

R&S® FSVA3000 SIGNAL AND SPECTRUM ANALYZER

Ahead with demanding applications



Product Brochure
Version 08.00

ROHDE & SCHWARZ

Make ideas real



AT A GLANCE

With 1 GHz of analysis bandwidth, outstanding phase noise of < -127 dBc (1 Hz) at 10 kHz offset and a high dynamic range, the R&S®FSVA3000 signal and spectrum analyzer has everything it takes to master demanding measurement applications such as 5G NR measurements. Offering high measurement speed and an advanced operating concept, it is the right instrument for challenging signal analysis tasks both in the lab and in production.

The R&S®FSVA3000 offers a performance level that until recently was reserved for high-end instruments. It is equally suitable for analyzing frequency agile signals and wideband signals as for linearizing power amplifiers. It supports all modern cellular and wireless standards, and its frequency ranges and bandwidth options perfectly match the requirements of 5G NR.

The R&S®FSVA3000 excels with high measurement speed without any compromise in RF performance. It provides high throughput and yield in cellular base station and component production and is also perfectly suited for use in development and verification labs.

The R&S®FSVA3000 features functions and wizards that make the configuration of complex measurements fast and easy. Setting up RF parameters with touchscreen gestures is as easy as using your smartphone. The auto-set feature automatically sets key parameters such as frequency, level and gating. An SCPI recorder, which translates manual operation into remote control command scripts, considerably speeds up script programming. And event based actions support you when debugging your DUT by capturing and documenting rare events.



Front view of the R&S®FSVA3000.

KEY FACTS

- ▶ Frequency range from 10 Hz to 4 GHz/7.5 GHz/13.6 GHz/30 GHz/44 GHz/50 GHz/54 GHz
- ▶ Frequency range extension up to 325 GHz with external harmonic mixer from Rohde & Schwarz
- ▶ Frequency range extension up to 50 GHz for best performance signal analysis with external frontends from Rohde & Schwarz
- ▶ Analysis bandwidth up to 1 GHz
- ▶ SSB phase noise at 10 kHz offset (1 GHz): < -127 dBc (1 Hz)
- ▶ Third-order intercept (TOI) at 1 GHz: +20 dBm (typ.)
- ▶ DANL at 1 GHz: -153 dBm
- ▶ DANL at 1 GHz with optional preamplifier: -167 dBm
- ▶ Ready for cloud based testing
- ▶ 10 Gbit/s LAN interface (option)
- ▶ User interface with multitouch display, SCPI recorder and event based actions
- ▶ Measurement applications for analog and digital signal analysis, including 5G NR

BENEFITS

- Advanced user interface
 - ▶ page 4
- Clearly structured, intuitive GUI
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- Ready for 5G and other wireless standards
 - ▶ page 8
- Fast measurement speed for production
 - ▶ page 9
- Health and utilization monitoring service (HUMS)
 - ▶ page 10
- Best-in-class performance and feature set
 - ▶ page 11
- Wide range of measurement applications
 - ▶ page 12



Rear view of the R&S®FSVA3000.

ADVANCED USER INTERFACE

Depending on the application, certain settings need to be made on the signal and spectrum analyzer. For simple spectral measurements, this can be just a few parameters. In the case of complex automated conformance tests, lengthy programming may be required. Whatever the objective, the R&S®FSVA3000 excels with fast access to measurement results thanks to its simple and fast setup.

Multitouch display

Basic RF measurements typically require the center frequency, span, level and probably the resolution bandwidth to be configured. Finding the ideal settings can be tricky when measuring an unknown signal. The R&S®FSVA3000 features a multitouch display and intuitive menu structure for exceptional ease of operation. A one-finger swipe across the screen adjusts the center frequency or the reference level. Two-finger gestures adjust the displayed span or level range. The right settings are done in no time.

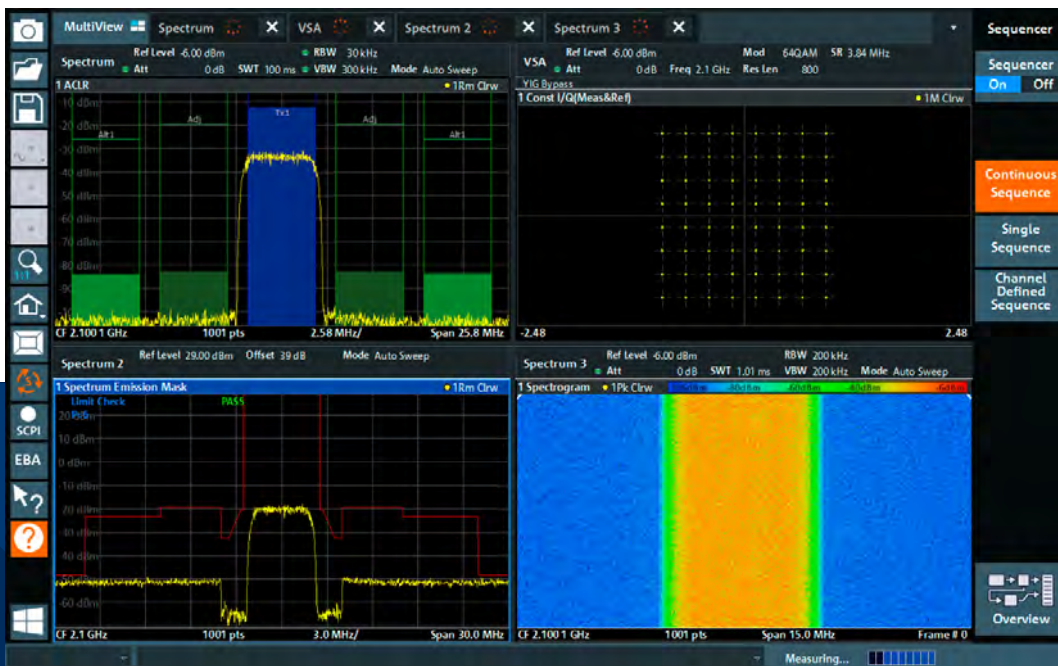
Various measurements can be displayed simultaneously in separate windows on the large 10.1" screen. This greatly facilitates result interpretation. The MultiView function displays all active measurements on one screen. With the sequencer function, all channels are measured consecutively, one after the other. The user is provided with constantly updated results, and no time-consuming parameter adjustments are necessary.

SCPI recorder for fast automation

The R&S®FSVA3000 embedded SCPI recorder accelerates the programming of executable control scripts. All manual user input is translated into SCPI commands that can be exported as plain SCPI or in the syntax of common programming languages and tools such as C++, Python and MATLAB®.

If manual code adaptation is required, context-sensitive online help provides comprehensive information, including SCPI commands and parameters.

MultiView displays all active measurements at the same time.



Event based actions dialog

Troubleshooting in R&D regularly requires the analysis of sporadic events, for instance failure to comply with limit lines or specified EVM values. The R&S®FSVA3000 lets you define rules to perform specific actions in response to such events, for instance storing I/Q data or screenshots. A final report lists all triggered events over an extended period.

The setup is done on a simple GUI, eliminating the need for an external PC for remote control.

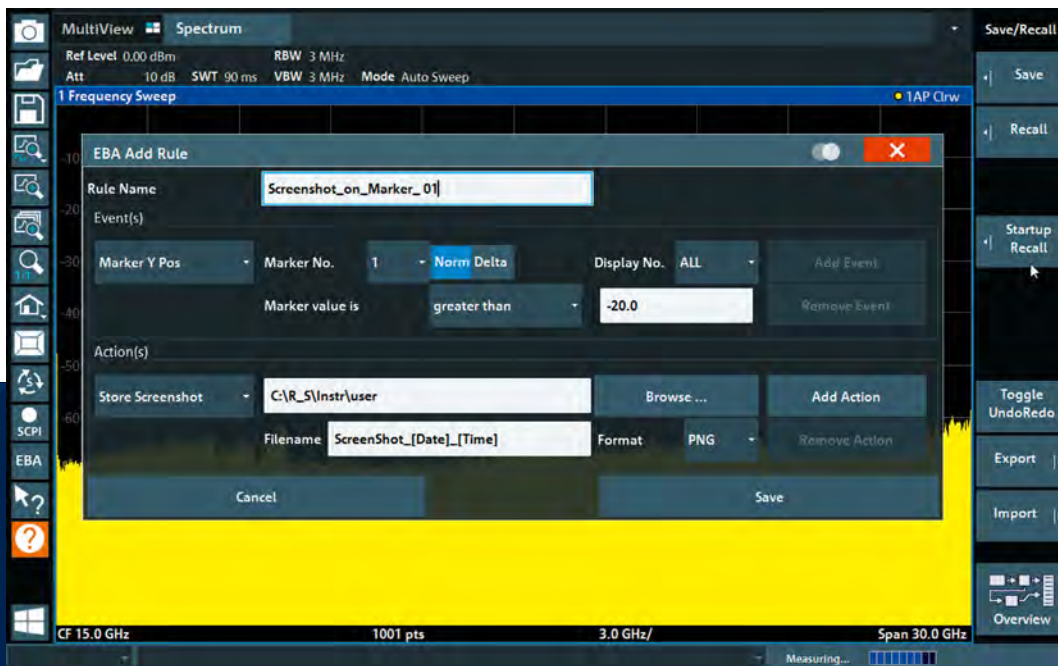
Autoset

The autoset feature allows you to quickly configure frequently performed measurements such as occupied bandwidth, spectrum, TDP, CCDF, APD and C/N. With the autoset feature, the instrument detects the parameters of an incoming signal and automatically sets the appropriate frequency, level, trigger and gating. For standard conformant ACLR and SEM measurements, the settings are automatically configured in line with the corresponding standard.

Smart signal generator control

Many measurements require a signal generator, either to provide a simple CW signal or a modulated carrier. For such applications, the interaction between the R&S®FSVA3000 and a generator such as the R&S®SMBV100B vector signal generator goes far beyond classic signal tracking. With the coupling manager, the analyzer directly controls the generator. Changes of frequency or level on the analyzer are directly taken over by the generator. The user interface of the generator can be displayed on the analyzer, so the user can operate the complete setup from a single screen. The SCPI recorder can also be coupled. Manual settings on either instrument are recorded in a single script. Advanced amplifier measurements with digital predistortion are possible. The analyzer directly provides the predistorted waveform to the generator. The hardware can be coupled via the optional 1 GHz clock reference for better phase synchronization.

In many cases, the event based actions dialog eliminates the need for an external PC. Instead of SCPI programming, IF-THEN commands are set up via the GUI.



CLEARLY STRUCTURED, INTUITIVE GUI

10.1" high-resolution, multitouch display

- ▶ 1280 × 800 pixel
- ▶ Multitouch operation

Toolbar

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

Zoom into graphs

- ▶ Zoom into graphs for a detailed view
- ▶ Zoom into multiple areas simultaneously
- ▶ Adapt hardware settings to zoom area

SCPI recorder

- ▶ Simplified code generation for automatic, remote controlled measurements

Event based actions

- ▶ Configure and apply IF-THEN tasks right on the GUI
- ▶ Trigger on sporadic events for quick troubleshooting

Application starter

- ▶ Quick access to .exe or .com Windows programs

Three USB 2.0 ports

- ▶ For storage media
- ▶ For connecting accessories
- ▶ For power sensors with USB connector (additional USB 2.0/USB 3.0 ports on rear panel)



MultiView and sequencer

- ▶ Display all active measurements on one screen
- ▶ Measure all channels consecutively
- ▶ Receive continually updated results

Autoset

- ▶ Automatic setting of frequency, level, trigger and gating based on the incoming signal
- ▶ Automatic selection of ACLR and SEM parameter tables in line with the corresponding standard



Start commonly used measurements

- ▶ ACLR, OBW, TOI, C/N, SEM

Removable solid state disk

- ▶ Option

Probe power supply

- ▶ +15 V DC, -12.6 V DC and ground

Settings overview

- ▶ Display and adapt all hardware related settings on one screen

Smart port

- ▶ For power sensors
- ▶ For smart noise sources

READY FOR 5G AND OTHER WIRELESS STANDARDS

The R&S®FSVA3000 signal and spectrum analyzer is ideal for analyzing wireless communications signals in R&D, system testing, verification and production.

More bandwidth

Modern communications signals require ever more bandwidth. With 1 GHz of analysis bandwidth, the R&S®FSVA3000 sets a new standard in its class. It allows capturing 10 contiguous 5G NR component carriers simultaneously. This saves measurement time and makes it possible to analyze interactions and timing between the carriers. The 1 GHz bandwidth is available up to the maximum frequency of the respective analyzer model, e.g. 44 GHz. The R&S®FSVA3000 features an excellent dynamic range, which is beneficial not only for spectral measurements but also for analyzing and demodulating signals with a high crest factor, such as OFDM signals or signals with a high modulation order. Excellent EVM values better than 1% can be achieved for 320 MHz wide WLAN signals at 2.4 GHz or 5.8 GHz and also for 5G NR signals at 28 GHz. This increases the margin for the DUT as it minimizes the error introduced by the measuring instrument.

Support of all modern wireless standards

The R&S®FSVA3000 provides signal analysis options for all modern wireless and cellular communications standards, i.e.

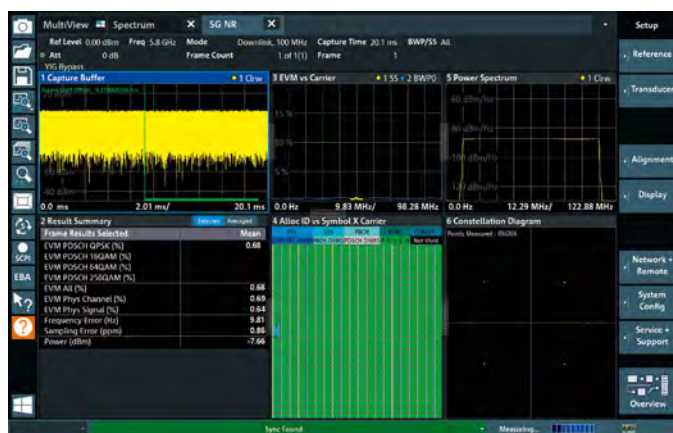
- ▶ 3GPP 5G NR
- ▶ EUTRA/LTE/LTE-Advanced
- ▶ NB-IoT downlink
- ▶ WCDMA
- ▶ GSM/EDGE/EDGE Evolution
- ▶ WLAN IEEE 802.11a/b/g/n/p/ac/ax/be
- ▶ Bluetooth® Basic Rate/Enhanced Data Rate/Low Energy



R&S®FE50DTR external frontend with R&S®SMM100A vector signal generator and R&S®FSVA3000 signal and spectrum analyzer.

Best signal analysis performance with external frontends

5G NR signal analysis at microwave frequencies usually takes place in anechoic chambers where space is scarce. The R&S®FE50DTR and R&S®FE44S external frontends solve this challenge. With separation of frequency upconversion and downconversion from the signal analyzer and generator, the small radio head can be mounted close to the antenna in order to reduce cable losses. Additionally, lower frequency base units can be used, allowing for an upgrade of existing FR1 setups. The excellent radio quality of the R&S®FE50DTR and R&S®FE44S allow all relevant in-band measurements in line with 3GPP and provides EVM performance up to 0.35% for 100 MHz wide 5G NR signals at 28 GHz.



Analysis of a 5G NR signal with the R&S®FSVA3-K144 (downlink) and R&S®FSVA3-K145 (uplink) options.

FAST MEASUREMENT SPEED FOR PRODUCTION

Automated production of components, modules and devices requires spectral measurements as well as signal demodulation. The R&S®FSVA3000 signal and spectrum analyzer performs even complex measurement cycles in a minimum of time.

The R&S®FSVA3000 has been designed for high-speed performance in automated test systems. It performs spectral measurements, signal demodulation and switching between different measuring modes in a minimum of time. Its synthesizer technology enables fast frequency switching. FFT based ACLR and SEM measurements are faster than swept spectrum measurements while offering the same dynamic range.

The R&S®FSV3-K147 option enables combined and automated ACLR, SEM and EVM measurements on 5G NR downlink signals. This feature provides significant speed advantages thanks to parallelized calculations and adaptable trigger settings. It is especially advantageous for over-the-air (OTA) characterization of devices, which involves a large number of measurements.

The enhanced computing power option provides a quad core CPU and a PCIe 3.0 bus system to deliver faster clock speed, higher data transfer rates and more RAM capacity to accelerate digital signal demodulation.

Ready for cloud based testing

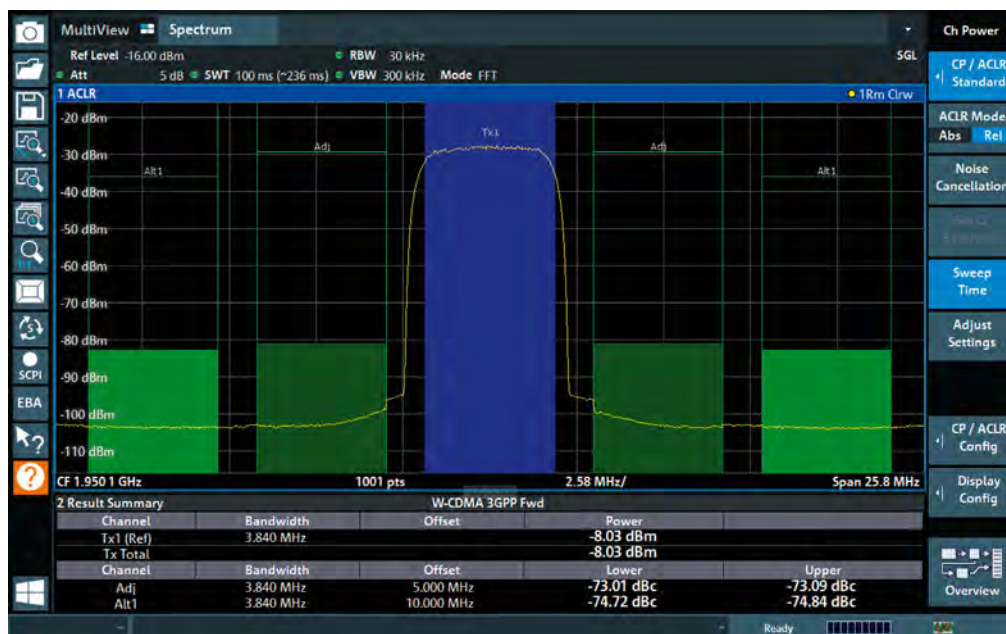
In cloud based test systems, signal analysis is done on external CPUs. This requires the transfer of huge amounts of I/Q data. The R&S®FSVA3000 perfectly interacts with cloud based processing. Its architecture enables fastest transfer of I/Q measurement data. The optional 10 Gbit/s LAN interface allows I/Q data transfer even at the high sample rates required for 1 GHz analysis bandwidth.

Emulation modes for legacy instruments

Replacing legacy equipment in automated test systems can be a laborious task if all control code has to be rewritten.

The R&S®FSVA3000 simplifies the replacement of obsolete instruments. Emulation modes for many legacy analyzers, including R&S®FSP, R&S®FSU/R&S®FSQ, R&S®FSV, Keysight PSA, Keysight PXA and HP 856x/HP 8560E, make it possible to keep existing code. Now there is no reason to hesitate to upgrade your legacy equipment to an R&S®FSVA3000.

FFT based ACLR measurements provide significant speed improvements over swept measurements while the R&S®FSVA3000 maintains its excellent dynamic range.



HEALTH AND UTILIZATION MONITORING SERVICE (HUMS)

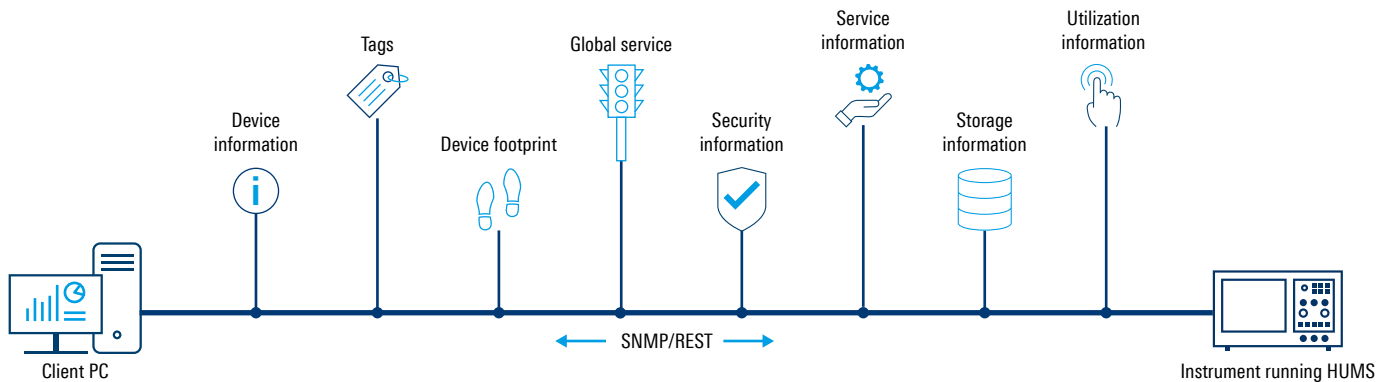
Increase utilization, avoid downtime and reduce costs.

Nowadays, more and more test and measurement equipment is connected to the local network. Monitoring this equipment is necessary to increase the overall instrument utilization, avoid downtimes and optimize costs.

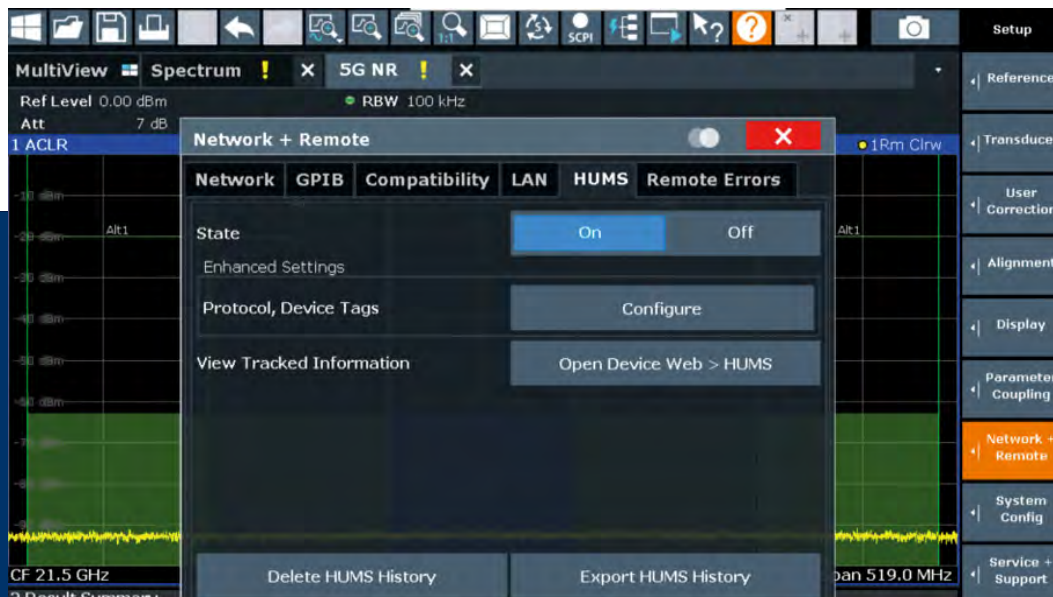
The R&S®FSVA3000 offers the optional R&S®FSV3-K980 health and utilization monitoring service software option for easy monitoring of the instrument use, status and health.

The software runs as a service in the background on the device operating system and communicates with the operating system (OS) and the device firmware. HUMS can be accessed via an SNMP or REST interface and provides all necessary information about the health status and utilization over time.

The R&S®FSV3-K980 HUMS option provides utilization and health data via SNMP or REST interfaces



The R&S®FSV3-K980 HUMS option configuration



BEST-IN-CLASS PERFORMANCE AND FEATURE SET

Many measurement applications in the wireless, A&D and component industries require low phase noise, wide analysis bandwidth and high dynamic range. The R&S®FSVA3000 signal and spectrum analyzer is the perfect tool in the production and verification of wireless communications systems and components and for service and maintenance applications in the A&D market.

Best-in-class RF performance

The R&S®FSVA3000 offers RF performance that was previously reserved for high-end instruments. With SSB phase noise as low as < -127 dBc (1 Hz) at 10 kHz offset, narrowband measurements very close to the carrier become possible. With the optional R&S®FSV3-K40 phase noise measurement application, the instrument's low inherent phase noise leaves enough margin for phase noise measurements on the most commonly used oscillators in the wireless and A&D industries.

The maximum analysis bandwidth of 1 GHz is unrivaled in this instrument class. It is important for analyzing wideband signals, characterizing frequency agile signals and capturing extremely short events. Characterizing the nonlinear behavior of power amplifiers also requires a wide analysis bandwidth.

The dynamic range is typically limited at the upper end by the third-order intercept (TOI). The R&S®FSVA3000 has a typical TOI of +20 dBm at 1 GHz. This allows accurate measurements of harmonics and spurs even in the presence of strong signals, and provides an excellent dynamic range for adjacent channel power measurements. It also leaves sufficient margin for demodulation and EVM measurements on signals with a very wide bandwidth and a high crest factor.

Measurement applications

The R&S®FSVA3000 features a huge set of measurement applications, including:

- ▶ AM/FM/PM modulation analysis
- ▶ Vector signal analysis of single-carrier digitally modulated signals, including calculation of EVM and equalization
- ▶ Amplifier noise figure and gain measurements
- ▶ Phase noise measurements
- ▶ In-depth pulse analysis and analysis of pulse behavior over time
- ▶ Amplifier measurements including AM/AM, AM/PM and digital predistortion
- ▶ Measurement options for all modern wireless and cellular standards

WIDE RANGE OF MEASUREMENT APPLICATIONS

GENERAL-PURPOSE MEASUREMENT APPLICATIONS

Measurement application	Measurement parameters	Measurement functions
R&S®FSV3-K6 Pulse measurements	Pulse parameters: <ul style="list-style-type: none"> ▶ 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 ratio, pulse-to-pulse power ratio ▶ 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 	<ul style="list-style-type: none"> ▶ Point-in-pulse measurements: frequency, amplitude, phase versus pulse, trend charts and histograms for all parameters ▶ Pulse statistics: standard deviation, average, maximum, minimum ▶ Pulse tables ▶ User-defined measurement parameters
R&S®FSV3-K7 Modulation analysis for AM/FM/PM modulated single carriers	<ul style="list-style-type: none"> ▶ Modulation depth (AM) ▶ Frequency deviation (FM) ▶ Phase deviation (PM) ▶ Modulation frequency ▶ THD and SINAD ▶ Carrier power 	<ul style="list-style-type: none"> ▶ AF spectrum ▶ RF spectrum ▶ AF scope display ▶ AF filters (lowpass and highpass) ▶ Weighting filters (CCITT) ▶ Squelch
R&S®FSV3-K8 Bluetooth® Basic Rate/Enhanced Data Rate/Low Energy measurements	<ul style="list-style-type: none"> ▶ Packet type ▶ Packet length ▶ Output power ▶ Delta frequency (Δf) ▶ Frequency drift ▶ ICFT 	<ul style="list-style-type: none"> ▶ RF spectrum ▶ RF envelope ▶ Constellation ▶ Demod waveform ▶ Symbols
R&S®FSV3-K18 Amplifier measurements R&S®FSV3-K18D Direct DPD measurements R&S®FSV3-K18F Frequency response and group delay R&S®FSV3-K18M Memory-polynomial DPD	<ul style="list-style-type: none"> ▶ AM/AM, AM/PM, EVM ▶ Width of AM/AM and AM/PM curves ▶ Magnitude, phase and group delay versus frequency (R&S®FSV3-K18F) ▶ Polynomial coefficients (R&S®FSV3-K18) ▶ Memory-polynomial coefficients (R&S®FSV3-K18M) 	<ul style="list-style-type: none"> ▶ General amplifier measurements ▶ Polynomial based digital predistortion (R&S®FSV3-K18) ▶ Direct digital predistortion (R&S®FSV3-K18D) ▶ Memory-polynomial predistortion (R&S®FSV3-K18M) ▶ Control and synchronization of an external signal generator, e.g. the R&S®SMBV100B vector signal generator ▶ Characterization of dynamic behavior of two-port devices ▶ Real-time memory DPD (with Hammerstein model) (R&S®FSV3-K18M)
R&S®FSV3-K30 Noise figure and gain measurements based on Y-factor method	<ul style="list-style-type: none"> ▶ Noise figure ▶ Noise temperature ▶ Gain ▶ Y-factor 	<ul style="list-style-type: none"> ▶ 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

Measurement application	Measurement parameters	Measurement functions
R&S®FSV3-K40 Phase noise measurements	<ul style="list-style-type: none"> ▶ SSB phase noise ▶ Residual FM and residual PM ▶ Jitter 	<ul style="list-style-type: none"> ▶ 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/PM ▶ Signal tracking ▶ Optional suppression of spurious emissions
R&S®FSV3-K54 EMI measurements	EMI diagnostics and precompliance measurements in line with commercial and military standards: <ul style="list-style-type: none"> ▶ Disturbance voltage ▶ Disturbance power ▶ Radiated disturbance 	<ul style="list-style-type: none"> ▶ EMI detectors and resolution bandwidths in line with CISPR 16-1-1, MIL-STD-461 and DO-160 ▶ Limit line library as specified in the latest EMI standards ▶ Test automation and reporting for fast and repeatable measurements ▶ Transducer factors for antennas, cables, LISNs, etc. ▶ Support of R&S®Elektra EMC software
R&S®FSV3-K60 Transient measurements R&S®FSV3-K60C Transient chirp measurements R&S®FSV3-K60H Transient hop measurements R&S®FSV3-K60P Transient phase noise measurements	<ul style="list-style-type: none"> ▶ 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 	<ul style="list-style-type: none"> ▶ Spectrogram and spectrogram sections, 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, frequency and time domain trace displays ▶ Phase noise ▶ Frequency and phase deviation spectrograms ▶ Trend charts and histograms for all parameters ▶ Chirp and hop statistics: standard deviation, average, maximum and minimum ▶ User-defined measurement parameters
R&S®FSV3-K70 Vector signal analysis R&S®FSV3-K70M Multimodulation analysis R&S®FSV3-K70P BER PRBS measurements	Analysis of digitally modulated single carriers down to bit level: <ul style="list-style-type: none"> ▶ EVM ▶ MER ▶ Phase error ▶ Magnitude error ▶ Carrier frequency error ▶ Symbol rate error ▶ I/Q skew ▶ Rho ▶ I/Q offset, I/Q imbalance, quadrature error ▶ Amplitude droop ▶ Power ▶ Bit error rate of known data streams ▶ Bit error rate of bit streams generated with PRBS shift registers (R&S®FSV3-K70P) ▶ Analysis of vector modulated signals with multiple modulations, e.g. DVB-S2(X) (R&S®FSV3-K70M) 	<ul style="list-style-type: none"> ▶ Eye diagram ▶ Constellation diagram ▶ Vector diagram ▶ Histogram ▶ Equalizer ▶ Multiple modulation formats, e.g.: <ul style="list-style-type: none"> - 2FSK to 64FSK - MSK, GMSK, DMSK - Multiple PSKs (e.g. BPSK, QPSK, 8PSK, 3π/8-8PSK and more) - 16QAM to 1024QAM - 16APSK (DVB-S2), 32APSK (DVB-S2), 2ASK, 4ASK - User-definable constellations

WIDE RANGE OF MEASUREMENT APPLICATIONS

MEASUREMENT APPLICATIONS FOR WIRELESS COMMUNICATIONS SYSTEMS

Measurement application	Power	Modulation quality	Spectrum measurements	Miscellaneous	Special features
R&S®FSV3-K544 Frequency response correction	▶ SnP file in Touchstone file format	▶ Corrects frequency response (amplitude and phase) of the measurement setup	▶ Frequency response correction	▶ SnP file in Touchstone file format	▶ Corrects frequency response (amplitude and phase) of the measurement setup
R&S®FSV3-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 format
R&S®FSV3-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®FSV3-K91 WLAN IEEE 802.11a/b/g R&S®FSV3-K91P WLAN IEEE 802.11p R&S®FSV3-K91N WLAN IEEE 802.11n R&S®FSV3-K91AC WLAN IEEE 802.11ac R&S®FSV3-K91AX WLAN IEEE 802.11ax R&S®FSV3-K91BE WLAN IEEE 802.11be	▶ 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	▶ Bit stream ▶ 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 ▶ IEEE802.11ax PPDU formats: HE SU PPDU, HE MU PPDU, HE trigger based PPDU, HE extended range SU PPDU ▶ IEEE802.11be PPDU formats: EHT MU PPDU (compressed, non-compressed), ETH trigger based PPDU

Measurement application	Power	Modulation quality	Spectrum measurements	Miscellaneous	Special features
R&S®FSV3-K100/-K101/-K104/-K105 EUTRA/LTE TDD and FDD, uplink and downlink measurements	<ul style="list-style-type: none"> ▶ Power measurement in time and frequency domains ▶ CCDF 	<ul style="list-style-type: none"> ▶ EVM ▶ Constellation diagram ▶ I/Q offset ▶ Gain imbalance ▶ Quadrature error ▶ Center frequency error (symbol clock error) 	<ul style="list-style-type: none"> ▶ Spectrum mask ▶ ACLR ▶ Power measurement ▶ Spectrum flatness 	<ul style="list-style-type: none"> ▶ Bit stream ▶ Allocation summary list ▶ Averaging over multiple measurements 	Automatic detection of modulation format, cyclic prefix length and cell ID
R&S®FSV3-K102 EUTRA/LTE MIMO		<ul style="list-style-type: none"> ▶ R&S®FSV3-K100 and -K104 modulation quality measurements for each individual MIMO path 			<ul style="list-style-type: none"> ▶ MIMO time alignment for R&S®FSV3-K100/-K104 ▶ Interband carrier aggregation time alignment
R&S®FSV3-K103 EUTRA/LTE-Advanced uplink measurements			<ul style="list-style-type: none"> ▶ Multicarrier ACLR for FDD and TDD ▶ SEM for contiguously aggregated component carriers 		
R&S®FSV3-K106 EUTRA/LTE NB-IoT downlink measurements	<ul style="list-style-type: none"> ▶ Power measurement in time and frequency domains 	<ul style="list-style-type: none"> ▶ EVM ▶ Constellation diagram ▶ Frequency error ▶ Sampling error 	<ul style="list-style-type: none"> ▶ Spectrum flatness, ACLR, SEM 	<ul style="list-style-type: none"> ▶ Allocation summary list 	<ul style="list-style-type: none"> ▶ Standalone, guard band and in-band operation ▶ Automatic detection of cell ID
R&S®FSV3-K144 5G NR Rel. 15 downlink measurements R&S®FSV3-K145 5G NR Rel. 15 uplink measurements R&S®FSV3-K147 5G NR combined ACLR/SEM/EVM measurements R&S®FSV3-K148 5G NR Rel. 16 extension for uplink/downlink measurements R&S®FSV3-K171 5G NR Rel. 17 extension for uplink/downlink measurements R&S®FSV3-K175 Extension for O-RAN measurements	<ul style="list-style-type: none"> ▶ Power versus time 	<ul style="list-style-type: none"> ▶ EVM ▶ EVM xPDSCH ▶ Constellation diagram ▶ I/Q offset ▶ I/Q imbalance ▶ Gain imbalance ▶ Center frequency error 	<ul style="list-style-type: none"> ▶ Multicarrier ACLR, SEM 	<ul style="list-style-type: none"> ▶ Allocation summary list ▶ Channel table with channels used on base station 	<ul style="list-style-type: none"> ▶ Automatic detection of cell ID ▶ Support of multiple bandwidth parts

SPECIFICATIONS IN BRIEF

Specifications in brief		
Frequency		
Frequency range	R&S®FSVA3004	10 Hz ¹⁾ to 4 GHz
	R&S®FSVA3007	10 Hz ¹⁾ to 7.5 GHz
	R&S®FSVA3013	10 Hz ¹⁾ to 13.6 GHz
	R&S®FSVA3030	10 Hz ¹⁾ to 30 GHz
	R&S®FSVA3044	10 Hz ¹⁾ to 44 GHz
	R&S®FSVA3050	10 Hz ¹⁾ to 50 GHz
	with R&S®FSV3-B54G option	10 Hz ¹⁾ to 54 GHz
Aging of frequency reference		1 × 10 ⁻⁶ per year
	with R&S®FSV3-B4 option	1 × 10 ⁻⁷ per year
Bandwidth		
	standard filter	1 Hz to 10 MHz
Resolution bandwidth	RRC filter	18 kHz (NADC), 24.3 kHz (TETRA), 3.84 MHz (3GPP), 4.096 MHz
	channel filter	100 Hz to 5 MHz
	video filter	1 Hz to 10 MHz
I/Q demodulation bandwidth	standard	28 MHz
	with R&S®FSV3-B40 option	40 MHz
	with R&S®FSV3-B200 option	200 MHz
	with R&S®FSV3-B400 option	400 MHz
	with R&S®FSV3-B1000 option	1 GHz for $f_{\text{carrier}} > 7.5 \text{ GHz}$, 400 MHz for $f_{\text{carrier}} \leq 7.5 \text{ GHz}$
Phase noise (with R&S®FSV3-B710 option)		
	1 GHz carrier	
	1 kHz offset	< -122 dBc (1 Hz)
	10 kHz offset	< -127 dBc (1 Hz)
	100 kHz offset	< -127 dBc (1 Hz)
	1 MHz offset	< -140 dBc (1 Hz)
Displayed average noise level (DANL)	1 GHz	-153 dBm (typ.)
DANL with preamplifier (R&S®FSV3-B24 option)	50 MHz ≤ f < 7.5 GHz	-167 dBm (typ.)
Intermodulation		
Third order intercept (TOI)	1 GHz	> 17 dBm, 20 dBm (typ.)
Total measurement uncertainty	2 GHz	0.29 dB

¹⁾ The R&S®FSV3-B710 option extends the low end frequency range to 2 Hz.

RELATED DOCUMENTS

Title of document	PD No.
R&S®VSE Vector Signal Explorer Software – Product Brochure	3607.1371.12
R&S®FS-SNS Smart Noise Source – Product Brochure	5216.2718.12
EMI Measurement Application for Signal and Spectrum Analyzers – R&S®FSW-K54, R&S®FSV3-K54, R&S®FPL1-K54, R&S®FSV-K54 – Product Brochure	3608.3949.12
R&S®FE50DTR External Frontend 36 GHz to 50 GHz – Product Brochure	3609.5551.12
R&S®FE44S External Frontend 24 GHz to 44 GHz – Product Brochure	3609.5545.12

ORDERING INFORMATION

Designation	Type	Order No.	Remarks
Base unit			
Signal and spectrum analyzer, 10 Hz ¹⁾ to 4 GHz	R&S®FSVA3004	1330.5000.05	
Signal and spectrum analyzer, 10 Hz ¹⁾ to 7.5 GHz	R&S®FSVA3007	1330.5000.08	
Signal and spectrum analyzer, 10 Hz ¹⁾ to 13.6 GHz	R&S®FSVA3013	1330.5000.14	
Signal and spectrum analyzer, 10 Hz ¹⁾ to 30 GHz	R&S®FSVA3030	1330.5000.31	
Signal and spectrum analyzer, 10 Hz ¹⁾ to 44 GHz	R&S®FSVA3044	1330.5000.44	
Signal and spectrum analyzer, 10 Hz ¹⁾ to 50 GHz	R&S®FSVA3050	1330.5000.51	
Hardware options			
Side carrying handles	R&S®FSV3-B1	1330.5700.02	
Audio demodulator	R&S®FSV3-B3	1330.3765.02	
OCXO frequency reference	R&S®FSV3-B4	1330.3794.02	
Additional interfaces, incl. GPIB, IF/video out, trigger out, AUX port	R&S®FSV3-B5	1330.3820.02	AUX control for TTL synchronisation with R&S®FSV3-B10 option
Additional interfaces, incl. IF/video out, trigger out, AUX port	R&S®FSV3-B5E	1330.3820.03	AUX control for TTL synchronisation with R&S®FSV3-B10 option
10 Gbit/s LAN interface	R&S®FSV3-B6	1330.3913.02	requires R&S®FSV3-B114
Resolution bandwidth up to 40 MHz	R&S®FSV3-B8E	1346.4337.02	the signal analysis bandwidth is defined by the R&S®FSV3-B40/-B200/-B400/-B600/-B1000 options, not by the R&S®FSV3-B8E option; user-retrofitable
External generator control	R&S®FSV3-B10	1330.3859.02	
YIG preselector bypass	R&S®FSV3-B11	1330.3865.02	
40 MHz analysis bandwidth	R&S®FSV3-B40	1330.4103.02	
200 MHz analysis bandwidth	R&S®FSV3-B200	1330.4132.02	requires R&S®FSV3-B114; requires R&S®FSV3-B11 for frequencies > 7.5 GHz
400 MHz analysis bandwidth	R&S®FSV3-B400	1330.7154.02	requires R&S®FSV3-B114; requires R&S®FSV3-B11 for frequencies > 7.5 GHz
600 MHz analysis bandwidth	R&S®FSV3-B600	1346.5004.02	requires R&S®FSV3-B114 and R&S®FSV3-B11; only for R&S®FSVA3013, R&S®FSVA3030, R&S®FSVA3044
1 GHz analysis bandwidth	R&S®FSV3-B1000	1346.3699.02	requires R&S®FSV3-B114 and R&S®FSV3-B11; only for R&S®FSVA3013, R&S®FSVA3030, R&S®FSVA3044
Spare hard drive	R&S®FSV3-B18	1330.4003.02	only for R&S®FSVA3013, R&S®FSVA3030, R&S®FSVA3044
Removable hard drive	R&S®FSV3-B20	1330.3971.02	
LO/IF connections for external mixers	R&S®FSV3-B21	1330.4010.02	only for R&S®FSVA3030, R&S®FSVA3044 and R&S®FSVA3050
RF preamplifier, for R&S®FSVA3004 and R&S®FSVA3007	R&S®FSV3-B24	1330.4049.07	
RF preamplifier, for R&S®FSVA3013	R&S®FSV3-B24	1330.4049.13	
RF preamplifier, for R&S®FSVA3030	R&S®FSV3-B24	1330.4049.30	
RF preamplifier, for R&S®FSVA3044	R&S®FSV3-B24	1330.4049.44	
RF preamplifier, for R&S®FSVA3050	R&S®FSV3-B24	1330.4049.49	
RF preamplifier, for R&S®FSVA3050	R&S®FSV3-B24	1330.4049.50	export license required
Electronic attenuator, 1 dB steps	R&S®FSV3-B25	1330.4078.02	
Enhanced computing power	R&S®FSV3-B114	1330.4910.04	always included, ex factory only
Noise source control via BNC	R&S®FSV3-B28V	1330.6664.02	
1 GHz reference	R&S®FSV3-K703	1330.7502.02	
Enhanced performance	R&S®FSV3-B710	1346.4950.xx (xx = 05/08/14/ 31/44/51)	
Frequency extension 54 GHz, for R&S®FSVA3050	R&S®FSV3-B54G	1346.6369.02	requires R&S®FSV3-B11

¹⁾ The R&S®FSV3-B710 option extends the low end frequency range to 2 Hz.

Designation	Type	Order No.	Remarks
Firmware options			
Pulse measurements	R&S®FSV3-K6	1346.3330.02	
AM/FM/PM modulation analysis	R&S®FSV3-K7	1330.5022.02	
Bluetooth® Basic Rate/Enhanced Data Rate/Low Energy measurements	R&S®FSV3-K8	1346.5679.02	
Power sensor support	R&S®FSV3-K9	1346.3676.02	
GSM/EDGE/EDGE Evolution/VAMOS measurements	R&S®FSV3-K10	1330.5039.02	
Amplifier measurements	R&S®FSV3-K18	1346.3347.02	
Direct DPD measurements	R&S®FSV3-K18D	1346.3353.02	requires R&S®FSV3-K18
Frequency response measurements	R&S®FSV3-K18F	1346.4408.02	requires R&S®FSV3-K18
Memory-polynomial DPD	R&S®FSV3-K18M	1345.1486.02	requires R&S®FSV3-K18 and R&S®FSV3-K18D
Noise figure measurements	R&S®FSV3-K30	1330.5045.02	
Phase noise measurements	R&S®FSV3-K40	1330.5051.02	
EMI measurements	R&S®FSV3-K54	1330.5068.02	
CISPR calibration, for R&S®FSV3-K54	R&S®FSV3-K54C	1346.3624.02	requires R&S®FSV3-K54, retrofit requires instrument calibration by the Rohde & Schwarz service
Transient measurements	R&S®FSV3-K60	1346.4350.02	
Transient chirp measurements	R&S®FSV3-K60C	1346.4366.02	requires R&S®FSV3-K60
Transient hop measurements	R&S®FSV3-K60H	1346.4372.02	requires R&S®FSV3-K60
Transient phase noise measurements	R&S®FSV3-K60P	1346.6298.02	requires R&S®FSV3-K60C or R&S®FSV3-K60H
Vector signal analysis	R&S®FSV3-K70	1330.5074.02	
Multimodulation analysis	R&S®FSV3-K70M	1346.3376.02	requires R&S®FSV3-K70
BER PRBS measurements	R&S®FSV3-K70P	1346.3382.02	requires R&S®FSV3-K70
3GPP FDD (WCDMA) base station measurements, incl. HSDPA and HSDPA+	R&S®FSV3-K72	1330.5080.02	
3GPP FDD (WCDMA) mobile station measurements, incl. HSUPA and HSUPA+	R&S®FSV3-K73	1330.5097.02	
WLAN IEEE 802.11a/b/g measurements	R&S®FSV3-K91	1330.5100.02	requires R&S®FSV3-B40, R&S®FSV3-B200 or R&S®FSV3-B1000 to support signal analysis bandwidths > 28 MHz
WLAN IEEE 802.11ac measurements	R&S®FSV3-K91AC	1330.5116.02	requires R&S®FSV3-K91
WLAN IEEE 802.11ax measurements	R&S®FSV3-K91AX	1346.3399.02	requires R&S®FSV3-K91
WLAN IEEE802.11be measurements	R&S®FSV3-K91BE	1346.4966.02	requires R&S®FSV3-K91
WLAN IEEE 802.11n measurements	R&S®FSV3-K91N	1330.5139.02	requires R&S®FSV3-K91
WLAN IEEE 802.11p measurements	R&S®FSV3-K91P	1330.5122.02	requires R&S®FSV3-K91
EUTRA/LTE FDD base station measurements	R&S®FSV3-K100	1330.5145.02	
EUTRA/LTE FDD UE measurements	R&S®FSV3-K101	1330.5151.02	
EUTRA/LTE base station MIMO measurements	R&S®FSV3-K102	1330.5168.02	requires R&S®FSV3-K100 or R&S®FSV3-K104
EUTRA/LTE-Advanced uplink measurements	R&S®FSV3-K103	1330.7231.02	requires R&S®FSV3-K101 or R&S®FSV3-K105
EUTRA/LTE TDD base station measurements	R&S®FSV3-K104	1330.5174.02	
EUTRA/LTE TDD uplink measurements	R&S®FSV3-K105	1330.5180.02	
EUTRA/LTE NB-IoT downlink measurements	R&S®FSV3-K106	1346.3418.02	
5G NR Rel. 15 downlink measurements	R&S®FSV3-K144	1330.7219.02	
5G NR Rel. 15 uplink measurements	R&S®FSV3-K145	1330.7225.02	
5G NR combined ACLR/SEM/EVM measurements	R&S®FSV3-K147	1346.4250.02	requires R&S®FSV3-K144
5G NR Rel. 16 extension for uplink/downlink measurements	R&S®FSV3-K148	1346.4914.02	requires R&S®FSV3-K144 or R&S®FSV3-K145
5G NR Rel. 17 extension for downlink/uplink measurements	R&S®FSV3-K171	1346.5362.02	requires R&S®FSV3-K144 or R&S®FSV3-K145 and R&S®FSV3-K148
O-RAN measurements	R&S®FSV3-K175	1346.6452.02	requires R&S®FSV3-K10x or R&S®FSV3-K14x
User-defined frequency correction with SnP file (corrects frequency response – amplitude and phase – of measurement setup)	R&S®FSV3-K544	1346.3630.02	

Designation	Type	Order No.	Remarks
External frontend control	R&S®FSV3-K553	1346.4889.02	
Instrument security			
USB mass memory write protection	R&S®FSV3-B33	1330.4861.02	
Security write protection for solid state drive	R&S®FSV3-K33	1346.3360.02	
Recommended extras			
Smart noise sources for noise figure and gain measurements up to 55 GHz	R&S®FS-SNS26/ R&S®FS-SNS40/ R&S®FS-SNS55	1338.8008.xx (xx = 26/40/55)	requires R&S®FSV3-K30
Health and utilization monitoring service (HUMS)	R&S®FSV3-K980	1346.4943.02	
19" rack adapter, 4 RU 1/1	R&S®ZZA-KN4	1175.3033.00	
Headphones		0708.3010.00	requires R&S®FSV3-B3
IEC/IEEE bus cable, length: 1 m	R&S®PCK	0292.2013.10	requires R&S®FSV3-B5
IEC/IEEE bus cable, length: 2 m	R&S®PCK	0292.2013.20	requires R&S®FSV3-B5
Matching pad, 50 Ω/75 Ω, 0 Hz to 2700 MHz, matching at both ends	R&S®RAM	0358.5414.02	
Matching pad, 50 Ω/75 Ω, 0 Hz to 2700 MHz, matching at one end	R&S®RAZ	0358.5714.02	
Anti-glare film	R&S®FPL1-Z5	1323.1690.02	
DC block, 10 kHz to 18 GHz, N connector	R&S®FSE-Z4	1084.7443.03	

Designation	Type	Order No.
PC software ¹⁾		
R&S®VSE basic edition ^{2), 3)}	R&S®VSE	1345.1011.06
R&S®VSE enterprise edition ⁴⁾	R&S®VSE Enterprise Edition	1345.1105.06
License dongle		
License dongle	R&S®FSPC	1310.0002.03
Floating license dongle	R&S®FSPC-FL	1310.0002.04
Service option		
R&S®VSE software maintenance	R&S®VSE-SWM	1320.7622.81

¹⁾ To obtain the floating license for the product, R&S®FSPC-FL is needed, and order number xxxx.xxxx.51 must be used instead of xxxx.xxxx.06.

²⁾ Requires R&S®FSPC.

³⁾ R&S®FSPC-FL is not available for this product.

⁴⁾ Requires R&S®FSPC or R&S®FSPC-FL.

Warranty		
Base unit		3 years
All other items ¹⁾		1 year
Service 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 installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

Your local Rohde & Schwarz expert will help you find the best solution for your requirements.

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