export is a loaded *.rscmd file with full prescan.*

Structure and content of export files

The structure is a table. First line contains "speaking" column headers. The delimiter between the columns is the ';'

Four data types are combined in the table, and the first column is the "Type":

`SETUP`	`//Setup param`
`EVENT`	`//Event data`
`COCHTOPN`	`//Co channel TopN interferers at event time`
`ADJCHTOPN`	`//Adjacent channel TopN interferers at event time`

Setup Parameters

SetupParam
SetupValue

Event Data

EventNumber
TimeStamp[ms]
EventType
EventDescriptionLong
ServingCellName
Channel
CToI[dB]
MobileName
Duration[s]
Distance[m]
LongPosStart
LatPosStart
LongPosEnd
LatPosEnd

Co/Adj channel interferer data (COCHTOPN/ ADJCHTOPN)

RankIsServingCell
SCHPower[dBm]
DeltaT[ms]
DeltaS[m]
SectorName
MCC/MNC/LAC/CI
Distance[km]
C0C0
C0Cx
CxC0
CxCx

Example Export File

Setup parameters

SETUP;MeasurementFile;G:\RuS\MeasData\GSM-NWS-UMTS\GSM NWS\Manert_3.60SP2B4_GSM NWS OT290 QC6250_2006-07-04_07-00-18.cmd;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MobileCtoIMeasAlarmOn;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MobileCtoIAlarmThreshold[dB];10.000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MinDurationOnBeforeMobileCtoIAlarmEvent[ms];0;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MinDurationOffAfterMobileCtoIAlarmEvent[ms];0;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;DedicatedModeRxLevRxQualAlarmOn;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;DedicatedModeRxLevThreshold[dBm];-90.000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;DedicatedModeRxQualThresholdSteps;4;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MinDurationOnBeforeDedicatedModeEvent[ms];1000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MinDurationOffAfterDedicatedModeEvent[ms];1000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;DedicatedMode_Hopping_RxLevThreshold[dBm];-90.000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;DedicatedMode_Hopping_RxQualThresholdSteps;4;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MinDurationOnBeforeDedicatedMode_Hopping_Event[ms];1000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MinDurationOffAfterDedicatedMode_Hopping_Event[ms];1000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;CoChanInterfererEvalTheshold[dB];30.000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;AdjChanInterfererEvalTheshold[dB];12.000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MaxTimeDeviationOfInterfererMeasurements[ms];7000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;TopNSize;5;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;MinTimeBeforeNextInterferenceCheck[ms];250;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;RadiusForCacheLoadsFromDatabase[km];80.000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;RadiusMaxForSearchOfBts[km];50.000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;DistMinBetweenUpdatingInterfererStatistic[m];1000.000;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;UseMccMncInSectorMatch;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;IncludeInTopN_C0C0;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;IncludeInTopN_C0Cx;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;IncludeInTopN_CxC0;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;IncludeInTopN_CxCx;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;IncludeInTopN_C0AdjC0;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;IncludeInTopN_C0AdjCx;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;IncludeInTopN_CxAdjC0;true;;;;;;;;;;;;;;;;;;;;;;;;

SETUP;IncludeInTopN_CxAdjCx;true;;;;;;;;;;;;;;;;;;;;;;;;

Event Entry

EVENT;;;1;352721;MobileC/I;Mobile measured C/I < threshold value; MXBD59A;11;7.3;Test Tool OT290[1];3.0;22.5;11.578732;48.114191;11.578915;48.114352;;;;;;;;;;

Interferer Entry

COCHTOPN;;;;;;;;;;;;;;;;4;false;-65.68;-155;0;MXBD44A;262/2/831/13441;5452.8;;;;11

GSM NWS Frequency Reuse View – Event List Configuration

The *GSM NWS Frequency Reuse View – Event List* configuration menu selects the contents of the event list and shows information about the view version.

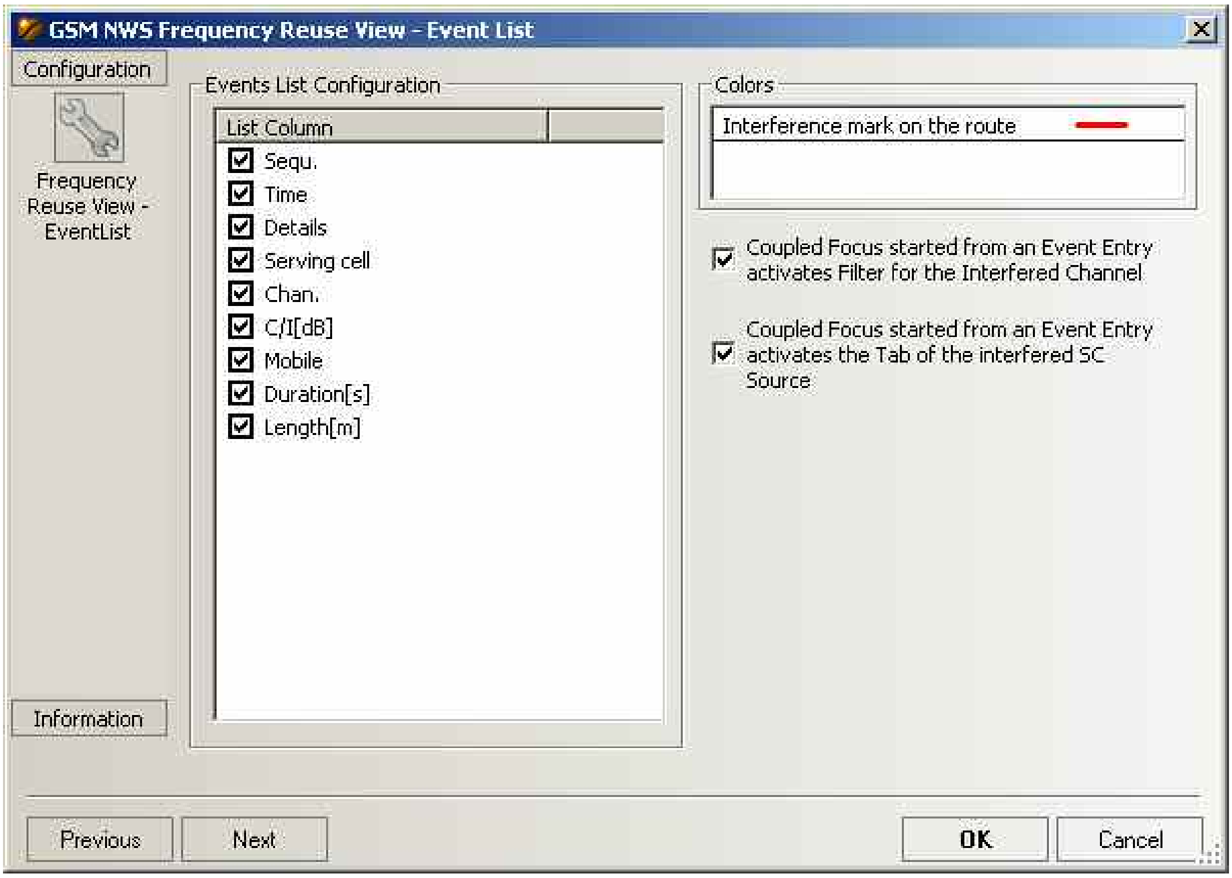


Fig. 4-268 GSM NWS Frequency Reuse View: Event List Configuration

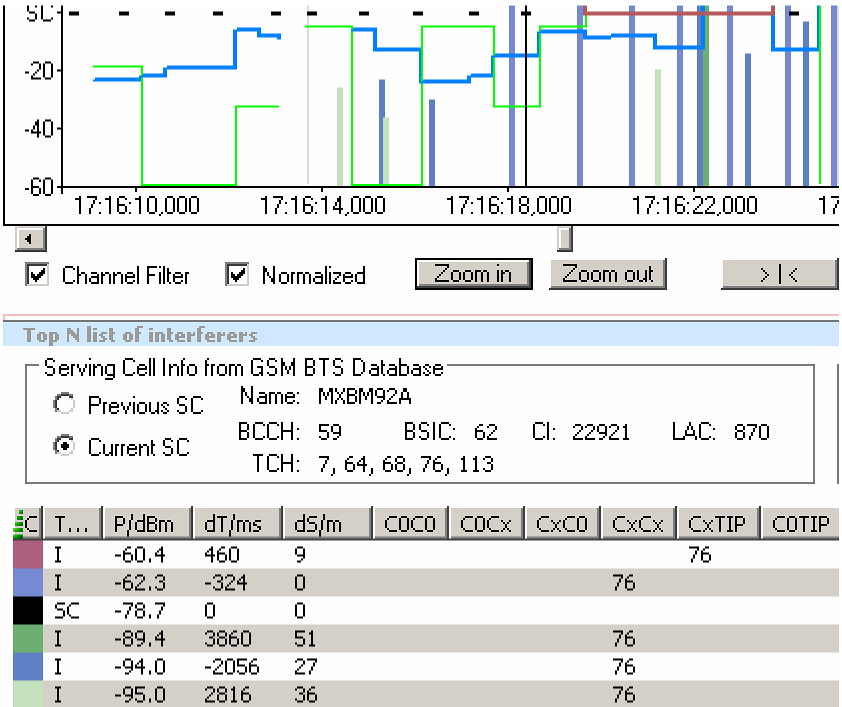
Colors Selects the color scheme for the displayed elements in the *event list*.

Coupled Focus from Eventlist activates a Channel Filter

If the interfered channel is known from the mobile measurements or the scanner measurements and if the channel is shown in the events list, then it will be used for the new Channel Filter.

When using the coupled focus from the event list entry, the Frequency Reuse Views will use the Channel Filter to show only the relevant interferers for this channel. This filtered view on the interference situation is a clear advantage for analysis.

When the view is filtered, there will a new checkbox “Channel Filter” be shown below the graphic presentation. The checkbox allows to switch the filter off and on again.



Coupled Focus from Eventlist switches Tab Views

The Event List Views show lists of events which originate from different Serving Cell (SC) sources like Mobiles, TopN Members or Fixed SC.

The Frequency Reuse Views display the data for the different SC sources on different tabs.

When used with coupled focus, the new feature will automatically select the tab of the SC source of interest, which reported the event in the event list.

GSM NWS Top N View

The *GSM NWS Top N View* displays the properties of the signals from the base transceiver stations that are elements of the *Top N Pools* defined in the driver configuration menu. A Top N Pool contains up to N BSICs with specific characteristics providing the strongest synchronization channel P(SCH) level at a given position and time; for more information refer to the description of the driver configuration menu in chapter 6.

The view area is divided into a list and a chart panel:

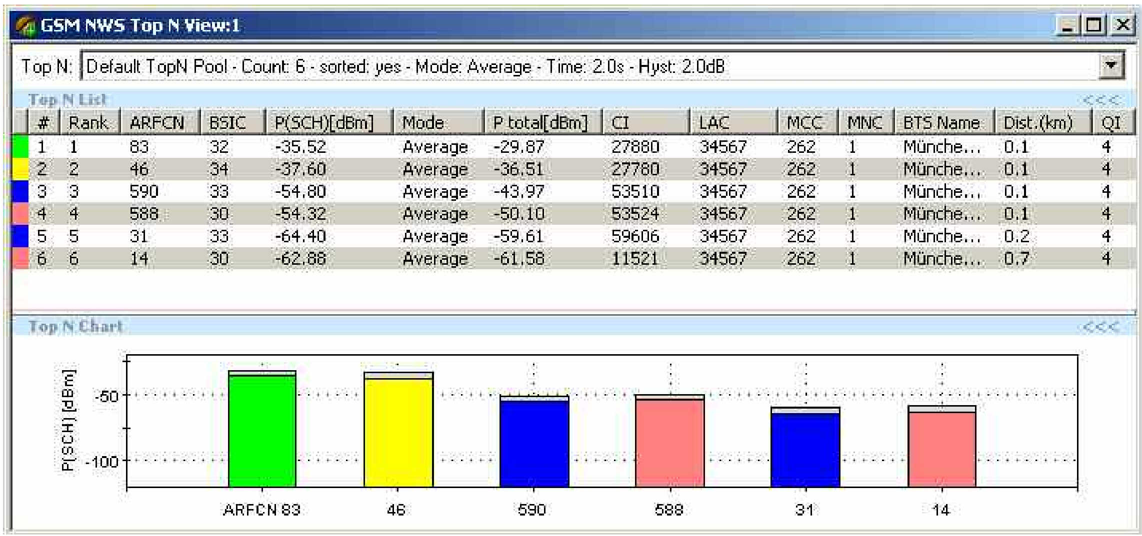


Fig. 4-269 GSM NWS Top N View

View area

The entire view area is horizontally split to accommodate a list with all defined *Top N* measurements, and a bar chart.

A click on the *Top N List* or *Top N Chart* title bars compresses and expands the table or chart. A compressed chart leaves more space for the table and vice versa. A compressed sub panel is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Top N List

Below the view title, the *Top N* list contains all top N pools defined in the *Top N* tab of the driver configuration menu.

The *Top N List* gives an overview of the received signals in the current top N pool together with their measured power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. The *Top N List* contains the following columns:

Number of the measured SCH within the Top N pool. The SCHs are numbered in ascending order, according to the time when they enter the Top N pool. This means that the current numbers tend to increase as the measurement progresses.

Rank Current rank of the measured SCH within the Top N pool, according to its average or maximum Ec/Io (see driver configuration menu). The ranks are reassigned every time the pool is updated; they are in the range *1* $\leq$ *Rank* $\leq$ *N*.

ARFCN	Absolute Radio Frequency Channel Number, the GSM channel number of the measured SCH.
BSIC	Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the *Available Signals* tab of the *Preferences* menu (octal/decimal/hex).
P(SCH) [dBm]	Code power of the measured SCH (synchronization channel)
Mode	Valuation method (average, min./max.)
P total [dBm]	Max. slot power measured in the GSM channel
CI	Cell Identity (16 bit)
LAC	Location Area Code
MCC	Mobile Country Code
MNC	Mobile Network Code
BTS Name	Name of the closest base transceiver station with matching MNC, MCC, LAC, and CI. This parameter is displayed if a valid BTS list is available. Detailed information can be obtained by double-clicking the BTS name.

Note:
R&S ROMES uses the BCCH and the BSIC to identify the BTS name. If the BTS assignment is ambiguous because several BTS with the same BCCH and BSIC are encountered, then a plus "+" sign precedes the BTS name.

Dist. (km)	Distance to the BTS (in kilometers)
QI	The Quality Indicator (QI) is shown as a grey top on the power bars. It gives an indication of the interference which was calculated during the SCH power measurement, see also p. 4.441.

The TopN pools configuration is done in the GSM NWS Technology component and not in the driver component like with UMTS. From this follows, that the TopN configuration can be modified to get different results from the same measurement file.

In the view configuration menu, it is possible to show or hide each individual table column. Up to 3 different named pools can be configured in the default setup.

Each pool has several configurable parameters.

Diagram

Below the table, the *Top N Chart* shows the code power of the measured SCH (synchronization channel) for all ARFCN signals in the current top N measurement as a bar chart.

In the configuration menu, it is also possible to select the upper and lower P(SCH) levels for the y-axis of the chart.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2.

GSM NWS Top N Configuration

The *GSM NWS Top N* configuration menu defines the y-axis scale, i.e. the minimum *(P(SCH) Min [dBm])* and the maximum *(P(SCH) Max [dBm])* level to be displayed in the *GSM NWS Top N View* and selects the contents of the table. It is opened via a right mouse click on a point inside the *GSM NWS Top N View* or via the *Tools - Modules Configuration...* command (see chapter 3).

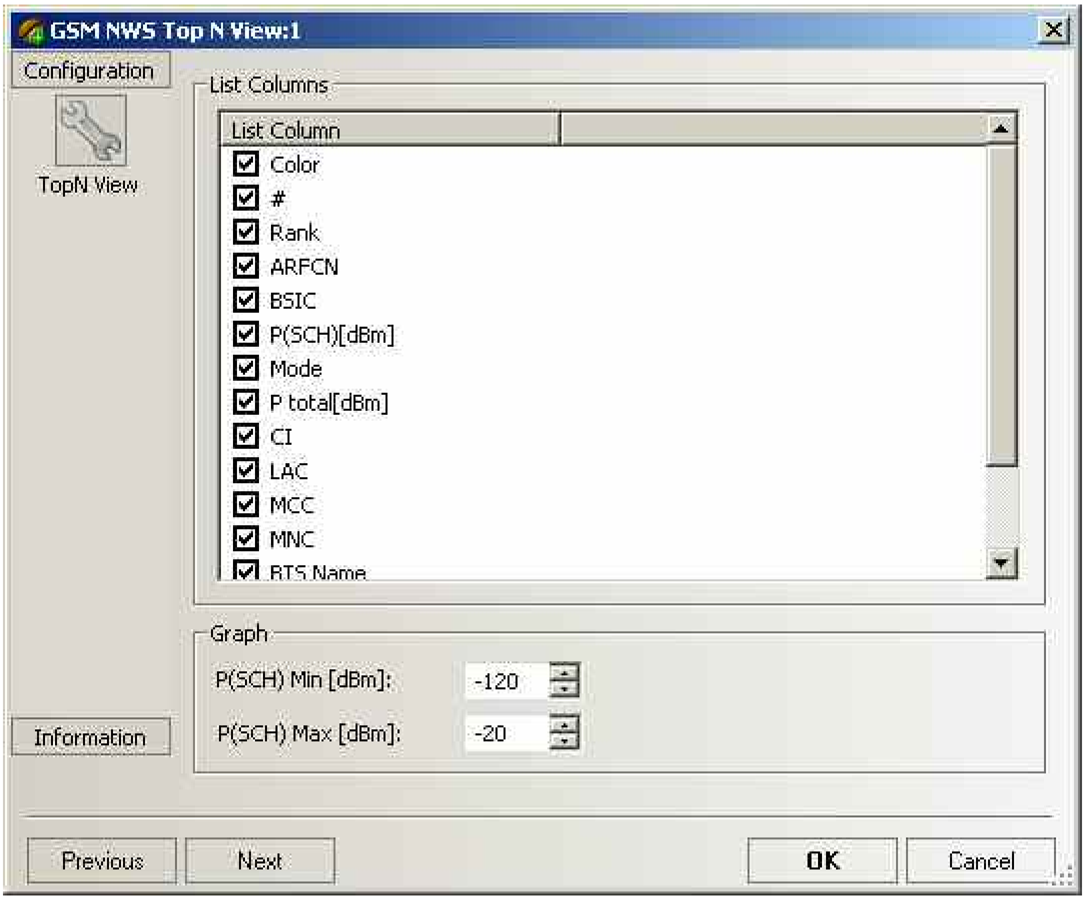


Fig. 4-270 GSM NWS Top N configuration: Top N View

Graph	*P(SCH) Min/Max [dBm]*	Sets the upper and lower P(SCH) levels for the y-axis of the chart.

GSM NWS Frequency Reuse Spectrum View

The *GSM NWS Frequency Reuse View - Spectrum* displays the spectrum of the channels (BCCH and TCHs) of the serving cell (DL and/or UL) and optional also the spectrum of the adjacent channels. The x-axis is the frequency and the y-axis is the time. The sequence of spectrum measurements is shown as n colored lines like in the *UMTS PN Scanner Spectrum History view*. The time dimension can be used for CF by clicking on the view. The view will be updated during measurement and replay. During CF, it will be updated accordingly the data in the *Frequency Reuse View*. The CF can be used actively by using the spectrum history.

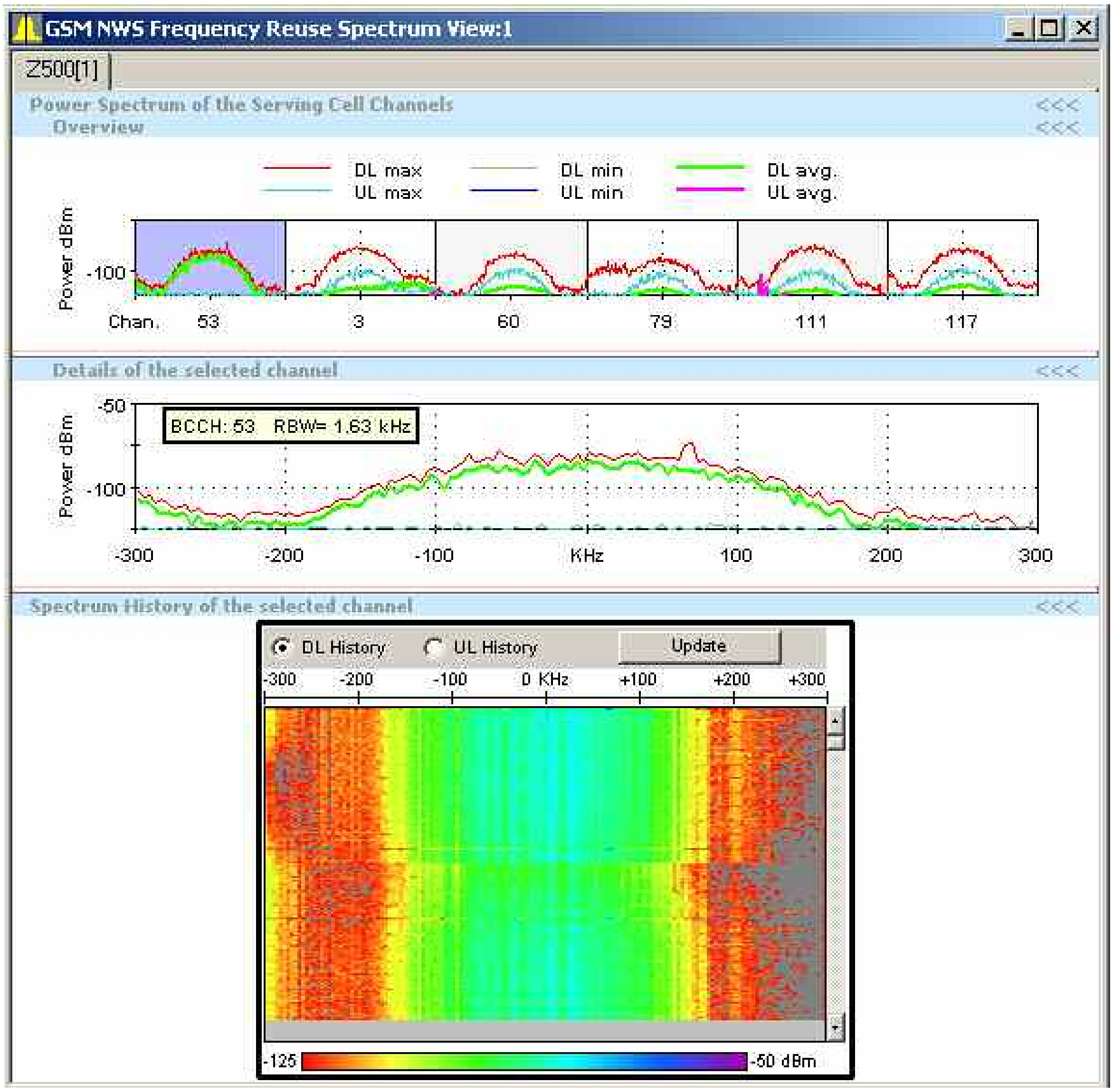


Fig. 4-271 GSM NWS Frequency Reuse Spectrum View

View area

The Spectrum View is tabbed, with the tabs corresponding to the mobiles or other Serving Cell sources. Switching between tabs is synchronized with the other *Frequency Reuse Views*.

The *Spectrum View* has three sections which can be individually sized and opened or closed.

Top section	The top section displays an overview of the spectrums of the channels of the serving cell. All spectrums are shown in a row and the channel numbers displayed.
Middle section	The middle section displays the spectrum of one GSM channel plus optionally its adjacent channels in detail. If an adjacent channel was measured at another time than the co-channel, then this will be indicated. The channel which is displayed in the middle section can be chosen from the list of channels in the top section by clicking on it.
Bottom Section	The bottom section displays the spectrum with a time dimension: Spectrum History. Here the power values will be indicated through a color scale.

Precondition for this is the configuration of spectrum measurements in the GSM NWS driver. There is a new config page in the driver for configuring the details of the spectrum measurements.

GSM NWS Frequency Reuse Spectrum View - Configuration

The *GSM NWS Frequency Reuse Spectrum View* configuration menu selects the contents of the view tables, sets general view options, and defines conditions for the generated alarm messages and the displayed potential interferers. It is opened via a right mouse click on any point inside *GSM NWS Frequency Reuse Spectrum View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Frequency Reuse Spectrum View* tab selects the contents of the view tables and sets general view options like scaling of the graph and color settings

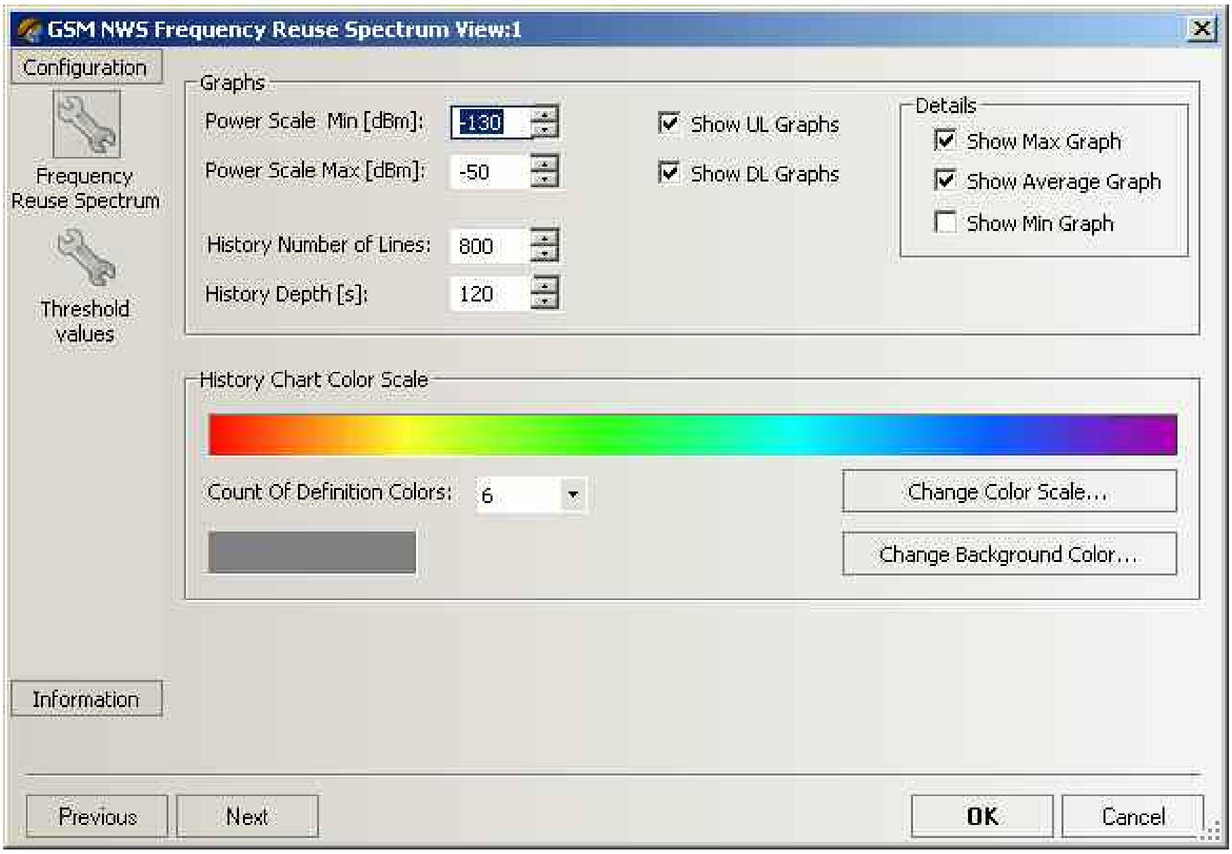


Fig. 4-272 GSM NWS Frequency Reuse Spectrum View - Configuration: Frequency Reuse Spectrum View

The *Threshold Values* tab sets conditions for the generated alarm messages and the displayed potential interferers.

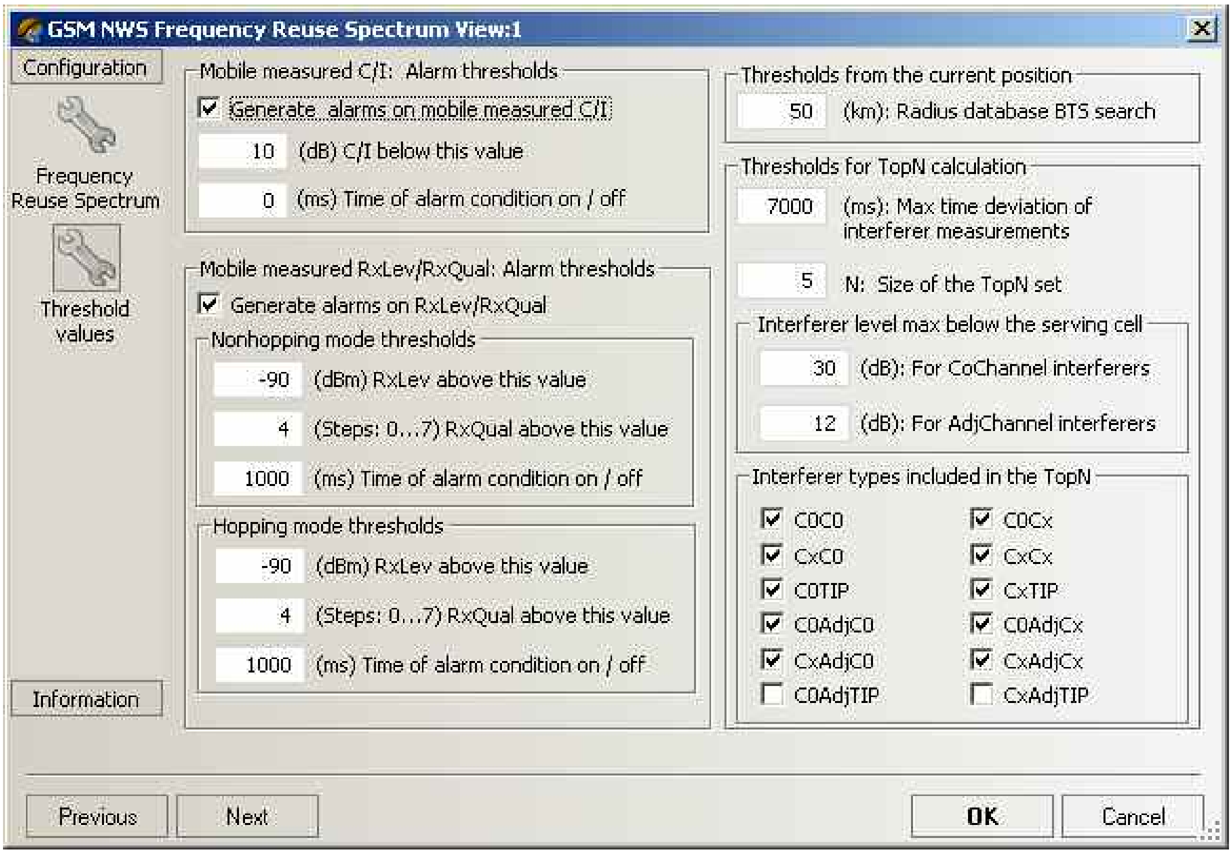


Fig. 4-273 GSM NWS Frequency Reuse View - Spectrum Configuration: Threshold values

Alarm thresholds

Depending on the parameters for the reception quality that the mobile provides in its measurement reports, R&S ROMES can generate two different and independent alarm types:

- A C/I alarm can be generated if the reported C/I values fall below a specified threshold. C/I alarms requires C/I values provided by the test mobile.
- A dedicated mode alarm can be generated if the reported RxQual is above a specified value (i.e. the bit error rate is high) although RxLev is sufficiently high (see definition of RX Level and RX Quality in chapter 8). A bad RxQual at high RxLev is likely to be caused by interfering signals.

For both alarm types it is possible to specify a minimum time interval during which the alarm conditions must be met. A zero time of alarm means that the alarm is already generated if the alarm conditions are met in a single measurement.

Events are generated by the analysis if the quality values exceed the configured threshold values. The alarm events are displayed in the *GSM NWS Frequency Reuse View – Event List.* The list remains empty while no alarm situation is detected.

Thresholds from the current position

The BTS search threshold limits the database search for potential interferers to a circle around the current position with specified radius. Base stations outside this radius are not considered as Potential Interferers. They are also discarded for the top N list in the lower part of the NWS Frequency Reuse View.

Thresholds for top N calculation

The values in this panel limit the number of entries in the top N list in the lower part of the NWS Frequency Reuse View.

Max. time dev.…
Maximum time offset between 0 and 60 s. The selected value should at least cover a measurement cycle.

Size of the Top N set
Maximum number of entries (BTS sectors) in the top N list.

Interferer level…
Minimum interferer level relative to the carrier level. In general there is no need to analyze very weak interfering signals. The effect of adjacent channel interferers is due to their out-of-channel emissions, so it makes sense to select a larger threshold for them.

Interferer Types…
Restriction of the top N lists to interferers of specific types (see description of the top N lists). The interferer types for co-channel and adjacent channel interferers can be selected independently.

Interferer types included in the TopN

Configuration information from the GSM BTS database is used to define a set of potential interferer BTS of the channels of the serving cell (C0C0, C0CX, CXC0, CXCX) in a radius around the measurement location.

The GSM NWS delivers C0 measurements (SCH power) of BTS, identified by channel and BSIC or channel and CI/LAC/MCC/MNC.

If the C0 of a potential interferer (as defined above) can be measured and exceeds a configurable threshold, then the C0 power is used directly in case of C0C0 and CXC0 measurements or as proxy for the CX power in the C0CX and CXCX cases and will be displayed in the view as interferer.

GSM NWS Frequency Reuse View Type 2 - Co-Channel Interferer

The *GSM NWS Frequency Reuse View Type 2 – Co Channel Interferer* provides detailed information about the serving cell, the potential co-channel interferers, and the characteristics of the interference situations encountered during the measurement tour.

A co-channel interferer is a neighbor cell that has a C0 channel (BCCH, SCH…) or a Cx channel (TCH) in common with one of the channels of the serving cell. To analyze possible adjacent channel interferers use the *GSM NWS Frequency Reuse View – Adj. Channel Interferer* described on page 4.460.

The *GSM NWS Frequency Reuse View Type 2 – Co Channel Interferer* is analogous to the *GSM NWS* Frequency Reuse Views, but has other sources of the serving cell:

- Member of a TopN pool
- Fixed Serving cell.

The analysis can also be done for several test mobiles in parallel. Each test mobile connects during the drive test to a sequence of serving cells and continuously measures the transmission quality in terms of the quality indicator (QI) as described on page 4.441.

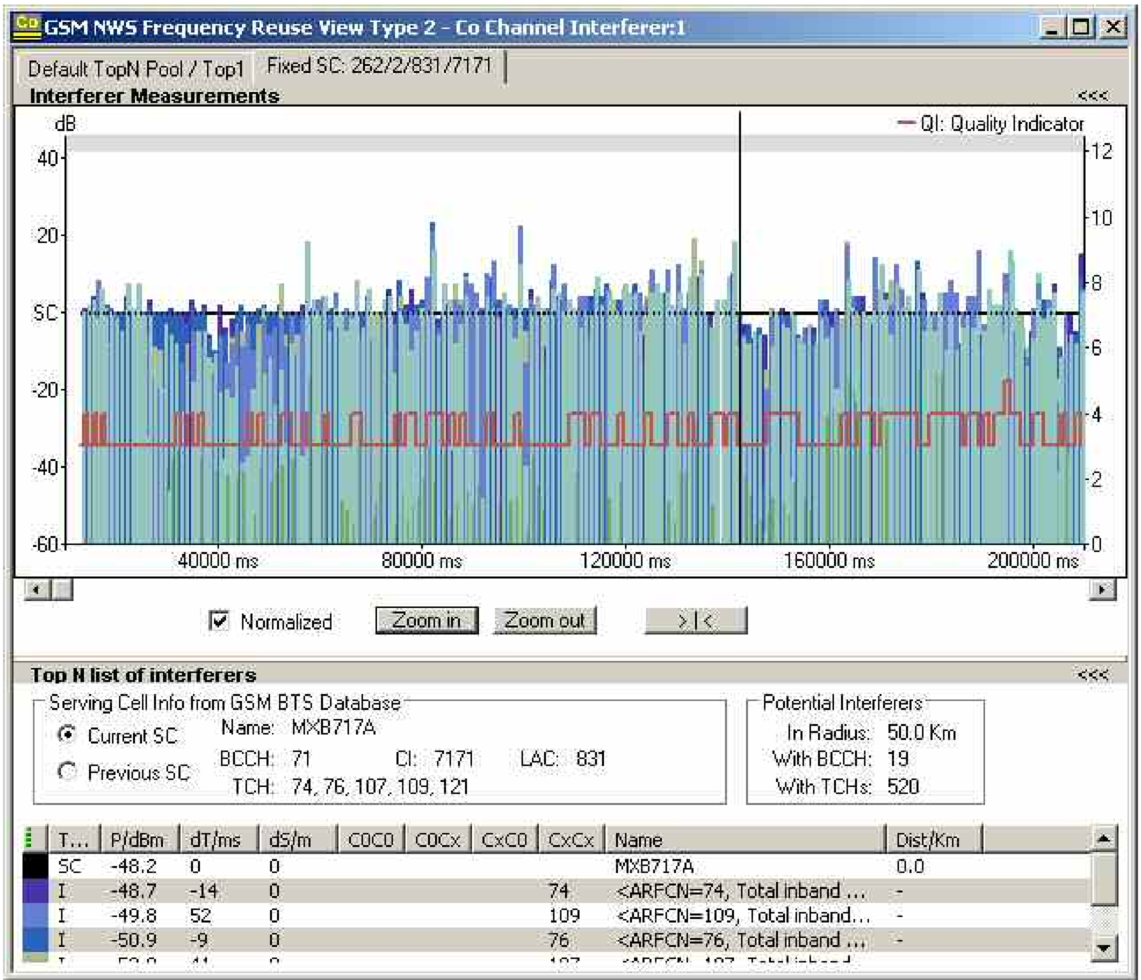


Fig. 4-274 GSM NWS Frequency Reuse View Type 2: Co Channel Interferer

Shown above is the chart for the fixed serving cell 262/2/831/7171. No handovers will occur in this type of display.

GSM NWS Frequency Reuse View Type 2 – Co Channel Interferer Configuration

The *GSM NWS Frequency Reuse View Type 2 – Co Channel Interferer* configuration menu is identical to the corresponding *GSM NWS Frequency Reuse View – Co Channel Interferer* configuration menu, except that an additional tab is available, in which SC sources can be added or deleted:

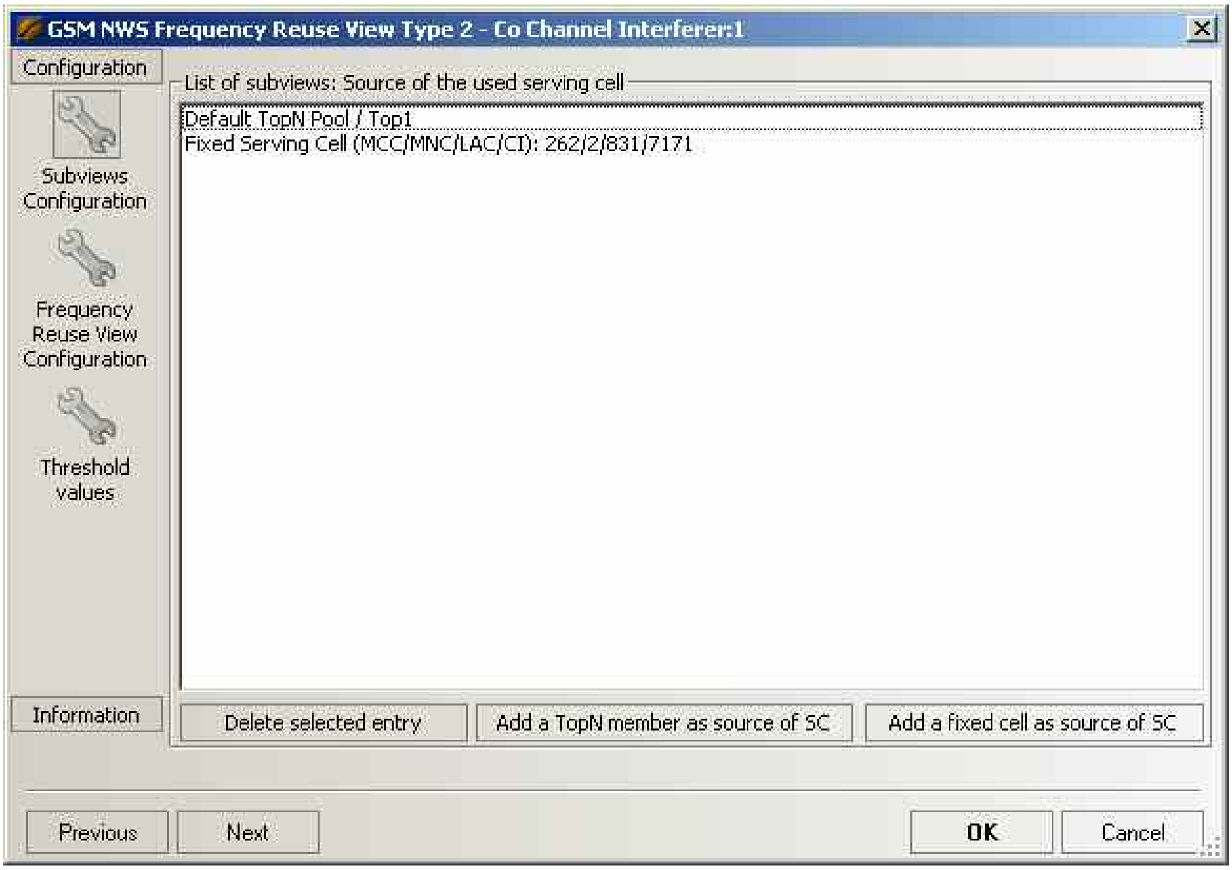


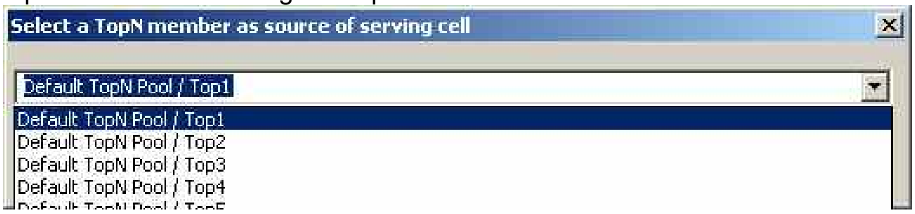
Fig. 4-275 GSM NWS Frequency Reuse View Type 2: Subviews configuration

List of subviews: Source of the used serving cell

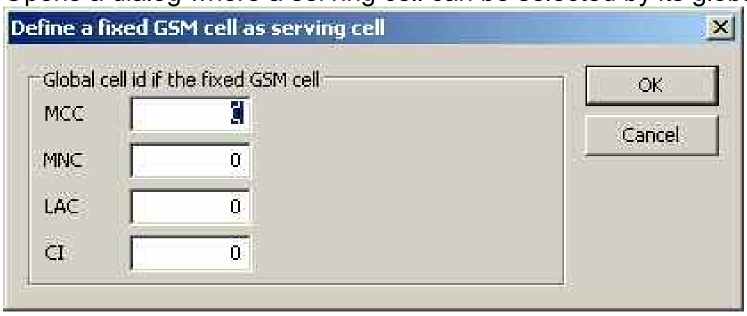
Shows a list in which serving cell sources can be added or deleted.

Delete selected entry
Deletes the selected SC source from the list.

Add a TopN member as source of SC
Opens a selection dialog for TopN members to be the SC source:



Add a fixed cell as source of SC
Opens a dialog where a serving cell can be selected by its global ID:



GSM NWS Frequency Reuse View Type 2 - Adj. Channel Interferer

The *GSM NWS Frequency Reuse View Type 2 – Adj. Channel Interferer* provides detailed information about the serving cell, the potential adjacent channel interferers, and the characteristics of the interference situations encountered during the measurement tour.

An adjacent channel interferer is a neighbor cell that has a C0 channel (BCCH, SCH…) or a Cx channel (TCH) adjacent to one of the channels of the serving cell (the channel numbers differ by ±1). To analyze possible co-channel interferers use the *GSM NWS Frequency Reuse View – Co Channel Interferer* described on page 4.452.

The view contents of the *Adj. Channel Interferer Type 2* view are analogous to the *Co Channel Interferer Type 2* view. Both views use the same configuration menu (i.e. all configuration settings are valid for both views).

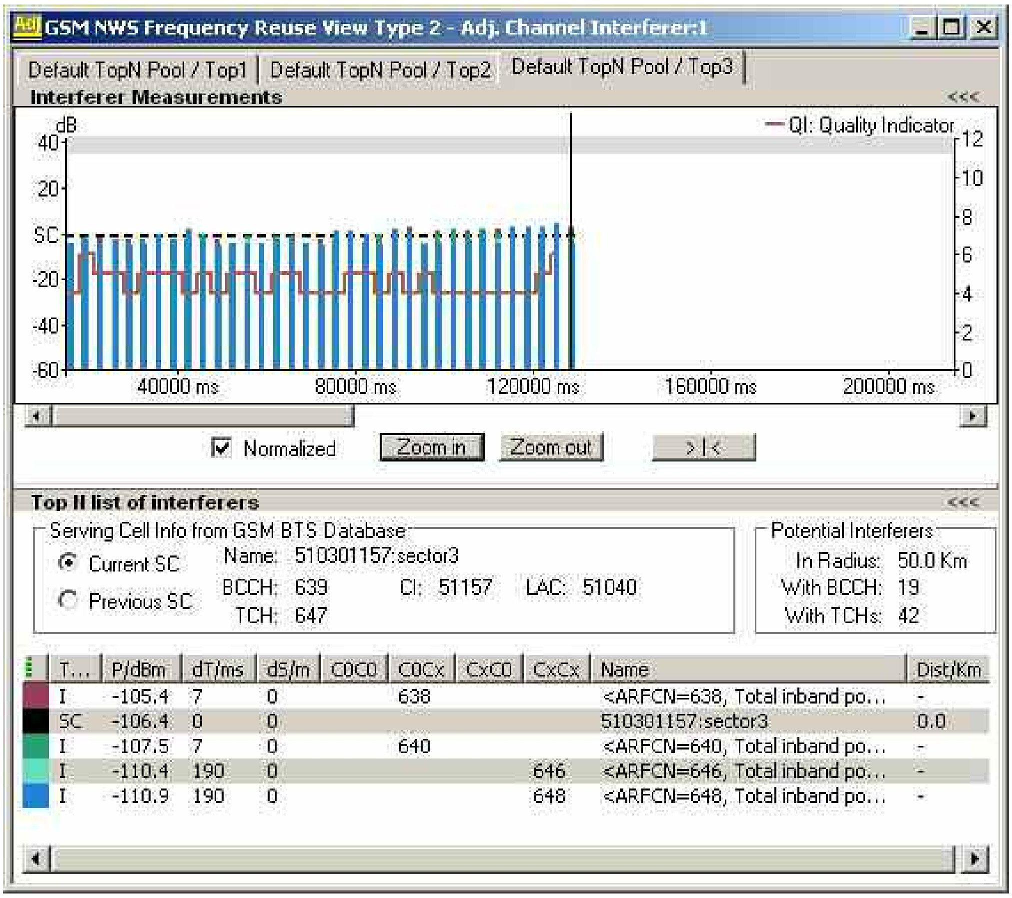
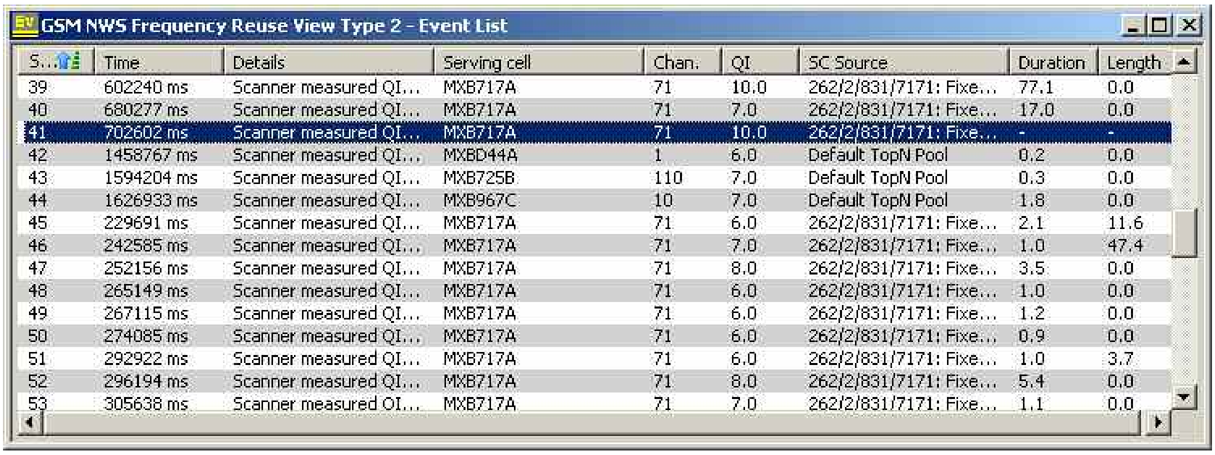


Fig. 4-276 GSM NWS Frequency Reuse View Type 2: Adj. Channel Interferer

GSM NWS Frequency Reuse View Type 2 - Event List

The *GSM NWS Frequency Reuse View Type 2– Event List* contains a list of alarm messages generated according to the QI values measured by the test mobile. Conditions for alarm messages (alarm thresholds) can be set in the *Thresholds* tab of the *Co Channel Interferer Type 2* configuration menu. Therefore, the contents of the *Event List Type* are not fixed for a given measurement file but vary depending on the alarm thresholds.



S...	Time	Details	Serving cell	Chan.	QI	SC Source	Duration	Length
39	602240 ms	Scanner measured QI...	MXB717A	71	10.0	262/2/831/7171: Fixe...	77.1	0.0
40	680277 ms	Scanner measured QI...	MXB717A	71	7.0	262/2/831/7171: Fixe...	17.0	0.0
41	702602 ms	Scanner measured QI...	MXB717A	71	10.0	262/2/831/7171: Fixe...	-	-
42	1458767 ms	Scanner measured QI...	MXBD44A	1	6.0	Default TopN Pool	0.2	0.0
43	1594204 ms	Scanner measured QI...	MXB725B	110	7.0	Default TopN Pool	0.3	0.0
44	1626933 ms	Scanner measured QI...	MXB967C	10	7.0	Default TopN Pool	1.8	0.0
45	229691 ms	Scanner measured QI...	MXB717A	71	6.0	262/2/831/7171: Fixe...	2.1	11.6
46	242585 ms	Scanner measured QI...	MXB717A	71	7.0	262/2/831/7171: Fixe...	1.0	47.4
47	252156 ms	Scanner measured QI...	MXB717A	71	8.0	262/2/831/7171: Fixe...	3.5	0.0
48	265149 ms	Scanner measured QI...	MXB717A	71	6.0	262/2/831/7171: Fixe...	1.0	0.0
49	267115 ms	Scanner measured QI...	MXB717A	71	6.0	262/2/831/7171: Fixe...	1.2	0.0
50	274085 ms	Scanner measured QI...	MXB717A	71	6.0	262/2/831/7171: Fixe...	0.9	0.0
51	292922 ms	Scanner measured QI...	MXB717A	71	6.0	262/2/831/7171: Fixe...	1.0	3.7
52	296194 ms	Scanner measured QI...	MXB717A	71	8.0	262/2/831/7171: Fixe...	5.4	0.0
53	305638 ms	Scanner measured QI...	MXB717A	71	7.0	262/2/831/7171: Fixe...	1.1	0.0

Fig. 4-277 GSM NWS Frequency Reuse View Type 2: Event List

Export of the event list

The Export process is started with choosing the Context Menu option “Export …” in the Event List view.

A file name will be automatically derived from the current *.rscmd file and can be chosen in the following File Chooser Dialog. After this the export file will be generated in the chosen directory and with the given name.

The export process ends with a dialog which gives the option to open the export file with an editor for evaluation. Structure and content of the export file is described in the chapter GSM NWS Frequency Reuse View – Event List on p.4.461.

NOTE

*The Precondition of the export is a loaded *.rscmd file with full prescan.*

GSM NWS Frequency Reuse View Type 2 – Event List Configuration

The *GSM NWS Frequency Reuse View Type 2– Event List* configuration menu selects the contents of the event list and shows information about the view version.

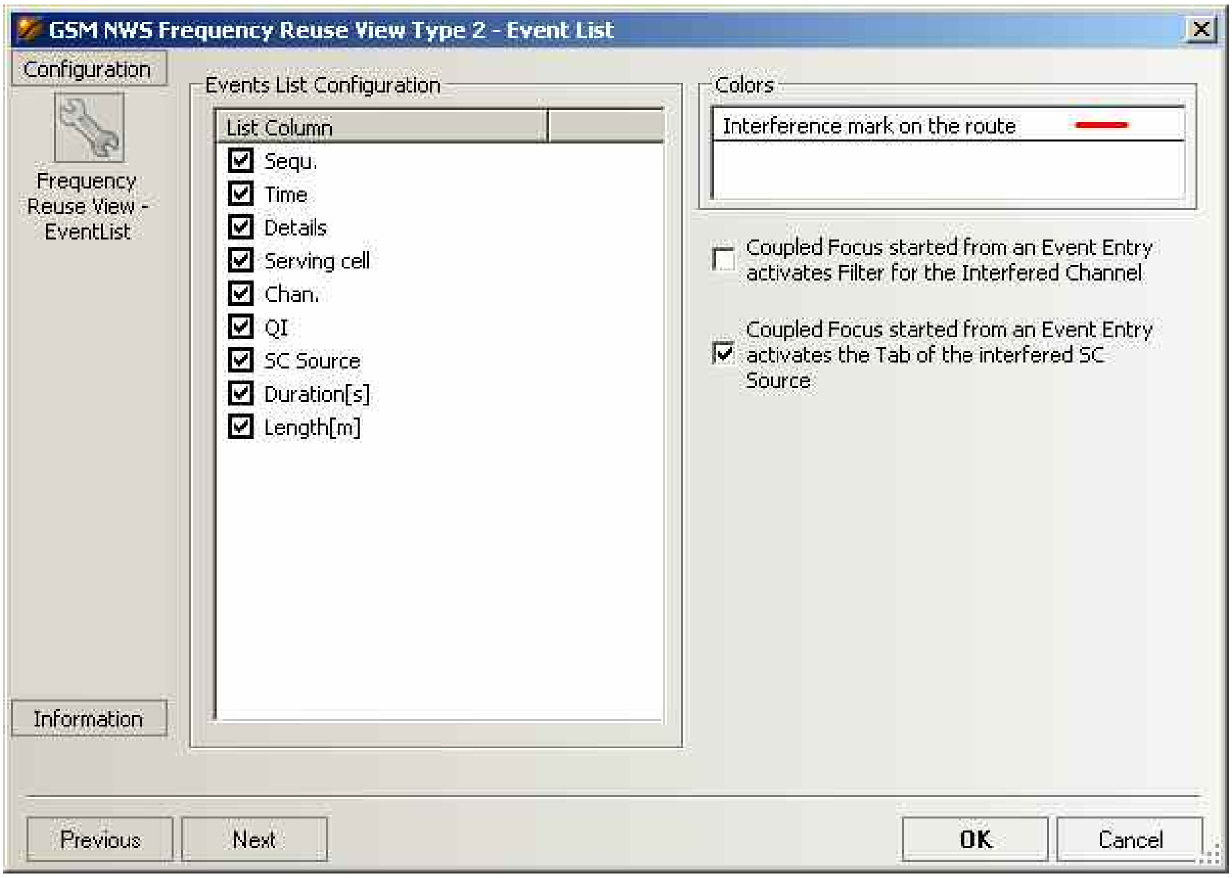


Fig. 4-278 GSM NWS Frequency Reuse View Type 2: Event List Configuration

Colors Selects the color scheme for the displayed elements in the *event list*.

Coupled Focus… The coupled focus is configured in the same way as described in *GSM NWS Frequency Reuse View – Event List Configuration* on p.4.464.

GSM NWS Frequency Reuse Spectrum View Type 2

The *GSM NWS Frequency Reuse View Type 2- S*pectrum shows the same data as Type 1, but with the tabs which are specified in the *Frequency Reuse View Type 2*. It displays the spectrum of the channels (BCCH and TCHs) of the Serving Cell (DL and/or UL) and optional also the spectrum of the adjacent channels. The x-axis is the frequency like in the other sections and the y-axis is the time. The sequence of spectrum measurements is shown as n colored lines like in the UMTS PN Scanner Spectrum history view. The time dimension can be used for CF by clicking on the view. The View will be updated during measurement and replay. During CF, it will be updated accordingly the data in the Frequency Reuse View. The CF can be used actively by using the spectrum history.

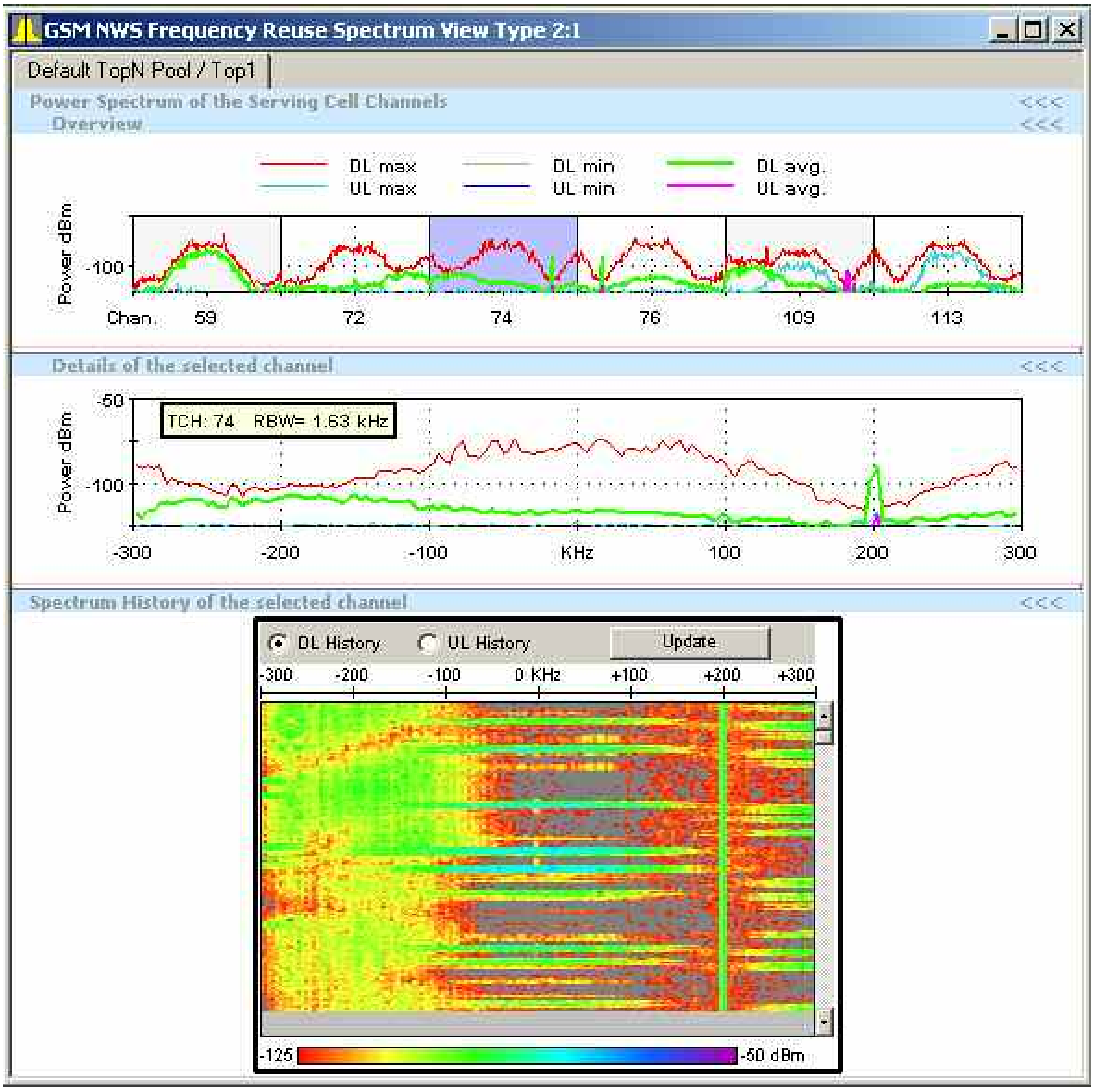


Fig. 4-279 GSM NWS Frequency Reuse Spectrum View Type 2

View area

The Spectrum View is tabbed, with the tabs corresponding to the mobiles or other Serving Cell sources. Switching between tabs is synchronized with the other Frequency Reuse Views.

The Spectrum View has three sections which can be individually sized and opened or closed.

Top section	The top section of the Spectrum View displays an overview of the spectrums of the channels of the serving cell. All spectrums are shown in a row and the channel numbers displayed.
Middle section	The Middle section of the Spectrum View displays the spectrum of one GSM channel plus optionally its adjacent channels in detail. If an adjacent channel was measured at another time than the co-channel, then this will be indicated. The channel which is displayed in the middle section can be chosen from the list of channels in the top section by clicking on it.
Bottom Section	The bottom Section of the Spectrum View displays the spectrum with a time dimension: Spectrum History. Here the power values will be indicated through a color scale.

NOTE Precondition for this is the configuration of spectrum measurements in the GSM NWS driver. There is a new config page in the driver for configuring the details of the spectrum measurements.

GSM NWS Frequency Reuse Spectrum View Type 2- Configuration

The *GSM NWS Frequency Reuse Spectrum View Type 2* – configuration menu is identical to the corresponding *GSM NWS Frequency Reuse Spectrum View - Configuration on p.4.472* menu, except that an additional tab is available, in which SC sources can be added or deleted:

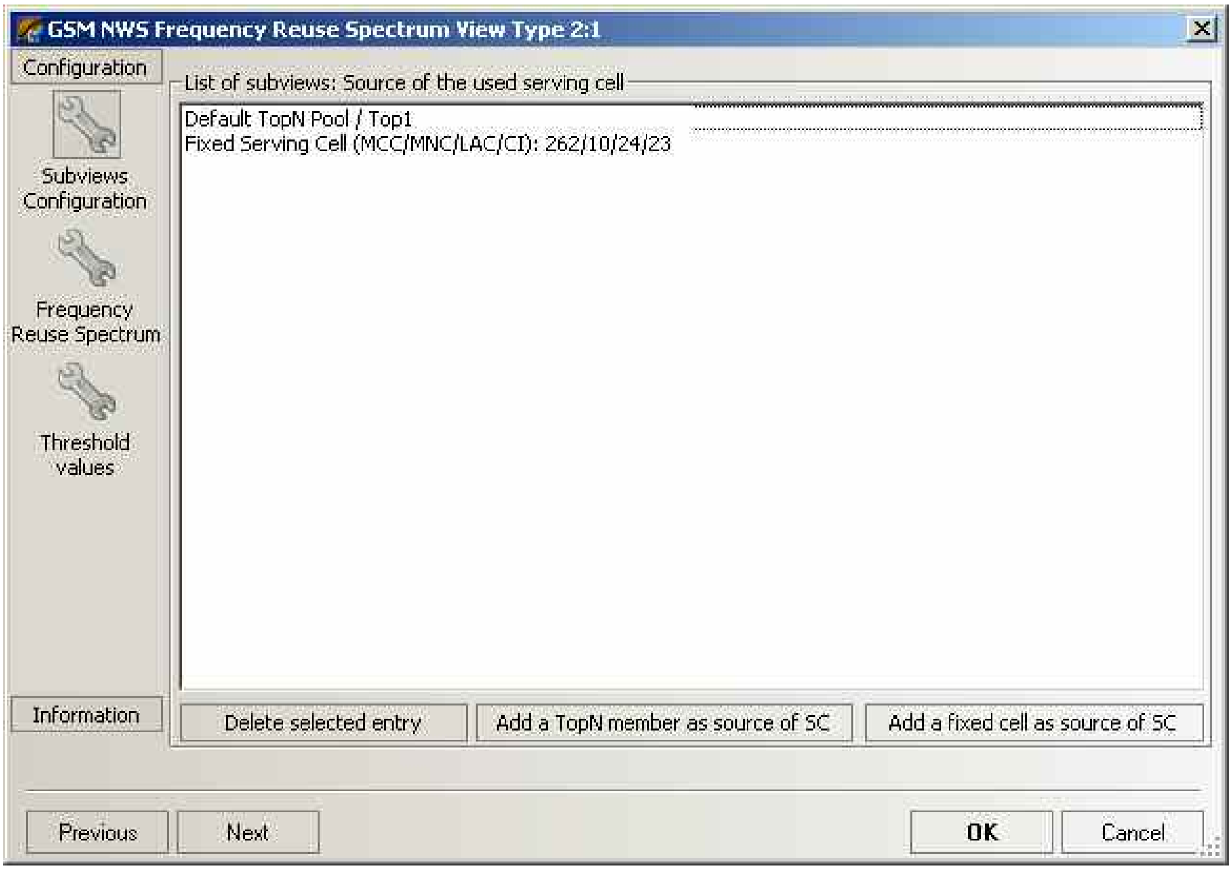


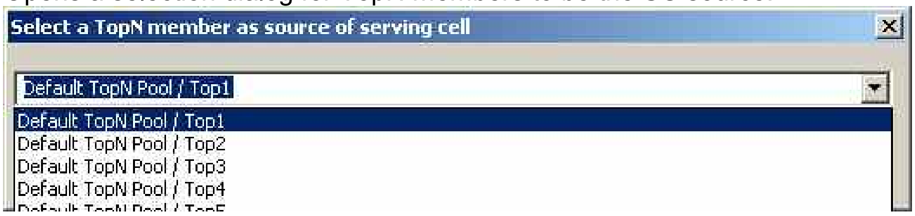
Fig. 4-280 GSM NWS Frequency Reuse Spectrum View Type 2 - Configuration: Subviews Configuration

List of subviews: Source of the used serving cell

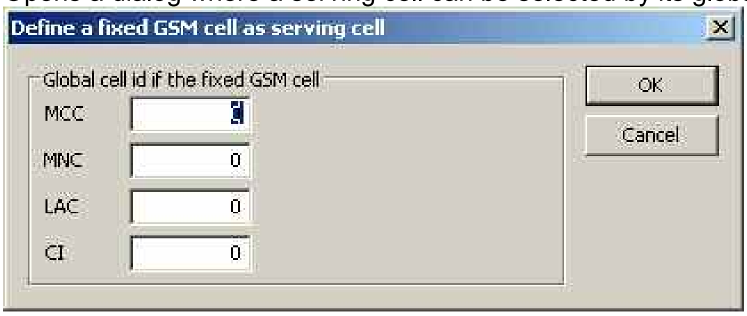
Shows a list in which serving cell sources can be added or deleted.

Delete selected entry
Deletes the selected SC source from the list.

Add a TopN member as source of SC
Opens a selection dialog for TopN members to be the SC source:



Add a fixed cell as source of SC
Opens a dialog where a serving cell can be selected by its global ID:



GSM BCH View

The *GSM BCH View* shows a list of all System Information (SI) decoded from the GSM BCH. The contents of each block appear in a tree view as soon as the block is selected. The SI types and their information elements are described in standard 3GPP TS 44.018.

The SI information is available only if the scanner data are recorded with *BCH Demodulation* enabled. Decoding of each SI type must be enabled explicitly in the GSM NWS driver configuration menu; see description in chapter 6.

The *GSM BCH* View displays the GSM System Information Types provided by the GSM BCH Demodulator.

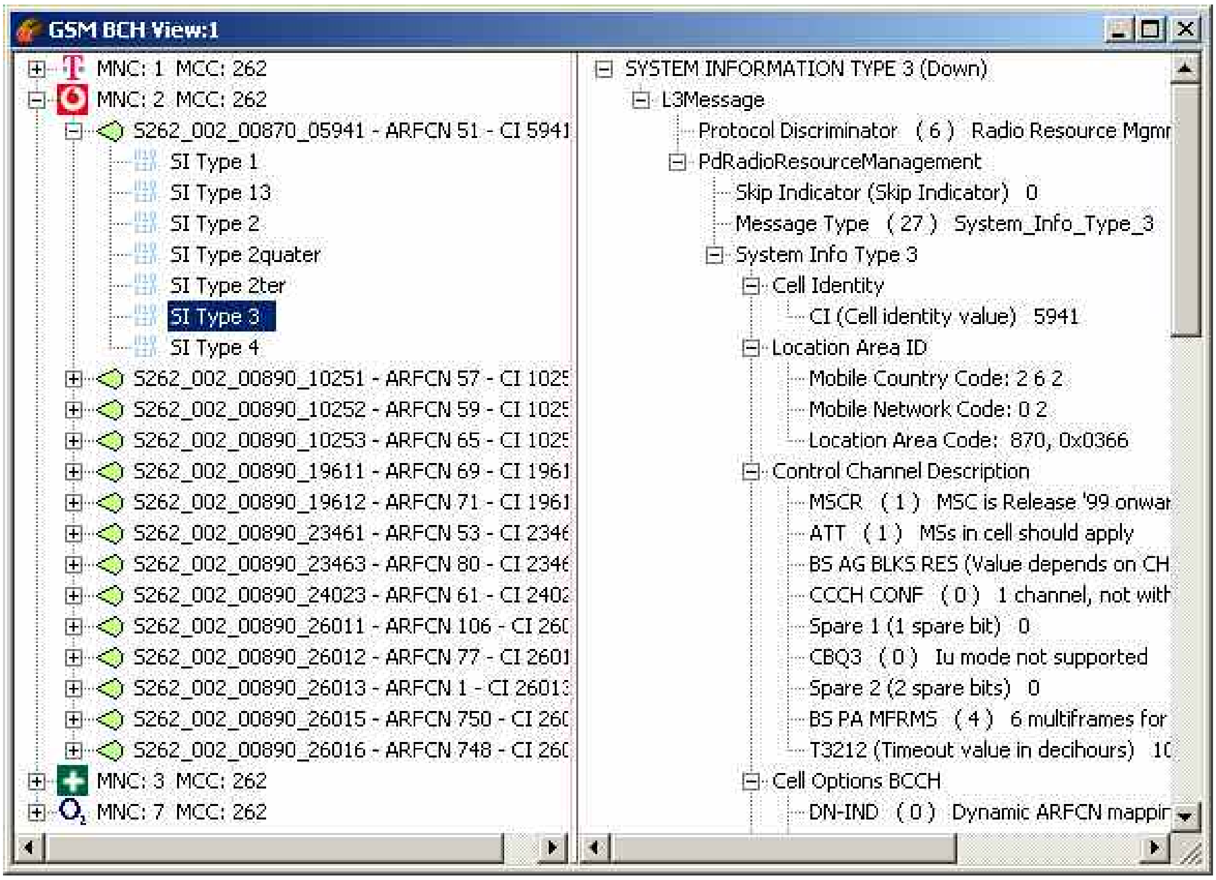


Fig. 4-281 GSM BCH View - SI Type content

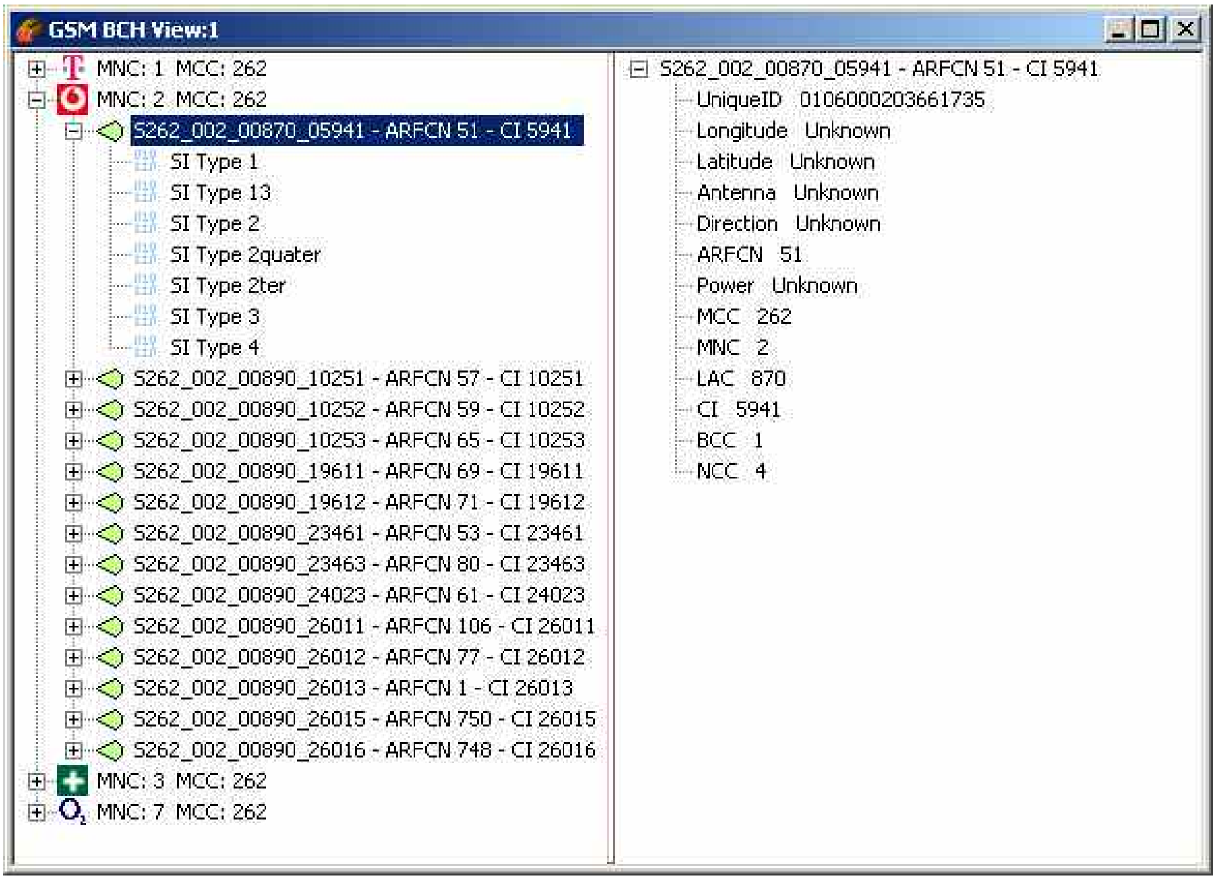


Fig. 4-282 GSM BCH View - BTS parameters

The view accumulates the SI Types acquired as tree and displays the decoded content of a certain System Information Type by clicking it. The information is grouped by the network provider, i.e. by MNC and MCC.

Each second level node of the data tree shown represents a BTS (Base Station Transceiver Sector) identified by MCC, MNC, CI and LAC. If it can be found in the GSM BTS Database loaded, the corresponding name is shown, e.g. MXB053A. Otherwise the name is composed as “S” followed by the hexadecimal values of those parameters, e.g. S0106000395AF35B5.

If an SI Type node is selected by clicking on it, its decoded content is shown as tree in the right part of the view. If a BTS node is selected by clicking on it, its parameters are shown.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, or save the current configuration as default; see *Context menu* description on p. 4.2. The context menu provides the following additional, view-specific commands:

Show Base Station on Map
: *Use the color selected in the* GSM BCH View *configuration menu (see below) to mark the selected GSM cells in the* Route Track *view. This feature is only available while a cell is selected in the view. The UMTS layer / GSM BTS layer in the* Route Track *view must be visible to use this feature.*

Hide Base Station on Map
: *Hide the selected GSM cell in the* Route Track *view.*

Hide all Base Stations on Map
: *Hide all selected GSM cells in the* Route Track *view.*

Generate BTS List
: *The BTS list can also be generated after the complete file has been replayed and ROMES has been stopped.*

Export Sys Info
: *The System Information can be exported to an ASCII file in the EXPORT directory of ROMES.*

Export System Information

If the export has been started before measurement or replay has been stopped, the file contains all System Information starting from the selected node in the BCH tree, i.e. all SIs of the selected BTS or all SIs belonging to all BTSs of one provider (MCC, MNC).

If the export has been started after measurement or replay has been stopped, the file contains all SIs belonging to all BTSs of the GSM BCH View.

The System Information can be exported to an ASCII file in the EXPORT directory of ROMES. The export file is named:

GSM_SysInfo_<measurement filename>.txt

Content Export File

```
Provider MNC: 2  MCC: 262
BTS MXBW70A - ARFCN 4 - CI 32701 - Lon 11°26'18"E - Lat
48°8'19"N


SYSTEM INFORMATION TYPE 3 (Down)
L3Message
->
Protocol Discriminator   ( 6 )   Radio Resource Mgmnt
PdRadioResourceManagement
->
Skip Indicator (Skip Indicator)   0
Message Type   ( 27 )   System_Info_Type_3
System Info Type 3
->
Cell Identity
->
CI (Cell identity value)   32701
<-
Location Area ID
->
Mobile Country Code: 2 6 2
Mobile Network Code: 0 2
Location Area Code:  893, 0x037D
<-
Control Channel Description
->
MSCR   ( 1 )   MSC is Release '99 onwards
ATT   ( 1 )   MSs in cell should apply
BS AG BLKS RES (Value depends on CHAN CONF)   1
CCCH CONF   ( 0 )   1 channel, not with SDCCHs
Spare 1 (1 spare bit)   0
CBQ3   ( 0 )   Iu mode not supported
Spare 2 (2 spare bits)   0
BS PA MFRMS   ( 4 )   6 multiframes for TX
T3212 (Timeout value in decihours)   10
<-
Cell Options BCCH
->
DN-IND   ( 0 )   Dynamic ARFCN mapping not used
PWRC   ( 0 )   PWRC is not set
```

Position Estimation

If Position Estimation is active (see Position Estimation Driver), the estimated positions are added to the BTS entries. Estimated positions are marked by an asterisk.

During measurement, the view automatically generates a BTS list import files with an entry for every estimated BTS position.

Files

Two files are generated for each *.rscmd measurememnt file.

GSM_BTS_LIST<measurement filename>.ATD	Contains the database definition.
GSM_BTS_LIST<measurement filename>.TXT	Contains the BTS data.

Example

Measurement file:	manert_bts-position-estimation__2008-01-11_20-32-07.rscmd
Generated files:	GSM_BTS_LIST_manert_bts-position-estimation__2008-01-11_20-55-47.ATD
	GSM_BTS_LIST_manert_bts-position-estimation__2008-01-11_20-55-47.TXT

Content ATD file

```
[Main]
Type=ATD
[Table1]
Name=
File=GSM_BTS_LIST_manert_bts-position-estimation__2008-01-11_20-55-47.TXT
Columns_Size=13
Columns0_Name=BTS_Name
Columns0_Type=utDynChar
Columns1_Name=Longitude
Columns1_Type=utDouble
Columns2_Name=Latitude
Columns2_Type=utDouble
Columns3_Name=BCC
Columns3_Type=utUTInt
Columns4_Name=C0
Columns4_Type=utUSInt
Columns5_Name=CI
Columns5_Type=utUSInt
Columns6_Name=NCC
Columns6_Type=utUTInt
Columns7_Name=LAC
Columns7_Type=utUSInt
Columns8_Name=MNC
Columns8_Type=utUTInt
Columns9_Name=MCC
Columns9_Type=utUTInt
Columns10_Name=#PosErr1
Columns10_Type=utFloat
Columns11_Name=#PosErr2
Columns11_Type=utFloat
Columns12_Name=#Err1Axis
Columns12_Type=utFloat
```

Content TXT file

```
#Sectorame;#Longitude;#Latitude;#BCC;#BCCH;#CI;#NCC;#LAC;#MNC;#MCC;#PosErr1;#PosErr2;#Err1Axis;
S0106000A1B8F02ED; 11.301098; 48.106977; 7; 967;   749; 7;  7055; 10; 262;  316;   178; -45.8;
S0106000395AF83AD; 11.301593; 48.106943; 4; 998; 33709; 3; 38319;  3; 262;    0;     0;   0.0;
S0106000395AF35B5; 11.303235; 48.107451; 3; 987; 13749; 3; 38319;  3; 262;    0;     0;   0.0;
S0106000395AF83C1; 11.301747; 48.107044; 0; 985; 33729; 3; 38319;  3; 262;    0;     0;   0.0;
S0106000395AF83B7; 11.302060; 48.107289; 0; 992; 33719; 3; 38319;  3; 262;  145;   112; -30.6;
S0106000203481BD1; 11.301003; 48.106554; 7;   1;  7121; 3;   840;  2; 262;    0;     0;   0.0;
S01060001840A0C6C; 11.238018; 48.106229; 4; 101;  3180; 3; 33802;  1; 262; 9718;  5794; -91.9;
S01060001840ACB67; 11.318230; 48.110330; 7;  85; 52071; 3; 33802;  1; 262;    0;     0;   0.0;
S01060001840A7869; 11.300633; 48.106320; 6;  95; 30825; 3; 33802;  1; 262;    0;     0;   0.0;
```

Note:

The BTS List files are stored in the R&S ROMES measurement directory.

This BTS list can also be generated after the complete file has been replayed and ROMES has been stopped via the view's context menu option “Generate BTS List”

GSM BCH – Configuration

The *GSM BCH View* configuration menu defines the color for the selected Node B / BTS symbols in the *Route Track View* and defines the filter for Node B / BTS list generating. It is opened via a right mouse click on a point inside the *GSM BCH View* (see chapter 3).

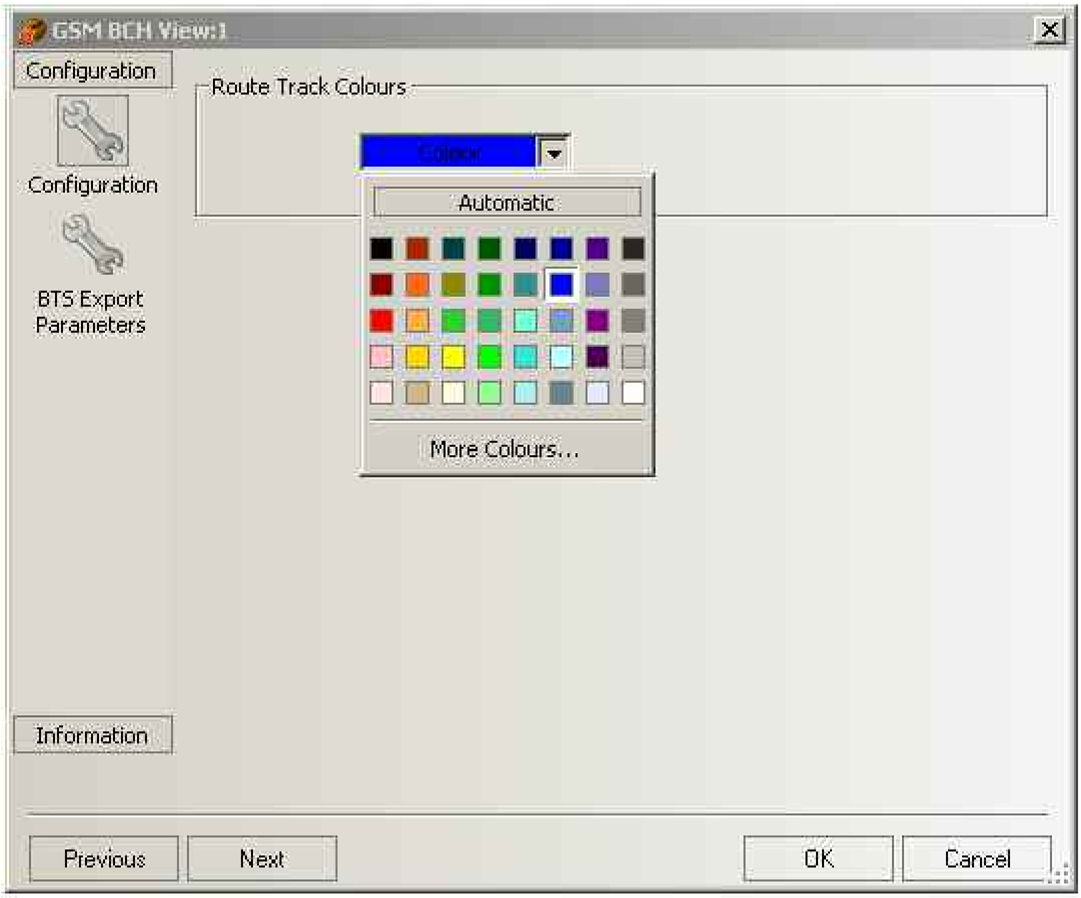


Fig. 4-283 GSM BCH View - Configuration

The *BTS Export Parameters* tab defines a filter for Node B / BTS list generating.

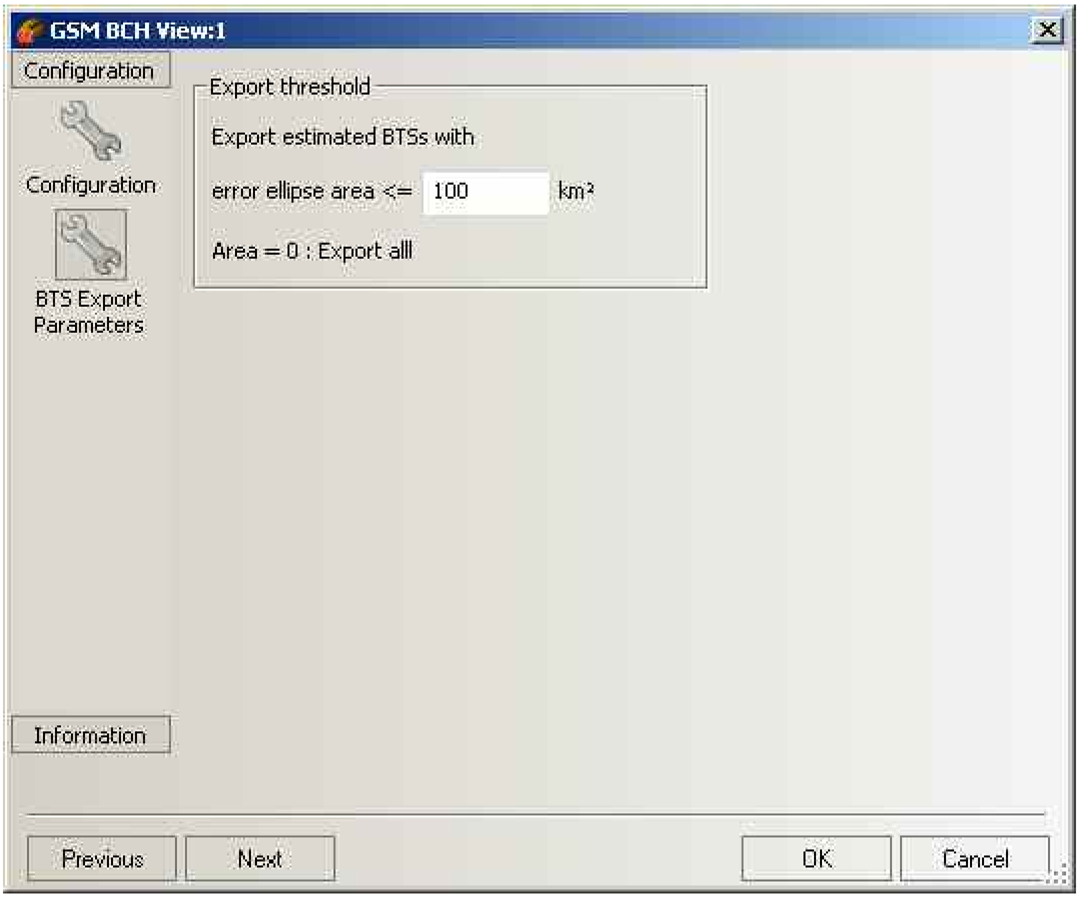


Fig. 4-284 GSM BCH View - BTS Export Parameters

Export estimated BTS with …

The filtering is done by a threshold value for the error ellipse area of the estimated position. If this value is 0, all BTS entries with estimated position will be exported. Otherwise, only entries whose error ellipse area is less than the threshold value will be exported via the BCH View's "Generate BTS (NodeB) List" context menu item.

The error ellipse area A_ε can be calculated from the position error values:

$$A_\varepsilon = PosErr1 * PosErr2 * \pi$$

GSM NWS Frequency Reuse Time Slot View

The *GSM NWS Frequency Reuse Time Slot View* shows the results of the time slot and channel power measurements. Mobiles are used as source for the serving cell.

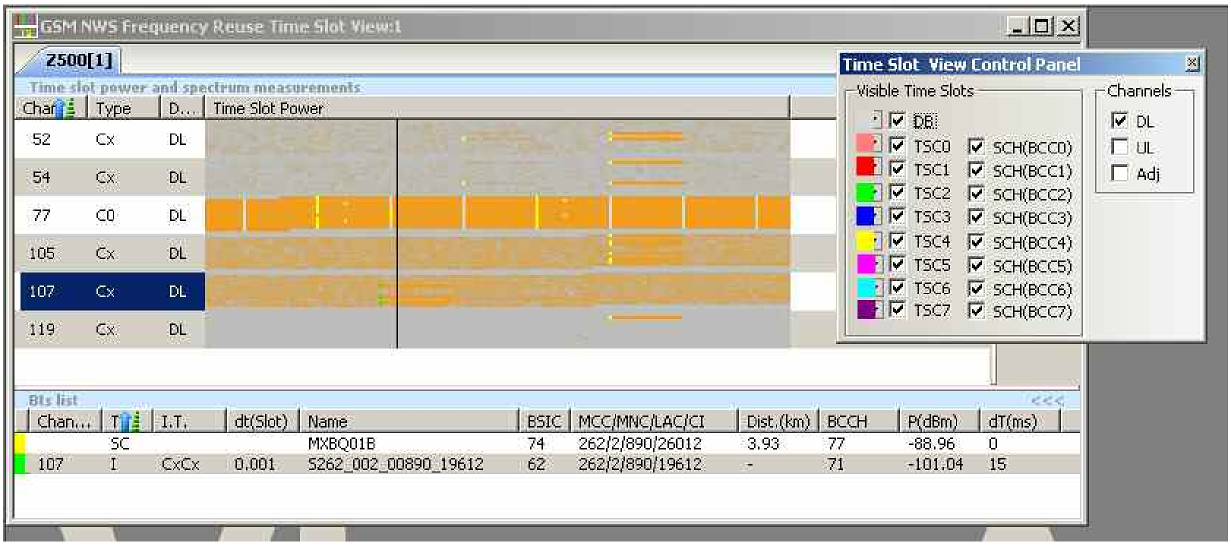


Fig. 4-285 GSM NWS Frequency Reuse Time Slot View

View area

The entire view area is horizontally split to accommodate two different tables for the *Time slot power and spectrum measurements* and the *BTS list*. A click on the Active Set or Neighbor Set title bars compresses and expands the corresponding table. A compressed table leaves more space for the other table. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol. The contents of both tables can be selected in the configuration menu.

Table list (Time slot power and spectrum measurements)

Display time slot power, channel type and direction for each channel of the serving cell.

Channel	Show the channel number.
Type	Display the channel type. (C0/Cx).
Direction	Display the channel type for the destination. DL, UL or Adj.
Time Slot Power	Displaying a graphic the time slot power.

The channel power is marked in gray-orange colors.

SCH/TSC/DB time slots are visible as dots with the BCC colors or light gray as shown in the control panel.

The colored dots for the time slot measurements are shown at the start of the time slots.

The width of the graphic is 8 slots (which is one GSM frame). The height of the graphic is 12 GSM frames. This means the 50 ms channel power measurement is folded into 12 lines and the time axis is from left to right and from top to bottom.

This is the basic design. The example view above shows 13 lines because the channel power has to be time adjusted to the GSM frames so that the power data begin somewhere in the first line and end somewhere in the additional 13. line. Furthermore every line is shown twice to make a nice picture (26 lines overall).

The channel power display is normalized for each channel to show the upper 32 dBm of the measurement in different color values. Therefore every channel display contains at least one dot with the color for highest power and the channel power coloring is relative and not absolute.

BTs list

Show data of the serving cell and data of identified interferers.

Channel — Show the channel number of the channel where interferer time slots is measured.

Type — Display the entry type.

SC
: Serving Cell

I
: *Interferer*

I.T. — Defines the Interferer Type.

C0C0
: The BCCH numbers of the interferer and the serving cell are equal.

C0Cx
: One of the TCH channel numbers of the interferer is equal to the BCCH number of the serving cell.

CxC0
: One of the TCH channel numbers of the serving cell is equal to the BCCH number of the interferer.

CxCx
: *One or more of the TCH numbers of the interferer and the serving cell are equal.*

dt(Slot) — Define the delta time between the interferer time slot measurement and the interferer SCH Info measurement.

Name — Define the BTS name and sector number from the BTS data base.

BSIC — Base transceiver station (BTS) identity code. In this view the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the *Available Signals* tab of the *Preferences* menu (octal/ decimal/hex).

CGI — Cell Global Identity

The Cell Global Identity is the concatenation of the MCC (Mobile Country Code), MNC (Mobile Network Code), LAI (Location Area Identity) and the CI (Cell Identity).

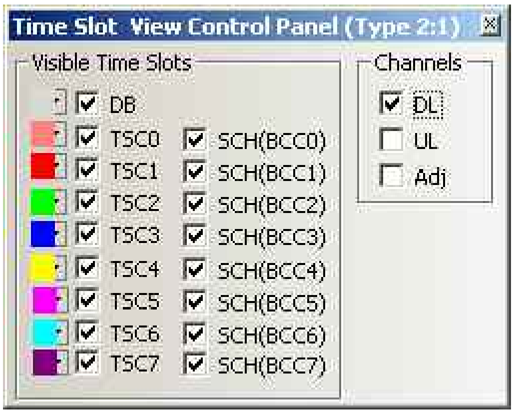
Dist.(Km) — Distance between the potential interferer and the serving cell in km, calculated from the BTS data base. 0 km means that the interferer is a different sector of the same BTS.

BCCH — Number of the broadcast control channel of the cell and mobile.

P(dBm) — BTS signal power of the SCH burst in dBm.

dT(ms) — Delta T in ms between the interferer SCH burst measurement and serving cell SCH burst measurement.

Time Slot View Control Panel



The panel allows to activate and deactivate the view of the available Time Slots. Furthermore a mouse click on the color field allows to change the color of the selected Time Slot.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default, see *Context menu* description on p. 4.2. . The context menu contains the following additional commands:

Show Control Panel

The Time Slot View Control Panel allows to change view settings of the Time Slot View. Over the Control Panel the visible time slots channels and destination channel types (UL, DL, Adj) can activated or deactivated.

The example above shows a CxCx interferer on the traffic channel 107 which is identified by its timing and the TSC (green).

If the user clicks into a graphic in the channel list, an automatic function looks for the nearest identifiable time slot power measurement (SCH, TSC, DB) on the channel.

In this case the green TSC measurement was found. From its timing and its TSC followed, that the shown Bts S262_002_00890_19612 is the best match of all measured stations and so its data are shown in the lower list.

The value dt(slot) shows how close the match in timing is between the time slot measurement and the SCH measurement of the shown station. It is measured in fractions of one GSM time slot. The best match would be dt=0.000 . The shown dt of 0.001 is a very good value, it means a delta t of about 0.6 microseconds or 0.156 GSM Bits.

In case of multiple interferers on a channel it is important to place the cursor line very close to the interferer power dots which shall be evaluated.

GSM NWS Frequency Reuse Time Slot View Configuration

The *GSM NWS Frequency Reuse View Time Slot* configuration menu allows to change the update behavior of the visible table and BTS list.

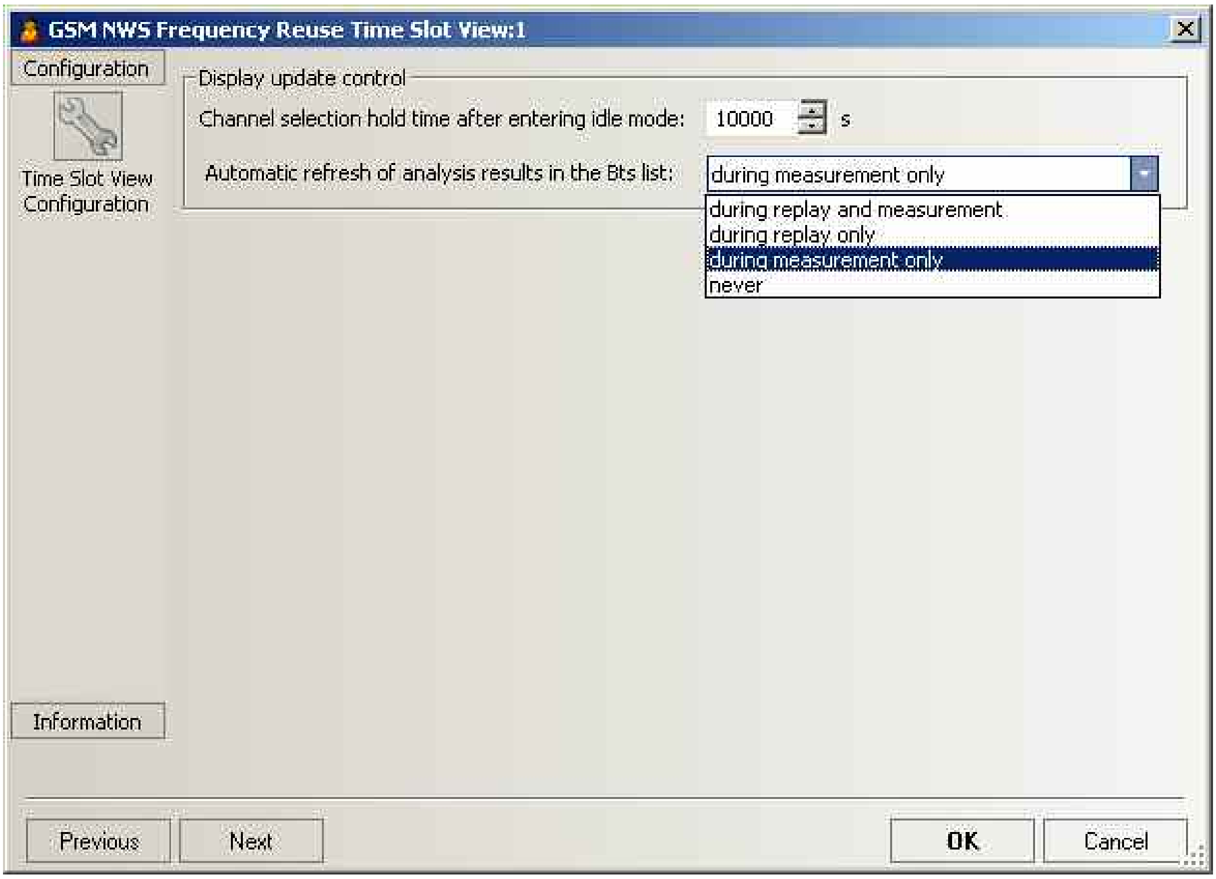


Fig. 4-286 GSM NWS Frequency Reuse Time Slot View Configuration

Display update control

Change the update behavior of the view.

Channel selection hold time after entering idle mode

The value range is between 0.. 3600 seconds. Ohterwise an error message appears.

Automatic refresh of analysis results in the BTS list

Following values are available:

- during measurement only
- during replay only
- during measurement and replay only
- never

GSM NWS Frequency Reuse Time Slot View Type 2

The *GSM NWS Frequency Reuse Time Slot View Type 2* shows the results of the time slot and channel power measurements. TopN members or fixed stations are used as source for the serving cell.

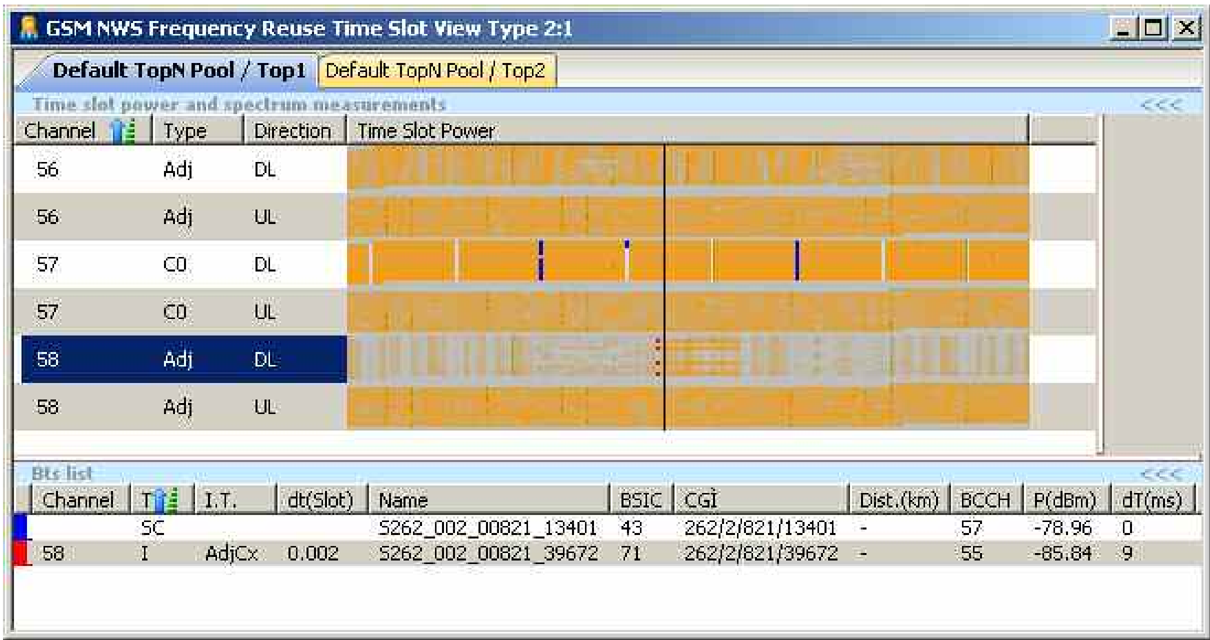


Fig. 4-287 GSM NWS Frequency Reuse View Type 2 Time Slot

View area

The entire view area is horizontally split to accommodate two different tables for the *Time slot power and spectrum measurements* and the *BTS list*. A click on the Active Set or Neighbor Set title bars compresses and expands the corresponding table. A compressed table leaves more space for the other table. A compressed table is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol. The contents of both tables can be selected in the configuration menu.

Table list (Time slot power and spectrum measurements)

Display time slot power, channel type and direction for each channel of the serving cell.

Channel
Show the channel number.

Type
Display the channel type. (C0/Cx).

Direction
Display the channel type for the destination. DL, UL or Adj.

Time Slot Power
A graphic visualize the time slot power.

The channel power is marked in gray-orange colors.

SCH/TSC/DB time slots are visible as dots with the BCC colors or light gray as shown in the control panel.

The colored dots for the time slot measurements are shown at the start of the time slots.

The width of the graphic is 8 slots (which is one GSM frame). The height of the graphic is 12 GSM frames. This means the 50 ms channel power measurement is folded into 12 lines and the time axis is from left to right and from top to bottom.

This is the basic design. The example view above shows 13 lines because the channel power has to be time adjusted to the GSM frames so that the power data begin somewhere in the first line and end somewhere in the additional 13. line. Furthermore every line is shown twice to make a nice picture (26 lines overall).

The channel power display is normalized for each channel to show the upper 32 dBm of the measurement in different color values. Therefore every channel display contains at least one dot with the color for highest power and the channel power coloring is relative and not absolute.

BTs list

Show data of the serving cell and data of identified interferers.

Channel Show the channel number of the channel where interferer time slots is measured.

Type Display the entry type.

SC
Serving Cell

I
Interferer

I.T. Defines the Interferer Type.

C0C0
The BCCH numbers of the interferer and the serving cell are equal.

C0Cx
One of the TCH channel numbers of the interferer is equal to the BCCH number of the serving cell.

CxC0
One of the TCH channel numbers of the serving cell is equal to the BCCH number of the interferer.

CxCx
One or more of the TCH numbers of the interferer and the serving cell are equal.

dt(Slot) Define the delta time between the interferer time slot measurement and the interferer SCH Info measurement.

Name Define the BTS name and sector number from the BTS data base.

BSIC Base transceiver station (BTS) identity code. In this view, the BSIC is always octal (so that BSIC = ab where a is the NCC and b is the BCC), irrespective of the format selected in the *Available Signals* tab of the *Preferences* menu (octal/ decimal/hex).

CGI Cell Global Identity

The Cell Global Identity is the concatenation of the MCC (Mobile Country Code), MNC (Mobile Network Code), LAI (Location Area Identity) and the CI (Cell Identity).

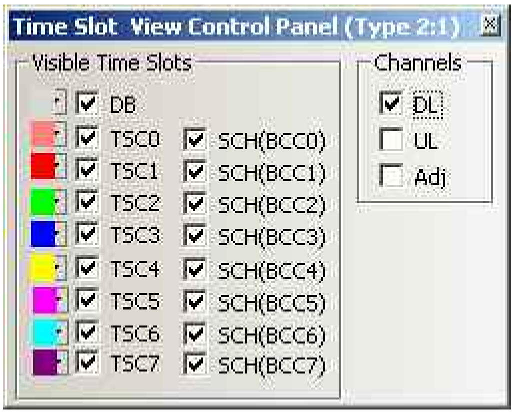
Dist.(Km) Distance between the potential interferer and the serving cell in km, calculated from the BTS data base. 0 km means that the interferer is a different sector of the same BTS.

BCCH Number of the broadcast control channel of the cell and mobile.

P(dBm) BTS signal power of the SCH burst in dBm.

dT(ms) Delta T in ms between the interferer SCH burst measurement and serving cell SCH burst measurement.

Time Slot View Control Panel



The panel allows to activate and deactivate the view of the available Time Slots. Furthermore a mouse click on the color field allows to change the color of the selected Time Slot.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default, see *Context menu* description on p. 4.2. . The context menu contains the following additional commands:

Show Control Panel

The Time Slot View Control Panel allows to change view settings of the Time Slot View. Over the Control Panel the visible time slots channels and destination channel types (UL, DL, Adj) can activated or deactivated.

GSM NWS Frequency Reuse Time Slot View Type 2 Subviews Configuration

The *GSM NWS Frequency Reuse Time Slot View Type 2* configuration menu allows to add and remove the used serving sells, specifies the update behavior of the view and defines the threshold values.

The *Subviews Configuration* tab adds and removes serving cell sources.

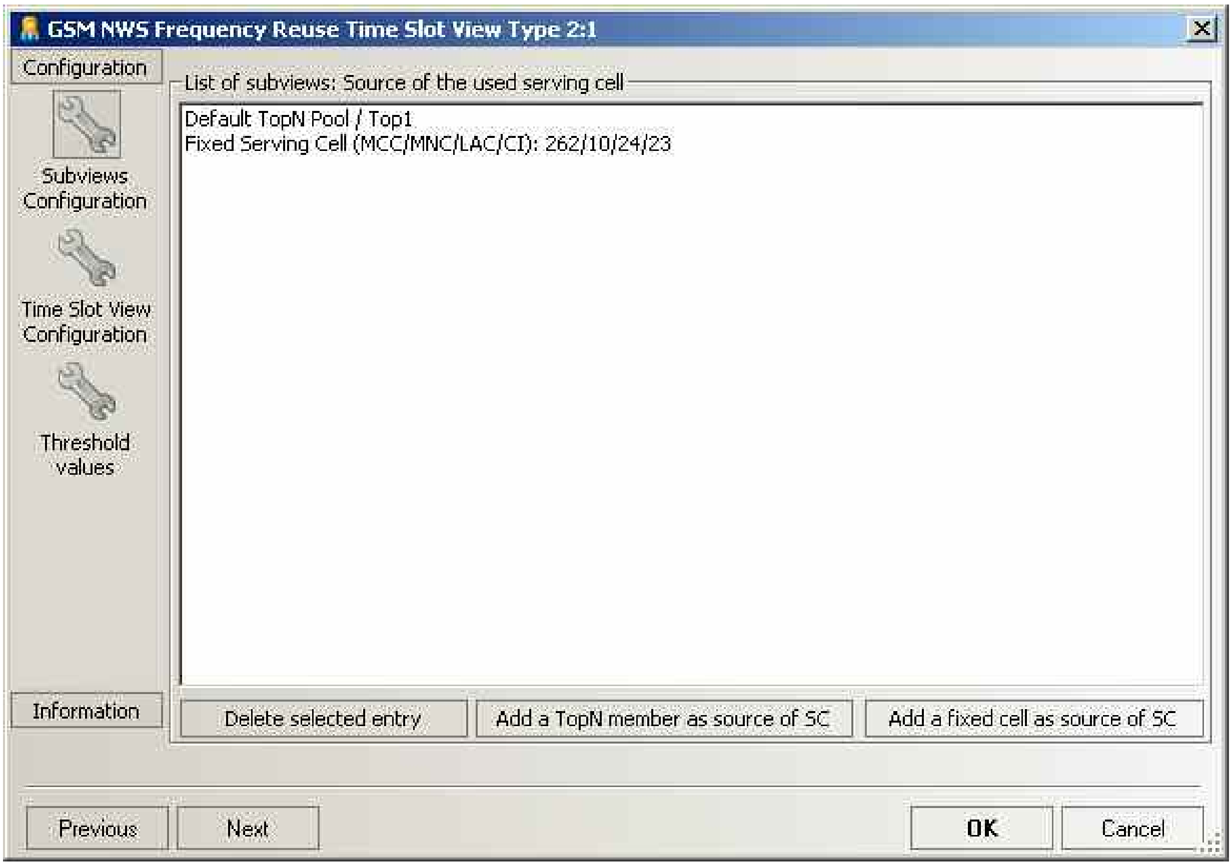


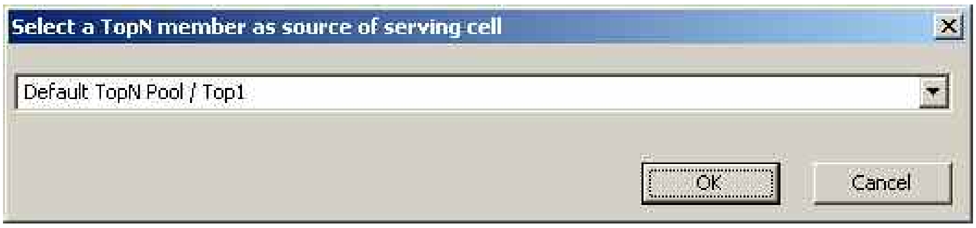
Fig. 4-288 GSM NWS Frequency Reuse Time Slot View Type 2 Subviews Configuration

List of subviews: Source ... Shows a list in which serving cell sources can be added or deleted.

Delete selected entry Deletes the selected serving cell source from the list.

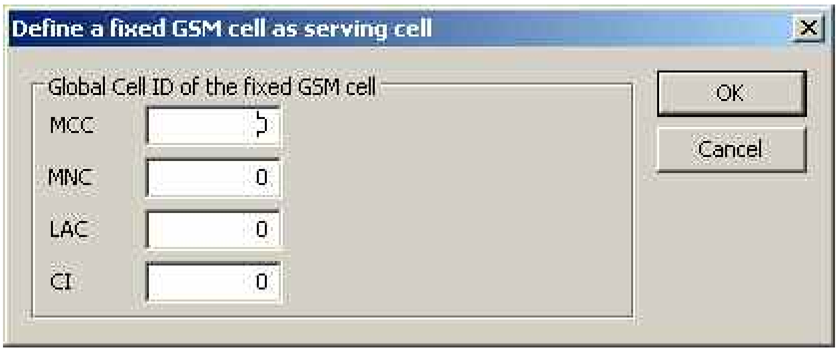
Add a TopN member as source of SC

Opens a selection dialog for TopN members to be the serving cell source:



Add a fixed cell as source of SC

Opens a dialog where a serving cell can be selected by its global ID



GSM NWS Frequency Reuse Time Slot View Type 2 Time Slot View Configuration

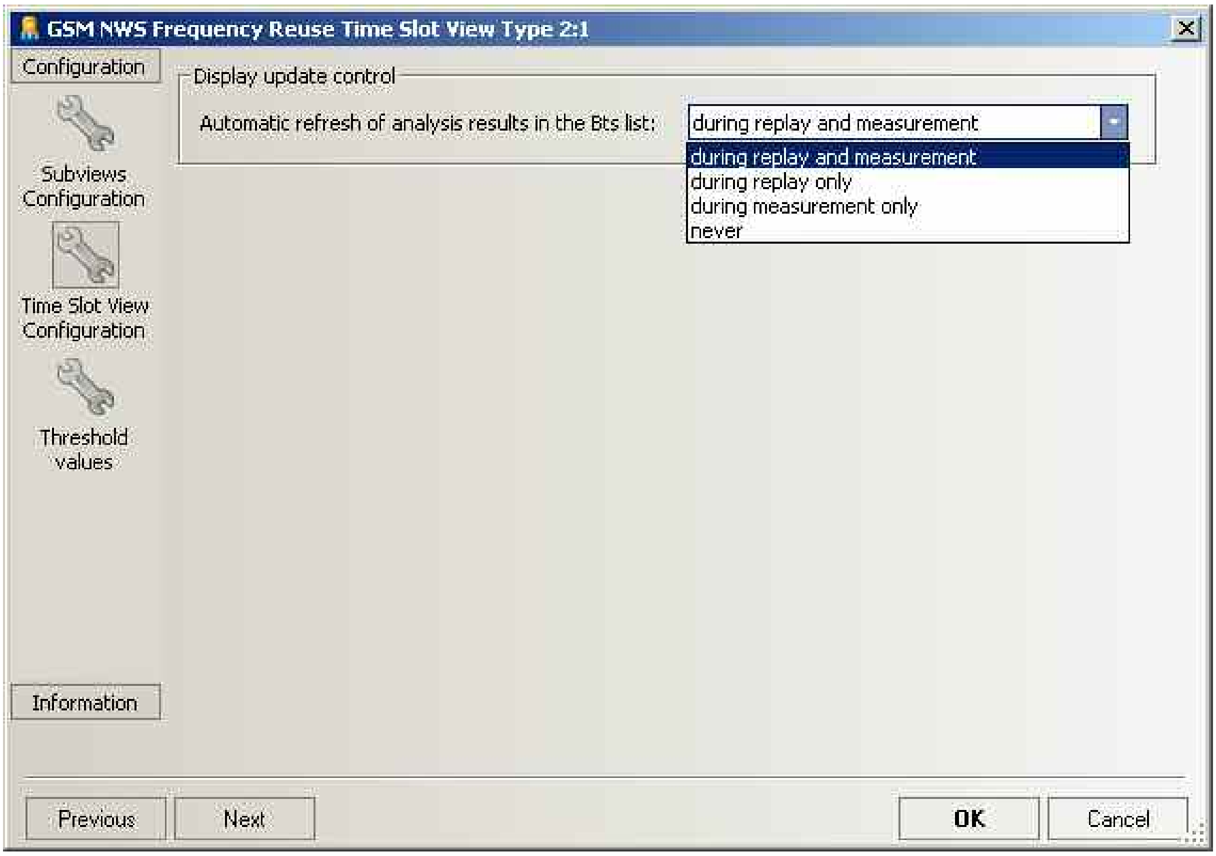


Fig. 4-289 GSM NWS Frequency Reuse View Time Slot View Time Slot View Configuration

Display update control

Change the update behavior of the view.

Automatic refresh of analysis results in the BTS list

Following values are available:

- during measurement only
- during replay only
- during measurement and replay only
- never

GSM NWS Frequency Reuse Time Slot View Type 2 Threshold values

The *Threshold values* tab sets conditions for the generated alarm messages and the displayed potential interferers.

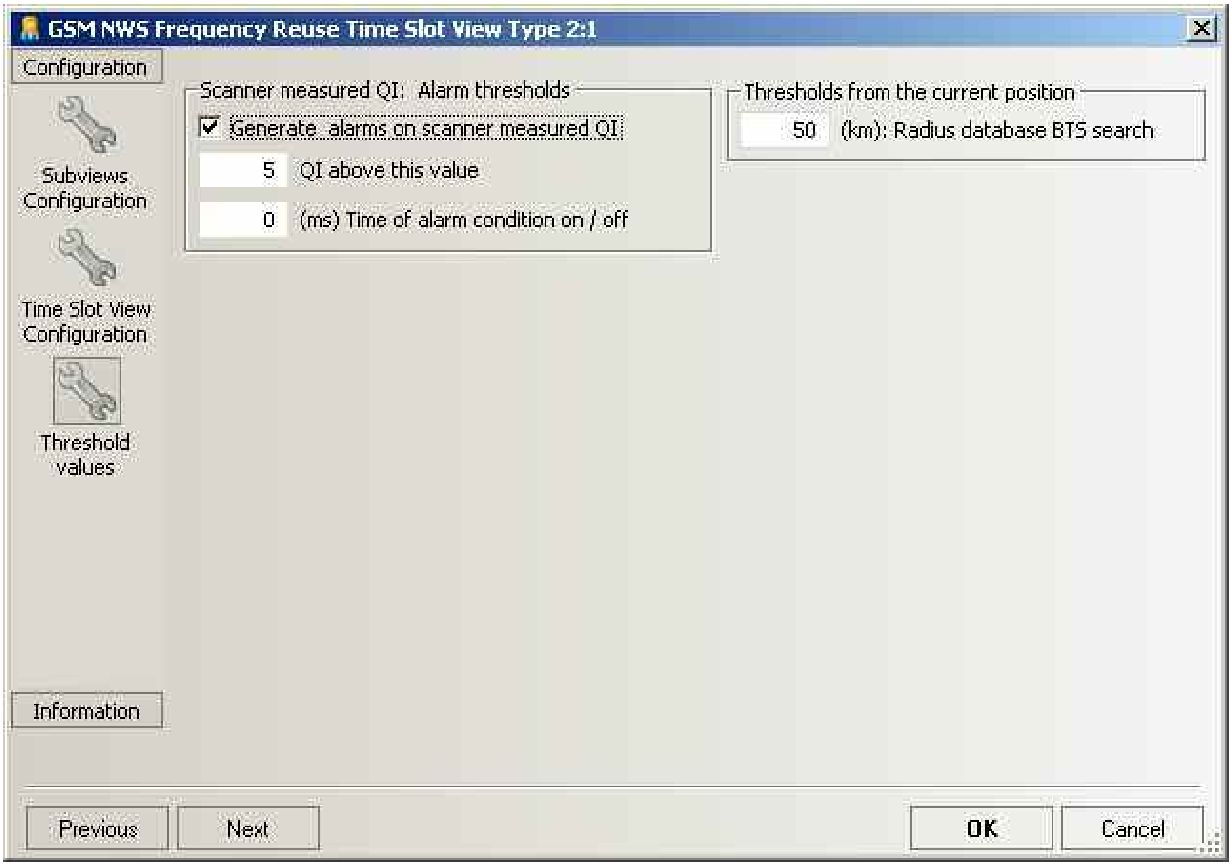


Fig. 4-290 GSM NWS Frequency Reuse Time Slot View Type 2 Threshold values

Scanner measured QI: Alarm thresholds

Generate alarms on scanner measured QI.

Thresholds from the current position

The BTS search threshold limits the database search for potential interferers to a circle around the current position with specified radius. Base stations outside this radius are not considered as Potential Interferers. They are also discarded for the top N list in the lower part of the NWS Frequency Reuse View.

WLAN Views

The *WLAN Views* show the WLAN information obtained in the network scans performed by a WLAN adapter in regular intervals. WLAN data can be acquired with Wireless LAN Client Adapters supporting Network Device Interface Specification (NDIS) V5.1 or higher using the *R&S IEEE 802.11 Wireless LAN NDIS* driver.

The *WLAN Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse pauses over *WLAN Views*.

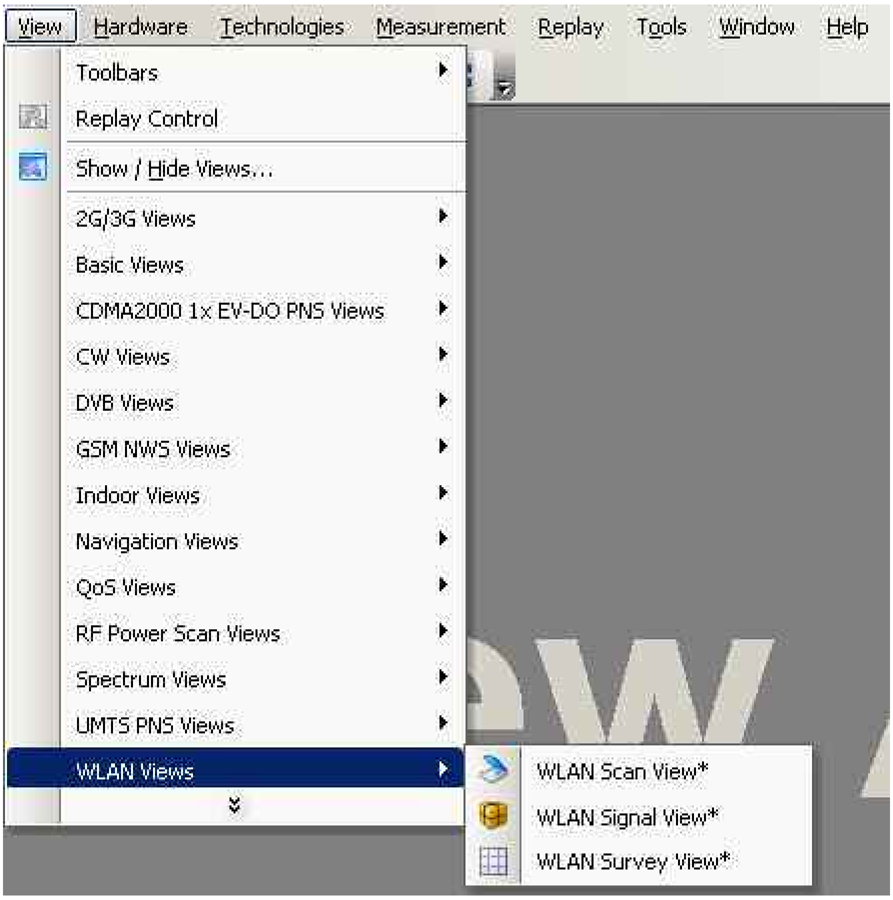


Fig. 4-291 WLAN views

WLAN adapters constantly monitor and report a large number of parameters describing the current signal quality and data traffic. The parameters are used to generate the signals in the WLAN section of the data tree. The signals complement the WLAN network scan information; they can be viewed in the *Basic Views*.

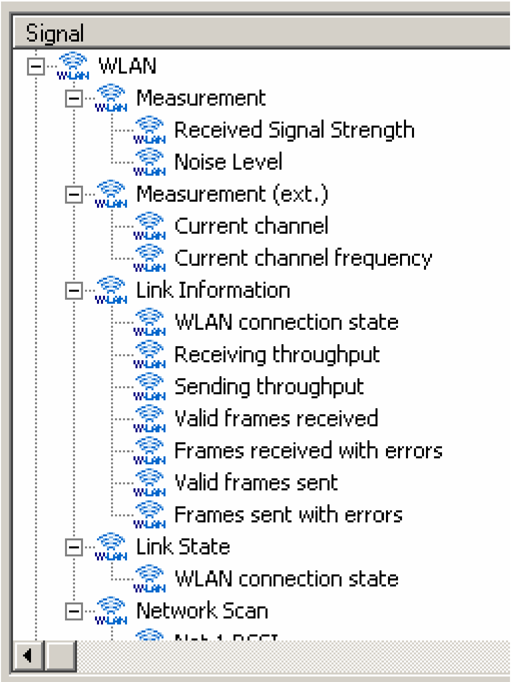


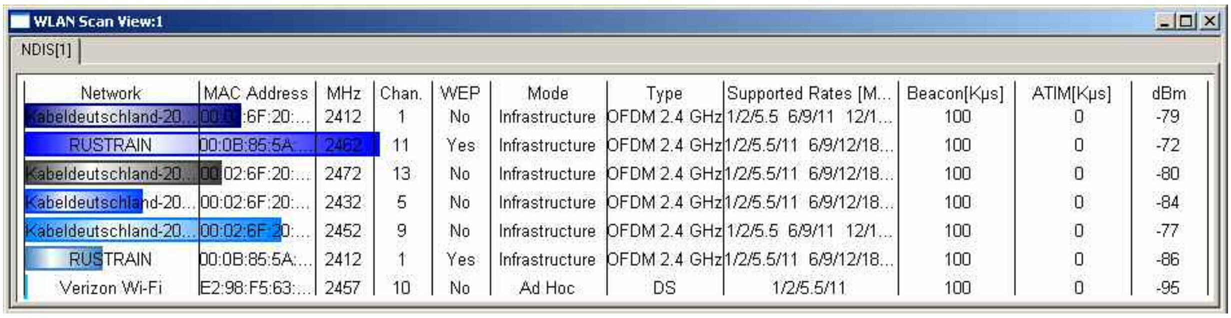
Fig. 4-292 WLAN signals

Note:

The data to be displayed in the WLAN views is collected by the test device during the network scan. It is only transferred to R&S ROMES and stored to a measurement file after the network scan is complete. In contrast the Received Signal Strength, the Link Information and the Link State signals (see figure above) are continuously monitored. As a consequence, the current Received Signal Strength is generally not equal to the RSSI displayed in the Scan View.

WLAN Scan View

The *WLAN Scan View* displays basic information acquired in a WLAN network scan (WLAN BSSID list information).



Network	MAC Address	MHz	Chan.	WEP	Mode	Type	Supported Rates [M...	Beacon[Kµs]	ATIM[Kµs]	dBm
Kabeldeutschland-20...	00:0[illegible]:6F:20:...	2412	1	No	Infrastructure	OFDM 2.4 GHz	1/2/5.5 6/9/11 12/1...	100	0	-79
RUSTRAIN	00:0B:85:5A:...	2462	11	Yes	Infrastructure	OFDM 2.4 GHz	1/2/5.5/11 6/9/12/18...	100	0	-72
Kabeldeutschland-20...	00:02:6F:20:...	2472	13	No	Infrastructure	OFDM 2.4 GHz	1/2/5.5/11 6/9/12/18...	100	0	-80
Kabeldeutschland-20...	00:02:6F:20:...	2432	5	No	Infrastructure	OFDM 2.4 GHz	1/2/5.5/11 6/9/12/18...	100	0	-84
Kabeldeutschland-20...	00:02:6F:20:...	2452	9	No	Infrastructure	OFDM 2.4 GHz	1/2/5.5 6/9/11 12/1...	100	0	-77
RUSTRAIN	00:0B:85:5A:...	2412	1	Yes	Infrastructure	OFDM 2.4 GHz	1/2/5.5/11 6/9/12/18...	100	0	-86
Verizon Wi-Fi	E2:98:F5:63:...	2457	10	No	Ad Hoc	DS	1/2/5.5/11	100	0	-95

Fig. 4-293 WLAN Scan View

The results provided by each test device are displayed in a separate tab. Each tab shows the WLAN parameters of the signals from the access points detected by the test device in a network scan. The results are updated every time the test device terminates a network scan.

WLAN Parameters

Each access point generates a table row with a colored analog bar. The columns displayed and the maximum number of rows (access points) can be limited in the configuration menu. The length of each bar is a measure for the received signal strength *(RSSI)* of the signal from the access point; the numeric RSSI value appears in the *dBm* row. The scale settings in the configuration menu define the length of the bars.

The table contains the following parameters:

Network	Network name
MAC Address	Media Access Control (MAC) address of the access point or other client, depending on whether the test device operates in infrastructure or ad hoc mode. The MAC is a unique serial number assigned to a networking device by the manufacturer.
Chan.	Channel identifier of the radio channel that the test device uses for communication.
MHz	Center frequency of the used channel. According to standard IEEE 802.11b, the channel numbers 1 to 14 correspond to center frequencies of 2412 MHz, 2417 MHz … 2484 MHz. Depending on the regulatory domain, the channel range may be restricted.
WEP	Use of Wired Equivalent Privacy *(Yes/No)*. WEP is an optional security mechanism defined within the 802.11 standard designed to protect the data as it is transmitted through the wireless network.
Mode	*Infrastructure* or *Ad hoc* mode. In *Infrastructure* mode the test device can communicate with access points and other network infrastructure devices; in *Ad hoc* mode, it can also communicate with other client devices.
Type	Spread-spectrum type used for the physical layer: Direct Sequence *(DS)* or Frequency Hopping *(FS).*

Rates [MBit/s] Data rate at which the test device should transmit or receive data. *1/2/5/11/18/24/36/54* means that a 5-GHz test device uses Auto Rate Selection.

Beacon [Kµs] Beacon period in the range between 20 Kµs and 976 Kµs, specifies the duration between beacon packets, which are used to help clients find each other in ad hoc mode.
(Kµs is a measurement unit in software terms, K = 1024, µ = 10^{-6}, s = seconds, therefore 1 Kµs = 0.001024 seconds = 1.024 ms.)

ATIM [Kµs] Wake duration, specifies the amount of time following a beacon that the test device stays awake to receive announcement traffic indication message (ATIM) packets, which are sent to the adapter to keep it awake until the next beacon.

dBm Signal strength for all received packets (RSSI).

Hop Set Frequency hopping set including up to 78 pattern used in *FS* type transmission.

Hop Pattern Hopping pattern number used in *FS* type transmission.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default; see *Context menu* description on p. 4.2.

WLAN Scan View Configuration

The *WLAN Scan View Configuration* menu specifies the scale and the contents of the view, defines the color settings, and displays information about the view version. It is opened via a right mouse click on a point inside the *WLAN View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Configuration* tab defines the scale for the bars in the *WLAN Scan View,* specifies the maximum number of bars and selects the parameters shown in the table.

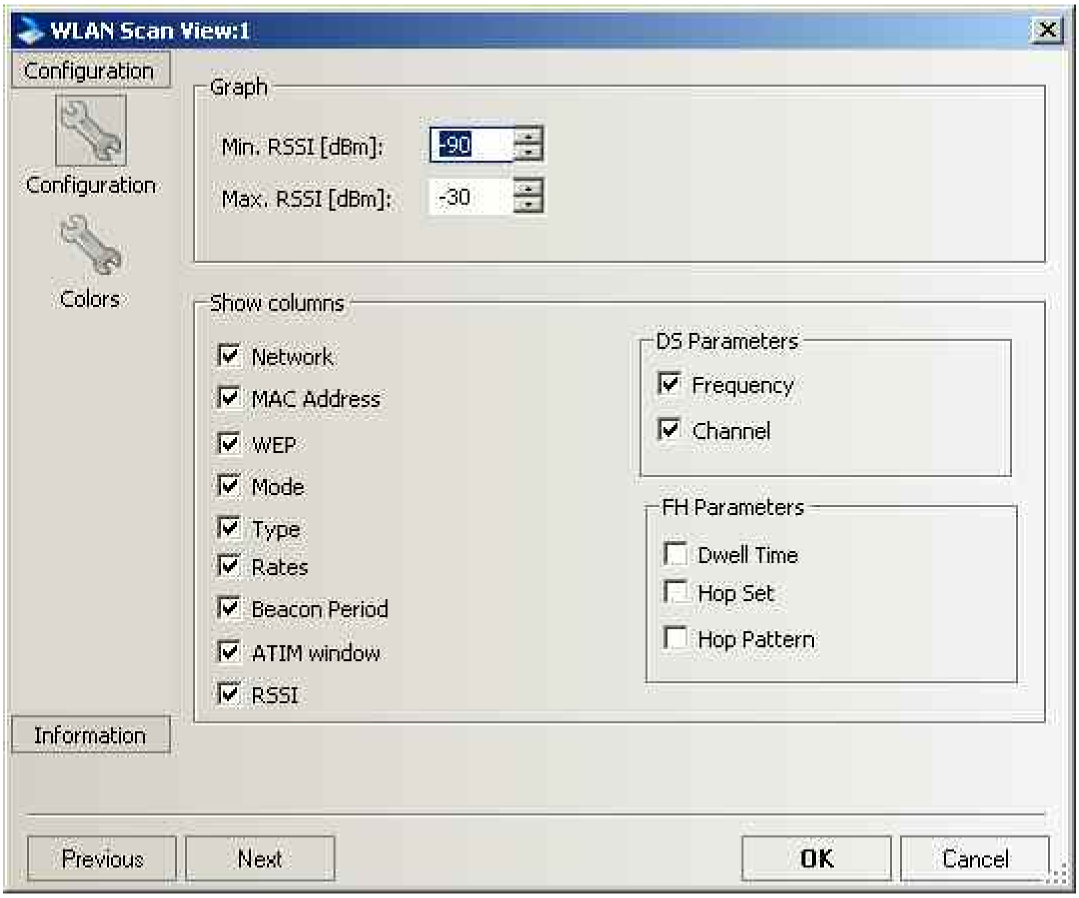


Fig. 4-294 WLAN Scan View Configuration

Graph

The three input fields in the *Graph* panel define the RSSI levels corresponding to bars of zero length and full length. The actual length of the bars in the *WLAN Scan View* is equal to:

*L = RSSI [dBm] * <full length> / (Max. RSSI [dBm] – Min. RSSI [dBm])*

Max. Count

Maximum number of bars/access points displayed in the WLAN Scan View. *The actual number can be smaller, if less than* Max. Count *access point signals are detected.*

Show Columns

Selects the parameters to be displayed in the *WLAN Scan View* table.

The *Colors* tab of the *WLAN Scan View* configuration menu defines the colors for all WLAN views.

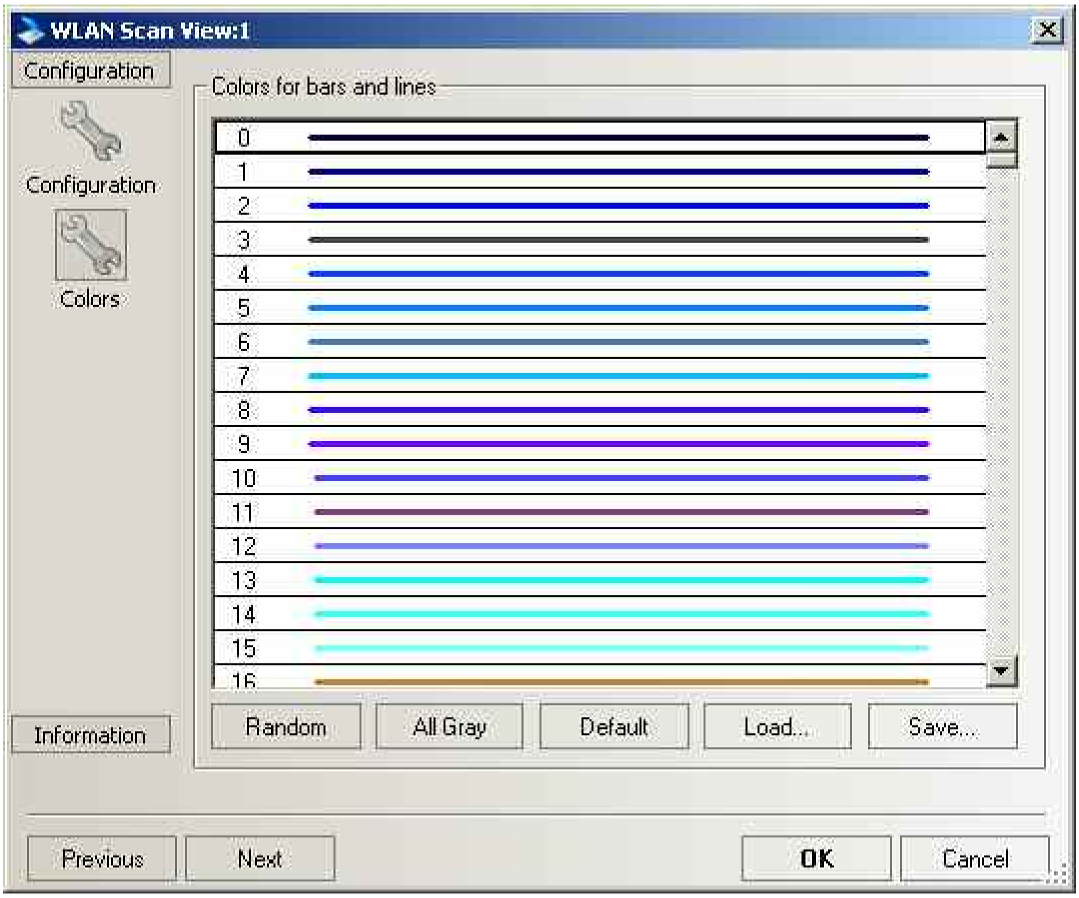


Fig. 4-295 WLAN Scan View Colors

The *Colors* menu is analogous to the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378. Note the following special features of the WLAN color settings:

- The color no. 0 is always used for the noise signal which is measured in a single, fixed channel defined in the NDIS driver configuration menu.
- The colors no. 1 to 500 can be assigned to signals from access points or other clients (the maximum number of signals received simultaneously is 39). The assignment is chronological: The first detected signal is displayed with color code no. 1, the second with color code no. 2, etc.
- The color settings in the WLAN configuration menus apply to all WLAN views; color definitions overwrite each other.

WLAN Signal View

The *WLAN Signal View* displays the RSSI of all received signals in a 3-dimensional bar graph.

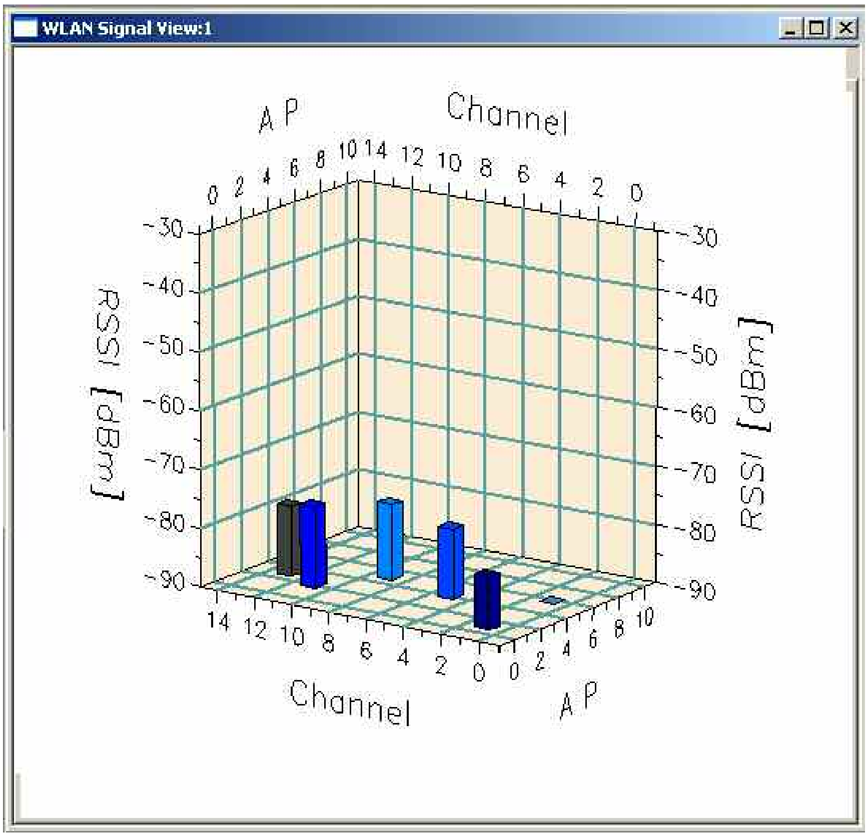


Fig. 4-296 WLAN Signal View

In the bar graph, the signals are sorted according to their channel number *(Channel)* and access point *(AP).* Each received signal generates a colored bar. The length of the bars is a measure for the received signal strength *(RSSI)*; the numeric RSSI value appears in the *dBm* row of the *WLAN Scan View* (see p.4.507).

Note:

A test device operating in Ad hoc mode can also communicate with other clients. The Signal View does not only show access point signals but all signals used for communication.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default; see *Context menu* description on p. 4.2.

The configuration menu is analogous to the *WLAN Scan View Configuration* menu. It defines the scale for the bars in the *WLAN Signal View.*

WLAN Survey View

The *WLAN Survey View* gives an overview of the measured WLAN parameters from all access points including the distribution of the RSSI, C/I, and S/N values.

If a replayed measurement file was recorded in *Block Mode*, the WLAN Survey View generates block-specific statistical results. Blocks are defined in the *Indoor View* as described in section Indoor Measurement Control on p. 4.365.

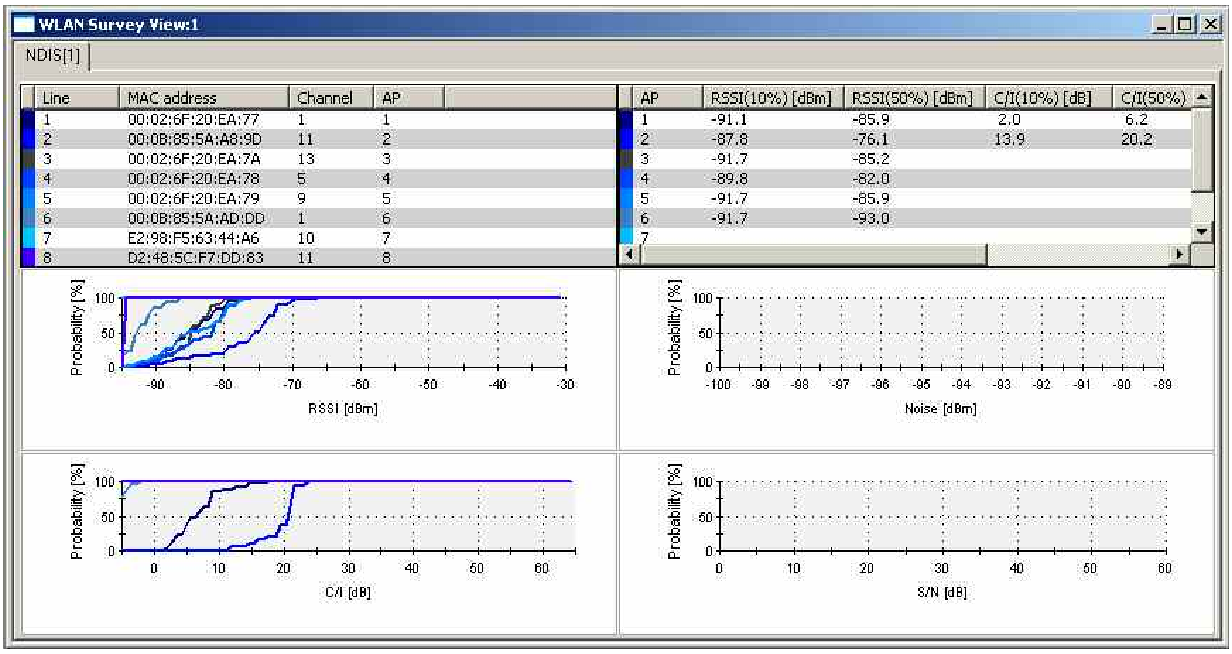


Fig. 4-297 WLAN Survey View

The WLAN Survey View contains an access point table, a percentage table, and four 2D chart diagrams.

Access point table

In the two tables, each access point generates a table row with a color code. The columns displayed and the colors can be defined in the configuration menu. The access point table in the left half of the view contains the following parameters:

Line
: *Number of the table row, assigned in the order the row is created. If n rows are displayed, the line numbers are 1 to n.*

AP
: *Number of the access point, assigned in ascending order according to the detection time of the access point signal. New access points always receive a new (higher) AP number, so the AP numbers and line numbers can be different as soon as a signal is no longer detected.*

MAC Address
: *Media Access Control (MAC) address of the access point. The MAC is a unique serial number assigned to a networking device by the manufacturer.*

Channel
: *Channel number that the access point uses for communication.*

Percentage table

The percentage table in the right half of the view contains the following parameters:

AP
: *Number of the access point, assigned in the order the access point signal is detected.*

RSSI (10%)
: *RSSI that is reached or exceeded by 90% of the measured values (10% of the measured RSSIs are below RSSI (10%)). RSSI denotes the received signal strength of the signal from the access point in dBm.*

RSSI (50%)
: *RSSI that is reached or exceeded by 50% of the measured values.*

C/I (10%)
: *C/I that is reached or exceeded by 90% of the measured values (10% of the measured C/I are below C/I (10%)). C/I denotes the ratio of the RSSI of the strongest (carrier) signal to the sum of the RSSIs of all other signals in the channel.*

C/I (50%)
: *C/I that is reached or exceeded by 50% of the measured values.*

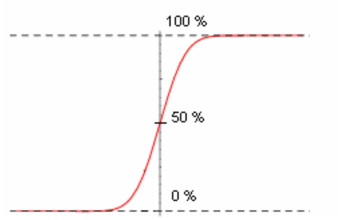
S/N (10%)
: *S/N that is reached or exceeded by 90% of the measured values (10% of the measured S/N are below S/N (10%)). S/N denotes the ratio of the RSSI of the strongest (carrier) signal in the noise channel to the noise level.*

S/N (50%)
: *S/N that is reached or exceeded by 50% of the measured values.*

RSSI chart

Shows the integrated distribution of the measured RSSI values from all access points. For a given RSSI, the curves show the percentage of measured RSSI values that fall below this RSSI. The complement, i.e. 100% minus the *Probability [%],* corresponds to the percentage of measured RSSIs above this RSSI. The color of the curves correspond to the color codes in the access point table.

For a Gaussian distribution of the measured RSSI values around the center value RSSI (50%), the integrated distribution corresponds to an error function:



The curve which rises at the highest RSSI values (i.e. in the right side of the diagram) corresponds to the access point with the strongest signal.

C/I chart

Shows the integrated distribution of the measured C/I values from all access points. The diagram is analogous to the RSSI chart.

Noise chart

Shows the integrated distribution of the measured noise level in dBm in a single, fixed channel defined in the NDIS driver configuration menu. The noise channel number is stored in the *Current Channel* signal in the WLAN section of the data tree. The noise measurement and the channel definition requires a *CISCO Aironet Series 350 IEEE 802.11 Wireless LAN Client Adapter.* The diagram contains a single curve.

S/N chart

Shows the integrated distribution of the measured S/N values in the noise channel. The diagram contains a single curve.

Context menu

A right mouse click on any point in the view opens the context menu to print the view contents, access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default; see *Context menu* description on p. 4.2.

WLAN Survey View Configuration

The *WLAN Survey View Configuration* menu specifies the contents of the access point and percentage tables, defines the color settings, and displays information on the view version. It is opened via a right mouse click on a point inside the *WLAN View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Access Points* tab selects the contents of the access point table. The *Percentage table* tab is analogous to the *Access Points* tab.

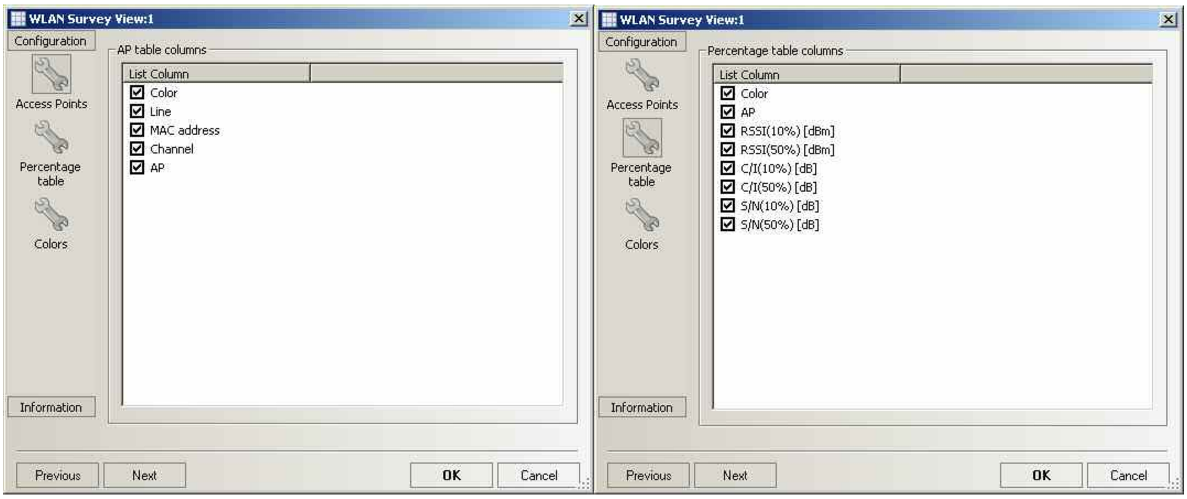


Fig. 4-298 WLAN Survey View configuration

The *Colors* tab of the *WLAN Survey View* configuration menu corresponds to the same tab in the *WLAN Scan View* configuration menu; see *Fig. 4-295* on p. 4.510.

CDMA2000 1x EV-DO PNS Views

The *CDMA2000 1x EV-DO PNS Views* shows the CDMA2000 information obtained in the CDMA2000 network scans performed by an R&S TSMx radio network analyzer. For CDMA2000 network scans, the analyzers R&S TSML-C,TSMQ, or R&S TSMx with enabled driver option K12 can be used. The CDMA2000 Network Scanner driver is described in chapter 6.

The *CDMA2000 1x EV-DO PNS Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse hovers over *CDMA2000 1x EV-DO PNS Views*.

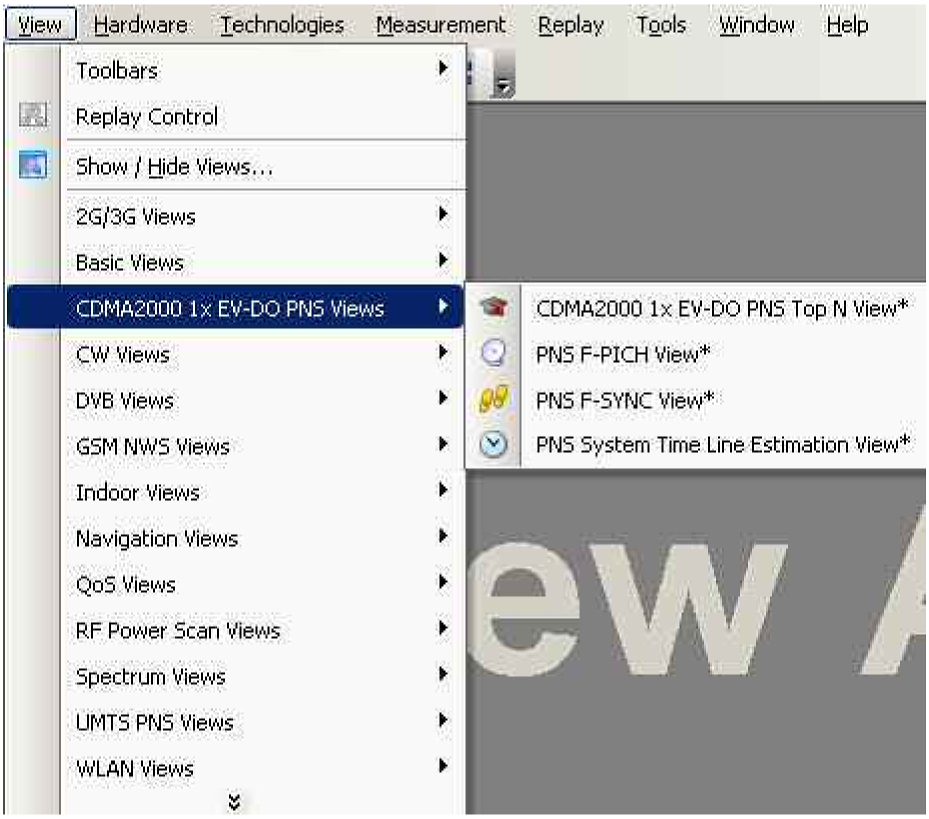


Fig. 4-299 CDMA2000 1x EV-DO PNS views

PNS F-PICH View

The *PNS F-PICH View* shows the average signal power of the received Forward Pilot Channels (F-PICHs) and a comprehensive analysis of the properties of all DL signals received in the CDMA2000 PN scan.

The F-PICH is an unmodulated, direct-sequence spread spectrum signal transmitted continuously by each CDMA base station. The Pilot Channel allows a mobile station to acquire the timing of the Forward CDMA Channel, provides a phase reference for coherent demodulation, and provides a means for signal strength comparisons between base stations for determining when to handoff and for forward link signal strength measurement.

Different base stations are identified by different pilot PN sequence time phases *(Offset* values). Signals with different timing but equal PN offset originate from the same BTS but propagated along different paths. A comparison of those signals provides important information on reflections and possible interferences.

The R&S TSMx provides different synchronization modes for CDMA2000 signals.

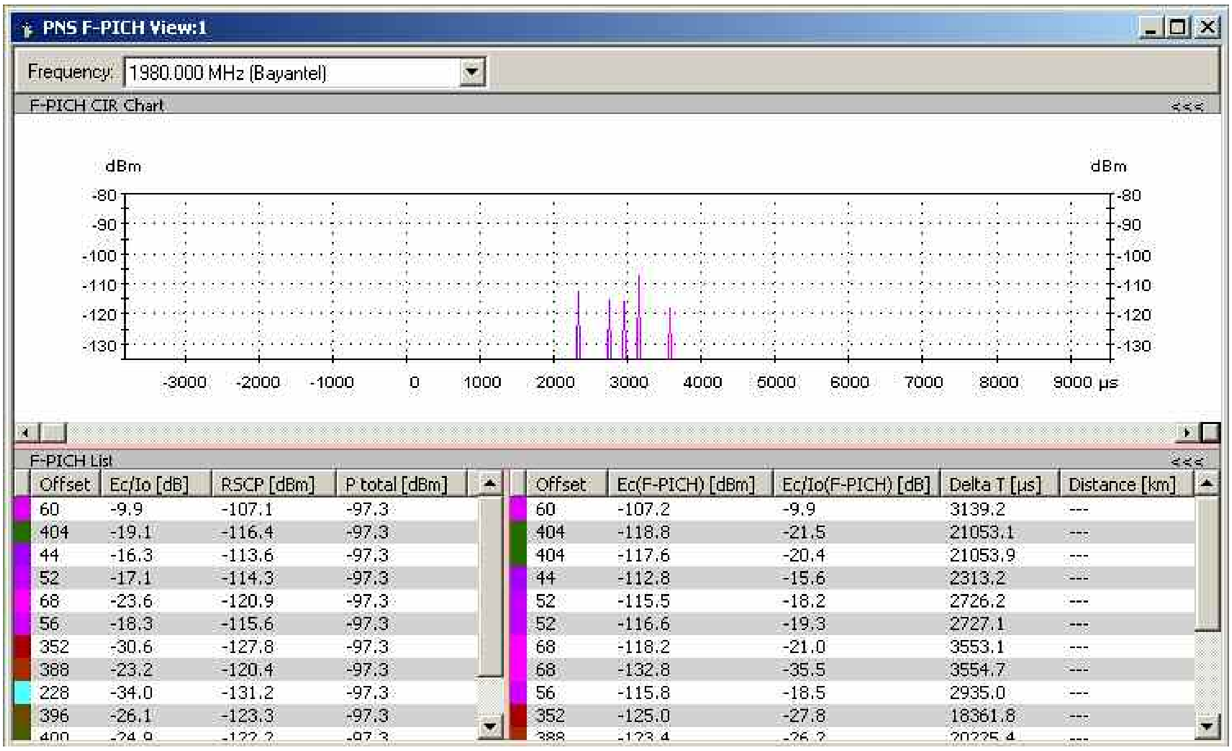


Fig. 4-300 PNS F-PICH View

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS F-SYNC View.*

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

View area

The entire view area is horizontally split to accommodate a chart and a table/list. The *F-PICH CIR Chart* (Carrier-to-Interference Ratio) shows the average signal power of the F-PICHs of all received signals over the time. The displayed powers and times correspond to the *Ec (F-PICH) [dBm]* and *Delta T[μs]* values listed in the *Peak List* (right-hand part of the *F-PICH List)*.

A click on the *F-PICH CIR Chart* or *F-PICH Lists* title bars compresses and expands the 2D-chart or table. A compressed chart leaves more space for the table and vice versa. Moreover, the tables appear in several PNS views so that compressing them can help to avoid redundancies. A compressed sub diagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Diagram scale

The diagram is opened with a default x-axis scale of little more than one F-SYNC frame length (25.666 ms, the F-PICH frame is 20 ms long). If placed inside the diagram area the cursor takes the shape of a zoom-in icon (a magnifying glass with a '+' inside), and a vertical line is displayed at the cursor position.

A left mouse click magnifies the diagram in x-direction around the cursor position, *Ctrl* plus left mouse click causes the opposite. An area to become the new x-axis range (e.g. the area around a peak) can be marked while the left mouse button is pressed. *Reset Zoom* in the context menu restores the default scale. A scrollbar is provided to move the magnified diagram to the right or left.

The scale of the y-axis (power in dBm) can be set in the configuration menu.

Table entries

Below the diagram, the *F-PICH List* gives an overview of the received signals together with their scrambling codes, different power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column.

The entire table is divided into the *F-PICH List* and the *Peak List.* In the configuration menu, it is possible to show or hide each individual table row in both lists.

F-PICH List

The *F-PICH List* (left-hand part of the *F-PICH Lists)* provides a general description of the received F-PICH signals from each BTS. Each signal is characterized by its PN sequence offset, corresponding to the transmitting BTS, and includes all possible peaks (reflections) indicated in the *Peak List* on the right-hand side. The list can contain the following F-PICH-related values (see also standard TIA-2000.2-D and related standards. All power results in the F-PICH List and Peak List are obtained in an unbiased measurement: The contribution of the noise floor to the powers is subtracted off.):

Offset

Pilot PN sequence offset index; time offset of the Forward Pilot Channel from CDMA System time, as transmitted by the base station. The offset is expressed in units of 64 PN chips of the F-PICH; it is in the range 0 to 511.
Each offset is identified by a color, to be customized in the configuration menu. The offset color codes are also shown in the Route Track *menu; see paragraph on scrambling code indication on p. 4.53.*

Signal power

Ec/Io [dB]

Ratio of the received energy per PN chip of the F-PICH to the total inband power spectral density. The value equals to the sum of the Ec/Io (F-PICH) [dB] *values of all individual peaks of the same PN offset displayed in the* Peak List; *see below.*

RSCP [dBm]

F-PICH Received Signal Code Power; sum of the received powers of all peaks on one code, measured within the correlation section of the F-PICH.

P total [dBm]

Total received wide-band power in the channel, measured within the correlation sections of the F-PICH. The correlation section is the same for all signals, so P total *is the same for all BTSs.* P total *is equal to Io within the F-PICH correlation section so that the following relation holds:*
P total + Ec/Io = RSCP

Peak List

The rows of the *Peak List* (right-hand part of the *F-PICH Lists)* describe the single peaks (reflections) that contribute to the different BTS signals. The list can contain the following values (see also standard TIA-2000.2-D and related standards):

Offset

Pilot PN sequence offset index.

Signal power

Ec (F-PICH) [dBm]

Average energy per transmitted PN (Pseudo Noise) chip for the F-PICH, divided by the chip period and thus converted into an average received signal power (in dBm).

Ec/Io (<Ch>) [dB]

Ratio of the received energy per PN chip for the F-PICH to the total transmit power spectral density.

Signal timing

Delta T [µs]

Time delay of the signal slot timing relative to the CDMA system time or GPS time (hardware-dependent). The reference time (left edge of the diagram) is of minor importance as the diagram extends over more than one frame, which is enough to display and separate all received signals.

Distance (km)

Distance to BTS in kilometers.

Special table entries

Depending on the conditions of the measurement the tables may show some particular results:

- An invalid result "---" denotes that a peak or the entire BTS signal was too weak to be accurately measured. Selecting *SR1 High Dynamic* mode in the measurements tab of the driver configuration menu generally reduces the number of invalid results.
- A number *(:1, :2* etc.) behind the offset denotes that signals with the same PN offset but with a significant difference in their time delays were received. Two different scenarios can cause multiple PN offsets:
  - — If several of those signals occur at the same time, they are likely to belong to different BTSs that accidentally use the same PN offset.
  - — Two signals with different numbers behind their PN offsets that are received at different times can belong to the same BTS but actually indicate a strong time drift.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default; see *Context menu* description on p. 4.2.

The context menu provides the following additional commands:

Reset Zoom	Resets the x-axis scale to 0 ms to approx. 26.5 ms.

PNS F-PICH View Configuration

The *PNS F-PICH View* configuration menu customizes the diagram in the *PNS F-PICH View* and the contents of the table. It is opened via a right mouse click on a point inside the *PNS F-PICH View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *F-PICH View* tab sets the y-axis scale of the *PNS F-PICH View*, selects the information to be displayed in the table and corrects the Doppler frequency.

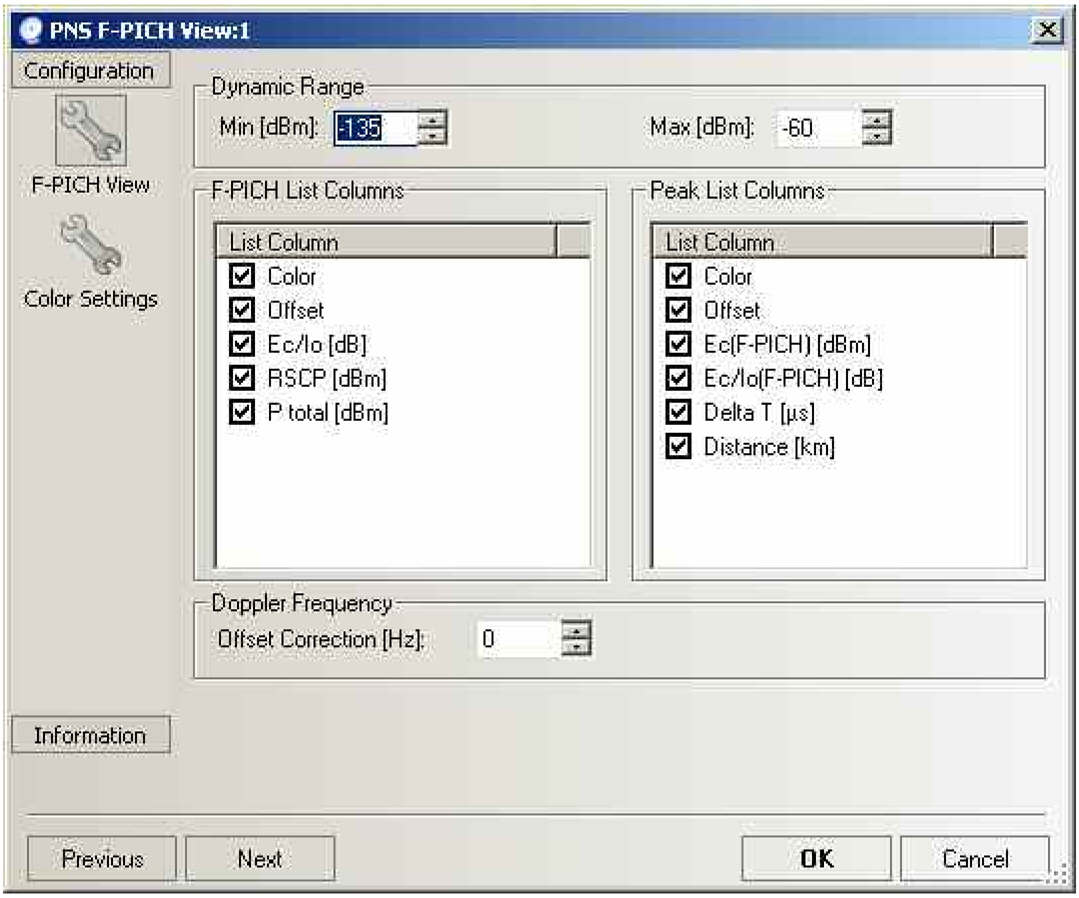


Fig. 4-301 PNS F-PICH View F-PICH View

Dynamic Range

The two input fields in the *Dynamic Range* panel define the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *PNS F-PICH* view diagram.

F-PICH List

Peak List

The *F-PICH List* and *Peak List* panels select which information is displayed in the tables below the *PNS F-PICH* diagram (see figure above). Clearing a box hides the corresponding column in the diagram

The *Color Settings* tab sets the color scale for the different PN offsets. The color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.53.

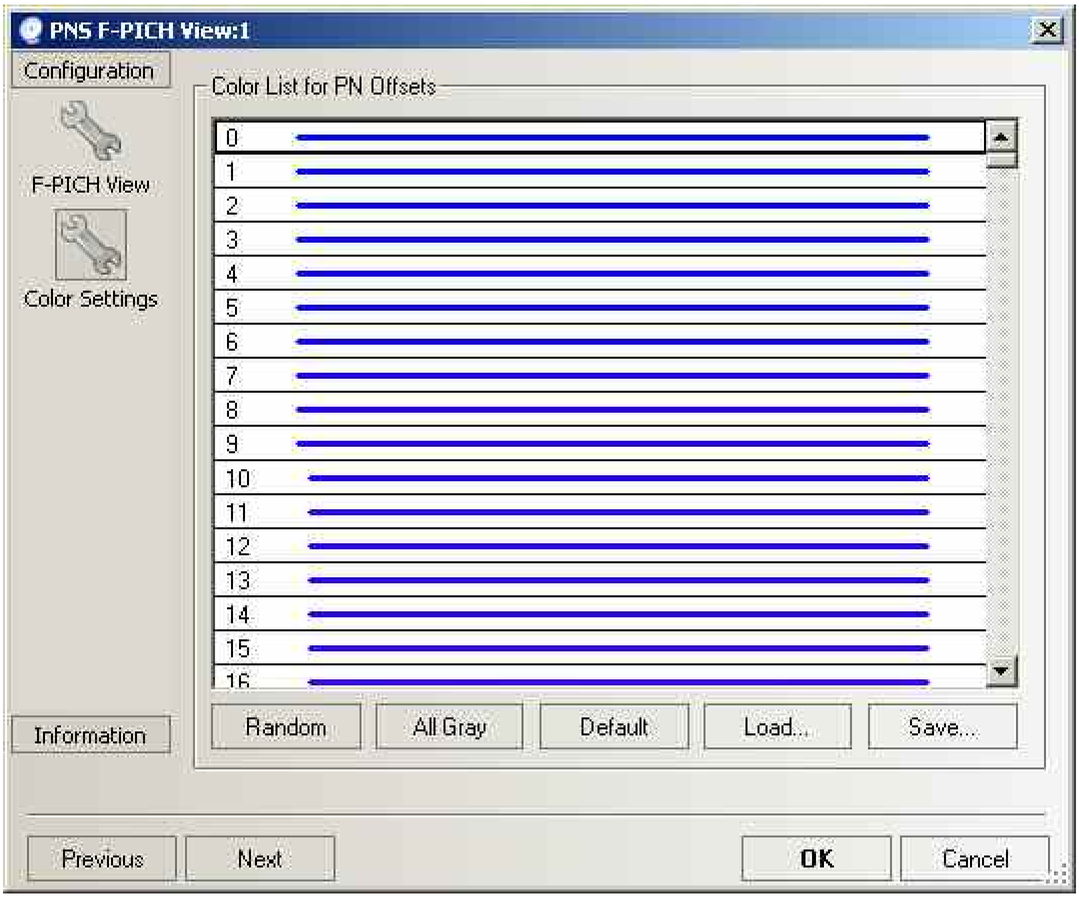


Fig. 4-302 PNS F-PICH View Color Settings

The colors are displayed in the diagram (power peaks) and in the first table row (scrambling code scale). A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.392) to change the current display color.

Random No ordering; colors are assigned to the scrambling codes at random.

All Gray Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single scrambling code (or a small number of scrambling codes), colored different, from all other codes, colored gray.

Default Predefined color scale: Colors change continuously as the scrambling codes increase.

Load/Save A color scale can be loaded from an SC color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

PNS F-SYNC View

The *PNS F-SYNC View* shows the information that the network analyzer TSMx (see CDMA2000 1x EV-DO PNS Views on p. 4.1) decoded from the Forward Synchronization Channel (F-SYNC). The F-SYNC corresponds to code channel 32 in the forward CDMA channel which transports the synchronization message to the mobile station.

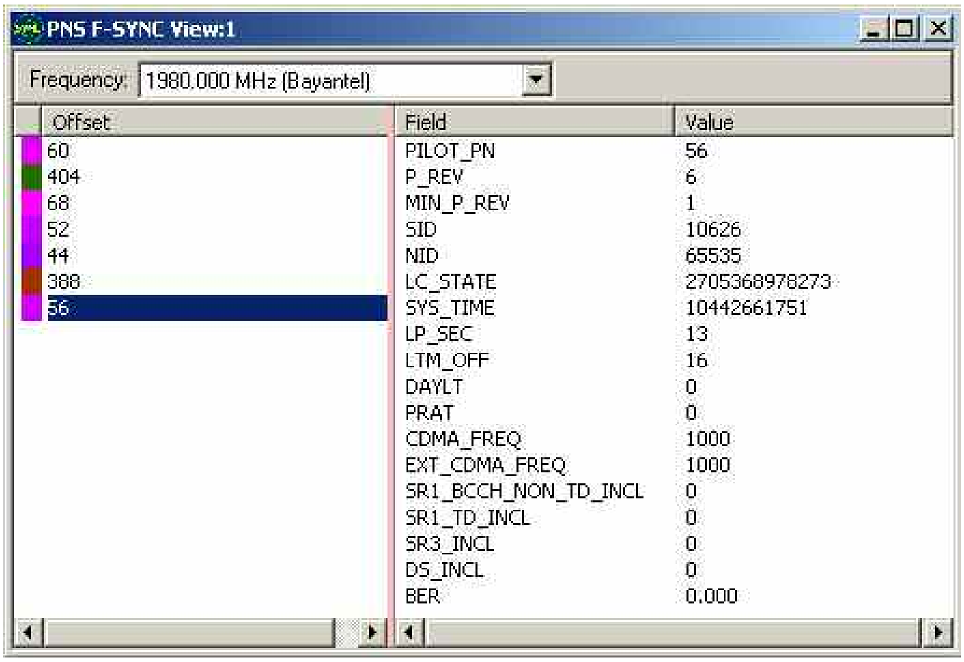


Fig. 4-303 PNS F-SYNC View

Frequency

Below the view title, the *Frequency* pull-down list contains all measured frequencies selected in the *Receiver* tab of the driver configuration menu. The list is also provided in the *PNS F-PICH View.*

Changing the frequency in one of these views automatically adapts the frequencies in all other views, provided they have the same current number in their title bar (e.g. the 1 in the figure above). Using this feature, it is possible to generate different groups of views with the same current number (opened by means of the context menu; see below) and select frequencies for an entire group with a single mouse click.

View area

The entire view area is vertically split in two parts:

- The left part displays all PN offset values decoded from the F-SYNC. The frequency of F-SYNC demodulation can be set in the *Measurements* tab of the CDMA PNS driver configuration menu (once for each frequency, once for each new pilot, or once for each new pilot but not more than once per 30 s; see chapter 6). The color code is set in the *PNS F-SYNC View* configuration menu.
- The left part displays the name of the different information elements in the synchronization message and the last decoded values.

Information elements

The contents of the synchronization message are described in standard TIA-2000.5-D.

PILOT_PN
: *Pilot PN sequence offset index (see description of the* PNS F-PICH *view on p.* *4.517**).*

P_REV
: *Protocol revision level*

MIN_P_REV
: *Minimum protocol revision level*

SID
: *System identification*

NID
: *Network identification*

LC_STATE
: *Long code state*

SYS_TIME
: *System time*

LP_SEC
: *Number of leap seconds that have occurred since the start of the system time*

LTM_OFF
: *Offset of local time from system time*

DAYLT
: *Daylight savings time indicator*

PRAT
: *Paging channel data rate*

CDMA_FREQ
: *Frequency assignment*

EXT_CDMA_FREQ
: *Extended frequency assignment*

SR1_BCCH_NON_TD_INCL
: *SR1 Non-TD BCCH support indicator*

SR1_TD_INCL
: *SR1 TD BCCH support indicator*

SR3_INCL
: *SR3 support indicator*

DS_INCL
: *Direct spread (DS) system and information available*

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default, see *Context menu* description on p. 4.2.

PNS F-SYNC View Configuration

The *PNS F-SYNC View* configuration menu customizes the diagram in the *PNS F-SYNC View*. It is opened via a right mouse click on a point inside the *PNS F-SYNC View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *Color Settings* tab sets the color scale for the different PN offsets. The color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.53.

The *Color Settings* tab of the *PNS F-SYNC View* configuration menu corresponds to the same tab in the *PNS F-PICH View* configuration menu; see *PNS F-PICH View Configuration* on p. *4.521* .

PNS Time Line Estimation View

The *PNS Time Line Estimation View* shows information about the time estimation of the PN offset arrival time intervals.

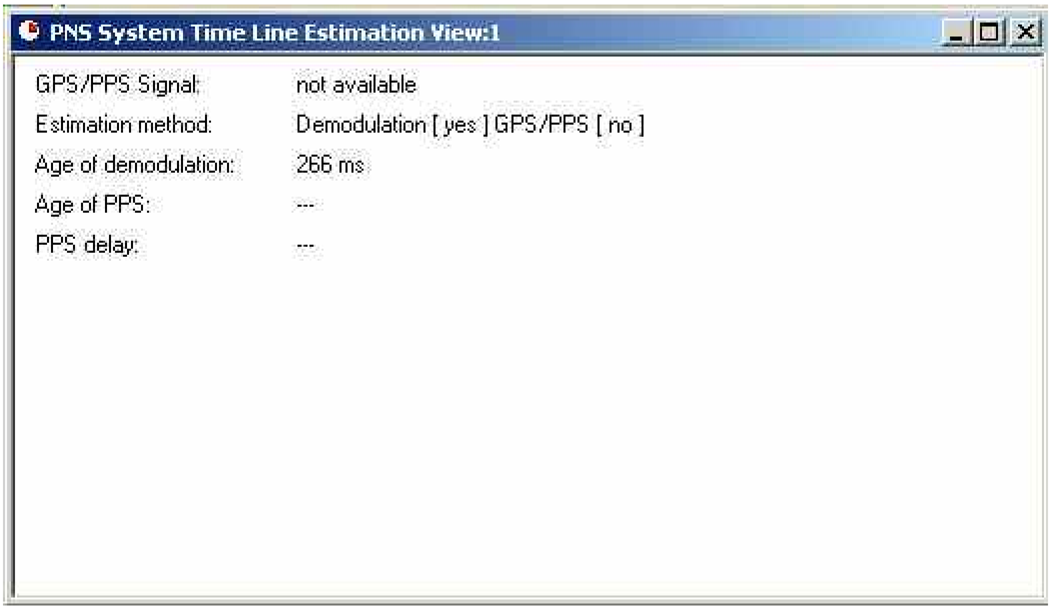


Fig. 4-304 PNS Time Line Estimation View

View area The pulse-per-second (PPS) signal from GPS and its delay have to be assessed continuously even when the GPS signal is not available.

This view shows the parameters related to the CDMA time line measurement. The *PNS Time Line Estimation View* has no configuration menu assigned.

Information elements

The contents of the PNS Time Line Estimation View are described below:

GPS/PPS Signal

Shows if arrival time was measured via GPS.

Estimation Method

The following combinations are possible:
1. No Demod. / no GPS PPS: Offset value is random, transmit time is estimated by receive time.

[2. No Demod. / GPS PPS: not used]

3. Demod. / no GPS PPS: Offset value is correct, transmit time was estimated by received pilots.

4. Demod. / GPS PPS: Offset value is correct, transmit time has GPS PPS accuracy.

Age of demodulation

Age of the last GPS PPS demodulation

Age of PPS

Age of the last PPS signal from GPS.

PPS Delay

Measured GPS PPS pulse time difference in [ns].

Range: -1 ms (-1000000) ... 999 ms (999000000)

The PPS Delay *shows the GPS arrival time for the case that the measurement results (delays) are correct. If a time delay for a BTS signal is known, the measurement error of the PN Scanner result can be calculated. The same error applies to this value.*

*Example: PN Offset 271 was measured. The frame of this signal is transmitted 271*64/1228800 sec = 14114.58 µs after a frame with offset 0.*
Assumption: The distance to the BTS is 5 km. So a measurement result of 14114.58 µs + 16.67 µs = 14131.31 µs is the expected measurement value. If, for instance, a delay of 14141.31 µs is measured as a delay value for this BTS, the measurement result has an error of +10 µs. Now both delay value and PPS delay value can be reduced by 10 µs to obtain the correct results.

See also Calibration of the PPS Delay, *in* CDMA2000 PNS Driver Settings.

CDMA2000 1x EV-DO PNS Top N View

The *CDMA2000 1x EV-DO PNS Top N View* displays the properties of the signals from the Node Bs that are elements of the *Top N Pools* defined in the driver configuration menu. A Top N Pool contains up to N Node Bs with specific characteristics providing the strongest P-CPICH level at a given position and time; for more information refer to the description of the driver configuration menu in chapter 6.

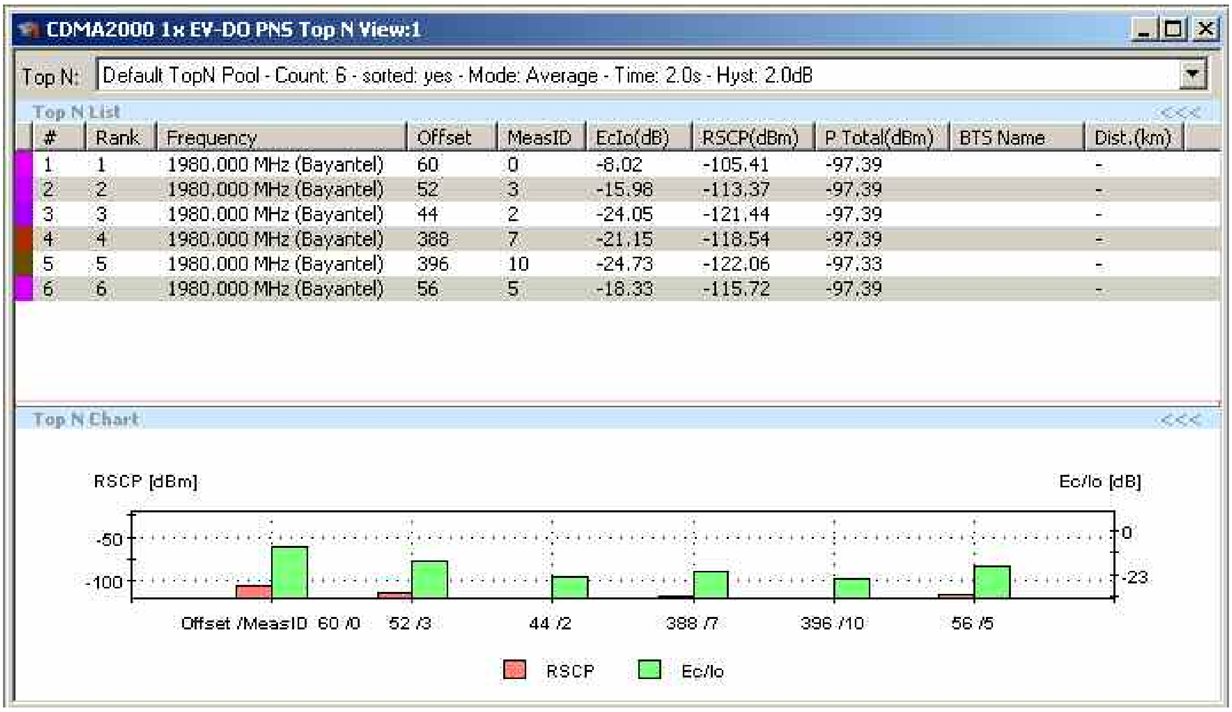


Fig. 4-305 CDMA PNS Top N View

View area The entire view area is horizontally divided to accommodate a pull-down list with all defined *Top N* measurements, a table and a bar chart.

A click on the *Top N List* or *Top N Chart* title bars compresses and expands the table or chart. A compressed chart leaves more space for the table and vice versa. Moreover, most of the information in the table is also displayed in the *PNS CPICH View* (see p. 4.378) so that compressing it can help to avoid redundancies. A compressed sub diagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Top N Below the view title, the *Top N* pull-down list contains all top N pools defined in the *Top N* tab of the driver configuration menu. The results in the table and the *Top N Chart* refer to the top N pool selected in the list.

Table

The *CDMA Top N List* gives an overview of the received signals in the current top N pool together with different power parameters, frequency and timing information. On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. For a detailed explanation of the parameters refer to section *PNS CPICH View* on p. 4.378. The *Top N List* contains the following additional columns:

#
: *Current number of a Node B within the measurement. Node Bs are numbered in ascending order, according to the time when they enter the top N pool. This means that the current numbers tend to increase as the measurement progresses.*

Rank
: *Current rank of a Node B within the pool, according to its average or maximum Ec/Io (see driver configuration menu). The ranks are reassigned every time the pool is updated; they are in the range* 1 ≤ Rank ≤ N.

Offset
: *Channel offset*

MeasID
: *Measurement ID for measurements of a specific BTS*

BTS Name
: *BTS name and sector number from the BTS database.*

Dist. (km)
: *Distance between the potential interferer and the serving cell in km, calculated from the BTS data base. 0 km means that the interferer is a different sector of the same BTS.*

In the view configuration menu, it is possible to show or hide each individual table row.

Diagram

Below the table, the *Top N Chart* shows the ratio *Ec/Io* and the Received Signal Code Power *(RSCP)* for all Node B signals in the current top N measurement (see section *PNS CPICH View* on p. 4.378).

Signals from different Node Bs are distinguished by their *Offset* and *MeasID* displayed along the x-axis. The scales for the two parameters RSCP and Ec/Io are displayed on the left and right edge of the diagram. Both y-axis scales (RSCP in dBm and Ec/Io in dB) can be set independently in the configuration menu.

In the configuration menu, it is also possible to select the display colors for the RSCP and Ec/Io bars and to choose whether the pilot pollution limits are displayed in the diagram. The pilot pollution limits are displayed as two horizontal lines across all Node B bars except the ones with the highest rank (1).

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create or delete views, or to save the current configuration as default; see *Context menu* description on p. 4.2.

The Info tab can also be accessed via the *Tools - Modules Configuration...* command.

CDMA PNS Top N View Configuration

The *CDMA PNS Top N View* configuration menu defines the y-axis scale, i.e. the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the CDMA *PNS Top N View,* and selects the contents of the table. It is opened via a right mouse click on a point inside the *PNS Top N View* or via the *Tools - Modules Configuration...* command (see chapter 3).

All RSCP settings are analogous to the settings in the *PNS CPICH* configuration menu; see section *PNS CPICH View* on p. 4.378.

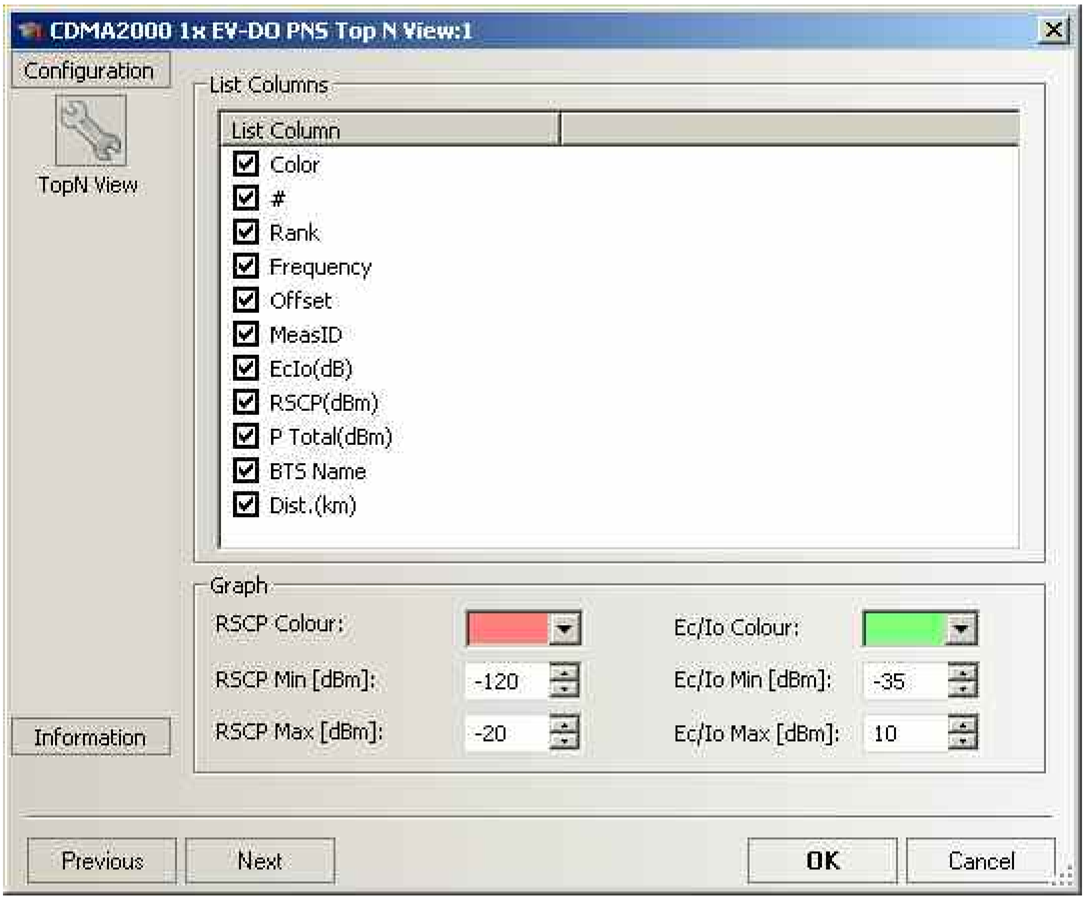


Fig. 4-306 CDMA PNS Top N View TopN View

RF Power Scan Views

The *RF Power Scan Views* shows the RF Power information obtained in the RF power scans performed by an R&S TSMx radio network analyzer. For RF Power scans, the analyzers R&S TSMU,TSMQ, or R&S TSML-x with enabled driver option K17 can be used. The RF Power Scanner driver is described in chapter 6.   To perform RF Power Scans R&S option ROMES3T17 must be available.

The *RF Power Scan Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse hovers over *RF Power Scan Views*.

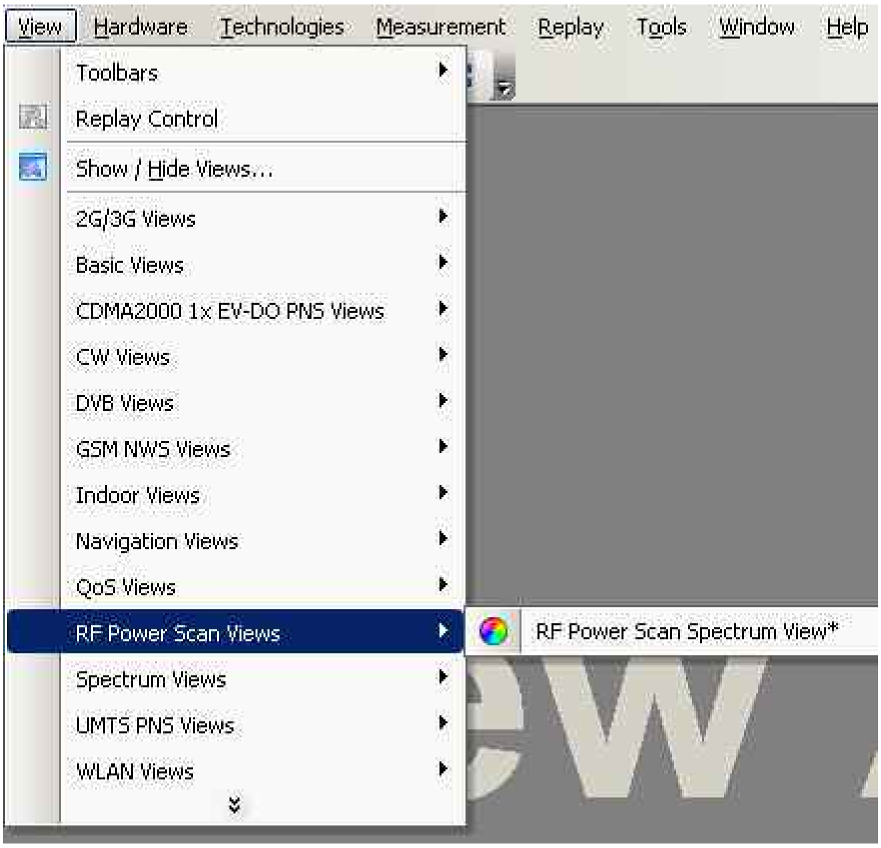


Fig. 4-307 RF Power Scan views

RF Power Scan Spectrum View

The *RF Power Scan Spectrum View* displays the power spectrum in three different ways. The top section of the RF Power scan Spectrum View displays an overview of the sweeps, which were configured in the driver. The middle section of the RF Power scan Spectrum View displays the spectrum of the selected sweep in detail. The bottom section of the RF Power scan Spectrum View displays the spectrum with a time dimension (Spectrum History). Here the power values will be indicated through a color scale. The sweep which is displayed in the middle and in the bottom section can be chosen from the list of channels in the top section by clicking on it.

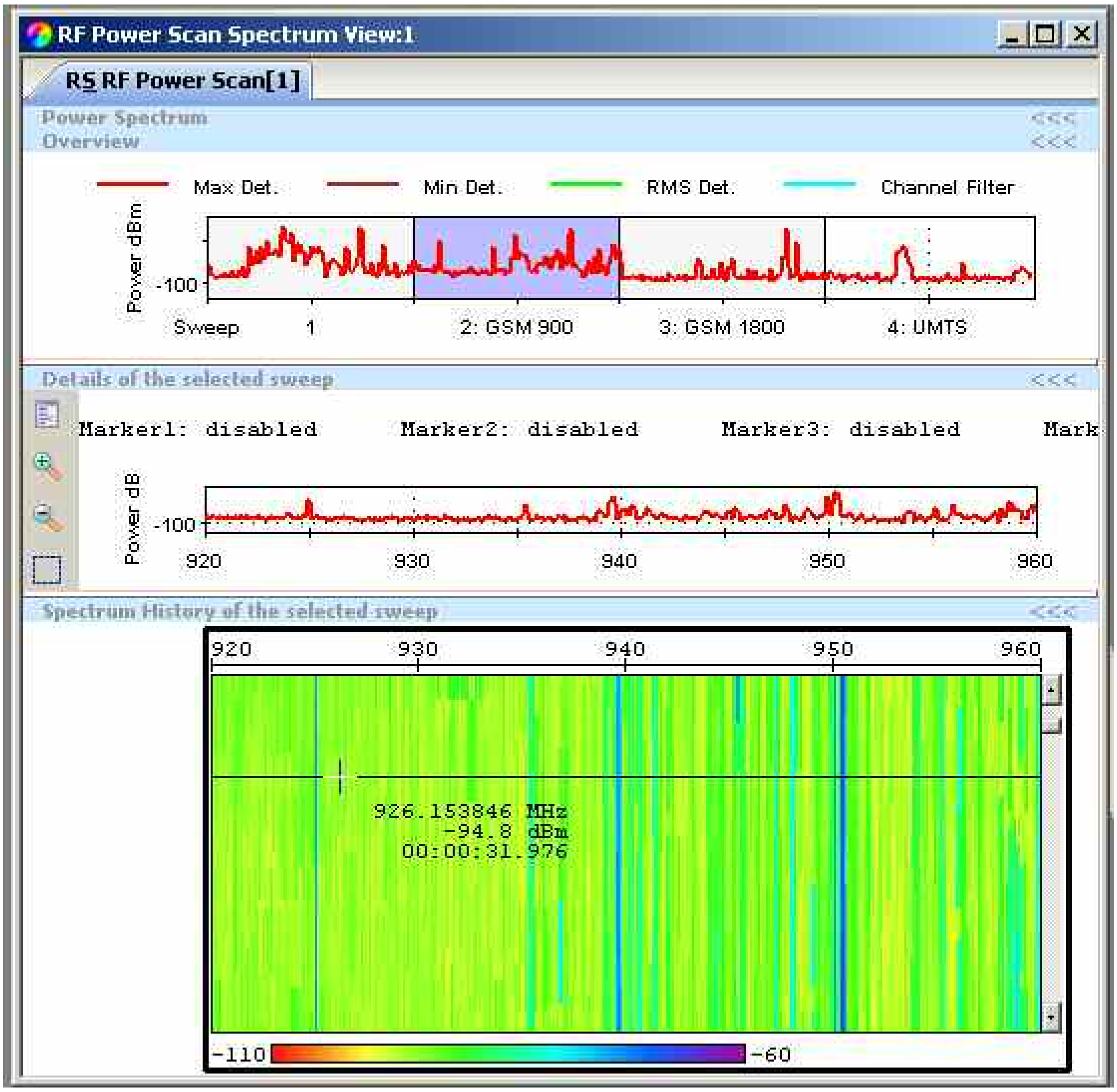


Fig. 4-308 RF Power Scan Spectrum View

View area The Spectrum View is tabbed, with the tabs corresponding to the used scanners. The *RF Power Scan Spectrum View* has three sections which can be individually sized and opened or closed.

Power Spectrum Overview The top section displays an overview of all sweeps. The x-axis represents the sweep number and the y-axis the absolute power value in dBm.

Details of the selected Sweep

The detailed Spectrum View is a 2D-Chart which displays an actual image of the spectrum and will be updated continuously. The view follows the Coupled Focus in the time domain. It is possible to use one or even multiple views for each measurement range. The views are free to overlap in their measurement range and each view displays at most the entire measurement range. A view may not outrun the limits of the measurement range.

By displaying bigger frequency ranges each pixel contains the spectral information of a relative big sub-range. So on each pixel appears a couple of results (samples). Which of these results will be displayed by the pixel depend on the detector. The Spectrum View supports three kinds of detectors:

Peak (Maximum Peak, displays the maximum value of all the dedicated samples)

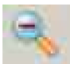
RMS (Root Mean Square, displays the effective value of all the dedicated samples)

Auto Peak (Minimum Peak and Maximum Peak, displays the minimum and maximum value of all the dedicated samples)

The view has some marker functions. Furthermore the Spectrum View has some other features for a different graphic rendition of the channel filters and functions for zooming.

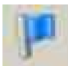
 Show Menu which reflects the buttons functions

 Zoom in

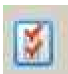
 Zoom out

 Select Rectangle

 Reset X- and Y-Axis

 Show/Hide Free Marker

 Show/Hide Current Peak Marker

 Show Configuration

Spectrum, History of the selected sweep

The History View is admitted to the Coupled Focus. It will be controlled and it is able to control. The view displays one row for each image of the Spectrum View. The x-axis represents the frequency, the y-axis the time and the level is represented by the color.

One marker is available, which displays the time, the frequency and the power value.

The History View supports two kinds of detectors but as opposed to the Spectrum View, the History View is able to display only the levels of one detector.

Peak (Maximum Peak, displays the maximum value of all the dedicated samples)

RMS (Root Mean Square, displays the effective value of all the dedicated samples)

RF Power Scan Spectrum View Configuration

The *RF Power Scan Spectrum View* configuration menu selects the contents of the view tables, sets general view options. It is opened via a right mouse click on any point inside *RF Power Scan Spectrum View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *RF Power Scan Spectrum View Configuration* tab shows the available sweeps and offers the possibility to edit them.

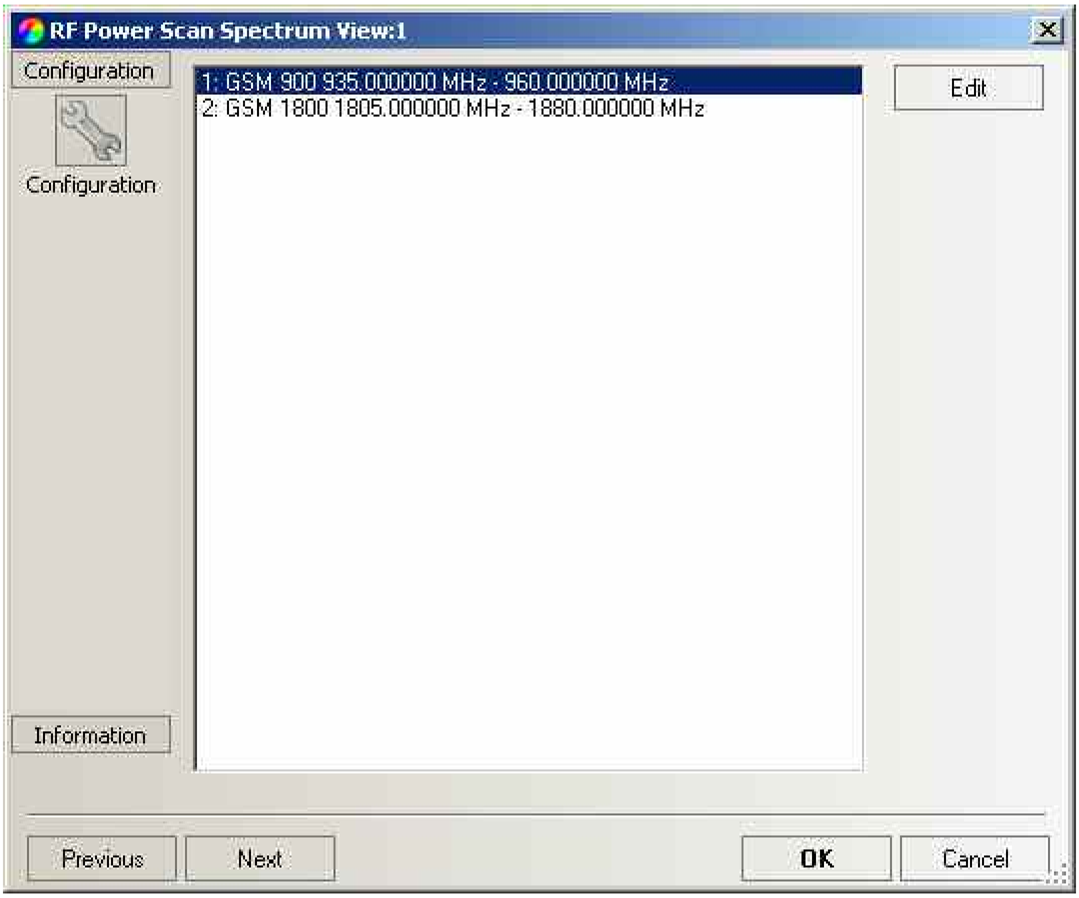


Fig. 4-309 RF Power Scan Spectrum View Configuration

The *Spectrum View Settings* tab configures parameter settings.

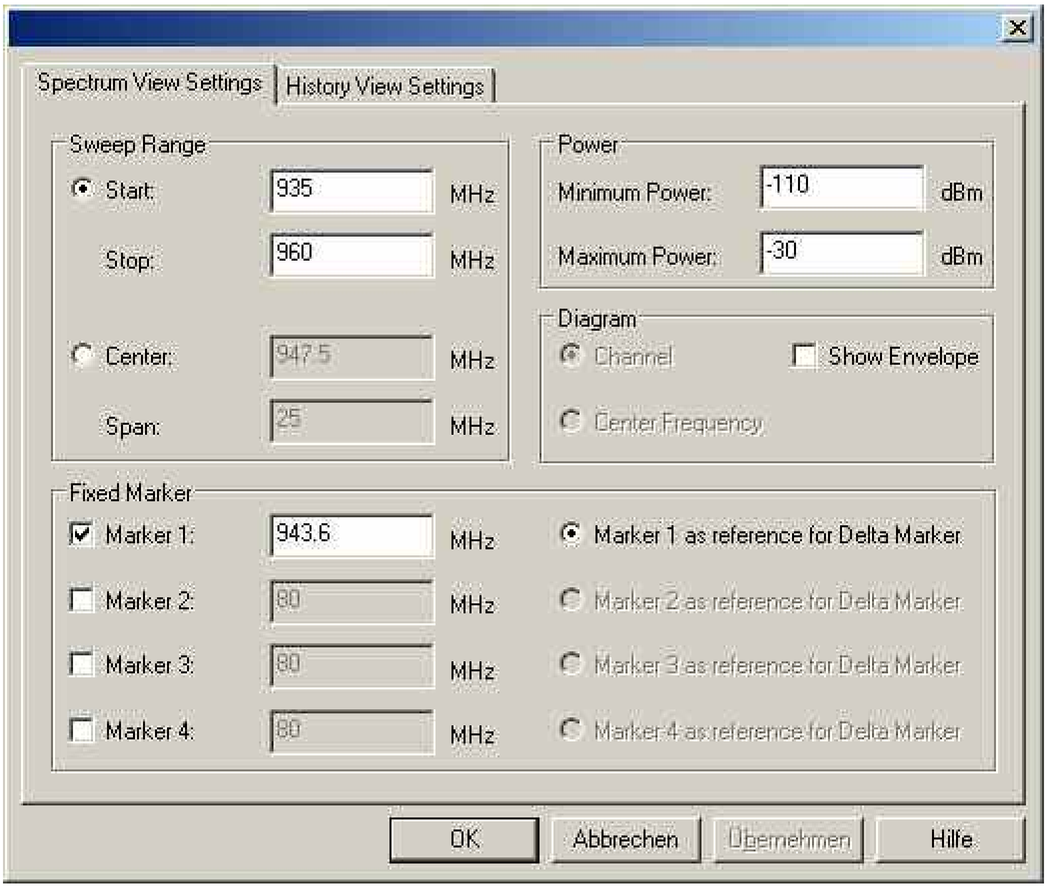


Fig. 4-310 RF Power Scan Spectrum View Configuration > Spectrum View Settings

Sweep Range

The sweep range of the Spectrum View and the Spectrum History View can be adjusted alternatively by Start- and Stop-Frequency or by Center-Frequency and Span. The values are specified in MHz.

The minimum and maximum values for the frequency range are the adjusted minimum and maximum power values in the driver.

Power

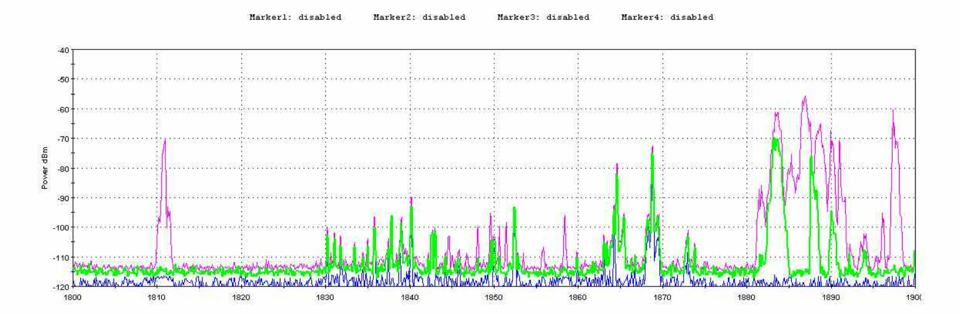
The power display areas of the Spectrum View and the Spectrum History View are defined by the following two parameters:

Minimum Power	Minimum displayed power value in dBm.
Maximum Power	Maximum displayed power value in dBm.

Diagram

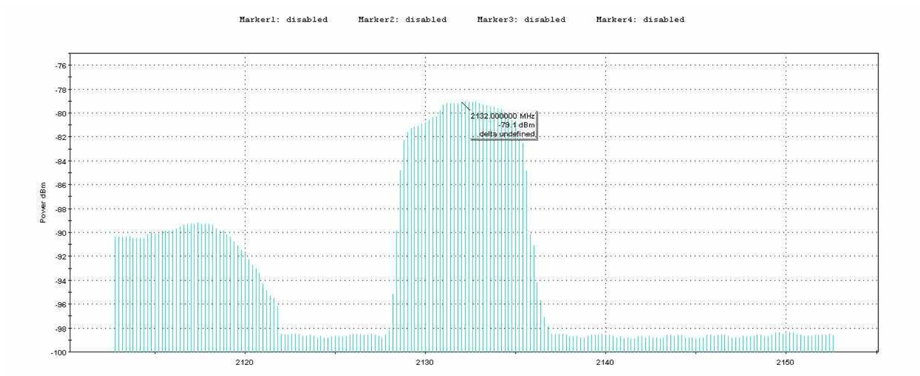
If a channel filter will be used there are two different ways for displaying the values:

Channel	Displays the values as a bar. The height is defined by the power value and the width by the channel filter span. This diagram will be suggested, if the spacing of the center frequencies is greater than or equal to the span of the channel filter type.



Show Envelope — This feature is not available for sweeps where channel filter is activated.

Center Frequency — Displays the values as a thin line. This diagram will be suggested, if the spacing of the center frequencies is less than the span of the channel filter type.



Fixed Marker

The view has some marker functions, which displays the values of each view for (only) one detector. The marker functions can be set for each view individual. So for each view you can use one free marker, one maximum peak marker and four fixed markers (fixed frequencies). The marker-functions support the feature for getting the level-difference between two markers.

The *History View Settings* tab selects general settings like the basic settings and color definitions.

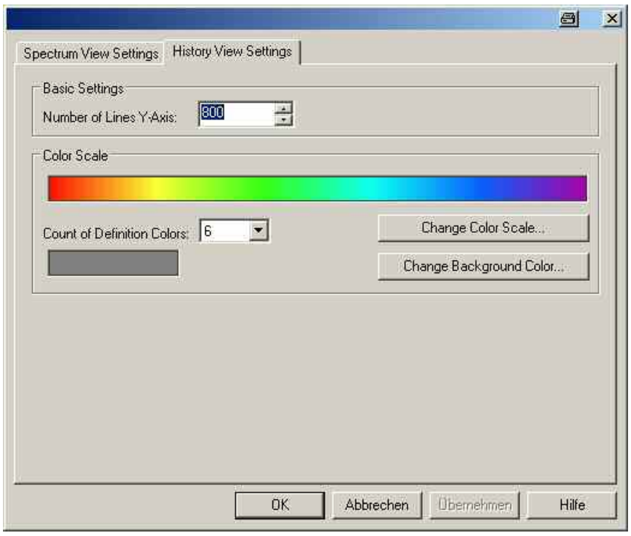


Fig. 4-311 RF Power Scan Spectrum View Cnfiguration > History View Settings

Basic Settings	*Number of Lines Y-Axis*	Specifies the height of the Spectrum History View in lines.
Color Scale	*Count of Definition Colors*	Number of different colors which can be defined for the color scale. The color scale is responsible for the coloring of the power values in the Spectrum History View.

WiMAX Scanner Views

The *WiMAX Views* shows WiMAX. information obtained in the WiMAX network scans performed by an R&S WiMAX Scanner (option R&S ROMES4T1W). How to install and configure the WiMAX network scanner driver is described in chapter 6, Hardware Components section WiMAX Scanner.

The *WiMAX Views* can be selected from a submenu displayed on the right side of the *View* menu when the mouse hovers over *WiMAX Views*.

WiMAX Scanner CIR View

The *WiMAX Scanner CIR View* displays the channel impulse response of the WiMAX signals.

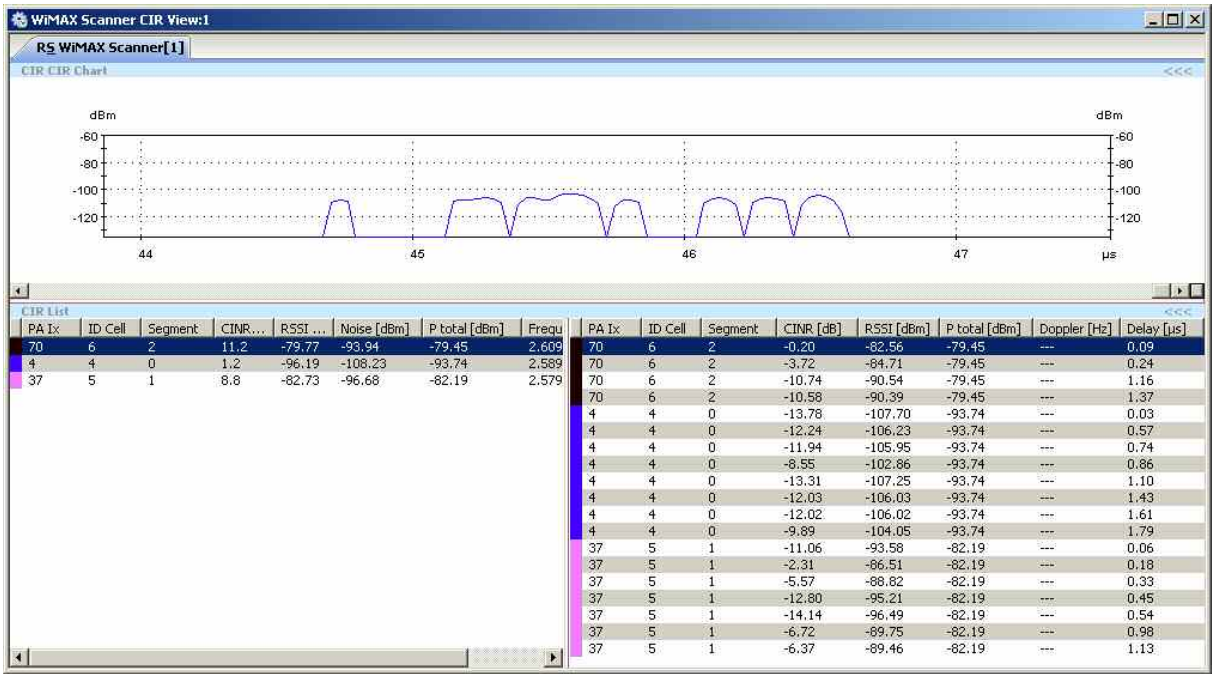


Fig. 4-312 WiMAX Scanner CIR View

View area

The entire view area is horizontally split to accommodate a chart and a table/list. The *CIR CIR Chart* (Carrier-to-Interference Ratio) shows the CIR of the different WiMAX signals which have been scanned. The graph allows to zoom into the chart. The small button on the right of the scroll bar reset the zoom level.

A click on the *CIR CIR Chart* or *CIR Lists* title bars compresses and expands the 2D-chart or table. A compressed chart leaves more space for the table and vice versa. Moreover, the tables appear in several views so that compressing them can help to avoid redundancies. A compressed sub diagram is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Diagram scale

If placed inside the diagram area the cursor takes the shape of a zoom-in icon (a magnifying glass with a '+' inside), and a vertical line is displayed at the cursor position.

A left mouse click magnifies the diagram in x-direction around the cursor position, *Ctrl* plus left mouse click causes the opposite. An area to become the new x-axis range (e.g. the area around a peak) can be marked while the left mouse button is pressed. *Reset Zoom* in the context menu restores the default scale. A scrollbar is provided to move the magnified diagram to the right or left.

The scale of the y-axis (power in dBm) can be set in the configuration menu.

Left table

The left table lists all scanned WiMAX segments.

Preamble Index Color
: The color represents the Preamble Index of the segment. It can be configured in the views configuration page.

Preamble Index
: Downlink preamble Index.

ID Cell
: Cell name, if applicable. If no name is available, "---" is shown.

Segment Number
: A cell site can be divided up into three different segments. Thus segment number can be 0, 1, or 2.

CINR
: Ratio of carrier/interference plus noise.

RSSI
: The received signal strength indicator is the received wide band power in dBm, including thermal noise and noise generated in the receiver. Total Inband Power Doppler Frequency.

Noise Floor
: Noise Floor [dBm]

Total Inband Power
: Total inband power.

Right table

The right table shows the different path of the segments. For each path the following parameters are displayed:

Preamble Index Color
: The color represents the Preamble Index of the segment. It can be configured in the views configuration page.

Preamble Index
: Downlink preamble Index.

ID Cell
: Cell name, if applicable. If no name is available, "---" is shown.

Segment Number
: A cell site can be divided up into three different segments. Thus segment number can be 0, 1, or 2.

CINR
: Ratio of carrier/interference plus noise.

RSSI
: The received signal strength indicator is the received wide band power in dBm, including thermal noise and noise generated in the receiver.

Total Inband Power
: Total Inband Power.

Doppler
: Doppler Frequency

Delay
: Signal Delay Time [µs]

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, (de-)select the view for hold, copy the current view to the clipboard, create or delete views, save the current configuration as default; see *Context menu* description on p. 4.2.

The context menu provides the following additional commands:

Reset Zoom Resets the x-axis scale to 0 ms to approx. 26.5 ms.

WiMAX Scanner CIR View Configuration

The *WiMAX Scanner CIR View* configuration menu customizes the diagram in the *WiMAX Scanner CIR View* and the contents of the table. It is opened via a right mouse click on a point inside the *WIMAX Scanner CIR View* or via the *Tools - Modules Configuration...* command (see chapter 3).

The *CIR View* tab sets the y-axis scale of the *CIR View*, selects the information to be displayed in the table and corrects the Doppler frequency.

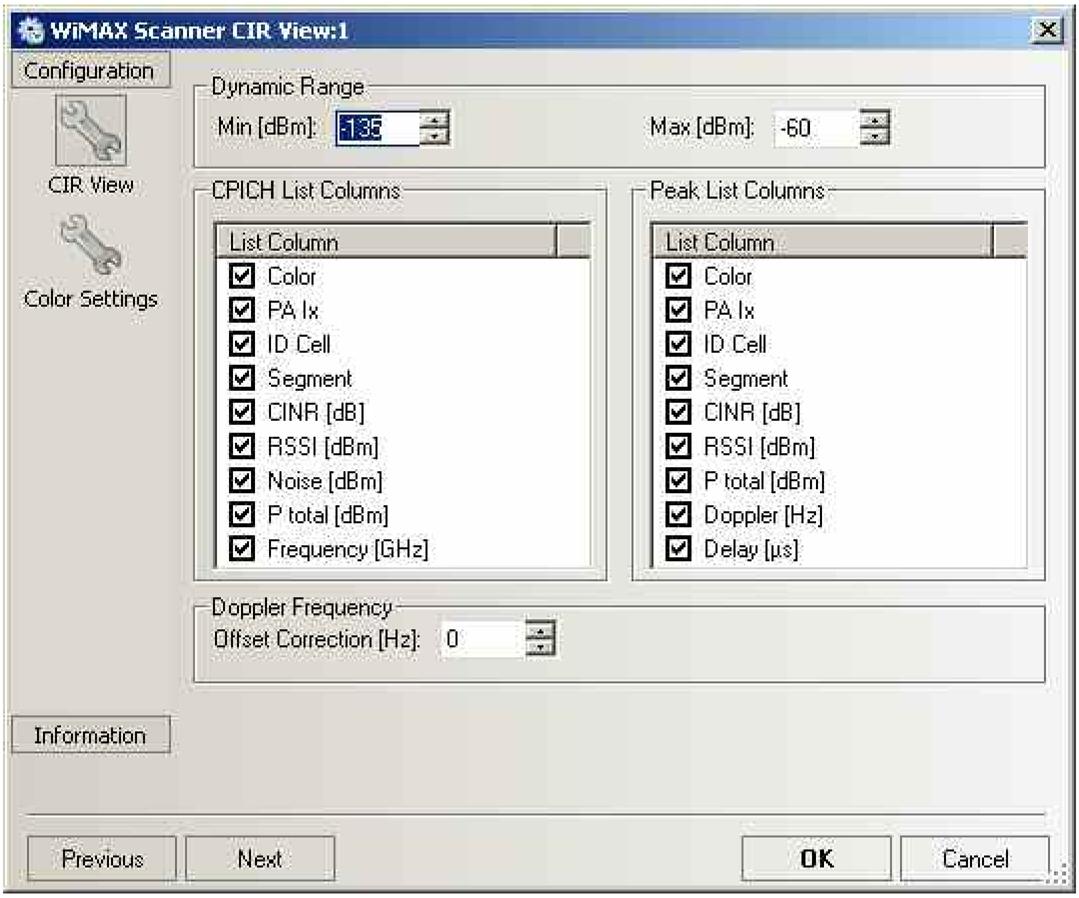


Fig. 4-313 WiMAX Scanner CIR View CIR View

Dynamic Range The two input fields in the *Dynamic Range* panel define the minimum *(Min [dBm])* and the maximum *(Max [dBm])* level to be displayed in the *WiMAX Scanner CIR View.*

CPICH List

Peak List The *CPICH List* and *Peak List* panels select which information is displayed in the tables below the *CIR CIR Chart* diagram. Clearing a box hides the corresponding row in the diagram

Doppler Frequency The *Doppler Frequency* panel provides an input field to correct the *Doppler Frequency* displayed in the *Peak List*. The purpose of the correction is to subtract out constant frequency offsets that can not originate from the speed of the test vehicle relative to the signal source.

The *Color Settings* tab sets the color scale for the scrambling codes. The SC color codes are also shown in the *Route Track* menu; see paragraph on scrambling code indication on p. 4.53.

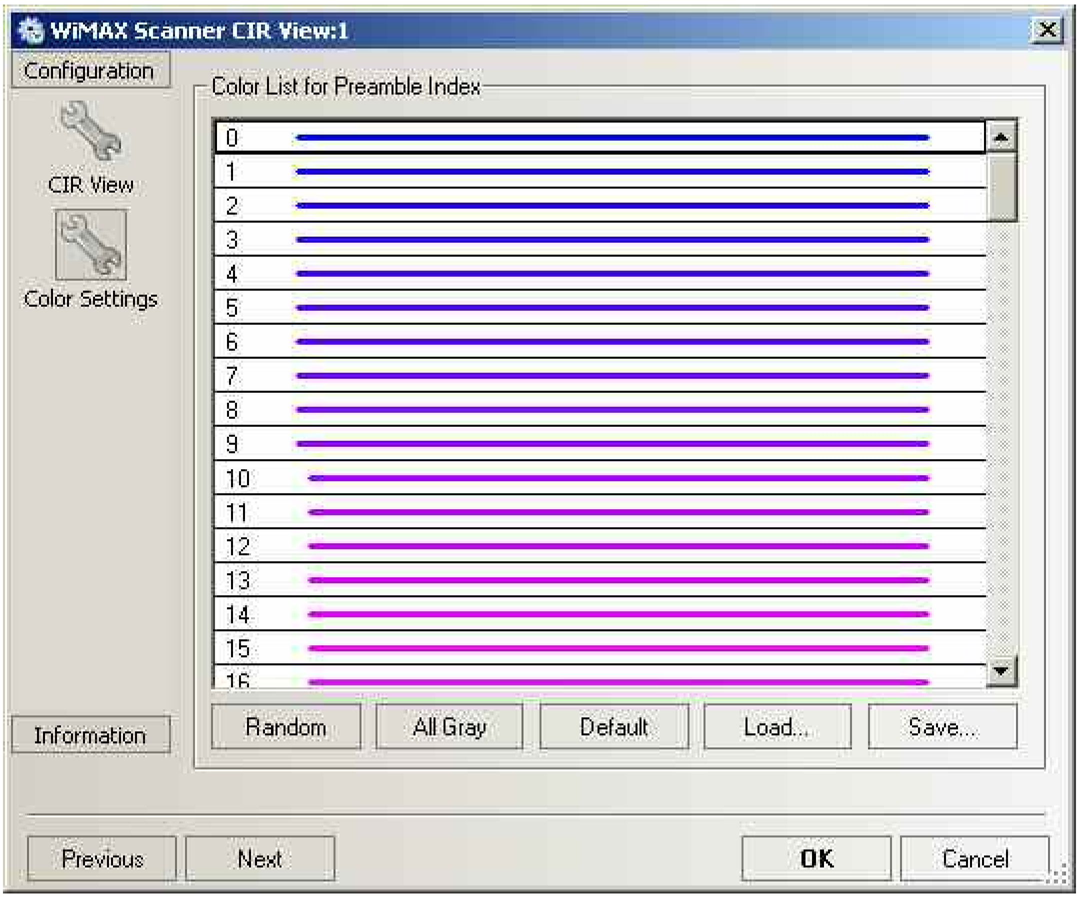


Fig. 4-314 WiMAX Scanner CIR configuration: Color Settings

The colors are displayed in the diagram (power peaks) and in the first table row (preamble index scale). A double-click on a line in the *Color List* opens the *Colors* dialog (see p. 4.392) to change the current display color.

Random No ordering; colors are assigned to the preamble index at random.

All Gray Color scale suppressed; all colors are gray. This option is suitable e.g. to distinguish a single preamble index (or a small number of preamble index), colored different, from all other codes, colored gray.

Default Predefined color scale: Colors change continuously as the preamble index increase.

Load/Save A color scale can be loaded from a color file (*.scc) and user-defined color scales can be stored to *.scc files to be reused in a later session.

WiMAX Scanner Top N View

The *WIMAX Scanner Top N View*. displays the properties of the signals from the base transceiver stations that are elements of the *Top N Pools* defined in the technology configuration. A Top N Pool contains cells with specific characteristics providing the strongest RSSI or CINR level at a given position and time.

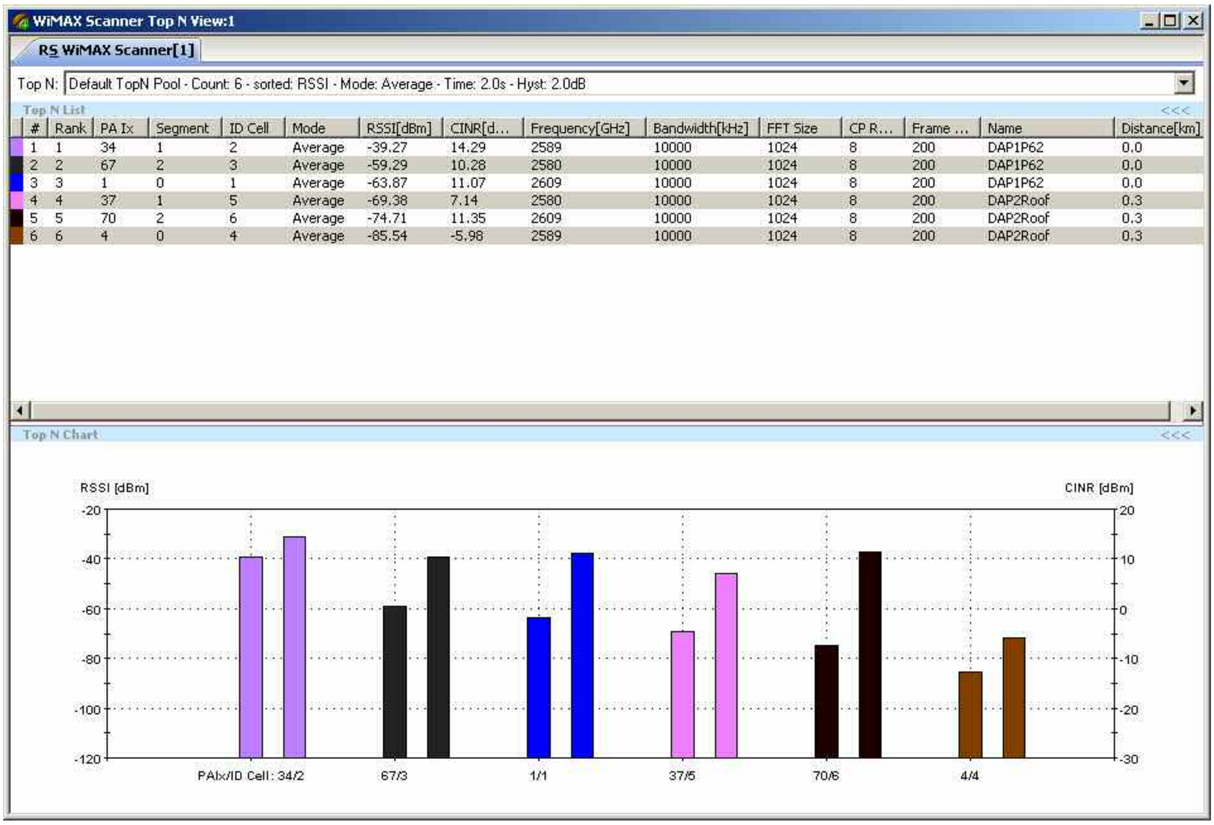


Fig. 4-315 WiMAX Scanner Top N View

View area

The entire view area is horizontally split to accommodate a list with all defined *Top N* measurements, and a bar chart. A click on the *Top N List* or *Top N Chart* title bars compresses and expands the table or chart. A compressed chart leaves more space for the table and vice versa. A compressed sub panel is characterized by the symbol >>> (instead of <<<) in its title bar. On pausing on one of the title bars, the cursor displays a compress symbol.

Top N List

Below the view title, the *Top N list* contains all top N pools defined in the *Top N* tab of the technology configuration. The *Top N List* gives an overview of the received signals in the current top N pool together with their measured power parameters, frequency and timing information.

The TopN pools configuration is done in the WIMAX Scan Technology component.
In the view configuration menu, it is possible to show or hide each individual table column. Up to 3 different named pools can be configured in the default setup. Each pool has several configurable parameters.
On mouse rollover, each cell in the table header provides a short explanation of the corresponding column. The *Top N List* contains the following columns:

#
Number of the measured Cell and Preamble Index within the Top N pool.

Rank
Current rank within the TopN Pool.

Preamble Index
Downlink preamble Index.

Segment
A cell site can be divided up into three different segments. Thus segment number can be 0, 1, or 2.

ID Cell
Cell name, if applicable. If no name is available, "---" is shown.

Mode (Average / Max)
Valuation Method (Average/Max/Min)

RSSI
The received signal strength indicator is the received wide band power in dBm, including thermal noise and noise generated in the receiver. Total Inband Power Doppler Frequency.

CINR
Ratio of carrier/interference plus noise.

Center Frequency
Center frequency of the used channel. According to standard IEEE 802.16.

Bandwidth
For WiMAX different bandwidth are possible according to standard IEEE 802.16.

FFT Size
Fast Fourier Transformation

CP Ratio
Cyclic Prefix Ratio

Frame Rate
Frame Rate

BTS Name
WiMAX Base Station name.

Distance (to BTS)
Distance to the BTS.

Diagram

Below the table, the *Top N Chart* shows the RSSI and CINR for all cells in the current top N measurement as a bar chart. In the configuration menu, it is also possible to select the upper and lower RSSI und CINR levels for the y-axis of the chart.

Context menu

A right mouse click on any point in the view opens the context menu to access the configuration menus, put the view on hold, copy the current view to the clipboard, create new views, or to save the current configuration; see *Context menu* description on p. 4.2.

WiMAX Scanner Top N View Configuration

The *Top N View* tab in the configuration menu defines the y-axis scale, the minimum *RSSI / CINR [dBm]* and the maximum *RSSI / CINR [dBm])* level to be displayed in the *WIMAX Scanner Top N View* and selects the contents of the table. It is opened via a right mouse click on a point inside the *View* or via the *Tools - Modules Configuration...* command (see chapter 3).

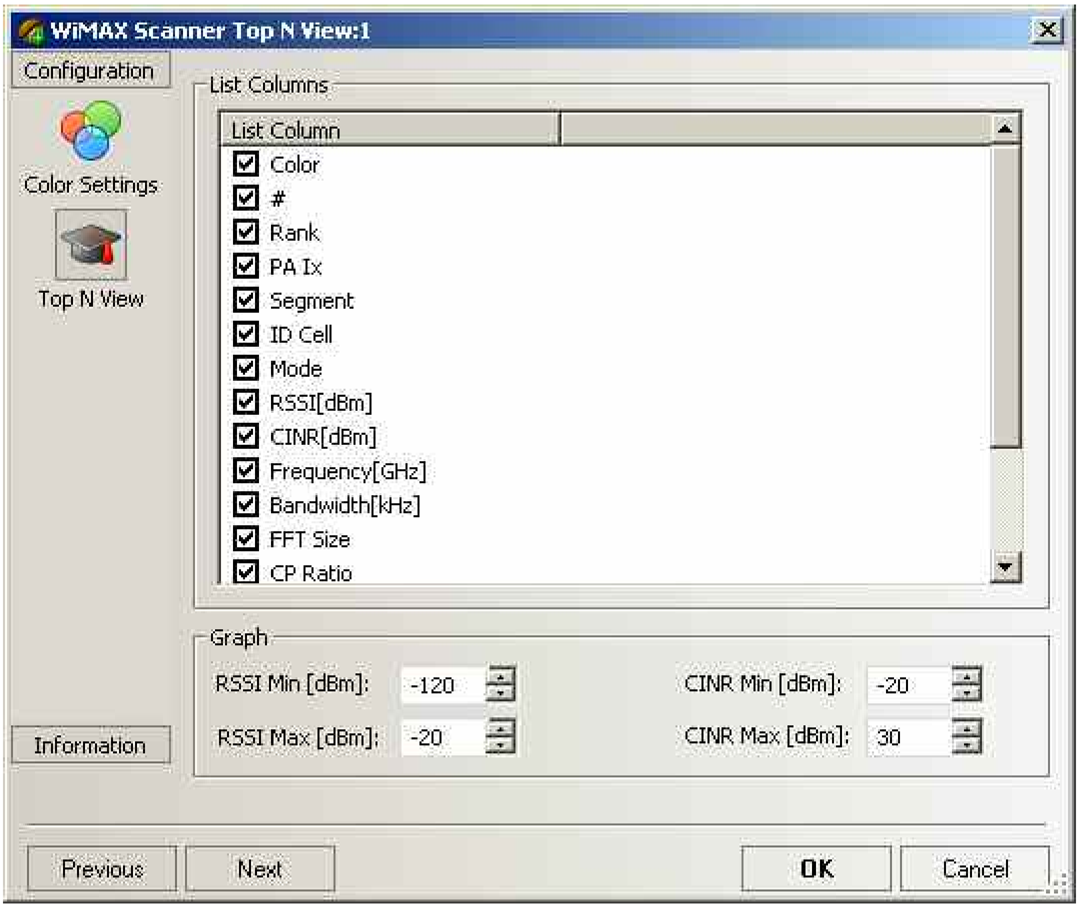


Fig. 4-316 WiMAX Scanner Top N View Top N View

Graph	*RSSI Min/Max [dBm]*	Sets the upper and lower RSSI levels for the left y-axis of the chart.
	CINR Min/Max [dBm]	Sets the upper and lower CINR levels for the right y-axis of the chart.

The *Color Settings* tab of the *WiMAX Scanner Top N* configuration menu is analogous to the *WiMAX Scanner CIR* configuration menu; see section *WiMAX Scanner CIR View Configuration* on p. *4.540.*

5 Reserved for future use

This section is reserved for future use.

Contents

6 Hardware Components

In the following, the hardware devices necessary for interference measurements and their installation and configuration is described. Note that, before any measurement is started, drivers for the mobile phone (see section Test Devices on page 6.34 ff.) and for the positioning system (see section Navigation on page 6.278 ff.) must be loaded.

Driver Installation

The following examples show how to install and remove hardware drivers and to assign them to a physical or virtual COM port. These actions are analogous for all drivers with a few exceptions:

- Loading the R&S Indoor driver and QoS Tester does not require any hardware or port assignments.
- The Rohde & Schwarz test receivers R&S ESVx, and R&S ESPI can be connected via IEC/IEEE bus interface, LAN interface or a dial-up connection; see section *Test Receiver Drivers* on p. 6.14 ff.
- The IEEE1394 Firewire interface is required for the Rohde & Schwarz TSMx.
- A PCMCIA slot is used i.e. for WLAN cards or for the UMTS data cards.

Configuration of the drivers is explained in the following sections (see page 6.30 ff.).

Hardware Dialog Window for loading Drivers

The hardware device drivers can be installed either by the *Hardware – Add/Remove...* menu, or simply by loading the desired configuration file. They are not necessary if the measurement data is simply replayed from a measurement file.

The drivers have been re-organized in R&S ROMES 4U compared to previous version. The drivers are now grouped according to their functionality.

The order of the group is changed dynamically. The group with the most accesses is listed on top. The following groups and drivers exist at the time of writing:

Navigation (GPS and indoor drivers; only one may be loaded at a time)	NMEA GPS (most GPS drivers) uBlox (TSMX-PPS) GPS (e.g. TSMX-PPS) Simulator GPS (formerly: Dummy driver) Placer GPS Travel Pilot GPS (formerly: Tprgs08) SVee6 GPS Indoor

Network Scanner	TSMx WCDMA TSMx GSM TSMx cdma2000 1xEVDO TSMx RF Power Scan FSP/ESPI WCDMA TSMW WiMAX
Mobile Devices **(drivers for mobiles, wlan cards, WiMAX cards etc.)**	Generic Mobile GSM WCDMA Sagem GSM TrioRail GSM AEG GSM RSTM GSM Nokia 6230 GSM NDIS WLAN Beceem WiMAX Qualcomm cdma2000® 1xEVDO (3GPP2) Qualcomm (E)GSM / WCDMA / HSPA (3GPP) Nokia (E)GSM / WCDMA / HSPA (3GPP)
Receiver	CW TSMx EB200 ESPI ESVx TS55-R2 DAB Philips 752 ETL TSM DVB
Quality of Service	Data Quality Analyzer Speech Quality Analyzer (Test with CMU only)
Others:	Attenuator BTS Position Estimator Windows Counters

Connection via COM Port

Loading the drivers is initiated by the *Add/Remove…* command in the *Hardware* menu. This command opens the *Load/Unload Drivers* menu.

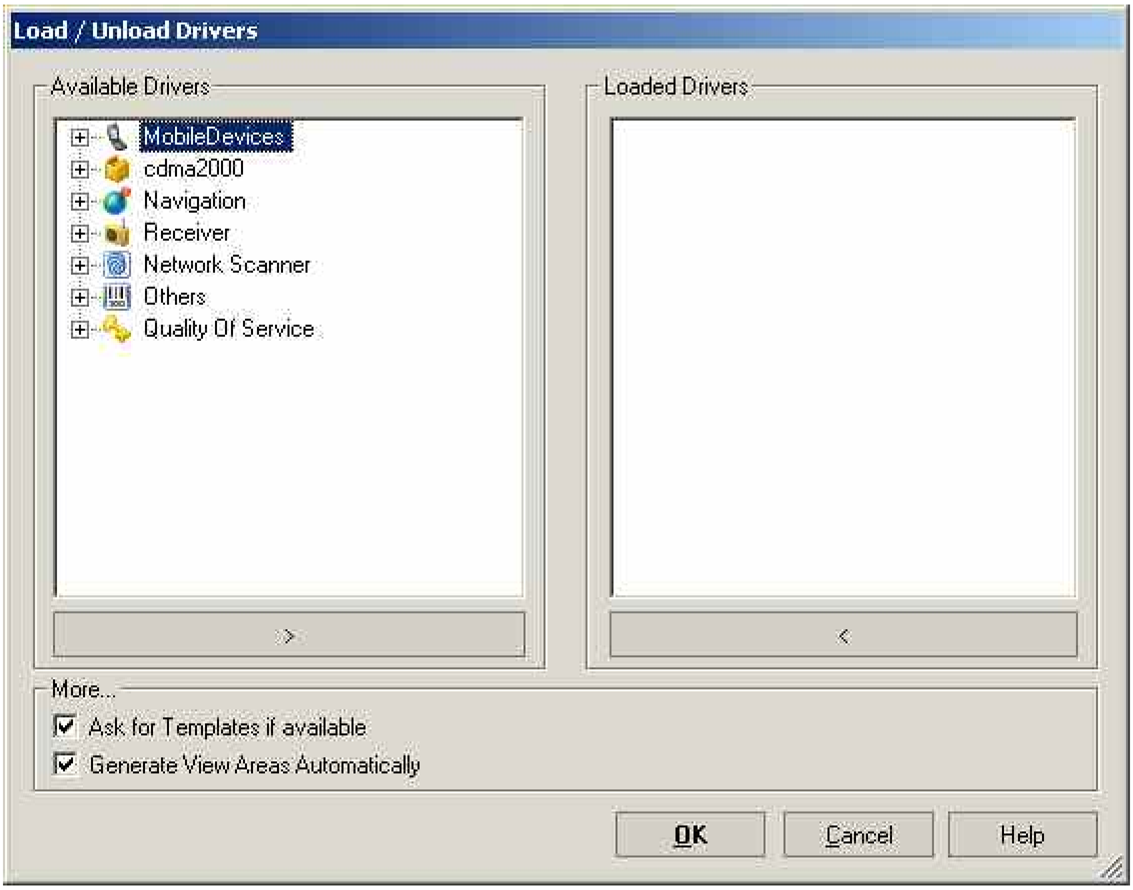


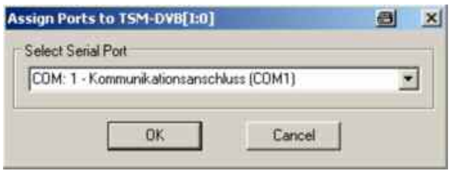
Fig. 6-1 Hardware Configuration – Load/Unload Drivers dialog box

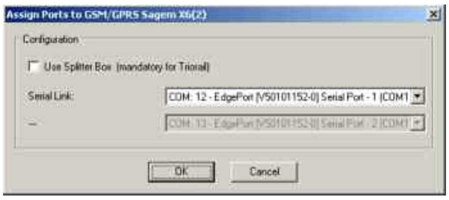
Multiple drivers It may be necessary to add one driver type several times, e.g. if several mobiles of the same type are used. The number in square brackets displayed behind the device node denotes the number of drivers allowed. In the example of Fig. 6-1 , it is possible to use up to 4 GSM mobiles (the number can be increased on request). The same GSM mobile driver can be assigned to several different ports.

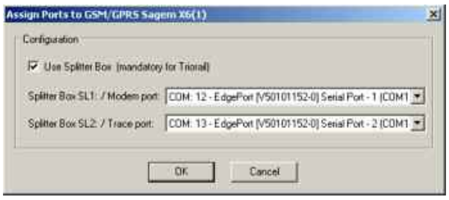
Available drivers The left-hand field shows a list of all available devices and installed drivers.

> button

For applicable drivers, the > button opens the *Assign Ports to ...* window for the selected driver, see examples below. The *Assign Ports to ...* windows for other drivers are analogous (see also section *Test Receiver Drivers* on p. 6.14 ff.).







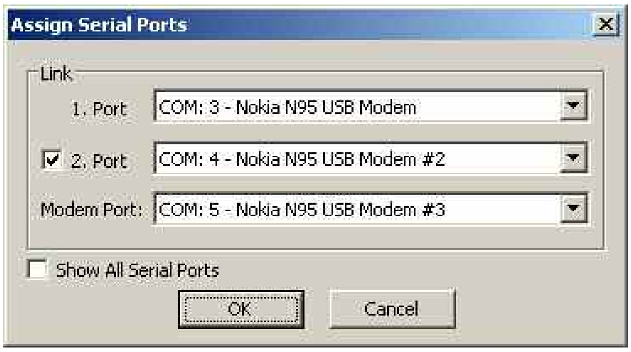
The *Driver resources* window assigns a COM port to the selected driver. It provides three buttons:

Serial Port Assigns a port to the driver to be loaded. Select a port from the pull-down list if the current assignment is to be changed.

OK Confirms the port assignment and closes the window. The driver previously selected (clicked) in the *Available drivers* list is initialized (loaded) and finally entered in the *Loaded drivers* list of the *Load/Unload Drivers* window. The progress of the procedure is monitored in a popup window.

Cancel Discards the changes made and closes the window

There is an automatic verification if the COM port is still available; only free ports are offered in the pull-down list. Drivers can be assigned to different ports by repeating the process, which leads to an *Assign Serial Ports* dialog.



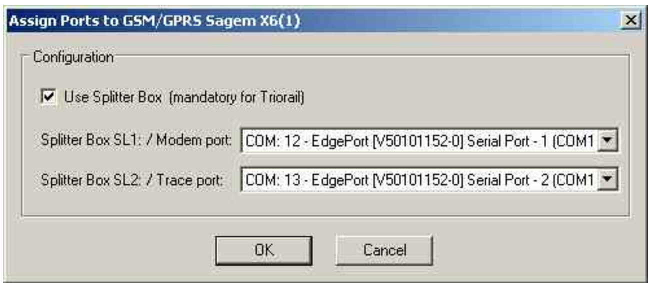
Splitter box (Mobiles supporting GPRS)

Instead of being directly connected to one of the COM ports, the Sagem or Trio-Rail TTS mobiles supporting GPRS may be used in combination with a splitter box. This additional device is connected to the mobile and to the power supply as shown below.

The splitter box separates the trace and data interface of the mobile. The trace interface corresponds to the normal GSM test mobile mode except GPRS, the data interface represents an extension that is used for GPRS data transfer. Three different modes can be set at the mobile:

Trace	Route the trace interface to SL1
Data	Route the data interface to SL1
Trace/Data	Route the data interface to SL1, the trace interface to SL2

The two outputs *SL 1* and *SL 2* of the splitter box can then be connected to two separate COM ports. The COM ports can be assigned in the *Assign Ports to ...* after the *Use Splitter box ...* option is checked.

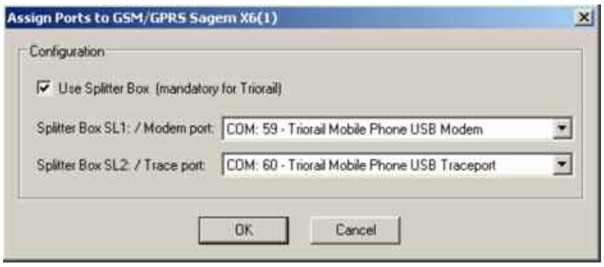


Note:

To measure, record and view GPRS data, the mobile must be used in Trace/Data mode and the trace and data interfaces must be routed to different COM ports. Therefore, the splitter box is a prerequisite for GPRS measurements using Sagem test mobiles.

GPRS test mobiles from Nokia and Qualcomm can be connected via USB interface; see section Connection via USB Interface on p. 6.8 ff.

For the TrioRail TTS-S75 and TTS-S75R test mobiles, please note that no automatic port recognition is performed with the Sagem X6 driver, so choose the applicable COM ports manually:



In the upper combo box select *TrioRail Mobile Phone USB Modem*
In the lower combo box select *TrioRail Mobile Phone USB Traceport*
These special COM ports are only available as long as the mobile is connected to the PC and powered on.

Note:
For the Sagem X6 driver the flag for the splitter box must be set even if a USB connection is used.

Failed Initialization

If the initialization of the mobile driver fails (e.g. because no mobile of appropriate type is available at the serial port), ROMES displays the following messages:

In this case check the connection and verify if the correct port has been selected.

< button

The < button removes a selected driver from the *Loaded drivers* list.

More...

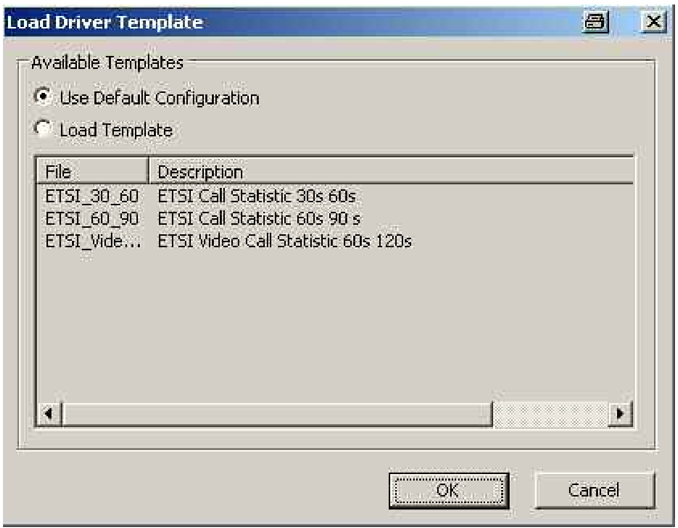
These settings control the loading options for the available drivers:

Ask for Templates if available
If this checkbox is activated, ROMES checks whether or not a driver template is stored in the *Driver Templates* subdirectory of ROMES program directory (see *Templates* on p. 6.79 ff.) and displays a list of the templates found.

Generate Worksheets automatically
If this checkbox is activated, ROMES automatically generates a view area depending on the loaded hardware. After loading one or more drivers, ROMES will propose automatically some view areas with the most important views concerning the loaded drivers.

Driver Templates

When a driver is loaded ROMES checks whether a driver template is stored in the *Driver Templates* subdirectory of ROMES program directory (see *Templates* on p. 6.79 ff.) and displays a list of the templates found.



The driver can be loaded with default settings or with the settings stored in any of the templates found.

OK

Confirms the port assignments made, loads the drivers with the configuration settings suitable for the connected mobile type, and closes the *Hardware drivers* window.

Cancel

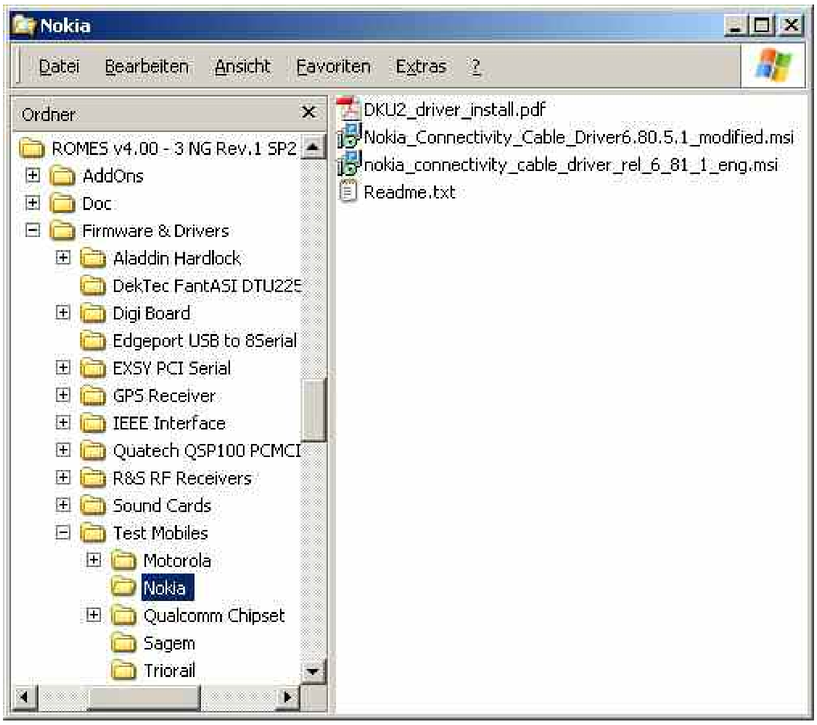
Cancels the installations made and closes the *Hardware drivers* window.

Connection via USB Interface

Most of the test mobiles are connected via USB cable using an appropriate driver. Physical COM ports are not needed. The USB drivers are already pre-installed on controllers from Rohde & Schwarz. They can also be installed from the ROMES DVD-ROM.

Installing the drivers

The USB drivers are mobile-specific and located in the *Firmware & Drivers\Test Mobiles* subdirectory on the R&S ROMES DVD-ROM, see the following example for the Nokia test mobile.



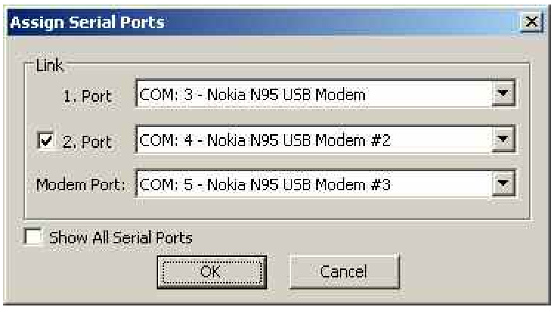
To install the driver(s) for your test mobile(s):

- ➢ Go to the relevant subdirectory for your test mobile type.
- ➢ Follow the instructions in the *Readme.txt* files or in the *.pdf installation instructions.

During the installation, MS Windows creates the necessary number of virtual COM ports and attaches them to the mobiles. Therefore, test mobiles connected via USB interface do not need a splitter box to separate the trace and data interface.

Loading the drivers (Nokia)

Once the USB drivers are installed on the system, they can be loaded following the procedure outlined in section *Connection via COM Port* (see p. 6.3 ff.). When one of the Nokia drivers is loaded, *R&S* ROMES opens the following dialog box:



One of the virtual COM ports created during USB driver installation can be assigned to the 1st port (data interface), the 2nd port (AT interface) and the *Modem Port* (data interface). The three virtual COM port numbers must be different.

The second port is optional but is required for autodialing. Besides it is recommended to always assign all three ports.

The operating system does not reliably delete unused virtual COM ports if USB devices are connected and disconnected repeatedly. It is recommended to delete redundant USB ports using the Special Device Manager (see chapter 8) if the assigned port numbers exceed values around 30.

Connecting several Qualcomm mobiles

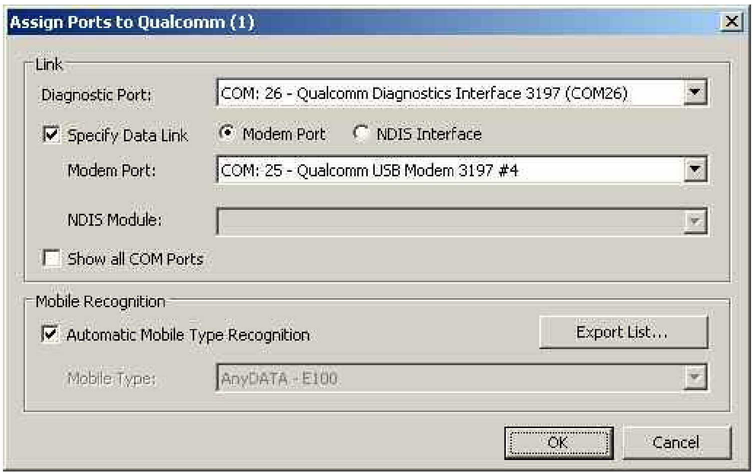
The supported Qualcomm mobiles (e.g. Samsung Z500, TM6250/6275, etc.) are composite devices which require two virtual COM ports. To install the driver, the test mobile must be connected to the USB port of the PC (see the installation information supplied with the driver). During installation, MS Windows will enumerate the mobile in order to add it to the USB device list.

The Qualcomm driver for cdma200/EV-DO mobile now supports EV-DO Rev. A. The following Rev. A capable devices are integrated in ROMES:

- Novatel S720
- Sierra Wireless AC595
- Kyocera Coronado

Under Windows XP several mobiles can be connected to the host PC without any modifications as long as they all use the same USB hub. The number of devices is limited by the number of ports on the hub.

Once the USB drivers are installed on the system, they can be loaded following the procedure outlined in section *Connection via COM Port* (see p. 6.3 ff.). When one of the Qualcomm drivers is loaded, ROMES opens the following dialog box:



To connect more devices, use the method described below.

The *Mobile Recognition* of a connected mobile is active per default. If the checkbox is unchecked, a mobile type can be selected from the related list box field.

The *Export List...* button saves the list of supported mobiles to a *.csv file. The following mobiles are currently supported:

Name	Category	HSDPA	HSUPA
A580	Category II	no	no
A930	Category II	no	no
A940	Category I	no	no
AC595	Category II	no	no
AC850	Category II	yes	no
AC860	Category II	yes	no
AC875	Category II	yes	no
Coronado	Category III	no	no
Crocky2	Category II	yes	no
E100	Category II	no	no
E17X	Category III	yes	yes
E220	Category II	yes	no
E270	Category II	yes	yes
E620	Category II	yes	no
E870	Category II	yes	yes
EF91	Category II	yes	no
Expedite EU740	Category II	yes	no
Fuji	Category II	yes	no
GlobeSurfer ICON	Category II	yes	no
GlobeTrotter Fusion	Category II	no	no
GlobeTrotter Fusion Quad Lite	Category II	no	no
GlobeTrotter HSDPA Modem	Category II	yes	no
GlobeTrotter HSUPA Modem	Category I	yes	yes
LG CU320	Category II	no	no
LG CU500	Category II	yes	no
LG Shine	Category II	yes	no
Merlin TU520	Category II	no	no

Merlin U530	Category II	no	no
Merlin U730	Category II	yes	no
Merlin U740	Category I	yes	no
Merlin U870	Category I	yes	no
Merlin U950	Category II	yes	yes
Merlin X950D	Category II	yes	yes
Merlin XU870	Category II	yes	no
Nozomi	Category II	yes	no
Nozomi V1.0.1Hd	Category II	yes	no
Nozomi V3	Category II	yes	no
Option PC Card	Category II	no	no
QTP6500	Category II	no	no
QTP6500	Category II	no	no
S620	Category II	no	no
S720	Category II	no	no
SE47	Unspecified	no	no
SGH-G800	Category III	yes	no
Siemens DC120	Category II	yes	no
TM6200	Category II	no	no
TM6250	Category I	no	no
TM6250	Category II	no	no
TM6275	Category I	yes	no
TM6280	Category I	yes	no
TM7200	Category I	yes	yes
U700	Category II	yes	no
UM-300	Category II	no	no
Unknown Mobile with QC Chipset	Unspecified	yes	yes
Z1	Category III	no	no
Z105	Category I	no	no
Z107	Category II	no	no
Z130	Category II	no	no
Z500	Category I	no	no
Z560	Category II	yes	no
Z720i	Category II	no	no
ZTE	Category II	no	no
ZV10	Category II	no	no
ZV40	Category II	no	no
ZV50	Category II	yes	no
ZX10	Category II	no	no

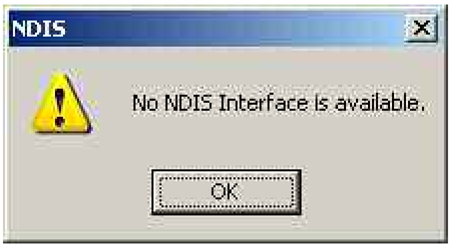
(*) Category I means the mobile is permanently used for tests, Category II means that the mobile was tested successfully at least once.

IMPORTANT

The Samsung and TrioRail mobiles rely on the USB interface for their power supply. A supply current of up to 0.5 A is required. Check the specification of your USB interface, especially when connecting several mobiles or other power-consuming devices in parallel. If necessary, use a self-powered USB hub.

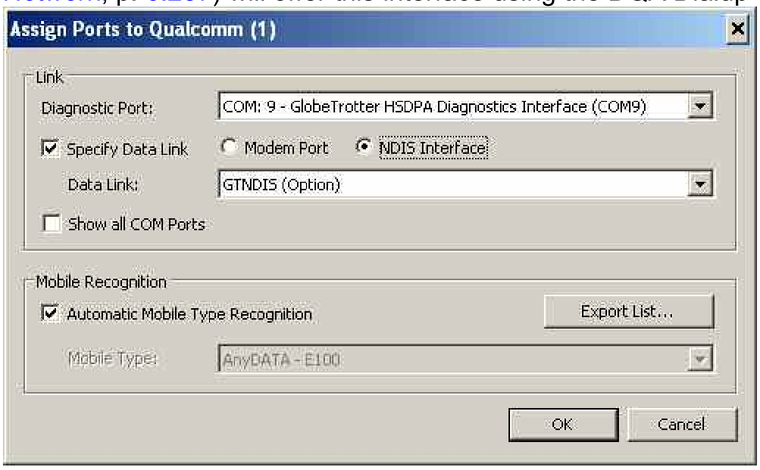
NDIS Interface

To use the NDIS interface, select the option “NDIS Interface” on the Assign Ports dialog. ROMES will search for available NDIS Interfaces on the PC. If at least one NDIS Interface was found, the “NDIS Module” option gets active, and the user can select the desired NDIS Interface in the NDIS Module Combo Box. If there is no NDIS Interface available the message below will be displayed and the options for the NDIS Interface will be grayed out.



Option Data Cards

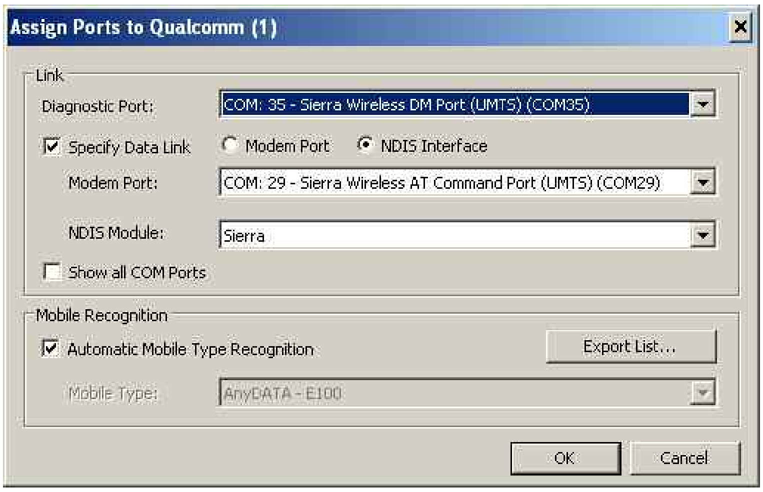
The Qualcomm Driver supports the NDIS “*Network Device Interface Specification”* interface called GTNDIS. The DQA Connect Job (see chapter *Connect to Network*, p. 6.237) will offer this interface using the DQA Dialup Option.



Currently only one device per PC is supported. If the NDIS interface is chosen, the modem port will not be used at all.

Sierra AC875

The Sierra Wireless AC875 is supported by NDIS Interface. Unlike the Option Card, the Sierra Wireless NDIS Interface does not support AT Commands. Thus a modem port has to be specified, to be able to communicate with the card.



TIP

Select “Sierra Wireless DM Port” and “Sierra Wireless AT Command Port” in the case of using NDIS. Ensure that the “Watcher” is not running during the ROMES session.

Test Receiver Drivers

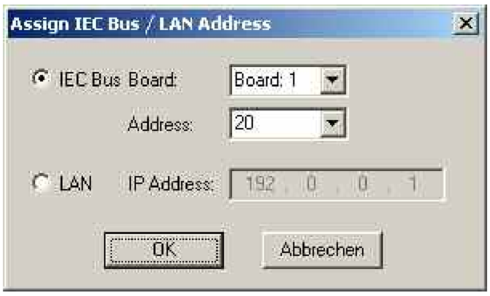
When a test receiver driver is loaded *(R&S ESPI, R&S ESVx, R&S TSMx, EB200, TS55-R2),* ROMES checks whether the driver configuration settings comply with the connected receiver. If they do not, the *Receiver settings* tab of the test receiver configuration menu is opened to adjust the driver settings. Test receivers must be switched on to be identified by the drivers.

Interfaces

- The R&S ESVx is always controlled via IEC/IEEE interface.
- The R&S ESPI can be controlled either via IEC/IEEE interface or via LAN interface.
- The R&S TSMx is always controlled via IEEE 1394 Firewire interface.
- The EB200 can be controlled either via LAN interface or via serial RS232 interface with 9-pole sub-D connector on the rear panel of the instrument, to be used preferably in the mode RS232 PPP (dial-up Point-to-Point Protocol connection). Both interfaces are optional; at least one of them is provided on each unit. It is recommended to use the LAN interface because it is more reliable.
- The R&S TS55-R2 is controlled via serial RS232 interface.

R&S ESPI Driver

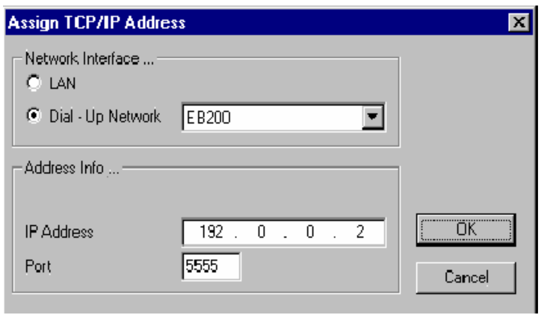
The LAN interface is provided as an option for the R&S ESPI receiver (option FSP-B16, LAN Interface). Loading the R&S ESPI driver opens the *Assign IEC Bus/LAN Address* window:



The window chooses between the IEC/IEEE bus interface and the LAN interface and defines the IEC bus or IP address of the test receiver. See paragraph *Allocating a valid IP Address* below.

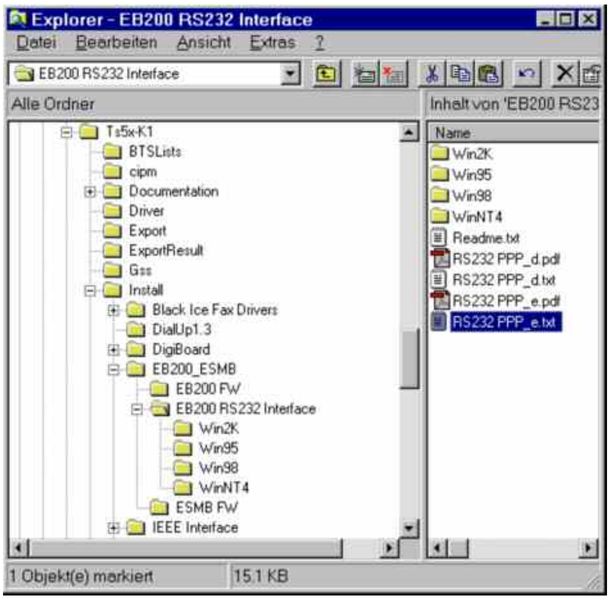
EB200 Driver

Loading the EB200 driver opens the *Assign TCP/IP Address* window.



This window chooses between the LAN interface and a dial-up network connection via RS232 (PPP connection) for data exchange by means of a terminal program. It also sets the *IP Address* (see paragraph *Allocating a valid IP Address* below) of the test receiver and the *Port* number for the connection. The default port number of 5555 needs to be adjusted only in case of problems, e.g. due to a firewall with port filters.

Establishing a dial-up PPP connection to the EB200 via serial interface and by means of the TCP/IP network protocol and a virtual modem is described in the EB200 operating manual and in the instructions supplied with the ROMES installation:

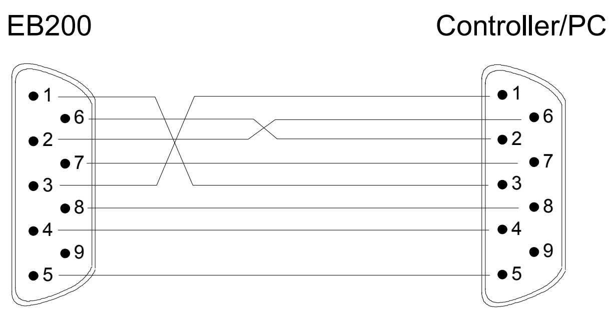


Note:

To establish the physical connection between the EB200 RS232 interface and the controller, a special null modem cable must be used. The cabling is as shown below; in particular, the two pin pairs 1, 3 and 2, 6 must be cross-connected. This specification differs from the ordinary cabling for a connection of a test instrument with a controller via RS232 interfaces (see e.g. PPP installation instructions).

Note:

It is recommended to use the LAN Interface, because it is more stable.



IP Addresses

Allocating a valid IP address

To establish a LAN connection, the IP address of the test instrument and the controller must be compatible. In practice, the IP address of the test instrument is adapted to the IP address of the controller. Determining the addresses that can be potentially used for the test instrument (if they are not yet assigned to another host in the LAN) involves the following steps:

Determine the IP configuration of your controller.

Use the IP address and the subnet mask to determine the available network IDs.

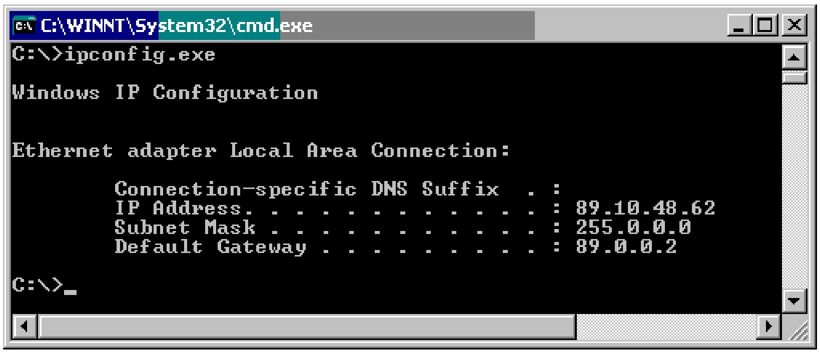
Note:
The following procedure is appropriate for a standalone, dedicated connection between a controller and a test device. If you intend to connect through an established network (e.g. a company intranet), contact your network administrator to obtain the required IP addresses.

Determining the IP configuration

To determine the IP configuration of your controller,

- ➢ Open the *Start* menu of your Windows operating system and select *Run…*
- ➢ In the *Run* dialog opened, enter *CMD* and click *OK.*
- ➢ In the DOS box opened, type *ipconfig.exe* and press *Enter.*

The IP address information of your controller is displayed:



IP address and subnet mask

The IP address (IPv4) consists of four 8-bit values, called octets that are written as decimal numbers (0 to 255) and separated by dots. The IP address consists of the network ID and the host ID:

- The *network ID* identifies the LAN and must be common to the controller and the test instrument.
- The *host ID* identifies a controller, test instrument or other TCP/IP host within the LAN. The address for each host must be unique to the network ID.

The subnet mask is a 32-bit value that is used to distinguish the two parts of an arbitrary IP address:

- A 1 in the subnet mask (written in binary notation) means that the corresponding bit in the IP address belongs to the network ID.
- A 0 in the subnet mask (written in binary notation) means that the corresponding bit in the IP address belongs to the host ID.

The 1s in the subnet mask are always chosen in a contiguous fashion from the high order bits.

The IP Address numbers 10.a.b.c, 172.d.b.c, 192.168.b.c (where a = 0 to 255, b = 0 to 255, c = 1 to 254, d = 16 to 31) are reserved for private addresses; they are not reachable on the Internet.

Special subnet mask values

In decimal notation, a subnet mask octet value of 255 (= 11111111 binary) means that the entire octet belongs to the network ID, so the corresponding octets of the controller and the connected test device must be equal. A subnet mask octet value 0 means that they must be different.

Example:

IP address of the controller: 192.168.48.62
Subnet mask of the controller: 255.255.255.0
The first three octet values in the IP addresses must be equal. An example for a valid IP address for the test device is 192.168.48.52.

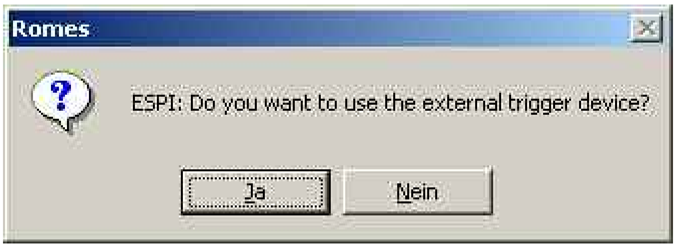
Note:

Host IDs must not consist of all zeros or all ones (in binary notation) because these values are reserved. For subnet mask values other than 0 or 255, a conversion into binary notation is helpful.

External Trigger Device

Trigger Box

The Rohde & Schwarz test receivers R&S ESPI, R&S ESVx, EB200 and TS55-R2 can be operated with the Trigger Box, an external trigger device to be connected to a serial port. The Trigger Box is mandatory for the R&S ESVx receivers, optional for the R&S ESPI receivers. Clicking *OK* in the *Assign IEC Bus/LAN Address* window opens the following message box:



After clicking *Yes,* ROMES asks for a serial COM port to be assigned to the Trigger Box and terminates the installation. Both the test receiver and the Trigger Box configuration menus can be accessed from the *Hardware* menu; see Fig. 6-79 on p. 6.148.

R&S TSMx Firewire Driver and Firmware Installation

Firewire Driver (R&S TSMx) - Information

The R&S TSMx devices are controlled via IEEE 1394 Firewire interface. Due to measurement requirements, a special driver from Rohde & Schwarz is required for the operation.

When the R&S TSMU was introduced for ROMES, the original Microsoft driver file **ohci1394.sys** was replaced by a modified R&S file with the same name. Two major disadvantages were observed:

- The R&S driver file was not digitally signed, as opposed to the original MS files. And since MS Windows always prefers its own signed files – if not fooled by some smart tricks, performed by the R&S installer tool *R&S_OHCI1394_InstallationTool.exe*. However, on some PCs this did not work, and sometimes MS Windows re-installed the original file later, as it is not possible to remove it from the system completely.
- The modified R&S driver did not work with all IEEE1394 interface hardware. Some devices were successfully tested and therefore recommended, but it can happen that a manufacturer e.g. changes the chipset without announcement – and without notification on the label.

So the idea to use the original driver file again and install an additional R&S driver instead was pursued, providing the required R&S TSMx functions.

To keep it simple, we call the first one (replacement of the original ohci1394.sys by an R&S file) the **Old FireWire driver**, and the installation of an additional driver the **New FireWire driver**.

However, there are two important conditions for both Old and New driver: The R&S TSMx firmware version and the ROMES version. This diagram shows the relationships between ROMES version, FireWire driver and R&S TSMx firmware:

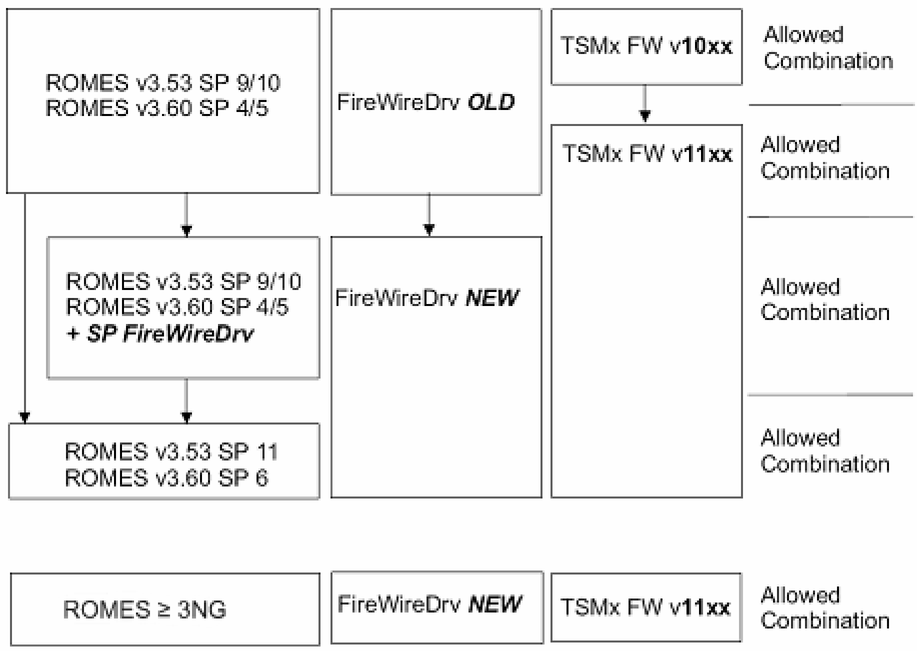
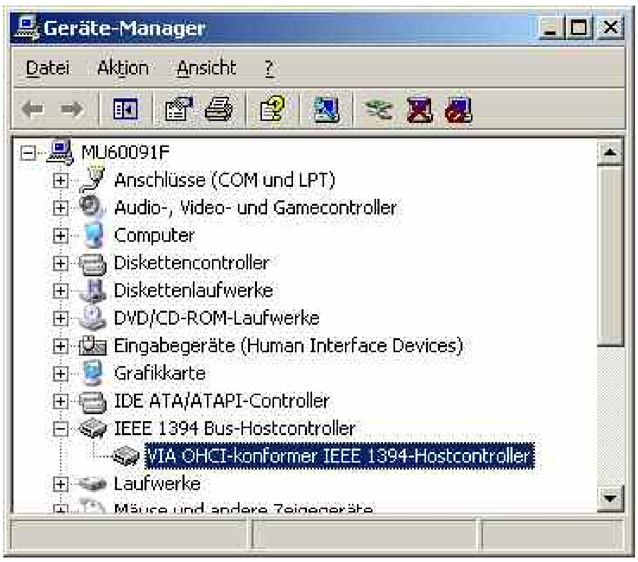


Fig. 6-2 ROMES version, FireWire driver and R&S TSMx firmware dependencies

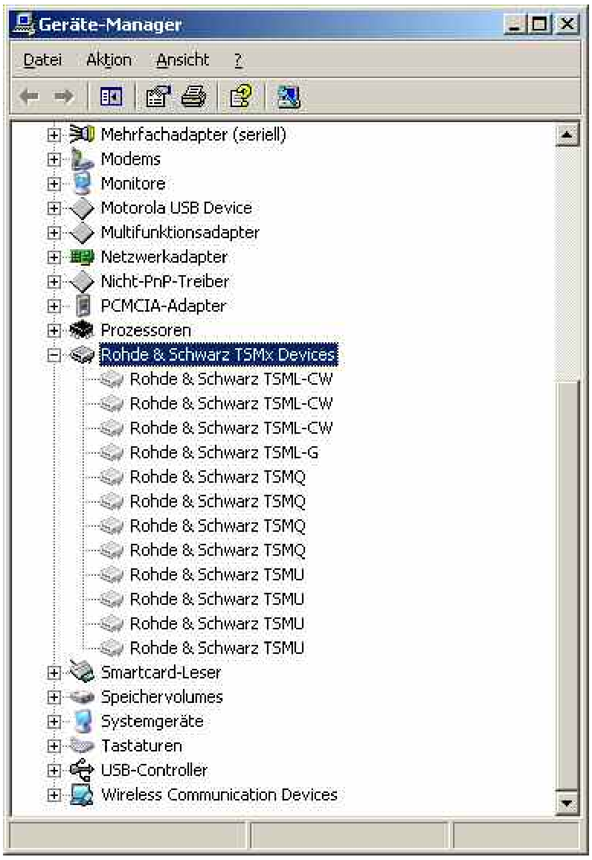
To determine the currently installed FireWire driver version, go to the MS Windows Device Manager and select the IEEE1394 controller:



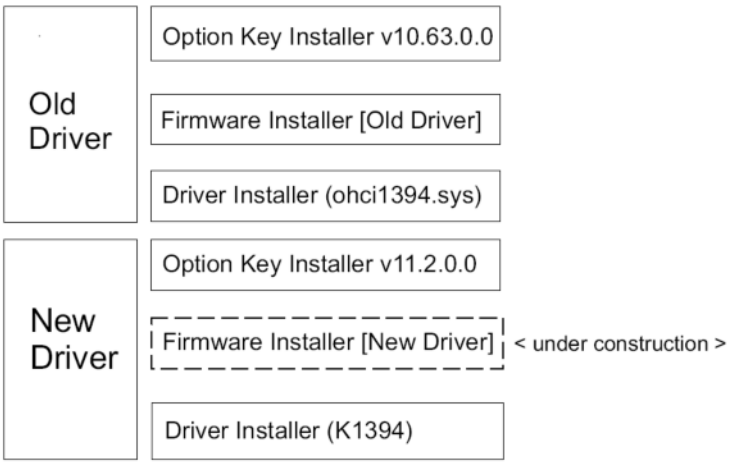
Right-click the controller, select *Driver*, then *Driver Details*:

Select the **ohci1394.sys** file list entry to view its properties. If the file originates from Rohde & Schwarz, then the old driver is installed.

To verify if the new R&S Firewire driver is installed, run the Special Device Manager *(see chapter 8)* and select Show hidden Devices. If you can see the section Rohde & Schwarz TSMx Devices, the new driver is already installed. Every entry in this section shows a device which has already been connected. A new serial number will cause a new entry, so you may see multiple entries of the same device as shown below.



To resolve the installation difficulties, another set of R&S TSMx tools is included on the R&S ROMES DVD). Here is an overview of the available old and new R&S TSMx tools:



Note that the firmware version numbers are subject to change, but v**10**.xxxx always refers to the **Old** and v**11**.xxxx to the **New** Firewire driver.

The Option Key and *Firmware Installer* tools only work with the related driver.

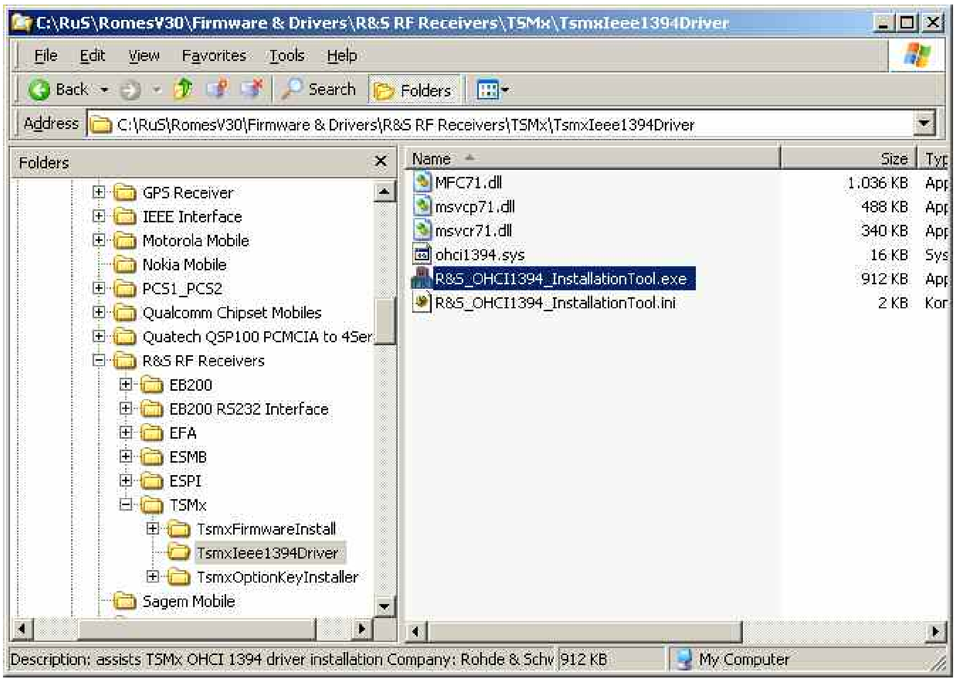
As long as the *Firmware Installer* for the *New* driver is not available, all firmware updates have to be done with the old tool and the old driver, also e.g. an update from FW 11.04 to 11.05.

For this reason, the ROMES DVD contains the old driver as well, as a possible fallback position.

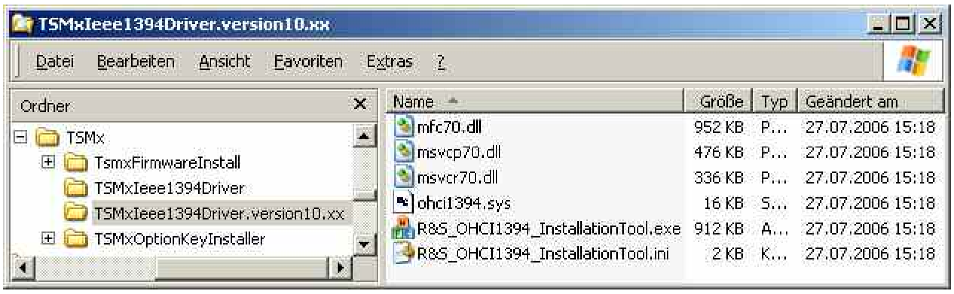
Old Firewire Driver (TSMx) - Installation

Please consult *Fig. 6-2 ROMES version, FireWire driver and R&S TSMx firmware dependencies* first to confirm that the old Firewire driver is to be installed.

The old TSMx IEEE 1394 Firewire driver is located in the *Firmware and Drivers\R&S RF Receivers\TSMx\TSMxIEEE1394Driver* subdirectory of the ROMES DVD-ROM:



If a new TSMx IEEE 1394 Firewire driver is available, the directory structure shown above is slightly different:



In case of the presence of a new driver, the directory of the old driver is named "*TSMxIEEE1394Driver.version10.xxx* ".

- To install the old driver, double-click *R&S_OHCI1394_InstallationTool.exe* and follow the directions in the installation wizard.

The old TSMx IEEE 1394 Firewire driver replaces the Microsoft driver delivered with the IEEE 1394 hardware and reserves the IEEE 1394 functionality for R&S TSMx operation. The original Microsoft driver is restored by deleting the system file C:\WINNT\system32\drivers\ohci1394.sys.

To prevent Windows from accessing its own installation sources while the driver is installed, it is necessary to disable network and dial-up connections and block the Windows file protection mechanism. Once the installation is complete, the driver can be enabled in the Windows Control Panel or by simply restarting the computer. For details refer to the information in the installation wizard.

New Firewire Driver (TSMx) - Installation

Please consult *Fig. 6-2 ROMES version, FireWire driver and R&S TSMx firmware dependencies* first to confirm that the new Firewire driver is to be installed.

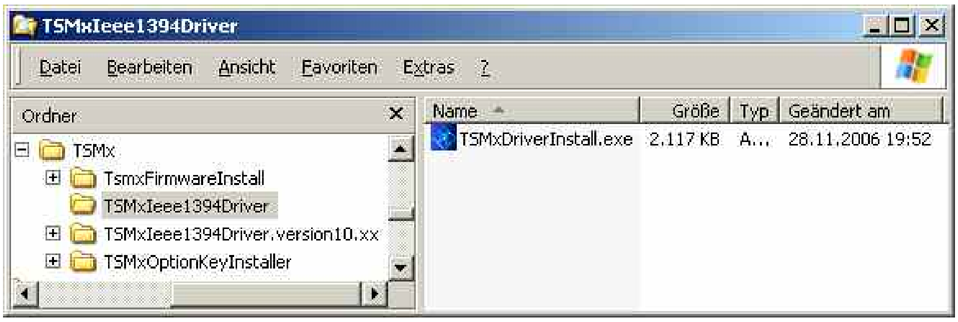
The installation of the new Firewire driver can either be done from scratch (new installation) or as a migration from old to new version (if a ROMES update is performed).

The R&S TSMx Firmware Installer for the new driver is still under development, so for all firmware updates the old tool has to be used, which makes it necessary to switch back to the old driver temporarily, even if you go i.e. from FW 11.04 to 11.05. This is described in step 3.).

For this reason, the installation tool for the old driver is available as well.

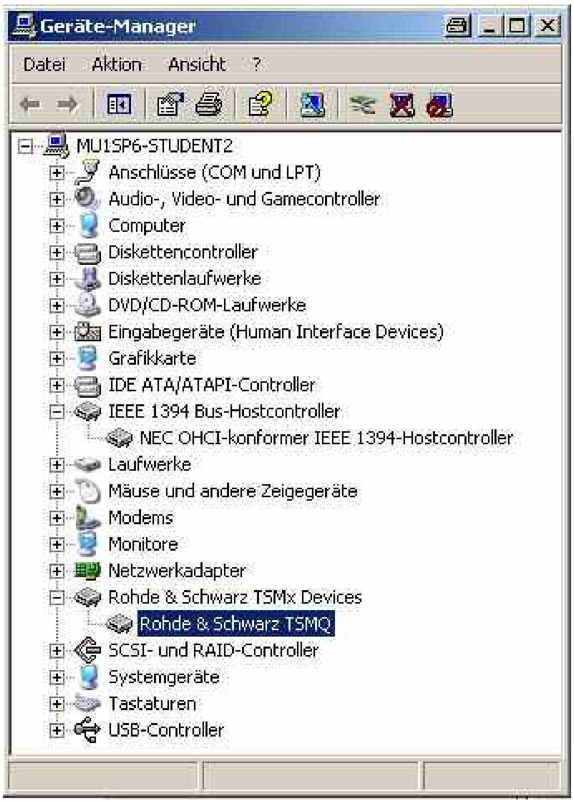
1.) Installation of the New Firewire Driver from Scratch

The new TSMx IEEE 1394 Firewire driver is located in the *Firmware and Drivers / R&S RF Receivers / TSMx / TSMxIEEE1394Driver* subdirectory of the ROMES DVD-ROM:

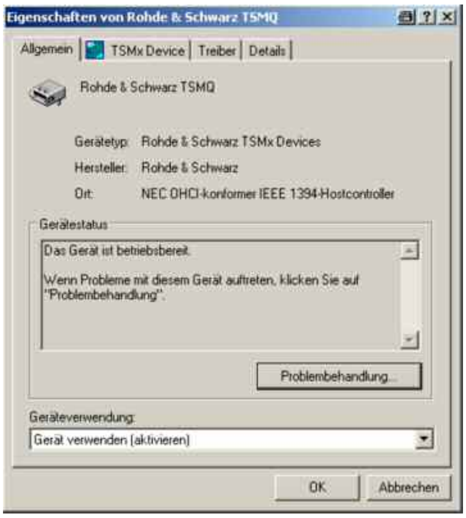


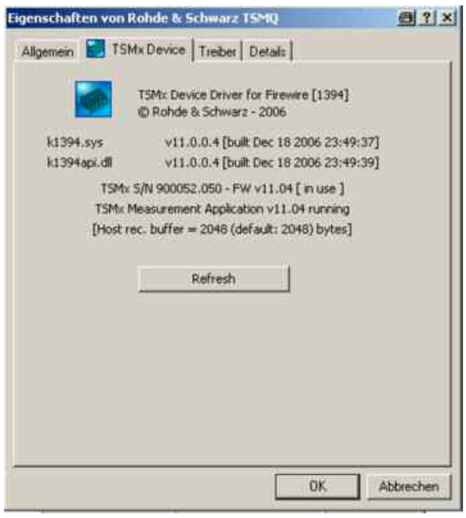
➢ To install the new driver, double-click *TSMxDriverInstall.exe* and follow the directions in the installation wizard.

The installation of the new Firewire driver verifies that the original ohci1394.sys from MS is restored and installs the new add-on driver. The add-on driver is activated as soon as the R&S TSMx is connected to the ROMES computer. The MS Windows Device Manager shows the driver, e.g. for an R&S TSML-CW.



The driver properties are available using the context menu of the Device Manager entry:





According to the driver file name, the new driver can be referred to as **K1394** driver.

Checking the driver details shows that the K1394.sys file is still not signed digitally, but now the file is ignored by the Windows file protection mechanism.

The new K1394 add-on driver is also available in the *Windows Software manager*.

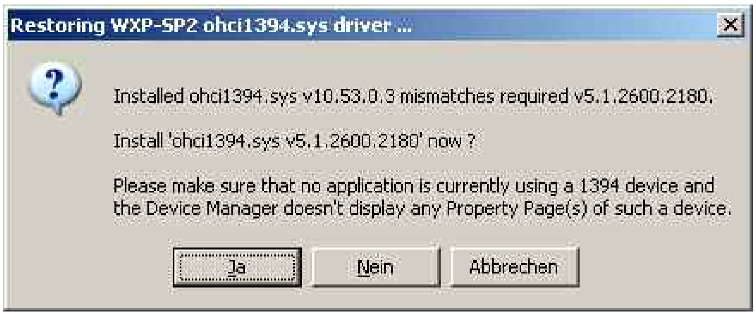
Every time the new driver detects an R&S TSMx with a new serial number, it will initiate the “New hardware found” dialog and install itself in the device manager. If the serial number is already known this will be done silently.

2.) Migration from Old to New Firewire Driver

Since the new R&S TSMx driver only complies with firmware v11.xx or above, it is advised that first all R&S TSMx units are upgraded to the latest available firmware while the old Firewire driver is in operation. This is done with the Firmware Installer as described below.

In case the New driver is already installed and an R&S TSMx still running on Firmware v10.xx must be updated, you have to go back to the old driver, upgrade the R&S TSMx to FW v11.xx, and then re-install the new driver. This will become obsolete as soon as the *Firmware Installer* for the *new* driver becomes available.

After all R&S TSMx devices are updated to firmware v11.xx or above, the new driver is installed by double-clicking *TSMxDriverInstall.exe* as described in step 1.). No R&S TSMx needs to be connected. When the old driver is detected, the following message is shown:



Click on *Yes* to restore the original ohci1394.sys from Microsoft.

After that, the K1394 driver is installed.

If ROMES is used, the driver migration is now finished.

With ROMES 3.53 SP10 or ROMES 3.60 SP5 the special Service Pack for the new FireWire driver has to be installed before ROMES is restarted.

3.) If needed: Return from New to Old Firewire Driver

If it is necessary to return to the old driver for firmware updates, just use the driver install tool *R&S_OHCI1394_InstallationTool.exe*. After that the necessary firmware update(s) can be performed.

Then the new K1394 driver can be reinstalled as described above.

This rollback is sufficient for the firmware updates from v10.xx to v11.xx, but NOT for ROMES measurements with the *Old* driver.

Certain DLLs in the ROMES path are changed with the update from *Old* to *New* driver, and these will not be restored by reinstalling the *Old* driver. If only the firmware installer is run, the old DLL versions are provided in its path – but ROMES is run, the ROMES program path DLLs is used.

If the old version of Romes is required, it is necessary to re-install ROMES .

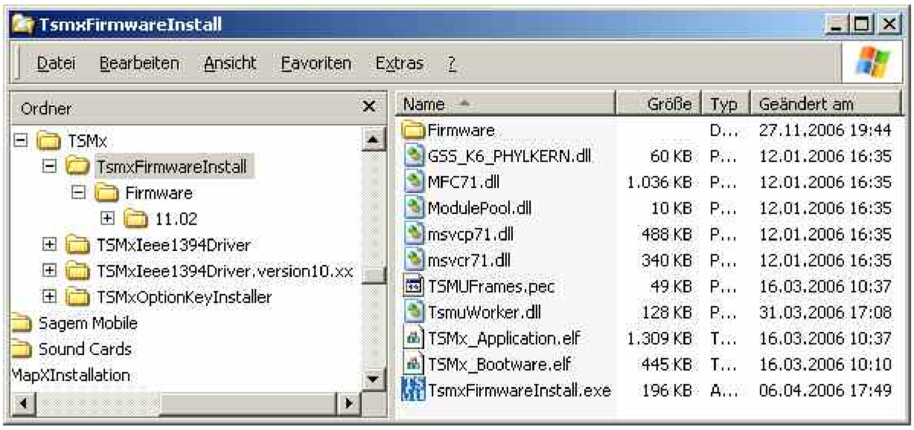
R&S TSMx Tools - Firmware Installer

To install a different firmware on a R&S TSMx. the following steps have to be conducted:

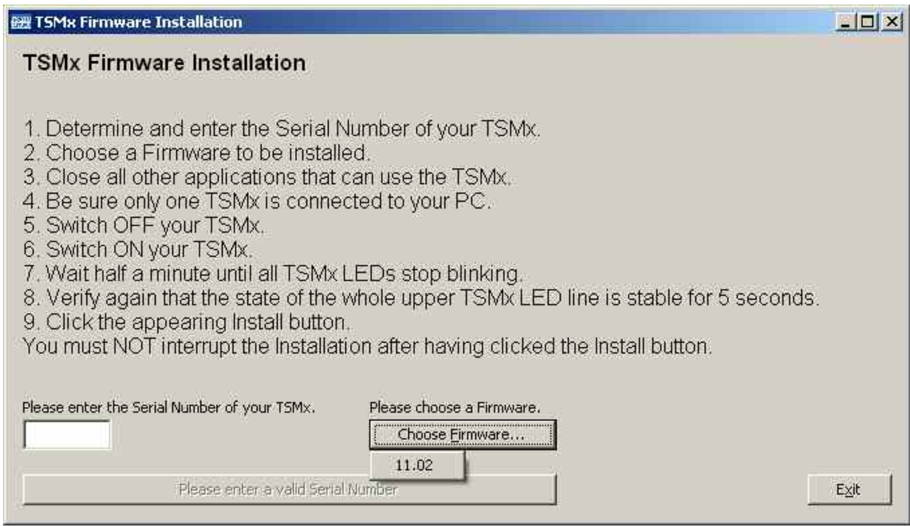
The ROMES program directory contains a subdirectory

...\Firmware & Drivers\R&S RF Receivers\TSMx

where the R&S TSMx tools are available.



To install a new firmware version on a connected R&S TSMx, change to the subdirectory "TsmxFirmwareInstall" and run the "TsmxFirmwareInstall.exe" executable, which opens a control dialog similar to the following:



Follow the given instructions closely to install the selected firmware version.

> ***Note:***
> *In case you are already running the New driver, and receive an R&S TSMx still running on Firmware v10.xx, you have to go back to the Old driver, upgrade the R&S TSMx to FW v11.xx, and then re-install the New driver.*

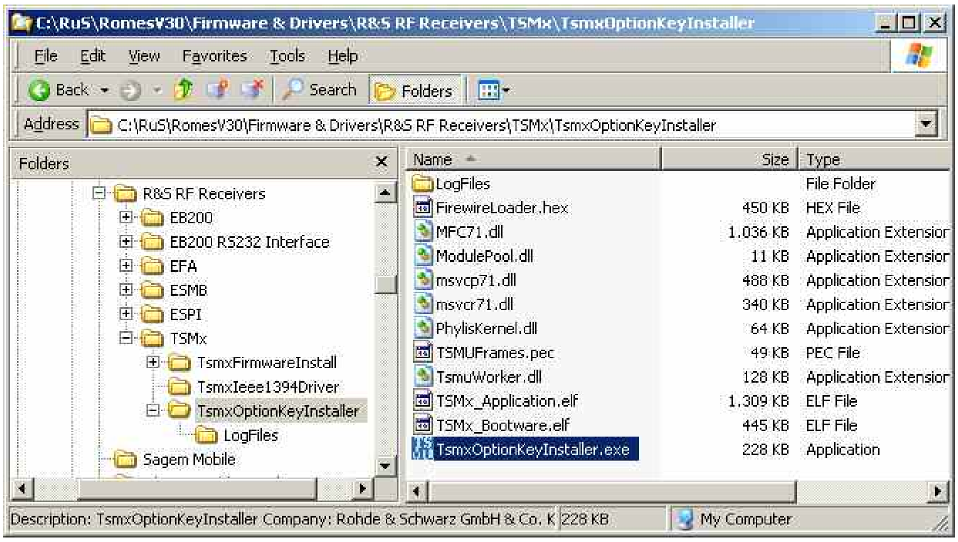
R&S TSMx Tools - Option Key Installer

To activate an option key for a R&S TSMx. the following steps have to be conducted:

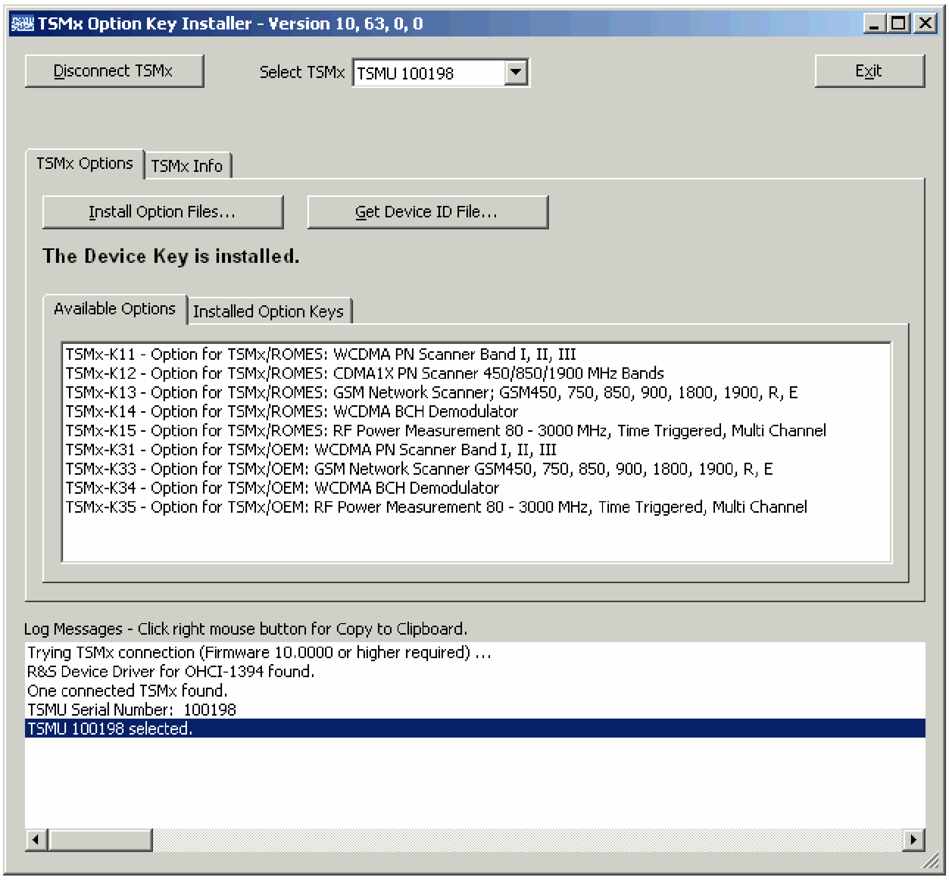
The ROMES program directory contains a subdirectory

...\Firmware & Drivers\R&S RF Receivers\TSMx

where the R&S TSMx tools are available.



To activate an option key for a connected R&S TSMx, change to the subdirectory "TSMxOptionKeyInstaller" and run the "TsmxOptionKeyInstaller.exe" executable, which opens a control dialog similar to the following:



Connect TSMx / Disconnect TSMx

After a connected TSMx from the *Select TSMx* list is marked, the *Connect TSMx* button queries the installed and available options for this R&S TSMx. The results are displayed in the related fields of the option key installer dialog.

After an R&S TSMx is selected, the button changes to *Disconnect TSMx.*

Select TSMx

A list can be opened which contains the available R&S TSMx for selection.

Exit

Saves the modifications and closes the dialog.

TSMx Options

This panel contains information about the available and installed options and it allows the installation of the purchased option files.

Install Option Files...

Opens a *File Open...* dialog to load the option key files which were delivered after purchase of the desired option for the selected R&S TSMx.

Get Device ID File...

Creates a file named DevID_TSMx_xxxxxx.hex, which is used for the identification of the device. In some cases, e.g. when additional options are ordered, the file has to be sent to R&S.

Available Options Lists the options for the selected R&S TSMx.

Installed Option Keys Lists the installed and currently enabled options.

TSMx Info This panel contains a list of information of the R&S TSMx device (hardware, serial numbers, firmware version, and calibration data).

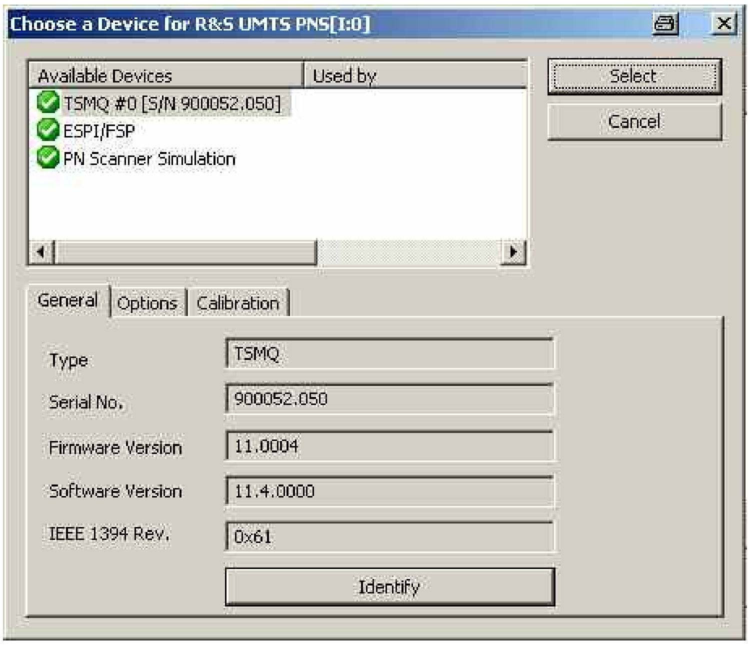
Log Messages... The message log of the activities related to the option key installation is shown.

Device Chooser (R&S TSMx)

The R&S TSMx can be used as a *CW Receiver*, as a GSM Network Scanner *(GSM NWS),* or as a *UMTS PN Scanner.* Whenever one of the three drivers is loaded, ROMES displays the *Device Chooser* dialog with a list of available test devices, their general properties, and the enabled options.

Note:
The two IEEE 1394 (Firewire) connectors on the rear panel of the R&S TSMx can be used to cascade several units together and perform different measurements in parallel. One unit can be used as a GSM network scanner, one as a PN scanner, and more as CW receivers. The position of an R&S TSMx unit in the cascade is irrelevant for its use, just check whether the unit is equipped with the required options.

In the following *UMTS PN Scanner* example, one can choose between an R&S TSMx test receiver, the simulation (which is always available), and an R&S ESPI/FSP test receiver. The *Device Chooser* is closed after selecting the device; the installed driver is configured in an independent driver configuration menu.



Configuration of Installed Drivers

All added drivers are shown in the *Loaded Drivers* list of the *Load/Unload Drivers* menu. Additionally, they appear in the *Tools – Modules Configuration...* menu. To distinguish multiple drivers (i.e. drivers assigned to various COM ports) from each other, they are assigned a number in the command line (*Z500 [**1**] ..., Z500 [**2**] ...*).

If a *Custom Name* was assigned to the device (see section *Driver Configuration GSM – Serial Port Driver Info*, p. 6.81), it is displayed in a column of the *Device Chooser* list above. The *Custom Name* can be used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider.

An example for a Sagem OT260 mobile with an assigned *Custom Name* of "This_is_my_mobile" is shown below:

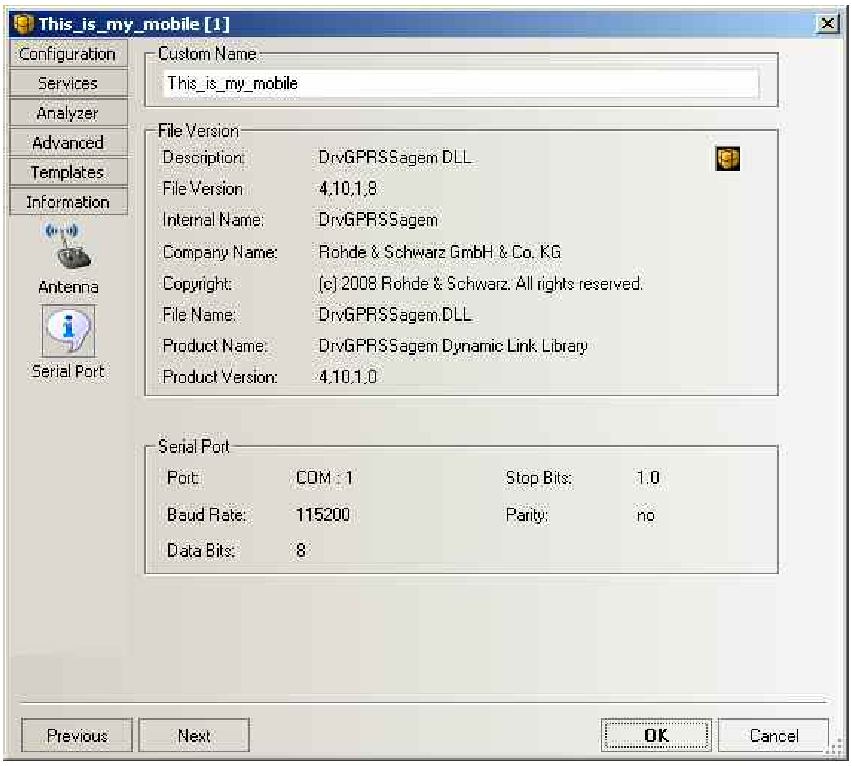


Fig. 6-3 Custom name

For many device drivers the *Action* menu is also added to the menu bar. It contains driver-specific functions for control during measurement and recording (see subsections Action Menu in the corresponding mobile driver sections).

Fig. 6-4 Driver indication with Custom Name ...without Custom Name

The *Driver* commands in the *Hardware* menu open the driver-specific configuration menus described in section

Driver Configuration Menu on page 6.49 ff.

System Monitor and Performance Counters

The *Windows Counters*driver is a hardware-independent driver that stores Windows performance counters to the measurement file. Monitoring this information during the measurement can be helpful for assessing the validity of measurement results.

Example:

Suppose that a DQA job involving an FTP download from a remote server fails. Monitoring the local processor time together with the measurement data helps to decide whether the failure is due to local performance problems rather than to an unstable data connection.

The *Windows Counters* driver is installed from the *Load/Unload Drivers* menu (see Fig. 6-1 on p. 6.3) like any other driver. The driver configuration menus are accessible from the *Hardware* menu.

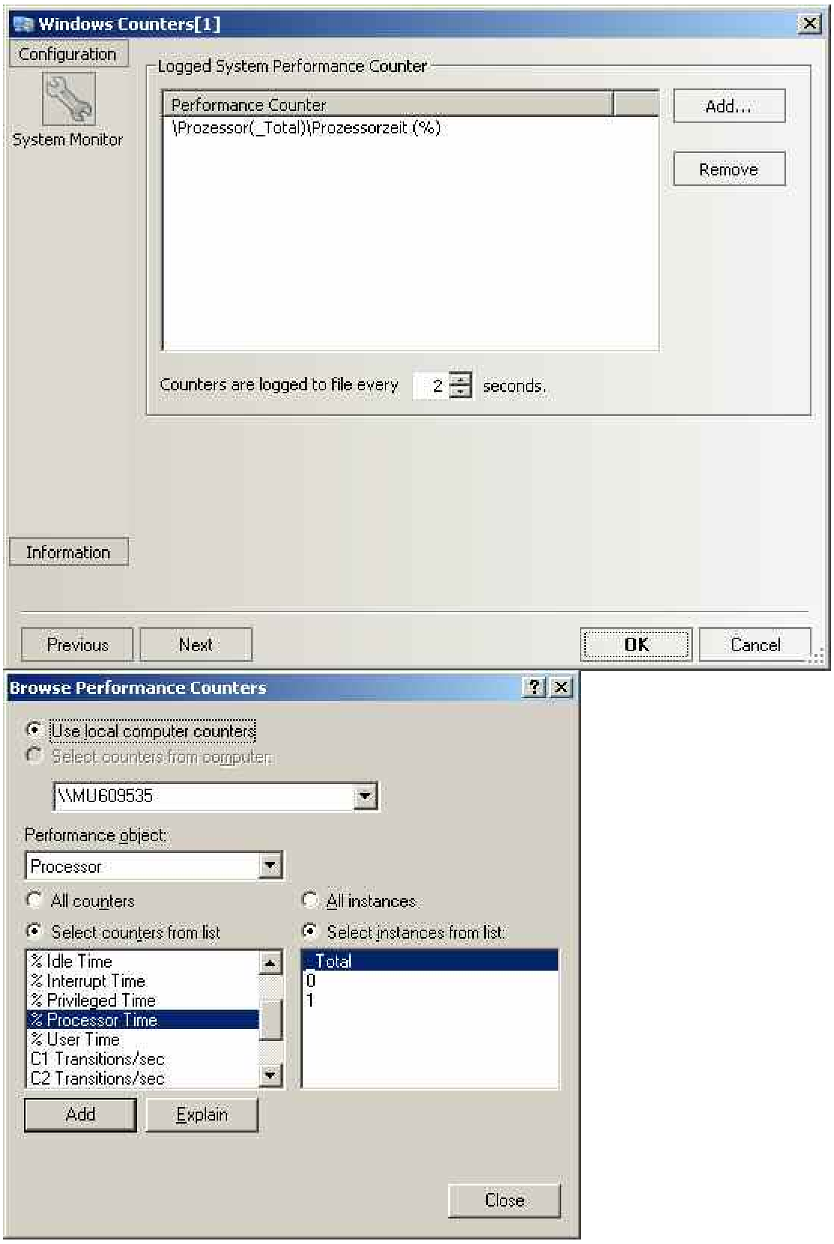


Fig. 6-5 System driver configuration

The *System Monitor* tab selects the performance counters to be stored to the measurement file and the time interval between two consecutive loggings. *Add* opens the *Browse Performance Counters* selection dialog. A selected local computer counters in directly written into the *Performance Counter* list in the *System* dialog.

ROMES generates a signal for each selected counter. The signals are displayed in the *Available Signals* tab of the *Preferences* menu. They can be viewed in correlation with other signals using an appropriate view (e.g. the *2D Chart View* or *Alphanumeric View* in the *General Views* section of the *View* menu).

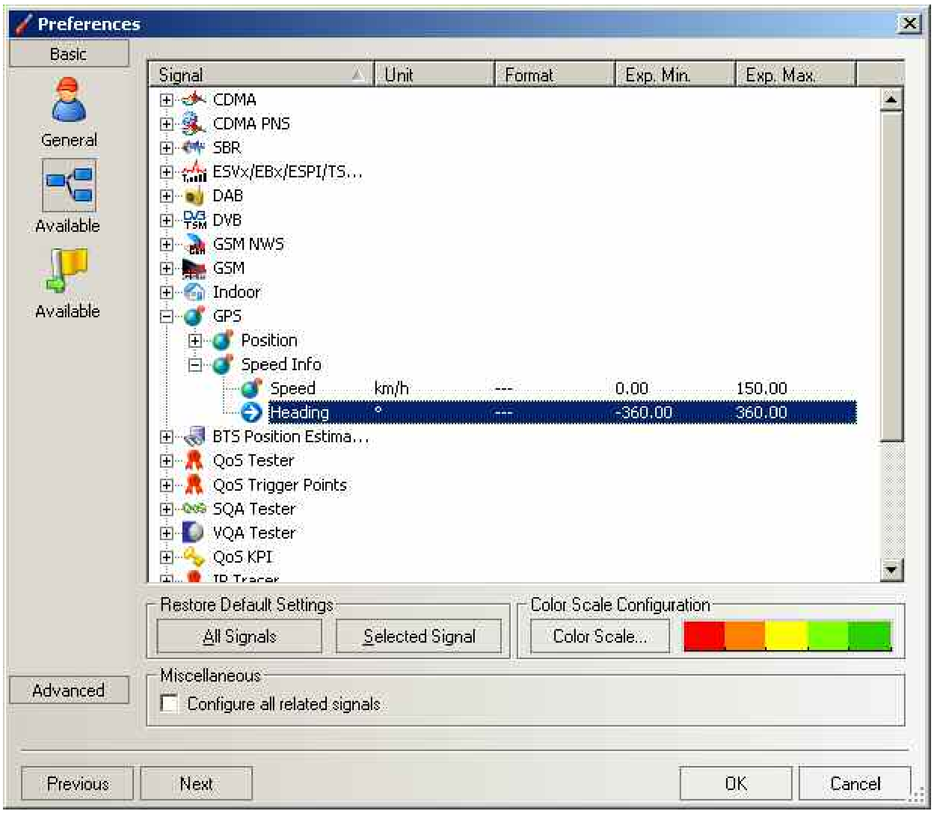


Fig. 6-6 Performance counter signals

Automatic Reload of Test Devices

R&S ROMES reconnects the mobiles automatically to the correct COM ports, if mixed up, it depends on the mobiles IMEI.

***Note**:*
Only COM ports are taken into account, which are specified in the workspace. If the mobile is connected to a different one, you have to reallocate the COM port by selecting "Assign New Link".

If the IMEI of the currently connected mobile is not equal to the IMEI stored in the workspace, R&S ROMES searches the workspace for the appropriate setting for the current IMEI. If such a setting is included in the workspace file, this will be loaded for the mobile. Otherwise an message appears that the workspace setting do not match the currently connected mobile.

If the COM has to be changed the DQA and the SQA are reconfigured automatically.

This feature is currently implemented for the following drivers:

- Qualcomm
- Nokia
- Sagem/TrioRail

Test Devices

The measurement system supports a wide range of devices that can be used to perform measurements and provide the desired results:

- Mobile phones for various networks and of various types
- A selection of test receivers and analyzers

The drivers needed for the test devices and their configuration is described in the following sections.

Generic Mobile Driver

The driver for generic mobile test devices is based on AT commands, so that most common mobile phones can be used for testing with a reduced functionality. The generic mobile is no longer a fully enabled test mobile, instead it is limited to return data like the measurement report (RxLev, RxQual) or the phone mode. Nevertheless, the generic mobile can be used for e.g. speech quality measurements, where the AT commands and responses are shown in the *Layer 3 View* instead of the L3 messages.

The selection of generic mobile test devices is performed similar to the GSM hardware selection. This is shown in the *Hardware Configuration – Load/Unload Drivers* screenshot below, where the *Generic Mobile* GSM/WCDMA menu item loads a generic driver.

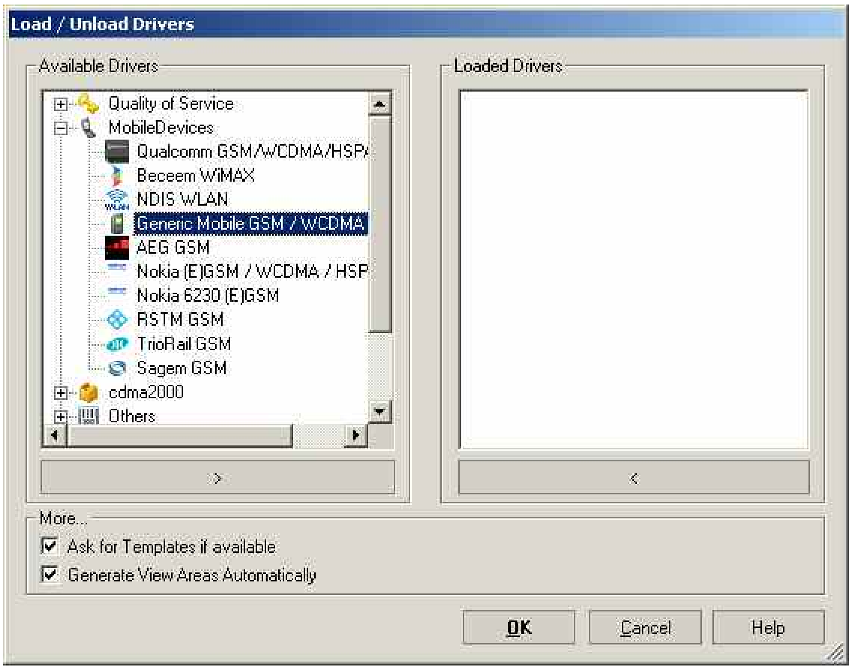


Fig. 6-7 Hardware Configuration – Load/Unload Drivers tab

The measurement system provides a generic mobile driver for the test mobiles not covered by the GSM or UMTS drivers.

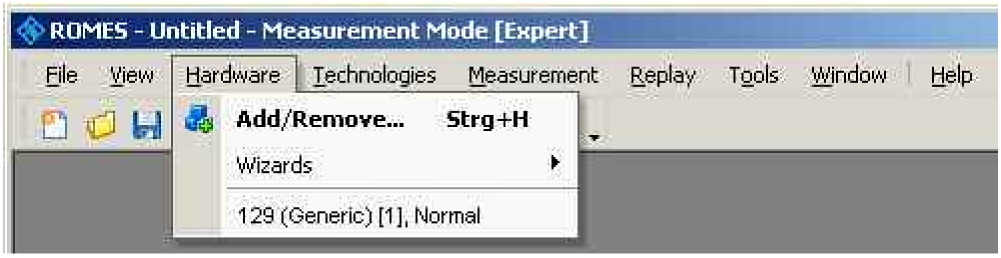


Fig. 6-8 Generic Mobile driver – Qualcomm chip set

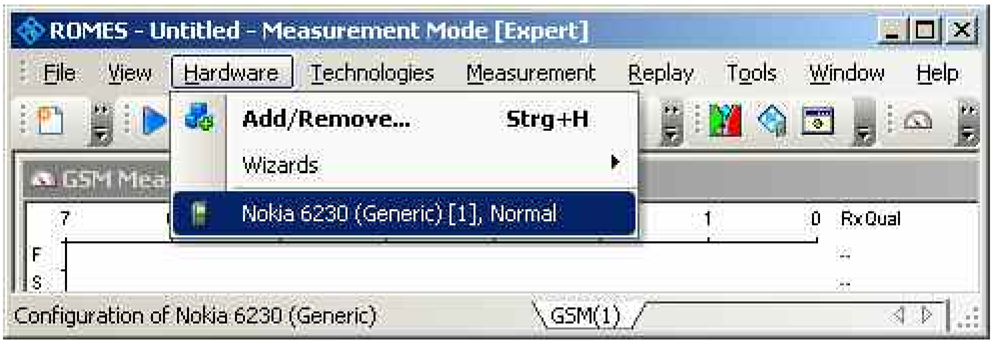


Figure 6-1 Generic Mobile driver - Nokia 6230

Configuration Menu Generic Mobile

The *Generic Mobile* driver configuration menu contains various tabs to select the measurement and message types evaluated by the test system *(GM Settings, Communication Item List Editor, Mobile Options),* to configure the autodialing and autoanswer call mode *(Autodialing)*, to set up the Speech Quality (*SQA*), to define the characteristics of the antenna used *(Antenna),* and to display information on the driver and the serial port assigned *(Serial Port Driver Info).* It can be opened by clicking the *Driver* command line of the *Hardware* menu which is available as soon as a mobile driver is loaded (see Fig. 6-4) or via the *Driver* tab in the *Configuration of Software Modules* menu opened via the *Tools – Modules Configuration...* command.

Generic Mobile (GM) Settings

The *GM Settings* tab defines the PIN number, if applicable.

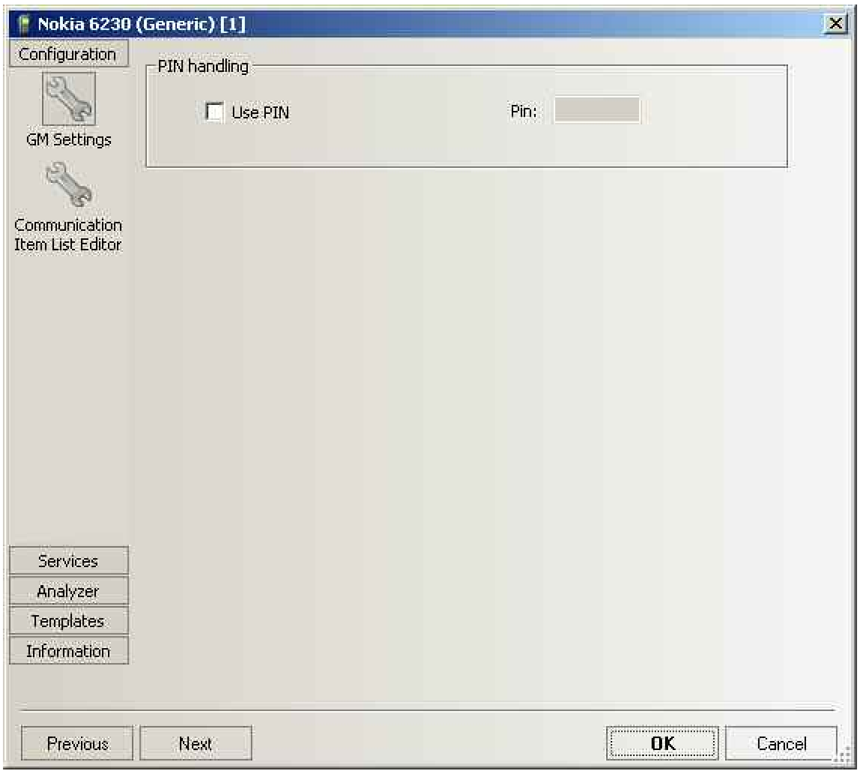


Fig. 6-9 Generic Mobile (GM) driver configuration – GM Settings

PIN handling If *Use PIN* is checked, the PIN number for identification after switching on the test mobile can be entered in the *GM Settings* panel of the configuration dialog. If nothing is entered, the SIM must be entered manually at the mobile each time it is started.

Communication Item List Editor

The *Communication Item List Editor* tab shows the message commands, requests, and responses to be recorded to the measurement file.

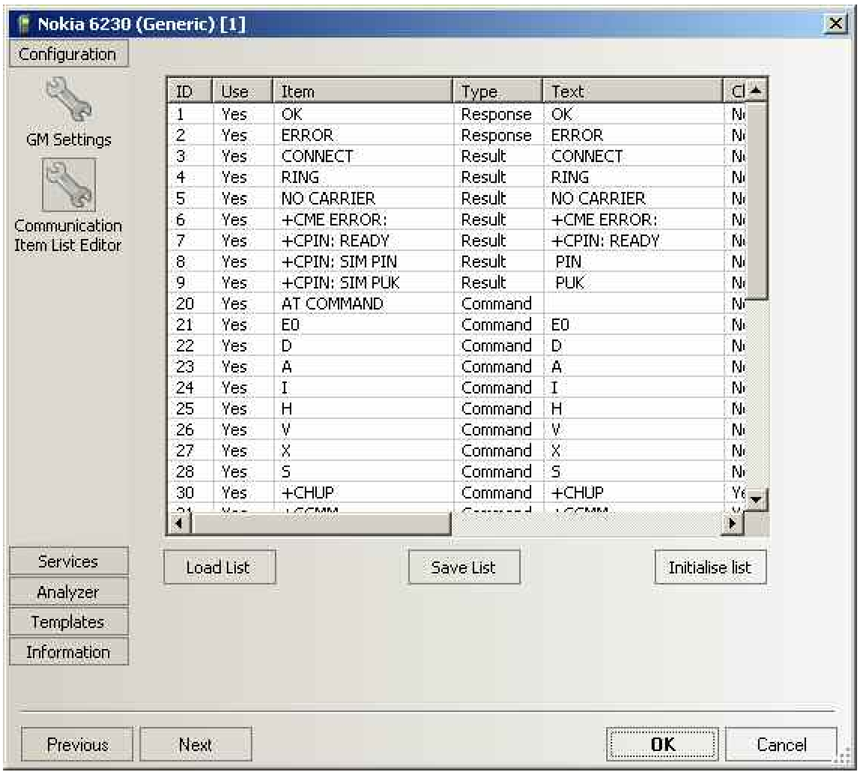


Fig. 6-10 Generic Mobile driver configuration – Communication Item List Editor

Communication Item List

The communication item list displays the following columns:

ID
: Internal list number of the communication item.

Use
: Toggles the use of the selected list item.

Item
: Communication item descriptor (or AT command).

Type
: Qualifies the list item to be a command, request, or result.

Text
: Additional optional description of the list item.

Check
: Sets whether or not the communication item is supported by the mobile, a setting of *Yes* indicates that there is active feedback from the mobile.

Get Par.
: List item parameter is requested by the generic mobile.

Set Par.
: List item parameter is sent to the mobile (e.g. PIN).

Term.
: Termination of the mobile response, i.e. the item defines the end of the

mobile response.

Delim.
Sets the delimiter for parts of multi-part responses from the mobile.

Time [ms]
Defines the time to wait for the response from the mobile.

Response
This represents the value of the response, e.g. 0 means "Response is a valid value", 1 usually means "OK".

Load List Clicking the *Load List* button calls a *Load List* dialog window to select a previously saved list to be loaded.

Save List Clicking the *Save List* button calls a *Save List* dialog window to store the current list.

Initialise List Clicking the *Intialise List* button loads the default list (unsaved manual changes are lost).

NQA Settings

The *NQA Settings* tab provides the parameters for *Network Quality Analysis*. NQA is a prerequisite for drawing up a call statistics where the calls are classified and the classes are visualized separately (see *2G/3G NQA View* in chapter 4).

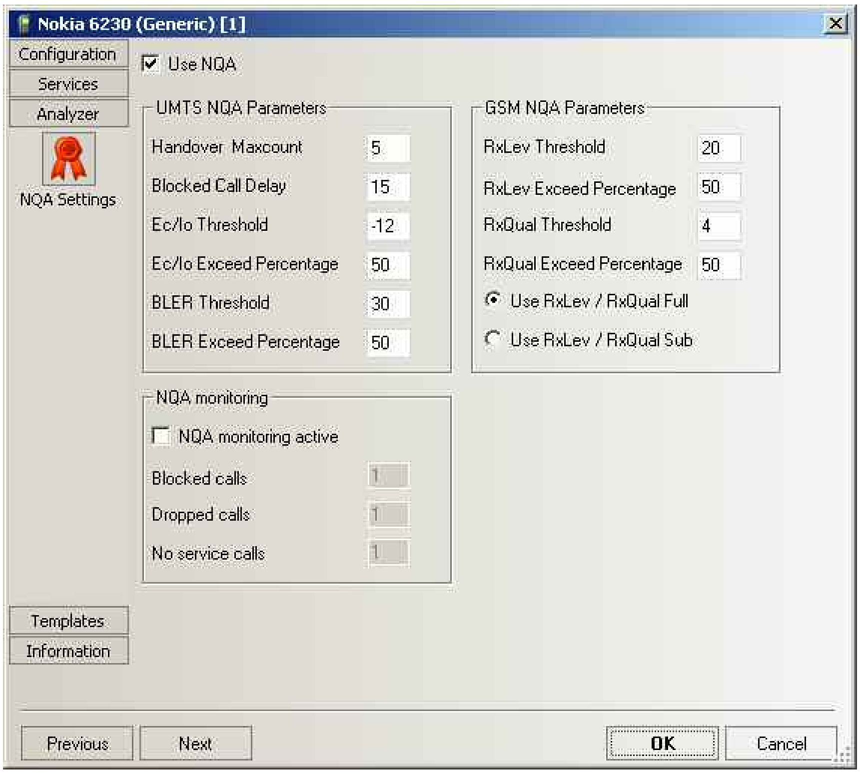


Fig. 6-11 Generic Mobile driver configuration – NQA Settings

The parameters in the *GSM NQA Parameters* and *NQA Monitoring* sections are identical to the NQA parameters for GSM; see section *Driver Configuration – NQA* on p. 6.71 ff.

Use NQA If checked, the box activates the network quality analysis (default).

UMTS NQA Parameters The following numeric parameters configure the UMTS NQA by defining conditions and limits for the different call classes (we quote the ranges for all parameters; default values are underscored)

Handover Maxcount Maximum number of handover procedures during a call in the range 1 to 5 to 100. If the defined value is exceeded, the call will be classified as EXCESSIVE HO.

Blocked Call Delay Maximum delay (in seconds) between CM_SERV_REQ and ASSIGNMENT_COMMAND in the range 1 (s) to 15 (s) to 63 (s). If the defined delay is exceeded, the call will be classified as DELAYED CALL.

Ec/Io Threshold Minimum signal to noise ratio in dB and in the range –20 (dB) to –12 (dB) to 0 (dB). Ec/Io values which fall below this threshold contribute to NOISY.

Ec/Io Exceed Perc.	Minimum ratio (in percent) of reported RxLev values falling below the RxLev Threshold in the range 0 (%) to 50 (%) to 100 (%). If the actual ratio falls below the specified percentage the call is classified as NOISY.
BLER Threshold	Maximum Block Error Rate in percent in the range 0 (%) to 30 (%) to 100 %). BLER values above this threshold contribute to NOISY.
BLER Exceed Perc.	Minimum ratio (in percent) of reported BLER values exceeding the BLER Threshold in the range 0 (%) to 50 (%) to 100 (%). If the actual ratio exceeds the specified percentage the call is classified as NOISY.

GSM NQA Parameters Configures the GSM NQA, see *NQA* on p. 6.71 ff.

NQA Monitoring Activates NQA monitoring and displays the number of *Blocked Calls, Dropped Calls,* and *No Service Calls,* see *NQA* on p. 6.71 ff.

Autodialing Generic Mobile

The *Autodialing* tab configures the mode where a definite phone number is dialed periodically, and a call is set up to the mobile phone. This mode is relevant for the network quality analysis described on page 6.71. All settings are analogous to the GSM driver settings described on p. 6.65 ff.

If a 2nd virtual COM port is needed to be operated in *autodial* mode; see the paragraph on *Loading the drivers* on page 6.8.

Fig. 6-12 Generic Mobile driver configuration – Autodialing tab

SQA Settings Generic Mobile

The *SQA* tab enables and configures the Speech Quality (SQA, with option ROMES3SQA, *Voice Quality PESQ)*. SQA results can be displayed in the *SQA Message* view (see chapter 4). All settings are analogous to the GSM driver settings described on p.6.285 ff.

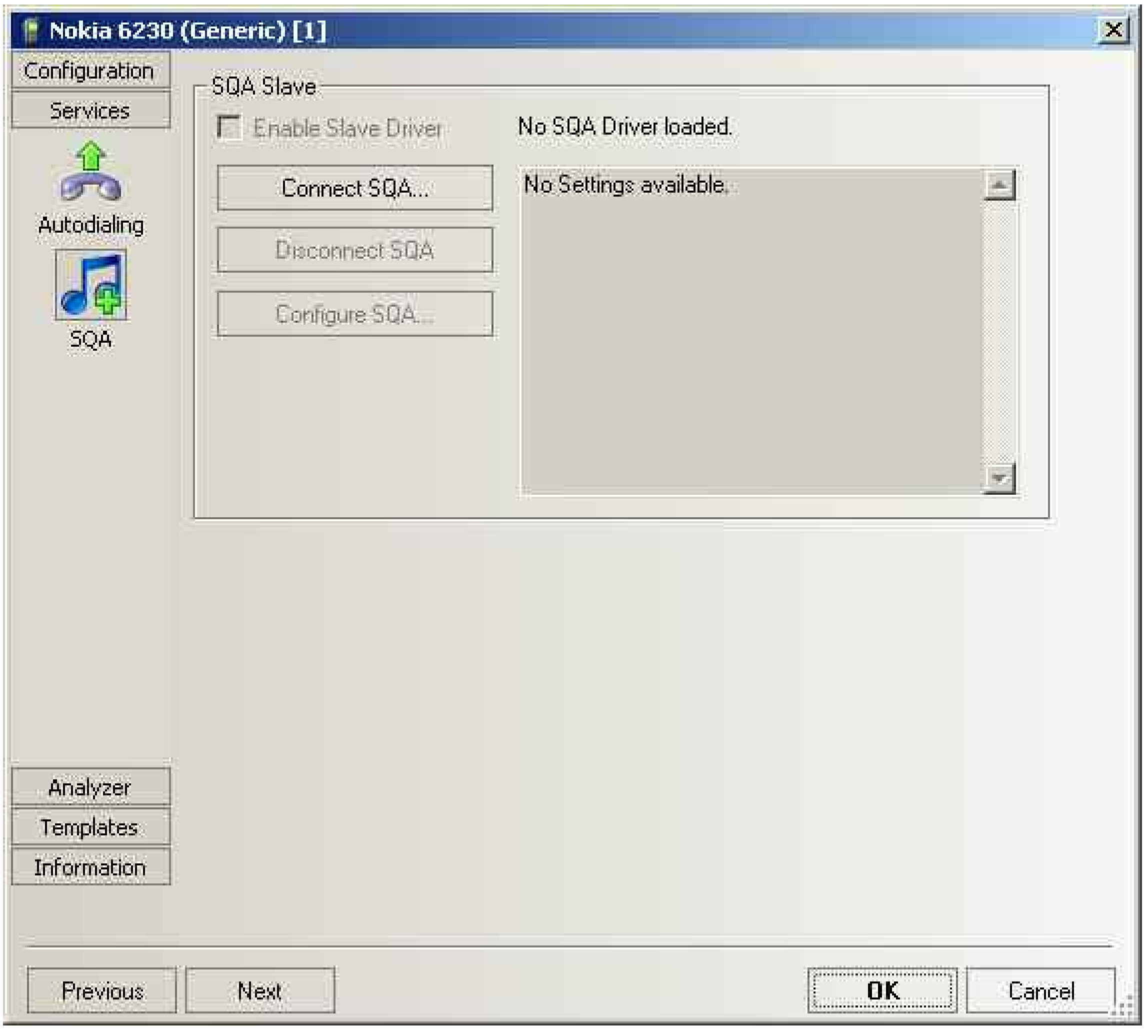


Fig. 6-13 Driver Configuration – Speech Quality tab

Antenna Generic Mobile

The *Antenna* tab defines *Antenna Name, Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

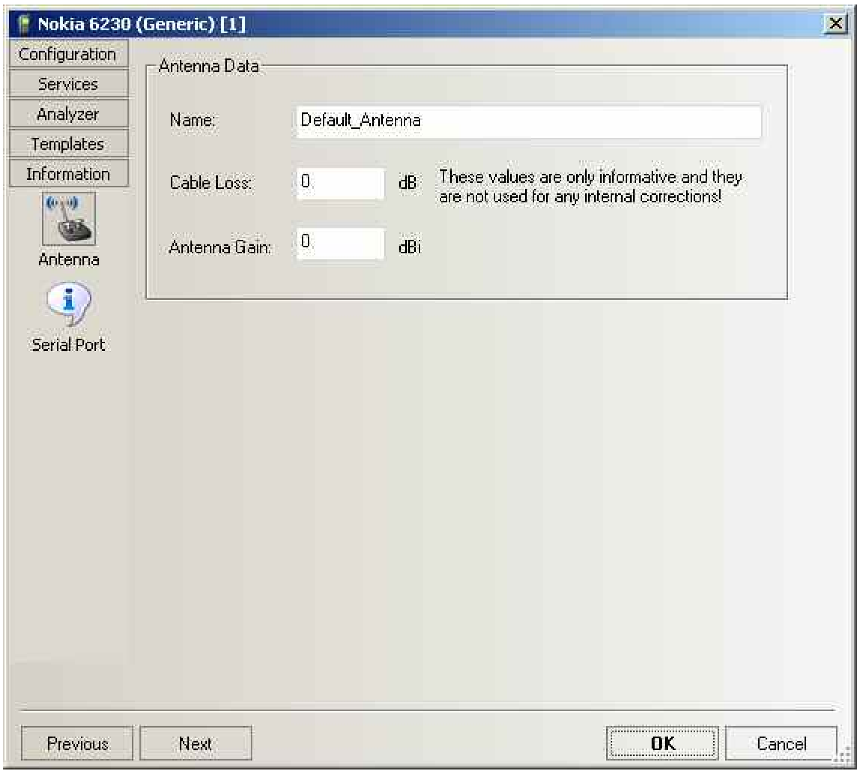


Fig. 6-14 Driver Configuration – Antenna tab

Templates Generic Mobile

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. All settings and buttons are analogous to the GSM driver settings described on p. 6.79 ff.

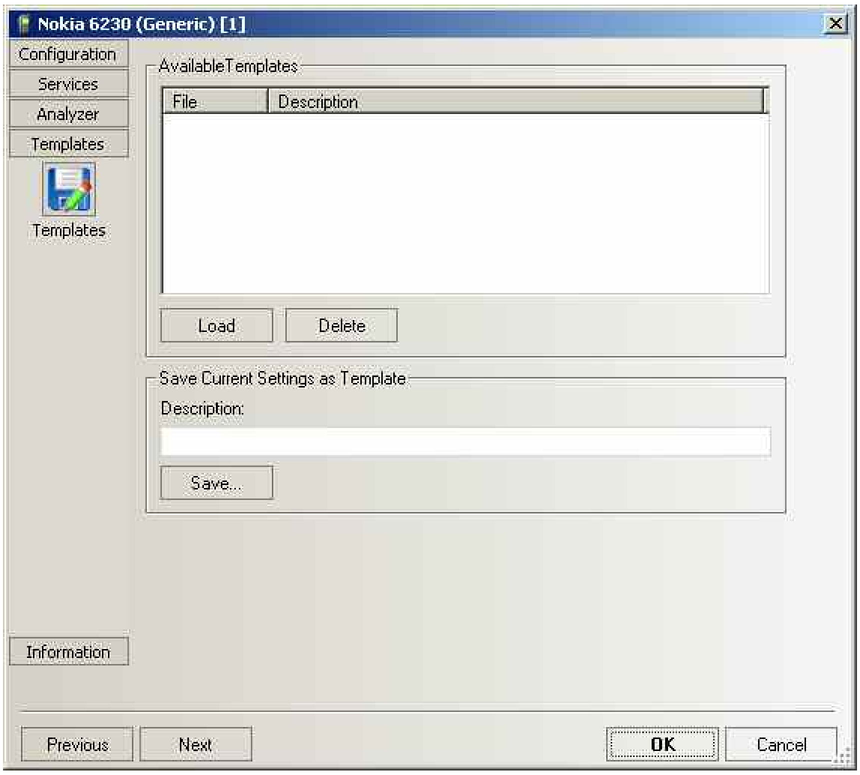


Fig. 6-15 Driver Configuration – Templates tab

Serial Port Driver Info Generic Mobile

The *Serial Port Driver Info* tab displays the custom name of the device, information on the file version of the generic mobile driver, the serial port assigned to it and the transfer parameters.

The *Custom Name* is used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider. An example is provided in section *Configuration of Installed Drivers* on p. 6.30.

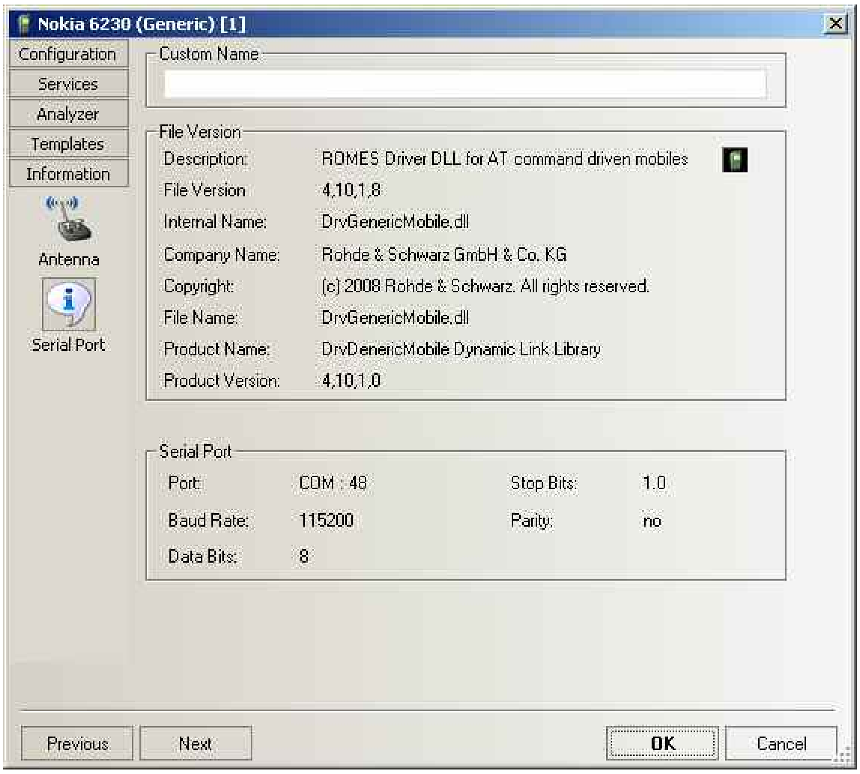


Fig. 6-16 Driver Configuration – Serial Port Driver Info tab

Action Menu Generic Mobile

The *Action* menu opens popup boxes used to set up a call or show the contents of the mobile display. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section *Driver Installation* on page 6.1 ff). If several mobiles are connected, separate command lines are displayed for each of them.

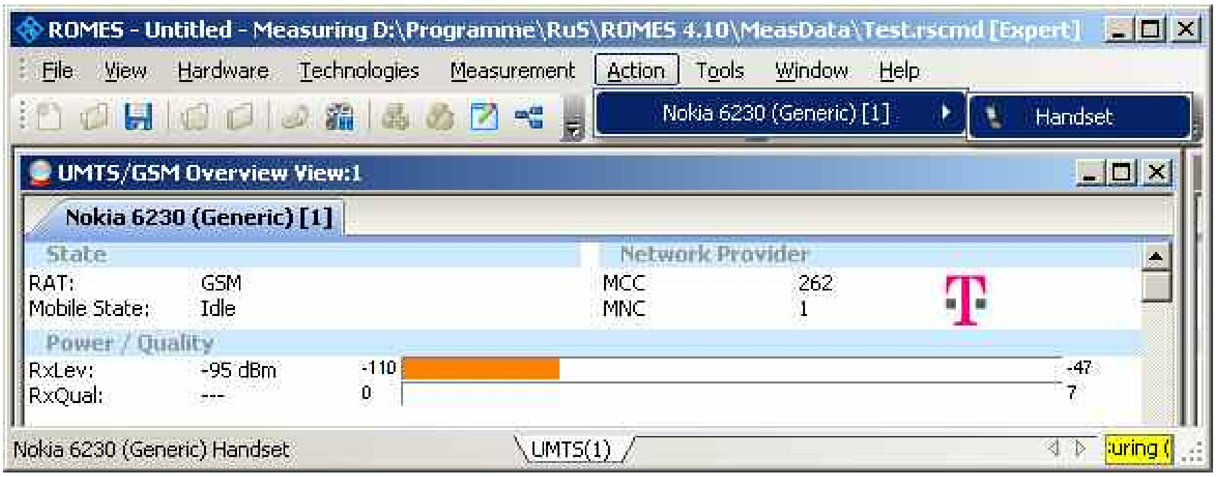
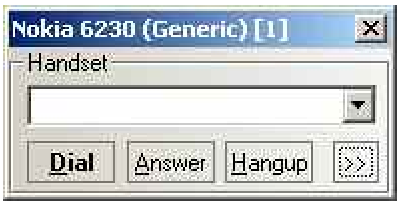


Fig. 6-17 Action menu for different driver types

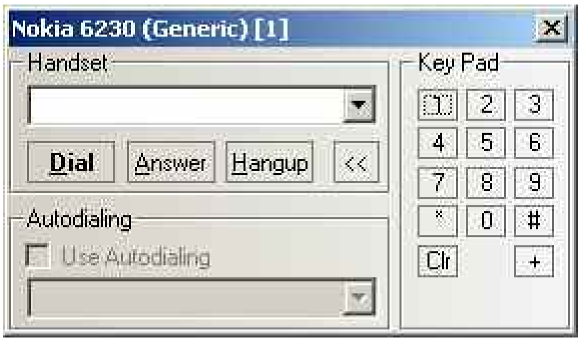
Handset Generic Mobile

Activates the entry of a number to dial, set up and terminate a call .

The *Handset* command opens the following dialog box:



The **>>** button enlarges the dialog box, giving access to the Key pad and the *Autodialing* option:



Dialed number The number to be dialed can be entered either via the keyboard and the input field or by clicking the on-screen keypad.

 Closes the window without any further action.

Dial	Starts dialing the number entered before.
Answer	Instructs the phone to accept the call.
Hangup	Drops the line.
Autodialing	If the box is checked, the phone number entered below is called periodically, the Dial, Answer, and Hangup buttons are disabled (grayed). The autodialing mode (see p. 6.40) can be set even during the measurement, but only in Idle mode. This item starts *Autodialing* if the *Start with Measurement* option was not checked in the driver configuration autodialing panel.

GSM Mobile Drivers

Several different GSM mobile drivers are provided with the measurement system: AEG, Nokia, Sagem, and TrioRail. Each of the drivers supports a set of mobile types. Installation of all drivers is analogous (see section *Driver Installation* on page 6.1 ff.); differences concerning the configuration are pointed out in the following sections. The devices listed in the following tables are either hand-portable or vehicle-mounted mobile phones (AEG, Sagem) or modules for system integration (RS TM).

The mobile drivers and mobiles are now grouped into the R&S support classes 1 and 2. The mobiles of R&S support class 1 are continuously tested with new ROMES versions and service packs, they are permanently available to our testing staff. The mobiles of R&S support class 2 are not always available for testing, but they have been tested successfully at least once with the current ROMES software release. The introduction of the R&S support classes is necessary due to the sheer number of supported mobiles. The mobile types with R&S support class 1 are listed with normal title typeface in the tables below, the mobiles with R&S support class 2 are marked with ***italic*** title typeface.

All GSM channels and frequencies are listed in chapter 8, section GSM Channels and Power classes.

Table 6-1 GSM mobile drivers and supported devices

Notes:

Mobile Devices in italic typeface are R&S Support Class 2. The OT 76 and OT 96-M GPRS mobiles support the P-GSM and the E-GSM band (channels 975 to 1023). The OT 96-M GPRS mobile supports GPRS and can be used to record GPRS data.
The OT 96-RBAND mobile supports the P-GSM, the E-GSM and R-GSM band (channels 955 to 974) but no GPRS.
The OT 190 and OT290 mobiles support GPRS and can be used to record GPRS data.

Manufacturer: AEG	Manufacturer: TrioRail	Manufacturer: Sagem
HT901 GSM Mobile Hand-portable GSM900 mobile Power classes: 4-5 Channel numbers: 1-124 ***D902 GSM Portable*** Vehicle-mounted GSM900 mobile Power classes: 2-5 Channel numbers: 1-124 ***HT1801 DCS Mobile*** Hand-portable GSM1800 mobile Power classes: 1-2 Channel numbers: 512-885	**TrioRail TTS-S75** GSM900 / 1800 / 1900 triple-band mobile supporting GPRS class 10, EDGE and AMR. **TrioRail TTS-S75R** GSM900 / 1800 / 1900 triple-band mobile supporting GPRS class 10, EDGE and AMR. Additionally supports GSM-R. **TrioRail TTS-S55** GSM900 / 1800 / 1900 triple-band mobile supporting GPRS class 10 **TrioRail TTS-S55R** GSM900 / 1800 / 1900 triple-band mobile supporting GPRS class 10, supports GSM-R	***SAGEM OT 76-M/OT 96-M GPRS*** ***SAGEM OT 96-MW/OT 96-RBAND*** Hand-portable GSM900/1800 dual-band mobiles Power classes: 4-5 | 1-2 Channel numbers: 512-885 **SAGEM OT 160/190** Hand-portable GSM900/1800 dual-band mobiles Channel numbers: 1-124, 975-1023 | 512-885 ***SAGEM OT 169/199*** Hand-portable GSM900/1900 dual-band mobiles Channel numbers: 1-124, 975-1023 | 512-810

<table>
<tr><th>Manufacturer: AEG</th><th>Manufacturer: TrioRail</th><th>Manufacturer: Sagem</th></tr>
<tr>
<td>HT1901 PCS Mobile
Hand-portable GSM1900 mobile
Power classes: 1-2
Channel numbers: 512-735

911 GSM Mobile

1811 DCS Mobile

1911 PCS Mobile</td>
<td>TrioRail TTS-M65
GSM900 / 1800 / 1900 triple-band mobile supporting GPRS class 10

TrioRail TTS-M65R
GSM900 / 1800 / 1900 triple-band mobile, supporting GPRS class 10, supports GSM-R

The TrioRail mobiles are used with the SAGEM x6 driver. Note that EDGE is only available for S75/S75R with FW 33 or higher and option ROMES3EDG. S75/S75R test mobiles must be connected via Siemens USB DCA-540 cable to the USB 2.0 port (which generates 2 virtual serial ports), see section Connection via USB Interface on p. 6.8 ff .The other TrioRail test mobiles are connected via RS232 and splitter box, see section Splitter box (Mobiles supporting GPRS) on p. 6.5.</td>
<td rowspan="3">SAGEM OT 260/290
Hand-portable GSM900/1800/1900 triple-band mobiles
Channel numbers: 1-124, 975-1023 | 512-885
All models require the SAGEM x6 driver.</td>
</tr>
<tr><th>Manufacturer: Nokia</th><th>Manufacturer: Rohde & Schwarz</th></tr>
<tr>
<td>Nokia 6230/6230i
GSM900 / 1800 / 1900 or GSM 850 / 1800 / 1900 triple-band mobile supporting GPRS and EGPRS.

The test mobile must be connected via USB port, see section Connection via USB Interface on p. 6.8 ff and does not support Scanning.</td>
<td>RS TM GSM900
GSM900 module for system integration
Power classes: 4-5
Channel numbers: 1-124

RS TM GSM 1800
GSM900/GSM1800 module for system integration
Power classes: 1-2
Channel numbers: 512-885

RS TM GSM 1900
GSM850/GSM1900 module for system integration
Power classes: 1-2
Channel numbers: 512-735</td>
</tr>
</table>

Driver Configuration Menu GSM

The *Driver Configuration* menu contains various tabs configuring the mobile type *(Setup)* and *Measurement Mode,* the autodialing and autoanswer call mode *(Autodialing)*, the network quality analysis *(NQA),* the characteristics of the antenna used *(Antenna),* a fax terminal driver connected *(Slaves),* and displays information on the driver and the serial port assigned *(Serial Port Driver Info).* It can be opened by clicking the *Driver* command line of the *Hardware* menu which is available as soon as a mobile driver is loaded or via the *Driver* tab in the *Configuration of Software Modules* menu opened via the *Tools – Modules Configuration...* command.

Many mobile drivers support template files. These files store a complete driver configuration which can be re-used independent of the workspace; see Templates on p. 6.79 ff.

Driver Configuration GSM – Setup

The *Basic* tab defines the device type used, its power class and the PIN number (not for all drivers). In addition it opens the menu configuring the Rx Level Calibration.

For mobiles supporting GPRS (e.g. SAGEM OT 96-M GPRS, OT190 GPRS, OT 290 GPRS, TrioRail TTS-S75/S75R), the *Basic* tab is replaced by the *GGSM/GPRS Forcing* tab; see section *GSM/GPRS Forcing* on page 6.55.

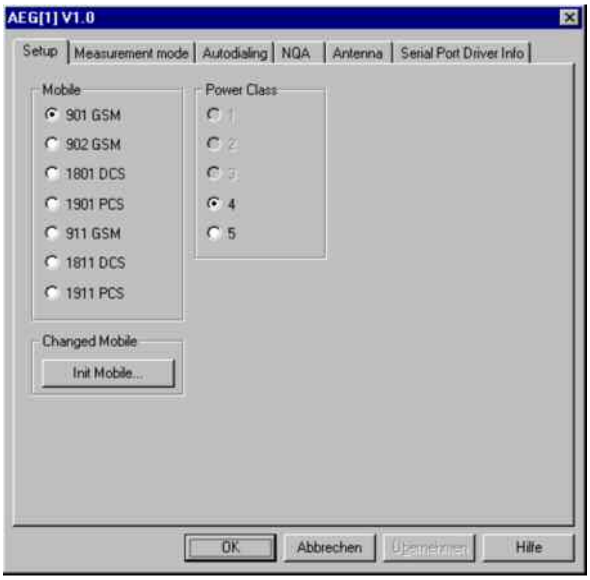


Fig. 6-18 Driver configuration – Setup (AEG)

Mobile List of the mobile types supported by the driver (see section

GSM Mobile Drivers on page 6.47). To select a mobile type click the corresponding radio button. The COM port assigned to the driver is indicated below the *Mobile* list.

Power Class

Power class of the mobile phone used. The GSM standard defines power classes 1 to 5:

Power class	GSM900	GSM/GSM1800	GSM/GSM1900
1	-	1 W / 30 dBm	1 W / 30 dBm
2	8 W / 39 dBm	0.25 W / 24 dBm	0.25 W / 24 dBm
3	5 W / 37 dBm	4 W / 36 dBm	2 W / 33 dBm
4	2 W / 33 dBm	-	-
5	0.8 W / 29 dBm	-	-

The power class may be decreased, however, it is not possible to go beyond the highest supported power class of the selected mobile type. See also overview of power classes and power control levels in chapter 8.

Changed Mobile

The *Init Mobile...* button in the *Changed Mobile* panel starts the initialization if a mobile (even of the same type) was changed.

Speaker

In the *Speaker* panel, one of the two speaker connections of the RS TM mobile can be selected.

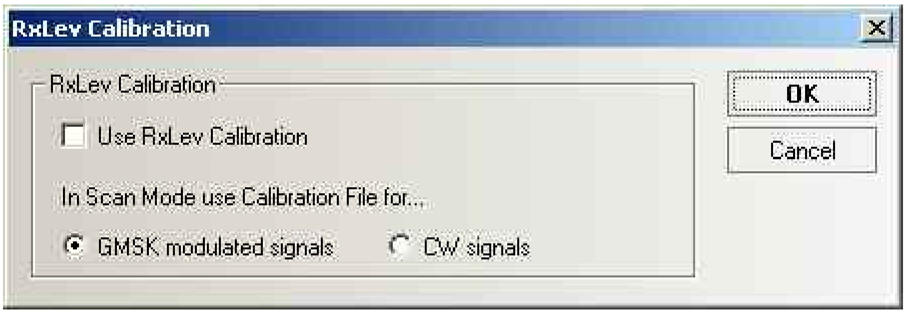
PIN

Some driver types allow to enter the PIN number in the configuration dialog:

In the Sagem driver configuration menu the PIN number is directly entered into the *PIN* input field. Alternatively, the PIN can be entered via the mobile phone.

RxLev Calibration

The *RxLev Calibration* button, which is available for AEG, Sagem, and Nokia mobiles, opens a dialog to activate the calibration of the received signal level reported by the mobile:



The RxLev Calibration is based on a comparison between the RX level values reported by the mobile and the actual RX levels applied to the mobile receiver. This comparison can be drawn with a CMD Digital Radio Communication Tester and the *MobCal* software tool from Rohde & Schwarz.

Presently, RxLev calibration is implemented only with GSM900 and GSM1800. The calibration can be used for single-band as well as for GSM900/1800 dual-band mobiles. For GSM-E or GSM-R calibration, the values of BCCH 1 are used.

For dual-band mobiles two separate correction table files have to be created for the two GSM bands, and they must be stored in the \driver\ subdirectory of the ROMES program directory.

In order to be recognized as two files belonging to the same mobile, the two correction tables must be named as follows:

for GSM900: <IMEI 8 last significant digits>.<ext> (e.g. 12345678.cm)

for GSM1800: <IMEI 8 last significant digits>_D.<ext> (e.g. 12345678_D.cm)

If the file name does not follow this convention, a file open dialog prompts for the wanted .<ext> file at start of measurement.

The file extensions are used as follows:

<ext>	**is used for ...**
.CM	Normal and Camp measurements
.SC	Scan measurements with GMSK signal form (a special scan mode only available at RSTM, AEG)
.CW	Scan measurements with CW signal form (a special scan mode only available at RSTM, AEG)
.IT	Test transmitter mode (a special scan mode only available at RSTM, AEG)

Please note:

- A correction table file (ASCII) contains a maximum of 50 different channels.
- Channels others than 1..124 in the first file and 512..855 in the second file are not allowed and could lead to crashes
- Level lines are between -110dB and -35dB in 1dB steps in a 3 dimensional matrix.
- Between the channels the calibration value will be linear interpolated. Outside the last valid value will be extrapolated. Between two level lines the calibration value will be linear interpolated.

Example of a simple .CM file:

The following file is an example with 3 channels (Ch 1, 40, and 124) and 9 level lines. The shown calibration values change linearly from 1.0dB to 1.2dB.

```
{[D]};15.09.104;12:05:55;11:16:52
{[T]}25;25;25
{[M]}GSM; 350639.07.031008.0; 206.10.2000005178;4
{[F]}CM;GMSK;0.00
{[O]}1;-110;10
{[O]}1;-101;10
{[O]}1;-77;10
{[O]}1;-57;10
{[O]}1;-53;10
{[O]}1;-51;10
{[O]}1;-50;10
{[O]}1;-49;10
{[O]}1;-48;10
{[ ]}
{[O]}40;-110;11
{[O]}40;-101;11
{[O]}40;-77;11
{[O]}40;-57;11
{[O]}40;-53;11
{[O]}40;-51;11
```

```
{[O]}40;-50;11
{[O]}40;-49;11
{[O]}40;-48;11
{[ ]}
{[O]}124;-110;12
{[O]}124;-101;12
{[O]}124;-77;12
{[O]}124;-57;12
{[O]}124;-53;12
{[O]}124;-51;12
{[O]}124;-50;12
{[O]}124;-49;12
{[O]}124;-48;12
{[ ]}
```

Explanation of the line identifiers:

Identifier	Meaning of succeeding parameters
`{[D]}`	User*);Date*);Time*);Duration of creation*)
`{[T]}`	Room temp*);Mobile temp. (start)*);Mobile temp. (end)*)
`{[B]}`	CMD TxPower (start)*);TCH (start)*);Tslot (start)*);used Tslot(dBm)*);unused Tslot (offset dB)*)
`{[M]}`	Network type*);IMEI*);IMSI*);Powerclass*)
`{[F]}`	`CM;GMSK;0.00` // Type of corr.file CM; GMSK|CW*); FreqOff-set in KHZ*)
`{[O]}`	Channel;Level line RxLev in dB; calibration offset in 1/10 dB
`{[ ]}`	Separator

*) not used so far

Driver Configuration – Nokia Settings

The *Basic* tab selects GSM and GPRS-related parameters to be measured and recorded by Nokia 6230 mobile phones. It replaces the *Setup* tab provided for mobiles that do not support GPRS; see section *Setup* on page 6.49.

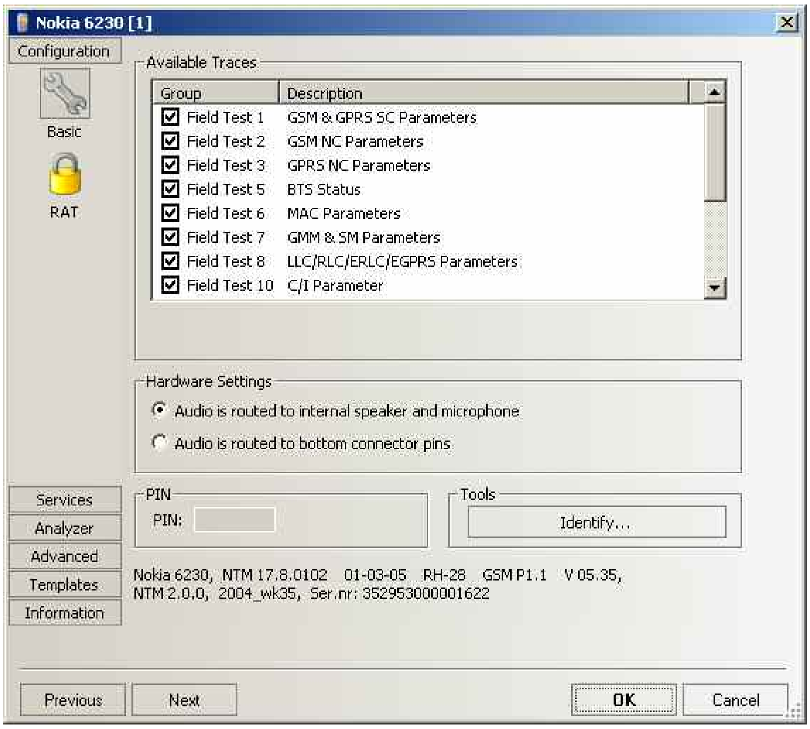


Fig. 6-19 Driver configuration – Nokia Settings

The available message types are arranged in the groups listed in the table Table 6-2 below, together with the names of the corresponding views and data structures/signals in the data tree. For an explanation of the recorded parameters refer to the description of the GSM and GSM/GPRS views in chapter 4. The table below indicates the most important views and signals which use the different message types.

All parameters are selected by default. Deselecting some of the groups reduces the size of the measurement file but does not speed up the measurement.

Hardware settings The input and output signals of the mobile audio circuit are usually routed to the speaker and microphone. As an alternative it is possible to route the signals to the bottom connector pins of the mobile to be tapped off and analyzed.

Table 6-2 GSM/GPRS message types, views and signals

Message type	**View**	**Data structure / signal**
Field Test 1: GSM & GPRS SC Parameters	GSM Measurement Report, GSM System Information, GSM GPRS/EGPRS, GSM Layer 1	Measurement Report, Server Report, Packet Server Report Layer 1 Ext
Field Test 2: GSM Neighbor Cell Parameters	GSM Measurement Report, GSM Layer 1	Measurement Report, Server Report
Field Test 3: GPRS Neighbor Cell Parameters	GSM GPRS/EGPRS	Packet Server Report
Field Test 5: BTS Status		
Field Test 6: MAC Parameters	GSM GPRS PDP Info	GPRS LLC Info GPRS MAC Info
Field Test 7: GMM & SN Parameters		

Message type	View	Data structure / signal
Field Test 8: LLC/ RLC/ERLC/EGPRS Parameters	GSM GPRS/EGPRS	Packet Server Report, EGPRS Info
Field Test 10: C/I Parameter		
Field Test 12: AMR Parameters		
Trace 1: GSM System Information Messages	GSM System Information View GSM GPRS System Information View	
Trace 2: GSM Layer 3 Messages	UMTS/GSM Layer 3 View	Layer 3
Trace 3: GSM & GPRS Parameters		
Trace 4: GSM & EGPRS Configuration Parameters	GSM GPRS/EGPRS View	
Trace 5: GPRS Context & GMM/SM Messages		

Driver Configuration – TrioRail forcings

The *TrioRail forcings* tab configures special forcing for TrioRail mobiles. This tab is only available for mobile TTS-S75 with the Option ID “TrioRail Forcing Extension” (included in ROMES4GSM) and the TTS-S75 with a firmware greater or equal than 37.

The prevent handover forcing gives the possibility to disallow a handover in dedicated mode to the deselected channels. In idle mode these deselected channels never gets the serving cell.

If the checkbox *Prevent Handover* is deactivated or all channels are on, gives default behavior of a normal mobile. Deselecting some channels prevents the mobile from using these channels while starting a measurement. Stopping a measurement will disable forcing.

The settings during the measurement can be seen at the Measurement File Info.

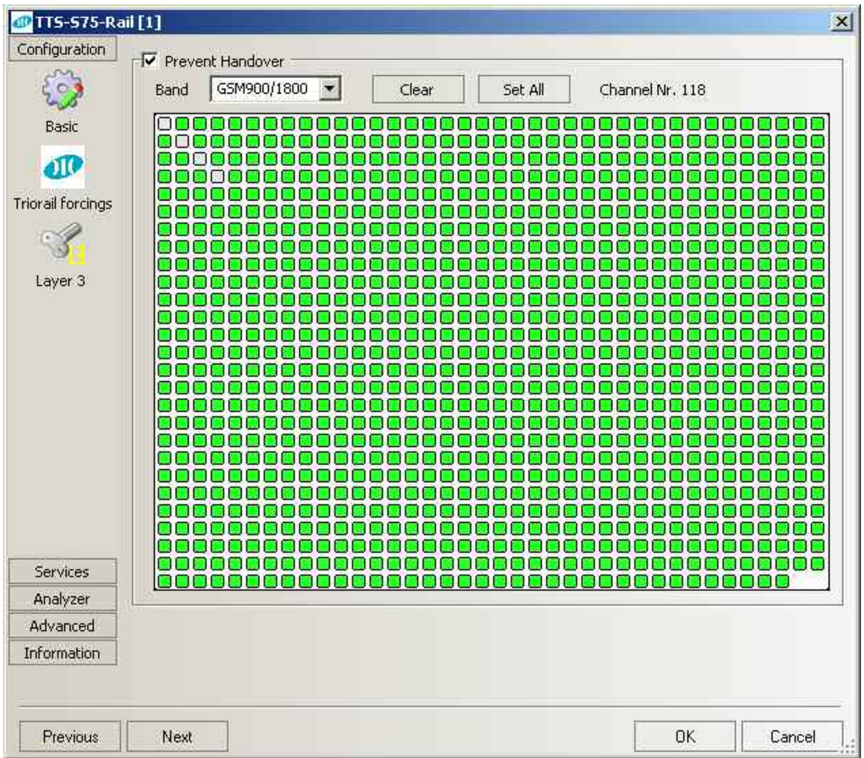


Fig. 6-20 Driver configuration – TrioRail forcings

Prevent Handover Check box Prevent Handover enables/disables the whole feature.

Band *Band GSM900/1800* let you choose ARFCN 0..1023

Band GSM1900 let you choose ARFCN 512..810

Clear Button *Clear* disables/enables all channels of the selected band.
A click on a channel toggles the state (green/grey). While moving the mouse pointer over the channels the number will be displayed

Set All Button *Set All* disables/enables all channels of the band.

Graphic with all channels A click on a channel toggles the state (green/grey). While moving the mouse pointer over the channels the number will be displayed

Driver Configuration – GSM/GPRS Forcing

The *GSM/GPRS Forcing* tab selects GPRS-related parameters that can be set at the Sagem mobile phones supporting GPRS. It replaces the *Setup* tab provided for mobiles that do not support GPRS; see section *Setup* on page 6.49.

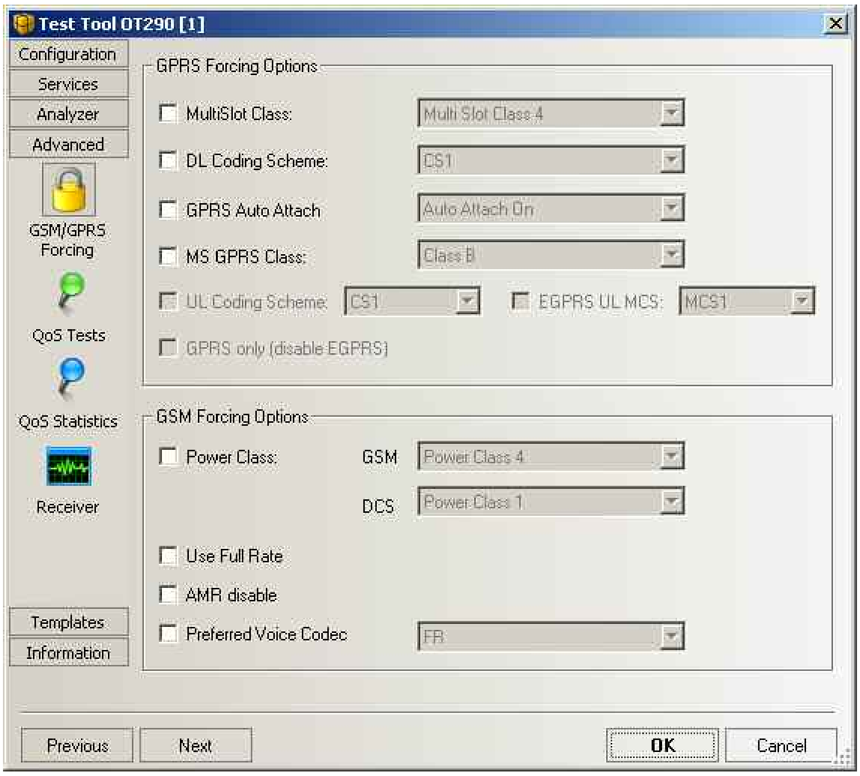
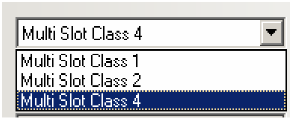


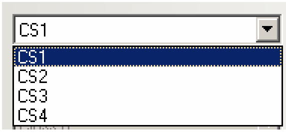
Fig. 6-21 Driver configuration – GSM/GPRS Forcing

The GPRS parameters to be forced at the mobile can be selected in the *GPRS Forcing Options* panel from several pull-down lists. Each of the lists is activated by checking the box associated to the parameter. Otherwise, the parameter will not be enforced and the mobile will use its default value.

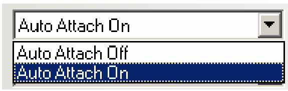
Multislot Class GPRS multislot class according to GSM 05.02. The list indicates the MS class no. (1, 2, 4) plus (in brackets) the maximum number of receive and transmit timeslots that the MS can use per TDMA frame.



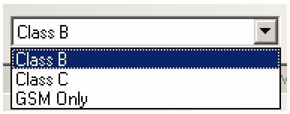
DL Coding Scheme Coding scheme (CS1 to CS4) for downlink data transfer.



GPRS Auto Attach This function allows to specify whether the mobile station shall automatically attach to the GPRS network at power-up *(On)* or not *(Off)*. If it is set to *Off*, the mobile station only attaches upon PDP Context Activation.



MS GPRS Class GPRS class of the mobile station *(Class B* or *Class C)*.



UL Coding Scheme Coding scheme (CS1 to CS4) for uplink data transfer. Disabling this item gives the MS/network the decision.

EGPRS UL MCS If the checkbox is activated, the related list allows the selection of the EGPRS uplink coding scheme (MCS1 to MCS9, MCS5–7, and MCS6–9). Disabling this item gives the MS/network the decision.

GPRS only (disable EGPRS) The activation of this checkbox forces the use of GPRS. Disabling this item gives the MS/network the decision.

General GSM parameters can be set in the *GSM Forcing Options* panel:

Power Class Power class of the mobile while in GSM900 or GSM1800 mode. See list of power classes on page 6.50 and overview of power classes and power control levels in chapter 8.

Use Full Rate If this box is checked, the mobile is forced to use either Full Rate or Half Rate but not Enhanced Full Rate (EFR) data transfer mode. *Use Full Rate* becomes unavailable if an EFR codec is selected explicitly.

The following voice codec selections are available for SAGEM OT 2xx test mobiles only. They ensure that the test mobile does not change its voice codec, which might have an undesired impact on the measurement results:

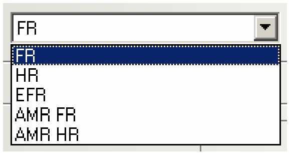
AMR Disable

Prevent the test mobile from activating an Adaptive Multi Rate (AMR FR or AMR HR) codec. The test mobile uses its Full Rate (FR), Half Rate (HR), or Enhanced Full Rate (EFR) codec.

AMR Disable becomes unavailable as soon as an AMR codec is selected explicitly.

Preferred Voice Codec

Explicit selection of a voice codec that the mobile will use. The explicit voice codec selection might possibly overwrite the *AMR Disable* and *Use Full Rate* settings.



Driver Configuration – General Settings / RAT Settings

The *Basic* tab configures the measurement mode, synchronization channel, scan settings, call broadcast settings and RxLev correction. For the Nokia driver, it is labeled *RAT Settings* (Radio Access Technology Settings).

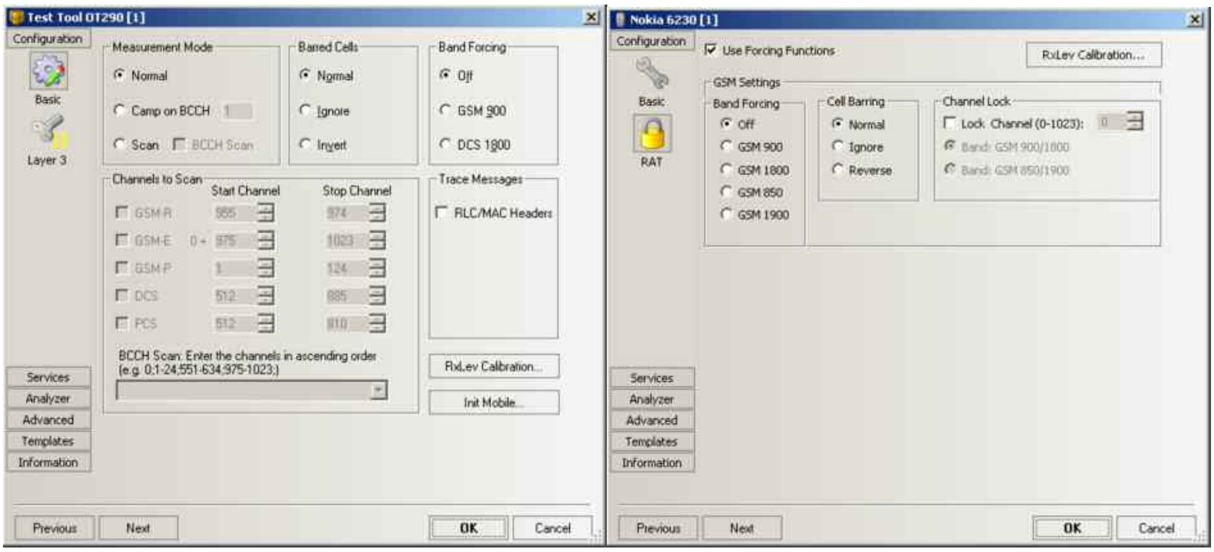


Fig. 6-22 Driver Settings (Sagem, Nokia)

(Measurement) Mode

The drivers provide the four measurement modes *Normal, Camp*, *Scan(ning)* and *Test Transmitter*. Some test mobiles do not support all test modes. The SAGEM mobiles can be used in *Test Transmitter mode* by using the *Ignore Barred Cells* feature in the *Camp* mode.

Normal measurement mode

The measurements are performed in the selected network.

Forced handover: During the measurement, and during a call (dedicated mode), it is possible to switch over to one of the six neighbor cells by force if the conditions in the desired cell are appropriate. If several mobiles are installed, switching can be performed separately for each one. See *Handover* command in the *Action* menu (page 6.84).

Camp Mode

In Camp mode, the access to all cells except the one with a particular BCCH is denied for the mobile. Handover attempts are thus suppressed. Therefore the Camp mode is recommended for cell boarder determinations.

When the measurement is started, the mobile initiates a *Cell Reselect process* and tries to register to the BCCH and BSIC set in the *Synch. Channel* panel of the *Measurement Mode* menu (for the Sagem X6 driver, the BCCH in the entry field behind the *Camp on BCCH* radio button). Obviously this will not be successful unless the selected BCCH number and BSIC are available. For RS TM devices, selection of a definite BSIC can be disabled.

Scan(ning) Mode

The scan(ning) mode allows to scan the complete frequency band or part of it. In this measurement mode the operator can get a quick overview on the current activities of the channels within the used frequency band. By default, only the signal strength of each channel in *dBm* is measured.

For this mode it is necessary to select the desired channel range in the *Scan Settings* or *Channels to Scan* panel; see below. Typically, *Start BCCH* and *Stop BCCH* define the scan range, which must be completely within the used frequency band.

The Sagem x6 driver provides a special *BCCH Scan* mode where the mobile also decodes the BSIC in a specified channel range; see *BCCH Scan* below.

Test Transmitter Mode

The *Test* or *Interims Transmitter* mode is used in combination with the *TS9953 Test Transmitter System* from Rohde & Schwarz to test the geographical conditions for a proposed place to build up a new transmitter station. In this mode, a low-level signal is transmitted on the downlink path from the test transmitter to the test mobile, so that already here the *RxQual* parameter can be detected.

The desired channel is to be set via the BCCH parameter in the *Measurement Mode* menu. In addition, either the corresponding modulation type, frequency and output level must be set at the R&S SME or R&S SMIQ signal generator of the *TS9953* system or the TS9953 GMSK test transmitter must be used with internal GMSK modulation.

Note:

Test transmitter measurements can be performed in regions with operational GSM networks without influences on those - you just have to select an available channel. To avoid any conflicts, the channels on the left and right of the used channel (adjacent channels) must also be available. So first use the Scanning mode to look for a gap you can use.

After synchronization of the test mobile on the test transmitter signal, the program flow is similar to the *Camp* mode, however, only the downlink will be performed.

Synch. Channel

BCCH number and octal BSIC to which the mobile has access in the Camp mode.

Use RxLev Correction

If this function is active, the system uses the calibration file generated for the connected mobile. This file has to be located in the subdirectory *\Driver* . The software needed to generate the file is available from Rohde & Schwarz on request.

Scan Settings / Channels to Scan

The *Start BCCH* and *Stop BCCH* channel numbers determine the measurement range in the *Scan(ning)* mode. This range must be within the supported channel range (e.g. 1 to 124 for GSM900). The SAGEM and other dual-band mobiles support the two bands between 1 and 124 and between 512 and 885. The Sagem x6 driver provides an overview of channel ranges that can be set depending of the GSM band used. Moreover, it supports the *BCCH Scan* with BSIC decoding over an arbitrary combination of single BCCH channels and channel ranges; see *BCCH Scan* below.

The *Samples* parameter (not for SAGEM) defines the number of measured values to be acquired in each channel – see *Scanning Mode* above.

Decode BSIC

For RS TM devices: If this function is active, the test mobile tries to decode the BSIC from all channels. The decoded BSIC values are displayed in the *GSM Scan View* (see chapter 4).

Note:

Decoding requires a certain minimum amount of samples per channel. Allowed range: 1...50; recommended for this feature: 20 or more. Decoding is improved if the number of channels to be measured is reduced.

BCCH Scan

For the Sagem x6 driver: If this function is active, the test mobile tries to decode the BSIC in the *BCCH Scan* channel range entered in the *Channels to Scan* panel. The decoded BSIC values are displayed in the *GSM Scan View* (see chapter 4).

Note:

While the BCCH scan is active the mobile measures each channel until the BSIC has been successfully decoded. This can cause a considerable extension of the measurement time.

Barred Cells / Cell Barring /Cell Bar Flag

For Nokia and SAGEM devices: This function allows to ignore or even invert the cell bar flag:

Normal	Only cells that are not barred are accessible for the mobile
Ignore	Cell bar flag ignored – all cells are accessible
Invert	Cell bar flag inverted – only barred cells are accessible

Band Forcing

For all SAGEM multi-band mobiles and Nokia mobiles, one of the supported GSM bands can be selected:

Off	All supported GSM bands allowed
GSM900/1800/850/1900	Use a specific GSM band
DCS 1800	Use DCS 1800 band (Sagem and TrioRail, corresponds to GSM1800)

Misc.

RLC/MAC Headers

For SAGEM OT 190 / 290 (GPRS) and TrioRail (GPRS/EDGE) devices: If this function is active, the information in the RLC/MAC headers of the transmitted radio blocks is included in the measurement data and can be displayed in the *GSM RLC/MAC Header View*.

Be aware that the ROMES *.RSCMD file size will increase quickly if this parameter is on and packet data transfer is performed.

RxLev Calibration

For SAGEM mobiles using the Sagem X6 driver and for TrioRail test mobiles: The *RxLEV Calibration...* button opens a dialog to activate the calibration of the received signal level reported by the mobile; see description of *RxLev Calibration* on p. 6.50.

Init Mobile

For SAGEM mobiles using the Sagem x6 driver and for TrioRail test mobiles: The *Init Mobile...* button starts the initialization if a mobile (even of the same type) was changed:

Channel Lock

For Nokia 6230 mobiles: *Lock Channel* forces the test mobile to use a specified existing GSM channel. In the different GSM bands, the same channel numbers are used for different frequencies (see overview of GSM channels in chapter 8). The ambiguities in the channel-frequency assignment are resolved by specifying one of the two band combinations *GSM900/1800* or *GSM 850/1900*.

Driver Configuration – Receiver

The *Receiver* tab configures the tracking mode where a the mobile phone controls a CW test receiver and sets its receive frequency. In tracking mode, the measurement must be performed on a single frequency channel although most test receivers are able to measure at several frequencies simultaneously. The *Remote Receiver* tab is identical for all GSM and UMTS mobile drivers.

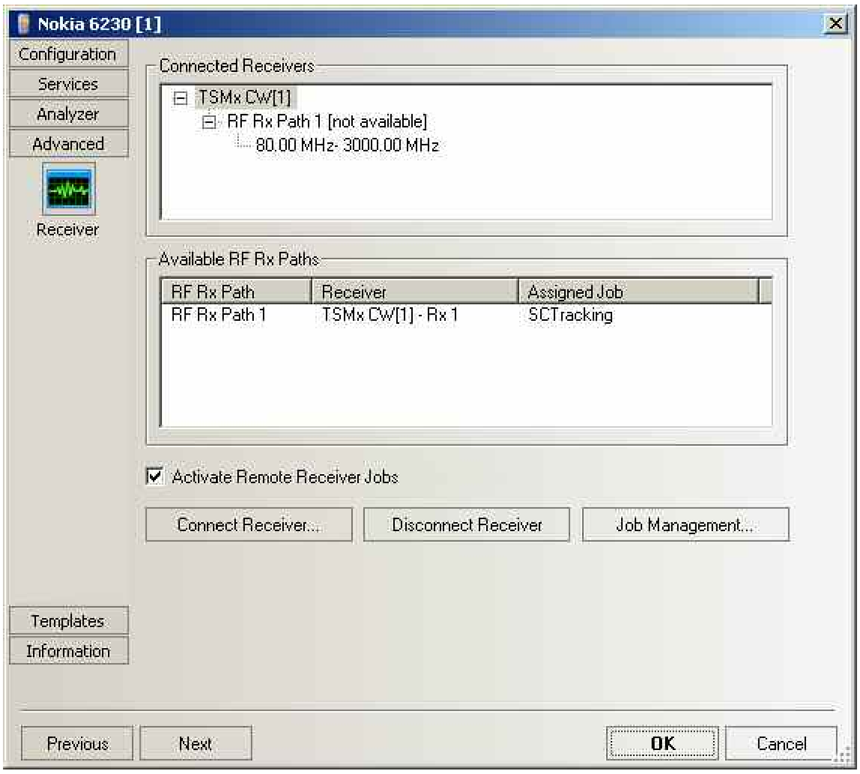


Fig. 6-23 Driver Configuration – Remote Receiver tab (all drivers)

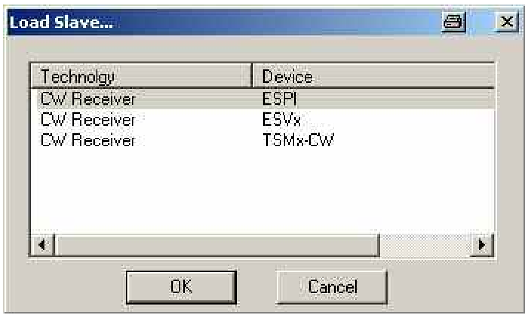
Connected Receivers — List of test available receivers. To connect an additional test receiver, click the *Connect Receiver...* button. To remove a test receiver from the list, select the receiver and click the *Disconnect Receiver...* button.

Available RF Rx Paths — List of receiver signal paths, receiver, and receiver jobs assigned to each path. To select an additional job to be done, click the *Job Management...* button.

Activate Rem. Rec. Jobs — If the box is checked, the jobs that are shown in the *Available RF Rx Paths* table will be done after *OK* is clicked and the configuration menu is closed.

Connect Receiver... The *Connect Receiver...* button opens a selection dialog showing all test receivers available as slaves.

Test receivers are not shown in the pull-down list before the test receiver drivers are loaded. This can be done by clicking the *Load Slave* button to call up the *Load Slave* window and select a test receiver to be loaded.



The following receiver drivers can be used for tracking: *R&S ESPI, R&S ESVx, R&S TSMU.*

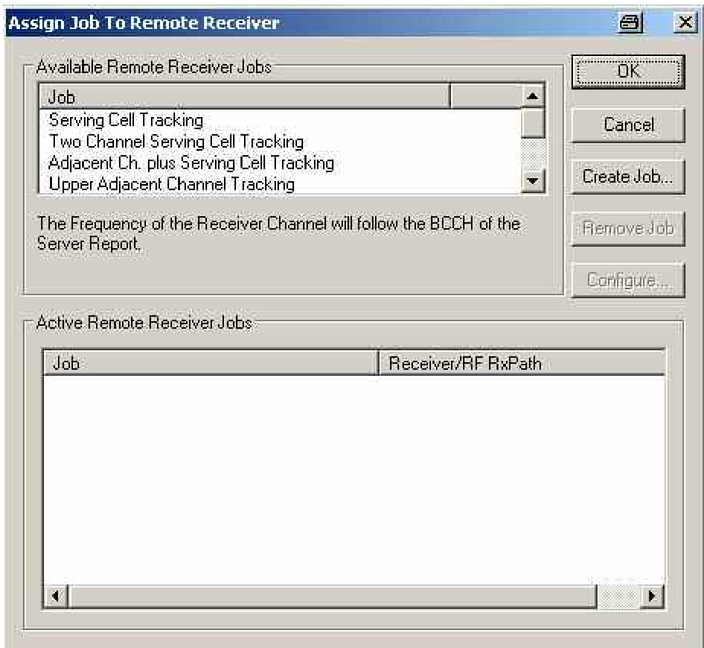
OK Connect the selected test receiver, add it to the list of *Connected Receivers* in the *Remote Receiver* tab and close the *Load Slave* window.

Cancel Close the *Load Slave* window without connecting a test receiver.

Disconnect Receiver... The *Disconnect Receiver...* button disconnects the receiver selected in the list of *Connected Receivers.*

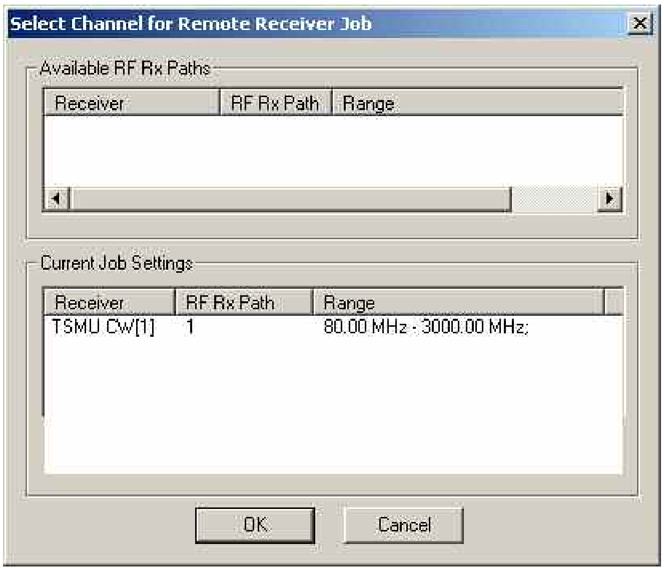
Job Management...

The *Job Management...* button opens the *Assign Job to Remote Receiver* dialog to create or select a job and assign it to a remote test receiver.



The job to be assigned to the remote receiver can be selected from the list of *Available Remote Receiver Jobs*. A description of each job is displayed below the list when the job is selected.

OK	Assign the selected job to the receiver selected in the list of *Connected Receivers* in the *Remote Receiver* tab and close the current dialog.
Cancel	Discard the current selection and close the dialog.
Create Job...	Activate the selected job and add it to the list of *Active Remote Receiver Jobs*.
Remove Job	Remove the selected job from the list of *Active Remote Receiver Jobs*. This softkey is disabled if the list is empty or if no job is selected in the list.
Configure	Open the *Select Channel...* dialog to assign one or several receiver channels *(RF Rx Paths)* to the job selected in the list of *Active Remote Receiver Jobs*. The *Configure* softkey is disabled if the list is empty or if no job is selected in the list. Some jobs require several channels which can be provided by one or several test receivers.



The *Select Channel...* dialog displays all channels that are available but not yet assigned *(Available RF Rx Paths)* and the channels that are already assigned to the current job *(Current Job Settings)*. Double-click on a channel in one of the tables to move it to the other table.

Remarks about the Tracking Mode

The tracking mode has an impact on some driver configuration menus and views.

- In the tree views for data selection (e.g. in the *Values* tab of the *2D Chart View* configuration menu), the master of a channel (i.e. the mobile phone controlling the test receiver) is indicated instead of the measurement frequency.
- The settings of test receiver channels controlled by a master cannot be changed in the *Measurement Settings* tab of the test receiver driver configuration menus; see section *Test Receiver Configuration* on page 6.148 ff.
- Each channel change and each receiver used generates an event in the measurement data. These events can be viewed together with all other events in the *Event View*, in the *Route Track View* and in the *2D Chart View.* In addition, each channel change is indicated in the *General Status View.*

Driver Configuration – Autodialing

The *Autodialing* tab configures the mode where the mobile periodically attempts a call to the network dialing a definite phone number. This mode is relevant for the network quality analysis described on page6.71. The *Autodialing* tab is similar for all GSM mobile drivers.

The Nokia test mobile needs a 2nd virtual COM port to be operated in *autodial* mode; see paragraph *Loading the drivers (Nokia)* on p. 6.8.

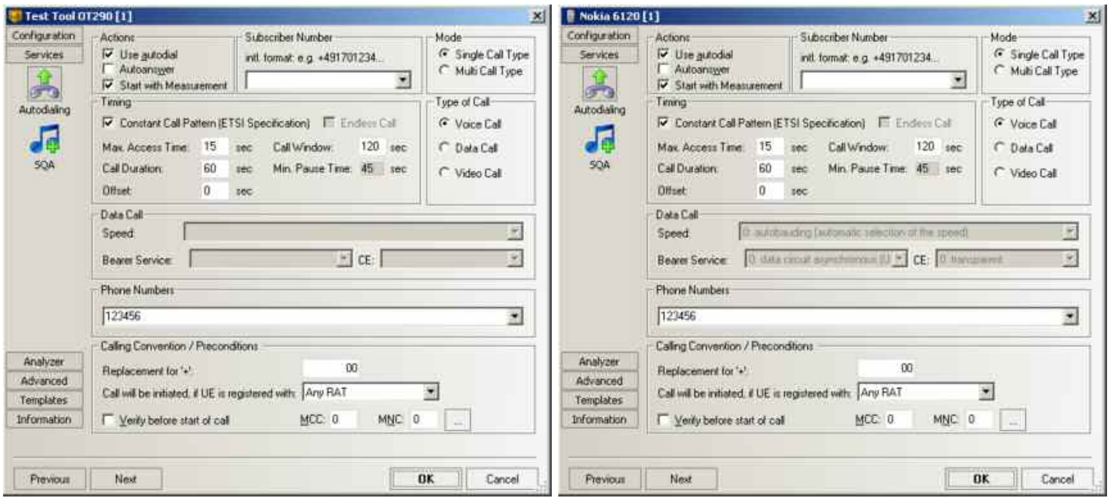


Fig. 6-24 Driver Configuration – Autodialing tab (all drivers, single call type)

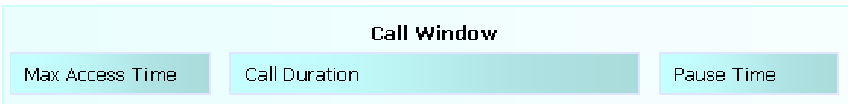
Actions The check boxes in the *Actions* panel activate automatic call options:

Use autodial If the box is selected the mobile sets up periodic calls using the parameters in the remaining panels of the Autodialing tab. The autodial function is useful for many applications, in particular for the Network Quality Analysis.

The mobile autodialer algorithm has been modified to insert a pause after a call has terminated to prevent a new dial attempt during radio resource clean-up. This is done only in the *Constant Call Pattern* configuration.

In some cases, the NQA state machine had difficulties if a new call was started when the previous call was not completely finished (DISCONNECT message was sent, but RELEASE was not yet received). This happens e.g. when one call lasts longer than specified in the call window property.

The autodialing mechanism works as follows:



This means that even in case a call takes longer than the overall call window to complete, the mobile and the network are given the chance to clean up the call properly:

The pause time is calculated from the settings made in the *Timing* section of the autodialer configuration page. Therefore, the sum of the maximum access time and the call duration is subtracted from the overall call window duration.

The minimum value for a pause time is 5 seconds. Even if a shorter pause is defined in the configuration dialog, the autodialer will append such a delay to each call after a hang-up has been triggered.

Autoanswer incoming calls If the box is selected the mobile automatically accepts all incoming calls after a certain number of ring tones.

Start with Measurement If the box is selected, autodialing starts automatically with the measurement.

Subscriber number Selects the subscriber number.

Mode (Sagem x6) To option buttons switch between a single call type and a multi call type:

- A single call is set up according to the settings in the remaining panels of the *Autodialing* tab (see *Fig. 6-24* on p. 6.65). The call is periodically repeated if *Use autodial* is selected.
- A multi call is a sequence of calls with individual call settings, to be configured in the multi call version of the *Autodialing* tab (see Fig. 6-25 on p. 6.3). The call sequence is periodically repeated if *Use autodial* is selected.

Type of Call (Sagem X6, Nokia etc.) Several drivers display the *Type of Call* panel:

- All test mobiles support voice calls.
- Data calls can be set up with Nokia devices, provided that *Use autodial* is active. They can also be used with Qualcomm test devices; see *Fig. 6-43* on p. 6.105 ff, with the Samsung Z105 test mobile, and with all other test devices supporting GSM and UMTS. When the driver is loaded, R&S ROMES automatically initializes the data call service using an appropriate AT command.
- Some test devices (e.g. the Samsung Z105) support video calls. To test this call type, the called party must be configured for video calls as well and *Autoanswer incoming calls* must be enabled.

Data and video calls are not supported by Sagem mobiles, even if the splitter box is used.

Timing

Defines the periodicity of the autodial process.

Constant Call Pattern (ETSI Specification)

If this option is enabled (box checked), the calls are repeated in the fixed Call duration/Call Window pattern, no matter whether a connection is released or lost before the end of the Call duration. This setting is in accordance with IREG specifications and ensures that several connected test mobiles operate synchronously. It is required for an analysis of the calls in the UMTS/GSM NQA State View.

In the alternative setting, the call duration ends and the next Min. Pause Time starts at the moment when a call is lost. This ensures that a maximum number of calls per unit of time can be set up at fixed call duration and idle time.

Max. Access Time

Maximum time allowed for cell access. If no call can be established within this time, the call is classified as a blocked call.

Call Duration

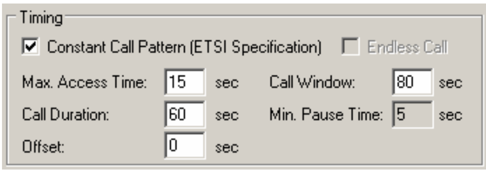
Time between start and release of a call in the range between 15 s and 86400 s. For some mobiles it may be necessary to set the Call duration time higher than 15 s to get a Good Call, e.g. to 25 s. Therefore check the call statistics in the GSM NQA View before you start the measurement tour.

Min. Pause Time

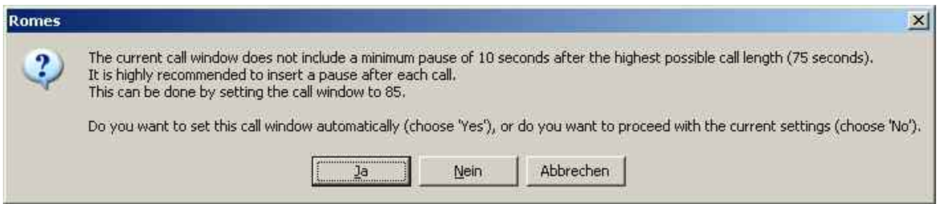
The minimum pause time is automatically calculated as

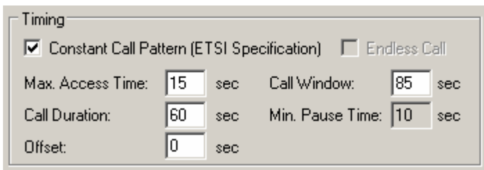
Call Window – (*Max. Access Time* + *Call Duration*)

An example:



If the resulting pause time is less than 10 seconds, an error message is issued and the Call Window is increased correspondingly:





Call Window	Time between two subsequent call attempts, including the access time, the call duration and a possible idle time until the next call is initiated. The Call Window is available while *Constant Call Pattern* is enabled.
Offset	Time offset for dialing. Different Offset times for different test mobiles (e.g. 0 s for the first, 20 s for the second mobile etc.) ensure that the test mobiles will not dial simultaneously. Possible problems in the connection setup are avoided.
Endless call	For an endless call (box checked), the call duration is set to infinity; the Call duration input field is disabled. *Endless call* is disabled while Constant Call Pattern (ETSI Specification) is selected.

The timing of the calls can be monitored in the *UMTS/GSM NQA State View.*

Data Call

If a data call is selected, then the input fields in the *Data Call* panel are enabled. They provide a subset of the possible parameters for the +CBST call control command described in standard 3GPP TS 07.07. The values depend on the test mobile type.

Speed	Baud rate of the data connection. The test mobile provides automatic baud rate selection according to the quality of the radio link.
Bearer Service	The value *data circuit asynchronous (UDI or 3.1 kHz modem)* cannot be changed.
CE	Connection Element; the value *non-transparent* cannot be changed.

Subscriber Number

The Subscriber Number, which is mandatory for SQA, is entered or selected in this list field.

The number must be entered using the international format, e.g. (089) 12345678 would be entered as "+498912345678" without fillers (such as blanks or hyphens).

Phone Numbers

One or more phone number(s) can be entered via the keyboard and the input field.

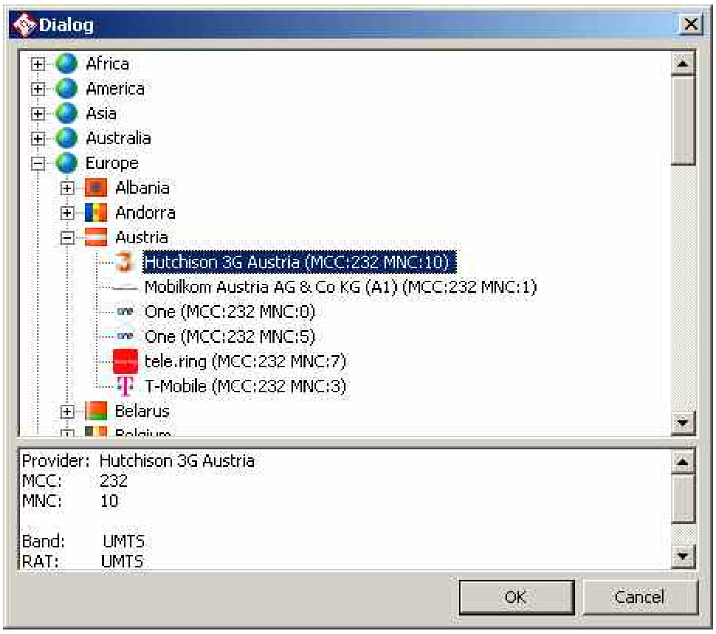
Calling Conversion

R&S ROMES requires phone numbers in international format, including the ‘+’. However, on some mobiles the ‘+’ cannot emulated. Thus it has to be replaced by the national numbers to access the international network. Former this replacement was done with ‘00’. But several regions do use other numbers. Now this number can be defined her. The default value is ‘00’, which reflects the former behavior.

Preconditions

The *Preconditions* panel sets home network-related parameters:

Call will be initiated if UE...	The initiation of a call can be set to depend on the presence of *Any RAT*, *Only UMTS*, *Only GSM*, or *Only CDMA*.
Verify before start of call	If *verify before start of call* is checked, the mobile will be out of service if a call is attempted from a foreign network (e.g. during a measurement tour near the border of a network where roaming is possible). This ensures that calls from foreign networks will not impair the network quality analysis; see next section. By default, the *verify before start of call* function is not active.
MCC/MNC	Mobile country code (MCC) and mobile network code (MNC) together identifies the home network.
	This button opens a Home Network selection dialog:



The *Autodialing* tab driver configuration menu changes if a *Multi Call Type* is selected.

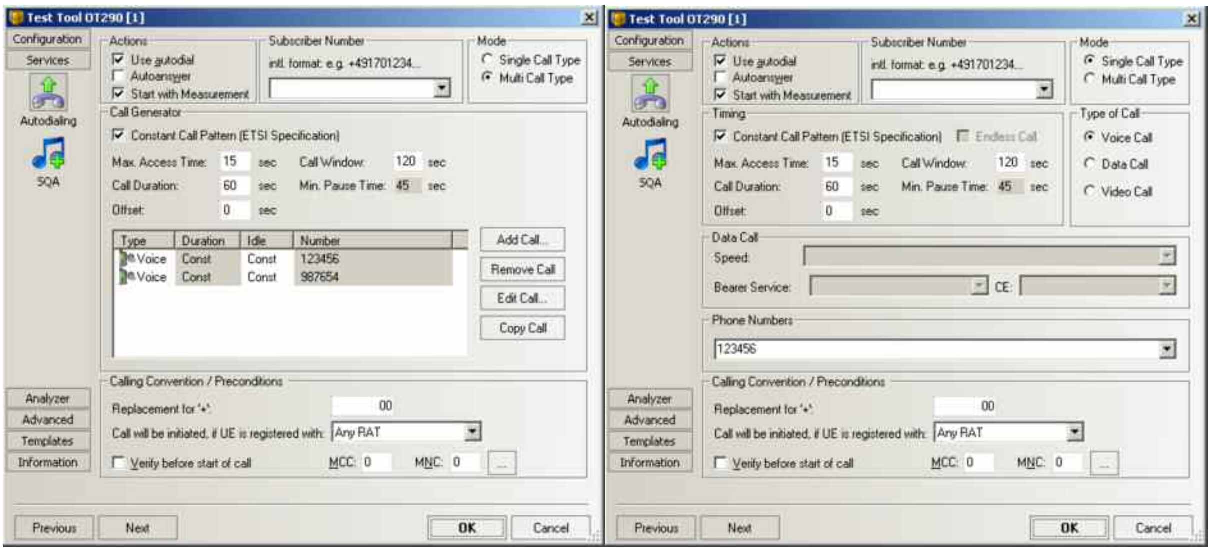


Fig. 6-25 Driver Configuration – Autodialing tab (Sagem x6, multi call type)

A multi call is sequence of single calls with independent call settings. The settings for each call are identical with the single call settings described above. The individual calls are listed in the center of the *Call Generator* panel. If *Constant Call Pattern* is active, the timing settings in this panel are valid for all calls in the list.

The buttons to the right of the list add or remove calls from the list and edit or modify a selected call. *Add Call…* or *Edit Call* opens the following *Call Settings* dialog:

Fig. 6-26 Call Settings (Sagem x6, multi call type)

The *Timing* settings in the *Call Settings* dialog are unavailable if a *Constant Call Pattern* is active.

Driver Configuration – NQA Settings

The *NQA Settings* tab provides the parameters for *Network Quality Analysis*. NQA is a prerequisite for drawing up a call statistics where the calls are classified and the classes are visualized separately (see *UMTS/GSM NQA View* window in chapter 3). The *NQA Settings* tab is identical for all GSM mobile drivers.

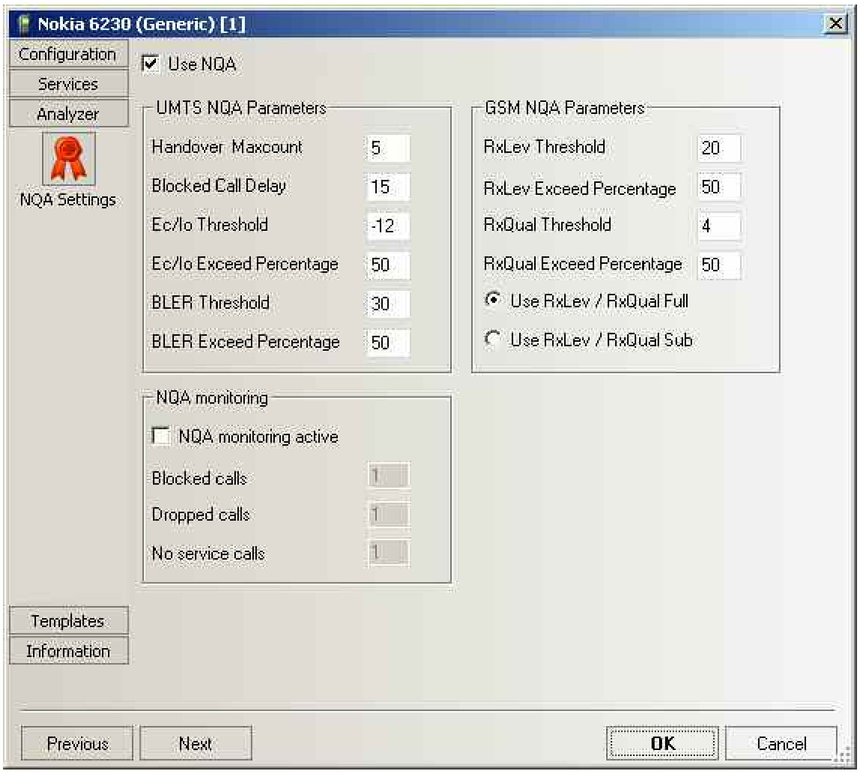


Fig. 6-27 Driver Configuration – NQA Settings tab (all drivers)

Use NQA If checked, the box activates the network quality analysis (default).

UMTS/GSM NQA Parameters The following numeric parameters configure the UMTS/GSM NQA by defining conditions and limits for the different call classes (the ranges for all parameters are quoted; default values are underscored)

Handover Maxcount Maximum number of handover procedures during a call in the range 1 to <u>5</u> to 100. If the defined value is exceeded, the call will be classified as EXCESSIVE HO.

Blocked Call Delay Maximum delay (in seconds) between CM_SERV_REQ and ASSIGNMENT_COMMAND in the range 1 (s) to <u>15</u> (s) to 63 (s). If the defined delay is exceeded, the call will be classified as DELAYED CALL.

RxLev Threshold Minimum received signal input level in the range 1 to <u>20</u> to 63. RxLev values which fall below this threshold contribute to NOISY.

RxLev Exceed Perc. Minimum ratio (in percent) of reported RxLev values falling below the RxLev Threshold in the range 1 (%) to <u>50</u> (%) to 99 (%). If the actual ratio falls below the *specified percentage the call is classified as NOISY.*

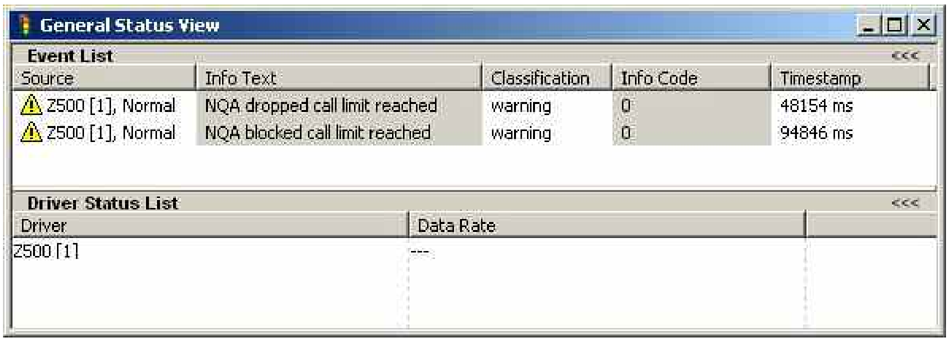
RxQual Threshold — Maximum value of RxQual (i.e. minimum received signal quality) in the range 1 to 4 to 7. RxQual values above this threshold contribute to NOISY.

RxQual Exceed Perc. — Minimum ratio (in percent) of reported RxQual values exceeding the RxQual Threshold in the range 1 (%) to 50 (%) to 99 (%). If the actual ratio exceeds the specified percentage the call is classified as NOISY.

NQA monitoring

If checked, the *NQA monitoring active* box activates NQA monitoring. In this mode, a message is displayed in the *General Status* view (see chapter 3) as soon as the number of *Blocked Calls*, *Dropped Calls*, or *No Service Calls* entered in the three input fields of the *NQA monitoring* panel is reached.

Example for a *General Status* view message:



RxLev/RxQual Source

The radio buttons in the *RxLev/RxQual Source* field determine the type of values used for the NQA:

Use RxLev/RxQual Full — Both parameters are assessed over the full range of TDMA frames within a SACCH block

Use RxLev/RxQual Sub — Both parameters are assessed over a subset of 12 TDMA frames

The full and sub values are displayed separately in the *GSM Measurement Report View*, see chapter 3.

Important note on NQA in downlink DTX mode:

If the BTS uses discontinuous transmission (DTX), the BTS transmitter is switched off during time periods where no information needs to be transferred. The BTS (downlink) signal shows strong variations in time resulting in a large difference between the measured *RXLev/RXQual Full* and *RXLev/RXQual Sub* values. The NQA must be performed with the *Use RxLev/RxQual Sub* option, otherwise it will generally underestimate the network quality.

Display of results

If NQA is active during a measurement *(Use NQA* box checked), the *NQA View* displays a bar graph showing the percentages of the current call statistics, i.e. the percentage of *Good, Blocked, Dropped* and *No Service* calls.

Call Classes

The *NQA View* shows the following call classes:

Good: Every call successfully established and terminated by the system after exactly the *Call duration* set in the *Autodialing* tab.

Blocked: A call is qualified as blocked if one of the following applies:

An idle message was detected during call setup but the call was not canceled. This happens in all cases where a call setup was performed at least up to the layer-3 message SERVICE REQUEST, but not up to ALERTING / CONNECT, and where no DISCONNECT, RELEASE or CHANNEL RELEASE was executed **or**...

The call was canceled, call setup was not performed up to ALERTING and/or CONNECT **or**...

A dial command has been sent to the mobile, but because of insufficient coverage no call could be established: The NQA machine remains IDLE. On the next dialing the system recognizes that no call could be established and one blocked call is added.

Dropped: A call is qualified as dropped if one of the following applies:

An established call is cancelled before the *Call duration* set in the *Autodialing* tab has passed **or**...

An established call is terminated not to order. A NQA data package will be generated when an *Idle or Error (No Service)* state is detected after a call was completely established and the *Call duration* has not passed yet.

No service: A *No service* call is added every time the system wants to dial but the mobile is out of service. If the mobile remains out of service the time interval between two subsequent *No service* calls is equal to the *Call duration* plus the *Idle time*, both set in the *Autodialing* tab.

Note:
A single call can fit into more than one class and can therefore contribute to several bars. The percentages do not necessarily sum up to 100 %.

Extensions

For an extended NQA evaluation, *Rohde & Schwarz* offers the NQA evaluation software *TS9954 NQA* for use with MS Excel. The software is described in chapter 7 of this manual.

Driver Configuration GSM – Antenna

The *Antenna* tab defines *Antenna Name, Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors. The *Antenna* tab is identical for all GSM mobile drivers.

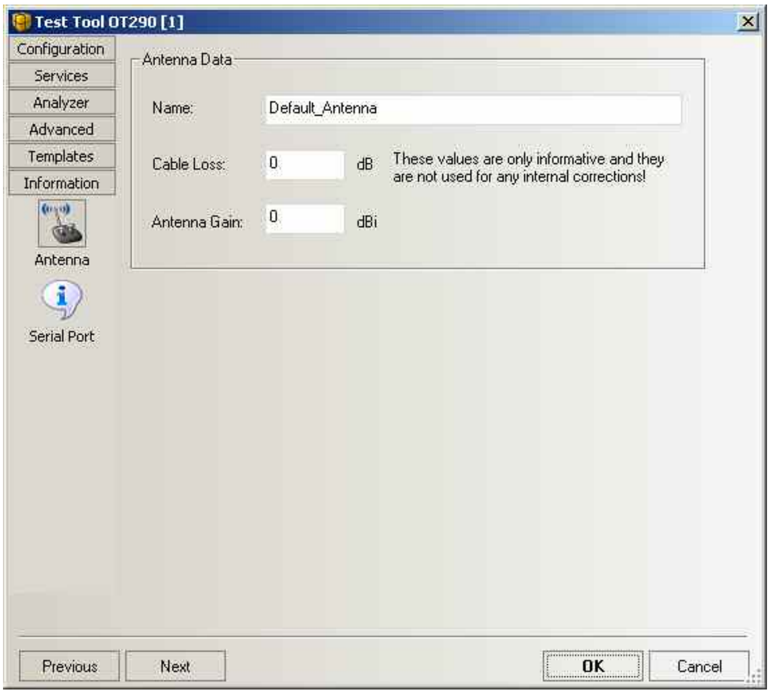


Fig. 6-28 Driver Configuration – Antenna tab (all drivers)

Driver Configuration – Layer 3 Uplink frames

The *Layer 3 Uplink frames* tab modifies up to four layer 3 messages that the Sagem mobile sends to the network.

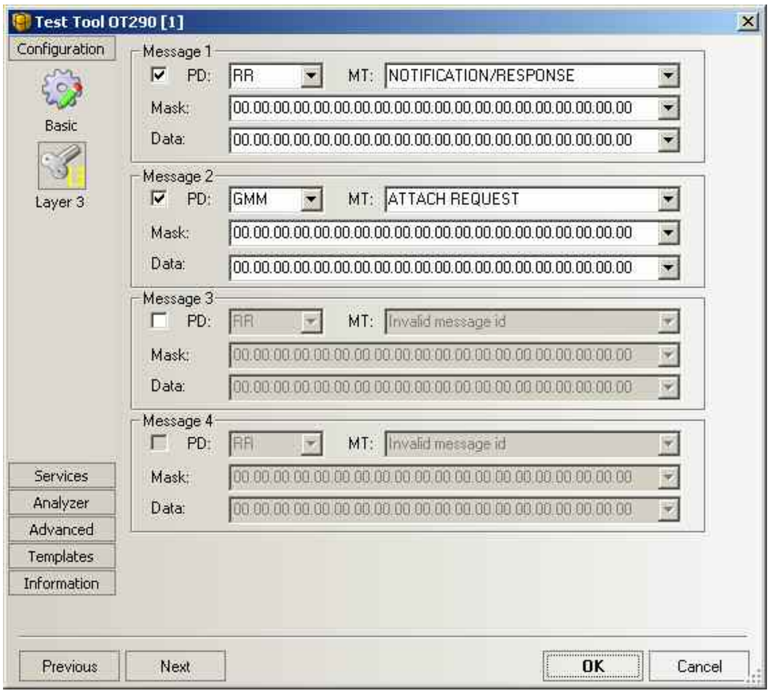


Fig. 6-29 Driver Configuration – Layer 3 Uplink frames tab

The layout of the *Layer 3 Uplink frames* tab depends on the mobile type, however, all functions are equivalent.

Protocol discriminator / PD and MT This column indicates the *Protocol Discriminator* (PD, first two characters) and *Message Type* value of the GSM or GPRS layer 3 message that shall be modified; see GSM 04.08.

Mask [Hex] Mask to be applied on the GSM or GPRS layer 3 messages for the modification.

Data [Hex] Data for the modification. For further reference see also user documentation of the Sagem mobile.

Driver Configuration – QoS Tests

The *QoS Tests* tab configures the mode where important GPRS mobility management actions *(GPRS Attach/Detach, Routing Area Update)*, GPRS packet routing actions *(Activate/Deactivate PDP Context),* GSM layer 3 actions *(Location Area Update),* or *Cyclic Handover* procedures of a GPRS mobile in dedicated mode are initiated periodically. A statistical evaluation of the actions provides an overview of the Quality of Service (QoS), e.g. the amount of network resources given to the mobile. It can be displayed in the *GSM QoS View*.

Note:
To be recorded and evaluated, the actions must be enabled in the QoS Statistics tab of the driver configuration menu; see Fig. 6-31 on p.6.78.

The *QoS Tests* tab is only provided for the SAGEM x6 driver.

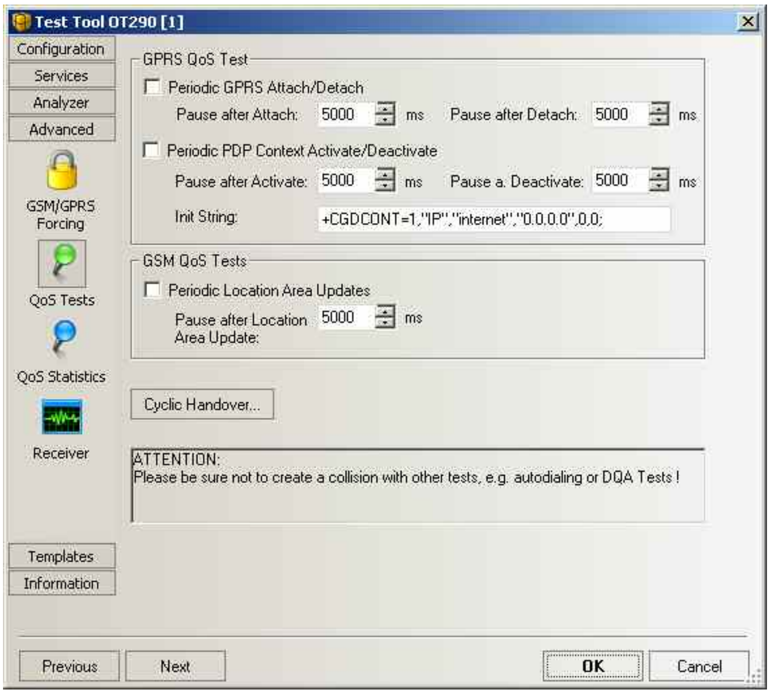


Fig. 6-30 Driver Configuration – QoS Tests tab (all drivers)

The entries to control *Periodic GPRS Attach/Detach, Periodic PDP Context Activate/Deactivate* and *Periodic Location Update* are analogous.

Enable/Disable

The three types of periodic actions can be activated independently; they are compatible with each other.

Note:
GSM test mobiles can be used for various automatically controlled, periodic tests, e. g. Autodialing, DQA analysis. Some of the periodic tests cause conflicts when activated simultaneously. E.g. the QoS test functions can not be performed after the autodialing function has released the call.

Pause after…

Defines the periodicity of the actions:

- The *GPRS Attach/Detach* cycle consists of an attach, followed by the *Pause after Attach*, detach, *Pause after Detach*.
- The *PDP Context Activate/Deactivate* cycle consists of a PDP context activate, followed by the *Pause after Activate*, PDP context deactivate, *Pause after Deactivate*.
- The *Location Area Update* cycle consists of an location update procedure followed by the *Pause after Location Update*.

Init String

PDP Context +CGDCONT command, specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter (first numeric parameter after "="). The command is described in standard 3GPP TS 07.07 and is preset as shown in Fig. 6-30 above.

In most networks, adjusting the third string parameter *(Access Point Name (APN),* preset as "internet") will be sufficient to activate a PDP context.

Cyclic Handover

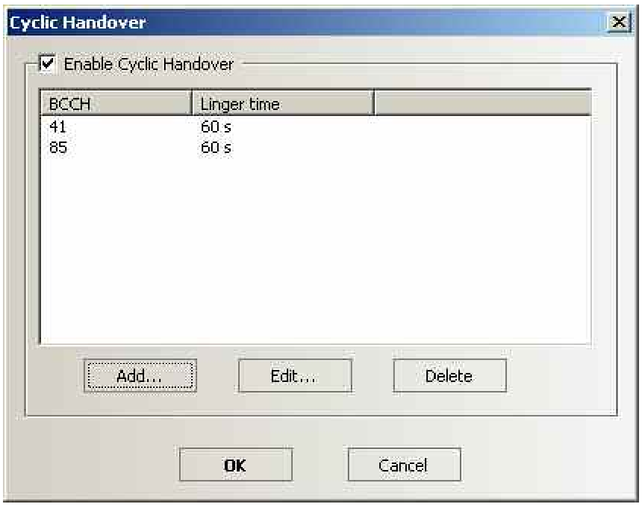
Configures the neighbor cell BCCH and timing parameters necessary for cyclic handover that a GPRS mobile can initiate while it is in dedicated mode (during a call).

For a cyclic handover the mobile manipulates the received signal strengths in its receiver reports in such a way that the network periodically initiates a handover to a given neighbor cell. The cells are arranged in a BA list. The mobile cycles through the list, lingering in each cell for a definite amount of time.

The process is stopped if one of the cells is no longer detected, so cyclic handover is typically tested on a fixed location. Cyclic handover and manual handover exclude each other. It is recommendable to perform cyclic handover tests in autodial mode and with endless call duration (see *Autodialing* tab on p. 6.65).

If the network fails to initiate a handover, the *General Status View* displays a timeout warning. Other warnings and error messages (e.g. *Autodial switched off, Telephone number is empty, No endless call selected, BA list empty)* are also displayed in the *General Status View.*

The *Cyclic Handover…* button opens the following dialog:



Cyclic handover must be enabled explicitly *(Enable Cyclic Handover).* The BA list contains the BCCH channel numbers of all cells to be allocated during the cyclic handover process. The mobile dwells in each cell for a definite *Linger time*. The *Add…, Edit…,* and *Delete* buttons are used to modify the BA list and its entries:

Driver Configuration – QoS Statistics

A statistical evaluation of the actions initiated by these messages provides an overview of the Quality of Service (QoS), e.g. the amount of network resources given to the mobile. It can be displayed in the *GSM QoS View*.

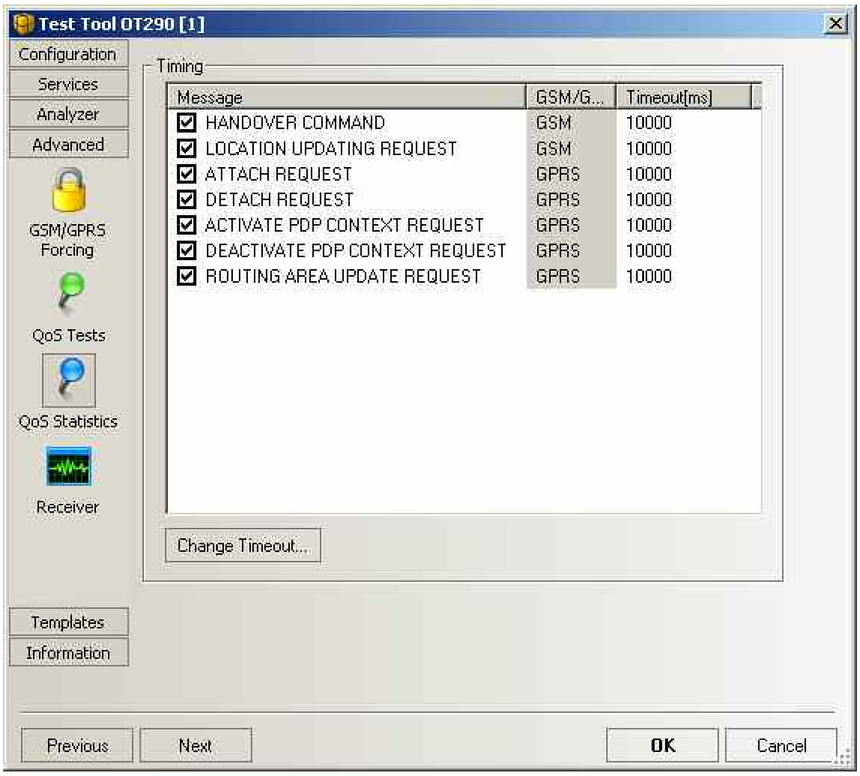
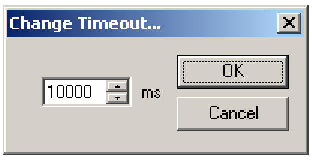


Fig. 6-31 Driver Configuration – QoS Statistics tab

Message / GSM/GPRS List of layer 3 and RLC/MAC control messages generated or received by the mobile. The actions initiated by the checked messages will be included in the measurement file. The messages are related to either GSM or GPRS service.

Timeout Maximum time that the selected actions can take until they are classified as *No Response* actions. For mobile-initiated actions, the time is measured from the time the mobile transmits the *... REQUEST* message to the time it receives the response from the network.



An individual timeout can be set for each selected action.

Driver Configuration GSM – Templates

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. It is provided for many GSM mobile drivers and is identical for all of them.

Note:

When a driver is loaded using Hardware – Add/Remove... (see section Driver Installation on p. 6.1 ff.) ROMES checks whether a driver template is stored in the Driver Templates directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

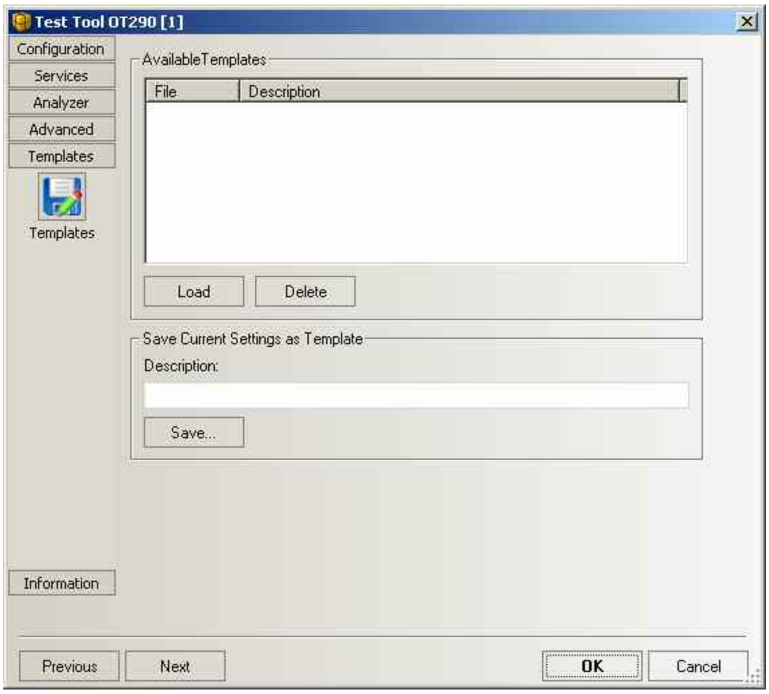
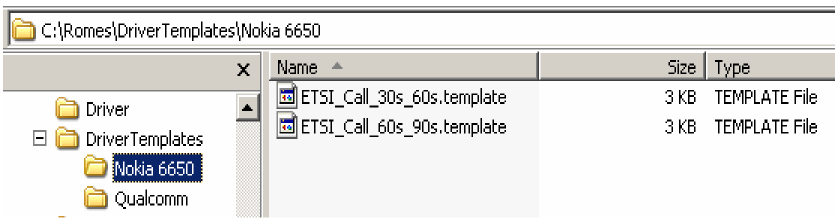


Fig. 6-32 Driver Configuration – Templates

Load/Delete

Loads or deletes a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent from the workspace. A selection of template files for different drivers is supplied with the R&S ROMES installation.



Save

Saves the current driver settings together with the *Description* to a selected template file.

Driver Configuration – Handover Analyzer

The *Handover Analyzer* tab (HOA) enables or disables the handover analyzer (option ROMES3HOA) and sets the timeout for the HO analysis. The HO analysis and the meaning of the timeout is described in chapter 4, section *UMTS/GSM Handover Analyzer View*. The *HOA* tab is provided for many GSM mobile drivers and is identical for all of them.

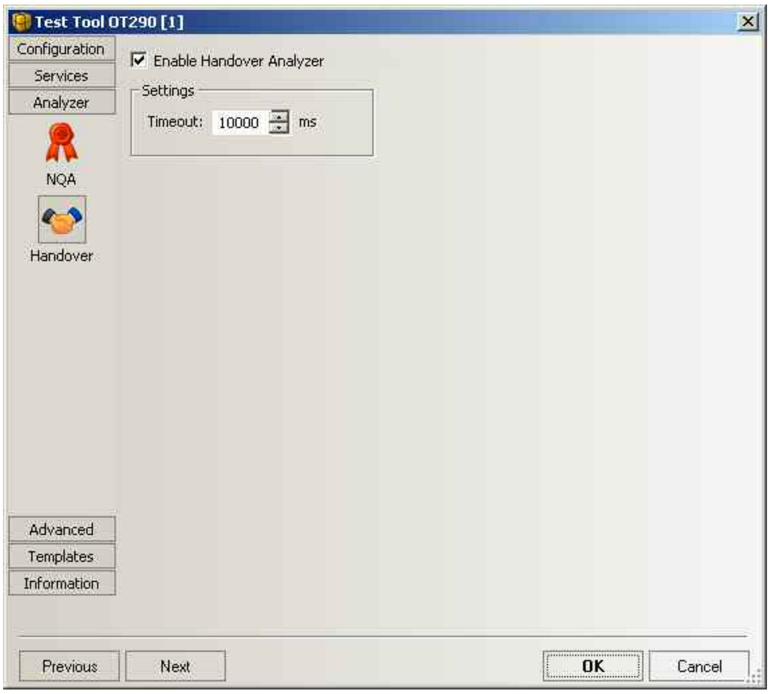


Fig. 6-33 Driver Configuration – Handover Analyzer

Driver Configuration GSM – Serial Port Driver Info

The *Serial Port Driver Info* tab displays information on the file version of the GSM driver, the serial port assigned to it and the transfer parameters. It is identical for all GSM mobile drivers.

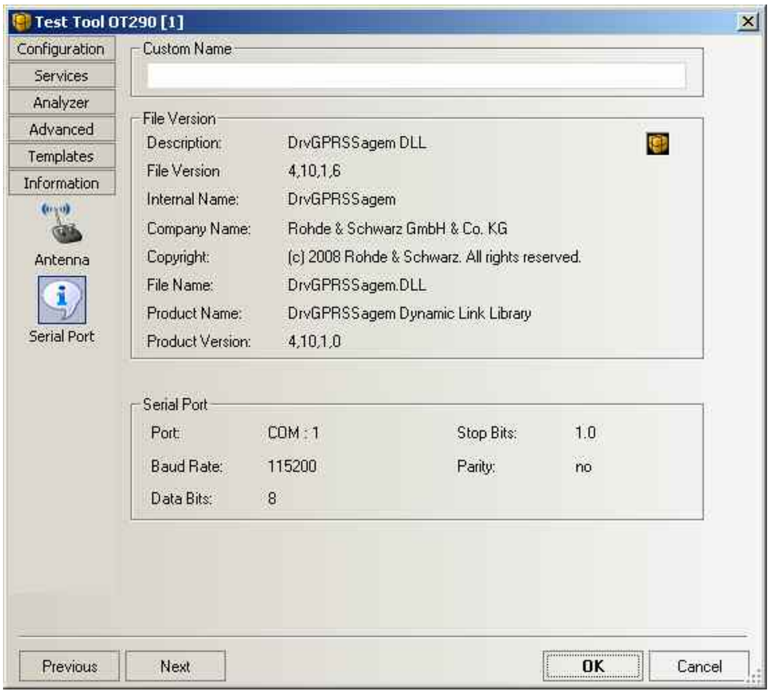


Fig. 6-34 Driver Configuration – Serial Port Driver Info tab (all drivers)

Custom Name Used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider.

An example is provided in section *Configuration of Installed Drivers* on p. 6.30.

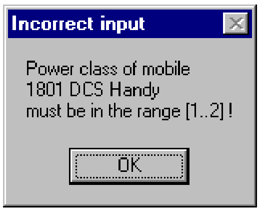
OK Confirms all settings made in the *Driver Configuration* menu and closes the menu.

If any of the settings made are wrong (i.e. not compatible with the connected device) an error message box pops up – see section *Settings Check and Loading of a Symbol File* below.

Cancel Discards all changes made and closes the *Driver Configuration* menu.

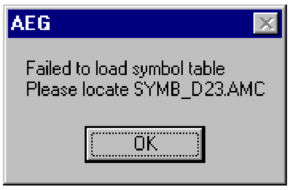
Settings Check and Loading of a Symbol File

On closing the *Driver Configuration* menu (see *OK* button above), the system checks whether the configuration to be saved conforms to the connected mobile. (Analogously, the driver configurations are checked when a driver is loaded, see section *Driver Installation* on page 6.1 ff). If there is any incompatibility an error message pops up as in the following example (wrong power class):



On clicking *OK* the message box is closed, and the wrong setting can be corrected in the *Driver Configuration* menu. This procedure must be repeated for all wrong settings.

For AEG mobiles the system will then automatically search for the **symbol file**. If this file, located in the *Driver* subdirectory, is found immediately, no message will appear. Otherwise:



On clicking *OK* an *Open file* box opens. Here all detected symbol files are shown, the one which corresponds to the current configuration is entered in the *File name:* field.

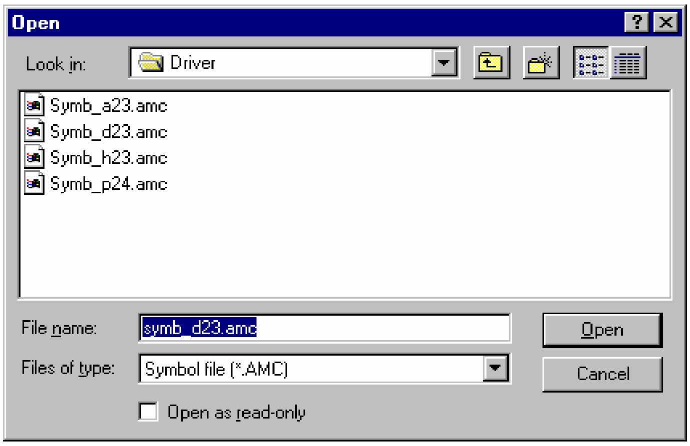


Fig. 6-35 Loading of symbol files

Symbol files

Symbol files are only used with AEG mobiles. They contain all information about the connected mobile, such as type, firmware version or software communication parameters.

The matching firmware version of the mobile is indicated in the name of the symbol file, e.g.:

`SYMB_`*`D23`*`.AMC`	where *D* denotes a DCS (GSM1800) mobile and *23* the firmware version. The extension *.AMC* stands for *A*EG *m*obile *c*ompany.

If any problems concerning the test mobile should occur, please include the firmware version number in your service request. Also add the *ROMES* software version number indicated in the *About ROMES* box (see section *Help menu* in chapter 2).

Note:
The firmware version of all AEG mobiles must be 16, 23 or 24 to operate with ROMES.

OK

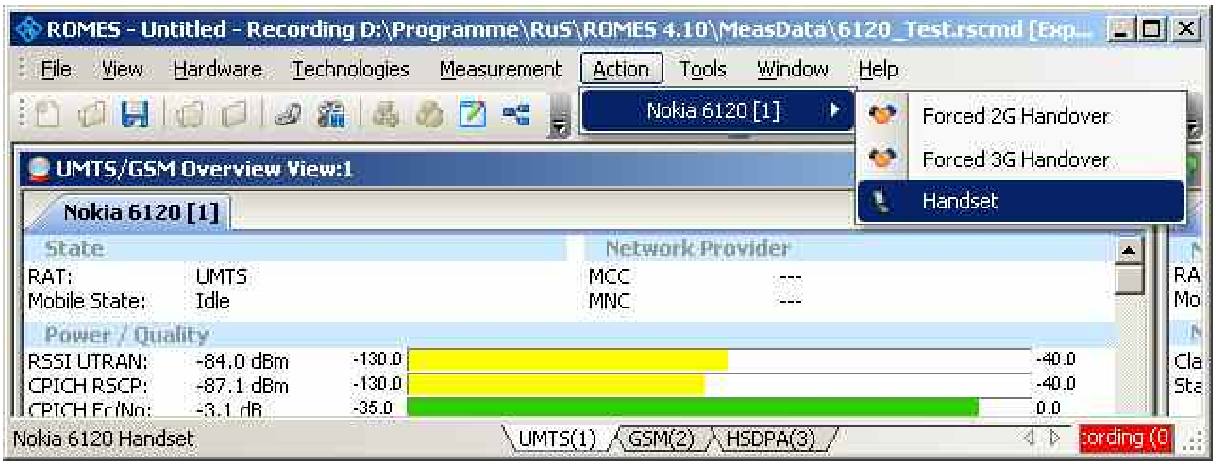
Loads the selected symbol file. If all settings are correct the *Open file* dialog is closed.

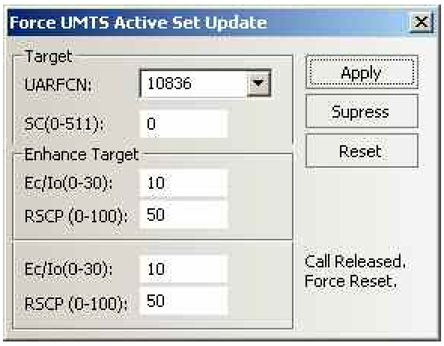
Cancel

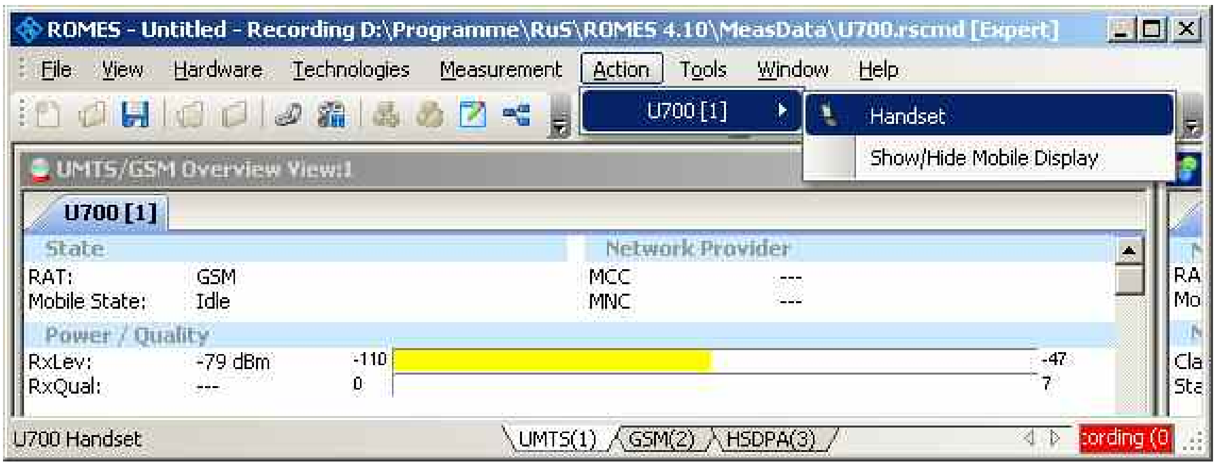
Does not load any new symbol file.

Action Menu GSM

The *Action* menu opens popup boxes used to perform various actions at the mobile phone, e.g. set up a call, force a handover to a neighbor cell, perform a location update. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section *Driver Installation* on page 6.1 ff). The *Action* menu and its functionality depends on the driver and mobile type; the examples in *Fig. 6-36* on p.6.85 have been taken from the Sagem OT 95-M (driver SAGEM) and the Sagem OT 96-M GPRS mobile (driver SAGEM x6). If several mobiles are connected, separate command lines are displayed for each of them.







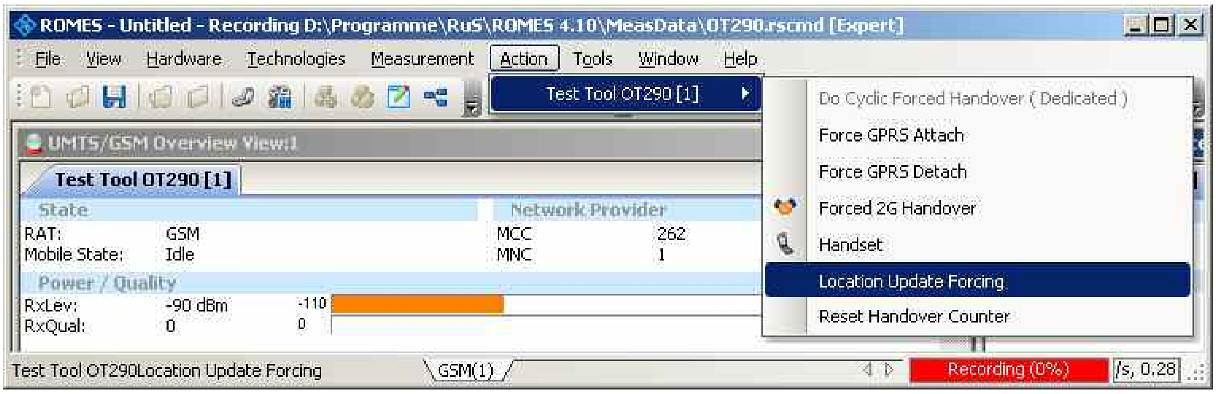
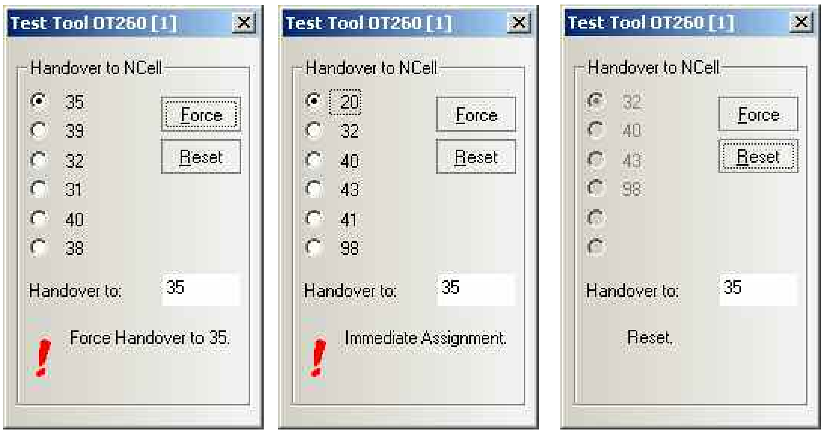


Fig. 6-36 Action menu for different driver types

Handover

Switches over to one of the six neighbor cells if possible.

Handover is possible in dedicated mode (during a call) only. The *Handover* command opens a dialog box (equal for all drivers).



NCell BCCH channel numbers of the neighbor cells. The available neighbor cells might be less than six. One of the cells must be selected for handover.

Force Initiates a forced handover to the selected neighbor cell. This can be done several times in succession. After a forced handover the mobile is locked on the former neighbor cell which is now the serving cell.

Reset Cancel all forced handover procedures and return to Normal measurement mode.

Done Closes the Handover window.

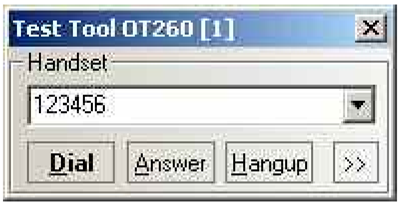
The current action is indicated in the two output fields below the buttons.

Note:
This function is only possible in NORMAL measurement mode (see Fig. 6-22 on page 6.57).

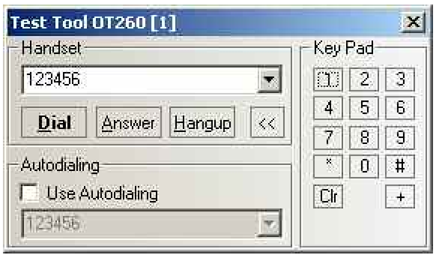
Handset

Activates the entry of a number to dial, set up and terminate a call .

The *Handset* command opens a dialog box (equal for all drivers).



The **>>** button enlarges the dialog box, giving access to the Key pad and the *Autodialing* option.



Dialed number — The number to be dialed can be entered either via the keyboard and the input field or by clicking the on-screen keypad.

 — Closes the window without any further action.

Dial — Starts dialing the number entered before.

Answer — Instructs the phone to accept the call.

Hangup — Drops the line.

Autodialing — If the box is checked, the phone number entered below is called periodically, the Dial, Answer, and Hangup buttons are disabled (grayed). The autodialing mode (see p. 6.65) can be set even during the measurement, but only in Idle mode.

This item starts *Autodialing* if the *Start with Measurement* option was not checked in the driver configuration autodialing tab panel.

Location Update Forcing

Forces the mobile phone to attempt a location update.

This option is provided for SAGEM mobiles supporting GPRS only.

Reset Handover Counter

Resets the counter for handovers during the current call to 0.

This option is provided by the SAGEM X6 driver only. A reset of the handover counter has an influence on the Network Quality Analysis (NQA); see *Handover Maxcount parameter* in 6.71.

Do Cyclic Forced Handover

Forces the mobile to cyclically attempt a handover procedure.

This option is provided by the SAGEM X6 driver only; see Cyclic Handover on p. 6.77. It is grayed unless the mobile is in dedicated mode (during a call).

Force GPRS Attach

Forces the mobile phone to attempt a GPRS attach.

This option is provided by the SAGEM X6 driver only. It is grayed unless a SAGEM mobile supporting GPRS is used.

Force GPRS Detach

Forces the mobile phone to attempt a GPRS detach.

This option is provided by the SAGEM X6 driver only. It is grayed unless a SAGEM mobile supporting GPRS is used.

UMTS Mobile Drivers

The measurement system provides UMTS mobile drivers for the following UMTS test mobiles:

- Devices based on the Qualcomm chipsets 6200, 6250, 6275, 6280 and 7200. Only prototypes of data cards and the Qualcomm TM7200 currently support HSUPA.
- Nokia test mobiles Nokia 6120, 6121, 6630, 6650, 6680, 7600, N80, N95 and N95 NAM.
- For HSUPA, only prototypes of data cards and the TM7200 are currently supported.

The driver is installed as described in section *Driver Installation* on page 6.1 ff.; its configuration is described in the following sections. The maximum number of test mobiles to be used simultaneously is limited by the option file, the number of interfaces and the performance of the controller. The test mobiles must be connected via USB interface; see section *Connection via USB Interface* on p. 6.8.

Caution:
The Samsung mobiles rely on the USB interface for their power supply. A supply current of approx. 0.5 A is required. Check the specification of your USB interface, especially when connecting several Samsung mobiles or other power-consuming devices in parallel. If necessary, use a self-powered USB hub.

All UMTS channels and frequencies are listed in chapter 8, section *UMTS Channels.*

The Nokia and Qualcomm test mobiles can be used to acquire data for most of the UMTS and UMTS/GSM views described in chapter 4. Limitations are listed in the following table.

Table 6-3 Views for Nokia and Qualcomm test mobiles (excerpt)

View	NOKIA 6120/6121/ 6650/6630/6680/ 7600/N80/N95/ N95-NAM	Qualcomm MSM6200-based Qualcomm MSM6250-based	Qualcomm MSM6275-based
UMTS Finger Data View	No	Yes	Yes
UMTS Cell Set View	Yes, only active, monitored set	Yes, active set and neighbor set	Yes, active set and neighbor set
UMTS NAS Status View	No (only Cell Id, Name)	Yes	Yes
UMTS TrCH View	No	Yes	Yes
UMTS Physical Channel View	No	Yes	Yes
UMTS SIB View	Yes	Yes	Yes

View	NOKIA 6120/6121/ 6650/6630/6680/ 7600/N80/N95/ N95-NAM	Qualcomm MSM6200-based Qualcomm MSM6250-based	Qualcomm MSM6275-based
UMTS RLC/MAC View	No	Yes	Yes
UMTS Measurement Report View	Yes	Yes	Yes
UMTS Reselection View	Yes	Yes	Yes
UMTS Power Control View	Yes	Yes	Yes
UMTS Layer 1 Graph View	Yes	Yes	Yes
UMTS Neighborhood Analyzer View	Yes	Yes	Yes
All UMTS HSDPA Views	No	No	Yes
2G/3G Layer 3 View	Yes	Yes	Yes
2G/3G NQA View	Yes	Yes	Yes
2G/3G ETSI QoS View	Yes	Yes	Yes
UMTS/GSM Handover Analyzer View	Yes	Yes	Yes
UMTS/GSM NQA State View	Yes	Yes	Yes
UMTS/GSM Overview	Yes	Yes	Yes

Analogous to GSM, the UMTS test mobiles and drivers are now grouped into the R&S support classes 1 and 2. The mobiles of R&S support class 1 are continuously tested with new ROMES versions and service packs, they are permanently available to our testing staff. The mobiles of R&S support class 2 are not always available for testing, but they have been tested successfully at least once with the current ROMES software release. The introduction of the R&S support classes is necessary due to the sheer number of supported mobiles. The mobile types with R&S support class 1 are listed with normal title typeface in the table below, the mobiles with R&S support class 2 are marked with ***italic*** title typeface.

Table 6-4 UMTS properties of UMTS test mobiles

Manufacturer: Nokia	Manufacturer: Qualcomm	Manufacturer: Samsung	Manufacturer: LG
Nokia 6120 UMTS 850/2100 MHz + HSDPA GSM850/900/1800/1900 + GPRS + EDGE **Nokia 6121** UMTS 900/2100 MHz + HSDPA GSM850/900/1800/1900 + GPRS + EDGE **Nokia 6650** UMTS 2100 MHz GSM900/1800 + GPRS **Nokia 6680** UMTS 2100 MHz GSM900/1800/1900 + GPRS + EDGE ***Nokia 7600*** UMTS 2100 MHz GSM900/1800/1900 + GPRS **Nokia N80** UMTS800/1900/2100 MHz GSM850/900/1800/1900 + GPRS + EDGE **Nokia N95** WCDMA (2100 MHz + HSDPA) GSM850/900/1800/1900 + GPRS + EDGE **Nokia N95 NAM** WCDMA (850/1900 MHz + HSDPA) GSM850/900/1800/1900 + GPRS + EDGE	***Qualcomm TM6200*** UMTS 2100 MHz GSM900/1800 + GPRS **Qualcomm TM6250** UMTS 2100 MHz GSM850/900/1800 + GPRS **Qualcomm TM6275** UMTS 2100 MHz (platform 1) or 1900/850 (platform 2) + HSDPA GSM850/900/1800/1900 + GPRS + EDGE **Qualcomm TM6280** UMTS800/1900/2100 MHz + HSDPA GSM850/900/1800/1900 + GPRS + EDGE **Qualcomm TM7200** UMTS800/1900/2100 MHz + HSDPA + HSUPA GSM850/900/1800/1900 + GPRS + EDGE	**Samsung Z105/107** UMTS 2100 MHz GSM900/1800 + GPRS ***Samsung Z130/Z500/ ZV10/ZV50*** UMTS 2100 MHz GSM900/1800/1900 + GPRS **Samsung Z560** UMTS 2100 MHz + HSDPA GSM900/1800/1900 + GPRS + EDGE **Samsung U700** UMTS 2100 MHz + HSDPA GSM900/1800/1900 + GPRS + EDGE	**LG CU500** UMTS 2100 MHz/1900/850 + HSDPA GSM850/900/1800/1900 + GPRS

Recently UMTS services have become available for PCMCIA slot-based data cards, therefore the following cards (based on the Qualcomm chipset) are now supported.

Table 6-5 UMTS properties of UMTS test data cards

Manufacturer: Novatel Wireless	Manufacturer: Option	Manufacturer: Sierra Wireless
Merlin U740 UMTS 2100 MHz + HSDPA 1.8 MBit GSM850/900/1800/1900 + GPRS + EDGE **Merlin U870** UMTS 2100 MHz + HSDPA 7.2 MBit GSM850/900/1800/1900 + GPRS + EDGE	**Globetrotter GT 3G + EMEA** UMTS 2100 MHz + HSDPA 1.8 MBit GSM 900/1800 + GPRS	***A850/A875*** UMTS 2100 MHz GSM 900/1800 + GPRS

Driver Configuration Menu UMTS (Qualcomm)

The *Qualcomm* driver configuration menu contains various tabs to select the message types evaluated by the test system *(Configuration, Expert Mode),* configure the network quality analysis *(NQA)* and the autodialing and autoanswer call mode *(Autodialing)*, define the characteristics of the antenna used *(Antenna),* and display information on the driver and the serial port assigned *(Serial Port Driver Info).* It can be opened by clicking the *Driver* command line of the *Hardware* menu which is available as soon as a mobile driver is loaded (see Fig. 6-4) or via the *Driver* tab in the *Configuration of Software Modules* menu opened via the *Tools – Modules Configuration...* command.

Configuration UMTS (Qualcomm)

The *Basic* tab defines the PIN number and allows a rough pre-selection of the evaluated message type. The message type selection can be refined in the *Expert Mode* tab (see p. 6.93 ff.).

Note:
The UMTS test mobiles provide a wealth of information that the test system is able to store and evaluate. In many applications, only a subset of this information is actually needed. Restricting the recorded data saves system resources and reduces the size of the measurement files.

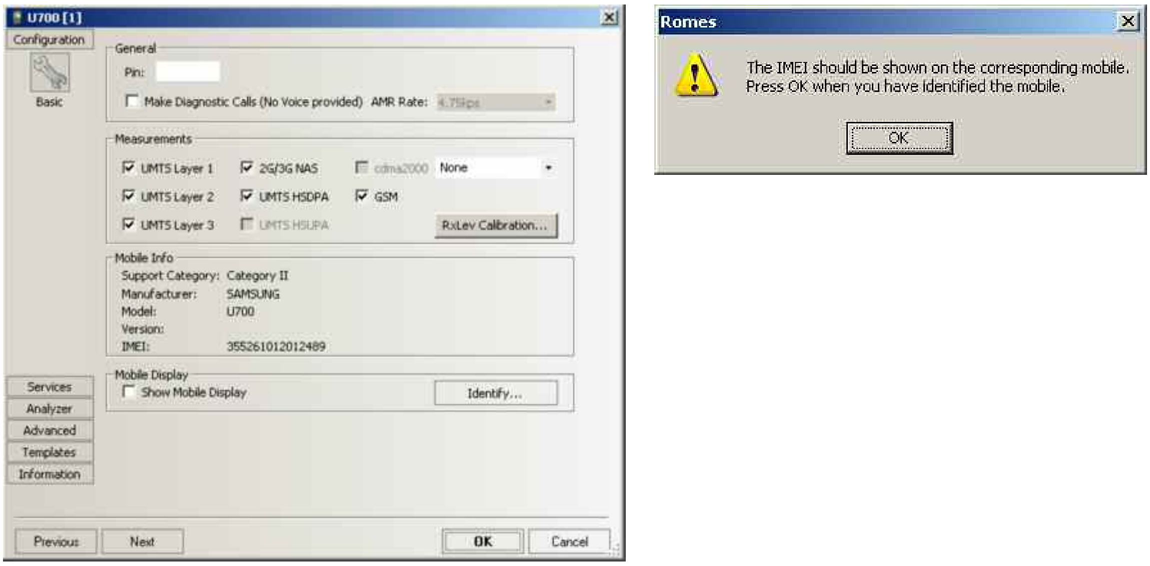


Fig. 6-37 UMTS driver configuration – Basic

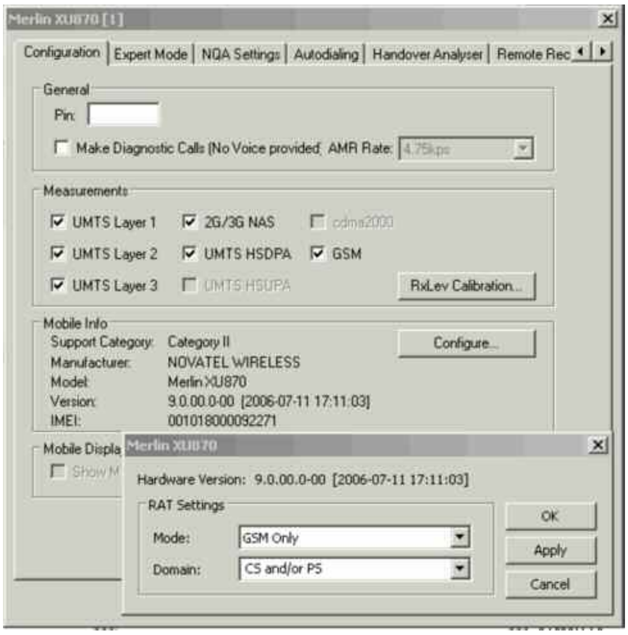


Fig. 6-38 UMTS driver configuration – Configuration (data card)

General

The PIN number for identification after switching on the test mobile can be entered in the *General* panel of the configuration dialog. If nothing is entered, the SIM must be entered manually at the mobile each time it is started.

If *Make Diagnostic Calls…* is selected, the mobile will set up connections (no voice calls) at a fixed data rate. This option is particularly suitable for connections with test devices that are not equipped with an audio circuit.

Measurements

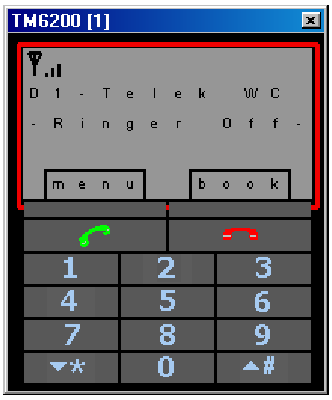
The six UMTS/GSM-related checkboxes in the *Measurements* group are used for a rough preselection of the messages and information types to be recorded and written to the measurement (*.rscmd) file. The selection can be refined in the *Expert Mode* tab. For an overview of available messages, views and signals see Table 6-6 below.

Mobile Info

In the Mobile Info field information about the mobile is displayed. The button *Configure…* is used to force a Qualcomm data card to GSM.

Mobile Display

Show Mobile Display opens a view of the test mobile so that it is possible to observe the display, dial numbers and browse the menu from the controller while a measurement is performed. This function is also provided in the *Action* menu; see section *Action Menu* on p. 6.111 ff.



Expert Mode UMTS (Qualcomm)

The *Expert Mode* tab selects the message types to be recorded to the measurement file. A *Layer 1, Layer 2, Layer 3,* or *UMTS* message type can be selected only if the driver has been configured to do *Layer 1, Layer 2, Layer 3,* or *UMTS* measurements; see description of the *Hardware* tab above.

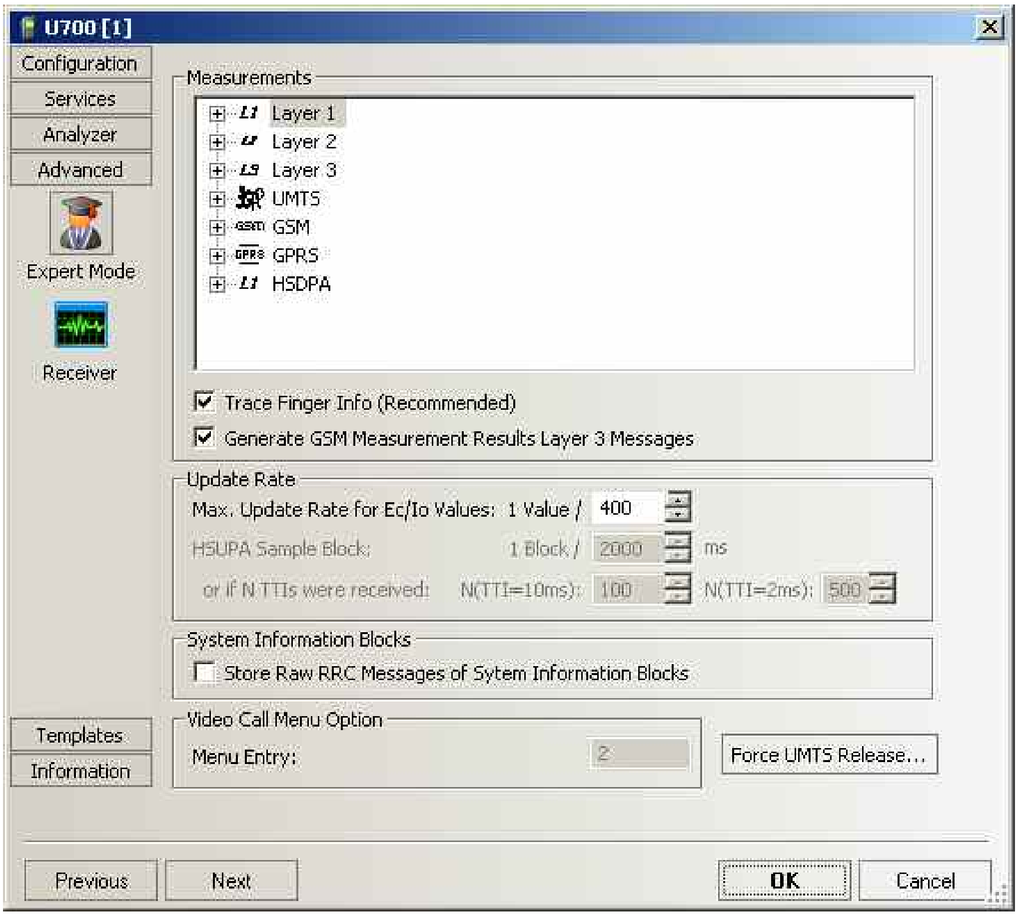


Fig. 6-39 UMTS driver configuration – Expert Mode

The available message types are listed in the table Table 6-6 below, together with the names of the corresponding views and data structures/signals in the data tree. For an explanation of the recorded parameters refer to the description of the UMTS and UMTS/GSM views in chapter 4.

Table 6-6 UMTS message types, views and signals

Message type	View	Data structure / signal
Layer 1 Messages		
WCDMA AGC	UMTS Layer 1	Layer 1
WCDMA RACH Parameters	Only general purpose views (e.g. Alphanumeric View)	RACH Parameters
WCDMA DRX Mode	Only general purpose views (e.g. Alphanumeric View)	DRX Mode
WCDMA TrCH Downlink	UMTS TrCH	
WCDMA TrCH Uplink	UMTS TrCH	
WCDMA Common Physical Channels Downlink	UMTS Physical Channels	

Message type	View	Data structure / signal
WCDMA Dedicated Physical Channels Downlink	UMTS Physical Channels	
WCDMA Physical Channels Uplink	UMTS Physical Channels	
WCDMA PRACH	UMTS Physical Channels	
WCDMA Active Set	UMTS CellSet, UMTS Network Analyzer	Active Set
WCDMA Neighbour Set		
WCDMA BLER		
WCDMA SIR Estimation		SIR
WCDMA Cell Reselection	UMTS Reselection View	
WCDMA List Searcher		
WCDMA compressed mode interfrequency Step 1 search		
WCDMA compressed mode interfrequency list search		
Layer 2 Messages	–	–
WCDMA Radio Bearer States		
WCDMA MAC UL Logical Channel Parameters		
WCDMA MAC DL Logical Channel Parameters		
WCDMA MAC UL Traffic Volume Measurement Report		
WCDMA MAC Ciphering Configuration		
WCDMA RLC UL State		
WCDMA RLC UL Ciphering		
WCDMA RLC UL Ciphering V1		
WCDMA RLC DL Ciphering		
WCDMA RLC DL Ciphering V1		
WCDMA RLC DL Cipher PDU Combination V1		
WCDMA RLC UL Cipher PDU Combination V1		
WCDMA RLC UL AM Configuration		
WCDMA RLC UL AM User Plane PDU		
WCDMA RLC UL AM Signaling Plane PDU		
WCDMA RLC DL AM User Plane PDU		
WCDMA RLC DL AM Signaling Plane PDU		
WCDMA RLC UL TM		
WCDMA RLC UL UM		
WCDMA RLC UL AM		
WCDMA RLC UL AM Statistics		
WCDMA RLC UL AM PDU		

Message type	View	Data structure / signal
WCDMA RLC UL AM NAK PDU		
WCDMA RLC DL State		
WCDMA RLC DL TM		
WCDMA RLC DL UM		
WCDMA RLC DL AM		
WCDMA RLC DL AM V1		
WCDMA RLC DL AM Statistics		
WCDMA RLC DL AM PDU		
WCDMA RLC DL AM NAK PDU		
WCDMA RACH Control Parameters		
WCDMA Uplink TFC		
Layer 3 Messages		
WCDMA RRC Signaling Messages	UMTS SIB, UMTS Layer 3, UMTS Measurement Report, all	Layer 3, RRC Message
UMTS		
UMTS NAS GMM State	UMTS NAS Status	NAS State
UMTS NAS MM State	UMTS NAS Status	NAS State
UMTS NAS REG State	UMTS NAS Status	NAS State
UMTS NAS CS Connection Management		CS Call Management
UMTS NAS MM Characteristics	UMTS NAS Status	MM Info
UMTS NAS OTA Messages		NAS Message
UMTS NAS QoS		NAS QoS
UMTS NAS Connection Bearer Capability		Connection Bearer Capability
UMTS Vocoder UL		
UMTS Vocoder DL		
UMTS NAS AMR Uplink (only older firmware versions)		AMR Uplink
UMTS NAS AMR Downllink (only older firmware versions)		AMR Downlink

The *NQA State Machine* signals require several layer 3 and layer 1 messages; they are available in the default configuration of the driver configuration menu.

Table 6-7 GSM/GPRS message types, views and signals

Message type	View	Data structure / signal
GSM Messages		
GSM Burst Metrics		
GSM surround cell BA list	MMR	MMR, SVR
GSM serving cell info	MMR	MMR, SVR
GSM TxLev Timing Advance		SVR
GSM L3 RR state		SVR
GSM L3 RR protocol error	-	-
GSM L3 RR signaling message	GSM/UMTS Layer 3	Layer 3

Message type	View	Data structure / signal
GSM L3 RR cell selection and reselection parameters	GSM Layer 1	Layer 1 ext.
GSM L3 RR RACH control parameters		SVR
GSM L3 RR control channel description parameters		MM Info
GSM L3 RR cell options		SVR
GSM L3 RR cell information	MMR	MMR, SVR
GSM L3 RR channel configuration		SVR, MM Info
GSM L3 RR ciphering mode		MM Info
GSM L3 RR cell selection and reselection measurements	MMR	MMR, SVR
GSM L3 RR downlink signaling counter		SVR
GSM L3 RR radio link timeout counter		SVR
GSM L3 RR SACCH report	MMR	MMR, SVR
GSM L3 RR 3G rejected cells	Rejected 3G Cells	RR 3G Rejected Cells
GSM L3 idle WCDMA known list	Idle 3G Cell List	Idle Mode WCDMA Known List
GSM L3 dedicated WCDMA cell list	Dedicated 3G Cell List	3G Dedicated Measurements
GSM 3G dedicated measurements	Dedicated 3G Cell List	3G Dedicated Measurements
GPRS Messages		
GPRS indicators	GSM Layer 1	Layer 1 ext.
GPRS general parameters	RLC/MAC	MAC Info
GPRS cell options	RLC/MAC	MAC Info
GPRS power control parameters	RLC/MAC	MAC Info
GPRS mobile allocation		
GPRS PBCCH description		
GPRS GRR State		
GPRS RR cell reselection parameters	GSM Layer 1	Layer 1 ext.
GPRS RR cell reselection measure-ments	GSM Layer 1	Layer 1 ext.
GPRS RR packet system information 1	RLC/MAC	GPRS RR Info
GPRS RR packet system information 2	RLC/MAC	GPSR MM Info
GPRS RLC-UL statistics	RLC/MAC	QoS Info
GPRS RLC-DL statistics	RLC/MAC	QoS Info
GPRS RLC-UL Release Indicators		
GPRS RLC-DL Release Indicators		
GPRS LLC ME information	RLC/MAC	QoS Info
GPRS LLC PDU statistics	RLC/MAC	QoS Info
GPRS LLC XID Information		
GPRS SNDCP PDP context information		SNDCP Info
GPRS MAC signaling message	GSM/UMTS Layer 3	GPRS RLC Msg.
GPRS MAC UL TBF establish	RLC/MAC	MAC Info, RLC Info
GPRS MAC UL TBF release	RLC/MAC	MAC Info, RLC Info
GPRS MAC DL TBF establish	RLC/MAC	MAC Info, RLC Info
GPRS MAC DL TBF release	RLC/MAC	MAC Info, RLC Info
GPRS SM/GMM OTA signaling mes-sage	GSM/UMTS Layer 3	GPRS GMM Msg.
GPRS air interface summary		RAT Info
GPRS timing advance		SVR

Message type	View	Data structure / signal
GPRS power control	RLC/MAC	RLC Info
GPRS transfer summary	RLC/MAC	MAC Info, RLC Info
GPRS Uplink TBF Data Block Count		
GPRS L1 Message Metrics A	RLC/MAC	MAC Info, RLC Info
GPRS L1 Message Metrics B	RLC/MAC	MAC Info, RLC Info
GPRS L1 Message Metrics C	RLC/MAC	MAC Info, RLC Info
GPRS L1 Message Metrics D	RLC/MAC	MAC Info, RLC Info
GPRS L1 Burst Metrics A		
GPRS L1 Burst Metrics B		
GPRS L1 Burst Metrics C		
GPRS L1 Burst Metrics D		
GPRS L1 Hopping ARFCN		
GPRS RR 3G reselection measurements parameter	RR 3G Reselection Measurements Parameters	GRR 3G Reselection Measurements Parameters
GPRS RR 3G reselection measurements	RR 3G Reselection Measurements	GRR 3G Reselection Measurements
GPRS/EGPRS RLC Uplink Header	GPRS/EGPRS	EGPRS Info
GPRS/EGPRS RLC Downlink	GPRS/EGPRS	EGPRS Info
GPRS/EGPRS RLC Uplink	GPRS/EGPRS	EGPRS Info
HSDPA Messages (only 6275, 6280, and 7200 chipsets)		
HSDPA Configuration	UMTS HSDPA Configuration	HSDPA DL Configuration HSDPA DL Configuration Disable HSDPA UL Configuration HSDPA UIL Configuration Disable HSDPA Finger Configuration
HSDPA UL Beta Gain Table	–	–
HSDPA Demodulator Control Table	–	–
HSDPA Modulator Control Table	–	HSDPA Modulator Control Table
HSDPA Decode Status	UMTS HSDPA Decode Status	HSDPA Decode Summary
HSDPA HS-SCCH Statistics		HSDPA SCCH Statistics
HSDPA HS-DSCH HARQ Statistics	UMTS HSDPA HARQ Statistic	HSDPA DSCH HARQ Statistics HSDPA DSCH HARQ
HSDPA UL HS DPCCH Information	UMTS HSDPA UL HS DPCCH	
HSDPA MAC HS Configuration	UMTS HSDPA MAC Configuration	
HSDPA MAC HS Headers	UMTS HSDPA MAC Header	
HSDPA MAC HS Status	UMTS HSDPA MAC Status	
HSUPA Messages (7200 chipset only)		
HSUPA EUL DL Channel Configuration		
HSUPA EUL UL Channel Configuration		
HSUPA EUL UL E-DPCH		
HSUPA EUL combined L1/MAC		
HSUPA EUL L1/MAC statistics		
HSUPA EUL MAC-e/es Configuration		
HSUPA EUL MAC-e/es Header		
HSUPA EUL UL UM PDU		
HSUPA EUL DL UM PDU		
HSUPA EUL Ciphering		

Trace Finger Info

The WCDMA finger info is necessary for the *UMTS Layer 1 View, UMTS Finger View,* and the *UMTS Network Analyzer View.* It must be selected as well to obtain the *Finger Info* signals.

Generate GSM Layer 3 Messages

The GSM L3 "Measurement Report" messages are actually not reported by a phone with Qualcomm chipset, despite the fact that the message is defined in the Qualcomm message list (see driver configuration). However, the phone sends the "GSM RR SACCH Report" messages, which basically contain the same information.

If this option is activated, the Qualcomm reports "GSM surround cell BA list" and "GSM L3 RR SACCH report" (see GSM message tree in *Measurements*), both of which have to be enabled are used to create GSM Measurement Layer 3 Messages. These can be analyzed in the Layer 3 View as usual.

If this option is deactivated, no GSM Measurement Layer 3 Messages are created.

Update Rate

The high amount of trace data for HSUPA needs to be stored into HSUPA Sample Blocks. The size of these blocks can be defined. A block will be sent if either the specified time (default 2s) is reached, or the specified number of TTIs were logged (default 1s (10ms*100 or 2ms*500)).

Max. Update Rate for Ec/Io Values
: Sets the maximum update rate for Ec/Io values. A lower update rate decreases the size of the measurement file.

HSUPA Sample
: Sets the *Max. Update Rate for Ec/Io Values* for HSUPA samples. Additional option fields are provided for the case when N samples are logged for a TTI of 10 ms or 2 ms.

NOTE

The HSUPA views show always one block at one point in time. Thus the specified number of TTIs is responsible for the size of the HSUPA graphs.

System Information Blocks

Layer 3 Radio Resource Control (RRC) messages are broadcast in system information blocks of various types (see standard 3GPP TS 25.331). If the box *Store Raw RRC Messages…* is checked, the complete information transmitted in the layer 3 RRC signaling messages is stored to the measurement file.

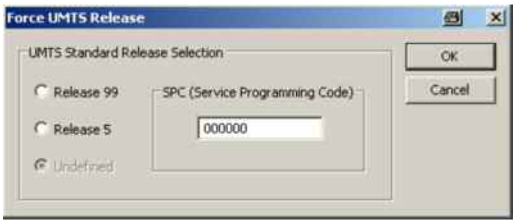
If only the system information blocks are needed, the default configuration (box unchecked) is sufficient. This will reduce the size of the measurement file.

Force UMTS Release

The button "*Force UMTS Release"* in the Expert Mode allows the user to force the mobile to select a specific network access stratum. If the mobile doesn't allow different access strata the button is grayed out.

Change the UMTS access strata:

➢ clicking the button "*Force UMTS Release"* and an additional dialog box opens:



The dialog will show what kind of operation is currently active. If no operation has been forced "*Undefined*" will be selected.

➢ Select Release 99 or Release 5 to force the UMTS standard.

➢ Enter the correct Service Programming Code (SPC). If you enter the wrong SPC ROMES informs you with a failure message later on.

➢ Click OK.

Another dialog box will be opened.

➢ Click yes to verify your action.

After 5 to 30 seconds ROMES informs you if the change was successfully.

➢ Click OK.

➢ Wait another 10 second until this dialog appears:

➢ Reactivate the mobile, enter the pin.

➢ Click OK.

The result can easily be seen by a data transfer, if the network provides HSDPA. A mobile in Release 5 operation mode will use HSDPA for data transfer, whereas a mobile in Release 99 operation mode will only use pure UMTS data transfer.

Driver Configuration – Nokia Settings

The *Basic* tab selects GSM/GPRS and UMTS-related parameters to be measured and recorded by Nokia mobile phones.

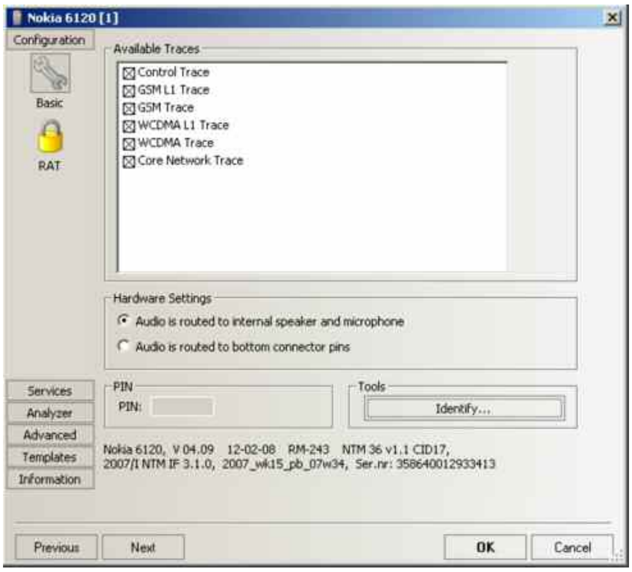


Fig. 6-40 UMTS driver configuration – Nokia Settings

The available message types are arranged in the groups listed in the tables below, together with the names of the corresponding views and data structures/signals in the data tree. For an explanation of the recorded parameters refer to the description of the GSM and UMTS views in chapter 4.

All parameters are selected by default. Deselecting some of the groups reduces the size of the measurement file but does not speed up the measurement.

Hardware settings The input and output signals of the mobile audio circuit are usually routed to the speaker and microphone. As an alternative it is possible to route the signals to the bottom connector pins of the mobile to be tapped off and analyzed.

Table 6-8 GSM/GPRS message types, views and signals (N95, N95-NAM)

Message type	**View**	**Data structure / signal**
Control Trace	-	-
GSM L1 Trace	GSM Layer 1	Layer 1 Ext C/I Average FER counters AMR Information
GSM Trace	All GSM related views	All GSM parameters
WCDMA L1 Trace	UMTS Layer 1 Graph View	UMTS Layer 1
WCDMA Trace	All UMTS related views	All UMTS parameters
Core Network Trace	-	-

Table 6-9 GSM/GPRS/UMTS message types, views and signals (Nokia 6630)

Message type	View	Data structure / signal
Field Test 1: GSM & GPRS SC Parameters	GSM Measurement Report, GSM System Information, GSM GPRS/EGPRS, GSM Layer 1	Measurement Report, Server Report, Packet Server Report Layer 1 Ext
Field Test 2: GSM Neighbor Cell Parameters	GSM Measurement Report, GSM Layer 1	Measurement Report, Server Report
Field Test 3: GPRS Neighbor Cell Parameters	GSM GPRS/EGPRS	Packet Server Report
Field Test 5: BTS Status		
Field Test 6: MAC Parameters	GSM GPRS PDP Info	GPRS LLC Info GPRS MAC Info
Field Test 7: GMM & SN Parameters		
Field Test 8: LLC/ RLC/ERLC/EGPRS Parameters	GSM GPRS/EGPRS	Packet Server Report, EGPRS Info
Field Test 10: C/I Parameter		
Field Test 14: WCDMA MAC Information	–	–
Field Test 15:WCDMA RRC Information	UMTS Layer 1	UMTS Layer 1
Field Test 18: General WCDMA Information	UMTS Layer 1	UMTS Layer 1
Field Test 19: Inter-System GSM Neighbor information		
Field Test 20: WCDMA Intra-Frequency Neighbor information	UMTS Cellset View	Active Set, Neighbor Set
Field Test 21: WCDMA Inter1- Frequency Neighbor information	UMTS Cellset View	Neighbor Set
Field Test 22: WCDMA Inter2- Frequency Neighbor information	UMTS Cellset View	Neighbor Set
Trace 1: GSM System Information Messages		
Trace 2: GSM Layer 3 Messages		
Trace 3: GSM & GPRS Parameters		
Trace 4: GPRS & EGPRS Configuration Parameters		
Trace 5: LLC PDU Size Information		
Trace 6: GPRS Context & GMM/SM Messages		
Trace 7: WCDMA Layer 3 Parameters		
Trace 8: WCDMA RLC Messages		

Table 6-10 GSM/GPRS/UMTS message types, views and signals (Nokia 6630, older firmware versions)

Message type	View	Data structure / signal
Field Test 1: GSM & GPRS SC Parameters	GSM Measurement Report, GSM System Information, GSM GPRS/EGPRS, GSM Layer 1	Measurement Report, Server Report, Packet Server Report Layer 1 Ext
Field Test 2: GSM NC Parameters	GSM Measurement Report, GSM Layer 1	Measurement Report, Server Report
Field Test 3: GPRS NC Parameters	GSM GPRS/EGPRS	Packet Server Report
Field Test 4: BTS Status		
Field Test 5: MAC & GPRS Parameters	GSM GPRS PDP Info	GPRS LLC Info GPRS MAC Info
Field Test 6: GMM & SN Parameters	–	–
Field Test 7: LLC/RLC/ERLC/EGPRS Parameters	GSM GPRS/EGPRS	Packet Server Report, EGPRS Info
Field Test 10: WCDMA MAC Information	–	–

Message type	View	Data structure / signal
Field Test 11: WCDMA RRC Information	GSM Layer 3	
Field Test 12: General WCDMA Information	UMTS Layer 1	
Field Test 13: Inter System GSM Neighbor Information	–	–
Field Test 14: WCDMA Intra Freq. Neighbor Information	UMTS Cellset View	Active Set, Neighbor Set
Field Test 15: WCDMA Inter1 Freq. Neighbor Information	UMTS Cellset View	Neighbor Set
Field Test 16: WCDMA Inter2 Freq. Neighbor Information	UMTS Cellset View	Neighbor Set
Field Test 17: GSM System Information Messages	GSM System Information View GSM GPRS System Information View	
Field Test 18: GSM Layer 3 Messages	UMTS/GSM Layer 3 View	Layer 3
Field Test 19: GSM & GPRS Parameters	RLC MAC View	
Field Test 20: GSM & EGPRS Configuration Parameters	GSM GPRS/EGPRS View	
Field Test 21: GPRS Context & GMM/SM Messages	RLC MAC View	
Field Test 22: WCDMA Layer 3 Messages	UMTS/GSM Layer 3 View	Layer 3
Field Test 23: WCDMA RLC Messages (recommended: disable this message group)	–	–

Driver Configuration – RAT Settings

The *RAT Settings* (Radio Access Technology Settings) tab restricts the GSM bands, the channels or technologies that the mobile is allowed to use.

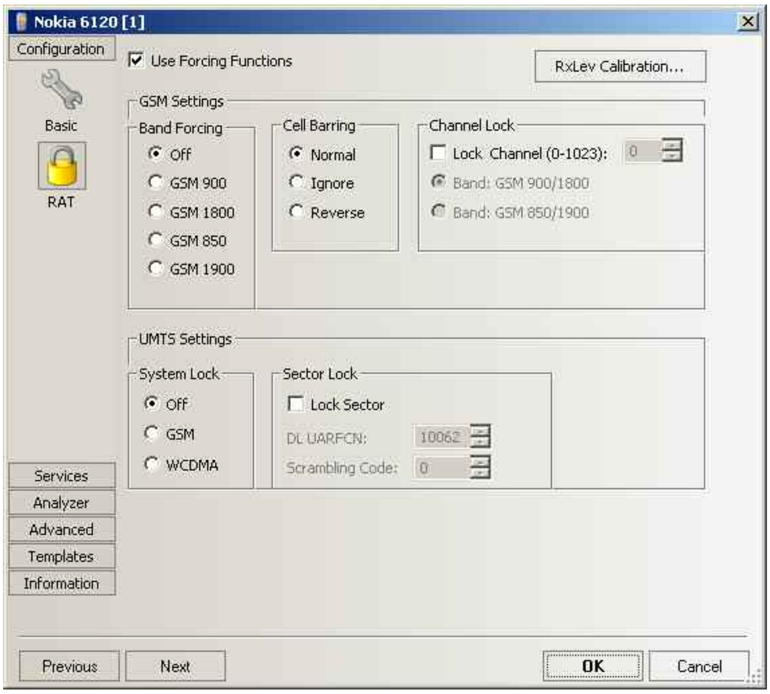


Fig. 6-41 UMTS driver configuration – RAT Settings

All settings are only effective if *Use Forcing Functions* is selected.

RxLev Calibration… Open the dialog of the same name in order to calibrate the GMSK modulated or CW input signals against a calibration file; see *RxLev Calibration* on p. 6.50.

GSM Settings – Band Forcing

Selects one of the supported GSM bands for communication:

Off	All supported GSM bands allowed
GSM900/1800/850/1900	Use a specific GSM band

If the band forcing should be turned off again, it is not enough to disable *Use Forcing Functions*. You have to set all GSM and UMTS forcing to off and *Use Forcing Functions* must be turned on. After this the Nokia is forced to normal operation.

Note:
This function is only available for Nokia mobiles, for Qualcomm mobiles you have the possibility to force the band on the mobile itself, for Qualcomm data cards see ***Mobile Info*** *on p.6.91.*

Cell Barring

This function allows to ignore or invert the cell bar flag:

Normal	Only cells that are not barred are accessible for the mobile
Ignore	Cell bar flag ignored – all cells are accessible
Invert	Cell bar flag inverted – only barred cells are accessible

Channel Lock

Lock Channel forces the test mobile to use a specified GSM channel. In the different GSM bands, the same channel numbers are used for different frequencies (see overview of GSM channels in chapter 8). The ambiguities in the channel-frequency assignment are resolved by specifying one of the two band combinations *GSM900/1800* or *GSM 850/1900*.

UMTS Settings – System Lock

Locks a particular technology for the mobile:

Off	The mobile can access GSM and UMTS cells.
GSM	GSM cells enforced, only GSM cells allowed.
UMTS	UMTS cells enforced, only UMTS cells allowed.

Sector Lock

Sector Lock forces the test mobile to use a specified UTRAN cell. If *Lock Sector* is selected, the *DL* channel number and Primary *Scrambling Code* of the locked (enforced) cell can be entered below.

Qualcomm / Nokia – NQA Settings

The *NQA Settings* tab provides the parameters for *Network Quality Analysis*. NQA is a prerequisite for drawing up a call statistics where the calls are classified and the classes are visualized separately (see *2G/3G NQA View* in chapter 4).

The driver settings for Qualcomm and Nokia devices are identical.

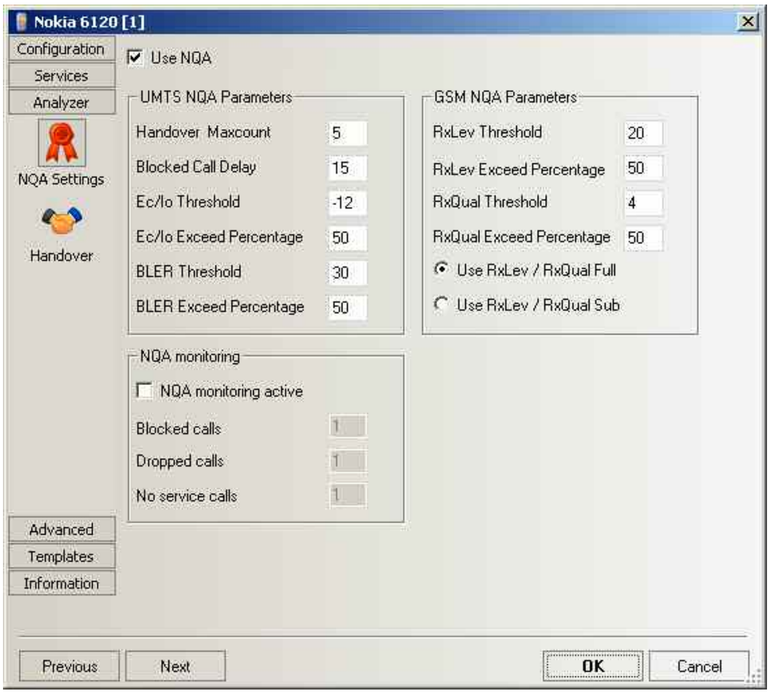


Fig. 6-42 Driver Configuration – NQA Settings tab

The parameters in the *GSM NQA Parameters* and *NQA Monitoring* sections are identical to the NQA parameters for GSM; see section *Driver Configuration – NQA* on p. 6.71 ff.

Use NQA If checked, the box activates the network quality analysis (default).

UMTS NQA Parameters The following numeric parameters configure the UMTS NQA by defining conditions and limits for the different call classes (we quote the ranges for all parameters; default values are underscored)

Handover Maxcount Maximum number of handover procedures during a call in the range 1 to 5 to 100. If the defined value is exceeded, the call will be classified as EXCESSIVE HO.

Blocked Call Delay Maximum delay (in seconds) between CM_SERV_REQ and ASSIGNMENT_COMMAND in the range 1 (s) to 15 (s) to 63 (s). If the defined delay is exceeded, the call will be classified as DELAYED CALL.

Ec/Io Threshold Minimum signal to noise ratio in dB and in the range –20 (dB) to –12 (dB) to 0 (dB). Ec/Io values which fall below this threshold contribute to NOISY.

Ec/Io Exceed Perc. Minimum ratio (in percent) of reported RxLev values falling below the RxLev Threshold in the range 0 (%) to 50 (%) to 100 (%). If the actual ratio falls below the specified percentage the call is classified as NOISY.

BLER Threshold Maximum Block Error Rate in percent in the range 0 (%) to 30 (%) to 100 %). BLER values above this threshold contribute to NOISY.

BLER Exceed Perc. Minimum ratio (in percent) of reported BLER values exceeding the BLER Threshold in the range 0 (%) to 50 (%) to 100 (%). If the actual ratio exceeds the specified percentage the call is classified as NOISY.

GSM NQA Parameters Configures the GSM NQA, see *NQA* on p. 6.71 ff.

NQA Monitoring Activates NQA monitoring and displays the number of *Blocked Calls, Dropped Calls,* and *No Service Calls,* see *NQA* on p. 6.71 ff.

Qualcomm / Nokia – Autodialing

The *Autodialing* tab configures the mode where a definite phone number is dialed periodically, and a call is set up to the mobile phone. This mode is relevant for the network quality analysis described on page 6.71. All settings are analogous to the GSM driver settings described on p. 6.65 ff.

The driver settings for Qualcomm and Nokia devices are identical. The Nokia test mobiles need a 2nd virtual COM port to be operated in *autodial* mode; see paragraph on *Loading the drivers (Nokia)* on p.6.8.

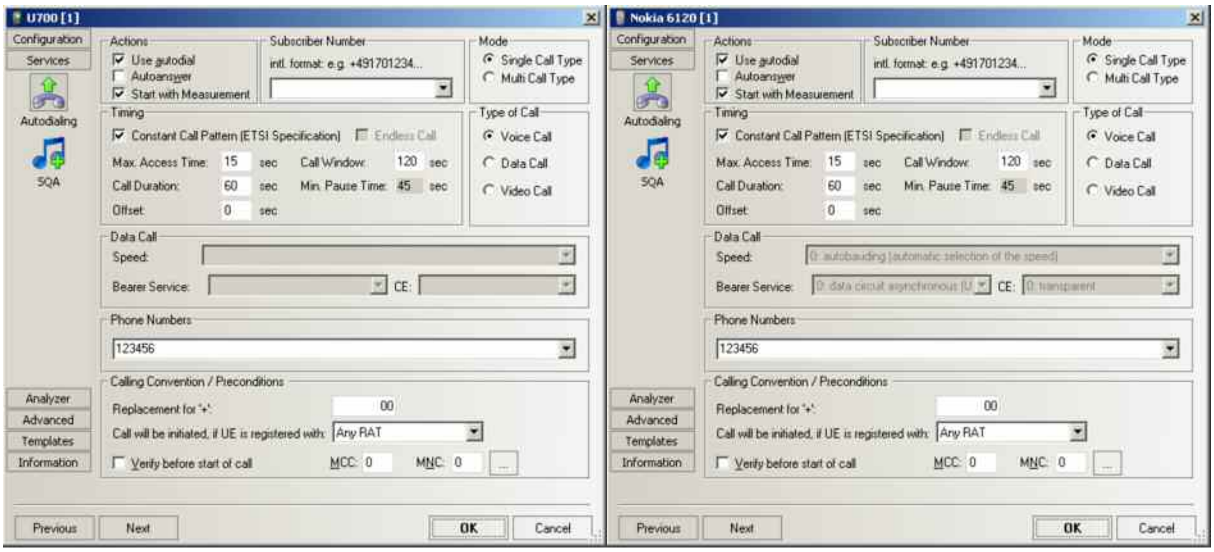


Fig. 6-43 Driver Configuration – Autodialing tab

Qualcomm / Nokia – Handover Analyzer

The *Handover Analyzer* tab enables or disables the handover analyzer (option ROMES3HOA) and sets the timeout for the HO analysis. The HO analysis and the meaning of the timeout is described in chapter 4, section *UMTS/GSM Handover Analyzer View*.

The driver settings for Qualcomm and Nokia devices are identical.

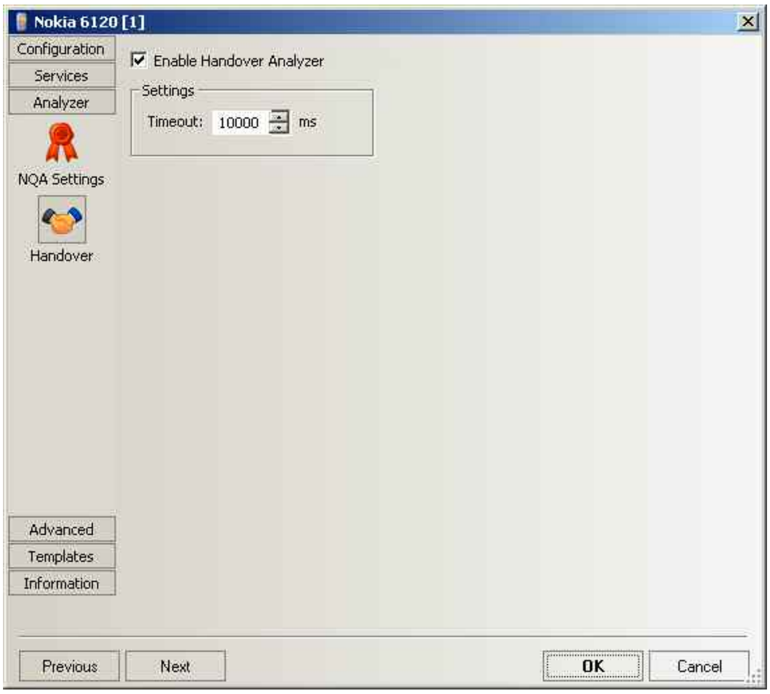


Fig. 6-44 Driver Configuration – Handover Analyzer tab

Qualcomm / Nokia – Remote Receiver

The *Remote Receiver* tab configures the tracking mode where a the mobile phone controls a CW test receiver and sets its receive frequency. All settings are analogous to the GSM driver settings described on p. 6.61 ff.

The driver settings for Qualcomm and Nokia devices are identical.

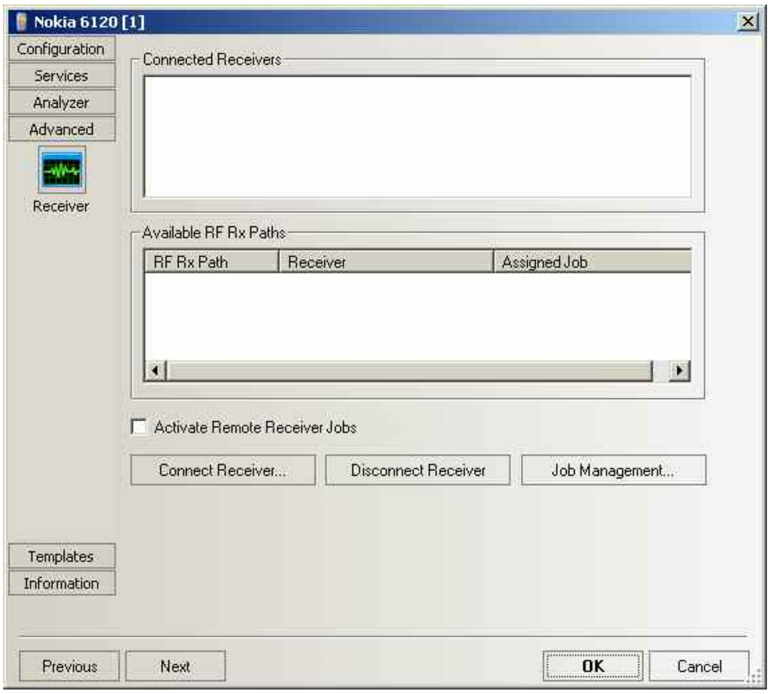


Fig. 6-45 Driver Configuration – Remote Receiver tab

Qualcomm / Nokia – Speech Quality

The *SQA* tab enables and configures the Speech Quality Analysis (SQA, with option ROMES3SQA, *Voice Quality PESQ)* , as described on page 6.267 ff. SQA results can be displayed in the *SQA Message* view (see chapter 4). All settings are analogous to the GSM driver settings described on p. 6.285 ff.

The driver settings for Qualcomm and Nokia devices are identical.

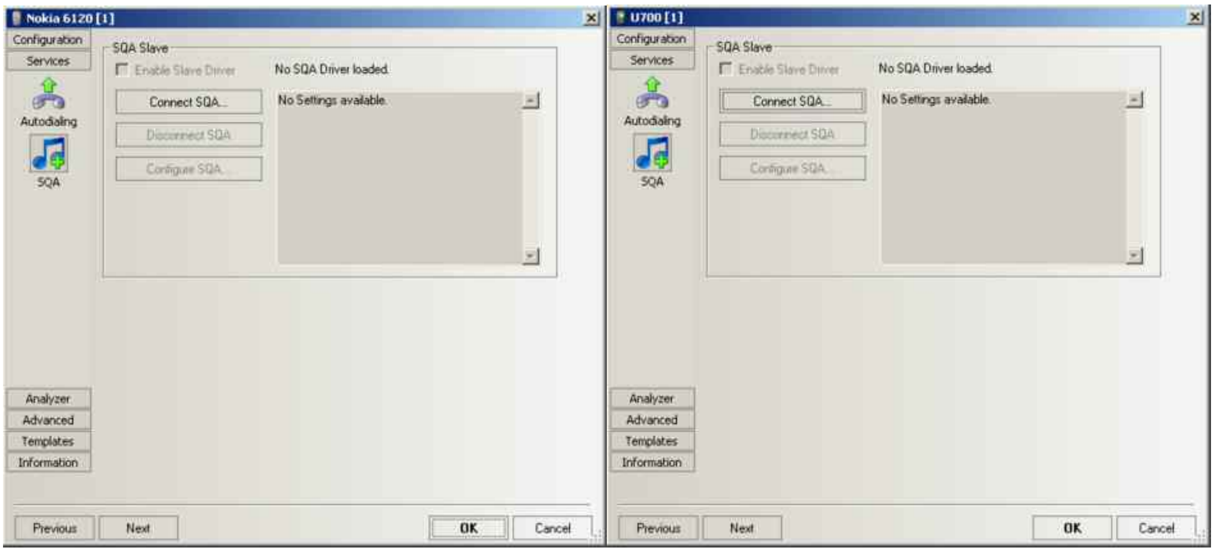


Fig. 6-46 Driver Configuration – SQA tab

Qualcomm / Nokia – Antenna

The *Antenna* tab defines *Antenna Name, Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

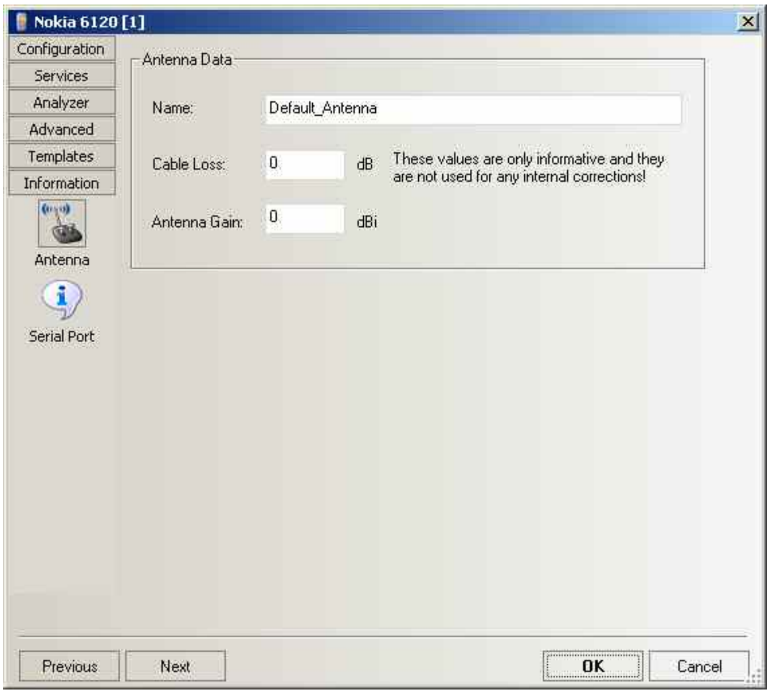


Fig. 6-47 Driver Configuration – Antenna tab

Qualcomm / Nokia – Templates

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. All settings are analogous to the GSM driver settings described on p. 6.79 ff.

The driver settings for Qualcomm and Nokia devices are identical.

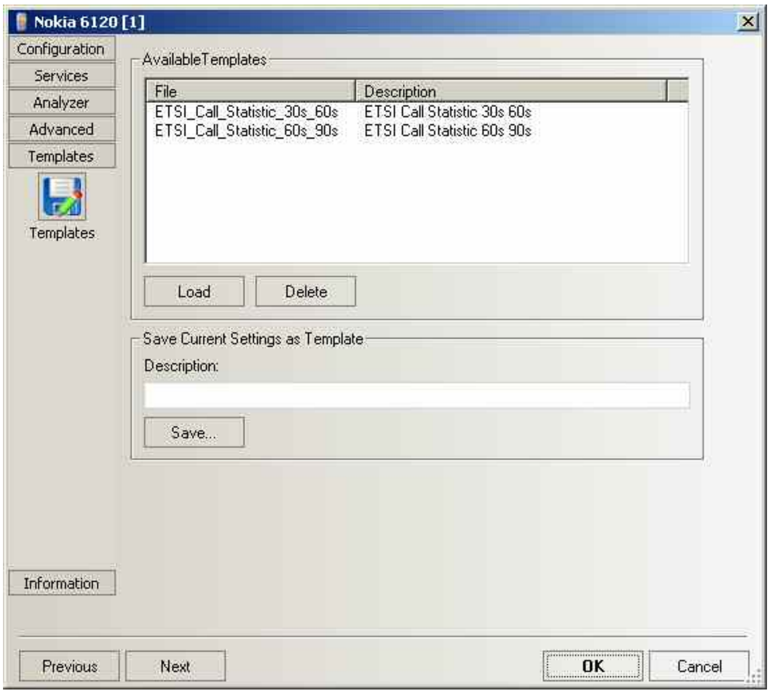


Fig. 6-48 Driver Configuration – Templates tab

Qualcomm / Nokia – Serial Port Driver Info

The *Serial Port Driver Info* tab displays the custom name of the device, information on the file version of the UMTS driver, the serial port assigned to it and the transfer parameters.

The *Custom Name* is used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider. An example is provided in section *Configuration of Installed Drivers* on p. 6.30.

The tabs for Qualcomm and Nokia devices are identical.

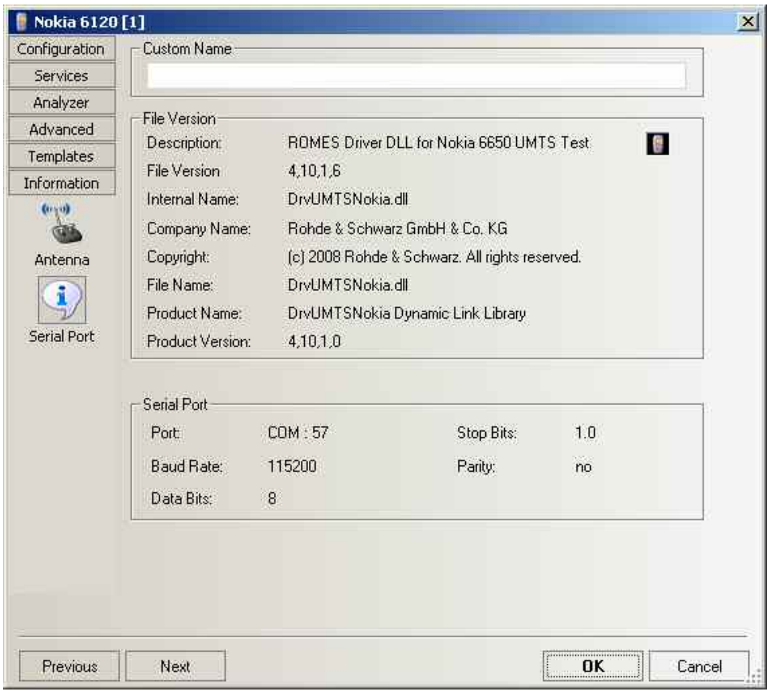


Fig. 6-49 Driver Configuration – Serial Port Driver Info tab

Action Menu UMTS

The *Action* menu opens popup boxes used to set up a call or show the contents of the mobile display. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section *Driver Installation* on page 6.1 ff). If several mobiles are connected, separate command lines are displayed for each of them.

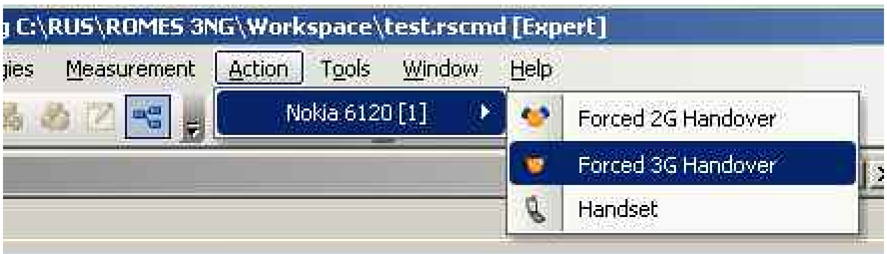
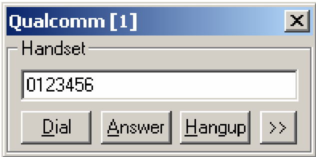


Fig. 6-50 Action menu for Qualcomm/Nokia driver

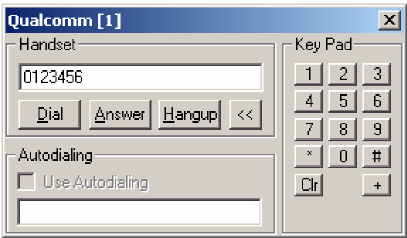
Handset UMTS

Activates the entry of a number to dial, set up and terminate a call.

The *Handset* command opens the following dialog box:



The **>>** button enlarges the dialog box, giving access to the Key pad and the *Autodialing* option:



Dialed number The number to be dialed can be entered either via the keyboard and the input field or by clicking the on-screen keypad.

 Closes the window without any further action.

Dial Starts dialing the number entered before.

Answer Instructs the phone to accept the call.

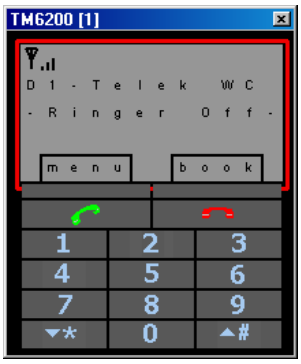
Hangup Drops the line.

Autodialing If the box is checked, the phone number entered below is called periodically, the Dial, Answer, and Hangup buttons are disabled (grayed). The autodialing mode (see p. 6.65) can be set even during the measurement, but only in Idle mode.

Show/Hide Mobile Display UMTS

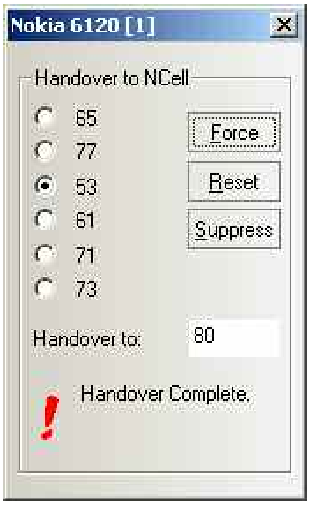
Shows or hides a view of the test mobile.

With the view it is possible to observe the display, dial numbers and browse the menu from the controller while a measurement is performed (for Qualcomm mobiles only).



Forced 2G Handover

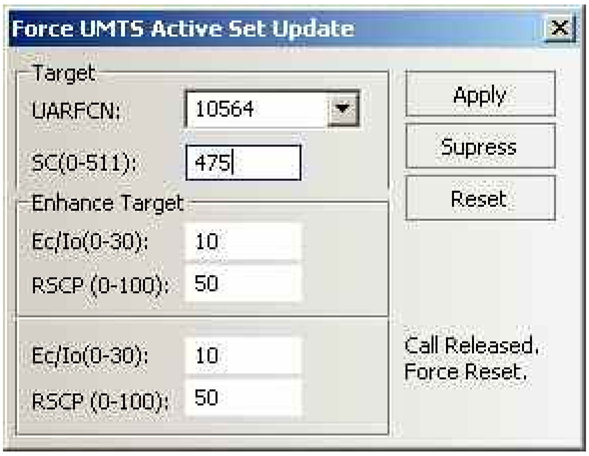
Force the handover in 2G. The feature is only available during a CS call. All cell settings are reset when the cell is released. (This feature is only available for Nokia 6120 and 6121.)



Handover to NCell	The check boxes list the numbers of the current neighbors cells for which a GSM forcing is allowed. Select the desired on.
Force	Force the handover to the selected cell.
Suppress	Suppress any handover during the call.
Reset	Reset all former forcing.

Forced 3G Handover

Force the handover in 3G. The feature is only available during a CS call. All settings are reset when the cell is released. (This feature is only available for Nokia 6120 and 6121.)



UARFCN	Defines the UARFCN (UTRA Absolute Radio Frequency Channel Number) which shall be put into active state.
SC	Defines the SC (Scrambling Code) which shall be put into active state.
Ec/Io	Enhance the target report for Ec/Io.
RSCP	Enhance the target report for RSCP.
Ec/Io	Degrade the Ec/Io for all other.
RSCP	Degrade the RSCp for all other.
Apply	Force the handover.
Suppress	Suppress any handover during the call.
Reset	Reset all former forcing.

CDMA2000 and 1xEV-DO Mobile Drivers

The Qualcomm driver for cdma200/EV-DO mobile now supports EV-DO Rev. A. Over the mobile drivers configuration dialog the user has to select the revision of the network under test. By default the highest available revision for the loaded mobile is selected.

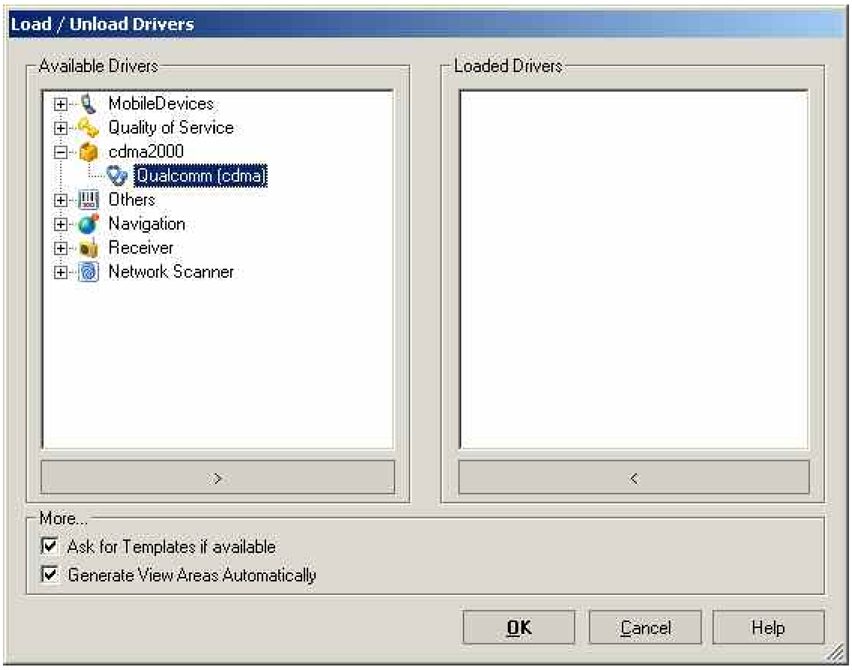


Fig. 6-51 Hardware Configuration – Load/Unload Drivers tab

The measurement system provides CDMA2000 and 1xEV-DO mobile drivers for the following test mobiles:

- Devices based on the Qualcomm MSM6500 chipset, e.g. the Qualcomm TM6500 test mobile (dual mode GSM 850 / 900 / 1800 / 1900 MHz, CDMA2000 Cell 850 / JCDMA 800 / KPCS 1700 / PCS 1900 MHz + GPRS),
- Devices based on the Qualcomm 5100 and 6025 chipset, e.g. the Pantech Zapp Z720i test mobile (GSM 450 MHz, CDMA2000 450, 1xEV-DO), the Huawei ETS310 (GSM 450 MHz, CDMA2000 450), or the Zapp EVDO Modem Z010 (GSM 450 MHz, CDMA2000 450, 1xEV-DO),
- Devices based on the Qualcomm 60xx chipsets, e.g. the Samsung SCH-A-940 / SCH-A-890 (GSM 800 / 1900 MHz, CDMA2000 850/1900, 1xEV-DO) or the Huawei ETS318 (GSM 800 MHz, CDMA2000 450),
- Hyundai test mobile Zapp H-150 (CDMA2000 450)

The CDMA2000/Qualcomm driver is installed by selecting *cdma2000* in the *Hardware Drivers* window (see Fig. 6-56 on page *6.121*). It is possible to load up to four CDMA mobile drivers at the same time.

Caution:

The Samsung mobiles rely on the USB interface for their power supply. A supply current of approx. 0.5 A is required. Check the specification of your USB interface, especially when connecting several Samsung mobiles or other power-consuming devices in parallel. If necessary, use a self-powered USB hub.

The configuration menus and additional settings are explained below.

The CDMA2000/1xEV-DO test mobiles can be used to acquire data for most of the CDMA and 1xEV-DO views described in chapter 4.

Analogous to GSM, the CDMA2000 / 1xEV-DO test mobiles and drivers are now grouped into the R&S support classes 1 and 2. The mobiles of R&S support class 1 are continuously tested with new ROMES versions and service packs, they are permanently available to our testing staff. The mobiles of R&S support class 2 are not always available for testing, but they have been tested successfully at least once with the current ROMES software release. The introduction of the R&S support classes is necessary due to the sheer number of supported mobiles. The mobile types with R&S support class 1 are listed with normal title typeface in the table below, the mobiles with R&S support class 2 are marked with ***italic*** title typeface.

Table 6-11 Properties of CDMA2000 / 1xEV-DO test mobiles

Chipset: MSM6500	Chipset: 5100 and 6025	Chipset: 60xx	Chipset: xxxx
Qualcomm TM6500 GSM 850 / 900 / 1800 / 1900 MHz, CDMA2000 Cell 850 / JCDMA 800 / KPCS 1700 / PCS 1900 MHz + GPRS	**Pantech Zapp Z720i** GSM 450 MHz, CDMA2000 450, 1xEV-DO ***Huawei ETS310*** GSM 450 MHz, CDMA2000 450 **Zapp EVDO Modem Z010** GSM 450 MHz, CDMA2000 450, 1xEV-DO	***Huawei ETS318*** GSM 800 MHz, CDMA2000 450 **Samsung SCH-A-940/ SCH-A-890** GSM 800 / 1900 MHz, CDMA2000 850/1900, 1xEV-DO	***Hyundai Zapp H-150*** CDMA2000 450

Configuration Menu CDMA2000/1xEV-DO

The *Qualcomm* driver configuration menu contains various tabs to select the measurement and message types evaluated by the test system *(Configuration, Expert Mode),* to configure the network quality analysis *(NQA)* and the autodialing and autoanswer call mode *(Autodialing)*, to define the characteristics of the antenna used *(Antenna),* and to display information on the driver and the serial port assigned *(Serial Port Driver Info).* It can be opened by clicking the *Driver* command line of the *Hardware* menu which is available as soon as a mobile driver is loaded (see Fig. 6-4) or via the *Driver* tab in the *Configuration of Software Modules* menu opened via the *Tools – Modules Configuration...* command.

Configuration CDMA2000/1xEV-DO

The *Configuration* tab defines the PIN number and allows a rough pre-selection of the evaluated message type. The message type selection can be refined in the *Expert Mode* tab (see p. 6.118 ff.).

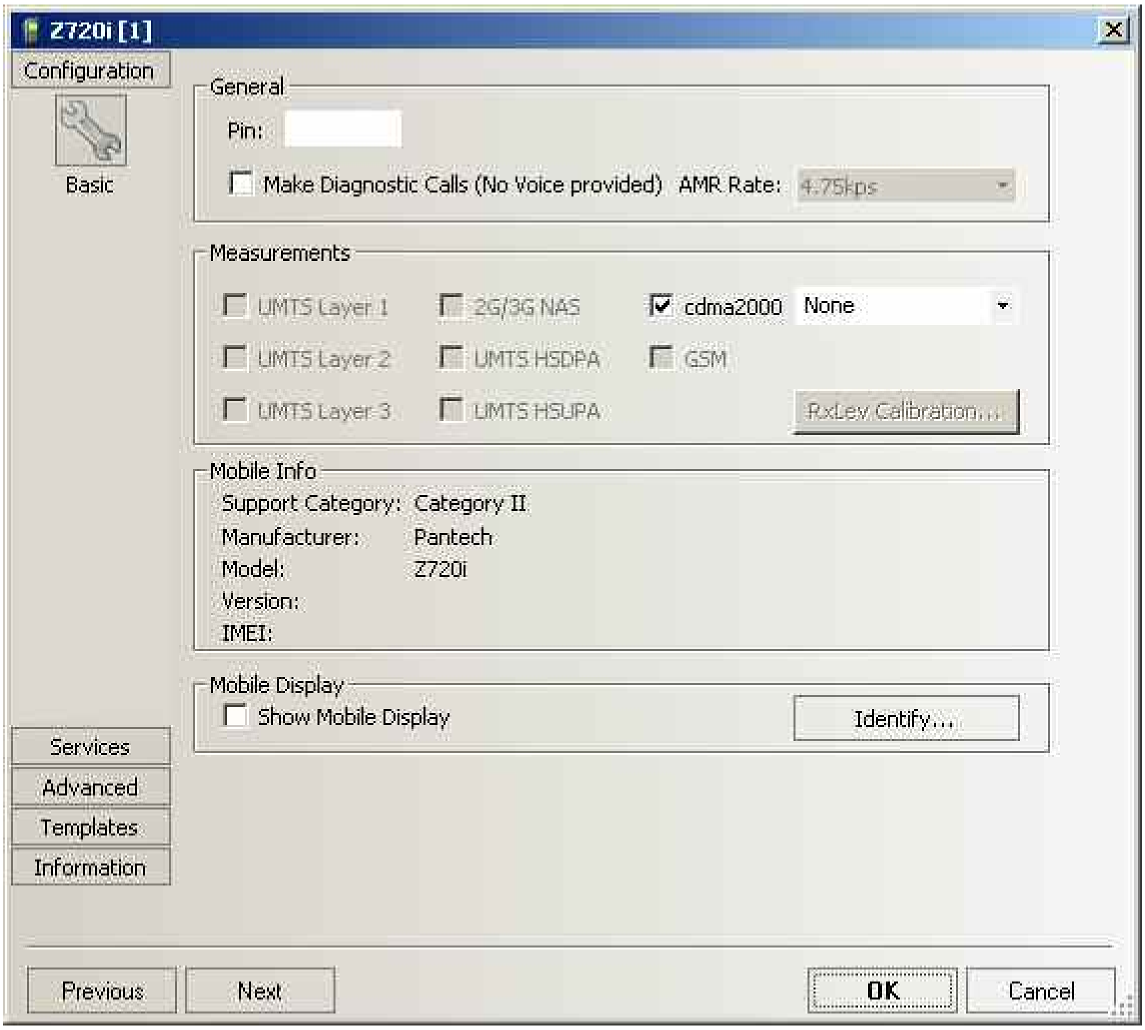


Fig. 6-52 CDMA2000 / 1x EV-DO driver configuration – configuration

General

The PIN number for identification after switching on the test mobile can be entered in the *General* panel of the configuration dialog. If nothing is entered, the SIM must be entered manually at the mobile each time it is started.

If *Make Diagnostic Calls…* is selected, the mobile will set up connections (no voice calls) at a fixed data rate. This option is particularly suitable for connections with test devices that are not equipped with an audio circuit.

If several Qualcomm mobiles are connected to an MS Windows based test system; see the paragraph on *Connecting several Qualcomm mobiles* on p. 6.9.

Measurements

The available CDMA2000 checkbox in the *Measurements* is used to enable CDMA2000 messages and information types to be recorded and written to the measurement (*.rscmd) file. The selection can be refined in the *Expert Mode* tab. For an overview of available messages, views and signals see Table 6-6 above.

All other options are automatically greyed out, unless the mobile is actually capable to support one of the listed technologies.

Please note that the *RXLev Calibration...* button is permanently grayed out, because the calibration is only useful in a GSM context.

Mobile Display

Show Mobile Display opens a view of the test mobile so that it is possible to observe the display, dial numbers and browse the menu from the controller while a measurement is performed. This function is also provided in the *Action* menu; see section *Action Menu* on p. 6.111 ff.

The *Identify...* button is useful when several test mobiles are connected. Clicking the button causes the currently active test mobile to identify itself by showing its IMEI on the mobile display, and the following message box pops up:

After confirmation with OK the IMEI on the mobile display disappears.

Expert Mode CDMA2000/1xEV-DO

The *Expert Mode* tab selects the message types to be recorded to the measurement file. A *Layer 1 cdma2000* message type can be selected only if the driver has been configured to do *cdma2000* measurements; see description of the *Configuration* tab above.

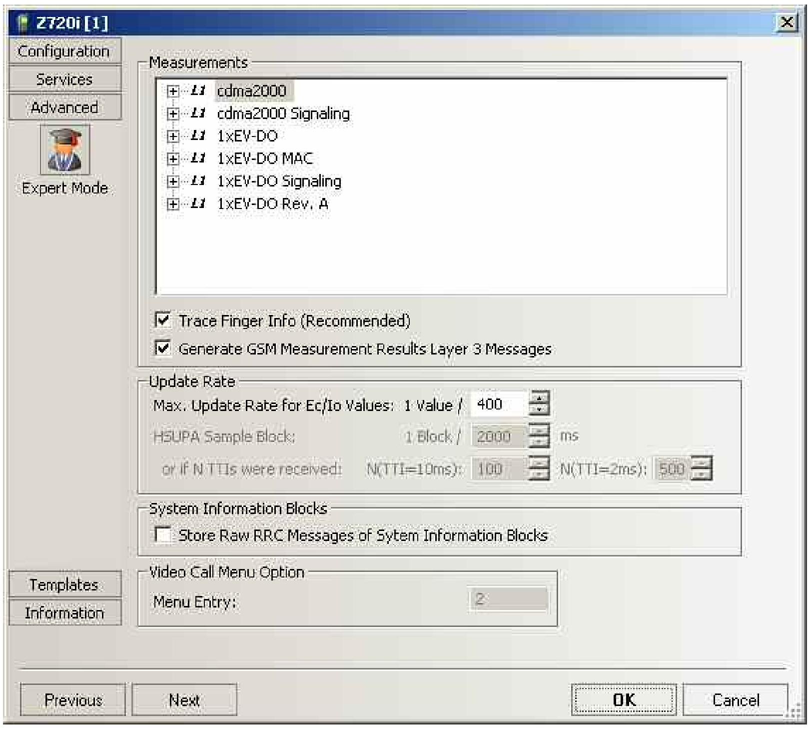


Fig. 6-53 CDMA2000 / 1x EV-DO driver configuration – Expert Mode

For an explanation of the recorded parameters refer to the description of the CDMA200 and 1xEV-DO views in chapter 4.

Trace Finger Info The CDMA finger info is necessary for the *CDMAFinger View.* It must be selected as well to obtain the *Finger Info* signals.

Generate GSM Layer 3 Messages The checkbox has no effect in a CDMA2000/1xEV-DO context.

Update Rate *Max. Update Rate for Ec/Io Values*

Sets the maximum update rate for Ec/Io values. A lower update rate decreases the size of the measurement file.

HSUPA Sample

Sets the *Max. Update Rate for Ec/Io Values* for HSUPA samples. Additional option fields are provided for the case when N samples are logged for a TTI of 10 ms or 20 ms.

System Information Blocks Radio Resource Control (RRC) messages are broadcast in system information blocks of various types (see standard 3GPP TS 25.331). If the box *Store Raw RRC Messages…* is checked, the complete information transmitted in the RRC signaling messages is stored to the measurement file.

If only the system information blocks are needed, the default configuration (box unchecked) is sufficient. This will reduce the size of the measurement file.

Autodialing CDMA2000/1xEV-DO

The *Autodialing* tab configures the mode where a definite phone number is dialed periodically, and a call is set up to the mobile phone. This mode is relevant for the network quality analysis described on page 6.71. All settings (except for SID and NID in the *Home Network* group as described below) are analogous to the GSM driver settings described on p. 6.65 ff.

The driver settings for the CDMA2000/1xEV-DO devices are identical. If a 2nd virtual COM port is needed to be operated in *autodial* mode; see the paragraph on *Loading the drivers* on p. 6.8.

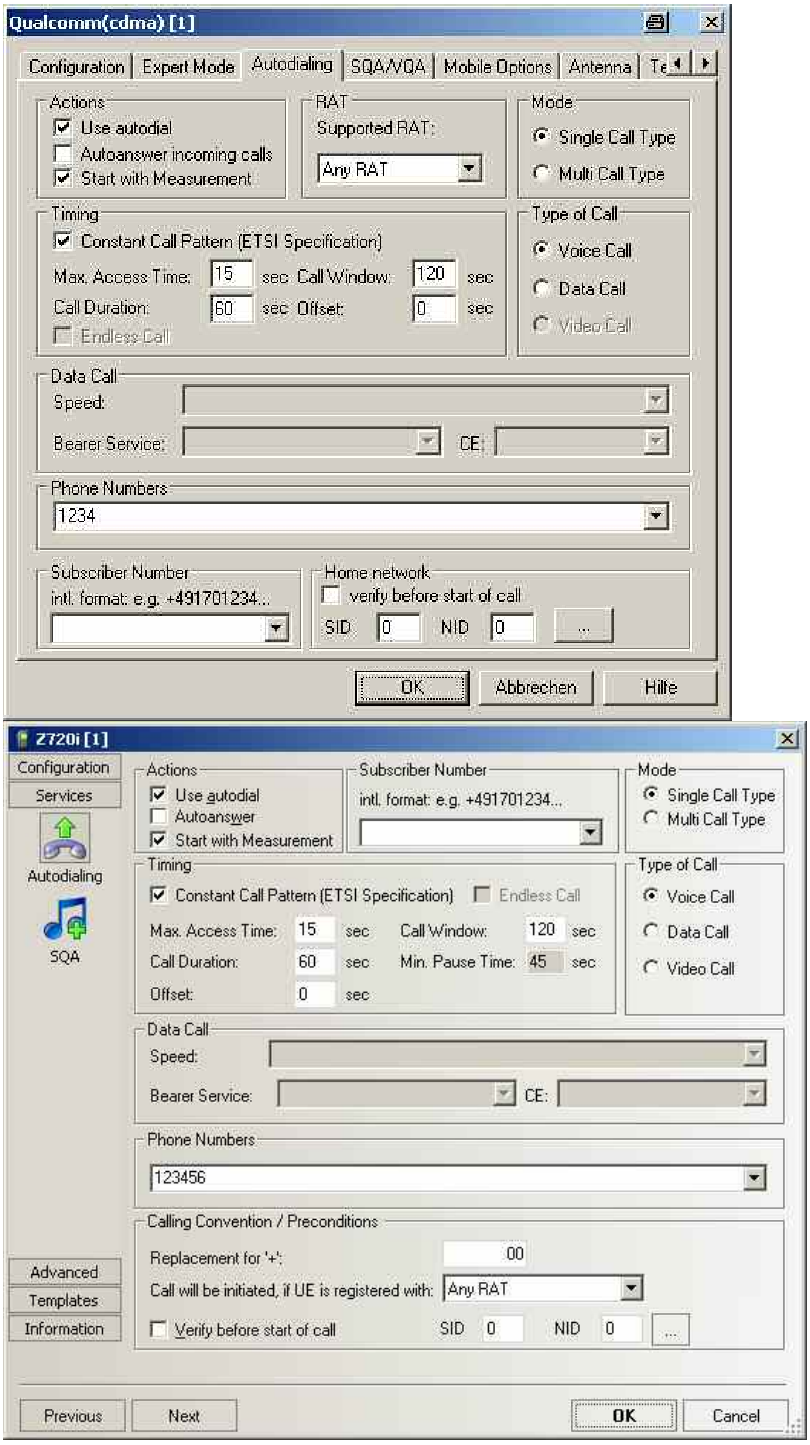


Fig. 6-54 Driver Configuration – Autodialing tab

Home network

The home network identified by the system identification code (SID, range 0 to 32767) and the network identification code (NID, range 0 to 65535).

If *verify before start of call* is checked, the mobile will be out of service if a call is attempted from a foreign network (e.g. during a measurement tour near the border of a network where roaming is possible). This ensures that calls from foreign networks will not impair the network quality analysis; see next section.

By default, the *verify before start of call* function is not active.

SQA Settings CDMA2000/1xEV-DO

The *SQA* tab enables and configures the Speech Quality (SQA, with option ROMES3SQA). SQA results can be displayed in the *SQA Message* view (see chapter 4). as described in section *Speech Quality Tester Driver (SQA)* on p. 6.262. All settings are analogous to the GSM driver settings described on p. 6.285 ff.

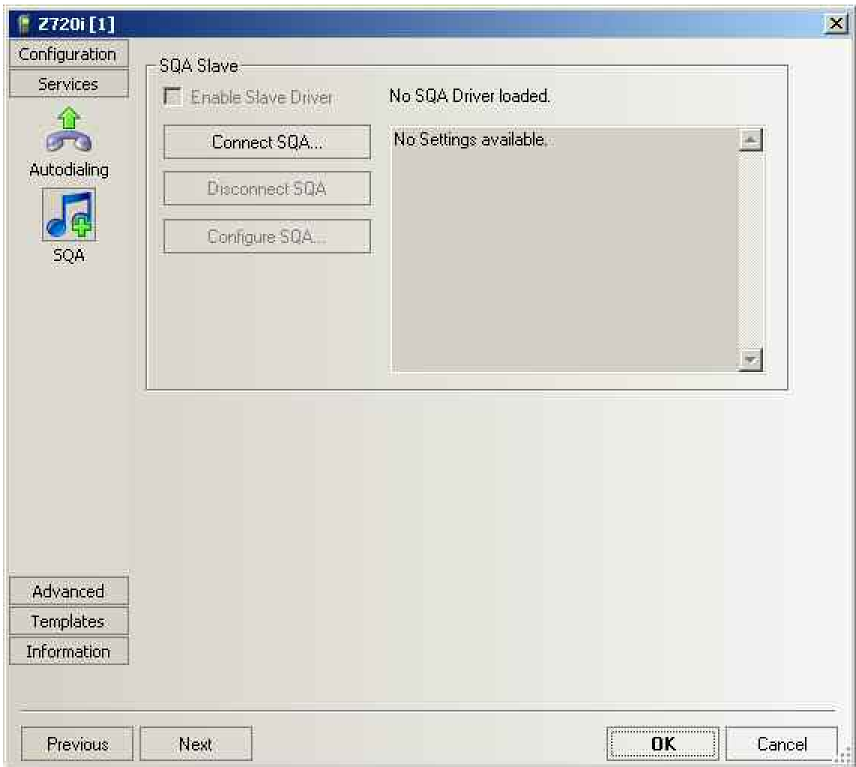


Fig. 6-55 Driver Configuration – SQA tab

Antenna CDMA2000/1xEV-DO

The *Antenna* tab defines *Antenna Name, Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

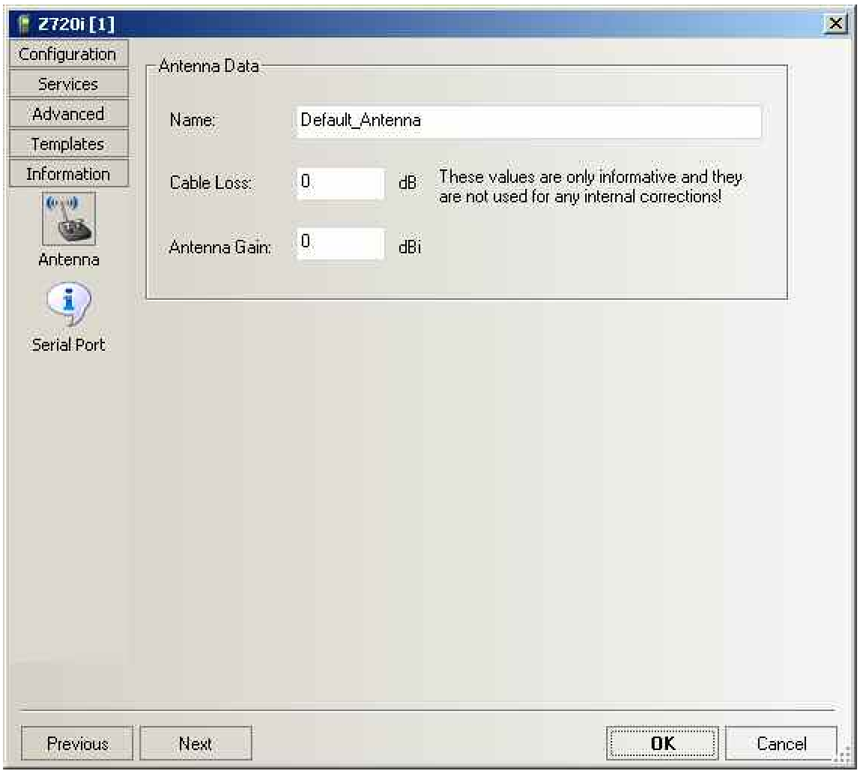


Fig. 6-56 Driver Configuration – Antenna tab

Templates CDMA2000/1xEV-DO

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. All settings and buttons are analogous to the GSM driver settings described on p. 6.79 ff.

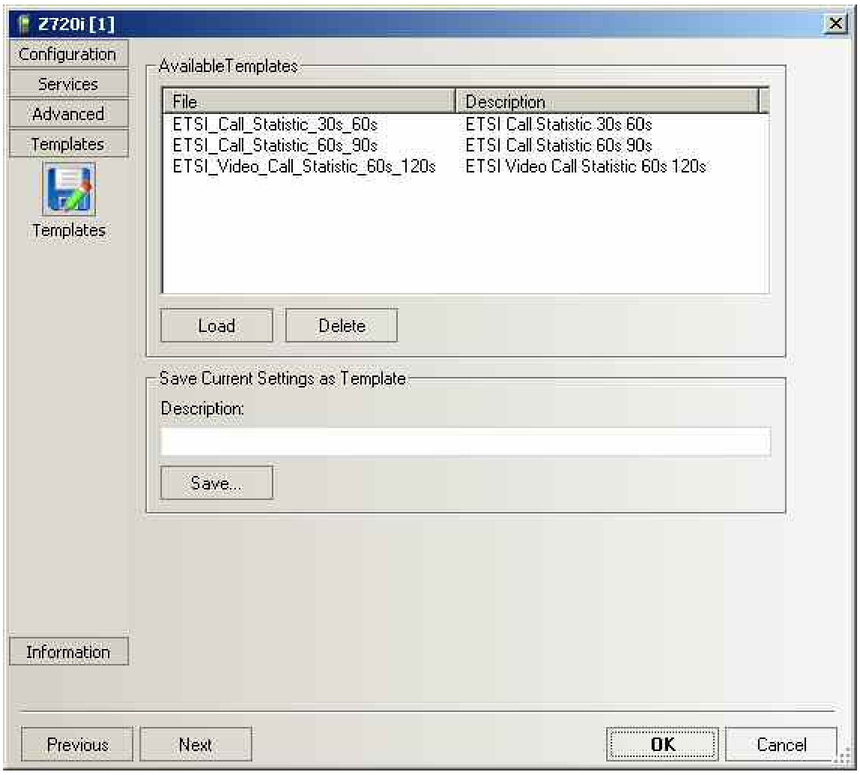


Fig. 6-57 Driver Configuration – Templates tab

Serial Port Driver Info CDMA2000/1xEV-DO

The *Serial Port Driver Info* tab displays the custom name of the device, information on the file version of the UMTS driver, the serial port assigned to it and the transfer parameters.

The *Custom Name* is used to assign a name to a mobile, e.g. to make a quick association of a test mobile to its designated test network provider. An example is provided in section *Configuration of Installed Drivers* on p. 6.30.

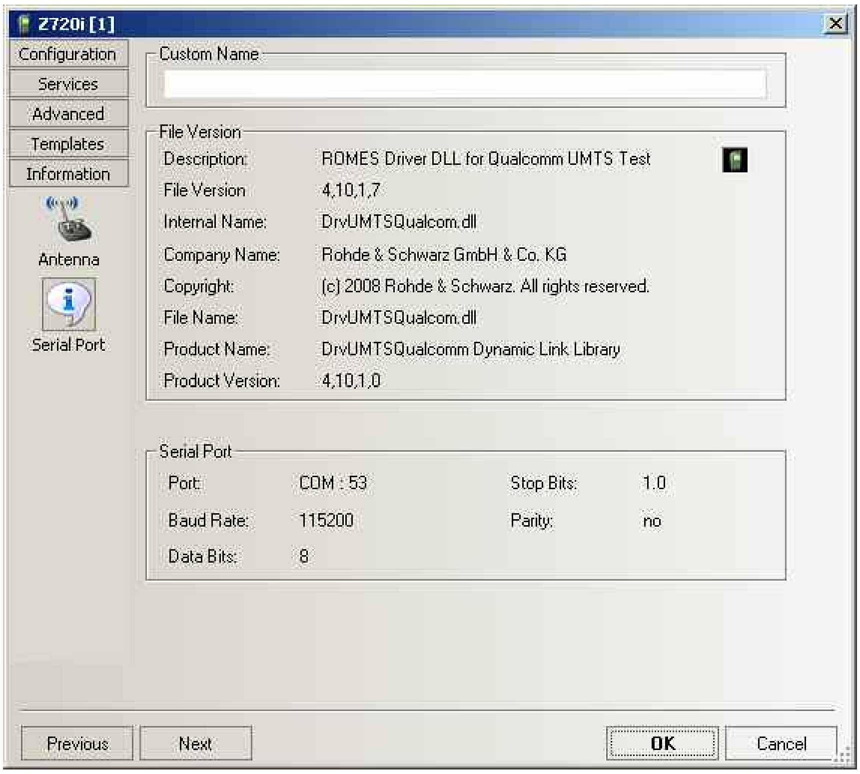


Fig. 6-58 Driver Configuration – Serial Port Driver Info tab

Action Menu CDMA2000/1xEV-DO

The *Action* menu opens popup boxes used to set up a call or show the contents of the mobile display. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section *Driver Installation* on page 6.1 ff). If several mobiles are connected, separate command lines are displayed for each of them.

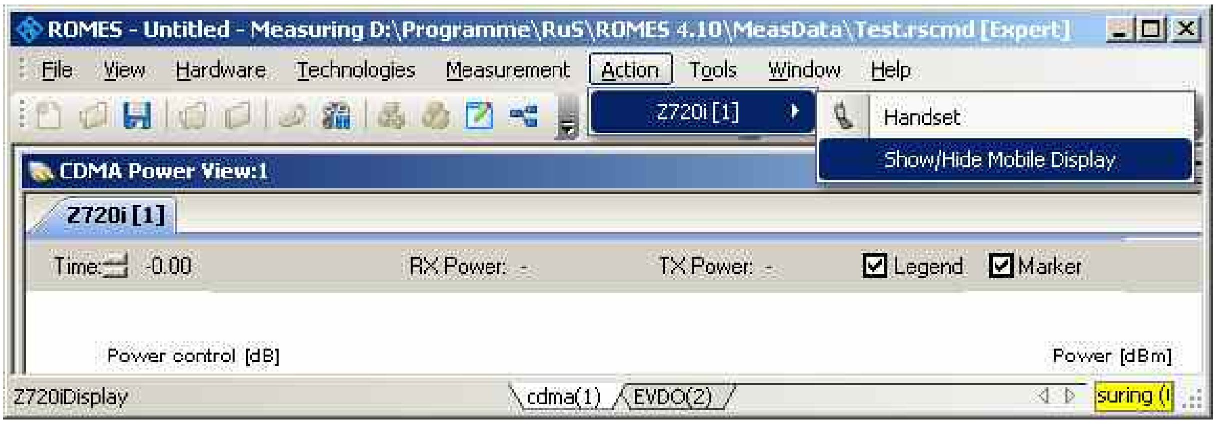


Fig. 6-59 Action menu for different driver types

Handset CDMA2000 / 1xEVDO

Activates the entry of a number to dial, set up and terminate a call .

The *Handset* command opens the following dialog box:

The **>>** button enlarges the dialog box, giving access to the Key pad and the *Autodialing* option:

Dialed number	The number to be dialed can be entered either via the keyboard and the input field or by clicking the on-screen keypad.
	Closes the window without any further action.
Dial	Starts dialing the number entered before.
Answer	Instructs the phone to accept the call.

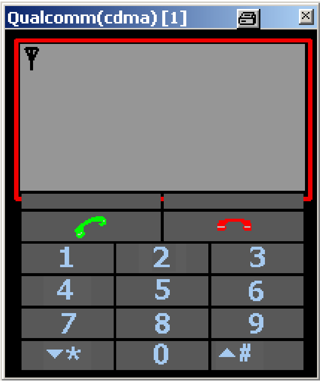
Hangup Drops the line.

Autodialing If the box is checked, the phone number entered below is called periodically, the Dial, Answer, and Hangup buttons are disabled (grayed). The autodialing mode (see p. 6.65) can be set even during the measurement, but only in Idle mode.

Show/Hide Mobile Display CDMA2000 / 1xEV-DO

Shows or hides a view of the test mobile.

With the view it is possible to observe the display, dial numbers and browse the menu from the controller while a measurement is performed (for Qualcomm mobiles only).



WiMAX Mobile Driver

Currently only WiMAX cards, based on Beceem chipsets are supported. To load the driver, go to *Hardware* – Add/Remove... and select the Beceem device, in the *MobileDevices* branch. To perform WiMAX measurements R&S option ROMESWXB must be enabled.

The best way to do WiMAX measurement is the following:

1. Configure the WiMAX Card for automatic connection or use the WCM (WiMAX Connection Manager) to connect to the network. Please see the manual of the used WiMAX card for further information.
2. Load the ROMES drivers for Beceem and DQA
3. Disable the Network Search Feature at the Beceems configuration page.
4. Specify the services to test in the DQA, but do not add any Connect or Disconnect Job.
5. Start the measurement.

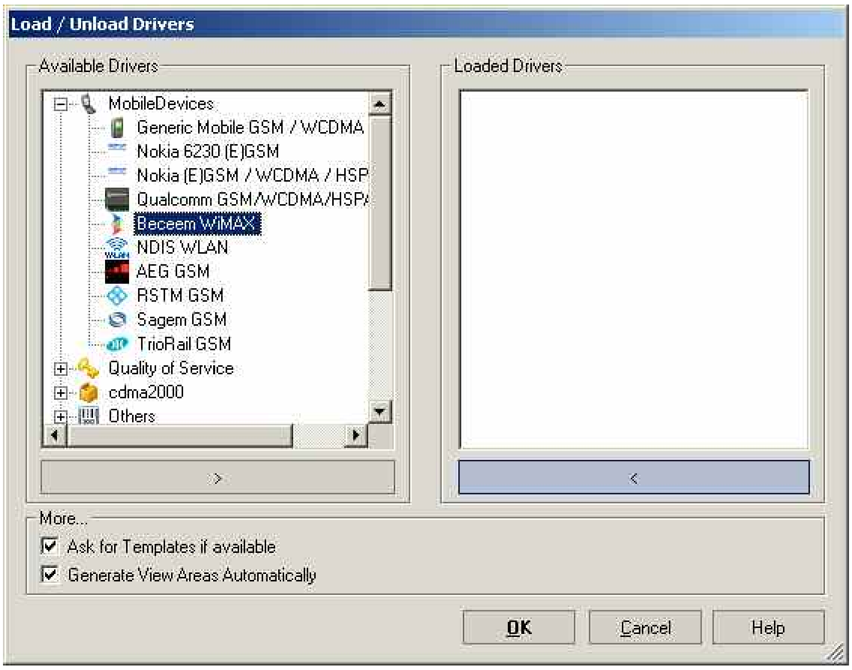


Fig. 6-60 Hardware Configuration – Load/Unload Drivers

Configuration Menu WiMAX

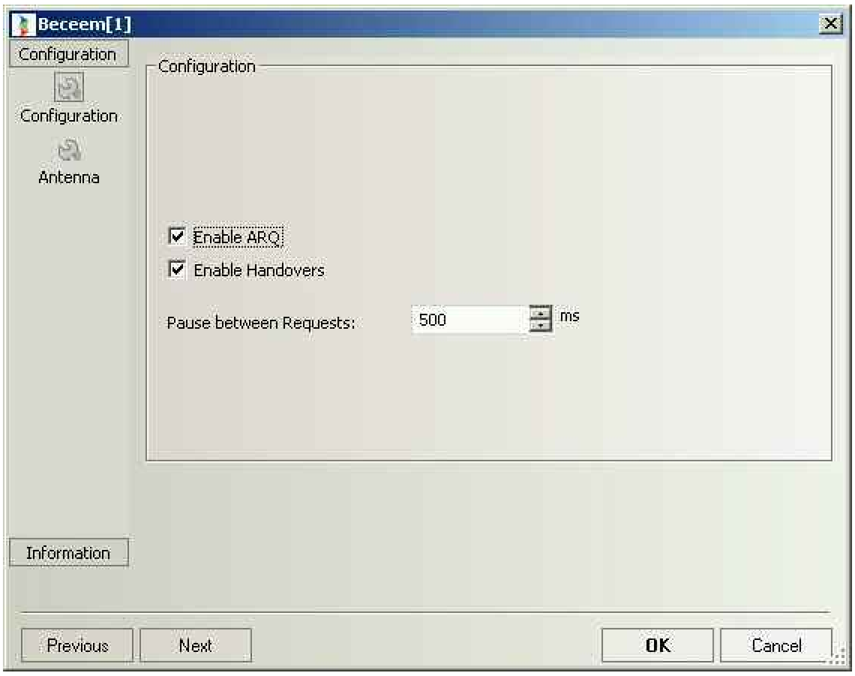


Fig. 6-61 WiMAX driver Configuration – Configuration

Network Search The driver supports automatic network search. To enable this feature check the *Network Search* and specify a list of frequencies and the bandwidth. Whenever the DQA requests a connect (Connect Job), the card will do a network search before trying to connect.

> ***Note:***
> *Currently this feature can be used only, if no authentification is required.*

Enable ARQ The ARQ and HARQ features of the card can be disabled by the driver.

Enable Handovers If checked the handover is allowed.

Pause between Requests The update rate of the measurement values can be changed by setting the *Pause between Requests* to an appropriate value.

Antenna WiMAX

The *Antenna* tab defines *Antenna Name, Antenna Gain* and *Cable Loss*. These values are used to correct the received signal powers:

- If a *Cable Loss* of n dB is specified, the system assumes the received signals to be attenuated by n dB. n dB is added to all measured signal powers so that the displayed results correspond to the unattenuated signal.
- If an *Antenna Gain* of n dB is specified, the system assumes the received signals to be amplified by n dB. n dB is subtracted from all measured signal powers so that the displayed results correspond to the unamplified signal

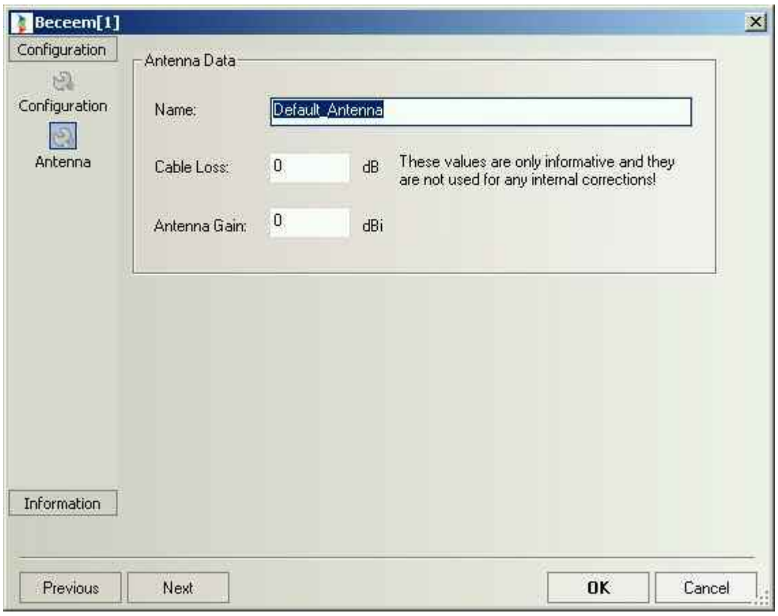


Fig. 6-62 WiMAX driver configuration – Antenna

Info

The *Info* tabs display information on the software versions of the driver.

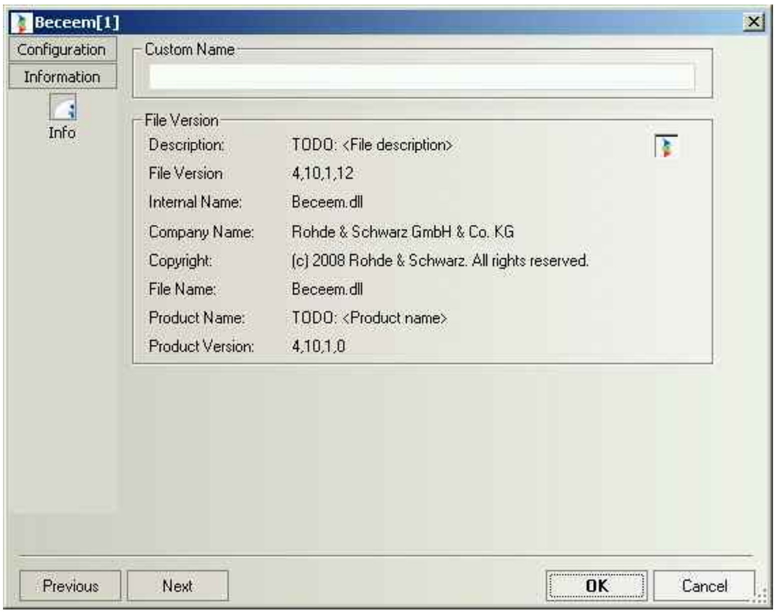


Fig. 6-63 Test receiver driver configuration – Driver Info

OK Saves all settings and closes the menu.

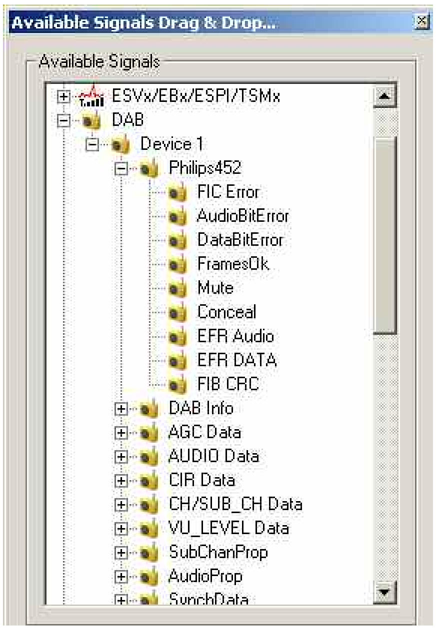
Cancel Discards all settings and closes the menu.

DAB752 Driver

The DAB driver provided with the measurement system supports the Philips752 DAB test receiver. An earlier type, the Philips452 DAB test receiver, is supported by ROMES versions V2.xx, however, measurement data recorded with this receiver can also be replayed and evaluated in R&S ROMES The DAB driver is installed by selecting *DAB* in the *Hardware Drivers* window (see Fig. 6-1 on page 6.3).

Note:

In the data tree, data recorded by the Philips452 receiver appears in a separate data structure. In particular the Philips452 signals are not overwritten by Philips752 DAB test receiver data.



The DAB receiver provides a wealth of data that can be viewed in all *Basic Views* (see chapter 3). The configuration menus and additional settings are explained below.

Configuration Menu Philips752

The configuration menu contains two tabs to configure the measurement *(Philips752 Configuration)* and define the characteristics of the antenna used *(Antenna)*.

The *Driver Configuration* menu is opened by clicking the *Driver* command line in the *Hardware* menu which is available as soon as a receiver driver is loaded. Besides, it is opened automatically whenever a driver for a receiver which does not conform to the default configuration settings is loaded, i.e. on confirming the driver selection and port assignment made in the *Load/Unload Drivers* menu (see Fig. 6-1 on page 6.3).

Configuration Philips752

The *Philips752 Configuration* tab controls the receiver frequency, the sampling rate *(Measurement Period)*, and further test receiver parameters.

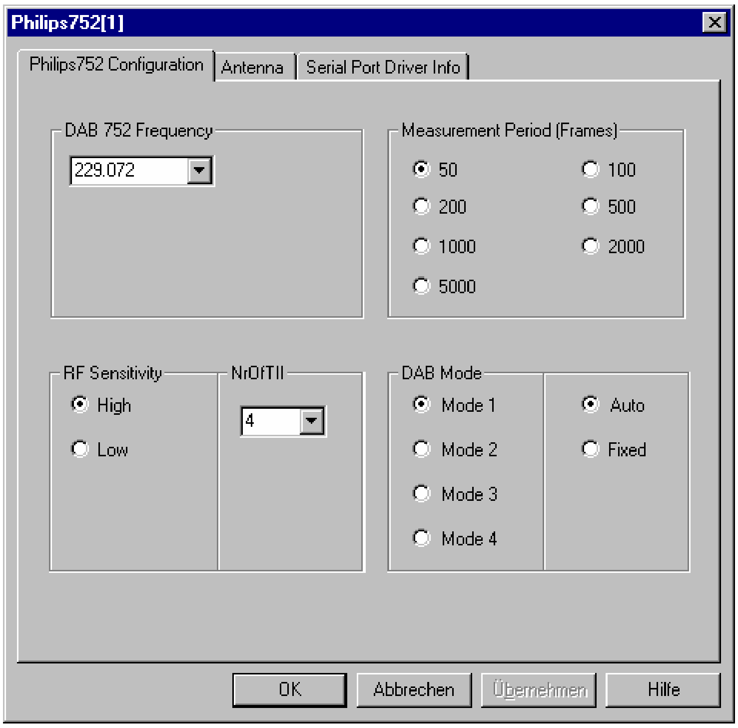


Fig. 6-64 Philips752 driver configuration – Measurement settings

DAB 752 Frequency

The *DAB 752 Frequency* panel contains an input field to specify the frequency the receiver is tuned to. The frequency entered determines the ensemble tested; see section *DAB Action Menu* on page 6.132.

Measurement Period

The *Measurement Period* specifies the number of logical frames that are processed to produce a measurement summary of the monitored DAB signal. The measurement speed is 1.2 s per 50 frames. A longer measurement period reduces the data rate.

RF Sensitivity

The *RF Sensitivity* radio buttons switch the receiver between high (min. –95 dBm, typ. –98 dBm) and low sensitivity (typ. –45 dBm). The default setting is *High*. *Low* RF sensitivity is recommended for very strong received signals (e.g. due to a direct connection of the receiver via test cable or a measurement in the vicinity of the BTS). In addition, it avoids detection of weak unwanted signals when the DAB signal disappears.

NrOfTII

Number of TII signals generated in the measurement file in the range 1 to 8. The number can be reduced to accelerate the measurement.

DAB Mode

One of four *DAB Modes* can be selected *(Fixed* setting). Alternatively, the mode is set by the system according to the test conditions *(Auto* setting).

Antenna Philips752

The *Antenna* tab sets RF parameters such as the cable loss caused by the test setup, the type and gain of an antenna used. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

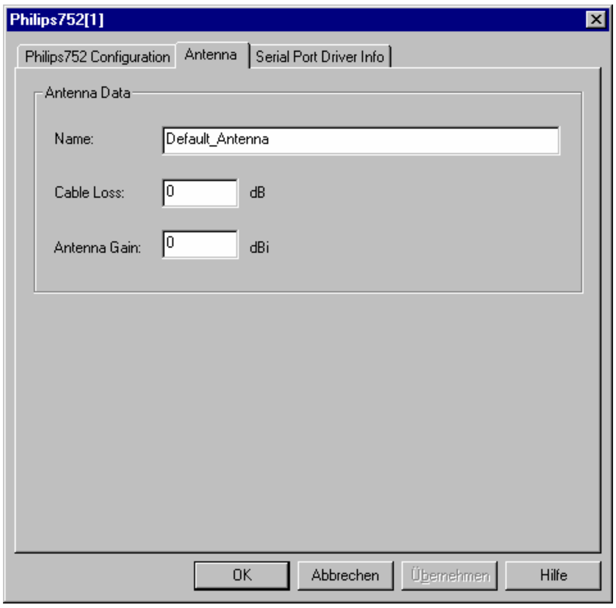


Fig. 6-65 Philips752 driver configuration – Antenna

Serial Port Driver Info Philips752

The *Serial Port Driver Info* tab of the configuration menu displays information about the file version of the current driver, the product name, and the manufacturer. In addition, it shows the serial port assigned to the driver and the transmission parameters.

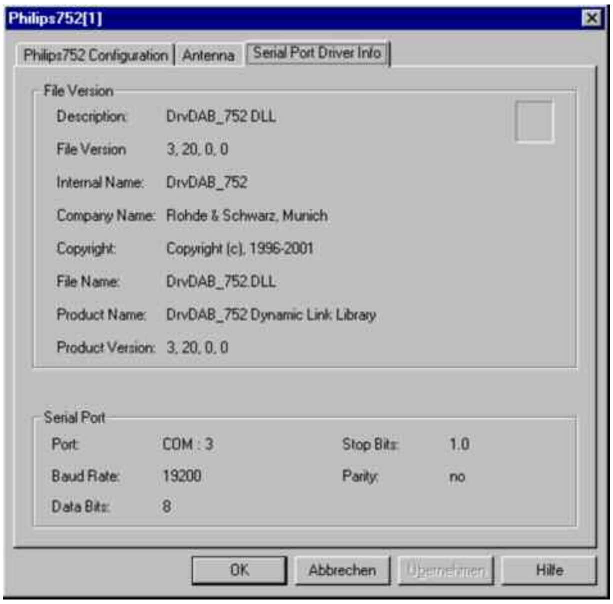


Fig. 6-66 Philips752 driver configuration – Serial Port Driver Info

DAB Action Menu

The *Action* menu opens a popup box used to select the service and displaying information on the DAB connection. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section *Driver Installation* on page 6.1 ff). If several mobiles are connected, a separate command line is displayed for each of them.

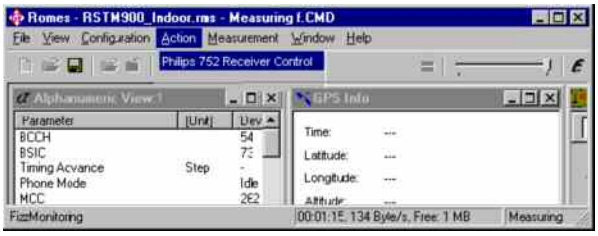
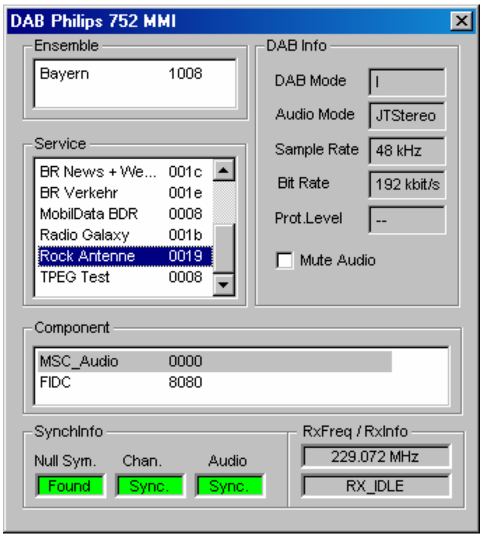


Fig. 6-67 Action menu (DAB driver)

Receiver Control DAB

Selects the service and displays information on the connection.

The *Receiver Control* command opens the *DAB Philips 752 MMI* dialog box:



Ensemble Indicates the DAB ensemble determined by the DAB 752 Frequency selected in the Philips 752 Configuration tab

Service List to select among several DAB services

DAB Info Indicates several transmission parameters of the DAB receiver

Component List to select among several DAB service components (click the arrow buttons)

SynchInfo Indicates the synchronization of different system components. Synchronization is complete when all output fields are green; otherwise, an output field is red and an appropriate message is displayed.

RXFreq/ RXInfo Indicates the received carrier frequency (identical with the DAB 752 Frequency selected in the Philips 752 Configuration tab) and the receiver state.

DVB Driver

The DVB (Digital Video Broadcasting) driver provided with the measurement system supports the R&S TSM-DVB diversity test receiver by Rohde & Schwarz. The DVB driver is installed by selecting *DVB...* in the *Hardware Drivers* window (see Fig. 6-1 on page 6.3).

The DVB receivers and analyzers provide a wealth of data that can be viewed in the *DVB Constellation View* and in all *Basic Views* (see chapter 3). The configuration menus and additional settings are explained below.

Configuration Menu DVB

The configuration settings vary depending on the analyzer or receiver type.

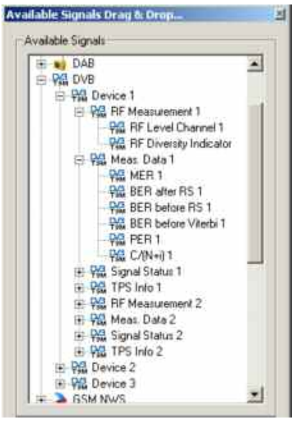
Configuration R&S TSM-DVB

The DVB-T diversity test receiver R&S TSM-DVB is controlled by the R&S TSM-DVB driver (option ROMES3DVB). The R&S TSM-DVB is equipped with two independent antenna connectors RF IN 1 and RF IN 2. An RS-232 interface is used for the communication with the controller; see also Fig. 6-69 on p. 6.136.

The driver configuration menu is divided into several tabs.

NOTE

The R&S TSM-DVB data is not displayed in the DVB Constellation View. To analyze R&S TSM-DVB data select the R&S TSM-DVB signals in the data tree (Tools – Preferences – Available Signals) and use the basic views (Alphanumeric View, 2D Chart View…). The following information is available for channel 1 and 2:



- RF level
- RF Diversity Indicator
- Modulation Error Rate (MER)
- BER after Reed Solomon error correction
- Packet Error Rate (PER, MPEG packets per second)
- Carrier to Noise Ratio
- Various status indicator signals
- Various transport signal (TPS) information signals

Configuration R&S TSM-DVB

The *Configuration* tab selects the operating mode of the R&S TSM-DVB diversity test receiver and configures both RF channels.

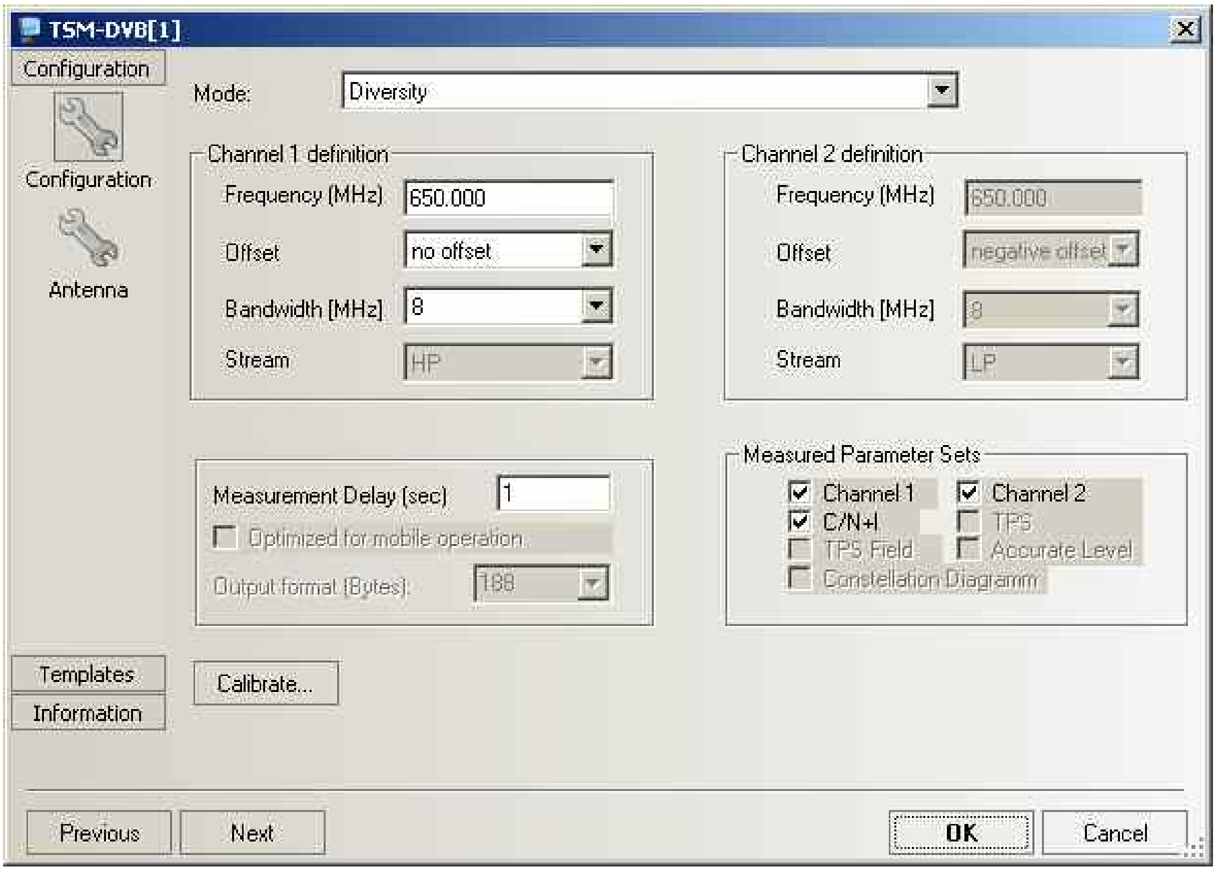


Fig. 6-68 R&S TSM-DVB Configuration

Mode

Selects the operating mode of the diversity test receiver. The R&S TSM-DVB receiver has two antenna inputs (input connectors RF IN 1 and RF IN 2 at the rear panel) for two independent demodulation channels, providing two separate MPEG transport streams (MPEG-TS). The MPEG-TS are converted to ASI format in accordance with the DVB-ASI recommendation and fed to the output connectors ASI 1 and ASI 2. The operating mode controls the switching between the two MPEG-TS.

Diversity The two demodulator channels have the same frequency, offset and bandwidth. The MPEG-TS are switched internally; no stream priority is defined. The ASI output stream is available at both ASI outputs

Dual input The two demodulator channels are independent and can be configured with different parameters. Each MPEG-TS has its own ASI output (RF IN 1 – > ASI 1 and RF IN 2 – > ASI 2). This mode can be used for redundant input with external switching.

Hierarchical	The two demodulator channels differ by their stream priority settings. The frequency, offset, and bandwidth settings can be the same or different. Each MPEG-TS has its own ASI output (RF IN 1 –> ASI 1 and RF IN 2 – > ASI 2).
Redundant Manual Switch Input 1/2	The two demodulator channels are independent; internal automatic switching is disabled. The same output stream is available on both ASI outputs.
Redundant Sync failed Input 1/2	The two demodulator channels are independent and switched internally whenever synchronization is lost at input RF IN 1 or RF IN 2. The same output stream is available on both ASI outputs.
Redundant DRS failed Input 1/2	The two demodulator channels are independent and switched internally whenever an uncorrected packet (remaining error Data packet after Reed Solomon, DRS) is detected at input RF IN 1 or RF IN 2. The same output stream is available on both ASI outputs.

Channel 1 / 2 definition

The R&S TSM-DVB provides the same receiver settings for the two input channels 1 and 2. Some parameters might be unavailable, depending on the operating mode.

Frequency	Nominal RF carrier frequency in MHz. The DVB-T signal can be received on VHF frequencies 170 to 230 MHz or UHF frequencies 470 to 862 MHz. The frequency ranges are as follows: 170 MHz to 230 MHz and 470 MHz to 862 MHz
Offset	These frequency offsets are used to minimize interference from adjacent channels. The DVB-T signal may be transmitted with a frequency offset of 0 MHz *(no offset)*, +1/6 MHz or –1/6 MHz for 8 MHz bandwidth (UHF) and with a frequency offset of 0 MHz, +1/8 MHz or –1/8 MHz for 7 MHz bandwidth (VHF) *(negative offset* or *positive offset)*.
Bandwidth [MHz]	Bandwidth of the DVB-T channel: 6 MHz, 7 MHz or 8 MHz. A 7 MHz bandwidth is used in the VHF band, the 8 MHz bandwidth is used in the UHF band.
Stream	Priority setting for *Hierarchical* mode: high or low priority.

Measurement Delay

Measurement Delay (sec)

Sets the delay between consecutive measurements.

Measured Parameter Sets

It is possible to measure with a higher rate than one measurement per second. The measurement delay may be set to zero. In this case the TSM-DVB *variant 02* will take approximately 250 ms for all possible measurement values. *Variant 10* needs approximately 600 ms. It is also possible to use only one channel. With only one channel and all measurement sets disabled it is possible to measure with a rate of 1/15 s. The basic measurement parameters (RF level, MER, BER, PER and signal status) are always measured. For a reduction of measurement time it is possible to disable the measurement of some parameters.

Channel 1/ Channel 2	Defines which channel should be measured.
C/N+I	Carrier to Noise and Interference Measurements.
TPS	Inner interleaver, DVB-H signaling, DVB-H Time Slicing, DVB-H MPE FEC (only *var. 10*).
TPS Field	TPS bits b16 to b55 (only *var. 10*).
Accurate Level	Accuracy of level measurement is reduced to 3 dB instead of 2 dB (only *var. 10*).
Constellation Diagram	No data for the constellation diagram will be measured (only *var. 10*).

Calibrate…

Opens a submenu for an RF input level calibration of the R&S TSM-DVB using an external signal generator R&S SFQ (or SFU). The signal generator provides an RF input signal for the R&S TSM-DVB that is varied over its entire input power and frequency range. The known input power is used for a correction of the R&S TSM-DVB *RF Level* reading.

The R&S SFQ must be connected to the local PC using the GPIB (IEEE) bus connector. The entire calibration procedure is controlled automatically via GPIB bus; no additional settings at the R&S SFQ (or SFU)are required. The R&S TSM-DVB also provides a calibration verification procedure that can serve as a quick check whether a new complete calibration is necessary.

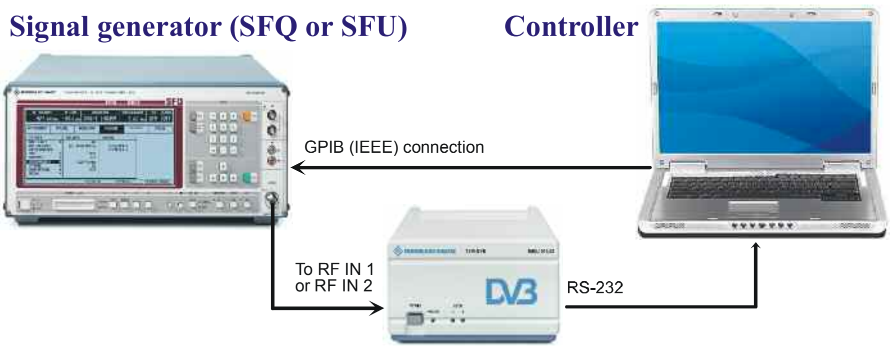


Fig. 6-69 R&S TSM-DVB calibration – test setup

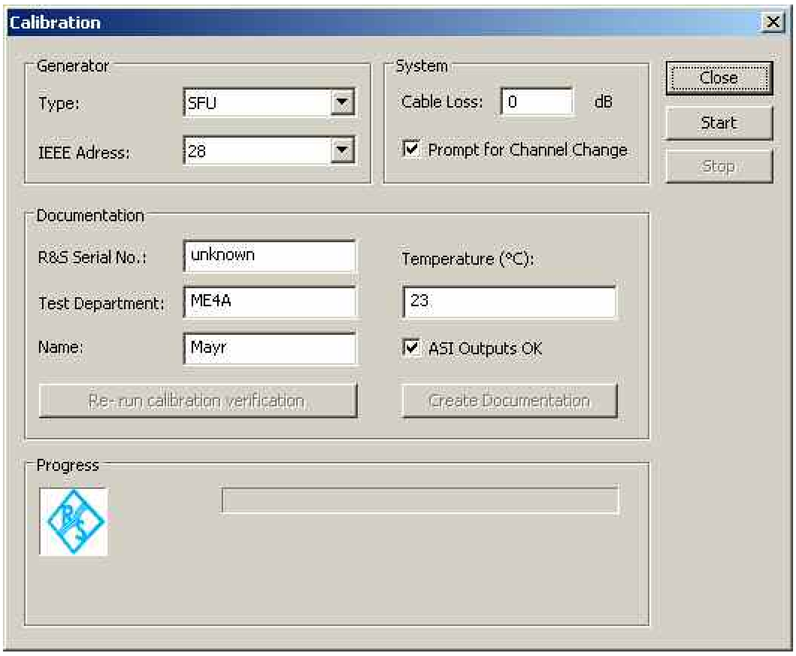


Fig. 6-70 R&S TSM-DVB Configuration – Calibration

Generator

Generator type (SFQ, SFU or SFL-T) and GPIB/IEEEE address of the signal generator in the test system.

System

ROMES can take into account a known cable loss between the generator output and the R&S TSM-DVB RF input. The R&S SFQ (or SFU) RF signal must be applied to both RF inputs of the R&S TSM-DVB. This can be done in two different ways:

- If *Prompt for Channel Change* is selected, then the inputs are calibrated one after another. A message indicates the RF input to be connected to the R&S SFQ RF output connector.
- If *Prompt for Channel Change* is cleared, then the inputs are calibrated simultaneously. A power splitter is used to feed the generated RF signal to both RF inputs.

Documentation

Input of user information to be included in the calibration documentation. In addition to the user information the documentation file contains the calibration verification data acquired in an automatic verification procedure after the end of the calibration.

The documentation is stored in a file named *TC_xxxx.RTF* where *xxxx* denotes the Teamcast serial no. of the receiver module. This file is stored in the *Driver* subdirectory of the ROMES program directory. The *Documentation* panel provides the following additional control elements:

- *ASI Outputs OK* can be written to the documentation file after a manual change of the R&S TSM-DVB ASI outputs.
- *Re-run Calibration Verification* initiates a new verification procedure (duration: approx. 3 minutes). The verification information indicates whether a new calibration is needed.
- *Create Documentation* updates the documentation file using the current user and verification information.

Start / Stop / Progress

The calibration can be started after completing the test setup and performing the necessary settings at the signal generator. The progress is monitored in the *Calibration* dialog. The complete calibration takes approx. 80 minutes.

Antenna R&S TSM-DVB

The *Antenna* tab sets RF parameters such as the cable loss caused by the test setup, the type and gain of the antenna(s) used. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

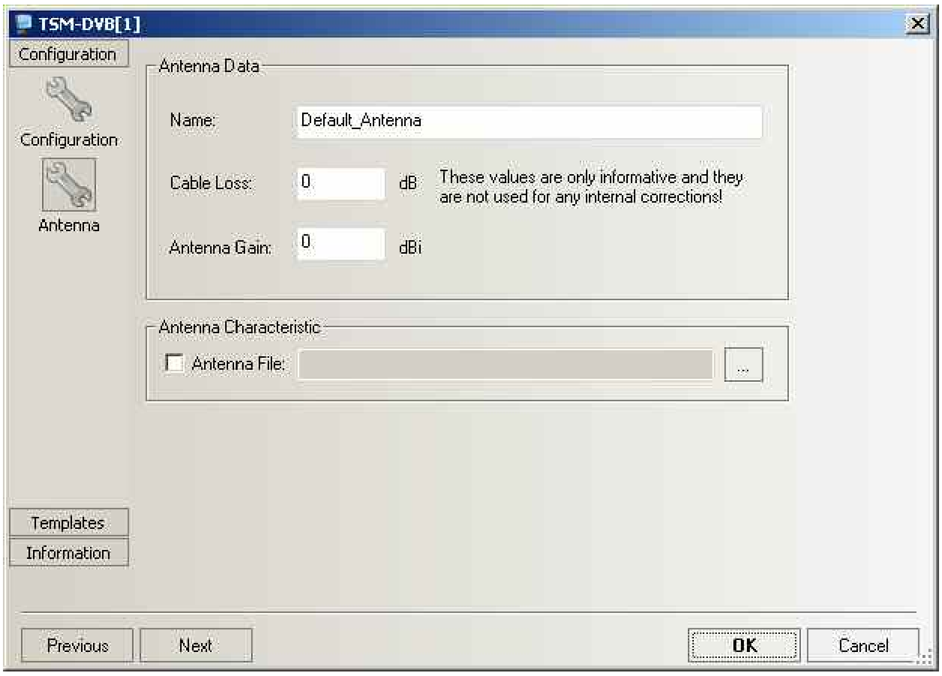


Fig. 6-71 R&S TSM-DVB driver configuration: Antenna

Antenna Characteristic

If the checkbox to use an antenna file is activated, an antenna frequency response file can be imported, e.g. in order to calculate the RF power in basic views.

The antenna file is in .csv format (Comma Separated Values)

```
f1 [MHz], Delta Level 1 [dB]
f2 [MHz], Delta Level 2 [dB]
f3 [MHz], Delta Level 3 [dB]
...
fn [MHz], Delta Level n [dB]
```

where n >= 2 and f is formatted as x.xx (the number of decimals does not matter, but the period is mandatory, e.g. "345" is not a valid frequency value, but "345.0" is). Values between frequency values in the list are interpolated.
Here is an example for a csv antenna file for typical R&S TSM-DVB frequencies:

```
320.0, -1.5
345.5, -1.1
362.5, -0.65
385.0, 0.5
410.0, -0.5
455.0, -0.8
460.0, -1.15
470.0, -1.65
485.5, -2.1
492.5, -2.0
505.0, -1.5
```

Templates R&S TSM-DVB

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. It is provided for many test device drivers and is identical for all of them.

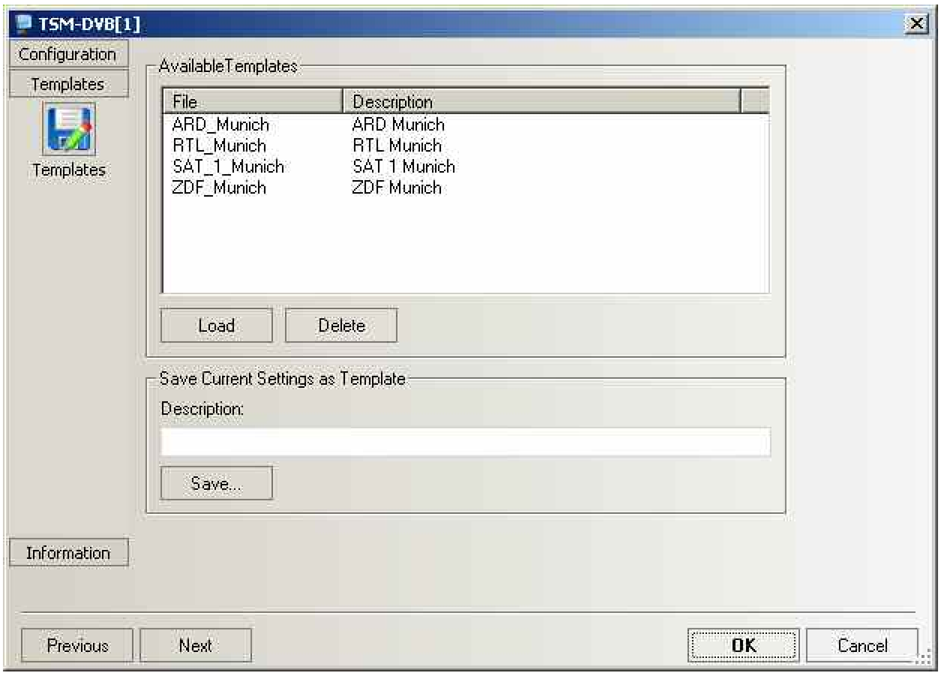


Fig. 6-72 R&S TSM-DVB driver configuration: Templates

Serial Port Driver Info R&S TSM-DVB

The *Serial Port Driver Info* tab of the configuration menu displays information about the file version of the current driver, the product name, and the manufacturer. In addition, it shows the serial port assigned to the driver and the transmission parameters.

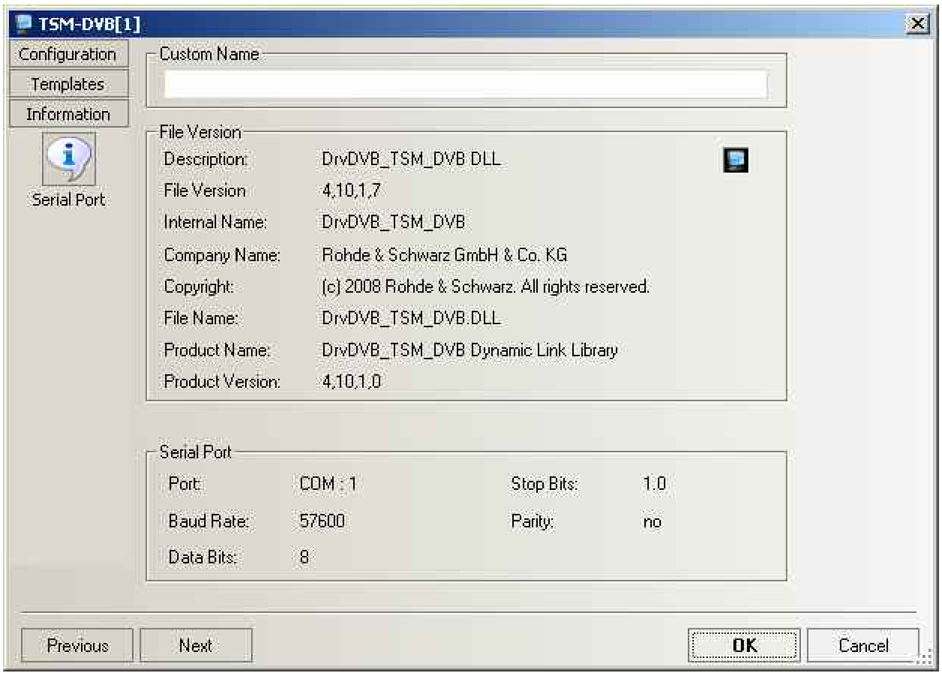


Fig. 6-73 R&S TSM-DVB driver configuration: Serial Port

ETL Driver

The ETL Driver (option ROMES3ETL) offers the possibility to integrate the ETL TV analyzer into the ROMES measurement system. Therewith the ETL TV analyzer can be utilized for DVB-T drive tests.

After connecting the ETL to the R&S ROMES Measurement PC, the new driver can be loaded via the ‘Load/Unload Drivers’ dialog. After selecting *ETL* the user is prompted for the ip address of the ETL device. Once the driver has been loaded, the ETL device is ready for a measurement with default parameters. Assign IEC / LAN Bus. The standard bus is LAN. All ETLS LAN IEC Bus are optional.

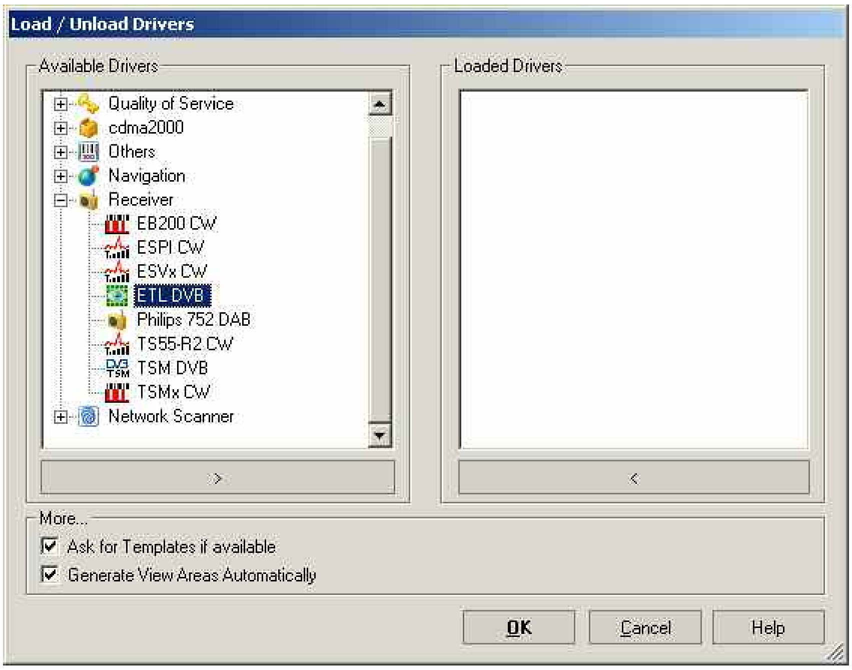


Fig. 6-74 Hardware Configuration – Load/Unload ETL driver

Fig. 6-75 Hardware Configuration – Assign IEC / LAN Bus

Note:

Default Assignment is a LAN connection with IP address, all ETL devices are equipped with a LAN connection. IEC bus is not supported by R&S ROMES.

Configuration ETL driver

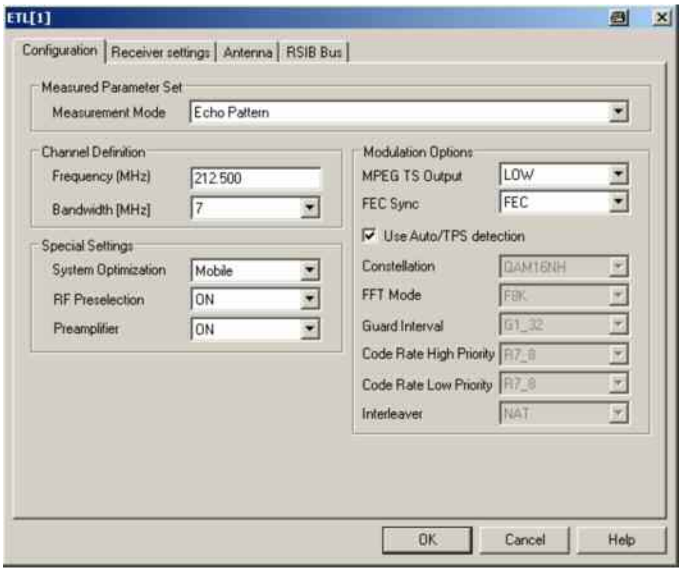


Fig. 6-76 ETL driver configuration: Configuration

Measured Parameter Set

Choose type of measurement mode, currently there are three different modes. Due to some limitations of the ETL this measurements can not be done simultaneously.

- Echo pattern measurement
- Constellation diagram
- Modulation Error measurement

Channel Definition

Define the measured channel by specifying *bandwidth* and *frequency*.

System optimization

Slow/Laboratory The *Slow/Laboratory* setting optimizes the receiver for stationary operation, i.e. for measurements directly on the transmitter. It mainly results in narrowband interpolation of the scattered pilots available in the DVB-T/H signal.

In the Fast/SFN mode, the pilots are interpolated (channel estimation) using a medium bandwidth. The receiver is thus optimally set for transmission channel conditions that change moderately with respect to time. This is, for example, the case with reception within a single-frequency network (SFN).

In the Mobile mode, the receiver is optimally set for reception in mobile operation. Mobile reception is primarily characterized by very fast changes of the transmission channel's frequency response.

Preselection

Switches on/off the preselection for the instrument.

Preamplifier

Switches on/off the Preamplifier for the instrument.

Modulation Options

MPEG TS Output Selects the low or high priority data stream of a hierarchical DVB-T signal. For non-hierarchical signals, this parameter has no influence.

FEC Sync Instructs the receiver to take the synchronization status of the forward error correction (FEC) into account as a synchronization criterion of the entire demodulator.

Use Auto/TPS detection Certain modulation parameters contained in TPS carriers (transmitter parameter signaling) are determined automatically i.e. read from TPS, If *Use Auto/TPS…*is not set they must be set manually.

Constellation Used in the transmitter, e.g. 64QAM.

FFT Mode Used in the transmitter, e.g. 8K.

Guard Interval Used in the transmitter in order to prevent intersymbol interference, e.g. 1/4.

Code Rate High Priority Code rate of the high priority data stream for hierarchical signals.

Code Rate Low Priority Code rate of the low priority data stream for hierarchical signals. For non-hierarchical signals, this parameter has no influence.

Interleaver sets the symbol interleaver mode (Native or In-depth).

Receiver Service ETL driver

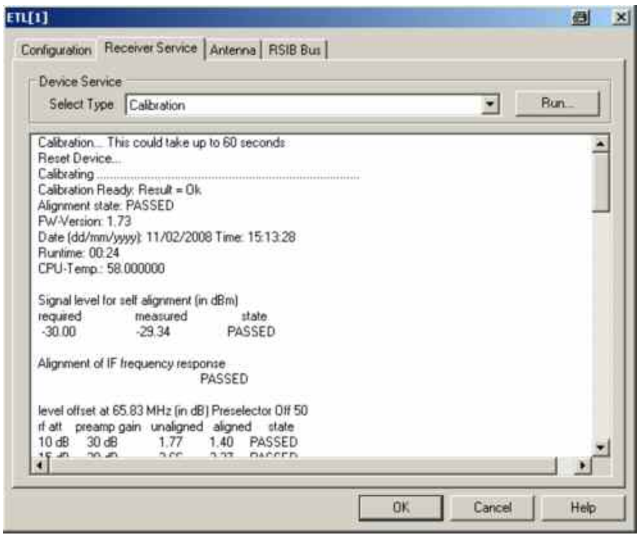


Fig. 6-77 ETL driver configuration: Receiver Service

Device Service Following Services are available:

- Run Self test or Calibration of the device
- Obtain information about the calibration status

Obtain information about the status of the device.

Antenna ETL driver

The *Antenna* tab sets RF parameters such as the cable loss caused by the test setup, the type and gain of the antenna(s) used. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors. Or detailed explanations refer to Antenna R&S TSM-DVB on p.6.138.

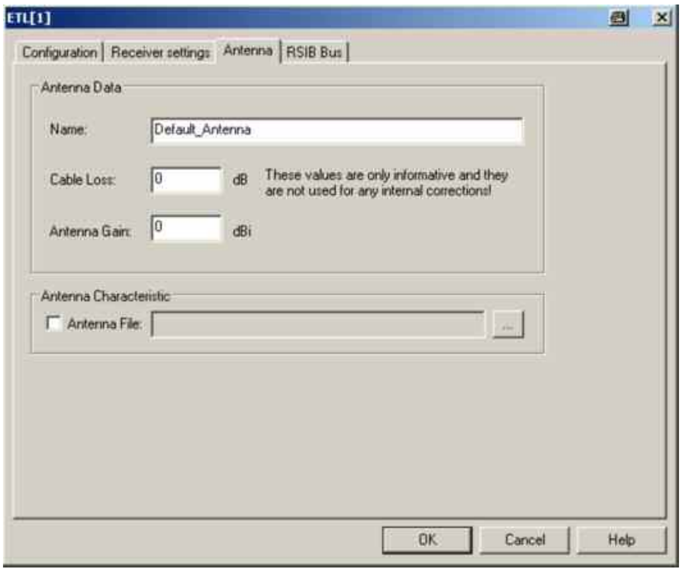


Fig. 6-78 ETL driver configuration: Antenna

RSIB Bus ETL driver

The *RSIVB BUS* tabs display information on the software version of the driver and the used IEC/LAN connection. The ETL driver shows the IEC bus board number or IP address, depending on the selected connection type.

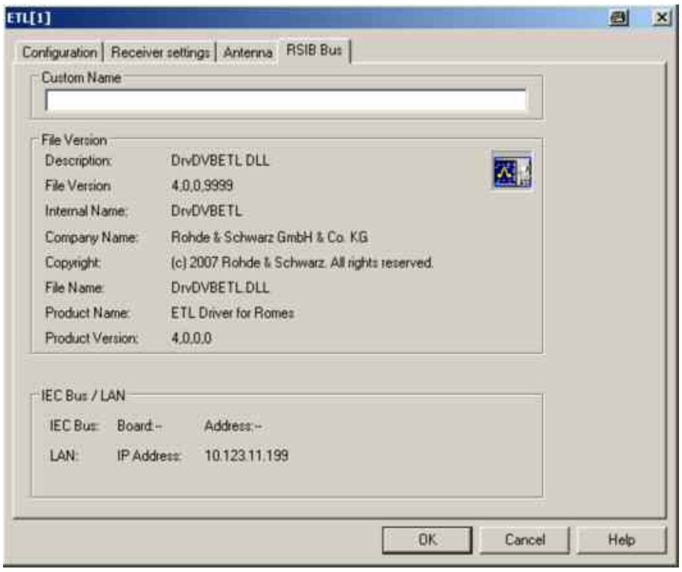


Fig. 6 83 ETL driver configuration: RSIB Bus

Test Receiver Drivers

The measurement system offers five different test receiver drivers to be used with the test receivers from Rohde & Schwarz (R&S ESPI, R&S ESVx,R&S TSMx, EB200, TS55-R2).

R&S ROMES offers drivers for all types of test receivers. Installation of the drivers is explained in section *Driver Installation* on page 6.1; their configuration is explained below. The test receiver data can be viewed in all *Basic Views* (see chapter 3).

Supported Devices Test Receiver

The R&S ESVx driver supports the receivers of the ESxx family by Rohde & Schwarz listed in the following table.

Table 6-12 Test receiver family ESxx

Receiver type	Bandwidths supported by ROMES / kHz	Detectors available
ESVD	10, 120, 300, 1000	Peak, Average
ESVB	10, 120, 300, 1500	Peak, Average, RMS
ESVB12	10, 120, 300, 8000	Peak, Average, RMS
ESVS10	10, 120	Peak, Average
ESVS20	10, 120	Peak, Average
ESVS30	10, 120, 300, 1000	Peak, Average
ESN	1, 3, 9, 15, 120, 250	Peak, Average, RMS
ESVN20	1, 3, 9, 15, 120, 250	Peak, Average, RMS
ESVN30	1, 3, 9, 15, 120, 250	Peak, Average, RMS
ESVN40	1, 3, 9, 15, 120, 250	Peak, Average, RMS
ESPC	10, 120	Peak, Average

- The R&S ESPI driver supports the R&S ESPI test receiver from Rohde & Schwarz.
- The R&S TSMx driver supports the R&S TSMU/R&S TSML-CW/R&S TSMQ test receivers. For ROMES, R&S TSMx firmware version 11.xx or higher is required.

Resources Configuration Test Receiver

The test receiver drivers are installed by selecting *CW Receiver* in the *Load/Unload Drivers* window (see Fig. 6-1 on page 6.3). The resources needed differ according to the test receiver. The installation of all test receiver drivers is described in section *Test Receiver Drivers* on p. 6.14 ff.

R&S ESVx Driver The R&S ESVx driver requires:

- The IEC/IEEE bus interface (here: GPIB7210) with the corresponding driver. GPIB7210 driver versions for different operating systems are located on the hard disk after ROMES installation, see subdirectory Install\IEEE Interface of the program directory.
- The Trigger Box as external trigger unit, which needs a COM port as control interface.

R&S ESPI Driver

The R&S ESPI driver requires:

- Either the IEC/IEEE bus interface (GPIB7210) or LAN interface with the corresponding driver. The LAN interface is provided as an option (FSP-B16). The GPIB7210 driver for Win XP is located on the ROMES DVD under <DVD>\Firmware & Drivers\IEEE Interface\IEEE NI\
- The Trigger Box (one COM port required) which serves as an external trigger unit, in case Distance Triggered recording is needed. The R&S ESPI receiver can also be used without the Trigger Box (Time Triggered recording only).

R&S TSMx Driver

The R&S TSMx driver requires:

- An IEEE 1394 Firewire interface, controlled by means of the Rohde & Schwarz Firewire driver.

The Trigger Box cannot be used together with the R&S TSMx units, because these have a built-in triggering unit.

EB200 Driver

The EB200 driver requires:

- Either the serial RS232 interface or LAN interface with the corresponding driver. Both interfaces are optional; at least one of them is provided on each unit.
- The Trigger Box (one COM port required) which serves as an external trigger unit, in case Distance Triggered recording is needed. The EB200 receiver can also be used without the Trigger Box (Time Triggered recording only).
- Firmware version 2.50 or higher in EB200 and 1.50 or higher in ESMB. It is recommended to install the latest firmware version, which can be found on the ROMES DVD in the *Firmware & Drivers* directory.
- Software option EB200CM (Coverage Measurement) for EB200, if the EB200 test receiver is used.

TS55-R2 Driver

The single-board receiver driver require:

- A COM port for the receiver
- The Trigger Box (one COM port required) which serves as an external trigger unit, in case Distance Triggered recording is needed. The TS55-R2 receiver can also be used without the Trigger Box (Time Triggered recording only).

Configuration Menus Test Receiver

ROMES provides configuration menus for the test receiver drivers and for the Trigger Box. Both configuration menus are accessed by clicking the corresponding *Driver...* command lines in the *Hardware* menu that are available as soon as the drivers are loaded.

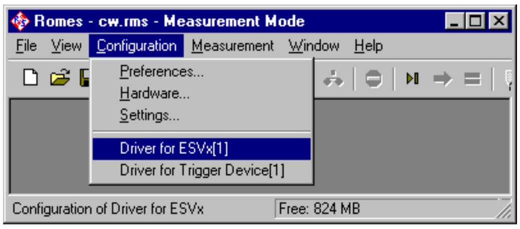


Fig. 6-79 Accessing the test receiver driver configurations

Note:

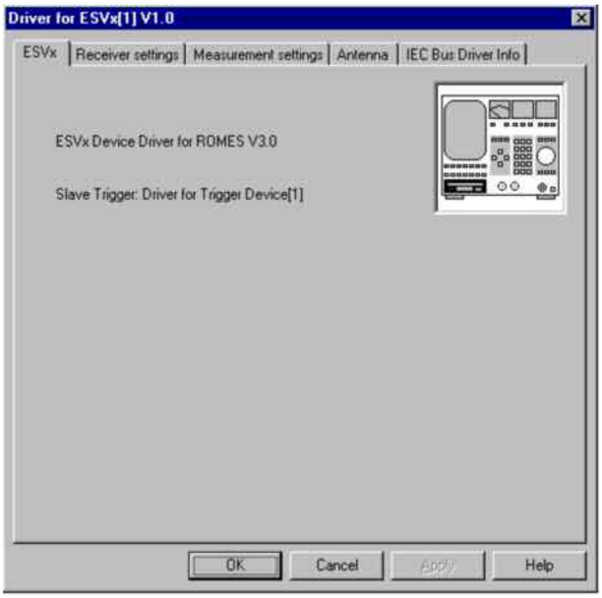
The number of test receiver signals that are displayed in the data trees can be limited in the Configuration of Software Modules menu; see section TEC for CW Devices in chapter 3.

Test Receiver Configuration

The test receiver configuration menus contain several tabs to display information on the test receiver driver and configure the *Receiver settings*, the *Measurement settings* (channel selection and trigger), and the *Antenna* parameters.
The *Driver Configuration* menus are opened by clicking the *Driver…* command lines in the *Hardware* menu which are available as soon as a receiver driver is loaded (see *Fig. 6-79*). Besides, they are opened automatically whenever a driver for a receiver which does not conform to the default configuration settings is loaded, i.e. on confirming the driver selection and port assignment made in the *Hardware Drivers* menu (see Fig. 6-1 on page 6.3).

R&S ESVx/R&S ESPI/R&S TSMx

The *R&S ESVx/R&S TSMx* tabs indicate the driver version and the slave trigger.



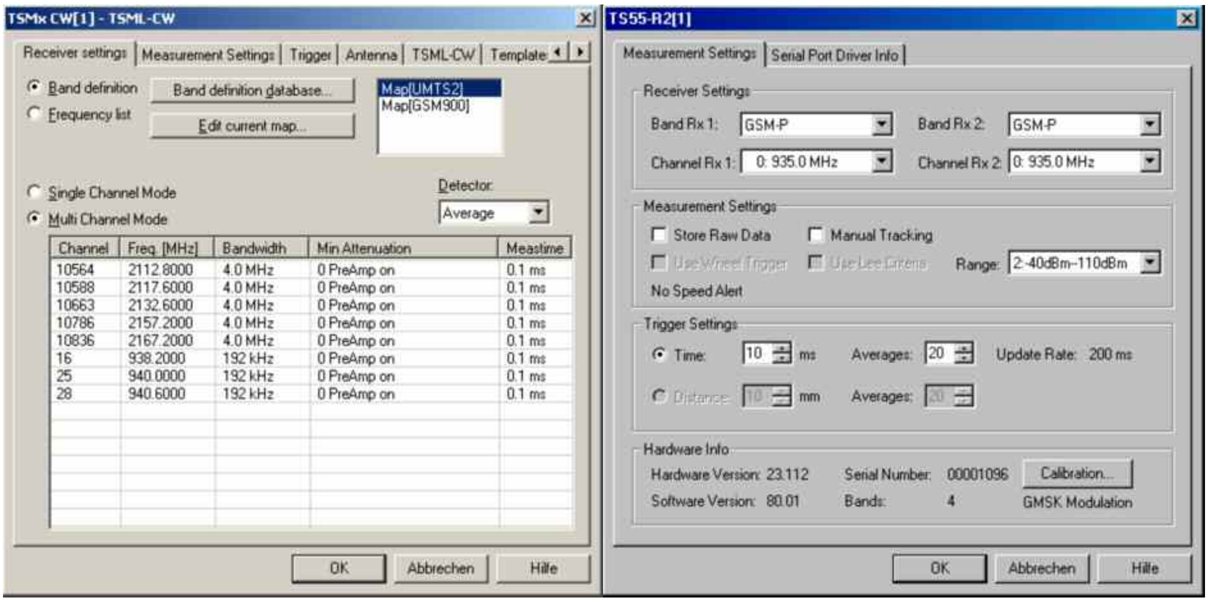


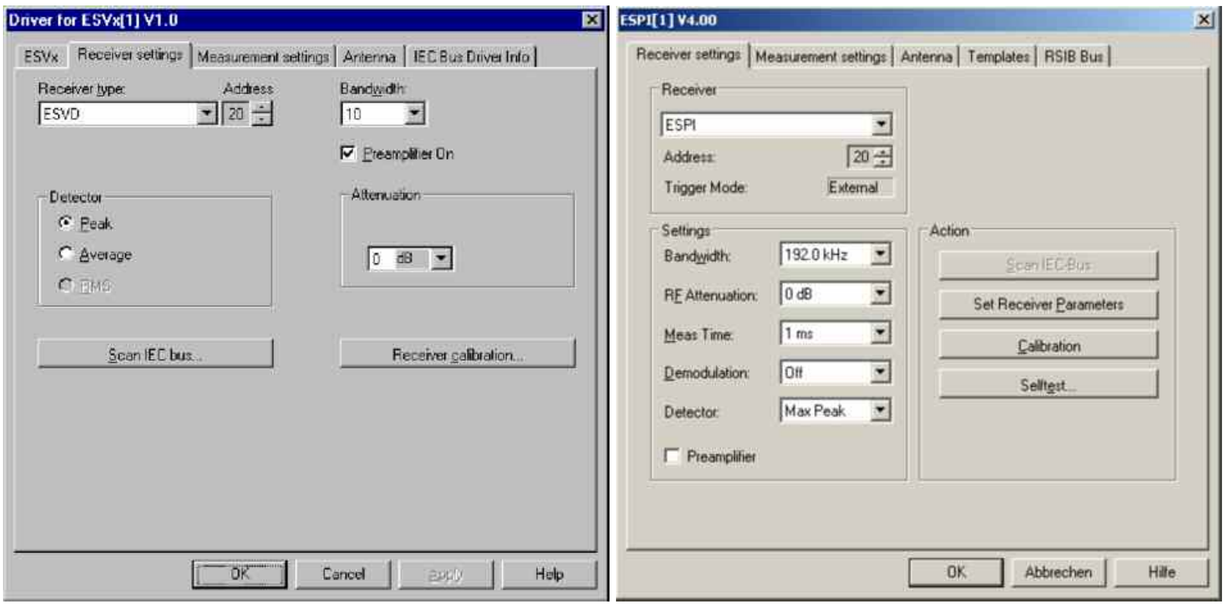
Fig. 6-80 Test receiver driver configuration – R&S ESVx/R&S ESPI/R&S TSMx

The R&S TSMx properties and available options are also displayed in the Device Chooser (R&S TSMx) described on p. 6.29.

Receiver settings

The *Receiver Settings* tab selects the receiver type and receiver parameters. All settings are explained in more detail in the test receiver manuals.

If the settings in the *Receiver Settings* tab do not comply with the connected test receiver, the tab is opened automatically while the driver is installed; see section *Test Receiver Drivers* on p. 6.14 ff.



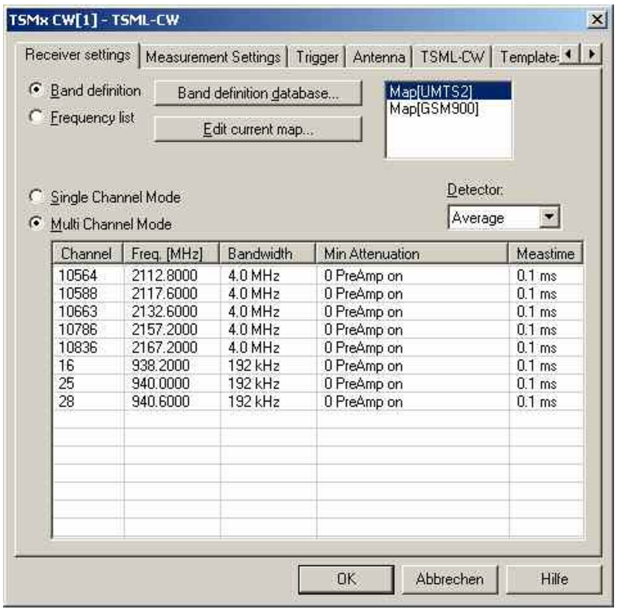


Fig. 6-81 Test receiver driver configuration – Receiver settings

Receiver type/ Receiver Option

The *Receiver (type)* pull-down list indicates all receiver types supported by the driver (see section *Supported Devices* on page 6.146). The used receiver can be selected from the list.

The R&S ESPI driver configuration menu also indicates whether an internal trigger is used. With internal trigger, no Trigger Box is used and the measurement must be triggered by time (see p. 6.157).

Address TCP/IP Address

The *Address* input field sets the IEC/IEEE bus address of a test receiver that is connected via IEC/IEEE bus interface, see paragraph entitled *Allocating a valid IP address* on p. 6.16. This input field is available for R&S ESVx and R&S ESPI drivers only. If the R&S ESPI driver is assigned to a LAN interface (see section *Test Receiver Drivers* on p. 6.14 ff.) the IEC/IEEE bus address is ignored.

Attenuation

Autoranging is switched off at the start of a measurement and the attenuation is set to the fixed value entered here.

Preamplifier

The internal preamplifier of the ESVD and R&S ESPI can be switched on (box checked) or off.

Bandwidth

Pull-down list of all available receiver bandwidth settings (in kHz) for the selected receiver type. For CW measurements in GSM networks, where the channel spacing is 200 kHz, a bandwidth of 300 kHz is sufficient. A bandwidth of 120 kHz should be used if the neighbor channels are at high signal power.

Note:
A small bandwidth reduces the measurement speed when more than one channel is used.

Detector The *Detector* panel selects a method of weighting the received signal levels and deriving the measurement curve from the entire set of measurement results. The test receivers provide different detectors described in the receiver manuals.

Demodulation The *Demodulation* field provides a pull-down list to select the type of demodulation or switch off the demodulation completely. The test receivers provide different demodulation types described in the receiver manuals.

Meas. Time The *Meas. Time* field provides a pull-down list to select the time during which the test receiver acquires the measurement points that its detector weights and processes together; see receiver manuals.

GC Selects a gain control factor to control the sensitivity of the receiver. In the AGC (Automatic Gain Control) setting the GC factor is automatically adapted to the input signal level; see receiver manual.

Scan IEC bus... The *Scan IEC bus* button detects all connected devices and their IEC(IEEE)-bus addresses, see receiver manuals.

Receiver calibration.../ Calibration The *Receiver calibration* or *Calibration* buttons start the short receiver calibration, see receiver manual and section *R&S Test Receiver Calibration* on p. 6.169 ff. A message indicates the end of the calibration:

Selftest.../ Test The *Selftest* or *Test* buttons initiate a self test of the test receiver. In the case of the R&S ESPI receiver, R&S ROMES displays the following report when the self test is terminated:

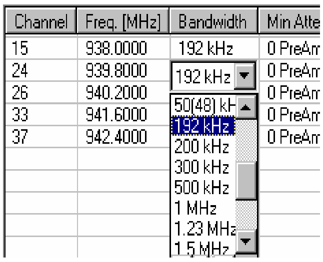
Channel selection (R&S TSMx)

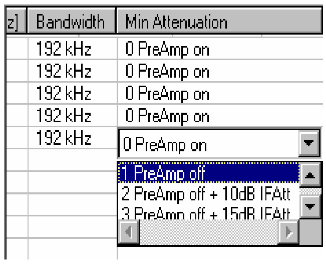
The channels selection for the R&S TSMx is analogous to the other test receivers. For a description of the *Band definition* and *Frequency list* refer to the *Channel selection* paragraph on p. 6.153.

The R&S TSMx provides the most flexible receiver settings of all test receivers:

Several bands (GSM900/GSM-P, GSM-E, GSM-R, GSM1800 etc.) and even several technologies (GSM, UMTS,…) can be measured simultaneously.

The *Bandwidth* and the *Min. Attenuation* can be selected individually for each channel. A click on the cells in the channel list opens pull-down menus, e.g.:

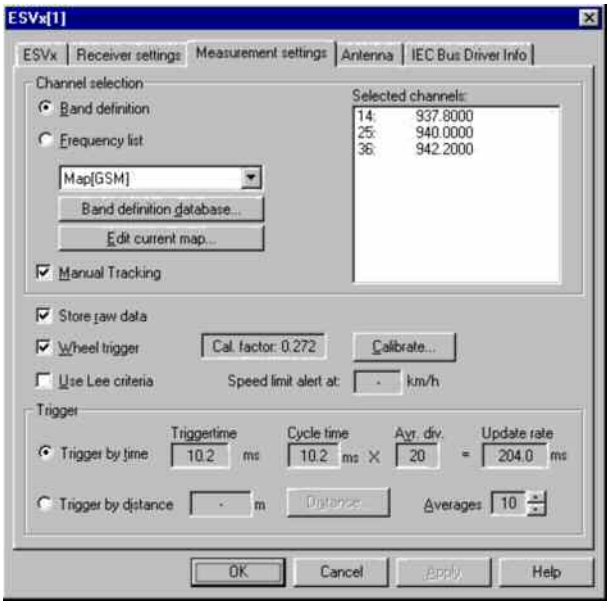


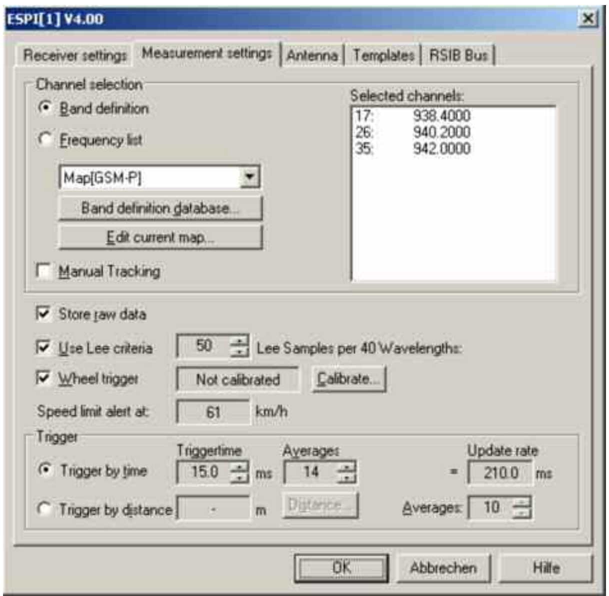


For more information refer to the Technical Information for the R&S TSMU CW Driver *ROMES3T15*.

Measurement settings Test Receiver

The *Measurement Settings* tab controls the channel selection, data storage, and provides a variety of trigger options.





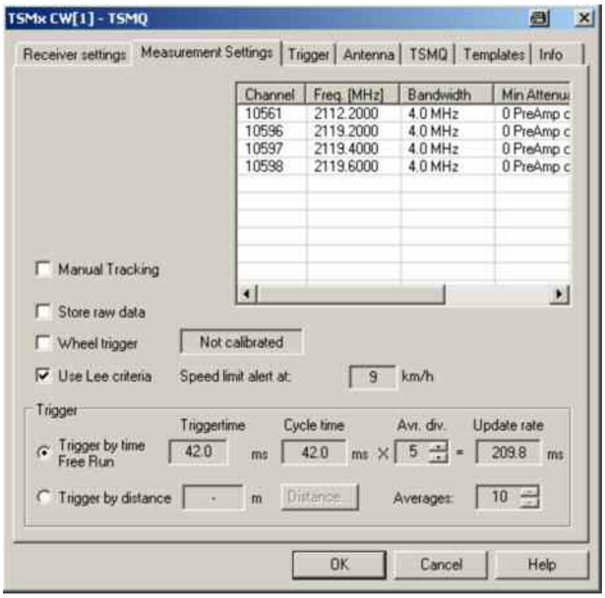


Fig. 6-82 Test receiver driver configuration – Measurement settings

Channel selection

The *Channel selection* panel specifies the radio channels to be measured. The channels can be selected in two alternative ways:

Band definition Channels are selected from a band, i.e. a continuous range of channels with constant spacing. This method is appropriate for radio networks with equidistant channels such as GSM.

Frequency list Channels are selected from a list of specific frequencies. This method is appropriate for radio networks with non-equidistant channels such as DAB.

The panel provides further controls and output fields:

Selection window Pull-down list showing all available *Band definition* and *Frequency list* channel maps.

Selected channels Channel numbers and frequencies in the map shown in the selection window.

Note on R&S TSMx:
The selected channels are shown in the Measurement Settings *tab, however, the selection is made in the* Receiver Settings *tab.*

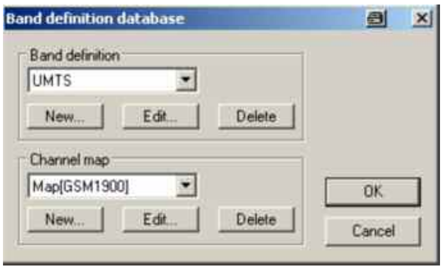
Manual Tracking

If the box is checked, the R&S ESVx, R&S ESPI, or R&S TSMx test receiver is set to manual tracking mode. In this mode, a channel list is defined using the *Band definition* or *Frequency list* options, however, the receiver measures on only one channel that can be selected or changed manually. To change the channel, the *Action* menu must be used; see section *Action Menu Test Receiver* on p. 6.167 ff. The current measurement frequency can be viewed in the *CW Tracking Info View;* see chapter 4.

The buttons below the selection window depend on the way the channels are selected:

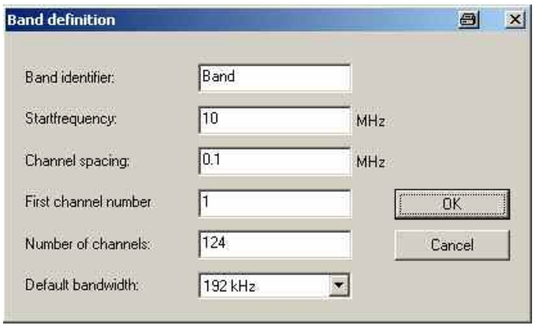
Band Definition Database

Opens the menu for editing the database containing all channel selections created via *Band definition*.



In the *Band definition database* dialog, the existing *Band definitions* and corresponding *Channel maps* are shown in the pull-down lists of two analogous panels. The three buttons below create a new element of the list *(New...),* view without editing *(View...), Edit,* or delete *(Delete...)* the selected element.

The *New...* button in the *Band definition* panel opens the *Band definition* dialog:

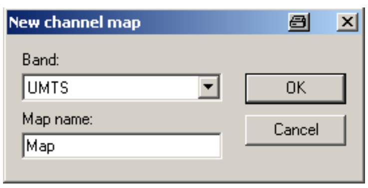


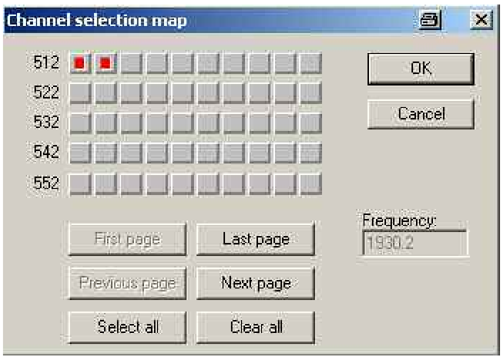
A band is specified by a *Start frequency* (f_{init}) with corresponding *First channel number* (n_{init}), a constant *Channel spacing* (Δf), and the *Number of channels* (n). For n_{init} through n_{init} + n, the channel frequencies f_i are determined according to the linear equation:

$$f_i = f_{init} + (i - n_{init})\Delta f \ ; \quad i = n_{init} \ldots n_{init} + n$$

The *Band identifier* is a user-defined name which allows to distinguish between different bands. Note that, in contrast to the channel map, the band definition can not be modified after it is stored via the *OK* button.

The *New...* button in the *Channel map* panel opens the *Channel selection map* dialog:





The *Channel selection map* dialog shows all channels defined in the current band, represented by small square buttons arranged in several rows. If necessary, the diagram consists of several pages that can be scrolled using the *First page, Last page, Previous page*, and *Next page* buttons. An individual channel can be selected via mouse-click; moreover, it is possible to select all channels or clear the current selection. If a channel is selected, the corresponding frequency is shown in the *Frequency* field.

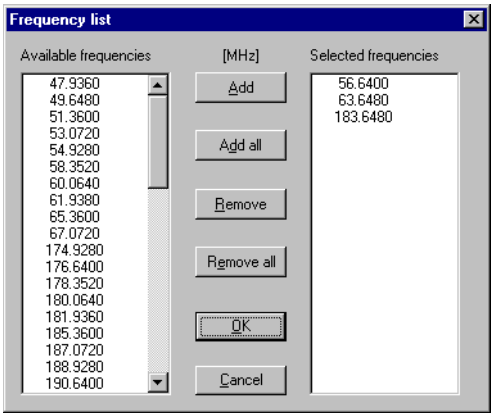
An existing channel map can be modified via the *Edit..* button of the *Band definition* database dialog or via the *Edit current map...* button of the *Measurement Settings* tab. It can be renamed in the *Channel map* entry field of the *Band definition database* window.

After quitting the *Channel selection map* with *OK*, the selected channels will be shown in the *Selected channels* field of the *Driver Configuration* menu.

Frequency list

Opens the menu for editing the database containing all channel selections created via *Frequency list*.

In the *Frequency list* dialog, the frequencies to be measured can be selected from a list of *Available frequencies*.



Store raw data

If the *Store raw data* box is checked the raw data, i.e. all measurement data taken by the test receiver, are saved with the measurement file. Otherwise, only the averaged data is saved.

(Use) Wheel Trigger

If the *Wheel trigger* box is checked, a wheel trigger is used to monitor the distance driven with the measurement vehicle.

Calibrate...

A *calibration factor* (equal to the distance driven per trigger pulse) can be determined to convert the trigger pulse scale into a length scale. Calibration of the wheel trigger is also accessible from the *Trigger Box* configuration menu; for more information see section *Trigger Box Configuration* on p. 6.163 ff.

Use Lee criteria

If the *Use Lee criteria* checkbox is checked a speed limit alert message will be issued when the vehicle drives faster than the Lee speed. When distance trigger is in use (see below), the trigger distance will be corrected at the same time.

The Lee speed is indicated in the output field to the right of the *Use Lee criteria* checkbox.

The Lee criteria are derived from a statistical model describing the geographical distribution of the field strength in mobile communication networks and its variation in time. The model provides an averaging procedure for the field strength in typical coverage situations, where random, non-reproducible variations are smoothed out but the relevant information (e.g. the attenuation of the field strength due to long-term fading) is preserved in the averaged data.

Lee's averaging model

According to Lee, the field strength should be averaged over a length of approx. $L = 40\lambda$ (where λ denotes the carrier wavelength of the network); a reasonable number of test points is $N = 50$ for each radio channel measured. Assuming an average measurement time for a single test point of $T = 2.5$ ms and n different channels, this yields a maximum speed of the test vehicle (Lee speed) of

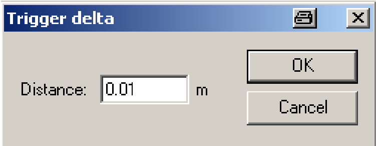
$$V_{Lee} = \frac{L}{NnT} = \frac{40 \times 10^3}{n \times 50 \times 2.5s} \lambda \approx \frac{360}{n} \frac{\text{km}}{\text{h}} \quad \text{for GSM900} \qquad \textit{(Equation 1)}$$

The Lee speed decreases as λ gets smaller (e.g. for GSM1800) or as the number of test points N is increased for the sake of accuracy. It also decreases if the number of channels or the measurement time of the test receiver increases, e.g. due to a reduction of the resolution bandwidth.

Trigger

The *Trigger* panel specifies how the measurement is triggered. This can be done in two alternative ways:

Trigger by time	The time between two measurements (trigger time) is specified.
Trigger by distance	The distance driven between two measurements (trigger distance) is specified in a dialog



All controls of the *Trigger* panel depend on the trigger mode.

Trigger by time

The *trigger time* is the time between two consecutive measurement data sets containing the data for all selected channels. The default trigger time corresponds to the fastest trigger rate (minimum measurement time) of the used test receiver, i.e. to the quantity nNT in *(Equation 1)*.

Enlarging the trigger time reduces the amount of raw data generated such that a doubled trigger time results in about half as large a data file. The Lee speed limit decreases according to *(Equation 1)*.

The following parameters configure the time trigger:

Trigger time	Time between two measurements (see above), to be adapted to the expected maximum speed of the test vehicle.
Averages	Number of samples (measurements) taken per fixed distance for each channel (i.e. the quantity N in *(Equation 1)*) in the range of 1 to 100. In the Trigger by time mode, this value can also be changed to modify the Lee speed limit. A low value increases the Lee speed limit at the expense of accuracy.
Cycle Time	Measurement time for all selected channels (fixed). This is roughly equal to the step width (i.e. minimum trigger time for one channel) multiplied by the number of selected channels.
Average divider	Number of data collected for averaging (different from the quantity N in *(Equation 1*, adjustable). The minimum value is automatically set such that the Update rate (see below) is not below 100 ms. This parameter does not depend on the raw data and has therefore no impact on the Lee criterion.
Update rate	Time needed to collect an averaged measurement data set for all selected channels (fixed). The update rate must not fall below 200 ms, otherwise the average divider is increased.

Trigger by distance

The *trigger distance* is the distance between two measurement sets containing the data for all selected channels. The default setting is the maximum distance according to Lee.

The following parameters configure the distance trigger:

Distance... Trigger distance, can be modified if no Lee trigger criterion is used (the *Use Lee criteria* checkbox is unchecked). With the Lee criterion, the trigger distance is calculated as a function the *Averages* value set, see below.

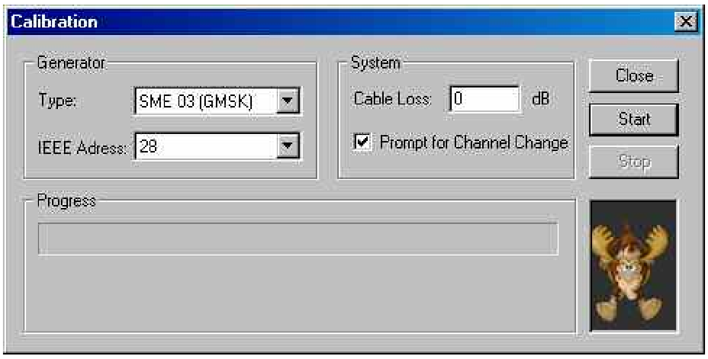
Averages Number of samples (measurements) taken per fixed distance for each channel (i.e. the quantity N in *(Equation 1)* in the range of 1 to 100. If the Lee criterion is applied, a higher *Averages* value reduces both the trigger distance and the Lee speed limit.

The maximum speed according to Lee is always shown in the *Speed limit alert at: ...* field, see above. Before starting the measurement tour, check whether the speed limit is sufficiently high. E.g. a limit of 20 km/h is far too low for reasonable driving. In this case

- ➢ Increase the receiver bandwidth (a larger bandwidth reduces the measurement time T and thus enhances the speed limit), if possible
- ➢ Reduce the number n of channels
- ➢ Reduce the number N of samples *(Averages,* in *Trigger by Distance* mode only)

Calibrate... (TS55-R2)

In the *TS55-R2* driver configuration menu, the *Calibrate…* button opens a menu to configure and start a receiver calibration:



The receiver calibration consists of measuring a known test signal with variable frequency and power and calculate a correction table that is stored in a *.cal file. The test signal settings are automatically controlled to cover the entire frequency and dynamic range of the receiver.

Generator Type Type of signal generator providing the test signal; R&S SMHU (CW) or R&S SME 03 (GMSK). GMSK modulation must be set explicitly at the SMHU; this improves the accuracy of GSM signal measurements. For CW signal measurements (e.g. if a CW test transmitter is used), it is recommended to use a SMHU generator providing a CW signal.

IEEE Address	IEEE address of the generator in the measurement system
Cable Loss	Entry of a known cable loss between the signal generator and the input of the receiver
Prompt for...	If the box is checked, the ROMES prompts with a message before changing the receiver/measurement channel; otherwise the calibration is performed without interruption. This option should be selected when calibrating both receivers Rx 1 and Rx 2, in particular if the test setup requires a change of the connectors.
Start	Start the calibration. The relative progress is indicated with a progress bar.
Stop	Stop a running calibration.
Close	Close the *Calibration* menu.

The generated calibration file, named C2_xxxxxxxx.cal (where xxxxxxxx denotes the serial no. of TS55-R2), is stored in the *Driver* subdirectory of the ROMES program directory.

Note:
The CW level calibration is mandatory when the TS55-R2 device driver for CW measurements is used for the first time (i.e. if no calibration file is found when the driver is loaded). For an overview of test receiver calibration see section R&S Test Receiver Calibration on p. 6.169 ff.

It is recommended to create a backup of the calibration file and store it to a separate directory.

Antenna Test Receiver

The *Antenna* tab defines *Antenna Name, Antenna Gain* and *Cable Loss*. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors. The antenna file is a *.csv file.

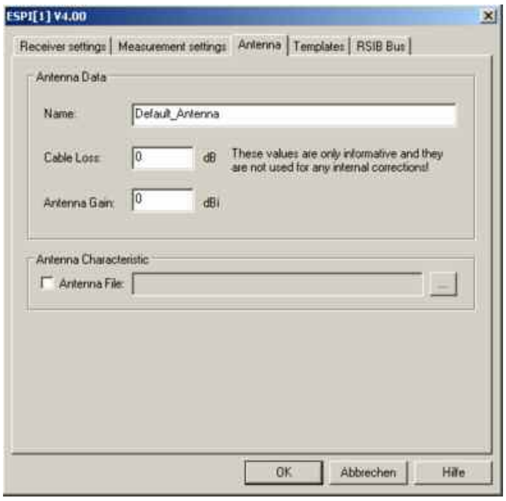


Fig. 6-83 Test receiver driver configuration – Antenna

Templates

The *Templates* tab stores the current R&S ESVx/R&S ESPI/R&S TSMx driver configuration as a template, lists, loads or deletes driver templates.

Note:
When a driver is loaded using Hardware – Add/Remove... (see section Driver Installation on p. 6.1 ff.) ROMES checks whether or not a driver template is stored in the Driver Templates directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

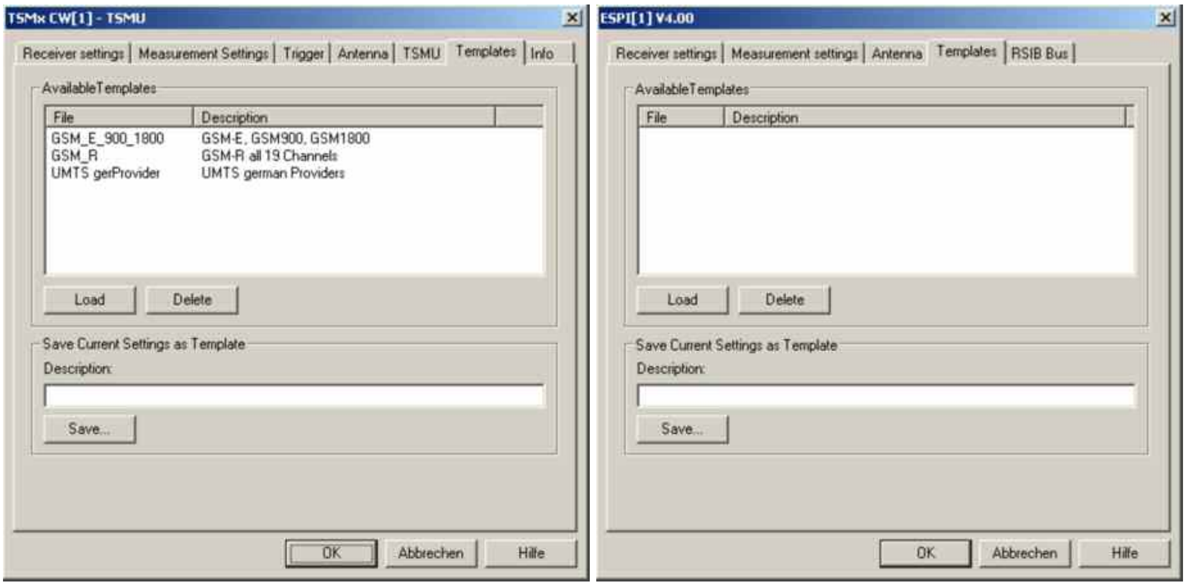
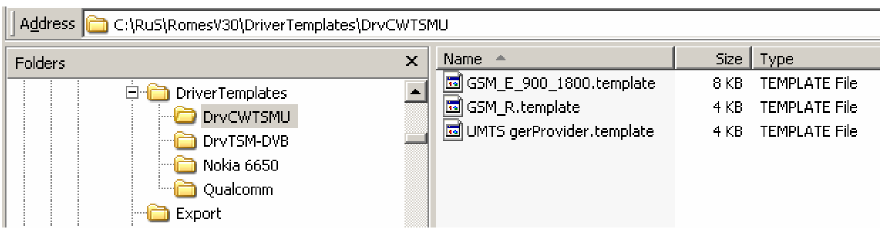


Fig. 6-84 Test receiver driver configuration – Templates

Load/Delete Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent of the workspace. A selection of template files for the R&S TSMx is supplied with the ROMES installation:



Save Saves the current driver settings together with the *Description* to a selected template file.

Info Test Receiver

The *Info* tabs display information on the software versions of the different drivers and the different types of connections. The R&S TSMx drivers display no connection information. The R&S ESVx driver shows the IEC/IEEE bus board number. The R&S ESPI driver shows IEC/IEEE bus or IP address, depending on the selected connection type.

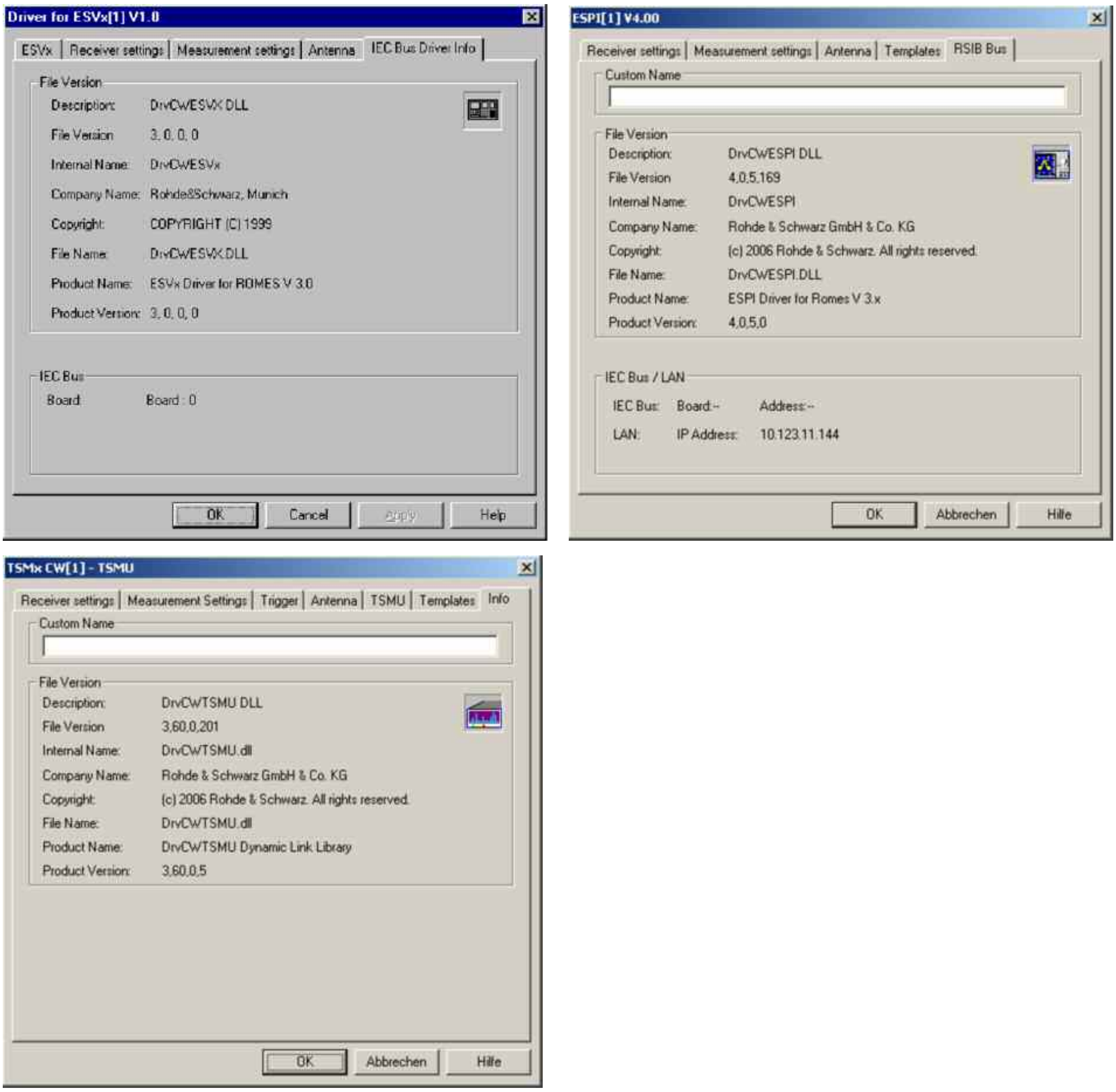


Fig. 6-85 Test receiver driver configuration – Driver Info

OK Saves all settings made in the test receiver driver configuration menu and closes the menu.

Cancel Discards all settings made in the test receiver driver configuration menu and closes the menu.

Trigger Box Configuration

The *Trigger Device* configuration menus are equal for the R&S ESVx/R&S ESPI/TS55-R2 and EB200 drivers. They contain two tabs to define the calibration factor and user distance and to display information on the trigger driver.

The *Driver Configuration* menu is opened by clicking the *Driver* command line in the *Hardware* menu which is available as soon as a receiver driver is loaded (see *Fig. 6-79*).

Note:

For R&S ESVx, R&S ESPI, EB200 and TS55-R2 devices, the trigger box is a separate externally connected unit. Only for the R&S ESVX it is mandatory, for the other three it is optional. The configuration is described with the menus in the following section.
These devices all support external triggering by loading the trigger box driver as a slave.

The R&S TSMx devices have an integrated triggering unit, which are configured as described in section Trigger (R&S TSMx) *on p. 6.166.*

Triggerbox (external)

The *Triggerbox* tab defines the calibration factor for the wheel trigger and a user distance signal.

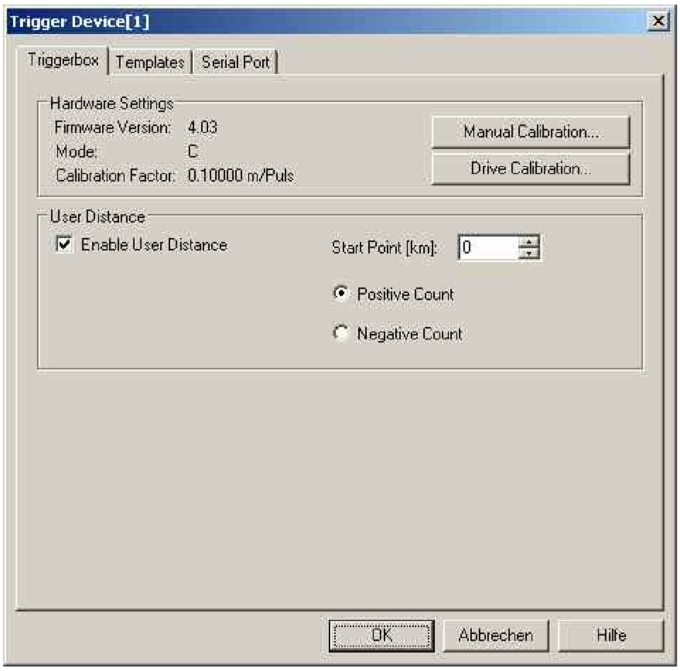


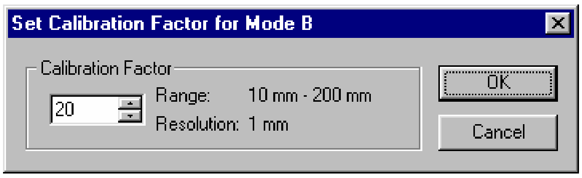
Fig. 6-86 Trigger Box driver configuration (for the R&S external trigger box)

Hardware Settings

The *Hardware Settings* panel indicates the current ROMES *Firmware Version,* the *Mode* (B or C mode are equivalent as far as their function for ROMES is concerned; not to be changed by the user because new measurement systems are delivered with optimized settings; mode D is used for special services like railway and acts in a different way), and the current *Calibration Factor*. A calibration factor is needed to convert the trigger pulse scale into a length/distance scale if a *Wheel trigger* is used (see p. 6.155). The calibration factor can be defined in two different ways:

Manual Calibrat.

For Trigger Box firmware versions ≥V3.7: The calibration factor (distance driven in mm per trigger pulse) is entered manually. This option is suitable if the calibration factor is known; otherwise a *Drive Calibration* must be performed.



Drive Calibration (only Mode B and C)

The calibration factor (distance driven in mm per trigger pulse) is determined experimentally by driving a particular distance while counting the number of trigger pulses.

The procedure is identical with the calibration from the *Measurement Settings* tab of the driver configuration menu. The calibration factor is entered into the Trigger Box and the registry, therefore it is valid for all drivers. A calibration must be carried out only once with the R&S ESVx test receiver driver.

User distance

If *User Distance* is enabled, a new marker point can be defined during the measurement where the *Start Point* (reference) and the direction *(Positive/Negative Count)* of the user distance may change. The same settings are provided in the *Action* menu; see p. 6.167 ff.

Trigger Box Mode D

Only trigger by distance is possible, trigger by time trigger is greyed out. One channel is measured by a trigger pulse (in the case of B and C all channels are measured per trigger pulse). If three channels are set, they will be measured successively. This humiliates the sampling rate by a factor of three. This doesn't fit to the values displayed in the driver so it is recommended to measure in Mode D only a single channel.

To indicate that D mode is selected, the LED TRIGGER MODE: TIME flashes permanently on the front panel of the mobile system panels, in which the trigger box normally built-in.

Templates Trigger Device

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates.

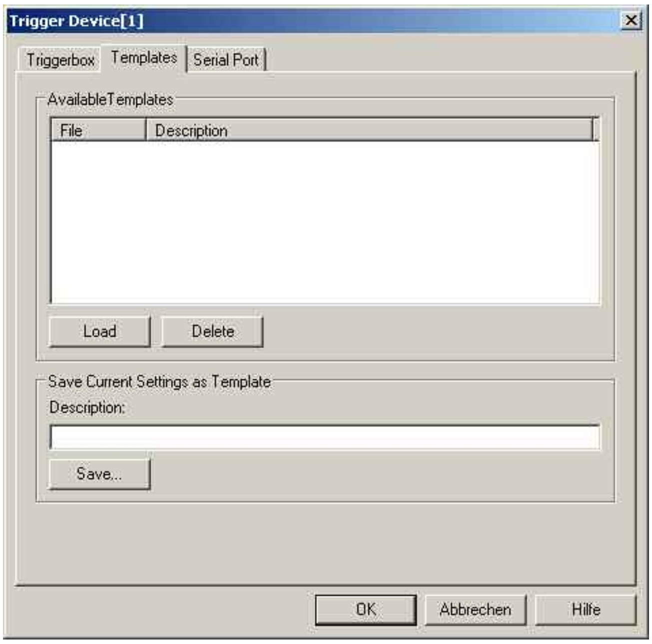


Fig. 6-87 Trigger Box configuration: Templates

Serial Port Driver Info

The *Serial Port Driver Info* tab displays information on the file version of the Trigger Device driver, the serial port assigned to it, and the transmission parameters.

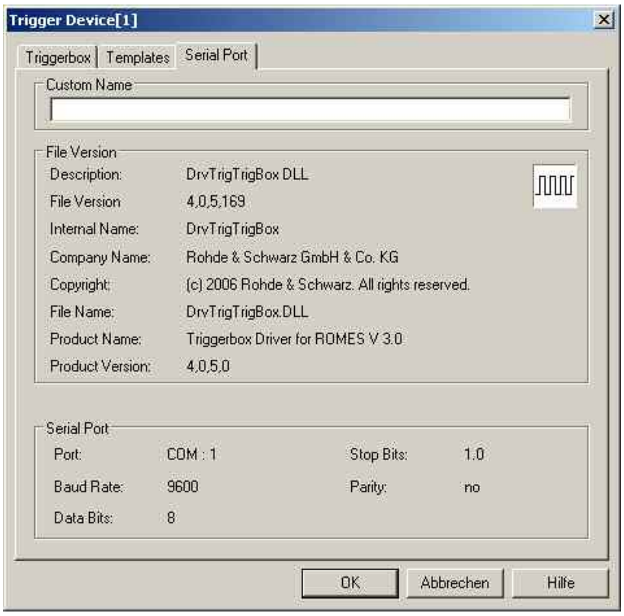


Fig. 6-88 Trigger Box configuration – Serial Port Driver Info

OK Saves all settings made in the *Driver for Trigger Device* configuration menu and closes the menu.

Cancel Discards all settings made in the *Driver for Trigger Device* configuration menu and closes the menu.

Trigger (R&S TSMx)

The *Trigger* tab defines the calibration factor for the wheel trigger. The user distance signal is provided automatically in R&S TSMx devices.

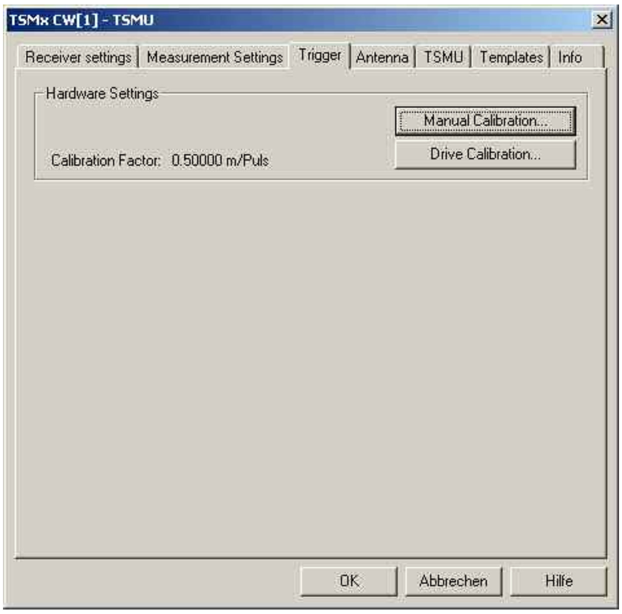
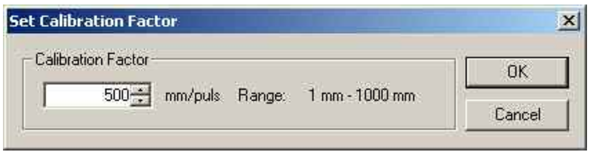


Fig. 6-89 Trigger configuration for R&S TSMx driver

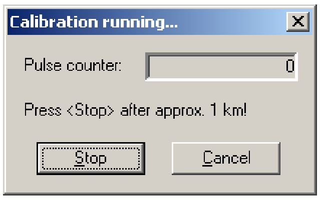
Hardware Settings The *Hardware Settings* panel indicates the current *Calibration Factor*. The calibration factor is needed to convert the trigger pulse scale into a length/distance scale for *Wheel triggers* (see p. 6.155).
The calibration factor can be defined in two different ways:

Manual Calibration The calibration factor (distance driven in mm per trigger pulse) is entered manually. This option is suitable if the calibration factor is known; otherwise a *Drive Calibration* must be performed.



Drive Calibration The calibration factor (distance driven in mm per trigger pulse) is determined experimentally by driving a particular distance while counting the number of trigger pulses.

The procedure is identical with the calibration from the *Measurement Settings* tab of the driver configuration menu.



The running *Drive Calibration* pulse counter is shown during the actual calibration. The pressing of the *Stop* button determines the applicable calibration factor.

Action Menu Test Receiver

The *Action* menu controls the *Manual Tracking* mode (for R&S ESVx receivers) and configures the *Trigger Device*. It is added to the menu bar as soon as a mobile driver has been successfully installed (see section *Driver Installation* on page 6.1 ff.). If several test receivers are connected, a separate command line is displayed for each of them.

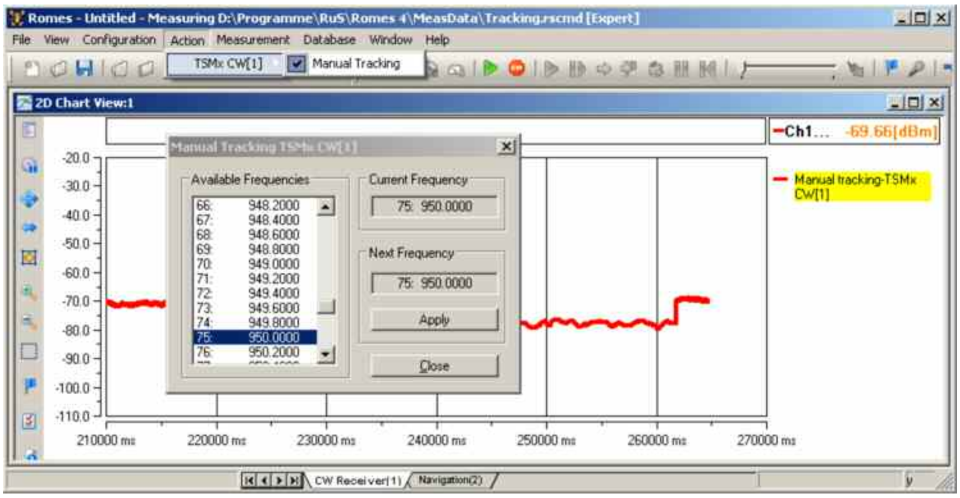


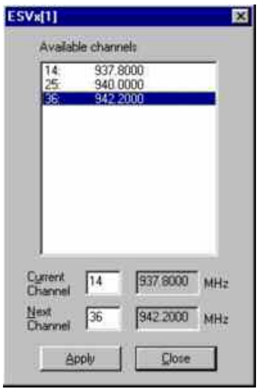
Fig. 6-90 Action menu (test receiver drivers)

Manual Tracking

Controls the *Manual Tracking* mode for R&S ESVx, R&S ESPI or R&S TSMx receivers.

Manual Tracking is a test mode where the receiver can change between several measurement channels listed in a frequency/channel list (see p. 6.153). *Manual Tracking* must be activated in the *Measurement Settings* tab of the driver configuration menu where also a channel list can be defined.

The *Manual Tracking* command in the *Action* menu opens then a menu to change the current measurement channel:



Below the list of *Available Channels/Frequencies*, the *Current Channel/Frequency* and the selected channel (that is to become the *Next Channel/Frequency)* is indicated. The measurement is continued on the *Next Channel* after the *Apply* button is pressed.

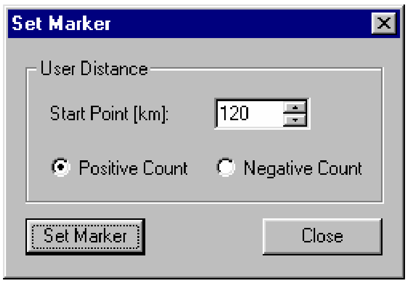
A message in the *General Status View* indicates when the channel was changed. The current measurement frequency can be viewed in the *CW Tracking Info View*. Moreover, *Manual tracking* is indicated in the list of available signals within the *2D Chart View* and *Alphanumeric View* configuration menus. The figure *Fig. 6-90* above shows an example for displaying a *Manual tracking* signal in a *2D Chart View.*

Trigger Device – Set Marker

Changes the reference point *(Start Point)* or direction of the user distance.

The *User Distance* is a generalized distance signal with a finite number of marker points where the distance values may jump and/or change their direction. Unlike the real distance the *User Distance* is a composite signal that globally does not have to follow a continuous and monotonic ascending or descending curve. However, in each section between two consecutive marker points, the *User Distance* is a linear (ascending or descending) function of the real distance.

The *Trigger Device – Set Marker* command opens the *Set Marker* dialog box to define a new section of the *User Distance* signal during the measurement:



Start Point [km]	Definition of a (new) reference/start point for the user distance.
Positive Count/ Negative Count	The values in the new user distance section are counted in ascending (positive)/descending (negative) order.
Set Marker	Define the current position during the measurement as a marker for the *User Distance* signal and close the *Set Marker* dialog. The next section of the *User Distance* will start with the settings made in the *User Distance* panel.
Close	Close the *Set Marker* dialog without defining a new marker.

R&S Test Receiver Calibration

To ensure the accuracy of CW measurements, the Rohde & Schwarz test receivers provide different calibration methods. The CW level calibration can be performed for all receiver types (R&S ESVx, R&S ESPI).

The following section gives an overview of the calibration methods.

Note:
It is recommended to create backups of the calibration files (i.e. in a separate directory), especially of the ones where a generator (R&S SME, R&S SMHU) is required for the calibration.

CW Level Calibration

A CW level calibration ensures the accuracy of a general CW measurement. The calibration method differs according to the Rohde & Schwarz receiver type.

R&S ESVx/R&S ESPI

Two different calibration types are provided:

- The short calibration can be done with the R&S ESVx and R&S ESPI driver, see ROMES operating manual, or with the R&S ESVx itself.
- The total calibration is only necessary if the short calibration indicates it (i.e. the message “CAL TOTAL required” at the R&S ESVx front panel display is shown).

For more information on both calibration types see R&S ESVx operating manual.

Calibration	Equipment required	Calibration file(s)
Short calibration	R&S ESVx / R&S ESPI (+ ROMES R&S ESVx/R&S ESPI driver)	–
Total calibration	R&S ESVx / R&S ESPI	–

R&S TSMx

The R&S TSMx receiver family members are calibrated by R&S. If a new calibration is desired, please contact the R&S Service.

TS55-R2 (two-channel receiver)

A CW level calibration of the TS55-R2 is mandatory when the TS55-R2 device driver for CW measurements is used for the first time. The system prompts with an error message if no calibration file is found when the driver is loaded. The matching calibration file is identified by the receiver serial number in the file name; see below.

The calibration will automatically be performed for both receiver modules and all available frequency ranges. It can be started from the driver menu, see *Calibrate... (TS55-R2)* on p. 6.158.

Calibration	Equipment required	Calibration file(s)
CW level calibration	TS55-R2 + ROMES TS55-R2 driver + SME/SMHU via IEEE	\ROMES[1]\Driver**C2_xxxxxxxx.CAL** xxxxxxxx = serial no. of TS55-R2

IF and Level Calibration for C/I Measurements

IF and C/I level calibrations are only used for C/I measurements (ROMES-GS). The calibration method differs according to the Rohde & Schwarz receiver type. The ESPI cannot be used for C/I measurements.

ESVx: IF calibration

With the installation of ROMES, two general purpose IF calibration files are copied to the ROMES program directory:

IF_R_E1G.PHF

IF_R_E1D.PHF

R: Receiver

E1: ESVx #1

[1] The directory name \ROMES\ is just an alias for the ROMES program directory name defined during the setup procedure.

G: GSM900 frequency band

D: DCS/GSM1800 frequency band

These calibration files will do in general, however, for maximum accuracy an additional IF calibration of the ESVx can be performed. Whenever this is desired, remove the default calibration files before starting the Transmitter Scan, and the calibration will start automatically (shown by gray instead of colored bars in the K7 Transmitter Scan view.

Calibration	Equipment required	Calibration file(s)
IF calibration	ESVx + ROMES C/I driver + PCS1/2 boards	\ROMES[1]**IF_R_E1G.PHF** \ROMES[1]**IF_R_E1D.PHF**

ESVx: C/I level calibration

The signal level is displayed in the K7 Transmitter Scan view. In general the most important information is about detected interferences, so a medium accuracy concerning the level is sufficient. However, to obtain maximum accuracy, a C/I level calibration can be performed – which is different from the CW measurement calibration.

For this calibration, an R&S SME generator is required. It will be controlled by the ROMES C/I driver via an RS232 interface. After the calibration, a file is created in the ROMES program directory:

LC_R_E1.PHF

LC: Level Calibration

R: Receiver

E1: ESVx #1

This calibration file contains information for all supported GSM frequency ranges (GSM900, 1800 and 1900), depending on the used receiver.

Calibration	Equipment required	Calibration file(s)
Level Calibration LC	ESVx + ROMES C/I driver + PCS1/2 boards + SME via RS232	\ROMES[1]**LC_R_E1.PHF**

TS55-R2: IF calibration

There are no default calibration files, so this calibration is mandatory. After calibration the following files will be created in the ROMES directory:

IF_R_31G.PHF

IF_R_31D.PHF

R: Receiver

31: Three Channel Receiver, Receiver #1

G: GSM900 frequency band

D: DCS/GSM1800 frequency band

On the receiver TS55-R2 only the first receiver module is used for C/I measurements, so there are no calibration files for the other modules.

Calibration	Equipment required	Calibration file(s)
IF calibration	TS55-R2 / TS55-RX + ROMES C/I driver + PCS1/2 boards	\ROMES[1]**IF_R_31G.PHF** \ROMES[1]**IF_R_31D.PHF**

Conditions for IF calibration

Each GSM band must be calibrated separately. Therefore the calibration can be started only if the following conditions are met:

- A GSM900 or GSM1800 single-band BTS data base has been loaded
- A single-band channel range (1 to 124 or 512 to 885) has been selected in the C/I driver configuration menu.

Monitoring the calibration

The status of the IF calibration can be monitored in several views:

- The *Message View* displays information about the progress of the calibration.
- The bars in the *K7 Transmitter Scan View* are gray if no IF calibration has been performed. They are colored as soon as the calibration has been terminated.

TS55-R2: C/I level calibration

The signal level is displayed in the K7 Transmitter Scan view. In general the most important information is about detected interferences, so a medium accuracy concerning the level is sufficient. However, to obtain maximum accuracy, a C/I level calibration can be performed – which is different from the CW measurement calibration.

For this calibration, an R&S SME generator is required. It will be controlled by the ROMES C/I driver via an RS232 interface. After the calibration, a file is created in the ROMES program directory:

LC_R_31.PHF

LC:	Level Calibration
R:	Receiver
31:	Three Channel Receiver, Receiver #1

This calibration file contains information for all supported GSM frequency ranges (GSM900, 1800 and 1900), depending on the used receiver.

On the receiver TS55-R2 only the first receiver module is used for C/I measurements, so there are no calibration files for the other modules.

Calibration	Equipment required	Calibration file(s)
Level Calibration LC	TS55-R2 + ROMES C/I driver + PCS1/2 boards + SME via RS232	\ROMES[1]**\LC_R_31.PHF**

UMTS PN Scanner Driver

The UMTS PNS (Pseudo Noise Scanner) driver controls an R&S FSP spectrum analyzer, a R&S ESPI test receiver, or the R&S TSMU/R&S TSMQ/R&S TSML-W radio network analyzers in order to alternate between UMTS Pseudo Noise (PN) scans and a spectrum analysis.

In an UMTS PN scan, the test devices measure and identify all UMTS downlink (Node B) signals in the air. The spectrum analysis consists of a frequency sweep over a specified range to detect arbitrary UMTS downlink and uplink signals.

Installation of the driver is explained in section *Driver Installation* on page 6.1; its configuration is explained below. The UMTS PN data can be viewed in the *UMTS PNS Views* (see chapter 3). Some measurement examples using the UMTS PN Scanner are outlined in chapter 2.

Resources Configuration UMTS PNS

The UMTS PNS driver is installed by selecting *Network Scanner – TSMx cdma2000 1xEVDO* in the *Load/Unload Drivers* window (see Fig. 6-1 on page 6.3).

A *Device Chooser* dialog is opened when the UMTS PNS driver is loaded. The *Device Chooser* is used to select the test device and to define the essential connection parameters, if necessary.

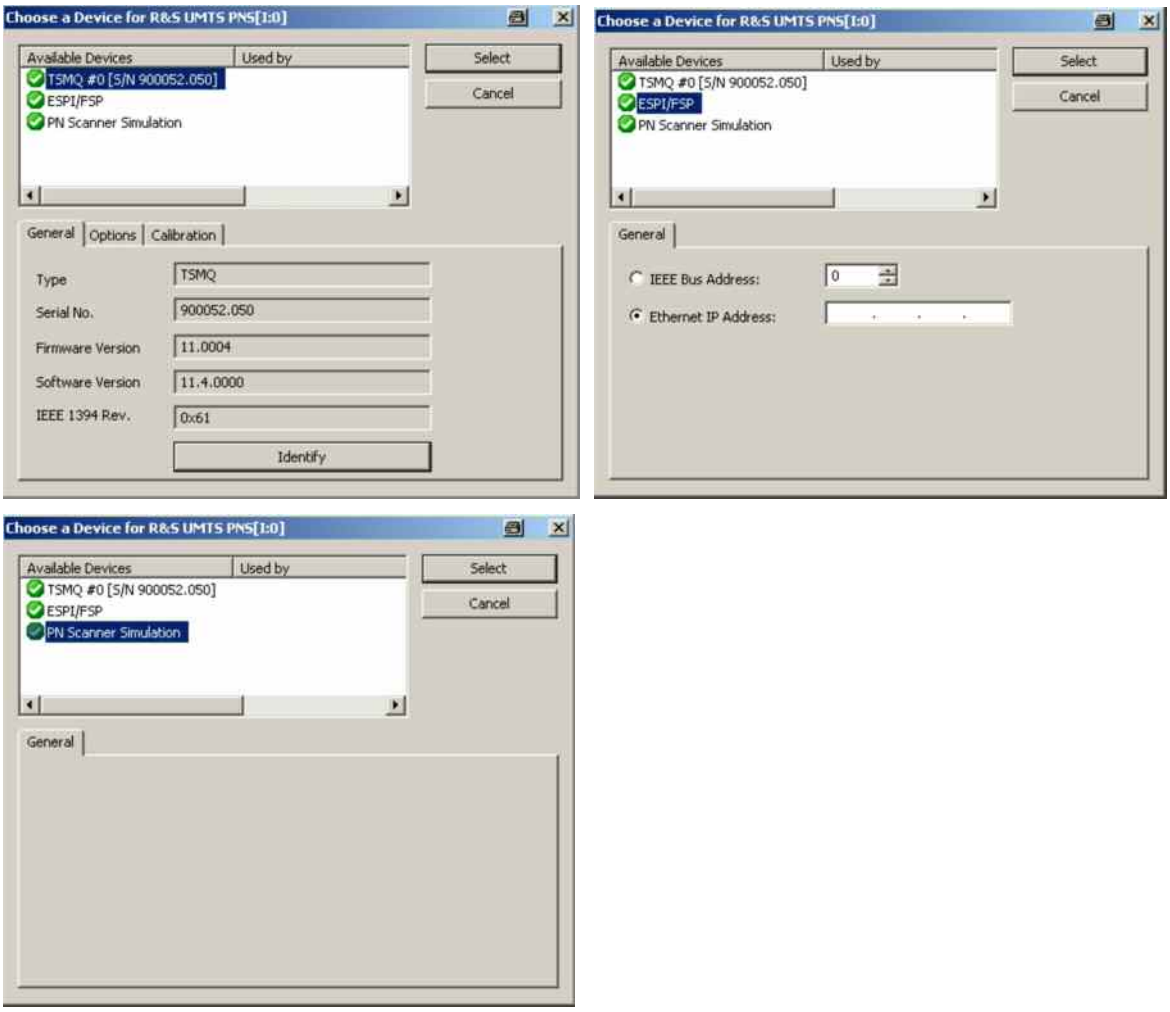


Fig. 6-91 UMTS PNS Device Chooser

The tabs on the *Device Chooser* dialog contain subsets of the receiver setting tabs described in section *Configuration Menus* below.

R&S ESPI, FSP

The resources needed are identical for the FSP spectrum analyzer and the R&S ESPI test receiver; they are listed in section *Resources Configuration* on p. 6.146 ff. (see paragraph on *R&S ESPI Driver)*. No Trigger Box is needed, however, the *Synchronization Unit for UMTS PN Scanner* TS-PNSYNC must be used instead to provide an external trigger signal to the FSP or R&S ESPI.

TS-PNSYNC is an external trigger device that divides and converts the 10-MHz reference frequency from the test instrument (FSP or R&S ESPI) into a TTL trigger signal with 1, 2, 5, 10 or 20 pulses per second. The trigger signal is fed back to the external trigger input *EXT TRIG* of the test instrument. The trigger device can be power-supplied by the 5 V DC current from the *MOUSE* connector of the FSP or R&S ESPI. The test setup is shown below.

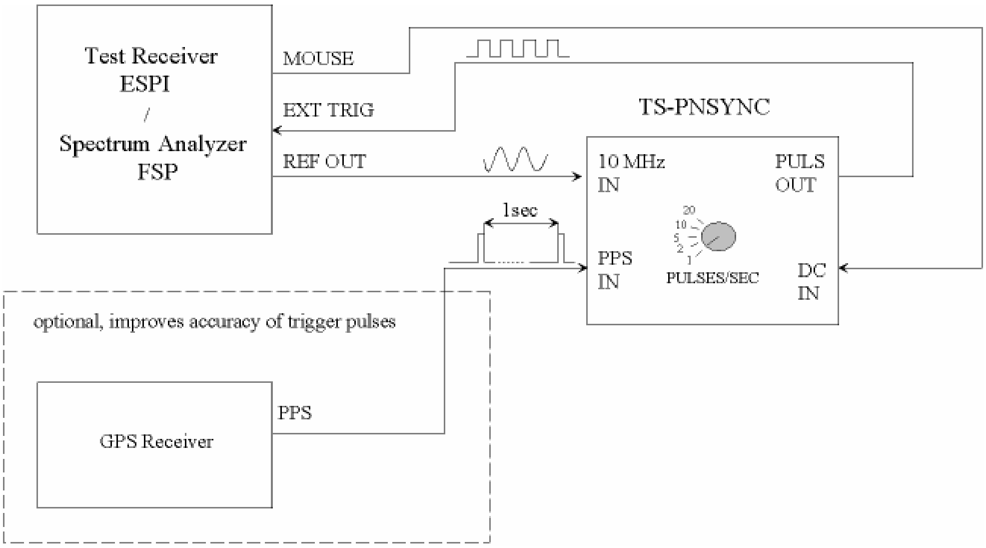


Fig. 6-92 Test setup for UMTS PN Scanner with TS-PNSYNC

The performance and accuracy of the UMTS PN Scanner measurement can be improved by adding a high-precision PPS (pulse per second) signal from a GPS receiver (e.g. GINA, Trimble Placer).

R&S TSMx

The R&S TSMx devices must be connected to the controller via one of the Firewire interfaces (IEEE1394) on the rear panel. No external trigger unit is needed, however, the performance and accuracy of the UMTS PN Scanner measurement can be improved by adding a high-precision PPS (pulse per second) signal from a GPS receiver (e.g. GINA, Trimble Placer). The synchronization mode *(Time Base)* is selected in the *Measurements* tab of the driver configuration menu (*TSMx Advanced Settings)*.

The PPS signal from the GPS receiver is directly fed to the BNC connector labeled *PULSE IN* at the rear panel of the R&S TSMx. No additional synchronization unit is required.

The R&S TSMx operating manual and an installation tool for the Firewire Interface is provided on the ROMES DVD-ROM. Refer to the directory Firmware & Drivers\R&S RF Receivers\R&S TSMU. See also the paragraph about the Firewire Driver on p. 6.18.

Configuration Menus UMTS PNS

R&S ROMES provides a configuration menu for the UMTS PNS driver that is opened by clicking the *RS UMTS PNS[1]* command line in the *Hardware* menu. The command line is available as soon as the driver has been loaded.

Fig. 6-93 Accessing the UMTS PNS driver configurations

The UMTS PNS driver configuration menu contains several tabs to display information on the test receiver driver *(Info),* configure the *Receiver* and the two alternate *Measurements,* define *Top N* pools to be scanned, load driver *Templates,* and specify *Antenna* settings.

Receiver Settings UMTS PNS

The *Receiver* tab selects the type of connection, the receiver address and the frequencies measured in an UMTS PN scan.

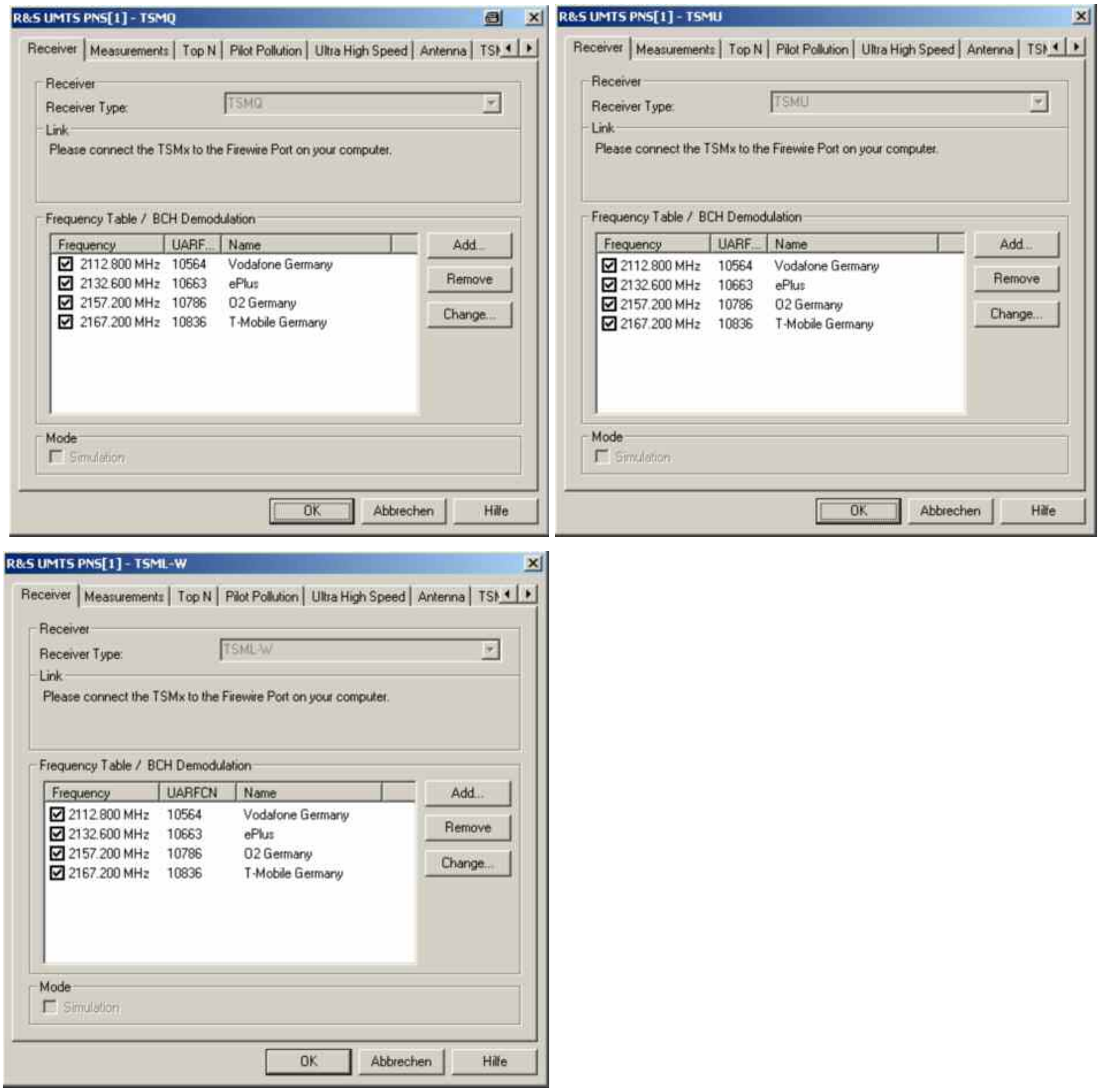


Fig. 6-94 UMTS PNS configuration – Receiver (R&S TSMQ, R&S TSMU, and R&S TSML-W)

Receiver type The UMTS PNS driver depends on the test receiver type *(R&S ESPI/FSP, R&S TSMx,* or *Simulation* mode). The receiver type is selected in the *Device Chooser* dialog which is opened during driver installation (see p. 6.29). In the *Receiver Type* field it is only displayed for information.

The R&S ESPI/FSP and R&S TSMx driver versions differ in a few settings in the *Receiver* and *Measurements* tab; for an overview on the individual TSMx model features see the table in section Measurements UMTS PNS on p. 6.180. The measurement results are equivalent for all test instruments.

Link (R&S The two *Link* radio buttons select the interface used for the connection of the test

ESPI/FSP) instrument and the IEC/IEEE bus address (for a connection via IEC/IEEE-bus interface) or IP address (for a connection via Ethernet/LAN interface; see paragraph entitled *Allocating a valid IP address* on p. 6.16). The LAN interface is provided as an option for both the FSP spectrum analyzer and the R&S ESPI receiver (option FSP-B16, LAN Interface).

A R&S TSMU/R&S TSML-W analyzer is directly connected to the Firewire port of the controller; no address information is needed.

Frequency Table The *Frequency Table* displays a selection of predefined channels to be measured. The WCDMA-related channel frequencies are in the nominal UMTS downlink band, depending on the WCDMA band (1 to 9) or the channel frequency can be defined freely from 80 to 3000 MHz. The channel frequencies differ by the UMTS carrier spacing of 5 MHz:

- All WCDMA Bands (I – IX) and free configurable measurements on one TSMU

WCDMA Band	Uplink (MHz) (Spectrum)	Downlink (MHz) (Spectrum & Measurement)
I	1920 – 1980	2110 – 2170
II	1850 – 1910	1930 – 1990
III	1710 – 1785	1805 – 1880
IV	1710 – 1755	2110 – 2155
V	824 – 849	869 – 894
VI	830 – 840	875 – 885
VII	880 – 915	925 – 960
VIII	2500 – 2570	2620 – 2690
IX	1750 – 1785	1845 – 1880
Free (10 kHz Resolution)	80 – 3000	80 – 3000

Clicking a checkbox activates the measurement on the associated channel.

Add Opens a dialog for adding a new channel frequency to the table and configure the BCH demodulation (R&S TSMx); see section *Add Frequency / BCH Demodulation* below.

Remove Removes a selected channel from the list.

Change Opens an input field to change the *Name* of the current channel or assign a new name. The *Change* dialog also allows access to the SIB Decoder Settings Menu for the current channel (see *Add Frequency / BCH Demodulation* on p. 6.178). Double-clicking a channel on the frequency table also opens the *Add Frequency / BCH Demodulation* dialog.

Simulation The *PN Scanner Simulation* represents an operating mode where ROMES generates UMTS PN Scanner data and writes it to a measurement file, if so desired. At least one frequency must be activated in the *Frequency* list to run the simulation.

The simulation mode is selected in the *Device Chooser* dialog which is opened during driver installation (see p. 6.29).

Data generation is initiated by the *Start Measurement* or *Start Recording* commands in the *Measurement* menu. The UMTS PN Scanner data can be viewed in one of the *UMTS PNS Views* while the simulated measurement is running. With *Start Recording,* the data is written to a measurement file. The *.rscmd measurement file name is generated automatically if this was specified in the Measurement Info field group of the *Preferences - General Settings* tab (see chapter 3). A comment can be added to the measurement file preamble before the simulated measurement is manually stopped.

The simulated measurement illustrates many aspects and features of the UMTS PN scanner. It can be used for test and demo purposes even if no hardware is available and no real measurement can be performed.

Add Frequency / BCH Demodulation UMTS PNS

The *Add Frequency / BCH Demodulation* dialog adds frequencies to the frequency table in the *Receiver* tab (see above) and selects the system information to be demodulated and decoded from the UMTS Broadcast Channel (BCH). For new channels, it is opened by the *Add…* button in the *Receiver* tab of the R&S UMTS PNS driver configuration menu, for existing channels the dialog can be accessed from the *Change…* button on the same tab (or by simply double-clicking the channel on the list).

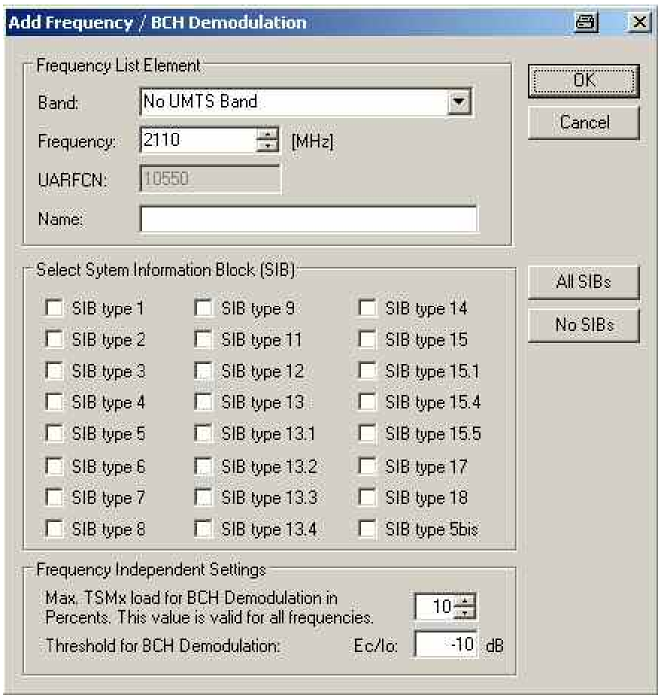


Fig. 6-95 UMTS PNS configuration – Add Frequency/BCH Demodulation

Frequency List Element

Adds frequencies to the frequency table in the *Receiver* tab. It is possible to select frequencies off the nominal UMTS downlink band, however, all frequencies must be in multiples of 0.2 MHz, corresponding to specified UARFCNs (UTRA Absolute Radio Frequency Channel Numbers).

The nominal UMTS bands are listed in chapter 8. The measured frequencies can be selected in the measurement range of the used test device.

Select SIB

The remaining panels in the *Add Frequency / BCH Demodulation* tab are only enabled for a R&S TSMx which is equipped with option R&S TSMx-K14, *BCH Demodulation.*

The *Select System Information Block (SIB)* panel provides the SIBs to be demodulated and decoded from the UMTS BCH. Selecting at least one SIB type enables BCH demodulation. If any SIB type is selected, SIB type 3 is also enabled automatically, because it is necessary to determine the Cell Identity (CI). BCH decoding is performance critical, therefore it is recommended to restrict the selection to the SIBs of interest.

Example:
SIB type 11 and SIB type 3 is necessary (and sufficient) for the UMTS neighborhood analysis (with option R&S ROMES3HOA); see description of the *UMTS Neighborhood Analyzer View* in chapter 4.

Note:
The SIB contents can be displayed in the PNS BCH View, see chapter 4.

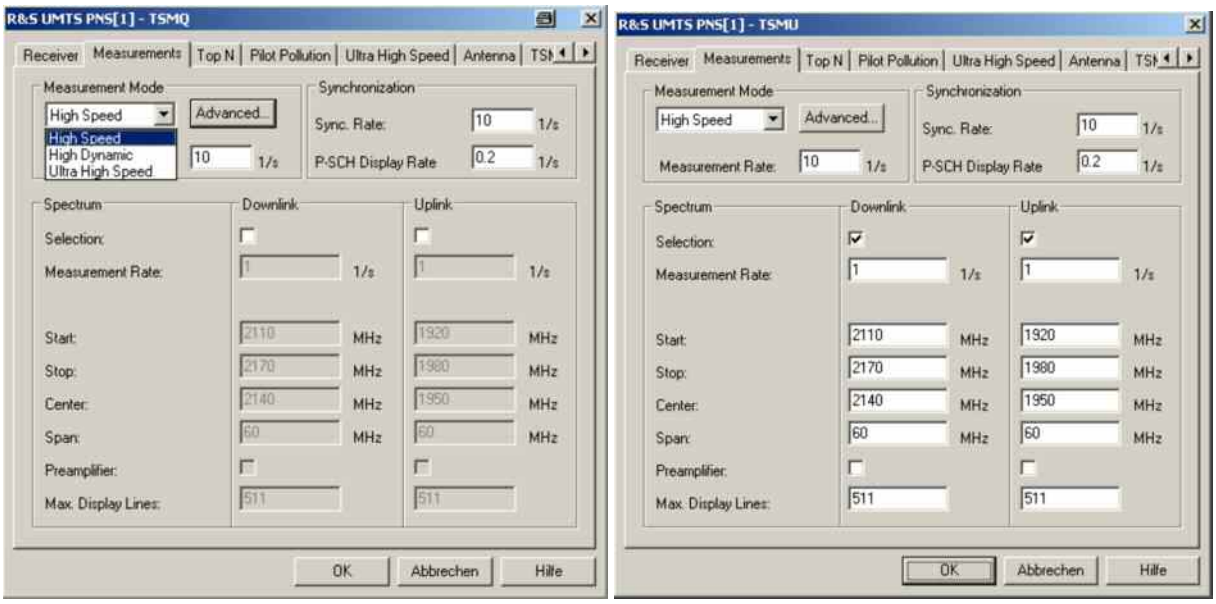
Frequency Independent Settings

The following settings restrict the system resources reserved for BCH demodulation:

Max. TSMx load…	Sets the maximum load that the R&S TSMx reserves for BCH demodulation. The load is expressed as a percentage (between 10% and 50%) of the total R&S TSMx performance. The performance leftover is used for PN Scanning.
Threshold…	Defines a minimum signal strength E_c/I_0 for BCH demodulation. Only signals above this threshold will be decoded.

Measurements UMTS PNS

The *Measurements* tab defines general measurement settings for the UMTS PN scan and configures the spectrum analysis.



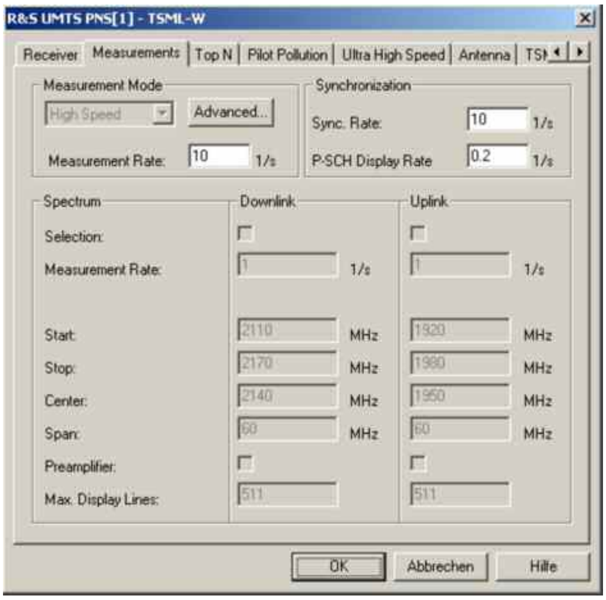


Fig. 6-96 UMTS PNS configuration – Measurements (R&S TSMQ, R&S TSMU and R&S TSML-W)

The test devices (R&S TSMQ and R&S TSMU) alternate between UMTS PN scans that are continuously repeated and single frequency sweeps *(Spectrum* measurements).

- The settings in the *Measurement mode* and *Synchronization* panels are relevant for the UMTS PN scans. Results of the UMTS PN scans are displayed in all PNS views except the *PNS Spectrum View* and in the *PNS Spectrum History View.*

- The *Spectrum* settings configure the spectrum display for R&S TSMQ and R&S TSMU. The results are displayed in the *PNS Spectrum View* and in the *PNS Spectrum History View.*

The supported measurement modes for the R&S TSMQ, R&S TSMU and R&S TSML-W test devices are shown in the table below:

	R&S TSMQ	R&S TSML-W	R&S TSMU
High Speed	Yes	Yes	Yes
High Dynamic	Yes	-	Yes
Ultra High Speed	Yes	-	Yes
Spectrum	Yes	-	Yes

Measurement Mode

The controls in the *Measurement Mode* panel define how ROMES processes the baseband (I/Q) data for an UMTS PN scan. The measurement mode has an impact on the measurement speed, the dynamic range, the synchronization procedure and the measured quantities (see also description of *UMTS PNS CPICH View* in chapter 4).

High Speed — For R&S TSMQ, R&S TSMU and R&S TSML-W: The analysis is based on a limited amount of data and optimized for fast evaluation

High Dynamic — For R&S TSMQ and R&S TSMU: Refined analysis using a larger amount of data, slowing down the measurement but increasing its dynamic range. The SC is determined by correlation with the pilot bits of the CPICH; the *Doppler Offset* frequency is available.

Ultra High Speed — For R&S TSMU and R&S TSMQ: Measurement on a single frequency with known scrambling code but with highest measurement rate (up to 333/s). The Ultra High Speed Mode is mainly intended for measuring different echoes of a single Node B signal. It is configured in a special *Ultra High Speed* tab (see p. 6.191). The results can be displayed in the *PNS Rake Finger View* and in the *PNS Rake Finger Chart View* (see chapter 4).

NOTE

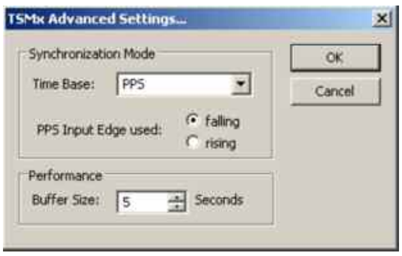
In Ultra High Speed mode, the R&S TSMU always uses UMTS Network synchronization, see below.

Measurement Mode (R&S TSMU) The following measurement mode settings are available for the R&S TSMU analyzer only:

Measurement Rate — Number of PN scans per second in the range between 0.1 and 20 (in *High Speed* mode) or 0.1 and 1.2 (High Dynamic mode). The actual measurement time is smaller than 1/20 s or 1/1.2 s for all provided test device settings so that even a large measurement rate never blocks the spectrum measurement completely.

In *Ultra High Speed* mode, the R&S TSMU achieves measurement rates up to 333/s, corresponding to a measurement time of 3 ms. At normal vehicle speed the maximum measurement time of 10 ms usually guarantees that the R&S TSMU rake receiver can still trace the signal. A higher measurement rate increases the measurement file.

Advanced… — Opens a sub dialog to configure additional measurement settings. The settings are not valid for the *Ultra High Speed* mode.



Time Base — Signal source providing the time base for the R&S TSMx measurements. The (default) PPS (pulse per second) signal from an external GPS receiver provides maximum accuracy. The time base settings are described in the shaded paragraph *R&S TSMx Time Base* below.

Buffer Size

Time for which the raw measurement data is stored in the R&S TSMx, should ROMES be unable to process it immediately (e.g. due to temporary low performance of the controller). If the ROMES buffer continues to be blocked after the buffer size time, the oldest data in the buffer is deleted and overwritten by new data. Data transfer starts as soon as ROMES is ready again to receive and process data.

A large buffer size increases the probability that no measurement data is lost, even though ROMES may be blocked for an extended time. On the other hand, storage and transfer of large amounts of buffer data increase the possible delay between data recording and evaluation/display in the views.

The buffer size for the *Ultra High Speed* mode can be set independently; see description of the *Ultra High Speed* tab on p. 6.191.

TSMx Time Base

The R&S TSMx must synchronize to a reference signal at the beginning of each measurement. In the UMTS PN scan, the R&S TSMx provides the following methods for synchronization:

PPS

Use GSM Network or PPS synchronization, if one of these signal types is available. If none of the signals is available, use Internal synchronization. If both signal types are available and almost synchronous to each other, use the PPS signal. If both signal types are available but not synchronous, assume that the PPS signal is inaccurate (e.g. because the GPS receiver cannot detect a sufficient number of satellites so that it must use its internal reference signal) and use the GSM signal.

The PPS (pulse per second) signal from an external GPS receiver fed to the PULSE IN connector at the rear panel of the R&S TSMx (see section *Resources Configuration* on p. 6.173 ff.) provides maximum accuracy.

In the GSM network scanner driver or CDMA PNS driver, this synchronization mode is referred to as GSM Network | PPS synchronization. This mode is always used while no measurement is active.

Internal

Synchronization by means of the reference signal generated by the internal quartz oscillator of the analyzer. The internal time base is activated automatically if no PPS signal is available. While a network time base is selected, the network signals constantly correct the frequency and phase of the internal oscillator in order to compensate for a possible drift. If the network signals are affected by a systematic error (e.g. due to a Doppler shift in a moving test vehicle), Internal time base can be used to prevent this correction.

UMTS Network	Synchronization by means of approx. 2/3 of the received UMTS signals, discarding the signals with the strongest timing deviation and time drift. This mode remains active as long as the standard deviation of the time drift of all detected (and not discarded) UMTS signals is below 60 ns/s. If this condition is no longer met, or if no UTRAN cell is detected any more, the R&S TSMx automatically switches to Internal time base. UMTS Network is the recommended setting if no PPS signal is available. UMTS Network synchronization is always used while the R&S TSMU/TSMQ operates in Ultra High Speed mode.
PPS Input Edge used	This configuration option allows to use for the PPS Input Edge the rising or falling edge. The user can choose the edge of the signal which has the lowest jitter.

> ***Note:***
> *Using the feature needs the minimum firmware and the ELF file version 12.12.*

Synchronization The two input fields in the *Synchronization* panel define how often the system synchronizes to the received UMTS PN signals and updates the measurement file:

Synchronization Rate	Number of synchronization processes per received channel and per second. A low synchronization rate improves the system performance, especially if R&S ROMES receives a large number of channels, at the risk of missing Node B signals that are only received for a short time.
Update Rate for P-SCH View	Rate by which the data for the *PNS P-SCH View* is stored to the measurement file and the view itself is updated. The P-SCH data is always acquired during synchronization so that the update rate must be smaller or equal to the *Synchronization Rate.* A smaller update rate has no impact on the measurement but can considerably reduce the size of the measurement file.
Display Update Rate	Rate by which the results in the *PNS Rake Finger View* and the *PNS Rake Finger Chart View* are updated if the R&S TSMU operates in *Ultra High Speed* mode. A high update rate prevents sudden jumps of the traces in the *PNS Rake Finger Chart View* but requires a higher system performance.

Spectrum (R&S TSMQ and R&S TSMU)

The input fields in the *Spectrum* panel configure the single frequency sweeps for the spectrum analysis and defines how often they are repeated, interrupting the UMTS PN scan. The parameters for downlink and uplink signal measurements can be set independently; their frequency ranges may overlap.

Selection	Enables (if checked) or disables the data entry for the downlink or uplink.
Measurement Rate	Number of sweeps per second in the range between 0.1 and 20. The actual sweep time is smaller than 1/20 s for all provided test device settings so that even a large measurement rate never blocks the UMTS PN scan completely.
Resolution Bandwidth	Bandwidth of the IF resolution filter of the analyzer or receiver. Possible bandwidths can be selected from a pull-down list.
Start/Stop/Center/Span	Definition of the measurement range/sweep range of the analyzer or receiver. The sweep range is a continuous frequency interval which is either defined by a *Start* and *Stop* value or by a *Center* frequency and *Span. Start/Stop* and *Center/Span* are alternative settings and overwrite each other according to: *Center = (Start + Stop)/2* *Span = Stop – Start* (must be positive) Depending on the sweep range, the test device automatically sets the number of sweep points and their position.

The following settings are provided for the R&S TSMU:

Preamplifier	Switches the preamplifier in the R&S TSMU on or off.
Max. Display Lines	Sets the number of displayed measurement points per sweep and thus the frequency resolution of the measurement curves in the spectrum views. Increasing the value broadens the *Spectrum History View.*

NOTE

The maximum frequency resolution of the R&S TSMU/TSMQ is approx. 48 kHz. The *Max. Display Lines* setting is ignored if it results in a frequency resolution beyond this value. At a measurement span of 20 MHz, the maximum number of display lines is 20 MHz / 48 kHz ≈ 420.

Top N UMTS PNS

The *Top N* tab defines the top N pools to be evaluated in the *PNS Top N View;* see chapter 3. Top N pools also appear in the data tree so they can be analyzed in general ROMES views, e.g. in the *Alpha-numeric View*, the *2D Chart View*, the *Route Track View,* and the *Statistic Histogram View*.

Definition:

Suppose that, at a given position and time, a test device receives several UMTS downlink signals from different Node Bs. The ***Top N*** *signals are the N (N = 1,2,...) signals with the strongest P-CPICH level. A* ***Top N Pool*** *contains up to N Node Bs with specific characteristics providing the strongest P-CPICH level at a given position and time.*

Top N and *Top N Pool* are dynamic concepts: The signal level from a specific Node B varies in time and according to the measurement position. The elements of a top N pool are exchanged accordingly and even their number may change, if the system detects less than N signals.

On loading the UMTS PNS driver, ROMES generates a default top N pool with the following properties:

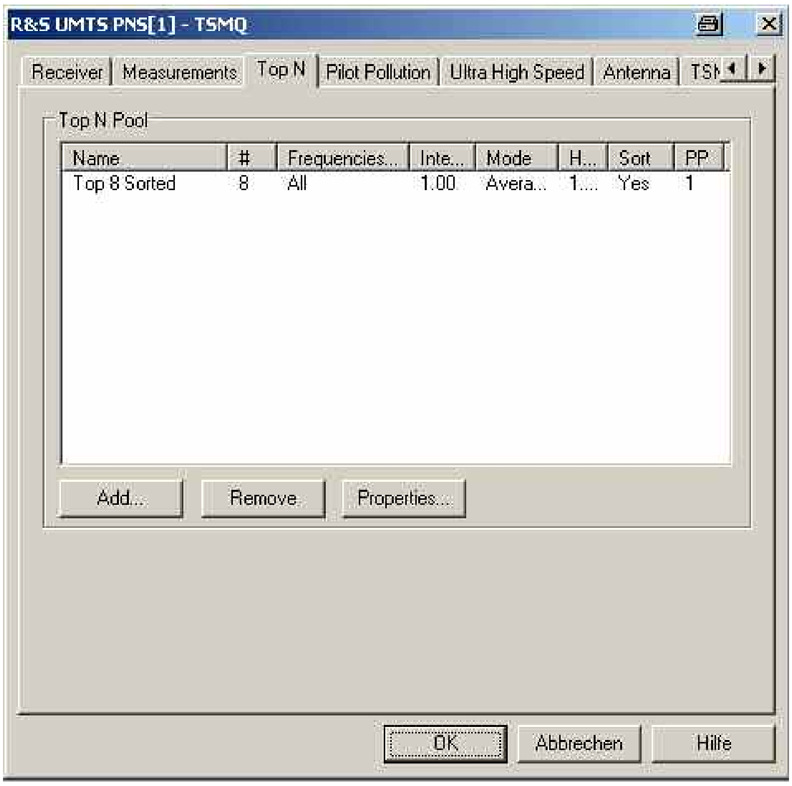
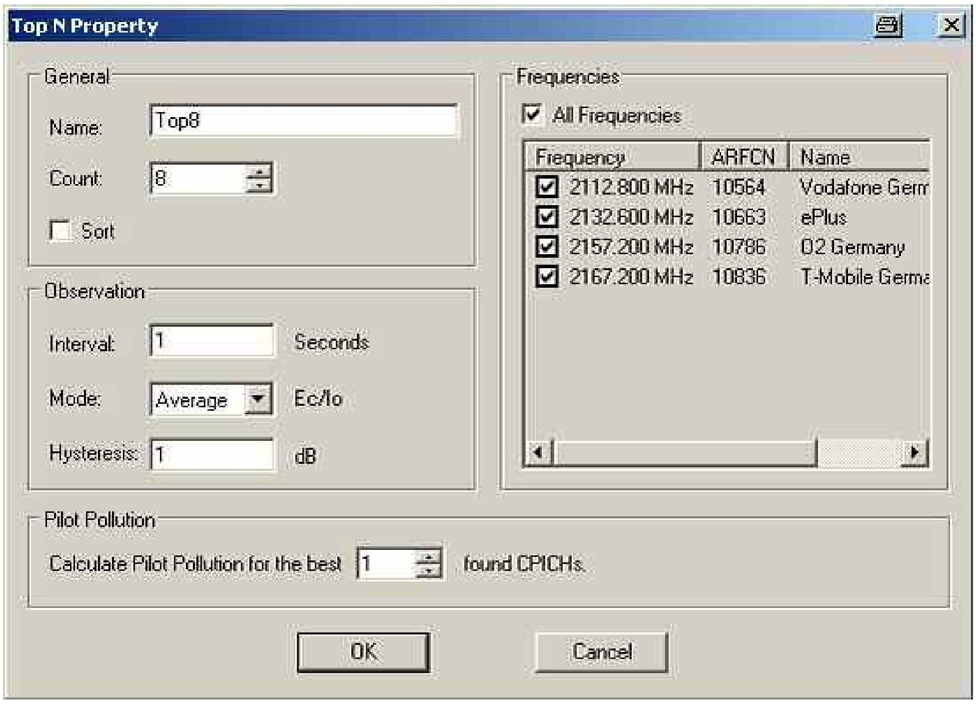


Fig. 6-97 UMTS PNS configuration – Top N

Top N Pool Table of the defined top N pools with their *Name,* the (maximum) number of elements (#), the allowed *Frequencies,* and the update and sorting criteria. The parameters are set when a new pool is created *(Add)* or when a selected pool is changed *(Properties)*; see below.

Add Opens the *Top N Property* dialog to generate a new top N pool.



The following parameters are set in the *General* panel:

Name Name of the top N pool. The name identifies the pool in the views and in the data tree, so it is worth selecting meaningful names

Count Maximum number N of elements/Node Bs in the top N pool. The actual number of elements can fall below N and vary if the system is not able to detect and analyze enough signals.

Sort In an unsorted pool (box unchecked), the elements remain at fixed positions unless they are replaced by a new element with a stronger CPICH. Unsorted pools are suitable for monitoring a Node B or a fixed set of Node Bs for an extended period of time; they are particularly easy to monitor in graphical diagrams where fixed positions always correspond to the same Node Bs.

In a sorted pool (box checked), the elements are sorted according to their CPICH signal strength. The positions are re-distributed after each update, according to the current signal strengths. Sorted pools are suitable for monitoring or comparing signals with definite strength, e.g. the strongest and second-strongest signal along a measurement tour, irrespective of the transmitting Node Bs.

The parameters in the *Observation* panel define the update and sorting criteria for the top N pool:

Interval Moving evaluation period for the average or maximum of the quantity Ec/Io (CPICH) for all signals. The average or maximum value is re-calculated and the pool is updated every time the system receives new UMTS PN scan data. All Ec/Io values received within the evaluation *Interval* before the current time enter into the calculation. Large evaluation *Intervals* tend to stabilize the pool by delaying the exchange of pool elements.

The observation interval obey the following rules:

1. With only one frequency in the TopN pool the interval is regardless of the measured rate always a multiple of 0,016 s.

If the current value differs following warning appears:

The correction is performed automatically.

2. In the case of multiple frequencies in the TopN pool the minimum interval is in dependency of the number of frequencies in the measurement and the sampling rate according to this formula:

2 * (number of frequencies in the measurement) / sampling rate + 0.5 s.

e.g.: 2 * (4 Freq.) / 0.1 + 0.5 = 80.5s

Sampling rate = number of measurements per second

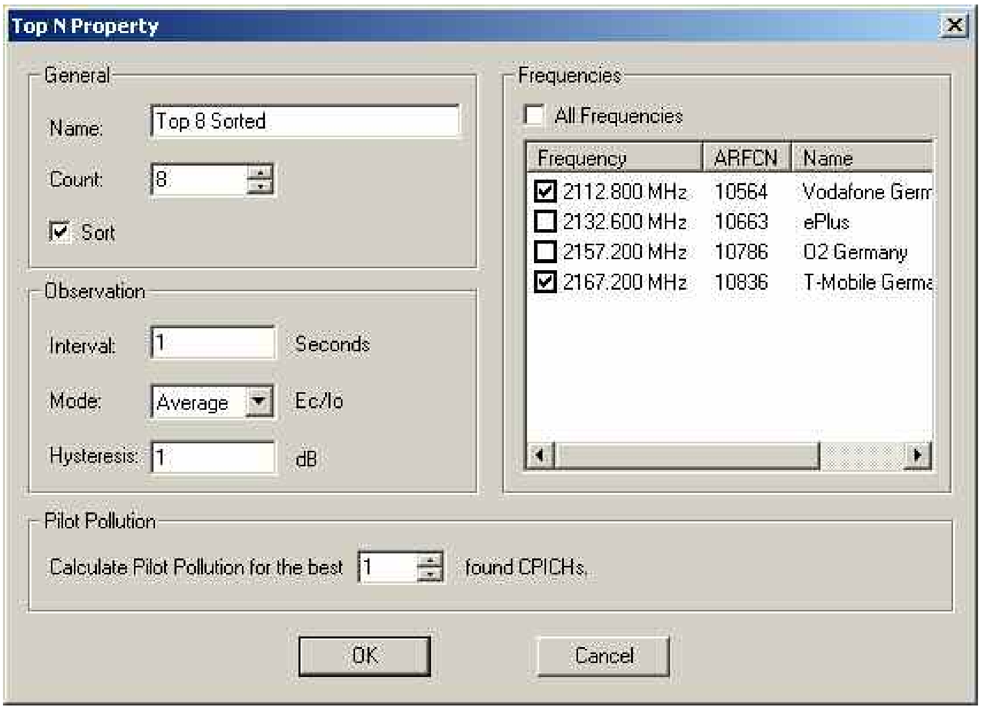
Mode Update and sorting criterion for the pool: *Average* or *Peak* value of Ec/Io (CPICH) in the moving evaluation *Interval.* Ec/Io (CPICH) is the ratio of the received energy per PN chip for the P-CPICH to the total transmit power spectral density; see also section *PNS CPICH View* in chapter 4.

Hysteresis Minimum level difference between the Ec/Io of a pool candidate and the lowest Ec/Io in the pool. A pool candidate becomes a pool element and replaces a previous element if

Ec/Io (candidate) $\geq$ *Ec/Io (previous)* + *Hysteresis*

A large hysteresis stabilizes the pool, preventing elements from being replaced because of small fluctuations in the measurement results.

Frequencies The *Frequencies* panel shows all frequencies selected for measurement in the *Frequency Table* of the *Receiver* tab. It is possible to select *All Frequencies* in the list or only a number of specific frequencies, e.g. to generate a pool with Node Bs from a particular provider., as shown below:



Pilot Pollution The *Pilot Pollution* panel contains an input field to select the number of reference CPICHs for which a pilot pollution analysis is performed (see *Pilot Pollution* tab below). The pilot pollution if always calculated for the k signals in the top N pool with the strongest P-CPICH level, where $0 \le k \le N$. A selected number $k > N$ is replaced by N upon pressing *OK.*

Remove Removes the current *Top N* from the *Top N Pool. Remove* is disabled while no *Top N* is selected.

Properties Opens the *Top N Property* dialog showing the properties of the current *Top N. Properties* is disabled while no *Top N* is selected. The properties of the current *Top N* can be edited and changed.

Pilot Pollution UMTS PNS

The *Pilot Pollution* tab defines the thresholds for the calculation of the Hard Pilot Pollution (HPP) and the Soft Pilot Pollution (SPP). HPP and SPP are weighted sums of the Received Signal Code Powers (RSCP) of all measured CPICHs relative to a reference CPICH signal and thus a measure of the potential interference/pollution of the reference CPICH.

The HPP and SPP is indicated in the *PNS Top N View;* see chapter 3. Pilot pollution signals also appear in the data tree so they can be analyzed in general ROMES views, e.g. in the *Alphanumeric View*, the *2D Chart View*, the *Route Track View,* and the *Statistic Histogram View*.

The same thresholds apply to all reference pilot signals selected in the *Top N Property* dialog.

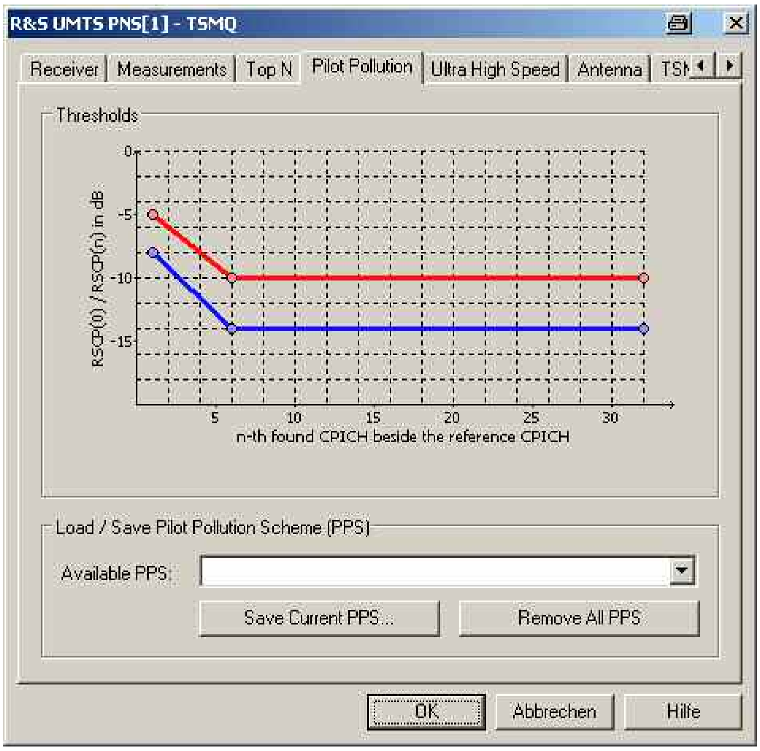


Fig. 6-98 UMTS PNS configuration – Pilot Pollution

Thresholds

Graphical representation of the upper threshold T_{high} and the lower threshold T_{low} for the calculation of the pilot pollution. To calculate the pilot pollution for a given reference signal CPICH(0), all other detected CPICHs are sorted according to their signal strength and compared with T_{high} and T_{low} :

HPP(0) is equal to the total number of received channels CPICH(n) (n=1,2,3...) exceeding the upper threshold $T_{high}(n)$.

SPP(0) is equal to HPP(0) plus the sum of all received channels CPICH(n) between the lower threshold T_{low} (n) and the upper threshold $T_{high}(n)$, each weighted by the ratio (RSCP(n) – T_{low} (n)) / ($T_{high}(n)$ – T_{low} (n)).

Signals below T_{low} (n) contribute to neither HPP nor SPP. This definition shows that HPP(0) ≤ SPP(0) irrespective of the reference CPICH and that both quantities are minimized for the strongest CPICH in the top N pool (CPICH(j) > CPICH(k) ⇒ HPP(j) ≤ HPP(k) and SPP(j) ≤ SPP(k)).

Threshold Settings

The thresholds $T_{high}(n)$ and $T_{low}(n)$ are both defined by means of two polygonal curves in the range $1 \leq n \leq 32$. The cursor shows an A symbol when pausing over one of the circles separating the straight sectors of the curves. It can then be used to drag the circle in vertical direction. Double-clicking a point on a curve inserts a new point or removes the current point. $T_{high}(n)$ and $T_{low}(n)$ can be modified with the following restrictions:

$T_{high}(n)$ must be larger than $T_{low}(n)$ for all n.

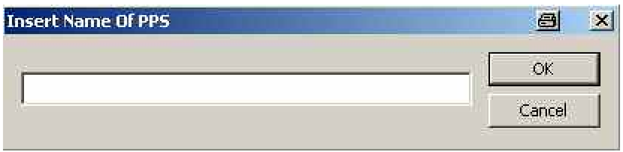
Both functions must be monotonically descending: $n > m \Rightarrow T_{high}(n) \leq T_{high}(m)$ and $T_{low}(n) \leq T_{low}(m)$.

Load/Save PPS

Once defined in the *Thresholds* diagram, a pilot pollution scheme can be named and stored for later reuse.

Available PPS — List of all defined pilot pollution schemes. A selected PPS appears in the *Thresholds* diagram. *OK* applies the selected PPS.

Save current PPS — Opens an input box for the name of the current PPS. The saved PPS is added to the list of available PPS.



Remove all PPS — Clears the list of available PPS.

Ultra High Speed (R&S TSMU/TSMQ) UMTS PNS

The *Ultra High Speed* tab configures the R&S TSMU/TSMQ for a measurement on a single frequency with known scrambling code but with highest measurement rate (up to 333/s). The *Ultra High Speed Mode* is mainly intended for measuring different echoes of a single Node B signal. It must be activated explicitly in the *Measurements* tab of the driver configuration menu. The results can be displayed in the *PNS Rake Finger View* and in the *PNS Rake Finger Chart View* (see chapter 4).

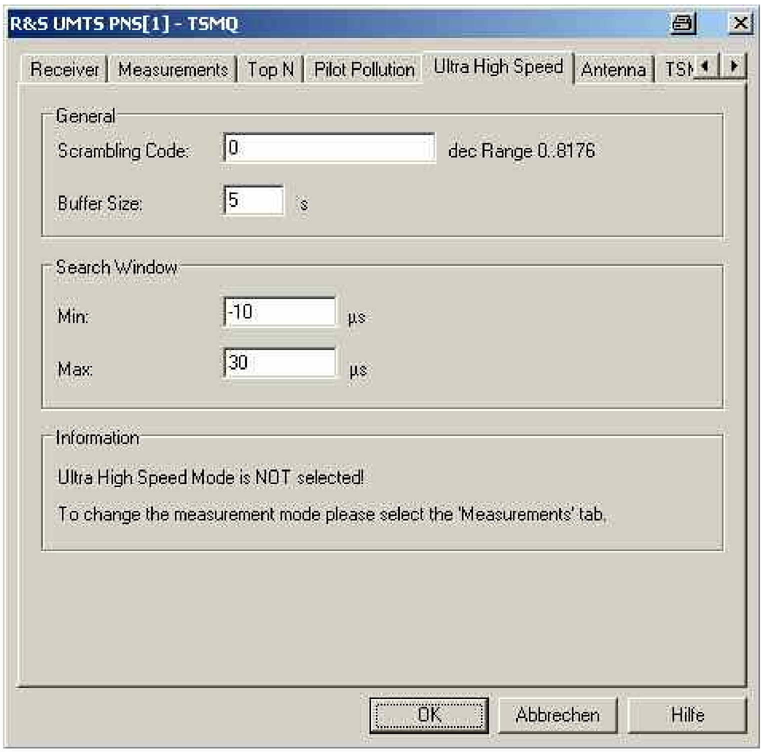


Fig. 6-99 UMTS PNS configuration – Ultra High Speed (R&S TSMU/TSMQ)

General Provides basic measurement settings for the R&S TSMU/TSMQ:

Scrambling Code Scrambling code of the measured cell signal in decimal format.

Buffer Size Time for which the raw measurement data is stored in the R&S TSMU/TSMQ, should R&S ROMES be unable to process it immediately (e.g. due to temporary low performance of the controller). This buffer size is only valid for the ultra high speed mode where it replaces the buffer size in the *Measurement* tab (for a detailed description see *Buffer Size* on p. 6.182).

Search Window Minimum and maximum time delay of the measured echoes relative to the strongest echo. A signal with a negative time delay arrives prior to the strongest echo, which is a typical situation if there is an obstacle in the direct path between the node B transmitter and the receiver. A small search window limits the number of echoes measured.

The maximum number of echoes measured simultaneously is 12. This maximum number decreases for very high measurement rates (8 for 250 Hz, 4 for 333 Hz).

Antenna UMTS PNS

The *Antenna* tab defines *Antenna Name, Antenna Gain* and *Cable Loss*. These values are used to correct the received signal powers:

- If a *Cable Loss* of n dB is specified, the system assumes the received signals to be attenuated by n dB. n dB is added to all measured signal powers so that the displayed results correspond to the unattenuated signal.
- If an *Antenna Gain* of n dB is specified, the system assumes the received signals to be amplified by n dB. n dB is subtracted from all measured signal powers so that the displayed results correspond to the unamplified signal

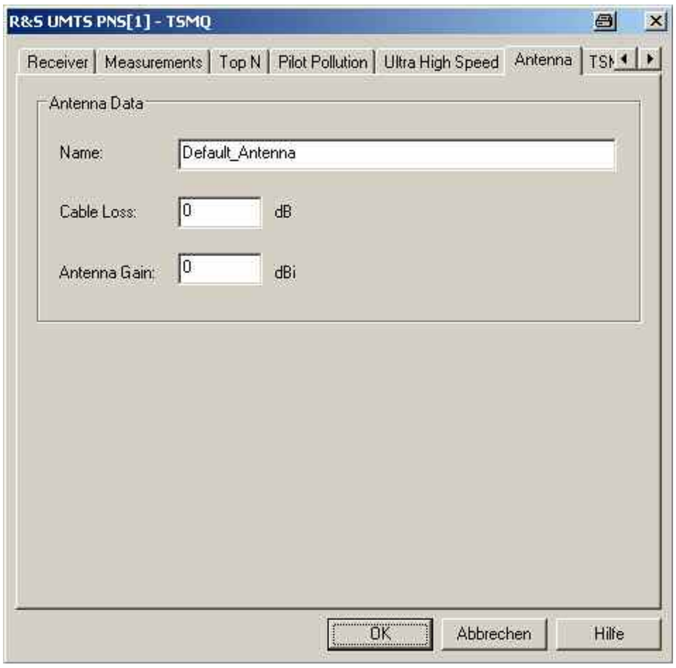


Fig. 6-100 UMTS PNS configuration – Antenna

R&S TSMU UMTS PNS

The *R&S TSMx* tabs display the properties of the R&S TSMx devices and available options. This information is also displayed in the *Device Chooser* described on p. 6.29.

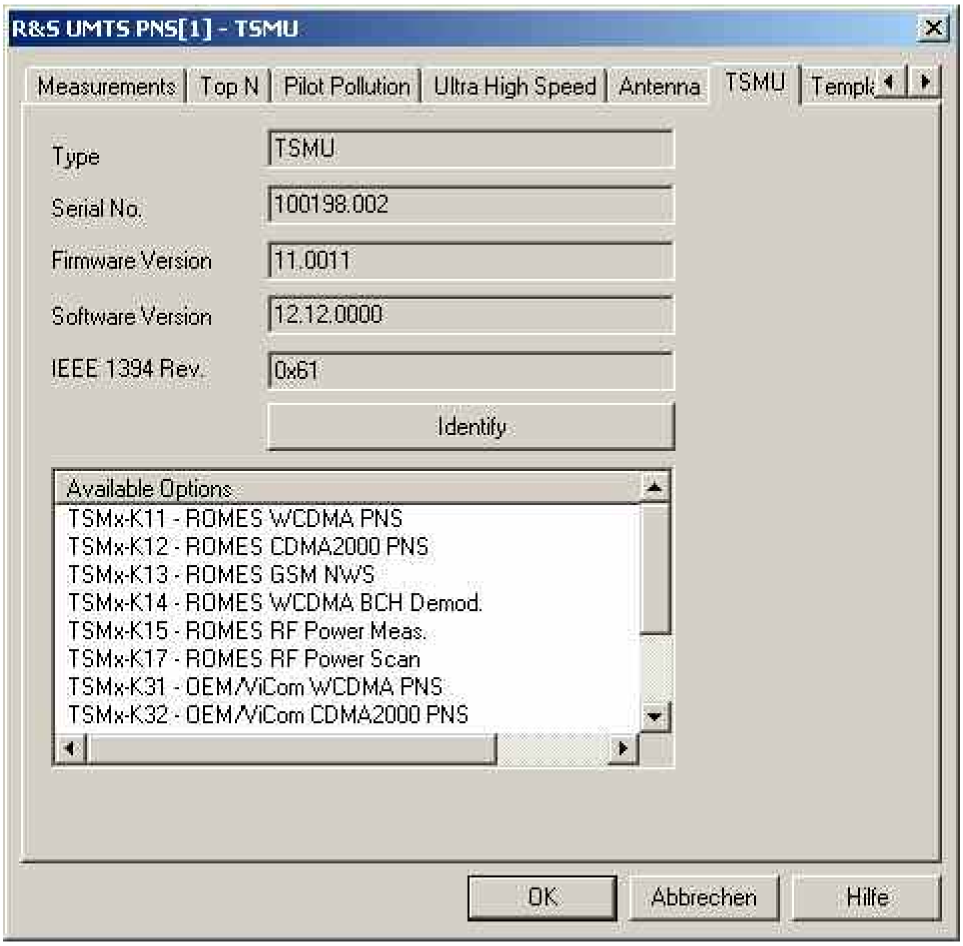


Fig. 6-101 UMTS PNS configuration – R&S TSMU

Templates UMTS PNS (R&S TSMx)

The *Templates* tab stores the current R&S TSMx driver configurations as a template, lists, loads or deletes driver templates.

Note:

When a driver is loaded using Hardware – Add/Remove... (see section Driver Installation on p. 6.1 ff.) ROMES checks whether a driver template is stored in the Driver Templates directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

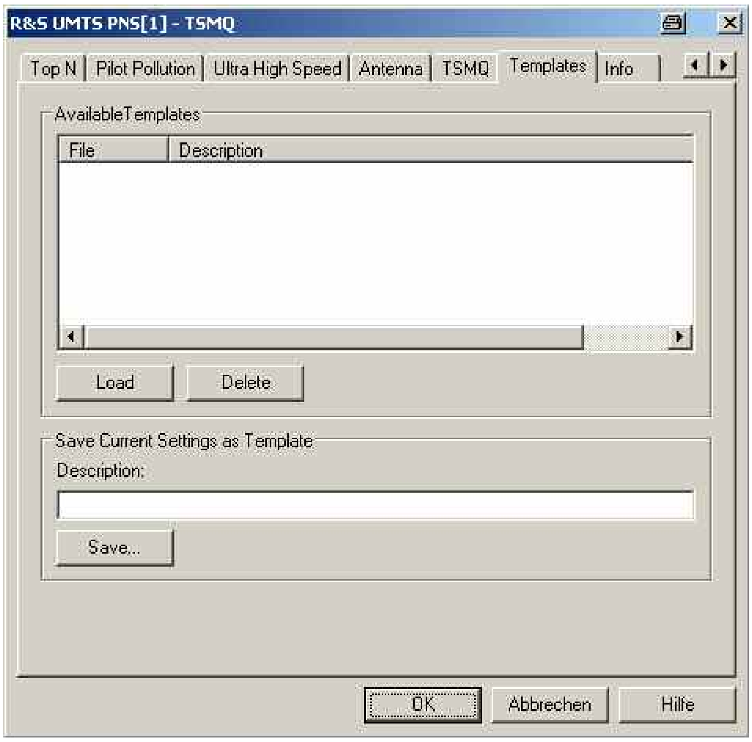
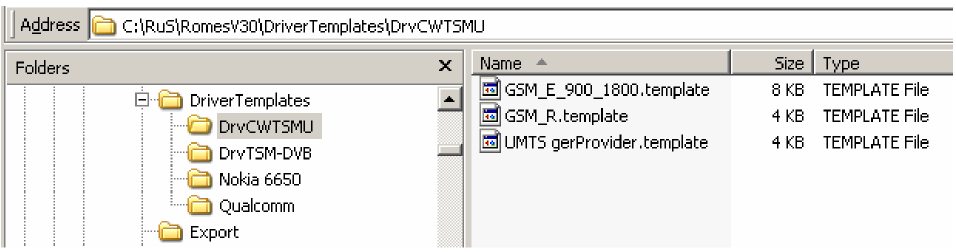


Fig. 6-102 UMTS PNS configuration – Templates

Load/Delete

Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent of the workspace. A selection of template files for the R&S TSMx is supplied with the ROMES installation:



Save

Saves the current driver settings together with the *Description* to a selected template file.

GSM Network Scanner Driver

The GSM NWS (Network Scanner) driver controls a R&S TSMQ / R&S TSMU / R&S TSML-G radio network analyzer to measure and identify all GSM downlink signals in the air. The driver is available with option R&S ROMES3T13, *GSM Network Scanner.*

Installation of the driver is explained in section *Driver Installation* on page 6.1; its configuration is explained below. The GSM NWS data can be viewed in the *GSM NWS Views* (see chapter 4). A special export format for GSM NWS data is described in chapter 7.

Resources Configuration GSM NWS

The GSM NWS driver is installed by selecting *GSM NWS – R&S GSM NWS* in the *Load/Unload Drivers* dialog (see Fig. 6-1 on page 6.3).

A *Device Chooser* dialog is opened when the GSM NWS driver is selected. The *Device Chooser* is used to select the test device and the necessary options. Click on the button *Select* will load the driver.

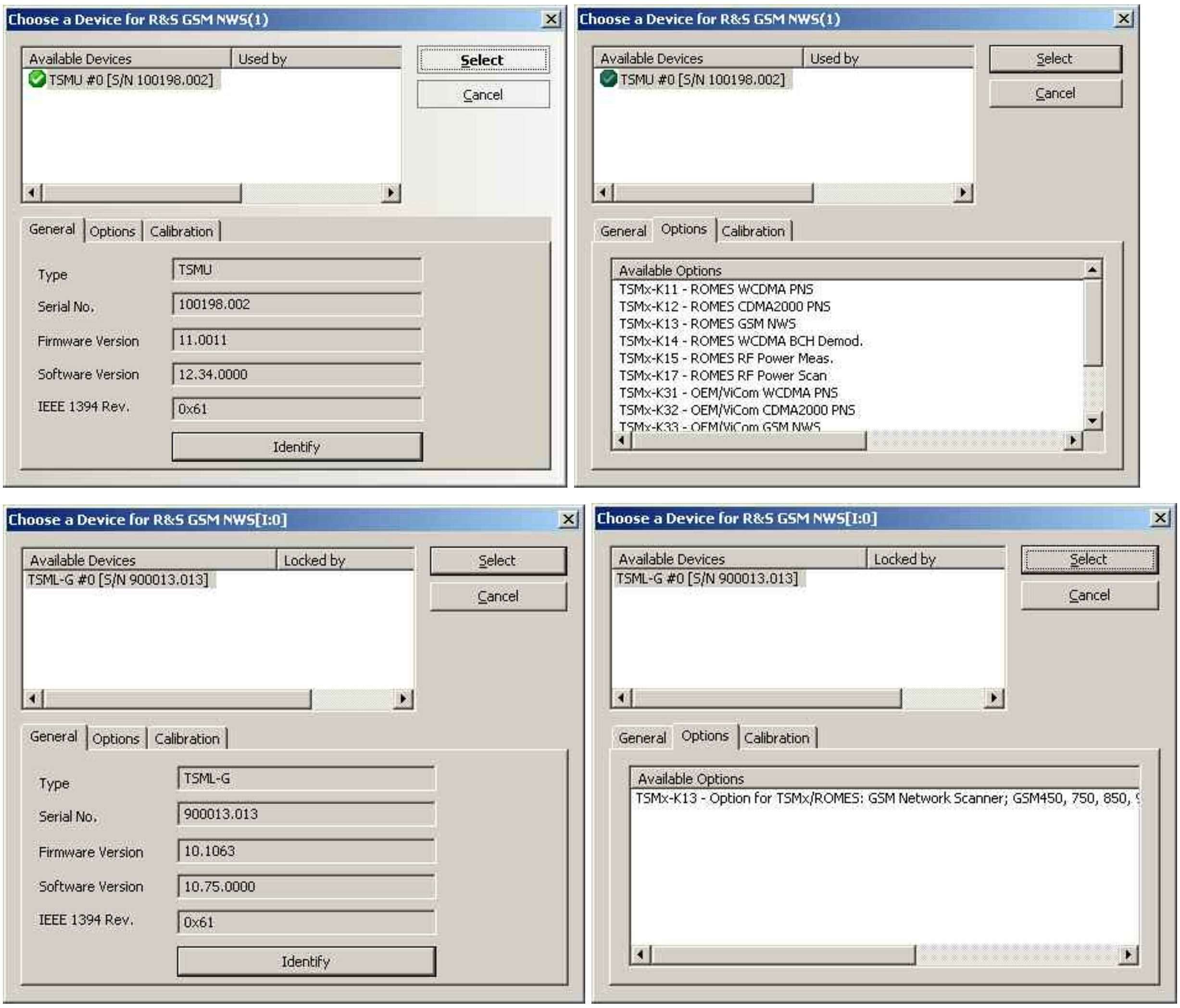


Fig. 6-103 GSM NWS Device Chooser (example: R&S TSMU / R&S TSML-G)

R&S TSMx

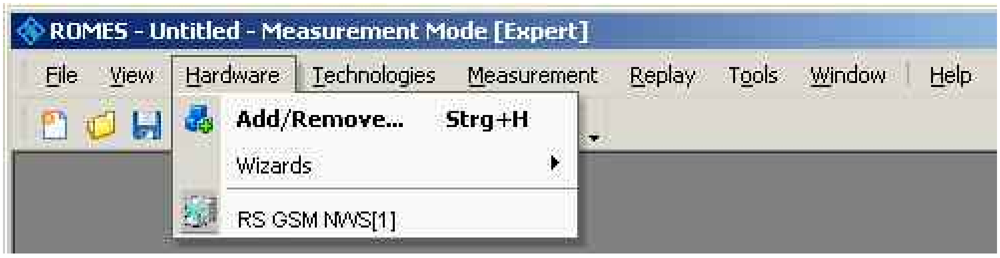
The R&S TSMx must be connected to the controller via one of the Firewire interfaces (IEEE1394) on the rear panel. No external trigger unit is needed, however, the performance and accuracy of the GSM NWS Scanner measurement can be improved by adding a high-precision PPS (pulse per second) signal from a GPS receiver (e.g. GINA, Trimble Placer). The synchronization mode is selected in the *Setup GSM NWS Driver* tab of the driver configuration menu.

The PPS signal from the GPS receiver is directly fed to the BNC connector labeled *PULSE IN* at the rear panel of the R&S TSMU. No additional synchronization unit is required.

The R&S TSMx operating manual and an installation tool for the Firewire Interface is provided on the ROMES DVD-ROM. Refer to the directory Firmware & Drivers\R&S RF Receivers\R&S TSMx. *See also the paragraph about the Firewire Driver on p. 6.18.*

Configuration Menu GSM NWS

ROMES provides a configuration menu for the GSM NWS driver that is opened by clicking the *RS GSM NWS[1]* command line in the *Hardware* menu. The command line is available as soon as the driver has been loaded.



The GSM NWS driver configuration menu contains several tabs to select the measured channels, the measurement rate, and the synchronization mode, configure the time slot and channel power measurement, to display information on the test receiver driver *(Info),* and to store the settings to a template.

Setup GSM NWS Driver

The *Setup GSM NWS Driver* tab selects the measured channels, the measurement rate, and the synchronization mode.

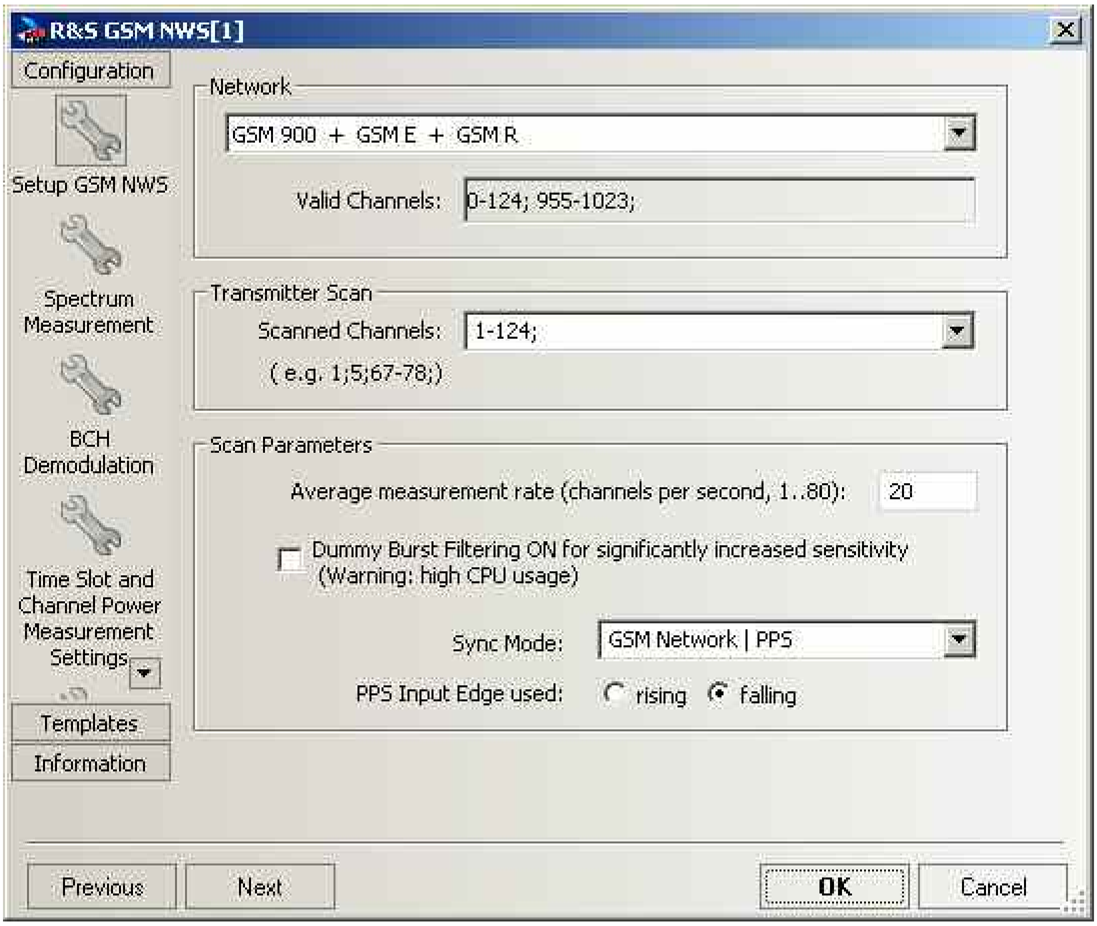


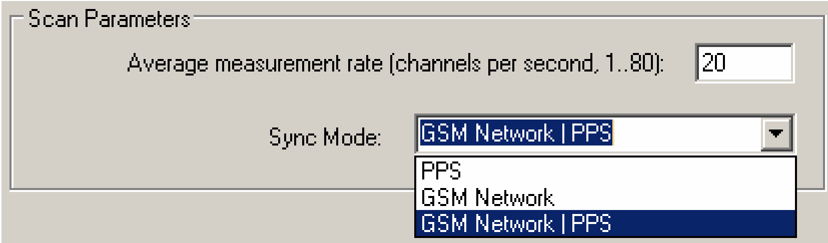
Fig. 6-104 GSM NWS configuration – Setup GSM NWS

Network Selection of the measured GSM band or a combination of bands. The GSM channel numbers (ARFCNs) for the selected bands are displayed below *(Valid Channels)*.

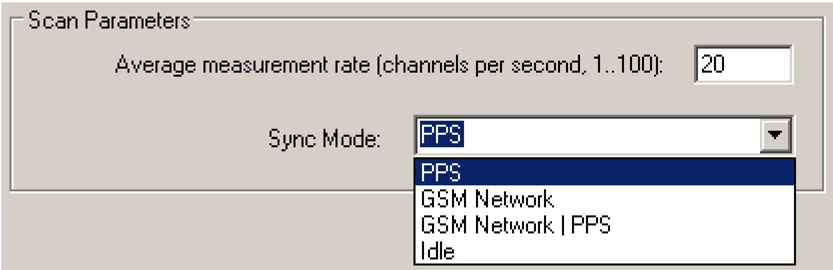
For an overview of GSM bands, channels, and frequencies refer to chapter 8.

Transmitter Scan Selection of the scanned channels within the selected GSM bands. The channels are scanned periodically with the measurement rate selected below. A warning *The channel list is invalid* indicates that one or more channels do not belong to any of the selected GSM bands.

Scan Parameters Measurement rate and synchronization mode for the R&S TSMU:



and for R&S TSMQ:



Average measurement rate…

Number of GSM channels measured per second.

Please note that the R&S devices support different average measurement rates:

R&S TSMU: up to 80 channels per second

R&S TSMQ up to 100 channels per second

R&S TSML-G up to 40 channels per second.

A lower measurement rate limits the size of the measurement file. If the system performance is not sufficient, R&S ROMES reduces the amount of evaluated data by discarding part of the results acquired by the R&S TSMx.

DUMMY Burst Filtering…

This option activates a preprocessing step in the GSM NWS software which detects dummy bursts in the GSM signal and subtracts the dummy bursts from the signal before further processing. This additional processing uses CPU cycles and should be used with care.

The benefit of the Dummy Burst Filtering is increased sensitivity for measuring transmitters which work on the same channel (Reused channel).

After the filtering the remaining signal shows more clearly the Synchron Channel (SCH) bursts which can then be demodulated and processed. Also the chance to successfully demodulate the System Information Types on the BCH increases.

Sync. Mode

Selection of the signal source providing the time base for the network scan measurements.

- PPS
- GSM Network
- GSM Network | PPS
- Idle (only TSMQ)

TSMQ is able to run different scanner (e.g. GSM, CDMA, UMTS) in the same time, if synchronization mode for one of the drivers is chosen, the others will be set to idle.

PPS Input Edge used

This configuration option allows to use for the PPS Input Edge the rising or falling edge.

The user can choose the edge of the signal which has the lowest jitter.

Note:
Using the feature needs the minimum firmware and the ELF file version 12.12.

R&S TSMx Synchronization

In addition to the default *PPS* time base setting described above, the R&S TSMx provides the following synchronization types for GSM network scans:

GSM Netw. | PPS

Use GSM Network or PPS synchronization, if one of these signal types is available. If none of the signals is available, use Internal synchronization. If both signal types are available and almost synchronous to each other, use the PPS signal. If both signal types are available but not synchronous, assume that the PPS signal is inaccurate (e.g. because the GPS receiver cannot detect a sufficient number of satellites so that it must use its internal reference signal) and use the GSM signal.

This mode is always used while no measurement is active.

GSM Network

Synchronization by means of approx. 2/3 of the received GSM signals, discarding the signals with the strongest timing deviation and time drift. This mode remains active as long as the R&S TSMx is capable of measuring the signals from at least 3 GSM cells and the standard deviation of the time drift of all used signals is below 60 ns/s. If at least one of the two conditions is no longer met, the R&S TSMx automatically switches to Internal time base.

The R&S TSMx synchronizes either to the GSM900/1800 or GSM850/1900 dual band. When it is switched on the instrument automatically scans the entire frequency range and selects the dual band where signals are available. GSM Network is the recommended setting if no PPS signal is available.

PPS

The PPS (pulse per second) signal from an external GPS receiver fed to the PULSE IN connector at the rear panel of the R&S TSMx is used for synchronization (see section Resources Configuration on p. 6.173 ff.). This signal provides maximum accuracy.

Internal	Synchronization by means of the reference signal generated by the internal quartz oscillator of the analyzer. The internal time base is activated automatically if no PPS signal is available. While a network time base is selected, the network signals constantly correct the frequency and phase of the internal oscillator in order to compensate for a possible drift. If the network signals are affected by a systematic error (e.g. due to a Doppler shift in a moving test vehicle), Internal time base can be used to prevent this correction.
Idle	Only available for TSMQ. TSMQ is able to run different scanner (e.g. GSM, CDMA, UMTS) in the same time, if synchronization mode for one of the drivers is chosen, the others will be set to idle.

Spectrum Measurement Settings

The *Spectrum Measurement Settings* Tab displays the properties for channel selection and spectrum resolution for spectrum measurements.

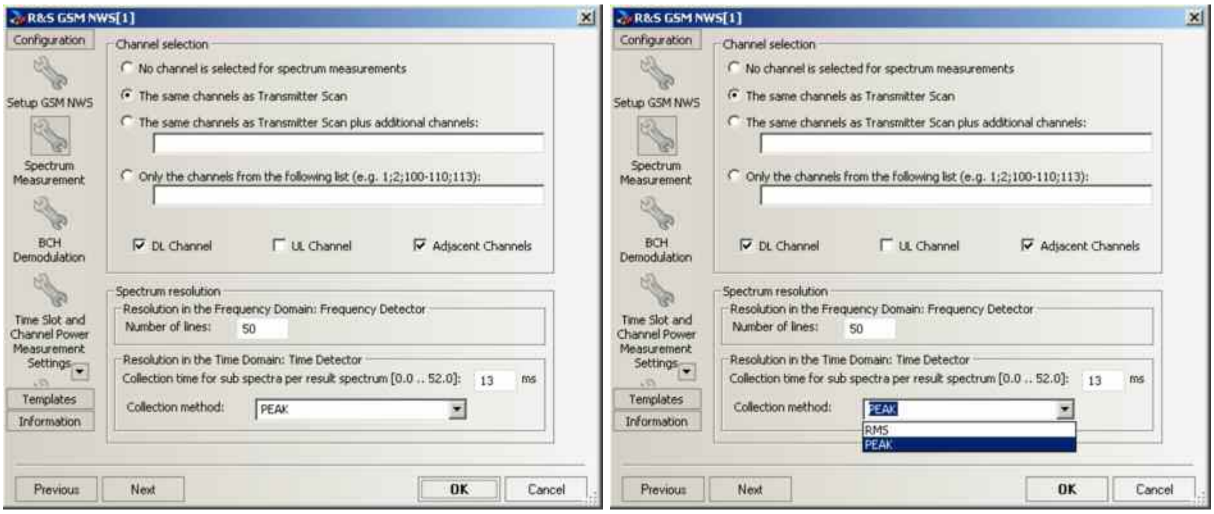


Fig. 6-105 GSM NWS configuration – Spectrum Measurement Settings

Channel Selection

In the first part of *Channel selection* is defined which channels are used for spectrum measurements.

- None
- Same as NWS Measurements, default
- NWS channels + additional
- User defined list

Additionally it is defined if Uplink, Downlink and also adjacent Channels are observed.

Spectrum resolution

The Spectrum resolution settings, divided in Frequency and Time Domain are valid for all selected channels.

Number of Lines	Range 10-100, default 50

Collection time [ms]	Time for collecting subspectra from a single 52 ms measurement. With 0.0 ms every subspectrum will be reported as result. With 52.0 ms all subspectra will be collected with the *Collection Method* and only one result spectrum will be reported. The default value of 13 ms will produce 4 result spectra per measurement. It is possible to choose between high time resolution in the time domain with high results data volume and lower time resolution in the time domain with lower results data volume.
Collection method	Peak or Average

The Spectrum settings must be chosen carefully because of the large data volumes which can be requested and must be handled.
The data volume depends on the count of channels which are configured for spectrum measurements and also on the Spectrum resolution as given by “number of lines” and “Count of collected sub spectrums”.

BCH Demodulation

The *BCH Demodulation* tab provides the GSM BCH Demodulation. The GSM NWS driver can be configured to demodulate the GSM BCCH channels (normal and extended) by specifying the System Information Types to be decoded. The results of this measurement can be displayed in the GSM NWS BCH View.

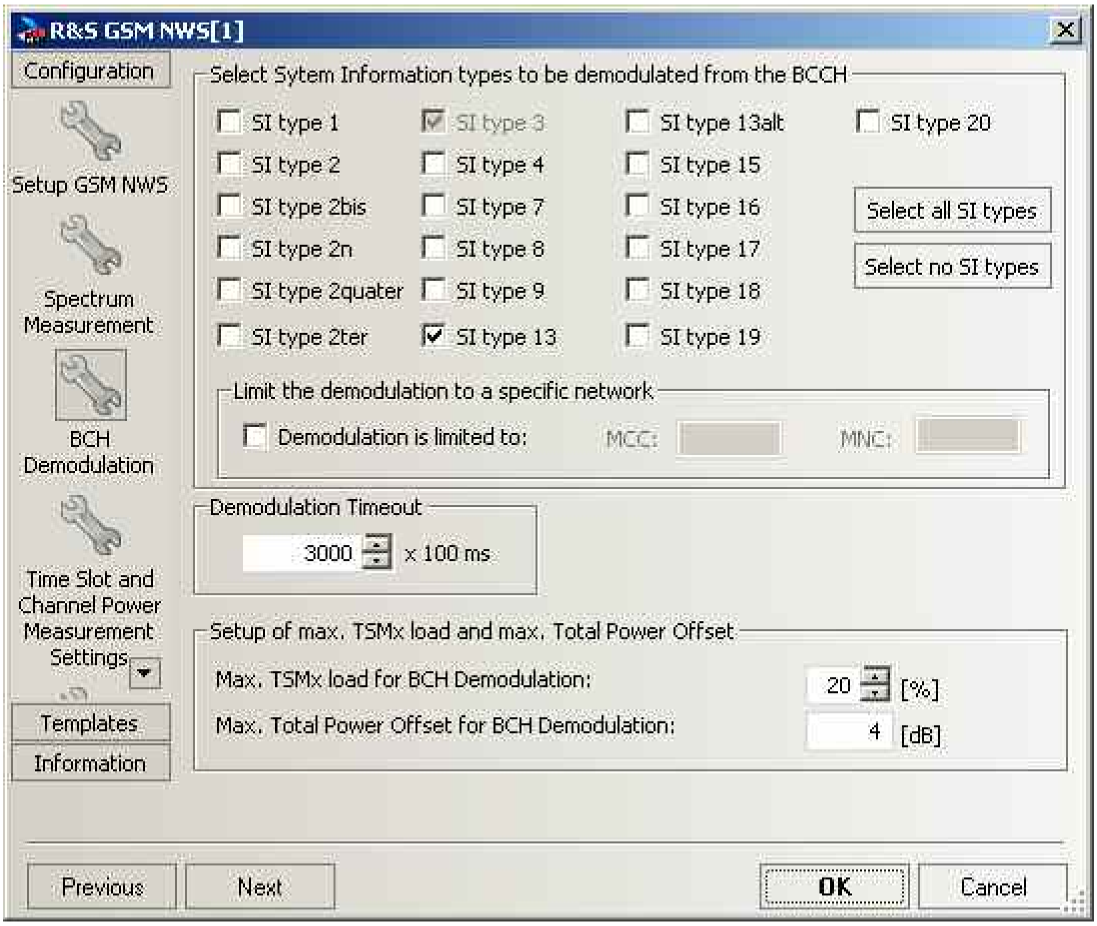


Fig. 6-106 GSM NWS configuration – BCH Demodulation

Select System Information… The first section "*Select System Information types to be demodulated from the BCCH*" offers to check demodulation of specific System Information types. System Information type 3 will always be demodulated and is switched on by default.

Select all SI types Checks all System Information Types.

Select no SI types Removes all checks for the System Information Types.

Demodulation is limited to: The demodulation of the checked SI types can further be restricted by MCC and/or MNC: If the feature is checked, then the given MCC and MNC will be compared to the information in the SI type 3 and only if there is a match, then the demodulation of the other SI types will be done. If either MCC or MNC is left empty, it will not be included in the comparison. This can be used for example to select only a specific country code.

Demodulation After identification of a new station by demodulation of the SI type 3, all the other

Timeout	checked SI types will be requested and demodulation will be performed with a timeout.	
	Demodulation Timeout	Steps of 100ms, range 0 … 18000
Setup of max. TSMx load…	*Max. TSMx load for BCH Demodulation*	10 … 50 %
	Max. Total Power offset for BCH De-modulation	0 … 20 dB.

Antenna GSM NWS

The *Antenna* tab defines *Antenna Name, Antenna Gain* and *Cable Loss*. These values are used to correct the received signal powers:

- If a *Cable Loss* of n dB is specified, the system assumes the received signals to be attenuated by n dB. n dB is added to all measured signal powers so that the displayed results correspond to the unattenuated signal.
- If an *Antenna Gain* of n dB is specified, the system assumes the received signals to be amplified by n dB. n dB is subtracted from all measured signal powers so that the displayed results correspond to the unamplified signal

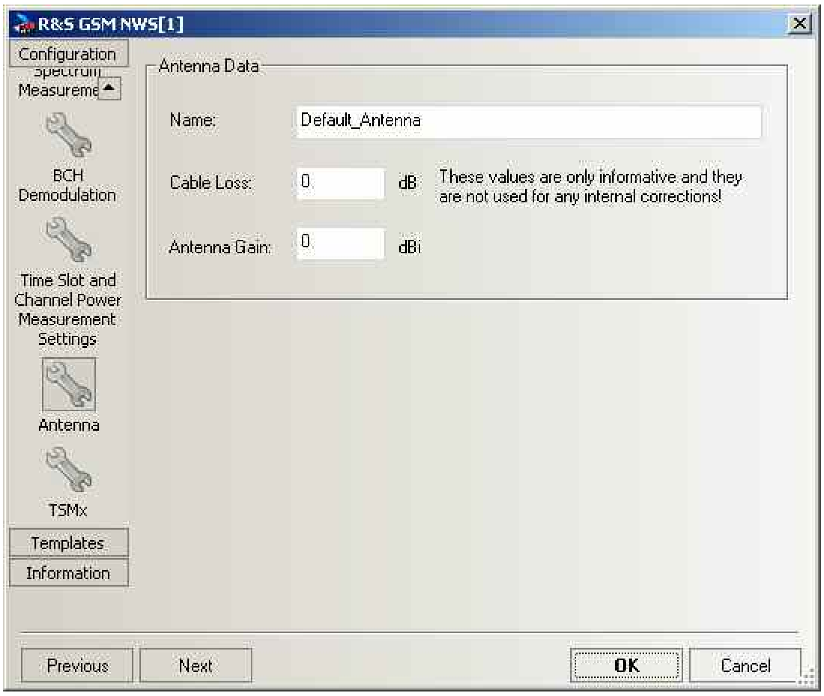


Fig. 6-107 GSM NWS configuration – Antenna

R&S TSMx

The *TSMx* tabs display the properties of the R&S TSMU / R&S TSMQ /TSML-G/ R&S TSMW devices and available options. This information is also displayed in the *Device Chooser* described on p. 6.29.

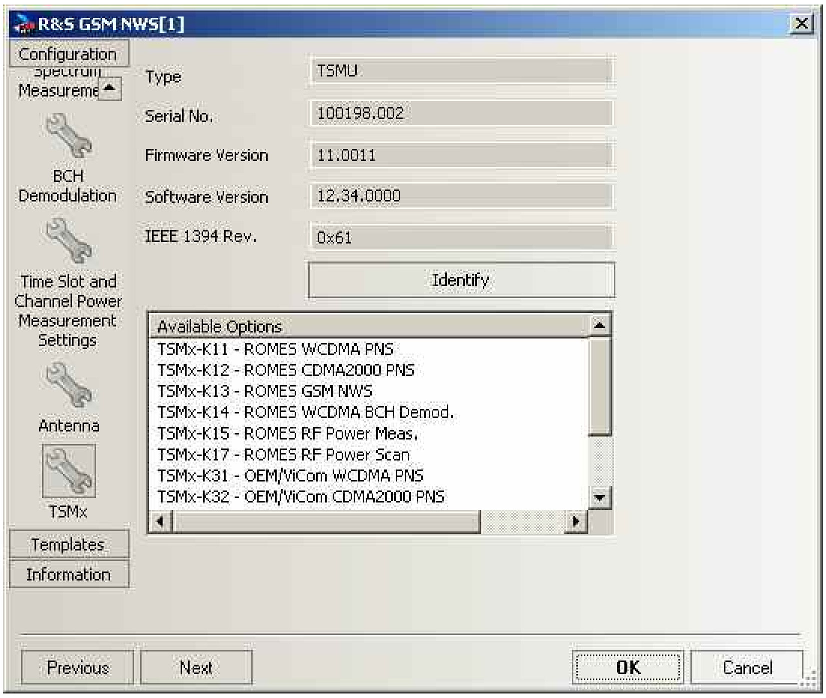


Fig. 6-108 GSM NWS configuration – R&S TSMU

Time Slot and channel power measurement

The *Time Slot and channel power measurement* tab allows to configure new time slot and channel power for the GSM Network. This option is available with option R&S ROMES4COI.

The measurements can generate a high data volume. It depends on the count of channels which are configured for measurement and on the *Results per GSM slot* setting. Therefore the parameters have to be set with care.

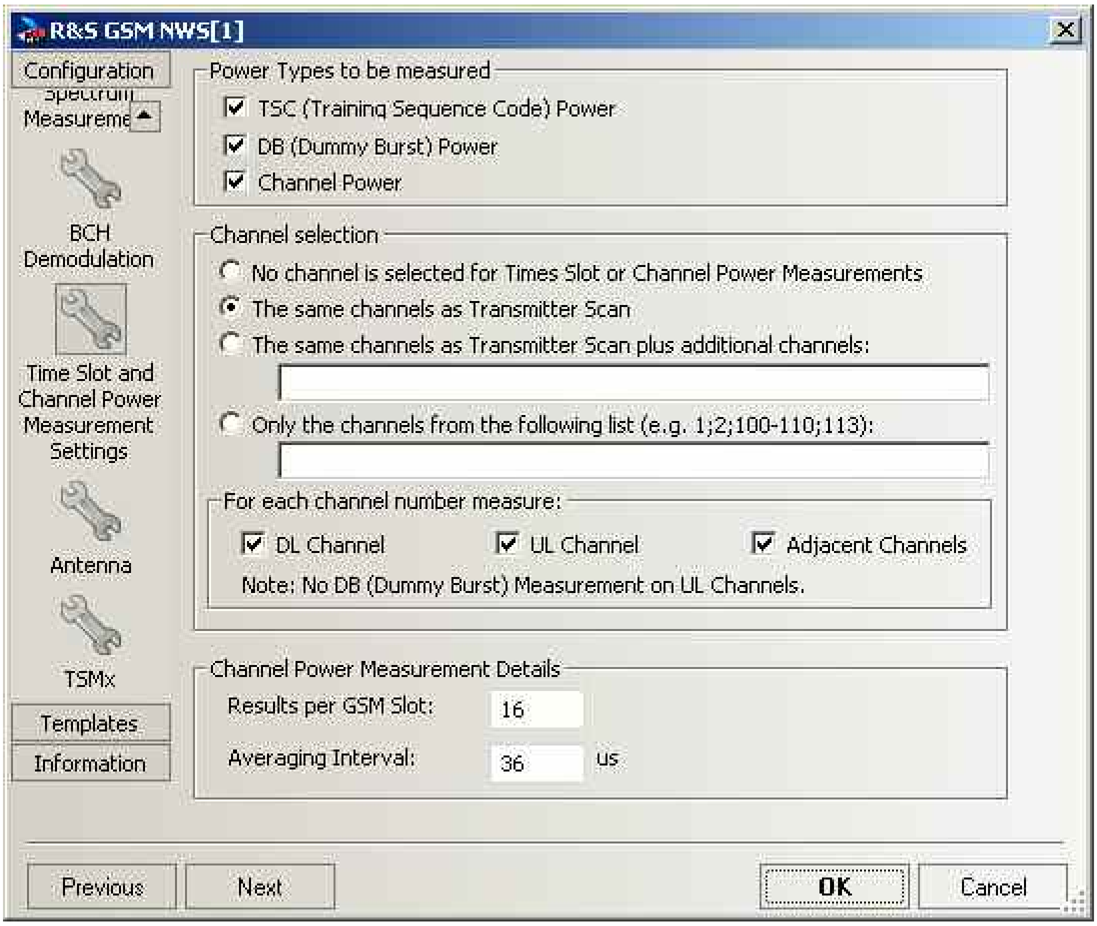


Fig. 6-109 GSM NWS configuration – Time Slot and channel power measurement

Power Types to be measured

Defines the measured power types.

TSC (Training Sequence Code) Power

The power of GSM bursts which have a Training Sequence Code: The bursts on the traffics channels and also the bursts on the broadcast channel which are used for System Information broadcast.

Besides the power also the exact timing and the TSC (0..7) will be measured. The TSC of a station has the same code as the BCC of the station and can be used to identify the station which transmitted the GSM burst.

(This function is only available for computers with processor with SSE2 unit, e.g. Pentium 4, Pentium M or Core 2 and not available i.e. for computers with Pentium 3 inside.)

DB (Dummy Burst)

The Power of Dummy Bursts which can be measured on

Power	the broadcast channels of stations. Besides the power also the exact timing will be measured and can be used to identify the station which transmitted the Dummy Bursts.
Channel Power:	The inband power on the channel as sequence of power values with a fine resolution over time. Each sequence has a duration of about 50 ms and covers at least 11 GSM frames. The resolution and the averaging of the values can be configured in the lower section of the configuration page.

Channel selection

The first part of *Channel selection* defines which channels are used for Times Slot or channel power measurements.

- None
- Same channels as the transmitter scan, default
- Same channels as the transmitter scan plus additional from list
- Only channels from user defined list

For each ... Select from the above selected channels the desired types for the Time Slot or channel power measurement.

> *Note:*
> *Since no dummy bursts are expected on UL channels, no dummy burst measurement is done on UL channels.*

DL Channel	If activated downlink channels are measured.
UL Channel	If activated uplink channels are measured.
Adjacent Channels	If activated adjacent channels are measured.

Channel Power Measurement Details

Results per GSM Slot	Range of 1 ... 50. Default value is 16.
Averaging Interval	Range of 6.4 ... 577.0 us Default value is 32.

Templates GSM NWS

The *Templates* tab stores the current GSM NWS driver configuration as a template, lists, loads or deletes driver templates.

Note:
When a driver is loaded using Hardware – Add/Remove... (see section Driver Installation on p. 6.1 ff.) ROMES checks whether a driver template is stored in the Driver Templates directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

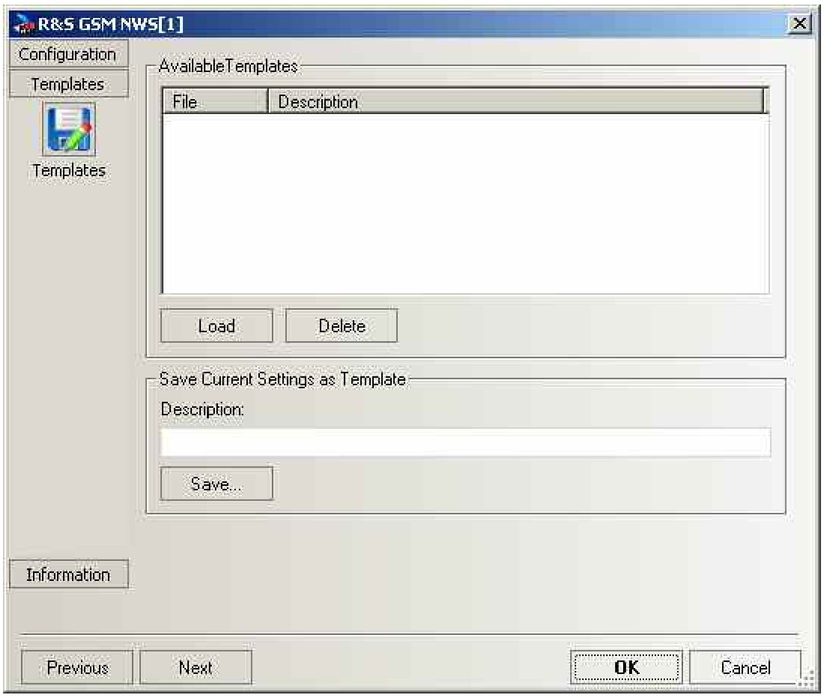
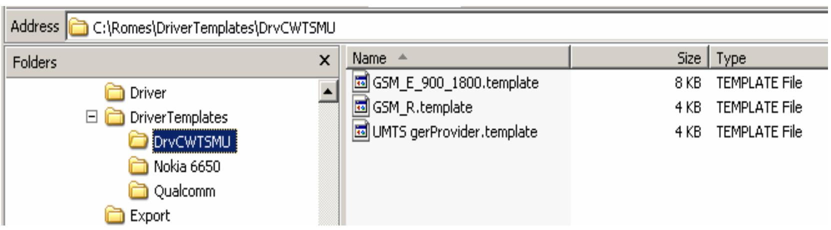


Fig. 6-110 GSM NWS configuration – Templates (identical for all TSMx)

Load/Delete Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent of the workspace. A selection of template files for the R&S TSMx is supplied with the ROMES installation:



Save Saves the current driver settings together with the *Description* to a selected template file.

CDMA2000 PN Scanner (PNS) Driver

The CDMA PNS (Pseudo Noise Scanner) driver controls an R&S TSMQ / R&S TSMU / R&S TSML-C radio network analyzer in order to perform CDMA Pseudo Noise (PN) scan. In a CDMA PN scan, the test device measures and identifies all CDMA2000 downlink (BTS) signals in the air.

Installation of the driver is explained in section *Driver Installation* on page 6.1; its configuration is explained below. The CDMA PN data can be viewed in the *CDMA PNS Views* (see chapter 3).

Resources Configuration CDMA PNS

The CDMA PNS driver is installed by selecting *CDMA2000 PN Scanner – R&S PNS* in the *Load/Unload Drivers* window (see Fig. 6-1 on page 6.3).

A *Device Chooser* dialog is opened when the CDMA PNS driver is loaded. The *Device Chooser* displays the test device and the essential connection parameters.

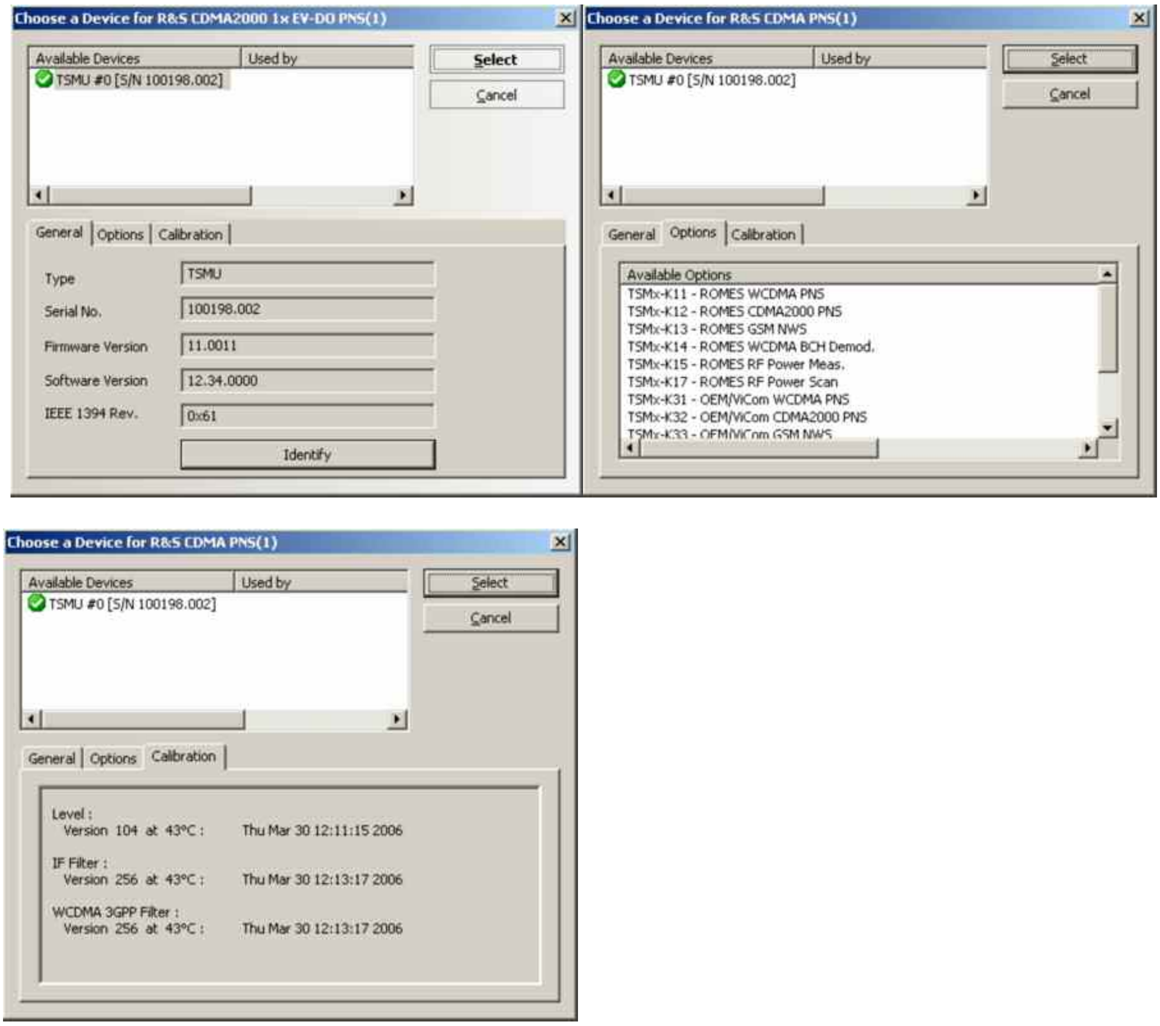


Fig. 6-111 CDMA PNS Device Chooser R&S TSMQ

TSMx

The R&S TSMx must be connected to the controller via one of the Firewire interfaces (IEEE1394) on the rear panel. No external trigger unit is needed, however, the performance and accuracy of the CDMA PN Scanner measurement can be improved by adding a high-precision PPS (pulse per second) signal from a GPS receiver (e.g. GINA, Trimble Placer). The synchronization mode *(Time Base)* is selected in the *Measurements* tab of the driver configuration menu (*TSMx Advanced Settings)*.

The PPS signal from the GPS receiver is directly fed to the BNC connector labeled *PULSE IN* at the rear panel of the R&S TSMx. No additional synchronization unit is required.

The R&S TSMx operating manual and an installation tool for the Firewire Interface is provided on the ROMES DVD-ROM. Refer to the directory Firmware & Drivers\R&S RF Receivers\R&S TSMx. See also the paragraph about the Firewire Driver on p. 6.18.

Configuration Menus CDMA PNS

ROMES provides a configuration menu for the CDMA PNS driver that is opened by clicking the *RS CDMA PNS[1]* command line in the *Hardware* menu. The command line is available as soon as the driver has been loaded.

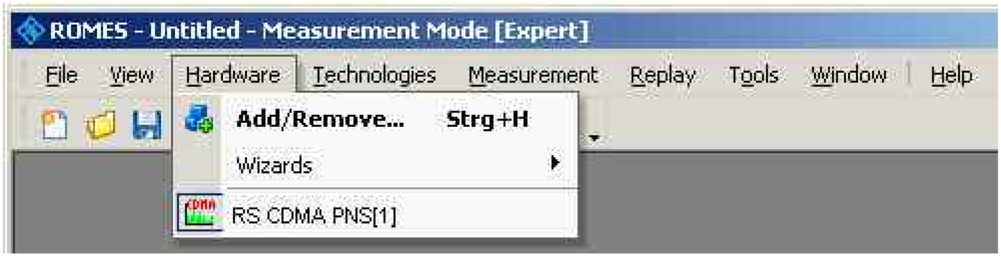


Fig. 6-112 Accessing the CDMA PNS driver configurations

The CDMA PNS driver configuration menu contains several tabs to display information on the test receiver driver *(Info),* configure the *Receiver* and the two alternate *Measurements,* identify the connected *R&S TSMU / R&S TSMQ / R&S TSML-C* and their options, and load driver *Templates*.

EVDO Measurement Configuration

The *EVDO Measurement Configuration* tab defines the parameter about frequencies and measurement in a CDMA PN scan. The configured options are also shown in the enhanced measurement file header.

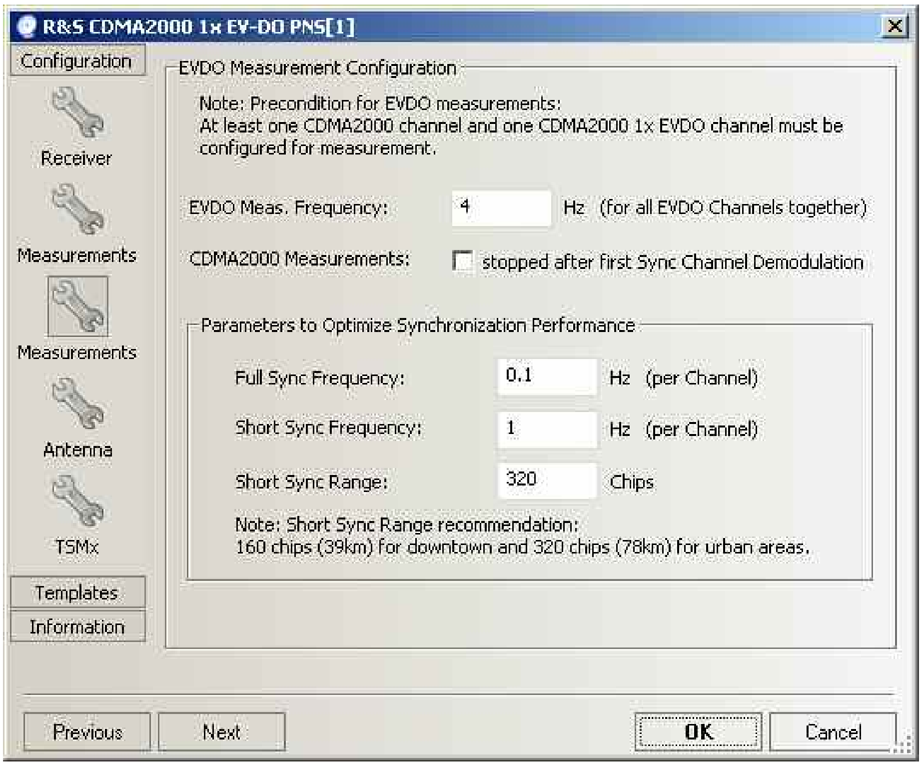


Fig. 6-113 CDMA PNS configuration – EVDO Measurement Configuration

EVDO Measurement Configuration

Note:
As precondition for EV-DO measurements at least one CDMA2000 channel and one CDMA2000 1x EV-DO channels must be configured for measurement. Since it is needed for synchronization.

EVDO Meas. Frequency

The measurement frequency can be set between 0.1 and 10Hz for all EV-DO channels together.

CDMA2000 Measurements

Check the box to stop the measurement after the first Sync. Channel Demodulation. This task is only useful if only one EV-DO channel measurements are of interest.

Parameters of the ...

The following parameters allows to fine tune the synchronize process.

Full Sync Frequency	Full Synchronize Frequency from 0.1 to 10Hz.
Short Sync Frequency	Short Synchronize Frequency from 1.0 to 10Hz.
Short Sync Range	Short Synchronize Range from 160 to 1024Hz.

Receiver settings CDMA PNS

The *Receiver* tab selects the frequencies measured in a CDMA PN scan.

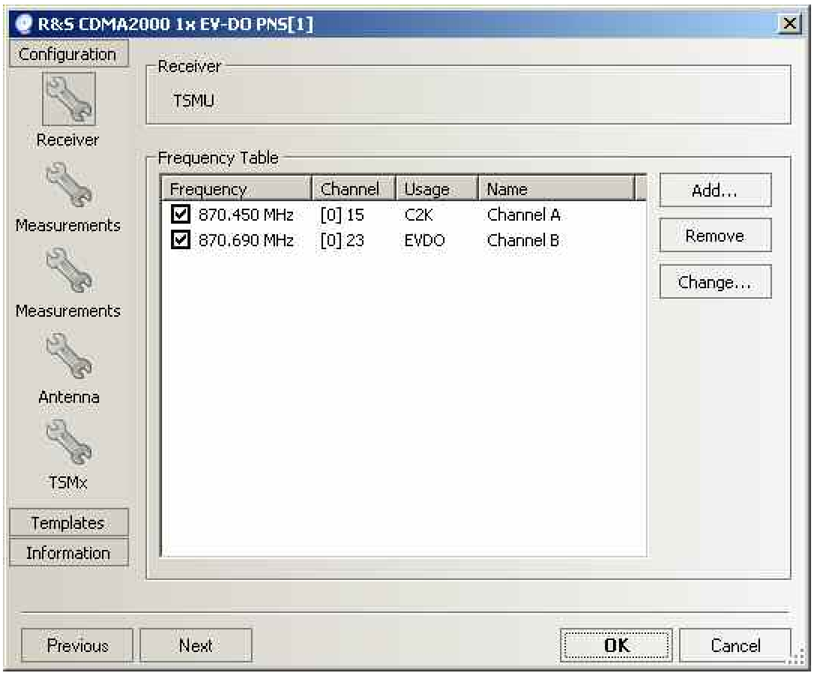


Fig. 6-114 CDMA PNS configuration – Receiver

Frequency Table The *Frequency Table* displays a selection of forward CDMA frequencies with their channel numbers. In the *Channel* columns, the SR 1 band class of the channel is displayed in angular brackets. To modify or extend the list use the *Add Frequency* dialog; see below. The R&S TSMU / R&S TSML-C measure all channels with selected check boxes.

Add Opens a dialog for adding a new channel frequency to the table; see section *Add Frequency* below.

Remove Removes a selected channel from the list.

Change Opens an input field to change the *Name* of the current channel or assign a new name.

Add Frequency CDMA PNS

The *Add Frequency* dialog adds frequencies to the frequency table in the *Receiver* tab (see above). It is opened by the *Add…* button in the *Receiver* tab of the R&S CDMA PNS driver configuration menu.

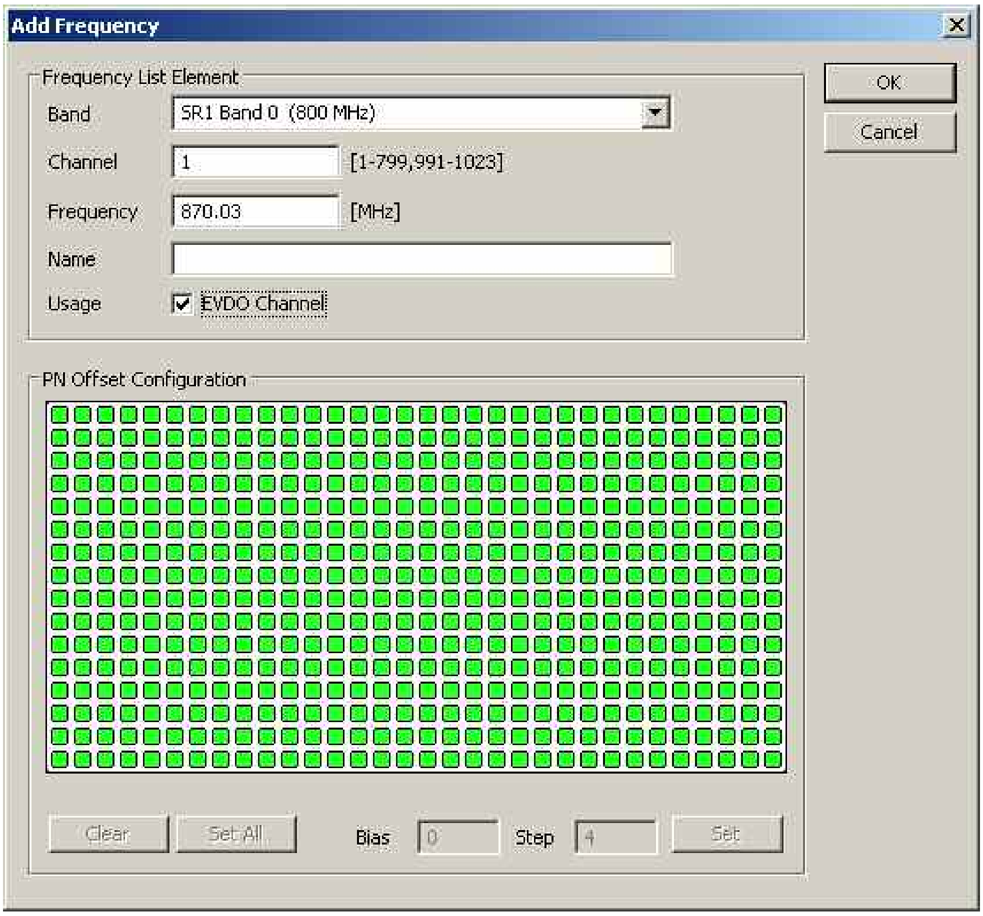


Fig. 6-115 CDMA PNS configuration – Add Frequency

Frequency List Element
Adds frequencies to the frequency table in the *Receiver* tab. The driver supports all Spreading Rate 1 (SR 1) band classes 0 to 10 specified in standard 3GPP2 C.S0002. It is even possible to select frequencies off the nominal CDMA downlink bands.

Band Selection of the SR 1 band class (0 to 10).

Channel CDMA channel number within the selected band. If an undefined channel number is specified, the frequency becomes invalid.

Frequency Either the frequency calculated according to the selected *Band* and *Channel,* or any frequency within the R&S TSMU frequency range. *Out of Band !* indicates that the frequency entered is an off-band frequency.

Name Arbitrary, optional identification string for the selected frequency.

Usage Activation of the *Usage EV-DO Channel* defines channels as DO channels and disables the PN Offset Configuration block of controls which are not needed for EV-DO.

PN Offset Configuration

Different CDMA cells and cell sectors all use the same short code, but use different phases of it, which is how the mobile differentiates them from each other. The phase is known as the *PN Offset*, which defines the offset of the PN sequence. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.
Each square represents one unit of 64 PN chips. The squares can either be selected manually (clicking on a square toggles its value) or they can be defined by entering values into the *Bias* and *Step* entry fields, which are activated by the *Set* button.

PN Offset Shows the selected value for the PN Offset as configured (range from 0 to +511)

Clear Clears all unit squares in the PN Offset Configuration table.

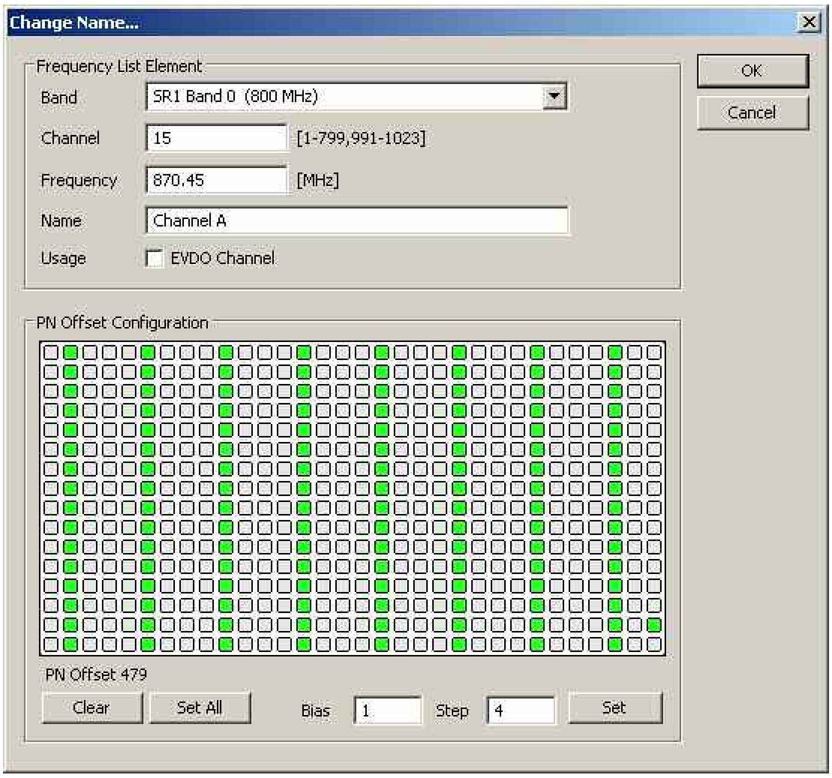
Set All Sets all unit squares in the *PN Offset Configuration* table.

Bias The bias value sets the number of cleared unit squares at the beginning of the *PN Offset Configuration* table. The change becomes active after *Set* is clicked.

Step The step value defines the interval of the set unit squares as a sequence. The change becomes active after *Set* is clicked.

Set Activates the defined settings for *Bias* and *Step*.

An example for a setup with a *Bias* of 0 and a *Step* of 4, resulting in a *PN Offset* of 282, is shown below:



Measurements CDMA PNS

The *Measurements* tab defines general measurement settings for the CDMA PN scan.

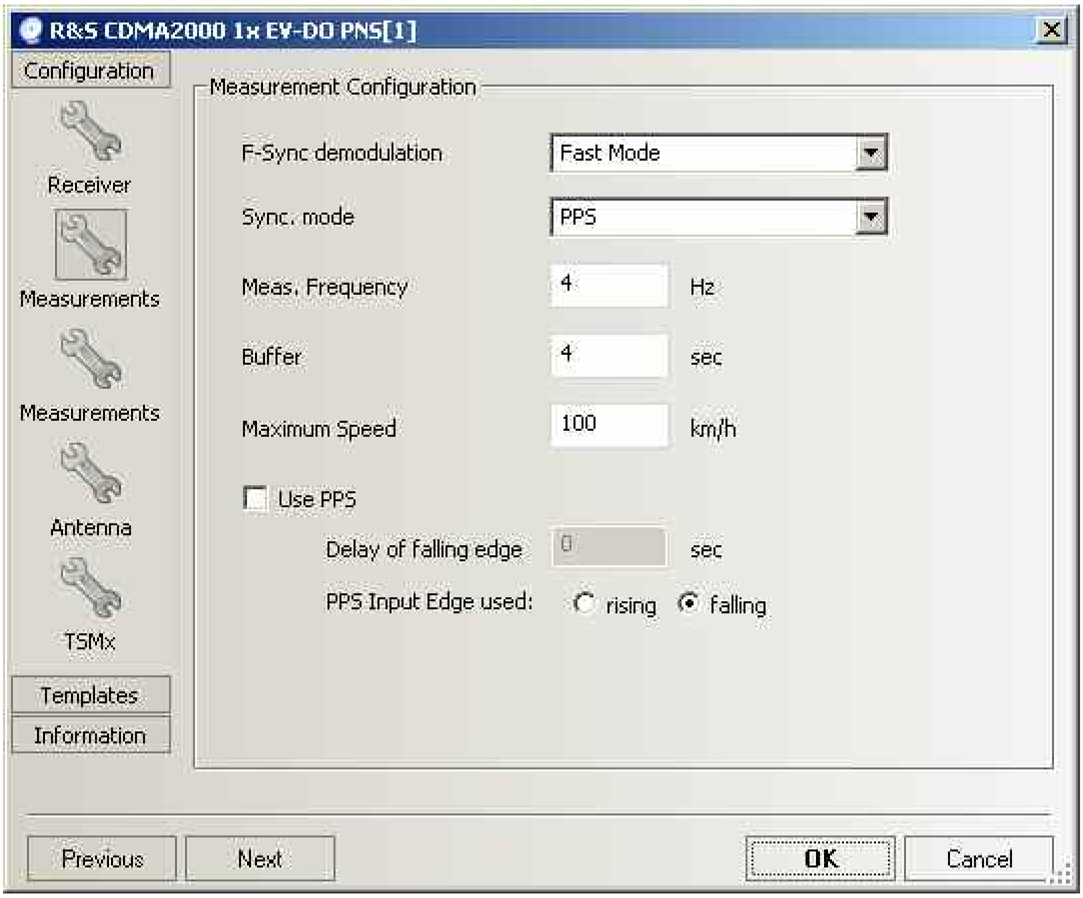


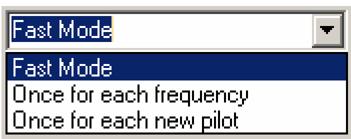
Fig. 6-116 CDMA PNS configuration – Measurements

Measurement Configuration

The settings in the *Measurement Configuration* panel define how ROMES processes the baseband (I/Q) data for a CDMA PN scan.

F-SYNC Demodulation

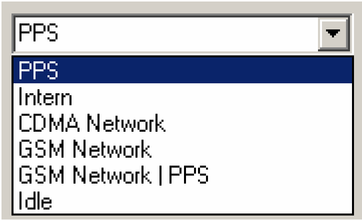
Determines how often the R&S TSMU will demodulate the Forward Synchronization Channel (F-SYNC) and decode the information elements in the synchronization message (see description of the *CDMA PNS F-SYNC View* in chapter 4).



The synchronization message is demodulated at least once per measured frequency. A smaller F-SYNC demodulation rate has no impact on the measurement but can considerably reduce the size of the measurement file.

Sync. Mode

Signal source providing the time base for the R&S TSMx measurements. The R&S TSMx must synchronize to a reference signal at the beginning of each measurement. The R&S TSMx provides the following methods for synchronization:



PPS

The PPS (pulse per second) signal from an external GPS receiver fed to the *PULSE IN* connector at the rear panel of the R&S TSMx is used for synchronization (see section *Resources Configuration* on p. 6.173 ff.). This signal provides maximum accuracy.

Intern

Synchronization by means of the reference signal generated by the internal quartz oscillator of the analyzer. The internal time base is activated automatically if no PPS signal is available. While a network time base is selected, the network signals constantly correct the frequency and phase of the internal oscillator in order to compensate for a possible drift. If the network signals are affected by a systematic error (e.g. due to a Doppler shift in a moving test vehicle), *Internal* time base can be used to prevent this correction.

CDMA Network

Synchronization by means of the received CDMA signals. *CDMA Network* is the recommended setting if no PPS signal is available.

GSM Network

Synchronization by means of approx. 2/3 of the received GSM signals, discarding the signals with the strongest timing deviation and time drift. This mode remains active as long as the R&S TSMx is capable of measuring the signals from at least 3 GSM cells and the standard deviation of the time drift of all used signals is below 60 ns/s. If at least one of the two conditions is no longer met, the R&S TSMx automatically switches to *Internal* time base.

The R&S TSMx synchronizes either to the GSM900/1800 or GSM850/1900 dual band. When it is switched on the instrument automatically scans the entire frequency range and selects the dual band where signals are available. *GSM Network* is the recommended setting if no PPS signal is available.

GSM Netw. | PPS	Use *GSM Network* or *PPS* synchronization, if one of these signal types is available. If none of the signals is available, use *Internal* synchronization. If both signal types are available and almost synchronous to each other, use the PPS signal. If both signal types are available but not synchronous, assume that the PPS signal is inaccurate (e.g. because the GPS receiver cannot detect a sufficient number of satellites so that it must use its internal reference signal) and use the GSM signal.
	This mode is always used while no measurement is active.
Idle	Only available for TSMQ. TSMQ is able to run different scanner (e.g. GSM, CDMA, UMTS) at the same time, if synchronization mode for one of the drivers is chosen, the others will be set to idle.

Buffer

Time for which the raw measurement data is stored in the R&S TSMx, should ROMES be unable to process it immediately (e.g. due to temporary low performance of the controller). If the ROMES buffer continues to be blocked after the buffer size time, the oldest data in the buffer is deleted and overwritten by new data. Data transfer starts as soon as ROMES is ready again to receive and process data.

A large buffer size increases the probability that no measurement data is lost, even though ROMES may be blocked for an extended time. On the other hand, storage and transfer of large amounts of buffer data increase the possible delay between data recording and evaluation/display in the views.

Maximum Speed

The value for the maximum speed of the measurement vehicle is used for improved evaluation of fading channel measurements. The range is between 0 and 300 km/h, otherwise an error message is displayed:

(Please enter a number between 0 and 300)

Use PPS

The checkbox toggles the use of the PPS (pulse per second) signal from an external GPS receiver.

If *Use PPS* is activated, the delay of the falling edge of the PPS signal can be manually set in the corresponding field. This is useful for the calibration of the PPS propagation delay as described below.

The possible range is between -0.0010000 and 0.9999999 s, otherwise an error message is displayed:

(Please enter a number between -0.001 and 0.999)

PPS Input Edge used

This configuration option allows to use for the PPS Input Edge the rising or falling edge.

The user can choose the edge of the signal which has the lowest jitter.

Note:

Using the feature needs the minimum firmware and the ELF file version 12.12.

Calibration of the PPS Delay CDMA PNS

The calibration of the PPS delay is done by first performing a measurement of a base station with a known distance. This measurement is configured such that "Use PPS" is deactivated:

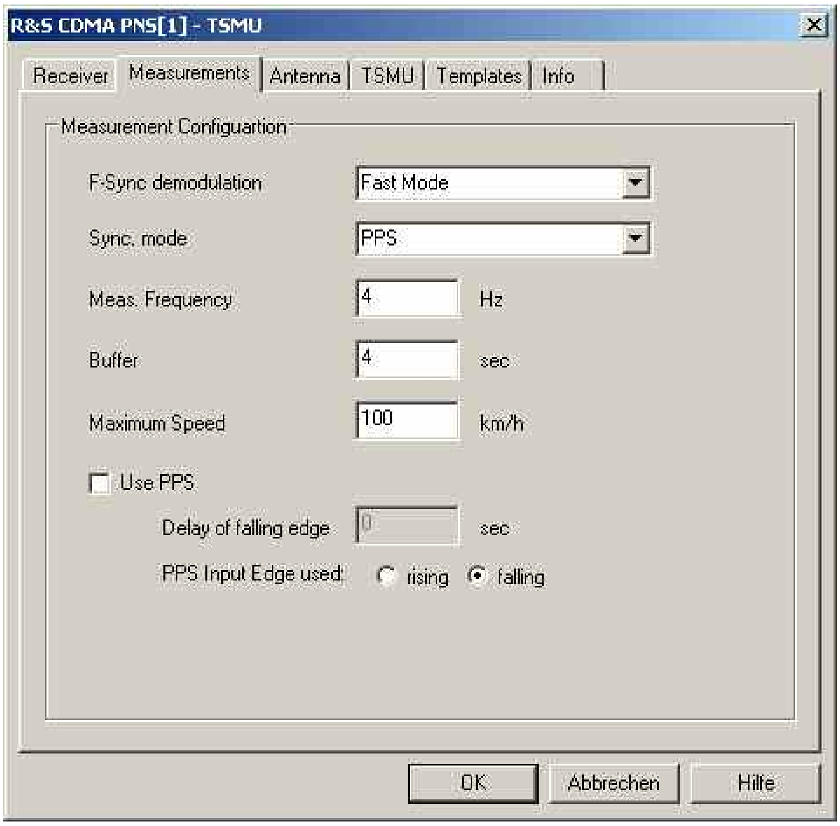
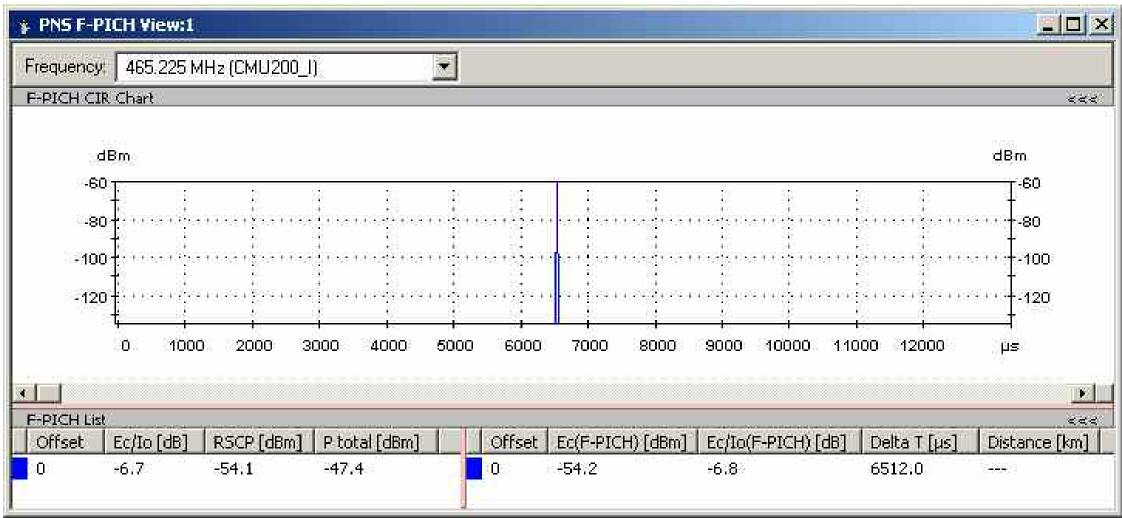


Fig. 6-117 CDMA PNS R&S TSMQ configuration – PPS Calibration

The measurement of the station with known distance yields the reference signal propagation time (Delta T_{Ref}). In the *PNS F-PICH View* list the measured Delta T (the time delay of the signal slot timing relative to the CDMA system time or GPS time) is shown.

In this example the Delta $T_{Meas.}$ is 6512 µs.



Also, the *PNS System Time Line Estimation View* shows the measured PPS Delay without calibration.

With these values, return to the CDMA PNS R&S TSMQ measurement configuration tab (see Fig. 6-119) and enter the *Delay of falling edge*, which is calculated as follows:

$$\text{Delay of falling edge} = \text{PPS Delay}_{Meas.} - (\text{Delta } T_{Meas.} - \text{Delta } T_{Ref.})$$

The entered value should be as exact as possible (**at least 7 decimal places**), because 0,1 µs corresponds to 30 m distance, even though the dialog window only suggests three decimal places.

Note that as long as the measurements are performed in the same network using the same GPS/PPS signal source, the calibration is not necessary. For measurements in different networks, the calibration can be useful and if a different GPS signal source is used, the PPS calibration is recommended.

Antenna CDMA PNS

The *Antenna* tab defines *Antenna Name, Antenna Gain* and *Cable Loss*. These values are used to correct the received signal powers:

- If a *Cable Loss* of n dB is specified, the system assumes the received signals to be attenuated by n dB. n dB is added to all measured signal powers so that the displayed results correspond to the unattenuated signal.
- If an *Antenna Gain* of n dB is specified, the system assumes the received signals to be amplified by n dB. n dB is subtracted from all measured signal powers so that the displayed results correspond to the unamplified signal

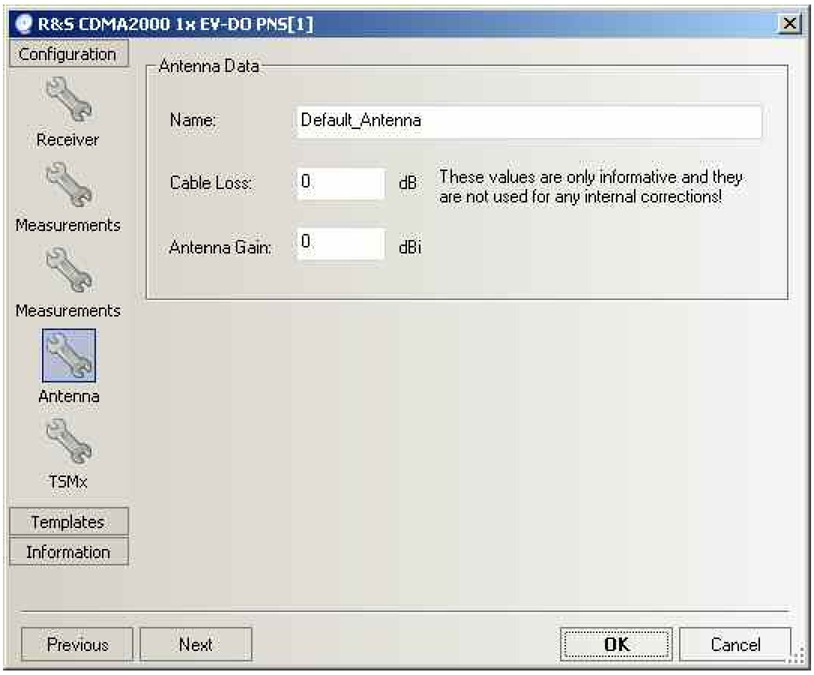


Fig. 6-118 CDMA PNS configuration – Antenna

R&S TSMx CDMA PNS

The *TSMx* tabs display the properties of the R&S TSMQ and its available options. This information is also displayed in the *Device Chooser* described on p. 6.29.

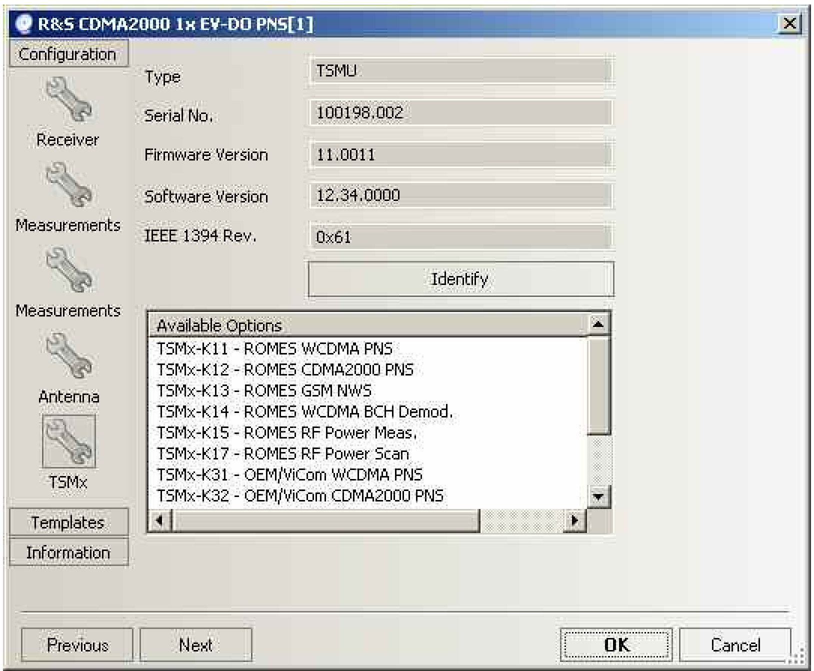


Fig. 6-119 CDMA PNS configuration – R&S TSMU

Templates R&S TSMx CDMA PNS

The *Templates* tab stores the current R&S TSMx driver configuration as a template, lists, loads or deletes driver templates.

Note:

When a driver is loaded using Tools – Preferences – Hardware (see section Driver Installation on p. 6.1 ff.) ROMES checks whether a driver template is stored in the Driver Templates directory and its subdirectories (see below). The driver can be loaded with default settings or with the settings stored in any of the templates found.

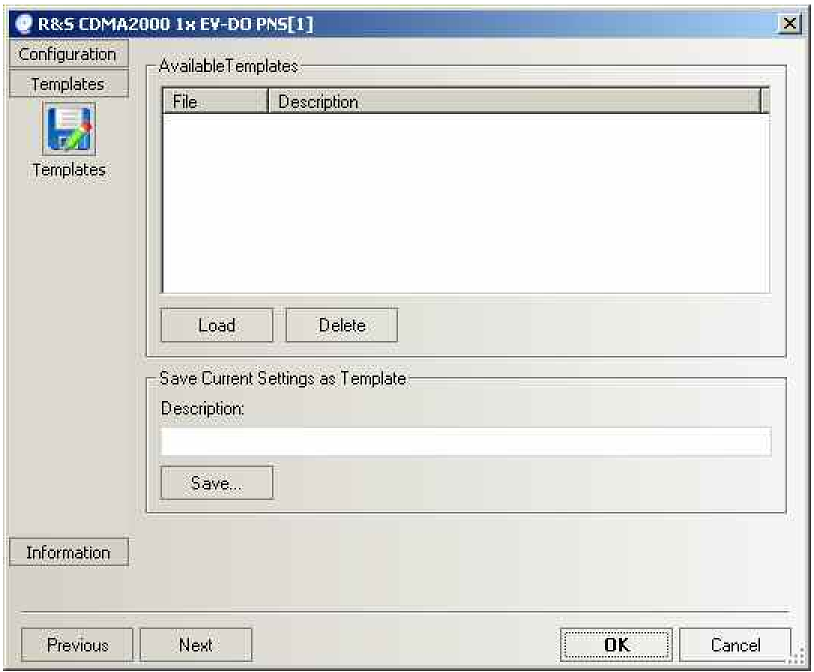
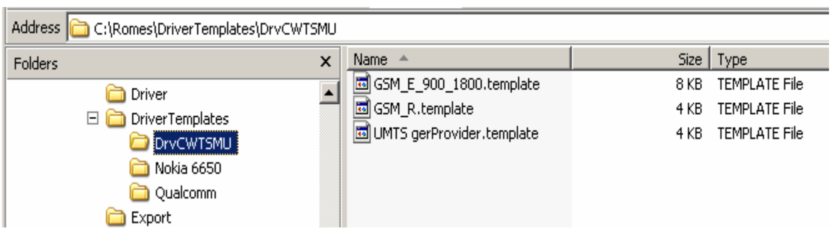


Fig. 6-120 CDMA PNS configuration – Templates

Load/Delete Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent of the workspace. A selection of template files for the R&S TSMx is supplied with the ROMES installation:



Save Saves the current driver settings together with the *Description* to a selected template file.

BTS Position Estimation

To use the BTS Position Estimation the option ROMES3LOC must be installed. The BTS Position Estimator calculates BTS locations from GSM/WCDMA3GPP/CDMA2000 scanner measurements plus GPS position measurements plus high accuracy PPS signals.

Enabling the feature need a ROMES option per technology (DRV_LOC_UMTS, DRV_LOC_GSM, DRV_LOC_CDMA).

Requirements

Position estimation is only possible under the following preconditions:

- UMTS PNS (TSMx only) or GSM Network scanner driver loaded
- A GPS receiver supporting a PPS pulse; PPS routed to the corresponding TSMx
- The system must be moving to deliver results

The TSMx needs 100 PPS pulses to synchronize its internal time base correctly to the GPS system. Therefore, a measurement delivers results not earlier than 2 minutes after start of measurement.

Components

The following components are necessary to provide this feature:

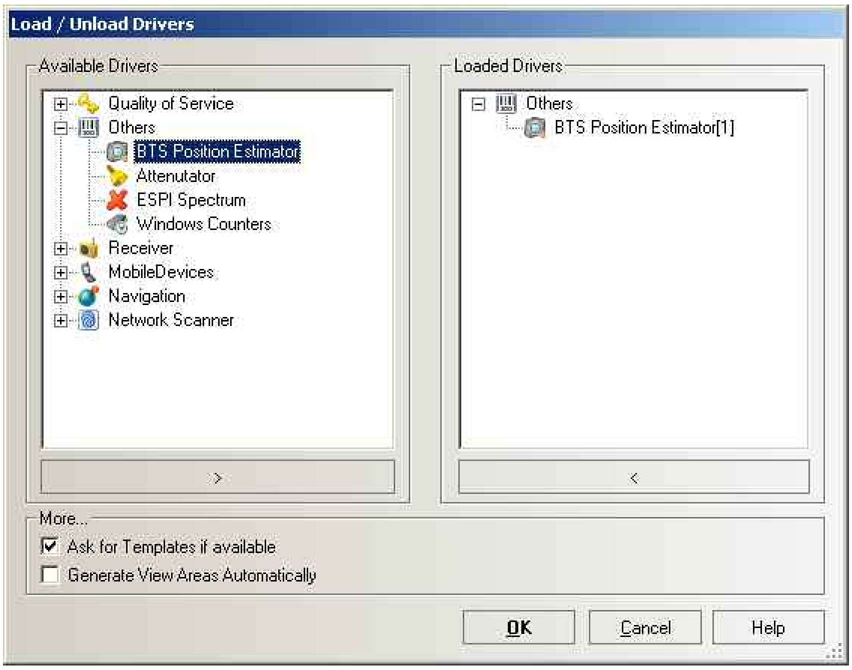
PositionEstimator.dll (on the ROMES home directory)	This dll does the position estimation calculations. It has a ‘knowledge base’ in which it accumulates measurements for its calculations. This knowledge base can be saved after a measurement and can be reused in a later measurement to speed up the next position estimation calculations and yield higher accuracy.
DRVPE.dll (on the ‘driver’ directory)	This is a new ROMES driver which provides the configuration interface and also manages the position estimation process during measurement.
FrameGrabberPE.dll (on the ‘framegrabber’ directory)	This new component grabs the result frames from the GSM/WCDMA3GPP/CDMA2000 scanners which are configured for position estimation, puts them in a wrapper frame and forwards them to the position estimator dll. Also it grabs the position result frames from the current GPS driver and forwards them to the position estimator dll.

Note:
Enabling the feature need a ROMES option per technology (DRV_LOC_UMTS, DRV_LOC_GSM, DRV_LOC_CDMA).

Load BTS Position Estimation driver

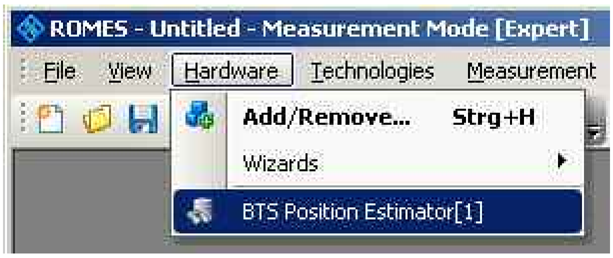
The first step is to load the position estimation driver:

The driver category is “BTS Position Estimation”.

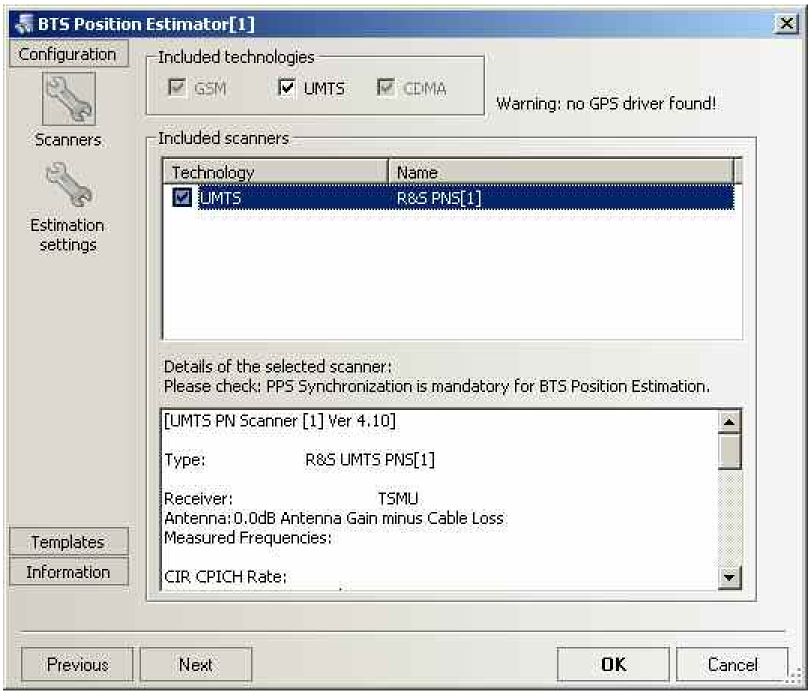


Configuration Menus R&S Position Estimator

ROMES provides a configuration menu for the Position Estimator driver opened by clicking the *RS Position Estimator[1]* command line in the *Hardware* menu. The command line is available as soon as the driver has been loaded.



Scanner Settings Position Estimator



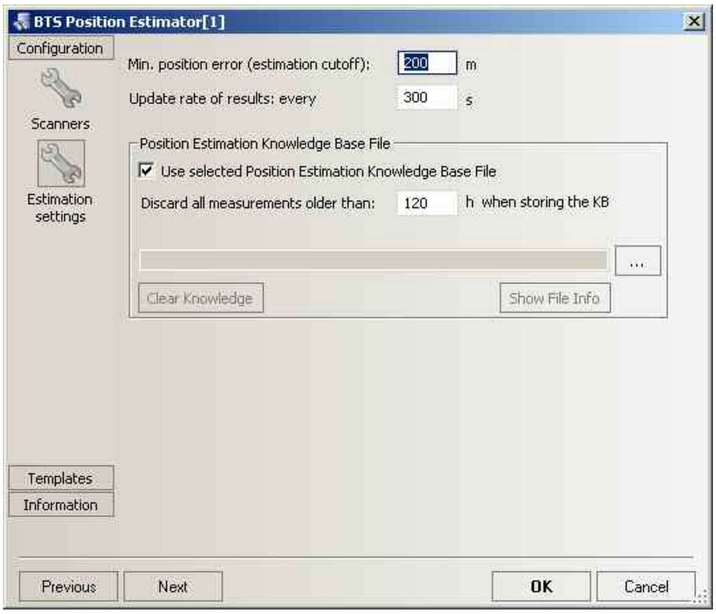
All technologies are included by default, but can be disabled per technology with the check boxes in *Included technologies*.

The available scanner drivers of the included technologies (which have the DRV_LOC_xxx options) are shown in the list *Included scanners*.

The configuration details of the selected scanner are shown in the field below the scanner list.

All scanners are included per default in the position estimation process, but can be individually included or excluded by checking the check boxes in the list.

Estimation Settings Position Estimator



Min. position error (estimation cutoff)
Defines a distance in meter which limits the position estimation to a reasonable accuracy for performance reasons. If the 66% probability of the estimated position falls below this distance, the estimation process for this transmitter is finished.

Update rate of results
Defines the period in seconds between estimation orders for the position estimator. After executing the estimation order, new position estimation results will be requested from the position estimator and will be stored in the measurement file (*.rscmd). Also the result frames will be distributed in R&S ROMES and results can be viewed for example in the *GSM NWS BCH View* or *UMTS PNS BCH View*.

Position estimation knowledge base file:

Use stored Position Estimation Knowledge Base File	Use/don’t use a knowledge base file to enhance later measurements. If the flag is checked, then the currently selected knowledge base will be sent to the position estimator at the start of measurement and will be used in the estimation process and at least one estimation was executed, then the knowledgebase of the estimator will be written to the current knowledge base file (overwriting the old contents).
Discard all measurements older than xxx hours when storing the knowledge base	For performance reasons and data volume limiting: The option to discard older measurements (than xxx hours) from the knowledge base when storing the file.

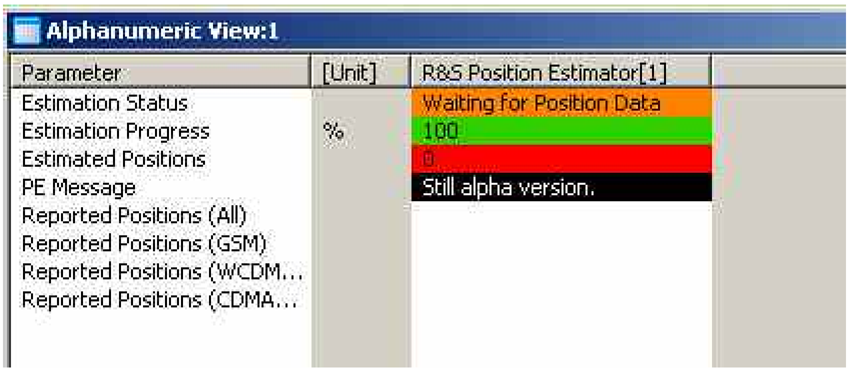
The pathname of the current position estimation (PE) knowledge base file. By pressing the “…” button, the file can be selected in an enhanced file chooser dialog, which shows also a summary of the content of the selected knowledge base. Also a new (empty) knowledge base may be created in the file dialog by typing a new file name and pressing OK. The extension .pekb will be automatically added if not already specified.

Clear knowledge
The content of the current knowledge base file can be reset to the initial empty content by using this button.

Make Testfile
The button is only available in the debug version. It generates a valid KB file

Show File Info
The button displays a dialog which shows details of the content of the current knowledge base file. This is the same info as in the file chooser dialog.

TecPE: Signals of the Position Estimator



The signals allow to detect error conditions and to monitor the progress of the estimation process.

The status of the position estimator will be polled every 5 seconds during the first minute of measurement and in this time the "*Estimation Status*" should go to OK.

If the Estimation Status OK is reached, the estimation cycle will be started and estimation results will be reported periodically.

Measuring with the position estimator

Preconditions:

This measurement mandates that the scanner is used with a PPS signal, so this must be provided by the hardware and software setup.

With a scanner, the DRV_LOC_xxx option, a GPS source and a PPS signal available, a measurement can be configured.

The estimation process needs from each transmitter a set of measurements which are taken from different locations.

The locations shall be distributed in a larger area and also shall not be on a single straight line. Useful patterns could be a roundtrip or two lines with a large crossing angle or parallel lines in a reasonable distance.

Checking results:

Current position estimation results can be viewed during measurement in the *GSM NWS BCH* or *UMTS PNS BCH* views, where the decoded GSM transmitters will be shown with the estimated positions when they become available.

WLAN (NDIS) Driver

The *IEEE 802.11 WLAN (NDIS)* driver controls the data transfer from Wireless LAN client adapters supporting Network Device Interface Specification (NDIS) V5.1 or higher, in particular the *CISCO Aironet Series 350 IEEE 802.11 Wireless LAN Client Adapter*.

Installation of the driver is explained in section *Driver Installation* on page 6.1; its configuration is explained below. The measured WLAN data can be viewed in the *WLAN Views* and in many general purpose views (see chapter 4).

Resources Configuration WLAN (NDIS)

The *WLAN (NDIS)* driver is installed by selecting *MobileDevices – NDIS WLAN* in the *Load/Unload Drivers* dialog (see Fig. 6-1 on page 6.3). ROMES uses the adapter as it is configured by the manufacturer or by means of the manufacturer's configuration utility. Important adapter configuration parameters are displayed in the driver configuration menu.

The *CISCO Aironet Series 350 IEEE 802.11 Wireless LAN Client Adapter* supports the full functionality of the ROMES WLAN option.

Configuration Menus WLAN (NDIS)

ROMES provides a configuration menu for the *WLAN (NDIS)* driver that is opened by clicking the *WLAN (NDIS) [1]* command line in the *Hardware* menu. The command line is available as soon as the driver has been loaded.

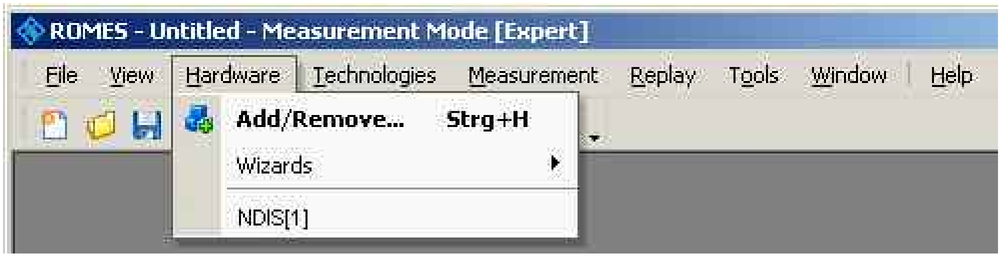


Fig. 6-121 Accessing the WLAN (NDIS) driver configurations

The *WLAN (NDIS)* driver configuration menu and configures the measurement interval and channel *(Device Setup)* and provides information on the test receiver driver *(Info)* and the device *(Device Info)*.

Device Setup WLAN (NDIS)

The *Device Setup* tab selects the measurement interval and channel.

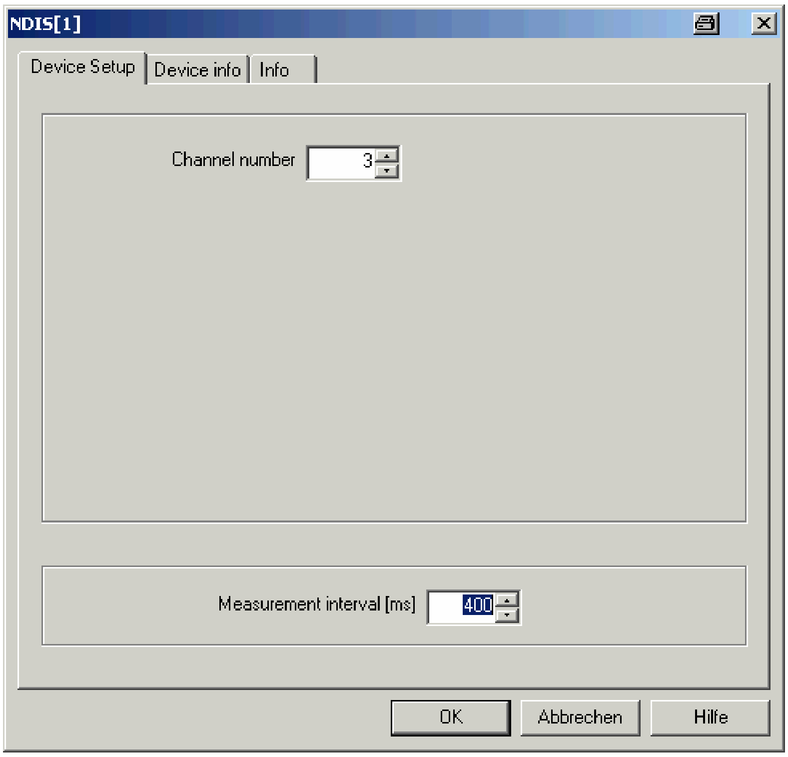


Fig. 6-122 WLAN (NDIS) configuration – Device Setup

Channel number Channel used for the noise measurement, providing the *Noise* and *S/N* results in the *WLAN Survey View* and the *WLAN S/N View.* The noise measurement and the channel definition requires a *CISCO Aironet Series 350 IEEE 802.11 Wireless LAN Client Adapter.*

Measurement interval [ms] The *Measurement interval* is the time in ms after which ROMES records and evaluates a new set of measurement data from the test device. A short measurement interval allows to analyze quick variations of the signal quality and the data traffic but causes large measurement files and requires more ROMES system capacity.

The actual update interval of the data in the test device is generally shorter than the *Measurement interval* so that ROMES skips part of the available information. This update interval is not influenced by the driver settings.

Device Info WLAN (NDIS)

The *Device Into* tab displays information about the test device.

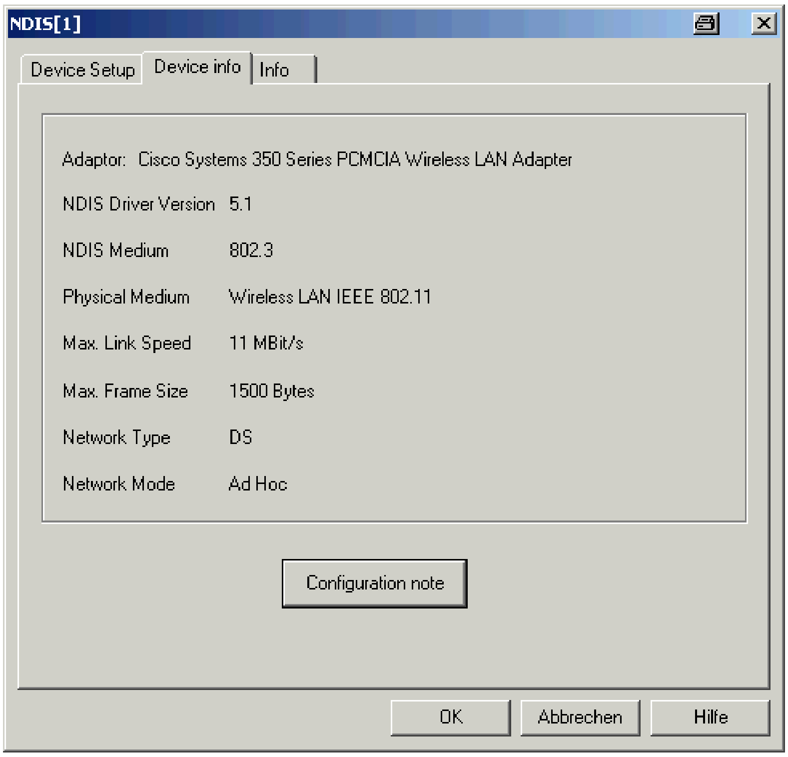


Fig. 6-123 WLAN (NDIS) configuration – Receiver

WiMAX Scanner

The WiMAX Scanner driver controls an R&S TSMW radio network analyzer in order to perform WiMAX scan. To use the WiMAX Scanner driver the option R&S ROMES4T1W is required.

Installation of the driver is explained in section *Driver Installation* on page 6.1; its configuration is explained below. The WiMAX data can be viewed in the *WiMAX Scanner Views* (see chapter 3).

Configuration Menus R&S WiMAX Scanner

R&S ROMES provides a configuration menu for the R&S WiMAX Scanner driver that is opened by clicking the *TSMW WiMAX* command line in the *Hardware* menu. The command line is available as soon as the driver has been loaded.

The WiMAX Scanner driver configuration menu contains a tab to select the measured channels, the measurement rate, to display information on the test receiver driver *(Info)*, and to store the settings to a template.

WiMAX Scanner Configuration

The WiMAX Scanner Configuration tab allows to configure the measurement parameters.

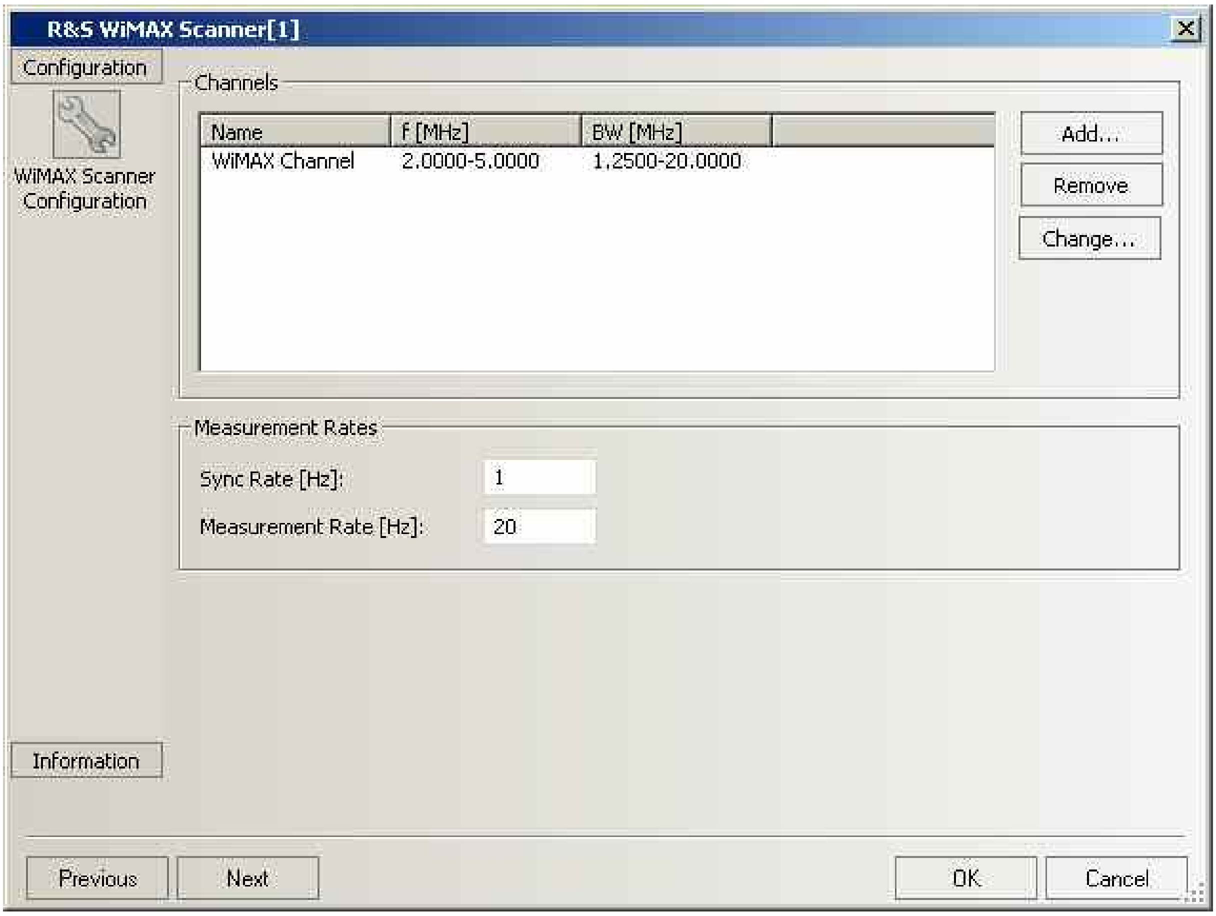


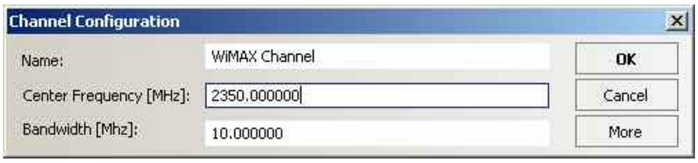
Figure 6-2: R&S WiMAX Scanner

Channels

The *Channels* displays the channels which should be scanned.

Add...

Opens the dialog window which allows to add a channel for scanning.

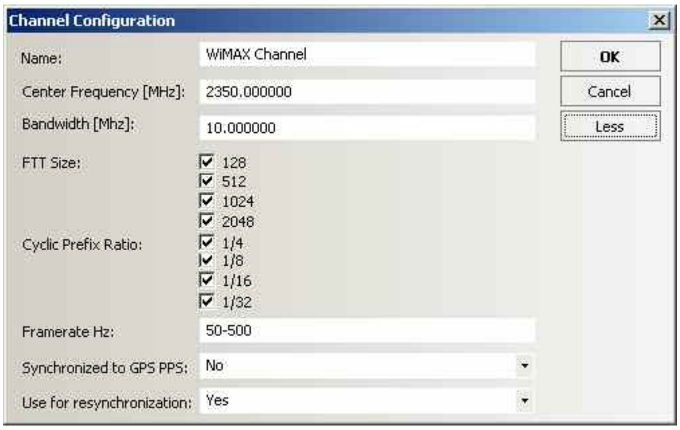


The basic configuration of the channel is the Center Frequency and the bandwidth used.

OK
Add the new defined channel to the Channel list and returns to the *WiMAX Scanner Configuration* tab.

Cancel
Discard the changes made and return to the *WiMAX Scanner Configuration* tab.

More
Shows more detailed information which can be given to the driver in order to increase the performance of the scan:



It can be selected which FFT Size and Cyclic Prefix Ratio should be taken into account. Furthermore the Frame rate can be predefined. The item "Synchronized to GPS PPS" shall be set to Yes, if all signals on the channel are assumed synchronised to the PPS of the GPS.

The measurement results of this channel can be used for synchronisation of the receiver. If this should be done set the "Use for resynchronization" to Yes.

Remove

Deletes the selected channel from the list.

Change...

Opens the Channel Configuration window of the selected channel.

Measurement Rates

The two input fields define how often the system synchronizes to the received WiMAX signals and updates the measurement file.

Sync Rate [Hz]	Defines the synchronization rate in Hz.
Measurement Rate [Hz]	Defines the used measurement rate in Hz.

.

Device-Independent Drivers (QoS)

The drivers in this section do not depend on a particular test device or technology. They can be loaded as explained in section *Driver Installation* on page 6.1, however, the ports (if needed) are assigned in the driver configuration menus.

Data Quality Tester Driver (DQA)

The DQA driver controls the measurement of parameters assessing the Quality of Service (QoS) of any kind of data transfer connection by means of the Data Quality Tester (DQA) ROMES3DQA.

Installation of the driver is explained in section *Driver Installation* on page 6.1; its configuration is explained below. The DQA data can be viewed in the *QoS Views* (see chapter 3). An example procedure for setting up and testing a connection is described in chapter 2; see section *Data Quality Tester*.

Resources Configuration DQA

The DQA driver is installed by selecting *Quality of Service – Data Quality Analyzer* in the *Load/Unload Drivers* window (see Fig. 6-1 on page 6.3). Loading the driver does not require any hardware or additional test devices. In fact the Data Quality Tester can be used to test the QoS of any kind of physical connection between the test system and a remote address. The connection can be a network connection established by means of test mobiles of any supported technology (GSM, GPRS, HSCSD, EDGE, UMTS, ...) or a fixed connection to a remote server accessible from the test system. The driver provides configuration menus to configure and set up the different types of connections.

If test mobiles are used, the results of the DQA complement the information acquired by means of the test mobile drivers.

Configuration Menus DQA

ROMES provides a configuration menu for the DQA driver that is opened by clicking the *DQA[1]* command line in the *Hardware* menu. The command line is available as soon as the driver has been loaded.

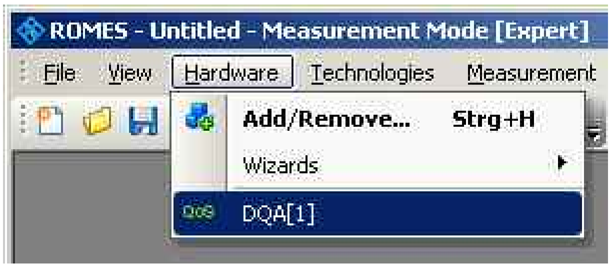


Fig. 6-124 Accessing the DQA driver configurations

The DQA driver configuration menu contains several tabs to define the connections to be set up and closed during the measurement, select connection and network-related parameters to be recorded, define patch files and display information on the current DQA driver version.

DQA Settings

The *DQA Settings* tab arranges and configures a list of jobs, each of them defining a connection to be set up or closed and defines a test file of definite size to be transferred.

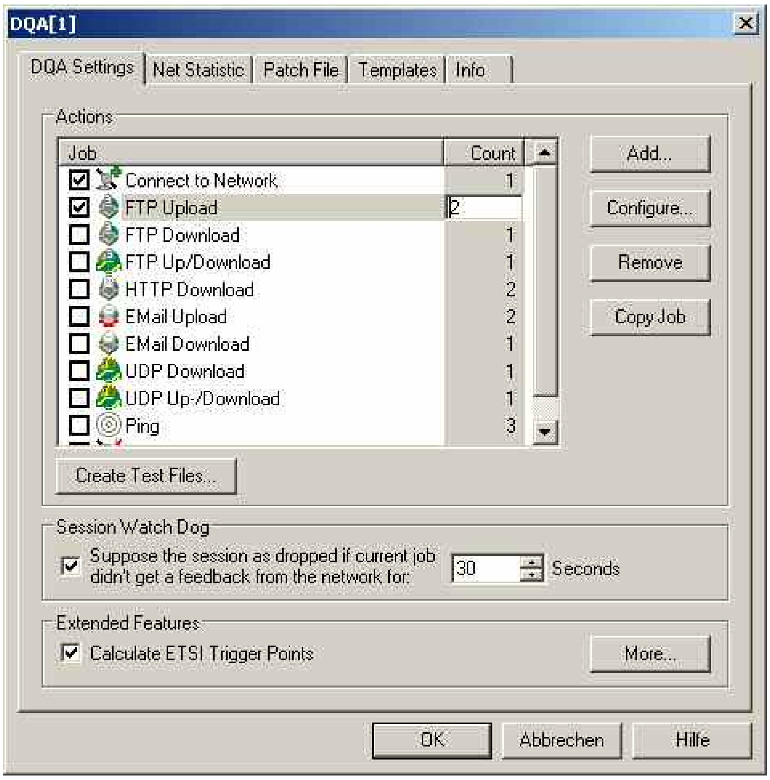


Fig. 6-125 DQA driver configuration – DQA settings

Job list

The list shows the jobs to be executed in the DQA measurement. The jobs will be executed in the order of the list. According to the example of *Fig. 6-125* on p.6.233, ROMES will first set up a call to a network provider, then send a ping to a remote server, access an URL and download a HTTP site, wait for a predefined time period, download a file from a remote FTP server, wait for a predefined time period, download a file using UDP, download an e-mail, and finally release the call to the network provider. The entire job list is executed repeatedly while the DQA measurement is running.

A click on a job selects the job for further actions; see description of *Add…, Configure…, Remove* and *Copy Job* buttons below. A double-click opens the configuration menu for the job; see below.

In this column it is possible to define how many times a DQA Job will be executed in a session loop. The default value is 1. To edit this value, click on the selected job in column "*Count*".

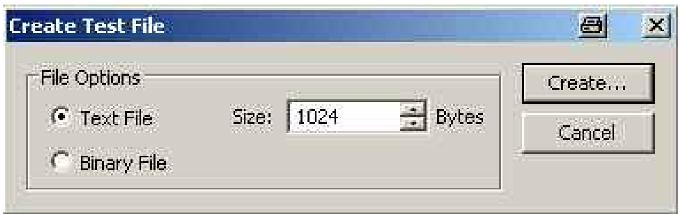
Note:

It is not possible to calculate ETSI trigger points when a job runs more than once in a session loop.

The **IP Tracer** (option ROMES3IPT) is activated in the Connect to Network job configuration menu.

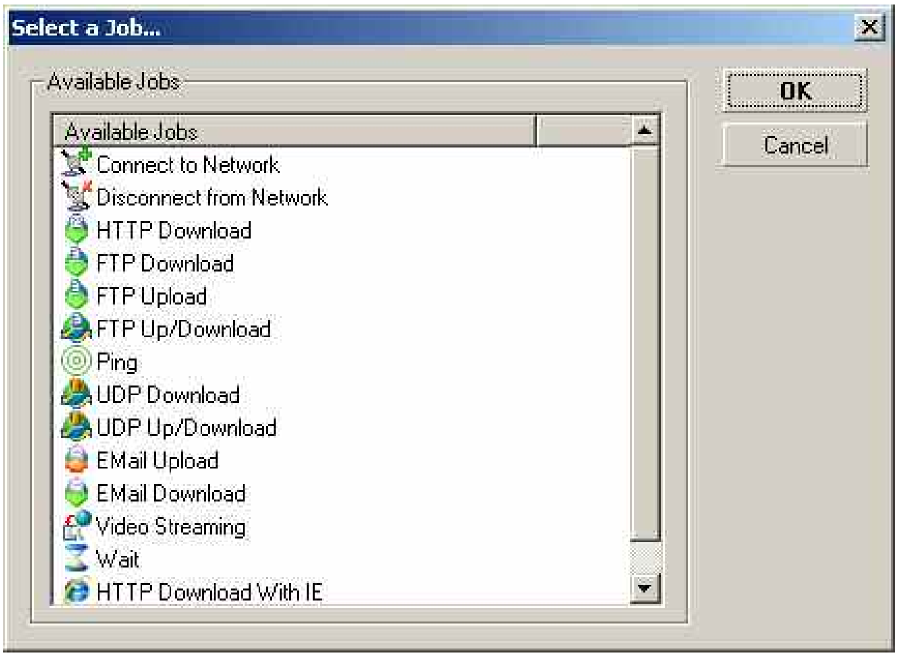
Create Test Files…

The *Create Test Files* button to define the size and file format *(Text File* or *Binary File)* of a test file that can be stored to a local directory and used for file transfer to a remote location. The contents of the file are random. A file of definite size is useful for many DQA applications.



Add

The *Add* button opens a list of jobs to be added to the current job list.



A new job is added at the end of the list (if no existing job is selected in the list) or directly before the selected job. The configuration menus for each job are opened before this is done.

Configuration Check

The Connection Job stores the IMEI/IMSI combination of the used Test UE in the configuration settings. When loading the Connection Job it checks, if still the same Test UE and SIM card is available. If not, the user will be informed and can ignore the message, retry the check or remove the Connection Job.

Configure

The *Configure* button opens the configuration menu for the selected job. It is disabled as long as no job is selected in the *Job* list. The configuration menus provide input fields for the remote addresses to access and additional settings like timeouts. A separate configuration menu is provided for each job; see section *Configuration* menus for the DQA jobs.

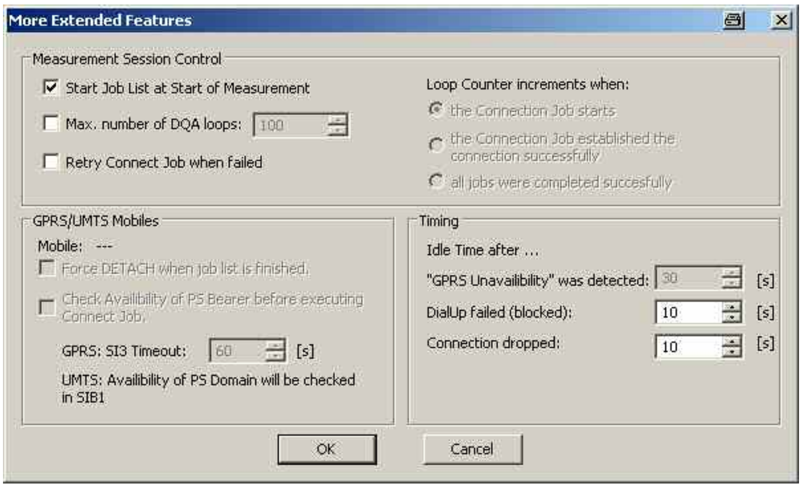
Copy Job

Duplicates the job selected in the job list.

Extended Features

Provides various settings to control the timing and statistics of the DQA session.

Calculate ETSI Trigger Points	Calculate trigger points according to the ETSI (IREG) specification; this provides parameters such as the *FTP Setup Time, GPRS Setup Time etc.* This feature is not time or performance critical. If the ETSI trigger points are disabled, the corresponding parameters in the QoS views are not available. For more information refer to the ETSI specifications, e.g. TS 102.250-3 (formerly: PRD IR.42) and related documents.
More…	Opens the *More Extended Features* dialog.



The two checkboxes in the *Measurement Session Control* panel define how and how often the job list is executed:

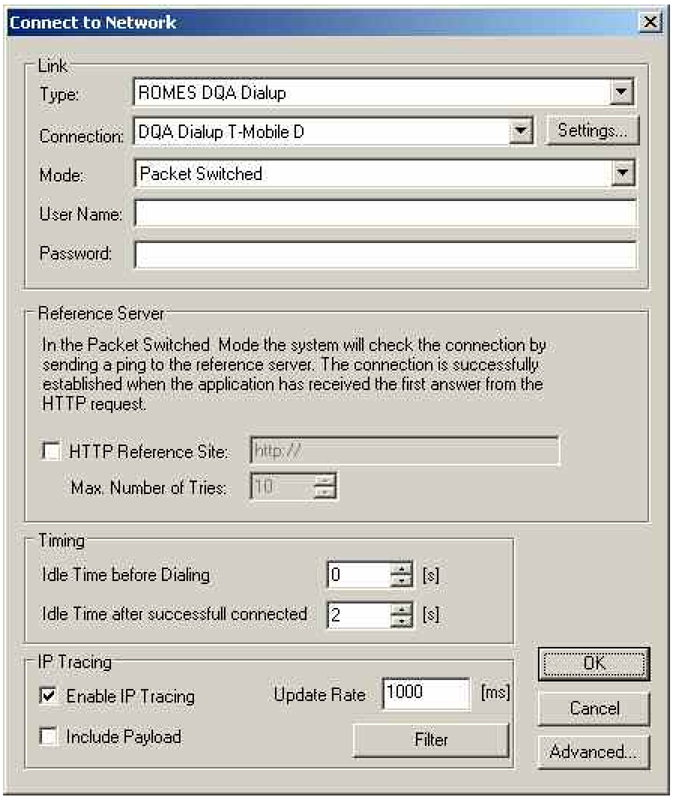
Start Job List …	If active, the entire job list is automatically started when the DQA measurement is initiated *(Measurement – Start Measurement).* Otherwise it is paused and can be initiated via *Action – DQA – Enable DQA.*
Max. Number of…	Limits the scope of the DQA measurement to a maximum number of job lists (loops) to be executed. In addition it is possible to specify whether all loops or just the successful loops are counted.
Retry Connect…	If this check box is selected ROMES will try to dial up to the network repeatedly if the previous connection fails.
GPRS/UMTS Mobiles	Controls a packet switched (PS) data connection through a GPRS or UMTS mobile. The panel is enabled after an appropriate GSM or UMTS driver is loaded and the virtual COM ports have been assigned; see section *Connection via USB Interface* on p. 6.8 ff. In the panel, it is possible to force the PS service to be detached after each job, to check whether the network supports the PS service *(Check Availability of …).* PS support is indicated through layer 3 System Information messages or blocks. For GSM/GPRS networks it is possible to specify a timeout after which a network will be considered as not supporting the PS service. An additional idle time after *GPRS Unavailability was detected* can be set in the *Timing* panel.
Timing	Defines an idle time to be inserted each time the connection failed because the cell was blocked, and each time the connection was dropped.

Configuration menus for the DQA jobs

The configuration menus described below are opened when a job is added to the list in the *DQA Settings* dialog *(Add Job…)* or if a job selected in the list is re-configured *(Configure…).*

Connect to Network

The *Connect to Network* configuration menu selects a network link and a reference server and defines the idle time intervals for redialing.



Type Three different link types are available:

- Windows Dialup requires a modem port of the device under test.
- Windows Network Adapter, one of the existing network adaptors can be chosen. The connect job will not connect or disconnect this connection without trigger. Typically used for WLAN measurements.
- ROMES DQA Dialup, default type. Dialup Wizard allows defining all necessary access parameters. DQA Dialup type is mandatory, if the NDIS interface of the Test UE shall be used. In this case, the DQA requests connecting and disconnecting at the Test UE Driver.

TIP

Create Windows dialup connection before the start of a "Connect Job". This prevents to use a wrong modem by accident.

Connection List of available network connections.

Mode Type of connection: circuit switched or packet switched.

User Name/ Passw. Optional input fields for authentication at the network.

Ping Ref. Server Name of the reference server to ping; host name like in the example above or IP address. The reference server is used to check whether a packet switched connection could be established and to define a time limit for setting up the connection; see also explanation in the configuration menu.

Max. No. of Tries Maximum no. of pings sent to the reference server before the system assumes that the dial-up has failed and aborts the job.

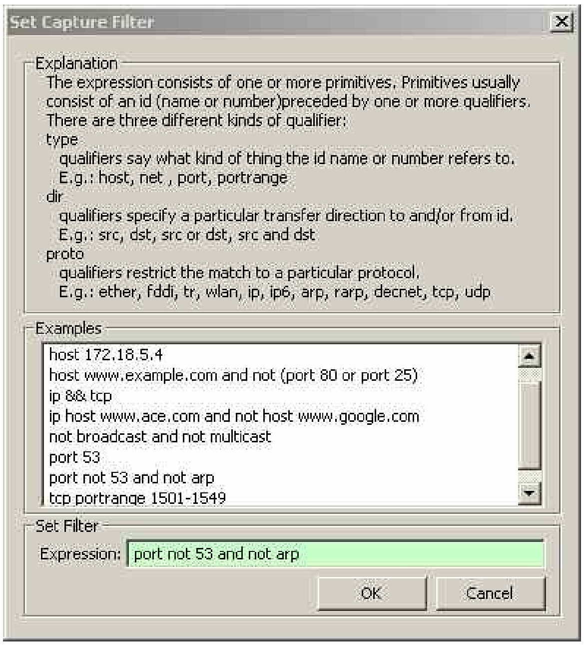
Timing Idle time interval between the start of the job and dialing (The *QoS Message View* displays the message *Waiting <n> seconds before dialing)* and after a successful connection.

Enable IP Tracing If the purchased option (ROMES3IPT) is activated this flag enables the IP Protocol Sniffer for this connection. The Update Rate is the time span the results are written into *.rscmd file.

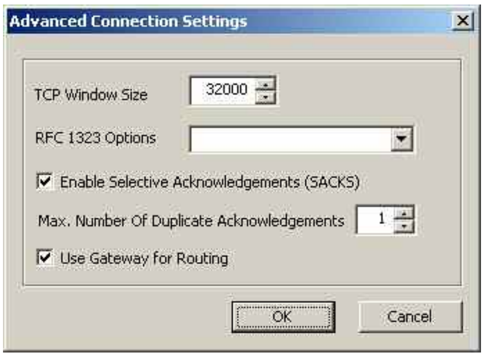
IP Tracer results are shown in the 2G/3G Layer 3 View (see chapter 4).

Include Payload Defines if the payload is included in the IP Tracer messages or not.

Filter When the “Filter” button is pressed, the “IP Message Protocol” is filtered by the filter expression.



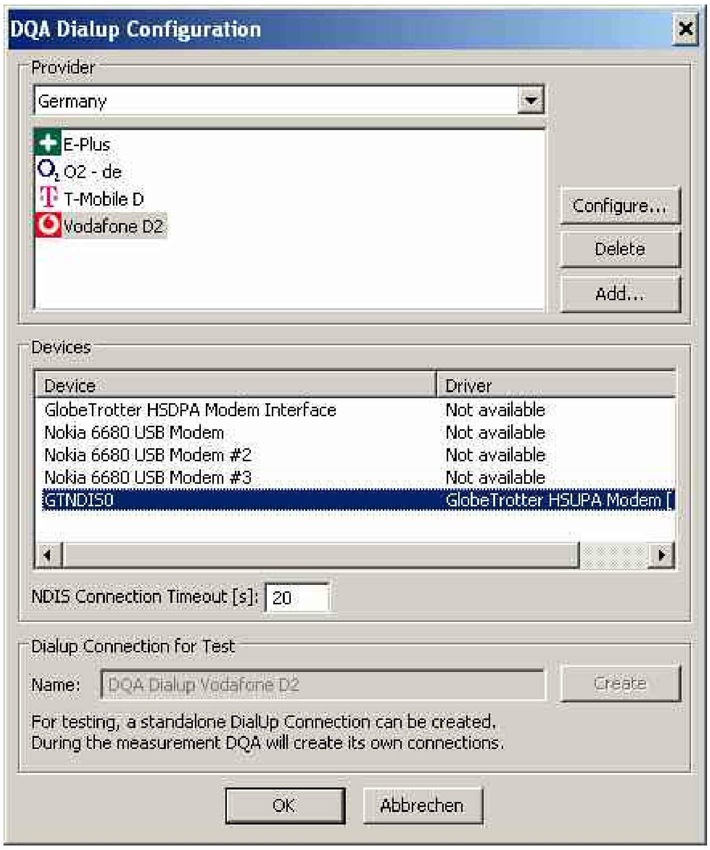
Advanced Opens a dialog to define additional connection settings.



It is possible to disable the *RFC 1323 Options* completely, enable both options or you can choose between *Windows Scale* and *Timestamps* enabled only

The “Use Gateway for Routing” checkbox should be set when connecting with network adapters, but it depends on the LAN. If checked, the route to the destination server (e.g. a FTP Server) will be created through the LAN’s default gateway.

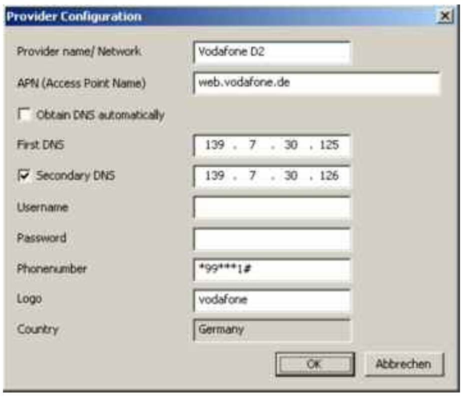
Settings Opens a dialog to specify necessary access parameters for the DQA Dialup Connection.



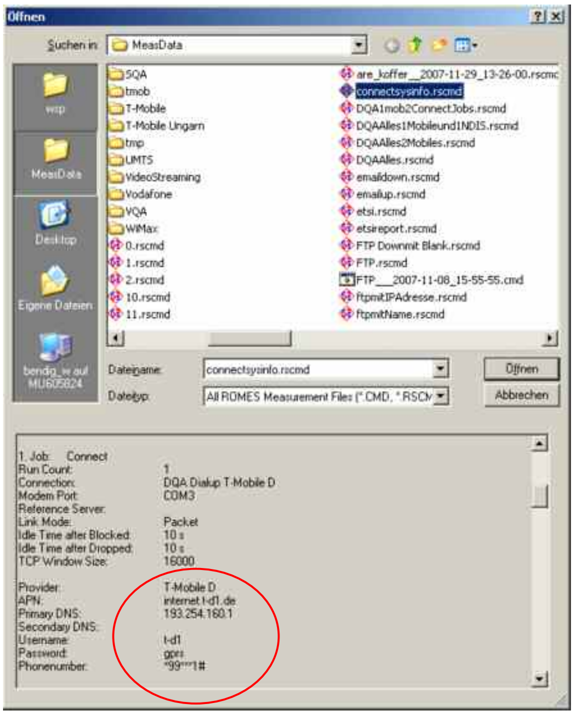
A network provider and an available modem/NDIS Interface have to be selected. This list also shows the available corresponding ROMES Mobile Driver. *Dialup Connection for test* is not used.

To get access to this information it is mandatory, that all mobile drivers have been loaded before configuring the Connect Job.

Configure Opens a dialog to edit the provider specific access parameters

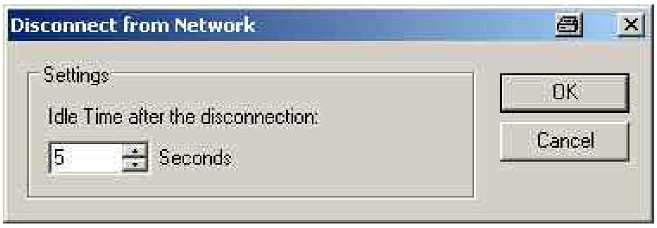


Provider Information The Provider Information of Dialup – Connections are shown in the measurement file info, when the connection mode is ROMES Dialup.



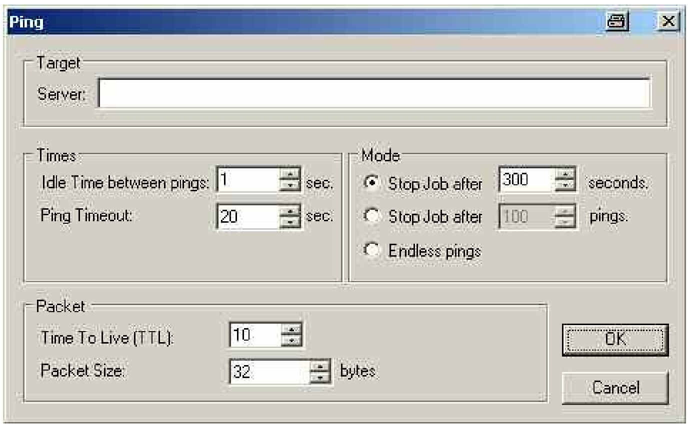
Disconnect from Network

The *Disconnect from Network* configuration menu defines an idle time in seconds between disconnection from the network and start of the next job in the *Job* list.



Ping

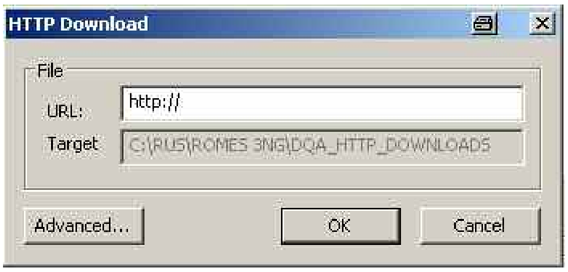
The *Ping* configuration menu defines a target server to ping (using an ICMP protocol), the timing and the number of pings to send.



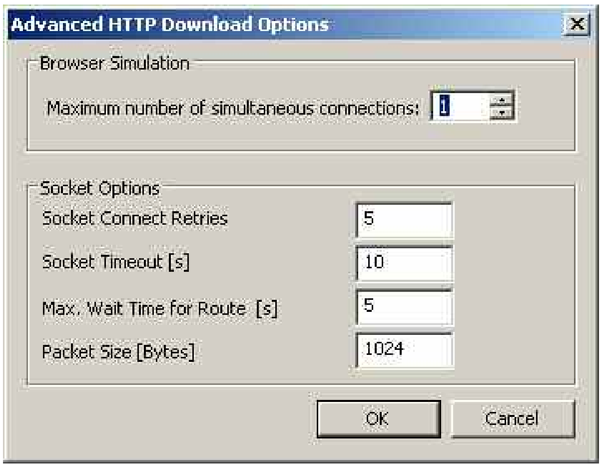
Server	Name of the target server to ping; IP address like in the example above or host name.
Idle Time between pings	Time elapsed between reception of a response from the target server and start of the next ping.
Ping Timeout	Maximum time between the start of a ping and reception of a response from the target server. After the *Ping Timeout* the ping is classified as unsuccessful.
Mode	Defines the scope of the ping job: Either a time limit in seconds or a maximum number of pings can be set.
Time to Live	Time_of_life parameter allocated to the transmitted data packets. Packets are discarded if their time to live has expired.
Packet Size	Packet size in the range between 32 and 1024 bytes.

HTTP Download

The *HTTP Download* configuration menu defines a file on a target web server to be downloaded using TCP/IP. The downloaded file can be displayed in a HTTP browser and printed using the *Action* menu.



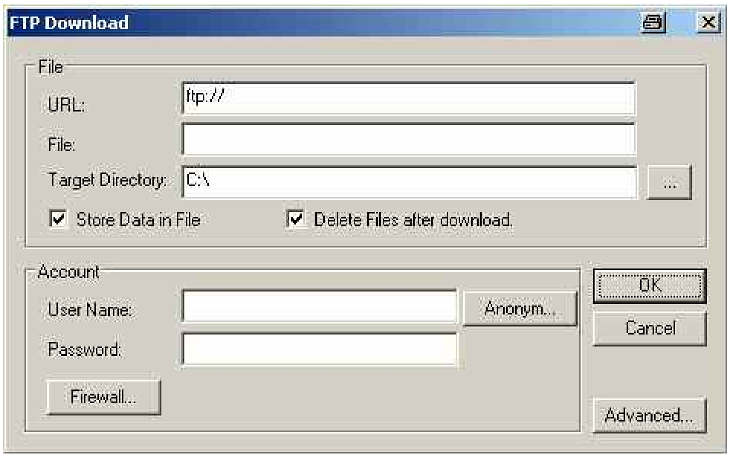
URL	Universal Resource Locator encoding the link to the file to be downloaded.
Target Directory	Standard directory (subdirectory of the ROMES program directory) where the downloaded file is stored.
Advanced	Opens an additional dialog with more connection settings.



Browser Simulation.	Limitation of the maximum number of HTTP connections.
Socket Connect Retries	Number of retries, if socket connection fails.
Socket Timeout [s]	The time, when the socket should close the connection without having received data. This can be used to limit the transfer time and thus the amount of information transferred.
Max.Wait Time for Route [s]	The socket connection will be started only when the route is created. If the route is not created in the wait time, the job fails. Default is 5 seconds.
Packet Size [Bytes]	The “Transfer Packet Size” is the size of the buffer in bytes to be used to send / receive data to / from a connected socket. This size can be configured for FTP – Up- and Download jobs. The default is 4096 bytes. With HSDPA / HSUPA it is necessary to increase this parameter to get higher data rates.

FTP Download

The *FTP Download* configuration menu defines a file on a remote server to be downloaded using FTP.



URL — Universal Resource Locator (host name) or IP address identifying the remote server.

File — File to be downloaded including the directory path.

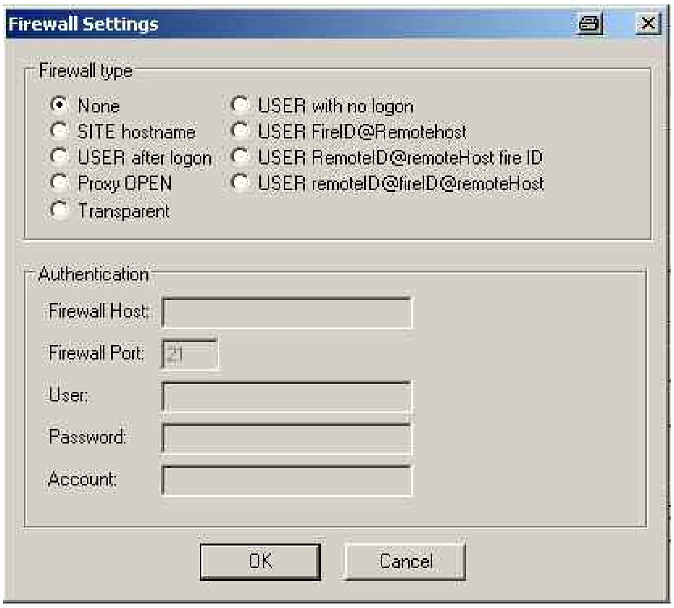
Target Directory — Directory accessible from the test system (e.g. the hard disk of the PC) where the downloaded file is stored. The ... button provides a tree view of all available directories.

Store Data in File — If this option is selected, the downloaded data is stored in a file that is copied to the local hard disk. If it is cleared, the data can be kept in memory (see *Delete Files…* below) but are not processed, which generally improves the system performance.

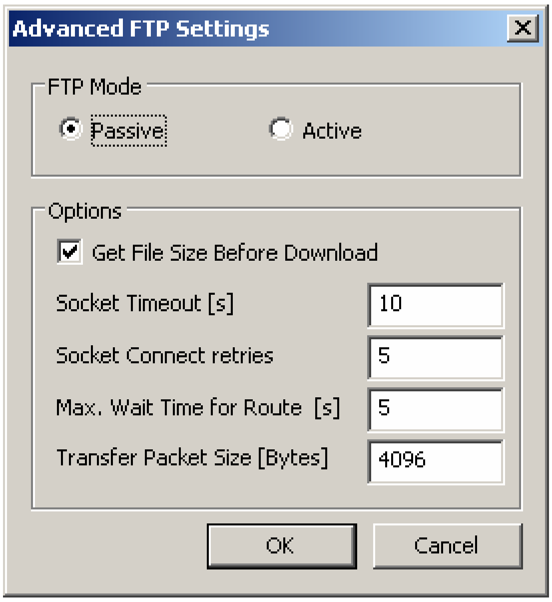
Delete Files... — If this option is selected, no copy of the downloaded file is kept after the job is finished. Otherwise ROMES creates multiple copies of the downloaded file when the *FTP Download* job is performed repeatedly. For a downloaded file <file_name>.<extension>, the copies are named <file_name>_0.<extension>, <file_name>_1.<extension> etc.

Account — Optional input fields for authentication at the remote server *(User Name* and *Password)*. The *Anonym…* button inserts the user name *anonymous* and an arbitrary password. The password can be overwritten, if required.

Firewall — Opens an additional dialog to define the authentication information necessary to access a remote server protected by a firewall. For all firewall types (except *None* for non-protected servers) the fields in the *Authentication* panels must be filled in.



Advanced Opens a dialog to define additional file transfer parameters. If the option *Get File Size before Download* is selected, the size of the transferred file is indicated in the *QoS Progress View* together with downloaded number of bytes.



The *Options* panel contains the following settings:

Socket Timeout [s]
The time, when the socket should close the connection without having received data. This can be used to limit the transfer time and thus the amount of information transferred.

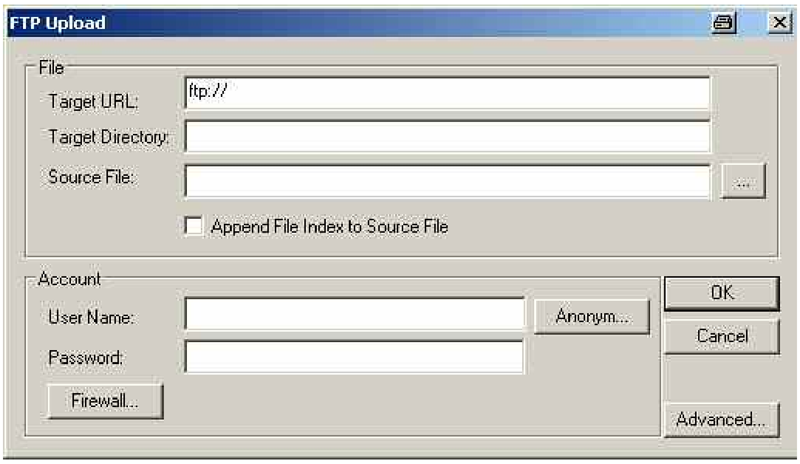
Socket Connect Retries
Number of retries, if socket connection fails.

Max.Wait Time for Route [s]
The socket connection will be started only when the route is created. If the route is not created in the wait time, the job fails. Default is 5 seconds.

Transfer Packet Size [Bytes]
The “Transfer Packet Size” is the size of the buffer in bytes to be used to send / receive data to / from a connected socket. This size can be configured for FTP – Up- and Download jobs. The default is 4096 bytes. With HSDPA / HSUPA it is necessary to increase this parameter to get higher data rates.

FTP Upload

The *FTP Upload* configuration menu defines a target server and a file to be uploaded using FTP.



Target URL	Universal Resource Locator (host name) or IP address identifying the target server
Target Directory	Directory name and path on the target server.
Source File	File to be uploaded including the directory path.

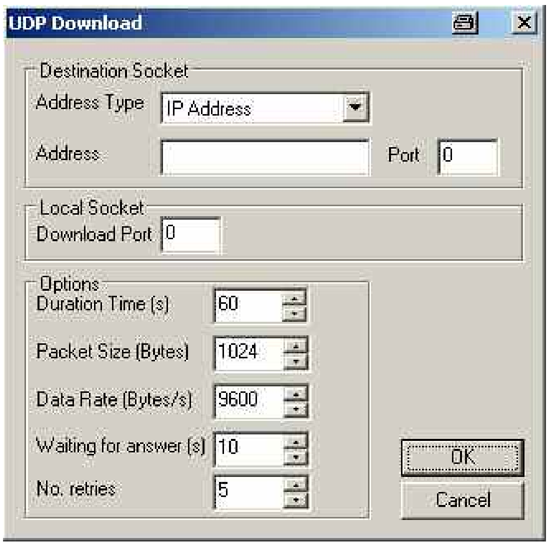
Append File Index to Source File	If this option is selected the source file name is extended by an index before the file is transferred. The index is incremented before each FTP upload so the target server receives multiple copies of the same file with different file names.
Account	Optional input fields for authentication at the remote server *(User Name* and *Password)*. The *Anonym…* button inserts the user name *anonymous* and an arbitrary password. The password can be overwritten, if required.
Firewall	Opens an additional dialog to define the authentication information necessary to access a remote server protected by a firewall; see *FTP Download.*
Advanced	Opens a dialog to define additional file transfer parameters; see *FTP Download* above. *Get File Size…* is not available for uploaded files.

FTP Up/Download

The *FTP Up/Download* configuration menu defines a remote server and two files on the remote server and the local file system to be uploaded and downloaded using FTP. The configuration menu combines the *FTP Upload* and *FTP Download* menus.

UDP Download

The *UDP Download* configuration menu defines a remote server to be accessed for downloading data using the User Datagram Protocol (UDP) and configures the data transfer options. This job requires a remote server which is configured as a ROMES measurement server. This is done by installing the *ROMES DQA Measurement Server* software, which serves the measurement job with the expected data.



Address Type	Host name or IP address identifying the measurement server.

Address	Server address, conforming to the selected *Address Type*
Port	Measurement server port number
Local Socket	Port numbers of the local ports used to download data *(Download Port)*.

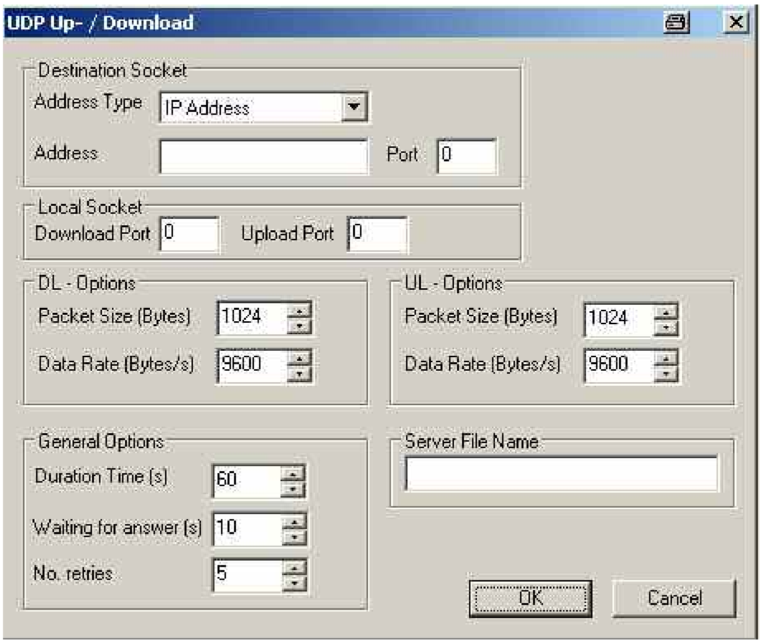
The following *Options* define transfer parameters and timeouts:

Duration Time (s)	Time to execute the job (download time) in seconds
Packet Size	Size of the transferred data packets
Data Rate	Number of bytes transferred per second
Wait. for answer	Timeout for an attempted connection to a measurement server that does not respond. ROMES will retry a connection several times (see *No. retries* below) with the same timeout before the job is aborted.
No. retries	Number of times that ROMES tries to connect to the remote server, using the *Waiting for answer* time, before the job is aborted.

UDP Up/Download

The *UDP Up/Download* configuration menu defines a remote server to be accessed for downloading data using the User Datagram Protocol (UDP) and configures the data transfer options. In addition it specifies a file on the local file system to be uploaded to the remote server and defines the file options.

This job requires a remote server which is configured as a ROMES measurement server. This is done by installing the *ROMES DQA Measurement Server* software, which serves the measurement job with the expected data.

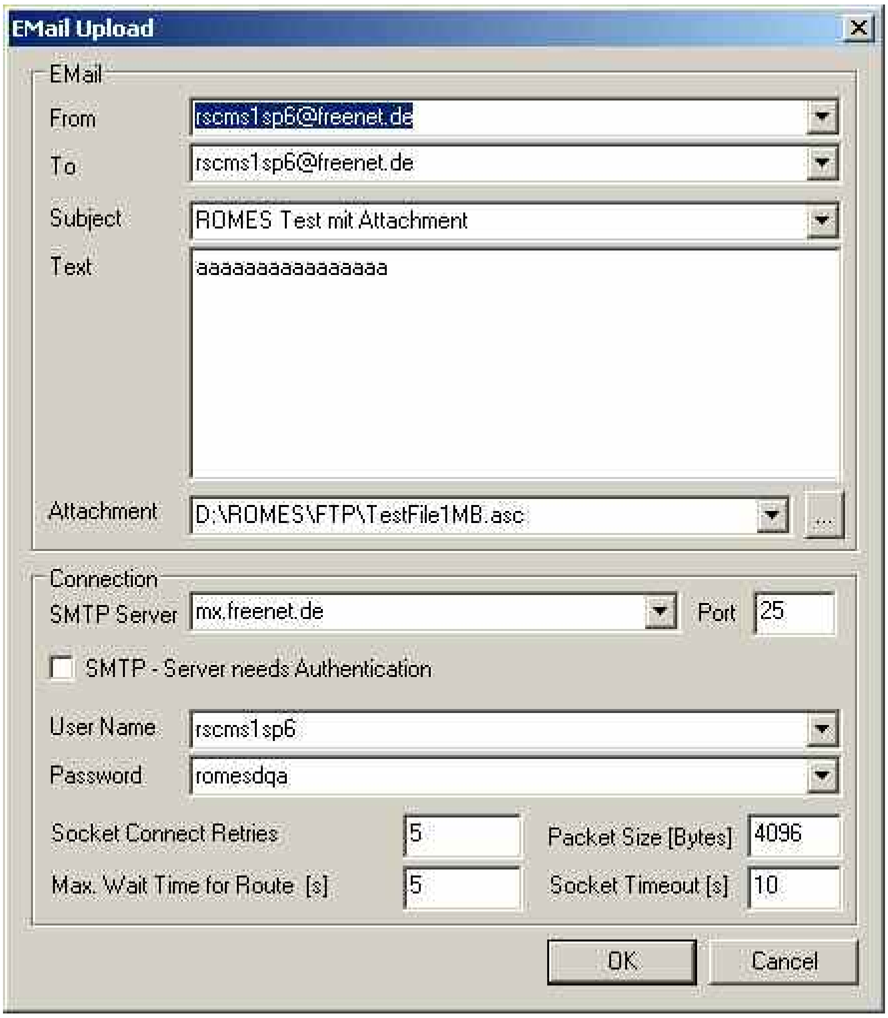


The settings concerning the measurement server, the ports, and the downlink options are identical with the *UDP Download* configuration menu; see above. The *General Options* are valid for both the download and up-load.

Besides the configuration menu defines a packet size and data rate for the upload and the name of the file to be uploaded from the local file system to the measurement server.

E-Mail Upload

The *EMail Upload* configuration menu defines mail send parameters and connection parameters to the SMPT server.



From E-mail address of the sender.

To E-mail address of the receiver.

Subject Defines an e-mail subject.

Attachment Location of attachment.

SMTP Server Name of an existing SMTP server for sending the e-mail.

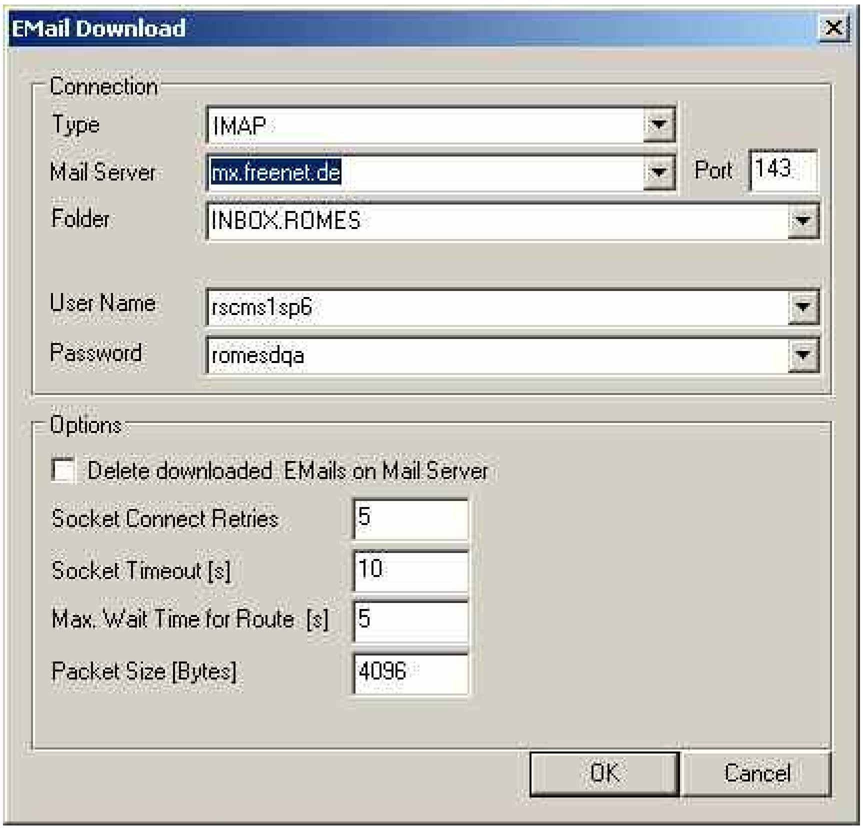
Port Port number of the selected outgoing mail server.
For SMTP mail server the default value is 25.

SMTP - … Check the option when the selected SMTP server requires an authentication.

User Name / Password	Authentication information for accessing the server.
Socket Connect Retries	Number of retries, if socket connection fails.
Packet Size [Bytes]	The “Transfer Packet Size” is the size of the buffer in bytes to be used to send / receive data to / from a connected socket. This size can be configured for FTP – Up- and Download jobs. The default is 4096 bytes. With HSDPA / HSUPA it is necessary to increase this parameter to get higher data rates.
Max.Wait Time for Route [s]	The socket connection will be started only when the route is created. If the route is not created in the wait time, the job fails. Default is 5 seconds.
Socket Timeout [s]	The time, when the socket should close the connection without having received data. This can be used to limit the transfer time and thus the amount of information transferred.

E-Mail Download

The *EMail Download* configuration menu defines the addresses, contents and connection parameters for e-mail transfer from a remote POP3 or IMAP server.



Type	Name of the mail server type. The Post Office Protocol Version 3 (POP3) and the Internet Message Access Protocol (IMAP) are supported.
Mail Server	Name of POP3 or IMAP server of the service provider that will send the downloaded e-mail.
Port	Port number of the selected mail server. For POP3 mail server the default value is 110. For IMAP mail server the default value is 143.
Folder	Name of the inbox folder. The default name is INBOX.
User Name / Password	Authentication information for accessing the server.
Delete…	If the option is checked, the downloaded e-mail is deleted on the POP3 server. Otherwise the same e-mail can be downloaded repeatedly. Deleting the downloaded e-mail makes sense if the DQA job contains an upload/download cycle which is continuously repeated.

Socket Connect Retries	Number of retries, if socket connection fails.
Socket Timeout [s]	The time, when the socket should close the connection without having received data. This can be used to limit the transfer time and thus the amount of information transferred.
Max.Wait Time for Route [s]	The socket connection will be started only when the route is created. If the route is not created in the wait time, the job fails. Default is 5 seconds.
Packet Size [Bytes]	The “Transfer Packet Size” is the size of the buffer in bytes to be used to send / receive data to / from a connected socket. This size can be configured for FTP – Up- and Download jobs. The default is 4096 bytes. With HSDPA / HSUPA it is necessary to increase this parameter to get higher data rates.

Video Streaming

The *Video Streaming* configuration menu defines the source addresses, the file transfer options, and evaluation criteria for a video stream download.

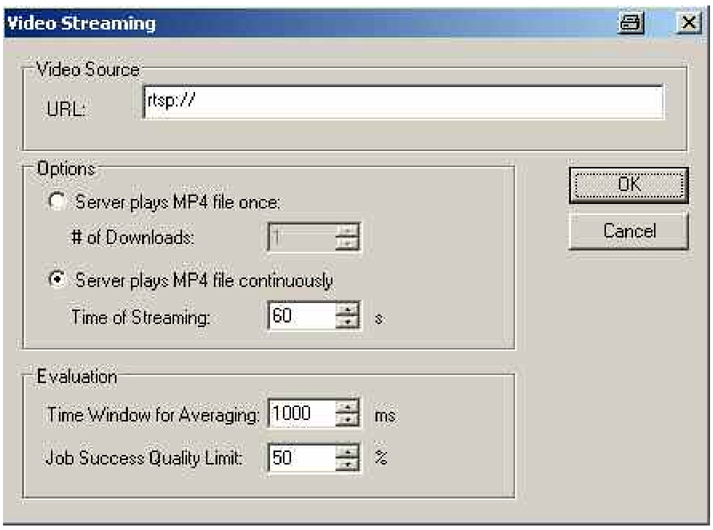
If you use a modem connection please check if your proxy is transparent. You can do this with the www page www.ip-adress.com. The entry "My Proxy" will show your transparent IP address. If it is not transparent the state will be "None/Highly Anonymous". If the address is not transparent the Direct Show RTSP reader filter is unable to receive the video stream. If you use a NDIS adapter this is not required.

Video Streaming is available with option R&S ROMES3STR and requires ROMES3DQA. A packet-switched network connection is set up to a server using a GPRS or UMTS test mobile or commercial mobile. The server provides a stream of MP4 video data at constant frame rate, using the Real Time Streaming Protocol (rtsp). The test system performs an analysis of the received data, evaluates the received frame rate and estimates the quality of the transferred video stream. No data is returned or retransmitted.

The video streaming results can be viewed in several QoS views, in particular the *QoS Progress View* (see chapter 4).

Video streaming is tested with a network connection through a mobile phone in packet data mode, i.e. with the job sequence:

Note:
To set up a connection to a server and test video streaming, the server must support the required (virtual) COM ports for the mobile connection (see section Connection via USB Interface on p. 6.8), and the network must support the rstp protocol. To exclude other sources of errors, first test the connection with an ordinary MP4 player before using ROMES.



Video Source MP4 file name and location (URL) on the remote server (mount point) providing the video stream.

Options	Defines the duration of the video stream measured in a single job. It is possible to specify either a definite amount of transmitted data *(number of downloads)* or a definite *Time of Streaming.*
Evaluation	Defines the *Time Window…* for the calculation of the average *Frame Rate, Video Quality,* and *Spatial* and *Temporal* variation displayed in the *QoS Progress View. Job Success Limit* is the minimum video quality beyond which a job is considered to be successful; see description of *QoS Progress View* in chapter 4.

Wait

The *Wait* configuration menu defines a wait time between two jobs. A wait job can be used to provide the necessary time for system (re-)configurations before the next job is started.

HTTP Download With IE

The *HTTP Download With IE* job allows to download an internet page with MS Internet Explorer (IE). IE version 6 and 7 are supported. The data rates are measured as in job *HTTP Download* on page 6.242.

URL	Universal Resource Locator encoding the link to the file to be downloaded.
Wait Time after Download before IE will be closed[s]	Time the application waits before the Internet Explorer window will be closed.
Internet Explorer time-out[s]	Time the job will be terminated when the page is not downloaded completely and no data are received anymore..
Delete Temporary Internet Files before Download	The Internet Explorer stores downloaded files in a temporary directory and checks every time a page is requested, whether files to be downloaded are already on disc. If there are not newer files on server, those files will not be downloaded again to speed up the navigation. If you would like to download always all files from a page, check the checkbox.

Note:

Due to limitations of the MS Internet Explorer, it is not possible to work with more than one instance of DQA, when this job is included in the job list. The MS Internet Explorer uses the default gateway for data transfer. Therefore in the window Advanced Connection Settings *the Checkbox* Use (Default) Gateway for Routing *has to be checked.*

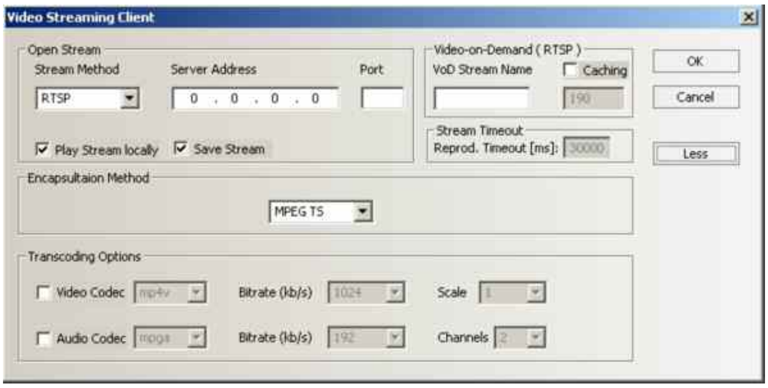
The ETSI Trigger Points HTTP Round Trip Time and *IP Service Setup Time* are not calculated, because the Internet Explorer has no interface to access the TCP/IP Socket.

VLC Video Streaming

The VLC Video Streaming job allows the user to reproduce a network stream. Supported protocols are RTP/UDP for Multicast or Unicast, HTTP and RTSP. In order to start the reproduction, make sure to setup the server first.

It is also possible to save the received stream as well as to transcode the stream encapsulation format or video/audio codec.

After selecting the job, the configuration dialog appears.

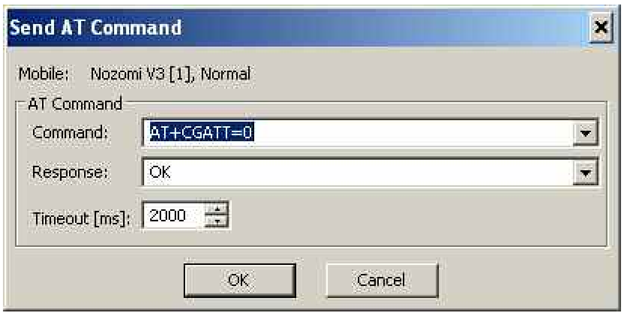


Stream Method	Choose between RTSP, HTTP, UNICAST, MULTICAST.
Server Address	Set the streaming server IP address.
Port	Enter the port number on which the streaming server is transmitting.
Play Stream Locally	If selected, the stream will be displayed locally.
Save Stream	If selected, the stream will be saved.
VoD Stream Name	Enter the name of the Video-on-Demand stream. This field applies only for RTSP streams.
Caching	If selected, set the buffer-cache size. By default: 190.
Stream Time-out	Stream reproduction will be finished if the timeout ex-pires.
Encapsulation Method	Select an encapsulation method that fits the codec and access method of your stream, among MPEG TS, MPEG PS, MPEG 1, OGG, Raw, ASF, etc.
Video Codec	Choose a codec from the list. You can also specify an average bit rate and scale the input.
Audio Codec	Choose a codec from the list. You can also specify an average bit rate and the number of audio channels to encode.

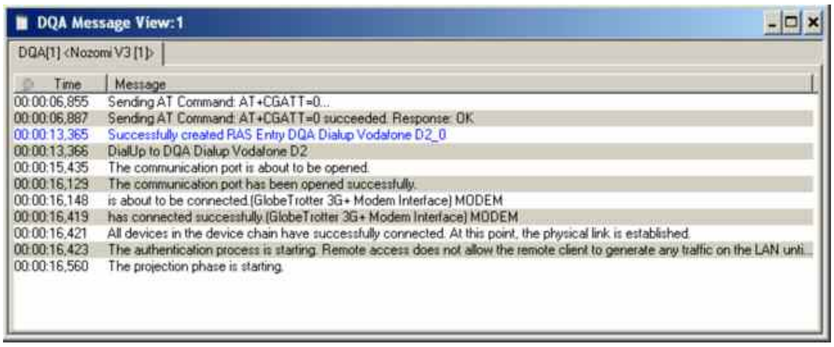
AT Command

This job allows sending AT commands to the Test UE. The job is only available, if a Test UE Driver is loaded. In the job list the AT Command Job for all Test UE drivers can be found.

After selecting the job, the configuration dialog will pop up. Specify the desired AT command, the expected response and a timeout value.



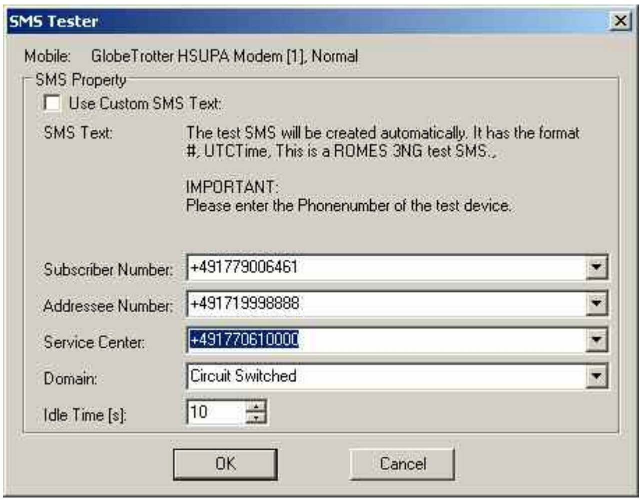
The DQA Message view shows the command and the received response.



Send SMS

This job allows sending SMS to another Mobile. The job is only available, if a Test UE Driver is loaded. The result of the job is, whether the SMS could be sent to the SMS Service Provider. After selecting the job, the configuration dialog will pop up. A text can be produced automatically or a custom text can be entered. Following numbers have to be entered.

SMS Text	In the mobile display following text appears "0,1203590186, This is a test ROMES SMS" In the next SMS the number before comma is increased by 1. After the comma the UTC time is given in seconds after 1st January 1970.
Subscriber Number	Phone number of the originating subscriber
Addressee Number	Phone number of the destination subscriber
Service Center	Number of the service center.
Domain	Circuit or Packet Switched
Idle Time [s]	Waiting time after sending the sms before starting the next *Send SMS* job.



Note:
A SMS Send Job can only be created outside a Connect – Disconnect – Cycle.

In the DQA Message View all relevant steps of sending the message are listed. ETSI specified KPIs can be evaluated by using the QoS KPI View.

Net Statistic

The *Net Statistic* tab selects the data to be recorded in a DQA measurement.

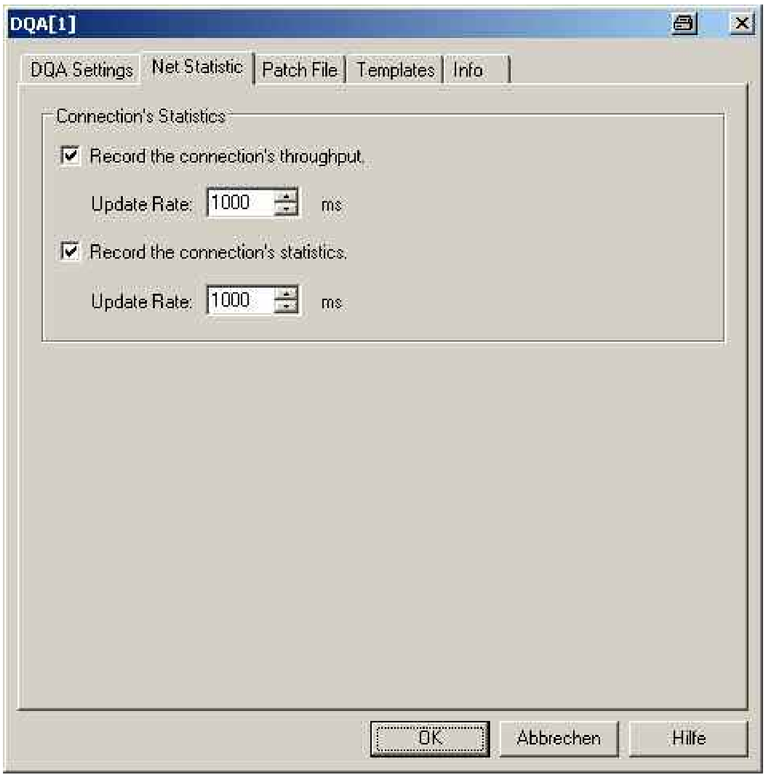


Fig. 6-126 DQA driver configuration – Net Statistic

Record the connection throughput

Selects the current and average data rate in uplink/upload and downlink/download direction to be recorded. The throughput is displayed in the *QoS Throughput View* which is empty if recording is disabled.

The data is recorded with a selectable update rate: An update rate of n milliseconds means that the throughput values are updated every n milliseconds.

Record the connection statistics

Selects the parameters describing the network traffic to be recorded. The statistics is displayed in the *QoS RAS Statistics View* which is empty if recording is disabled.

The data is recorded with a selectable update rate: An update rate of n milliseconds means that the statistics values are updated every n milliseconds.

Patch File DQA

The *Patch File* tab controls the transfer of DQA measurement data from the remote server back to a local measurement file.

Retrieving measurement data from the remote server is an essential step in assessing the QoS of an upload job. Every time an upload job is executed, the DQA software evaluates the results and stores them in a separate DQA measurement file (*.rscmd) generated on the remote server. To view the results, the remote files are transferred to a local directory, and the measurement data is merged into a single measurement file.

Without the results evaluated on the remote server, there is still some information about an upload job available. However, it is obtained indirectly and therefore less accurate.

To evaluate the QoS of an upload connection...

1. Set up a connection to a remote server and configure an upload job *(FTP Upload, UDP Upload, UDP Up/Download),* specifying a prefix for the measurement files to be created on the remote server. See chapter 2, section *Data Quality Tester,* for further details.
2. Click the icon to start the DQA measurement. Wait until the job has been repeated 10 times (the measurement progress can be monitored in the *QoS Message View),* then terminate the measurement by clicking the icon.
3. Transfer the measurement files from the remote server to a local directory, e.g. via FTP.
4. Open the *Patch File* tab of the DQA driver configuration menu and patch the downloaded files to a single measurement file *(File to Patch)* as described below.
5. Open any of the QoS Views (see chapter 4) and replay the *File to Patch.*

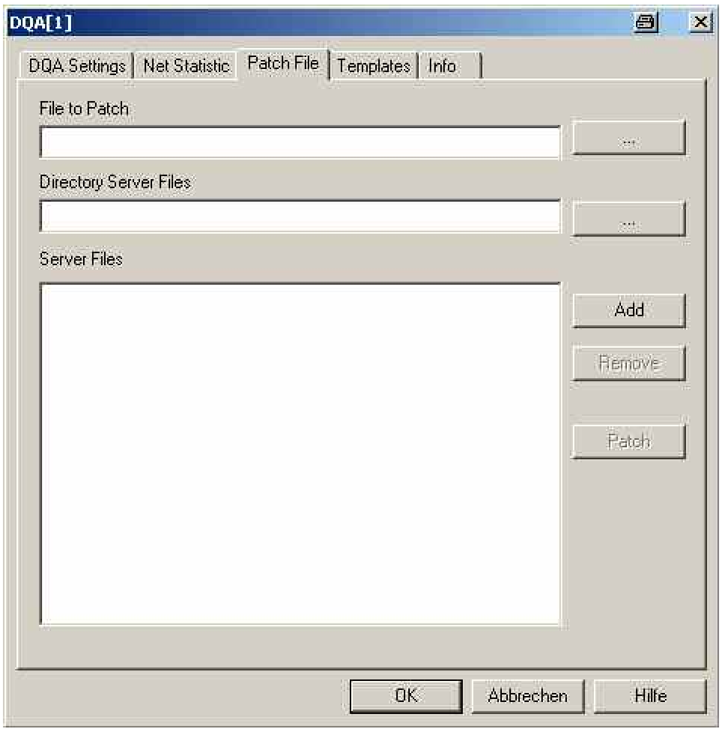


Fig. 6-127 DQA driver configuration – Patch File

File to Patch

Name and (local) directory of an existing *.rscmd file containing DQA data, preferably from a UDP Up/Download job. The file to patch is the target file for the DQA results retrieved from the remote server.

Directory Server Files

Name and path of the local directory containing the DQA measurement files downloaded from the remote server.

Server Files

List of all files on the remote server that contain information to be merged into the file to patch. The list is generated automatically according to the predefined measurement file names but can be modified with the buttons on the left side:

Add Add a file to the list, e.g. a file that was (erroneously or temporarily) removed before

Remove Remove a selected file from the list

Patch Patch the current file list to the file to patch: Merge the file information into a common file to be subsequently replayed

Templates DQA

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. It is provided for many test device drivers and is identical for all of them.

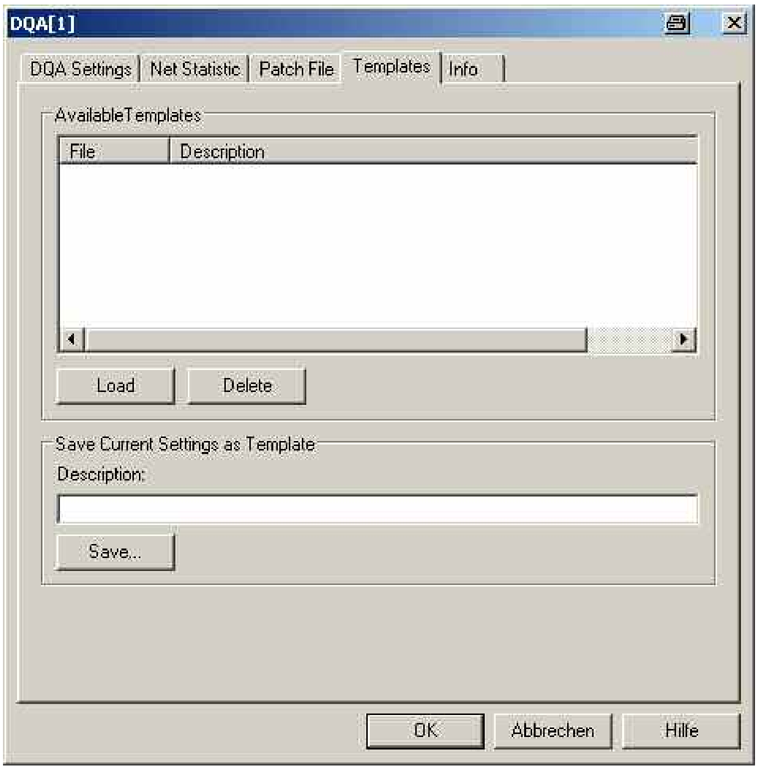


Fig. 6-128 DQA driver configuration: Templates

Action Menu DQA

The *Action* menu provides DQA session control commands. It is added to the menu bar while a DQA measurement is running *(Measurement – Start Measurement* or *Start Recording)*. If the DQA driver has been loaded several times in order to define several DQA sessions, a separate command line is displayed for each of them.

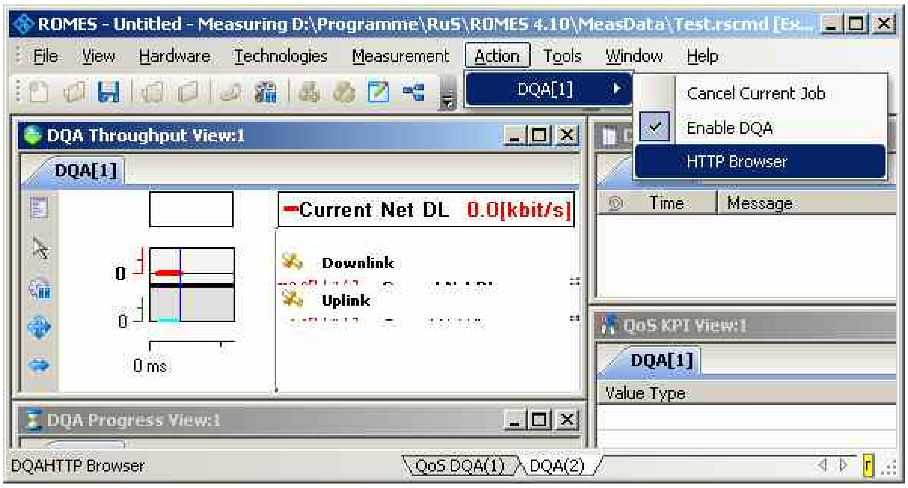


Fig. 6-129 Action menu (DQA driver)

Enable DQA Starts a DQA measurement that is paused.

This command is relevant if *Start Job List at Start of Measurement* has been deactivated in the *More Extended Settings* dialog.

Cancel Current Job Aborts a running DQA session.

HTTP Browser Opens a HTTP browser window to display and print a HTML file transferred in a *HTTP Download* job. :

Speech Quality Tester Driver (SQA)

In outgoing wave mode, the external SQA server plays sound files to a calling device. In incoming wave mode the SQA server measures speech quality of sound coming from a calling device. The measurement results are stored in *.RSCMD files which can later be merged into a destination *.RSCMD file by the ROMES application as described in section 3.13 of this manual.

The installation, setup and configuration of the external SQA server is described in the document "User Manual for ROMES SQA Server". The complete SQA measurement setup is described in the document "Configuration of SQA measurements with ROMES.pdf". Both documents are available on the R&S ROMES DVD. Once the SQA server is configured as described, the ROMES SQA driver can be configured.

The measurement results from both client and server are stored in *.RSCMD files which can later be merged into a destination *.RSCMD file by the ROMES application as described in section 3.13 of this manual. To ensure a successful file merge, both involved Measurement Systems have to be synchronized by GPS or NTP.

The measurement work process is divided in two steps. The first step is to make the measurements, and the second to evaluate and calculate the KPIs.

Note:

A soundcard without specific requirements is necessary to perform SQA analysis otherwise a failure message will be displayed.

SQA Settings

SQA results can be displayed in the *SQA Message* view (see chapter 4), SQA results can be obtained as described in section for driver configuration, please refer to chapter Driver Configuration – Speech Quality on p.6.266.

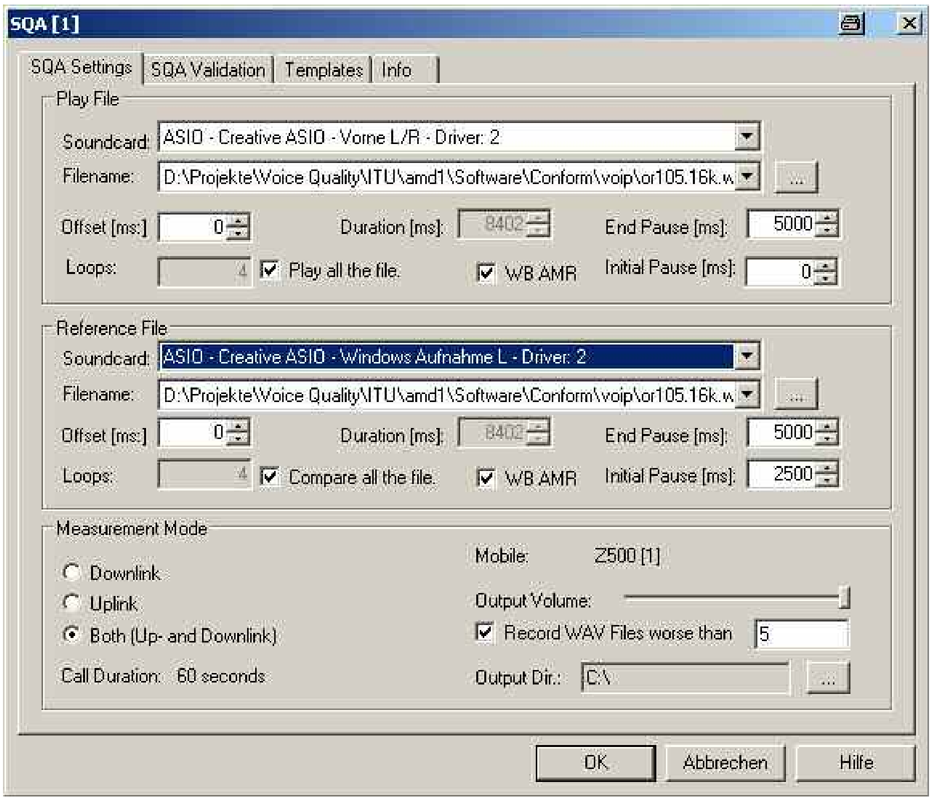


Fig. 6-130 SQA Settings

The *SQA Settings* tab is divided into three panels. The lower panel *(Measurement Mode)* selects the signal direction and global test parameters. The *Play File* and *Reference File* panels are relevant for downlink and uplink tests, respectively. They are only available after the corresponding measurement mode has been selected.

Play File Configures the *Uplink* SQA test. The uplink test consists of a repeated conversion of a test file located on the local PC to an analog speech signal and the transmission of this signal to a remote device using the test mobile speech coder (see section *SQA – Principle and Test Setup* on p. 6.265). The *Play File* parameters determine how often and how long the sound card will play the test file.

Sound card Selection of the sound card used to play the local test file and convert it into an analog signal.

Filename Name and location of the played test file.

Offset [ms] Delay from the beginning of the loop (beginning of the play file) until the sound card starts playing the file. During the offset time, the sound card plays silence. In contrast to the *Initial Pause,* this offset is used once at the beginning of each loop.

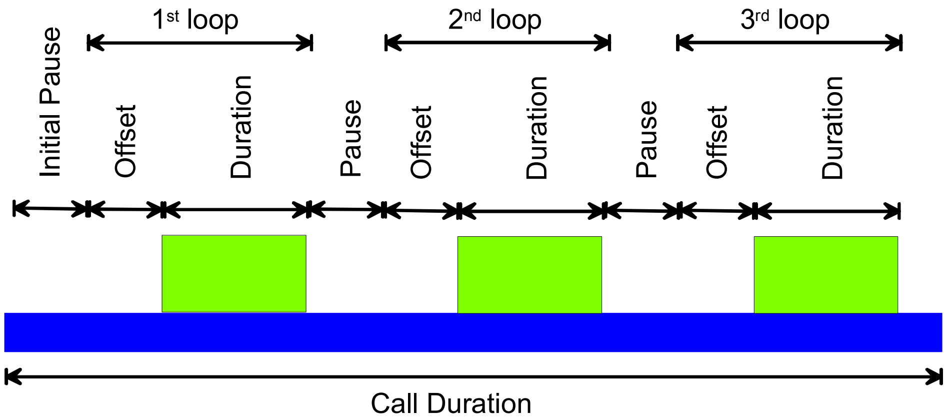
Duration [ms] Duration of the played section of the file. If *Play all the file* is selected, *Duration* is unavailable and shows the time needed to play the entire file.

End Pause [ms] Pause time after each test loop, i.e. after each single transmission of the test file. During the pause the sound card plays silence.

Initial Pause [ms] Pause time before each test loop, i.e. before each single transmission of the test file. During the pause the sound card plays silence.

Loops Number of test loops.

The configured measurement time must be smaller or equal than the *Call Duration* defined in the *Autodialing* tab of the driver configuration menu.



Play all the file If checked complete file will be played.

WB AMR If checked also Wilde Band Adaptive Multi Rate (WB AMR) can be used.

Note:
Please use only voice samples with a sample rate of 16k.
Limts: The mobile and network have to support WB AMR. For this reason up to now only mobile2mobile tests are supported.

The entire call is periodically repeated if autodialing is enabled.

Reference file Configures the *Downlink* SQA test. The downlink test consists of a repeated transmission of a test file from a remote device (typically: an answering machine) to the local PC using the test mobile speech decoder and a subsequent conversion of the analog speech signal to a digital sample file.

The parameters are analogous to the uplink parameters in the *Play File* section.

If parallel SQA tests are performed with different test mobiles, each test mobile must be configured with its own copy of the reference file.

Measurement mode

Selects the measurement mode (*Downlink* test, *Uplink* test or combined, simultaneous *Up- and Downlink);* see section *SQA – Principle and Test Setup* on p. 6.265) and specifies the following global settings:

Initial Pause [ms] Delay time between the start of each call and the beginning of the first loop. An initial pause can be set in order to allow the hardware to settle at the beginning of the call before the actual SQA measurement is started.

Output Volume Volume at the analog output of the sound card (minimum value to maximum value). The output volume is relevant for uplink tests where it controls the input level at the mobile's audio input.

Record WAV Files worse than Store the downloaded files (or the part of the files used for the PESQ evaluation) provided their speech quality is below a specified PESQ score (for downlink tests only). If the highest PESQ value is entered, all files will be stored.

Output Dir. Selection of an output directory for the downloaded files.

If parallel SQA tests are performed with different test mobiles, each test mobile must be configured with its own output directory to avoid file access conflicts.

The *Call Duration* defined in the *Autodialing* tab of the driver configuration menu and the test mobile type is displayed for information.

SQA – Principle and Test Setup

The objective of the Speech Quality Analysis is to assess the subjective quality of speech codecs operating in a real network. The SQA is carried out as a cyclic end-to-end measurement in downlink and/or uplink direction.

Downlink

In downlink mode, a remote device (typically an answering machine) plays a known .wav file. The output of the test mobile speech decoder is digitalized using a sound card and the acquired sample file is compared to a copy of the original played file (reference file). ROMES assesses the quality of the mobile's speech decoder using the PESQ algorithm described below.

Uplink

In uplink mode, a file is played on a sound card; the analog output of the sound card is fed to the mobile speech coder. The speech coder data is transferred to a remote device (typically an SQA server) where it can be compared to a copy of the original play file.

PESQ algorithm

The PESQ (Perceptual Evaluation of Speech Quality) algorithm compares an original .wav file with a degraded file .wav' that is obtained by passing the original file through a communication system. The result of the comparison is translated into a PESQ score in the range between –0.5 and +4.5 (+1 to approx. +4.55 after conversion); where low values indicate poor speech quality, high values indicate good quality (see description of the *SQA Message View* in chapter 4).

The PESQ model was built with the aim of ensuring that the objective PESQ score is closely correlated to subjective scores of the speech quality acquired in listening tests with real subjects. For a description of the PESQ method, its use and its limitations refer to the ITU-T recommendation P.862.

Preconditions

The SQA requires option ROMES3SQA, *Voice Quality Test PESQ*. A test file (.wav) must be stored both on the local PC (reference file, play file) and on the remote device. The test mobile must be equipped with an appropriate connector so that its audio circuit can be fed to the analog input/output of a sound card. The basic test setup is shown below.

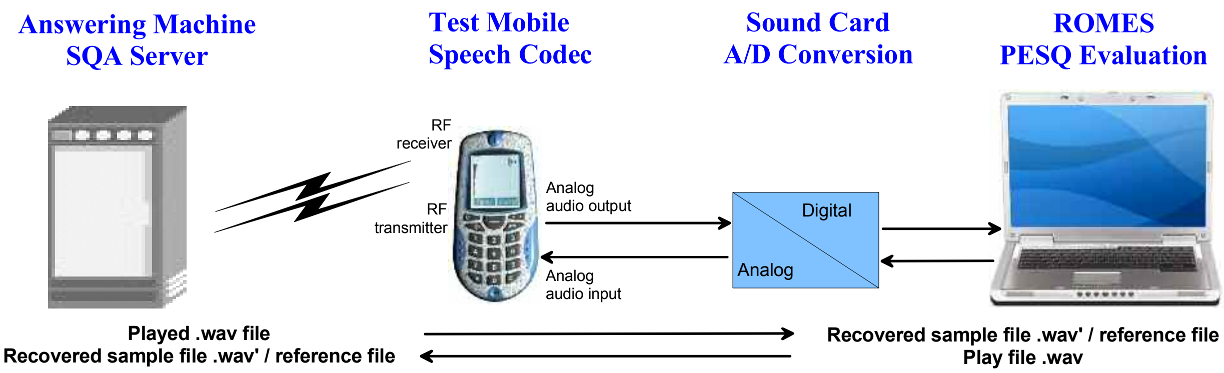


Fig. 6-131 Basic SQA Test Setup

Driver Configuration – Speech Quality

The *Speech Quality* tab enables and configures the Speech Quality Analysis (SQA, with option ROMES3SQA, *Voice Quality PESQ)*. SQA results can be displayed in the *SQA Message* view (see chapter 4). The *Speech Quality* tab is provided for many mobile types and technologies (GSM, GPRS, UMTS, cdmaOne/IS-95, CDMA2000) and is identical for all of them.

The purpose of the SQA is to test the quality of the speech codec while the mobile operates in the network; see section *SQA – Principle and Test Setup* on p. 6.265. The SQA involves the following steps:

6. Establish the basic test setup according to Fig. 6-131 on p. 6.266, ensuring that the answering machine/SQA server and the local PC contain copies of the same *.wav file.
7. Load the appropriate mobile driver, e.g. the GSM driver, as described in section *Driver Installation* on p. 6.1.
8. In the *Autodialing* tab of the driver configuration menu, select *Use Autodial* and set an appropriate *Call Duration*.
9. Open the *Speech Quality* tab, click *Connect SQA,* and load the SQA slave driver as described below.
10. Click *Configure SQA…* and select the measurement mode and the appropriate configuration settings.
11. Back in the *Speech Quality* tab, select *Enable Speech Quality* and click *OK.*
12. Open the *SQA Message* view (*View – QoS Views – SQA Messages View)* and observe the displayed results.

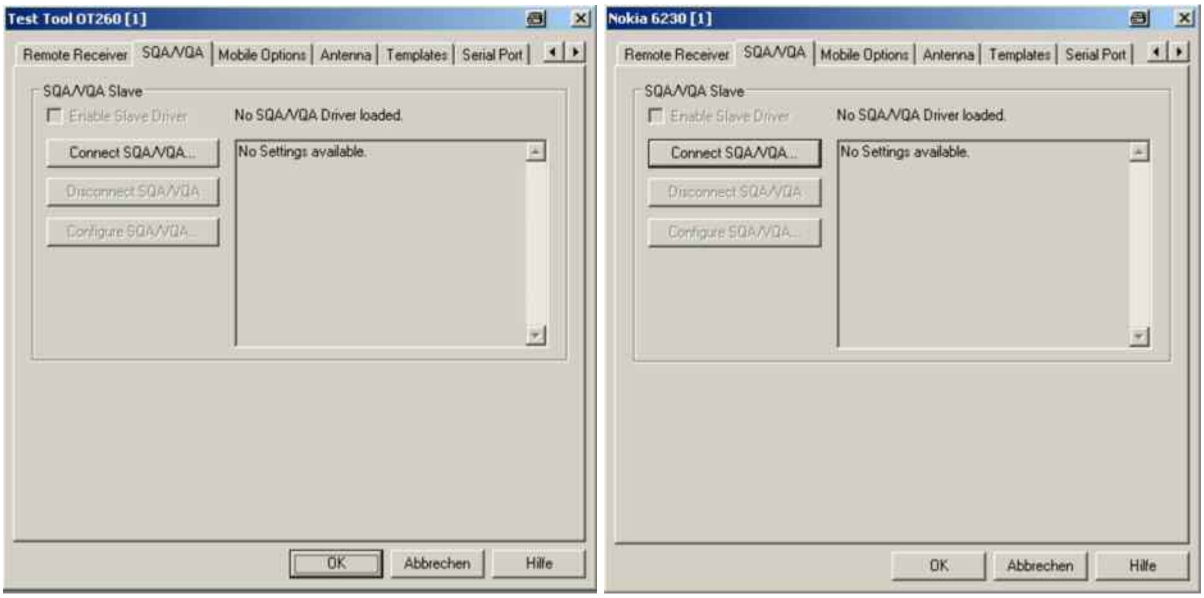


Fig. 6-132 Driver Configuration – Speech / Video Quality

Enable Slave Driver Enables the SQA slave, causing ROMES to initiate the data transfer and the analysis as soon as the test mobile has set up a call. It is recommended to use the autodial feature (see p. 6.65) in order to repeat a call of fixed duration in periodic time intervals.

Connect SQA… Loads the *SQA Tester* driver. The driver must be selected in the following dialog box:

After loading the driver ROMES displays its name and parameters in the settings table of the *Speech Quality* tab; see right side of the figure above. The parameters can be changed using the configuration menu. The *Disconnect SQA…* and *Configure SQA…* buttons are available as soon as a driver has been loaded. Only one SQA driver can be active at one time.

Disconnect SQA… Releases/disconnects the loaded SQA driver.

Configure SQA/ Opens the configuration menu for the loaded SQA driver. The *SQA* configuration menu provides all settings for downlink or uplink SQA tests and displays information about the driver version.

Merging the Server and Client Measurement Files

The measurement file of both client and server sides have to be merged for proper evaluation. This is done in the ROMES File Merger as described in section 3.13 of this manual.

The master file hast to be the file of the MO party. As *Input File* specify the file(s) of the MT party.

Check the box to merge only files which fit together, i.e. only files which were involved with the measurement. This will be VERIFIED by the number of the MT side.

The merger will extract all relevant data and start the evaluation process.

If you are not interested in PESQ, the evaluation can be switched of by adding the following registry keys.

Key: *"HKEY_LOCAL_MACHINE\SOFTWARE\P3\Evaluator"*
String: *"Pesq" -> „false“*

RF Power Scan Driver

R&S ROMES provides a configuration menu for the RF Power Scan driver that is opened by clicking the *RS RF POWER SCAN[1]* command line in the *Hardware* menu. The command line is available as soon as the driver has been loaded.

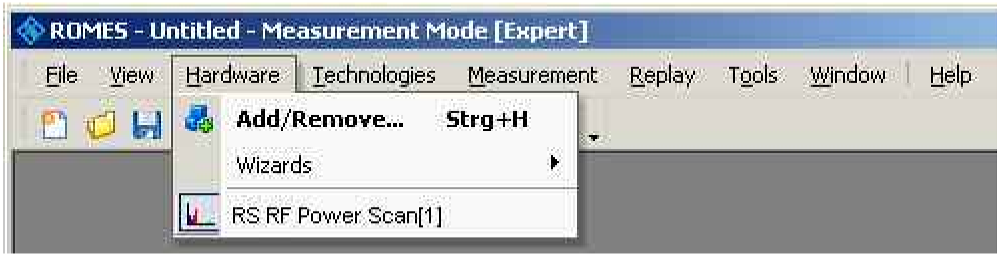


Fig. 6-133 Accessing the RF Power Scan driver configurations

The RF POWER SCAN driver configuration menu contains several tabs to display information on the test receiver driver and configure different kinds of settings.

R&S RF Power Scan - Measurements

The *Measurements* tab shows the existing sweeps for the R&S RF Power scan. The spectrum analysis settings will be set here. The buttons *Add* and *Edit* open a configuration dialog with five tabs where a new sweep or an existing sweep can be edited.

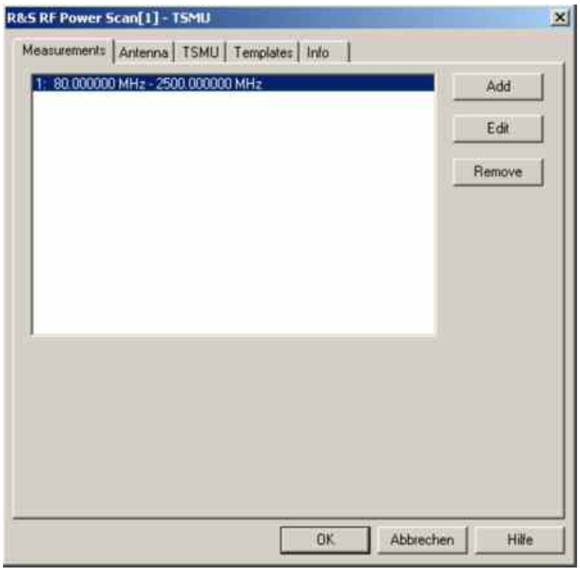


Fig. 6-134 R&S RF Power Scan – Measurements

Basic Settings

The *Basic Settings* tab selects the Sweep Rate and Range and minimum and maximum Power.

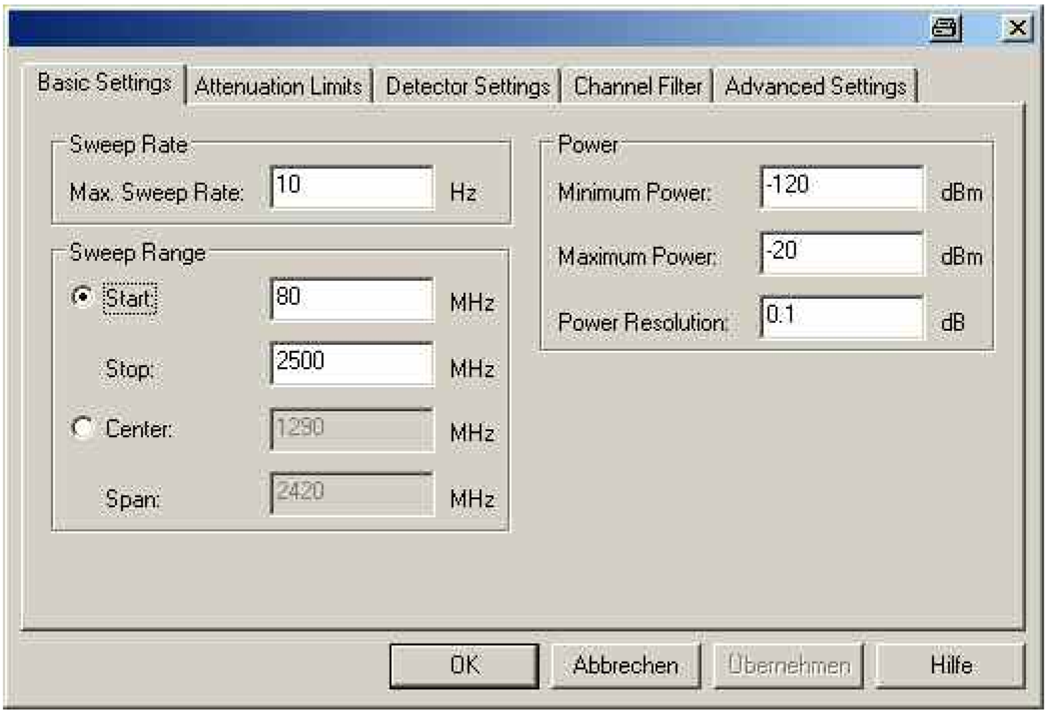


Fig. 6-135 RF Power Scan configuration – Basic Settings

Max. Sweep Rate Maximum update rate of the sweep in Hz.

Sweep Range The *Sweep Range* can be adjusted alternatively by *Start*- and *Stop*-Frequency or by *Center*-Frequency and *Span*. The values are specified in MHz. The minimum value for a frequency is 80 MHz and the maximum 3 000 MHz (if you have a TSML-CW device, the upper limit is 6 000 MHz).

Power The power display area is defined by the following three parameters:

Maximum Power	Maximum power value in dBm
Minimum Power	Minimum power value in dBm.
Power Resolution	Grid for the power values in dB.

Attenuation Limits

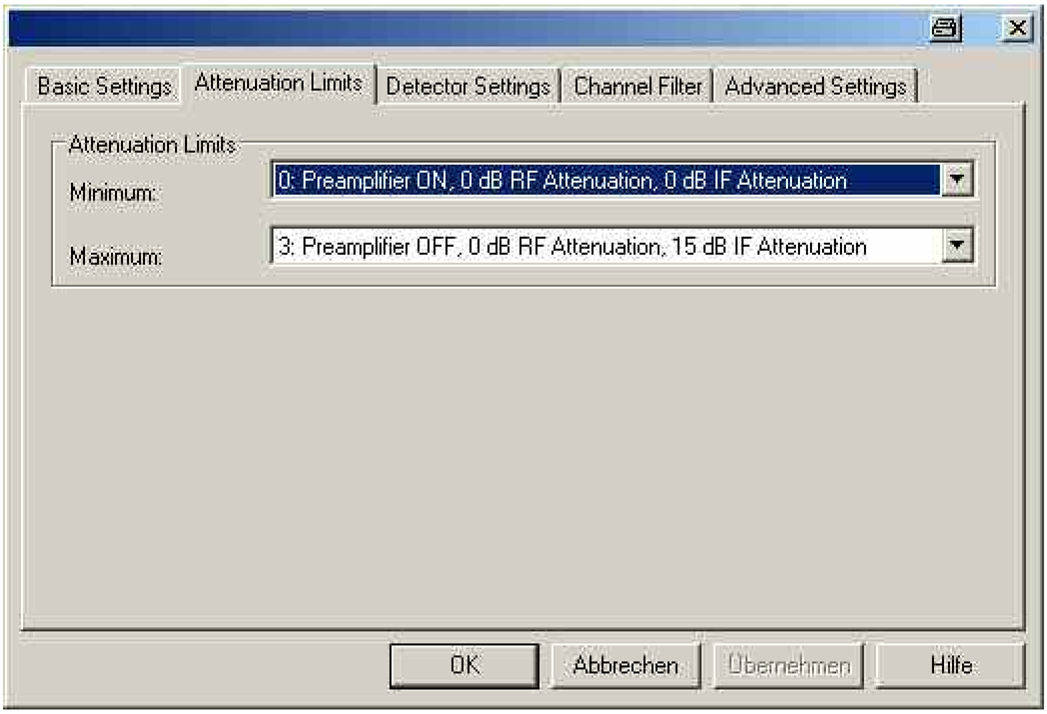


Fig. 6-136 RF Power Scan configuration – Attenuation Limits

Attenuation Limits

These two Limits define the Minimum and Maximum Attenuation Limits for the TSMU input

Possible choice for the attenuation limits:

- 0: Preamplifier ON, 0 dB RF Attenuation, 0 dB IF Attenuation
- 1: Preamplifier OFF, 0 dB RF Attenuation, 0 dB IF Attenuation
- 2: Preamplifier OFF, 0 dB RF Attenuation, 10 dB IF Attenuation
- 3: Preamplifier OFF, 0 dB RF Attenuation, 15 dB IF Attenuation

Detector Settings

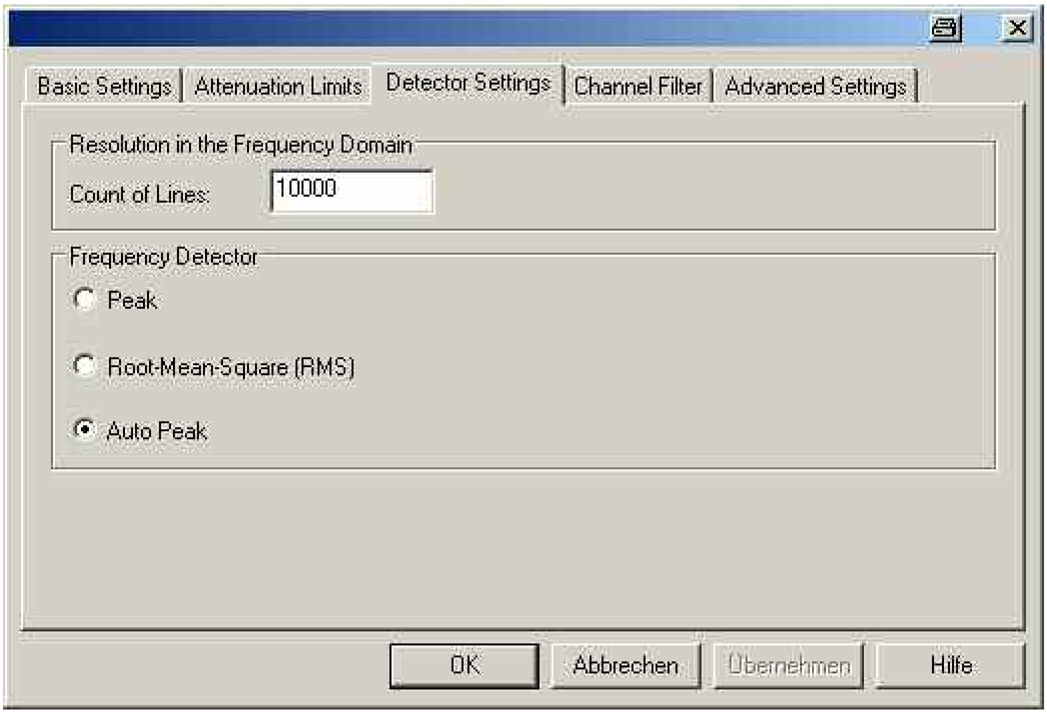


Fig. 6-137 RF Power Scan configuration – Detector Settings

Resolution in the Frequency Domain	*Count of Lines*	The count of lines specifies the resolution of the virtual window in the frequency domain. The maximum number of lines is defined by the TSMx native resolution of 12.8 kHz.
Frequency Detector	For the detection of the frequencies there three possibilities:	
	Peak	Maximum Peak, maximum value of all the dedicated samples
	RMS	Root Mean Square, effective value of all the dedicated samples
	Auto Peak	Minimum Peak and Maximum Peak of all the dedicated samples

Channel Filter

The *Channel Filter* tab allows to create, edit or remove channel filter.

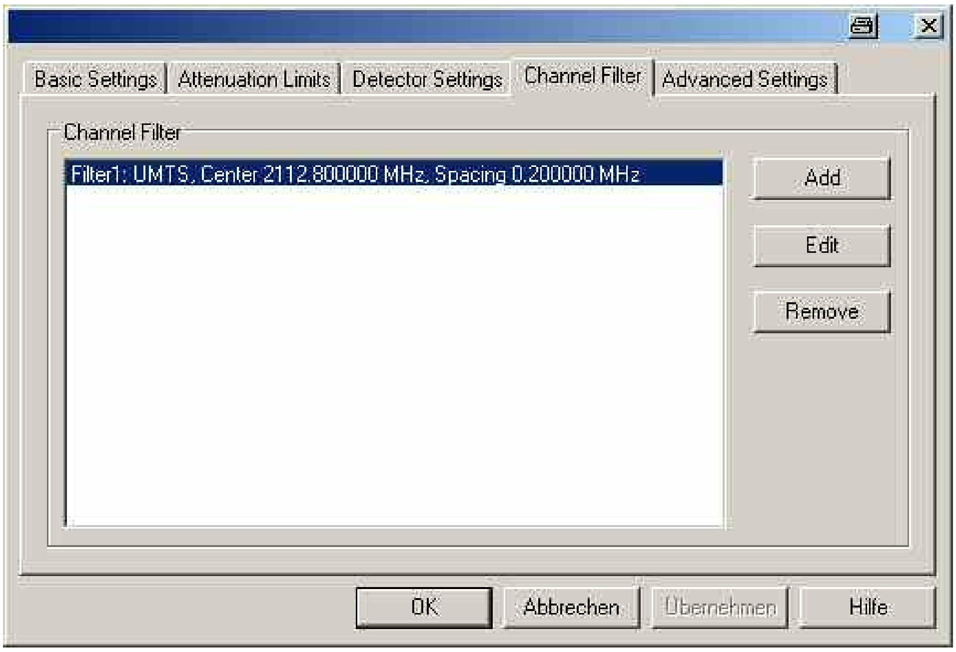
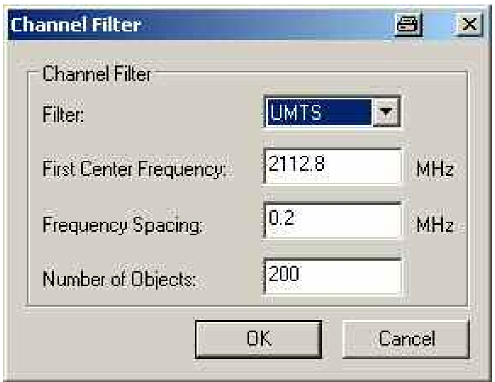


Fig. 6-138 RF Power Scan configuration – Channel Filter

Add Opens the *Channel Filter* dialog to generate a new filter.



The following parameters are set in the *Channel Filter* panel:

Filter	Filter-Type like GSM, UMTS or TETRA
First Center Frequency	Defines the first center frequency of the first channel in MHz.
Frequency Spacing	Distance between center frequencies of two channels specified in MHz.
Number of Objects	Number of channels with the chosen filter-type.

XML-File The Filter definitions are configured by a XML-File, with the following parameters:

Name Defines the name, which appears in the channel filter dialog of the driver.

Indicator User defined unique number for identification.

Freq-Spacing Distance between filter values in Hz.

Weight

Value: Filter values vary in division of 0 and 1. It is assumed that filters are symmetrical. Only the values of one side of filter are needed.

Repeat: Specifies, how often this value will be repeated.

```
<?xml version="1.0" encoding="ISO-8859-1"?>

<channel-filter-list>

    <!-- BEGIN: Channel Filter Definition for UMTS -->
    <channel-filter>
        <name>UMTS</name>                                   <!-- Channel Filter Name -->
        <indicator>127</indicator>                          <!-- Channel Filter Indicator -->
        <freq-spacing>20000</freq-spacing>                  <!-- Frequency Spacing in Hz -->
        <weights>                                           <!-- Values -->
            <weight repeat="116"    value="1.000"/>
            <weight repeat="1"      value="0.988"/>
            <weight repeat="1"      value="0.951"/>
            <weight repeat="1"      value="0.891"/>
            <weight repeat="1"      value="0.809"/>
            <weight repeat="1"      value="0.707"/>
            <weight repeat="1"      value="0.588"/>
            <weight repeat="1"      value="0.454"/>
            <weight repeat="1"      value="0.309"/>
            <weight repeat="1"      value="0.156"/>
            <weight repeat="1"      value="0.000"/>
        </weights>
    </channel-filter>
    <!-- END: Channel Filter Definition for UMTS -->

    <!-- BEGIN: Channel Filter Definition for GSM -->
    <channel-filter>
        <name>GSM</name>                                    <!-- Channel Filter Name -->
        <indicator>255</indicator>                          <!-- Channel Filter Indicator -->
        <freq-spacing>10000</freq-spacing>                  <!-- Frequency Spacing in Hz -->
        <weights>                                           <!-- Values -->
            <weight repeat="11"     value="1.000"/>
            <weight repeat="1"      value="0.988"/>
            <weight repeat="1"      value="0.951"/>
            <weight repeat="1"      value="0.891"/>
            <weight repeat="1"      value="0.809"/>
            <weight repeat="1"      value="0.707"/>
            <weight repeat="1"      value="0.588"/>
            <weight repeat="1"      value="0.454"/>
            <weight repeat="1"      value="0.309"/>
            <weight repeat="1"      value="0.156"/>
            <weight repeat="1"      value="0.000"/>
        </weights>
    </channel-filter>
    <!-- END: Channel Filter Definition for GSM -->

</channel-filter-list>
```

Fig. 6-139 XML-File for the Channel Filter Configuration

Advanced Settings

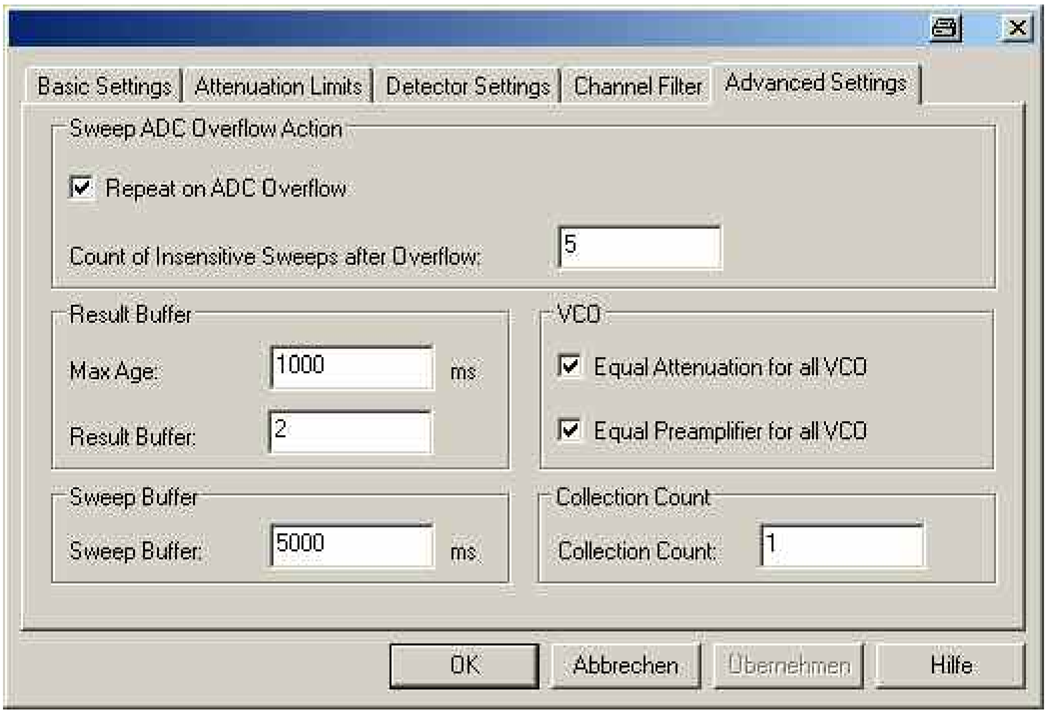


Fig. 6-140 RF Power Scan configuration – Advanced Settings

Sweep ADC Overflow Action	*Repeat on ADC Overflow*	If checked sweep over VCO range where an overflow occurred will be repeated (TSMU has one Voltage Controlled Oscillator for every 1GHz range due to better frequency accuracy and lower phase noise).
	Count of Insensitive Sweeps after Overflow	Count of Insensitive Sweeps after Overflow.
Result Buffer	*Max. Age*	Number of results in the TSMU, which wait in a send queue before the new one deletes oldest one.
	Result Buffer	Lifetime of results in the TSMU, which wait in a send queue before being deleted.
Sweep Buffer	*Sweep Buffer*	Lifetime of results in the SpectrumWorker, which wait in a send queue before being deleted.
VCO		
	Equal Attenuation for all VCO	If checked the same attenuation is used for all VCO ranges.
	Equal Preamplifier for all VCO	If checked the same preamplifier setting is used over all VCO ranges.
Collection Count	*Collection Count*	Number of results collected into one package and send out together.

R&S RF Power Scan - Antenna

The *Antenna* tab sets RF parameters such as the cable loss caused by the test setup, the type and gain of an antenna used. These values have no impact on the measurement but are stored in the measurement file header so they can be taken into account for the calculation of correction factors.

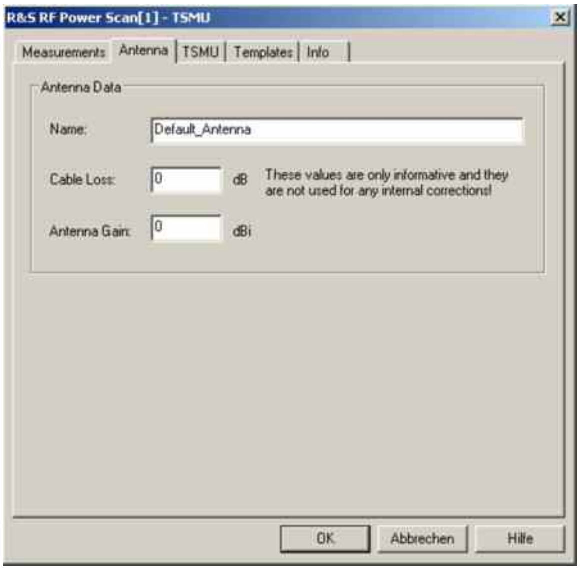


Fig. 6-141 R&S RF Power Scan – Antenna

R&S RF Power Scan - TSMx

The *TSMx* tabs display the properties of the R&S TSMU / R&S TSMQ /TSML-x devices and available options. This information is also displayed in the *Device Chooser* described on p. 6.29.

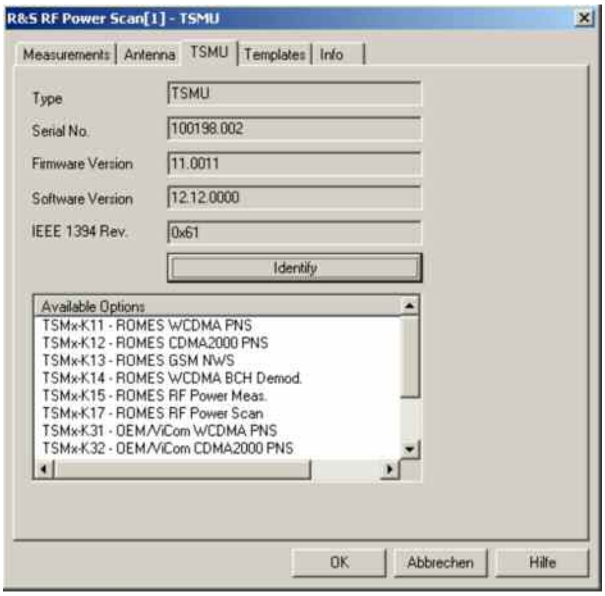


Fig. 6-142 R&S RF Power Scan - TSMx

R&S RF Power Scan - Template

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. It is provided for many test device drivers and is identical for all of them. For details information refer to Driver Configuration GSM – Templates on p.6.79

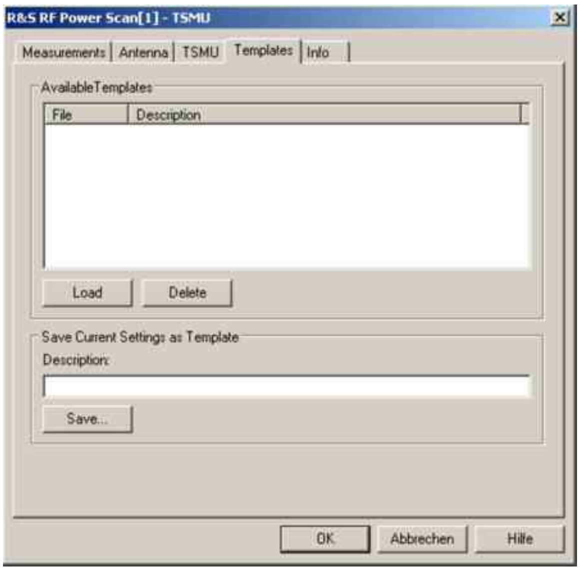


Fig. 6-143 R&S RF Power Scan - Template

R&S RF Power Scan - Info

The *R&S RF Power Scan - Info* tab displays information on the file version of the R&S RF Power Scan driver.

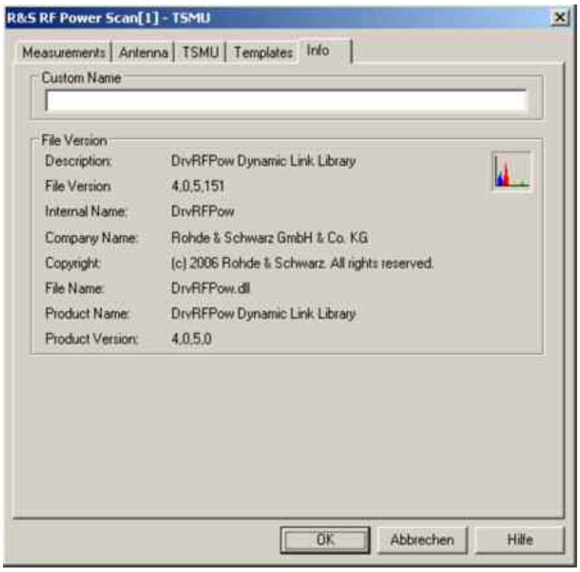


Fig. 6-144 R&S RF Power Scan - Info

Navigation

ROMES uses two different methods to determine the geographic coordinates of a measurement position:

- For ordinary outdoor applications, a GPS receiver is used to detect the satellite signals of the *Global Positioning System* (GPS).
- In areas where no GPS signals can be detected, e.g. inside closed buildings, the position is defined by means of a user-defined map.

GPS and indoor drivers and their configuration are described in the following sections.

GPS Drivers

The measurement system offers five different GPS (global positioning system) receiver drivers to be used with the different GPS receivers.

GPS drivers are installed by selecting *Positioning system* in the *Hardware Drivers* window (see Fig. 6-1 on page 6.3). The configuration menus are explained below.

GPS Driver Types and Supported Devices

Table 6-13 GPS drivers and supported devices

Trimble Svee6/ Trimble Placer	**Travel Pilot RGS08 Pro**	**NMEA**
Six-channel GPS receiver Manufacturer: *Trimble Navigation* company The ROMES GPS driver accepts the following protocol settings of the Trimble GPS receivers: Svee6 TSIP (Trimble Standard Interface Protocol) Placer TAIP (Trimble ASCII Interface Protocol)	Car navigation system Manufacturer: *BOSCH* company Description: The system uses GPS information as well as DVD-ROM based road map data and shows the current car position on an additional display, mounted in sight of the driver.	All GPS receivers supporting the NMEA (*National Marine Electronics Association*) protocol. This driver is required for GINA, the standard GPS receiver for ROMES running in a test vehicle.
GPS Receiver Device Protocol U-Blox		
The U-Blox driver enables the U-Blox protocol with enhanced setting possibilities supported by the GPS receivers R&S TSMX-PPS GPS MODULE.		

In addition, a *Dummy GPS* driver is provided with each ROMES configuration. This driver assigns fictitious geographic information to a set of measurement data so that they can be displayed in the *Route Track View*. No GPS receiver is required; the COM port suggested during the installation will not be used.

Configuration Menus GPS

The *GPS Driver Configuration* menus offer device-specific driver settings. They can be opened by clicking the *Driver* command line of the Hardware menu which is available as soon as a mobile driver is loaded (see Fig. 6-4).

Trimble Svee6

The *Svee6* configuration menu configures the Trimble SveeSix driver and indicates the current file version.

Svee6 Configuration

The *Svee6 configuration* tab selects the *DGPS Mode (Differential GPS)* and the corresponding port settings.

Fig. 6-145 Svee6 driver configuration

If a DGPS signal for maximum resolution is provided either the *DGPS only* or the *Auto* mode must be set. Otherwise, select *DGPS off*.

Inconsistent settings:

The DGPS settings are checked for consistency when the configuration menu is closed via *OK*. If the settings are incorrect, a message window is called up explaining the detected mistake. In this case the configuration window remains open so that the correct setting can be entered.

For more information see the GPS glossary in chapter 8.

Svee6 Navigation Driver

The *Svee6 Navigation Driver* tab indicates the current file version and allows to use the GPS time:

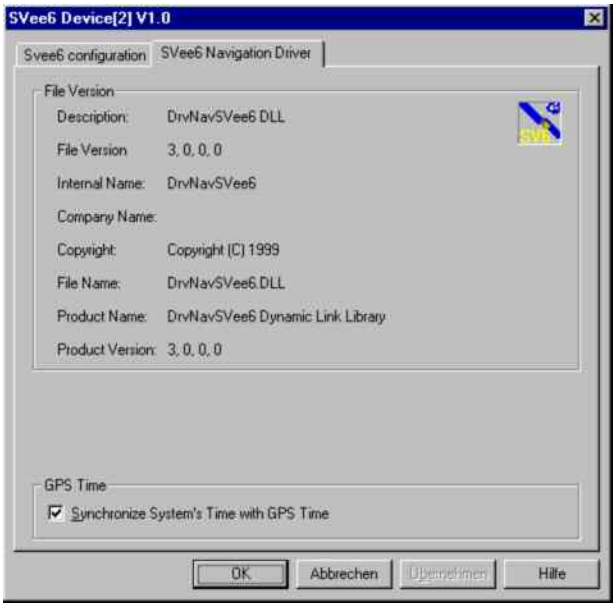


Fig. 6-146 Svee6 driver configuration –Info

GPS Time

If the *GPS Time* box is checked, the system time is synchronized with the GPS time so that the PC clock can be set according to the accurate GPS clock. This implies that the measurement can be started only after a string containing the time information has been received. This time delay can be avoided, however, by switching the correction off and starting the measurement immediately.

Trimble Placer

The *Trimble Placer* configuration menu configures the Trimble Placer driver and indicates the current file version.

Calibration Data

The *Calibration Data* tab handles the dead reckoning (calibration) data of the placer.

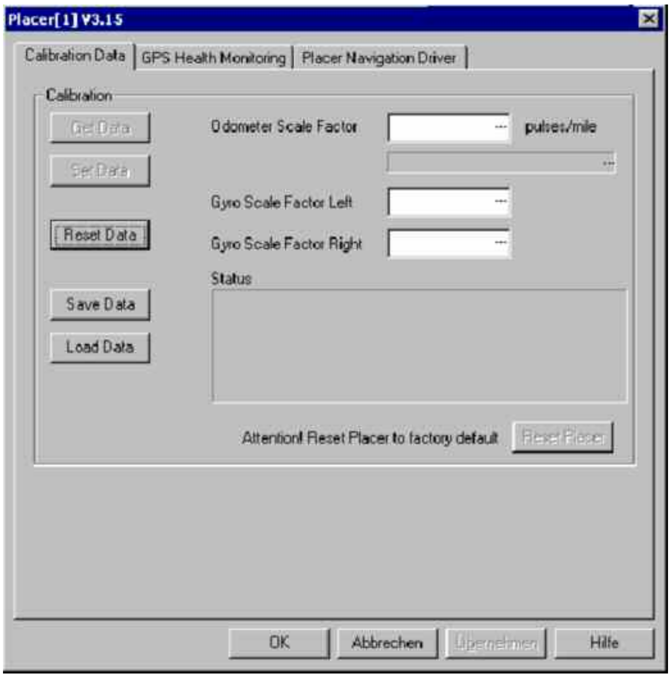


Fig. 6-147 Trimble Placer configuration: Calibration Data

Dead reckoning is used to calculate the geographic position of the test vehicle in situations where the GPS signal is not available. The calculation is based on the distance from a known position and the direction of the test vehicle; the placer determines both values by means of a calibrated odometer and a gyroscope. Usually, the three calibration data (the odometer scale factor and the left and right gyroscope scale factor) do not have to be changed.

In the *Calibration* panel, it is possible to retrieve the calibration data from the placer *(Get Data)* and replace the placer data by the current values entered in the three input fields *(Set Data)*. The *Reset Data* button sets the current data to default. *Save Data* writes the current data to a file named *Placer.dat* in the application program directory; *Load Data* loads the values in *Placer.dat* to the input fields. The factory calibration data of the placer are resident in the system; they can be used any time to reset the placer *(Reset Placer)*.

GPS Health Monitoring

The *GPS Health Monitoring* tab switches health monitoring in the *General Status View* on or off.

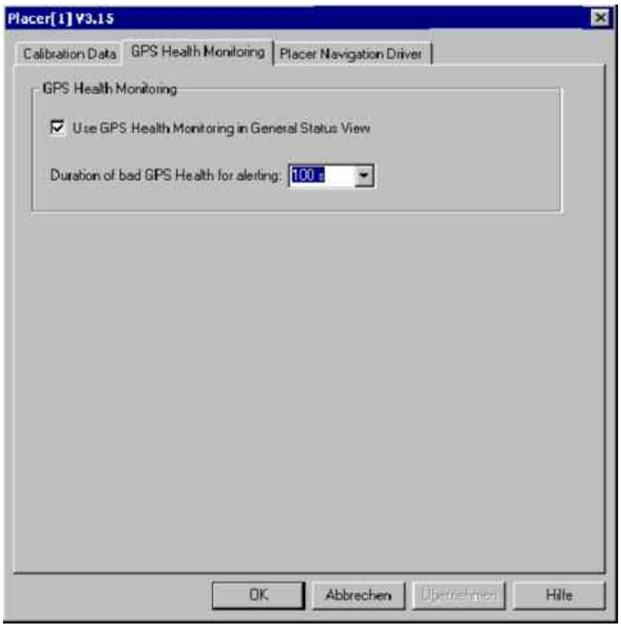


Fig. 6-148 Trimble Placer configuration: GPS Health Monitoring

Bad GPS health means that the GPS signal received is low. Bad health situations can frequently occur during an ordinary test trip, e.g. if the vehicle crosses an underpass or a tunnel. If *Use GPS Health Monitoring...* is checked, bad health situations will cause a warning message to be displayed in the *General Status View*, provided that they last longer than the time selected in the *Duration of bad GPS Health...* entry field.

Placer Navigation Driver

The *Placer Navigation Driver* tab indicates the file version and selects either the active or the inactive communication mode.

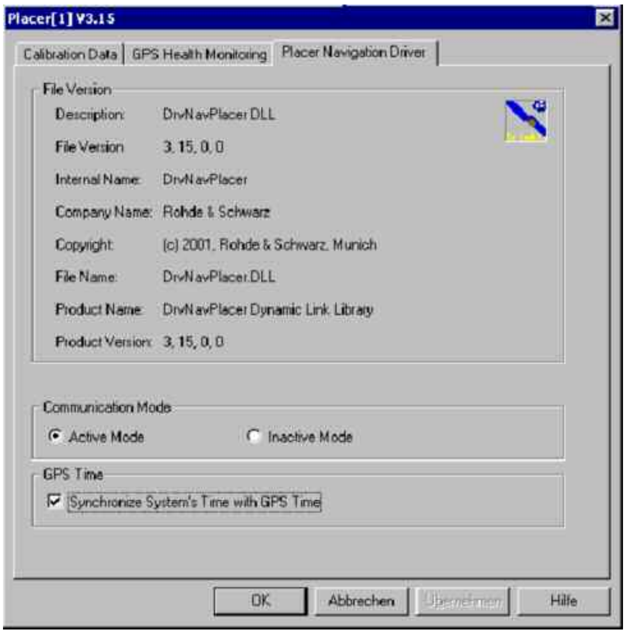


Fig. 6-149 Trimble Placer configuration: Placer Navigation Driver

Communication Mode:

The *Communication Mode* defines in which mode a connected system works:

Active mode	Basic (and default) mode; the system reads and sends data
Inactive Mode	System only reads data

Use of inactive mode:

The inactive mode allows to connect a second measurement system or one working in active mode without using a second *Trimble Placer*.

➢ Select communication mode active in system I, inactive in system II.

➢ Connect the devices as follows:

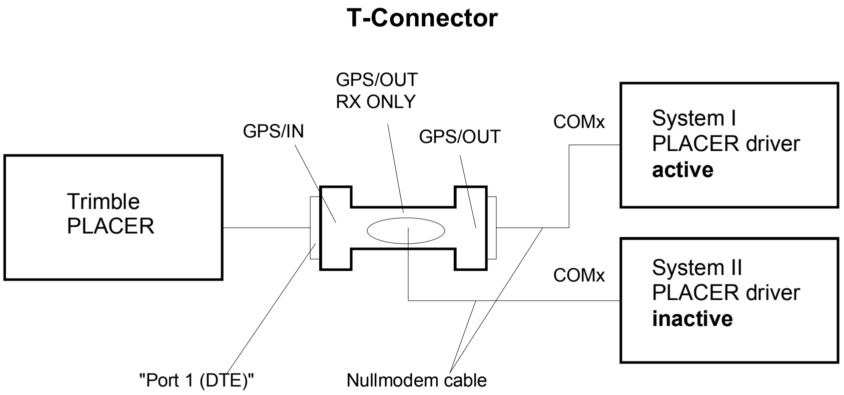


Fig. 6-150 Test setup for inactive GPS driver

Antennas, power supply etc. are not shown in Fig. 6-150.

Note:

As the inactive driver only reads data, the system cannot automatically detect cabling errors or wrong COM port settings. So check if correct GPS data is displayed on both systems in the Route Track window before starting the measurement tour.

It is indispensable to have one System working in active mode.

Do not load the Placer driver into the inactive system when it is connected to an active system while a measurement is running. The reason is, that the default setting is active I/O Mode, and two active systems will collide with each other. So disconnect the inactive system before loading.

Cabling of the T-Connector (stock no. 1086.5331):

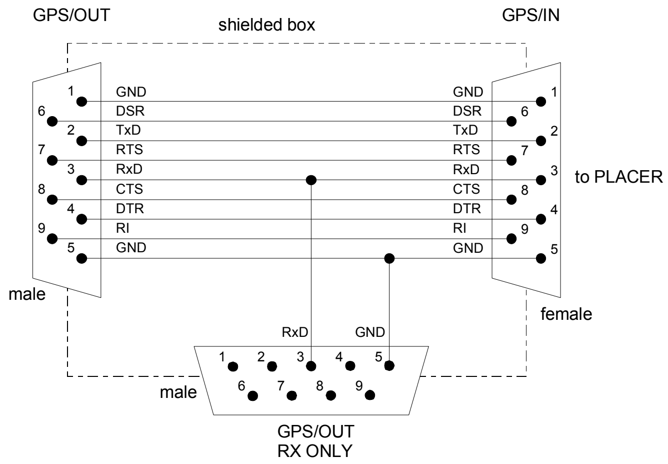


Fig. 6-151 Cabling of the T-connector

Inconsistent settings:

The *communication Mode* settings are checked for consistency when the configuration menu is closed via *OK*. If the settings are incorrect, a message window is called up explaining the detected mistake. In this case the configuration window remains open so that the correct setting can be entered.

For more information see the GPS glossary in chapter 8.

GPS Time

If the *GPS Time* box is checked, the system time is synchronized with the GPS time so that the PC clock can be set according to the accurate GPS clock. This implies that the measurement can be started only after a string containing the time information has been received. This time delay can be avoided, however, by switching the correction off and starting the measurement immediately.

The *Travel Pilot IDS* has currently no configuration menu assigned, because no configuration settings are necessary. The corresponding message box indicates the associated COM port and detects the hardware at this port. If this fails, check the COM port and the device power supply.

Travel Pilot RGS08

The Travel Pilot RGS08 offers the configuration settings shown below.

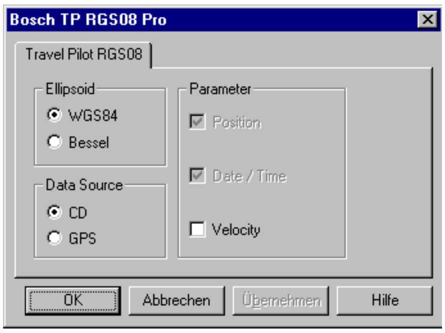


Fig. 6-152 Travel pilot – COM port messages

For more information, especially on the RGS08 settings, see the *Travel Pilot* user manual.

NMEA Driver

The NMEA driver is required for GINA, the standard GPS receiver for ROMES running in a test vehicle.

The ROMES NMEA driver version supports the following NMEA protocol versions: GSA, GGA, RMC, ZDA. Protocol versions not listed here are ignored. The format of the NMEA data depends on the protocol version. The following example shows a comparison of the RMC, GGA and VTG (not supported) protocols:

```
$GPRMC,144732,A,4807.530037,N,01136.650214,E,0,144,070800,001.0,E*76
$GPGGA,144732,4807.530037,N,01136.650214,E,1,09,1.1,546.6,M,46.8,M,,*4F
$GPVTG,144,T,069.3,M,0,N,0,K*5D
$GPRMC,144733,A,4807.530037,N,01136.650214,E,0,144,070800,001.0,E*77
$GPGGA,144733,4807.530037,N,01136.650214,E,1,09,1.1,546.6,M,46.8,M,,*4E
$GPVTG,144,T,080.7,M,0,N,0,K*5E
$GPRMC,144734,A,4807.530037,N,01136.650214,E,0,144,070800,001.0,E*70
$GPGGA,144734,4807.530037,N,01136.650214,E,1,09,1.1,546.7,M,46.8,M,,*48
$GPVTG,144,T,074.7,M,0,N,0,K*55
```

...

GPS Health Monitoring

The *GPS Health Monitoring* tab switches health monitoring in the *General Status View* on or off. Additional the tab offers the possibility to adjust the synchronization between PC and GPS time (see Navigation Driver

on page 6.287). Transmission time will cause delays in milliseconds, if the delay is known higher accuracy can be reached by setting the *Constant Offset*. Only important for Video Quality Analysis.

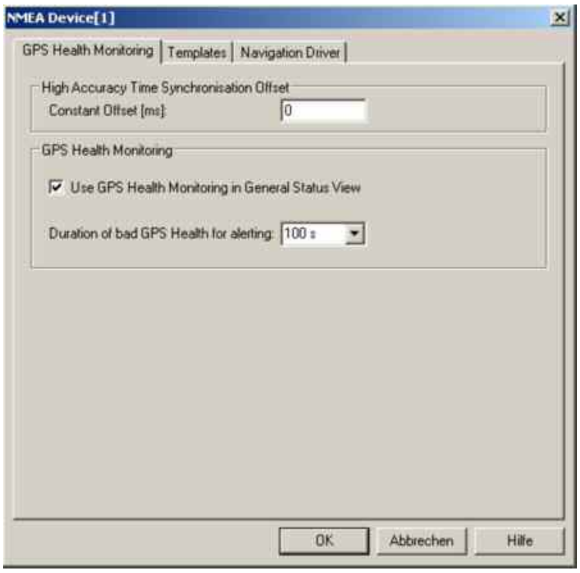


Fig. 6-153: NMEA configuration: GPS Health Monitoring

Bad GPS health means that the GPS signal received is low. Bad health situations can frequently occur during an ordinary test trip, e.g. if the vehicle crosses an underpass or a tunnel. If *Use GPS Health Monitoring...* is checked, bad health situations will cause a warning message to be displayed in the *General Status View*, provided that they last longer than the time selected in the *Duration of bad GPS Health...* entry field.

Templates

The *Templates* tab stores the current driver configuration as a template, lists, loads or deletes driver templates. It is provided for many test device drivers and is identical for all of them.

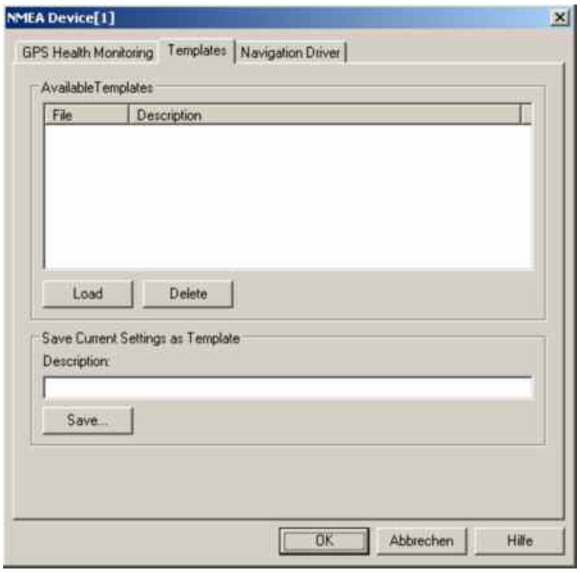


Fig. 6-154: NMEA Configuration: Templates

Navigation Driver

The NMEA *Navigation Driver* menu displays information on the current driver version. If the *GPS Time and Initial Position* box is checked, the system time is synchronized with the GPS time so that the PC clock can be set according to the accurate GPS clock. This implies that the measurement can be started only after a string containing the time information has been received. This time delay can be avoided, however, by switching the correction off and starting the measurement immediately. No other configuration settings are required.

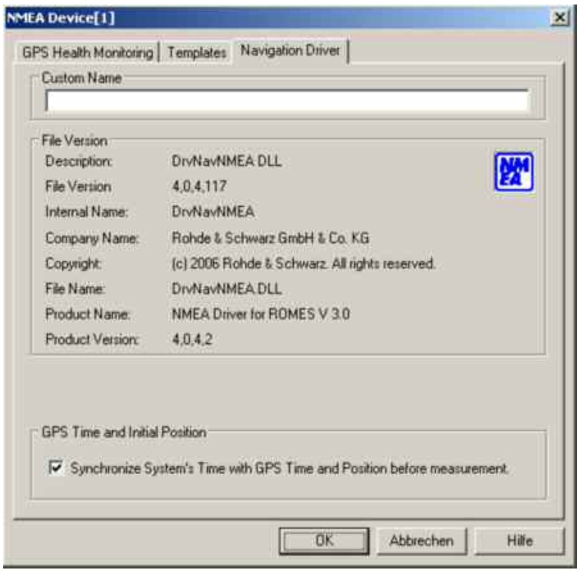


Fig. 6-155: NMEA Configuration: Navigation Driver

The system will detect any NMEA device at the selected COM port. If not, check the COM port and the device power supply.

U-Blox

The *U-Blox Device* configuration menu configures the *U-Blox* driver. With this protocol it is possible to set the navigation output filters. Depending on the used hardware it is also possible to configure the DGPS settings and use the car sensors. The settings in the *GPS Health Monitoring* tab and the *Templates* tab are explained above on page 6.285. The *Navigation Driver* tab displays information on the current driver version. Messages such as "*GPS bad health condition"* or "Antenna open circuit" are displayed in the General Status View.

The update rate with the UBLOX driver is 200 ms instead of one sec with NMEA driver.

The settings and information in the *GPS Health Monitoring*, *Templates* and *Navigation Driver* tabs are the same as for the NMEA Driver.

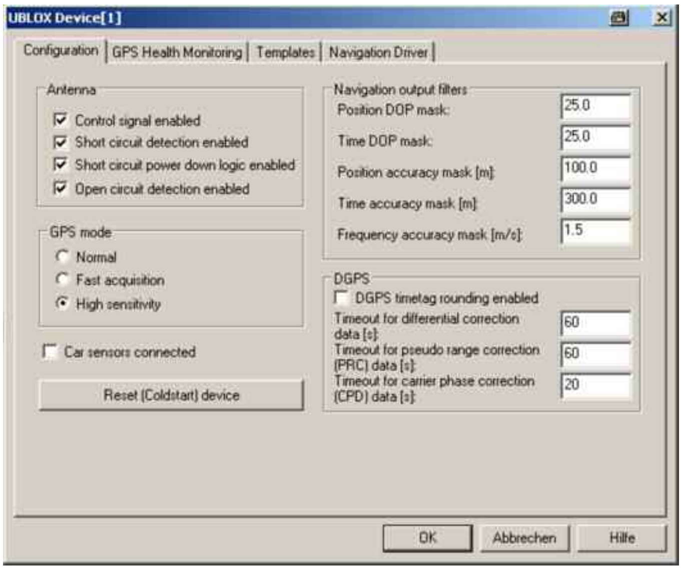


Fig. 6-156: UBLOX Device - Configuration

Note:

The ROMES ublox driver will disable the output of NMEA messages on the device. To use the device again with NMEA protocol it must be enabled again with the u-center software from ublox (www.ublox.com).

Antenna

If the GPS antenna is not correctly connected the user will be informed if this is enabled in the driver configuration. Following fault reports can be enabled:

- Control signal
- Short circuit detection
- Short circuit power down logic
- Open circuit detection

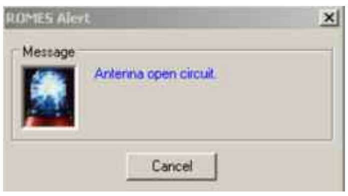


Fig. 6-157: Example of a R&S ROMES Alert popup message

GPS mode

Three different modes for the GPS are available

- Normal
- Fast acquisition
- High sensitivity

Navigation output filters

- Position DOP mask
- Time DOP mask
- Position accuracy mask [m]
- Time accuracy mask [m]
- Frequency accuracy mask [m/s]

DGPS

- DGPS timetag rounding enabled
- Timeout for differential correction data [s]
- Timeout for pseudo range correction (PRC) data [s]:
- Timeout for carrier phase correction data (CPD) [s]

Car Sensors

Car sensors connected	If "*car sensors connected*" are checked and from the used hardware supported the speed pulse accuracy and status indicators like taco pulse will be filled and shown in the GPS Info View. Up to twelve satellites will be indicated in the GPS Info View.

Reset Button

Reset (Coldstart) device	Click the button "*Reset (Coldstart) device"* shuts down and resets the device.

Dummy GPS

The *Dummy GPS* configuration menu configures the *Dummy GPS* driver and indicates the current file version.

The *Position* tab selects a geographical start position and the speed and direction of the measurement curve on the map. It also assigns attributes to the measurement data.

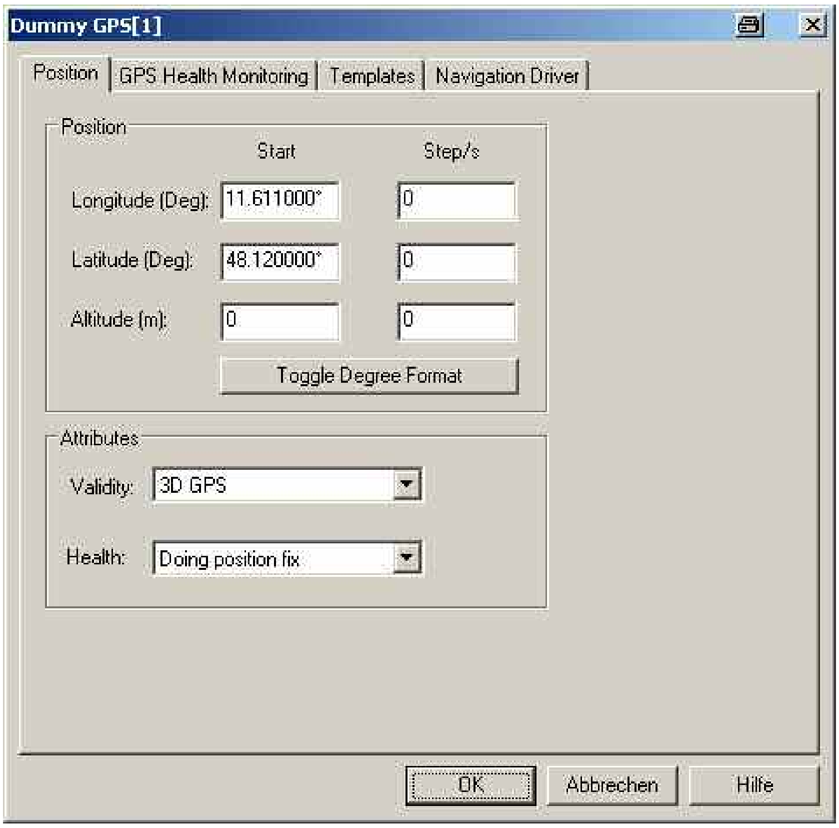


Fig. 6-158 Dummy GPS driver configuration

The *Position* panel defines the position of the measurement data on the map:

Start The first measurement point will be assigned the three geographic coordinates in the *Start* column. If the data is displayed in the *Route Track View*, then the *Altitude* coordinate does not contribute to the representation but is shown in the *GPS Info* view.

Step/s The three coordinates in the *Step/s* column define the geographical distance of a data point from another that was recorded 1 s earlier. The *Altitude* coordinate is not taken into account. The ratio between *Longitude* and *Latitude* determines the angle of the measurement curve on the map; the sum of the squares of both values is proportional to the square of the speed of the measurement curve on the map.

The *Attributes* panel assigns a (fictitious) *Validity* and *Health* value to the measurement. Both values are shown in the *GPS Info* view.

The settings in the *GPS Health Monitoring* tab are not used for the measurement. The *Navigation Driver* tab displays information on the current driver version.

Indoor Navigation Driver INDOOR

The INDOOR driver is used to perform measurements in areas where no GPS navigation signal is available, e.g. inside buildings. To visualize the measurement route, one or more user-defined maps, e.g. floor plans, are used, which are contained in a Geoset file (see *Background Set* paragraph on p. 6.292).

The INDOOR driver itself does not need additional hardware.

Note:
As opposed to all other hardware drivers, the Indoor driver must be loaded before indoor measurement data can be replayed. On loading the driver the Indoor submenu is added to the View menu, see below. At the same time, the Hardware menu is extended by the Indoor Navigation command line, see section Driver Configuration Menu on page 6.292.

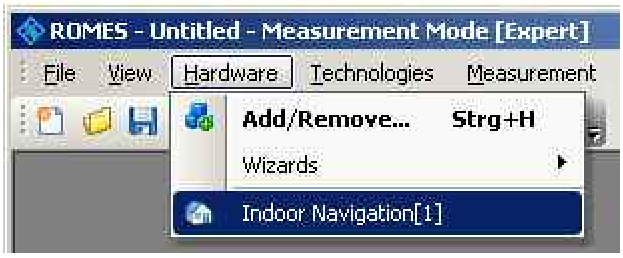


Fig. 6-159 Indoor Navigation - Configuration

Driver Configuration Menu INDOOR

Indoor Navigation - Setup

The *Indoor Navigation* configuration menu is used to select the background bitmap set from an archive, to select the measurement mode and the navigation mode. The configuration menu can be opened by selecting the *Indoor* command line in the *Hardware* menu which is available after loading the Indoor driver.

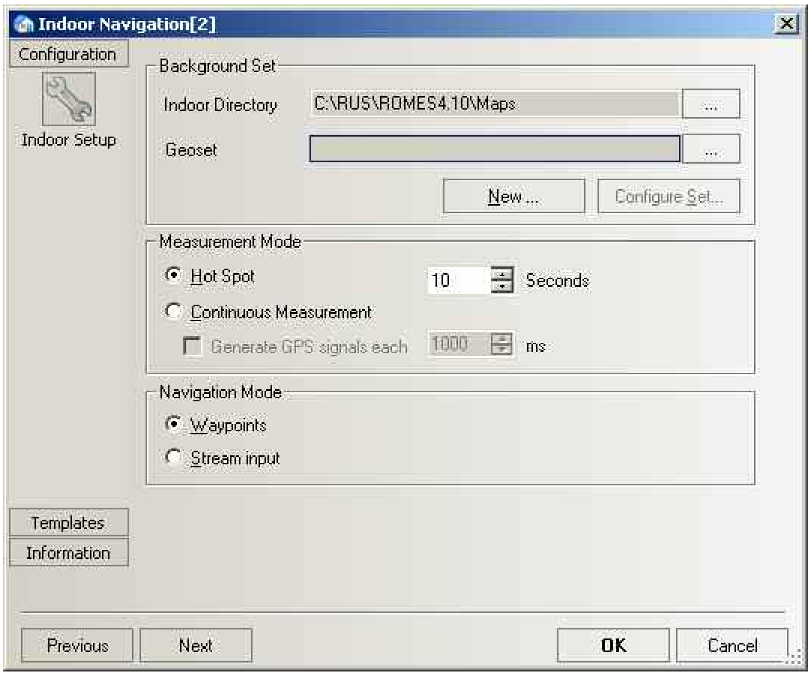


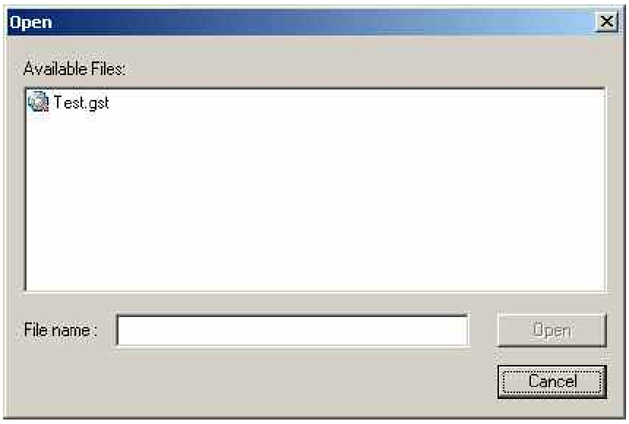
Fig. 6-160 Indoor driver configuration

Back-ground Set The *Background Set* panel contains the fields and buttons to select or create a so-called Geoset file (*.gst). Geosets can include several background floorplans, which makes it very easy to change the background map without stopping the measurement.

Indoor Directory First check if the displayed directory is the one where the background maps and Geosets are stored. Only from this directory Geoset files and maps can be selected later.

You may change the directory with the  button next to the *Indoor Directory* field.

Geoset Using the  button next to the *Geoset* field opens a *File Open* dialog (see chapter 2) to select one of the Geoset files available. It is not possible to change the directory here, this must be done via *Indoor Diretory*.



After selection, the file is indicated in the *Geoset* output field and the *Configure Set* button is enabled.

New The *New* button opens a dialog to define a new Geoset (*.gst) file:

Enter a name for the new Geoset file (*.gst) and click *OK*. The Configure Set dialog is the opened automatically.

Configure Set Once a Geoset file is selected or created, this button opens the Geoset configuration menu:

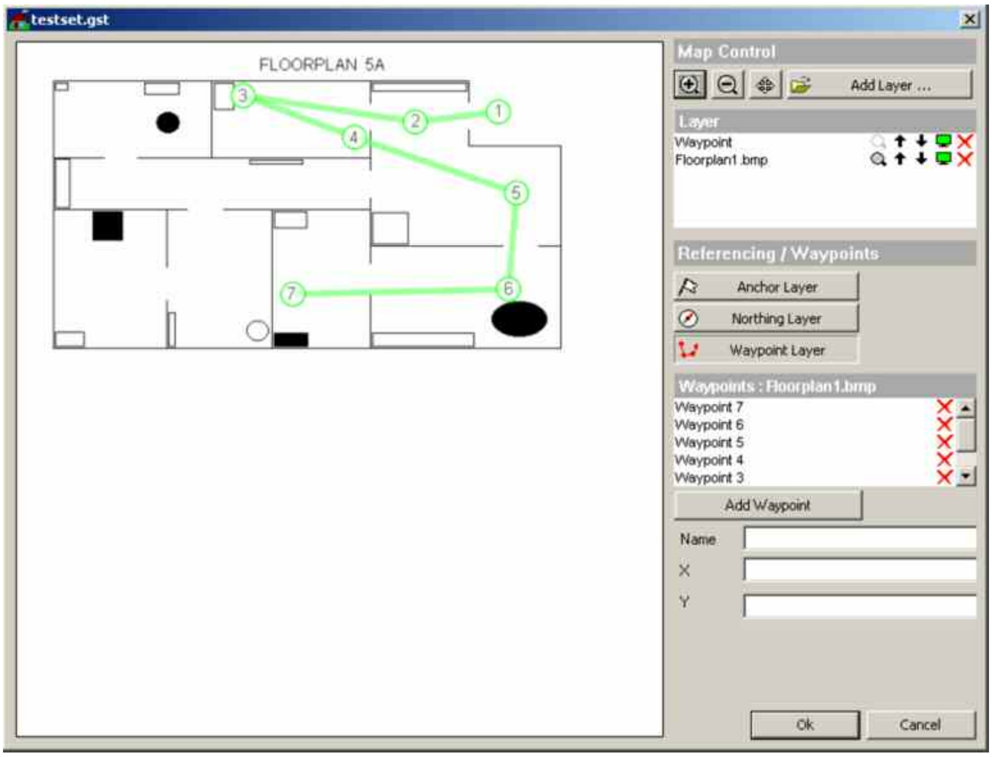


Fig. 6-161 Geoset configuration dialog

Map Control

The *Map Control* area consists of four buttons:

To zoom into the map, click this button and mark a rectangle in the background map to define the area to zoom. The marking of a rectangle is done by keeping the left mouse key pressed while moving from top left to down right. Different from the *Route Track View*, **a single click is not working**.

To reset the map scale after zooming, click the reset icon in the Layer management field.

To zoom out of the map, click this button and single click on the background map.

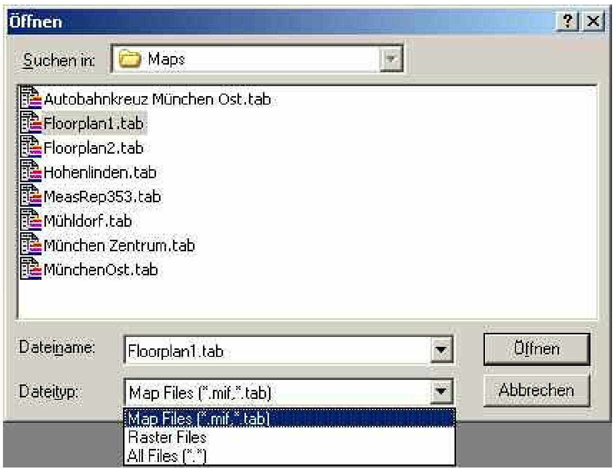
To reset the map scale after zooming, click the reset icon in the Layer management field.

To scroll the map, click this button, click on a starting point on the background map and then move to the end point of the desired map scroll. After the starting point on the map is clicked, the scroll is shown by a thick line between the mouse cursor and the starting point.

Once the end point of the desired scroll is clicked, the map is scrolled accordingly.

To reset the map position after scrolling, click the reset icon in the Layer management field.

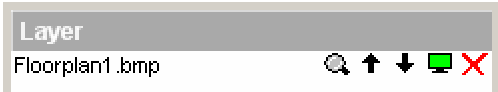
Add Layer... Clicking this button an *Open File* dialog for background maps is displayed, where the directory is fixed to the previously defined *Indoor Directory*.



This example shows that already referenced maps as well as unreferenced ones can be loaded

The Indoor bitmap files are positioned and stored according to the scheme used for *Route Track* background maps; refer to section *Bitmap Handling and Positioning* in chapter 3: The coordinates are defined in a separate configuration menu (see *Referencing* below) and stored in a **.tab* file associated to the bitmap.

Once selected, the map is visible in the Geoset configuration menu and the Layer management field shows the related filename:



If a second background map is added using the *Add Layer...* button, the new map is inserted on the top layer, which causes the previously added map layer to disappear:

Layer display and management is described below.

Layer This field displays all loaded layer names or map filenames and offers a series of icons for layer display:

A click on this icon resets the effects from the last map zoom or map scroll action. This icon is only active for background map layers, for other layers the icon is disabled ( ).

Single-clicking on these icons moves the corresponding layer one level up or down. With background map layers, only the top active map layer is visible.

This icon shows that the corresponding layer is active. To disable the layer, click on the icon. The icon is greyed ( ) and the corresponding layer becomes invisible. If the top map layer is disabled, the next map layer becomes visible, if defined.

Clicking on this icon removes the corresponding layer from view and list.

Referencing To reference a map, the according layer must be on top, because only the top layer is selected for referencing.

Either **set three anchors** can be set directly; or **one anchor, northing and scale** can be used, similar to the previous Indoor version (in ROMES V.3.53).

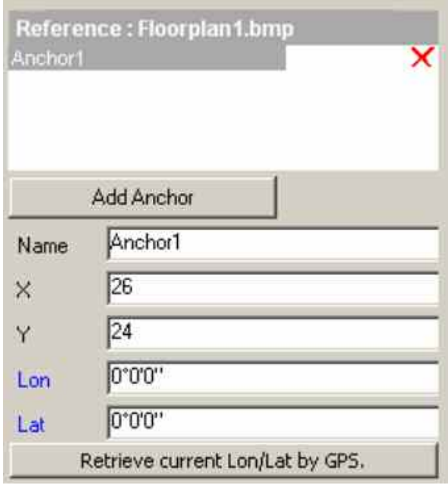
1.) Referencing by setting three anchors:

First select the Layer to be referenced and ensure that it is the top background map layer.

Then click on the *Anchor* Layer button 

This creates a new layer called "*Geo Referencing*" and changes the dialog content below the layer management list.

Now move the mouse pointer to the position where Anchor 1 should be placed and left-click to set the first anchor position. This inserts an anchor symbol into the map display and fills the reference list and the anchor property fields as shown below:

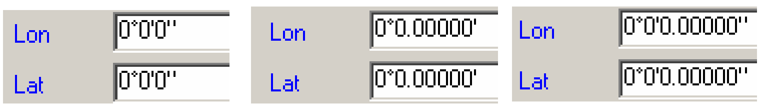


The anchor can be removed from the background map reference list by clicking on the ✕ to the right of the anchor name.

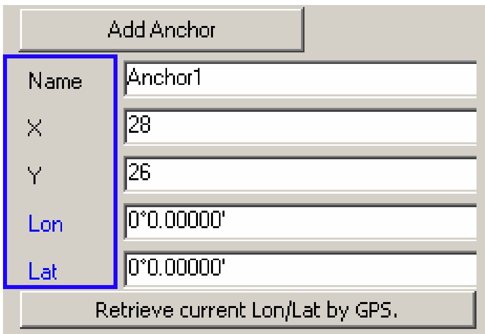
The anchor can be moved in two ways: Either by clicking on the map anchor symbol and dragging it to the new position on the map, or by clicking on the map anchor symbol and clicking on the new position.

Once the anchor is on the desired map position, the geographic latitude and longitude of this position must be entered. With a connected GPS receiver, the anchor Lon/Lat can be taken from the receiver by clicking the Retrieve current Lon/Lat by GPS. button.

Alternatively, the anchor Lon/Lat can be entered manually, using either degree-minute-second or degree-minute-decimal or degree-minute-second-decimal formats:

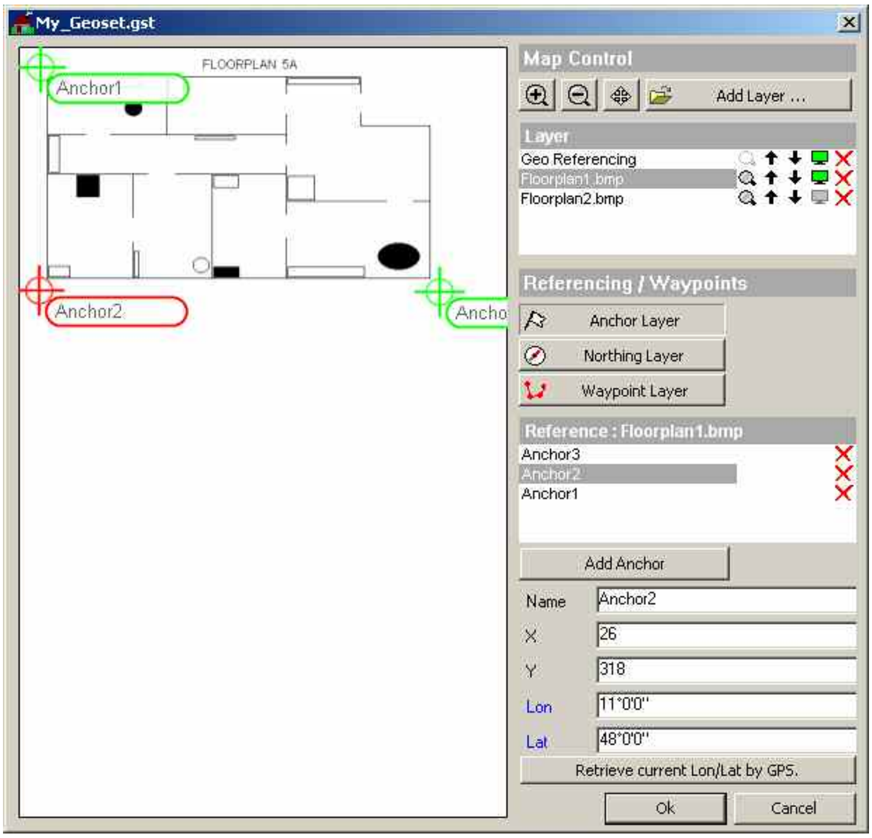


To switch between these formats, double-click in the area marked by the blue rectangle:

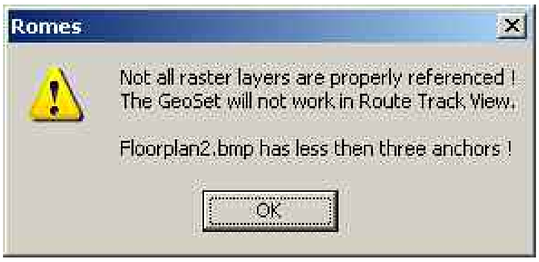


To place the second anchor, either click on *Add Anchor* and generate a new anchor in the top left corner which can then be moved to the wanted position, or click the *Anchor Layer* key again and then on the wanted position of the new anchor. Otherwise only the first anchor is moved to the clicked position. Repeat for the third Anchor.

Once all three anchors are set, the map display looks similar to the screenshot below, where the red anchor is currently selected:



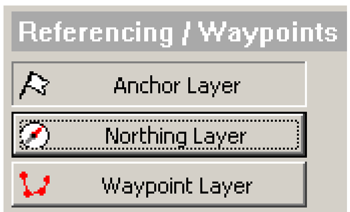
Save your changes to the Geoset by clicking the *OK* button. If there is a second background map layer that has not been referenced, the following warning appears:



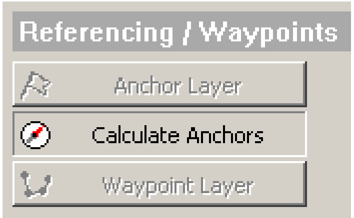
For the sake of clarity, the second background map is referenced using the second map layer referencing method:

2.) Referencing by setting one anchor, scale, and northing:

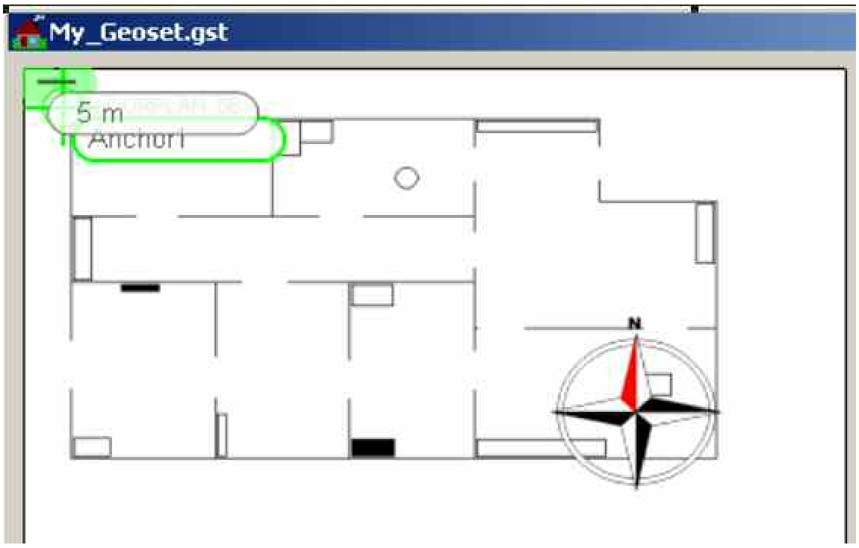
First select the second layer to be referenced and ensure that it is the top background map layer. Then click on *Northing Layer*:



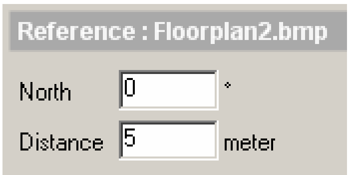
The *Northing Layer* button now changes to *Calculate Anchors:*



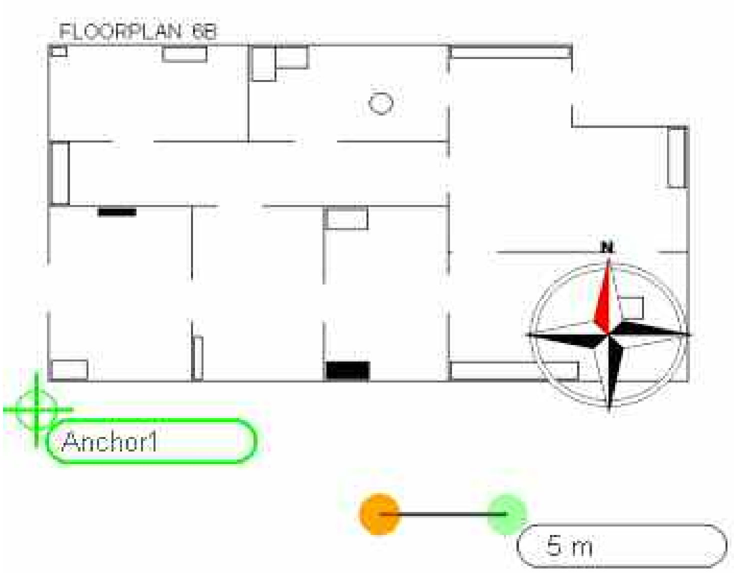
The map display now contains an anchor, a scale icon, and a compass:



Also instead of the list of anchors, the north direction (in degrees) and the scale distance value is shown (5 m default value).



The anchor and the two ends of the distance line can be placed individually now:



Enter another distance value if applicable, then select the anchor, and enter its *Longitude/Latitude*. If the compass is clicked, it can be rotated using the mouse.

Alternatively, position the anchor, and enter the North direction as well as the scale distance manually in the *North* and *Distance* entry fields.

Now that the necessary references have been entered, click on *Calculate Anchors* to generate three anchors, which is the internally used map positioning reference.

Verify the dialog

and save your changes to the Geoset by clicking the *OK* button.

Waypoints

A series of predefined positions on the indoor map is specified before the measurement is started. During the measurement, the operator informs the system by clicking on the waypoint when it has been reached.

To configure waypoints, click on the *Waypoint Layer* button. The layer management list now displays a layer called "Waypoint", and the dialog area below the button looks similar to this:

To add a Waypoint, either click on the desired map position, or click on the *Add Waypoint* button, which creates a waypoint in the top left corner of the map.

As with anchors, the waypoints can be moved by moving the mouse pointer on it and keeping the left mouse key pressed while dragging the waypoint icon to its desired position.

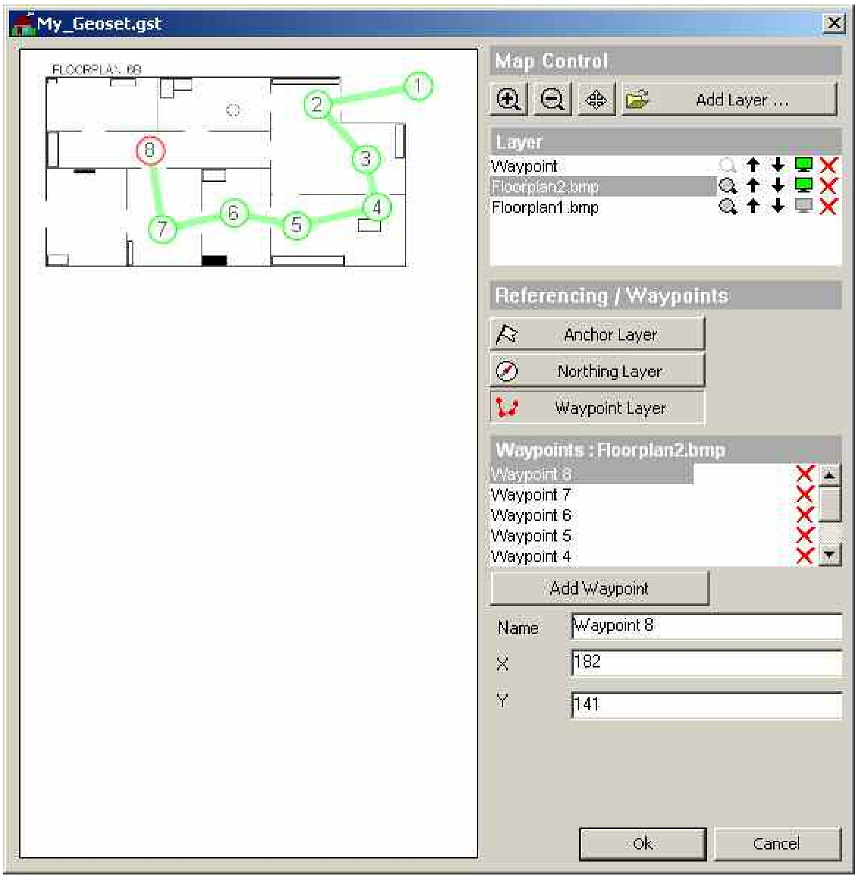
Inserting the next waypoint increases its index automatically.

The waypoints can be created intuitively:

- Every click on the map *adds* a waypoint at the cursor position with a link to the previous waypoint.
- Every click on an existing waypoint *deletes* it and connects its former neighbors with each other.

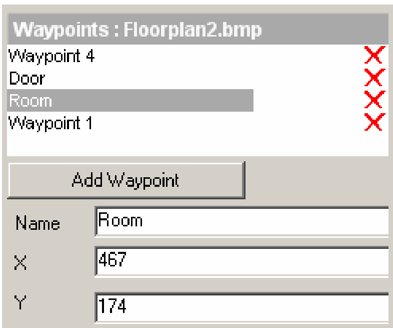
- Drag-and-drop with the mouse *moves* a waypoint.

Create as many waypoints as necessary to obtain a map display similar to the following:



Waypoints can be removed from the waypoints reference list by clicking on the ✕ to the right of the waypoint name.

By filling the Name field of a waypoint in the list, this waypoint is renamed accordingly:



NOTE:

*If you would remove e.g. the 2nd waypoint ("Room") now, "Waypoint 4" becomes the **logically third** waypoint, although the name remains the same. The automatically issued names from the waypoint creation are **static**.*

Measurement Mode Selects either a measurement in a fixed time interval *(Hot Spot)* or a measurement which lasts for an undetermined time unless restarted explicitly *(Continuous).*

Like in the previous Indoor version, *Hot Spot / Continuous Measurement* can be combined individually with *Waypoints / Stream Input*, see following table.

See also section *Measurement Mode* on page 6.302.

If the *Generate Max. ... GPS signals each ... ms* checkbox iis checked, the position interpolation is activated during the measurement, which is available only in Continuous mode. The frequency and number of GPS signals define the granularity of the interpolation.

Navigation Mode Defines how the position of a measurement location is reported to the measurement system:

Waypoints During the measurement, the current measurement position is set on the map by clicking on the waypoint button of the control menu, see following table.

Stream input During the measurement, the current measurement position is set on the map of the control menu, via the mouse or trackball, see following table.

OK Applies the current configuration (if it is valid) and closes the *Indoor Navigation* menu.

Cancel Discards the configurations made and closes the *Indoor Navigation* menu.

Table 6-14 Indoor measurements in different navigation and measurement modes

Navigation Mode	**Measurement Mode**	
	Hot Spot (measurement with time limit)	**Continuous** (measurement without time limit)
Waypoints (predefined measurement points)	➢ Go to next waypoint ➢ Click the waypoint button in the control menu to initiate new measurement after preset second count. The result is shown at the waypoints (discrete values)	➢ Go to next waypoint ➢ Click waypoint button in the control menu to initiate new measurement The result is shown between the waypoints (color scale)
Stream input (measurement points defined ad hoc)	➢ Go to next measurement point ➢ Use mouse to mark the measurement point (current position) on the Indoor view ➢ Click position to initiate new measurement after preset second count The result is shown at the measurement points (discrete values)	➢ Go to next measurement point ➢ Use mouse to mark the measurement point on the Indoor view ➢ Click map location to initiate new measurement. The result is shown between the measurement points (color scale)

Measurement Mode INDOOR

The *Measurement Mode* panel of the *Indoor Navigation* configuration menu offers two different measurement modes, the *Hot Spot* and *Continuous* measurement:

Hot Spot Performs a measurement that is terminated after a fixed time but can be restarted at each measurement position (hot spot). The fixed measurement time is set in the input field to the right of the *Hot Spot* radio button. Values between 1 s and 10 s are allowed.

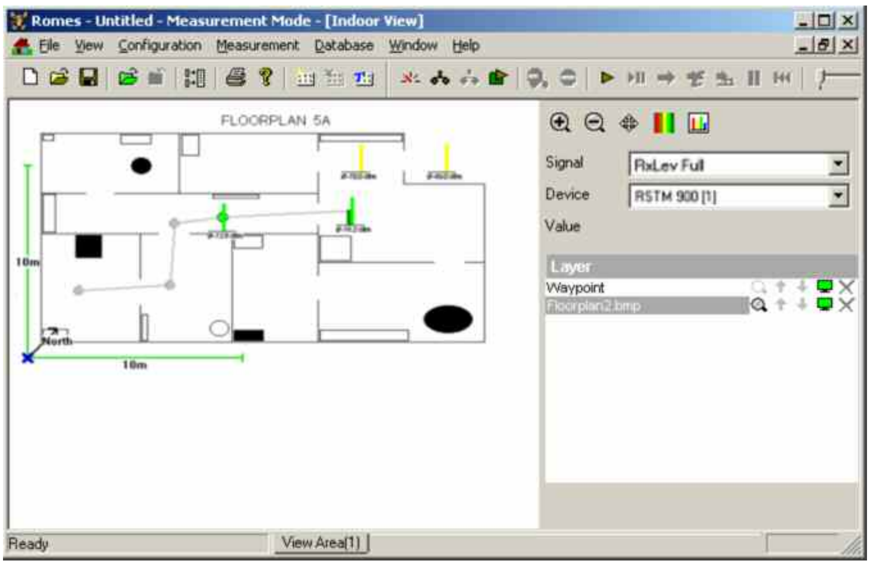


Fig. 6-162 Performing a hot spot measurement

Depending on the *navigation mode* set (see p. 6.301) the hot spots are either the way-points defined before the actual measurement (see Fig. 6-163 on page 6.3) and stored in the waypoints configuration file or arbitrary points on the map that are defined during the measurement via the mouse or trackball.

Every single measurement is initiated via the Waypoint button of the Indoor Control view.

Note:

A measurement can be started and the next hot spot can be defined only after the end of the previous measurement, i.e. after the measurement time has elapsed.

Continuous Performs a measurement without time limit at previously defined waypoints. The *Check Point* button is to be clicked every time the operator reaches a waypoint.

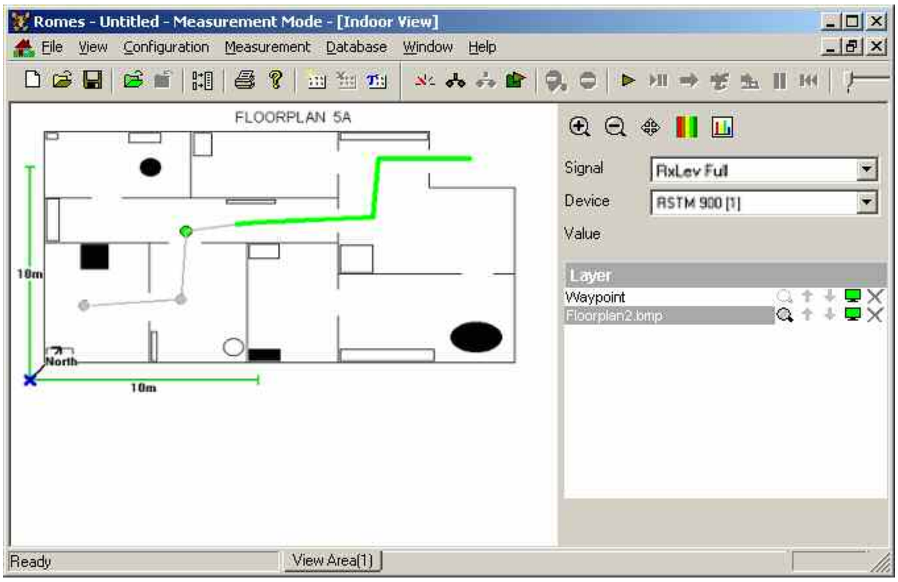


Fig. 6-163 Performing a continuous measurement

In this mode, the measured data is visualized along the way between two waypoints according to the color scale shown in the legend of the view window. To achieve this graphical representation, ROMES interpolates the measurement data along the straight lines between each pair of consecutive waypoints.

Note:

After the last waypoint is reached, the measurement is not stopped automatically. To terminate, click the Stop Measurement button or the corresponding command line in the Measurement menu.

ROMES uses the measurement results at the predefined waypoints to interpolate intermediate points and measurement results and store them in the measurement file. The number of the interpolated points is controlled by entering a time difference Δt (in ms) in the *Seconds* field associated to the *Measurement Mode* field: The number of interpolated values between two waypoints numbered n and n+1 equals to the integer number closest to the ratio $(t_{n+1} - t_n) / \Delta t$. The smaller Δt, the larger the number of interpolated values stored in the measurement file.

The interpolated positions and measurement results are not visible in the *Indoor View*. They can be exported though to an ASCII file or evaluated and viewed by an appropriate .*rscmd evaluation and post-processing software.

Indoor Navigation - Templates

The *Templates* tab stores the current indoor driver configuration as a template, lists, loads or deletes driver templates.

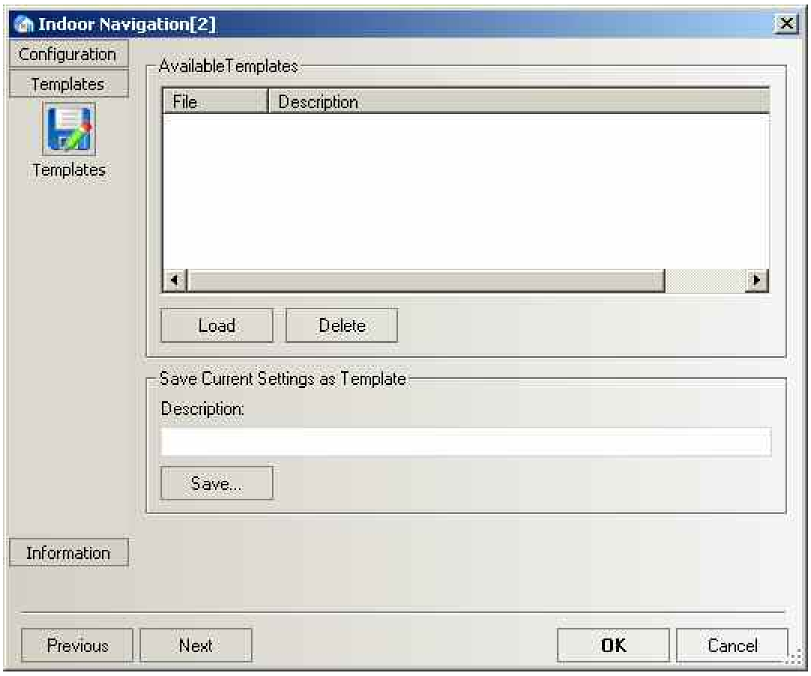
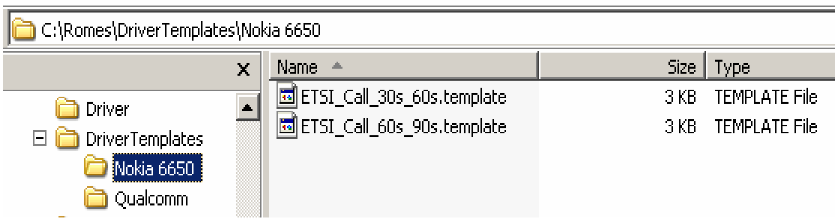


Fig. 6-164 Indoor Navigation – Templates

Load/Delete Loads a driver template or deletes a template displayed in the list of *Available Templates*. Template files are ASCII files with the extension *.template. The template definition is independent from the workspace.



Save Saves the current driver settings together with the *Description* to a selected template file.

Contents

7 Data Processing

The following chapter describes the various options offered for saving and exporting measurement data.

The steps taken for data acquisition and for the data analysis are independent in principle. R&S ROMES uses its own standard format for measurement files (*.rscmd or *.cmd files) but offers various options for printing results or interchanging the data with other applications:

- The *.rscmd or *.cmd files can be directly used by an appropriate measurement file evaluation and post-processing software.
- The contents of a view can be printed to a file or hardcopy using the *Print* options in the *File* menu (see chapter 3).
- The *.rscmd or *.cmd data can be converted into other file formats and exported.
- A screenshot of the whole screen or part of the screen (= active window) can be generated.

Saving Data with R&S ROMES

Data Recording

If a measurement is started via *Start recording* (see chapter 3), the recorded data is automatically saved under the selected file name with the extension *.rscmd. This and the older format *.cmd provide the *Replay* feature. The *.rscmd and *.cmd format are also supported by other software tools.

Care has to be taken when starting a measurement via *Start measurement* (see chapter 3) without recording. In this case the system asks you to enter a measurement file name. This name will be used at the moment you start recording. If you do not record any data, the file will be deleted and not be stored as an empty file after the measurement is terminated.

Attention:
If you select an existing measurement file it will be deleted if no data is recorded and overwritten if data is recorded.

Export

For further evaluation with applications which cannot read the original R&S ROMES *.rscmd format, e.g. the *TS9954* NQA evaluation software, the required data formats must be generated via the *Export* function.

Save Workspace

The *Save Workspace* and *Save Workspace as* functions in the *File* menu and the corresponding floppy disk icon in the tool bar are only used for saving workspace files (*.RSXKS).

Exporting Data

The export of measurement files is carried out in several steps:

- Selection of the target file format and directory
- Selection of the measurement file
- Export configuration (selection of signal parameters, export options)
- Generation of the export file

The export process is described in the following section. The configuration menus depend on the selected export file format; they are described on page 7.6 ff.

Export Procedure

Measurement data files can be exported via the *Export Measurement File* command in the *File* menu.

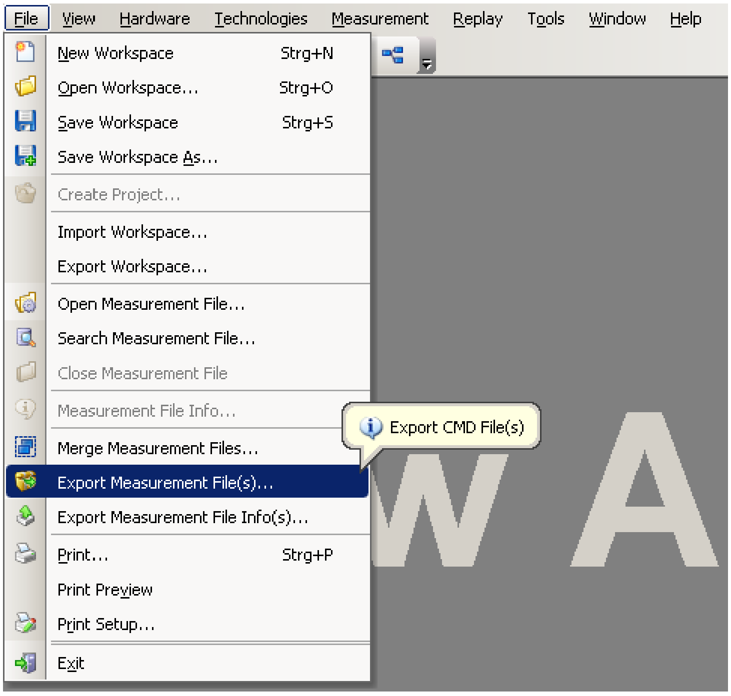


Fig. 7-1 Export Measurement File(s)...

The Export Measurement File command opens the *Export measurement data* dialog. With this dialog, an arbitrary measurement file can be converted and stored to a file in a *target directory* and with one of the *export formats* offered.

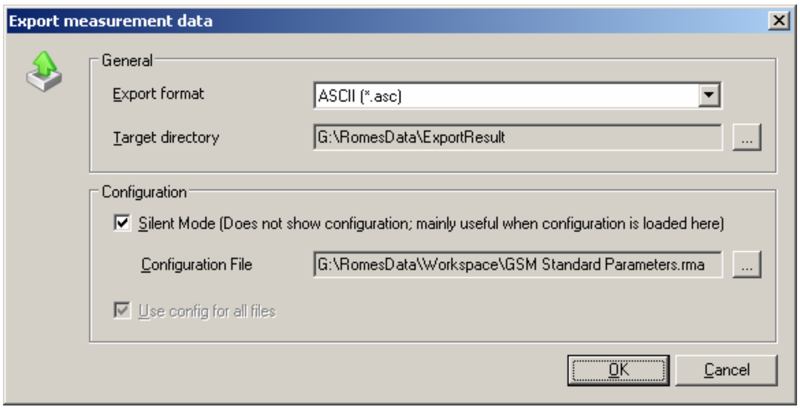
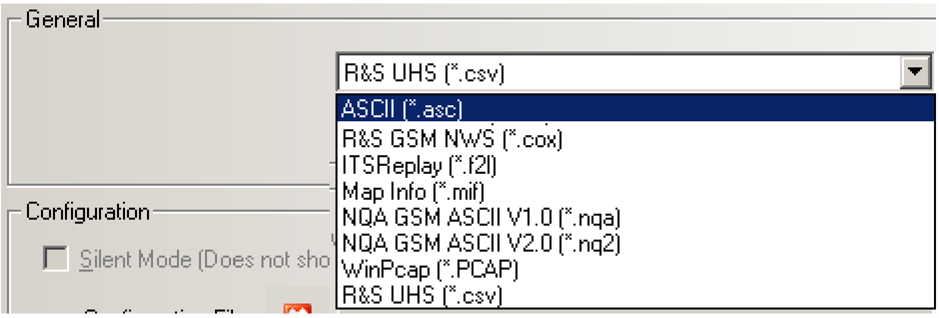


Fig. 7-2 Export measurement data

Export format

The *Export format* pull-down list offers the file formats for the target files. Which formats are available depends on your system options:



ASCII (.asc)*

ASCII tables, e.g. for import into an MS Excel chart; see User-defined ASCII format (*.asc) on p. 7.6 f.

R&S GSM NWS (.cox)*

For GSM Network Scan data acquired with the R&S TSMU. The format is identical with the *.cox format for C0 scan export files, see GSM NWS Export (*.cox) on p.7.16. Note that an empty GSM network data base (*.ndb) must be loaded before scan data is exported to a *.cox file. It is recommended to monitor the export messages in the *Message View* while a data export is in progress.

ITSReplay (.f2l)*

XML-based interchange format for replay on R&S CRTU devices; see ITSReplay format (*.f2l) on p. 7.13 f.

Map Info (.mif)*

MapInfo Interchange Format for evaluation in MapInfo; see MapInfo Interchange Format (*.mif) on p. 7.22 f.

NQA ASCII V1.0 (.nqa)*

Network Quality Analysis ASCII; see NQA ASCII format (*.nqa) on p. 7.25 f.

NQA ASCII V2.0 (.nq2)*

Network Quality Analysis ASCII; recommended format for MS Excel 8.0 and higher; see NQA ASCII format (*.nqa) on p. 7.25 f.

WinPcap (.pcap)*

A PCap file can be loaded in a libcap based program of your choice and processed further. For more details see PCap format (*.pcap) on p. 7.25.

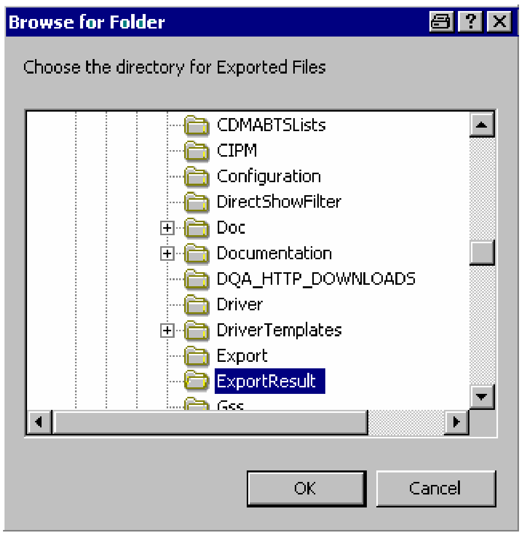
R&S UHS (.cvs)*

For UMTS PN Scan data acquired with the R&S TSMU and TSMQ in Ultra High Speed mode. The export format is the textual based CVS file format; see UHS CVS format (*.cvs) on p. 7.26.

These formats are explained in the following sections.

Target directory

The *Target directory* field shows the current target directory for the export file. The directory can be changed via the browse (...) button on the right side. A *Browse for Folder* dialog is opened:



Directory tree

Overview of all available directories. A selected directory is high-lighted and represented by a changed icon.

OK

Close the *Change directory* dialog using the selected directory as the export target directory.

Cancel

Close the Change directory dialog discarding any changes.

Silent Mode

This prevents the export from displaying messages and configuration questions during the export. If enabled, then a configuration file should be specified to assure a proper configuration of the export. Some modules do not require spe-cial configuration (e.g. NQA Export, PCap Export). It is not necessary to specify a configuration file in such a case.

Configuration File

If the specified configuration file is not compatible with the selected export type a small white cross on red sub font will be displayed. A tool tip is explaining the mismatching.

Use config for all files

If *Use configuration for all files* is enabled, the configuration dialog is only shown for the first file to be exported and the configuration is then reused for subsequent exports of other files. If silent is enabled, this is implicitly set.

OK

Export a measurement file with the format and target directory selected. The *OK* button opens a standard *Open* file dialog (see *Open Workspace* command in chapter 3) where the measurement file(s) to be exported is (are) selected, followed by the *Export Configuration* menu for the selected file format. The configuration menus depend on the export format; they are described in the following sections (p. 7.6).

Several CMD files can be selected simultaneously (use the *Shift* or *Ctrl* key) and exported to several target files. If a CMD file is already open (e.g. because an *Open CMD File* command was executed before starting the file export), the open file is selected by default. Otherwise, an arbitrary CMD file can be selected in the *File Open* dialog.

The names of the export files are assigned automatically; the extension of the exported *.cmd file is simply replaced by the selected export format. It is possible to modify the default export file names using a *File Pre/Suffix*; see description of the *Export Configuration* menu. The *Export Info* window logs the file creation process:

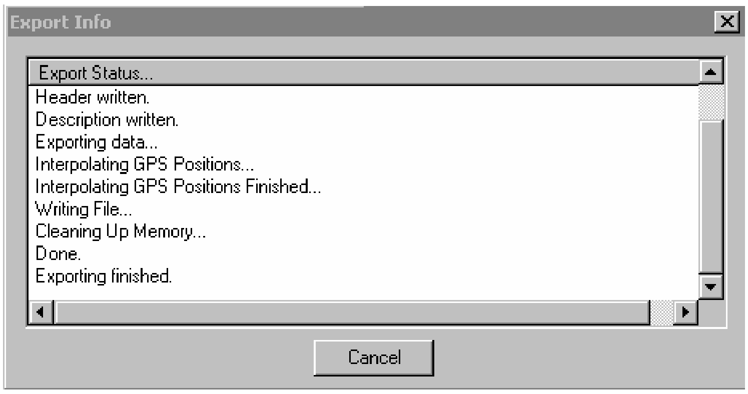


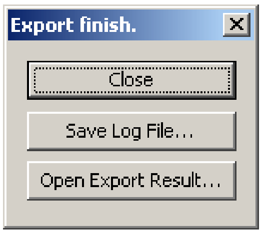
Fig. 7-3 Export Info

Cancel

Cancel the file export and close all corresponding dialogs.

Export Info

After successful termination of the file export, or after its interruption by means of the *Cancel* button, the following message box is displayed:



Close

Terminates the file export without saving the logging information to a file or opening the result.

Save Log File…

Saves the logging information shown in the *Export Info* window in a text (*.TXT) file to be specified in a *File Open* dialog and terminates the file export.

Open Export Result…

Open the generated export file using the standard application for the export file type. If no standard application is defined for the export file type, use MS Windows Explorer to assign an appropriate application (e.g. Notepad, MS Excel,…). To assign an application, open the context menu for the file and select *Properties – General – Opens with... – Change*.

Export Configuration Menus

Every export format is assigned its own *Export configuration* menu which is opened automatically during the file export, see previous section. In contrast to other configuration menus (e.g. for views), the *Export configuration* menus can not be accessed unless a file is being exported. Therefore, switchover between the menus for different export formats is not possible. However, all selections and settings made in a particular *Export configuration* menu are saved and can be re-used.

User-defined ASCII format (*.asc)

With the *.asc format, a user-defined ASCII measurement data table, useful e.g. to import the data into an MS Excel chart can be created. The file starts with a header, containing all useful information about the tour, see example file at the end of this section. The *ASCII Export* configuration dialog contains three tabs:

Values Tab

The *Configuration - Values* tab offers a list of all parameters in the selected measurement file (*.rscmd or *.cmd).

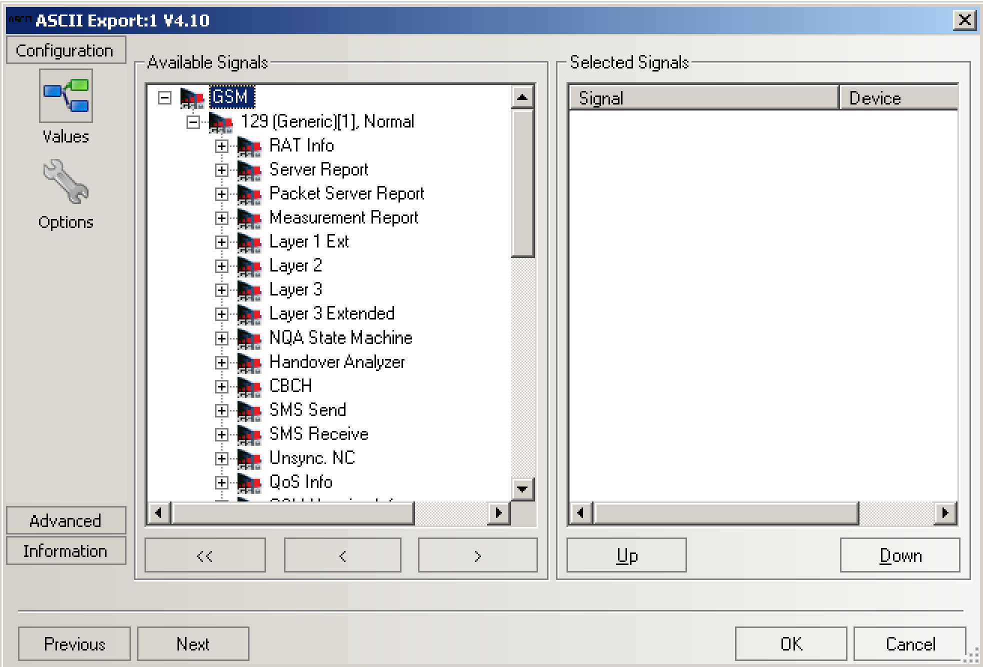


Fig. 7-4 ASCII Export configuration: Values

Available Signals Data tree (see chapter 1) showing all available signal parameters (hierarchy level 4 of the data tree).

Selected Signals List of all signal parameters selected for display.

The order of the list can be changed using the two buttons below. Each selected signal forms a column in the ASCII file; the order of columns is equal to the order of signals in the *Selected Signals* list.

Option Tab

In the *Configuration - Option* tab, the data selection can be refined by imposing additional selection criteria to the exported signal values. This is suitable (or even inevitable) to handle large amounts of data.

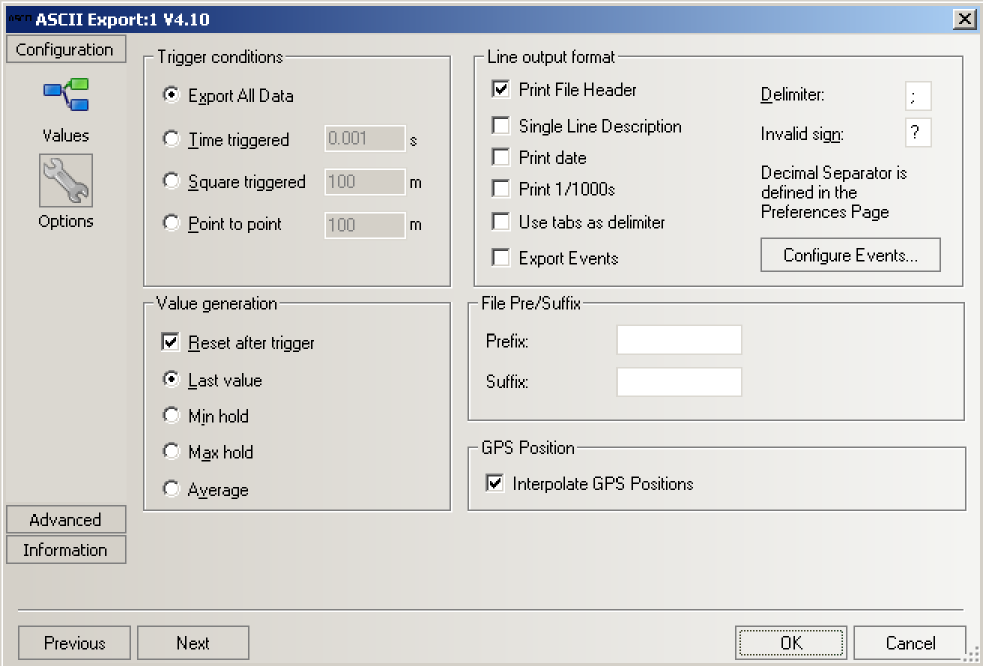


Fig. 7-5 ASCII Export configuration: Options

Trigger conditions

The *Trigger conditions* panel defines a parameter interval in which exactly one value per output signal is written to the target export file.

Export All Data

No reduction of the original data; the unchanged values are exported.

Time triggered

A time interval between 0.001 s and 60 s is specified.

Square triggered

A square surface with a side length between 1 m and 10000 m is specified
The Square Trigger period is not distance-related but depends on the actual position in a field of squares. A value is generated whenever a square is left. As a consequence, the last square does not contribute to the export file.
The amount of data collected used for export value generation and the time between two trigger events may differ extremely from one square to another: In the B square of the figure below,*Fig*, very much time is spent and a lot of data may be collected, but in C, D and E this is obviously different. The number of data points actually measured in a square does not have any influence on the length of the export file.

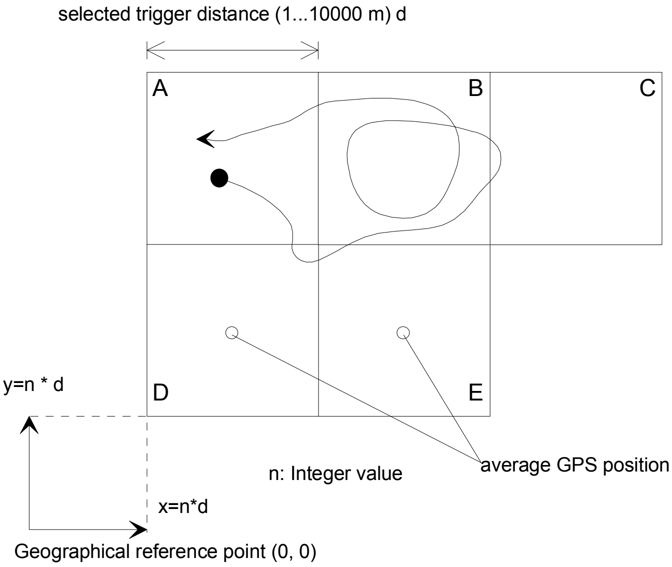


Fig. 7-6 Square Trigger condition

If large squares are defined, it is not recommended to use the time stamp in combination with the average GPS position to determine the vehicle speed, as this will lead to a high error rate.

Point to point

A driven distance between 10 m and 1000 m is specified.

Value generation

The *Value generation* panel defines how the value exported in a trigger period is calculated.

Reset after trigger

If the box is checked the buffer is cleared after each trigger period. If not, the export values (i.e. the last value, minimum, maximum, or average, whichever is selected) in each trigger period is stored in the buffer. If only invalid values are detected in one trigger period, the buffer value (i.e. the value of the previous trigger period) is exported.

Last value

If only invalid values are detected in one trigger period, the last valid value is exported

Min hold

The minimum value within one trigger period is exported

Max hold

The maximum value within one trigger period is exported

Average

The average value within one trigger period is exported.

GPS Position

If *Interpolate GPS Positions* is checked, R&S ROMES calculates the position of each measurement record by linear interpolation of the closest position data provided by the GPS receiver. Otherwise, a position remains valid until a new GPS result is available.

GPS position data are updated about once per second. Interpolating the positions is suitable, especially if the measurement rate of the other test devices is much larger than 1/s (e.g. CW receivers), or at high speed of the test vehicle.

Line output format

The *Line output format* panel defines the format of an ASCII table line:

Print File Header
If the box is checked, the file header information is included in the target file. The file header comprises the information retrieved with the *File – Measurement File Info…* command (see chapter 3).

Single Line Description
If the box is checked, the description of all parameters is written into a single line, the entries are separated by the *Delimiter* that is used for the data. This option is suitable for an import of the target file into MS Excel, where each parameter description forms a table heading.

If the box is unchecked, each parameter description is written into a separate line.

Print date
If the box is checked, the date will be added to the beginning of every data line.

Print 1/100 s
The 1/100 s data will be added to every data line start.

Use tabs as delimiter
Two signals in the export file are separated by tabs; the *Delimiter* field below is disabled.

Export Events
Events included in the measurement file is included in the export file.

Delimiter
This character separates the values of two signals in the export file. The *Delimiter* field is disabled if the *Use tabs as delimiter* option is checked.

Invalid sign
The invalid sign shows that no valid value was detected.

Decimal Separator
This character should be different from the *Delimiter* to avoid conflicts when post-processing the exported data.

Configure Events
Opens the *Available Events* tab of the *Preferences* menu; see chapter 3, *Tools – Preferences – Available Events*.

File Pre/Suffix Defines two text strings which can be used to modify the file names and distinguish several exported files. The prefix is inserted at the beginning of the file name, the suffix at the end:

<file name>.asc <prefix><file name><suffix>.asc

Export Configuration Management Tab

Once the configuration dialog is shown for an export, it is possible to load and save the current configuration to or from a file. Export modules supporting that feature have this *Export Configuration Management* tab in their configuration setup dialog.

The dialog contains a list of files found in the default directory for export configuration (i.e. the workspace directory). Selecting an entry in the list defines the default value for the “Load” and “Save” dialogs shown when pressing the related buttons.

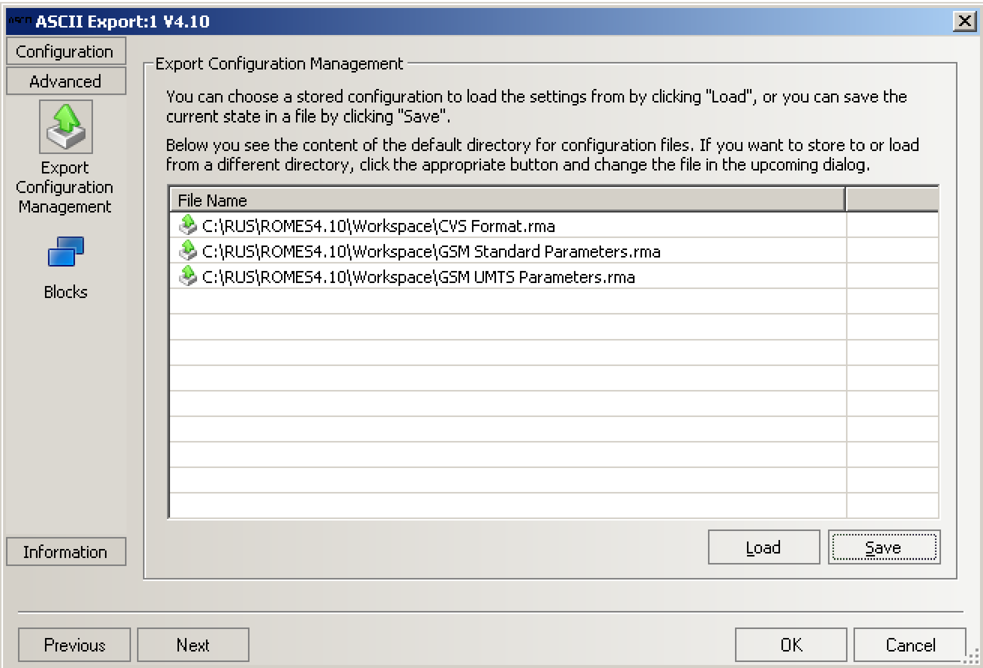


Fig. 7-7 ASCII Export configuration: Export Configuration Management

Blocks Tab

The *Blocks* tab shows a list of all blocks and a list of all bookmarks in the measurement file and selects the blocks or bookmarks to be exported. Measurement files recorded with R&S ROMES V3.22 and higher can be divided into several blocks; see description of *Replay Jump to Next Block* command in chapter 3. The *Blocks* tabs are analogous for all export formats and will be omitted in the following.

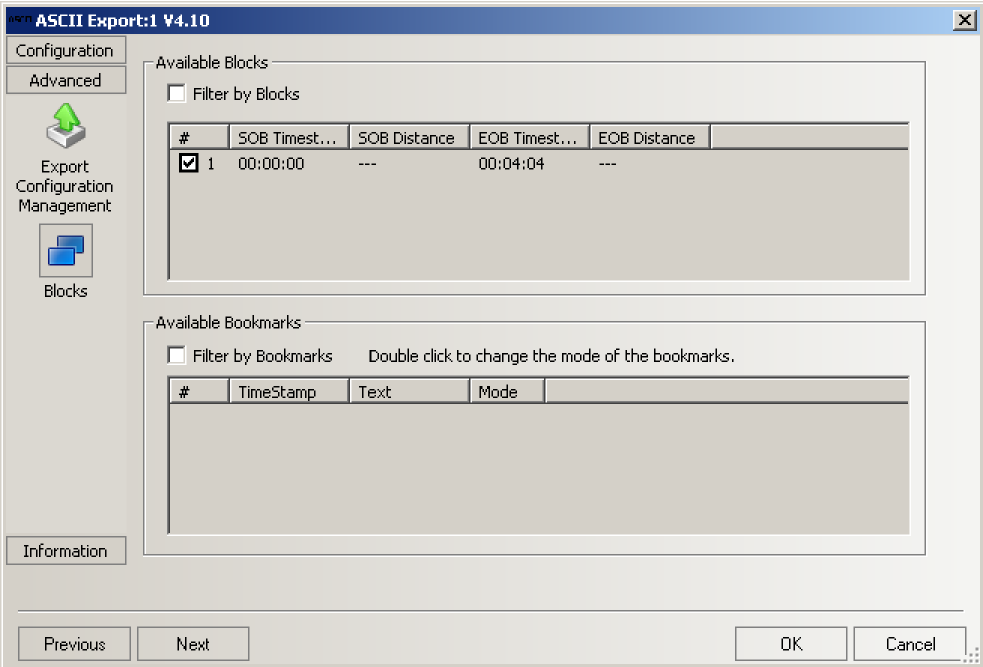


Fig. 7-8 ASCII Export configuration: Blocks

Info Tab

The *Info* tab shows information on the current ASCII export software module. The *Info* tabs are analogous for all export formats and will be omitted in the following.

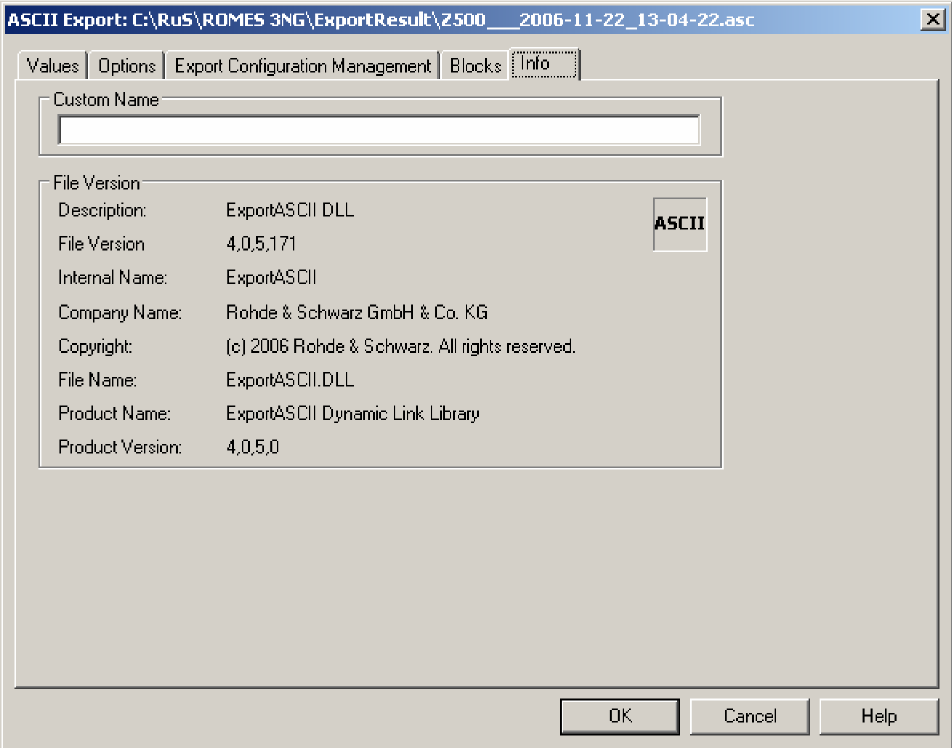


Fig. 7-9 ASCII Export configuration: Info

Example File

Example for an ASCII export file: (OT290, 1 GSM/GPRS Mobile)

```
[Measurement Info, Ver. 4.00 Rev. 1 SP 4]
Time Zone: Westeuropäische Normalzeit
Start Of Measurement:Monday, 11.02.2008, 20:14:36.99

Comment: Test with AMR

Username:John Doe
Vehicle Name: Test Car
Vehicle ID:M-RS 123
Num of Blocks: 1
Duration:00:02:52 (HH:MM:SS)

=================================================================

Drivers:
- Test Tool OT290[1]
- NMEA Device[1]

=================================================================

[Test Tool OT290 [1], Ver 4.00]
Type:  Sagem GPRS (Firmware JY3,Bj 315)
```

```
ROMES Locking Info:
GSM Band Lock: Off
GSM Channel Lock: No

GSM Net: GSM900/DCS1800
Meas. Mode: Normal
IMEI:  08202501
Subscriber Number:
Auto Dial Timing:
 Supported RAT: Any RAT
 Call Window: 60 sec
 Call Duration: 30 sec
 Max. Access Time:15 sec
Call Window Offset:0 sec
Type of Call: Voice Call
NQA Rx Source: Full
Number: 2000
RxLev Calibration:No
Antenna name:  Default_Antenna
Cable loss [dB]:  0.00
Antenna gain [dBi]: 0.00
Cellbar Flag:  Normal
CBCH:  not decoded
GPRS Mobile: Yes
Forcing Settings:
 Multi Slot Class:No Forcing
 Coding Scheme: No Forcing
 GPRS Auto Attach:No Forcing
 MS Class: No Forcing
 GSM Power Class: No Forcing
 DCS Power Class: No Forcing
 EFR:  Off
GSM/GPRS QoS Actions Evaluation
 1. GSM Handover:
  Timeout: 10000 ms
 2. Location Area Update:
  Timeout: 10000 ms
 3. GPRS Attach:
  Timeout: 10000 ms
 4. GPRS Detach:
  Timeout: 10000 ms
 5. Activate PDP Context:
  Timeout: 10000 ms
 6. Deactivate PDP Context :
  Timeout: 10000 ms
 7. Routing Area Update:
  Timeout: 10000 ms


Handover Analyzer
 Enabled: No


Port Settings
1. Port:
    Type: Trace
    Name: COM1

=================================================================


[GPS Ver 4.00]
Type: NMEA Device
```

```
Ellipsoid: WGS84
Nav.Proc.Version: not available
Sig.Proc.Version: not available
Driven area: 48.128276 (Lat. up left)
 11.613015 (Long. up left)
 48.126521 (Lat. bottom right)
 11.614277 (Long. bottom right)

=================================================================

[EXPORT OPTIONS]
Exported by version: 4,0,5,163
Trigger type: All Data is Exported
Delimiter: ;
Invalid Sign: ?
Created during multiple file export: no
Parameter selection: individual

[DESCRIPTION]
Timestamp [hh:mm:ss]
GPS\Position\Longitude [°] : [1]
GPS\Position\Latitude [°] : [1]
GSM\Server Report\MCC : [1]
GSM\Server Report\MNC : [1]
GSM\Server Report\LAC : [1]
GSM\Measurement Report\BCCH [ChanNr] : [1]
GSM\Server Report\CI : [1]
GSM\Measurement Report\BSIC : [1]
GSM\Measurement Report\RxLev Full [dBm] : [1]
GSM\Measurement Report\RxQual Full : [1]

[DATA]
20:16:01;11.613307;48.126941;262;1;34567;23;5717;32;-79;0
20:16:02;11.613119;48.126671;262;1;34567;23;5717;32;-79;0
20:16:03;11.613077;48.126606;262;1;34567;23;5717;32;-82;0
20:16:03;11.613058;48.126580;262;1;34567;23;5717;32;-82;0
```

GSM NWS Export (*.cox)

The *.cox file is an ASCII file which can be opened and evaluated with standard tools, e.g. with MS Excel. The entries are separated by semicolons:

Scan;	T1970[Sec	Latitude[[	Longitude	ARFCN;	Pow[dBm	NCC;	BCC;	CI;	LAC;	MNC;	MCC;	ST3_Source
1;	105844483	48.763000	11.234000	11;	-106.2;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	12;	-103.8;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	13;	-112.3;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	14;	-107.8;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	16;	-109.6;	;	;	;	;	;	;	-
1;	105844483	48.763000	11.234000	15;	-100.1;	7;	1;	279;	31568;	1;	262;	T-Scan
1;	105844483	48.763000	11.234000	15;	-100.7;	7;	1;	279;	31568;	1;	262;	T-Scan

Each row in the C0 scan export file corresponds to a scanned C0 signal on a specific GSM channel (ARFCN). The rows contain the following information:

Scan Sequence number for the C0 scan, comprising a sequence of channels selected in the driver menu.

T1970 [Sec] Time of the channel measurement in s since 1970.

Latitude [deg], Longitude [deg] Geographic coordinates of the measurement position.

ARFCN, Pow [dBm], Pow [dBm] Absolute Radio Frequency Channel Number (see tables in chapter 8) of the GSM channel and measured power of the C0 carrier. In the driver menu, channels below a specified power threshold can be excluded from the measurement.

NCC, BCC Network Color Code and BTS Color Code demodulated from the signal. If the code numbers are not available, the system was not able to identify the signal: The measured power is the total channel power and therefore an upper limit for the actual C0 carrier power.

CI, LAC, MNC, MCC Cell Identity, Location Area Code, Mobile Network Code and Mobile Country Code. These code number are part of the System Information Type 3; they are either demodulated from the C0 signal (with option *R&S GSM Demodulator)* or determined by comparing the power, BCC and timing of the measured signal with the entries in the BTS data base (see description of the *Measurement Process* in chapter 1). The source of the data is indicated in the last column *(ST3_Source)* of the table.

ST3_Source Source of the parameters that are part of the System Information Type 3 (CI, LAC, MNC, MCC); see above:

T-Scan
: Parameters demodulated during the scan, with option *R&S GSM Demodulator*

NDB
: Parameters obtained from a comparison with the data in the network data base

–
: Parameters not available

COX Export Options Tab

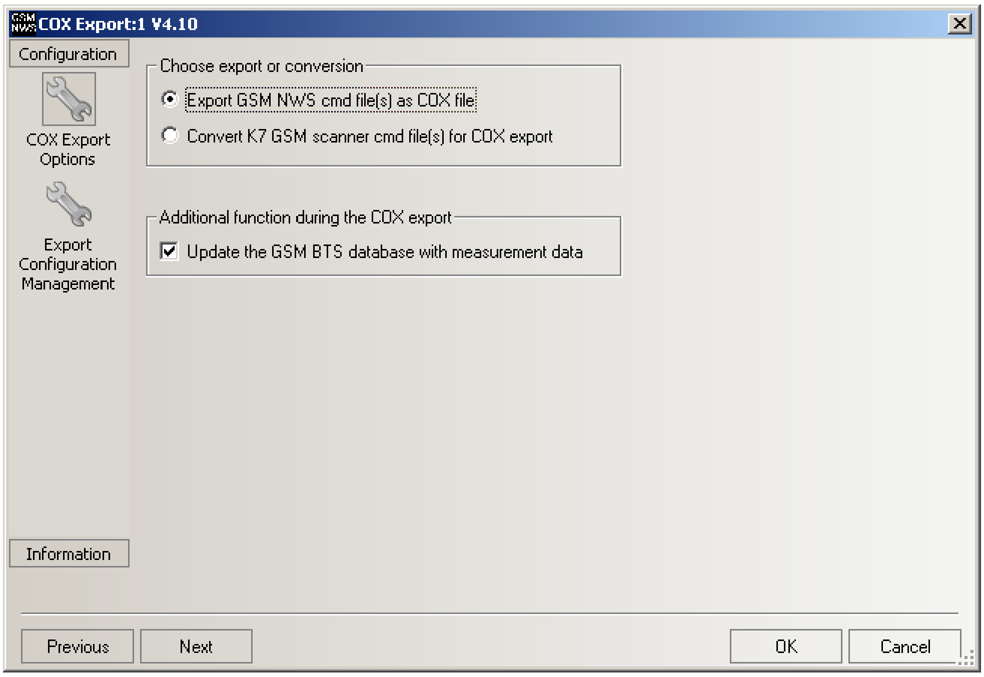


Fig. 7-10 GSM NWS Export: COX Export Option

Choose export or conversion	*Export GSM NWS cmd file(s) as COX file*	Default setting for the export.
	Convert K7 GSM scanner cmd file(s) for COX export	Used for GSM Transmitter Scan Measurements made by K6 and K7. These measurements were able to do the COX export only directly after the measurement. Should be the export subsequently carried out, the file can be converted with setting *Convert K7…*, and afterwards exported as a GSM NWS - Measurement.
Additional function during the COX export	*Update the GSM BTS database with measurement data*	For these exports a GSM data base is necessary - usually a newly created (see Export format on page 7.3). With the option *Update GSM BTS…*, the database will be filled with the GSM network scanner found BTS.

Export Configuration Management Tab

Once the configuration dialog is shown for an export, it is possible to load and save the current configuration to or from a file. Export modules supporting that feature have this *Export Configuration Management* tab in their configuration setup dialog.

The dialog contains a list of files found in the default directory for export configuration (i.e. the workspace directory). Selecting an entry in the list defines the default value for the “Load” and “Save” dialogs shown when pressing the related buttons.

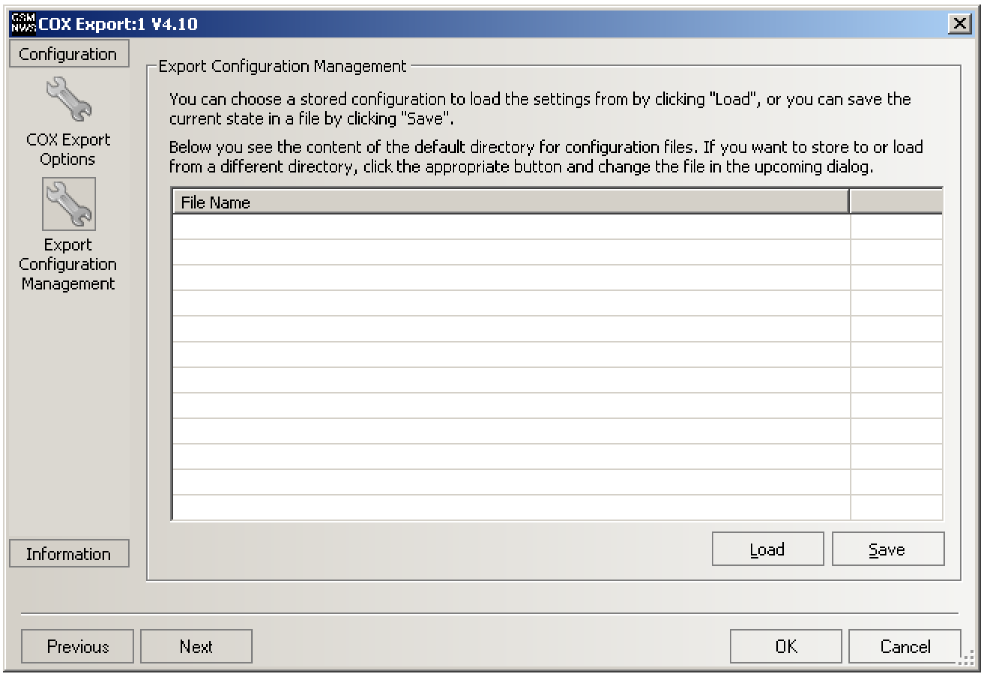


Fig. 7-11 GSM NWS Export: Export Configuration Management

Info Tab

The *Information - Info* tab shows information on the current ASCII export software module. The *Info* tabs are analogous for all export formats and will be omitted in the following.

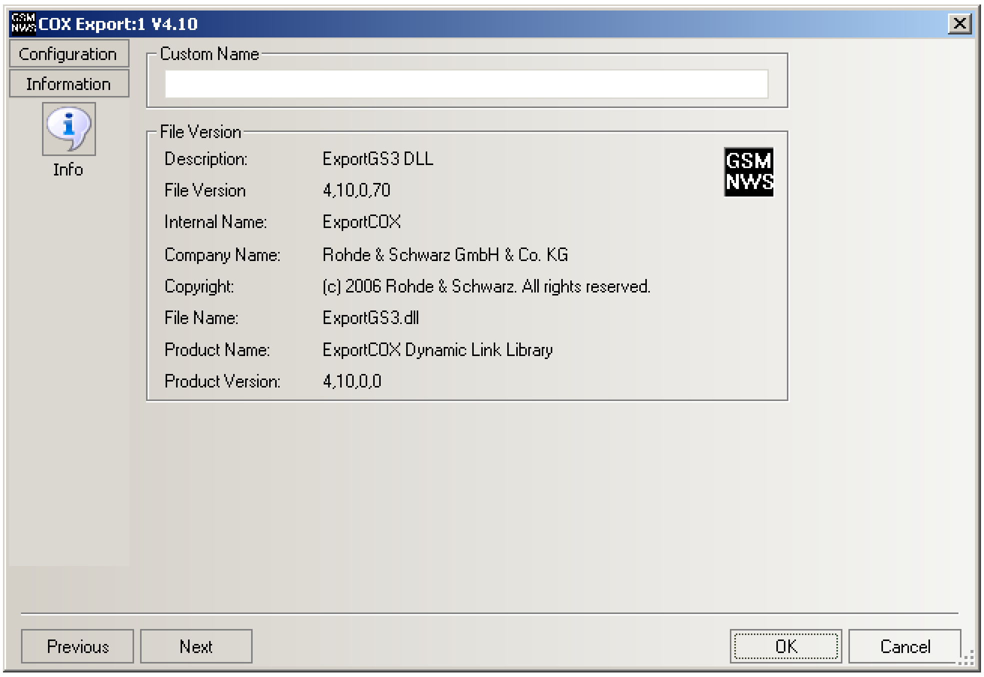


Fig. 7-12 GSM NWS Export: Info

ITSReplay format (*.f2l)

F2L is a particular XML-based file format that stores a recorded measurement field scenario to be replayed and modified on different members of the R&S CRTU family. The *ITS Replay* configuration dialog contains three tabs. The *Blocks* and *Info* tabs are analogous to the *ASCII Export* tabs; see p. 7.12 ff.

The *ITS Replay* tab of offers several options to control the export of the selected measurement file (*.rscmd or *.cmd):

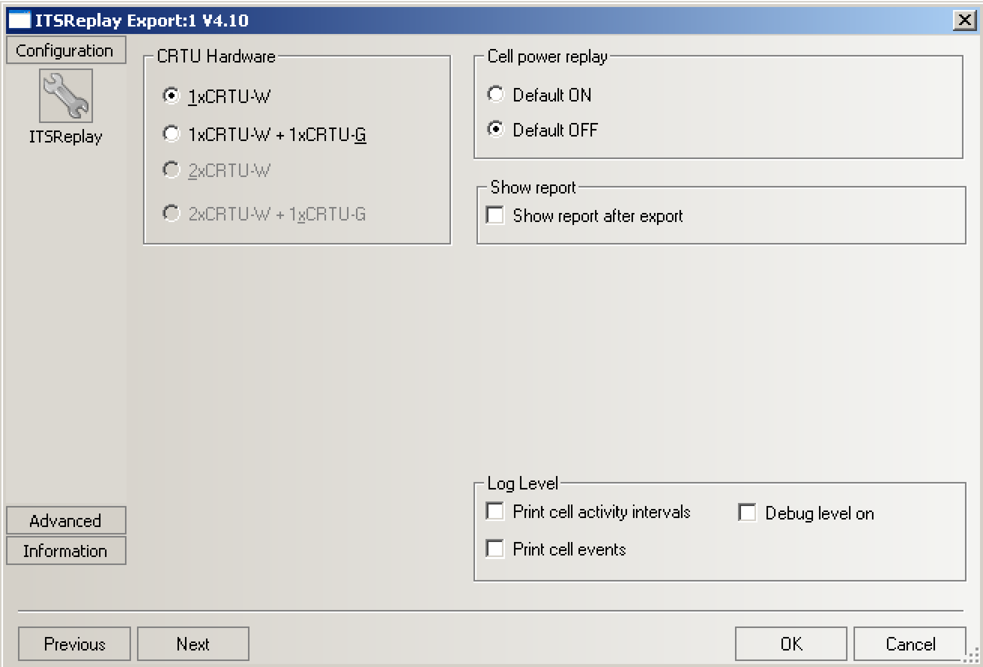


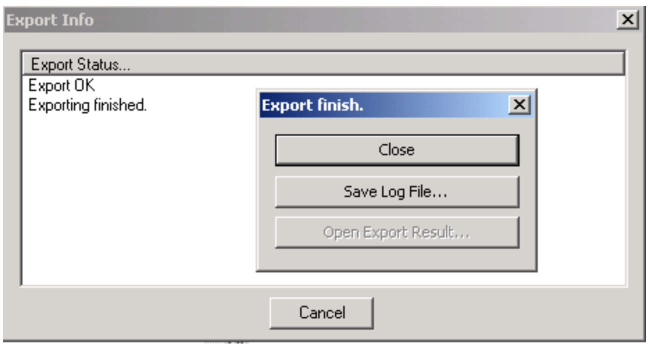
Fig. 7-13 F2L Export configuration: ITS Replay

CRTU Hardware These radio buttons set the type of CRTU to be used for the replay of the exported *.f2l file. Currently only one CRTU-W is supported.

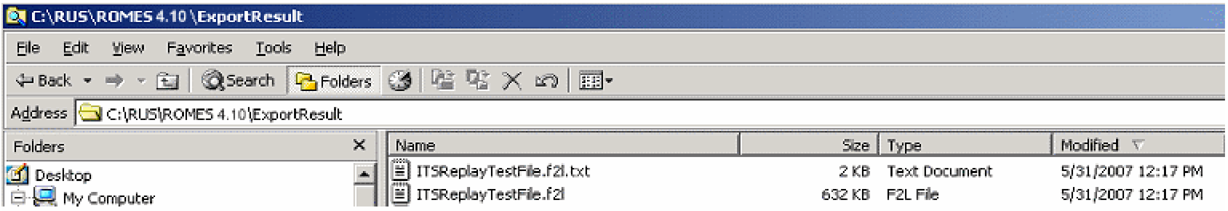
Cell power replay The replay of the measured cell power can be toggled between *Default ON* and *Default OFF*. The CRTU holds the intelligence for computing the power during replay, depending on whether or not cell power replay is desired.

Log level Different log levels can be set for the optional export log file.

When the desired blocks and measurement file bookmarks have been selected, the export is triggered by clicking OK. The progress of the export is shown in an *Export Info* pop-up window:



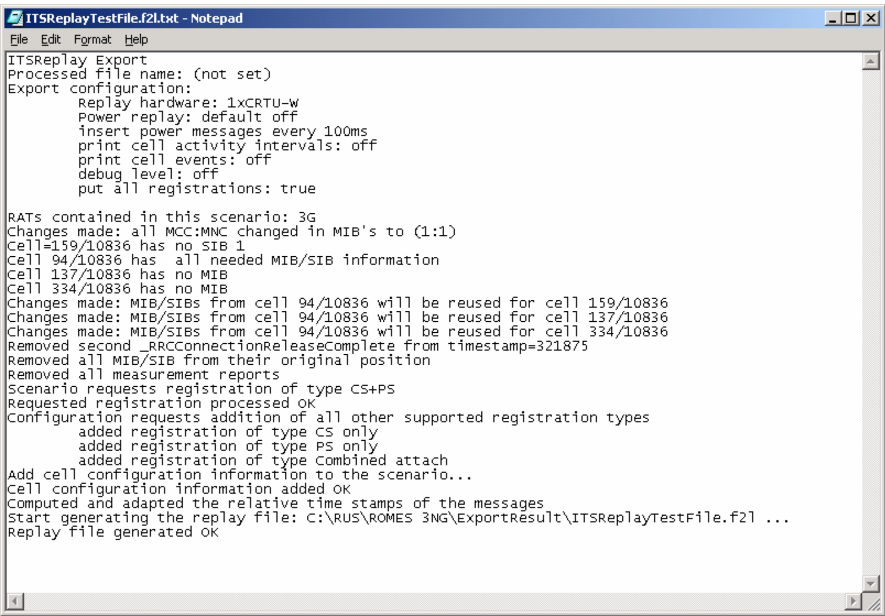
When the export is finished, a dialog prompts to save the log file, which is stored by default in the \ExportResult\ subdirectory of ROMES. The name of the export log file is the same as the name of the *.f2l file, amended by a *.txt file extension (*.f2l.txt):



The export file itself contains the measurement data in a structured XML format, e.g.


```
<INDEX>
 <GuiInfo>
  <CatGroupTag VALUE="1"/>
  <ExecuteGroupTag VALUE="1"/>
  <Remark VALUE="" TYPE="C"/>
  <DisplayMessageString VALUE="DL_CRRCCellStart_Req" TYPE="C"/>
  <BreakpointControl VALUE="0"/>
  <UL_Timestamp VALUE="0"/>
 </GuiInfo>
 <ReplayMessage>
  <MddbClassName VALUE="_UmtsCrrcAsp" TYPE="C"/>
  <MddbClassId VALUE="0"/>
  <F2LBitLength VALUE="328"/>
  <F2LData VALUE="44CDC861000001DC0000008600000F0000118470000001280000001100000000000000000000000000" TYPE="B"/>
  <RAN VALUE="1"/>
  <ReplayMessageNumber VALUE="20"/>
  <F2LCommand VALUE="DL" TYPE="C"/>
  <MessageFlow VALUE="0"/>
  <Timestamp VALUE="0"/>
  <CnDomain VALUE="0"/>
  <MmiEmmiString VALUE="" TYPE="C"/>
  <ExtraStringParam VALUE="" TYPE="C"/>
  <CellId VALUE="0"/>
  <UeId VALUE="0"/>
  <RbIdChComb VALUE="0"/>
 </ReplayMessage>
</INDEX>
```


If it was saved, the export log file can be viewed with any text editor for evaluation purposes.




```
ITSReplay Export
Processed file name: (not set)
Export configuration:
        Replay hardware: 1xCRTU-W
        Power replay: default off
        insert power messages every 100ms
        print cell activity intervals: off
        print cell events: off
        debug level: off
        put all registrations: true

RATs contained in this scenario: 3G
Changes made: all MCC:MNC changed in MIB's to (1:1)
Cell=159/10836 has no SIB 1
Cell 94/10836 has  all needed MIB/SIB information
Cell 137/10836 has no MIB
Cell 334/10836 has no MIB
Changes made: MIB/SIBs from cell 94/10836 will be reused for cell 159/10836
Changes made: MIB/SIBs from cell 94/10836 will be reused for cell 137/10836
Changes made: MIB/SIBs from cell 94/10836 will be reused for cell 334/10836
Removed second _RRCConnectionReleaseComplete from timestamp=321875
Removed all MIB/SIB from their original position
Removed all measurement reports
Scenario requests registration of type CS+PS
Requested registration processed OK
Configuration requests addition of all other supported registration types
        added registration of type CS only
        added registration of type PS only
        added registration of type Combined attach
Add cell configuration information to the scenario...
Cell configuration information added OK
Computed and adapted the relative time stamps of the messages
Start generating the replay file: C:\RUS\ROMES 3NG\ExportResult\ITSReplayTestFile.f2l ...
Replay file generated OK
```

Fig. 7-14 ITSReplay Export Log File - Example

MapInfo Interchange Format (*.mif)

MIF is a particular ASCII file format that stores graphical information to be displayed in a MapInfo table. The *MIF Export* configuration dialog contains five tabs. The *Export Configuration Management*, *Blocks* and *Info* tabs are analogous to the *ASCII Export* tabs; see p. 7.12 ff.

The *Values* tab of offers a list of all parameters in the selected measurement file (*.rscmd or *.cmd).

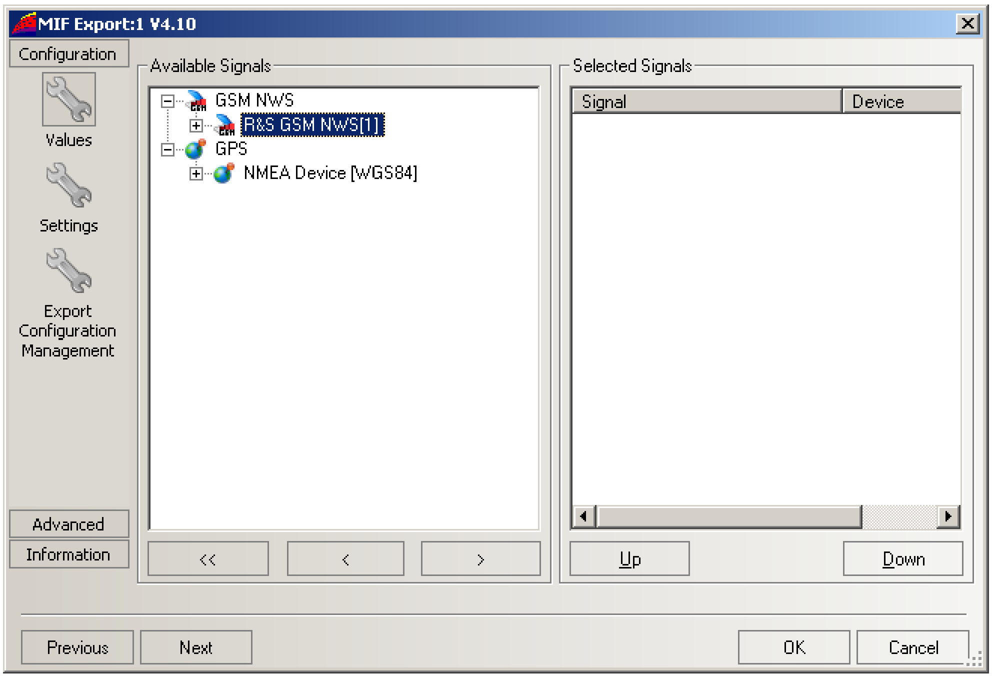
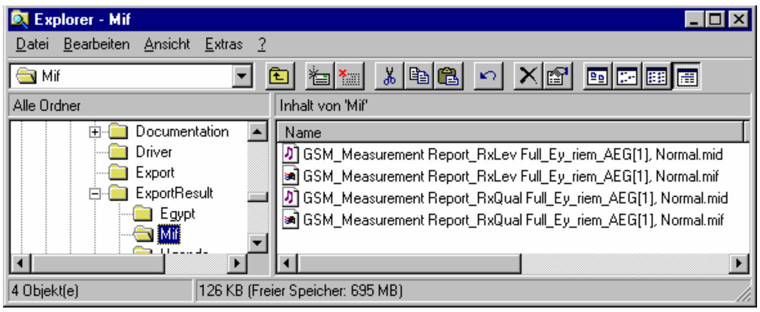


Fig. 7-15 MIF Export configuration: Values

Available Signals Data tree (see chapter 1) showing all available signal parameters (hierarchy level 4 of the data tree).

Selected Signals List of all signal parameters selected for display.

The order of the list can be changed using the two buttons below. For each selected signal, a separate *.mif plus a *.MID file is generated.



The *.mif file contains a file header followed by the geographic coordinates of each exported data point and the code for the symbols to be used for display in MapInfo; see description of *Settings* tab below. This file can be imported into MapInfo as described in section *Importing *.mif files to MapInfo* on p. 7.1.

The *.MID file contains two columns for the exported signal values and a general signal, e.g. the time stamp associated to each signal value.

The *Settings* tab selects the symbols to display the data in MapInfo and the data to be exported to the *.mif file.

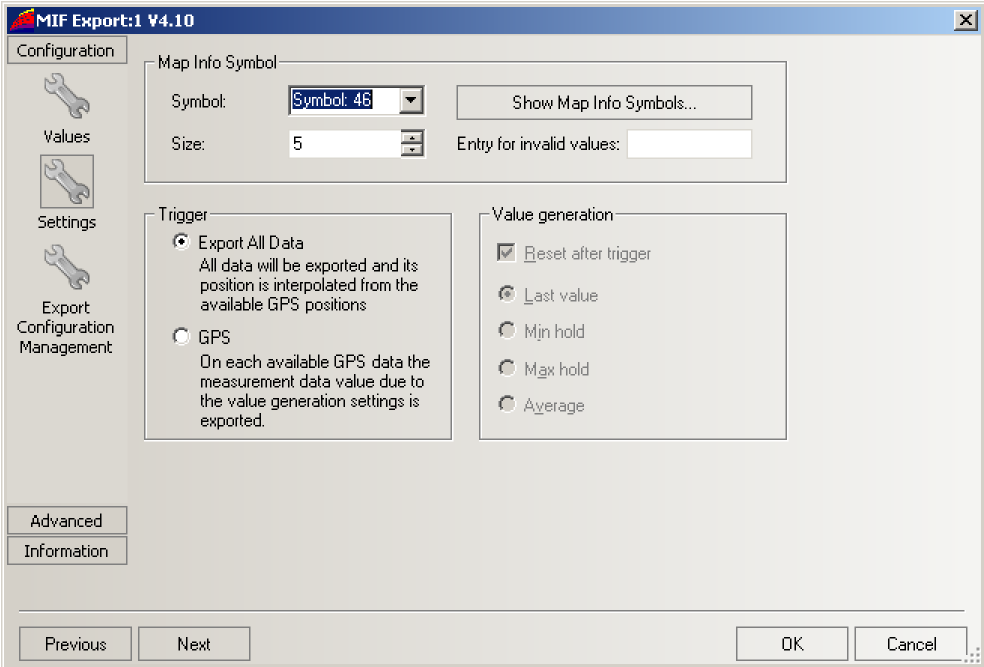
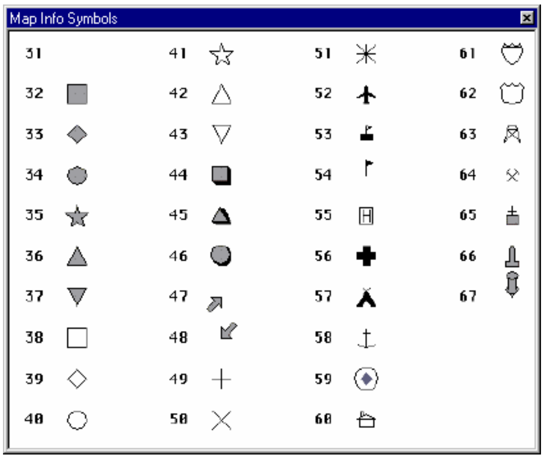


Fig. 7-16 MIF Export configuration: Settings

MapInfo Symbol Selects the symbol to display the data in a MapInfo view and the symbol size. The symbols can be defined with their code number *(Symbol)* and *Size* or selected from a list that is opened on clicking the *Show Map Info Symbols...* buttons.



Trigger

Defines which values in the selected signals are exported and how the geographical coordinates assigned to the exported values are calculated. The following alternative options are provided:

Export All Data
Export all values of the selected signals to the *.mif file. Use an appropriate interpolation method to determine the position of each value from the GPS data available in the measurement file.

GPS
Export one signal value for each GPS position stored in the measurement file using the *Value Generation* settings; see below.

Value generation

Defines how the signal value assigned to a definite GPS position is calculated. The panel is active only if the *GPS* trigger condition is set. One trigger period corresponds to the time between two consecutive GPS positions.

Reset after trigger
If the box is checked the buffer is cleared after each trigger period. If not, the export values (i.e. the last value, minimum, maximum, or average, whichever is selected) in each trigger period is stored in the buffer. If only invalid values are detected in one trigger period, the buffer value (i.e. the value of the previous trigger period) is exported.

Last value
If only invalid values are detected in one trigger period, the last valid value is exported

Min hold
The minimum value within one trigger period is exported

Max hold
The maximum value within one trigger period is exported

Average
The average value within one trigger period is exported. This option is not applied to parameters where averaging does not make sense, e.g. channel numbers or station codes.

Importing *.mif files to MapInfo

The .MIF file can be imported to MapInfo and converted to a MapInfo table file (*.TAB) to be viewed in a MapInfo table. This involves several steps:

1. Open MapInfo and select the *Import* command in the *Table* menu.
2. In the *Import File* dialog opened, select the file type *MIF and the *.mif file to be imported and press *Open* to start the file import.
3. In the *Import into Table* dialog opened, select a name and directory for the *TAB file to be created and press *Save*.

By default, the *TAB file is stored in the same directory and uses the same file name as the *MIF file.

4. In the *File* menu, select *Open Table* to display an *Open Table* dialog and select the created *TAB file.
5. To display all data points stored in the *.mif file, use the *View Entire Layer* command in the *Map* menu.

For more information refer to the MapInfo help.

NQA ASCII format (*.nqa)

The NQA (**N**etwork **Q**uality **A**nalysis) ASCII format is used with the *TS9954 NQA* evaluation software. This software offers an extended analysis of GSM data allowing, e.g., to combine the NQA view with the complete MS Excel functionality. For detailed information see section *Evaluation of GSM NQA Data with TS9954* NQA on p. 7.45 ff. The following program and file format versions are available:

NQA format version	TS9954 NQA version	MS Excel version
V1.0 (*.nqa)	V2.10	V5.0 or higher
	V3.00, V3.01	V8.0 or higher
V2.0 (*.nq2, recommended format)	V3.00, V3.01	V8.0 or higher

To generate and evaluate NQA data a GSM or multi mode mobile must be used, i.e. UMTS/GSM mobile in GSM mode. Both *NQA* and *Autodialing* must be enabled in the corresponding hardware driver configuration menus (see chapter 6). If the selected measurement file contains no NQA data, an error message will appear when you try to use the *.nqa export format.

PCap format (*.pcap)

Raw packet data recorded via IPTracer module und stored in a measurement (*.rscmd) can be exported into the PCap file format. These file format is used by any libpcap based program, e.g. Wireshark (Ethereal) or tcpdump.

The *PCap Export* configuration dialog contains two tabs: The *Blocks* and *Information* tabs are analogous to the *ASCII Export* tabs; see p. 7.12 ff.

UHS CVS format (*.cvs)

For the Ultra High Speed (UHS) export the textual based *.cvs format is used. The CVS file can be opened and evaluated with standard tools, e.g. with MS Excel. The file starts with a header section, containing all useful information about the source file. After it the data section follows with data of the scan and geographic position. The entries are separated by semicolons:

Time;Lat;Long;Mode;...

Time	Timestamp of 8001 frame
Lat	Interpolated Latitude
Long	Interpolated Longitude
Mode	The rest of the line depends on the mode

SOR Start of Result

SOR;SMT40;F;P1;P2;P3;P4;P5;P6;N

SMT 40	Time of measurement in 40ns
F	Frequency in hertz
P1..P6	Subsection power in dBm
N	Number of Pilots

PIL Pilot Information

PIL; FT40;SC; N

FT40	Frame time in 40ns
SC	Scrambling Code
N	Number of Reflections

REF Reflection Information

REF;DEL;EcIo1;EcIo2;EcIo3;EcIo4;EcIo5;EcIo6;RSCP1;RSCP2;RSCP3;RSCP4;RSCP5;RSCP6

DEL	sDelayIn20ns
EcIo1..6	sEcIoInDB100[0..5] / 100.0
RSCP1..6	sSubsectionPowerInDB100[0..5] / 100.0 + sEcIoInDB100[0..5] / 100.0

Example:

2000;48.6;11.6;SOR;10000; 2127600000;-79.4;-79.6;-80.2;-81.0;-77.8;-79.1;2

2000;48.6;11.6;PIL;333;16;2

2000;48.6;11.6;REF;10;-1.0;-2.0;-1.5;-0.5;-2.5;-3.0;-80.4;-81.6;-80.7;-81.5;-80.3;-82.1

2000;48.6;11.6;REF;-10;-2.0;-3.0;-2.5;-1.5;-3.5;-4.0;-81.4;-82.6;-81.7;-82.5;-81.3;-83.1

2000;48.6;11.6;PIL;643;48;3

2000;48.6;11.6;REF;10;-1.0;-2.0;-1.5;-0.5;-2.5;-3.0;-80.4;-81.6;-80.7;-81.5;-80.3;-82.1

2000;48.6;11.6;REF;-10;-2.0;-3.0;-2.5;-1.5;-3.5;-4.0;-81.4;-82.6;-81.7;-82.5;-81.3;-83.1

2000;48.6;11.6;REF;20;-1.0;-2.0;-1.5;-0.5;-2.5;-3.0;-80.4;-81.6;-80.7;-81.5;-80.3;-82.1

Export via MS Windows Command Line

If you actually do not intend to perform any measurement or replay on your system, but just want to export some measurement files, you may do this also from the command line (except for user-defined ASCII format *.ASC).

General command line export syntax:

```
[C:\RuS\ROMES4.1\]romes.exe -e <export module> -f <measurement file(s)>+ [-
s] [-c <export config file>] [-w <workspace file>] [-y] [-r <report file>]
[-d <destination dir>]
```

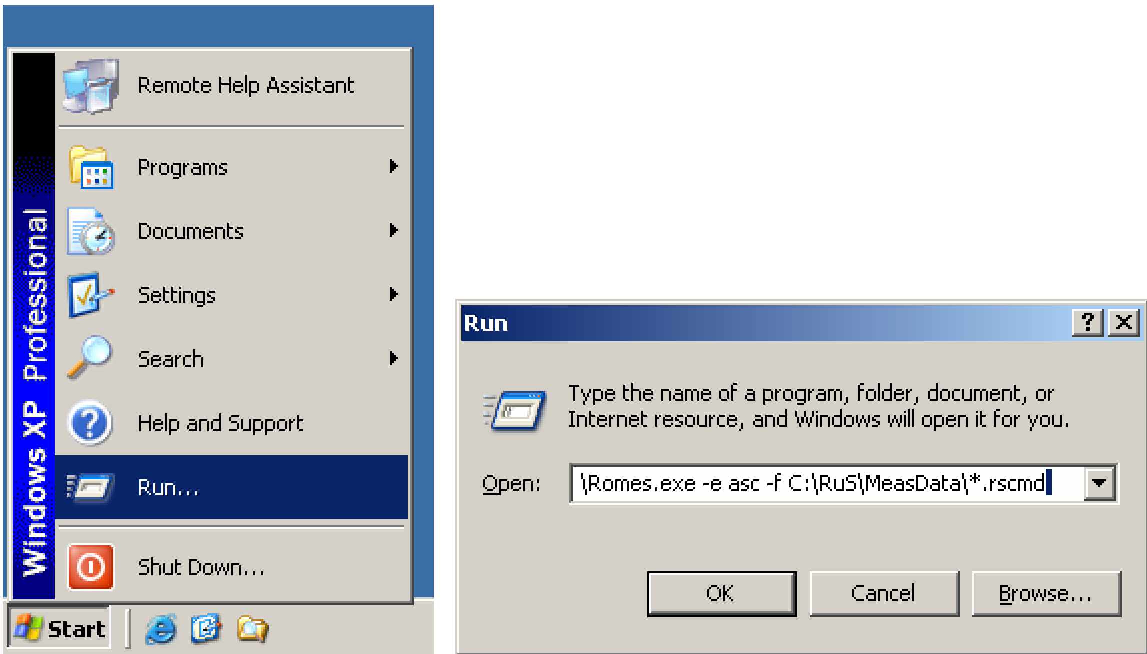
To export the data, one of the formats[mif], [asc], [nqa], [cvs] or [f2l] must be selected. Multiple selections are allowed.

If an input file name has no related output file name after the /o switch, the input file name will be used for the output file.

If more output file names than input files are specified, the spare output files are ignored. If less output files than input files are specified, the *n* given output file names are used for the first *n* input files. The names of remaining files are unchanged, only the default extension is used.

If the /r option is used, all text output (e.g. error messages) produced during export is diverted into a report file. If no report file name is specified, the default name *error.txt* will be used.

Enter the MS Windows command line into the input field of the *Run* dialog box which is accessible from the *Start* menu:



You can also start from the DOS box. Here you may also use a batch file, if desired. If you do so, start every new line with the CALL command, otherwise only the first line of the batch file will be executed.

Additional Features for Command Line Export

The command line export functionality supported features:

- recursive directory scan for measurement files
- export configuration files can be specified
- silent mode to support batch export

All the options available on the command line can be requested by showing the command line help (using –help argument). The valid syntax is shown below:

```
romes.exe –e <export module> -f <measurement file(s)>+ [-s] [-c <export config file>] [-w <workspace file>] [-y] [-r <report file>] [-d <destination dir>]
```

The command line options have the meanings as described below.

Option	Count	Argument	Description
-e	1	Name of an export module	This specifies which kind of export shall be performed. Possible values are “asc”, “cvs”, “mif”, “nqa”, “f2l”.
-f	1+	Name(s) of the files to be exported	This specifies which files shall be exported. The names are interpreted as wildcards and are used to recursively scan directories. For example, if a name “C:\Rus\ROMES4.1\MeasData*.rscmd” is specified, all files with the suffix rscmd in the ROMES measurement data directory and all subdirectories are exported.
-s	0/1		If this is used, then all kind of feedback or graphical output like dialog and messages boxes is suppressed. It is useful to consult the Export.txt file after the export has finished. Nevertheless, some windows are displayed during export, but they close automatically.
-c	0/1	Configuration File (*.rma)	Specifies which configuration file shall be used to initialize the export module. The ASCII export for example can store the list of export parameters in that file.
-w	0/1	Workspace File	Export configurations can be saved in a workspace as well, so if no configuration file is available, a workspace might also do well. If –c is specified, this is ignored.
-y	0/1		Specifies if the default settings for the export stored in the registry shall be used. Is only considered if neither –c nor –w are set.
-r	0/1	Result Log File	In the result log file, the messages from the export are written. Per default, this file is stored in the ROMES home directory as Export.txt, but it is possible to specify another file using this option.
-d	0/1	Output Directory	Controls where to write the export result data to. If omitted, the results are written to the same directory as the input file.

Note:

If no configuration is specified (-c, -w or –y) and silent mode is enabled, then the export will fail in some cases (ASCII export), since the list of output parameters is missing. If –s is omitted, the standard export configuration dialog for the specific export module is shown.

BTS / Node B List Formats

BTS (base transceiver station) and UMTS Node B data are imported via the *Configuration of Software Modules* menu (see *Tools – Modules Configuration...* command in chapter 3) from a BTS / Node B list file. BTS list files are ASCII files characterized by one of the extensions *.txt, *.atd, *buf or *.vig. Information on the base stations can be indicated e.g. in the *Alphanumeric View, Measurement Report,* or *Route Track* views (see chapter 4). An example for a base station list is shown on page 7.35.

File formats

The formats *.buf and *.vig are customized, fixed formats and not intended for general use. *.atd and the two *.txt versions are BTS list file formats which can be configured as described in the following sections. The information in all BTS files is arranged in a table. Each column of the table corresponds to a BTS parameter, each line to a particular BTS sector.

- The extensible *.txt format is available for R&S ROMES software versions ≥ V3.20. The BTS parameters in the file can be selected at will; their number and order is described in a header line.
- The old *.txt format is available for R&S ROMES software versions < V3.20 but will be also supported in future versions. Compared to the extensible *.txt format, the old format uses a header line with a different syntax and a number of mandatory BTS parameters in a fixed order.
- The *.atd format is available for R&S ROMES software versions < V3.20 but will be also supported in future versions. The names of the BTS parameters in the file are fixed. This file format can be used also for WiMAX BTS, CDMA BTS and UMTS Node B list files.

Starting with R&S ROMES software V3.20, it is recommended to use the new flexible and extensible *.txt format for GSM BTS list files; see section *Extensible BTS List (*.txt) Format below*. This extensible file format is also used as an export format for GSM data from an internal network data base (*.ndb) file (see *Tools – Modules Configuration...* command in chapter 3). The *.atd format must be used for WiMAX BTS, CDMA BTS andUMTS Node B network data bases.

Alternatively, it is possible to write a DLL file defining a new, user-defined BTS list format; see section *User-Defined List Format* on p. 7.42 ff.

Identification of base stations

The assignment of different sectors to a particular BTS is based on the measured geographical position of each sector: Up to three sectors with a distance of less than 5 meters are considered to belong to the same base station. It is assumed that the 51-multiframes (T_{51} frames) of all sectors of the BTS are time-synchronized, i.e. that the starting time of their M51 multiframe is the same. In the case of asynchronous sectors or a number of sectors larger than three, individual clock codes are required; see below.

Update of the BTS data base

The BTS list data base can be updated by adding a new BTS list file; see description of *Tools – Modules Configuration...* command in chapter 3. In the update process base stations that are already included in the data base are replaced, and new base stations are added to the data base. Two BTSs are considered to be identical if both their geographical position and the clock codes of their sectors match.

Clock codes

Up to three sectors with a distance of less than 5 meters are considered to be time-synchronized if their clock codes are equal. A maximum of three sectors with the same position and the same clock codes are allowed.

If a the BTS list data base and the added BTS list file contain the same BTS with different clock codes, the system will erroneously assume that the BTS in the list file is new and add it to the data base for a second time. In order to avoid such a situation an automatically generated clock code should never be used. To clearly indicate whether two base stations are identical and whether or not their sectors are time-synchronized we recommend the following choice:

- If the sectors are not synchronized, use the Cell Identity (CI) of the individual sectors as clock codes.
- If the sectors are synchronized, use the smallest of the CIs of all sectors as a common clock code.

This problem is reduced as soon as the GSM Network Scanner (ROMES3T13) decodes the Cell Identity (CI) and the complete Location Area Information (LAI). Then the comparison is taken using these values.

Extensible BTS List (*.txt) Format

The extensible *.txt format is the standard GSM BTS list format for ROMES software versions ≥ V3.20. It is also used as an export format for GSM data from an internal network data base (*.ndb) file (see *Tools – Modules Configuration...* command in chapter 3). For older software versions it is recommended to use the old *.txt format described in section *Old BTS List (*.txt) Format* on p. 7.32 ff.

The extensible *txt format provides the advantage that BTS parameters can be selected at will; their number and order is described in a header line containing an arbitrary number of descriptors. Consecutive descriptors are separated by exactly one tab or semicolon and introduced by hash sign #, e.g.:

#BTS_Name; #C0; #BCC; #NCC; #CI; #Lon; #Lat

In order to interpret and process the BTS parameters correctly R&S ROMES must be able to clearly identify the meaning of the descriptors. To this end a list of keywords has been defined; see *Table 7-1 below*. A descriptor is assigned to a keyword if the leading characters of the descriptor are identical to the keyword. The comparison of descriptors and keywords is not case-sensitive; blanks preceding a # are ignored.

Example:

The descriptors #Longitude, #LON or #LoNgit in degrees are equivalent. R&S ROMES assigns all these descriptors to the keyword #Lon and interprets the values in the associated column as geographical longitude values.

Each of the table rows below the header line contains the parameters of one BTS sector. All numbers must be entered in decimal format. Like in the header table rows must be separated by tabs (ASCII code: 0x09) or semicolons; lines are separated by a line feed (CR/LF ASCII code:0x0D/0x0A). The following example shows a valid *.txt file:

```
#SectorName    ; #Longitude;  #Latitude;#BCC;#BCCH
Base station 11;  11.672931;  47.921935;   4;  790
Base station 4 ;  11.684844;  47.940659;   7;  784
Base station 17;  11.635992;  47.992432;   4;  799
```

Table 7-1 Keywords for the extensible *.txt format

Keyword	Description	Remarks
#Lon	Geographical Longitude	Format: Decimal with dot, e.g. 11.34179
#Lat	Geographical Latitude	Format: Decimal with dot, e.g. 47.89407
#BCC	BTS Color Code	0 to 7 decimal
#NCC	Network Color Code	0 to 7 decimal
#CI	Cell Identity	1 to 65535 decimal
#LAC	Location Area Code	
#MNC	Mobile Network Code	
#MCC	Mobile Country Code	
#BTS #SEC #Nam	Name of a BTS sector	e.g. BTS_Name e.g. Sector Name e.g. Name of BTS
#C0 #BCCH	Channel no. of the C0 carrier/BCCH	
#Cx #TCHx	Channel no. of the TCHs	x = 1 to 63
#CC #Clk #Clock	Clock code	1 to 65535 decimal. Up to three sectors with a distance of less than 5 meters are considered to be synchronized if their clock codes are equal. A maximum of three sectors with the same position and the same clock codes are allowed.
#Power #EIRP	Transmitter output power/ antenna power	Equivalent Isotropically Radiated Power
#Ant	Antenna type	0 omnidirectional 1 directed (120° sectors)
#Dir	Direction of maximum transmitter power	Direction in °, 0..360, North = 0°, East=90°
#SyncCode	Synchronization code	Sectors with identical Sync Codes are grouped to facilitate the calculation of the statistical time deviation. For each group of identical Sync Codes the statistical drift is calculated and used in the interference analysis. The measurement accuracy can be augmented in cases where different types of BTS show a different drift behavior, by differentiating the BTSs using different Sync Codes.
#Lay #Hir	Layer of the BTS in the network	Relevant for handovers.
#Man #Pro #Ven	Manufacturer of the BTS	0 unknown 1 Motorola 2 Siemens 3 Nokia 4 Ericsson 5 Lucent

The following keywords/descriptors are generated when data in a network data base (*.ndb) file are exported to a BTS list file (see description of *Tools – Modules Configuration...* command in chapter 3). They are usually not part of a user-defined *txt file.

Table 7-2 Keywords for *.ndb export

Keyword	**Description**	**Remarks**
#MainErrDir	Main direction of position uncertainty in °, 0..360, North = 0°, East=90°	For each estimate an error ellipse is given. This ellipse describes a two dimensional area with 66% confidence.
#PosErr1	Position uncertainty in main direction in meters	For each estimate an error ellipse is given. This ellipse describes a two dimensional area with 66% confidence.
#PosErr2	Position uncertainty orthogonal to the main direction in meters	For each estimate an error ellipse is given. This ellipse describes a two dimensional area with 66% confidence.
#SourceST1	Source for BTS data from *System Information Type 1*	Values: INVALID, BTS_LIST, USER_EDIT, MEASURED
#SourceST3	Source for BTS data from *System Information Type 3*	Values: INVALID, BTS_LIST, USER_EDIT, MEASURED
#ValidityST1 #ValST1	Validity for BTS data from *System Information Type 1*	Values: IIS_VALID, TO_BE_VERIFIED
#ValidityST3 #ValST3	Validity for BTS data from *System Information Type 3*	Values: IIS_VALID, TO_BE_VERIFIED
#TimeSector	Time for the last check of entered values for a sector in s since 1970	E.g. time of the measurement or time of last change of BTS list files.
#TimeST1	Time for the last check of *System Information Type 1* values for a sector in s since 1970	
#TimeST3	Time for the last check of *System Information Type 3* values for a sector in s since 1970	

Old BTS List (*.txt) Format

The old *.txt BTS list format is available for R&S ROMES software versions < V3.20 but will be also supported in future versions. Compared to the extensible *.txt format (see section *Extensible BTS List (*.txt) Format* on p. 7.30 ff.), the old format uses a header line with a different syntax and a number of mandatory BTS parameters in a fixed order.

The header line of the file contains the descriptors for the BTS parameters. It is possible to use arbitrary descriptors (exception: \n indicates the end of a line and must not be used as a descriptor), however, the assignment of many BTS parameters to table columns is fixed and the order of many rows must not be changed (see *Table 7-3 below*). The descriptors are not introduced by a hash sign. The following example shows a valid header line:

Name	Longitude	Latitude	BCC	BCCH	TCH1	TCH2	TCH3	TCH4	TCH5	TCH6	
TCH7	TCH8	TCH9	TCH10	TCH11	TCH12	TCH13	TCH14	TCH15	CI	NCC	ClkCode
Power	Antenna	Direction	FixVal	LAX	MNC	MCC	TCH16	TCH17	...	\n	

Each of the table rows below the header line contains the parameters of one BTS sector. Numbers must be entered in decimal format. Table rows must be separated by tabs (ASCII code: 0x09) or semicolons;

the end of a line is indicated by a \n, and lines are separated by a line feed (CR/LF ASCII code:0x0D/0x0A).

Table 7-3 BTS List

Label	Format	Description
Name	1..23 ASCII Chars	Unique identification of the sector
Longitude	[+,-]#[#][#][.[#][#][#][#][#][#][#]]	Geographical longitude in degrees, -360.0000000° ... +360.0000000°
Latitude	[+,-]#[#][.[#][#][#][#][#][#][#]]	Geographical latitude in degrees, -90.0000000° ... +90.0000000°
BCC	#	BCC 0..7, decimal
BCCH	#[#][#]	C0 Carrier 1...124 or 512...887
TCH1	#[#][#]	C1 Carrier 1...124 or 512...887, or 0, if not available
TCH2	#[#][#]	"
TCH3	#[#][#]	"
TCH4	#[#][#]	"
TCH5	#[#][#]	"
TCH6	#[#][#]	"
TCH7	#[#][#]	"
TCH8	#[#][#]	"
TCH9	#[#][#]	"
TCH10	#[#][#]	"
TCH11	#[#][#]	"
TCH12	#[#][#]	"
TCH13	#[#][#]	"
TCH14	#[#][#]	"
TCH15	#[#][#]	"
CI	#[#][#][#][#]	Cell Identity, 1...65535, decimal
NCC	#	NCC 0...7, decimal
ClkCode	###	Clock code: 1..65534, decimal If no clock code is assigned, the internal default value of 65535 is used. For sectors differing by less than 5 meters in position and identical clock code (e.g. default), synchronous transmission of the SCHs is assumed (normal). If the sectors of a BTS work asynchronously or if several BTSs use the same location, individual clock codes must be given for each sector (special).
Power	#[#][.[#][#]]	EIRP power in dBm, 5 dBm .. 66 dBm

Label	Format	Description
Antenna	#	Antenna type: 0: omnidirectional 1: 120° Sector
Direction	#[#][#]	Direction in °, 0..360, North = 0°, East=90°
Sync Code	#[#][#]	Synchronization identification: 1..25 decimal Sectors with identical Sync Codes are grouped to facilitate the calculation of the statistical time deviation. If no value is given a default value of 0 is used. For each group (of identical Sync codes) the statistical drift is calculated and used in the interference analysis. The measurement accuracy can be augmented in cases where different types of BTS show a different drift behavior, by differentiating the BTSs using different Sync Codes.
FixVal	#	Denotes how many of the following data fields LAC, MNC and MCC are defined for this sector. These data fields must be in the given order.
LAC	#[#][#][[#][#]	Location area code. Value 65535 if not available.
MNC	#[#][#]	Mobile network code. Value 65535 if not available. If available, the MNC overwrites the default value, which can be given in the *DB Settings/Query – Init* dialog.
MCC	#[#][#]	Mobile country code. Value 65535 if not available. If available, the MNC overwrites the default value, which can be given in the *DB Settings/Query – Init* dialog.
TCH16	#[#][#]	Traffic channel 16, values 1...124 or 512...887, or 0, if not available
...	#[#][#]	Every entry for one sector denotes an additional traffic channel.

Number 0..9

[...] optional value

All fields up to the *Direction* field are mandatory, further values only extend the measurement result. However, in order to use the additional data given by the K7 driver, the LAC, MNC and MCC must be specified for each sector.

Example for Base Station Lists (Old *txt Format)

Using MS-Excel (Tab-separated file m u s t be saved in ASC/TXT format !!)

Name	Lon	Lat	BCC	C0	C1	C2	C3		C14	C15	CI	NCC	CC	Power	Ant	Dir
Station1/Cell1/90	14.123354	48.196572	0	84	51	33	0		0	0	3356	3	3356	38	1	90
Station1/Cell2/210	14.123354	48.196572	2	96	10	0	0	filled with zeroes	0	0	3367	3	3367	38	1	210
Station1/Cell3/330	14.123354	48.196572	2	101	0	0	0	and TABs	0	0	3361	3	3361	38	1	330
MUC_Cent1	13.95700	47.843251	4	91	46	13	0		0	0	3477	3	3451	44	1	60
MUC_Cent2	13.95700	47.843251	1	111	70	8	0		0	0	3451	3	3451	44	1	180
MUC_Cent3	13.95700	47.843251	3	106	11	0	0		0	0	3460	3	3451	44	1	300
Example/Omni_1	14.934562	48.798645	7	83	17	4	14						3411	48	0	0

Cells are synchronuous

Cells are asvnchronuous

Omni-directional cell

SyncCode - Field discarded

ASC/TXT format (separated by semicolon)

Name; Lon; Lat; BCC; C0; C1; C2; C3; C4; C5; C6; C7; C8; C9; C10; C11; C12; C13; C14; C15; CI; NCC; CC; Power; Ant; Dir <CR>

Station1/Cell1/90; 14.123354; 48.196572; 0; 84; 51; 33; 0; 0; 0; 0; 0; 0; 0; 0 ; 0 ; 0; 0; 0; 3356; 3; 3356; 38; 1; 90 <CR>
Station1/Cell2/210; 14.123354; 48.196572; 2; 96; 10; 0; 0; 0 ; 0 ; 0 ; 0; 0 ; 0 ; 0 ; 0 ; 0 ; 0; 0; 3367; 3; 3367; 38; 1; 210 <CR>
Station1/Cell3/330; 14.123354; 48.196572; 2; 101; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0 ; 0 ; 0; 0; 0; 3361; 3; 3361; 38; 1; 330<CR>
MUC_Cent1; 13.95700; 47.843251; 4; 91; 46; 13; 0; 0; 0; 0; 0; 0; 0 ; 0 ; 0 ; 0; 0; 0; 3477; 3; 1; 44; 1; 60<CR>
MUC_Cent2; 13.95700; 47.843251; 1; 111; 70; 8; 0; 0 ; 0 ; 0 ; 0; 0; 0; 0 ; 0 ; 0 ; 0 ; 0; 0; 3451; 3; 1; 44; 1; 180<CR>
MUC_Cent3; 13.95700; 47.843251; 3; 106; 11; 0; 0; 0 ; 0 ; 0 ; 0 ; 0 ; 0 ; 0 ; 0 ; 0 ; 0 ; 0; 0; 3460; 3; 1; 44; 1; 300<CR>
Example/Omni_1; 14.934562; 48.798645; 7; 83; 17; 4; 14; 0 ; 0 ; 0 ; 0; 0 ; 0; 0 ; 0 ; 0 ; 0 ; 0; 0; 3411; 3; 3411; 48; 0; 0<CR>

ASC/TXT format (separated by tabs)

Name	Lon	Lat	BCC	C0	C1	C2	C3	....	C14	C15	CI	NCC	CC	Power	Ant	Dir<CR>
Station1/Cell1/90	14.123354	48.196572	0	84	51	33	0		0	0	3356	3	3356	38	1	90<CR>
Station1/Cell2/210	14.123354	48.196572	2	96	10	0	0		0	0	3367	3	3367	38	1	210<CR>
Station1/Cell3/330	14.123354	48.196572	2	101	0	0	0		0	0	3361	3	3361	38	1	330<CR>
MUC_Cent1	13.95700	47.843251	4	91	46	13	0		0	0	3477	3	1	44	1	60<CR>
MUC_Cent2	13.95700	47.843251	1	111	70	8	0		0	0	3451	3	1	44	1	180<CR>
MUC_Cent3	13.95700	47.843251	3	106	11	0	0		0	0	3460	3	1	44	1	300<CR>
Example/Omni_1	14.934562	48.798645	7	83	17	4	14		0	0	3411	3	3411	48	0	0<CR>

filled with zeroes and TABs

Tab characters

Tab characters

ASCII Table Description (*.atd) Format

ATD (ASCII Table Description) files control the import of ASCII tables, in particular BTS / Node B lists, into ROMES V3.0 and higher versions. In ROMES V3.20 and higher versions, it is recommended to use the extensible *.txt format described in section *Extensible BTS List (*.txt) Format* on p. 7.30 ff. to import data into a GSM network data base. However, the *.atd format must be used for WiMAX network data bases, CDMA network data bases and UMTS Node B data bases.

Since R&S ROMES allows flexible import of different ASCII table formats, a description format is required to explain the table attributes. This format (*.atd) is a plain text file, which can be edited with any text editor (e.g. Notepad) that does not insert format commands into the text (like MS Word does into the *.doc format files). The table attributes can be defined at will, however, R&S ROMES uses fixed names to identify the parameters in the individual columns (see paragraph on *Column Names* on p. 7.40).

Note:

*Example *.atd files are provided in the BaseStationLists subdirectories of the R&S ROMES program directory.*

Example of an ATD file

```
[Main]
Type=ATD
[Table1]
Name=CellData
File=celldata.txt
Columns_Size=5
Columns0_Name=BTS_Name
Columns0_Type=utFixedChar
Columns0_Size=25
Columns0_boIndexed=1
Columns0_boPrimaryKey=1
Columns1_Name=Longitude
Columns1_Type=utDouble
Columns1_boIndexed=1
Columns2_Name=Latitude
Columns2_Type=utDouble
Columns2_boIndexed=1
Columns3_Name=BCC
Columns3_Type=utTInt
Columns3_boIndexed=1
Columns4_Name=C0
Columns4_Type=utSInt
```

Entry	**Required/ Optional**	**Remarks**
[Main]	req.	
Type=ATD	req.	
[Table{TableIndex}] TableIndex: index of table (> 0)	req.	More than one table can be imported using one ATD file; table index is one-based, thus the first table entry is [Table1]; TableIndex numbers have to be in consecutive order; the tables after a gap will not be used.
Name={TableName} TableName: name of the table, as it should be imported and appear inside R&S ROMES; use only letter characters, numbers and ‚_‘ to form a valid table name;	req.	**Attention!** **SQL keywords used as ASCII table or column names cause an error when the ASCII file is loaded.**
File={FilePath} FilePath: relative or absolute file path of the ASCII table file; relative path root is the location of the ATD file, this means a mere file name without directory has to be located in the same directory as the ATD file	req.	Examples: File=c:\data\cells.txt File=..\cell.asc
Columns_Size={NumOfColumns} NumOfColumns: Number of columns of this table (>0)	req.	The table must contain at least NumOfColumns column entries; if more column entries exist, only the first NumOfColumns will be used.
Columns{ColumnIndex}_{Attrib} column attribute entry; ColumnIndex: index of column (zero based) the attribute belongs to; Attrib: attribute of column as specified below;	-	Multiple of these attribute entries belong to one column with the same index.
Columns{ColumnIndex}_Name= {ColumnName} ColumnName: name of column, as it should be imported and appear in the data tree; use only letter characters, numbers and ‚_‘ to form a valid column name;	req.	**Attention!** **SQL keywords used as ASCII table or column names cause an error when the ASCII file is loaded.** **The column names must be unique to be identified by the measurement system; see list on p. 7.40.**
Columns{ColumnIndex}_Type = {ColumnType} ColumnType: data type of the column (refer to reference table below)	req.	
Columns{ColumnIndex}_Size = {TypeSize} TypeSize: size of fixed size data	req. for fixed size data;	Specify it only for types „utFixedChar“ and „utFixedArray“; the maximum size is 4000 Bytes.
Columns{ColumnIndex}_ boIndexed={IndexedFlag} IndexedFlag: 0 or 1; indicating if column will have an index (1) or not (0)	opt.; default 0	Selections will be much faster if columns used as search criteria are indexed; thus index columns which are often used as selection or join criterion! Indexed columns need slightly more disk space.
Columns{ColumnIndex}_ boPrimaryKey={PrimaryKeyFlag} PrimaryKeyFlag: 0 or 1; indicating if column is used as primary key (1) or not (0)	opt.; default 0	all columns with primary key flag set will form the primary key; only one record with the same primary key may exist inside the database, otherwise an exception will be thrown during import; (this can be used to ensure consistent data even when appending data to an already existing table); primary keys may also have an advantageous influence on selection performance.

The following ASCII table is compatible with the example *.atd file listed above:

```
Cell1:112.774 50.038 2 814
```

```
Cell2:1     12.397     49.991     1     ?
Cell2:2     12.397     49.991     2     807
```

The records are separated by <NewLine>, the columns by <TAB>.

The last line must also be terminated with <NewLine>, otherwise it will be ignored!

If an attempt is made to import an ASCII table which does not match the ATD description file, an error message describing the kind and position of the erroneous statement(s) is produced. The error messages are self-explanatory.

Attributes

The attributes must correspond to the type specified in the table description according to the following type reference:

Table 7-4 Attributes in an *.atd file

Type Identifier	Description	Range / Representation in ASCII table file
utInt	1 byte integer	–128 ... 127
utSInt	2 byte integer	–32 768 ... 32 767
utLInt	4 byte integer	–2 147 483 648 ... 2 147 483 647
utFloat	4 byte floating point	3.4E-38 ... 3.4E+38 (7 digits) (decimal or scientific notation)
utUInt	1 byte unsigned integer	0 ... 255
utUSInt	2 byte unsigned integer	0 ... 65 535
utULInt	4 byte unsigned integer	0 ... 4 294 967 295
UtDouble	8 byte floating point	1.7E-308 ... 1.7E+308 (15 digits) (decimal or scientific notation)
utFixedChar	Character string of fixed size as specified by ‚size‘ attribute.	In single quotes or without: ['string'] or [string] (first way is more secure); an empty string has always to be represented by ''; the string may be shorter than the given size, but must not exceed it.
utDynChar	Character string of variable size (variant by record).	Refer to utFixedChar, except that there is no size limitation other than the 4000 Bytes maximum.
utFixedArray	Array of fixed size as specified by ‚size‘ attribute.	Hexadecimal literal, e.g. 0x341a5bc2 for a 4 Bytes vector; all ‚size‘ bytes have to be specified.
utDynArray	Array of variable size (variant by record);	Hexadecimal literal, e.g. 0x341a5bc2 for a 4 Bytes vector.
utBlob	Large array of variable size (variant by record); may be bigger than 4000 Bytes.	Not supported in version 3.0 !

Column Names

The column names in an ATD file must be unambiguous in order to be clearly identified by the test system. In analogy to the conventions in the *.txt files the following names may be used for GSM BTS data bases (see also *Table 7-3* on p. 7.33 and BTS list example on page 7.35):

Column Name	Type	Range	Description
UniqueId	utULInt	0 to 4 294 967 295	Unique Identifier of the BTS sector for the database (The easiest way of providing a UniqueID is to use the line (record) number)
Longitude	utDouble	–180 to 180	Longitude of the position of the BTS
Latitude	utDouble	–90 to 90	Latitude of the position of the BTS
BTS_Name	utFixedChar	–	Name of BTS sector
BCC	utTInt	0 to 7 decimal	BTS Color Code
C0	utSInt	See chapter 8	C0 carrier channel number
C1 to C15	utSInt	See chapter 8	Cn carrier channel number
CI	utLInt	1 to 65535 decimal	Cell Identity
NCC	utTInt	0 to 7 decimal	Network Color Code
CC	utLInt	1 to 65535 decimal	Clock Code
Ant	utLInt	–	Antenna type
Power	utFloat	See chapter 8	EIRP power
MNC	utUSInt	0 to 999	Mobile Network Code
MCC	utUSInt	0 to 999	Mobile Country Code
LAC	utUSInt	1 to 65533 and 65535	Location Area Code
2GNC	utDynChar	–	GSM neighbor cell list for neighborhood analysis (option R&S ROMES3HOA). CI [, LAC [, MCC, MNC]] for each neighbor cell, a # character separates two cells, e.g. 1234,5678,262,1#1238,5678,262,1#1240,5678,262,1
3GNC	utDynChar	–	UMTS neighbor cell list for neighborhood analysis (option R&S ROMES3HOA). MCC, MNC, LAC, CI for each neighbor cell, a # character separates two cells, e.g. 262,1,1234, 5678#262,1,1234,5679#262,1,1234,5680

The columns MNC through *3GNC* are required for the UMTS neighborhood analysis; see description of the *UMTS Neighborhood Analyzer View* in chapter 4.

The following names may be used for UMTS Node B data bases:

Column Name	Type	Range	Description
UniqueId	utULInt	0 to 4 294 967 295	Unique Identifier of the Node B sector for the database (The easiest way of providing a UniqueID is to use the line (record) number)
PosLongitude	utDouble	–180 to 180	Longitude of the position of the Node B in degrees
PosLatitude	utDouble	–90 to 90	Latitude of the position of the Node B in degrees
NodeB_Name	utDynChar	–	Name of Node B sector
CellID	utULInt	–	Cell Identity
SC	utUSInt	0 to 8176	Scrambling Code. It must be in the range of 0…8176, and SC modulo 16 has to be equal to 0
ARFCN	utUSInt	8 000 to 12 000	Channel Number
IsDirected	utUTInt	0 to 1	1: Antenna is directed 0: Antenna is omnidirectional

Direction	utUSInt	0 to 360	Direction of the directed antenna in degrees
Power	utDouble	–10 to 100	Power of CPICH in dBm
CellIDNeighborsList	utDynChar	–	Information about the cell identities of the neighbor cells; list of numbers separated by # characters , e.g. 67#861#14558.
MNC	utUSInt	0 to 999	Mobile Network Code
MCC	utUSInt	0 to 999	Mobile Country Code
LAC	utUSInt	1 to 65533 and 65535	Location Area Code
2GNC	utDynChar	–	GSM neighbor cell list for neighborhood analysis (option R&S ROMES3HOA). MCC, MNC, LAC, CI for each neighbor cell, a # character separates two cells, e.g. 262,1,1234, 5678#262,1,1234,5679#262,1,1234,5680
3GNC	utDynChar	–	UMTS neighbor cell list for neighborhood analysis (option R&S ROMES3HOA). MCC, MNC, LAC, CI for each neighbor cell, a # character separates two cells, e.g. 262,1,1234, 5678#262,1,1234,5679#262,1,1234,5680

In UMTS Node B data bases, the columns *UniqueID* to *Power* are mandatory. Column *CellID-NeighborsList* is optional but is also recognized by the measurement system. If it is provided, R&S ROMES checks for differences between the entries and the real network. Each time that the UMTS test mobile fails to detect the signal from one of the neighbor cells in the list, a *Neighbor List Alarm* is generated. The alarms can be displayed e.g. in the *UMTS Network Analyzer View;* see description in chapter 4.

The columns MNC through *3GNC* are required for the UMTS neighborhood analysis; see description of the *UMTS Neighborhood Analyzer View* in chapter 4.

In general, R&S ROMES is not able to process data in columns with user-defined names other than the ones listed above. The UniqueID parameter is explained in section *Speeding up the File Import below*.

Missing entries

If a value to be entered in the ASCII table file is not available, a question mark *(?)* can be used instead. R&S ROMES interprets question marks as missing entries, the corresponding table cells in the views and dialogs of the application are left empty.

Speeding up the File Import

R&S ROMES has to assign numbers to all lines of the BTS lists every time the list is opened. This time-consuming line numbering can be bypassed by adding the *UniqueID* column to the BTS list. The *UniqueID* entries (e.g. 1, 2, 3, ...) can be added with a tool like MS Excel.

Example for the modification of the ATD file:

```
Columns12_Name=UniqueID

Columns12_Type=utLInt

Columns12_Size=4

Columns12_boIndexed=1

Columns12_boPrimaryKey=0
```

Important Note:

All numbers in the UniqueID column must be unique. Any number that is used more than once will cause problems. So it is recommended to use a unique scheme like the line numbers from MS Excel to fill the UniqueID column.

User-Defined List Format

Instead of using the *.txt and *.atd formats described in the previous sections, it is also possible to define new formats for the base station list. To be distinguished from the standard BTS list formats the user-defined list files must have extensions different from *.txt or *.atd. Additionally, a dynamic link library (DLL) with the name "GSS_K6_Import_xxx.dll“ must be written, where "xxx“ is the extension of the format file.

The DLL must contain a class (e.g. "Import“), derived from the following abstract class AsciiImport:

```
class AsciiImport
{
public:
enum NEXT_LINE_STATUS {SECTOR_VALID, SECTOR_INVALID,    END_OF_FILE, SKIP_SECTOR};

 AsciiImport(){};
 virtual ~AsciiImport(){};

 // Open the file "pFilename":
 virtual bool Start(char* pFilename) = 0;

 // load next sector:
 virtual NEXT_LINE_STATUS NextSector(char** ppErrorString) = 0;

 // number of the sector in the Ascii file
 virtual unsigned int* GetSectorNr() = 0;

 virtual char *GetSectorName() = 0;           // Name
 virtual double* GetLongitude() = 0;          // Longitude
 virtual double* GetLatitude() = 0;           // Latitude
 virtual unsigned short* GetBCC() = 0;        // Base station color code
 virtual unsigned short* GetChannelArray(int index) = 0;
                                                // index = 0 points to the C0 carrier
   // index points to TCH index
 virtual unsigned int* GetCI() = 0;           // Cell Identity
 virtual unsigned int* GetNcc() = 0;          // National color code
 virtual unsigned int* GetClockCode() = 0;    // ClockCode
 virtual double* GetPower() = 0;              // EIRP
 virtual unsigned int* GetAntennaType() = 0;  // Antenna type
 virtual double* GetDirection() = 0;          // Direction of the antenna
 virtual unsigned int* GetSyncCode() = 0;     // Synchronisation Identification
 virtual unsigned short* GetLAC() = 0;   // Location area code
 virtual unsigned short* GetMNC() = 0;   // Mobile network code
 virtual unsigned short* GetMCC() = 0;   // Mobile country code
};
```

(The file is installed in the *Installation* subdirectory of the main directory.)

The function "`bool Start(char* pFilename)`“ opens the ASCII file. The return value is "true“ if the file could be successfully opened. If the return value is "false“the program returns to the calling menu.

Each call of the function "`NEXT_LINE_STATUS NextSector(char** ppErrorString)`“loads the next sector, or the first one if it is called after "`Start(char* pFilename)`“ has been called. When the return value is "`END_OF_FILE`“, the DLL is deallocated and the loading of the operator information is considered to be finished.

The return value "`SECTOR_INVALID`“ is used to indicate an error in loading the sector. An error message is displayed including a message in a character string, to which "`ppErrorString`“ points. The memory of this character string must be defined and allocated in the DLL and the content of this string can be specified arbitrarily. After that error message the loading of the operator information is stopped and the sectors already loaded are canceled.

The return value “`SKIP_SECTOR`” can be used to skip a sector if, e.g., the sector contains some invalid data and should not be loaded. However, the program does not stop loading the base station list but reads the next sector instead. A message will be written into the file *Ctol_Reports.txt* stored in the *Test-Files* subdirectory.

The return value `SECTOR_VALID` implies that the sector has been loaded successfully. In this case there must be access to its data, described in table *Table 7-3*, *BTS List*, on page 7.33 via the remaining functions pointing to them. The name of the sector, as well as its geographical position, BCC and C0 carrier (obtained by the value of `GetChannelArray(0)`) as well as the sector number are mandatory, the remaining values are for additional information. In case that some of the latter are not included in the sector information, the corresponding access functions must return the NULL pointer. The sector number is necessary to monitor possible inconsistencies in the data.

The declaration of exported DLL functions is realized via the file "Import_xxx.def“:

```
LIBRARY IMPORT_xxx.DLL
DESCRIPTION "Reading the operator info of the BTS stations"
EXPORTS
ImportConstruction @1
ImportDestruction @2
```

where xxx has to be replaced by the file extension.

"`ImportConstruction`“ is a function which takes no arguments. It allocates memory for the class "`Import`“ and returns a pointer to this memory. "`ImportDestruction`“ is a function taking a reference to a pointer to "`Import`“ as an argument and deleting the allocated memory. The return value of this function is of type "`void`“.

The following example of the corresponding *DLLStart.cpp* is a possible realization of the **.txt* format file:

```
# include "ImportTxt.h"
ImportTxt* ImportConstruction()
{
 return (new ImportTxt());
}
void ImportDestruction(ImportTxt* & Import)
{
 if(Import != NULL)
  delete Import;
}
```

where "ImportTxt.h" is the header file declaring the class.

Obtaining Screenshots

R&S ROMES fully supports the *Print Screen* functionality familiar from many other MS Windows applications. The contents of all views can be printed to a file or sent to a printer; an extended selection of print options is available. In addition, all pages can be previewed before they are sent to the printer.

If you still wish to obtain an accurate copy of your application screen, there are different ways to obtain screenshots:

- Available for all views is the *Copy to Clipboard* Function via the *Configuration Menu* (right mouse click), to copy the view to the clipboard.
- Via *File Print/Print Preview* it is possible to print everything what is visible in the *View Area*, date and name of the measurement file will be added.
- Copy the whole screen to the clipboard (***<PrtSc>***) or
- Copy the active window to the clipboard (***<Alt> + <PrtSc>***)

Note:
In R&S ROMES, the active window is always the frame application, not the individual views which are so-called child windows. Use the Copy to Clipboard Function *for a specific view.*

Now you can switch to another MS Windows application (***<Alt> + <TAB>***), like MS Word or MS PowerPoint, and insert the screenshot via ***<Shift> + <Insert>***. From this application you may also obtain hardcopies. All the screenshots in this documentation have been created this way.

Evaluation of GSM NQA Data with TS9954 NQA

TS9954 NQA is an evaluation software for GSM NQA data. The software is based on MS Excel. The GSM NQA data are loaded into an MS Excel folder with several worksheets providing tables and graphical diagrams. The worksheets can be modified using the full MS Excel functionality and stored to files.

Network Quality Analysis

The Network Quality Analysis data (NQA data) are the result of automatically performed telephone calls between the measuring GSM Test Mobile Station (TMS) and a fixed landline partner station. Each call is analyzed and the results are saved to a data file.

For each performed call a data package will be added to the generated NQA data file ("*.nqa", "*.nq2").

Measurement Parameters

To generate the NQA data file, both *NQA* and *Autodialing* must be enabled in the GSM driver configuration menus. The *NQA* and *Autodialing* tabs of the driver configuration menu provide parameters to define conditions and limits for the different call classes; see detailed information in chapter 6.

The measurement parameters used in the test are indicated in the *Header* MS Excel sheet which is the first sheet displayed when the TS9954 NQA MS Excel table *Nqa-mak.xls* is opened. See section Header on p. 7.53 ff.

The NQA Data Package

After the end of each performed call a NQA data package containing the following parameters is generated:

Table 7-5 NQA parameters

Number	NQA parameter	Available in MS Excel sheet DATA*) as	Explanation
1	Time	Time	HH:MM:SS
2	Position Latitude	---	**+** = North / **-** = South
3	Position Longitude	---	**+** = East / **-** = West
4	Class	Class	0 = Good Call 1 = Blocked Call 2 = Dropped Call 3 = No Service 4 = Start_of_Call 5 = *reserved* 6 = Start Of Dialing
5	Status	Status	0x0001 = Noisy 0x0002 = Excess_HO 0x0004 = Roaming 0x0010 = Delayed 0x0020 = RxLev_Noisy (only with *Noisy*) 0x0040 = RxQual_Noisy (only with *Noisy*)

Number	NQA parameter	Available in MS Excel sheet DATA*) as	Explanation
6	Blocking Cause	Bl Cause	Reason for *Blocked Call*
7	AVG PWR	Avg	Average transmitting power
8	RxQual Total	RxQ Total	Number of *RxQual* values
9...16	RxQual distribution	RxQ1...RxQ8	Distribution values of *RxQual*
17	RxLev Total	RxLev Total	Number of *RxLev* values
18...26	RxLev distribution	RxLev1...9	Distribution values of *RxLev*. Coding: 0 = RxLev of [0...10], dBm: <=-100 1 = RxLev of]10...15], dBm:]-100...-95] 2 = RxLev of]15...20], dBm:]-95...-90] 3 = RxLev of]20...25], dBm:]-90...-85] 4 = RxLev of]25...30], dBm:]-85...-80] 5 = RxLev of]30...35], dBm:]-80...-75] 6 = RxLev of]35...45], dBm:]-75...-65] 7 = RxLev of]45...50], dBm:]-65...-60] 8 = RxLev of]50...63], dBm: >-60
27	HO Attempt	HO Attempt	Number of *Handover* attempts
28	HO Success inter	HO Suc inter	Number of successful InterCell Handover attempts
29...36	HO Success distribution	HO Suc d1... ...HO Suc d8	Distribution values
37	HO Success intra	HO Suc intra	Number of successful IntraCell Handover attempts
38	SysResptime	SysResptime	Time between *Service Request* and *Assignment Command* in 1/18 seconds
39	CallResptime	CallResptime	Time between *Service Request* and *Alerting* in 1/18 seconds
40	EffectiveCallDuration	EffCall	Measured Call Duration in 1/18 seconds
41	Initial CI	Initial CI	*Cell Identity* at *Start of Call*
42	Final CI	Final CI	*Cell Identity* at *End of Call*
43	MCC	MCC	Mobile Country Code
44	MNC	MNC	Mobile Network Code
45	Mobile No.	Mobil Nr	Mobile number in the Measurement system

*) See section *DATA Table* on p. 7.65 ff.

Call Class and Status

For each call a *Class* and *Status* value is generated. The meaning of the values is listed in the following code table:

Class	0 = Good Call 1 = Blocked Call 2 = Dropped Call 3 = No Service 4 = Start_of_Call 5 = *reserved* 6 = Start Of Dialing
Status	Bit 0 = Noisy Bit 1 = Excess_HO Bit 2 = Roaming Bit 4 = Delayed Bit 5 = RxLev_Noisy (only with *Noisy*) Bit 6 = RxQual_Noisy (only with *Noisy*)

The *Class* parameter can own only one of the listed states at the same time, while *Status* consists of several bits and may contain any combination of values, with the exception of bit 5 and 6 (only with *Noisy*, bit 0).

The calls can be categorized in terms of the *Class* and the *Status* parameters. The following table shows the most important combinations used by TS9954 NQA. It is also shown as a legend in the description of every worksheet containing class/status combined parameters used in formulas; see section *Worksheets* on p. 7.52 ff.

Status \ ***Class***	**Good (0)**		**Blocked (1)**	**Dropped (2)**		**No Service (3)**
	CallResp-time >... s	CallResp-time <=...s		CallResp-time >... s	CallResp-time <=...s	
not Noisy 0xXXX**0**	**GR**	**G**	**BC**	**DR**	**D**	**NC**
Noisy 0xXXX**1**	**GRN**	**GN**		**DRN**	**DN**	

Example:

DRN means a *Dropped Call* has been classified as *Noisy* and its *Call Response Time* is beyond a certain limit.

The *Call Class* is the most important NQA parameter of the NQA data. The following classes are defined.

Class = Start of Dialing (MOC) A NQA data package with *Class* = *Start of Dialing* is generated every time the *Autodialing* function dials a number. The *Idle Time* to be set in the *Autodialing* tab of the driver configuration menu delays the beginning of the dialing relative to the start of the measurement or the last call. After the *Idle Time* a dial sequence is started and a *Start of Dialing* event is generated.

Class = Start of Call (MOC) A NQA data package with *Class* = *Start of Call* is generated every time dialing is finished and a call is established by the *Autodialing* function.

Class = Start of Call (MTC)

A NQA data package with *Class = Start of Call* is triggered for a MTC every time a PAGING_RESPONSE message is received and *Autodialing* function is enabled.

Class = Good Call (MOC)

A NQA data package with *Class = Good* is generated every time the successfully started call (ALERTING and/or CONNECT reached) is terminated by the system after the time defined by *Call Duration* in the *Autodialing* tab of the driver configuration menu has passed.

The package is generated after the first of the three messages DISCONNECT, RELEASE or CHANNEL RELEASE.

Class = Good Call (MTC)

A NQA data package with *Class = Good* is generated every time the successfully started call (PAGING_RESPONSE message is received) is terminated by the system after the time defined by *Call Duration* in the *Autodialing* tab of the driver configuration menu. The call has passed with CONNECT_ACK and DISCONNECT message.

Class = Blocked Call (MOC)

Class = Blocked is generated every time that

An idle message was detected during call setup but the call was not canceled. This happens in all cases where a call setup was performed at least up to the layer-3 message SERVICE REQUEST, but not up to ALERTING / CONNECT, and where no DISCONNECT, RELEASE or CHANNEL RELEASE was executed or....

The call was canceled, call setup was not performed up to ALERTING and/or CONNECT or...

A dial command has been sent to the mobile, but because of insufficient coverage no call could be established: The NQA machine remains IDLE. On the next dialing the system recognizes that no call could be established and one *Blocked call* is added.

Class = Blocked Call (MTC)

Class = Blocked is generated every time that the mobile switches to idle before the call was acknowledged, so no CONNECT_ACK message was received after the PAGING_RESPONSE.

Class = Dropped Call (MOC)

Class = Dropped is generated every time that

An established call is cancelled before the *Call duration* set in the *Autodialing* tab has passed or...

An established call is terminated not to order. A NQA data package will be generated when an *Idle or Error (No Service)* state is detected after a call was completely established and the *Call Duration* has not passed yet.

Class = Dropped Call (MTC)

Class = Dropped is generated every time that the mobile switches to idle after CONNECT_ACK but no DISCONNET message.

Class = No Service

Class = No Service is generated every time the system wants to dial but the mobile is out of service.

If the mobile remains out of service the time interval between two subsequent

No service calls is equal to the *Call duration* plus the *Idle time*, both set in the *Autodialing* tab.

Installation and Use of the NQA Software

The Network Quality Analysis software TS9954 NQA is an MS Excel application. All functions and formula have been developed using this product. TS9954 is available in different versions that are compatible with different MS Excel versions:

- TS9954 NQA version V2.1 for MS Excel V5.0 or higher
- TS9954 NQA version V3.0x for MS Excel V8.0 or higher

The version number of the software is displayed in the upper left corner of the *Header* sheet; see section *Header* on p. 7.53 f. The application files of both versions and the used file formats are listed in the following table.

Table 7-6 Comparison of TS9954 NQA V2.1 and V3.0x

	TS9954 NQA V2.1	**TS9954 NQA V3.0x**
Required MS Excel Version	V5.0 or higher	V8.0 or higher
Operating system	Windows 3.1 (16-bit application)	Newer Windows systems (32-bit application)
Data file formats	*.nqa, see p. 7.25	*.nqa, *, NQ2 (recommended), see p. 7.25
Max. number of mobiles	3	16
Application files	**NQA-MAK.XLS** Application startup file, containing basic settings and program functions. This file is hidden in MS Excel but can be unhidden and edited; see section *Special Functions* on p. 7.64 ff. **MOB1-NQA.XLT** MS Excel sheet with all charts and parameter tables for the evaluation of the mobile 1 data. **MOB2-NQA.XLT** MS Excel sheet with all charts and parameter tables for the evaluation of the mobile 2 data. **MOB3-NQA.XLT** MS Excel sheet with all charts and parameter tables for the evaluation of the mobile 3 data.	**NQA-MAK.XLS** Application startup file, containing basic settings and program functions, including the settings for language and logo. This file is hidden in MS Excel but can be unhidden and edited; see section *Special Functions* on p. 7.64 ff. **MOB-NQA.XLT** MS Excel template with all charts and parameter tables for the evaluation of all mobile data. This template is multiplied according to the number of mobiles included in the loaded measurement data.

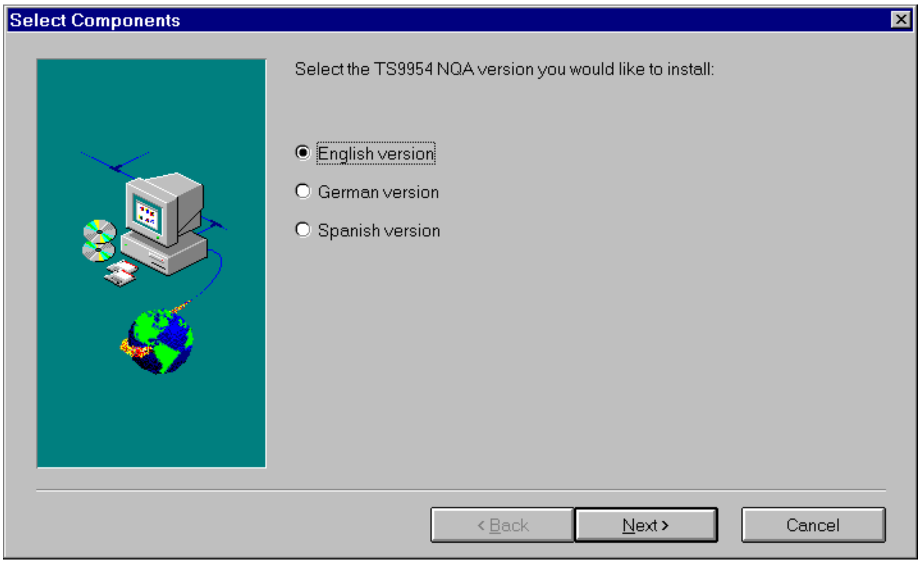
Note:
Unless otherwise stated the information given in the following sections holds for TS9954 NQA V3.0x. However, it is also valid for TS9954 NQA V2.1 with minor modifications. In particular, all worksheets provided are identical in both versions.

Installing the NQA Software

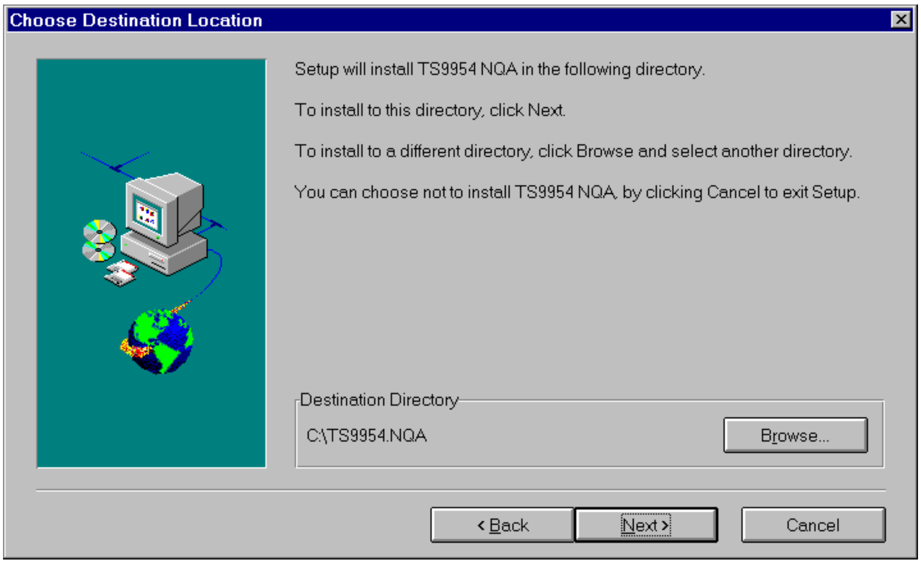
Installation of TS9954 NQA is menu-guided. We point out the essential steps.

1. Copy the installation version into a directory and run the setup file *Setup.exe* (double-clicks or use the *Run* command in the Windows *Start* menu).

The setup program opens a blue *Setup* screen and a dialog to select the preferred language:



2. Click one of the three radio buttons to select your language and click *Next* > to continue.

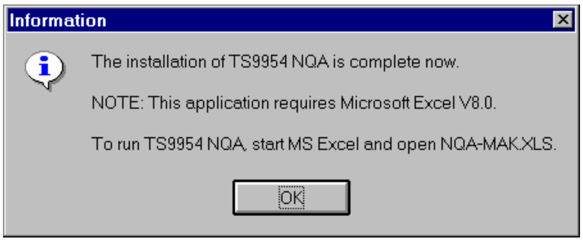


The language can still be changed after the software is installed; see section *Language and Logo* on p. 7.65 ff.

3. In the *Choose Destination Location* dialog, use the *Browse* button to select a directory for the application files NQA-MAK.XLS and MOB-NQA.XLT.

4. Click *Next* > to continue and finish the setup procedure.

The application displays the following message box:



5. Click OK to confirm the message and close the *Setup* screen.

Note:
All application files have to remain in the same directory and are necessary part of the application. Missing or renamed files will cause an error message File ... not found.

Starting and Operating TS9954 NQA

The installed application is simply started by loading the application file NQA-MAK.XLS into the appropriate MS Excel version. Doing this opens a dialog to select the NQA data file (*.nqa or *.nq2; see *Table 7-6* on p. 7.49) to be analyzed. The NQA data file can be located in any directory of any drive accessible from the PC.

Loading the data can take some time, during which the current status is shown in the bottom line. Irrespective of the number of data files to be viewed and the number of mobiles included in each data file, the file NQA-MAK.XLS has to be loaded only once. It provides all necessary functions for the current MS Excel session.

NQA-MAK.XLS generates a separate MS Excel folder for every mobile analyzed. The folders are divided into several individual worksheets; see section *Worksheets* on p. 7.52 ff. The worksheets can be modified and extended using the full MS Excel functionality; for information refer to the MS Excel help system. To facilitate data handling and switchover between different folders the application adds some functionality to MS Excel:

File – Read NQA Data ...

In the *File* menu, the additional command *Read NQA Data* is added. This command calls up an *Open NQA Data File* dialog to select and open a new NQA data file .

Loading a new NQA data file initiates a new evaluation, independent from the previous ones. MS Excel creates a new folder for each mobile in the new data file and numbers the folders in ascending order.

Window – MOBn-NAQm

The *Windows* menu contains a list of all current folders. The names of the folders *MOBn-NAWm* are automatically generated when a NQA data file is opened:

n numbers the mobiles within a data file, starting with 1 (n ≤ 16).

m numbers the folders in order of their creation.

Two folders can have the same mobile number n but always differ by their folder number m. Selecting a folder activates it and displays either the worksheet that was active last time when the folder was opened or the (default) *Header* worksheet.

Saving Folders

A folder can be saved to an MS Excel file using the *Save* or *Save As...* commands in the *File* menu. The default folder file name is NQA-MAK.XLS for software version 2.1 (see warning below) and MOB-NQAm.XLS (where m numbers the folders generated in a session) for software version 3.0x. Saved folder files can be reused and modified.

Caution!

*Be sure **not** to overwrite the application files when saving your evaluated NQA charts ! In software V2.1, the default file name for saving a folder is identical with the name of the startup file* NQA-MAK.XLS.

It is therefore recommended to keep a backup of the application files before starting the software for the first time.

The default values for the chart entries can be modified after unhiding NQA-MAK.XLS, which is hidden by default; see section *Special Functions* on p. 7.64 ff. The folder files are not write-protected and can be modified.

Worksheets

In software version V3.0x, NQA-MAK.XLS generates a separate MS Excel folder for every mobile analyzed; see section *Starting and Operating TS9954 NQA* on p. 7.51 ff. The folder is divided into several individual worksheets. The worksheets can be activated by clicking the tabs across the bottom of the MS Excel main application window:

The *Header* worksheet is opened by default. All worksheets contain the data for one mobile.

In software 2.1 one folder for up to three mobiles is created. The *Header* sheet describes all mobiles ; the other worksheets are mobile-specific. Besides, the contents and use of the worksheets does not depend on the software version.

Note:
Many of the worksheets contain pie charts or bar charts to visualize the distribution of a quantity. Clicking a point inside a diagram opens dialog boxes to customize the diagram or one of its elements. For more information refer to the MS Excel What's this...? help.

Header

This sheet contains general information about the measurement tour, the mobile used and the NQA settings:

C:\TS9954\DD2MU3.DIR\MEASDATA\DD2MU302.NQA		*NQA data filename*
03/18/02		*Date*
14:09:06		*Time*
DEMOCASE		*Operator*
		Comment line 1
		Comment line 2
		Comment line 3
		Comment line 4
	Mobile 1	
Name:	AEG9020_104	*Mobile Name*
FW Version:	2.00	*Mobile Firmware Vers.*
Mobile Configuration:	GSM	*Net type*
MCC:	262	*Mobile Country Code (*Three-digit number, e.g. 262 for Germany)
MNC:	01	*Mobile Network Code ((Two-digit number, e.g. 01 = D1 Net (GSM 900), 02 = D2 Net (GSM 900), 03 = E Net (DCS 1800) in Germany))*
Call Delay [sec]:	10	
Call Duration [sec]:	10	*(*Parameter set in the *Autodialing* tab of the driver configuration menu)
HO Maxcnt:	2	*(*Parameter set in the *NQA* tab of the driver configuration menu)
Call Delay Limit [sec]:	10	(Identical with the *Blocked Call Delay* parameter set in the *NQA* tab of the driver configuration menu)
RxLev Threshold:	20	
RxLev Exceed:	50	
RxQual Threshold:	5	
RxQual Exceed:	50	

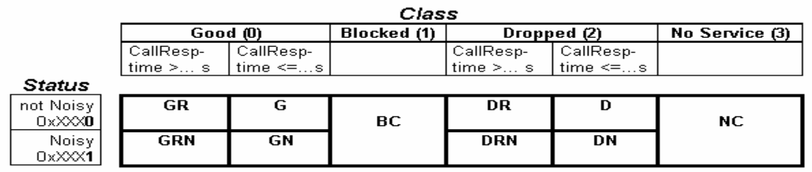
Call Statistics

This sheet displays the number of calls for each call class and the relative frequency of call classes:

Good	Blocked	Dropped	No Service
58,8%	2,0%	39,2%	0,0%
117	4	78	0

+ Pie chart showing the relative frequency of call classes.

Column	Row	Meaning	Formula (see legend below)
Good	abs	Number of calls with Class = Good (0)	G+GR+GN+GRN
Blocked	abs	Number of calls with Class = Blocked (1)	BC
Dropped	abs	Number of calls with Class = Dropped (2)	D+DR+DN+DRN
No Service	abs	Number of calls with Class = No Service (3)	NC
Good	rel	Ratio of Good calls to Sum of all calls	(G+GR+GN+GRN) / all calls
Blocked	rel	Ratio of Blocked calls to Sum of all calls	BC / all calls
Dropped	rel	Ratio of Dropped calls to Sum of all calls	(D+DR+DN+DRN) / all calls
No Service	rel	Ratio of NoService calls to Sum of all calls	NC / all calls



RxQual

This sheet displays information about the distribution of RxQual values measured by the mobile phone and transferred to the test system. In GSM networks the mobile provides a new RxQual value about every 480 ms.

RxQual	0	1	2	3	4	5	6	7
relative	68,9%	4,8%	3,7%	4,4%	4,4%	3,4%	1,7%	9,0%
absolute	4352	302	231	275	275	214	105	566

+ Bar chart showing the relative frequency of all RxQual values.

Column	Row	Meaning
RxQual 0	abs	Number of RxQual = 0 values
RxQual 1	abs	Number of RxQual = 1 values
RxQual 2	abs	Number of RxQual = 2 values
RxQual 3	abs	Number of RxQual = 3 values
RxQual 4	abs	Number of RxQual = 4 values
RxQual 5	abs	Number of RxQual = 5 values
RxQual 6	abs	Number of RxQual = 6 values
RxQual 7	abs	Number of RxQual = 7 values
RxQual 0	rel	Ratio of RxQual = 0 values to total number of recorded RxQual values
RxQual 1	rel	Ratio of RxQual = 1 values to total number of recorded RxQual values
RxQual 2	rel	Ratio of RxQual = 2 values to total number of recorded RxQual values
RxQual 3	rel	Ratio of RxQual = 3 values to total number of recorded RxQual values
RxQual 4	rel	Ratio of RxQual = 4 values to total number of recorded RxQual values
RxQual 5	rel	Ratio of RxQual = 5 values to total number of recorded RxQual values
RxQual 6	rel	Ratio of RxQual = 6 values to total number of recorded RxQual values
RxQual 7	rel	Ratio of RxQual = 7 values to total number of recorded RxQual values

RxQual (Range)

This sheet contains information about the distribution of RxQual values in different ranges of the RxQual scale (ranging from 0 to 7). In GSM networks the mobile provides a new RxQual value about every 480 ms. The three default RxQual ranges are 0 to 3, 4, and 5 to 7.

RxQual	0 to 3	4	5 to 7					
relative	81,6%	4,4%	14,0%					
absolute	5160	275	885					

+ Pie chart showing the relative frequency of RxQual values in the current ranges.

Up to 8 ranges can be defined in the table below the pie chart. Overwriting a number in the white cells changes the results in the upper table and the pie chart. Clicking the *Default* cell restores the default ranges. These ranges are stored in the NQA-MAK.XLS file; see section *Special Functions* on p. 7.64 ff.

Default	B1	B2	B3	B4	B5	B6	B7	B8
from	0	4	5					
to	3	4	7					

Column	Row	Meaning
RxQual 0...3	abs	Number of RxQual = 0...3
RxQual 4	abs	Number of RxQual = 4
RxQual 5...7	abs	Number of RxQual = 5...7
...	...	...
RxQual 0...3	rel	Ratio of RxQual = 0...3 values to total number of recorded RxQual values
RxQual 4	rel	Ratio of RxQual = 4 values to total number of recorded RxQual values
RxQual 5...7	rel	Ratio of RxQual = 5...7 values to total number of recorded RxQual values
...	...	...

RxLev

This sheet contains information about the distribution of RxLev values in different ranges of the RxLev scale (ranging from 0 to 63). In GSM networks the mobile provides a new RxLev value about every 480 ms.

+ Bar chart showing the relative frequency of all RxLev values in the current ranges.

RxLev / dBm	<=-100	]-100...-95]	]-95...-90]	]-90...-85]	]-85...-80]	]-80...-75]	]-75...-65]	]-65...-60]	>-60
relative	0,3%	1,7%	3,4%	5,4%	9,9%	14,2%	31,0%	15,5%	18,7%
absolute	18	113	218	350	643	920	2011	1007	1211

Column	Row	Meaning
<=-100	abs	Number of RxLev = 0
]-100...-95]	abs	Number of RxLev = 1
] -95...-90]	abs	Number of RxLev = 2
] -90...-85]	abs	Number of RxLev = 3
] -85...-80]	abs	Number of RxLev = 4
] -80...-75]	abs	Number of RxLev = 5
] -75...-65]	abs	Number of RxLev = 6
] -65...-60]	abs	Number of RxLev = 7
>-60	abs	Number of RxLev = 8
<=-100	rel	Ratio of RxLev = 0 values to total number of recorded RxLev values
]-100...-95]	rel	Ratio of RxLev = 1 values to total number of recorded RxLev values
] -95...-90]	rel	Ratio of RxLev = 2 values to total number of recorded RxLev values
] -90...-85]	rel	Ratio of RxLev = 3 values to total number of recorded RxLev values
] -85...-80]	rel	Ratio of RxLev = 4 values to total number of recorded RxLev values
] -80...-75]	rel	Ratio of RxLev = 5 values to total number of recorded RxLev values
] -75...-65]	rel	Ratio of RxLev = 6 values to total number of recorded RxLev values
] -65...-60]	rel	Ratio of RxLev = 7 values to total number of recorded RxLev values
>-60	rel	Ratio of RxLev = 8 values to total number of recorded RxLev values

PWR-Time

This sheet contains information about the average transmitter output power of the mobile and the system times.

	Avg-PWR	Avg-PWR [dBm]	Mobile Configuration
Min	6	18	GSM1800
Max	0	30	
Avg	1,59		
Std. dev.	1,81		

	SysResptime	CallResptime	EffectiveCallDuration
Min	4,83	6,56	3,11
Max	8,83	11,22	15,22
Avg	5,71	7,69	10,47
Std. dev.	0,39	0,47	1,48

Column	Row	Meaning
Avg-PWR (The average transmitter output power Avg-PWR is expressed in Power Control Level (PCL) units; see PCL tables in chapter 8.)	Min	Maximum of the average PWR values of all Good (0) or Dropped (2) calls
	Max	Minimum of the average PWR values of all Good (0) or Dropped (2) calls
	Avg	Average of the average PWR values of all Good (0) or Dropped (2) calls
	Std. dev.	Standard deviation of the average PWR values of all Good (0) or Dropped (2) calls

Column	Row	Meaning
Avg-PWR [dBm] (The average transmitter output power Avg-PWR [dBm] is derived from the PCLs (Avg-PWR) as follows: GSM900: Avg-PWR [dBm] = 43 - 2* Avg-PWR GSM1800/1900: Avg-PWR [dBm] = 30 - 2* Avg-PWR)	Min	Maximum of the average PWR values of all Good (0) or Dropped (2) calls in [dBm]
	Max	Minimum of the average PWR values of all Good (0) or Dropped (2) calls in [dBm]
Mobile Configuration		Taken from *Header* sheet : *Mobile Configuration* of the actual mobile
SysResptime (Calculation: SysResptime [sec] = System response time / 18)	Min	Minimum SysResptime of all Good (0) or Dropped (2) calls
	Max	Maximum SysResptime of all Good (0) or Dropped (2) calls
	Avg	Average SysResptime of all Good (0) or Dropped (2) calls
	Std. dev.	Standard deviation of the SysResptime of all Good (0) or Dropped (2) calls
CallResptime (Calculation: CallResptime [sec] = Call response time / 18)	Min	Minimum CallResptime of all Good (0) or Dropped (2) calls
	Max	Maximum CallResptime of all Good (0) or Dropped (2) calls
	Avg	Average CallResptime of all Good (0) or Dropped (2) calls
	Std. dev.	Standard deviation of the CallResptime of all Good (0) or Dropped (2) calls
EffectiveCallDuration (Calculation: EffectiveCall-Duration [sec] = Effective call duration / 18)	Min	Minimum EffectiveCallDuration of all Good (0) or Dropped (2) calls
	Max	Maximum EffectiveCallDuration of all Good (0) or Dropped (2) calls
	Avg	Average EffectiveCallDuration of all Good (0) or Dropped (2) calls
	Std. dev.	Standard deviation of the EffectiveCallDuration of all Good (0) or Dropped (2) calls

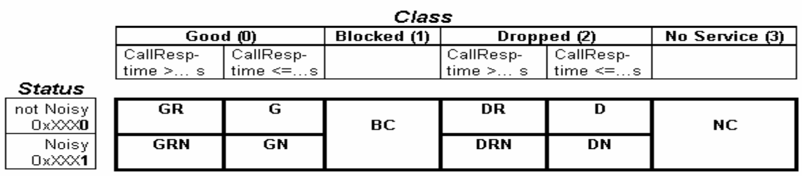
HO Info

This sheet contains a statistical evaluation of all recorded handover attempts and handovers.

	absolute	relative	relative
Sum of Calls	195		
Sum of HO trials	111	100%	
Successful HOs	111	100%	100%
InterCell	75		68%
IntraCell	36		32%
Trials/Call Min	0		
Trials/Call Max	2		
Trials/Call Avg	0,57		

Column	Row	Meaning	Formula (see legend below)
abs	Sum of calls	Number of Good (0) or Dropped (2) calls	G+GR+GN+GRN+D+DR+DN+DRN

Column	Row	Meaning	Formula (see legend below)
abs	Sum of HO trials	Total number of handover attempts in all Good (0) or Dropped (2) calls	
abs	Successful HOs	Total number of all InterCell and IntraCell handovers in all Good (0) or Dropped (2) calls	
abs	InterCell	Total number of all successful Intercell handovers in all Good (0) or Dropped (2) calls	
abs	IntraCell	Total number of all successful Intracell handovers in all Good (0) or Dropped (2) calls	
abs	Trials/Call Min	Minimum Number of handover attempts during a Call in all Good (0) or Dropped (2) calls	
abs	Trials/Call Max	Maximum Number of handover attempts during a Call in all Good (0) or Dropped (2) calls	
abs	Trials/Call Avg	Ratio of Sum of HO trials to Sum of calls	
rel	Sum of HO trials	100 %	
rel	Successful HOs	Ratio of Successful HOs to HO attempts	
rel	Successful HOs	100 %	
rel	InterCell	Ratio of InterCell HOs to successful HOs	
rel	IntraCell	Ratio of IntraCell HOs to successful HOs	



SysResptime

This sheet contains information about the distribution of the System Response Time values :

t/s	[0...2[	[2...4[	[4...6[	[6...8[	[8...10[	[10...12[	[12...14[	[14...16[	[16...18[	[18...
relative	0,0%	0,0%	83,1%	16,4%	0,5%	0,0%	0,0%	0,0%	0,0%	0,0%
absolute	0	0	162	32	1	0	0	0	0	0

+ Bar chart showing the relative number of calls with a System Response Time in the defined ranges.

The ranges can be defined in the table below the bar chart. Overwriting a number in the white cells changes the results in the upper table and the pie chart. Clicking the *Default* cell restores the default ranges. These ranges are stored in the NQA-MAK.XLS file; see section *Special Functions* on p. 7.64 ff.

Column	Row	Meaning
[0...2 [	abs	Number of calls with SysResptime/18 in the range 0 ... 2 in all Good (0) or Dropped (2) calls
[2...4 [	abs	...
[4...6 [	abs	...
[6...8 [	abs	...
[8...10 [	abs	...
[10...12 [	abs	...
[12...14 [	abs	...
[14...16 [	abs	...
[16...18 [	abs	...
[18...	abs	...

Column	Row	Meaning
[0...2 [	rel	Ratio: Number of calls with SysResptime/18 in the range of 0 ... 2 divided by the Sum of all Good (0) or Dropped (2) calls
[2...4 [	rel	...
[4...6 [	rel	...
[6...8 [	rel	...
[8...10 [	rel	...
[10...12 [	rel	...
[12...14 [	rel	...
[14...16 [	rel	...
[16...18 [	rel	...
[18...	rel	...

Call Resptime

This sheet contains information about the distribution of the Call Response Time values :

t/s	[0...2[	[2...4[	[4...6[	[6...8[	[8...10[	[10...12[	[12...14[	[14...16[	[16...18[	[18...
relative	0,0%	0,0%	0,0%	78,3%	21,2%	0,5%	0,0%	0,0%	0,0%	0,0%
absolute	0	0	0	159	43	1	0	0	0	0

+ Bar chart showing the relative number of calls with a Call Response Time in the defined ranges.

The ranges can be defined in the table below the bar chart. Overwriting a number in the white cells changes the results in the upper table and the pie chart. Clicking the *Default* cell restores the default ranges. These ranges are stored in the NQA-MAK.XLS file; see section *Special Functions* on p. 7.64 ff.

Column	Row	Meaning
[0...2 [	abs	Number of calls with CallResptime/18 in the range 0 ... 2 in all Good (0) or Dropped (2) calls
[2...4 [	abs	...
[4...6 [	abs	...
[6...8 [	abs	...
[8...10 [	abs	...
[10...12 [	abs	...
[12...14 [	abs	...
[14...16 [	abs	...
[16...18 [	abs	...
[18...	abs	...
[0...2 [	rel	Ratio: Number of calls with CallResptime/18 in the range of 0 ... 2 divided by the Sum of all Good (0) or Dropped (2) calls
[2...4 [	rel	...
[4...6 [	rel	...
[6...8 [	rel	...
[8...10 [	rel	...
[10...12 [	rel	...
[12...14 [	rel	...
[14...16 [	rel	...
[16...18 [	rel	...
[18...	rel	...

Noisy

This sheet gives information about the *Noisy* calls:

	absolute	relative
Total Calls	213	100%
Noisy Calls	8	3,8%
Noisy RxLev	8	3,8%
Noisy RxQual	2	0,9%

Column	Row	Meaning	Formula (see legend below)
abs	Total Calls	Number of Good (0) or Dropped (2) calls	G+GR+GN+GRN + D+DR+DN+DRN
abs	Noisy Calls	Number of Noisy calls among the Good (0) or Dropped (2) calls	GN+GRN +DN+DRN
abs	Noisy RxLev	Number of RxLev Noisy calls among the Good (0) or Dropped (2) calls	Subset RxLev Noisy of (GN+GRN +DN+DRN)
abs	Noisy RxQual	Number of RxQual Noisy calls among the Good (0) or Dropped (2) calls	Subset RxQual Noisy of (GN+GRN +DN+DRN)
rel	Total Calls	100 %	100 %
rel	Noisy Calls	Ratio of Number of Noisy calls among all Good (0) or Dropped (2) calls to Sum of all Good (0) or Dropped (2) calls	(GN+GRN +DN+DRN) / (G+GR+GN+GRN + D+DR+DN+DRN)
rel	Noisy RxLev	Ratio of Number of RxLev Noisy calls among all Good (0) or Dropped (2) calls to Sum of all Good (0) or Dropped (2) calls	(Subset RxLev Noisy of (GN+GRN +DN+DRN)) / (G+GR+GN+GRN + D+DR+DN+DRN)
rel	Noisy RxQual	Ratio of Number of RxQual Noisy calls among all Good (0) or Dropped (2) calls to Sum of all Good (0) or Dropped (2) calls	(Subset RxQual Noisy of (GN+GRN +DN+DRN)) / (G+GR+GN+GRN+ D+DR+DN+DRN)

	Class					
	Good (0)		Blocked (1)	Dropped (2)		No Service (3)
Status	CallResp-time >... s	CallResp-time <=...s		CallResp-time >... s	CallResp-time <=...s	
not Noisy 0xXXX0	GR	G	BC	DR	D	NC
Noisy 0xXXX1	GRN	GN		DRN	DN	

SucRate

This sheet contains information about the Success Rate, i.e. the absolute and relative frequency of the different call classes. In contrast to the

SucRate 100% (see p. 7.61) the SucRate is not normalized. A call may contribute to more than one call class, so the sum of Good, Dropped, Blocked, No Service and Noisy calls may exceed the total number of calls. In particular, the Noisy calls contribute to the Good as well as to the Dropped calls.

	absolute	relative
Total Calls	217	100%
Good	213	98,2%
Dropped	0	0,0%
Blocked	4	1,8%
No Service	0	0,0%
Noisy	8	3,7%

+ Bar chart showing the relative frequencies of Good, Dropped, Blocked, No Service, and Noisy calls.

Column	Row	Meaning	Formula (see legend below)
Abs	Total Calls	Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls, including the Noisy calls among the Good (0) or Dropped (2) calls	G+GR+GN+GRN+ D+DR+DN+DRN+ +BC+NC
Abs	Good Calls	Number of Good (0) calls	G+GR+GN+GRN
Abs	Dropped	Number of Dropped (2) calls	D+DR+DN+DRN
Abs	Blocked Calls	Number of Blocked (1) calls	BC
Abs	No Service	Number of No Service (3) calls	NC
Abs	Noisy	Number of Noisy calls among the Good (0) or Dropped (2) calls	GN+GRN+DN+DRN
rel	Total Calls	100 %	100 %
rel	Good Calls	Ratio of Good (0) Calls to Total Calls	(G+GR+GN+GRN)/ (G+GR+GN+GRN+ D+DR+DN+DRN+ BC+NC)
rel	Dropped	Ratio of Dropped (2) Calls to Total Calls	(D+DR+DN+DRN) / (G+GR+GN +GRN+ D+DR+DN+DRN+BC+NC)
rel	Blocked Calls	Ratio of Blocked (1) Calls to Total Calls	BC / (G+GR+GN+GRN+ D+DR+DN+DRN + BC+NC)
rel	No Service	Ratio of No Service (3) Calls to Total Calls	NC / (G+GR+GN+GRN + D+DR+DN+DRN+BC+NC)
rel	Noisy	Ratio of Noisy calls among the Good (0) or Dropped (2) Calls to Total Calls	(GN+GRN+DN+DRN) / (G+GR+GN+GRN+ D+DR+DN+DRN+BC+NC)

<table>
<tr><td></td><td colspan="6">Class</td></tr>
<tr><td></td><td colspan="2">Good (0)</td><td>Blocked (1)</td><td colspan="2">Dropped (2)</td><td>No Service (3)</td></tr>
<tr><td>Status</td><td>CallResp-time >... s</td><td>CallResp-time <=...s</td><td></td><td>CallResp-time >... s</td><td>CallResp-time <=...s</td><td></td></tr>
<tr><td>not Noisy 0xXXX0</td><td>GR</td><td>G</td><td rowspan="2">BC</td><td>DR</td><td>D</td><td rowspan="2">NC</td></tr>
<tr><td>Noisy 0xXXX1</td><td>GRN</td><td>GN</td><td>DRN</td><td>DN</td></tr>
</table>

SucRate 100%

This sheet contains information about the normalized Success Rate. In contrast to the *SucRate* (see p. 7.60) the SucRate 100% is normalized in such a way that the sum of Good, Dropped, Blocked, No Service and Noisy calls plus the Good calls exceeding a definite Call Response Time is equal to the total number of calls. The Noisy calls and the calls exceeding a definite Call Response Time are not included in the Good calls.

Default		absolute	relative
Total Calls		217	100%
No Service		0	0,0%
Blocked		4	1,8%
Dropped		0	0,0%
CallResptime	>15s	0	0,0%
Noisy		8	3,7%
Good		205	94,5%

The CallResptime (Call Response Time) parameter can either be changed via keyboard or by clicking the *Default* button, which inserts the default value taken from the application file NQA-MAK.XLS; see section *Special Functions* on p. 7.64 ff.

+ Bar chart showing the relative frequencies of Total (100%), No Service, Blocked, CallRespTime, Noisy, and Good Calls.

Column	Row	Meaning	Formula (see legend below)
abs	Total Calls	Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls	G+GR+ GN+GRN+ D+DR+ DN+DRN+ BC+NC
abs	No Service	Number of No Service (3) calls	NC
abs	Blocked Calls	Number of Blocked (1) calls	BC
abs	Dropped	Number of Dropped (2) calls	D+DR+DN+DRN
abs	CallResptime > 15 s	Number of Good (0) calls with Call Response time exceeding the selected value	GR+GRN
abs	Noisy	Number of Good (0) calls with Call Response time below the selected value that are also Noisy	GN
abs	Good Calls	Number of Good (0) calls with Call Response time below the selected value that are not Noisy	G
rel	Total Calls	100 %	100 %
rel	No Service	Ratio: Number of No Service (3) calls divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	NC / (G+GR+GN+GRN+ D+DR+DN+DRN+ BC+NC)
rel	Blocked Calls	Ratio: Number of Blocked (1) calls divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	BC / (G+GR+GN +GRN+ D+DR+DN+DRN+ BC+NC)
rel	Dropped	Ratio: Number of Dropped (2) calls divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	(D+DR+DN+DRN) / (G+GR+GN+GRN+ D+DR+DN+DRN+ BC+NC)
rel	Call Response Time > 10 s 1)	Ratio: Number of Good (0) calls with Call Response time exceeding the selected value divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	(GR+GRN) / (G+GR+GN+GRN + D+DR+DN+DRN+ BC+NC)

Column	Row	Meaning	Formula (see legend below)
rel	Noisy	Ratio: Number of Good (0) calls with Call Response time below the selected value that are also Noisy, divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	GN / (G+GR+GN+GRN+ D+DR+DN+DRN+ BC+NC)
rel	Good Calls	Ratio: Number of Good (0) calls with Call Response time below the selected value that are not Noisy, divided by the Sum of all Good (0), Dropped (2), Blocked (1) and No Service (3) calls plus the Noisy calls among the Good (0) or Dropped (2) calls	G / (G+GR+GN+GRN+ D+DR+DN+DRN+ BC+NC)

Status \ *Class*	Good (0)		Blocked (1)	Dropped (2)		No Service (3)
	CallResp-time >... s	CallResp-time <=...s		CallResp-time >... s	CallResp-time <=...s	
not Noisy 0xXXX0	GR	G	BC	DR	D	NC
Noisy 0xXXX1	GRN	GN		DRN	DN	

Each call is assigned exclusively to one single type of call. As some calls can possibly be assigned to more than one class, priorities must be assigned to the classes :

Priority	Call type	Formula
6	No Service	NC
5	Blocked	BC
4	Dropped	D+DR+DN+DRN
3	Call Response Time > 10 s	GR+GRN
2	Noisy	GN
1	Good	G

6 is the top priority, 1 is the lowest priority. Therefore, if a call is Dropped and Noisy at the same time, it will be classified as a *Dropped* call.

SucRate (switch.)

This sheet defines and evaluates a Success Rate with selectable contributions. The sheet provides switches to select the calls that are classified as successful calls.

Call Trials	Call SucRate
100%	100.0%

Filter	Dropped	Blocked	Noisy	No Service	Call Resp. Time	Syst. Resp. Time	
On/Off	Off	Off	Off	Off	Off (>10s)	Off (>10s)	
	S1	**S2**	**S3**	**S4**	**S5**	**S6**	← **Switch**

+ Bar chart showing the percentage of call trials and the user-defined Call Success Rate.

The parameter list for setting the switches S1 to S6 and the Response Times is located directly underneath the bar chart. The *Default* button assigns the default values taken from the *Default* sheet in NQA-MAK.XLS; see section *Special Functions* on p. 7.64 ff.

Column	**Meaning**	**Formula (see legend below)**
Call Trials = All Calls	Sum of the Good (0), Dropped (2), Blocked (1) and No Service (3) calls.	G+GR+GN+GRN+D+ DR+DN+DRN+BC+NC
Call Success Rate	Depending on the switch position, the single types of calls are subtracted from the total number of Call Trials.	See below

$$\text{Call Success Rate} = \frac{\text{All Calls} - \sum_{\textit{All Calls}} \text{Flag}}{\text{All Calls}}$$

The Call Success Rate is a number between 0% and 100%. The *Flag* is calculated for every single call according to the following formula:

Flag =
$(S1 \cap \text{Dropped}) \cup (S2 \cap \text{Blocked}) \cup (S3 \cap \text{Good} \cap \text{Noisy}) \cup$
$(S3 \cap \text{Dropped} \cap \text{Noisy}) \cup (S4 \cap \text{No Service}) \cup$
$(S5 \cap \text{Good} \cap \text{Call Response Time} > \text{selected value}) \cup$
$(S5 \cap \text{Dropped} \cap \text{Call Response Time} > \text{selected value}) \cup$
$(S6 \cap \text{Good} \cap \text{System Response Time} > \text{selected value}) \cup$
$(S6 \cap \text{Dropped} \cap \text{System Response Time} > \text{selected value})$

S1 to S6 are switches, to be set independently in the parameter list to either ON (1) or OFF (0). $\cap$ denotes an "AND" combination, $\cup$ denotes an "OR" combination.

Status \ *Class*	Good (0) CallResp-time >... s	Good (0) CallResp-time <=...s	Blocked (1)	Dropped (2) CallResp-time >... s	Dropped (2) CallResp-time <=...s	No Service (3)
not Noisy 0xXXX0	GR	G	BC	DR	D	NC
Noisy 0xXXX1	GRN	GN		DRN	DN	

Examples: In the default setting where all switches S1 to S6 are set to OFF (0), the Call Success Rate is always 100%.
If only S1 is set to ON (1), all Dropped calls (DR + D + DRN + DN) are classified as being not successful. If the data set contains any Dropped calls, the Call Success Rate is smaller than 100%.
If only S3 is set to ON (1), all Dropped calls that are also Noisy (DRN + DN) are classified as being not successful; the Dropped calls that are not Noisy (DR + D) are still classified as being successful. If the data set contains any Dropped calls that are also Noisy, the Call Success Rate is smaller than 100%.

Special Functions

The evaluation software TS9954 NQA provides a number of additional functions to customize the worksheets, change the language and the logo, modify the data and print the contents of a worksheet.

The NQA-MAK.XLS file contains three sheets to edit default values and select the language and the logo displayed on top of each worksheet. Within MS Excel this file is hidden by default but can be displayed and edited using the *Window - Unhide* menu item. The file provides a folder with three tabs to select the three worksheets *Default, Language,* and *Logo.*

All three sheets are protected with a password that must be entered into a dialog window following the instructions displayed by MS Excel.

Note:
*The password to be used at the first time after installing TS9954 NQA is "**a**". After typing in "a" to access and modify a NQA-MAK.XLS sheet it is possible to renew the protection using another password or omit the password protection altogether.*

Default Values

The *Default* worksheet in the NQA-MAK.XLS file displays the following **Default values:**

RxQual (Range)	B1	B2	B3	B4	B5	B6	B7	B8
from (incl.)	0	4	5					
to (incl.)	3	4	7					

CallResptime	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
from (incl.)	0	2	4	6	8	10	12	14	16	18
to (excl.)	2	4	6	8	10	12	14	16	18	

SysResptime	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
from (incl.)	0	2	4	6	8	10	12	14	16	18
to (excl.)	2	4	6	8	10	12	14	16	18	

SucRate 100%	
CallResptime	>15s

SucRate (switch.)		On(1)/Off(0)
Dropped		**0**
Blocked		**0**
Noisy		**0**
No Service		**0**
CallResptime	>15s	**0**
SysResptime	>10s	**0**

The headers *RxQual (Range)* etc. denote the worksheets where the default values are used. A default value can be modified after double-clicking on the cell.

Language and Logo

The *Language* worksheet in the NQA-MAK.XLS file displays a German, English, and a Spanish dictionary. It is possible to select one of the three languages and modify the vocabulary.

In the *Logo* worksheet, it is possible to select a logo to be displayed on each worksheet and define its position.

DATA Table

When the NQA data files are loaded the data are evaluated and the results written into the DATA table. The DATA table provides easy access to the data and can be used to modify the data and create new charts.

Printing

All sheets have a pre-defined printing area set for DIN A4 landscape format. Hardcopies can be printed using the MS Excel printer settings. A print preview is available in the file menu or on clicking the corresponding button in the MS Excel toolbar.

Modification of the Worksheets

The *MOB1...* folder files (see section *Starting and Operating TS9954 NQA* on p. 7.51 ff.) are visible and not protected. They can be modified for your own personal requirements.

All functions used are standard MS Excel functions. Every experienced MS Excel user can modify and extend the formula. Knowledge about database, matrix and VBA macro functions are indispensable, knowledge in software programming is useful.

Sheet concept The sheets depend on each other, data links have been installed between them.

Hidden cells In some sheets several areas are hidden. These areas are used for matrix definitions and interim calculations.

Macros In the VBA macro a special item is to be found: It is not possible to detect missing mobile data before loading is finished, and copying functions on empty cells in this macro would lead to error messages. So, during this time, error messages are suppressed. When you face problems modifying the software, switch off this function.

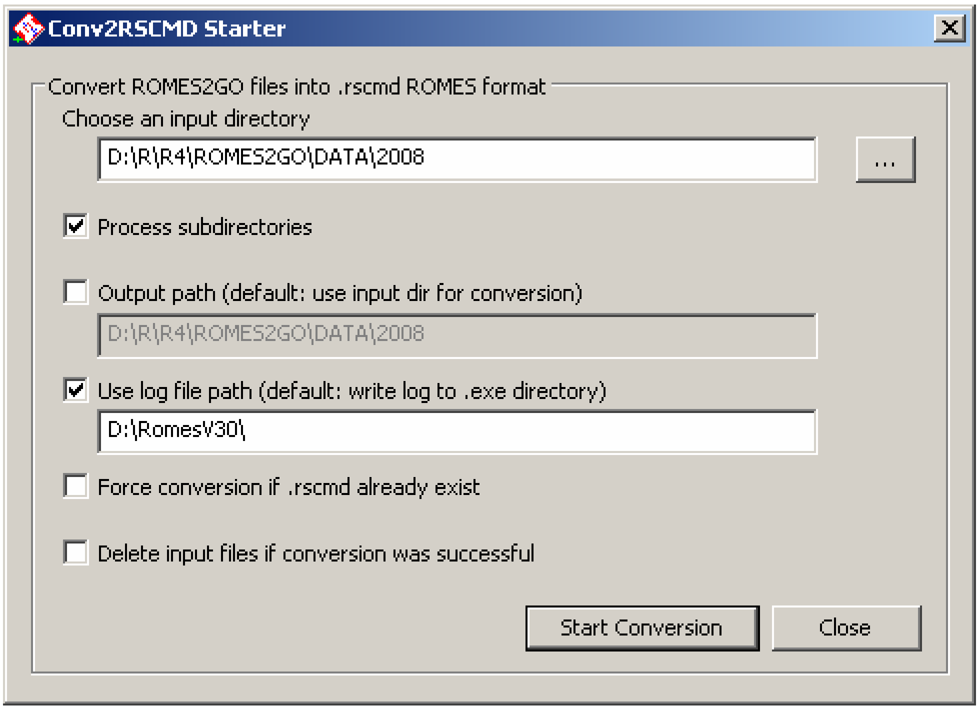
The ‘Bit’ function contains an AND function for the comparison of two values. MS Excel compares on a bit by bit basis but returns a TRUE value as soon as two bits are found due to this result. Therefore this function is used twice in ‘NOISY’ evaluations to compare two set bits.

ROMES2GO Converter

R&S ROMES2GO is a hand held drive test tool which runs on a mobile and is sold as separate product. The measurement files produced by R&S ROMES2GO can be converted into a format which can be read and evaluated by R&S ROMES.

Procedure:

- Via *Tools -ROMES2Go Converter* the GUI Application *Conv2RSCMD Starter* opens.



- Enter the conversion parameter:

Choose an input directory
Enter the input directory into the field *Choose an input directory*.

Process subdirectories
If activated all sub directories of the starting directory are searched for valid R2G log files. These files are considered for conversion.

Output path
If activated, enter into the text box the alternative output directory.

Use log file path
If activated enter the alternative output directory of the conversion logging file.
All information about the conversion process and error messages is written to the file.

Force conversion if .rscmd already exists
If activated the conversion can be forced. If not activated only new files are going to converted. For R&S ROMES2GO measurement files where a *.RSCMD files exists will not convert again.

Delete input files if conversion was successful
If activated the input files are deleted after successful conversion.

- Click *Start Conversion* to execute the conversion with the entered values.
  Starting the conversion executes the application `CONV2RSCMD.exe.`

The converted data can be used in R&S ROMES e.g. replaying the *.RSCMD file.

Contents

8 Installation Instructions and Background Information

This chapter explains how to install R&S ROMES and third-party utilities that might be useful or necessary for the operation of some R&S ROMES components and contains useful information on coordinate systems for geographical projections, GSM and GPS. Appended are lists of all terms and abbreviations used throughout this manual.

R&S ROMES Installation

R&S ROMES is software to be run on a controller with an MS Windows XP operating system with Service Pack 3. The application is supplied on a DVD-ROM containing all program parts and utilities necessary for operation including the additional hardware drivers.

The DVD is organized in several directories:

- *Doc* provides documentation on various devices of the measurement system, including the present ROMES operating manual in printable (*.pdf) version and overview documents of new features within the R&S ROMES Service Packs on the DVD. Further information (readme files) can be found in the *Firmware & Drivers* directory.
- *Firmware & Drivers* contains driver software, HaspHL and Hardlock driver with instructions for manually installing the driver (only relevant if the automatic installation fails), documentation for various purposes; see

Table 8-1 below.

- *MapX Installation* contains an installation version of the third-party utility *Map X5* that R&S ROMES uses for the map projection in the *Route Track View.*
- *Romes* contains the coverage measurement system R&S ROMES including possible Service Packs.
  Please note that the service packs have to be installed manually. A service pack usually consists of an executable installer file and the associated release notes as a text file. The service pack can be installed from any location on the target computer, because the required R&S ROMES installation directory is obtained from the MS Windows registry.
- *AddOns* various applications and utilities for R&S ROMES as described on p. 8.31 ff.
- *Samples* contains *Measurement examples* ordered by technologies.

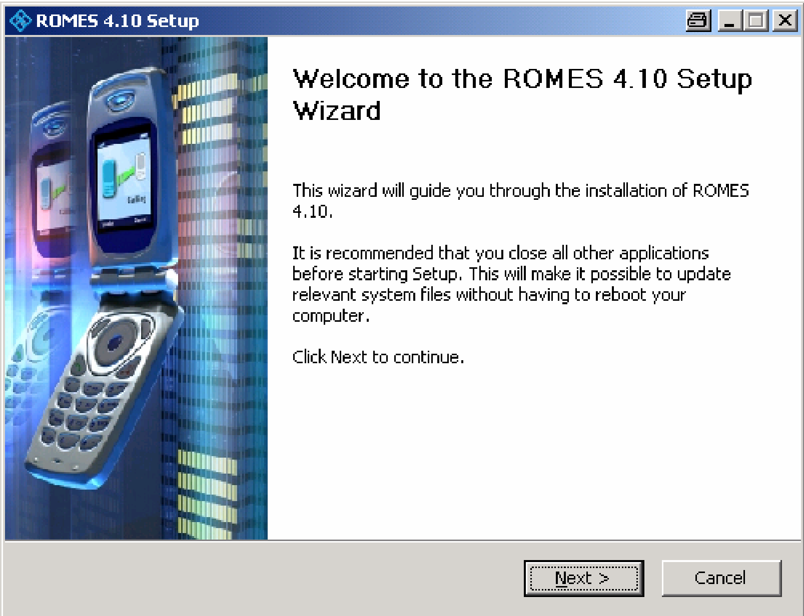
Table 8-1 List of drivers and further utilities

Drivers for ...	Purpose	Installation file	Reference
DekTec FantASI DTU225	Decoder required for the TSM-DVB DVB-T receiver to watch the selected programm on TV monitor	Firmware & Drivers\ DekTec FantASI DTU225*.zip	Firmware & Drivers\ DekTec FantASI DTU225\Readme.txt
Digi Board	ISA plug-in card with 4 or 8 additional COM ports	Firmware & Drivers\ Digi Board\AccelePort Xr - W2K & WXp\40002207_A.exe	Firmware & Drivers\ Digi Board\Readme.txt
Edgeport USB to 8Serial Converter	Edgeport/8 301-1002-08 USB to 8x serial Converter	Firmware & Drivers\ Edgeport USB to 8Serial Converter\ip4n5340.exe	Firmware & Drivers\ Edgeport USB to 8Serial Converter\Readme.txt
EXSY PCI Serial	PCI plug-in card with 4 or 8 additional COM ports	Firmware & Drivers\ EXSY PCI Serial...*.exe	Firmware & Drivers\ EXSY PCI Serial...\Readme.txt
GPS Receiver	Various drivers for GPS receivers with USB interface	Firmware & Drivers\ GPS Receiver\...\...*.exe	Firmware & Drivers\ GPS Receiver\...*.pdf
IEEE Interface	GPIB bus driver for NI	Firmware & Drivers\ IEEE Interface...*.exe	Section Hardware Recognition: GPIB Drivers below.
Nokia	DKU2 (USB) driver for Nokia mobiles	Firmware & Drivers\Test Mobiles*.exe	Firmware & Drivers\Test Mobiles\...
Qualcomm Chipset	USB driver for Qualcomm Chipset mobiles (Qualcomm, Samsung,…)	Firmware & Drivers\Test Mobiles*.exe	Firmware & Drivers\Test Mobiles\...
Quatech...	PCMCIA card for 4 additional COM ports	Firmware & Drivers\Quatech QSP100 PCMCIA to 4Serial\Win2k_Xp	
R&S RF Receivers, TSMx IEEE1394 driver	Current firmware, utilities and documentation for R&S RF test receivers, including the IEEE 1394 firewire driver for the TSMx	Firmware & Drivers\R&S RF Receivers\<Type>...	Firmware & Drivers\R&S RF Receivers\<Type>...., chapter 6 of this manual (Test Receiver Drivers).
Sagem	USB driver for Sagem OT290, required for use with Splitter Box only	Firmware & Drivers\Test Mobiles*.exe	Firmware & Drivers\Test Mobiles\...
Sound Cards	Drivers for Sound Cards used for Speech Quality measurements (SQA)	Firmware & Drivers\Sound Cards\...*.exe (or *.zip)	Firmware & Drivers\Sound Cards\...
Trigger Box	Firmware and Tools for the R&S Trigger Box	Firmware & Drivers\Trigger Box\TriggerBoxSetup.exe	Firmware & Drivers\Trigger Box\Readme.txt
Triorail	USB driver for Triorail mobiles.	Firmware & Drivers\Test Mobiles*.inf Firmware & Drivers\Test Mobiles*.sys	Firmware & Drivers\Test Mobiles\...
Aladdin Hardlock	Driver for hardlock.	Firmware & Drivers\Aladdin\Hardlock\hldrv32.exe	Firmware & Drivers\Aladdin\Hardlock\readme.txt
Aladdin HaspHL	Driver for licence server hardlock.	Firmware & Drivers\Aladdin\HaspHL\HASPUserSetup.exe	Firmware & Drivers\Aladdin\HaspHL\readme.txt

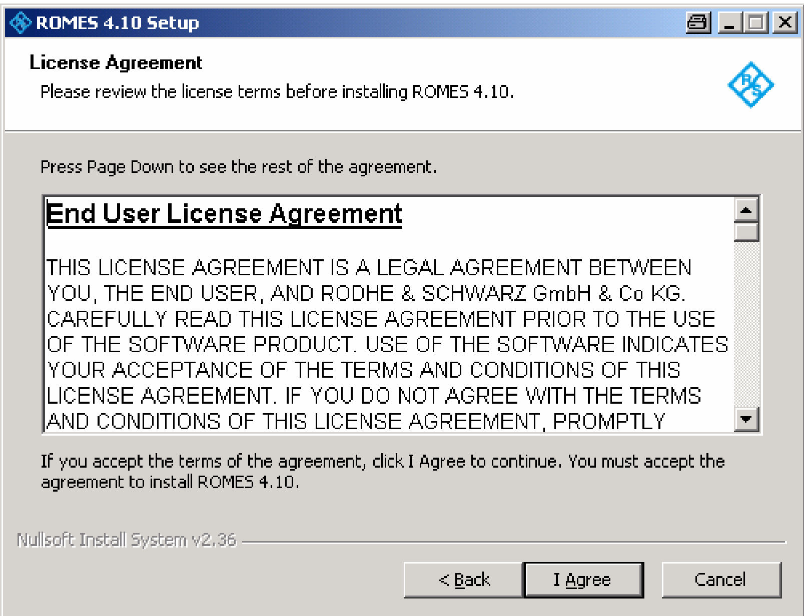
Installing R&S ROMES Basic Software

Installation of the software is controlled by a setup program. All necessary settings are configured automatically during the installation process. Please take the following steps:

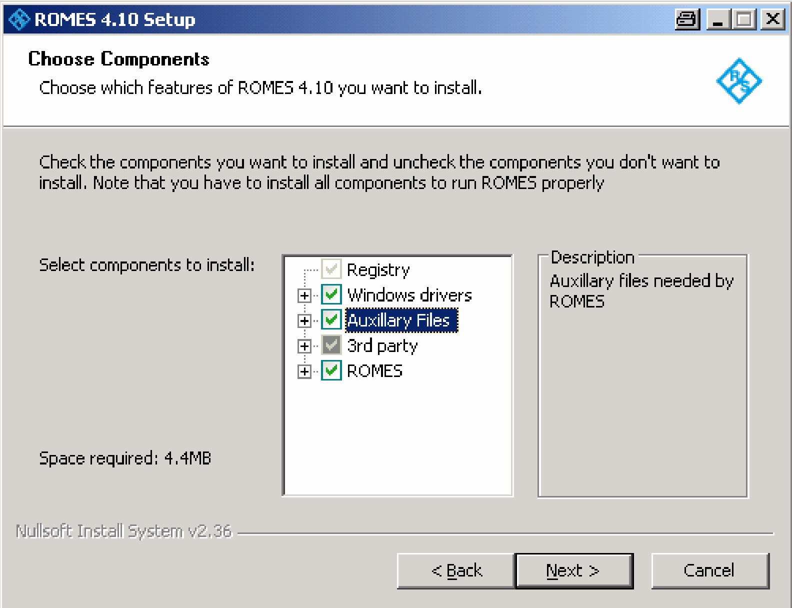
- Connect the external DVD-ROM drive (if no internal DVD-ROM drive is available on your controller).
- Turn on your controller and start your MS Windows operating system.
- If the program Hardcopy is running on your machine, stop this program.
- Insert the DVD-ROM in your drive. Unless the auto start option is disabled on your operating system the setup routine on the DVD-ROM starts automatically. Otherwise start the setup.exe program in the root directory of the DVD-ROM.
  The R&S ROMES Service Pack installation wizard opens with a start-up screen:



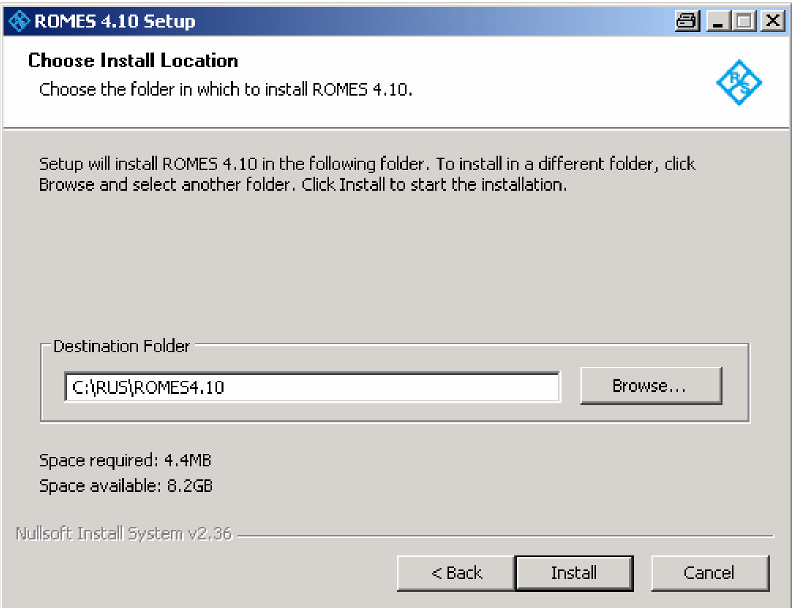
- Click *Next* to start the installation.
  The *End User License Agreement* window opens.



- Please read the End User License carefully, before proceeding to the next step.
- Click *I Agree* to accept the End User License and to continue the installation.
  The *Choose Components* window opens.



- Check the desired components for installation. A detailed description of the components are available in section Installing R&S ROMES Components on page 8.5.
  It is safe to accept the default selection.
- Click *Next* to accept your selection and continue.
  The *Choose Install Location* window opens.



- Enter the desired destination folder for ROMES. The default directory is C:\RUS\ROMES4.10.
- Click *Install* to start the installation of the selected components.
  Depending on your selection in the *Choose Component* window, different installers are called.
  Just follow each of the instructions and accept the defaults.

Note: *If you abort any of the sub-installers, ROMES installation may also terminate.*

For detailed description of the various sub installation process see the section Installing R&S ROMES Components on page 8.5.

Installing R&S ROMES Components

The following sub chapters describe the single component installation during the installation procedure. It is safe to accept the default entries during installation process.

During start-up of the installer, it checks, whether the components are already installed or need to be installed. This information is shown in the *Choose Component* window. In case, the component is not already installed, in the *Choose Component* window the component is checked and marked read-only, so that the component has to be installed. Any component, which is installed already is deselected, but can be overwritten by the user.

Note:
If you abort any of the sub-installers, R&S ROMES installation may also be terminated

Installing Registry

This component is enabled for ROMES installation and cannot be disabled by the user. During the registry installation, ROMES is registered at windows and the registry settings needed by ROMES are installed.

The component is mandatory for any new installation or update.

Installing Windows drivers

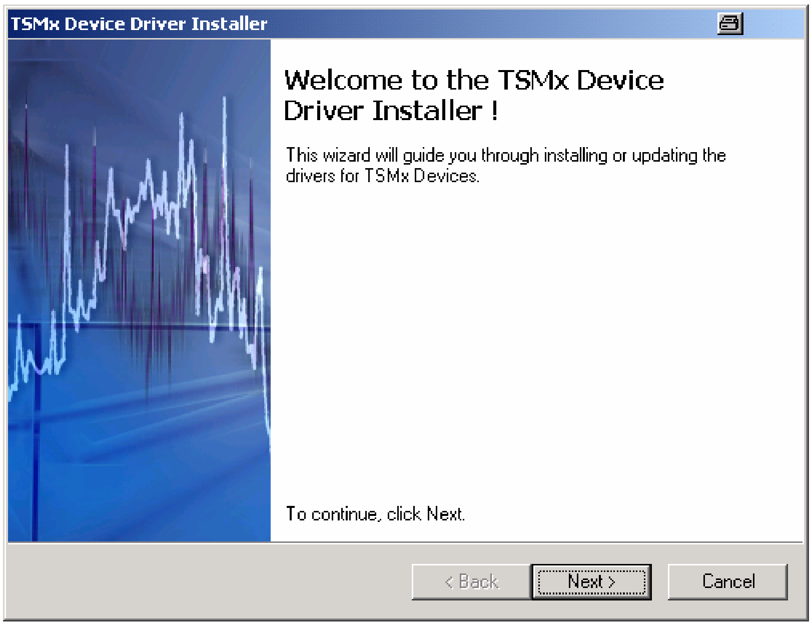
In this group, all drivers for the different hardware are listed.

Note:
HW drivers are mandatory, even if the installation is meant only for replay only installation.

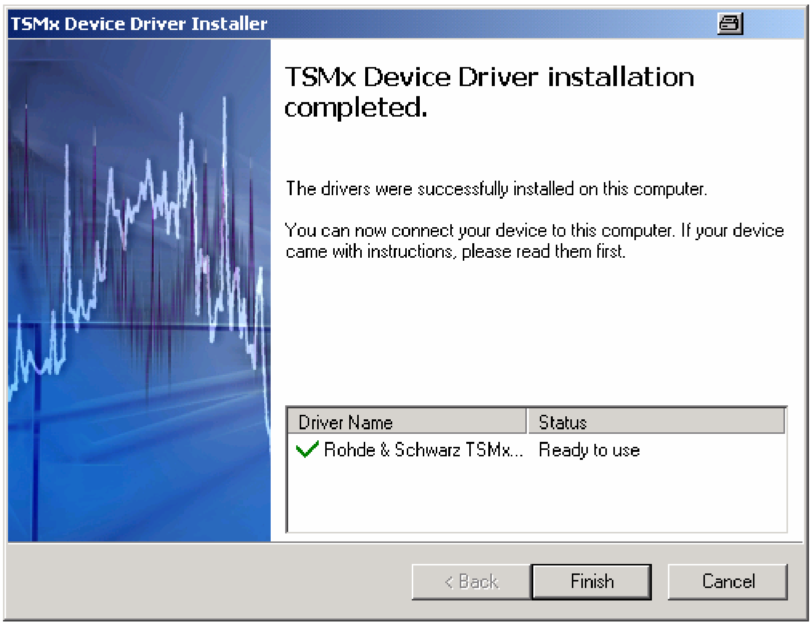
TSMx

- If the component is selected in the *Choose Component* window during the installation procedure the *Installing TSMx Device Driver* window opens:

- Click *Yes* to start the installation of the TSMx Device Driver.
The welcome window of the *TSMx Device Driver Installer* opens.



➢ Click *Next* to continue.
The installation proceeds. When the installation is finished the complete window of the Installer opens.



➢ Click *Finish* to complete the installation.

The TSMx device driver is installed and the basic ROMES installation continues to install the next component which is selected in the *Choose Component* window.

Hardlock This driver may be used for both, the blue Hardlock and for the black HASP time dongle.

➢ If the component *Hardlock* is selected in the *Choose Component* window during the installation procedure the *Hardlock Device Drivers Installation* window opens.

- Click *Next* to start the installation.
  After successful installation the *Hardlock device driver* window opens.
- Click *Finish* to finish the installation.

The Hardlock driver is installed and the basic ROMES installation continues to install the next component which is selected in the *Choose Component* window.

Note:
The installation seems to "hang" on some computers; it can take up to 10 minutes to come to a successful end.

IEC API This driver is installed absolutely silent. No user interface is shown.

Installing Auxiliary Files

AtlControls This driver is installed absolutely silent. No user interface is shown.

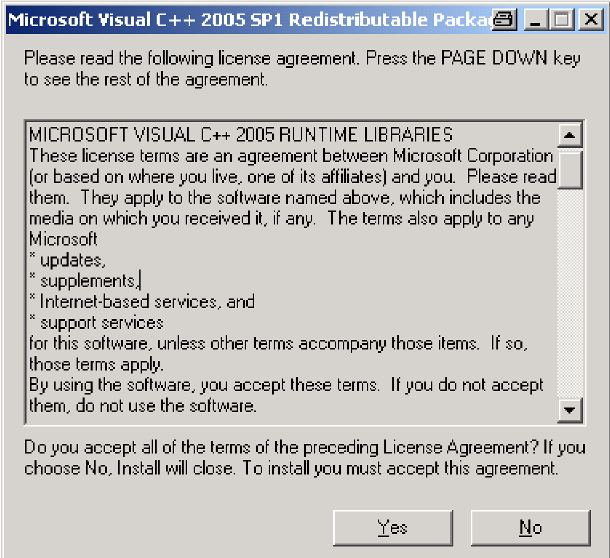
Installing 3rd Party Software

Libraries and utility programs such as the MFCxxx libs from Microsoft and MapX are listed in this group.

MFC 7.1 Files This is the C-library of Microsoft Visual C, version 7.1; the library is installed absolutely silent. No user interface is shown.

MFC 8.0 runtime This is the C-library of Microsoft Visual C, version 8.0.

- During installation a license agreement window appears.

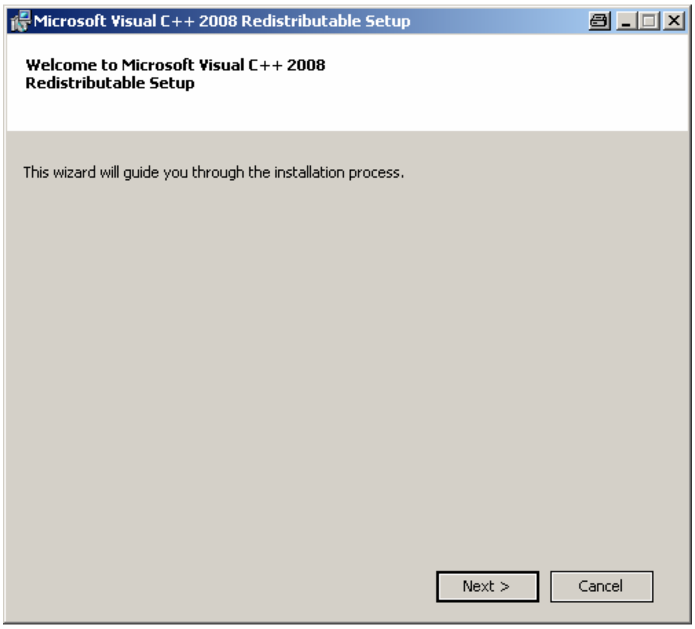


➢ Click *Yes* to continue.

The library is installed. The basic ROMES installation continues to install the next component which is selected in the Choose Component window.

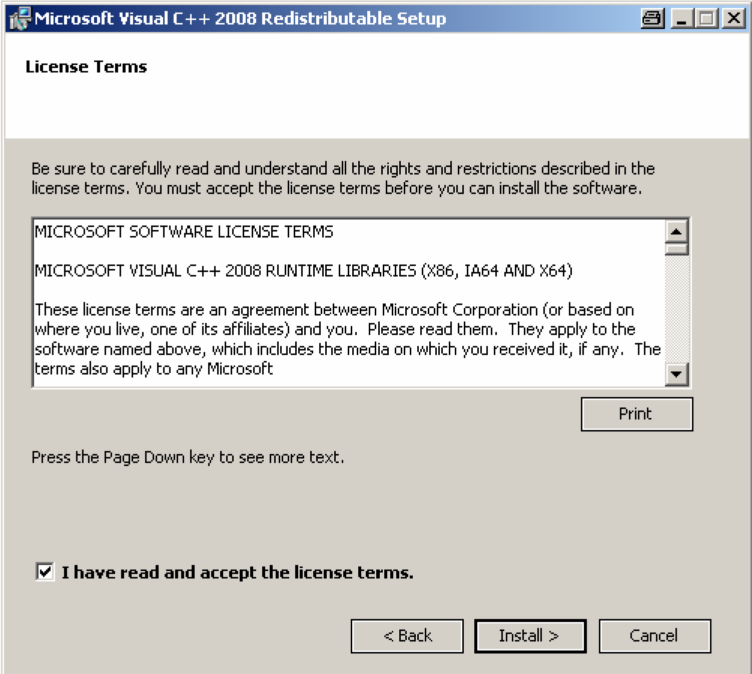
MFC 9.0 runtime This is the MFC runtime version 9.0.

➢ During R&S ROMES installation the MFC 9.0 install window opens:



➢ Click next to start the installation of MFC 9.0 runtime.

➢ During installation a license agreement window appears.



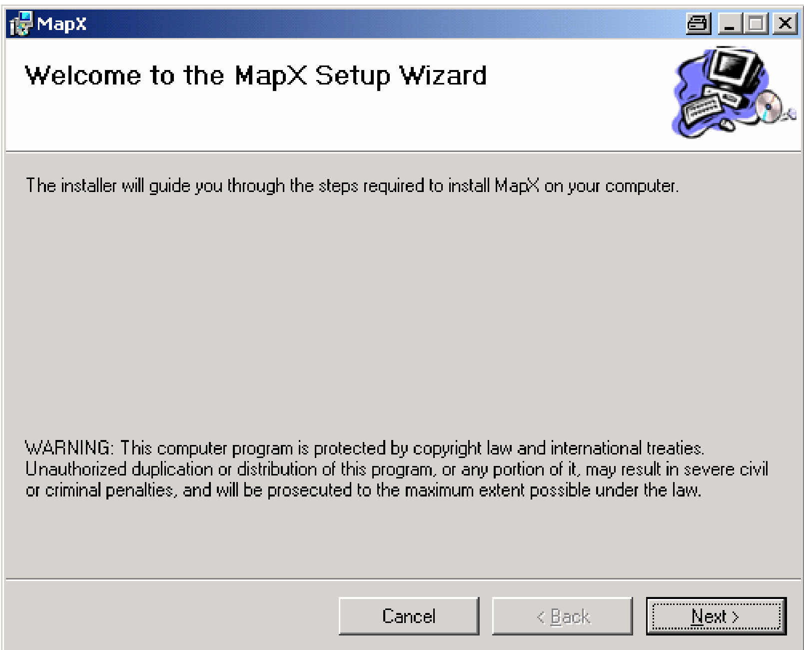
- ➢ Click *Yes* to accept the license terms and to continue.
  The installation finishes and shows a setup complete window.
- ➢ Click *Finish* to close the window.

The basic R&S ROMES installation continues to install the next component which is selected in the Choose Component window.

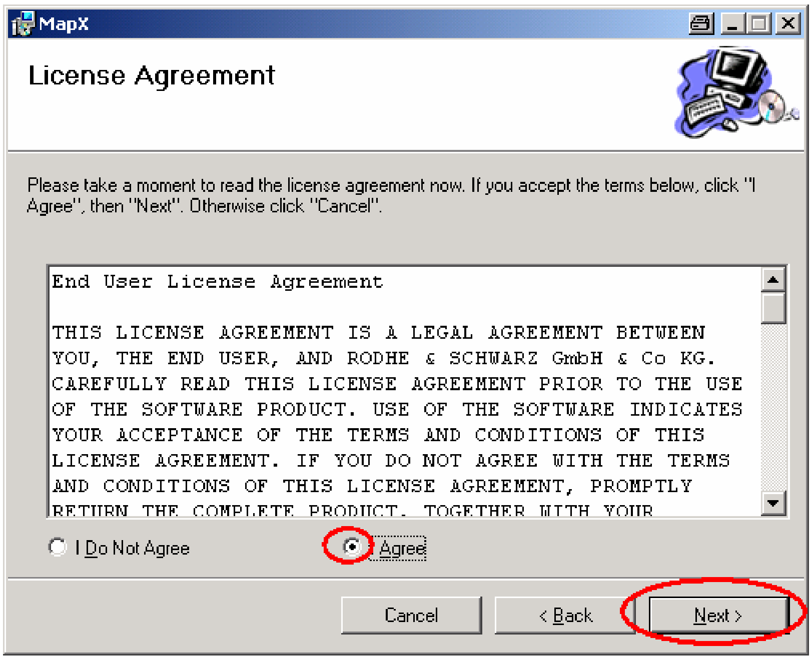
MapX

The installation of MapX is started only, if MapX is found on the DVD. ROMES supplied with TSML has no support for MapX. Therefore the installation of MapX is suppressed on a TSML installation.

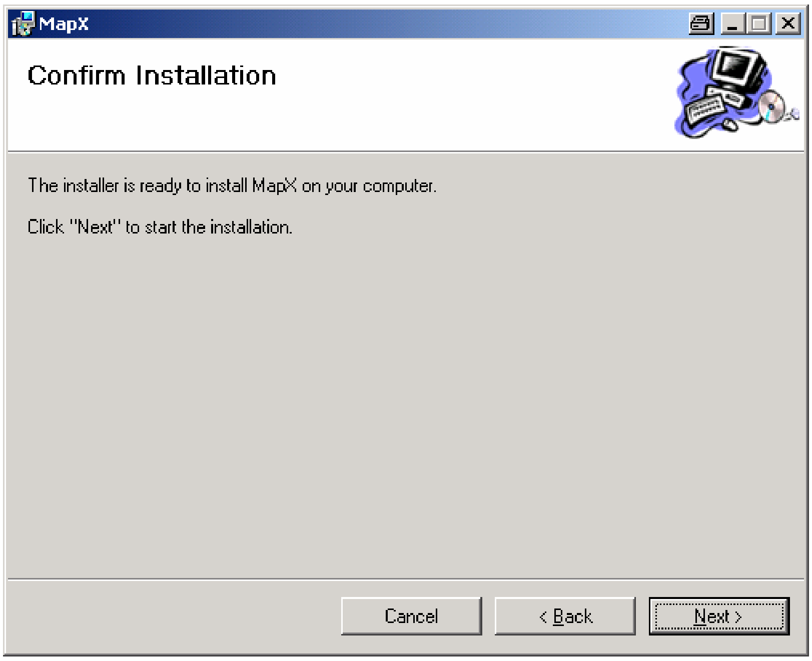
During installation of MapX the welcome window of the MapX wizard opens.



- ➢ Click *Next* to start the installer.
  The *License Agreement* window opens.



- Check *I Agree* to agree to the license.
- Click *Next* to continue.
  The *Select Installation folder* window opens.
- Keep the default install folder and click *Next* to continue.
  The *Confirm Installation* window opens.



- Click *Next* to start the installation.
- After successful installation the *Installation Complete* window appears.
  Click *Close* to finish the installation.

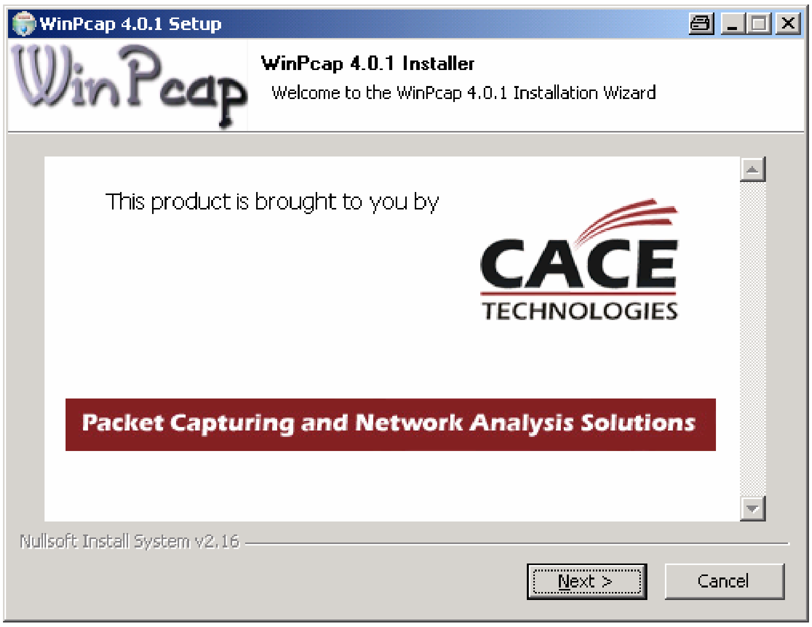
MapX is installed. The basic ROMES installation continues to install the next component which is selected in the *Choose Component* window.

WinPcap The library WinPcap is needed for the IP-Tracing tool.

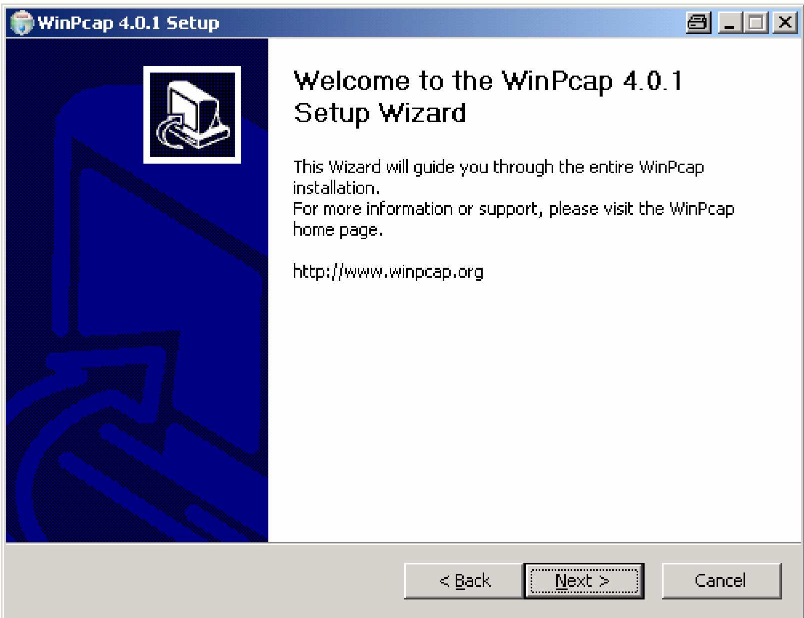
Note:

It is recommended to use only the version supplied with ROMES and not a newer one which may be installed by Wireshark or similar tools.

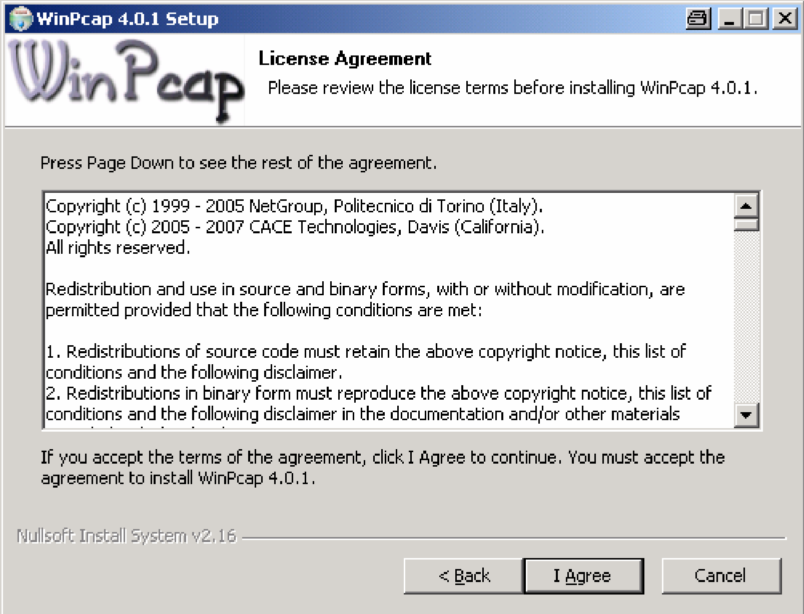
During installation of WinPcap the setup window of the WinPcap installer opens.



➢ Click *Next* to start installation.
The welcome window of the *WinPcap Setup Wizard* opens.



➢ Click *Next* to continue.
The *WinPcap License Agreement* window opens.



- Click *I Agree* to accept the License Agreement and to continue installation.
- After successful installation the *Installation Complete* window appears. Click *Finish* to close the wizard window.

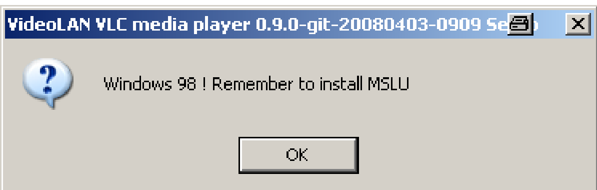
WinPcap is installed. The basic ROMES installation continues to install the next component which is selected in the *Choose Component* window.

VideoLAN VLC Media Player

The VideoLAN VLC media player may be used together with the DQA, as a video streaming client. At the time of writing, unfortunately only a beta version of this client was available. R&S ROMES will check the version of the client, so the VideoLAN VLC media player must be installed from the ROMES CD, if you want to use it. However, the installation of the player can safely be skipped if you don't want to use the streaming functionality in R&S ROMES.

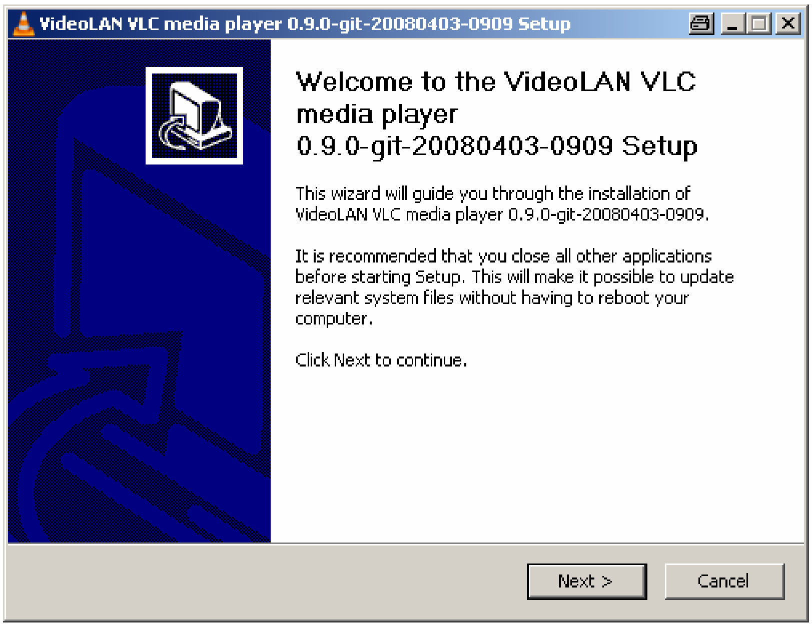
During the standard R&S ROMES installation following dialog window opens for the VideoLAN VLC media player installation:

- Select the desired *VideoLAN VLC media player* language and click *OK* to continue the installation process. A message window for Windows 98 appears.

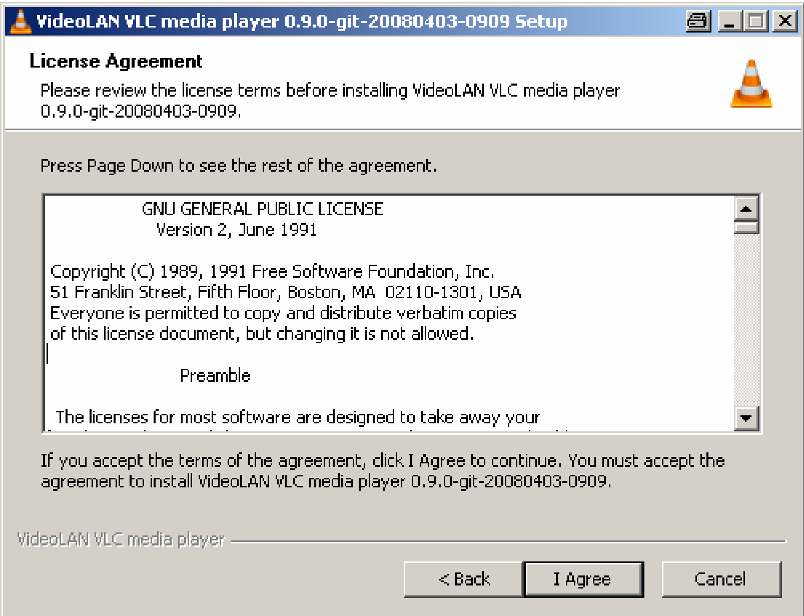


- Since R&S ROMES do not run on Windows 98 ignore the message window

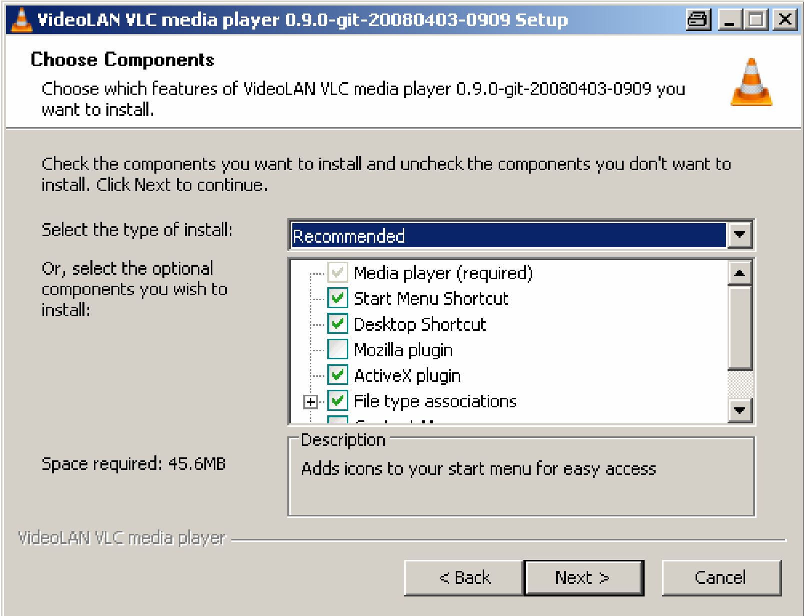
and click *OK* to continue the installation.
The VideoLAN VLC media player install wizard window opens.



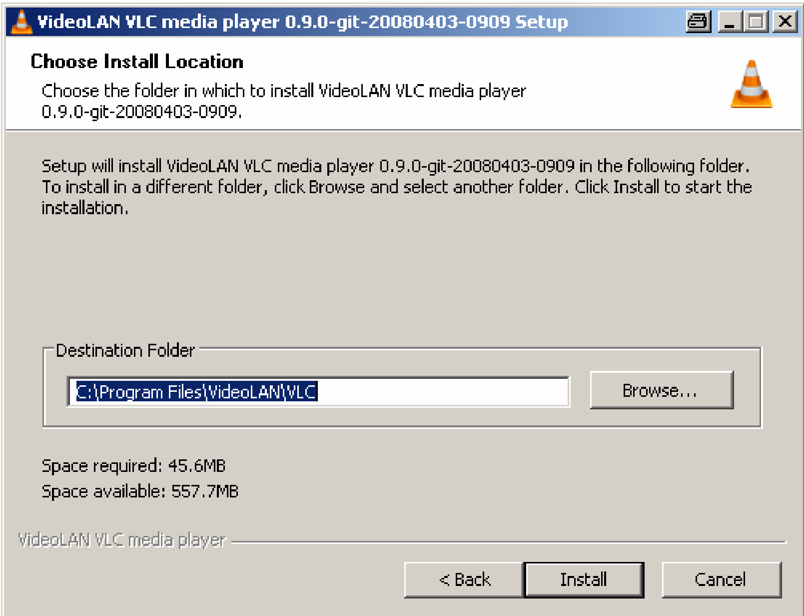
- Click *Next* to continue.
  The *License Agreement* window opens.



- Click *I Agree* to accept the License Agreement and to continue installation.
  The *Choose Components* window opens.



- Keep the default component selection.
- Click *Next* to continue.
  The *Choose Install Location* window opens.



- The installer offers a default destination folder for the VideoLAN VLC media player installation. Accept the setting by clicking the *Install* button.
  The wizard starts the installation.
- After successful installation the *Installation Complete* window appears. Deselect the box *Run VideoLAN VLC media player...* .
- Click *Finish* to close the wizard window.

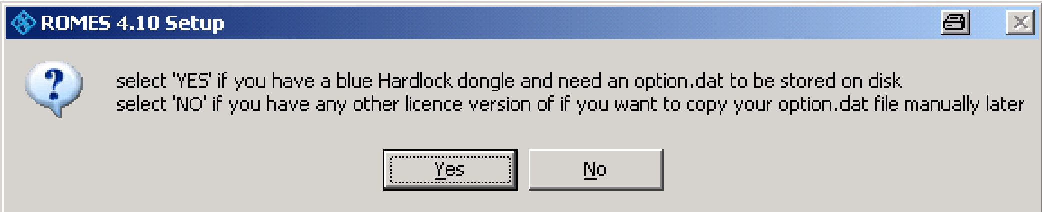
VideoLAN VLC media player is installed. The basic ROMES installation continues to install the next component.

Installing ROMES

Please note that all section in this group can be deselected in the first installation and installed later on in a second step.

Copy License Files This section copies the license files needed for running ROMES.

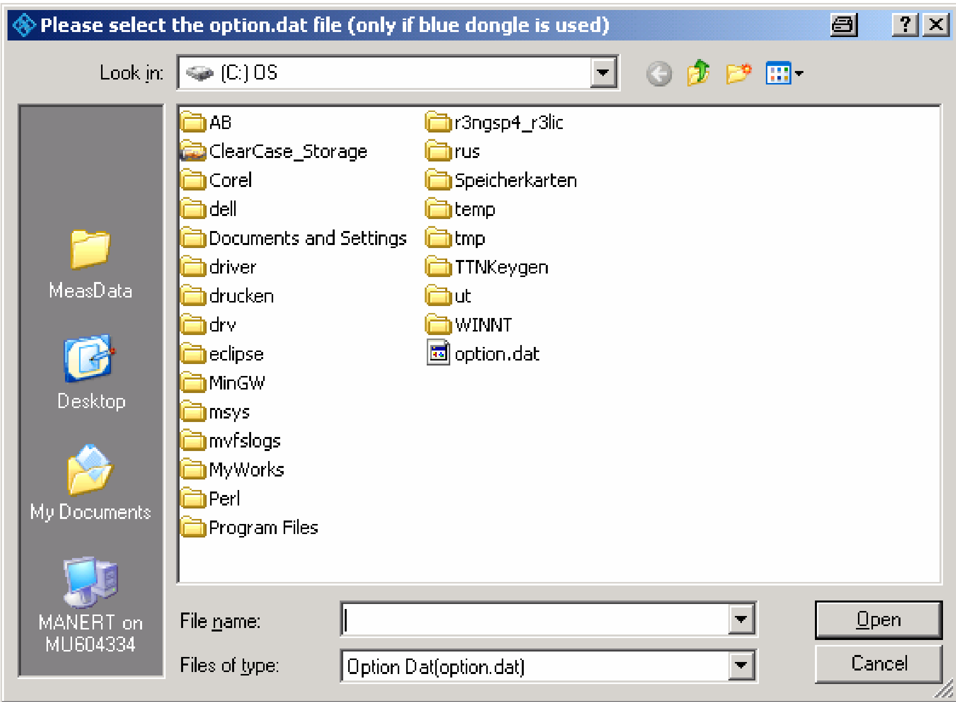
License using a blue Hardlock During installation following dialog window opens:



➢ If you run ROMES with a blue dongle click *Yes*.

Note:
You may safely skip the setup by clicking "No" and copy the license file by yourself later on.

A file browser opens to select the corresponding file "option.dat".

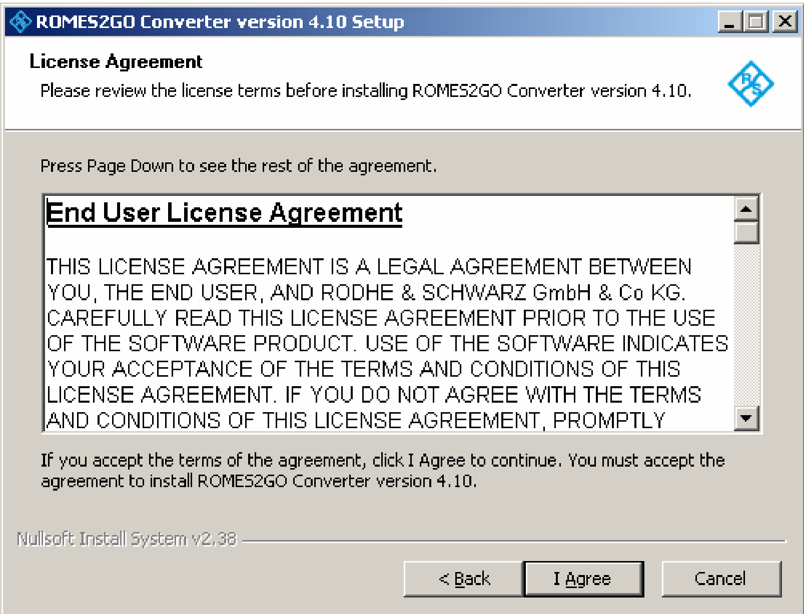


➢ In the file browser select the corresponding "option.dat" file and click Open. The installer copies the file to the correct location in the ROMES installation.

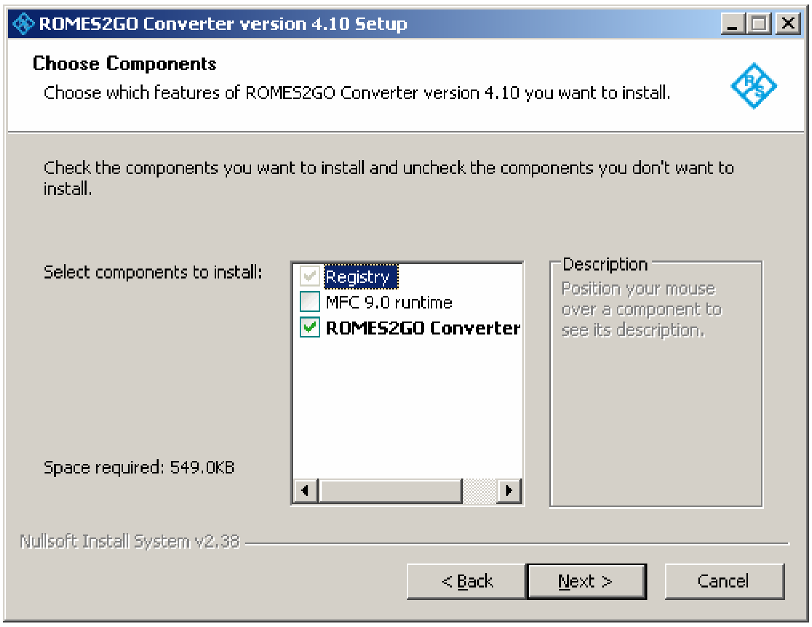
Installing ROMES2GO Converter

During R&S ROMES installation following dialog window opens for the ROMES2GO installation:

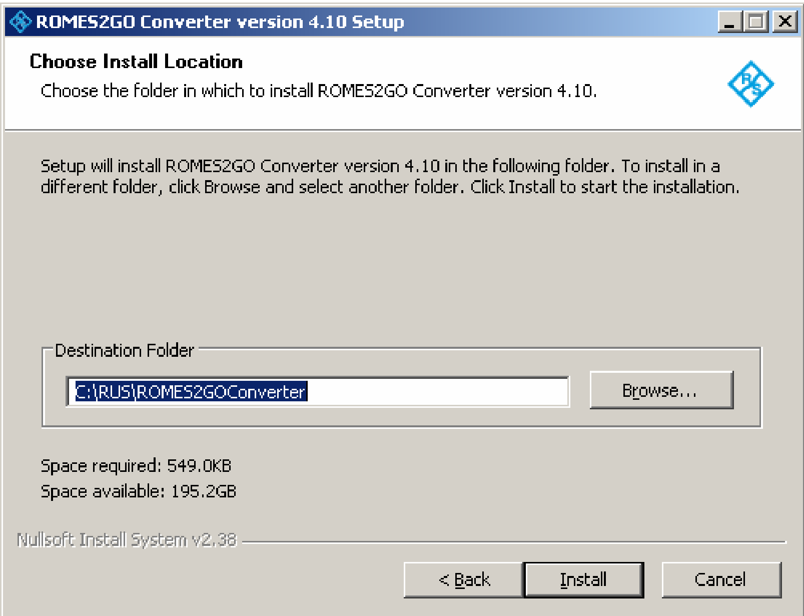
➢ Click *Next* to start the installer.
The *License Agreement* window opens.



➢ Click *I Agree* to accept the License Agreement and to continue installation.
The *Choose Components* window opens.



- ➢ Select the components:
  - ➢ Deselect MFC 9.0 runtime since it is already installed before.
  - ➢ Select ROMES2Go Converter.
- ➢ Click *Next* to continue.
  The *Choose Install Location* window opens.

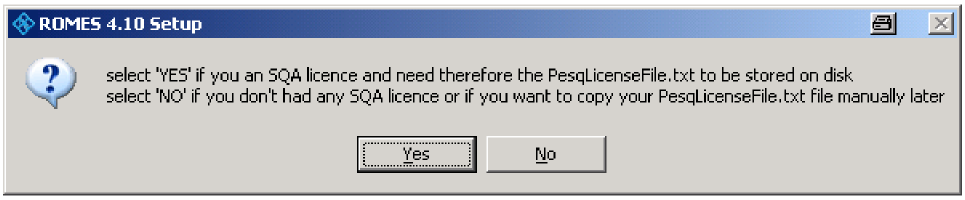


- ➢ The installer offers a default destination folder.
  Accept the setting by clicking the *Install* button.
  The wizard starts the installation.
- ➢ After successful installation the *Installation Complete* window appears.
  Click *Finish* to close the wizard.

R&S ROMES2Go Converter is installed. The basic ROMES installation continues to install the next component.

Copy PESQ License

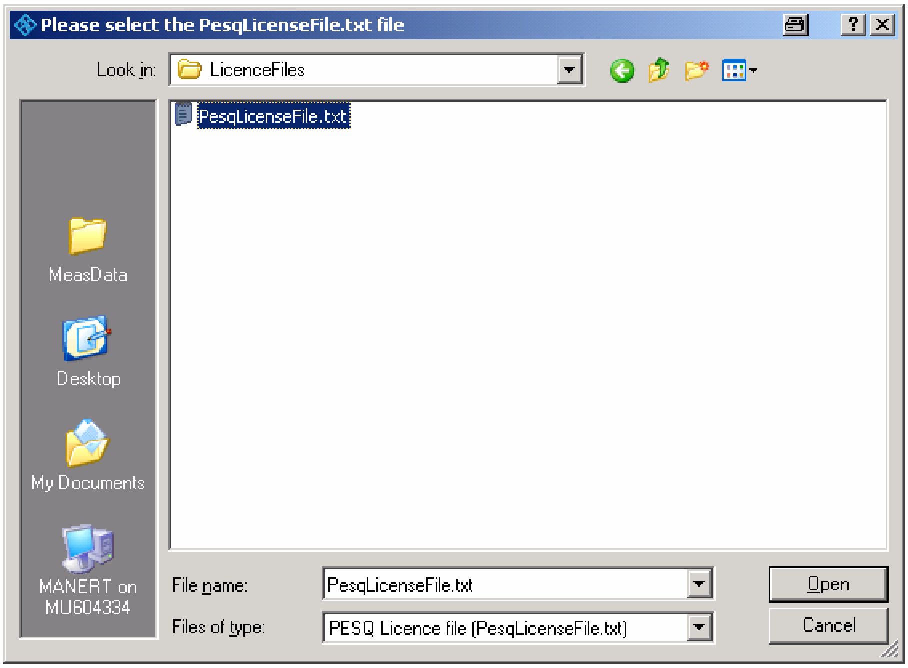
During installation following dialog window opens:



➢ If you run a SQA with ROMES click *Yes*.

Note:
You may safely skip the setup by clicking No and copy the license file by yourself later on.

A file browser opens to select the corresponding file “PesqLicenseFile.txt”.



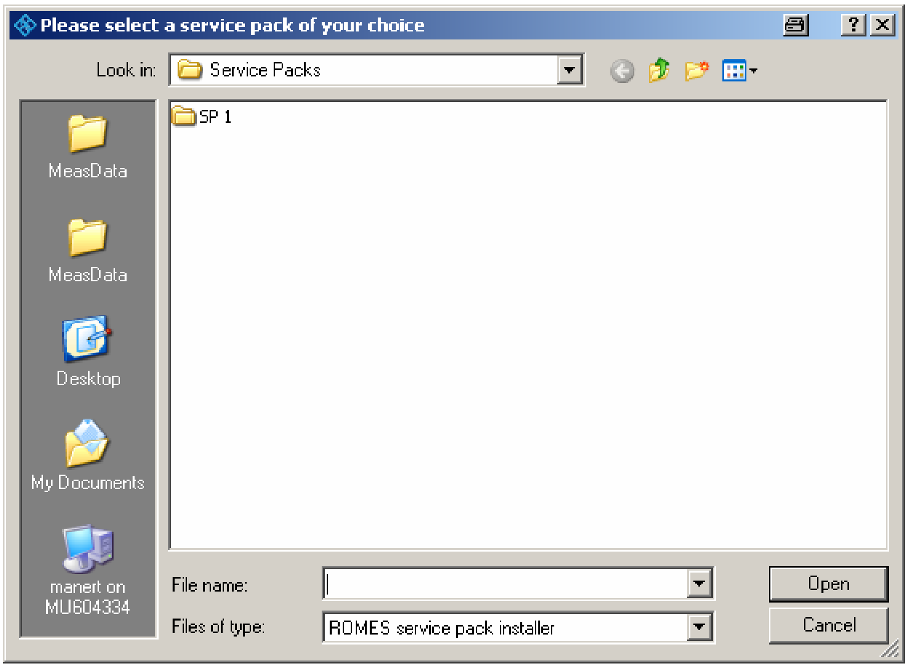
➢ In the file browser select the corresponding “PesqLicenseFile.txt” file and click *Open*.
The installer copies the file to the correct location in the ROMES installation.

Installing R&S ROMES Service Packs

Installation of the software is also controlled by a setup program (see Installing R&S ROMES Basic Software on p.8.3)The R&S ROMES Service Pack installation guide is opened with a start-up screen.

The installer searches for the Service Packs directory, which is on the R&S ROMES DVD if Service Packs are available. You may safely select the latest or any Service Pack of your choice to be installed. Any newer Service Pack contains all files of the previous ones.

The installation of the latest Service Pack is recommended. For information on the contents see Service Pack release notes, located in the same path as the according Service Pack. If new features are included, see also Overview New Features document in the Doc directory of the ROMES DVD.



After the installation is done click *Finish* to verify the installation.

Hardware Recognition: GPIB Drivers

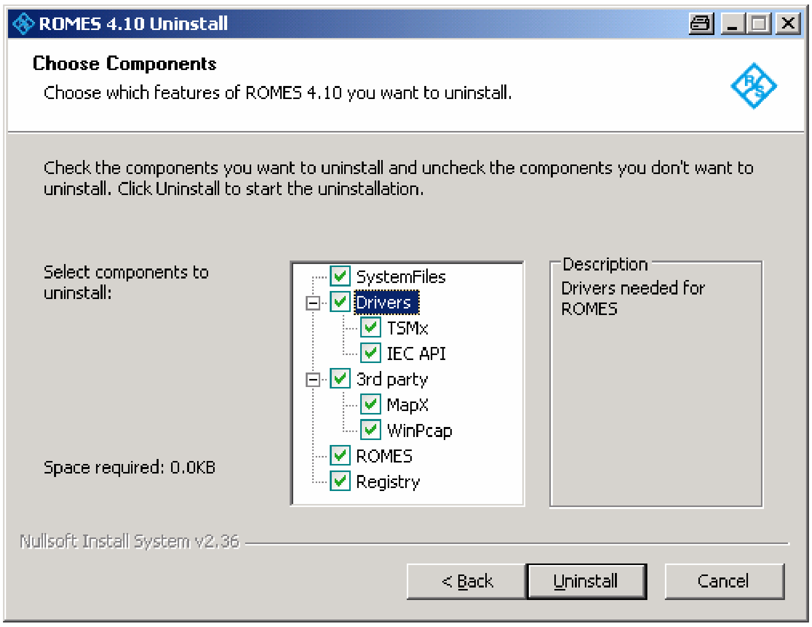
R&S ROMES provides GPIB driver files for the connection of a test receiver ESVx or ESPI to the controller via a National Instruments (NI) IEEE bus interface. Further drivers are provided for an R&S IEEE bus card (please also note the installation message displayed before the R&S ROMES installation is terminated). All drivers are located in the *Firmware & Drivers\IEEE Interface* subdirectory of the DVD-ROM and must be installed manually:

- Start the program *ni488216.exe* which copies the files necessary for the driver installation into a temporary directory.
- Use the default values for all settings, terminate the installation and shut down your controller.
- Install or plug in the NI hardware (PCI/PCMCIA card).
- Restart your controller.
- Start MS Windows Explorer and right-click *Measurement and Automation – Devices and Interfaces – GPIB Interfaces.*
- In the context menu, click *NI-488.2 Getting Started Wizard* and follow the instructions in the dialogs.

R&S Romes Uninstall

- The uninstall process of ROMES can be started over several ways
    - Start → Programs → Rohde & Schwarz → ROMES 4.10 → Uninstall ROMES
    - Start → Settings → Control Panel → Add Remove Programs → ROMES
    - Open the ROMES installation folder (C:\RUS\ROMES 4.10 by default) → Click ROMESUninstall.exe

➢ The Uninstall wizard window opens.
Click *Next* to continue.
The *Choose Component* window opens.



➢ Check the desired components to uninstall.

SystemFiles

The component *SystemFiles* defines the files which have been registered and been copied to the windows system directory.

Drivers

Some of the hardware drivers can be de-installed in this group:

Note:
Only drivers which can automatically de-install can be de-installed by the ROMES uninstaller.

IEC API This driver will be installed silently without any user interface.

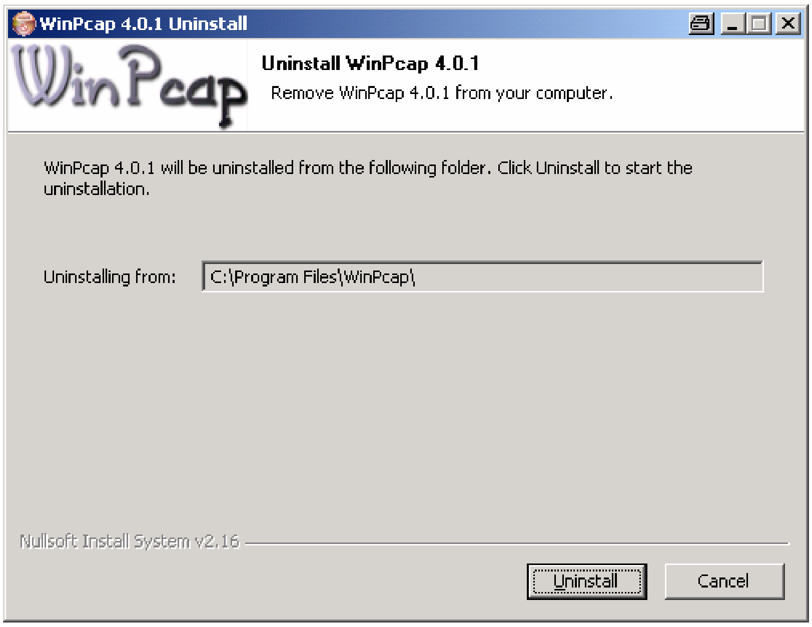
3rd Party

All 3rd party products, which can be de-installed automatically, are available in this group.

Note:
The libraries from Microsoft will not be de-installed since to many other programs rely on the presence of these libraries.

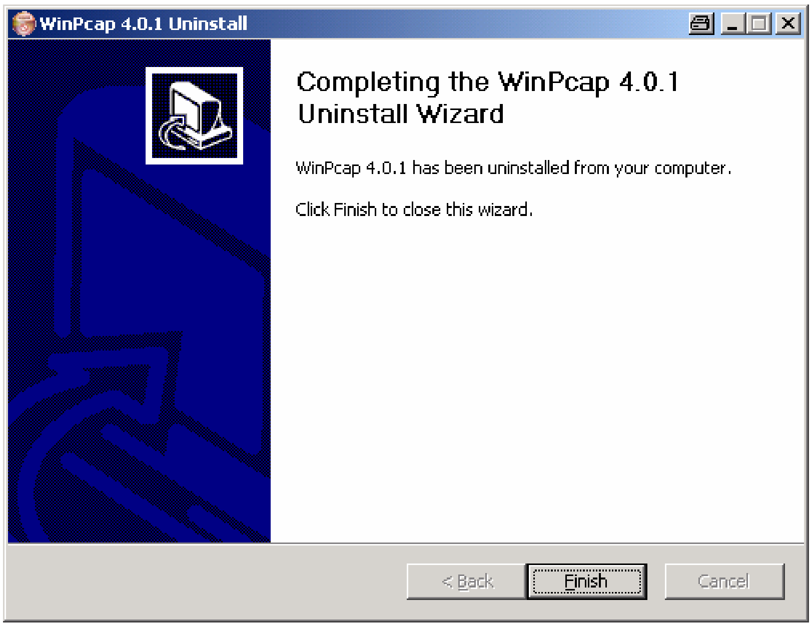
WinPcap

➢ During the de-install process the *WinPcap Uninstall* window opens:



➢ Click *Uninstall* to start de-installation.

➢ After successful de-installation the complete window appears.



➢ Click *Finish* to close the wizard window.

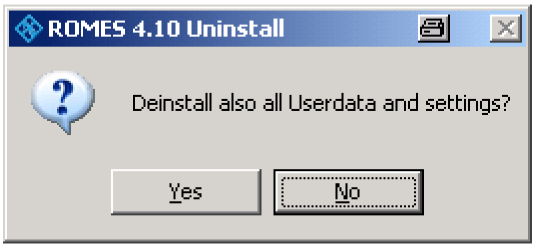
WinPcap is uninstalled.

ROMES

ROMES may either be de-installed including all user data or only the files which have been installed during installation.

Note:
Only user data which are in the ROMES directory will be de-installed on request.

Note:
Licenses are only de-installed when user data and settings are also de-installed.



Registry

Registry settings are de-installed silently without any user interface.

R&S Romes Distributed Measurements

Operating several mobiles and data quality analyzers within once instance of R&S ROMES causes high load on a single computer. The computation power of the machines limits the number of tests that can be done in parallel. With the upcoming ability to perform Internet Explorer driven measurements, where the IE can only use one network connection at a time, the need for a distributed measurement system increased additionally. This issue is addressed in ROMES 4.10. A single measurement can be distributed across different computers. This feature requires option ROMES4NET.

Introduction

Several R&S ROMES instances can be connected together to form a more complex and powerful measurement system. The single instances are organized in a star-topology, where one central instance (called ROMES Master) is used to control the different subordinated instances (called Satellites). Configuration and measurement control is performed by the master instance, and satellites are ought to run constantly like small measurement servers.

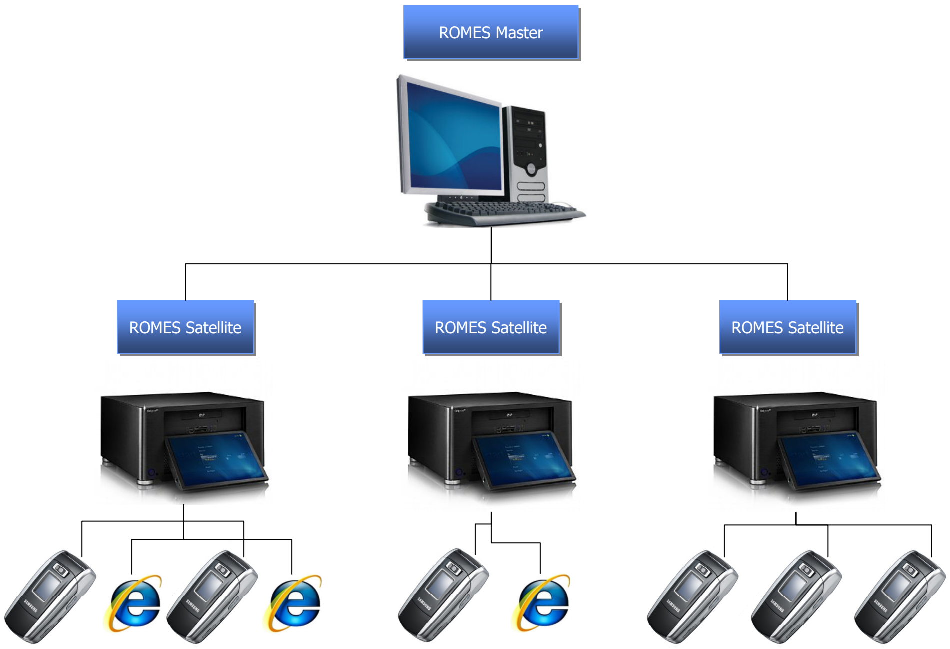


Fig. 8-1: Example of an R&S ROMES distributed measurement configuration

Once a distributed measurement is set up, the measured data are collected and written into the RSCMD file on the Master machine. Such a file can be replayed and analyzed as any other file measurement with R&S ROMES, distributed version or not.

Step-By-Step Setup of a Satellite

Before an R&S ROMES instance can act as satellite, it must be setup once. The setup defines which drivers on a satellite machine can be used in the distributed measurement, and how their initial configuration looks like. Therefore an R&S ROMES workspace (rsxks-File) has to be created. All the drivers that shall be accessible from the master must be loaded in the workspace. GUI elements and signal definitions are not used, so only the hardware settings are of any interest.

In this section, the setup of a satellite is described in detail. Use this as a checklist or template to create satellites if you are not already familiar with the usage.

- Prepare your R&S ROMES dongle to contain the licenses that are necessary for the drivers that shall be setup on the satellite PC.
- Start R&S ROMES on the satellite PC with the appropriate dongle.
- Load the drivers that shall be available in the distributed system, i.e. which can be loaded as remote drivers at the master PC.
- Save the workspace. Remember the location where the workspace has been saved.
- Once one or a whole set of workspaces for the distributed measurement system are created, R&S ROMES can be closed and the satellite mode can be turned on.
  With R&S ROMES 4.10 a special tool is shipped that is used to perform this task. This small tool is called *RomesSatelliteCfg* and can be found in the R&S ROMES installation directory (or in the start menu entry of R&S ROMES Tools).
- Start the Satellite Configuration Tool.
- Enable the Satellite Mode, providing the address of the master PC where the satellite instance shall connect to and refer to the workspace that contains the drivers that shall be part of the distributed measurement.
  - The name of the satellite as it shall be identified in the master PC. It is important that this name is unique in the complete distributed measurement system, since the satellites are internally identified by this name as well.
  - The address of the master PC (either IP address or host name).
  - The workspace that contains the hardware.

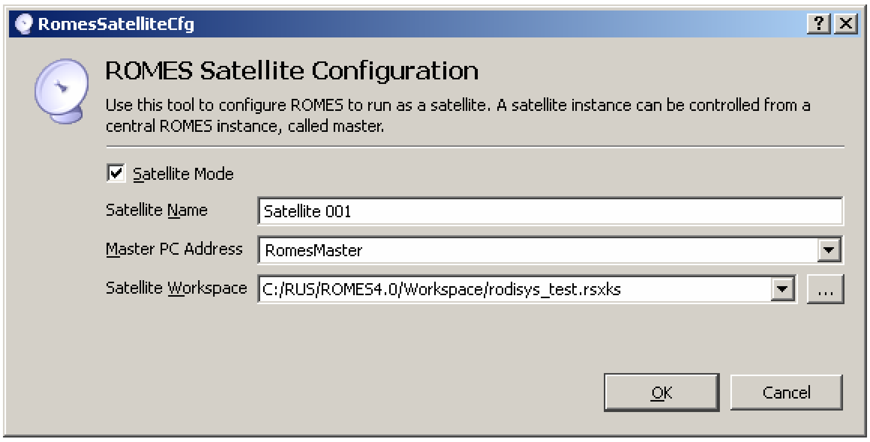


Fig. 8-2: R&S ROMES Satellite Configuration window

- After configuring the R&S ROMES Satellite mode click the *OK* button to save the settings and to quit the Satellite Configuration window.

The *RomesSatelliteCfg* application starts a new instance of R&S Romes. The instance is running in satellite mode.

Note:
Don’t forget your dongle when you leave the satellite PC.

Performing a Distributed Measurement

Once all the satellites have been configured properly, only the ROMES master instance is used to control the measurement. The configuration of the single drivers can be done without accessing the satellite again.

Basically, the handling of the remote drivers located on the satellites is very similar to the usage of the local ones. They can be loaded using the hardware configuration dialog (Hardware|Add/Remove Hardware or Ctrl+H), saved in and restored from workspaces. Once they are loaded, configuration can be performed in the same way as for local drivers. Measurement can be started and stopped without any differences.

The only notable differences can be found in the configuration dialogs. Maybe some of the configuration options cannot be modified in a remote driver or are even not available. For example, the SQA page in the Qualcomm Configuration is not available since the SQA module has not been ported to be compatible with the distributed measurement system.

Fail-Safe Mechanisms

A distributed measurement system has a higher chance to suffer from unexpected errors that a local one running in a single process. Therefore several strategies to handle different kind of such errors are put into place in the distributed measurement mode. These are explained in the following sub chapters.

Nevertheless some maintenance is required to keep the satellites running properly. It is important to regularly check the log-files created by the master and the clients and to pay attention to message shown in the "General Status View" on the master to get early notification when something extraordinary happens.

Connection Errors

When the connection between the master and a satellite is broken, the satellite constantly tries to reconnect to the master. In the meantime, the master can not display any measurement information from that satellite and issue a warning. The satellite itself buffers measurement data as long as it meaningful, and once the connection is re-established the buffered information will be transferred to the master to make the measurement data complete.

WatchDog

A watchdog process monitors the activity of an R&S ROMES satellite. If the satellite process seems to hang or crashes, then the WatchDog will try to stop the R&S ROMES process and/or restart it again. This helps making the satellite mode act server-like with high availability.

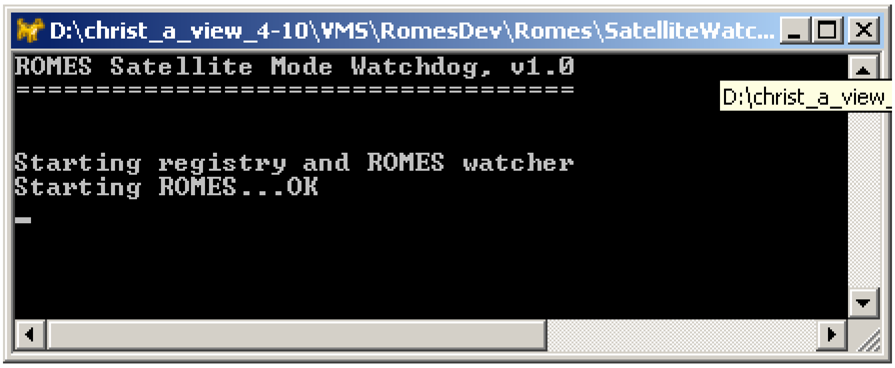


Fig. 8-3: WatchDog window

The WatchDog is restarted with a reboot of the system, as long as the satellite mode is enabled.

Measurement Restart

If a satellite registers at a master PC that already performs a measurement, then the drivers of that satellite that have been part of the measurement are reset to do the same measurements as before. This is especially useful when the WatchDog terminates an R&S ROMES instance that seems to be locked.

Preconditions and Restrictions

Licensing

To use the distributed R&S ROMES feature, a special option (ROMES4NET) is required. One such a license must be obtained to make the master PC run in the distributed measurement mode. The satellites only need an R&S ROMES dongle when the basic workspaces are configured, for satellite measurement mode no dongle is required.

The master PC can only manage as many instances of a driver as it has license for that specific type of device. Be aware that these are restricted to a maximum number of 16 instances per device type in most options. If more are required, please contact your Rohde & Schwarz sales partner.

Hardware

The master PC must fulfill at least to the minimum required system constrains defined by a standard ROMES installation. Nevertheless it is recommended to use a computer with higher computing capabilities to be able to properly manage all the data coming from the satellites, especially when more complex systems are built.

Satellites do not display any important data, so these machines don't define tight constraints on the hardware used. It mainly depends on the types of measurements that are performed on the satellite.

Network Requirements

Communication in the distributed R&S ROMES system is done over a TCP/IP network connection, and both satellite and master require some socket ports to be free for use. These ports can be modified in the `%ROMES_HOME%\Configuration\master.config` and `satellite.config` file, if there is a conflict with existing applications.

The default ports are `10010 to 10013`, so they need to be made available in the network. Otherwise using R&S ROMES over several PC is not possible.

Supported Drivers

Currently only two drivers support the distributed R&S ROMES, more are to come in future versions:

- Qualcomm (GSM, UMTS, CDMA etc)
- DQA

Drivers not supported will be ignored when included in the satellite workspace and will not be connected to the master PC.

Operating R&S ROMES without Local Admin Rights

In case you want to operate R&S ROMES with a “Limited Account” (without local Admin rights) it is necessary to perform the following steps to grant additional rights needed to ensure full functionality.

The steps described here are valid for the MS Windows XP operating system.

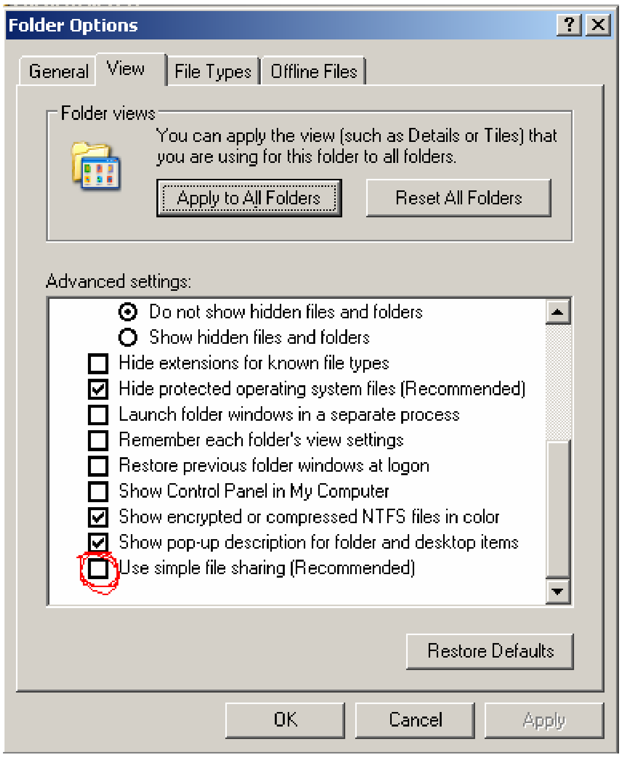
File Sharing Settings

The limited account user without local administration rights needs full file control for the following directories:

- R&S ROMES directory (e.g. C:\RuS or C:\ROMES4.10)
- MapInfo directory (e.g. C:\Programme\MapInfo)
- R&S ROMES temporary directory for route track modules (C:\TEMP)

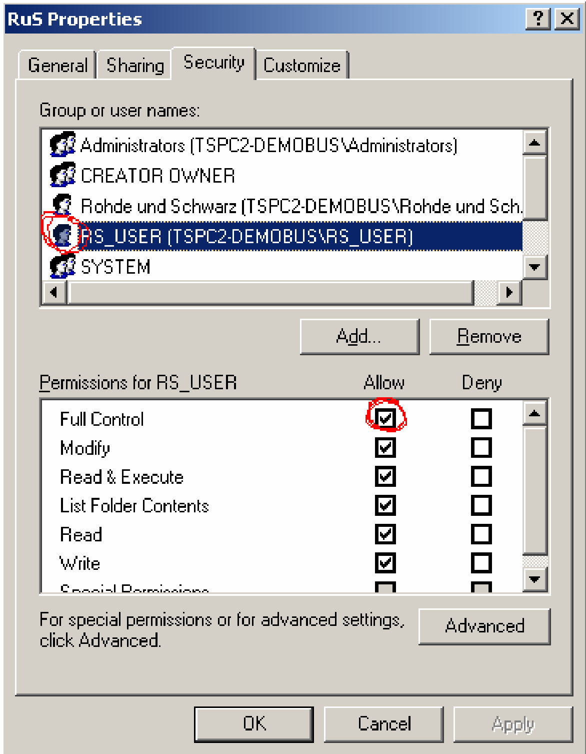
This involves the following steps:

1.) Open the Windows Explorer and select the menu item "Tools"->"Folder Options...". Select the tab "View" and scroll down until the "Use simple file sharing" list item is visible as shown below:



Deselect the "Use simple file sharing" checkbox and "Apply" the change.

2.) Back in the Windows Explorer, select the default R&S ROMES directory (e.g. C:\RuS) and right-click it. In the resulting context menu, select the item "Properties", which leads to a dialog window for the selected directory. Click on tab "Security" to obtain a dialog similar to the one shown below:



In the upper list, select the user with limited account privileges (RS_USER in this example). Then select "Allow" in the "Full control" list item of the lower list. "Apply" the change and repeat this step for all directories listed at the beginning of this section.

3.) When Step 2.) is completed, modify the registry as described below.

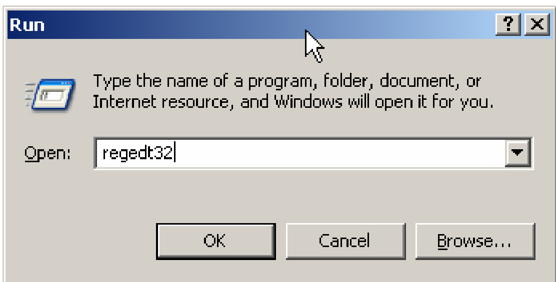
Registry Modifications

To operate R&S ROMES with a limited account user as described above, the following registry keys need to be updated:

- ROMES Registry Key:
  HKEY_LOCAL_MACHINE\SOFTWARE\Rohde & Schwarz
- MapInfo Registry Key:
  HKEY_LOCAL_MACHINE\SOFTWARE\MapInfo

This involves the following steps:

4.) Open the "Start" menu and select "Run..." to obtain the following dialog.

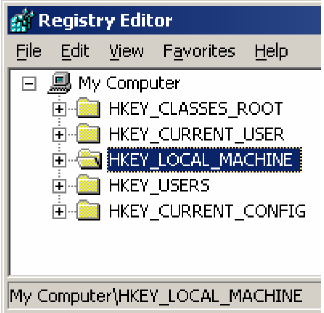


Type "regedt32", as shown above and click "OK" to start the MS Windows Registry editor.

Do not use “regedit” as this tool does not support security settings for registry entries.

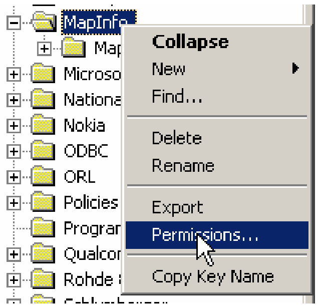
Alternatively, call C:\WINNT\SYSTEM32\regedt32.exe from the command prompt.

The Registry Editor starts with a window similar to the following:

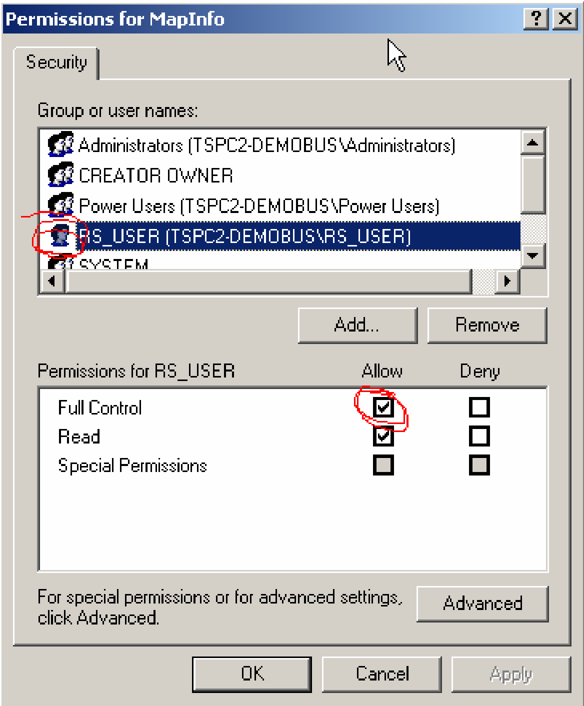


Click on "HKEY_LOCAL_MACHINE", then on "SOFTWARE".

5.) In the "SOFTWARE" list, locate the "Rohde & Schwarz" and "MapInfo" items. Right-click an item to obtain a context menu similar to the following:



6.) Select "Permissions..." to open the following dialog:



In the upper list, select the user with limited account privileges (RS_USER in this example). Then select "Allow" in the "Full control" list item of the lower list. "Apply" the change and repeat this step for all SOFTWARE items listed at the beginning of this section.

These changes allow the full functionality of the R&S ROMES software in the context of a limited user account.

R&S ROMES Tools

Together with the main application, R&S ROMES installs additional useful software tools. The tools are accessible in the *Tools* submenu of the R&S ROMES program menu:

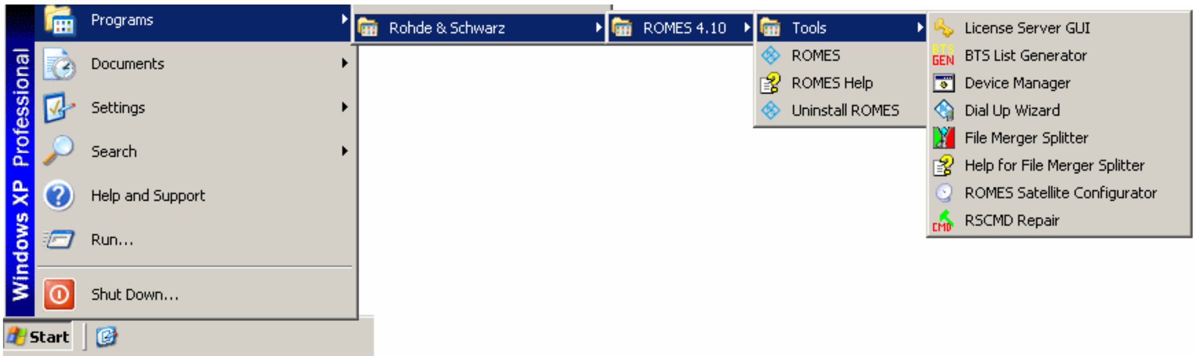


Fig.. 8-4: R&S ROMES Tools

RSCMD File Repair

The *RSCMDRepair* utility can repair measurement (*.rscmd or *.cmd) files that are corrupted, e.g. because of a system crash or a sudden voltage drop during the measurement. Successfully repaired measurement files can be used again for evaluation in a replay session. The success of the repair algorithm depends on the state of the measurement file.

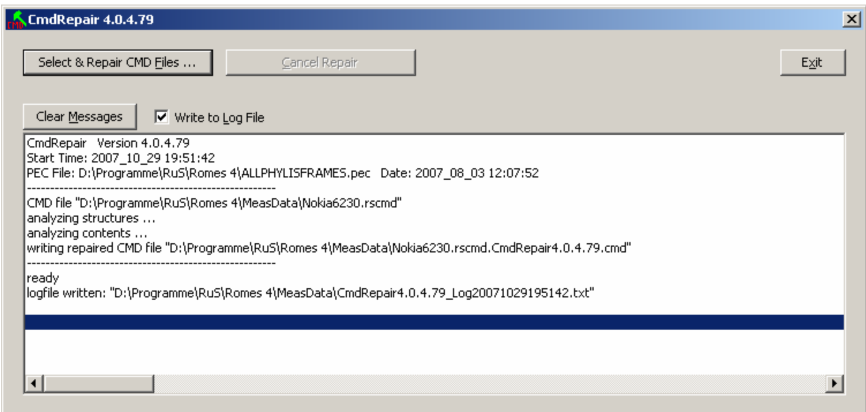
Installation

The RSCMDRepair utility is automatically installed together with the test system. An executable file *RSCMDRepair.EXE* is stored in the R&S ROMES program directory.

Repairing a CMD file

To repair a RSCMD or CMD file...

Make sure that ROMES is closed.
Select RSCMDRepair in the *Tools* program subdirectory; see **Fig.. 8-4: R&S ROMES Tools** .
In the dialog opened, click *Select & Repair CMD Files* to call up an *Open File* dialog and choose the corrupted measurement file <file>.rscmd (or <file>.cmd).
If it is able to open the file, the file repair tool automatically assigns an output file name *<file>.cmd.CmdRepair3.25.0.0.cmd* and writes it to the CMD file directory. The progress of the file repair process is reported in the main application window but can also be written to a separate *.txt file (check *Write to Log File)*.



The tool indicates *ready* as soon as the file is successfully repaired. If a non-corrupted file is repaired, the repaired file is identical to the original file.

BTS List Generator

The *BTS List Generator* is a software utility which can be used to generate a sample BTS/Node B list from a GSM/CDMA/UMTS measurement (*.rscmd or *.cmd) file. The sample BTS/Node B list is adjusted to the contents of the measurement file. It is a useful tool for demo purposes and for exploring the part of ROMES functionality that depends on a BTS/Node B list.

Installation

The *BTS List Generator* is automatically installed together with the test system. An executable file *BTSListGenerator.EXE* is stored in the ROMES program directory.

Generating a sample BTS list

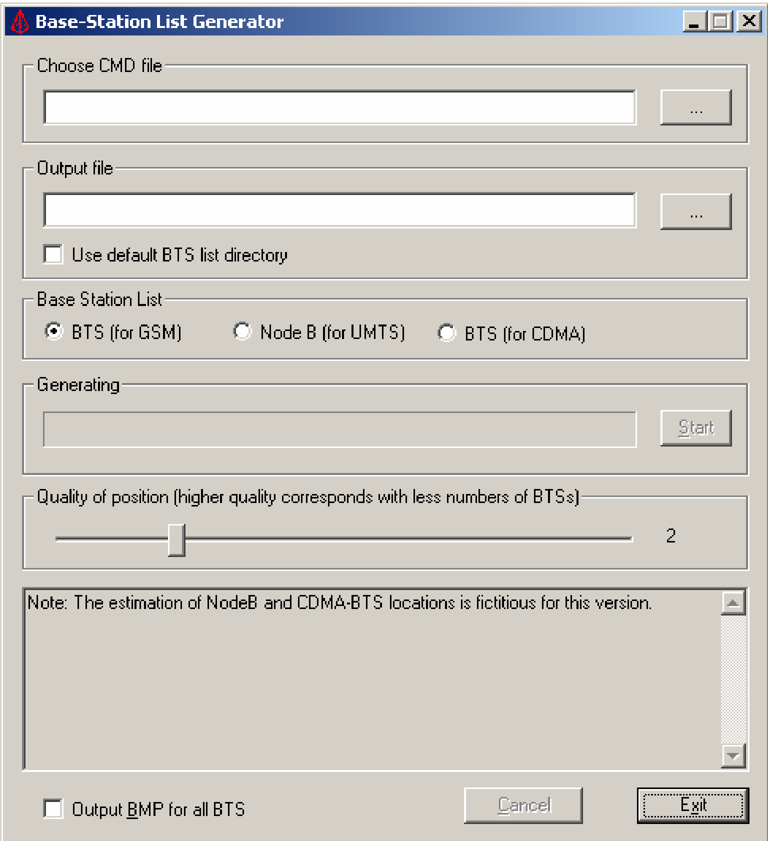
To generate a sample BTS or Node B list...

1. Make sure that ROMES is closed.

Double-click *BTSListGenerator.EXE* (or select *Demo BTS List Generator* in the *Tools* program subdirectory; see **Error! Reference source not found.** on p. **Error! Bookmark not defined.**).

In the dialog opened, click the *Choose Measurement file* "..." button to choose the GSM, CDMA or UMTS <file>.rscmd (or *.cmd) file to be used for the BTS/Node B list generation.

The list generator automatically assigns an output file name <file>.txt and selects the folder of the measurement file as default BTS list file location. The *.txt BTS list file format is described in chapter 7.



If you wish to use another file name or file location, click the *Output file* "..." button or check *Use default BTS List directory*.

The default BTS list directory is the *BTSLists* subdirectory of the ROMES program directory.

Select either *BTS (for GSM)* or *Node B (for UMTS)* or *BTS (for CDMA),* depending on the technology of your CMD file.

Click *Start* and check the messages displayed in the *Generating* panel and in the lower section of the dialog.

BTSs detected in the measurement file are displayed as a scrollable list. The *Generating* panel displays a *Ready!* message when the BTS list is generated. The BTS list file can be imported into the GSM BTS data base as described in chapter 3.

Further program settings

The *BTS List Generator* provides additional parameters to control the generated output. The parameters are related to the calculation of the BTS position, which is based on the route of the test vehicle and the measured timing advance of the signals. The geometry and varying test conditions introduce a specific uncertainty to the position estimation of each BTS.

Quality of position

The BTSs are ordered according to the estimated accuracy of their position, BTSs with large inaccuracies are discarded. The condition for discarding BTSs can be varied on a scale between 1 and 6. Larger numbers cause more BTSs to be discarded so that the BTS list becomes shorter.

Output BMP for all BTS

If the box is checked, a bitmap file named *<PositionEstimation_<n>.bmp* for each BTS in the BTS list is written to the output directory. The bitmap shows a graphical code for the estimated accuracy of the BTS position.

Error Messages

The measurement file must contain valid data according to the selected technology. If an invalid measurement file is selected, file generation is stopped and the *BTS List Generator* displays the following message:

No GSM information found!
Could not calculate BTS!

Example

An example BTS list file named *SAUERLACH_MUC.TXT* generated with the *BTS List Generator* is provided together with the application. The file has been generated from the sample measurement file *SAUERLACH_MUC.CMD* and is stored in the *BTSLists* subdirectory of the ROMES program directory.

DialUp Wizard

The *DialUp Wizard* offers a preconfigured list of connections to internet providers all over the world. To establish a dial-up connection from your local PC, it is sufficient to select a provider and a country. The wizard allows you to change the parameters of an existing connection or add new connections in an easy way.

Installation

The *DialUp Wizard* is automatically installed together with the test system. An executable file *DialUp Wizard.exe* is stored in the ROMES program directory.

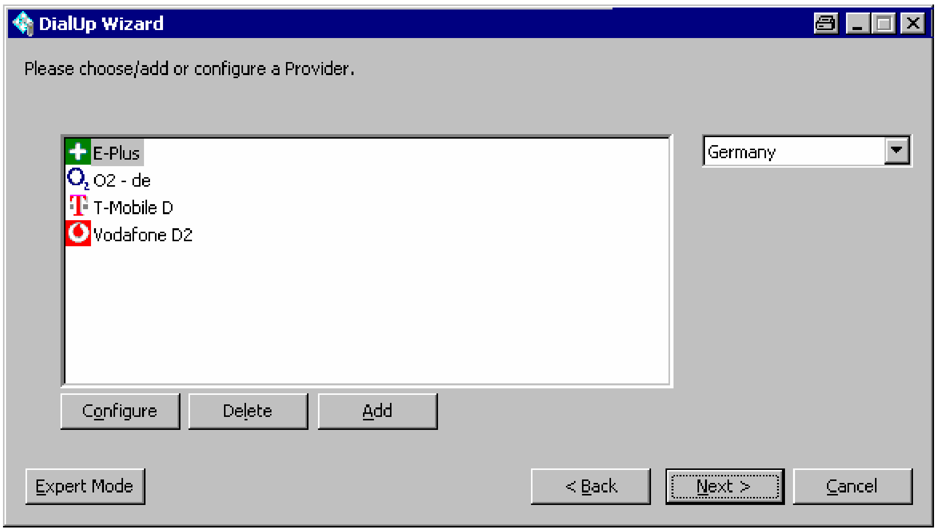
Setting up a connection

To disable unused views, technologies, or drivers...

2. Select *DialUp Wizard* in the *Tools* program subdirectory; In the country list on

the right side of the wizard, select your country.

3. In the provider list, select your provider.



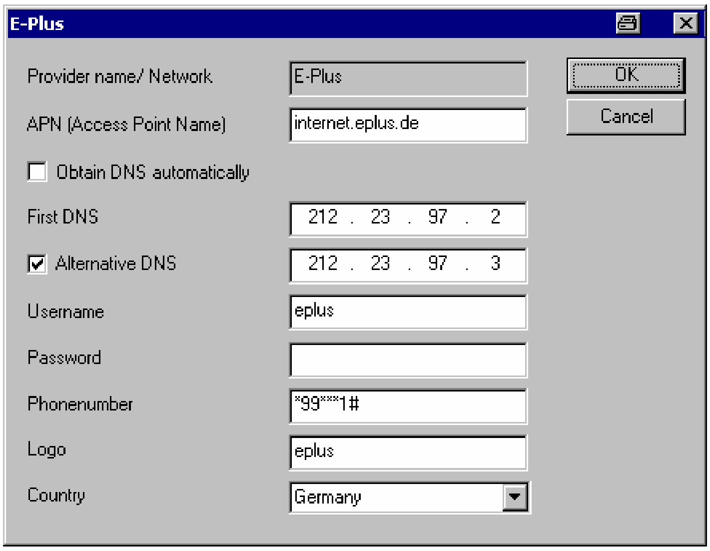
4. Click *Next* to proceed to the next dialog of the wizard and select a modem.

5. Click *Finish* to attempt the connection and close the wizard.

Customizing the DialUp Wizard

The buttons in the *DialUp Wizard* dialog allow you to perform the following configurations:

- Configure opens a dialog to modify or complement the connection parameters of the selected provider.



- *Delete* removes the selected connection from the list.

- *Add* opens the dialog shown above where you can add the name and the parameters for a new connection. The connection parameters are usually published in the internet.

- *Expert Mode* opens a dialog where you can again change your connection configuration, look up or change your modem settings, or configure a Remote Access Service (RAS) connection. In expert mode, you can also set up a *GPRS Connection* to the internet using a GPRS mobile phone connected to your local PC.

File Merger/Splitter

The *File Merger/Splitter* application merge or split *.rscmd files. It is an application which is independent from R&S ROMES: The *File Merger / Splitter* application offers a graphical user interface mode and a command line mode. The application will run in command line mode automatically when any command line switches is specified.

Merger

The Merger allows two types of merging:

1. Time domain merging,
2. Device domain merging.

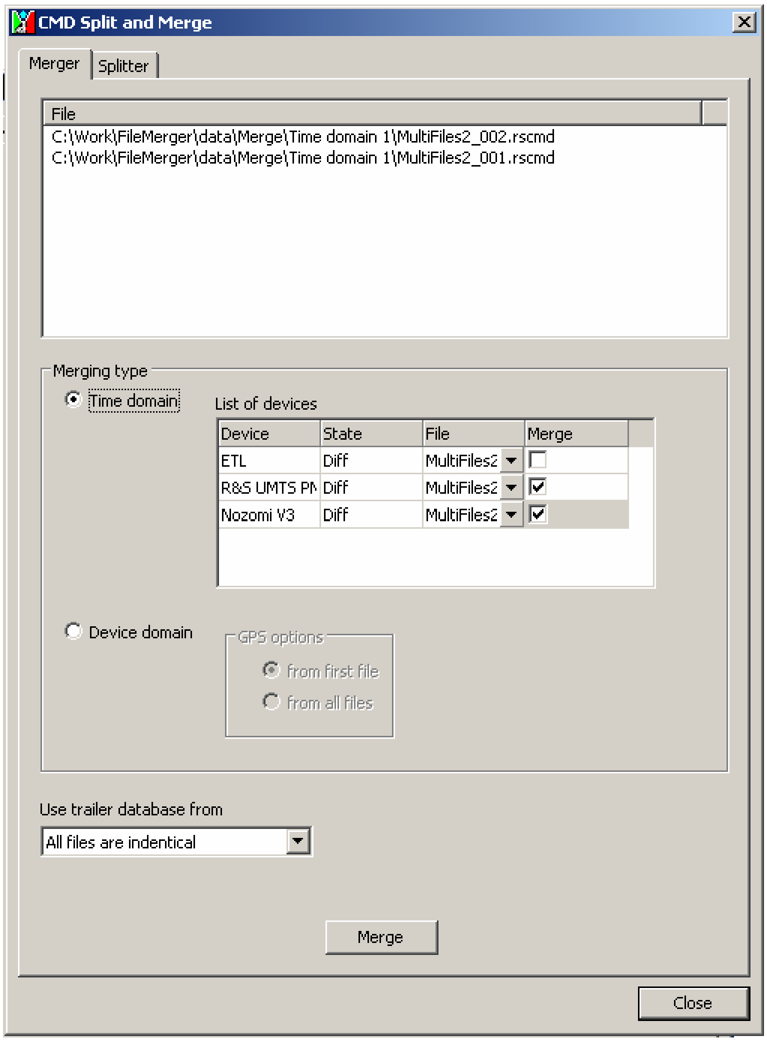


Fig. 8-5: File Merger/ Splitter - Merger tab window

Time domain merging

Several RSCMD files, which were recorded one after the other and do not overlap in time, can be merged to one RSCMD file.

The standard case for merging in time domain are files, which have exactly the same driver list, driver settings and do not overlap in time. Such files occur, if a measurement is stopped in R&S ROMES and started again without changing the driver's configuration.

If devices have different settings resulting in different file headers, the user has to choose the header which will be stored with the resulting file.

The merged files will contain the original measurements as blocks.

For files with different drivers the merging will be rejected.

Device domain merging

Several RSCMD file can be merged by building a driver list which is the sum of all involved drivers. The duration of the merged files is the duration from the very first data frame of the first RSCMD file to the last frame of the last RSCMD frame.

If more than one GPS are involved, the merger provides the following options:

- Use only GPS data of first file. After the end of the first file, no more GPS data will be available.
- Use GPS device of first file, but after the end of the first while project the GPS data of the next file to this device.

User trailer database from

Some kind of RSCMD files contain database in the trailer. Content of the databases can be the same for all the files or different. You can select the file in the combo box below in the dialog which database content will be stored at the resulting file.

Splitter

The Splitter allows two types of splitting:

1. Time domain splitting,
2. Device domain splitting.

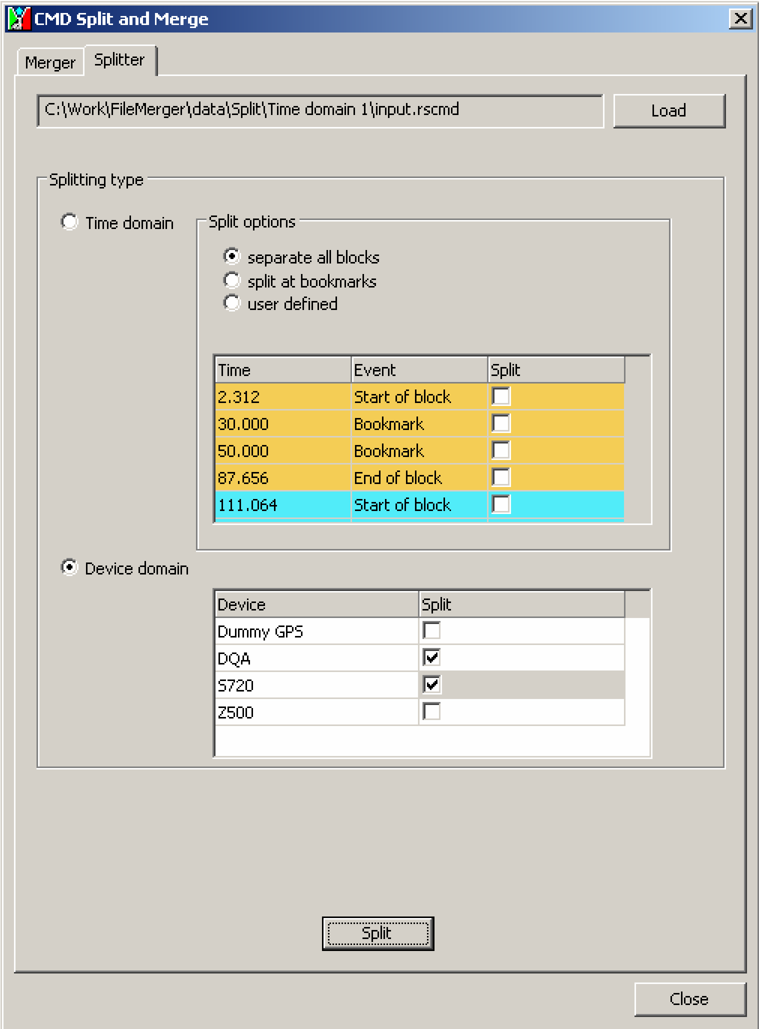


Fig. 8-6: File Merger / Splitter - Splitter tab window

Time domain splitting The Splitter is able to split the input file at specified points. There are three predefined types of splitting:

separate all blocks
Each data inside block are stored at separate resulting file.

split at bookmarks
The file will be splitted only at bookmarks.

user defined
The user can select splitting points (bookmarks and blocks).

Device domain splitting The Splitter provides a list of all involved drivers. The user has to select from this list which driver will be included in the result file. The splitter creates a file which has the same duration as the source file, but includes only the selected device(s).

This procedure can i.e. remove unwanted device data from a file and reduce the file size.

Command Line Switches

In command line mode you can use some kind of switches:

General	**/s**	Shows help.
Merger	**Time domain**	
	/mt	Sets application to time domain merging.
	/f:"file1.rscmd"	Adds "file1.rscmd" to the list of files to be merged.
	/d:same	Merges only devices with identical settings.
	/d:all	Merges all devices regardless their settings.
	/d:print	Dumps all devices from input files which can be merged.
	/o:"result.rscmd"	Merged result will be written to the file "result.rscmd".
	Device domain	
	/mt	Sets application to device domain merging.
	/f:"file1.rscmd"	Adds "file1.rscmd" to the list of files to be merged.
	/gps1	Uses GPS information only from the very first file.
	/gps2	Merges GPS information from all files.
	/o:"result.rscmd"	Result of merging will be placed to the file "result.rscmd".
Splitter	**Time domain**	
	/st	Sets application to time domain splitting
	/f:"file1.rscmd"	Adds "file1.rscmd" to the list of files to be splitted.
	/allblocks	Moves all blocks into separate file.
	/allbookmarks	Splits the file at bookmarks.
	/dir:"c:\result"	Splitted files will be placed into target directory.
	Device domain	
	/st	Sets application to device domain splitting
	/f:"file1.rscmd"	Adds "file1.rscmd" to the list of files to be splitted.
	/d:3	New file will contain device with ID = 3.
	/d:print	Dumps all devices stored at input file.
	/o:"result.rscmd"	Splitted data will be stored at file "result.rscmd".

Notice

Switches /mt /md /st /sd *cannot be combined. Using only one is allowed.*
Switch /f *can be used repeatedly to add several files.*
Switches /d:same /d:all /d:print /d:ID *(where ID is number) cannot be combined together. While multiply using of* /d:ID *is allowed.*
Switches /gps1 *and* /gps2 *cannot be combined together.*
Switches /allblocks *and* /allbookmarks *cannot be combined together.*

License Server GUI

The application *License Server GUI* application shows which license are active and allows requesting for a further license.

R&S ROMES only loads those modules that are supported by the available licenses and resolved dependencies during start-up automatically.
If only a subset of views, technologies and drivers shall be available in the R&S ROMES, then such a setup can be created using the “Create Project” action in the File menu. Such a project reduces the amount of modules that ROMES loads during startup, therefore minimizing the overall startup time and the complexity of the menus/dialog filled with information regarding such modules.

Since licensing itself is a challenging issue, the associated Romes information is contained in file User Manual Romes Licence Server and Client.pdf in the Documentation subdirectory of the Romes DVD.

Installation The *Licenses Server GUI is* automatically installed together with the test system. An executable file *LicCentralGui.exe* is stored in the ROMES program directory.

The LicCentral window has two tabs.

Dongle The Dongle tab displays information about the available licenses. Information about validation and the status.

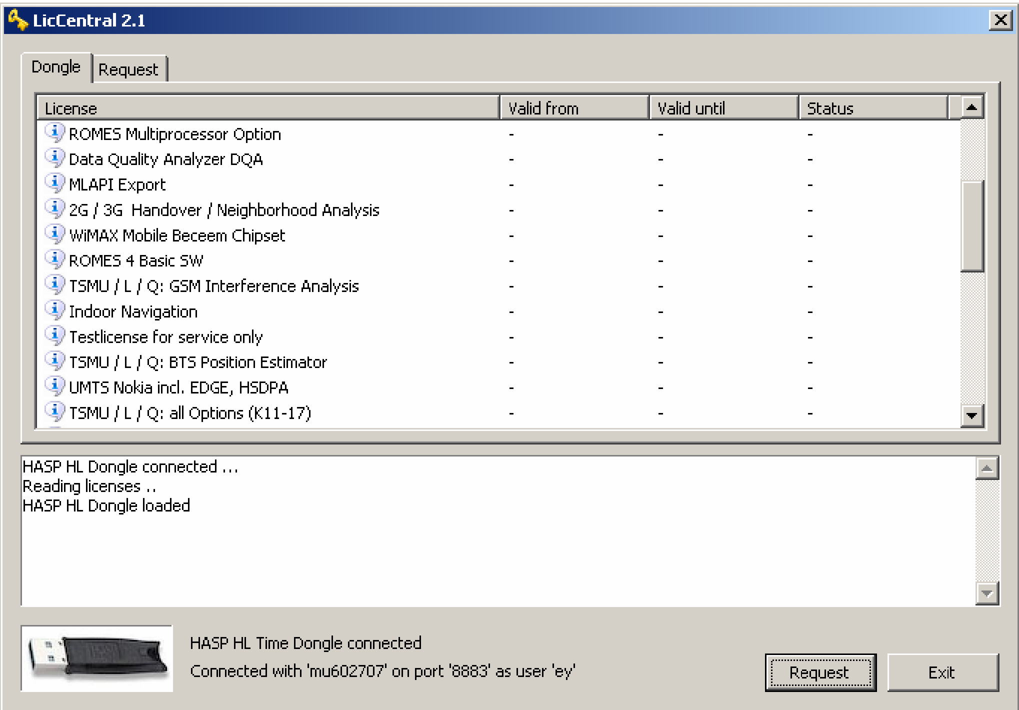


Fig. 8-7: LicCentral: Dongle tab

Request The Request tab allows requesting a license.

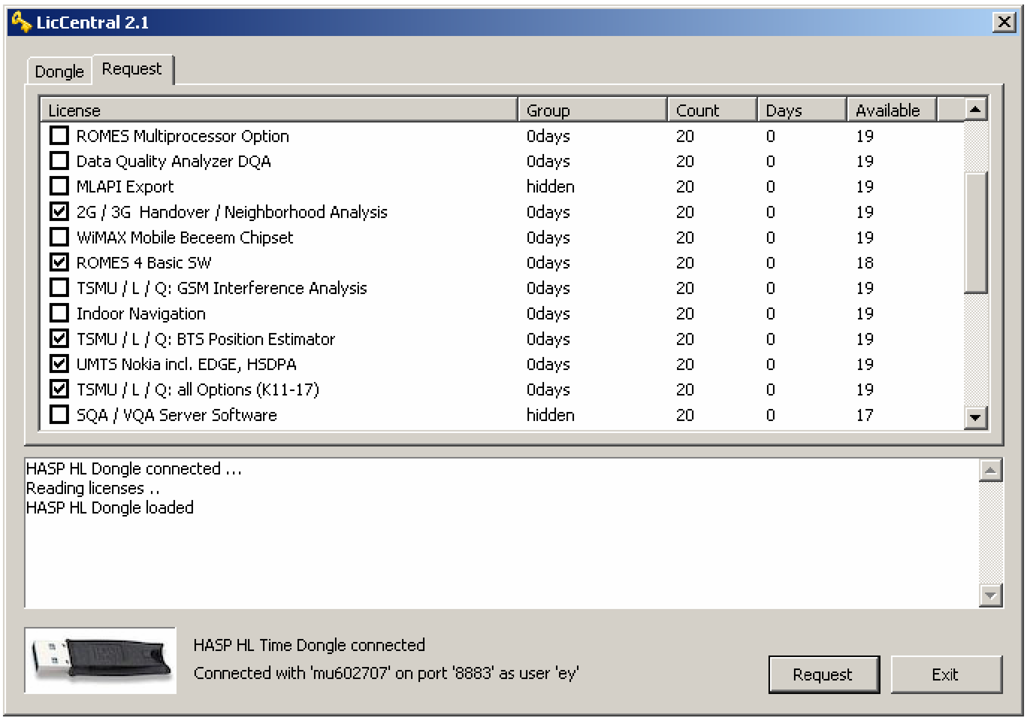


Fig. 8-8: LicCentral: Request tab

Special Device Manager

The *Special Device Manager* helps to remove redundant USB drivers that R&S ROMES used in previous measurement sessions. A USB driver must be loaded and assigned to several virtual COM ports whenever a USB device (in particular, a Nokia or Qualcomm UMTS test mobile) is connected; see section *Connection via USB Interface* in chapter 6.

The operating system does not delete unused virtual COM ports if USB devices are connected and disconnected repeatedly. As a result, the virtual COM port numbers for new devices *(Assign Serial Ports* dialog) tend to increase, which in the long run may cause connection problems. It is recommended to delete redundant USB ports using the *Special Device Manager* if the assigned port numbers exceed values of 30, or if holes in the sequence of the COM port numbers are noticed.

The *Special Device Manager* is the standard Device Manager from Microsoft with the environment variable SET DEVMGR_SHOW_NONPRESENT_DEVICES set to 1.

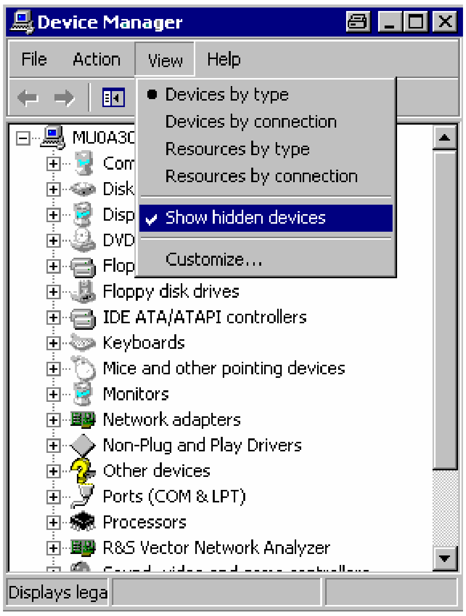
Installation

The *Special Device Manager* is automatically installed together with the test system. An executable file *DeviceManager.bat* is stored in the *Tools\DeviceManager* subdirectory of the ROMES program directory.

Removing unused drivers

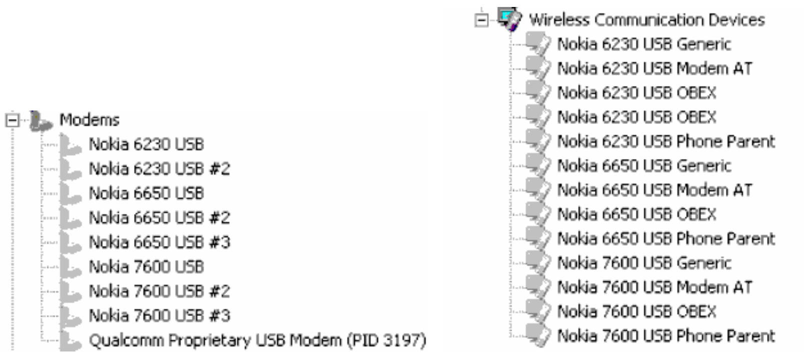
To remove unused drivers...

1. Select *Special Device Manager* in the *Tools* program subdirectoryIn the dialog opened, select *View – Show hidden devices.*



The entry must be ticked after each program start.

2. Expand the *Modems* and *Wireless Communication Devices* nodes in the *Device Manager* window*.*



Unused drivers and port assignments are displayed with gray icons.

3. Delete redundant entries, e.g. all *Nokia* and *Qualcomm* entries, all Qualcomm COM ports and “compound devices”, and all other drivers that are listed several times and no longer needed.

4. Close the *Special Device Manager.*

The lower virtual COM port numbers are available once again; you can use them for the connection of new USB devices.

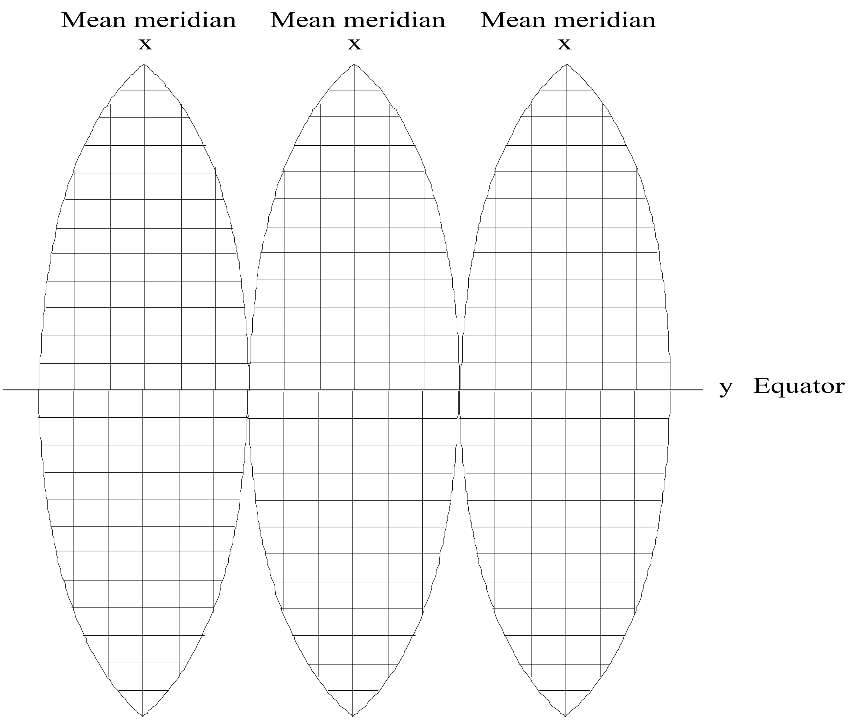
Coordinate Systems

The measured field strength values can be displayed in a variety of coordinate systems, depending on the needs of the user. Digitized data on the location coordinates can be obtained with a GPS system or with a digitizer, which is moved over an appropriate land map.

Gauß Coordinate Systems

The mathematical principles for this type of coordinate system were developed by Gauß, and its adaptation for practical application was completed by Krüger. This projection can be seen more or less as a cylindrical projection on a quadrature axis, where a cylinder is rotated over the earth ellipsoid at right angles to the rotational axis of the ellipsoid. The surface of the earth is then translated through a central projection to the inside of the cylinder. The position of the cylinder is chosen in such a manner that a tangential meridian forms a distortion-free straight line. The equator, perpendicular to the meridian, also forms a straight line. As distance from the tangential meridian increases, there is some distortion. This is also noticeable in the representation of the earth's surface to the east and to the west of the tangential meridian.

To keep the distortion as low as possible, the projection is limited to a strip 1.5° to the side of the tangential meridian (for this reason also referred to as the mean or main meridian). An ellipse is thus created on the surface of the cylinder, the extremities of which are the poles. The entire surface of the earth is divided into 60 meridian strips, which, by "opening up" the cylinder, can be represented as follows:



The Gauß-Krüger System

With the Gauß quadrature axis projection the surface of the earth can be represented on one level in meridian strips. The mean meridian is represented by the y-axis (abscissa) and the equator by the x-axis (ordinate). Both axes are perpendicular to each other. The result is a rectangular coordinate system in each meridian strip (cf. diagram above). The abscissa to the north of the equator are vertical values, the ordinates to the east of the mean meridian are horizontal values.

To avoid negative values for the ordinates, every main meridian is given the value of 500000 meters. As a means of identification, this is prefaced by its degree of longitude divided by three.

To reduce to acceptable values the distortions occurring as distance from the tangential meridian increases, strip systems were introduced in Germany which assume the degrees of longitude (meridians) at 6°, 9°, 12°, etc. to be main meridians true to longitude and represent them as abscissa axes. Every partial system has an extension of 1.5 degrees of longitude in both directions (approx. 100 km).

A point which is 30500 m to the west of the mean meridian at 6° is assigned the horizontal value

500000 m - 30500 m = 469500 m.

The UTM System

The Universal Transversal Mercator projection (UTM) is a transversal cylindrical projection used mainly for NATO and USA military maps. The UTM system covers the earth between 80° north and south with 60 meridian systems (zones). The main meridians of each zone lying at 3°, 9°, 15°, etc. are numbered from west to east, beginning with the mean meridian at 177° west. In each zone intervals of approx. 8° are selected and marked with capital letters, beginning at 80° south. All of the fields produced in this way are then divided by grids with round 100 km values in the x and y directions from the mean meridian to form squares with a width of 100 km. These squares are marked with two letters according to their row and column position. Coordinates are then used to determine an exact position within one of the squares. The coordinates are marked E (east, corresponding to y or the horizontal value) and N (north, corresponding to x or the vertical value). The resulting structure is a universal grid.

The Coordinate System of the East European States

For average-scale maps the East European states use Gauß-Krüger meridian systems with a longitudinal extension of 6° and a mean meridian true to longitude on the basis of Krassovskij earth ellipsoid. For maps with scales of 1:5000 and more, strips of 3° are used.

The Geographical Grid

In the geographical grid positional information is given by measuring the degrees of longitude and latitude in degrees, minutes and seconds.

The Decimal Grid

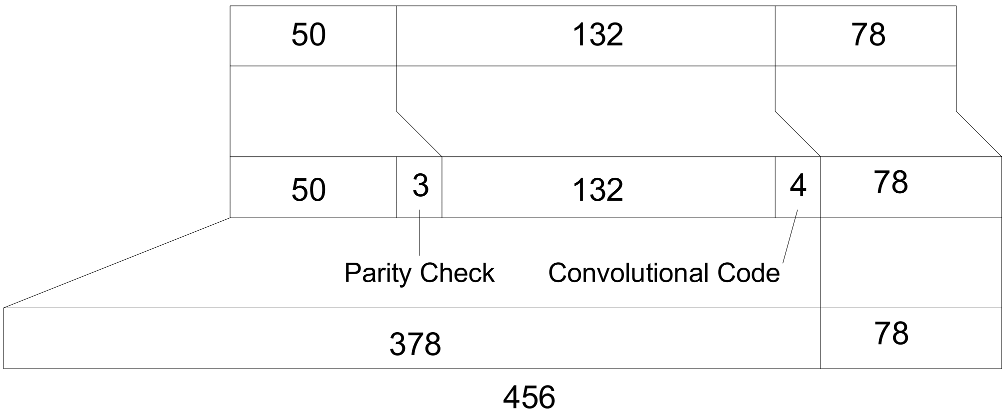
In the decimal grid positional information is given by measuring the degrees of longitude and latitude in decimal figures.

GSM: The Coded Channel

There are various types of channels. The traffic channel (TCH) serves to carry data, the control channel (CCH) to carry signaling and synchronization data. Furthermore there are three types of control channel: broadcast channels are used to carry mobile station frequency corrections (FCCH = frequency correction channel), for frame synchronization (SCH = synchronization channel) and to carry information about the mode in operation at the base station (BCCH = broadcast control channel). General control channels (CCCH = common control channel) carry information about the communication network set-up. Purpose-related control channels (DCCH = dedicated control channels) encode the exchanges between the base station (BS) and the mobile station (MS).

Channel coding with error recognition and correction causes redundancies in the utilizable data. Channel coding may raise the bandwidth requirements, but it also raises the signal interference resistance and therefore lowers the power requirement.

The language coder on the TCH delivers 260 bit per 20 ms (13 kbit/s) to channel coding. The first 182 bits (class 1 bits) are far more important than the rest of the data (78 bit, class 2 bits) as far as their content is concerned. The first 50 bits in class 1 are further protected with 3 parity bits (class 1a bits). The remaining bits in class 1 are called class 1b bits. Three sensibility classes stem from this.



All class 1 bits are coded with a convolutional code (Viterbi-Code, R = 1/2, v = 4). 4 additional bits are allocated to each bit in class 1 whereby the additional bits form the memory of the Viterbi coder. So, a coded bit sequence of bit length 378 results from the 189 bits of class1. The bit sequence together with the 78 non-coded, class 2 bits form a block of 456 bits which are transmitted in 20 ms (22.8 kBit/s).

On the SCH (Synchronization Channel) 25-bit blocks are sequentially coded to a block length of 78 bits with a BCH code shortened to 35 bits and then analogue to the TCH.

To save the signaling data, 184 bit frames are sequentially coded to a block length of 456 bits with the fire code on a 224 bit frame length and then analogue to the TCH.

The data are then interleaved and encoded.

GSM Channels and Power Classes

Table 8-2 Frequency ranges

Band	Subband	Uplink [MHz]	Downlink [MHz]
GSM400	**GSM450**	450.4 to 457.4	460.4 to 467.4
	GSM480	478.8 to 486.0	488.8 to 496.0
GSM700	**GSM 750**	747 to 762	777 to 792
GSM900	**P-GSM900 (primary GSM)**	890 to 915	935 to 960
	E-GSM (extended GSM)	880 to 890	925 to 935
	R-GSM (Railways GSM)	876 to 880	921 to 925
GSM1800	**GSM1800**	1710 to 1785	1805 to 1880
GSM850	**GSM850**	824 to 849	869 to 894
GSM1900	**GSM1900**	1850 to 1910	1930 to 1990

Table 8-3 Channel numbers (ARFCN)

(Sub)band	Uplink [MHz]	Downlink [MHz]	n Range
GSM450	450.6 + 0.2 * (n – 259)	460.6 + 0.2 * (n – 259)	259 ≤ n ≤ 293
GSM480	479.0 + 0.2 * (n – 306)	489.0 + 0.2 * (n – 306)	306 ≤ n ≤ 340
GSM 750	747.2 + 0.2 * (n – 438)	777.2 + 0.2 * (n – 438)	438 ≤ n ≤ 511
P-GSM900	890 + 0.2 * n	935 + 0.2 * n	1 ≤ n ≤ 124
E-GSM900	880.2 + 0.2 * (n – 975)	925.2 + 0.2 * (n – 975)	975 ≤ n ≤ 1023
R-GSM900	876.2 + 0.2 * (n – 955)	921.2 + 0.2 * (n – 955)	955 ≤ n ≤ 974
GSM1800	1710.2 + 0.2 * (n – 512)	1805.2 + 0.2 * (n – 512)	512 ≤ n ≤ 885
GSM850	824.2 + 0.2 * (n – 128)	869.2 + 0.2 * (n – 128)	128 ≤ n ≤ 251
GSM1900	1850.2 + 0.2 * (n - 512)	1930.2 + 0.2 * (n - 512)	512 ≤ n ≤ 810

n: Channel number (ARFCN)

Table 8-4 Downlink channels in P-GSM900 (primary GSM)

Channel	f [MHz]		Channel	f [MHz]		Channel	f [MHz]		Channel	f [MHz]
1	935,2		41	943,2		81	951,2		121	959,2
2	935,4		42	943,4		82	951,4		122	959,4
3	935,6		43	943,6		83	951,6		123	959,6
4	935,8		44	943,8		84	951,8		124	959,8
5	936		45	944		85	952			
6	936,2		46	944,2		86	952,2			
7	936,4		47	944,4		87	952,4			
8	936,6		48	944,6		88	952,6			
9	936,8		49	944,8		89	952,8			
10	937		50	945		90	953			
11	937,2		51	945,2		91	953,2			
12	937,4		52	945,4		92	953,4			
13	937,6		53	945,6		93	953,6			
14	937,8		54	945,8		94	953,8			
15	938		55	946		95	954			
16	938,2		56	946,2		96	954,2			
17	938,4		57	946,4		97	954,4			
18	938,6		58	946,6		98	954,6			
19	938,8		59	946,8		99	954,8			
20	939		60	947		100	955			
21	939,2		61	947,2		101	955,2			
22	939,4		62	947,4		102	955,4			
23	939,6		63	947,6		103	955,6			
24	939,8		64	947,8		104	955,8			
25	940		65	948		105	956			
26	940,2		66	948,2		106	956,2			
27	940,4		67	948,4		107	956,4			
28	940,6		68	948,6		108	956,6			
29	940,8		69	948,8		109	956,8			
30	941		70	949		110	957			
31	941,2		71	949,2		111	957,2			
32	941,4		72	949,4		112	957,4			
33	941,6		73	949,6		113	957,6			
34	941,8		74	949,8		114	957,8			
35	942		75	950		115	958			
36	942,2		76	950,2		116	958,2			
37	942,4		77	950,4		117	958,4			
38	942,6		78	950,6		118	958,6			
39	942,8		79	950,8		119	958,8			
40	943		80	951		120	959			

Table 8-5 Downlink channels in GSM900: E-GSM and R-GSM

R-GSM Channel	f [MHz]
955	921.2
956	921.4
957	921.6
958	921.8
959	922
960	922.2
961	922.4
962	922.6
963	922.8
964	923
965	923.2
966	923.4
967	923.6
968	923.8
969	924
970	924.2
971	924.4
972	924.6
973	924.8
974	925

E-GSM Channel	f [MHz]	E-GSM Channel	f [MHz]
975	925.2	1000	930.2
976	925.4	1001	930.4
977	925.6	1002	930.6
978	925.8	1003	930.8
979	926	1004	931
980	926.2	1005	931.2
981	926.4	1006	931.4
982	926.6	1007	931.6
983	926.8	1008	931.8
984	927	1009	932
985	927.2	1010	932.2
986	927.4	1011	932.4
987	927.6	1012	932.6
988	927.8	1013	932.8
989	928	1014	933
990	928.2	1015	933.2
991	928.4	1016	933.4
992	928.6	1017	933.6
993	928.8	1018	933.8
994	929	1019	934
995	929.2	1020	934.2
996	929.4	1021	934.4
997	929.6	1022	934.6
998	929.8	1023	934.8
999	930		

Table 8-6 Downlink channels in GSM1800

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
		551	1813	591	1821	631	1829
512	1805.2	552	1813.2	592	1821.2	632	1829.2
513	1805.4	553	1813.4	593	1821.4	633	1829.4
514	1805.6	554	1813.6	594	1821.6	634	1829.6
515	1805.8	555	1813.8	595	1821.8	635	1829.8
516	1806	556	1814	596	1822	636	1830
517	1806.2	557	1814.2	597	1822.2	637	1830.2
518	1806.4	558	1814.4	598	1822.4	638	1830.4
519	1806.6	559	1814.6	599	1822.6	639	1830.6
520	1806.8	560	1814.8	600	1822.8	640	1830.8
521	1807	561	1815	601	1823	641	1831
522	1807.2	562	1815.2	602	1823.2	642	1831.2
523	1807.4	563	1815.4	603	1823.4	643	1831.4
524	1807.6	564	1815.6	604	1823.6	644	1831.6
525	1807.8	565	1815.8	605	1823.8	645	1831.8
526	1808	566	1816	606	1824	646	1832
527	1808.2	567	1816.2	607	1824.2	647	1832.2
528	1808.4	568	1816.4	608	1824.4	648	1832.4
529	1808.6	569	1816.6	609	1824.6	649	1832.6
530	1808.8	570	1816.8	610	1824.8	650	1832.8
531	1809	571	1817	611	1825	651	1833
532	1809.2	572	1817.2	612	1825.2	652	1833.2
533	1809.4	573	1817.4	613	1825.4	653	1833.4
534	1809.6	574	1817.6	614	1825.6	654	1833.6
535	1809.8	575	1817.8	615	1825.8	655	1833.8
536	1810	576	1818	616	1826	656	1834
537	1810.2	577	1818.2	617	1826.2	657	1834.2
538	1810.4	578	1818.4	618	1826.4	658	1834.4
539	1810.6	579	1818.6	619	1826.6	659	1834.6
540	1810.8	580	1818.8	620	1826.8	660	1834.8
541	1811	581	1819	621	1827	661	1835
542	1811.2	582	1819.2	622	1827.2	662	1835.2
543	1811.4	583	1819.4	623	1827.4	663	1835.4
544	1811.6	584	1819.6	624	1827.6	664	1835.6
545	1811.8	585	1819.8	625	1827.8	665	1835.8
546	1812	586	1820	626	1828	666	1836
547	1812.2	587	1820.2	627	1828.2	667	1836.2
548	1812.4	588	1820.4	628	1828.4	668	1836.4
549	1812.6	589	1820.6	629	1828.6	669	1836.6
550	1812.8	590	1820.8	630	1828.8	670	1836.8

751	1853	791	1861	831	1869	871	1877
752	1853,2	792	1861,2	832	1869,2	872	1877,2
753	1853,4	793	1861,4	833	1869,4	873	1877,4
754	1853,6	794	1861,6	834	1869,6	874	1877,6
755	1853,8	795	1861,8	835	1869,8	875	1877,8
756	1854	796	1862	836	1870	876	1878
757	1854,2	797	1862,2	837	1870,2	877	1878,2
758	1854,4	798	1862,4	838	1870,4	878	1878,4
759	1854,6	799	1862,6	839	1870,6	879	1878,6
760	1854,8	800	1862,8	840	1870,8	880	1878,8
761	1855	801	1863	841	1871	881	1879
762	1855,2	802	1863,2	842	1871,2	882	1879,2
763	1855,4	803	1863,4	843	1871,4	883	1879,4
764	1855,6	804	1863,6	844	1871,6	884	1879,6
765	1855,8	805	1863,8	845	1871,8	885	1879,8
766	1856	806	1864	846	1872		
767	1856,2	807	1864,2	847	1872,2		
768	1856,4	808	1864,4	848	1872,4		
769	1856,6	809	1864,6	849	1872,6		
770	1856,8	810	1864,8	850	1872,8		
771	1857	811	1865	851	1873		
772	1857,2	812	1865,2	852	1873,2		
773	1857,4	813	1865,4	853	1873,4		
774	1857,6	814	1865,6	854	1873,6		
775	1857,8	815	1865,8	855	1873,8		
776	1858	816	1866	856	1874		
777	1858,2	817	1866,2	857	1874,2		
778	1858,4	818	1866,4	858	1874,4		
779	1858,6	819	1866,6	859	1874,6		
780	1858,8	820	1866,8	860	1874,8		
781	1859	821	1867	861	1875		
782	1859,2	822	1867,2	862	1875,2		
783	1859,4	823	1867,4	863	1875,4		
784	1859,6	824	1867,6	864	1875,6		
785	1859,8	825	1867,8	865	1875,8		
786	1860	826	1868	866	1876		
787	1860,2	827	1868,2	867	1876,2		
788	1860,4	828	1868,4	868	1876,4		
789	1860,6	829	1868,6	869	1876,6		
790	1860,8	830	1868,8	870	1876,8		

Table 8-7 Downlink channels in GSM850

141	871,8	181	879,8	221	887,8
142	872	182	880	222	888
143	872,2	183	880,2	223	888,2
144	872,4	184	880,4	224	888,4
145	872,6	185	880,6	225	888,6
146	872,8	186	880,8	226	888,8
147	873	187	881	227	889
148	873,2	188	881,2	228	889,2
149	873,4	189	881,4	229	889,4
150	873,6	190	881,6	230	889,6
151	873,8	191	881,8	231	889,8
152	874	192	882	232	890
153	874,2	193	882,2	233	890,2
154	874,4	194	882,4	234	890,4
155	874,6	195	882,6	235	890,6
156	874,8	196	882,8	236	890,8
157	875	197	883	237	891
158	875,2	198	883,2	238	891,2
159	875,4	199	883,4	239	891,4
160	875,6	200	883,6	240	891,6
161	875,8	201	883,8	241	891,8
162	876	202	884	242	892
163	876,2	203	884,2	243	892,2
164	876,4	204	884,4	244	892,4
165	876,6	205	884,6	245	892,6
166	876,8	206	884,8	246	892,8

Table 8-8 Downlink channels in GSM1900

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
		551	1938	591	1946	631	1954	671	1962
512	1930.2	552	1938.2	592	1946.2	632	1954.2	672	1962.2
513	1930.4	553	1938.4	593	1946.4	633	1954.4	673	1962.4
514	1930.6	554	1938.6	594	1946.6	634	1954.6	674	1962.6
515	1930.8	555	1938.8	595	1946.8	635	1954.8	675	1962.8
516	1931	556	1939	596	1947	636	1955	676	1963
517	1931.2	557	1939.2	597	1947.2	637	1955.2	677	1963.2
518	1931.4	558	1939.4	598	1947.4	638	1955.4	678	1963.4
519	1931.6	559	1939.6	599	1947.6	639	1955.6	679	1963.6
520	1931.8	560	1939.8	600	1947.8	640	1955.8	680	1963.8
521	1932	561	1940	601	1948	641	1956	681	1964
522	1932.2	562	1940.2	602	1948.2	642	1956.2	682	1964.2
523	1932.4	563	1940.4	603	1948.4	643	1956.4	683	1964.4
524	1932.6	564	1940.6	604	1948.6	644	1956.6	684	1964.6
525	1932.8	565	1940.8	605	1948.8	645	1956.8	685	1964.8
526	1933	566	1941	606	1949	646	1957	686	1965
527	1933.2	567	1941.2	607	1949.2	647	1957.2	687	1965.2
528	1933.4	568	1941.4	608	1949.4	648	1957.4	688	1965.4
529	1933.6	569	1941.6	609	1949.6	649	1957.6	689	1965.6
530	1933.8	570	1941.8	610	1949.8	650	1957.8	690	1965.8
531	1934	571	1942	611	1950	651	1958	691	1966
532	1934.2	572	1942.2	612	1950.2	652	1958.2	692	1966.2
533	1934.4	573	1942.4	613	1950.4	653	1958.4	693	1966.4
534	1934.6	574	1942.6	614	1950.6	654	1958.6	694	1966.6
535	1934.8	575	1942.8	615	1950.8	655	1958.8	695	1966.8
536	1935	576	1943	616	1951	656	1959	696	1967
537	1935.2	577	1943.2	617	1951.2	657	1959.2	697	1967.2
538	1935.4	578	1943.4	618	1951.4	658	1959.4	698	1967.4
539	1935.6	579	1943.6	619	1951.6	659	1959.6	699	1967.6
540	1935.8	580	1943.8	620	1951.8	660	1959.8	700	1967.8
541	1936	581	1944	621	1952	661	1960	701	1968
542	1936.2	582	1944.2	622	1952.2	662	1960.2	702	1968.2
543	1936.4	583	1944.4	623	1952.4	663	1960.4	703	1968.4
544	1936.6	584	1944.6	624	1952.6	664	1960.6	704	1968.6
545	1936.8	585	1944.8	625	1952.8	665	1960.8	705	1968.8
546	1937	586	1945	626	1953	666	1961	706	1969
547	1937.2	587	1945.2	627	1953.2	667	1961.2	707	1969.2
548	1937.4	588	1945.4	628	1953.4	668	1961.4	708	1969.4
549	1937.6	589	1945.6	629	1953.6	669	1961.6	709	1969.6
550	1937.8	590	1945.8	630	1953.8	670	1961.8	710	1969.8

Channel	f [MHz]	Kanal	f [MHz]	Kanal	f [MHz]
711	1970	751	1978	791	1986
712	1970,2	752	1978,2	792	1986,2
713	1970,4	753	1978,4	793	1986,4
714	1970,6	754	1978,6	794	1986,6
715	1970,8	755	1978,8	795	1986,8
716	1971	756	1979	796	1987
717	1971,2	757	1979,2	797	1987,2
718	1971,4	758	1979,4	798	1987,4
719	1971,6	759	1979,6	799	1987,6
720	1971,8	760	1979,8	800	1987,8
721	1972	761	1980	801	1988
722	1972,2	762	1980,2	802	1988,2
723	1972,4	763	1980,4	803	1988,4
724	1972,6	764	1980,6	804	1988,6
725	1972,8	765	1980,8	805	1988,8
726	1973	766	1981	806	1989
727	1973,2	767	1981,2	807	1989,2
728	1973,4	768	1981,4	808	1989,4
729	1973,6	769	1981,6	809	1989,6
730	1973,8	770	1981,8	810	1989,8
731	1974	771	1982		
732	1974,2	772	1982,2		
733	1974,4	773	1982,4		
734	1974,6	774	1982,6		
735	1974,8	775	1982,8		
736	1975	776	1983		
737	1975,2	777	1983,2		
738	1975,4	778	1983,4		
739	1975,6	779	1983,6		
740	1975,8	780	1983,8		
741	1976	781	1984		
742	1976,2	782	1984,2		
743	1976,4	783	1984,4		
744	1976,6	784	1984,6		
745	1976,8	785	1984,8		
746	1977	786	1985		
747	1977,2	787	1985,2		
748	1977,4	788	1985,4		
749	1977,6	789	1985,6		
750	1977,8	790	1985,8		

Table 8-9 GSM power classes and output powers

	GSM900		1800/1900	
TxPower Level (PCL)	**Nominal output power / dBm**	**Power Class/ Max. output power**	**Nominal output power / dBm**	**Power Class/ Max. output power**
0	43	1 / 20 W	30	1 / 1 W
1	41		28	
2	39	2 / 8 W	26	
3	37	3 / 5 W	24	2 / 0.25 W
4	35		22	
5	33	4 / 2 W	20	
6	31		18	
7	29	5 / 0.8 W	16	
8	27		14	
9	25		12	
10	23		10	
11	21		8	
12	19		6	
13	17		4	
14	15		-	
15	13		-	
16	11		-	
17	9		-	
18	7		-	
19	5		-	

GSM Phase 1: $0 \leq$ TxPower $\leq$ **15**

GSM Phase 2 (since 1996): $0 \leq$ TxPower $\leq$ **19**

Table 8-10 Definition of RX Level and RX Quality

Value of RX Level	Corresponding signal strength
63	> –48 dBm
62	–49 dBm to –48 dBm
62	–50 dBm to –49 dBm
...	...
...	...
2	–109 dBm to –108 dBm
1	–110 dBm to –109 dBm
0	< –110 dBm

Value of RX Quality	Corresponding bit error rate
0	0% to 0.2%
1	0.2% to 0.4%
2	0.4% to 0.8%
3	0.8% to 1.6%
4	1.6% to 3.2%
5	3.2% to 6.4%
6	6.4% to 12.8%
7	12.8% to 100%

UMTS Channels

The assignment between UMTS UARFCNs (UTRA Absolute Radio Frequency Channel Numbers) *N*, carrier frequency *F*, and frequency offset F_{offset} is defined in the 3GPP specification (TS 21.141). The following relation holds for both directions of transmission (uplink and downlink) and all operating bands (I to IX):

$$N = 5 \cdot (F / MHz - F_{offset}), \quad 0.0\ MHz \le F \le 3276.6\ MHz$$

The downlink and uplink channels assigned in the operating bands I to IX are listed in the tables below. Note that in operating bands II, IV and VI additional center frequencies are specified. These additional channels are outside of the normal 200 kHz raster and are calculated with different offsets according to the formula above, they must be specified with their channel frequency.

Table 8-11 UTRA operating bands and channel numbers: Downlink

Operating Band	DL Frequency Band (MHz)	DL Frequency Offset (MHz)	Assigned Channels (UARFCNs)	Assigned Center Frequencies (MHz)
I	2110 to 2170	0.0	10562 to 10838	2112.4 to 2167.6
II	1930 to 1990	0.0 1850.1	9662 to 9938, Additional channels: 412, 437, 462, 487, 512, 537, 562, 587, 612, 637, 662, 687	1932.4 to 1987.6, 1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5
III	1805 to 1880	1575.0	1162 to 1513	1807.4 to 1877.6
IV	2110 to 2155	1805.0 1735.1	1537 to 1738, Additional channels: 1887, 1912, 1937, 1962, 1987, 2012, 2037, 2062, 2087	2112.4 to 2152.6, 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5
V	869 to 894	0.0 670.1	4357 to 4458, Additional channels: 1007, 1012, 1032, 1037, 1062, 1087	871.4 to 891.6, 871.5, 872.5, 876.5, 877.5, 882.5, 887.5
VI	875 to 885	0.0 670.1	4387 to 4413, Additional channels: 1037, 1062	877.4 to 882.6, 877.5, 882.5
VII	2620 to 2690	2175 2105.1	2237 to 2563 Additional channels: 2587, 2612, 2637, 2662, 2687, 2712, 2737, 2762, 2787, 2812, 2837, 2862, 2887, 2912	2622.4 to 2687.6, 2622.5, 2627.5, 2632.5, 2637.5, 2642.5, 2647.5, 2652.5, 2657.5, 2662.5, 2667.5, 2672.5, 2677.5, 2682.5, 2687.5
VIII	925 to 960	340	2937 to 3088	927.4 to 957.6
IX	1844.9 to 1879.9	0.0	9237 to 9387	1847.4 to 1877.4
Free (10 kHz resolution)[1]	80 to 3000	–	–	–

[1] freely configurable measurement with TSMQ / TSMU / TSML-W

Table 8-12 UTRA operating bands and channel numbers: Uplink

Operating Band	UL Frequency Band (MHz)	UL Frequency Offset (MHz)	Assigned Channels (UARFCNs)	Assigned Center Frequencies (MHz)
I	1920 to 1980	0.0	9612 to 9888	1922.4 MHz to 1977.6 MHz
II	1850 to 1910	0.0 1850.1	9262 to 9538, Additional channels: 12, 37, 62, 87, 112, 137, 162, 187, 212, 237, 262, 287	1852.4 MHz to 1907.6 MHz, 1852.5, 1857.5, 1862.5, 1867.5, 1872.5, 1877.5, 1882.5, 1887.5, 1892.5, 1897.5, 1902.5, 1907.5
III	1710 to 1785	1525.0	937 to 1287	1712.4 MHz to 1782.6 MHz
IV	1710 to 1755	1450.0 1380.1	1312 to 1513, Additional channels: 1662, 11687, 1712, 1737, 1762, 1787, 1812, 1837, 1862	1712.4 MHz to 1752.6 MHz, 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5, 1742.5, 1747.5, 1752.5
V	824 to 849	0.0 670.1	4132 to 4233, Additional channels: 782, 787, 807, 812, 837, 862	826.4 MHz to 846.6 MHz, 826.5, 827.5, 831.5, 832.5, 1 827.5, 842.5
VI	830 to 840	0.0 670.1	4162 to 4188, Additional channels: 812, 837	832.4 MHz to 837.6 MHz, 832.5, 837.5
VII	2500 to 2570	2100.0 2030.1	2012 to 2338 Additional channels: 2362, 2387, 2412, 2437, 2462, 2487, 2512, 2537, 2562, 2587, 2612, 2637, 2662, 2687	2502.4 MHz to 2567.6 MHz 2502.5, 2507.5, 2512.5, 2517.5, 2522.5, 2527.5, 2532.5, 2537.5, 2542.5, 2547.5, 2552.5, 2557.5, 2562.5, 2567.5
VIII	880 to 915	340	4412 to 4563	882.4 MHz to 912.6 MHz
IX	1749.9 to 1784.9	0.0	8762 to 8912	1752.4 MHz to 1782.4 MHz
Free (10 kHz resolution)[2]	80 to 3000	–	–	–

[2] freely configurable measurement with TSMU

Table 8-13 Downlink channels in UMTS operating band I

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
10562	2112,4	10622	2124,4	10682	2136,4	10742	2148,4	10802	2160,4
10563	2112,6	10623	2124,6	10683	2136,6	10743	2148,6	10782	2156,4
10564	2112,8	10624	2124,8	10684	2136,8	10744	2148,8	10783	2156,6
10565	2113	10625	2125	10685	2137	10745	2149	10784	2156,8
10566	2113,2	10626	2125,2	10686	2137,2	10746	2149,2	10785	2157
10567	2113,4	10627	2125,4	10687	2137,4	10747	2149,4	10786	2157,2
10568	2113,6	10628	2125,6	10688	2137,6	10748	2149,6	10787	2157,4
10569	2113,8	10629	2125,8	10689	2137,8	10749	2149,8	10788	2157,6
10570	2114	10630	2126	10690	2138	10750	2150	10789	2157,8
10571	2114,2	10631	2126,2	10691	2138,2	10751	2150,2	10790	2158
10572	2114,4	10632	2126,4	10692	2138,4	10752	2150,4	10791	2158,2
10573	2114,6	10633	2126,6	10693	2138,6	10753	2150,6	10792	2158,4
10574	2114,8	10634	2126,8	10694	2138,8	10754	2150,8	10793	2158,6
10575	2115	10635	2127	10695	2139	10755	2151	10794	2158,8
10576	2115,2	10636	2127,2	10696	2139,2	10756	2151,2	10795	2159
10577	2115,4	10637	2127,4	10697	2139,4	10757	2151,4	10796	2159,2
10578	2115,6	10638	2127,6	10698	2139,6	10758	2151,6	10797	2159,4
10579	2115,8	10639	2127,8	10699	2139,8	10759	2151,8	10798	2159,6
10580	2116	10640	2128	10700	2140	10760	2152	10799	2159,8
10581	2116,2	10641	2128,2	10701	2140,2	10761	2152,2	10800	2160
10582	2116,4	10642	2128,4	10702	2140,4	10762	2152,4	10801	2160,2
10583	2116,6	10643	2128,6	10703	2140,6	10763	2152,6	10802	2160,4
10584	2116,8	10644	2128,8	10704	2140,8	10764	2152,8	10803	2160,6
10585	2117	10645	2129	10705	2141	10765	2153	10804	2160,8
10586	2117,2	10646	2129,2	10706	2141,2	10766	2153,2	10805	2161
10587	2117,4	10647	2129,4	10707	2141,4	10767	2153,4	10806	2161,2
10588	2117,6	10648	2129,6	10708	2141,6	10768	2153,6	10807	2161,4
10589	2117,8	10649	2129,8	10709	2141,8	10769	2153,8	10808	2161,6
10590	2118	10650	2130	10710	2142	10770	2154	10809	2161,8
10591	2118,2	10651	2130,2	10711	2142,2	10771	2154,2	10810	2162
10592	2118,4	10652	2130,4	10712	2142,4	10772	2154,4	10811	2162,2
10593	2118,6	10653	2130,6	10713	2142,6	10773	2154,6	10812	2162,4
10594	2118,8	10654	2130,8	10714	2142,8	10774	2154,8	10813	2162,6
10595	2119	10655	2131	10715	2143	10775	2155	10814	2162,8
10596	2119,2	10656	2131,2	10716	2143,2	10776	2155,2	10815	2163
10597	2119,4	10657	2131,4	10717	2143,4	10777	2155,4	10816	2163,2
10598	2119,6	10658	2131,6	10718	2143,6	10778	2155,6	10817	2163,4
10599	2119,8	10659	2131,8	10719	2143,8	10779	2155,8	10818	2163,6
10600	2120	10660	2132	10720	2144	10780	2156	10819	2163,8
10601	2120,2	10661	2132,2	10721	2144,2	10781	2156,2	10820	2164
10602	2120,4	10662	2132,4	10722	2144,4	10782	2156,4	10821	2164,2
10603	2120,6	10663	2132,6	10723	2144,6	10783	2156,6	10822	2164,4
10604	2120,8	10664	2132,8	10724	2144,8	10784	2156,8	10823	2164,6
10605	2121	10665	2133	10725	2145	10785	2157	10824	2164,8
10606	2121,2	10666	2133,2	10726	2145,2	10786	2157,2	10825	2165
10607	2121,4	10667	2133,4	10727	2145,4	10787	2157,4	10826	2165,2
10608	2121,6	10668	2133,6	10728	2145,6	10788	2157,6	10827	2165,4
10609	2121,8	10669	2133,8	10729	2145,8	10789	2157,8	10828	2165,6
10610	2122	10670	2134	10730	2146	10790	2158	10829	2165,8
10611	2122,2	10671	2134,2	10731	2146,2	10791	2158,2	10830	2166
10612	2122,4	10672	2134,4	10732	2146,4	10792	2158,4	10831	2166,2
10613	2122,6	10673	2134,6	10733	2146,6	10793	2158,6	10832	2166,4
10614	2122,8	10674	2134,8	10734	2146,8	10794	2158,8	10833	2166,6
10615	2123	10675	2135	10735	2147	10795	2159	10834	2166,8
10616	2123,2	10676	2135,2	10736	2147,2	10796	2159,2	10835	2167
10617	2123,4	10677	2135,4	10737	2147,4	10797	2159,4	10836	2167,2
10618	2123,6	10678	2135,6	10738	2147,6	10798	2159,6	10837	2167,4
10619	2123,8	10679	2135,8	10739	2147,8	10799	2159,8	10838	2167,6
10620	2124	10680	2136	10740	2148	10800	2160		
10621	2124,2	10681	2136,2	10741	2148,2	10801	2160,2		

Table 8-14 Downlink channels in UMTS operating band II

Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]	Channel	f [MHz]
9662	1932.4	9722	1944.4	9782	1956.4	9842	1968.4	9902	1980.4
9663	1932.6	9723	1944.6	9783	1956.6	9843	1968.6	9882	1976.4
9664	1932.8	9724	1944.8	9784	1956.8	9844	1968.8	9883	1976.6
9665	1933	9725	1945	9785	1957	9845	1969	9884	1976.8
9666	1933.2	9726	1945.2	9786	1957.2	9846	1969.2	9885	1977
9667	1933.4	9727	1945.4	9787	1957.4	9847	1969.4	9886	1977.2
9668	1933.6	9728	1945.6	9788	1957.6	9848	1969.6	9887	1977.4
9669	1933.8	9729	1945.8	9789	1957.8	9849	1969.8	9888	1977.6
9670	1934	9730	1946	9790	1958	9850	1970	9889	1977.8
9671	1934.2	9731	1946.2	9791	1958.2	9851	1970.2	9890	1978
9672	1934.4	9732	1946.4	9792	1958.4	9852	1970.4	9891	1978.2
9673	1934.6	9733	1946.6	9793	1958.6	9853	1970.6	9892	1978.4
9674	1934.8	9734	1946.8	9794	1958.8	9854	1970.8	9893	1978.6
9675	1935	9735	1947	9795	1959	9855	1971	9894	1978.8
9676	1935.2	9736	1947.2	9796	1959.2	9856	1971.2	9895	1979
9677	1935.4	9737	1947.4	9797	1959.4	9857	1971.4	9896	1979.2
9678	1935.6	9738	1947.6	9798	1959.6	9858	1971.6	9897	1979.4
9679	1935.8	9739	1947.8	9799	1959.8	9859	1971.8	9898	1979.6
9680	1936	9740	1948	9800	1960	9860	1972	9899	1979.8
9681	1936.2	9741	1948.2	9801	1960.2	9861	1972.2	9900	1980
9682	1936.4	9742	1948.4	9802	1960.4	9862	1972.4	9901	1980.2
9683	1936.6	9743	1948.6	9803	1960.6	9863	1972.6	9902	1980.4
9684	1936.8	9744	1948.8	9804	1960.8	9864	1972.8	9903	1980.6
9685	1937	9745	1949	9805	1961	9865	1973	9904	1980.8
9686	1937.2	9746	1949.2	9806	1961.2	9866	1973.2	9905	1981
9687	1937.4	9747	1949.4	9807	1961.4	9867	1973.4	9906	1981.2
9688	1937.6	9748	1949.6	9808	1961.6	9868	1973.6	9907	1981.4
9689	1937.8	9749	1949.8	9809	1961.8	9869	1973.8	9908	1981.6
9690	1938	9750	1950	9810	1962	9870	1974	9909	1981.8
9691	1938.2	9751	1950.2	9811	1962.2	9871	1974.2	9910	1982
9692	1938.4	9752	1950.4	9812	1962.4	9872	1974.4	9911	1982.2
9693	1938.6	9753	1950.6	9813	1962.6	9873	1974.6	9912	1982.4
9694	1938.8	9754	1950.8	9814	1962.8	9874	1974.8	9913	1982.6
9695	1939	9755	1951	9815	1963	9875	1975	9914	1982.8
9696	1939.2	9756	1951.2	9816	1963.2	9876	1975.2	9915	1983
9697	1939.4	9757	1951.4	9817	1963.4	9877	1975.4	9916	1983.2
9698	1939.6	9758	1951.6	9818	1963.6	9878	1975.6	9917	1983.4
9699	1939.8	9759	1951.8	9819	1963.8	9879	1975.8	9918	1983.6
9700	1940	9760	1952	9820	1964	9880	1976	9919	1983.8
9701	1940.2	9761	1952.2	9821	1964.2	9881	1976.2	9920	1984
9702	1940.4	9762	1952.4	9822	1964.4	9882	1976.4	9921	1984.2
9703	1940.6	9763	1952.6	9823	1964.6	9883	1976.6	9922	1984.4
9704	1940.8	9764	1952.8	9824	1964.8	9884	1976.8	9923	1984.6
9705	1941	9765	1953	9825	1965	9885	1977	9924	1984.8
9706	1941.2	9766	1953.2	9826	1965.2	9886	1977.2	9925	1985
9707	1941.4	9767	1953.4	9827	1965.4	9887	1977.4	9926	1985.2
9708	1941.6	9768	1953.6	9828	1965.6	9888	1977.6	9927	1985.4
9709	1941.8	9769	1953.8	9829	1965.8	9889	1977.8	9928	1985.6
9710	1942	9770	1954	9830	1966	9890	1978	9929	1985.8
9711	1942.2	9771	1954.2	9831	1966.2	9891	1978.2	9930	1986
9712	1942.4	9772	1954.4	9832	1966.4	9892	1978.4	9931	1986.2
9713	1942.6	9773	1954.6	9833	1966.6	9893	1978.6	9932	1986.4
9714	1942.8	9774	1954.8	9834	1966.8	9894	1978.8	9933	1986.6
9715	1943	9775	1955	9835	1967	9895	1979	9934	1986.8
9716	1943.2	9776	1955.2	9836	1967.2	9896	1979.2	9935	1987
9717	1943.4	9777	1955.4	9837	1967.4	9897	1979.4	9936	1987.2
9718	1943.6	9778	1955.6	9838	1967.6	9898	1979.6	9937	1987.4
9719	1943.8	9779	1955.8	9839	1967.8	9899	1979.8	9938	1987.6
9720	1944	9780	1956	9840	1968	9900	1980		
9721	1944.2	9781	1956.2	9841	1968.2	9901	1980.2		

The 12 additional downlink channels of the 200 MHz raster are listed in Table 8-11 on p. 8.51.

Table 8-15 Downlink channels in UMTS operating band III

Channel	f [MHz]
1162	1807,4
1163	1807,6
1164	1807,8
1165	1808
1166	1808,2
1167	1808,4
1168	1808,6
1169	1808,8
1170	1809
1171	1809,2
1172	1809,4
1173	1809,6
1174	1809,8
1175	1810
1176	1810,2
1177	1810,4
1178	1810,6
1179	1810,8
1180	1811
1181	1811,2
1182	1811,4
1183	1811,6
1184	1811,8
1185	1812
1186	1812,2
1187	1812,4
1188	1812,6
1189	1812,8
1190	1813
1191	1813,2
1192	1813,4
1193	1813,6
1194	1813,8
1195	1814
1196	1814,2
1197	1814,4
1198	1814,6
1199	1814,8
1200	1815
1201	1815,2
1202	1815,4
1203	1815,6
1204	1815,8
1205	1816
1206	1816,2
1207	1816,4
1208	1816,6
1209	1816,8
1210	1817
1211	1817,2
1212	1817,4
1213	1817,6
1214	1817,8
1215	1818
1216	1818,2
1217	1818,4
1218	1818,6
1219	1818,8
1220	1819
1221	1819,2
1222	1819,4
1223	1819,6
1224	1819,8
1225	1820
1226	1820,2
1227	1820,4
1228	1820,6
1229	1820,8
1230	1821

Channel	f [MHz]
1231	1821,2
1232	1821,4
1233	1821,6
1234	1821,8
1235	1822
1236	1822,2
1237	1822,4
1238	1822,6
1239	1822,8
1240	1823
1241	1823,2
1242	1823,4
1243	1823,6
1244	1823,8
1245	1824
1246	1824,2
1247	1824,4
1248	1824,6
1249	1824,8
1250	1825
1251	1825,2
1252	1825,4
1253	1825,6
1254	1825,8
1255	1826
1256	1826,2
1257	1826,4
1258	1826,6
1259	1826,8
1260	1827
1261	1827,2
1262	1827,4
1263	1827,6
1264	1827,8
1265	1828
1266	1828,2
1267	1828,4
1268	1828,6
1269	1828,8
1270	1829
1271	1829,2
1272	1829,4
1273	1829,6
1274	1829,8
1275	1830
1276	1830,2
1277	1830,4
1278	1830,6
1279	1830,8
1280	1831
1281	1831,2
1282	1831,4
1283	1831,6
1284	1831,8
1285	1832
1286	1832,2
1287	1832,4
1288	1832,6
1289	1832,8
1290	1833
1291	1833,2
1292	1833,4
1293	1833,6
1294	1833,8
1295	1834
1296	1834,2
1297	1834,4
1298	1834,6
1299	1834,8

Channel	f [MHz]
1300	1835
1301	1835,2
1302	1835,4
1303	1835,6
1304	1835,8
1305	1836
1306	1836,2
1307	1836,4
1308	1836,6
1309	1836,8
1310	1837
1311	1837,2
1312	1837,4
1313	1837,6
1314	1837,8
1315	1838
1316	1838,2
1317	1838,4
1318	1838,6
1319	1838,8
1320	1839
1321	1839,2
1322	1839,4
1323	1839,6
1324	1839,8
1325	1840
1326	1840,2
1327	1840,4
1328	1840,6
1329	1840,8
1330	1841
1331	1841,2
1332	1841,4
1333	1841,6
1334	1841,8
1335	1842
1336	1842,2
1337	1842,4
1338	1842,6
1339	1842,8
1340	1843
1341	1843,2
1342	1843,4
1343	1843,6
1344	1843,8
1345	1844
1346	1844,2
1347	1844,4
1348	1844,6
1349	1844,8
1350	1845
1351	1845,2
1352	1845,4
1353	1845,6
1354	1845,8
1355	1846
1356	1846,2
1357	1846,4
1358	1846,6
1359	1846,8
1360	1847
1361	1847,2
1362	1847,4
1363	1847,6
1364	1847,8
1365	1848
1366	1848,2
1367	1848,4

Channel	f [MHz]
1368	1848,6
1369	1848,8
1370	1849
1371	1849,2
1372	1849,4
1373	1849,6
1374	1849,8
1375	1850
1376	1850,2
1377	1850,4
1378	1850,6
1379	1850,8
1380	1851
1381	1851,2
1382	1851,4
1383	1851,6
1384	1851,8
1385	1852
1386	1852,2
1387	1852,4
1388	1852,6
1389	1852,8
1390	1853
1391	1853,2
1392	1853,4
1393	1853,6
1394	1853,8
1395	1854
1396	1854,2
1397	1854,4
1398	1854,6
1399	1854,8
1400	1855
1401	1855,2
1402	1855,4
1403	1855,6
1404	1855,8
1405	1856
1406	1856,2
1407	1856,4
1408	1856,6
1409	1856,8
1410	1857
1411	1857,2
1412	1857,4
1413	1857,6
1414	1857,8
1415	1858
1416	1858,2
1417	1858,4
1418	1858,6
1419	1858,8
1420	1859
1421	1859,2
1422	1859,4
1423	1859,6
1424	1859,8
1425	1860
1426	1860,2
1427	1860,4
1428	1860,6
1429	1860,8
1430	1861
1431	1861,2
1432	1861,4
1433	1861,6
1434	1861,8
1435	1862

Channel	f [MHz]
1436	1862,2
1408	1856,6
1409	1856,8
1410	1857
1411	1857,2
1412	1857,4
1413	1857,6
1414	1857,8
1415	1858
1416	1858,2
1417	1858,4
1418	1858,6
1419	1858,8
1420	1859
1421	1859,2
1422	1859,4
1423	1859,6
1424	1859,8
1425	1860
1426	1860,2
1427	1860,4
1428	1860,6
1429	1860,8
1430	1861
1431	1861,2
1432	1861,4
1433	1861,6
1434	1861,8
1435	1862
1436	1862,2
1437	1862,4
1438	1862,6
1439	1862,8
1440	1863
1441	1863,2
1442	1863,4
1443	1863,6
1444	1863,8
1445	1864
1446	1864,2
1447	1864,4
1448	1864,6
1449	1864,8
1450	1865
1451	1865,2
1452	1865,4
1453	1865,6
1454	1865,8
1455	1866
1456	1866,2
1457	1866,4
1458	1866,6
1459	1866,8
1460	1867
1461	1867,2
1462	1867,4
1463	1867,6
1464	1867,8
1465	1868
1466	1868,2
1467	1868,4
1468	1868,6
1469	1868,8
1470	1869
1471	1869,2
1472	1869,4
1473	1869,6
1474	1869,8

Channel	f [MHz]
1475	1870
1447	1864,4
1448	1864,6
1449	1864,8
1450	1865
1451	1865,2
1452	1865,4
1453	1865,6
1454	1865,8
1455	1866
1456	1866,2
1457	1866,4
1458	1866,6
1459	1866,8
1460	1867
1461	1867,2
1462	1867,4
1463	1867,6
1464	1867,8
1465	1868
1466	1868,2
1467	1868,4
1468	1868,6
1469	1868,8
1470	1869
1471	1869,2
1472	1869,4
1473	1869,6
1474	1869,8
1475	1870
1476	1870,2
1477	1870,4
1478	1870,6
1479	1870,8
1480	1871
1481	1871,2
1482	1871,4
1483	1871,6
1484	1871,8
1485	1872
1486	1872,2
1487	1872,4
1488	1872,6
1489	1872,8
1490	1873
1491	1873,2
1492	1873,4
1493	1873,6
1494	1873,8
1495	1874
1496	1874,2
1497	1874,4
1498	1874,6
1499	1874,8
1500	1875
1501	1875,2
1502	1875,4
1503	1875,6
1504	1875,8
1505	1876
1506	1876,2
1507	1876,4
1508	1876,6
1509	1876,8
1510	1877
1511	1877,2
1512	1877,4
1513	1877,6

The GPS Receiver

The Global Positioning System (GPS) is a satellite-supported navigation system which enables the current position of a user to be determined to within a few meters. In this system, a GPS receiver calculates the coordinates of the user from the satellite signals which contain the known positions of the satellites. To minimize disturbance the satellite signals are transmitted simultaneously on two frequencies.

The satellite signal consists of a message and codes. The message describes the position of the satellite and its path. The distances from the satellites can be calculated using the codes (spread spectrum technique). The correlation between the internal code copy and the code received enable a period of time corresponding to the distance being sought to be determined. The codes must also be decodable (correlated) for the message to be received. The GPS receiver evaluates the information and calculates its position on this basis.

GPS Glossary

2-D, 3-D	Refers to two-dimensional and three-dimensional positions. A 2-D position fix provides latitude and longitude. Altitude is assumed to be fixed. Only three satellites are required to provide a 2-D position with a user-supplied altitude. A 3-D position provides the altitude in addition to LAT/LON and requires four satellites.
Almanac	Data transmitted by a GPS satellite which includes orbit information on all the satellites, clock correction, and atmospheric delay parameters. This data is used to facilitate rapid SV acquisition. The orbit information is a subset of the ephemeris data with reduced accuracy.
Ambiguity	The unknown integer number of cycles of the reconstructed carrier phase contained in an unbroken set of measurements from a single satellite pass at a single receiver.
Argument of latitude	The sum of the true anomaly and the argument of perigee.
Argument of perigee	The angle or arc from the ascending node to the closest approach of the orbiting body to the focus or perigee point, as measured at the focus of an elliptical orbit, in the orbital plane in the direction of motion of the orbiting body.
Ascending node	The point at which an object's orbit crosses the reference plane (e.g. equatorial plane) from south to north.
Azimuth	A horizontal direction expressed as the angular distance between a fixed direction, say North, and the direction of the object.
Bandwidth	A measure of the information-carrying capacity of a signal, expressed as the width of the spectrum of that signal (frequency domain representation) in Hertz.
Baseline	The three-dimensional vector distance between a pair of stations for which simultaneous GPS data has been collected and processed with differential techniques. The most accurate GPS result.

Beat frequency	Either of the two additional frequencies obtained when signals of two frequencies are mixed. The beat frequencies are equal to the sum or difference of the original frequencies.
Bias	See Integer Bias Terms.
Binary biphase modulation	Phase changes of either 0 or 180 degrees on a constant frequency carrier (representing a binary 0 or 1 respectively). GPS signals are bi-phase modulated.
Binary pulse code modulation	Pulse modulation using a string of binary numbers (codes). This coding is usually represented by ones and zeros with definite meanings assigned to them, such as changes in phase or direction of a wave.
C/A code	The Coarse/Acquisition (or Clear/Acquisition) code modulated onto the GPS L1 signal. This code is a sequence of 1023 pseudo random binary bi-phase modulations on the GPS carrier at a chipping rate of 1.023 MHz, thus having a code repetition period of one millisecond. This code was selected to provide good acquisition properties.
Carrier	A radio wave having at least one characteristic (such as frequency, amplitude, phase) which may be varied from a known reference value by modulation.
Carrier beat	The phase of the signal which remains when the incoming Doppler-shifted satellite carrier signal is beat (the difference frequency signal is generated) with the nominally constant reference frequency generated in the receiver.
Carrier frequency	The frequency of the unmodulated fundamental output of a radio transmitter. The GPSL1 carrier frequency is 1575.42 MHz.
Celestial equator	The great circle that is the projection of the Earth's geographical equator of rotation onto the celestial sphere. Its poles are the North and South Celestial Poles.
Celestial meridian	That vertical circle through the elevated celestial pole. It also passes through the other celestial pole, the astronomical zenith, and the nadir.
Channel	The receiver hardware that is required to lock to a satellite, make the range measurements and collect data from the satellite.
Chip	The length of time to transmit either a zero or a one in a binary pulse code.
Chip rate	Number of chips per second (e.g., C/A code = 1.023 MHz).

Clock offset	Constant difference in the time reading between two clocks.
Code division multiple access (CDMA)	A method of frequency reuse whereby many radios use the same frequency but with each one having a separate and unique code. GPS uses CDMA techniques with Gold's codes for their unique cross-correlation properties.
Conventional international origin (CIO)	Average position of Earth's rotation axis during the years 1900- 1905.
Correlation-type channel	A GPS receiver channel which uses a delay lock loop to maintain an alignment (correlation peak) between the replicas of the GPS code generated in the receiver and the received code.
Datum	A mathematical model of the earth. Many local data model the earth for a small region: e.g., Tokyo datum, OSGB-36 (Ordnance Survey of Great Britain 1936), NAD-27(North American). Others, WGS-84, for example, model the whole earth. See also Geodetic Datum
Deflection of the vertical	The angle between the normal to the ellipsoid and the vertical (true plumb line). Since this angle has both a magnitude and a direction, it is usually resolved into two components: one in the meridian and the other perpendicular to it in the prime vertical.
Delay lock	The technique whereby the received code (generated by the satellite clock) is compared with the internal code (generated by the receiver clock) and the latter is shifted in time until the two codes match. Delay lock loops can be implemented in several ways; tau dither and early-minus-late gating.
Delta pseudo-range	See reconstructed carrier phase.
DGPS	Differential GPS operation. The use of a reference station to provide corrections using the RTCM SC-104 protocol for one or more mobile receivers. This may be carried out in real time over a telemetry link or by storing the data and post processing (see below).The accuracy of position measurement may be improved from 100 meters 2dRMSunder Selective Availability conditions to 1 - 15 meters depending on the choice of sensors and telemetry.
Differential processing	GPS measurements can be differenced between receivers, satellites, and epochs. Although many combinations are possible, the present convention for differential processing of GPS phase measurements is to take differences between receivers (single difference), then between satellites (double difference), then between measurement epochs (triple difference). A single-difference measurement between receivers is the instantaneous difference in-phase of the signal from the same satellite, measured by two receivers simultaneously. A double-difference measurement is obtained by differencing the single difference for one satellite with respect to the corresponding single difference for a chosen reference satellite.

	A single-difference measurement is the difference between a double difference at one epoch of time and the same double difference at the previous epoch of time.
Differential (relative) positioning	Determination of relative coordinates of two or more receivers which are simultaneously tracking the same satellites. Static differential GPS involves determining baseline vectors between pairs of receivers. See also DGPS.
Dilution of precision (DOP)	A description of the purely geometrical contribution to the uncertainty in a position fix, given by the expression DOP = SQRT TRACE (A A) where A A is the design matrix for the instantaneous position solution (dependent on satellite-receiver geometry). The DOP factor depends on the parameters of the position-fix solution. Standard terms for the GPS application are: GDOP — Geometric (three position coordinates plus clock offset in the solution) PDOP — Position (three coordinates) HDOP — Horizontal (two horizontal coordinates) TDOP — Time (clock offset only) VDOP — Vertical (height only) RDOP — Relative (normalized to 60 seconds)
Doppler aiding	The use of Doppler carrier-phase measurements to smooth code-phase position measurements.
Doppler shift	The apparent change in frequency of a received signal due to the rate of change of the range between the transmitter and receiver. See reconstructed carrier phase.
Double-difference method	A method to determine that set of ambiguity values which minimizes the variance of the solution for a receiver pair baseline vector.
Dynarnic positioning	Determination of a timed series of sets of coordinates for a moving receiver, each set of coordinates being determined from a single data sample, and usually computed in real time.
Earth-centered earth-fixed (ECEF)	Cartesian coordinate system where the X direction is the intersection of the prime meridian (Greenwich) with the equator. The vectors rotate with the earth. Z is the direction of the spin axis.
Eccentric anomaly E	The regularizing variable in the two-body problem. E is related to the mean anomaly M by Kepler's equation: M = E - e.sinE (e stands for eccentricity).
Eccentricity	The ratio of the distance from the center of an ellipse to its focus to the semimajor axis. e = (l - b^2/a^2)^-0.5 where a and b are the semimajor and semiminor axes of the ellipse.

Ecliptic	The earth-sun orbital plane. North is the direction of the system angular momentum. Also called the ecliptic pole.
Elevation	Height above mean sea level. Vertical distance above the geoid.
Elevation Mask Angle	That angle below which satellites should not be tracked. This varies according to the task and location, e.g. for land surveying it is normally set to 15 degrees to avoid interference problems caused by buildings, trees and multipath errors. For marine navigation on the other hand, the angle can be lowered to 5 degrees. Please note that, because of the greater thickness of the ionosphere and troposphere traversed by the signal at low angles together with the increased distance of the satellite, the signal is weaker.
Ellipsoid	In geodesy, unless otherwise specified, a mathematical figure formed by revolving an ellipse about its minor axis. It is often used interchangeably with spheroid. Two quantities define an ellipsoid; these are usually given as the length of the semimajor axis, a, and the flattening, f = (a - b)/a, where b is the length of the semiminor axis. Prolate and triaxial ellipsoids are invariably described as such.
Ellipsoid height	The measure of vertical distance above the ellipsoid. Not the same as elevation above sea level. GPS receivers output position-fix height in the WGS-84 datum.
Ephemeris	A list of (accurate) positions or locations of a celestial object as a function of time. Available as "broadcast ephemeris" or as post processed "precise ephemeris." For GPS navigation purposes the broadcast ephemeris is always used and is updated every hour. It is sent as a set of 8 elements of the Keplerian orbital equation (qv) and used by the receiver to compute the instantaneous position of that satellite.
Epoch	Measurement interval or data frequency, as in making observations every 15 seconds. Loading data using 30-second epochs means loading every other measurement.
Fast switching channel	A switching channel with a sequence time short enough to recover (through software prediction) the integer part of the carrier beat phase.
Flattening	f = (a - b)/a = I -(I - e^2)^1/2 where: a = Semimajor axis b - Semiminor axis e = Eccentricity
Frequency band	A range of frequencies in a particular region of the electromagnetic spectrum.
Frequency spectrum	The distribution of amplitudes as a function of frequency of the constituent waves in a signal.

Fullwave	Term used to differentiate between measurements made with signal-squared (codeless)and code-tracking receivers. Specifically, a receiver tracking L2 P-code can make measurement using the whole L2 wavelength (23 cm): the full wave.
Fundamental frequency	The fundamental frequency used in GPS is 10.23 MHz. The carrier frequencies L1 and L2 are integer multiples of this fundamental frequency. L1 = 154F = 1575.42 MHz L2 =120F = 1227.60 MHz
GDOP	Geometric Dilution of Precision. The relationship between errors in user position and time and in satellite range. GDOP^2= PDOP^2 + TDOP^2
Geocenter	The center of the earth.
Geodetic datum	A mathematical model designed to best fit part or all of the geoid. It is defined by an ellipsoid and the relationship between the ellipsoid and a point on the topographic surface established as the origin of datum. This relationship can be defined by six quantities, generally (but not necessarily) the geodetic latitude, longitude, and the height of the origin, the two components of the deflection of the vertical at the origin, and the geodetic azimuth of a line from the origin to some other point. The GPS uses WGS-84.
Geoid	The actual physical shape of the earth which is hard to describe mathematically because of the local surface irregularities and sea-land variations. In geodetic terms it is the particular equipotential surface which coincides with mean sea level, and which maybe imagined to extend through the continents. This surface is everywhere perpendicular to the force of gravity.
Geoid height	The height above the geoid is often called elevation above mean sea level.
GPS	Global Positioning System, consisting of: 1) A Space Segment (up to 24 NAVSTAR satellites in 6 different orbits) 2) The Control Segment (5 monitor stations, 1 master control station and 3 upload stations) 3) The User Segment (GPS receivers) NAVSTAR satellites carry extremely accurate atomic clocks and broadcast coherent simultaneous signals.
GPS ICD-200	The GPS Interface Control Document is a government document that contains the full technical description of the interface between the satellites and the user. GPS receivers must comply with this specification if they are to receive and process GPS signals properly.
GPS Time	The length of the second is fixed and is determined by primary atomic frequency standards. Leap-seconds are not used, as they are in UTC. Therefore, GPS time and UTC differ by a variable whole number of seconds. See also Universal Time.

Gravitational constant	The proportionality constant in Newton's Law of Gravitation: G=6.672 x 1 1 1 Nm2/K92.
Greenwich mean time (GMT)	See Universal Time. They are often used interchangeably, although Universal Time is now defined as the accepted standard. Halfwave - Measurements made using L2-squared measurements. The squaring process results in only half of the original L2 wavelength being available.
HDOP	Horizontal Dilution of Precision. See DOP and PDOP.
HOW	Handover word. The word in the GPS message that contains time synchronization information for the transfer from the C/A code to the P-code.
Inclination	The angle between the orbital plane of a body and some reference plane (e.g., equatorial plane).
INS	Inertial Navigation System, which contains an inertial measurement unit (IMU).
Integer Bias Terms	The receiver counts the radio waves from the satellite, as they pass the antenna, to a high degree of accuracy. However, it has no information on the number of waves to the satellite at the time it started counting. This unknown number of wavelengths between the satellite and the antenna is the integer bias term.
Integrated Doppler	A measurement of Doppler shift frequency or phase over time.
IODE	Issue Of Data, Ephemeris. Part of the navigation data. It is the issue number of the ephemeris information. A new ephemeris is available usually on the hour. Especially important for Differential GPS operation that the IODE change is tracked at both the reference station and mobile stations.
Ionospheric delay	A wave propagating through the ionosphere [which is a non homogeneous (in space and time) and dispersive medium] experiences delay. Phase delay depends on electron content and affects carrier signals. Group delay depends on dispersion in the ionosphere as well, and affects signal modulation (codes). The phase and group delay are of the same magnitude but opposite sign.
ipar soln	Values giving the difference in each of delta X, delta Y, delta Z vector components.
JPO	Joint Program Office for GPS located at the USAF Space Division at El Segundo, California. The JPO consists of the USAF Program Manager and Deputy Program Managers representing the Army, Navy, Marine Corps, Coast Guard, Defense Mapping Agency and NATO.
Kalman Filter	A numerical method used to track a time-varying signal in the presence of noise.

	If the signal can be characterized by some number of parameters that vary slowly with time, then Kalman filtering can be used to tell how incoming raw measurements should be processed to best estimate those parameters as a function of time.
Kinematic surveying	A form of continuous differential carrier-phase surveying requiring only short periods of data observations. Operational constraints include starting from or determining a known baseline, and tracking a minimum of four satellites. One receiver is statically located at a control point, while others are moved between points to be measured.
Keplerian orbital elernents	Allow description of any astronomical orbit: a: semimajor axis I: right ascension of ascending node e: eccentricity i: inclination o: argument of perigee t: true anomaly
L1	The primary L-band signal radiated by each NAVSTAR satellite at 1575.42 MHz. The L1 beacon is modulated with the C/A and P-codes, and with the NAV message. L2 is centered at 1227.60 MHz and is modulated with the P-code and the NAV message.
Lane	The area (or volume) enclosed by adjacent lines (or surfaces) of zero phase of either the carrier beat phase signal, or of the difference between two carrier beat phase signals. On the earth's surface a line of zero phase is the locus of all points for which the observed value would be an exact integer for the complete instantaneous phase measurement. In three dimensions, this locus becomes a surface. Lane counts are used extensively also in terrestrial radio navigation systems such as Loran or Decca to define position.
L band	The radio-frequency band extending from 390 MHz to (nominally) 1550 MHz.
LLA	A topocentric spherical coordinate system, whose coordinates are Latitude, Longitude, and Altitude. Note that altitude can be expressed with respect to any particular ellipsoid or geoid model and generally depends on the model.
MCX	A small RF coaxial cable antenna connector system produced by several companies, e.g. Huber & Suhner.
Mean anomaly	M = n (t - T) where: n is the mean motion, t is the time and T is the instant of perigee passage.
Mean motion	n = 2 /P where P is the period of revolution.
Microstrip	Antenna. A two-dimensional, flat, precisely cut piece of metal foil glued to a substrate.

Monitor station	Worldwide group of stations used in the GPS control segment to monitor satellite clock and orbital parameters. Data collected here is linked to a Master Station where corrections are calculated and controlled. This data is uploaded to each satellite at least once per day from an Upload Station.
Multichannel receiver	A receiver containing many independent channels. Such a receiver offers highest SNR because each channel tracks one satellite continuously.
Multipath	Interference similar to "ghosts" on a television screen which occurs when GPS signals arrive at an antenna having traversed different paths. The signal traversing the longer path will yield a larger pseudo range estimate and increase the error. Multiple paths may arise from reflections from structures near the antenna.
Multipath error	A positioning error resulting from interference between radio waves which have traveled between the transmitter and the receiver by two paths of different electrical lengths.
Multiplexing channel	A receiver channel which is sequenced through several satellite signals (each from a specific satellite and at a specific frequency) at a rate which is synchronous with the satellite message bit-rate (50 bits per second, or 20 milliseconds per bit). Thus, one complete sequence is completed in a multiple of 20 milliseconds.
NAD-83	North American Datum, 1983.
NAVDATA	The 1500 bit Navigation Message broadcast by each satellite at 50 bps on both L1 or L2 beacons. This message contains system time, clock correction parameters, ionospheric delay model parameters, and the vehicle'ephemeris and health. This information is used to process GPS signals to obtain user position and velocity.
NAVSTAR	The name given to GPS satellites, built by Rockwell International (Block I) or GE (Block II), which is an acronym formed from NAVigation System with Time And Ranging.
N-type	A large diameter screwed coaxial antenna connector, normally used with RF cables such as RG213 or RG58 where the mechanical strain relief is taken through the connector.
Observing session	The period of time over which GPS data is collected simultaneously by two or more receivers.
Outage	The occurrence in time and space of a GPS dilution of precision value exceeding a specified maximum.

P-code
: The protected or precise code used on both L1 and L2 GPS beacons. This code will be made available by the DOD only to authorized users. The P-code is a very long (about 1014 bits) sequence of pseudo random binary biphase modulations on the GPS carrier at a chipping rate of 10.23 MHz which does not repeat itself for about 38 weeks. Each satellite uses a one-week segment of this code which is unique to each GPS satellite, and is reset each week.

PDOP
: Position Dilution of Precision, a unitless figure of merit expressing the relationship between the error in user position and the error in satellite position. Geometrically, PDOP is proportional to 1 divided by the volume of the pyramid formed by lines running from the receiver to four satellites observed. Values considered "good" for positioning are small, say 3. Values greater than 7 are considered poor. Thus, small PDOP is associated with widely separated satellites. Small PDOP is important in navigation and positioning, but much less so in surveying. PDOP is related to horizontal and vertical DOP by PDOP^2 = HDOP^2 + VDOP^2.

Parity error
: A digital message is composed of 1s and 0s. Parity can be defined as the sum of these bits within a word unit. A parity error results when one of the bits is changed so that the parity calculated at reception is not the same as it was at transmission of the message.

PCB
: Printed Circuit Board. Reference is also made to flexible PCBs, a method of providing flexible connector ribbons to normal PCBs.

Pengee
: That point in a geocentric orbit when the geometric distance is a minimum. The closest approach of a body.

Phase lock
: The technique whereby the phase of an oscillator signal is made to follow exactly the phase of a reference signal by first comparing the phases of the two signals, and then using the resulting phase difference signal to adjust the reference oscillator frequency to eliminate phase difference when the two signals are next compared.

Phase observable
: See reconstructed carrier phase.

Point positioning
: A geographic position produced from one receiver in a stand-alone mode. At best, position accuracy obtained from a stand-alone receiver is 15-25 meters, depending on the geometry of the satellites. With Selective Availability in operation the best that can be expected is 100 meters 2dRMS.

Polar motion
: Motion of the instantaneous axis of the rotation of the Earth with respect to the solid body of the Earth. Irregular but more or less circular motion with an amplitude of about 15m and a main period of about 430 days (called Chandler Wobble).

Precise positioning service (PPS)
: The highest level of military dynamic positioning accuracy that will be provided by GPS, based on the dual-frequency P-code and having high anti-jam and anti-spoof qualities.

Prime vertical	The vertical circle perpendicular to the celestial meridian.
PRN	Pseudorandom noise, a sequence of digital Is and 0s which appears to be randomly distributed like noise, but which can be exactly reproduced. The important property of PRN codes is that they have a low autocorrelation value for all delays or lags except when they are exactly coincident. Each NAVSTAR satellite has its own unique C/A and P pseudorandom-noise codes.
Pseudolite	A ground-based GPS transmitter station which broadcasts a signal with a structure similar to that of an actual GPS satellite.
Pseudorange	A measure of the apparent propagation time from the satellite to the receiver antenna, expressed as a distance. Pseudorange is obtained by multiplying the apparent signal-propagation time by the speed of light. Pseudorange differs from the actual range by the amount that the satellite and user clocks are offset, by propagation delays, and other errors. The apparent propagation time is determined from the time shift required to align (correlate) a replica of the GPS code generated in the receiver with the received GPS code. The time shift is the difference between the time of signal reception (measured in the receiver time frame) and the time of emission (measured in the satellite time frame).
Pseudorange difference	See reconstructed carrier phase.
Range rate	The rate of change of range between the satellite and receiver. The range to a satellite changes due to satellite and observer motions. Range rate is determined by measuring the Doppler shift of the satellite beacon carrier.
RDOP	Relative Dilution Of Precision, defined as: (_DX^2 + _DY^2 + DZ^2)^1/2 ――――――――――――――― _DD usually in units of m/cycle. Multiplying RDOP by the uncertainty of a double-difference measurement yields the spherical relative-position error.
Reconstructed carrier phase	The difference between the phase of the incoming Doppler-shifted GPS carrier and the phase of a nominally constant reference frequency generated in the receiver. For static positioning, the reconstructed carrier phase is sampled at epochs determined by a clock in the receiver. The reconstructed carrier phase changes according to the continuously integrated Doppler shift of the incoming signal, biased by the integral of the frequency offset between the satellite and receiver reference oscillators.

	The reconstructed carrier phase can be related to the satellite-to-receiver range, once the initial range (or phase ambiguity) has been determined. A change in the satellite-to-receiver range of one wavelength of the GPS carrier (19 cm for L1) will result in a one-cycle change in the phase of the reconstructed carrier.
Relative navigation	A technique similar to relative positioning except that one or both, of the points may be moving. The pilot of a ship or aircraft may need to know his position relative to a harbor or runway. A data link is used to relay the error terms to the moving vessel to allow real-time navigation.
Relative positioning	The process of determining the relative difference in position between two marks with greater precision than that to which the position of a single point can be determined. Here, a receiver (antenna) is placed over each spot and measurements are made by observing the same satellite at the same time. This technique allows cancellation (during computations) of all errors which are common to both observers, such as satellite clock errors, propagation delays, etc. See also Translocation and Differential Navigation.
Right ascension of ascending node	The angular distance measured from the vernal equinox, positive to the east, along the celestial equator to the ascending node. Typically denoted by a capital omega (Ω). Used to discriminate between orbital planes.
RTCM	Radio Technical Commission for Maritime Services. Commission set up to define a differential data link to relay GPS correction messages from a monitor station to a field user. RTCM SC-104 recommendations define the correction message format and 16 different correction message types.
SA	See Selective Availability SATNAV - A local term referring to use of the older TRANSIT system for satellite navigation. One major difference between TRANSIT and GPS is that the TRANSIT satellites are in low-altitude polar orbits with a 90-minute period.
Selective Availability(SA)	A DoD program to control the accuracy of pseudorange measurements, whereby the user receives a false pseudorange which is in error by a controlled amount. Differential GPS techniques can reduce these effects for local applications.
Semimajor axis	One half of the major axis of an ellipse.
SEP	Spherical Error Probable, a statistical measure of precision defined as the 50th percentile value of the three-dimensional position error statistics. Thus, half of the results are within a 3-D SEP value.
Sidereal day	Time between two successive upper transits of the vernal equinox.
Simultaneous measurements	Measurements referenced to time-frame epochs which are either exactly equal, or else so closely spaced in time that the time misalignment can be accommodated by correction terms in the observation equation, rather than by parameter estimation.

Slope distance	The three-dimensional vector distance from station one to station two. The shortest distance (a chord) between two points.
Slow switching channel	A switching channel with a sequencing period which is too long to allow recovery of the integer part of the carrier beat phase.
SMA, SMB, SMC	Small diameter RF coaxial cable connectors with various fastening mechanisms. See manufacturers' catalogues for details.
Solar day	Time between two successive upper transits of the sun.
Spheroid	See ellipsoid.
Spread spectrum	The received GPS signal is a wide bandwidth, low-power signal (-1 60dBW). This property results from modulating the L-band signal with a PRN code in order to spread the signal energy over a bandwidth which is much greater than the signal information bandwidth. This is done to provide the ability to receive all satellites unambiguously and to provide some resistance to noise and multipath.
Spread spectrum systems	A system in which the transmitted signal is spread over a frequency band much wider than the minimum bandwidth needed to transmit the information being sent.
Squaring-type channel	A GPS receiver channel which multiplies the received signal by itself to obtain a second harmonic of the carrier which does not contain the code modulation. Used in so-called codeless receiver channels.
Standard positioning service (SPS)	The level of dynamic- or static-positioning capability that will be provided by GPS, based on the single-frequency C/A-code. The accuracy of this service will be set at a level consistent with national security.
Static positioning	Positioning applications in which the positions of static or near static points are determined.
SV	Satellite Vehicle or Space Vehicle.
Switching channel	A receiver channel which is sequenced through a number of satellite signals (each from a specific satellite and at a specific frequency) at a rate which is slower than, and asynchronous with, the message data rate.
TAIP	Trimble ASCII Interface Protocol. A protocol used to interface with Trimble vehicle navigation sensors such as the Starfinder and SVeeSix. It is designed for bi-directional use with communication modems and radio data telemetry systems which have problems with binary or hexadecimal data packets. Each

packet is preceded by two letters, followed by a sequence of alphanumeric information. A full specification of the protocol is contained Appended.

TANS — Trimble Advanced Navigation Sensor. A family of rugged 6 channel GPS sensors. Used also to refer to the protocol, also known as TSIP, Trimble Standard Interface Protocol (q.v.).

TDOP — Time Dilution of Precision. See DOP.

TOW — Time of week, in seconds, from midnight Sunday UTC.

Translocation — A version of relative positioning which makes use of a known position, such as a national survey authority mark, to aid in the accurate positioning of a desired point. Here, the position of the mark, determined using GPS, is compared with the accepted value. The three-dimensional differences are then used in the calculations for the second point.

Trop — Tropospheric correction. The correction applied to the measurement to account for tropospheric delay. This value is obtained from the modified Hopfield model.

True anomaly — The angular distance, measured in the orbital plane from the earth's center (occupied focus) from the perigee to the current location of the satellite (orbital body).

TSIP — Trimble Standard Interface Protocol. A binary/hex packet bi-directional protocol, also known as the TANS protocol. Used by a large number of Trimble sensors. TSIP is the subset of TANS which is recognized by all sensors except those of the 4000 series. The protocol is defined in full in the TSIP Appendix.

Universal time — Local solar mean time at Greenwich Meridian. Some commonly used versions of Universal Time are:

UTO	Universal Time as deduced directly from observations of stars and the fixed numerical relationship between Universal and Sidereal Time; 3 minutes 56.555 seconds.
UTI	UTO corrected for polar motion.
UT2	UTI corrected for seasonal variations in the earth's rotation rate.
UTC	Universal Time Coordinated; uniform atomic time system kept very close to UT2 by offsets. Maintained by the US. Naval Observatory. GPS time can be directly related to UTC.
UTC	GPS = seconds. (changing constant = 7 seconds in 1991).

User range accuracy (URA) — The contribution to the range-measurement error from an individual error source (apparent clock and ephemeris prediction accuracy's), converted into range units, assuming that the error source is uncorrelated with all other error sources. Values less than 10 are preferred. Block II satellites operating under Selective Availability are usually set to 32.

UTM	Universal Transverse Mercator Map Projection. A special case of the Transverse Mercator projection. Abbreviated as the UTM Grid, it consists of 60 north-south zones, each 6 degrees wide in longitude.
VDOP	Vertical Dilution of Precision. See DOP and PDOP.
Vernal equinox	The intersection of the celestial equator with the ecliptic, with the positive sense being from the earth to the sun, as the sun crosses the equator from south to north.
Vertical	The line perpendicular to the geoid at any point. The direction of the force of gravity at that point. Plumb line.
WGS-72	World Geodetic System (1972); the mathematical reference ellipsoid previously used by GPS, having a semimajor axis of 6378.135 km and a flattening of 1/298.26.
WGS-84	World Geodetic System (1984); the mathematical ellipsoid used by GPS since January 1987. The shift from WGS-72 to WGS-84 in Sunnyvale CA (370 N, 1220 W) is about 13.6 meters east, 45 meters north and 2.7 meters up.
Widelane	A linear combination of L1 and L2 observations (L1-L2) used to partially remove ionospheric errors. This combination yields a solution in about one-third the time of a complete ionosphere-free solution.
Z-count	The GPS satellite clock time at the leading edge of the next data subframe of the transmitted GPS message (usually expressed as an integer number of 6 seconds).

GSM Abbreviations

A

A3	Authentication Algorithm A3
A5/1	Encryption Algorithm A5
A5/2	Encryption Algorithm A5
A8	Algorithm A8
AB	Access Burst
AC	- Access Class (C0 to C15)
	- Application Context
ACC	Automatic Congestion Control
ACCH	Associated Control Channel
ACK	ACKnowledgement
ACM	Address Complete Message
ACU	Antenna Combining Unit
ADC	- ADministration Centre
	- Analogue to Digital Converter
ADN	Abbreviated Dialling Number
ADPCM	Adaptive Differential Pulse Code Modulation
AE	Application Entity
AEC	Acoustic Echo Control
AEF	Additional Elementary Functions
AGCH	Access Grant CHannel
Ai	Action indicator
AoCC	Advice of Charge (Charging) supplementary service
AoCI	Advice of Charge (Information) supplementary service
ASE	Application Service Element
ASN.1	Abstract Syntax Notation One
ARFCN	Absolute Radio Frequency Channel Number
ARQ	Automatic Request for Retransmission
ATT (flag)	Attach
AU	Access Unit
AuC	Authentication Centre
AUT(H)	Authentication

B

BA	BCCH Allocation
BAIC	Barring of All Incoming Calls supplementary service
BAOC	Barring of All Outgoing Calls supplementary service
BCC	Base Transceiver Station (BTS) Colour Code
BCCH	Broadcast Control Channel
BCCH_FREQ_NCELL	Frequency of the RF carrier on which the BCCH of a neighboring cell is transmitted
BCD	Binary Coded Decimal
BCF	Base Station Control function
BCIE	Bearer Capability Information Element
BCU	(See GSM 08.56)
BER	Bit Error Ratio
BFI	Bad Frame Indication
BI	all Barring of Incoming call services
BIC-Roam	Barring of Incoming Calls when Roaming outside the HOME PLMN country supplementary service
Bm	Full-rate traffic channel
BN	Bit Number
BO	all Barring of Outgoing call services
BOIC	Barring of Outgoing International Calls supplementary service
BOIC-exHC	Barring of Outgoing international Calls except those directed to the Home PLMN Country supplementary service
BS	- Basic Service (group)
	- Bearer Service
BS_AG_BLKS_RES	Number of blocks on each common control channel reserved for access grant messages
BS_BCCH_SDCCH_C0MB	Logical variable that indicates the combination of dedicated and associated control channels on the same physical channel
BS_CC_CHANS	Number of basic physical channels supporting common control channels
BSG	Basic Service Group
BS_G_BLKS_RES	Number of blocks on each common control channel reserved for access grant messages
BS_PA_MFRMS	Number of multiframes between two transmissions of the same paging message to MSs of the same paging group
BSC	Base Station Controller
BSIC	Base Transceiver Station Identity Code
BSIC-NCELL	BSIC of an adjacent cell
BSS	Base Station System
BSSAP	Base Station System Application Part

BSSMAP	Base Station System Management Application Part
BSSOMAP	Base Station Operation and Maintenance Application Part
BTS	Base Transceiver Station

C

C	Conditional
CA	Cell Allocation
CAI	Charge Advice Information
CA_BAND_NUMB	Number of the frequency band that contains the cell allocation
CBC	Cell Broadcast Centre
CBCH	Cell Broadcast CHannel
CC	Country Code
CC	Call Control
CCBS	Completion of Calls to Busy Subscribers supplementary service
CCCH	Common Control CHannel
CCCH_GROUP	Group of MSs in idle mode
CCF	Conditional Call Forwarding
CCH	Control CHannel
CCITT	Comité Consultatif International Télégraphique et Téléphonique
CCPE	Control Channel Protocol Entity
Cct	Circuit
CED	called station identifier
CELL-BAR-ACCESS	Cell Access Barred
CELL_RESELECT_HYSTERESIS	RXLEV Hysteresis required for Cell Reselection
CEPT	Conférence des administrations Européennes des Postes et Telecommunications
CFC	Conditional Call Forward
CF	- Conversion Facility
	- All Call Forwarding services
CFB	Call Forwarding on mobile subscriber Busy supplementary service
CFNRc	Call Forwarding on MS Not Reachable supplementary service
CFNRy	Call Forwarding on No Reply supplementary service
CFU	Call Forwarding Unconditional supplementary service
CHV	Card Holder Verification
CI	- Cell Identity
	- CUG Index
CIR	Channel Interference Ratio
CKSN	Ciphering Key Sequence Number

CLI	Calling Line Identity
CLIP	Calling Line Identification Presentation supplementary service
CLIR	Calling Line Identification restriction supplementary service
CM	Connection Management
CMD	Command
CMM	Channel Mode Modify
CNG	calling tone
COLI	Connect Line Identity
CoLP	Connected Line Identification Presentation supplementary service
CoLR	Connected Line identification Restriction supplementary service
COM	Complete
CONNACK	CONNect ACKnowledgement
C/R	Command/Response field bit
CRC	Cyclic Redundancy Check (3 bit)
CRE	Call RE-establishment procedure
CS	Coding Scheme
CSPDN	Circuit Switched Public Data Network
CT	Channel Tester
CUG	Closed User Group supplementary service
CW	Call Waiting supplementary service

D

DAC	Digital to Analogue Converter
DB	Dummy Burst
DCCH	Dedicated Control Channel
DCE	Data Circuit terminating Equipment
DCF	Data Communication Function
DCN	Data Communication Network
DET	Detach
DISC	DISConnect
DL	- Data Link (layer), - Downlink (base station to mobile)
DLCI	Data Link Connection Identifier
DLD	Data Link Discriminator
Dm	Control Channel (ISDN terminology applied to mobile service)
DMR	Digital Mobile Radio
DNIC	Data Network Identifier
DP	Dial/Dialled Pulse

DRX	Discontinuous Reception (Mechanism)
DSE	Data Switching Exchange
DSI	Digital Speech Interpolation
DSS1	Digital Subscriber Signalling No1
DTAP	Direct Transfer Application Part
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-Frequency (signalling)
DTX	Discontinuous Transmission (Mechanism)

E

EA	External Alarms
EBSG	Elementary Basic Service Group
ECM	Error Correction Mode (facsimile)
Ec/No	Ratio of energy per modulating bit to the noise spectral density
ECT	Explicit Call Transfer supplementary service
EEL	Electric Echo Loss
EIR	Equipment Identity Register
EL	Echo Loss
EMMI	Electrical Man Machine Interface
ERP	Ear Reference Point
ERR	ERRor
ETR	ETSI Technical Report
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute

F

FA	- Full Allocation
	- Fax Adapter
FAC	Final Assembly Code
FACCH	Fast ACCH
FACCH/F	Full rate Fast Associated Control Channel
FACCH/H	Half rate Fast Associated Control Channel
FB	Frequency correction Burst
FCCH	Frequency Correction CHannel
FCS	Frame Check Sequence
FDM	Frequency Division Multiplex
FEC	Forward Error Correction
FER	Frame Erasure Ratio

FH	Frequency Hopping
FN	Frame Number
FR	Full Rate
ftn	forwarded-to number

G

GMSC	Gateway Mobile services Switching Centre
GMSK	Gaussian Minimum Shift Keying (modulation)
GPA	GSM PLMN Area
GPRS	General Packet Radio Service
GSA	GSM System Area
GSM	Global System for Mobile communication
GSM MS	GSM Mobile Station
GSM PLMN	GSM Public Land Mobile Network
GT	Global Title

H

HANDO	Handover
HDLC	High Level Data Link Control
HLC	High Layer Compatibility
HLR	Home Location Register
HO_MARGIN	SDL Message name for Handover Margin
HOLD	Call Hold supplementary service
HPLMN	Home PLMN
HPU	Hand Portable Unit
HR	Half Rate
HSN	Hopping Sequence Number

I

I	Information (frames)
IA	Incoming Access (closed user group SS)
IAM	Initial Address Message
IC	Interlock Code (CUG SS)
ICB	Incoming Calls Barred
IC(pref)	Interlock Code of the preferential CUG
ICM	In-Call Modification
ID	Identification / Identity

IDN	Integrated Digital Network
IE	Signalling Information Element
IEI	Information Element Identifier
IMEI	International Mobile station Equipment Identity
IMSI	International Mobile Subscriber Identity
IN	Interrogating Node
IPv4	Internet Protocol version 4
ISC	International Switching Centre
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part (of signalling system No.7)
ITC	Information Transfer Capability
IWF	InterWorking Function
IWMSC	InterWorking MSC
IWU	InterWorking Unit

K

K	Constraint Length of the Convolutional Code
Kc	Ciphering Key
Ki	Individual subscriber authentication key

L

L1	Layer 1
L2ML	Layer 2 Management Link
L2R	Layer 2 Relay
L2R BOP	L2R Bit Orientated Protocol
L2R COP	L2R Character Orientated Protocol
L3	Layer 3
LA	Location Area
LAC	Location Area Code
LAI	Location Area Identity
LAN	Local Area Network
LAPB	Link Access Protocol Balanced
LAPDm	Link Access Protocol on the Dm channel
LCN	Local Communication Network
LE	Local Exchange
LI	- Length Indicator - Line Identity
LLc	Low Layer Compatibility

Lm	Traffic channel with capacity lower than Bm
LMSI	Local Mobile Station Identity
LPLMN	Local PLMN
LR	Location Register
LSTR	Listener Sidetone Rating
LTE	Local Terminal Emulator
LV	Length and Value

M

MA	Mobile Allocation
MAC	Medium Access Control (GPRS)
MACN	Mobile Allocation Channel Number
MAF	Mobile Additional Function
MAH	Mobile Access Hunting supplementary service
MAI	Mobile Allocation Index
MAIO	Mobile Allocation Index Offset
MAP	Mobile Application Part
MCC	Mobile Country Code
MCI	Malicious Call Identification supplementary service
MCS	Modulation and Coding Scheme
MD	Mediation Device
MDL	(mobile) Management (entity) - Data Link (layer)
ME	- Maintenance Entity
	- Mobile Equipment
MEF	Maintenance Entity Function
MF	MultiFrame
MHS	Message Handling System
MIC	Mobile Interface Controller
MM	- Man Machine
	- Mobility Management
MME	Mobile Management Entity
MMI	Man Machine Interface
MNC	Mobile Network Code
MO	Mobile Originated
MoU	Memorandum of Understanding
MPH	(mobile) Management (entity) - PHysical (layer) [primitive]
MPTY	MultiParTY supplementary service
MRP	Mouth Reference Point

MS	Mobile Station
MS_PWR_CLASS	MS PoWeR Class. Parameter defining the power class of an MS expressed in the same way as the R parameters
MS_RANGE_MAX	Mobile Station Range Maximum. Handover criterion to determine serving cell
MS_RXLEV_L	Lower Receive Level. Threshold of RXLEV received from the serving BS below which either power control or handover must take place to improve the cell quality
MS_TXPWR_CONF MS	Transmitted RF Power Confirmation. Parameter sent by the MS to indicate its current transmitted RF power level
MS_TXPWR_MAX_CCH	Maximum Allowed Transmitted RF Power for MSs to Access the System until commanded otherwise
MS_TXPWR_REQUEST	MS Transmitted RF Power Request. Parameter sent by the BSS that commands the required MS RF Power Level
MSC	Mobile-services Switching Centre, Mobile Switching Centre
MSCM	Mobile Station Class Mark
MSCU	Mobile Station Control Unit
MSISDN	Mobile Station ISDN Number
MSRN	Mobile Station Roaming Number
MT	- Mobile Terminated
MT (0,1,2)	- Mobile Termination
MTM	Mobile-To-Mobile (call)
MTP	Message Transfer Part
MUMS	Multi User Mobile Station

N

N/W	Network
NB	Normal Burst
NBIN	A parameter in the hopping sequence
NC0, NC1, NC2	NETWORK_CONTROL_ORDER options defining the measurement reports provided by the mobile and its cell re-selection
NCC	Network (PLMN) Colour Code
NCELL	Neighbouring (or current serving) Cell
NDC	National Destination Code
NDUB	Network Determined User Busy
NE	Network Element
NEF	Network Element Function
NET	Norme Européenne des Télécommunications
NF	Network Function
NIC	Network Independent Clocking
NM	Network Management

NMC	Network Management Centre
NMSI	National Mobile Station Identification number
NPI	Number Plan Indentifier
NSAP	Network Service Access Point
NSAPI	Network layer Service Access Point Identifier
NT	- Network Termination
	- Non Transparent
NUA	Network User Access
NUI	Network User Identification
NUP	National User Part (of signalling system No7)

O

O	Optional
OA	Outgoing Access (CUG SS)
O&M	Operations & Maintenance
OACSU	Off-Air-Call-Set-Up
OCB	Outgoing Calls Barred within the CUG
OD	Optional for operators to implement for their aim
OLR	Overall Loudness Rating
OMC	Operations & Maintenance Centre
OML	Operations and Maintenance Link
OS	Operating System
OSI	Open System Interconnection
OSI RM	OSI Reference Model

P

PABX	Private Automatic Branch eXchange
PAD	Packet Assembly/Disassembly facility
PAGING_GROUP	The set of MSs monitoring a particular paging block
PCH	Paging CHannel
PCM	Pulse Code Modulation
PD	- Protocol Discriminator
	- Public Data
PDN	Public Data Networks
PH	- Packet Handler
	- PHysical (layer)
PHI	Packet Handler Interface
PI	Presentation Indicator

PIN	Personal Identification Number
PLMN_PERMITTED	PLMN Permitted for handover purposes
PLMN	Public Land Mobile Network
PNE	Présentation des Normes Européennes
POI	Point Of Interconnection (with PSTN)
PP	Point-to-Point
PPE	Primative Procedure Entity
Pref CUG	Preferential CUG
Ps	Location Probability
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
PW	Pass Word

Q

QA	Q (Interface) - Adapter
QAF	Q - Adapter Function
QoS	Quality Of Service

R

[R]	Value of Reduction of the MS Transmitted RF Power relative to the maximum allowed output power of the highest power class of MS (A)
RA	RAndom mode request information field
RAB	Random Access Burst
RACH	Random Access CHannel
RADIO_LINK_TIMEOUT	The timeout period for radio link failure. Maximum value of the radio link timer
RADIO_LINK_TIMER	Parameter which is incremented or decremented according to the success with which SACCH messages are decoded
RAND	RANDom Number (used for authentication)
RBER	Residual Bit Error Ratio
REC	RECommendation
REJ	Reject(ion)
REL	RELease
REQ	REQuest
RESELECT_INTERVAL_MIN	Minimum time between cell reselections
RFC	Radio Frequency Channel
RFCH	Radio Frequency CHannel
RFN	Reduced TDMA Frame Number
RLC	Radio Link Control (GPRS)

RLP	Radio Link Protocol
RLR	Receiver Loudness Rating
RMS	Root Mean Square (value)
RNTABLE	Table of 128 integers in the hopping sequence
RPOA	Recognised Private Operating Agency
RR	Radio Resource
RSE	Radio System Entity
RSL	Radio Signalling Link
RTE	Remote Terminal Emulator
RXLEV	Received Signal Level
RXLEV_ACCESS_MIN	The minimum received signal level at a MS for access to a cell
RXLEV_MIN	The minimum received signal level at a MS from a neighbouring cell for handover to be permitted
RXLEV_NCELL	Received signal level of neighbouring or current serving cell measured on the BCCH carrier
RXLEV_SERVING_CELL	Received signal level in the serving cell measured on the BCCH carrier
RXQUAL	Received Signal Quality
RXQUAL_FULL	Received signal quality assessed over the full set of TDMA frames within a SACCH block
RXQUAL_SERVING_CELL	Received signal quality of serving cell
RXQUAL_SUB	Received signal quality assessed over a subset of 12 TDMA frames

S

S/W	SoftWare
SABM	Set Asynchronous Balanced Mode
SACCH	Slow Associated Control CHannel
SACCH/C4	Slow, SDCCH/4 Associated, Control CHannel
SACCH/C8	Slow, SDCCH/8 Associated, Control CHannel
SACCH/T	Slow, TCH-Associated, Control CHannel
SACCH/TF	Slow, TCH/F-Associated, Control CHannel
SACCH/TH	Slow, TCH/H-associated, Control CHannel
SAP	Service Access Point
SAPI	Service Access Point Indicator/Identifier
SB	Synchronization Burst
SC	- Service Centre (used for SMS)
	- Service Code
SCCP	Signalling Connection Control Part
SCH	Synchronization CHannel

SCN	Sub-Channel Number
SDCCH	Stand-alone Dedicated Control CHannel
SDCCH/4	Stand-alone Dedicated Control CHannel/4
SDCCH/8	Stand-alone Dedicated Control CHannel/8
SDL	Specification Description Language
SDU	Service Data Unit
SE	Support Entity
SEF	Support Entity Function
SFH	Slow Frequency Hopping
SI	- Screening Indicator
	- Service Interworking
	- Supplementary Information (SIA Supplementary Information A)
SID	Silence Descriptor
SIM	Subscriber Identity Module
SLR	Send Loudness Rating
SLTM	Signalling Link Test Message
SME	Short Message Entity
SMS	Short Message Service
SMSCB	Short Message Service Cell Broadcast
SMS-SC	Short Message Service - Service Centre
SMS/PP	Short Message Service / Point-to-Point
Smt	Short message terminal
SN	Subscriber Number
SNDCP	Subnetwork Dependent Convergence Protocol
SNR	Serial NumbeR
SOA	Suppress Outgoing Access
SP	- Service Provider
	- Signalling Point
	- Spare
SPC	Signalling Point Code
SPC	Suppress Preferential (CUG)
SRES	Signed RESponse (authentication)
SS	- Supplementary Service
	- System Simulator
SSC	Supplementary Service Control string
SSN	Sub-System Number
SS7/SS#7	Signalling System No 7
STMR	Sidetone Masking Rating

STP	Signalling Transfer Point

T

T	- Timer
	- Transparent
	- Type only
TA	Terminal Adapter
TAC	Type Approval Code
TAF	Terminal Adaptation Function
TBF	Temporary Block Flow
TC	Transaction Capabilities
TCH	Traffic CHannel
TCH/F	A Full-rate TCH
TCH/F2.4	A Full-rate data TCH (< 2.4kbit/s)
TCH/F4.8	A Full-rate date TCH (4.8kbit/s)
TCH/F9.6	A Full-rate data TCH (9.6kbit/s)
TCH/FS	A Full-rate Speech TCH
TCH/H	A Half-rate TCH
TCH/H2.4	A Half-rate data TCH (2.4kbit/s)
TCH/H4.8	A Half-rate data TCH (4.8kbit/s)
TCH/HS	A Half-rate Speech TCH
TCI	Transceiver Control Interface
TDMA	Time Division Multiple Access
TE	Terminal Equipment
Tei	Terminal endpoint identifier
TFA	Transfer Allowed
TFI	Temporary Flow Identity
TFP	Transfer Prohibited
TI	Transaction Identifier
TLV	Type, Length and Value
TMN	Telecommunications Management Network
TMSI	Temporary Mobile Subscriber Identity
TN	Timeslot Number
TON	Type Of Number
TRX	Transceiver
TS	- Time Slot
	- Technical Specification (see ETS)
	- Teleservice

TSC	Training Sequence Code
TSDI	Transceiver Speech & Data Interface
TUP	Telephone User Part (of signalling system No7)
TV	Type and Value
TXPWR	Transmit power; Tx power level in the MS_TXPWR_REQUEST and MS_TXPWR_CONF parameters

U

UDI	Unrestricted Digital Information
UDUB	User Determined User Busy
UI	Unnumbered Information (Frame)
UL	Uplink (mobile to base station)
UPCMI	Uniform PCM Interface (13-bit)
UPD	Up to Date
USSD	Unstructured SS Data
UUS	User-to-User Signalling supplementary service

V

V	Value only
VAD	Voice Activity Detection
VAP	Videotex Access Point
VLR	Visitor Location Register
VMSC	Visited MSC, (recommendation not to be used)
VPLMN	Visited PLMN
VSC	Videotex Service Centre
V(SD)	SenD state Variable
VTX host	The components dedicated to Videotex service

W

WS	Work Station
WPA	Wrong Password Attempts (counter)

X

XID	eXchange IDentifier

Contents

9 Messages

This chapter describes the messages shown during database maintenance procedures. Some of the choice list dialogs do not appear during measurement, they are only shown during manual database manipulations. Those messages are written to the file *Ctol_Reports.txt* in the *TestFiles* subdirectory of the R&S ROMES main directory.

Message Dialogs

- *DB Init: Database Init OK:* A database has been successfully loaded.
- *DB Init: Init Failed:* The database could not be loaded. See the accompanying choice list dialog for details.
- *DB Init: Transmitter Scan is nonlinear:* There are several Transmitter Scan values out of the allowed deviation. See the accompanying choice list dialog for details.

The other Message Dialogs are self explanatory.

Choice List Dialogs

****

Message #1

Info
Unexpected network type
Database: DCS1800
BTS_INFO frame: GSM
Abort

Reason: A database was loaded which contains a network type different from the one chosen in the *network* field in the *DB Settings/Query* dialog.

Effect: The new database was not loaded.

****

Message #2

Info
Missing DLL
No DLL GSS_K6_Import_... is available in the path
Abort

Reason: If the user takes the opportunity to write a dynamical linked library (DLL) to define the loading of a network operator file of its own format (see chapter 5) this DLL must be in the main directory or in a directory being in the path so that automatic loading is possible.

Effect: The database is not created or updated.

****

Message #3

Info
Skip sector <*nr*> (name)
Abort
Suppress this message for the next sectors
OK

Reason: If the user takes the opportunity to write a dynamical linked library (DLL) to define the loading of a network operator file of its own format (see chapter 5) and has defined a situation where loading yields the return value SKIP_SECTOR this message appears, showing the sector number <*nr*> and, if defined, the sector name.

Effect: Abort selected: The database remains unchanged

Suppress this message for the next sectors: During loading of the ASCII file, this message is not shown anymore on screen. Instead, all subsequent messages are written into the file *Dummy.chl* in the subdirectory *TestFiles.*

OK selected: This sector is not loaded, but the program continues loading the next sector.

****

Message #4

Format error
Wrong BCC
At value: 8
In line 33
BTS1 | 22.33454 | 44.5666 | 8 | 120 | 34 | 77
Abort

Reason: Format error was found in ASCII text.

Effect: The database remains unchanged.

Remarks: The error is specified in more detail by the name (here BCC), the value (here 8), the line number in the text file (here 33, where caption line is line number 0) and the contents of the complete line.

****

Message #5

Info
Line buffer too small while reading antenna type list
Abort

Reason: The length of one line in the antenna type list text file exceeds 256 bytes.
Effect: The database remains unchanged.

Remarks: The end-of-line character is Line Feed (= 0x0A)

****

Message #6

Info
More than 3 sectors at one position with the same clock code.
Ok

Reason: The database can handle up to 3 synchronized sectors at one position. If more than 3 sectors at one position share the same clock code, the PCSD will try to separate the sectors by their name. If that is not possible a message occurs.

Effect: The database remains unchanged.

****

Message #7

Info
Skip invalid position value:
34.5566 -> 34.5578
11.2345 -> 11.4345
22.2 km (distance) > 0.6 km (max. range)
Ok
All

Reason: Before processing any Transmitter Scan data the system checks whether a valid position value was obtained during the last 3 evaluated seconds. A position value is valid if it lies inside a circle of radius r = 100 m + 120 km/h * (t - t_1) around the position measured at time t_1. Message no. 10 indicates that an invalid position value was detected.

Effect: OK selected: The indicated position value will be skipped.
All selected: The indicated position value and all subsequent invalid position values will be skipped.

Remarks: Parameters displayed: position measured at time t_1 (here: 34.5566, 11.2345)
invalid position at time t (here: 34.5578, 11.4345)
distance between the position values (here: 22.2 km)
allowed distance (here: 0.6 km)

****

Message #8

Info
Measurement not related to database.
Ok

Reason: No Transmitter Scan was assigned to a BTS in the database.

Effect: The database remains unchanged.

Remarks: Possible reasons

1) The GPS was not working properly during the Transmitter Scan. In this case no position data for the Transmitter Scan are found and an assignment to a BTS is not possible
2) The Transmitter Scan was performed in an area for which no BTSs are available in the database
3) The network has been provided with a new channel configuration, but the database has not been updated with this new configuration.
4) If there is a finite reset probability per month for a BTS, the total reset probability might be above a threshold where an assignment is still reasonable. In this case, a new database should be created.

****

Message #9

Info
Drift time evaluation failed.

Abort

Reason: There is not enough input data to calculate the time drift of the ESVD. This might e.g.
occur, if the number of Transmitter Scan data with strong drift is larger than 5%.

Effect: The database remains unchanged.

****

Message #10

Info
1.10% measurements out of time range
Abort
Discard wrong values and continue

Reason: There are two reasons for obtaining values out of time range

1) The ESVD time drift is not constant. This may occur if the ESVD was cold in the beginning of the measurement or strong temperature changes occurred.
2) One or more base stations transmit signals with time stability out of specification (0.05 ppm)

Effect: Discard the wrong values or interrupt the update process without changing the database

Remarks:

To evaluate the time drift of the ESVD against the network a group of Transmitter Scan values is used and the time drift is evaluated by means of linear approximation. It is assumed that the time drift of the ESVD is constant and the time drift of the used BTS signals is smaller than 0.05 ppm. If the time drift has been evaluated, all completed measurements will be checked to test the validity of the assumption.

****

Message #11

Info
Start time evaluation failed.
Ok

Reason: Synchronization between previous Transmitter Scans and the new one failed.

Effect: The database remains unchanged.

Remarks: No common BTSs were found or the reset probability for the BTSs found was too high.

****

Message #12

Example 1 **Different timing for one base station:**
BTS_A1 [25: 7]

[C0:BCC]	**Probability**	**T51(TS)/us**	**Distance/km**	**Power/dBm**
[25: 7]	**99.7%**	**011234**	**3.5**	**-77**
[25: 7]	**98.4%**	**123567**	**4.7**	**-88**

Do not use 1st measurement.
Do not use 2nd measurement.
Do not use either measurement.

BTS_A1 [25: 7]	BTS name [C0: BCC]
[C0:BCC]	Channel and BCC of measurement value
Probability	Probability that the measurement belongs to the given BTS
T_{51}(TS)/us	Synchronization time of the T_{51} frame within the Transmitter Scan. ***Note:*** *This time* ***(TS)*** *is* ***not*** *the time in the database because the start time of the Transmitter Scan file was not evaluated while this message was produced.*
Distance/km	Distance of measurement to the BTS
Power/dBm	Received power in Transmitter Scan

Example 2 **Different timing for one base station:**

BTS_B1 [27: 7]
BTS_B2 [33: 7]
BTS_B3 [49: 3]

[C0:BCC]	**Probability**	**T51(dB)/us**	**Distance/km**	**Power/dBm**
[33: 7]	**99.3%**	**055534**	**3.5**	**-61**
[49: 3]	**97.4%**	**177777**	**4.7**	**-85**

Do not use 1st measurement.
Do not use 2nd measurement.
Do not use either measurement.

BTS_B1 [27: 7] BTS_B2 [33: 7] BTS_B3 [49: 3]	Names of synchronized sectors and [C0: BCC] information.
[C0:BCC]	Channel and BCC of measurement value
Probability	Probability that the measurement belongs to the given BTS (one of the sectors)
T_{51}(dB)/us	Synchronization time of the T_{51} frame within the Transmitter Scan. ***Note:*** *This time **(dB)** is the time in the database because the start time of the Transmitter Scan file was evaluated before this message was produced.*
Distance/km	Distance of measurement to the BTS
Power/dBm	Received power in Transmitter Scan

Reason:

1) The BTS list is not complete or the C0 channel number or BCC value has been changed.
2) During the Transmitter Scan a signal from BTS A [C0, BCC] was received next to BTS B. The power of the signal was high with respect to the distance to BTS A and C0, BCC is reused for BTS B. In this case the evaluated probability value that the received signal belongs to BTS B was higher than 95%. At another location next to BTS B the signal of BTS B was received. So there are two measurements for BTS B.
3) If 2 or 3 sectors are given and the measurements have been performed on different channels (as in example 2) the clock code setting for this BTS may be wrong. In this case the given sectors have the same clock code and the PCSD is forced to assign the same synchronization time to each sector. If the sectors are not synchronized, then this message is displayed.

Effect: Either the first, the second or both measurements can be discarded.

Remarks: To assign a Transmitter Scan value to a BTS the probability that the measurement belongs to the BTS is calculated and assessed. The assignment is made if this probability exceeds 95%. In the case that two measurements with different synchronization times for the T_{51} frames belong to the same BTS with a probability greater than 95%, message no. 13 will appear.

****

Message #13

Example 1

Difficult assignment:
TS from: 06.22.97 15.30.07 P =-88 dBm T51 = 098840

Sector name	**p(P)**	**p(P, T51)**	**d/km**	**T51/us**
BTS_A1	**98.0%**	**1.5%**	**3.7**	**123456**
BTS_B2	**2.0%**	**98.5%**	**17.8**	**098883**

Use first assignment
Do not use first assignment

Example 2

Difficult assignment:
TS from: 06.22.97 15.30.07 P =-69 dBm T51 = 05789

Sector name	**p(P)**	**p(P, T51)**	**d/km**	**T51/us**
BTS_A1	**98.0%**	**3.5%**	**3.7**	**123456**
BTS_B2	**2.0%**	**96.5%**	**19.5**	**------**

Use first assignment
Do not use first assignment

TS from: 06.22.97 15.30.07	Date and time of the measurement
P = -88 dBm	Measured power
T_{51} = 098840	Measured synchronization time for T_{51} frame
Sector name	Name of the sector of both BTSs the measurement may belong to
p(P)	Probability of received power
p(P, T_{51})	Probability of received power and T_{51} synchronization time
d/km	Distance from the measurement position to the location of BTS
T_{51}/us	Last synchronization time value assigned to the BTS

Reason: In both examples, the first given BTS has the higher power probability, whereas the second has the higher probability with respect to power **and** time.
In example 1 it is highly probable that the measurement belongs to the BTS_B2 due to the matching of the old and new measured T_{51} time.
In example 2 the new measured T_{51} value does not match the value in the database for BTS_A1. For the BTS_B2 no previous synchronization time measurement exists. This is why the probability p(P, T51) for BTS_B2 is higher than for BTS_A1.

Effect: Example 1: <Do not use first assignment> may be a good choice

Example 2: If it is positively known that BTS_A1 was hit by a reset between the last and the new Transmitter Scan, or if it is not probable that the signal from BTS_B2 was received with a power of –67 dBm at a distance of 19.5 km, then it may be the right choice to assign the measurement value to BTS_A1 by selecting <Use first assignment>.

Remarks: To assign a Transmitter Scan to a BTS, two probabilities p(P) and p(P, T51) will be evaluated if some BTSs already have synchronization time values obtained from other measurements in the same Transmitter Scan file or other measurements in the database.

The probability p(P) takes into account the received power and position of the measurement and location, transmitted power, antenna type and direction for all the BTSs listed in the database which match the C0 and BCC of the Transmitter Scan.
For the probability p(P, T51) will be used in addition to the measured synchronization time of the T_{51} frame and the probability function for this synchronization time for each BTS which depend on the existence of a previous T_{51} measurement, the age of this measurement, the drift of the BTS and the reset probability. In case that p(P) and p(P, T_{51}) contradict each other, message no. 13 will be produced.

****

Message #14 **Info**
... sectors were discarded in the validation of its values
Ok

Reason: After reading a base station list, the program checks, whether the entries are consistent (e.g. channel 150 does not denote a valid channel). If the data are not consistent, a message appears in the *K6 Message View* window for each sector containing such inconsistent data.

Effect: These sectors are not included in the database.

****

Index

C

H

I

J

K

L

P

Q

R

S

T

U

V

W

X

Z