

R&S® FSV-K8

Firmware Option Bluetooth

Measurements

Operating Manual



1173.0808.02 – 04.1

This manual describes the following options:

- R&S FSV-K8 (1310.8155.02)

The contents of this manual correspond to the following R&S®FSVR models with firmware version 1.56 or higher:

- R&S®FSVR7 (1311.0006K7)
- R&S®FSVR13 (1311.0006K13)
- R&S®FSVR30 (1311.0006K30)
- R&S®FSVR40 (1311.0006K40)

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

| Package | Link | License |
|---------------|---|-----------------------------|
| OpenSSL | http://www.openssl.org | OpenSSL/SSLLeavy |
| Xitami | http://www.xitami.com | 2.5b6 |
| PHP | http://www.php.net | PHP v.3 |
| DOJO-AJAX | http://www.dojotoolkit.org | Academic Free License (BSD) |
| ResizableLib | http://www.geocities.com/ppescher | Artistic License |
| BOOST Library | http://www.boost.org | Boost Software v.1 |
| ONC/RPC | http://www.plt.rwth-aachen.de/index.php?id=258 | SUN |

The product Open SSL includes cryptographic software written by Eric Young (eay@cryptsoft.com) and software written by Tim Hudson (tjh@cryptsoft.com).

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

© 2010 Rohde & Schwarz GmbH & Co. KG

Muehldorfstr. 15, 81671 Munich, Germany

Phone: +49 89 41 29 - 0

Fax: +49 89 41 29 12 164

E-mail: info@rohde-schwarz.com

Internet: <http://www.rohde-schwarz.com>

Printed in Germany – Subject to change – Data without tolerance limits is not binding.

R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG.

Trade names are trademarks of the owners.

The following abbreviations are used throughout this manual: R&S®FSV is abbreviated as R&S FSV. R&S®FSVR is abbreviated as R&S FSVR.

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 $\pm 10\%$ shall apply to the nominal voltage and $\pm 5\%$ 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 $V_{\text{rms}} > 30 \text{ V}$, 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.

Basic Safety Instructions

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.







Informaciones elementales de seguridad

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 | Advertencia: 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 $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ 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 $U_{\text{eff}} > 30 \text{ V}$ 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 señalar 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.

Informaciones elementales de seguridad

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.

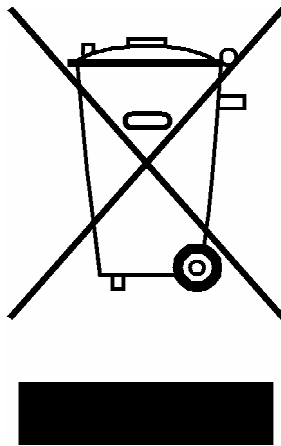
Eliminación

1. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polveros 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.

Customer Information Regarding Product Disposal

The German Electrical and Electronic Equipment (ElektroG) Act is an implementation of the following EC directives:

- 2002/96/EC on waste electrical and electronic equipment (WEEE) and
- 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).



Product labeling in accordance with EN 50419

Once the lifetime of a product has ended, this product must not be disposed of in the standard domestic refuse. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.

Rohde & Schwarz GmbH & Co. KG has developed a disposal concept for the environmental-friendly disposal or recycling of waste material and fully assumes its obligation as a producer to take back and dispose of electrical and electronic waste in accordance with the ElektroG Act.

Please contact your local service representative to dispose of the product.



Kundeninformation zur Batterieverordnung (BattV)

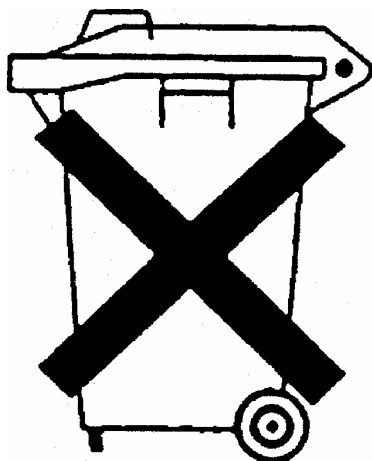
Dieses Gerät enthält eine schadstoffhaltige Batterie. Diese darf nicht mit dem Hausmüll entsorgt werden.

Nach Ende der Lebensdauer darf die Entsorgung nur über eine Rohde&Schwarz-Kundendienststelle oder eine geeignete Sammelstelle erfolgen.

Safety Regulations for Batteries (according to BattV)

This equipment houses a battery containing harmful substances that must not be disposed of as normal household waste.

After its useful life, the battery may only be disposed of at a Rohde & Schwarz service center or at a suitable depot.



Normas de Seguridad para Baterías (Según BattV)

Este equipo lleva una batería que contiene sustancias perjudiciales, que no se debe desechar en los contenedores de basura domésticos.

Después de la vida útil, la batería sólo se podrá eliminar en un centro de servicio de Rohde & Schwarz o en un depósito apropiado.

Consignes de sécurité pour batteries (selon BattV)

Cet appareil est équipé d'une pile comprenant des substances nocives. Ne jamais la jeter dans une poubelle pour ordures ménagères.

Une pile usagée doit uniquement être éliminée par un centre de service client de Rohde & Schwarz ou peut être collectée pour être traitée spécialement comme déchets dangereux.

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.

Europe, Africa, Middle East

Phone +49 89 4129 12345
customersupport@rohde-schwarz.com

North America

Phone 1-888-TEST-RSA (1-888-837-8772)
customer.support@rsa.rohde-schwarz.com

Latin America

Phone +1-410-910-7988
customersupport.la@rohde-schwarz.com

Asia/Pacific

Phone +65 65 13 04 88
customersupport.asia@rohde-schwarz.com



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 efficacité énergétique
- ▮ Amélioration continue de la durabilité environnementale
- ▮ Système de gestion de l'environnement certifié selon ISO 14001

75 Years of
Driving
Innovation


ROHDE & SCHWARZ



ROHDE & SCHWARZ

CE Declaration of Conformity



Certificate No.: 2010-50

This is to certify that:

| Equipment type | Stock No. | Designation |
|----------------|--------------|-------------------|
| F5VR | 1311.0006.XX | REALTIME ANALYZER |

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electrical equipment for use within defined voltage limits (2006/95/EC)
- relating to electromagnetic compatibility (2004/108/EC)

Conformity is proven by compliance with the following standards:

EN 61010-1: 2001
EN 61326-1: 2006
EN 61326-2-1: 2006
EN 55011: 2007 + A2: 2007, Class A
EN 61000-3-2: 2006
EN 61000-3-3: 1995 + A1: 2001 + A2: 2005

For the assessment of electromagnetic compatibility, the limits of radio interference for Class A equipment as well as the immunity to interference for operation in industry have been used as a basis.

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

Munich, 2010-05-26

Central Quality Management MF-QZ / Radde

1311.0006.XX

CE

E-1

Contents

| | | |
|----------|---|------------|
| 1 | Conventions Used in the Documentation..... | 5 |
| 1.1 | Typographical Conventions..... | 5 |
| 1.2 | Conventions for Procedure Descriptions..... | 5 |
| 2 | How to Use the Help System..... | 7 |
| 3 | Bluetooth Measurements Option R&S FSV-K8..... | 9 |
| 3.1 | Introduction to Bluetooth Measurements (K8)..... | 9 |
| 3.2 | Instrument Functions for Bluetooth Measurements (K8)..... | 19 |
| 3.3 | Remote Commands for Bluetooth Measurements (K8)..... | 64 |
| | List of Commands..... | 129 |
| | Index..... | 132 |

1 Conventions Used in the Documentation

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. |
| <i>Input</i> | 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. |

1.2 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 device 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 device or on a keyboard.

2 How to Use the Help System

Calling context-sensitive and general help

- ▶ To display the general help dialog box, press the HELP key on the front panel.
The help dialog box "View" tab is displayed. A topic containing information about the current menu or the currently opened dialog box and its function is displayed.



For standard Windows dialog boxes (e.g. File Properties, Print dialog etc.), no context-sensitive help is available.

- ▶ If the help is already displayed, press the softkey for which you want to display help.
A topic containing information about the softkey and its function is displayed.



If a softkey opens a submenu and you press the softkey a second time, the submenu of the softkey is displayed.

Contents of the help dialog box

The help dialog box contains four tabs:

- "Contents" - contains a table of help contents
- "View" - contains a specific help topic
- "Index" - contains index entries to search for help topics
- "Zoom" - contains zoom functions for the help display

To change between these tabs, press the tab on the touchscreen.

Navigating in the table of contents

- To move through the displayed contents entries, use the UP ARROW and DOWN ARROW keys. Entries that contain further entries are marked with a plus sign.
- To display a help topic, press the ENTER key. The "View" tab with the corresponding help topic is displayed.
- To change to the next tab, press the tab on the touchscreen.

Navigating in the help topics

- To scroll through a page, use the rotary knob or the UP ARROW and DOWN ARROW keys.
- To jump to the linked topic, press the link text on the touchscreen.

Searching for a topic

1. Change to the "Index" tab.

2. Enter the first characters of the topic you are interested in. The entries starting with these characters are displayed.
3. Change the focus by pressing the ENTER key.
4. Select the suitable keyword by using the UP ARROW or DOWN ARROW keys or the rotary knob.
5. Press the ENTER key to display the help topic.
The "View" tab with the corresponding help topic is displayed.

Changing the zoom

1. Change to the "Zoom" tab.
2. Set the zoom using the rotary knob. Four settings are available: 1-4. The smallest size is selected by number 1, the largest size is selected by number 4.

Closing the help window

- ▶ Press the ESC key or a function key on the front panel.

3 Bluetooth Measurements Option R&S FSV-K8

Overview of Firmware Option R&S FSV-K8

This section contains all information required for operation of an analyzer equipped with Application Firmware R&S FSV-K8. It covers operation via menus and the remote control commands for bluetooth measurements.

This part of the documentation consists of the following chapters:

- [chapter 3.1, "Introduction to Bluetooth Measurements \(K8\)"](#), on page 9
Introduces the Bluetooth option and provides further information.
- [chapter 3.2, "Instrument Functions for Bluetooth Measurements \(K8\)"](#), on page 19
Shows all softkeys available in the "Bluetooth" menu. This chapter also presents the remote control commands associated with each softkey function.
- [chapter 3.3, "Remote Commands for Bluetooth Measurements \(K8\)"](#), on page 64
Describes all remote control commands defined for bluetooth measurements.

This part of the documentation includes only functions of the Application Firmware R&S FSV-K8. For all other descriptions, refer to the description of the base unit.

3.1 Introduction to Bluetooth Measurements (K8)

Introduction

This section gives background information on Bluetooth Measurements (option R&S FSV-K8).

| | | |
|-------|---|----|
| 3.1.1 | Bluetooth Overview..... | 10 |
| 3.1.2 | Supported Tests..... | 11 |
| 3.1.3 | Overview of Transmitter Tests..... | 12 |
| 3.1.4 | Functional Description – Block Diagram..... | 14 |
| 3.1.5 | Bandwidths..... | 15 |
| 3.1.6 | Measurement Filter (Meas Filter On)..... | 15 |
| 3.1.7 | Oversampling | 16 |
| 3.1.8 | Determining Average or Max/Min Values..... | 17 |
| 3.1.9 | Trigger Concepts | 18 |

3.1.1 Bluetooth Overview

This section provides the following general information on Bluetooth measurements:

- Bluetooth technical parameters
- Power classes
- Structure of a Bluetooth data packet

Bluetooth technical parameters

Table 3-1: Common Parameters

| | |
|------------------------------------|----------------------|
| frequency bands | 2402 + (0...78) MHz |
| channel spacing | 1 MHz |
| symbol rate | 1 Msym/s |
| slot length (frequency hopping) | 625 (sec |
| packet sizes | 1, 3, 5 slot packets |

Table 3-2: Modulation Parameters Basic Rate

| | |
|----------------------------|---|
| modulation | GFSK |
| TX filter | Gaussian |
| BT / | 0.5 |
| modulation index | 0.28 – 0.35 nominal 0.32 |
| frequency deviation | 160 kHz settled 141 kHz 010101 suite |
| bandwidth –3dB –20dB | 220 kHz 1 MHz |
| bit rate | 1 Mbps |

Table 3-3: Modulation Parameters Enhanced Data Rate

| | | |
|-----------------|----------------|---------------|
| modulation | $\pi/4$ -DQPSK | 8DPSK |
| TX filter | RRC | RRC |
| roll-off factor | 0.4 | 0.4 |
| bandwidth –3dB | ± 500 kHz | ± 500 kHz |
| bit rate | 2 Mbps | 3 Mbps |

Power classes

| Power Class | Maximum (Pmax) | Nominal | Minimum (Pmin) | Power Control |
|-------------|-----------------|--------------|-----------------|------------------------------|
| 1 | 100 mW (20 dBm) | | 1 mW (0 dBm) | from Pmin (< +4 dBm) to Pmax |
| 2 | 2.5 mW (4dBm) | 1 mW (0 dBm) | 0.25 mW (-6dBm) | optional |
| 3 | 1 mW (0dBm) | | | optional |

Structure of a Bluetooth data packet

Every Bluetooth data packet is divided into 3 basic sections: access code, header and payload. The following figures show the order and bit lengths of the individual sections:

| | | | | |
|---------------------|-------------------|----------------|----------------|----------------------------------|
| access code 72 bits | | | | |
| 4 bits preamble | 64 bits sync word | 4 bits trailer | 54 bits header | 240 / 1496 / 2744 bits payload*) |

*) During EUT evaluation the payload contains certain bit sequences: PRBS9 (Pseudo Random Bit Sequence) or 11110000 or 10101010.

The sync word is transmitted as the major part of the access code. For this purpose, the LAP (lower address part) of the BD address is expanded to 64 bit by adding the BCH code and baker.

| | | | |
|-------------------|-------------|---------------|--|
| sync word 64 bits | | | |
| BCH code 34 bits | LAP 24 bits | Barker 6 bits | |

The LAP (lower address part) of the BD address serves as a basis for the sync word.

| | | |
|----------------------|------------|-------------|
| BD – address 48 bits | | |
| NAP 16 bits | UAP 8 bits | LAP 24 bits |

In case of EDR packets the payload is divided into 6 other sections:

| | | | | | |
|-----------|------|----------------|-------------------------|----------|---------|
| DPSK | | | | | |
| guard 5µs | SYNC | payload header | user payload 0–2723Symb | CRC code | trailer |

3.1.2 Supported Tests

The Bluetooth Measurements Option supports measurements according to the Bluetooth RF Test Specification (Bluetooth SIG), Revision 2.0.E.3, Mar 2005, on the analyzer. The following tests are currently implemented according to this specification:

- Output Power
- TX Output Spectrum – Adjacent Channel Power

- Modulation Characteristics
- Initial Carrier Frequency Tolerance (ICFT)
- Carrier Frequency Drift
- EDR Relative Transmit Power
- EDR Carrier Frequency Stability and Modulation Accuracy
- EDR Differential Phase Encoding
- EDR In-band Spurious Emissions

3.1.3 Overview of Transmitter Tests

Table 3-4: Basic Rate Measurements

| | Output Power | TX Output Spectrum – Adjacent Channel Power | Modulation Characteristics | Initial Carrier Frequency Tolerance | Carrier Frequency Drift |
|-------------------------|-------------------------------------|---|----------------------------|-------------------------------------|---------------------------------|
| Hop | on | off | off | on / off | on / off |
| Trigger | extern | – | – | – | – |
| Synchronization | Yes (p0), but also possible without | no | yes (p0) | yes (p0) | yes (p0) |
| packet Type | longest supported | DH1 | longest supported | DH1 | all supported packets (DH1/3/5) |
| Payload | PRBS 9 | PRBS 9 | 11110000 10101010 | PRBS 9 | 10101010 |
| Test Mode | loop back | loop back | loop back | loop back | loop back |
| Operating Mode | IQ mode | analyzer zero span | IQ mode | IQ mode | IQ mode |
| RBW | 3 MHz | 100 kHz | – | – | – |
| VBW | 3 MHz | 300 kHz | – | – | – |
| Power | supported maximum | supported maximum | supported maximum | supported maximum | not specified |
| Sweep Time | one complete packet | 79s per sweep (= 100ms * 10 * 79) | one complete packet | – | one complete packet |
| Sweep Count | – | 10 | 10 (extern) | 10 | 10 |
| Trace Mode | Maxh | Maxh | – | – | – |
| Detector | Peak | Aver | – | – | – |
| Frequency in MHz | low / middle / high | each channel | low / middle / high | low / middle / high | low / middle / high |

| | Output Power | TX Output Spectrum – Adjacent Channel Power | Modulation Characteristics | Initial Carrier Frequency Tolerance | Carrier Frequency Drift |
|-----------|---|--|--|---|--|
| Span | – | – | – | – | – |
| Test cond | norm / ext | norm / ext | norm / ext | norm / ext | norm / ext |
| Results | peak and average power 1) $P_{AV} < 100$ mW (20 dBm) 2) $P_{PK} < 200$ mW (23 dBm) 3) $P_{max} > P_{AV} > P_{min}$ at maximum power step $P_{AV} < 1$ mW (0 dBm) | channel power of all channels 1) $P_{TX}(f) \leq -20$ dBm for $ M-N = 2$ 2) $P_{TX}(f) \leq -40$ dBm for $ M-N \geq 3$ | all 8 bit peak deviations and average deviations | carrier offset within the 4 preamble bits | carrier offsets of the 4 bit preamble, of all 10 bit payload sequences; maximum drift rate of all 10 bit payload sequences at 50 μ s offset |

| | EDR Relative TX Power | EDR Carrier Frequency Stability and Modulation Accuracy | EDR Differential Phase Encoding | EDR In-band Spurious Emissions |
|-----------------|----------------------------|---|---------------------------------|---------------------------------|
| Hop | off | off | off | off |
| Trigger | – | – | – | extern/ IF power |
| Synchronization | yes | yes | yes | yes, needed for gate adjustment |
| packet Type | longest supported | longest supported | longest supported | longest supported |
| Payload | PRBS 9 | PRBS9 | PRBS9 | PRBS9 |
| Test Mode | loop back | loop back | TX mode | loop back |
| Operating Mode | IQ mode | IQ mode | IQ mode | analyzer zero span |
| RBW | 3 MHz | – | – | 100 kHz |
| VBW | 3 MHz | – | – | 300 kHz |
| Power | supported minimum/ maximum | supported minimum/ maximum | supported minimum/ maximum | supported minimum/ maximum |
| Sweep Time | one complete packet | one complete packet | one complete packet | 10*79* gate length |
| Sweep Count | 10 | 200 blocks | 100 | 10 |
| Trace Mode | ClrWr | – | – | Maxh |
| Detector | Aver | – | – | Aver |

| | EDR Relative TX Power | EDR Carrier Frequency Stability and Modulation Accuracy | EDR Differential Phase Encoding | EDR In-band Spurious Emissions |
|------------------|------------------------------|---|---------------------------------|--------------------------------|
| Frequency in MHz | low / middle / high | low / middle / high | low / middle / high | each channel |
| Span | – | – | – | 79 MHz |
| Test cond | norm / ext | norm / ext | norm / ext | norm / ext |
| Results | ratio of DPSK and GFSK power | carrier frequency stability and error vector magnitude | number of failed packets | channel power of all channels |

3.1.4 Functional Description – Block Diagram

The Adjacent Channel Power and EDR In-band Spurious Emissions measurements are performed in the "Spectrum Analyzer" mode. For this test case the complete frequency band is scanned using a sequence of zero span measurements.

All other test cases are based on a digital I/Q demodulator which determines the temporal characteristics of power and frequency. The output data of the demodulator are the basis for calculation of all relevant measurement results like modulation characteristics or output power. The demodulator reaches a maximum in accuracy and temperature stability by sampling the IF signal and converting it digitally down into the base band (I/Q area).

The measurements are performed by passing the following signal processing steps:

- LAP (Lower Address Part) trigger detection
- Resampling
- Channel filtering
- Automated packet and bit pattern detection
- Limit check
- Parallel display of measurement curves and numeric results on the screen

The [figure 3-1](#) shows the analyzer hardware from the IF to the processor. The analog IF filter is fixed to 20MHz. The A/D converter samples the 20 MHz IF signal with a sampling frequency of 65.83 MHz.

Low pass filtering is performed after the signal has been down-converted into the complex base band and the data rate is reduced in the sequence. The amount of decimation depends on the selected oversampling factor = points / symbol. The default setting is 4, resulting in a 4 MHz sampling rate. For EDR-measurements, the oversampling factor is always fixed to 4. The resulting I/Q data are stored in a memory of 512 k words for I and Q respectively. The hardware trigger (external or IF power) controls the memory access.

Data acquisition hardware

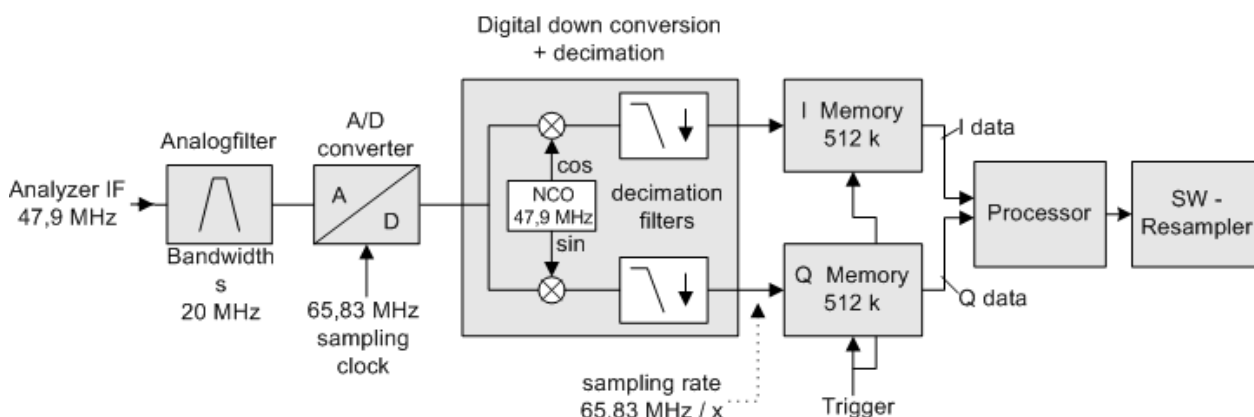


Fig. 3-1: Block diagram of the signal processing architecture of the analyzer

3.1.5 Bandwidths

The Bluetooth RF Specification defines a minimal bandwidth of 3 MHz. The digital bandwidth depends on the selected oversampling factor (= points / symbol). With the default setting of 4, the digital bandwidth is 3 MHz. This digital filter has a flat amplitude characteristics and does not affect the frequency deviation of the signal.

3.1.6 Measurement Filter (Meas Filter On)

The RF Specification allows high distortion power in the first adjacent channels. The 3 MHz filter does not suppress this kind of distortion, which leads to a high interference in modulation. Therefore a precise measurement of the frequency deviation is not possible.

In order to obtain correct deviation results, the spectrum analyzer supplies an optional filter with a passband only appropriate for the channel to measure. This filter is used by default. The Bluetooth spectrum has a bandwidth of 1 MHz. The filter is flat within 1.04 MHz (ripple: only 0.02 dB) and has steep edges. This measurement filter is not dependent on the selected oversampling factor. As a result the displayed deviation value is increased by 3.2%, but without the filter the displayed deviation value can increase dramatically due to interference from adjacent channels. Generally the result is more precise, if the displayed deviation is lower with filtering than without filtering. In these cases the inaccuracy caused by the adjacent channel interference is higher than the systematic inaccuracy caused by the filter.

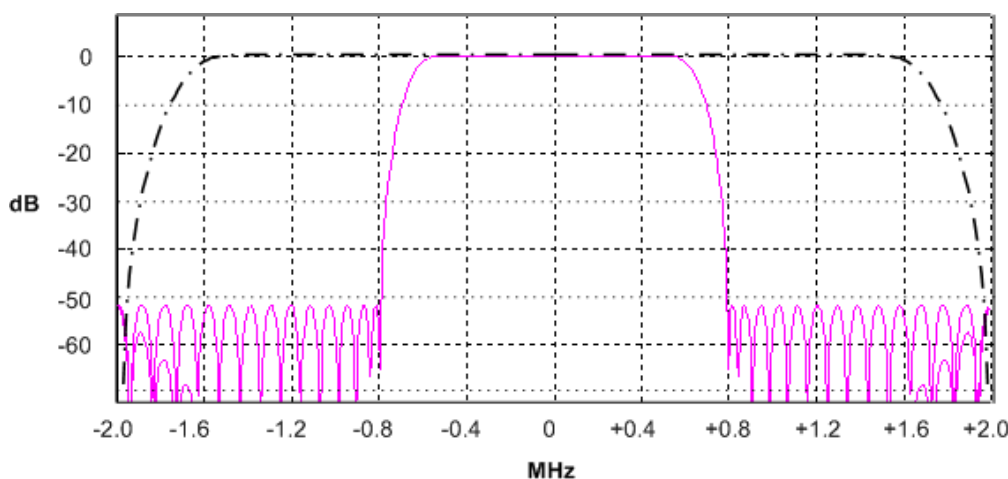


Fig. 3-2: Selection of digital filters

Dashed-dotted curve: Standard filter with 4 points / symbol

Solid curve: Optional measurement filter, independent of the points / symbol setting

3.1.7 Oversampling

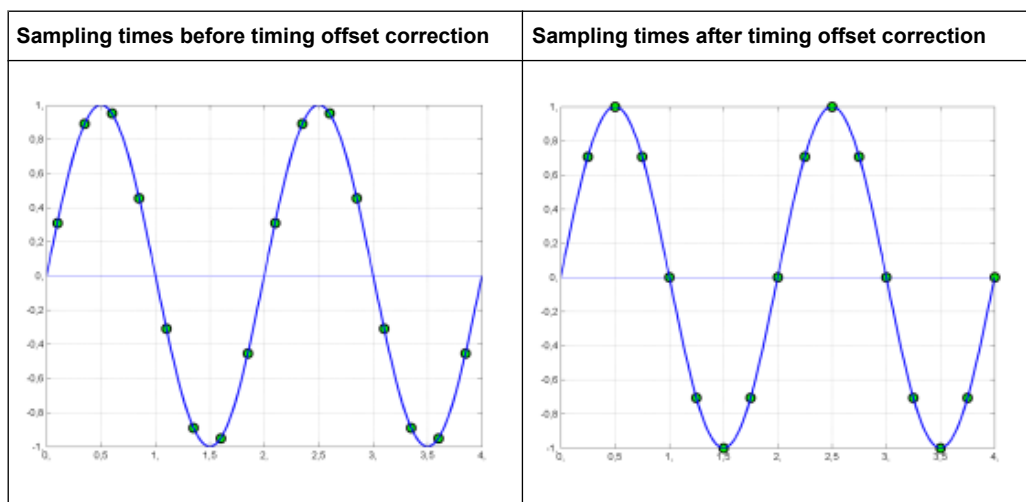
The number of samples per symbol is equivalent to the sampling rate in MHz (due to the symbol length of 1 μ s).

| Digital bandwidth (flat area) | Points per Symbol | Sampling rate |
|----------------------------------|-------------------|---------------|
| 10 MHz | 32 | 32 MHz |
| 8 MHz | 16 | 16 MHz |
| 5 MHz | 8 | 8 MHz |
| 3.0 MHz | 4 | 4 MHz |
| 1.6 MHz | 2 | 2 MHz |

According to the RF Test Specification an oversampling factor of 4 is required at minimum. For Basic Rate measurements, this oversampling factor can be selected as oversampling factor in a range from 2 to 32. For EDR-measurements, the oversampling factor is fixed to 4 which is also the default value.

Although possible, a value greater than 4 is not recommended. It increases the measurement time due to the extended calculation effort. Additionally, the resulting bandwidth will be larger than required, which leads to lower measurement accuracy, unless the optional measurement filter (Meas Filter On) is used as described in [chapter 3.1.5, "Bandwidths"](#), on page 15.

The spectrum analyzer uses a timing offset correction in order to move the samples to the zero trespassing points. As a result there is one sample per symbol time, which is especially important for a 0101 symbol sequence in order to obtain the precise value for the peak frequency deviation.



Advantages of the timing offset correction:

- No jitter with low sampling rates
- With one sample per zero, the trespassing point is always a sample in the middle of the bit length. Therefore the maximum values in the frequency deviation of 0101 bit patterns can be detected precisely also with low sampling rates.
- The immunity to interference when determining the data bits is improved.
- Higher suppression of the distortion during peak detection.

3.1.8 Determining Average or Max/Min Values

These functions are very useful in order to obtain more stable results or to find sporadic spurious signals not included in every burst. In many cases the RF Test Specification defines measurements over a 10 burst period.

The number of measurements can be selected using sweep count function, thus adapting the measurement to the individual requirements. In single sweep mode, the calculation of average or maximum / minimum values is performed over a well-defined number of sweeps (= sweep count). Continuous sweep mode yields continuous averaging and calculation of maximum / minimum values over the whole measurement time.

Modulation measurements

They are performed in the "Clear Write" trace mode. In continuous sweep mode, a "live" display is obtained, which allows e.g. an instant view of changes during alignment of a DUT. In single sweep mode and with the sweep count set to 10, the spectrum analyzer evaluates 10 bursts as required by the RF Test Specification. This means that a result is obtained after exactly 10 bursts.

Power measurements

They are performed in the "Maxhold" trace mode in relation with the defined measurement time. The measurement time is selected in order to make sure that always one complete

burst is acquired. In this case, several sweeps are combined to one trace before this result trace is evaluated.

Impact of the sweep count on the measurement results

| Trace Mode | Continuous Sweep | Single Sweep & Sweep Count |
|-----------------------|--|---|
| Clear Write | All measurement results (min., max., average) are updated with every sweep. The corresponding values are calculated based on the current curve. | Starts a measurement with n sweeps (n = sweep count). All measurement results (min., max., average) are calculated based on these n sweeps. |
| AVG, MaxHold, MinHold | All measurement results (min., max., average) are updated with every sweep. The corresponding values are calculated based on the current curve. The trace is the continuous average value (AVG) or the extreme value (MaxHold, MinHold) since the start of the measurement. | Starts a measurement with n sweeps (n = sweep count). n defines the number of sweeps that are taken into account for the trace math functions (AVG, MaxHold, MinHold). The n sweeps result in one trace and the measurement results (Min, Max, Average) are calculated based on this summarized trace. |

The functions described above differ from the detector functions of the instrument:

- Detectors combine the measurement data obtained by oversampling to one measurement point on the screen. The kind of combination (Max Peak, Min Peak, Average, RMS) can be selected.
- The trace functions affect complete measurement curves: A resulting curve is calculated from several subsequent sweeps. The method of calculation (Average, Maxhold, Minhold) can be selected here as well.

Thus the detector is the arithmetic rule for how sample data collected with a high data rate are combined to a measurement point of one individual measurement curve, whereas the trace mode is the rule of how samples taken from several measurement curves are to be combined to a new resulting curve.

For the ACP measurement, the "Average" detector is set.

3.1.9 Trigger Concepts

As the DUT (Device Under Test) uses frequency hopping, a trigger method is necessary for two reasons:

- A measurement is only possible during the period of time, when there is a TX signal (burst) at the frequency under request.
- In order to determine the modulation characteristics correctly, a synchronization with the preamble of the signal must be supplied.

If the "Find Sync" softkey is activated, the synchronization is supplied towards the 64 bit sync word. For this purpose, in a first step a burst is searched automatically within the RF signal, or, if selected, the external trigger or the IF power trigger are used to determine the burst position.

In a second step the sync word position is searched by correlation of the signal with the sync word defined in the initialization phase. The correlation is performed directly with the FM signal, not with the data bits, which are only available after the phase shifter has been processed. The find burst process is continued as long as no sync word is found.

After the position of the sync word has been determined, the position of the p0 bit is calculated from the average value of all zero trespassing points, as defined in the RF test specification. Finally the samples are moved in a way that each sample matches one zero trespassing point (phase shifting).

The only measurement possible without synchronization is the Output Power measurement. The specified measurement time is 20% to 80% of the burst length. Without synchronization the burst length is defined via the -3dB points of the power curve. With synchronization the burst starts with the p0 bit. Therefore varying measurement results is possible if the power of the EUT is not constant within the burst.

In order to supply stable synchronization the EUT must be operated in reduced hopping mode. The EUT is only allowed to toggle between two frequencies, because otherwise the repetition time for the same frequency would become higher than the record length. If the test environment supplies an external trigger that marks the channel to be measured a synchronization is also possible with normal hopping operation.

3.2 Instrument Functions for Bluetooth Measurements (K8)

This option provides measurements to test the conformity of signal sources to the Bluetooth RF Test Specification (Bluetooth SIG).

For background information on Bluetooth measurements refer to [chapter 3.1, "Introduction to Bluetooth Measurements \(K8\)"](#), on page 9.

To open the Bluetooth menu

- If the "Bluetooth" mode is not the active measurement mode, press the MODE key and activate the "Bluetooth" option.
If the "Bluetooth" mode is already active, press the MENU key.
The "Bluetooth" menu is displayed.

Menu and softkey description

The following softkey menus are specific to the R&S FSV-K8 option and are described here:

- [chapter 3.2.3, "Softkeys of the Bluetooth Menu"](#), on page 32
- [chapter 3.2.4, "Softkeys of the MEAS CONFIG menu"](#), on page 47
- [chapter 3.2.7, "Softkeys of the Frequency Menu \(option R&S FSV-K8\)"](#), on page 54
- [chapter 3.2.5, "Softkeys of the Amplitude Menu \(Bluetooth Mode\)"](#), on page 48

- [chapter 3.2.6, "Softkeys of the Bandwidth Menu \(option R&S FSV-K8\)"](#), on page 51
- [chapter 3.2.8, "Softkeys of the Sweep Menu \(Bluetooth mode\)"](#), on page 54
- [chapter 3.2.9, "Softkeys of the Trigger Menu \(Option R&S FSV-K8\)"](#), on page 58

The span menu is not available in the "Bluetooth" mode. All other menus are provided as described for the base unit. For details refer to the corresponding menu descriptions.

To display help to a softkey, press the HELP key and then the softkey for which you want to display help. To close the help window, press the ESC key. For further information refer to [chapter 2, "How to Use the Help System"](#), on page 7.

Tasks

- [chapter 3.2.2, "Adapting the settings to the characteristics of the DUT"](#), on page 32

Measurement settings

Various measurement types are available with the Bluetooth option, see [chapter 3.2.1, "Measurement Types and Result Display"](#), on page 21.

The basic parameter settings are described in [chapter 3.2.2, "Adapting the settings to the characteristics of the DUT"](#), on page 32. The settings that can be configured individually for each measurement are the following:

- RBW (the IF bandwidth set up for modulation measurements is valid for all measurements)
- VBW
- RBW auto mode
- VBW auto mode
- trace mode
- detector
- sweep count
- sweep time auto mode
- sweep time

They are available in the corresponding menus as soon as the corresponding measurement is selected. Changes to these settings are always related to the selected measurement. The settings defined in the RF Test Specification can thus be modified individually for development or production. By using the start recall function, the individual configuration of the various tests can be preserved over a preset.

Position of a Bluetooth burst

The RF Test Specification allows different methods to determine the position of a Bluetooth burst:

- The burst is defined by the p0 bit and the automatically determined packet length ("Find Sync On").

- The burst is defined by the two 3dB points ("Find Sync Off" and "Find Burst On"). The search of the 3dB points is defined in the RF Test Specification as the alternative method compared with the p0 bit method.

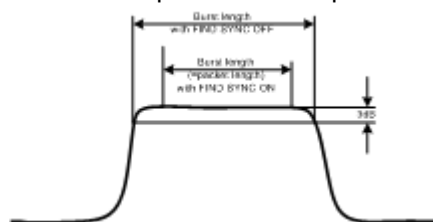


Fig. 3-3: Definition of a Bluetooth burst

Labels used in the measurement displays

- Enhancement label "TDF"

Offset values, set with the "Antenna Gain" softkey, that are larger or smaller than 0 dB activate the enhancement label "TDF" at the right diagram border.

3.2.1 Measurement Types and Result Display

The Bluetooth Measurements option provides various measurement types. The measurements and the corresponding result display are described in the following chapters. Generally, a diagram and a table with the main results are displayed.

For each measurement, the results are compared to the selected standard. If the results match the standard, the status is indicated as "Passed". If one of the results does not match the standard, that value is displayed in red, and the status of the measurement is indicated as "Failed".

| | | |
|---------|--|----|
| 3.2.1.1 | Output Power Measurement..... | 21 |
| 3.2.1.2 | Adjacent Channel Power Measurement..... | 23 |
| 3.2.1.3 | Modulation Characteristics Measurement..... | 24 |
| 3.2.1.4 | Initial Carrier Frequency Tolerance Measurement..... | 25 |
| 3.2.1.5 | Carrier Frequency Drift Measurement..... | 26 |
| 3.2.1.6 | Relative Transmit Power (EDR) Measurement..... | 27 |
| 3.2.1.7 | In-band Spurious Emissions (EDR) measurement..... | 28 |
| 3.2.1.8 | Carrier Frequency Stability and Modulation Accuracy (EDR) measurement..... | 29 |
| 3.2.1.9 | Differential Phase Encoding (EDR) measurement..... | 31 |

3.2.1.1 Output Power Measurement

The Output Power measurement (**Output Power** softkey) determines the maximum and average output power during a burst of the equipment under test (EUT). For this purpose a complete packet is recorded in the time domain.

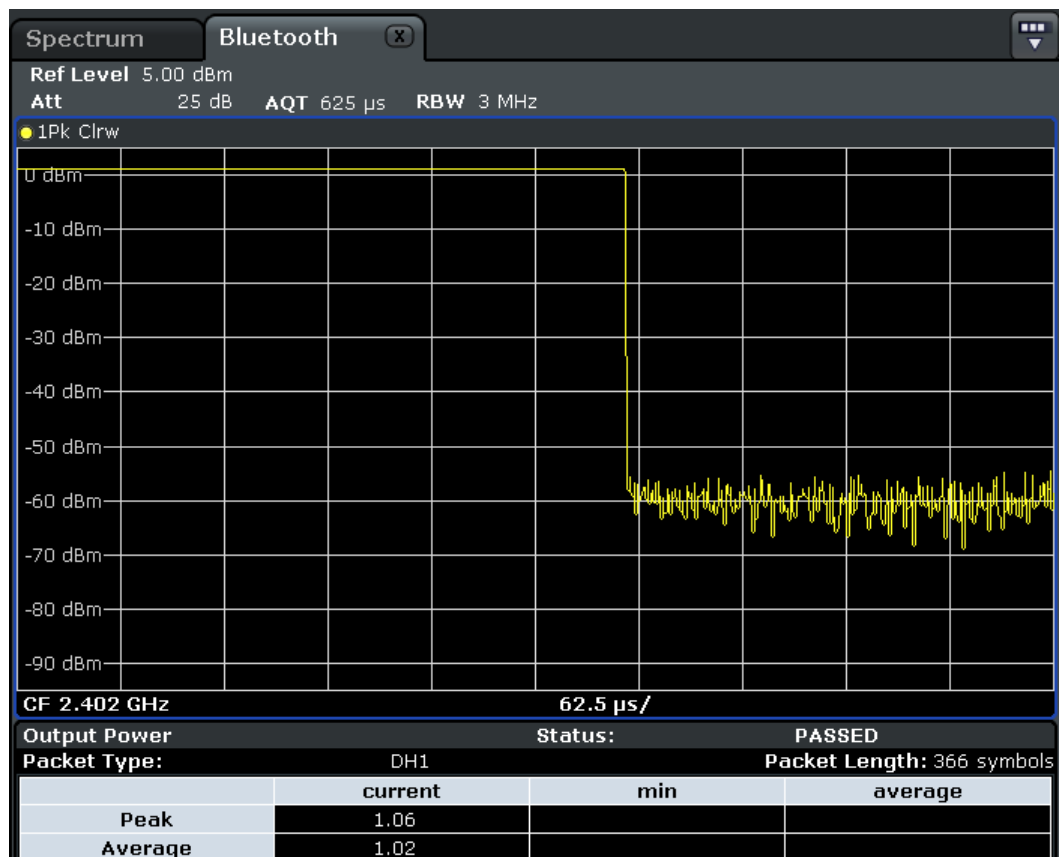


Fig. 3-4: Output power measurement

The peak value is determined from the complete contents of the measurement trace, whereas the average power is calculated from an area of at least 20% to 80% of the burst.

During the Output Power measurement the Bluetooth demodulator is active in order to determine the sync word within the signal, which is used as the trigger basis later. The Bluetooth demodulator is placed in a signal path without video filter. This is why the video filter cannot be activated with the Output Power measurement.

The EUT (equipment under test) must not exceed the following limits according to the RF Test Specification:

- $P_{AV} < 100 \text{ mW}$ (20 dBm) EIRP
- $P_{PK} < 200 \text{ mW}$ (23 dBm) EIRP
- If the EUT conforms to power class 1: $P_{AV} > 1 \text{ mW}$ (0 dBm)
- If the EUT conforms to power class 2: 0.25 mW (−6 dBm) $< P_{AV} < 2.5 \text{ mW}$ (4 dBm)
- If the EUT conforms to power class 3: $P_{AV} < 1 \text{ mW}$ (0 dBm)

A violation of these limits is marked on the screen in red color.

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Packet type
- Packet length
- Peak power (current packet value, minimum and average values of all previous and current packets)
- Average power (current packet value, minimum and average values of all previous and current packets)

3.2.1.2 Adjacent Channel Power Measurement

The measurement of the TX Output Spectrum – Adjacent Channel Power measurement (TX Spec ACLR softkey) measures the power of all adjacent channels.

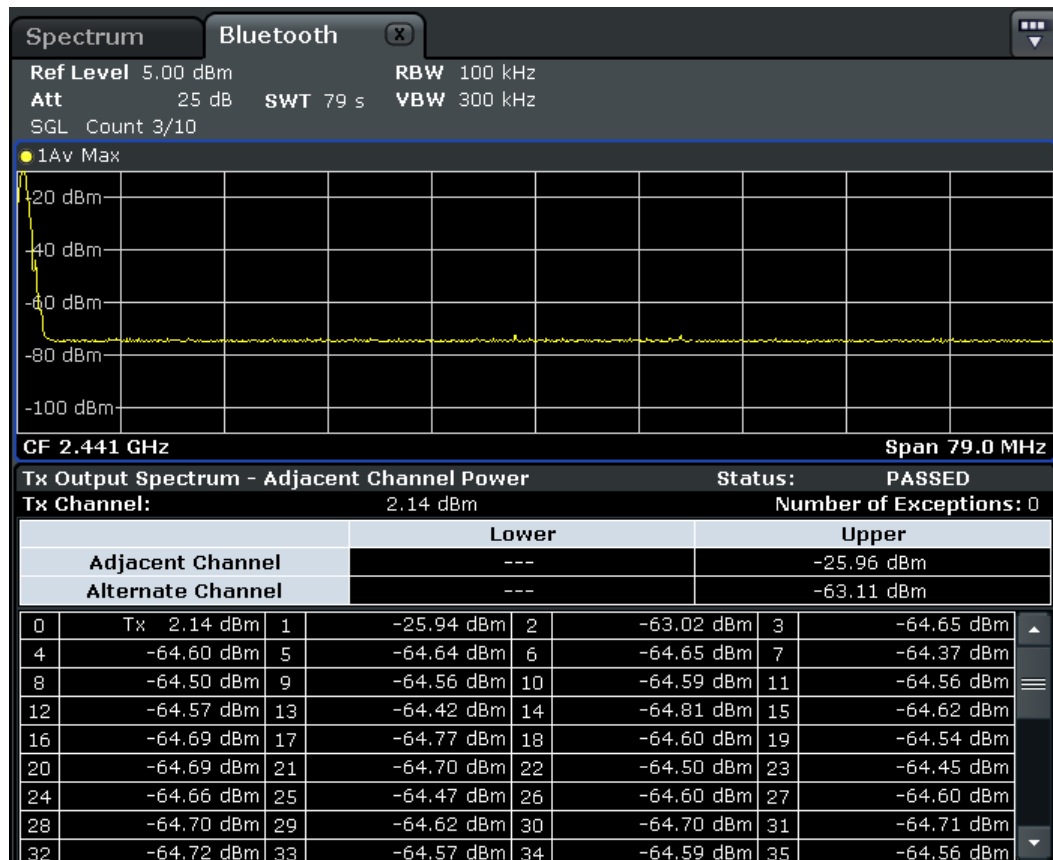


Fig. 3-5: TX Spectrum ACP measurement

The following limits are given by the RF Test Specification:

- $P_{TX}(f) \leq -20$ dBm for $|M-N| = 2$
- $P_{TX}(f) \leq -40$ dBm for $|M-N| \geq 3$

with M = Transmit channel of the equipment under test, N = adjacent channel to be measured. A violation of these limits is indicated on the screen by red color and an asterisk (*).

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Tx channel
- Number of Exceptions
- Lower and upper adjacent channel
- Lower and upper alternate channel
- Channel power for each channel

3.2.1.3 Modulation Characteristics Measurement

The measurement of the modulation characteristics (**Modulation Char** softkey) determines the maximum frequency deviation of all 8 bit sequences of the payload.

Additionally the average value of the maximum frequency deviation of a packet is calculated. Thus, the equipment under test is configured such that packets with bit patterns "111110000" and "10101010" are transmitted alternately. According to the RF Test Specification this sequence has to be repeated 10 times.

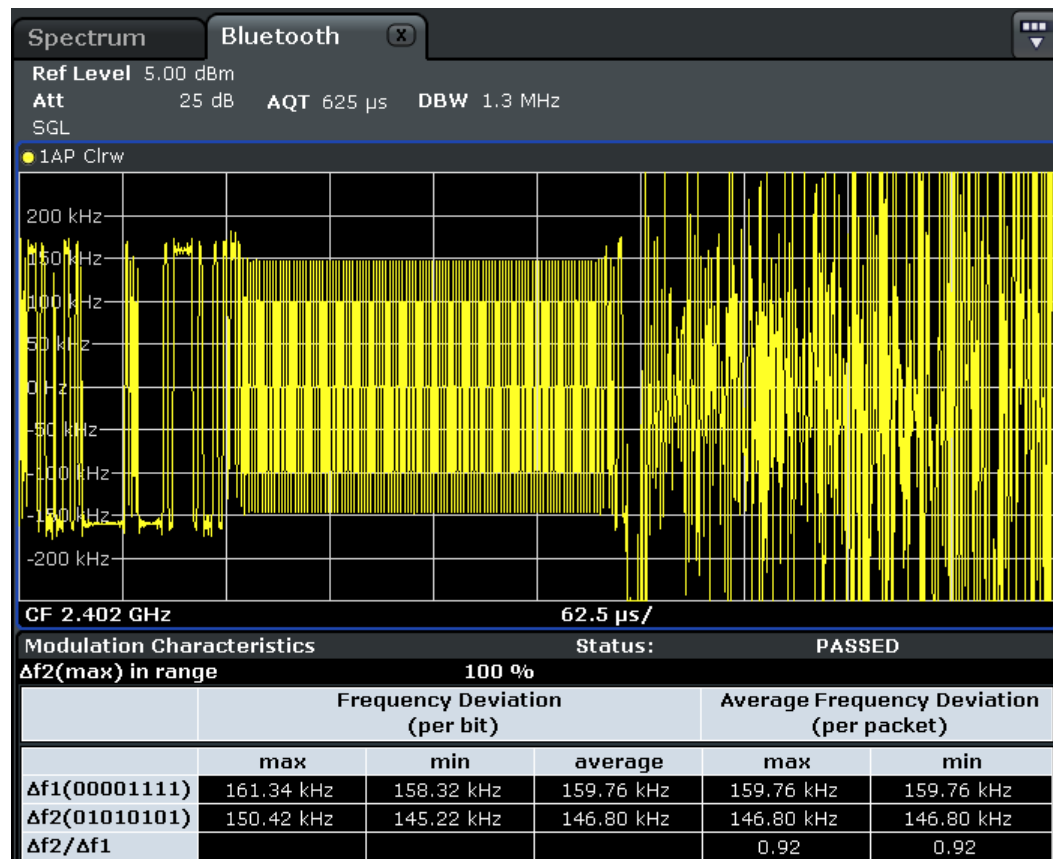


Fig. 3-6: Modulation Characteristics measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

| Label | Description |
|--|--|
| $\Delta f_2(\text{max})$ in range | Maximum frequency deviation in range |
| Frequency Deviation (per bit) | Maximum, minimum and average frequency deviation per bit |
| Average Frequency Deviation (per packet) | Minimum and maximum average frequency deviation per packet |
| Δf_1 (00001111) | Frequency deviation for bit pattern "00001111" |
| Δf_2 (01010101) | Frequency deviation for bit pattern "01010101" |
| $\Delta f_2/\Delta f_1$ | Ratio of the frequency deviations of both patterns |

3.2.1.4 Initial Carrier Frequency Tolerance Measurement

The measurement of the Initial Carrier Frequency Tolerance ([Init Carr Freq Tol](#) softkey) determines the carrier offset of the four preamble bits. According to the RF Test Specification the calculation of the carrier offset is performed from the middle of the first preamble bit to the middle of the bit following the preamble.

With "Clear/Write" trace mode and single sweep operation the selected number of sweeps is processed and, according to the RF Test Specification, the results of all sweeps are compared with the defined tolerance. If a different trace mode is selected, alternatively, the analyzer can combine several traces and determine the measurement results from the resulting trace.

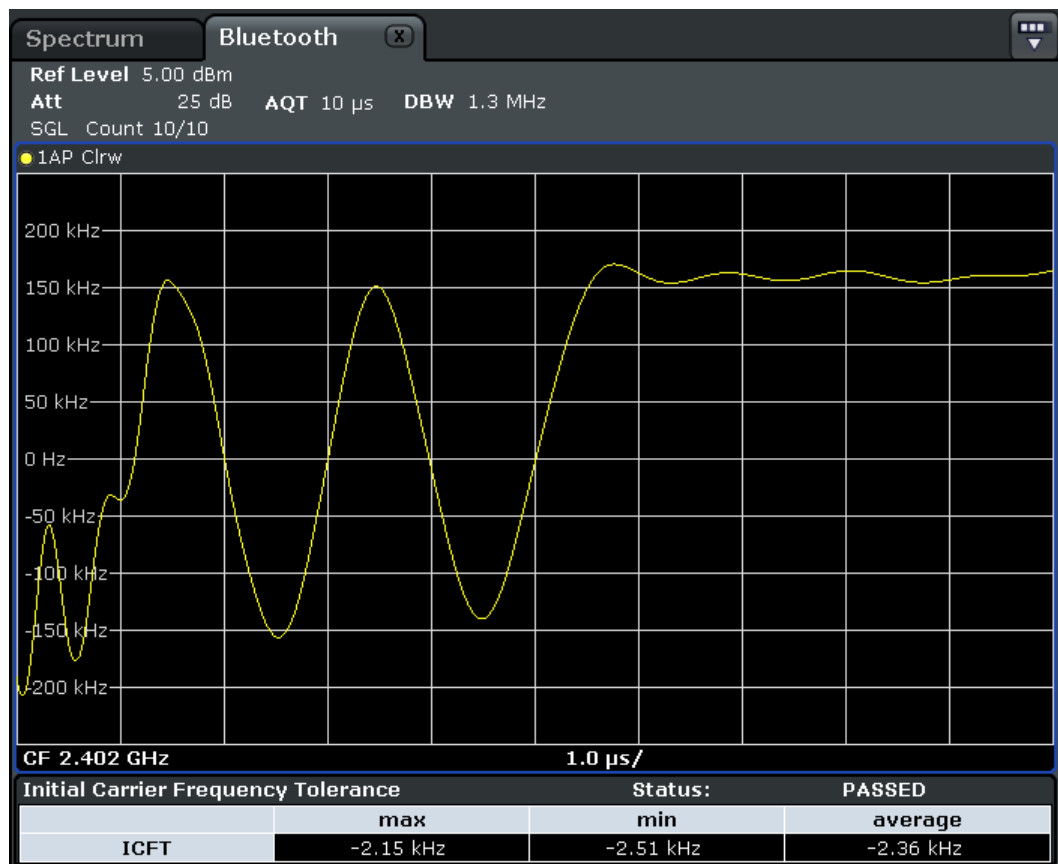


Fig. 3-7: Initial Carrier Frequency Tolerance measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Maximum, minimum and average initial carrier frequency tolerance

3.2.1.5 Carrier Frequency Drift Measurement

The measurement of the Carrier Frequency Drift (**Carr Freq Drift** softkey) determines the maximum frequency drift between the average value of the preamble bits and any 10 bit group of the payload. Additionally, the maximum drift rate between all 10 bit groups in the payload is determined every 50μs.

With "Clear/Write" trace mode and single sweep operation the selected number of sweeps is processed and, according to the RF Test Specification, the results of all sweeps are compared with the defined tolerance. If a different trace mode is selected, alternatively, the analyzer can combine several traces and determine the measurement results from the resulting trace.

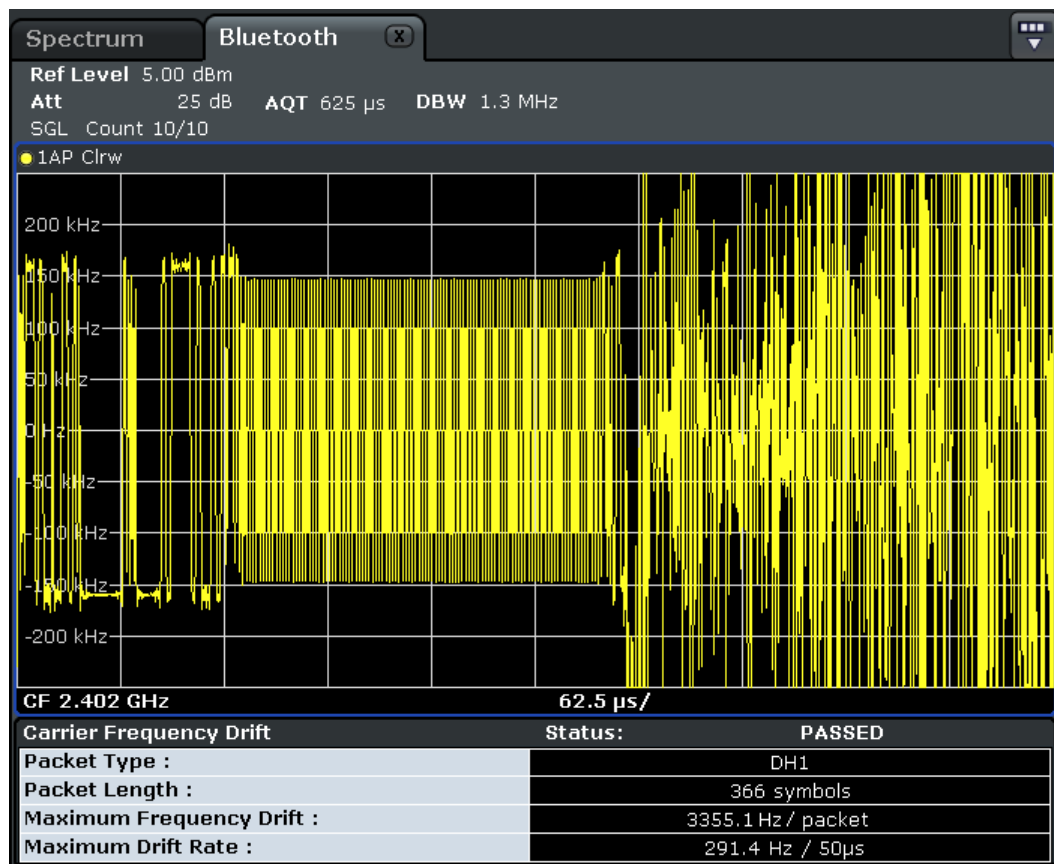


Fig. 3-8: Carrier Frequency Drift measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Packet type
- Packet length in symbols
- Maximum frequency drift per packet
- Maximum drift rate per 50 μs interval

3.2.1.6 Relative Transmit Power (EDR) Measurement

The measurement of the Relative Transmit Power (**Rel TX Power** softkey) is an enhanced data rate measurement (EDR). It determines the average transmission power of the GFSK and DPSK modulated parts of the signal and calculates the ratio of those values.

The measurement results must conform to the requirement:

- $(P_{\text{GFSK}} - 4\text{dB}) < P_{\text{DPSK}} < (P_{\text{GFSK}} + 1\text{dB})$

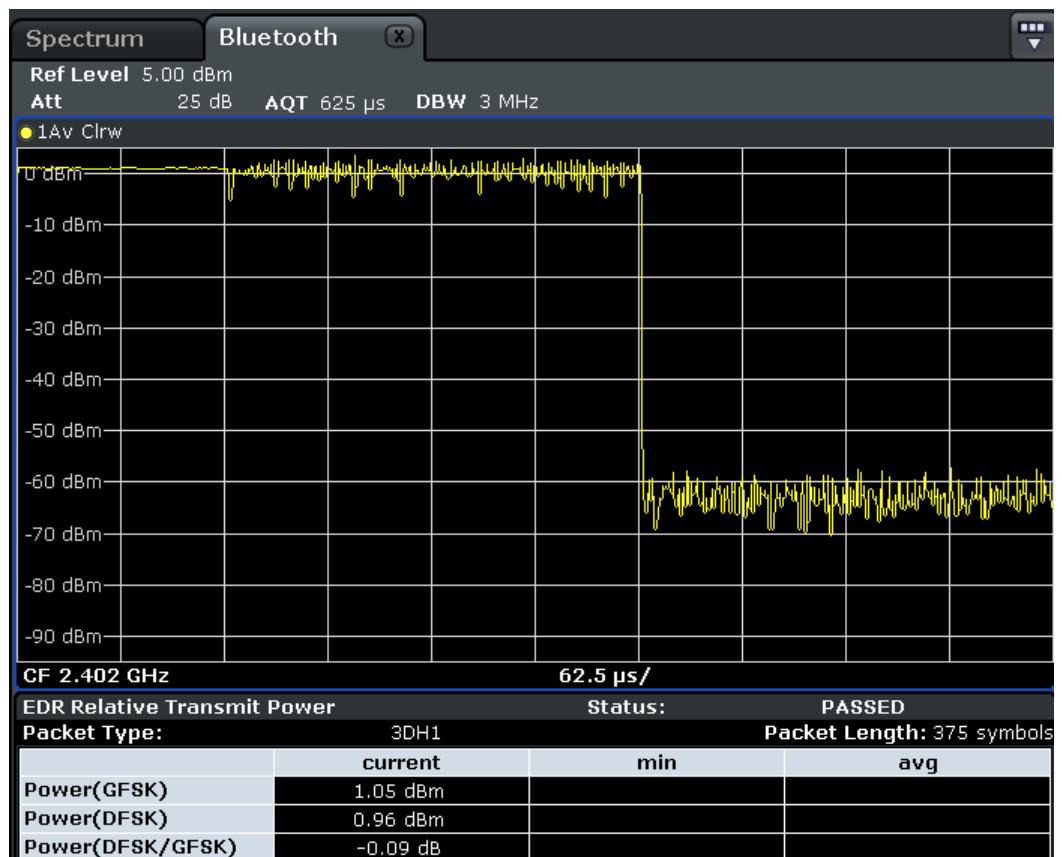


Fig. 3-9: Relative Transmit Power (EDR) measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Packet type
- Packet length in symbols
- Maximum, minimum and average power of the GFSK modulated part
- Maximum, minimum and average power of the DFSK modulated part
- Maximum, minimum and average ratio of the two powers

3.2.1.7 In-band Spurious Emissions (EDR) measurement

The measurement of the In-band Spurious Emissions ([Spurious Emissions](#) softkey) is an enhanced data rate measurement (EDR). It verifies whether the level of unwanted signals within the used frequency band lies below the required level. The analyzer records the signal only in those parts of the signal in which the instrument transmits DPSK-modulated data.

The signal must meet the following conditions:

- $P_{TX}(f) \leq -20 \text{ dBm}$ for $|M-N| = 2$

- $P_{TX}(f) \leq -40 \text{ dBm}$ for $|M-N| \geq 3$
with M = transmit channel of the equipment under test, N = adjacent channel to be measured
- The adjacent channel power between 1 MHz and 1.5 MHz from the carrier (Adj500kHz Low/Upp) shall be at least 26 dB below the maximum power of the carrier (TX Channel (Ref)).

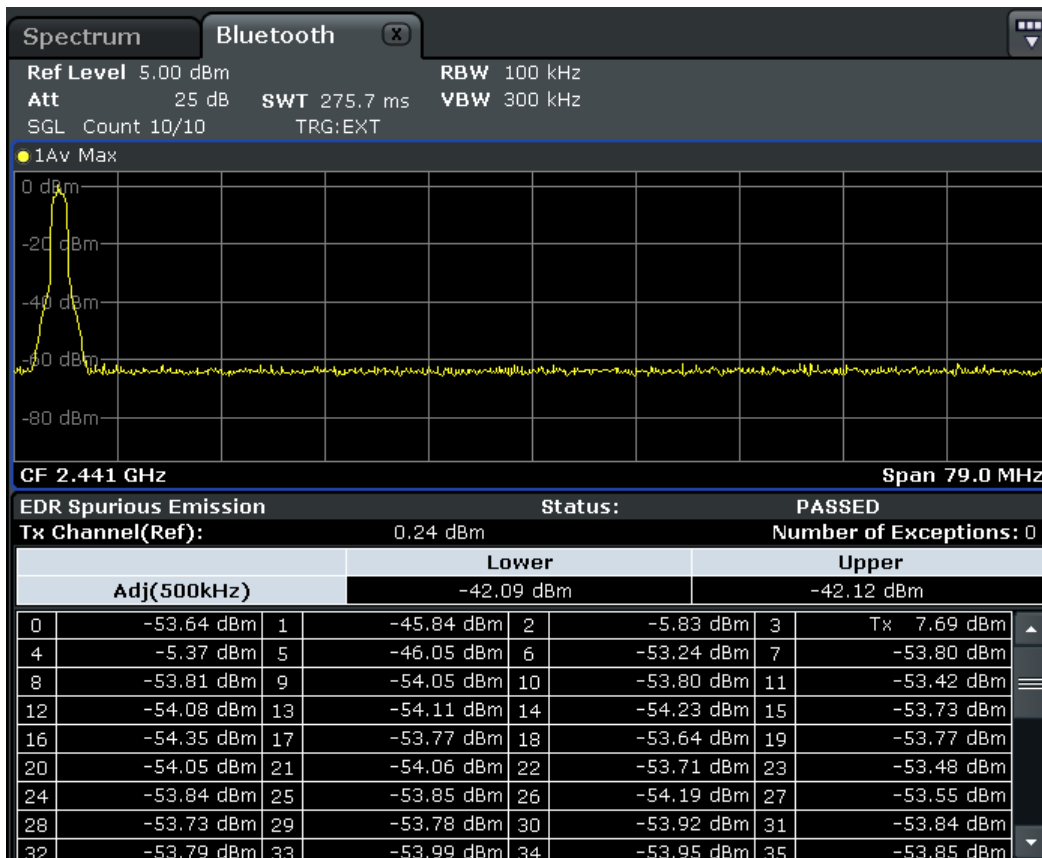


Fig. 3-10: In-band Spurious Emissions (EDR) measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Upper and lower adjacent channels (500 kHz from the carrier)
- Power level for each channel

3.2.1.8 Carrier Frequency Stability and Modulation Accuracy (EDR) measurement

The measurement of the Carrier Frequency Stability and Modulation Accuracy (Carr Freq Stability softkey) is an enhanced data rate measurement (EDR). It verifies that the modulation accuracy and the frequency stability are within the required limits. According to the RF Test Specification, the software records 200 blocks, each with a length of 50 μs

for the evaluation. The number of blocks to be recorded can be changed using the **Block Count (Carr Freq Stability)** softkey.



Fig. 3-11: Carrier Frequency Stability and Modulation Accuracy (EDR) measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

| Label | Description |
|---------------------|--|
| Packet Type | Packet type |
| Packet Length | Packet length in symbols |
| Initial Freq. Error | Minimum, maximum and average error in the initial frequency |
| Freq.Error/Block | Minimum, maximum and average frequency error per block |
| Total Freq. Error | Minimum, maximum and average frequency error per block + initial frequency error |
| DEVM (RMS) | Differential error vector magnitude as RMS value |

| Label | Description |
|-------------|--|
| DEVM (Peak) | Peak differential error vector magnitude |
| DEVM (99%) | 99-percentile of differential error vector magnitude |

3.2.1.9 Differential Phase Encoding (EDR) measurement

The measurement of the Differential Phase Encoding ([Diff Phase](#) softkey) is an enhanced data rate measurement (EDR). It checks whether the instrument modulates the data correctly in the time range of the DPSK modulation. Correct modulation is assumed if a specific bit pattern (PRBS9) is received from the sender. For each packet, this pattern is checked and each positive test result is counted.

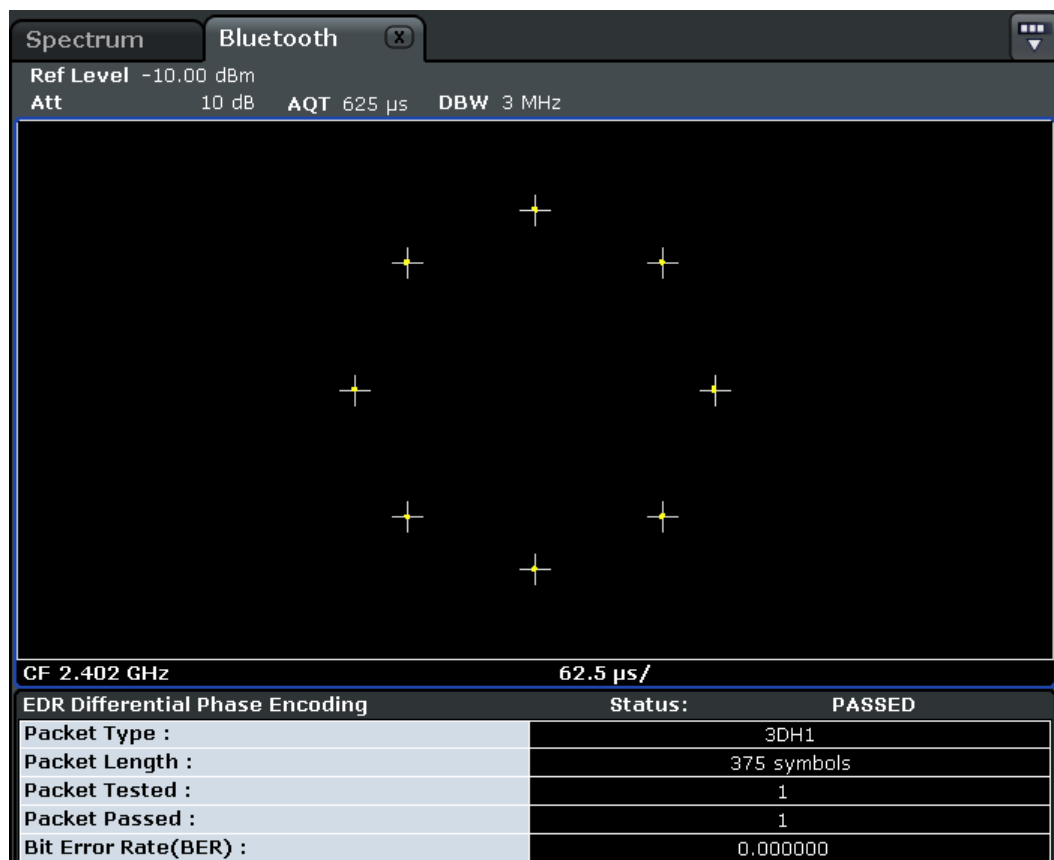


Fig. 3-12: Differential Phase Encoding (EDR) measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Packet type
- Packet length in symbols
- Packet tested (Number of tested packets)
- Packet passed (Number of successful tests, i.e. correctly modulated packets)

- Bit error rate

3.2.2 Adapting the settings to the characteristics of the DUT

1. Set the spectrum analyzer to its default state.
 - a) Press "PRESET".
The analyzer is set to its default state.
2. Select the Bluetooth operating mode.
 - a) Press "MODE" key.
 - b) In the "Measurement Modes" dialog box, select "Bluetooth".
The "Bluetooth" mode is activated and the main menu of the option is displayed.
3. Select the required measurement type to be performed.
 - a) Press "Standard" and select the required standard.
 - b) Press the softkey for the required measurement type.
The measurement configuration menu is displayed.
4. Select the transmit channel.
 - a) Press "Channel" softkey and enter the desired channel number.
5. Select the packet type and power class.
 - a) Press "Meas Setup".
The "Meas Setup Settings" dialog box is displayed.
 - b) Select the desired packet type.
 - c) Select the power class of the DUT.
 - d) Press "Close".
6. Configure the sync settings (LAP).
 - a) Press "Find Sync" softkey.
The "Find Sync" dialog box is displayed.
 - b) Enter the "LAP (lower address part)" of the Bluetooth device address of the DUT.
The sync word used for the sync search is calculated.
7. Configure measurement time, measurement control and the number of measurement cycles by pressing the corresponding softkeys. For further information refer to [chapter 3.2.8, "Softkeys of the Sweep Menu \(Bluetooth mode\)"](#), on page 54.

3.2.3 Softkeys of the Bluetooth Menu

The following softkeys and settings are available in the main "Bluetooth" menu which is displayed when you select the "Bluetooth" mode. The same menu is also displayed when "Bluetooth" mode is selected and you press the MEAS or HOME key.

[Standard](#).....34

| | |
|--|----|
| Output Power..... | 34 |
| L Channel..... | 34 |
| L Meas Setup..... | 35 |
| L Packet Type..... | 35 |
| L Packet Bytes SCO..... | 35 |
| L Power Class..... | 36 |
| L Points / Symbol..... | 36 |
| L Antenna Gain..... | 36 |
| L Selected Trace..... | 36 |
| L Find Sync..... | 36 |
| L LAP..... | 36 |
| L Find Sync On/Off..... | 37 |
| L Sync Offset..... | 37 |
| L Find Burst On/Off (Output Power)..... | 37 |
| L Burst Offset..... | 38 |
| L Search Len Auto..... | 38 |
| L Search Len Manual..... | 38 |
| L Power Avg Start (Output Power)..... | 39 |
| L Power Avg Stop (Output Power)..... | 39 |
| TX Spec ACLR..... | 39 |
| L Channel..... | 39 |
| L Meas Setup..... | 40 |
| L Find Sync..... | 40 |
| L No. of ACP Chan (TX Spec ACLR, Spurious Emissions)..... | 40 |
| Modulation Char..... | 40 |
| L Channel..... | 40 |
| L Meas Setup..... | 41 |
| L Find Sync..... | 41 |
| L Start Test (Modulation Char)..... | 41 |
| L Continue Test (Modulation Char)..... | 41 |
| L Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift)..... | 41 |
| Init Carr Freq Tol..... | 41 |
| L Channel..... | 42 |
| L Meas Setup..... | 42 |
| L Find Sync..... | 42 |
| L Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift)..... | 42 |
| Carr Freq Drift..... | 42 |
| L Channel..... | 42 |
| L Meas Setup..... | 43 |
| L Find Sync..... | 43 |
| L Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift)..... | 43 |
| Rel TX Power..... | 43 |
| L Channel..... | 43 |
| L Meas Setup..... | 43 |
| L Find Sync..... | 43 |
| L Settings..... | 43 |
| L GFSK Start..... | 44 |
| L GFSK Stop..... | 44 |
| L DPSK Start..... | 44 |
| L DPSK Stop..... | 44 |

| | |
|---|----|
| Spurious Emissions..... | 45 |
| L Channel..... | 45 |
| L Meas Setup..... | 45 |
| L Find Sync..... | 45 |
| L No. of ACP Chan (TX Spec ACLR, Spurious Emissions)..... | 45 |
| L Gate Delay (Spurious Emissions)..... | 46 |
| L Gate Length (Spurious Emissions)..... | 46 |
| L Adjust Gate..... | 46 |
| Carr Freq Stability..... | 46 |
| L Channel..... | 46 |
| L Meas Setup..... | 46 |
| L Find Sync..... | 47 |
| L Block Count (Carr Freq Stability)..... | 47 |
| Diff Phase..... | 47 |
| L Channel..... | 47 |
| L Meas Setup..... | 47 |
| L Find Sync..... | 47 |

Standard

Opens a dialog box to select the standard by which the Bluetooth measurements are performed.

Currently, the following standards are supported:

- Bluetooth 2.1 - Base Rate
- Bluetooth 2.1 - EDR

Depending on the selected standard, different measurement types are available via softkeys.

SCPI command:

Output Power

Opens a submenu to configure the Output Power measurement. For further details refer to [chapter 3.2.1.1, "Output Power Measurement"](#), on page 21.

SCPI command:

`CONF:BTO:MEAS OPOW`, see [CONFIGure:BT0oth:MEASurement](#) on page 93

`CALCulate<n>:BT0oth:OPOWER[:PEAK]` on page 79

`CALCulate<n>:BT0oth:OPOWER:AVERage` on page 80

Channel ← Output Power

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

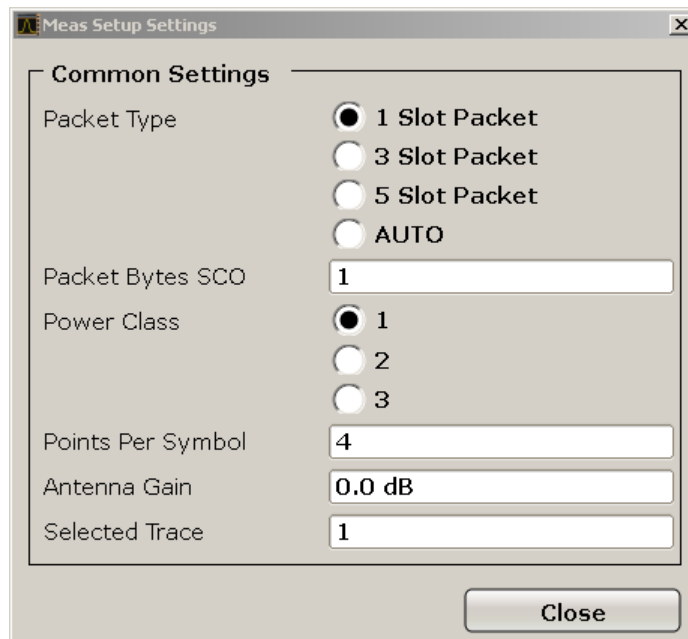
Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also [Center](#) softkey in the "Frequency" menu).

SCPI command:

`CONFIGure:BT0oth:CHANnel` on page 91

Meas Setup ← Output Power

Opens a dialog box for common measurement settings.

**Packet Type ← Meas Setup ← Output Power**

Defines the number of occupied slots in the sent packet.

The number of occupied slots is used for the automatic calculation of the sweep time ([Sweeptime Auto \(TX Spec ACLR\)](#) softkey) and the search length of the sync word ([Search Len Auto](#) setting).

The currently transmitted packet type is determined automatically by the Bluetooth demodulator (which means that the selected packet type need not necessarily correspond to the actually transmitted packet type; it will only affect the settings for sweep time and search length as described above).

"DH 1" 1 slot packet (default)

"DH 3" 3 slot packet

"DH 5 | AUTO" 5 slot packet

SCPI command:

[CONFigure:BT0oth:PTYPe](#) on page 96

Packet Bytes SCO ← Meas Setup ← Output Power

Defines the number of payload bytes that are transmitted in a packet. For SCO packets, the payload length must be adjusted because those packets have no payload header.

SCPI command:

[CONFigure:BT0oth:PBSCo](#) on page 94

Power Class ← Meas Setup ← Output Power

Selects one of the Bluetooth power classes (1 to 3). The selection of the power class determines the limits. The default setting is power class 1 (100 mW).

SCPI command:

[CONFigure:BT0oth:PClass](#) on page 94

Points / Symbol ← Meas Setup ← Output Power

Defines the number of measurement samples per symbol. For Basic Rate measurements, the possible values are 2, 4, 8, 16, 32. The default value is 4. For EDR measurements, the default value is set and cannot be changed.

The RF Test Specification requests an oversampling factor of at least 4. With this oversampling factor a 5 Slot Packet corresponds to 12500 measurement samples (= 2500 samples / slot).

SCPI command:

[CONFigure:BT0oth:PRATe](#) on page 95

Antenna Gain ← Meas Setup ← Output Power

Defines a level offset in order to take the gain of an antenna into account for displaying power values. The default setting is 0 dB. Offset values that are larger or smaller than 0 dB activate the enhancement label "TDF" at the right diagram border.

SCPI command:

[\[SENSe:\]CORRection:EGain:INPut\[:MAGNitude\]](#) on page 111

Selected Trace ← Meas Setup ← Output Power

Selects the measurement trace whose numeric results are displayed in the table below the diagram. By default, trace 1 is selected.

SCPI command:

[CONFigure:BT0oth:TRACe<t>:SElect](#) on page 100

Find Sync ← Output Power

Opens a dialog box to set the signal processing functions of the analyzer. They are necessary to determine the position of the first preamble bit p_0 by correlation with the sync word. Thus, a sufficient record length of the FM demodulated signal is necessary.

For further information refer to "Position of a Bluetooth burst" in [chapter 3.2, "Instrument Functions for Bluetooth Measurements \(K8\)"](#), on page 19.

LAP ← Find Sync ← Output Power

Defines the lower 24 bit Lower Address Part (LAP) of the Bluetooth Device Address (BD_ADDR) of the equipment under test (EUT).

The LAP is used to calculate the 64-bit sync word. The sync word in return is used to determine the start of a packet by correlation and to determine the position of the first preamble bit p_0 using the method described in the RF Test Specification.

The values for the lower address part range from 000000h to FFFFFFFh. The default setting is 0000000h.

SCPI command:

[\[SENSe:\]DDEMod:SEARch:SYNC:LAP](#) on page 119

Find Sync On/Off ← Find Sync ← Output Power

Activates or deactivates the search of the sync word. The default setting is activated.

The results of the modulation measurements Modulation Characteristics, Initial Carrier Frequency Tolerance, Carrier Frequency Drift can only be calculated if the softkey is activated. The measurement of the Output Power can be performed with either this softkey or the Find Burst On/Off softkey activated. If both softkeys are activated, the search area for the sync word will be limited to the area of the detected burst. If the Find Burst On/Off softkey is not activated or no burst is identified, the total record length (search length) is investigated.

SCPI command:

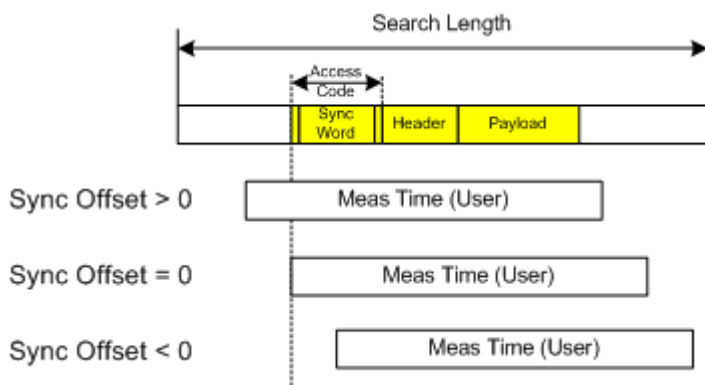
[\[SENSe\] : DDEMod : SEARch : SYNC : STATe](#) on page 118

Sync Offset ← Find Sync ← Output Power

Defines the number of bits to be displayed in front of the of the first preamble bit p_0 . If the sync word is identified, but the selected measurement time cannot be displayed due to the selected sync offset, the message "SYNC OFFSET INVALID" is displayed.

The value range depends on the search length and the upper limit of symbols (400001 points / symbol). The default setting for the sync offset is 0.

This softkey is only available if the [Find Sync On/Off](#) softkey is activated.



SCPI command:

[\[SENSe : \] DDEMod : SEARch : SYNC : OFFSet](#) on page 119

Find Burst On/Off (Output Power) ← Find Sync ← Output Power

Activates the burst search if the [Find Sync On/Off](#) softkey is deactivated. Beside the synchronization on the sync word, the Output Power measurement can perform a burst search to evaluate the signal according to the standard.

If the [Find Sync On/Off](#) softkey is not activated and no burst is identified, the message "BURST NOT FOUND" is displayed, and the corresponding bit in the `STATus:QUESTionable:SYNC` register is set during remote operation.

SCPI command:

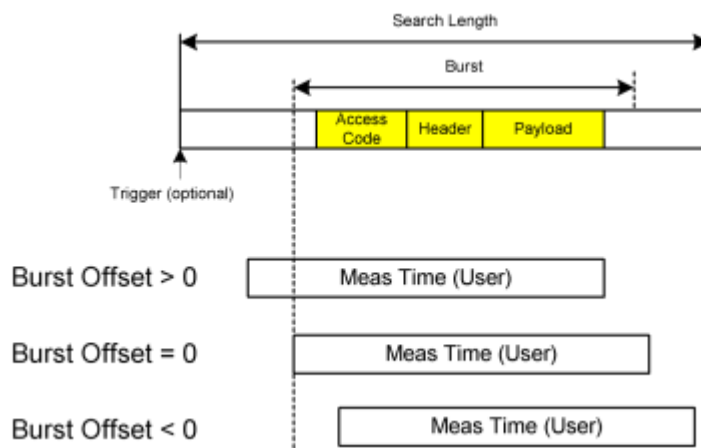
[\[SENSe : \] DDEMod : SEARch : PULSe \[: STATe\]](#) on page 118

Burst Offset ← Find Sync ← Output Power

Opens an edit dialog box to define the time to be displayed before the identified burst. The values range from –10 ms to + 10 ms, with negative values moving the burst to the left, positive values to the right. The default setting for the burst offset is 0.

If the burst is identified, but the selected measurement time cannot be displayed due to the selected burst offset, the message "BURST OFFSET INVALID" is displayed.

This softkey is only available if the [Find Sync On/Off](#) is deactivated and the [Find Burst On/Off \(Output Power\)](#) softkey is activated.



SCPI command:

[\[SENSe:\] DDEMod:SEARch:PULSe:OFFSet](#) on page 118

Search Len Auto ← Find Sync ← Output Power

Activates or deactivates the automatic selection of the search length for the search of the sync word or the burst, depending on the selected packet type. The automatic search length is determined as follows:

Trigger free run:

$\text{search length} = 3 * \text{packet length} + |\text{sync offset or burst offset}|$

All other trigger modes:

$\text{search length} = 1 * \text{packet length} + 1 \text{ Slot} + |\text{sync offset or burst offset}|$

If the selected measurement time is higher than the packet length, the following difference is added to the search length:

$\text{measurement time} - \text{packet length}$

In the default setting, the automatic calculation of the search length is activated.

SCPI command:

[\[SENSe:\] DDEMod:SEARch:TIME:AUTO](#) on page 120

Search Len Manual ← Find Sync ← Output Power

Opens an edit dialog box to enter the search length used for determining the sync word or the burst. The unit of the search length is seconds; the values range from 100 μs to (400001 / points per symbol) μs . The default setting is 1825 μs .

The selected number of points per symbol and the maximum search length is listed in the table below.

| Points per symbol | Max. search length (number of slots) |
|-------------------|---|
| 2 | 104.4 |
| 4 | 52.2 |
| 8 | 26.1 |
| 16 | 13.1 |
| 32 | 6.5 |

For information on the correlation of trigger and record length refer to the [Search Len Auto](#) softkey.

SCPI command:

[\[SENSe:\] DDEMod:SEARch:TIME](#) on page 119

Power Avg Start (Output Power) ← Output Power

Opens an edit dialog box to enter the start position of the evaluation area for the average burst power. The values range is from 0 to 100%, the default setting is 20%.

For further information refer to [chapter 3.1, "Introduction to Bluetooth Measurements \(K8\)"](#), on page 9.

SCPI command:

[CONFigure:BT0oth:POWer:AVERage:STARt](#) on page 94

Power Avg Stop (Output Power) ← Output Power

Opens an edit dialog box to enter the stop position of the evaluation area for the average burst power. The values range from 0 to 100%, the default setting is 80%.

For further information refer to [chapter 3.1, "Introduction to Bluetooth Measurements \(K8\)"](#), on page 9.

SCPI command:

[CONFigure:BT0oth:POWer:AVERage:STOP](#) on page 95

TX Spec ACLR

Opens a submenu to configure the TX Spec ACLR measurement. For further details refer to [chapter 3.2.1.2, "Adjacent Channel Power Measurement"](#), on page 23.

SCPI command:

[CONF:BT0:MEAS ACLR](#), see [CONFigure:BT0oth:MEASurement](#) on page 93

[CALCulate<n>:BT0oth:ACLR\[:LIST\]](#) on page 66

[CALCulate<n>:BT0oth:ACLR:EXCeptions](#) on page 66

Channel ← TX Spec ACLR

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also [Center](#) softkey in the "Frequency" menu).

SCPI command:

[CONFigure:BT0oth:CHANnel](#) on page 91

Meas Setup ← TX Spec ACLR

Opens a dialog box for common measurement settings, see ["Meas Setup"](#) on page 35.

Find Sync ← TX Spec ACLR

Opens a dialog box to set the signal processing functions of the analyzer, see ["Find Sync"](#) on page 36.

No. of ACP Chan (TX Spec ACLR, Spurious Emissions) ← TX Spec ACLR

Opens an edit dialog box to enter the number of adjacent channels, for which the power is to be measured. The values range from 0 to 78. A minimum value of 3 is recommended. The default setting is 78 (all channels).

As with the ACP measurement of the basic instrument firmware this value refers to the number of adjacent channels on one side of the TX channel. This means that with a selected value of 10 the analyzer will measure in total 21 channels (10 lower channels + TX channel + 10 upper channels).

The frequency range required for the measurement is set up automatically. The center frequency will also be adapted automatically dependent on the selected TX channel.

The measurement of the adjacent channels is limited to the available Bluetooth frequency band, which means that at maximum 79 channels (23 channels in France) will be measured.

SCPI command:

[CONFigure:BT0oth:ACLR:ACPairs](#) on page 88

[CONFigure:BT0oth:IBSemiissions:ACPairs](#) on page 92

Modulation Char

Opens a submenu to configure the Modulation Char measurement. For further details refer to [chapter 3.2.1.3, "Modulation Characteristics Measurement"](#), on page 24.

SCPI command:

[CONF:BT0:MEAS MCH](#), see [CONFigure:BT0oth:MEASurement](#) on page 93

[CALCulate<n>:BT0oth:MCHar:DF<Delta>:AVERage](#) on page 76

[CALCulate<n>:BT0oth:MCHar:DF<Delta>:MAXimum](#) on page 77

[CALCulate<n>:BT0oth:MCHar:DF2:PERCent](#) on page 78

[CALCulate<n>:BT0oth:MCHar:RATio](#) on page 78

Channel ← Modulation Char

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also [Center](#) softkey in the "Frequency" menu).

SCPI command:

[CONFigure:BT0oth:CHANnel](#) on page 91

Meas Setup ← Modulation Char

Opens a dialog box for common measurement settings, see ["Meas Setup"](#) on page 35.

Find Sync ← Modulation Char

Opens a dialog box to set the signal processing functions of the analyzer, see ["Find Sync"](#) on page 36.

Start Test (Modulation Char) ← Modulation Char

Initiates a new measurement. All frequency deviation values obtained earlier are discarded.

The bit pattern in the payload is detected automatically. The frequency deviation of a packet is determined according to the procedure defined in the RF Test Specification.

SCPI command:

INIT;*WAI

Continue Test (Modulation Char) ← Modulation Char

Measures the frequency deviation of further packets after the bit pattern has been changed at the EUT, just like the "Start Test" softkey did for the first bit pattern type. The results of the preceding measurement are preserved and are taken into account for the new measurements.

SCPI command:

INIT:CONM;*WAI

Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift) ← Modulation Char

Activates or deactivates the zoom function. Opens an edit dialog box to enter the zoom start position. The valid value range for the zoom start position is 0 to (measurement time – 500 / sampling rate). The default setting for the zoom function is 0s (off).

With active zoom function, an area of only 501 samples is displayed.

SCPI command:

[\[SENSe:\]ADEMod:ZOOM\[:STATe\]](#) on page 116

[\[SENSe:\]ADEMod:ZOOM:START](#) on page 117

Init Carr Freq Tol

Opens a submenu to configure the Init Carr Freq Tol measurement. For further details refer to [chapter 3.2.1.4, "Initial Carrier Frequency Tolerance Measurement"](#), on page 25.

SCPI command:

CONF:BT0:MEAS IFCT, see [CONFigure:BT0oth:MEASurement](#) on page 93

[CALCulate<n>:BT0oth:ICFTolerance](#) on page 76

Channel ← Init Carr Freq Tol

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also [Center](#) softkey in the "Frequency" menu).

SCPI command:

[CONFigure:BT0oth:CHANnel](#) on page 91

Meas Setup ← Init Carr Freq Tol

Opens a dialog box for common measurement settings, see ["Meas Setup"](#) on page 35.

Find Sync ← Init Carr Freq Tol

Opens a dialog box to set the signal processing functions of the analyzer, see ["Find Sync"](#) on page 36.

Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift) ← Init Carr Freq Tol

Activates or deactivates the zoom function. Opens an edit dialog box to enter the zoom start position. The valid value range for the zoom start position is 0 to (measurement time – 500 / sampling rate). The default setting for the zoom function is 0s (off).

With active zoom function, an area of only 501 samples is displayed.

SCPI command:

[\[SENSe:\]ADEMod:ZOOM\[:STATe\]](#) on page 116

[\[SENSe:\]ADEMod:ZOOM:START](#) on page 117

Carr Freq Drift

Opens a submenu to configure the Carr Freq Drift measurement. For further details refer to [chapter 3.2.1.5, "Carrier Frequency Drift Measurement"](#), on page 26.

SCPI command:

[CONF:BT0:MEAS CFDR](#), see [CONFigure:BT0oth:MEASurement](#) on page 93

[CALCulate<n>:BT0oth:CFDRift\[:MAXimum\]](#) on page 67

[CALCulate<n>:BT0oth:CFDRift:RATE](#) on page 67

Channel ← Carr Freq Drift

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also [Center](#) softkey in the "Frequency" menu).

SCPI command:

[CONFigure:BT0oth:CHANnel](#) on page 91

Meas Setup ← Carr Freq Drift

Opens a dialog box for common measurement settings, see "[Meas Setup](#)" on page 35.

Find Sync ← Carr Freq Drift

Opens a dialog box to set the signal processing functions of the analyzer, see "[Find Sync](#)" on page 36.

Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift) ← Carr Freq Drift

Activates or deactivates the zoom function. Opens an edit dialog box to enter the zoom start position. The valid value range for the zoom start position is 0 to (measurement time – 500 / sampling rate). The default setting for the zoom function is 0s (off).

With active zoom function, an area of only 501 samples is displayed.

SCPI command:

[\[SENSe:\]ADEMod:ZOOM\[:STATe\]](#) on page 116

[\[SENSe:\]ADEMod:ZOOM:START](#) on page 117

Rel TX Power

Opens a submenu to configure the Rel TX Power measurement. For further details refer to [chapter 3.2.1.6, "Relative Transmit Power \(EDR\) Measurement"](#), on page 27.

SCPI command:

[CONF:BTO:MEAS RTP](#), see [CONFigure:BT0oth:MEASurement](#) on page 93

[CALCulate<n>:BT0oth:RTPower:\[DPSK\]](#) on page 82

[CALCulate<n>:BT0oth:RTPower:GFSK](#) on page 83

[CALCulate<n>:BT0oth:RTPower:RATio](#) on page 83

Channel ← Rel TX Power

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also [Center](#) softkey in the "Frequency" menu).

SCPI command:

[CONFigure:BT0oth:CHANnel](#) on page 91

Meas Setup ← Rel TX Power

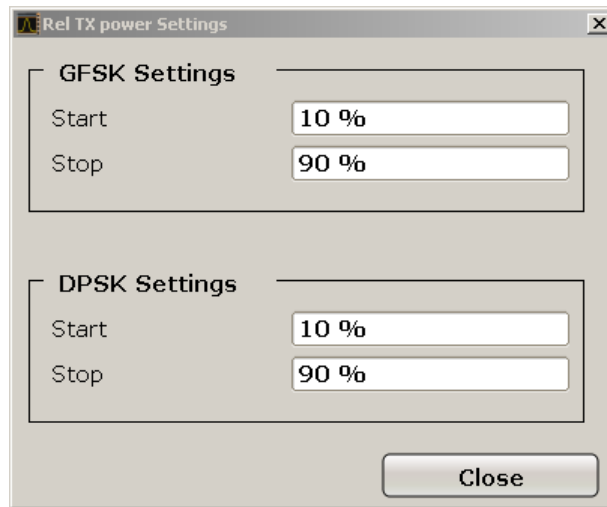
Opens a dialog box for common measurement settings, see "[Meas Setup](#)" on page 35.

Find Sync ← Rel TX Power

Opens a dialog box to set the signal processing functions of the analyzer, see "[Find Sync](#)" on page 36.

Settings ← Rel TX Power

Opens a dialog box to define the start and stop times for power measurements.

**GFSK Start ← Settings ← Rel TX Power**

Defines the start time for the power measurement of the GFSK sections of the packet. The default value is 10%.

The abbreviation GFSK stands for "Gaussian Frequency Shift Keying".

SCPI command:

[CONFfigure:BT0oth:RTPower:GAverage:START](#) on page 97

GFSK Stop ← Settings ← Rel TX Power

Defines the stop time for the power measurement of the GFSK sections of the packet. The default value is 90%.

The abbreviation GFSK stands for "Gaussian Frequency Shift Keying".

SCPI command:

[CONFfigure:BT0oth:RTPower:GAverage:STOP](#) on page 97

DPSK Start ← Settings ← Rel TX Power

Defines the start time for the power measurement of the DPSK sections of the packet. The default value is 10%.

The abbreviation DPSK stands for "Differential Phase Shift Keying".

SCPI command:

[CONFfigure:BT0oth:RTPower:DAverage:START](#) on page 96

DPSK Stop ← Settings ← Rel TX Power

Defines the stop time for the power measurement of the DPSK sections of the packet. The default value is 90%.

The abbreviation DPSK stands for "Differential Phase Shift Keying".

SCPI command:

[CONFfigure:BT0oth:RTPower:DAverage:STOP](#) on page 96

Spurious Emissions

Opens a submenu to configure the Spurious Emissions measurement. For further details refer to [chapter 3.2.1.7, "In-band Spurious Emissions \(EDR\) measurement"](#), on page 28.

SCPI command:

`CONF:BTO:MEAS IBS`, see `CONFigure:BT0oth:MEASurement` on page 93

`CALCulate<n>:BT0oth:IBSemissions:[List]` on page 74

`CALCulate<n>:BT0oth:IBSemissions:EXCeptions` on page 74

`CALCulate<n>:BT0oth:IBSemissions:HADJacent` on page 75

Channel ← Spurious Emissions

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also [Center](#) softkey in the "Frequency" menu).

SCPI command:

`CONFigure:BT0oth:CHANnel` on page 91

Meas Setup ← Spurious Emissions

Opens a dialog box for common measurement settings, see ["Meas Setup"](#) on page 35.

Find Sync ← Spurious Emissions

Opens a dialog box to set the signal processing functions of the analyzer, see ["Find Sync"](#) on page 36.

No. of ACP Chan (TX Spec ACLR, Spurious Emissions) ← Spurious Emissions

Opens an edit dialog box to enter the number of adjacent channels, for which the power is to be measured. The values range from 0 to 78. A minimum value of 3 is recommended. The default setting is 78 (all channels).

As with the ACP measurement of the basic instrument firmware this value refers to the number of adjacent channels on one side of the TX channel. This means that with a selected value of 10 the analyzer will measure in total 21 channels (10 lower channels + TX channel + 10 upper channels).

The frequency range required for the measurement is set up automatically. The center frequency will also be adapted automatically dependent on the selected TX channel.

The measurement of the adjacent channels is limited to the available Bluetooth frequency band, which means that at maximum 79 channels (23 channels in France) will be measured.

SCPI command:

`CONFigure:BT0oth:ACLR:ACPairs` on page 88

`CONFigure:BT0oth:IBSemissions:ACPairs` on page 92

Gate Delay (Spurious Emissions) ← Spurious Emissions

Opens an edit dialog box to enter the time between trigger event and start of the DPSK packet. That is the measurement start time.

SCPI command:

[\[SENSe:\]SWEep:EGATe:HOLDoff](#) on page 113

Gate Length (Spurious Emissions) ← Spurious Emissions

Opens an edit dialog box to enter the sweep time in seconds. Usually, this is the length of the DPSK section.

SCPI command:

[\[SENSe:\]SWEep:EGATe:LENGth](#) on page 113

Adjust Gate ← Spurious Emissions

Adjusts the gate settings according to the pre-measurement results.

SCPI command:

[CONFigure:BT0oth:IBSemiissions:GATE:AUTO ONCE](#) on page 92

Carr Freq Stability

Opens a submenu to configure the Carr Freq Stability measurement. For further details refer to [chapter 3.2.1.8, "Carrier Frequency Stability and Modulation Accuracy \(EDR\) measurement"](#), on page 29.

SCPI command:

[CONF:BT0:MEAS CFST](#), see [CONFigure:BT0oth:MEASurement](#) on page 93

[CALCulate<n>:BT0oth:CFSTability:FERRor:\[TOTal\]](#) on page 70

[CALCulate<n>:BT0oth:CFSTability:FERRor:BLOCK](#) on page 71

[CALCulate<n>:BT0oth:CFSTability:FERRor:INITial](#) on page 71

[CALCulate<n>:BT0oth:CFSTability:DEVM:\[RMS\]](#) on page 68

[CALCulate<n>:BT0oth:CFSTability:DEVM:PEAK](#) on page 70

[CALCulate<n>:BT0oth:CFSTability:DEVM:D99Pct](#) on page 69

[CALCulate<n>:BT0oth:CFSTability:COUNT](#) on page 68

Channel ← Carr Freq Stability

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also [Center](#) softkey in the "Frequency" menu).

SCPI command:

[CONFigure:BT0oth:CHANnel](#) on page 91

Meas Setup ← Carr Freq Stability

Opens a dialog box for common measurement settings, see ["Meas Setup"](#) on page 35.

Find Sync ← Carr Freq Stability

Opens a dialog box to set the signal processing functions of the analyzer, see "[Find Sync](#)" on page 36.

Block Count (Carr Freq Stability) ← Carr Freq Stability

Opens an edit dialog box to enter the number of blocks to be measured. Every block has the length of 50 μ s. The default value is 200 blocks.

This softkey is only available in single sweep operation.

SCPI command:

[CONFigure:BT0oth:CFSTability:BCOunt](#) on page 91

Diff Phase

Opens a submenu to configure the Diff Phase measurement. For further details refer to [chapter 3.2.1.9, "Differential Phase Encoding \(EDR\) measurement"](#), on page 31.

SCPI command:

[CONF:BT0:MEAS DPEN](#), see [CONFigure:BT0oth:MEASurement](#) on page 93

[CALCulate<n>:BT0oth:DPENcoding:NERRor](#) on page 73

[CALCulate<n>:BT0oth:DPENcoding:\[TOTal\]](#) on page 72

[CALCulate<n>:BT0oth:DPENcoding:BER](#) on page 73

Channel ← Diff Phase

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also [Center](#) softkey in the "Frequency" menu).

SCPI command:

[CONFigure:BT0oth:CHANnel](#) on page 91

Meas Setup ← Diff Phase

Opens a dialog box for common measurement settings, see "[Meas Setup](#)" on page 35.

Find Sync ← Diff Phase

Opens a dialog box to set the signal processing functions of the analyzer, see "[Find Sync](#)" on page 36.

3.2.4 Softkeys of the MEAS CONFIG menu

The MEAS CONFIG key provides direct access to the submenu of the currently selected measurement type. For a description of the submenus, see the corresponding keys in [chapter 3.2.3, "Softkeys of the Bluetooth Menu"](#), on page 32.

3.2.5 Softkeys of the Amplitude Menu (Bluetooth Mode)

The following table shows all softkeys available in the amplitude menu in Bluetooth mode (AMPT key). It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

Ref Level

Opens an edit dialog box to enter the reference level in the currently active unit (dBm, dB μ V, etc).

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](#) on page 102

Range Log Manual

Opens an edit dialog box to enter a value for logarithmic scaling for the level display range.

SCPI command:

`DISP:WIND:TRAC:Y:SPAC LOG`

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104.)

Not available for Carr Freq Drift, Init Carr Freq Tol, and Modulation Char measurements.

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 101

Range

Opens a submenu to define the level display range.

Range Log 100 dB ← Range

Sets the level display range to 100 dB.

SCPI command:

`DISP:WIND:TRAC:Y:SPAC LOG`

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104.)

`DISP:WIND:TRAC:Y 100DB` (see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 101).

Range Log 50 dB ← Range

Sets the level display range to 50 dB.

SCPI command:

`DISP:WIND:TRAC:Y:SPAC LOG`

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104.)

`DISP:WIND:TRAC:Y 50DB`

Sets the level display range to 50 dB (see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 101).

Range Log 10 dB ← Range

Sets the level display range to 10 dB.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104.)

DISP:WIND:TRAC:Y 10DB (see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 101).

Range Log 5 dB ← Range

Sets the level display range to 5 dB.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104.)

DISP:WIND:TRAC:Y 5DB (see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 101).

Range Log 1 dB ← Range

Sets the level display range to 1 dB.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104.)

DISP:WIND:TRAC:Y 1DB (see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 101).

Range Log Manual ← Range

Opens an edit dialog box to enter a value for logarithmic scaling for the level display range.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104.)

Not available for Carr Freq Drift, Init Carr Freq Tol, and Modulation Char measurements. [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 101

Range Linear % ← Range

Selects linear scaling in % for the level display range, i.e. the horizontal grid lines are labeled in %. The grid is divided in decadal steps.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in % referenced to the voltage value at the position of marker 1. This is the default setting for linear scaling.

SCPI command:

DISP:TRAC:Y:SPAC LIN,see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104

Range Lin. Unit ← Range

Selects linear scaling in dB for the level display range, i.e. the horizontal lines are labeled in dB.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in dB referenced to the power value at the position of marker 1.

SCPI command:

DISP:TRAC:Y:SPAC LDB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104

Preamp On/Off (option RF Preamplifier, B22/B24)

Switches the preamplifier on or off.

If option R&S FSV-B22 is installed, the preamplifier is only active below 7 GHz.

If option R&S FSV-B24 is installed, the preamplifier is active for all frequencies.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

SCPI command:

[INPut:GAIN:STATe](#) on page 107

RF Atten Manual/Mech Att Manual

Opens an edit dialog box to enter the attenuation, irrespective of the reference level. If electronic attenuation is activate (option R&S FSV-B25 only; "EI Atten Mode Auto" softkey), this setting defines the mechanical attenuation.

The mechanical attenuation can be set in 10 dB steps.

The RF attenuation can be set in 5 dB steps (with option R&S FSV-B25: 1 dB steps). The range is specified in the data sheet. If the defined reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Note: Values under 10 dB can only be entered via the numeric keypad or via remote control command in order to protect the input mixer against overload.

The RF attenuation defines the level at the input mixer according to the formula:

$$\text{"level}_{\text{mixer}} = \text{level}_{\text{input}} - \text{RF attenuation"}$$

The maximum mixer level allowed is -10 dBm. mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVLD" status display.

SCPI command:

[INPut:ATTenuation](#) on page 106

RF Atten Auto/Mech Att Auto

Sets the RF attenuation automatically as a function of the selected reference level. This ensures that the optimum RF attenuation is always used. It is the default setting.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

SCPI command:

[INPut:ATTenuation:AUTO](#) on page 107

Ref Level Offset

Opens an edit dialog box to enter the arithmetic level offset. This offset is added to the measured level irrespective of the selected unit. The scaling of the y-axis is changed accordingly. The setting range is ± 200 dB in 0.1 dB steps.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 103

Ref Level Position

Opens an edit dialog box to enter the reference level position, i.e. the position of the maximum AD converter value on the level axis. The setting range is from -200 to +200 %, 0 % corresponding to the lower and 100 % to the upper limit of the diagram.

Not available for Carr Freq Drift, Init Carr Freq Tol, and Modulation Char measurements.

Grid Abs/Rel

Switches between absolute and relative scaling of the level axis (not available with "Linear" range).

Not available for Carr Freq Drift, Init Carr Freq Tol, and Modulation Char measurements.

"Abs" Absolute scaling: The labeling of the level lines refers to the absolute value of the reference level. Absolute scaling is the default setting.

"Rel" Relative scaling: The upper line of the grid is always at 0 dB. The scaling is in dB whereas the reference level is always in the set unit (for details on unit settings see the "Unit" softkey).

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE` on page 101

Input 50 Ω /75 Ω

Uses 50 Ω or 75 Ω as reference impedance for the measured levels. Default setting is 50 Ω .

The setting 75 Ω should be selected if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = $10 \log(75 \Omega/50 \Omega)$.

All levels specified in this Operating Manual refer to the default setting of the instrument (50 Ω).

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

SCPI command:

`INPut:IMPedance` on page 107

3.2.6 Softkeys of the Bandwidth Menu (option R&S FSV-K8)

The following section describes all softkeys available in the "Bandwidth" menu in Bluetooth mode (BW key). It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

[Sweeptime Manual \(TX Spec ACLR\)](#).....52

| | |
|---|----|
| Sweeptime Auto (TX Spec ACLR)..... | 52 |
| Meas Time Manual..... | 52 |
| Meas Time Auto..... | 52 |
| Res BW Manual (Output Power, Rel TX Power)..... | 52 |
| Res BW Auto (Output Power, TX Spec ACLR, Rel TX Power, Spurious Emissions) | 53 |
| Video BW Manual (TX Spec ACLR)..... | 53 |
| Video BW Auto (TX Spec ACLR, Spurious Emissions)..... | 53 |
| Filter Type (Output Power, TX Spec ACLR, Spurious Emissions, Rel TX Power)..... | 53 |
| Meas Filter (Modulation Char, Init Carr Freq Tol, Carr Freq Drift)..... | 53 |

Sweeptime Manual (TX Spec ACLR)

Opens an edit dialog box to enter the sweep time. The valid value range is 10 μ s (minimum measurement time for one channel) to 16000 s. The default setting is 79 s.

SCPI command:

[CONFigure:BT0oth:SWEep:TIME](#) on page 98

Sweeptime Auto (TX Spec ACLR)

Activates the automatic calculation of the sweep time. The automatic sweep time corresponds to the settings defined in the RF Test Specification. By default, it is activated.

SCPI command:

[CONFigure:BT0oth:SWEep:TIME:AUTO](#) on page 99

Meas Time Manual

Opens an edit dialog box to enter the measurement time. The valid value range is 1 μ s to (400001 / points per symbol) μ s.

This function is not available for Spurious Emissions measurements.

SCPI command:

[CONFigure:BT0oth:SWEep:TIME](#) on page 98

Meas Time Auto

Activates the automatic calculation of the measurement time. The automatic sweep time corresponds to the settings defined in the RF Test Specification. By default, the automatic sweep time calculation is activated.

This function is not available for Spurious Emissions measurements.

SCPI command:

[CONFigure:BT0oth:SWEep:TIME:AUTO](#) on page 99

Res BW Manual (Output Power, Rel TX Power)

Opens an edit dialog box to enter the resolution bandwidth. The values range from 1 MHz to 3 MHz. The default value is 3 MHz.

SCPI command:

[CONFigure:BT0oth:BANDwidth|BWIDth\[:RESolution\]](#) on page 88

Res BW Auto (Output Power, TX Spec ACLR, Rel TX Power, Spurious Emissions)

Sets the bandwidth according to the values defined in the RF Test Specification.

SCPI command:

`CONFigure:BT0oth:BANDwidth|BWIDth[:RESolution]:AUTO` on page 89

Video BW Manual (TX Spec ACLR)

The default value is 300 kHz, according to the values defined in the RF Test Specification.

For further details refer to the "Video BW Manual" softkey in the bandwidth menu of the base unit.

SCPI command:

`CONFigure:BT0oth:BANDwidth|BWIDth:VIDeo` on page 90

Video BW Auto (TX Spec ACLR, Spurious Emissions)

Sets the video bandwidth according to the values defined in the RF Test Specification.

In the In-band Spurious Emissions measurement, the video bandwidth is always adjusted automatically. Therefore the softkey is activated by default and its state cannot be changed.

SCPI command:

`CONFigure:BT0oth:BANDwidth|BWIDth:VIDeo:AUTO` on page 90

Filter Type (Output Power, TX Spec ACLR, Spurious Emissions, Rel TX Power)

Opens the "Filter Type" dialog box to select the filter type. For the measurements Output Power and Rel TX Power, a Gaussian or a channel filter can be selected. For the measurements TX Spec ACLR and Spurious Emissions, the filter type is a Gaussian filter.

SCPI command:

`[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE` on page 111

Meas Filter (Modulation Char, Init Carr Freq Tol, Carr Freq Drift)

Activates or deactivates a filter that limits the bandwidth for the modulation measurements. Since the RF Test Specification Rev 2.0.E.3 it is required to use this filter and therefore it is activated by default.

The filter is flat within 1.04 MHz (ripple: only 0.02 dB) and has steep slopes outside this area. The filter has the following characteristics:

- passband ripple up to 550 kHz < 0.5 dB (peak to peak)
- minimum attenuation in the transition band

| | |
|--------------|----------|
| +/- 650 kHz: | >=3 dB |
| +/-1 MHz: | >= 14 dB |
| +/- 2 MHz: | >= 44 dB |

SCPI command:

`[SENSe:]DDEMod:FILTer:MEASurement` on page 118

3.2.7 Softkeys of the Frequency Menu (option R&S FSV-K8)

The following table shows all softkeys available in the "Frequency" menu in Bluetooth mode (FREQ key). It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

Center

Opens an edit dialog box to change the center frequency.

If the frequency channel was set via the "Channel" softkey (see "Channel" on page 34), you can change the center frequency, but the relation to the frequency channel will be lost, which means that the value range for the center frequency is not limited to frequencies within valid frequency channels.

The fixed relation between center frequency and Bluetooth frequency channels is restored when you press the "Channel" softkey or select another measurement. The center frequency is rounded to the nearest frequency channel.

SCPI command:

[SENSe:]FREQuency:CENTer on page 112

CF–Stepsize

Opens a submenu to set the step size of the center frequency.

0.1*Chan Spacing ← CF–Stepsize

Sets the step size of the center frequency to 1/10 of the channel spacing.

SCPI command:

= Chan Spacing ← CF–Stepsize

Sets the step size of the center frequency to the size of the channel spacing.

SCPI command:

3.2.8 Softkeys of the Sweep Menu (Bluetooth mode)

The following table shows all softkeys available in the sweep menu in Bluetooth mode (SWEEP key). In the Bluetooth mode, the sweep menu is used for direct entry into the measurement menu of the currently selected measurement. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

Continuous Sweep

Sets the continuous sweep mode: the sweep takes place continuously according to the trigger settings. This is the default setting.

The trace averaging is determined by the sweep count value (see the "Sweep Count" softkey, "[Sweep Count](#)" on page 55).

SCPI command:

INIT:CONT ON, see [INITiate<n>:CONTinuous](#) on page 105

Single Sweep

Sets the single sweep mode: after triggering, starts the number of sweeps that are defined by using the [Sweep Count](#) softkey. The measurement stops after the defined number of sweeps has been performed.

SCPI command:

INIT:CONT OFF, see [INITiate<n>:CONTinuous](#) on page 105

Meas Time Manual

Opens an edit dialog box to enter the measurement time. The valid value range is 1 μ s to (400001 / points per symbol) μ s.

This function is not available for Spurious Emissions measurements.

SCPI command:

[CONFigure:BT0oth:SWEep:TIME](#) on page 98

Meas Time Auto

Activates the automatic calculation of the measurement time. The automatic sweep time corresponds to the settings defined in the RF Test Specification. By default, the automatic sweep time calculation is activated.

This function is not available for Spurious Emissions measurements.

SCPI command:

[CONFigure:BT0oth:SWEep:TIME:AUTO](#) on page 99

Sweep Count

Opens an edit dialog box to enter the number of sweeps to be performed in the single sweep mode. Values from 0 to 32767 are allowed. If the values 0 or 1 are set, one sweep is performed. The sweep count is applied to all the traces in a diagram.

If the trace configurations "Average", "Max Hold" or "Min Hold" are set, the sweep count value also determines the number of averaging or maximum search procedures.

In continuous sweep mode, if sweep count = 0 (default), averaging is performed over 10 sweeps. For sweep count = 1, no averaging, maxhold or minhold operations are performed.

SCPI command:

[CONFigure:BT0oth:SWEep:COUNT](#) on page 98

Power Avg Start (Output Power)

Opens an edit dialog box to enter the start position of the evaluation area for the average burst power. The values range is from 0 to 100%, the default setting is 20%.

For further information refer to [chapter 3.1, "Introduction to Bluetooth Measurements \(K8\)"](#), on page 9.

SCPI command:

[CONFigure:BT0oth:POWer:AVERage:START](#) on page 94

Power Avg Stop (Output Power)

Opens an edit dialog box to enter the stop position of the evaluation area for the average burst power. The values range from 0 to 100%, the default setting is 80%.

For further information refer to [chapter 3.1, "Introduction to Bluetooth Measurements \(K8\)"](#), on page 9.

SCPI command:

[CONFigure:BT0oth:POWer:AVERAge:STOP](#) on page 95

No. of ACP Chan (TX Spec ACLR, Spurious Emissions)

Opens an edit dialog box to enter the number of adjacent channels, for which the power is to be measured. The values range from 0 to 78. A minimum value of 3 is recommended. The default setting is 78 (all channels).

As with the ACP measurement of the basic instrument firmware this value refers to the number of adjacent channels on one side of the TX channel. This means that with a selected value of 10 the analyzer will measure in total 21 channels (10 lower channels + TX channel + 10 upper channels).

The frequency range required for the measurement is set up automatically. The center frequency will also be adapted automatically dependent on the selected TX channel.

The measurement of the adjacent channels is limited to the available Bluetooth frequency band, which means that at maximum 79 channels (23 channels in France) will be measured.

SCPI command:

[CONFigure:BT0oth:ACLR:ACPairs](#) on page 88

[CONFigure:BT0oth:IBSemiissions:ACPairs](#) on page 92

Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift)

Activates or deactivates the zoom function. Opens an edit dialog box to enter the zoom start position. The valid value range for the zoom start position is 0 to (measurement time – 500 / sampling rate). The default setting for the zoom function is 0s (off).

With active zoom function, an area of only 501 samples is displayed.

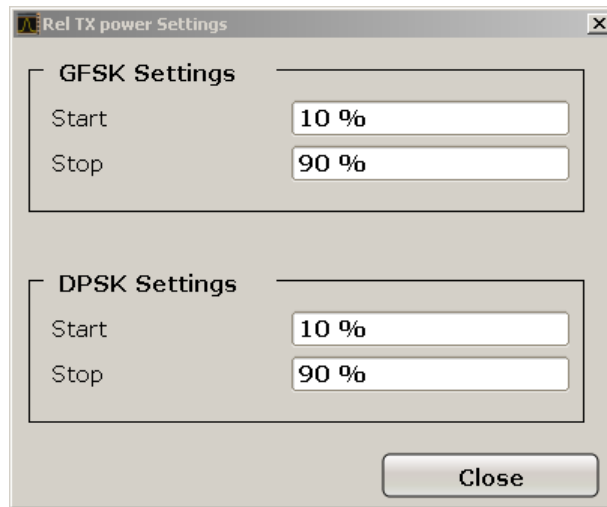
SCPI command:

[\[SENSe:\]ADEMod:ZOOM\[:STATe\]](#) on page 116

[\[SENSe:\]ADEMod:ZOOM:START](#) on page 117

Settings

Opens a dialog box to define the start and stop times for power measurements.

**GFSK Start ← Settings**

Defines the start time for the power measurement of the GFSK sections of the packet. The default value is 10%.

The abbreviation GFSK stands for "Gaussian Frequency Shift Keying".

SCPI command:

[CONFfigure:BT0oth:RTPower:GAverage:START](#) on page 97

GFSK Stop ← Settings

Defines the stop time for the power measurement of the GFSK sections of the packet. The default value is 90%.

The abbreviation GFSK stands for "Gaussian Frequency Shift Keying".

SCPI command:

[CONFfigure:BT0oth:RTPower:GAverage:STOP](#) on page 97

DPSK Start ← Settings

Defines the start time for the power measurement of the DPSK sections of the packet. The default value is 10%.

The abbreviation DPSK stands for "Differential Phase Shift Keying".

SCPI command:

[CONFfigure:BT0oth:RTPower:DAverage:START](#) on page 96

DPSK Stop ← Settings

Defines the stop time for the power measurement of the DPSK sections of the packet. The default value is 90%.

The abbreviation DPSK stands for "Differential Phase Shift Keying".

SCPI command:

[CONFfigure:BT0oth:RTPower:DAverage:STOP](#) on page 96

Gate Delay (Spurious Emissions)

Opens an edit dialog box to enter the time between trigger event and start of the DPSK packet. That is the measurement start time.

SCPI command:

[\[SENSe:\]SWEep:EGATe:HOLDoff](#) on page 113

Gate Length (Spurious Emissions)

Opens an edit dialog box to enter the sweep time in seconds. Usually, this is the length of the DPSK section.

SCPI command:

[\[SENSe:\]SWEep:EGATe:LENGth](#) on page 113

Block Count (Carr Freq Stability)

Opens an edit dialog box to enter the number of blocks to be measured. Every block has the length of 50 μ s. The default value is 200 blocks.

This softkey is only available in single sweep operation.

SCPI command:

[CONFigure:BT0oth:CFSTability:BCOunt](#) on page 91

3.2.9 Softkeys of the Trigger Menu (Option R&S FSV-K8)

The following table shows all softkeys available in the "Trigger" menu in Bluetooth mode (TRIG key). It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

Trg/Gate Source

Opens the "Trigger/Gate Source" dialog box to select the trigger/gate mode.

The default setting is "Free Run". If a trigger mode other than "Free Run" has been set, the enhancement label "TRG" is displayed and the trigger source is indicated.

SCPI command:

[TRIGger<n>\[:SEquence\]:SOURce](#) on page 125

Free Run ← Trg/Gate Source

The start of a sweep is not triggered. Once a measurement is completed, another is started immediately.

SCPI command:

[TRIG:SOUR IMM](#), see [TRIGger<n>\[:SEquence\]:SOURce](#) on page 125

External ← Trg/Gate Source

Defines triggering via a TTL signal at the "EXT TRIG/GATE IN" input connector on the rear panel.

SCPI command:

[TRIG:SOUR EXT](#), see [TRIGger<n>\[:SEquence\]:SOURce](#) on page 125

Video ← Trg/Gate Source

Defines triggering by the displayed voltage.

A horizontal trigger line is shown in the diagram. It is used to set the trigger threshold from 0 % to 100 % of the diagram height.

Video mode is only available in the time domain.

SCPI command:

TRIG:SOUR VID, see TRIGger<n>[:SEQuence]:SOURce on page 125

RF Power ← Trg/Gate Source

Defines triggering of the measurement via signals which are outside the measurement channel.

For this purpose the instrument uses a level detector at the first intermediate frequency. The detector threshold can be selected in a range between - 50 dBm and -10 dBm at the input mixer. The resulting trigger level at the RF input can be estimated via the following formula:

$$\text{MixerLevel}_{\min} + \text{RFAtt} - \text{PreampGain} \leq \text{InputSignal} \leq \text{MixerLevel}_{\max} + \text{RFAtt} - \text{PreampGain}$$

with:

$$500 \text{ MHz} \leq \text{InputSignal} \leq 7 \text{ GHz}$$

Note: If input values outside of this range occur (e.g. for fullspan measurements), the sweep may be aborted and a message indicating the allowed input values is displayed in the status bar.

This trigger mode is not available for input from the R&S Digital I/Q Interface (option analyzer-B17). If RF Power trigger mode is selected and digital baseband input is activated, the trigger mode is automatically switched to "Free Run".

SCPI command:

TRIG:SOUR RFP, see TRIGger<n>[:SEQuence]:SOURce on page 125

IF Power/BB Power ← Trg/Gate Source

Defines triggering of the measurement using the second intermediate frequency.

For this purpose, the analyzer uses a level detector at the second intermediate frequency. Its threshold can be set in a range between -50 dBm and -10 dBm at the input mixer. The resulting trigger level at the RF input is calculated via the following formula:

$$\text{"mixerlevel}_{\min} + \text{RFAtt} - \text{PreampGain} \leq \text{Input Signal} \leq \text{mixerlevel}_{\max} + \text{RFAtt} - \text{PreampGain}"$$

The bandwidth at the intermediate frequency depends on the RBW and sweep type:

Sweep mode:

- RBW > 500 kHz: 40 MHz, nominal
- RBW ≤ 500 kHz: 6 MHz, nominal

FFT mode:

- RBW > 20 kHz: 40 MHz, nominal
- RBW ≤ 20 kHz: 6 MHz, nominal

Note: Be aware that in auto sweep type mode, due to a possible change in sweep types, the bandwidth may vary considerably for the same RBW setting.

The analyzer is triggered as soon as the trigger threshold is exceeded around the selected frequency (= start frequency in the frequency sweep).

Thus, the measurement of spurious emissions, e.g. for pulsed carriers, is possible even if the carrier lies outside the selected frequency span.

SCPI command:

TRIG:SOUR IFP, see TRIGger<n>[:SEquence]:SOURce on page 125

Power Sensor ← Trg/Gate Source

Uses an external power sensor as a trigger function. This option is only available if the R&S FSV-K9 Power Sensor option is installed and a power sensor is connected and configured.

Power sensors are configured in the "Input/Output" menu, see "Configuring an External Power Trigger" in the base unit description.

- [Trg/Gate Level](#)
- [Trg/Gate Polarity](#)
- [Trigger Hysteresis](#)
- [Trigger Holdoff](#)

Note: For R&S power sensors, the "Gate Mode" *Lvl* is not supported. The signal sent by these sensors merely reflects the instant the level is first exceeded, rather than a time period. However, only time periods can be used for gating in level mode. Thus, the trigger impulse from the sensors is not long enough for a fully gated measurement; the measurement cannot be completed.

SCPI command:

TRIG:SOUR PSE, see TRIGger<n>[:SEquence]:SOURce on page 125

Time ← Trg/Gate Source

Opens an edit dialog box to define a repetition interval in which the measurement is triggered. The shortest interval is 2 ms.

SCPI command:

TRIG:SOUR TIMETRIGger<n>[:SEquence]:SOURce on page 125

Trg/Gate Level

Opens an edit dialog box to enter the trigger/gate level.

In the trigger modes "Time" and "Power Sensor", this softkey is not available.

SCPI command:

TRIGger<n>[:SEquence]:LEVel:IFPower on page 124

Trg/Gate Polarity

Sets the polarity of the trigger/gate source.

The sweep starts after a positive or negative edge of the trigger signal. The default setting is "Pos". The setting applies to all trigger modes with the exception of the "Free Run", "Power Sensor" and "Time" mode.

"Pos" Level triggering: the sweep is stopped by the logic "0" signal and restarted by the logical "1" signal after the gate delay time has elapsed.

"Neg" Edge triggering: the sweep is continued on a "0" to "1" transition for the gate length duration after the gate delay time has elapsed.

SCPI command:

[TRIGger<n>\[:SEquence\]:SLOPe](#) on page 125

Trigger Offset

Opens an edit dialog box to enter the time offset between the trigger signal and the start of the sweep.

| | |
|-------------|---|
| offset > 0: | Start of the sweep is delayed |
| offset < 0: | <p>Sweep starts earlier (pre-trigger)</p> <p>Only possible for span = 0 (e.g. I/Q Analyzer mode) and gated trigger switched off</p> <p>Maximum allowed range limited by the sweep time: pretrigger_{max} = sweep time</p> <p>When using the R&S Digital I/Q Interface (R&S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples.</p> |

In the "External" or "IF Power" trigger mode, a common input signal is used for both trigger and gate. Therefore, changes to the gate delay will affect the trigger delay (trigger offset) as well.

SCPI command:

[TRIGger<n>\[:SEquence\]:HOLDoff\[:TIME\]](#) on page 124

Trigger Hysteresis

Defines the value for the trigger hysteresis for "IF power" or "RF Power" trigger sources. The hysteresis in dB is the value the input signal must stay below the power trigger level in order to allow a trigger to start the measurement. The range of the value is between 3 dB and 50 dB with a step width of 1 dB.

SCPI command:

[TRIGger<n>\[:SEquence\]:IFPower:HYSteresis](#) on page 124

Trigger Holdoff

Defines the value for the trigger holdoff. The holdoff value in s is the time which must pass before triggering, in case another trigger event happens.

This softkey is only available if "IFPower", "RF Power" or "BBPower" is the selected trigger source.

SCPI command:

[TRIGger<n>\[:SEquence\]:IFPower:HOLDoff](#) on page 123

3.2.10 Further Information

- [Selecting the Appropriate Filter Type](#).....62
- [List of Available RRC and Channel Filters](#).....62

3.2.10.1 Selecting the Appropriate Filter Type

All resolution bandwidths are realized with digital filters.

The video filters are responsible for smoothing the displayed trace. Using video bandwidths that are small compared to the resolution bandwidth, only the signal average is displayed and noise peaks and pulsed signals are repressed. If pulsed signals are to be measured, it is advisable to use a video bandwidth that is large compared to the resolution bandwidth ($VBW * 10 \times RBW$) for the amplitudes of pulses to be measured correctly.

The following filter types are available:

- Normal (3dB) (Gaussian) filters
The Gaussian filters are set by default. The available bandwidths are specified in the data sheet.
- Channel filters
For details see [chapter 3.2.10.2, "List of Available RRC and Channel Filters"](#), on page 62 .
Channel filters do not support FFT mode.
- RRC filters
For details see [chapter 3.2.10.2, "List of Available RRC and Channel Filters"](#), on page 62 .
RRC filters do not support FFT mode.
- 5-Pole filters
The available bandwidths are specified in the data sheet.
5-Pole filters do not support FFT mode.

3.2.10.2 List of Available RRC and Channel Filters

For power measurement a number of especially steep-edged channel filters are available (see the following table). The indicated filter bandwidth is the 3 dB bandwidth. For RRC filters, the fixed roll-off factor (α) is also indicated.

Table 3-5: Filter types

| Filter Bandwidth | Filter Type | Application |
|------------------|-------------|-------------|
| 100 Hz | CFILter | |
| 200 Hz | CFILter | A0 |
| 300 Hz | CFILter | |
| 500 Hz | CFILter | |
| 1 kHz | CFILter | |
| 1.5 kHz | CFILter | |
| 2 kHz | CFILter | |
| 2.4 kHz | CFILter | SSB |
| 2.7 kHz | CFILter | |

Instrument Functions for Bluetooth Measurements (K8)

| Filter Bandwidth | Filter Type | Application |
|-------------------------|-------------|--------------------------------|
| 3 kHz | CFILter | |
| 3.4 kHz | CFILter | |
| 4 kHz | CFILter | DAB, Satellite |
| 4.5 kHz | CFILter | |
| 5 kHz | CFILter | |
| 6 kHz | CFILter | |
| 6 kHz, $\alpha=0.2$ | RRC | APCO |
| 8.5 kHz | CFILter | ETS300 113 (12.5 kHz channels) |
| 9 kHz | CFILter | AM Radio |
| | | |
| 10 kHz | CFILter | |
| 12.5 kHz | CFILter | CDMAone |
| 14 kHz | CFILter | ETS300 113 (20 kHz channels) |
| 15 kHz | CFILter | |
| 16 kHz | CFILter | ETS300 113 (25 kHz channels) |
| 18 kHz, $\alpha=0.35$ | RRC | TETRA |
| 20 kHz | CFILter | |
| 21 kHz | CFILter | PDC |
| 24.3 kHz, $\alpha=0.35$ | RRC | IS 136 |
| 25 kHz | CFILter | |
| 30 kHz | CFILter | CDPD, CDMAone |
| 50 kHz | CFILter | |
| | | |
| 100 kHz | CFILter | |
| 150 kHz | CFILter | FM Radio |
| 192 kHz | CFILter | PHS |
| 200 kHz | CFILter | |
| 300 kHz | CFILter | |
| 500 kHz | CFILter | J.83 (8-VSB DVB, USA) |
| | | |
| 1 MHz | CFILter | CDMAone |
| 1.228 MHz | CFILter | CDMAone |
| 1.28 MHz, $\alpha=0.22$ | RRC | |

| Filter Bandwidth | Filter Type | Application |
|--------------------------|-------------|-------------------|
| 1.5 MHz | CFILter | DAB |
| 2 MHz | CFILter | |
| 3 MHz | CFILter | |
| 3.75 MHz | CFILter | |
| 3.84 MHz, $\alpha=0.22$ | RRC | W-CDMA 3GPP |
| 4.096 MHz, $\alpha=0.22$ | RRC | W-CDMA NTT DOCoMo |
| 5 MHz | CFILter | |
| 20 MHz | CFILter | |
| 28 MHz | CFILter | |
| 40 MHz | CFILter | |

3.3 Remote Commands for Bluetooth Measurements (K8)

This chapter describes the remote commands specific to Bluetooth measurements and those required for the described programming examples.

For a description of the basic settings commands, see the base unit description.

| | | |
|---------|--|-----|
| 3.3.1 | CALCulate subsystem..... | 65 |
| 3.3.1.1 | CALCulate:BT0oth Subsystem (BLUETOOTH, K8)..... | 65 |
| 3.3.1.2 | CALCulate:DELTamarker Subsystem (BLUETOOTH, K8)..... | 84 |
| 3.3.1.3 | CALCulate:MARKer Subsystem (BLUETOOTH, K8)..... | 85 |
| 3.3.1.4 | Other Commands in the CALCulate subsystem..... | 87 |
| 3.3.2 | CONFigure:BT0oth Subsystem (BLUETOOTH, K8)..... | 87 |
| 3.3.3 | DISPlay Subsystem (BLUETOOTH, K8)..... | 100 |
| 3.3.4 | FORMat subsystem..... | 104 |
| 3.3.5 | INITiate subsystem..... | 105 |
| 3.3.6 | INPut subsystem..... | 106 |
| 3.3.7 | INSTRument Subsystem (BLUETOOTH, K8)..... | 108 |
| 3.3.8 | SENSE subsystem (BLUETOOTH, K8)..... | 108 |
| 3.3.9 | SENSE:ADEMod Subsystem (BLUETOOTH, K8)..... | 116 |
| 3.3.10 | SENSE:DDEMod Subsystem (BLUETOOTH, K8)..... | 117 |
| 3.3.11 | SYSTem subsystem..... | 120 |
| 3.3.12 | TRACe subsystem..... | 121 |
| 3.3.13 | TRIGGer subsystem..... | 123 |

| | | |
|--------|--------------------------|-----|
| 3.3.14 | Programming Example..... | 126 |
|--------|--------------------------|-----|

3.3.1 CALCulate subsystem

| | | |
|---------|--|----|
| 3.3.1.1 | CALCulate:BT0oth Subsystem (BLUETOOTH, K8)..... | 65 |
| 3.3.1.2 | CALCulate:DELTamarker Subsystem (BLUETOOTH, K8)..... | 84 |
| 3.3.1.3 | CALCulate:MARKer Subsystem (BLUETOOTH, K8)..... | 85 |
| 3.3.1.4 | Other Commands in the CALCulate subsystem..... | 87 |

3.3.1.1 CALCulate:BT0oth Subsystem (BLUETOOTH, K8)

| | |
|---|----|
| CALCulate<n>:BT0oth:ACLR[:LIST]..... | 66 |
| CALCulate<n>:BT0oth:ACLR:EXCeptions..... | 66 |
| CALCulate<n>:BT0oth:CFDRift[:MAXimum]..... | 67 |
| CALCulate<n>:BT0oth:CFDRift:RATE..... | 67 |
| CALCulate<n>:BT0oth:CFSTability:COUNT..... | 68 |
| CALCulate<n>:BT0oth:CFSTability:DEVM:[RMS]..... | 68 |
| CALCulate<n>:BT0oth:CFSTability:DEVM:DPCT..... | 69 |
| CALCulate<n>:BT0oth:CFSTability:DEVM:D99Pct..... | 69 |
| CALCulate<n>:BT0oth:CFSTability:DEVM:PEAK..... | 70 |
| CALCulate<n>:BT0oth:CFSTability:FERRor:[TOTal]..... | 70 |
| CALCulate<n>:BT0oth:CFSTability:FERRor:BLOCK..... | 71 |
| CALCulate<n>:BT0oth:CFSTability:FERRor:INITial..... | 71 |
| CALCulate<n>:BT0oth:DPENcoding:[TOTal]..... | 72 |
| CALCulate<n>:BT0oth:DPENcoding:BER..... | 73 |
| CALCulate<n>:BT0oth:DPENcoding:NERRor..... | 73 |
| CALCulate<n>:BT0oth:IBSeissions:[List]..... | 74 |
| CALCulate<n>:BT0oth:IBSeissions:EXCeptions..... | 74 |
| CALCulate<n>:BT0oth:IBSeissions:HADJacent..... | 75 |
| CALCulate<n>:BT0oth:IBSeissions:TXReference..... | 75 |
| CALCulate<n>:BT0oth:ICFTolerance..... | 76 |
| CALCulate<n>:BT0oth:MCHar:DF<Delta>:AVERage..... | 76 |
| CALCulate<n>:BT0oth:MCHar:DF<Delta>:MAXimum..... | 77 |
| CALCulate<n>:BT0oth:MCHar:DF2:PERCent..... | 78 |
| CALCulate<n>:BT0oth:MCHar:RATio..... | 78 |
| CALCulate<n>:BT0oth:OPOWer[:PEAK]..... | 79 |
| CALCulate<n>:BT0oth:OPOWer:AVERage..... | 80 |
| CALCulate<n>:BT0oth:PLENght..... | 81 |
| CALCulate<n>:BT0oth:PTYPE..... | 81 |
| CALCulate<n>:BT0oth:RTPower:[DPSK]..... | 82 |
| CALCulate<n>:BT0oth:RTPower:GFSK..... | 83 |
| CALCulate<n>:BT0oth:RTPower:RATio..... | 83 |
| CALCulate<n>:BT0oth:STATus..... | 84 |

CALCulate<n>:BTOoth:ACLR[:LIST]?

This command determines the power of the selected adjacent channels. The number of adjacent channel pairs is defined with the [CONFigure:BT0oth:ACLR:ACPairs](#) command.

This command is only available with active "Adjacent Channel Power" measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Return values:

<Result> <TX channel – n>...<TX channel – 1> <TX channel> <TX channel + 1>...<TX channel + n>

The results are returned as a list of power values.

The number of adjacent channels is limited by the Bluetooth band limits.

Example:

```
INST:SEL BTO
```

Activates the Bluetooth Measurements option.

```
INIT:CONT OFF
```

Selects single sweep operation.

```
CONF:BTO:MEAS ACLR
```

Activates the Adjacent Channel Power measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:ACLR?
```

Queries the power list.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:ACLR:EXceptions?

This command determines the number of exceptions which occurred during the adjacent channel power measurement according to the Bluetooth specification.

Note:

This command is only available with active Adjacent Channel Power measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

| | |
|-----------------|--|
| Example: | <pre>INST:SEL BTO Activates the Bluetooth Measurements option. INIT:CONT OFF Selects single sweep operation. CONF:BTO:MEAS ACLR Activates the Adjacent Channel Power measurement. INIT;*WAI Starts the measurement with synchronization. CALC:BTO:ACLR? Queries the power list. CALC:BTO:ACLR:EXC? Queries the number of exceptions.</pre> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:CFDRift[:MAXimum]?

This command determines the maximum Carrier Frequency Drift.

Note:

This command is only available with active Carrier Frequency Drift measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF:BTO:MEAS CFDR
Activates the Carrier Frequency Drift measurement.
INIT;*WAI
Starts the measurement with synchronization.
CALC:BTO:CFDR?
Queries the result.
```

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFDRift:RATE?

This command determines the maximum Carrier Frequency Drift per 50 (s).

Note:

This command is only available with active Carrier Frequency Drift measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

| | | |
|-----------------|-----|---|
| Suffix: | <n> | irrelevant |
| Example: | | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS CFDR</pre> <p>Activates the Carrier Frequency Drift measurement.</p> <pre>INIT;*WAI</pre> <p>Starts the measurement with synchronization.</p> <pre>CALC:BTO:CFDR:RATE?</pre> <p>Queries the result.</p> |
| Usage: | | Query only |
| Mode: | | BT |

CALCulate<n>:BTOoth:CFSTability:COUNT?

This command reads the number of measured blocks during or after a measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

| | | |
|-----------------|-----|---|
| Suffix: | <n> | irrelevant |
| Example: | | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS CFST</pre> <p>Activates the Carrier Frequency Stability and Modulation Accuracy measurement.</p> <pre>INIT;*WAI</pre> <p>Starts the measurement with synchronization.</p> <pre>CALC:BTO:CFST:COUNT?</pre> <p>Reads the number of measured blocks.</p> |
| Usage: | | Query only |
| Mode: | | BT |

CALCulate<n>:BTOoth:CFSTability:DEVM:[RMS]? <Mode>

This command reads the root mean square (RMS) of the differential error vector magnitude (DEVM) in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

| | |
|--------------------|---|
| Suffix: | |
| <n> | irrelevant |
| Parameters: | |
| <Mode> | MINimum MAXimum AVERage |
| | *RST: - |
| Example: | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS CFST</pre> <p>Activates the Carrier Frequency Stability and Modulation Accuracy measurement.</p> <pre>INIT;*WAI</pre> <p>Starts the measurement with synchronization.</p> <pre>CALC:BTO:CFST:DEVM? AVER</pre> <p>Reads the root mean square of the average differential error vector magnitude.</p> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:CFSTability:DEVM:DPCT
CALCulate<n>:BTOoth:CFSTability:DEVM:D99Pct?

This command reads 99% of the differential error vector magnitude (DEVM) in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see [CONFigure:BTOoth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

| | |
|-----------------|--|
| Suffix: | |
| <n> | irrelevant |
| Example: | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS CFST</pre> <p>Activates the Carrier Frequency Stability and Modulation Accuracy measurement.</p> <pre>INIT;*WAI</pre> <p>Starts the measurement with synchronization.</p> <pre>CALC:BTO:CFST:DEVM:D99Pct?</pre> <p>Reads 99% of the differential error vector magnitude.</p> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:CFSTability:DEVM:PEAK?

This command reads the peak of the differential error vector magnitude (DEVM) in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF:BTO:MEAS CFST
```

Activates the Carrier Frequency Stability and Modulation Accuracy measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:CFST:DEVM:PEAK?
```

Reads the peak of the differential error vector magnitude.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFSTability:FERRor:[TOTal]? <Mode>

This command reads the carrier frequency deviation of all packets in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

```
*RST: -
```

| | |
|-----------------|--|
| Example: | For the first steps refer to chapter 3.3.14, "Programming Example" , on page 126 <code>CONF:BTO:MEAS CFST</code> Activates the Carrier Frequency Stability and Modulation Accuracy measurement. <code>INIT;*WAI</code> Starts the measurement with synchronization. <code>CALC:BTO:CFST:FERR? MIN</code> Reads the minimum carrier frequency deviation of all packets. |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:CFSTability:FERRor:BLOCK? <Mode>

This command reads the maximum frequency deviation of all blocks in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

| | |
|-----------------|---|
| Example: | For the first steps refer to chapter 3.3.14, "Programming Example" , on page 126 <code>CONF:BTO:MEAS CFST</code> Activates the Carrier Frequency Stability and Modulation Accuracy measurement. <code>INIT;*WAI</code> Starts the measurement with synchronization. <code>CALC:BTO:CFST:FERR:BLOC? AVER</code> Reads the maximum average frequency deviation of all blocks. |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:CFSTability:FERRor:INITial? <Mode>

This command reads the combined frequency deviation of all packets and all blocks in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF:BTO:MEAS CFST
```

Activates the Carrier Frequency Stability and Modulation Accuracy measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:CFST:FERR:INIT? MAX
```

Reads the combined maximum frequency deviation of all packets and all blocks.

Usage:

Query only

Mode:

BT

CALCulate<n>:BT0oth:DPENcoding:[TOTAl]?

This command reads the number of tested packets in the Differential Phase Encoding measurement.

Note:

This command is only available with active Differential Phase Encoding measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF:BTO:MEAS DPEN
```

Activates the Differential Phase Encoding measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:DPEN?
```

Reads the number of tested packets.

Usage:

Query only

Mode:

BT

CALCulate<n>:BTOoth:DPENcoding:BER?

This command reads the bit error rate (BER) in the Differential Phase Encoding measurement.

Note:

This command is only available with active Differential Phase Encoding measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF: BTO: MEAS DPEN
```

Activates the Differential Phase Encoding measurement.

```
INIT; *WAI
```

Starts the measurement with synchronization.

```
CALC: BTO: DPEN: BER?
```

Reads the bit error rate.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:DPENcoding:NERRor?

This command reads the number of passed packets in the Differential Phase Encoding measurement.

Note:

This command is only available with active Differential Phase Encoding measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF: BTO: MEAS DPEN
```

Activates the Differential Phase Encoding measurement.

```
INIT; *WAI
```

Starts the measurement with synchronization.

```
CALC: BTO: DPEN: NERR?
```

Reads the number of passed packets.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:IBSEmissions:[List]?

This command reads the power of all adjacent channels in the In-band Spurious Emissions measurement.

Note:

This command is only available with active In-band Spurious Emissions measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF:BTO:MEAS IBS
```

Activates the In-band Spurious Emissions measurement.

```
CONF:BTO:CHAN 7
```

Adjust the TX channel number.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:IBS?
```

Reads the results of the In-band Spurious Emissions measurement.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:IBSEmissions:EXceptions?

This command reads the number of results that exceeded the specified limits in the In-band Spurious Emissions measurement.

Note:

This command is only available with active In-band Spurious Emissions measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF:BTO:MEAS IBS
```

Activates the In-band Spurious Emissions measurement.

```
CONF:BTO:CHAN 7
```

Adjust the TX channel number.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:IBS:EXC?
```

Reads the number of results that exceeded the specified limits.

Usage: Query only
Mode: BT

CALCulate<n>:BTOoth:IBSEmissions:HADJacent? <Band>

This command reads the maximum power of the upper or lower frequency band (500 kHz) of the TX channel in the In-band Spurious Emissions measurement.

Note:

This command is only available with active In-band Spurious Emissions measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Band> **UPPer | LOWer**

*RST: -

Example: For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF:BTO:MEAS IBS
```

Activates the In-band Spurious Emissions measurement.

```
CONF:BTO:CHAN 7
```

Adjust the TX channel number.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:IBS:HADJ? LOW
```

Reads the maximum power of the lower frequency band.

Usage: Query only
Mode: BT

CALCulate<n>:BTOoth:IBSEmissions:TXReference?

This command reads the TX channel reference power.

Note:

This command is only available with active In-band Spurious Emissions measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

| | |
|-----------------|---|
| Example: | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS IBS</pre> <p>Activates the In-band Spurious Emissions measurement.</p> <pre>CONF:BTO:CHAN 7</pre> <p>Adjust the TX channel number.</p> <pre>INIT;*WAI</pre> <p>Starts the measurement with synchronization.</p> <pre>CALC:BTO:IBS:TXR?</pre> <p>Reads the TX channel reference power.</p> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:ICFTolerance? <Mode>

This command determines the Initial Carrier Frequency Tolerance.

Note:

This command is only available with active Modulation Characteristics measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

| | |
|-----------------|--|
| Example: | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS ICFT</pre> <p>Activates the Initial Carrier Frequency Tolerance measurement.</p> <pre>CONF:BTO:SWE:COUN 20</pre> <p>Initiates the sweep counter with 20.</p> <pre>INIT;*WAI</pre> <p>Starts the measurement with synchronization.</p> <pre>CALC:BTO:ICFT? AVER</pre> <p>Queries the average value.</p> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:MCHar:DF<Delta>:AVERage? <Type>

This command determines the average frequency deviation for varying bit patterns of the payload.

Note:

This command is only available with active Modulation Characteristics measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant
 <Delta> 1 | 2
 the frequency deviation and the bit pattern:
 1 = $\Delta f_{1_{avg}}$: 11110000
 2 = $\Delta f_{2_{avg}}$: 10101010

Parameters:

<Type> **MINimum | MAXimum**
 *RST: -

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF:BTO:MEAS MCH
```

Activates the Modulation Characteristics measurement.

```
CONF:BTO:SWE:COUN 20
```

Initiates the sweep counter with 20.

... EUT emits bit pattern 11110000

```
INIT:IMM;*WAI
```

Starts the measurement with synchronization and erase previous measurement results.

```
CALC:BTO:MCH:DF1:AVER? MIN
```

Queries minimum value "11110000".

Usage: Query only

Mode: BT

CALCulate<n>:BT0oth:MCHar:DF<Delta>:MAXimum? <Mode>

This command determines the maximum frequency deviation for different bit patterns of the payload.

Note:

This command is only available with active Modulation Characteristics measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant
 <Delta> 1 | 2
 the frequency deviation and the bit pattern:
 1 = $\Delta f_{1_{avg}}$: 11110000
 2 = $\Delta f_{2_{avg}}$: 10101010

Parameters:

<Mode> **MINimum | MAXimum | AVERage**
 *RST: -

| | |
|-----------------|---|
| Example: | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS MCH</pre> <p>Activates the Modulation Characteristics measurement.</p> <pre>CONF:BTO:SWE:COUN 20</pre> <p>Initiates the sweep counter with 20.</p> <p>... EUT emits bit pattern 1111000</p> <pre>INIT:IMM;*WAI</pre> <p>Starts the measurement with synchronization and erase previous measurement results.</p> <pre>CALC:BTO:MCH:DF1:MAX? MIN</pre> <p>Queries minimum value "11110000".</p> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:MCHar:DF2:PERCent?

This command determines the percentage of measurements of the frequency deviation, for which the value of $f_{2_{max}}$ is within the allowed range. Therefore only the numeric suffix 2 is allowed for DF.

Note:

This command is only available with active Modulation Characteristics measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

| | |
|-----------------|---|
| Example: | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS MCH</pre> <p>Activates the Modulation Characteristics measurement.</p> <pre>CONF:BTO:SWE:COUN 20</pre> <p>Initiates the sweep counter with 20.</p> <p>... EUT emits bit pattern 10101010</p> <pre>INIT;*WAI</pre> <p>Starts the measurement with synchronization.</p> <pre>CALC:BTO:MCH:DF2:PERC?</pre> <p>Queries the percentage of "in range" measurements.</p> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:MCHar:RATio? <Mode>

This command determines the ratio of the average frequency deviations for varying bit patterns of the payload.

Note:

This command is only available with active Modulation Characteristics measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**
*RST: -

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF: BTO: MEAS MCH
```

Activates the Modulation Characteristics measurement.

```
CONF: BTO: SWE: COUN 20
```

Initiates the sweep counter with 20.

... EUT emits bit pattern 1111000

```
INIT: IMM; *WAI
```

Starts the measurement with synchronization and erase previous measurement results.

... EUT emits bit pattern 10101010

```
INIT: CONM; *WAI
```

Starts additional measurement with synchronization.

```
CALC: BTO: MCH: RAT? MIN
```

Queries the minimum value.

Usage: Query only

Mode: BT

CALCulate<n>:BT0oth:OPOWER[:PEAK]?

This command reads the peak value of the Output Power measurement according to the BLUETOOTH standard.

Note:

This command is only available with active Output Power measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements it causes a query error.

Suffix:

<n> irrelevant

| | |
|-----------------|---|
| Example: | For the first steps refer to chapter 3.3.14, "Programming Example" , on page 126 <code>CONF:BTO:MEAS OPOW</code> Activates the Output Power measurement. <code>INIT;*WAI</code> Starts the measurement with synchronization. <code>CALC:BTO:OPOW?</code> Queries the output power result. |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:OPOWER:AVERage? <Mode>

This command reads the average value of the Output Power measurement according to the Bluetooth standard.

With a sweep count value of ≥ 1 (`CONFigure:BT0oth:SWEEP:COUNT`) and trace mode "Clear/Write" (`DISPlay[:WINDow<n>]:TRACe<t>:MODE`) the selected number of measurements is performed when a single sweep is started (`INITiate<n>[:IMMEDIATE]`). During these measurements the minimum and maximum values are determined. If only a single measurement is performed, the minimum and maximum value are identical.

Note:

This command is only available with active Output Power measurement (see `CONFigure:BT0oth:MEASurement` on page 93). With all other measurements it causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**
 *RST: -

| | |
|-----------------|---|
| Example: | For the first steps refer to chapter 3.3.14, "Programming Example" , on page 126 <code>CONF:BTO:MEAS OPOW</code> Activates the Output Power measurement. <code>CONF:BTO:SWE:COUN 20</code> Activates measurement over 20 sweeps. <code>INIT;*WAI</code> Activates measurement over 20 sweeps. <code>CALC:BTO:OPOW:AVER? MAX</code> Queries the maximum average value of the Output Power measurement. |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:PLENght?

This command reads the length of the packet analyzed by the preceding measurement.

Note:

This command is only available if a measurement was started via [INITiate<n>\[:IMMEDIATE\]](#) before and if this measurement is completed. With a missing or incomplete measurement the command causes a query error. This command is only available with the measurements Output Power, Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Suffix:

<n> irrelevant

Example:

```
INST:SEL BTO
Activates the Bluetooth Measurements option
INIT:CONT OFF
Selects single sweep operation
CONF:BTO:MEAS OPOW
Activates the Output Power measurement
INIT;*WAI
Starts the measurement with synchronization
CALC:BTO:PLEN?
Queries the packet length
```

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:PTYPE?

This command determines the type of the packet analyzed by a preceding measurement.

Note:

This command is only available if a measurement was started via [INITiate<n>\[:IMMEDIATE\]](#) before and if this measurement is completed. With a missing or incomplete measurement the command causes a query error. This command is only available with the measurements Output Power, Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Suffix:

<n> irrelevant

Parameters:

Result AUX1| DH1| DH3| DH5| DM1| DM3| DM5| FHS| HV1| HV2| HV3| DV| NULL| POLL| UNDEF

These packet types are recognized and returned as character data.

*RST: -

| | |
|-----------------|---|
| Example: | <pre>INST:SEL BTO Activates the Bluetooth Measurements option INIT:CONT OFF Selects single sweep operation CONF:BTO:MEAS OPOW Activates the Output Power measurement INIT;*WAI Starts the measurement with synchronization CALC:BTO:PTYP? Queries the packet type</pre> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:RTPower:[DPSK]? <Mode>

This command reads the average transmission power for the DPSK sections of the packet in the Relative Transmission Power measurement. With a sweep count 1, the command returns the current value, irrespective of the parameter.

Note:

This command is only available with active Relative Transmit Power measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**
*RST: -

| | |
|-----------------|---|
| Example: | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS RTP Activates the Relative Transmit Power measurement. CONF:BTO:SWE:COUN 10 Initiates the sweep counter with 10. INIT;*WAI Starts the measurement with synchronization. CALC:BTO:RTP? MIN Reads the lowest recorded average power of the DPSK section of all packets.</pre> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:RTPower:GFSK? <Mode>

This command reads the transmission power for the GFSK sections of the packet in the Relative Transmission Power measurement. With a sweep count 1, the command returns the current value, irrespective of the parameter.

Note:

This command is only available with active Relative Transmit Power measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example:

For the first steps refer to [chapter 3.3.14, "Programming Example"](#), on page 126

```
CONF: BTO: MEAS RTP
```

Activates the Relative Transmit Power measurement.

```
CONF: BTO: SWE: COUN 10
```

Initiates the sweep counter with 10.

```
INIT; *WAI
```

Starts the measurement with synchronization.

```
CALC: BTO: RTP: GFSK? MIN
```

Reads the highest recorded average power of the GFSK section of all packets.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:RTPower:RATio? <Mode>

This command reads the ratio of the transmission power for the GFSK and DPSK modulation in the Relative Transmission Power measurement (PDPSK/PGFSK). With a sweep count 1, the command returns the current value, irrespective of the parameter.

Note:

This command is only available with active Relative Transmit Power measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

| | |
|-----------------|---|
| Example: | <p>For the first steps refer to chapter 3.3.14, "Programming Example", on page 126</p> <pre>CONF:BTO:MEAS RTP</pre> <p>Activates the Relative Transmit Power measurement.</p> <pre>CONF:BTO:SWE:COUN 10</pre> <p>Initiates the sweep counter with 10.</p> <pre>INIT;*WAI</pre> <p>Starts the measurement with synchronization.</p> <pre>CALC:BTO:RTP:RAT? MIN</pre> <p>Queries the minimum value.</p> |
| Usage: | Query only |
| Mode: | BT |

CALCulate<n>:BTOoth:STATus?

This command queries the status of a preceding measurement.

Note:

This command is only available, if a measurement was started via [INITiate<n>\[:IMMEDIATE\]](#) before and if this measurement is completed. With a missing or incomplete measurement the command causes a query error.

Suffix:

<n> irrelevant

Return values:

| | |
|----------|----------|
| <Result> | 0 |
| | PASS |
| | 1 |
| | FAIL |

| | |
|-----------------|---|
| Example: | <pre>INST:SEL BTO</pre> <p>Activates the Bluetooth Measurements option</p> <pre>INIT:CONT OFF</pre> <p>Selects single sweep operation</p> <pre>CONF:BTO:MEAS OPOW</pre> <p>Activates Output Power measurement</p> <pre>INIT;*WAI</pre> <p>Starts the measurement with synchronization</p> <pre>CALC:BTO:STAT?</pre> <p>Queries the status</p> |
|-----------------|---|

Usage: Query only

Mode: BT

3.3.1.2 CALCulate:DELTamarker Subsystem (BLUETOOTH, K8)

CALCulate<n>:DELTamarker<m>:Y.....85

CALCulate<n>:DELTaMarker<m>:Y

This command queries the measured value of the selected delta marker in the specified window. The corresponding delta marker is activated, if necessary. The output is always a relative value referred to marker 1 or to the reference position (reference fixed active).

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Depending on the unit defined with `CALC:NIT:POW` or on the activated measuring functions, the query result is output in the units below:

Table 3-6: Bluetooth measurements

| Parameter, measuring function or result display | Output unit |
|--|-------------|
| OUTPUT POWER result display (R&S FSV-K8) | dB |
| TX SPECTRUM ACP result display (R&S FSV-K8) | dB |
| MODULATION CHARACTERISTICS result display (R&S FSV-K8) | Hz |
| INITIAL CARR FREQ TOL result display (R&S FSV-K8) | Hz |
| CARRIER FREQ DRIFT result display (R&S FSV-K8) | Hz |
| RELATIVE TX POWER (R&S FSV-K8) | dB |
| IN-BAND SPURIOUS EMISSIONS (R&S FSV-K8) | dB |
| CARRIER FREQUENCY STABILITY (R&S FSV-K8) | – |
| DIFF PHASE ENCODING (R&S FSV-K8) | – |

Suffix:

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

Example:

```
INIT:CONT OFF
Switches to single sweep mode.
INIT;*WAI
Starts a sweep and waits for its end.
CALC:DELT2 ON
Switches on delta marker 2.
CALC:DELT2:Y?
Outputs measurement value of delta marker 2.
```

Mode: A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, VSA

3.3.1.3 CALCulate:MARKer Subsystem (BLUETOOTH, K8)

| | |
|--|----|
| CALCulate<n>:MARKer<m>:PEXCursion..... | 86 |
| CALCulate<n>:MARKer<m>:Y..... | 86 |

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

This command defines the peak excursion, i.e. the spacing below a trace maximum which must be attained before a new maximum is recognized, or the spacing above a trace minimum which must be attained before a new minimum is recognized. The set value applies to all markers and delta markers in the window specified by the suffix <n>. The unit depends on the selected operating and display mode.

| Mode/Display mode | Unit |
|--------------------|------|
| Spectrum | dB |
| ADEMOD, RF display | dB |
| ADEMOD, AM display | PCT |
| ADEMOD, FM display | kHz |
| ADEMOD, PM display | RAD |

Suffix:

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

<m> irrelevant

Parameters:

<Value> <numeric_value>

*RST: 6dB in "Spectrum" mode and RF displays; 5 PCT in AM displays, 50 kHz in FM displays, (0.5 RAD in PM displays

Example:

CALC:MARK:PEXC 10dB

Defines peak excursion 10 dB in "Spectrum" mode.

Mode:

A, ADEMOD, BT, TDS

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

This command queries the measured value of the selected marker in the window specified by the suffix <n>. The corresponding marker is activated before or switched to marker mode, if necessary.

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed after the change of a parameter and before the query of the Y value. This is only possible in single sweep mode.

Suffix:

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

<m> marker number

Return values:

<Result>

The measured value of the selected marker is returned.

In I/Q Analyzer mode, if the result display configuration "Real/Imag (I/Q)" is selected, this query returns the Real (I) value of the marker first, then the Imag (Q) value.

Example:

INIT:CONT OFF

Switches to single sweep mode.

CALC:MARK2 ON

Switches marker 2.

INIT;*WAI

Starts a sweep and waits for the end.

CALC:MARK2:Y?

Outputs the measured value of marker 2.

In I/Q Analyzer mode, for "Real/Imag (I/Q)", for example:

1.852719887E-011,0

Usage:

Query only

Mode:

ALL

3.3.1.4 Other Commands in the CALCulate subsystem**CALCulate<n>:UNIT:POWer <Unit>**

This command selects the unit for power.

The unit is defined globally for all windows.

Suffix:

<n> irrelevant

Parameters:<Unit> DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA
| AMPere

*RST: dBm

Example:

CALC:UNIT:POW DBM

Sets the power unit to dBm.

Mode:

A, ADEMOD, BT, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

3.3.2 CONFigure:BT0oth Subsystem (BLUETOOTH, K8)

This subsystem contains commands to configure Bluetooth measurements.

| | |
|--|----|
| CONFigure:BT0oth:ACLR:ACPairs..... | 88 |
| CONFigure:BT0oth:BANDwidth BWIDth[:RESolution]..... | 88 |
| CONFigure:BT0oth:BANDwidth BWIDth[:RESolution]:AUTO..... | 89 |
| CONFigure:BT0oth:BANDwidth BWIDth:VIDeo..... | 90 |
| CONFigure:BT0oth:BANDwidth BWIDth:VIDeo:AUTO..... | 90 |

| | |
|--|-----|
| CONFigure:BT0oth:CFSTability:BCOunt..... | 91 |
| CONFigure:BT0oth:CHANnel..... | 91 |
| CONFigure:BT0oth:DETEctor<1...4>[:FUNCTion]..... | 91 |
| CONFigure:BT0oth:IBSemiissions:ACPairs..... | 92 |
| CONFigure:BT0oth:IBSemiissions:GATE:AUTO ONCE..... | 92 |
| CONFigure:BT0oth:MEASurement..... | 93 |
| CONFigure:BT0oth:PBSCo..... | 94 |
| CONFigure:BT0oth:PCLass..... | 94 |
| CONFigure:BT0oth:POWER:AVERage:START..... | 94 |
| CONFigure:BT0oth:POWER:AVERage:STOP..... | 95 |
| CONFigure:BT0oth:PRATE..... | 95 |
| CONFigure:BT0oth:PTYPE..... | 96 |
| CONFigure:BT0oth:RTPower:DAVERage:START..... | 96 |
| CONFigure:BT0oth:RTPower:DAVERage:STOP..... | 96 |
| CONFigure:BT0oth:RTPower:GAVERage:START..... | 97 |
| CONFigure:BT0oth:RTPower:GAVERage:STOP..... | 97 |
| CONFigure:BT0oth:SWEEp:COUNT..... | 98 |
| CONFigure:BT0oth:SWEEp:TIME..... | 98 |
| CONFigure:BT0oth:SWEEp:TIME:AUTO..... | 99 |
| CONFigure:BT0oth:TRACe<t>:MODE..... | 99 |
| CONFigure:BT0oth:TRACe<t>:SELect..... | 100 |

CONFigure:BT0oth:ACLR:ACPairs <NoChannels>

This command selects the number of adjacent channel pairs during the Adjacent Channel Power measurement. The number of adjacent channels is limited as soon as the border of the Bluetooth frequency band is reached.

Note:

This command is only available with active "Adjacent Channel Power" measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Parameters:

<NoChannels> **1 to 78**
 *RST: 78

Example:

CONF:BT0:ACLR:ACP 10
 Selects 10 adjacent channel pairs.

Mode: BT

CONFigure:BT0oth:BANDwidth|BWIDth[:RESolution] <Bandwidth>

This command sets the resolution bandwidth of the analyzer for the currently selected Bluetooth measurement (see [\[SENSe:\]BANDwidth|BWIDth\[:RESolution\]](#) on page 109).

For the measurements of modulation characteristics, initial carrier frequency tolerance, and carrier frequency drift (see [CONFigure:BT0oth:MEASurement](#) on page 93), the resolution bandwidth corresponds to the IF bandwidth of the signal. If the resolution bandwidth is changed, its coupling to the settings according to the RF Test Specification is cancelled.

Note:

The settings for the measurements are valid for all three measurements. For all other Bluetooth measurements the setting is only valid for the currently active measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93). This command is not available with active Adjacent Channel Power measurement.

Parameters:

<Bandwidth> **300kHz to 10MHz**
 *RST: AUTO is set to ON

Example:

```
INST:SEL BTO
Activates the Bluetooth Measurements option.
CONF:BTO:MEAS OPOW
Activates the Output Power measurement.
CONF:BTO:BAND 1KHZ
Sets the resolution bandwidth to 1kHz.
```

Mode: BT

CONFigure:BT0oth:BANDwidth|BWIDTH[:RESolution]:AUTO <Mode>

This command couples the resolution bandwidth to the settings according to the RF Test Specification.

Note:

The settings for the measurements of Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift are common to all three measurements. For all other Bluetooth measurements the setting is only valid for the currently active measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Parameters:

<Mode> **ON | OFF**
 *RST: ON

Example:

```
INST:SEL BTO
Activates the Bluetooth Measurements option.
CONF:BTO:MEAS MCH
Activates the Modulation Characteristics measurement.
CONF:BTO:BAND:AUTO ON
Activates the RBW coupling.
```

Mode: BT

CONFigure:BT0oth:Bandwidth|BWIDth:VIDeo <Bandwidth>

This command sets the video bandwidth for the Adjacent Channel Power measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93).

The available filters have a bandwidth range of 1 Hz to 10 MHz. On a change in video bandwidth its link according to the RF Test Specification is switched off.

Note:

This setting is only available for Output Power measurements.

Parameters:

<Bandwidth> **1 Hz to 10 MHz**
 *RST: AUTO is set to ON

Example:

```
INST:SEL BTO
Activates the Bluetooth Measurements option.
CONF:BTO:MEAS ACLR
Activates the Adjacent Channel Power measurement.
CONF:BTO:BAND:VID 100HZ
Sets the video bandwidth to 100 Hz.
```

Mode: BT

CONFigure:BT0oth:Bandwidth|BWIDth:VIDeo:AUTO <Mode>

This command links the video bandwidth to the settings according to the RF Test Specification. It is only available for the Adjacent Channel Power measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Note:

This setting is only valid for the currently active measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93) and it is independent of the other Bluetooth measurements.

Parameters:

<Mode> **ON | OFF**
 *RST: ON

Example:

```
INST:SEL BTO
Activates the Bluetooth Measurements option.
CONF:BTO:MEAS ACLR
Activates the Adjacent Channel Power measurement.
CONF:BTO:BAND:VID:AUTO ON
Switches the VBW coupling on.
```

Mode: BT

CONFigure:BT0oth:CFSTability:BCOunt <NoBlocks>

This command sets the number of blocks to be measured.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Parameters:

<NoBlocks> **0 to 1,000,000**
 *RST: 200

Example: CONF:BT0:CFST:BCO 1000
 Selects 1000 blocks to be measured.

Mode: BT

CONFigure:BT0oth:CHANnel <Channel>

This command selects the frequency channel for the measurements according to the Bluetooth standard.

Parameters:

<Channel> **0 to 78**
 *RST: 0

Example: CONF:BT0:CHAN 20
 Selects channel 20

Mode: BT

CONFigure:BT0oth:DETEctor<1...4>[:FUNCTion] <Detector>

This command selects the detector for the currently selected Bluetooth measurement. The numeric suffix assigns the detector to a trace (1 to 4).

Note:

The RMS detector is not available for the measurements Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift (see [CONFigure:BT0oth:MEASurement](#) on page 93). The setting is valid for the currently selected measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93) and independent of other Bluetooth measurements.

Parameters:

<Detector> APEak | NEGative | POSitive | SAMPlE | RMS | AVERAge
 *RST: see table below

Example: INST:SEL BTO
 Activates the Bluetooth Measurements option.
 CONF:BTO:MEAS OPOW
 Activates the Output Power measurement.
 CONF:BTO:DET2 RMS
 Sets the detector for trace 2 to RMS.

Mode: BT

Table 3-7: RST value depending on measurement type

| Measurement type | RST value |
|--|-----------|
| Output Power | PEAK |
| Adjacent Channel Power EDR Rel TX Power EDR In-band Spurious Emissions | AVER |
| Modulation Characteristics Initial Carrier Frequency Tolerance Carrier Frequency Drift EDR Differential Phase Encoding EDR Carrier Frequency Stability and Modulation Accuracy | APEAK |

CONFigure:BT0oth:IBSemissions:ACPairs <NoChannels>

This command selects the number of adjacent channel pairs during the In-band Spurious Emissions measurement. The number of adjacent channels will be limited as soon as the border of the Bluetooth frequency band is reached.

Note:

This command is only available with active In-band Spurious Emissions measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Parameters:

<NoChannels> **1 to 78**
 *RST: 78

Example: CONF:BTO:IBS:ACP 20
 Selects 20 adjacent channel pairs.

Mode: BT

CONFigure:BT0oth:IBSemissions:GATE:AUTO ONCE

This command adjusts the gate settings for the In-band Spurious Emissions automatically.

Note:

This command is only available with active In-band Spurious Emissions measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Example: `CONF:BT0:IBS:GATE:AUTO ONCE`
Adjusts the gate automatically once.

Mode: BT

CONFigure:BT0oth:MEASurement <MeasType>

This command selects the current measurement according to the Bluetooth standard.

Parameters:

<MeasType>

OPOWER

Output Power measurement, see [chapter 3.2.1.1, "Output Power Measurement"](#), on page 21

ACLR

Adjacent Channel Power measurement, see [chapter 3.2.1.2, "Adjacent Channel Power Measurement"](#), on page 23

MChar

Modulation Characteristics measurement, see [chapter 3.2.1.3, "Modulation Characteristics Measurement"](#), on page 24

ICFTolerance

Initial Carrier Frequency Tolerance measurement, see [chapter 3.2.1.4, "Initial Carrier Frequency Tolerance Measurement"](#), on page 25

CFDRift

Carrier Frequency Drift measurement, see [chapter 3.2.1.5, "Carrier Frequency Drift Measurement"](#), on page 26

RTPower

Relative Transmit Power (EDR) measurement, see [chapter 3.2.1.6, "Relative Transmit Power \(EDR\) Measurement"](#), on page 27

IBSemissions

Spurious Emissions (EDR) measurement, see [chapter 3.2.1.7, "In-band Spurious Emissions \(EDR\) measurement"](#), on page 28

DPENcoding

Differential Phase Encoding (EDR) measurement, see [chapter 3.2.1.9, "Differential Phase Encoding \(EDR\) measurement"](#), on page 31

CFSTability

Carrier Frequency Stability and Modulation Accuracy (EDR) measurement, see [chapter 3.2.1.8, "Carrier Frequency Stability and Modulation Accuracy \(EDR\) measurement"](#), on page 29

*RST: OPOWER

Example: `CONF:BTO:MEAS ACLR`
Selects the measurement of the adjacent channel power.

Mode: BT

CONFigure:BT0oth:PBSCo <NoBytes>

This command selects the number of payload bytes that are transmitted in a packet.

Parameters:
<NoBytes> **1 – 1000**
*RST: 1

Example: `CONF:BTO:PBSC 50`
Selects the number of payload bytes.

Mode: BT

CONFigure:BT0oth:PCLass <Class>

This command selects the power class for the Output Power measurement. The power class defines the limits for the output power measurement.

Parameters:
<Class> **1 to 3**
*RST: 1

Example: `CONF:BTO:PCL 3`
Selects power class 3

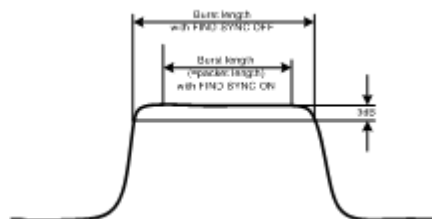
Mode: BT

CONFigure:BT0oth:POWER:AVERAge:STARt <Position>

This command defines the start position for the calculation of the average power of a burst.

Note:

Depending on the setting `FIND SYNC ON` or `OFF` (see [\[SENSe\]:DDEMod:SEARch:SYNC:STATe](#) on page 118) the burst is either defined by the p0 bit and the packet length or the 3 dB points according to the RF Test Specification. As a result there are different areas within the burst for calculating the average power:



Parameters:

<Position> **0 to 100PCT**
 *RST: 20%

Example:

CONF:BTO:POW:AVER:STAR 10PCT
 Sets the starting point for the calculation to 10% of the burst length.

Mode: BT

CONFigure:BT0oth:POWer:AVERage:STOP <Position>

This command defines the end position for the calculation of the average power of a burst.

Note:

Depending on the setting FIND SYNC ON or OFF (see [SENSe]:DDEMod:SEARCh:SYNC:STATe on page 118) the burst is either defined by the p0 bit and the packet length or the 3 dB points according to the RF Test Specification. As a result there are different areas within the burst for calculating the average power (see CONFigure:BT0oth:POWer:AVERage:STARt on page 94).

Parameters:

<Position> **0 to 100PCT**
 *RST: 80%

Example:

CONF:BTO:POW:AVER:STAR 90PCT
 Sets the end point for the calculation to 90% of the burst length.

Mode: BT

CONFigure:BT0oth:PRATe <NoSamples>

This command selects the number of measurement samples (points) per symbol for the measurement. This command is not available for EDR measurements. For EDR measurements, this parameter is set to 4 points/symbol and cannot be changed.

Note:

The RF Test Specification specifies an oversampling factor of at least 4.

Parameters:

<NoSamples> **2 | 4 | 8 | 16 | 32**
 *RST: 4

Example:

CONF:BTO:PRAT 16
 Selects 16 points/symbol.

Mode: BT

CONFigure:BT0oth:PTYPe <Type>

This command selects the packet type to be measured.

Parameters:

| | |
|--------|---|
| <Type> | DH1 1 slot packet |
| | DH3 3 slot packet |
| | DH5 5 slot packet |
| | AUTO automatic selection of the packet type |
| | *RST: DH1 |

Example: CONF:BT0:PTYP DH5
Selects type "5 slot packet".

Mode: BT

CONFigure:BT0oth:RTPower:DAverage:STARt <Time>

This command sets the start time for the power measurement of the DPSK sections of the packet.

Note:

This command is only available with active Relative Transmit Power measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Parameters:

| | |
|--------|------------------|
| <Time> | 0 to 100% |
| | *RST: 10% |

Example: CONF:BT0:RTP:DAV:STAR 20
Sets the start time for the power measurement of the DPSK sections of the packet.

Mode: BT

CONFigure:BT0oth:RTPower:DAverage:STOP <Time>

This command sets the stop time for the power measurement of the DPSK sections of the packet.

Note:

This command is only available with active Relative Transmit Power measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93).

Parameters:

<Time> **0 to 100%**
 *RST: 90%

Example:

CONF: BTO: RTP: DAV: STOP 80

Sets the stop time for the power measurement of the DPSK sections of the packet.

Mode: BT

CONFigure: BTOoth: RTPower: GAVerage: START <Time>

This command sets the start time for the power measurement of the GFSK sections of the packet.

Note:

This command is only available with active Relative Transmit Power measurement (see [CONFigure: BTOoth: MEASurement](#) on page 93).

Parameters:

<Time> **0 to 100%**
 *RST: 10%

Example:

CONF: BTO: RTP: GAV: STAR 20

Sets the start time for the power measurement of the GFSK sections of the packet.

Mode: BT

CONFigure: BTOoth: RTPower: GAVerage: STOP <Time>

This command sets the stop time for the power measurement of the GFSK sections of the packet.

Note:

This command is only available with active Relative Transmit Power measurement (see [CONFigure: BTOoth: MEASurement](#) on page 93).

Parameters:

<Time> **0 to 100%**
 *RST: 90%

Example:

CONF: BTO: RTP: GAV: STOP 80

Sets the stop time for the power measurement of the GFSK sections of the packet.

Mode: BT

CONFigure:BT0oth:SWEep:COUNT <NoSweeps>

This command defines the number of sweeps for the currently selected Bluetooth measurement. This number will be started as a "single sweep". With trace mode setting clear/write (see [CONFigure:BT0oth:TRACe<t>:MODE](#) on page 99) the measurement results will be calculated for each sweep and taken into account for the calculation of minimum, maximum and average values. For the remaining trace settings (AVER, MAXH, MINH) the measurement results will be calculated from the resulting trace. In average mode the value 0 defines the sliding average of the measurement data over 10 sweeps.

Note:

The setting is valid only for the currently active measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93) and independent of the other Bluetooth measurements.

Parameters:

<NoSweeps>

0 to 32767

*RST: see table below

Example:

INST:SEL BTO

Activates the Bluetooth Measurements option.

CONF:BTO:MEAS OPOW

Activates the Output Power measurement.

INIT:CONT OFF

Selects single sweep operation.

CONF:BTO:SWE:COUN 20

Sets the number of sweeps to 20.

INIT;*OPC

Starts a sweep with synchronization.

Mode: BT**Table 3-8: RST value depending on measurement type**

| Measurement type | RST value |
|---|-----------|
| Output Power | 0 |
| Adjacent Channel Power Modulation Characteristics Initial Carrier Frequency Tolerance Carrier Frequency Drift EDR Relative TX Power EDR In-band Spurious Emissions | 10 |
| Differential Phase Encoding | 100 |

CONFigure:BT0oth:SWEep:TIME <Duration>

This command defines the duration of a sweep sequence for the active Bluetooth measurement.

Parameters:

<Duration> **1us to [130560us / (points per symbol)]**
 *RST: AUTO is set to ON

Example:

```
INST:SEL BTO
Activates the Bluetooth Measurements option.
CONF:BTO:MEAS OPOW
Activates the Output Power measurement.
CONF:BTO:SWE:TIME 10MS
Sets a sweep time of 10 ms.
```

Mode: BT

CONFigure:BT0oth:SWEep:TIME:AUTO <Mode>

This command couples the sweep time to the settings according to the RF Test Specification.

Note:

The setting is valid only for the currently active measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93) and independent of the other Bluetooth measurements.

Parameters:

<Mode> **ON | OFF**
 *RST: ON

Example:

```
INST:SEL BTO
Activates the Bluetooth Measurements option.
CONF:BTO:MEAS OPOW
Activates the Output Power measurement.
CONF:BTO:SWE:TIME:AUTO ON
Switches the sweep time coupling on.
```

Mode: BT

CONFigure:BT0oth:TRACe<t>:MODE <Mode>

This command defines the way of displaying and evaluating the measurement curves for the selected Bluetooth measurement. WRITE corresponds to manual operating mode Clr/Write.

The number of measurement to be executed for AVERage, MAXHold and MINHold is defined with the [CONFigure:BT0oth:SWEep:COUNT](#) on page 98 command. Please note that a synchronization to the end of the indicated number of measurements is only possible during single sweep operation.

Note:

The setting is valid only for the currently active measurement (see [CONFigure:BT0oth:MEASurement](#) on page 93) and independent of the other Bluetooth measurements.

Suffix:

<t> the trace related to this setting

Parameters:

<Mode> **WRITe | VIEW | AVERage | MAXHold | MINHold | BLANK**
*RST: WRITe

Example:

```
INST:SEL BTO
Activates the Bluetooth Measurements option.
CONF:BTO:MEAS OPOW
Activates the Output Power measurement.
INIT:CONT OFF
Selects single sweep operation.
CONF:BTO:SWE:COUN 10
Sets the sweep count to 10.
CONF:BTO:TRAC2:MODE AVER
Switches averaging for trace 2 on.
INIT;*OPC
Starts a measurement with synchronization.
```

Mode: BT

CONFigure:BT0oth:TRACe<t>:SELeCt

This command selects the measurement curve for evaluation of the modulation characteristics.

Suffix:

<t> the trace related to this setting

Example:

```
INST:SEL BTO
Activates the Bluetooth Measurements option.
CONF:BTO:MEAS ACLR
Activates the Adjacent Channel Power measurement.
INIT:CONT OFF
Selects single sweep operation.
CONF:BTO:TRAC2:SEL
Selects trace 2 for measurement result queries.
```

Mode: BT

3.3.3 DISPlay Subsystem (BLUETOOTH, K8)

| | |
|--|-----|
| DISPlay[:WINDow<n>]:TRACe<t>[:STATe] | 101 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] | 101 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE | 101 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:PDIVision | 102 |

| | |
|---|-----|
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel..... | 102 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet..... | 103 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition..... | 103 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue..... | 103 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing..... | 104 |

DISPlay[:WINDow<n>]:TRACe<t>[:STATE] <State>

This command switches on or off the display of the corresponding trace in the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background.

Suffix:

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

Parameters:

<State> ON | OFF
 *RST: ON for TRACe1, OFF for TRACe2 to 6

Example: DISP:TRAC3 ON

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] <Range>

This command defines the display range of the y-axis (level axis) with logarithmic scaling ([DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 104) in the window specified by the suffix <n>.

For linear scaling, the display range is fixed and cannot be modified.

Suffix:

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

Parameters:

<Range> 10 dB to 200 dB or value in Hz
 *RST: 100dB

Example: DISP:TRAC:Y 110dB

Mode: all

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

This command defines the scale type of the y-axis (absolute or relative) in the window specified by the suffix <n>.

When `SYSTem:DISPlay:UPDate` is set to OFF, this command has no immediate effect on the screen (see `SYSTem:DISPlay:UPDate` on page 120).

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

Parameters:
 <Mode> ABSolute | RELative
 *RST: ABS

Example: `DISP:TRAC:Y:MODE REL`

Mode: all

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:PDIVision <Value>`

This remote command determines the grid spacing on the Y axis for all diagrams, where possible.

Suffix:
 <n> irrelevant
 <t> irrelevant

Parameters:
 <Value> numeric value; the unit depends on the result display
 *RST: depends on the result display

Example: `DISP:TRAC:Y:PDIV 10`
 Sets the grid spacing to 10 units (for example 10 dB in the Code Domain Power result display).

Mode: CDMA, BT, EVDO, TDS, WCDMA

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

This command sets the reference level.

With the reference level offset <> 0, the indicated value range of the reference level is modified by the offset.

Suffix:
 <n> irrelevant.
 <t> irrelevant

Parameters:
 <Value> <numeric_value>, range specified in data sheet
 *RST: -10dBm

Example: `DISP:TRAC:Y:RLEV -60dBm`

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, VSA, WCDMA

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

This command sets the reference level offset.

Suffix:

<n> irrelevant.

<t> irrelevant

Parameters:

<Value> -200dB to 200dB

*RST: 0dB

Example:

DISP:TRAC:Y:RLEV:OFFS -10dB

Mode:

ALL

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition <Position>

This remote command defines the position of the reference value on the Y axis (1 – 100 %) in the window specified by the suffix <n>.

When using a tracking generator (only with option R&S FSV-B9 or -B10, requires active normalization), and in Bluetooth mode (option R&S FSV-K8) this command defines the position of the reference value for all windows.

Suffix:

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

<t> irrelevant

Parameters:

<Position> 0 to 100PCT

*RST: 100 PCT = "Spectrum" mode, AF spectrum display;
50 PCT = Tracking Generator mode or time display

Example:

DISP:TRAC:Y:RPOS 50PCT

Mode:

A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD, VSA

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

The command defines the power value assigned to the reference position in the grid.

When using a tracking generator (only with option R&S FSV-B9 or -B10), this command requires active normalization.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Value> <numeric_value>

*RST: 0 dB, coupled to reference level

Example: `DISP:TRAC:Y:RVAL -20dBm`
 (Analyzer)
 `DISP:TRAC:Y:RVAL 0`
 Sets the power value assigned to the reference position to 0 dB
 (tracking generator)

Mode: A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD

DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing <ScalingType>

This command selects the scaling for the level display range in the window specified by the suffix <n>.

Suffix:

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

<t> irrelevant

Parameters:

<ScalingType> LOGarithmic | LINear | LDB

LOGarithmic

Selects logarithmic scaling.

LINear

Selects linear scaling in %.

LDB

Selects linear scaling in dB.

*RST: LOGarithmic

Example: `DISP:TRAC:Y:SPAC LIN`

Mode: A, ADEMOD, BT, VSA

3.3.4 FORMat subsystem

FORMat[:DATA] <Format>

This command specifies the data format for the data transmitted from the instrument to the control PC. It is used for the transmission of trace data. The data format of trace data received by the instrument is automatically recognized, regardless of the format which is programmed.

Parameters:

<Format> ASCII | REAL

ASCII

ASCII data are transmitted in plain text, separated by commas.

REAL

REAL data are transmitted as 32-bit IEEE 754 floating-point numbers in the "definite length block format".

*RST: ASCII

Example:

FORM REAL, 32

FORM ASC

Mode:

all

3.3.5 INITiate subsystem

| | |
|------------------------------|-----|
| INITiate<n>:CONTInuous..... | 105 |
| INITiate<n>[:IMMediate]..... | 105 |

INITiate<n>:CONTInuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

In the "**Spectrum**" mode, this setting refers to the sweep sequence (switching between continuous/single sweep).

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.

Mode:

all

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, synchronization to the end of the indicated number of measurements can be achieved with the command *OPC, *OPC? or *WAI. In continuous-sweep mode, synchronization to the sweep end is not possible since the overall measurement never ends.

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

3.3.6 INPut subsystem

| | |
|-----------------------------|-----|
| INPut:ATTenuation..... | 106 |
| INPut:ATTenuation:AUTO..... | 107 |
| INPut:GAIN:STATe | 107 |
| INPut:IMPedance..... | 107 |

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 FSV-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 FSV-B17) is active.

Parameters:

<Value> <numeric_value> in dB; range specified in data sheet

*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 FSV-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:GAIN:STATe <State>

This command switches the preamplifier on or off (only for option RF Preamplifier, R&S FSV-B22/B24).

With option R&S FSV-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSV-B24, the amplifier applies to the entire frequency range.

This command is not available when using R&S Digital I/Q Interface (R&S FSV-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:IMPedance <Value>

This command sets the nominal input impedance of the instrument. The set impedance is taken into account in all level indications of results.

The setting 75 Ω should be selected, if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75 Ω /50 Ω).

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:
 <Value> 50 | 75
 *RST: 50 Ω

Example: INP:IMP 75

Mode: all

3.3.7 INSTRument Subsystem (BLUETOOTH, K8)

INSTRument[:SElect].....108
 INSTRument:NSElect.....108

INSTRument[:SElect]

Parameters:
 Parameter **BT0oth**
 Bluetooth mode (option Bluetooth Measurements)

INSTRument:NSElect

Parameters:
 Parameter **12**
 Bluetooth mode (option Bluetooth Measurements)

3.3.8 SENSE Subsystem (BLUETOOTH, K8)

[SENSe:]AVERAge<n>:COUNT <NoMeasurements>

This command defines the number of measurements which contribute to the average value in the window specified by the AVERAge<n> suffix.

Note that continuous averaging is performed after the indicated number has been reached in continuous sweep mode.

In single sweep mode, the sweep is stopped as soon as the indicated number of measurements (sweeps) is reached. Synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

This command has the same effect as the [SENSe<source>:]SWEep:COUNT command. In both cases, the number of measurements is defined whether the average calculation is active or not.

The number of measurements applies to all traces in the window.

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

Parameters:

<NoMeasurements> 0 to 32767

*RST: 0

Example:

SWE:CONT OFF

Switching to single sweep mode.

AVER:COUN 16

Sets the number of measurements to 16.

AVER:STAT ON

Switches on the calculation of average.

INIT;*WAI

Starts the measurement and waits for the end of the 16 sweeps.

Mode: all**[SENSe:]AVERage<n>:TYPE <FunctionType>**

This command selects the type of average function in the window specified by the AVERage<n> suffix.

Suffix:

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

Parameters:

<FunctionType> VIDEo | LINear | POWer

VIDEo

The logarithmic power values are averaged.

LINear

The power values are averaged before they are converted to logarithmic values.

POWer

The power level values are converted into unit Watt prior to averaging. After the averaging, the data is converted back into its original unit.

*RST: VIDEo

Example:

AVER:TYPE LIN

Switches to linear average calculation.

Mode: A, ADEMOD, BT, WCDMA**[SENSe:]BANDwidth|BWIDth[:RESolution] <Bandwidth>**

This command defines the resolution bandwidth.

The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to [chapter 3.2.10.1, "Selecting the Appropriate Filter Type"](#), on page 62.

In realtime mode, the resolution bandwidth is always coupled to the span. In all other modes, a change of the resolution bandwidth automatically switches the coupling to the span off.

Parameters:

<Bandwidth> refer to data sheet
 *RST: (AUTO is set to ON)

Example:

BAND 1 MHz
 Sets the resolution bandwidth to 1 MHz

Mode:

all, except ADEMODO

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command either automatically couples the resolution bandwidth of the instrument to the span or cancels the coupling.

The automatic coupling adapts the resolution bandwidth to the currently set frequency span according to the relationship between frequency span and resolution bandwidth. The 6 dB bandwidths 200 Hz, 9 kHz and 120 kHz and the channel filters available are not set by the automatic coupling.

The ratio resolution bandwidth/span can be modified with the [SENSe:]BANDwidth|BWIDth[:RESolution]:RATio command.

Parameters:

<State> ON | OFF
 *RST: ON

Example:

BAND:AUTO OFF
 Switches off the coupling of the resolution bandwidth to the span.

Mode:

A-F, BT, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>

This command defines the ratio resolution bandwidth (Hz)/span (Hz). The ratio to be entered is reciprocal to the ratio span/RBW used in manual operation.

Parameters:

<Ratio> 0.0001 to 1
 *RST: 0.01

Example:

BAND:RAT 0.1

Mode:

A, BT, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>

This command switches the filter type for the resolution bandwidth.

For detailed information on filters see [chapter 3.2.10.1, "Selecting the Appropriate Filter Type"](#), on page 62 and [chapter 3.2.10.2, "List of Available RRC and Channel Filters"](#), on page 62.

When changing the filter type, the next larger filter bandwidth is selected if the same filter bandwidth is not available for the new filter type.

5 Pole filters are not available when using the sweep type "FFT".

Parameters:

| | |
|--------------|-----------------------------------|
| <FilterType> | NORMAL Gaussian filters |
| | FFT FFT filters |
| | CFILTER channel filters |
| | RRC RRC filters |
| | P5 5 Pole filters |
| *RST: | NORMAL |

Example: BAND:TYPE NORM

Mode: all, except ADEMOD

[SENSe:]CORRection:EGain:INPut[:MAGNitude]

This command makes an external gain known to the analyzer, which will take it into account during the display of measurement results. With this function the gain of an antenna or of an external preamplifier can be taken into account for the measurement values.

This command is only available with option K8, B9 or B10 installed.

Parameters:

| | |
|-------|--------------|
| | -200...200dB |
| *RST: | 0 dB |

Example: CORR:EGA:INP 10DB
Takes 10 dB external gain into account.

Mode: A, BT

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency of the analyzer or the measuring frequency for span = 0.

Parameters:

<Frequency> <numeric_value>

Range: 0 to f_{max}
 *RST: f_{max}/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:]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)

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 query command returns the current number of started sweeps. A sweep count value should be set and the device should be in single sweep mode.

Parameters:

*RST: 0

Example: SWE:COUNT 64
 Sets sweep count to 64
 INIT:CONT OFF
 Switches to single sweep mode
 INIT
 Starts a sweep (without waiting for the sweep end!)
 SWE:COUN:CURR?
 Queries the number of started sweeps

Mode: A, BT, ADEMOD, TDS

[SENSe:]SWEep:EGATe:HOLDoff <DelayTime>

This command defines the delay time between the external gate signal and the continuation of the sweep.

Note: Using gate mode "level" (see [SENSe:]SWEep:EGATe:TYPE on page 114) and an IFP trigger (see TRIGger<n>[:SEQuence]:SOURce on page 125), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

Parameters:

<DelayTime> 0 s to 30 s
 *RST: 0s

Example: SWE:EGAT:HOLD 100us

Mode: A, ADEMOD, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:LENGth <TimeInterval>

In case of edge triggering, this command determines the time interval during which the instrument sweeps.

Parameters:

<TimeInterval> 125 ns to 30 s
 *RST: 400µs

Example: SWE:EGAT:LENG 10ms

Mode: A, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:POLarity <Polarity>

This command determines the polarity of the external gate signal. The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

Parameters:

<Polarity> POSitive | NEGative
 *RST: POSitive

Example:

SWE:EGAT:POL POS

Mode:

A, ADEMOD, BT, EVDO, TDS, WCDMA

[SENSe:]SWEep:EGATe:TYPE <Type>

This command sets the type of triggering by the external gate signal.

A delay between applying the gate signal and the start of recording measured values can be defined, see [\[SENSe:\]SWEep:EGATe:HOLDoff](#) on page 113.

Parameters:

<Type> LEVel | EDGE

LEVel

The gate is level-triggered:

After detection of the gate signal, the gate remains open until the gate signal disappears. The gate opening time cannot be defined with the command [\[SENSe:\]SWEep:EGATe:HOLDoff](#).

Note: Using gating with gate mode "level" and an IFP trigger (see [TRIGger<n>\[:SEQuence\]:SOURce](#) on page 125), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

EDGE

The gate is edge-triggered:

After detection of the set gate signal edge, the gate remains open until the gate delay ([\[SENSe:\]SWEep:EGATe:HOLDoff](#)) has expired.

*RST: EDGE

Example:

SWE:EGAT:TYPE EDGE

Mode:

A, ADEMOD, BT, EVDO, TDS

[SENSe:]SWEep:MODE <Mode>

This command changes from "Spectrum" to "Spectrum Emission Mask" or "Spurious Emissions" measurement mode and back.

Parameters:

<Mode> AUTO | ESpectrum | LIST

AUTO

Switches to "Spectrum" measurement mode or stays in the current mode if it is not ESP/LIST

ESpectrum

"Spectrum Emission Mask" measurement mode

LIST

"Spurious Emissions" measurement mode

*RST: AUTO

Example:

SWE:MODE ESP

Sets the Spectrum Emission Mask measurement mode.

Mode:

A, BT, CDMA, EVDO, PHN

[SENSe:]SWEep:POINts <NumberPoints>

This command defines the number of measurement points to be collected during one sweep.

Note: For Spurious Emissions measurements the maximum number of sweep points in all ranges is limited to 100001.

Parameters:

<NumberPoints> 101 to 32001

*RST: 691 (NF: 11)

Example:

SWE:POIN 251

Mode:

A, ADEMOD, BT, CDMA, EVDO, TDS, NF, PHN, WCDMA

[SENSe:]SWEep:TIME <Time>

This command defines the sweep time.

The range depends on the frequency span.

If this command is used in analyzer mode, automatic coupling to resolution bandwidth and video bandwidth is switched off.

Parameters:

<Time> refer to data sheet

*RST: (AUTO is set to ON)

Example:

SWE:TIME 10s

Mode:

ALL

[SENSe:]SWEep:TIME:AUTO <State>

In realtime mode, this command automatically sets the sweep time to 32 ms.

In analyzer mode, this command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings. If [SENSe:]SWEep:TIME is used, automatic coupling is switched off.

Parameters:

<State> ON | OFF
*RST: ON

Example: SWE:TIME:AUTO ON
Activates automatic sweep time.

Mode: A, BT, CDMA, EVDO, RT, TDS, NF, WCDMA

[SENSe:]SWEep:TYPE <Type>**Parameters:**

<Type> SWE | AUTO | FFT
SWE
Sweep list
AUTO
Automatic selection of the sweep type.
FFT
FFT mode
*RST: AUTO
Sets the sweep type.

Example: SWE:TYPE FFT

Mode: all

3.3.9 SENSE:ADEMod Subsystem (BLUETOOTH, K8)

| | |
|----------------------------------|-----|
| [SENSe:]ADEMod:ZOOM[:STATe]..... | 116 |
| [SENSe:]ADEMod:ZOOM:START..... | 117 |

[SENSe:]ADEMod:ZOOM[:STATe] <Mode>

The command enables or disables the zoom function. Depending on the selected measurement time and the demodulation bandwidth, the number of recorded measurement points may be greater than that shown on the display.

If the zoom function is enabled, 501 test points of the result memory are displayed from the start time specified by the [SENSe:]ADEMod:ZOOM:START command.

If the zoom function is disabled, data reduction is used to adapt the measurement points to the number of points available on the display.

Note:

The zoom function is only available for the Output Power, Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift measurements.

Parameters:

<Mode> **ON | OFF**
 *RST: OFF

Example:

ADEM:ZOOM ON
 Switches on the zoom function

Mode: BT

[SENSe:]ADEMod:ZOOM:STARt <Time>

The command sets the start time for the display of individual measured values.

The zoom function is enabled or disabled by the [SENSe:]ADEMod:ZOOM[:STATe] command.

Note:

The zoom function is only available for the Output Power, Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift measurements.

Parameters:

<Time> **0 s to (meas time – 500 / sampling rate)**
 *RST: 0 s

Example:

ADEM:ZOOM ON
 Switches on the zoom function
 ADEM:ZOOM:STAR 500us
 Sets the starting point of the display to 500 µs.

Mode: BT

3.3.10 SENSe:DDEMod Subsystem (BLUETOOTH, K8)

| | |
|--|-----|
| [SENSe:]DDEMod:FILTer:MEASurement..... | 118 |
| [SENSe:]DDEMod:SEARch:PULSe[:STATe]..... | 118 |
| [SENSe:]DDEMod:SEARch:PULSe:OFFSet..... | 118 |
| [SENSe:]DDEMod:SEARch:SYNC:STATe..... | 118 |
| [SENSe:]DDEMod:SEARch:SYNC:LAP..... | 119 |
| [SENSe:]DDEMod:SEARch:SYNC:OFFSet..... | 119 |
| [SENSe:]DDEMod:SEARch:TIME..... | 119 |
| [SENSe:]DDEMod:SEARch:TIME:AUTO..... | 120 |

[SENSe:]DDEMod:FILTer:MEASurement <ReceiveFilter>

This command selects the receive filter for the signal to measure.

Note:

This command is only available with active Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift measurement (see [CONFigure: BT0oth:MEASurement](#) on page 93). With all other measurements it will lead to a query error.

Parameters:

<ReceiveFilter> **OFF | BT0oth**
*RST: ON

Example:

DDEM:FILT:MEAS BT0
Activates the Bluetooth measurement filter.

Mode: BT

[SENSe:]DDEMod:SEARch:PULSe[:STATe] <Mode>

This command switches the search for a signal burst on or off.

Parameters:

<Mode> **ON | OFF**
*RST: ON

Example:

DDEM:SEAR:PULS OFF

Mode: BT

[SENSe:]DDEMod:SEARch:PULSe:OFFSet <Time>

This command defines the time to be recorded before a signal burst is recognized.

Parameters:

<Time> **0 to 10 ms**
*RST: 0

Example:

DDEM:SEAR:PULS:OFFS 1MS
Sets the burst offset to 1ms before the start of the burst.

Mode: BT

[SENSe:]DDEMod:SEARch:SYNC:STATe <PatternSearch>

This command switches the search for a sync sequence on or off.

Setting parameters:

<PatternSearch> ON | OFF

*RST: OFF

Example:

DDEM:SEAR:SYNC ON

Switches the sync search on.

Mode:

BT, VSA

[SENSe:]DDEMod:SEARch:SYNC:LAP <Bits>

This command determines the 24 least significant bits (LAP) of the DUT 'Bluetooth device address'. They are used to define the synchronization pattern to determine the start of a packet.

Parameters:

<Bits> 0 to FFFFFFF hex

*RST: #H0

Example:

DDEM:SEAR:SYNC:LAP #HA3F45B

Sets on LAP A3F45B Hex

Mode:

BT

[SENSe:]DDEMod:SEARch:SYNC:OFFSet <NoBits>

This command defines the number of bits to be recorded before the first preamble bit is detected.

Parameters:

<NoBits> 0 to 10000

*RST: 0

Example:

DDEM:SEAR:SYNC:OFFS 10

Sets the sync offset to 10 bits before the preamble bits.

Mode:

BT

[SENSe:]DDEMod:SEARch:TIME <RecLength>

This command selects manual setting of the record length and defines the record length to be used for the search of sync word and burst.

Note:

For information on the correlation of trigger and record length refer to [\[SENSe:\]DDEMod:SEARch:TIME:AUTO](#) on page 120

Parameters:

<RecLength> 100ms to [130560ms / (points per symbol)]

*RST: 1875 us

Example: `DDEM:SEAR:TIME 100US`
Sets the record length for sync word and burst search to 100 us.

Mode: BT

Table 3-9: Max. record length depending on points per symbol

| Points per Symbol | Maximum record length |
|-------------------|-----------------------|
| 2 | 104.4 slots |
| 4 | 52.2 slots |
| 8 | 26.1 slots |
| 16 | 13.1 slots |
| 32 | 6.5 slots |

[SENSe:]DDEMod:SEARch:TIME:AUTO <Mode>

This command activates the automatic setting of the record length for the sync word and burst search, depending on the selected packet type.

The automatic record length is determined as follows:

Trigger free run:

$\text{search length} = 3 * \text{packet length} + |\text{sync offset or burst offset}|$

All other trigger modes:

$\text{search length} = 1 * \text{packet length} + 1 \text{ Slot} + |\text{sync offset or burst offset}|$

If the selected measurement time is higher than the packet length, the following difference is added to the search length:

$\text{measurement time} - \text{packet length}$

Parameters:

<Mode> **ON | OFF**
*RST: ON

Example: `DDEM:SEAR:TIME:AUTO OFF`
Selects manual input for the record length

Mode: BT

3.3.11 SYSTem subsystem

SYSTem:DISPlay:UPDate <State>

In remote control mode, this command switches on or off the instrument display. If switched on, only the diagrams, traces and display fields are displayed and updated.

The best performance is obtained if the display output is switched off during remote control.

Parameters:

<State> ON | OFF

*RST: OFF

Example:

SYST:DISP:UPD ON

Mode:

all

3.3.12 TRACe subsystem

TRACe<n>[:DATA]? <ResultType>

This command returns the current trace data or measurement results. In case of several result displays, you have to use specific parameters to query the results.

Suffix:

<n> 1...4

window; For applications that have only one measurement screen, the suffix is irrelevant.

Query parameters:

<ResultType>

TRACe1 | TRACe2 | TRACe3 | TRACe4 | TRACe5 | TRACe6 |
SPECTrogram | SGRam | LIST | SPURious

Selects the type of result to be returned.

TRACe1 | ... | TRACe6

The query returns a list of results with one value for each sweep point in the currently set level unit.

For details see [table 3-10](#)**LIST**Returns the results of the list evaluation of the Spectrum Emission Mask and Spurious Emissions measurement (Spectrum mode only). For a description of the syntax see [table 3-11](#) below.**SPURious**

Returns the peak list of the Spurious Emissions measurement (Spectrum mode only)

SPECTrogram | SGRam

Returns the results of the spectrogram result display (requires R&S FSV-K14 option). For every frame in the spectrogram, the command returns 801 power levels, one for each horizontal pixel on the display. The power level unit depends on the unit you have currently set. The number of frames depends on the history depth. The data format is either binary or ASCII.

PSpectrum

Returns the results of the persistence spectrum result display. The command returns 801*600 percentages, one for each pixel in the histogram from .

The data format is either binary or ASCII.

HMAXhold

Returns the results of the maxhold trace in the persistence spectrum result display. The command returns 801*600 percentages, one for each pixel in the maxhold trace.

The data format is either binary or ASCII.

Example:

TRAC? TRACe1

Returns the trace data for Trace 1.

Usage: Query only
Mode: A, ADEMOD, BT, NF, PHN, TDS

Table 3-10: Results for <TRACe...> ResultTypes

The query returns a list of results with one value for each sweep point in the currently set level unit. By default, the list contains 691 values. The currently used number of sweep points can be determined using SWE:POIN?, see [SENSe:]SWEep:POINts on page 115.

FORMat REAL, 32 is used as format for binary transmission, and FORMat ASCii for ASCII transmission.

With the auto peak detector, only positive peak values can be read out.

In **IQ Analyzer mode**, if the result display configuration "Real/Imag (I/Q)" is selected, this query returns the I values of each trace point first, then the Q values:

<result>= I₁,I₂,...,I_n, Q₁,Q₂,...,Q_n

In realtime mode, this parameter queries the results of the realtime spectrum result display.

Table 3-11: Results for <LIST> ResultType

Using the LIST parameter, the query returns the results of the list evaluation of the Spectrum Emission Mask and Spurious Emissions measurement (Spectrum mode only) with the following syntax:

<no>, <start>, <stop>, <rbw>, <freq>, <power abs>, <power rel>, <delta>, <limit check>, <unused1>, <unused2>

where:

| | |
|----------------|---|
| <no>: | peak number |
| <start>: | start frequency of range |
| <stop>: | stop frequency of range |
| <rbw>: | resolution bandwidth of range |
| <freq>: | frequency of peak |
| <power abs>: | absolute power in dBm of peak |
| <power rel>: | relative power in dBc (related to the channel power) of peak |
| <delta>: | distance to the limit line in dB (positive indicates value above the limit, fail) |
| <limit check>: | limit fail (pass = 0, fail = 1) |
| <unused1>: | reserved (0.0) |
| <unused2>: | reserved (0.0) |

3.3.13 TRIGger subsystem

TRIGger<n>[:SEQuence]:IFPower:HOLDoff <Value>

This command sets the holding time before the next IF power trigger event.

Suffix:
 <n> irrelevant

Parameters:
 <Value> <numeric_value> in s: 150 ns to 1000 s

*RST: 150 ns

Example: TRIG:SOUR IFP
Sets the IF power trigger source.
TRIG:IFP:HOLD 200 ns
Sets the holding time to 200 ns.

Mode: A-F, ADEMOD, CDMA, EVDO, GSM, VSA, OFDM, OFDMA/
WiBro, TDS, WCDMA, WLAN

TRIGger<n>[:SEQuence]:IFPower:HYSteresis <Value>

This command sets the limit that the hysteresis value for the IF power trigger has to fall below in order to trigger the next measurement.

Suffix:

<n> irrelevant

Parameters:

<Value> <numeric_value> in dB: 3 dB to 50 dB

*RST: 3 dB

Example: TRIG:SOUR IFP
Sets the IF power trigger source.
TRIG:IFP:HYST 10DB
Sets the hysteresis limit value.

Mode: ALL

TRIGger<n>[:SEQuence]:HOLDoff[:TIME] <Delay>

This command defines the length of the trigger delay.

A negative delay time (pretrigger) can be set in zero span only.

Suffix:

<n> irrelevant

Parameters:

<Delay>

Range: zero span: -sweep time (see data sheet) to 30 s; span:
0 to 30 s

*RST: 0 s

Example: TRIG:HOLD 500us

Mode: All

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]:SLOPe <Type>

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources.

Suffix:

<n> irrelevant

Parameters:

<Type> POSitive | NEGative
 *RST: POSitive

Example:

TRIG:SLOP NEG

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

Parameters:

<Source>

EXTernal | IFPower | IMMEDIATE | MASK | TIME | VIDEO

Note that the availability of the trigger source depends on the measurement you are in.

EXTernal

Selects an external trigger.

IFPower

Selects the trigger on the second intermediate frequency.

IMMEDIATE

Selects the free run mode (= no trigger).

MASK

Selects the frequency mask trigger.

TDTRIGGER

Selects the time domain trigger.

TIME

Selects the time trigger.

VIDEO

Selects the video trigger. The video trigger is available for time domain measurements.

*RST: IMMEDIATE

Example:

```
TRIG:SOUR EXT
```

Selects the external trigger input as source of the trigger signal

Mode:

ALL

3.3.14 Programming Example

Adapting the settings to the characteristics of the DUT

```
INST:SEL BTO
```

Activates the Bluetooth Measurements option

```
INIT:CONT OFF
```

Selects single sweep operation

```
CONF:BTO:CHAN 10
```

Selects channel 10

```
CONF:BTO:PCL 1
```

Selects power class 1

```
CONF:BTO:PRAT 4
```

Selects 4 points per symbol

```
CONF:BTO:PTYP DH1
```

Selects 1 slot packet

```
DDEM:SEAR:SYNC ON
```

Activates the FIND SYNC function

```
DDEM:SEAR:SYNC:OFFS 0
```

Sets the sync offset = 0

```
DDEM:SEAR:SYNC:LAP #H0
```

Sets the lower address part = 0

```
DDEM:SEAR:TIME:AUTO ON
```

Selects automatic search length

List of Commands

| | |
|---|-----|
| [SENSe:]ADEMod:ZOOM:START..... | 117 |
| [SENSe:]ADEMod:ZOOM[:STATe]..... | 116 |
| [SENSe:]AVERAge<n>:COUNT..... | 108 |
| [SENSe:]AVERAge<n>:TYPE..... | 109 |
| [SENSe:]BANDwidth BWIDth[:RESolution]..... | 109 |
| [SENSe:]BANDwidth BWIDth[:RESolution]:AUTO..... | 110 |
| [SENSe:]BANDwidth BWIDth[:RESolution]:RATio..... | 110 |
| [SENSe:]BANDwidth BWIDth[:RESolution]:TYPE..... | 111 |
| [SENSe:]CORRection:EGain:INPut[:MAGNitude]..... | 111 |
| [SENSe:]DDEMod:FILTer:MEASurement..... | 118 |
| [SENSe:]DDEMod:SEARch:PULSe:OFFSet..... | 118 |
| [SENSe:]DDEMod:SEARch:PULSe[:STATe]..... | 118 |
| [SENSe:]DDEMod:SEARch:SYNC:LAP..... | 119 |
| [SENSe:]DDEMod:SEARch:SYNC:OFFSet..... | 119 |
| [SENSe:]DDEMod:SEARch:TIME..... | 119 |
| [SENSe:]DDEMod:SEARch:TIME:AUTO..... | 120 |
| [SENSe:]FREQuency:CENTer..... | 112 |
| [SENSe:]SWEep:COUNT..... | 112 |
| [SENSe:]SWEep:COUNT:CURRent..... | 112 |
| [SENSe:]SWEep:EGATe:HOLDoff..... | 113 |
| [SENSe:]SWEep:EGATe:LENGth..... | 113 |
| [SENSe:]SWEep:EGATe:POLarity..... | 113 |
| [SENSe:]SWEep:EGATe:TYPE..... | 114 |
| [SENSe:]SWEep:MODE..... | 114 |
| [SENSe:]SWEep:POINts..... | 115 |
| [SENSe:]SWEep:TIME..... | 115 |
| [SENSe:]SWEep:TIME:AUTO..... | 116 |
| [SENSe:]SWEep:TYPE..... | 116 |
| [SENSe:]DDEMod:SEARch:SYNC:STATe..... | 118 |
| CALCulate<n>:BTOoth:ACLR:EXCEptions..... | 66 |
| CALCulate<n>:BTOoth:ACLR[:LIST]..... | 66 |
| CALCulate<n>:BTOoth:CFDRift:RATE..... | 67 |
| CALCulate<n>:BTOoth:CFDRift[:MAXimum]..... | 67 |
| CALCulate<n>:BTOoth:CFSTability:COUNT..... | 68 |
| CALCulate<n>:BTOoth:CFSTability:DEVM:[RMS]..... | 68 |
| CALCulate<n>:BTOoth:CFSTability:DEVM:D99Pct..... | 69 |
| CALCulate<n>:BTOoth:CFSTability:DEVM:DPCT..... | 69 |
| CALCulate<n>:BTOoth:CFSTability:DEVM:PEAK..... | 70 |
| CALCulate<n>:BTOoth:CFSTability:FERRor:[TOTal]..... | 70 |
| CALCulate<n>:BTOoth:CFSTability:FERRor:BLOCK..... | 71 |
| CALCulate<n>:BTOoth:CFSTability:FERRor:INITial..... | 71 |
| CALCulate<n>:BTOoth:DPENcoding:[TOTal]..... | 72 |
| CALCulate<n>:BTOoth:DPENcoding:BER..... | 73 |
| CALCulate<n>:BTOoth:DPENcoding:NERRor..... | 73 |
| CALCulate<n>:BTOoth:IBSemissions:[List]..... | 74 |
| CALCulate<n>:BTOoth:IBSemissions:EXCEptions..... | 74 |
| CALCulate<n>:BTOoth:IBSemissions:HADJacent..... | 75 |

| | |
|---|-----|
| CALCulate<n>:BTOoth:IBSemiissions:TXReference..... | 75 |
| CALCulate<n>:BTOoth:ICFTolerance..... | 76 |
| CALCulate<n>:BTOoth:MCHar:DF2:PERCent..... | 78 |
| CALCulate<n>:BTOoth:MCHar:DF<Delta>:AVERage..... | 76 |
| CALCulate<n>:BTOoth:MCHar:DF<Delta>:MAXimum..... | 77 |
| CALCulate<n>:BTOoth:MCHar:RATio..... | 78 |
| CALCulate<n>:BTOoth:OPower:AVERage..... | 80 |
| CALCulate<n>:BTOoth:OPower[:PEAK]..... | 79 |
| CALCulate<n>:BTOoth:PLENght..... | 81 |
| CALCulate<n>:BTOoth:PTYPe..... | 81 |
| CALCulate<n>:BTOoth:RTPower:[DPSK]..... | 82 |
| CALCulate<n>:BTOoth:RTPower:GFSK..... | 83 |
| CALCulate<n>:BTOoth:RTPower:RATio..... | 83 |
| CALCulate<n>:BTOoth:STATus..... | 84 |
| CALCulate<n>:DELTAmarker<m>:Y..... | 85 |
| CALCulate<n>:MARKer<m>:PEXCursion..... | 86 |
| CALCulate<n>:MARKer<m>:Y..... | 86 |
| CALCulate<n>:UNIT:POWER..... | 87 |
| CONFigure:BTOoth:ACLR:ACPairs..... | 88 |
| CONFigure:BTOoth:BANDwidth BWIDth:VIDeo..... | 90 |
| CONFigure:BTOoth:BANDwidth BWIDth:VIDeo:AUTO..... | 90 |
| CONFigure:BTOoth:BANDwidth BWIDth[:RESolution]..... | 88 |
| CONFigure:BTOoth:BANDwidth BWIDth[:RESolution]:AUTO..... | 89 |
| CONFigure:BTOoth:CFSTability:BCOunt..... | 91 |
| CONFigure:BTOoth:CHANnel..... | 91 |
| CONFigure:BTOoth:DETEctor<1...4>[:FUNction]..... | 91 |
| CONFigure:BTOoth:IBSemiissions:ACPairs..... | 92 |
| CONFigure:BTOoth:IBSemiissions:GATE:AUTO ONCE..... | 92 |
| CONFigure:BTOoth:MEASurement..... | 93 |
| CONFigure:BTOoth:PBSCo..... | 94 |
| CONFigure:BTOoth:PCLass..... | 94 |
| CONFigure:BTOoth:POWER:AVERage:START..... | 94 |
| CONFigure:BTOoth:POWER:AVERage:STOP..... | 95 |
| CONFigure:BTOoth:PRATe..... | 95 |
| CONFigure:BTOoth:PTYPe..... | 96 |
| CONFigure:BTOoth:RTPower:DAverage:START..... | 96 |
| CONFigure:BTOoth:RTPower:DAverage:STOP..... | 96 |
| CONFigure:BTOoth:RTPower:GAverage:START..... | 97 |
| CONFigure:BTOoth:RTPower:GAverage:STOP..... | 97 |
| CONFigure:BTOoth:SWEep:COUNT..... | 98 |
| CONFigure:BTOoth:SWEep:TIME..... | 98 |
| CONFigure:BTOoth:SWEep:TIME:AUTO..... | 99 |
| CONFigure:BTOoth:TRACe<t>:MODE..... | 99 |
| CONFigure:BTOoth:TRACe<t>:SELect..... | 100 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing..... | 104 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]..... | 101 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]:MODE..... | 101 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]:PDIVision..... | 102 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]:RLEVEL..... | 102 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]:RLEVEL:OFFSet..... | 103 |

| | |
|---|-----|
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition..... | 103 |
| DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue..... | 103 |
| DISPlay[:WINDow<n>]:TRACe<t>[:STATe]..... | 101 |
| FORMat[:DATA]..... | 104 |
| INITiate<n>:CONTInuous..... | 105 |
| INITiate<n>[:IMMEdiate]..... | 105 |
| INPut:ATTenuation..... | 106 |
| INPut:ATTenuation:AUTO..... | 107 |
| INPut:GAIN:STATe | 107 |
| INPut:IMPedance..... | 107 |
| INSTRument:NSElect..... | 108 |
| INSTRument[:SElect]..... | 108 |
| SYSTem:DISPlay:UPDate..... | 120 |
| TRACe<n>[:DATA]..... | 121 |
| TRIGger<n>[:SEquence]:HOLDoff[:TIME]..... | 124 |
| TRIGger<n>[:SEquence]:IFPower:HOLDoff..... | 123 |
| TRIGger<n>[:SEquence]:IFPower:HYSTeresis..... | 124 |
| TRIGger<n>[:SEquence]:LEVel:IFPower..... | 124 |
| TRIGger<n>[:SEquence]:SLOPe..... | 125 |
| TRIGger<n>[:SEquence]:SOURce..... | 125 |

Index

A

| | |
|---|---------|
| Adjacent-Channel Power measurement (K8) | 23 |
| amplitude menu | |
| K8 option | 48 |
| antenna gain (K8) | 36 |
| attenuation | |
| automatic | 50 |
| manual | 50, 106 |
| option B25 | 50 |
| average or peak values (K8) | 17 |

B

| | |
|-------------------------------------|----|
| bandwidth | |
| K8 Option | 15 |
| bandwidth menu | |
| K8 option | 51 |
| Baseband power | |
| Trigger mode | 59 |
| BD_ADDR (K8) | 36 |
| Bluetooth device address (K8) | 36 |
| Bluetooth measurement | |
| average or peak values (K8) | 17 |
| data packet structure (K8) | 11 |
| functional description (K8) | 14 |
| oversampling (K8) | 16 |
| supported tests (K8) | 11 |
| trigger concept (K8) | 18 |
| Bluetooth Measurements | |
| bandwidths (K8) | 15 |
| filter (K8) | 15 |
| Bluetooth menu (K8) | 19 |
| Bluetooth mode (K8) | |
| menus | 20 |

C

| | |
|--|--------------------------------|
| Carrier Frequency Drift measurement (K8) | 26 |
| Carrier Frequency Stability measurement (K8) | 30 |
| center frequency | |
| K8 option | 34, 39, 40, 42, 43, 45, 46, 47 |
| channel number (K8) | 34, 39, 40, 42, 43, 45, 46, 47 |
| continuous sweep | 54 |

D

| | |
|--|--------|
| data packet structure (k8) | 11 |
| Differential Phase Encoding measurement (K8) | 31 |
| display range | |
| level | 48, 49 |
| DPSK Start | |
| remote control, K8 | 96 |
| DPSK Stop | |
| remote control, K8 | 96 |

E

| | |
|---------------------------------|----|
| equipment under test (K8) | 36 |
| EUT (K8) | 36 |
| external trigger | 58 |

F

| | |
|-----------------------------------|--------------------------------|
| filter | |
| K8 option | 15 |
| Filters | |
| Overview | 62 |
| Selecting | 62 |
| Types | 62 |
| filter types | |
| 5-Pole | 62 |
| Normal (3dB) | 62 |
| RRC | 62 |
| frequency | |
| band (K8) | 34, 39, 40, 42, 43, 45, 46, 47 |
| frequency menu | |
| K8 option | 54 |
| functional description (K8) | 14 |

G

| | |
|--------------------------|--------|
| GFSK Start | |
| remote control, K8 | 97 |
| GFSK Start (K8) | 44, 57 |
| GFSK Stop | |
| remote control, K8 | 97 |

I

| | |
|--|----|
| IF power | |
| Trigger mode | 59 |
| impedance | |
| input | 51 |
| Initial Carrier Frequency Tolerance measurement (K8) ... | 25 |

L

| | |
|---------------------|--------|
| LAP (K8) | 36 |
| level | |
| display range | 48, 49 |
| range | 48, 49 |
| reference | 48 |
| trigger | 60 |

M

| | |
|--|----|
| measurement | |
| Carrier Frequency Drift (K8) | 26 |
| Carrier Frequency Stability (K8) | 30 |
| Differential Phase Encoding (K8) | 31 |
| Initial Carrier Frequency Tolerance (K8) | 25 |
| Modulation Accuracy (K8) | 30 |
| Modulation Characteristics | 24 |
| Output Power (K8) | 22 |
| Relative Transmit Power (K8) | 27 |
| Spurious Emissions (K8) | 28 |
| measurement Adjacent-Channel Power (K8) | 23 |
| menu | |
| amplitude (K8) | 48 |
| bandwidth (K8) | 51 |
| Bluetooth (K8) | 19 |
| frequency (K8) | 54 |
| sweep (K8) | 54 |
| trigger (K8) | 58 |
| mode | |

- trigger 58
- Modulation Accuracy measurement (K8) 30
- Modulation Characteristics measurement (K8) 24
- O**
- offset
 - reference level 51
 - trigger 61
- online help
 - working with 7
- options
 - FSV-B25 50
 - RF Preamplifier (B22) 50
- Output Power measurement (K8) 22
- oversampling 16
- oversampling factor (K8) 36
- overview
 - Bluetooth measurements (K8) 10
- P**
- p0 bit (K8) 19, 20
- Packet Bytes SCO
 - remote control, K8 94
- Packet Type
 - remote control, K8 81, 96
- parameter
 - technical (K8) 10
- pattern search
 - activating (remote control, K70) 118
- Points Per Symbol
 - remote control, K8 95
- polarity
 - external trigger/gate 60
 - trigger edge 60
- Power Class
 - remote control, K8 94
- power classes
 - bluetooth 11
- Power Sensor
 - Trigger mode 60
- pre-trigger 61
- R**
- reference level 48
 - offset 51
- Relative Transmit Power measurement (K8) 27
- RF Power trigger 59
- S**
- scaling
 - level axis 51
- Settings
 - (RelTXPower) softkey 43, 56
- softkey
 - 0.1*Chan Spacing (K8) 54
 - = Chan Spacing (K8) 54
 - Adjust Gate (K8) 46
 - Adjust Gate (remote control, K8) 92
 - Antenna Gain (K8) 36
 - Auto (remote control) 116
 - Average Mode (remote control) 109
 - BB Power 59
 - Block Count (K8) 47, 58
 - Block Count (remote control, K8) 91
 - Burst Offset (K8) 38
 - Burst Offset (remote control, K8) 118
 - Carr Freq Drift (K8) 42
 - Carr Freq Drift (remote control, K8) 67, 93
 - Carr Freq Stability (K8) 46
 - Carr Freq Stability (remote control, K8) 68, 69, 70, 71, 93
 - Center (K8) 54
 - Center (remote control) 112
 - CF–Stepsize (K8) 54
 - Channel (K8) 34, 39, 40, 42, 43, 45, 46, 47
 - Channel (remote control, K8) 91
 - Continue Single Sweep (remote control) 105
 - Continue Test (K8) 41
 - Continuous Sweep 54
 - Continuous Sweep (remote control) 105
 - Cont Meas (remote control) 105
 - Detector Manual Select (remote control, K8) 91
 - Deviation Lin/Log (remote control) 104
 - Diff Phase (K8) 47
 - Diff Phase (remote control, K8) 72, 73, 93
 - DPSK Start (K8) 44, 57
 - DPSK Stop (K8) 44, 57
 - External 58
 - Filter Type (K8) 53
 - Filter Type (remote control) 111
 - Find Burst On/Off (K8) 37
 - Find Burst On/Off (remote control, K8) 118
 - Find Sync (K8) 36
 - Find Sync On/Off (K8) 37
 - Free Run 58
 - Gate Delay (K8) 46, 58
 - Gate Delay (remote control) 113
 - Gate Length (K8) 46, 58
 - Gate Length (remote control) 113
 - Gate Mode Lvl/Edge (remote control) 114
 - GFSK Stop (K8) 44, 57
 - Grid Abs/Rel 51
 - Grid Abs/Rel (remote control) 101
 - IF Power 59
 - IF Power Retrigger Holdoff (remote control) 123
 - IF Power Retrigger Hysteresis (remote control) 124
 - Init Carr Freq Tol (K8) 41
 - Init Carr Freq Tol (remote control, K8) 93
 - Input 50 Ω /75 Ω 51
 - Input 50 Ω /75 Ω (remote control) 107
 - LAP (K8) 36
 - LAP (remote control, K8) 119
 - Marker 1 to 4 (remote control) 85, 86
 - Meas Filter (K8) 53
 - Meas Filter (remote control, K8) 118
 - Meas Time Auto (K8) 52, 55
 - Meas Time Manual (K8) 52, 55
 - Mech Atten Auto 50
 - Mech Atten Auto (remote control) 107
 - Mech Atten Manual 50
 - Mech Atten Manual (remote control) 106
 - Modulation Char (K8) 40
 - Modulation Char (remote control, K8) 76, 77, 78, 93
 - No. of ACLR Chan (remote control, K8) 92
 - No. of ACP Chan (K8) 40, 45, 56
 - No. of ACP Chan (remote control, K8) 88
 - Output Power (K8) 34
 - Output Power (remote control, K8) 79, 80, 93
 - Packet Bytes SCO (K8) 35
 - Packet Type (K8) 35

- Peak Excursion (remote control) 86
- Points / Symbol (K8) 36
- Power Avg Start (K8) 39, 55
- Power Avg Start (remote control, K8) 94
- Power Avg Stop (K8) 39, 56
- Power Avg Stop (remote control, K8) 95
- Power Class (K8) 36
- Preamplifier On/Off 50
- Preamplifier On/Off (remote control) 107
- Range 48
- Range Lin. Unit 50
- Range Lin. Unit (remote control) 104
- Range Linear % 49
- Range Linear % (remote control) 104
- Range Log (remote control) 101, 104
- Range Log 100 dB 48
- Range Log 10 dB 49
- Range Log 1 dB 49
- Range Log 50 dB 48
- Range Log 5 dB 49
- Range Log Manual 48, 49
- Reference Position (remote control) 103
- Ref Level 48
- Ref Level (remote control) 102
- Ref Level Offset 51
- Ref Level Offset (remote control) 103
- Ref Level Position 51
- Ref Level Position (remote control) 103
- Ref Value (remote control) 103
- Ref Value Position (remote control) 103
- Rel TX Power (K8) 43
- Rel TX Power (remote control, K8) 82, 83, 93
- Res BW (remote control) 109
- Res BW Auto (K8) 53
- Res BW Auto (remote control, K8) 89
- Res BW Auto (remote control) 110
- Res BW Manual (K8) 52
- Res BW Manual (remote control, K8) 88
- Res BW Manual (remote control) 109, 110
- RF Atten Auto 50
- RF Atten Auto (remote control) 107
- RF Atten Manual 50
- RF Atten Manual (remote control) 106
- RF Power 59
- Search Len Auto (K8) 38
- Search Len Manual (K8) 38
- Search Len Manual (remote control, K8) 119, 120
- Select 1 2 3 4 (remote control) 86
- Selected Trace (K8) 36
- Settings (RelTXPower) 43, 56
- Single Meas (remote control) 105
- Single Sweep 55
- Single Sweep (remote control) 105
- Spurious Emissions (K8) 45
- Spurious Emissions (remote control, K8) 74, 75, 93
- Standard 34
- Start Test (K8) 41
- Sweep Count 55
- Sweep Count (remote control, K8) 98
- Sweep Count (remote control) 112
- Sweep Points (remote control) 115
- Sweep Time (remote control) 115
- Sweeptime Auto (K8) 52
- Sweeptime Auto (remote control, K8) 99
- Sweeptime Auto (remote control) 116
- Sweeptime Manual (K8) 52
- Sweeptime Manual (remote control, K8) 98
- Sweeptime Manual (remote control) 115
- Sync Offset (K8) 37
- Sync Offset (remote control, K8) 119
- Trace 1 2 3 4 5 6 (remote control, K8) 100
- Trace 1 2 3 4 5 6 (remote control) 101
- Trace Mode (remote control, K8) 99
- Trace Mode (remote control) 101
- Trg/Gate Level 60
- Trg/Gate Polarity Pos/Neg 60
- Trg/Gate Polarity Pos/Neg (remote control) 113, 125
- Trg/Gate Source 58
- Trg/Gate Source (remote control) 124, 125
- Trigger Holdoff 61
- Trigger Holdoff (remote control) 124
- Trigger Hysteresis 61
- Trigger Offset 61
- TX Spec ACLR (K8) 39
- TX Spec ACP (remote control, K8) 66, 93
- Unit (remote control) 87
- Video 59
- Video BW Auto (K8) 53
- Video BW Auto (remote control, K8) 90
- Video BW Manual (K8) 53
- Video BW Manual (remote control, K8) 90
- Zoom (K8) 41, 42, 43, 56
- Softkeys
 - Power Sensor 60
- Spurious Emissions measurement (K8) 28
- Standard
 - softkey 34
- Status
 - measurement (K8) 21
- supported tests (K8) 11
- sweep
 - continuous 54
 - count 55
 - Free Run 58
 - single 55
- sweep menu
 - K8 option 54
- sync word (K8) 18, 36
- T**
 - test
 - transmitter (K8) 13
 - test supported (K8) 11
 - Time
 - softkey 60
 - transmitter tests (K8) 13
 - trigger
 - extern (K8) 18
 - external 58
 - holdoff 61
 - hysteresis 61
 - level 60
 - offset 61
 - slope 60
 - trigger concepts (K8) 18
 - trigger menu
 - K8 option 58
 - trigger mode 58
 - BB power 59
 - External 58
 - Free Run 58
 - IF power 59
 - RF power 59

Video 59

V

video triggering 59