FSWX
SIGNAL AND SPECTRUM ANALYZER

Specifications

Specifications
Version 09.00

ROHDE&SCHWARZ
Make ideas real

CONTENTS

Key features

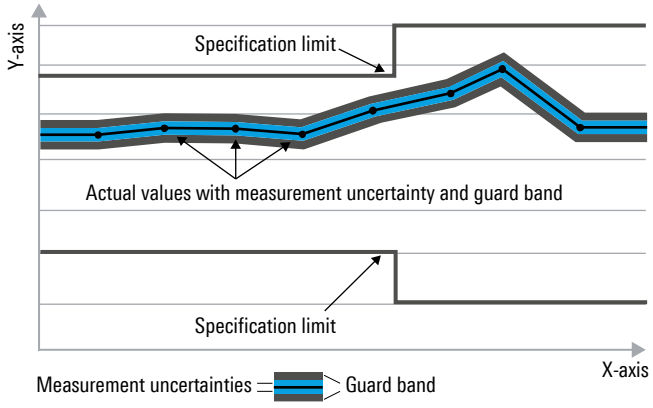
Multiport signal and spectrum analyzer	1 or 2 ports with fully equipped RF receive paths
Internal multipath architecture for 1-port and 2-port instruments	Allows use of cross-correlation for spectrum, noise measurement, phase noise and modulation quality (EVM) • Provides extended spurious free dynamic range (SFDR) • Improves displayed average noise level (DANL) to find hidden spurs • Measure distortion and noise in the presence of a high-power carrier • Characterize the most challenging components in terms of EVM
Multipath wideband phase coherent receivers	Use independent receivers for simultaneous signal and spectrum analysis. Investigate signals anywhere in the spectrum, at the same or different frequencies at the same time: • Measure H or V polarizations from an antenna simultaneously • Measure the input and output of a device simultaneously • Directly compare amplitude, frequency, phase between ports (CW or modulated/wideband, at the same or different frequencies)
High signal analysis bandwidth	Up to 4 GHz bandwidth per RF port
Accuracy	Excellent level measurement accuracy up to the maximum frequency, with pre-selection enabled by the novel filter bank architecture.
Image free I/Q and vector signal analysis (VSA)	Preselected capture and analysis ensures that you are not bothered from unwanted signals interfering in your measurement.
Operating system	Runs on a Linux based operating system, which provides high security and long-term support.

Definitions

General
Product data applies under the following conditions:

- Three hours of storage at ambient temperature followed by 30 minutes of warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Non-traceable specifications with limits (n. trc.)
Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

Specifications

Unless otherwise noted, all specifications in this section are valid for:

- RF channel A, in case of a one-channel and two-channel instrument
- RF channel B, in case of a two-channel instrument
- Temperature range from +20 °C to +30 °C, unless otherwise noticed

Frequency

Frequency range	R&S®FSWX3044	
	DC coupled	2 Hz to 44 GHz
	AC coupled	10 MHz to 44 GHz

Reference frequency, internal		
Accuracy		±(time since last adjustment × aging rate + temperature drift + calibration accuracy)
Aging per year	standard	±1 × 10^{-7}
	with R&S®FSW3-B4 option	±3 × 10^{-8}
Temperature drift	standard with R&S®FSW3-B113D (5 °C to +40 °C)	±1 × 10^{-7}
Achievable initial calibration accuracy	standard	±1 × 10^{-8}

Frequency readout		
Marker uncertainty		±(marker frequency × reference accuracy + 10 % × resolution bandwidth + ½ (span / (sweep points – 1)) + 1 Hz)
Number of sweep (trace) points	default value	1001
	range	101 to 100001
Frequency counter resolution		0.001 Hz
Frequency counter accuracy		±(frequency × reference accuracy + ½ (last digit))

Phase noise

Single sideband (SSB) phase noise		
SSB phase noise	frequency = 1 GHz, carrier offset	
	10 Hz	–80 dBc (1 Hz), typ. –90 dBc (1 Hz)
	100 Hz	–112 dBc (1 Hz), typ. –116 dBc (1 Hz)
	1 kHz	< –127 dBc (1 Hz), typ. –132 dBc (1 Hz)
	10 kHz	< –135 dBc (1 Hz), typ. –139 dBc (1 Hz)
	100 kHz	< –138 dBc (1 Hz), typ. –143 dBc (1 Hz)
	1 MHz	< –143 dBc (1 Hz), typ. –146 dBc (1 Hz)
	10 MHz	–149 dBc (1 Hz) (nom.)

Sweep time

Sweep time range	span = 0 Hz	1 µs to 16000 s
	span ≥ 10 Hz	3 µs to 16000 s [1]
Sweep time accuracy	span = 0 Hz, sweep points ≤ 10001	±0.1 % (nom.)

[1] The selected sweep time is the net data acquisition time (without the extra time needed for hardware settling or FFT processing).

Resolution bandwidths

Sweep filters and FFT filters		
Resolution bandwidths (–3 dB)		1 Hz to 10 MHz in 1/2/3/5 sequence
Bandwidth uncertainty		< 3 % (nom.)
Shape factor 60 dB:3 dB		< 5 (nom.)

Channel filters		
Bandwidths (–3 dB)	standard (RRC = root raised cosine)	100 Hz, 200 Hz, 300 Hz, 500 Hz
		1/1.5/2/2.4/2.7/3/3.4/4/4.5/5/6/7.5/8.5/9/10/ 12.5/14/15/16/18 (RRC)/20/21/ 24.3 (RRC)/25/30/50/100/150/192/200/ 300/500 kHz
		1/1.2288/1.28 (RRC)/1.5/2/3/3.75/ 3.84 (RRC)/4.096 (RRC)/5/10 MHz
Bandwidth accuracy		±2 % (nom.)
Shape factor 60 dB:3 dB		< 2 (nom.)

Video bandwidths	standard	1 Hz to 10 MHz in 1/2/3/5 sequence

Level

Level display		
Logarithmic level axis range		1 dB to 200 dB
Linear level axis		logarithmic scaling or linear scaling with 10 % of reference level per level division
Number of traces		6
Trace detector		auto peak (normal), max. peak, min. peak, RMS, average, sample
Trace functions		clear/write, max. hold, min. hold, average, view, density
Setting range of reference level		–130 dBm to +30 dBm (RF attenuation Auto), in steps of 0.01 dB
RF attenuation		0 dB to 82 dB, in 1 dB steps
Units of level axis	logarithmic level display	dBm, dBpW, dBm/Hz, dBm/MHz, dBmV, dBµV, dBµA
	linear level display	µV, mV, µA, mA, pW, nW

Maximum input level		
DC voltage	AC coupled	50 V
	DC coupled	0 V
CW RF power	RF attenuation < 20 dB with mechanical attenuation = 0 dB	20 dBm (= 0.1 W)
	RF attenuation ≥ 20 dB with mechanical attenuation = 20 dB	30 dBm (= 1 W)
Maximum pulse power, pulse duration τ = 20 µs	RF attenuation ≥ 20 dB with mechanical attenuation = 20 dB	1 mWs
Maximum pulse voltage	RF attenuation ≥ 20 dB with mechanical attenuation = 20 dB	50 V

Intermodulation		
Third-order intercept point (TOI)	R&S®FSWX3044, RF attenuation = 0 dB, level = –15 dBm (both), $\Delta f > 5 \times$ RBW, reference level = - 5 dBm, RF preamplifier off	
	f_{in} < 10 MHz	28 dBm (meas.)
	10 MHz ≤ f_{in} < 1 GHz	> 25 dBm, typ. 27 dBm
	1 GHz ≤ f_{in} < 3 GHz	> 20 dBm, typ. 22 dBm
	3 GHz ≤ f_{in} < 8 GHz	> 17 dBm, typ. 22 dBm
	8 GHz ≤ f_{in} < 13.6 GHz	> 8 dBm, typ. 15 dBm
	13.6 GHz ≤ f_{in} ≤ 40 GHz	> 10 dBm, typ. 15 dBm
	f_{in} > 40 GHz	12 dBm (meas.)
Second-harmonic intercept point (SHI)	R&S®FSWX3044, RF attenuation = 0 dB, level = –8 dBm (both), $\Delta f > 5 \times$ RBW, RF preamplifier off	
	10 MHz < f_{in} ≤ 500 MHz	> 45 dBm, typ. 55 dBm
	500 MHz < f_{in} < 1.5 GHz	> 47 dBm, typ. 56 dBm
	1.5 GHz ≤ f_{in} ≤ 4.9 GHz	> 62 dBm, typ. 70 dBm
	4.9 GHz < f_{in} < 7.5 GHz	60 dBm (nom.)
	7.5 GHz ≤ f_{in} ≤ 44 GHz	65 dBm (nom.)

Sensitivity

All noise level data in this section not marked as typical (typ.) or nominal (nom.) are specified values whose compliance is ensured by testing.

Displayed average noise level of the R&S®FSWX3044		
RF preamplifier off	RF attenuation = 0 dB, termination = 50 Ω, normalized to 1 Hz RBW, trace average, average mode = log, sample detector, YIG preselector off	
	2 Hz ≤ f < 10 Hz	–90 dBm (nom.)
	10 Hz ≤ f ≤ 100 Hz	–110 dBm, typ. –120 dBm
	100 Hz < f ≤ 1 kHz	–120 dBm, typ. –130 dBm
	1 kHz < f < 30 kHz	–135 dBm, typ. –147 dBm
	RF attenuation = 0 dB, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 1 Hz, YIG preselector off	
	30 kHz ≤ f ≤ 1 MHz	–145 dBm, typ. –150 dBm
	1 MHz < f ≤ 1 GHz	–149 dBm, typ. –154 dBm
	1 GHz < f < 8 GHz	–151 dBm, typ. –156 dBm
	8 GHz ≤ f < 13.6 GHz	–150 dBm, typ. –154 dBm
	13.6 GHz ≤ f < 18 GHz	–149 dBm, typ. –153 dBm
	18 GHz ≤ f < 25 GHz	–147 dBm, typ. –151 dBm
	25 GHz ≤ f ≤ 34 GHz	–143 dBm, typ. –147 dBm
	34 GHz < f ≤ 40 GHz	–140 dBm, typ. –144 dBm
	40 GHz < f ≤ 44 GHz	–138 dBm, typ. –142 dBm
	RF attenuation = 0 dB, termination = 50 Ω, normalized to 1 Hz RBW, trace average, average mode = log, sample detector, YIG preselector on	
	f < 10 GHz	same specification as with YIG preselector off
	10 GHz ≤ f < 13.6 GHz	–148 dBm, typ. –152 dBm
	13.6 GHz ≤ f < 18 GHz	–147 dBm, typ. –151 dBm
	18 GHz ≤ f ≤ 22 GHz	–145 dBm, typ. –149 dBm
	22 GHz < f < 25 GHz	–143 dBm, typ. –147 dBm
	25 GHz ≤ f ≤ 34 GHz	–141 dBm, typ. –145 dBm
	34 GHz < f ≤ 40 GHz	–138 dBm, typ. –142 dBm
	40 GHz < f ≤ 44 GHz	–135 dBm, typ. –139 dBm
RF preamplifier on	RF attenuation = 0 dB, termination = 50 Ω, normalized to 1 Hz RBW, trace average, average mode = log, sample detector, YIG preselector off	
	500 Hz ≤ f ≤ 1 kHz	–129 dBm, typ. –134 dBm
	1 kHz < f ≤ 100 kHz	–145 dBm, typ. –150 dBm
	RF attenuation = 0 dB, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 1 Hz, YIG preselector off	
	100 kHz < f ≤ 50 MHz	–160 dBm, typ. –163 dBm
	50 MHz < f ≤ 3 GHz	–165 dBm, typ. –169 dBm
	3 GHz < f ≤ 8 GHz	–162 dBm, typ. –166 dBm
	8 GHz < f ≤ 18 GHz	–162 dBm, typ. –166 dBm
	18 GHz < f ≤ 26.5 GHz	–161 dBm, typ. –165 dBm
	26.5 GHz < f ≤ 38 GHz	–160 dBm, typ. –164 dBm
	38 GHz < f ≤ 40 GHz	–160 dBm, typ. –164 dBm [2]
	40 GHz < f ≤ 43 GHz	–157 dBm, typ. –160 dBm
	43 GHz < f ≤ 44 GHz	–155 dBm, typ. –158 dBm
	RF attenuation = 0 dB, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 1 Hz, YIG preselector on	
	f < 10 GHz	same specification as with YIG preselector off
	10 GHz ≤ f ≤ 18 GHz	–162 dBm, typ. –165 dBm
	18 GHz < f ≤ 30 GHz	–160 dBm, typ. –164 dBm
	30 GHz < f ≤ 35 GHz	–158 dBm, typ. –161 dBm
	35 GHz < f ≤ 40 GHz	–157 dBm, typ. –160 dBm
	40 GHz < f ≤ 43 GHz	–155 dBm, typ. –158 dBm
	43 GHz < f ≤ 44 GHz	–150 dBm, typ. –153 dBm

Extended sensitivity	RMS cross-correlation detector	cross-correlation function in spectrum analysis

[2] For channel B add 2 dB to the specified values

Spurious responses

Spurious responses	mixer level ≤ –10 dBm [3], mode: spectrum, sweep type: auto, sweep optimization: auto or dynamic, f = receive frequency	
Image responses		< –90 dBc (nom.)
Residual spurious response	RF attenuation = 0 dB	
	f ≤ 3 MHz	< –90 dBm
	3 MHz < f ≤ 5900 MHz	< –110 dBm [4]
	5900 MHz < f ≤ 44 GHz	< –100 dBm
Local oscillator related spurious	f_{in} < 1 GHz	
	10 Hz ≤ offset from carrier < 200 Hz	< –90 dBc (nom.)
	offset from carrier > 200 Hz	< –100 dBc (nom.)
	f_{in} ≥ 1 GHz	
	10 Hz ≤ offset from carrier < 200 Hz	< –90 dBc + 20 log (f_{in}/GHz) (nom.)
	offset from carrier > 200 Hz	< –100 dBc + 20 log (f_{in}/GHz) (nom.)
Vibrational environmental stimuli	max. 0.21 g RMS	< –60 dBc + 20 log (f_{in}/GHz) (nom.)
Channel isolation	RF attenuation = 0 dB, reference level = –10 dBm in active channel, RF preamplifier off, span < 1 MHz in both channels, other settings equal in both channels	
	10 MHz ≤ f_{center} ≤ 26.5 GHz	> 90 dB (nom.)
	26.5 GHz < f_{center} ≤ 44 GHz	> 70 dB (nom.)

[3] Mixer level = signal level – RF attenuation + preamplifier gain.

[4] Add 10 dB to the specified value for f = 1.667 GHz.

Level measurement uncertainty

Absolute level uncertainty at 500 MHz	RBW = 10 kHz, level = –10 dBm, reference level = –10 dBm, RF attenuation = 10 dB	
		< 0.2 dB (σ = 0.07 dB)
Frequency response, referenced to 500 MHz	RF attenuation = 10 dB or 20 dB, mechanical attenuation auto, YIG preselector off, RF preamplifier off [5]	
	2 Hz ≤ f < 10 MHz	< 1 dB (nom.)
	10 MHz ≤ f ≤ 3.6 GHz	< 0.3 dB (σ = 0.10 dB)
	3.6 GHz < f ≤ 8 GHz	< 0.5 dB (σ = 0.17 dB)
	8 GHz < f ≤ 22 GHz	< 1.2 dB (σ = 0.40 dB)
	22 GHz < f ≤ 26.5 GHz	< 1.5 dB (σ = 0.50 dB)
	26.5 GHz < f ≤ 44 GHz	< 1.8 dB (σ = 0.60 dB)
	with option R&S®FSW31/32-B24, RF attenuation = 10 dB or 20 dB, mechanical attenuation auto, YIG preselector off, RF preamplifier on [5]	
	500 Hz ≤ f < 10 MHz	< 1 dB (nom.)
	10 MHz ≤ f < 3.6 GHz	< 0.6 dB (σ = 0.20 dB)
	3.6 GHz ≤ f ≤ 8 GHz	< 0.8 dB (σ = 0.27 dB)
	8 GHz < f < 22 GHz	< 1.3 dB (σ = 0.43 dB)
	22 GHz ≤ f ≤ 26.5 GHz	< 1.8 dB (σ = 0.60 dB)
	26.5 GHz < f ≤ 44 GHz	< 2.3 dB (σ = 0.77 dB)
	with option R&S®FSW3-B2, RF attenuation = 10 dB or 20 dB, mechanical attenuation auto, YIG preselector on, RF preamplifier off	
	10 GHz ≤ f < 22 GHz, span < 1 GHz	< 1.5 dB (σ = 0.50 dB)
	22 GHz ≤ f ≤ 26.5 GHz, span < 1 GHz	< 1.9 dB (σ = 0.63 dB)
	26.5 GHz < f ≤ 44 GHz, span < 1 GHz	< 2.4 dB (σ = 0.80 dB)
	with option R&S®FSW3-B2, RF attenuation = 10 dB or 20 dB, mechanical attenuation auto, YIG preselector on, RF preamplifier on	
	10 GHz ≤ f < 22 GHz, span < 1 GHz	< 1.9 dB (σ = 0.63 dB)
	22 GHz ≤ f ≤ 26.5 GHz, span < 1 GHz	< 2.4 dB (σ = 0.80 dB)
	26.5 GHz < f ≤ 44 GHz, span < 1 GHz	< 2.9 dB (σ = 0.97 dB)
	with mechanical attenuation = 0 dB	
	any RF attenuation ≠ 10 dB, all 1 dB steps	add 0.2 dB (nom.) to specifications for 10 dB or 20 dB above
	with mechanical attenuation = 20 dB	
	RF attenuation from 21 dB to 50 dB, all 1 dB steps	add 0.3 dB (nom.) to specifications for 10 dB or 20 dB above
	RF attenuation from 55 dB to 60 dB, all 5 dB steps	add 0.5 dB (nom.) to specifications for 10 dB or 20 dB above
	all other RF attenuation stages > 50 dB to < 60 dB	add 0.6 dB (nom.) to specifications for 10 dB or 20 dB above
Attenuator switching uncertainty	f = 500 MHz, 0 dB to 60 dB, referenced to 10 dB attenuation	< 0.2 dB (σ = 0.07 dB)
Bandwidth switching uncertainty	referenced to RBW = 10 kHz	< 0.1 dB (σ = 0.04 dB) [6]

Nonlinearity of displayed level		
Logarithmic level display	S/N > 16 dB, 0 dB ≤ level ≤ –70 dB	< 0.1 dB (σ = 0.04 dB)
	S/N > 16 dB, –70 dB < level ≤ –90 dB	< 0.2 dB (σ = 0.08 dB)
Linear level display	S/N > 16 dB, 0 dB to –90 dB	< 5 % of reference level (nom.)

[5] With cross-correlation RMS detector, specifications apply for f ≥ 400 MHz.

[6] Nominal values for RBW = 3.9 kHz and RBW = 6.25 kHz.

Total measurement uncertainty		
RF preamplifier off	signal level = 0 dB to –70 dB below reference level, S/N > 20 dB, sweep time = auto, RF attenuation = 10 dB or 20 dB, mechanical attenuation auto, YIG preselector off, span/RBW < 100, 95 % confidence level	
	10 MHz ≤ f ≤ 3.6 GHz	±0.26 dB
	3.6 < f ≤ 8 GHz	±0.37 dB
	8 GHz < f ≤ 22 GHz	±0.82 dB
	22 GHz < f ≤ 26.5 GHz	±1.01 dB
	26.5 GHz < f ≤ 44 GHz	±1.21 dB
	signal level = 0 dB to –70 dB below reference level, S/N > 20 dB, sweep time = auto, RF attenuation = 10 dB or 20 dB, mechanical attenuation auto, YIG preselector on, span/RBW < 100, 95 % confidence level	
	10 GHz < f ≤ 22 GHz	±1.01 dB
	22 GHz < f ≤ 26.5 GHz	±1.28 dB
	26.5 GHz < f ≤ 44 GHz	±1.61 dB
RF preamplifier on	signal level = 0 dB to –70 dB below reference level, S/N > 20 dB, sweep time = auto, RF attenuation = 10 dB or 20 dB, mechanical attenuation auto, YIG preselector off, span/RBW < 100, 95 % confidence level	
	10 MHz ≤ f < 3.6 GHz	±0.43 dB
	3.6 GHz ≤ f ≤ 8 GHz	±0.56 dB
	8 GHz < f < 22 GHz	±0.88 dB
	22 GHz ≤ f ≤ 26.5 GHz	±1.21 dB
	26.5 GHz < f ≤ 44 GHz	±1.54 dB
	signal level = 0 dB to –70 dB below reference level, S/N > 20 dB, sweep time = auto, RF attenuation = 10 dB or 20 dB, mechanical attenuation auto, YIG preselector on, span/RBW < 100, 95 % confidence level	
	10 GHz < f ≤ 22 GHz	±1.28 dB
	22 GHz < f ≤ 26.5 GHz	±1.61 dB
	26.5 GHz < f ≤ 44 GHz	±1.94 dB

Trigger functions

Trigger		
Trigger source	spectrum analysis	free run, external
Trigger offset	span ≥ 10 Hz	1 ns to 20 s
	span = 0 Hz	(–sweep time) to 20 s
Minimum trigger offset resolution	span > 0 Hz	1 ns
	span = 0 Hz, trigger offset > 0	1 ns
	span = 0 Hz, trigger offset < 0	sweep time/number of sweep points
Maximum deviation of trigger offset		1 ns

I/Q data

Maximum signal analysis bandwidth (equalized)	standard	40 MHz (nom.)
	with R&S®FSW31/32-B100 option	100 MHz (nom.)
	with R&S®FSW31/32-B320 option	320 MHz (nom.)
	with R&S®FSW31/32-B600 option	600 MHz (nom.)
	with R&S®FSW31/32-B1G2 option	1200 MHz (nom.)
	with R&S®FSW31/32-B2G option	2000 MHz (nom.)
	with R&S®FSW31/32-B4G option	f < 7.5 GHz 2000 MHz (nom.) f ⩾ 7.5 GHz 4000 MHz (nom.)

Record length	with R&S®FSW3-B114D	max. 130 Msample I and Q
	with R&S®FSW3-B114	max. 500 Msample I and Q
Word length of I/Q samples	standard	32 bit

Sampling rate	standard	100 Hz to 5 GHz
	with R&S®FSW31/32-B100 option	100 Hz to 5 GHz
	with R&S®FSW31/32-B320 option	100 Hz to 5 GHz
	with R&S®FSW31/32-B600 option	100 Hz to 5 GHz
	with R&S®FSW31/32-B1G2 option	100 Hz to 5 GHz
	with R&S®FSW31/32-B2G option	100 Hz to 5 GHz
	with R&S®FSW31/32-B4G option	100 Hz to 5 GHz

Amplitude flatness	RF attenuation = 10 dB or 20 dB, mechanical attenuation auto, YIG preselector off, RF preamplifier off	
	analysis bandwidth ≤ 600 MHz	
	350 MHz ≤ f_{center} ≤ 8 GHz	±0.7 dB, (σ = 0.24 dB)
	8 GHz < f_{center} ≤ 22 GHz	±0.9 dB, (σ = 0.30 dB)
	22 GHz < f_{center} ≤ 26.5 GHz	±1.0 dB, (σ = 0.33 dB)
	26.5 GHz < f_{center} ≤ 43.7 GHz	±1.5 dB, (σ = 0.50 dB)
	analysis bandwidth ≤ 1200 MHz	
	650 MHz ≤ f_{center} ≤ 8 GHz	±1.0 dB, (σ = 0.33 dB)
	8 GHz < f_{center} ≤ 22 GHz	±1.2 dB, (σ = 0.40 dB)
	22 GHz < f_{center} ≤ 26.5 GHz	±1.4 dB, (σ = 0.47 dB)
	26.5 GHz < f_{center} ≤ 43.4 GHz	±1.6 dB, (σ = 0.53 dB)
	analysis bandwidth ≤ 2000 MHz	
	1050 MHz ≤ f_{center} ≤ 8 GHz	±1.0 dB, (σ = 0.33 dB)
	8 GHz < f_{center} ≤ 22 GHz	±1.4 dB, (σ = 0.47 dB)
	22 GHz < f_{center} ≤ 26.5 GHz	±1.9 dB, (σ = 0.63 dB)
	26.5 GHz < f_{center} ≤ 43 GHz	±2.0 dB, (σ = 0.67 dB)
	analysis bandwidth ≤ 4000 MHz	
	7.5 GHz ≤ f_{center} ≤ 8 GHz	±1.5 dB, (σ = 0.50 dB)
	8 GHz < f_{center} ≤ 22 GHz	±2.5 dB, (σ = 0.83 dB)
	22 GHz < f_{center} ≤ 26.5 GHz	±2.5 dB, (σ = 0.83 dB)
	26.5 GHz < f_{center} ≤ 42 GHz	±2.5 dB, (σ = 0.83 dB)
Nonlinearity of displayed level	at center frequency	see section “Level measurement uncertainty – Nonlinearity of displayed level”
Absolute level uncertainty	at center frequency, reference level = –10 dBm, RF attenuation = 10 dB, RF preamplifier off	
	2.6 GHz with R&S®FSW31/32-B100/ -B320/-B600/-B1G2/-B2G	< 0.3 dB (σ = 0.1 dB)
	9 GHz with R&S®FSW31/32-B4G	< 0.4 dB (σ = 0.13 dB)

Frequency response	at center frequency	
	referenced to 2.6 GHz with R&S®FSW31/32-B100/-B320/-B600/ -B1G2/-B2G	see section “Level measurement uncertainty – Frequency response”, YIG preselector off
	referenced to 9 GHz with R&S®FSW31/32-B4G	
Residual spurious response	RF attenuation = 0 dB	
	analysis bandwidth ≤ 600 MHz	
	350 MHz ≤ f_{center} ≤ 43.8 GHz	–80 dBm (nom.)
	analysis bandwidth ≤ 1200 MHz	
	650 MHz ≤ f_{center} ≤ 43.5 GHz	–80 dBm (nom.)
	analysis bandwidth ≤ 2000 MHz	
	1050 MHz ≤ f_{center} ≤ 43.1 GHz	–70 dBm (nom.)
	analysis bandwidth ≤ 4000 MHz	
	7.5 GHz ≤ f_{center} ≤ 42.1 GHz	–60 dBm (nom.)
Other spurious responses		see section “Spurious responses”

Inputs and outputs

RF input		
Impedance		50 Ω
Connector	R&S®FSWX3044	2.4 mm male
VSWR of R&S®FSWX3044, 95 % percentile	RF attenuation ≤ 4 dB	
	10 MHz ≤ f ≤ 6 GHz	1.9 (nom.)
	6 GHz < f ≤ 23 GHz	2.0 (nom.)
	23 GHz < f ≤ 40 GHz	2.5 (nom.)
	40 GHz < f ≤ 44 GHz	2.5 (nom.)
	5 dB ≤ RF attenuation ≤ 19 dB	
	10 MHz ≤ f ≤ 6 GHz	1.5
	6 GHz < f ≤ 23 GHz	1.9
	23 GHz < f ≤ 40 GHz	2.5
	40 GHz < f ≤ 44 GHz	2.5 (nom.)
	RF attenuation ≥ 20 dB	
	10 MHz ≤ f ≤ 6 GHz	1.24
	6 GHz < f ≤ 19 GHz	1.55
	19 GHz < f ≤ 40 GHz	2.00
	40 GHz < f ≤ 44 GHz	2.50 (nom.)
Setting range of overall attenuation	standard	
	with mechanical attenuation = 0 dB	0 dB to 19 dB, in 1 dB steps
	with mechanical attenuation = 20 dB	20 dB to 82 dB, in 1 dB steps
	with R&S®FSW31/32-B25 option	
	with mechanical attenuation = 0 dB	0 dB to 31 dB, in 1 dB steps
	with mechanical attenuation = 20 dB	20 dB to 82 dB, in 1 dB steps

Power sensors		
Connector		7-pin LEMOSA female for R&S®NRP-Zxx power sensors

USB interfaces		3 ports, type A plug, version 3.1
		3 ports, type C plug, version 3.1

External trigger/gate		
Number of ports		2 × input (trigger 1, 3), 2 × input/output, selectable (trigger 2, 4)
Connector		BNC female
Trigger input voltage		0.5 V to 3.5 V (nom.)
Trigger output voltage		TTL-compatible, 0 V/5 V (nom.)
Impedance	trigger 1 and 3	50 Ω (nom.)
	trigger 2 and 4 on input	6 kΩ (nom.)
	trigger 2 and 4 on output	50 Ω (nom.)

Reference inputs/outputs		
Ref. In 1	reference frequency input (10 MHz, 100 MHz, 1 MHz to 250 MHz)	BNC female
Ref. In 2	reference frequency input (640 MHz, 1 GHz)	SMA female
Ref. Out 1	reference frequency output (10 MHz, 100 MHz, Ref. In 1 loop through: 1 MHz to 250 MHz)	BNC female
Ref. Out 2	reference frequency output (1 GHz, 8 GHz, Ref. In 2 loop through)	SMA female

IEC/IEEE bus control	with R&S®FSW3-B5	interface in line with IEC 625-2 (IEEE 488.2)
Command set		SCPI 1997.0
Connector		24-pin Amphenol female
Interface functions		SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C0

LAN interface		10/100/1000/10G BASE-T
Connector		RJ-45

External monitor		
Connector		HDMI, DisplayPort Rev 1.4

General data

Display		30.7 cm (12.1") WXGA color touchscreen
Resolution		1280 × 800 pixel (WXGA resolution)

Data storage		
Internal	standard	solid-state disk ≥ 128 Gbyte
External		supports USB 2.0 and USB 3.1 compatible memory devices

Temperature		
Operating temperature range	with R&S®FSW3-B113D	+5 °C to +40 °C
Storage temperature range		–40 °C to +70 °C
Climatic loading		+40 °C at 90 % rel. humidity, in line with EN 60068-2-30, without condensation

Altitude		
Maximum operating altitude	above sea level	4600 m (approx. 15100 feet)

Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, displacement: 0.15 mm constant amplitude (1.8 g at 55 Hz); 55 Hz to 150 Hz, acceleration: 0.5 g constant, in line with EN 60068-2-6
	random	8 Hz to 500 Hz, acceleration: 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810E, method no. 516.4, procedure I, MIL-PRF-28800F, class 3

Product conformity		
Electromagnetic compatibility		• IEC/EN 61326-1 [11, 12] • IEC/EN 61326-2-1 • CISPR 11/EN 55011 [11] • IEC/EN 61000-4-2 • IEC/EN 61000-4-3
EU legislation	for details, see user documentation	EU: in line with Data Act – Regulation (EU) 2023/2854

Recommended calibration interval		1 year

Power supply		
AC input voltage range		100 V to 240 V
AC supply frequency	100 V to 240 V	50 Hz to 60 Hz
	100 V to 120 V	400 Hz
Maximum input current		8.9 A (100 V) to 4.9 A (240 V)
Power consumption	R&S®FSWX3044	730 W
Power consumption (standby)	R&S®FSWX3044	15 W (nom.)
Safety		in line with IEC 61010-1, EN 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1
Test marks		CE, $_{C}$CSA$_{US}$, KCC

Dimensions and weight		
Dimensions (nom.) (W × H × D)	R&S®FSWX3044, including front handles and rear feet	464 mm × 240 mm × 510 mm (18.27 in × 9.45 in × 20.08 in)
Net weight (nom.)	R&S®FSWX3044, 1 RF	27.5 kg (60.6 lb)
	R&S®FSWX3044, 2 RF	27.8 kg (61.3 lb)

[11] Emission limits for class A equipment apply.

[12] Immunity test requirement for industrial environment (EN 61326 table 2).

Ordering information

Designation	Type	Order No.
Signal and spectrum analyzer, 2 Hz to 44 GHz, 1 RF	R&S®FSWX3044	1348.0000.41
Signal and spectrum analyzer, 2 Hz to 44 GHz, 2 RF	R&S®FSWX3044	1348.0000.42
Accessories supplied: Power cable, Getting Started manual R&S®FSWX3044: per RF channel one adapter 2.4 mm female/female		

A base unit can only be ordered with the suitable default equipment R&S®FSW3-B20D, R&S®FSW3-B113D and R&S®FSW3-B114D. R&S®FSW31-B15X is mandatory equipment for 1 RF models, R&S®FSW32-B15X is mandatory equipment for 2 RF models. Mandatory equipment must be ordered as well.

Options

Designation	Type	Order No.	Retrofittable	Remarks
YIG preselection	R&S®FSW3-B2	1347.5443.44	no	for all R&S®FSWX3044 models (44 GHz)
OCXO precision frequency reference	R&S®FSW3-B4	1348.6450.02	yes	for all FSWX models
Additional interfaces (incl. GPIB)	R&S®FSW3-B5	1348.3580.02	service	for all FSWX models
Hardware extension and cross-correlation in spectrum analysis	R&S®FSW31-B15X	1347.5537.41	no	for R&S®FSWX3044 (44 GHz, 1 RF), mandatory equipment
Hardware extension and cross-correlation in spectrum analysis	R&S®FSW32-B15X	1347.5537.42	no	for R&S®FSWX3044 (44 GHz, 2 RF), mandatory equipment
Spare CFexpress card	R&S®FSW3-B18	1347.5543.02	yes	for all FSWX models
Default internal solid-state drive	R&S®FSW3-B20D	1349.0110.02	service	for all FSWX models, default equipment
Removable CFexpress card drive	R&S®FSW3-B20	1347.5572.02	service	for all FSWX models, replaces FSW3-B20D
RF preamplifier 20 dB	R&S®FSW31-B24	1347.5595.41	service	for R&S®FSWX3044 (44 GHz,1 RF)
RF preamplifier 20 dB	R&S®FSW32-B24	1347.5595.42	service	for R&S®FSWX3044 (44 GHz,2 RF)
Enhanced electronic attenuator ranging	R&S®FSW31-B25	1348.1093.02	yes	for FSWX models with 1 RF
Enhanced electronic attenuator ranging	R&S®FSW32-B25	1348.1106.02	yes	for FSWX models with 2 RF
Default temperature range	R&S®FSW3-B113D	1348.4492.02	no	for all FSWX models, default equipment
Default computing power	R&S®FSW3-B114D	1348.4511.02	service	for all FSWX models, default equipment
CPU board with enhanced computing power and memory size	R&S®FSW3-B114	1348.4528.02	service	for all FSWX models replaces FSW3-B114D
100 MHz analysis bandwidth	R&S®FSW31-B100	1347.5672.02	yes	for FSWX models with 1 RF
100 MHz analysis bandwidth	R&S®FSW32-B100	1347.5689.02	yes	for FSWX models with 2 RF
320 MHz analysis bandwidth	R&S®FSW31-B320	1347.5708.02	yes	for FSWX models with 1 RF
320 MHz analysis bandwidth	R&S®FSW32-B320	1347.5714.02	yes	for FSWX models with 2 RF
600 MHz analysis bandwidth	R&S®FSW31-B600	1347.5737.02	yes	for FSWX models with 1 RF
600 MHz analysis bandwidth	R&S®FSW32-B600	1347.5743.02	yes	for FSWX models with 2 RF
1200 MHz analysis bandwidth	R&S®FSW31-B1G2	1347.5766.02	yes	for FSWX models with 1 RF
1200 MHz analysis bandwidth	R&S®FSW32-B1G2	1347.5772.02	yes	for FSWX models with 2 RF
2000 MHz analysis bandwidth	R&S®FSW31-B2G	1347.5795.02	yes	for FSWX models with 1 RF
2000 MHz analysis bandwidth	R&S®FSW32-B2G	1347.5808.02	yes	for FSWX models with 2 RF
4000 MHz analysis bandwidth	R&S®FSW31-B4G	1347.5820.02	yes	for FSWX models with 1 RF
4000 MHz analysis bandwidth	R&S®FSW32-B4G	1347.5837.02	yes	for FSWX models with 2 RF

Firmware

Designation	Type	Order No.	Remarks
User defined frequency correction	R&S®FSW3-KR110	1347.8113.02	
I/Q spectrum analyzer	R&S®FSW3-KM100	1347.7600.02	
Vector signal analysis	R&S®FSW3-KM101	1347.7846.02	R&S®FSW3-KM101 required
Multi-modulation analysis	R&S®FSW3-KM102	1347.7852.02	R&S®FSW3-KM101 required
BER PRBS Measurements	R&S®FSW3-KM103	1347.7869.02	R&S®FSW3-KM101 required
Cross-correlation for I/Q spectrum analyzer	R&S®FSW3-KM105	1349.2170.02	R&S®FSW3-KM100 required
Analog demodulation application	R&S®FSW3-KM107	1347.7646.02	
OFDM vector signal analysis	R&S®FSW3-KM112	1348.5930.02	
Amplifier measurements	R&S®FSW3-KM118	1347.7675.02	
Frequency response measurements	R&S®FSW3-KM119	1347.7698.02	R&S®FSW3-KM118 required
Direct DPD measurements	R&S®FSW3-KM120	1347.7681.02	R&S®FSW3-KM118 required
Memory-polynomial DPD measurements	R&S®FSW3-KM121	1347.8388.02	R&S®FSW3-KM118 required
Noise figure measurement application	R&S®FSW3-KM125	1347.7723.02	
Cross-correlation for noise figure measurement application	R&S®FSW3-KM126	1347.7730.02	R&S®FSW3-KM125 required
Phase noise measurement application	R&S®FSW3-KM129	1347.7752.02	
Cross-correlation for phase noise measurement application	R&S®FSW3-KM130	1347.7769.02	R&S®FSW3-KM129 required
Cross-application control and triggering	R&S®FSW3-KM135	1349.2129.02	
5G NR Release 15/16 downlink measurements	R&S®FSW3-KM320	3745.3491.02	
5G NR Release 15/16 uplink measurements	R&S®FSW3-KM321	3743.3507.02	
5G NR MIMO measurements	R&S®FSW3-KM324	3747.4137.02	R&S®FSW3-KM320 or R&S®FSW3-KM321 required
5G NR Release 17/18/19 measurements	R&S®FSW3-KM326	3745.4130.02	R&S®FSW3-KM320 or R&S®FSW3-KM321 required
O-RAN measurements	R&S®FSW3-KM327	1349.1300.02	R&S®FSW3-KM320 or R&S®FSW3-KM321 required
Cross-correlation for 5G NR	R&S®FSW3-KM331	3747.4772.02	R&S®FSW3-KM320 or R&S®FSW3-KM321 required
Beyond 5G measurements	R&S®FSW3-KM335	1349.1597.02	R&S®FSW3-KM320 or R&S®FSW3-KM321 required
WLAN 802.11a/b/g/n/p/ac measurement application	R&S®FSW3-KM410	1347.7881.02	
WLAN 802.11ax measurement application	R&S®FSW3-KM411	1347.7917.02	R&S®FSW3-KM410 required
WLAN 802.11be measurement application	R&S®FSW3-KM412	1347.7923.02	R&S®FSW3-KM410 required
WLAN 802.11bn measurement application	R&S®FSW3-KM414	1349.2287.02	R&S®FSW3-KM410 required
WLAN cross-correlation	R&S®FSW3-KM417	1347.7900.02	R&S®FSW3-KM410 required
Noise power ratio measurement	R&S®FSW3-KM620	1347.7717.02	

Warranty and service

Warranty		
Base unit		1 year
All other items		1 year
Service options		
	Service plans	**On demand**
Calibration	up to five years [13]	pay per calibration
Warranty and repair	up to five years [13]	standard price repair
Contact your Rohde & Schwarz sales office for further details.		

[13] For extended periods, contact your Rohde & Schwarz sales office.

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