R&S®FSW
Signal and Spectrum Analyzer
Continuing innovation in RF performance and usability

ROHDE&SCHWARZ

Product Brochure | Version 03.01

R&S®FSW Signal and Spectrum Analyzer

At a glance

The high-performance R&S®FSW signal and spectrum analyzer helps engineers accomplish the most demanding tasks. Its wide internal analysis bandwidth allows the characterization of wideband components and communications systems. Its unparalleled phase noise facilitates the development of high-performance oscillators such as those used in radars. A state-of-the-art multitouch display with gesture support ensures straightforward and intuitive operation. An embedded SCPI recorder enables easy creation of executable scripts.

The R&S®FSW offers up to 5 GHz analysis bandwidth for measuring wideband-modulated or frequency agile signals like those used in the new 5G New Radio standard or in automotive and pulsed radars.

The 800 MHz real-time analysis bandwidth allows users to monitor wide portions of the spectrum and trigger on short duration signals.

The R&S®FSW can measure multiple standards simultaneously. Users can quickly and easily detect and eliminate errors caused by interaction between signals.

Featuring a multitouch display and intuitive menu structure, the R&S®FSW offers exceptional ease of operation. Various measurements can be displayed simultaneously in separate windows on the large 12.1" screen, which greatly facilitates result interpretation.

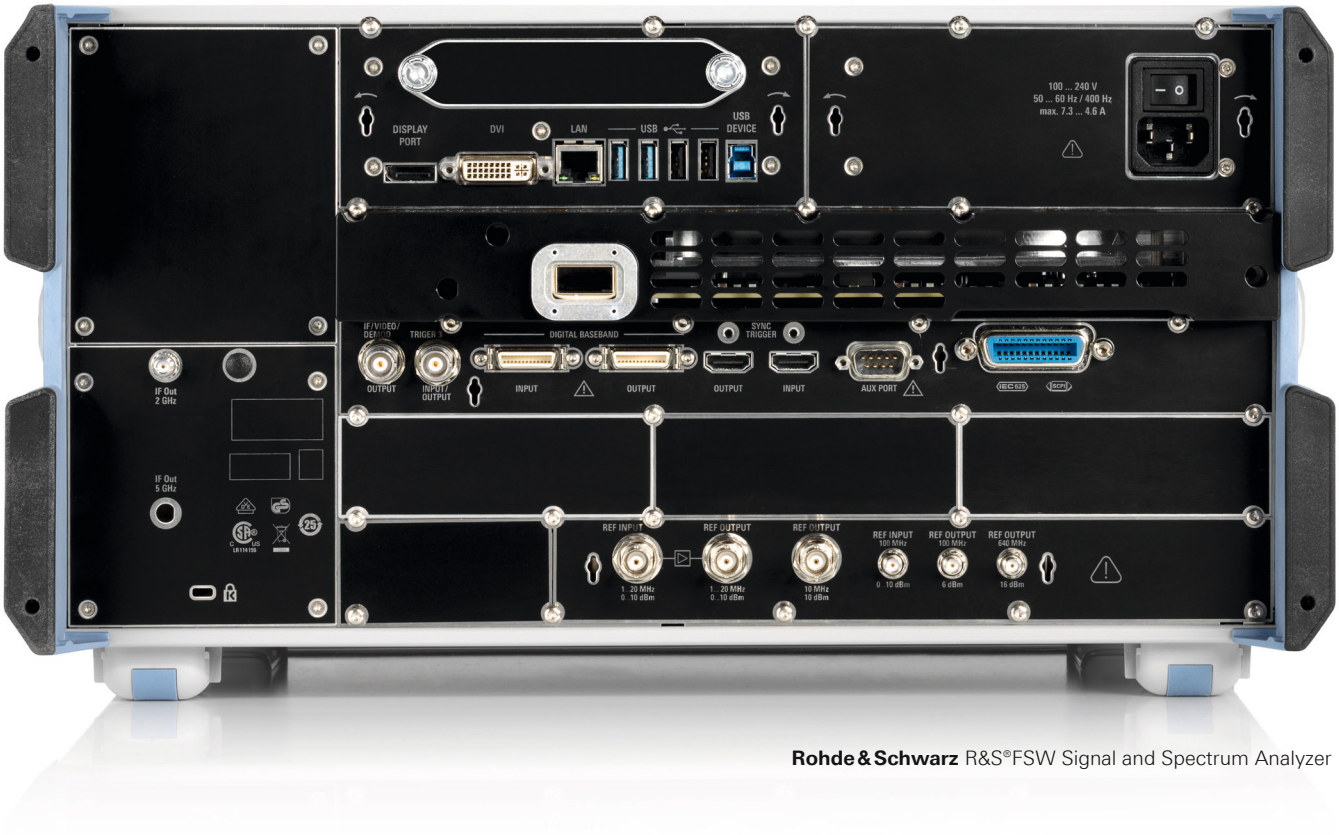
Front view of the R&S®FSW

Key facts

- Frequency range from 2 Hz to 90 GHz (up to 500 GHz with external harmonic mixers from Rohde&Schwarz)
- Low phase noise of –140 dBc (1 Hz) at 10 kHz offset, –143 dBc at 100 kHz offset (1 GHz carrier)
- 60 dBc spurious-free dynamic range for 2 GHz internal analysis bandwidth
- Up to 5 GHz analysis bandwidth (2 GHz internally and 5 GHz using an R&S®RTO oscilloscope as an external digitizer)
- 800 MHz real-time analysis bandwidth with 2.4 million FFT/s, 0.46 µs POI and 500 MHz I/Q data streaming interface.
- SCPI recorder simplifies code generation
- New flat Windows 10 design and multitouch gesture support
- Multiple measurement applications can be run and displayed in parallel

Benefits

Rear view of the R&S®FSW



Outstanding RF performance

The R&S®FSW redefines the top of the line for signal and spectrum analyzers, offering superior RF performance in terms of phase noise, displayed average noise level, intermodulation suppression and dynamic range for ACLR and harmonic measurements.

Unmatched phase noise – ideal for measuring oscillators for radar and communications applications

Developers of oscillators, synthesizers and transmit systems benefit from the R&S®FSW analyzer's excellent RF performance for phase noise measurements. At 10 kHz offset from the carrier, the R&S®FSW achieves a phase noise of typ. –140 dBc (1 Hz) for a 1 GHz carrier and typ. –131 dBc (1 Hz) for a 10 GHz carrier. It also has an excellent close-in phase noise of typ. –114 dBc (1 Hz) at 100 Hz offset. Depending on the frequency and offset range, the R&S®FSW outperforms other high-end analyzers by more than 10 dB.

Phase noise at 10 kHz offset from a 10 GHz carrier: typ. –133 dBc (1 Hz)

Harmonic measurement with highpass filter switched on (top) and off (bottom)

Excellent dynamic range for spurious measurements thanks to low DANL

Featuring a low displayed average noise level (DANL) of typ. –159 dBm (1 Hz) at 2 GHz and –150 dBm (1 Hz) at 25 GHz without using a preamplifier, the R&S®FSW measures spurious emissions quickly and reliably over a wide frequency range. A built-in preamplifier reduces the DANL further by over 15 dB and the analyzer's switch-selected noise cancellation improves the DANL by up to 13 dB. As a result, users can identify even the smallest of spurious emissions that were previously hidden in the noise floor, and effectively optimize transmit systems.

Harmonic measurements made easy thanks to integrated highpass filters

The R&S®FSW can optionally be equipped with switchable highpass filters (R&S®FSW-B13) for carrier frequencies up to 1.5 GHz for harmonic measurements on transmit systems. This preselection clearly improves the dynamic range compared with conventional spectrum analyzers. External filters are no longer needed, which simplifies test system setups.

High sensitivity even at low frequencies

The DANL of the R&S®FSW at low frequencies up to approx. 40 MHz is improved by routing the input signal directly to the A/D converter. Even in the audio and baseband frequency range it offers a high sensitivity of –120 dBm (1 Hz) at 2 Hz, surpassing comparable analyzers by up to 20 dB.

High accuracy

The R&S®FSW offers high level measurement accuracy. It measures signal levels with < 0.37 dB total measurement uncertainty for frequencies ≤ 8 GHz.

Unparalleled dynamic range up to 1 GHz with separate receive path

The R&S®FSW has a separate receive path optimized for frequencies < 1 GHz. This yields a previously unattained dynamic range, for example for measurements on radio systems for public safety and security.

Ultrawideband filters in sweep mode

UWB regulations such as EN 302065 call for a 50 MHz resolution filter to measure the peak power, a measurement easily performed with the R&S®FSW. With its optional resolution bandwidths of 28 MHz, 50 MHz and 80 MHz, the R&S®FSW offers unique possibilities for wideband signal testing.

Image rejection up to 85 GHz

A YIG preselector at the input of the R&S®FSW ensures that image frequencies are rejected and out-of-band interferers are suppressed.

The R&S®FSW85 signal and spectrum analyzer features a YIG preselector for frequencies between 8 GHz and 85 GHz. It provides image-free spectrum analysis at very high frequencies like those used in automotive radar.

Displayed average noise level (DANL) of an R&S®FSW43 with preamplifier and noise cancellation switched on/off

Scalable analysis bandwidth

The demand for analysis bandwidth is constantly increasing. The R&S®FSW is ready to take on this challenge.

Analysis bandwidth extensions for the different R&S®FSW models

Frequency range		80 MHz	320 MHz	512 MHz
R&S®FSW8	R&S®FSW-B80			
	R&S®FSW-B160, R&S®FSW-B320			
	R&S®FSW-B512			
R&S®FSW13	R&S®FSW-B80			
	R&S®FSW-B160, R&S®FSW-B320			
	R&S®FSW-B512			
R&S®FSW26	R&S®FSW-B80			
	R&S®FSW-B160, R&S®FSW-B320			
	R&S®FSW-B512			
	R&S®FSW-B1200, R&S®FSW-B2001			
R&S®FSW43	R&S®FSW-B80			
	R&S®FSW-B160, R&S®FSW-B320			
	R&S®FSW-B512			
	R&S®FSW-B1200, R&S®FSW-B2001			
	R&S®FSW-B5000			
R&S®FSW50	R&S®FSW-B80			
	R&S®FSW-B160, R&S®FSW-B320			
	R&S®FSW-B512			
	R&S®FSW-B1200, R&S®FSW-B2001			
R&S®FSW67	R&S®FSW-B80			
	R&S®FSW-B160, R&S®FSW-B320			
	R&S®FSW-B512			
	R&S®FSW-B1200, R&S®FSW-B2001			
R&S®FSW85	R&S®FSW-B80			
	R&S®FSW-B160, R&S®FSW-B320			
	R&S®FSW-B512			
	R&S®FSW-B1200, R&S®FSW-B2001			
	R&S®FSW-B5000			

Recommended signal analysis bandwidth extensions for the different signal analysis applications

	10 MHz	28 MHz	40 MHz	80 MHz
	Standard	**R&S®FSW-B28**	**R&S®FSW-B40**	**R&S®FSW-B80**
Standard applications and measurements on single carriers, e.g. WCDMA, CDMA2000®, TD-SCDMA, TETRA, NB-IoT	•			
LTE, WLAN IEEE 802.11a/b/g/p signals		•		
5G NR				
WLAN IEEE 802.11n signals			•	
WLAN IEEE 802.11ac and WLAN IEEE 802.11ax signals				•
WLAN IEEE 802.11ad signals				
WLAN IEEE 802.11ay signals				
Component characterization and linearization (amplifiers, frequency converters, etc.)			•	•
Pulsed radar				•
Wideband measurements on CW and frequency hopping radar systems				
Automotive radar				

The R&S®FSW has up to 2 GHz internal analysis bandwidth and 5 GHz analysis bandwidth when using the R&S®RTO oscilloscope as an external digitizer.

	2000 MHz	5000 MHz

	160 MHz	320 MHz	512 MHz	1200 MHz	2000 MHz	5000 MHz
	R&S®FSW-B160	R&S®FSW-B320	R&S®FSW-B512	R&S®FSW-B1200	R&S®FSW-B2001	R&S®FSW-B5000
	•			•		
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Advanced user interface

The R&S®FSW is designed for convenience – with straightforward result display.

SCPI recorder
Simplified code generation for automatic, remote controlled measurements

Toolbar
- Quickly access frequently used functions
- Load and save configurations
- Take screenshots
- Zoom graphs
- Configure displayed items

12.1" high-resolution, multitouch display
- 1280 × 800 pixel resolution
- Multitouch operation

Three USB 2.0 ports
- For storage media
- For connecting accessories
- For power sensors with USB connector

R&S®MultiView and R&S®Sequencer

- Display all tabs on one screen
- Measure consecutively
- Receive continually updated results

Overview settings

Display and adjust all hardware-related settings on one screen

Noise source control

- 28 V DC power for noise sources with BNC DC input
- Control with instrument firmware

Smart port

- For power meters
- For smart noise sources

Be ahead in 5G and other wireless standards

To meet the increasing demand for wireless connectivity, network infrastructures and user equipment need to accommodate diverse wireless technologies such as LTE, 5G NR, 802.11 and NB-IoT. The applications are many and diverse and range from high-speed wireless access to autonomous cars and artificial intelligence.

The R&S®FSW provides the right capabilities and measurement applications with uncompromised performance for fast and straightforward testing of different wireless standards with their specific requirements and characteristics.

Signal analysis of 5G signals

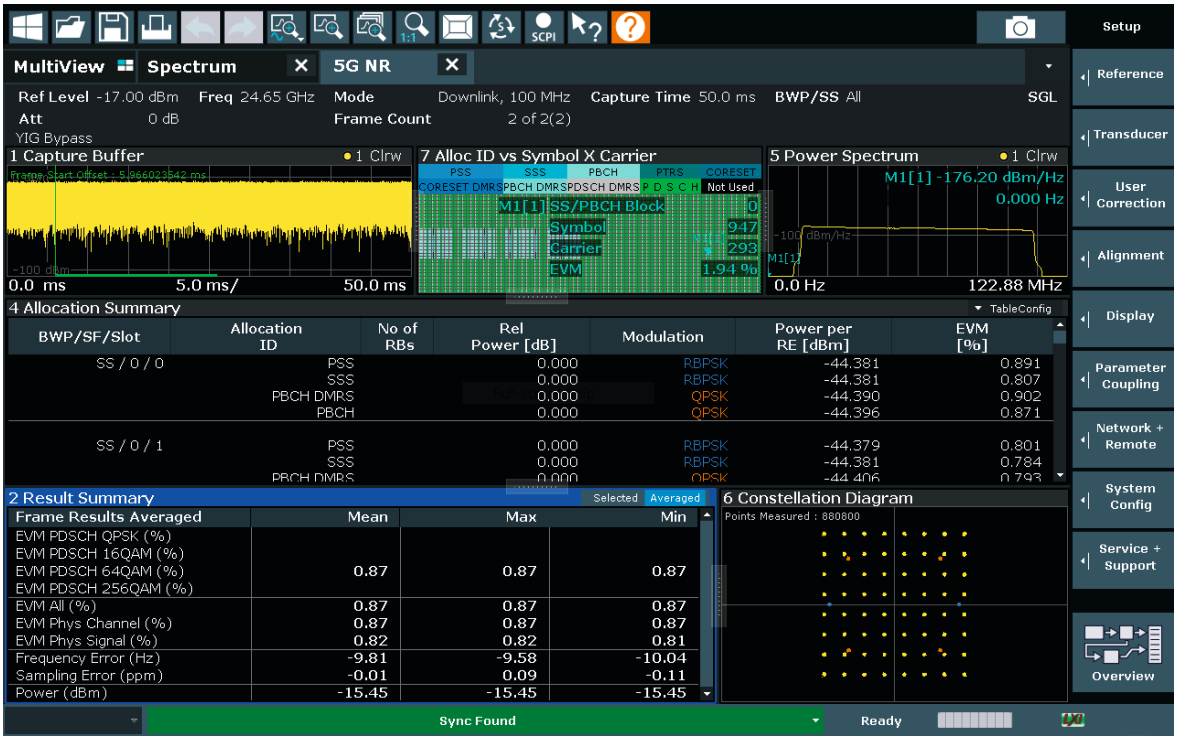
The R&S®FSW 5G measurement applications simplify and speed up in-depth analysis of the physical layer, allowing you to test at higher frequencies and wider measurement bandwidths and cover all the physical layer options specified in the standard with the best RF performance on the market.

The R&S®FSW-K144 and R&S®FSW-K145 options cover in-band measurements of 3GPP 5G NR in the downlink and uplink. Each signal subframe is analyzed and a wide range of measurement results are provided, including EVM, frequency and power of different channels and signals.

With its wide internal analysis bandwidth of optionally up to 2 GHz, the R&S®FSW-K144 can capture the entire bandwidth of the downlink signal and allows you to evaluate the complete system. Its high-performance digitizer yields a low inherent error vector magnitude (EVM), providing new insight into designs. Another advantage is that the bandwidth option is an internal R&S®FSW option. This reduces both the size of the test setup and the amount of cabling between components and also increases measurement accuracy.

The R&S®FSW-K144 and R&S®FSW-K145 support all specified 5G signal bandwidths from 5 MHz to 400 MHz, with multiple numerologies, multiple bandwidth parts and modulation formats from QPSK to 256QAM.

The R&S®FSW-K144 5G New Radio downlink measurement application



The R&S®FSW-K145 supports both the OFDMA and the transform precoded modes in the uplink.

To simplify signal analysis, several parameters are automatically detected, which reduces the number of user settings to a minimum.

For out-of-band measurements, a wide range of settings and limit lines are provided for adjacent channel leakage ratio and spectrum emission mask measurements.

Narrowband IoT (NB-IoT)

The R&S®FSW-K106 covers all three operating modes (in-band, guard band and out-of-band) for base station testing in line with the 3GPP specification. It delivers signal modulation results as well as out-of-band spectral measurements (ACLR and SEM). The timing alignment measurement is included to be able to easily measure the timing between transmitters in MIMO operation.

To simplify signal analysis, several parameters such as cell ID and modulation formats are automatically detected.

Wireless connectivity: WLAN IEEE 802.11ac/ax

The latest WLAN standards such as WLAN IEEE 802.11ac aim to significantly increase data rates. To achieve a higher throughput, IEEE 802.11ac has several new features, including a channel bandwidth of up to 160 MHz. The IEEE 802.11ax standard is an extension of the IEEE 802.11ac standard. Its aim is to improve system capacity especially in scenarios that are interference limited due to the high density of WLAN devices. The outstanding performance of the R&S®FSW signal and spectrum analyzer permits the precise signal analysis necessary when characterizing DUTs with the R&S®FSW-K91ac and R&S®FSW-K91ax options. For a 160 MHz bandwidth and 256QAM modulation, the residual EVM is as low as –47 dB.

WiGig IEEE 802.11ad/ay – very high data rates at 60 GHz

The IEEE 802.11ad standard provides data throughput speeds of up to 7 Gbps with a channel bandwidth of 2.16 GHz bandwidth in the 60 GHz ISM band. IEEE 802.11ay bonds up to four of those channels together for a maximum bandwidth of 8.64 GHz with transmission rates of 20 Gbit/s to 40 Gbit/s.

The R&S®FSW67 signal and spectrum analyzer equipped with R&S®FSW-B2001 option and special measurement options for IEEE 802.11ad (R&S®FSW-K95) is the only one-box solution on the market to cover IEEE 802.11ad applications.

In addition, the optional 5 GHz bandwidth extension (R&S®FSW-B5000) and a dedicated IEEE 802.11ay measurement application (R&S®FSW-K97) are also available for easy IEEE 802.11ay analysis at the push of a button.

The R&S®FSW-K106 NB-IOT measurement application

Extensive radar analysis functions

Extensive analysis functions and fast identification of spurious emissions are essential prerequisites when testing modern radar systems with their wideband signals, intrapulse modulation techniques and frequency hopping capabilities.

Fast and comprehensive radar signal analysis

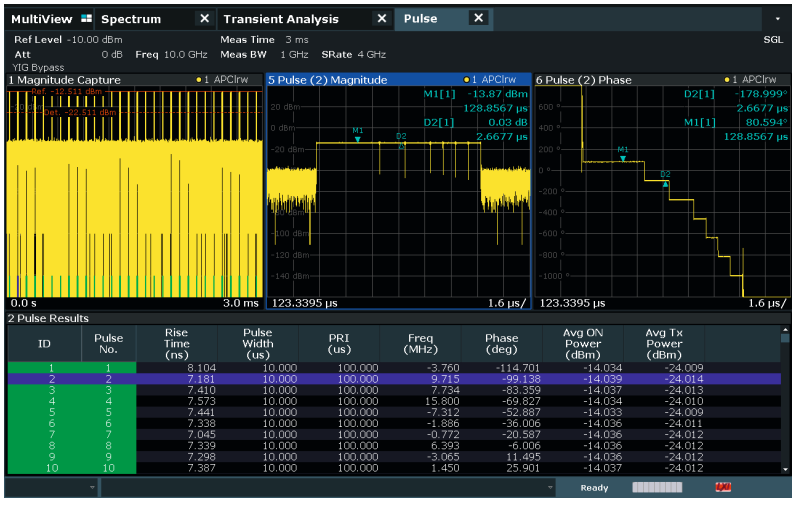
The R&S®FSW-K6 pulse measurement application measures all relevant pulse parameters such as pulse duration, pulse period, pulse rise and fall times, power drop across a pulse and intrapulse phase modulation at the touch of a button. It produces a trend analysis over many pulses. The user selects which results to display simultaneously on the screen. The R&S®FSW delivers a full picture of a radar system within seconds. The segmented I/Q capture function ensures that I/Q data is timestamped and stored in memory only when a pulse is detected. This feature significantly increases the analysis period – by a factor of nearly 1000 for pulse lengths less than 1 µs and a 1 kHz pulse repetition interval (PRI).

Detailed pulse compression radar measurements

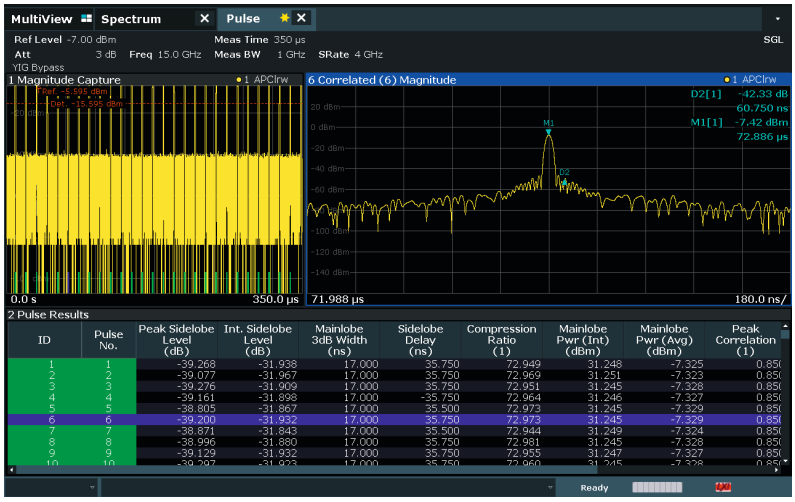
The R&S®FSW-K6S time sidelobe measurement option measures the pulse compression parameters and helps you evaluate the degradation of radar performance caused, for example, by modulators and exciters. You can import any I/Q-based reference waveform in I/Q data file format, allowing the use of confidential, proprietary waveforms. The R&S®FSW-K6S also supports reference waveforms captured with the R&S®FSW and stored in I/Q data file format as well as built-in waveforms such as Barker and polynomial FM.

Characterization of transient chirp and hop signals

The R&S®FSW-K60/-K60C transient analysis option/ chirp measurement option characterizes FMCW signals such as those used in car radar sensors. The R&S®FSW



Equipped with the R&S®FSW-K6 pulse measurements option, the R&S®FSW delivers pulse parameters at the touch of a button.

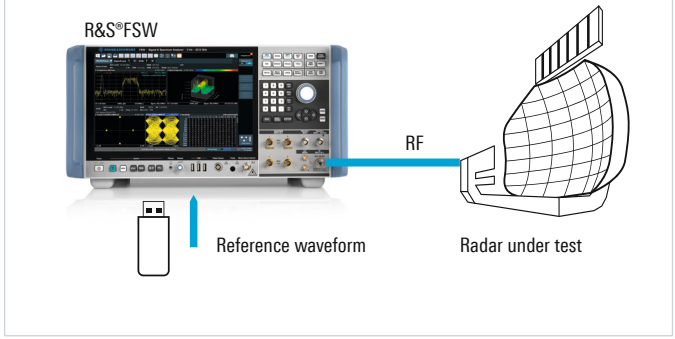


Pulse compression parameters and correlated magnitude display of a chirped pulse are shown with the R&S®FSW-K6S option.

automatically calculates the chirp rate and the deviation from the ideal FMCW chirp to enable efficient radar sensor optimization.

The R&S®FSW-K60 with the R&S®FSW-K60H transient hop measurement option is a convenient tool for analyzing signals with fast channel-switching characteristics such as those that occur in frequency hopping radios. Results include dwell time/hop, switching time, frequency, deviation and much more.

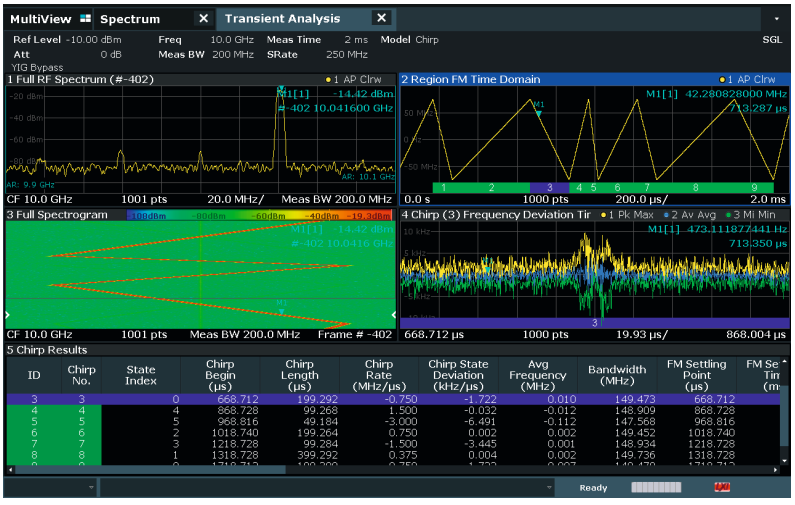
Pulse compression measurement setup with the R&S®FSW-K6/-K6S measurement option



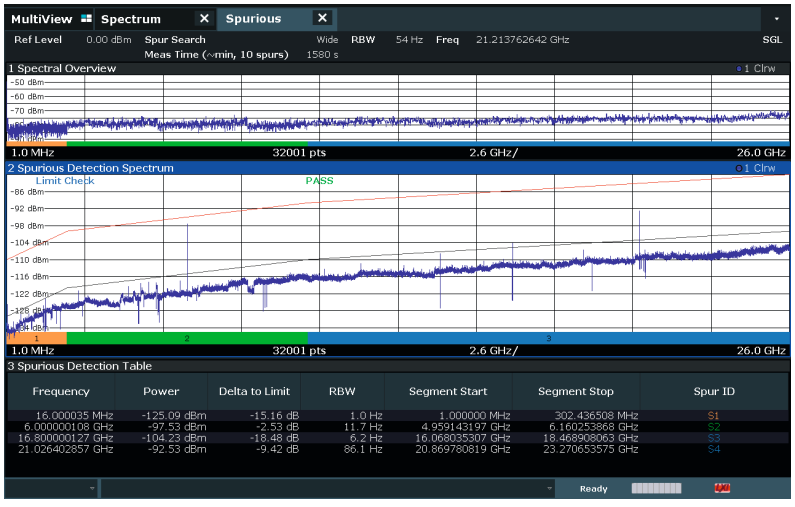
The analyzer shows trends and performs statistical analyses on all pulse, chirp and hop parameters. Trend analysis allows you to quickly identify the effects of supply voltages (or their frequencies, such as 50 Hz or 400 Hz) and to rapidly verify frequency hopping patterns and changes in the pulse repetition interval.

Fast and reliable detection of spurious emissions

In order to measure the low levels of spurious emissions, it is often necessary to reduce the resolution bandwidth, which increases the measurement time. The R&S®FSW-K50 spurious measurement option automates spurious searches, which are performed faster than the standard spurious search measurements available in spectrum analyzers. You only need to enter the frequency range and the desired spur detection level. The application calculates the optimum resolution bandwidth (RBW) for measuring at each frequency. The R&S®FSW-K50 spurious search option is significantly faster than conventional spurious search methods for measurements at –120 dBm or below.



Analysis of an FMCW signal with the R&S®FSW-K60C option



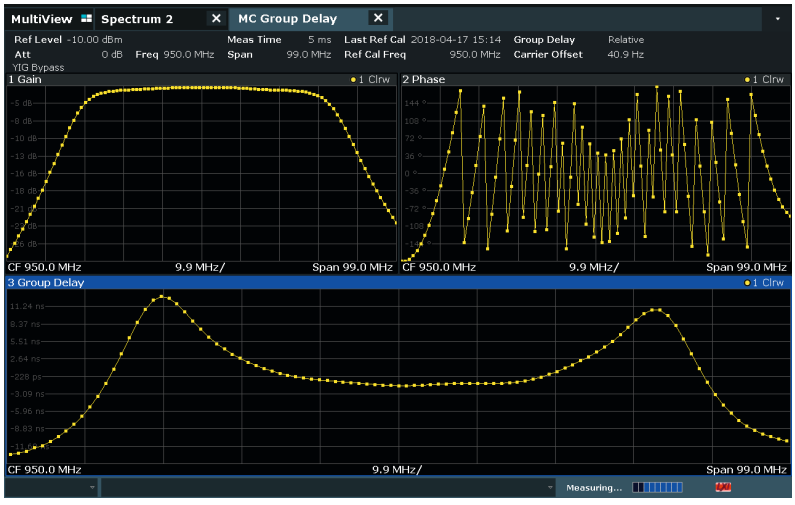
Spurious measurement result screen

Ideal for satellite RF testing

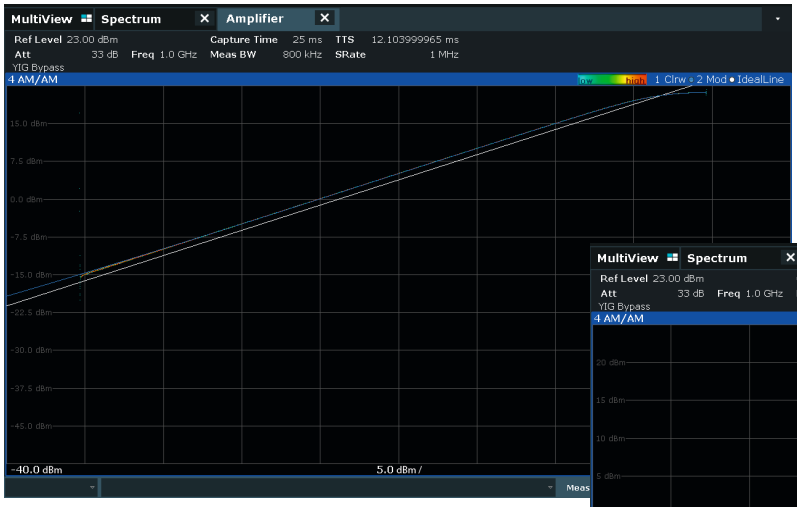
Satellite communications must cover a diverse set of user requirements in broadcasting, wireless communications and remote sensing for both commercial and government systems. Rohde&Schwarz offers fast and reliable high-performance measurement solutions for designing, developing and testing satellite payloads, payload subsystems and components.

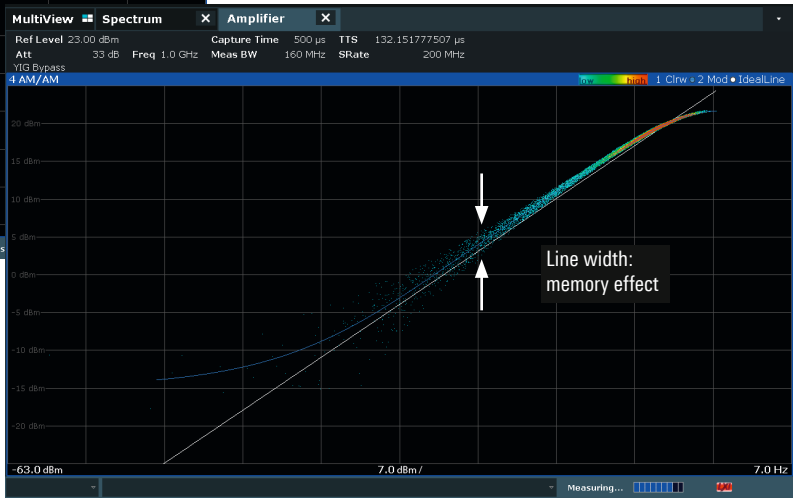
Multicarrier group delay measurements

The R&S®FSW spectrum analyzer and R&S®SMW200A signal generators can be used to measure absolute and relative group delay (GD) on satellite transponders, frequency converters and other components. The R&S®FSW-K17 option allows measurement of absolute and relative group delay on wideband signals within milliseconds. The R&S®FSW-K17 offers 1 ns measurement accuracy for relative GD measurements on frequency converters and 300 ps measurement accuracy in non-frequency-converting measurements. No reference mixer or golden device is required for frequency converting measurements.



Relative group delay measurement on a bandpass filter





Gain transfer curve measurement (AM/AM) of an amplifier. For the curve above, a CW signal with a linear power ramp has been used as the stimulus. As expected, the AM/AM curve is a line. The curve on the right was measured using a digitally modulated signal generated by the R&S®FSW. The AM/AM is a cloud-like curve; the line width is due to amplifier memory effects.

Linearity and gain transfer measurements

A combination of the R&S®SMW200A vector signal generator and the R&S®FSW signal and spectrum analyzer equipped with the R&S®FSW-K18 option can be used to characterize two-port devices such as satellite transponders, power amplifiers and converters. The R&S®FSW-K18 can use either a CW power sweep or a digitally modulated stimulus signal to determine how the DUT will perform when tested under real-world conditions using a signal with the same modulation, bandwidth and crest factor as in the intended application. Typical measurements include gain compression, AM/AM, AM/PM, distortion and ACLR.

Noise power ratio (NPR)

Equipped with the R&S®FSW-K19 option, the R&S®FSW offers a convenient and straightforward way to measure the NPR over a maximum of 25 notches.

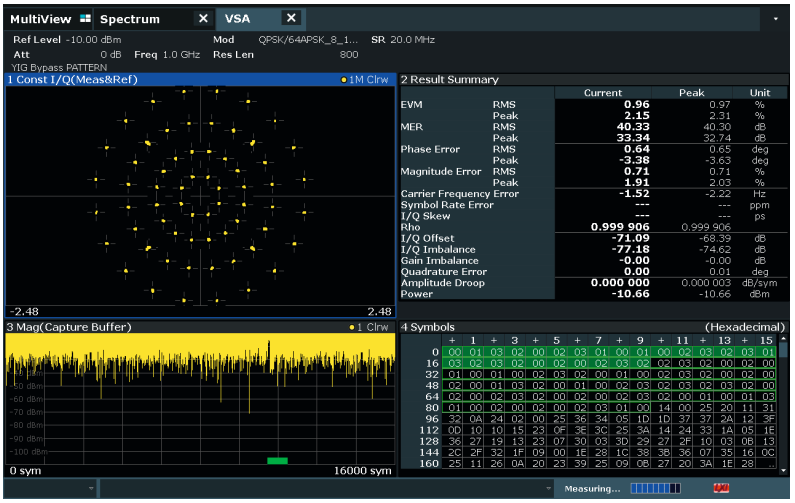
DVB-S2X modulation analysis

The R&S®FSW-K70M multicarrier modulation analysis application (R&S®FSW-K70 option required) allows DVB-S2X signals to be analyzed. The R&S®FSW-K70M detects the start of frame, demodulates both the header and payload parts of the signal and displays the constellation diagram and relevant modulation analysis parameters.

Uncoded bit error rate

The R&S®FSW-K70P is an extension of the R&S®FSW-K70 vector signal analysis option that allows the measurement of raw bit error rate (BER) on PRBS data up to PRBS23. In addition, the R&S®FSW-K70 offers the ability to measure BER based on user-defined bit sequences.

Noise power ratio measurement with the R&S®FSW-K19 option



DVB-S2X signals use different modulation schemes for the payload and the header sections of the frame. The different types of modulation can be analyzed using the R&S®FSW-K70M and R&S®FSW-K70 options. The screenshot above shows a DVB-S2X signal using 64APSK for the payload and QPSK for the pilot channels.

Don’t miss a thing with the real-time spectrum analysis option

Equipped with the high-performance R&S®FSW-K161R, R&S®FSW-B512R and R&S®FSW-B800R real-time options, the R&S®FSW displays RF spectra seamlessly and in real time. Level-controlled detection of signals takes less than 0.5 µs (R&S®FSW-B800R).

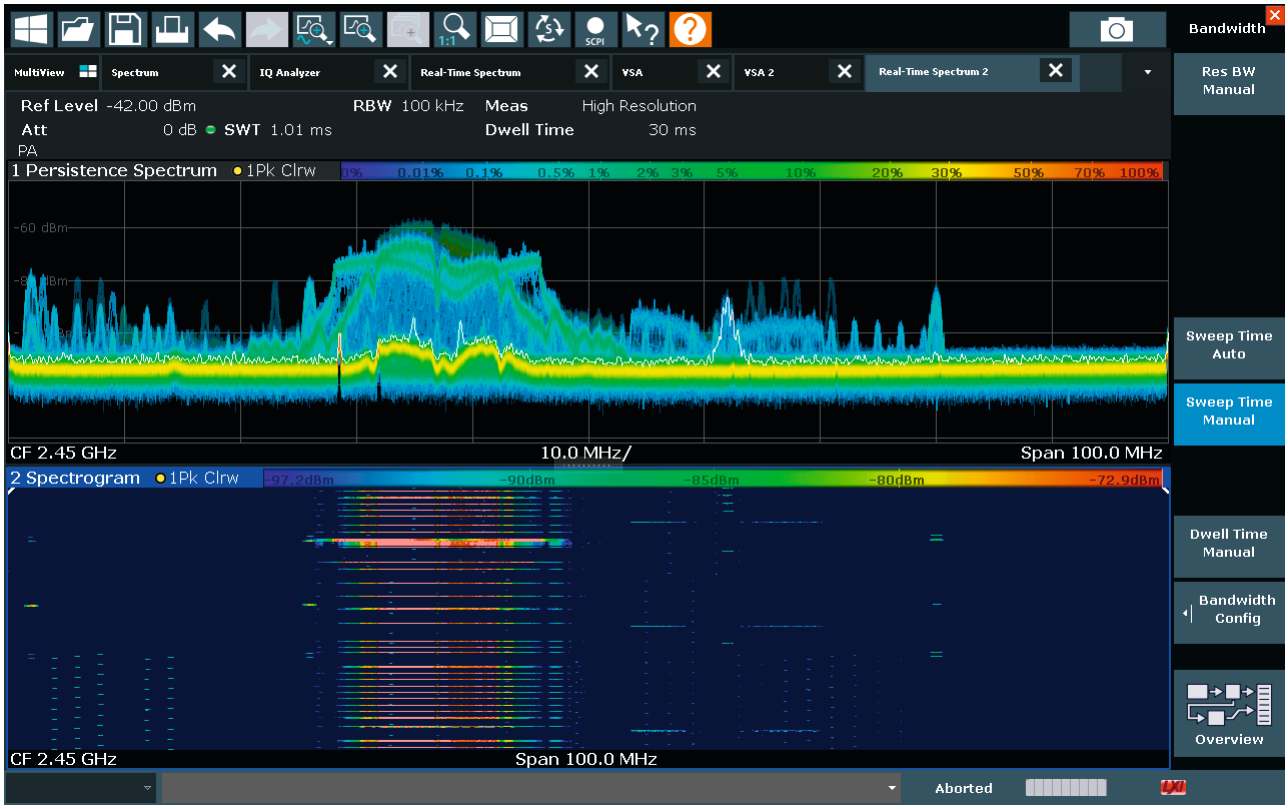
Full-featured signal and spectrum analyzer

The R&S®FSW-K161R, R&S®FSW-B512R and R&S®FSW-B800R options make the R&S®FSW a full-featured signal and spectrum analyzer with built-in real-time analyzer. If level-controlled detection of signals with a length > 15 µs is sufficient, the R&S®FSW-K512RE and R&S®FSW-K800RE firmware options can be activated with a keycode (if the necessary bandwidth option is installed).

This enables the R&S®FSW to perform measuring tasks for a wide range of applications. Aerospace and defense (A&D) engineers will primarily focus on seamlessly analyzing frequency agile radar signals and detecting unwanted spurious emissions or validating tactical, frequency agile communications systems.

Regulatory authorities also need to seamlessly monitor frequency bands and reliably detect unwanted or unlicensed signals.

Real-time spectrum of the ISM band at 2.4 GHz



Detection of extremely short or frequency agile signals

The R&S®FSW real-time options allow users to reliably detect extremely short sporadic interference in the nanosecond range even in close proximity to powerful carriers – in a bandwidth up to 800 MHz.

Detection is supported by the instantaneous spectrum, a real-time spectrogram and, in persistence mode, a real-time spectrum with the signal amplitudes shown in different colors according to their frequency of occurrence (persistence spectrum).

This seamless spectrum display enables users, for example, to analyze existing frequency hopping algorithms or create alternative ones to prevent collisions between signals of different standards operating in the same frequency band (e.g. WLAN and Bluetooth®).

Saving spectra for subsequent more detailed analysis

Using frequency-dependent masks, the R&S®FSW can also trigger on extremely short transient events that typical spectrum analyzers cannot detect. The spectrum or the I/Q data in the time domain can be saved for more detailed analysis at a later date.

Users can, for example, determine the cause of interference or what is hindering a base station's data throughput. Interference originating from digital circuits or produced during synthesizer frequency switching can also be easily detected using this method.

For correct level measurements and to mitigate signal loss at the edges of the FFT window or to achieve higher time resolution, the R&S®FSW performs measurements with up to 67 % spectral overlap in the time domain (R&S®FSW-K161R) at an analysis bandwidth of 160 MHz. The maximum FFT rate of almost 2.4 million spectra/s allows 16 % overlap at an analysis bandwidth of 800 MHz.

Key parameters in real-time analysis

	R&S®FSW-K161R[1]	R&S®FSW-B512R	R&S®FSW-B800R	R&S®FSW-K512RE[2]	R&S®FSW-K800RE[3]
FFT length	1024 to 16k	1024 to 32k	512 to 32k	1024 to 32k	512 to 32k
Max. RT bandwidth	160 MHz	512 MHz	800 MHz	512 MHz	800 MHz
Max. FFT rate (FFT/s)	585 938	1 171 875	2 343 750	71 022	71 022
POI	1.87 µs	0.91 µs	0.46 µs	> 15 µs	> 15 µs
User-configurable resolution bandwidth (RBW) for span/RBW ratio	6.35 to 3200	6.25 to 6400	6.25 to 6400	51.2 to 6400	80 to 6400

[1] Only with R&S®FSW-B160/-B320 bandwidth upgrade.
[2] Only with R&S®FSW-B512/-B1200/-B2001 bandwidth upgrade.
[3] Only with R&S®FSW-B1200/-B2001 bandwidth upgrade.

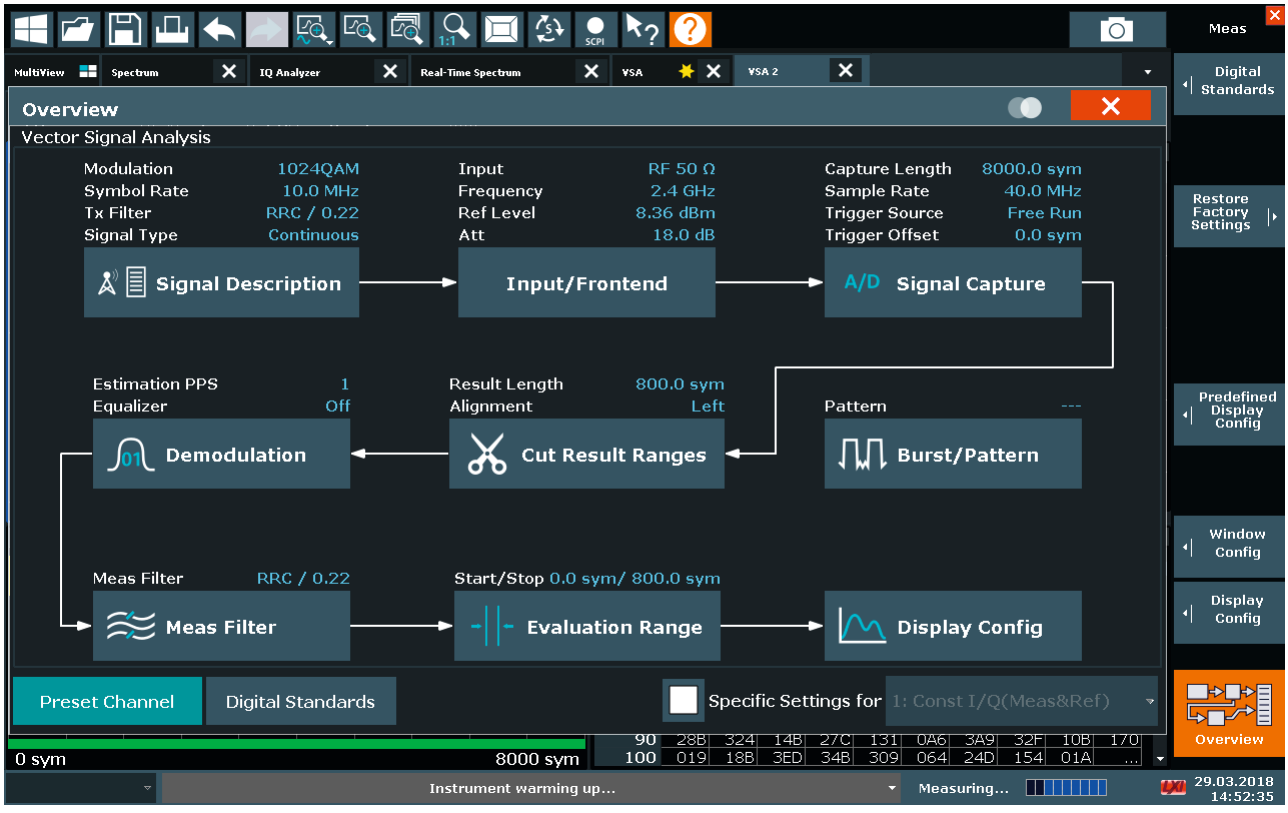
Powerful vector signal analysis application

The R&S®FSW-K70 vector signal analysis option allows users to flexibly analyze digitally modulated single carriers down to the bit level. The clearly structured operating concept simplifies measurements, despite the wide range of analysis tools.

Flexible modulation analysis from MSK to 4096QAM

- Modulation formats:
  - 2FSK, 4FSK to 64FSK
  - MSK, GMSK, DMSK
  - BPSK, π/2-BPSK, π/2-DBPSK, QPSK, offset QPSK, DQPSK, π/4-DQPSK, 3π/4-QPSK, 8PSK, D8PSK, 3π/8-8PSK, π/8-D8PSK
  - 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 1024QAM, 2048QAM, 4096QAM
  - 16APSK (DVB-S2), 32APSK (DVB-S2), 2ASK, 4ASK
  - π/4-16QAM (EDGE), –π/4-32QAM (EDGE), SOQPSK
- Analysis length up to 64 000 symbols
- 10 MHz signal analysis bandwidth (optionally 40/80/160/320/512/1200/2000 MHz and 5 GHz)

Clearly structured block diagram display



Numerous standard-specific default settings

- User-definable constellations and mappings
- GSM, GSM/EDGE
- 3GPP WCDMA, EUTRA/LTE, CDMA2000®
- TETRA, APCO25
- Bluetooth®, ZigBee
- DECT, DVB-S2, DOCSIS 3.0

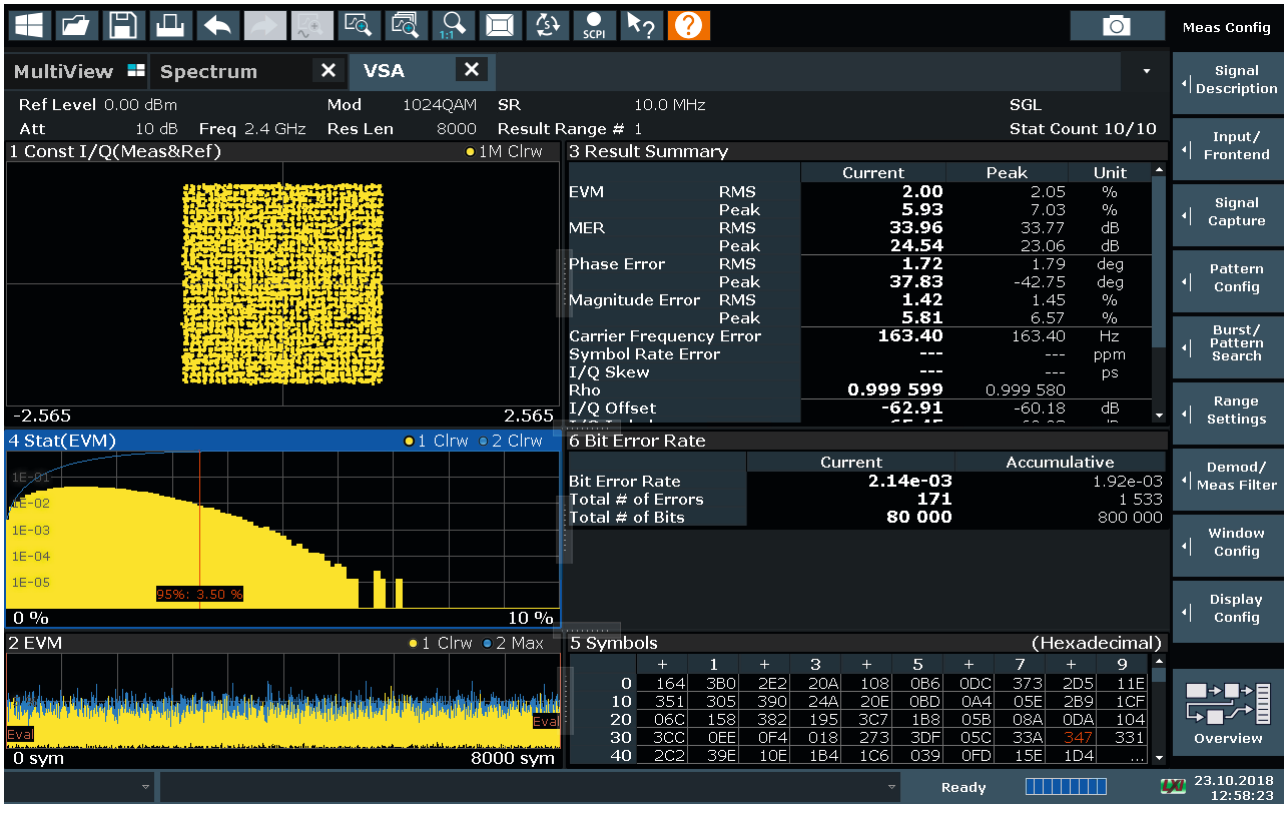
Easy operation with graphical support

The visualization of the demodulation stages and the associated settings is so clear that even inexperienced and infrequent users can find the correct settings. The combination of touchscreen and block diagram simplifies operation and readability. The R&S®FSW-K70 option helps users automatically find useful settings based on the description of the signal to be analyzed (e.g. modulation format, continuous or with bursts, symbol rate, transmit filtering).

Flexible analysis tools for detailed signal analysis make troubleshooting really easy

- Display options for amplitude, frequency and phase
  - I/Q, eye diagram; amplitude, phase and frequency errors
  - Constellation or vector diagram
- Analysis of RF signals or analog and digital baseband signals
- Statistical analysis
  - Histogram
  - Standard deviation and 95th percentile in the result summary
- Spectrum analyses of the measurement and error signal considerably help users find signal errors such as incorrect filtering and spurious emissions
- Flexible burst search for analyzing complex signal combinations, short bursts and signal mixes – capabilities that go beyond the scope of many signal analyzers
- Equalizer helps users find the optimum filter design

Analysis of a 1024QAM modulated signal: constellation diagram, result table, symbol table and EVM distribution



Wide range of measurement applications

General-purpose measurement applications

Measurement application	Measurement parameters	Measurement functions
R&S®FSW-K6 Pulse measurements	**Pulse parameters:** ▪ Timing: pulse width, pulse repetition interval, duty cycle, rise/fall time, settling time, timestamp, off time ▪ Frequency: carrier frequency, pulse-to-pulse frequency difference, chirp rate, frequency deviation, frequency error ▪ Power: peak power, average power, peak-to-average power, pulse-to-pulse power ▪ Phase: carrier phase, pulse-to-pulse phase difference, phase deviation, phase error ▪ Amplitude: droop, ripple, overshoot width, top/base power, average on power, average transmitted power, minimum/peak power, peak-to-average/peak-to-min power ratio, pulse-to-pulse power ratio	▪ Point-in-pulse measurements: frequency, amplitude, phase versus pulse, trends and histograms for all parameters ▪ Pulse statistics: standard deviation, average, maximum, minimum ▪ Pulse tables ▪ User-defined measurement parameters ▪ Segmented data capturing ▪ Time sidelobe analysis (R&S®FSW-K6S option required)
R&S®FSW-K6S Time sidelobe [1]	▪ Time sidelobe: peak-to-sidelobe level, integrated sidelobe level, mainlobe 3 dB width, sidelobe delay, compression ratio, mainlobe power/phase/ frequency, peak correlation	
R&S®FSW-K7 Modulation analysis for AM/FM/φM modulated single carriers	▪ Modulation depth (AM) ▪ Frequency deviation (FM) ▪ Phase deviation (φM) ▪ Modulation frequency ▪ THD and SINAD ▪ Carrier power	▪ AF spectrum ▪ RF spectrum ▪ AF scope display ▪ AF filters (lowpass and highpass) ▪ Weighting filters (CCITT) ▪ Squelch
R&S®FSW-K15 VOR/ILS measurements	**VOR:** ▪ Bearing (VOR phase) ▪ 30 Hz/9960 Hz AM modulation depth ▪ 30 Hz FM deviation (subcarrier) ▪ 30 Hz/9960 Hz AM / 30 Hz FM: frequency, K2, K3, THD ▪ Identifier: modulation depth, frequency, code **ILS:** ▪ DDM, SDM ▪ 90 Hz/150 Hz AM modulation depth ▪ 90 Hz/150 Hz AM: frequency, K2, K3, THD, phase ▪ Identifier: modulation depth, frequency, code	▪ Reference measurements for calibrating navigation receivers ▪ Production test measurements on ILS/VOR ground stations ▪ Measurement and calibration of ramp testers
R&S®FSW-K17 Multicarrier group delay measurements	▪ Group delay (absolute and relative) ▪ Magnitude ▪ Phase	▪ Up to 2 GHz signal capture bandwidth ▪ Calibration (load and save calibration data) for measurement of components and frequency converters ▪ Configurable multicarrier scenarios
R&S®FSW-K18 Amplifier measurements [2] **R&S®FSW-K18D** Direct DPD measurements [3]	▪ AM-AM, AM-PM, EVM ▪ Width of AM-PM and AM-AM curves ▪ Synchronous measurement of RF signal and amplifier current and voltage ▪ Power-added efficiency (PAE) on amplifiers with envelope tracking	▪ General amplifier measurements ▪ Polynomial-based digital predistortion (R&S®FSW-K18) ▪ Direct digital predistortion (R&S®FSW-K18D) ▪ Control and synchronization of the R&S®SMW200A vector signal generator
R&S®FSW-K19 Noise power ratio measurements	▪ Noise power ratio	▪ Noise power ratio measures the intermodulation and noise floor of RF transponders and components in satellite systems
R&S®FSW-K30 Noise figure and gain measurements based on Y-factor method [4]	▪ Noise figure ▪ Noise temperature ▪ Gain ▪ Y factor	▪ Analyzer noise correction (second stage correction) ▪ Measurements on frequency-converting DUTs ▪ Control of a generator as an LO in frequency-converting measurements ▪ SSB and DSB
R&S®FSW-K40 Phase noise measurements	▪ SSB phase noise ▪ Residual FM and residual φM ▪ Jitter	▪ 1 Hz to 10 GHz offset range ▪ Selection of resolution bandwidth and number of averages for each offset range ▪ Definable evaluation ranges for residual FM/φM ▪ Signal tracking ▪ Optional suppression of spurious emissions

[1] Requires R&S®FSW-K6.
[2] Requires the R&S®SMW200A vector signal generator.
[3] Requires R&S®FSW-K18.
[4] Requires an external noise source, e.g. Noisecom NC346.

General-purpose measurement applications

Measurement application	Measurement parameters	Measurement functions
R&S®FSW-K50 Spurious measurements	▪ List with true spurious emissions that violate a predefined threshold ▪ A second threshold can be defined as a hard limit; spurious emissions that violate this threshold are shown in red	▪ Detection of spurious emissions with optimized resolution bandwidth in line with a predefined S/N ratio ▪ At least three times faster than standard measurement due to optimal configuration of test parameters ▪ Spot search for further optimization of S/N ratio ▪ Targeted search for spurious emissions ▪ Suppression of internal spurious emissions
R&S®FSW-K54 EMC diagnosis and precompliance measurements in line with commercial and military standards	▪ Disturbance voltage ▪ Disturbance power ▪ Disturbance radiation	▪ Detectors and resolution bandwidths in line with CISPR 16-1-1 and MIL-STD/DO160 ▪ Up to 16 independent measurement markers; linkable to various EMI detectors and measurement times ▪ Limit lines and correction factors for typical measurement tasks ▪ Choice of linear or logarithmic scale on frequency axis ▪ Marker demodulation (AM/FM) for signal identification
R&S®FSW-K544 Frequency response correction	▪ SnP file in Touchstone file format	▪ Corrects frequency response (amplitude and phase) of the measurement setup
R&S®FSW-K60/ -K60C/-K60H Transient analysis	▪ Frequency hopping signals: dwell time, settling time, switching time, frequency deviation, power, phase deviation, power ripple ▪ Chirp signals: frequency deviation, chirp begin, chirp length, chirp rate, chirp state deviation, phase deviation, power, power ripple	▪ Spectrogram and section of spectrogram, tabular display, frequency, frequency error, phase and amplitude versus time, FFT spectrum ▪ Pan and zoom functions to select analysis region using touch gestures; supported in spectrogram, spectrum and time domain trace displays ▪ Trends and histograms for all parameters ▪ Hop/chirp statistics: standard deviation, average, maximum, minimum ▪ User-defined measurement parameters

Measurement applications for wireless communications systems

Measurement application/ technology	Power	Modulation quality	Spectrum measurements	Miscellaneous	Special features
R&S®FSW-K10 GSM/EDGE/ EDGE Evolution	▪ Power measurement in time domain, including carrier power	▪ EVM ▪ Phase/frequency error ▪ Origin offset suppression ▪ Constellation diagram	▪ Modulation spectrum ▪ Transient spectrum	–	▪ Single burst and multiburst ▪ Automatic detection of modulation
R&S®FSW-K72/-K73 3GPP FDD (WCDMA)	▪ Code domain power ▪ Code domain power versus time ▪ CCDF	▪ EVM ▪ Peak code domain error ▪ Constellation diagram ▪ I/Q offset ▪ Residual code domain error ▪ I/Q imbalance ▪ Gain imbalance ▪ Center frequency error (chip rate error)	▪ Spectrum mask ▪ ACLR ▪ Power measurement	▪ Channel table with channels used on base station ▪ Timing offset ▪ Power versus time	▪ Automatic detection of active channels and decoding of useful information ▪ Automatic detection of encryption code ▪ Automatic detection of HSDPA modulation format ▪ Support of compressed mode signals ▪ Support of HSPA and HSPA+ (HSDPA+ and HSUPA+)
R&S®FSW-K76/-K77 TD-SCDMA	▪ Code domain power ▪ Code domain power versus time ▪ CCDF	▪ EVM ▪ Peak code domain error ▪ Constellation diagram ▪ I/Q offset ▪ Residual code domain error ▪ Gain imbalance ▪ Center frequency error (chip rate error)	▪ Spectrum mask ▪ ACLR ▪ Power measurement	▪ Channel table with channels used on base station ▪ Timing offset ▪ Power versus time	▪ Automatic detection of active channels and decoding of useful information ▪ Automatic detection of HSDPA modulation format ▪ Support of HSPA+ (HSDPA+ and HSUPA+)
R&S®FSW-K82/-K83 CDMA2000®	▪ Carrier power ▪ Code domain power ▪ Code domain power versus time ▪ CCDF	▪ RHO ▪ EVM ▪ Constellation diagram ▪ I/Q offset ▪ I/Q imbalance ▪ Center frequency error	▪ Spectrum mask ▪ ACLR ▪ Power measurement	▪ Channel table with channels used on base station ▪ Timing offset	▪ Automatic detection of active channels and decoding of useful information ▪ Robust demodulation algorithms for reliable measurement of multicarrier signals

Measurement applications for wireless communications systems

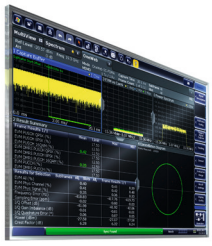
Measurement application/ technology	Power	Modulation quality	Spectrum measurements	Miscellaneous	Special features
R&S®FSW-K84/-K85 1xEV-DO	▪ Carrier power ▪ Code domain power ▪ Code domain power versus time ▪ CCDF	▪ RHO_{Pilot} (R&S®FSW-K84) ▪ RHO_{Data} (R&S®FSW-K84) ▪ RHO_{MAC} (R&S®FSW-K84) ▪ $RHO_{Overall}$ ▪ EVM ▪ Constellation diagram ▪ I/Q offset ▪ I/Q imbalance ▪ Center frequency error	▪ Spectrum mask ▪ ACLR ▪ Power measurement	▪ Channel table with channels used on base station ▪ Timing offset	▪ Automatic detection of active channels and decoding of useful information ▪ Robust demodulation algorithms for reliable measurement of multicarrier signals
R&S®FSW-K91 WLAN IEEE 802.11a/b/g **R&S®FSW-K91P** WLAN IEEE 802.11p **R&S®FSW-K91N** WLAN IEEE 802.11n **R&S®FSW-K91AC** WLAN IEEE 802.11ac **R&S®FSW-K91AX** WLAN IEEE 802.11ax	▪ Power versus time ▪ Burst power ▪ Crest factor	▪ EVM (pilot, data) ▪ EVM versus carrier ▪ EVM versus symbol ▪ Constellation diagram ▪ I/Q offset ▪ I/Q imbalance ▪ Gain imbalance ▪ Center frequency error ▪ Symbol clock error ▪ Group delay	▪ Spectrum mask ▪ ACLR ▪ Power measurement ▪ Spectrum flatness	▪ Bitstream ▪ Signal field ▪ Constellation versus carrier	▪ Automatic detection of burst type ▪ Automatic detection of MCS index ▪ Automatic detection of bandwidth ▪ Automatic detection of guard interval ▪ Estimation of payload length from burst ▪ IEEE 802.11ax PPDU formats: HE SU PPDU, HE MU PPDU, HE trigger-based PPDU, HE extended range SU PPDU
R&S®FSW-K95 WLAN IEEE 802.11ad	▪ Power versus time ▪ PPDU power ▪ Crest factor	▪ EVM (pilot, data) ▪ Constellation diagram ▪ I/Q offset ▪ I/Q imbalance ▪ Gain imbalance ▪ Symbol clock error ▪ Center frequency error ▪ Time skew ▪ Phase error versus symbol ▪ Phase tracking versus symbol	▪ Spectrum mask ▪ Power spectrum ▪ Channel frequency response	▪ Header information ▪ Bitstream (encoded and decoded)	▪ Automatic detection of PPDU type ▪ Automatic detection of MCS index
R&S®FSW-K97 WLAN IEEE 802.11ay SC (additional results and features to R&S®FSW-K95)	▪ SNR	▪ EVM versus symbol		▪ Bit error rate header ▪ Bit error rate payload	▪ Channel bonding 1-4. restricted by analysis bandwidth ▪ Automatic detection of guard interval ▪ Automatic detection of PPDU length ▪ Channel aggregation
R&S®FSW-K100/ -K101/-K104/-K105 EUTRA/LTE TDD and FDD UL and DL	▪ Power measurement in time and frequency domains ▪ CCDF	▪ EVM ▪ Constellation diagram ▪ I/Q offset ▪ Gain imbalance ▪ Quadrature error ▪ Center frequency error (symbol clock error)	▪ Spectrum mask ▪ ACLR ▪ Power measurement ▪ Spectrum flatness	▪ Bitstream ▪ Allocation summary list ▪ Averaging over multiple measurements	Automatic detection of modulation, cyclic prefix length and cell ID
R&S®FSW-K102 EUTRA/LTE MIMO		▪ See R&S®FSW-K100/ -K104 modulation quality measurements for each individual MIMO path			▪ MIMO time alignment for R&S®FSW-K100/-K104 ▪ Interband carrier aggregation time alignment
R&S®FSW-K103 EUTRA/ LTE-Advanced UL			▪ Multicarrier ACLR for FDD and TDD ▪ SEM for contiguously aggregated component carriers		
R&S®FSW-K106 NB-IoT DL measurements	▪ Power measurement in time and frequency domains	▪ EVM ▪ Constellation diagram ▪ Frequency error ▪ Sampling error	▪ Spectrum flatness, ACLR, SEM	▪ Allocation summary list	▪ Standalone, guard band and in-band operation ▪ Automatic detection of cell ID

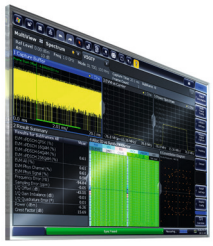
Measurement applications for wireless communications systems

Measurement application/ technology	Power	Modulation quality	Spectrum measurements	Miscellaneous	Special features
R&S®FSW-K201 OneWeb reverse link measurement application	▪ Power measurement in time and frequency domains ▪ CCDF	▪ EVM ▪ Constellation diagram ▪ I/Q offset ▪ Gain imbalance ▪ Quadrature error ▪ Center frequency error (symbol clock error)	▪ Spectrum mask ▪ ACLR ▪ Power measurement ▪ Spectrum flatness		▪ Automatic detection of modulation and cyclic prefix length
R&S®FSW-K118 Verizon 5GTF downlink	▪ Power versus time ▪ CCDF	▪ EVM ▪ EVM xPDSCH ▪ Constellation diagram ▪ I/Q offset ▪ I/Q imbalance ▪ Gain imbalance ▪ Center frequency error		▪ Allocation summary ▪ Multicarrier filter	▪ Automatic detection of Cell ID
R&S®FSW-K119 Verizon 5GTF uplink	▪ Power versus time ▪ CCDF	▪ EVM ▪ EVM xPUSCH ▪ Constellation diagram ▪ I/Q offset ▪ I/Q imbalance ▪ Gain imbalance ▪ Center frequency error		▪ Allocation summary ▪ Multicarrier filter	
R&S®FSW-K144 5G NR downlink **R&S®FSW-K145** 5G NR uplink	▪ Power versus time	▪ EVM ▪ EVM xPDSCH ▪ Constellation diagram ▪ I/Q offset ▪ I/Q imbalance ▪ Gain imbalance ▪ Center frequency error		▪ Allocation summary ▪ Channel table with channels used on base station	▪ Automatic detection of Cell ID ▪ Support of multiple bandwidth parts

Measurement application for wire-connected communications systems

Measurement application/ technology	Power	Modulation quality	Spectrum measurements	Miscellaneous	Special features
R&S®FSW-K192 DOCSIS 3.1 downstream	▪ Power ▪ Power versus time ▪ Power versus symbol × carrier	▪ MER versus carrier ▪ MER versus symbol ▪ MER versus symbol × carrier ▪ MER (pilot, data) ▪ Constellation diagram ▪ Center frequency error ▪ Symbol clock error ▪ Group delay	▪ Power measurement ▪ Spectrum flatness	Decoding ▪ LDPC BER ▪ LDPC CWER ▪ Trigger to frame	Automatic detection of ▪ Cyclic prefix ▪ Rolloff ▪ PLC start index ▪ Continuous pilots ▪ NCP ▪ Profile A ▪ N_{FFT}
R&S®FSW-K193 DOCSIS 3.1 upstream	▪ Power ▪ Power versus time ▪ Power versus symbol × carrier	▪ MER versus carrier ▪ MER versus symbol ▪ MER versus symbol × carrier ▪ MER (pilot, data) ▪ Constellation diagram ▪ Center frequency error ▪ Symbol clock error ▪ Group delay	▪ Power spectrum ▪ Power versus carrier (synchronous ACP) ▪ Spectrum flatness	▪ Individual results for frame objects ▪ Trigger to frame	Automatic detection of ▪ Cyclic prefix ▪ Rolloff


R&S®FSW-K201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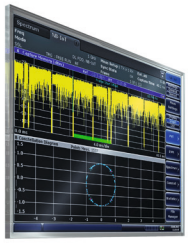
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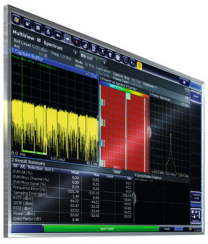
R&S®FSW-K106


R&S®FSW-K7

Specifications in brief

Specifications in brief		
Frequency		
Frequency range	R&S®FSW8	2 Hz to 8 GHz
	R&S®FSW13	2 Hz to 13.6 GHz
	R&S®FSW26	2 Hz to 26.5 GHz
	R&S®FSW43	2 Hz to 43.5 GHz
	R&S®FSW50	2 Hz to 50 GHz
	R&S®FSW67	2 Hz to 67 GHz
	R&S®FSW85	2 Hz to 85 GHz, up to 90 GHz with R&S®FSW-B90G option, YIG preselector = off
Aging of frequency reference		1×10^{-7}/year
	with R&S®FSW-B4 option	3×10^{-8}/year
Bandwidths		
Resolution bandwidths	standard filter	1 Hz to 10 MHz, 80 MHz with R&S®FSW-B8 option
	RRC filter	18 kHz (NADC), 24.3 kHz (TETRA), 3.84 MHz (3GPP)
	channel filter	100 Hz to 5 MHz
	video filter	1 Hz to 10 MHz
I/Q demodulation bandwidth		10 MHz
	with R&S®FSW-B28 option	28 MHz
	with R&S®FSW-B40 option	40 MHz
	with R&S®FSW-B80 option	80 MHz
	with R&S®FSW-B160 option	160 MHz
	with R&S®FSW-B320 option	320 MHz
	with R&S®FSW-B512 option	512 MHz
	with R&S®FSW-B1200 option	1.2 GHz [1]
	with R&S®FSW-B2001 option	2 GHz [1]
	with R&S®FSW-B2000 option	2 GHz [2]
	with R&S®FSW-B5000 option	5 GHz [3]
Phase noise	10 kHz offset from carrier	
	500 MHz carrier	–141 dBc (1 Hz) (typ.)
	1 GHz carrier	–140 dBc (1 Hz) (typ.)
	10 GHz carrier	–133 dBc (1 Hz) (typ.)
Displayed average noise level (DANL)	2 GHz	–156 dBm (1 Hz) (typ.)
	with R&S®FSW-B13 option	–159 dBm (1 Hz) (typ.)
DANL with preamplifier (R&S®FSW-B24 option)	2 GHz	–169 dBm (1 Hz) (typ.)
Intermodulation		
Third-order intercept (TOI)	f < 1 GHz	+30 dBm (typ.)
	f < 3 GHz	+25 dBm (typ.)
	19 GHz to 26.5 GHz	+23 dBm (typ.)
Total measurement uncertainty	8 GHz	< 0.37 dB

[1] Not available for the R&S®FSW8 and R&S®FSW13.
[2] 2 GHz demodulation bandwidth for frequencies > 5.5 GHz. R&S®RTO2044 digital oscilloscope required. Not available for the R&S®FSW8 and R&S®FSW13.
[3] Available for the R&S®FSW43 and R&S®FSW85. 5 GHz demodulation bandwidth for frequencies > 9.5 GHz. R&S®RTO2064 digital oscilloscope required.

Ordering information

Designation	Type	Order No.
Base unit		
Signal and spectrum analyzer, 2 Hz to 8 GHz	R&S®FSW8	1331.5003.08
Signal and spectrum analyzer, 2 Hz to 13.6 GHz	R&S®FSW13	1331.5003.13
Signal and spectrum analyzer, 2 Hz to 26.5 GHz	R&S®FSW26	1331.5003.26
Signal and spectrum analyzer, 2 Hz to 43.5 GHz	R&S®FSW43	1331.5003.43
Signal and spectrum analyzer, 2 Hz to 50 GHz	R&S®FSW50	1331.5003.50
Signal and spectrum analyzer, 2 Hz to 67 GHz	R&S®FSW67	1331.5003.67
Signal and spectrum analyzer, 2 Hz to 85 GHz [1]	R&S®FSW85	1331.5003.85
Hardware options		
OCXO precision frequency reference	R&S®FSW-B4	1313.0703.02
Resolution bandwidth > 10 MHz [2]	R&S®FSW-B8	1313.2464.26
Resolution bandwidth > 10 MHz [3]	R&S®FSW-B8	1313.2464.02
External generator control	R&S®FSW-B10	1313.1622.02
Highpass filter for harmonic measurements	R&S®FSW-B13	1313.0761.02
Digital baseband interface	R&S®FSW-B17	1313.0784.02
Spare solid state drive (removable hard drive)	R&S®FSW-B18	1313.0790.06
LO/IF connections for external mixers [4]	R&S®FSW-B21	1313.1100.28
LO/IF connections for external mixers [5]	R&S®FSW-B21	1313.1100.86
RF preamplifier, 100 kHz to 13.6 GHz [6]	R&S®FSW-B24	1313.0832.13
RF preamplifier, 100 kHz to 26.5 GHz [7]	R&S®FSW-B24	1313.0832.26
RF preamplifier, 100 kHz to 43.5 GHz [8]	R&S®FSW-B24	1313.0832.43
RF preamplifier, 100 kHz to 50 GHz [9]	R&S®FSW-B24	1313.0832.49
RF preamplifier, 100 kHz to 50 GHz [10]	R&S®FSW-B24	1313.0832.51
RF preamplifier, 100 kHz to 67 GHz [11]	R&S®FSW-B24	1313.0832.66
RF preamplifier, 100 kHz to 67 GHz [12]	R&S®FSW-B24	1313.0832.67
Electronic attenuator, 1 dB steps	R&S®FSW-B25	1313.0990.02
USB mass memory write protection	R&S®FSW-B33	1313.3602.02
28 MHz analysis bandwidth	R&S®FSW-B28	1313.1645.02
40 MHz analysis bandwidth	R&S®FSW-B40	1313.0861.02
80 MHz analysis bandwidth	R&S®FSW-B80	1313.0878.02
160 MHz analysis bandwidth	R&S®FSW-B160	1325.4850.14
320 MHz analysis bandwidth	R&S®FSW-B320	1325.4867.14
512 MHz analysis bandwidth	R&S®FSW-B512	1331.7106.14
1200 MHz analysis bandwidth [13]	R&S®FSW-B1200	1331.6400.14
2000 MHz analysis bandwidth [13]	R&S®FSW-B2001	1331.6916.14
2 GHz analysis bandwidth [14]	R&S®FSW-B2000	1325.4750.02
5 GHz analysis bandwidth [15]	R&S®FSW-B5000	1331.6997.43
5 GHz analysis bandwidth [16]	R&S®FSW-B5000	1331.6997.85

[1] Frequency range for R&S®FSW85 with R&S®FSW-B90G option: 2 Hz to 90 GHz (YIG preselector off).
[2] For R&S®FSW8, R&S®FSW13 and R&S®FSW26.
[3] For R&S®FSW43, R&S®FSW50, R&S®FSW67 and R&S®FSW85. Export license required.
[4] For R&S®FSW26, R&S®FSW43, R&S®FSW50 and R&S®FSW67.
[5] For R&S®FSW85.
[6] For R&S®FSW8 and R&S®FSW13.
[7] For R&S®FSW26.
[8] For R&S®FSW43 and R&S®FSW67.
[9] For R&S®FSW50.
[10] For R&S®FSW50. Export license required.
[11] For R&S®FSW67.
[12] For R&S®FSW67. Export license required.
[13] For R&S®FSW26, R&S®FSW43, R&S®FSW50, R&S®FSW67 and R&S®FSW85. Not in combination with R&S®FSW-B2000.
[14] For R&S®FSW26, R&S®FSW43, R&S®FSW50, R&S®FSW67 and R&S®FSW85. Requires R&S®RTO2044. Not in combination with R&S®FSW-B1200, R&S®FSW-B2001, R&S®FSW-B800R or R&S®FSW-B5000.
[15] For R&S®FSW43. Requires R&S®RTO2064. Not in combination with R&S®FSW-B2000.
[16] For R&S®FSW85. Requires R&S®RTO2064. Not in combination with R&S®FSW-B2000.

Designation	Type	Order No.
Analog baseband inputs, 40 MHz analysis bandwidth (for R&S®FSW8 and R&S®FSW13)	R&S®FSW-B71	1313.1651.13
Analog baseband inputs, 40 MHz analysis bandwidth (for R&S®FSW26, R&S®FSW43 and R&S®FSW50)	R&S®FSW-B71	1313.1651.26
Analog baseband inputs, 40 MHz analysis bandwidth (for R&S®FSW67)	R&S®FSW-B71	1313.1651.67
Analog baseband inputs, 40 MHz analysis bandwidth (for R&S®FSW85)	R&S®FSW-B71	1313.1651.86
80 MHz analysis bandwidth for analog baseband inputs	R&S®FSW-B71E	1313.6547.02
Oscilloscope baseband inputs	R&S®FSW-B2071	1331.8302.02
Real-time spectrum analyzer 512 MHz, POI ≤ 15 µs	R&S®FSW-B512R	1331.7106.16
Real-time spectrum analyzer 800 MHz, POI ≤ 15 µs [17]	R&S®FSW-B800R	1331.6400.16
Frequency extension 90 GHz [18]	R&S®FSW-B90G	1331.7693.02
I/Q memory extension 6 GB [19]	R&S®FSW-B106	1331.6451.02
I/Q memory extension 8 GB [20]	R&S®FSW-B108	1331.6751.02
DIG IQ 40G streaming out interface	R&S®FSW-B517	1331.6980.02
Firmware		
Pulse measurements	R&S®FSW-K6	1313.1322.02
Time side lobe measurement [21]	R&S®FSW-K6S	1325.3738.02
Analog modulation analysis for AM/FM/φM	R&S®FSW-K7	1313.1339.02
GSM/EDGE/EDGE Evolution/VAMOS measurements	R&S®FSW-K10	1313.1368.02
VOR/ILS measurements	R&S®FSW-K15	1331.4388.02
Multicarrier group delay measurements	R&S®FSW-K17	1313.4150.02
Amplifier measurements	R&S®FSW-K18	1325.2170.02
Direct DPD measurements [22]	R&S®FSW-K18D	1331.6845.02
Noise power ratio measurements	R&S®FSW-K19	1331.8283.02
Noise figure measurements	R&S®FSW-K30	1313.1380.02
Security write protection of solid state drive	R&S®FSW-K33	1322.7936.02
Phase noise measurements	R&S®FSW-K40	1313.1397.02
Spurious measurements	R&S®FSW-K50	1325.2893.02
EMI measurements	R&S®FSW-K54	1313.1400.02
CISPR calibration for R&S®FSW-K54	R&S®FSW-K54CAL	1331.5932.02
Transient measurement application	R&S®FSW-K60	1313.7495.02
Transient hop measurement [23]	R&S®FSW-K60H	1322.9916.02
Transient chirp measurement [23]	R&S®FSW-K60C	1322.9745.02
Vector signal analysis	R&S®FSW-K70	1313.1416.02
Multi-modulation analysis [24]	R&S®FSW-K70M	1338.4177.02
BER PRBS measurements [24]	R&S®FSW-K70P	1338.3893.02
3GPP FDD (WCDMA) BS measurements (incl. HSDPA and HSDPA+)	R&S®FSW-K72	1313.1422.02
3GPP FDD (WCDMA) MS measurements (incl. HSUPA and HSUPA+)	R&S®FSW-K73	1313.1439.02
TD-SCDMA BS measurements	R&S®FSW-K76	1313.1445.02
TD-SCDMA UE measurements	R&S®FSW-K77	1313.1451.02
CDMA2000® BS measurements	R&S®FSW-K82	1313.1468.02
CDMA2000® MS measurements	R&S®FSW-K83	1313.1474.02
1xEV-DO BS measurements	R&S®FSW-K84	1313.1480.02
1xEV-DO MS measurements	R&S®FSW-K85	1313.1497.02
WLAN IEEE 802.11a/b/g measurements	R&S®FSW-K91	1313.1500.02
WLAN IEEE 802.11n measurements	R&S®FSW-K91N	1313.1516.02

[17] For R&S®FSW26, R&S®FSW43, R&S®FSW50, R&S®FSW67 and R&S®FSW85.
[18] For R&S®FSW85, without preselection for f > 85 GHz.
[19] Requires R&S®FSW-B160 or R&S®FSW-B320.
[20] Requires R&S®FSW-B1200 or R&S®FSW-B2001.
[21] Requires R&S®FSW-K6.
[22] Requires R&S®FSW-K18.
[23] Requires R&S®FSW-K60.
[24] Requires R&S®FSW-K70.

Designation	Type	Order No.
WLAN IEEE 802.11ac measurements [25]	R&S®FSW-K91AC	1313.4209.02
WLAN IEEE 802.11ax measurements [25]	R&S®FSW-K91AX	1331.6345.02
WLAN IEEE 802.11p measurements [25]	R&S®FSW-K91P	1321.5646.02
WLAN IEEE 802.11ad measurements [26]	R&S®FSW-K95	1313.1639.02
WLAN IEEE 802.11ay measurements [26]	R&S®FSW-K97	1338.4902.02
EUTRA/LTE FDD BS measurements	R&S®FSW-K100	1313.1545.02
EUTRA/LTE FDD UE measurements	R&S®FSW-K101	1313.1551.02
EUTRA/LTE BS MIMO measurements	R&S®FSW-K102	1313.1568.02
EUTRA/LTE-Advanced UL measurements	R&S®FSW-K103	1313.2478.02
EUTRA/LTE TDD BS measurements	R&S®FSW-K104	1313.1574.02
EUTRA/LTE TDD uplink measurements	R&S®FSW-K105	1313.1580.02
EUTRA/LTE NB-IoT downlink measurements	R&S®FSW-K106	1331.6351.02
VERIZON 5GTF	R&S®FSW-K118	1331.7370.02
VERIZON 5GTF UL	R&S®FSW-K119	1331.8060.02
3GPP 5G-NR DL measurements	R&S®FSW-K144	1338.3606.02
3GPP 5G-NR UL measurements	R&S®FSW-K145	1338.3612.02
DOCSIS 3.1 OFDM downstream	R&S®FSW-K192	1325.4138.02
DOCSIS 3.1 OFDMA upstream	R&S®FSW-K193	1325.4144.02
OneWeb reverse link measurements	R&S®FSW-K201	1331.7387.02
160 MHz real-time measurement application, POI ≤ 15 µs [27]	R&S®FSW-K161R	1338.2700.02
512 MHz real-time measurement application, POI > 15 µs [28]	R&S®FSW-K512RE	1338.4731.02
800 MHz real-time measurement application, POI > 15 µs [29]	R&S®FSW-K800RE	1338.7801.02
User-defined frequency correction using SnP file	R&S®FSW-K544	1338.2716.02

[25] Requires R&S®FSW-K91.
[26] Requires R&S®FSW-B2000, R&S®FSW-B2001 or R&S®FSW-B5000.
[27] Requires R&S®FSW-B160 or R&S®FSW-B320.
[28] Requires R&S®FSW-B512.
[29] Requires R&S®FSW-B1200 or R&S®FSW-B2001.

Warranty		
Base unit		3 years
All other items [1]		1 year
Options		
Extended warranty, one year	R&S®WE1	Please contact your local Rohde&Schwarz sales office.
Extended warranty, two years	R&S®WE2	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	
Extended warranty with accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	

[1] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

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