

R&S® FSV-K40

Firmware Option Phase Noise Measurements

Operating Manual



1173.0708.02 – 04.1

This manual describes the following options:

- R&S FSV-K40 (1310.8403.02)

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.

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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>

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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.

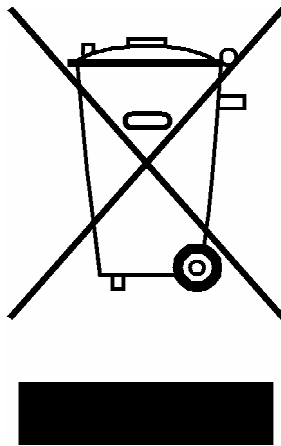
Eliminación

1. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
2. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

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)

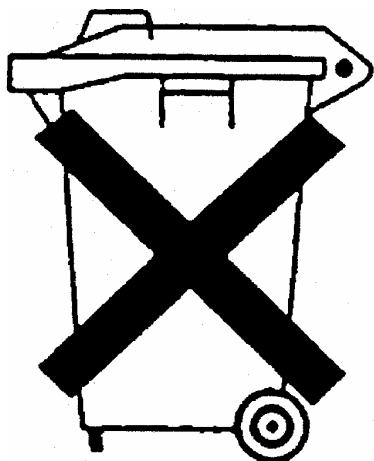
Dieses Gerät enthält eine schadstoffhaltige Batterie. Diese darf nicht mit dem Hausmüll entsorgt werden.

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

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1 Documentation Overview

The user documentation for the analyzer is divided as follows:

- Quick Start Guide
- Operating Manuals for base unit and options
- Service Manual
- Online Help
- Release Notes

Quick Start Guide

This manual is delivered with the instrument in printed form and in PDF format on the CD. It provides the information needed to set up and start working with the instrument. Basic operations and basic measurements are described. Also a brief introduction to remote control is given. The manual includes general information (e.g. Safety Instructions) and the following chapters:

Chapter 1	Introduction, General information
Chapter 2	Front and Rear Panel
Chapter 3	Preparing for Use
Chapter 4	Firmware Update and Installation of Firmware Options
Chapter 5	Basic Operations
Chapter 6	Basic Measurement Examples
Chapter 7	Brief Introduction to Remote Control
Appendix 1	Printer Interface
Appendix 2	LAN Interface

Operating Manuals

The Operating Manuals are a supplement to the Quick Start Guide. Operating Manuals are provided for the base unit and each additional (software) option.

The Operating Manual for the base unit provides basic information on operating the analyzer in general, and the "Spectrum" mode in particular. Furthermore, the software options that enhance the basic functionality for various measurement modes are described here. The set of measurement examples in the Quick Start Guide is expanded by more advanced measurement examples. In addition to the brief introduction to remote control in the Quick Start Guide, a description of the basic analyzer commands and programming examples is given. Information on maintenance, instrument interfaces and error messages is also provided.

In the individual option manuals, the specific instrument functions of the option are described in detail. For additional information on default settings and parameters, refer to the data sheets. Basic information on operating the analyzer is not included in the option manuals.

The following Operating Manuals are available for the analyzer:

- analyzer base unit; in addition:
 - R&S FSV-K7S Stereo FM Measurements
 - R&S FSV-K9 Power Sensor Support
 - R&S FSV-K14 Spectrogram Measurement
- R&S FSV-K10 GSM/EDGE Measurement
- R&S FSV-K30 Noise Figure Measurement
- R&S FSV-K40 Phase Noise Measurement
- R&S FSV-K70 Vector Signal Analysis
- R&S FSV-K72 3GPP FDD BTS Analysis
- R&S FSV-K73 3GPP FDD UE Analysis
- R&S FSV-K76/77 3GPP TD-SCDMA BTS/UE Measurement
- R&S FSV-K82/83 CDMA2000 BTS/MS Analysis
- R&S FSV-K84/85 1xEV-DO BTS/MS Analysis
- R&S FSV-K91 WLAN IEEE 802.11a/b/g/j/n
- R&S FSV-K93 WiMAX IEEE 802.16 OFDM/OFDMA Analysis
- R&S FSV-K100/K104 EUTRA / LTE Downlink Measurement Application
- R&S FSV-K101/K105 EUTRA / LTE Uplink Measurement Application

These manuals are available in PDF format on the CD delivered with the instrument. The printed manual can be ordered from Rohde & Schwarz GmbH & Co. KG.

Service Manual

This manual is available in PDF format on the CD delivered with the instrument. It describes how to check compliance with rated specifications, instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the analyzer by replacing modules. The manual includes the following chapters:

Chapter 1	Performance Test
Chapter 2	Adjustment
Chapter 3	Repair
Chapter 4	Software Update / Installing Options
Chapter 5	Documents

Online Help

The online help contains context-specific help on operating the analyzer and all available options. It describes both manual and remote operation. The online help is installed on the analyzer by default, and is also available as an executable .chm file on the CD delivered with the instrument.

Release Notes

The release notes describe the installation of the firmware, new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes. The current release notes are provided in the Internet.

2 Conventions Used in the Documentation

2.1 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.

2.2 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.

3 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.

4 Phase Noise Measurements Option R&S FSV-K40

Phase Noise Measurement Software R&S FSV-K40 extends the measurement capabilities of Rohde&Schwarz signal and spectrum analyzers by phase noise tests. The analyzer is ideal for this purpose because of its low inherent phase noise and noise figure. The high phase noise measurement speed is achieved through the high sweep rates of all analyzers. It is possible to trade off speed against accuracy at small resolution bandwidths (≤ 1 kHz) by using either FFT or digital filters. The software allows different settings within a phase noise diagram, e.g. FFT close to the carrier and analog/digital filters far off the carrier.

This part of the documentation consists of the following chapters:

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4.1 Instrument Functions of Phase Noise Measurements (R&S FSV-K40)

To open the main Phase Noise measurements menu

- If the Phase Noise mode is not the active measurement mode, press the MODE key and activate the "Phase Noise" option.
- If the Phase Noise mode is already active, press the HOME key. The main phase noise figure measurements menu is displayed.

Menu and softkey description

In the following sections the specific softkeys available for phase noise measurements are described.

- [chapter 4.1.2, "Softkeys of the Phase Noise Menu \(R&S FSV-K40\)", on page 29](#)
- [chapter 4.1.7, "Softkeys of the Sweep Menu – SWEEP key \(R&S FSV-K40\)", on page 33](#)
- [chapter 4.1.8, "Softkeys of the Trace Menu – TRACE key \(R&S FSV-K40\)", on page 33](#)
- [chapter 4.1.11, "Softkeys of the Lines Menu – LINES key \(R&S FSV-K40\)", on page 38](#)
- [chapter 4.1.9, "Softkeys of the Marker Menu – MKR key \(R&S FSV-K40\)", on page 37](#)

- [chapter 4.1.10, "Softkeys of the Marker To Menu – MKR-> key \(R&S FSV-K40\)", on page 38](#)

The "Trigger", "Meas Config", "Input/Output", and "Marker Functions" menus are not available for Phase noise measurements.

Further information

- [chapter 4.1.1.4, "Measurement Settings and Results Display", on page 27](#)
- [chapter 4.1.14, "Detector Overview", on page 41](#)
- [chapter 4.1.17, "Trace Mode Overview", on page 45](#)
- [chapter 4.1.15, "Selecting the Appropriate Filter Type", on page 42](#)
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- [chapter 4.1.1.1, "Overview of General Settings", on page 16](#)
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4.1.18	ASCII File Export Format.....	46

4.1.1 Measurements and Results

This section contains a detailed description of performing measurements and their results. It covers the following subjects:

- [chapter 4.1.1.3, "Running Measurements"](#), on page 26
- [chapter 4.1.1.4, "Measurement Settings and Results Display"](#), on page 27

4.1.1.1 Overview of General Settings

This section describes the "General Settings" view where all settings related to the general measurement can be modified, i.e. the signal characteristics, display settings, trace settings, residual calculation settings and spot noise settings.



When a particular parameter is selected within the "General Settings" view, the status bar changes to display information on the valid settings for the selected parameter.

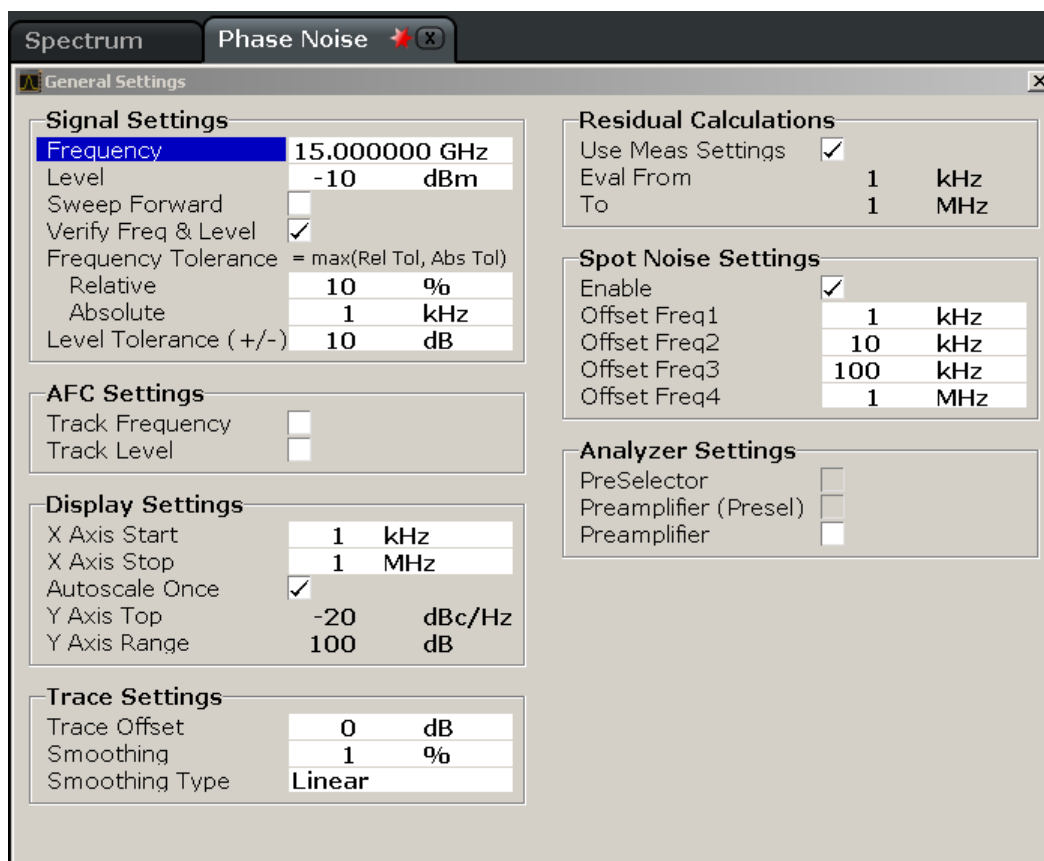


Fig. 4-1: "General Settings" view

The parameters within the "General Settings" view are logically grouped together into:

- Signal Settings.....18
 - Frequency.....18
 - Level.....18
 - Sweep Forward.....18
 - Verify Freq and Level.....18
 - Frequency Tolerance.....19
 - Level Tolerance.....19
- AFC SettingsTrack Frequency.....19
 - Track Level.....19
- Display Settings.....19
 - X Axis Start.....20
 - X Axis Stop.....20
 - Autoscale Once.....20
 - Y Axis Top.....20
 - Y Axis Range.....20
- Trace Settings.....20
 - Trace Offset.....21
 - Smoothing.....21
 - Smoothing Type.....21
- Residual CalculationsUse Meas Settings.....21
 - Eval From.....22

To.....	22
Spot Noise Settings.....	22
L Enable.....	23
L Offset Freq 1,2,3,4.....	23
PreSelector.....	23
Preamplifier (Preselect).....	23
Preamplifier.....	23

Signal Settings

The "Signal Settings" are the general settings concerning the level and frequency of the signal to be measured. These settings contain the following parameters:

- "Frequency" on page 18
- "Level" on page 18
- "Sweep Forward" on page 18
- "Verify Freq and Level" on page 18
- "Frequency Tolerance" on page 19
- "Level Tolerance" on page 19

Frequency ← Signal Settings

Specifies the center frequency of the signal to be measured.

Tip: you can switch directly to this field by pressing the **FREQ** key.

SCPI command:

[SENSe:] FREQuency: CENTer on page 79

Level ← Signal Settings

Specifies the expected level of the RF input signal.

Tip: you can switch directly to this field by pressing the **AMPT** key.

[SENSe:] POWer: RLEVel on page 83

Sweep Forward ← Signal Settings

Determines the sweep direction for the current measurement.

"ON" The measurement is performed from the start offset frequency to the stop offset frequency.

"OFF" The measurement is performed from the stop offset frequency to the start offset frequency.

SCPI command:

[SENSe:] SWEEp: FORWard on page 85

Verify Freq and Level ← Signal Settings

Enables a search across a frequency tolerance range, for the carrier of greatest magnitude. Carrier frequency and level are measured. If the level is within a level tolerance range, the measured level overrides the specified **Level**. Otherwise the measurement is aborted.

This should be used when the carrier frequency is not known precisely.

When "Verify Freq" is on, [Frequency Tolerance](#) and [Level Tolerance](#) parameters become enabled.

SCPI command:

[\[SENSe:\]FREQuency:VERify\[:STATe\]](#) on page 81

Frequency Tolerance ← Signal Settings

Used to verify the input signal frequency; the value used is the higher value of the specified "Relative" or "Absolute" tolerance values.

"Relative" The "Relative Frequency Tolerance" parameter is the ratio of the sub-span's start frequency. A frequency and level check is carried out before each subsweep.

"Absolute" The "Absolute Frequency Tolerance" is the range either side of the "Signal Frequency" within which the carrier is known to be. A frequency and level check is carried out before each subsweep.

SCPI command:

[\[SENSe:\]FREQuency:VERify:TOLerance:RELative](#) on page 82

[\[SENSe:\]FREQuency:VERify:TOLerance](#) on page 81

Level Tolerance ← Signal Settings

Offset relative to the "Level". It is used to verify the "Level" of the input signal.

"Level Tolerance" specifies the maximum and minimum deviation from the specified "Level" setting that the input signal may vary by and still pass the verification, i.e. the measured level between ("Level"+"Level_Tolerance") and ("Level"- "Level_Tolerance") is accepted.

SCPI command:

[\[SENSe:\]POWer:RLEVel:VERify:TOLerance](#) on page 84

AFC Settings Track Frequency

Enables or disables the signal frequency tracking mechanism during the measurement.

This parameter is only available when the ["Verify Freq and Level"](#) on page 18 parameter is enabled.

SCPI command:

[\[SENSe:\]FREQuency:TRACk](#) on page 80

Track Level ← AFC Settings Track Frequency

Enables or disables the signal level tracking mechanism during the measurement.

This parameter is only available when the ["Verify Freq and Level"](#) on page 18 parameter is enabled.

SCPI command:

[\[SENSe:\]POWer:TRACk](#) on page 84

Display Settings

The display settings configure the display of the measurement results. The settings contain the following parameters:

- ["X Axis Start"](#) on page 20
- ["X Axis Stop"](#) on page 20
- ["Autoscale Once"](#) on page 20

- ["Y Axis Top"](#) on page 20
- ["Y Axis Range"](#) on page 20

X Axis Start ← Display Settings

Specifies the minimum frequency for the X axis.

When "X Axis Start" changes, the "Start" parameter in the "Measurement Settings" view is updated accordingly.

SCPI command:

[\[SENSe:\] FREQuency: START](#) on page 80

X Axis Stop ← Display Settings

Specifies the maximum frequency for the X axis.

When "X Axis Stop" changes, the "Stop" parameter in the "Measurement Settings" view is updated accordingly.

SCPI command:

[\[SENSe:\] FREQuency: STOP](#) on page 80

Autoscale Once ← Display Settings

If activated, the y-axis scaling is calculated from the results.

The autoscaling is only carried out once in the first sweep. The subsequent sweeps do not autoscale the y-axis.

When "Autoscale Once" is on, "Y Axis Top" and "Range" parameters are unavailable. When it is off, the "Y Axis Top" and "Range" parameters are editable.

SCPI command:

[DISPlay\[:WINDow<n>\]: TRACe<t>: Y\[:SCALe\]: AUTO](#) on page 70

Y Axis Top ← Display Settings

Specifies the maximum phase noise level in the y-axis for the trace results.

SCPI command:

[DISPlay\[:WINDow<n>\]: TRACe<t>: Y\[:SCALe\]: AUTO](#) on page 70

Y Axis Range ← Display Settings

Specifies the distance from the top to the origin in the y-axis.

SCPI command:

[\[SENSe:\] POWer: RLEVel: VERify: TOLerance](#) on page 84

Trace Settings

The trace settings configure the trace and contain the following parameters:

- ["Trace Offset"](#) on page 21
- ["Smoothing"](#) on page 21
- ["Smoothing Type"](#) on page 21

If smoothing is activated using the ["Smoothing"](#) on page 35 softkey in the "Trace" menu, the trace on the screen is smoothed by the defined smoothing percentage (see ["Smoothing"](#) on page 21). Each trace (trace1, trace2 and trace3) can be smoothed and unsmoothed individually.

The smoothing algorithm used is as follows:

$$y'(s) = 10 * \text{Log}_{10} \left(\left(\sum_{x=s-\frac{n-1}{2}}^{x=s+\frac{n-1}{2}} 10^{\left(\frac{y(x)}{10}\right)} \right) \div n \right)$$

Where:

"s" = the trace sample number

"y(s)" = the phase noise at sample "s"

"x" = the sample offset from "s"

"n" = the width of the sliding window

When "x" exceeds the boundary samples, the boundary sample is used, i.e. if the trace has samples numbered 0 to 500, then with "n" = 5 and "s" = 0, the average is calculated as:

$$y'(0) = 10 * \text{Log}_{10} \left(\left(3 * 10^{\left(\frac{y(0)}{10}\right)} + 10^{\left(\frac{y(1)}{10}\right)} + 10^{\left(\frac{y(2)}{10}\right)} \right) \div 5 \right)$$

If both trace averaging (see ["Sweep Mode Settings"](#) on page 24) and smoothing are activated, then trace smoothing is applied first, and averaging is performed on the smoothed trace.

When smoothing is applied to a trace, the original (unsmoothed) trace is still held in memory. This makes it possible to toggle between a smoothed and unsmoothed trace without the need to run a new measurement sweep.

SCPI command:

[Display\[:WINDow<n>\]:TRACe<t>:SMOothing:APERture](#) on page 69

Trace Offset ← Trace Settings

Defines an arithmetic reference level offset which is added to the y axis labelling.

SCPI command:

[Display\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]:RLEVel:OFFSet](#) on page 73

Smoothing ← Trace Settings

Specifies the % of the display width to be used as a window when a trace is smoothed.

The larger the setting of the "Smoothing" parameter, the greater the smoothing effect.

SCPI command:

[Display\[:WINDow<n>\]:TRACe<t>:SMOothing:APERture](#) on page 69

Smoothing Type ← Trace Settings

Defines whether linear or logarithmic smoothing is to be used.

SCPI command:

[Display\[:WINDow<n>\]:TRACe<t>:SMOothing:TYPE](#) on page 70

Residual Calculations Use Meas Settings

Specifies whether to use the whole measurement range or the user defined evaluation range for the residual calculations.

If the "Use Meas Settings" is activated, the "Eval From" on page 22 and "To" on page 22 fields become disabled and residual calculations are performed across the complete range of the measurement results.

If the "Use Meas Settings" is deactivated, the "Eval From" on page 22 and "To" on page 22 fields become enabled. Use them to specify the range over which residual calculations are performed.

SCPI command:

`CALCulate<n>:EVALuation[:STATe]` on page 53

Eval From

Specifies the start of the measurement range for which residual calculations are to be performed.

The minimum value that can be specified for the "Eval From" setting is the value of the "X Axis Start" on page 20 setting.

The maximum value that can be specified for the "Eval From" setting is the value of the "X Axis Stop" on page 20 setting.

When the "X Axis Start" on page 20 or "X Axis Stop" on page 20 settings are modified, the "Eval From" is automatically adjusted to ensure that it is not outside the measurement range.

The "Eval From" setting cannot be set higher than the "To" setting.

SCPI command:

`CALCulate<n>:EVALuation:START` on page 54

To

Specifies the end of the measurement range for which residual calculations are to be performed.

The minimum value that can be specified for the "To" setting is the value of the "X Axis Start" on page 20 setting.

The maximum value that can be specified for the "To" setting is the value of the "X Axis Stop" on page 20 setting.

When the "X Axis Start" on page 20 or "X Axis Stop" on page 20 settings are modified, the "Eval From" on page 22 setting is automatically adjusted to ensure that it is not outside the measurement range.

The "To" setting cannot be set lower than the "Eval From" on page 22 setting.

SCPI command:

`CALCulate<n>:EVALuation:STOP` on page 54

Spot Noise Settings

In spot noise settings you can specify up to 4 discrete frequency points from which the phase noise result from a measurement sweep can be obtained and displayed.

Spot noise results are updated while a sweep is running.

Enable ← Spot Noise Settings

Activates and deactivates spot noise calculations.

SCPI command:

[CALCulate<n>:SNOise<m>:STATe](#) on page 66

[CALCulate<n>:SNOise<m>:AOFF](#) on page 65

Offset Freq 1,2,3,4 ← Spot Noise Settings

In the "Offset Freq" settings you can specify up to four frequency points at which spot noise calculations are performed.

If an offset frequency is specified which is outside the measurement frequency range, no results are displayed for that offset frequency.

SCPI command:

[CALCulate<n>:SNOise<m>:X](#) on page 66

PreSelector

Activates or deactivates the preselector (if installed).

SCPI command:

[INPut:PRESelection\[:STATe\]](#) on page 75

Preamplifier (Preselect)

Activates or deactivates the preamplifier on the preselector (if installed).

SCPI command:

[INPut:GAIN:STATe](#) on page 77

Preamplifier

Activates or deactivates the preamplifier.

SCPI command:

[INPut:GAIN:STATe](#) on page 77

4.1.1.2 Overview of Measurement Settings

This section describes the "Measurement Settings" view, in which the settings associated with measurement sweep are specified.

The "Measurement Settings" are logically grouped together into:

- "Sweep Mode Settings" on page 24
- "Span Settings" on page 25
- "Carrier Frequency Offset Table" on page 25
- "Preset Settings" on page 26

When a particular parameter is selected within the "Measurement Settings" view, the status bar changes to display information about the valid settings for the selected parameter.

Measurement Settings

Sweep Mode: NORMAL | Sweep Settings: FFT Window FLATTOP | Use Overlap:

Span Settings: Start Offset 1 kHz, Stop Offset 1 MHz

Carrier Frequency Offset		From	To	RBW	Avg	FFT	Meas Time
1 Hz	3 Hz	1 Hz	1	<input checked="" type="checkbox"/>	3.91 s		
3 Hz	10 Hz	1 Hz	1	<input checked="" type="checkbox"/>	3.91 s		
10 Hz	30 Hz	1 Hz	1	<input checked="" type="checkbox"/>	3.91 s		
30 Hz	100 Hz	1 Hz	3	<input checked="" type="checkbox"/>	11.74 s		
100 Hz	300 Hz	3 Hz	3	<input checked="" type="checkbox"/>	4.23 s		
300 Hz	1 kHz	10 Hz	3	<input checked="" type="checkbox"/>	1.24 s		
1 kHz	3 kHz	30 Hz	10	<input checked="" type="checkbox"/>	1.5 s		
3 kHz	10 kHz	100 Hz	10	<input checked="" type="checkbox"/>	521.98 ms		
10 kHz	30 kHz	300 Hz	10	<input checked="" type="checkbox"/>	233.94 ms		
30 kHz	100 kHz	1 kHz	10	<input checked="" type="checkbox"/>	191.62 ms		
100 kHz	300 kHz	3 kHz	10	<input checked="" type="checkbox"/>	227.07 ms		
300 kHz	1 MHz	10 kHz	10	<input type="checkbox"/>	409.13 ms		
1 MHz	3 MHz	30 kHz	10	<input type="checkbox"/>	296.36 ms		
3 MHz	10 MHz	100 kHz	10	<input type="checkbox"/>	222.77 ms		
10 MHz	30 MHz	300 kHz	10	<input type="checkbox"/>	202.15 ms		
30 MHz	100 MHz	1 MHz	10	<input type="checkbox"/>	214.15 ms		
100 MHz	300 MHz	3 MHz	10	<input type="checkbox"/>	327.75 ms		
300 MHz	1 GHz	10 MHz	10	<input type="checkbox"/>	344.23 ms		
1 GHz	3 GHz	10 MHz	10	<input type="checkbox"/>	347.71 ms		
3 GHz	10 GHz	10 MHz	10	<input type="checkbox"/>	351.18 ms		
Total Estimated Measurement Time							3.08 s

Preset Settings: RBW 10% (of start frequency), Average 1, FFT Filters

Fig. 4-2: Measurement Settings view

Sweep Mode Settings

When the "Sweep Mode" parameter is changed, the "Carrier Frequency Offset" table is updated from the instrument's default settings.

Tip: You can switch directly to this field by pressing the "Sweep Mode" softkey.

In fast, normal and averaged modes, the table is not editable, it is for information only.

- "Fast" Not averaged. The measurement is very fast, as the average column is set to 1 for all sub-bands.
- "Normal" Normal averaged. The measurement is slower than the "Fast" mode, but the sub-bands are averaged more.
- "Averaged" Highly averaged. The measurement is very slow, with high average in each sub-band for more accurate results.
- "Manual" The "RBW", "Average" and "FFT" columns in the "Carrier Frequency Offset Table", as well as the "Preset Settings", can be set by the user (see "Carrier Frequency Offset Table" on page 25 and "Preset Settings" on page 26).

Sweep Settings ← Sweep Mode Settings

The following sweep settings are displayed for information only:

Instrument Functions of Phase Noise Measurements (R&S FSV-K40)

Sweep type	FFT, Sweep or Auto
Window function	Window function for FFT, e.g. "Window FLATTOP"
Use overlap	Overlapping FFTs

Span Settings

Defines the span settings of the measurement.

Start Offset ← Span Settings

Defines the start frequency of the measurement.

When this parameter changes, the "[X Axis Start](#)" on page 20 parameter in the "General Settings" view is updated accordingly.

The selected span for the noise measurement is highlighted in the "[Carrier Frequency Offset Table](#)" on page 25 table.

Tip: you can switch directly to this setting by pressing the SPAN key.

Stop Offset ← Span Settings

Defines the stop frequency of the measurement.

When this parameter changes, the "[X Axis Stop](#)" on page 20 parameter in the "General Settings" view is updated accordingly.

The selected span for the noise measurement is highlighted in the "[Carrier Frequency Offset Table](#)" on page 25 table.

Carrier Frequency Offset Table

Carrier Frequency Offset							
From	To	RBW	Avg	FFT	Meas Time		
1 Hz	3 Hz	1 Hz	1	<input checked="" type="checkbox"/>	3.91	s	
3 Hz	10 Hz	1 Hz	1	<input checked="" type="checkbox"/>	3.91	s	
10 Hz	30 Hz	1 Hz	1	<input checked="" type="checkbox"/>	3.91	s	
30 Hz	100 Hz	1 Hz	3	<input checked="" type="checkbox"/>	11.74	s	
100 Hz	300 Hz	3 Hz	3	<input checked="" type="checkbox"/>	4.23	s	
300 Hz	1 kHz	10 Hz	3	<input checked="" type="checkbox"/>	1.24	s	
1 kHz	3 kHz	30 Hz	10	<input checked="" type="checkbox"/>	1.5	s	
3 kHz	10 kHz	100 Hz	10	<input checked="" type="checkbox"/>	521.98	ms	
10 kHz	30 kHz	300 Hz	10	<input checked="" type="checkbox"/>	233.94	ms	
30 kHz	100 kHz	1 kHz	10	<input checked="" type="checkbox"/>	191.62	ms	
100 kHz	300 kHz	3 kHz	10	<input checked="" type="checkbox"/>	227.07	ms	
300 kHz	1 MHz	10 kHz	10	<input type="checkbox"/>	409.13	ms	
1 MHz	3 MHz	30 kHz	10	<input type="checkbox"/>	296.36	ms	
3 MHz	10 MHz	100 kHz	10	<input type="checkbox"/>	222.77	ms	
10 MHz	30 MHz	300 kHz	10	<input type="checkbox"/>	202.15	ms	
30 MHz	100 MHz	1 MHz	10	<input type="checkbox"/>	214.15	ms	
100 MHz	300 MHz	3 MHz	10	<input type="checkbox"/>	327.75	ms	
300 MHz	1 GHz	10 MHz	10	<input type="checkbox"/>	344.23	ms	
1 GHz	3 GHz	10 MHz	10	<input type="checkbox"/>	347.71	ms	
3 GHz	10 GHz	10 MHz	10	<input type="checkbox"/>	351.18	ms	
Total Estimated Measurement Time						3.08	s

Note: Selected span highlighted in table. The selected spans for the noise measurement are highlighted in the "Carrier Frequency Offset" table.

The "RBW", "Avg" and "FFT" fields are editable in "Manual" sweep mode only. For all other sweep modes, this table is for information only.

The total measurement time for the selected sub-bands is displayed at the bottom of the table.

From ← Carrier Frequency Offset Table

The start frequency of each sub-band.

SCPI command:

[SENSe:] FREQuency: START on page 80

To ← Carrier Frequency Offset Table

The stop frequency of each sub-band.

SCPI command:

[SENSe:] FREQuency: STOP on page 80

RBW ← Carrier Frequency Offset Table

The resolution filter bandwidth used for each sub-band. Enter values in steps of 1/3/10.

Tip: you can switch directly to the first "RBW" field in the span by pressing the BW key.

Range ← Carrier Frequency Offset Table

0.1 % .. 30 % of the start frequency in that row.

Average ← Carrier Frequency Offset Table

The number of sweeps to average over for each sub-band.

Range ← Carrier Frequency Offset Table

1 .. 10000

FFT ← Carrier Frequency Offset Table

Selection to use the FFT Resolution Filter or the conventional filter for each decade.

FFT is only available for RBW values between 1 Hz and 30 kHz.

Meas Time ← Carrier Frequency Offset Table

The estimated measurement time for each sub-band. Note this time is for the measurement only and does not include processing time.

Preset Settings

The "Preset Settings" display the default values used for "RBW", "Average", "FFT" when the "Preset Settings" softkey is pressed (see "Preset Settings" on page 31). For sweep mode "MANUAL", you can edit these settings. In this case, the values in the "Carrier Frequency Offset" table are changed accordingly (see "Carrier Frequency Offset Table" on page 25).

4.1.1.3 Running Measurements

To start a measurement, press the RUN SINGLE or RUN CONT key.

- "RUN SINGLE" switches to single sweep mode and performs a single sweep, just as the [Single Sweep](#) softkey in the "Sweep" menu does.

- "RUN CONT" switches to continuous sweep mode and starts sweeping, just as the "Continuous Sweep" on page 33 softkey in the "Sweep" menu does.



If you press one of the RUN keys while a measurement is running, the measurement is aborted.

During a measurement, the text "Running..." is displayed in the status bar at the bottom of the screen. A progress bar is also displayed to show progress through the current measurement sweep. After successful completion of a single measurement, the status bar displays "Measurement Complete".

If the "Verify Freq and Level" on page 18 parameter is selected in the "General Settings" view, then R&S FSV-K40 checks if there is a signal within the specified frequency and level tolerance ranges relative to the specified signal frequency and level. If no signal is found, or a signal is found which is outside the tolerance range, then a message is displayed in the status bar ("No signals found within tolerance range") and the measurement is aborted.

While a measurement sweep is running, changing any of the settings in the "General Settings" or "Meas Settings" views causes the measurement to be aborted, apart from the following settings:

- "Verify On/Off" on page 30
- "Track Level On/Off" on page 30
- "Track Freq On/Off" on page 31
- "Preset Settings" on page 31
- "Autoscale Y Axis" on page 31
- "Ref Meas" on page 31

Once a measurement sweep has been performed, all active limit lines as well as the limit result are displayed.

4.1.1.4 Measurement Settings and Results Display

The diagram header shows the general measurement settings used to obtain the current measurement results.

Settings		Residual Noise		Spot Noise [T1]	
Signal Freq	15.000000 GHz	Eval from	...	1 kHz	...
Signal Level	-10 dBm	Residual PM	...	10 kHz	...
Signal Freq Δ	...	Residual FM	...	100 kHz	...
Signal Level Δ	...	RMS Jitter	...	1 MHz	...
Top	-20 dBc/Hz	RF Atten	...		

Fig. 4-3: Diagram header with measurement settings and results

The header includes the following information:

Signal Frequency	The frequency of the measured input signal.
Signal Level	The level of the input signal

Instrument Functions of Phase Noise Measurements (R&S FSV-K40)

Signal Freq Δ	The measured frequency difference (during verification and tracking)
Signal Level Δ	The measured level difference (during verification and tracking)
Top	The Y-Axis top (the maximum phase noise level in the y-axis for the trace results)
RF Atten	The RF attenuation
Eval from	The frequency range for which residual noise and spot noise results are calculated. The range of the residual noise calculations is displayed in the results trace by two lines, marker EL1 and EL2.
Residual PM	The residual PM result over the selected evaluation range.
Residual FM	The residual FM result over the selected evaluation range.
RMS Jitter	The RMS jitter result over the selected evaluation range

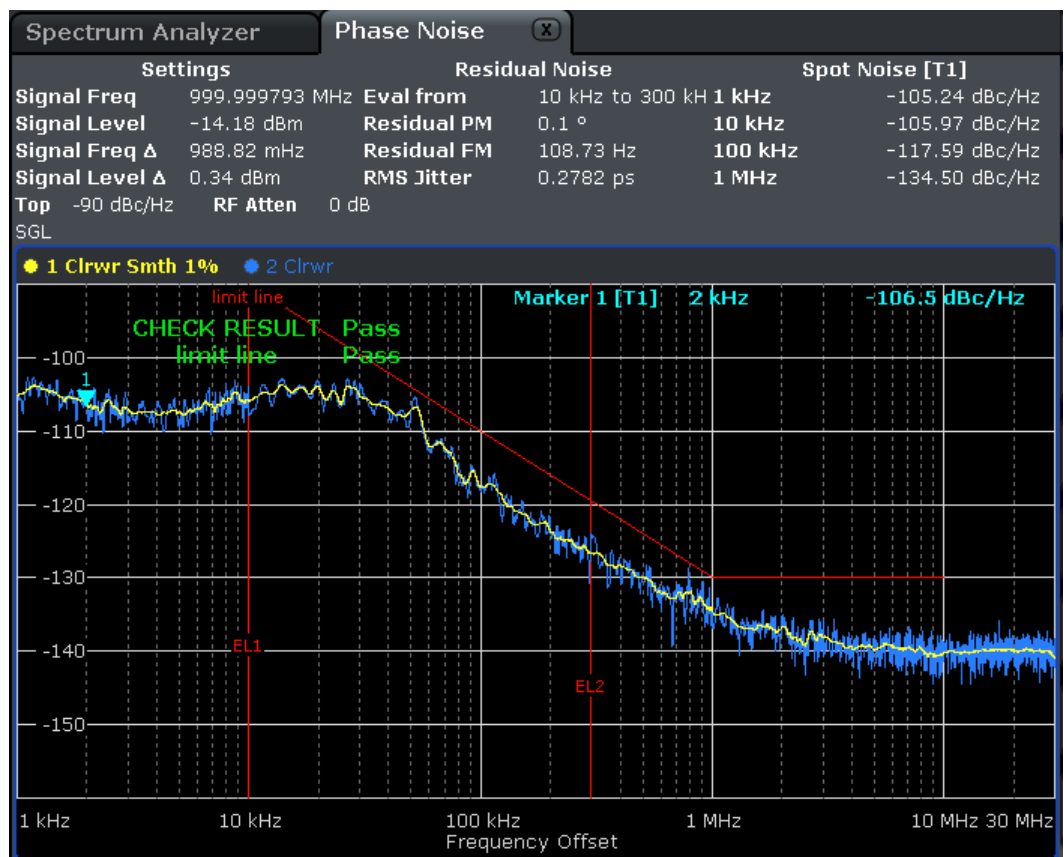


Fig. 4-4: Phase Noise Measurement Results

Note that the residual noise results are displayed at the end of a measurement sweep. If you change the range for the residual noise results in the "General Setting" view after a measurement sweep has been run, the residual noise results are automatically updated. The range of the residual noise calculations is displayed in the results trace by two lines, marker EL1 and EL2.

4.1.2 Softkeys of the Phase Noise Menu (R&S FSV-K40)

The following table shows all softkeys available in the "Phase Noise" menu.

General Settings.....	29
L Signal Settings.....	29
L Display Settings.....	29
L Trace Settings.....	29
L Residual Calc.....	29
L Spot Noise.....	29
L Smoothing %.....	30
Meas Settings.....	30
L Sweep Mode.....	30
L Span Start.....	30
L Span Stop.....	30
L Subspan RBW.....	30
L RBW %.....	30
L Average.....	30
L Use FFT On/Off.....	30
Verify On/Off.....	30
Track Level On/Off.....	30
Track Freq On/Off.....	31
Preset Settings.....	31
Autoscale Y Axis.....	31
Ref Meas.....	31

General Settings

Displays the "General Settings" view and the "General Settings" submenu. See [Overview of General Settings](#) for details.

Signal Settings ← General Settings

Switches to the first setting in the "Signal Settings" area of the "General Settings" view.

Display Settings ← General Settings

Switches to the first setting in the "Display Settings" area of the "General Settings" view. See [Overview of General Settings](#) for details.

Trace Settings ← General Settings

Switches to the first setting in the "Trace Settings" area of the "General Settings" view. See [Overview of General Settings](#) for details.

Residual Calc ← General Settings

Switches to the first setting in the "Residual Calculations" area of the "General Settings" view. See [Overview of General Settings](#) for details.

Spot Noise ← General Settings

Switches to the first setting in the "Spot Noise Settings" area of the "General Settings" view. See [Overview of General Settings](#) for details.

Smoothing % ← General Settings

Switches to the "Smoothing" setting in the "Trace Settings" area of the "General Settings" view. See [Overview of General Settings](#) for details.

Meas Settings

Displays the "Meas Settings" view and the "Meas Settings" submenu. See [Overview of Measurement Settings](#) for details.

Sweep Mode ← Meas Settings

Switches to the "Sweep Mode" setting in the "Measurement Settings" view. See [Overview of Measurement Settings](#) for details.

Span Start ← Meas Settings

Switches to the "Start Offset" setting in the "Span Settings" area of the "Measurement Settings" view. See [Overview of Measurement Settings](#) for details.

Span Stop ← Meas Settings

Switches to the "Stop Offset" setting in the "Span Settings" area of the "Measurement Settings" view. See [Overview of Measurement Settings](#) for details.

Subspan RBW ← Meas Settings

Switches to the first field in the "RBW" column for the subspan in the "Measurement Settings" view. This softkey is only available in sweep mode "MANUAL". See [Overview of Measurement Settings](#) for details.

RBW % ← Meas Settings

Switches to the "RBW" setting in the "Preset Settings" area of the "Measurement Settings" view. This softkey is only available in sweep mode "MANUAL". See [Overview of Measurement Settings](#) for details.

Average ← Meas Settings

Switches to the "Average" setting in the "Preset Settings" area of the "Measurement Settings" view. This softkey is only available in sweep mode "MANUAL". See [Overview of Measurement Settings](#) for details.

Use FFT On/Off ← Meas Settings

Switches to the "FFT Filters" setting in the "Preset Settings" area of the "Measurement Settings" view. This softkey is only available in sweep mode "MANUAL". See [Overview of Measurement Settings](#) for details.

Verify On/Off

toggles frequency and level verification on and off

SCPI command:

```
[SENSe:] FREQuency: VERify[:STATe]
```

Track Level On/Off

toggles level tracking on and off

SCPI command:

```
[SENSe:] POWer: TRACk
```

Track Freq On/Off

toggles frequency tracking on and off

SCPI command:

```
[SENSe:]FREQuency:TRACk
```

Preset Settings

Presets the option back to the default settings

Autoscale Y Axis

Scales the Y axis according to the trace results

SCPI command:

```
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO
```

Ref Meas

Performs a measurement and stores the trace as a reference trace in trace 3

SCPI command:

```
CONFigure:POWer:EXPEcted:RF
```

4.1.3 FREQ key

This key opens the "General Settings" dialog box and jumps directly to the "Frequency" field (see "Frequency" on page 18). Furthermore, a submenu with the following softkeys is displayed:

Frequency

Opens the "General Settings" dialog box and jumps directly to the "Frequency" field (see "Frequency" on page 18).

SCPI command:

```
[SENSe:]FREQuency:CENTer on page 79
```

X Axis Start

Opens the "General Settings" dialog box and jumps directly to the "X Axis Start" field (see "X Axis Start" on page 20).

SCPI command:

```
[SENSe:]FREQuency:STARt on page 80
```

X Axis Stop

Opens the "General Settings" dialog box and jumps directly to the "X Axis Stop" field (see "X Axis Stop" on page 20).

SCPI command:

```
[SENSe:]FREQuency:STOP on page 80
```


4.1.4 SPAN key

This key opens the "Measurement Settings" dialog box and jumps directly to the "Start Offset" field (see ["Start Offset"](#) on page 25 ["Span Settings"](#) on page 25).

Furthermore, the "Frequency" submenu is displayed, see [chapter 4.1.3, "FREQ key"](#), on page 31.

4.1.5 AMPT key

This key opens the "General Settings" dialog box and jumps directly to the "Level" field (see ["Level"](#) on page 18).

Furthermore, a submenu with the following softkeys is displayed:

Level

Opens the "General Settings" dialog box and jumps directly to the "Level" field (see ["Level"](#) on page 18).

SCPI command:

[\[SENSe:\] POWER:RLEVEL](#) on page 83

Autoscale Once

Activates or deactivates the "Autoscale Once" function (see ["Autoscale Once"](#) on page 20).

SCPI command:

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]:AUTO](#) on page 70

Y Axis Top

Opens the "General Settings" dialog box and jumps directly to the "Y Axis Top" field (see ["Y Axis Top"](#) on page 20).

SCPI command:

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]:AUTO](#) on page 70

Y Axis Range

Opens the "General Settings" dialog box and jumps directly to the "Y Axis Range" field (see ["Y Axis Range"](#) on page 20).

SCPI command:

[\[SENSe:\] POWER:RLEVEL:VERify:TOLerance](#) on page 84

4.1.6 BW key

This key opens the "Measurement Settings" dialog box and jumps directly to the "Sweep Mode" field (see ["Sweep Mode Settings"](#) on page 24).

4.1.7 Softkeys of the Sweep Menu – SWEEP key (R&S FSV-K40)

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 33).

SCPI command:

INIT:CONT ON, see INITiate<n>:CONTinuous on page 76

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 76

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:

[SENSe:] SWEEp:COUNT on page 85

4.1.8 Softkeys of the Trace Menu – TRACE key (R&S FSV-K40)

The TRACE key is used to configure the data acquisition for measurement and the analysis of the measurement data. In this section, only the commands specific to the phase noise option are described. The following softkeys of the "Trace" menu are available for phase noise measurements:

Trace 1 / Trace 2 / Trace 3.....	34
L Clear Write.....	34
L Max Hold.....	34
L Min Hold.....	34
L Average.....	34
L View.....	35
L Blank.....	35
L Smoothing.....	35
Sweep Count.....	35
ASCII Trace Export.....	35

Decim Sep.....	36
Trace Math.....	36
L T1-T3->T1.....	36
L T2-T3->T2.....	36
L Trace Math Off.....	36

Trace 1 / Trace 2 / Trace 3

Selects the active trace (1, 2, 3) and opens the "Trace" submenu for the selected trace.

Clear Write ← Trace 1 / Trace 2 / Trace 3

Overwrite mode: the trace is overwritten by each sweep. This is the default setting.

All available detectors can be selected.

SCPI command:

DISP:TRAC:MODE WRIT, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)
on page 72

Max Hold ← Trace 1 / Trace 2 / Trace 3

The maximum value is determined over several sweeps and displayed. The analyzer saves the sweep result in the trace memory only if the new value is greater than the previous one.

The detector is automatically set to "Positive Peak".

This mode is especially useful with modulated or pulsed signals. The signal spectrum is filled up upon each sweep until all signal components are detected in a kind of envelope.

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MAXH, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)
on page 72

Min Hold ← Trace 1 / Trace 2 / Trace 3

The minimum value is determined from several measurements and displayed. The analyzer saves for each sweep the smallest of the previously stored/currently measured values in the trace memory.

The detector is automatically set to "Negative Peak".

This mode is useful e.g. for making an unmodulated carrier in a composite signal visible. Noise, interference signals or modulated signals are suppressed whereas a CW signal is recognized by its constant level.

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MINH, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)
on page 72

Average ← Trace 1 / Trace 2 / Trace 3

The average is formed over several sweeps. The [Sweep Count](#) determines the number of averaging procedures.

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see [chapter 4.1.14, "Detector Overview"](#), on page 41).


This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE AVER, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#) on page 72

View ← Trace 1 / Trace 2 / Trace 3

The current contents of the trace memory are frozen and displayed.

Note: If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that the displayed trace no longer matches the current instrument setting is indicated by the  icon on the tab label.

If the level range or reference level is changed, the analyzer automatically adapts the measured data to the changed display range. This allows an amplitude zoom to be made after the measurement in order to show details of the trace.

SCPI command:

DISP:TRAC:MODE VIEW, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#) on page 72

Blank ← Trace 1 / Trace 2 / Trace 3

Hides the selected trace.

SCPI command:

DISP:TRAC OFF, see [DISPlay\[:WINDow<n>\]:TRACe<t>\[:STATe\]](#) on page 73

Smoothing ← Trace 1 / Trace 2 / Trace 3

Activates or deactivates smoothing for the selected trace according to the "[Trace Settings](#)" on page 20. If activated, the trace on the screen is smoothed by the smoothing percentage (see "[Smoothing](#)" on page 21). Toggling this softkey has an immediate effect on the active trace on display. Each trace (trace1, trace2 and trace3) can be smoothed/unsmoothed individually.

For details on smoothing, see "[Trace Settings](#)" on page 20.

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:

[\[SENSe:\]SWEep:COUNT](#) on page 85

ASCII Trace Export

Opens the "ASCII Trace Export Name" dialog box and saves the active trace in ASCII format to the specified file and directory.

The file consists of the header containing important scaling parameters and a data section containing the trace data. For details on an ASCII file see [chapter 4.1.18, "ASCII File Export Format"](#), on page 46.

This format can be processed by spreadsheet calculation programs, e.g. MS-Excel. It is necessary to define ';' as a separator for the data import. Different language versions of evaluation programs may require a different handling of the decimal point. It is therefore possible to select between separators '.' (decimal point) and ',' (comma) using the "Decim Sep" softkey (see ["Decim Sep"](#) on page 36).

SCPI command:

[FORMat:DEXPort:DSEParator](#) on page 75

[MMEMory:STORe<n>:TRACe](#) on page 78

Decim Sep

Selects the decimal separator with floating-point numerals for the ASCII Trace export to support evaluation programs (e.g. MS-Excel) in different languages. The values '.' (decimal point) and ',' (comma) can be set.

SCPI command:

[FORMat:DEXPort:DSEParator](#) on page 75

Trace Math

Opens the "Trace Math" submenu to select a trace math function. The following functions are available:

- ["T1-T3->T1"](#) on page 36
- ["T2-T3->T2"](#) on page 36

T1-T3->T1 ← Trace Math

Activates/Deactivates the trace math function that subtracts Trace3 from Trace1 and copies the results into Trace1.

To switch off the trace math, use the [Trace Math Off](#) softkey.

SCPI command:

[CALCulate<n>:MATH\[:EXPRession\] \[:DEFine\]](#) on page 67

[CALCulate<n>:MATH:STATe](#) on page 67

T2-T3->T2 ← Trace Math

Activates/Deactivates the trace math function that subtracts Trace3 from Trace2 and copies the results into Trace2.

To switch off the trace math, use the [Trace Math Off](#) softkey.

SCPI command:

[CALCulate<n>:MATH\[:EXPRession\] \[:DEFine\]](#) on page 67

[CALCulate<n>:MATH:STATe](#) on page 67

Trace Math Off ← Trace Math

Deactivates any previously selected trace math functions.

SCPI command:

[CALC:MATH:STAT OFF](#), see [CALCulate<n>:MATH:STATe](#) on page 67

4.1.9 Softkeys of the Marker Menu – MKR key (R&S FSV-K40)

The MKR key opens a submenu for the marker settings. The following table shows all softkeys available in the "Marker" menu in "Phase Noise" mode.

Marker 1/2/3/4.....	37
Marker Norm/Delta.....	37
Marker Zoom.....	37
All Marker Off.....	37

Marker 1/2/3/4

Selects the corresponding marker and activates it.

Marker 1 is always a normal marker. After Marker 2 to 4 have been switched on, they are delta markers that are referenced to Marker 1. These markers can be converted into markers with absolute value displays using the "Marker Norm/Delta" softkey. When Marker 1 is the active marker, pressing the "Marker Norm/Delta" softkey switches on an additional delta marker. Pressing the "Marker 1" to "Marker 4" softkey again switches the corresponding marker off.

SCPI command:

[CALCulate<n>:MARKer<m>\[:STATe\]](#) on page 63

[CALCulate<n>:MARKer<m>:X](#) on page 64

[CALCulate<n>:MARKer<m>:Y](#) on page 64

[CALCulate<n>:DELTAmarker<m>\[:STATe\]](#) on page 51

[CALCulate<n>:DELTAmarker<m>:X](#) on page 52

[CALCulate<n>:DELTAmarker<m>:Y](#) on page 53

Marker Norm/Delta

Changes the active marker to a normal (norm) or delta marker (with respect to marker 1).

SCPI command:

[CALCulate<n>:MARKer<m>\[:STATe\]](#) on page 63

[CALCulate<n>:DELTAmarker<m>\[:STATe\]](#) on page 51

Marker Zoom

Activates or deactivates the zoom for the current active marker. With the zoom function, more details of the measurement signal can be seen. This softkey can only be selected if at least one of the markers is activated.

SCPI command:

[CALCulate<n>:MARKer<m>:FUNCTION:ZOOM](#) on page 62

All Marker Off

Switches all markers off. It also switches off all functions and displays that are associated with the markers/delta markers.

SCPI command:

[CALCulate<n>:MARKer<m>:AOFF](#) on page 62

4.1.10 Softkeys of the Marker To Menu – MKR-> key (R&S FSV-K40)

The following table shows all softkeys available in the "Marker To" menu in "Phase Noise" mode (MKR-> key).

Select Marker.....	38
Marker to Trace.....	38

Select Marker

Opens a submenu to select one of the markers.

Marker to Trace

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

SCPI command:

CALCulate<n>:MARKer<m>:TRACe on page 63

4.1.11 Softkeys of the Lines Menu – LINES key (R&S FSV-K40)

The LINES key is used to configure limit and display lines. The "Lines" menu and the "Select Limit Line" dialog box are displayed. For details on the "Select Limit Line" dialog box refer to [chapter 4.1.12, "Working with Limit Lines"](#), on page 39.

The following table shows all softkeys available in the "Lines" menu in Phase Noise mode (LINES key).

New.....	38
L Name.....	38
L Value.....	38
L Insert.....	39
L Delete.....	39
L Save.....	39
Edit.....	39
Delete.....	39

New

Displays the "Edit Limit Line" dialog box and the "Limit Line Editor" submenu. For details on creating a new limit line, see [chapter 4.1.13, "Editing Limit Lines"](#), on page 40.

Name ← New

Switches to the "Name" field of the "Limit Line Editor". For details see [chapter 4.1.13, "Editing Limit Lines"](#), on page 40.

SCPI command:

CALCulate<n>:LIMit<k>:NAME on page 59

Value ← New

Switches to the "Frequency" field of the "Limit Line Editor". For details see [chapter 4.1.13, "Editing Limit Lines"](#), on page 40.

Insert ← New

Inserts a row above the currently selected row in the Frequency/Limits table of the "Limit Line Editor". For details see [chapter 4.1.13, "Editing Limit Lines"](#), on page 40.

Delete ← New

Deletes the currently selected row in the Frequency/Limits table of the "Limit Line Editor". For details see [chapter 4.1.13, "Editing Limit Lines"](#), on page 40. This action requires no confirmation.

Save ← New

Saves the currently displayed limit line definition. If data is missing or if some data is invalid, an error message is displayed.

Edit

Displays the "Edit Limit Line" dialog box in edit mode with all data of the selected limit line. For further details refer to [chapter 4.1.13, "Editing Limit Lines"](#), on page 40.

Delete

Deletes the selected limit line.

SCPI command:

`CALCulate<n>:LIMit<k>:DELete` on page 57

4.1.12 Working with Limit Lines

1. Press the LINES key.

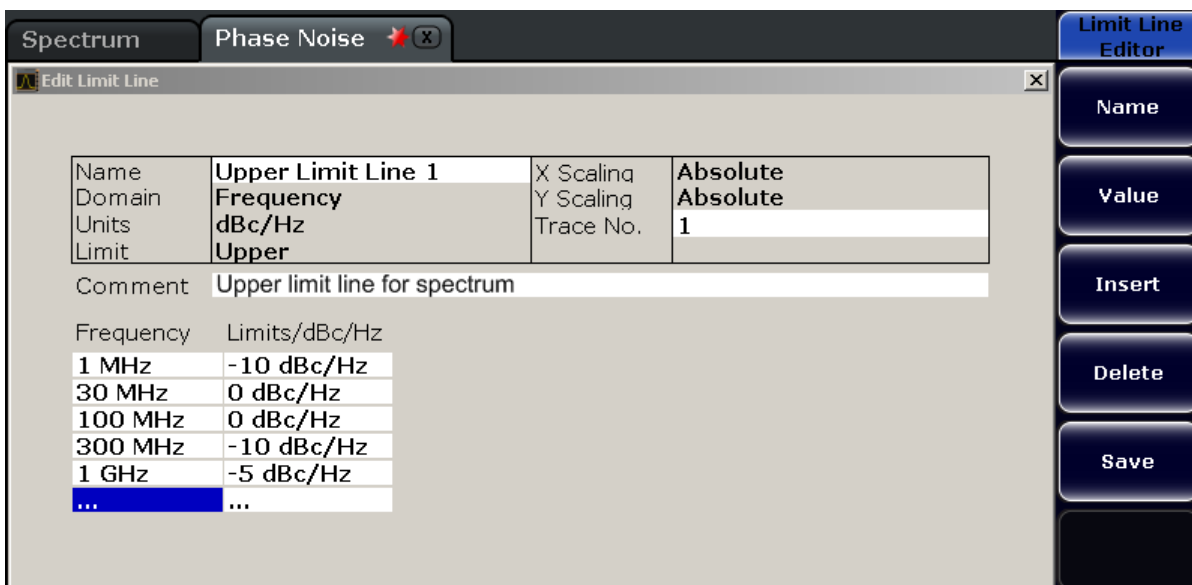
The "Select Limit Line" dialog box is displayed. For each limit line, the following information is given:

Name	Unique ID of the limit line as defined in the "Name" field (see chapter 4.1.13, "Editing Limit Lines" , on page 40).
Domain	Frequency or time domain
Units	Unit of the y-axis
Limit	Type of limit (for phase noise: upper)
X Scaling	Absolute or relative scaling
Y Scaling	Absolute or relative scaling
Trace No.	Selected trace (defined in "Trace No." field, see chapter 4.1.13, "Editing Limit Lines" , on page 40)
Compatible	Indicates compatibility of the limit line to the current measurement settings
Check	Activates/Deactivates the limit check using the limit line for the trace. If a limit check is performed, the trace values are checked whether they exceed the limit values and the result ("Pass"/"Fail") is indicated in the display.
Comment	Optional description as defined in the "Comment" field (see chapter 4.1.13, "Editing Limit Lines" , on page 40).

- To define a new limit line, press the "New" softkey and enter the limit line characteristics as described in [chapter 4.1.13, "Editing Limit Lines"](#), on page 40.
- To modify a limit line, select the limit line you want to edit and press the "Edit" softkey as described in [chapter 4.1.13, "Editing Limit Lines"](#), on page 40.
- To save a limit line, press the "Save" softkey.
If data is missing or if some data is invalid, an error message is displayed.
- To delete a limit line, select the limit line you want to edit and press the "Delete" softkey.

4.1.13 Editing Limit Lines

When you press the "New" softkey to define a new limit line (see "New" on page 38), or the "Edit" softkey to edit an existing limit line (see "Edit" on page 39), the "Edit Limit Line" dialog box and the "Limit Line Editor" submenu are displayed.



To create or edit a limit line:

- Enter the following settings as required:

Name	Name of the limit line to uniquely identify every limit line. Any combination of alphanumeric characters is allowed. If the entered name already exists, an error message is displayed with the request to alter the name.
Trace No.	Trace number for which the limit line is defined.
Comment	Description for the limit line. Any combination of alphanumeric characters is allowed.
Frequency	Receive frequencies (in Hz)
Limit	Limits for the receive frequencies (in dBc/Hz).

The "Frequency/Limits" table lists the limit values for specific frequency values. The list can contain up to 100 frequency/limit value pairs. Note that the frequency values must be in ascending order.

2. To insert a new frequency/limit entry, press the ENTER key after entering a limit, or press the "Insert" softkey.
To delete a frequency/limit entry, select the entry and press the "Delete" softkey.
3. When you have entered all required values, press the "Save" softkey.
If data is missing or if some data is invalid, an error message is displayed. Correct the input, if necessary.
4. In the "Select Limit Line" view, define whether the limit line is to be used to perform a limit check for the trace by activating or deactivating the "Check" option for the limit line.

Remote commands:

`CALCulate<n>:LIMit<k>:COMMeNT` on page 55

Specifies a description for the limit line.

`CALCulate<n>:LIMit<k>:CONTRol[:DATA]` on page 56

Specifies the receive frequencies.

`CALCulate<n>:LIMit<k>:LOWer[:DATA]` on page 58

`CALCulate<n>:LIMit<k>:UPPer[:DATA]` on page 61

Specifies the limits for the receive frequencies.

4.1.14 Detector Overview

The measurement detector for the individual display modes can be selected directly by the user or set automatically by the analyzer. The detector activated for the specific trace is indicated in the corresponding trace display field by an abbreviation.

The detectors of the analyzer are implemented as pure digital devices. They collect signal power data within each measured point during a sweep. The default number of sweep points is 691. The following detectors are available:

Table 4-1: Detector types

Detector	Indicator	Function
Auto Peak	Ap	Determines the maximum and the minimum value within a measurement point (not available for SEM)
Positive Peak	Pk	Determines the maximum value within a measurement point
Negative Peak (min peak)	Mi	Determines the minimum value within a measurement point
RMS	Rm	Determines the root mean square power within a measurement point

Detector	Indicator	Function
Average	Av	Determines the linear average power within a measurement point
Sample	Sa	Selects the last value within a measurement point

The result obtained from the selected detector within a measurement point is displayed as the power value at this measurement point.

All detectors work in parallel in the background, which means that the measurement speed is independent of the detector combination used for different traces.



Number of measured values

During a frequency sweep, the analyzer increments the first local oscillator in steps that are smaller than approximately 1/10 of the bandwidth. This ensures that the oscillator step speed is conform to the hardware settling times and does not affect the precision of the measured power.

The number of measured values taken during a sweep is independent of the number of oscillator steps. It is always selected as a multiple or a fraction of 691 (= default number of trace points displayed on the screen). Choosing less than 691 measured values (e.g. 125 or 251) will lead to an interpolated measurement curve, choosing more than 691 points (e.g. 1001, 2001 ...) will result in several measured values being overlaid at the same frequency position.



RMS detector and VBW

If the RMS detector is selected, the video bandwidth in the hardware is bypassed. Thus, duplicate trace averaging with small VBWs and RMS detector no longer occurs. However, the VBW is still considered when calculating the sweep time. This leads to a longer sweep time for small VBW values. Thus, you can reduce the VBW value to achieve more stable trace curves even when using an RMS detector. Normally, if the RMS detector is used the sweep time should be increased to get more stable trace curves.

4.1.15 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 4.1.16, "List of Available RRC and Channel Filters"](#), on page 43 .

Channel filters do not support FFT mode.

- RRC filters
For details see [chapter 4.1.16, "List of Available RRC and Channel Filters"](#), on page 43 .
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.

4.1.16 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 4-2: 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	
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

Instrument Functions of Phase Noise Measurements (R&S FSV-K40)

Filter Bandwidth	Filter Type	Application
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	
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	

4.1.17 Trace Mode Overview

The traces can be activated individually for a measurement or frozen after completion of a measurement. Traces that are not activated are hidden. Each time the trace mode is changed, the selected trace memory is cleared.

The analyzer offers 6 different trace modes:

Clear Write

Overwrite mode: the trace is overwritten by each sweep. This is the default setting.

All available detectors can be selected.

SCPI command:

DISP:TRAC:MODE WRIT, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)
on page 72

Max Hold

The maximum value is determined over several sweeps and displayed. The analyzer saves the sweep result in the trace memory only if the new value is greater than the previous one.

The detector is automatically set to "Positive Peak".

This mode is especially useful with modulated or pulsed signals. The signal spectrum is filled up upon each sweep until all signal components are detected in a kind of envelope.

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MAXH, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)
on page 72

Min Hold

The minimum value is determined from several measurements and displayed. The analyzer saves for each sweep the smallest of the previously stored/currently measured values in the trace memory.

The detector is automatically set to "Negative Peak".

This mode is useful e.g. for making an unmodulated carrier in a composite signal visible. Noise, interference signals or modulated signals are suppressed whereas a CW signal is recognized by its constant level.

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MINH, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)
on page 72

Average

The average is formed over several sweeps. The [Sweep Count](#) determines the number of averaging procedures.

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see [chapter 4.1.14, "Detector Overview"](#), on page 41).


This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE AVER, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#) on page 72

View

The current contents of the trace memory are frozen and displayed.

Note: If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that the displayed trace no longer matches the current instrument setting is indicated by the  icon on the tab label.

If the level range or reference level is changed, the analyzer automatically adapts the measured data to the changed display range. This allows an amplitude zoom to be made after the measurement in order to show details of the trace.

SCPI command:

DISP:TRAC:MODE VIEW, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#) on page 72

Blank

Hides the selected trace.

SCPI command:

DISP:TRAC OFF, see [DISPlay\[:WINDow<n>\]:TRACe<t>\[:STATe\]](#) on page 73

4.1.18 ASCII File Export Format

The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit. The data section starts with the keyword "Trace <n>" (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.

File contents: header and data section	Description
Type;FSVR;	
Version;1.45;	
Date;01.Apr 2010;	Date of data set storage
Screen;A;	Instrument mode
Points per Symbol;4;	Points per symbol
x Axis Start;-13;sym;	Start value of the x axis
x Axis Stop;135;sym;	Stop value of the x axis
Ref value y axis;-10.00;dBm;	Y axis reference value
Ref value position;100;%;	Y axis reference position
Trace;1;	Trace number
Meas;Result;	Result type

File contents: header and data section	Description
Meas Signal;Magnitude;	Result display
Demodulator;Offset QPSK;	Demodulation type
ResultMode;Trace;	Result mode
x unit;sym;	Unit of the x axis
y unit;dBm;	Unit of the y axis
Trace Mode;Clear Write;	Trace mode
Values;592;	Number of results
<values>	List of results

4.2 Remote Control

This section specifies the remote control commands specific to the R&S FSV-K40 option. Only those commands provided for this option are specified.

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

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4.2.1 Notation

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

Individual Description

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

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

Abbreviation	Description
A	spectrum analysis
A-F	spectrum analysis – span > 0 only (frequency mode)
A-T	spectrum analysis – zero span only (time mode)
ADEM0D	analog demodulation (option R&S FSV-K7)
BT	Bluetooth (option R&S FSV-K8)
CDMA	CDMA 2000 base station measurements (option R&S FSV-K82)
EVDO	1xEV-DO base station analysis (option R&S FSV-K84)
GSM	GSM/Edge measurements (option R&S FSV-K10)
IQ	IQ Analyzer mode
OFDM	WiMAX IEEE 802.16 OFDM measurements (option R&S FSV-K93)
OFDMA/WiBro	WiMAX IEEE 802.16e OFDMA/WiBro measurements (option R&S FSV-K93)
NF	Noise Figure measurements (R&S FSV-K30)

PHN	Phase Noise measurements (R&S FSV-K40)
PSM	Power Sensor measurements (option R&S FSV-K9)
SFM	Stereo FM measurements (option R&S FSV-K7S)
SPECM	Spectrogram mode (option R&S FSV-K14)
TDS	TD-SCDMA base station / UE measurements (option R&S FSV-K76/K77)
VSA	Vector Signal Analysis (option R&S FSV-K70)
WCDMA	3GPP Base Station measurements (option R&S FSV-K72), 3GPP UE measurements (option R&S FSV-K73)
WLAN	WLAN TX measurements (option R&S FSV-K91)



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

Upper/Lower Case Notation

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

Special Characters

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

Example:

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

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

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

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

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

Example: Selection of the parameters for the command

```
[SENSe<1...4>:]AVERage<1...4>:TYPE VIDEo | LINear
```

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

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

Description of Parameters

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

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

<Boolean>

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

<numeric_value> <num>

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

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

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

Example:

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

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

<arbitrary block program data>

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

4.2.2 CALCulate subsystem

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4.2.2.1 CALCulate:DELTamarker subsystem

CALCulate<n>:DELTamarker<m>:AOFF.....	51
CALCulate<n>:DELTamarker<m>[:STATe].....	51
CALCulate<n>:DELTamarker<m>:TRACe.....	52
CALCulate<n>:DELTamarker<m>:X.....	52
CALCulate<n>:DELTamarker<m>:Y.....	53

CALCulate<n>:DELTamarker<m>:AOFF

This command switches off all active delta markers 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.
 <m> marker number

Example:

CALC:DELT:AOff
 Switches off all delta markers.

Mode:

A, ADEMOD, CDMA, EVDO, PHN, TDS, VSA, WCDMA

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

This command defines the marker specified by the suffix <m> as a delta marker for the window specified by the suffix <n>. If the corresponding marker was not already active, it is activated and positioned on the maximum of the measurement curve.

If no suffix is given for DELTmarker, delta marker 1 is selected automatically.

Suffix:

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

Parameters:

<State> ON | OFF
 *RST: OFF

Example:

CALC:DELT1 ON
 Switches marker 1 to delta marker mode.

Mode:

All

CALCulate<n>:DELTamarker<m>:TRACe <TraceNumber>

This command assigns the selected delta marker to the indicated trace in the window specified by the suffix <n>. The selected trace must be active, i.e. its state must be different from "BLANK".

In the persistence spectrum result display, the command also defines if the delta marker is positioned on the persistence trace or the maxhold trace.

Suffix:

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

<m> marker number

Parameters:

<TraceNumber> **1 to 6**
Selects trace 1 through 6.

MAXHold

Defines the maxhold trace as the trace to put the delta marker on. This parameter is available only for the persistence spectrum result display.

WRITE

Defines the persistence trace as the trace to put the delta marker on. This parameter is available only for the persistence spectrum result display.

Example:

`CALC:DELT3:TRAC 2`
Assigns delta marker 3 to trace 2.

Mode:

A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA, SPECM, RT, VSA

CALCulate<n>:DELTamarker<m>:X <Position>

This command positions the selected delta marker to the indicated value in the window specified by the suffix <n>. The input is in absolute values.

Suffix:

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

<m> marker number

Parameters:

<Position> 0 to maximum frequency or sweep time

Example:

`CALC:DELT:X?`
Outputs the absolute frequency/time of delta marker 1.

Mode:

A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA, VSA

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:

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, TDS, WCDMA, VSA

4.2.2.2 CALCulate:EVALuation Subsystem

CALCulate<n>:EVALuation[:STATe].....	53
CALCulate<n>:EVALuation:START.....	54
CALCulate<n>:EVALuation:STOP.....	54

CALCulate<n>:EVALuation[:STATe] <State>

This command specifies whether residual noise values are calculated over the entire trace or within a specified frequency range.

Suffix:

<n> 1...4
 window

Parameters:

<State> ON (1) | OFF (0)

ON (1)

The residual noise values are calculated over the range specified by `CALCulate<n>:EVALuation:START` on page 54 and `CALCulate<n>:EVALuation:STOP` on page 54

OFF (0)

The results are calculated over the entire trace.

*RST: 0

Example:

`CALC:EVAL 0`

Specifies that residual noise is calculated over the entire trace.

Mode:

PHN

CALCulate<n>:EVALuation:START <Frequency>

This command specifies the start frequency for residual noise calculation when `CALCulate<n>:EVALuation[:STATe]` on page 53 is switched OFF.

Suffix:

<n> 1...4
window

Parameters:

<Frequency>

Range: 1 Hz to 3 GHz

*RST: 1 kHz

Example:

`CALC:EVAL:START 1MHZ`

Specifies that residual noise is calculated starting from 1 MHz

Mode:

PHN

CALCulate<n>:EVALuation:STOP <Frequency>

This command specifies the stop frequency for residual noise calculation when `CALCulate<n>:EVALuation[:STATe]` on page 53 is switched ON. This command has no effect if `CALCulate<n>:EVALuation[:STATe]` on page 53 is switched OFF.

Suffix:

<n> 1...4
window

Parameters:

<Frequency>

Range: 3 Hz to 10 GHz

*RST: 1 MHz

Example:

`CALC:EVAL:STOP 1 MHz`

Specifies that residual noise is calculated up to 1 MHz.

Mode: PHN

4.2.2.3 CALCulate:LIM subsystem

CALCulate<n>:LIMit<k>:CLEar[:IMMediate]	55
CALCulate<n>:LIMit<k>:COMMeNt	55
CALCulate<n>:LIMit<k>:CONTRol[:DATA]	56
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CALCulate<n>:LIMit<k>:NAME	59
CALCulate<n>:LIMit<k>:STATe	59
CALCulate<n>:LIMit<k>:TRACe	60
CALCulate<n>:LIMit<k>:UNIT	60
CALCulate<n>:LIMit<k>:UPPer[:DATA]	61
CALCulate<n>:LIMit<k>:UPPer:SHIFt	61
CALCulate<n>:LIMit<k>:UPPer:STATe	62

CALCulate<n>:LIMit<k>:CLEar[:IMMediate]

This command deletes the result of the current limit check for all limit lines in all windows.

Suffix:

<n> irrelevant
<k> irrelevant

Example: CALC:LIM:CLE
Deletes the result of the limit check.

Mode: A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WCDMA

CALCulate<n>:LIMit<k>:COMMeNt <Comment>

This command defines a comment for the selected limit line in all windows (max. 40 characters).

Suffix:

<n> irrelevant
<k> limit line

Parameters:

<Comment> <string>, max. 40 alphanumeric characters

Example: CALC:LIM5:COMM 'Upper limit for spectrum'
Defines the comment for limit line 5.

Mode: A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WCDMA

CALCulate<n>:LIMit<k>:CONTrol[:DATA] <XValue>, <XValue>

This command defines the x-axis values (frequencies or times) of the upper or lower limit lines.

The number of values for the CONTrol axis and for the corresponding UPPer and/or LOWEr limit lines has to be identical. Otherwise default values are entered for missing values or not required values are deleted.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
 <k> 1...8
 limit line

Parameters:

<XValue>, <XValue> <numeric_value>,<numeric_value>
 *RST: - (CALC:LIM is set to OFF)

Example:

CALC:LIM2:CONT 1 MHz, 30 MHz, 100 MHz, 300 MHz, 1 GHz

Defines 5 reference values for the x-axis of limit line 2.

CALC:LIM2:CONT?

Outputs the reference values for the x-axis of limit line 2 separated by a comma.

Mode:

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WCDMA

CALCulate<n>:LIMit<k>:CONTrol:SHIFt <XValue>

This command moves a limit line by the indicated value in x direction. The line is shifted by modifying the individual x values.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
 <k> 1...8
 limit line

Parameters:

<XValue> <numeric_value>
 *RST: - (CALC:LIM is set to OFF)

Example:

CALC:LIM2:CONT:SHIF 50 kHz

Shifts all reference values of limit line 2 by 50 kHz.

Mode:

PHN

CALCulate<n>:LIMit<k>:COPY <Line>

This command copies one limit line onto another one

Suffix:

<n> irrelevant
<k> limit line

Parameters:

<Line> 1 to 8 | <name>
1 to 8
number of the new limit line
<name>
name of the new limit line given as a string

Example:

```
CALC:LIM1:COPY 2
Copies limit line 1 to line 2.
CALC:LIM1:COPY 'FM2'
Copies limit line 1 to a new line named FM2.
```

Mode:

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WCDMA

CALCulate<n>:LIMit<k>:DELete

This command deletes the selected limit line.

Suffix:

<n> irrelevant
<k> limit line

Example:

```
CALC:LIM1:DEL
Deletes limit line 1.
```

Mode:

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WCDMA

CALCulate<n>:LIMit<k>:FAIL

This command queries the result of the limit check of the indicated limit line. It should be noted that a complete sweep must have been performed for obtaining a correct result. A synchronization with *OPC, *OPC? or *WAI should therefore be provided. The result of the limit check is given with 0 for PASS, 1 for FAIL, and 2 for MARGIN.

Suffix:

<n> irrelevant
<k> limit line

Return values:

Return values 0 for pass, 1 for fail

Example:

```
INIT;*WAI
Starts a new sweep and waits for its end.
CALC:LIM3:FAIL?
Queries the result of the check for limit line 3.
```

Mode:

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WLAN, WCDMA

CALCulate<n>:LIMit<k>:LOWer[:DATA] <LimitLineValues>

This command defines the values for the selected lower limit line.

The number of values for the CONTROL axis and for the corresponding LOWER limit line has to be identical. Otherwise default values are entered for missing values or not necessary values are deleted.

The unit must be identical with the unit selected by `CALCulate<n>:LIMit<k>:UNIT`. If no unit is indicated, the unit defined with `CALCulate<n>:LIMit<k>:UNIT` is automatically used.

If the measured values are smaller than the LOWER limit line, the limit check signals errors.

The units DEG, RAD, S, HZ, PCT are not available in the "Spectrum" mode.

Suffix:

<n> irrelevant
<k> 1...8
limit line

Parameters:

<LimitLineValues> numeric values, separated by commas
*RST: (LIMit:STATe is set to OFF)

Example:

```
CALC:LIM2:LOW -30,-40,-10,-40,-30
Defines 5 lower limit values for limit line 2 in the preset unit.
CALC:LIM2:LOW?
Outputs the lower limit values of limit line 2 separated by a comma.
```

Mode:

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS

CALCulate<n>:LIMit<k>:LOWer:SHIFt <YValue>

This command moves a limit line by the indicated value in y direction. The line is shifted by modifying the individual y values.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<k> 1...8
limit line

Parameters:

<YValue> <numeric_value>
*RST: - (CALC:LIM is set to OFF)

Example:

```
CALC:LIM2:LOW:SHIF 20 dB
Shifts all Y-values of limit line 2 by 20 dB.
```

Mode:

PHN

CALCulate<n>:LIMit<k>:LOWer:STATe <State>

This command switches on or off the indicated limit line. The limit check is activated separately with `CALCulate<n>:LIMit<k>:STATe`.

In "Spectrum" mode, the result of the limit check can be queried with `CALCulate<n>:LIMit<k>:FAIL`.

Suffix:

<n> irrelevant
<k> 1...8
limit line

Parameters:

<State> ON | OFF

*RST: OFF

Example:

`CALC:LIM4:LOW:STAT ON`
Switches on limit line 4 (lower limit).

Mode:

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS

CALCulate<n>:LIMit<k>:NAME <Name>

This command assigns a name to a limit line numbered 1 to 8. If it does not exist already, a limit line with this name is created.

Suffix:

<n> irrelevant
<k> 1...8 (NF: 1...6)
limit line

Parameters:

<Name> <name of limit line>

*RST: REM1 to REM8 for lines 1 to 8

Example:

`CALC:LIM1:NAME 'FM1'`
Assigns the name FM1 to limit line 1.

Mode:

A, ADEMOD, CDMA, EVDO, NF, TDS, PHN

CALCulate<n>:LIMit<k>:STATe <State>

This command switches on or off the limit check for the selected limit line.

The result of the limit check can be queried with `CALCulate<n>:LIMit<k>:FAIL`.

Suffix:

<n> irrelevant
<k> limit line

Parameters:

<State> ON | OFF
 *RST: OFF

Example:

CALC:LIM:STAT ON
 Switches on the limit check for limit line 1.

Mode:

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS

CALCulate<n>:LIMit<k>:TRACe <Number>

This command assigns a limit line to the selected trace.

Suffix:

<n> irrelevant
 <k> 1...8
 limit line

Parameters:

<Number> 1...6
 Trace number
 *RST: 1

Example:

CALC:LIM1:TRAC 2
 Assigns the limit line 1 to trace 2.

Mode:

PHN

CALCulate<n>:LIMit<k>:UNIT <Unit>

This command defines the unit of the selected limit line.

Upon selection of the unit DB the limit line is automatically switched to the relative mode. For units different from DB the limit line is automatically switched to absolute mode.

The units DEG, RAD, S, HZ, PCT are not available in "Spectrum" mode.

Suffix:

<n> irrelevant
 <k> limit line

Parameters:

<Unit> DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere
 | DB | DBUV_M | DBUA_M | DEG | RAD | S | HZ | PCT | (unitless)
 *RST: DBM

Example:

CALC:LIM4:UNIT DBUV
 Sets the unit of limit line 4 to dB μ V.

Mode:

A, ADEMOD, CDMA, EVDO, PHN, TDS

CALCulate<n>:LIMit<k>:UPPer[:DATA] <LimitLineValues>

This command defines the values for the upper limit lines

The number of values for the CONTROL axis and for the corresponding UPPER and/or LOWER limit line has to be identical. Otherwise default values are entered for missing values or not necessary values are deleted.

The unit must be identical to the unit selected by `CALCulate<n>:LIMit<k>:UNIT`. If no unit is indicated, the unit defined using `CALCulate<n>:LIMit<k>:UNIT` is automatically used.

In "Spectrum" mode, the limit check indicates errors if the measured values exceed the UPPER limit line. The units DEG, RAD, S, HZ, PCT are not available in "Spectrum" mode.

Suffix:

<n> irrelevant
<k> 1...8
limit line

Parameters:

<LimitLineValues> numeric values, separated by commas
*RST: ("CALCulate<n>:LIMit<k>" is set to OFF)

Example:

```
CALC:LIM2:UPP -10,0,0,-10,-5
Defines 5 upper limit values for limit line 2 in the preset unit.
CALC:LIM2:UPP?
Outputs the upper limit values for limit line 2 separated by a
comma.
```

Mode: A, ADEMOD, CDMA, EVDO, NF, PHN, TDS

CALCulate<n>:LIMit<k>:UPPer:SHIFt <YValue>

This command moves a limit line by the indicated value in y direction. The line is shifted by modifying the individual y values.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<k> 1...8
limit line

Parameters:

<YValue> <numeric_value>
*RST: - (CALC:LIM is set to OFF)

Example:

```
CALC:LIM2:UPP:SHIF 20 dB
Shifts all Y-values of limit line 2 by 20 dB.
```

Mode: PHN

CALCulate<n>:LIMit<k>:UPPer:STATe <State>

This command switches on or off the indicated limit line. The limit check is activated separately with `CALCulate<n>:LIMit<k>:STATe`.

In "Spectrum" mode, the result of the limit check can be queried with `CALCulate<n>:LIMit<k>:FAIL`.

Suffix:

<n> irrelevant
<k> 1...8
limit line

Parameters:

<State> ON | OFF
*RST: OFF

Example:

`CALC:LIM4:UPP:STAT ON`
Switches on limit line 4 (upper limit).

Mode:

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS

4.2.2.4 CALCulate:MARKer subsystem

<code>CALCulate<n>:MARKer<m>:AOFF</code>	62
<code>CALCulate<n>:MARKer<m>:FUNCTION:ZOOM</code>	62
<code>CALCulate<n>:MARKer<m>[:STATe]</code>	63
<code>CALCulate<n>:MARKer<m>:TRACe</code>	63
<code>CALCulate<n>:MARKer<m>:X</code>	64
<code>CALCulate<n>:MARKer<m>:Y</code>	64

CALCulate<n>:MARKer<m>:AOFF

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

Suffix:

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

Example:

`CALC:MARK:AOFF`
Switches off all markers.

Mode:

all

CALCulate<n>:MARKer<m>:FUNCTION:ZOOM <State>

If marker zoom is activated, the number of channels displayed on the screen in code domain power and code domain error power result diagram is reduced to 64.

The currently selected marker defines the center of the displayed range.

Suffix:

<n> irrelevant
 <m> 1...4
 marker number

Parameters:

<State> ON | OFF
 *RST: OFF

Example:

CALC:MARK:FUNC:ZOOM ON

Mode:

CDMA, EVDO, PHN, TDS, WCDMA

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

This command activates a marker in the specified window. If no indication is made, marker 1 is selected automatically. If activate, the marker is switched to normal mode.

Suffix:

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

Parameters:

<State> ON | OFF
 *RST: OFF

Example:

CALC:MARK3 ON
 Switches on marker 3 or switches to marker mode.

Mode:

all

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

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

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

In the persistence spectrum result display, the command also defines if the delta marker is positioned on the persistence trace or the maxhold trace.

Suffix:

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

Parameters:

<Trace>

1 to 6

Trace number the marker is assigned to.

MAXHold

Defines the maxhold trace as the trace to put the delta marker on. This parameter is available only for the persistence spectrum result display.

WRITe

Defines the persistence trace as the trace to put the delta marker on.

This parameter is available only for the persistence spectrum result display.

Example:`CALC:MARK3:TRAC 2`

Assigns marker 3 to trace 2.

Mode:

all

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

This command positions the selected marker to the indicated x-value 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.

<m>

marker number

Parameters:

<Position>

0 to MAX (frequency | sweep time | level)

Example:`CALC:MARK2:X 1.7MHz`

Positions marker 2 to frequency 1.7 MHz.

Mode:

ALL

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

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

Parameters:	
<MarkerPosition>	Defines the vertical marker position in the persistence spectrum result display.
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 (Q) value of the marker first, then the Imag (I) value.
Example:	<pre>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</pre>
Mode:	A, ADEMOD, BT, CDMA, EVDO, I/Q, GSM, TDS, WCDMA, VSA

4.2.2.5 CALCulate:SNOise Subsystem

The CALCulate:SNOise subsystem allows spot noise measurement points to be set, and results returned.

Note that for all spot noise commands the suffix for the CALCulate command must be 1.

CALCulate<n>:SNOise<m>:AOFF.....	65
CALCulate<n>:SNOise<m>:STATe.....	66
CALCulate<n>:SNOise<m>:X.....	66
CALCulate<n>:SNOise<m>:Y.....	66

CALCulate<n>:SNOise<m>:AOFF

Switches off all active spot noise markers in the specified measurement window.

Suffix:

<n>	1 window
<m>	1...4 spot noise marker

Example: `CALC1:SNO:AOFF`
Switches off all spot noise markers in the screen A window.

Mode: PHN

CALCulate<n>:SNOise<m>:STATe <State>

Switches on or off the currently selected spot noise marker in the selected measurement window. If no indication is made, marker 1 is selected automatically.

Suffix:

<n> 1
window
<m> 1...4
spot noise marker

Parameters:

<State> ON | OFF
*RST: 1

Example:

CALC1:SNO1:STATE ON
Switches the screen A marker ON.

Mode: PHN

CALCulate<n>:SNOise<m>:X <Frequency>

Positions the selected slot noise marker to the indicated frequency

Suffix:

<n> 1
window
<m> 1...4
spot noise marker

Parameters:

<Frequency> <numeric value>

Example:

CALC1:SNO:X 2MHz
Positions spot noise marker 1 in screen A to time 2 MHz.

Mode: PHN

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

Returns the measured spot noise marker result in the selected measurement window. The units for this command are dBc/Hz.

Suffix:

<n> 1
window
<m> 1...4
spot noise marker

Return values:

<Result> <numeric value>

Example:	CALC1:SNO:Y? Outputs the measured value of spot noise marker 1 in screen A.
Usage:	Query only
Mode:	PHN

4.2.2.6 Other CALCulate commands

CALCulate<n>:MATH[:EXpression][:DEFine].....	67
CALCulate<n>:MATH:STATe.....	67

CALCulate<n>:MATH[:EXpression][:DEFine] <Expression>

This command defines the mathematical expression for relating traces to trace1.

Suffix:

<n> irrelevant

Parameters:

<Expression> (TRACe1-TRACe2) | (TRACe1-TRACe3) | (TRACe1-TRACe4) |
(TRACe1-TRACe5) | (TRACe1-TRACe6)

(TRACe1-TRACe2)

Subtracts trace 2 from trace 1.

(TRACe1-TRACe3)

Subtracts trace 3 from trace 1.

(TRACe1-TRACe4)

Subtracts trace 4 from trace 1.

(TRACe1-TRACe5)

Subtracts trace 5 from trace 1.

(TRACe1-TRACe6)

Subtracts trace 6 from trace 1.

Example: CALC1:MATH (TRACe1 - TRACe2)
Selects the subtraction of trace 2 from trace 1.

Mode: A, SPECM, PHN

CALCulate<n>:MATH:STATe <State>

This command switches the mathematical relation of traces on or off.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MATH:STAT ON`
Switches on the trace mathematics.

Mode: `A, PHN, SPECM`

4.2.3 CONFigure Subsystem

The `CONFigure` subsystem contains commands for configuring complex measurement tasks. The `CONFigure` subsystem is closely linked to the functions of the `FETCH` subsystem, where the measurement results of the measurements are queried.

<code>CONFigure:POWer:AUTO</code>	68
<code>CONFigure:POWer:EXPeCted:RF</code>	68
<code>CONFigure:REFMeas ONCE</code>	68

`CONFigure:POWer:AUTO` <State>

Switches on or off automatic power level detection. When switched on, power level detection is performed at the start of each measurement sweep.

Parameters:

<State> `ON | OFF`

 *`RST:` `1`

Example: `CONF:POW:AUTO 1`
The FSV-K40 option detects the input power level automatically

Mode: `PHN`

`CONFigure:POWer:EXPeCted:RF` <InputLevel>

Specifies the input power level of the source signal as supplied to the Analyzer RF input.

Parameters:

<InputLevel> <numeric value>

 *`RST:` `0`

Example: `CONF:POW:EXP:RF 9`
The FSV-K40 option assumes an input signal strength of 9 dBm

Mode: `PHN`

`CONFigure:REFMeas ONCE`

Configures and initiates a reference measurement.

Example: `CONF:REFM ONCE`
A reference measurement is started.

Mode: PHN

4.2.4 DISPlay Subsystem

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

DISPlay[:WINDow<n>]:TRACe<t>:SMOothing:APERture.....	69
DISPlay[:WINDow<n>]:TRACe<t>:SMOothing[:STATe].....	69
DISPlay[:WINDow<n>]:TRACe<t>:SMOothing:TYPE.....	70
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]:AUTO.....	70

DISPlay[:WINDow<n>]:TRACe<t>:SMOothing:APERture <Value>

Specifies the aperture of the window to be used when trace smoothing is performed.

A single aperture applies to all traces which require smoothing.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Value> <numeric value>

*RST: 0

Example:

DISP:TRAC1:SMO:APER 1

Sets the smoothing window for trace 1 to 1 %

Usage: SCPI conform

Mode: PHN

DISPlay[:WINDow<n>]:TRACe<t>:SMOothing[:STATe] <State>

Specifies whether smoothing of a particular trace is carried out.

Suffix:

<n> irrelevant

<t> 1...3
trace

Parameters:

<State> ON | OFF

*RST: OFF

Example:

DISP:TRAC1:SMO 1

Specifies that smoothing of trace 1 is to be performed

Usage: SCPI conform

Mode: PHN

DISPlay[:WINDow<n>]:TRACe<t>:SMOothing:TYPE <Type>

Specifies whether linear or logarithmic smoothing is to be used when trace smoothing is performed.

Suffix:

<n> irrelevant
<t> 1...3
trace

Parameters:

<Type> LINear|LOGarithmic

*RST: LIN

Example:

DISP:TRAC1:SMO:TYPE LIN
Sets the smoothing type for trace 1

Usage: SCPI conform

Mode: PHN

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO <State>

This command switches automatic scaling for the Y axis on and off. If the "ONCE" setting is used with this command, automatic scaling is performed immediately, regardless of whether automatic scaling is switched on.

Suffix:

<n> irrelevant
<t> irrelevant

Parameters:

<State> ON | OFF | ONCE

*RST: ON

Example:

DISP:WIND:TRAC:Y:SCAL:AUTO 1
Switches on automatic Y axis scaling

Mode: PHN

4.2.5 FETCh Subsystem

The FETCh subsystem contains commands for reading out results of complex measurement tasks. This subsystem is closely linked to the CONFigure and SENSE subsystems.

FETCh:PNOise:RFM.....	70
FETCh:PNOise:RPM.....	71
FETCh:PNOise:RMS.....	71

FETCh:PNOise:RFM?

Returns the measured Residual FM result for the specified trace.

Example: FETC:PNO1:RFM?
Returns the Residual FM result for Trace1

Usage: Query only

Mode: PHN

FETCh:PNOise:RPM?

Returns the measured Residual PM result for the specified trace.

Example: FETC:PNO2:RPM?
Returns the Residual PM result for Trace2

Usage: Query only

Mode: PHN

FETCh:PNOise:RMS?

Returns the measured Residual RMS result for the specified trace.

Example: FETC:PNO3:RMS?
Returns the Residual RMS result for Trace3

Usage: Query only

Mode: PHN

4.2.6 DISPlay subsystem

DISPlay:FORMat.....	71
DISPlay[:WINDow<n>]:TRACe<t>:MODE.....	72
DISPlay[:WINDow<n>]:TRACe<t>[:STATe].....	73
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]:AUTO.....	73
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]:RLEVel:OFFSet.....	73
DISPlay[:WINDow<n>]:TRACe<t>:SMOothing:APERture.....	74
DISPlay[:WINDow<n>]:TRACe<t>:SMOothing[:STATe].....	74

DISPlay:FORMat <Format>

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

Parameters:

<Format> SINGle | SPLit

SPLit
Show 2 or more screens on the display

SINGle
Show only 1 screen on the display

*RST: SPL

Example: DISP:FORM:SING

Mode: all

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

This command defines the type of display and the evaluation of the traces in the window specified by the suffix <n>. WRITE corresponds to the Clr/Write mode of manual operation. The trace is switched off (= BLANK in manual operation) with `DISPlay[:WINDow<n>]:TRACe<t>[:STATe]`.

The number of measurements for AVERage, MAXHold and MINHold is defined with the `[SENSe:]AVERage<n>:COUNT` or `[SENSe:]SWEep:COUNT` commands. It should be noted that synchronization to the end of the indicated number of measurements 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.

<t> trace

Parameters:

<Mode> WRITe | VIEW | AVERage | MAXHold | MINHold | BLANK

*RST: WRITe for TRACe1, STATe OFF for TRACe2/3/4/5/6
For details on trace modes refer to [chapter 4.1.17, "Trace Mode Overview"](#), on page 45.

Example:

```
INIT:CONT OFF
Switching to single sweep mode.
SWE:COUN 16
Sets the number of measurements to 16.
DISP:TRAC3:MODE MAXH
Switches on the calculation of the maximum peak for trace 3.
INIT;*WAI
Starts the measurement and waits for the end of the 16 sweeps.
```

Mode: all

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]:AUTO <Mode>

This command switches on or off automatic scaling of the Y-axis for the specified trace display. Automatic scaling sets the Y-axis to automatically scale to best fit the measurement results.

Suffix:

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

<t> only 1
trace

Parameters:

<Mode> ON | OFF | ONCE

ON

Automatic scaling is on.

OFF

Automatic scaling is off.

ONCE

Automatic scaling is performed once, then switched off again.

*RST: OFF

Example: DISP:WIND2:TRAC:Y:SCAL:AUTO ONCE
Activates automatic scaling of the Y-axis for the active trace

Mode: CDMA, EVDO, OFDM, OFDMA/WiBro, PHN

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>:SMOothing:APERture <Value>

This command specifies the aperture of the window to be used when trace smoothing is performed. A single aperture applies to all traces which require smoothing.

Suffix:
 <n> irrelevant
 <t> irrelevant

Parameters:
 <Value> numeric value in percent

Example: DISP:TRAC3:SMO 1
 Sets the smoothing window of trace 3 to 1%.

Mode: PHN

DISPlay[:WINDow<n>]:TRACe<t>:SMOothing[:STATe] <State>

This command specifies whether smoothing of a particular trace is carried out.

Suffix:
 <n> irrelevant
 <t> trace

Parameters:
 <State> ON | OFF
 *RST: OFF

Example: DISP:TRAC3:SMO ON
 Smoothing is performed for trace 3.

Mode: PHN

4.2.7 FORMat subsystem

FORMat[:DATA].....75
 FORMat:DEXPort:DSEParator.....75

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

FORMat:DEXPort:DSEParator <Separator>

This command defines which decimal separator (decimal point or comma) is to be used for outputting measurement data to the file in ASCII format. Different languages of evaluation programs (e.g. MS-Excel) can thus be supported.

The suffix <1...4> is irrelevant, the separator is defined globally for all windows.

Parameters:

<Separator> POINT | COMMA

*RST: (factory setting is POINT; *RST does not affect setting)

Example:

FORM:DEXP:DSEP POIN

Sets the decimal point as separator.

Mode:

all

4.2.8 INPut Subsystem

The INPut subsystem controls the input characteristics of the RF inputs of the instrument.

[INPut:PRESelection\[:STATe\].....](#)75

INPut:PRESelection[:STATe] <State>

Switches the preselection on or off.

Parameters:

<State> ON | OFF
 *RST: OFF

Example:

INP: PRES: STAT ON
 - preselection is switched on.

Mode:

PHN

The command is only available with the preselector option B2.

4.2.9 INITiate subsystem

INITiate<n>:CONTInuous.....	76
INITiate<n>[:IMMEDIATE].....	76
INITiate<n>:DISPlay.....	77

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

INITiate<n>:DISPlay <State>

This command configures the behaviour of the display during a single sweep.

Suffix:
<n> irrelevant

Parameters:
<State> ON | OFF

ON
The display is switched on during the measurement

OFF
The display is switched off during the measurement

Mode: PHN

4.2.10 INPut subsystem

INPut:GAIN:STATe77

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

4.2.11 INSTRument subsystem

The INSTRument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

[INSTRument\[:SElect\]](#).....78
[INSTRument:NSElect](#).....78

INSTRument[:SElect] <Mode>

This command switches between the measurement modes by means of text parameters.

Parameters:

<Mode> **PNOise**
 Phase Noise Mode (R&S FSV-K40 option)

INSTRument:NSElect <Mode>

This command switches between the measurement modes by means of numbers.

Parameters:

<Mode> **20**
 Phase Noise Mode (R&S FSV-K40 option)

4.2.12 MMEMory subsystem

[MMEMory:STORe<n>:TRACe](#).....78

MMEMory:STORe<n>:TRACe <Trace>, <FileName>

This command stores the selected trace in the specified window in a file with ASCII format. The file format is described in [chapter 4.1.18, "ASCII File Export Format"](#), on page 46

The decimal separator (decimal point or comma) for floating-point numerals contained in the file is defined with the `FORMat:DEXPort:DSEParator` command (see [FORMat:DEXPort:DSEParator](#) on page 75).

Suffix:

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

Parameters:

<Trace> 1 to 6
 selected measurement trace

<FileName> DOS file name
The file name includes indication of the path and the drive name. Indication of the path complies with DOS conventions.

Example: MMEM:STOR:TRAC 3, 'TEST.ASC'
Stores trace 3 in the file TEST.ASC.

Mode: all

4.2.13 SENSE Subsystem

The SENSE command is used to set and get the values of parameters in the remote instrument. The get variant of the SENSE command differs from set in that it takes no parameter values (unless otherwise stated) but is followed by the character '?' and returns the parameter's value in the same format as it is set.

e.g SENS:FREQ 10GHZ – sets the frequency to 10 GHz

SENS:FREQ? – response 10GHZ – returns the current frequency

[SENSe:]FREQUENCY:CENTer.....	79
[SENSe:]FREQUENCY:START.....	80
[SENSe:]FREQUENCY:STOP.....	80
[SENSe:]FREQUENCY:TRACk.....	80
[SENSe:]FREQUENCY:VERify[:STATe].....	81
[SENSe:]FREQUENCY:VERify:TOLerance.....	81
[SENSe:]FREQUENCY:VERify:TOLerance:RELative.....	82
[SENSe:]LIST:RANGe<range>:BANDwidth[:RESolution].....	82
[SENSe:]LIST:RANGe<range>:FILTer:TYPE.....	82
[SENSe:]LIST:RANGe<1..20>:SWEep:COUNT.....	83
[SENSe:]POWER:RLEVel.....	83
[SENSe:]POWER:RLEVel:VERify[:STATe].....	83
[SENSe:]POWER:RLEVel:VERify:TOLerance.....	84
[SENSe:]POWER:TRACk.....	84
[SENSe:]SWEep:COUNT.....	85
[SENSe:]SWEep:FORWard.....	85
[SENSe:]SWEep:MODE.....	85
[SENSe:]SWEep:POINts.....	86

[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:]FREQUENCY:STARt <Frequency>

This command defines the start frequency of the analyzer. This command is only available with span > 0.

Parameters:

<Frequency> 0 to (fmax - min span)

In realtime mode, the minimum span is 100 Hz and the maximum span is 40 MHz. If you set a start frequency that would exceed this span, the analyzer adjusts the stop frequency to get a span of 40 MHz.

In analyzer mode, the span range is 10 Hz to f_{max} . For SEM and Spurious Emission measurements, the minimum span 20 Hz.

*RST: 0

Example: FREQ:STAR 20MHz

Mode: A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

[SENSe:]FREQUENCY:STOP <Frequency>

This command defines the stop frequency of the analyzer. This command is only available with span > 0.

Parameters:

<Frequency> min span to fmax

In realtime mode, the minimum span is 100 Hz and the maximum span is 40 MHz. If you set a stop frequency that would exceed this span, the analyzer adjusts the start frequency to get a span of 40 MHz.

In analyzer mode, the span range is 10 Hz to f_{max} . For SEM and Spurious Emission measurements, the minimum span 20 Hz.

*RST: fmax

Example: FREQ:STOP 2000 MHz

Mode: A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

[SENSe:]FREQUENCY:TRACk <State>

Switches the automatic frequency control on and off.

Parameters:

<State> ON | OFF
 *RST: ON

Example:

SENS:FREQ:TRACK ON
 Sets the automatic frequency control to ON.

Usage:

SCPI conform

Mode:

PHN

[SENSe:]FREQuency:VERify[:STATe] <State>

Specifies whether frequency and level verification are to be performed before a phase noise measurement.

This command is synonymous with [\[SENSe:\]POWer:RLEVel:VERify\[:STATe\]](#) on page 83.

Parameters:

<State> ON | OFF
 *RST: ON

Example:

SENS:FREQ:VER ON
 Specifies that frequency and level verification is to be performed

Usage:

SCPI conform

Mode:

PHN

[SENSe:]FREQuency:VERify:TOLerance <FreqTolerance>

Specifies the absolute frequency tolerance for the verification of the signal. If the signal frequency varies from the specified center frequency by a value greater than the tolerance then the verification fails.

The setting for this parameter only has an effect if the [\[SENSe:\]FREQuency:VERify\[:STATe\]](#) on page 81 or [\[SENSe:\]POWer:RLEVel:VERify\[:STATe\]](#) on page 83 command is set to ON.

The tolerance used during the measurement is the highest of the absolute and the relative tolerance values.

Parameters:

<FreqTolerance> <numeric value>
 *RST: 1 PCT

Example:

SENS:FREQ:VER:TOL 1KHZ
 Sets the absolute frequency tolerance for the verification measurement to 1 kHz

Usage: SCPI conform
Mode: PHN

[SENSe:]FREQuency:VERify:TOLerance:RELative <FreqTolerance>

Specifies the relative frequency tolerance for the verification of the signal. If the signal frequency varies from the specified center frequency by a value greater than the tolerance then the verification fails.

The setting for this parameter only has an effect if the [\[SENSe:\]FREQuency:VERify\[:STATe\]](#) on page 81 or [\[SENSe:\]POWer:RLEVel:VERify\[:STATe\]](#) on page 83 command is set to ON.

The tolerance used during the measurement is the highest of the absolute and the relative tolerance values.

Parameters:

<FreqTolerance> <numeric value> from 0 to 100

*RST: 1 PCT

Example:

SENS:FREQ:VER:TOL:REL 10

Sets the relative frequency tolerance for the verification measurement to 10 %

Usage: SCPI conform
Mode: PHN

[SENSe:]LIST:RANGe<range>:BANDwidth[:RESolution] <Value>

This command sets the RBW value for the specified range.

Suffix:

<range> 1...20
 range

Parameters:

<Value> Refer to the data sheet.

*RST: depends on sub-band

Example:

LIST:RANG2:BAND:RES 5000

Sets the RBW for range 2 to 5 kHz.

Mode: PHN

[SENSe:]LIST:RANGe<range>:FILTer:TYPE <Type>

This command sets the filter type for the specified range (sub-band).

Suffix:

<range> 1...20
 range (sub-band)

Parameters:

<Type>

NORMAL

Gaussian filters

FFT

FFT filter

***RST:** NORM

The available bandwidths of the filters are specified in the data sheet.

Example:

LIST:RANG1:FILT:TYPE FFT

Sets the FFT filter type for range 1.

Mode:

PHN

[SENSe:]LIST:RANGe<1..20>:SWEep:COUNT <Value>

Selects the sweep count for the specified sub-band:

Parameters:

<Value>

<numeric value>

***RST:** sub-band dependent**Example:**

SENS:LIST:RANG2:SWE:COUN 1

Sets the sweep count to 1

Usage:

SCPI conform

Mode:

PHN

[SENSe:]POWER:RLEVel <Power>

This command specifies the expected power.

Parameters:

<Power>

numeric value in dB

Range: -100 to 30

***RST:** 10 dB**Example:**

SENS:POW:RLEV 0 DB

Sets the expected power level to 0 dB.

Usage:

SCPI conform

Mode:

PHN

[SENSe:]POWER:RLEVel:VERify[:STATe] <State>

Specifies whether frequency and level verification are to be performed before a phase noise measurement.

This command is synonymous with `[SENSe:]FREQuency:VERify[:STATe]` on page 81.

Parameters:

<State> ON | OFF
 *RST: ON

Example:

`SENS:POW:RLEV:VER 1`
 Specifies that frequency and level verification is to be performed

Usage: SCPI conform

Mode: PHN

[SENSe:]POWer:RLEVel:VERify:TOLerance <PowerTolerance>

Specifies the power tolerance for the verification of the signal. If the signal level varies from the specified level by a value greater than the tolerance then the verification fails.

The setting for this parameter only has an effect if the `[SENSe:]FREQuency:VERify[:STATe]` on page 81 or `[SENSe:]POWer:RLEVel:VERify[:STATe]` on page 83 command is set to ON.

Parameters:

<PowerTolerance> <numeric value>
 *RST: 10 dB

Example:

`SENS:POW:RLEV:TOLerance 5DB`
 Sets the level tolerance for the verification measurement to 1 dB

Usage: SCPI conform

Mode: PHN

[SENSe:]POWer:TRACk <State>

Switches the automatic level control on and off.

Parameters:

<State> ON | OFF
 *RST: ON

Example:

`SENS:POW:TRACk ON`
 Sets the automatic level control to ON.

Usage: SCPI conform

Mode: PHN

[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:FORWARD <State>

Specifies the sweep direction. When switched on the sweep direction is from the start frequency to the stop frequency. When switched off the sweep direction is reversed

Parameters:

<State> ON | OFF
 *RST: OFF

Example:

```
SENS:SWEep:FORWARD 1
The sweep direction is set to sweep from start to stop frequency
```

Usage: SCPI conform

Mode: PHN

[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

4.2.14 STATus Subsystem

The STATus subsystem contains the commands for the status reporting registers specific to R&S FSV-K40 (see [chapter 4.2.15, "Status Reporting System"](#), on page 90). *RST does not influence the status registers.

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STATus:QUEStionable:CONDition

This command queries the CONDition section of the "STATus:QUEStionable" register. This section contains the sum bit of the next lower register. This register part can only be read, but not written into or cleared. Readout does not delete the contents of the CONDition section.

Example: STAT:QUES:COND?

Mode: all

STATus:QUEStionable[:EVENT]?

This command queries the contents of the EVENT section of the STATus:QUEStionable register. The EVENT part indicates whether an event has occurred since the last reading, it is the "memory" of the condition part. It only indicates events passed on by the transition filters. It is permanently updated by the instrument. This part can only be read by the user. Reading the register clears it.

Example: STAT:QUES?

Usage: Query only

Mode: all

STATus:QUEStionable:PNOise:CONDition?

Queries the contents of the CONDition section of the STATus:QUEStionable:PNOise register. Readout does not delete the contents of the CONDition section.

Example: STAT:QUES:PNOI:COND?

Usage: Query only
SCPI conform

Mode: PHN

STATus:QUEStionable:PNOise:ENABLE <BitDefinition>

Sets the bits of the ENABLE section of the [STATus:QUEStionable:PNOise\[:EVENT\]](#) on page 88. The ENABLE register selectively enables the individual events of the associated EVENT section for the summary bit.

Parameters:
<BitDefinition>

Range: 0 to 65535
*RST: 65535

Example: STAT:QUES:PNOI:ENAB 65535
All events bits are represented in the PNOise summary bit.

Mode: PHN

STATus:QUESTionable:PNOise:PTRansition <BitDefinition>

Determines what bits in the `STATus:QUESTionable:PNOise` Condition register sets the corresponding bit in the `STATus:QUESTionable:PNOise` Event register when that bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that are to be enabled.

Parameters:
<BitDefinition>

Range: 0 to 65535
*RST: 65535

Example: `STAT:QUES:PNOi:PTR 65535`
All condition bits are summarised in the Event register when a positive transition occurs.

Mode: PHN

STATus:QUESTionable:PNOise:NTRansition <BitDefinition>

Determines which bits in the `STATus:QUESTionable:PNOise` Condition sets the corresponding bit in the `STATus:QUESTionable:PNOise` Event register when that bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that are to be enabled.

Parameters:
<BitDefinition>

Range: 0 to 65535
*RST: 0

Example: `STAT:QUES:PNOi:NTR 65535`
All condition bits are summarised in the Event register when a positive transition occurs.

Mode: PHN

STATus:QUESTionable:PNOise[:EVENT]?

This command queries the contents of the `EVENT` section of the `STATus:QUESTionable:PNOise` register. Readout deletes the contents of the `EVENT` section. Which events can occur is described in [chapter 4.2.15, "Status Reporting System"](#), on page 90.

Usage: Query only

Mode: PHN

STATus:QUESTionable:LIMit[:EVENT]

STATus:QUEStionable:POWer[:EVENT]?

The EVENT part indicates whether an event has occurred since the last reading. It only indicates events passed on by the transition filters. It is permanently updated by the instrument. This part can only be read by the user. Reading the register clears it.

Possible events are described in:

[chapter 4.2.15.3, "STATus:QUEStionable:LIMit Register"](#), on page 93

[chapter 4.2.15.5, "STATus:QUEStionable:POWer Register"](#), on page 94

Usage: Query only
SCPI conform

Mode: OFDMA/WiBro

STATus:QUEStionable:LIMit:CONDition
STATus:QUEStionable:POWer:CONDition?

Contains the current status of the instrument. This register part can only be read, but not written into or cleared. Readout does not delete the contents of the CONDition section.

Usage: Query only
SCPI conform

Mode: OFDMA/WiBro

STATus:QUEStionable:LIMit:ENABLE
STATus:QUEStionable:POWer:ENABLE? <Filter>

Determines whether the EVENT bit of the associated status register contributes to the sum bit of the STATus:QUEStionable register. Each bit of the EVENT part is "ANDed" with the associated ENABLE bit. The results of all logical operations of this part are passed on to the event sum bit via an "OR" function.

Parameters:
<Filter> The sum of the decimal values of the event bits that are to be enabled for the summmary bit.
Range: 0 to 65535

Usage: Query only
SCPI conform

Mode: OFDMA/WiBro

STATus:QUEStionable:LIMit:NTRansition
STATus:QUEStionable:POWer:NTRansition? <Mode>

This bit acts as a transition filter. When a bit of the CONDition part of the associated status register for the result type is changed from 1 to 0, the NTR bit decides whether the EVENT bit is set to 1.

Usage: Query only
SCPI conform

Mode: OFDMA/WiBro

STATus:QUESTionable:LIMit:PTRansition
STATus:QUESTionable:POWer:PTRansition?

This bit acts as a transition filter. When a bit of the `CONDition` part of the associated status register for the result type is changed from 0 to 1, the `PTR` bit decides whether the `EVENT` bit is set to 1.

Parameters:

`<Filter>` The sum of the decimal values of the event bits that are to be enabled.
Range: 0 to 65535

Example: `STAT:QUES:LIM:PTR 65535`
All condition bits will be summarized in the Event register when a positive transition occurs.

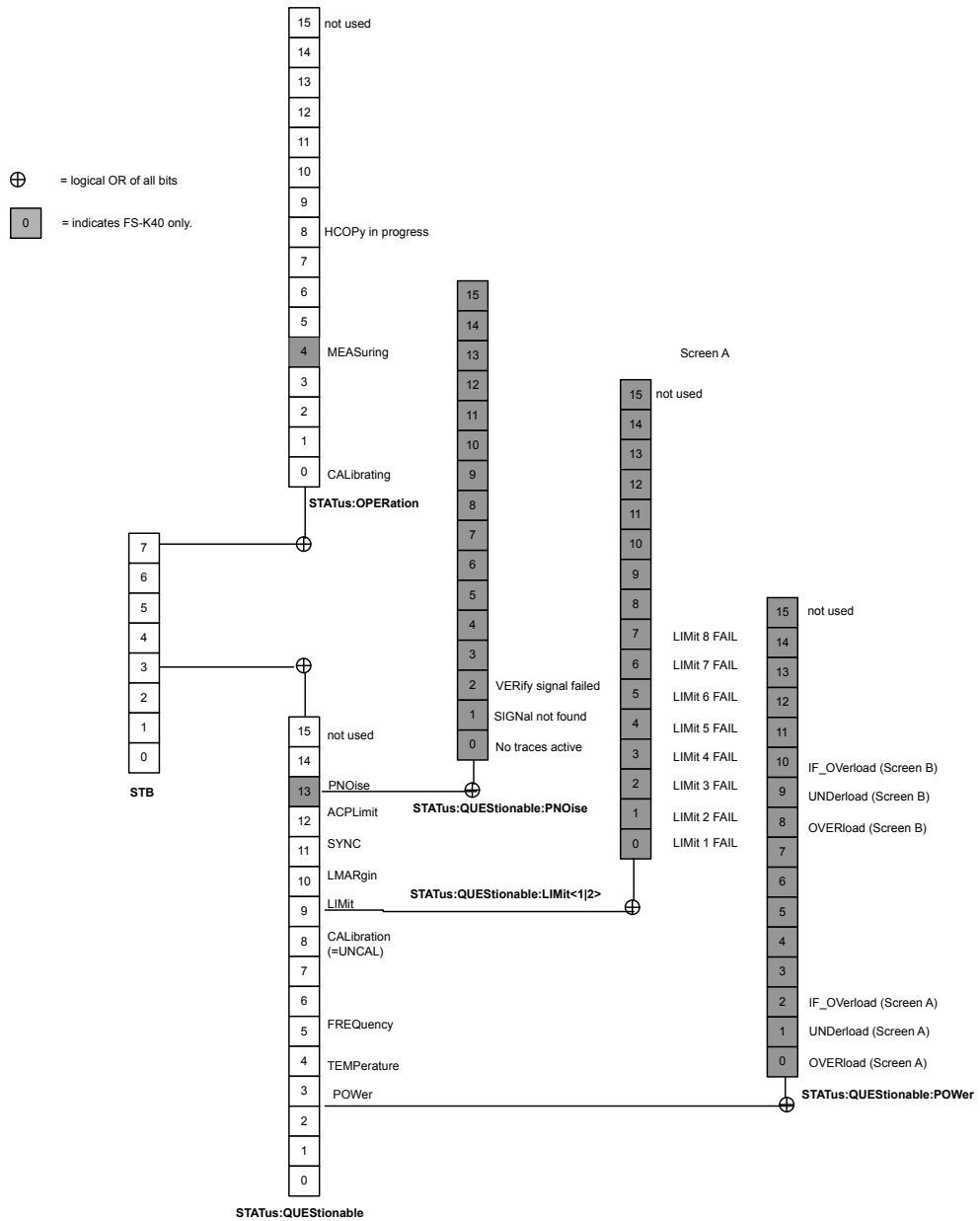
Usage: Query only
SCPI conform

Mode: OFDMA/WiBro

4.2.15 Status Reporting System

In addition to the registers provided by the base system, the following registers are used or modified in the Phase Noise Measurements option (R&S FSV-K40):

- `STATus:OPERation`
Although this register is provided by the base system, the Noise Figure Measurements option makes use of bits not used within the base system.
- `STATus:QUESTionable`
Although this register is provided by the base system, the Noise Figure Measurements option makes use of bits not used within the base system.
- `STATus:QUESTionable:LIMit`
- `STATus:QUESTionable:PNOise`
- This register is provided by the R&S FSV-K40 option.
- `STATus:QUESTionable:POWer`
Although this register is provided by the base system, the Noise Figure Measurements option makes use of bits not used within the base system.



4.2.15.1 STATUS:OPERation Register

This register contains information on which actions the instrument is executing or which actions the instrument has executed since the last reading. It can be read using the commands `STATUS:OPERation:CONDition` or `STATUS:OPERation:EVENT`.

Table 4-3: Meaning of the bits used in the STATUS:OPERation register

Bit No.	Meaning
0	CALibrating This bit is set as long as the instrument is performing a calibration.
1 - 3	Not used

Bit No.	Meaning
4	MEASuring This bit is set when a measurement is in progress (R&S FSV-K40 specific)
5 - 7	Not used
8	HardCOpy in progress This bit is set while the instrument is printing a hardcopy.
9 - 14	Not used
15	This bit is always 0.

4.2.15.2 STATus:QUEStionable Register

This register contains information about indefinite states which may occur if the unit is operated without meeting the specifications. It can be read using the commands `STATus:QUEStionable:CONDition` or `STATus:QUEStionable[:EVENT]`.

Table 4-4: Meaning of the bits used in the STATus:QUEStionable register

Bit No	Meaning
0 to 2	These bits are not used
3	POWer This bit is set if a questionable power occurs, see chapter 4.2.15.5, "STATus:QUEStionable:POWer Register" , on page 94
4	TEMPerature This bit is set if a questionable temperature occurs.
5	FREQuency The bit is set if a frequency is questionable
6 to 7	These bits are not used
8	CALibration The bit is set if a measurement is performed uncalibrated (= label "UNCAL")
9	LIMit (device-specific) This bit is set if a limit value is violated (for the Spectrum Mask measurement only), see chapter 4.2.15.3, "STATus:QUEStionable:LIMit Register" , on page 93
10	LMARgin (device-specific) These bits are not used within R&S FSV-K40
11	SYNC (device-dependent) These bits are not used within R&S FSV-K40
12	ACPLimit These bits are not used within R&S FSV-K40
13 to 14	PNOise This bit is set if a phase noise error occurs, see chapter 4.2.15.4, "STATus:QUEStionable:PNOise Register" , on page 93

Bit No	Meaning
14	Not used
15	This bit is always 0

4.2.15.3 STATUS:QUESTIONABLE:LIMit Register

This register contains information about the observance of limit lines. It can be read using the commands `STATUS:QUESTIONABLE:LIMit:CONDition?` and `STATUS:QUESTIONABLE:LIMit[:EVENT]?`.

Note that no limit lines are displayed in screen B and as such all bits in the LIMit2 register will always be set to 0.

Table 4-5: Meaning of the bits used in the STATUS:QUESTIONABLE:LIMit register

Bit No	Meaning
0 to 1	These bits are not used
2	LIMit FAIL This bit is set if the ETSI Spectrum Mask limit line is violated
3	LIMit FAIL This bit is set if the IEEE Spectrum Mask limit line is violated.
4	LIMit FAIL This bit is set if the Spectrum Flatness (Upper) limit line is violated
5	LIMit FAIL This bit is set if the Spectrum Flatness (Lower) limit line is violated
6	LIMit FAIL This bit is set if the Spectrum Flatness Difference (Upper) limit line is violated
7	LIMit FAIL This bit is set if the Spectrum Flatness Difference (Lower) limit line is violated
8 to 14	These bits are not used
15	This bit is always 0

4.2.15.4 STATUS:QUESTIONABLE:PNOise Register

The bits in the `STATUS:QUESTIONABLE:PNOise` register indicate events that occur during phase noise measurements. To query the status use the commands `STATUS:QUESTIONABLE:PNOise:CONDition` on page 87 or `STATUS:QUESTIONABLE:PNOise[:EVENT]` on page 88.

Bit No	Meaning
0	No traces are active This bit is set when all the traces are switch off.
1	"SIGNal not found" This bit is set if no valid signal is detected
2	"VERify signal failed" This bit is set if verification failed to detect a signal within the supplied tolerances.
3 to 14	These bits are not used
15	This bit is always 0

4.2.15.5 STATus:QUEStionable:POWer Register

This register contains all information about possible overloads of the unit. It can be read using the commands `STATus:QUEStionable:POWer:CONDition?` and `STATus:QUEStionable:POWer[:EVENT]?`.

Table 4-6: Meaning of the bits used in the STATus:QUEStionable:POWer register

Bit No.	Meaning
0	OVERload (Screen A) This bit is set if the RF input is overloaded. "OVLD" is displayed.
1	UNDerload (Screen A) This bit is set if the RF input is underloaded. "UNLD" is displayed.
2	IF_OVerload (Screen A) This bit is set if the IF path is overloaded. "IFOVL" is displayed.
3 to 7	Not used
8	OVERload (Screen B) This bit is set if the RF input is overloaded. "OVLD" is displayed.
9	UNDerload (Screen B) This bit is set if the RF input is underloaded. "UNLD" is displayed.
10	IF_OVerload (Screen B) This bit is set if the IF path is overloaded. "IFOVL" is displayed.
11 - 14	Not used
15	This bit is always 0.

4.2.16 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 4-7](#)

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 4-8](#) 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 4-7: 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 86.

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 4-8: 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)

4.2.17 Other Commands Referenced in this Document

[SENSe:]AVERAge<n>:COUNT.....96

[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

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