Supplement

Digital Standard EUTRA/LTE

R&S® SMU-K55
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R&S® SMJ-K55
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R&S® SMATE-K55
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ROHDE & SCHWARZ
Test and Measurement Division

Dear Customer,

The Signal Generator includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/).

R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG.
Trade names are trademarks of the owners.

Before putting the product into operation for the first time, make sure to read the following

S a f e t y   I n s t r u c t i o n s

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 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 the product be used exclusively by skilled and specialized staff or thoroughly trained personnel with the required skills. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation.

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	This tag indicates a definite hazard carrying a high risk of death or serious injury if not avoided.
WARNING	This tag indicates a possible hazard carrying a medium risk of death or (serious) injury if not avoided.
CAUTION	This tag indicates a hazard carrying a low risk of minor or moderate injury if not avoided.
ATTENTION	This tag indicates the possibility of incorrect use that can cause damage to the product.
NOTE	This tag indicates a situation where the user should pay special attention to operating the product but which does not lead to damage.

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.
Unless specified otherwise in the data sheet, 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 thermally 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 water, 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.

Por favor lea imprescindiblemente antes de la primera puesta en funcionamiento las siguientes

Informaciones de seguridad

El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los estandards 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 estandards técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las informaciones, 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 solamente fue elaborado para ser utilizado en la industria y el laboratorio o para fines de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda ser dañada. 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 parciales del idioma inglés. Por eso se deberá tener en cuenta de exclusivamente autorizar para el uso del producto a personas peritas o debidamente minuciosamente instruidas con los conocimientos citados. 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.

Símbolos y definiciones de seguridad

Ver documen-tación de producto	Informaciones para maquinaria con uns 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.
CUIDADO	Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo.
INFORMACIÓN	Indica una situación en la que deberían seguirse las instrucciones en el uso del producto, pero que no consecuentemente deben de llevar a un daño del mismo.

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 principalmente 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.
A menos que se especifique otra cosa en la hoja de datos, 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 perito 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. Despues 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 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, deberan 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 radiación HF, 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/usario está comprometido a valorar y señalar areas 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 prodcuto.

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 construciones 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 de la EC950/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 corto circuitos 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 el agua 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 usario 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 celulas 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 tenidas en cuenta. 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 laser 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 laser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo laser.

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Digital Standard EUTRA/LTE

Introduction - EUTRA/LTE

Currently, UMTS networks worldwide are being upgraded to High Speed Downlink Packet Access (HSDPA) in order to increase data rate and capacity for downlink packet data. In the next step, High Speed Uplink Packet Access (HSUPA) will boost uplink performance in UMTS networks. While HSDPA was introduced as a 3GPP release 5 feature, HSUPA is one of the most important features of 3GPP release 6.

However, even with the introduction of HSDPA and HSUPA, evolution of UMTS radio access networks has not reached its end. In order to ensure the competitiveness of UMTS for the next 10 years and beyond, concepts for UMTS Long Term Evolution (LTE) are being investigated. Objective is a high-data-rate, low-latency, and packet-optimized radio-access technology. Therefore, a study item was launched in 3GPP release 7 on Evolved UTRA (UMTS Terrestrial Radio Access) and UTRAN (UMTS Terrestrial Radio Access Network). Core specification work aims at 3GPP release 8 specifications.

In the context of the LTE study item, 3GPP work first focused on the definition of requirements, e.g. targets for data rate, capacity, spectrum efficiency, and latency. Also commercial aspects like costs for installing and operating the network were considered.

Based on these requirements, technical concepts for the air interface transmission schemes and protocols were studied. Notably, LTE uses new multiple access schemes on the air interface: OFDMA (Orthogonal Frequency Division Multiple Access) in downlink and SC-FDMA (Single Carrier Frequency Division Multiple Access) in uplink. Furthermore, MIMO (Multiple Input Multiple Output) antenna schemes form an essential part of LTE. In an attempt to simplify protocol architecture, LTE brings some major changes to the existing UMTS protocol concepts.

Requirements for UMTS Long Term Evolution

Long Term Evolution (LTE) is focusing on optimum support of Packet Switched (PS) Services. Main requirements for the design of an LTE system have been captured in TS 25.913 and can be summarized as follows:

- **Data Rate**: Peak data rates target 100 Mbps (downlink) and 50 Mbps (uplink) for 20 MHz spectrum allocation, assuming 2 receive antennas and 1 transmit antenna at the terminal.

- **Throughput**: Target for downlink average user throughput per MHz is 3-4 times better than release 6. Target for uplink average user throughput per MHz is 2-3 times better than release 6.

- **Spectrum Efficiency**: Downlink target is 3-4 times better than release 6. Uplink target is 2-3 times better than release 6.

- **Bandwidth**: Scaleable bandwidth of 5, 10, 15, 20 MHz shall be supported. Also bandwidths smaller than 5 MHz shall be supported for more flexibility.

- **Multimedia Broadcast Multicast Services (MBMS)**: MBMS shall be further enhanced.

- **Mobility**: The system should be optimized for low mobile speed (0-15 km/h), but higher mobile speeds shall be supported as well including high speed train environment as special case.

- **Spectrum allocation**: Operation in paired (Frequency Division Duplex/FDD mode) and unpaired spectrum (Time Division Duplex/TDD mode) should not be precluded.

- **Co-existence**: Co-existence in the same geographical area and co-location with GERAN/3G shall be ensured. Also, co-existence between operators in adjacent bands as well as cross-border co-existence is a requirement.

Long Term Evolution Downlink Transmission Scheme

The downlink transmission scheme for EUTRA/LTE FDD and TDD modes is based on conventional OFDM. OFDM is based on the well-known technique of Frequency Division Multiplexing (FDM). In FDM different streams of information are mapped onto separate parallel frequency channels. Each FDM channel is separated from the others by a frequency guard band to reduce interference between adjacent channels. The OFDM technique differs from traditional FDM in the following interrelated ways:

- multiple carriers (called sub-carriers) carry the information stream,

- the sub-carriers are orthogonal to each other, and

- a guard time may be added to each symbol to combat the channel delay spread.

OFDM is used as well in Wireless LAN, WiMAX and broadcast technologies like DAB and DVB. OFDM has several benefits including its robustness against multipath fading and its efficient receiver architecture.

The following picture shows a representation of an OFDM signal:
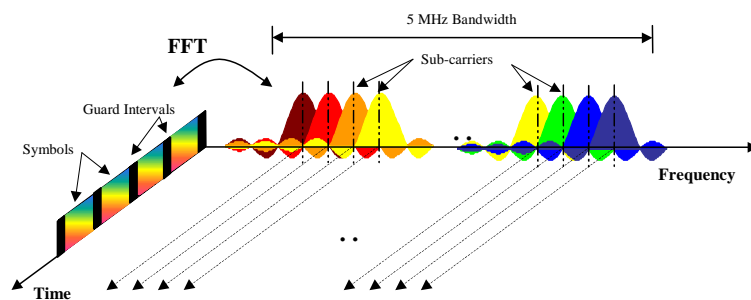

Fig. 1   Frequency Time Representation of an OFDMA Signal, taken from 3GPP TS 25.892; Feasibility Study for Orthogonal Frequency Division Multiplexing (OFDM) for UTRAN enhancement (Release 6)

Data symbols are synchronously and independently transmitted over a high number of closely spaced orthogonal sub-carriers using linear modulation. In EUTRA/LTE, downlink modulation schemes QPSK, 16QAM, and 64QAM are available.

In practice, the OFDM signal can be generated using IFFT digital signal processing as described in 3GPP TS 25.892, Release 6. The baseband representation of the OFDM signal generation using an N-point IFFT is illustrated in the figure below, where $a(mN+n)$ refers to the nth sub-channel modulated data symbol, during the time period $mT_u < t \leq (m+1)T_u$:
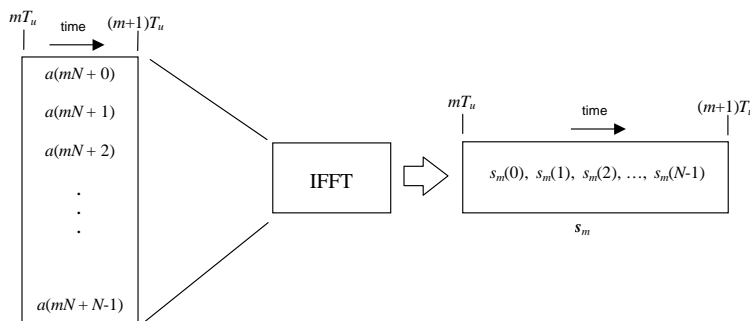

Fig. 2   OFDM Useful Symbol Generation Using an IFFT, taken from 3GPP TS 25.892; Feasibility Study for Orthogonal Frequency Division Multiplexing (OFDM) for UTRAN enhancement (Release 6)

The vector $\boldsymbol{s}_m$ is defined as the useful OFDM symbol. Note that the vector $\boldsymbol{s}_m$ is in fact the time superposition of the N narrowband modulated sub-carriers.

From a parallel stream of N sources of data, each one modulated with QAM useful symbol period T_u, a waveform composed of N orthogonal sub-carriers is obtained, with each narrowband sub-carrier having the shape of a frequency *sinc* function (see figure "Frequency Time Representation of an OFDMA Signal"). The figure below illustrates the mapping from a serial stream of QAM symbols to N parallel

streams, used as frequency domain bins for the IFFT. The *N*-point time domain blocks obtained from the IFFT are then serialized to create a time domain signal.
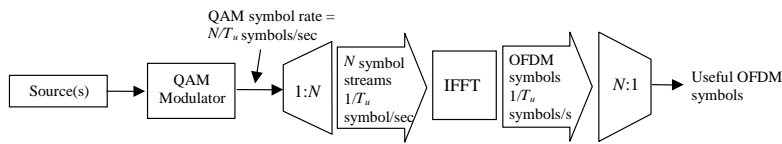

Fig. 3   OFDM Signal Generation Chain, taken from 3GPP TS 25.892; Feasibility Study for Orthogonal Frequency Division Multiplexing (OFDM) for UTRAN enhancement (Release 6)

In EUTRA/LTE, the **sub-carrier spacing** is Δf = 15 kHz and constant regardless of the transmission bandwidth. The guard time is a **cyclic-prefix** (CP) with duration of either $T_{CP} \approx 4.7$ or 16.7 μs (short or long CP). The longer cyclic prefix can be used in multi-cell broadcast and very-large-cell scenarios.

The 10 ms radio frame is divided into 20 equally sized sub-frames. Thus, the **sub-frame duration** is $T_{\text{sub-frame}}$ = 0.5 ms.

In contrast to an OFDM transmission scheme, **OFDMA** allows the access of multiple users on the available bandwidth. Each user is assigned a specific time-frequency resource. As a fundamental principle of EUTRA/LTE, the data channels are shared channels, i.e. for each transmission time interval, a new scheduling decision is taken regarding which users are assigned to which time/frequency resources during this transmission time interval.

OFDMA Parametrization Scheme

The table below shows the parametrization of the OFDMA scheme for different EUTRA/LTE bandwidths, defined in 3GPP TS 25.814, Release 7.

Table 1   Parameters for downlink transmission scheme

Transmission BW		1.25 MHz	2.5 MHz	5 MHz
Subframe duration		0.5 ms		
Subcarrier spacing		15 kHz		
Sampling frequency		1.92 MHz (1/2 x 3.84 MHz)	3.84 MHz	7.68 MHz (2 x 3.84 MHz)
FFT size		128	256	512
Number of occupied subcarriers		76	151	301
Number of OFDM symbols per subframe (Short/Long CP)		7/6		
CP length (µs/samples)	Short	(4.69/9) x 6, (5.21/10) x 1***	(4.69/18) x 6, (5.21/20) x 1	(4.69/36) x 6, (5.21/40) x 1
	Long	(16.67/32)	(16.67/64)	(16.67/128)

Transmission BW		10 MHz	15 MHz	20 MHz
Subframe duration		0.5 ms	15 kHz	
Subcarrier spacing				
Sampling frequency		15.36 MHz (4 x 3.84 MHz)	23.04 MHz (6 x 3.84 MHz)	30.72 MHz (8 x 3.84 MHz)
FFT size		1024	1536	2048
Number of occupied subcarriers*, **		601	901	1201
Number of OFDM symbols per subframe (Short/Long CP)		7/6		
CP length (µs/samples)	Short	(4.69/72) x 6, (5.21/80) x 1	(4.69/108) x 6, (5.21/120) x 1	(4.69/144) x 6, (5.21/160) x 1
	Long	(16.67/256)	(16.67/384)	(16.67/512)

*   {(x1/y1) x n1, (x2/y2) x n2} means (x1/y1) for n1 OFDM symbols and (x2/y2) for n2 OFDM symbols

**   Includes DC sub-carrier which contains no data

*** This is the assumption for the baseline proposal. Somewhat more carriers may be possible to occupy in case of the wider bandwidth

Downlink Data Multiplexing

Data is allocated to the UEs in terms of resource blocks. A physical resource block (PRB) consists of 12 consecutive subcarriers in the frequency domain and N consecutive OFDM symbols. N is equal to the number of OFDM symbols in a subframe. The resource block size is the same for all bandwidths, therefore the number of available physical resource blocks depends on the bandwidth.

Each UE can be assigned one or more resource blocks in each transmission time interval. These resource blocks can be adjacent or non-adjacent.

Note that the network may assign a transmission bandwidth to the UE which would be a fraction of the overall transmission bandwidth.

The EUTRA/LTE transmission time interval is 1 ms, i.e. 2 subframes.

Downlink Reference Signal Structure and Cell Search

The downlink reference signal structure is important for cell search, channel estimation and neighbour cell monitoring. The figure below shows the principle of the downlink reference signal structure. Specific pre-defined symbols in the time-frequency domain are carrying the reference signal. Besides first reference symbols, there may be a need for second reference symbols.

R_1 : First reference symbol R_2 : Second reference symbol   D : Data
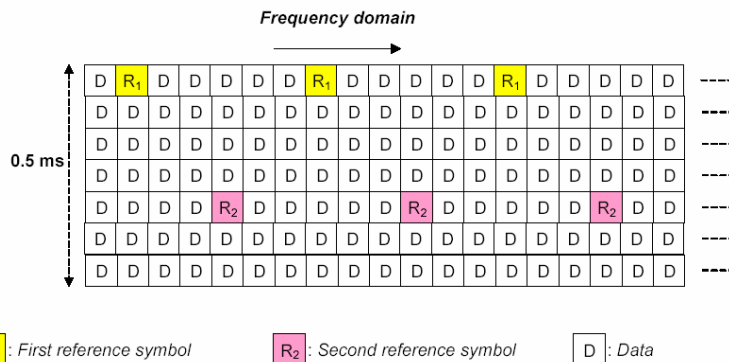
Fig. 4   Basic downlink reference signal structure, taken from 3GPP TS 25.814; Physical layer aspects for evolved Universal Terrestrial Radio Access (UTRA) (Release 7)

In case of multiple antennas, the reference symbol sequences of different antennas are mapped on different sub-carriers. Cells of the same eNode B will use different reference symbol sequences.

During cell search, different types of information need to be identified by the handset: symbol and radio frame timing, frequency of downlink signal, cell identification, overall transmission bandwidth, antenna configuration, cyclic prefix length.

Besides the reference symbols, an additional synchronization channel SCH is needed during cell search. EUTRA/LTE uses a hierarchical cell search scheme as known from WCDMA. This means that the synchronization acquisition and the cell ID or cell group ID detection are obtained from different SCH signals. Thus, a primary synchronization channel (P-SCH) and a secondary synchronization channel (S-SCH) are defined with a pre-defined structure. If S-SCH just carries cell group ID, the reference signals are used to acquire the full cell ID.

As additional help during cell search, a BCH (broadcast channel) is available which is transmitted at pre-defined time instants. The BCH bandwidth can be coupled to the transmission bandwidth of the cell.

The position of BCH and SCH within a sub-frame and their repetition interval is fixed.

The SCH and the BCH are transmitted with a constant bandwidth of 1.25 MHz in the centre of the overall transmission bandwidth of the cell. BCH may alternatively be transmitted over a 5 MHz bandwidth. To support this concept, the minimum UE bandwidth capability has been defined as 20 MHz.

The SCH should be received without any prior knowledge on the antenna configuration. Therefore, transmit diversity schemes can be used on SCH, and on BCH.

Downlink Physical Layer Procedures

For EUTRA, the following downlink physical layer procedures are defined:

- Cell search and synchronization:
  See above.

- **Scheduling**:
  Scheduling is done in the base station (eNodeB). A downlink control channel will inform the users about their allocated time/frequency resources and the transmission formats to use. The scheduler evaluates different types of information, e.g. Quality of Service parameters, measurements from the UE, UE capabilities, buffer status.

- **Link Adaptation**:
  Link adaptation is already known in HSDPA as Adaptive Modulation and Coding (AMC). Modulation and coding for the shared data channel is not fix, but it is adapted according to radio link quality.

- **Hybrid ARQ (Automatic Repeat Request)**:
  Downlink Hybrid ARQ is also known from HSDPA. It is a retransmission protocol. The UE can request retransmissions of incorrectly received data packets.

- **Power Control**:
  Power control might be needed for the downlink control channel.

- Inter-cell-interference mitigation:
  Possible mechanisms are:

  - interference randomization:
    cell specific scrambling or interleaving/IDMA (Interleaved Division Multiple Access)

  - interference cancellation:
    spatial suppression by means of multiple antennas at the UE or IDMA

  - interference co-ordination/avoidance:
    restrictions in terms of time/frequency resources available for scheduling or restrictions on the transmit power that can be applied to certain time/frequency resources

EUTRA/LTE Test & Measurement Assumptions by R&S

This chapter describes working assumptions for EUTRA/LTE test & measurement solutions that cannot be derived yet from 3GPP specifications. These assumptions are valid for all current implementations on R&S signal generators and signal analyzers.

OFDMA Parametrization

The OFDMA parameter sets given in "*OFDMA Parametrization Scheme*", page 3 are supported.

Note:
Table 1 is assumed for parametrization in the first version only. For later versions, the number of resource blocks will be the key parameter for parameterization instead of transmission bandwidth.

Reference Symbols

Regarding the reference symbols, the following assumptions can be made:

- First reference symbols are always present. Second reference symbols can be switched on or off in the R&S Signal Generator and FSQ Signal Analyzer.

- Spacing between reference symbols in the frequency domain and a subcarrier offset can be configured in the R&S Signal Generator and FSQ Signal Analyzer.

- Power of the first and second reference symbols can be set independently in the signal generator.

- The reference symbol sequence in use can be uploaded to the signal generator. It should be available in the "Data List"-format which is described in chapter "SOURce:BB:ARB Subsystem" of the section "Remote-Control – Description of Commands".

- Modulation of reference symbols is QPSK (for the modulation mapping, see 3GPP TS 25.814, Release 7).

- The reference symbol sequence is mapped onto the used subcarriers including the DC carrier. The first 2 bits of the reference symbol sequence will be mapped on the first subcarrier available for the pilot (seen from the left side, i.e. at –f). The bits to be mapped onto the DC carrier will be discarded. For the next reference symbol, the next 2 bits of the sequence will be used.

- When mapping the bit sequence on the subcarriers, it will be alternated between first and second reference symbols (starting with either first or second reference symbols, depending on what is first in the frequency domain). In case the second reference symbols are deactivated, the bit sequence will be mapped only on the first reference symbols. Therefore, the sequence on the first reference symbols depends on whether second reference symbols are present or not. The figure below shows an example for 1.25MHz case.

- FSQ signal analyzer expects the reference symbol sequence to be started again in the subframe following each SCH. Shorter reference symbol sequences (e.g. repeating each subframe) can be created by adapting the uploaded reference symbol sequence accordingly.

- The R&S Signal Generator allows to configure the repetition interval for the reference symbol sequence.

Note:
3GPP working assumption for the reference symbol sequence and mapping according to 3GPP TS 25.814, Release 7 will be supported in the next version.
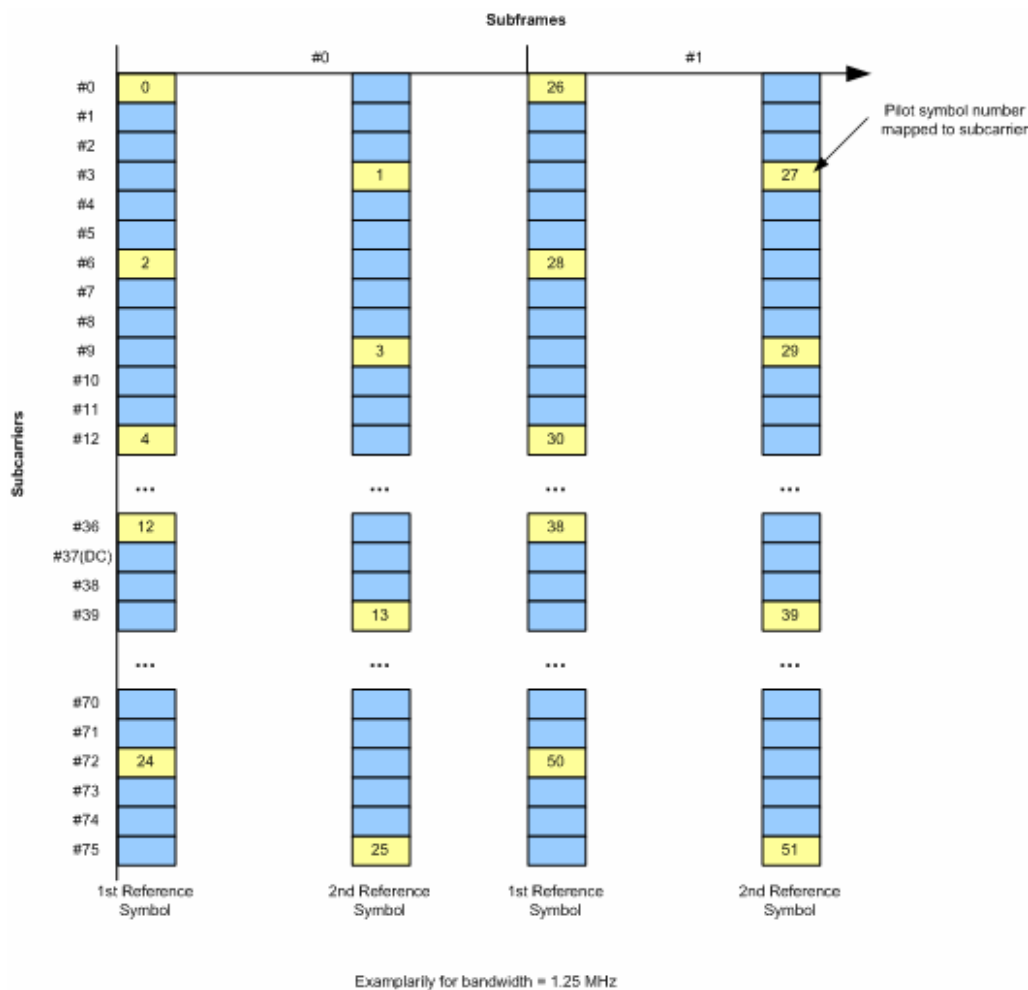
Fig. 5   Mapping of reference symbol sequence on first and second reference symbols

Synchronization Channel (SCH)

The modulation of SCH is QPSK; modulation mapping is described below. The SCH is located in last OFDM symbol of subframe (see the figure). SCH repetition interval is configurable for signal generation and signal analysis. First SCH subframe can be configured in the R&S Signal Generator.
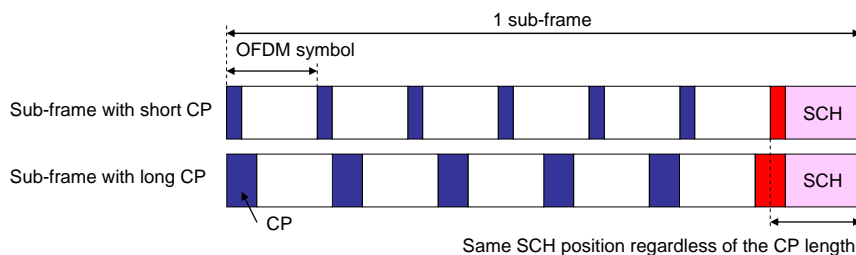

Fig. 6   Basic transmission timing of downlink SCH within subframe, taken from 3GPP TS 25.814; Physical layer aspects for evolved Universal Terrestrial Radio Access (UTRA) (Release 7)

The SCH bit sequence will consist of 150 bits and can be uploaded. The same file format as for the reference symbols should be used. Independent of the used bandwidth, the bits will be mapped on the 75 center subcarriers (37 left and 38 right from DC). DC is not used. For bandwidth of 1.25 MHz, all 3 resource blocks are filled with SCH. For bandwidths > 1.25 MHz the SCH is affecting the 4 center resource blocks. This is illustrated in Figure 7. Note that the remaining part of resource blocks 1 and 4 not occupied with SCH as shown below can be allocated with user data.
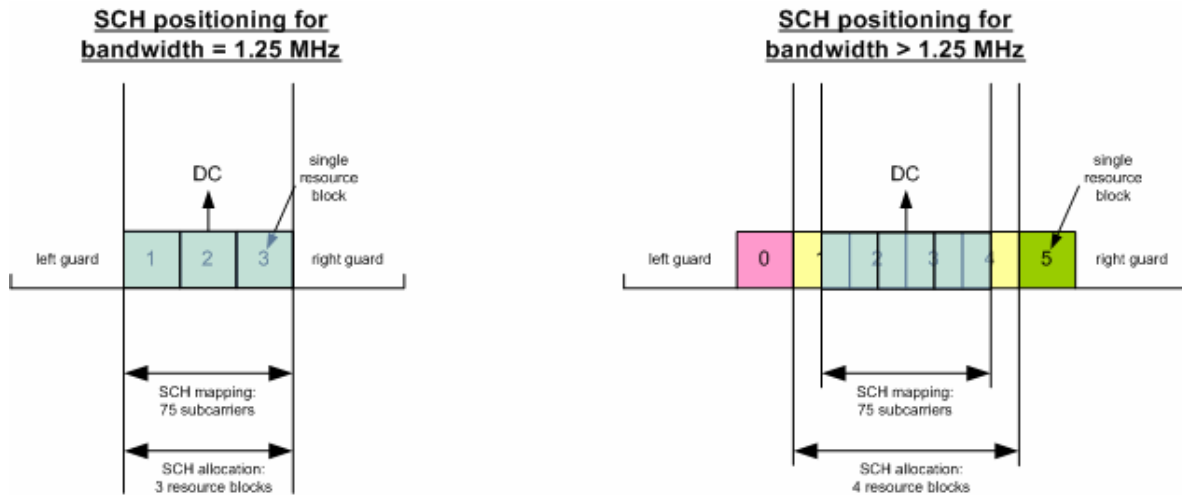
Fig. 7   SCH positioning

Note: *In the next version, SCH assumptions will be updated according to 3GPP specification.*

Broadcast Channel (BCH)

The BCH is located in the last OFDM symbols of the subframe. BCH repetition interval is assumed to be once per frame of 10 ms. First subframe carrying BCH can be configured in the signal generator.

The position of BCH in frequency domain is according to SCH position. In case of bandwidths > 2.5 MHz, the signal generator will allow to allocate 12 resource blocks (5 MHz) for BCH, too.

The contents of BCH remains to be defined. In the signal generator, an arbitrary data source can be selected.

Note: *In the next version, SCH assumptions will be updated according to 3GPP specification.*

Data Allocations

The Physical Resource Block size is 375 kHz (25 subcarriers) in the frequency domain for all bandwidth options.

Note: *3GPP working assumption of 12 subcarriers will be supported in the next version.*

Localized transmission is assumed. For localized transmission, the numbering of resource blocks starts with the left-most (lower frequency) used subcarriers of the frequency band. The numbering starts with zero. With the FFT-shift the DC carrier is moved to the first position, which is required to be conform to the standard IFFT input, see below:
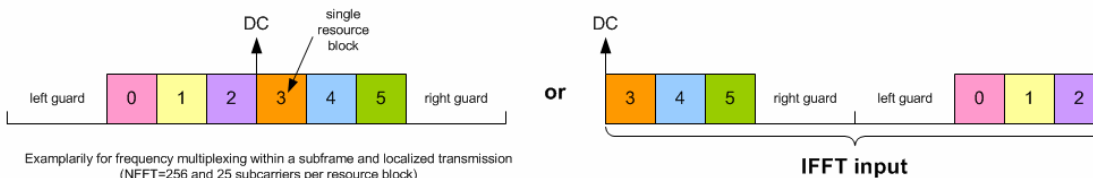

Examplarily for frequency multiplexing within a subframe and localized transmission (NFFT=256 and 25 subcarriers per resource block)

Fig. 8   Numbering of Resource Blocks

The modulated data symbols are mapped onto the subcarriers first along the frequency axis starting with the lowest resource block number, then along the available OFDM symbols. This is true also for non-adjacent resource blocks for the same user. This is illustrated in the figure below.

In case pre-defined symbols (e.g. reference symbols, SCH, BCH) are transmitted in a sub-frame, the number of available data symbols for user data allocation is reduced in a resource block
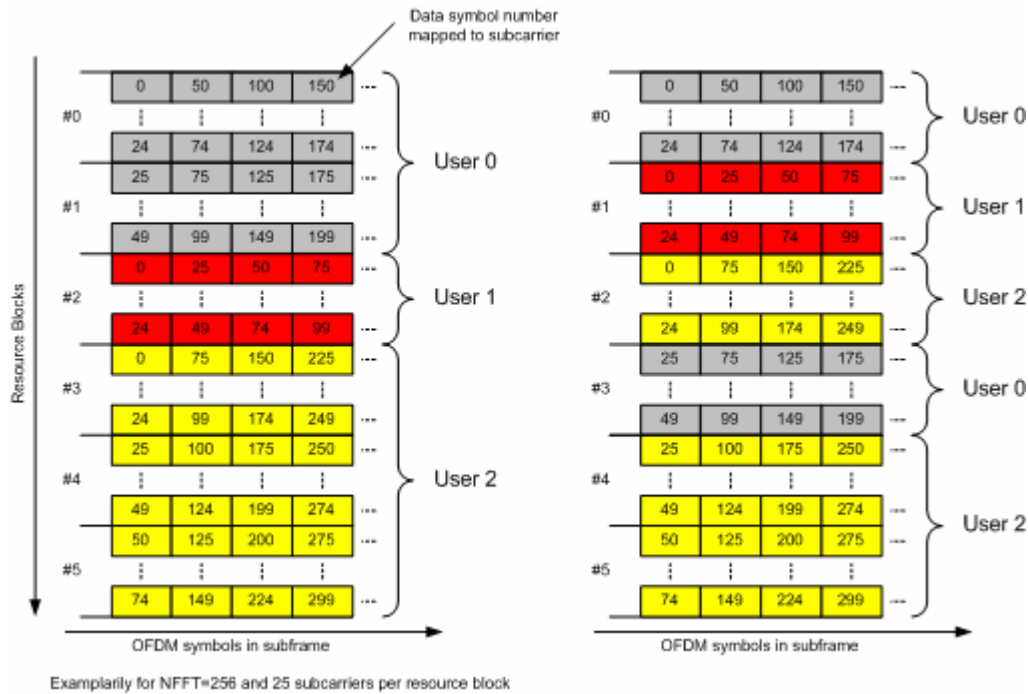

Fig. 9   Data symbol numbering

Modulation Mapping

The modulation mapping is done according to 3GPP TS 25.814, Release 7. All modulation schemes of 3GPP TS 25.814 are supported.

Conflict Handling in the EUTRA/LTE

In an EUTRA/LTE system the available resources in the time-frequency domain are shared by the reference symbols and different kinds of allocations (comparable to the different channel types in the 3GPP FDD mode). In the current EUTRA/LTE release, four different types of allocations are supported:

- Synchronization channel (SCH)

- Broadcast channel (BCH)

- L1/L2 control channel (can be used for different purposes, e.g. S-SCH)

- Data

Due to lack of standardization different situations may occur that need clarification. If several allocations (of the same or different type) partly share the same resources, a decision has to made what bits are really mapped to the affected subcarriers. The general rule here is that the allocation with the higher priority is transmitted completely while the affected subcarriers are stamped out of the lower allocation. Note that this reduces the number of available physical bits of an allocation. The actual size of a certain allocation is displayed in the column **Physical Bits** of the resource allocation table.

The following picture shows the priorities of the different allocation types including the reference symbols, which are not a real allocation. Note that SCH and BCH can never be mapped to the same subframe and are therefore treated with the same priority.
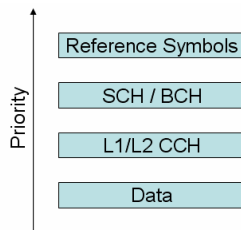
In case allocations of different content type (e.g. SCH and data) overlap, no conflict is displayed in the resource allocation table. The time plan can be used to check which allocation is the one with the higher priority and is therefore transmitted completely. If different allocations of the same priority are overlapping, the one with the lower allocation index (i.e. which comes first) in the resource allocation table is treated with higher priority. In this case the reduced allocation is marked in the conflict column of the resource allocation table.

Copy/Paste Subframe

In order to simplify the configuration of the EUTRA/LTE signal the user has the possibility to copy and paste settings from one subframe to another. Note that beside the cyclic prefix length only L1/L2CCH and data allocations are copied, but no SCH or BCH information. This is due to the fact that the SCH/BCH is configured globally in the **General Settings** menu and can therefore not be overwritten in the **Frame Configuration** menu. Copying allocations from a subframe without SCH/BCH to one with SCH/BCH and vice versa might lead to conflict situations. In this case the rules discussed above become effective. Note that configurations can occur where in different subframes allocations that are identical by means of scheduled resource blocks have a different amount of physical bits available, due to the out stamping of overlapping subcarriers.

Number of Configurable Subframes

Another possibility to simplify the configuration of the EUTRA/LTE signal for the user is to configure only a small number of frames manually and then let the EUTRA/LTE fill the whole frame periodically with the configured subframes. Internally the "*Copy/Paste Subframe*" functionality as described on page 10 is used, so again only L1/L2CCH and data allocations are copied, but no SCH/BCH allocations.

EUTRA/LTE Menu

The menu for setting the EUTRA/LTE digital standard is either called from the baseband block or from the menu tree under **Baseband**.
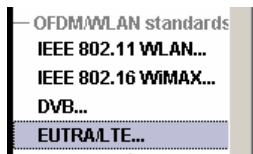
Main Menu for EUTRA/LTE Signals

The menu is split into several sections for configuring the standard.

The upper menu section is where the EUTRA/LTE digital standard is enabled and reset, the default settings are called, and where the generated waveform file can be selceted.

The middle menu section is where EUTRA/LTE related settings such as the link direction and the sequence length can be selected.

The buttons in the lower menu section lead to submenus to configure the EUTRA/LTE signal and setting the filter, trigger, and clock parameters.
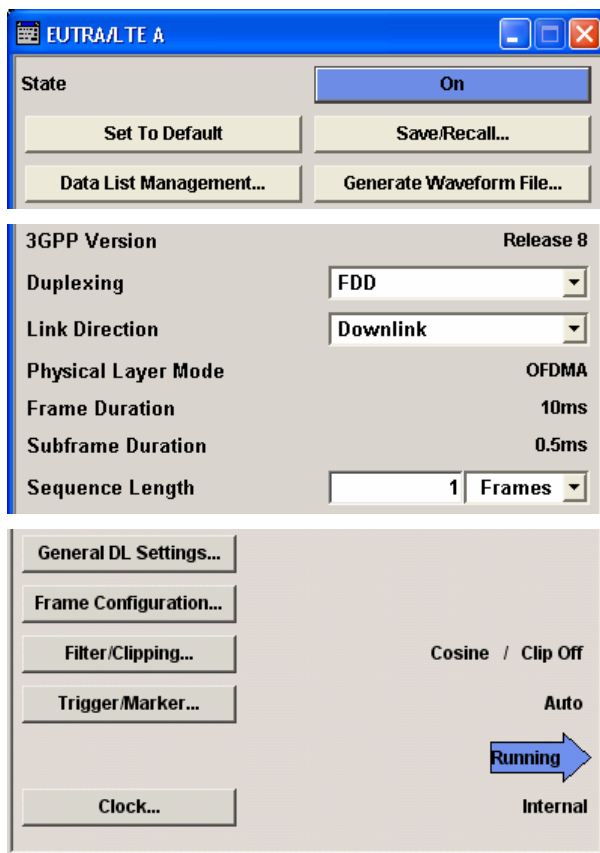
The upper menu section is where the EUTRA/LTE digital standard is enabled and reset, the default settings are called and where the generated waveform file can be selected.

State – EUTRA/LTE   Activates or deactivates the EUTRA/LTE standard.

Activating this standard disables all the other digital standards and digital modulation modes (in case of two-path instruments, this affects the same path).

The EUTRA/LTE signal is generated according to the performed settings.

Remote-control command:
SOUR:BB:EUTR:STAT ON

Set to Default - EUTRA/LTE   Calls the default settings.

Remote-control command:
SOUR:BB:EUTR:PRES

Parameter	Value
Main Settings	
State	OFF
Duplexing	FDD
Link Direction	Downlink
Physical Layer Mode	OFDMA (downlink)
Sequence Length	1 Frame
General Settings	
Channel Bandwidth	10 MHz
Physical Resource Block Bandwidth	375 kHz
Sampling Rate	15.36 MHz
FFT Size	1024
Number Of Occupied Subcarriers	601
Number Of Resource Blocks	24
Reference Symbol Configuration	Antenna 1
First Reference Symbol Position	1st Symbol
Frequency Spacing	6 Subcarriers
Subcarrier Offset	0 Subcarriers
Reference Symbol Repetition Period	5 Subframes
First Reference Symbol Power	0 dB
Use Second Reference Symbols	ON
Second Reference Symbol Power	0 dB
SCH Repetition Period	5 Subframes
First SCH Subframe	4
SCH Power	0 dB
BCH Subframe	0
BCH Length	1 OFDMA Symbol
BCH Bandwidth	1.25 MHz
BCH Power	0 dB
Frame Configuration	
No. Of Configurable Subframes	20
Behaviour In Unscheduled Resource Blocks	Dummy Data
Subframe Selection	0
Cyclic Prefix	Short
No. Of Used Allocations	0 | 1 (if SCH/BCH Subframe)
Modulation	QPSK
Channel Coding	Off
Transmission	Localized
No. Of Resource Blocks	1 | 4 (if SCH/BCH Subframe)

Parameter	Value
No. Of Symbols	5 | 1 (if SCH/BCH Subframe)
Resource Block Offset	0 | depending on channel bandwidth if SCH/BCH Subframe
Symbol Offest	2 | 6 (if SCH/BCH Subframe)
Auto	On
Data Source	PN9 | Data List (if SCH Subframe)
Power/dB	0 dB
Content Type	Data | SCH/BCH (if SCH/BCH Subframe)
User Settings	
Channel Coding	Off
Data Source	PN9
Dummy Data Settings	
Modulation	QPSK
Data Source	PN9
Power	0 dB

Save/Recall... - EUTRA/LTE   Calls the **Save/Recall** menu.

From the **Save/Recall** menu, the **File Select** windows for saving and recalling EUTRA/LTE configurations and the **File Manager** is called.

EUTRA/LTE configurations are stored as files with the predefined file extension ***.eutra**. The file name and the directory they are stored in are user-definable.

The complete settings in the **EUTRA/LTE** menu are saved and recalled.

Recall EUTRA/LTE Setting   Opens the **File Select** window for loading a saved EUTRA/LTE configuration.

The configuration of the selected (highlighted) file is loaded by pressing the **Select** button.

Remote-control command:
`MMEM:CDIR 'F:\gen_list\eutra'`

`SOUR:BB:EUTR:SETT:CAT?`
Response: `'e_utra_1', 'e_utra_2'`

`SOUR:BB:EUTR:SETT:LOAD "e_utra_1"`

Save EUTRA/LTE Setting   Opens the **File Select** window for saving the current EUTRA/LTE signal configuration.

The name of the file is specified in the **File name** entry field. The file is saved by pressing the **Save** button.
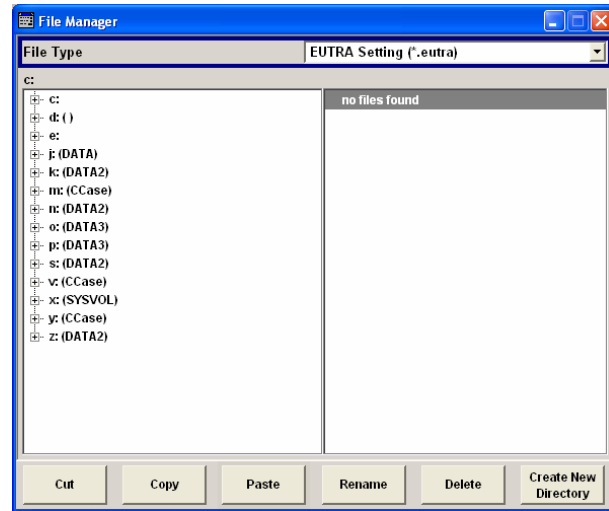
Remote-control command:
`MMEM:CDIR 'F:\gen_list\eutra'`

`SOUR:BB:EUTR:SETT:STOR "e_utra_1"`

File Manager   Calls the **File Manager**.

The **File Manager** is used to copy, delete, and
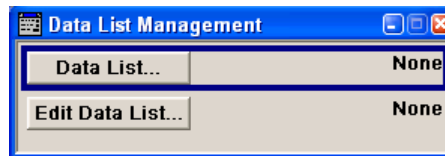rename files and to create new directories.

Remote-control command:
```
MMEM:CDIR 'F:\gen_list\eutra'
SOUR:BB:EUTR:SETT:DEL "e_utra_1"
```

Data List Management -   Calls the **Data List Management** menu. This menu is used to create
EUTRA/LTE   and edit a data list.

All data lists are stored as files with the predefined file extension ***.dm_iqd**.
The file name and the directory they are stored in are user-definable.

The data lists must be selected as a data source from the submenus
under the individual function.

Remote-control commands:

Note:
*All data lists are generated and edited by means of the SOURce:BB:DM
subsystem commands. Files containing data lists usually end with
*.dm_iqd. The data lists are selected as a data source for a specific
function in the individual subsystems of the digital standard.*

Creating and editing the data list:
```
SOUR:BB:DM:DLIS:SEL "e_utra"
SOUR:BB:DM:DLIS:DATA 1,1,0,1,0,1,0,1,1,1,1,0,0,0
SOUR:BB:DM:DLIS:DATA:APP 1,1,0,1,0,1,0,1,1,1,1,0,0
```

Selecting the data list:
```
SOUR:BB:EUTR:DL:SUBF1:ALL1:DATA DLIS
SOUR:BB:EUTR:DL:SUBF1:ALL1:DLIS "e_utra_1"

SOUR:BB:EUTR:DL:USER3:DATA DLIS
SOUR:BB:EUTR:DL:USER3:DLIS "e_utra_1"
```

Generate Waveform File… - EUTRA/LTE	Calls the **Generate Waveform** menu. This menu is used to store the current EUTRA/LTE signal as ARB signal in a waveform file.

This file can be loaded in the **ARB** menu and processed as multicarrier or multisegment signal.

The file name is entered in the submenu. The file is stored with the predefined file extension ***.wv**. The file name and the directory it is stored in are user-definable.

Remote-control command:
SOUR:BB:EUTR:WVF:CRE "c:\temp\eutra.wv"

The middle menu section is where EUTRA/LTE related settings such as the link direction and the sequence length can be selected.

3GPP Version	Displays the current version of the 3GPP standard.

The default settings and parameters provided are oriented towards the specifications of the version displayed.

Remote-control command:
SOUR:BB:EUTR:VERS?
Response: Release 8.0

Duplexing - EUTRA/LTE	Selects the duplexing. The duplexing mode determines how the uplink and downlink signals are separated.

TDD	In TDD mode, the same frequency is used for both directions of transmission (uplink and downlink). With one baseband, either downlink or uplink frames can be generated.

Note:
   The TDD mode is not implemented in this release.

Remote-control command:
SOUR:BB:EUTR:DUPL TDD

FDD	In FDD mode, different frequencies are used for downlink and uplink directions. If only one link direction is considered at once, the EUTRA/LTE standard defines no differences between TDD and FDD signals on the physical layer.

Note:
   In this release, only the FDD mode is supported.

Remote-control command:
SOUR:BB:EUTR:DUPL FDD

Link Direction - EUTRA/LTE	Selects the transmission direction.

Note:
In this release, only the downlink is supported.

	Downlink	The transmission direction selected is base station to user equipment. The signal corresponds to that of a base station.
		Remote-control command: `SOUR:BB:EUTR:LINK DOWN`
	Uplink	The transmission direction selected is user equipment to base station. The signal corresponds to that of a user equipment.
		Remote-control command: `SOUR:BB:EUTR:LINK UP`

Physical Layer Mode - EUTRA/LTE	Displays the physical layer mode.
	The physical layer mode depends on the link direction:
	For the downlink, the physical layer mode is always set to OFDMA. For the uplink, the physical layer mode is always set to SC-FDMA.

Note:
In this release, only OFDMA is supported.

Remote-control command:
`SOUR:BB:EUTR:PHYS?`

Frame Duration - EUTRA/LTE	Displays the frame duration. This value is fixed to 10 ms.
	Remote-control command: n.a.

Subframe Duration - EUTRA/LTE	Displays the subframe duration. The value is fixed to 0.5 ms.
	Remote-control command: n.a.

Sequence Length - EUTRA/LTE	Sets the sequence length of the signal in number of frames. The signal is calculated in advance and output in the arbitrary waveform generator. The maximum number of frames is calculated as follows:
	Max. No. of Frames = Arbitrary waveform memory size/(sampling rate x 10 ms).
	Remote-control command: `SOUR:BB:EUTR:SLEN 20`

The buttons in the lower menu section lead to submenus to configure the EUTRA/LTE signal and setting the filter, trigger, and clock parameters.

General DL Settings… - EUTRA/LTE	Calls the **General DL Settings** menu for configuring the EUTRA/LTE system.
	The menu is described in section "*General DL Settings - EUTRA/LTE*", page 18.
	Remote-control command: n.a.

Frame Configuration… - EUTRA/LTE

Calls the **Frame Configuration** menu for configuring the allocation of the resource blocks to the different users.

The menu is described in section "*Frame Configuration*", page 23.

Remote-control command: n.a.

Filtering, Clipping... - EUTRA/LTE

Calls the menu for setting baseband filtering and clipping. The current filter and the clipping state are displayed next to the button.

The menu is described in section "*Filter / Clipping Settings - EUTRA/LTE*", page 30.

Remote-control command: n.a.

Trigger - Marker - EUTRA/LTE

(Trigger for R&S SMx and R&S AMU instruments only)

Calls the menu for selecting the trigger mode and trigger source, for configuring the marker signals, and for setting the time delay of an external trigger signal.

This menu is described in section "*Trigger/Marker/Clock - EUTRA/LTE*", page 33.

The currently selected trigger mode and trigger source are displayed next to the button.

Remote-control command: n.a.

Execute Trigger - EUTRA/LTE

(R&S SMx and R&S AMU instruments only)

Executes the trigger manually.

A manual trigger can be executed only if an internal trigger source and a trigger mode other than **Auto** have been selected.

Remote-control command:
SOUR:BB:EUTR:TRIG:EXEC

Arm - EUTRA/LTE

(R&S SMx and R&S AMU instruments only)

Stops signal generation manually.

The **Arm** button is displayed only if the trigger modes **Armed Retrigger** or **Armed Auto** have been selected.

Remote-control command:
SOUR:BB:EUTR:TRIG:ARM:EXEC

Clock - EUTRA/LTE

(R&S SMx and R&S AMU instruments only)

Calls the menu for selecting the clock source and for setting a delay.

This menu is described in section "*Trigger/Marker/Clock - EUTRA/LTE*", page 33.
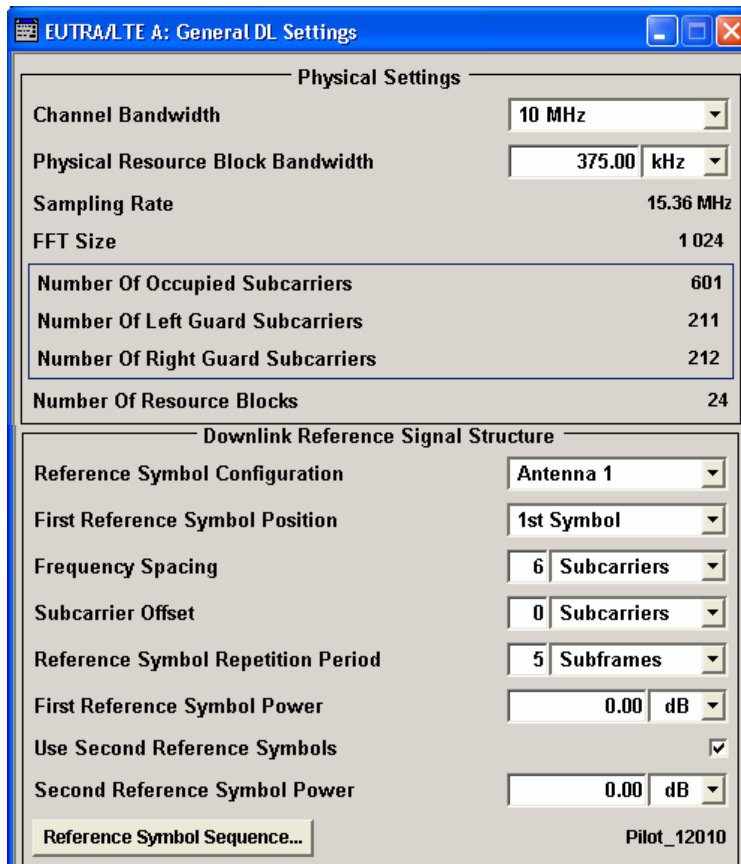
Remote-control command: n.a.

General DL Settings - EUTRA/LTE

The **General DL Settings** menu allows to configure the EUTRA/LTE system for transmission direction downlink.

In the **Physical Settings** section, the channel bandwith is selected.

The other parameters are fixed and read-only.

In the **Downlink Reference Signal Structure** section, the structure of the downlink reference signal is defined.In the **SCH/BCH Settings** section, the settings regarding the SCH and BCH are made

EUTRA/LTE A: General DL Settings		
Physical Settings		
Channel Bandwidth	10 MHz	
Physical Resource Block Bandwidth	375.00	kHz
Sampling Rate		15.36 MHz
FFT Size		1 024
Number Of Occupied Subcarriers		601
Number Of Left Guard Subcarriers		211
Number Of Right Guard Subcarriers		212
Number Of Resource Blocks		24
Downlink Reference Signal Structure		
Reference Symbol Configuration	Antenna 1	
First Reference Symbol Position	1st Symbol	
Frequency Spacing	6	Subcarriers
Subcarrier Offset	0	Subcarriers
Reference Symbol Repetition Period	5	Subframes
First Reference Symbol Power	0.00	dB
Use Second Reference Symbols		☑
Second Reference Symbol Power	0.00	dB
Reference Symbol Sequence...		Pilot_12010

Channel Bandwidth - EUTRA/LTE

Sets the channel bandwidth of the EUTRA/LTE system.

The channel bandwidth determines the sampling rate.

Note:
  In this release, 15 MHz is not supported.

Remote-control command:
`SOUR:BB:EUTR:LDIR0:BW BW5_00`

Physical Resource Block Bandwidth - EUTRA/LTE

This value determines the channel bandwidth of a physical resource block.

Note:
  In this release, this value is fixed to 375 kHz.

Remote-control command:
`SOUR:BB:EUTR:LDIR0:RESB:BW 375 kHz`

Sampling Rate - EUTRA/LTE

Displays the sampling rate. The sampling rate displayed depends on the setting for the channel bandwidth.

Remote-control command:
SOUR:BB:EUTR:LDIR0:SRAT?

FFT Size - EUTRA/LTE

Displays the FFT (Fast Fourier Transformation) size. The FFT size is set automatically according to the selected channel bandwidth.

Remote-control command:
SOUR:BB:EUTR:DL:FFTS?

Number Of Occupied Subcarriers - EUTRA/LTE

Displays the number of occupied subcarriers. This value is set automatically according to the selected channel bandwidth.

Remote-control command:
SOUR:BB:EUTR:DL:OCCS?

Number Of Left Guard Subcarriers - EUTRA/LTE

Displays the number of left guard subcarriers. This value is set automatically according to the FFT size.

Remote-control command: n.a.

Number Of Right Guard Subcarriers - EUTRA/LTE

Displays the number of right guard subcarriers. This value is set automatically according to the FFT size.

Remote-control command: n. a.

Number Of Resource Blocks - EUTRA/LTE

Displays the number of resource blocks. The value is set automatically according to the selected channel bandwidth and physical resource block bandwidth.

Remote-control command: n. a.
SOUR:BB:EUTR:LDIR0:RESB:COUN?

In the **Downlink Reference Signal Structure** section, the structure of the downlink reference signal is defined.

Reference Symbol Configuration - EUTRA/LTE

Selects the simulated antenna configuration.

Note:
In this release, only ANT1 is supported.

Remote-control command:
SOUR:BB:EUTR:DL:REFS:CONF ANT1

First Reference Symbol Position - EUTRA/LTE

Selects the position in the subframe for the first reference symbol.

Remote-control command:
SOUR:BB:EUTR:DL:REFS:FSTP SYM1

Frequency Spacing - EUTRA/LTE

Selects the spacing in subcarriers between two pilots.

Example:

FSP=6 results in a spacing of 5 subcarriers between the first and the last pilot.

You find this example in a graphical expression in figure 4.4, section "*Downlink Reference Signal Structure and Cell Search*", page 4.

Remote-control command:
SOUR:BB:EUTR:DL:REFS:FSP 6

Subcarrier Offset - EUTRA/LTE	Selects the subcarrier offset within the resource block.
	Remote-control command: SOUR:BB:EUTR:DL:REFS:SCOF 1

Reference Symbol Repetition Period - EUTRA/LTE

Selects the period in subframes, after which the sequence for the reference symbols is repeated.

Note:

The uploaded sequence for the reference symbols should be long enough to fulfill the here selected value.

Remote-control command:
SOUR:BB:EUTR:DL:REFS:REPP 4

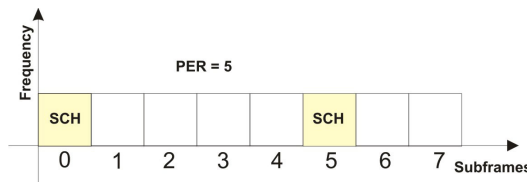|	
First Reference Symbol Power - EUTRA/LTE	Sets the power of the first reference symbols.
	Remote-control command: SOUR:BB:EUTR:DL:REFS:PWR1 0
Use Second Reference Symbols - EUTRA/LTE	Activates or deactivates the usage of the second reference symbols.
	Remote-control command: SOUR:BB:EUTR:DL:REFS:S2AC ON
Second Reference Symbol Power - EUTRA/LTE	Sets the power of the second reference symbols.
	Remote-control command: SOUR:BB:EUTR:DL:REFS:PWR2 0
Reference Symbol Sequence - EUTRA/LTE	Opens the **Load Data List** window for loading a saved reference symbol data list. The data list of the selected (highlighted) file is loaded by pressing the **Select** button.
	Remote-control command: MMEM:CDIR 'F:\gen_list\eutra' SOUR:BB:EUTR:DL:REFS:SEQ "e_utra_1"

In the **SCH/BCH Settings** section, the settings regarding the SCH and BCH are made.

SCH Repetition Period - EUTRA/LTE

Sets the period in subframes between two SCH subframes.

Example:

PER = 5 results in 4 subframes between two SCH subframes.

Remote-control command:
SOUR:BB:EUTR:DL:SCH:PER 5

First SCH Subframe - EUTRA/LTE	Sets the subframe in the radio frame, in which the SCH is transmitted the first time.

Example:

FSTS = 0 means that subframe 0 is the first subframe, in which the SCH is transmitted. The next SCH depends on the value for the SCH repetition period, see "*SCH Repetition Period - EUTRA/LTE*", see page 20.

The maximal value depends on the selected SCH repetition period: $FSTS_{max}$ = (SCH Repetition Period) minus 1.

Note:
> *The subframe for the SCH must be different from the subframe for the BCH.*
> *The SCH is automatically mapped to the endmost symbols of the subframe.*

Remote-control command:
SOUR:BB:EUTR:DL:SCH:FSTS 4

SCH Power - EUTRA/LTE	Sets the power of the SCH allocations.

Remote-control command:
SOUR:BB:EUTR:DL:SCH:PWR 0

SCH Sequence - EUTRA/LTE	Opens the **Load Data List** window for loading a saved SCH Sequence data list. The data list of the selected (highlighted) file is loaded by pressing the **Select** button.

Remote-control command:
MMEM:CDIR 'F:\gen_list\eutra'
SOUR:BB:EUTR:DL:SCH:SEQ "e_utra_1"

BCH Subframe - EUTRA/LTE	Sets the subframe in the radio frame, in which the BCH is transmitted the first time.

Note:
> *The subframe for the BCH must be different from the subframe for the SCH.*
> *The BCH is automatically mapped to the endmost symbols of the subframe.*

Remote-control command:
SOUR:BB:EUTR:DL:BCH:SUBF 5

BCH Length - EUTRA/LTE	Sets the length of the BCH in OFDMA-symbols.

Note:
> *The BCH is automatically mapped to the endmost symbols of the subframe.*

Remote-control command:
SOUR:BB:EUTR:DL:BCH:LENG 1

BCH Bandwidth - EUTRA/LTE	Selects the bandwidth of the BCH.

Note:
> *The BCH bandwidth 5 MHz is available only, if the selected channel bandwidth is greater or equal 5 MHz.*

Remote-control command:
```
SOUR:BB:EUTR:DL:BCH:BW BW1_25
```

BCH Power - EUTRA/LTE   Sets the power of the BCH allocations.

Remote-control command:
```
SOUR:BB:EUTR:DL:BCH:PWR 0
```

BCH Data Source - EUTRA/LTE   Selects the data source for the BCH allocations.

Remote-control command:
```
SOUR:BB:EUTR:DL:BCH:DATA PN9
```

BCH Pattern - EUTRA/LTE   **(Available for BCH data source Pattern only)**

Opens the editor for configuring a bit pattern. The length is limited to 64 bits.

Remote-control command:
```
SOUR:BB:EUTR:DL:DATA PAT
SOUR:BB:EUTR:DL:BCH:PAT #B1101,4
```

BCH Sequence - EUTRA/LTE   **(Available for BCH data source Data List only)**
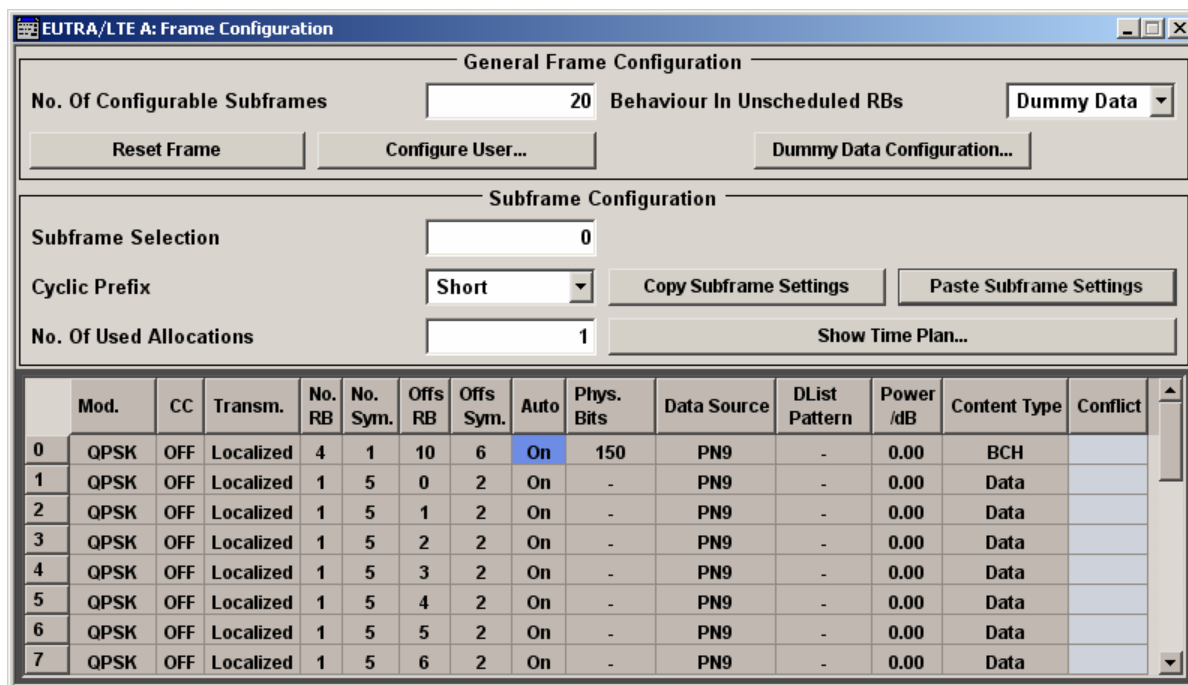
Opens the **Load Data List** window for loading a saved BCH Sequence data list. The data list of the selected (highlighted) file is loaded by pressing the **Select** button.

Remote-control command:
```
MMEM:CDIR 'F:\gen_list\eutra'
SOUR:BB:EUTR:DL:BCH:SEQ "e_utra_1"
```

Frame Configuration

The **Frame Configuration** menu allows to configure the subframes and the OFDMA resource allocations.

	Mod.	CC	Transm.	No. RB	No. Sym.	Offs RB	Offs Sym.	Auto	Phys. Bits	Data Source	DList Pattern	Power /dB	Content Type	Conflict
0	QPSK	OFF	Localized	4	1	10	6	On	150	PN9	-	0.00	BCH	
1	QPSK	OFF	Localized	1	5	0	2	On	-	PN9	-	0.00	Data	
2	QPSK	OFF	Localized	1	5	1	2	On	-	PN9	-	0.00	Data	
3	QPSK	OFF	Localized	1	5	2	2	On	-	PN9	-	0.00	Data	
4	QPSK	OFF	Localized	1	5	3	2	On	-	PN9	-	0.00	Data	
5	QPSK	OFF	Localized	1	5	4	2	On	-	PN9	-	0.00	Data	
6	QPSK	OFF	Localized	1	5	5	2	On	-	PN9	-	0.00	Data	
7	QPSK	OFF	Localized	1	5	6	2	On	-	PN9	-	0.00	Data	

No Of Configurable Subframes- EUTRA/LTE

Sets the number of configurable subframes. All twenty subframes of a frame are filled periodically with the configured subframes with the exception of the SCH/BCH allocations which are set globally in the **General Settings** menu.

For more detailed information, see "*Number of Configurable Subframes*", page 10.

Remote-control command:
SOUR:BB:EUTR:LDIR0:CONS 20

Reset Frame... - EUTRA/LTE

Resets settings of all subframes including cyclic prefix and number of used allocations to the default values.

Remote-control command:
SOUR:BB:EUTR:RSTF

Behaviour In Unscheduled Resource Blocks - EUTRA/LTE

Selects either to fill unscheduled resource blocks and subframes with dummy data or DTX.

Remote-control command:
SOUR:BB:EUTR:LDIR0:BUR DTX

Configure User.. - EUTRA/LTE

Calls the **Configure User** menu for configuring allocations for different users.

The menu is described in section "Configure User - EUTRA/LTE", page 27.

Remote-control command: n.a.

Dummy Data Configuration... - EUTRA/LTE	Calls the **Dummy Data Configuration** menu for setting the modulation, power and data source for the dummy data.
	The menu is described in section "*Dummy Data Configuration - EUTRA/LTE*", page 29.
	Remote-control command: n.a.
Subframe Selection - EUTRA/LTE	Sets the subframe to be configured in the frame configuration table.
	Remote-control command: n.a.
Cyclic Prefix - EUTRA/LTE	Sets the cyclic prefix for the according subframe.
	Remote-control command: SOUR:BB:EUTR:DL:SUBF1:CYCP SHORT
No. Of Used Allocations - EUTRA/LTE	Sets the number of scheduled allocations in the selected subframe.
	The number of available allocations depends on the allocation's content type for a subframe and the general channel bandwidth setting. If there exists a BCH or SCH allocation an additional allocation will be available. For instance, for a bandwidth of 10(/20)MHz there will be 24(/48) allocations(0, .., 23(/47)). Subframes that contain a BCH or SCH the maximum increases to 25(/49) available allocation(0,..,24(/48)). The same way an additional allocation will be available if a CCH allocation exists in the subframe.
	The default value depends on the existence of a SCH or BCH allocation in a subframe. In this case the default value is set to 1, otherwise 0.
	Remote-control command: SOUR:BB:EUTR:DL:SUBF1:ALC 2
Copy Subframe Settings - EUTRA/LTE	Copies the settings of the selected subframe to the clipboard. BCH/SCH allocations are not considered.
	For more detailed information, see "*Copy/Paste Subframe*", page 10.
	Remote-control command: n.a.
Paste Subframe Settings - EUTRA/LTE	Pastes the subframe settings from the clipboard to the selected subframe. BCH/SCH allocations are not considered.
	For more detailed information, see "*Copy/Paste Subframe*" page 10.
	Remote-control command: n.a.
Show Time Plan - EUTRA/LTE	Calls the time plan for the OFDMA resource allocation.
	The menu is described in detail in section "*Timeplan - EUTRA/LTE*", page 28.
	Remote-control command: n.a.

Resource Allocation Table - EUTRA/LTE

The resource allocation table is located in the lower part of the **Frame Configuration** menu. The resource allocation table is where the individual allocation parameters for a subframe are set.
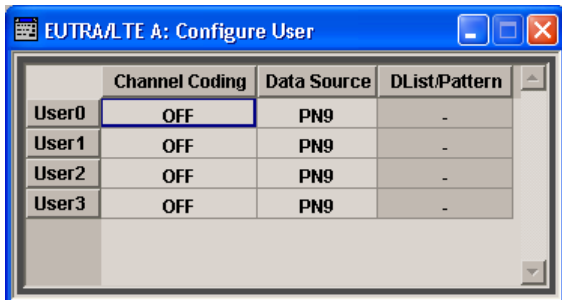
Allocation Index OFDMA - EUTRA/LTE	Displays the consecutive number of the allocation. Remote-control command: n.a. （selected via the suffix to the keyword）
Mod. - EUTRA/LTE	Selects the modulation scheme for the allocation. Remote-control command： SOUR:BB:EUTR:LDIR0:SUBF0:ALL5:MOD QPSK
CC - EUTRA/LTE	Selects whether turbo coding (**TC**) is used as channel coding scheme or not.

> *Note:*
> *In this release turbo coding (**TC**) is not supported.*

Remote-control command：
SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:CCOD NONE

Transmission - EUTRA/LTE   Selects whether the transmission is localized or not.

> *Note:*
> *In this release, the transmission is always localized.*

Remote-control command:
SOUR:BB:EUTR:LDIR0:SUBF1:ALL5:TRAN LOC

No. RB - EUTRA/LTE	Sets the size of the selected allocation in resource blocks. Remote-control command: SOUR:BB:EUTR:LDIR0:SUBF2:ALL5:RBC 1
No. Sym. - EUTRA/LTE	Sets the size of the selected allocation in OFDM symbols. For content type DATA, this value is set automatically in a way that the allocation always fills the complete subframe with consideration of the symbol offset. Example: For Cyclic Prefix Length = Short (7 OFDMA Symbols) and Symbol Offset = 2 the resulting No. Of Symbols is 5. Remote-control command: SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:SYMC 5
Offs RB - EUTRA/LTE	Sets the start resource block of the selected allocation.

> *Note:*
> *If the **Auto** mode is activated, this value is read only.*

Remote-control command:
SOUR:BB:EUTR:LDIR0:SUBF1:ALL2:RBOF 100

Offs Sym. - EUTRA/LTE   Sets the start OFDM symbol of the selected allocation.

For cyclic prefix = LONG, the maximum symbol offset is 5. For data allocations, the maximum value is 2, regardless of the cyclic prefix length.

Remote-control command:
`SOUR:BB:EUTR:LDIR0:SUBF2:ALL2:SYM 2`

Auto - EUTRA/LTE   Sets whether automatic offset calculation is used or not.

Note:

*If the **Auto** mode is activated, the resource block offset is set automatically and cannot be changed.*

Remote-control command:
`SOUR:BB:EUTR:LDIR0:SUBF1:ALL2:AOC ON`

Phys. Bits - EUTRA/LTE   Displays the size of this allocation in bits.

Remote-control command:
`SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:PHYS?`

Data Source - EUTRA/LTE   Selects the data source for the selected allocation.

Data lists can be generated internally in the data editor or externally.

Data lists are selected in the **File Select** window, which is called by means of the **Data List Management** button.

If the **Pattern** data type is used, the bit pattern is defined in the **Pattern** input box. The length is limited to 64 bits.

Remote-control command:
`SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:DATA PN9`

`SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:DATA PATT`
`SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:PATD #H3F,8`

`SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:DATA DLIST`
`SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:DLIS "e_utra_1"`

Power - EUTRA/LTE   Sets the power for the selected allocation.

Remote-control command:
`SOUR:BB:EUTR:LDIR0:SUBF1:ALL2:PWR 10`

Content Type – EUTRA/LTE   Selects the type of the selected allocation.

Remote-control command:
`SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:CONT DATA`

Conflict - EUTRA/LTE   Indicates a conflict between allocations.

Remote-control command:
`SOUR:BB:EUTR:LDIR0:SUBF1:ALL1:CONF?`

Configure User - EUTRA/LTE

The **Configure User** menu allows to define and configure up to four scheduled user equipments that can be freely distributed over the whole frame by setting the data source of a certain allocation to **USER**. Using this feature ensures that a common data source is used for allocations of one user equippment also in case that these allocations are non-adjacent.

For more details, see figure 4-9, in section "*Data Allocations*", page 8.

	Channel Coding	Data Source	DList/Pattern
User0	OFF	PN9	-
User1	OFF	PN9	-
User2	OFF	PN9	-
User3	OFF	PN9	-

User - EUTRA/LTE

Displays the consecutive number of the users.

Remote-control command: n.a.

Channel Coding - EUTRA/LTE

Selects whether turbo coding (**TC**) is used as channel coding scheme or not.

Note:
   *Turbo coding (**TC**) is not supported in this release.*

Remote-control command:
SOUR:BB:EUTR:DL:USER2:CCOD NONE

Data Source (User Configuration) - EUTRA/LTE

Selects the data source for the selected user.

Data lists can be generated internally in the data editor or externally.

Data lists are selected in the **File Select** window, which is called by means of the **Data List Management** button.

If the **Pattern** data type is used, the bit pattern is defined in the **Pattern** input box. The length is limited to 64 bits.

Remote-control command:
SOUR:BB:EUTR:DL:USER3:DATA PN9

SOUR:BB:EUTR:DL:USER3:DATA PATT
SOUR:BB:EUTR:DL:USER3:PATD #H3F,8

SOUR:BB:EUTR:DL:USER3:DATA DLIST
SOUR:BB:EUTR:DL:USER3:DLIS "e_utra_1"

Timeplan - EUTRA/LTE

The **Timeplan** menu is called in the **Frame Configuration** menu with the button **Show Time Plan**.

The x-axis shows allocation in the time domain. The y-axis shows the resource blocks as smallest allocation granularity in the frequency domain. One allocation to a UE can span 1 to up to "No. of Resource Blocks" in the frequency domain.

First Subframe - EUTRA/LTE	Selects the first subframe to be displayed. Remote-control command: n.a
No. of Subframes - EUTRA/LTE	Selects the number of subframes to be displayed. Remote-control command: n.a

Dummy Data Configuration - EUTRA/LTE

The **Dummy Data Configuration** menu is called in the **Frame Configuration** menu with the button **Dummy Data Configuration**. Here the dummy data for filling the unscheduled resource blocks and subframes are configured, if this feature has been enabled in the **Frame Configuration** menu.
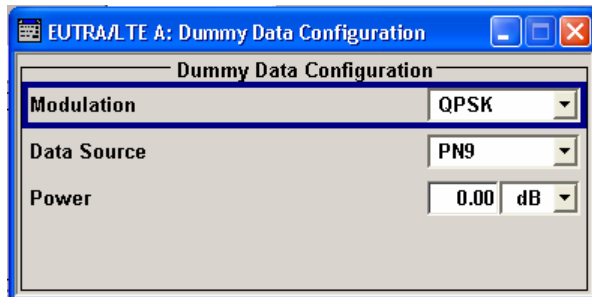
Modulation (Dummy Data) - EUTRA/LTE
Selects the modulation of the dummy data.

Remote-control command:
SOUR:BB:EUTR:DUMD:LDIR0:MOD QPSK

Data Source (Dummy Data) - EUTRA/LTE
Selects the data source for the dummy data configuration.

Remote-control command:
SOUR:BB:EUTR:DUMD:LDIR0:DATA PN9

Pattern (Dummy Data) - EUTRA/LTE
(Available for data source Pattern only)

Opens the editor for configuring a bit pattern. The length is limited to 64 bits.

Remote-control command:
SOUR:BB:EUTR:DUMD:LDIR0:PATD #B1001,4

Select Data List (Dummy Data) - EUTRA/LTE
(Available for data source Data List only)

Opens the **Load Data List** window for loading a saved dummy data data list. The data list of the selected (highlighted) file is loaded by pressing the **Select** button.

Remote-control command:
SOUR:EUTR:DUMD:LDIR0:DATA DLIS

Power (Dummy Data) - EUTRA/LTE
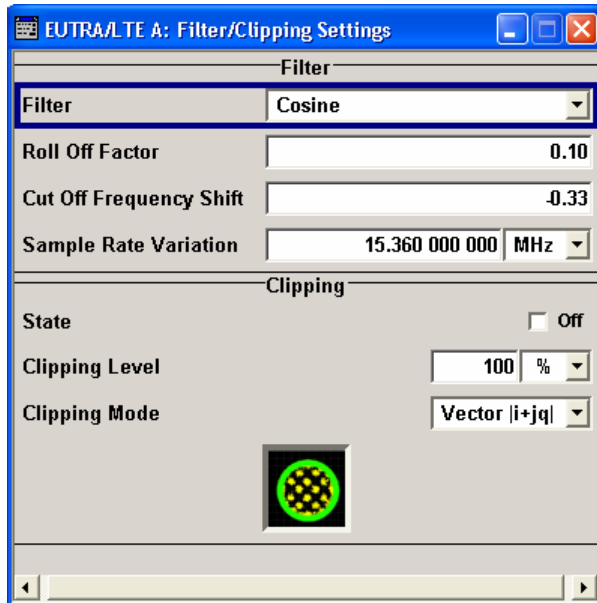Sets the power of the subcarriers allocated with dummy data.

Remote-control command:
SOUR:BB:EUTR:DUMD:LDIR0:PWR 5

Filter / Clipping Settings - EUTRA/LTE

The **Filter / Clipping** menu is reached via the EUTRA/LTE main menu.

The baseband filter, sample rate variation and clipping are defined in this menu.

Filter - EUTRA/LTE	Sets the baseband filter.
	Remote-control command: `SOUR:BB:EUTR:FILT:TYPE COS`
Roll Off Factor or BxT - EUTRA/LTE	Sets the filter parameter.
	For the default cosine filter, a roll off factor of 0.10 is used.

	Remote-control command:
	`SOUR:BB:EUTR:FILT:PAR:COS 0.05`
	`SOUR:BB:EUTR:FILT:PAR:RCOS 0.05`
	`SOUR:BB:EUTR:FILT:PAR:PGA 0.15`
	`SOUR:BB:EUTR:FILT:PAR:GAUS 0.15`
	`SOUR:BB:EUTR:FILT:PAR:SPH 0.15`
	`SOUR:BB:EUTR:FILT:PAR:APCO25 0.05`

Cut Off Frequency Shift - EUTRA/LTE	**(This feature is available for filter parameter Cosine only.)**
	Sets the value for the cut off frequency shift. The cut off frequency of the cosine filter can be adjusted to reach spectrum mask requirements.
	The value range is -1.0 to 1.0.
	Remote-control command: `SOUR:BB:EUTR:FILT:PAR:COS:COFS 1.0`
Cut Off Frequency Factor - EUTRA/LTE	**(This feature is available for filter parameter Lowpass only.)**
	Sets the value for the cut off frequency factor. The cut off frequency of the lowpass filter can be adjusted to reach spectrum mask requirements.
	Remote-control command: `SOUR:BB:EUTR:FILT:PAR:LPAS 0.5`

Sample Rate Variation - EUTRA/LTE	Sets the sample rate of the signal. A variation of this parameter only affects the ARB clock rate, all other signal parameters remain unchanged. If the sampling rate in the **General Settings** menu is changed, this parameter is reset to the chosen sampling rate. Remote-control command: `SOUR:BB:EUTR:SRAT:VAR 40000000`

Impulse Length - EUTRA/LTE	**(For WinIQSIM2 only)**
	
	Displays the number of filter tabs. If the check box is activated, the most sensible parameter values are selected. The value depends on the coherence check. If the check box is deactivated, the values can be changed manually.
	
	Remote-control command:
	`SOUR:BB:EUTR:FILT:ILEN:AUTO ON`
	`SOUR:BB:EUTR:FILT:ILEN 120`

Oversampling - EUTRA/LTE	**(For WinIQSIM2 only)**
	
	Determines the upsampling factor. If the check box is activated, the most sensible parameter values are selected. The value depends on the coherence check. If the check box is deactivated, the values can be changed manually.
	
	Remote-control command:
	`SOUR:BB:EUTR:FILT:OSAM:AUTO ON`
	`SOUR:BB:EUTR:FILT:OSAM 20`

The settings for clipping are collected in the **Clipping** section.

Clipping State - EUTRA/LTE	Switches baseband clipping on and off. Baseband clipping is a very simple and effective way of reducing the crest factor of the EUTRA/LTE signal. With baseband clipping, the signal level is limited to a settable value (Clipping Level). This level is specified as a percentage of the highest peak value. Since clipping is done prior to filtering, the procedure does not influence the spectrum. The EVM however increases. Remote-control command: `SOUR:BB:EUTR:CLIP:STAT ON`
Clipping Level - EUTRA/LTE	Sets the limit for clipping. This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place. Remote-control command: `SOUR:BB:EUTR:CLIP:LEV 50`

Clipping Mode -　　　　　　Selects the clipping method. A graphic illustration of the way in which
EUTRA/LTE　　　　　　　　these two methods work is given in the menu.

　　　　　　　　　Vector | i + q |　　The limit is related to the amplitude | i + q | . The I
　　　　　　　　　　　　　　　　　and Q components are mapped together, the angle
　　　　　　　　　　　　　　　　　is retained (see also *Clipping State - EUTRA/LTE*).

　　　　　　　　　　　　　　Remote-control command:
　　　　　　　　　　　　　　SOUR:BB:EUTR:CLIP:MODE VECT

　　　　　　　　　Scalar | i | + | q |　　The limit is related to the absolute maximum of all
　　　　　　　　　　　　　　　　　the I and Q values | i | + | q | .

　　　　　　　　　　　　　　The I and Q components are mapped separately, the
　　　　　　　　　　　　　　angle changes.

　　　　　　　　　　　　　　Remote-control command:
　　　　　　　　　　　　　　SOUR:BB:EUTR:CLIP:MODE SCAL

Trigger/Marker/Clock - EUTRA/LTE

Note:

The trigger, clock, and marker delay functions are available for R&S SMx and R&S AMU instruments only.

The **Trigger/Marker/Clock** menu can be reached via the EUTRA/LTE main menu.

The **Trigger In** section is where the trigger for the EUTRA/LTE signal is set. Various parameters will be provided for the settings, depending on which trigger source - internal or external - is selected. The current status of signal generation (**Running** or **Stopped**) is indicated for all trigger modes.
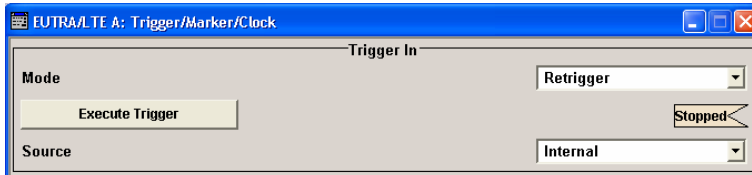
The **Marker Mode** section is where the marker signals at the MARKER output connectors are configured.
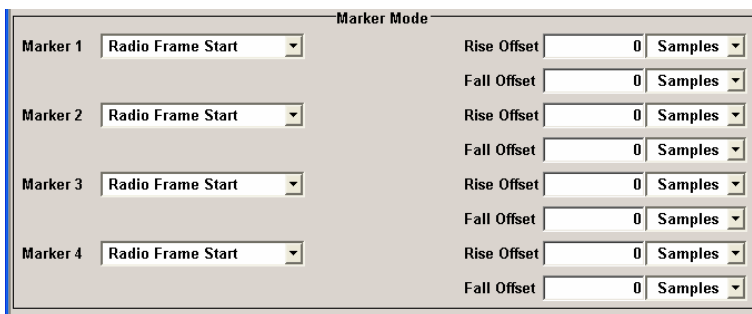
The **Marker Delay** section is where a marker signal delay can be defined, either without restriction or restricted to the dynamic section, i.e., the section in which it is possible to make settings without restarting signal and marker generation.
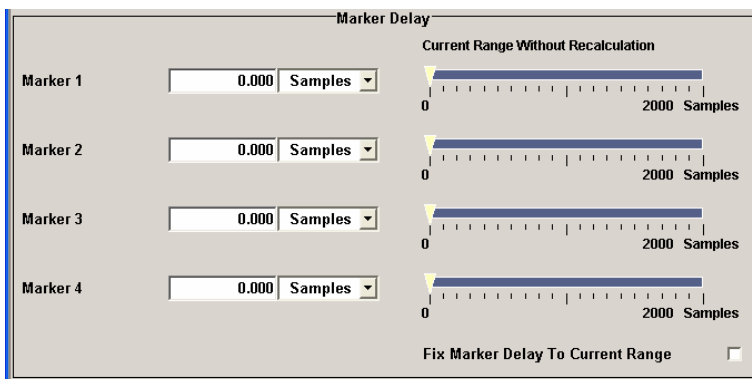
The **Clock Settings** section is where the clock source is selected and - in the case of an external source - the clock type.

The **Global Trigger/Clock Settings** button leads to a submenu for general trigger and clock settings.
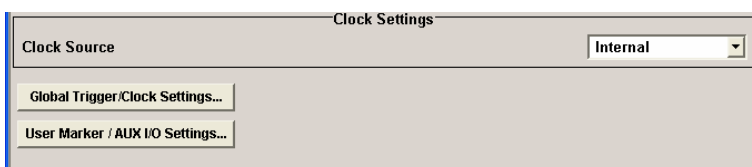
The **Trigger In** section is where the trigger for the EUTRA/LTE signal is set. The current status of the signal generation is displayed for all trigger modes.

Trigger Mode - EUTRA/LTE   **(R&S SMx and R&S AMU instruments only)**

Selects trigger mode.

The trigger mode determines the effect of a trigger on the signal generation.

Auto	The EUTRA/LTE signal is generated continuously.
	Remote-control command: `SOUR:BB:EUTR:TRIG:SEQ AUTO`
Retrigger	The EUTRA/LTE signal is generated continuously. A trigger event (internal or external) causes a restart.
	Remote-control command: `SOUR:BB:EUTR:TRIG:SEQ RETR`
Armed_Auto	The EUTRA/LTE-Signal signal is generated only when a trigger event occurs. Then the signal is generated continuously.
	Button **Arm** stops signal generation. A subsequent trigger event (internal with **Execute Trigger** or external) causes a restart.
	Remote-control command: `SOUR:BB:EUTR:TRIG:SEQ AAUT`
Armed_Retrigger	The EUTRA/LTE-Signal signal is generated only when a trigger event occurs. Then the signal is generated continuously. Every subsequent trigger event causes a restart.
	Button **Arm** stops signal generation. A subsequent trigger event (internal with **Execute Trigger** or external) causes a restart.
	Remote-control command: `SOUR:BB:EUTR:TRIG:SEQ ARET`
Single	The EUTRA/LTE signal is generated only when a trigger event occurs. Then the signal is generated once to the length specified at Signal Duration. Every subsequent trigger event (internal with **Execute Trigger** or external) causes a restart.
	Remote-control command: `SOUR:BB:EUTR:TRIG:SEQ SING`

Signal Duration Unit - EUTRA/LTE   **(R&S SMx and R&S AMU instruments only)**

Defines the unit for the entry of the length of the signal sequence to be output in the **Single** trigger mode. Available units are frame and sequence length (SL).

Remote-control commands:
`SOUR:BB:EUTR:TRIG:SLUN FRAM`

Signal Duration - EUTRA/LTE	**(R&S SMx and R&S AMU instruments only)**
	Defines the length of the signal sequence to be output in the **Single** trigger mode. The unit of the entry is defined under **Signal Duration Unit**. It is then possible to output deliberately just part of the signal, an exact sequence of the signal, or a defined number of repetitions of the signal.
	Remote-control commands: `SOUR:BB:EUTR:TRIG:SLEN 2000`

Running - Stopped - EUTRA/LTE	**(R&S SMx and R&S AMU instruments only)**
	Displays the status of signal generation for all trigger modes. This display appears only when EUTRA/LTE is enabled (**State On**).
	Remote-control command: `SOUR:BB:EUTR:TRIG:RMOD?` Response: RUN or STOP

Running	The EUTRA/LTE modulation signal is generated; a trigger was (internally or externally) initiated in triggered mode.
	If Armed_Auto and Armed_Retrigger have been selected, generation of signals can be stopped with the Arm button. A new trigger (internally with Execute Trigger or externally) causes a restart.
Stopped	The signal is not generated, and the instrument waits for a trigger event (internal or external).

Arm - EUTRA/LTE	**(R&S SMx and R&S AMU instruments only)**
	Stops signal generation. This button appears only with **Running** signal generation in the **Armed_Auto** and **Armed_Retrigger** trigger modes.
	Signal generation can be restarted by a new trigger (internally with **Execute Trigger** or externally).
	Remote-control command: `SOUR:BB:EUTRA:TRIG:ARM:EXEC`

Execute Trigger - EUTRA/LTE	**(R&S SMx and R&S AMU instruments only)**
	Executes trigger manually. A manual trigger can be executed only when an internal trigger source and a trigger mode other than Auto have been selected.

	Remote-control commands:
	 `SOUR:BB:EUTR:TRIG:SOUR INT`
	 `SOUR:BB:EUTR:TRIG:SEQ RETR`
	 `SOUR:BB:EUTR:TRIG:EXEC`

**Trigger Source -
EUTRA/LTE**

(R&S SMx and R&S AMU instruments only)

Selects trigger source. This setting is effective only when a trigger mode other than **Auto** has been selected.

Internal	The trigger event is executed by **Execute Trigger**.
	Remote-control command: SOUR:BB:EUTR:TRIG:SOUR INT
Internal (Baseband A/B)	The trigger event is executed by the trigger signal from the second path (two-path instruments only).
	Remote-control command: SOUR:BB:EUTR:TRIG:SOUR OBAS
External (TRIGGER 1 / 2)	The trigger event is executed with the aid of the active edge of an external trigger signal. The trigger signal is supplied via the TRIGGER 1 or TRIGGER 2 connector.
	The polarity, the trigger threshold and the input impedance of the TRIGGER input can be set in the **Global Trigger/Clock Settings** menu.
	Remote-control command: SOUR:BB:EUTR:TRIG:SOUR EXT | BEXT

**External / Trigger Delay -
EUTRA/LTE**

(R&S SMx and R&S AMU instruments only)

Sets the trigger signal delay in samples on external triggering (or on internal triggering via the second path for two-path instruments).

This enables the R&S Signal Generator to be synchronized with the device under test or other external devices.

Note:
For two-path instruments, the delay can be set separately for each of the two paths.

Remote-control command:
SOUR:BB:EUTR:TRIG:EXT:DEL 3
SOUR:BB:EUTR:TRIG:OBAS:DEL 3

**External / Trigger Inhibit -
EUTRA/LTE**

(R&S SMx and R&S AMU instruments only)

Sets the duration for inhibiting a new trigger event subsequent to triggering. The input is to be expressed in samples.

In the **Retrigger** mode, every trigger signal causes signal generation to restart. This restart is inhibited for the specified number of samples.

This parameter is only available on external triggering (or on internal triggering via the second path for two-path instruments).

Note:
For two-path instruments, the trigger inhibit can be set separately for each of the two paths.
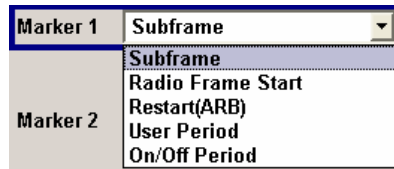
Remote-control command:
SOUR:BB:EUTR:TRIG:EXT:INH 1000
SOUR:BB:EUTR:TRIG:OBAS:INH 1000

The marker output signal for synchronizing external instruments is configured in the **Marker Settings** section **Marker Mode**.

Marker Mode - EUTRA/LTE   Selects a marker signal for the associated MARKER output.

Marker 1	Subframe ▼
	Subframe
	Radio Frame Start
Marker 2	Restart(ARB)
	User Period
	On/Off Period

Restart (ARB)   A marker signal is generated at the start of each ARB sequence.

Remote-control command:
SOUR:BB:EUTR:TRIG:OUTP1:MODE REST

Radio Frame Start   A marker signal is generated at the start of each radio frame.

Remote-control command:
SOUR:BB:EUTR:TRIG:OUTP1:MODE FRAM

Subframe   A marker signal is generated at the start of each subframe.

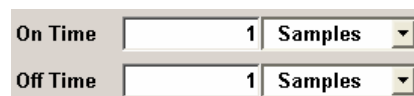Remote-control command:
SOUR:BB:EUTR:TRIG:OUTP1:MODE SUBF

User Period   A marker signal is generated at the beginning of every user-defined period. The period is defined in **Period**.

Period	2	Samples ▼

Remote-control command:
SOUR:BB:EUTR:TRIG:OUTP1:MODE PER
SOUR:BB:EUTR:TRIG:OUTP1:PER 2

ON/OFF Period   A regular marker signal that is defined by an ON/OFF ratio is generated. A period lasts one ON and OFF cycle.

The ON time and OFF time are each expressed as a number of samples and are set in an input field which opens when ON/OFF ratio is selected.

On Time	1	Samples ▼
Off Time	1	Samples ▼

Remote-control commands:
SOUR:BB:EUTR:TRIG:OUTP1:MODE RAT
SOUR:BB:EUTR:TRIG:OUTP1:OFFT 20
SOUR:BB:EUTR:TRIG:OUTP1:ONT 20

Rise Offset - EUTRA/LTE   **(Available for marker mode Subframe, Radio Frame Start, and Restart (ARB) only)**

Sets the value for the rise offset. The rising ramp of the marker is shifted by the set value in samples. Positive values shift the rising ramp to later positions, negative values shift it to earlier positions.

The value range is -640000 to 640000.

Remote-control command:
SOUR:BB:EUTR:TRIG:OUTP2:ROFF 5000

Fall Offset - EUTRA/LTE   **(Available for marker mode Subframe, Radio Frame Start, and Restart (ARB) only)**

Sets the value for the fall offset. The falling ramp of the marker is shifted by the set value in samples. Positive values shift the falling ramp to later positions, negative values shift it to earlier positions.

The value range is -640000 to 640000.

Remote-control command:
SOUR:BB:EUTR:TRIG:OUTP2:FOFF 5000

The **Marker Delay** section can be used to set a delay for the markers.

Note:
The marker delay functions are available for R&S SMx and R&S AMU instruments only.

Marker x Delay - EUTRA/LTE   **(R&S SMx and R&S AMU instruments only)**

Enters the delay between the marker signal at the marker outputs and the start of the signal.

The input is expressed as a number of samples.

If the setting "**Fix marker delay to dynamic range**" is enabled, the setting range is restricted to the dynamic range. In this range the delay of the marker signals can be set without restarting the marker and signal.

The allocation of marker signals to the outputs is described in the section "*Marker Output Signals*".

Remote-control command:
SOUR:BB:EUTR:TRIG:OUTP2:DEL 20

Current Range without Calculation - EUTRA/LTE   **(R&S SMx and R&S AMU instruments only)**

Displays the dynamic range within which the delay of the marker signals can be set without restarting the marker and signal.

The delay can be defined by moving the setting mark.

Remote-control command:
SOUR:BB:EUTR:TRIG:OUTP2:DEL:MAX?
SOUR:BB:EUTR:TRIG:OUTP2:DEL:MIN?

Fix marker delay to current   **(R&S SMx and R&S AMU instruments only)**
range - EUTRA/LTE

Restricts the marker delay setting range to the dynamic range. In this range the delay can be set without restarting the marker and signal.

Remote-control command:
`SOUR:BB:EUTR:TRIG:OUTP:DEL:FIX ON`

The clock source is selected in the **Clock Settings** section.

Note:
*   The clock functions are available for R&S SMx and R&S AMU instruments only.*

Clock Source - EUTRA/LTE   **(R&S SMx and R&S AMU instruments only)**

Selects the clock source (also see section "*Clock Signals*").

Intern   The internal clock reference is used to generate the sample clock.

Remote-control command:
`SOUR:BB:EUTR:CLOC:SOUR INT`

Extern   The external clock reference is fed in as the sample clock or multiple thereof via the CLOCK connector.

The sample rate must be correctly set to an accuracy of ± 2 % (see data sheet).

The polarity of the clock input can be changed with the aid of **Global Trigger/Clock Settings**.

In the case of two-path instruments, this selection applies to path A.

Remote-control command:
`SOUR:BB:EUTR:CLOC:SOUR EXT`

Clock Mode - EUTRA/LTE **(R&S SMx and R&S AMU instruments only)**

Enters the type of the externally supplied clock.

Sample A sample clock is supplied via the CLOCK connector.

Remote-control command:
SOUR:BB:EUTR:CLOC:MODE SAMP

Multiple Sample A multiple of the sample clock is supplied via the CLOCK connector; the sample clock is derived internally from this.

The **Multiplier** window provided allows the multiplication factor to be entered.

Remote-control command:
SOUR:EUTR:CLOC:MODE MSAM

Sample Clock Multiplier - EUTRA/LTE **(R&S SMx and R&S AMU instruments only)**

Enters the multiplication factor for clock type **Multiple Sample**.

Remote-control command:
SOUR:BB:EUTR:CLOC:MULT 4

Measured External Clock - EUTRA/LTE **(R&S SMx and R&S AMU instruments only)**

Displays the measured frequency of the external clock signal. This enables the user to permanently monitor the frequency of the externally introduced clock.

This information is displayed only if the external clock source has been selected.

Remote-control command:
:CLOC:INP:FREQ?

Global Trigger/Clock Settings - EUTRA/LTE **(R&S SMx and R&S AMU instruments only)**

Calls the **Global Trigger/Clock/Input Settings** menu. This menu is used among other things for setting the trigger threshold, the input impedance and the polarity of the clock and trigger inputs

In the case of two-path instruments, these settings are valid for both paths.

The parameters in this menu affect all digital modulations and standards, and are described in the section "*Global Trigger/Clock/Input Settings – Setup -Environment*".

User Marker / AUX I/O Settings - EUTRA/LTE **(R&S SMx and R&S AMU instruments only)**

Calls the **User Marker AUX I/O Settings** menu. This menu is used to map the connector on the rear of the instruments see section "*User Marker - AUX IO - Setup-Environment-Global...Settings*".

Remote-Control Commands

General Remote-Control Commands

This subsystem contains commands for the primary and general settings of the EUTRa standard. These settings concern activation and deactivation of the standard, setting the transmission direction, filter, clock, trigger and clipping settings, defining the frame duration and the sequence length, as well as the preset setting.

The commands for defining the frame configuration for physical layer mode OFDMA are described in the next section. The commands are divided up in this way to make the comprehensive SOURce:BB:EUTRa subsystem clearer.

The numerical suffix at SOURce distinguishes between path A and path B for two-path instruments:

SOURce<1> = path A

SOURce2 = path B

For two-path instruments, the keyword SOURce is optional with commands for path A and can be omitted. For path B, the command must include the keyword with the suffix 2.

For one-path instruments, the keyword SOURce is optional and can be omitted.

Command	Parameters	Default unit	Comments
[SOURce<[1]|2>:]BB:EUTRa:CLIPping:LEVel	1...100	PCT	
[SOURce<[1]|2>:]BB:EUTRa:CLIPping:MODE	VECTor | SCALar		
[SOURce<[1]|2>:]BB:EUTRa:CLIPping:STATe	ON | OFF		
[SOURce<[1]|2>:]BB:EUTRa:CLOCk:MODE	SAMPle | MSAMple		
[SOURce<[1]|2>:]BB:EUTRa:CLOCk:MULTiplier	1...64		
[SOURce<[1]|2>:]BB:EUTRa:CLOCk:SOURce	EXTernal | INTernal		
[SOURce<[1]|2>:]BB:EUTRa:DUPLexing	TDD | FDD		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:ILENgth	1...128		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:ILENgth:AUTO	ON | OFF		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:OSAMpling	1...32		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:OSAMpling:AUTO	ON | OFF		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:APCO25	0.05...0.99		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:COSine	0.00...0.99		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:COSine:COFS	-1.0...+1.0		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:GAUSs	0.15...2.5		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:LPASs	0.05 x symbol rate...2.0 x symbol rate		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:PGAuss	0.15...2.5		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:RCOSine	0.00...0.99		
[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:SPHase	0.15...2.5		

Command	Parameters	Default unit	Comments
[SOURce<[1]|2>:]BB:EUTRa:FILTer:TYPE	RCOSine | COSine | GAUSs | LGAuss | CONE | COF705 | COEQualizer | COFequalizer | C2K3x | APCO25 | SPHase | RECTangle | PGAuss | LPASs		
[SOURce<[1]|2>:]BB:EUTRa:LINK	DOWN | UP		
[SOURce<[1]|2>:]BB:EUTRa:PHYSmode			Query only
[SOURce<[1]|2>:]BB:EUTRa:PRESet			No query
[SOURce<[1]|2>:]BB:EUTRa:SETTing:CATalog			Query only
[SOURce<[1]|2>:]BB:EUTRa:SETTing:DELete	<file_name>		
[SOURce<[1]|2>:]BB:EUTRa:SETTing:LOAD	<file_name>		
[SOURce<[1]|2>:]BB:EUTRa:SETTing:STORe	<file_name>		
[SOURce<[1]|2>:]BB:EUTRa:SLENgth	1...Max		
[SOURce<[1]|2>:]BB:EUTRa:SRATe:VARiation	400 Hz...40 MHz	Hz	
[SOURce<[1]|2>:]BB:EUTRa:STATe	ON | OFF		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:ARM:EXECute			No query
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:EXECute			No query
[SOURce<[1]|2>:]BB:EUTRa:TRIGger[:EXTernal<[1]|2>]:DELay	0...65535 samples		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger[:EXTernal<[1]|2>]:INHibit	0...(2^32 - 1) samples		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OBASeband:DELay	0...65535 samples		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OBASeband:INHibit	0...(2^32 - 1) samples		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:DELay	0...(2^24 - 1) samples		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut:DELay:FIXed	ON | OFF	Hz	
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:DELay:MAXimum			Query only
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:DELay:MINimum			Query only
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:FOFFset	-640000...640000		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:MODE	RESTart | FRAM | SUBFram | PERiod | RATio		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:OFFTime	2...(2^24 - 1) samples		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:ONTime	2...(2^24 - 1) samples		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:PERiod	1...(1^32 - 1) symbols		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:ROFFset	-640000...640000		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:RMODe			Query only
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:SEQuence	AUTO | RETRigger | AAUTo | ARETrigger | SINGle		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:SLENgth	1...(2^32 - 1)		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:SLUNit	FRAMe | SEQuence		
[SOURce<[1]|2>:]BB:EUTRa:TRIGger:SOURce	EXTernal | INTernal | BEXTernal | OBASeband		
[SOURce<[1]|2>:]BB:EUTRa:WVFile:CREate	<file_name>		
[SOURce<[1]|2>:]BB:EUTRa:VERSion			Query only

[SOURce<[1]|2>:]BB:EUTRa:CLIPping:LEVel 0...100 PCT

The command sets the limit for level clipping. This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

Level clipping is activated with the command `BB:EUTR:CLIP:STAT ON`

Example: `"BB:EUTR:CLIP:LEV 80PCT"`
                            'sets the limit for level clipping to 80% of the maximum level.

                     `"BB:EUTR:CLIP:STAT ON"`
                            'activates level clipping.

*RST value	Resolution	SCPI
100 PCT	1	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:CLIPping:MODE VECTor | SCALar

The command sets the method for level clipping (Clipping).

Parameters: **VECTor**
                     The reference level is the amplitude | i+jq |

                     SCALar
                     The reference level is the absolute maximum of the I and Q values.

Example: `"BB:EUTR:CLIP:MODE SCAL"`
                            'selects the absolute maximum of all the I and Q values as the reference level.

                     `"BB:EUTR:CLIP:LEV 80PCT"`
                            'sets the limit for level clipping to 80% of this maximum level.

                     `"BB:EUTR:CLIP:STAT ON"`
                            'activates level clipping.

*RST value	Resolution	SCPI
VECTor	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:CLIPping:STATe ON | OFF

The command activates level clipping (Clipping). The value is defined with the command `[SOURce:]BB:EUTRa:CLIPping:LEVel`, the mode of calculation with the command `[SOURce:]BB:EUTRa:CLIPping:MODE`.

Example: `"BB:EUTR:CLIP:STAT ON"`
                            'activates level clipping.

*RST value	Resolution	SCPI
OFF		Device-specific

[SOURce<[1]|2>:]BB:EUTRa:CLOCk:MODE SAMPle | MSAMple

Note:
 This command is available for R&S SMx and R&S AMU instruments only.

The command enters the type of externally supplied clock (`:BB:EUTRa:CLOCk:SOURce EXTernal`).

When `MSAMple` is used, a multiple of the sample clock is supplied via the CLOCK connector and the sample clock is derived internally from this. The multiplier is entered with the command `:BB:EUTRa:CLOCk:MULTiplier`.

For two-path instruments, the only numerical suffix allowed for SOURce is 1, since the external clock source is permanently allocated to path A.

Example: `"BB:EUTR:CLOC:MODE SAMP"`
     'selects clock type **SAMPle**, i.e. the supplied clock is a sample clock.

*RST value	Resolution	SCPI
SAMPle	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:CLOCk:MULTiplier 1...64

The command specifies the multiplier for clock type **Multiplied** (`:BB:EUTRa:CLOCk:MODE MSAMple`) in the case of an external clock source.

Example: `"BB:EUTR:CLOC:SOUR EXT"`
     'selects the external clock source. The clock is supplied via the CLOCK connector.

     `"BB:EUTR:CLOC:MODE MSAM"`
     'selects clock type **Multiplied**, i.e. the supplied clock has a rate which is a multiple of the sample rate.

     `"BB:EUTR:CLOC:MULT 12"`
     'the multiplier for the external clock rate is 12.

*RST value	Resolution	SCPI
4	1	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:CLOCk:SOURce INTernal | EXTernal

Note:
 This command is available for R&S SMx and R&S AMU instruments only.

The command selects the clock source.

For two-path instruments, selecting EXTernal is only possible for path A, since the external clock source is permanently allocated to path A.

Parameter: **INTernal** The internal clock reference is used.

     EXTernal   The external clock reference is supplied to the CLOCK connector.

Example: `"BB:EUTR:CLOC:SOUR EXT"`
     'selects an external clock reference. The clock is supplied via the CLOCK connector.

     `"BB:EUTR:CLOC:MODE SAMP"`
     'specifies that a sample clock is supplied via the CLOCK connector.

*RST value	Resolution	SCPI
INTernal	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DUPLexing TDD | FDD

The command selects the duplexing mode. The duplexing mode determines how the uplink and downlink signal are separated.

Note:
In this release, only FDD is supported.

| **Parameter:** | **TDD** | The same frequency is used for both directions of transmission (uplink and downlink). With one baseband, either downlink or uplink frames can be generated. |
| | **FDD** | Different frequencies are used for downlink and uplink directions. If only one link direction is considered at once, the EUTRA/LTE standard defines no differences between TDD and FDD signals on the physical layer. |

Example: `"BB:EUTR:DUPL FDD"`
'selects frequency division duplexing.

*RST value	Resolution	SCPI
FDD	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:ILENgth 1...128

Note:
This command is available for WinIQSIM2 only.

The command sets the impulse length (number of filter tabs).

Example: `"BB:EUTR:FILT:ILEN 10"`
'sets the number of filter tabs to 10.

*RST value	Resolution	SCPI
10	1	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:ILENgth:AUTO ON | OFF

Note:
This command is available for WinIQSIM2 only.

The command acivates/deactivates the impulse length state. If activated, the most sensible parameter values are selected. The value depends on the coherence check.

Example: `"BB:EUTR:FILT:ILEN:AUTO ON"`
'the most sensible parameters are selected automatically.

*RST value	Resolution	SCPI
ON	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:OSAMpling 1...32

Note:
    This command is available for WinIQSIM2 only.

The command sets the upsampling factor.

Example: "BB:EUTR:FILT:OSAM 32"
                    'sets the upsampling factor to 32.

*RST value	Resolution	SCPI
32	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:OSAMpling:AUTO ON | OFF

Note:
    This command is available for WinIQSIM2 only.

The command acivates/deactivates the upsampling factor state. If activated, the most sensible parameter values are selected. The value depends on the coherence check. If deactivated, the values can be changed manually.

Example: "BB:EUTR:FILT:OSAM:AUTO ON"
                    'the most sensible parameters are selected automatically.

*RST value	Resolution	SCPI
ON	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:APCO25   0.05...0.99

The command sets the roll-off factor for the APCO25 filter type.

Example: "BB:EUTR:FILT:PAR:APCO25 0.04"
                    'the roll-off factor is set to 0.04.

*RST value	Resolution	SCPI
0.20		Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:COSine   0.00...0.99

The command sets the roll-off factor for the Cosine filter type.

Example: "BB:EUTR:FILT:PAR:COS 0.04"
                    'the roll-off factor is set to 0.04.

*RST value	Resolution	SCPI
0.1	0.01	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:COSine:COFS   -1.0...1.0

The command sets the "cut of frequency shift' value for the Cosine filter type.

Example: `"BB:EUTR:FILT:PAR:COS:COFS 0.04"`

    'the "cut of frequency shift' value is set to 0.04.

*RST value	Resolution	SCPI
-0.33	0.01	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:GAUSs   0.15...2.5

The command sets the BxT for the Gauss filter type (FSK).

Example: `"BB:EUTR:FILT:PAR:GAUS 0.5"`

    'the BxT is set to 0.5.

*RST value	Resolution	SCPI
0.5		Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:LPASs   0.05...2.0

The command sets the cut off frequency factor for the Lowpass filter type.

Example: `"BB:EUTR:FILT:PAR:LPAS 0.5"`

    'the cut of frequency factor is set to 0.5.

*RST value	Resolution	SCPI
0.50	0.01	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:PGAuss   0.15...2.5

The command sets the BxT for the Gauss filter type (pure).

Example: `"BB:EUTR:FILT:PAR:PGA 0.5"`

    'the BxT is set to 0.5.

*RST value	Resolution	SCPI
0.5		Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:RCOSine   0.00...0.99

The command sets the roll-off factor for the Root Cosine filter type.

Example: `"BB:EUTR:FILT:PAR:RCOS 0.4"`

    'the roll-off factor is set to 0.4.

*RST value	Resolution	SCPI
0.10		Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:PARameter:SPHase 0.15...2.5

The command sets the BxT for the Split Phase filter type.

Example: `BB:EUTR:FILT:PAR:SPH 2`
              'the BxT is set to 2.0

*RST value	Resolution	SCPI
2.00		Device-specific

[SOURce<[1]|2>:]BB:EUTRa:FILTer:TYPE RCOSine | COSine | GAUSs | LGAuss | CONE | COF705 | COEQualizer | COFequalizer | C2K3x | APCO25 | SPHase | RECTangle | PGAuss | LPASs

The command selects the baseband filter type.

Example: `"BB:EUTR:FILT:TYPE COS"`
              'sets the baseband filter type.

*RST value	Resolution	SCPI
COSine		Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LINK DOWN | UP

The command defines the transmission direction. The signal either corresponds to that of a base station (DOWN) or that of a subscriber station (UP).

Note:
    In this release, only the downlink is supported.

Example: `"BB:EUTR:LINK DOWN"`
              'the transmission direction selected is base station to subscriber station. The signal corresponds to that of a base station.

*RST value	Resolution	SCPI
DOWN	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:PHYSmode?

The command queries the physical layer mode.

The command is a query only and therefore has no *RST value.

Example: `"BB:EUTR:PHYS?"`
              'queries the physical layer mode.

*RST value	Resolution	Dependencies	SCPI
OFDMA	-	All EUTRA/LTE settings are preset.	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:PRESet

The command produces a standardized default for the EUTRA/LTE standard. The settings correspond to the *RST values specified for the commands.

This command triggers an action and therefore has no *RST value and no query form.

Example: `"BB:EUTR:PRES"`
             'resets all the EUTRA/LTE settings to default values.

*RST value	Resolution	Dependencies	SCPI
-	-	All EUTRA/LTE settings are preset.	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:SEQuence AUTO | RETRigger | AAUTo | ARETrigger | SINGle

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command selects the trigger mode.

Parameter: **AUTO**   The modulation signal is generated continuously.

                    RETRigger   The modulation signal is generated continuously. A trigger event (internal or external) causes a restart.

                    AAUTo   The modulation signal is generated only when a trigger event occurs. After the trigger event the signal is generated continuously. Signal generation is stopped with command `BB:EUTR:TRIG:ARM:EXEC` and started again when a trigger event occurs.

                    ARETrigger   The modulation signal is generated only when a trigger event occurs. The device automatically toggles to RETRIG mode. Every subsequent trigger event causes a restart. Signal generation is stopped with command `BB:EUTR:TRIG:ARM:EXEC` and started again when a trigger event occurs.

                    SINGle   The modulation signal is generated only when a trigger event occurs. Then the signal is generated once to the length specified with command `BB:EUTR:TRIG:SLEN`. Every subsequent trigger event causes a restart.

Example: `"BB:EUTR:TRIG:SEQ AAUT"`
             'sets the **Armed_auto** trigger mode; the device waits for the first trigger (e.g. with `*TRG`) and then generates the signal continuously.

*RST value	Resolution	SCPI
AUTO	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:SETTing:CATalog?

This command reads out the files with EUTRA/LTE settings in the default directory. The default directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only files with the file extension ***.eutra** will be listed.

The command is a query command and therefore has no *RST value.

Example: "`MMEM:CDIR 'D:\user\eutra'`"
        'sets the default directory to `D:\user\eutra`.

        "`BB:EUTR:SETT:CAT?`"
        'reads out all the files with EUTRA/LTE settings in the default directory.

        Response: "`'e_utra1','e_utra2'`"
        'the files `'e_utra1'` and `'e_utra2'` are available.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:SETTing:DELete   <file_name>

This command deletes the selected file with EUTRA/LTE settings. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension ***.eutra** will be deleted.

This command triggers an event and therefore has no *RST value and no query form.

Example: "`BB:EUTR:SETT:DEL 'e_utra_1'`"
        'deletes file 'e_utra_1'.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:SETTing:LOAD <file_name>

This command loads the selected file with EUTRA/LTE settings. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension ***.eutra** will be loaded.

This command triggers an event and therefore has no *RST value and no query form.

Example: "`BB:EUTR:SETT:LOAD 'e_utra_1'`"
        'loads file '`e_utra_1`'.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:SETTing:STORe <file_name>

This command stores the current EUTRA/LTE settings into the selected file. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only the file name has to be entered. EUTRA/LTE settings are stored as files with the specific file extension ***.eutra**.

This command triggers an event and therefore has no *RST value and no query form.

Example: `"BB:EUTR:SETT:STOR 'e_utra_1'"`
                `'stores the current settings into file 'e_utra_1'.`

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:SLENgth   1...max

The command sets the sequence length of the signal in number of frames. The signal is calculated in advance and output in the arbitrary waveform generator. The maximum number of frames is calculated as follows:

Max. No. of Frames = Arbitrary waveform memory size/(sampling rate x 10 ms).

Example: `"BB:EUTR:SLEN 4"`
                `'selects the generation of 4 frames.`

*RST value	Resolution	SCPI
1	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:SRATe:VARiation   40 Hz...40 MHz

The command enters the output sample rate.

A variation of this parameter only affects the ARB clock rate, all other signal parameters remain unchanged. If the sampling rate in the General Settings menu is changed, this parameter is reset to the chosen sampling rate.

Example: `"BB:EUTR:SRAT:VAR 400Hz"`
                `"sets the output sample rate to 400 Hz.`

*RST value	Resolution	SCPI
15360000 Hz	0.001 Hz	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:STATe   ON | OFF

The command activates modulation in accordance with the EUTRA/LTE standard. Activating this standard deactivates all the other digital standards and digital modulation modes (in case of two-path instruments, this affects the same path).

Example: `"BB:EUTR:STAT ON"`
                `'activates modulation in accordance with the EUTRA/LTE standard.`

*RST value	Resolution	Dependencies	SCPI
OFF	-	`BB:EUTR:STAT ON` deactivates the other standards and digital modulation.	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:ARM:EXECute

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command stops signal generation for trigger modes **Armed_Auto** and **Armed_Retrigger**. A subsequent internal or external trigger event restart signal generation.

This command triggers an event and therefore has no *RST value and no query form.

Example: `"BB:EUTR:TRIG:SOUR INT"`
              'sets internal triggering.

              `"BB:EUTR:TRIG:SEQ ARET"`
              'sets Armed_Retrigger mode, i.e. every trigger event causes signal generation to restart.

              `"BB:EUTR:TRIG:EXEC"`
              'executes a trigger, signal generation is started.

              `"BB:EUTR:TRIG:ARM:EXEC"`
              'signal generation is stopped.

              `"BB:EUTR:TRIG:EXEC"`
              'executes a trigger, signal generation is started again.

*RST value	Resolution	SCPI
		Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:EXECute

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command executes a trigger. The internal trigger source must be selected using the command `:BB:EUTR:TRIG:SOUR INT` and a trigger mode other than `AUTO` must be selected using the command `:BB:EUTR:TRIG:SEQ`.

This command triggers an event and therefore has no *RST value and no query form.

Example: `"BB:EUTR:TRIG:SOUR INT"`
              'sets internal triggering.

              `"BB:EUTR:TRIG:SEQ RETR"`
              'sets Retrigger mode, i.e. every trigger event causes signal generation to restart.

              `"BB:EUTR:TRIG:EXEC"`
              'executes a trigger.

*RST value	Resolution	SCPI
		Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger[:EXTernal<[1]|2>]:DELay 0...65535

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command specifies the trigger delay (expressed as a number of samples) for external triggering. The numeric suffix to EXTernal distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

Example: `"BB:EUTR:TRIG:SOUR EXT"`
                'sets an external trigger via the TRIGGER 1 connector.

                `"BB:EUTR:TRIG:DEL 50"`
                'sets a delay of 50 samples for the trigger.

*RST value	Resolution	SCPI
0 samples	1 sample	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger[:EXTernal<[1]|2>]:INHibit 0...2^32-1

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command specifies the number of samples by which a restart is to be inhibited following a trigger event. This command applies only in the case of external triggering. The numeric suffix to EXTernal distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

Example: `"BB:EUTR:TRIG:SOUR EXT"`
                'selects an external trigger via the TRIGGER 1 connector

                `"BB:EUTR:TRIG:INH 200"`
                'sets a restart inhibit for 200 samples following a trigger event.

*RST value	Resolution	SCPI
0 samples	1 sample	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OBASeband:DELay 0...65535

Note:
   This command is available for R&S SMx and R&S AMU two-path instruments only.

The command specifies the trigger delay (expressed as a number of samples) for triggering by the trigger signal from the second path (two-path instruments only).

Example: `"BB:EUTR:TRIG:SOUR OBAS"`
                'sets for path A the internal trigger executed by the trigger signal from the second path (path B).

                `"BB:EUTR:TRIG:OBAS:DEL 50"`
                'sets a delay of 50 samples for the trigger.

RST value	Resolution	SCPI
0 samples	1 sample	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OBASband:INHibit 0...2^32-1

> *Note:*
> *This command is available for R&S SMx and R&S AMU two-path instruments only.*

The command specifies the number of samples by which a restart is to be inhibited following a trigger event. This command applies only for triggering by the second path.

Example:　　　`"BB:EUTR:TRIG:SOUR OBAS"`
　　　　　　　　　'sets for path A the internal trigger executed by the trigger signal from the second path (path B).

　　　　　　　　　`"BB:EUTR:TRIG:OBAS:INH 200"`
　　　　　　　　　'sets a restart inhibit for 200 samples following a trigger event.

*RST value	Resolution	SCPI
0 samples	1 sample	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:DELay 0...2^24 - 1 Samples

> *Note:*
> *This command is available for R&S SMx and R&S AMU instruments only.*

The command defines the delay between the signal on the marker outputs and the start of the signal, expressed in terms of samples. Command :BB:EUTRa:TRIGger:OUTPut:DELay:FIXed can be used to restrict the range of values to the dynamic range, i.e. the range within which a delay of the marker signals can be set without restarting the marker and signal.

Example:　　　`"BB:EUTR:TRIG:OUTP2:DEL 1600"`
　　　　　　　　　'sets a delay of 1600 samples for the signal on connector MARKER 2.

*RST value	Resolution	SCPI
0	1 sample	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut:DELay:FIXed ON | OFF

> *Note:*
> *This command is available for R&S SMx and R&S AMU instruments only.*

The command restricts the marker delay setting range to the dynamic range. In this range the delay can be set without restarting the marker and signal. If a delay is entered in setting ON but is outside this range, the maximum possible delay is set and an error message is generated.

Example:　　　`"BB:EUTR:TRIG:OUTP:DEL:FIX ON"`
　　　　　　　　　'restricts the marker signal delay setting range to the dynamic range.

*RST value	Resolution	SCPI
OFF	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:DELay:MAXimum

Note:
This command is available for R&S SMx and R&S AMU instruments only.

The command queries the maximum marker delay for setting `:BB:EUTRa:TRIG:OUTP:DEL:FIX ON`.

The command is a query only and therefore has no *RST value.

Example: `"BB:EUTR:TRIG:OUTP:DEL:FIX ON"`
'restricts the marker signal delay setting range to the dynamic range.

`"BB:EUTR:TRIG:OUTP:DEL:MAX"`
'queries the maximum of the dynamic range.

Response: `"2000"`
'the maximum for the marker delay setting is 2000 samples.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:DELay:MINimum

Note:
This command is available for R&S SMx and R&S AMU instruments only.

The command queries the minimum marker delay for setting `:BB:EUTRa:TRIGger:OUTPut:DELay:FIXed ON`.

The command is a query only and therefore has no *RST value.

Example: `"BB:EUTR:TRIG:OUTP:DEL:FIX ON"`
'restricts the marker signal delay setting range to the dynamic range.

`"BB:EUTR:TRIG:OUTP:DEL:MIN"`
'queries the minimum of the dynamic range.

Response: `"0"`
'the minimum for the marker delay setting is 0 samples.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:FOFFset   -640000...+640000 samples

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command sets the fall offset for an Subframe, Radio Frame Start, and Restart (ARB) marker in number of samples.

Example: `"BB:EUTR:TRIG:OUTP2:FOFF 20"`
          'sets a fall offset of 20 samples for marker signal 2 on path A.

          `"BB:EUTR:TRIG:OUTP2:FOFF 200"`
          'sets a fall offset of 20 samples for marker signal 2.

          `"BB:EUTR:TRIG:OUTP2:FOFF 200"`
          'sets a fall offset of 20 samples for marker signal 2.

*RST value	Resolution	SCPI
0	1	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:MODE   RESTart | FRAM | PERiod | SUBFram | RATio

The command defines the signal for the selected marker output.

Parameter: **RESTart** A marker signal is generated at the start of each ARB sequence.

          FRAM   A marker signal is generated at the start of each radio frame.

          SUBFram   A marker signal is generated at the start of each subframe.

          PERiod A marker signal is generated at the beginning of every user-defined period. The period is defined in **Period**.

          RATio   A marker signal corresponding to the Time Off / Time On specifications in the commands `BB:EUTRa:TRIGger:OUTPut:OFFT` and `BB:EUTRa:TRIGger:OUTPut:ONT` is generated.

Example: `"BB:EUTR:TRIG:OUTP2:MODE FRAMe"`
          'selects the frame marker signal on output MARKER 2.

*RST value	Resolution	SCPI
FRAM	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:OFFTime   1.. 2^32 - 1 (1..16 777 215) samples

The command sets the number of samples in a period (ON time + OFF time) during which the marker signal in setting `BB:EUTRa:TRIGger:OUTPut:MODE RATio` on the marker outputs is OFF.

Example: `"BB:EUTR:TRIG:OUTP2:OFFT 200"`
          'sets an OFF time of 200 samples for marker signal 2.

*RST value	Resolution	SCPI
1	1	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:ONTime 1.. 2^24 - 1 (1..16 777 215) samples

The command sets the number of samples in a period (ON time + OFF time) during which the
marker signal in setting BB:EUTR:TRIGger:OUTPut:MODE RATio on the marker outputs is ON.

Example: "BB:EUTR:TRIG:OUTP2:ONT 200"
                     'sets an ON time of 200 samples for marker 2.

*RST value	Resolution	SCPI
1	1	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:PERiod 1 ... (1^24-1) symbols

The command sets the repetition rate for the signal at the marker outputs, expressed in terms of
symbols. The setting is only valid for selection **USER** in BB:EUTR:TRIG:OUTP:MODE.

Example: "BB:EUTR:TRIG:OUTP2:MODE USER"
                     'selects the user marker for the signal on connector MARKER 2.

                     "BB:EUTR:TRIG:OUTP2:PER 1600"
                     'sets a period of 1600 symbols, i.e. the marker signal is repeated every 1600th
                     symbol.

*RST value	Resolution	SCPI
1	1 symbol	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:OUTPut<[1]...4>:ROFFset   -640000...+640000 samples

The command sets the rise offset for an Subframe, Radio Frame Start, or Restart (ARB) marker in
number of samples.

Example: "BB:EUTR:TRIG:OUTP2:ROFF 200"
                     'sets a rise offset of 20 samples for marker signal 2.

*RST value	Resolution	SCPI
0	1	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:RMODe

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command queries the current status of signal generation for all trigger modes with EUTRA/LTE modulation on.

The command is a query command and therefore has no *RST value.

| **Parameter:** | **RUN** | the signal is generated. A trigger event occurred in the triggered mode. |
| | **STOP** | the signal is not generated. A trigger event did not occur in the triggered modes, or signal generation was stopped by the command :BB:EUTRa:TRIG:ARM:EXECute (armed trigger modes only). |

Example: `"BB:EUTR:TRIG:SOUR EXT"`
                'sets external triggering via the TRIGGER 1 connector.

              `"BB:EUTR:TRIG:SEQ ARET"`
                'selects the Armed_Retrigger mode.

              `"BB:EUTR:TRIG:RMOD?"`
                'queries the current status of signal generation.

              Response: `"RUN"`
                'the signal is generated, an external trigger was executed.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:SLENgth   1...(2^32-1)

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command defines the length of the signal sequence to be output in the **Single** trigger mode (`BB:EUTRa:TRIG:SEQ SING`).

It is possible to output deliberately just part of the frame, an exact sequence of the frame, or a defined number of repetitions of the frame. The unit is defined with command `BB:EUTRa:TRIG:SLUNit`.

Example: `"BB:EUTR:TRIG:SEQ SING"`
                'sets the trigger mode Single.

              `"BB:EUTR:TRIG:SLUN FRAM"`
                'sets the unit Frame length for the entry of the sequence length.

              `"BB:EUTR:TRIG:SLEN 200"`
                'sets a sequence length of 200 frames. The first 200 samples of the current
                frame will be output after the next trigger event.

*RST value	Resolution	SCPI
1	1	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:SLUNit   FRAMe | SEQuence

Note:
This command is available for R&S SMx and R&S AMU instruments only.

The command defines the unit for the entry of the length of the signal sequence
(BB:EUTRa:TRIG:SLEN) to be output in the **Single** trigger mode (BB:EUTRa:TRIG:SEQ SING).

Parameter:	**FRAMe** Unit Frame. A single frame is generated after a trigger event. **SEQuence** Unit Sequence Length. A single sequence is generated after a trigger event.

Example:	"BB:EUTR:TRIG:SEQ SING"
	  'sets trigger mode **Single**.
	
	"BB:EUTR:TRIG:SLUN FRAM"
	  'sets unit Frame length for the entry of sequence length.
	
	"BB:EUTR:TRIG:SLEN 2"
	  'sets a sequence length of 2 frame. Two frames will be output after the next trigger event.

*RST value	Resolution	SCPI
SEQuence	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:TRIGger:SOURce   INTernal | EXTernal | BEXTernal | OBASeband

Note:
This command is available for R&S SMx and R&S AMU instruments only.

The command selects the trigger source.

Parameter:	**INTernal** Triggering is executed by means of the Trigger command BB:EUTR:TRIGger:EXECute or *TRG in the case of remote control and by means of **Execute Trigger** in the case of manual operation. **EXTernal** Triggering is executed by means of the signal on the TRIGGER 1 connector. **BEXTernal** Triggering is executed by means of the signal on the TRIGGER 2 connector. **OBASeband** Triggering is executed by means of the trigger signal from the second path (two-path instruments only).
Example:	"BB:EUTR:TRIG:SOUR EXT" 'sets external triggering via the TRIGGER 1 connector.

*RST value	Resolution	SCPI
INTernal	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:WVFile:CREate <file_name>

This command creates a waveform using the current settings of the **EUTRA/LTE** menu. The file name is entered with the command. The file is stored with the predefined file extension ***.wv**. The file name and the directory it is stored in are user-definable.

This command triggers an event and therefore has no *RST value and no query form.

Example: "MMEM:CDIR 'D:\user\waveform"

'sets the default directory to D:\user\waveform.

"BB:EUTR:WVF:CRE 'e_utra_1'"

'creates the waveform file e_utra_1.wv in the default directory.

*RST value	Resolution	SCPI
-	-	device-specific

[SOURce<[1]|2>:]BB:EUTRa:VERSion?

The command queries the version of the 3GPP standard underlying the definitions.

The command is a query command and therefore does not have an *RST value.

Example: "BB:EUTR:VERS?"

'queries the 3GPP version.

*RST value	Resolution	SCPI
-	-	Device-specific

General EUTRA/LTE Downlink Settings

Command	Parameters	Default unit	Comments
[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:BW	BW1_25 | BW5_00	MHz	
[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:DATA	PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | PAT | DLIS | ZERO | ONE		
[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:LENGth	1...4		
[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:PAT	<bit pattern>		
[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:PWR	-80 dB...10 dB	dB	
[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:SEQuence	<file name>		
[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:SUBFrame	0...19		
[SOURce<[1]|2>:]BB:EUTRa:DL:FFTSize			Query only
[SOURce<[1]|2>:]BB:EUTRa:DL:OCCSubc			Query only
[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:CONFiguration	ANT1 | ANT2 | ANT3 | ANT4		
[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:FSPacing	2 | 4 | 6 | 8		
[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:FSTPosition	SYM0 | SYM1		
[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:PWR1	-80 dB...10 dB	dB	
[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:PWR2	-80 dB...10 dB	dB	
[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:REPPeriod	1 | 2 | 4 | 5 | 10 | 20		
[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:S2ACtive	ON | OFF		
[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:SCOFfset	0 - Max		
[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:SEQuence	<file name>		
[SOURce<[1]|2>:]BB:EUTRa:DL:SCH:FSTSubf	0...19		
[SOURce<[1]|2>:]BB:EUTRa:DL:SCH:PERiod	2 | 4 | 5 | 10 | 20		
[SOURce<[1]|2>:]BB:EUTRa:DL:SCH:PWR	-80 dB...10 dB	dB	
[SOURce<[1]|2>:]BB:EUTRa:DL:SCH:SEQuence	<file name>		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:BW	BW1_25 | BW2_50 | BW5_00 | BW10_00 | BW15_00 | BW20_00	MHz	
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:RESBlk:BW	180 | 375		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:RESBlk:COUNt			Query only
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SRATe		MHz	Query only

[SOURce<[1]\|2>:]BB:EUTRa:DL:BCH:BW BW1_25 | BW5_00

The command selects the bandwidth of the BCH.

Note:
The BCH bandwidth 5 MHz is available only, if the selected channel bandwidth is greater or equal 5 MHz.

Example: `"BB:EUTR:DL:BCH:BW BW1_25"`
                   'sets the bandwidth for the BCH to 1.25 MHz.

*RST value	Resolution	SCPI
BW1_25	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:DATA PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | PAT | DLIS | ZERO | ONE

This command selects the data source for the BCH allocations.

Example: "BB:EUTR:DL:BCH:DATA PN9"
                'PN9 is selected as data source for the BCH allocations.

*RST value	Resolution	SCPI
PN9	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:LENGth 1...4

This command sets the length of the BCH in OFDMA-symbols.

Note:
    The BCH is automatically mapped to the endmost symbols of the subframe.

Example: "BB:EUTR:DL:BCH:LENG 1"
                'the BCH is one OFDMA-symbol long.

*RST value	Resolution	SCPI
1	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:PAT <data pattern>

The command selects the bit pattern for the BCH allocations. The maximum length is 64 bits.

Example: "BB:EUTR:DL:BCH:PAT #B1101,4"
                'defines the bit pattern.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:PWR -80 dB...10 dB

The command sets the power of the BCH allocations.

Example: "BB:EUTR:DL:BCH:PWR 5.00"
                'sets the power of the BCH allocations to 5 dB.

*RST value	Resolution	SCPI
0 dB	0.01 dB	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:SEQuence <file name>

This command loads the selected BCH sequence data list. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read.

The command triggers an event and therefore has no *RST value and no query form.

Example:　　　　`MMEM:CDIR 'F:\gen_list\eutra'`
　　　　　　　　　'selects the directory for the BCH sequence data lists.

　　　　　　　　`"BB:EUTR:DL:BCH:SEQ 'eutra_list1'"`
　　　　　　　　　'selects file `eutra_list1` as the BCH sequence data list.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:BCH:SUBFrame 0...19

The command sets the subframe in the radio frame, in which the BCH is transmitted the first time.

Note:
　　The subframe for the BCH must be different from the subframe for the SCH.
　　The BCH is automatically mapped to the endmost symbols of the subframe.

Example:　　　　`"BB:EUTR:DL:BCH:SUBF 2"`
　　　　　　　　　'sets subframe 2 as BCH subframe.

*RST value	Resolution	SCPI
0	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:FFTSize?

This command queries the FFT (Fast Fourier Transformation) size. The FFT size is set automatically according to the selected channel bandwidth.

The command is a query command and therefore does not have an *RST value.

Example:　　　　`"BB:EUTR:DL:FFTS?"`
　　　　　　　　　'queries the automatically set FFT size.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:OCCSubc?

The command queries the number of occupied subcarriers. This value is set automatically according to the selected channel bandwidth.

The command is a query command and therefore does not have an *RST value.

Example:　　　　`"BB:EUTR:DL:OCCS?"`
　　　　　　　　　'queries the automatically set number of subcarriers.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:CONFiguration　ANT1 | ANT2 | ANT3 | ANT4

This command selects the simulated antenna configuration.

Note:
　　In this release, only ANT1 is supported.

Example:　　　　　"BB:EUTR:DL:REFS:CONF ANT1"
　　　　　　　　　　'selects antenna configuration 1 for simulation.

*RST value	Resolution	SCPI
ANT1	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:FSPacing　2 | 4 | 6 | 8

This command selects the spacing in subcarriers between two pilots.

Example:

FSP = 6 results in a spacing of 5 subcarriers between the first and the last pilot.

Example:　　　　　"BB:EUTR:DL:REFS:FSP 2"
　　　　　　　　　　'two subcarriers are used for spacing between two pilots.

*RST value	Resolution	SCPI
6	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:FSTPosition　SYM0 | SYM1

This command selects the position in the subframe of the first reference symbol.

Example:　　　　　"BB:EUTR:DL:REFS:FSTP SYM1"
　　　　　　　　　　'selects the second subframe as the position of the first reference symbol.

*RST value	Resolution	SCPI
SYM0	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:PWR1　-80 dB...10 dB

The command sets the power of the first reference symbols.

Example:　　　　　"BB:EUTR:DL:REFS:PWR1 5.00"
　　　　　　　　　　'sets the power of the first reference symbols to 5 dB.

*RST value	Resolution	SCPI
0 dB	0.01 dB	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:PWR2 -80 dB...10 dB

This command sets the power of the second reference symbols.

Example: `"BB:EUTR:DL:REFS:PWR2 5"`

                     'the power of the second reference symbol is set to 5 dB.

*RST value	Resolution	SCPI
0.00 dB	0.01 dB	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:REPPeriod 1 | 2 | 4 | 5 | 10 | 20

This command selects the period in subframes, after which the sequence for the reference symbols is repeated.

Example: `"BB:EUTR:DL:REFS:REPP 4"`

                     'after four subframes, the sequence of the reference symbols is repeated.

*RST value	Resolution	SCPI
5	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:S2ACtive ON | OFF

The command activates or deactivates the usage of the second reference symbols.

Example: `"BB:EUTR:DL:REFS:S2AC ON"`

                     'the second reference symbols are used also.

*RST value	Resolution	SCPI
ON	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:SCOFfset 0...Max

This command selects the subcarrier offset within the resource block. The maximum value is Frequency Spacing minus 1.

Example: `"BB:EUTR:DL:REFS:SCOF 2"`

                     'an offset of two subcarriers is set.

*RST value	Resolution	SCPI
0	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:REFSym:SEQuence <file name>

This command loads the selected reference symbol data list. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read.

The command triggers an event and therefore has no *RST value and no query form.

Example: `MMEM:CDIR 'F:\gen_list\eutra'`
                'selects the directory for the reference symbol data lists.

                `"BB:EUTR:DL:REFS:SEQ 'eutra_list1'"`
                'selects file `'eutra_list1'` as the data source.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:SCH:FSTSubf 0...19

This command sets the subframe in the frame, in which the SCH is transmitted the first time.

Example:

FSTS = 0 means that subframe 0 is the first subframe, in which the SCH is transmitted. The next SCH depends on the value for the SCH repetition period.

The maximal value depends on the selected SCH repetition period: $FSTS_{max}$ = (SCH Repetition Period) minus 1.

Note:
    The subframe for the SCH must be different from the subframe for the BCH.
    The SCH is automatically mapped to the endmost symbols of the subframe.

Example: `"BB:EUTR:DL:SCH:FSTS 4"`
                'determines that the SCH is transmitted in subframe 4 for the first time.

*RST value	Resolution	SCPI
4	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:SCH:PERiod 2 | 4 | 5 | 10 | 20

This command sets the period in subframes between two SCH subframes.

Example:

PER = 5 results in 4 subframes between two SCH subframes.

Example: `"BB:EUTR:DL:SCH:PER 2"`
                'sets a period of two subframes between two SCH subframes.

*RST value	Resolution	SCPI
5	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:SCH:PWR -80 dB...10 dB

The command sets the power of the SCH allocations.

Example: `"BB:EUTR:DL:SCH:PWR 5"`
                      'sets the power of the SCH allocations to 5 dB.

*RST value	Resolution	SCPI
0 dB	0.01 dB	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:SCH:SEQuence <file name>

This command loads the selected SCH sequence data list. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read.

The command triggers an event and therefore has no *RST value and no query form.

Example: `MMEM:CDIR 'F:\gen_list\eutra'`
                      'selects the directory for the SCH sequence data lists.

                      `"BB:EUTR:DL:SCH:SEQ 'eutra_list1'"`
                      'selects file `'eutra_list1'` as the SCH sequence data list..

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:BW BW1_25 | BW2_50 | BW5_00 | BW10_00 | BW15_00 | BW20_00

The command sets the channel bandwidth. The channel bandwidth determines the sampling rate.

Note:
    In this release, 15 MHz is not supported.

Example: `"BB:EUTR:LDIR0:BW BW1_25"`
                      'selects a frequency band of 1.25 MHz.

*RST value	Resolution	SCPI
10 MHz	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:RESBlk:BW 180 | 375 kHz

This command selects the channel bandwidth of a physical resource block.

Note:
   In this release, this value is fixed to 375 kHz.

Example: `"BB:EUTR:LDIR0:RESB:BW 375 kHz"`
                     'sets the channel bandwidth of a physical resource block to 375 kHz.

*RST value	Resolution	SCPI
375 kHz	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:RESBlk:COUNt?

The command queries the number of resource blocks. The value is set automatically according to the selected channel bandwidth and physical resource block bandwidth.

The command is a query command and therefore does not have an *RST value.

Example: `"BB:EUTR:LDIR0:RESB:COUN?"`
                     'queries the automatically set number of resource blocks.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SRATe?

This command displays the sampling rate. The value for the sampling rate depends on the setting for the channel bandwidth.

The command is a query command and therefore does not have an *RST value.

Example: `"BB:EUTR:LDIR0:SRAT?"`
                     'queries the automatically set sampling rate.

*RST value	Resolution	SCPI
-	-	Device-specific

Frame Configuration

Command	Parameters	Default unit	Comments
[SOURce<[1]|2>:]BB:EUTRa:DL:SUBF<0...19>:CYCPrefix	SHORT | LONG		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:BUR	DUData | DTX		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:CONSubframes	1...20		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALCount	0...49		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:AOC	ON |OFF		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:CCODing	NONE | TC		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:CONFlict			Query only
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:CONType	DATA | SCH | BCH | CCH		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:DATA	USER1|USER2 |USER3| USER4 | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | PATT | DLIST | ALL0 | ALL1		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:DLISt	<data list>		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:MODulation	QPSK | QAM16 | QAM64		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:PATData	<bit pattern>		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:PHYSbits			Query only
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:PWR	-80 dB...10 dB	dB	
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:RBCount	1...50		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:RBOFfset	0...50		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:SYMCount	1...7		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:SYMoffset	0...6		
[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:TRANsmission	LOCal | DISTRib		
[SOURce<[1]|2>:]BB:EUTRa:RSTFrame			

[SOURce<[1]|2>:]BB:EUTRa:DL:SUBF<0...19>:CYCPrefix SHORT | LONG

This command sets the cyclic prefix for the according subframe.

Example: `"BB:EUTR:DL:SUBF6:CYCP SHORT"`
                'a short prefix is added to subframe 6.

*RST value	Resolution	SCPI
SHORT	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:BUR DUData | DTX

This command selects either to fill unscheduled resource blocks and subframes with dummy data or DTX.

Example:　　　　　"BB:EUTR:LDIR0:BUR DUD"

　　　　　　　　　　'the unscheduled resource blocks are filled with dummy data.

*RST value	Resolution	SCPI
DUData	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:CONSubframes 1...20

This command sets the number of configurable subframes. All twenty subframes of a frame are filled periodically with the configured subframes with the exception of the SCH/BCH allocations which are set globally in the **General Settings** menu.

Example:　　　　　"BB:EUTR:LDIR0:CONS 20"

　　　　　　　　　　'all twenty subframes of a frame are configurable.

*RST value	Resolution	SCPI
20	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALCount 0...50

This command sets the number of scheduled allocations in the selected subframe.

Example:　　　　　"BB:EUTR:LDIR0:SUBF4:ALC 5"

　　　　　　　　　　'five scheduled allocations are assigned to subframe four.

*RST value	Resolution	SCPI
0	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:AOC ON | OFF

The command sets whether automatic offset calculation is used or not.

Example:　　　　　"BB:EUTR:LDIR0:SUBF4:ALL5:AOC ON"

　　　　　　　　　　'activates the automatic offset calculation for the selected allocation.

*RST value	Resolution	SCPI
ON	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:CCODing NONE | TC

This command selects whether turbo coding (**TC**) is used as channel coding scheme or not.

Note:
　　*In this release, turbo coding (**TC**) is not supported.*

Example:　　　　　"BB:EUTR:LDIR0:SUBF4:ALL5:CCOD NONE"

　　　　　　　　　　'no channel coding scheme is used.

*RST value	Resolution	SCPI
NONE	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:CONFlict?

This command queries whether there is a conflict between several allocations.

The command is a query and therefore does not have an *RST value.

Example: "BB:EUTR:LDIR0:SUBF4:ALL5:CONF?"

                    'queries whether the allocation has a conflict with another allocation.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:CONType DATA | SCH | BCH | CCH

This command selects the type for the selected allocation.

Example: "BB:EUTR:LDIR0:SUBF4:ALL5:CONT SCH"

                    'selects SCH as type for the selected allocation.

*RST value	Resolution	SCPI
DATA	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:DATA USER1 | USER2 | USER3 | USER4 | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | PATT | DLIST | ALL0 | ALL1

This command selects the data source for the selected allocation.

Example: "BB:EUTR:LDIR0:SUBF4:ALL5:DATA PN9"

                    'PN9 is the data source for the selected allocation.

*RST value	Resolution	SCPI
PN9	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:DLISt <data file>

The command selects the data list for the allocation data source **Data List**.

The lists are stored as files with the fixed file extensions ***.dm_iqd** in a directory of the user's choice. The directory applicable to the following commands is defined with the command MMEMory:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Example: "BB:EUTR:LDIR0:SUBF2:ALL5:DATA DLIS"

                    'selects the Data Lists data source.

                    "MMEM:CDIR 'D:\Lists\DM\IqData'"

                    'selects the directory for the data lists.

                    "BB:EUTR:LDIR0:SUBF2:ALL5:DLIS 'eutra_list1'"

                    'selects file 'eutra_list1' as the data source. This file must be in the
                    directory D:\Lists\DM\IqData and have the file extension *.dm_iqd.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:MODulation QPSK | QAM16 | QAM64

This command selects the modulation scheme for the allocation.

Example: `"BB:EUTR:LDIR0:SUBF4:ALL5:MOD QPSK"`
                 'selects QPSK as modulation scheme for the allocation.

*RST value	Resolution	SCPI
QPSK	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:PATData <bit pattern>

The command selects the bit pattern for the allocation data source **Pattern**. The maximum length is 64 bits.

Example: `"BB:EUTR:LDIR0:SUBF4:ALL5:PATD #H3F,8"`
                 'defines the bit pattern.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:PHYSbits?

This command queries the size of this allocation in bits.

The command is a query and therefore does not have an *RST value.

Example: `"BB:EUTR:LDIR0:SUBF4:ALL5:PHYS?"`
                 'queries the allocation size in bits.

                 Response: `"524"`
                 'the allocation size is 524 bits.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:PWR -80.00 dB...10.00 dB

This command sets the power for the selected allocation.

Example: `"BB:EUTR:LDIR0:SUBF4:ALL5:PWR 10"`
                 'sets the power for the selected allocation to 10 dB.

*RST value	Resolution	SCPI
0 dB	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:RBCount 1...50

This command sets the size of the selected allocation in resource blocks.

Example: `"BB:EUTR:LDIR0:SUBF4:ALL5:RBC 1"`
                  'the size of allocation five for subframe 4 is set to one resource block.

*RST value	Resolution	SCPI
1	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:RBOFfset 0...50

This command sets the start resource block of the selected allocation. The maximum value is (number of resource blocks) minus 1.

Note:
    *If the **Auto** mode is activates, this value is read only.*

Example: `"BB:EUTR:LDIR0:SUBF4:ALL5:RBOF 5"`
                  'resource block five is the start resource block for allocation five in subframe four.

*RST value	Resolution	SCPI
0	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:SYMCount 1...7

This command sets the size of the selected allocation in OFDM symbols. For content type DATA, this value is set automatically in a way that the allocation always fills the complete subframe with consideration of the symbol offset.

Example:

For Cyclic Prefix Length = Short (7 OFDMA Symbols) and Symbol Offset = 2 the resulting No. Of Symbols is 5.

Example: `"BB:EUTR:LDIR0:SUBF4:ALL5:SYMC 5"`
                  'the size of allocation 5 for subframe 4 is set to five OFDM symbols.

*RST value	Resolution	SCPI
5	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:SYMoffset 0...6

This command sets the start OFDM symbol of the selected allocation.

For cyclic prefix = LONG, the maximum symbol offset is 5. For data allocations, the maximum value is 2, regardless of the cyclic prefix length.

Example: `"BB:EUTR:LDIR0:SUBF4:ALL5:SYM 5"`
                  'OFDM symbol five is the start OFDM symbol for allocation five in subframe four.

*RST value	Resolution	SCPI
2	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:LDIR<0|[1]>:SUBF<0...19>:ALLoc<0...49>:TRANsmission LOCal | DISTrib

This command selects whether the transmission is localized or not.

Note:
In this release, the transmission is always localized.

Example: `"BB:EUTR:DL:LDIR0:SUBF4:ALL5:TRAN LOC"`
                      'the transmission is localized.

*RST value	Resolution	SCPI
LOCAL	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:RSTFrame

This command resets all subframe settings to the default values.

Example: `"BB:EUTR:RSTF"`
                      'resets all subframe parameters to the default settings.

*RST value	Resolution	SCPI
-	-	Device-specific

Configure User

Command	Parameters	Default unit	Comme nts
[SOURce<[1]	2>:]BB:EUTRa:DL:USER<1...4>:CCODing	NONE	TC		
[SOURce<[1]|2>:]BB:EUTRa:DL:USER<1...4>:DATA	PN9	PN11	PN15	PN16	PN20	PN21	PN23	PATT	DLIST	ALL0	ALL1		
[SOURce<[1]|2>:]BB:EUTRa:DL:USER<1...4>:DLISt	<data list>		
[SOURce<[1]|2>:]BB:EUTRa:DL:USER<1...4>:PATData	<data pattern>		

[SOURce<[1]|2>:]BB:EUTRa:DL:USER<1...4>:CCODing   NONE | TC

This command selects whether turbo coding (**TC**) is used as channel coding scheme or not.

Note:
   *Turbo coding (**TC**) is not supported in this release.*

Example: `"BB:EUTR:DL:USER2:CCOD NONE"`
               'no channel coding scheme is used.

*RST value	Resolution	SCPI
NONE	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:USER<1...4>:DATA   PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | PATT | DLIST | ALL0 | ALL1

This command selects the data source for the selected user configuration.

Example: `"BB:EUTR:DL:USER2:DATA PN9"`
               'PN9 is selected as data source for the user configuration.

*RST value	Resolution	SCPI
PN9	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:USER<1...4>:DLISt <data list>

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions ***.dm_iqd** in a directory of the user's choice. The directory applicable to the following commands is defined with the command MMEMory:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Example: "BB:EUTR:DL:USER2:DATA DLIS"
     'selects the Data Lists data source.

     "MMEM:CDIR 'D:\Lists\DM\IqData'"
     'selects the directory for the data lists.

     "BB:EUTR:DL:USER2:DLIS 'eutra_list1'"
     'selects file 'eutra_list1' as the data source. This file must be in the
     directory D:\Lists\DM\IqData and have the file extension *.dm_iqd.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DL:USER<1...4>:PATData <data pattern>

The command selects the bit pattern for the PATData selection. The maximum length is 64 bits.

Example: "BB:EUTR:DL:USER2:PATD #H3F,8"
     'defines the bit pattern.

*RST value	Resolution	SCPI
-	-	Device-specific

Configure Dummy Data

Command	Parameters	Default unit	Comments
[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:DATA	PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | PATT | DLIST | ALL0 | ALL1		
[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:DLISt	<file name>		
[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:MODulation	QPSK | QAM16 | QAM64		
[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:PATData	<bit pattern>		
[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:PWR	-80 db...10 dB		

[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:DATA   PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | PATT | DLIST | ALL0 | ALL1

The command selects the data source for the dummy data configuration.

Example: "BB:EUTR:DUMD:LDIR0:DATA PN9"

                 'selects PN9 as data source for the dummy data configuration.

*RST value	Resolution	SCPI
PN9	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:DLISt   <data file>

The command selects the data list for the dummy data source **Data List**.

The lists are stored as files with the fixed file extensions ***.dm_iqd** in a directory of the user's choice. The directory applicable to the following commands is defined with the command MMEMory:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Example: "BB:EUTR:DUMD:LDIR0:DATA DLIS"

                 'selects the Data Lists data source.

                 "MMEM:CDIR 'D:\Lists\DM\IqData'"

                 'selects the directory for the data lists.

                 "BB:EUTR:DUMD:LDIR0:DLIS 'eutra_list1'"

                 'selects file 'eutra_list1' as the data source. This file must be in the directory D:\Lists\DM\IqData and have the file extension *.dm_iqd.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:MODulation   QPSK |QAM16 | QAM64

The command selects the modulation of the dummy data.

Example: "BB:EUTR:DUMD:LDIR0:MOD QPSK"

                 'selects QPSK as dummy modulation type.

*RST value	Resolution	SCPI
QPSK	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:PATData <bit pattern>

The command selects the bit pattern for the dummy data configuration.

Example: `"BB:EUTR:DUMD:LDIR:PATD #B1001,4"`
                     'defines the bit pattern for the dummy data configuration.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:EUTRa:DUMD:LDIR<0|[1]>:PWR -80 dB...10 dB

The command sets the power of the subcarriers allocated with dummy data.

Example: `"BB:EUTR:DUMD:LDIR0:PWR 5"`
                     'sets the power of the subcarriers allocated with dummy data to 5 dB.

*RST value	Resolution	SCPI
0 dB	0.01	Device-specific

Alphabetical List of Commands

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