R&S®ESRP
EMI TEST RECEIVER

Specifications

Specifications
Version 05.00

ROHDE&SCHWARZ
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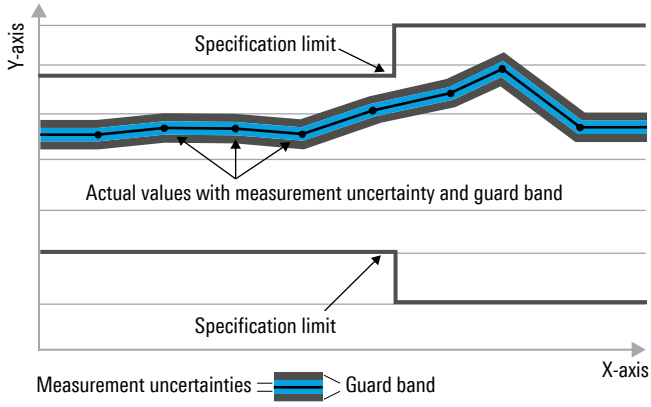
Definitions

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.



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”.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Specifications

Operating modes		EMI test receiver
		spectrum analyzer

Frequency

Frequency range	R&S®ESRP3	
	AC coupled	10 MHz to 3.6 GHz
	DC coupled	9 kHz to 3.6 GHz
	R&S®ESRP7	
	AC coupled	10 MHz to 7 GHz
	DC coupled	9 kHz to 7 GHz
	with R&S®ESRP-B29 option, DC coupled	10 Hz to max. frequency
Frequency resolution	receiver mode	0.1 Hz
	analyzer mode	0.01 Hz

Reference frequency, internal		
Accuracy		±((time since last adjustment × aging rate) + temperature drift + calibration accuracy)
Aging per year	standard	$\pm 1 \times 10^{-6}$
	with R&S®FSV-B4 option	$\pm 1 \times 10^{-7}$
Temperature drift (+5 °C to +45 °C)	standard	$\pm 1 \times 10^{-6}$
	with R&S®FSV-B4 option, model .02	$\pm 1 \times 10^{-7}$
	with R&S®FSV-B4 option, model .03	$\pm 1 \times 10^{-8}$
Maximum initial calibration accuracy	standard	$\pm 5 \times 10^{-7}$
	with R&S®FSV-B4 option	$\pm 5 \times 10^{-8}$

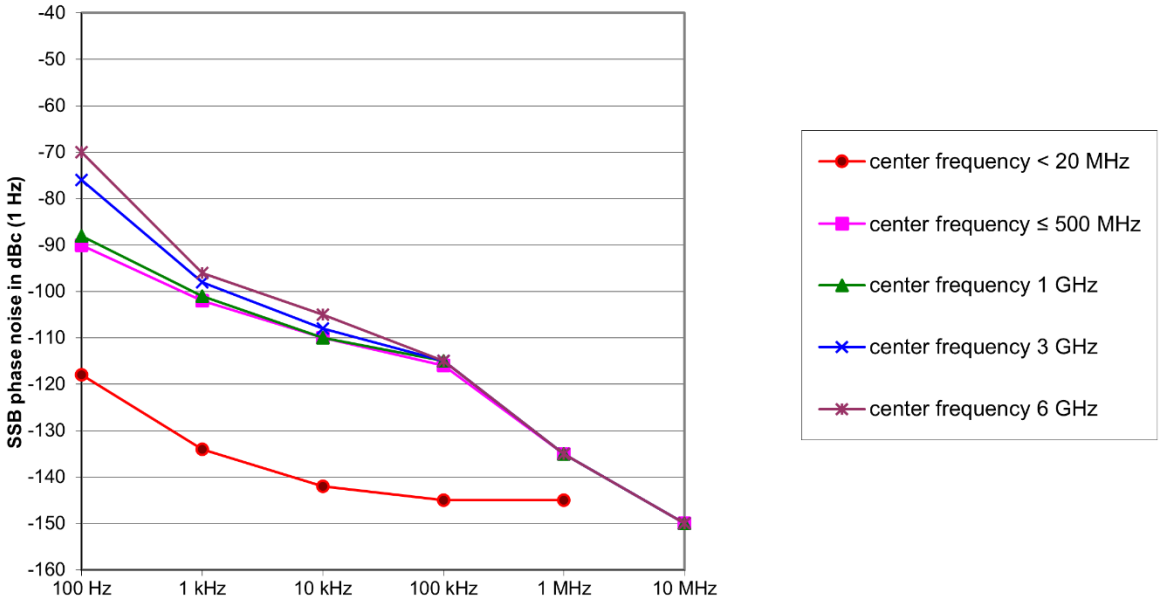
Frequency readout (analyzer mode)		
Marker resolution		1 Hz
Uncertainty		±(marker frequency × reference accuracy + 10 % × resolution bandwidth + ½ (span / (sweep points – 1)) + 1 Hz)
Number of sweep (trace) points	default value	691
	range	
	spectrum analyzer	101 to 32 001
	EMI measurement	101 to 200 001
Marker tuning frequency step size	marker step size = sweep points	span / (sweep points – 1)
	marker step size = standard	span / (default sweep points – 1)
Frequency counter resolution		0.001 Hz
Count accuracy		±(frequency × reference accuracy + ½ (last digit))
Display range for frequency axis		0 Hz, 10 Hz to max. frequency
Resolution		0.1 Hz
Maximum span deviation		±0.1 %

Receiver scan		
Scan		scan with max. 10 subranges with different settings
Scan modes		normal scan, time domain scan [1]
Measurement time	normal scan, per frequency	50 µs to 100 s
	time domain scan, per subrange [1]	50 µs to 100 s [2]
Number of trace points		up to 4 000 000
Frequency step size	normal scan	min. 1 Hz
	time domain scan [1]	0.25 × resolution bandwidth
Time domain scan [1]		
Maximum frequency segment processed in parallel	RBW = 200 Hz	0.66 MHz
	RBW = 9 kHz	30 MHz
	RBW = 120 kHz	24.6 MHz
	RBW = 1 MHz	25.6 MHz
FFT overlap factor		≥ 93 %

[1] Requires R&S®ESRP-K53 option.
[2] For RBW ≤ 120 kHz.

Spectrum analyzer		
Sweep time range	span = 0 Hz	1 µs to 16 000 s
	span ≥ 10 Hz, swept	1 ms to 16 000 s [3]
	span ≥ 10 Hz, FFT	7 µs to 16 000 s [4]
Sweep time accuracy	span = 0 Hz, sweep points ≤ 10001	±0.1 % (nom.)
	span ≥ 10 Hz, swept	±3 % (nom.)

Spectral purity		
SSB phase noise	frequency = 500 MHz, carrier offset	
	100 Hz	< –84 dBc (1 Hz)
	1 kHz	< –101 dBc (1 Hz)
	10 kHz	< –106 dBc (1 Hz)
	100 kHz	< –115 dBc (1 Hz)
	1 MHz	< –134 dBc (1 Hz)
	10 MHz	< –150 dBc (1 Hz) (nom.)
Residual FM	frequency = 500 MHz, RBW = 1 kHz, sweep time = 100 ms	< 3 Hz (nom.)



Typical phase noise at different center frequencies

[3] Net sweep time without additional hardware settling time.
[4] Data acquisition time for FFT calculation.

Preselection and preamplifier (R&S®ESRP-B2 option)

Preselection		
State	receiver mode	always on
	analyzer mode	on/off (selectable)
Number of preselection filters		16
Bandwidths (–6 dB), nominal	10 Hz to 150 kHz	fixed lowpass filter
	150 kHz to 30 MHz	35 MHz, fixed bandpass filter
	30 MHz to 80 MHz	94 MHz, fixed bandpass filter
	80 MHz to 130 MHz	94 MHz, fixed bandpass filter
	130 MHz to 180 MHz	91 MHz, fixed bandpass filter
	180 MHz to 230 MHz	105 MHz, fixed bandpass filter
	230 MHz to 300 MHz	110 MHz, fixed bandpass filter
	300 MHz to 425 MHz	195 MHz, fixed bandpass filter
	425 MHz to 570 MHz	200 MHz, fixed bandpass filter
	570 MHz to 715 MHz	210 MHz, fixed bandpass filter
	715 MHz to 860 MHz	200 MHz, fixed bandpass filter
	860 MHz to 1005 MHz	200 MHz, fixed bandpass filter
	1005 MHz to 1750 MHz	fixed highpass filter
	1750 MHz to 2850 MHz	fixed highpass filter
	2850 MHz to 4850 MHz	fixed highpass filter
	4850 MHz to 7000 MHz	fixed highpass filter
Preamplifier	switchable	
Location		in the signal path between preselection and first mixer
Frequency range		1 kHz to 7 GHz
Gain		20 dB (nom.)

RF preamplifier (R&S®FSV-B22 option)

Preamplifier		
Availability	instruments without R&S®ESRP-B2 option	receiver, analyzer
	instruments with R&S®ESRP-B2 option	analyzer with preselection = off only
Frequency range		100 kHz to 7 GHz
Gain		20 dB (nom.)

IF and resolution bandwidths

IF and sweep filters		
Resolution bandwidths (–3 dB)	receiver mode or analyzer mode, span ≥ 10 Hz	10 Hz to 10 MHz in 1/2/3/5 sequence
	analyzer mode, span = 0 Hz	20 MHz, 28 MHz, 40 MHz additionally
Bandwidth uncertainty		< 3 %
Shape factor 60 dB:3 dB		< 5
EMI bandwidths (–6 dB)	standard	200 Hz, 9 kHz, 120 kHz, 1 MHz
	with R&S®ESRP-B29 option	10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz additionally
Bandwidth uncertainty		< 3 %
Shape factor 60 dB:6 dB		< 4

FFT filters (analyzer mode)		
Resolution bandwidths (–3 dB)	span ≥ 10 Hz	10 Hz to 300 kHz in 1/2/3/5 sequence
Bandwidth uncertainty		< 3 % (nom.)
Shape factor 60 dB:3 dB		< 5 (nom.)

Channel filters (analyzer mode)		
Bandwidths (–3 dB)	standard (RRC = root raised cosine)	100/200/300/500 Hz
		1/1.5/2/2.4/2.7/3/3.4/4/4.5/5/6/8.5/9/10/ 12.5/14/15/16/18 (RRC)/20/21/24.3 (RRC)/ 25/30/50/100/150/192/200/300/500 kHz
		1/1.228/1.28 (RRC)/1.5/2/3/3.84 (RRC)/ 4.096 (RRC)/5/10/20/28/40 MHz
Bandwidth accuracy		< 2 % (nom.)
Shape factor 60 dB:3 dB		< 2 (nom.)

Video bandwidths (analyzer mode)		1 Hz to 10 MHz in 1/2/3/5 sequence, 20 MHz, 28 MHz, 40 MHz

Level

Display range		displayed noise floor up to +30 dBm

Maximum input level	AC coupled	50 V
	DC coupled	0 V
CW RF power	RF attenuation = 0 dB	
	RF preamplifier = off	20 dBm (= 0.1 W)
	RF preamplifier = on	13 dBm (= 0.02 W)
	RF attenuation ≥ 10 dB	
	RF preamplifier = off	30 dBm (= 1 W)
	RF preamplifier = on	23 dBm (= 0.2 W)
Pulse spectral density	RF attenuation ≥ 0 dB, preselection = on [5], RF preamplifier = off	97 dB µV/MHz
Maximum pulse voltage	RF attenuation ≥ 10 dB	150 V
Maximum pulse energy	RF attenuation ≥ 10 dB, 10 µs	1 mWs

Intermodulation		
1 dB compression of input mixer	RF attenuation = 0 dB, preselection and preamplifier = off [6]	+3 dBm (nom.)
Third order intercept point (TOI)	RF attenuation = 0 dB, level = 2 × –15 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger, preselection = off [6], with R&S®FSV-B22 option: RF preamplifier = off	
	10 MHz ≤ f_{in} < 100 MHz	> 12 dBm, 15 dBm (typ.)
	100 MHz ≤ f_{in} < 3.6 GHz	> 13 dBm, 16 dBm (typ.)
	3.6 GHz ≤ f_{in} ≤ 7 GHz	> 15 dBm, 18 dBm (typ.)
	with R&S®ESRP-B2 option, preselection = on [7], preamplifier = off, RF attenuation = 0 dB, level = 2 × –20 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger	
	10 MHz ≤ f_{in} < 100 MHz	> 5 dBm, 8 dBm (typ.)
	100 MHz ≤ f_{in} < 4.5 GHz	> 8 dBm, 11 dBm (typ.)
	4.5 GHz ≤ f_{in} ≤ 7 GHz	> 5 dBm, 8 dBm (typ.)
	with R&S®ESRP-B2 option, preselection = on [7], preamplifier = on, RF attenuation = 0 dB, level = 2 × –45 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger	
	10 MHz ≤ f_{in} < 100 MHz	> –16 dBm, –13 dBm (typ.)
	100 MHz ≤ f_{in} < 3.6 GHz	> –14 dBm, –11 dBm (typ.)
	3.6 GHz ≤ f_{in} ≤ 7 GHz	> –10 dBm, –7 dBm (typ.)
	with R&S®FSV-B22 option, preselection = off [6], RF preamplifier = on, RF attenuation = 0 dB, level = 2 × –45 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger	
	10 MHz ≤ f_{in} < 100 MHz	–3 dBm (nom.)
	100 MHz ≤ f_{in} < 3.6 GHz	–2 dBm (nom.)
	3.6 GHz ≤ f_{in} ≤ 7 GHz	0 dBm (nom.)

[5] With R&S®ESRP-B2 option.

[6] With R&S®ESRP-B2 option. Preselection = off is only available in analyzer mode. In receiver mode the preselection is permanently on.

[7] With R&S®ESRP-B2 option. Default setting in receiver mode.

Second harmonic intercept (SHI)	RF attenuation = 0 dB, level = –10 dBm, preselection = off [6], with R&S®FSV-B22 option: RF preamplifier = off	
	100 MHz < f_{in} ≤ 3.5 GHz	45 dBm (nom.)
	with R&S®ESRP-B2 option, RF attenuation = 0 dB, level = –15 dBm, preselection = on [7], preamplifier = off	
	100 MHz < f_{in} ≤ 3.5 GHz	50 dBm (nom.)
	with R&S®ESRP-B2 option, RF attenuation = 0 dB, level = –10 dBm, preselection = on [7], preamplifier = on	
	100 MHz < f_{in} ≤ 3.5 GHz	35 dBm (nom.)
	with R&S®FSV-B22 option, preselection = off [6], RF preamplifier = on, RF attenuation = 0 dB, level = –40 dBm	
	100 MHz < f_{in} ≤ 3.5 GHz	25 dBm (nom.)

Displayed average noise level (analyzer mode)	RF attenuation = 0 dB, preselection = off/on [8], preamplifier = off, termination = 50 Ω, logarithmic scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time = 50 ms, sample detector, trace average, sweep count = 20, mean marker	
	R&S®ESRP3, R&S®ESRP7	
	9 kHz ≤ f < 100 kHz	< –130 dBm, –140 dBm (typ.)
	100 kHz ≤ f < 1 MHz	< –145 dBm, –150 dBm (typ.)
	1 MHz ≤ f < 1 GHz	< –152 dBm, –155 dBm (typ.)
	1 GHz ≤ f < 3.6 GHz	< –150 dBm, –151 dBm (typ.)
	R&S®ESRP7	
	3.6 GHz ≤ f < 6 GHz	< –148 dBm, –151 dBm (typ.)
	6 GHz ≤ f ≤ 7 GHz	< –146 dBm, –149 dBm (typ.)
	with R&S®ESRP-B29 option, RF attenuation = 0 dB, preselection = off/on [8], preamplifier = off, termination = 50 Ω, logarithmic scaling, normalized to 1 Hz RBW, RBW = 10 Hz, VBW = 10 Hz, zero span, sweep time = 500 ms, sample detector, trace average, sweep count = 20, mean marker	
	R&S®ESRP3, R&S®ESRP7	
	10 Hz	< –90 dBm, –100 dBm (typ.)
	20 Hz	< –100 dBm, –110 dBm (typ.)
	100 Hz	< –110 dBm, –120 dBm (typ.)
	1 kHz	< –120 dBm, –130 dBm (typ.)
	with R&S®ESRP-B2 option, RF attenuation = 0 dB, preselection = on, preamplifier = on, termination = 50 Ω, logarithmic scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time = 50 ms, sample detector, trace average, sweep count = 20, mean marker	
	R&S®ESRP3, R&S®ESRP7	
	9 kHz ≤ f < 100 kHz	< –150 dBm, –155 dBm (typ.)
	100 kHz ≤ f < 1 MHz	< –155 dBm, –160 dBm (typ.)
	1 MHz ≤ f < 1 GHz	< –165 dBm, –168 dBm (typ.)
	1 GHz ≤ f < 3.6 GHz	< –162 dBm, –165 dBm (typ.)
	R&S®ESRP7	
	3.6 GHz ≤ f < 6 GHz	< –160 dBm, –163 dBm (typ.)
	6 GHz ≤ f ≤ 7 GHz	< –158 dBm, –161 dBm (typ.)
	with R&S®ESRP-B2 and R&S®ESRP-B29 option, RF attenuation = 0 dB, preselection = on, preamplifier = on, termination = 50 Ω, logarithmic scaling, normalized to 10 Hz RBW, RBW = 10 Hz, VBW = 5 Hz, zero span, sweep time = 500 ms, sample detector, trace average, sweep count = 20, mean marker	
	R&S®ESRP3, R&S®ESRP7	
	1 kHz	< –140 dBm, –150 dBm (typ.)
	with R&S®FSV-B22 option, RF attenuation = 0 dB, preselection = off [8], RF preamplifier = on, termination = 50 Ω, logarithmic scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time = 50 ms, sample detector, trace average, sweep count = 20, mean marker	
	R&S®ESRP3, R&S®ESRP7	
	100 kHz ≤ f < 1 MHz	< –150 dBm, –155 dBm (typ.)
	1 MHz ≤ f < 1 GHz	< –162 dBm, –165 dBm (typ.)
	1 GHz ≤ f < 3.6 GHz	< –160 dBm, –163 dBm (typ.)
	R&S®ESRP7	
	3.6 GHz ≤ f < 6 GHz	< –158 dBm, –161 dBm (typ.)
	6 GHz ≤ f ≤ 7 GHz	< –156 dBm, –159 dBm (typ.)

[8] With R&S®ESRP-B2 option. Preselection = off is only available in analyzer mode. In receiver mode preselection is permanently on.

Noise indication (receiver mode), nominal, calculated from DANL data	RF attenuation = 0 dB, preamplifier = off, termination = 50 Ω, average detector (AV)	
	R&S®ESRP3, R&S®ESRP7	
	9 kHz ≤ f < 100 kHz, BW = 200 Hz	< 0 dBµV
	100 kHz ≤ f < 150 kHz, BW = 200 Hz	< –15 dBµV
	150 kHz ≤ f < 1 MHz, BW = 9 kHz	< 2 dBµV
	1 MHz ≤ f < 30 MHz, BW = 9 kHz	< –5 dBµV
	30 MHz ≤ f < 1 GHz, BW = 120 kHz	< 6 dBµV
	1 GHz ≤ f < 3.6 GHz, BW = 1 MHz	< 17 dBµV
	R&S®ESRP7	
	3.6 GHz ≤ f < 6 GHz, BW = 1 MHz	< 19 dBµV
	6 GHz ≤ f ≤ 7 GHz, BW = 1 MHz	< 21 dBµV
	with R&S®ESRP-B29 option, RF attenuation = 0 dB, preamplifier = off, termination = 50 Ω, average detector (AV)	
	R&S®ESRP3, R&S®ESRP7	
	10 Hz, BW = 10 Hz	< 27 dBµV
	20 Hz, BW = 10 Hz	< 17 dBµV
	100 Hz, BW = 10 Hz	< 7 dBµV
	1 kHz, BW = 100 Hz	< 7 dBµV
	with R&S®ESRP-B2 option, RF attenuation = 0 dB, preamplifier = on, termination = 50 Ω, average detector (AV)	
	R&S®ESRP3, R&S®ESRP7	
	9 kHz ≤ f < 100 kHz, BW = 200 Hz	< –20 dBµV
	100 kHz ≤ f < 150 kHz, BW = 200 Hz	< –25 dBµV
	150 kHz ≤ f < 1 MHz, BW = 9 kHz	< –8 dBµV
	1 MHz ≤ f < 30 MHz, BW = 9 kHz	< –18 dBµV
	30 MHz ≤ f < 1 GHz, BW = 120 kHz	< –7 dBµV
	1 GHz ≤ f < 3.6 GHz, BW = 1 MHz	< 5 dBµV
	R&S®ESRP7	
	3.6 GHz ≤ f < 6 GHz, BW = 1 MHz	< 7 dBµV
	6 GHz ≤ f ≤ 7 GHz, BW = 1 MHz	< 9 dBµV
	with R&S®ESRP-B2 option and R&S®ESRP-B29 option, RF attenuation = 0 dB, preamplifier = on, termination = 50 Ω, average detector (AV)	
	R&S®ESRP3, R&S®ESRP7	
	1 kHz, BW = 100 Hz	< –13 dBµV
	with R&S®FSV-B22 option (instruments without R&S®ESRP-B2 option only), RF attenuation = 0 dB, preamplifier = on, termination = 50 Ω, average detector (AV)	
	100 kHz ≤ f < 150 kHz, BW = 200 Hz	< –20 dBµV
	150 kHz ≤ f < 1 MHz, BW = 9 kHz	< –3 dBµV
	1 MHz ≤ f < 30 MHz, BW = 9 kHz	< –15 dBµV
	30 MHz ≤ f < 1 GHz, BW = 120 kHz	< –4 dBµV
	1 GHz ≤ f < 3.6 GHz, BW = 1 MHz	< 7 dBµV
	R&S®ESRP7	
	3.6 GHz ≤ f < 6 GHz, BW = 1 MHz	< 9 dBµV
	6 GHz ≤ f ≤ 7 GHz, BW = 1 MHz	< 11 dBµV

Spurious responses		
Image response	30 MHz ≤ f ≤ 7 GHz	
	f_{in} – 2 × 8409.9 MHz (first IF)	< –80 dBc (nom.)
	f_{in} – 2 × 729.9 MHz (second IF)	< –80 dBc
	f_{in} – 2 × 89.9 MHz (third IF)	< –80 dBc
Intermediate frequency response	30 MHz ≤ f ≤ 7 GHz	
	first IF (8409.9 MHz)	< –70 dBc (nom.)
	second IF (729.9 MHz)	< –80 dBc
	third IF (89.9 MHz)	< –80 dBc
Residual spurious response	RF attenuation = 0 dB	
	f ≤ 1 MHz	< –90 dBm
	f > 1 MHz	< –103 dBm
Local oscillator related spurious	30 MHz ≤ f ≤ 7 GHz	
	1 kHz ≤ offset from carrier ≤ 10 MHz	< –70 dBc
	offset from carrier > 10 MHz	< –80 dBc
Other interfering signals		
Subharmonic of first LO	20 MHz ≤ f < 7 GHz, spurious at 8410 MHz – 2 × f_{in}	< –70 dBc
Harmonic of first LO	mixer level < –25 dBm, spurious at f_{in} –4205 MHz	< –70 dBc

Level display (analyzer mode)		
Logarithmic level axis		1 dB to 200 dB, in steps of 1/2/5
Linear level axis		10 % of reference level per level division, 10 divisions or logarithmic scaling
Number of traces		6
Trace detector		max. peak, min. peak, auto peak (normal), sample, RMS, average, quasi-peak, CISPR average, RMS average
Trace functions		clear/write, max. hold, min. hold, average, view
Setting range of reference level		–130 dBm to (–10 dBm + RF attenuation – RF preamplifier gain), in steps of 0.01 dB
Units of level axis	logarithmic level display	dBm, dBµV, dBmV, dBµA, dBpW
	linear level display	µV, mV, µA, mA, pW, nW

Level display (receiver mode)		
Level display	analog	bargraph display, separately for each detector
	digital	numeric, 0.01 dB resolution
Detectors	maximum 4 selectable	max. peak, min. peak, RMS, average, quasi-peak, CISPR average, RMS average
Units of level axis		dBm, dBµV, dBmV, dBµA, dBpW, dBpT
RF spectrum		
Logarithmic level axis		10 dB to 200 dB, in steps of 10
Frequency axis		linear or logarithmic
Number of traces		6
Detectors	normal scan	max. peak, min. peak, RMS, average, quasi-peak, CISPR average, RMS average
	time domain scan [9]	max. peak, min. peak, average, quasi-peak, CISPR average, RMS average

[9] Requires R&S®ESRP-K53 option.

Spectrogram display (analyzer mode)		
Result display		color-graded bitmap
Spectrogram bitmap color depth		240 colors
Dynamic range covered by bitmap colors		selectable, up to 200 dB (nom.)
History depth		max. 100 000 frames
Recording mode		single trace, continuous, frame count
Trace detector		max. peak, min. peak, sample, RMS, average
Number of markers		16
Marker readout		frequency, time/frame number, level

Level measurement uncertainty		
Absolute level uncertainty at 64 MHz	RBW = 10 kHz, CW signal, level = –10 dBm, reference level = –10 dBm, RF attenuation = 10 dB	
	+20 °C to +30 °C	
	preselection = off [10]	< 0.2 dB (σ = 0.07 dB)
	preselection = on [11]	< 0.3 dB (σ = 0.1 dB)
	+5 °C to +40 °C	
	preselection = off [10]	< 0.35 dB (σ = 0.12 dB)
	preselection = on [11]	< 0.45 dB (σ = 0.15 dB)
Frequency response referenced to 64 MHz	DC coupling, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, preselection = off [10], with R&S®FSV-B22 option: RF preamplifier = off, +20 °C to +30 °C	
	9 kHz ≤ f < 10 MHz	< 0.5 dB (σ = 0.17 dB)
	10 MHz ≤ f < 3.6 GHz	< 0.3 dB (σ = 0.1 dB)
	3.6 GHz ≤ f ≤ 7 GHz	< 0.5 dB (σ = 0.17 dB)
	DC coupling, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, preselection = on [11], +20 °C to +30 °C	
	9 kHz ≤ f < 3.6 GHz	< 0.6 dB (σ = 0.2 dB)
	3.6 GHz ≤ f ≤ 7 GHz	< 0.8 dB (σ = 0.27 dB)
	any setting for RF attenuation, preselection and preamplifier, +5 °C to +40 °C	
	9 kHz ≤ f < 3.6 GHz	< 1 dB (σ = 0.33 dB)
	3.6 GHz ≤ f ≤ 7 GHz	< 1.5 dB (σ = 0.5 dB)
	with R&S®ESRP-B29 option, DC coupling, preamplifier = off, +5 °C to +40 °C	
	10 Hz ≤ f < 9 kHz	< 1 dB (σ = 0.33 dB)
Attenuator switching uncertainty	f = 64 MHz, 0 dB to 70 dB, referenced to 10 dB attenuation	< 0.2 dB (σ = 0.07 dB)
Uncertainty of reference level setting		0 dB [12] (nom.)
Bandwidth switching uncertainty	referenced to RBW = 10 kHz	
	sweep filters	< 0.1 dB (σ = 0.04 dB)
	FFT filters	< 0.2 dB (σ = 0.07 dB)
Quasi-peak display	pulse repetition frequency ≥ 20 Hz	in line with CISPR 16-1-1
	with R&S®ESRP-B2 option, pulse repetition frequency ≥ 10 Hz	in line with CISPR 16-1-1

Nonlinearity of displayed level		
Logarithmic level display	S/N > 16 dB	
	0 dB to –50 dB	< 0.1 dB (σ = 0.04 dB)
	–50 dB to –60 dB	< 0.15 dB (σ = 0.05 dB)
	–60 dB to –70 dB	< 0.2 dB (σ = 0.07 dB)
Linear level display	S/N > 16 dB, 0 dB to –70 dB	< 5 % of reference level (nom.)

[10] With R&S®ESRP-B2 option. Preselection = off is only available in analyzer mode. In receiver mode the preselection is permanently on.

[11] With R&S®ESRP-B2 option. Default setting in receiver mode.

[12] The setting of the reference level affects only the graphical representation of the measurement result on the display, not the measurement itself. Therefore, the reference level setting causes no additional uncertainty in measurement results.

Total measurement uncertainty	CW signal, level = 0 dB to –70 dB below reference level, S/N > 20 dB, sweep time = auto, sweep type = sweep, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, preselection = off [10], with R&S®FSV-B22 option: RF preamplifier = off, span/RBW < 100, 95 % confidence level, +20 °C to +30 °C	
	9 kHz ≤ f < 10 MHz	0.4 dB
	10 MHz ≤ f < 3.6 GHz	0.31 dB
	3.6 GHz ≤ f ≤ 7 GHz	0.4 dB
	CW signal, level = 0 dB to –70 dB below reference level, S/N > 20 dB, sweep time = auto, sweep type = sweep, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, preselection = on [11], span/RBW < 100, 95 % confidence level, +20 °C to +30 °C	
	9 kHz ≤ f < 3.6 GHz	0.47 dB
	3.6 GHz ≤ f ≤ 7 GHz	0.57 dB

Trigger functions

Trigger		
Trigger source	analyzer mode	free run, video, external, IF power
	receiver mode	free run, video, external
Trigger offset	analyzer mode, span ≥ 10 Hz	31.25 ns to 30 s, min. resolution = 31.25 ns (or 1 % of offset)
	analyzer mode, span = 0 Hz	(–sweep time) to 30 s, min. resolution = 31.25 ns (or 1 % of offset)
Maximum deviation of trigger offset	analyzer mode	±(7.8125 ns + (0.1 % × trigger offset))
IF power trigger (analyzer mode)		
Sensitivity	minimum signal power	–60 dBm + RF attenuation – RF pre-amplifier gain (nom.)
	maximum signal power	–10 dBm + RF attenuation – RF pre-amplifier gain (nom.)
IF power trigger bandwidth	RBW > 500 kHz, swept	40 MHz (nom.)
	RBW > 20 kHz, FFT	
	RBW ≤ 500 kHz, swept	6 MHz (nom.)
	RBW ≤ 20 kHz, FFT	
Gated sweep (analyzer mode)		
Gate source		video, external, IF power
Gate delay		31.25 ns to 30 s, min. resolution = 31.25 ns (or 1 % of delay)
Gate length		31.25 ns to 30 s, min. resolution = 31.25 ns (or 1 % of gate length)
Maximum deviation of gate length		±(7.8125 ns + (0.1 % × gate length))

Audio demodulation

AF demodulation types		AM and FM
Audio output		loudspeaker and phone jack
Marker stop time in spectrum mode		100 ms to 60 s

Inputs and outputs

RF input		
Impedance		50 Ω
Connector		N female
VSWR	RF attenuation ≥ 10 dB, DC coupled	
	10 Hz ≤ f ≤ 1 GHz	< 1.2
	1 GHz < f < 3.6 GHz	< 1.5, 1.3 (typ.)
	3.6 GHz ≤ f ≤ 7 GHz	< 2, 1.8 (typ.)
	RF attenuation < 10 dB, DC coupled	
	10 Hz ≤ f ≤ 1 GHz	< 2
	1 GHz < f ≤ 7 GHz	< 3
	RF attenuation ≥ 10 dB, AC coupled	
	10 MHz ≤ f ≤ 1 GHz	< 1.2
	1 GHz < f < 3.6 GHz	< 1.5, 1.3 (typ.)
	3.6 GHz ≤ f ≤ 7 GHz	< 2, 1.8 (typ.)
Setting range of attenuator		0 dB to +70 dB, in 10 dB steps

Probe power supply		
Supply voltages	3-pin connector	+15 V DC, –12.6 V DC and ground, max. 150 mA (nom.)
	5-pin connector	±10 V DC and ground, max. 100 mA, (nom.)

Noise source drive		
Connector		BNC female
Output voltage		0 V/28 V, max. 100 mA, switchable (nom.)

AF output		
Connector		3.5 mm mini jack
Output impedance		10 Ω (nom.)
Open-circuit voltage		up to 1.5 V, adjustable

USB interface	front panel	2 ports, type A plug, version 2.0
	rear panel	2 ports, type A plug, version 2.0

Reference output		
Connector		BNC female
Impedance		50 Ω (nom.)
Output frequency	internal reference	10 MHz
	external reference	same as reference input signal
Level		> 0 dBm (nom.)

Reference input		
Connector		BNC female
Impedance		50 Ω (nom.)
Input frequency range		1 MHz ≤ f_{in} ≤ 20 MHz, in 100 kHz steps
Required level		> 0 dBm into 50 Ω (nom.)

External trigger/gate input		
Connector		BNC female
Trigger voltage		0.5 V to 3.5 V (nom.)
Input impedance		10 kΩ (nom.)

IEC/IEEE bus control		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		10/100/1000BASE-T
Connector		RJ-45

External monitor		
Connector		VGA-compatible, 15-pin mini D-Sub

User port		
Connector		9-pin D-Sub male
Output		TTL-compatible, 0 V/5 V (nom.), max. 15 mA (nom.)
Input		TTL-compatible, max. 5 V (nom.)

IF/video out (analyzer mode)		
Connector		BNC female, 50 Ω (nom.)
IF out		
Bandwidth		= RBW setting
IF frequency		32 MHz (nom.)
Output level (gain versus RF input)	RF attenuation = 0 dB, RF preamplifier = off, span = 0 Hz	0 dB (nom.)
Video out		
Bandwidth		= VBW setting
Output scaling	display scale	logarithmic
		linear
Output level	center frequency > 10 MHz, span = 0 Hz, signal at reference level and center frequency	1 V, open circuit (nom.)

Trigger out		
Connector		BNC female
Output		TTL-compatible, 0 V/5 V (nom.)

General data

Display		21 cm LC TFT color display (8.4")
Resolution		800 × 600 pixel (SVGA resolution)
Pixel failure rate		< 1 × 10^{-5}

Data storage		
Internal		solid-state disk (SSD) ⩾ 120 GB
External		supports USB 2.0 compatible memory devices

Temperature		
Temperature	operating temperature range	+5 °C to +40 °C
	permissible temperature range	0 °C to +50 °C
	storage temperature range	–40 °C to +70 °C
Climatic loading		+40 °C at 90 % rel. humidity, in line with EN 60068-2-30

Mechanical resistance		
Vibration	sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz, 0.5 g from 55 Hz to 150 Hz, 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-T-28800F, class 3, MIL-STD-810E, method 516.4, procedure I

EMC		in line with EMC Directive 2004/108/EC including: • IEC/EN 61326-1 [13, 14] • IEC/EN 61326-2-1 • CISPR 11/EN 55011 [13] • IEC/EN 61000-3-2 • IEC/EN 61000-3-3
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, ± 10 % (nom.)
AC supply frequency		50 Hz to 400 Hz, + 10 %/– 6 % (nom.)
Maximum input current		3 A (100 V) to 1.25 A (240 V) (nom.)
Power consumption		100 W, max. 180 W with all options (meas.)
Safety		in line with: • IEC 61010-1 • EN 61010-1 • CAN/CSA-C22.2 No. 61010-1-04 • UL 61010-1
Test mark		VDE, $_{C}CSA_{US}$

Dimensions and weight		
Dimensions (nom.)	W × H × D	412 mm × 197 mm × 417 mm (16.22 in × 7.76 in × 16.42 in)
Net weight without options (nom.)		9.5 kg (20.94 lb)

[13] Emission limits for class B equipment.

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

Options

R&S®ESR-B10 external generator control

Interface		
IEC/IEEE bus control		24-pin Amphenol female
Aux control		9-pin D-Sub female

Supported signal generators		R&S®SGS100A, R&S®SMA100A, R&S®SMB100A, R&S®SMBV100A, R&S®SMC100A, R&S®SME, R&S®SMF100A, R&S®SMG, R&S®SMGL, R&S®SMGU, R&S®SMH, R&S®SMHU, R&S®SMIQ, R&S®SMJ100A, R&S®SML, R&S®SMP, R&S®SMR, R&S®SMT, R&S®SMU200A, R&S®SMV03, R&S®SMX, R&S®SMY

R&S®FSV-B30 DC power supply for 12 V/24 V supply voltage

Input voltage range		10 V to 28 V
Output voltage		120 V to 360 V DC
Input current	V_{in} = 12 V, instrument without options, preset settings	
	R&S®ESRP3, R&S®ESRP7	11 A (typ.)
Temperature	operating temperature range	0 °C to +50 °C
	storage temperature range	–40 °C to +70 °C
Dimensions	W × H × D	201 mm × 125 mm × 56 mm (7.91 in × 4.92 in × 2.20 in)
Net weight		1 kg (2.2 lb)

R&S®FSV-B32 lithium-ion battery pack

Battery pack		
Output voltage		12 V (nom.)
Operating time	instrument without options, preset settings	
	R&S®ESRP3, R&S®ESRP7	2 h (nom.)
Charge time	with R&S®FSV-B34 charger, T = +25 °C	3.5 h (nom.)
Temperature	operating temperature range, discharge	0 °C to +50 °C
	operating temperature range, charge	0 °C to + 45 °C
	storage temperature range	–20 °C to +60 °C [15]
Dimensions	W × H × D	406 mm × 71 mm × 241 mm (16 in × 2.76 in × 9.49 in)
Net weight		3.4 kg (7.5 lb)

R&S®FSV-B34 charger for R&S®FSV-B32 lithium-ion battery pack

AC input voltage range		100 V to 240 V, ± 10 % (nom.)
AC supply frequency		50 Hz to 60 Hz (nom.)
Power consumption		max. 300 W (nom.)
Dimensions	W × H × D	400 mm × 127 mm × 203 mm (15.75 in × 5 in × 8 in)
Net weight		3.1 kg (6.9 lb)

R&S®ESRP-K56 IF analysis

Level display (receiver mode)		
IF spectrum		
Span		max. 10 MHz
Resolution bandwidths		10 Hz to 100 kHz in 1/2/3/5 sequence
Detector		sample
Logarithmic level axis		10 dB to 200 dB in steps of 10 dB
Frequency axis		linear
Number of traces		3

[15] The battery packs should be stored in an environment with low humidity, free from corrosive gas at a recommended temperature range < +21 °C. Extended exposure to temperatures above +45 °C could degrade battery performance and life.

Ordering information

Designation	Type	Order No.
EMI test receiver	R&S®ESRP3	1316.4500.03
EMI test receiver	R&S®ESRP7	1316.4500.07
Accessories supplied		
Power cable, probe power cable and quick start guide		

Options

Designation	Type	Order No.	Retrofittable	Remarks
Ruggedized housing	R&S®FSV-B1	1310.9500.02	no	
Preselection and preamplifier	R&S®ESRP-B2	1316.4700.02	yes	retrofit in service center
OCXO reference frequency	R&S®FSV-B4	1310.9522.02	yes	user-retrofittable
OCXO extended frequency stability	R&S®FSV-B4	1310.9522.03	yes	user-retrofittable
External generator control	R&S®ESR-B10	1310.9551.03	yes	retrofit in service center
Spare solid-state drive (SSD) with Windows 10 IoT Enterprise 2019 LTSC, removable [16]	R&S®ESRP-B18	1316.3555.21	yes	user-retrofittable
RF preamplifier (100 kHz to 7 GHz)	R&S®FSV-B22	1310.9600.02	yes	user-retrofittable
Frequency extension 10 Hz and MIL bandwidths	R&S®ESRP-B29	1316.4880.02	yes	user-retrofittable
DC power supply for 12 V/24 V supply voltage	R&S®FSV-B30	1329.0243.02	yes	user-retrofittable
Lithium-ion battery pack	R&S®FSV-B32	1321.3750.04	yes	user-retrofittable, requires R&S®FSV-B1, R&S®FSV-B30 and R&S®FSV-B34
Lithium-ion battery charger	R&S®FSV-B34	1321.3950.02		
Firmware/software				
Time domain scan	R&S®ESRP-K53	1316.4639.02		
IF analysis	R&S®ESRP-K56	1316.4897.02		

Upgrade

Designation	Type	Order No.	Retrofittable	Remarks
Windows 10 IoT Enterprise LTSC 2019 upgrade, for R&S®ESRP with R&S®FMR11 (hardware)	R&S®ESRP-U3	1338.2380.03	yes	Contact your Rohde & Schwarz sales office for further details.

Recommended extras

Designation	Type	Order No.
Headphones		0708.9010.00
IEC/IEEE bus cable, length: 1 m	R&S®PCK	0292.2013.10
IEC/IEEE bus cable, length: 2 m	R&S®PCK	0292.2013.20
19" rack adapter	R&S®ZZA-478	1096.3248.00
Matching pads, 50 Ω/75 Ω		
Matching pad, 50 Ω /75 Ω, L section, matching at both ends	R&S®RAM	0358.5414.02
Matching pad, 50 Ω /75 Ω, series resistor, 25 Ω, matching at one end (taken into account in instrument function RF INPUT 75 Ω)	R&S®RAZ	0358.5714.02
SWR bridges, 50 Ω		
SWR bridge, 50 Ω, 5 MHz to 3 GHz	R&S®ZRB2	0373.9017.5x
SWR bridge, 50 Ω, 40 kHz to 4 GHz	R&S®ZRC	1039.9492.5x
High-power attenuators		
High-power attenuator, 100 W, 3/6/10/20/30 dB, 1 GHz	R&S®RBU100	1073.8495.xx (xx = 03/06/10/20/30)
High-power attenuator, 50 W, 3/6/10/20/30 dB, 2 GHz	R&S®RBU50	1073.8695.xx (xx = 03/06/10/20/30)
High-power attenuator, 50 W, 20 dB, 6 GHz	R&S®RDL50	1035.1700.52
Connector		
Probe power connector, 3-pin		1065.9480.00
DC block		
DC block, 10 kHz to 18 GHz (type N)	R&S®FSE-Z4	1084.7443.02

[16] For instruments delivered with Windows 10 IoT Enterprise LTSC 2019 ex factory or instruments with upgrade R&S®ESRP-U3 only. For other models and spare parts contact your local Rohde & Schwarz service center.

Warranty and service

Warranty		
Base unit		1 year
All other items		1 year
Service options		
	Service plans	**On demand**
Calibration	up to five years [17]	pay per calibration
Warranty and repair	up to five years [17]	standard price repair
Contact your Rohde & Schwarz sales office for further details.		

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

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