R&S®FSH4/FSH8 Handheld Spectrum Analyzer

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Test&Measurement

Product Brochure | 02.00

R&S®FSH4/FSH8 Handheld Spectrum Analyzer

At a glance

The R&S®FSH spectrum analyzer is rugged, handy and designed for use in the field. Its low weight, its simple, well-conceived operation and the large number of measurement functions make it an indispensable tool for anyone who needs an efficient measuring instrument for outdoor work.

Easy-to-replace battery.

The R&S®FSH is a spectrum analyzer and, depending on the model and the options installed, a power meter, a cable and antenna tester and a two-port vector network analyzer. It provides the three most important RF analysis functions that an RF service technician or an installation and maintenance team needs to solve daily routine measurement tasks. For example, it can be used for maintaining or installing transmitter systems, checking cables and antennas, assessing signal quality in broadcasting, radiocommunications and service, measuring electric field strength or in simple lab applications. The R&S®FSH can perform any of these tasks quickly, reliably and with high measurement accuracy.

Weighting only 3 kg, the R&S®FSH is a handy instrument. All frequently used functions have their own function keys and are within reach of your fingertips. The brilliant color display is easy to read even under poor lighting conditions and has a monochrome mode for extreme conditions.

The capacity of the R&S®FSH battery enables you to work without interruptions for up to 4.5 hours. The battery is changed within seconds. And if it rains? No problem – all connectors are splash-proof.

Key facts

- Frequency range from 9 kHz to 3.6 GHz or 8 GHz
- High sensitivity (< –141 dBm (1 Hz), with preamplifier < –161 dBm (1 Hz))
- Low measurement uncertainty (< 1 dB)
- Measurement functions for all important measurement tasks related to the startup and maintenance of transmitter systems
- Internal tracking generator and VSWR bridge with built-in DC voltage supply (bias)
- Two-port network analyzer
- Easy-to-replace Li-ion battery for up to 4.5 h of operation
- Rugged, splash-proof housing for rough work in the field
- Easy handling due to low weight (3 kg with battery) and easy-to-reach function keys
- Saving of measurement results on SD card
- LAN and USB interface for remote control and transfer of measurement data
- R&S®FSH4View software for simple documentation of measurement results

R&S®FSH4/FSH8 Handheld Spectrum Analyzer

Benefits and key features

R&S®FSH with fold-out stand for desktop use.

Installation and maintenance of transmitter stations (base stations)

- Power measurements on pulsed signals
- Channel power measurements
- Analysis of 3GPP WCDMA transmit signals
- Distance-to-fault measurements
- Two-port vector network analysis
- Scalar network analysis
- One-port cable loss measurements
- Vector voltmeter
- Power measurements up to 18 GHz
- Directional power measurements up to 4 GHz

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Measurements of electromagnetic fields

- Field strength measurements with directional antenna
- Field strength measurements with isotropic antenna

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Diagnostic applications in the lab or in service

- General spectrum analysis
- Location of EMC problems

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Documentation and remote control

- R&S®FSH4View software for documenting measurement results
- Remote control via LAN or USB

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Easy operation

- Quick function selection via keypad and rotary knob
- Optimal reading of measurement results in any situation
- Setting of frequency via channel tables
- Easy-to-access, well-protected connectors

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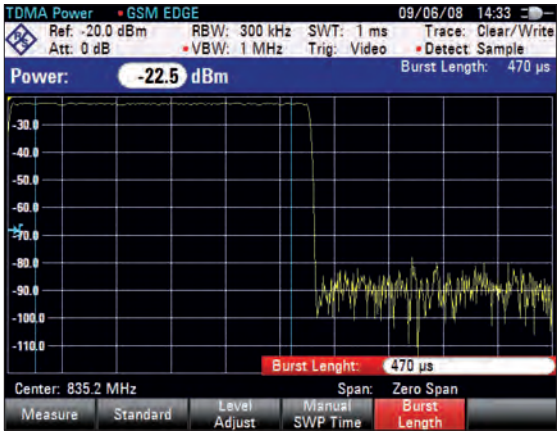
Installation and maintenance of transmitter stations

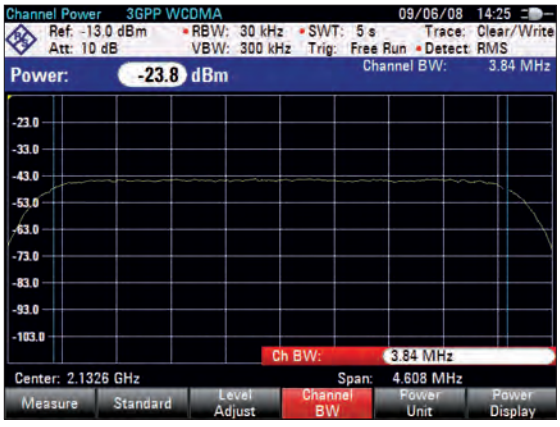
The R&S®FSH is designed for the installation and maintenance of transmitter systems. For this purpose, it provides the following measurement functions:

- Checking of signal quality in the spectral and time domain with channel power measurements and measurements on pulsed signals
- Distance-to-fault measurements on cables and one-port cable loss measurements
- Measuring of antenna match and testing of power amplifiers with vector network analysis
- Determination of transmission power with power sensors

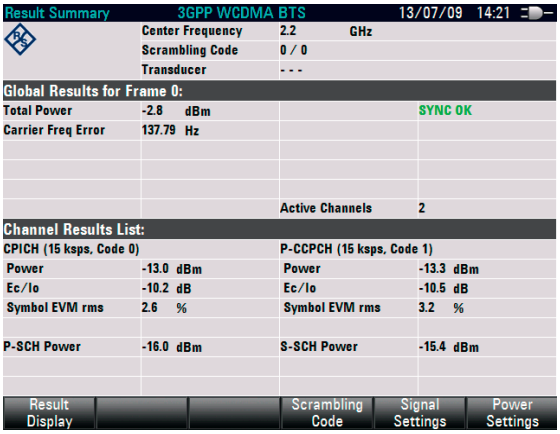
TDMA power measurement.



Channel power measurement.



Analysis of a 3GPP WCDMA transmit signal.



Power measurements on pulsed signals

By means of the TDMA POWER function, the R&S®FSH performs time-domain power measurements within a time division multiple access (TDMA) timeslot. To make work easier for the user, all required instrument settings are already predefined for the GSM and EDGE standards.

Channel power measurements

The R&S®FSH determines the power of a definable transmission channel by means of the channel power measurement function. A channel power measurement for the LTE, 3GPP WCDMA, cdmaOne and CDMA2000®[1] 1x digital mobile radio standards is performed at a keystroke.

Analysis of 3GPP WCDMA BTS transmit signals

When base stations are put into operation or maintained, a quick overview of the modulation characteristics, the power of the code channels and signal quality is necessary.

The R&S®FSH-K44 option demodulates 3GPP WCDMA base station signals and performs a detailed analysis. In addition to the overall power, it measures the power of the most important code channels such as common pilot channel (CPICH), primary common control physical channel (P-CCPCH) as well as primary and secondary synchronization channel (P-SCH and S-SCH). It also displays the carrier frequency offset and the error vector magnitude (EVM) which is used to draw conclusions about signal quality. The ratio of the chip energy (E_c) to the power density of the interference signal (I_0) provides information about the signal-to-noise ratio. The scrambling code can be determined at the press of a button and used automatically for decoding the code channels. To get a quick overview of adjacent base stations, the R&S®FSH provides up to eight scrambling codes with associated CPICH power.

[1] CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA -USA).

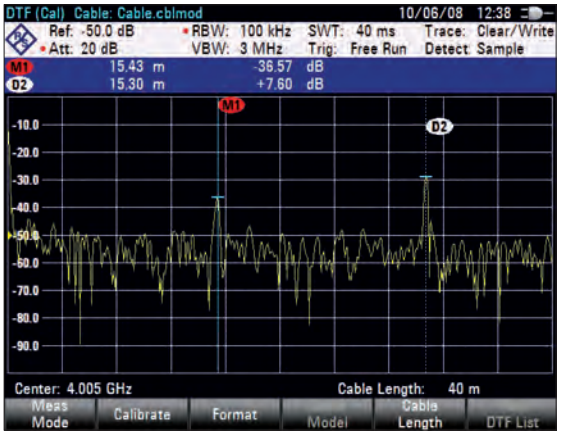
Using the R&S®FSH-K44 option in practice is really easy. Only three operating steps are required to display the measurement results:

- Select the 3GPP WCDMA function
- Set the center frequency
- Start the scrambling code search

Distance-to-fault measurements

The distance-to-fault, caused by a pinched cable or by loose or corroded cable connections, is determined quickly and precisely. The built-in threshold function ensures that only true cable faults, i.e. faults that exceed a tolerance limit, are displayed in a list. This considerably simplifies the evaluation of the measurement.

Distance-to-fault (DTF) measurement.



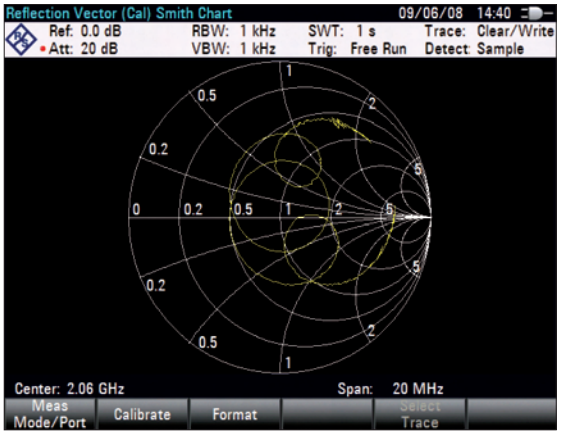
Two-port vector network analysis

The "vector measurements" option transforms the R&S®FSH models with built-in tracking generator and internal VSWR bridge into a two-port vector network analyzer. Matching and transmission characteristics of filters, amplifiers, etc., can be determined quickly and with high accuracy in the forward and reverse direction with only one test setup. The built-in DC bias supplies power to active DUTs such as amplifiers via the RF cable. This function is especially useful for mast-mounted amplifiers of a mobile radio base station.

- Increased measurement accuracy due to vector system error correction
- Measurement of magnitude and phase of S-parameters S_{11}, S_{21}, S_{12} and S_{22}
- Simultaneous display of magnitude and phase in split-screen mode
- Smith chart with zoom function
- Support of all conventional marker formats
- Input of a reference impedance for DUTs with an impedance that is not 50 Ω
- Electrical length measurement
- Determination of group delay

Vector network analysis: display of magnitude and phase.

Vector network analysis: measurement with Smith chart.



Scalar network analysis

If you do not need the advantages of vector network analysis for reflection and transmission measurements, the R&S®FSH models featuring a built-in tracking generator are a more cost-effective solution for determining the transmission characteristics of cables, filters and amplifiers. The R&S®FSH models with a built-in VSWR bridge (models .24 and .28) can, in addition, measure the matching (return loss, reflection coefficient or VSWR), e.g. of an antenna.

One-port cable loss measurements

The R&S®FSH can determine the cable loss of installed cables without much effort. It is sufficient to connect one end of the cable to the R&S®FSH measurement port. The other end of the cable is terminated with a short circuit or left open.

Vector voltmeter

The R&S®FSH-K45 vector voltmeter option displays the magnitude and phase of a DUT on a fixed frequency. Thus, the R&S®FSH (models .24 and .28) can replace a conventional vector voltmeter for many applications. Because the required signal source and bridge are already available in the R&S®FSH, costs are saved and the test setup is significantly simplified, making the R&S®FSH-K45 the right choice for field use. For relative measurements, the measurement results of a reference DUT are stored at the press of a button. Comparison measurements, e.g. between different RF cables and a reference cable (golden device), can be quickly and easily performed.

Typical applications are as follows:

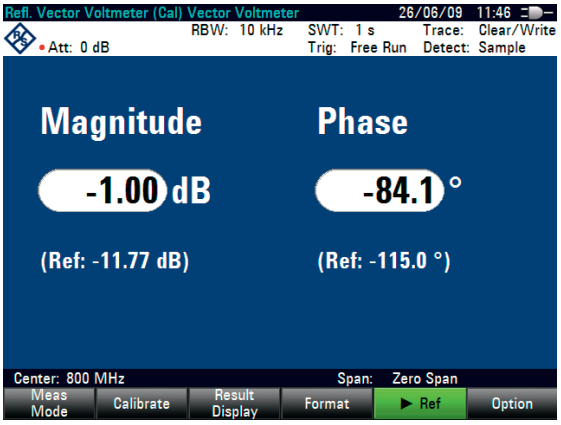
- Adjustment of electrical cable length
- Checking of phase-controlled antennas as used, for example, in air traffic control with instrument landing system (ILS)

Position finding and increase of measurement accuracy using the GPS receiver

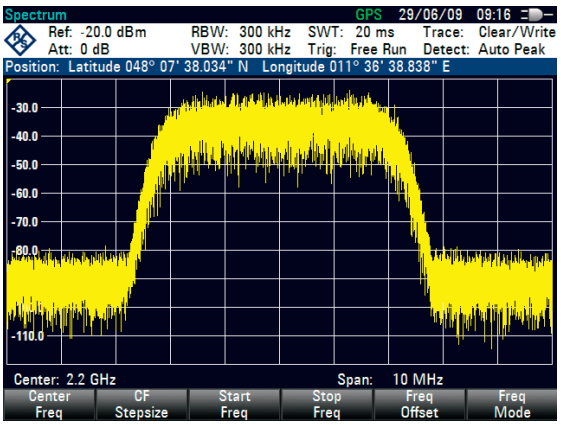
By using the R&S®HA-Z240 GPS receiver, the R&S®FSH documents where a measurement is carried out. The display indicates the longitude and latitude of the site. If required, the position can be stored together with the measurement results. Moreover, the GPS receiver increases the frequency measurement accuracy by synchronizing the internal reference oscillator to the GPS frequency reference. One minute following position finding, the frequency accuracy of the R&S®FSH is 25 ppb (25×10^{-9}). To fasten the GPS receiver on the roof of a car, for example, the GPS receiver is equipped with a magnet and a 5 m cable.

Scalar transmission measurement.

Display of vector voltmeter.



Display of the current location with the R&S®HA-Z240 GPS receiver connected.



Power measurements up to 18 GHz

Equipped with the R&S®FSH-Z1 and R&S®FSH-Z18 power sensors, the R&S®FSH becomes a highly accurate RF power meter up to 8 GHz or 18 GHz with a measurement range from –67 dBm to +23 dBm.

Directional power measurements up to 4 GHz under operating conditions

The R&S®FSH-Z14 and R&S®FSH-Z44 directional power sensors transform the R&S®FSH into a full-featured directional power meter for the frequency ranges from 25 MHz to 1 GHz and from 200 MHz to 4 GHz. The R&S®FSH can then simultaneously measure the output power and the matching of transmitter system antennas under operating conditions. The power sensors measure average power up to 120 W and normally eliminate the need for any extra attenuators. They are compatible with the common GSM/EDGE, 3GPP WCDMA, cdmaOne, CDMA2000® 1x, DVB-T and DAB standards. In addition, the peak envelope power (PEP) up to max. 300 W can be determined.

R&S®FSH and R&S®FSH-Z1 terminating power sensor.

R&S®FSH and R&S®FSH-Z44 directional power sensor.

Measurements of electromagnetic fields

The effects of electromagnetic fields (EMF) caused by transmitter systems can be reliably determined by the R&S®FSH. Due to its large frequency range of up to 8 GHz, the R&S®FSH covers all common wireless communications services, including mobile radio (GSM, CDMA, WCDMA, LTE), DECT, Bluetooth® [2], WLAN (IEEE 802.11a, b, g, n), WiMAX™ [3], broadcasting and television.

[2] The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Rohde&Schwarz is under license.

[3] "WiMAX Forum" is a registered trademark of the WiMAX Forum. "WiMAX," the WiMAX Forum logo, "WiMAX Forum Certified," and the WiMAX Forum Certified logo are trademarks of the WiMAX Forum.

- Determination of maximum field strength using directional antennas
- Direction-independent field strength measurements using an isotropic antenna
- Determination of electric field strength in a transmission channel with defined bandwidth (channel power measurement)

Field strength measurements with directional antenna

When measuring electric field strength, the R&S®FSH takes into account the specific antenna factors of the connected antenna. The field strength is displayed directly in dBµV/m. If W/m² is selected, the power flux density is calculated and displayed. In addition, frequency-dependent loss or gain, e.g. of a cable or amplifier, can be corrected. For simple result analysis, the R&S®FSH provides two user-definable limit lines with automatic limit monitoring.

Field strength measurements with isotropic antenna

Equipped with the R&S®TS-EMF isotropic antenna, the R&S®FSH can determine the direction-independent resultant field strength in the frequency range from 30 MHz to 3 GHz. The antenna includes three orthogonally arranged antenna elements for measuring the resultant field strength. The R&S®FSH sequentially activates the three antenna elements and calculates the resultant field strength, taking into account the antenna factors for each individual antenna element as well as the cable loss of the connection cable.

R&S®FSH with R&S®TS-EMF isotropic antenna.

R&S®FSH with R&S®HE300 antenna.

Diagnostic applications in the lab or in service

The fold-out stand turns the R&S®FSH into a desktop analyzer for work in the lab or in service.

The R&S®FSH is suitable, for example, for the following applications:

- Frequency and level measurements
- Power measurements up to 18 GHz with the accuracy of a power meter
- Measurements on amplifiers, filters, etc., using vector network analysis
- Automated creation of test sequences by remote control via LAN or USB

Location of EMC problems

The R&S®HZ-15 near-field probes are used as diagnostic tools for locating EMC problems, e.g. on circuit boards, integrated circuits, cables and shieldings. The R&S®HZ-15 near-field probe set is adequate for emission measurements from 30 MHz to 3 GHz. The R&S®HZ-16 preamplifier improves measurement sensitivity up to 3 GHz, with approx. 20 dB gain and a noise figure of 4.5 dB. In combination with the R&S®FSH, the preamplifier and near-field probe set are a cost-effective means of analyzing and locating disturbance sources during development.

R&S®FSH with near-field probes and DUT.

R&S®FSH with laptop.

Documentation and remote control

The supplied software is easy to operate. It allows you to document measurement results and helps you administer instrument settings.

R&S®FSH4View software for documenting measurement results

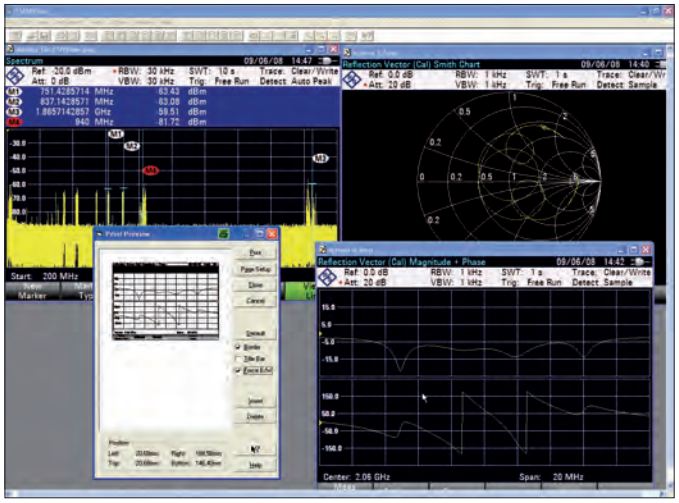
- Fast data exchange via a USB or LAN connection between the R&S®FSH and a PC
- Easy further processing of measurement results by means of data export in ASCII or MS Excel format
- Storage of graphics data in .bmp, .pcx, .png and .wmf format
- Printout of all relevant data via Windows PC
- Remote signal monitoring via LAN by means of permanent and continuous transfer of sweeps
- Simple comparison of measurement results
- Automatic storage of measurement results at selectable intervals
- Subsequent analysis of measurement results by displaying/hiding and shifting markers
- Subsequent display of limit lines
- Generation of cable data using an integrated cable editor and downloading to the R&S®FSH for the distance-to-fault measurement
- Editor for generating limit lines, antenna factors and transducer factors for external attenuators or amplifiers as well as channel lists
- Compatible with Windows XP and Vista (32 bit version for each)

Remote control via LAN or USB

The R&S®FSH can be remote-controlled via the USB or LAN interface and integrated into user-specific programs.

The SCPI-compatible remote-control commands are activated by the R&S®FSH-K40 option.

R&S®FSH4View software.

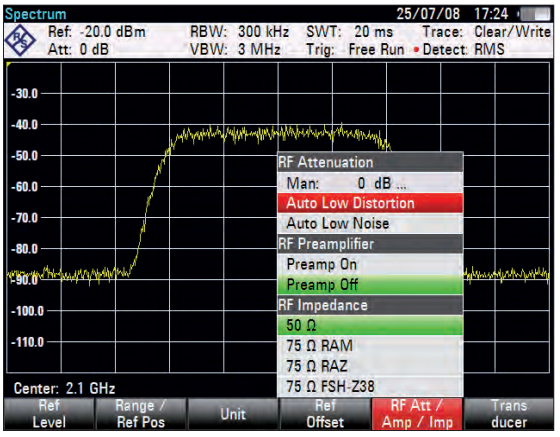


Easy operation

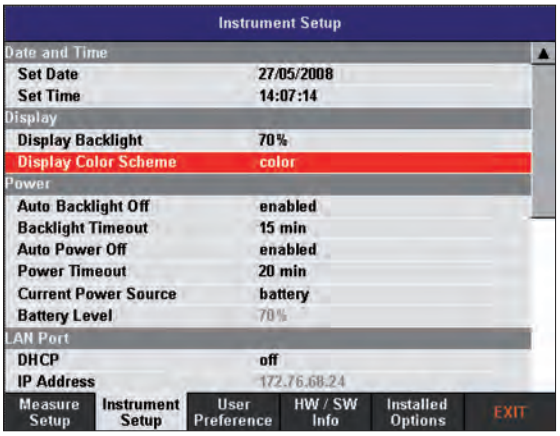
All frequently used functions such as reference level, bandwidths and frequency can be set directly via keys.

Selecting the channel table.

Straightforward menus for easy selection of functions.



Easy configuration of instrument setup.



Quick function selection via keypad and rotary knob

The R&S®FSH is operated via the keypad and rotary knob. The selected function can be activated directly using the Enter button that is integrated in the rotary knob. Due to the vertical design, you can easily reach all operating elements with your fingers. You can switch between different operating modes (e.g. "spectrum analyzer", "vector network analyzer", "power meter") using the MODE key.

All basic settings can be conveniently set in a straightforward list. Measurement results including instrument settings are saved to the internal memory or the replaceable SD memory card. Predefined instrument settings can be locked to prevent them from being changed unintentionally. This reduces the danger of incorrect measurements.

Frequently required measurements can be summarized in a single menu using the USER key. User-defined instrument setups are then assigned to the softkeys under an individually selectable name.

For documentation purposes, the contents of a screenshot can be saved as a graphics file.

Optimal reading of measurement results in any situation

The measurement results on the bright, 6.5" VGA color display are easy to read. The backlighting of the display can be adjusted to the ambient lighting conditions. For use in extremely strong sunlight, a special monochrome mode provides optimal contrast.

Setting of frequency via channel tables

As an alternative to entering a frequency, you can tune the R&S®FSH by means of channel numbers. The channel number is displayed instead of the center frequency. Users who are familiar with channel assignments from common TV or mobile radio applications can operate the R&S®FSH even more easily. TV channel tables for a large number of countries are supplied with the R&S®FSH.

Additional connectors (e.g. for LAN and USB) are protected by caps.

Operation in national language

The user interface of the R&S®FSH is available in various national languages. Almost all of the softkeys, operating instructions and messages can be displayed in the selected national language. The R&S®FSH supports the following languages: English, Korean, Japanese, Chinese, Russian, Italian, Spanish, Portuguese, French, Hungarian and German.

Easy-to-access, well-protected connectors

Additional inputs/outputs such as the DC voltage supply (bias), interfaces and the SD card are easily accessible under dust-proof caps on the side of the instrument.

Front view

System configuration

Options and applications

Altogether six R&S®FSH models for different applications and frequency ranges are available. The R&S®FSH4 and R&S®FSH8 can perform measurements up to an upper frequency limit of 3.6 GHz and 8 GHz, respectively. Models featuring a built-in tracking generator can also be used to determine the transmission characteristics of cables, filters, amplifiers, etc.

Additional models with built-in tracking generator and internal VSWR bridge are available for distance-to-fault (DTF) measurements, matching measurements and vector network analysis. All models have an adjustable preamplifier, making them suitable for measuring very small signals. Two power sensors are available as accessories – for precise terminating power measurements up to 18 GHz and for directional power measurements up to 4 GHz. The following tables show possible configurations for different standard functions and applications as well as an overview of available models.

Standard functions

Application R&S®FSH4/8 model	TDMA power measurements	Channel power measurements	Field strength measurements/ measurements with isotropic antenna	Occupied bandwidth measurements	Frequency settings via channel table	Scalar transmission measurements	Scalar reflection measurements
.04/.08	●	●	●	●	●	–	–
.14/.18	●	●	●	●	●	●	–
.24/.28	●	●	●	●	●	●	●

Options

Application R&S®FSH4/8 model	Analysis of 3GPP WCDMA transmit signals	Distance-to-fault (DTF) measurements	Vector reflection and transmission measurements	One-port cable loss measurements	Vector voltmeter	Power measurements up to 8 GHz/18 GHz	Directional power measurements up to 1 GHz/4 GHz	Remote control via LAN or USB
.04/.08	R&S®FSH-K44	–	–	–	–	R&S®FSH-Z1/-Z18	R&S®FSH-Z14/-Z44	R&S®FSH-K40
.14/.18	R&S®FSH-K44	–	–	–	–	R&S®FSH-Z1/-Z18	R&S®FSH-Z14/-Z44	R&S®FSH-K40
.24/.28	R&S®FSH-K44	R&S®FSH-K41	R&S®FSH-K42	R&S®FSH-K42	R&S®FSH-K45	R&S®FSH-Z1/-Z18	R&S®FSH-Z14/-Z44	R&S®FSH-K40

Models

R&S®FSH model	Frequency range	Preamplifier	Tracking generator	Built-in VSWR bridge
R&S®FSH4, model .04	9 kHz to 3.6 GHz	●	–	–
R&S®FSH4, model .14	9 kHz to 3.6 GHz	●	●	–
R&S®FSH4, model .24	100 kHz to 3.6 GHz	●	●	●
R&S®FSH8, model .08	9 kHz to 8 GHz	●	–	–
R&S®FSH8, model .18	9 kHz to 8 GHz	●	●	–
R&S®FSH8, model .28	100 kHz to 8 GHz	●	●	●

Specifications in brief

Spectrum analysis			
		R&S®FSH4	**R&S®FSH8**
Frequency range	model .04/.14 or model .08/.18	9 kHz to 3.6 GHz	9 kHz to 8 GHz
	model .24/.28	100 kHz to 3.6 GHz	100 kHz to 8 GHz
Resolution bandwidths		10 Hz to 3 MHz	
Displayed average noise level	without preamplifier, RBW = 1 Hz (normalized)		
	9 kHz to 100 kHz (models .04/.14/.08/.18 only)	< –108 dBm, typ. –118 dBm	< –108 dBm, typ. –118 dBm
	100 kHz to 1 MHz	< –115 dBm, typ. –125 dBm	< –115 dBm, typ. –125 dBm
	1 MHz to 10 MHz	< –136 dBm, typ. –144 dBm	< –136 dBm, typ. –144 dBm
	10 MHz to 2 GHz	< –141 dBm, typ. –146 dBm	< –141 dBm, typ. –146 dBm
	2 GHz to 3.6 GHz	< –138 dBm, typ. –143 dBm	< –138 dBm, typ. –143 dBm
	3.6 GHz to 5 GHz	–	< –142 dBm, typ. –146 dBm
	5 GHz to 6.5 GHz	–	< –140 dBm, typ. –144 dBm
	6.5 GHz to 8 GHz	–	< –136 dBm, typ. –141 dBm
	with preamplifier, RBW = 1 Hz (normalized)		
	100 kHz to 1 MHz	< –133 dBm, typ. –143 dBm	< –133 dBm, typ. –143 dBm
	1 MHz to 10 MHz	< –157 dBm, typ. –161 dBm	< –157 dBm, typ. –161 dBm
	10 MHz to 2 GHz	< –161 dBm, typ. –165 dBm	< –161 dBm, typ. –165 dBm
	2 GHz to 3.6 GHz	< –159 dBm, typ. –163 dBm	< –159 dBm, typ. –163 dBm
	3.6 GHz to 5 GHz	–	< –155 dBm, typ. –159 dBm
	5 GHz to 6.5 GHz	–	< –151 dBm, typ. –155 dBm
	6.5 GHz to 8 GHz	–	< –147 dBm, typ. –150 dBm
Third-order intercept (TOI)	300 MHz to 3.6 GHz	> 10 dBm, typ. +15 dBm	> 10 dBm, typ. +15 dBm
	3.6 GHz to 8 GHz	–	> 3 dBm, typ. +10 dBm
Phase noise	frequency 500 MHz		
	30 kHz carrier offset	< –95 dBc (1 Hz), typ. –105 dBc (1 Hz)	
	100 kHz carrier offset	< –100 dBc (1 Hz), typ. –110 dBc (1 Hz)	
	1 MHz carrier offset	< –120 dBc (1 Hz), typ. –127 dBc (1 Hz)	
Detectors		sample, max/min peak, auto peak, RMS	
Level measurement uncertainty	10 MHz < f ≤ 3.6 GHz	< 1 dB, typ. 0.5 dB	< 1 dB, typ. 0.5 dB
	3.6 MHz < f ≤ 8 GHz	–	< 1.5 dB, typ. 1 dB
Display		6.5" color LCD with VGA resolution	
Battery operating time (without tracking generator)	R&S®HA-Z204, 4.5 Ah	up to 3 h	
	R&S®HA-Z206, 6.75 Ah	up to 4.5 h	
Dimensions (W × H × D)		194 mm × 300 mm × 69 mm (144 mm [1]) 7.6 in × 11.8 in × 2.7 in (5.7 in [1])	
Weight		3 kg (6.6 lb)	

[1] With carrying handle.

Vector network analysis/vector voltmeter (model .24/.28 with R&S®FSH-K42/R&S®FSH-K45 only)			
		R&S®FSH4	**R&S®FSH8**
Frequency range	model .24 or model .28	300 kHz to 3.6 GHz	300 kHz to 8 GHz
Output power (port 1, port 2)		0 dBm to –50 dBm	
Reflection measurement (S_{11}, S_{22})			
Directivity	300 kHz to 3 GHz	nominal > 43 dB	nominal > 43 dB
	3 GHz to 3.6 GHz	nominal > 37 dB	nominal > 37 dB
	3.6 GHz to 6 GHz	–	nominal > 37 dB
	6 GHz to 8 GHz	–	nominal > 31 dB
Display modes	vector reflection and transmission measurement (R&S®FSH-K42)	magnitude, phase, magnitude + phase, Smith diagram, VSWR, reflection coefficient, mp, one-port cable loss, electrical length, group delay	
	vector voltmeter (R&S®FSH-K45)	magnitude + phase, Smith diagram	
Transmission measurements			
Dynamic range (S_{21})	100 kHz to 300 kHz	typ. 70 dB	typ. 70 dB
	300 kHz to 3.6 GHz	> 70 dB, typ. 90 dB	> 70 dB, typ. 90 dB
	3.6 GHz to 6 GHz	–	> 70 dB, typ. 90 dB
	6 GHz to 8 GHz	–	typ. 50 dB
Dynamic range (S_{12})	100 kHz to 300 kHz	typ. 80 dB	typ. 80 dB
	300 kHz to 3.6 GHz	> 80 dB, typ. 100 dB	> 80 dB, typ. 100 dB
	3.6 GHz to 6 GHz	–	> 80 dB, typ. 100 dB
	6 GHz to 8 GHz	–	typ. 60 dB
Display modes	vector reflection and transmission measurement (R&S®FSH-K42)	magnitude (attenuation, gain), phase, magnitude + phase, electrical length, group delay	
	vector voltmeter (R&S®FSH-K45)	magnitude + phase	

Ordering information

Designation	Type	Order No.
Base unit		
Handheld Spectrum Analyzer, 9 kHz to 3.6 GHz, with preamplifier	R&S®FSH4	1309.6000.04
Handheld Spectrum Analyzer, 9 kHz to 3.6 GHz, with preamplifier and tracking generator	R&S®FSH4	1309.6000.14
Handheld Spectrum Analyzer, 100 kHz to 3.6 GHz, with preamplifier, tracking generator and internal VSWR bridge	R&S®FSH4	1309.6000.24
Handheld Spectrum Analyzer, 9 kHz to 8 GHz, with preamplifier	R&S®FSH8	1309.6000.08
Handheld Spectrum Analyzer, 9 kHz to 8 GHz, with preamplifier and tracking generator	R&S®FSH8	1309.6000.18
Handheld Spectrum Analyzer, 100 kHz to 8 GHz, with preamplifier, tracking generator and internal VSWR bridge	R&S®FSH8	1309.6000.28
Accessories supplied		
Li-ion battery pack (4.5 Ah), USB cable, LAN cable, AC power supply, CD-ROM with R&S®FSH4View software and documentation, quick start guide		
Software options (usually firmware)		
Remote Control via LAN or USB	R&S®FSH-K40	1304.5606.02
Distance-to-Fault Measurement (for models .24 and .28 only, requires R&S®FSH-Z320 or R&S®FSH-Z321 and R&S®FSH-Z28 or R&S®FSH-Z29)	R&S®FSH-K41	1304.5612.02
Vector Reflection and Transmission Measurements (for models .24 and .28 only, requires R&S®FSH-Z28 or R&S®FSH-Z29)	R&S®FSH-K42	1304.5629.02
3GPP WCDMA, BTS/NodeB Pilot Channel and EVM Measurement Application	R&S®FSH-K44	1304.5641.02
Vector Voltmeter (for models .24 and .28 only, requires R&S®FSH-Z28 or R&S®FSH-Z29)	R&S®FSH-K45	1304.5658.02
Accessories		
Power Sensor, 10 MHz to 8 GHz	R&S®FSH-Z1	1155.4505.02
Power Sensor, 10 MHz to 18 GHz	R&S®FSH-Z18	1165.1909.02
Directional Power Sensor, 25 MHz to 1 GHz	R&S®FSH-Z14	1120.6001.02
Directional Power Sensor, 200 MHz to 4 GHz	R&S®FSH-Z44	1165.2305.02
RF Cable (length 1 m), N male/N female connectors for R&S®FSH-K41 option, DC to 8 GHz	R&S®FSH-Z320	1309.6600.00
RF Cable (length 3 m), N male/N female connectors for R&S®FSH-K41 option, DC to 8 GHz	R&S®FSH-Z321	1309.6617.00
Combined Open/Short/50 Ω Load Calibration Standard, for calibrating the VSWR and DTF measurement, DC to 3.6 GHz	R&S®FSH-Z29	1300.7510.03
Combined Open/Short/50 Ω Load Calibration Standard, for calibrating the VSWR and DTF measurement, DC to 8 GHz	R&S®FSH-Z28	1300.7810.03
Matching Pad, 50 Ω/75 Ω, bidirectional, 0 Hz to 2.7 GHz, N female/N male connectors, load capacity 2 W	R&S®RAZ	0358.5714.02
Matching Pad, 50 Ω/75 Ω, bidirectional, 0 Hz to 2.7 GHz, N female/N male connectors, load capacity 2 W	R&S®RAM	0358.5414.02
Matching Pad, 50 Ω/75 Ω, bidirectional, 0 Hz to 1 GHz, BNC female/N male connectors, load capacity 1 W	R&S®FSH-Z38	1300.7740.02
Li-Ion Battery Pack, 4.5 Ah	R&S®HA-Z204	1309.6130.00
Li-Ion Battery Pack, 6.75 Ah	R&S®HA-Z206	1309.6146.00
Battery Charger for Li-ion battery pack, 4.5 Ah/6.75 Ah [1)]	R&S®HA-Z203	1309.6123.00
12 V Car Adapter	R&S®HA-Z202	1309.6117.00
Soft Carrying Bag W × H × D: 260 mm × 360 mm × 280 mm (10.2 in × 14.2 in × 11.0 in)	R&S®HA-Z220	1309.6175.00
Hard Case	R&S®HA-Z221	1309.6181.00
Carrying Holster, including chest harness and rain cover	R&S®HA-Z222	1309.6198.00

Designation	Type	Order No.
SD Memory Card, 1 Gbyte[2]	R&S®HA-Z231	1309.6217.00
SD Memory Card, 2 Gbyte[2]	R&S®HA-Z232	1309.6223.00
GPS Receiver	R&S®HA-Z240	1309.6700.02
Headphones	R&S®FSH-Z36	1145.5838.02
Active Directional Antenna, 20 MHz to 7.5 GHz	R&S®HE300	4067.5900.02
Loop Antenna for R&S®HE300, 9 kHz to 20 MHz	R&S®HE300-HF	4067.6806.02
Isotropic Antenna, 30 MHz to 3 GHz	R&S®TS-EMF	1158.9295.13
Near-Field Probe Set	R&S®HZ-15	1147.2736.02
Preamplifier for R&S®HZ-15	R&S®HZ-16	1147.2720.02
Spare USB Cable	R&S®HA-Z211	1309.6169.00
Spare LAN Cable	R&S®HA-Z210	1309.6152.00
Spare AC Power Supply	R&S®HA-Z201	1309.6100.00

[1] Battery charger is required to load the battery pack outside the R&S®FSH4/R&S®FSH8.
[2] SD memory card is required for a firmware update.

For data sheet, see PD 5214.0482.22 and www.rohde-schwarz.com

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*0.14 €/min within German wireline network; rates may vary in other networks (wireline and mobile) and countries.