R&S®SMA100B
RF and Microwave Signal Generator
Specifications

3 year warranty

ROHDE&SCHWARZ

Data Sheet | Version 01.02

CONTENTS

Key features

First class devices thanks to first class signals

- Purest signals
  - Excellent SSB phase noise in base unit: < –119 dBc (typ.) for 10 GHz at an offset of 20 kHz
  - Outstanding SSB phase noise with option: < –132 dBc (typ.) for 10 GHz at an offset of 10 kHz
  - Lowest close-in SSB phase noise: < –83 dBc (typ.); f = 10 GHz, offset = 10 Hz
  - Virtually no wideband noise: < –160 dBc (typ.) at 10 GHz and an offset of 30 MHz
- Lowest harmonic and nonharmonic signal components
  - Very low harmonic signal components over the entire frequency range (< –63 dBc) even at very high output power
  - Very low nonharmonic signal components of < –90 dBc (typ.) at 10 GHz

Very high output power without compromise

- Exceptionally high output level
  - Ultra high output power up to 38 dBm with the 6 GHz model
  - Over 30 dBm at 18 GHz and 28 dBm at 20 GHz
  - First stage high power upgrade via key code
- Excellent level accuracy and repeatability for CW signals, narrow pulses and modulated signals

User friendly in every detail

- Flexible 2 HU or 3 HU housing
- 3 HU with larger 7" display and multiple front panel connectors
- Ergonomic operation thanks to state-of-the-art GUI with touch display

R&S®LegacyPro: refresh your technology

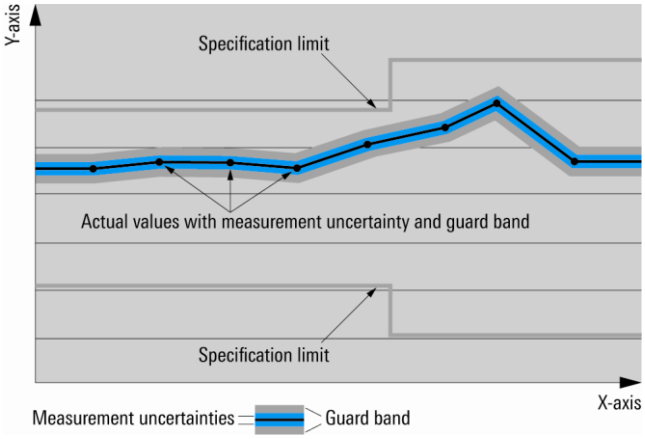
- Plug and play the R&S®SMA100B in an automated test system without changing the test software
- Emulation of R&S®SMA100A, R&S®SMF100A, Keysight PSG, Keysight MXG, etc.

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

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: “parameter: value”.

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

In line with the 3GPP/3GPP2 standard, chip rates are specified in Mcps (million chips per second), whereas bit rates and symbol rates are specified in Mbps (million bits per second), kbps (thousand bits per second) or ksps (thousand symbols per second), and sample rates are specified in Msample/s (million samples per second). Mcps, kbps, ksps and Msample/s are not SI units.

Introduction

Frequency and platform options (mandatory options)

One of the following frequency options must be installed.

R&S®SMAB-B103	8 kHz to 3 GHz
R&S®SMAB-B106	8 kHz to 6 GHz
R&S®SMAB-B112	8 kHz to 12.75 GHz
R&S®SMAB-B120	8 kHz to 20 GHz

One of the following platform height options must be selected.

R&S®SMAB-B92	2 HU with 5" touch display
R&S®SMAB-B93	3 HU with 7" touch display

Frequency, high power and rear panel connector options

The following table shows the frequency options and their corresponding high power, ultra high power and rear panel connector options.

Frequency option	High power option	Ultra high power option	Rear panel connector option
R&S®SMAB-B103	R&S®SMAB-K31	R&S®SMAB-B32	R&S®SMAB-B80
R&S®SMAB-B106	R&S®SMAB-K31	R&S®SMAB-B32	R&S®SMAB-B80
R&S®SMAB-B112	R&S®SMAB-K33	R&S®SMAB-B34	R&S®SMAB-B81
R&S®SMAB-B120	R&S®SMAB-K33	R&S®SMAB-B34	R&S®SMAB-B81

Note: an ultra high power option requires the corresponding high power option to be installed. For example, R&S®SMAB-K31 is a prerequisite for R&S®SMAB-B32.

RF characteristics

Unless stated otherwise, the specifications within the specified level range apply.

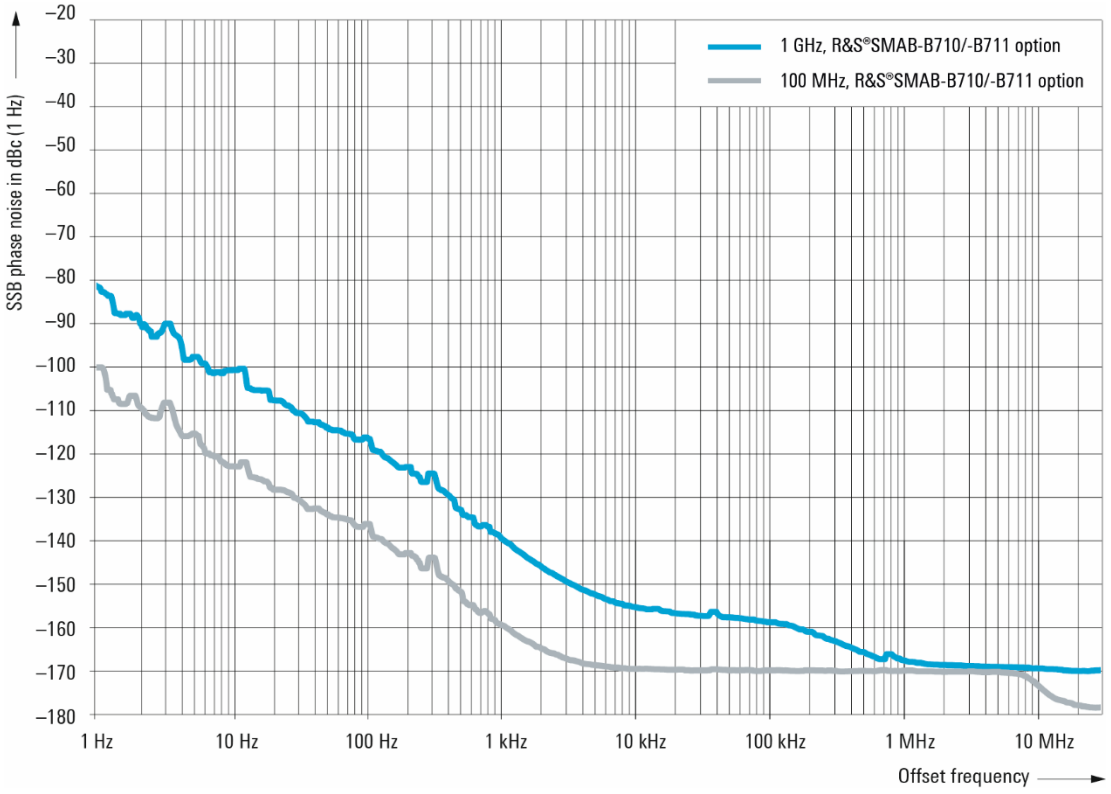
Frequency

Range	R&S®SMAB-B103	8 kHz to 3 GHz
	R&S®SMAB-B106	8 kHz to 6 GHz
	R&S®SMAB-B112	8 kHz to 12.75 GHz
	R&S®SMAB-B120	8 kHz to 20 GHz
Resolution of setting		0.001 Hz
Resolution of synthesis	f = 1 GHz	0.053 nHz (nom.)
Setting time	to within < 1×10^{-7} for f > 10 MHz or < 30 Hz for f < 10 MHz, with GUI update stopped after IEC/IEEE bus delimiter with R&S®SMAB-B86 option level setting characteristic: auto	
		< 1.5 ms
	with R&S®SMAB-B711 option	< 4.5 ms
Resolution of phase offset setting		adjustable in 0.01° steps

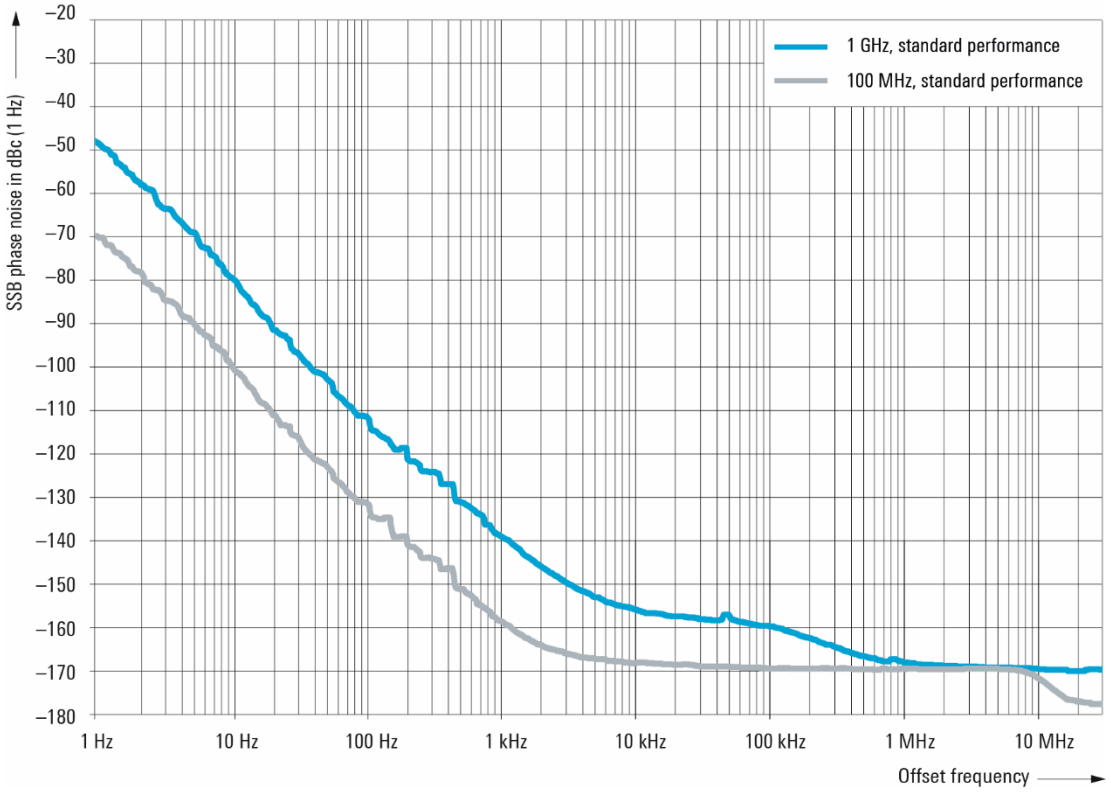
Reference frequency

Frequency error	at time of calibration in production	
	standard or with R&S®SMAB-B1H option	< 1×10^{-8}
	with R&S®SMAB-B710/-B711 options	< 5×10^{-9}
Aging	after 30 days of uninterrupted operation	
	standard	≤ 1×10^{-9}/day ≤ 1×10^{-7}/year
	with R&S®SMAB-B1H/-B710/-B711 options	≤ 5×10^{-10}/day ≤ 3×10^{-8}/year
Temperature effect	in temperature range from 0 °C to +55 °C	
	standard	±6×10^{-8}
	with R&S®SMAB-B1H option	±6×10^{-9}
	with R&S®SMAB-B710/-B711 options	±3×10^{-9}
Warm-up time	to nominal thermostat temperature	≤ 10 min (nom.)
Input for external reference frequency		
Connector type	REF in on rear panel	BNC female
Input frequency	standard	10 MHz
	with R&S®SMAB-K703 option	10 MHz, 100 MHz
	with R&S®SMAB-K704 option	10 MHz, 1 MHz to 100 MHz, variable
Input frequency setting resolution	with R&S®SMAB-K704 option	0.1 Hz
Input level range	level limits	0 dBm to 20 dBm
	recommended input level for optimum phase noise performance	7 dBm to 13 dBm
Input impedance		50 Ω (nom.)
Minimum frequency locking range	synchronisation bandwidth: wide	±3×10^{-6}
	synchronisation bandwidth: narrow	
	standard or with R&S®SMAB-B1H option	±0.3×10^{-6}
	with R&S®SMAB-B710/-B711 options	±0.15×10^{-6}
Output for internal reference frequency		
Connector type	REF out on rear panel	BNC female
Output frequency	standard	sine wave 10 MHz
	with R&S®SMAB-K703 option	sine wave 10 MHz, 100 MHz
	with R&S®SMAB-K704 option	
	instrument set to internal reference	sine wave 10 MHz
	instrument set to external reference	sine wave 10 MHz, applied external reference frequency
Output level		7 dBm to 14 dBm
Source impedance		50 Ω (nom.)
Wideband noise	with R&S®SMAB-K703 option, 100 MHz, internal reference, carrier offset = 10 MHz, measurement bandwidth 1 Hz	< –163 dBc, –167 dBc (typ.)

Ultra low noise 1 GHz reference frequency (R&S®SMAB-K703 option)		
Input connector type	1 GHz in on rear panel	SMA female
Input frequency		1 GHz
Input level range	level limits	≥ 6 dBm, ≤ 20 dBm
	recommended input level for optimum phase noise performance	7 dBm to 13 dBm
Input impedance		50 Ω (nom.)
Minimum frequency locking range		$\pm 3 \times 10^{-6}$
Output connector type	1 GHz out on rear panel	SMA female
Output frequency		sine wave 1 GHz
Output level		7 dBm to 13 dBm
Source impedance		50 Ω (nom.)
Wideband noise	1 GHz, internal reference, carrier offset = 10 MHz, measurement bandwidth 1 Hz	< –164 dBc, –168 dBc (typ.)
Input for electronic tuning of internal reference frequency		
Connector type	external tune on rear panel	BNC female
Sensitivity	external tuning slope, low	5×10^{-9}/V (typ.)
	external tuning slope, high	50×10^{-9}/V (typ.)
Input voltage range		–10 V to +10 V
Input impedance		10 kΩ (nom.)



Measured SSB phase noise of reference outputs at f = 100 MHz and 1 GHz with the R&S®SMAB-B710(N) and R&S®SMAB-B711(N) options (only available with the R&S®SMAB-K703 option).



Measured SSB phase noise of reference outputs at f = 100 MHz and 1 GHz with the R&S®SMAB-K703 option.

Reference frequency option concept

		Without option	With R&S®SMAB-K703 option, 1 GHz reference	With R&S®SMAB-K704 option, variable reference input
INPUT	10 MHz input frequency	●	●	●
	100 MHz input frequency	–	●	●
	1 MHz to 100 MHz input frequency	–	–	●
	1 GHz input frequency	–	●	–
OUTPUT	10 MHz output frequency	●	●	●
	100 MHz output frequency	–	●	–
	"Loop through" of input to output	–	●	●
	1 GHz output frequency	–	●	–

R&S®SMAB-K703 option **(1 GHz reference)**
When this option is installed, the user can use the 1 GHz low noise input and output for synchronization.
In WIDE mode, the signal generator will use this signal directly as a reference for the synthesizer.
This option should be used if a very high phase stability between multiple generators is required.
The 100 MHz low noise input and output mode is only available with this option.

R&S®SMAB-K704 option (variable reference input)
When this option is installed, the user can set the reference input frequency in 0.1 Hz steps between 1.0 MHz and 100 MHz.
The signal generator will lock its internal reference oscillator on the input frequency.

Note on choosing the proper reference synchronization bandwidth
The user has the choice to set the synchronization bandwidth either to NARROW or WIDE.

In WIDE mode, the best possible phase stability is achieved.
The phase noise performance close to the carrier depends on the phase noise of the external signal source.
In NARROW mode, the reference PLL acts as a clean-up-loop in which the phase noise is mainly determined by the signal generator's internal reference source.
This mode is recommended when using external reference sources with close-to-carrier phase noise worse than the R&S®SMA100B (i. e. rubidium standards).
Please note that due to the slow synchronization, reference locking can take up to 10 seconds.

Level

Setting range		
R&S®SMAB-B103/-B106	standard	–145 dBm to +20 dBm
	with R&S®SMAB-K31 option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +35 dBm
	with R&S®SMAB-B32 option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +40 dBm
R&S®SMAB-B112/-B120	standard	
	f ≤ 13 GHz	–145 dBm to +19 dBm
	f > 13 GHz	–145 dBm to +18 dBm
	with R&S®SMAB-K31/-K33 options	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +35 dBm
	with R&S®SMAB-B32/-B34 options	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +40 dBm
Interruption-free level setting range	level setting characteristic: uninterrupted level setting	> 20 dB
Setting resolution		0.01 dB
Specified level range	peak envelope power (PEP), not valid for instruments equipped with with R&S®SMAB-B80/-B81 options	
R&S®SMAB-B103/-B106	standard	
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 6 GHz	–127 dBm to +19 dBm
	with R&S®SMAB-K31 option	
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 6 GHz	–127 dBm to +25 dBm
	with R&S®SMAB-K31 and R&S®SMAB-B32 options	
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 8 MHz	–127 dBm to +25 dBm
	8 MHz < f ≤ 6 GHz	–127 dBm to +30 dBm
R&S®SMAB-B112/-B120	standard	
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 6 GHz	–127 dBm to +18 dBm
	6 GHz < f ≤ 13 GHz	–120 dBm to +18 dBm
	13 GHz < f ≤ 20 GHz	–120 dBm to +17 dBm
	with R&S®SMAB-K33 option	
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 6 GHz	–127 dBm to +23 dBm
	6 GHz < f ≤ 20 GHz	–120 dBm to +20 dBm
	with R&S®SMAB-K33 and R&S®SMAB-B34 options	
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 8 MHz	–127 dBm to +25 dBm
	8 MHz < f ≤ 6 GHz	–127 dBm to +28 dBm
	6 GHz < f ≤ 8 GHz	–120 dBm to +26 dBm
	8 GHz < f ≤ 18 GHz	–120 dBm to +27 dBm
	18 GHz < f ≤ 20 GHz	–120 dBm to +24 dBm
Level accuracy	CW, level setting characteristic: auto, temperature range from +18 °C to +33 °C	
	level from–90 dBm to +25 dBm	
	100 kHz < f ≤ 8 MHz	< 1.0 dB
	8 MHz < f ≤ 3 GHz	< 0.5 dB
	3 GHz < f ≤ 20 GHz	< 0.9 dB
	level > +25 dBm	
	8 MHz < f ≤ 18 GHz	< 1.0 dB
	level ≤ –90 dBm	
	100 kHz < f ≤ 8 MHz	< 1.2 dB
	8 MHz < f ≤ 3 GHz	< 0.8 dB
	3 GHz < f ≤ 20 GHz	< 1.2 dB
Additional level error	ALC state off (table)	< 0.7 dB
Setting time	level deviation < 0.1 dB from final value, with GUI update stopped, temperature range from +18 °C to +33 °C, after IEC/IEEE bus delimiter with R&S®SMAB-B86 option	
	level setting characteristic: auto	< 1.5 ms

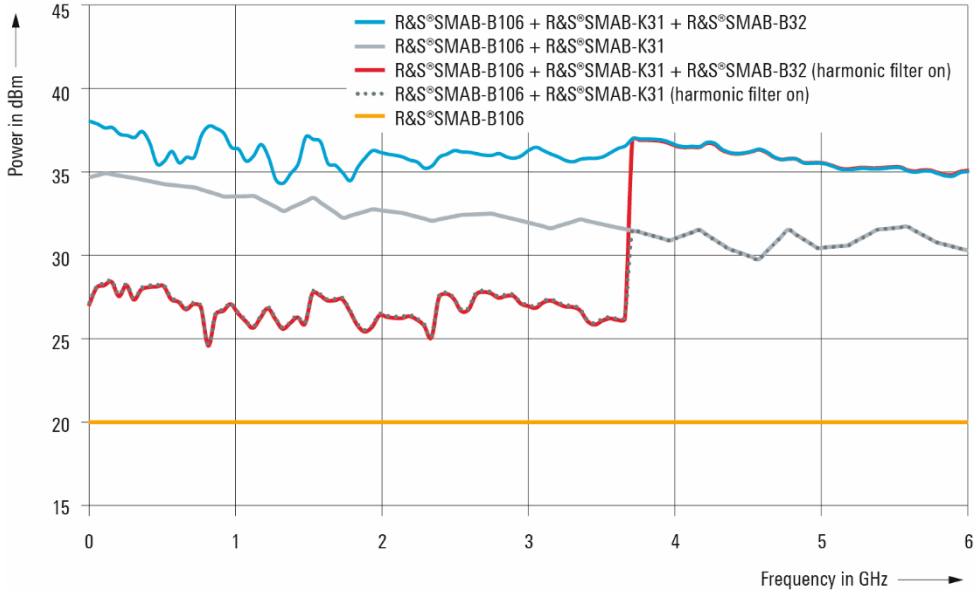
Level setting characteristics	predefined modes to optimize the instrument behavior for common applications	• auto • uninterrupted level setting • strictly monotone • constant VSWR
Automatic level control modes		auto, on, off (table), table and on

Reverse power

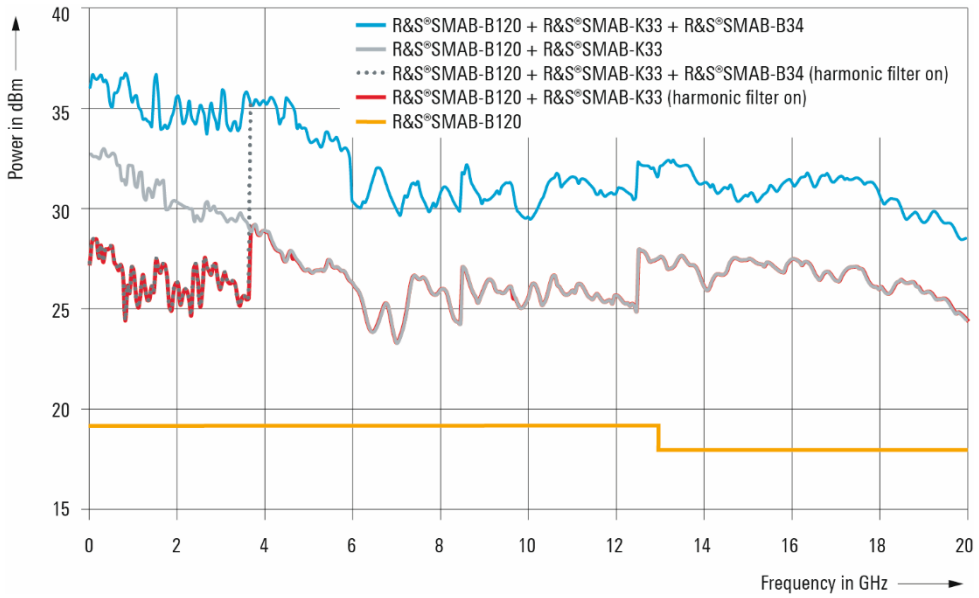
Reverse power	R&S®SMAB-B103/-B106, from 50 Ω source, maximum permissible RF power in output frequency range of RF path for f > 1 MHz; in case of too high reverse power, the RF output is switched off by a mechanical relay	
	1 MHz < f ≤ 3 GHz	50 W
	3 GHz < f < 6 GHz	10 W
	R&S®SMAB-B112/-B120, from 50 Ω source	0.5 W
Maximum permissible DC voltage	R&S®SMAB-B103/-B106	50 V
	R&S®SMAB-B112/-B120	5 V

VSWR

Output impedance VSWR in 50 Ω system, ALC state auto	R&S®SMAB-B103/-B106	
	200 kHz < f ≤ 6 GHz	< 1.6
	R&S®SMAB-B112/-B120	
	200 kHz < f ≤ 3 GHz	< 1.9 (meas.)
	3 GHz < f ≤ 6 GHz	< 1.7 (meas.)
	6 GHz < f ≤ 20 GHz	< 1.6 (meas.)
	R&S®SMAB-B112/-B120 with R&S®SMAB-B34	
	200 kHz < f ≤ 3 GHz	< 1.9 (meas.)
	3 GHz < f ≤ 6 GHz	< 1.7 (meas.)
	6 GHz < f ≤ 20 GHz	< 1.8 (meas.)



Measured maximum available output power versus frequency.



Measured maximum available output power versus frequency.

Frequency and level sweep

Operating mode		digital sweep in discrete steps
Sweep parameters		RF frequency, RF level, RF frequency and RF level simultaneously
Trigger modes	execute sweep continuously with internal trigger source	auto
	execute one full sweep	single
	execute one step	step
	sweep start and stop controlled by external trigger signal	start/stop
Trigger source		external trigger signal (INST TRIG at rear), rotary knob, touch panel, remote control
Sweep range		fully specified frequency and level range
	interruption-free level sweep with attenuator mode fixed	0.01 dB to 20 dB
Sweep shape		sawtooth, triangle
Step size setting resolution	frequency sweep linear	0.001 Hz
	frequency sweep logarithmic	0.01 %
	level sweep	0.01 dB
Dwell time setting range		3 ms to 100 s
Dwell time setting resolution		0.1 ms

Spectral purity

Harmonics [1]	CW	
	R&S®SMAB-B103/-B106: level = 10 dBm; for instruments equipped with R&S®SMAB-K31 high power option: level = 10 dBm; for instruments equipped with R&S®SMAB-B32 ultra high power option: level = 18 dBm	
	100 kHz ≤ f ≤ 10 MHz	< –30 dBc
	10 MHz ≤ f ≤ 6 GHz	< –60 dBc
	R&S®SMAB-B112/-B120: level = 10 dBm; for instruments equipped with R&S®SMAB-K33 high power option: level = 10 dBm; for instruments equipped with R&S®SMAB-B34 ultra high power option: level = 16 dBm	
	100 kHz ≤ f ≤ 10 MHz	< –30 dBc
	10 MHz ≤ f ≤ 20 GHz	< –55 dBc
Nonharmonics	CW, offset > 10 kHz from carrier, level = 10 dBm	
	f ≤ 750 MHz	< –96 dBc
	750 MHz < f ≤ 1.5 GHz	< –92 dBc
	1.5 GHz < f ≤ 3 GHz	< –86 dBc
	3 GHz < f ≤ 6 GHz	< –80 dBc
	6 GHz < f ≤ 12 GHz	< –74 dBc
	12 GHz < f ≤ 20 GHz	< –68 dBc
	for instruments equipped with R&S®SMAB-B711 ultra low phase noise option: CW, offset > 10 kHz from carrier, level = 10 dBm	
	f ≤ 1.5 GHz	< –100 dBc
	1.5 GHz < f ≤ 3 GHz	< –94 dBc
	3 GHz < f ≤ 6 GHz	< –88 dBc
	6 GHz < f ≤ 12 GHz	< –82 dBc
	12 GHz < f ≤ 20 GHz	< –76 dBc
Subharmonics [2]	CW, level operating mode: auto, level = 10 dBm	
	f ≤ 6 GHz	none
	6 GHz < f ≤ 20 GHz	< –60 dBc
Wideband noise	level operating mode: auto, level = 10 dBm, measurement bandwidth 1 Hz, CW	
	carrier offset 10 MHz or 10 % of carrier frequency, whichever is lower	
	f ≤ 8 MHz	< –150 dBc
	8 MHz < f ≤ 1.5 GHz	< –155 dBc
	1.5 GHz < f ≤ 3 GHz	< –153 dBc
	3 GHz < f ≤ 6.0 GHz	< –150 dBc
	carrier offset 30 MHz	
	6.0 GHz < f ≤ 12 GHz	< –150 dBc
	12 GHz < f ≤ 20 GHz	< –145 dBc
	instruments equipped with R&S®SMAB-B711 ultra low phase noise option	
	carrier offset 10 MHz or 10 % of carrier frequency, whichever is lower	
	f ≤ 8 MHz	< –150 dBc
	8 MHz < f ≤ 1.5 GHz	< –157 dBc
	1.5 GHz < f ≤ 3 GHz	< –155 dBc
	3 GHz < f ≤ 6.0 GHz	< –155 dBc
	carrier offset 30 MHz	
	6.0 GHz < f ≤ 12 GHz	< –154 dBc
	12 GHz < f ≤ 16 GHz	< –152 dBc
	carrier offset 100 MHz	
	16 GHz < f ≤ 20 GHz	< –152 dBc
SSB phase noise	CW, standard performance, carrier offset 20 kHz CW, measurement bandwidth 1 Hz, level = 10 dBm	
	f = 10 MHz	< –158 dBc, –163 dBc (typ.)
	f = 100 MHz	< –154 dBc, –158 dBc (typ.)
	f = 1 GHz	< –135 dBc, –139 dBc (typ.)
	f = 2 GHz	< –129 dBc, –133 dBc (typ.)
	f = 3 GHz	< –125 dBc, –129 dBc (typ.)
	f = 4 GHz	< –123 dBc, –127 dBc (typ.)
	f = 6 GHz	< –119 dBc, –123 dBc (typ.)
	f = 10 GHz	< –115 dBc, –119 dBc (typ.)
	f = 20 GHz	< –109 dBc, –113 dBc (typ.)

[1] Specifications are not valid for harmonics beyond “specified frequency range”.

[2] Specifications are not valid for subharmonics beyond “specified frequency range”.

SSB phase noise with R&S®SMAB-B710(N) option

Specified values in plain text, typical values in brackets ( ), measured values in brackets *( ) and italic.*
Specifications above 3 GHz only applicable for R&S®SMAB-B710 option.

Measured phase noise in dBc (1 Hz) , CW, level = 10 dBm				
Offset frequency / Carrier frequency	**1 Hz**	**10 Hz**	**100 Hz**	**1 kHz**
f = 10 MHz	*(–116)*	–124 (–132)	–136 (–142)	–147 (–155)
f = 100 MHz	*(–96)*	–117 (–122)	–129 (–136)	–144 (–148)
f = 1 GHz	*(–76)*	–97 (–103)	–111 (–116)	–131 (–135)
f = 2 GHz	*(–70)*	–91 (–97)	–105 (–110)	–125 (–129)
f = 3 GHz	*(–66)*	–87 (–93)	–101 (–106)	–121 (–125)
f = 4 GHz	*(–64)*	–86 (–91)	–99 (–104)	–119 (–123)
f = 6 GHz	*(–60)*	–81 (–87)	–95 (–100)	–115 (–119)
f = 10 GHz	*(–56)*	–77 (–83)	–91 (–96)	–111 (–115)
f = 20 GHz	*(–50)*	–71 (–77)	–85 (–90)	–105 (–110)

Measured phase noise in dBc (1 Hz) , CW, level = 10 dBm				
Offset frequency / Carrier frequency	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**
f = 10 MHz	–157 (–161)	–160 (–164)	–161 (–165)	
f = 100 MHz	–153 (–157)	–155 (–159)	–162 (–166)	–162 (–166)
f = 1 GHz	–135 (–139)	–135 (–139)	–145 (–150)	–160 (–165)
f = 2 GHz	–129 (–133)	–129 (–133)	–139 (–144)	–159 (–164)
f = 3 GHz	–125 (–129)	–125 (–129)	–136 (–141)	–159 (–164)
f = 4 GHz	–123 (–127)	–123 (–127)	–133 (–138)	–157 (–162)
f = 6 GHz	–119 (–123)	–119 (–123)	–131 (–136)	–156 (–161)
f = 10 GHz	–115 (–119)	–115 (–119)	–124 (–129)	–148 (–153)
f = 20 GHz	–109 (–113)	–109 (–113)	–118 (–123)	–142 (–147)

SSB phase noise with R&S®SMAB-B711(N) option

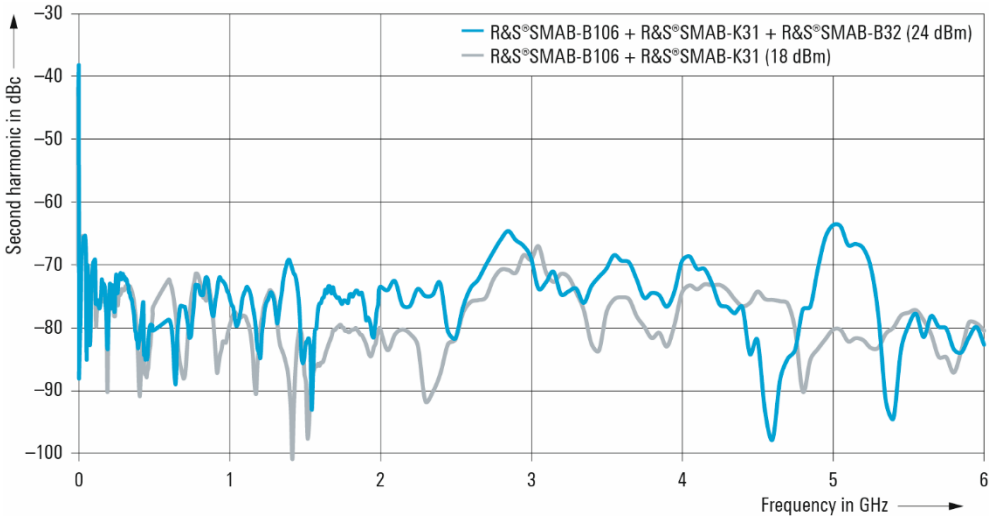
Specified values in plain text, typical values in brackets ( ), measured values in brackets *( ) and italic*.
Specifications above 3 GHz only applicable for R&S®SMAB-B711 option.

Measured phase noise in dBc (1 Hz) , CW, level = 10 dBm				
Offset frequency / Carrier frequency	**1 Hz**	**10 Hz**	**100 Hz**	**1 kHz**
f = 10 MHz	*(–116)*	–124 (–132)	–136 (–142)	–147 (–155)
f = 100 MHz	*(–96)*	–117 (–122)	–129 (–136)	–146 (–150)
f = 1 GHz	*(–76)*	–97 (–103)	–111 (–116)	–135 (–139)
f = 2 GHz	*(–70)*	–91 (–97)	–105 (–110)	–129 (–133)
f = 3 GHz	*(–66)*	–87 (–93)	–101 (–106)	–125 (–129)
f = 4 GHz	*(–64)*	–86 (–91)	–99 (–104)	–122 (–127)
f = 6 GHz	*(–60)*	–81 (–87)	–95 (–100)	–119 (–123)
f = 10 GHz	*(–56)*	–77 (–83)	–91 (–96)	–115 (–119)
f = 20 GHz	*(–50)*	–71 (–77)	–85 (–90)	–109 (–113)

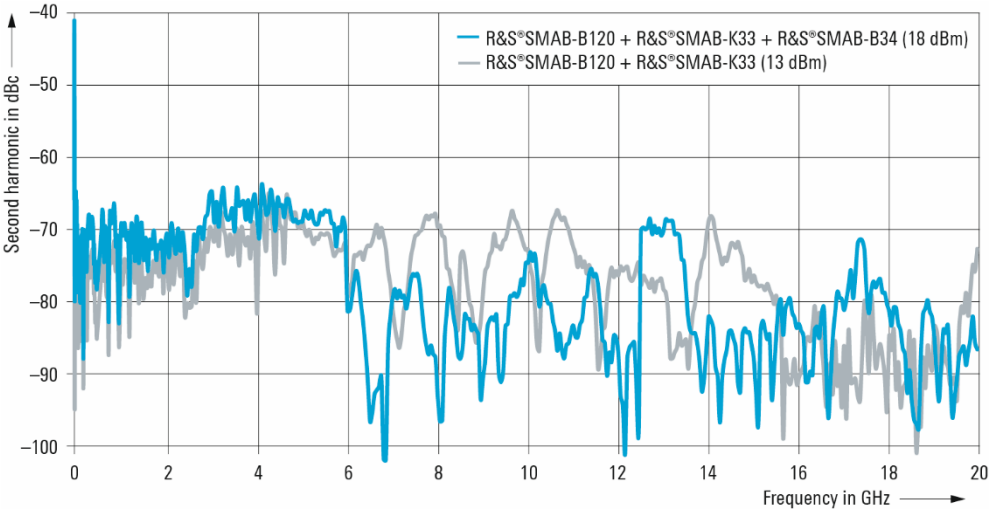
Measured phase noise in dBc (1 Hz) , CW, level = 10 dBm				
Offset frequency / Carrier frequency	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**
f = 10 MHz	–157 (–161)	–160 (–164)	–161 (–165)	
f = 100 MHz	–155 (–160)	–162 (–166)	–162 (–166)	–162 (–166)
f = 1 GHz	–147 (–152)	–148 (–152)	–157 (–162)	–160 (–165)
f = 2 GHz	–142 (–146)	–142 (–146)	–151 (–156)	–159 (–164)
f = 3 GHz	–138 (–142)	–138 (–142)	–148 (–153)	–159 (–164)
f = 4 GHz	–135 (–140)	–136 (–140)	–147 (–151)	–157 (–162)
f = 6 GHz	–132 (–136)	–132 (–136)	–144 (–149)	–155 (–160)
f = 10 GHz	–128 (–132)	–128 (–132)	–140 (–145)	–156 (–161)
f = 20 GHz	–122 (–126)	–122 (–126)	–134 (–139)	–148 (–153)

RMS jitter

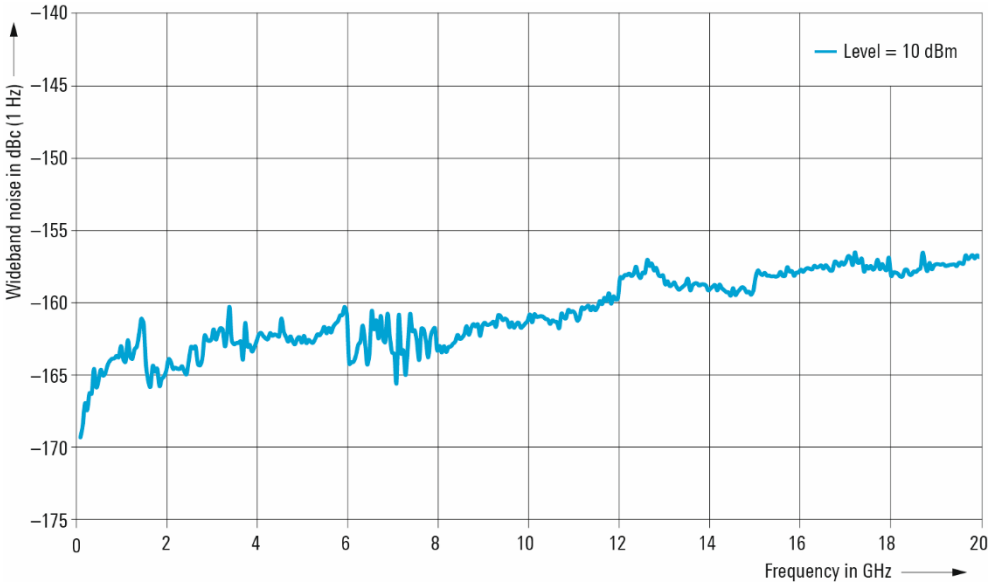
RMS jitter	f = 155 MHz, BW 100 Hz to 1.5 MHz	20.1 fs (meas.)
	f = 622 MHz, BW 1 kHz to 5 MHz	18.7 fs (meas.)
	f = 1 GHz, BW 1 Hz to 10 MHz	558 fs (meas.)
	f = 2.488 GHz, BW 5 kHz to 20 MHz	18.7 fs (meas.)
	f = 9.952 GHz, BW 10 kHz to 80 MHz	18.5 fs (meas.)
RMS jitter with R&S®SMAB-B1H option	f = 155 MHz, BW 100 Hz to 1.5 MHz	19.7 fs (meas.)
	f = 622 MHz, BW 1 kHz to 5 MHz	18.8 fs (meas.)
	f = 1 GHz, BW 1 Hz to 10 MHz	129 fs (meas.)
	f = 2.488 GHz, BW 5 kHz to 20 MHz	18.7 fs (meas.)
	f = 9.952 GHz, BW 10 kHz to 80 MHz	18.5 fs (meas.)
RMS jitter with R&S®SMAB-B710 option	f = 155 MHz, BW 100 Hz to 1.5 MHz	19.7 fs (meas.)
	f = 622 MHz, BW 1 kHz to 5 MHz	18.7 fs (meas.)
	f = 1 GHz, BW 1 Hz to 10 MHz	23.7 fs (meas.)
	f = 2.488 GHz, BW 5 kHz to 20 MHz	18.6 fs (meas.)
	f = 9.952 GHz, BW 10 kHz to 80 MHz	16.6 fs (meas.)
RMS jitter with R&S®SMAB-B711 option	f = 155 MHz, BW 100 Hz to 1.5 MHz	8.4 fs (meas.)
	f = 622 MHz, BW 1 kHz to 5 MHz	5.1 fs (meas.)
	f = 1 GHz, BW 1 Hz to 10 MHz	17.5 fs (meas.)
	f = 2.488 GHz, BW 5 kHz to 20 MHz	4.1 fs (meas.)
	f = 9.952 GHz, BW 10 kHz to 80 MHz	3.8 fs (meas.)
Residual FM	RMS values at f = 1 GHz	
	0.3 kHz to 3 kHz, weighted (ITU-T)	< 1 Hz
	0.03 kHz to 23 kHz	< 4 Hz
Residual AM	level = 8 dBm, RMS value (0.03 kHz to 20 kHz)	< 0.02 %



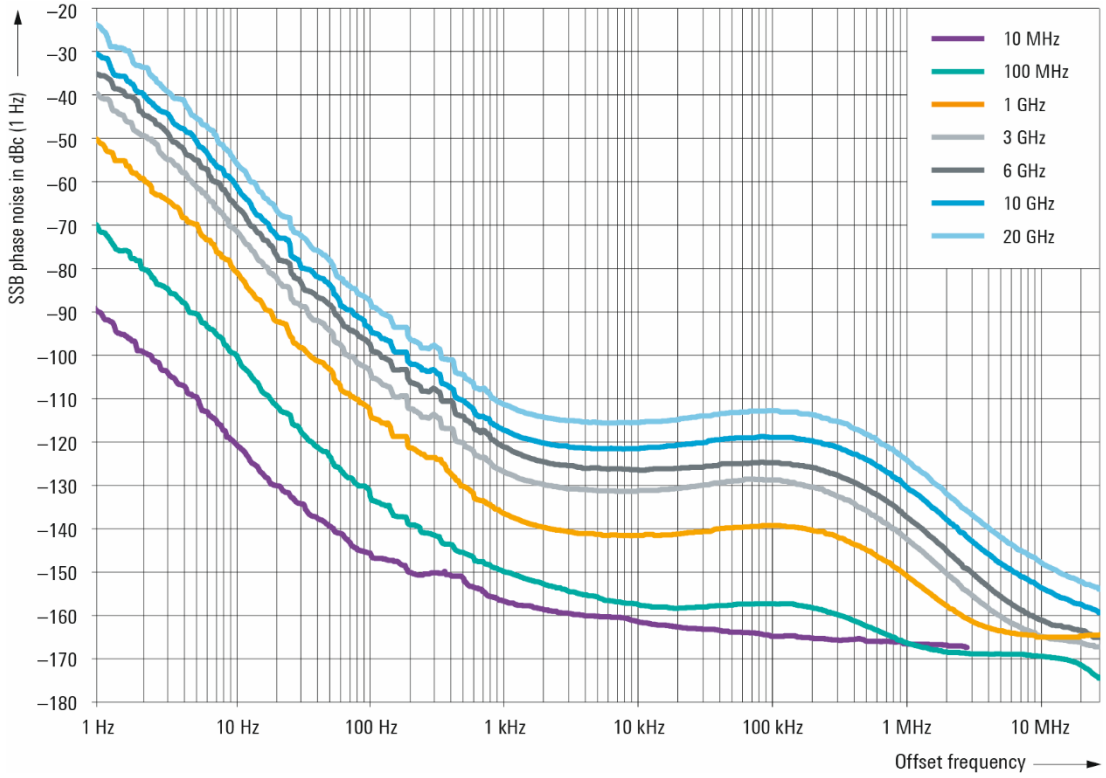
Measured harmonics versus carrier frequency with harmonic filter on for f ≤ 3.7 GHz.



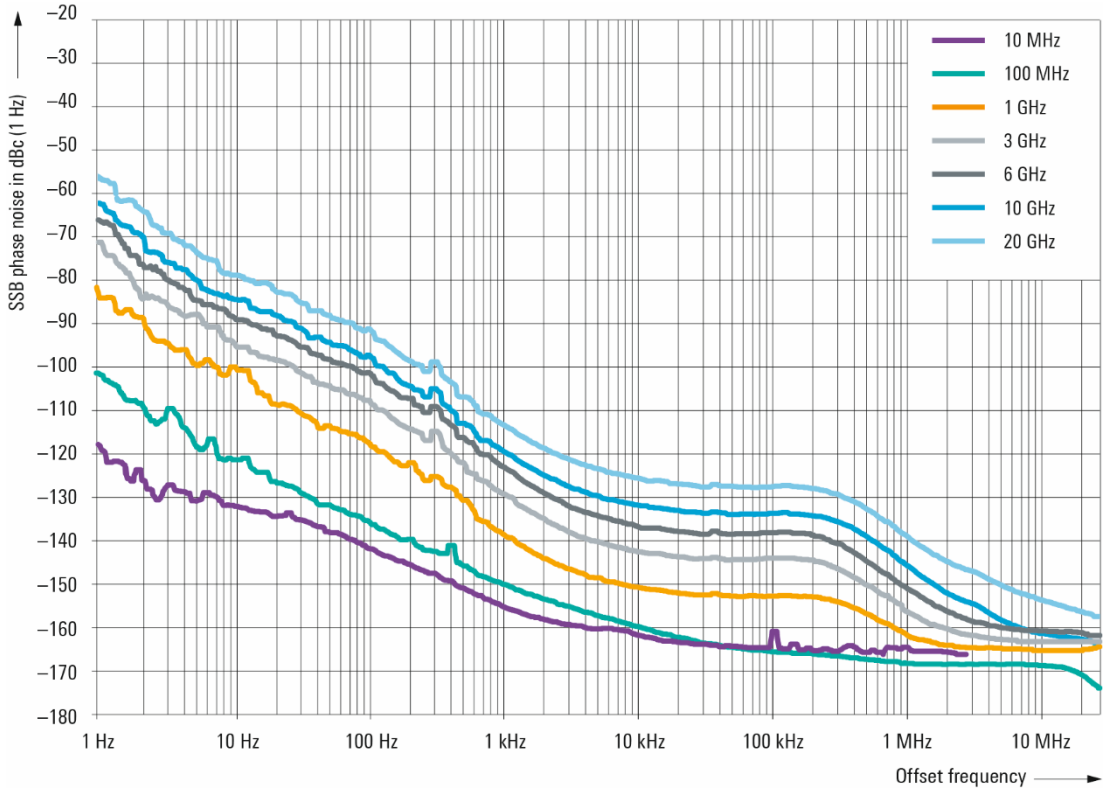
Measured harmonics versus carrier frequency with harmonic filter on for f ≤ 3.7 GHz.



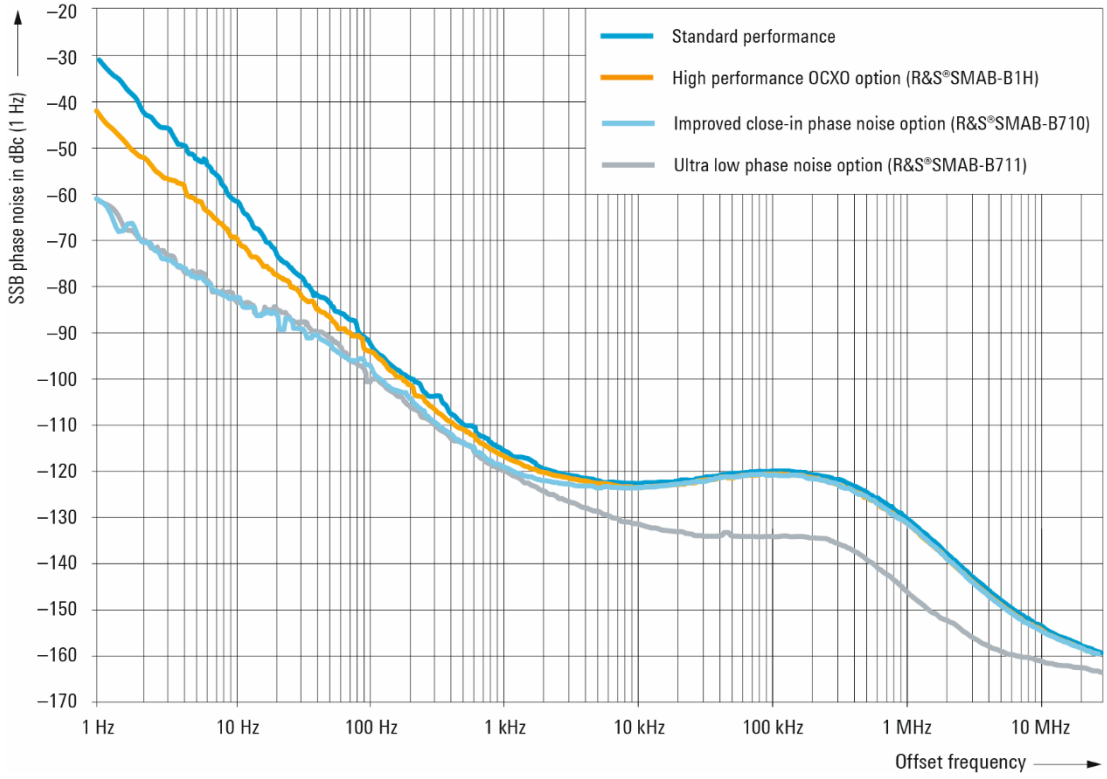
Measured wideband noise at 30 MHz offset and +10 dBm versus carrier frequency with the R&S®SMAB-B120, R&S®SMAB-B711 and R&S®SMAB-B34 options. Measured with the R&S®FSWP phase noise analyzer.



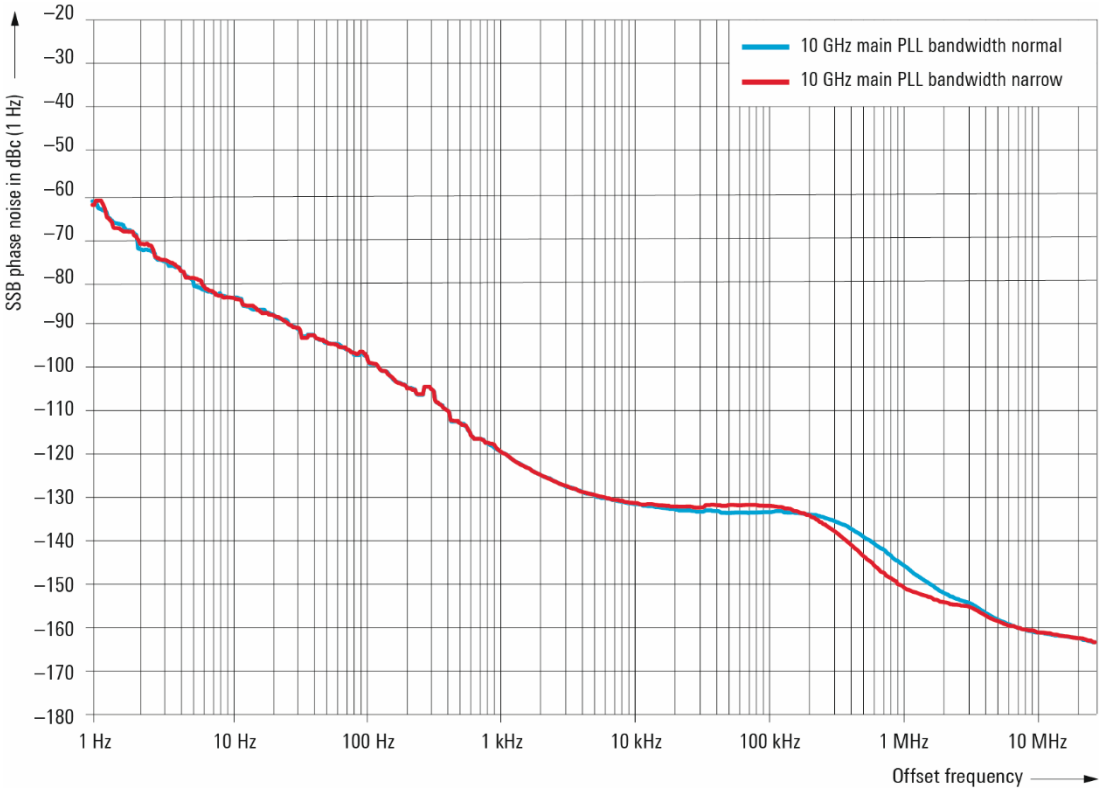
Measured SSB phase noise (standard performance).



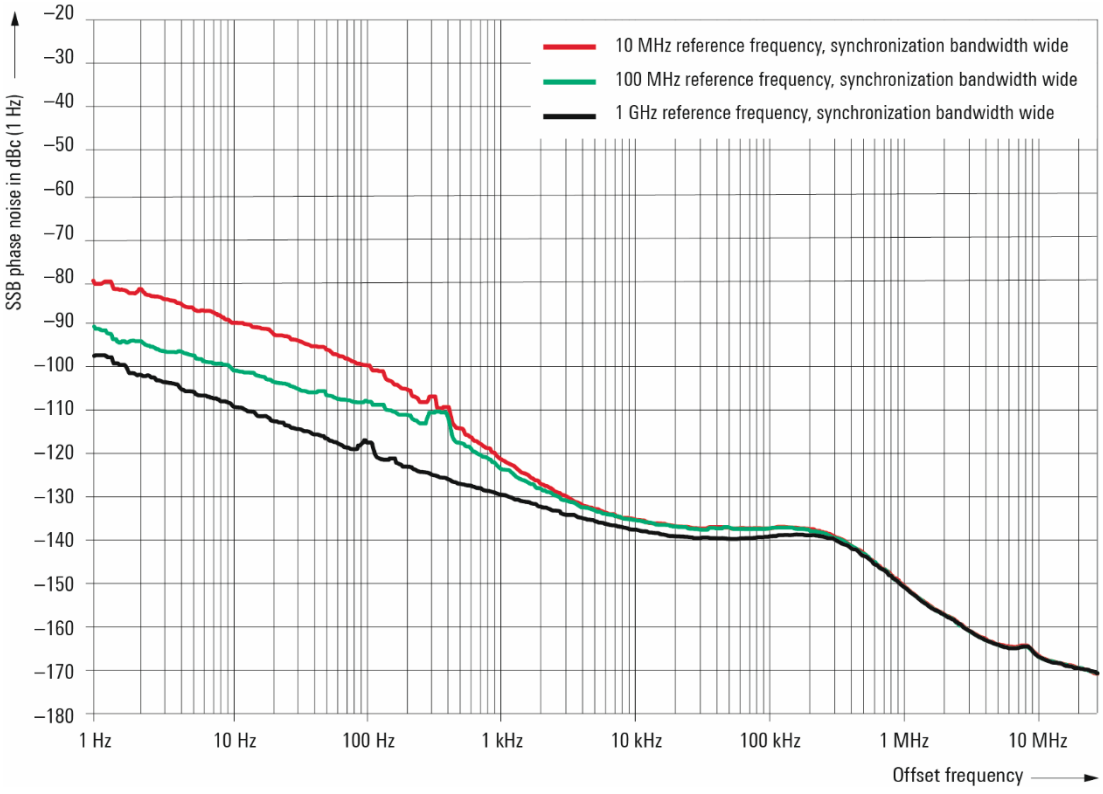
Measured SSB phase noise with the R&S®SMAB-B711 option.



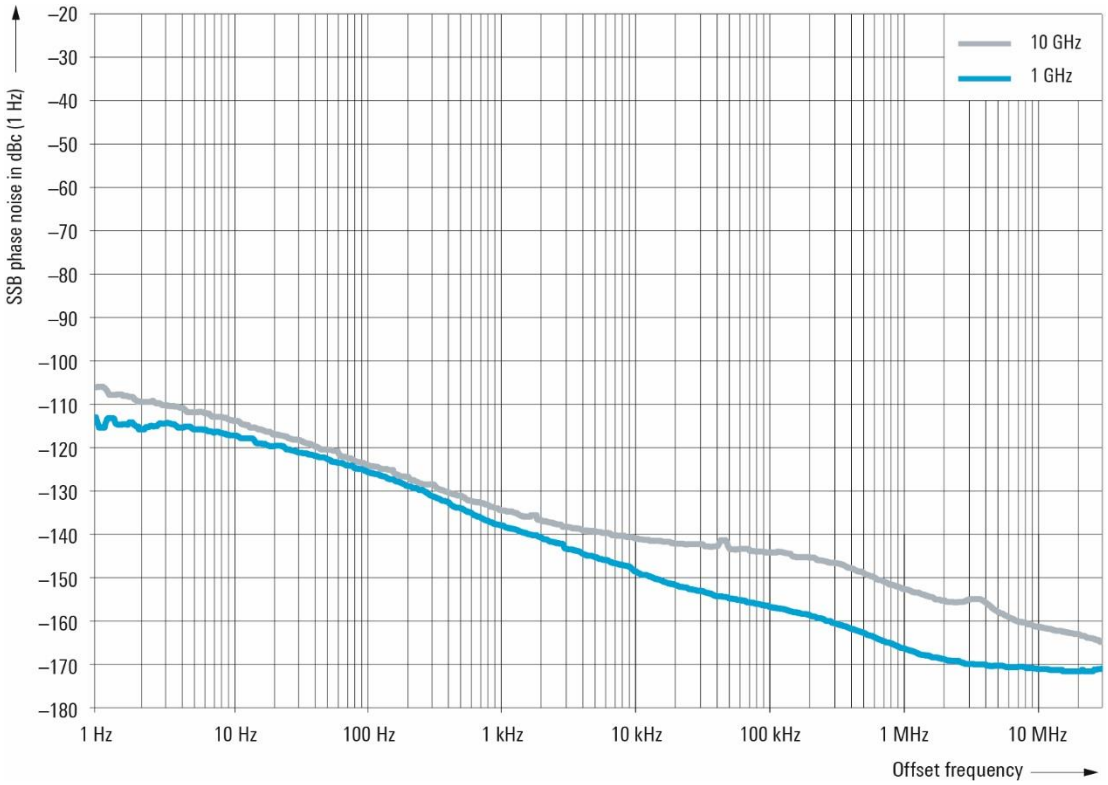
Measured SSB phase noise at f = 10 GHz, standard performance versus the R&S®SMAB-B1H, R&S®SMAB-B710 and R&S®SMAB-B711 options.



Measured SSB phase noise at f = 10 GHz, comparison of PLL bandwidth normal and narrow with the R&S®SMAB-B711 option.



Measured residual SSB phase noise at f = 10 GHz with the R&S®SMAB-B711 option, comparison of different reference frequencies.



Measured AM noise at f = 1 GHz and 10 GHz with the R&S®SMAB-B711 option.

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

Amplitude modulation (R&S®SMAB-K720 option)

For f ≥ 100 kHz, attenuator mode: auto, level (PEP) [3] = 10 dBm or
level = 15 dBm for instruments equipped with R&S®SMAB-B32/-B34 ultra high power option

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 %
Setting resolution		0.01 %
AM depth (m) error	f_{mod} = 1 kHz and m < 80 %	< (3 % of reading + 1 %)
AM distortion	f_{mod} = 1 kHz	
	m = 30 %	< 1 %
	m = 80 %	< 2 %
Modulation frequency response	m = 60 %, coupling: DC/AC, input impedance: 50 Ω	
	DC, 10 Hz to 100 kHz	< 3 dB
Incidental φM at AM	m = 30 %, f_{mod} = 1 kHz, ±peak/2	
	f ≤ 15 GHz	< 0.15 rad
	f > 15 GHz	< 0.2 rad

Frequency bands for frequency modulation and phase modulation

Multiplier N is used to define FM and φM specifications within this document.

Multiplier (N) for different frequency ranges	FM mode: low noise, φM mode: low noise	
	f ≤ 8 MHz	1/2
	8 MHz < f ≤ 11.71875 MHz	1/128
	11.71875 MHz < f ≤ 23.4375 MHz	1/64
	23.4375 MHz < f ≤ 46.875 MHz	1/32
	46.875 MHz < f ≤ 93.75 MHz	1/16
	93.75 MHz < f ≤ 187.5 MHz	1/8
	187.5 MHz < f ≤ 375 MHz	1/4
	375 MHz < f ≤ 750 MHz	1/2
	750 MHz < f ≤ 1.5 GHz	1
	1.5 GHz < f ≤ 3 GHz	2
	3 GHz < f ≤ 6 GHz	4
	6 GHz < f ≤ 12 GHz	8
	12 GHz < f ≤ 20 GHz	16
	FM mode: high bandwidth, φM mode: high bandwidth, high deviation	
	f ≤ 350 MHz	1/2
	350 MHz < f ≤ 375 MHz	1/4
	375 MHz < f ≤ 750 MHz	1/2
	750 MHz < f ≤ 1.5 GHz	1
	1.5 GHz < f ≤ 3 GHz	2
	3 GHz < f ≤ 6 GHz	4
	6 GHz < f ≤ 12 GHz	8
	12 GHz < f ≤ 20 GHz	16

[3] PEP = peak envelope power.

Frequency modulation (R&S®SMAB-K720 option)

Specifications only valid for main PLL bandwidth normal.

Modulation source		internal, external, internal + external
External coupling		AC, DC
FM modes		high bandwidth, low noise
Maximum deviation	FM mode: high bandwidth	N × 10 MHz
	FM mode: low noise	N × 100 kHz
Resolution of setting		< 0.02 % of set deviation or N × 0.1 Hz, whichever is greater, min. 0.01 Hz
FM deviation error	f_{mod} = 10 kHz, deviation ⩽ half of max. deviation or 10 MHz, whichever is lower	
	source: internal	< (1.5 % of reading + 20 Hz)
	source: external, input impedance: high	< (2 % of reading + 20 Hz)
FM distortion	f_{mod} = 10 kHz, deviation = N × 1 MHz	< 0.1 %
Modulation frequency response	FM mode: high bandwidth, coupling: DC/AC, input impedance: 50 Ω	
	DC, 10 Hz to 100 kHz	< 0.5 dB
	f > 350 MHz	
	DC, 10 Hz to 10 MHz	< 3 dB
	f ≤ 350 MHz	
	DC, 10 Hz to 5 MHz	< 3 dB
	FM mode: low noise, coupling: DC/AC, input impedance: 50 Ω	
	DC, 10 Hz to 100 kHz	< 3 dB
Synchronous AM with FM	FM mode: high bandwidth, 40 kHz deviation, f_{mod} = 1 kHz	
	8 MHz < f ≤ 3 GHz	< 0.1 %
	f > 3 GHz	< 0.2 %
Carrier frequency offset with FM DC	after FM offset calibration, FM source external, input impedance 50 Ω	< 0.2 % of set deviation

Phase modulation (R&S®SMAB-K720 option)

Specifications only valid for main PLL bandwidth normal.

Modulation source		internal, external, internal + external
External coupling		AC, DC
φM modes		high deviation, high bandwidth, low noise
Maximum deviation	φM mode: high deviation	N × 20 rad
	φM mode: high bandwidth	N × 1 rad
	φM mode: low noise	N × 0.25 rad
Resolution of setting	φM modes: high deviation, low noise	< 0.02 % of set deviation or N × 20 µrad, whichever is greater, min. 1 µrad
	φM mode: high bandwidth	< 0.1 % of set deviation, min. N × 20 µrad
φM deviation error	f_{mod} = 10 kHz, deviation ≤ half of max. deviation	
	source: internal	< (1.5 % of reading + 0.003 rad)
	source: external, input impedance: high	< (2 % of reading + 0.003 rad)
φM distortion	f_{mod} = 10 kHz, deviation = half of max. deviation	< 0.2 %, < 0.1 % (typ.)
Modulation frequency response	φM mode: high deviation, coupling: DC/AC, input impedance: 50 Ω	
	deviation ≤ N × 5 rad DC, 10 Hz to 500 kHz	< 1 dB
	deviation > N × 5 rad DC, 10 Hz to 10 kHz	< 1 dB
	φM mode: high bandwidth, coupling: DC/AC, input impedance: 50 Ω	
	DC, 10 Hz to 100 kHz	< 1 dB
	f > 350 MHz	
	DC, 10 Hz to 10 MHz	< 3 dB
	f ≤ 350 MHz	
	DC, 10 Hz to 5 MHz	< 3 dB
	φM mode: low noise, coupling: DC/AC, input impedance: 50 Ω	
	DC, 10 Hz to 100 kHz	< 3 dB

Pulse modulation (R&S®SMAB-K22 option)

Modulation source		external
	with R&S®SMAB-K23 option	external, internal
On/off ratio		> 80 dB
Rise/fall time	f > 700 MHz	
	10 % to 90 % of RF amplitude	< 10 ns, 5 ns (typ.)
Minimum pulse width	50 % / 50 % of RF amplitude	< 20 ns
Video feedthrough	level < 10 dBm	
	f ≤ 3 GHz	< 10 % of RF
	f > 3 GHz	< 10 % of RF, < 2 mV (peak-to-peak value)
Pulse overshoot		< 10 %
Pulse delay	pulse external trigger to RF	50 ns (nom.)
Pulse external trigger input		
Input impedance		10 kΩ or 50 Ω (nom.)
Threshold voltage		0 V to 2.0 V (nom.)
Input polarity		normal, inverse

Sources for analog modulation

Internal modulation generator

Signal types		sine
Frequency setting range		0.1 Hz to 1 MHz
Frequency setting resolution		0.01 Hz
Frequency error		< (0.001 Hz + relative deviation of reference frequency × modulation frequency)
Frequency response	up to 1 MHz	< 0.3 dB
Distortion	f < 100 kHz, at R_L ≥ 50 Ω, level (V_{EMF}) < 1 V	< 0.1 %

Multifunction generator (R&S®SMAB-K24 option)

Signal types	LF generator 1	sine, pulse, triangle, trapezoid
	LF generator 2	sine, pulse, triangle, trapezoid
	noise generator (noise amplitude distribution)	Gaussian, equal
Frequency range	sine	0.1 Hz to 10 MHz
	pulse, triangle, trapezoid	0.01 Hz to 1 MHz (displayed value)
	noise bandwidth	100 kHz to 10 MHz
Resolution of setting	sine	0.01 Hz
	pulse, triangle, trapezoid	10 ns
	noise bandwidth	100 kHz
Frequency error		< (0.001 Hz + relative deviation of reference frequency × modulation frequency)
Frequency response	sine, up to 1 MHz	< 0.3 dB
	sine, up to 10 MHz	< 1 dB
Distortion	f < 100 kHz, at R_L ≥ 50 Ω, level (V_{EMF}) 1 V	< 0.1 %

LF frequency sweep

Operating mode		digital sweep in discrete steps
Trigger modes	execute sweep continuously with internal trigger source	auto
	execute one full sweep	single
	execute one step	step
	sweep start and stop controlled by external trigger signal	start/stop
Trigger source		external trigger signal (INST TRIG at rear), rotary knob, touch panel, remote control
Sweep range		full frequency range
Sweep shape		sawtooth, triangle
Step size	linear	full frequency range
	logarithmic	0.01 % to 100 % per step
Dwell time setting range		3 ms to 100 s
Dwell time setting resolution		0.1 ms

LF output

Monitoring of resulting modulation signal for		AM, FM , φM
Source		LF generator 1, LF generator 2, noise generator, external 1, external 2
Output voltage	V_{peak} at LF connector, open-circuit voltage EMF	
Setting range		1 mV to 4 V
Setting resolution		1 mV
Setting error	f = 1 kHz, R_L > 50 kΩ	< (1 % of reading + 1 mV)
Output impedance		50 Ω (nom.)

Pulse generator (R&S®SMAB-K23 option)

Pulse modes		single pulse, double pulse
Trigger modes	free run, internally triggered	auto
		external trigger
		external gate
Pulse period		
Setting range		20 ns to 100 s
Setting resolution		5 ns
Pulse width	pulse widths of double pulses can be set independently	
Setting range		5 ns to 100 s
Setting resolution		5 ns
Pulse delay		
Setting range		0 s to 100 s
Setting resolution		5 ns
Double-pulse spacing		
Setting range		10 ns to 100 s
Setting resolution		5 ns
External trigger		
Delay	trigger to video output	40 ns (nom.)
Jitter		< 5 ns (nom.)

Pulse train (R&S®SMAB-K27 option)

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

Prerequisite: R&S®SMAB-K23 option must be installed.

Pulse mode	user-settable pulse width, pulse spacing and pulse sequences	train
Trigger modes	free run, internally triggered	auto
		external trigger
Number of bursts		1 to 2047
Number of identical pulses per burst		1 to 65535
Pulse on time setting range		0 ns to 5 ms
Pulse off time setting range		5 ns to 5 ms
Pulse on and off time setting resolution		5 ns

Pulse generator outputs

SYNC output	output of a synchronizing pulse at pulse start or start of pulse sequence	
Connector type	PULSE SYNC output	BNC female
SYNC output level	$R_L \geq 50\ \Omega$	digital signal 0 V/3.3 V (nom.)
SYNC pulse width	pulse period < 100 ns	10 ns (nom.)
	pulse period ≥ 100 ns or externally triggered	50 ns (nom.)
VIDEO output	output of pulse generator signal	
Connector type	PULSE VIDEO output	BNC female
VIDEO output level	$R_L \geq 50\ \Omega$	digital signal 0 V/3.3 V (nom.)

Additional performance options

Differential clock synthesizer (R&S®SMAB-B29 option)

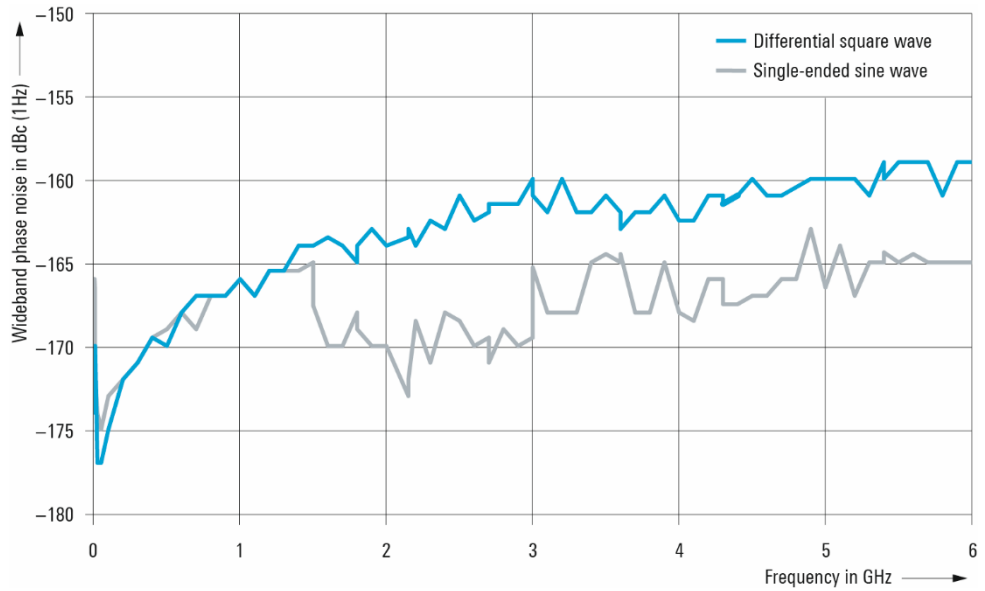
The R&S®SMAB-B29 option provides a differential or single-ended clock signal with selectable waveform and DC offset up to 3 GHz or up to 6 GHz with the R&S®SMAB-K722 option.

The R&S®SMAB-K722 option is not available for instruments equipped with the 3 GHz R&S®SMAB-B103 RF frequency option. The frequency of the clock synthesizer (R&S®SMAB-B29 option) can be set independently of the RF frequency of the R&S®SMAB100A.

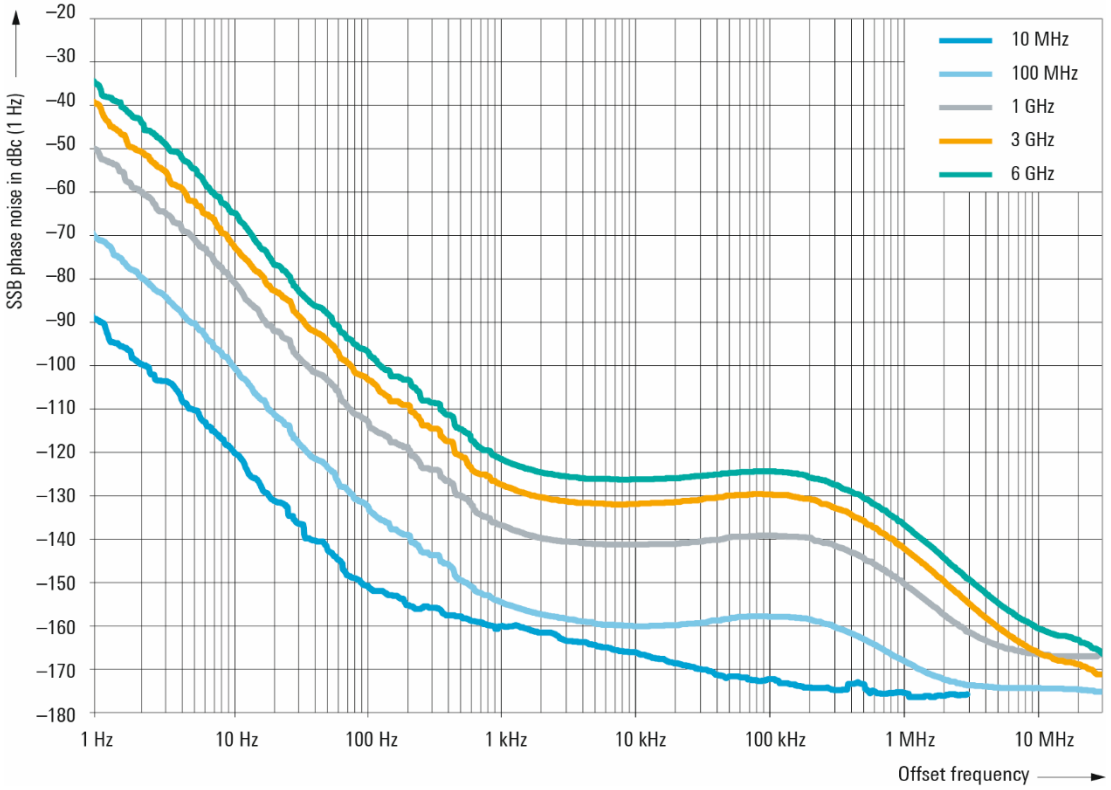
Specifications above 3 GHz are only valid for instruments equipped with the R&S®SMAB-K722 option.

Output types		differential square wave, differential sine wave, single-ended sine wave, differential CMOS
Frequency		
Frequency range	differential square wave, single-ended sine wave	100 kHz to 3 GHz
	differential sine wave	10 MHz to 3 GHz
	with R&S®SMAB-K722 option	10 MHz to 6 GHz
	differential square wave, single-ended sine wave	100 kHz to 6 GHz
	differential sine wave	10 MHz to 6 GHz
	CMOS output	100 kHz to 200 MHz
Resolution of setting		0.001 Hz
Resolution of synthesis	f = 1 GHz	0.053 nHz (nom.)
Frequency setting time	to within <1 × 10^{-7} for f > 10 MHz, with GUI update stopped after IEC/IEEE bus delimiter with R&S®SMAB-B86 option	< 1.5 ms
Level		
Level range	sine wave, differential and single-ended	–24 dBm to 20 dBm
	differential square wave	fixed
	differential CMOS	0.8 V to 2.7 V
Output connectors		
Connector type	CLK SYN, CLK SYN_N outputs	SMA female
	with R&S®SMAB-B93 option (3 HU)	front panel
	with R&S®SMAB-B92 option (2 HU) or with R&S®SMAB-B93 option (3 HU) and R&S®SMAB-B80/-B81 rear panel connector options	rear panel
Reverse power		
Reverse power (from 50 Ω source)	maximum permissible RF power	0.05 W
Maximum permissible DC voltage	sine wave and square wave, DC offset disabled	±5 V
	any output type with DC offset enabled	0 V (short-circuit-proof)
	differential CMOS	0 V (short-circuit-proof)
DC offset		
Setting range	not available in CMOS mode	–5 V to +5 V
Setting resolution		1 mV
DC offset source impedance		50 Ω (nom.)
Spectral purity		
Nonharmonics	offset > 10 kHz from carrier, level = 10 dBm, sine wave	
	f ≤ 10 MHz	< –90 dBc
	10 MHz < f ≤ 750 MHz	< –96 dBc
	750 MHz < f ≤ 1.5 GHz	< –92 dBc
	1.5 GHz < f ≤ 3 GHz	< –86 dBc
	3 GHz < f ≤ 6 GHz	< –80 dBc
	instruments equipped with R&S®SMAB-B711 ultra low phase noise option	
	f ≤ 10 MHz	< –90 dBc
	10 MHz < f ≤ 750 MHz	< –96 dBc
	750 MHz < f ≤ 1.5 GHz	< –92 dBc
	1.5 GHz < f ≤ 3 GHz	< –86 dBc
	3 GHz < f ≤ 6 GHz	< –80 dBc

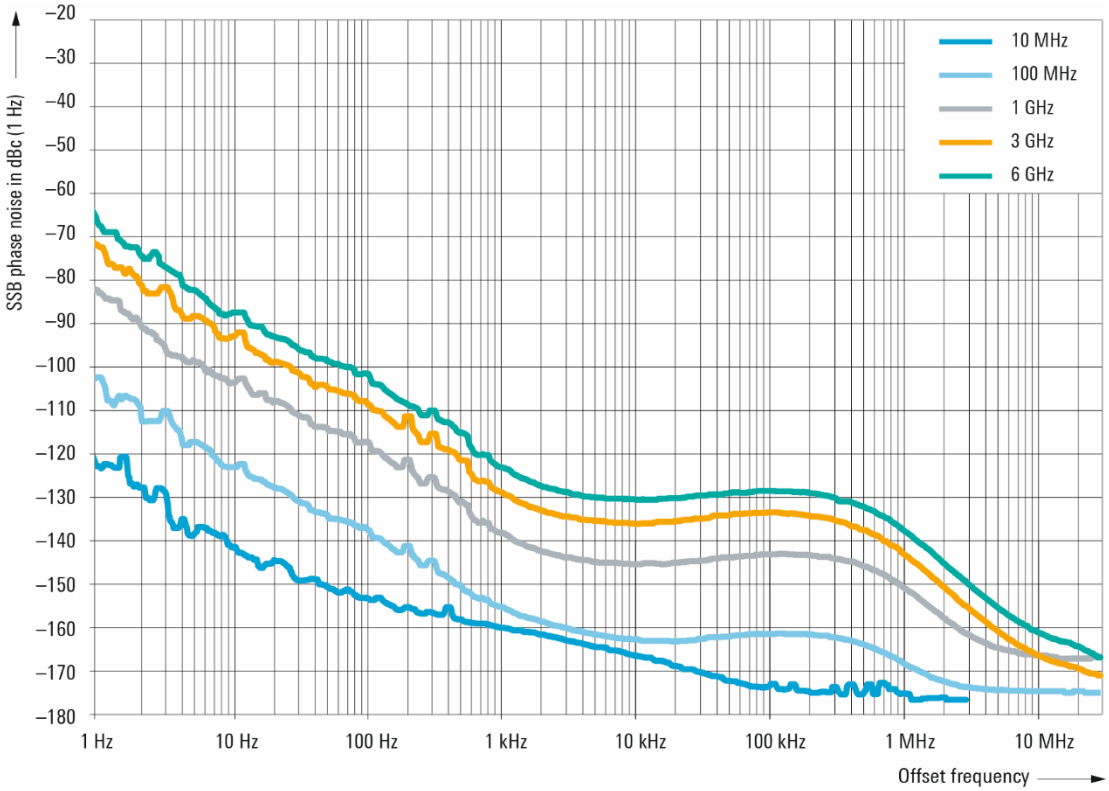
Wideband noise	maximum output level, sine wave, carrier offset 10 MHz, measurement bandwidth 1 Hz	
	carrier offset 10 MHz or 10 % of carrier frequency, whichever is lower	
	f ≤ 8 MHz	< –150 dBc
	8 MHz < f ≤ 1.5 GHz	< –155 dBc
	1.5 GHz < f ≤ 3 GHz	< –153 dBc
	carrier offset 30 MHz	
	3 GHz < f ≤ 6.0 GHz	< –150 dBc
	instruments equipped with R&S®SMAB-B711 ultra low phase noise option	
	carrier offset 10 MHz or 10 % of carrier frequency, whichever is lower	
	f ≤ 8 MHz	< –150 dBc
	8 MHz < f ≤ 1.5 GHz	< –157 dBc
	1.5 GHz < f ≤ 3 GHz	< –155 dBc
	carrier offset 30 MHz	
	3 GHz < f ≤ 6.0 GHz	< –155 dBc
SSB phase noise	single-ended and differential sine wave or differential square wave; carrier offset 20 kHz, measurement bandwidth 1 Hz	
	f = 10 MHz	< –163 dBc, –168 dBc (typ.)
	f = 100 MHz	< –155 dBc, –158 dBc (typ.)
	f = 1 GHz	< –135 dBc, –139 dBc (typ.)
	f = 2 GHz	< –129 dBc, –133 dBc (typ.)
	f = 3 GHz	< –125 dBc, –129 dBc (typ.)
	f = 4 GHz	< –123 dBc, –127 dBc (typ.)
	f = 6 GHz	< –119 dBc, –123 dBc (typ.)
	instruments equipped with R&S®SMAB-B711	
	f = 10 MHz	< –163 dBc, –168 dBc (typ.)
	f = 100 MHz	< –158 dBc, –162 dBc (typ.)
	f = 1 GHz	< –141 dBc, –145 dBc (typ.)
	f = 2 GHz	< –135 dBc, –139 dBc (typ.)
	f = 3 GHz	< –131 dBc, –135 dBc (typ.)
	f = 4 GHz	< –129 dBc, –133 dBc (typ.)
	f = 6 GHz	< –125 dBc, –129 dBc (typ.)
RMS jitter	single-ended and differential sine wave or differential square wave	
	f = 155 MHz, BW = 100 Hz to 1.5 MHz	18.3 fs (meas.)
	f = 622 MHz, BW = 1 kHz to 5 MHz	18.0 fs (meas.)
	f = 1 GHz, BW = 1 Hz to 10 MHz	558 fs (meas.)
	f = 2.488 GHz, BW = 5 kHz to 20 MHz	18.0 fs (meas.)
RMS jitter with R&S®SMAB-B710 option	f = 155 MHz, BW = 100 Hz to 1.5 MHz	18.0 fs (meas.)
	f = 1 GHz, BW = 1 Hz to 10 MHz	24.1 fs (meas.)
	f = 622 MHz, BW = 1 kHz to 5 MHz	18.0 fs (meas.)
	f = 2.488 GHz, BW = 5 kHz to 20 MHz	18.1 fs (meas.)
RMS jitter with R&S®SMAB-B711 option	f = 155 MHz, BW = 100 Hz to 1.5 MHz	13.6 fs (meas.)
	f = 622 MHz, BW = 1 kHz to 5 MHz	13.7 fs (meas.)
	f = 1 GHz, BW = 1 Hz to 10 MHz	21.6 fs (meas.)
	f = 2.488 GHz, BW = 5 kHz to 20 MHz	13.7 fs (meas.)



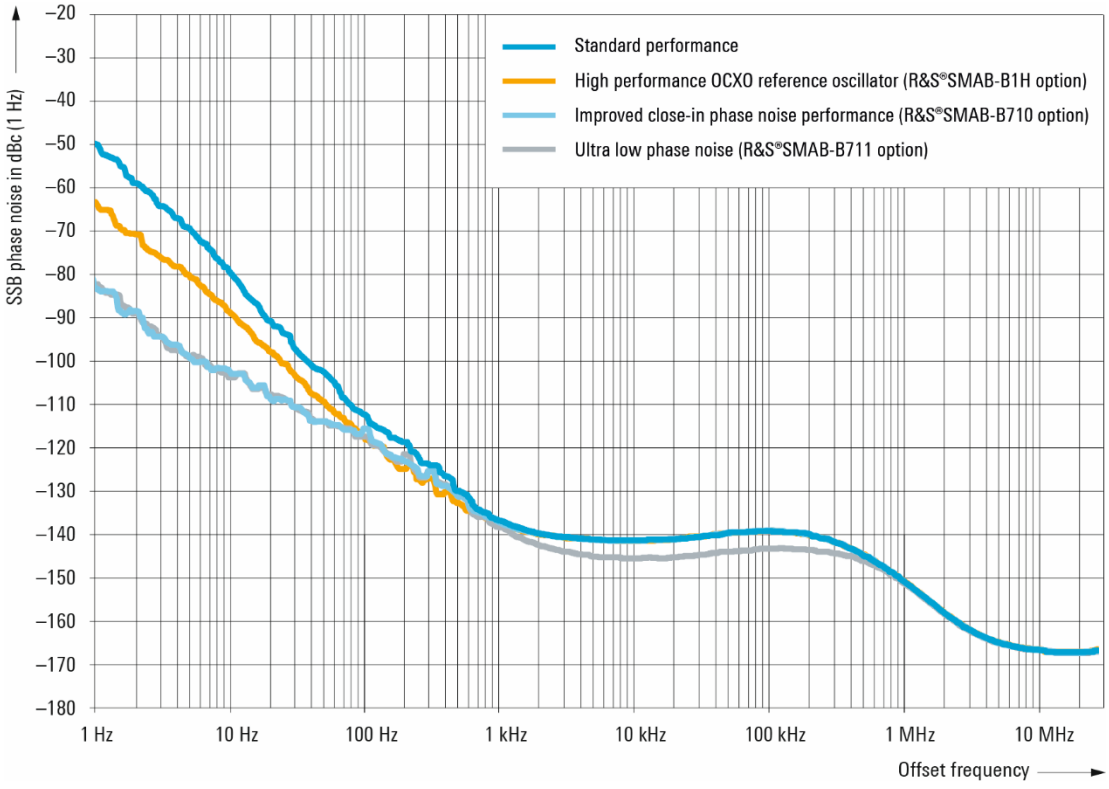
Measured wideband noise of clock synthesizer output at maximum output power versus carrier frequency with the R&S®SMAB-B29 and R&S®SMAB-K722 options. Measured with the R&S®FSWP phase noise analyzer.



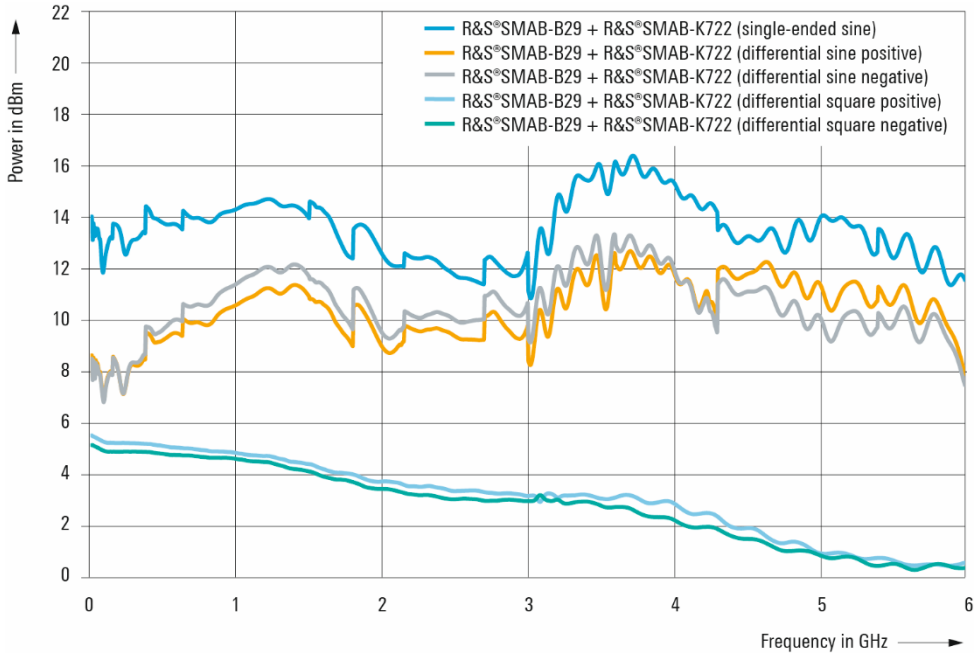
Measured SSB phase noise of clock synthesizer (standard performance) with the R&S®SMAB-B29 and R&S®SMAB-K722 options.



Measured SSB phase noise of clock synthesizer with the R&S®SMAB-B29, R&S®SMAB-B711 and R&S®SMAB-K722 options.



Measured SSB phase noise of clock synthesizer at f = 1 GHz, standard performance versus R&S®SMAB-B710 and R&S®SMAB-B711 options.



Measured maximum available output power versus frequency for the R&S®SMAB-B29 and R&S®SMAB-K722 options.

Remote control

Interfaces/systems	standard	Ethernet/LAN 10/100/1000BASE-T
	with R&S®SMAB-B86 option	IEC 60625 (GPIB IEEE-488.2) USB 2.0 (according to VISA USB-TMC) Serial (RS-232) [4]
Command set		SCPI 1999.5 or compatible command sets
Compatible command sets	These command sets can be selected in order to emulate another instrument. A subset of common commands is supported.	**Hewlett-Packard** • HP8340, HP8341 • HP8360 • HP83620, HP83622, HP83623, HP83624 • HP83630, HP83640, HP83650 • HP8373 • HP83711, HP83712, HP83731, HP83732 • HP8642A/B • HP8643A, HP8644A/B, HP8645A • HP8647A, HP8648A/B/C/D • HP8662A, HP8663A • HP8664A, HP8665B • HP8673 **Agilent Technologies** • E4428C (ESG) • E8257D, E8663B/D (PSG) • N5161A, N5181A/B, N5183A/B (MXG) **Aeroflex (IFR/Marconi)** • 2023, 2024 • 2030 series • 2040 series **Anritsu** • AN68017, AN68037 **Panasonic** • PA8303 **Racal Dana** • 3102, 9087 **Rohde & Schwarz** • R&S®SMA100A • R&S®SMF100A • R&S®SMY • R&S®SMGU/SMHU • R&S®SMT/SME/SML • R&S®SMP/SMR
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 facilitate direct connection to a system controller

[4] Requires recommended extra R&S®TS-USB1.

Connectors

All digital inputs and outputs are CMOS 3.3 V unless otherwise noted. The input damage level is –0.5 V/+5 V.

Front or rear panel connectors

These connectors are located either on the front or the rear panel of the instrument, depending on the option configuration.

Instrument with 2 HU (equipped with the R&S®SMAB-B92 option): RF 50 Ω, USB, SENSOR, SD card on the front panel, all others on the rear panel

Instrument with 3 HU (equipped with the R&S®SMAB-B93 option): all connectors on front panel

Instrument with 2 or 3 HU and equipped with an R&S®SMAB-B80/-B81 rear panel connector option: all except USB on the rear panel

RF 50 Ω	RF output	
	R&S®SMAB-B103, R&S®SMAB-B106	N female
	R&S®SMAB-B112, R&S®SMAB-B120	test port adapter, PC 2.92 mm female (interchangeable port connector system)
LF	LF generator output	BNC female
Ext 1, Ext 2	input for external analog modulation (AM, FM, φM, scan modulation) and external detector voltage (external ALC)	BNC female
Input impedance		100 kΩ; 600 Ω or 50 Ω (nom.)
Input sensitivity	AM, FM, φM: peak value for set deviation	1 V (nom.)
	scan modulation	–6 V to 6 V
Input damage voltage	50 Ω input impedance	±7 V
	600 Ω and 100 kΩ input impedance	±10 V
Pulse Ext	input for external pulse modulation external trigger input for pulse generator external gate input for pulse generator	BNC female/digital signal
Input impedance	selectable	10 kΩ or 50 Ω (nom.)
Input voltage	TTL , CMOS compatible	
	threshold low	0.7 V (nom.)
	threshold high	0.9 V (nom.)
Input damage voltage		–0.5 V/+5 V
Input polarity	selectable	normal, inverse
Pulse Video	pulse generator output video output for external pulse modulation	BNC female/digital signal
Pulse Sync	synchronizing output for pulse generator	BNC female/digital signal
SENSOR	connector for R&S®NRP-Zxx power sensor	6 pol. ODU mini-snap series B
USB	USB 2.0 connector for external USB devices such as mouse, keyboard, R&S®NRP-Z power sensors (with R&S®NRP-Z4 adapter cable), memory stick for software update and data exchange or USB serial adapter for RS-232 remote control	USB type A
SD	with R&S®SMAB-B85 option for removable mass storage	SD card slot
Clk Sync	clock synthesizer output	SMA female
Clk Sync_N	clock synthesizer inverted output	SMA female

Rear panel connectors

Ref In	external reference frequency input	BNC female
Input damage level		> 20 dBm
Ref Out	reference frequency output	BNC female
Ref In 1 GHz	external 1 GHz reference frequency input	SMA female
Input damage level		> 20 dBm
Ref Out 1 GHz	ultra low noise 1 GHz reference frequency output	SMA female
Ext Tune	input for electronic tuning of internal reference frequency	BNC female
Inst Trig	trigger input for sweep and list mode	BNC female/digital signal
Signal Valid	output for triggering external devices, low state indicates that the instrument has settled to its final value	BNC female/digital signal
LAN	provides remote control functionality and other services, see section "Remote control"	RJ-45
USB	USB 2.0 connector for external USB devices such as mouse, keyboard, R&S®NRP-Z power sensors (with adapter cable R&S®NRP-Z4), memory stick for software update and data exchange or USB serial adapter for RS-232 remote control	USB type A
USB In	with R&S®SMAB-B86 option, USB 2.0, remote control of instrument	USB type micro-B
IEEE488	with R&S®SMAB-B86 option, remote control of instrument via GPIB	24-pin Amphenol series 57 female

General data

Power rating		
Rated voltage		100 V to 240 V AC (± 10 %)
Rated frequency		50 Hz to 60 Hz (± 5 %), 400 Hz (± 5 %)
Rated current	instrument with 2 HU (R&S®SMAB-B92 option)	3.5 A to 1.6 A (50 Hz to 60 Hz), 3.5 A to 2.9 A (400 Hz)
	instrument with 3 HU (R&S®SMAB-B93 option)	7.3 A to 4.6 A (50 Hz to 60 Hz/400 Hz)
Rated power	instrument with 2 HU (R&S®SMAB-B92 option), when fully equipped	300 W (meas.)
	instrument with 3 HU (R&S®SMAB-B93 option), when fully equipped	300 W (meas.)
Power factor correction		in line with EN 61000-3-2
Product conformity		
Electromagnetic compatibility	EU: in line with EMC Directive 2004/108/EC	applied harmonized standards: • EN 61326-1 (industrial environment) • EN 61326-2-1 • EN 55011 class A • EN 61000-3-2 • EN 61000-3-3
Electrical safety	EU: in line with Low Voltage Directive 2006/95/EC	applied harmonized standard: EN 61010-1
	USA	UL 61010-1
	Canada	CAN/CSA-C22.2 No. 61010-1
International safety approvals	VDE – Association for Electrical, Electronic and Information Technologies	GS mark 40045930
	CSA – Canadian Standards Association	CSA_{UL} mark 70108101
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.2 g RMS, in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810E, method 516.4, procedure I
Environmental conditions		
Temperature range	operation	0 °C to +55 °C
	storage	–40 °C to +71 °C
Damp heat		+40 °C, 90 % rel. humidity, steady state, in line with EN 60068-2-78
Altitude	operating, linear derating of max. ambient temperature to +45 °C starting at altitude = 3000 m	4600 m (15000 ft)
	transport	4600 m (15000 ft)
Weight and dimensions		
Dimensions (L × W × H)	instrument with 2 HU (R&S®SMAB-B92 option), without front handles and instrument feet, for use with extra R&S®ZZA-xxx	472 mm × 445 mm × 108 mm (18.58 in × 17.52 in × 4.25 in)
	instrument with 3 HU (R&S®SMAB-B93 option), without front handles and instrument feet, for use with extra R&S®ZZA-xxx	472 mm × 445 mm × 152 mm (18.58 in × 17.52 in × 5.98 in)
Weight	2 HU instrument (R&S®SMAB-B92 option), when fully equipped	14.4 kg (31.7 lb)
	3 HU instrument (R&S®SMAB-B93 option), when fully equipped	19.0 kg (41.9 lb)

Display		
Resolution		800 × 480 pixel
Size	2 HU instrument	5" touch display
	3 HU instrument	7" touch display
Calibration interval		
Recommended calibration interval	operation 40 h/week in the full range of the specified environmental conditions	3 years

Ordering information

R&S®SMAB-Bxxx = hardware option
R&S®SMAB-Kxxx = software/keycode option

Designation	Type	Order No.
Signal Generator [5] including power cable and quick start guide	R&S®SMA100B	1419.8888.02
Options		
Frequency options		
8 kHz to 3 GHz	R&S®SMAB-B103	1420.8488.02
8 kHz to 6 GHz	R&S®SMAB-B106	1420.8588.02
8 kHz to 12.75 GHz	R&S®SMAB-B112	1420.8688.02
8 kHz to 20 GHz	R&S®SMAB-B120	1420.8788.02
Platform height options		
2 HU with 5" touch display	R&S®SMAB-B92	1420.8288.02
3 HU with 7" touch display	R&S®SMAB-B93	1420.8388.02
Phase noise performance and reference oscillator options		
High Performance OCXO Reference Oscillator	R&S®SMAB-B1H	1420.8188.02
Improved Close-in Phase Noise Performance for R&S®SMAB-B106/-B112/-B120	R&S®SMAB-B710	1420.8007.02
Improved Close-in Phase Noise Performance for R&S®SMAB-B103	R&S®SMAB-B710N	1420.8107.02
Ultra Low Phase Noise for R&S®SMAB-B106/-B112/-B120	R&S®SMAB-B711	1420.8020.02
Ultra Low Phase Noise for R&S®SMAB-B103	R&S®SMAB-B711N	1420.8120.02
100 MHz, 1 GHz Ultra Low Noise Reference Input/Output	R&S®SMAB-K703	1420.9761.02
Flexible Reference Input from 1 MHz to 100 MHz	R&S®SMAB-K704	1420.9778.02
Output power options		
High Output Power 3 GHz/6 GHz	R&S®SMAB-K31	1420.7100.02
Ultra High Output Power 3 GHz/6 GHz [6]	R&S®SMAB-B32	1420.7200.02
High Output Power 12.75 GHz/20 GHz	R&S®SMAB-K33	1420.7300.02
Ultra High Output Power 12.75 GHz/20 GHz [7]	R&S®SMAB-B34	1420.7400.02
Analog modulation options		
High Performance Pulse Modulator	R&S®SMAB-K22	1420.9710.02
Pulse Generator	R&S®SMAB-K23	1420.9726.02
Multifunction Generator	R&S®SMAB-K24	1420.9732.02
Pulse Train [8]	R&S®SMAB-K27	1420.9749.02
AM/FM/φM	R&S®SMAB-K720	1420.9790.02
Additional performance options		
Differential Clock Synthesizer 3 GHz	R&S®SMAB-B29	1420.8088.02
Clock synthesizer frequency extension to 6 GHz (only for instruments equipped with R&S®SMAB-B106/-B112/-B120)	R&S®SMAB-K722	1420.9810.02
Other options		
Rear Panel Connectors (3 GHz/6 GHz)	R&S®SMAB-B80	1420.6504.02
Rear Panel Connectors (12.75 GHz/20 GHz)	R&S®SMAB-B81	1420.6510.02
Removable Mass Storage	R&S®SMAB-B85	1420.6556.02
Remote Control GPIB and USB	R&S®SMAB-B86	1420.6562.02
Recommended extras		
19" Rack Adapter for 2 HU model	R&S®ZZA-KNA21	1177.8026.00
19" Rack Adapter for 3 HU model	R&S®ZZA-KNA31	1177.8032.00
USB Serial Adapter for RS-232 Remote Control	R&S®TS-USB1	6124.2531.00
Spare SD Card	R&S®SMAB-Z10	1420.6662.02
Adapters for instruments with an R&S®SMAB-B112/-B120 frequency option		
Test port adapter, 2.4 mm female		1088.1627.02
Test port adapter, 2.92 mm female		1036.4790.00
Test port adapter, 2.92 male		1036.4802.00
Test port adapter, N female		1036.4777.00
Test port adapter, N male		1036.4783.00

[5] The base unit can only be ordered with an R&S®SMAB-B1xx frequency option and an R&S®SMAB-B92 or R&S®SMAB-B93 platform height option.

[6] R&S®SMAB-B32 can only be ordered with R&S®SMAB-K31.

[7] R&S®SMAB-B34 can only be ordered with R&S®SMAB-K33.

[8] R&S®SMAB-K27 can only be ordered with R&S®SMAB-K23.

Designation	Type	Order No.
Documentation		
Documentation of Calibration Values	R&S®DCV-2	0240.2193.18
R&S®SMA100B Accredited Calibration	R&S®SMA100B-ACA	

Warranty		
Base unit		3 years
All other items [9]		1 year
Options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Accredited Calibration Coverage, one year	R&S®AW1	
Extended Warranty with Accredited Calibration Coverage, two years	R&S®AW2	

Extended warranty with a term of one and two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge [10]. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration coverage (CW1 and CW2)
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [10] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

Extended warranty with accredited calibration (AW1 and AW2)
Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs [10] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

[9] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

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

Service that adds value

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

Rohde&Schwarz

The Rohde&Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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