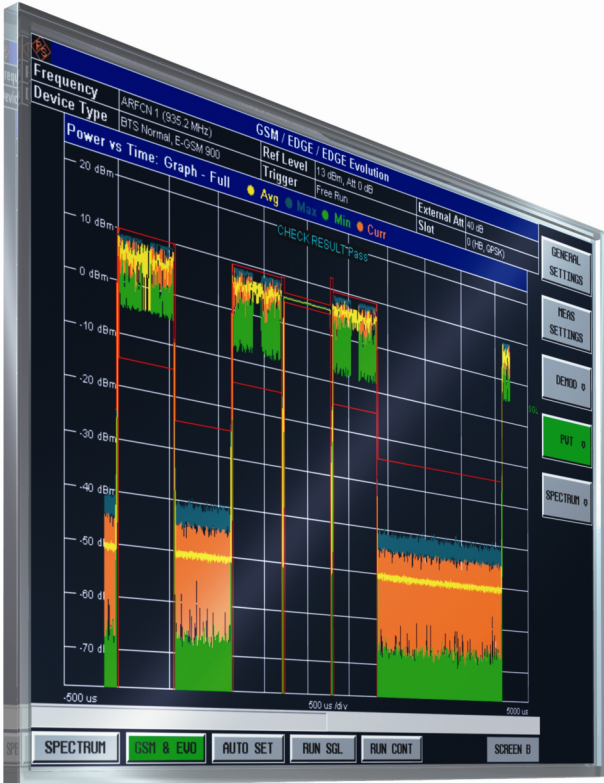# R&S®FS-K10
GSM/EDGE/EDGE Evolution
Measurements
Software Manual

ROHDE&SCHWARZ

The Software Manual describes the following R&S®FS-K10 models:

GSM/EDGE/EDGE Evolution Measurements R&S FS-K10

The firmware of the instrument makes use of several valuable open source software packages. the most important of them are listed below, together with their corresponding open source license. The verbatimlicense texts are provided on the user documentation CD-ROM (included in delivery).

Package	Link	License
Xitami	http://www.xitami.com	2.5b6

Rohde&Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

The following abbreviations are used throughout this manual:

R&S®FS-K10 is abbreviated as R&S FS-K10.

Basic Safety Instructions

Always read through and comply with the following safety instructions!

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standards of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment they require are designed, built and tested in accordance with the safety standards that apply in each case. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed, built and tested in accordance with the attached 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, you must observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, the Rohde & Schwarz group of companies will be happy to answer them.

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

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

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 and when using the product. It is also absolutely essential to observe the additional safety instructions on personal safety, for example, 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.

Symbols and safety labels

| Notice, general danger location

Observe product documentation	Caution when handling heavy equipment	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Be careful when handling electrostatic sensitive devices

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

Tags and their meaning

The following signal words are used in the product documentation in order to warn the reader about risks and dangers.

DANGER   indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING   indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION   indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE   indicates the possibility of incorrect operation which can result in damage to the product.
In the product documentation, the word ATTENTION is used synonymously.

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

Operating states and operating positions

The product may be operated only under the operating conditions and in the positions specified by the manufacturer, without the product's ventilation being obstructed. If the manufacturer's specifications are not observed, this can result in electric shock, fire and/or serious personal injury or death. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: predefined operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of ±10 % shall apply to the nominal voltage and ±5 % to the nominal frequency.

2. 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). An installation that is not carried out as described in the product documentation could result in personal injury or death.

3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or death.

Electrical safety

If the information on electrical safety is not observed either at all to the extent necessary, electric shock, fire and/or serious personal injury or death may occur.

1. Prior to switching on the product, always ensure 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.

2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with an earthing contact and protective earth connection.

3. 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.

4. If the product does not have a power switch for disconnection from the AC supply network, the plug of the connecting cable is regarded as the disconnecting device. In such cases, always ensure 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 network. If products without power switches are integrated into racks or systems, a disconnecting device must be provided at the system level.

5. 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, you can ensure that the cable will not be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.

6. 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).

7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, sparks that result in fire and/or injuries may occur.

8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.

9. 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.

10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards that apply in each case.

11. 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.

12. 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 licensed electrician.

13. 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 anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.

14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.

15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.

16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1. Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.

17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.

18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.

2. Before you move or transport the product, read and observe the section titled "Transport".

3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.

4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal", item 1.

5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.

6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.

7. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.

2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts 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). This helps ensure the continued safety of the product.

Batteries and rechargeable batteries/cells

If the information regarding batteries and rechargeable batteries/cells is not observed either at all or to the extent necessary, product users may be exposed to the risk of explosions, fire and/or serious personal injury, and, in some cases, death. Batteries and rechargeable batteries with alkaline electrolytes (e.g. lithium cells) must be handled in accordance with the EN 62133 standard.

1. Cells must not be taken apart or crushed.

2. Cells or batteries must not be exposed to heat or fire. Storage in direct sunlight must be avoided. Keep cells and batteries clean and dry. Clean soiled connectors using a dry, clean cloth.

3. Cells or batteries must not be short-circuited. Cells or batteries must not be stored in a box or in a drawer where they can short-circuit each other, or where they can be short-circuited by other conductive materials. Cells and batteries must not be removed from their original packaging until they are ready to be used.

4. Keep cells and batteries out of the hands of children. If a cell or a battery has been swallowed, seek medical aid immediately.

5. Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.

6. If a cell develops a leak, the fluid must not be allowed to come into contact with the skin or eyes. If contact occurs, wash the affected area with plenty of water and seek medical aid.

7. Improperly replacing or charging cells or batteries that contain alkaline electrolytes (e.g. lithium cells) can cause explosions. Replace cells or batteries only with the matching Rohde & Schwarz type (see parts list) in order to ensure the safety of the product.

8. Cells and batteries must be recycled and kept separate from residual waste. Rechargeable batteries and normal batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.

2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.

3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

Waste disposal

1. If products or their 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 by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.

2. If handling the product releases 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. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

Informaciones elementales de seguridad

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

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

Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda sufrir daño. El uso del producto fuera de sus fines definidos o sin tener en cuenta las instrucciones 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 conforme a las indicaciones de la correspondiente documentación del 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 técnicos y ciertos conocimientos del idioma inglés. Por eso se debe tener en cuenta que el producto solo pueda ser operado por personal especializado o personas instruidas en profundidad con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de Rohde & Schwarz, encontraría la información debida en la documentación del producto en el capítulo correspondiente. Guarde bien las informaciones de seguridad elementales, así como la documentación del producto, y entréguelas a usuarios posteriores.

Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto. Deberán tenerse en cuenta todas las demás informaciones de seguridad, como p. ej. las referentes a la protección de personas, que encontrarán en el capítulo correspondiente de la documentación del producto y que también son de obligado cumplimiento. En las presentes informaciones de seguridad se recogen todos los objetos que distribuye el grupo de empresas Rohde & Schwarz bajo la denominación de "producto", entre ellos también aparatos, instalaciones así como toda clase de accesorios.

Símbolos y definiciones de seguridad

Aviso: punto de peligro general Observar la documentación del producto	Atención en el manejo de dispositivos de peso elevado	Peligro de choque eléctrico	Adver-tencia: superficie caliente	Conexión a conductor de protección	Conexión a tierra	Conexión a masa	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)

Tensión de alimentación de PUESTA EN MARCHA / PARADA	Indicación de estado de espera (Standby)	Corriente continua (DC)	Corriente alterna (AC)	Corriente continua / Corriente alterna (DC/AC)	El aparato está protegido en su totalidad por un aislamiento doble (reforzado)

Palabras de señal y su significado

En la documentación del producto se utilizan las siguientes palabras de señal con el fin de advertir contra riesgos y peligros.

⚠ **PELIGRO**   PELIGRO identifica un peligro inminente con riesgo elevado que provocará muerte o lesiones graves si no se evita.

⚠ **ADVERTENCIA**   ADVERTENCIA identifica un posible peligro con riesgo medio de provocar muerte o lesiones (graves) si no se evita.

⚠ **ATENCIÓN**   ATENCIÓN identifica un peligro con riesgo reducido de provocar lesiones leves o moderadas si no se evita.

AVISO   AVISO indica la posibilidad de utilizar mal el producto y, como consecuencia, dañarlo.
En la documentación del producto se emplea de forma sinónima el término CUIDADO.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación del 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 interpretaciones equivocadas y tener por consecuencia daños en personas u objetos.

Estados operativos y posiciones de funcionamiento

El producto solamente debe ser utilizado según lo indicado por el fabricante respecto a los estados operativos y posiciones de funcionamiento sin que se obstruya la ventilación. Si no se siguen las indicaciones del fabricante, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte. En todos los trabajos deberán ser tenidas en cuenta las normas nacionales y locales de seguridad del trabajo y de prevención de accidentes.

1. Si no se convino de otra manera, es para los productos Rohde & Schwarz válido lo que sigue: como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, uso solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4500 m sobre el nivel del mar. Se aplicará una tolerancia de ±10 % sobre el voltaje nominal y de ±5 % sobre la frecuencia nominal.

2. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptos para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (p. ej. paredes y estantes). Si se realiza la instalación de modo distinto al indicado en la documentación del producto, pueden causarse lesiones o incluso la muerte.

3. No ponga el producto sobre aparatos que generen calor (p. ej. radiadores o calefactores). La temperatura ambiente no debe superar la temperatura máxima especificada en la documentación del producto o en la hoja de datos. En caso de sobrecalentamiento del producto, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

Seguridad eléctrica

Si no se siguen (o se siguen de modo insuficiente) las indicaciones del fabricante en cuanto a seguridad eléctrica, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.

2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.

3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.

4. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de conexión como interruptor. En estos casos se deberá asegurar que el enchufe siempre sea de fácil acceso (de acuerdo con la longitud del cable de conexión, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.

5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.

6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).

7. 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. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.

8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.

9. En las mediciones en circuitos de corriente con una tensión U_{eff} > 30 V se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).

10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.

11. 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 lesiones, fuego o daños en el producto.

12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.

13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.

14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.

15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.

16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.

17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.

18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.

2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".

3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados, los llamados alérgenos (p. ej. el níquel). Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.

4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación", punto 1.

5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalizar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.

6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.

7. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).

Reparación y mantenimiento

1. El producto solamente debe ser abierto por personal especializado con autorización para ello. Antes de manipular el producto o abrirlo, es obligatorio desconectarlo de la tensión de alimentación, para evitar toda posibilidad de choque eléctrico.

2. El ajuste, el cambio de partes, el mantenimiento y la reparación deberán ser efectuadas solamente por electricistas autorizados por Rohde & Schwarz. Si se reponen partes con importancia para los aspectos de seguridad (p. ej. el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada cambio de partes relevantes para la seguridad deberá realizarse un control de seguridad (control a primera vista, control del conductor de protección, medición de resistencia de aislamiento, medición de la corriente de fuga, control de funcionamiento). Con esto queda garantizada la seguridad del producto.

Baterías y acumuladores o celdas

Si no se siguen (o se siguen de modo insuficiente) las indicaciones en cuanto a las baterías y acumuladores o celdas, pueden producirse explosiones, incendios y/o lesiones graves con posible consecuencia de muerte. El manejo de baterías y acumuladores con electrolitos alcalinos (p. ej. celdas de litio) debe seguir el estándar EN 62133.

1. No deben desmontarse, abrirse ni triturarse las celdas.

2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.

3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.

4. Mantener baterías y celdas fuera del alcance de los niños. En caso de ingestión de una celda o batería, avisar inmediatamente a un médico.

5. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.

6. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.

7. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).

8. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

Transporte

1. El producto puede tener un peso elevado. Por eso es necesario desplazarlo o transportarlo con precaución y, si es necesario, usando un sistema de elevación adecuado (p. ej. una carretilla elevadora), a fin de evitar lesiones en la espalda u otros daños personales.

2. Las asas instaladas en los productos sirven solamente de ayuda para el transporte del producto por personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como p. ej. grúas, carretillas elevadoras de horquilla, carros etc. Es responsabilidad suya fijar los productos de manera segura a los medios de transporte o elevación. Para evitar daños personales o daños en el producto, siga las instrucciones de seguridad del fabricante del medio de transporte o elevación utilizado.

3. Si se utiliza el producto dentro de un vehículo, recae de manera exclusiva en el conductor la responsabilidad de conducir el vehículo de manera segura y adecuada. El fabricante no asumirá ninguna responsabilidad por accidentes o colisiones. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Asegure el producto dentro del vehículo debidamente para evitar, en caso de un accidente, lesiones u otra clase de daños.

Eliminación

1. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.

2. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

Qualitätszertifikat
Certificate of quality
Certificat de qualité

Certified Quality System
ISO 9001

Certified Environmental System
ISO 14001

Sehr geehrter Kunde,
Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde & Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO 9001 und ISO 14001 zertifiziert.

Der Umwelt verpflichtet
- Energie-effiziente, RoHS-konforme Produkte
- Kontinuierliche Weiterentwicklung nachhaltiger Umweltkonzepte
- ISO 14001-zertifiziertes Umweltmanagementsystem

Dear Customer,
You have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards. The Rohde & Schwarz quality management system is certified according to standards such as ISO 9001 and ISO 14001.

Environmental commitment
- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Cher client,
Vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité. Le système de gestion qualité de Rohde & Schwarz a été homologué, entre autres, conformément aux normes ISO 9001 et ISO 14001.

Engagement écologique
- Produits à efficience énergétique
- Amélioration continue de la durabilité environnementale
- Système de gestion de l'environnement certifié selon ISO 14001

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Customer Support

Technical support – where and when you need it

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

Up-to-date information and upgrades

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

USA & Canada	Monday to Friday 8:00 AM – 8:00 PM	(except US public holidays) Eastern Standard Time (EST)
	Tel. from USA From outside USA Fax	888-test-rsa (888-837-8772) (opt 2) +1 410 910 7800 (opt 2) +1 410 910 7801
	E-mail	CustomerSupport@rohde-schwarz.com
East Asia	Monday to Friday 8:30 AM – 6:00 PM	(except Singaporean public holidays) Singapore Time (SGT)
	Tel. Fax	+65 6 513 0488 +65 6 846 1090
	E-mail	CustomerSupport@rohde-schwarz.com
Rest of the World	Monday to Friday 08:00 – 17:00	(except German public holidays) Central European Time (CET)
	Tel. Fax	+49 89 4129 13774 +49 (0) 89 41 29 637 78
	E-mail	CustomerSupport@rohde-schwarz.com

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Table of Contents

1 Overview

Overview of firmware option R&S FS-K10

This section contains all information required for operation of an R&S FSQ or R&S FSG equipped with Application Firmware R&S FS-K10. It covers operation via menus and the remote control commands for GSM / EDGE and EDGE Evolution (EGPRS2) measurements.

This part of the documentation consists of the following chapters:

● Chapter "Functions "
  Describes the overall instrument functions and provides further information
● Chapter "Status Reporting System"
  Provides a description of the status registers
● Chapter "Remote Commands"
  Describes all remote control commands defined for the GSM / EDGE and EDGE Evolution (EGPRS2) measurements.

This part of the documentation includes only functions of the Application Firmware R&S FS-K10. For all other descriptions, refer to the operating manual of the base unit (R&S FSQ or R&S FSG).

2 General Information

2.1 Installation

From the analyzer select firmware update.

► Press the SETUP hardkey followed by NEXT, FIRMWARE UPDATE and finally the FIRMWARE UPDATE softkey. Following the instructions displayed.

Once the installation has completed the analyzer will reboot.

Once the option has been installed it needs to be activated:

1. Start up the analyzer.

2. Press the *SETUP* hardkey, followed by the *GENERAL SETUP* softkey and then the *OPTIONS* softkey.
   A list of the options currently activated is displayed.

3. Press the *INSTALL OPTION* softkey. A Dialog is displayed allowing the option key to be entered.
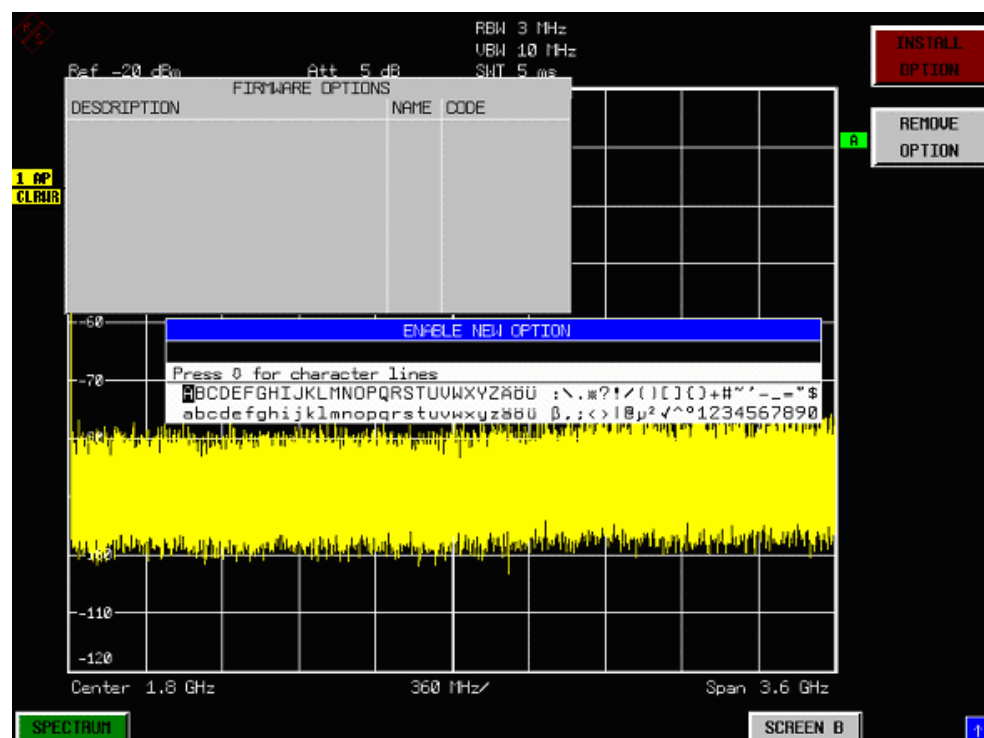
4. Enter the option key supplied with the R&S FS-K10 software. If upgrading from R&S FS-K5, the R&S FS-K5U upgrade key needs to be entered instead of the R&S FS-K10 option key.

5. When a valid option key has been supplied a dialog will be displayed explaining that a reboot is required to complete this operation. Select OK in this dialog and the instrument will be rebooted.

6. When the analyzer starts after the reboot a new hotkey will be displayed at the bottom of the display labelled *GSM & EVO.* In addition an entry for the R&S FS-K10 option will be displayed in the *FIRMWARE OPTIONS* dialog.
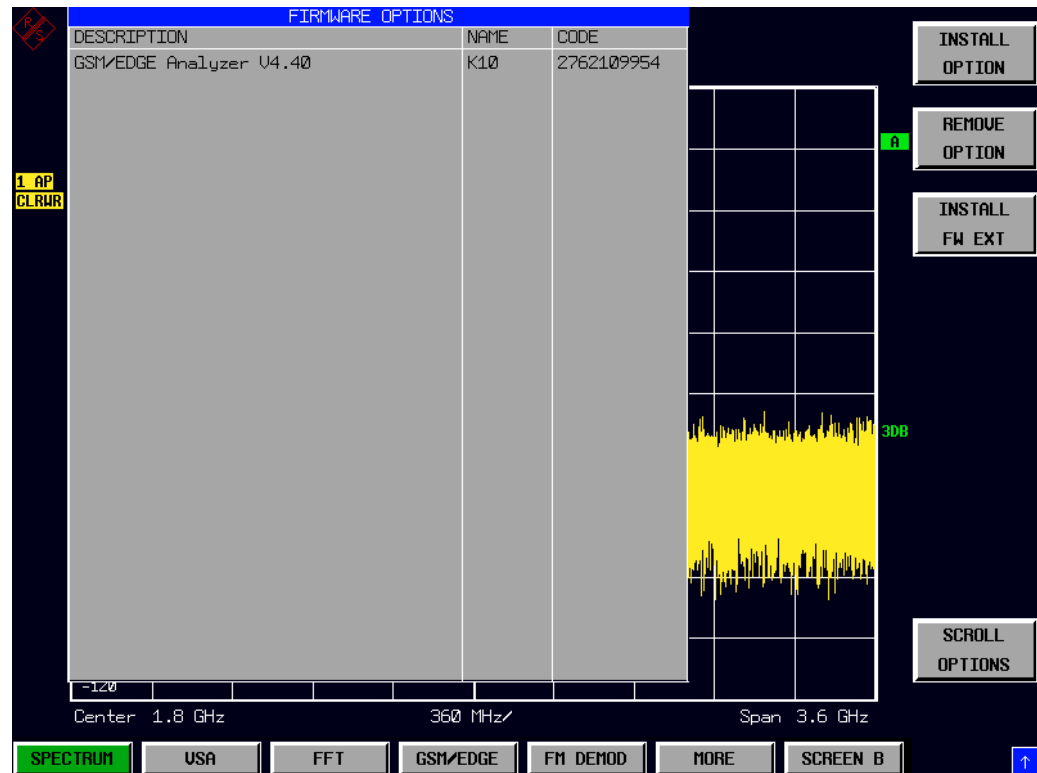
2.2 Starting the Application

Power up the R&S FSQ or R&S FSG analyzer. When R&S FS-K10 is correctly installed there will be a hotkey labelled *GSM & EVO* at the bottom of the screen. Press the *GSM & EVO* hotkey to start R&S FS-K10.

Note that if the spectrum analyzer is powered down whilst R&S FS-K10 is active, then when the spectrum analyzer is powered up again it will start up in the R&S FS-K10 application.

2.3 Exiting the Application

To exit the R&S FS-K10 option, press the *SPECTRUM* hotkey at the bottom of the screen. This will cause the option to exit and the spectrum analyzer to be activated.

2.4 Navigation

This section deals with navigation within the option. Navigation here is taken to mean all forms of interaction with the option except for remote control. The different methods of interacting with the option are:

- Hotkeys
- Softkeys
- Hardkeys
- Numeric Keypad
- Roll-key
- Cursor Keys
- External Keyboard
- Mouse

2.4.1 Hotkeys

Hotkeys are allocated to the seven keys at the bottom edge of the screen. On initial start-up of the R&S FS-K10 option, the hotkeys provided are shown in Figure 1. These hotkeys are present at all times once the option has been started.

Figure 1 Hotkey menu of GSM mode

| SPECTRUM | GSM & EVO | AUTO SET | RUN SGL | RUN CONT | | SCREEN B |
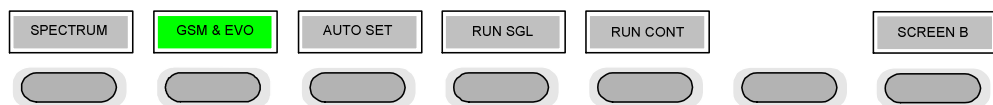
A keystroke activates the associated hotkey. An activated hotkey changes color to green, as shown.
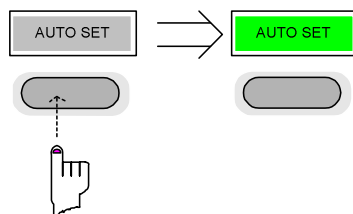
| AUTO SET | ⟹ | AUTO SET |

| SPECTRUM Hotkey |
| GSM & EVO Hotkey |
| AUTO SET Hotkey |
| RUN SGL Hotkey |
| RUN CONT Hotkey |
| SCREEN A/B Hotkey |

2.4.2 Softkeys

2.4.2.1 Settings Softkeys

The softkeys are assigned to the nine keys on the right-hand side of the display. These enable quick access to all of the parameter settings and measurement screens of the R&S FS-K10 option. Each of the top two softkeys, when pressed, brings up a settings view for a group of parameters. These softkeys are always available (except when using Save/Recall and Print manager or controlling markers) and are as follows:

Figure 2 Softkeys of the Main Menu of the R$S FS-K10

General Settings - Signal charachteristics, data capture, trigger and IQ settings

Measurement Settings - specifies details about the demodulation and the measurements
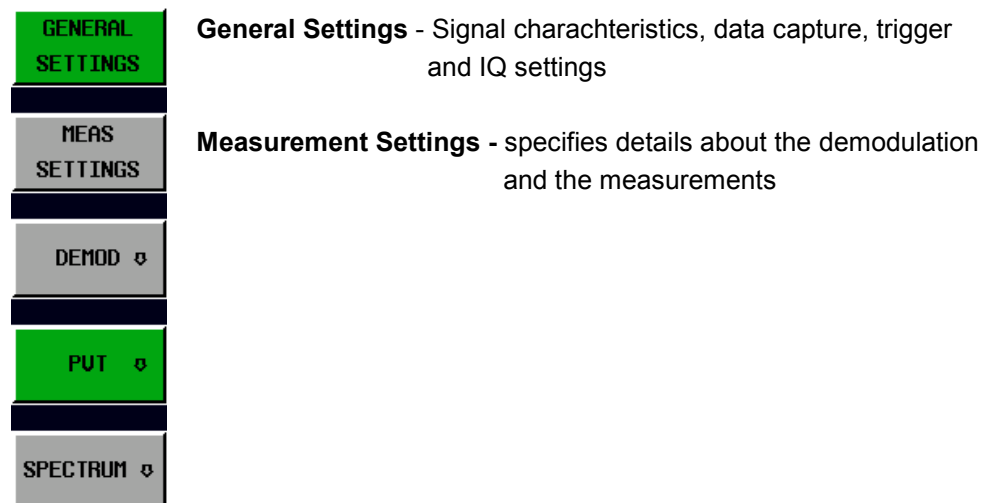
Each of these groups of settings is described in detail in the Measurements & Settings section of this manual. (Please see chapter 3.3)

2.4.2.2   Other Softkeys

All other softkeys have different functions depending on the instrument state. Therefore, the labels (text) on the softkeys will vary to reflect their current function. The state of the softkeys is indicated by different appearances and colors, as follows:

Figure 3 Setup of the softkey area
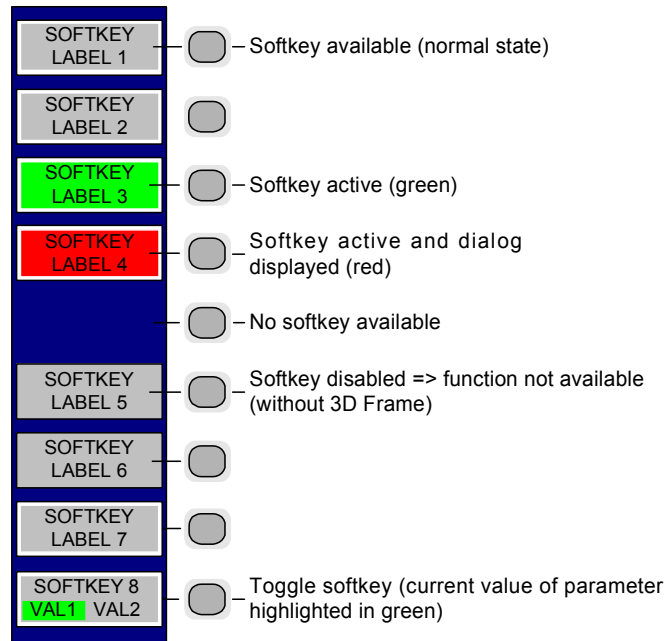
A softkey in its normal state, where its function is available, is colored grey with a 3D border.

A softkey that is disabled, because its function is <u>not</u> available, is colored grey <u>without</u> a 3D border. Softkeys may become disabled because of the state of the instrument or because other settings disable the function associated with the softkey.

An active softkey (highlighted in green) is used when the softkey selects an item or view. For example, the *PVT* softkey will be highlighted green when the Power vs Time measurement is active.

A toggle softkey is used to change the value of a parameter that has only two states. Each press of the softkey toggles the value of the parameter. The current parameter value is highlighted in green in the lower half of the softkey label. For example, in the modulation and transient spectrum measurements, the *DISPLAY* softkey will have either *LIST* or *GRAPH* highlighted in green depending on whether the results are currently displayed as a list or as traces in a graph.

When no function is assigned to a softkey then no softkey label will be shown.

2.4.3 Hardkeys

Hardkeys allow quick access to the desired parameter and various functions. The hardkeys supported by the R&S FS-K10 option are as follows (other hardkeys do nothing):

- FREQ Hardkey
- AMPT Hardkey
- MKR Hardkey
- MKR-> Hardkey
- SWEEP Hardkey
- MEAS Hardkey
- TRACE Hardkey
- DISP Hardkey
- FILE Hardkey
- PRESET Hardkey
- HCOPY Hardkey

2.4.4 External Keyboard

The external keyboard is optional. The keys on the external keyboard that can be used to interact with the R&S FS-K10-option are as follows:

Number keys 0 to 9

Decimal point (".")	Inserts a decimal point "." at the cursor position.
Minus key	Changes the sign of the mantissa or exponent of a numeric parameter. A "-" is inserted at the cursor position in the case of an alphanumeric parameter.
ESC key	Aborts the entry before it has been terminated. The previous value is restored. Closes the entry field after termination of input. Closes pop-up dialogs.
ENTER key	Terminates the input of dimension quantities. The new value is set. Invokes the input of parameters or immediately sets the new value. Selects the highlighted item in drop-down menus.
Left and Right Cursor Keys are used to:	Navigate between individual parameters within the setting views and some of the pop-up dialogs. Navigate between the individual items within drop-down menus. Move the cursor left & right inside the entry window to reach a particular position in the string during alphanumeric entry.
Up and Down Cursor keys are used to:	Navigate between individual parameters within the setting views and some of the pop-up dialogs. Navigate between the individual items within drop-down menus. Increment or decrement the value of a parameter during numeric entry.
CTRL keys	Used to activate hotkeys. Each of the seven hotkeys corresponds to a different function (F) key. To access these hotkeys press CTRL and the corresponds to a F key together (see Figure 4):

Figure 4 Quick Access to Hotkeys

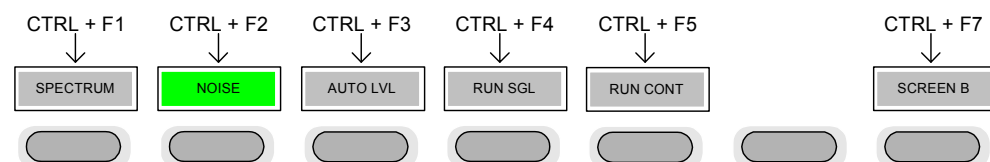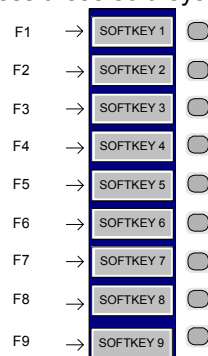| CTRL + F1	CTRL + F2	CTRL + F3	CTRL + F4	CTRL + F5		CTRL + F7
SPECTRUM	NOISE	AUTO LVL	RUN SGL	RUN CONT		SCREEN B

Figure 5 Quick access to softkeys

Function Keys	Used to activate softkeys. Each of the nine softkeys is corresponds to a different function (F) key. To access these softkeys press the corresponding F key, as shown below:

F1 → SOFTKEY 1
F2 → SOFTKEY 2
F3 → SOFTKEY 3
F4 → SOFTKEY 4
F5 → SOFTKEY 5
F6 → SOFTKEY 6
F7 → SOFTKEY 7
F8 → SOFTKEY 8
F9 → SOFTKEY 9

2.4.5 Mouse

The mouse can be used to select individual parameters within the settings dialogs or data entry dialogs and to activate hotkeys and softkeys. It can also be used to select values from a drop-down list.

2.4.6 Selecting and Editing Parameters

Parameters are set either by numeric or alphanumeric entry or by simple selection from a list of possible values (a drop-down list is used to select an "enumerated" value) or by using checkboxes to turn a parameter setting on and off.

In all cases, the parameter has to be selected by placing focus on it and then editing has to be enabled before its value can be changed.

The rollkey and cursor keys on the front panel are provided for navigation and selection of parameters.

The numeric keypad, rollkey and cursor keys on the front panel and an external keyboard (optional) are provided for the entry of parameter values.

2.4.6.1 Numeric Keypad

The numeric keypad is provided for entry of numeric parameters. It contains the following keys:

● Number keys 0 to 9
    Starts editing of the selected parameter. This enables a new value to be entered for a parameter directly without having to press ENTER first. The digit will be displayed as the first digit of the newly entered value.
    Inserts a digit at the cursor position when editing an alphanumeric parameter.
● Decimal point
    Inserts a decimal point "." at the cursor position.
● Sign key ("-")
    Changes the sign of the mantissa or exponent of a numeric parameter. A "-" is inserted at the cursor position when editing an alphanumeric parameter.
● Unit keys (GHz/-dBm, MHz/dBm, kHz/dB and Hz/dB)
    Provides the numeric value entered with the selected unit and sets the parameter to that value.
    The unit keys are all assigned the value "1" for dimensionless quantities or for level entries (e.g. in dB). The unit keys thus assume the function of an ENTER key.
● BACK key
    Deletes the character to the left of the cursor with alphanumeric entry.
● ESC/CANCEL key
    Aborts the entry of a new parameter value. The previous value is restored.
● Closes pop-up dialogs.
● *ENTER* key
    Enables editing of the selected parameter (using numeric keys or rollkey).
    Finishes the editing of a parameter value. The new value is set.
    For an alphanumeric value, the new value is set to that displayed (using the current unit if applicable).
    In a drop-down menu, the parameter is set to the currently selected value in the list.

2.4.6.2   Rollkey
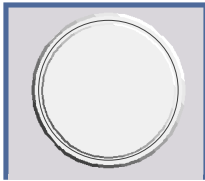
The rollkey has various functions:

- In a settings view, the rollkey can be used to navigate between individual parameters (the parameter selected being highlighted).
- In drop-down menus, the rollkey can be used to navigate between the individual values for the parameter.
- During numeric entry, the parameter is incremented (by turning clockwise) or decremented (by turning counter-clockwise).
- In setting views and data entry dialogs pressing the rollkey invokes the input of parameters or immediately sets the new value, i.e. pressing the rollkey is like pressing the *ENTER* key.
- In drop-down menus, pressing the rollkey selects the item in focus.

2.4.6.3   Cursor Keys
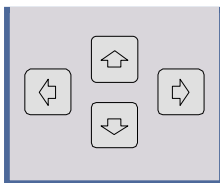
The keys ⬅ and ➡ are used to:

- Navigate between individual parameters within the setting views and some of the pop-up dialogs.
- Navigate between the individual values within drop-down menus.
- Move the cursor left & right inside the entry window to reach a particular position in the string during alphanumeric entry.

The keys ⬆ and ⬇ are used to:

- Navigate between individual parameters within the setting views and some of the pop-up dialogs.
- Navigate between the individual items within drop-down menus.
- Increment or decrement the value of a parameter during numeric entry.

2.4.6.4   Selection of a Parameter within a Settings Dialog

Selection using rollkey

1. Press GENERAL SETTINGS softkey for example (the General Settings dialog is displayed).
2. Rotate the rollkey until reaching the required parameter.

Note: When the parameter is selected its label is highlighted blue.
When the desired parameter is reached press the rollkey to edit the parameter.

Selection using cursor keys (front panel or ext. keyboard)

1. Use the cursor keys ⬆ , ⬇ , ⬅ or ➡ to navigate to the required parameter.
2. To start editing the parameter, either press the *ENTER* key on the numeric keypad, the rollkey, or directly enter the new value via the numeric keypad.

Selection using mouse

► Use the mouse to move the cursor to the parameter and press the left mouse button to select the parameter.

2.4.6.5   Entry of a Numeric Value

Once a parameter has been selected (see above), a new value for a numeric parameter can be entered in a number of ways. With the exception of entry via the number keys, to start editing the parameter, either press the *ENTER* key on the numeric keypad, or press the rollkey before following the instructions below.

If an error occurs, for example, the entered value is out of range, then the new value will not be accepted for the parameter setting.

Entry using
number keys

► Enter required value using the number keys.

Example: To enter 200 MHz

| 2 |

| 0 |

| 0 |

| MHz dBm | ⟹ | Frequency | 200 MHz |
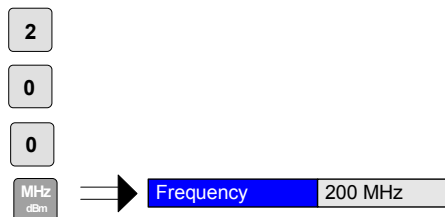
Note: The parameter is not set to the new value until either one of the unit keys, the ENTER or the rollkey is pressed.

Entry using cursor
keys

► Press the cursor key ⬆ or ⬇ until obtaining the required value.

Example: Cursor down to 100MHz

| Frequency | 100 MHz |
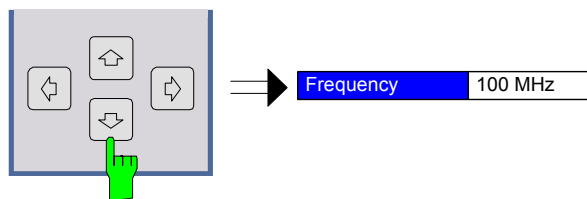
Note: - The cursor keys increment/decrement a parameter value in large steps.
*   - Each change of the parameter value takes place immediately. No other keys need to be pressed.*

Entry using
rollkey

► Rotate the rollkey until reaching the required value.
Turning the rollkey clockwise increases the value, turning it counter-clockwise decreases the value.

Example: Rotate to 200 MHz

| Frequency | 200 MHz |
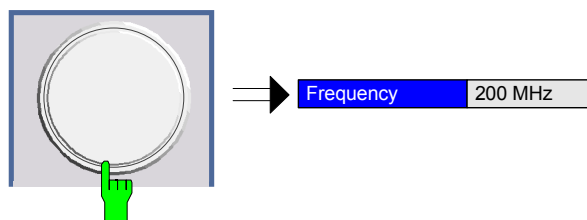
Note: - The rollkey increment/decrement a parameter value in small steps.
*   - Each change of the parameter value takes place immediately. No other keys need to be pressed.*

Entry using external keyboard	► Enter value using number keys 0 - 9 in the same way as for using the number keys on the numeric keypad (see above).
Terminating the entry	1. Press one of the unit keys on the numeric keypad.
	2. Press the *ENTER* key (on numeric keypad or external keyboard) or press the rollkey. The new parameter value is set immediately.

Note: *Pop-up dialogs, where used, do not close automatically. They can be closed by pressing the ESC key.*

Correcting the entry	1. Position the cursor to the right of the digit which is to be deleted using the cursor keys ⬅ or ➡.
	2. Press the BACK key. The digit to the left of the cursor is deleted.
	3. Enter new digits. Each digit is inserted to the left of the cursor, the other digits are shifted right.
Aborting the entry	1. Press the *ESC* key during parameter editing.
	2. The original parameter value is restored. The new entry is deleted.
	3. If a pop-up dialog is displayed, press the *ESC* key again.

The entry window is closed, the original value remains active.

2.4.6.6   Entry of an Enumerated Value

Once a parameter has been selected (see above), a new value for an enumerated parameter can be entered in a number of ways. To start editing the parameter, either press the *ENTER* key on the numeric keypad, press the rollkey or left click with the mouse on the drop down button before following the instructions below.

When the rollkey or ENTER is pressed, a drop-down menu is displayed, which contains all the available settings that may be selected for the parameter.

Selection of setting using cursor keys	1. Cursor ⬆ or ⬇ until obtaining the required setting. 2. Press *ENTER* on external keyboard or numeric keypad, or press rollkey to select the desired setting of parameter. *Note:* *Currently selected setting of the parameter is highlighted blue.* *Pressing ENTER sets the new setting of the parameter immediately.*
Selection of setting using rollkey	1. Rotate the rollkey until reaching the required setting. 2. Press rollkey to select setting. **Example:** Select te *Trigger Mode* parameter in the General Settings dialog. *Note:* *Currently selected setting of the parameter is highlighted blue.* *Pressing the rollkey sets the new setting of the parameter immediately.*
Selection of setting using mouse	► When the parameter is selected and ready for editing, select a new setting using the mouse by left-clicking on the new setting from the drop-down list. The new setting of the parameter is set immediately.
Selection of setting using ext. keyboard	1. Select setting using cursor keys. 2. Press *ENTER* to set the parameter to the new value.

2.4.6.7   Entry of a Checkbox

A checkbox is used for parameter settings that are either On or Off. A checkmark (✓) appears in the box when the setting is On; the checkbox is empty when the setting is Off.

Once a checkbox has been selected, the value can be toggled either by pressing the rollkey, the *ENTER* key or left clicking with the mouse.

Example 1: Press the rollkey to turn the *Auto Level* setting Off.
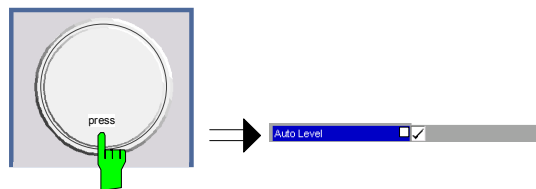
Note: *The checkbox is empty when the settings is Off.*

Example 2: Press the *ENTER* key to *Auto Level* setting to On
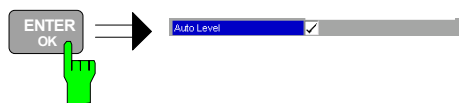
Note: *Acheckmark (✓) shows that he checkbox is On.*

2.5 Printing

This section of the user manual describes print facility of the option.

The *HCOPY* hardkey brings up the print softkey menu. Any settings views on display when the print softkey menu is displayed shall be closed.

The print facility provided by R&S FS-K10 is exactly the same as that provided by the analyzer. Refer to the user manual for the spectrum analyzer for details of the print facility operation.

To close the print softkey menu and return to the main R&S FS-K10 softkey menu, press the *GSM & EVO* hotkey.

3 Functions of the R&S FS-K10

The R&S FSQ / R&S FSG equipped with the GSM / EDGE and EDGE Evolution Measurement Application performs measurements on downlink or uplink signals according to the Third Generation Partnership Project (3GPP) standards for GSM / EDGE and EDGE Evolution (EGPRS2) in different domains (Time, Frequency, IQ). Signals with GSMK, QPSK, 8PSK, 16QAM and 32QAM modulation, normal or higher symbol rate and different TX filters (e.g narrow and wide pulse) can be measured. The measurements for Power versus Time, Modulation Accuracy and Modulation and Transient Spectrum as required in the standard can be performed.

The measurements and the physical layer - the layer of the GSM network on which modulation, transmission of RF signals, reception of RF signals, and demodulation take place - is defined in the standards:

- 3GPP TS 45.004   Details on Modulation
- 3GPP TS 45.005   General measurement specifications and limit values
- 3GPP TS 45.010   Details on Synchronization and Timing
- 3GPP TS 51.010   Detailed measurement specifications and limit values for mobile stations (MS)
- 3GPP TS 51.021   Detailed measurement specifications and limit values for base transceiver stations (BTS)

For details on basic instrument functions refer to the base unit section of the documentation.

To Start the R&S FS-K10 Application

If the R&S FS-K10 is not the active measurement mode, press the *GSM & EVO* hotkey.

Menu and Softkey Description

- "Softkeys of the Main Menu"
- "Softkeys of the Frequency Menu"
- "Softkeys of the Amplitude Menu"
- "Softkeys of the Sweep Menu"
- "Softkeys of the Trigger Menu"
- "Softkeys of the Trace Menu"
- "Softkeys of the Marker Menu"
- "Softkeys of the Marker Function Menu"
- "Softkeys of the Marker to Menu"

Further Information

- "List of Abbreviations"
- "Short Description of GSM (GMSK, EDGE and EDGE Evolution)"
- "Transducer Factors"
- "Trigger Settings"
- "Slot Level Settings"
- "Defining the Scope of the Measurement"

Measurements and Result Displays

- "Modulation Accuracy"
- "Phase Error vs Time"
- "EVM vs Time"
- "Magnitude Error vs Time"
- "Constellation"
- "Power vs Time"
- "Modulation Spectrum"
- "Transient Spectrum"
- "Wide Modulation Spectrum"

3.1 Measurements and Result Displays

This chapter provides information about the measurement and result displays of the GSM / EDGE and EDGE Evolution Measurement Application.

The following measurements are explained in detail:

- "Screen Layout"
- "Modulation Accuracy"
- "Phase Error vs Time"
- "EVM vs Time"
- "Constellation"
- "Power vs Time"
- "Modulation Spectrum"
- "Transient Spectrum"
- "Wide Modulation Spectrum"

Screen Layout

Within the GSM / EDGE and EDGE Evolution Measurement Application, each measurement (e.g. "Power vs Time") has its own screen layout. This is typically a combination of a graph in the upper screen part and a table in the lower screen part.

You can switch between the screens and select a split screen layout (to see all displays) or a full screen layout (to see only the graph or the table in more detail).

Table content in split screen mode

Due to the reduced space available for each result in split screen mode, the content of the tables may be reduced.

Via remote control, all results are available at any table state.

Modulation Accuracy

The fundamental characteristics of the signal to be analyzed in the vector (IQ) domain are error vector magnitude (EVM), magnitude and phase error, IQ imbalance, etc. The numerical readings are displayed in the Modulation Accuracy table.

Figure 6 Modulation Accuracy

A: Modulation Accuracy		Current	Average	Peak	Std Dev	Unit
EVM	RMS	0.08	0.14	0.29	0.09	%
	Peak	0.21	0.34	0.68	0.16	%
Mag Error	RMS	0.06	0.13	0.28	0.09	%
	Peak	0.15	0.32	0.67	0.17	%
Phase Error	RMS	0.06	0.07	0.16	0.03	deg
	Peak	0.46	0.50	1.60	0.34	deg
Origin Offset Suppression		74.60	73.22	67.27	2.59	dB
IQ Offset		0.03	0.02	0.04	0.01	%
IQ Imbalance		0.01	0.01	0.02	0.00	%
Frequency Error		- 21.85	- 21.67	- 22.00	0.11	Hz
Burst Power		- 1.34	- 1.26	- 0.96	0.15	dBm
Amplitude Droop		0.04	0.04	0.04	0.00	dB

95%ile	EVM	0.38	%	Mag Error	0.38	%	Phase Error	0.10	deg

To display a "Modulation Accuracy" table, select: "Demod > Modulation Accuracy" (see "Modulation Accuracy"). The following default settings are used for a"Modulation Accuracy" table.

Setting	Default
Measurement Scope	The slot selected as "Slot to Measure" in "Demodulation Settings".
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings".
Limit Check	none

The **amplitude droop** value shown in the table gives the total change in amplitude (in dB) over the estimation range. The estimation range is set according to the 3GPP standard for GMSK modulation to 147 normal symbol periods and for 8PSK, 16QAM and 32 QAM (Level A) to 142 normal symbol periods. For QPSK, 16QAM and 32QAM (Level B) the estimation range is set to 169 reduced symbol periods.

Phase Error vs Time

This measurement displays the phase error over time. The measurement consists of a graph and a table which is a condensed version of the "Modulation Accuracy" table.

Figure 7   Phase Error vs Time
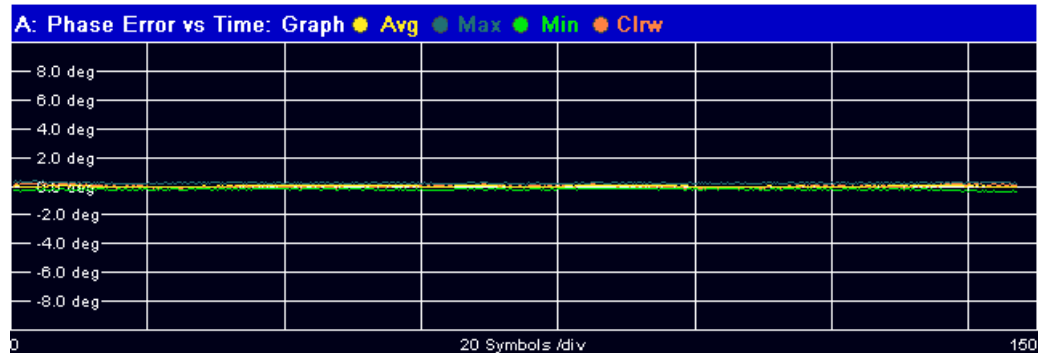
Figure 8 Modulation Accuracy

To start a "Phase Error vs Time" measurement, select: "Demod > Phase Error" (see "Phase Error"). The following default settings are used for a "Phase Errorvs Time" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to Measure" in "Demodulation Settings".
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings".
Limit Check	none

EVM vs Time

This measurement displays the error vector magnitude over time. The measurement consists of a graph and a table which is a condensed version of the "Modulation Accuracy" table.

Figure 9 EVM vs Time

Figure 10 Modulation Accuracy

Setting	Default
Measurement Scope	The slot selected as "Slot to Measure" in "Demodulation Settings".
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings".
Limit Check	none

To start a "EVM vs Time" measurement, select: "Spectrum > EVM" (see "EVM"). The following default settings are used for a "EVM vs Time" measurement.

Magnitude Error vs Time

This measurement displays the magnitude error over time. The measurement consists of a graph and a table which is a condensed version of the "Modulation Accuracy" table.

Figure 11 Magnitude Error vs Time

Figure 12 Modulation Accuracy

To start a "Magnitude Error vs Time" measurement, select: "Demod > Magnitude Error" (see "Magnitude Error"). The following default settings are used for a "Magnitude Error vs Time" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to Measure" in "Demodulation Settings".
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings".
Limit Check	none

Constellation

This measurement displays the constellation diagram. The measurement consists of a graph and a table which is a condensed version of the "Modulation Accuracy" table.

Figure 13 Constellation
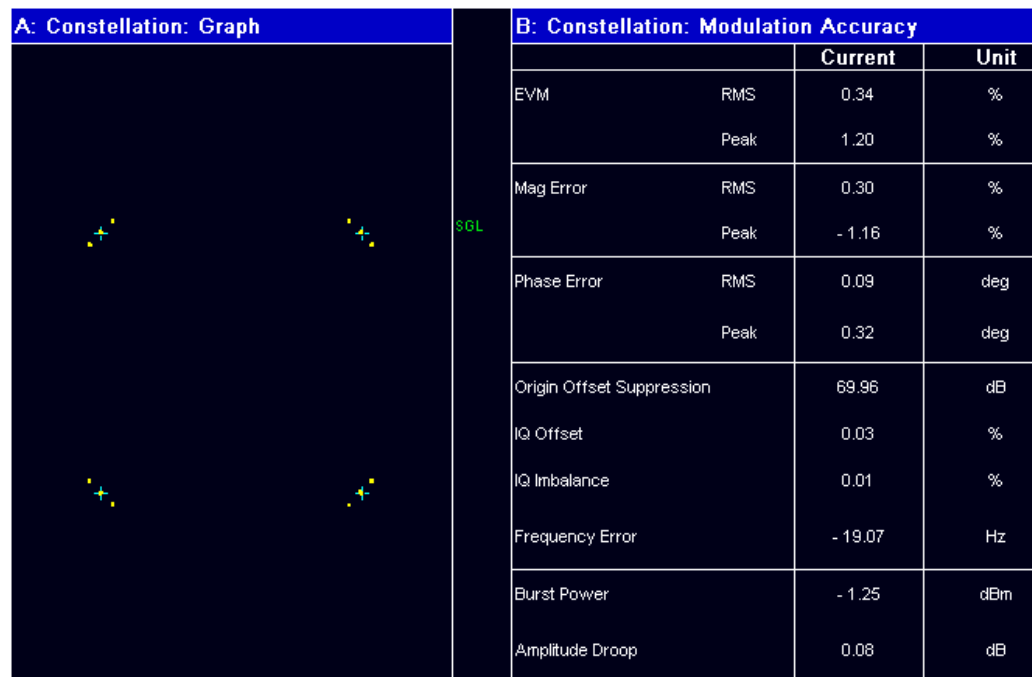
To display a "Constellation" diagram, select: "Demod > Constell" (see "Constell"). The following default settings are used for a "Constellation" display.

Setting	Default
Measurement Scope	The slot selected as "Slot to Measure" in "Demodulation Settings".
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings".
Limit Check	none

Power vs Time

The Power vs Time (PvT) measurement is the most important GSM measurement in the time domain. It displays the power of all slots (bursts) in the selected slot scope (see "Defining the Scope of the Measurement") and runs an evaluation against the specified template mask.

The measurement consists of a graph showing the Power vs Time trace including the limit lines.

In the graph display, it is possible to focus on different parts of the signal:

● "Full": Displays all bursts in the slot scope
● "Rise & Fall": Rising and falling edges zoomed
● "Top": Useful part high resolution (same as "Full", but y-axis zoomed)

Figure 14 Full Burst view in Power vs Time
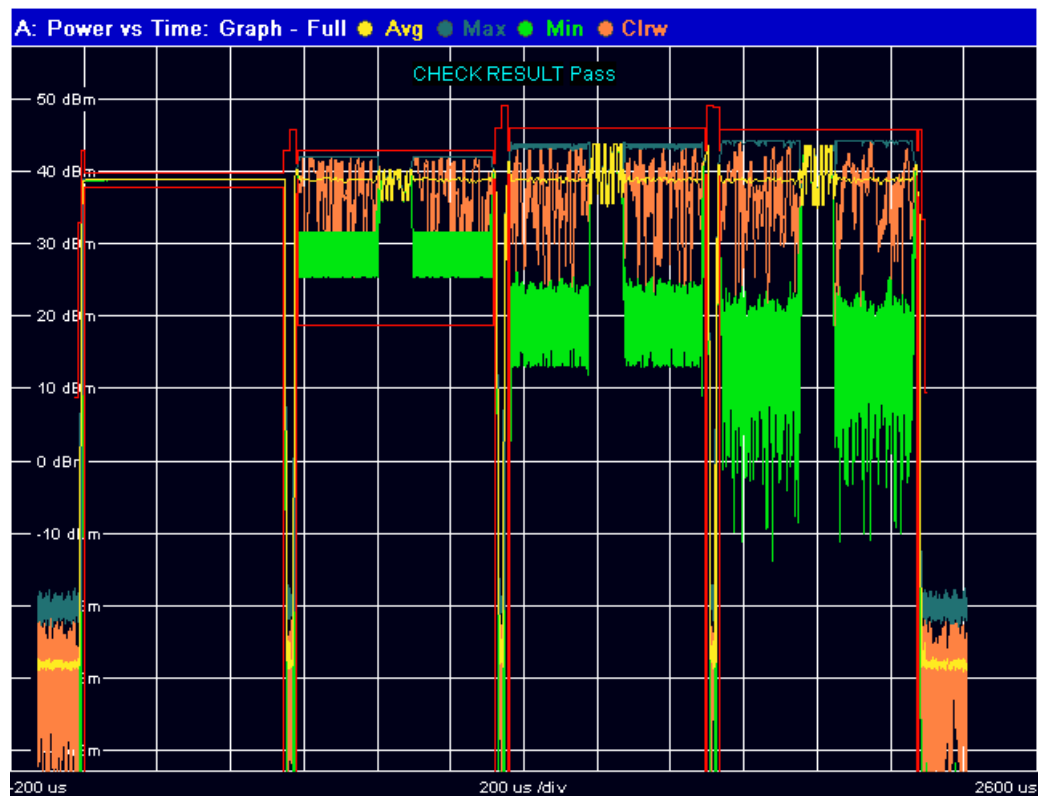
Figure 15 Rising and Falling Edge view in Power vs Time
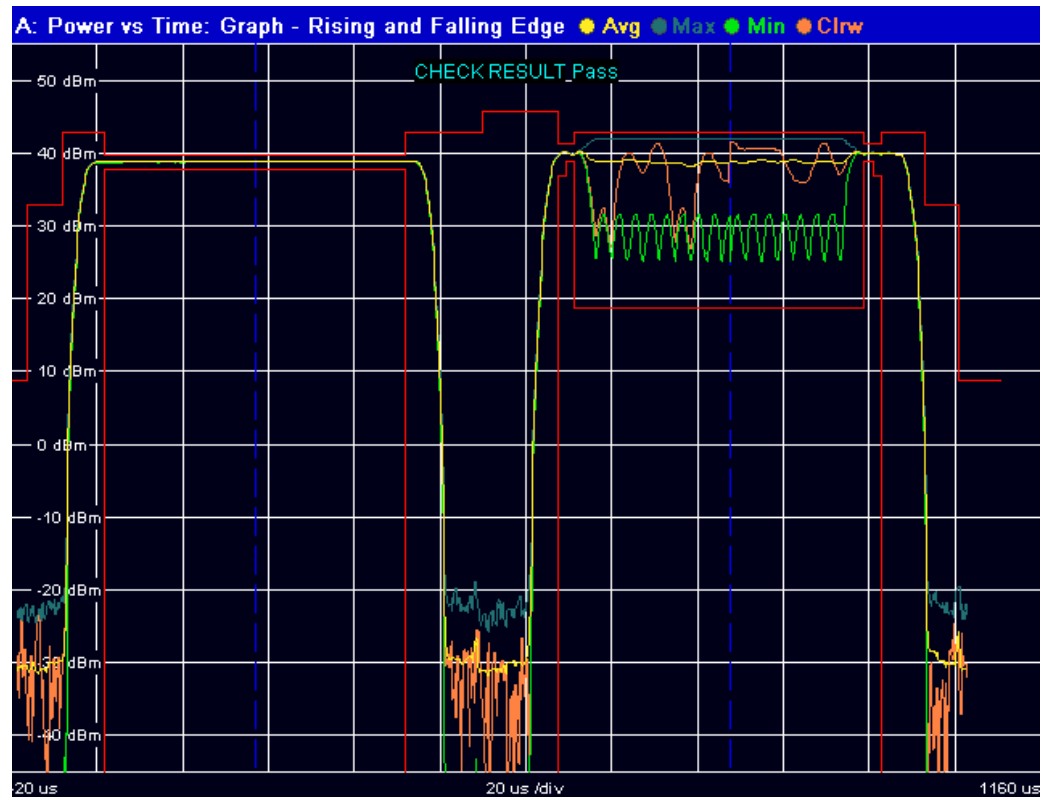
Figure 16 Top High Resolution view in Power vs Time

Setting	Default
Measurement Scope	The slot scope selected using "Number of Slots to measure" and "First Slot to Measure" in "Demodulation Settings".
Averaging Configuration	Number of frames as selected in "Statistic Count" in "General Settings".
Limit Check	According to standard. - The maximum (Max) trace is checked against the upper limit - The minimum (Min) trace is checked against the lower limit. - The limit masks are generated adaptively from the measured signal.

Measurement and Zoom

When switching between Full, Rise & Fall, and Top, neither the measurement itself, nor the limit checking is changed. The only change is that the displayed signal data is cropped.

Modulation Spectrum

The modulation spectrum measurement evaluates the spectral property (shape and values at certain fixed frequency offsets) of a certain part of the burst (50 to 90 % of the useful part, excluding the training sequence) by measuring the average power in this part over several bursts. The results of this measurement can be displayed in a graph or list.

Figure 17 Frequency Domain with traces and limits (red)
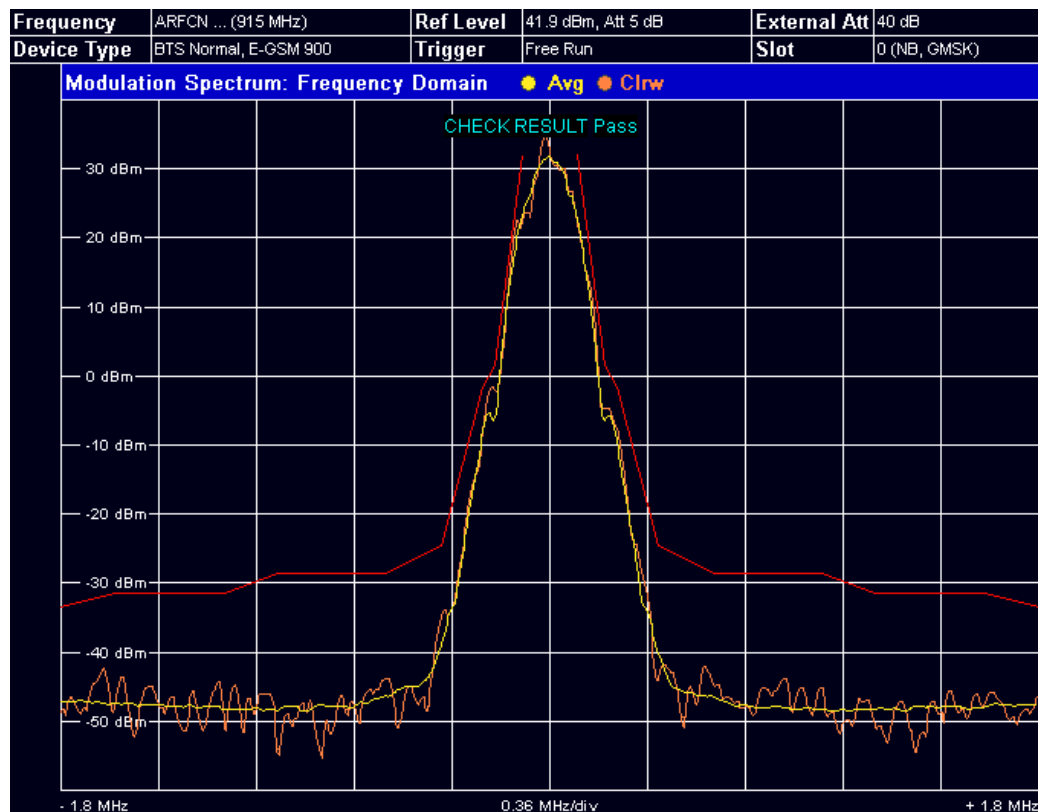
Figure 18 Results Table in Modulation Spectrum

Offset	Lower			Upper		
/kHz	**/dB**	**/dBm**	**Δ to Lim**	**/dB**	**/dBm**	**Δ to Lim**
100	- 8.5	22.7	9.00	- 8.6	22.7	9.08
200	- 37.7	- 6.5	7.72	- 37.4	- 6.2	7.45
250	- 41.0	- 9.8	8.00	- 41.3	- 10.1	8.34
400	- 70.9	- 39.7	14.90	- 71.1	- 39.9	15.11
600	- 77.7	- 46.5	17.72	- 78.5	- 47.2	18.46
800	- 79.6	- 48.3	19.58	- 79.7	- 48.4	19.69
1000	- 79.8	- 48.6	19.82	- 80.5	- 49.2	20.47
1200	- 79.9	- 48.7	16.92	- 80.1	- 48.8	17.09
1400	- 79.4	- 48.1	16.38	- 80.0	- 48.7	16.97
1600	- 79.2	- 48.0	16.22	- 79.5	- 48.3	16.55
1800	- 78.7	- 47.4	13.69	- 79.2	- 48.0	14.21

Modulation Spectrum: List

To start a "Modulation Spectrum" measurement, select: "Spectrum > Modulation Spectrum" (see "Modulation Spectrum"). The following default settings are used for a "Modulation Spectrum" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to Measure" in "Demodulation Settings".
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings".
Limit Check	According to standard. - Frequency Domain: Limit check of average (Avg) trace. - List: Limit check of absolute and relative scalar values.

Transient Spectrum

The transient spectrum measurement is done in a very similar way to the modulation spectrum measurement.

The differences to the modulation spectrum measurement are:

● Instead of measuring only in the useful part of the burst (in the "Slot to Measure"), the measurement is performed over the interval defined by the "Number of Slots to measure" and "First Slot to Measure" in "Measurement Settings", i.e. one measurement per frame. See also "Defining the Scope of the Measurement". Therefore, the rising and falling edges affect the measurement result.
● Instead of the average power, the peak power is measured.
● The number of fixed offset frequencies is lower.

Figure 19: Frequency Domain of Transient Spectrum with traces and limits (red)
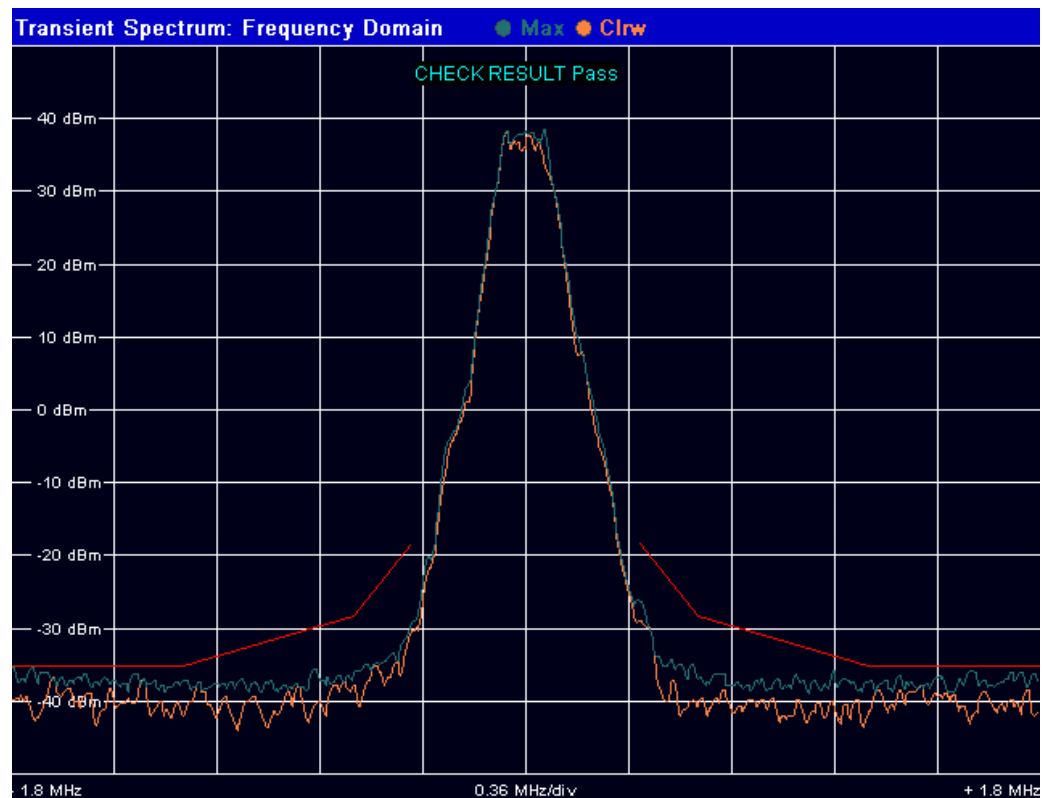
Figure 20: Result Table in Transient Spectrum

Offset	Lower			Upper		
/kHz	/dB	/dBm	Δ to Lim	/dB	/dBm	Δ to Lim
400	- 67.3	- 28.6	10.30	- 64.4	- 25.6	7.39
600	- 73.5	- 34.7	6.49	- 74.5	- 35.8	7.54
1200	- 76.6	- 37.8	2.57	- 76.7	- 37.9	2.69
1800	- 74.6	- 35.8	0.56	- 74.8	- 36.1	0.83

To start a "Transient Spectrum" measurement, select: "Spectrum > Transient Spectrum" (see "Transient Spectrum").

The following default settings are used for "Transient Spectrum" measurements.

Setting	Default
Measurement Scope	The slot scope selected using "Number of Slots to measure" and "First Slot to Measure" in "Demodulation Settings".
Averaging Configuration	Number of frames as selected in "Statistic Count" in "General Settings".
Limit Check	- Frequency Domain: Limit check of maximum (Max) trace - List: Limit check of absolute and relative scalar values - The limit masks are generated adativelyfrom the measured signal.

Wide Modulation Spectrum

The "Wide Modulation Spectrum" measurement measures the spectrum due to modulation at offset frequencies up to 5.8 MHz from the carrier. In principle, this measurement provides the same functionality as the existing "Modulation Spectrum List" measurement (see "Modulation Spectrum"), however the offset frequencies measured are extended past the current limit of 1.8 MHz up to 5.8 MHz. The full list of measured frequencies and filter bandwidths are listed in Table 1.

To start a "Wide Modulation Spectrum" measurement, select "Wide Spectrum > Wide Mod Spectrum" (see "Wide Mod Spectrum").

Table 1: Frequencies and filter bandwidths in wide modulation spectrum measurements

Offset (kHz)	RBW (kHz)	VBW (kHz)
±100	30	30
±200	30	30
±250	30	30
±400	30	30
±600	30	30
±800	30	30
±1000	30	30
±1200	30	30
±1400	30	30
±1600	30	30
±1800	30	30
±2000	100	100
±2200	100	100
±2400	100	100
±2600	100	100
±2800	100	100
±3000	100	100
±3200	100	100
±34000	100	100
±36000	100	100
±38000	100	100
±4000	100	100
±4200	100	100
±4400	100	100
±4600	100	100
±4800	100	100
±5000	100	100
±5200	100	100
±54000	100	100
±56000	100	100
±58000	100	100

The measurement can be performed using either the "EXTERNAL" or "POWER" trigger modes. The trigger signal must be received once per GSM frame.

When using a power trigger, every active burst in the frame is measured. It is therefore important that all active bursts in the frame have the same modulation and filter type, otherwise the measurement results are not standard conformant.

Power trigger operation is not recommended for modulation formats that have no constant envelope (i.e. all except GMSK). Therefore, the power trigger should only be used for GMSK bursts. For QPSK, 8PSK, 16QAM and 32QAM bursts an external trigger should be used.

The measurement is performed in gated zero-span mode, where the gating parameters (offset and length) are calculated based on the user-defined "Trigger Offset" and "Frame Configuration" settings. 50-90 % of the active part of the "Slot to Measure" (excludingTSC) are measured.

It is recommended that you use the "Auto Set" functionality of the R&S FS-K10 application before starting the list measurement. This automatically determines the appropriate "Trigger Offset" and "Frame Configuration" for the signal under test.

Figure 21: Results Table in Wide Modulation Spectrum

Wide Modulation Spectrum: List

Offset	Lower			Upper		
/kHz	/dB	/dBm	Δ to Lim	/dB	/dBm	Δ to Lim
100	- 7.9	- 16.0	8.38	- 8.1	- 16.2	8.56
200	- 36.1	- 44.2	6.08	- 35.6	- 43.8	5.63
250	- 40.9	- 49.1	7.89	- 41.0	- 49.1	7.96
400	- 68.1	- 76.3	12.12	- 66.9	- 75.1	10.90
600	- 76.6	- 84.7	19.72	- 76.9	- 85.1	20.07
800	- 79.3	- 87.5	22.51	- 79.9	- 88.1	23.10
1000	- 81.5	- 89.7	24.70	- 80.8	- 88.9	23.93
1200	- 83.4	- 91.5	26.52	- 83.1	- 91.3	26.28
1400	- 84.6	- 92.8	27.77	- 84.0	- 92.2	27.21
1600	- 85.4	- 93.6	28.57	- 84.3	- 92.5	27.47
1800	- 86.3	- 94.4	29.45	- 85.8	- 93.9	28.93
2000	- 81.4	- 89.6	24.57	- 80.8	- 88.9	23.91
2200	- 81.7	- 89.8	24.84	- 81.4	- 89.5	24.54
2400	- 82.3	- 90.5	25.46	- 81.7	- 89.9	24.89
2600	- 82.2	- 90.4	25.40	- 82.1	- 90.2	25.22
2800	- 82.2	- 90.4	25.38	- 82.5	- 90.6	25.64
3000	- 82.4	- 90.6	25.61	- 82.6	- 90.8	25.79

Remote commands

The "Wide Modulation Spectrum" measurement is started using the CONFigure:WSPectrum:MODulation[:IMMediate] command.
The gating parameters of the "Wide Modulation Spectrum" measurement can be queried using READ:SPECtrum:WMODulation:GATing?.
The results of the "Wide Modulation Spectrum" measurement can be queried using READ:SPECtrum:MODulation[:ALL]?.

3.2 Further Information

This chapter provides further information on the GSM standard, the corresponding measurement settings and results for the R&S FS-K10 application.

- "List of Abbreviations"
- "Short Description of GSM (GMSK, EDGE and EDGE Evolution)"
- "Transducer Factors"
- "Trigger Settings"
- "Slot Level Settings"
- "Defining the Scope of the Measurement"

List of Abbreviations

16QAM	16-ary Quadrature Amplitude Modulation
32QAM	32-ary Quadrature Amplitude Modulation
3GPP	3rd Generation Partnership Project
8PSK	Phase Shift Keying with 8 phases
ARFCN	Absolute Radio Frequency Channel Number
BTS	Base Transceiver Station
DL	Downlink (MS to BTS)
DUT	Device Under Test
EDGE	Enhanced Data Rates for GSM Evolution
EGPRS	Enhanced General Packet Radio, synonym for EDGE.
EGPRS2	Enhanced General Packet Radio and support of additional modulation / coding schemes and higher symbol rate.
FDMA	Frequency Division Multiplex Access
GMSK	Gaussian Minimum Shift Keying
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
HSCSD	High-Speed Circuit-Switch Data
IF	Intermediate Frequency
MS	Mobile Station
PCL	Power Control Level
PvT	Power vs Time
QPSK	Quadrature Phase Shift Keying
SFH	Slow Frequency Hopping
TDMA	Time Division Multiplex Access
TSC	Training Sequence Code
UL	Uplink (BTS to MS)
YIG	Yttrium Iron Garnet

Short Description of GSM (GMSK, EDGE and EDGE Evolution)

The GSM (Global System for Mobile Communication) standard describes the GSM mobile radio network that is in widespread use today. In a first step to enhance this network, 8PSK modulation has been defined in addition to the existing GMSK (Gaussian Minimum Shift Keying) modulation. With 8PSK, the mobile or base station operates in the EDGE mode. While the 8PSK modulation transmits 3 bits within a symbol, GMSK can only transmit 1 bit within a symbol.

In a second step to enhance this network, higher symbol rate (HSR) , QPSK, 16QAM , and 32QAM modulation, narrow and wide pulse shapes for the TX filter have been defined. Here, EDGE Evolution and EGPRS2 are synonyms for this second enhancement.

This means that GSM includes different modes: GMSK, EDGE and EDGE Evolution. The terms EDGE and EDGE Evolution are used here only when there are significant differences between the modes. In all other cases, the term GSM is used.

A TDMA (Time Division Multiple Access) and FDMA (Frequency Division Multiple Access) scheme is used to transfer data in the GSM network. This means that the digital information is transmitted discretely in the time domain (mainly used to distinguish between different users) as well as in the frequency domain (mainly used to distinguish between BTS).

The time domain is divided into slots with a duration of 576.923 µs (exact: 3/5200 s). 8 slots (with number 0 to 7) are combined into 1 frame with a duration of approx. 4.6154 ms (exact: 3/650 s).

Multiframes and Superframes

Frames can be grouped into a multiframe consisting of either 26 (for support traffic and associated control channels) or 51 (for all other purposes) frames. Multiframes can be grouped to superframes consisting of either 51 26-frame or 26 51-frame multiframes.

Multiframes and superframes are not of relevance for the physical measurements on the GSM system and thus not discussed in detail here.

A mobile phone, therefore, does not communicate continuously with the base station; instead, it communicates discretely in individual slots assigned by the base station during connection and call establishment. In the simplest case, 8 mobiles share the 8 slots of a frame (TDMA).

The frequency range assigned to GSM is divided into frequency bands, and each band, in turn, is subdivided into channels.

Each frequency channel is identified by its center frequency and a number, known as the ARFCN (Absolute Radio Frequency Channel Number), which identifies the frequency channel within the specific frequency band. The GSM channel spacing is 200 kHz.

Communication between a mobile and a base station can be either frequency-continuous or frequency-discrete - distributed across various frequency channels (FDMA). In the standard, the abbreviation "SFH" (slow frequency hopping) is used to designate the latter mode of communication.

Base stations and mobiles communicate in different frequency ranges; the mobile sends in the "uplink" (UL), and the base station in the "downlink" (DL).

The frequencies specified in the standard plus their channel numbers (ARFCN) are shown in the figure and table below.
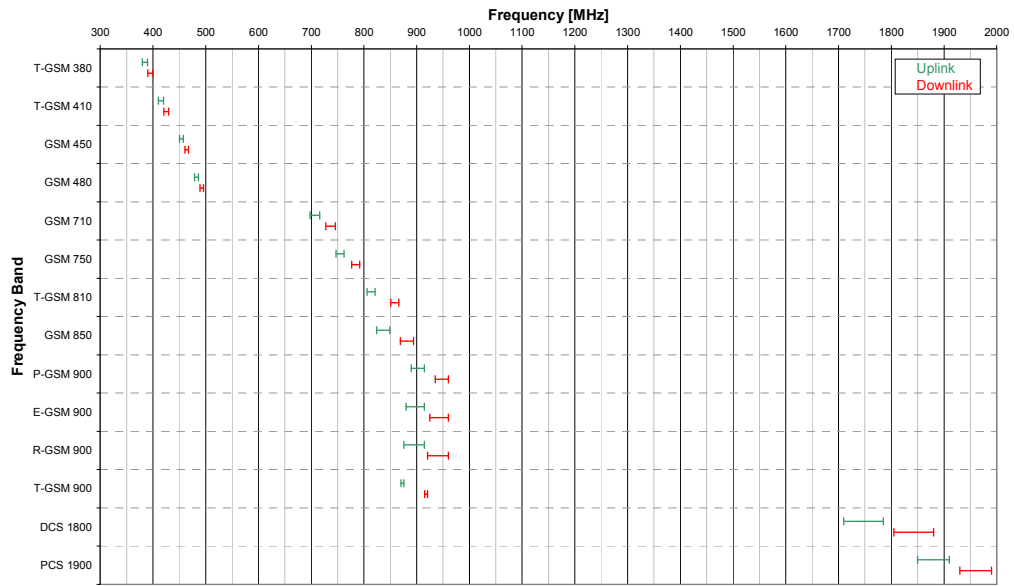
Band Class	UL Frequency [MHz]		DL Frequency [MHz]		Frequency Band Middle		UL-DL Shift	ARFCN	
	Lower	Upper	Lower	Upper	UL	DL		Range 1	Range 2
T-GSM 380	380,2	389,8	390,2	399,8	385,0	395,0	10 MHz	0 … 48 [1]	---
T-GSM 410	410,2	419,8	420,2	429,8	415,0	425,0	10 MHz	0 … 48 [1]	---
GSM 450	450,4	457,6	460,4	467,6	454,0	464,0	10 MHz	259 … 293	---
GSM 480	478,8	486,0	488,8	496,0	482,4	492,4	10 MHz	306 … 340	---
GSM 710	698,0	716,0	728,0	746,0	707,0	737,0	30 MHz	0 … 90 [1]	---
GSM 750	747,0	762,0	777,0	792,0	754,5	784,5	30 MHz	438 … 511	---
T-GSM 810	806,0	821,0	851,0	866,0	813,5	858,5	45 MHz	0 … 75 [1]	---
GSM 850	824,0	849,0	869,0	894,0	836,5	881,5	45 MHz	128 … 251	---
P-GSM 900	890,0	915,0	935,0	960,0	902,5	947,5	45 MHz	1 … 124	---
E-GSM 900	880,0	915,0	925,0	960,0	897,5	942,5	45 MHz	0 … 124	975 … 1023
R-GSM 900	876,0	915,0	921,0	960,0	895,5	940,5	45 MHz	0 … 124	955 … 1023
T-GSM 900	870,4	876,0	915,4	921,0	873,2	918,2	45 MHz	0 … 28 [1]	---
DCS 1800	1710,0	1785,0	1805,0	1880,0	1747,5	1842,5	95 MHz	512 … 885	---
PCS 1900	1850,0	1910,0	1930,0	1990,0	1880,0	1960,0	80 MHz	512 … 810	---

[1] For these frequency bands, there is no fixed ARFCN to frequency assignment, instead it is calculated with a formula taking an OFFSET parameter which is signaled by a higher layer of the network. The given ARFCNs assume an OFFSET value of 0.

Different modulation modes are used in the GSM mobile radio network. The original GSM modulation is GMSK, with the normal symbol rate (NSR) of approx. 270.833 ksymb/s (exact: 1625/6 ksymb/s). This corresponds to a bit rate of 270.833 kbit/s. The details are specified in "3GPP TS 45.004", Chapter 2.

The 8PSK (Phase Shift Keying) modulation, which is used within EDGE, was introduced to increase the data rate on the physical link. It uses the same symbol rate (the normal symbol rate) as GMSK (270.833 ksymb/s), but has a bit rate of 3 x 270.833 kbit/s (exact: 812.5 kbit/s).

In this method, three bits represent a symbol. The details are specified in "3GPP TS 45.004", Chapter 3.

The 16QAM and 32QAM (Quadrature Amplitude Modulation) modulation, which are used in EDGE Evolution, were introduced to further increase the data rate on the physical link. They use the normal symbol rate (270.833 ksymb/s), but have bit rates of 4 x 270.833 kbit/s or 5 x 270.833 kbit/s, respectively. The details are specified in "3GPP TS 45.004", Chapter 4.

The QPSK, 16QAM and 32QAM modulation at higher symbol rate, which is used in EDGE Evolution, were introduced to further increase the data rate on the physical link. They use a higher symbol rate (325 ksymb/s), but have bit rates of 2 x 325 kbit/s, 4 x 325 kbit/s or 5 x 325 kbit/s, respectively. The details are specified in "3GPP TS 45.004", Chapter 5.

The figure below shows the modulation spectrum for both GMSK and 8PSK.

Figure 22 GMSK and 8PSK modulation spectrum
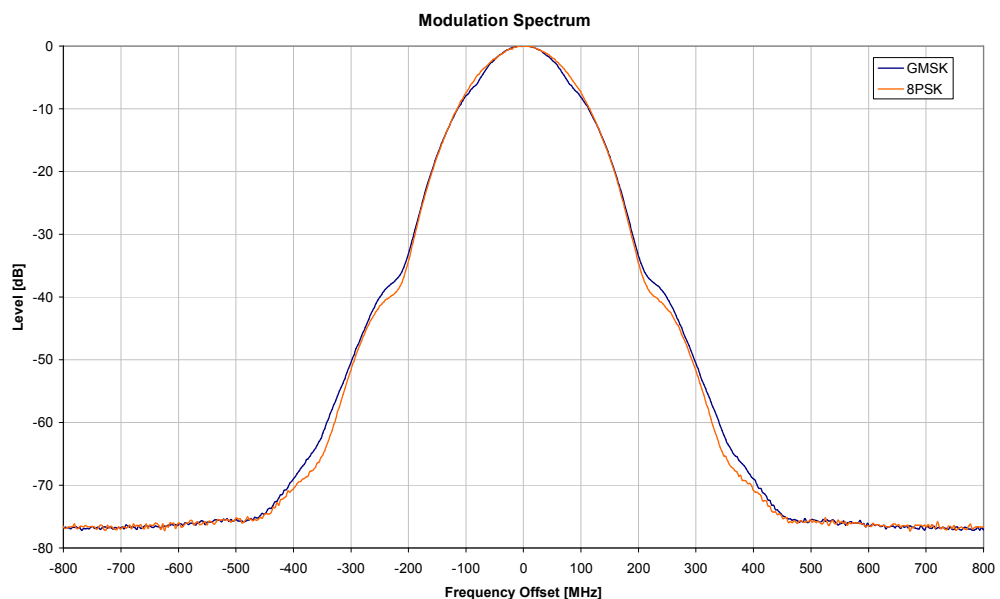
The customers' demand for higher telecommunication speeds increases the demand for bandwidth. Therefore, the GSM standard has to evolve constantly. An example of this development is the introduction of the EDGE / EDGE Evolution specification and the GPRS / EGPRS2 and HSCSD modes.

Until now, each mobile could use only one slot per frame, but the new HSCSD (High Speed Circuit Switched Data) and GPRS (General Packet Radio Service) methods will allow permanent assignment of more than one slot per mobile, plus dynamic utilization of multiple slots.

The concept behind GPRS is dynamic assignment of up to 8 slots to each mobile for data transmission, depending on demand (and availability in the network).

HSCSD allows permanent assignment of up to 4 slots to a mobile.

The modulation modes GMSK, QPSK, 8PSK, 16QAM and 32QAM can be used with either normal or higher symbol rate and different TX filters.

What is significant for the R&S FS-K10 application firmware in this respect is that the mobile can send power on a frequency in more than one slot.

Transducer Factors

Transducer factors (frequency response correction of external components like power splitters, cables or attenuator pads) are not supported within the R&S FS-K10 option.

Trigger Settings

The GMS measurements can be performed in "Free Run" (untriggered) mode, however, an external trigger or a power trigger can speed up measurements. To perform measurements the R&S FS-K10 needs the frame start as a time reference. The R&S FS-K10 searches for a frame start after every I/Q data capture. The required search effort depends on the trigger mode.

Note the following trigger mode settings:

- In **Free Run** mode, i.e. without any trigger, the application totally relies on the frame / slot configuration to find the frame start. The start of a measurement is not triggered. Once a measurement is completed, another is started immediately. For an unambiguous frame configuration, the application searches for the frame start inside the captured I/Q data. This is the slowest frame search mode.
- With a **Power Trigger**, the measurement is triggered by the power ramp of the received GSM bursts. Nevertheless the GSM application still relies on the frame/slot configuration to find the frame start inside the captured I/Q data. Once a measurement is completed, the GSM application waits for the next trigger event to start the next measurement. The search for the frame start is as in "Free Run" mode, except that I/Q capture is triggered.
- With an **External Trigger**, the measurement is triggered by an external signal (connected to the "EXT TRIGGER" input of the R&S FSQ). The GSM application assumes that the frame start directly follows the trigger event. An external trigger requires a correct setting of the trigger offset. The search is faster compared to the free run and power trigger modes. Use an external trigger to maximize the measurement speed or if the frame configuration is ambiguous (i.e. if the slot properties are cyclic with a cycle less than the frame duration).

Refer to section "General Settings Dialog" to learn more about appropriate trigger settings and the frame/slot configuration. Refer to section "Auto Set tab" to learn more about auto setting the trigger offset.

Slot Level Settings

In a multi-slot configuration, every slot can have different parameters. For example, the burst type and the slot level can differ. The slot level plays an important role. On the one hand, the expected slot level is defined by the power control level (PCL) parameters and is used to select the limit line mask. On the other hand, the measured slot level is used to position the limit mask in the "Power vs Time" measurement.

For clarification, the slot level parameter equations are given below.

For **Mobiles (MS)**, the expected slot level can be calculated as follows:

SlotLevel(n) [dBm] = PCLNominal(n) [dBm]

where

n	stands for the slot number in the range from 0 to 7
PCLNominal(n)	is the nominal slot power which depends the PCL of the slot and the frequency band

For **Base Transceiver Stations** (BTS), the expected slot level can be calculated as follows:

SlotLevel(n) [dBm] =

MaximumOutputPower(n) [dBm]

*- 2 * StaticPCL [dB]*

*- 2 * DynamicPCL(n) [dB]*

where

n	stands for the slot number in the range from 0 to 7.
MaximumOutputPower(n)	is the maximum output power for the given power class, frequency band and modulation of the slot
StaticPCL	is an attenuation factor specific for the BTS (equal for all slots)
DynamicPCL(n)	is an attenuation factor specific for each individual slot

Refer to section "Demod tab" and section "Burst" to learn more about the frame and slot parameters.

3.2.1.2   Defining the Scope of the Measurement

Within this measurement interval (defined by "First Slot to Measure" and "Number of Slots to measure"), a single slot ("Slot to Measure") is selected for a more detailed analysis (e.g. "Modulation Accuracy" measurement). The "Slot to Measure" provides:

- The reference power and time reference for the "Power vs Time" measurement. The masks for all slots are time-aligned according to the timing of the "Slot to Measure".
- The results of all "Modulation Spectrum" diagrams are based on the "Slot to Measure". (The results of all "Transient Spectrum" diagrams are based on the slot scope, i.e. on the interval defined by the "First Slot to Measure" and the "Number of Slots to measure").
- All results that require demodulation of one slot and their statistical analysis (e.g. "Modulation Accuracy", "Phase Error vs Time", and "EVM vs Time").

Figure 23 Concept of "First Slot to measure", "Number of Slots to measure" and "Slot to Measure"
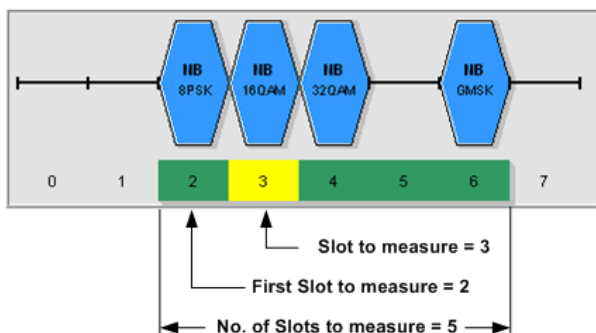
The measurement interval is set in the "Demod tab" of the "Baseband Analog"

Input Impedance
IQ Path
Balanced
Low Passs
Dither

Input Impedance

Allows the selection of the impedance of the baseband inputs (R%S FSQ-B71). Either 50 Ω or 1 MΩ can be selected. The Input Impedance parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:IMP LOW

IQ Path

This parameter is set to "I+j*Q" and can not be changed. Use the parameter Swap IQ if the I and Q cables are interchanged.

The IQ Path parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:TYPE IQ

Balanced

Switches the baseband inputs between symmetrically (balanced) and asymmetrical (unbalanced).

The *Balanced* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:BAL ON

Low Pass

When switched on the *Low Pass* parameter specifies that an analog anti-aliasing filter is internally applied to all the IQ inputs.

The filter must be turned on if there might be frequency components (harmonics) above about 40 MHz.

The amplitude and phase equalized single sided bandwidth of the analog Baseband inputs is for

- Low pass On: 30 MHz
- Low pass Off: 36 MHz

The *Low Pass* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:LPAS ON

Dither

When switched on the *Dither* parameter specifies that a 2 MHz wide noise signal at 42.67 MHz is injected into the signal path of the analog baseband input. It appears in the spectrum at 38.92 MHz.

The dither signal distinctly improves the linearity of the A/D converter at very low signal levels (low drive level at the A/D converter) and thus the accuracy of the level displayed.

The *Dither* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:DITH ON

Meas Settings Dialog" dialog, and it is visualized above by a green border and the parameter "Slot to Measure" is visualized by a filled green box (see figure below).
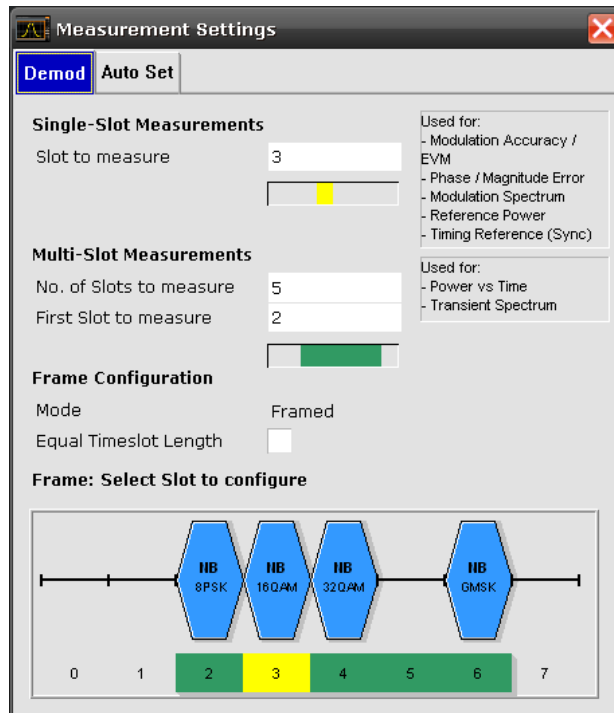
3.2.1.3   Overview of Filters

The K10 measurement application requires a number of filters for different stages of the signal processing process. These include the **Multi Carrier Filter** (for Multi Carrier base station measurements only), the **Power vs Time Filter** and the **Measurement Filter**. A signal flow diagram is shown below in Figure 24 to illustrate where the different filters are used.

Figure 24 Signal flow diagram highlighting filtering operations.
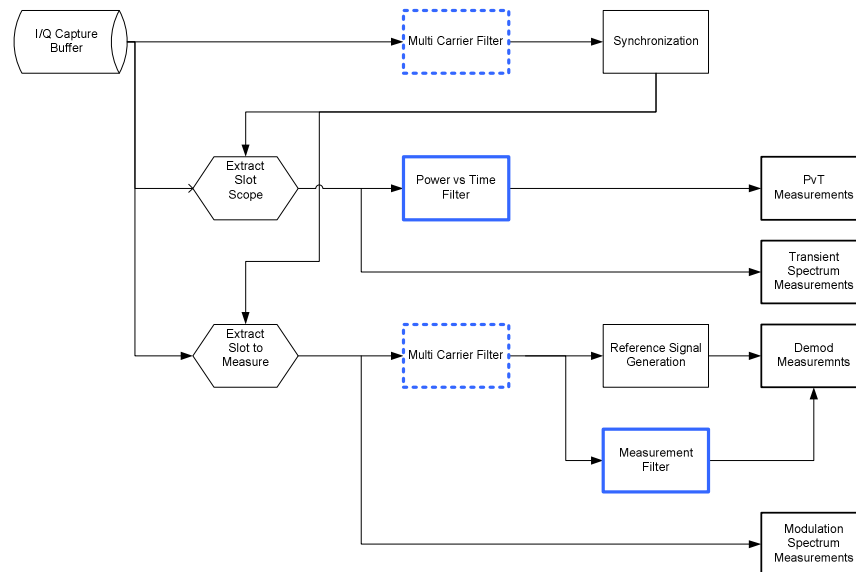
Multi Carrier Filter

The Multi Carrier Filter is only applied to the captured data if the "Multi Carrier BTS" option is checked (see Meas Settings Dialog; Multi Carrier tab). This filter is used to suppress neighboring channels which may disturb measurement of the channel of interest. The output from the Multi Carrier Filter is used to perform synchronization and demodulation. This filter is **not** applied for Power vs Time or Spectrum Measurements. For suppression of neighboring channels in the Power vs Time measurement, see PvT Filter. The Frequency Response of the Multi Carrier Filter is shown in Figure 25.

Figure 25 Frequency Respone of the Multi Carrier Filter

Magnitude Response of the Multi Carrier Filter
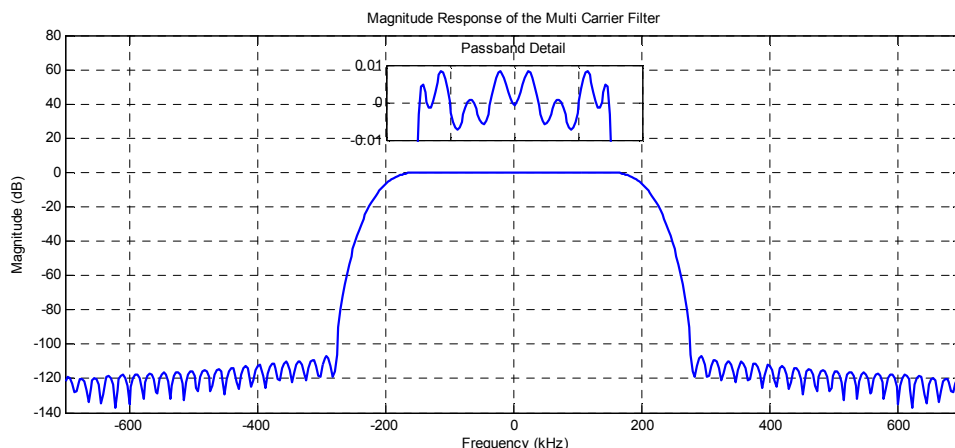
Power vs Time Filter

The Power vs Time Filter is used to suppress out-of-band interference in the Power vs Time measurement. There are five possible filters available:

- 1 MHz Gauss
- 500 kHz Gauss
- 600 kHz
- 400 kHz MC
- 300 kHz MC

The last two "MC" filters are only available for Multi Carrier BTS measurements, i.e. if the "Multi Carrier BTS" option is selected. The magnitude and step responses of the different Power vs Time Filters are shown in Figure 26 and Figure 27 respectively. In general, the smaller the filter bandwidth, the worse the step response becomes (in terms of "ringing" effects) and the better the suppression of interference at higher frequencies. Gaussian type filters are especially useful for signals with "sharp" edges as the step response does not exhibit overshoot.

Figure 26 Magnitude Response of the Power vs Time Filters
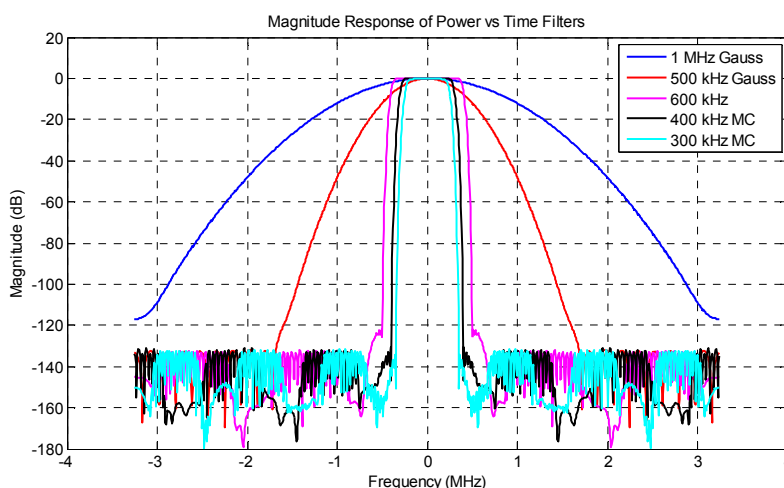
Figure 27 Step Response of the Power vs Time Filters"
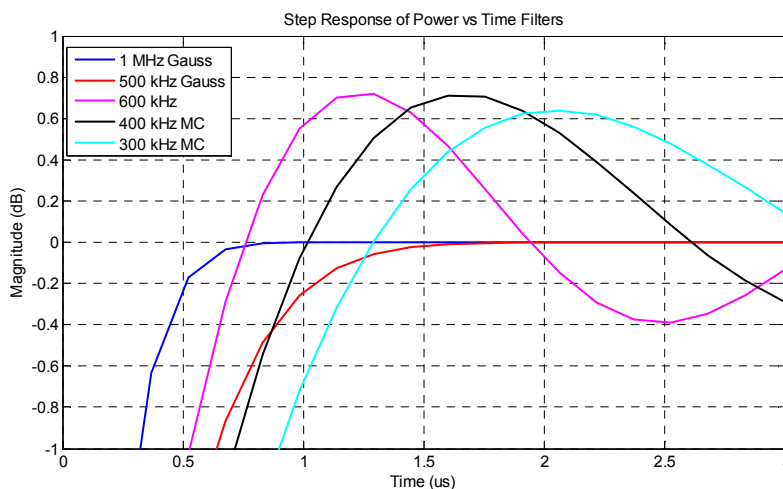
Measurement Filter

The measurement filter is used to limit the bandwidth of the demodulation measurements and is described in the 3GPP Standard document TS 45.005 V8.5.0 (2009-05) for QPSK, 8PSK, 16QAM and 32QAM as follows:

- a raised-cosine filter with roll-off 0.25 and single side-band 6 dB bandwidth 90 kHz for normal symbol rate and for higher symbol-rate using [narrow] bandwidth pulse-shaping filter.
- a raised-cosine filter with roll-off [0.25] and single side-band 6 dB bandwidth [108] kHz for higher symbol-rate using [wide] bandwidth pulse-shaping filter.

In addition to these filters, a measurement filter for GMSK is used in the K10 option, to limit the effects of out-of-band interference due to the high sampling rate of 6.5 MHz which is used. The magnitude responses of all the Measurement Filters are shown in Figure 28.

Figure 28 Magnitude Responses of Measurement Filters for Demodulation Measurements in K10
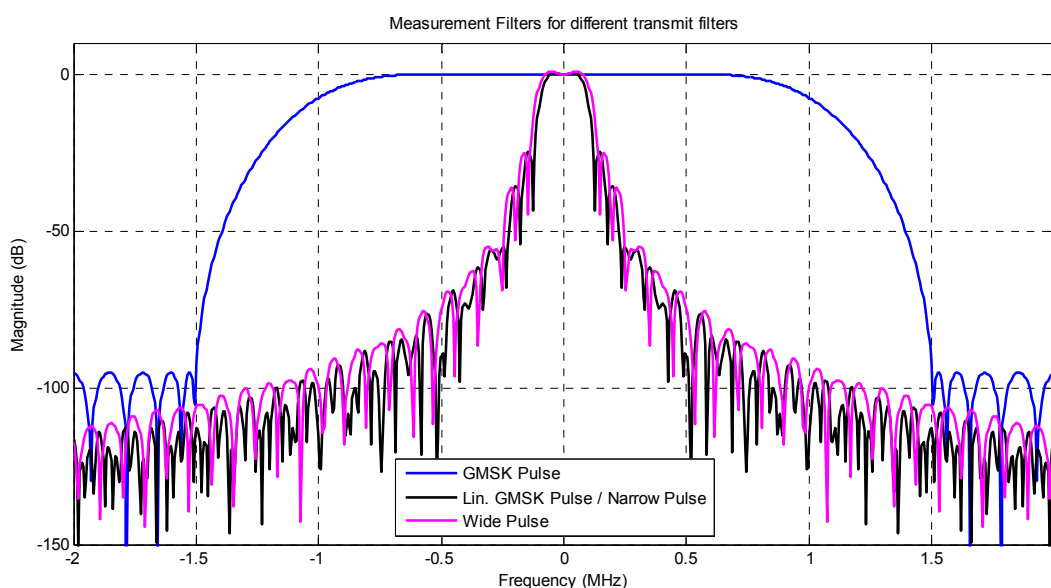
3.2.1.4 GSM Timing

Definition of the Symbol Period

GMSK Modulation (Normal Symbol Rate)

The GMSK frequency pulse is defined in the standard document "3GPP TS 45.004" as a Gaussian pulse convolved with a rectangular pulse, as illustrated in the upper plot of Figure 1. With the frequency pulse denoted g(t), the phase of a GMSK signal due to a sequence of symbols { α_i } is defined in the standard as:

$$\varphi(t') = \sum_i \alpha_i \, \pi \, h \int_{-\infty}^{t'-iT} g(u) \, du$$

where T is the normal symbol period **,** and the modulating index h is chosen such that the maximum phase change of $\pi/2$ radians per data interval is achieved.

Note that the standard specifies:

"The time reference t' = 0 is the start of the active part of the burst as shown in figure 1. This is also the start of the bit period of bit number 0 (the first tail bit) as defined in 3GPP TS 45.002."

The phase change due to the first tail symbol is illustrated in the lower plot of Figure 29, where it can be seen that the "decision instant" corresponding to the center of the frequency pulse occurs at the beginning of the first symbol period, i.e. at $t' = 0$.

Figure 29 GMSK Frequency Pulse (top) and phase of the first tail symbol (bottom)
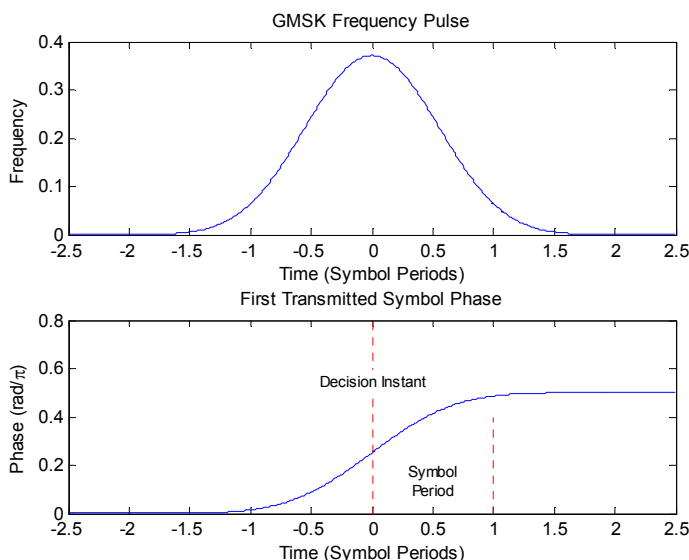
8PSK, 16QAM and 32QAM Modulation (Normal Symbol Rate)

The EDGE transmit pulse is defined in the standard document "3GPP TS 45.004" as a linearised GMSK pulse , as illustrated in the upper plot of Figure 30. Note that according to the definition in the standard, the center of the pulse occurs at 2.5 T, where T is the normal symbol period . With the transmit pulse denoted $c_0(t)$, the baseband signal due to a sequence of symbols { $\hat{s}_i$ } is defined in the standard as

$$y(t') = \sum_i \hat{s}_i \cdot c_0 (t' - iT + 2T)$$

Note that the standard specifies:

"time reference t' = 0 is the start of the active part of the burst as shown in figure 3. This is also the start of the symbol period of symbol number 0 (containing the first tail bit) as defined in 3GPP TS 45.002."

The transmitted pulse for the first tail symbol is illustrated in the lower part of Figure 30, where it can be seen that the "decision instant" corresponding to the center of the transmit pulse occurs in the center of the first symbol period, i.e. at $t' = 0.5T$.

Figure 30 EDGE transmit pulse (top) and the first transmitted symbol (bottom)
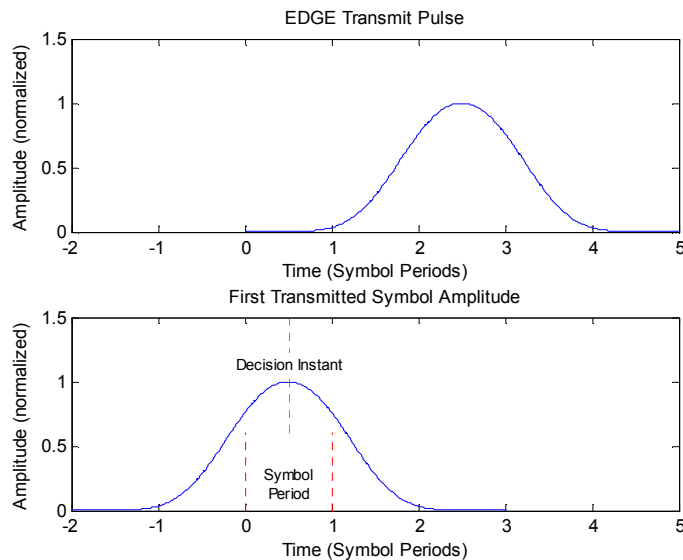
Note: the description above also applies to the 16QAM and 32QAM modulations defined for EDGE Evolution, using the "normal" symbol rate.

QPSK, 16QAM and 32QAM Modulation (Higher Symbol Rate)

For the newer "reduced" symbol period (higher symbol rate) the standard document "3GPP TS 45.004" defines two transmit pulse shapes; the so-called "narrow" and "wide" pulses. The narrow pulse is the same linearised GMSK pulse as discussed in Section 2.2, while the wide pulse was designed based on a numerically optimized set of discrete filter coefficients. Both narrow and wide pulse shapes are illustrated in the upper plot of Figure 31, where you can see that the center of the pulse occurs at 3T, with T being the reduced symbol period. Let us denote the transmit pulse by $c(t)$ (which may be either the narrow or wide pulse), then for a sequence of symbols $\{\hat{s}_i\}$ the transmitted signal is defined in the standard as

$$y(t') = \sum_i \hat{s}_i \cdot c(t' - iT + 2.5T)$$

Note that the standard specifies:

"The time reference t' = 0 is the start of the active part of the burst as shown in figure 3. This is also the start of the symbol period of symbol number 0 (containing the first tail bit) as defined in 3GPP TS 45.002."

The transmitted pulse for the first tail symbol is illustrated in the lower part of Figure 31, where you can see that the "decision instant" corresponding to the center of the transmit pulse occurs in the center of the first symbol period, i.e. at $t' = 0.5T$.

Figure 31 EDGE Evolution transmit pulses (top) and the first transmitted symbols (bottom)
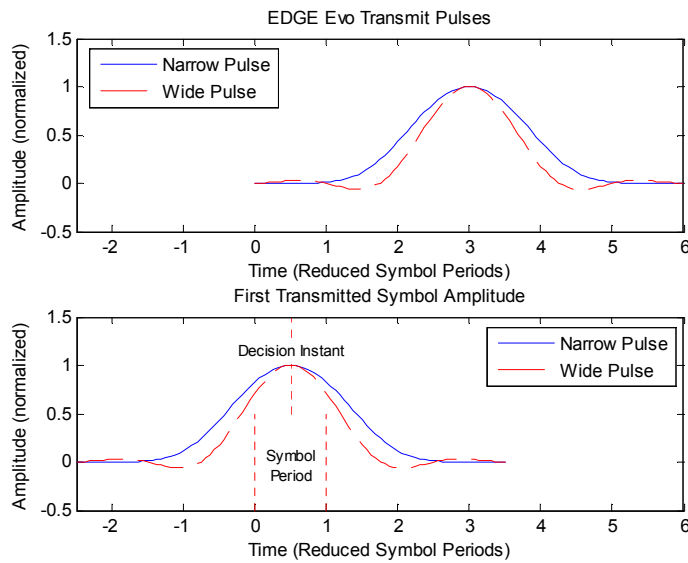
Timeslot Alignment

Reference Time

The definition of a "reference time" is necessary for the following description of timeslot alignment. In the standard document "3GPP TS 5.010", in Section 5.7 it is stated that:

> "Irrespective of the symbol duration used, the center of the training sequence shall occur at the same point in time. "

This is illustrated in Figure 5.7.3 of the standard document "3GPP TS 45.010" which is reproduced below for convenience: Due to this requirement, the "middle of midamble" or "center of Active Part" shall be used as the reference time when specifying timeslot alignment. Additionally, the "middle of midamble" is used for the alignment of the Power vs Time limit masks (see also "Limit Time Alignment" parameter).

Figure 32 Timing alignment between normal symbol period and reduced symbol period bursts
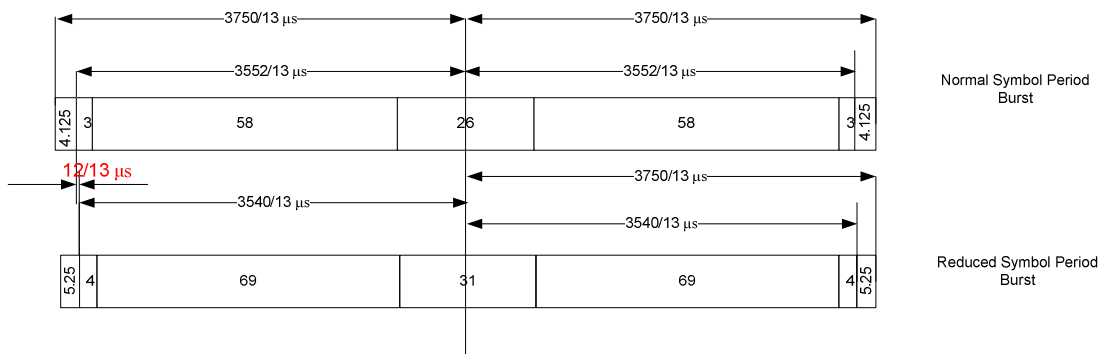
Following the previous description in Section 2, the middle of midamble can be defined with respect to symbol periods and symbol decision instants. This is illustrated in Figure 33. You can see that for normal symbol period bursts (Normal bursts), the middle of midamble for GMSK occurs exactly at the decision instant of symbol 74. However, for EDGE it occurs between the decision instants of symbols 73 and 74, while for reduced symbol period bursts (Higher Symbol Rate bursts), it occurs exactly at the decision instant of symbol 88.

Figure 33 Middle of midamble for normal and reduced symbol period bursts
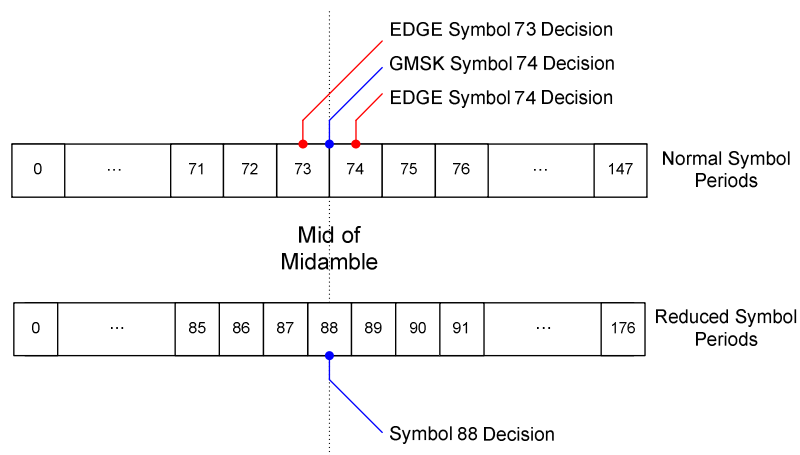
Timeslot Alignment

The standard document "3GPP TS 45.010" provides details on the alignment of slots within the GSM frame:

> "Optionally, the BTS may use a timeslot length of 157 normal symbol periods on timeslots with TN = 0 and 4, and 156 normal symbol periods on timeslots with TN = 1, 2, 3, 5, 6, 7, rather than 156.25 normal symbol periods on all timeslots"

The alignment of slots therefore falls under the "Not Equal Timeslot Length" (Equal Timeslot Length = off) or the "Equal Timeslot Length" (Equal Timeslot Length = on) criterion, which are illustrated in Figure 34.

Figure 34 "Not equal"(top) and "equal" (bottom) timeslot length criteria.
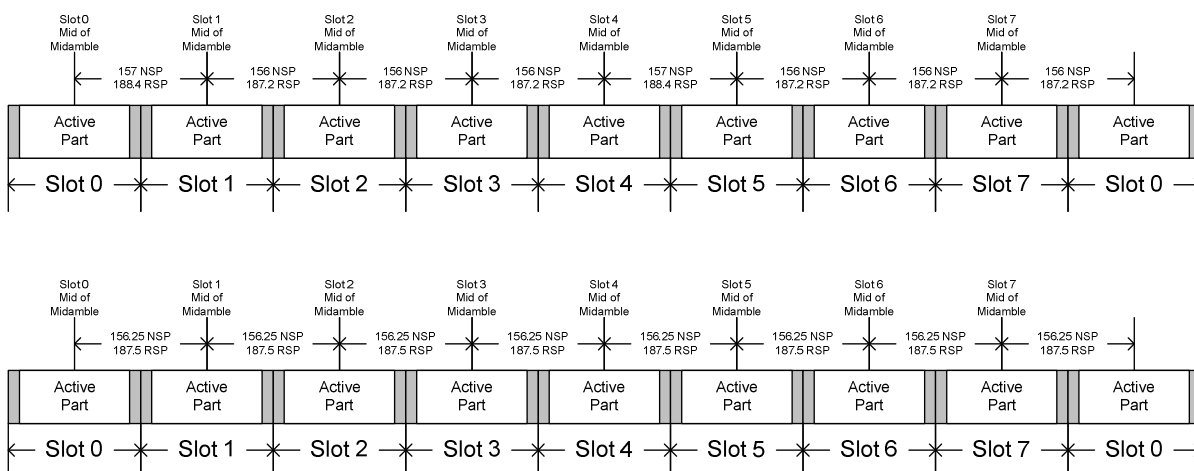
Note that, since the reference point at the "middle of midamble" of each slot must coincide, the length of the guard interval between successive bursts will depend on both the timeslot length and the symbol rate of bursts in successive slots. As stated in the standard "3GPP TS 45.010", for the "Equal Timeslot Length" case:

"… if there is a pair of different symbol period bursts on adjacent timeslots, then the guard period between the two bursts shall be 8.5 normal symbol periods which equals 10.2 reduced symbol periods."

For the "Not Equal Timeslot Length" case, deriving the guard interval length is somewhat more complicated, and the possible values are summarized in Table 5.7.2 of "3GPP TS 45.010", reproduced below as Table 2, for convenience:

Table 2 Guard period lengths between different timeslots.

Burst Transition	Guard Period Between Timeslots (In terms of normal symbol periods)		Guard Period Between Timeslots (In terms of reduced symbol periods)	
	TS0 and TS1 or TS4 and TS5	Any other timeslot pair	TS0 and TS1 or TS4 and TS5	Any other timeslot pair
normal symbol period to normal symbol period	9	8	10.8	9.6
normal symbol period to reduced symbol period	9.25	8.25	11.1	9.9
reduced symbol period to normal symbol period	9.25	8.25	11.1	9.9
reduced symbol period to reduced symbol period	9.5	8.5	11.4	10.2

3.3 Softkeys of the Main Menu

The following table shows all softkeys available in the main menu of the GSM / EDGE and EDGE Evolution Measurement Application.

Pressing the *GSM & EVO* hotkey or the MEAS key opens a submenu containing the following softkeys:

General Settings
Baseband Analog
Measurement Settings Dialog
Demod >
PvT >
Spectrum >
Wide Spectrum

3.3.1 General Settings Dialog

Opens the "General Settings" dialog box to modify the following groups of parameters.

3.3.1.1 Primary Settings tab

To modify primary settings in more detail (e.g. to meet special measurement requirements), modify the values for this group of parameters.

```
CONFigure:MS:DEVice:TYPE BTSNormal

CONFigure:MS:NETWork:TYPE EGSM
CONFigure:MS:NETWork:FREQuency:BAND 900
SENSe1:FREQuency:CENTer 935 MHz
CONFigure:MS:ARFCn 0

DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel 40 DBM
CONFigure:MS:POWer:AUTO OFF

DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel:OFFSet 40 DB
CONFigure:MS:POWer:CLASs 1
CONFigure:MS:POWer:STATic 6


n.a.
SENSe1:SWEep:TIME 100 MS
CONFigure:MS:SYNC:MODE ALL
CONFigure:MS:SYNC:ONLY ON
TRIGger1:SEQuence:SOURce EXTernal
TRIGger1:SEQuence:HOLDoff 576.92 US
SENSe1:SWEep:COUNt 20
```

General Settings

Primary Settings | Advanced Settings

Device Under Test
Type   BTS Normal

Signal Characteristics
Frequency Band   E-GSM 900
Frequency   935 MHz
ARFCN   0

Level Settings
Reference Level   Auto   40 dBm
External Atten.   40 dB
Power Class   1
Static PCL   6

Capture Settings
Signal Source   RF Input
Capture Time   100 ms
Synchronization   Burst + TSC
Measure only on Sync   ✓
Trigger Mode   External
Trigger Offset   576.92 µs   1 slots
Statistic Count   20

Device Under Test
Signal Characteristics
Level Settings
Capture Settings
Advanced Settings

Device Under Test

To change the type of device under test (DUT), enter one of the following types:

- BTS Normal
- BTS Micro
- BTS Pico
- MS Normal
- MS Small

The default device type is "BTS Normal".

  Remote: CONF:DEV:TYPE BTSN

Signal Characteristics

To change the signal characteristics, modify the values for this group of parameters.

  Frequency Band
  Frequency
  ARFCN

Frequency Band

The following frequency bands are supported:

- T-GSM 380
- T-GSM 410
- GSM 450
- GSM 480
- GSM 710
- GSM 750
- T-GSM 810
- GSM 850
- P-GSM 900
- E-GSM 900
- R-GSM 900
- T-GSM 900
- DCS 1800
- PCS 1900

The default frequency band is E-GSM 900.

Remote: CONF:NETW GSM
Remote: CONF:NETW:FREQ:BAND 450

Frequency

Specifies the center frequency of the signal to be measured. If the frequency is modified, the "ARFCN" is updated accordingly (see ARFCN).

For details refer to the "CENTER" softkey description in the R&S FSx operating manual.

Remote: SENS:FREQ:CENT 5 MHZ

ARFCN

To set the Absolute Radio Frequency Channel Number (ARFCN), enter the desired number in this field. Setting the ARFCN will update the Frequency.

Possible values are in the range from 0 to 1023, however, some values may not be allowed depending on the selected frequency band.

Remote: CONF:ARFC 259

Level Settings

To change the level settings, modify the values for this group of parameters.

| Ref. Level |
| External Attenuation |
| Power Class |
| Static PCL |

Ref. Level

Opens an edit dialog box to enter the reference level in the currently active unit (dBm)

Activate the checkbox for continuous auto levelling.

The reference level value is the maximum value the AD converter can handle without distortion of the measured value. Signal levels above this value will not be measured correctly, which is indicated by the "IFOVL" status display.

Remote: DISP:WIND:TRAC:Y:SCAL:RLEV:RF

Remote: CONF:MS:POW:AUTO ON

External Attenuation

Specifies the external attenuation or gain applied to the RF signal. A positive value indicates attenuation, a negative value indicates gain. Displayed power level values are shifted by this value. For details refer to the "REF LEVEL OFFSET" softkey description in the R&S FSx operating manual.

This parameter is not aviailable for signals from the analog baseband inputs (option R&S FSQ-B70).

Remote: DISP:WIND1:TRAC1:Y:SCAL:RLEV:OFFS 10dB

Power Class

The following power classes are supported:

● 1, …, 8 (BTS)
● 1, … ,5 (MS: GMSK)
● E1, E2, E3 (MS: all except GMSK)
● M1, M2, M3 (Micro BTS)
● P1 (Pico BTS)

The default power class is 2.

Remote: CONF:POW:CLAS 1

Static PCL

Static power control level. The maximum output power of a base transceiver station (BTS) is reduced by 2*StaticPCL dB.
Possible values are in the range from 0 to 6. The default is 0.
This parameter is only available if the device type is a BTS.
Also refer to section "Slot Level Settings".

Remote: CONF:POW:STAT 1

Capture Settings

In the "Capture Settings" parameter group the following parameters are available:

Signal Source
Capture Time
Synchronization
Measure only on Sync
Synchronization
Trigger Mode
Trigger Offset
Statistic Count

Signal Source

The following signal source is supported:

- RF Input
- Baseband Analog (Option R&S FSQ-B71 basenad inputs DC to 36 MHz requiered)

Remote: INP:SEL RF

Capture Time

Specifies the time (and therefore the amount of IQ data) to be captured in a single measurement. If the capture time is too short, demodulation will fail. Choose e.g. 100 ms to run a measurement. Here the capture time can be entered in seconds. Alternatively, in the "Advanced Settings", the capture time can be entered in the unit slots.

Remote: SENS:SWE:TIME 10 ms

Synchronization

This parameter sets the synchronization mode of the K10. The following values are available:

- **Burst + TSC:** First search for the power profile (burst search) according to the frame configuration in the capture buffer. Second, inside the found bursts search for the TSC of the 'Slot to measure' as given in the frame configuration.
  'Burst +TSC' typically will be faster than 'TSC' for bursted signals.
- **TSC**: Search the capture buffer for the TSC of the 'Slot to measure' as given in the frame configuration. This mode corresponds to a correlation with the given TSC. This mode can be used for continous (but framed) signals or bursted signals.
- **Burst**: Search for the power profile (burst search) according to the frame configuration in the capture buffer. Note: For 'Burst' no demodulation measurements (e.g. Modulation Accuracy) are not supported. Only Power vs Time,

Modulation Spectrum, Transient Spectrum measurements are supported.

- **None**: Do not synchronize at all. If an external or power trigger is chosen the trigger instant corresponds to the frame start. Hint: Manually asjust the trigger offset to navigate the burst to be analyzed under the mask in the Power vs Time measurement. Note: For 'Nonet' no demodulation measurements (e.g. Modulation Accuracy) are not supported. Only Power vs Time, Modulation Spectrum, Transient Spectrum measurements are supported.

Remote: CONF:MS:SYNC:MODE ALL

Measure only on Sync

If activated only results from frames (slots) where the 'Slot to measure' was found are displayed and taken into account in the averaging of the results. The behavior of this parameter depends on the value of the 'Synchronization' parameter.

Note: This parameter does not affect the "Wide Modulation Spectrum" measurement (see "Wide Modulation Spectrum"

Remote: CONF:MS:SYNC:ONLY ON

Trigger Mode

The following trigger modes are supported:

- Free Run
- External
- Power

The default mode is Free Run.

For further information refer to "Trigger Settings".

Remote: TRIG:SOUR EXT

Trigger Offset

Specifies the time offset between the trigger event (e.g. for an external or power trigger) and the frame start of the GSM signal. The value can be entered either in seconds or in slots. For details refer to the *TRIGGER OFFSET* softkey description in the R&S FSx operating manual and to "Trigger Settings" and "Auto Set tab.

The duration of one GSM slot equals 15/26 ms = 0.576923 ms

The duration of one GSM frame (8 slots) equals 60/13 ms = 4.615384 ms

Remote: TRIG1:SEQ:HOLD 1MS

Statistic Count

In this field, the number of frames to be measured can be set. For measurements on the Slot to Measure, the statistic count corresponds to the number of bursts (slots).

The default value is 200 in accordance with the GSM standard.

Remote: SENS:SWE:COUN 5

3.3.1.2 Advanced Settings tab

To modify advanced settings in more detail (e.g. to meet special measurement requirements), modify the values for this group of parameters.
Depending on the selected signal source the available parameters vary.

```
SENSe1:FREQuency:OFFSet 0 HZ
DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel 40 DBM
INPut1:ATTenuation 10
INPut1:ATTenuation:AUTO ON
INPut1:ATTenuation 10
INPut1:EATT:STATe ON
INPut1:EATT:AUTO ON
INPut1:EATT 0 DB
INPut1:GAIN:STATe OFF
n.a.
n.a.
n.a.
CONFigure:MS:POWer:AUTO:SWEep:TIME 10 MS
TRIGger1:SEQuence:LEVel 1.4 V
TRIGger1:SEQuence:LEVel:IFPower -20 DBM
SENSe1:SWAPiq ON
```

General Settings

Primary Settings | **Advanced Settings**

Advanced Capture Settings - (RF Input)

Frequency Offset	0 Hz	
Ref. Level	40 dBm	
RF Atten.	10 dB	
Mechanical Atten.	Auto	10 dB
El Atten. State	On	
Electrical Atten.	Auto	0 dB
Preamplifier		
Trigger Polarity	..	
IF Pow. Retrig. Holdoff	...	
IF Pow. Retrig. Hysteresis ...		
Auto Track Time	10 ms	17.33 slots
Trigger Level	1.4 V	
Swap IQ		

RF Input

For RF Input, the following parameters are available:

Frequency Offset
Ref. Level
Mechanical Atten
Electrical Atten
Preamplifier
Trigger Level
Auto Track Time
Swap IQ

Frequency Offset

For details refer to the "FREQUENCY OFFSET" softkey description in the R&S FSx operating manual.

Remote: SENS:FREQ:OFFS 5 MHZ

Ref. Level

Opens an edit dialog box to enter the reference level in the currently active unit (dBm).
Activate the checkbox for continuous auto levelling.
The reference level value is the maximum value the AD converter can handle without distortion of the measured value. Signal levels above this value will not be measured correctly, which is indicated by the "IFOVL" status display.

Remote: DISP:WIND:TRAC:Y:SCAL:RLEV RF

Mechanical Atten

To set the mechanical attenuation, edit the following two fields:
- In the MODE dropdown menu, either "Auto" or "Manual" are available. If set to "Auto", the mechanical attenuator is set automatically by the firmware. The default value is "Auto".
- Set the power level of the mechanical attenuator in this field.

Remote: INP:ATT:AUTO ON
Remote: INP:ATT 10DB

Electrical Atten

To set the electrical attenuation, edit the following three fields:
- In the MODE dropdown menu, either "Auto" or "Manual" are available. If set to "Auto", the electrical attenuator is set automatically by the firmware. The default value is "Auto".
- The "Path" dropdown menu activates or deactivates the electrical attenuator.
- Set the power level of the electrical attenuator in this field.

Remote: INP:EATT 10DB
Remote: INP:EATT:AUTO OFF
Remote: INP:EATT:STAT ON

Preamplifier

Use this parameter to activate the preamplifier (option B22 required). For details refer to the "PREAMP" softkey description in the R&S FSx operating manual.

Remote: INP:GAIN:STAT ON

Trigger Level

Specifies the trigger level in Volts / dBm if the K10 is in external / power trigger mode. For details refer to the "Trg / Gate Level" softkey of the base unit and to "Trigger Settings".

Remote: TRIG:LEV:IFP -20 DBM
Remote: TRIG:SEQ:LEV:EXT 1 MV

Auto Track Time

Sets the sweep time for auto level measurements or swept measurements, and the capture time for auto detection. There are separate input fields for the unit seconds and slots.

Remote: CONF:POW:AUTO:SWE:TIME 10 ms

Swap IQ

Swaps the I and Q signals. Swapping I and Q inverts the sideband.

Hint: Try this function if the TSC can not be found.

On	I and Q are exchanged, inverted sideband, Q+j*I
Off	Normal sideband, I+j*Q

Remote: SENS1:SWAP ON

3.3.2 Baseband Analog

Input Impedance
IQ Path
Balanced
Low Pass
Dither

Input Impedance

Allows the selection of the impedance of the baseband inputs (R&S FSQ-B71). Either 50 Ω or 1 MΩ can be selected. The Input Impedance parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:IMP LOW

IQ Path

This parameter is set to "I+j*Q" and can not be changed. Use the parameter Swap IQ if the I and Q cables are interchanged.
The IQ Path parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:TYPE IQ

Balanced

Switches the baseband inputs between symmetrically (balanced) and asymmetrical (unbalanced).
The *Balanced* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:BAL ON

Low Pass

When switched on the *Low Pass* parameter specifies that an analog anti-aliasing filter is internally applied to all the IQ inputs.
The filter must be turned on if there might be frequency components (harmonics) above about 40 MHz.
The amplitude and phase equalized single sided bandwidth of the analog baseband inputs is for

- Low pass = On: 30 MHz
- Low pass = Off: 36 MHz

The *Low Pass* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:LPAS ON

Dither

When switched on the *Dither* parameter specifies that a 2 MHz wide noise signal at 42.67 MHz is injected into the signal path of the analog baseband input. It appears in the spectrum at 38.92 MHz.
The dither signal distinctly improves the linearity of the A/D converter at very low signal levels (low drive level at the A/D converter) and thus the accuracy of the level displayed.

The *Dither* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:DITH ON

3.3.3   Measurement Settings Dialog

Opens the "Measurement Settings" dialog box.
The "Measurement Settings" dialog box consists of the following tabs:

Demod tab
Advanced tab
Multi Carrier tab
Auto Set tab

3.3.3.1   Advanced tab

To modify parameter values related to the Power vs Time, Modulation Spectrum and Transient Spectrum measurements, the following parameter groups are available in the "Advanced" tab.

Power vs Time
Modulation / Transient Spectrum
Synchronization
Demodulation

CONFigure:BURSt:PTEMplate:FILTer G1000

CONFigure:BURSt:PTEMplate:TALign PSLot

CONFigure:SPECtrum:LIMit:LEFT ON

CONFigure:SPECtrum:LIMit:RIGHt ON

SENSe:BANDwidth:RESolution:TYPE P5

CONFigure:MS:SYNC:IQCThreshold 85

CONFigure:MS:DEMod:DECision AUTO

CONFigure:MS:DEMod:STDBits DETected

Power vs Time

In the "Power vs Time" parameter group, the following parameters related to the Power vs Time measurement are available:

PvT Filter
Limit Time Alignment

PvT Filter

The PvT Filter controls the filter used to reduced the measurement bandwidth for single carrier Power vs Time measurements. The parameter is only available if Multi Carrier BTS in the Multi Carrier tab is switched off. Therefore the PvT Filter parameter in the Multi Carrier tab will be ignored in the single carrier case.

The following filters are supported:

- 1 MHz Gauss (default)
- 500 kHz Gauss (backwards compatibility to FS-K5)
- 600 kHz (backwards compatibility to FS-K5)

The PvT filter is optimized to get smooth edges after filtering burst signals. It is not sufficient to suppress adjacent, active channels. Therfore please refer to the Multi Carrier tab and the PvT Filter there.

Remote: `CONF:BURS:PTEM:FILT G1000`

Limit Time Alignment

The Limit Time Alignment controls how the limit lines are aligned in a Power vs Time measurement graph . Limit lines are defined for each slot. The limit lines are time-aligned in each slot, based on the position of the TSC (the center of the TSC is the reference point). This parameter affects how the center of the TSC is determined for each slot:

- **Slot to measure** (default): For each slot the center of the TSC is derived from the measured center of the TSC of the "Slot to measure" and the timeslot lengths specified in the standard (see "Timeslot length" in 3GPP TS 45.010).
- **Per Slot**: For each slot the center of the TSC is measured. This provides reasonable time-alignment if the slot lengths are not according to standard. Note that in this case the "Power vs Time" limit check may show "pass" even if the timeslot lengths are not correct according to the standard.

Remote: `CONF:BURS:PTEM:TAL`

Modulation / Transient Spectrum

In the "Modulation / Transient Spectrum" parameter group, the following parameters related to the , Modulation Spectrum and Transient Spectrum measurements are available:

Enable Left Limit
Enable Right Limit
Filter Type

Enable Left Limit

This parameter controls the left limit check of the spectrum trace (spectrum graph measurement) and which offset frequencies in the table (spectrum list measurement) are checked against the limit. This parameter effects the Modulation Spectrum and Transient Spectrum measurements.

For measurements on multi carrier signals using either the check on the left or right side can be used to measure the spectrum of the left- / right-most channel and to ignore the side where adjacent channels are located.

Remote: CONF:SPEC:LEFT ON

Enable Right Limit

This parameter controls the right limit check of the spectrum trace (spectrum graph measurement) and which offset frequencies in the table (spectrum list measurement) are checked against the limit. This parameter effects the Modulation Spectrum and Transient Spectrum measurements.

For measurements on multi carrier signals using either the check on the left or right side can be used to measure the spectrum of the left- / right-most channel and to ignore the side where adjacent channels are located.

Remote: CONF:SPEC:RIGH ON

Filter Type

This parameter sets the filter type for the resolution filter to "Normal" (3 dB Gauss filter) or a 5-pole (according to the GSM standard) filter for the "Modulation Spectrum", "Transient Spectrum" and "Wide Modulation Spectrum" measurements.

Remote: SENS:BAND:RES:TYPE

Synchronization

| IQ Correlation |
| Demodulation |

IQ Correlation

This threshold determines whether a burst is accepted if Measure only on Sync is activated. If the correlation value between the ideal IQ signal of the given TSC and the measured TSC is below the IQ correlation threshold, then the application reports "Sync not found" in the status bar. Additionally, such bursts are ignored if "Measure only on Sync" is activated.

Note: If the R&S FS-K10 is configured to measure GMSK normal bursts, a threshold below 97% will also accept 8PSK normal bursts (with the same TSC) for analysis. In this case, activate Measure only on Sync and set the IQ Correlation Threshold to 97%. This will exclude the 8PSK normal bursts from the analysis.

Remote: CONF:SYNC:IQCT 0

Demodulation

In the "Demodulation" parameter group, the following parameters related to the Demod measurement are available:

| Symbol Decision |
| Tail & TSC Bits |

Symbol Decision

The symbol decision determines how the symbols are detected in the demodulator.

The setting of this parameter does not effect the demodulation of Normal Bursts with GMSK modulator.

For Normal Bursts with 8PSK, 16QAM, 32QAM or AQPSK modulation or Higher Symbol Rate Bursts with QPSK, 16QAM or 32QAM modulation use this parameter to get a trade-off between performance (symbol error rate of the K10) and measurement speed.

"Auto"   Automatically selects the symbol decision method.

"Linear"   Linear symbol decision: Uses inverse filtering (kind of zero-forcing filter) and a symbol-wise decision method. This method is recommendable to be used for high symbol to noise ratios, but not for Higher Symbol Rate Bursts with the narrow pulse. The inverse filter colors the noise inside the signal bandwidth and therfore is not recommended for narrow-band signals or signals with a low signal to noise ratio. Peaks in the EVM vs Time measurement may occur if the "Linear" symbol decision algorithm fails. In that case use the "Sequence" method. Linear is the fastest option.

"Sequence"   Symbol decision via sequence estimation This method uses an algorithm that minimizes the symbol errors of the entire burst. It requires that the tail bits in the analyzed signal are correct. It has a better performance (lower symbol error rate) compared to the "Linear" method especially at low signal to noise ratios at a price of measurement speed. It is recommended to use this method for Normal Bursts with 16QAM or 32QAM modulation and for Higher Symbol Rate bursts with the narrow pulse.

     Remote: CONF:MS:DEM:DEC SEQ

Tail & TSC Bits

The K10 demodulator requires the bits of the burst (Tail, Data, TSC, Data, Tail) to provide an ideal version of the measured signal.
The "Data" bits can be random and are typically not known inside the demodulator of the K10. "Tail" and "TSC" bits are specified in the burst dialog.
Using the Tail & TSC Bits setting the user can select wether the detected Tail and TSC bits or the standard bits (as set in the Burst dialog) are used for the construction ideal signal. Using the standard bits can be advantageous to veryify whether the device under test sends the correct Tail and TSC bits. Incorrect bits would lead to peaks in the EVM vs Time trace at the positions of the incorrect bits.

"Detected"   Measures Tail and TSC bits (detection during symbol decision) . Take the measured bits to generate the ideal signal. Incorrect Tail and TSC

bits have no effect on the EVM bs Time measurement.

"Standard"   Use standard-specified Tail and TSC bits (as set in the Burst dialog) in the demodulated bit stream and to generate the ideal signal. The measured (detected) bits are replaced. Incorrect Tail and TSC bits do effect the EVM bs Time measurement. Peaks occur at the positions of the incorrect bits.

Remote: CONF:MS:DEM:STDB STD

3.3.3.2 Auto Set tab

Select the parameters to be set automatically when you press the AUTO SET key or "AUTO SET" softkey in this tab. The following parameters are available for auto detection:

| Level |
| Frame Configuration |
| Trigger |

CONFigure:MS:AUTO:LEVel ON →

CONFigure:MS:AUTO:FRAMe ON →

CONFigure:MS:AUTO:TRIGger ON →
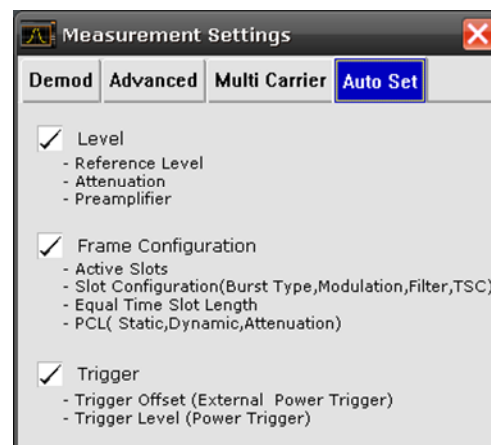
Level

When activated, performs a single auto level measurement when the AUTO SET key is pressed.

Remote: CONF:AUTO:LEV ON | OFF | ONCE

Frame Configuration

When activated, performs a single auto frame configuration measurement when the AUTO SET key is pressed. The auto frame configuration measurement may take a long time, therefore it is deactivated per default. The following parameters are detected and automatically measured:

● Active slots
● Slot configuration (burst type, modulation, filter, TSC)
● Equal time slot length
● PCL (static, dynamic)

The auto frame configuration typically does not work with frequency hopping systems, only if the trigger offset is set correctly. In this case not every frame is populated by a modulated GSM signal. Workaround to use auto frame configuration with a manually set trigger offset:

- Set Synchronization = None
- Manually set the trigger offset in the Power vs Time measurement.
- Set Synchronization back to "Burst + TSC" or "TSC".
- Deactivite the Trigger check box in the Auto Set tab.
- To run the auto frame configuration measurement press the AUTO SET hotkey.

Remote: CONF:AUTO:FRAM ON | OFF | ONCE

Trigger

The following parameters are detected and automatically measured when the AUTO SET key is pressed:

- Trigger Offset (for external and power trigger)
- Trigger Level (for power trigger only)

For details on the parameters refer to "Capture Settings".

Remote: CONF:AUTO:FRAM ON | OFF | ONCE

3.3.3.3 Demod tab

To modify parameter values related to the demodulation and frame / slot configuration, the following parameter groups are available in the "Demod" tab.

| Demodulation Settings |
| Frame Configuration |
| Frame: Select Slot to Configure |

CONFigure:MS:CHANnel:MSLots:MEASure 0 ——→

CONFigure:MS:CHANnel:MSLots:NOFSlots 1 ——→
CONFigure:MS:CHANnel:MSLots:OFFSet 0 ——→

CONFigure:MS:CHANnel:FRAMe:EQUal ON ——→
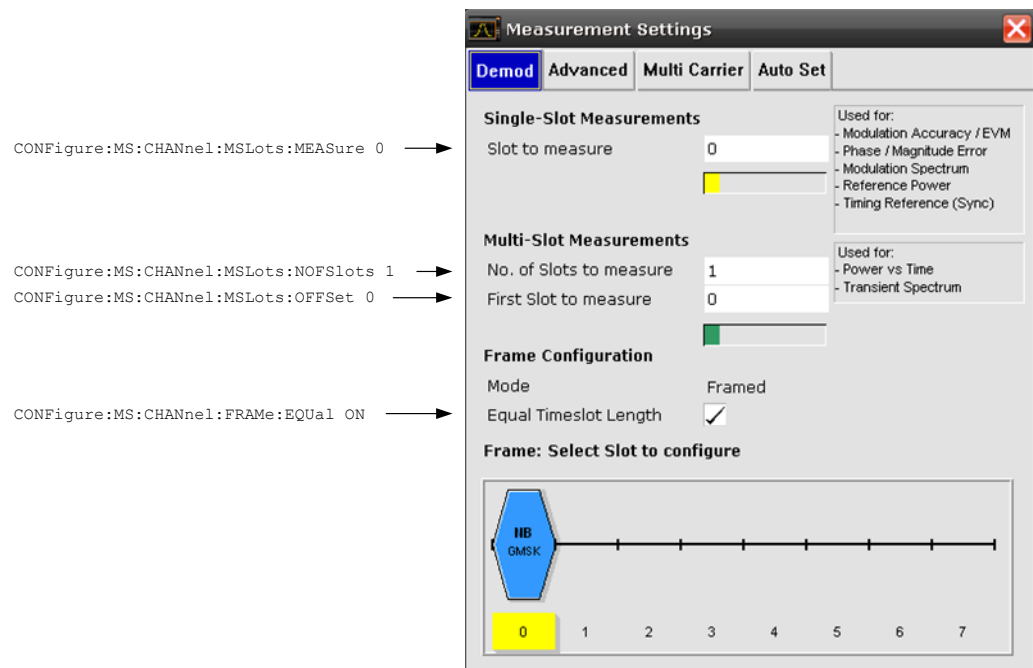
Demodulation Settings

In the "Demodulation Settings" parameter group the following parameters are available:

Slot to Measure
Number of Slots to measure
First Slot to Measure

Slot to Measure

This parameter specifies the slot to be measured in single-slot measurements relative to the GSM frame boundary. The following rule applies:

   $0 \le$ "Slot to Measure" ≤ 7

The "Slot to Measure" is used as the only slot to be measured measurements:

● Modulation Accuracy
● EVM vs Time
● Phase Error vs Time
● Magnitude Error vs Time
● Constellation
● Modulation Spectrum

Furthermore, the "Slot to Measure" is used to measure the reference power for the following measurements:

● Power vs Time
● Modulation Spectrum
● Transient Spectrum

Finally, the "Slot to Measure" is used to measure the position of its TSC, which represents the timing reference for the Power vs Time mask (limit lines) of all slots.

See also "Defining the Scope of the Measurement".

Remote: `CONF:CHAN:MSL:MEAS 4`

Number of Slots to measure

This parameter specifies the "Number of Slots to measure" for the measurement interval of multi-slot measurements, i.e. the "Power vs Time" and "Transient Spectrum" measurements. Between 1 and 8 consecutive slots can be measured.

See also "Defining the Scope of the Measurement".

Remote: `CONF:CHAN:MSL:NOFS 2`

First Slot to Measure

This parameter specifies the start of the measurement interval for mulit-slot measurements, i.e. "Power vs Time" and "Transient Spectrum" measurements, relative to the GSM frame boundary. The following conditions apply:

● "First Slot to measure" ≤ "Slot to Measure"
● "Slot to Measure" ≤ "First Slot to measure" + "Number of Slots to measure" -1

See also "Defining the Scope of the Measurement".

Remote: `CONF:CHAN:MSL:OFF 2`

Frame Configuration

In the "Frame Configuration" parameter group, the following parameter is available:

● Equal Timeslot Length

Equal Timeslot Length

If activated, all slots of a frame have the same length (8 x 156.26 normal symbol periods). If deactivated, slots number 0 and 4 of a frame have a longer duration, all other a shorter duration compared to the 'equal slot length' (157, 156, 156, 156, 157, 156, 156, 156 normal symbol periods). See 3GPP TS 51.021 and 3GPP TS 45.010 chapter "6.7 Timeslot length" for further details. This parameter is used to time adjust the Power vs Time masks of all slots where the 'Slot to measure' is used as the time reference for the entire frame.

Remote: `CONF:CHAN:FRAM:EQU ON`

Frame: Select Slot to Configure

This field shows a graphic representation of the configuration of each slot. Selecting a slot leads to its "Burst" dialog box.

Inside the slot the following information is given:

● The burst type, e.g. Normal (NB) for a normal burst.
● The modulation, e.g. GMSK.

Below the slot symbol, the corresponding slot numbers (0 to 7) are displayed. The frame always starts with slot number 0. The slots beginning with the "First Slot to Measure" and ending with "First Slot to Measure" + "Number of Slots to measure" - 1 are marked with a green box, while the slot specified as the "Slot to Measure" is highlighted in yellow.

The parameters of a specific slot can be edited by putting the focus (blue border) on the slot and pressing the ENTER key. The "Burst" dialog box opens.

Burst

The "Burst" dialog box opens when a single slot is to be configured.

In the title bar of the dialog box the selected slot number is displayed.

```
CONFigure:MS:CHANnel:SLOT0:STATe ON
CONFigure:MS:CHANnel:SLOT0:TYPE NB
CONFigure:MS:CHANnel:SLOT0:PCL 5
CONFigure:MS:CHANnel:SLOT0:MTYPe GMSK
CONFigure:MS:CHANnel:SLOT0:FILTer GMSK
CONFigure:MS:CHANnel:SLOT0:TSC 1
```

Burst @ Slot 0		
Tail 3	Data 58	TSC 26	Data 58	Tail 3	Guard 8.25

Active	✓
Burst Type	Normal (NB)
Dynamic PCL	0
Modulation	GMSK
Filter	GMSK Pulse
TSC	TSC 0
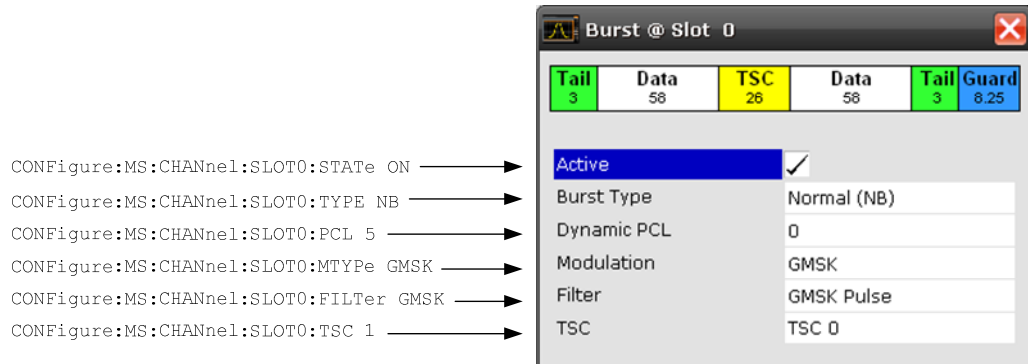
In the dialog box itself the following parameters are available:

Active
Burst Type
PCL
Dynamic PCL
Modulation
Filter
TSC
Multi Carrier tab

Active

Activates or deactivates the selected slot.

Remote: CONF:CHAN:SLOT1 ON

Burst Type

Assigns a burst type to the selected slot. The following burst types are supported:

- Normal (NB)
- Higher Symbol Rate (HB)

Remote: CONF:CHAN:SLOT1:TYPE NB

PCL

Specifies the attenuation of the power control level (PCL) of the slot. The values are used for synchronization purposes and for the "Power vs Time" mask selection.

The parameter is only available if the "Device Type" (s. Device Under Test) is set to MS Normal or MS Small.

Also refer to section "Slot Level Settings".

Remote: CONF:MS:CHAN:SLOT1:PCL 4

Dynamic PCL

Dynamic power control level. The slot power of a base transceiver station (BTS) is reduced by 2*DynamicPCL dB.
Possible values are in the range from 0 to 15. The default is 0.
This parameter is only available if the "Device Type" (s. Device Under Test) is a BTS.

Also refer to section "Slot Level Settings".

Remote: CONF:CHAN:SLOT:PCL 4

Modulation

Select the modulation to be used in the slot. The available selections depend on the burst type. The following modulation types are supported:

- GMSK
- QPSK
- 8PSK
- 16QAM
- 32QAM

Remote: CONF:CHAN:SLOT1:MTYP GMSK

Filter

Specifies the pulse shape of the modulator. The following filter types are supported:

- GMSK Pulse
- Linearised GMSK Pulse
- Narrow Pulse
- Wide Pulse

Remote: CONF:CHAN:SLOT1:FILT GMSK

TSC

Select the training sequence of a single slot. The name of the parameter and the possible selections depend on the selected burst type.

For Normal bursts, the parameter is called TSC, and the following selections are supported:

● TSC 0, … , TSC 7

The predefined training sequences comply with the GSM standard.

Remote: CONF:MS:CHAN:SLOT1:TSC 2

3.3.3.4 Multi Carrier tab

To modify parameter values related to measurements on multi carrier base stations, the following parameters are available in the "Multi Carrier" tab.

Multi Carrier BTS
No. of active Carriers
BTS Class
PvT Filter

CONFigure:MS:MCARrier:MCBTs ON

CONFigure:MS:MCARrier:ACTCarriers 1

CONFigure:MS:MCARrier:BTSClass 1

CONFigure:MS:MCARrier:FILTer MC400
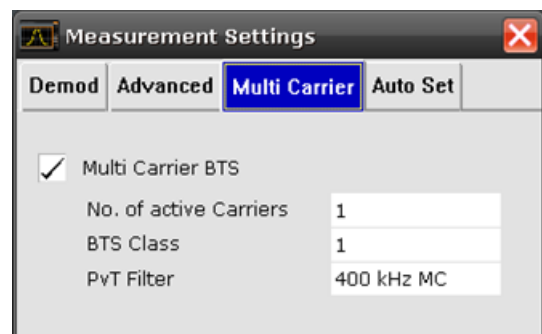
Multi Carrier BTS

This parameter tells the K10 that the measured signal is a multi carrier signal. The parameter is only available if the Device Type in the General Settings dialog is a BTS type.

Activating this checkbox has the following effects:

● An additional **multi carrier filter** is switched into the demodulation path of the K10. This filter is for example able to suppress up tp six adjacent channels with a channel spacing of 600 kHz from the measured channel (at the set center frequency) and 30 dB higher power compared to the measured channel. This filter is also taken into account during the generation of the ideal (reference) signal in order to get meaningful EVM values (Otherwise there would be an increase in EVM because the measured signal has a smaller bandwidth compared to the reference signal).
● Additional multi carrier parameter become available.

Remote: CONF:MS:MCAR:MCBT ON

No. of active Carriers

Specifies the total number of active carriers of the multi-carrier BTS to be measured. Its value affects the calculation of the limits according to the 3GPP standard for the modulation spectrum measurement, see 3GPP2 TS 45.005 (chapter 4.2.1. "Spectrum due to modulation and wide band noise"). The limit is changed by 10*log(N).

Currently this parameter is ignored.

Remote: CONF:MS:MCAR:ACTC 1

BTS Class

Defines the base station class. The specified BTS Class effects the calculation of the limits according to the 3GPP standard for the modulation spectrum measurement, see 3GPP2 TS 45.005 (chapter 4.2.1. "Spectrum due to modulation and wide band noise" and chapter 4.3.2 "Base Transceiver Station", search for "Multicarrier BTS").

Remote: CONF:MS:MCAR:BTSC 1

PvT Filter

The PvT Filter controls the filter used to reduced the measurement bandwidth for multi-carrier Power vs Time measurements. The PvT Filter parameter in the Advanced tab will be ignored in the multi carrier BTS case. The following filters are supported:

- **400 kHz MC** (default): Recommended for measurements with multi channels of equal power.
- **300 kHz MC:** Recommended for measurement scenarios where a total of six channels is active and the channel to be measured has a reduced power (e.g. 30 dB) compared to its adjacent channels.

The PvT filter is optimized to get smooth edges after filtering burst signals and to suppress adjacent, active channels.

Remote: CONF:MS:MCAR:FILT MC400

Demod

Opens a demodulation submenu containing the following softkeys.

General Settings
Measurement Settings
Modulation Accuracy
Phase Error
EVM
Magnitude Error
Constell
R&S Support

The **Demod** its submenu is only available if the parameter 'Synchronization' in the Primary tab of the General Settings dialog is either 'Burst +TSC' or 'TSC'.

General Settings

For details refer to the "General Settings" softkey in the root menu of the GSM / EDGE and EDGE Evolution application.

Measurement Settings

For details refer to the "Baseband Analog"

Input Impedance
IQ Path
Balanced
Low Pass
Dither

Input Impedance

Allows the selection of the impedance of the baseband inputs (R%S FSQ-B71). Either 50 Ω or 1 M can be selected.The Input Impedance parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: `INP:IQ:IMP LOW`

IQ Path

This parameter is set to "I+j*Q" and can not be changed. Use the parameter Swap IQ if the I and Q cables are interchanged.
The IQ Path parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: `INP:IQ:TYPE IQ`

Balanced

Switches the baseband inputs between symmetrically (balanced) and asymmetrical (unbalanced).
The *Balanced* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: `INP:IQ:BAL ON`

Low Pass

When switched on the *Low Pass* parameter specifies that an analog anti-aliasing filter is internally applied to all the IQ inputs.

The filter must be turned on if there might be frequency components (harmonics) above about 40 MHz.

The amplitude and phase equalized single sided bandwidth of the analog Baseband inputs is for

● Low pass On: 30 MHz
● Low pass Off: 36 MHz

The *Low Pass* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: `SENS:IQ:LPAS ON`

Dither

When switched on the *Dither* parameter specifies that a 2 MHz wide noise signal at 42.67 MHz is injected into the signal path of the analog baseband input. It appears in the spectrum at 38.92 MHz.

The dither signal distinctly improves the linearity of the A/D converter at very low signal levels (low drive level at the A/D converter) and thus the accuracy of the level displayed.

The *Dither* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:DITH ON

Meas Settings " softkey in the root menu of the GSM / EDGE and EDGE Evolution application.

Modulation Accuracy

Starts the Modulation Accuracy measurement.

For details on the measurement refer to "Modulation Accuracy".

Remote: CONF:BURS:MACC

Phase Error

Starts either the "Phase Error vs Time" measurement. For details on the measurements refer to "Phase Error vs Time".

Remote: CONF:BURS:PFER

EVM

Starts either the "EVM vs Time" measurement. For details on the measurements refer to "EVM vs Time".

 Remote: CONF:BURS:ETIM

Magnitude Error

Starts the magnitude error measurement.

Remote: CONF:BURS:MERR

Constell

Starts the constellation measurement.
For details on the measurement refer to "Constellation".

Remote: CONF:BURS:CONS

PvT

Starts the "Power vs Time" measurement and opens a submenu containing the following softkeys:

General Settings

Measurement Settings
Full
Rise & Fall
Top
R&S Support

Remote: CONF:BURS:PTEM

General Settings

For details refer to the "General Settings" softkey in the root menu of the GSM / EDGE and EDGE Evolution application.

Measurement Settings

For details refer to the "Baseband Analog"

Input Impedance
IQ Path
Balanced
Low Pass
Dither

Input Impedance

Allows the selection of the impedance of the baseband inputs (R%S FSQ-B71). Either 50 Ω or 1 MΩ can be selected.The Input Impedance parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:IMP LOW

IQ Path

This parameter is set to "I+j*Q" and can not be changed. Use the parameter Swap IQ if the I and Q cables are interchanged.

The IQ Path parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:TYPE IQ

Balanced

Switches the baseband inputs between symmetrically (balanced) and asymmetrical (unbalanced).

The *Balanced* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:BAL ON

Low Pass

When switched on the *Low Pass* parameter specifies that an analog anti-aliasing filter is internally applied to all the IQ inputs.

The filter must be turned on if there might be frequency components (harmonics) above about 40 MHz.

The amplitude and phase equalized single sided bandwidth of the analog Baseband inputs is for

- Low pass On: 30 MHz
- Low pass Off: 36 MHz

The *Low Pass* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:LPAS ON

Dither

When switched on the *Dither* parameter specifies that a 2 MHz wide noise signal at 42.67 MHz is injected into the signal path of the analog baseband input. It appears in the spectrum at 38.92 MHz.

The dither signal distinctly improves the linearity of the A/D converter at very low signal levels (low drive level at the A/D converter) and thus the accuracy of the level displayed.

The *Dither* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:DITH ON

Meas Settings " softkey in the root menu of the GSM / EDGE and EDGE Evolution application.

Full

Switches the "Power vs Time" measurement to the "full burst" view.
This softkey is one of the view choices ("Full", "Rise & Fall" or "Top") of the "Power vs Time" measurement.

Remote: CONF:BURS:PTEM:SEL FULL

Rise & Fall

Switches the "Power vs Time"" measurement to the "rise & fall" view, i.e. only rising and falling edges of the bursts are displayed.
This softkey is one of the view choices ("Full", "Rise & Fall" or "Top") of the ""Power vs Time" measurement.

Remote: CONF:BURS:PTEM:SEL FRIS

Top

Switches the "Power vs Time" measurement to the "top" view, i.e. the useful part of the bursts are shown with a zoomed y-axis.
This softkey is one of the view choices ("Full", "Rise & Fall" or "Top") of the "Power vs Time" measurement.

Remote: CONF:BURS:PTEM:SEL TOP

Spectrum

Opens a submenu containing the following softkeys:

General Settings
Measurement Settings
Modulation Spectrum
Transient Spectrum
Display List / Graph
R&S Support

General Settings

For details refer to the "General Settings" softkey in the root menu of the GSM / EDGE and EDGE Evolution application.

Measurement Settings

For details refer to the Baseband Analog

Input Impedance
IQ Path
Balanced
Low Pass
Dither

Input Impedance

Allows the selection of the impedance of the baseband inputs (R&S FSQ-B71). Either 50 Ω or 1 M can be selected. The Input Impedance parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:IMP LOW

IQ Path

This parameter is set to "I+j*Q" and can not be changed. Use the parameter Swap IQ if the I and Q cables are interchanged.

The IQ Path parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:TYPE IQ

Balanced

Switches the baseband inputs between symmetrically (balanced) and asymmetrical (unbalanced).

The *Balanced* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:BAL ON

Low Pass

When switched on the *Low Pass* parameter specifies that an analog anti-aliasing filter is internally applied to all the IQ inputs.

The filter must be turned on if there might be frequency components (harmonics) above about 40 MHz.

The amplitude and phase equalized single sided bandwidth of the analog baseband inputs is for

- Low pass = On: 30 MHz
- Low pass = Off: 36 MHz

The *Low Pass* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:LPAS ON

Dither

When switched on the *Dither* parameter specifies that a 2 MHz wide noise signal at 42.67 MHz is injected into the signal path of the analog baseband input. It appears in the spectrum at 38.92 MHz.

The dither signal distinctly improves the linearity of the A/D converter at very low signal levels (low drive level at the A/D converter) and thus the accuracy of the level displayed.

The *Dither* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:DITH ON

Measurement Settings " softkey in the root menu of the GSM / EDGE and EDGE Evolution application.

Modulation Spectrum

Starts the Modulation Spectrum measurement.

For details on the measurement refer to "Modulation Spectrum".

Remote: CONF:SPEC:MOD

Transient Spectrum

Starts the Transient Spectrum measurement.

For details on the measurement refer to "Transient Spectrum".

Remote: CONF:SPEC:SWIT

Display List / Graph

Sets the display mode of the "Modulation Spectrum" and the "Transient Spectrum" measurements. Two modes are available:

- List   The results are displayed in a table.

● Graph A graph containing traces and bars at the offset frequencies are displayed.

Remote: CONF:SPEC:SEL LIST

R&S Support

Creates files that help identify the current problem. They are stored under "D:\USER\Support\GSM" and contain, for example, the K10 option state and a screen capture.
If you contact the Rohde&Schwarz support to get help for a certain problem, send these files to the support in order to identify and solve the problem faster.

Wide Spectrum

Opens a submenu containing the following softkeys:

General Settings
Measurement Settings
Wide Mod Spectrum
R&S Support

General Settings

For details refer to the "General Settings" softkey in the root menu of the GSM / EDGE and EDGE Evolution application.

Measurement Settings

For details refer to the "Baseband Analog"

Input Impedance
IQ Path
Balanced
Low Pass
Dither

Input Impedance

Allows the selection of the impedance of the baseband inputs (R%S FSQ-B71). Either 50 Ω or 1 M Ω can be selected̃The Input Impedance parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:IMP LOW

IQ Path

This parameter is set to "I+j*Q" and can not be changed. Use the parameter Swap IQ if the I and Q cables are interchanged.

The IQ Path parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:TYPE IQ

Balanced

Switches the baseband inputs between symmetrically (balanced) and asymmetrical (unbalanced).

The *Balanced* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: `INP:IQ:BAL ON`

Low Pass

When switched on the *Low Pass* parameter specifies that an analog anti-aliasing filter is internally applied to all the IQ inputs.

The filter must be turned on if there might be frequency components (harmonics) above about 40 MHz.

The amplitude and phase equalized single sided bandwidth of the analog Baseband inputs is for

- Low pass On: 30 MHz
- Low pass Off: 36 MHz

The *Low Pass* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: `SENS:IQ:LPAS ON`

Dither

When switched on the *Dither* parameter specifies that a 2 MHz wide noise signal at 42.67 MHz is injected into the signal path of the analog baseband input. It appears in the spectrum at 38.92 MHz.

The dither signal distinctly improves the linearity of the A/D converter at very low signal levels (low drive level at the A/D converter) and thus the accuracy of the level displayed.

The *Dither* parameter is only avaible when Baseband Analog is selected as Signal Source.

Remote: `SENS:IQ:DITH ON`

Meas Settings " softkey in the root menu of the GSM / EDGE and EDGE Evolution application.

Wide Mod Spectrum

Starts the Wide Mod Spectrum measurement.

For details on the measurement refer to "Modulation Spectrum".

Remote: `CONF:WSP:MOD`

R&S Support

Creates files that help identify the current problem. They are stored under
"`D:\USER\Support\GSM`" and contain, for example, the K10 option state and a
screen capture.
If you contact the Rohde&Schwarz support to get help for a certain problem, send
these files to the support in order to identify and solve the problem faster.

3.4   SPECTRUM Hotkey

The *SPECTRUM* hotkey exits the R&S FS-K10 option and returns to the spectrum analyzer with all previous settings restored.

3.5   GSM & EVO Hotkey

The *GSM & EVO* hotkey returns to the main measurement menu of R&S FS-K10, where measurement results can be seen. All open dialog boxes are closed, and the main softkey menu is displayed.

The *GSM & EVO* hotkey remains green whenever R&S FS-K10 is active.

3.6   AUTO SET Hotkey

The AUTO SET hotkey starts a single auto set procedure. Select the parameters to be set automatically in the "Auto set tab".

3.7   RUN SGL Hotkey

The *RUN SGL* hotkey starts the selected measurement in single sweep mode.

If another measurement is running, such as a continuous sweep measurement, the running measurement will be aborted before the single sweep measurement is started.

Pressing the *RUN SGL* hotkey whilst a single sweep measurement is running causes the measurement to be stopped (aborted).

3.8   RUN CONT Hotkey

The *RUN CONT* hotkey starts the selected measurement in continuous sweep mode.

If another measurement is running then the running measurement will be aborted before the continuous sweep measurement is started.

Pressing the *RUN CONT* hotkey whilst a continuous sweep measurement is running causes the measurement to be stopped (aborted).

3.9   SCREEN A/B Hotkey

The *SCREEN [A|B]* hotkey selects the specified screen as the active screen.

In full screen mode pressing the *SCREEN [A|B]* hotkey will display the specified screen.

After Pressing the *SCREEN [A|B]* hotkey the label displayed in the hotkey is changed e.g. after pressing the *SCREEN A* hotkey the label of the hotkey is changed to *SCREEN B.* The label indicates which screen will become the active screen after the hotkey is pressed.

3.10 Softkeys of the Frequency Menu - FREQ Key

This key opens the "General Settings" dialog box and directly jumps to the "Frequency" field. For details refer to the "General Settings" dialog box in the root menu of the GSM / EDGE and EDGE Evolution application.

3.11 Softkeys of the Amplitude Menu - AMPT Key

This key opens the "General Settings" dialog box and directly jumps to the "Ref. Level" field. For details refer to the "General Settings" dialog box in the root menu of the GSM / EDGE and EDGE Evolution application.

3.12 Softkeys of the Sweep Menu - SWEEP Key

This key opens the "General Settings" dialog box and directly jumps to the "Capture Time" field. For details refer to the "General Settings" dialog box in the root menu of the GSM / EDGE and EDGE Evolution application.

3.13 Softkeys of the Trigger Menu - TRIG Key

This key opens the "General Settings" dialog box and directly jumps to the "Synchronization".

3.14 Softkeys of the Trace Menu - TRACE Key

This key opens the "General Settings" dialog box and directly jumps to the "Statistic Count" field. For details refer to the "General Settings" dialog box in the root menu of the GSM / EDGE and EDGE Evolution application.

3.15 Softkeys of the Marker Menu - MKR Key

The following table shows the softkeys of the marker menu specific to the GSM / EDGE and EDGE Evolution application. For details on the other softkeys of the "Marker" menu refer to the MKR key of the base unit.

Marker 1

Marker 1

Opens the "Marker" dialog box. The contents of the dialog depend on the measurement in which the marker is to be set. The "Marker" softkey has three states:

- Grey: no settings are made.
- Red: the marker is deactivated.
- Green: the marker is activated.

3.16 Softkeys of the Marker Function Menu - MKR FUNC Key

For details on the softkeys and their submenus refer to the MKR MFUNC key of the base unit.

3.17 Softkeys of the Marker to Menu - MKR-> Key

The following table shows the softkeys of the "Marker" menu specific to the GSM / EDGE and EDGE Evolution application. For details on the other softkeys of the "Marker To" menu refer to the MKR -> key of the base unit.

Marker -> Trace

Marker -> Trace

Opens the "Select Trace" dialog box. In the box, enter the trace to which the marker should be attached.

4 Status Reporting System

In addition to the registers provided by the base system, the following register is used in the GSM / EDGE and EDGE Evolution (R&S FS-K10): STAT:QUES:SYNC. Although this register is provided by the base system, the GSM / EDGE and EDGE Evolution (R&S FS-K10) uses different bits and definitions.

In this section, only the new and altered status registers / bits for the GSM / EDGE and EDGE Evolution (R&S FS-K10) are described. Detailed information on the status registers of the base system is given in the section "Status Reporting System" in Chapter 5 of the Operating Manual.

The status reporting system stores all information on the current operating state of the instrument, e.g. that the instrument is currently performing a calibration and information on errors which have occurred. This information is stored in the status registers and in the error queue. The status registers and the error queue can be queried via IEC bus.

The information is structured hierarchically. The register *status byte* (STB) defined in IEEE 488.2 and its associated mask register *service request enable* (SRE) form the uppermost level. The STB receives its information from the standard *event status register* (ESR) which is also defined in IEEE 488.2 with the associated mask register standard *event status enable* (ESE). The STB registers STATus:OPERation and STATus:QUEStionable, which are defined by SCPI and contain detailed information on the instrument.

The *Individual STatus* flag (IST) and the *parallel poll enable* register (PPE) allocated to it are also part of the status reporting system. The IST flag, like the SRQ, combines the entire instrument status in a single bit. The PPE fulfils the same function for the IST flag as the SRE for the service request.

The output buffer contains the messages the instrument returns to the controller. It is not part of the status reporting system, but determines the value of the MAV bit in the STB.

Description of the Status Registers

& = Logical AND
⊕ = logical OR of all bits

0 = indicates Created by FSV Analyser, Used and accessible within FSV-K10

0 = indicates FSV-K10 only.

0 = indicates NOT available in FSV-K10

= Provided by FSV Kernal Main.

STATus:OPERation

15	not used
14	
13	
12	
11	
10	
9	
8	HCOPy in progress
7	
6	
5	
4	MEASuring
3	
2	
1	
0	CALibrating

STATus:QUEStionable:ACPLimit

15	not used
14	
13	ALT2 LOWer FAIL (Screen B)
12	ALT2 UPPer FAIL (Screen B)
11	ALT1 LOWer FAIL (Screen B)
10	ALT1 UPPer FAIL (Screen B)
9	ADJ LOWer FAIL (Screen B)
8	ADJ UPPer FAIL (Screen B)
7	
6	
5	
4	
3	
2	
1	
0	

STATus:QUEStionable:SYNC

15	not used
14	
13	
12	
11	
10	
9	
8	
7	
6	
5	
4	
3	Carrier overload
2	No carrier
1	SYNC not found
0	BURSt not found

SRQ

SRE   STB

&	7
&	6
&	5
&	4
&	3
&	2
	1
	0

PPE

ISTflag

STATus:QUEStionable

15	not used
14	
13	
12	ACPLimit
11	SYNC
10	LMARgin
9	LIMit
8	CALibration (=UNCAL)
7	
6	
5	FREQuency
4	TEMPerature
3	POWer
2	
1	
0	

STATus:QUEStionable:LMARgin<1|2>

	Screen A	Screen B
15	not used	not used
14		
13		
12		
11		
10		
9		
8		
7	LMARgin 8 FAIL	
6	LMARgin 7 FAIL	
5	LMARgin 6 FAIL	
4	LMARgin 5 FAIL	
3	LMARgin 4 FAIL	
2	LMARgin 3 FAIL	
1	LMARgin 2 FAIL	
0	LMARgin 1 FAIL	

STATus:QUEStionable:LIMit<1|2>

	Screen A	Screen B
15	not used	not used
14		
13		
12		
11		
10		
9		
8		
7	LIMit 8 FAIL	
6	LIMit 7 FAIL	
5	LIMit 6 FAIL	
4	LIMit 5 FAIL	
3	LIMit 4 FAIL	
2	LIMit 3 FAIL	
1	LIMit 2 FAIL	
0	LIMit 1 FAIL	

STATus:QUEStionable:FREQuency

15	not used
14	
13	
12	
11	
10	
9	LO UNLocked (Screen B)
8	
7	
6	
5	
4	
3	
2	
1	LO UNLocked (Screen A)
0	OVEN COLD

STATus:QUEStionable:POWer

15	not used
14	
13	
12	
11	
10	IF_OVerload (Screen B)
9	UNDerload (Screen B)
8	OVERload (Screen B)
7	
6	
5	
4	
3	
2	IF_OVerload (Screen A)
1	UNDerload (Screen A)
0	OVERload (Screen A)

ESE   ESR

&	7
&	6
&	5
&	4
&	3
&	2
&	1
&	0

Error/event queue   Output buffer

All the status registers are the same as those provided by the base system, with the exception of the following:

● STATus:OPERation - Although this register is provided by R&S FSQ or R&S FSG Kernel main, R&S FS-K10 makes use of bits 4 & 7 in this register which are not used within R&S FSQ or R&S FSG Kernel main

- STATus:QUESTionable:ACPLimit - This register is provided by the analyser and is not available from the R&S FS-K10 command tree
- STATus:QUESTionable:LIMit2 - This register is provided by the analyser and is not available from the R&S FS-K10 command tree
- STATus:QUESTionable:LMARgin<1|2> - These registers are provided by the analyser and are not available from the R&S FS-K10 command tree

The deviations from the status register structure of the base system are described below.

STATus:OPERation Register

In the CONDition part, this register contains information on which actions the instrument is being executing or, in the EVENt part, information on which actions the instrument has executed since the last reading. It can be read using commands "STATus:OPERation:CONDition?" or "STATus:OPERation[:EVENt]?" of the operating manual of analyzer.

Bit No	Meaning
0	CALibrating
	This bit is set as long as the instrument is performing a calibration.
1 to 3	These bits are not used
4	MEASuring
	A '1' in this bit position indicates that a measurement is in progress. R&S FS-K10 only
5 to 7	These bits are not used
8	HardCOPy in progress
	This bit is set while the instrument is printing a hardcopy.
9 to 14	These bits are not used
15	This bit is always 0

STATus:QUEStionable Register

This register comprises information about indefinite states which may occur if the unit is operated without meeting the specifications. It can be queried by commands `STATus:QUEStionable: CONDition?` and `STATus:QUEStionable[:EVENt ]?`.

Bit No	Meaning
0 to 2	These bits are not used
3	POWer
	This bit is set if a questionable power occurs (cf. also section "STATus:QUEStionable:POWer Register").
4	TEMPerature
	This bit is set if a questionable temperature occurs.
5	FREQuency
	The bit is set if a frequency is questionable (cf. section "STATus:QUEStionable:FREQuency Register").
6 to 7	These bits are not used
8	CALibration
	The bit is set if a measurement is performed uncalibrated (= ^ label "UNCAL")
9	LIMit (device-specific)
	This bit is set if a limit value is violated (see also section STATus:QUEStionable:LIMit Register). Note: Limit register is associated with limit lines for the Spectrum Mask measurement only.
10	LMARgin (device-specific)
	This bit is set if a margin is violated (see also section STATus:QUEStionable:LMARgin

Bit No	Meaning
	Register)
11	SYNC (device-dependent) This bit is set if, in measurements or pre-measurements in FS-K10 mode, synchronization fails, no signal is detected or no burst is found. This bit is also set if input settings conflict with the measurement setup (see also "STATus:QUEStionable:SYNC Register").
12	ACPLimit This bit is set if a limit for the adjacent channel power measurement is violated (see also section "STATus:QUEStionable:ACPLimit Register").
13 to 14	These bits are not used
15	This bit is always 0

STATus:QUEStionable:LIMit Register

This register comprises information about the observance of limit lines in the corresponding measurement window (LIMit 1 corresponds to Screen A, LIMit 2 to Screen B). It can be queried with commands STATus:QUEStionable:ACPLimit :CONDition? and STATus:QUEStionable:ACPLimit[:EVENt]?.

Note that no limit lines are displayed in screen A and as such all bits in the LIMit1 register are always set to 0.

Bit No	Meaning
0	LIMit FAIL This bit is set if limit line 1 is violated
1	LIMit FAIL This bit is set if limit line 2 is violated
2	LIMit FAIL This bit is set if limit line 3 is violated
3	LIMit FAIL This bit is set if limit line 4 is violated
4	LIMit FAIL This bit is set if limit line 5 is violated
5	LIMit FAIL This bit is set if limit line 6 is violated
6	LIMit FAIL This bit is set if limit line 7 is violated
7	LIMit FAIL This bit is set if limit line 8 is violated
10-14	These bits are not used
15	This bit is always 0

STATus:QUEStionable:SYNC Register

This contains information about sync and bursts not found, and about pre-measurement results exceeding or falling short of expected values.

The bits can be queried with commands
`STATus:QUEStionable:LIMit<1>:CONDition?` and
`STATus:QUEStionable:LIMit<1>[:EVENt?].`

Bit No	Meaning
0	BURSt not found (screen A) This bit is set if no burst is found in the measurements/premeasurements for phase/frequency error (PFE) or carrier power versus time (PVT) in GSM/EDGE mode. If a burst is found in these measurements/premeasurements, the bit is reset.
1	SYNC not found (screen A) This bit is set if the synchronization sequence (training sequence) of the midamble is not found in the measurements/premeasurements for phase/frequency error (PFE) or carrier power versus time (PVT) in GSM/EDGE mode. If the synchronization sequence (training sequence) of the midamble is found in these measurements/premeasurements, the bit is reset.
2	No carrier (screen A) This bit is set if, in GSM/EDGE mode, the level value determined in the premeasurements for carrier power versus time (PVT) and spectrum due to modulation is too low. The bit is reset at the beginning of the premeasurement (see also Chapter 2, description of the named premeasurements).
3	Carrier overload (screen A) This bit is set if, in GSM/EDGE mode, the level value determined in the premeasurements for carrier versus time (PVT) and spectrum due to modulation is too high. The bit is reset at the beginning of the premeasurement (see also Chapter 2, description of the named premeasurements).
4 to 14	These bits are not used
15	This bit is always 0

5 Remote Commands

In this section, all remote control commands for the GSM / EDGE and EDGE Evolution R&S FS-K10 are described in detail. For details on conventions used in this chapter refer to section .

For further information on analyzer or basic settings commands, refer to the corresponding subsystem in the operating manual of analyzer.

The following subsystems are included:

ABORt Subsystem

CALCulate Subsystem

CONFigure Subsystem

DISPlay Subsystem

FETCh Subsystem

INITiate Subsystem

INSTrument Subsystem

READ Subsystem

SENSe Subsystem

SENSe Subsystem

STATus Subsystem

TRACe Subsystem

TRIGger Subsystem

5.1.1 ABORt Subsystem

The ABORt Subsystem contains the commands for aborting triggered actions. An action can be triggered again immediately after being aborted. All commands trigger events, and therefore they have no *RST value.

Commands of the ABORt subsystem:

ABORt

ABORt

This command aborts a current measurement and resets the trigger system.

Characteristics

RST value:

SCPI: compatible

Example

```
ABORt
```

5.1.2 CALCulate Subsystem

The CALCulate Subsystem contains commands for converting instrument data, transforming and carrying out corrections. These functions are carried out subsequent to data acquisition, i.e. following the SENSe Subsystem.

The following subsystems are included:

- LIMit
- MARKer

Commands of the CALCulate subsystem:

CALCulate<1>:LIMit<1..8>:FAIL? <State>

CALCulate<1>:MARKer<1>[:STATe] <State>

CALCulate<1>:MARKer<1>:AOFF

CALCulate<1>:MARKer<1>:TRACe <Value>

CALCulate<1>:MARKer<1>:X <Value>

CALCulate<1>:MARKer<1>:Y?

5.1.2.1 CALCulate:LIMit Subsystem

The CALCulate:LIMit Subsystem contains commands for the limit lines and the corresponding limit checks. Limit lines can be defined as upper or lower limit lines. The individual Y values of the limit lines correspond to the values of the x-axis (CONTrol). The number of X and Y values must be identical. For details on limit lines refer to chapter "Instrument Functions", section "Using Limit Lines and Display Lines - LINES Key".

CALCulate<1>:LIMit<1..8>:FAIL? <State>

This command queries the result of the limit check of the limit line indicated in the selected measurement window. It should be noted that a complete sweep must have been performed to obtain a valid result. A synchronization with *OPC, *OPC? Or *WAI should therefore be provided. The result of the limit check responds with 0 for PASS and 1 for FAIL. For the power vs. time graph measurement CALCulate:LIMit1:FAIL? returns the result for the Max trace and CALCulate:LIMit2:FAIL? returns the result for the Min trace.

Result

<Boolean value>

Result of the limit check.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
CALCulate1:LIMit1:FAIL?
```

5.1.2.2 CALCulate:MARKer Subsystem

The marker is used to evaluate the (graphical) measurement results at certain trace points. Therefore, the marker is placed at a certain position (by specifying the X value or a trace property like maximum or minimum peak search) and then query the marker value.

CALCulate<1>:MARKer<1>[:STATe] <State>

This command switches the specified marker in the specified screen on or off.

Parameter

<Boolean value>

Marker active / deactivated.

Characteristics

RST value:

SCPI: device specific

Example

```
CALCulate1:MARKer1:STATe ON
```

CALCulate<1>:MARKer<1>:AOFF

This command switches off all active markers in the specified measurement window. The window will either be Screen A or Screen B and will be determined by the numeric value that follows the CALCulate keyword.

Characteristics

RST value:

SCPI: device specific

Example

```
CALCulate1:MARKer1:AOFF
```

CALCulate<1>:MARKer<1>:TRACe <Value>

This command assigns the selected marker to the indicated measurement curve in the selected measurement window.

Parameter

<Integer value>

Trace number the marker is assigned to.

Characteristics

RST value:

SCPI: device specific

Example

```
CALCulate1:MARKer1:TRACe 5
```

CALCulate<1>:MARKer<1>:X <Value>

This command positions the selected marker to the indicated position in the selected measurement window.

Parameter

<Double value>

x axis position of the marker.

Characteristics

RST value:

SCPI: device specific

Example

```
CALCulate1:MARKer1:X 5
```

CALCulate<1>:MARKer<1>:Y?

This command returns the Y value at the position of the marker.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
CALCulate1:MARKer1:Y?
```

5.1.3 CONFigure Subsystem

The CONFigure Subsystem is used to set up the signal characteristics which are used in the signal, as for example the frame configuration, the measurement type to use, ...

The following subsystems are included:

- MS
- BURSt

- SPECtrum
- WSPectrum

Commands of the CONFigure subsystem:

CONFigure:DSP <Value>

CONFigure[:MS]:ARFCn <Value>

CONFigure[:MS]:BSEarch <State>

CONFigure[:MS]:BSTHreshold <Value>

CONFigure[:MS]:PRATe <Value>

CONFigure[:MS]:RESTore

CONFigure[:MS]:SSEarch <State>

CONFigure[:MS]:AUTO <Value>

CONFigure[:MS]:AUTO:FRAMe <Value>

CONFigure[:MS]:AUTO:LEVel <Value>

CONFigure[:MS]:AUTO:TRIGger <Value>

CONFigure[:MS]:CHANnel:FRAMe:EQUal <State>

CONFigure[:MS]:CHANnel:MSLots:MEASure <Value>

CONFigure[:MS]:CHANnel:MSLots:NOFSlots <Value>

CONFigure[:MS]:CHANnel:MSLots:OFFSet <Value>

CONFigure[:MS]:CHANnel:SLOT<0..7>[:STATe] <State>

CONFigure[:MS]:CHANnel:SLOT<0..7>:FILTer <Value>

CONFigure[:MS]:CHANnel:SLOT<0..7>:MTYPe <Value>

CONFigure[:MS]:CHANnel:SLOT<0..7>:MULTi <Value>

CONFigure[:MS]:CHANnel:SLOT<0..7>:PCL <Value>

CONFigure[:MS]:CHANnel:SLOT<0..7>:TYPE <Value>

CONFigure[:MS]:CHANnel:SLOT<0..7>:TSC <Value>

CONFigure[:MS]:DEMod:DECision <Value>

CONFigure[:MS]:DEMod:STDBits <Value>

CONFigure[:MS]:DEVice:TYPE <Value>

CONFigure[:MS]:MCARrier[:STATe] <State>

CONFigure[:MS]:MCARrier:ACTCarriers <Value>

CONFigure[:MS]:MCARrier:BTSClass <Value>

CONFigure[:MS]:MCARrier:FILTer <Value>

CONFigure[:MS]:MCARrier:MCBTs <State>

CONFigure[:MS]:NETWork[:TYPE] <Value>

CONFigure[:MS]:NETWork:FREQuency:BAND <Value>

CONFigure[:MS]:POWer:CLASs <Value>

CONFigure[:MS]:POWer:STATic <Value>

CONFigure[:MS]:POWer:AUTO <Value>

CONFigure[:MS]:POWer:AUTO:SWEep:TIME <Value>

CONFigure[:MS]:SYNC:IQCThreshold <Value>

CONFigure[:MS]:SYNC:MODE <Value>

CONFigure[:MS]:SYNC:ONLY <State>

CONFigure:BURSt:CONStell[:IMMediate]

CONFigure:BURSt:ETIMe[:IMMediate]

CONFigure:BURSt:MACCuracy[:IMMediate]

CONFigure:BURSt:MERRor[:IMMediate]

CONFigure:BURSt:PFERror[:IMMediate]

CONFigure:BURSt:PTEMplate[:IMMediate]

CONFigure:BURSt:PTEMplate:FILTer <Value>

CONFigure:BURSt:PTEMplate:FRZoom <Value>

CONFigure:BURSt:PTEMplate:SELect <Value>

CONFigure:BURSt:PTEMplate:TALign <Mode>

CONFigure:BURSt:PTEMplate:TMHRes <State>

CONFigure:SPECtrum:SELect <Mode>

CONFigure:SPECtrum:LIMit:LEFT <State>

CONFigure:SPECtrum:LIMit:RIGHt <State>

CONFigure:SPECtrum:MODulation[:IMMediate]

CONFigure:SPECtrum:SWITching[:IMMediate]

CONFigure:SPECtrum:SWITching:LIMit <LimitMode>

CONFigure:SPECtrum:SWITching:TYPE <DetectorMode>

CONFigure:WSPectrum:MODulation[:IMMediate]

CONFigure:DSP <Value>

For internal use by Rohde&Schwarz only. Do not use this command.

Parameter

<String>

Parameter string

Characteristics

RST value:

SCPI: device specific

Example

CONFigure:DSP

CONFigure[:MS]:ARFCn <Value>

To set the Absolute Radio Frequency Channel Number (ARFCN), enter the desired number in this field. Setting the ARFCN will update the Frequency. Possible values are in the range from 0 to 1023, however, some values may not be allowed depending on the selected frequency band.

Parameter

<Integer value>

ARFCN to be measured.

Characteristics

RST value:

SCPI: device specific

Example

CONFigure:MS:ARFCn 5

CONFigure[:MS]:BSEarch <State>

This command is retained for compatibility with R&S FS-K5 only. Refrain from using this command in new K10 remote scripts and use pure K10 remote commands instead. Use 'CONFigure:MS:SYNC:MODE BURSt' or 'CONFigure:MS:SYNC:MODE ALL'.

Parameter

<Boolean value>

0 = Burst search off, 1 = Burst search on.

Characteristics

RST value: 1

SCPI: device specific

Example

CONFigure:MS:BSEarch ON

CONFigure[:MS]:BSTHreshold <Value>

This command changes the burst find threshold.

Parameter

<Double value>

Burst find threshold. (Unit: dB)

Note

This command is retained for compatibility with R&S FS-K5 only. Due to the improved measurement capabilities of this GSM analysis software, this remote control command (and the function behind) is not required any more.

Characteristics

RST value:

SCPI: device specific

Example

CONFigure:MS:BSTHreshold 10 DB

CONFigure[:MS]:PRATe <Value>

This command is retained for compatibility with R&S FS-K5 only. This command has no effect.

Parameter

<Integer value>

Dummy

Characteristics

RST value: 4

SCPI: device specific

Example

CONFigure:MS:PRATe 5

CONFigure[:MS]:RESTore

This command is retained for compatibility with R&S FS-K5 only. This command has no effect.

Characteristics

RST value:

SCPI: device specific

Example

CONFigure:MS:RESTore

CONFigure[:MS]:SSEarch <State>

This command is retained for compatibility with R&S FS-K5 only. Refrain from using this command in new K10 remote scripts and use pure K10 remote commands instead. Use 'CONFigure:MS:SYNC:MODE TSC' or 'CONFigure:MS:SYNC:MODE ALL'.

Parameter

<Boolean value>

0 = TSC search off, 1 = TSC search on.

Characteristics

RST value: 1

SCPI: device specific

Example

CONFigure:MS:SSEarch ON

CONFigure[:MS]:AUTO <Value>

This command executes the auto set routines once, i.e. its function corresponds to pressing the AUTO SET key. Tip: Use CONFigure:MS:AUTO:LEVel ONCE, CONFigure:MS:AUTO:FRAMe ONCE or CONFigure:MS:AUTO:TRIGger ONCE to execute the auto set routines seperately.

Parameter

Value	Description
ONCE	Execute the function once

Characteristics

RST value:

SCPI: device specific

Example

CONFigure:MS:AUTO ONCE

CONFigure[:MS]:AUTO:FRAMe <Value>

This command is used to switch on or off automatic frame configuration detection while running auto set. When switched on, frame configuration detection is performed on auto set. Using the ONCE argument starts one auto frame configuration measurement immediately.

Parameter

Value	Description
OFF	Switch the function off
ON	Switch the function on
ONCE	Execute the function once

Characteristics

RST value: ON

SCPI: device specific

Example

`CONFigure:MS:AUTO:FRAMe OFF`

CONFigure[:MS]:AUTO:LEVel <Value>

This command is used to switch on or off automatic level detection while running auto set. When switched on, level detection is performed on auto set. Using the ONCE argument starts one auto level measurement immediately.

Parameter

Value	Description
OFF	Switch the function off
ON	Switch the function on
ONCE	Execute the function once

Characteristics

RST value: ON

SCPI: device specific

Example

`CONFigure:MS:AUTO:LEVel OFF`

CONFigure[:MS]:AUTO:TRIGger <Value>

This command is used to switch on or off automatic trigger (offset / level) detection while running auto set. When switched on, trigger detection is performed on auto set. Using the ONCE argument starts one auto trigger measurement immediately.

Parameter

Value	Description
OFF	Switch the function off
ON	Switch the function on
ONCE	Execute the function once

Characteristics

RST value: ON

SCPI: device specific

Example

```
CONFigure:MS:AUTO:TRIGger OFF
```

CONFigure[:MS]:CHANnel:FRAMe:EQUal <State>

If activated, all slots of a frame have the same length (8 x 156.26 normal symbol periods). If deactivated, slots number 0 and 4 of a frame have a longer duration, all other a shorter duration compared to the 'equal slot length' (157, 156, 156, 156, 157, 156, 156, 156 normal symbol periods). See 3GPP TS 51.0213GPP TS 51.021 and 3GPP TS 45.0103GPP TS 45.010 chapter '6.7 Timeslot length' for further details. This parameter is used to time adjust the Power vs Time masks of all slots where the 'Slot to measure' is used as the time reference for the entire frame.

Parameter

<Boolean value>

On = equal timeslot lengths (8 x 156.25 normal symbol periods), Off = unequal timeslot lengths (157, 156, 156, 156, 157, 156, 156, 156 normal symbol periods).

Characteristics

RST value: 1

SCPI: device specific

Example

```
CONFigure:MS:CHANnel:FRAMe:EQUal ON
```

CONFigure[:MS]:CHANnel:MSLots:MEASure <Value>

This command specifies the Slot to measure in single-slot measurements relative to the GSM frame start.

Parameter

<Integer value>

Slot to measure in single-slot measurements. (Unit: Slots)

Characteristics

RST value: 0 Slots

SCPI: device specific

Example

```
CONFigure:MS:CHANnel:MSLots:MEASure 5
```

CONFigure[:MS]:CHANnel:MSLots:NOFSlots <Value>

This command specifies the Number of Slots to measure for the measurement interval of multi-slot measurements, i.e. the "Power versus Time" and "Transient Spectrum" measurements. Between 1 and 8 consecutive slots can be measured.

Parameter

<Integer value>

Number of slots to measure. (Unit: Slots)

Characteristics

RST value: 8 Slots

SCPI: device specific

Example

```
CONFigure:MS:CHANnel:MSLots:NOFSlots 5
```

CONFigure[:MS]:CHANnel:MSLots:OFFSet <Value>

This command specifies the 'First Slot to measure' for the measurement interval for multi-slot measurements, i.e. the "Power versus Time" and "Transient Spectrum" measurements, relative to the GSM frame start.

Parameter

<Integer value>

0-based index for the first slot to measure relative to the GSM frame start. (Unit: Slots)

Characteristics

RST value: 0 Slots

SCPI: device specific

Example

```
CONFigure:MS:CHANnel:MSLots:OFFSet 5
```

CONFigure[:MS]:CHANnel:SLOT<0..7>[:STATe] <State>

This command activates the specified slot (this means that e.g. this slot is not considered as inactive in the Power vs Time limit evaluation).

Parameter

<Boolean value>

Slot active / deactivated.

Characteristics

RST value:

SCPI: device specific

Example

CONFigure:MS:CHANnel:SLOT1:STATe ON

CONFigure[:MS]:CHANnel:SLOT<0..7>:FILTer <Value>

This command specifies the pulse shape of the transmit filter of the specified slot.

Parameter

Value	Description
GMSK	GMSK Pulse
LINearised	Linearised GMSK Pulse
NARRow	Narrow Pulse
WIDE	Wide Pulse

Characteristics

RST value: GMSK

SCPI: device specific

Example

CONFigure:MS:CHANnel:SLOT1:FILTer GMSK

CONFigure[:MS]:CHANnel:SLOT<0..7>:MTYPe <Value>

This command specifies the modulation type of the specified slot.

Parameter

Value	Description
GMSK	GMSK, Gaussian Minimum Shift Keying, 1 bit/symbol.
QPSK	QPSK, Quadrature Phase Shift keying, 2 bits/symbol.
PSK8	8PSK (EDGE), Phase Shift Keying, 3 bits/symbol.
QAM16	16QAM, 16-ary Quadrature Amplitude Modulation, 4 bits/symbol.
QAM32	32QAM, 16-ary Quadrature Amplitude Modulation, 5 bits/symbol.

Note

The available values depend on the burst type. For Normal Burst GMSK, 8PSK, 16QAM, and 32QAM are available. For Higher Symbol Rate Burst QPSK, 16QAM and 32QAM are available.

Characteristics

RST value: GMSK

SCPI: device specific

Example

```
CONFigure:MS:CHANnel:SLOT1:MTYPe GMSK
```

CONFigure[:MS]:CHANnel:SLOT<0..7>:MULTi <Value>

The command has the following behavior: For ACT<k>sync<m> 'Slot to measure' is set to m-1, 'No. of Slots' to k, and 'First Slot to measure' to 0. Slot properties of slot numbers 0 to k-1 are copied from the last active 'Slot to measure'. Slots 0 to k-1 are set to active and the remaining slots are set to inactive.

Parameter

Value	Description
ACT1sync1	1 active slot, sync on 1st slot (slot number 0)
ACT2sync1	2 active slots, sync on 1st slot (slot number 0)
ACT2sync2	2 active slots, sync on 2nd slot (slot number 1)
ACT3sync1	3 active slots, sync on 1st slot (slot number 0)
ACT3sync2	3 active slots, sync on 2nd slot (slot number 1)
ACT3sync3	3 active slots, sync on 3rd slot (slot number 2)
ACT4sync1	4 active slots, sync on 1st slot (slot number 0)
ACT4sync2	4 active slots, sync on 2nd slot (slot number 1)
ACT4sync3	4 active slots, sync on 3rd slot (slot number 2)
ACT4sync4	4 active slots, sync on 4th slot (slot number 3)
ACT5sync1	5 active slot, sync on 1st slot (slot number 0)
ACT5sync2	5 active slot, sync on 2nd slot (slot number 1)
ACT5sync3	5 active slot, sync on 3rd slot (slot number 2)
ACT5sync4	5 active slot, sync on 4th slot (slot number 3)
ACT5sync5	5 active slot, sync on 5th slot (slot number 4)
ACT6sync1	6 active slots, sync on 1st slot (slot number 0)
ACT6sync2	6 active slots, sync on 2nd slot (slot number 1)
ACT6sync3	6 active slots, sync on 3rd slot (slot number 2)
ACT6sync4	6 active slots, sync on 4th slot (slot number 3)
ACT6sync5	6 active slots, sync on 5th slot (slot number 4)

ACT6sync6	6 active slots, sync on 6th slot (slot number 5)
ACT7sync1	7 active slots, sync on 1st slot (slot number 0)
ACT7sync2	7 active slots, sync on 2nd slot (slot number 1)
ACT7sync3	7 active slots, sync on 3rd slot (slot number 2)
ACT7sync4	7 active slots, sync on 4th slot (slot number 3)
ACT7sync5	7 active slots, sync on 5th slot (slot number 4)
ACT7sync6	7 active slots, sync on 6th slot (slot number 5)
ACT7sync7	7 active slots, sync on 7th slot (slot number 6)
ACT8sync1	8 active slots, sync on 1st slot (slot number 0)
ACT8sync2	8 active slots, sync on 2nd slot (slot number 1)
ACT8sync3	8 active slots, sync on 3rd slot (slot number 2)
ACT8sync4	8 active slots, sync on 4th slot (slot number 3)
ACT8sync5	8 active slots, sync on 5th slot (slot number 4)
ACT8sync6	8 active slots, sync on 6th slot (slot number 5)
ACT8sync7	8 active slots, sync on 7th slot (slot number 6)
ACT8sync8	8 active slots, sync on 8th slot (slot number 7)

Note

The slot number is ignored. This command is retained for compatibility with R&S FS-K5 only.Refrain from using this command in new K10 remote scripts and use pure K10 remote commands instead.

Characteristics

RST value: ACT1sync1

SCPI: device specific

Example

```
CONFigure:MS:CHANnel:SLOT1:MULTi ACT1sync1
```

CONFigure[:MS]:CHANnel:SLOT<0..7>:PCL <Value>

Specifies the Power Control Level (PCL) / Dynamic Power Control Level (Dynamic PCL) for the specific slot. The set value is relevant to calculate the correct Power versus Time limit for the slot. If the Device Type is a BTS the Dynamic PCL is used whereas MS uses PCL.

Parameter

<Integer value>

PCL or Dynamic PCL of the slot.

Characteristics

RST value: 0

SCPI: device specific

Example

```
CONFigure:MS:CHANnel:SLOT1:PCL 5
```

CONFigure[:MS]:CHANnel:SLOT<0..7>:TYPE <Value>

Specifies the type of the burst (e.g. Normal Burst, Higher Symbol Rate Burst) of the specified slot.

Parameter

Value	Description
NB	Normal Burst
HB	Higher Symbol Rate Burst

Characteristics

RST value: NB

SCPI: device specific

Example

```
CONFigure:MS:CHANnel:SLOT1:TYPE NB
```

CONFigure[:MS]:CHANnel:SLOT<0..7>:TSC <Value>

This command selects the training sequence of the specified slot used by the mobile or base station.

Parameter

Value	Description
0	TSC 0
1	TSC 1
2	TSC 2
3	TSC 3
4	TSC 4
5	TSC 5
6	TSC 6
7	TSC 7

Characteristics

RST value: 0

SCPI: device specific

Example

// Enter the GSM option K10
INSTrument:SELect GSM

// Activate slot 0
CONFigure:MS:CHANnel:SLOT0:STATe ON

// Normal Burst
CONFigure:MS:CHANnel:SLOT0:TYPE NB

// --- GMSK modulation ---
CONFigure:MS:CHANnel:SLOT0:MTYPe GMSK

// TSC 3
CONFigure:MS:CHANnel:SLOT0:TSC 3

// Query TSC number
CONFigure:MS:CHANnel:SLOT0:TSC?
// -> 3

// --- 8PSK modulation ---
CONFigure:MS:CHANnel:SLOT0:MTYPe PSK8

// TSC 3
CONFigure:MS:CHANnel:SLOT0:TSC 3

// Query TSC number
CONFigure:MS:CHANnel:SLOT0:TSC?
// -> 3

CONFigure[:MS]:DEMod:DECision <Value>

This command determines how the symbols are detected in the demodulator. The setting of this parameter does not effect the demodulation of Normal Bursts with GMSK modulation. For Normal Bursts with 8PSK, 16QAM, or 32QAM modulation or Higher Symbol Rate Bursts with QPSK, 16QAM or 32QAM modulation use this parameter to get a trade-off between performance (symbol error rate of the K10) and measurement speed.

Parameter

Value	Description
AUTO	Auto: Automatically selects the symbol decision method.
LINear	Linear symbol decision: Uses inverse filtering (kind of zero-forcing filter) and a symbol-wise decision method. This method is recommendable to be used for high symbol to noise ratios, but not for Higher Symbol Rate Bursts with the narrow pulse. The inverse filter colors the noise inside the signal bandwidth and therfore is not

	recommended for narrow-band signals or signals with a low signal to noise ratio.Peaks in the EVM vs Time measurement may occur if the 'Linear' symbol decision algorithm fails. In that case use the 'Sequence' method. Linear is the fastest option.
SEQuence	Symbol decision via sequence estimation: This method uses an algorithm that minimizes the symbol errors of the entire burst. It requires that the 'Tail' bits in the analyzed signal are correct. It has a better performance (lower symbol error rate) compared to the 'Linear' method especially at low signal to noise ratios at a price of measurement speed. It is recommended to use this method for Normal Bursts with 16QAM or 32QAM modulation and for Higher Symbol Rate bursts with the narrow pulse.

Characteristics

RST value: AUTO

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Activate EVM vs Time measurement
`CONFigure:BURSt:ETIMe:IMMediate`

// Set slot 0: Higher Symbol Rate burst, 16QAM, Wide Pulse & TSC 0
`CONFigure:MS:CHANnel:SLOT0:STATe ON`
`CONFigure:MS:CHANnel:SLOT0:TYPE HB`
`CONFigure:MS:CHANnel:SLOT0:MTYPe QAM16`
`CONFigure:MS:CHANnel:SLOT0:FILTer WIDE`
`CONFigure:MS:CHANnel:SLOT0:TSC 0`

// Use 'sequence estimator' for the symbol decision
`CONFigure:MS:DEMod:DECision SEQuence`
// Run a (blocking) single sweep
`INITiate:IMMediate;*WAI`
// Read the averaged EVM RMS value
`FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?`

// Use the 'linear' method for the symbol decision
`CONFigure:MS:DEMod:DECision LINear`
// Run a (blocking) single sweep
`INITiate:IMMediate;*WAI`
// Read the averaged EVM RMS value
`FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?`

CONFigure[:MS]:DEMod:STDBits <Value>

This command selects whether the detected Tail and TSC bits or the standard bits (as set in the Burst dialog) are used for the construction of the ideal (reference) signal. The K10 demodulator requires the bits of the burst (Tail, Data, TSC, Data, Tail) to provide an ideal version of the measured signal. The 'Data' bits can be random and are typically not known inside the demodulator of the K10. 'Tail' and 'TSC' bits are specified in the burst dialog. Using the standard bits can be advantageous to veryify whether the device under test sends the correct Tail and TSC bits. Incorrect bits would lead to peaks in the EVM vs Time trace at the positions of the incorrect bits.

Parameter

Value	Description
DETected	Measures Tail and TSC bits (detection during symbol decision) . Take the measured bits to generate the ideal signal. Incorrect Tail and TSC bits have no effect on the EVM bs Time measurement.
STD	Use standard-specified Tail and TSC bits (as set in the Burst dialog) in the demodulated bit stream and to generate the ideal signal. The measured (detected) bits are replaced. Incorrect Tail and TSC bits do effect the EVM bs Time measurement. Peaks occur at the positions of the incorrect bits.

Characteristics

RST value: DETected

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Activate EVM vs Time measurement
`CONFigure:BURSt:ETIMe:IMMediate`

// Replace detected Tail & TSC bits by the standard bits
`CONFigure:MS:DEMod:STDBits STD`

// Run a (blocking) single sweep
`INITiate:IMMediate;*WAI`
// Read the averaged EVM RMS value
`FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?`

CONFigure[:MS]:DEVice:TYPE <Value>

This command specifies the type of device to be measured.

Parameter

Value	Description
BTSNormal	BTS, TRX power class Normal
BTSMicro	BTS, TRX power class Micro
BTSPico	BTS, TRX power class Pico
MSNormal	MS, normal type
MSSMall	MS, small type

Characteristics

RST value: BTSNormal

SCPI: device specific

Example

```
CONFigure:MS:DEVice:TYPE BTSNormal
```

CONFigure[:MS]:MCARrier[:STATe] <State>

This command is retained for compatibility with R&S FS-K5 only. Refrain from using this command in new K10 remote scripts and use pure K10 remote commands instead. Use 'CONFigure:MS:MCARrier:MCBTs ON'.

Parameter

<Boolean value>

State

Characteristics

RST value: 0

SCPI: device specific

Example

// Use the following pure K10 commands instead of the old FS-K5 command
// 'CONFigure:MS:MCARrier:STATe ON'.

// Switch on mode for multi-carrier BTS measurements
// Note: With the next command internally also a
// multi-carrier pre-filter for the 'Demod' measurements
// will be activated.
// Switch on mode for multi-carrier BTS measurements.
```
CONFigure:MS:MCARrier:MCBTs ON
```
// Select K5 compatible multi-carrier pre-filter for PvT measurement.

```
CONFigure:MS:MCARrier:FILTer MC300
```

CONFigure[:MS]:MCARrier:ACTCarriers <Value>

This parameter specifies the total number of active carriers of the multi carrier BTS to be measured. Its value effects the calculation of the limits according to the 3GPP standard for the modulation spectrum measurement, see 3GPP2 TS 45.005 (chapter 4.2.1. 'Spectrum due to modulation and wide band noise', The limit is changed by 10*log(N).).

Parameter

<Integer value>

1 <= No. of active carriers <= 12

Characteristics

RST value: 1

SCPI: device specific

Example

```
CONFigure:MS:MCARrier:ACTCarriers 5
```

CONFigure[:MS]:MCARrier:BTSClass <Value>

Base station Class. The set BTS Class effects the calculation of the limits according to the 3GPP standard for the modulation spectrum measurement, see 3GPP2 TS 45.005 (chapter 4.2.1. 'Spectrum due to modulation and wide band noise' and chapter 4.3.2 'Base Transceiver Station', search for 'Multicarrier BTS').

Parameter

Value	Description
1	BTS class 1
2	BTS class 2

Characteristics

RST value: 1

SCPI: device specific

Example

```
CONFigure:MS:MCARrier:BTSClass 1
```

CONFigure[:MS]:MCARrier:FILTer <Value>

The PvT Filter controls the filter used to reduced the measurement bandwidth for multi-carrier Power vs Time measurements. The PvT Filter parameter in the Advanced tab will be ignored in the multi carrier BTS case.

Parameter

Value	Description
MC400	400 kHz bandwidth. Recommended for measurements with multi channels of equal power.
MC300	300 kHz bandwidth. Recommended for measurement scenarios where a total of six channels is active and the channel to be measured has a reduced power (e.g. 30 dB) compared to its adjacent channels.

Characteristics

RST value: MC400

SCPI: device specific

Example

`CONFigure:MS:MCARrier:FILTer MC400`

CONFigure[:MS]:MCARrier:MCBTs <State>

This parameter tells the K10 that the measured signal is a multi carrier signal. The parameter is only available if the Device Type in the General Settings dialog is a BTS type. If active a special multi carrier filter will be switched into the demodulation path and further multi-carrier-specific parameters will become available.

Parameter

<Boolean value>

State

Characteristics

RST value: 0

SCPI: device specific

Example

`CONFigure:MS:MCARrier:MCBTs ON`

CONFigure[:MS]:NETWork[:TYPE] <Value>

This command works in conjunction with the CONFigure[:MS]:NETWork:FREQuency: BAND command to specify the frequency band name of the signal to be measured. The command is not in-line with the manual operation to hold the SCPI remote control part compatible with the R&S FS-K5.

Parameter

Value	Description
PGSM	P-GSM, i.e. Primary GSM.
EGSM	E-GSM, i.e. Extended GSM.
DCS	DCS
PCS	PCS, i.e. Personal Communication Service.
TGSM	T-GSM, i.e. TETRA GSM.
RGSM	R-GSM, i.e. Railway GSM.
GSM	GSM

Characteristics

RST value: EGSM

SCPI: device specific

Example

```
CONFigure:MS:NETWork:TYPE PGSM
```

CONFigure[:MS]:NETWork:FREQuency:BAND <Value>

This command works in conjunction with the CONFigure[:MS]:NETWork[:TYPE] command to specify the frequency band of the signal to be measured. The command is not in-line with the manual operation to hold the SCPI remote control part compatible with the R&S FS-K5.

Parameter

Value	Description
380	380 MHz band, valid for T-GSM.
410	410 MHz band, valid for T-GSM.
450	450 MHz band, valid for GSM.
480	450 MHz band, valid for GSM.
710	710 MHz band, valid for GSM.
750	750 MHz band, valid for GSM.
810	810 MHz band, valid for T-GSM.
850	850 MHz band, valid for GSM.
900	900 MHz band , valid for P-GSM, E-GSM, R-GSM and T-GSM.
1800	1800 MHz band, valid for DCS.

1900	1900 MHz band, valid for PCS.

Characteristics

RST value: 900

SCPI: device specific

Example

```
CONFigure:MS:NETWork:FREQuency:BAND 380
```

CONFigure[:MS]:POWer:CLASs <Value>

This command the power class of the device under test.

Parameter

Value	Description
1	MS and BTS power class 1
2	MS and BTS power class 2
3	MS and BTS power class 3
4	MS and BTS power class 4
5	MS and BTS power class 5
6	BTS power class 6
7	BTS power class 7
8	BTS power class 8
E1	MS power class E1
E2	MS power class E2
E3	MS power class E3
M1	BTS power class M1 (Micro)
M2	BTS power class M2 (Micro)
M3	BTS power class M3 (Micro)
P1	BTS power class P1 (Pico)

Characteristics

RST value: 2

SCPI: device specific

Example

```
CONFigure:MS:POWer:CLASs 1
```

CONFigure[:MS]:POWer:STATic <Value>

This command specifies the static power control level. The static PCL is only available when a BTS is selected as the device type (see CONFigure[:MS]:DEVice:TYPE).

Parameter

<Integer value>

BTS static power control level.

Characteristics

RST value:

SCPI: device specific

Example

```
CONFigure:MS:POWer:STATic 5
```

CONFigure[:MS]:POWer:AUTO <Value>

This command is used to switch on or off automatic level detection. When switched on, level detection is performed prior to each I/Q data capture or measurement sweep. In the General Settings dialog the Auto checkbox of the Reference Level corresponds to this setting. Using the ONCE argument starts the auto level measurement immediately.

Parameter

Value	Description
OFF	Switch the function off
ON	Switch the function on
ONCE	Execute the function once

Characteristics

RST value: ON

SCPI: device specific

Example

```
CONFigure:MS:POWer:AUTO OFF
```

CONFigure[:MS]:POWer:AUTO:SWEep:TIME <Value>

This command is used to specify the sweep time for auto level measurements or swept measurements and the capture time for auto detection.

Parameter

<Double value>

Auto level measurement sweep time. (Unit: s)

Characteristics

RST value: 0.1 s

SCPI: device specific

Example

`CONFigure:MS:POWer:AUTO:SWEep:TIME 0.01 MS`

CONFigure[:MS]:SYNC:IQCThreshold <Value>

This command sets the IQ correlation threshold. The IQ correlation threshold decides whether a burst is accepted if "Measure only on Sync" is activated. If the correlation value between the ideal IQ signal of the given TSC and the measured TSC is below the IQ correlation threshold then K10 reports "Sync not found" in the status bar. Additionally such bursts are ignored if "Measure only on Sync" is activated.

Parameter

<Integer value>

IQ Correlation Threshold

Characteristics

RST value: 85

SCPI: device specific

Example

`CONFigure:MS:SYNC:IQCThreshold 0`

CONFigure[:MS]:SYNC:MODE <Value>

This command sets the synchronization mode of the K10.

Parameter

Value	Description
ALL	Burst + TSC: First search for the power profile (burst search) according to the frame configuration in the capture buffer. Second, inside the found bursts search for the TSC of the 'Slot to measure' as given in the frame configuration. 'Burst +TSC' typically will be faster than 'TSC' for bursted signals.
TSC	TSC: Search the capture buffer for the TSC of the 'Slot to measure' as given in the frame configuration. This mode corresponds to a correlation with the given TSC. This mode can be used for continous (but framed) signals or bursted signals.

BURSt	Burst: Search for the power profile (burst search) according to the frame configuration in the capture buffer. Note: For 'Burst' no demodulation measurements (e.g. Modulation Accuracy) are not supported. Only Power vs Time, Modulation Spectrum, Transient Spectrum measurements are supported.
NONE	None: Do not synchronize at all. If an external or power trigger is chosen the trigger instant corresponds to the frame start. Tip: Manually asjust the trigger offset to navigate the burst to be analyzed under the mask in the Power vs Time measurement. Note: For 'Nonet' no demodulation measurements (e.g. Modulation Accuracy) are not supported. Only Power vs Time, Modulation Spectrum, Transient Spectrum measurements are supported.

Characteristics

RST value: ALL

SCPI: device specific

Example

CONFigure:MS:SYNC:MODE ALL

CONFigure[:MS]:SYNC:ONLY <State>

If activated only results from frames (slots) where the 'Slot to measure' was found will displayed and be taken into account in the averaging of the results. The behavior of this parameter depends on the value of the 'Synchronization' parameter. Therefore 'Sync' is a synonym for the item the synchronization searches for, i.e. 'Burst + TSC', 'TSC' or 'Burst'.

Parameter

<Boolean value>

State. 1 = measure only on sync, 0 = always measure even if sync not found.

Characteristics

RST value: 0

SCPI: device specific

Example

CONFigure:MS:SYNC:ONLY ON

CONFigure:BURSt:CONStell[:IMMediate]

This command selects measurement of the constellation diagram.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

```
CONFigure:BURSt:CONStell:IMMediate
```

CONFigure:BURSt:ETIMe[:IMMediate]

This command selects measurement of the EVM Vs time.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

```
CONFigure:BURSt:ETIMe:IMMediate
```

CONFigure:BURSt:MACCuracy[:IMMediate]

This command selects measurement of the modulation accuracy.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

```
CONFigure:BURSt:MACCuracy:IMMediate
```

CONFigure:BURSt:MERRor[:IMMediate]

This command selects measurement of the magnitude error vs time.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

```
CONFigure:BURSt:MERRor:IMMediate
```

CONFigure:BURSt:PFERror[:IMMediate]

This command selects measurement of the phase error Vs time.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

```
CONFigure:BURSt:PFERror:IMMediate
```

CONFigure:BURSt:PTEMplate[:IMMediate]

This command selects the measurement of power vs. time (PvT) of the mobile or base station. Both graph and list results (slot power and "Delta to Sync" values) are displayed.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

CONFigure:BURSt:PTEMplate:IMMediate

CONFigure:BURSt:PTEMplate:FILTer <Value>

The PvT Filter controls the filter used to reduced the measurement bandwidth for single carrier Power vs Time measurements. The parameter is only available if Multi Carrier BTS in the Multi Carrier tab is switched off. Therefore the PvT Filter parameter in the Multi Carrier tab will be ignored in the single carrier case.

Parameter

Value	Description
G1000	1 MHz Gaussian filter.
G500	500 kHz Gaussian filter. (This value is retained for compatibility with R&S FS-K5 only.)
B600	600 kHz bandwidth low pass filter. (This value is retained for compatibility with R&S FS-K5 only.)

Characteristics

RST value: G1000

SCPI: device specific

Example

CONFigure:BURSt:PTEMplate:FILTer G1000

CONFigure:BURSt:PTEMplate:FRZoom <Value>

This command is retained for compatibility with R&S FS-K5 only. Use the Measurement Slot selection to zoom the corresponding area.

Parameter

<Integer value>

--- (This command is retained for compatibility with R&S FS-K5 only.)

Characteristics

RST value: 1

SCPI: device specific

Example

CONFigure:BURSt:PTEMplate:FRZoom 5

CONFigure:BURSt:PTEMplate:SELect <Value>

This command defines the burst section to be measured.

Parameter

Value	Description
FULL	Full burst, all bursts of the slot scope are displayed.
RISing	Rising Edge. Selects Rising/Falling. (This value is retained for compatibility with R&S FS-K5 only.)
FALLing	Falling Edge. Selects Rising/Falling. (This value is retained for compatibility with R&S FS-K5 only.)
TOP	Top high resolution (the y axis is streched to show the measurement slot power area in detail).
FRISing	Rising and Falling together (useful parts and guard intervals removed).

Characteristics

RST value: FULL

SCPI: device specific

Example

CONFigure:BURSt:PTEMplate:SELect FULL

CONFigure:BURSt:PTEMplate:TALign <Mode>

This command controls the time-alignment of the limit lines for the "Power vs Time" measurement (see "Limit Time Alignment").

Parameter

Value	Description
STMeasure	For each slot the mid of TSC is derived from the measured mid of TSC of the "Slot to measure" and the timeslot lengths specified in the standard (see "Timeslot length" in 3GPP TS 45.010).
PSLot	For each slot the mid of TSC is measured. This provides reasonable time-alignment if the slot lengths are not according to standard. However, the "Power vs Time" limit check is also passed.

Characteristics

RST value: STMeasure

SCPI: device specific

Example

`CONFigure:BURSt:PTEMplate:TALign STMeasure`

CONFigure:BURSt:PTEMplate:TMHRes <State>

This command is retained for compatibility with R&S FS-K5 only. Due to the improved measurement capabilities of this GSM analysis software, this remote control command (and the function behind) is not required any more.

Parameter

<Boolean value>

Parameter is ignored

Characteristics

RST value: ON

SCPI: device specific

Example

`CONFigure:BURSt:PTEMplate:TMHRes ON`

CONFigure:SPECtrum:SELect <Mode>

This command selects how the modulation and transient spectrum measurement is performed and displayed.

Parameter

Value	Description
LIST	List: Spectrum results are measured at several frequency offsets from the center frequency. The results are displayed in a table.
FREQdomain	Frequency Domain: A sepectrum trace is measured and displayed as a graph.

Characteristics

RST value: FREQdomain

SCPI: device specific

Example

CONFigure:SPECtrum:SELect LIST

CONFigure:SPECtrum:LIMit:LEFT <State>

This parameter controls the left limit check of the spectrum trace (spectrum graph measurement) and which offset frequencies in the table (spectrum list measurement) are checked against the limit. This parameter effects the Modulation Spectrum and Transient Spectrum measurements. Tip: For measurements on multi carrier signals using either the check on the left or right side can be used to measure the spectrum of the left- / right-most channel and to ignore the side where adjacent channels are located.

Parameter

<Boolean value>

On = check limit, Off = do not check limit.

Characteristics

RST value: 1

SCPI: device specific

Example

CONFigure:SPECtrum:LIMit:LEFT ON

CONFigure:SPECtrum:LIMit:RIGHt <State>

This parameter controls the right limit check of the spectrum trace (spectrum graph measurement) and which offset frequencies in the table (spectrum list measurement) are checked against the limit. This parameter effects the Modulation Spectrum and Transient Spectrum measurements. Tip: For measurements on multi carrier signals using either the check on the left or right side can be used to measure the spectrum of the left- / right-most channel and to ignore the side where adjacent channels are located.

Parameter

<Boolean value>

On = check limit, Off = do not check limit.

Characteristics

RST value: 1

SCPI: device specific

Example

CONFigure:SPECtrum:LIMit:RIGHt ON

CONFigure:SPECtrum:MODulation[:IMMediate]

This command selects measurement of the spectrum due to modulation (MOD). This measurement is based on captured I/Q data. Use the Wide Modulation spectrum measurements for measurements in zero span mode (see :CONFigure:WSPectrum:MODulation[:IMMediate]).

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

```
CONFigure:SPECtrum:MODulation:IMMediate
```

CONFigure:SPECtrum:SWITching[:IMMediate]

This command selects measurement of the spectrum due to switching transients (TRA).

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

```
CONFigure:SPECtrum:SWITching:IMMediate
```

CONFigure:SPECtrum:SWITching:LIMit <LimitMode>

This command is retained for compatibility with R&S FS-K5 only. Due to the improved measurement capabilities of this GSM analysis software, this remote control command (and the function behind) is not required any more.

Parameter

Value	Description
ABSolute	Absolute limits
RELative	Relative limits

Characteristics

RST value:

SCPI: device specific

Example

```
CONFigure:SPECtrum:SWITching:LIMit ABSolute
```

CONFigure:SPECtrum:SWITching:TYPE <DetectorMode>

This command is retained for compatibility with R&S FS-K5 only.

Parameter

Value	Description
PEAK	Use the PEAK mode for the reference measurement
RMS	Use the RMS mode for the reference measurement

Characteristics

RST value:

SCPI: device specific

Example

```
CONFigure:SPECtrum:SWITching:TYPE PEAK
```

CONFigure:WSPectrum:MODulation[:IMMediate]

This command selects the measurement of the wide spectrum due to modulation (WMOD). The wide modulation spectrum measurement uses a series of zero span mode measurements and can measure offset frequencies up to 5.8 MHz. This command is only available for IF power or external trigger mode. Make sure that the Trigger Offset (in the General Settings dialog) is set correctly, e.g. using the Auto Set (Trigger) functionality of the K10.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Switch display on
```
SYSTem:DISPlay:UPDate ON
```

// Activate slot 0
```
CONFigure:MS:CHANnel:SLOT0:STATe ON
```

// Deactivate all other slots(1-7)

```
CONFigure:MS:CHANnel:SLOT1:STATe OFF
CONFigure:MS:CHANnel:SLOT2:STATe OFF
CONFigure:MS:CHANnel:SLOT3:STATe OFF
CONFigure:MS:CHANnel:SLOT4:STATe OFF
CONFigure:MS:CHANnel:SLOT5:STATe OFF
CONFigure:MS:CHANnel:SLOT6:STATe OFF
CONFigure:MS:CHANnel:SLOT7:STATe OFF
```

// Set slot 0 to Normal Burst, GMSK, TSC 0
```
CONFigure:MS:CHANnel:SLOT0:TYPE NB
CONFigure:MS:CHANnel:SLOT0:MTYPe GMSK
```

// Set center frequency to 900 MHz
```
SENSe:FREQuency:CENTer 900MHZ
```

// Set the Ref level to 0 dbm
```
DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel:RF 0
```

// Read back the Ref Level
```
DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel:RF?
```

// Choose the Wide Modulation spectrum measurement
```
CONFigure:WSPectrum:MODulation:IMMediate
```

// Trigger Mode should be set to Power mode by default
```
TRIGger1:SEQuence:SOURce IFPower
```

// Run Auto Trigger (determine the trigger level and offset)
```
CONFigure:MS:AUTO:TRIGger ONCE;*OPC?
```

// Read out the trigger level
```
TRIGger1:SEQuence:LEVel:IFPower?
```

// Read out the Trigger Offset
```
TRIGger1:SEQuence:HOLDoff:TIME?
```

// Set the statistic count to 50
```
SENSe:SWEep:COUNt 50
```

// Do one measurement and read out the results for all offset frequencies
```
READ:WSPectrum:MODulation:ALL?
```

5.1.4 DISPlay Subsystem

The DISPLay subsystem controls the selection and presentation of textual and graphic information as well as of measurement data on the display.

The following subsystems are included:

WINDow

Commands of the DISPlay subsystem:

DISPlay:FORMat <ScreenMode>

DISPlay[:WINDow<1|2>]:SELect

DISPlay[:WINDow<1|2>]:TRACe<1>:Y[:SCALe]:RLEVel[:RF] <Value>

DISPlay[:WINDow<1|2>]:TRACe<1>:Y[:SCALe]:RLEVel:IQ <Value>

DISPlay[:WINDow<1|2>]:TRACe<1>:Y[:SCALe]:RLEVel:OFFSet <Value>

DISPlay:FORMat <ScreenMode>

This command sets the visible screen display type to full or split screen.

Parameter

Value	Description
SPLit	Show 2 or more screens on the display
SINGle	Show only 1 screen on the display

Characteristics

RST value: SINGle

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Activate constellation measurement
```
CONFigure:BURSt:CONStell:IMMediate
```
// Run a (blocking) single sweep
```
INITiate:IMMediate;*WAI
```

// Switch to full screen mode (show only one screen)
```
DISPlay:FORMat SINGle
```
// Select screen A (I/Q constellation graph)
```
DISPlay:WINDow1:SELect
```
// Select screen B (modulation accuracy table)
```
DISPlay:WINDow2:SELect
```

// Switch to split screen mode (show all screens)
```
DISPlay:FORMat SPLit
```

DISPlay[:WINDow<1|2>]:SELect

This command selects whether screen A or screen B is active. WINDow1 corresponds to SCREEN A, WINDow2 to SCREEN B.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Activate constellation measurement
`CONFigure:BURSt:CONStell:IMMediate`
// Run a (blocking) single sweep
`INITiate:IMMediate;*WAI`

// Switch to full screen mode (show only one screen)
`DISPlay:FORMat SINGle`
// Select screen A (I/Q constellation graph)
`DISPlay:WINDow1:SELect`
// Select screen B (modulation accuracy table)
`DISPlay:WINDow2:SELect`

// Switch to split screen mode (show all screens)
`DISPlay:FORMat SPLit`

DISPlay[:WINDow<1|2>]:TRACe<1>:Y[:SCALe]:RLEVel[:RF] <Value>

This command can be used to retrieve or set the current internal instrument reference level for RF used when performing measurements.

Parameter

<Double value>

Reference level of RF input. (Unit: dBm)

Note

All numerical suffixes are irrelevant for this command.

Characteristics

RST value: -20 dBm

SCPI: device specific

Example

`DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel:RF -20 DBM`

DISPlay[:WINDow<1|2>]:TRACe<1>:Y[:SCALe]:RLEVel:IQ <Value>

This command can be used to retrieve or set the current internal instrument reference level for analog baseband inputs used when performing measurements.

Parameter

<Double value>

Reference level for analog baseband inputs in Volts. (Unit: V)

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required. All numerical suffixes are irrelevant for this command.

Characteristics

RST value: 1 V

SCPI: device specific

Example

```
DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel:IQ 1 MV
```

DISPlay[:WINDow<1|2>]:TRACe<1>:Y[:SCALe]:RLEVel:OFFSet <Value>

Specifies the external attenuation or gain applied to the RF signal. A positive value indicates attenuation, a negative value indicates gain. Displayed power level values are shifted by this value. For details refer to the 'Reference Level Offset' softkey of the base unit.

Parameter

<Double value>

External attenuation (positive) or gain (negative). (Unit: dB)

Note

All numerical suffixes are irrelevant for this command. This parameter is not available for signals from the analog baseband inputs (option R&S FSQ-B71).

Characteristics

RST value: 0 dB

SCPI: device specific

Example

```
DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel:OFFSet 10 DB
```

5.1.5 FETCh Subsystem

The FETCh Subsystem contains commands for reading out results of complex measurement tasks.

The following subsystems are included:

BURSt

SPECtrum

Commands of the FETCh subsystem:

FETCh:BURSt[:MACCuracy]:ALL?

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:AVERage?

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:CURRent?

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:MAXimum?

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:SDEViation?

FETCh:BURSt[:MACCuracy][:EVM]:RMS:AVERage?

FETCh:BURSt[:MACCuracy][:EVM]:RMS:CURRent?

FETCh:BURSt[:MACCuracy][:EVM]:RMS:MAXimum?

FETCh:BURSt[:MACCuracy][:EVM]:RMS:SDEViation?

FETCh:BURSt[:MACCuracy]:ADRoop:AVERage?

FETCh:BURSt[:MACCuracy]:ADRoop:CURRent?

FETCh:BURSt[:MACCuracy]:ADRoop:MAXimum?

FETCh:BURSt[:MACCuracy]:ADRoop:SDEViation?

FETCh:BURSt[:MACCuracy]:BPOWer:AVERage?

FETCh:BURSt[:MACCuracy]:BPOWer:CURRent?

FETCh:BURSt[:MACCuracy]:BPOWer:MAXimum?

FETCh:BURSt[:MACCuracy]:BPOWer:SDEViation?

FETCh:BURSt[:MACCuracy]:FERRor:AVERage?

FETCh:BURSt[:MACCuracy]:FERRor:CURRent?

FETCh:BURSt[:MACCuracy]:FERRor:MAXimum?

FETCh:BURSt[:MACCuracy]:FERRor:SDEViation?

FETCh:BURSt[:MACCuracy]:FREQuency:AVERage?

FETCh:BURSt[:MACCuracy]:FREQuency:CURRent?

FETCh:BURSt[:MACCuracy]:FREQuency:MAXimum?

FETCh:BURSt[:MACCuracy]:FREQuency:SDEViation?

FETCh:BURSt[:MACCuracy]:IQIMbalance:AVERage?

FETCh:BURSt[:MACCuracy]:IQIMbalance:CURRent?

FETCh:BURSt[:MACCuracy]:IQIMbalance:MAXimum?

FETCh:BURSt[:MACCuracy]:IQIMbalance:SDEViation?

FETCh:BURSt[:MACCuracy]:IQOFfset:AVERage?

FETCh:BURSt[:MACCuracy]:IQOFfset:CURRent?

FETCh:BURSt[:MACCuracy]:IQOFfset:MAXimum?

FETCh:BURSt[:MACCuracy]:IQOFfset:SDEViation?

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:AVERage?

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:CURRent?

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:MAXimum?

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:SDEViation?

FETCh:BURSt[:MACCuracy]:MERRor:RMS:AVERage?

FETCh:BURSt[:MACCuracy]:MERRor:RMS:CURRent?

FETCh:BURSt[:MACCuracy]:MERRor:RMS:MAXimum?

FETCh:BURSt[:MACCuracy]:MERRor:RMS:SDEViation?

FETCh:BURSt[:MACCuracy]:OSUPpress:AVERage?

FETCh:BURSt[:MACCuracy]:OSUPpress:CURRent?

FETCh:BURSt[:MACCuracy]:OSUPpress:MAXimum?

FETCh:BURSt[:MACCuracy]:OSUPpress:SDEViation?

FETCh:BURSt[:MACCuracy]:PERCentile:EVM?

FETCh:BURSt[:MACCuracy]:PERCentile:MERRor?

FETCh:BURSt[:MACCuracy]:PERCentile:PERRor?

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:AVERage?

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:CURRent?

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:MAXimum?

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:SDEViation?

FETCh:BURSt[:MACCuracy]:PERRor:RMS:AVERage?

FETCh:BURSt[:MACCuracy]:PERRor:RMS:CURRent?

FETCh:BURSt[:MACCuracy]:PERRor:RMS:MAXimum?

FETCh:BURSt[:MACCuracy]:PERRor:RMS:SDEViation?

FETCh:BURSt:SPOWer:SLOT<0..7>:ALL:AVERage?

FETCh:BURSt:SPOWer:SLOT<0..7>:ALL:CRESt?

FETCh:BURSt:SPOWer:SLOT<0..7>:ALL:MAXimum?

FETCh:BURSt:SPOWer:SLOT<0..7>:CURRent:AVERage?

FETCh:BURSt:SPOWer:SLOT<0..7>:CURRent:CRESt?

FETCh:BURSt:SPOWer:SLOT<0..7>:CURRent:MAXimum?

FETCh:SPECtrum:MODulation[:ALL]?

FETCh:SPECtrum:SWITching[:ALL]?

FETCh:BURSt[:MACCuracy]:ALL?

This command returns all the results of the Modulation Accuracy table. The results are output as a list of comma separated strings. The returned item order is: Error Vector Magnitude RMS, Error Vector Magnitude Peak, Magnitude Error RMS, Magnitude Error Peak, Phase Error RMS, Phase Error Peak, Burst Power, Frequency Error, IQ Offset, IB Imbalance. Each item consists of an Average, Current, Maximum and Standard Deviation value. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<String>

The measurement value.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:ALL?

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:AVERage?

This command reads out the average of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
*RST

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Activate modulation accuracy measurement
`CONFigure:BURSt:MACCuracy:IMMediate`
// Run a (blocking) single sweep
`INITiate:IMMediate;*WAI`
// Query the measurement result
`FETC:BURS:PEAK:AVER?`

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:CURRent?

This command reads out the current of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Activate modulation accuracy measurement
`CONFigure:BURSt:MACCuracy:IMMediate`
// Run a (blocking) single sweep
`INITiate:IMMediate;*WAI`
// Query the measurement result
`FETC:BURS:PEAK:CURR?`

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:MAXimum?

This command reads out the maximum of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Activate modulation accuracy measurement
`CONFigure:BURSt:MACCuracy:IMMediate`
// Run a (blocking) single sweep
`INITiate:IMMediate;*WAI`
// Query the measurement result
`FETC:BURS:PEAK:MAX?`

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:SDEViation?

This command reads out the standard deviation of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Activate modulation accuracy measurement
`CONFigure:BURSt:MACCuracy:IMMediate`
// Run a (blocking) single sweep
`INITiate:IMMediate;*WAI`
// Query the measurement result
`FETC:BURS:PEAK:SDEV?`

FETCh:BURSt[:MACCuracy][:EVM]:RMS:AVERage?

This command reads out the average of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Activate modulation accuracy measurement
`CONFigure:BURSt:MACCuracy:IMMediate`
// Run a (blocking) single sweep
`INITiate:IMMediate;*WAI`
// Query the measurement result
`FETC:BURS:RMS:AVER?`

FETCh:BURSt[:MACCuracy][:EVM]:RMS:CURRent?

This command reads out the current of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Activate modulation accuracy measurement
```
CONFigure:BURSt:MACCuracy:IMMediate
```
// Run a (blocking) single sweep
```
INITiate:IMMediate;*WAI
```
// Query the measurement result
```
FETC:BURS:RMS:CURR?
```

FETCh:BURSt[:MACCuracy][:EVM]:RMS:MAXimum?

This command reads out the maximum of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Activate modulation accuracy measurement
```
CONFigure:BURSt:MACCuracy:IMMediate
```
// Run a (blocking) single sweep
```
INITiate:IMMediate;*WAI
```
// Query the measurement result
```
FETC:BURS:RMS:MAX?
```

FETCh:BURSt[:MACCuracy][:EVM]:RMS:SDEViation?

This command reads out the standard deviation of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Activate modulation accuracy measurement
```
CONFigure:BURSt:MACCuracy:IMMediate
```
// Run a (blocking) single sweep
```
INITiate:IMMediate;*WAI
```
// Query the measurement result
```
FETC:BURS:RMS:SDEV?
```

FETCh:BURSt[:MACCuracy]:ADRoop:AVERage?

This command reads out the average measurement of the Amplitude Droop taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:ADRoop:AVERage?
```

FETCh:BURSt[:MACCuracy]:ADRoop:CURRent?

This command reads out the current measurement of the Amplitude Droop taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:ADRoop:CURRent?
```

FETCh:BURSt[:MACCuracy]:ADRoop:MAXimum?

This command reads out the maximum measurement of the Amplitude Droop taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:ADRoop:MAXimum?
```

FETCh:BURSt[:MACCuracy]:ADRoop:SDEViation?

This command reads out the standard deviation measurement of the Amplitude Droop taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`FETCh:BURSt:MACCuracy:ADRoop:SDEViation?`

FETCh:BURSt[:MACCuracy]:BPOWer:AVERage?

This command reads out the average measurement of the Burst Power taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`FETCh:BURSt:MACCuracy:BPOWer:AVERage?`

FETCh:BURSt[:MACCuracy]:BPOWer:CURRent?

This command reads out the current measurement of the Burst Power taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`FETCh:BURSt:MACCuracy:BPOWer:CURRent?`

FETCh:BURSt[:MACCuracy]:BPOWer:MAXimum?

This command reads out the maximum measurement of the Burst Power taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:BPOWer:MAXimum?

FETCh:BURSt[:MACCuracy]:BPOWer:SDEViation?

This command reads out the standard deviation measurement of the Burst Power taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:BPOWer:SDEViation?

FETCh:BURSt[:MACCuracy]:FERRor:AVERage?

This command is retained for compatibility with R&S FS-K5 only. Use the FETCh:BURSt:MACCuracy:FREQuency:AVERage? command which behaves the same way.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:FERRor:AVERage?

FETCh:BURSt[:MACCuracy]:FERRor:CURRent?

This command is retained for compatibility with R&S FS-K5 only. Use the
FETCh:BURSt:MACCuracy:FREQuency:CURRent? command which behaves the
same way.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:FERRor:CURRent?

FETCh:BURSt[:MACCuracy]:FERRor:MAXimum?

This command is retained for compatibility with R&S FS-K5 only. Use the
FETCh:BURSt:MACCuracy:FREQuency:MAXimum? command which behaves the
same way.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:FERRor:MAXimum?

FETCh:BURSt[:MACCuracy]:FERRor:SDEViation?

This command is retained for compatibility with R&S FS-K5 only. Use the
FETCh:BURSt:MACCuracy:FREQuency:SDEViation? command which behaves
the same way.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:FERRor:SDEViation?

FETCh:BURSt[:MACCuracy]:FREQuency:AVERage?

This command reads out the average measurement of the Frequency Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:FREQuency:AVERage?

FETCh:BURSt[:MACCuracy]:FREQuency:CURRent?

This command reads out the current measurement of the Frequency Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:FREQuency:CURRent?

FETCh:BURSt[:MACCuracy]:FREQuency:MAXimum?

This command reads out the maximum measurement of the Frequency Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:FREQuency:MAXimum?

FETCh:BURSt[:MACCuracy]:FREQuency:SDEViation?

This command reads out the standard deviation measurement of the Frequency Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:FREQuency:SDEViation?

FETCh:BURSt[:MACCuracy]:IQIMbalance:AVERage?

This command reads out the average measurement of the IQ Imbalance taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`FETCh:BURSt:MACCuracy:IQIMbalance:AVERage?`

FETCh:BURSt[:MACCuracy]:IQIMbalance:CURRent?

This command reads out the current measurement of the IQ Imbalance taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`FETCh:BURSt:MACCuracy:IQIMbalance:CURRent?`

FETCh:BURSt[:MACCuracy]:IQIMbalance:MAXimum?

This command reads out the maximum measurement of the IQ Imbalance taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`FETCh:BURSt:MACCuracy:IQIMbalance:MAXimum?`

FETCh:BURSt[:MACCuracy]:IQIMbalance:SDEViation?

This command reads out the standard deviation measurement of the IQ Imbalance taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:IQIMbalance:SDEViation?

FETCh:BURSt[:MACCuracy]:IQOFfset:AVERage?

This command reads out the average measurement of the IQ Offset taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:IQOFfset:AVERage?

FETCh:BURSt[:MACCuracy]:IQOFfset:CURRent?

This command reads out the current measurement of the IQ Offset taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:IQOFfset:CURRent?

FETCh:BURSt[:MACCuracy]:IQOFfset:MAXimum?

This command reads out the maximum measurement of the IQ Offset taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:IQOFfset:MAXimum?

FETCh:BURSt[:MACCuracy]:IQOFfset:SDEViation?

This command reads out the standard deviation measurement of the IQ Offset taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:IQOFfset:SDEViation?

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:AVERage?

This command reads out the average of the peak measurement of the Magnitude Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:MERRor:PEAK:AVERage?

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:CURRent?

This command reads out the current of the peak measurement of the Magnitude Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:MERRor:PEAK:CURRent?

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:MAXimum?

This command reads out the maximum of the peak measurement of the Magnitude Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:MERRor:PEAK:MAXimum?

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:SDEViation?

This command reads out the standard deviation of the peak measurement of the Magnitude Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:MERRor:PEAK:SDEViation?
```

FETCh:BURSt[:MACCuracy]:MERRor:RMS:AVERage?

This command reads out the average of the RMS measurement of the Magnitude Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:MERRor:RMS:AVERage?
```

FETCh:BURSt[:MACCuracy]:MERRor:RMS:CURRent?

This command reads out the current of the RMS measurement of the Magnitude Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:MERRor:RMS:CURRent?
```

FETCh:BURSt[:MACCuracy]:MERRor:RMS:MAXimum?

This command reads out the maximum of the RMS measurement of the Magnitude Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:MERRor:RMS:MAXimum?

FETCh:BURSt[:MACCuracy]:MERRor:RMS:SDEViation?

This command reads out the standard deviation of the RMS measurement of the Magnitude Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:MERRor:RMS:SDEViation?

FETCh:BURSt[:MACCuracy]:OSUPpress:AVERage?

This command reads out the average measurement of the IQ Offset Suppression taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:OSUPpress:AVERage?

FETCh:BURSt[:MACCuracy]:OSUPpress:CURRent?

This command reads out the current measurement of the IQ Offset Suppression taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`FETCh:BURSt:MACCuracy:OSUPpress:CURRent?`

FETCh:BURSt[:MACCuracy]:OSUPpress:MAXimum?

This command reads out the maximum measurement of the IQ Offset Suppression taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`FETCh:BURSt:MACCuracy:OSUPpress:MAXimum?`

FETCh:BURSt[:MACCuracy]:OSUPpress:SDEViation?

This command reads out the standard deviation measurement of the IQ Offset Suppression taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`FETCh:BURSt:MACCuracy:OSUPpress:SDEViation?`

FETCh:BURSt[:MACCuracy]:PERCentile:EVM?

This command reads out the 95% percentile of the Error Vector Magnitude measurement taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:PERCentile:EVM?
```

FETCh:BURSt[:MACCuracy]:PERCentile:MERRor?

This command reads out the 95% percentile of the Magnitude Error measurement taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:PERCentile:MERRor?
```

FETCh:BURSt[:MACCuracy]:PERCentile:PERRor?

This command reads out the 95% percentile of the Phase Error measurement taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: degree)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:PERCentile:PERRor?
```

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:AVERage?

This command reads out the average of the peak measurement of the Phase Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: degree)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:PERRor:PEAK:AVERage?
```

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:CURRent?

This command reads out the current of the peak measurement of the Phase Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: degree)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
FETCh:BURSt:MACCuracy:PERRor:PEAK:CURRent?
```

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:MAXimum?

This command reads out the maximum of the peak measurement of the Phase Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: degree)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:PERRor:PEAK:MAXimum?

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:SDEViation?

This command reads out the standard deviation of the peak measurement of the Phase Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: degree)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:PERRor:PEAK:SDEViation?

FETCh:BURSt[:MACCuracy]:PERRor:RMS:AVERage?

This command reads out the average of the RMS measurement of the Phase Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: degree)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:PERRor:RMS:AVERage?

FETCh:BURSt[:MACCuracy]:PERRor:RMS:CURRent?

This command reads out the current of the RMS measurement of the Phase Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: degree)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:PERRor:RMS:CURRent?

FETCh:BURSt[:MACCuracy]:PERRor:RMS:MAXimum?

This command reads out the maximum of the RMS measurement of the Phase Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: degree)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:PERRor:RMS:MAXimum?

FETCh:BURSt[:MACCuracy]:PERRor:RMS:SDEViation?

This command reads out the standard deviation of the RMS measurement of the Phase Error taken over the selected number of bursts.

Result

<Double value>

The measurement value. (Unit: degree)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:BURSt:MACCuracy:PERRor:RMS:SDEViation?

FETCh:BURSt:SPOWer:SLOT<0..7>:ALL:AVERage?

This command reads out the average power for the selected slot for all measured bursts. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>

The measurement value. (Unit: dBm)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
`CONFigure:MS:CHANnel:MSLots:NOFSlots 8`
// First Slot to measure = 0
`CONFigure:MS:CHANnel:MSLots:OFFSet 0`

// Activate PvT (Power vs Time) measurement
`CONFigure:BURSt:PTEMplate:IMMediate`

// Run a (blocking) single sweep
// Note: 'FETCh' only reads the results without starting a new sweep!
`INITiate:IMMediate;*WAI`

`FETCh:BURSt:SPOWer:SLOT0:ALL:AVERage?`

FETCh:BURSt:SPOWer:SLOT<0..7>:ALL:CRESt?

This command reads out the crest factor for the selected slot for all measured bursts. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
// First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```

// Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```

// Run a (blocking) single sweep
// Note: 'FETCh' only reads the results without starting a new sweep!
```
INITiate:IMMediate;*WAI
```

```
FETCh:BURSt:SPOWer:SLOT0:ALL:CRESt?
```

FETCh:BURSt:SPOWer:SLOT<0..7>:ALL:MAXimum?

This command reads out the maximum power for the selected slot for all measured bursts. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>

The measurement value. (Unit: dBm)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
`CONFigure:MS:CHANnel:MSLots:NOFSlots 8`
// First Slot to measure = 0
`CONFigure:MS:CHANnel:MSLots:OFFSet 0`

// Activate PvT (Power vs Time) measurement
`CONFigure:BURSt:PTEMplate:IMMediate`

// Run a (blocking) single sweep
// Note: 'FETCh' only reads the results without starting a new sweep!
`INITiate:IMMediate;*WAI`

`FETCh:BURSt:SPOWer:SLOT0:ALL:MAXimum?`

FETCh:BURSt:SPOWer:SLOT<0..7>:CURRent:AVERage?

This command reads out the average power for the selected slot for the current burst. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>

The measurement value. (Unit: dBm)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
// First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```

// Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```

// Run a (blocking) single sweep
// Note: 'FETCh' only reads the results without starting a new sweep!
```
INITiate:IMMediate;*WAI
```

```
FETCh:BURSt:SPOWer:SLOT0:CURRent:AVERage?
```

FETCh:BURSt:SPOWer:SLOT<0..7>:CURRent:CRESt?

This command reads out the crest factor for the selected slot for the current burst. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
// First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```

// Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```

// Run a (blocking) single sweep

// Note: 'FETCh' only reads the results without starting a new sweep!
```
INITiate:IMMediate;*WAI
```

```
FETCh:BURSt:SPOWer:SLOT0:CURRent:CRESt?
```

FETCh:BURSt:SPOWer:SLOT<0..7>:CURRent:MAXimum?

This command reads out the maximum power for the selected slot for the current burst. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>

The measurement value. (Unit: dBm)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
// First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```

// Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```

// Run a (blocking) single sweep
// Note: 'FETCh' only reads the results without starting a new sweep!
```
INITiate:IMMediate;*WAI
```

```
FETCh:BURSt:SPOWer:SLOT0:CURRent:MAXimum?
```

FETCh:SPECtrum:MODulation[:ALL]?

This command reads out the result of the measurement of the modulation spectrum of the mobile or base station. The result is output as a list of partial result strings separated by ',' as for the command FETCh:SPECtrum:SWITching[:ALL?]. This command is only available if the modulation spectrum measurement is selected (see CONFigure:SPECtrum:MODulation[:IMMediate]).

Result

Value	Description
ARFCn	This parameter is retained for compatibility with R&S FS-K5 only.
COMBined	This parameter is retained for compatibility with R&S FS-K5 only.
DCSRx1800	This parameter is retained for compatibility with R&S FS-K5 only.
RXBand	This parameter is retained for compatibility with R&S FS-K5 only.
TXBand	This parameter is retained for compatibility with R&S FS-K5 only.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:SPECtrum:MODulation:ALL?

FETCh:SPECtrum:SWITching[:ALL]?

This command reads out the result of the measurement of the transient spectrum of the mobile or base station. The result is output as a list of partial result strings separated by ',' as for the command FETCh:SPECtrum:MODulation[:ALL?]. This command is only available when the transient spectrum measurement is selected (see CONFigure:SPECtrum:SWITching[:IMMediate]).

Characteristics

RST value: none (Result)

SCPI: device specific

Example

FETCh:SPECtrum:SWITching:ALL?

5.1.6 INITiate Subsystem

The INITiate subsystem is used to start and stop a measurement.

Commands of the INITiate subsystem:

INITiate[:IMMediate]

INITiate:CONTinuous <State>

INITiate[:IMMediate]

This command requests the option to start a new measurement sequence. If a measurement sequence is already in progress, then the command will be ignored.

Characteristics

RST value: none (Execute command)

SCPI: compatible

Example

```
INITiate:IMMediate
```

INITiate:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

Parameter

<Boolean value>

Sweep mode: 0 = Single sweep mode, 1 = Continuous sweep mode.

Characteristics

RST value: 1

SCPI: compatible

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and do one measurement
```
INITiate1:CONTinuous OFF
INITiate1:IMMediate
```

// Switch to continuous sweep mode and start to measure
```
INITiate:CONTinuous ON
INITiate1:IMMediate
```

5.1.7 INPut Subsystem

The INPut subsystem controls the input characteristics of the RF inputs of the instrument.

The following subsystems are included:

- EATT
- FILTer
- GAIN
- IQ

Commands of the INPut subsystem:

INPut:ATTenuation <Attenuation>

INPut:SELect <Source>

INPut:EATT <Attenuation>

INPut:EATT:AUTO <State>

INPut:EATT:STATe <State>

INPut:GAIN:STATe <State>

INPut:IQ:IMPedance <Value>

INPut:IQ:TYPE <Value>

INPut:IQ:BALanced[:STATe] <State>

INPut:ATTenuation <Attenuation>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the command DEC.

Parameter

<Integer value>

Attenuation value (Unit: dB)

Characteristics

RST value: 10 dB

SCPI: device specific

Example

```
INPut:ATTenuation 10 DB
```

INPut:SELect <Source>

This command selects the signal source, i.e. the input where the signal to be analyzed comes from.

Parameter

Value	Description
AIQ	Baseband Analog (Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.)
RF	RF Input

Characteristics

RST value: RF

SCPI: device specific

Example

```
INPut:SELect AIQ
```

INPut:EATT <Attenuation>

This command programs the attenuation of the electronic input attenuator. The attenuation can be varied in 5 dB steps from 0 to 30 dB. Other entries are rounded to the next lower integer value. If the attenuation is programmed directly, the coupling to the reference level is switched off. If the defined reference level cannot be set with the given RF attenuation, this level is adapted to the maximum possible value. The electronic attenuator is switched off in the default state.

Parameter

<Integer value>

Attenuation value; 0 sets the state to OFF (Unit: dB)

Characteristics

RST value: 0 dB

SCPI: device specific

Example

```
INPut:EATT 10 DB
```

INPut:EATT:AUTO <State>

This command automatically couples the electronic input attenuation to the reference level and the attenuation of the mechanical attenuator (state ON) or switches the input attenuation to manual entry (state OFF).

Parameter

<Boolean value>

Automatic electronic attenuator control active / deactivated.

Characteristics

RST value: 1

SCPI: device specific

Example

INPut:EATT:AUTO ON

INPut:EATT:STATe <State>

This command switches the electronic input attenuation into the signal path (state ON) or removes it from the signal path (state OFF).

Parameter

<Boolean value>

Electronic attenuator active / deactivated.

Characteristics

RST value: 0

SCPI: device specific

Example

INPut:EATT:STATe ON

INPut:GAIN:STATe <State>

This command switches the preamplifier of the instrument on. The switchable gain is fixed.

Parameter

<Boolean value>

Preamplifier active / deactivated.

Characteristics

RST value: 0

SCPI: device specific

Example

INPut:GAIN:STATe ON

INPut:IQ:IMPedance <Value>

This command specifies the input impedance for the analog baseband I/Q inputs.

Parameter

Value	Description
LOW	50 Ohm
HIGH	1 kOhm or 1 MOhm (depending on the instrument configuration)

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.

Characteristics

RST value: LOW

SCPI: device specific

Example

`INPut:IQ:IMPedance LOW`

INPut:IQ:TYPE <Value>

This remote control command specifies the input path for the analog baseband input. Currently the value can not be changed.

Parameter

Value	Description
IQ	I + j*Q

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.

Characteristics

RST value: IQ

SCPI: device specific

Example

`INPut:IQ:TYPE IQ`

INPut:IQ:BALanced[:STATe] <State>

This command specifies whether the analog baseband I/Q inputs are symmetrical (balanced) or asymmetrical (unbalanced).

Parameter

<Boolean value>
State, 1 = balanced, 0 = unbalanced.

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.

Characteristics

RST value: 1

SCPI: device specific

Example

`INPut:IQ:BALanced:STATe ON`

5.1.8 INSTrument Subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

Commands of the INSTrument subsystem:

INSTrument[:SELect] <Mode>
INSTrument:NSELect <Mode>

INSTrument[:SELect] <Mode>

Selects the operating mode

Parameter

Value	Description
SANalyzer	Spectrum analyzer
GSM	GSM option, R&S FS-K10.

Note

For further details refer to section Remote Control - Description of Basic Settings Commands, INSTrument subsystem.

Characteristics

RST value: SANA

SCPI: compatible

Example

```
INSTrument:SELect SANalyzer
```

INSTrument:NSELect <Mode>

Selects the operating mode.

Parameter

Value	Description
1	Spectrum analyzer
7	GSM option, R&S FS-K10.

Note

For further details refer to section Remote Control - Description of Basic Settings Commands, INSTrument subsystem.

Characteristics

RST value: 1

SCPI: compatible

Example

```
INSTrument:NSELect 1
```

5.1.9 READ Subsystem

The READ subsystem contains commands for starting complex measurement tasks, and for querying the results subsequently.

The following subsystems are included:

- BURSt
- SPECtrum
- WSPectrum

Commands of the READ subsystem:

READ:BURSt[:MACCuracy]:ALL?

READ:BURSt[:MACCuracy][:EVM]:PEAK:AVERage?

READ:BURSt[:MACCuracy][:EVM]:PEAK:CURRent?

READ:BURSt[:MACCuracy][:EVM]:PEAK:MAXimum?

READ:BURSt[:MACCuracy][:EVM]:PEAK:SDEViation?

READ:BURSt[:MACCuracy][:EVM]:RMS:AVERage?

READ:BURSt[:MACCuracy][:EVM]:RMS:CURRent?

READ:BURSt[:MACCuracy][:EVM]:RMS:MAXimum?

READ:BURSt[:MACCuracy][:EVM]:RMS:SDEViation?

READ:BURSt[:MACCuracy]:ADRoop:AVERage?

READ:BURSt[:MACCuracy]:ADRoop:CURRent?

READ:BURSt[:MACCuracy]:ADRoop:MAXimum?

READ:BURSt[:MACCuracy]:ADRoop:SDEViation?

READ:BURSt[:MACCuracy]:BPOWer:AVERage?

READ:BURSt[:MACCuracy]:BPOWer:CURRent?

READ:BURSt[:MACCuracy]:BPOWer:MAXimum?

READ:BURSt[:MACCuracy]:BPOWer:SDEViation?

READ:BURSt[:MACCuracy]:FERRor:AVERage?

READ:BURSt[:MACCuracy]:FERRor:CURRent?

READ:BURSt[:MACCuracy]:FERRor:MAXimum?

READ:BURSt[:MACCuracy]:FERRor:SDEViation?

READ:BURSt[:MACCuracy]:FREQuency:AVERage?

READ:BURSt[:MACCuracy]:FREQuency:CURRent?

READ:BURSt[:MACCuracy]:FREQuency:MAXimum?

READ:BURSt[:MACCuracy]:FREQuency:SDEViation?

READ:BURSt[:MACCuracy]:IQIMbalance:AVERage?

READ:BURSt[:MACCuracy]:IQIMbalance:CURRent?

READ:BURSt[:MACCuracy]:IQIMbalance:MAXimum?

READ:BURSt[:MACCuracy]:IQIMbalance:SDEViation?

READ:BURSt[:MACCuracy]:IQOFfset:AVERage?

READ:BURSt[:MACCuracy]:IQOFfset:CURRent?

READ:BURSt[:MACCuracy]:IQOFfset:MAXimum?

READ:BURSt[:MACCuracy]:IQOFfset:SDEViation?

READ:BURSt[:MACCuracy]:MERRor:PEAK:AVERage?

READ:BURSt[:MACCuracy]:MERRor:PEAK:CURRent?

READ:BURSt[:MACCuracy]:MERRor:PEAK:MAXimum?

READ:BURSt[:MACCuracy]:MERRor:PEAK:SDEViation?

READ:BURSt[:MACCuracy]:MERRor:RMS:AVERage?

READ:BURSt[:MACCuracy]:MERRor:RMS:CURRent?

READ:BURSt[:MACCuracy]:MERRor:RMS:MAXimum?

READ:BURSt[:MACCuracy]:MERRor:RMS:SDEViation?

READ:BURSt[:MACCuracy]:OSUPpress:AVERage?

READ:BURSt[:MACCuracy]:OSUPpress:CURRent?

READ:BURSt[:MACCuracy]:OSUPpress:MAXimum?

READ:BURSt[:MACCuracy]:OSUPpress:SDEViation?

READ:BURSt[:MACCuracy]:PERCentile:EVM?

READ:BURSt[:MACCuracy]:PERCentile:MERRor?

READ:BURSt[:MACCuracy]:PERCentile:PERRor?

READ:BURSt[:MACCuracy]:PERRor:PEAK:AVERage?

READ:BURSt[:MACCuracy]:PERRor:PEAK:CURRent?

READ:BURSt[:MACCuracy]:PERRor:PEAK:MAXimum?

READ:BURSt[:MACCuracy]:PERRor:PEAK:SDEViation?

READ:BURSt[:MACCuracy]:PERRor:RMS:AVERage?

READ:BURSt[:MACCuracy]:PERRor:RMS:CURRent?

READ:BURSt[:MACCuracy]:PERRor:RMS:MAXimum?

READ:BURSt[:MACCuracy]:PERRor:RMS:SDEViation?

READ:BURSt:SPOWer:SLOT<0..7>:ALL:AVERage?

READ:BURSt:SPOWer:SLOT<0..7>:ALL:CRESt?

READ:BURSt:SPOWer:SLOT<0..7>:ALL:MAXimum?

READ:BURSt:SPOWer:SLOT<0..7>:CURRent:AVERage?

READ:BURSt:SPOWer:SLOT<0..7>:CURRent:CRESt?

READ:BURSt:SPOWer:SLOT<0..7>:CURRent:MAXimum?

READ:SPECtrum:MODulation[:ALL]?

READ:SPECtrum:SWITching[:ALL]?

READ:SPECtrum:WMODulation:GATing?

READ:WSPectrum:MODulation[:ALL]?

READ:WSPectrum:MODulation:GATing?

READ:BURSt[:MACCuracy]:ALL?

This command starts the measurement and returns all the results. The results are output as a list of comma separated strings. The returned item order is: Error Vector Magnitude RMS, Error Vector Magnitude Peak, Magnitude Error RMS, Magnitude Error Peak, Phase Error RMS, Phase Error Peak, Burst Power, Frequency Error, IQ Offset, IB Imbalance. Each item consists of an Average, Current, Maximum and Standard Deviation value. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:ALL?
```

READ:BURSt[:MACCuracy][:EVM]:PEAK:AVERage?

This command starts the measurement and reads out the average of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:EVM:PEAK:AVERage?`

READ:BURSt[:MACCuracy][:EVM]:PEAK:CURRent?

This command starts the measurement and reads out the current of the peak
measurement of the Error Vector Magnitude taken over the selected number of
bursts. When the measurement is started the analyzer is automatically set to single
sweep. Further results of the measurement can then be queried without restart of
the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:EVM:PEAK:CURRent?`

READ:BURSt[:MACCuracy][:EVM]:PEAK:MAXimum?

This command starts the measurement and reads out the maximum of the peak
measurement of the Error Vector Magnitude taken over the selected number of
bursts. When the measurement is started the analyzer is automatically set to single
sweep. Further results of the measurement can then be queried without restart of
the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

READ:BURSt:MACCuracy:EVM:PEAK:MAXimum?

READ:BURSt[:MACCuracy][:EVM]:PEAK:SDEViation?

This command starts the measurement and reads out the standard deviation of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

READ:BURSt:MACCuracy:EVM:PEAK:SDEViation?

READ:BURSt[:MACCuracy][:EVM]:RMS:AVERage?

This command starts the measurement and reads out the average of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:EVM:RMS:AVERage?`

READ:BURSt[:MACCuracy][:EVM]:RMS:CURRent?

This command starts the measurement and reads out the current of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:EVM:RMS:CURRent?`

READ:BURSt[:MACCuracy][:EVM]:RMS:MAXimum?

This command starts the measurement and reads out the maximum of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:EVM:RMS:MAXimum?
```

READ:BURSt[:MACCuracy][:EVM]:RMS:SDEViation?

This command starts the measurement and reads out the standard deviation of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:EVM:RMS:SDEViation?
```

READ:BURSt[:MACCuracy]:ADRoop:AVERage?

This command starts the measurement and reads out the average measurement of the Amplitude Droop taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:ADRoop:AVERage?
```

READ:BURSt[:MACCuracy]:ADRoop:CURRent?

This command starts the measurement and reads out the current measurement of the Amplitude Droop taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:ADRoop:CURRent?
```

READ:BURSt[:MACCuracy]:ADRoop:MAXimum?

This command starts the measurement and reads out the maximum measurement of the Amplitude Droop taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:ADRoop:MAXimum?
```

READ:BURSt[:MACCuracy]:ADRoop:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the Amplitude Droop taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:ADRoop:SDEViation?
```

READ:BURSt[:MACCuracy]:BPOWer:AVERage?

This command starts the measurement and reads out the average measurement of the Burst Power taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:BPOWer:AVERage?
```

READ:BURSt[:MACCuracy]:BPOWer:CURRent?

This command starts the measurement and reads out the current measurement of the Burst Power taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:BPOWer:CURRent?
```

READ:BURSt[:MACCuracy]:BPOWer:MAXimum?

This command starts the measurement and reads out the maximum measurement of the Burst Power taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:BPOWer:MAXimum?
```

READ:BURSt[:MACCuracy]:BPOWer:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the Burst Power taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:BPOWer:SDEViation?`

READ:BURSt[:MACCuracy]:FERRor:AVERage?

This command is retained for compatibility with R&S FS-K5 only. Use the READ:BURSt:MACCuracy:FREQuency:AVERage? command which behaves the same way.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:FERRor:AVERage?`

READ:BURSt[:MACCuracy]:FERRor:CURRent?

This command is retained for compatibility with R&S FS-K5 only. Use the READ:BURSt:MACCuracy:FREQuency:CURRent? command which behaves the same way.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

READ:BURSt:MACCuracy:FERRor:CURRent?

READ:BURSt[:MACCuracy]:FERRor:MAXimum?

This command is retained for compatibility with R&S FS-K5 only. Use the READ:BURSt:MACCuracy:FREQuency:MAXimum? command which behaves the same way.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

READ:BURSt:MACCuracy:FERRor:MAXimum?

READ:BURSt[:MACCuracy]:FERRor:SDEViation?

This command is retained for compatibility with R&S FS-K5 only. Use the READ:BURSt:MACCuracy:FREQuency:SDEViation? command which behaves the same way.

Result

<Double value>

The measurement value. (Unit: Hz)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

READ:BURSt:MACCuracy:FERRor:SDEViation?

READ:BURSt[:MACCuracy]:FREQuency:AVERage?

This command starts the measurement and reads out the average measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: Hz)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:FREQuency:AVERage?
```

READ:BURSt[:MACCuracy]:FREQuency:CURRent?

This command starts the measurement and reads out the current measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: Hz)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:FREQuency:CURRent?
```

READ:BURSt[:MACCuracy]:FREQuency:MAXimum?

This command starts the measurement and reads out the maximum measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: Hz)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:FREQuency:MAXimum?`

READ:BURSt[:MACCuracy]:FREQuency:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Return value(s)

<Double value>

The measurement value. (Unit: Hz)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:FREQuency:SDEViation?`

READ:BURSt[:MACCuracy]:IQIMbalance:AVERage?

This command starts the measurement and reads out the average measurement of the IQ Imbalance taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:IQIMbalance:AVERage?
```

READ:BURSt[:MACCuracy]:IQIMbalance:CURRent?

This command starts the measurement and reads out the current measurement of the IQ Imbalance taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:IQIMbalance:CURRent?
```

READ:BURSt[:MACCuracy]:IQIMbalance:MAXimum?

This command starts the measurement and reads out the maximum measurement of the IQ Imbalance taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:IQIMbalance:MAXimum?
```

READ:BURSt[:MACCuracy]:IQIMbalance:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the IQ Imbalance taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>
The measurement value. (Unit: %)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:IQIMbalance:SDEViation?
```

READ:BURSt[:MACCuracy]:IQOFfset:AVERage?

This command starts the measurement and reads out the average measurement of the IQ Offset taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>
The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:IQOFfset:AVERage?
```

READ:BURSt[:MACCuracy]:IQOFfset:CURRent?

This command starts the measurement and reads out the current measurement of the IQ Offset taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>
The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:IQOFfset:CURRent?
```

READ:BURSt[:MACCuracy]:IQOFfset:MAXimum?

This command starts the measurement and reads out the maximum measurement of the IQ Offset taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>
The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)
SCPI: device specific

Example

```
READ:BURSt:MACCuracy:IQOFfset:MAXimum?
```

READ:BURSt[:MACCuracy]:IQOFfset:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the IQ Offset taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>
The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:IQOFfset:SDEViation?`

READ:BURSt[:MACCuracy]:MERRor:PEAK:AVERage?

This command starts the measurement and reads out the average of the peak measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:MERRor:PEAK:AVERage?`

READ:BURSt[:MACCuracy]:MERRor:PEAK:CURRent?

This command starts the measurement and reads out the current of the peak measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:MERRor:PEAK:CURRent?
```

READ:BURSt[:MACCuracy]:MERRor:PEAK:MAXimum?

This command starts the measurement and reads out the maximum of the peak measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:MERRor:PEAK:MAXimum?
```

READ:BURSt[:MACCuracy]:MERRor:PEAK:SDEViation?

This command starts the measurement and reads out the standard deviation of the peak measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:MERRor:PEAK:SDEViation?`

READ:BURSt[:MACCuracy]:MERRor:RMS:AVERage?

This command starts the measurement and reads out the average of the RMS measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

`READ:BURSt:MACCuracy:MERRor:RMS:AVERage?`

READ:BURSt[:MACCuracy]:MERRor:RMS:CURRent?

This command starts the measurement and reads out the current of the RMS measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:MERRor:RMS:CURRent?
```

READ:BURSt[:MACCuracy]:MERRor:RMS:MAXimum?

This command starts the measurement and reads out the maximum of the RMS measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:MERRor:RMS:MAXimum?
```

READ:BURSt[:MACCuracy]:MERRor:RMS:SDEViation?

This command starts the measurement and reads out the standard deviation of the RMS measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:MERRor:RMS:SDEViation?
```

READ:BURSt[:MACCuracy]:OSUPpress:AVERage?

This command starts the measurement and reads out the average measurement of the IQ Offset Suppression taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:OSUPpress:AVERage?
```

READ:BURSt[:MACCuracy]:OSUPpress:CURRent?

This command starts the measurement and reads out the current measurement of the IQ Offset Suppression taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:OSUPpress:CURRent?
```

READ:BURSt[:MACCuracy]:OSUPpress:MAXimum?

This command starts the measurement and reads out the maximum measurement of the IQ Offset Suppression taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>
The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:OSUPpress:MAXimum?
```

READ:BURSt[:MACCuracy]:OSUPpress:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the IQ Offset Suppression taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>
The measurement value. (Unit: dB)

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:OSUPpress:SDEViation?
```

READ:BURSt[:MACCuracy]:PERCentile:EVM?

This command starts the measurement and reads out the 95% percentile of the Error Vector Magnitude measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>
The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERCentile:EVM?
```

READ:BURSt[:MACCuracy]:PERCentile:MERRor?

This command starts the measurement and reads out the 95% percentile of the Magnitude Error measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: %)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERCentile:MERRor?
```

READ:BURSt[:MACCuracy]:PERCentile:PERRor?

This command starts the measurement and reads out the 95% percentile of the Phase Error measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: degree)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERCentile:PERRor?
```

READ:BURSt[:MACCuracy]:PERRor:PEAK:AVERage?

This command starts the measurement and reads out the average of the peak measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: degree)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERRor:PEAK:AVERage?
```

READ:BURSt[:MACCuracy]:PERRor:PEAK:CURRent?

This command starts the measurement and reads out the current of the peak measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: degree)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERRor:PEAK:CURRent?
```

READ:BURSt[:MACCuracy]:PERRor:PEAK:MAXimum?

This command starts the measurement and reads out the maximum of the peak measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: degree)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERRor:PEAK:MAXimum?
```

READ:BURSt[:MACCuracy]:PERRor:PEAK:SDEViation?

This command starts the measurement and reads out the standard deviation of the peak measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: degree)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERRor:PEAK:SDEViation?
```

READ:BURSt[:MACCuracy]:PERRor:RMS:AVERage?

This command starts the measurement and reads out the average of the RMS measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: degree)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERRor:RMS:AVERage?
```

READ:BURSt[:MACCuracy]:PERRor:RMS:CURRent?

This command starts the measurement and reads out the current of the RMS measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: degree)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERRor:RMS:CURRent?
```

READ:BURSt[:MACCuracy]:PERRor:RMS:MAXimum?

This command starts the measurement and reads out the maximum of the RMS measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: degree)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERRor:RMS:MAXimum?
```

READ:BURSt[:MACCuracy]:PERRor:RMS:SDEViation?

This command starts the measurement and reads out the standard deviation of the RMS measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Result

<Double value>

The measurement value. (Unit: degree)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

```
READ:BURSt:MACCuracy:PERRor:RMS:SDEViation?
```

READ:BURSt:SPOWer:SLOT<0..7>:ALL:AVERage?

This command starts the measurement out the average power for the selected slot for all measured burst. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>
The measurement value. (Unit: dBm)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Set the slot scope: Use all 8 slots for the PvT measurement.

// Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
// First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```

// Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```

// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!

```
READ:BURSt:SPOWer:SLOT1:ALL:AVERage?
```

READ:BURSt:SPOWer:SLOT<0..7>:ALL:CRESt?

This command starts the measurement out the crest factor for the selected slot for all measured burst. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>
The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
// First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```

// Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```

// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!

```
READ:BURSt:SPOWer:SLOT1:ALL:CRESt?
```

READ:BURSt:SPOWer:SLOT<0..7>:ALL:MAXimum?

This command starts the measurement out the maximum power for the selected slot for all measured burst. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>
The measurement value. (Unit: dBm)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
```
*RST
```

// Enter the GSM option K10
```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
// First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```

// Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```

// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!

```
READ:BURSt:SPOWer:SLOT1:ALL:MAXimum?
```

READ:BURSt:SPOWer:SLOT<0..7>:CURRent:AVERage?

This command starts the measurement out the average power for the selected slot for the current burst. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>

The measurement value. (Unit: dBm)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
`CONFigure:MS:CHANnel:MSLots:NOFSlots 8`
// First Slot to measure = 0
`CONFigure:MS:CHANnel:MSLots:OFFSet 0`

// Activate PvT (Power vs Time) measurement
`CONFigure:BURSt:PTEMplate:IMMediate`

// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!

`READ:BURSt:SPOWer:SLOT1:CURRent:AVERage?`

READ:BURSt:SPOWer:SLOT<0..7>:CURRent:CRESt?

This command starts the measurement out the crest factor for the selected slot for the current burst. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>

The measurement value. (Unit: dB)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10
`INSTrument:SELect GSM`

// Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;::ABORt`

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
`CONFigure:MS:CHANnel:MSLots:NOFSlots 8`
// First Slot to measure = 0
`CONFigure:MS:CHANnel:MSLots:OFFSet 0`

// Activate PvT (Power vs Time) measurement
`CONFigure:BURSt:PTEMplate:IMMediate`

// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!

`READ:BURSt:SPOWer:SLOT1:CURRent:CRESt?`

READ:BURSt:SPOWer:SLOT<0..7>:CURRent:MAXimum?

This command starts the measurement out the maximum power for the selected slot for the current burst. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1). This command is only available when the Power vs Time measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate]).

Result

<Double value>

The measurement value. (Unit: dBm)

Note

An ongoing measurement can be aborted via the command ABORt.

Characteristics

RST value: none (Result)

SCPI: device specific

Example

// Preset the instrument
`*RST`

// Enter the GSM option K10

```
INSTrument:SELect GSM
```

// Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```

// Set the slot scope: Use all 8 slots for the PvT measurement.
// Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
// First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```

// Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```

// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!

```
READ:BURSt:SPOWer:SLOT1:CURRent:MAXimum?
```

READ:SPECtrum:MODulation[:ALL]?

This command starts the measurement and reads out the result of the measurement of the modulation spectrum of the mobile or base station. This command is only available when the modulation spectrum measurement is selected (see CONFigure:SPECtrum:MODulation[:IMMediate]).

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

```
READ:SPECtrum:MODulation:ALL?
```

READ:SPECtrum:SWITching[:ALL]?

This command starts the measurement and reads out the result of the measurement of the transient spectrum of the mobile or base station. The result is output as a list of partial result strings separated by ',' as for the command FETCh:SPECtrum:MODulation[:ALL?]. This command is only available when the transient spectrum measurement is selected (see CONFigure:SPECtrum:SWITching[:IMMediate]).

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

```
READ:SPECtrum:SWITching:ALL?
```

READ:SPECtrum:WMODulation:GATing?

This command reads out the gating settings for gated "Modulation Spectrum" or "Wide Modulation Spectrum" measurements. It is identical to READ:WSPectrum:MODulation:GATing? and is maintained for compatibility reasons only.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

`READ:SPECtrum:WMODulation:GATing?`

READ:WSPectrum:MODulation[:ALL]?

This command starts the measurement and reads out the result of the measurement of the wide modulation spectrum of the mobile or base station. This command is only available when the wide modulation spectrum measurement is selected (see CONFigure:WSPectrum:MODulation[:IMMediate]).

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

`READ:WSPectrum:MODulation:ALL?`

READ:WSPectrum:MODulation:GATing?

This command reads out the gating settings for gated "Modulation Spectrum" or "Wide Modulation Spectrum" measurements. Two parameters are returned, the "Trigger Offset" in seconds and the "Gate Length" in seconds. The returned values can be used to set the gating interval for "list" measurements (i.e. a series of gated measurements in zero span mode at several offset frequencies). This is done in the "Spectrum" mode using the SENSe:LIST subsystem (see [SENSe:]LIST:POWer:SET). The parameters ("Trigger Offset" and "Gate Length") are calculated based on the "Trigger Offset" and "Frame Configuration" settings, such that 50-90% of the active part of the "Slot to measure" (excluding TSC) will be measured. Prior to this command make sure you set the correct "Trigger Mode" ("Power" or "External") and "Trigger Offset" (in the General Settings dialog). The "Trigger Offset" can be determined using the Auto Set (Trigger) functionality of the K10.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

`READ:WSPectrum:MODulation:GATing?`

5.1.10 SENSe Subsystem

The SENSe subsystem is organized in several subsystems. The commands of these subsystems directly control device-specific settings, they do not refer to the signal characteristics of the measurement signal. The SENSe subsystem controls the essential parameters of the analyzer. In accordance with the SCPI standard, the keyword SENSe is optional for this reason, which means that it is not necessary to include the SENSe node in command sequences.
The following subsystems are included:

- BANDwidth
- BURSt
- FREQuency
- IQ
- SWEep

Commands of the SENSe subsystem:

[SENSe]:SWAPiq <State>

[SENSe]:BANDwidth[:RESolution]:TYPE <Type>

[SENSe]:BURSt:COUNt <Count>

[SENSe]:FREQuency:CENTer <CenterFrequency>

[SENSe]:FREQuency:OFFSet <FrequencyOffset>

[SENSe]:IQ:DITHer[:STATe] <State>

[SENSe]:IQ:LPASs[:STATe] <State>

[SENSe]:SWEep:COUNt <Count>

[SENSe]:SWEep:TIME <Time>

[SENSe]:SWAPiq <State>

Swaps the I and Q signals. Swapping I and Q inverts the sideband. Tip: Try this function if the TSC can not be found.

Parameter

<Boolean value>

I/Q swap mode: 0 = Normal sideband, I+j*Q, 1 = I and Q are exchanged, inverted sideband, Q+j*I.

Characteristics

RST value: 0

SCPI: device specific

Example

SENSe:SWAPiq ON

[SENSe]:BANDwidth[:RESolution]:TYPE <Type>

This command switches the filter type for the resolution filter between "normal" (3 dB Gauss filter) or a 5-pole filter (according to the GSM standard) for the "Modulation Spectrum", "Transient Spectrum" and "Wide Modulation Spectrum" measurements.

Parameter

Value	Description
NORMal	Gaussian filter with a 3 dB bandwith of either 30 kHz or 100 kHz. This value is retained for compatibility with R&S FS-K5 only.
P5	5 pole filter with a 3 dB bandwidth of either 30 kHz or 100 kHz. This filter is required by the GSM standard specification.

Characteristics

RST value: P5

SCPI: device specific

Example

```
SENSe:BANDwidth:RESolution:TYPE NORMal
```

[SENSe]:BURSt:COUNt <Count>

The remote control command is used to specify the number of measurements to be averaged. This command is synonymous with SENS:SWE:COUN.

Parameter

<Integer value>

Target statistic count, i.e. number of measurements to be averaged.

Characteristics

RST value: 200

SCPI: device specific

Example

```
SENSe:BURSt:COUNt 5
```

[SENSe]:FREQuency:CENTer <CenterFrequency>

Specifies the center frequency of the signal to be measured. If the frequency is modified, the 'ARFCN' is updated accordingly.

Parameter

<Double value>

Center frequency. (Unit: Hz)

Characteristics

RST value: same as base instrument Hz

SCPI: compatible

Example

`SENSe:FREQuency:CENTer 5 MHZ`

[SENSe]:FREQuency:OFFSet <FrequencyOffset>

The remote control command is used to specify the frequency offset to be used. The frequency offset should be specified if the displayed frequency does not correspond to the frequency the hardware is really measuring at.

Parameter

<Double value>

Offset frequency value. (Unit: Hz)

Characteristics

RST value: 0 Hz

SCPI: compatible

Example

`SENSe:FREQuency:OFFSet 5 MHZ`

[SENSe]:IQ:DITHer[:STATe] <State>

If activated this command links a 2 MHz broad dithering signal at 42.67 MHz into the signal path of the analog baseband inputs.

Parameter

<Boolean value>

State, 1 = dither signal active, 0 = no dither signal.

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.

Characteristics

RST value: 0

SCPI: device specific

Example

`SENSe:IQ:DITHer:STATe ON`

[SENSe]:IQ:LPASs[:STATe] <State>

If activated this commans switches an anti-aliasing filter into the I and Q branches of the analog baseband inputs.

Parameter

<Boolean value>
State, 1 = filter active, 0 = filter inactive.

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.

Characteristics

RST value: 0

SCPI: device specific

Example

SENSe:IQ:LPASs:STATe ON

[SENSe]:SWEep:COUNt <Count>

The remote control command is used to specify the number of measurements to be averaged. This command is synonymous with SENSe:BURSt:COUNt.

Parameter

<Integer value>
Target statistic count, i.e. number of measurements to be averaged.

Characteristics

RST value: 200

SCPI: device specific

Example

SENSe:SWEep:COUNt 5

[SENSe]:SWEep:TIME <Time>

This command specifies the capture time to be used for measurements.

Parameter

<Double value>
Capture time (Unit: s)

Characteristics

RST value: 0.1 s

SCPI: device specific

Example

SENSe:SWEep:TIME 0.01 MS

5.1.11　STATus Subsystem

The STATus subsystem contains the commands for the status reporting system (for details refer to the Operating Manual, Remote Control - Basics, Status Reporting System. *RST does not influence the status registers.

The following subsystems are included:

QUEStionable

Commands of the STATus subsystem:

STATus:QUEStionable:LIMit<1>[:EVENt]?
STATus:QUEStionable:LIMit<1>:CONDition?
STATus:QUEStionable:LIMit<1>:ENABle <RegisterContent>
STATus:QUEStionable:LIMit<1>:NTRansition <RegisterContent>
STATus:QUEStionable:LIMit<1>:PTRansition <RegisterContent>
STATus:QUEStionable:POWer[:EVENt]?
STATus:QUEStionable:POWer:CONDition?
STATus:QUEStionable:POWer:ENABle <RegisterContent>
STATus:QUEStionable:POWer:NTRansition <RegisterContent>
STATus:QUEStionable:POWer:PTRansition <RegisterContent>
STATus:QUEStionable:SYNC[:EVENt]?
STATus:QUEStionable:SYNC:CONDition?
STATus:QUEStionable:SYNC:ENABle <RegisterContent>
STATus:QUEStionable:SYNC:NTRansition <RegisterContent>
STATus:QUEStionable:SYNC:PTRansition <RegisterContent>

5.1.11.1　STATus:QUEStionable Subsystem

The STATus:QUEStionable subsystem contains information about the observance of limits during adjacent power measurements, the reference and local oscillator, the observance of limit lines and limit margins and possible overloads of the unit.

The following subsystems are included:

- LIMit
- POWer
- SYNC

STATus:QUEStionable:LIMit<1>[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:LIMit:EVENt? register. Readout deletes the contents of the EVENt section.

Note

Currently limit lines are only available on screen A, which displays the traces while screen B displays the measurement results as a list.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

STATus:QUEStionable:LIMit1:EVENt?

STATus:QUEStionable:LIMit<1>:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:LIMit:CONDition? register.

Note

Currently limit lines are only available on screen A, which displays the traces while screen B displays the measurement results as a list.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

STATus:QUEStionable:LIMit1:CONDition?

STATus:QUEStionable:LIMit<1>:ENABle <RegisterContent>

This command sets the bits of the ENABle section of the STATus:QUEStionable:LIMit:ENABle register for screen A and B. The ENABle register selectively enables the individual events of the associated EVENt section for the summary bit.

Parameter

<Status register content>
Content of the specific aspect of the status register

Note

Currently limit lines are only available on screen A, which displays the traces while screen B displays the measurement results as a list.

Characteristics

RST value:

SCPI: device specific

Example

STATus:QUEStionable:LIMit1:ENABle 32

STATus:QUEStionable:LIMit<1>:NTRansition <RegisterContent>

This command determines what bits in the STATus:QUEStionable:LIMit:NTRansition:CONDition register will set the corresponding bit in the STATus:QUEStionable:LIMit:NTRansition:EVENt register when that bit has a negative transition (1 to 0).The parameter is the sum of the decimal values of the bits that are to be enabled.

Parameter

<Status register content>
Content of the specific aspect of the status register

Note

Currently limit lines are only available on screen A, which displays the traces while screen B displays the measurement results as a list.

Characteristics

RST value:

SCPI: device specific

Example

STATus:QUEStionable:LIMit1:NTRansition 32

STATus:QUEStionable:LIMit<1>:PTRansition <RegisterContent>

This command determines what bits in the STATus:QUEStionable:LIMit:PTRansition:CONDition register will set the corresponding bit in the STATus:QUEStionable:LIMit:PTRansition:EVENt register when that bit has a positive transition (0 to 1).The parameter is the sum of the decimal values of the bits that are to be enabled.

Parameter

<Status register content>

Content of the specific aspect of the status register

Note

Currently limit lines are only available on screen A, which displays the traces while screen B displays the measurement results as a list.

Characteristics

RST value:

SCPI: device specific

Example

STATus:QUEStionable:LIMit1:PTRansition 32

STATus:QUEStionable:POWer[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:POWer:EVENt? register. Readout deletes the contents of the EVENt section.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

STATus:QUEStionable:POWer:EVENt?

STATus:QUEStionable:POWer:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:POWer:CONDition? register.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

STATus:QUEStionable:POWer:CONDition?

STATus:QUEStionable:POWer:ENABle <RegisterContent>

This command sets the bits of the ENABle section of the STATus:QUEStionable:POWer:ENABle register for screen A and B. The ENABle register selectively enables the individual events of the associated EVENt section for the summary bit.

Parameter

<Status register content>

Content of the specific aspect of the status register

Characteristics

RST value:

SCPI: device specific

Example

STATus:QUEStionable:POWer:ENABle 32

STATus:QUEStionable:POWer:NTRansition <RegisterContent>

This command determines what bits in the
STATus:QUEStionable:POWer:NTRansition:CONDition register will set the
corresponding bit in the STATus:QUEStionable:POWer:NTRansition:EVENt
register when that bit has a negative transition (1 to 0).The parameter is the sum of
the decimal values of the bits that are to be enabled.

Parameter

<Status register content>

Content of the specific aspect of the status register

Characteristics

RST value:

SCPI: device specific

Example

STATus:QUEStionable:POWer:NTRansition 32

STATus:QUEStionable:POWer:PTRansition <RegisterContent>

This command determines what bits in the
STATus:QUEStionable:POWer:PTRansition:CONDition register will set the
corresponding bit in the STATus:QUEStionable:POWer:PTRansition:EVENt
register when that bit has a positive transition (0 to 1).The parameter is the sum of
the decimal values of the bits that are to be enabled.

Parameter

<Status register content>

Content of the specific aspect of the status register

Characteristics

RST value:

SCPI: device specific

Example

STATus:QUEStionable:POWer:PTRansition 32

STATus:QUEStionable:SYNC[:EVENt]?

This command queries the contents of the EVENt section of the
STATus:QUEStionable:SYNC:EVENt? register. Readout deletes the contents of
the EVENt section.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

STATus:QUEStionable:SYNC:EVENt?

STATus:QUEStionable:SYNC:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:SYNC:CONDition? register.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

STATus:QUEStionable:SYNC:CONDition?

STATus:QUEStionable:SYNC:ENABle <RegisterContent>

This command sets the bits of the ENABle section of the STATus:QUEStionable:SYNC:ENABle register for screen A and B. The ENABle register selectively enables the individual events of the associated EVENt section for the summary bit.

Parameter

<Status register content>

Content of the specific aspect of the status register

Characteristics

RST value: 65535

SCPI: device specific

Example

STATus:QUEStionable:SYNC:ENABle 32

STATus:QUEStionable:SYNC:NTRansition <RegisterContent>

This command determines what bits in the STATus:QUEStionable:SYNC:NTRansition:CONDition register will set the corresponding bit in the STATus:QUEStionable:SYNC:NTRansition:EVENt register when that bit has a negative transition (1 to 0).The parameter is the sum of the decimal values of the bits that are to be enabled.

Parameter

<Status register content>

Content of the specific aspect of the status register

Characteristics

RST value: 0

SCPI: device specific

Example

```
STATus:QUEStionable:SYNC:NTRansition 32
```

STATus:QUEStionable:SYNC:PTRansition <RegisterContent>

This command determines what bits in the
STATus:QUEStionable:SYNC:PTRansition:CONDition register will set the
corresponding bit in the STATus:QUEStionable:SYNC:PTRansition:EVENt register
when that bit has a positive transition (0 to 1).The parameter is the sum of the
decimal values of the bits that are to be enabled.

Parameter

<Status register content>

Content of the specific aspect of the status register

Characteristics

RST value: 65535

SCPI: device specific

Example

```
STATus:QUEStionable:SYNC:PTRansition 32
```

5.1.12 TRACe Subsystem

The TRACe subsystem controls access to the instruments internal trace memory.

The following subsystems are included:

DATA

IQ

Commands of the TRACe subsystem:

TRACe<1..4>[:DATA][:]? <TraceNumber>

TRACe<1..4>[:DATA]:X?

TRACe<1..4>:IQ:DATA:MEMory?

TRACe<1..4>[:DATA][:]? <TraceNumber>

This command reads trace data out of the instrument. The associated measurement window is selected with the numeric suffix of TRACe. The parameter of the query is the trace name TRACE1 to TRACE4, it indicates which trace memory will be read out. The returned values are scaled in the current level unit. In ASCII format, a list of values separated by commas is returned (Comma Separated Values = CSV).

Return value(s)

Value	Description
TRACe1	Average trace; except: for transient spectrum: Maximum trace
TRACe2	Maximum trace
TRACe3	Minimum trace
TRACe4	Current trace

Note

All numerical suffixes are irrelevant for this command.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

```
TRACe1:DATA?
```

TRACe<1..4>[:DATA]:X?

This command reads the x values (time in second) of the Power vs Time measurement.

Note

This command is only available when the Power vs Time measurement is active.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

TRACe1:DATA:X?

TRACe<1..4>:IQ:DATA:MEMory?

Returns the captured I/Q data. The result values are scaled linear in unit Volt and correspond to the voltage at the RF input of the instrument. The command returns a comma separated list of the measured voltage values in floating point format (Comma Separated Values = CSV). The number of values returned is 2 * "# of samples", the first half being the I-values, the second half the Q-values. Two parameters must be specified. "Offset Samples" is the offset of the values to be read related to the start of the captured I/Q data. "# of samples" is the number of samples to be read.

Note

The data can be only required if the measurement is not running.

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

// Requests first 2000 samples
TRACe:IQ:DATA:MEMory? 0,2000

5.1.13 TRIGger Subsystem

The TRIGger subsystem is used to synchronize instrument actions with events. It is thus possible to control and synchronize the start of a sweep.

The following subsystems are included:

SEQuence

Commands of the TRIGger subsystem:

TRIGger<1|2>[:SEQuence]:SOURce <TriggerSource>

TRIGger<1|2>[:SEQuence]:HOLDoff[:TIME] <TriggerOffset>

TRIGger<1|2>[:SEQuence]:LEVel[:EXTernal] <Level>

TRIGger<1|2>[:SEQuence]:LEVel:IFPower <Level>

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:AUTO <Value>

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:EXTernal <TriggerDelay>

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:IFPower <TriggerDelay>

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:IMMediate

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:RFPower <TriggerDelay>

TRIGger<1|2>[:SEQuence]:SOURce <TriggerSource>

This command selects the trigger source for the start of a sweep.

Parameter

Value	Description
EXTernal	External trigger via the rear BNC trigger connector
IFPower	Trigger on the RF or IF power of the signal.
IMMediate	Immediate trigger = free run; the instrument starts capturing immediate after the capture was requested by the user

Characteristics

RST value: IMMediate

SCPI: device specific

Example

```
TRIGger1:SEQuence:SOURce EXTernal
```

TRIGger<1|2>[:SEQuence]:HOLDoff[:TIME] <TriggerOffset>

Specifies the time offset between the trigger event (e.g. for an external or power trigger) and the frame start of the GSM signal in seconds. For details refer to the 'Trigger Offset' softkey of the base unit.

Parameter

<Double value>
Trigger offset in the unit seconds. (Unit: s)

Characteristics

RST value: 0 s

SCPI: device specific

Example

```
TRIGger1:SEQuence:HOLDoff:TIME 1 MS
```

TRIGger<1|2>[:SEQuence]:LEVel[:EXTernal] <Level>

This command sets the level of the external trigger source.

Parameter

<Double value>
External trigger level. (Unit: V)

Characteristics

RST value: 1.4 V

SCPI: device specific

Example

```
TRIGger1:SEQuence:LEVel:EXTernal 1 MV
```

TRIGger<1|2>[:SEQuence]:LEVel:IFPower <Level>

This command sets or reads the level of the power trigger. For an 'RF' signal (signal source) the parameter corresponds to the IF power trigger level in dBm, for 'Baseband Analog' it corresponds to an I/Q power trigger level in Volts (Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.).

Parameter

<Double value>
IF power trigger level. (Unit: dBm)

Characteristics

RST value: -20 dBm

SCPI: device specific

Example

```
TRIGger1:SEQuence:LEVel:IFPower -20 DBM
```

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:AUTO <Value>

This command is identical to "CONFigure:MS:AUTO:TRIGger" and is maintained for compatibility reasons only.

Parameter

Value	Description
OFF	Switch the function off
ON	Switch the function on
ONCE	Execute the function once

Characteristics

RST value: ON

SCPI: device specific

Example

```
TRIGger1:SEQuence:SYNChronize:ADJust:AUTO OFF
```

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:EXTernal <TriggerDelay>

This command is a combination of 2 commands: For one, the 'Extern' GSM trigger is selected. For all GSM measurements requiring a trigger signal and for which an external trigger is possible, the EXTernal trigger setting is used. If an external trigger is not possible, the IMMediate trigger setting is used. For another, the correction value for the time offset of the external trigger from the beginning of the first active slot is defined. This correction value is needed in order to establish an exact time reference between the trigger event and the beginning of the slot if there is no midamble triggering.

Parameter

<Double value>

Trigger offset value. (Unit: s)

Characteristics

RST value: 0 s

SCPI: device specific

Example

```
TRIGger1:SEQuence:SYNChronize:ADJust:EXTernal 1 MS
```

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:IFPower <TriggerDelay>

This command is a combination of 2 commands: For one, the 'Power' GSM trigger is selected. For all GSM measurements for which an IF power trigger is possible, the IFPower trigger setting is used. If an IF power trigger is not possible, the IMMediate trigger setting is used. For another, the correction value for the time

offset of the IF power trigger from the beginning of the first active slot is defined. This correction value is needed in order to establish an exact time reference between the trigger event and the beginning of the slot if there is no midamble triggering.

Parameter

<Double value>
Trigger offset value. (Unit: s)

Characteristics

RST value: 0 s

SCPI: device specific

Example

```
TRIGger1:SEQuence:SYNChronize:ADJust:IFPower 1 MS
```

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:IMMediate

This command selects the FREE RUN GSM trigger.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

```
TRIGger1:SEQuence:SYNChronize:ADJust:IMMediate
```

TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:RFPower <TriggerDelay>

This command is a combination of 2 commands: For one, the 'Power' GSM trigger is selected. For all GSM measurements for which an RF power trigger is possible, the RFPower trigger setting is used. If an RF power trigger is not possible, the IMMediate trigger setting is used. For another, the correction value for the time offset of the RF power trigger from the beginning of the first active slot is defined. This correction value is needed in order to establish an exact time reference between the trigger event and the beginning of the slot if there is no midamble triggering.

Parameter

<Double value>
Trigger offset value. (Unit: s)

Characteristics

RST value: 0 s

SCPI: device specific

Example

```
TRIGger1:SEQuence:SYNChronize:ADJust:RFPower 1 MS
```

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