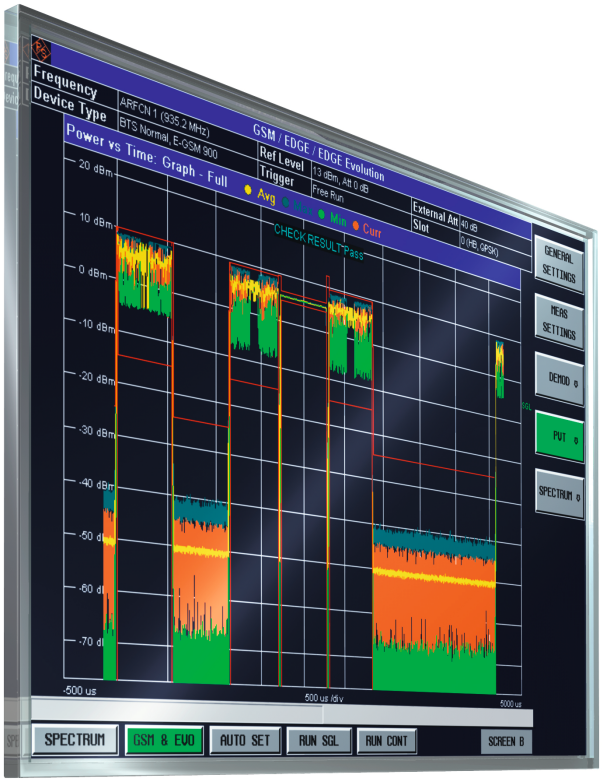
R&S® FS-K10
GSM/EDGE/EDGE Evolution Measurements
User Manual



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Test & Measurement

User Manual

ROHDE&SCHWARZ

This manual describes the following R&S®FS options for all models of the R&S® FSQ and FSG spectrum analyzer families:

- R&S FSQ/FSG-K10 GSM/EDGE/EDGE Evolution Measurements (1309.9700.02)

The firmware of the instrument makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" on the user documentation CD-ROM (included in delivery).
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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The following abbreviations are used throughout this manual: R&S®FS-K10 is abbreviated as R&S FS-K10. GSM/EDGE/EDGE Evolution Measurements are abbreviated as GSM measurements.

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.

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

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

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

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

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

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

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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1 Introduction

Overview of firmware option R&S FSQ/FSG-K10

This document contains all information required for operation of an R&S FSQ/FSG equipped with Application Firmware R&S FSQ/FSG-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 2, "Instrument Functions GSM", on page 5
  describes the overall instrument functions and provides further information
- chapter 3, "Remote Commands (GSM)", on page 77
  describes all remote control commands defined for the GSM/EDGE and EDGE Evolution (EGPRS2) measurements.
- chapter 4, "Status Reporting System", on page 213
  provides a description of the status registers

This part of the documentation includes only functions of the Application Firmware R&S FSQ/FSG-K10. For all other descriptions, refer to the description of the base unit.

1.1 Conventions Used in the Documentation

1.1.1 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
`File names, commands, program code`	File names, commands, coding samples and screen output are distinguished by their font.
Input	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

1.1.2 Conventions for Procedure Descriptions

When describing how to operate the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touch screen is described. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the instrument or the on-screen keyboard is only described if it deviates from the standard operating procedures.

The term "select" may refer to any of the described methods, i.e. using a finger on the touchscreen, a mouse pointer in the display, or a key on the instrument or on a keyboard.

2 Instrument Functions GSM

The R&S FSQ/FSG equipped with the GSM option performs measurements on downlink or uplink signals according to the Third Generation Partnership Project (3GPP) standards for GSM/EDGE, EDGE Evolution (EGPRS2) and Voice services over Adaptive Multi-user Channels on One Slot (VAMOS) in different domains (Time, Frequency, IQ). Signals with GMSK, AQPSK, 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 vs 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:

Table 2-1: GSM 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)

To open the GSM menu

- If the "GSM" mode is not the active measurement mode, press the GSM & EVO hotkey at the bottom of the screen.

Menu and softkey description

For a description of the GSM-specific softkeys see chapter 2.4, "Softkeys and Settings of the GSM Menu", on page 46.

The "Mkr Func" menu is identical to the base unit. The "Span", "BW", and "Lines" menus are not available in GSM mode.

For all menus not described here, see the description of the R&S FSQ/FSG base unit.

2.1 Measurements and Result Displays

This chapter provides information about the measurement and result displays of the GSM application.

Multiple measurement mode

The multiple measurement mode allows you to perform several measurements on the same captured I/Q data in parallel. In this case, the results of the selected measurements are available immediately, without starting a new measurement. Simply select the softkey for the performed measurement.

To retrieve the results for other measurement types, you must perform a new measurement first. The softkeys for the measurements not included in the multiple measurement selection only become available again when you deactivate multiple measurement mode or include the measurement in the multiple measurement selection.

2.1.1 Screen Layout

Within the GSM measurement option, each measurement has its own screen layout (see e.g. chapter 2.1.7, "Power vs Time", on page 12). 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 in any table state.

2.1.2 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.

A: Modulation Accuracy						
		Current	Average	Peak	Std Dev	Unit
EVM	RMS	0.12	0.13	0.14	0.00	%
	Peak	0.24	0.29	0.42	0.04	%
Mag Error	RMS	0.08	0.08	0.10	0.00	%
	Peak	- 0.23	0.22	- 0.28	0.02	%
Phase Error	RMS	0.13	0.09	0.20	0.03	deg
	Peak	- 1.07	0.58	- 2.18	0.39	deg
Origin Offset Suppression		70.80	69.23	62.83	2.38	dB
IQ Offset		0.03	0.04	0.07	0.01	%
IQ Imbalance		0.08	0.07	0.08	0.00	%
Frequency Error		130.22	130.60	131.31	0.26	Hz
Burst Power		- 0.42	- 0.28	0.01	0.14	dBm
Amplitude Droop		- 0.00	0.00	0.01	0.00	dB
95%ile	EVM 0.24 %	Mag Error 0.19 %	Phase Error 0.17 deg			

To display a "Modulation Accuracy" table, select: "Demod > Modulation Accuracy" (see "Modulation Accuracy" on page 70) and then start a measurement (RUN SINGLE/RUN CONT key).

Modulation Accuracy results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.

If the "Modulation Accuracy" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "Modulation Accuracy" table.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 56).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" ("Statistic Count" on page 53).
Limit Check	None

Amplitude Droop

The "Amplitude Droop" value shown in the result table indicates the total change in amplitude (in dB) over the estimation range. The estimation range is set according to the 3GPP standard:

Modulation type	Estimation Range
GMSK	147 normal symbol periods
8PSK, 16QAM and 32 QAM (EGPRS2 Level A)	142 normal symbol periods
QPSK, 16QAM and 32QAM (EGPRS2 Level B)	169 reduced symbol periods

2.1.3 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 (see chapter 2.1.2, "Modulation Accuracy", on page 7).

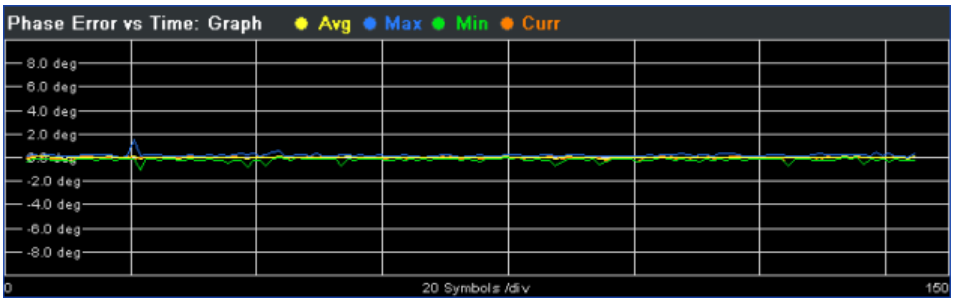


Fig. 2-1: Phase Error vs Time graph

Modulation Accuracy: List

Item		Current	Average	Peak	Std Dev	Unit
Phase Error	RMS	0.18	0.21	0.35	0.05	deg
	Peak	0.56	0.62	0.92	0.13	deg
Origin Offset Suppression		6.42	5.44	4.51	0.84	dB
IQ Offset		0.06	0.26	0.55	0.16	%
IQ Imbalance		0.06	0.06	0.11	0.03	%
Frequency Error		- 1.09	4.48	- 7.18	1.42	Hz
Burst Power		- 77.00	- 77.00	- 77.00	- 77.00	dBm

Fig. 2-2: Phase Error values in Modulation Accuracy list

To start a "Phase Error vs Time" measurement, select: "Demod > Phase Error" (see "Phase Error" on page 70) and then start a measurement (RUN SINGLE/RUN CONT key).

Phase Error vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.

If the "Phase Error" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "Phase Error vs Time" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 56).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings""Statistic Count" on page 53.
Limit Check	None

2.1.4 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 (see chapter 2.1.2, "Modulation Accuracy", on page 7).

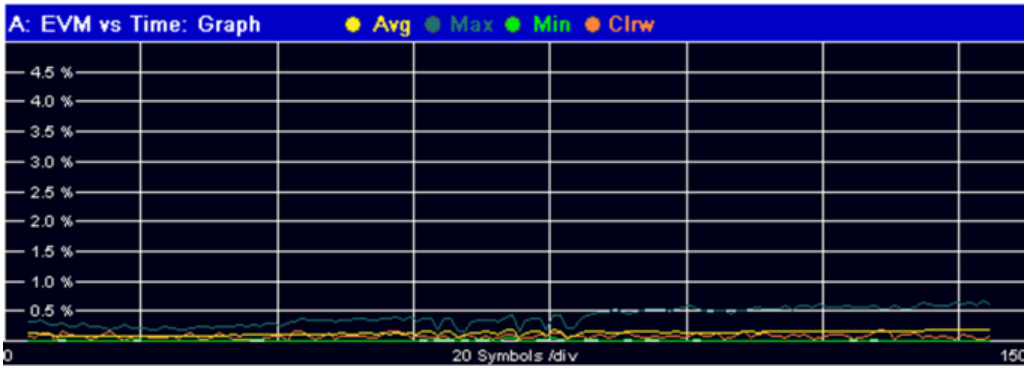


Fig. 2-3: EVM vs Time graph

Modulation Accuracy: List

Item		Current	Average	Peak	Std Dev	Unit
EVM	RMS	0.39	0.65	1.28	0.36	%
	Peak	6.39	6.71	7.38	0.39	%
Origin Offset Suppression		6.42	5.44	4.51	0.84	dB
IQ Offset		0.06	0.26	0.55	0.16	%
IQ Imbalance		0.06	0.06	0.11	0.03	%
Frequency Error		- 1.09	4.48	- 7.18	1.42	Hz
Burst Power		- 77.00	- 77.00	- 77.00	- 77.00	dBm

Fig. 2-4: EVM vs Time values in Modulation Accuracy list

To start a "EVM vs Time" measurement, select: "Demod > EVM" (see "EVM" on page 70) and then start a measurement (RUN SINGLE/RUN CONT key).

EVM vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.

If the "EVM vs Time" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "EVM vs Time" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 56).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 53).
Limit Check	None

2.1.5 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 (see chapter 2.1.2, "Modulation Accuracy", on page 7).

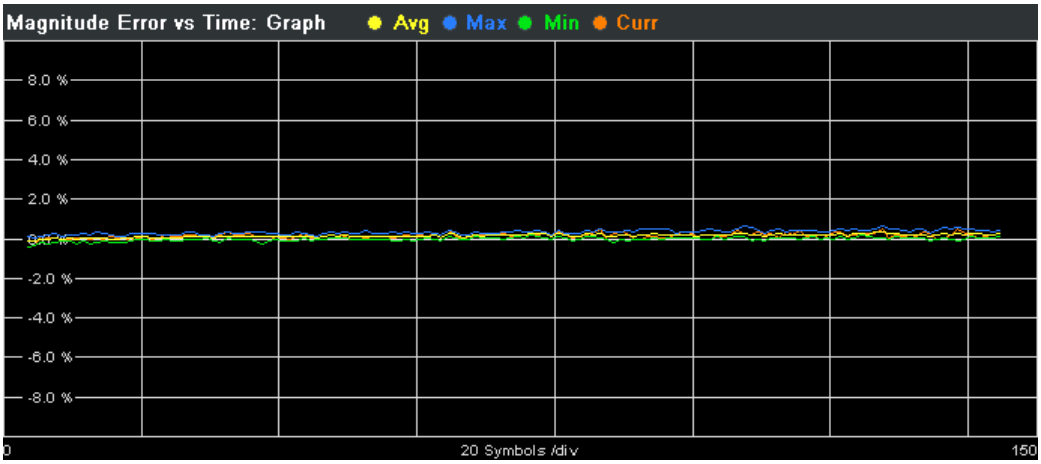


Fig. 2-5: Magnitude Error vs Time graph

Magnitude Error vs Time: Modulation Accuracy						
		Current	Average	Peak	Std Dev	Unit
Mag Error	RMS	0.20	0.20	0.24	0.02	%
	Peak	0.50	0.52	0.63	0.05	%
Burst Power		- 30.40	- 30.56	- 30.40	0.17	dBm
Amplitude Droop		0.00	0.00	0.00	0.00	dB

Fig. 2-6: Magnitude Error values in Modulation Accuracy list

To start a "Magnitude Error vs Time" measurement, select: "Demod > Magnitude Error" (see "Magnitude Error" on page 70) and then start a measurement (RUN SINGLE/RUN CONT key).

Magnitude Error vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.

If the "Magnitude Error" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

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 "Measurement Settings" (see "Slot to Measure" on page 56).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 53).
Limit Check	None

2.1.6 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 (see chapter 2.1.2, "Modulation Accuracy", on page 7).

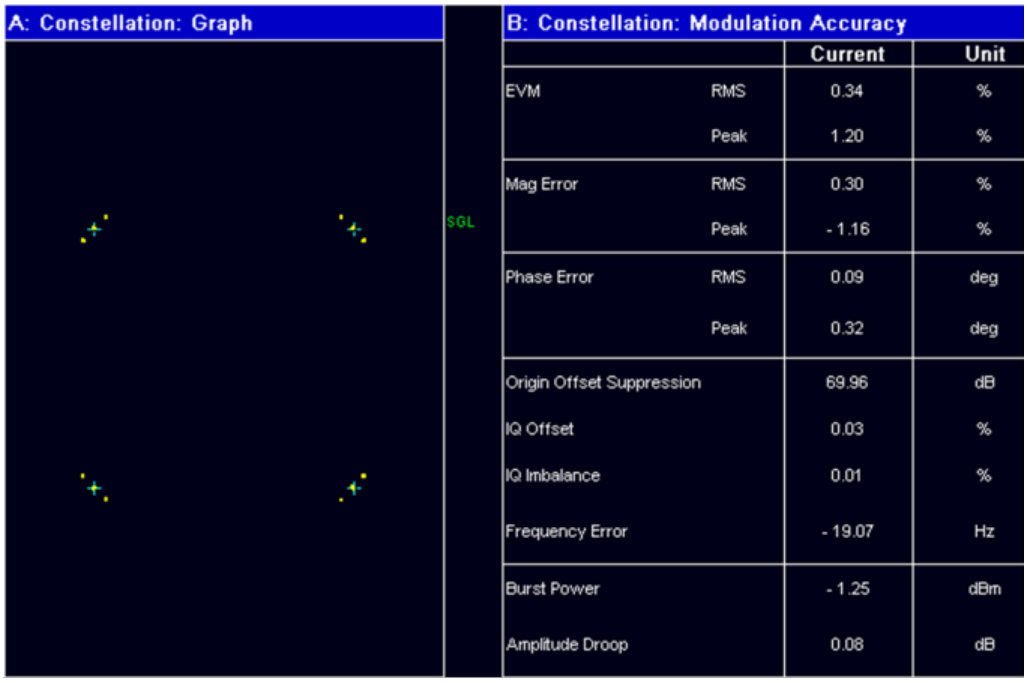


Fig. 2-7: Constellation

To display a "Constellation" diagram, select: "Demod > Constell" (see "Constell" on page 71) and then start a measurement (RUN SINGLE/RUN CONT key).

Constellation diagrams can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.

If the "Constell" softkey is not available, include "Constellation" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "Constellation" display.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 56).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 53).
Limit Check	None

2.1.7 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 chapter 2.2.7, "Defining the Scope of the Measurement", on page 33) 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, and a table that displays the slot powers of all slots in the slot scope.

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

- "Full" on page 71: Displays all bursts in the slot scope
- "Rising" on page 71: Displays rising edges only (the rest of the burst is removed)
- "Falling" on page 71: Displays fallling edges only (the rest of the burst is removed)
- "Rise & Fall" on page 72: Rising and falling edges zoomed
- "Top" on page 72: Useful part high resolution (same as "Full" on page 71, but y-axis zoomed)

To start a "Power vs Time" measurement, select "PvT" and then the required measurement type. Then start a measurement (RUN SINGLE/RUN CONT key).

Power vs. Time results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.

If the "PvT" softkey is not available, include "Power vs. Time" in the multiple measurement selection or disable the multiple measurement mode.

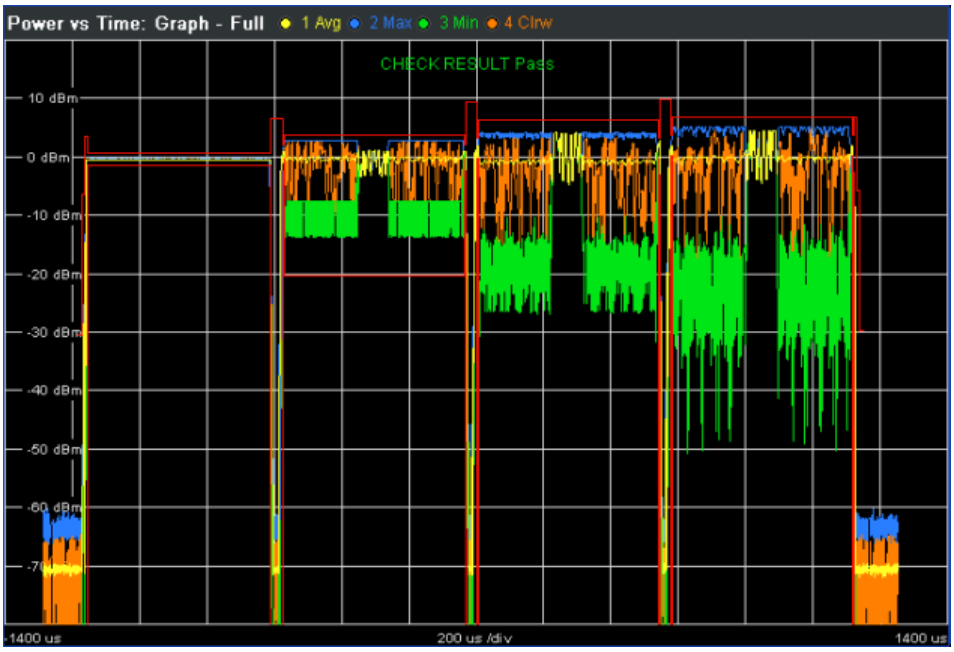


Fig. 2-8: Full Burst view in Power vs Time

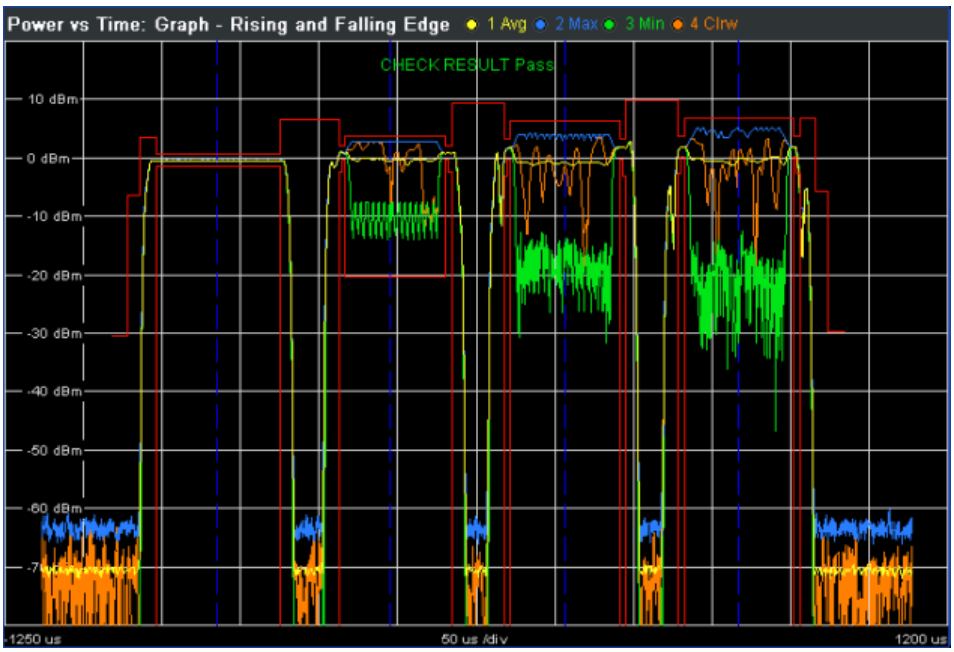


Fig. 2-9: Rising and Falling Edge view in Power vs Time

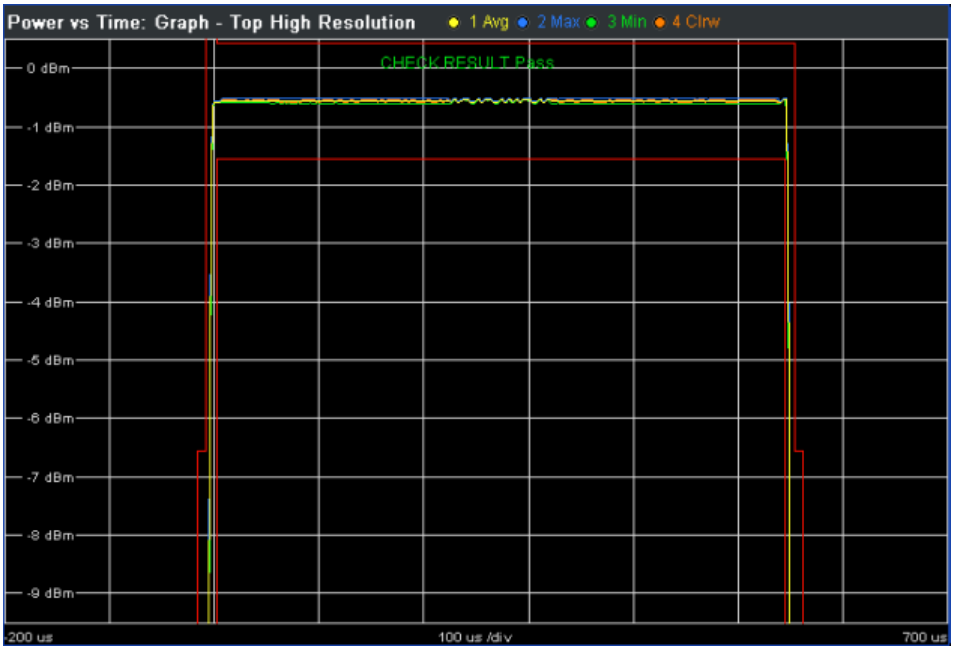


Fig. 2-10: Top High Resolution view in Power vs Time

The table displays the following information (see figure 2-11):

- The slot powers of all slots in the slot scope (see chapter 2.2.7, "Defining the Scope of the Measurement", on page 33. The average power, the peak power and the crest factor on a per-slot basis are displayed. The table contains results of the current ("Curr") frame as well as the statistics done over all ("All") analyzed frames according to the set statistic count.

- The "Delta to Sync" values correspond to the distance between the center of the Training Sequence TSC in a given slot and the center of the TSC in the Slot to Measure. The unit is normal symbol periods (NSP = 1 / Normal Symbol Rate = 6 / 1625000 s = 3.69 us). These values are either assumed to be constant (according to the 3GPP standard) or measured, depending on the setting of the Limit Time Alignment parameter ("Slot to measure" or "Per Slot").

B: Power vs Time: List

Slot		0	1	2	3	4	5	6	7	Unit
Power	Avg			- 0.7	0.2	0.1	- 73.6	- 0.6		dBm
Curr	Peak			2.6	4.4	4.7	- 63.9	- 0.6		dBm
	Crest			3.3	4.2	4.6	9.7	0.0		dB
Power	Avg			- 0.6	0.0	- 0.1	- 73.9	- 0.6		dBm
All	Peak			2.6	4.5	4.9	- 61.6	- 0.6		dBm
	Crest			3.5	4.8	5.6	13.6	0.1		dB
Delta to	Sync			- 156.00	0.00	156.00		469.00		NSP

Fig. 2-11: Power vs Time list display

According to the standard (see "Timeslot length" in 3GPP TS 45.010), there are either eight slots of equal length (156.25 NSP), or slot 0 and slot 4 have a length of 157 NSP while all other slots have a length of 156 NSP. For details see chapter 2.2.10, "Timeslot Alignment", on page 42.

The timeslot length is defined as the distance between the centers of the TSCs in successive slots. By setting the "Limit Time Alignment" parameter to "Per Slot" the "Delta to Sync" values can be measured and used in order to verify the timeslot lenghts.

Setting the Limit Time Alignment to "Slot to measure" displays the expected values (according to the standard and depending on the value of Equal Timeslot Length). These values are summarized in table 2-2 (Slot to measure = 0, No. of slots = 8 and First slot to measure = 0).

Table 2-2: Expected "Delta to Sync" values in normal symbol periods

Slot Number	0 = Slot to measure	1	2	3	4	5	6	7
Equal Timeslot Length = On	0	156.25	312.50	468.75	625.00	781.25	937.50	1093.75
Equal Timeslot Length = Off	0	157	313	469	625	782	938	1094

Default measurement settings

The following default settings are used for the "Power vs Time" measurement:

Setting	Default
Measurement Scope	The slot scope defined by First Slot to measure and Number of Slots to measure in "Measurement Settings" (see chapter 2.2.7, "Defining the Scope of the Measurement", on page 33).
Averaging Configuration	Number of frames as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 53)..
Limit Check	According to standard. • The maximum (Max) trace is checked agains the upper limit. • The minimum (Min) trace is checked against the lower limit. • The limit masks are generated adaptively from the measured signal according to the following parameters: – Frequency band (special masks for PCS1900 and MXM11800 BTS with GMSK) – Burst type – Modulation – Filter – The reference burst power is measured and the "0 dB line" of the limit mask is assigned to it. – For MS, the "-6 dB line" of the limit mask depends on the PCL. The PCL is derived from the measured burst power.

Measurement and Zoom

When switching between Full, Rising, Falling, 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.

Remote commands

The results of the "Power vs Time" measurement can be queried using the following remote commands:

`FETCh:BURSt:SPOWer:SLOT<s>:ALL:AVERage` on page 147

`FETCh:BURSt:SPOWer:SLOT<s>:ALL:CRESt` on page 148

`FETCh:BURSt:SPOWer:SLOT<s>:ALL:MAXimum` on page 149

`FETCh:BURSt:SPOWer:SLOT<s>:CURRent:AVERage` on page 150

`FETCh:BURSt:SPOWer:SLOT<s>:CURRent:CRESt` on page 151

`FETCh:BURSt:SPOWer:SLOT<s>:CURRent:MAXimum` on page 152

`FETCh:BURSt:SPOWer:SLOT<s>:DELTatosync` on page 153

2.1.8 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 TSC) by measuring the average power in this part over several bursts. The results of this measurement can be displayed in a graph or list.

The full list of measured frequency and filter bandwidths is provided in table 2-3.

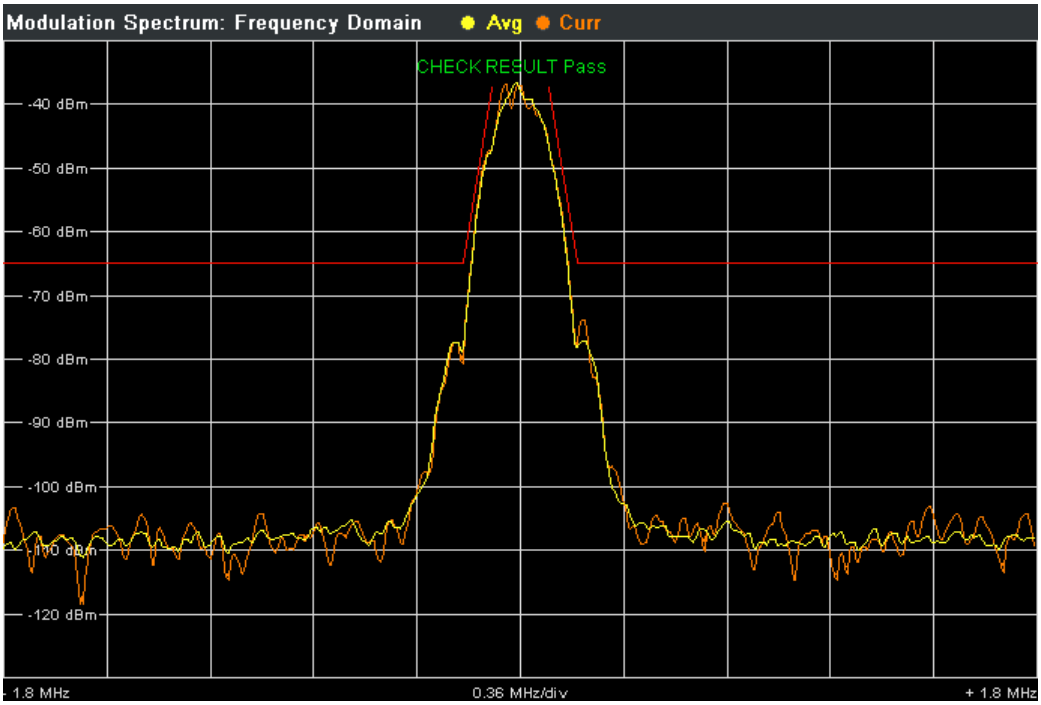


Fig. 2-12: Frequency Domain of modulation spectrum with traces and limits (red)

Modulation Spectrum: List

Offset	Lower			Upper		
/kHz	/dB	/dBm	Δ to Lim	/dB	/dBm	Δ to Lim
100	- 7.3	- 45.7	7.83	- 8.0	- 46.4	8.53
200	- 37.1	- 75.5	10.45	- 37.2	- 75.6	10.59
250	- 41.2	- 79.5	14.55	- 42.5	- 80.8	15.83
400	- 65.6	- 104.0	38.96	- 66.7	- 105.1	40.08
600	- 69.3	- 107.6	42.65	- 70.2	- 108.6	43.60
800	- 69.7	- 108.0	43.03	- 70.1	- 108.4	43.45
1000	- 70.7	- 109.0	44.04	- 70.5	- 108.8	43.85
1200	- 69.5	- 107.8	42.83	- 70.0	- 108.4	43.39
1400	- 70.5	- 108.9	43.86	- 69.4	- 107.8	42.81
1600	- 69.9	- 108.3	43.32	- 70.0	- 108.4	43.41
1800	- 70.7	- 109.0	44.05	- 70.7	- 109.1	44.12

Fig. 2-13: Results Table in Modulation Spectrum

To start a "Modulation Spectrum" measurement, select: "Spectrum > Modulation Spectrum" (see "Modulation Spectrum" on page 72) and then start a measurement (RUN SINGLE/RUN CONT key).

Modulation Spectrum results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.

If the "Modulation Spectrum" softkey is not available, include "Modulation Spectrum" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "Modulation Spectrum" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 56).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 53)..
Limit Check	According to standard. ● Frequency Domain: Limit check of average (Avg) trace ● List: Limit check of absolute and relative scalar values ● The limits depend on the following parameters: – Frequency band – Device Type (only BTS type, not MS type) – Burst Type / Modulation / Filter - limits are different for Higher Symbol Rate and Wide Pulse Filter (case 2) and others (case 1), see 3GPP TS 45.005, chapter 4.2.1.3 – The measured reference power (30 kHz bandwidth) – No. of active Carriers for multi-carrier BTS. The limit is relaxed by 10*log10(N) dB for offset frequencies ≥1.8 MHz, see 3GPP TS 45.005 chapter 4.2.1.2

Table 2-3: Frequencies and filter bandwidths in modulation spectrum measurements

Offset Frequency (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

Remote commands

The "Modulation Spectrum" measurement is started using the `CONFigure:SPECtrum:MODulation[:IMMediate]` command.

The gating parameters of the "Modulation Spectrum" measurement can be queried using `READ:WSPectrum:MODulation:GATing`.

The results of the "Modulation Spectrum" measurement can be queried using `READ:WSPectrum:MODulation[:ALL]`.

2.1.9 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", see "Slot to Measure" on page 56), the measurement is performed over the interval defined by the "Number of slots to measure" (see "Number of Slots to measure" on page 57) and the "First Slot to measure" (see "First Slot to measure" on page 57) in the "Measurement Settings", i.e. one measurement per frame. See also chapter 2.2.7, "Defining the Scope of the Measurement", on page 33. 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.

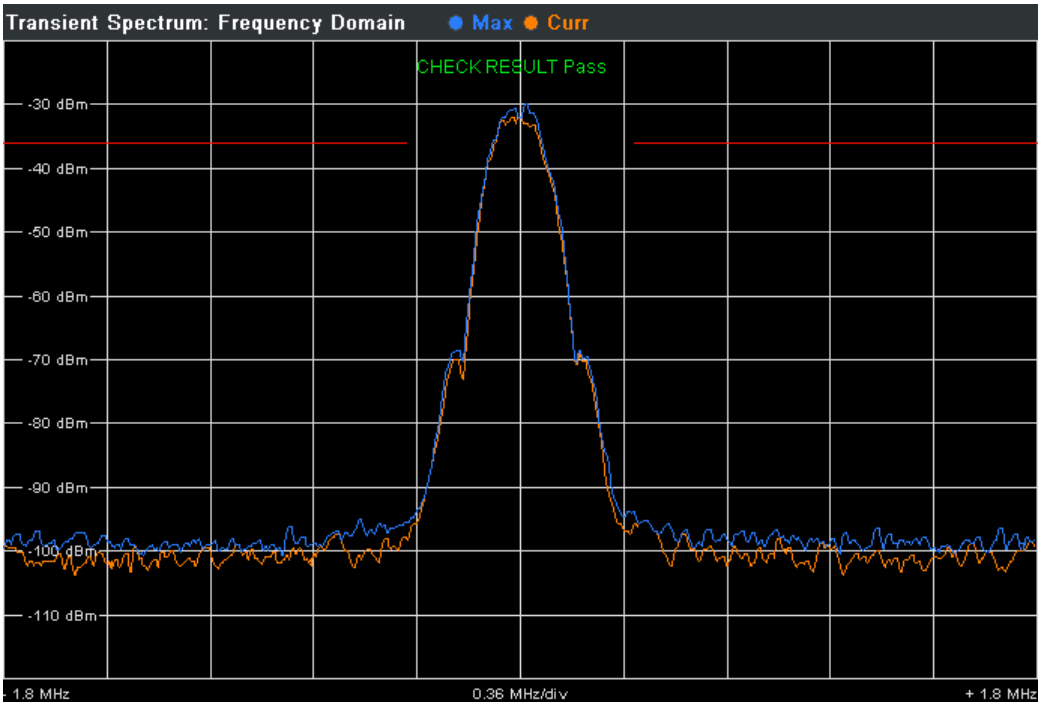


Fig. 2-14: Frequency Domain of Transient Spectrum with traces and limits (red)

Transient Spectrum: List						
Offset	Lower			Upper		
/kHz	/dB	/dBm	Δ to Lim	/dB	/dBm	Δ to Lim
400	- 65.2	- 95.8	59.83	- 64.1	- 94.7	58.67
600	- 67.6	- 98.2	62.23	- 68.1	- 98.8	62.76
1200	- 68.2	- 98.8	62.85	- 67.7	- 98.3	62.35
1800	- 67.6	- 98.2	62.24	- 68.2	- 98.8	62.80

Fig. 2-15: Result Table in Transient Spectrum

To start a "Transient Spectrum" measurement, select: "Spectrum > Transient Spectrum" (see "Transient Spectrum" on page 72) and then start a measurement (RUN SINGLE/RUN CONT key).

Transient Spectrum results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.

If the "Transient Spectrum" softkey is not available, include "Transient Spectrum" in the multiple measurement selection or disable the multiple measurement mode.

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

Setting	Default
Measurement Scope	The slot scope defined by First Slot to measure and Number of Slots to measure in "Measurement Settings" (see chapter 2.2.7, "Defining the Scope of the Measurement", on page 33).
Averaging Configuration	Number of frames as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 53).
Limit Check	According to standard. • Frequency Domain: Limit check of maximum (Max) trace • List: Limit check of absolute and relative scalar values • The limit masks are generated adaptively from the measured signal. • The limits depend on the following parameters: – Frequency band (not for MS) – Burst Type / Modulation / Filter (not for MS) – The measured reference (burst) power

2.1.10 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 chapter 2.1.8, "Modulation Spectrum", on page 16), however the measured offset frequencies 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 2-4.

Contrary to the "Modulation Spectrum" measurement, the "Wide Modulation Spectrum" measurement uses a series of gated zero-span measurements. This approach provides improved measurement dynamics compared to the "Modulation Spectrum" approach that is based on captured I/Q data.

To start a "Wide Modulation Spectrum" measurement, select "Wide Spectrum > Wide Mod Spectrum" (see "Wide Mod Spectrum" on page 73).

Wide modulation spectrum measurements are not available for signals from the Analog Baseband Interface (R&S FSQ/FSG-B71).

Table 2-4: Frequencies and filter bandwidths in wide modulation spectrum measurements

Offset Frequency (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
± 3400	100	100
± 3600	100	100
± 3800	100	100
± 4000	100	100
± 4200	100	100
± 4400	100	100
± 4600	100	100
± 4800	100	100
± 5000	100	100
± 5200	100	100
± 5400	100	100

Offset Frequency (kHz)	RBW (kHz)	VBW (kHz)
± 5600	100	100
± 5800	100	100

The measurement can be performed using either the "External" or "Power" trigger modes (see chapter 2.2.6, "Trigger settings", on page 33). 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 zero-crossings (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.

It is recommended that you use the "Auto Set > Trigger" functionality of the R&S FSQ/FSG-K10 application before starting the wide modulation list measurement. This automatically determines the appropriate "Trigger Offset" for the given frame configuration and the signal under test (see "Trigger Offset" on page 52).

Contrary to "Modulation Spectrum", the Wide Modulation Spectrum 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" (excluding TSC) are measured. This approach provides improved measurement dynamics compared to the "Modulation Spectrum" approach that is based on captured I/Q data.

Wide Modulation Spectrum: List

Offset	Lower			Upper		
/kHz	/dB	/dBm	Δ to Lim	/dB	/dBm	Δ to Lim
2600	- 81.5	- 90.5	25.54	- 81.6	- 90.6	25.58
2800	- 81.9	- 90.9	25.86	- 81.6	- 90.6	25.61
3000	- 81.7	- 90.7	25.74	- 82.1	- 91.1	26.13
3200	- 82.2	- 91.2	26.18	- 81.9	- 90.9	25.95
3400	- 82.1	- 91.1	26.14	- 82.5	- 91.5	26.55
3600	- 82.5	- 91.5	26.47	- 82.7	- 91.8	26.75
3800	- 82.8	- 91.8	26.77	- 82.3	- 91.4	26.36
4000	- 82.8	- 91.8	26.76	- 82.3	- 91.3	26.28
4200	- 82.6	- 91.6	26.64	- 82.7	- 91.7	26.71
4400	- 83.3	- 92.3	27.31	- 82.7	- 91.7	26.67
4600	- 83.4	- 92.4	27.40	- 83.3	- 92.3	27.30
4800	- 83.2	- 92.2	27.21	- 83.4	- 92.4	27.37
5000	- 83.6	- 92.6	27.62	- 83.1	- 92.1	27.07
5200	- 83.5	- 92.5	27.52	- 83.2	- 92.2	27.19
5400	- 83.6	- 92.6	27.59	- 83.7	- 92.8	27.76
5600	- 83.0	- 92.0	27.04	- 83.4	- 92.4	27.39
5800	- 83.4	- 92.4	27.41	- 83.2	- 92.2	27.23

Fig. 2-16: Results Table in Wide Modulation Spectrum

The following default settings are used for a "Wide Modulation Spectrum" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 56).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings""Statistic Count" on page 53.
Limit Check	According to standard. • List: Limit check of absolute and relative scalar values • The limits depend on the following parameters: – Frequency band – Device Type (only BTS type, not MS type) – Burst Type / Modulation / Filter - limits are different for Higher Symbol Rate and Wide Pulse Filter (case 2) and others (case 1), see 3GPP TS 45.005, chapter 4.2.1.3 – The measured reference power (30 kHz bandwidth) – Number of carriers for multi-carrier BTS. The limit is relaxed by 10*log10(N) dB for offset frequencies ≥1.8 MHz, see 3GPP TS 45.005 chapter 4.2.1.2

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:WSPectrum:MODulation:GATing`.

The results of the "Wide Modulation Spectrum" measurement can be queried using READ:WSPectrum:MODulation[:ALL] on page 199.

2.1.11 Wide Transient Spectrum

The "Wide Transient Spectrum" measurement measures the spectrum due to switching at offset frequencies up to 1.8 MHz. In principle, this measurement provides the same functionality as the existing "Transient Spectrum" list measurement (see chapter 2.1.9, "Transient Spectrum", on page 19. Contrary to "Transient Spectrum", Wide Transient uses a series of gated zero-span measurements. This approach provides improved measurement dynamics compared to the "Transient Spectrum" approach that is based on captured I/Q data.

To start a "Wide Transient Spectrum" measurement, select "Wide Spectrum > Wide Trans Spectrum" (see "Wide Mod Spectrum" on page 73).

Wide Transient spectrum measurements are not available for signals from the Analog Baseband Interface (R&S FSQ/FSG-B71).

Table 2-5: Frequencies and filter bandwidths in Wide Transient spectrum measurements

Offset Frequency (kHz)	RBW (kHz)	VBW (kHz)
± 400	30	100
± 600	30	100
± 1200	30	100
± 1800	30	100

The measurement can be performed using either the "External" or "IF Power" trigger modes (see chapter 2.2.6, "Trigger settings", on page 33). The external trigger signal must be received once per GSM frame.

It is recommended that you use the "Auto Set > Trigger" functionality of the R&S FSQ/FSG-K10 application before starting the Wide Transient list measurement. This automatically determines the appropriate "Trigger Offset" for the given frame configuration and the signal under test (see "Trigger Offset" on page 52).

Wide Transient Spectrum: List

Offset /kHz	Lower /dB	Lower /dBm	Lower Δ to Lim	Upper /dB	Upper /dBm	Upper Δ to Lim
400	-67.3	-67.9	31.90	-64.0	-64.6	28.61
600	-78.8	-79.4	43.41	-80.8	-81.4	45.41
1200	-86.0	-86.6	50.57	-84.5	-85.0	49.03
1800	-87.3	-87.9	51.86	-86.5	-87.1	51.07

Fig. 2-17: Results Table in Wide Transient Spectrum

The following default settings are used for a "Wide Transient Spectrum" measurement.

Setting	Default
Reference power	Gated zero-span measurement with RMS detector, an RBW of 300 kHz and a VBW of 1 MHz. The reference power value is the RMS average over the "useful part" of the Slot to Measure and Statistic Count bursts. The gating interval is chosen according to the set trigger offset.
Power at offset frequency	Gated zero-span measurement with peak detector, an RBW of 30 kHz and a VBW of 100 kHz. The gate interval starts at the trigger event (trigger offset is ignored) and has a duration of StatisticCount * FrameDuration / NofActiveBursts where Statistic Count is the parameter from the "General Settings" dialog, FrameDuration equals 4.615 ms and NofActiveBursts is the number of active bursts in one frame according to the given frame configuration.
Limit Check	According to standard. • List: Limit check of absolute and relative scalar values • The limit masks are generated adaptively from the measured signal. • The limits depend on the following parameters: – Burst Type / Modulation / Filter (not for MS) – The measured reference (burst) power

Remote commands

The "Wide Transient Spectrum" measurement is started using the `CONFigure:WSPectrum:SWITching[:IMMediate]` command.

The results of the "Wide Transient Spectrum" measurement can be queried using `READ:WSPectrum:SWITching[:ALL]`.

2.2 Further Information

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

2.2.1 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 phase states
AQPSK	Adaptive Quadrature Amplitude Modulation
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
SCPIR	Subchannel Power Imbalance Ratio
SFH	Slow Frequency Hopping
TDMA	Time Division Multiplex Access
TSC	Training Sequence Code
UL	Uplink (BTS to MS)
VAMOS	Voice services over Adaptive Multi-user Channels on One Slot
YIG	Yttrium Iron Garnet

2.2.2 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 (exactly: 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.

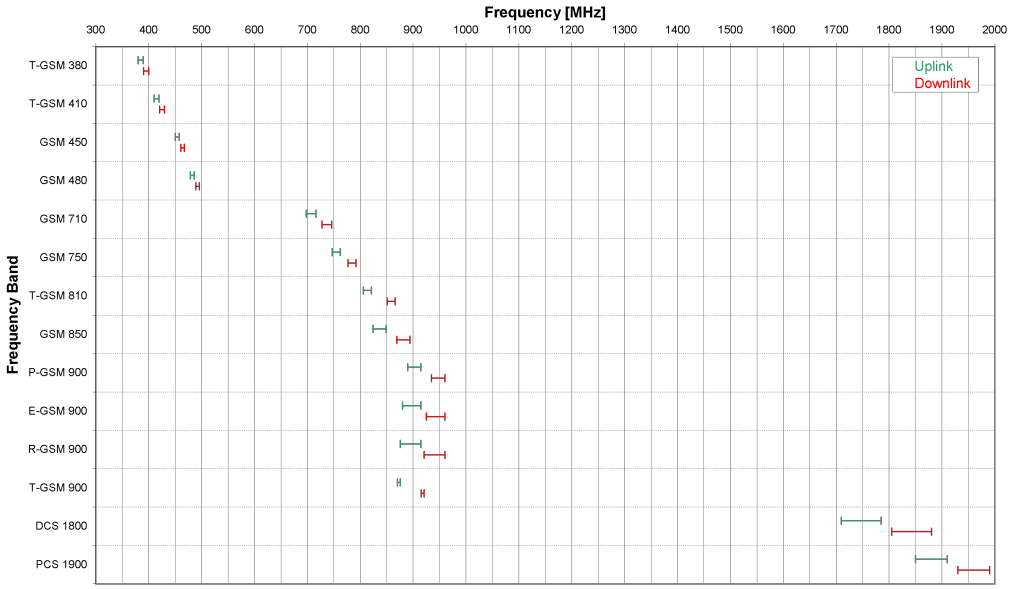


Fig. 2-18: The frequencies specified in the GSM standard

Table 2-6: Frequencies and channel numbers (ARFCN) in the GSM standard

Band Class	UL [MHz]	Frequency	DL [MHz]	Frequency	Frequency Middle	Band	UL-DL Shift	ARFCN	
	Low.	Up.	Low.	Up.	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	–

Band Class	UL [MHz]	Frequency	DL [MHz]	Frequency	Frequency Middle	Band	UL-DL Shift	ARFCN	
	Low.	Up.	Low.	Up.	UL	DL		Range 1	Range 2
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 chapter 2 of "3GPP TS 45.004" (see table 2-1).

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 × 270.833 kbit/s (exact: 812.5 kbit/s).

In this method, three bits represent a symbol. The details are specified in chapter 3 "3GPP TS 45.004" (see table 2-1).

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 × 270.833 kbit/s or 5 × 270.833 kbit/s, respectively. The details are specified in chapter 4 "3GPP TS 45.004" (see table 2-1).

The QPSK, 16QAM and 32QAM modulation at higher symbol rate, which are 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 × 325 kbit/s, 4 × 325 kbit/s or 5 × 325 kbit/s, respectively. The details are specified in chapter 5 "3GPP TS 45.004" (see table 2-1).

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

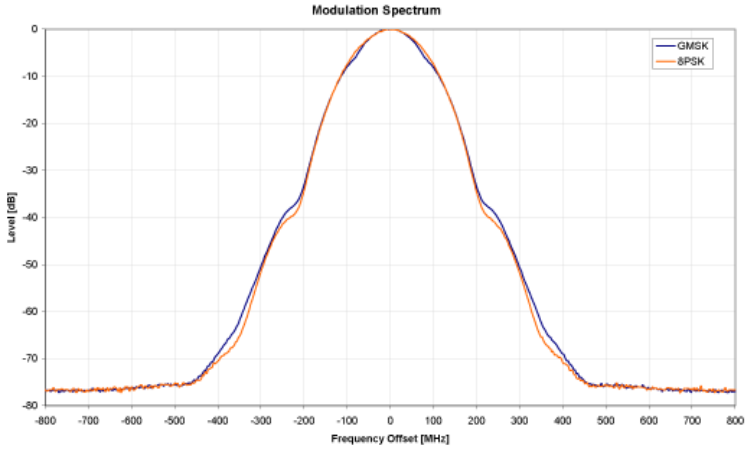


Fig. 2-19: GMSK and 8PSK modulation spectrum

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 FSQ/FSG-K10 application firmware in this respect is that the mobile can send power on a frequency in more than one slot.

2.2.3 Short Introduction to VAMOS

The "Voice services over Adaptive Multi-user Channels on One Slot" (VAMOS) extension to the GSM standard allows transmission of two GMSK users simultaneously within a single timeslot.

The standard specifies the downlink signal using Adaptive QPSK (AQPSK) modulation (to appear in the 3GPP Release 9 TS 45.004 document), where two "subchannel" binary sequences are multiplexed to form a single QPSK sequence. The ratio of powers for the subchannels is referred to as the "Subchannel Power Imbalance Ratio" (SCPIR). One of the subchannels is interpreted as interference. The value of SCPIR affects the shape of the AQPSK constellation. For an SCPIR of 0dB the constellation is square (as in "normal" QSPK), while for other values of the SCPIR the constellation becomes rectangular.

A new set of training sequences (TSCs) has also been proposed (see 3GPP Release 9 TS 45.002) for GMSK signals. The previous TSCs for GMSK bursts are listed as "Set 1", while the new TSCs are listed as "Set 2". AQPSK signals can be formed using TSCs from Set 1 on the first subchannel and TSCs from either Set 1 or Set 2 on the second subchannel. In case a TSC from Set 2 is used, it should match the TSC from Set 1, i.e. TSC<n> from Set 1 on subchannel 1 should match TSC<n> from Set 2 on subchannel 2, for n = 0..7.

The R&S FSQ/FSG-K10 supports measurement of the following signals:

- GMSK bursts using the TSCs from Set 1 or Set 2
- AQPSK bursts with any combination of TSCs from Set 1 and 2 on the subchannels
- AQPSK bursts with a user-specified SCPIR

The following measurement of the above signals are supported:

- Auto Trigger-Offset
- Power vs Time
- Demod (Modulation Accuracy, EVM vs Time, Phase Error vs Time, Magnitude Error vs Time, Constellation)
- Spectrum (modulation, transient) including limit check
- Wide Spectrum (modulation, transient) including limit check

Restriction

Auto Frame configuration only detects AQPSK normal bursts where the subchannels have a TSC according to table 2-7. The SCPIR value is detected with a resolution of 1 dB. To obtain reliable measurement results on AQPSK normal bursts, compare the auto-detected slot settings with the settings of your device under test.

Table 2-7: Required subchannel - TSC assignment for AQPSK auto frame configuration

AQPSK			Subchannel 2															
			TSC j (Set 1)								TSC j (Set 2)							
			0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Subchannel 1	TSC i (Set 1)	0			x	x				x	x							
		1			x	x				x		x						
		2	x	x				x					x					
		3	x	x			x							x				
		4				x			x						x			
		5			x				x							x		
		6					x	x									x	
		7	x	x														x

2.2.4 AQPSK Modulation

The AQPSK modulation scheme as proposed for use in GSM systems is illustrated in figure 2-20. First, the bits from two users (subchannels 1 and 2) are interleaved. The combined bit sequence is then mapped to an AQPSK constellation which depends on the SCPIR value. The AQPSK symbols are then modulated using the linearized GMSK pulse (see 3GPP TS 45.004).

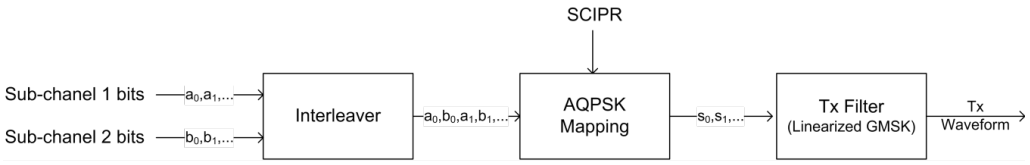


Fig. 2-20: AQPSK modulation scheme for GSM systems

The proposed AQPSK mapping (as assumed in the R&S FSQ/FSG-K10 software) is given in table 2-8 and illustrated in figure 2-21, where the first (leftmost) bit corresponds to subchannel 1 and the second (rightmost) bit corresponds to subchannel 2.

Table 2-8: AQPSK symbol mappings [reproduced from 3GPP TS 45.004]

Modulating bits for a_i, b_i	**AQPSK symbol in polar notation s_i**
(0,0)	$e^{j\alpha}$
(0,1)	$e^{-j\alpha}$
(1,0)	$-e^{-j\alpha}$
(1,1)	$-e^{j\alpha}$

The AQPSK modulation constellation diagram is shown in figure 2-21, where the value α is an angle related to the SCPIR as follows:

$SCPIR_{dB} = 20*\log_{10}[\tan(\alpha)\ ]$ dB

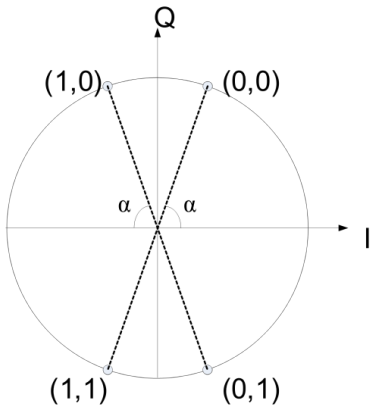


Fig. 2-21: AQPSK constellation [reproduced from 3GPP change request document GP-100275].

2.2.5 Transducer factors

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

2.2.6 Trigger settings

The GSM 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 FSQ/FSG-K10 needs the frame start as a time reference. The R&S FSQ/FSG-K10 searches for a frame start after every IQ 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 GSM 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 GSM application searches for the frame start inside the captured IQ 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 the "External Trigger", the measurement is triggered by an external signal (connected to the "EXT TRIGGER" input of the R&S FSQ/FSG). 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" on page 48 to learn more about appropriate trigger settings and the frame/slot configuration. Refer to section "Auto Set tab" on page 68 to learn more about auto setting the trigger offset.

2.2.7 Defining the Scope of the Measurement

The R&S FSQ/FSG-K10 is a slot-based application. It can measure up to 8 consecutive GSM slots (1 frame) and store the power results for all slots ("Power vs Time" measurement, see chapter 2.1.7, "Power vs Time", on page 12).

Within this measurement interval (defined by First Slot to measure and Number of Slots to measure), a single slot ("Slot to Measure" on page 56) is selected for a more detailed analysis (e.g. "Modulation Accuracy" measurement, see chapter 2.1.2, "Modulation Accuracy", on page 7). The Slot to Measure provides:

- The reference power and time reference for the "Power vs Time" measurement (see chapter 2.1.7, "Power vs Time", on page 12). 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" on page 56 (see chapter 2.1.8, "Modulation Spectrum", on page 16). (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, see chapter 2.1.9, "Transient Spectrum", on page 19).
- All results that require demodulation of one slot and their statistical analysis (e.g. Modulation Accuracy, Phase Error vs Time, and EVM vs Time).

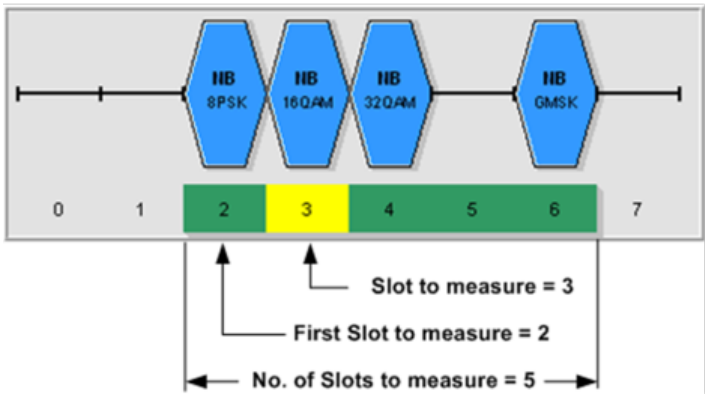
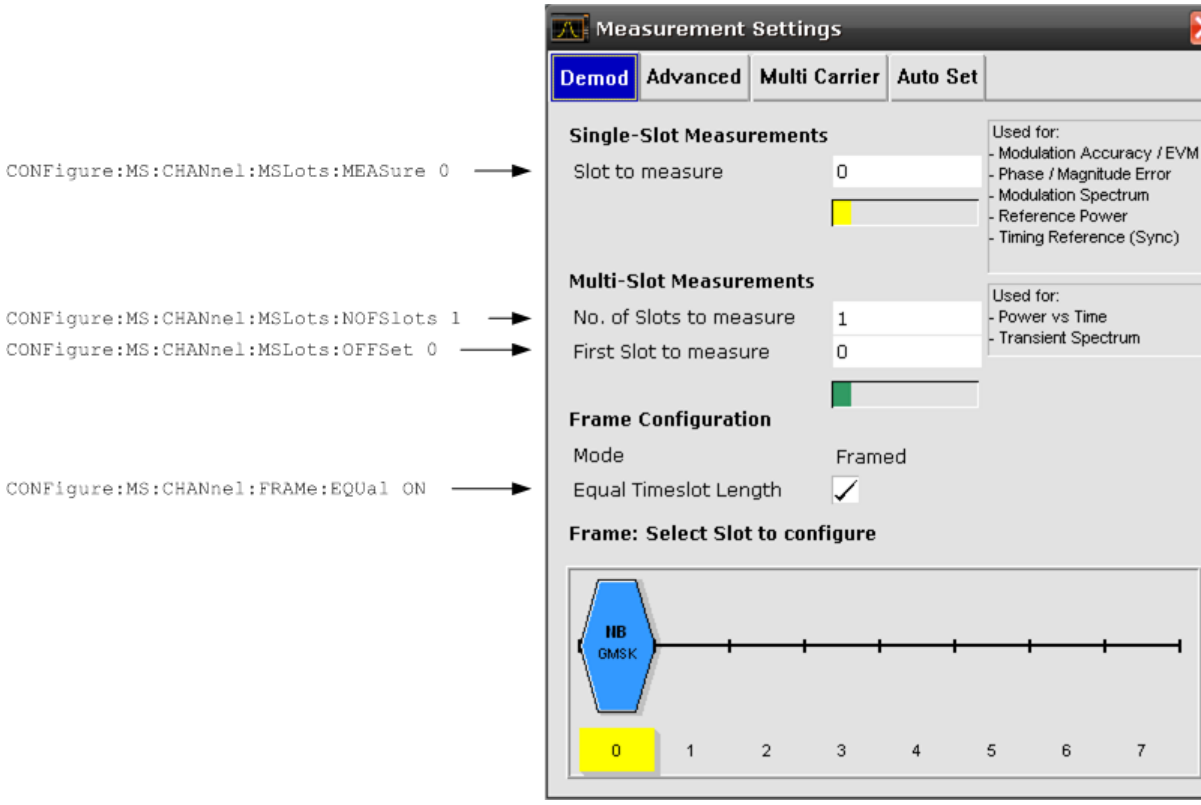


Fig. 2-22: Concept of "First Slot to measure", "Number of Slots to measure" and "Slot to Measure"

The measurement interval is set in the Demod tab of the Meas Settings dialog, and it is visualized above by a filled green box and the parameter Slot to Measure is visualized by a filled yellow box.



2.2.8 Overview of filters in R&S FSQ/FSG-K10

The R&S FSQ/FSG-K10 measurement application requires a number of filters for different stages of signal processing. 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 in figure 2-23 to illustrate where the different filters are used.

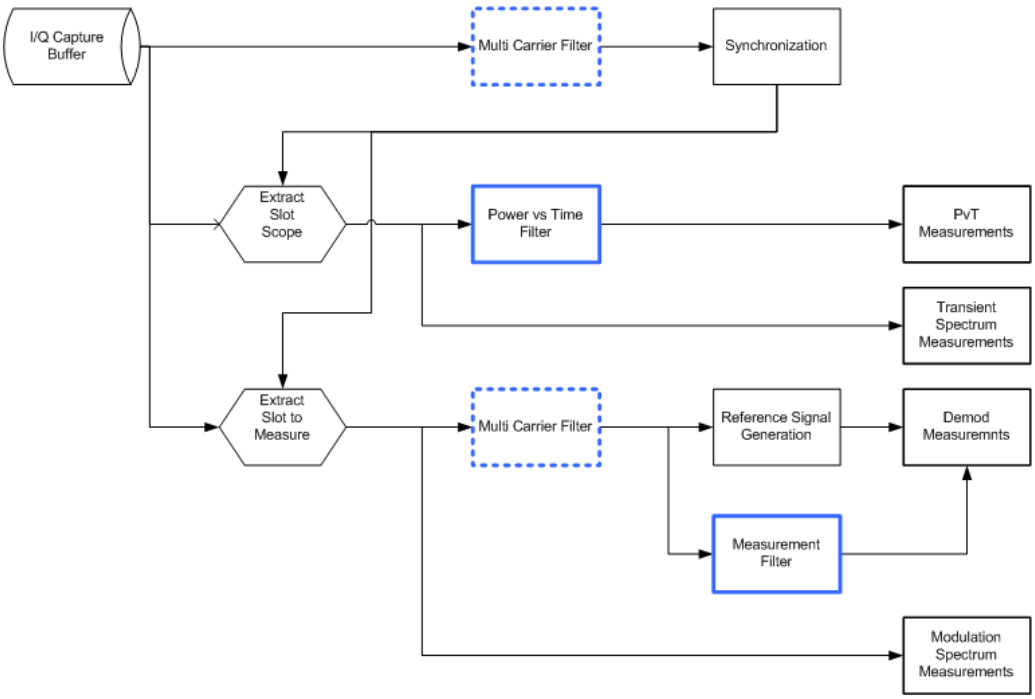


Fig. 2-23: Signal flow diagram highlighting filtering operations

2.2.8.1 Multi Carrier Filter

The "Multi Carrier" filter is only applied to the captured data if the "Multi Carrier BTS" option is selected (see "Multi Carrier BTS" on page 67). 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 the Power vs Time Filter. The frequency response of the "Multi Carrier" filter is shown in figure 2-24.

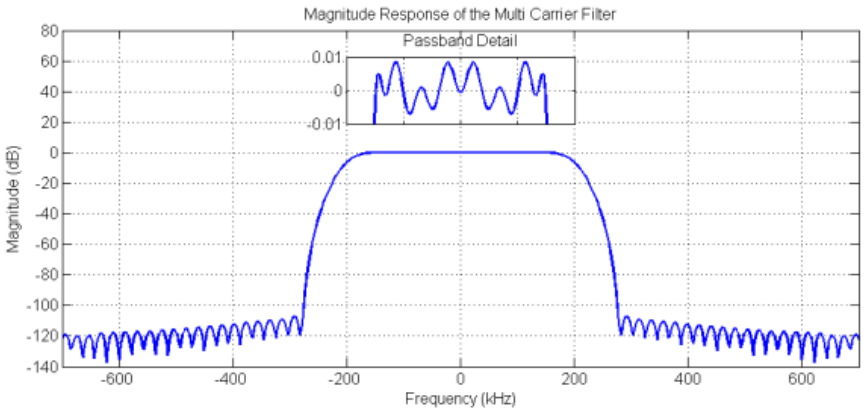


Fig. 2-24: Frequency Response of the Multi Carrier Filter

2.2.8.2 Power vs Time Filter

The "Power vs Time" filter is used to suppress out-of-band interference in the Power vs Time measurement.

The following filters are 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 (see "Multi Carrier BTS" on page 67). The magnitude and step responses of the different "Power vs Time" filters are shown in figure 2-25 and figure 2-26, 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.

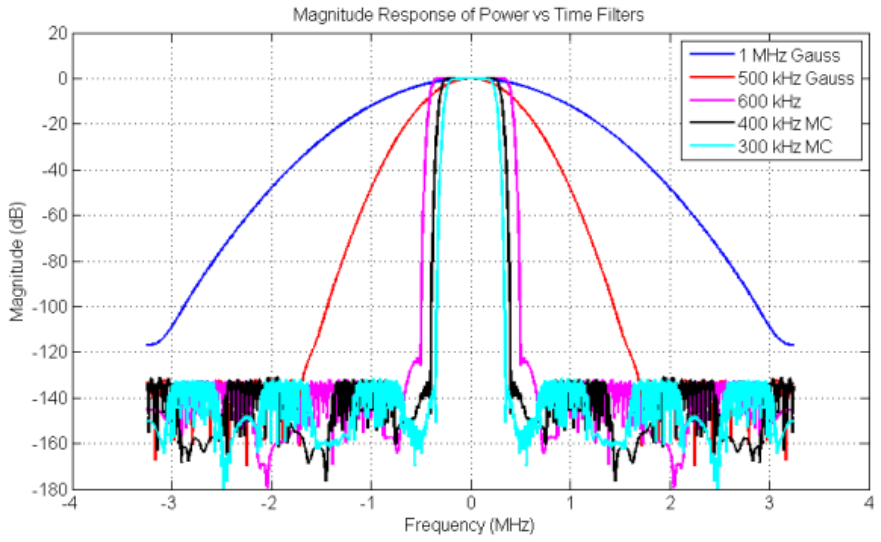


Fig. 2-25: Magnitude Response of the Power vs Time Filters

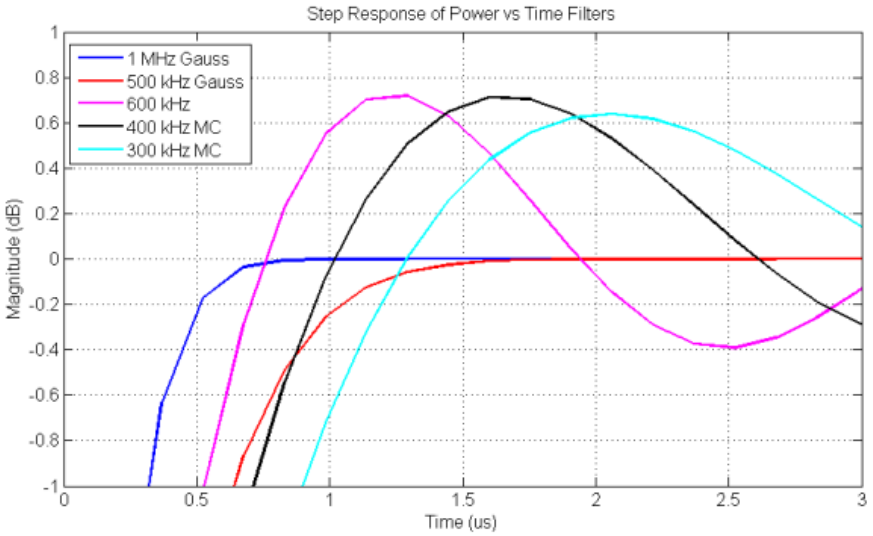


Fig. 2-26: Step Response of the Power vs Time Filters

2.2.8.3 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 R&S FSQ/FSG-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 2-27.

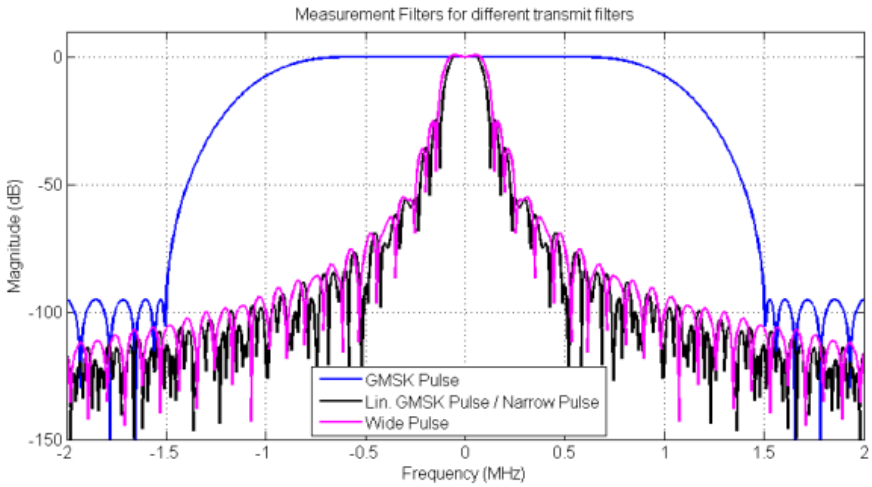


Fig. 2-27: Magnitude Responses of Measurement Filters for Demodulation Measurements

2.2.9 Definition of the Symbol Period

The following sections define the symbol period for various modulation types.

2.2.9.1 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 at the top of figure 2-28. With the frequency pulse denoted g(t), the phase of a GMSK signal due to a sequence of symbols {α} 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 is chosen such that the maximum phase change of π/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 2-28. 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 at the bottom of figure 2-28, where you can see 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.

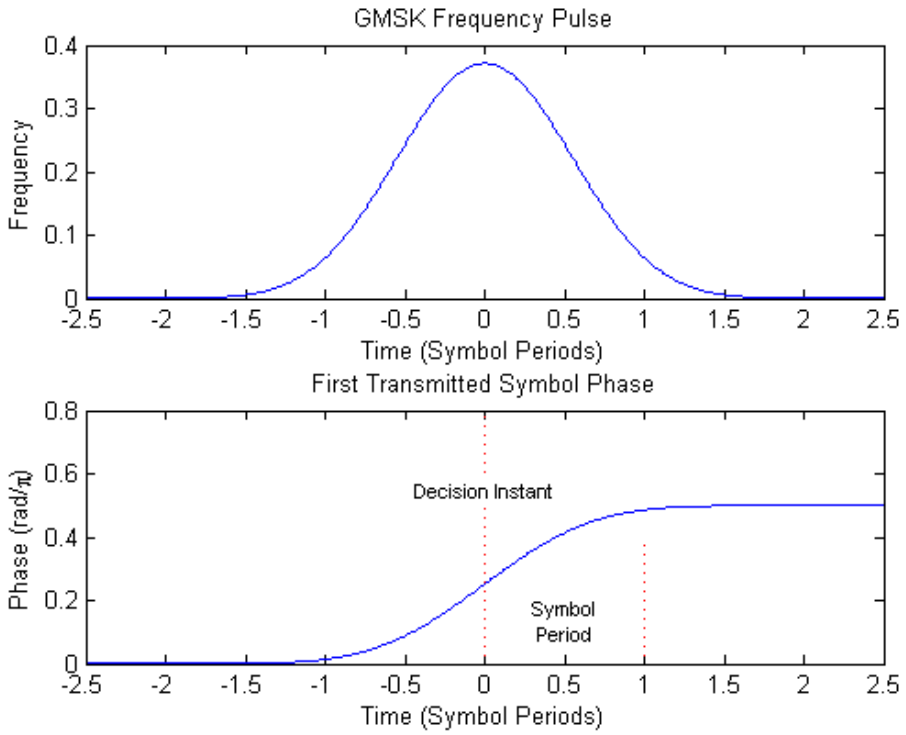


Fig. 2-28: GMSK Frequency Pulse (top) and phase of the first tail symbol (bottom)

2.2.9.2 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 at the top of figure 2-29. 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 as $c_0(t)$, 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:

"The time reference t' = 0 is the start of the active part of the burst as shown in figure 2-29. 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 2-29, 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.

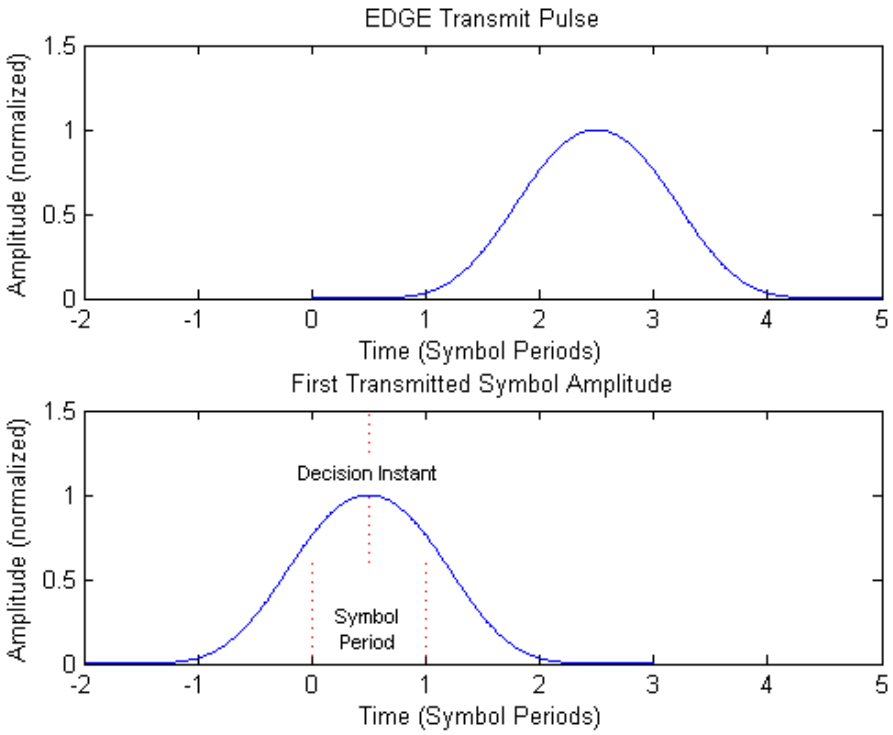


Fig. 2-29: EDGE transmit pulse (top) and the first transmitted symbol (bottom)

The description above also applies to the 16QAM and 32QAM modulations defined for EDGE Evolution, using the "normal" symbol rate.

2.2.9.3 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 described in chapter 2.2.9.2, "8PSK, 16QAM and 32QAM Modulation (Normal Symbol Rate)", on page 40, while the wide pulse was designed based on a numerically optimized set of discrete filter coefficients. Both narrow and wide pulse shapes are illustrated at the top of figure 2-30, 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 2-30. 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 at the bottom of figure 2-30, 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.

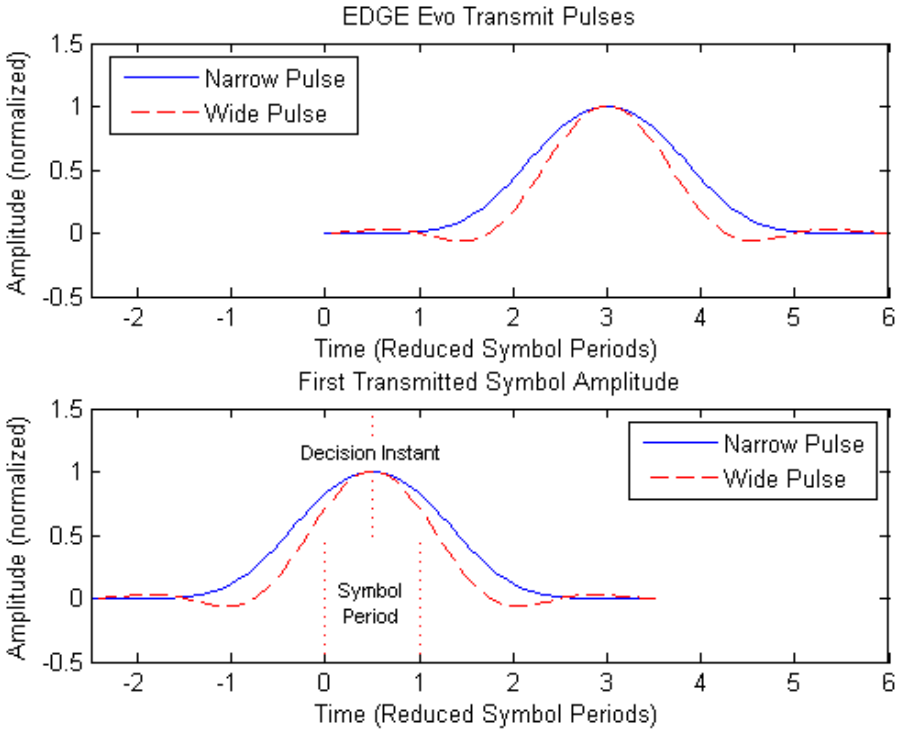


Fig. 2-30: EDGE Evolution transmit pulses (top) and the first transmitted symbols (bottom)

2.2.10 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 (figure 2-31). 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" on page 62).

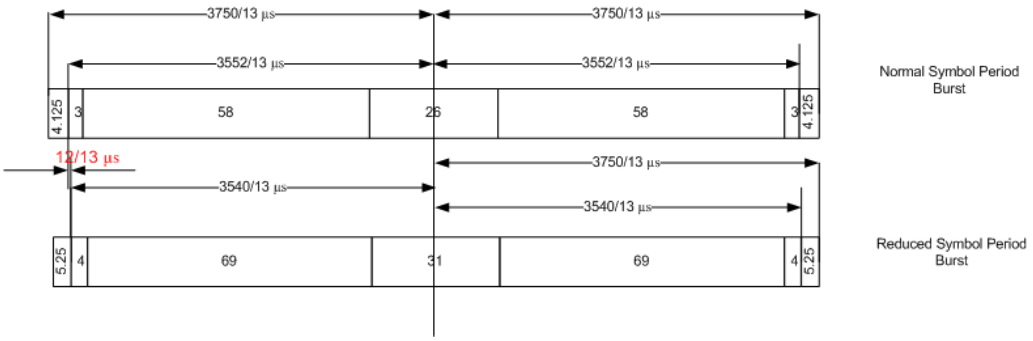


Fig. 2-31: Timing alignment between normal symbol period and reduced symbol period bursts

As described in chapter 2.2.9, "Definition of the Symbol Period", on page 39, the middle of midamble can be defined with respect to symbol periods and symbol decision instants. This is illustrated in figure 2-32. 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.

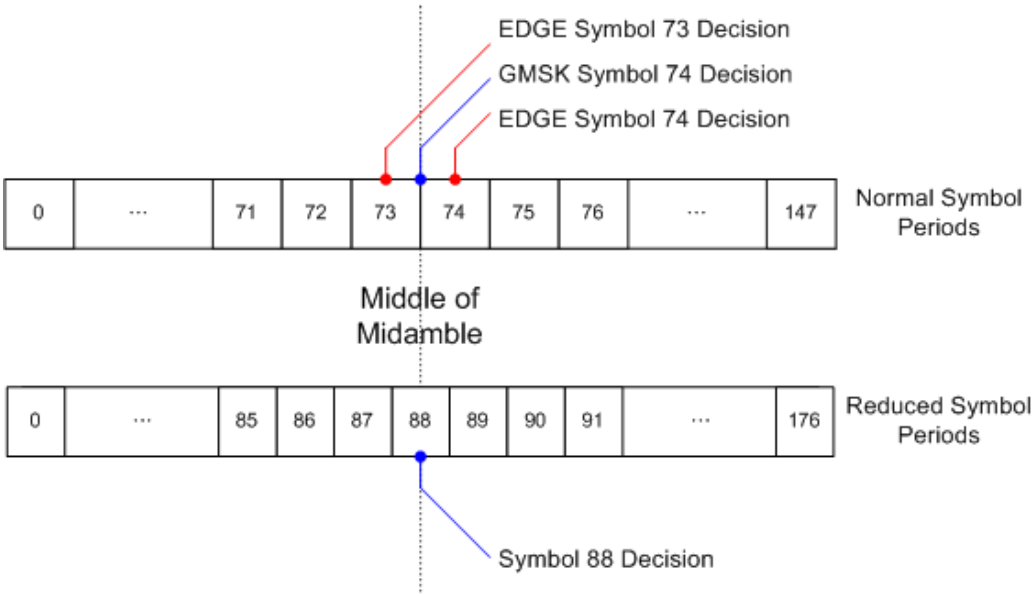


Fig. 2-32: Middle of midamble for normal and reduced symbol period bursts.

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 (see also "Equal Timeslot Length" on page 57), which are illustrated in figure 2-33.

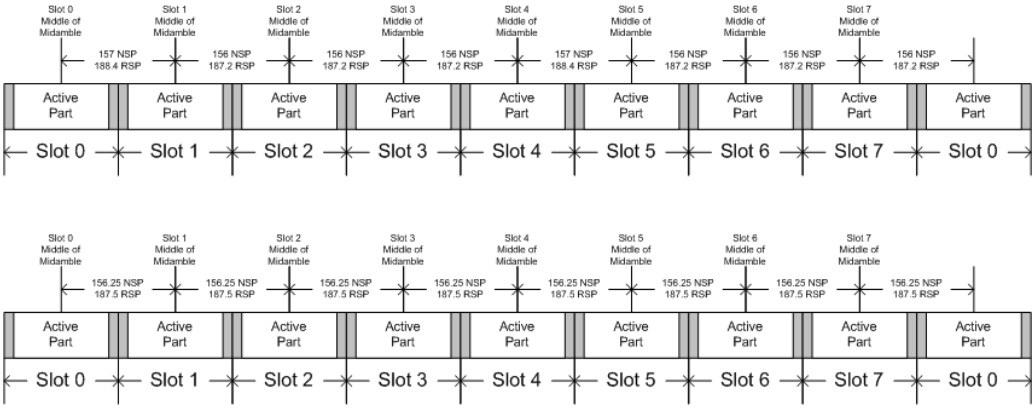


Fig. 2-33: "Not equal"(top) and "equal" (bottom) timeslot length criteria

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 2-9, for convenience:

Table 2-9: 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

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
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

2.3 Hotkeys of the GSM Mode

Hotkeys are allocated to the seven keys at the bottom edge of the screen. These hotkeys are available at all times once the option has been started.

SPECTRUM
Exits the R&S FSQ/FSG-K10 option and returns to the Spectrum mode with all previous settings restored.

GSM & EVO
Returns to the main measurement menu of R&S FSQ/FSG-K10, where measurement results can be seen. All open dialog boxes are closed, and the main softkey menu is displayed.

AUTO SET
Starts a single auto set procedure. Select the parameters to be set automatically in the "Auto Set tab" on page 68 of the "Meas Settings" on page 55 dialog box.

RUN SGL
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).

RUN CONT
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).

REFRESH
Repeats the evaluation of the data currently in the capture buffer without capturing new data. This is useful after changing settings, for example the Statistic Count. Averaging is performed according to the "Statistic Count" and automatically stops when the defined "Statistic Count" or the end of the captured data is reached.

SCPI command:
`INITiate:REFMeas[:IMMediate]` on page 159

SCREEN A/B
Selects the specified screen as the active screen. The label indicates which screen will become the active screen after the hotkey is pressed.

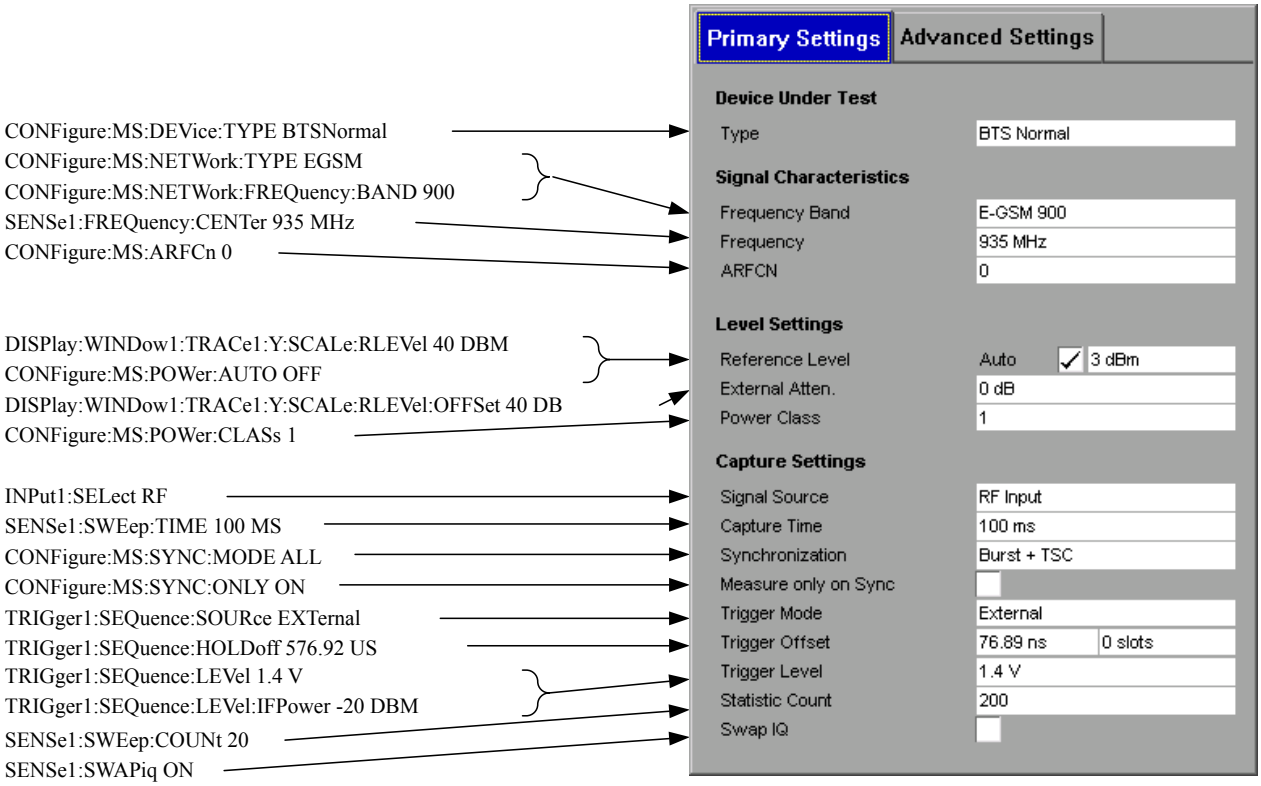
2.4 Softkeys and Settings of the GSM Menu

The following table shows all softkeys and settings available from the main menu of the GSM application.

Press the MEAS key to open this menu.

General Settings
Opens the "General Settings" dialog box.

Primary Settings ← General Settings
This tab contains the basic measurement settings.



Device Under Test: Type ← Primary Settings ← General Settings
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".

SCPI command:
CONFigure[:MS]:DEVice:TYPE on page 101

Frequency Band ← Primary Settings ← General Settings
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.

SCPI command:
CONFigure[:MS]:NETWork[:TYPE] on page 107
CONFigure[:MS]:NETWork:FREQuency:BAND on page 108

Frequency ← Primary Settings ← General Settings
Specifies the center frequency of the signal to be measured. If the frequency is modified, the "ARFCN" is updated accordingly (see "ARFCN" on page 50).

SCPI command:
[SENSe:]FREQuency:CENTer on page 203

ARFCN ← Primary Settings ← General Settings
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.

SCPI command:
CONFigure[:MS]:ARFCn on page 85

Reference Level ← Primary Settings ← General Settings
Defines the reference level in dBm.

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.

"AUTO" enables continuous auto levelling. In this case, the optimal reference level for the current measurement is defined automatically.

SCPI command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel[:RF] on page 126
CONFigure[:MS]:POWer:AUTO on page 111

External Attenuation ← Primary Settings ← General Settings
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 FSQ/FSG operating manual.

This parameter is not available for signals from the analog baseband input (option R&S FSQ/FSG-B71).

SCPI command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet on page 125

Power Class ← Primary Settings ← General Settings
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.

SCPI command:

`CONFigure[:MS]:POWer:CLASs` on page 109

Signal Source ← Primary Settings ← General Settings

The following signal sources are supported:

- RF Input
- ● Baseband Analog (only with baseband inputs DC to 36 MHz option, R&S FSQ/FSG-B71)

SCPI command:

`INPut:SELect` on page 162

Capture Time ← Primary Settings ← General Settings

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.

Note: 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.

SCPI command:

`[SENSe:]SWEep:TIME` on page 204

Synchronization ← Primary Settings ← General Settings

Sets the synchronization mode of the R&S FSQ/FSG-K10.

"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" is usually 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 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.
Tip: Manually adjust the trigger offset to move the burst to be analyzed under the mask in the "Power vs Time" measurement.
Note: For "None" no demodulation measurements (e.g. "Modulation Accuracy") are supported. Only "Power vs Time", "Modulation Spectrum", "Transient Spectrum" measurements are supported.

SCPI command:
`CONFigure[:MS]:SYNC:MODE` on page 112

Measure only on Sync ← Primary Settings ← General Settings
If activated (default), 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 option depends on the value of the Synchronization parameter.

Note: This parameter does not affect the "Wide Modulation Spectrum" measurement (see chapter 2.1.10, "Wide Modulation Spectrum", on page 20).

SCPI command:
`CONFigure[:MS]:SYNC:ONLY` on page 113

Trigger Mode ← Primary Settings ← General Settings
The following trigger modes are supported:

- Free Run
- External
- Power

The default mode is Free Run.

For further information refer to chapter 2.2.6, "Trigger settings", on page 33.

SCPI command:
`TRIGger<n>[:SEQuence]:SOURce` on page 210

Trigger Offset ← Primary Settings ← General Settings
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 chapter 2.2.6, "Trigger settings", on page 33.

Note: 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.

SCPI command:
`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 209

Trigger Level ← Primary Settings ← General Settings
Specifies the trigger level in Volts if the instrument is in external trigger mode, or in dBm in power trigger mode.

SCPI command:
`TRIGger<n>[:SEQuence]:LEVel:IFPower` on page 209
`TRIGger<n>[:SEQuence]:LEVel[:EXTernal]` on page 209

Statistic Count ← Primary Settings ← General Settings
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.

SCPI command:
`[SENSe:]SWEep:COUNt` on page 204

Swap I/Q ← Primary Settings ← General Settings
Swaps the I and Q values of the signal. Swapping I and Q inverts the sideband.

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

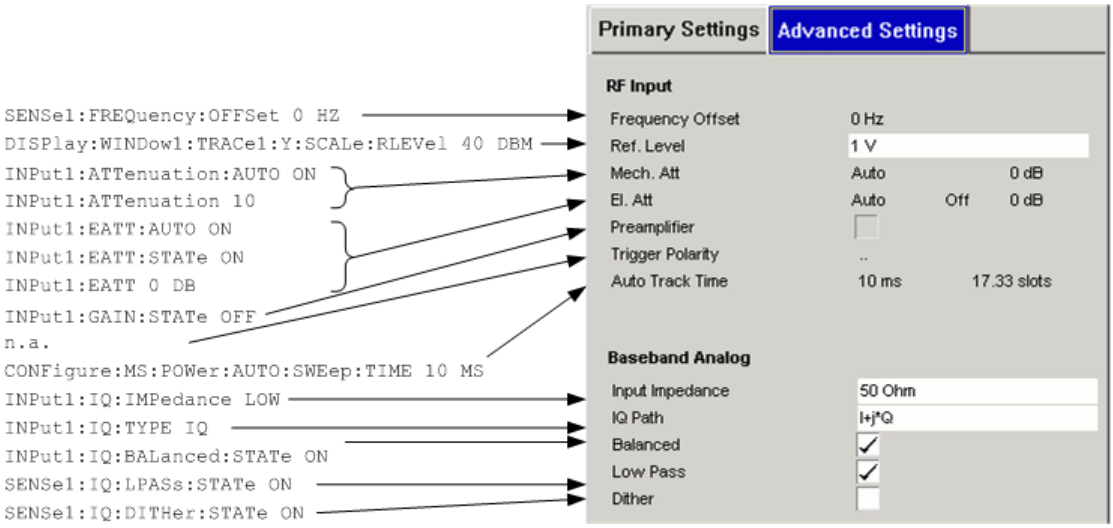
"ON" I and Q are exchanged, inverted sideband, Q+j*I

"OFF" Normal sideband, I+j*Q

SCPI command:
`[SENSe:]SWAPiq` on page 203

Advanced Settings tab ← General Settings
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.



RF Input ← Advanced Settings tab ← General Settings
Settings for RF Input

Frequency Offset ← RF Input ← Advanced Settings tab ← General Settings
The frequency offset shifts the displayed frequency range by the specified offset.

SCPI command:
`[SENSe:]FREQuency:OFFSet` on page 203

Ref. Level ← RF Input ← Advanced Settings tab ← General Settings
Defines the reference level in dBm.

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.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel[:RF]` on page 126

Mechanical Atten ← RF Input ← Advanced Settings tab ← General Settings
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 manual attenuation value of the mechanical attenuator in this field.

SCPI command:
`INPut:ATTenuation` on page 160
`INPut:ATTenuation:AUTO` on page 160

Electrical Atten ← RF Input ← Advanced Settings tab ← General Settings
To set the electrical attenuation, edit the following 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 manual power level of the electrical attenuator.

SCPI command:
`INPut:EATT` on page 161
`INPut:EATT:AUTO` on page 161
`INPut:EATT:STATe` on page 162

Preamplifier (option B22) ← RF Input ← Advanced Settings tab ← General Settings
Use this parameter to activate the preamplifier (option R&S FSQ/FSG-B22 required). For details refer to the "PREAMP" softkey description in the R&S FSQ/FSG operating manual.

Trigger Polarity ← RF Input ← Advanced Settings tab ← General Settings
for future use

Auto Track Time ← RF Input ← Advanced Settings tab ← General Settings
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.

SCPI command:
`CONFigure[:MS]:POWer:AUTO:SWEep:TIME` on page 111

Baseband Analog ← Advanced Settings tab ← General Settings
This section configures the signal settings for the Signal Source "Baseband Analog" (requires baseband inputs DC to 36 MHz option, R&S FSQ/FSG-B71).

Input Impedance ← Baseband Analog ← Advanced Settings tab ← General Settings
Allows the selection of the impedance of the baseband inputs (R&S FSQ/FSG-B71). Either 50 Ω or 1 MΩ can be selected.

SCPI command:
INP:IQ:IMP LOW

IQ Path ← Baseband Analog ← Advanced Settings tab ← General Settings
This parameter is set to "I+j*Q" and can not be changed. Use the parameter Swap I/Q if the I and Q cables are interchanged.

SCPI command:
INP:IQ:TYPE IQ

Balanced ← Baseband Analog ← Advanced Settings tab ← General Settings
Switches the baseband inputs between symmetrically (balanced) and asymmetrical (unbalanced).

SCPI command:
INP:IQ:BAL ON

Low Pass ← Baseband Analog ← Advanced Settings tab ← General Settings
If activated, an analog anti-aliasing filter is applied internally to all the I/Q inputs. The filter must be turned on if there might be frequency components (harmonics) above approximately 40 MHz. The amplitude and phase equalized single-sided bandwidth of the analog baseband inputs is:

for Low pass = On: 30 MHz

for Low pass = Off: 36 MHz

SCPI command:
SENS:IQ:LPAS ON

Dither ← Baseband Analog ← Advanced Settings tab ← General Settings
If activated, 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.

SCPI command:
SENS:IQ:DITH ON

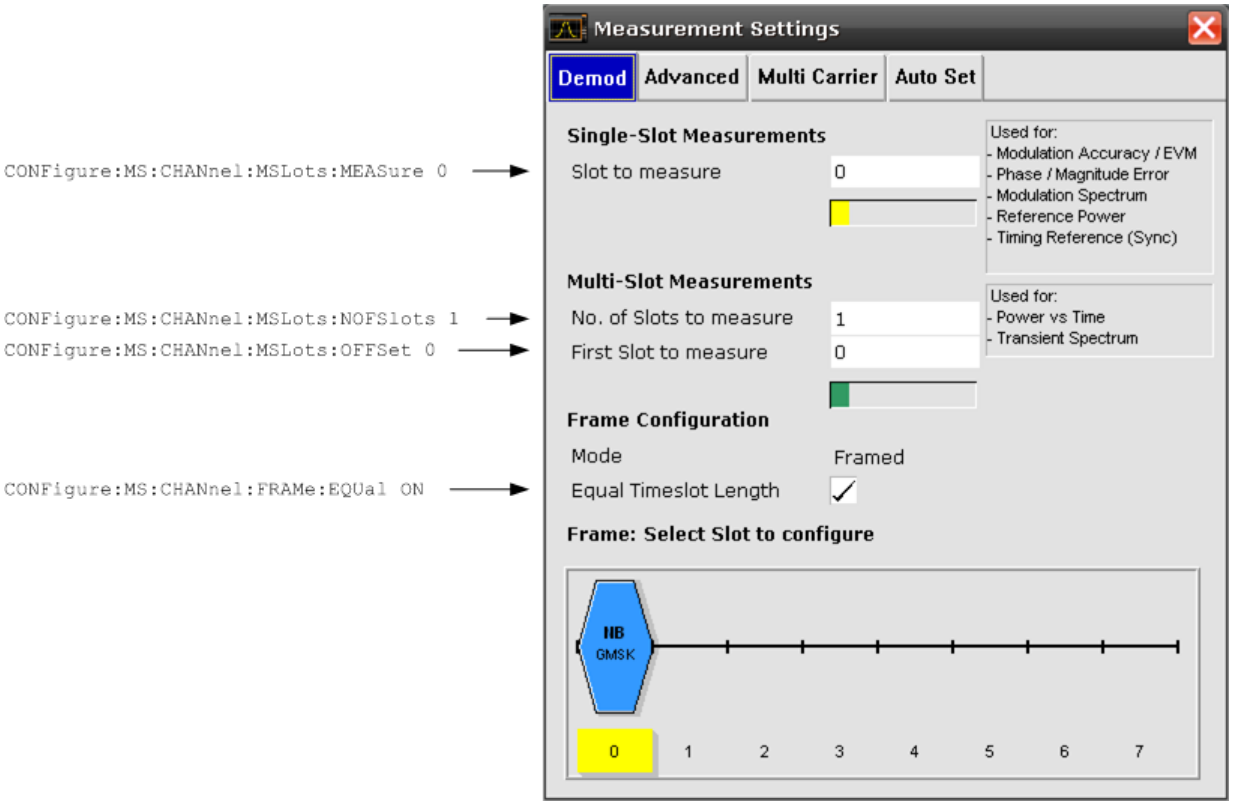
Meas Settings
Opens the "Measurement Settings" dialog box.

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

- "Demod tab" on page 56
- "Advanced tab" on page 62
- "Multi Meas Tab" on page 65
- "Multi Carrier tab" on page 66
- "Auto Set tab" on page 68

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

- Single-slot measurements
- Multi-slot measurements
- Frame configuration



Slot to Measure ← Demod tab ← Meas Settings
This parameter specifies the slot to be measured in single-slot measurements relative to the GSM frame boundary. The following rule applies:

0 ≤ Slot to Measure ≤ 7

The "Slot to Measure" is used as the (only) slot to measure in the following measurements: (see "First Slot to measure" on page 57)

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

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

- Power vs Time
- Modulation Spectrum
- Transient Spectrum

- Wide Modulation Spectrum
- Wide 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 chapter 2.2.7, "Defining the Scope of the Measurement", on page 33. For details on the measurement types see chapter 2.1, "Measurements and Result Displays", on page 6.

SCPI command:
`CONFigure[:MS]:CHANnel:MSLots:MEASure` on page 88

Number of Slots to measure ← Demod tab ← Meas Settings
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 chapter 2.2.7, "Defining the Scope of the Measurement", on page 33.

SCPI command:
`CONFigure[:MS]:CHANnel:MSLots:NOFSlots` on page 88

First Slot to measure ← Demod tab ← Meas Settings
This parameter specifies the start of the measurement interval for mulit-slot measurements, i.e. "Power vs. Time"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 chapter 2.2.7, "Defining the Scope of the Measurement", on page 33.

SCPI command:
`CONFigure[:MS]:CHANnel:MSLots:OFFSet` on page 89

Equal Timeslot Length ← Demod tab ← Meas Settings
This parameter is only taken into account if "Limit Time Alignment" is set to "Slot to measure" (see "Limit Time Alignment" on page 62).

This parameter is used to adjust the time for the "Power vs Time" masks of all slots for which the "Slot to measure" is used as the time reference for the entire frame.

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 others have a shorter duration compared to the "Equal Timeslot Length" (157, 156, 156, 156, 157, 156, 156, 156 normal symbol periods).

See GPP TS 51.021 and 3GPP TS 45.010 chapter "6.7 Timeslot length" for further details.

SCPI command:
`CONFigure[:MS]:CHANnel:FRAMe:EQUal` on page 88

Frame: Select Slot to Configure ← Demod tab ← Meas Settings
This field shows a graphical representation of the configuration of each slot. Selecting a slot leads to its "Burst" dialog box (see "Burst" on page 58).

Inside the slot the following information is given:

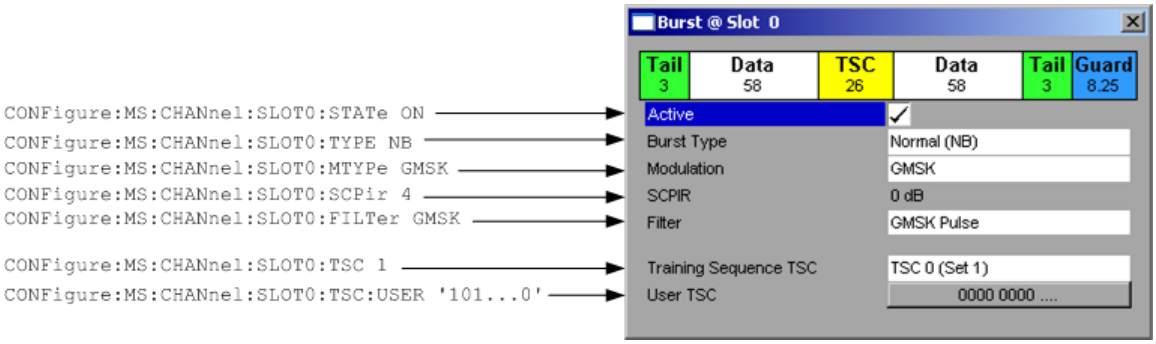
- The burst type, e.g. "Normal (NB)" for a normal burst.
- The modulation, e.g. GMSK.

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 (see "Burst" on page 58).

Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
The "Burst" dialog box opens when you select a slot to be configured in the "Demod" tab of the "Measurement Settings" (see "Frame: Select Slot to Configure" on page 57) .

In the title bar of the dialog box the selected slot number is displayed. At the top of the dialog box, the sections of the burst and their number of bits are indicated.



Active ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Activates or deactivates the selected slot.

SCPI command:
`CONFigure[:MS]:CHANnel:SLOT<s>[:STATe]` on page 89

Burst Type ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Assigns a burst type to the selected slot. The following burst types are supported:

- Normal (NB)
- Higher Symbol Rate (HB)
- Access Burst (AB)

SCPI command:
`CONFigure[:MS]:CHANnel:SLOT<s>:TYPE` on page 97

Modulation ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Select the modulation to be used in the slot. The available selections depend on the burst type. The following modulation types are supported, depending on the burst type:

Modulation	Normal Burst (NB)	Higher Symbol Rate (HB)
GMSK	x	-
QPSK	-	x
8PSK	x	-
16QAM	x	x
32QAM	x	x
AQPSK	x	-

SCPI command:
CONFigure[:MS]:CHANnel:SLOT<s>:MTYPe on page 90

Filter ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Specifies the pulse shape of the modulator. The following filter types are supported:

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

SCPI command:
CONFigure[:MS]:CHANnel:SLOT<s>:FILTer on page 89

Training Sequence TSC ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Selects the training sequence and the set of a single slot. The available values depend on the modulation as indicated in the table below.

For user-defined TSCs, select "User" and define the training sequence in "User TSC" on page 60.

Note: For AQPSK modulation, the training sequence is defined for each subchannel, see "Training Sequence TSC" on page 61.

Modulation	TSC
GMSK	TSC 0 (Set 1) TSC 1 (Set 1) TSC 2 (Set 1) TSC 3 (Set 1) TSC 4 (Set 1) TSC 5 (Set 1) TSC 6 (Set 1) TSC 7 (Set 1) TSC 0 (Set 2) TSC 1 (Set 2) TSC 2 (Set 2) TSC 3 (Set 2) TSC 4 (Set 2) TSC 5 (Set 2) TSC 6 (Set 2) TSC 7 (Set 2) USER
QPSK, 8PSK, 16QAM, 32QAM	TSC 0 TSC 1 TSC 2 TSC 3 TSC 4 TSC 5 TSC 6 TSC 7
User	user-defined TSCs ("User TSC" on page 60)

SCPI command:
`CONFigure[:MS]:CHANnel:SLOT<s>:TSC` on page 94

User TSC ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Sets the bits of the user-defined TSC. The number of bits depend on the burst type and the modulation and is indicated in the table below.

Note: For AQPSK modulation, the user-defined TSC is defined for each subchannel, see "User TSC" on page 61.

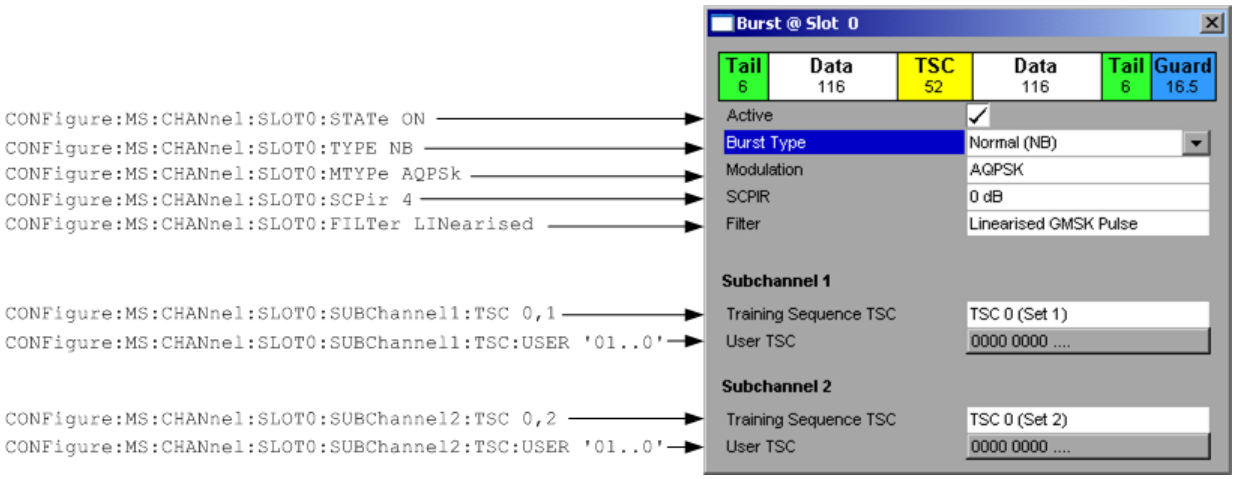
Table 2-10: Number of TSC bits depending on burst type and modulation

Burst Type	Modulation	Number of Bits
Normal	GMSK	26
Normal	8PSK	78
Normal	16QAM	104
Normal	32QAM	130

Burst Type	Modulation	Number of Bits
Higher Symbol Rate	QPSK	62
Higher Symbol Rate	16QAM	124
Higher Symbol Rate	32QAM	155

SCPI command:
CONFigure[:MS]:CHANnel:SLOT<s>:TSC:USER on page 96

Subchannel 1/2 ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
For AQPSK modulation, the training sequence and user-defined TSC are defined for each subchannel.



Training Sequence TSC ← Subchannel 1/2 ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Selects the training sequence and the set of the selected subchannel of a single slot for AQPSK modulation.

"TSC 0…TSC 7 (Set 1/2)"
Selects a standard TSC of Set 1/2 that complies with the GSM standard
For subchannel 1, only "Set 1" is available.

"USER" Selects a user-defined TSC (see "User TSC" on page 61).

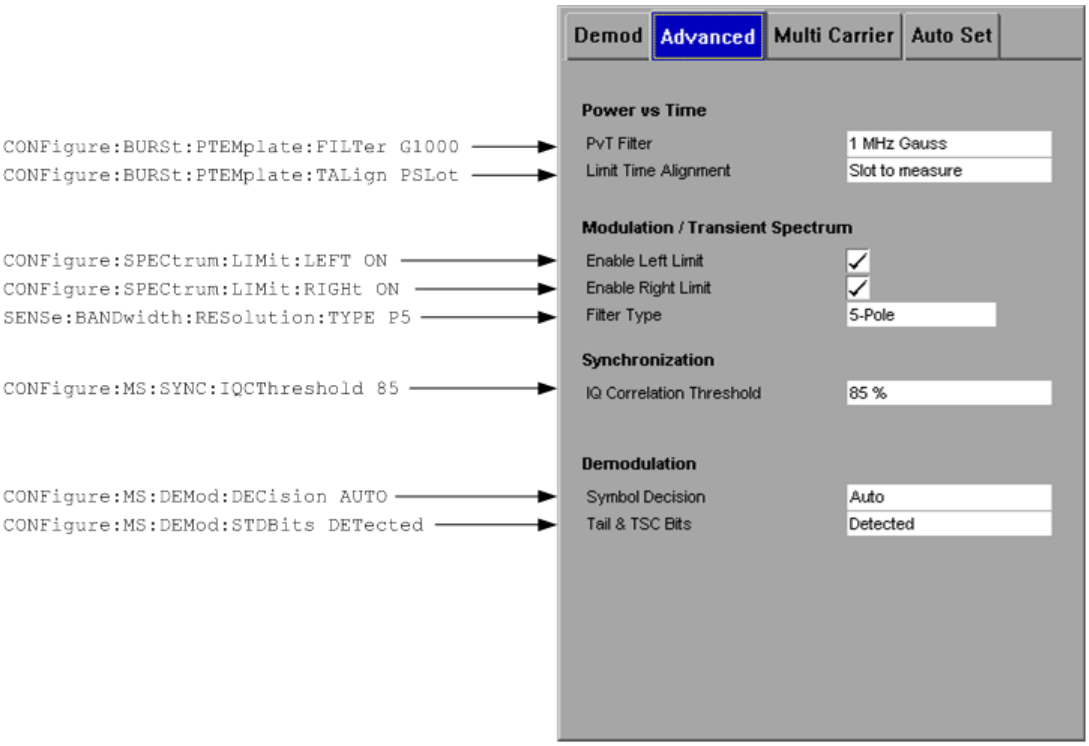
SCPI command:
CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC on page 92

User TSC ← Subchannel 1/2 ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Sets the 26 bits of the user-defined TSC of the selected subchannel for AQPSK modulation.

SCPI command:
CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC:USER on page 93

Advanced tab ← Meas Settings

This tab contains settings related to the Power vs Time, Modulation Spectrum and Transient Spectrum measurements.



PvT Filter ← Advanced tab ← Meas Settings

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" is switched off (see "Multi Carrier BTS" on page 67). For single-carrier measurements, the "PvT Filter" parameter in the "Multi Carrier" tab is ignored (see "PvT Filter" on page 68).

"1 MHz Gauss"
default

"500 kHz Gauss"
for backwards compatibility to FS-K5

"600 kHz"
for backwards compatibility to FS-K5

SCPI command:
CONFigure:BURSt:PTEMplate:FILTer on page 115

Limit Time Alignment ← Advanced tab ← Meas Settings

The Limit Time Alignment controls how the limit lines are aligned in a "Power vs Time" measurement graph (see chapter 2.1.7, "Power vs Time", on page 12). 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 and "Slot to Measure" on page 56).
- **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.

Note: The "Limit Time Alignment" also decides whether the "Delta to sync" values of the "Power vs Time" list result are measured (for "Limit Time Alignment" = "Per Slot") or if they are constant as defined by the 3PP standard (for "Limit Time Alignment" = "Slot to measure").

The R&S FSQ/FSG-K10 option offers a strictly standard-conformant, multiple-slot PvT limit line check. This is based on time alignment to a single specified slot (the "Slot to Measure") and allows the user to check for correct BTS timeslot alignment in the DUT, according to the GSM standard. In addition, a less stringent test which performs PvT limit line alignment on a per-slot basis ("Per Slot") is also available.

SCPI command:
`CONFigure:BURSt:PTEMplate:TALign` on page 116

Enable Left Limit ← Advanced tab ← Meas Settings
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.

Note: For measurements on multi-carrier signals, using either the check on the left or right side allows you to measure the spectrum of the left or right-most channel while ignoring the side where adjacent channels are located.

SCPI command:
`CONFigure:SPECtrum:LIMit:LEFT` on page 117

Enable Right Limit ← Advanced tab ← Meas Settings
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.

Note: For measurements on multi-carrier signals, using either the check on the left or right side allows you to measure the spectrum of the left or right-most channel while ignoring the side where adjacent channels are located.

SCPI command:
`CONFigure:SPECtrum:LIMit:RIGHt` on page 118

Filter Type ← Advanced tab ← Meas Settings
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.

SCPI command:
`[SENSe]:BANDwidth[:RESolution]:TYPE` on page 202

IQ Correlation Threshold ← Advanced tab ← Meas Settings
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 FSQ/FSG-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.

SCPI command:
`CONFigure[:MS]:SYNC:IQCThreshold` on page 112

Symbol Decision ← Advanced tab ← Meas Settings
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 R&S FSQ/FSG-K10) and measurement speed.

"Auto" Automatically selects the symbol decision method.

"Linear" Linear symbol decision: Uses inverse filtering (a kind of zero-forcing filter) and a symbol-wise decision method. This method is recommended for high symbol to noise ratios, but not for Higher Symbol Rate bursts with a narrow pulse. The inverse filter colors the noise inside the signal bandwidth and therefore is not recommended for narrow-band signals or signals with a low signal to noise ratio. Peaks in the "EVM vs Time" measurement (see chapter 2.1.4, "EVM vs Time", on page 9) 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, but with a loss of measurement speed. This method is recommended for normal bursts with 16QAM or 32QAM modulation and for Higher Symbol Rate bursts with a narrow pulse.

SCPI command:
`CONFigure[:MS]:DEMod:DECision` on page 98

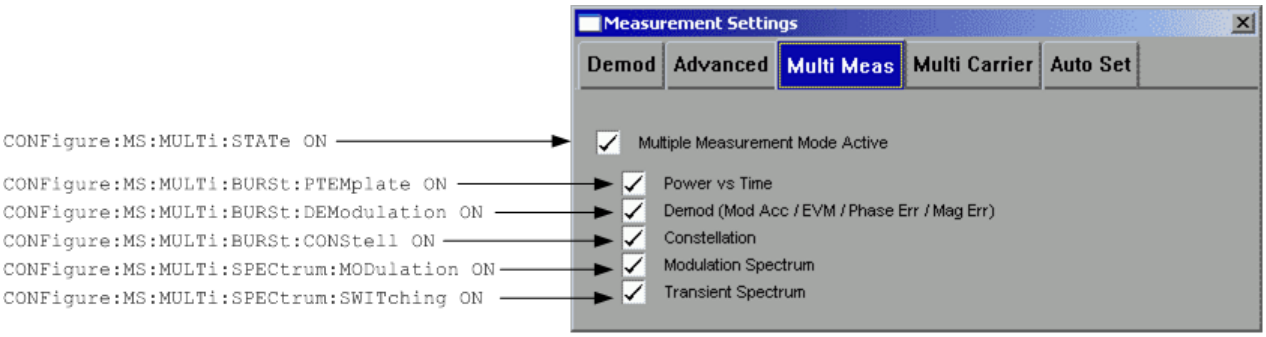
Tail & TSC Bits ← Advanced tab ← Meas Settings
The R&S FSQ/FSG-K10 demodulator requires the bits of the burst (Tail, Data, TSC, Data, Tail) to provide an ideal version of the measured signal. The "Data" bits can be random and are typically not known inside the demodulator of the R&S FSQ/FSG-K10. "Tail" and "TSC" bits are specified in the "Burst" dialog box (see "Burst" on page 58).

"Detected" The detected Tail and TSC bits are used to construct the ideal signal.

"Standard" The standard Tail and TSC bits (as set in the "Burst" dialog box) are used to construct the ideal signal.
Using the standard bits can be advantageous to verify whether the device under test sends the correct Tail and TSC bits. Incorrect bits would lead to peaks in the "EVM vs Time" trace (see chapter 2.1.4, "EVM vs Time", on page 9) at the positions of the incorrect bits.

SCPI command:
`CONFigure[:MS]:DEMod:STDBits` on page 100

Multi Meas Tab ← Meas Settings
This tab allows you to perform several measurements at once.



Multiple Measurement Mode active ← Multi Meas Tab ← Meas Settings
Activates the multiple measurement mode. In this mode, several measurement results can be calculated on the same captured I/Q data in parallel. Only the results of the selected measurements are available. The softkeys for the other measurements only become available again when you deactivate multiple measurement mode or include the measurement in the multiple measurement selection.

Use this mode to reduce total measurement time if you know in advance which measurement results are required.

SCPI command:
`CONFigure[:MS]:MULTi:STATe` on page 106

Power vs Time ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Power vs Time" measurement (see chapter 2.1.7, "Power vs Time", on page 12) are included in an active multiple measurement.

SCPI command:
`CONFigure[:MS]:MULTi:BURSt:PTEMplate` on page 105

Demod ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Modulation Accuracy", "EVM vs Time", "Phase Error vs Time" and "Magnitude Error vs Time" measurements are included in an active multiple measurement.

See:

chapter 2.1.2, "Modulation Accuracy", on page 7

chapter 2.1.4, "EVM vs Time", on page 9

chapter 2.1.3, "Phase Error vs Time", on page 8

chapter 2.1.5, "Magnitude Error vs Time", on page 10

SCPI command:
`CONFigure[:MS]:MULTi:BURSt:DEModulation` on page 105

Constellation ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Constellation" measurement (see chapter 2.1.6, "Constellation", on page 11) are included in an active multiple measurement.

SCPI command:
`CONFigure[:MS]:MULTi:BURSt:CONStell` on page 104

Modulation Spectrum ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Modulation Spectrum" measurement (see chapter 2.1.8, "Modulation Spectrum", on page 16) are included in an active multiple measurement.

Note: By default, list results are calculated. To receive graph results, set the "Display List/Graph" softkey to "Graph" (see "Display List/Graph" on page 73).

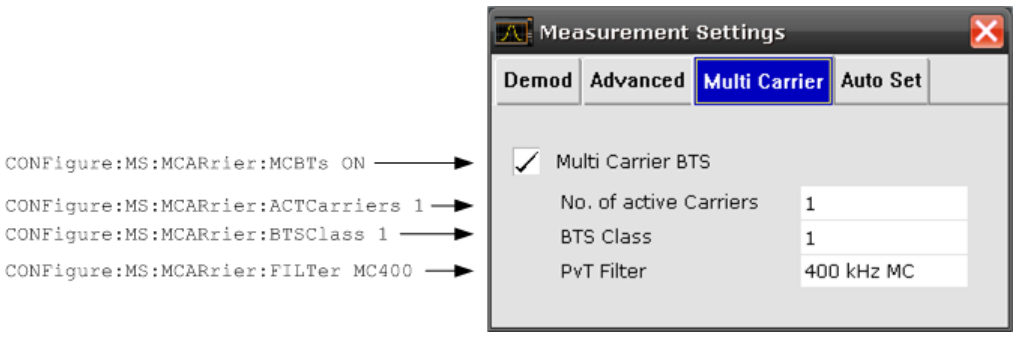
SCPI command:
`CONFigure[:MS]:MULTi:SPECtrum:MODulation` on page 105

Transient Spectrum ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Transient Spectrum" measurement (see chapter 2.1.9, "Transient Spectrum", on page 19) are included in an active multiple measurement.

Note: By default, list results are calculated. To receive graph results, set the "Display List/Graph" softkey to "Graph" (see "Display List/Graph" on page 73).

SCPI command:
`CONFigure[:MS]:MULTi:SPECtrum:SWITching` on page 106

Multi Carrier tab ← Meas Settings
This tab provides settings related to measurements on multi-carrier base stations.



Multi Carrier BTS ← Multi Carrier tab ← Meas Settings
This parameter informs the R&S FSQ/FSG-K10 that the measured signal is a multi-carrier signal. This function is only available if the "Device Type" is a "BTS" type (see "Device Under Test: Type" on page 49).

Activating this checkbox has the following effects:

- An additional multi-carrier filter is switched into the demodulation path of the R&S FSQ/FSG-K10. This filter can, for example, suppress up to 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 parameters become available.

SCPI command:
CONFigure[:MS]:MCARrier:MCBTs on page 103

No. of active Carriers ← Multi Carrier tab ← Meas Settings
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 relaxed by 10*log(N) dB for frequencies ≥ 1.8 MHz.

SCPI command:
CONFigure[:MS]:MCARrier:ACTCarriers on page 102

BTS Class ← Multi Carrier tab ← Meas Settings
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").

SCPI command:
CONFigure[:MS]:MCARrier:BTSClass on page 102

PvT Filter ← Multi Carrier tab ← Meas Settings
Controls the filter used to reduced the measurement bandwidth for multi-carrier "Power vs Time" measurements. For multi-carrier BTS measurements, the PvT Filter parameter in the "Advanced" tab is ignored (see "PvT Filter" on page 62).

For further details on filtering in the R&S FSQ/FSG-K10 see chapter 2.2.8, "Overview of filters in R&S FSQ/FSG-K10", on page 35.

The following filters are supported:

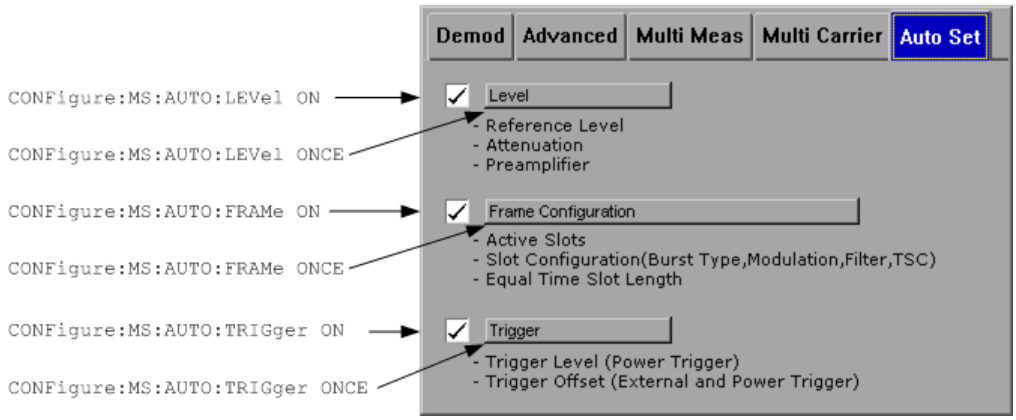
Note: The PvT filter is optimized to get smooth edges after filtering burst signals and to suppress adjacent, active channels.

"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.

SCPI command:
`CONFigure[:MS]:MCARrier:FILTer` on page 102

Auto Set tab ← Meas Settings
Select the parameters to be set automatically when you press the AUTO SET key or "Auto Set" softkey.



Level ← Auto Set tab ← Meas Settings
When activated, a single auto level measurement is performed when the AUTO SET key is pressed.

Press the button to perform a single auto level measurement immediately.

SCPI command:
`CONF:AUTO:LEV ON`: Execute Auto Level on Auto Set.
`CONF:AUTO:LEV OFF`: Do not execute Auto Level on Auto Set.
`CONF:AUTO:LEV ONCE`: Perform one Auto Level measurement immediately.
see `CONFigure[:MS]:AUTO:LEVel` on page 86

Frame Configuration ← Auto Set tab ← Meas Settings
When activated, a single auto frame configuration measurement is performed when the AUTO SET key is pressed.

The auto frame configuration measurement may take a long time, therefore it is deactivated by default. The following parameters are detected and automatically measured:

- Active slots
- Slot configuration (burst type, modulation, filter, TSC)
- Equal time slot length
- For VAMOS normal burst and GMSK: TSCs of set 1 and set 2
- For VAMOS normal burst and AQPSK: TSCs of both subchannels (restrictions see table 2-7) and SCPIR

Press the button to perform a single auto frame configuration measurement immediately.

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

- Set "Synchronization" = "None"
- Set the trigger offset manually in the "Power vs Time" measurement.
- Set "Synchronization" back to "Burst + TSC" or "TSC".
- Deactivate the "Trigger" check box in the "Auto Set" tab.
- Press the AUTO SET key to run the auto frame configuration measurement.

SCPI command:

`CONF:AUTO:FRAM ON`: Execute Auto Frame Configuration on Auto Set.

`CONF:AUTO:FRAM OFF`: Do not execute Auto Frame Configuration on Auto Set.

`CONF:AUTO:FRAM ONCE`: Perform one Auto Frame Configuration measurement immediately.

see `CONFigure[:MS]:AUTO:FRAMe` on page 86

Trigger ← Auto Set tab ← Meas Settings

If activated, the following parameters are detected and automatically measured when the AUTO SET key is pressed:

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

Press the button to perform a single auto trigger measurement immediately.

For details on the parameters refer to "General Settings" on page 48.

SCPI command:

`CONF:AUTO:TRIG ON`: Execute Auto Trigger on Auto Set.

`CONF:AUTO:TRIG OFF`: Do not execute Auto Trigger on Auto Set.

`CONF:AUTO:TRIG ONCE`: Perform one Auto Trigger measurement immediately.

see `CONFigure[:MS]:AUTO:TRIGger` on page 87

Demod

Opens a demodulation submenu.

General Settings ← Demod

For details refer to the "General Settings" on page 48 softkey in the root menu of the GSM option.

Meas Settings ← Demod
For details refer to the "Meas Settings" on page 55 softkey in the root menu of the GSM option.

Modulation Accuracy ← Demod
Displays the Modulation Accuracy measurement results.

For details on the measurement refer to chapter 2.1.2, "Modulation Accuracy", on page 7.

Note: Modulation Accuracy results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.
If the "Modulation Accuracy" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

SCPI command:
`CONFigure:BURSt:MACCuracy[:IMMediate]` on page 114

EVM ← Demod
Displays the "EVM vs Time" measurement results. For details on the measurements refer to chapter 2.1.4, "EVM vs Time", on page 9.

Note: EVM vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.
If the "EVM vs Time" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

SCPI command:
`CONFigure:BURSt:ETIMe[:IMMediate]` on page 114

Phase Error ← Demod
Displays the "Phase Error vs Time" measurement results. For details on the measurements refer to chapter 2.1.3, "Phase Error vs Time", on page 8.

Note: Phase Error vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.
If the "Phase Error" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

SCPI command:
`CONFigure:BURSt:PFERror[:IMMediate]` on page 115

Magnitude Error ← Demod
Displays the magnitude error measurement results. For details see chapter 2.1.5, "Magnitude Error vs Time", on page 10.

Note: Magnitude Error vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.
If the "Magnitude Error" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

SCPI command:
`CONFigure:BURSt:MERRor[:IMMediate]` on page 115

Constell ← Demod
Displays the "Constellation" measurement results. For details see chapter 2.1.6, "Constellation", on page 11.

Note: Constellation diagrams can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.
If the "Constell" softkey is not available, include "Constellation" in the multiple measurement selection or disable the multiple measurement mode.

SCPI command:
`CONFigure:BURSt:CONStell[:IMMediate]` on page 114

PvT
Opens the submenu for "Power vs Time" settings, starts the measurement and displays the measurement results. See also chapter 2.1.7, "Power vs Time", on page 12.

Note: Power vs. Time results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.
If the "PvT" softkey is not available, include "Power vs. Time" in the multiple measurement selection or disable the multiple measurement mode.

SCPI command:
`CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115

General Settings ← PvT
For details refer to the "General Settings" on page 48 softkey in the root menu of the GSM option.

Meas Settings ← PvT
For details refer to the "Meas Settings" on page 55 softkey in the root menu of the GSM option.

Full ← PvT
Switches the "Power vs Time" measurement to the "full burst" view.

SCPI command:
`CONF:BURS:PTEM:SEL FULL`, see `CONFigure:BURSt:PTEMplate:SELect` on page 116

Rising ← PvT
Switches the "Power vs Time" measurement to a view of the rising edges only (the rest of the burst is removed).

SCPI command:
`CONF:BURS:PTEM:SEL RIS`, see `CONFigure:BURSt:PTEMplate:SELect` on page 116

Falling ← PvT
Switches the "Power vs Time" measurement to a view of the falling edges only (the rest of the burst is removed).

SCPI command:
`CONF:BURS:PTEM:SEL FALL`, see `CONFigure:BURSt:PTEMplate:SELect` on page 116

Rise & Fall ← PvT
Switches the "Power vs Time" measurement to the "rise & fall" view, i.e. only rising and falling edges of the bursts are displayed.

SCPI command:
`CONF:BURS:PTEM:SEL FRIS`, see `CONFigure:BURSt:PTEMplate:SELect` on page 116

Top ← PvT
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.

SCPI command:
`CONF:BURS:PTEM:SEL TOP`, see `CONFigure:BURSt:PTEMplate:SELect` on page 116

Spectrum
Opens a submenu for spectrum measurement settings.

General Settings ← Spectrum
For details refer to the General Settings softkey in the root menu of the GSM option.

Meas Settings ← Spectrum
For details refer to the Meas Settings softkey in the root menu of the GSM option.

Modulation Spectrum ← Spectrum
Displays the "Modulation Spectrum" measurement results.

For details on the measurement refer to chapter 2.1.8, "Modulation Spectrum", on page 16.

Note: Modulation Spectrum results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.
If the "Modulation Spectrum" softkey is not available, include "Modulation Spectrum" in the multiple measurement selection or disable the multiple measurement mode.

SCPI command:
`CONFigure:SPECtrum:MODulation[:IMMediate]` on page 118

Transient Spectrum ← Spectrum
Displays the "Transient Spectrum" measurement results.

For details on the measurement refer to chapter 2.1.9, "Transient Spectrum", on page 19.

Note: Transient Spectrum results can be included in multiple measurements (see "Multi Meas Tab" on page 65). In this case, you do not need to start a new measurement.
If the "Transient Spectrum" softkey is not available, include "Transient Spectrum" in the multiple measurement selection or disable the multiple measurement mode.

SCPI command:
`CONFigure:SPECtrum:SWITching[:IMMediate]` on page 120

Display List/Graph ← Spectrum
Sets the display mode of the "Modulation Spectrum" and the "Transient Spectrum" measurements.

"List" Spectrum results are measured at several frequency offsets from the center frequency. The results are displayed in a table.

"Graph" A spectrum trace is measured and displayed as a graph.

SCPI command:
`CONFigure:SPECtrum:SELect` on page 119

Wide Spectrum
Displays a menu for "Wide Spectrum" measurements.

Note: "Wide Spectrum" measurements are performed using the "Spectrum" mode and thus require either an external or IF power trigger.

General Settings ← Wide Spectrum
See "General Settings" on page 48

Meas Settings ← Wide Spectrum
See "Meas Settings" on page 55

Wide Mod Spectrum ← Wide Spectrum
Starts a "Wide Modulation Spectrum" measurement (see chapter 2.1.10, "Wide Modulation Spectrum", on page 20).

SCPI command:
`CONFigure:WSPectrum:MODulation[:IMMediate]` on page 121

Wide Tra Spectrum ← Wide Spectrum
Starts a "Wide Transient Spectrum" measurement (see chapter 2.1.11, "Wide Transient Spectrum", on page 24).

SCPI command:
`CONFigure:WSPectrum:SWITching[:IMMediate]` on page 123

Import
Opens the "Choose the file to import" dialog box.

Select the IQ data file you want to import and press ENTER. The extension of data files is *.iqw.

This function is not available while a measurement is running.

I/Q data is imported into the capture buffer. Then evaluation of the data including averaging (according to Statistic Count) is started. Averaging automatically stops when the defined "Statistic Count" or the end of the captured data is reached.

To automatically detect the frame/slot configuration of the imported I/Q data, press the AUTO SET key after import (see also "Frame Configuration" on page 68).

Example: Saving I/Q data to an iqw file using MATLAB for import to the R&S FSQ/FSG-K10 option

Note:
- I/Q values are in the unit Volt
- Sample rate = 6.5 MHz
- Minimum number of complex samples = 68751 (10 ms capture time)
- Maximum number of complex samples = 6503751 (1 s capture time)
- The data order of the float values in the iqw file is III...QQQ...

```
IQ = randn(1,68751)+1i*randn(1,68751); % Example for I/Q data
iq_interleaved = [real(IQ(:)) ; imag(IQ(:)) ];
fid = fopen('IQ_for_import_into_K10.iqw','w');
fwrite(fid,single(iq_interleaved),'float32');
fclose(fid);
```

SCPI command:
MMEMory:LOAD:IQ:STATe on page 164

Export
Opens the "Choose the file to export" dialog box.

Enter the path and the name of the I/Q data file you want to export and press ENTER. The extension of data files is *.iqw. If the file cannot be created or if there is no valid I/Q data to export an error message is displayed.

This function is not available while a measurement is running.

Example: Loading I/Q data exported from the R&S FSQ/FSG-K10 option using MATLAB

Note:
- I/Q values are in the unit Volt
- Sample rate = 6.5 MHz
- Minimum number of complex samples = 68751 (10 ms capture time)
- Maximum number of complex samples = 6503751 (1 s capture time)
- The data order of the float values in the iqw file is III...QQQ...

```
fid = fopen('IQ_exported_from_K10.iqw','r');
[samples, count] = fread(fid,inf,'float32');
fclose (fid);
nof_cplx_smpls = floor(count/2);
IQ = samples(1:nof_cplx_smpls) + 1i*samples(nof_cplx_smpls+1:
2*nof_cplx_smpls);
plot(20*log10(abs(IQ)),'.-');
```

SCPI command:
MMEMory:STORe:IQ:STATe on page 165

R&S Support
Stores useful information for troubleshooting in case of errors.

This data is stored in the `D:\USER\Support\GSM` directory on the instrument.

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.

2.5 FREQ Key

This key opens the "General Settings" dialog box and directly jumps to the "Frequency" field (see "Frequency" on page 50).

2.6 AMPT Key

This key opens the "General Settings" dialog box and directly jumps to the "Reference Level" field (see "Reference Level" on page 50).

2.7 AUTO SET Key

The AUTO SET key starts a single auto set procedure. Select the parameters to be set automatically in the "Auto Set tab" on page 68 of the "Meas Settings" on page 55 dialog box.

2.8 SWEEP Key

Refresh
Repeats the evaluation of the data currently in the capture buffer without capturing new data. This is useful after changing settings, for example the Statistic Count. Averaging is performed according to the "Statistic Count" and automatically stops when the defined "Statistic Count" or the end of the captured data is reached.

SCPI command:
`INITiate:REFMeas[:IMMediate]` on page 159

2.9 TRIG Key

This key opens the "General Settings" dialog box and directly jumps to the "Trigger Mode" field (see "Trigger Mode" on page 52).

2.10 MKR Key

This key opens the "Marker" menu which is identical to the "Spectrum" mode. See the R&S FSQ/FSG description for details.

2.11 Softkeys of the Marker to Menu – MKR-> Key

This section describes the softkeys of the "Marker To" menu available for the GSM mode.

Marker to Trace
Opens an edit dialog box to enter the number of the trace on which the marker is to be placed.

SCPI command:
`CALCulate<n>:MARKer<m>:TRACe` on page 82

3 Remote Commands (GSM)

In this section, all remote control commands specific to the GSM option R&S FSQ/FSG-K10 are described in detail. For details on conventions used in this chapter refer to section chapter 3.1, "Notation", on page 77.

For further information on analyzer or basic settings commands, refer to the corresponding subsystem in the base unit description.

3.1 Notation

In the following sections, all commands implemented in the instrument are first listed and then described in detail, arranged according to the command subsystems. The notation is adapted to the SCPI standard. The SCPI conformity information is included in the individual description of the commands.

Individual Description

The individual description contains the complete notation of the command. An example for each command, the *RST value and the SCPI information are included as well.

The options and operating modes for which a command can be used are indicated by the following abbreviations:

Abbreviation	Description
A	spectrum analysis
A-F	spectrum analysis – span > 0 only (frequency mode)
A-T	spectrum analysis – zero span only (time mode)
ADEMOD	analog demodulation (option R&S FSQ/FSG-K7)
BT	Bluetooth (option R&S FSQ/FSG-K8)

CDMA	CDMA 2000 base station measurements (option R&S FSQ/FSG-K82)
EVDO	1xEV-DO base station analysis (option R&S FSQ/FSG-K84)
GSM	GSM/Edge measurements (option R&S FSQ/FSG-K10)
IQ	IQ Analyzer mode
OFDM	WiMAX IEEE 802.16 OFDM measurements (option R&S FSQ/FSG-K93)
OFDMA/WiBro	WiMAX IEEE 802.16e OFDMA/WiBro measurements (option R&S FSQ/FSG-K93)
NF	Noise Figure measurements (R&S FSQ/FSG-K30)
PHN	Phase Noise measurements (R&S FSQ/FSG-K40)
PSM	Power Sensor measurements (option R&S FSQ/FSG-K9)
SFM	Stereo FM measurements (optionR&S FSQ/FSG-K7S)
SPECM	Spectogram mode (option R&S FSQ/FSG-K14)
TDS	TD-SCDMA base station / UE measurements (option R&S FSQ/FSG-K76/K77)
VSA	Vector Signal Analysis (option R&S FSQ/FSG-K70)
WCDMA	3GPP Base Station measurements (option R&S FSQ/FSG-K72), 3GPP UE measurements (option R&S FSQ/FSG-K73)
WLAN	WLAN TX measurements (option R&S FSQ/FSG-K91)

The spectrum analysis mode is implemented in the basic unit. For the other modes, the corresponding options are required.

Upper/Lower Case Notation

Upper/lower case letters are used to mark the long or short form of the key words of a command in the description. The instrument itself does not distinguish between upper and lower case letters.

Special Characters

|	A selection of key words with an identical effect exists for several commands. These keywords are indicated in the same line; they are separated by a vertical stroke. Only one of these keywords needs to be included in the header of the command. The effect of the command is independent of which of the keywords is used.

Example:

```
SENSe:FREQuency:CW|:FIXed
```

The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:

```
SENSe:FREQuency:CW 1E3
```

```
SENSe:FREQuency:FIXed 1E3
```

A vertical stroke in parameter indications marks alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.

Example: Selection of the parameters for the command

```
[SENSe<1…4>:]AVERage<1…4>:TYPE VIDeo | LINear
```

[]	Key words in square brackets can be omitted when composing the header. The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards. Parameters in square brackets can be incorporated optionally in the command or omitted as well.

{}	Parameters in braces can be incorporated optionally in the command, either not at all, once or several times.

Description of Parameters

Due to the standardization, the parameter section of SCPI commands consists always of the same syntactical elements. SCPI has therefore specified a series of definitions, which are used in the tables of commands. In the tables, these established definitions are indicated in angled brackets (<…>) and is briefly explained in the following.

For details see the chapter "SCPI Command Structure" in the base unit description.

<Boolean>

This keyword refers to parameters which can adopt two states, "on" and "off". The "off" state may either be indicated by the keyword OFF or by the numeric value 0, the "on" state is indicated by ON or any numeric value other than zero. Parameter queries are always returned the numeric value 0 or 1.

<numeric_value> <num>

These keywords mark parameters which may be entered as numeric values or be set using specific keywords (character data). The following keywords given below are permitted:

- `MAXimum`: This keyword sets the parameter to the largest possible value.
- `MINimum`: This keyword sets the parameter to the smallest possible value.
- `DEFault`: This keyword is used to reset the parameter to its default value.
- `UP`: This keyword increments the parameter value.
- `DOWN`: This keyword decrements the parameter value.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example:

```
SENSe:FREQuency:CENTer? MAXimum
```

Returns the maximum possible numeric value of the center frequency as result.

<arbitrary block program data>

This keyword is provided for commands the parameters of which consist of a binary data block.

3.2 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.

ABORt

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

Example: `ABOR;INIT:IMM`

Mode: all

3.3 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.

3.3.1 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" in the base unit description.

CALCulate<n>:LIMit<i>:FAIL?

This command queries the result of the limit check of the limit line indicated in the selected measurement window. Note that a complete sweep must have been performed to obtain a valid result. A synchronization with *OPC, *OPC? Or *WAI should therefore be provided.

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.

Suffix:

<n> <1>
irrelevant

<i> <1..8>
The number of the limit line to access.
1: Max trace
2: Min trace

Return values:

<State> 1 | 0 | ON | OFF

1
Pass

0
Fail

Usage: Query only

Mode: GSM

3.3.2 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.

GSM mode now also supports up to 4 markers.

CALCulate<n>:MARKer<m>[:STATe] <State>

This command activates a marker in the specified window.

Suffix:

<n> <1>
irrelevant

<m> <1..4>
Marker number

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

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 Power vs Time measurement
CONFigure:BURSt:PTEMplate:IMMediate
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Switch all 4 markers on
CALCulate:MARKer1:STATe ON
CALCulate:MARKer2:STATe ON
CALCulate:MARKer3:STATe ON
CALCulate:MARKer4:STATe ON
// Assign marker 1/2/3/4 to trace 1/2/3/4
CALCulate:MARKer1:TRACe 1
CALCulate:MARKer2:TRACe 2
CALCulate:MARKer3:TRACe 3
CALCulate:MARKer4:TRACe 4
// Set marker 2 to start of active part of burst
CALCulate:MARKer:X 0
// Read y-value (level of max trace) of marker 2
CALCulate:MARKer:Y?
// Switch all markers off
CALCulate:MARKer1:AOFF
```

Mode: GSM

CALCulate<n>:MARKer<m>:AOFF

This command switches off all active markers, delta markers, and marker measurement functions in the specified window.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode
irrelevant

Example:

```
CALC:MARK:AOFF
```

Switches off all markers.

Mode: all

CALCulate<n>:MARKer<m>:TRACe <Trace>

This command assigns the selected marker to the indicated trace in the specified window. The corresponding trace must be active, i.e. its status must not be "BLANK".

If necessary, the corresponding marker is switched on prior to the assignment.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode
marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

Parameters:

<Trace> **1 to 4**
Trace number the marker is assigned to.

Example: `CALC:MARK3:TRAC 2`
Assigns marker 3 to trace 2.

Mode: all

CALCulate<n>:MARKer<m>:X <Value>

This command positions the selected marker to the indicated position. The corresponding trace must be active, i.e. its status must not be "BLANK" (see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 125).

Suffix:

<n> <1>
irrelevant

<m> <1..4>
Marker number

Parameters for setting and query:

<Value> numeric value
x-axis position of the marker
Default unit: NONE

Example: `CALC1:MARK1:X 5`

Mode: GSM

CALCulate<n>:MARKer<m>:Y?

This command returns the y-value at the position of the marker.

Suffix:

<n> <1>
irrelevant

<m> <1..4>
Marker number

Usage: Query only

Mode: GSM

CALCulate<n>:MARKer<m>:ZOOM <Value>

This command defines the ratio to be zoomed around the marker 1 in the selected measurement window. The default value is 1, where the full trace is shown.

Suffix:

<n> <1>
irrelevant

<m> <1..4>
irrelevant

Parameters for setting and query:

<Value> numeric value
Zoom factor
Range: 1 to 100
*RST: 1
Default unit: NONE

Mode: GSM

3.4 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, etc.

3.4.1 Configure[:MS] subsystem

Commands of the Configure[:MS] subsystem:

CONFigure[:MS]:ARFCn <Value>

This command specifies the Absolute Radio Frequency Channel Number (ARFCN) to be measured. Setting the ARFCN updates the frequency.

Parameters for setting and query:

<Value> numeric value

Range: 0 to 1023 (some values may not be allowed depending on the selected frequency band)

Default unit: NONE

Example: `CONF:ARFC 5`

Mode: GSM

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.

Parameters for setting and query:

<Value> ONCE

Mode: GSM

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

Parameters for setting and query:

<Value> OFF | ON | ONCE

OFF
Switch the function off

ON
Switch the function on

ONCE
Execute the function once

*RST: ON

Example: `CONF:AUTO:FRAM OFF`

Mode: GSM

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.

Parameters for setting and query:

<Value> OFF | ON | ONCE

OFF
Switch the function off

ON
Switch the function on

ONCE
Execute the function once

*RST: ON

Example: `CONF:AUTO:LEV OFF`

Mode: GSM

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.

Parameters for setting and query:

<Value> OFF | ON | ONCE

OFF
Switch the function off

ON
Switch the function on

ONCE
Execute the function once

*RST: ON

Example: `CONF:AUTO:TRIG OFF`

Mode: GSM

CONFigure[:MS]:BSEarch <State>

This command toggles between active burst search and inactive burst search.

Note

This command is retained for compatibility with R&S FS-K5 only. Use `CONFigure:MS:SYNC:MODE BURSt` or `CONFigure:MS:SYNC:MODE ALL` instead (see `CONFigure[:MS]:SYNC:MODE` on page 112).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Burst search on

OFF
Burst search off

*RST: 1

Mode: GSM

CONFigure[:MS]:BSTHreshold <Value>

This command changes the burst find threshold.

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.

Parameters for setting and query:

<Value> numeric value

Threshold for burst detection

Default unit: dB

Example: `CONF:BSTH 10 DB`

Mode: GSM

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 adjust the time for the "Power vs Time" masks of all slots. The "Slot to measure" is used as the time reference for the entire frame.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

*RST: ON

Example: `CONF:CHAN:FRAM:EQU OFF`

Mode: GSM

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

This command specifies the slot to be measured in single-slot measurements relative to the GSM frame start.

Parameters for setting and query:

<Value> numeric value

Slot to measure in single-slot measurements relative to the GSM start frame

Range: 0 to 7
*RST: 0 Slots
Default unit: NONE

Example: `CONF:CHAN:MSL:MEAS 5`

Mode: GSM

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 vs Time" and "Transient Spectrum" measurements. Between 1 and 8 consecutive slots can be measured.

Parameters for setting and query:

<Value> numeric value

Number of slots to measure.

Range: 1 to 8
*RST: 1 Slots
Default unit: NONE

Example: `CONF:CHAN:MSL:NOFS 5`

Mode: GSM

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

This command specifies the start for the measurement interval for multi-slot measurements, i.e. the "Power vs Time" and "Transient Spectrum" measurements, relative to the GSM frame boundary.

Parameters for setting and query:

<Value> numeric value

First slot to measure in multi-slot measurements relative to the GSM frame start.

Range: 0 to 7
*RST: 0 Slots
Default unit: NONE

Example: `CONF:CHAN:MSL:OFFS 5`

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>[:STATe] <State>

This command activates this slot (this means, for example, that this slot is not considered as inactive in the PvT limit evaluation).

Suffix:

<s> <0..7>
Select the slot to configure.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

*RST: Slot 0: 1; Slot 1-7: 0

Example: `CONF:CHAN:SLOT1 ON`

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:FILTer <Value>

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

Suffix:
<s> <0..7>
the slot to configure

Parameters for setting and query:
<Value> GMSK | LINearised | NARRow | WIDE

GMSK
GMSK Pulse

LINearised
Linearised GMSK Pulse

NARRow
Narrow Pulse

WIDE
Wide Pulse

*RST: GMSK

Example: `CONF:CHAN:SLOT:FILT GMSK`

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:MTYPe <Value>

This command specifies the modulation type of the specified slot.

Suffix:
<s> <0..7>
the slot to configure

Parameters for setting and query:
<Value> GMSK | QPSK | PSK8 | QAM16 | QAM32 | AQPSk

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

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, 32-ary Quadrature Amplitude Modulation, 5 bits/symbol.

AQPSk
Adaptive Quadrature Amplitude Modulation

*RST: GMSK

Example: CONF:CHAN:SLOT:MTYP GMSK

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:MULTi <Value>

This command defines the used slots of the mobile or base station. The multislot setting defines how many adjacent slots are active and which of the active slots should be used for synchronization.

For the phase-frequency error, modulation accuracy and power vs. time measurement the training sequence for the slot to synchronize must be set correctly! The reference measurement of power vs. time measurement and the questionable signal power of the main measurement is related to the slot to synchronize. In the main measurement of power vs.time, the slot to synchronize defines the synchronization point of the multislot signal on the screen. All results of the phase-frequency error and modulation accuracy measurement are related to the slot to synchronize.

In carrier power and modulation spectrum measurement the slot to synchronize is used to adjust the trigger delay so that the slot to synchronize is measured. With the slot to synchronize it is therefore possible to investigate a certain slot of multislot signals.

Note: 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.

Suffix:

<s> <0..7>
irrelevant

Parameters for setting and query:

<Value> ACT1sync1 | ACT2sync1 | ACT2sync2 | ACT3sync1 | ACT3sync2 | ACT3sync3 | ACT4sync1 | ACT4sync2 | ACT4sync3 | ACT4sync4 | ACT5sync1 | ACT5sync2 | ACT5sync3 | ACT5sync4 | ACT5sync5 | ACT6sync1 | ACT6sync2 | ACT6sync3 | ACT6sync4 | ACT6sync5 | ACT6sync6 | ACT7sync1 | ACT7sync2 | ACT7sync3 | ACT7sync4 | ACT7sync5 | ACT7sync6 | ACT7sync7 | ACT8sync1 | ACT8sync2 | ACT8sync3 | ACT8sync4 | ACT8sync5 | ACT8sync6 | ACT8sync7 | ACT8sync8

For ACT<k>sync<m> the following settings are defined:
"Slot to measure" is set to *m-1*
"No. of Slots" is set to *k*
"First Slot to measure" is set to *0*
Slots 0 to k-1 are set to active; the remaining slots are set to inactive
Slot properties of slot numbers 0 to k-1 are copied from the last active "Slot to measure".

*RST: ACT1sync1

Example: `CONF:CHAN:SLOT:MULT ACT3sync2`
Slot to measure is 1.
Number of slots is 3.
First slot to measure is 0.
Slots 0, 1, 2 are active.

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:PCL <Value>

This command is now obsolete and is retained for compatibility reasons only.

Suffix:
<s> <0..7>

Parameters for setting and query:
<Value> numeric value
PCL or Dynamic PCL of the slot.
*RST: 0
Default unit: NONE

Example: `CONF:CHAN:SLOT:PCL 5`

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC <Value>

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

This command is only available for AQPSK modulation.

Suffix:
<s> <0..7>
Number of slot to configure

<ch> <1|2>
Subchannel number

Query parameters:
<ResultType> TSC | SET
Queries the currently used TSC number or the set.

Parameters for setting and query:
<Value> 0,1 | 0,2 | 1,1 | 1,2 | 2,1 | 2,2 | 3,1 | 3,2 | 4,1 | 4,2 | 5,1 | 5,2 | 6,1 | 6,2 | 7,1 | 7,2 | USER
TSC number and Set or User TSC
Set 2 is only available for subchannel 2.
*RST: 0,1

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
// AQPSK (VAMOS) modulation
CONFigure:MS:CHANnel:SLOT0:MTYPe AQPSk
// Subchannel 1: TSC 0 (Set 1)
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC 0,1
// Subchannel 1: Query TSC number and Set number
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC?
// -> 0,1
// Subchannel 1: Query TSC number
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC? TSC
// -> 0
// Subchannel 1: Query Set number
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC? SET
// -> 1
// Subchannel 2: TSC 0 (Set 1)
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC 0,2
// Subchannel 2: Query TSC number and Set number
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC?
// -> 0,2
// Subchannel 2: Query TSC number
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC? TSC
// -> 0
// Subchannel 2: Query Set number
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC? SET
// -> 2
```

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC:USER <Value>

This command sets the bits of the user definable TSC. The number of bits must be 26. `CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC:USER` must be set first.

This command is only available for AQPSK modulation.

Suffix:

<s> <0..7>
Number of slot to configure

<ch> <1|2>
Subchannel number

Parameters for setting and query:

<Value> string
String containing the 26 user-defined bits

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
// AQPSK (VAMOS) modulation
CONFigure:MS:CHANnel:SLOT0:MTYPe AQPSk
// Subchannel 1: User TSC
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC USER
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC?
// -> USER
// Subchannel 1: Set User TSC bits
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC:USER
'10111101100110010000100001'
// Subchannel 1: Query User TSC bits
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC:
USER?
// -> 10111101100110010000100001
// Subchannel 2: User TSC
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC USER
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC?
// -> USER
// Subchannel 2: Set User TSC bits
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC:USER
'11010111111101011001110100'
// Subchannel 2: Query User TSC bits
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC:
USER?
// -> 11010111111101011001110100
```

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:TSC <Value>

This command selects the training sequence code TSC (Normal and Higher Symbol Rate Bursts) or training (synchronization) sequence TS (for Access Bursts) of the specified slot and subchannel used by the mobile or base station. See 3GPP TS 45.002, chapter 5.2 'Bursts'.

This command is not available for AQPSK modulation (use `CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC` instead).

Suffix:

<s> 0..7
Number of the slot to configure

Query parameters:

<ResultType> TSC | SET

Queries the currently used TSC number or the set.
If no query parameter is defined, only the TS or the TSC is returned.

TSC
Only the TSC or TS is returned.

SET
The set of the TSC is returned.

Parameters for setting and query:

<Value> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0,1 | 0,2 | 1,1 | 1,2 | 2,1 | 2,2 | 3,1 | 3,2 | 4,1 | 4,2 | 5,1 | 5,2 | 6,1 | 6,2 | 7,1 | 7,2 | TS0 | TS1 | TS2 | USER

training sequence for normal burst

0...7
One of the 7 pre-defined training sequence codes is used

0,1 | 0,2 | 1,1 | 1,2 | 2,1 | 2,2 | 3,1 | 3,2 | 4,1 | 4,2 | 5,1 | 5,2 | 6,1 | 6,2 | 7,1 | 7,2
TSC number and set for normal bursts

TS0 | TS1 | TS2
Training (synchronization) sequence for access bursts

USER
A user-defined training sequence is used (see `CONFigure[:MS]:CHANnel:SLOT<s>:TSC:USER` on page 96).

*RST: 0

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 (Set 1)
CONFigure:MS:CHANnel:SLOT0:TSC 3,1
// Query TSC number
// Note: For backwards compatibility only
// the TSC number is returned.
CONFigure:MS:CHANnel:SLOT0:TSC?
// -> 3
// Query TSC number
CONFigure:MS:CHANnel:SLOT0:TSC? TSC
// -> 3
// Query Set number
CONFigure:MS:CHANnel:SLOT0:TSC? SET
// -> 1
// --- 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
```

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:TSC:USER <Value>

This command sets the bits of the user definable TSC. The number of bits must be in accordance with the defined burst type and modulation (as indicated in"User TSC" on page 60). `CONFigure:MS:CHANnel:SLOT0:TSC USER` must be defined first (see `CONFigure[:MS]:CHANnel:SLOT<s>:TSC` on page 94).

Note: This command is not available for AQPSK modulation (use `CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC:USER` on page 93 instead).

Suffix:

<s> <0..7>
The slot to configure

Parameters for setting and query:

<Value> String containg the user defined bits, e.g. '10101111101010101100111100' for a GMSK normal burst.

Example:

```
// Enter the GSM option K10
INSTrument:SELect GSM
// 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 GMSK
CONFigure:MS:CHANnel:SLOT0:MTYPe GMSK
// User TSC 0 as user TSC in slot 0
CONFigure:MS:CHANnel:SLOT0:TSC USER
CONFigure:MS:CHANnel:SLOT0:TSC:USER
'00100101110000100010010111'
// Activate EVM vs Time measurement
CONFigure:BURSt:ETIMe
// Switch to split screen mode
DISPlay:FORMat SPLit
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Read the averaged EVM RMS value
FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?
// -> 0.388730555772781
```

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:TYPE <Value>

Specifies the type of the burst.

Suffix:

<s> <0..7>

Parameters for setting and query:

<Value> NB | HB | AB

NB
Normal Burst

HB
Higher Symbol Rate Burst

AB
Access Burst

*RST: NB

Example:

```
CONF:CHAN:SLOT:TYPE NB
```

Mode: GSM

CONFigure[:MS]:CHANnel:TSC <Value>

Sets the TSC of the 'Slot to measure'. Refrain from using this command in new K10 remote scripts and use pure K10 remote commands instead. Use `CONFigure[:MS]:CHANnel:SLOT<s>:TYPE` and `CONFigure[:MS]:CHANnel:SLOT<s>:TSC`

Parameters for setting and query:

<Value> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | AB0 | AB1 | AB2 | USER

0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
TSC number (Normal Burst)

AB0 | AB1 | AB2
TSC number (Access Burst)

USER
User-defined TSC number

*RST: 0

Example: `CONFigure:MS:CHANnel:TSC 0`

Mode: GSM

CONFigure[:MS]:CHANnel:TSC:USER <Value>

This command sets the bits of the user definable TSC of the "Slot to measure". The number of bits must be in accordance with the set burst type and modulation. `CONFigure:MS:CHANnel:TSC USER` needs to be set first.

Refrain from using this command in new K10 remote scripts and use pure K10 remote commands instead. Use `CONFigure:MS:CHANnel:SLOT0:TSC USER` and `CONFigure:MS:CHANnel:SLOT0:TSC:USER '10101111101010101100111100'`.

Parameters for setting and query:

<Value> string

Example:
```
CONFigure:MS:CHANnel:TSC:USER
'10101111101010101100111100'
```

Mode: GSM

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, 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.

Parameters for setting and query:

<Value> AUTO | LINear | SEQuence

Symbol decision method

AUTO
Automatically selects the symbol decision method.

LINear
Linear symbol decision: Uses inverse filtering (a kind of zero-forcing filter) and a symbol-wise decision method. This method is recommended for high symbol to noise ratios, but not for Higher Symbol Rate bursts with a narrow pulse. The inverse filter colors the noise inside the signal bandwidth and therefore is not recommended for narrow-band signals or signals with a low signal to noise ratio. Peaks in the "EVM vs Time" measurement (see chapter 2.1.4, "EVM vs Time", on page 9) 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, but with a loss of measurement speed. This method is recommended for normal bursts with 16QAM or 32QAM modulation and for Higher Symbol Rate bursts with a narrow pulse.

*RST: AUTO

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 'seqeunce 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?
```

Mode: GSM

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

The R&S FSQ/FSG-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 R&S FSQ/FSG-K10. "Tail" and "TSC" bits are specified in the "Burst" dialog box (see "Burst" on page 58). Using the "Tail & TSC Bits" setting you can select whether the detected Tail and TSC bits or the standard bits (as set in the "Burst" dialog box) are used to construct the ideal signal. Using the standard bits can be advantageous to verify whether the device under test sends the correct Tail and TSC bits. Incorrect bits would lead to peaks in the "EVM vs Time" trace (see chapter 2.1.4, "EVM vs Time", on page 9) at the positions of the incorrect bits.

Parameters for setting and query:

<Value> DETected | STD

*RST: DETected

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?
```

Mode: GSM

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

This command specifies the type of device to be measured.

Parameters for setting and query:

<Value> BTSNormal | BTSMicro | BTSPico | MSNormal | MSSMall

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

*RST: BTSNormal

Example:
```
CONF:DEV:TYPE BTSNormal
```

Mode: GSM

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

This command is retained for compatibility with R&S FSQ/FSG-K5 only. In new R&S FSQ/FSG-K10 remote scripts use the commands described in the example below instead.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

*RST: 0

Example: \\Switch on mode for multi-carrier BTS measurements
```
CONFigure:MS:MCARrier:STATe ON
```
\\ Note: With the next command, a multi-carrier pre-filter for the "Demod" measurements is also activated internally.
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
```

Mode: GSM

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

This parameter 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).

Parameters for setting and query:

<Value> numeric value

Number of active carriers

Range: 1 to 12
*RST: 1
Default unit: NONE

Example:
```
CONF:MCAR:ACTC
```

Mode: GSM

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

This command 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").

Parameters for setting and query:

<Value> 1 | 2

*RST: 1

Example:
```
CONF:MCAR:BTSClass
```

Mode: GSM

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

This command controls the filter used to reduce the measurement bandwidth for multi-carrier "Power vs Time" measurements.

For multi-carrier BTS, the PvT Filter parameter in the "Advanced" tab is ignored.

Parameters for setting and query:

<Value> MC400 | MC300

PvT filter type

MC400
Recommended for measurements with multi-channels of equal power.

MC300
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.

*RST: MC400

Example: `CONF:MCAR:FILT MC400`

Mode: GSM

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

This parameter informs the R&S FSQ/FSG-K10 that the measured signal is a multi-carrier signal. This function is only available if the "Device Type" is a "BTS" type (see `CONFigure[:MS]:DEVice:TYPE` on page 101). If active, a special multi-carrier filter is switched into the demodulation path and further multi-carrier-specific parameters become available.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
The measured signal is a multi-carrier signal.

OFF
The measured signal is a single-carrier signal.

*RST: OFF

Example: `CONF:MCAR:MCBT ON`

Mode: GSM

CONFigure[:MS]:MTYPe <Value>

This command sets the modulation type of all slots.

Note: This command is retained for compatibility with R&S FS-K5 only.

Parameters for setting and query:

<Value> GMSK | EDGE

Modulation type

*RST: GMSK

Example:

```
// Enter the GSM option K10
INSTrument:SELect GSM
// Old FS-K5 commands
CONFigure:MS:MTYPe EDGE
// Please use the following K10 commands instead
// K5: 'GMSK' -> K10: 'GMSK'
// K5: 'EDGE' -> K10: 'PSK8'
CONFigure:MS:CHANnel:SLOT0:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT1:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT2:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT3:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT4:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT5:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT6:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT7:MTYPe PSK8
// Old FS-K5 commands
CONFigure:MS:CHANnel:SLOT1:MTYPe GMSK
CONFigure:MS:CHANnel:SLOT1:MTYPe?
// -> GMSK
// Please use the following K10 commands instead
CONFigure:MS:CHANnel:MSLots:MEASure?
// -> 0 This is the slot number of the 'slot to measure'
// Set and query the modulation of the 'slot to measure'
CONFigure:MS:CHANnel:SLOT0:MTYPe GMSK
CONFigure:MS:CHANnel:SLOT0:MTYPe?
// -> GMSK
```

Mode: GSM

CONFigure[:MS]:MULTi:BURSt:CONStell <State>

Use this command to always include / exclude the calculation of the results of the "Constellation" measurement when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe`).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate "Constellation" results.

OFF
Do not calculate "Constellation" results.

*RST: 1

Mode: GSM

CONFigure[:MS]:MULTi:BURSt:DEModulation <State>

Use this command to always include / exclude the calculation of the results of the Modulation Accuracy, EVM vs Time, Phase Error vs Time and Magnitude Error vs Time measurements when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe`).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate Modulation Accuracy, EVM vs Time, Phase Error vs Time and Magnitude Error vs Time results.

OFF
Do not calculate Modulation Accuracy, EVM vs Time, Phase Error vs Time and Magnitude Error vs Time results.

*RST: 1

Mode: GSM

CONFigure[:MS]:MULTi:BURSt:PTEMplate <State>

Use this command to always include / exclude the calculation of the (graph and list) results of the "Power vs Time" measurement when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe`).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate Power vs Time (list and graph) results.

OFF
Do not calculate Power vs Time (list and graph) results.

*RST: 1

Mode: GSM

CONFigure[:MS]:MULTi:SPECtrum:MODulation <State>

Use this command to always include / exclude the calculation of the results of the "Modulation Spectrum" measurement when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe` on page 106).

Note: When activated, list results are returned. To obtain graphical results, use `CONFigure:SPECtrum:SELect FREQdomain`, see `CONFigure:SPECtrum:SELect` on page 119.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate "Modulation Spectrum" results.

OFF
Do not calculate "Modulation Spectrum" results.

*RST: 1

Example: `CONFigure:MS:MULTi:SPECtrum:MODulation ON`

Mode: GSM

CONFigure[:MS]:MULTi:SPECtrum:SWITching <State>

Use this command to always include / exclude the calculation of the results of the "Transient Spectrum" measurement when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe`).

Note: When activated, list results are returned. To obtain graphical results, use `CONFigure:SPECtrum:SELect FREQdomain`, see `CONFigure:SPECtrum:SELect` on page 119.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate Transient Spectrum results.

OFF
Do not calculate Transient Spectrum results.

*RST: 1

Mode: GSM

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

This command activates the multiple measurement mode. Multiple measurement mode means that several measurement results can be calculated on the same I/Q data capture in parallel. If it is known in advance which measurement results are required, then use the multiple measurement mode to reduce total measurement time. When active, only the results of the selected measurements are available. Measurements that are not selected are not available.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

*RST: 0

Example:

```
// Multiple measurement mode example for a 16QAM signal
// 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 center frequency to 935 MHz
SENSe1:FREQuency:CENTer 935MHz
// Multiple measurement mode example for a 16QAM signal
// Configure for a 16QAM signal
CONFigure:MS:CHANnel:SLOT0 ON
CONFigure:MS:CHANnel:SLOT0:TYPE NB
CONFigure:MS:CHANnel:SLOT0:MTYPe QAM16
CONFigure:MS:CHANnel:SLOT0:FILTer LINearised
CONFigure:MS:CHANnel:SLOT1 OFF
CONFigure:MS:CHANnel:SLOT2 OFF
CONFigure:MS:CHANnel:SLOT3 OFF
CONFigure:MS:CHANnel:SLOT4 OFF
CONFigure:MS:CHANnel:SLOT5 OFF
CONFigure:MS:CHANnel:SLOT6 OFF
CONFigure:MS:CHANnel:SLOT7 OFF
// Set the statistic count
SENSe1:SWEep:COUNt 200
// Activate the multi meas mode
CONFigure:MS:MULTi:STATe 1
// Select all required measurements
CONFigure:MS:MULTi:BURSt:DEModulation 1
CONFigure:MS:MULTi:SPECtrum:MODulation 1
CONFigure:MS:MULTi:BURSt:PTEMplate 1
CONFigure:MS:MULTi:SPECtrum:SWITching 1
// Turn off the display while the measurement is running
SYST:DISP:UPD OFF
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Turn on the display to view results
SYST:DISP:UPD ON
```

Mode: GSM

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

This command works in conjunction with the CONFigure[:MS]:NETWork:FREQuency:BAND 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.

Parameters for setting and query:

<Value> PGSM | EGSM | DCS | PCS | TGSM | RGSM | GSM

PGSM
Primary GSM

EGSM
Extended GSM

DCS
DCS

PCS
PCS

TGSM
T-GSM

RGSM
Railway GSM

GSM
GSM

*RST: EGSM

Example: `CONF:NETW PGSM`

Mode: GSM

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.

Parameters for setting and query:

<Value> 380 | 410 | 450 | 480 | 710 | 750 | 810 | 850 | 900 | 1800 | 1900

380
380 MHz band – valid for TGSM

410
410 MHz band – valid for TGSM

450
450 MHz band – valid for GSM

480
480 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 TGSM

850
850 MHz band – valid for GSM

900
900 MHz band – valid for PGSM, EGSM, RGSM and TGSM

1800
1800 MHz band – valid for DCS

1900
1900 MHz band – valid for PCS

*RST: 900

Example: `CONF:NETW:FREQ 380`

Mode: GSM

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

This command the power class of the device under test.

Parameters for setting and query:

<Value> 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | E1 | E2 | E3 | M1 | M2 | M3 | P1

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)

*RST: 2

Example: `CONF:POW:CLAS 1`

Mode: GSM

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

This command is now obsolete and is retained for compatibility reasons only.

Parameters for setting and query:

<Value> numeric value

BTS static power step / power control level.

Default unit: NONE

Example: CONF:POW:STAT 5

Mode: GSM

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

This command is used to switch on or off automatic power level detection. When switched on, power level detection is performed at the start of each measurement sweep. Using the ONCE argument starts the auto level measurement immediately.

Parameters for setting and query:

<Value> OFF | ON | ONCE

OFF
Switch the function off

ON
Switch the function on

ONCE
Execute the function once

*RST: ON

Example: CONF:POW:AUTO OFF

Mode: GSM

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

This command is used to specify the auto track time, i.e. the sweep time for auto level measurements or swept measurements and the capture time for auto detection.

Parameters for setting and query:

<Value> numeric value

Auto level measurement sweep time

Range: 0.01 to 1
*RST: 0.1 s
Default unit: S

Example: CONF:POW:AUTO:SWE:TIME 0.01 MS

Mode: GSM

CONFigure[:MS]:PRATe <Value>

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

Parameters for setting and query:

<Value> numeric value

*RST: 4
Default unit: NONE

Mode: GSM

CONFigure[:MS]:RESTore

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

Mode: GSM

CONFigure[:MS]:SSEarch <State>

This command is retained for compatibility with R&S FSQ/FSG-K5 only. In new K10 remote scripts use `CONFigure:MS:SYNC:MODE TSC` or `CONFigure:MS:SYNC:MODE ALL` instead (see `CONFigure[:MS]:SYNC:MODE` on page 112).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
TSC search on

OFF
TSC search off

*RST: 1

Example: `CONF:SSE ON`

Mode: GSM

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 (see `CONFigure[:MS]:SYNC:ONLY` on page 113). 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.

Parameters for setting and query:

<Value> numeric value

IQ Correlation Threshold

Range: 0 to 100
*RST: 85
Default unit: NONE

Example: `CONF:SYNC:IQCT 0`

Mode: GSM

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

This command sets the synchronization mode of the R&S FSQ/FSG-K10.

Parameters for setting and query:

<Value> ALL | TSC | BURSt | NONE

ALL
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. "ALL" is usually 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 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.
Tip: Manually adjust the trigger offset to move the burst to be analyzed under the mask in the "Power vs Time" measurement.
Note: For "None" no demodulation measurements (e.g. "Modulation Accuracy") are supported. Only "Power vs Time", "Modulation Spectrum", "Transient Spectrum" measurements are supported.

*RST: ALL

Example: `CONF:SYNC:MODE TSC`

Mode: GSM

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

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 function depends on the value of the"Synchronization" parameter (see `CONFigure[:MS]:SYNC:MODE` on page 112).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

1 | ON
measure only on sync

0 | OFF
always measure even if sync not found

*RST: OFF

Example: CONF:SYNC:MODE TSC
Search the capture buffer for the TSC of the "Slot to measure" as given in the frame configuration.
CONF:SYNC:ONLY ON
Only if the TSC is found, the results are displayed.

Mode: GSM

3.4.2 CONFigure:BURSt subsystem

Commands of the Configure:BURSt subsystem:

CONFigure:BURSt:CONStell[:IMMediate]

This command selects the constellation measurement.

Example: CONF:BURS:CONS

Usage: Setting only

Mode: GSM

CONFigure:BURSt:ETIMe[:IMMediate]

This command selects measurement of the EVM Vs time.

Example: CONF:BURS:ETIM

Usage: Setting only

Mode: GSM

CONFigure:BURSt:MACCuracy[:IMMediate]

This command selects measurement of the modulation accuracy.

Example: CONF:BURS:MACC

Usage: Setting only

Mode: GSM

CONFigure:BURSt:MERRor[:IMMediate]

This command selects measurement of the "Magnitude Error vs Time" (see chapter 2.1.5, "Magnitude Error vs Time", on page 10).

Example: `CONF:BURS:MERR`

Usage: Setting only

Mode: GSM

CONFigure:BURSt:PFERror[:IMMediate]

This command selects measurement of the "Phase Error vs Time" (see chapter 2.1.3, "Phase Error vs Time", on page 8).

Example: `CONF:BURS:PFER`

Usage: Setting only

Mode: GSM

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.

Example: `CONF:BURS:PTEM`

Usage: Setting only

Mode: GSM

CONFigure:BURSt:PTEMplate:FILTer <Value>

The PvT Filter controls the filter used to reduce 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 (see "Multi Carrier BTS" on page 67). Therefore the "PvT Filter" parameter in the "Multi Carrier" tab is ignored in the single carrier case.

Parameters for setting and query:

<Value> G1000 | G500 | B600

B600
Default Lowpass, 600 kHz

G500
Gaussian Filter, 500 kHz

G1000
Gaussian Filter, 1000 kHz

*RST: G1000

Example: CONF:BURS:PTEM:FILT G500

Mode: GSM

CONFigure:BURSt:PTEMplate:FRZoom <Value>

This command is retained for compatibility with R&S FSQ/FSG-K5 only. Use the "Measurement Slot" selection to zoom the corresponding area.

Parameters for setting and query:

<Value> numeric value

*RST: 1
Default unit: NONE

Example: CONF:BURS:PTEM:FRZ 5

Mode: GSM

CONFigure:BURSt:PTEMplate:SELect <Value>

Parameters for setting and query:

<Value> FULL | RISing | FALLing | TOP | FRISing

FULL
Full burst; all bursts in the slot scope are displayed

RISing
Rising edges only (the rest of the bursts are removed)

FALLing
Falling edges only (the rest of the bursts are removed)

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)

*RST: FULL

Example: CONF:BURS:PTEM:SEL FULL

Mode: GSM

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" on page 62).

Parameters for setting and query:

<Mode> STMeasure | PSLot

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.

*RST: STMeasure

Example: `CONF:BURS:PTEM:TAL PSL`

Mode: GSM

CONFigure:BURSt:PTEMplate:TMHRes <State>

This command is retained for compatibility with R&S FSQ/FSG-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.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

*RST: ON

Example: `CONF:BURS:PTEM:TMHR`

Mode: GSM

3.4.3 CONFigure:SPEC subsystem

Commands of the Configure:SPEC subsystem:

CONFigure:SPECtrum:LIMit:LEFT <State>

This command 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 command affects the "Modulation Spectrum" and "Transient Spectrum" measurements.

Note: For measurements on multi-carrier signals, use either the check on the left or right side to measure the spectrum of the left- or right-most channel and to ignore the side where adjacent channels are located.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
check limit

OFF
do not check limit

*RST: 1

Example: `CONF:SPEC:LIM:LEFT OFF`

Mode: GSM

CONFigure:SPECtrum:LIMit:RIGHt <State>

This command 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 command affects the "Modulation Spectrum" and "Transient Spectrum" measurements.

Note: For measurements on multi-carrier signals, use either the check on the left or right side to measure the spectrum of the left- or right-most channel and to ignore the side where adjacent channels are located.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
check limit

OFF
do not check limit

*RST: 1

Example: `CONF:SPEC:LIM:LEFT OFF`

Mode: GSM

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]` on page 121).

Example: `CONF:SPEC:MOD`

Usage: Setting only

Mode: GSM

CONFigure:SPECtrum:MODulation:LIMIT <Mode>

This command selects whether the list results (power and limit values) of the "Modulation Spectrum" measurement are returned in a relative (dB) or absolute (dBm) unit. This command is only available when the "Modulation Spectrum" measurement is selected (see `CONFigure:SPECtrum:MODulation[:IMMediate]` on page 118.

Parameters for setting and query:

<Mode> ABSolute | RELative

*RST: RELative

Example:

```
// Select Modulation Spectrum measurement
// (measurement on captured I/Q data)
CONFigure:SPECtrum:MODulation:IMMediate
// Only list results are required
CONFigure:SPECtrum:SELect LIST
// Absolute power and limit results in dBm
CONFigure:SPECtrum:MODulation:LIMit ABSolute
// Run one measurement and query absolute list results
READ:SPECtrum:MODulation:ALL?
// -> 0,933200000,933200000,-108.66,-65.00,ABS,PASSED, ...
```

Mode: GSM

CONFigure:SPECtrum:SELect <Mode>

This command selects how the modulation and transient spectrum measurement is performed and displayed.

Parameters for setting and query:

<Mode> LIST | FREQdomain

LIST
Spectrum results are measured at several frequency offsets from the center frequency. The results are displayed in a table.

FREQdomain
A spectrum trace is measured and displayed as a graph.

*RST: FREQdomain

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
// Modulation spectrum graph measurement
CONFigure:SPECtrum:MODulation:IMMediate
// --- Graph example ---
// Graph (frequency domain) and List results are required
CONFigure:SPECtrum:SELect FREQdomain
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Fetch graph results, i.e. average trace (trace 1)
TRACe1:DATA? TRACe1
// Fetch list results (table)
FETCh:SPECtrum:MODulation:ALL?
// --- List example ---
// Only list results are required ---
CONFigure:SPECtrum:SELect LIST
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Fetch list results (table)
FETCh:SPECtrum:MODulation:ALL?
```

Mode: GSM

CONFigure:SPECtrum:SWITching[:IMMediate]

This command selects measurement of the spectrum due to switching transients (TRA).

Example:
```
CONF:SPEC:SWIT
```

Usage: Setting only

Mode: GSM

CONFigure:SPECtrum:SWITching:LIMIT <Mode>

This command selects whether the list results (power and limit values) of the "Transient Spectrum" measurement are returned in a relative (dB) or absolute (dBm) unit. This command is only available when the "Transient Spectrum" measurement is selected (see `CONFigure:SPECtrum:SWITching[:IMMediate]` on page 120).

Parameters for setting and query:

<Mode> ABSolute | RELative

*RST: RELative

Example:
```
// Select Transient Spectrum measurement
// (measurement on captured I/Q data)
CONFigure:SPECtrum:SWITching:IMMediate
// Only list results are required
CONFigure:SPECtrum:SELect LIST
// Absolute power and limit results in dBm
CONFigure:SPECtrum:SWITching:LIMit ABSolute
// Run one measurement and query absolute list results
READ:SPECtrum:SWITching:ALL?
// -> 0,933200000,933200000,-101.55,-36.00,ABS,PASSED, ...
```

Mode: GSM

CONFigure:SPECtrum:SWITching:TYPE <DetectorMode>

This command is retained for compatibility with R&S FSQ/FSG-K5 only.

Parameters for setting and query:

<DetectorMode> PEAK | RMS

*RST: RMS

Example:
```
CONFigure:SPECtrum:SWITching:TYPE?
```

Mode: GSM

3.4.4 Other Commands in the CONF Subsystem

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 R&S FSQ/FSG-K10 (see "Trigger Mode" on page 52 and "Trigger" on page 69).

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?
```

Usage: Setting only

Mode: GSM

CONFigure:WSPectrum:SWITching[:IMMediate]

This command selects the measurement of the wide spectrum due to switching (WTRA). The wide transient spectrum measurement uses a series of zero span mode measurements and can measure offset frequencies up to 1.8 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 R&S FSQ/FSG-K10 (see "Trigger Mode" on page 52 and "Trigger" on page 69).

Usage: Setting only

Mode: GSM

CONFigure:WSPectrum:SWITching:LIMIT <Mode>

This command selects whether the list results (power and limit values) of the "Wide Transient Spectrum" measurement are returned in a relative (dB) or absolute (dBm) unit. This command is only available when the "Wide Transient Spectrum" measurement is selected (see `CONFigure:WSPectrum:SWITching[:IMMediate]` on page 123).

Parameters for setting and query:

<Mode> ABSolute | RELative

*RST: RELative

Mode: GSM

3.5 DISPlay Subsystem

The DISPLay subsystem controls the selection and presentation of textual and graphic information as well as of measurement data on the display.

DISPlay:FORMat <Format>

This command switches the measurement result display between FULL SCREEN and SPLIT SCREEN.

Parameters:

<Format> SINGle | SPLit

SPLit
Show 2 or more screens on the display

SINGle
Show only 1 screen on the display

*RST: SPL

Example:
```
DISP:FORM SING
```

Mode: all

DISPlay[:WINDow<n>]:SELect

This command selects whether screen A or screen B is active.

Suffix:

<n> <1|2>
Screen number. 1 = screen A, 2 = screen B.

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
```

Usage: Setting only

Mode: GSM

DISPlay[:WINDow<n>]:SSELect

This command selects whether screen A or screen B is active. WINDow1 corresponds to SCREEN A, WINDow2 to SCREEN B.

Suffix:

<n> <1>

Example: DISP:SSEL

Usage: Setting only

Mode: GSM

DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command controls whether a trace is displayed or not, and in which mode. Each trace can only display a certain mode, or nothing at all ("Blank"). The table below indicates which measurements can display which traces and which trace modes.

Note: even if a trace is not displayed, the results can still be queried (see TRACe[:DATA] on page 207).

Suffix:

<n> <1|2>
Screen number. 1 = screen A, 2 = screen B.

<t> <1..4>
Trace number

Parameters for setting and query:

<Mode> AVERage | MAXHold | MINHold | WRITe | PDFavg | BLANk

For a description of the trace modes see the "Trace Mode Overview" section in the base unit manual.

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
// Modulation spectrum graph measurement
CONFigure:SPECtrum:MODulation:IMMediate
CONFigure:SPECtrum:SELect FREQdomain
INITiate:IMMediate
// Switch off the display of all available traces
DISPlay:WINDow1:TRACe1:MODE BLANk
DISPlay:WINDow1:TRACe4:MODE BLANk
// Switch on the display of all available traces again
DISPlay:WINDow1:TRACe1:MODE AVERage
DISPlay:WINDow1:TRACe4:MODE WRITe
```

Mode: GSM

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet <Value>

This command 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.

This command is not available for signals from the Digital Baseband Interface (R&S FSQ/FSG-B17).

Suffix:

<n> <1|2>
irrelevant

<t> <1..4>
irrelevant

Parameters for setting and query:

<Value> numeric value

External attenuation (positive) or gain (negative).

*RST: 0 dB
Default unit: dB

Example: `DISP:TRAC:Y:SCAL:RLEV:OFFS 10 DB`

Mode: GSM

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel[:RF] <Value>

This command can be used to retrieve or set the current internal instrument reference level for RF input used when performing measurements.

Suffix:

<n> <1|2>
irrelevant

<t> <1..4>
irrelevant

Parameters for setting and query:

<Value> numeric value

Reference level of RF input.

*RST: -20 dBm
Default unit: dBm

Example: `DISP:TRAC:Y:SCAL:RLEV -20 DBM`

Mode: GSM

3.6 FETCh Subsystem

The FETCh Subsystem contains commands for reading out results of complex measurement tasks.

The following subsystems are included:

3.6.1 FETCh:BURSt subsystem

FETCh:BURSt[:MACCuracy]:ADRoop:AVERage?

This command reads out the average measurement of the Amplitude Droop taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Average value
Default unit: dB

Example: `FETC:BURS:ADR:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:ADRoop:CURRent?

This command reads out the currently measured value of the Amplitude Droop taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: `FETC:BURS:ADR:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:ADRoop:MAXimum?

This command reads out the maximum measurement of the Amplitude Droop taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `FETC:BURS:ADR:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:ADRoop:SDEViation?

This command reads out the standard deviation measurement of the Amplitude Droop taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `FETC:BURS:ADR:SDEV?`

Usage: Query only

Mode: GSM

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.

When the measurement is started, the analyzer is automatically set to single sweep.

Further results of the measurement can be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> <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

Example: `FETC:BURS:ALL?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:BPOWer:AVERage?

This command reads out the average measurement of the Burst Power taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Average value
Default unit: dB

Example: `FETC:BURS:BPOW:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:BPOWer:CURRent?

This command reads out the currently measured value of the Burst Power taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: `FETC:BURS:BPOW:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:BPOWer:MAXimum?

This command reads out the maximum measurement of the Burst Power taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `FETC:BURS:BPOW:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:BPOWer:SDEViation?

This command reads out the standard deviation measurement of the Burst Power taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `FETC:BURS:BPOW:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average value
Default unit: NONE

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?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:CURRent?

This command reads out the current peak value of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured peak
Default unit: NONE

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?
```

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value

Maximum

Default unit: NONE

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?
```

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

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?
```

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average value
Default unit: NONE

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?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:RMS:CURRent?

This command reads out the current RMS value of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value

Currently measured value

Default unit: NONE

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?
```

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value

Maximum

Default unit: NONE

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?
```

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value

Standard deviation

Default unit: NONE

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?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FERRor:AVERage?

This command reads out the average measurement of the Frequency Error taken over the selected number of bursts.

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.

Return values:

<Result> numeric value

Average value

Default unit: Hz

Example:

```
FETC:BURS:FERR:AVER?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FERRor:CURRent?

This command reads out the currently measured value of the Frequency Error taken over the selected number of bursts.

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.

Return values:

<Result> numeric value
Currently measured value
Default unit: Hz

Example: `FETC:BURS:FERR:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FERRor:MAXimum?

This command reads out the maximum measurement of the Frequency Error taken over the selected number of bursts.

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.

Return values:

<Result> numeric value
Maximum
Default unit: Hz

Example: `FETC:BURS:FERR:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FERRor:SDEViation?

This command reads out the standard deviation measurement of the Frequency Error taken over the selected number of bursts.

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: Hz

Example: FETC:BURS:FERR:SDEV?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FREQuency:AVERage?

This command reads out the average measurement of the Frequency Error taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Average value
Default unit: Hz

Example: FETC:BURS:FREQ:AVER?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FREQuency:CURRent?

This command reads out the currently measured value of the Frequency Error taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Currently measured value
Default unit: Hz

Example: FETC:BURS:FREQ:CURR?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FREQuency:MAXimum?

This command reads out the maximum measurement of the Frequency Error taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Maximum
Default unit: Hz

Example: FETC:BURS:FREQ:MAX?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FREQuency:SDEViation?

This command reads out the standard deviation measurement of the Frequency Error taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Standard deviation
Default unit: Hz

Example: `FETC:BURS:FREQ:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQIMbalance:AVERage?

This command reads out the average measurement of the IQ Imbalance taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: `FETC:BURS:IQIM:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQIMbalance:CURRent?

This command reads out the currently measured value of the IQ Imbalance taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `FETC:BURS:IQIM:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQIMbalance:MAXimum?

This command reads out the maximum measurement of the IQ Imbalance taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `FETC:BURS:IQIM:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQIMbalance:SDEViation?

This command reads out the standard deviation measurement of the IQ Imbalance taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `FETC:BURS:IQIM:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQOFfset:AVERage?

This command reads out the average measurement of the IQ Offset taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: `FETC:BURS:IQOF:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQOFfset:CURRent?

This command reads out the currently measured value of the IQ Offset taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: FETC:BURS:IQOF:CURR?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQOFfset:MAXimum?

This command reads out the maximum measurement of the IQ Offset taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: FETC:BURS:IQOF:MAX?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQOFfset:SDEViation?

This command reads out the standard deviation measurement of the IQ Offset taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: FETC:BURS:IQOF:SDEV?

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: FETC:BURS:MERR:PEAK:AVER?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:CURRent?

This command reads out the currently measured peak value of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured peak value
Default unit: NONE

Example: `FETC:BURS:MERR:PEAK:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `FETC:BURS:MERR:PEAK:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `FETC:BURS:MERR:PEAK:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: `FETC:BURS:MERR:RMS:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:RMS:CURRent?

This command reads out the currentl ymeasured RMS value of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `FETC:BURS:MERR:RMS:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `FETC:BURS:MERR:RMS:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: FETC:BURS:MERR:RMS:SDEV?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:OSUPpress:AVERage?

This command reads out the average measurement of the IQ Offset Suppression taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Average value
Default unit: dB

Example: FETC:BURS:OSUP:AVER?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:OSUPpress:CURRent?

This command reads out the currently measured value of the IQ Offset Suppression taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: FETC:BURS:OSUP:CURR?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:OSUPpress:MAXimum?

This command reads out the maximum measurement of the IQ Offset Suppression taken over the selected number of bursts (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: FETC:BURS:OSUP:MAX?

Usage: Query only

Mode: GSM

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 (see "Statistic Count" on page 53).

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `FETC:BURS:OSUP:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Default unit: NONE

Example: `FETC:BURS:PERC:EVM?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERCentile:MERRor?

This command reads out the 95 % percentile of the Magnitude Error measurement taken over the selected number of bursts.

Return values:

<Result> numeric value
Default unit: NONE

Example: `FETC:BURS:PERC:MERR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERCentile:PERRor?

This command reads out the 95 % percentile of the Phase Error measurement taken over the selected number of bursts.

Return values:

<Result> numeric value
Default unit: NONE

Example: FETC:BURS:PERC:PERR?

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: FETC:BURS:PERR:PEAK:AVER?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:CURRent?

This command reads out the current peak value of the Phase Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured peak
Default unit: NONE

Example: FETC:BURS:PERR:PEAK:CURR?

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: FETC:BURS:PERR:PEAK:MAX?

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `FETC:BURS:PERR:PEAK:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: `FETC:BURS:PERR:RMS:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:RMS:CURRent?

This command reads out the currently measured RMS value of the Phase Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `FETC:BURS:PERR:RMS:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `FETC:BURS:PERR:RMS:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `FETC:BURS:PERR:RMS:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:ALL:AVERage?

This command reads out the average power for the selected slot for all measured bursts.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<s> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value
Average value
Default unit: dBm

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 single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:ALL:AVERage?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:ALL:CRESt?

This command reads out the crest factor for the selected slot for all measured bursts.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<s> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value
Crest factor
Default unit: dB

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 single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:ALL:CRESt?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:ALL:MAXimum?

This command reads out the maximum power for the selected slot for all measured bursts.

This command is only available if "Power vs Time" measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate] on page 115).

Suffix:

<s> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value

Maximum

Default unit: dBm

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 single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:ALL:MAXimum?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:CURRent:AVERage?

This command reads out the average power for the selected slot for the current burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<s> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value

Average power

Default unit: dBm

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 single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:CURRent:AVERage?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:CURRent:CRESt?

This command reads out the crest factor for the selected slot for the current burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<s> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value
Crest factor
Default unit: dB

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 single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:CURRent:CRESt?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:CURRent:MAXimum?

This command reads out the maximum power for the selected slot for the current burst.

This command is only available if "Power vs Time" measurement is selected and if the slot is part of the selected slot scope (see chapter 2.2.7, "Defining the Scope of the Measurement", on page 33).

Suffix:

<s> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value

Maximum

Default unit: dBm

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 single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:CURRent:MAXimum?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:DELTatosync?

This command reads out the "Delta to Sync" value for the selected slot (see chapter 2.1.7, "Power vs Time", on page 12). This command is only available when the "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<s> <0..7>
Slot number to measure power on. The selected slot must be within the slot scope, i.e.
(First slot to measure) ≦ <slot> ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Default unit: dBm

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 single sweep
\\ Note: "FETCh" only reads the results without starting a new single sweep.
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT1:DELTatosync?
```

Usage: Query only

Mode: GSM

3.6.2 FETCh:SPECtrum subsystem

FETCh:SPECtrum:MODulation[:ALL]?

This command returns the measured modulation spectrum of the mobile or base station. This command is only available when "Modulation Spectrum" measurement is selected (see `CONFigure:SPECtrum:MODulation[:IMMediate]` on page 118).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm (depending on `CONFigure:SPECtrum:MODulation:LIMIT`).

<Limit> Limit at the offset frequency in dB or dBm (depending on `CONFigure:SPECtrum:MODulation:LIMIT`).

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned (depending on `CONFigure:SPECtrum:MODulation:LIMIT`).

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example:
```
FETC:SPEC:MOD?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,
...
```

Usage: Query only

Mode: GSM

FETCh:SPECtrum:MODulation:REFerence?

This command returns the measured reference power of the "Modulation Spectrum". This command is only available when the "Modulation Spectrum" measurement is selected (see `CONFigure:SPECtrum:MODulation[:IMMediate]` on page 118).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example:
```
FETCh:SPECtrum:MODulation:REFerence?
```

Usage: Query only

Mode: GSM

FETCh:SPECtrum:SWITching[:ALL]?

This command reads out the result of the measurement of the transient spectrum of the mobile or base station. This command is only available when the "Transient Spectrum" measurement is selected (see `CONFigure:SPECtrum:SWITching[:IMMediate]` on page 120).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm
For more information see CONFigure:SPECtrum:SWITching:LIMIT).

<Limit> Limit at the offset frequency in dB or dBm.
For more information see CONFigure:SPECtrum:SWITching:LIMIT).

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned.
For more information see CONFigure:SPECtrum:SWITching:LIMIT).

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example:
```
FETC:SPEC:SWIT?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,
```

Usage: Query only

Mode: GSM

FETCh:SPECtrum:SWITching:REFerence?

This command returns the measured reference power of the "Transient Spectrum". This command is only available when the "Transient Spectrum" measurement is selected (see CONFigure:SPECtrum:SWITching[:IMMediate] on page 120).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example:
```
FETCh:SPECtrum:SWITching:REFerence?
```

Usage: Query only

Mode: GSM

3.6.3 FETCh:WSPEctrum subsystem

FETCh:WSPectrum:MODulation[:ALL]?

This command reads out the result of the "Wide Modulation Spectrum" measurement of the mobile or base station. This command is only available if the modulation spectrum measurement is selected (see `CONFigure:WSPectrum:MODulation[:IMMediate]`.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm.

<Limit> Limit at the offset frequency in dB or dBm.

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned.

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example: `FETCh:WSPectrum:MODulation:ALL?`

Usage: Query only

Mode: GSM

FETCh:WSPectrum:MODulation:REFerence?

This command returns the measured reference power of the "Wide Modulation Spectrum". This command is only available when the "Wide Modulation Spectrum" measurement is selected (see `CONFigure:WSPectrum:MODulation[:IMMediate]` on page 121).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example: `FETCh:WSPectrum:MODulation:REFerence?`

Usage: Query only

Mode: GSM

3.7 INITiate Subsystem

The INITiate subsystem is used to start and stop a measurement.

Commands of the INITiate subsystem:

INITiate<n>[:IMMediate]

The command initiates a new measurement sequence.

With sweep count > 0 or average count > 0, this means a restart of the indicated number of measurements. With trace functions MAXHold, MINHold and AVERage, the previous results are reset on restarting the measurement.

In single sweep mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous sweep mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous sweep mode in remote control, as results like trace data or markers are only valid after a single sweep end synchronization.

Suffix:
<n> irrelevant

Example:
`INIT:CONT OFF`
Switches to single sweep mode.
`DISP:WIND:TRAC:MODE AVER`
Switches on trace averaging.
`SWE:COUN 20`
Setting the sweep counter to 20 sweeps.
`INIT;*WAI`
Starts the measurement and waits for the end of the 20 sweeps.

Mode: all

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

In R&S FSQ/FSG-K10, the measurement is not started by this command, `INITiate:IMMediate` has to be used to start a measurement.

Suffix:
<n> irrelevant

Parameters:
<State> ON | OFF
*RST: ON

Example:
```
INIT:CONT OFF
```
Switches the sequence to single sweep.
```
INIT:CONT ON
```
Switches the sequence to continuous sweep.
```
INIT:IMM
```
Starts a new measurement in continuous sweep mode.

Mode: all

INITiate:REFMeas[:IMMediate]

Repeats the evaluation of the data currently in the capture buffer without capturing new data. This is useful after changing settings, for example the Statistic Count. Averaging is performed according to the "Statistic Count" and automatically stops when the defined "Statistic Count" or the end of the captured data is reached.

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
// Set capture time to 1 s
SENSe1:SWEep:TIME 1 S
// Activate power vs time measurement
CONFigure:BURSt:PTEMplate:IMMediate
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_1.iqw'
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_2.iqw'
// Now we want to analyze the first capture again
// Import I/Q data from file
MMEMory:LOAD:IQ:STATe 1,'C:\gsm_1.iqw'
// Instead of 1 slots 8 slots should be analyzed
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
// Refresh to apply the changed setting
INITiate:REFMeas:IMMediate
```

Usage: Event

Mode: GSM

3.8 INPut Subsystem

The INPut subsystem controls the input characteristics of the RF inputs of the instrument.

INPut:ATTenuation <Value>

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 DOWN command.

The attenuation can be set in 5 dB steps (with option R&S FSQ/FSG-B25: 1 dB steps). If the defined reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

In the default state with "Spectrum" mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

This function is not available if the R&S Digital I/Q Interface (R&S FSQ/FSG-B17) is active.

Parameters:

<Value> *RST: 10 dB (AUTO is set to ON)

Example: `INP:ATT 30dB`
Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

Mode: all

INPut:ATTenuation:AUTO <State>

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF).

This function is not available if the R&S Digital I/Q Interface (R&S FSQ/FSG-B17) is active.

Parameters:

<State> ON | OFF

*RST: ON

Example: `INP:ATT:AUTO ON`
Couples the attenuation set on the attenuator to the reference level.

Mode: All

INPut:DIQ:RANGe[:UPPer] <Level>

Defines or queries the "Full Scale Level", i.e. the level that should correspond to an I/Q sample with the magnitude "1".

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSQ/FSG-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSQ/FSG-B17) description of the base unit.

Parameters:

<Level> <numeric value>

Range: 1E-06 V to 7.071 V
*RST: 1 V

Example: `INP:DIQ:RANG 1V`

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

INPut:EATT <Attenuation>

Requires option R&S FSQ/FSG-B25.

Switches the electronic attenuator on (if not already active) and allows the attenuation of the electronic attenuator to be set.

This command is only available with option R&S FSQ/FSG-B25, but not if R&S FSQ/FSG-B17 is active.

The attenuation can be varied in 1 dB steps from 0 to 25 dB. Other entries are rounded to the next lower integer value.

If the defined reference level cannot be set for the given RF attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is output.

Parameters:

<Attenuation> 0...25

*RST: 0 dB (OFF)

Example: `INP1:EATT 10 dB`

Mode: all

INPut:EATT:AUTO <State>

Switches the automatic behaviour of the electronic attenuator on or off. If activated, electronic attenuation is used to reduce the operation of the mechanical attenuation whenever possible.

This command is only available with option R&S FSQ/FSG-B25, but not if R&S FSQ/FSG-B17 is active.

Parameters:

<State> ON | OFF

*RST: ON

Example: `INP1:EATT:AUTO OFF`

Mode: all

INPut:EATT:STATe <State>

Switches the electronic attenuator on or off.

This command is only available with option R&S FSQ/FSG-B25, but not if R&S FSQ/FSG-B17 is active.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:EATT:STAT ON`
Switches the electronic attenuator into the signal path.

Mode: all

INPut:GAIN:STATe <State>

This command switches the preamplifier on or off (only for option RF Preamplifier, R&S FSQ/FSG-B22/B24).

With option R&S FSQ/FSG-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSQ/FSG-B24, the amplifier applies to the entire frequency range.

This command is not available when using R&S Digital I/Q Interface (R&S FSQ/FSG-B17).

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:GAIN:STAT ON`
Switches on 20 dB preamplification.

Mode: A, ADEMOD, BT, CDMA, EVDO, NF, PHN, WCDMA, GSM, VSA, TDS

INPut:SELect <Source>

This command selects the signal source for measurements.

Parameters:

<Source> RF | DIQ

RF
Radio Frequency ("RF INPUT" connector)

DIQ
Baseband Digital (IQ) (only available with R&S Digital I/Q Interface, option R&S FSQ/FSG-B17)

*RST: RF

Example: INP:SEL RF

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

3.9 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>

Selects the operating mode. Note that the commands are different for R&S FSQ/FSG and R&S FSQ/FSG.

Parameters for setting and query:

<Mode> SANalyzer | MGSM | GSM

SAN
Spectrum analyzer

MGSM (R&S FSQ/FSG: GSM)
GSM mode (R&S FSQ/FSG-K10 option)

*RST: SAN

Example:
```
INST MGSM
```

Usage: SCPI confirmed

Mode: GSM

INSTrument:NSELect <Mode>

Selects the operating mode.

Note that the commands are different for R&S FSQ/FSG and R&S FSQ/FSG.

Parameters for setting and query:

<Mode> 1 | 5

1
Spectrum analyzer

5
GSM option, R&S FSQ/FSG-K10

*RST: 1

Example: `INST:NSEL 5`

Usage: SCPI confirmed

Mode: GSM

3.10 MMEMory Subsystem

MMEMory:LOAD:IQ:STATe 1, <FileName>

This command loads the I/Q data from the specified `.iqw` file.

Note: switch to single sweep mode (`INIT:CONT OFF`) before importing I/Q data as otherwise the instrument will continue to measure data and display the current results rather than the imported data.

Parameters:

<FileName> Complete file name including the path

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
// Set capture time to 1 s
SENSe1:SWEep:TIME 1 S
// Activate power vs time measurement
CONFigure:BURSt:PTEMplate:IMMediate
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_1.iqw'
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_2.iqw'
// Now we want to analyze the first capture again
// Import I/Q data from file
MMEMory:LOAD:IQ:STATe 1,'C:\gsm_1.iqw'
// Instead of 1 slots 8 slots should be analyzed
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
// Refresh to apply the changed setting
INITiate:REFMeas:IMMediate
```

Usage: Setting only

Mode: CDMA, EVDO, GSM, IQ, TDS, VSA, WCDMA

MMEMory:STORe:IQ:STATe 1, <FileName>

This command stores the I/Q data to the specified `.iqw` file.

Parameters:

<FileName> Complete file name including the path

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
// Set capture time to 1 s
SENSe1:SWEep:TIME 1 S
// Activate power vs time measurement
CONFigure:BURSt:PTEMplate:IMMediate
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_1.iqw'
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_2.iqw'
// Now we want to analyze the first capture again
// Import I/Q data from file
MMEMory:LOAD:IQ:STATe 1,'C:\gsm_1.iqw'
// Instead of 1 slots 8 slots should be analyzed
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
// Refresh to apply the changed setting
INITiate:REFMeas:IMMediate
```

Mode: CDMA, EVDO, GSM, IQ, TDS, VSA, WCDMA

3.11 READ Subsystem

The READ subsystem contains commands for starting complex measurement tasks, and for querying the results subsequently.

The following subsystems are included:

3.11.1 READ:BURSt subsystem

READ:BURSt[:MACCuracy]:ALL?

This command starts the measurement and returns all the results. 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.

Example: `READ:BURS:ALL?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: dB

Example: `READ:BURS:ADR:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:ADRoop:CURRent?

This command starts the measurement and reads out the currently measured value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: `READ:BURS:ADR:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `READ:BURS:ADR:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `READ:BURS:ADR:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: dB

Example: `READ:BURS:BPOW:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:BPOWer:CURRent?

This command starts the measurement and reads out the currently measured value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: `READ:BURS:BPOW:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `READ:BURS:BPOW:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `READ:BURS:BPOW:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:PEAK:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:PEAK:CURRent?

This command starts the measurement and reads out the currently measured peak value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:PEAK:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:PEAK:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:PEAK:SDEViation?

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:PEAK:AVER?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:RMS:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:RMS:CURRent?

This command starts the measurement and reads out the currently measured RMS value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:RMS:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:RMS:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:RMS:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FERRor: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.

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.

Return values:

<Result> numeric value
Average
Default unit: Hz

Example: `READ:BURS:FERR:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FERRor:CURRent?

This command starts the measurement and reads out the currently measured value 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.

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.

Return values:

<Result> numeric value
Currently measured value
Default unit: Hz

Example: `READ:BURS:FERR:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FERRor: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.

This command is retained for compatibility with R&S FSQ/FSG-K5 only. Use the `READ:BURSt[:MACCuracy]:FREQuency:MAXimum` command which behaves the same way.

Note

An ongoing measurement can be aborted via the command `ABORt`.

Return values:

<Result> numeric value
Maximum
Default unit: Hz

Example: `READ:BURS:FERR:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FERRor: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.

This command is retained for compatibility with R&S FSQ/FSG-K5 only. Use the `READ:BURSt[:MACCuracy]:FREQuency:SDEViation` command which behaves the same way.

Return values:

<Result> numeric value
Standard deviation
Default unit: Hz

Example: `READ:BURS:FERR:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: Hz

Example: `READ:BURS:FREQ:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FREQuency:CURRent?

This command starts the measurement and reads out the currently measured value 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 values:

<Result> numeric value
Currently measured value
Default unit: Hz

Example: `READ:BURS:FREQ:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: Hz

Example: `READ:BURS:FREQ:MAX?`

Usage: Query only

Mode: GSM

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 values:

<Result> numeric value
Standard deviation
Default unit: Hz

Example: `READ:BURS:FREQ:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:IQIM:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQIMbalance:CURRent?

This command starts the measurement and reads out the currently measured value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:IQIM:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:IQIM:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:IQIM:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:IQOF:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQOFfset:CURRent?

This command starts the measurement and reads out the currently measured value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: READ:BURS:IQOF:CURR?

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: READ:BURS:IQOF:MAX?

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: READ:BURS:IQOF:SDEV?

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:MERR:PEAK:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:PEAK:CURRent?

This command starts the measurement and reads out the currently measured peak value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:MERR:PEAK:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:MERR:PEAK:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:MERR:PEAK:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:MERR:RMS:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:RMS:CURRent?

This command starts the measurement and reads out the currently measured RMS value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:MERR:RMS:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:MERR:RMS:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:MERR:RMS:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: dB

Example: `READ:BURS:OSUP:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:OSUPpress:CURRent?

This command starts the measurement and reads out the currently measured value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: `READ:BURS:OSUP:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `READ:BURS:OSUP:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `READ:BURS:OSUP:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Default unit: NONE

Example: `READ:BURS:PERC:EVM?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Default unit: NONE

Example: `READ:BURS:PERC:MERR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Default unit: NONE

Example: `READ:BURS:PERC:PERR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:PERR:PEAK:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:PEAK:CURRent?

This command starts the measurement and reads out the currently measured peak value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:PERR:PEAK:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:PERR:PEAK:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:PERR:PEAK:SDEV?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:PERR:RMS:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:RMS:CURRent?

This command starts the measurement and reads out the currently measured RMS value 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.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:PERR:RMS:CURR?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:PERR:RMS:MAX?`

Usage: Query only

Mode: GSM

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.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:PERR:RMS:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:ALL:AVERage?

This command starts the measurement and reads out the average power for the selected slot for all measured burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<Slot> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value
Average
Default unit: dBm

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 annd then reads the results. Please use 'FETCh' to query several results!
```
READ:BURSt:SPOWer:SLOT1:ALL:AVERage?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:ALL:CRESt?

This command starts the measurement and reads out the crest factor for the selected slot for all measured burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<Slot> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value
Crest factor
Default unit: dB

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 annd then reads the results. Please use 'FETCh' to query several results!
```
READ:BURSt:SPOWer:SLOT1:ALL:CRESt?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:ALL:MAXimum?

This command starts the measurement and reads out the maximum power for the selected slot for all measured burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<Slot> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value

Maximum

Default unit: dBm

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 annd then reads the results. Please use 'FETCh' to query several results!
```
READ:BURSt:SPOWer:SLOT1:ALL:MAXimum?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:CURRent:AVERage?

This command starts the measurement out the average power for the selected slot for the current burst. This command is only available when the Power vs Time measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<Slot> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value

Average

Default unit: dBm

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 annd then reads the results. Please use 'FETCh' to query several results!
```
READ:BURSt:SPOWer:SLOT1:CURRent:AVERage?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:CURRent:CRESt?

This command starts the measurement out the crest factor for the selected slot for the current burst. This command is only available when the "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<Slot> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value
Crest factor
Default unit: dB

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 annd then reads the results. Please use 'FETCh' to query several results!
```
READ:BURSt:SPOWer:SLOT1:CURRent:CRESt?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:CURRent:MAXimum?

This command starts the measurement out the maximum power for the selected slot for the current burst. This command is only available when the Power vs Time measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 115).

Suffix:

<Slot> <0..7>
Slot number to measure power on. 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).

Return values:

<Result> numeric value

Maximum

Default unit: dBm

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 annd then reads the
results. Please use 'FETCh' to query several results!
READ:BURSt:SPOWer:SLOT1:CURRent:MAXimum?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:DELTatosync?

This command starts the measurement of the "Delta to Sync" value for the selected slot (see chapter 2.1.7, "Power vs Time", on page 12). This command is only available when the "Power vs Time" measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate] on page 115).

Suffix:

<Slot> <0..7>
Slot number to measure power on. The selected slot must be within the slot scope, i.e.
(First slot to measure) ≦ <slot> ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Default unit: dBm

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 annd then reads the results. Use `FETCh` to query several results.
`READ:BURSt:SPOWer:SLOT1:DELTatosync?`

Usage: Query only

Mode: GSM

3.11.2 READ:SPECtrum subsystem

Commands of the READ:SPECtrum subsystem

READ:BURSt[:MACCuracy]:ALL

This command starts the measurement and returns all the results. 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 values:

<MeasValue> <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>

The results are output as a list of comma separated strings. Each item consists of an Average, Current, Maximum and Standard Deviation value.

Example: `READ:BURS:ALL?`

Mode: GSM

READ:SPECtrum:MODulation[:ALL]

This command starts the measurement and returns the result of the measured 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] on page 118).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm (depending on CONF:WSP:MOD:LIM).

<Limit> Limit at the offset frequency in dB or dBm (depending on CONF:WSP:MOD:LIM).

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned (depending on CONF:WSP:MOD:LIM).

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example: READ:SPEC:MOD?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,

Mode: GSM

READ:SPECtrum:MODulation:REFerence[:IMMediate]?

This command starts the measurement and returns the measured reference power of the "Modulation Spectrum". This command is only available when the "Modulation Spectrum" measurement is selected (see CONFigure:SPECtrum:MODulation[:IMMediate] on page 118).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example: `READ:SPECtrum:MODulation:REFerence:IMMediate?`

Usage: Query only

Mode: GSM

READ:SPECtrum:SWITching[:ALL]?

This command starts the measurement and reads out the result of the measurement of the transient spectrum. This command is only available when the transient spectrum measurement is selected (see `CONFigure:SPECtrum:SWITching[:IMMediate]` on page 120).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm.
For more information see `CONFigure:SPECtrum:SWITching:LIMIT`).

<Limit> Limit at the offset frequency in dB or dBm
For more information see `CONFigure:SPECtrum:SWITching:LIMIT`).

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned.
For more information see `CONFigure:SPECtrum:SWITching:LIMIT`).

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example:
```
READ:SPEC:SWIT?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,
```

Usage: Query only

Mode: GSM

READ:SPECtrum:SWITching:REFerence[:IMMediate]

This command starts the measurement and returns the measured reference power of the "Transient Spectrum". This command is only available when the "Transient Spectrum" measurement is selected (see `CONFigure:SPECtrum:SWITching[:IMMediate]` on page 120).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example: `READ:SPECtrum:SWITching:REFerence:IMMediate?`

Mode: GSM

READ:SPECtrum:WMODulation:GATing (obsolete)

This command reads out the gating settings for gated `Wide Modulation Spectrum` measurements. It is identical to `READ:SPECtrum:WMODulation:GATing (obsolete)` and is maintained for compatibility reasons only.

Example: `READ:SPEC:WMOD:GAT?`

Mode: GSM

3.11.3 READ:WSPectrum subsystem

Commands of the READ:WSPectrum subsystem

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]` on page 121).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm.

<Limit> Limit at the offset frequency in dB or dBm.

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned.

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example:
```
READ:WSP:MOD?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,
...
```

Usage: Query only

Mode: GSM

READ:WSPectrum:MODulation:GATing?

This command reads out the gating settings for gated "Modulation Spectrum" or "Wide Modulation Spectrum" measurements (see chapter 2.1.8, "Modulation Spectrum", on page 16 and chapter 2.1.10, "Wide Modulation Spectrum", on page 20).

The returned values can be used to set the gating interval for "list" measurements (i.e. a series of 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`).

Prior to this command make sure you set the correct Trigger Mode ("IF power" or "External") and Trigger Offset (in the "General Settings" dialog, see "General Settings" on page 48). The "Trigger Offset" can be determined using the "Auto Set" (Trigger) functionality of the R&S FSQ/FSG-K10.

Return values:

<TriggerOffset> Calculated trigger offset, based on the user-defined "Trigger Offset" and "Frame Configuration", such that 50-90% of the active part of the "Slot to measure" (excluding TSC) is measured.

<GateLength> Calculated gate length, based on the user-defined "Trigger Offset" and "Frame Configuration", such that 50-90% of the active part of the "Slot to measure" (excluding TSC) is measured.

Example:
```
READ:WSP:MOD:GAT?
```

Usage: Query only

Mode: GSM

READ:WSPectrum:MODulation:REFerence[:IMMediate]

This command starts the measurement and returns the measured reference power of the "Wide Modulation Spectrum". This command is only available when the "Wide Modulation Spectrum" measurement is selected (see CONFigure:WSPectrum:MODulation[:IMMediate] on page 121).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example: READ:WSPectrum:MODulation:REFerence:IMMediate?

Mode: GSM

READ:WSPectrum:SWITching[:ALL]?

This command starts the measurement and reads out the result of the measurement of the wide transient spectrum. This command is only available when the wide transient spectrum measurement is selected (see CONFigure:WSPectrum:SWITching[:IMMediate] on page 123).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm.
For more information see CONFigure:WSPectrum:SWITching:LIMIT on page 123).

<Limit> Limit at the offset frequency in dB or dBm
For more information see CONFigure:WSPectrum:SWITching:LIMIT on page 123).

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned.
For more information see CONFigure:WSPectrum:SWITching:LIMIT on page 123).

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example:
```
READ:SPEC:SWIT?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,
```

Usage: Query only

Mode: GSM

3.12 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:

Commands of the SENSe subsystem:

[SENSe]:BANDwidth[:RESolution]:TYPE <Type>

This command switches the filter type for the resolution filter for the "Modulation Spectrum", "Transient Spectrum" and "Wide Modulation Spectrum" measurement.

Parameters for setting and query:

<Type> NORMal | P5

NORMal
Gaussian filter with a 3 dB bandwidth 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.

*RST: P5

Example:
```
BAND:TYPE NORM
```

Mode: GSM

[SENSe]:BURSt:COUNt <Count>

The remote control command is used to specify the number of measurements to be averaged. This command is synonymous with `[SENSe:]SWEep:COUNt` on page 204.

Parameters for setting and query:

<Count> numeric value

Target statistic count, i.e. number of measurements to be averaged.

*RST: 200
Default unit: NONE

Example: `BURS:COUN 5`

Mode: GSM

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency of the analyzer or the measuring frequency for span = 0.

If the frequency is modified, the "ARFCN" is updated accordingly.

Parameters:

<Frequency> Range: 0 to fmax
*RST: fmax/2
Default unit: Hz
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:CENT 100 MHz`

Mode: all

[SENSe:]FREQuency:OFFSet <Offset>

This command defines the frequency offset of the instrument.

Parameters:

<Offset> Range: -100 GHz to 100 GHz
*RST: 0 Hz

Example: `FREQ:OFFS 1GHZ`

Mode: all

[SENSe:]SWAPiq <State>

This command defines whether or not the recorded IQ pairs should be swapped (I<->Q) before being processed. Swapping I and Q inverts the sideband.

Try this function if the TSC can not be found.

Parameters:

<State> ON | OFF

ON
I and Q are exchanged, inverted sideband, Q+j*I

OFF
Normal sideband, I+j*Q,

*RST: OFF

Example: `SWAP ON`
Specifies that IQ values should be swapped.

Mode: WLAN, GSM, OFDM, OFDMA/WiBro

[SENSe:]SWEep:COUNt <NumberSweeps>

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

Parameters:

<NumberSweeps> 0 to 32767

*RST: 0 (GSM: 200, PHN:1)

Example: `SWE:COUN 64`
Sets the number of sweeps to 64.
`INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for its end.

Mode: A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, GSM, NF

[SENSe:]SWEep:COUNt:CURRent?

This command returns the current Statistic Count. It can be used to track the progress of the averaging progress until it reaches the set "Statistic Count" (see `[SENSe:]SWEep:COUNt` on page 204).

Usage: Query only

Mode: A, BT, ADEMOD, TDS, GSM

[SENSe:]SWEep:TIME <Time>

This command defines the sweep time.

The range depends on the frequency span.

Parameters:

<Time> refer to data sheet

*RST: (AUTO is set to ON)

Example: SWE:TIME 10s

Mode: ALL

3.13 STATus Subsystem

The STATus subsystem contains the commands for the status reporting system (for details refer to chapter 4, "Status Reporting System", on page 213). *RST does not influence the status registers.

3.13.1 Commands of the STATus subsystem

STATus:OPERation[:EVENt]

This command queries the contents of the EVENt section of the STATus:OPERation register. The contents of the EVENt section are deleted after readout.

Example: STAT:OPER?

Mode: all

STATus:OPERation:CONDition

This command queries the CONDition section of the STATus:OPERation register (see the base unit description of status registers in the Remote Control Basics chapter).

Readout does not delete the contents of the CONDition section. The value returned reflects the current hardware status.

Example: STAT:OPER:COND?

Mode: all

3.13.2 STATus:QUEStionable Subsystem

This subsystem queries the information in the status reporting system. For details see chapter 4, "Status Reporting System", on page 213.

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.

For details on possible events see chapter 4, "Status Reporting System", on page 213.

Example: `STAT:QUES:SYNC`

Usage: Query only

Mode: GSM

STATus:QUEStionable:SYNC:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:SYNC:CONDition? register. Readout deletes the contents of the CONDition section.

Example: `STAT:QUES:SYNC:COND?`

Usage: Query only

Mode: GSM

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.

Parameters for setting and query:

<RegisterContent> numeric value

Content of the specific aspect of the status register

*RST: 65535

Mode: GSM

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.

Parameters for setting and query:

<RegisterContent> numeric value

Content of the specific aspect of the status register

*RST: 0

Mode: GSM

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.

Parameters for setting and query:

<RegisterContent> numeric value

Content of the specific aspect of the status register

*RST: 65535

Mode: GSM

3.14 TRACe Subsystem

The TRACe subsystem controls access to the instruments internal trace memory.

TRACe[:DATA]? <TraceNumber>

This command reads trace data out of the instrument. 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).

Query parameters:

<TraceNumber> TRACe1 | TRACe2 | TRACe3 | TRACe4

Trace name to be read out

TRACe1
Average trace; (transient spectrum: Maximum trace)

TRACe2
Maximum trace

TRACe3
Minimum trace

TRACe4
Current trace

Example: `TRAC1:DATA? TRACe1`

Usage: Query only

Mode: GSM

TRACe[:DATA]:X? <TraceNumber>

This command reads the x-values (time in seconds) of the "Power vs Time" measurement (if active).

If a trace number is defined as a parameter for this command, the x-values (time in seconds) of the "Trigger to Sync" measurement (if active) are returned.

Query parameters:

<TraceNumber> TRACe1 | TRACe2 | TRACe3 | TRACe4

Trace number

TRACe1
Average trace; (Transient Spectrum: Maximum trace, Trigger to Sync: histogram values)

TRACe2
Maximum trace (Trigger to Sync: PDF of average trace)

TRACe3
Minimum trace

TRACe4
Current trace

Example: `TRACe:DATA:X?`
Returns the Power vs Time values for the active trace.
`TRACe:DATA:X? TRACe1`
Returns the Trigger to Sync values for trace 1.

Usage: Query only

Mode: GSM

TRACe<n>:IQ:DATA:MEMory <OffsetSamples>, <NoOfSamples>

Returns the captured I/Q data.

Note: The data can be only queried if the measurement is not running.

Query parameters:

<OffsetSamples> The offset of the values to be read related to the start of the captured I/Q data.

<NoOfSamples> The number of samples to be read.

Return values:

<Result> a comma separated list of 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.

The result values are scaled linearly in Volt and correspond to the voltage at the RF input of the instrument.

Default unit: Volt

Mode: GSM

3.15 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.

TRIGger<n>[: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.

Suffix:
<n> <1|2>

Parameters for setting and query:
<TriggerOffset> numeric value
*RST: 0
Default unit: S

Example: TRIG:HOLD 1ms

Mode: GSM

TRIGger<n>[:SEQuence]:LEVel[:EXTernal] <Level>

This command sets the level of the external trigger source.

Suffix:
<n> <1|2>

Parameters for setting and query:
<Level> numeric value
External trigger level
*RST: 1.4 V
Default unit: V

Example: `TRIG:LEV:EXT 1 MV`

Mode: GSM

TRIGger<n>[:SEQuence]:LEVel:IFPower <TriggerLevel>

This command sets the level of the IF power trigger source.

Suffix:
<n> irrelevant

Parameters:
<TriggerLevel> -50 to +20 DBM
*RST: -20 DBM

Example: `TRIG:LEV:IFP -30DBM`

Mode: All

TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source for the start of a sweep.

For details on trigger modes refer to the "Trg/Gate Source" softkey in the base unit description.

Suffix:
<n> irrelevant

Example: `TRIG:SOUR EXT`
Selects the external trigger input as source of the trigger signal

Mode: ALL

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:AUTO <Value>

This command is identical to `CONFigure[:MS]:AUTO:TRIGger` on page 87 and is maintained for compatibility reasons only.

Suffix:
<n> <1|2>

Parameters for setting and query:
<Value> OFF | ON | ONCE
*RST: ON

Mode: GSM

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:EXTernal <TriggerDelay>

This command is a combination of 2 commands: Firstly, the "External" 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.

Secondly, 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.

Suffix:
<n> <1|2>

Parameters for setting and query:

<TriggerDelay> numeric value

*RST: 0 s
Default unit: S

Example: `TRIG:SYNC:ADJ:EXT 1 MS`

Mode: GSM

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:IFPower <TriggerDelay>

This command is a combination of 2 commands: Firstly, 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.

Secondly, 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.

Suffix:

<n> <1|2>

Parameters for setting and query:

<TriggerDelay> numeric value

*RST: 0 s
Default unit: S

Example: `TRIG:SYNC:ADJ:IFP 1 MS`

Mode: GSM

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:IMMediate

This command selects the FREE RUN GSM trigger.

Suffix:

<n> <1|2>

Example: `TRIG:SYNC:ADJ:IMM`

Usage: Setting only

Mode: GSM

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:RFPower <TriggerDelay>

This command is a combination of 2 commands: Firstly, 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.

Secondly, 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.

Suffix:
<n> <1|2>

Parameters for setting and query:
<TriggerDelay> numeric value

*RST: 0 s
Default unit: S

Example: `TRIG:SYNC:ADJ:RFP 1 MS`

Mode: GSM

4 Status Reporting System

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

In this section, only the new and altered status registers/bits for the GSM option (R&S FSQ/FSG-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 on CD.

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

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/FSG Kernel main, R&S FSQ/FSG-K10 makes use of bits in this register which are not used within R&S FSQ/FSG Kernel main
- STATus:QUES:SYNC - Although this register is provided by the base system, the GSM option (R&S FSQ/FSG-K10) uses different bits and definitions.
- STATus:QUES:LIMit - This register is provided by the base system; however, in the GSM option (R&S FSQ/FSG-K10) , there is only 1 limit register combining all displayed limits. (Limit lines are only available in screen A, which displays the traces, while screen B displays the measurement results as a list.)

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]`.

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 FSQ/FSG-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 with commands `STATus:OPERation[:EVENt]` and `STATus:OPERation:CONDition`.

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.

Bit No	Meaning
10	LMARgin (device-specific) This bit is set if a margin is violated (see also section STATus:QUEStionable:LMARgin Register)
11	SYNC (device-dependent) This bit is set if, in measurements or pre-measurements in FSV-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: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:SYNC[:EVENt]` on page 206 and `STATus:QUEStionable:SYNC:CONDition` on page 206.

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 vs 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 vs 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 vs 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 vs 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

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