

R&S®SMB100A Signal Generator Specifications



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Definitions

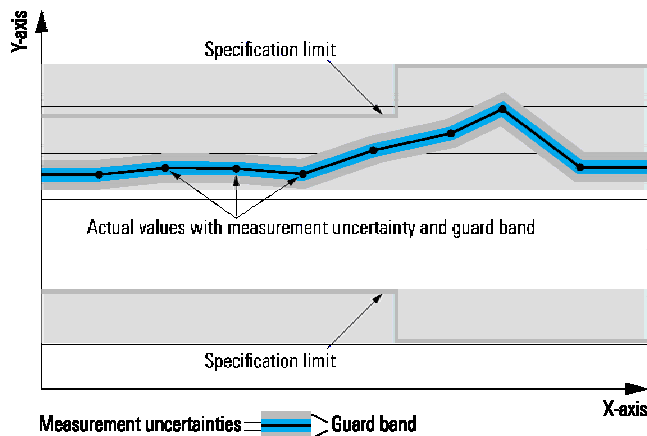
General

Product data applies under the following conditions:

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

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 $<$, $\leq$, $>$, $\geq$, $\pm$, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)¹

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.)¹

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.)¹

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.

¹ Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Specifications

Hardware and software option concept

The available frequency ranges and the corresponding hardware options are shown in the table below.

	9 kHz to 1.1 GHz	9 kHz to 2.2 GHz	9 kHz to 3.2 GHz	9 kHz to 6 GHz	100 kHz to 12.75 GHz
With electronic step attenuator	R&S®SMB-B101	R&S®SMB-B102	R&S®SMB-B103	R&S®SMB-B106	R&S®SMB-B112
Without electronic step attenuator	–	–	–	–	R&S®SMB-B112L
High power	standard				
Reference oscillator OCXO ²	R&S®SMB-B1				
Reference oscillator OCXO high performance ²	R&S®SMB-B1H				
Reverse power protection	standard				R&S®SMB-B30
Stereo/RDS coder	R&S®SMB-B5				–
Pulse modulator	R&S®SMB-K22				R&S®SMB-K21
Pulse generator	R&S®SMB-K23				
Pulse train ³	R&S®SMB-K27				

RF performance

Frequency

Range	R&S®SMB-B101	9 kHz to 1.1 GHz
	R&S®SMB-B102	9 kHz to 2.2 GHz
	R&S®SMB-B103	9 kHz to 3.2 GHz
	R&S®SMB-B106	9 kHz to 6 GHz
	R&S®SMB-B112, R&S®SMB-B112L	100 kHz to 12.75 GHz
Resolution of setting		0.001 Hz
Resolution of synthesis	f = 1 GHz	nom. 0.44 µHz
Setting time	to within $< 1 \times 10^{-7}$ for f > 200 MHz or < 20 Hz for f ≤ 200 MHz	
	after IEC/IEEE bus delimiter	
	ALC state ON	< 3 ms
	ALC state Sample & Hold	< 7 ms
	after trigger pulse in List mode	< 1 ms
Resolution of phase offset setting		0.1°

Frequency sweep

Operating mode		digital sweep in discrete steps
Trigger mode	free run	automatic
	full sweep	single
	execute one step	step
	external trigger only	start/stop
Trigger source		keyboard, external trigger, remote control
Trigger slope		positive, negative
Sweep range		full frequency range
Sweep shape		triangle, sawtooth
Step spacing		linear, logarithmic
Step size	linear	full frequency range, minimum 0.001 Hz
	logarithmic	0.01 % to 100 %
Dwell time range		10 ms to 10 s
Dwell time resolution		0.1 ms

² Only one of the options R&S®SMB-B1 or R&S®SMB-B1H can be installed

³ Requires option R&S®SMB-K23, only available for instruments with serial number > 102400

Reference frequency

Frequency error	at time of calibration in production	$< 1 \times 10^{-7}$
	with R&S®SMB-B1, R&S®SMB-B1H option	$< 1 \times 10^{-8}$
Aging (after 10 days of uninterrupted operation)	standard	$< 1 \times 10^{-6}$ /year
	with R&S®SMB-B1 option	$< 1 \times 10^{-9}$ /day, $< 1 \times 10^{-7}$ /year
	with R&S®SMB-B1H option	$< 5 \times 10^{-10}$ /day, $< 3 \times 10^{-8}$ /year
Temperature effect (0 °C to +50 °C)	standard	$< 2 \times 10^{-6}$
	with R&S®SMB-B1 option	$< 1 \times 10^{-7}$
	with R&S®SMB-B1H option	$< 1 \times 10^{-8}$
Warm-up time	to nominal thermostat temperature with R&S®SMB-B1/R&S®SMB-B1H option	≤10 min
Output of internal reference		
Connector type	REF OUT on rear panel	BNC female
Output frequency	sinewave	10 MHz
Output level		+7 dBm to +13 dBm, typ. +10 dBm
Source impedance		nom. 50 Ω
Input for external reference		
Connector type	REF IN on rear panel	BNC female
Input frequency		10 MHz
Frequency locking range		$\pm 3 \times 10^{-6}$
Input level range		0 dBm, to +16 dBm
Input impedance		nom. 50 Ω

Level

General explanations

Instruments equipped with frequency options R&S®SMB-B101/-B102/-B103/-B106/-B112 include an electronic step attenuator with step ranges of 5 dB (6 dB with R&S®SMB-B112). Instruments equipped with frequency option R&S®SMB-B112L include no step attenuator. These instruments have a limited level setting range and limited specified level range.

Level setting modes

The R&S®SMB100A offers two different operating modes for level setting:

- AUTO MODE: The step attenuator is switched over automatically.
- FIXED MODE: The level is set without changing the step attenuator. The step attenuator is thus fixed to the current setting. If ALC is ON, level changes are performed without interruption. The maximum interruption-free setting range is limited.

ALC modes

The R&S®SMB100A offers different ALC modes.

- ALC STATE AUTO: The best suited ALC mode is set automatically.
- ALC STATE ON: The level control loop is closed. This mode is suitable for CW, AM, FM and φM.
- ALC STATE SAMPLE & HOLD (S&H): At every frequency and level change, the level control loop is closed for about 1 ms and the level control voltage is sampled. The level control voltage is then clamped. This mode is used internally while in ALC state Auto for pulse modulation.

During a sample & hold measurement the level is decreased by 30 dB for instruments including an electronic step attenuator. For instruments with no step attenuator the set ON level is present for 3 ms to 5 ms during a sample & hold procedure after level or frequency setting.

Level settings

Setting range		
R&S®SMB-B101/-B102/-B103/-B106	$9 \text{ kHz} \leq f < 100 \text{ kHz}$	–145 dBm to +8 dBm
	$100 \text{ kHz} \leq f < 300 \text{ kHz}$	–145 dBm to +13 dBm
	$300 \text{ kHz} \leq f < 1 \text{ MHz}$	–145 dBm to +18 dBm
	$1 \text{ MHz} \leq f \leq 6 \text{ GHz}$	–145 dBm to +30 dBm
R&S®SMB-B112	$100 \text{ kHz} \leq f \leq 200 \text{ kHz}$	–145 dBm to +3 dBm
	$200 \text{ kHz} < f \leq 300 \text{ kHz}$	–145 dBm to +8 dBm
	$300 \text{ kHz} < f \leq 1 \text{ MHz}$	–145 dBm to +11 dBm
	$1 \text{ MHz} < f \leq 12.75 \text{ GHz}$	–145 dBm to +30 dBm
R&S®SMB-B112L	$100 \text{ kHz} \leq f \leq 200 \text{ kHz}$	–20 dBm to +5 dBm
	$200 \text{ kHz} < f \leq 300 \text{ kHz}$	–20 dBm to +10 dBm
	$300 \text{ kHz} < f \leq 1 \text{ MHz}$	–20 dBm to +13 dBm
	$1 \text{ MHz} < f \leq 12.75 \text{ GHz}$	–20 dBm to +30 dBm
Resolution of setting		0.01 dB
Interruption-free level setting range	FIXED mode, ALC state ON	0 to 20 dB

Level performance

Specified level range PEP (peak envelope power)		
R&S®SMB-B101/-B102/-B103/-B106	9 kHz ≤ f ≤ 200 kHz	–120 dBm to +5 dBm
	200 kHz < f ≤ 1 MHz	–120 dBm to +13 dBm
	1 MHz < f ≤ 6 GHz	–120 dBm to +18 dBm
R&S®SMB-B112	standard	
	200 kHz < f ≤ 1 MHz	–120 dBm to +6 dBm
	1 MHz < f ≤ 12.75 GHz	–120 dBm to +18 dBm
	with option R&S®SMB-B30 reverse power protection	
	200 kHz < f ≤ 1 MHz	–120 dBm to +5 dBm
R&S®SMB-B112L	1 MHz < f ≤ 12.75 GHz	–120 dBm to +15 dBm
	standard	
	200 kHz < f ≤ 1 MHz	–5 dBm to +10 dBm
	1 MHz < f ≤ 12.75 GHz	–5 dBm to +18 dBm
	with option R&S®SMB-B30 reverse power protection	
Level error	200 kHz < f ≤ 1 MHz	–5 dBm to +9 dBm
	1 MHz < f ≤ 12.75 GHz	–5 dBm to +15 dBm
	ALC state ON, temperature range +18 °C to +33 °C	
R&S®SMB-B101/-B102/-B103/-B106/-B112	9 kHz ≤ f ≤ 200 kHz ⁴	< 1.0 dB
	200 kHz < f ≤ 3 GHz	< 0.5 dB
	f > 3 GHz	< 0.9 dB
R&S®SMB-B112L	200 kHz < f ≤ 3 GHz	< 0.7 dB
	f > 3 GHz	< 1.1 dB
Additional level error	ALC state Sample & Hold	< 0.25 dB

Level setting times

Setting time	instruments with electronic step attenuator or no step attenuator to < 0.1 dB deviation from final value with GUI update stopped, temperature range 18 °C to 33 °C	
	after IEC/IEEE bus delimiter	
	ALC state ON	< 2.5 ms
	ALC state Sample & Hold	< 7 ms
	in List mode after trigger pulse	< 1 ms

Reverse power

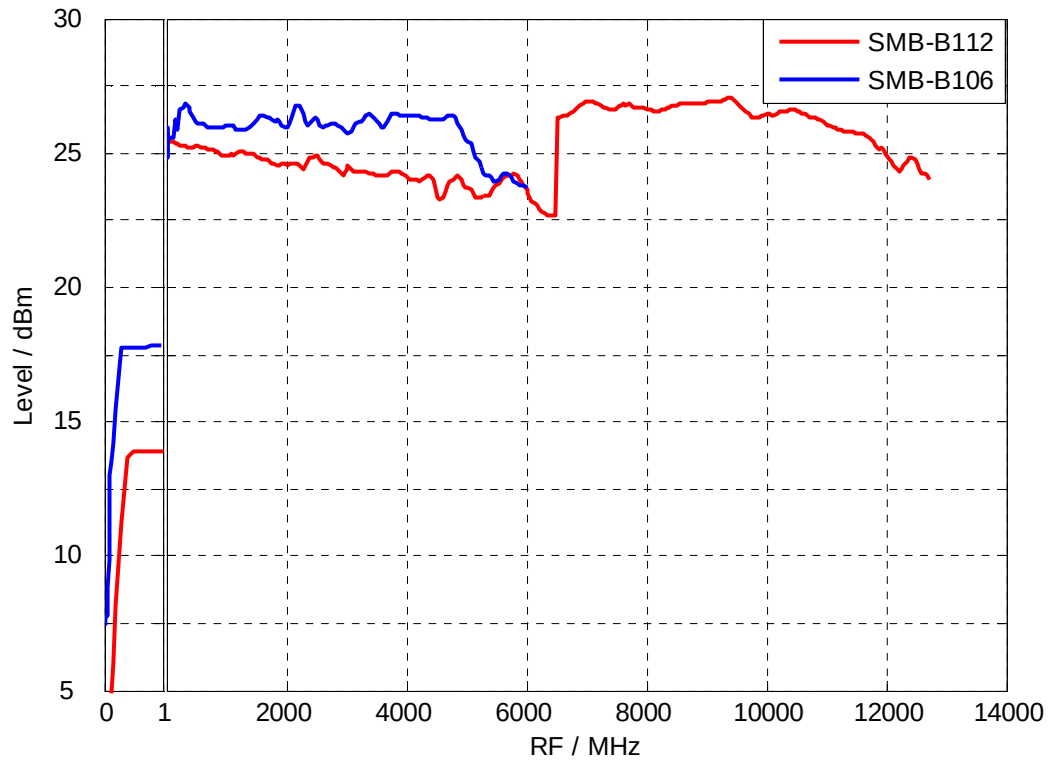
The R&S®SMB100A equipped with frequency options R&S®SMB-B101/-B102/-B103/-B106 includes a reverse power protection as standard. For instruments equipped with frequency option R&S®SMB-B112 or R&S®SMB-B112L a reverse power protection option (R&S®SMB-B30) is available.

Maximum permissible RF power in output frequency range of RF path for f > 1 MHz from ≥ 50 Ω source		
Instruments with reverse power protection		
Reverse power	1 MHz < f ≤ 1 GHz	50 W
	1 GHz < f ≤ 2 GHz	25 W
	2 GHz < f ≤ 12.75 GHz	10 W
Maximum permissible DC voltage		35 V
Instruments without reverse power protection		
Reverse power		0.5 W
Maximum permissible DC voltage	R&S®SMB-B112/112L	35 V

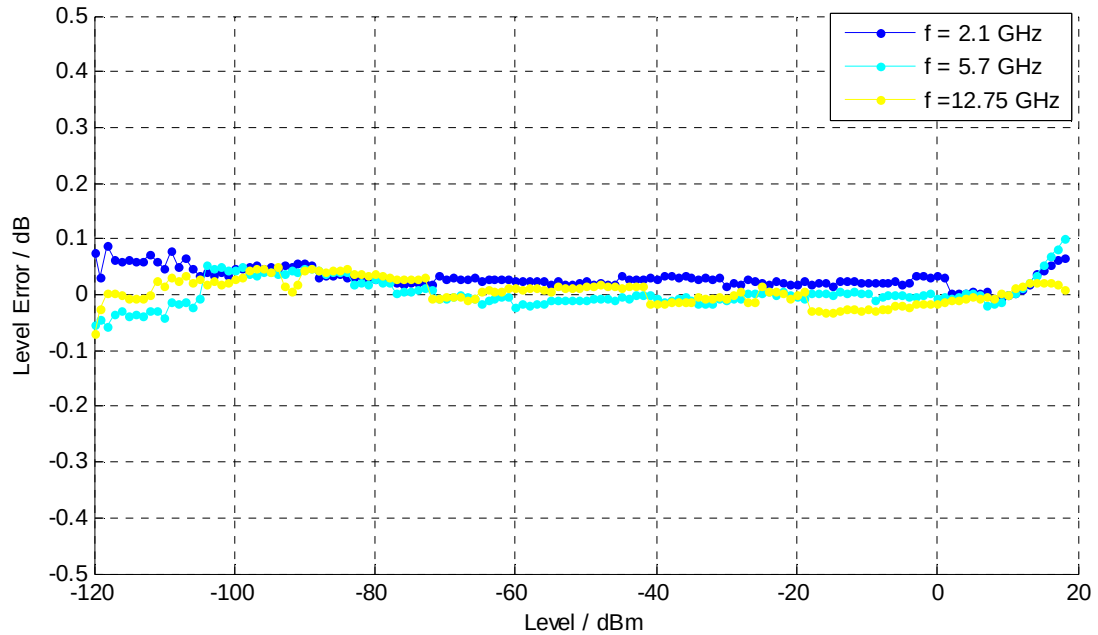
VSWR

Output impedance VSWR in 50 Ω system, f > 200 kHz, ALC state ON		
R&S®SMB-B101/-B102/-B103/-B106/-B112		< 1.8
R&S®SMB-B112L, R&S®SMB-B30		< 2.0

⁴ Only for instruments equipped with option R&S®SMB-B101, R&S®SMB-B102, R&S®SMB-B103 or R&S®SMB-B106.



Maximum available output level versus frequency [meas].



Level linearity, ALC ON [meas].

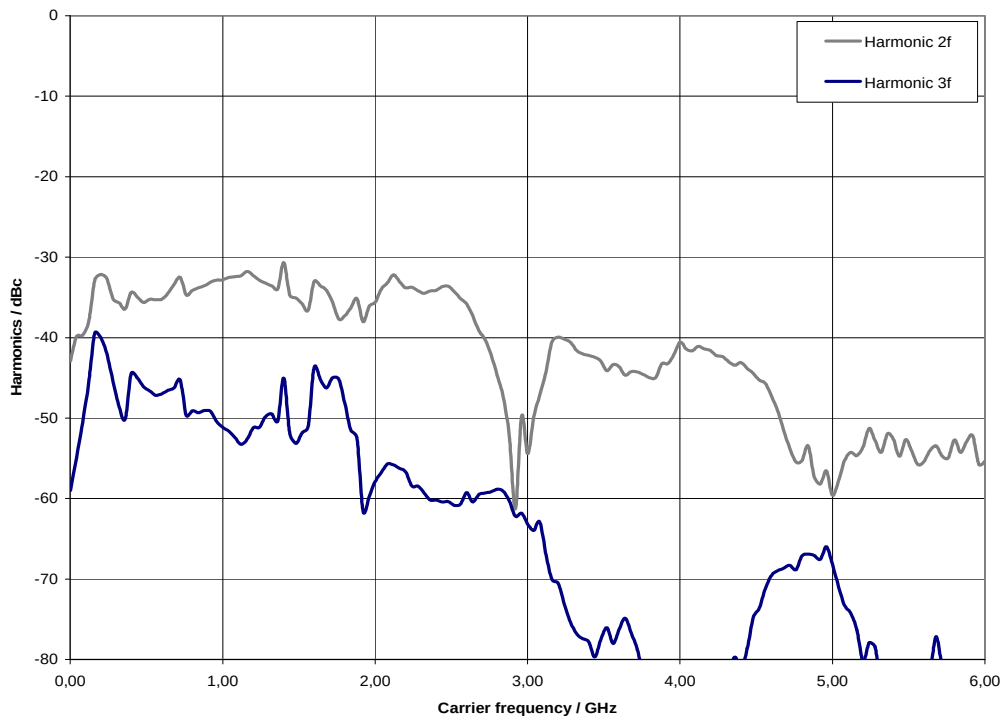
Level sweep

Operating mode		digital sweep in discrete steps
Trigger mode	free run	automatic
	full sweep	single
	execute one step	step
	ext. trigger only	start/stop
Trigger source		keyboard, external connector, remote control
Trigger slope	with external trigger	positive, negative
Sweep range		full specified level range
	interruption-free	–20 dB to +20 dB
Sweep shape		triangle, sawtooth
Step spacing		logarithmic
Step size setting resolution		0.01 dB
Dwell time setting range		10 ms to 10 s
Dwell time setting resolution		0.1 ms

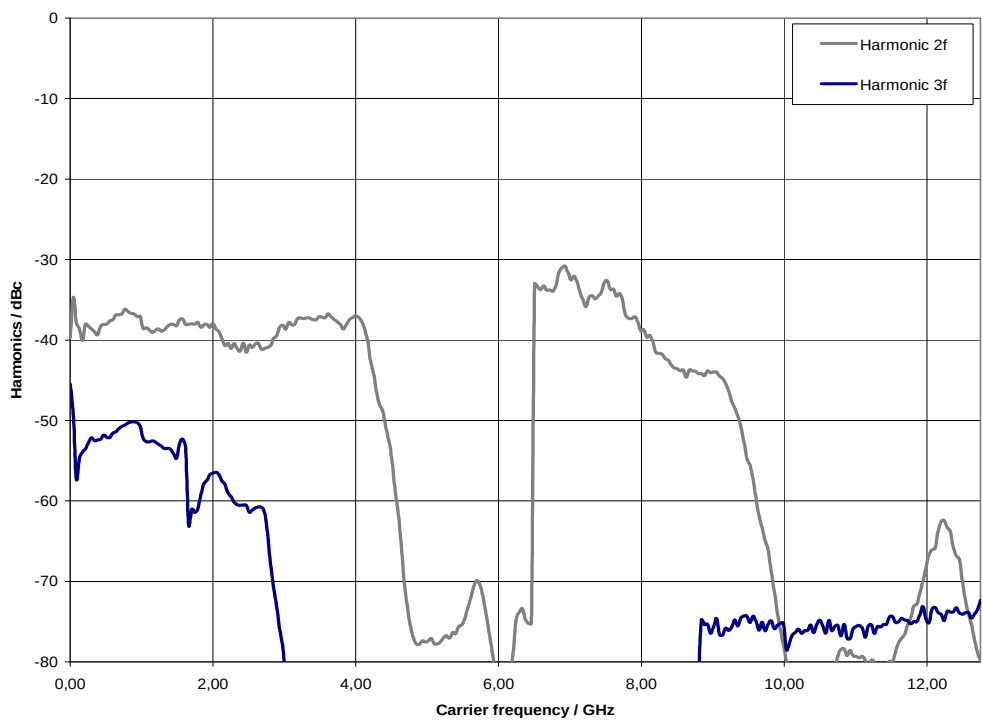
Spectral purity

Harmonics	1 MHz < f ≤ 6 GHz; level ≤ 13 dBm f > 6 GHz; level ≤ 10 dBm	< –30 dBc
Nonharmonics	CW, level > –10 dBm ⁵ , offset > 10 kHz from carrier	
	f ≤ 23.4375 MHz	< –70 dBc
	23.4375 MHz < f ≤ 1500 MHz	< –70 dBc, typ. < –84 dBc
	1500 MHz < f ≤ 3 GHz	< –64 dBc, typ. < –78 dBc
	3 GHz < f ≤ 6.375 GHz	< –58 dBc, typ. < –72 dBc
Subharmonics	6.375 GHz < f ≤ 12.75 GHz	< –52 dBc, typ. < –66 dBc
	level > –10 dBm ⁵	
	f < 6.375 GHz	none
Wideband noise	6.375 GHz < f ≤ 12.75 GHz	< –55 dBc
	level operating mode AUTO, level > 10 dBm, measurement bandwidth 1 Hz, CW	
	f ≤ 6.375 GHz carrier offset 10 MHz	< –142 dBc
SSB phase noise	6.375 GHz < f ≤ 12.75 GHz carrier offset 30 MHz	< –138 dBc
	carrier offset 20 kHz, measurement bandwidth 1 Hz, CW	
	f = 100 MHz, level = 10 dBm	< –141 dBc, typ. –145 dBc
	f = 1 GHz	< –122 dBc, typ. –128 dBc
	f = 2 GHz	< –116 dBc, typ. –122 dBc
	f = 3 GHz	< –112 dBc, typ. –118 dBc
	f = 4 GHz	< –110 dBc, typ. –116 dBc
	f = 6 GHz	< –106 dBc, typ. –112 dBc
RMS jitter	f = 10 GHz	< –102 dBc, typ. –107 dBc
	f = 1 GHz, BW = 1 Hz to 10 MHz, CW	
	standard	7.2 ps (meas.), (7.2 mUI)
	with R&S [®] SMB-B1 option	1.3 ps (meas.), (1.3 mUI)
	with R&S [®] SMB-B1H option	105 fs (meas.), (105 μUI)
	f = 155 MHz, BW = 100 Hz to 1.5 MHz, CW	83 fs (meas.), (12.9 μUI)
Residual FM	f = 622 MHz, BW = 1 kHz to 5 MHz, CW	63 fs (meas.), (39.2 μUI)
	f = 2.488 GHz, BW = 5 kHz to 15 MHz, CW	55 fs (meas.), (137 μUI)
	RMS value at f = 1 GHz, CW	
	0.3 kHz to 3 kHz, weighted (ITU-T)	< 4 Hz, typ. 0.22 Hz
	0.03 kHz to 23 kHz	< 10 Hz, typ. 1.35 Hz
Residual AM	RMS value (0.03 kHz to 20 kHz) level = 8 dBm	< 0.02 %

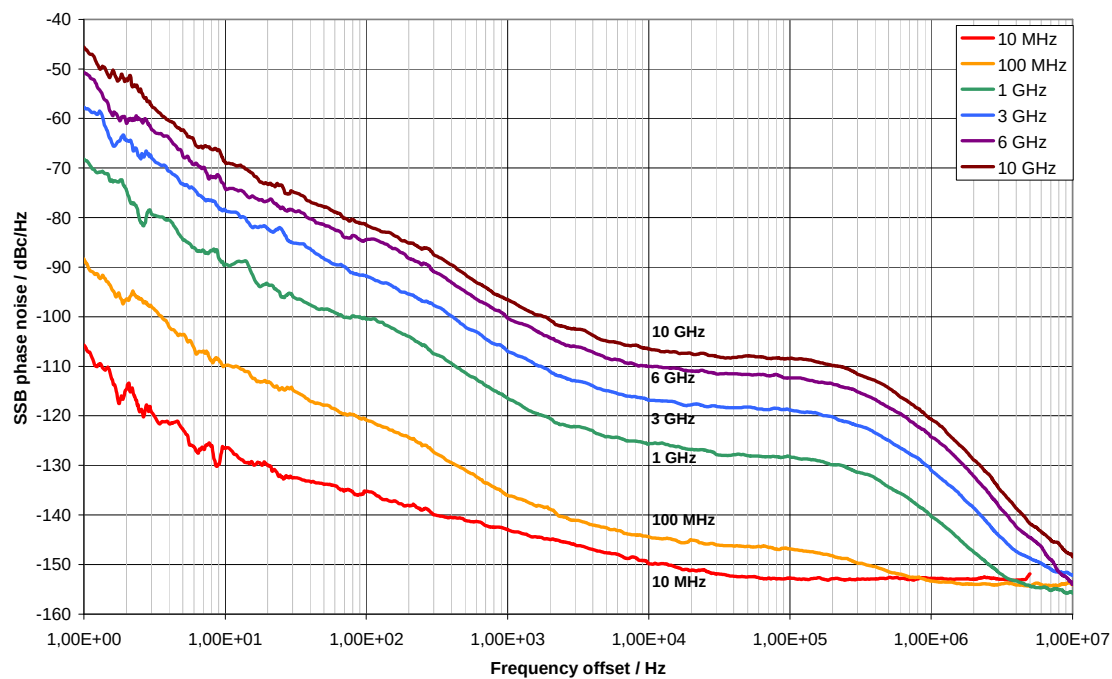
⁵ > 0 dBm for instruments without step attenuator



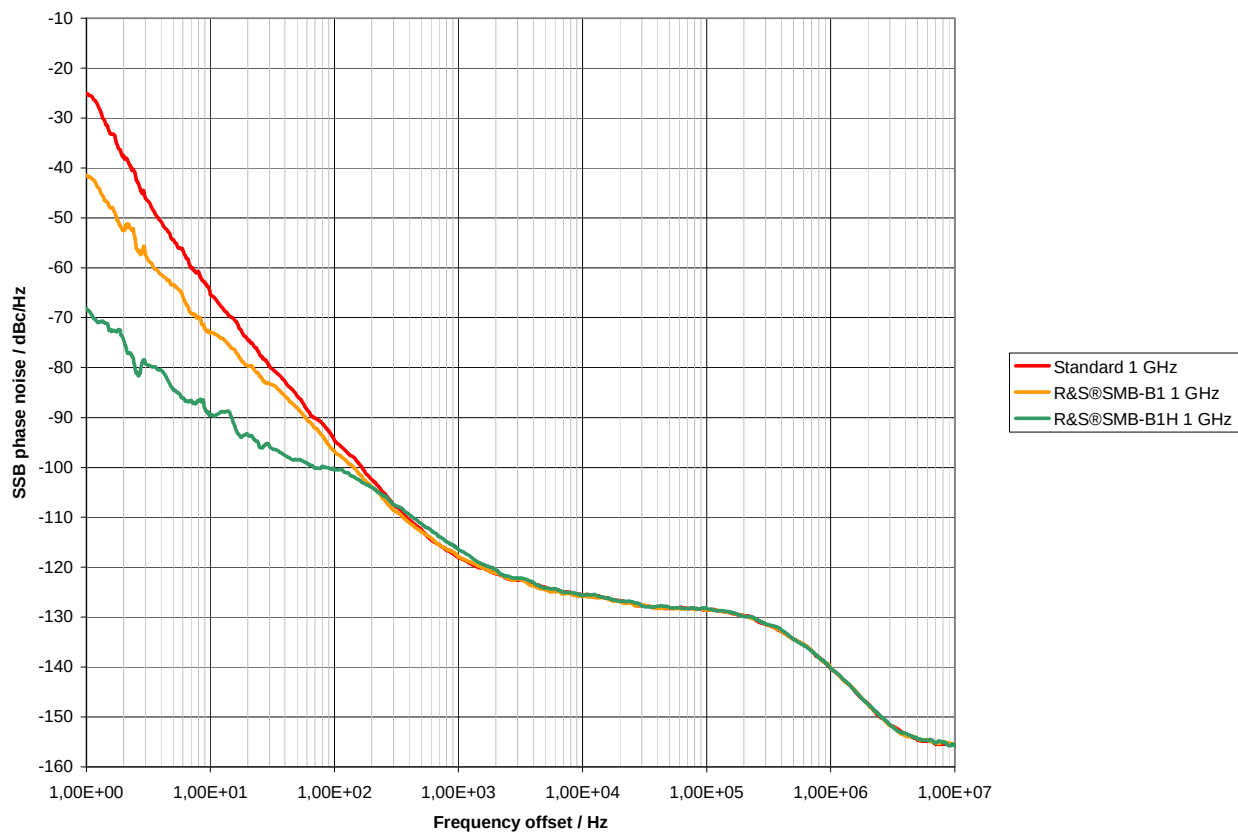
Harmonics versus carrier frequency at +15 dBm output level with option R&S®SMB-B106 [meas.]



Harmonics versus carrier frequency at +15 dBm output level with option R&S®SMB-B112 [meas.]



SSB phase noise with option R&S®SMB-B1H [meas.].



SSB phase noise comparison with standard internal reference, R&S®SMB-B1, R&S®SMB-B1H [meas.].

List mode settings

Frequency and level pairs can be stored in a list and set in an extremely short amount of time.

Trigger mode	free run	automatic
	full sweep	single
	execute one step	step
Trigger source		keyboard, external trigger, remote control
Max. number of stored settings		2000
Dwell time setting range		1 ms to 1 s
Dwell time setting resolution		0.1 ms
Setting time	after external trigger	see frequency and level data

Analog modulation

Simultaneous modulation

	Amplitude modulation	Frequency modulation	Phase modulation	Pulse modulation
Amplitude modulation		●	●	(●)
Frequency modulation	●		○	●
Phase modulation	●	○		●
Pulse modulation	(●)	●	●	

● = compatible

○ = incompatible

(●) = compatible with limitations: No specification applies for AM distortion, AM depth error and ON/OFF ratio with pulse modulation.

Amplitude modulation

For $f \geq 200$ kHz, level setting mode AUTO, AM envelope within specified level range.

Modulation source		internal, external, internal + external	
External coupling		AC, DC	
AM depth setting range	At high levels, modulation is clipped when the maximum PEP is reached.	0 % to 100 %	
Resolution of setting		0.1 %	
AM depth (m) error	$f_{\text{mod}} = 1$ kHz and $m < 80$ %		
	R&S®SMB-B101/-B102/-B103/-B106		
	$f \leq 23.4375$ MHz	< (1 % of setting + 1 %)	
	$f > 23.4375$ MHz	< (4 % of setting + 1 %)	
	R&S®SMB-B112/-B112L $f > 1$ MHz, PEP ≤ 15 dBm	< (4 % of setting + 1 %)	
AM distortion	$f_{\text{mod}} = 1$ kHz	$m = 30\%$	$m = 80\%$
	R&S®SMB-B101/-B102/-B103/-B106		
	$f \leq 23.4375$ MHz	< 0.25 %	< 0.5 %
	$f > 23.4375$ MHz	< 1.5 %	< 3 %
	R&S®SMB-B112/-B112L $f > 5$ MHz, PEP ≤ 15 dBm	< 1.5 %	< 3 %
Modulation frequency response	$m = 60$ %, DC-coupling: 0 to 50 kHz, AC-coupling: 10 Hz to 50 kHz	< 3 dB	
Synchronous ϕ M at AM	$m = 30$ %, $f_{\text{mod}} = 1$ kHz, $\pm$ peak/2	< 0.2 rad	

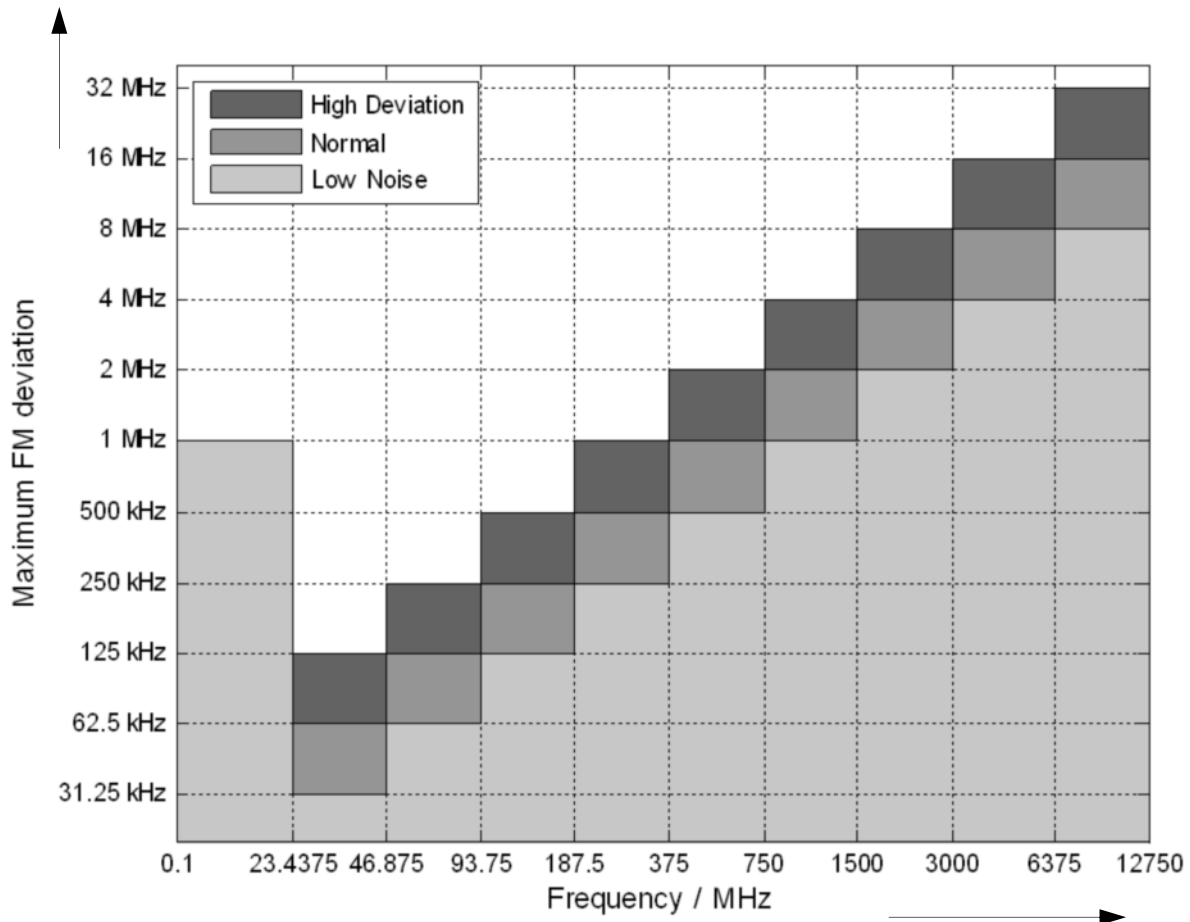
Frequency bands for frequency and phase modulation

Multiplier N is used to define FM and ϕ M specifications within this document

Multiplier (N) for different frequency ranges	$f \leq 23.4375$ MHz	1/4
	$23.4375 \text{ MHz} < f \leq 46.875 \text{ MHz}$	1/32
	$46.875 \text{ MHz} < f \leq 93.75 \text{ MHz}$	1/16
	$93.75 \text{ MHz} < f \leq 187.5 \text{ MHz}$	1/8
	$187.5 \text{ MHz} < f \leq 375 \text{ MHz}$	1/4
	$375 \text{ MHz} < f \leq 750 \text{ MHz}$	1/2
	$750 \text{ MHz} < f \leq 1500 \text{ MHz}$	1
	$1500 \text{ MHz} < f \leq 3 \text{ GHz}$	2
	$3 \text{ GHz} < f \leq 6.375 \text{ GHz}$	4
	$6.375 \text{ GHz} < f \leq 12.75 \text{ GHz}$	8

Frequency modulation

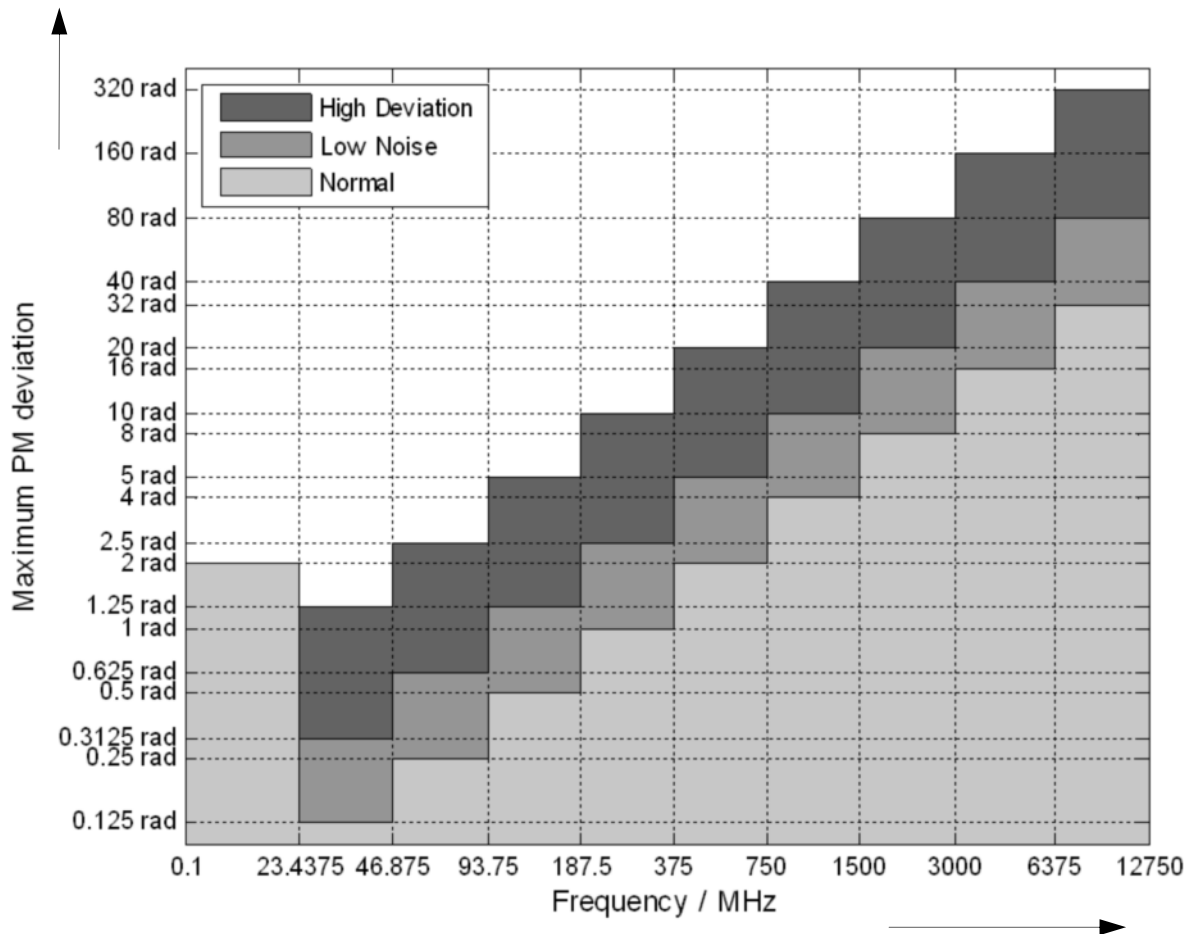
Modulation source		internal, external, internal + external
External coupling		AC, DC
Operating modes		FM mode Low Noise FM mode Normal FM mode High Deviation
Maximum deviation	$f \leq 23.4375 \text{ MHz}$	1 MHz
	$f > 23.4375 \text{ MHz}$	
	FM mode Normal	$N \times 2 \text{ MHz}$
	FM mode Low Noise	$N \times 1 \text{ MHz}$
	FM mode High Deviation	$N \times 4 \text{ MHz}$
Resolution		<0.02 % of set deviation, min. $N \times 0.1 \text{ Hz}$
FM deviation error	$f_{\text{mod}} = 1 \text{ kHz}$, deviation $\leq N \times 1 \text{ MHz}$	
	internal	< (2 % of setting + 20 Hz)
	external	< (3 % of setting + 20 Hz)
FM distortion	$f_{\text{mod}} = 2 \text{ kHz}$, deviation = $N \times 1 \text{ MHz}$	< 0.2 %
Modulation frequency response	FM modes Low Noise and High Deviation	
	DC-coupling: 0 to 100 kHz, AC-coupling: 10 Hz to 100 kHz	< 3 dB
	FM mode Normal	
	DC-coupling: 0 to 500 kHz, AC-coupling: 10 Hz to 500 kHz	< 3 dB
Synchronous AM with FM	40 kHz deviation, $f_{\text{mod}} = 1 \text{ kHz}$, $f > 10 \text{ MHz}$	< 0.2 %
Carrier frequency offset with FM DC	after FM offset adjustment	< 0.2 % of set deviation



FM deviation versus frequency and operating mode.

Phase modulation

Modulation source		internal, external, internal + external
External coupling		AC, DC
Operating modes	ϕ M modes Low Noise/Normal/High Deviation	
Maximum deviation	$f \leq 23.4375$ MHz	2 rad
	$f > 23.4375$ MHz	
	ϕ M mode Normal	$N \times 4$ rad
	ϕ M mode Low Noise	$N \times 10$ rad
Resolution	ϕ M mode High Deviation	$N \times 40$ rad
		$< 0.02\%$ of set deviation, min. $N \times 20 \mu$ rad
ϕ M deviation error	$f_{\text{mod}} = 1$ kHz, deviation $\leq$ half of max. deviation	
	internal	$< (2\% \text{ of setting} + 0.003 \text{ rad})$
	external	$< (3\% \text{ of setting} + 0.003 \text{ rad})$
ϕ M distortion	$f_{\text{mod}} = 10$ kHz, half of max. deviation	$< 0.2\%$
Modulation frequency response	ϕ M modes Low Noise and High Deviation	
	DC-coupling: 0 to 100 kHz	< 3 dB
	AC-coupling: 10 Hz to 100 kHz	
	ϕ M mode Normal	
	DC-coupling: 0 to 500 kHz	< 3 dB
	AC-coupling: 10 Hz to 500 kHz	



ϕ M deviation versus frequency and operating mode.

Pulse modulation (R&S®SMB-K21 or R&S®SMB-K22 option)

When pulse modulation is activated, the R&S®SMB100A automatically switches to the ALC mode S&H. In this case, the ALC loop is opened and the output level is set directly. In order to set the correct level, a sample & hold measurement is performed prior to each frequency and level setting.

- Option R&S®SMB-K21 is available for R&S®SMB-B112 or R&S®SMB-B112L
- Option R&S®SMB-K22 is available for R&S®SMB-B101/-B102/-B103/-B106

Modulation source		external, internal
On/off ratio ⁶		> 80 dB
Rise/fall time	10 % to 90 % of RF amplitude, f > 23.4375 MHz	< 20 ns, typ. < 5 ns
Pulse repetition frequency		0 Hz to 25 MHz
Video crosstalk	spectral line of fundamental of 100 kHz pulse repetition frequency	< -30 dBc

Input for external modulation signals

Modulation input EXT for AM/FM/φM		
Connector type	MOD EXT on rear panel	BNC female
Input impedance	selectable	nom. 220 kΩ or 600 Ω
Input sensitivity	peak value for set modulation factor or deviation	nom. 1 V
Maximum input voltage		nom. 1 V
Input damage voltage		± 10 V
Modulation input PULSE EXT		
Connector type	PULSE EXT on rear panel	BNC female
Input impedance	selectable	nom. 10 kΩ or 50 Ω
Input voltage	TTL, CMOS compatible, threshold low	nom. 0.5 V
	TTL, CMOS compatible, threshold high	nom. 1.5 V
Input damage voltage		± 5 V
Input polarity	selectable	normal, inverse

Modulation sources

Internal modulation generator (LF)

Waveforms		sine wave, square wave
Frequency range	sine wave	0.1 Hz to 1 MHz
	square wave	0.1 Hz to 20 kHz
Resolution of frequency setting		0.1 Hz
Frequency error	< (0.005 Hz + relative error of reference frequency × modulation frequency)	
Frequency response	sine wave, 0.1 Hz to 1 MHz	< 1 dB
Frequency setting time	to within $< 1 \times 10^{-7}$, after IEC/IEEE bus delimiter	< 5 ms (meas.)
Distortion	sine wave, f ≤ 100 kHz at R _L > 200 Ω, U _{peak} = 1 V	< 0.1 %
Output voltage range	U _{peak} at LF connector, open circuit voltage	1 mV to 3 V
Resolution of output voltage setting		1 mV
Output voltage setting error	at 1 kHz, R _L ≥ 10 kΩ	< (1 % of setting + 1 mV)
Output impedance	selectable	nom. 10 Ω or 600 Ω

⁶ level > 0 dBm for instruments without step attenuator

LF frequency sweep

Operating mode		digital sweep in discrete steps
Trigger mode	free run	automatic
	full sweep	single
	execute one step	step
	ext. trigger only	start/stop
Trigger source		keyboard, external trigger, remote control
Trigger slope		positive, negative
Sweep range		full frequency range, minimum 0.1 Hz
Sweep shape		triangle, sawtooth
Step spacing		linear, logarithmic
Step size setting resolution	linear	0.1 Hz
	logarithmic	0.01 %
Dwell time setting range		10 ms to 10 s
Dwell time setting resolution		0.1 ms

Pulse generator (R&S® SMB-K23 option)

Pulse generator is implemented fully digital; the clock is directly derived from the instruments reference frequency.

Pulse mode		single pulse, double pulse
Trigger modes	free run, internal triggered	automatic
		external triggered, external gated
Active trigger edge		positive or negative
Pulse period setting range		40 ns to 85 s
Pulse period setting resolution		10 ns
Pulse width setting range	pulse widths of double pulses can be set independently	10 ns to 1 s
Pulse width setting resolution		10 ns
Pulse delay setting range	with external trigger	10 ns to 1 s
Pulse delay setting resolution	with external trigger	10 ns
Double-pulse spacing setting range		20 ns to 1 s
Double-pulse spacing setting resolution		10 ns
External trigger delay		50 ns (meas.)
External trigger jitter of delay		< 10 ns
PULSE/VIDEO output signal	without load	digital signal nom. 0 V/3.3 V

Pulse Train (R&S® SMB-K27 option)

Option R&S® SMB-K27 extends the functionality of the pulse generator (R&S® SMB-K23 option). With this option pulses and sequences of pulses can be freely defined, e.g. to generate jittered or staggered pulse scenarios widely used in radar applications.

Pulse modes	setting of pulse width, pulse spacing and pulse sequences	freely programmable
Trigger modes		automatic (free run)
		external triggered
Active trigger edge		positive or negative
Number of pulses		1 to 2047
Number of repetitions per pulse		1 to 65535
Pulse width and pulse spacing setting range		10 ns to 5 ms
Pulse width and pulse spacing setting resolution		10 ns

Stereo/RDS coder (R&S® SMB-B5 option)

The specifications apply to RF frequencies in the range 66 MHz to 110 MHz. This option is only available for instruments equipped with frequency options R&S® SMB-B101/-B102/-B103/-B106.

Stereo modes	internal with modulation generator	L, R, R = L, R = -L
	external analog (via L and R inputs) or external digital (via S/P DIF input)	L, R, R = L, R = -L, R ≠ L
MPX frequency deviation range		0 Hz to 80 kHz
MPX frequency deviation setting resolution		10 Hz
AF frequency range	L, R signal	20 Hz to 15 kHz
AF frequency response	L, R signal (referenced to 500 Hz)	
	AF = 20 Hz to 40 Hz	< 0.3 dB
	AF = 40 Hz to 15 kHz	< 0.2 dB
Stereo crosstalk attenuation	AF = 1 kHz	> 50 dB
Distortion	67.5 kHz MPX frequency deviation	< 0.1 %
	AF = 1 kHz	
S/N ratio	stereo/ RDS signal generator without preemphasis, receiver with deemphasis.	
	ITU-R weighted (quasi-peak)	> 60 dB
	ITU-R unweighted (rms)	> 70 dB
	A-weighted (rms)	> 70 dB
Preemphasis	selectable	off, 50 µs, 75 µs
Pilot tone 19 kHz		
Frequency error		< 2 Hz
Deviation range		0 Hz to 10 kHz
Deviation setting resolution		10 Hz
Phase setting range		-5° to +5°
Phase setting resolution		0.1°
ARI/RDS subcarrier 57 kHz		
Frequency error		< 6 Hz
Deviation range		0 Hz to 10 kHz
Deviation setting resolution		10 Hz
ARI		
Identification modes	traffic announcement identification (DK) area identification (BK)	OFF, DK, BK, DK + BK
BK area identification		A to F
RDS		
Traffic program		OFF/ON
Traffic announcement		OFF/ON
Data set	user-selectable	1 to 5
Maximum data length		64 kbyte
Modulation inputs analog L, R		
Connector type	L and R on rear panel	BNC female
Input impedance	selectable	nom. 600 Ω or 100 kΩ
Input sensitivity	peak value for set deviation	nom. 1 V
Modulation input digital S/P DIF		
Connector type	S/P DIF on rear panel	BNC female
Input impedance		nom. 75 Ω
Input voltage range	peak to peak voltage	400 mV to 5 V

Remote control

Interfaces	Remote control	IEC 60625 (GPIB IEEE-488.2)
	Ethernet/LAN	10/100BaseT
	USB	2.0 (high speed)
	serial	RS-232-C
Command set		SCPI 1999.5 or compatible command sets
Compatible command sets	these command sets can be selected in order to emulate another instrument.	Agilent/HP E442x Agilent/HP E443x Agilent/HP E8663 Agilent/HP E8257/67 Agilent/HP N51xx Analog Parts Agilent/HP 8642 Agilent/HP 8643A Agilent/HP 8644A/B Agilent/HP 8645 Agilent/HP 8647A Agilent/HP 8648A/B/C/D Agilent/HP 8656A/B Agilent/HP 8657A/B Agilent/HP 8664/65 Aeroflex/IFR 2023/2024 Aeroflex/IFR 203x,204x,205x R&S®SML01, R&S®SML02, R&S®SML03 R&S®SMT
IEC/IEEE bus address		0 to 30
Ethernet/LAN protocols and services		VISA VXI-11 (remote control) Telnet/RawEthernet (remote control) VNC (remote operation with web browser) FTP (file transfer protocol) SMB (mapping parts of the instrument to a host file system)
Ethernet/LAN addressing		DHCP, static, support of ZeroConf and M-DNS to ease the direct connection to a system controller
USB protocol		VISA USB-TMC

Connectors

Front panel connectors

RF 50 Ω	RF output	
	R&S [®] SMB-B101, R&S [®] SMB-B102, R&S [®] SMB-B103, R&S [®] SMB-B106	type-N female
	R&S [®] SMB-B112, R&S [®] SMB-B112L	test port adapter PC 3.5 mm female (interchangeable port connector system)
LF	modulation generator output	BNC female
MOD EXT	input for external analog modulation	BNC female

Rear panel connectors

REF IN	reference frequency input	BNC female
REF OUT	reference frequency output	BNC female
PULSE EXT	input for external pulse modulation	BNC female
PULSE VIDEO	pulse generator output	BNC female
INST TRIG	trigger input, TTL 5 V compatible	BNC female
SIGNAL VALID	output for triggering external devices; low state indicates that the instrument has settled to its final value	BNC female
L	stereo signal input for L signal, only available with R&S [®] SMB-B5 option	BNC female
R	stereo signal input for R signal, only available with R&S [®] SMB-B5 option	BNC female
S/P DIF	stereo signal input for digital stereo signal	BNC female
USB IN	USB 2.0 (high speed) remote control of instrument (USB-TMC)	USB type B
USB	USB 2.0 (high speed) connector for external USB devices, – mouse and keyboard for enhanced operation – R&S [®] NRP-Z power sensors (with adapter cable R&S [®] NRP-Z4) for external power measurements and level adjustment of instrument – memory stick for software update and data exchange – USB serial adapter for RS-232-C remote control	USB type A
LAN	provides remote control functionality and remote operation via VNC and file transfer via FTP	RJ-45
IEEE488	remote control of instrument via GPIB	24-pin Amphenol series 57 female

General data

Power supply		
AC input voltage range		90 V to 264 V
AC supply frequency	100 V to 240 V	45 Hz to 66 Hz
	100 V to 120 V	380 Hz to 440 Hz
Max. input current		1.4 A (100 V) to 0.6 A (240 V)
Power consumption	when fully equipped	
	instruments with option R&S®SMB-B101/-B102/-B103/-B106	60 W (meas.)
	instruments with option R&S®SMB-B112	80 W (meas.)
Power factor correction		in line with EN 61000-3-2
Electrical safety		
Compliance		in line with IEC 61010-1, EN 61010-1, CAN/CSA-C22.2 No. 61010-1-04, UL 61010-1
Test mark		VDE-GS, cCSA _{US}
EMC		
Electromagnetic compatibility	emissions	in line with EN 55011 class B
	immunity to interfering field strength	in line with EN 61326 (industrial environment)
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz, max. 0.5 g at 55 Hz to 150 Hz, in line with DIN EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.2 g (rms) in line with DIN EN 60068-2-64
Shock		40 g shock spectrum in line with DIN EN 60068-2-27, MIL-STD-810E
Environmental conditions		
Temperature range	operating	0 °C to +55 °C in line with DIN EN 60068-2-1, DIN EN 60068-2-2
	storage	–40 °C to +71 °C
Climatic resistance	+40 °C/95 % relative humidity	in line with DIN EN 60068-2-78
Altitude	operating	up to 4600 m
	storage	up to 4600 m
Weight and dimensions		
Weight	when fully equipped	
	instruments with option R&S®SMB-B101/-B102/-B103/-B106	5.3 kg
	instruments with option R&S®SMB-B112 and R&S®SMB-B30	5.6 kg
Dimensions	width × height × depth	
	instruments with option R&S®SMB-B101/-B102/-B103/-B106	344 mm × 112 mm × 368 mm
	instruments with option R&S®SMB-B112/-B112L	344 mm × 112 mm × 418 mm
Calibration interval		
Recommended calibration interval	operation 40 h/week in the full range of the specified environmental conditions	3 years

Ordering information

Designation	Type	Order No.
Base unit		
Signal Generator ⁷	R&S®SMB100A	1406.6000.02
Including power cable, Quick Start Guide, and CD-ROM (with operating and service manual)		
Options		
RF Path/Frequency Option		
9 kHz to 1.1 GHz	R&S®SMB-B101	1407.2509.02
9 kHz to 2.2 GHz	R&S®SMB-B102	1407.2609.02
9 kHz to 3.2 GHz	R&S®SMB-B103	1407.2709.02
9 kHz to 6 GHz	R&S®SMB-B106	1407.2909.02
100 kHz to 12.75 GHz with electronic step attenuator	R&S®SMB-B112	1407.2109.02
100 kHz to 12.75 GHz without step attenuator	R&S®SMB-B112L	1407.2150.02
Reverse Power Protection, 100 kHz to 12.75 GHz ⁸	R&S®SMB-B30	1407.1160.02
Reference Oscillator OCXO ⁹	R&S®SMB-B1	1407.3005.02
Reference Oscillator OCXO High Performance ⁹	R&S®SMB-B1H	1407.3070.02
Stereo/RDS Coder ¹⁰	R&S®SMB-B5	1407.3205.02
Pulse Modulator for R&S®SMB-B112/-B112L	R&S®SMB-K21	1407.3811.02
Pulse Modulator for R&S®SMB-B101/-B102/-B103/-B106	R&S®SMB-K22	1407.3770.02
Pulse Generator	R&S®SMB-K23	1407.3786.02
Pulse Train ¹¹	R&S®SMB-K27	1407.3828.02
Recommended extras		
Hardcopy manuals (in English, UK)		1407.0806.32
Hardcopy manuals (in English, US)		1407.0806.39
19" Rack Adapter	R&S®ZZA-S234	1109.4493.00
Power Sensor 9 kHz to 6 GHz incl. USB adapter cable	R&S®NRP-Z92	1171.7005.42
Power Sensor DC to 40 GHz, for levels up to 20 dBm	R&S®NRP-Z55	1138.2008.02
Power Sensor 10 MHz to 18 GHz	R&S®NRP-Z22	1137.7506.02
Keyboard with USB Interface (US character set)	R&S®PSL-Z2	1157.6870.04
Mouse with USB Interface, optical	R&S®PSL-Z10	1157.7060.03
USB Adapter for R&S®NRP power sensors	R&S®NRP-Z4	1146.8001.02
USB Serial Adapter for RS-232-C remote control	R&S®TS-USB1	6124.2531.00
Adapters for instruments with test port system		
Test port adapter PC 3,5 mm female		1021.0512.00
Test port adapter PC 3,5 mm male		1021.0529.00
Test port adapter N female		1021.0535.00
Test port adapter N male		1021.0541.00
Service options		
Two-Year Calibration Service	R&S®CO2SMB100A	please contact your local Rohde & Schwarz sales office
Three-Year Calibration Service	R&S®CO3SMB100A	
Five-Year Calibration Service	R&S®CO5SMB100A	
One-Year Repair Service following the warranty period	R&S®RO2SMB100A	
Two-Year Repair Service following the warranty period	R&S®RO3SMB100A	
Four-Year Repair Service following the warranty period	R&S®RO5SMB100A	0240.2193.18
Documentation of Calibration Values	R&S®DCV-2	
DKD (ISO 17025) Calibration including ISO 9000 calibration	R&S®SMB-DKD	1161.3607.02

For product brochure, see PD 5213.8396.12 and www.rohde-schwarz.com

⁷ The base unit must be ordered together with an R&S®SMB-B101, R&S®SMB-B102, R&S®SMB-B103, R&S®SMB-B106, R&S®SMB-B112, R&S®SMB-B112L frequency option

⁸ Only available with R&S®SMB-B112, R&S®SMB-B112L

⁹ Only one of the options R&S®SMB-B1 or R&S®SMB-B1H can be installed

¹⁰ Only available with R&S®SMB-B101, R&S®SMB-B102, R&S®SMB-B103, R&S®SMB-B106

¹¹ Requires option R&S®SMB-K23, only available for instruments with serial number > 102400

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About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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PD 5213.8396.22 | Version 03.00 | November 2010 | R&S®R&S®SMB100A

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