

Version
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EMI Test Receiver R&S® ESCI

Specifications



ROHDE & SCHWARZ

Specifications

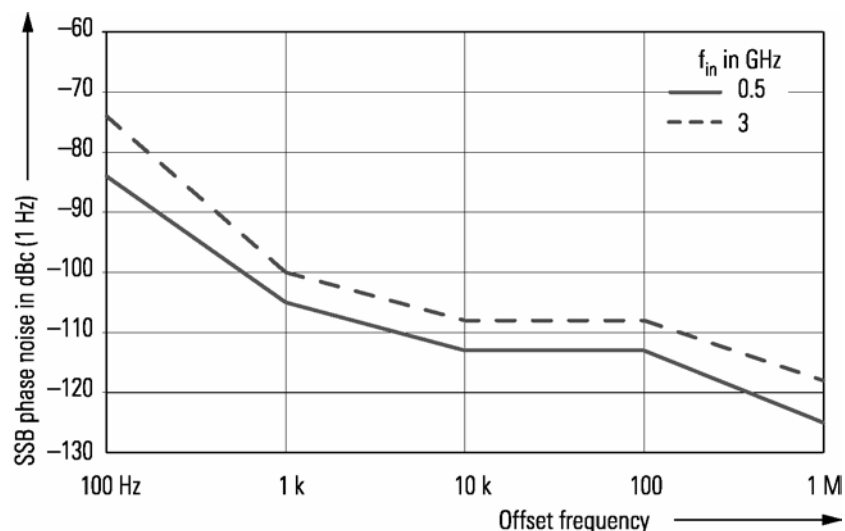
Specifications apply under the following conditions:

15 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and total calibration performed. Data designated "nominal" applies to design parameters and is not tested.

The specification " $\sigma = xx \text{ dB}$ " indicates the standard deviation.

Frequency

Frequency range		9 kHz to 3 GHz
Frequency resolution		0.01 Hz
Internal reference frequency (nominal)	standard OCXO	
Aging per year	after 30 days of continuous operation	1×10^{-6}
Temperature drift	+5°C to +45°C	1×10^{-6}
Internal reference frequency (nominal)	Option R&S®FSP-B4	
Aging per year	after 30 days of continuous operation	1×10^{-7}
Temperature drift	+5°C to +45°C	1×10^{-8}
External reference frequency		10 MHz
Frequency display (receiver mode)		numeric display
Resolution		0.1 Hz
Frequency display (analyzer mode)		with marker or frequency counter
Marker resolution		span/500
Max. deviation	sweep time > 3 x auto sweep time	$\pm(\text{marker frequency} \times \text{reference frequency error} + 0.5\% \times \text{span} + 10\% \times \text{resolution bandwidth} + \frac{1}{2} \text{ (last digit)})$
Frequency counter resolution	selectable	0.1 Hz to 10 kHz
Count accuracy	S/N > 25 dB	$\pm(\text{marker frequency} \times \text{reference frequency error} + \frac{1}{2} \text{ (last digit)})$
Display range of frequency axis		0 Hz, 10 Hz to 3 GHz
Max. deviation of display range		0.1%
Spectral purity, SSB phase noise	f = 500 MHz, for f > 500 MHz see diagram	
	100 Hz 1 kHz 10 kHz 100 kHz, span > 100 kHz 1 MHz, span > 100 kHz 10 MHz	<-84 dBc (1 Hz), typ. -90 dBc (1 Hz) <-100 dBc (1 Hz), typ. -108 dBc (1 Hz) <-106 dBc (1 Hz), typ. -113 dBc (1 Hz) <-110 dBc (1 Hz), typ. -113 dBc (1 Hz) <-120 dBc (1 Hz), typ. -125 dBc (1 Hz) typ. -145 dBc (1 Hz)
Residual FM	f = 500 MHz, RBW = 1 kHz, sweep time = 100 ms	typ. 3 Hz



Scan (receiver mode)

Scan		scan of max. 10 subranges with different, independent settings
Measurement time per frequency	selectable	100 μ s to 100 s

Sweep (analyzer mode)

Sweep time	in time domain, span = 0 Hz in frequency domain, span \geq 10 Hz	1 μ s to 16000 s, resolution 125 ns 2.5 ms to 16000 s
Max. deviation of sweep time		1%

Resolution bandwidths

Sweep filters		
3 dB bandwidths		10 Hz to 3 MHz, in steps of 1/3/10
Bandwidth accuracy	\leq 100 kHz 300 kHz to 3 MHz	<3% <10%
Shape factor 60 dB : 3 dB	\leq 100 kHz 300 kHz to 3 MHz	<5 <15
EMI bandwidths	6 dB bandwidths pulse bandwidth	200 Hz, 9 kHz, 120 kHz 1 MHz
Bandwidth accuracy	\leq 120 kHz 1 MHz	<3% <10%
Shape factor 60 dB : 6 dB	\leq 120 kHz 1 MHz	<5 <15

Video bandwidths	analyzer mode	1 Hz to 10 MHz, in steps of 1/3/10
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FFT filters		
3 dB bandwidths		1 Hz to 30 kHz, in steps of 1/3/10
Bandwidth accuracy		5%, nominal
Shape factor 60 dB : 3 dB		2.5, nominal

Channel filters		
Bandwidths		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 MHz (RRC = raised root cosine)

Preselection

Preselection	can be switched off in analyzer mode	11 preselection filters
Bandwidths (-6 dB), nominal	<150 kHz 150 kHz to 2 MHz 2 MHz to 8 MHz 8 MHz to 30 MHz 30 MHz to 70 MHz 70 MHz to 150 MHz 150 MHz to 300 MHz 300 MHz to 600 MHz 600 MHz to 1 GHz 1 GHz to 2 GHz 2 GHz to 3 GHz	230 kHz, fixed-tuned lowpass filter 2.6 MHz, fixed-tuned bandpass filter 2 MHz, tracking bandpass filter 6 MHz, tracking bandpass filter 15 MHz, tracking bandpass filter 30 MHz, tracking bandpass filter 60 MHz, tracking bandpass filter 80 MHz, tracking bandpass filter 100 MHz, tracking bandpass filter tracking highpass filter fixed-tuned highpass filter
Preamplifier	switchable, between preselection and 1st mixer	20 dB

Level

Display range		displayed average noise level (DANL) to 30 dBm
Maximum input level		
DC voltage	DC-coupled AC-coupled	0 V 50 V
CW RF power	RF attenuation 0 dB RF attenuation ≥ 10 dB	20 dBm 30 dBm
Pulse spectral density	RF attenuation 0 dB	97 dB μ V/MHz
Max. pulse voltage	RF attenuation ≥ 10 dB, 10 μ s	150 V
Max. pulse energy	RF attenuation ≥ 10 dB, 20 μ s	10 mWs
Intermodulation		
1 dB compression of input mixer	f > 200 MHz, RF attenuation 0 dB, preselection and preamplifier off	5 dBm, nominal
Third-order intercept (TOI)	level 2 x -30 dBm, $\Delta f > 5 \times$ RBW or 10 kHz, whichever value is larger	
	without preselection 20 MHz to 200 MHz 200 MHz to 3 GHz with preselection, without preamplifier 20 MHz to 200 MHz 200 MHz to 3 GHz with preselection and preamplifier 20 MHz to 200 MHz 200 MHz to 3 GHz	>5 dBm >7 dBm, typ. 10 dBm >0 dBm >2 dBm, typ. 5 dBm >-20 dBm >-18 dBm, typ. -15 dBm
Second harmonic intercept (SHI)	without preselection <100 MHz 100 MHz to 3 GHz with preselection, without preamplifier 4 MHz to 100 MHz 100 MHz to 3 GHz with preselection and preamplifier 4 MHz to 100 MHz 100 MHz to 3 GHz	typ. 25 dBm typ. 35 dBm >40 dBm >50 dBm >25 dBm >35 dBm
Displayed average noise level (DANL) (analyzer mode)	RF attenuation 0 dB, RBW = 10 Hz, VBW = 1 Hz, span = 0 Hz, trace average function over 20 sweeps, 50 Ω termination	
	without preselection, AC-coupled 9 kHz 100 kHz 1 MHz 10 MHz to 1 GHz 1 GHz to 3 GHz without preselection, DC-coupled 9 kHz 100 kHz 1 MHz 10 MHz to 1 GHz 1 GHz to 3 GHz with preselection, without preamplifier 9 kHz 100 kHz 1 MHz 10 MHz to 1 GHz 1 GHz to 3 GHz with preselection and preamplifier 9 kHz 100 kHz 1 MHz 10 MHz to 1 GHz 1 GHz to 3 GHz	<-105 dBm, nominal <-110 dBm, nominal <-130 dBm, nominal <-142 dBm, typ. -145 dBm <-140 dBm, typ. -143 dBm <-115 dBm <-120 dBm <-140 dBm, typ. -143 dBm <-142 dBm, typ. -145 dBm <-140 dBm, typ. -143 dBm <-115 dBm <-120 dBm, typ. -140 dBm <-140 dBm, typ. -148 dBm <-142 dBm, typ. -150 dBm <-140 dBm, typ. -148 dBm <-135 dBm <-140 dBm <-150 dBm, typ. -153 dBm <-152 dBm, typ. -155 dBm <-150 dBm, typ. -155 dBm

Displayed average noise level (DANL) (receiver mode)	0 dB RF attenuation, 50 Ω termination	
Average (AV) display	without preamplifier 9 kHz, BW = 200 Hz 150 kHz, BW = 200 Hz 150 kHz, BW = 9 kHz 1 MHz, BW = 9 kHz 10 MHz to 30 MHz, BW = 9 kHz 30 MHz to 1 GHz, BW = 120 kHz 1 GHz to 3 GHz, BW = 1 MHz with preamplifier 9 kHz, BW = 200 Hz 150 kHz, BW = 200 Hz 150 kHz, BW = 9 kHz 1 MHz, BW = 9 kHz 10 MHz to 30 MHz, BW = 9 kHz 30 MHz to 1 GHz, BW = 120 kHz 1 GHz to 3 GHz, BW = 1 MHz	<5 dB μ V <0 dB μ V, typ. -23 dB μ V <16 dB μ V typ. -7 dB μ V <-4 dB μ V, typ. -12 dB μ V <-6 dB μ V, typ. -12 dB μ V <6 dB μ V, typ. 1 dB μ V <16 dB μ V, typ. 8 dB μ V <-15 dB μ V <-20 dB μ V <-4 dB μ V <-14 dB μ V, typ. -17 dB μ V <-16 dB μ V, typ. -19 dB μ V <-4 dB μ V, typ. -7 dB μ V <6 dB μ V, typ. 3 dB μ V
Increase of DANL relative to AV display	Max Peak RMS Quasi Peak Band A Band B Bands C and D	typ. +11 dB typ. +1 dB typ. +3 dB typ. +4 dB typ. +6 dB
Immunity to interference		
Image frequency		>70 dB
Intermediate frequency		>70 dB
Spurious response	f > 1 MHz, 0 dB RF attenuation, without input signal	<-103 dBm
Other interfering signals	$\Delta f > 100$ kHz, mixer level < -10 dBm	<-70 dBc

RF shielding	field strength 3 V/m, 0 dB RF attenuation, 50 Ω termination, f \neq f _{IF}	
Level display		<10 dB μ V, nominal

Level display (receiver mode)		
Level display	digital analog	numeric, resolution 0.01 dB bargraph display separate for each detector
Spectrum	level axis frequency axis	10 dB to 200 dB in steps of 10 dB; linear or logarithmic selectable
Units of level display	three detectors can be switched on simultaneously	Average (AV), RMS, Max Peak, Min Peak, Quasi Peak (QPK), CISPR AV
Measurement time	selectable	100 μ s to 100 s

Level display (analyzer mode)		
Screen		501 x 400 pixels (one measurement diagram); max. 2 measurement diagrams with independent settings
Logarithmic level display range		1 dB, 10 dB to 200 dB in steps of 10 dB
Linear level display range		10% of reference level per level division, 10 divisions
Number of traces	1 measurement diagram 2 measurement diagrams	3 6
Trace detectors		Max Peak, Min Peak, Auto Peak, Sample, Quasi Peak, Average, RMS
Trace functions		Clear/Write, Max Hold, Min Hold, Average
Number of measurement points	default value range	501 125 to 8001 in steps of approx. a factor of 2
Setting range of reference level	logarithmic level display linear level display	-130 dBm to 30 dBm in steps of 0.1 dB 70.71 nV to 7.07 V in steps of 1%
Units of level axis	logarithmic level display linear level display	dBm, dBmV, dB μ V, dB μ A, dBpW mV, μ V, mA, μ A, nW, pW

Max. uncertainty of level measurement		
Reference level uncertainty at 128 MHz	level = -30 dBm, RF attenuation 10 dB, RBW 10 kHz, reference level -20 dBm without preselection/preamplifier with preselection/preamplifier	<0.2 dB ($\sigma = 0.07$ dB) <0.3 dB ($\sigma = 0.1$ dB)
Frequency response referenced to 128 MHz	without preselection/preamplifier, AC-coupled <50 kHz 50 kHz to 3 GHz without preselection/preamplifier, DC-coupled 9 kHz to 3 GHz with preselection/preamplifier, AC-coupled <50 kHz 50 kHz to 3 GHz with preselection/preamplifier, DC-coupled 9 kHz to 3 GHz	<+0.5 dB/-1 dB, nominal <0.5 dB ($\sigma = 0.17$ dB) <0.5 dB ($\sigma = 0.17$ dB) <+0.8 dB/-1.3 dB, nominal <0.8 dB ($\sigma = 0.27$ dB) <0.8 dB ($\sigma = 0.27$ dB)
Uncertainty of attenuator setting	f = 128 MHz, 0 dB to 70 dB, referenced to 10 dB RF attenuation	<0.2 dB ($\sigma = 0.07$ dB)
Uncertainty of reference level setting		<0.2 dB ($\sigma = 0.07$ dB)
Log/lin display nonlinearity	S/N > 16 dB	
	RBW \leq 100 kHz 0 dB to -70 dB -70 dB to -90 dB RBW > 100 kHz 0 dB to -50 dB -50 dB to -70 dB	<0.2 dB ($\sigma = 0.07$ dB) <0.5 dB ($\sigma = 0.17$ dB) <0.2 dB ($\sigma = 0.07$ dB) <0.5 dB ($\sigma = 0.17$ dB)
Bandwidth switching uncertainty	referenced to RBW = 10 kHz	
	10 kHz to 100 kHz 300 kHz to 10 MHz FFT filter, 1 Hz to 3 kHz	<0.1 dB ($\sigma = 0.03$ dB) <0.2 dB ($\sigma = 0.07$ dB) <0.2 dB ($\sigma = 0.07$ dB)
Total measurement uncertainty	without preselection/preamplifier with preselection/preamplifier	0.5 dB 1 dB
Quasi-peak indication		to CISPR 16-1

Trigger functions

Trigger		
Trigger source		free run, video, external, IF level
Trigger offset	span \geq 10 Hz span = 0 Hz	125 ns to 100 s, resolution min. 125 ns (or 1% of offset) \pm (125 ns to 100 s), resolution min. 125 ns, dependent on sweep time
Max. deviation of trigger offset		\pm (125 ns + (0.1% x trigger offset))
Gated sweep		
Gate source		video, external, IF level
Gate delay		1 μ s to 100 s
Gate length		125 ns to 100 s, resolution min. 125 ns (or 1% of gate length)
Max. deviation of gate length		\pm (125 ns + (0.1% x gate length))

Audio demodulation

AF demodulation modes		AM and FM
Audio output		loudspeaker and earphone jack
Marker hold time in analyzer mode	selectable	100 ms to 60 s

Inputs and outputs (front panel)

RF input		
Impedance		50 Ω
Connector		N female
VSWR	RF attenuation < 10 dB, DC-coupled RF attenuation < 10 dB, AC-coupled 9 kHz to 100 kHz 100 kHz to 3 GHz RF attenuation \geq 10 dB, DC-coupled 9 kHz to 1 GHz 1 GHz to 3 GHz RF attenuation \geq 10 dB, AC-coupled 9 kHz to 100 kHz 100 kHz to 1 GHz 1 GHz to 3 GHz	2 2.5 2 <1.2 <1.5 2.5 <1.2 <1.5
Setting range of attenuator		0 dB to 70 dB in steps of 5 dB
Probe power supply		
Supply voltages		+15 V DC, -12.6 V DC and ground, max. 150 mA, nominal
Power supply for antennas, etc		
Supply voltages		\pm 10 V DC and ground, max. 100 mA, nominal
Keyboard connector		PS/2 female for MF-2 keyboard

AF output		
Connector		3.5 mm jack
Impedance		10 Ω
Open-circuit voltage		adjustable up to 1.5 V

Inputs and outputs (rear panel)

IF 20.4 MHz		
Connector		BNC female
Impedance		50 Ω
Level	Mixer level > -60 dBm RBW \leq 100 kHz or FFT RBW > 100 kHz	-10 dBm at reference level 0 dBm at reference level
Reference frequency output		
Connector		BNC female
Impedance		50 Ω
Output frequency		10 MHz
Level		0 dBm, nominal
Reference frequency input		
Connector		BNC female
Input frequency		10 MHz
Required level		0 dBm from 50 Ω
Power supply for noise source		
Connector		BNC female
Output voltage	switchable	28 V, nominal
External trigger/gate input		
Connector		BNC female
Impedance		>10 k Ω
Trigger voltage		1.4 V (TTL)
IEC/IEEE bus remote control		
Connector		24-pin Amphenol female
Command set		SCPI 1997.0
Interface functions		SH1, AH1, T6, SR1, RL1, PP1, DC1, DT1, C0

Serial interface		RS-232-C (COM), 9-pin D-sub
Printer interface		parallel (Centronics compatible)
USB interface		USB version 1.1
Connector for external monitor (VGA)		15-pin D-sub
User interface		25-pin D-sub

General data

Display		21 cm TFT colour display
Resolution		640 x 480 pixels (VGA)
Pixel error rate		$<2 \times 10^{-5}$
Mass memory		1.44 Mbyte 3 ½" disk drive, hard disk
Data storage		>500 instrument setups and traces
Temperature ranges		
Nominal temperature range	with option R&S®ESCI-B20	+5°C to +40°C 0°C to +50°C
Permissible temperature range	with option R&S®ESCI-B20	+5°C to +45°C 0°C to +55°C
Storage temperature range		-40°C to +70°C
Climatic loading		+40°C at 95% relative humidity (IEC 60068-2-30: 2000-02)
Mechanical resistance		
Sinusoidal vibration	5 Hz to 150 Hz 55 Hz	0.5 g max. 2 g meets DIN EN 60068-2-6: 1996-05, DIN EN 60068-2-30: 2000-02, DIN EN 61010-1, MIL-T-28800D, class 5
Random vibration	10 Hz to 100 Hz with option R&S®ESCI-B20 10 Hz to 300 Hz	acceleration 1 g (RMS) acceleration 1.9 g (RMS)
Shock		40 g shock spectrum, meets MIL-STD-810C and MIL-T-28800D, classes 3 and 5
Recommended calibration interval	operation with external reference operation with internal reference	2 years 1 year
Power supply		
AC supply		100 V AC to 240 V AC, 50 Hz to 400 Hz, 3.1 A to 1.3 A, class of protection I to VDE 411
Power consumption		typ. 70 VA
Safety		meets EN 61010-1, UL 3111-1, CSA C22.2 No. 1010-1, IEC 1010-1
EMC		meets CISPR 11/EN 55011 group 1 class B ¹ ; meets IEC/EN 61326, emission: class B (residential environment), immunity: industrial environment (excluding operating frequency)
Test marks		VDE, GS, CSA, CSA-NRTL/C
Dimensions (W x H x D)		412 mm x 197 mm x 417 mm
Weight		10.5 kg

¹ Appendix A contains examples of equipment classification, for example test signal generators and test receivers (network analyzers, for example, combine both types of equipment in one).

Ordering information

Order designation	Type	Order No.
EMI Test Receiver 9 kHz to 3 GHz	R&S®ESCI	1166.5950.03
Accessories supplied		
Power cable, operating manual, service manual		

Options

Order designation	Type	Order No.
Rugged Case with Carrying Handle	R&S®FSP-B1	1129.7998.02
OCXO Reference Frequency	R&S®FSP-B4	1129.6740.02
TV Trigger/RF Power Trigger	R&S®FSP-B6	1129.8594.02
Internal Tracking Generator, I/Q Modulator	R&S®FSP-B9	1129.6991.02
External Generator Control	R&S®FSP-B10	1129.7246.02
LAN Interface 100BT	R&S®FSP-B16	1129.8042.03
Expanded Environmental Specifications	R&S®ESCI-B20	1155.1606.09
DC Power Supply	R&S®FSP-B30	1155.1158.02
Battery Pack	R&S®FSP-B31	1155.1258.02
Spare Battery Pack	R&S®FSP-B32	1155.1506.02



For product brochure, see PD 0758.1558.12
and www.rohde-schwarz.com
(search term: ESCI)



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