

R&S® FSV Signal and Spectrum Analyzer Signal analysis at its best



75 Years of
Driving
Innovation


ROHDE & SCHWARZ

R&S®FSV Signal and Spectrum Analyzer At a glance

The R&S®FSV is the fastest and most versatile signal and spectrum analyzer available for performance-oriented, cost-conscious users working in the development, production, installation and servicing of RF systems.

In development applications, the R&S®FSV excels due to its outstanding RF properties, a 40 MHz signal analysis bandwidth that is unmatched in its class, and a wide range of analysis packages for analog modulation methods as well as wireless and wideband communications standards.

The R&S®FSV is five times faster than comparable signal and spectrum analyzers and provides measurement routines that are optimized for speed and high data throughput. This is a crucial advantage in production applications.

With its touch screen for easy operation, compact dimensions, low weight and direct support of power sensors, the R&S®FSV is the best possible choice for installation and service work.

Key facts

- Frequency range up to 3.6/7/13.6/30/40 GHz
- 40 MHz analysis bandwidth
- 0.4 dB level measurement uncertainty up to 7 GHz
- Analysis software for GSM/EDGE (including EDGE evo), WCDMA/HSPA+, LTE, WiMAX™, WLAN, analog modulation methods
- Easy on-site upgrading with options
- -110 dBc (1 Hz) phase noise at 10 kHz frequency offset
- +15 dBm third order intercept (TOI)
- Displayed average noise level (DANL) in 1 Hz bandwidth: -155 dBm at 1 GHz, -147 dBm at 30 GHz
- Removable hard drive for applications where security is a concern
- Frequency range up to 110 GHz with R&S®FSV-B21 option built in the R&S®FSV30/40 and the R&S®FS-Z60/-Z75/-Z90/-Z110 harmonics mixers



R&S®FSV Signal and Spectrum Analyzer

Benefits and key features

Ready for today's – and tomorrow's – standards

- ▮ Fully digital back-end ensures high measurement accuracy and excellent repeatability
- ▮ 40 MHz signal analysis bandwidth largest in its class; suitable for all WiMAX™ profiles and WLAN IEEE802.11n
- ▮ Largest I/Q memory depth in its class for recording long signal sequences

▷ [page 4](#)

Low test costs and high throughput for efficient production

- ▮ Up to five times faster than other signal and spectrum analyzers
- ▮ Customized test routines for production applications
- ▮ Efficient remote-control operation

▷ [page 5](#)

Wealth of functions and performance for effective use in labs

- ▮ Outstanding RF performance for a mid-range analyzer
- ▮ Unsurpassed level measurement accuracy up to 7 GHz
- ▮ Power measurement functions for analysis of digital communications systems
- ▮ Versatile marker and trace functions
- ▮ Scalar network analysis: easy measurement of frequency response, bandwidth, gain

▷ [page 6](#)

Easy, intuitive operation

- ▮ Touch screen operation
- ▮ Hotkeys for fast access to all important functions

▷ [page 7](#)

Easy transition to next generation in signal analysis

- ▮ Easy transition due to remote-control compatibility with the R&S®FSP and R&S®FSU
- ▮ Fast learning time due to functional compatibility with existing signal and spectrum analyzers from Rohde&Schwarz

▷ [page 8](#)

Low life-cycle costs

- ▮ Easy on-site upgrading with options
- ▮ Easy scalability to handle application-specific requirements
- ▮ Always up-to-date with free firmware updates

▷ [page 9](#)

Ready for today's and tomorrow's standards

Featuring a signal analysis bandwidth of up to 40 MHz – the largest in its class – the R&S®FSV is a sound investment, ready for the future. The R&S®FSV has what is needed to analyze and demodulate existing and future communications standards.

Fully digital back-end ensures high measurement accuracy and excellent repeatability

- 28 MHz signal analysis bandwidth with base unit (40 MHz optional)
- 16-bit A/D converter with 128 MHz sampling frequency ensures wide dynamic range and excellent display linearity
- 200 Msample signal memory for largest memory depth in its class
- High measurement accuracy and good repeatability with digitally implemented analysis filters

40 MHz signal analysis bandwidth largest in its class; suitable for all WiMAX™ profiles and WLAN IEEE 802.11n

Wireless communications systems are using ever larger RF bandwidths in their quest to boost data rates and transmission capacity. Due to its large analysis bandwidth and wealth of software options, the new R&S®FSV signal and spectrum analyzer is the only instrument in its class that can handle all existing and most forthcoming wireless communications applications.

	28 MHz bandwidth (standard)	40 MHz bandwidth (optional)
LTE	exceeds the channel width of max. 20 MHz of LTE signals	–
WiMAX™	covers the signal bandwidths for all WiMAX™ profiles	covers signal and adjacent channels
WLAN	exceeds the 20 MHz channel width of WLAN IEEE 802.11a/b/g signals	covers WLAN IEEE 802.11n wideband technology
WCDMA	exceeds the 20 MHz bandwidth required for CCDF measurements on four-carrier WCDMA signals	–

Largest I/Q memory depth in its class for recording long signal sequences

The base unit of the R&S®FSV provides an I/Q memory depth of 200 Msample. This ensures data recording over a long time period even when testing systems with high bandwidths and high sample rates. Conventional signal analyzers have an I/Q memory depth of only a few Msample.

The R&S®FSV is ideally suited for performing wideband modulation measurements during the development and production of chipsets and terminal equipment as well as in the development, maintenance and installation of infrastructures.

Low test costs and high throughput for efficient production

The R&S®FSV signal and spectrum analyzer significantly reduces total test costs in a production environment. It performs everything from simple measurements up to complex modulation analysis quickly, reliably and with low measurement uncertainty. Fast access to I/Q data with a wide bandwidth also allows the speedy execution of complex evaluation routines in an external computer as well as use of the R&S®FSV as a fast digitizer with a wide dynamic range. The R&S®FSV signal and spectrum analyzer thus enables fast, flexible and efficient production.

Up to five times faster than other signal and spectrum analyzers

With more than 500 sweeps/s in manual operation and up to 1000 sweeps/s in remote operation, the R&S®FSV is up to five times faster than other signal and spectrum analyzers. This high measurement speed cuts production time especially in cases that require the averaging of a large number of measurements (as specified in many standards).

Customized test routines for production applications

The R&S®FSV also offers a number of functions that speed up test routines by cutting alignment and measurement time, thus increasing the overall throughput:

- Frequency list mode (LIST MODE):
 - fast measurement on up to 300 different frequencies using different analyzer settings with a single remote-control command
- Measurement of different power levels in the time domain in a single sweep for very fast alignment (multisummary marker)
- Fast ACP measurement in the time domain with channel filters or in the frequency domain using FFT sweep
- Frequency counter with 0.1 Hz resolution at a measurement time of < 50 ms
- Fast FFT sweep mode accelerates spurious measurements and spurious searches due to fast sweep times, particularly with narrow resolution bandwidths and simultaneously large spans

Efficient remote-control operation

- GBIT LAN interface for quickly transferring large quantities of data
- Trigger interface for synchronization with the production system in LIST MODE

Measurement speed	
Sweep rate, remote control, 1000 sweep averages	1000/s (1 ms/sweep)
LIST MODE, measurement of the level of the fundamental and five harmonics	21 ms
Marker peak search	1.5 ms
Frequency change and query	15 ms
Sweep rate, manual mode	500/s (2 ms/sweep)
Fastest sweep time (zero span)	1 μ s
Fastest sweep time (frequency sweep)	1 ms

Wealth of functions and performance for effective use in labs

Outstanding RF performance for a mid-range analyzer

- ▮ Displayed average noise level (DANL):
 - 155 dBm (1 Hz) at 1 GHz, –147 dBm (1 Hz) at 30 GHz
- ▮ Very low DANL even at 9 kHz: typ. –140 dBm (1 Hz)
- ▮ Third order intercept (TOI) of 15 dBm, typ. 18 dBm
- ▮ Phase noise at 10 kHz offset from carrier:
 - 106 dBc (1 Hz), typ. –110 dBc (1 Hz)
- ▮ Dynamic range for WCDMA ACLR: 73 dB
- ▮ Resolution bandwidths from 1 Hz to 10 MHz, as well as 20 MHz and 28 MHz in zero span mode (40 MHz optional)

Unsurpassed level measurement accuracy up to 7 GHz

The R&S®FSV is a leader when it comes to level measurement accuracy. Featuring a measurement uncertainty of 0.4 dB up to 7 GHz, the analyzer delivers accurate and dependable measurement results. This means that the R&S®FSV can also measure levels in the 5.8 GHz ISM band and higher satellite bands with outstanding accuracy, eliminating the need for an additional power meter in many cases. When equipped with the R&S®FSV-K9 option, the R&S®FSV also supports the direct connection of power sensors from the R&S®NRP series. This increases the accuracy for power measurements in applications requiring extremely high precision and saves the expense of an additional power meter. The R&S®NRP-Z27/R&S®NRP-Z37 sensors contain an integrated power splitter so that the power sensor and the R&S®FSV signal and spectrum analyzer can measure the same signal in parallel without any switching required.



ACP measurement: a wealth of predefined standards included to simplify making settings.

Power measurement functions for the analysis of digital communications systems

Comprehensive power measurement functions are an absolute must when analyzing digital communications systems:

- ▮ Channel/adjacent channel power measurements
 - Up to 12 user channels and up to 12 adjacent channels
 - Numerous predefined test configurations for transmission standards
- ▮ Occupied bandwidth (OBW)
- ▮ Spectrum emission mask measurement
- ▮ Complementary cumulative distribution function (CCDF)
- ▮ Burst power measurement
- ▮ Spurious emissions
- ▮ C/N and C/N₀
- ▮ Complete selection of detectors: RMS, average, auto peak, pos/neg peak, sample, quasi peak

Versatile marker and trace functions

- ▮ Up to 16 markers
- ▮ Marker measurement functions such as AM modulation factor, TOI, phase noise/noise, frequency counter
- ▮ Up to six simultaneously active traces with any combination of detectors
- ▮ Selectable number of sweep points (up to 32001)
- ▮ Peak list for evaluating up to 100 peaks at the press of a key
- ▮ Limit lines for PASS/FAIL monitoring
- ▮ Transducer factors

Scalar network analysis: easy measurement of frequency response, bandwidth, gain

- ▮ External generator control allowing signal generators to be used as tracking generators to measure cable loss, filters, amplifiers, converters, multipliers
- ▮ Tracking generator up to 7 GHz with settable frequency offset up to 1 GHz to measure cable loss, filters, amplifiers, converters
- ▮ Measured frequency response characteristics can be saved directly as transducer factors and used as correction values for test setups



Measurement of the power of a wideband WLAN signal using the time domain power function.

Easy, intuitive operation

The R&S®FSV is unsurpassed in ease of operation. By offering a touch screen, an on-screen keyboard and hotkeys, the operating concept sets new standards in meeting the expectations placed on a modern-day signal and spectrum analyzer. The ultimate customer benefit is thus fast and straightforward operation.

Touch screen operation

The R&S®FSV enables convenient, intuitive operation with its touch screen. Users can complete their work faster and in fewer steps while enjoying greater convenience. The straightforward menu-driven design also reduces learning time.

Alternatively (depending on user preferences), all functions and measurement parameters can be configured in the conventional manner by using the keys and rotary knob or mouse/keyboard. The large SVGA display ensures high resolution and good readability.

Hotkeys for fast access to all important functions

The clearly labeled keys allow fast access to all main menu items, settings and functions. Parameters such as frequency and resolution bandwidth can be directly set using these keys. Hardkeys are also provided to simplify access to frequently used functions such as PRESET, SAVE/RECALL and Marker Peak.

R&S®FSV controls

Built-in HELP function:

The context-sensitive help provides a detailed explanation of the current function and lists the associated remote-control commands. Even inexperienced users come up to speed quickly, and programming becomes a much easier task

Touch screen with zoom function:

Convenient, intuitive operation with direct entry exactly where needed; the signal section of interest is marked with a rectangle and the marked section is enlarged to full screen size

Automatic parameter settings at the press of a key using the **AUTO SET** function:
automatic adaptation of settings to the individual measurement signal

USB ports:

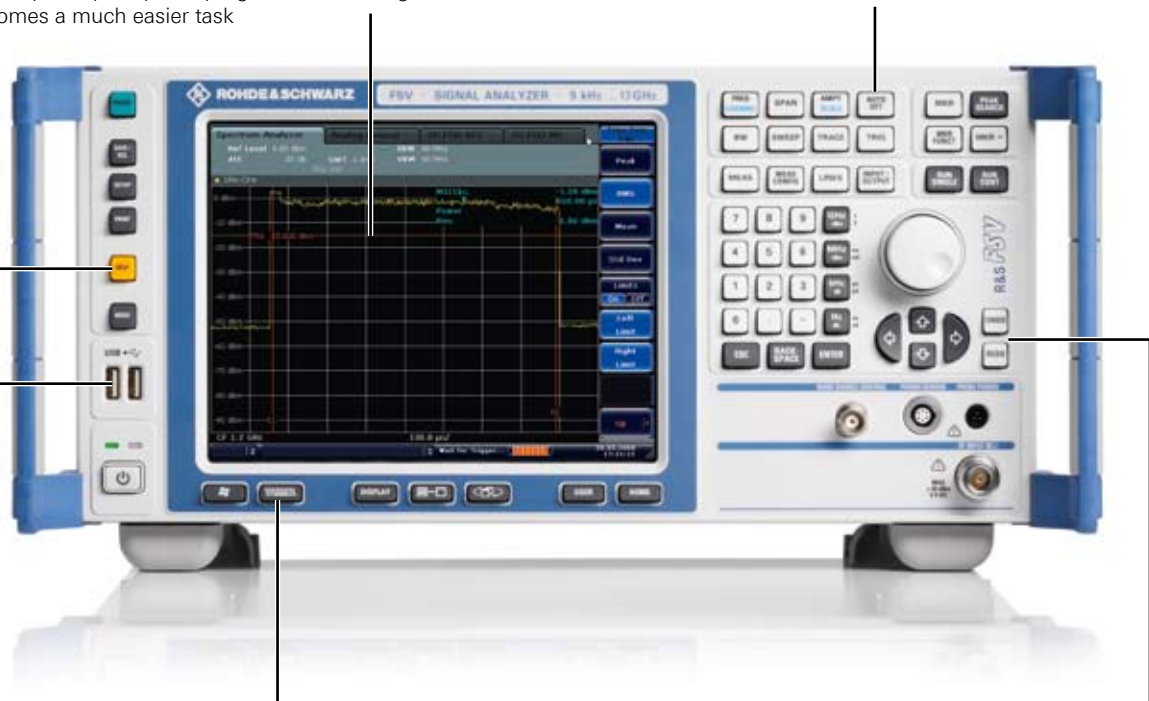
Easy firmware updates at the press of a key via USB, simple documentation of measurement results

On-screen keyboard:

The analyzer's virtual keyboard together with the touch screen make an external keyboard completely unnecessary

UNDO/REDO softkeys:

Up to six prior operating steps can be undone, even beyond a preset. This enables users to correct mistakes or quickly toggle between two different states



Easy transition to the next generation in signal analysis

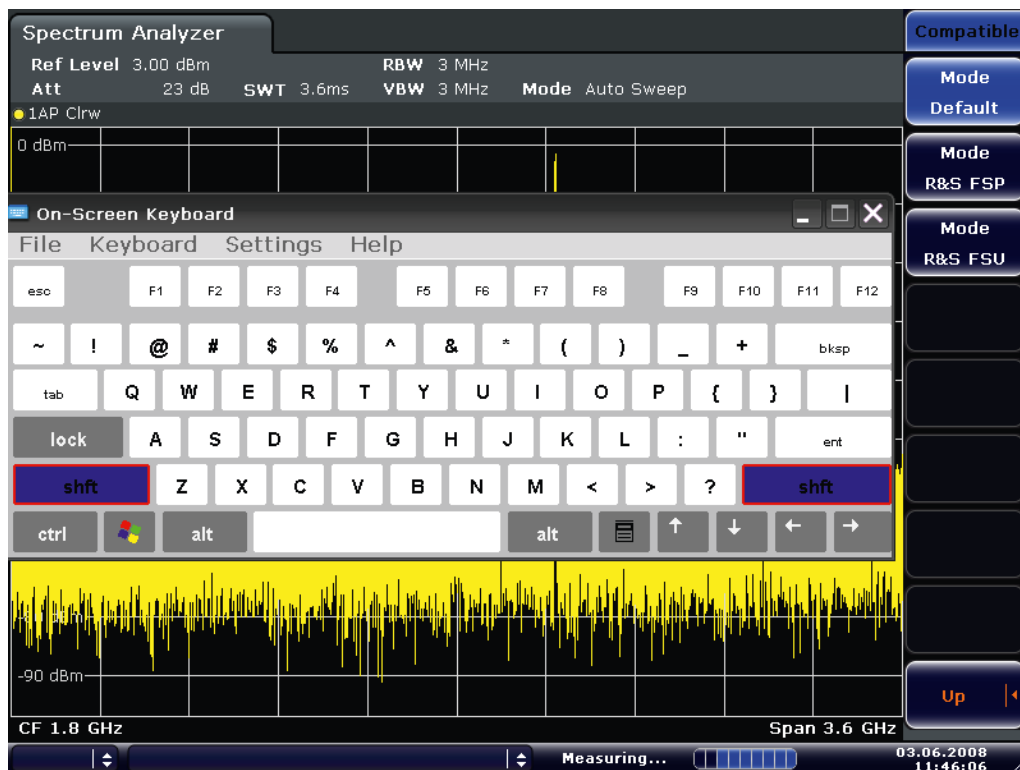
Compatibility with earlier instrument families and the family concept from Rohde & Schwarz greatly simplify the transition to the new generation – no matter whether the issue is remote-control software programs used on a production line, the space required to replace an instrument in a rack, or the manual operation of an instrument in a development lab. The ultimate customer benefit is security of investments in software, system design and training.

Easy transition due to remote-control compatibility with the R&S®FSP and R&S®FSU

The remote-control command set used in the R&S®FSV is compatible with that used in the R&S®FSP and R&S®FSU when operating in the spectrum analysis mode and also in most applications. This allows users to continue using existing remote-control programs without encountering any additional costs as they transition to the new generation in signal analysis. Replacing signal and spectrum analyzers in development and production environments is thus made easier. Introducing new instruments used in manufacturing will increase production throughput due to the increased speed provided by the R&S®FSV and it will boost efficiency and capacity in the simplest manner ever available.

Fast learning time due to functional compatibility with existing signal and spectrum analyzers from Rohde & Schwarz

The family concept from Rohde & Schwarz is also highly beneficial. The same operating concept and the largely identical functions in all analyzers are provided by the new generation as well. The R&S®FSV represents a further development of the existing concept. New features include operation with the touch screen and on-screen keyboard along with new functions such as AUTO SET and UNDO/REDO. Users can learn how to operate the new signal and spectrum analyzers in only a minimum of time.



The special compatibility mode with the R&S®FSP and R&S®FSU makes it easy to continue using existing remote-control programs.

Low life-cycle costs

Easy on-site upgrading with options

The R&S®FSV can meet new requirements in the fastest possible time. The plug&play concept used for upgrading the instrument with options is unique. Users can add almost any option without having to open the instrument.

This concept offers a variety of benefits:

- No additional alignment after installation
- No recalibration
- No need to send the instrument in to a service center (i.e. negligible downtime)
- No installation costs
- Easy expandability for additional tasks

Easy scalability to handle application-specific requirements

The base unit already has all functions expected in a modern-day signal and spectrum analyzer. Using a wide variety of options, it is possible to customize the R&S®FSV to handle diverse applications in accordance with equipment needs and the available budget.

Always up-to-date with free firmware updates

The firmware used in the R&S®FSV can easily be updated with a USB memory stick or via the LAN interface. Firmware updates are free of charge and can be easily downloaded from www.rohde-schwarz.com.

Instrument rear panel with plug-in options

Instrument hard drive:

The hard drive can be easily removed and replaced with a second hard drive (R&S®FSV-B19) if measurement results and instrument settings need to be kept confidential

Additional interfaces:

IF/video output, trigger output, two additional USB ports, AUX port

Ready for future expansion



Applications

Transmitter and modulation measurements in wireless communications systems

R&S®FSV-K7: AM/FM/φM	R&S®FSV-K10: GSM/EDGE/EDGE evo	R&S®FSV-K72/-K73: WCDMA	R&S®FSV-K76/77: TD-SCDMA	R&S®FSV-K8: CDMA2000®
Power Carrier power	Power Power measurement in time domain including carrier power	Power Code domain power Code domain power versus time CCDF	Power Code domain power Code domain power versus time CCDF	Power Carrier power Code domain power Code domain power versus time CCDF
Modulation Modulation factor Frequency deviation Phase deviation Modulation frequency	Modulation quality EVM Phase/frequency error Origin offset suppression	Modulation quality EVM Peak code domain error Constellation diagram Residual code domain error I/Q offset Gain imbalance Center frequency error (chip rate error)	Modulation quality EVM Peak code domain error Constellation diagram Residual code domain error I/Q offset Gain imbalance Center frequency error (chip rate error)	Modulation quality RHO EVM Peak code domain error Constellation diagram Residual code domain error I/Q offset Gain imbalance Center frequency error (chip rate error)
Spectrum measurements RF spectrum and RF power versus time Audio spectrum and time domain	Spectrum measurements Modulation spectrum Transient spectrum Spurious emissions	Spectrum measurements Spectrum mask ACLR Power measurement	Spectrum measurements Spectrum mask ACLR Power measurement	Spectrum measurements Spectrum mask ACLR Power measurement
Miscellaneous Audio filters: 20 Hz/50 Hz/300 Hz HP, 3 kHz/15 kHz/23 kHz/150 kHz LP, deemphasis, ITU-T filter Detectors: +Peak, -Peak, RMS SINAD, THD	Miscellaneous –	Miscellaneous Channel table with summary of channels used on base station Timing offset	Miscellaneous Channel table with summary of channels used on base station Timing offset Power versus Time	Miscellaneous Channel table with summary of channels used on base station Timing offset
Special features Universal wideband AM/FM/φM measurement demodulator, analysis bandwidth up to 40 MHz	Special features Single burst and multiburst	Special features Automatic detection of active channels and decoding of signal information Automatic detection of encryption code Automatic detection of HSDPA modulation format Support for signals with compressed mode Support for HSPA and HSDPA+	Special features Automatic detection of active channels and decoding of signal information Automatic detection of HSDPA modulation format Support for HSPA+ and HSDPA	Special features Automatic detection of active channels and decoding of signal information Robust demodulation for unreliable carrier signals

2:	R&S®FSV-K84: 1xEV-DO	R&S®FSV-K91/-K91n: WLAN IEEE 802.11a/b/g/ j/n	R&S®FSV-K93: WiMAX™ IEEE 802.16e, OFDM and OFDMA	R&S®FSV-K100/-K101/ -K102/-K104/-K105: LTE
Power Power versus time	Power Carrier power Code domain power Code domain power versus time CCDF	Power Power measurement in time and frequency domains Rising/falling edge CCDF	Power Power measurement in time and frequency domains Rising/falling edge CCDF	Power Power measurement in time and frequency domains CCDF
Modulation quality Modulation error Modulation error Main error Error	Modulation quality RHO _{Pilot} RHO _{Data} RHO _{MAC} RHO _{Overall} EVM Peak code domain error Constellation diagram Residual code domain error I/Q offset Gain imbalance Center frequency error (chip rate error)	Modulation quality EVM Constellation diagram I/Q offset Gain imbalance Quadrature error Center frequency error (symbol clock error)	Modulation quality EVM Constellation diagram I/Q offset Gain imbalance Quadrature error Center frequency error (symbol clock error)	Modulation quality EVM Constellation diagram I/Q offset Gain imbalance Quadrature error Center frequency error (symbol clock error)
Measurements	Spectrum measurements Spectrum mask ACLR Power measurement	Spectrum measurements Spectrum mask ACP Spectrum flatness	Spectrum measurements Spectrum mask ACP Spectrum flatness	Spectrum measurements Spectrum flatness
Channel summary of base station	Miscellaneous Channel table with summary of channels used on base station Timing offset	Miscellaneous Bit stream Signal field Averaging over multiple measurements	Miscellaneous Bit stream Signal field Averaging over multiple measurements Burst summary list Graphical display of DL map	Miscellaneous Bit stream Allocation summary list Signal flow diagram Averaging over multiple measurements
Detection of active coding of signal Demodulation algorithms for multiplexing of multicar-	Special features Automatic detection of active channels and decoding of signal information Robust demodulation algorithms for reliable measurement of multicar- rier signals	Special features 40 MHz bandwidth for WLAN IEEE 802.11n	Special features Automatic demodulation in line with DL map User-editable spectrum mask	Special features Automatic detection of modulation, cyclic prefix length and cell ID MIMO measurements

R&S®FSV-K7

AM/FM/φM

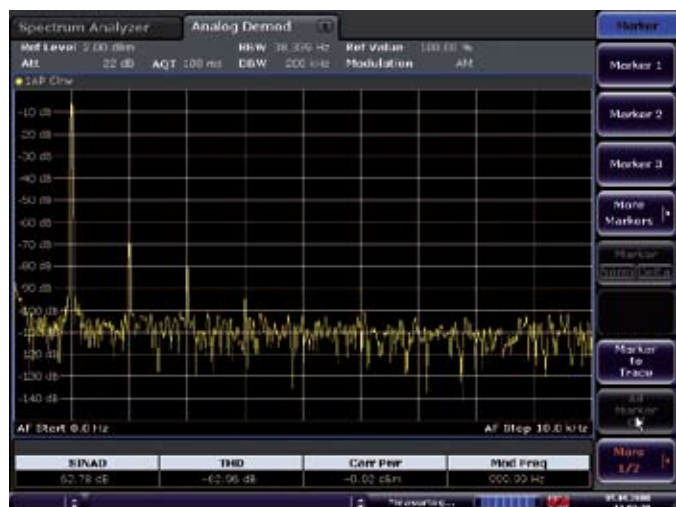
measurement demodulator

The R&S®FSV-K7 AM/FM/φM measurement demodulator option converts the R&S®FSV into an analog modulation analyzer for amplitude-, frequency- or phase-modulated signals. It measures not only characteristics of the useful modulation, but also factors such as residual FM or synchronous modulation.

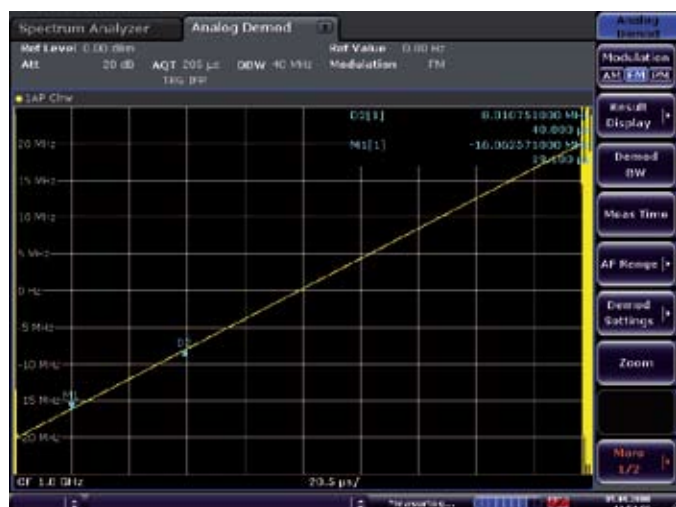
The following display and analysis alternatives are available:

- ▮ Modulation signal versus time
- ▮ Spectrum of the modulation signal (FFT)
- ▮ RF signal power versus time
- ▮ Spectrum of the RF signal (FFT versus max. 18 MHz)
- ▮ Table with numeric display of
 - Deviation or modulation factor, RMS weighted, +Peak, -Peak, ± Peak/2
 - Modulation frequency
 - Carrier frequency offset
 - Carrier power
 - Total harmonic distortion (THD) and SINAD

Condensed data	
Demodulation bandwidth	100 Hz to 28 MHz, 40 MHz optional
Recording time (depends on demodulation bandwidth)	7.5 ms to 3932 s
AF filters	
Highpass filters	20 Hz, 50 Hz, 300 Hz
Lowpass filters	3 kHz, 15 kHz, 23 kHz, 150 kHz and 5%, 10% or 25% of demodulation bandwidth
Deemphasis	25/50/75/750 μs
Modulation frequency	< 14 MHz, > 20 MHz optional, max. 0.5 × demodulation bandwidth
Measurement uncertainty (deviation or modulation factor)	3%



THD measurement on an amplitude-modulated signal. The first harmonic of the modulation signal is well suppressed by 69 dB. This corresponds to a THD (D2) of less than 0.1%.



Measurement of the linearity of an FM ramp versus 40 MHz bandwidth.

R&S®FSV-K7S

FM stereo measurement application

The R&S®FSV-K7S option expands the functionality of the R&S®FSV-K7 option with measurements on FM stereo transmitters.

An integrated stereo decoder measures the frequency deviation of the channels left, right, mono and stereo as well as the pilot and RDS carrier. The variety of analysis capabilities is expanded to include THD measurement, time-domain analysis (oscilloscope mode display) and frequency-domain analysis (AF spectrum) of the corresponding channel. To perform standard-compliant S/N ratio measurements, both the compulsory audio filters and the quasipeak detectors are available. A clear result summary displays the numeric results for all the measurement channels at the same time and thus enables crosstalk attenuation measurements without having to switch between channels. This means that all necessary measurements can be performed on FM stereo transmitters with the R&S®FSV-K7S option.

Comprehensive measurement functions for complete FM stereo analysis

- Frequency deviation measurement in channels MPX, L, R, M, S and frequency deviation measurement of the pilot and RDS carrier
- Carrier power and carrier frequency measurement
- Audio frequency measurement
- Absolute and relative deviation measurement for easy to perform S/N ratio and crosstalk attenuation measurement
- AF spectrum display and per channel
- Up to 4 measurement windows

A variety of audio filters and detectors for standard-compliant measurements

- CCIR filter, weighted and unweighted
- Highpass filters 20 Hz, 50 Hz, 300 Hz and lowpass filters 3 kHz, 15 kHz, 23 kHz and 150 kHz
- Selectable deemphasis 50 μ s, 75 μ s, 750 μ s
- Detectors: \pm peak/2, +peak, -peak, RMS, RMS \times SQR2, quasipeak (in accordance with CCIR 468) and quasipeak \times SQR2

The result summary clearly displays the measurement results of all the channels; further switchover is not required. Additional displays such as the mono signal or the MPX spectrum display support further analysis.



Built-in THD measurement

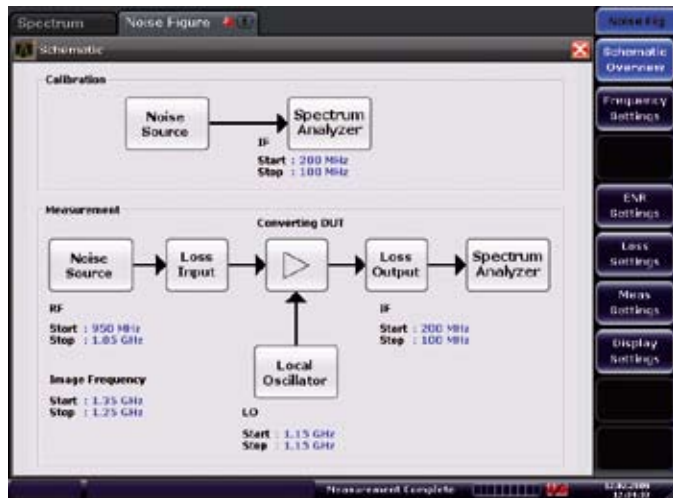
- Automatically tuned to the fundamental
- Simultaneous display of SINAD and THD values
- Selective THD measurement of individual harmonics using marker functions in the AF spectrum display

R&S®FSV-K30

Noise figure and gain measurement application

The R&S®FSV-K30 option expands the R&S®FSV signal and spectrum analyzer by adding measurement functionality otherwise only provided by special noise measurement analyzers.

The schematic view of the test setup simplifies measurements on frequency-converting DUTs.



The following parameters can be measured at a specified frequency or in a selectable frequency range:

- ▮ Noise figure in dB
- ▮ Noise temperature in K
- ▮ Gain in dB

Compared with conventional noise measurement systems, R&S®FSV-K30 has the advantage that a wide variety of further RF measurements can also be performed. The R&S®FSV also allows the measurement of harmonics, intermodulation, spurious responses and many other RF-relevant criteria (for measurements on amplifiers and on frequency-converting DUTs, e.g. low-noise converters).

Noise measurements

- ▮ Measurement range 0 dB to 35 dB
- ▮ Resolution 0.01 dB
- ▮ Device measurement uncertainty 0.05 dB

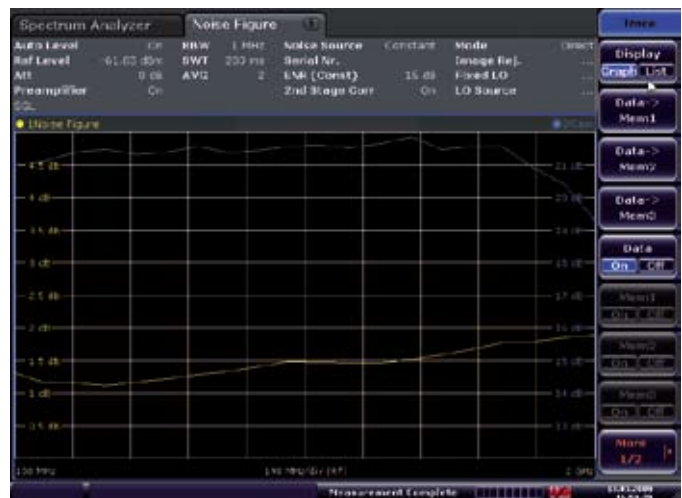
Gain measurements

- ▮ Measurement range -20 dB to +60 dB
- ▮ Resolution 0.01 dB
- ▮ Measurement accuracy ± 0.2 dB

Tabular representation of measurement results.

RF	NF	Noise Temp	Gain
100.00 MHz	1.200 dB	101.200 K	20.865 dB
200.00 MHz	1.199 dB	80.523 K	21.108 dB
300.00 MHz	1.181 dB	87.712 K	21.390 dB
400.00 MHz	1.115 dB	84.219 K	21.475 dB
500.00 MHz	1.163 dB	88.261 K	21.368 dB
600.00 MHz	1.211 dB	83.245 K	21.365 dB
700.00 MHz	1.263 dB	89.261 K	21.557 dB
800.00 MHz	1.332 dB	104.124 K	21.373 dB
900.00 MHz	1.404 dB	110.674 K	21.447 dB
1.000 GHz	1.476 dB	117.334 K	21.579 dB
1.100 GHz	1.483 dB	116.923 K	21.583 dB
1.200 GHz	1.483 dB	115.296 K	21.526 dB
1.300 GHz	1.488 dB	115.710 K	21.636 dB
1.400 GHz	1.524 dB	121.091 K	21.624 dB
1.500 GHz	1.583 dB	127.513 K	21.474 dB
1.600 GHz	1.677 dB	136.629 K	21.580 dB
1.700 GHz	1.768 dB	146.730 K	21.533 dB
1.800 GHz	1.791 dB	148.001 K	20.906 dB

Measurements on an amplifier.



R&S®FSV-K40

Phase noise measurement application

Phase noise is an important parameter in wireless communications systems. The R&S®FSV-K40 option enables the R&S®FSV to perform fast and easy phase noise measurements in development and production.

When equipped with the R&S®FSV-K40 option, the R&S®FSV can measure the single sideband phase noise across a selectable carrier offset frequency range with logarithmic display of the offset range. Based on the measured phase noise, the user can also determine the residual FM/PM and the jitter.

Phase noise measurement at 1 kHz to 100 MHz from the carrier: The dynamic range that is limited by the thermal inherent noise at large carrier offsets can be improved by noise correction. Trace 1 (yellow) shows the noise-corrected measurement while trace 2 (blue) shows the measurement without noise correction.



Phase noise measurement

- Carrier offset frequency range selectable from 1 Hz to 1 GHz in 1/3/10 sequence (1 Hz, 3 Hz, 10 Hz, 30 Hz, etc.)
- Number of averages, sweep mode and filter bandwidth for every measurement subrange can be individually selected to optimize the measurement speed
- Fast results for the subranges are obtained by starting the measurement at the maximum carrier offset
- Verification of carrier frequency and power prior to each measurement avoids incorrect measurements
- Improvement of dynamic range by measuring the thermal inherent noise in a reference trace and performing noise correction

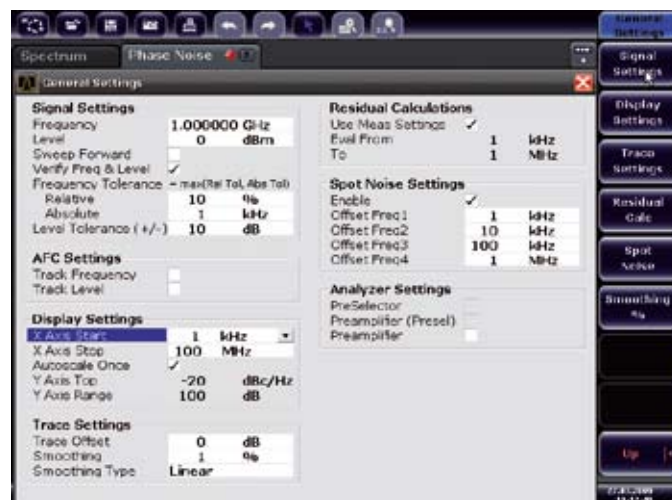
Measurement of residual FM/PM and jitter

- Integration across the entire selected carrier offset frequency range or across a separately selectable frequency range
- Tabular display of residual FM, residual PM and RMS jitter in addition to measurement trace

Evaluation aids

- Limit lines with PASS/FAIL indication
- Spot phase noise at up to four selectable frequency offsets
- Maximum of four additional markers

An overview of all important parameters is displayed in a clear-cut table.

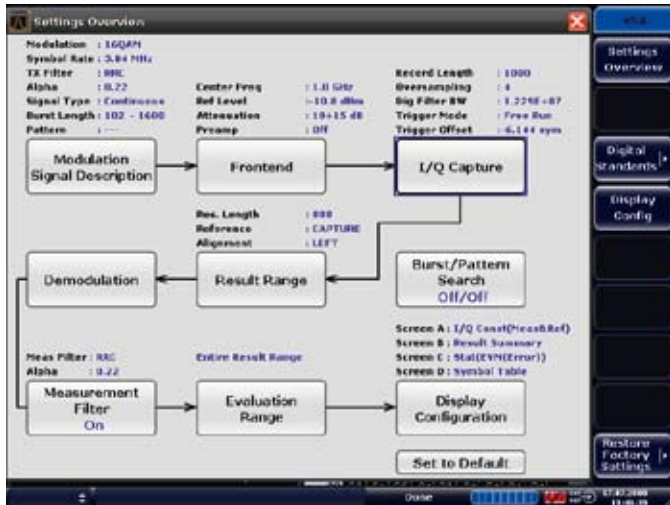


R&S®FSV-K70

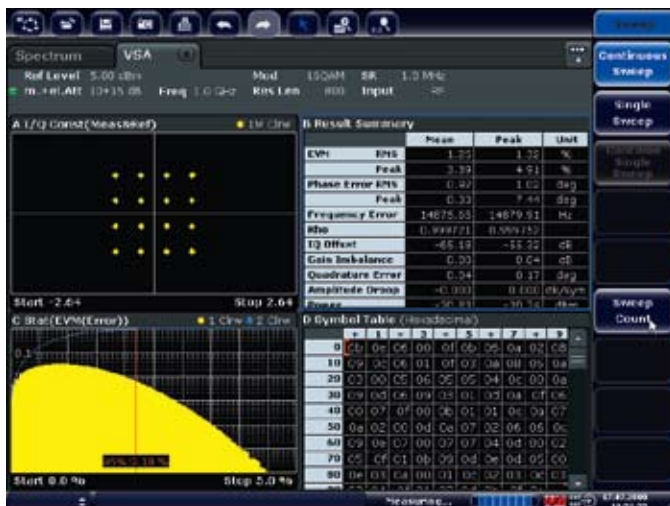
Vector signal analysis application

The R&S®FSV-K70 option enables users to flexibly set the analysis of digitally modulated single carriers down to the bit level using the R&S®FSV. The clear-cut operating concept simplifies measurements, despite the wide range of analysis tools.

Block diagram Overview



16QAM with 4 screens



Flexible modulation analysis from MSK to 64QAM

- Modulation formats
 - MSK, DMSK, BPSK, QPSK, 8PSK, DQPSK, D8PSK, $\pi/4$ -DQPSK, $3\pi/8$ -D8PSK, 16QAM bis 64QAM
- Symbol rate up to 32 MHz
- Analysis length up to 50000 symbols
- Signal analysis bandwidth 28 MHz, 40 MHz optional

Numerous standard-specific default settings

- GSM
- GSM/EDGE
- WCDMA
- TETRA

Easy operation with graphical support

As the demodulation stages and the associated settings are visualized, even beginners and infrequent users can find the correct settings. The combination of touchscreen and block diagram simplifies operation and representation.

Based on the description of the signal to be analyzed (e.g. modulation format, continuous or with burst, symbol rate, transmit filtering), the R&S®FSV-K70 option supports users in automatically finding useful settings.

Flexible analysis tools for detailed signal analysis make troubleshooting really easy

- Display choices for amplitude, frequency, phase, I/Q, eye diagram, amplitude, phase, or frequency error, constellation or vector diagram
- Statistical evaluations
- Histogram representation
- Standard deviation and 95% percentile in the result summary
- Spectrum evaluations of the measurement and error signal considerably support users in finding signal errors such as incorrect filtering or spurious
- A flexible burst search allows the analysis of complex signal combinations, short bursts or signal mix — capabilities that go beyond the scope of many signal analyzers

Specifications in brief

Base unit		
Frequency		
Frequency range	R&S®FSV3	9 kHz to 3.6 GHz
	R&S®FSV7	9 kHz to 7 GHz
	R&S®FSV13	9 kHz to 13.6 GHz
	R&S®FSV30	9 kHz to 30 GHz
	R&S®FSV40	9 kHz to 40 GHz
	R&S®FSV with R&S®FSV-B29 option	20 Hz to 3.6/7/13.6/30 GHz
Aging of frequency reference		1×10^{-6}
	with R&S®FSV-B4 option	1×10^{-7}
Resolution/bandwidths		
Resolution bandwidths	standard sweep	1 Hz to 10 MHz
	standard sweep, zero span	1 Hz to 10 MHz, 20 MHz, 28 MHz; 40 MHz optional
	FFT sweep	1 Hz to 300 kHz
	channel filter	100 Hz to 5 MHz
	EMI filter	200 Hz, 9 kHz, 120 kHz, 1 MHz
Video filter		1 Hz to 10 MHz, 20 MHz, 28 MHz, 40 MHz
Signal analysis bandwidth		28 MHz
	with R&S®FSV-B70 option	40 MHz
Displayed average noise level (DANL)		
DANL (1 Hz bandwidth)	1 GHz	-152 dBm, typ. -155 dBm
	3 GHz	-150 dBm, typ. -153 dBm
	7 GHz	-146 dBm, typ. -149 dBm
	13 GHz	-148 dBm, typ. -151 dBm
	30 GHz	-144 dBm, typ. -147 dBm
	40 GHz	-136 dBm, typ. -139 dBm
DANL with preamplifier, R&S®FSV-B22 option	1 GHz	-162 dBm, typ. -165 dBm
	3 GHz	-160 dBm, typ. -163 dBm
	7 GHz	-156 dBm, typ. -159 dBm
Intermodulation		
Third order intercept (TOI)	$f < 3.6$ GHz	+13 dBm, typ. +16 dBm
	3.6 GHz to 30 GHz	+15 dBm, typ. +18 dBm
Dynamic range WCDMA ACLR		
	without noise compensation	70 dB
	with noise compensation	73 dB
Phase noise		
1 GHz carrier frequency	10 kHz offset from carrier	-106 dBc (1 Hz), typ. -110 dBc (1 Hz)
	100 kHz offset from carrier	-115 dBc (1 Hz)
	1 MHz offset from carrier	-134 dBc (1 Hz)
Total measurement uncertainty		
	3.6 GHz	0.29 dB
	7 GHz	0.39 dB
R&S®FSV-B9 tracking generator		
Frequency range	R&S®FSV3	100 kHz to 3.6 GHz
	R&S®FSV7, R&S®FSV13, R&S®FSV30, R&S®FSV40	100 kHz to 7 GHz
Frequency offset		up to 1 GHz
Level range		-60 dBm to 0 dBm

Software options

Further information

Separate data sheets are available for the following software options. You can order these data sheets under the numbers specified below.

Designation	Type	Data Sheet Order No.
Analog Modulation Analysis (AM/FM/φM)	R&S®FSV-K7	PD 5214.0530.22
GSM/EDGE/EDGE evo Analysis	R&S®FSV-K10	PD 5214.0447.22
Noise Figure and Gain Measurements	R&S®FSV-K30	PD 5214.1837.22
Phase Noise Measurements	R&S®FSV-K40	PD 5214.1843.22
Vector signal analysis	R&S®FSV-K70	PD 5214.0599.22
3GPP BS (DL) Analysis, incl. HSDPA	R&S®FSV-K72	PD 5214.1743.22
3GPP UE (UL) Analysis, incl. HSUPA	R&S®FSV-K73	PD 5214.0976.22
TD-SCDMA BS (DL) Analysis	R&S®FSV-K76	PD 5214.1572.22
TD-SCDMA UE (UL) Analysis	R&S®FSV-K77	PD 5214.1614.22
CDMA2000® BS (DL) Analysis	R&S®FSV-K82	PD 5214.1714.22
1xEV-DO BS (DL) Analysis	R&S®FSV-K84	PD 5214.1850.22
WLAN IEEE 802.11a/b/g/j Analysis	R&S®FSV-K91	PD 5214.1450.22
WLAN IEEE 802.11n Analysis	R&S®FSV-K91n	PD 5214.1450.22
WiMAX™ IEEE 802.16e OFDM/OFDMA Analysis	R&S®FSV-K93	PD 5214.1466.22
EUTRA/LTE Uplink PC software	R&S®FSV/FSQ-K101/-K105	PD 5213.9186.22

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Ordering information

Designation	Type	Order No.
Base unit (including supplied accessories such as power cable and manual)		
Signal and Spectrum Analyzer 9 kHz to 3.6 GHz	R&S®FSV3	1307.9002K03
Signal and Spectrum Analyzer 9 kHz to 7 GHz	R&S®FSV7	1307.9002K07
Signal and Spectrum Analyzer 9 kHz to 13.6 GHz	R&S®FSV13	1307.9002K13
Signal and Spectrum Analyzer 9 kHz to 30 GHz	R&S®FSV30	1307.9002K30
Signal and Spectrum Analyzer 9 kHz to 40 GHz	R&S®FSV40	1307.9002K40
Hardware options		
Ruggedized Housing	R&S®FSV-B1	1310.9500.02
AM/FM Audio Demodulator	R&S®FSV-B3	1310.9516.02
OCXO, Precision Reference Frequency	R&S®FSV-B4	1310.9522.02
Additional Interfaces (IF/video/AM/FM output, AUX port, trigger output, two additional USB ports)	R&S®FSV-B5	1310.9539.02
Tracking Generator 100 kHz to 3.6 GHz/7 GHz	R&S®FSV-B9	1310.9545.02
External Generator Control	R&S®FSV-B10	1310.9551.02
Digital Baseband Interface	R&S®FSV-B17	1310.9568.02
Spare Hard Drive (removable hard drive)	R&S®FSV-B19	1310.9574.02
LO/IF-Ports for external Mixers	R&S®FSV-B21	1310.9597.02
Preamplifier 9 kHz to 3.6 GHz/7 GHz	R&S®FSV-B22	1310.9600.02
Electronic Attenuator (1 dB steps)	R&S®FSV-B25	1310.9622.02
Frequency Range Extension to 20 Hz	R&S®FSV-B29	1310.9639.02
40 MHz Analysis Bandwidth	R&S®FSV-B70	1310.9645.02
Software options		
Analog Modulation Analysis (AM/FM/ϕM)	R&S®FSV-K7	1310.8103.02
FM Stereo Measurements for R&S®FSV-K7	R&S®FSV-K7S	1310.8126.02
Power Sensor Support (power measurement with the R&S®NRP power sensors)	R&S®FSV-K9	1310.8203.02
GSM/EDGE/EDGE evo Analysis	R&S®FSV-K10	1310.8055.02
Spectrogram Measurements	R&S®FSV-K14	1310.8255.02
Noise Figure and Gain Measurements	R&S®FSV-K30	1310.8355.02
Phase Noise Measurements	R&S®FSV-K40	1310.8403.02
Vector signal analysis	R&S®FSV-K70	1310.8455.02
3GPP BS (DL) Analysis, incl. HSDPA and HSDPA+	R&S®FSV-K72	1310.8503.02
3GPP UE (UL) Analysis, incl. HSUPA	R&S®FSV-K73	1310.8555.02
TD-SCDMA BS Measurements	R&S®FSV-K76	1310.8603.02
TD-SCDMA UE Measurements	R&S®FSV-K77	1310.8655.02
CDMA2000® BS (DL) Analysis	R&S®FSV-K82	1310.8703.02
1xEV-DO BS (DL) Analysis	R&S®FSV-K84	1310.8803.02
WLAN IEEE 802.11a/b/g/j Analysis	R&S®FSV-K91	1310.8903.02
WLAN IEEE 802.11n Analysis	R&S®FSV-K91n	1310.9468.02
WiMAX™ IEEE 802.16e OFDM/OFDMA Analysis	R&S®FSV-K93	1310.8955.02
EUTRA/LTE FDD Downlink Analysis	R&S®FSV-K100	1310.9051.02
EUTRA/LTE FDD Uplink Analysis	R&S®FSV-K101	1310.9100.02
EUTRA/LTE Downlink MIMO Analysis	R&S®FSV-K102	1310.9151.02
EUTRA/LTE TDD Downlink Analysis	R&S®FSV-K104	1309.9774.02
EUTRA/LTE TDD Uplink Analysis	R&S®FSV-K105	1309.9780.02

The data sheet containing all specifications is available under PD 5214.0499.22 and at www.rohde-schwarz.com.

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