2 Performance Test

2.1 Test Equipment

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
1	Signal generator	R&S FSWP 8: 10 kHz to 8 GHz R&S FSWP 26: 10 kHz to 26.5 GHz R&S FSWP 50: 10 kHz to 50 GHz Frequency Error < 1e-9	R&S SMA100B with options depending on frequency range and LF output	1419.8888.02	Reference frequency uncertainty Display linearity
2	Signal generator	R&S FSWP 8: 10 MHz to 8 GHz R&S FSWP 26: 10 MHz to 26 GHz R&S FSWP 50: 10 MHz to 50 GHz For all models: generator output level > +10 dBm	R&S SMA100B with high power option	1419.8888.02	Immunity to interference Nonlinearities Frequency response
4	Power splitter* 2-resistor design *or* Power combiner** 3-resistor design	R&S FSWP 8: 10 MHz to 8 GHz R&S FSWP 26: 10 MHz to 26 GHz R&S FSWP 50: 10 MHz to 50 GHz level imbalance 10 MHz to 26.5 GHz: ≤ 0.3dB 26.5 GHz to 50 GHz: ≤ 0.5 dB 50 GHz to 67 GHz: ≤ 1.8 dB equivalent output SWR 10 MHz to 3.6 GHz: ≤ 1.1 3.6 GHz to 26.5 GHz:≤ 1.3 26.5 GHz to 50 GHz: ≤ 1.7 50 GHz to 67 GHz: ≤ 3.11	Keysight 11667A Weinschel 1870A *or* Keysight 11636A Keysight 11667B Weinschel WA1534 *or* Keysight 11636B Keysight 11667C *or* Keysight 11636C		Frequency response* Third order intercept**
5	50-Ohm termination	Frequency Range from DC to the maximum Frequency of the FSWP	Anritsu 28N50-2 (N/m, 18 GHz) Anritsu 28SF50-1 (3.5 mm/f, 26 GHz) Anritsu 28VF50D (1.85 mm/f, 70 GHz)		Noise display

6	Power meter	−30 dBm to +10 dBm	R&S NRX	1424.7005.02	Frequency response, LO output power
7	Power sensor	9 kHz to 7 GHz −30 dBm to 0 dBm	R&S NRP18T	1424.6115.02	Frequency response
8	Power sensor	R&S FSWP 8/26 DC to 33 GHz −30 dBm to 0 dBm R&S FSWP 50 DC to 50 GHz	R&S NRP33T R&S NRP50T	1424.6138.02 1424.6137.02	Frequency response, R&S FSWP-B21 LO output power
9	Step attenuator	variable attenuation 0 dB to 100 dB, 1-dB steps attenuation uncertainty < 0.1 dB (f = 128 MHz)	R&S RSG with special calibration R&S RSC	1009.4505.02 0859.4822.00 1313.8004.03	Display linearity RF attenuator Reference level switching
10	Fixed Attenuator	fixed attenuation 10 dB	Anritsu 43KC-10		LO output power R&S FSWP-B21
11	Network analyzer	R&S FSWP 8: 20 MHz to 8 GHz R&S FSWP26: 20 MHz to 26.5 GHz R&S FSWP50: 20 MHz to 40 GHz	R&S ZVA or R&S ZNB	1145.1110.10 1145.1110.24 1145.1110.40	VSWR
12	AC Voltmeter	2 Hz to 9 kHz	R&S URE2	0350.5315.02	Troubleshooting tests
13	50 Ω termination	BNC, 50 Ω ± 0.1 %	RAD 50	0844.9352.02	frequency response
15	DC multimeter	Voltage max. ±30 V voltage accuracy < ±0.01 mV current max. 2000 mA current accuracy < ±0.3 mA	Keysight 34401A or Keysight 34461A		Troubleshooting tests
16	Signal Source 1GHz or 640 MHz	< −105 dBc/Hz @ 100 Hz < −130 dBc/Hz @ 1 kHz < −140 dBc/Hz @ 10 kHz < −150 dBc/Hz @ 100 kHz < −150 dBc/Hz @ 1 MHz	R&S SMA100B incl. option SMAB-B711	1419.8888.02 1420.8020.02	Phase Noise of spectrum analyzer option R&S FSWP-B1
23	Low Phase Noise Reference 100 MHz Output Level ≥ +13 dBm	Phase Noise @1 Hz < −80 dBc(Hz) @10 Hz < −110 dBc(Hz) @100 Hz < −138 dBc(Hz) @1 kHz < −160 dBc(Hz) @10 kHz < −176 dBc(Hz) @100 kHz < −180 dBc(Hz) @1 MHz < −180 dBc(Hz)	R&S LPNR100	5026.6520.03	Phase Noise Sensitivity Test

24	Low pass filter set	9 MHz 21 MHz, 106 MHz, 274 MHz, 450 MHz, 700 MHz, 1 GHz, 1.5 GHz, 1.75 GHz, 3.5 GHz			2nd order harmonic distortion
25	Vector signal generator	Signal frequency 100 MHz; including ARB baseband generator	R&S SMBV100B +SMBVB-B103 or R&S SMW200A +SMW-B10	1423.1003.02 1423.6270.02 or 1412.0000.02 1413.1200.02	Phase noise measurement uncertainty test

2.2 Performance Test R&S FSWP

2.2.1 Checking the Return Loss at the RF Input

Test equipment: Network analyzer (Section "Test Equipment", item 11)

Test setup: ► Connect the test port of the network analyzer to the RF input of the R&S FSWP.

Remarks:

- Connect reference input of R&S FSWP to the master reference signal.
- For R&S ZVA models, adjust bandwidth to 500 Hz.
- For R&S ZNB models adjust bandwidth to 1 kHz.

R&S FSWP settings:

R&S FSWP8 without option R&S FSWP-B1 :

- No measurement since VSWR value is nominal in the data sheet.

R&S FSWP26/50 or R&S FSWP8 with option R&S FSWP-B1 :

- [PRESET]

- [Mode : Phase Noise]

- [AMPT : RF ATTEN MANUAL : {Att_{FSWP}}]

Measurement: ► See operating manual of the network analyzer for detailed information about S_{11} measurement. The R&S FSWP has to be set to the test frequency.

R&S FSWP26/ 50 or R&S FSWP8 with option R&S FSWP-B1 :

► Determine S_{11} of the R&S FSWP input with the following setting of the RF attenuator and input set to DC coupling:

Att_{FSWP} = 5 dB, 10 dB, 20 dB, 40 dB

► Determine S_{11} of the R&S FSWP input with the following setting of the RF attenuator and input set to AC coupling:

Att_{FSWP} = 10 dB

Test frequencies F_{in} = 10 MHz to 8 GHz >101 points,

R&S FSWP26: additional from Fin = 8 GHz to 26.5 GHz >201 points,

R&S FSWP50: additional from Fin = 8 GHz to 40 GHz >201 points,

Test limits according to data sheet.

2.2.2 Checking the RF Attenuator Uncertainty – PN Mode

This test has only to be performed for the instruments FSWP26 and FSWP50 *without* option FSWP-B1!

Test equipment: Signal generator (Section "Test Equipment", item 1)

Frequency 128 MHz

Maximum level ≥ +10 dBm

Step attenuator (Section "Test Equipment", item 9)

Frequency 128 MHz

Attenuation 0 to 80 dB in 5 dB steps

Attenuation uncertainty < 0.1 dB

Test setup:

- Connect RF output of the signal generator to RF input of the step attenuator
- Connect RF output of the step attenuator to RF input of the R&S FSWP

Signal generator settings:

- Frequency 128.1 MHz
- Level +10 dBm

R&S®FSWP settings:

- [**PRESET**]
- [Password „894129“]
- [**MODE** : IQ Analyzer]
- [**FREQ** : CENTER : **128.1 MHz**]
- [**MEAS CONFIG** : Data Acquisition : Sample Rate : **10.0 kHz**]
- [**MEAS CONFIG** : Data Acquisition : Analysis Bandwidth (ABW) : **8.0 kHz**]
- [**MEAS CONFIG** : Data Acquisition : Meas Time : **100 ms**]
- [**MEAS CONFIG** : Data Acquisition : Record Length : **1000**]
- [**TRACE** : DETECTOR : RMS]
- [**TRACE** : MODE : AVERAGE]
- [**SWEEP** : SWEEP COUNT : 10]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : Ref Level : +1**0 dBm**]

Step attenuator settings:

- Attenuation $\boldsymbol{ATT}_{STEP} = 80\ dB - \boldsymbol{ATT}_{FSWP}$

where $\boldsymbol{ATT}_{STEP}$ is the attenuation of the step attenuator and $\boldsymbol{ATT}_{FSWP}$ is the attenuation of the R&S FSWP instrument ranging from 0 dB to 70 dB in steps of 5 dB.

Reference measurement:

- Step attenuator $\boldsymbol{ATT}_{step}$ = 70 dB and RF ATTEN MANUAL $\boldsymbol{ATT}_{FSWP}$ = 10 dB.
- before Run single: wait 20 sec. then Run single and read Marker value.

---> reference value @ RF ATTEN MANUAL $\boldsymbol{ATT}_{FSWP}$ = 10 dB:
REF10DB = (Marker Reading)@10dB

R&S®FSWP settings:

- [**AMPT** : RF ATTEN MANUAL : {$\boldsymbol{ATT}_{FSWP}$}]
- [**MKR** ⇒ : PEAK]

See table below for values of $\boldsymbol{ATT}_{FSWP}$.

Evaluation:

error/dB = (Marker Reading)@$\boldsymbol{ATT}_{FSWP}$ **–** *REF10DB* **–** $\boldsymbol{ATT}_{FSWP}$ + 10

Note: For R&S FSWP instruments without option B1 (spectrum analysis) there are no specifications for the RF attenuator uncertainty in the instruments data sheet. Therefore, the evaluation result is simply a PASS or FAIL.

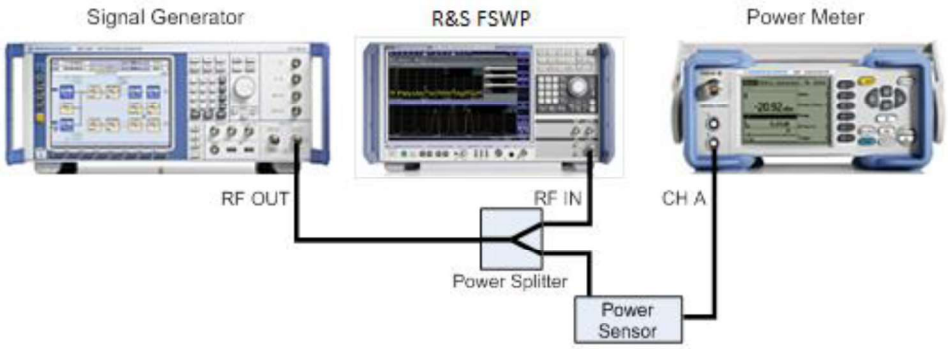
Test limits:

a $_{FSWP}$	Limits for ***error***/dB
0 dB	± 0.3 dB
5 dB	± 0.3 dB
10 dB	± 0.3 dB (*reference*)
15 dB	± 0.3 dB
20 dB	± 0.3 dB
25 dB	± 0.3 dB
30 dB	± 0.3 dB
35 dB	± 0.3 dB
40 dB	± 0.3 dB
45 dB	± 0.3 dB
50 dB	± 0.3 dB
55 dB	± 0.3 dB
60 dB	± 0.3 dB
65 dB	± 0.3 dB
70 dB	± 0.3 dB

2.2.3 Frequency Measurement Test

Test setup:

- ► Standardize the Power Meter and Power Sensor (item 6, 7, 8).
- ► Use Power Splitter/Combiner (item 4) and connect equipment as shown below.
- ► Connect the power splitter directly to the R&S FSWP RF input.
- ► Connect reference input of R&S FSWP to the master reference signal.



Important Note:
Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Signal generator settings:

- Level see setting table
- Frequency {center}

R&S FSWP settings:

- [PRESET]
- [Internal Reference]
- [Password „894129“]
- [MODE IQ Analyzer]
- [Meas Config : Signal Source State : ON] // ← this command is only for instruments with option FSWP-B1

// If firmware version 1.60 or lower is installed:

- [Data Acquisition: Sample Rate 10 kHz, Record Length 2001]
- [Sweep Config: Sweep Points : 2001]
- [SWEEP : SINGLE]

// If firmware version 1.70 or higher is installed:

//Turn on UDC processing to enable higher marker resolution
- [INP:SSA:UDC:STAT 1]

//Set data acquisition and advanced Fourier transformation parameters:

For input frequencies ≤ 1 GHz:
- [Sample Rate: 100 Hz; Record Length: 100; FFT Length = Sweep Points: 65536]

For 1 GHz < input frequencies ≤ 8 GHz
- [Sample Rate: 1 kHz; Record Length: 1000; FFT Length = Sweep Points: 65536]

For input frequencies > 8 GHz
- [Sample Rate: 10 kHz; Record Length: 10000; FFT Length = Sweep Points: 65536]

- [SWEEP : SINGLE]

Measurement:
- ► Set the generator frequency according to the table below.
- ► Adjust the signal generator output level until the Power Meter shows the level according to the setting table.
- ► Switch Signal Source HwChannel to 1
- ► Start a Sweep of the R&S FSWP
- ► Read out the signal frequency of the R&S FSWP

Evaluation: Calculate the frequency deviation according to the following formula for HwChannel 1:

Frequency Deviation = Generator Frequency − R&S FSWP Frequency Reading

Setting table:

	Signal Level	Input frequency
R&S FSWP8/26/50	−20 dBm ± 0.5 dB	10 MHz
		100 MHz
		1 GHz
		2 GHz
		3 GHz
		4 GHz
		5 GHz
		6 GHz
		7 GHz
		7.999 GHz
R&S FSWP26/50	−20 dBm ± 1 dB	8.001 MHz
		16 GHz
		26 GHz
R&S FSWP50	−20 dBm ± 1 dB	32 GHz
		34 GHz
		50 GHz

Testlimits : Standard: ± (10 Hz + 0.1 ppm of signal frequency)

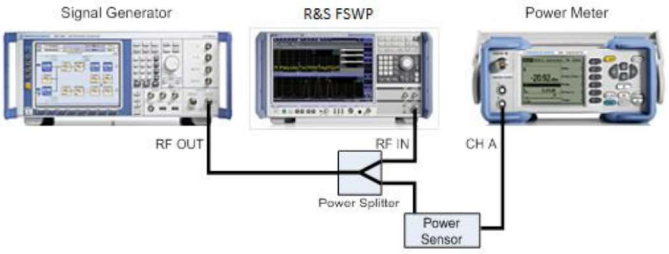
With option R&S FSWP-B4 or
option R&S FSWP-B61: ± (10 Hz + 0.05 ppm of signal frequency)

For specification: see data sheet

2.2.4 Power Measurement Uncertainty Test

Test setup:

- ► Standardize the Power Meter and Power Sensor (item 6, 7, 8).
- ► Use Power Splitter/Combiner (item 4) and connect equipment as shown below.
- ► Connect the power splitter directly to the R&S FSWP RF input.
- ► Connect reference input of R&S FSWP to the master reference signal.



Important Note
Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Signal generator settings:

- Level see setting table
- Frequency {center}

R&S FSWP settings:

- [PRESET]
- [Internal Reference]
- [Password „894129“]
- [MODE IQ Analyzer]
- [Meas Config : Signal Source State: ON]
- [SETUP : MORE : SERVICE : SERVICE FUNCTION : 2.26.1.6.1.5]
- [SETUP : MORE : SERVICE : SERVICE FUNCTION : 2.3.16.20.3]

(With the above Service Functions the synthesizer is switched to the proper mode. The functions shall be reset after the test sequence with “2.0.0”.)

- [Data Acquisition: Sample Rate 10 kHz, Record Length 2001]
- [Sweep Config: Sweep Points : 2001]
- [AMPT : RF Atten : 10 dB]
- [SWEEP : SINGLE]

Measurement:

- ► Set the generator frequency according to the table below
- Adjust the signal generator output level until the power meter reading is −10 dBm ± 0.5 dB
- ► Switch Signal Source HwChannel to 1
- ► Start a Sweep of the R&S FSWP
- ► Read out the signal power of the R&S FSWP

Evaluation:

Calculate the test result by using the following formula for HwChannel 1:

Test result (dB) = R&S FSWP Power Reading – Power Meter Reading

Setting table:		Signal Level	Input frequency
	R&S FSWP8/26/50	−10 dBm ± 2 dB	10 MHz
			20 MHz
			30 MHz
			50 MHz
			100 MHz
			200 MHz
			300 MHz
			500 MHz
			1 GHz
			2 GHz
			4 GHz
			5 GHz
			6 GHz
			7 GHz
			8 GHz
	R&S FSWP26/50	−10 dBm ± 2 dB	8.1 GHz
			10 GHz
			12 GHz
			14 GHz
			16 GHz
			18 GHz
			20 GHz
			22 GHz
			24 GHz
			26.4 GHz
	R&S FSWP50	−10 dBm ± 2 dB	28 GHz
			30 GHz
			35 GHz
			40 GHz
			45 GHz
			49.9 GHz
Testlimits:	+20°C to +30°C: according to data sheet		

2.2.5 Phase Noise Measurement Uncertainty Test

Test equipment: Generator with IQ modulator (see “Test Equipment”, item 25)

Signal frequency 100 MHz

Signal generator settings:
- Level 0 dBm
- Frequency 100 MHz
- Load the file “`PhaseNoise.wv`” into the ARB Waveform Generator
- With the SMW200A: switch the I/Q Modulator Optimization Mode to “Fast”
- Switch the ARB on

Remark: Connect reference input of R&S FSWP to the master reference signal.

Due to the digital modulation and the high resolution of the ARB, the output signal of the signal generator has a very accurate phase noise spectrum.

R&S FSWP settings:
- [PRESET]
- [MODE Phase Noise]
- [SWEEP : SINGLE]
- [Auto Freq : Off]
- [Signal Frequency : 100 MHz]
- [Start Offset : 100 Hz]
- [Stop Offset : 3 MHz]
- [Spur suppression : ON]
- [Smoothing : 1%]
- [RBW : 10%]
- [Xcorr Factor : 500]
- [SETUP : MORE : SERVICE : PASSWORD : 894129]
- [SETUP : MORE : SERVICE : SERVICE FUNCTION : 2.27.4.4.1]

With the Service Function the frequency search function is disabled. The function shall be reset after the test sequence with “2.27.4.4.0”.

Measurement:
- ► Adjust the signal generator output level until the Power Meter reading is 0 dBm ± 1 dB
- ► Start the Measurement of the R&S FSWP
- ► Read out the Phase Noise Values for frequency offsets in the following table:

Test limits:	Frequency offset	Test limit	Measurement uncertainty
	100 Hz	−40 dBc(Hz) ±1.5 dB	±0.5 dB
	1 kHz	−60 dBc(Hz) ±1.5 dB	±0.5 dB
	10 kHz	−80 dBc(Hz) ±1.5 dB	±0.5 dB
	100 kHz	−97 dBc(Hz) ±1.5 dB	±0.5 dB
	1 MHz	−100 dBc(Hz) ±1.5 dB	±0.5 dB
	3 MHz	−100 dBc(Hz) ±1.5 dB	±0.5 dB

Screenshot of R&S FSWP measurement – example:

2.2.6 Checking the Phase Noise Sensitivity

This is a PASS/FAIL test that should be performed prior to testing the synthesizer phase noise in section 2.2.7.

Test equipment: Phase Noise Standard (refer to "Test Equipment", item 23)
Frequency 100 MHz
Signal Level at R&S FSWP input (14 ± 1.5) dBm

Specification of test equipment:

Frequency offset	Phase noise
1 kHz	< −160 dBc(Hz)
10 kHz	< −176 dBc(Hz)
100 kHz	< −180 dBc(Hz)
1 MHz	< −180 dBc(Hz)
10 MHz	< −180 dBc(Hz)

Remark: The specification of the test equipment is tighter than the test limits given in the tables below.

R&S FSWP settings:

- [**PRESET**]
- [MODE : Phase Noise]
- [SWEEP : SINGLE]
- [Auto Freq : Off]
- [**AMPT** : RF ATTEN MANUAL : **5 dB**] // This adjustment ***not*** for FSWP8 ***without*** Option B1
- [Signal Frequency : 100 MHz]
- [Start Offset : 1 Hz]
- [Stop Offset : 10 MHz]
- [Trace 1: Smoothing : 5%]
- [RBW : 3%]
- [Xcorr Factor : 1]

Measurement:

- ► Start the Measurement of the R&S FSWP
- ► Read out the Phase Noise Values in Trace 1 for frequency offset in the following table.
- ► No additional Measurement uncertainty is needed as the result is the sum of the oscillator phase noise and the R&S FSWP.

Evaluation: This test is simply **PASS** if the measurement results satisfy the test limits below. In case the test limits in the tables below are not reached, the PN-Digitizer module can be checked according to Section 4.4.5.1.

Test limits:

Frequency offset	Test limit standard
10 Hz	< −102 dBc(Hz)
100 Hz	< −130 dBc(Hz)
1 kHz	< −155 dBc(Hz)
10 kHz	< −167 dBc(Hz)
100 kHz	< −170 dBc(Hz)
1 MHz	< −170 dBc(Hz)
3 MHz	< −170 dBc(Hz)

Frequency offset	Test limit with R&S FSWP-B60
10 kHz	< −170 dBc(Hz)
100 kHz	< −173 dBc(Hz)
1 MHz	< −175 dBc(Hz)
3 MHz	< −175 dBc(Hz)

Frequency offset	Test limit with R&S FSWP-B61
10 kHz	< −170 dBc(Hz)
100 kHz	< −173 dBc(Hz)
1 MHz	< −175 dBc(Hz)
3 MHz	< −175 dBc(Hz)

2.2.7 Checking the Synthesizer Phase Noise with option R&S FSWP-B60 or R&S FSWP-B61

This test measures the phase noise of the two R&S FSWP synthesizers.

In service mode the output of the 2nd synthesizer is switched to the input of the signal path. The 1st synthesizer is used for both channels as local oscillator as shown in the simplified block diagram below.

The result of the measurement is the sum of the phase noise of the two synthesizers. Since both synthesizers are not correlated, the phase noise of each synthesizer is 3 dB lower than the measurement result.

For this measurement, the cross correlations cancel only the noise of the signal chain but not the phase noise of the synthesizers. The following settings, especially the Xcorr factor = 5, ensure that the phase noise of the synthesizers are measured with a sufficient small measurement uncertainty within a reasonable measurement time.

Attention: This test is very sensitive to microphonic noise and hum. Please, make sure that the device-under-test FSWP is located isolated from noisy sources. Avoid stacking instruments on the FSWP.

R&S FSWP settings:

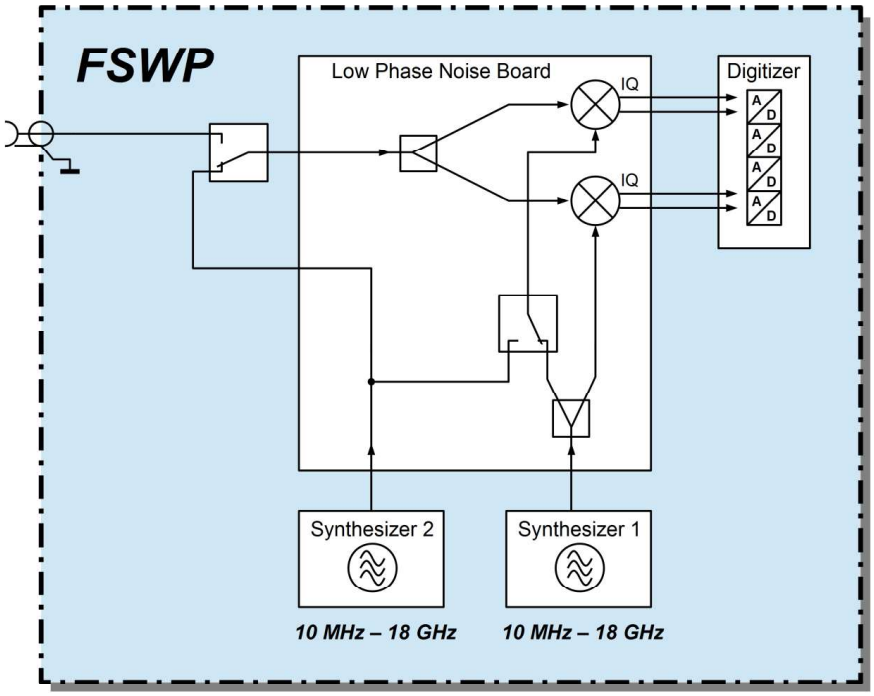
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [MODE : Phase Noise]
- [SWEEP : SINGLE]
- [Auto Freq : Off]
- [Signal Frequency : Freq]
- [Start Offset : 1 Hz]
- [Stop Offset : 30 MHz]
- [Trace 1: Smoothing : 5%]
- [RBW : 3%]
- [Xcorr Factor : 5]
- [Calibration Input Synthesizer Frequency {Freq}]
- [Internal Reference : Loop BW : 30 Hz]

Measurement:

► Start the Measurement of the R&S FSWP for each of the following test frequencies.

► Read out the phase noise values of Trace 1 for the offset frequencies 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz, 10 MHz and 30 MHz.

Simplified block diagram:



The phase noise sensitivity is derived from the measurements of the synthesizers phase noise.

As the improvement of the phase noise sensitivity due to the number of cross correlations *XCORR* is known, the phase noise sensitivity of the R&S FSWP can be calculated with the result of this synthesizers phase noise measurement:

$$\text{Phase Noise Sensitivity} = \text{PN Result Synthesizers} - 3\ \text{dB} - 0.5\ \text{dB} - 5 * \text{LOG}_{10}(XCORR)$$

Since both synthesizers are identical with respect to their phase noise and are not correlated the term “PN Result Synthesizers” must be corrected by −3 dB.

The additional value of −0.5 dB takes into account that the measurement against two independent synthesizers in cross correlation mode improves the result by a factor of $\sqrt{\pi/4}$ with one measurement.

The phase noise sensitivity of the R&S FSWP is specified with a start offset of 1 Hz. The following table shows the numbers of cross correlations for this setting and the calculated correction factors:

Frequency offset	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	30 MHz
Cross correlation number at frequency offset	1	10	130	1300	13000	100000	100000	100000	100000
Improvement due to cross correlation number	0 dB	5 dB	10.5 dB	15.5 dB	20.5 dB	25 dB	25 dB	25 dB	25 dB
Offset between PN Result & PN Sensitivity	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB
Sum of corrections (Correction Factor)	3.5 dB	8.5 dB	14 dB	19 dB	24 dB	28.5 dB	28.5 dB	28.5 dB	28.5 dB

The measurement uncertainty in this test is derived from the test “Phase Noise Measurement Uncertainty” in section 2.2.5. Since the receiver part in this test is physically the ~~very~~ same as in the test in section 2.2.5 the phase noise measurement uncertainty given in the datasheet of the R&S FSWP is valid for this test.

Test limits with option R&S FSWP-B60

Freq = 100 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-76	3.5	-72.5	±1.5 dB
	10 Hz	-108	8.5	-99.5	±1.5 dB
	100 Hz	-136	14	-122.0	±1.5 dB
	1 kHz	-163	19	-144.0	±1.5 dB
	10 kHz	-170	24	-146.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-175	28.5	-146.5	±2 dB
	10 MHz	-175	28.5	-146.5	±2 dB

Freq = 1000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-56	3.5	-52.5	±1.5 dB
	10 Hz	-88	8.5	-79.5	±1.5 dB
	100 Hz	-116	14	-102.0	±1.5 dB
	1 kHz	-143	19	-124.0	±1.5 dB
	10 kHz	-166	24	-142.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-173	28.5	-144.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-173	28.5	-144.5	±2 dB

Freq = 3000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-46	3.5	-42.5	±1.5 dB
	10 Hz	-78	8.5	-69.5	±1.5 dB
	100 Hz	-106	14	-92.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-156	24	-132.0	±1.5 dB
	100 kHz	-158	28.5	-129.5	±1.5 dB
	1 MHz	-163	28.5	-134.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-170	28.5	-141.5	±2 dB

Freq = 7000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-39	3.5	-35.5	±1.5 dB
	10 Hz	-71	8.5	-62.5	±1.5 dB
	100 Hz	-99	14	-85.0	±1.5 dB
	1 kHz	-130	19	-111.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-166	28.5	-137.5	±2 dB
	30 MHz	-166	28.5	-137.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 10 GHz	1 Hz	-36	3.5	-32.5	±1.5 dB
	10 Hz	-68	8.5	-59.5	±1.5 dB
	100 Hz	-96	14	-82.0	±1.5 dB
	1 kHz	-128	19	-109.0	±1.5 dB
	10 kHz	-147	24	-123.0	±1.5 dB
	100 kHz	-150	28.5	-121.5	±1.5 dB
	1 MHz	-155	28.5	-126.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-173	28.5	-144.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 16 GHz	1 Hz	-32	3.5	-28.5	±1.5 dB
	10 Hz	-64	8.5	-55.5	±1.5 dB
	100 Hz	-92	14	-78.0	±1.5 dB
	1 kHz	-124	19	-105.0	±1.5 dB
	10 kHz	-143	24	-119.0	±1.5 dB
	100 kHz	-146	28.5	-117.5	±1.5 dB
	1 MHz	-151	28.5	-122.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-170	28.5	-141.5	±2 dB

Test limits with option R&S FSWP-B61 and OCXO model 05

Valid for R&S FSWP instruments with serial numbers lower than:

- R&S FSWP8: #101280
- R&S FSWP26: #101323
- R&S FSWP50: #101223

Freq = 100 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-92	3.5	-88.5	±1.5 dB
	10 Hz	-115	8.5	-106.5	±1.5 dB
	100 Hz	-140	14	-126.0	±1.5 dB
	1 kHz	-166	19	-147.0	±1.5 dB
	10 kHz	-170	24	-146.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-175	28.5	-146.5	±2 dB
	10 MHz	-175	28.5	-146.5	±2 dB

Freq = 1000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-72	3.5	-68.5	±1.5 dB
	10 Hz	-95	8.5	-86.5	±1.5 dB
	100 Hz	-120	14	-106.0	±1.5 dB
	1 kHz	-150	19	-131.0	±1.5 dB
	10 kHz	-166	24	-142.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-173	28.5	-144.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-173	28.5	-144.5	±2 dB

Freq = 3000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-62	3.5	-58.5	±1.5 dB
	10 Hz	-85	8.5	-76.5	±1.5 dB
	100 Hz	-110	14	-96.0	±1.5 dB
	1 kHz	-140	19	-121.0	±1.5 dB
	10 kHz	-156	24	-132.0	±1.5 dB
	100 kHz	-158	28.5	-129.5	±1.5 dB
	1 MHz	-163	28.5	-134.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-170	28.5	-141.5	±2 dB

Freq = 7000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-55	3.5	-50.5	±1.5 dB
	10 Hz	-78	8.5	-68.5	±1.5 dB
	100 Hz	-103	14	-89.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-166	28.5	-137.5	±2 dB
	30 MHz	-166	28.5	-137.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 10 GHz	1 Hz	-52	3.5	-47.5	±1.5 dB
	10 Hz	-75	8.5	-65.5	±1.5 dB
	100 Hz	-100	14	-86.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-175	28.5	-146.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 16 GHz	1 Hz	-48	3.5	-43.5	±1.5 dB
	10 Hz	-71	8.5	-61.5	±1.5 dB
	100 Hz	-96	14	-82.0	±1.5 dB
	1 kHz	-129	19	-110.0	±1.5 dB
	10 kHz	-148	24	-124.0	±1.5 dB
	100 kHz	-149	28.5	-120.5	±1.5 dB
	1 MHz	-153	28.5	-124.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-171	28.5	-142.5	±2 dB

Test limits with option R&S FSWP-B61 and OCXO model 06

Valid for R&S FSWP instruments with serial numbers starting with:

- R&S FSWP8: #101280
- R&S FSWP26: #101323
- R&S FSWP50: #101223

Freq = 100 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-95	3.5	-91.5	±1.5 dB
	10 Hz	-117	8.5	-108.5	±1.5 dB
	100 Hz	-140	14	-126.0	±1.5 dB
	1 kHz	-166	19	-147.0	±1.5 dB
	10 kHz	-170	24	-146.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-175	28.5	-146.5	±2 dB
	10 MHz	-175	28.5	-146.5	±2 dB

Freq = 1000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-75	3.5	-71.5	±1.5 dB
	10 Hz	-97	8.5	-88.5	±1.5 dB
	100 Hz	-120	14	-106.0	±1.5 dB
	1 kHz	-150	19	-131.0	±1.5 dB
	10 kHz	-166	24	-142.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-173	28.5	-144.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-173	28.5	-144.5	±2 dB

Freq = 3000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-65	3.5	-61.5	±1.5 dB
	10 Hz	-87	8.5	-78.5	±1.5 dB
	100 Hz	-110	14	-96.0	±1.5 dB
	1 kHz	-140	19	-121.0	±1.5 dB
	10 kHz	-156	24	-132.0	±1.5 dB
	100 kHz	-158	28.5	-129.5	±1.5 dB
	1 MHz	-163	28.5	-134.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-170	28.5	-141.5	±2 dB

Freq = 7000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-58	3.5	-54.5	±1.5 dB
	10 Hz	-80	8.5	-71.5	±1.5 dB
	100 Hz	-103	14	-89.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-166	28.5	-137.5	±2 dB
	30 MHz	-166	28.5	-137.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 10 GHz	1 Hz	-55	3.5	-51.5	±1.5 dB
	10 Hz	-77	8.5	-68.5	±1.5 dB
	100 Hz	-100	14	-86.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-175	28.5	-146.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 16 GHz	1 Hz	-51	3.5	-47.5	±1.5 dB
	10 Hz	-73	8.5	-64.5	±1.5 dB
	100 Hz	-96	14	-82.0	±1.5 dB
	1 kHz	-129	19	-110.0	±1.5 dB
	10 kHz	-148	24	-124.0	±1.5 dB
	100 kHz	-149	28.5	-120.5	±1.5 dB
	1 MHz	-153	28.5	-124.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-171	28.5	-142.5	±2 dB

Test of phase noise for offset frequencies below 1 Hz

(only with option R&S FSWP-B61 and with OCXO model 06)

R&S FSWP settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 10 dB]
- [MODE : Phase Noise]
- [SWEEP : SINGLE]
- [Auto Freq : Off]
- [Signal Frequency : Freq]
- [Start Offset : 0.01 Hz]
- [Stop Offset : 1 kHz]
- [Trace 1: Smoothing : 5%]
- [RBW : 30%]
- [Xcorr Factor : 5]
- [Calibration Input Synthesizer Frequency {Freq}]
- [Internal Reference : Loop BW : 30 Hz]

Measurement:

► Start the Measurement of the R&S FSWP for each of the following test frequencies
► Read out the Phase Noise Values for 0.01 Hz and 0.1 Hz offset frequency of Trace 1

Freq = 100 MHz:

Frequency Offset	Specification [dBc(1Hz)]	Correction Factor [dB]	Testlimit [dBc(1Hz)]	Measurement Uncertainty
0.01 Hz	- 20	3.5	- 16.5	±1.5 dB
0.1 Hz	- 66	8.5	- 57.5	±1.5 dB

2.3 Performance Test Option R&S FSWP-B1

2.3.1 Checking Immunity to Interference

Test equipment: Signal generator (Section "Test Equipment", item 2):

Frequency range

R&S FSWP8 : 10 MHz to 18 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50: 10 MHz to 40 GHz

Output level: −10 dBm minimum

Test setup: ► Connect RF output of the signal generator to RF input.

R&S FSWP settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : REF LEVEL : **−30 dBm**]
- [**SPAN** : **15 MHz**]
- [**BW** : RES BW MANUAL : **100 Hz**]

2.3.1.1 2nd IF Image Frequency Rejection

Additional signal generator settings:

- Frequency f_{in} + 2×1317 MHz
- Level: adjust the output level of signal generator for an RF-Input level of −10 dBm

R&S FSWP settings:

- [**FREQ** : CENTER : {f_{in}}]

Test frequencies: R&S FSWP8 : f_{in} = 1 GHz

R&S FSWP26/50: f_{in} = 1 GHz, f_{in} = 9 GHz

Measurement: ► Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

Evaluation: The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}):

Image frequency rejection = −10 dB − L_{dis}

2.3.1.2 3rd IF Image Frequency Rejection

Additional signal generator settings:
- Frequency f_{in} + 2x37 MHz
- Level: adjust the output level of signal generator for an RF-Input level of −10 dBm

Additional R&S FSWP settings:
- [**FREQ** : CENTER : {f_{in}}]

Test frequencies:
R&S FSWP8 : f_{in} = 63 MHz, 100 MHz, 900 MHz, 1100 MHz, 7990 MHz

R&S FSWP26: f_{in} = 63 MHz, 100 MHz, 900 MHz, 1100 MHz, 7990 MHz

Measurement:
► Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

Evaluation:
The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}):

Image frequency rejection = −10 dBm − L_{dis}

2.3.1.3 2nd IF Rejection

Additional signal generator settings:
- Frequency 1317 MHz
- Level: adjust the output level of the signal generator for a RF-Input level of −10 dBm

Additional R&S FSWP settings:
- [**FREQ** : CENTER : {f_{in}}]

Test frequencies
50 MHz, 200 MHz, 500 MHz, 900 MHz, 1100 MHz, 7990 MHz

R&S FSWP26: additional at 9 GHz, 12 GHz, 25 GHz

R&S FSWP50: additional at 9 GHz, 12 GHz, 25 GHz, 38 GHz

Measurement:
► Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

Evaluation:
The IF rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}):

IF rejection = −10 dBm − L_{dis}

2.3.1.4 3rd IF Rejection

Additional signal generator settings:	- Frequency 37 MHz - Level: adjust the output level of the signal generator for a RF-Input level of −10 dBm
Additional R&S FSWP settings:	- [**FREQ** : CENTER : {f_{in}}]
Test frequencies	100 MHz, 200 MHz, 500 MHz, 900 MHz, 1100 MHz, 7990 MHz R&S FSWP26: additional at 9 GHz, 12 GHz, 25 GHz R&S FSWP50: additional at 9 GHz, 12 GHz, 25 GHz, 38 GHz
Measurement:	► Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The IF rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): IF rejection = −10 dBm − L_{dis}

2.3.2 Checking Nonlinearities

2.3.2.1 Third-Order Intercept Point

Test equipment: 2 signal generators (Section "Test Equipment", item 2)

Frequency range:

R&S FSWP8: 10 MHz to 8 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50 10 MHz to 40 GHz

2 attenuators (Section "Test Equipment", item 10)

Attenuation a_{ATT} = 10 dB

Frequency range:

R&S FSWP8: 10 MHz to 8 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50 : 10 MHz to 40 GHz

Power splitter/combiner (Section "Test Equipment", item 4)

Frequency range:

R&S FSWP8: 10 MHz to 8 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50 : 10 MHz to 40 GHz

Test setup:

- ► Connect RF outputs of the signal generators via 10 dB attenuators to the inputs of the combiner.
- ► Connect output of the combiner to the RF input of the R&S FSWP.

Note: If the interference between the generators is sufficient low without attenuators, the generators may be connected directly to the power combiner.

Signal generator settings:

(both generators):

- Frequency:

generator 1 $f_{g1} = f_{in} – 500$ kHz

generator 2 $f_{g2} = f_{in} + 500$ kHz

- ► Adjust the output level of the signal generators for an input level at the R&S FSWP of –15 dBm ± 1 dB.
- ► Switch off the ALC of the generators to reduce the interference between the generators.

R&S FSWP settings:	- [**PRESET**] - [**AMPT** : RF ATTEN MANUAL : **0 dB**] - [**AMPT** : **−5 dBm**] - [**SPAN** : **4 MHz**] - [**BW** : RES BW MANUAL : 2 kHz] - [**FREQ** : CENTER : {f_{in}}]
Test frequencies	Fin = 11 MHz, 20 MHz, 50 MHz, 100 MHz, 190 MHz to 990 MHz in 200 MHz steps, 1010 MHz, 1190 MHz to 2990 MHz in 200 MHz steps, 3010 MHz, 3490 MHz to 7990 MHz in 500 MHz steps R&S FSWP26: additional 8.1 GHz to 26.1 GHz in 1 GHz steps R&S FSWP50: additional 8.1 GHz to 39.1 GHz in 1 GHz steps, and 39.9 GHz
Measurement:	- [MKR FCTN : TOI]
Evaluation:	The third order intercept point (T.O.I) referred to the input signal is displayed in the marker field by the reading [TOI].
Note:	If the input signal is exactly known, the level of the spurious products can alternatively be measured in a span of 20 kHz, for example. The TOI is then calculated from the average of the two spurious signals and the average of the two useful signals.

2.3.2.2 Second-Order Harmonic Distortion

Test equipment: Signal generator (Section "Test Equipment", item 2)

Frequency range: 9 MHz to 3.5 GHz

Recommended harmonic suppression:

10 MHz < f < 4 GHz: >80 dBc

f > 4 GHz : >90 dBc

In order to improve the harmonic suppression of the generator it is recommended to insert a lowpass filter with a suitable cut-off frequency (Section "Test Equipment", item 24) after the generator.

Test setup: Connect RF output of signal generator to the input of the lowpass filter

Connect the output of the lowpass filter to the RF input of the R&S FSWP

Note: The RF output of the generator can be connected directly to the RF input of the R&S FSWP in this case.

Signal generator settings:
- Level: −5 dBm at the input of the R&S FSWP
- Frequency: f_{in}

R&S FSWP settings:
- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : −10 dBm]
- [SPAN : 500 kHz]
- [BW : RES BW MANUAL : 30 Hz]
- [BW : VIDEO BW MANUAL : 10 Hz]
- [FREQ : CENTER : { fin }]

Test frequencies f_{in} = 9 MHz, 21 MHz, 106 MHz, 274 MHz, 449.9 MHz, 699.9 MHz, 999.9 MHz, 1499.9 MHz 1749.9 MHz, 2699.9 MHz, 3449.9 MHz

Test limits according to datasheet

With option R&S FSWP-B13: switch on the high pass filter and repeat the measurement with 699.9 MHz and 1499 MHz. Test limits according to data sheet.

Measurement: Set marker to peak of signal

- [MKR ⇒ : PEAK]

The level of the input signal Lin is displayed by the marker reading for marker 1.

Set center frequency of the R&S FSWP to the frequency of the 2nd harmonic

- [FREQ : CENTER : {2 x f_{in}}]

Measurement: Set marker to peak of the 2nd harmonic

- [MKR ⇒ : PEAK]

The level of the harmonic signal LK2 is displayed by the marker reading for marker 1

Evaluation: The second order harmonic distortion can be calculated as:

IPk2 / dBm = (Lin − L K2) + Lin

2.3.3 Checking IF Filters

Test equipment: Signal generator (Section "Test Equipment", item 1):

Frequency 64 MHz

Level ≥ 0 dBm

Test setup: ► Connect RF output of the signal generator to the RF input of the R&S FSWP.

2.3.3.1 Checking the bandwidth switching level uncertainty

Reference measurement (RBW 10 kHz)

Signal generator settings:
- Frequency: 64 MHz
- Level: −20 dBm

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : **−10 dBm**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**FREQ** : CENTER : **64 MHz**]
- [**SPAN** : **100 kHz**]
- [**BW** : RBW MANUAL : **10 kHz**]
- [**BW** : VBW MANUAL : **100 kHz**]
- [**BW** : SWEEP TIME MANUAL : 100 ms]
- [**TRACE** : DETECTOR : RMS]

Reference measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

► Set reference to peak of signal
- [**MKR** : REFERENCE FIXED]

Checking the level uncertainty:

R&S FSWP settings:
- [**SPAN** : {10 x RBW}] for RBW ≤ 10 MHz or
- [**SPAN** : ZERO] for RBW > 10 MHz
- [**BW** : RBW MANUAL : {RBW} : **ENTER**]
- [**BW** : VBW MANUAL : {10 x RBW} : **ENTER**]

Measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

Test points — Check the following resolution filters :

RBW = 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz, 10 MHz

Evaluation: The level difference is displayed in the marker field by the reading ´Delta [T1 FXD] {xxx} dB´.

2.3.3.2 Checking the bandwidth switching level uncertainty with option R&S FSWP-B8 or with option R&S FSWP-B8E

Reference measurement (RBW 10 kHz)

Signal generator settings:
- Frequency: 64 MHz
- Level: −20 dBm

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : **−10 dBm**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**FREQ** : CENTER : **64 MHz**]
- [**SPAN** : **100 kHz**]
- [**BW** : RBW MANUAL : **10 kHz**]
- [**BW** : VBW MANUAL : **100 Hz**]
- [**BW** : SWEEP TIME MANUAL : 100 ms]
- [**TRACE** : DETECTOR : RMS]

Reference measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

► Set reference to peak of signal
- [**MKR** : REFERENCE FIXED]

Checking the level uncertainty:

R&S FSWP settings:
- [**SPAN** : ZERO]
- [**BW** : RBW MANUAL : {RBW} : **ENTER**]
- [**BW** : VBW MANUAL : {0.01 x RBW} : **ENTER**]

If RBW < 100 Hz then use VBW = 1 Hz

Measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

Test points: Check the following resolution filters :

R&S FSWP-B8: RBW = 20 MHz, 28 MHz, 50 MHz, 80 MHz
R&S FSWP-B8E: RBW = 20 MHz, 28 MHz, 40 MHz

Evaluation: The level difference is displayed in the marker field by the reading ´Delta [T1 FXD] {xxx} dB´.

2.3.4 Checking Spurious Response

Test equipment: 50 Ω termination (Section "Test Equipment", item 5)

Frequency range:

R&S FSWP8: DC to 8 GHz

R&S FSWP26 DC to 26.5 GHz

R&S FSWP50: DC to 50 GHz

Test setup: ► Terminate the RF input of the R&S FSWP with 50 Ohm

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : **−50 dBm**]
- [**FREQ** : START : **1 MHz**]
- [**FREQ** : STOP : **8900 MHz**] // 8000 MHz with R&S FSWP8
- [**BW** : RES BW MANUAL : **200 Hz**]

Measurement: Start a Sweep and set the Marker to peak. The level should be below −110 dBm.

R&S FSWP settings: R&S FSWP26, R&S FSWP50:
- [**FREQ** : START : **8900 MHz**]
- [**FREQ** : STOP : 26500 MHz]
- [**BW** : RES BW MANUAL : **1 kHz**]

Measurement: Start a Sweep and set the Marker to peak. The level should be below −100 dBm.

2.3.5 Checking Noise Display

Test equipment: 50 Ω termination (Section "Test Equipment", item 5)

Frequency range:

R&S FSWP8: DC to 8 GHz

R&S FSWP26: DC to 26.5 GHz

R&S FSWP50: DC to 50 GHz

► Terminate the RF input of the R&S FSWP with 50 Ω

R&S FSWP settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : **−60 dBm**]
- [**INPUT**:COUPLING:DC]
- [**SPAN** : 0 Hz]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : {SWPCNT} **ENTER**]
- [**MEAS** : TIME DOMAIN POWER : MEAN]
- [**FREQ** : CENTER : {f_n}]
- [**BW** : RBW MANUAL : {RBW}]
- [**BW** : VBW MANUAL : 1Hz]

Measurement: ► Read out the mean marker and correct the measurement value by −10 x log (RBW / 1 Hz):

- RBW = 1 Hz corresponds with 0 dB correction
- RBW = 10 Hz corresponds with −10 dB correction
- RBW = 100 Hz corresponds with −20 dB correction
- RBW = 1 kHz corresponds with −30 dB correction

Test frequencies: RBW = 3 Hz; SWPCNT = 20; f_n = 10 Hz

RBW = 10 Hz; SWPCNT = 5; f_n = 30 Hz, 90 Hz,

RBW = 100 Hz; SWPCNT = 5; f_n = 300 Hz, 980 Hz

RBW = 1 kHz; SWPCNT = 1; f_n = 9.8 kHz, 98 kHz, 998 kHz, 9.8 MHz, 30 MHz, 99 MHz to 7999 MHz in 100 MHz steps

8500 MHz to the maximum Frequency of the instrument in 500 MHz steps.

Test limits according to data sheet.

Additional test frequencies with Option R&S FSWP-B24	Set the RF preamplifier to 30 dB gain and check with RBW = 1 kHz and SWPCNT = 1 the noise display with the following test frequencies: 50 MHz, 99 MHz to 7999 MHz in 100 MHz steps. For instruments with a maximum frequency above 8 GHz additional: 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps. Test limits according to data sheet.
Additional test frequencies with Option R&S FSWP-B13	Activate the high pass (preamp off) and check the following test frequencies: 1051 MHz to 2850 MHz in 200 MHz steps and 2950 MHz. Test limits according to data sheet.
YIG Filter Bypass	Activate the YIG Filter Bypass and check the following test frequencies:
For instruments with a maximum frequency > 8 GHz	8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps. Test limits according to data sheet.

2.3.6 Checking the Level uncertainty and the Frequency Response

Test equipment: Signal Generator (Section "Test Equipment", item 1)

Frequency range: 9 kHz to 1 GHz

Maximum level: ≥ 0 dBm

Signal Generator (Section "Test Equipment", item 2)

Frequency range:

R&S FSWP8: 10 MHz to 8 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50: 10 MHz to 50.0 GHz

Maximum level: ≥ −10 dBm

Signal Generator with frequency doubler, driver amplifier and waveguide highpassfilter for frequency generation > 43.5 GHz (Section "Test Equipment", item 2 plus item 17 to 19)

Frequency range:

R&S FSWP 50: 43.5 GHz to 50 GHz

Maximum level: ≥ −10 dBm

Power meter (Section "Test Equipment", item 6)

Power range: −30 to 0 dBm

Instrumentation uncertainty: <0.5%

Uncertainty of power reference: <1.2%

VSWR of power reference: <1.10

Power Sensor (Section "Test Equipment", item 7)

Frequency range: 9 kHz to 7 GHz

Power range: −30 to 0 dBm

Cal factor uncertainty:

1 MHz to 3.6 GHz: <1.6 %

3.6 GHz to 7 GHz: <2 %

VSWR:

1 MHz to 7 GHz <1.15

50 MHz to 128 MHz <1.10

Power Sensor (Section "Test Equipment", item 8)

Frequency range:

R&S FSWP8: DC to 8 GHz

R&S FSWP26: DC to 26.5 GHz

R&S FSWP50: DC to 50 GHz

Power range: −30 to 0 dBm

Cal factor uncertainty:

50 to 128 MHz	<1.6 %
3.6 to 8 GHz	<2 %
8 to 22 GHz	<2.5 %
22 to 26.5 GHz	<3 %

VSWR:

50 to 128 MHz	<1.15
3.6 to 8 GHz	<1.15
8 to 22 GHz	<1.25
22 to 26.5 GHz	<1.35
26.5 to 50 GHz	<1.30

6 dB Power Splitter (Section "Test Equipment", item 4)

Frequency range: DC to 3.6 GHz

Level imbalance:

10 MHz to 3.6 GHz <0.1 dB

Equivalent output VSWR:

10 MHz to 3.6 GHz ≤ 1.1

6 dB Power Splitter (Section "Test Equipment", item 4)

Frequency range:

R&S FSWP8: DC to 8 GHz

R&S FSWP26: DC to 26.5 GHz

R&S FSWP50: DC to 50.0 GHz

Level imbalance:

3.6 to 7 GHz	≤ 0.3 dB
7 to 22 GHz	≤ 0.4 dB
22 to 26.5 GHz	≤ 0.5 dB
26.5 to 43 GHz	≤ 0.8 dB

Equivalent output VSWR:

3.6 to 7 GHz	≤ 1.3
7 to 22 GHz	≤ 1.4
22 to 26.5 GHz	≤ 1.5
26.5 to 43 GHz	≤ 2

2.3.6.1 Absolute level uncertainty at 64 MHz

Test setup:
- ► Standardize the power meter and power sensor (item 6, 7).
- ► Set the power meter Cal Factor to the appropriate value for the power sensor for 64 MHz.
- ► Connect power sensor through a cable to RF output of Signal Generator.

Signal generator settings:
- Frequency: 64 MHz
- Level: −10 dBm

Measurement:
- ► Adjust level to −10 dBm ± 0.1 dB as viewed on the power meter.
- ► Record the power meter indication.
- ► Disconnect power sensor from the cable.

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **−10 dBm**]
- [**SWEEP** : SWEEP TIME : **10 ms**]
- [**SPAN** : **30 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **64 MHz**]
- ► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

Evaluation:
The difference between the signal levels measured with the power meter and the R&S FSWP (level reading of marker 1) reflects the absolute level uncertainty of the R&S FSWP. It can be calculated as:

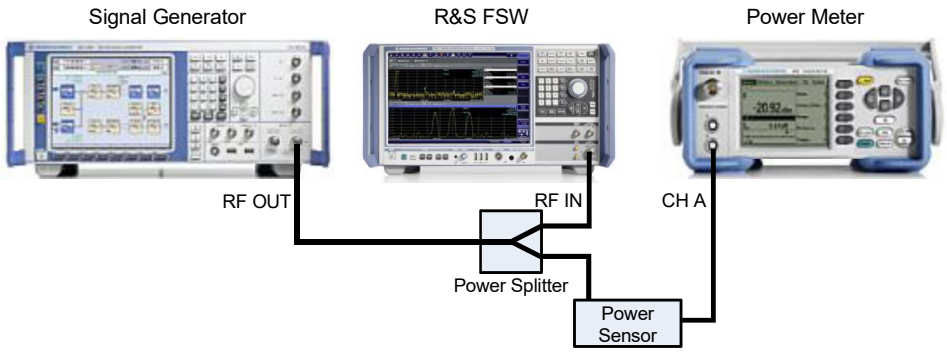
$$\text{Level uncertainty}_{64MHz} = L_{FSWP} - L_{powermeter}$$

2.3.6.2 Frequency response

Checking the frequency response

Note: If a power splitter with higher level imbalance is used, correction of the measured frequency response is recommended.

Test setup:
- ► Standardize the Power Meter and Power Sensor (items 6, 7, 8).
- ► Use Power Splitter/Combiner (item 3) and connect equipment as shown below.
- ► Connect the power splitter directly to the RF input of the R&S FSWP.



Important Note

Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Signal generator settings:
- Level 0 dBm
- Frequency 64 MHz

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : RF INPUT {coupling}]
- [**AMPT** : RF ATTEN MANUAL : **{a_{FSWP}}**]
- [**AMPT** : **0 dBm**]
- [**SPAN : 100 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**FREQ** : CENTER : **64 MHz**]
- [**MKR** ⇒ : MORE : EXCLUDE LO]

Reference measurement:
- ► Determine signal level $L_{powermeter}$.
- ► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
- ► Read level indication from R&S FSWP (reading of marker 1): L_{FSWP}

Power Meter:
- ► Read level indication from power meter : $L_{powermeter}$

Evaluation:	► Calculate ΔRef / dB = L_{FSWP} / dBm – $L_{powermeter}$ / dBm Record ΔRef / dB
Signal generator settings:	Set the signal generator to the test frequency
R&S FSWP settings:	- [**SPAN : zero**] - [**FREQ** : CENTER : {f_{fresp}}] - [**BW** : RES BW MANUAL : **{RBW}**] For f < 100 kHz use a RBW = Fin / 10, use a RBW of 10 kHz for other frequencies. ► Set marker to peak of signal - [**MKR** ⇒ : PEAK] ► Read level indication from R&S FSWP (reading of marker 1): L_{FSWP}
Power Meter:	► Read level indication from Power Meter : $L_{powermeter}$
Evaluation:	► The frequency response can be calculated as: Freq. response / dB = L_{FSWP} – $L_{powermeter}$ – ΔRef / dB
Attenuator Setting	Repeat the measurement for RF attenuation of 0 dB, 5 dB, 10 dB, 20 dB, 40 dB
Test frequencies	With RF attenuation = 10 dB, DC coupling: Fin = 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3MHz With RF attenuation 0 dB, 5 dB, 10 dB, 20 dB, 40 dB, AC coupling : Fin = 10 MHz, 50 MHz, 100 MHz 200 MHz, 500 MHz to 8 GHz in 500 MHz steps 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps Test limits according to datasheet.
YIG Filter Bypass	Repeat the measurement for RF attenuation of 10 dB and YIG Filter Bypass, test frequencies: 8001 MHz, 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps.
Instruments with option B24	With option B24 RF Preamplifier switch the RF preamplifier to 30 dB gain, RF-Attenuation 10 dB, DC coupling, reference level = −20 dBm and signal level −25dBm. Check the level uncertainty with the following test frequencies: 10 MHz, 50 MHz to 7999 MHz in 100 MHz steps 8500 MHz to the maximum frequency of the instrument in 500 MHz steps Test limits according to data sheet.

2.3.7 Checking the Display Nonlinearity

Test equipment: Signal generator (Section "Test Equipment", item 1)

Frequency: 128 MHz

Maximum level: ≥ +10 dBm

Step attenuator (Section "Test Equipment", item 9)

Frequency: 128 MHz

Attenuation: 0 to 100 dB in 1 dB steps

Attenuation uncertainty: < 0.1 dB

Test setup:
► Connect RF output of the signal generator to RF input of the step attenuator
► Connect RF output of the step attenuator to RF input of the R&S FSWP

Signal generator settings:
- Frequency: 128.1 MHz
- Level: +10 dBm

Step attenuator settings:
- attenuation: 20 dB

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **0 dBm**]
- [**FREQ** :CENTER : **128.1 MHz**]
- [**SPAN** : **0 Hz**]
- [**TRACE** : DETECTOR : AV]
- [**BW** : RES BW MANUAL : **1kHz**]
- [**SWEEP** : SWEEP TIME MANUAL : **{sweep time}**]
- [**MEAS** : TIME DOMAIN POWER : MEAN]

Wait 30 seconds to ensure that there is no thermal drift.

See table below for values of sweep time.

Reference measurement:
► Read out the mean marker value (= L_{Ref})

Measurement:

Step attenuator settings:
- attenuation: {a_{ATT}}

See table of performance test report for values of a_{ATT}.

Evaluation:
► Read out the mean marker value. The difference between the level of the input signal of the R&S FSWP and the reference L_{Ref} (about 10 dB below the reference level) can be calculated as :

$\Delta L = L_{FSWP} - L_{Ref}$

Test points: Check linearity from 0 to −70 dB in 2 dB steps

from −70 dB to −90 dB in 5 dB steps

Note: A frequency between 5 MHz and 1 GHz may be used. It is recommended to use correction values for the uncertainty of the attenuator.

a_{ATT}	10 dB to 50 dB	50 dB to 80 dB	80 dB to 100 dB
Sweep time	200 ms	600 ms	1000 ms

2.3.8 Checking the RF Attenuator uncertainty

Test equipment: Signal generator (Section "Test Equipment", item 1)

Frequency: 128 MHz

Maximum level: ≥ +10 dBm

Step attenuator (Section "Test Equipment", item 9)

Frequency: 128 MHz

Attenuation: 0 to 80 dB in 5 dB steps

Attenuation uncertainty: < 0.1 dB

Test setup:
► Connect RF output of the signal generator to RF input of the step attenuator
► Connect RF output of the step attenuator to RF input of the R&S FSWP

Signal generator settings:
- Frequency: 128.1 MHz
- Level: +10 dBm

R&S FSWP settings:
- [**PRESET**]
- [**FREQ** : CENTER : **128.1 MHz**]
- [**SPAN** : **500 Hz**]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**BW** : VIDEO BW MANUAL : **100 Hz**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **−35 dBm**]

Reference measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
► Set reference to peak of signal
- [**MKR** : REFERENCE FIXED]

Measurement

Step attenuator settings:
- Attenuation { 80 dB − a_{FSWP}}

R&S FSWP settings:
- [**AMPT** : RF ATTEN MANUAL : { a_{FSWP}}]
- [**AMPT** : {−45 + a_{FSWP} } **dBm**]
- [**MKR** ⇒ : PEAK]

See table below for values of a_{FSWP}, a_{ATT} and reference level.

Evaluation: The difference between the level of the input signal of the R&S FSWP and the reference (at 10 dB RF-Attenuation) is displayed in the marker field by the reading Delta [T1 FXD].

a_{ATT}	70 dB	80 dB	75 dB	65 dB	60 dB	55 dB	50 dB	40dB	30 dB	20 dB	10 dB
a_{FSWP}	10 dB	0 dB	5 dB	15 dB	20 dB	25 dB	30 dB	40dB	50 dB	60 dB	70 dB
reference level	−35 dBm	−45 dBm	−40 dBm	−30 dBm	−25 dBm	−20 dBm	−15 dBm	−5 dBm	+5 dBm	+15 dBm	+25 dBm

2.3.9 Checking the Phase Noise

Test equipment: Signal generator (refer to "Test Equipment", item 16)

Frequency: 1000 MHz

Level: ≥ +5 dBm

Test setup: ► Connect RF output of the signal generator to RF input of the R&S FSWP.

Signal generator settings:
- Frequency: 1000 MHz
- Level: > +5 dBm

R&S FSWP settings:
- [**PRESET**]
- [**SETUP** : REFERENCE INT]
- [**FREQ** : CENTER : **1000 MHz**]
- [**AMPT** : ATTEN MANUAL**: 20 dB**]
- [**AMPT : 20 dBm**]
- [**SPAN** : **1 MHz**]
- [**SWEEP** : SINGLE]
- [**MKR FCTN** : SIGNAL COUNT]

► Set center frequency to counter frequency

- [**MKR FCTN** : PHASE NOISE]
- [**SPAN** : {span}]
- [**MKR** : {Offset}]

See table below for values of reference level, sweep time, sweep count and span.

Refer to "Performance Test Report" table for values of offset, reference level and RF attenuation.

Example: For a input power of +10 dBm the reference level shall be set to +10 dBm for offsets below or equal 1 kHz. The attenuation to 10 dB for a mixer level of 0 dBm.

With bigger offsets the broadband noise becomes critical therefore the reference level and the attenuation shall be decreased by 2 dB.

Evaluation: The phase noise is displayed in the marker field by the reading

´PHNOISE 2´.

Note: Please make sure not to measure on a spurious signal. The phase noise may be checked at 640 MHz instead of 1 GHz. In this case the test limits at frequency offsets less or equal 100 kHz are 1 dB better as with 1 GHz test frequency. At offsets above 100 kHz check for the same limit as with 1 GHz.

At 100 Hz offset the measurement is performed at 95 Hz to avoid interference with the line frequency f.e. in Europe.

Settings for phase noise measurement				
Offset	Span	RBW / VBW	Reference level	a_{FSWP}
100 Hz	220 Hz	1 Hz / 1 Hz Trace Average 5	= signal level	= signal level
1 kHz	2.2 kHz	100 Hz / 1 Hz	= signal level	= signal level
10 kHz	22 kHz	1 kHz / 1 Hz	signal level − 2 dB	signal level − 2 dB
100 kHz	220 kHz	10 kHz / 1 Hz	signal level − 2 dB	signal level − 2 dB
1 MHz	2.2 MHz	10 kHz / 1 Hz	signal level − 6 dB	signal level − 6 dB

2.4 Performance Test Option LO/IF ports for external mixers R&S FSW-B21

2.4.1 Checking LO-level

Test equipment: Power Meter (section "Test Equipment", item 6)

Power sensor (section "Measurement Equipment", item 8)

Frequency range 7.0 GHz to 17.45 GHz

Max. input power Pmax = +23 dBm

RSS ≤ 2.5% referred to measured power

Impedance Z = 50 Ohm

Fixed attenuator with 10 dB (Section "Measurement Equipment" item 10)

Power meter settings: Connect power sensor to the power meter and execute function ´ZERO´ when there is no signal applied to the power sensor

R&S FSWP settings:

- [PRESET]
- [SENS : MIX ON]
- [MIX : HARM : BAND USER]
- [MIX : HARM 2]
- [FREQ : SPAN 0HZ]
- [SETUP : MORE : SERVICE : PASSWORD : 30473035]

Fix IF2-Frequency to 1.58 GHz

- [DIAG : SERV : SFUN ‘2.3.16.1.4’]

Select LO-Power:

- [SENS:MIX:LOP {PLO}]

for P_{LO} = +15.5 dBm // measured at 15.5 dBm according to data sheet

Bias current set to zero:

- [SENS : MIX : BIAS 0.0]

Select upper sideband with service-function:

- [DIAG : SERV : SFUN ‘2.5.2.2.1’]
- [FREQ CENTER : {fCenter1}]

resulting LO-frequency fLO = (fCenter1 – 1580.0 MHz) / 2

Select lower sideband with service-function:

- [SETUP : SERVICE FUNCTIONS 2.5.2.2.0]

- [FREQ CENTER : {fCenter2}]

resulting LO-frequency fLO = (fCenter2 + 1580.0 MHz) / 2

Test setup: ► Connect power sensor via fixed attenuator to the output 'LOout / IFin'

Measurement: Determine level of the LO-signal LLO,meas
To achieve higher uncertainty the frequency response of the power sensor must be compensated. For compensation frequency use fLO

Evaluation: The level of the LO-signal can be determined as LLO = LLO,meas + 10 dB

Test Frequencies Fcenter1 = 16880 MHz to 26880 MHz in 500 MHz Steps

Fcenter2 = 23820 MHz to 33320 MHz in 500 MHz Steps

2.4.2 Checking the Input LOout / IFin (2-Port-Mixers in Spectrum Mode R&S FSWP-B1)

Test equipment: Signal Generator (section " Test Equipment ", item 1)

Frequency 1330.0 MHz

Output power –20 dBm

R&S FSWP settings:

- [PRESET]
- [SENS : MIX ON]
- [SENS : MIX:HARM:BAND USER]
- [SENS : MIX:HARM 2]
- [SPAN : ZERO SPAN]
- [FREQ : CENT 18.00 GHz]
- [SENS : BAND 2KHz]
- [DET : FUNC RMS]
- [SETUP : MORE : SERVICE : PASSWORD : 30473035]

Fix IF2-Frequency to 1.33GHz:

- [DIAG : SERV : SFUN ‘2.3.16.1.2’]

Activate syncon mode of synthesizer

- [DIAG : SERV : SFUN ‘2.3.16.20.0’]

Force NCO sweep

- [DIAG : SERV : SFUN ‘2.3.16.49.1’]

Switch off LO with service function:

- [DIAG : SERV : SFUN ‘2.5.2.8.0’]

Bias current set to zero:

- [SENS : MIX : BIAS 0.0]

Select 2-port case:

- [SENS : MIX : PORT 2]

Conversion Loss set to 0dB

- [SENS : MIX : LOSS 0.0]

Signal generator settings:

- Frequency 1330.0 MHz
- Input Level DUT –30 dBm ± 0.1 dB

Test setup: Connect the generator to the connector LOout / IFin;

Measurement:

- [MKR-> : PEAK]

Read out the marker and test limit according to data sheet.

2.4.3 Checking the Input IF_{in} (3-Port-Mixers in Spectrum Mode R&S FSWP-B1)

Test equipment: Signal Generator (section "Test Equipment ", item 1)

Frequency 1330.0 MHz

Output power −20 dBm

R&S FSWP settings:

- [PRESET]
- [SENS : MIX ON]
- [SENS : MIX:HARM:BAND USER]
- [SENS : MIX:HARM 2]
- [SPAN : ZERO SPAN]
- [FREQ : CENT 18.00 GHz]
- [SENS : BAND 2KHz]
- [DET : FUNC RMS]
- [SETUP:MORE:SERVICE:PASSWORD: 30473035]

Fix IF2-Frequency to 1.33GHz:

- [DIAG:SERV:SFUN ‘2.3.16.1.2’]

Activate syncon mode of synthesizer

- [DIAG:SERV:SFUN ‘2.3.16.20.0’]

Force NCO sweep

- [DIAG:SERV:SFUN ‘2.3.16.49.1’]

Switch off LO with service function:

- [DIAG:SERV:SFUN ‘2.5.2.8.0’]

Bias current set to zero:

- [SENS:MIX:BIAS 0.0]

Select 2-port case:

- [SENS:MIX:PORT 3]

Conversion Loss set to 0 dB

- [SENS : MIX:LOSS 0.0]

Signal generator settings:

- Frequency 1330.0 MHz
- Input Level DUT −30 dBm ± 0.1 dB

Test setup: Connect the generator to the connector LOout / IFin;

Measurement:

- [MKR-> : PEAK]

Read out the marker and test limit according to datasheet

2.4.4 Checking the Input IF_{in} (3-Port-Mixers in Phase Noise Mode)

Test equipment: Signal Generator (section " Test Equipment ", item 1)

Frequency 26.0 MHz

Output power −20 dBm

R&S FSWP settings:

- [**MODE** : Phase Noise]

Set the R&S FSWP to external mixer

- INPUT/OUTPUT : Input Source Config : External Mixer : ON

Conversion Loss set to 0 dB
- [**SENS** : MIX:LOSS 0.0]

Deactivate signal tracking but keep leveling / fix IF to 26 MHz

- []

- FREQ : Auto Search : OFF

- [**DIAG**:SERV:SFUN '2.27.4.4.2']

- [**DIAG**:SERV:SFUN '2.26.1.6.26']

Signal generator settings:

- Frequency 26.0 MHz

- Input Level DUT −30 dBm ± 0.1 dB

Test setup: ► Connect the generator to the connector EXT MIX IF_{in};

Measurement: ► Read out the level
► Test limit according to datasheet

After finishing this test, set signal tracking back to AUTO: **2.27.4.4.0** and **2.0.0**

2.5 Signal Source R&S FSWP-B64

2.5.1 Checking Output Level

Test equipment: Power meter (Section "Test Equipment", item 6)

Power sensor (section "Test Equipment ", item 8)

Frequency range: 10 MHz to 18 GHz

Max. input power:

P_{max} = +23 dBm

RSS ≤ 2.5% referred to measured power

Impedance: Z = 50 Ohm

Power meter settings:

► Connect power sensor to the power meter and execute function ´ZERO´ when there is no signal applied to the power sensor

R&S FSWP settings:

- [**PRESET**]
- [Mode: Phase Noise]
- [Meas: Additive Noise]
- [Signal Source: On]
- [Signal Source : Level : “Lev”]
- [Signal Source : Frequency: “Freq”]

Test setup: ► Connect the power sensor directly to the output ‘SIGNAL SOURCE OUTPUT’.

Measurement: ► Determine level of the Signal Source Output.

To achieve lower uncertainty the frequency response of the power sensor shall be compensated.

Setting table		Signal level	Frequency
	R&S FSWP8/26/50	+ 10 dBm	10 MHz
		+ 10 dBm	20 MHz
		+ 10 dBm	50 MHz
		+ 10 dBm	100 MHz
		+ 10 dBm	200 MHz
		+ 10 dBm	500 MHz
		+ 10 dBm	1 GHz
		+ 10 dBm	2 GHz
		+ 10 dBm	4 GHz
		+ 10 dBm	8 GHz

	+ 10 dBm	12 GHz
	+ 10 dBm	16 GHz
	+ 10 dBm	18 GHz
Test 10 dB Att	0 dBm	100 MHz
Test 20 dB Att	- 10 dBm	100 MHz
Test 40 dB Att	- 30 dBm	100 MHz

Test limits according to datasheet.