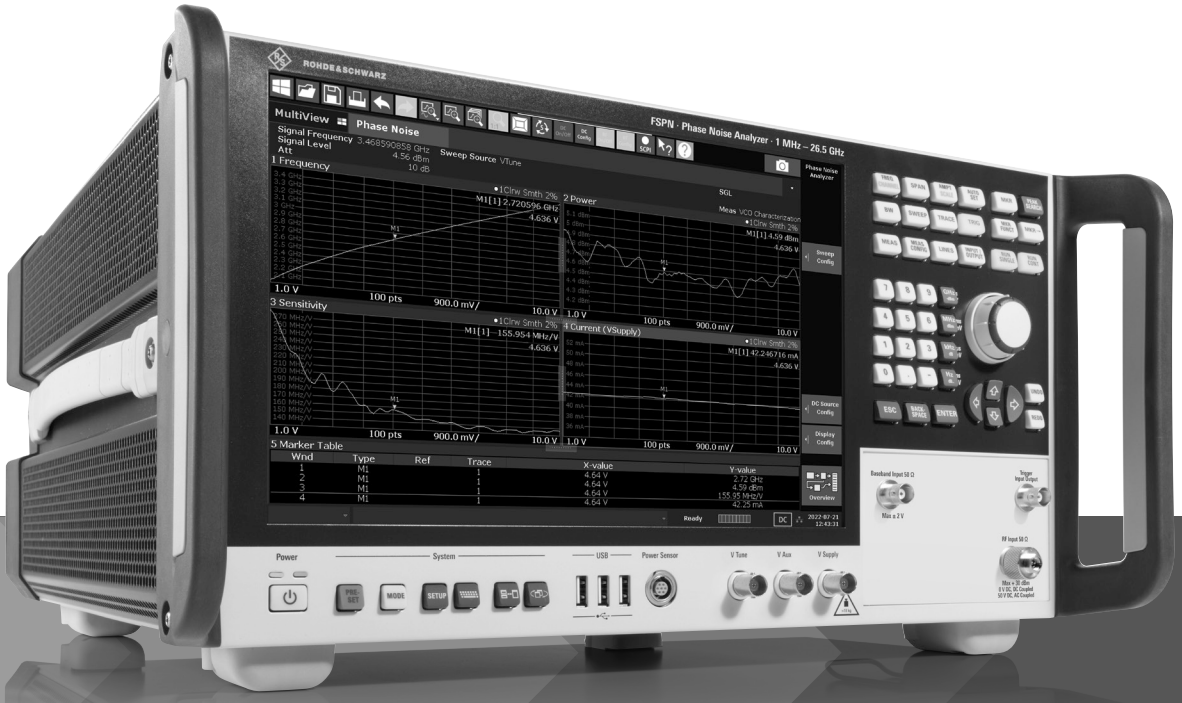
R&S®FSPN PHASE NOISE ANALYZER AND VCO TESTER

Specifications



Specifications
Version 02.00

ROHDE&SCHWARZ
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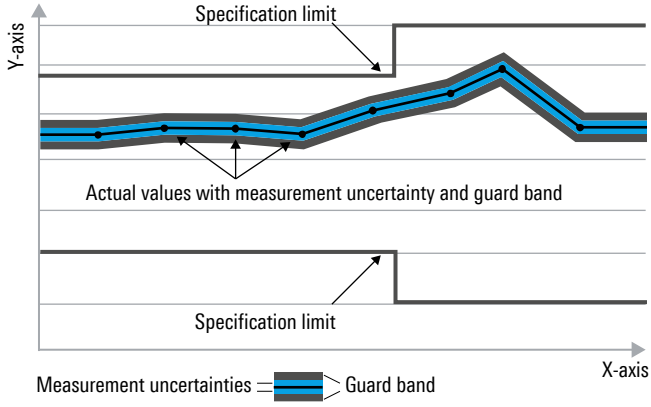
CONTENTS

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

Frequency

Frequency range, RF input		
Phase noise, AM noise measurements	R&S®FSPN8	
	AC coupled	1 MHz to 8 GHz
	R&S®FSPN26	
	DC coupled	1 MHz to 26.5 GHz
	AC coupled	10 MHz to 26.5 GHz
	R&S®FSPN50	
	DC coupled	1 MHz to 50 GHz
	AC coupled	10 MHz to 50 GHz
Baseband noise measurement	see “Baseband noise measurement” section	
Frequency resolution		0.01 Hz
Reference frequency, internal		
Accuracy		± (time since last adjustment × aging rate + temperature drift + calibration accuracy)
Aging per year	first year of operation	$\pm 5 \times 10^{-8}$
	after first year of operation	$\pm 3 \times 10^{-8}$
Temperature drift	0 °C to +40 °C	$\pm 1 \times 10^{-9}$
Achievable initial calibration accuracy		$\pm 5 \times 10^{-9}$

Phase noise measurements

Measurement results		SSB phase noise, spurious signals, integrated RMS phase deviation, residual FM, time jitter
Offset frequency range	carrier frequency ≤ (maximum input frequency – 1 GHz)	1 µHz to max. input frequency – carrier frequency
	carrier frequency ≥ (maximum input frequency – 1 GHz)	1 µHz to 1 GHz
Signal level range	level setting = high	–20 dBm to +30 dBm
	level setting = low	–40 dBm to +30 dBm
Number of traces		6
Phase noise measurement uncertainty	DUT phase noise ≥ 15 dB above phase noise sensitivity of R&S®FSPN [1]	
	1 µHz ≤ offset < 10 mHz	1.5 dB (nom.)
	10 mHz ≤ offset < 1 MHz	< 1.5 dB
	1 MHz ≤ offset ≤ 30 MHz	< 2 dB
	offset > 30 MHz	< 3 dB
Level measurement uncertainty	–20 dBm ≤ signal level ≤ 15 dBm, +20 °C to +30 °C	
	1 MHz ≤ signal frequency < 8 GHz	< 1 dB
	8 GHz ≤ signal frequency < 18 GHz	< 2 dB
	18 GHz ≤ signal frequency	< 3 dB
Spurious level [2]	f_{in} < 1 GHz	
	10 Hz ≤ offset from carrier < 1 kHz	< –90 dBc
	1 kHz ≤ offset from carrier ≤ 30 MHz	< –100 dBc
	f_{in} ≥ 1 GHz	
	10 Hz ≤ offset from carrier < 1 kHz	< –90 dBc + 20 log(f_{in}/GHz)
	1 kHz ≤ offset from carrier ≤ 30 MHz	< –100 dBc + 20 log(f_{in}/GHz)
AM suppression	10 mHz < offset < 1 MHz	40 dB (nom.)
	1 MHz ≤ offset ≤ 30 MHz, level setting = high, capture range = narrow or wide	30 dB (nom.)
	1 MHz ≤ offset ≤ 10 MHz, level setting = low, capture range = narrow or wide	30 dB (nom.)

[1] The phase noise sensitivity improvement due to the number of cross correlations is included. For DUT phase noise between 6 dB and 15 dB above phase noise sensitivity of the R&S®FSPN, add 1 dB of uncertainty.

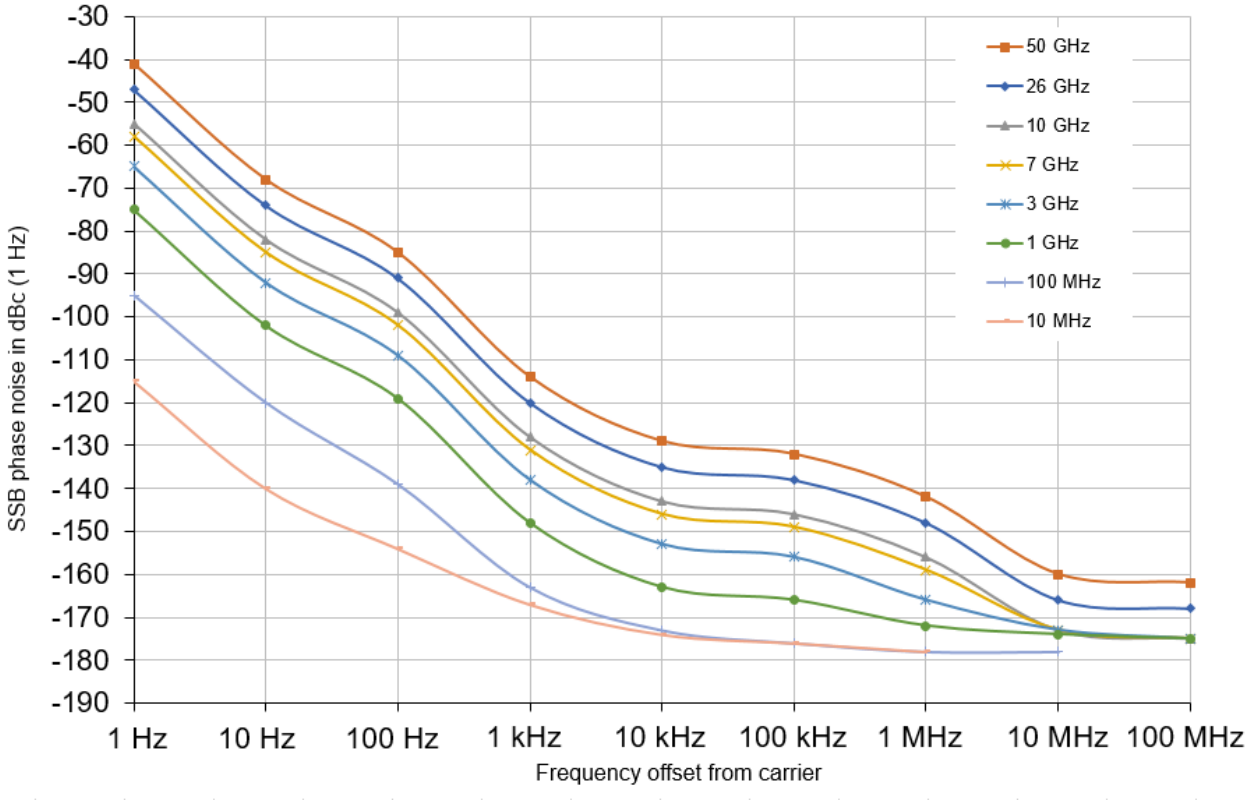
[2] For offset frequencies > 30 MHz spurious levels are not warranted but meet typically the same specification as for 30 MHz offset.

Phase noise sensitivity

Start offset = 1 Hz, cross correlation factor = 1, frequency reference: internal, internal reference loop bandwidth = 30 Hz, signal level ≥ 10 dBm [3], temperature range: +20 °C to +30 °C, specified values in dBc (1 Hz), numbers in brackets are typical values in dBc (1 Hz).

RF input frequency	Offset frequency from the carrier							
	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz
10 MHz	(–115)	(–140)	–140 (–156)	–158 (–167)	–170 (–176)	–170 (–176)	–170 (–176)	
100 MHz	(–95)	(–120)	–133 (–139)	–157 (–163)	–167 (–173)	–170 (–176)	–172 (–178)	–172 (–178)
1 GHz	(–75)	(–102)	–113 (–119)	–142 (–148)	–157 (–163)	–160 (–166)	–167 (–173)	–168 (–174)
3 GHz	(–65)	(–92)	–103 (–109)	–132 (–138)	–147 (–153)	–150 (–156)	–160 (–166)	–168 (–174)
7 GHz	(–58)	(–85)	–96 (–102)	–125 (–131)	–140 (–146)	–143 (–149)	–153 (–159)	–168 (–174)
10 GHz	(–55)	(–82)	–93 (–99)	–122 (–128)	–137 (–143)	–140 (–146)	–150 (–156)	–168 (–174)
16 GHz	(–51)	(–78)	–89 (–95)	–118 (–124)	–133 (–139)	–136 (–142)	–146 (–152)	–165 (–171)
26 GHz	(–47)	(–74)	–85 (–91)	–114 (–120)	–129 (–135)	–132 (–138)	–142 (–148)	–161 (–167)
50 GHz	(–41)	(–68)	–79 (–85)	–108 (–114)	–123 (–129)	–126 (–132)	–136 (–142)	–155 (–161)

Improvement of phase noise sensitivity by number of cross correlations				
Offset frequencies ≥ 1 Hz [4]				
Cross correlations	10	100	1000	10 000
Improvement	5 dB	10 dB	15 dB	20 dB



Typical phase noise sensitivity
(start offset = 1 Hz, cross correlation factor = 1, signal level = 10 dBm)

[3] For signal levels below +10 dBm, the phase noise sensitivity is limited by the thermal noise floor of –177 dBm (1 Hz).

[4] For offset frequencies below 1 Hz, the improvement impact of cross correlation is limited by the coupling between the two R&S®FSPN local oscillators. The improvement achievable in this case ranges from 15 dB (nom.) at 0.1 Hz frequency offset to 3 dB (nom.) at a frequency offset ≤ 30 mHz.

Measurement speed, nominal values

Auto freq = off, half decade config = auto, RBW = 10 %, cross correlation factor ≥ 10, measurement times ≥ 2 s, measurement times normalized to cross correlation factor = 1		
Time per cross correlation	span	
	0.1 Hz to 100 MHz	27 s
	1 Hz to 100 MHz	6.7 s
	10 Hz to 100 MHz	0.8 s
	100 Hz to 100 MHz	0.1 s
	1 kHz to 100 MHz	0.01 s
	10 kHz to 100 MHz	0.001 s

To obtain the measurement time for a given number of cross correlations (without automatic signal frequency search), multiply the above figures by the number of cross correlations.

AM noise measurements

Offset frequency range	input signal ≤ 100 MHz	1 µHz to 40 % of carrier frequency
	input signal > 100 MHz	1 µHz to 40 MHz
AM noise measurement uncertainty	DUT AM noise ≥ 15 dB above AM noise sensitivity of R&S®FSWP [5]	
	1 µHz < offset < 10 mHz	2 dB (nom.)
	10 mHz < offset < 1 MHz	< 2 dB
	1 MHz ≤ offset ≤ 30 MHz	< 2.5 dB
Level measurement uncertainty	–20 dBm ≤ signal level ≤ +15 dBm, +20 °C to +30 °C	
	1 MHz ≤ signal frequency < 8 GHz	< 1 dB
	8 GHz ≤ signal frequency < 18 GHz	< 2 dB
	18 GHz ≤ signal frequency	< 3 dB

AM noise sensitivity

Start offset = 1 Hz, cross correlation factor = 1, signal level ≥ 10 dBm [6], specified values in dBc (1 Hz), numbers in brackets are typical values in dBc (1 Hz).

RF input frequency	**Offset frequency from the carrier**								
	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	30 MHz
100 MHz ≤ f ≤ 1 GHz	–102 (–108)	–117 (–123)	–132 (–138)	–147 (–153)	–155 (–161)	–165 (–171)	–165 (–171)	–165 (–171)	–165 (–171)
1 GHz < f ≤ 12 GHz	–97 (–103)	–112 (–118)	–127 (–133)	–142 (–148)	–152 (–158)	–160 (–166)	–165 (–171)	–165 (–171)	–165 (–171)
12 GHz < f ≤ 18 GHz	–87 (–93)	–102 (–108)	–117 (–123)	–132 (–138)	–147 (–153)	–160 (–166)	–165 (–171)	–165 (–171)	–165 (–171)
f > 18 GHz	–77 (–83)	–92 (–98)	–107 (–113)	–122 (–128)	–137 (–143)	–150 (–156)	–160 (–166)	–165 (–171)	–165 (–171)

Improvement of AM noise sensitivity by number of cross correlations				
Cross correlations	10	100	1000	10 000
Improvement	5 dB	10 dB	15 dB	20 dB

[5] Specified values for offset frequencies ≤ 30 % of signal frequency. The AM noise sensitivity improvement due to the number of cross correlations is included. For DUT phase noise from 6 dB to 15 dB above AM noise sensitivity of the R&S®FSPN, add 1 dB of uncertainty.

[6] For signal levels below +10 dBm, the AM noise is limited by the thermal noise floor of –177 dBm (1 Hz).

Baseband noise measurement

Frequency range	R&S®FSPN8	
	RF input	1 MHz to 8 GHz
	baseband input	10 mHz to 30 MHz
	R&S®FSPN26	
	RF input, DC coupled	10 mHz to 26.5 GHz
	RF input, AC coupled	10 MHz to 26.5 GHz
	baseband input	10 mHz to 30 MHz
	R&S®FSPN50	
	RF input, DC coupled	10 mHz to 50 GHz
	RF input, AC coupled	10 MHz to 50 GHz
	baseband input	10 mHz to 30 MHz
Level measurement range	RF input	< +8 dBm
	baseband input	< +4 dBm
Level measurement uncertainty	+20 °C to +30 °C	
	10 mHz < f_{in} < 1 MHz	< 2 dB (nom.)
	1 MHz ≤ f_{in} ≤ 30 MHz	< 2.5 dB (nom.)
Units		dBm (1 Hz), dBµV (1 Hz), dBV (1 Hz), V ($\sqrt{Hz}$)

Baseband noise level

Start offset = 1 Hz, cross correlation factor = 1, input = baseband input, 50 Ω terminated, specified values in dBm (1 Hz), numbers in brackets are typical values in dBc (1 Hz).									
Input frequency	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	30 MHz
Noise level	–117 (–123)	–127 (–133)	–142 (–148)	–151 (–157)	–158 (–164)	–160 (–166)	–160 (–170)	–160 (–170)	–160 (–170)

VCO characterization measurements (frequency, RF power, DC supply current)

Sweep parameters		• DC tune voltage (V_{tune}) • DC auxiliary voltage (V_{aux}) • DC supply voltage (V_{supply}) • DC supply current (I_{supply})
Measurement parameters		• frequency • RF power • DC supply current • tuning sensitivity
Frequency resolution		100 mHz to 100 kHz in steps of 1, 10, …
RF power measurement range	1 MHz ≤ signal frequency ≤ 100 MHz	–15 dBm to +27 dBm
	signal frequency > 100 MHz	–20 dBm to +27 dBm
Level measurement uncertainty	–20 dBm ≤ signal level ≤ 15 dBm, +20 °C to +30 °C	
	1 MHz ≤ signal frequency < 8 GHz	< 1 dB
	8 GHz ≤ signal frequency < 18 GHz	< 2 dB
	signal frequency ≥ 18 GHz	< 3 dB
V_{tune}	setting range	–10 V to +28 V
	setting resolution	1 mV
	setting uncertainty	±(0.2 % of reading + 8 mV) (meas.)
	reading uncertainty	±(0.5 % of reading + 25 mV) (meas.)
	output resistance	50 Ω
	output settling time	7 ms/V
	noise level	< 1 nV (RMS) at 10 kHz (meas.)
V_{aux}	setting range	–10 V to +10 V
	setting resolution	1 mV
	setting uncertainty	±(0.1 % of reading + 2 mV) (meas.)
	reading uncertainty	±(0.5 % of reading + 25 mV) (meas.)
	output resistance	5 Ω
	output settling time	1 ms/V
	noise level	< 10 nV (RMS) at 10 kHz (meas.)
V_{supply}	setting range	0 to 16 V
	setting resolution	1 mV
	setting uncertainty	±(0.1 % of reading + 1 mV) (meas.)
	reading uncertainty	±(0.5 % of reading + 25 mV) (meas.)
	output resistance	0.5 Ω
	output settling time	50 ms/V
	noise level	< 10 nV (RMS) at 10 kHz (meas.)
I_{supply}	setting range	10 mA to 2000 mA
	setting resolution	1 mA
	setting uncertainty	±(0.5 % of reading + 0.5 mA) (meas.)
	reading uncertainty	±(0.5 % of reading + 1.5 mA) (meas.)

Transient analysis

Frequency range	R&S®FSPN8	
	AC coupled	1 MHz to 8 GHz
	R&S®FSPN26	
	DC coupled	1 MHz to 26.5 GHz
	AC coupled	10 MHz to 26.5 GHz
	R&S®FSPN50	
	DC coupled	1 MHz to 50 GHz
	AC coupled	10 MHz to 50 GHz
Measurement parameters	narrow mode/wide mode	frequency
	narrow mode additionally	phase
Frequency transient bandwidth	narrow mode	40 MHz
	wide mode	256 MHz to 8 GHz
Frequency uncertainty		±(resolution + reference frequency accuracy)
Phase uncertainty	DUT signal locked to target frequency	0.05° + 0.1° × f_{in}/GHz
RF input level range	narrow mode	−20 dBm to +20 dBm
	wide mode	
	256 MHz to 6 GHz	−15 dBm to +20 dBm
	6 GHz to 7 GHz	−10 dBm to +20 dBm
	7 GHz to 8 GHz	0 dBm to +20 dBm
Time span		1 µs to 16 s
Time resolution		> 20 ns
Measurement trigger	trigger mode	free run, external, frequency
	external trigger polarity	positive, negative (3.3 V TTL level)
	pretrigger delay	(–1) × time span to 16 s

Frequency resolution, narrow mode

Observation time	1 µs	10 µs	100 µs	1 ms	10 ms	100 ms	1 s	10 s	16 s
Minimum VBW	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz
Maximum VBW	5 MHz	5 MHz	5 MHz	5 MHz	625 kHz	96 kHz	10 kHz	1 kHz	625 Hz
Measurement points	51	501	5001	50001	62501	100001	100001	100001	100001
Time resolution at maximum VBW	20 ns	20 ns	20 ns	20 ns	160 ns	1 µs	10 µs	100 µs	160 µs
Frequency resolution at mininimum VBW for span > 1 MHz	20 Hz	20 Hz	20 Hz	20 Hz	20 Hz	20 Hz	20 Hz	20 Hz	20 Hz
Frequency resolution at mininimum VBW for span ≤ 1 MHz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz
Frequency resolution at maximum VBW	57 kHz	57 kHz	57 kHz	57 kHz	1.2 kHz	500 Hz	30 Hz	30 Hz	30 Hz

Frequency resolution, wide mode (256 MHz to 8 GHz)

Observation time	1 µs	10 µs	100 µs	1 ms	10 ms	100 ms	1 s	10 s	16 s
Minimum VBW	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz
Maximum VBW	100 kHz	100 kHz	100 kHz	100 kHz	100 kHz	96 kHz	10 kHz	1 kHz	625 Hz
Measurement points	51	501	5001	50001	62501	100001	100001	100001	100001
Time resolution at maximum VBW	20 ns	20 ns	20 ns	20 ns	160 ns	1 µs	10 µs	100 µs	160 µs
Frequency resolution at minimum VBW	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz	1 Hz
Frequency resolution at maximum VBW	15 MHz	15 MHz	1 MHz	20 kHz	20 kHz	5 kHz	250 Hz	20 Hz	20 Hz

Allan deviation, Allan variance

Frequency range	R&S®FSPN8	1 MHz to 8 GHz
	R&S®FSPN26	1 MHz to 26.5 GHz
	R&S®FSPN50	1 MHz to 50 GHz
Measurement range	measurement time τ	100 ns to 1 000 000 s
Allan deviation	reference frequency with highly stable external reference, reference loop bandwidth = 100 Hz	8.8×10^{-14} at τ = 1 s (meas.)
		7.0×10^{-15} at τ = 1000 s (meas.)

Inputs and outputs

RF input		
Impedance		50 Ω
Connector	R&S®FSPN8	N female
	R&S®FSPN26	APC 3.5 mm male (compatible with SMA)
	R&S®FSPN50	1.85 mm male (compatible with 2.4 mm)
VSWR	R&S®FSPN8	
	10 MHz ≤ f < 3 GHz	< 1.5 (nom.)
	3 GHz ≤ f ≤ 8 GHz	< 2.0 (nom.)
	R&S®FSPN26, R&S®FSPN50	
	RF attenuation = 0 dB	
	10 MHz ≤ f ≤ 26.5 GHz	< 2.0 (nom.)
	RF attenuation = 5 dB	
	10 MHz ≤ f ≤ 3.5 GHz	< 1.5 (nom.)
	3.5 GHz < f ≤ 18 GHz	< 1.8 (nom.)
	18 GHz < f ≤ 50 GHz	< 2.0 (nom.)
	RF attenuation ≥ 10 dB	
	10 MHz ≤ f ≤ 3.5 GHz	< 1.2 (nom.)
	3.5 GHz < f ≤ 18 GHz	< 1.5 (nom.)
	18 GHz < f ≤ 50 GHz	< 2.0 (nom.)
Setting range of attenuator	R&S®FSPN8	no user accessible attenuator
	R&S®FSPN26, R&S®FSPN50	0 dB to 75 dB, in 5 dB steps

Maximum RF input level		
DC voltage	AC coupled	50 V
	DC coupled	0 V
CW RF power	R&S®FSPN8	
	input frequency < 5 MHz	20 dBm (= 0.1 W)
	input frequency ≥ 5 MHz	30 dBm (= 1 W)
	R&S®FSPN26, R&S®FSPN50	
	RF attenuation < 10 dB	20 dBm (= 0.1 W)
	RF attenuation ≥ 10 dB	30 dBm (= 1 W)
Maximum pulse voltage	R&S®FSPN26, R&S®FSPN50, RF attenuation ≥ 10 dB	50 V
Maximum pulse power	R&S®FSPN26, R&S®FSPN50, RF attenuation ≥ 10 dB, pulse duration τ = 3 µs	100 W

V_{supply}		
Connector		BNC female
Impedance		50 Ω (nom.)
Output voltage		0 V to 16 V
Output current		0 mA to 2000 mA

V_{aux}		
Connector		BNC female
Impedance		50 Ω (nom.)
Output voltage		–10 V to +10 V
Output current		±100 mA

V_{tune}		
Connector		BNC female
Impedance		50 Ω (nom.)
Output voltage		–10 V to +28 V
Output current		±20 mA

Baseband input		
Connector		BNC female
Impedance		50 Ω (nom.)
Input frequency range		DC to 30 MHz
Maximum input level		±2 V

Probe power supply		
Supply voltages		+15 V DC, –12.6 V DC and ground, max. 150 mA (nom.)

Trigger in/out		
Connector		BNC female
Impedance		50 Ω (nom.)

Power sensor		
Connector		6-pin LEMOSA female for R&S®NRP-Zxx power sensors

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

Reference input 100 MHz/1 GHz		
Connector		SMA female
Impedance		50 Ω (nom.)
Input frequency range		100 MHz, 1 GHz
Required level		0 dBm to 10 dBm

Reference output 10 MHz								
Connector					BNC female			
Impedance					50 Ω (nom.)			
Output frequency					10 MHz			
Level					10 dBm (nom.)			
Measured phase noise, internal reference loop bandwidth 30 Hz								
Offset frequency from the carrier	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	3 MHz
Phase noise in dBc (1 Hz)	–110	–134	–146	–157	–165	–166	–167	–168

Reference output 1 MHz to 50 MHz		
Connector		BNC female
Impedance		50 Ω (nom.)
Output frequency	internal reference	not active
	external reference	same as reference input signal
Level		same as reference input signal

Reference output 100 MHz								
Connector					SMA female			
Impedance					50 Ω (nom.)			
Output frequency					100 MHz			
Level					6 dBm (nom.)			
Measured phase noise internal reference loop bandwidth 30 Hz								
Offset frequency from the carrier	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz
Phase noise in dBc (1 Hz)	–90	–114	–126	–154	–162	–163	–164	–164

Reference output 640 MHz								
Connector					SMA female			
Impedance					50 Ω (nom.)			
Output frequency					640 MHz			
Level					16 dBm (nom.)			
Measured phase noise with internal reference loop bandwidth 30 Hz								
Offset frequency from the carrier	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz
Phase noise in dBc (1 Hz)	–75	–98	–112	–142	–156	–158	–165	–165

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		DVI-D, DisplayPort Rev 1.1

USB interface		7 ports, type A plug, version 2.0
		1 port, type B plug, version 2.0

General data

Display		30.7 cm (12.1"), WXGA color touchscreen
Resolution		1280 × 800 pixel (WXGA resolution)
Pixel failure rate		< 1 × 10^{-5}

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

Temperature		
Operating temperature range		+5 °C to +40 °C
Permissible temperature range		0 °C to +55 °C
Storage temperature range		–40 °C to +70 °C
Climatic loading	without condensation	+40 °C at 90 % rel. humidity, in line with EN 60068-2-30

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

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

EMC		
		• IEC/EN 61326-1 [7, 8] • CISPR 11/EN 55011 [7]

Recommended calibration interval		1 year

Power supply		
Input voltage range	AC	(100 V to 240 V) ± 10 %
Supply frequency	AC	(50 Hz to 60 Hz/400 Hz) ± 5 %
Maximum input current		7.3 A to 4.6 A (100 V to 240 V)
Power consumption	R&S®FSPN8	210 W
	R&S®FSPN26, R&S®FSPN50	235 W
Safety		in line with: IEC 61010-1, EN 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1
Test marks		VDE, CE, $_{C}$CSA$_{US}$, KCC

Dimensions and weight		
Dimensions (nom.)	W × H × D, including front handles and rear feet	462 mm × 240 mm × 504 mm (18.15 in × 9.44 in × 19.81 in)
Net weight (nom.)	R&S®FSPN8	20.5 kg (45.2 lb)
	R&S®FSPN26, R&S®FSPN50	22 kg (48.5 lb)

[7] Emission limits for class A equipment.

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

Ordering information

Designation	Type	Order No.
Phase noise analyzer and VCO tester, 1 MHz to 8 GHz	R&S®FSPN8	1322.8003.07
Phase noise analyzer and VCO tester, 1 MHz to 26.5 GHz	R&S®FSPN26	1322.8003.25
Phase noise analyzer and VCO tester, 1 MHz to 50 GHz	R&S®FSPN50	1322.8003.49
Accessories supplied: power cable, quick start guide; additionally for R&S®FSPN26: adapter 3.5 mm (APC3.5-compatible), female/female; additionally for R&S®FSPN50: adapter 1.85 mm, female/female		

Recommended extras

Designation	Type	Order No.
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
Front cover	R&S®ZZF-511	1174.8825.00
19" rack adapter	R&S®ZZA-KN5B	1703.1352.00
Matching pads, 50/75 Ω		
L section, matching at both ends	R&S®RAM	0358.5414.02
Series resistor, 25 Ω, matching at one end (taken into account in instrument function RF INPUT 75 Ω)	R&S®RAZ	0358.5714.02
High-power attenuators		
100 W, 3 dB, 1 GHz	R&S®RBU100	1073.8495.03
100 W, 6 dB, 1 GHz	R&S®RBU100	1073.8495.06
100 W, 10 dB, 1 GHz	R&S®RBU100	1073.8495.10
100 W, 20 dB, 1 GHz	R&S®RBU100	1073.8495.20
100 W, 30 dB, 1 GHz	R&S®RBU100	1073.8495.30
50 W, 3 dB, 2 GHz	R&S®RBU50	1073.8695.03
50 W, 6 dB, 2 GHz	R&S®RBU50	1073.8695.06
50 W, 10 dB, 2 GHz	R&S®RBU50	1073.8695.10
50 W, 20 dB, 2 GHz	R&S®RBU50	1073.8695.20
50 W, 30 dB, 2 GHz	R&S®RBU50	1073.8695.30
50 W, 20 dB, 6 GHz	R&S®RDL50	1035.1700.52
Connectors and cables		
Coaxial adapter, N (f)/3.5 mm (f), APC3.5-compatible, for R&S®FSPN8		3587.7829.00
Coaxial adapter, 3.5 mm (f/f), APC3.5-compatible, for R&S®FSPN26		3689.9442.00
Coaxial adapter, 1.85 mm (f/f), APC2.4-compatible, for R&S®FSPN50		3588.9654.00
Probe power connector, 3-pin		1065.9480.00
Type N adapter, for R&S®RT-Zxx oscilloscope probes	R&S®RT-ZA9	1417.0909.02
DC block		
DC block, 10 kHz to 18 GHz (type N)	R&S®FSE-Z4	1084.7443.02

Service options

Service options		
Extended warranty, one year	R&S®WE1	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	

Extended warranty with a term of one and two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge [9]. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration coverage (CW1 and CW2)
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [9] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

Extended warranty with accredited calibration (AW1 and AW2)
Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs [9] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

[9] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.