R&S®SMA100B
RF AND MICROWAVE SIGNAL GENERATOR

Specifications

Data Sheet
Version 07.01

ROHDE&SCHWARZ
Make ideas real

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Key features

First class devices thanks to first class signals

- Purest signals
  - Excellent SSB phase noise in base unit: < –120 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: < –162 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 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 with the 20 GHz model
  - More than 30 dBm from 20 GHz to 35 GHz with the 40 GHz model
  - More than 19 dBm up to 70 GHz with the 67 GHz model
- 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

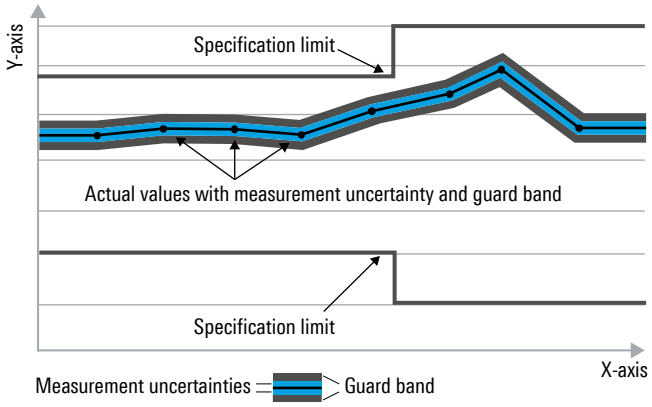
- Plug and play the R&S®SMA100B in an automated test system without changing the test software
- Emulation of R&S®SMA100A, R&S®SMF100A, Keysight PSG, Keysight MXG, etc.

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.

Introduction

Frequency options and step attenuator technology

Prerequisite is to install one of the following frequency options.

	Overview of installed step attenuator modules	
Frequency option	**Electronic step attenuator up to 20 GHz**	**Mechanical step attenuator for complete frequency range**
R&S®SMAB-B103/-B106/-B112/-B120	●	–
R&S®SMAB-B131/-B140(N)/ -B150(N)/-B167(N)	–	●
R&S®SMAB-B131/-B140(N) with R&S®SMAB-B35 option	●	●
R&S®SMAB-B131/-B140(N) with R&S®SMAB-B36S option	●	–
R&S®SMAB-B150(N) with R&S®SMAB-B37 option	●	●
R&S®SMAB-B167(N) with R&S®SMAB-B39 option	●	●

● = installed, – = not available

If both, electronic and mechanical step attenuators are installed, the electronic step attenuator is used up to 20 GHz as default setting.

If the R&S®SMAB-B36S super ultra high output power option is installed, the electronic step attenuator is used up to 20 GHz. Above 20 GHz the mechanical step attenuator is used.

Platform height options and hardware configurations

Depending on the hardware configuration the R&S®SMA100B is available with:

2 height units (2 HU; R&S®SMAB-B92 option) or
3 height units (3 HU; R&S®SMAB-B93 option).

The height unit option is together with the frequency option a prerequisite.

Frequency option	No high output power option installed	With high output power option	With ultra high output power option	With super ultra high output power option
R&S®SMAB-B103	2 or 3 HU	2 or 3 HU	2 or 3 HU	–
R&S®SMAB-B106	2 or 3 HU	2 or 3 HU	2 or 3 HU	–
R&S®SMAB-B112	2 or 3 HU	2 or 3 HU	2 or 3 HU	–
R&S®SMAB-B120	2 or 3 HU	2 or 3 HU	2 or 3 HU	–
R&S®SMAB-B131	2 or 3 HU	3 HU	3 HU	3 HU
R&S®SMAB-B140, R&S®SMAB-B140N	2 or 3 HU	3 HU	3 HU	3 HU
R&S®SMAB-B150, R&S®SMAB-B150N	2 or 3 HU	3 HU	3 HU	–
R&S®SMAB-B167, R&S®SMAB-B167N	2 or 3 HU	3 HU	3 HU	–

Frequency, high output power and rear panel connector options

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

Frequency option	**Super ultra high output power option**			**Rear panel connector option**
	Ultra high output power option			
	High output power 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
R&S®SMAB-B131	R&S®SMAB-B35	R&S®SMAB-K36	R&S®SMAB-B36S	R&S®SMAB-B81
R&S®SMAB-B140, R&S®SMAB-B140N	R&S®SMAB-B35	R&S®SMAB-K36	R&S®SMAB-B36S	R&S®SMAB-B81
R&S®SMAB-B150, R&S®SMAB-B150N	R&S®SMAB-B37	R&S®SMAB-K38	–	R&S®SMAB-B82
R&S®SMAB-B167, R&S®SMAB-B167N	R&S®SMAB-B39	R&S®SMAB-K40	–	R&S®SMAB-B82

Notes:

- An ultra high output power option requires the corresponding high output power option to be installed. For example, R&S®SMAB-K31 is a prerequisite for R&S®SMAB-B32.
- R&S®SMAB-B36S super ultra high output power option requires R&S®SMAB-K36 ultra high output power option and R&S®SMAB-B35 high output power option.

RF characteristics

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

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
	R&S®SMAB-B131	8 kHz to 31.8 GHz
	R&S®SMAB-B140/-B140N	8 kHz to 40 GHz
	R&S®SMAB-B150/-B150N	8 kHz to 50 GHz
	R&S®SMAB-B167/-B167N	8 kHz to 67 GHz
	overrange	67 GHz to 72 GHz
Resolution of setting		0.001 Hz
Resolution of synthesis	f = 1 GHz	0.053 nHz (nom.)
Setting time	CW, 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 (without LAN connection), with R&S®SMAB-B86 option, level setting characteristic: auto	
	R&S®SMAB-B103/-B106/-B112/-B120	< 1.7 ms
	R&S®SMAB-B131/-B140(N)/-B150(N)/-B167(N)	< 2.3 ms
	with R&S®SMAB-B35/-B36S/-B37/-B39 option	< 2.5 ms
	instruments equipped with R&S®SMAB-B711(N) ultra low phase noise option	
	R&S®SMAB-B103/-B106/-B112/-B120	< 4.5 ms
	R&S®SMAB-B131/-B140(N)/-B150(N)/-B167(N)	< 5 ms
Resolution of phase offset setting		adjustable in 0.01° steps
Phase-continuous frequency setting range [1]		≥ 1.64 % of set frequency
	instruments equipped with R&S®SMAB-B711(N) ultra low phase noise option	
	narrow mode	≥ 0.163 % of set frequency
	wide mode	≥ 1.47 % of set frequency
Maximum phase-continuous frequency step [1]	synthesizer remains in phase locked state during frequency step	0.02 % of set frequency (nom.)

Reference frequency

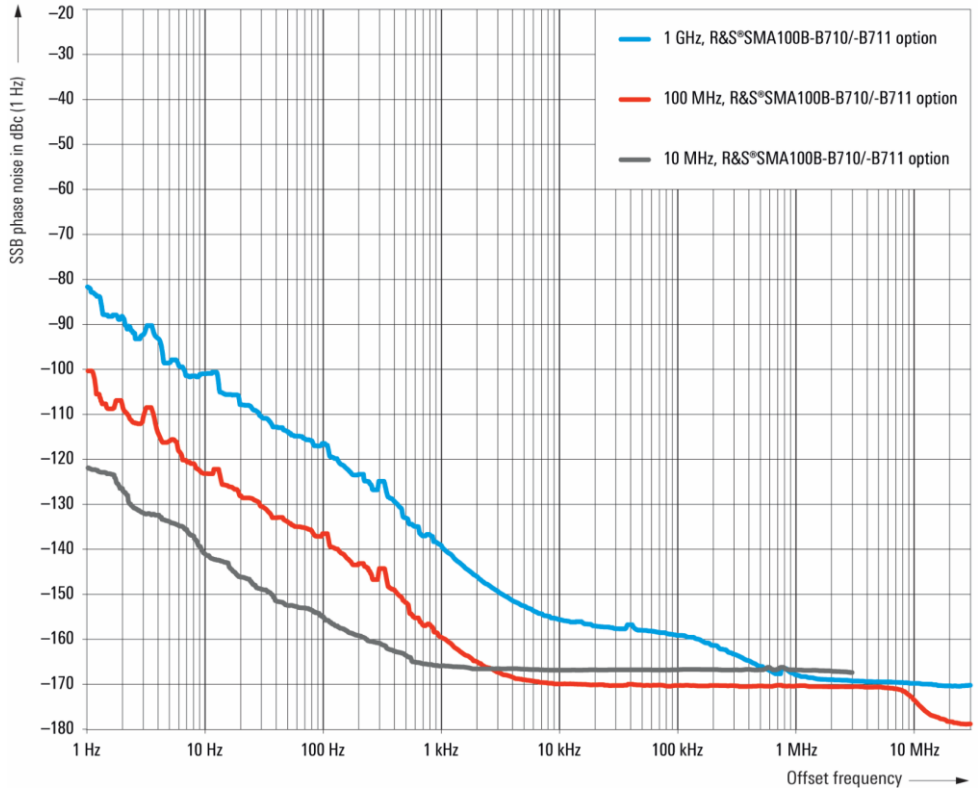
Frequency error	at time of calibration in production	
	standard or with R&S®SMAB-B1H/-B709 option	< 1×10^{-8}
	with R&S®SMAB-B710(N)/-B711(N) option	< 5×10^{-9}
Aging	after 30 days of uninterrupted operation	
	standard	≤ 1×10^{-9}/day, ≤ 1×10^{-7}/year
	with R&S®SMAB-B1H/-B709/-B710(N)/-B711(N) option	≤ 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/-B709 option	±6×10^{-9}
	with R&S®SMAB-B710(N)/-B711(N) option	±3×10^{-9}
Warm-up time	to nominal thermostat temperature	≤ 10 min (nom.)

[1] Spectral purity not tested in this mode.

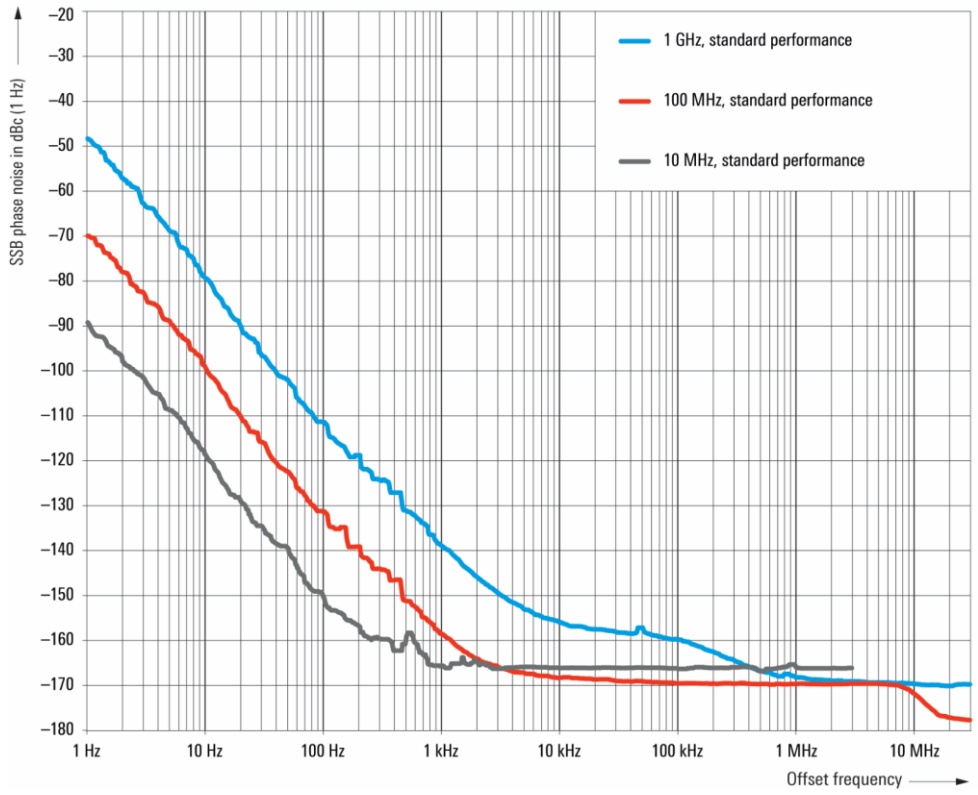
Input for external reference frequency		
Connector type	REF in on rear panel	BNC female
Input frequency	standard	10 MHz
	with R&S®SMAB-K703 option	10 MHz, 100 MHz
	with R&S®SMAB-K704 option	10 MHz, 1 MHz to 100 MHz, variable
Input frequency setting resolution	with R&S®SMAB-K704 option	0.1 Hz
Input level 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	synchronization bandwidth: wide	$\pm 3 \times 10^{-6}$
	synchronization bandwidth: narrow	
	standard or with R&S®SMAB-B1H/ -B709 option	$\pm 0.3 \times 10^{-6}$
	with R&S®SMAB-B710(N)/-B711(N) option	$\pm 0.15 \times 10^{-6}$
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	1×10^{-8}/V (typ.)
	external tuning slope, high	5×10^{-8}/V (typ.)
Input voltage range		–10 V to +10 V
Input impedance		10 kΩ (nom.)

Overview of synchronization bandwidth of reference PLL with external reference frequency

External reference frequency	**Synchronization bandwidth (nominal)**	
	Bandwidth set to narrow	**Bandwidth set to wide**
10 MHz	0.5 Hz	100 Hz
100 MHz (with R&S®SMAB-K703 option)	0.5 Hz	250 Hz
Flexible reference input frequency from 1 MHz to 100 MHz (with R&S®SMAB-K704 option)	0.5 Hz	5 Hz
1 GHz (with R&S®SMAB-K703 option)	5 Hz	> 150 kHz



Measured SSB phase noise of reference outputs at f = 10 MHz, 100 MHz and 1 GHz with the R&S®SMAB-B710(N) and R&S®SMAB-B711(N) options (f = 100 MHz and 1 GHz only available with the R&S®SMAB-K703 option)



Measured SSB phase noise of reference outputs at f = 10 MHz, 100 MHz and 1 GHz (f = 100 MHz and f = 1 GHz are only available 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.

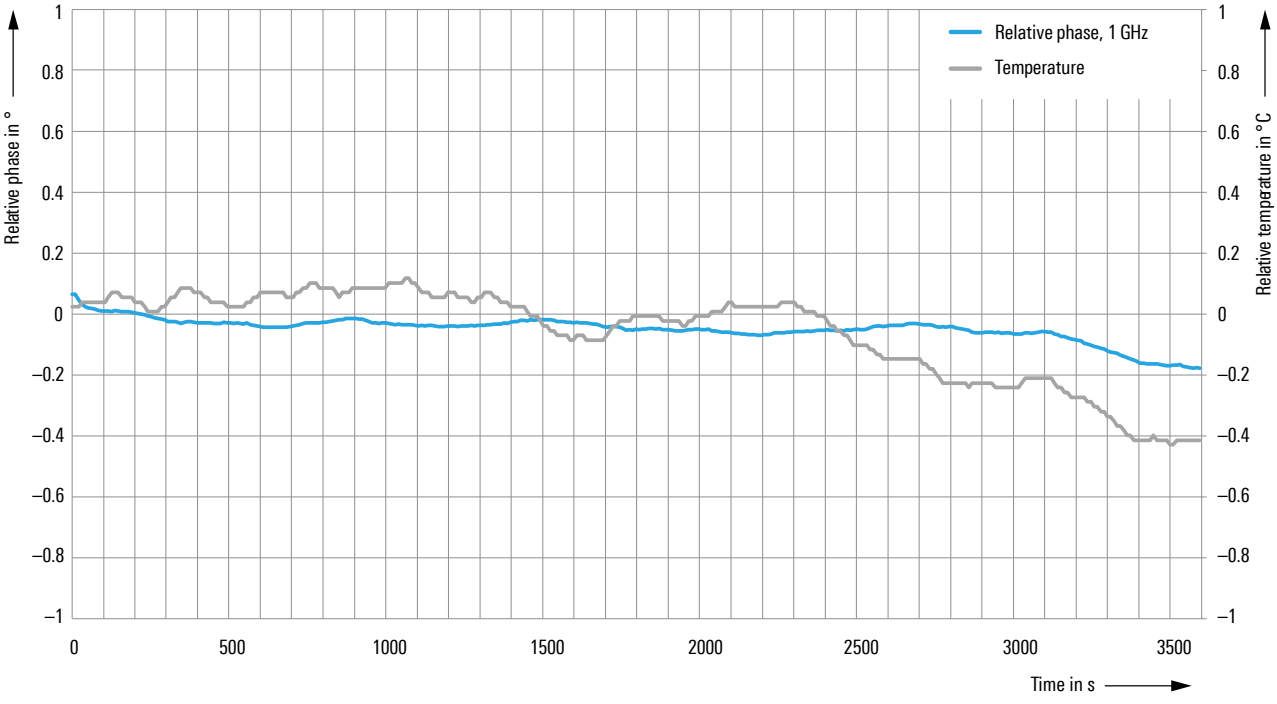
R&S®SMAB-K704 option (variable reference input)
When this option is installed, the user can set the reference input frequency in 0.1 Hz steps between 1.0 MHz and 100 MHz.
The signal generator will lock its internal reference oscillator on the input frequency.
The reference output frequency can be set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

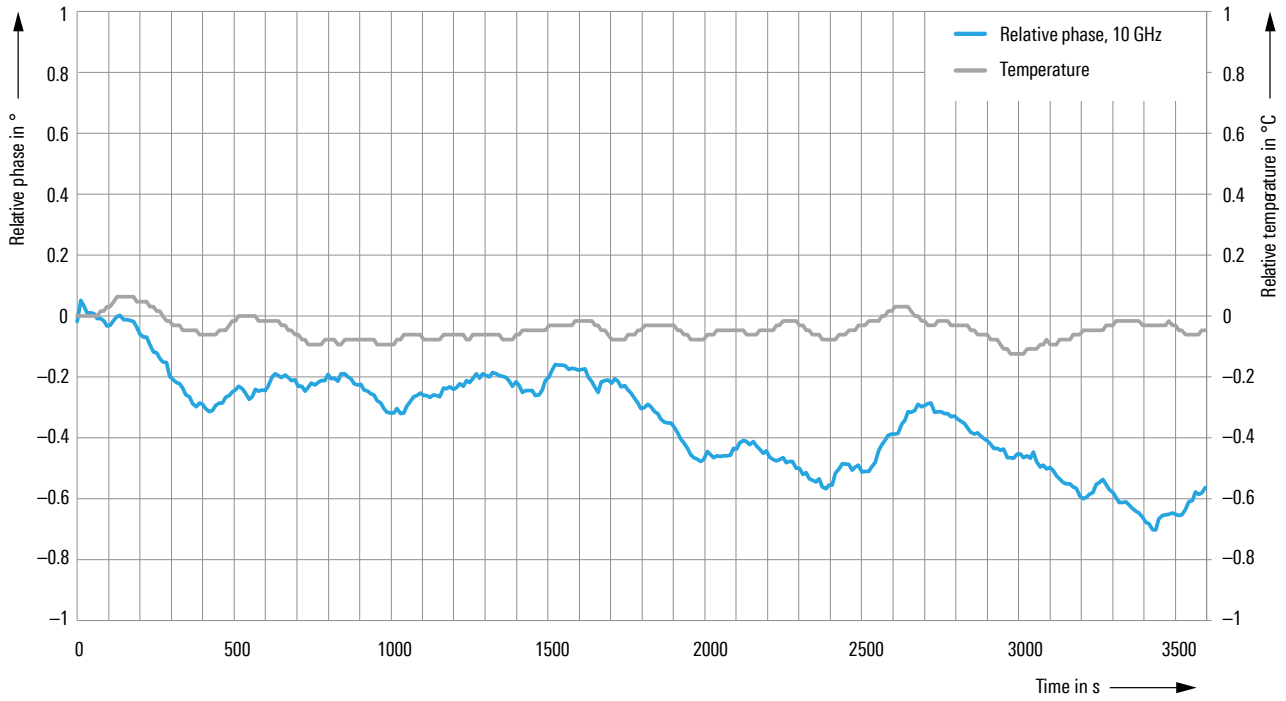
In WIDE mode, the best possible phase stability is achieved.
The phase noise performance close to the carrier depends on the phase noise of the external signal source.

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).

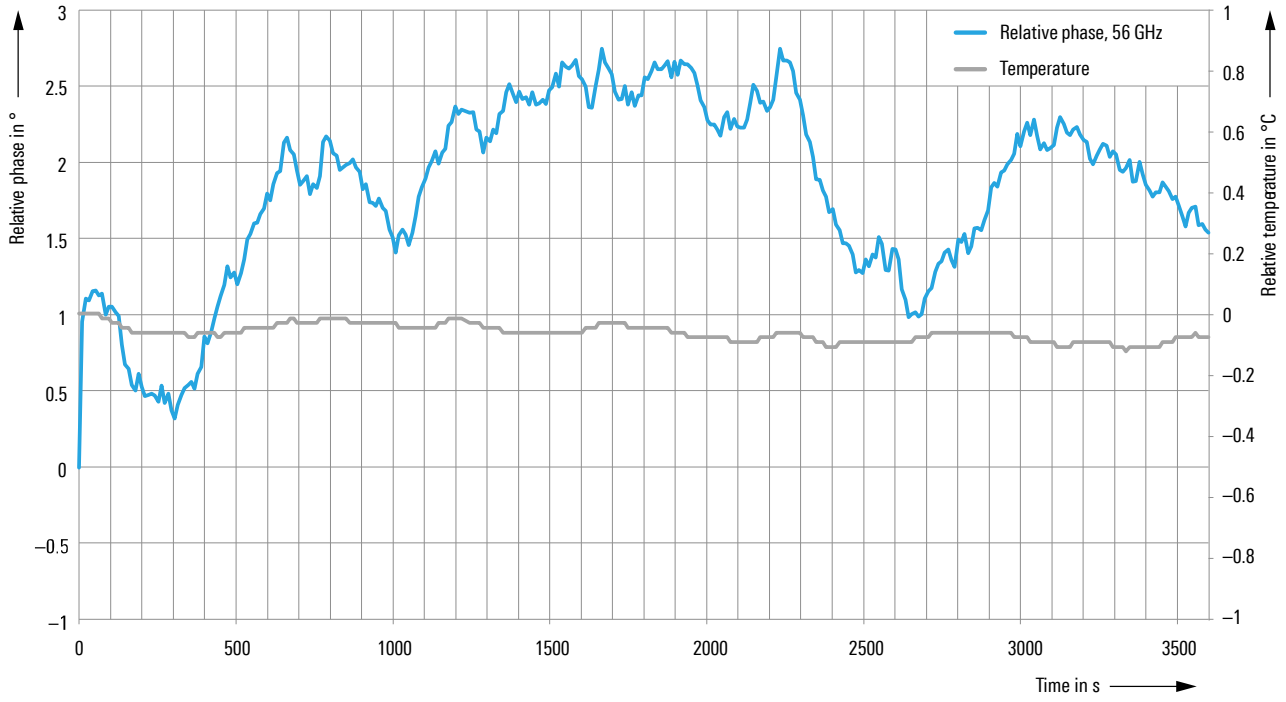
Please note that due to the slow synchronization, reference locking can take up to 10 seconds.



Measured relative phase versus time of two R&S®SMA100B instruments at f = 1 GHz carrier frequency, coupled with 1 GHz reference frequency (R&S®SMAB-K703 option)



Measured relative phase versus time of two R&S®SMA100B instruments at f = 10 GHz carrier frequency, coupled with 1 GHz reference frequency (R&S®SMAB-K703 option)



Measured relative phase versus time of two R&S®SMA100B instruments at f = 56 GHz carrier frequency, coupled with 1 GHz reference frequency (R&S®SMAB-K703 option)

Level

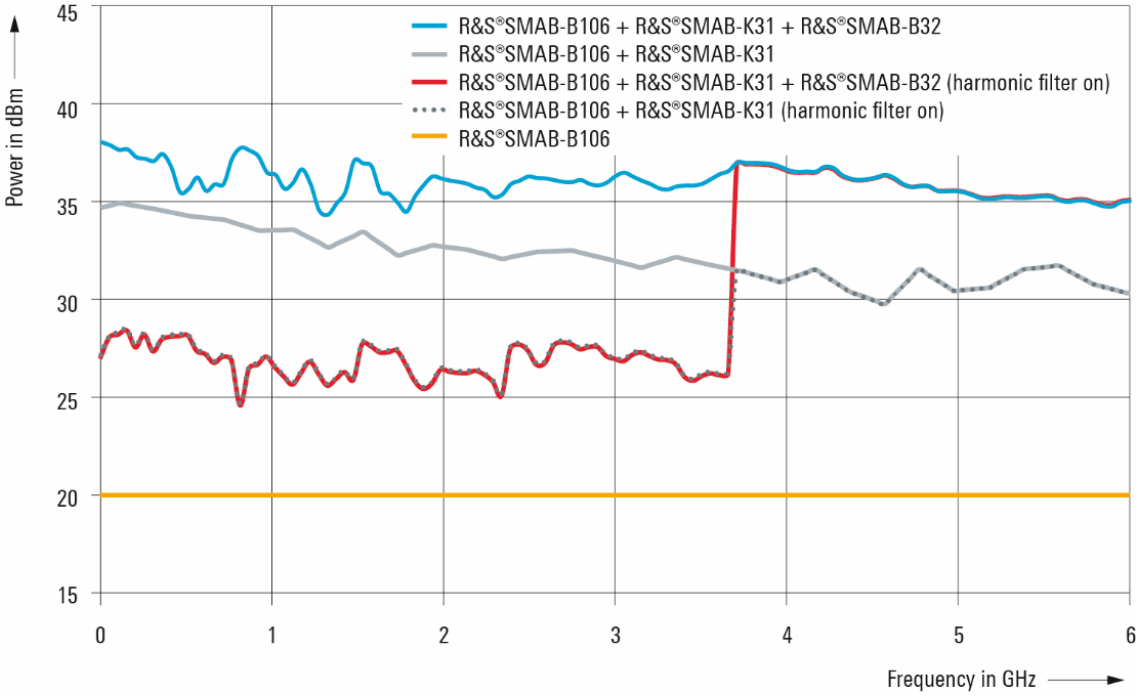
Setting range		
R&S®SMAB-B103/-B106	standard	–145 dBm to +20 dBm
	with R&S®SMAB-K31 option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +35 dBm
	with R&S®SMAB-B32 option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +40 dBm
R&S®SMAB-B112/-B120	standard	
	f ≤ 13 GHz	–145 dBm to +19 dBm
	f > 13 GHz	–145 dBm to +18 dBm
	with R&S®SMAB-K33 option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +35 dBm
	with R&S®SMAB-B34 option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +40 dBm
R&S®SMAB-B131/-B140/-B140N	standard	
	f ≤ 18 GHz	–145 dBm to +16 dBm
	f > 18 GHz	–145 dBm to +15 dBm
	with R&S®SMAB-B35/-K36/-B36S option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +40 dBm
R&S®SMAB-B150/-B167/ -B150N/-B167N	standard	
	f ≤ 20 GHz	–145 dBm to +10 dBm
	f > 20 GHz	–145 dBm to +7 dBm
	with R&S®SMAB-B37/-B39 option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +30 dBm
	with R&S®SMAB-B150/-B167/-K38/-K40 option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	f > 1 MHz	–145 dBm to +35 dBm
	with R&S®SMAB-B150N/-B167N/-K38/-K40 option	
	f ≤ 1 MHz	–145 dBm to +30 dBm
	1 MHz < f ≤ 40 GHz	–145 dBm to +35 dBm
	f > 40 GHz	–145 dBm to +19 dBm
Setting resolution		0.01 dB
Specified level range	peak envelope power (PEP)	
R&S®SMAB-B103/-B106	standard	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	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	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	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/-B32 option	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	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	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	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	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	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 [2]
	with R&S®SMAB-K33/-B34 option	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	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 ≤ 18 GHz	–120 dBm to +27 dBm [2]
	18 GHz < f ≤ 20 GHz	–120 dBm to +24 dBm [2]
R&S®SMAB-B131/-B140/-B140N	standard	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	100 kHz < f ≤ 1 MHz	–120 dBm to +13 dBm
	1 MHz < f ≤ 18 GHz	–120 dBm to +14 dBm
	18 GHz < f ≤ 40 GHz	–120 dBm to +13 dBm
	with R&S®SMAB-B35 option	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 3 GHz	–127 dBm to +22 dBm
	3 GHz < f ≤ 6 GHz	–127 dBm to +18 dBm
	6 GHz < f ≤ 18 GHz	–120 dBm to +18 dBm [2]
	18 GHz < f ≤ 37 GHz	–120 dBm to +17 dBm [2]
	37 GHz < f ≤ 40 GHz	–120 dBm to +16 dBm [2]
	with R&S®SMAB-B35/-K36 options	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 3 GHz	–127 dBm to +24 dBm
	3 GHz < f ≤ 6 GHz	–127 dBm to +21 dBm [2]
	6 GHz < f ≤ 18 GHz	–120 dBm to +21 dBm [2]
	18 GHz < f ≤ 20 GHz	–120 dBm to +20 dBm [2]
	20 GHz < f ≤ 33 GHz	–120 dBm to +22 dBm [2]
	33 GHz < f ≤ 37 GHz	–120 dBm to +20 dBm [2]
	37 GHz < f ≤ 40 GHz	–120 dBm to +19 dBm [2]
	with R&S®SMAB-B35/-K36/-B36S options	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 8 MHz	–127 dBm to +24 dBm
	8 MHz < f ≤ 3 GHz	–127 dBm to +29 dBm
	3 GHz < f ≤ 6 GHz	–127 dBm to +28 dBm
	6 GHz < f ≤ 18 GHz	–120 dBm to +24 dBm [2]
	18 GHz < f ≤ 20 GHz	–120 dBm to +22 dBm [2]
	20 GHz < f ≤ 33 GHz	–120 dBm to +27 dBm [2]
	33 GHz < f ≤ 38 GHz	–120 dBm to +26 dBm [2]
	38 GHz < f ≤ 40 GHz	–120 dBm to +25 dBm [2]

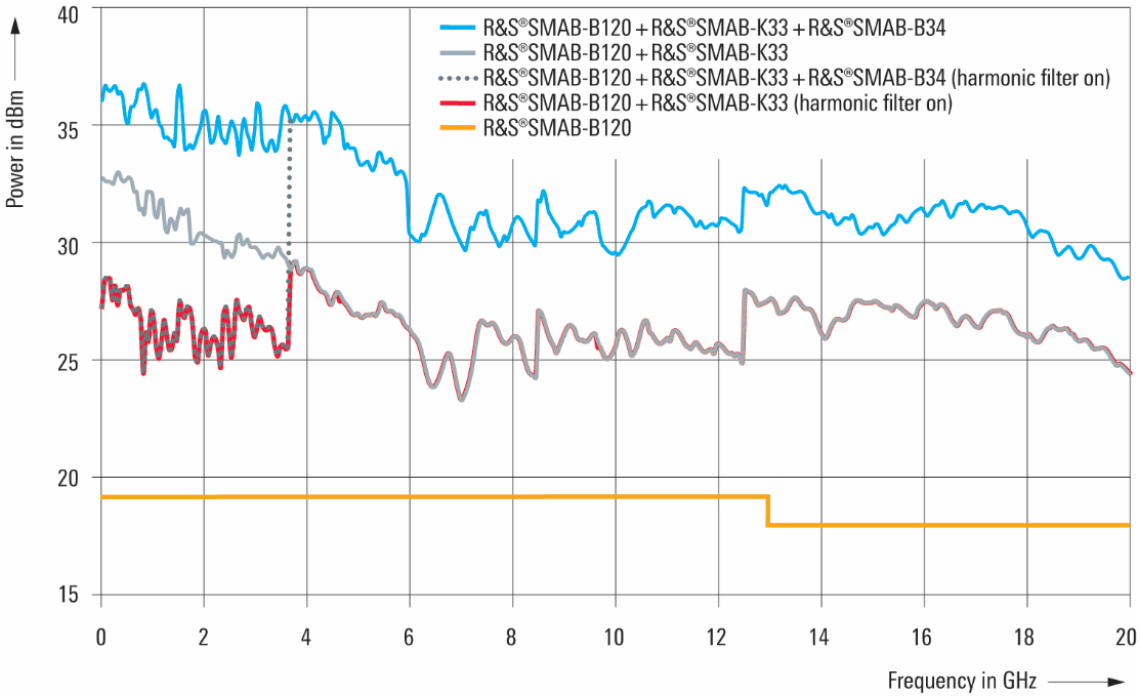
[2] With the R&S®SMAB-B81/-B82 rear panel connectors option, for f > 6 GHz the level is reduced by (0.2 dB + 0.025 dB/GHz).

R&S®SMAB-B150/-B150N/ -B167/-B167N	standard	
	8 kHz < f ≤ 100 kHz	–90 dBm to +8 dBm
	100 kHz < f ≤ 6 GHz	–95 dBm to +8 dBm
	6 GHz < f ≤ 20 GHz	–95 dBm to +8 dBm
	20 GHz < f ≤ 40 GHz	–95 dBm to +5 dBm
	40 GHz < f ≤ 67 GHz	–75 dBm to +5 dBm
	with R&S®SMAB-B37/-B39 option	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 3 GHz	–127 dBm to +21 dBm
	3 GHz < f ≤ 6 GHz	–127 dBm to +18 dBm
	6 GHz < f ≤ 18 GHz	–120 dBm to +18 dBm [2]
	18 GHz < f ≤ 20 GHz	–120 dBm to +15 dBm [2]
	20 GHz < f ≤ 33 GHz	–95 dBm to +15 dBm [2]
	33 GHz < f ≤ 40 GHz	–95 dBm to +11 dBm [2]
	40 GHz < f ≤ 65 GHz	–75 dBm to +11 dBm [2]
	65 GHz < f ≤ 67 GHz	–75 dBm to +9 dBm [2]
	with R&S®SMAB-B37/-K38/-B39/-K40 option	
	8 kHz < f ≤ 20 kHz	–90 dBm to +8 dBm
	20 kHz < f ≤ 100 kHz	–90 dBm to +13 dBm
	100 kHz < f ≤ 1 MHz	–127 dBm to +13 dBm
	1 MHz < f ≤ 3 GHz	–127 dBm to +23 dBm
	3 GHz < f ≤ 6 GHz	–127 dBm to +20 dBm
	6 GHz < f ≤ 18 GHz	–120 dBm to +20 dBm [2]
	18 GHz < f ≤ 20 GHz	–120 dBm to +17 dBm [2]
	20 GHz < f ≤ 33 GHz	–95 dBm to +18 dBm [2]
	33 GHz < f ≤ 40 GHz	–95 dBm to +15 dBm [2]
	40 GHz < f ≤ 52 GHz	–95 dBm to +18 dBm [2]
	52 GHz < f ≤ 65 GHz	–75 dBm to +15 dBm [2]
	65 GHz < f ≤ 67 GHz	–75 dBm to +10 dBm [2]
Level accuracy	CW, level setting characteristic: auto, temperature range from +18 °C to +33 °C	
	level from –90 dBm to +25 dBm	
	8 kHz < f ≤ 8 MHz	< 1.0 dB
	8 MHz < f ≤ 3 GHz	< 0.5 dB
	3 GHz < f ≤ 20 GHz	< 0.9 dB
	20 GHz < f ≤ 40 GHz	< 1.0 dB
	40 GHz < f ≤ 50 GHz	< 1.5 dB
	50 GHz < f ≤ 67 GHz	< 2.0 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
	20 GHz < f ≤ 40 GHz	< 1.5 dB
	40 GHz < f ≤ 50 GHz	< 2.0 dB
	50 GHz < f ≤ 67 GHz	< 2.5 dB
Interruption-free level setting range	level setting characteristic: uninterrupted level setting	> 20 dB
	with R&S®SMAB-K724 option, level setting characteristic: high dynamic uninterrupted	
	f > 52 MHz	> 60 dB, 70 dB (typ.)
Additional level error	ALC state off (table)	< 0.7 dB
	with R&S®SMAB-K724 option, level setting characteristic: high dynamic uninterrupted, temperature range from +18 °C to +33 °C, specifications are measured for f > 40 GHz	
	attenuation range	
	0 dB < m ≤ 10 dB	< 0.25 dB
	10 dB < m ≤ 20 dB	< 1 dB
	20 dB < m ≤ 40 dB	< 2 dB (typ.)
	40 dB < m ≤ 50 dB	< 3 dB (typ.)
	50 dB < m ≤ 60 dB	< 4 dB (typ.)

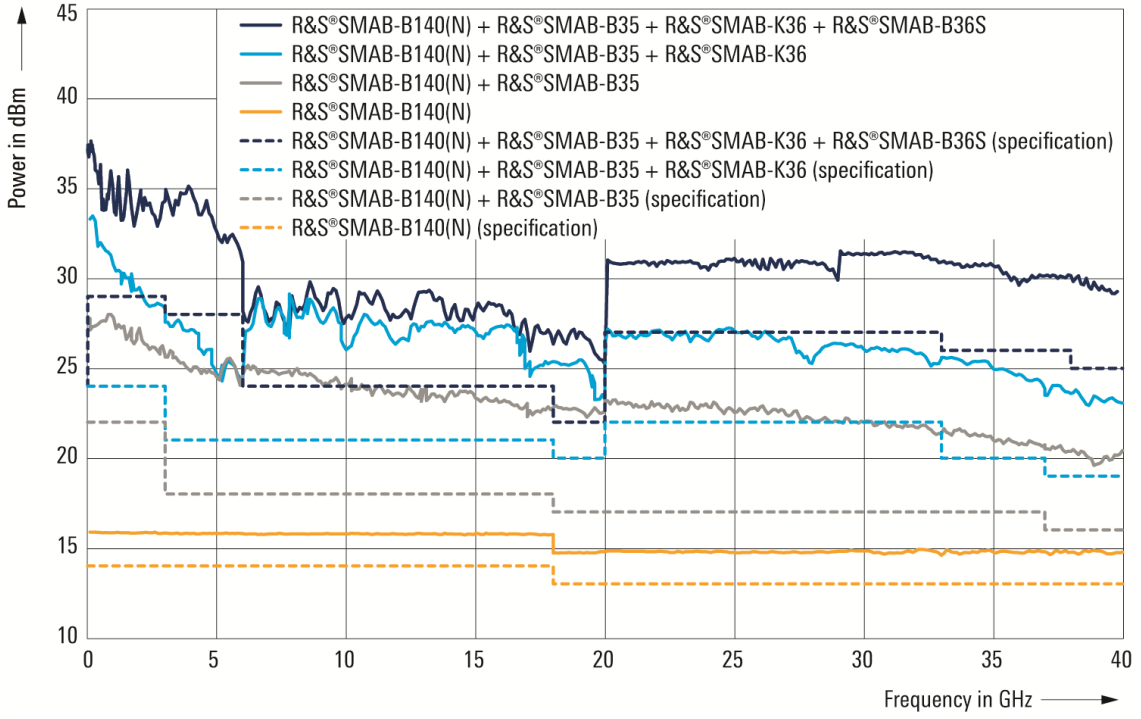
Setting time	CW, level deviation < 0.1 dB from final value, with GUI update stopped, temperature range from +18 °C to +33 °C, after IEC/IEEE bus delimiter (without LAN connection), with R&S®SMAB-B86 option, level setting characteristic: auto, no relay switchover	
	R&S®SMAB-B103/-B106/-B112/-B120	< 1.5 ms
	R&S®SMAB-B131/-B140(N)/-B150(N)/ -B167(N)	< 1.7 ms
	with switching of mechanical step attenuator	< 25 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



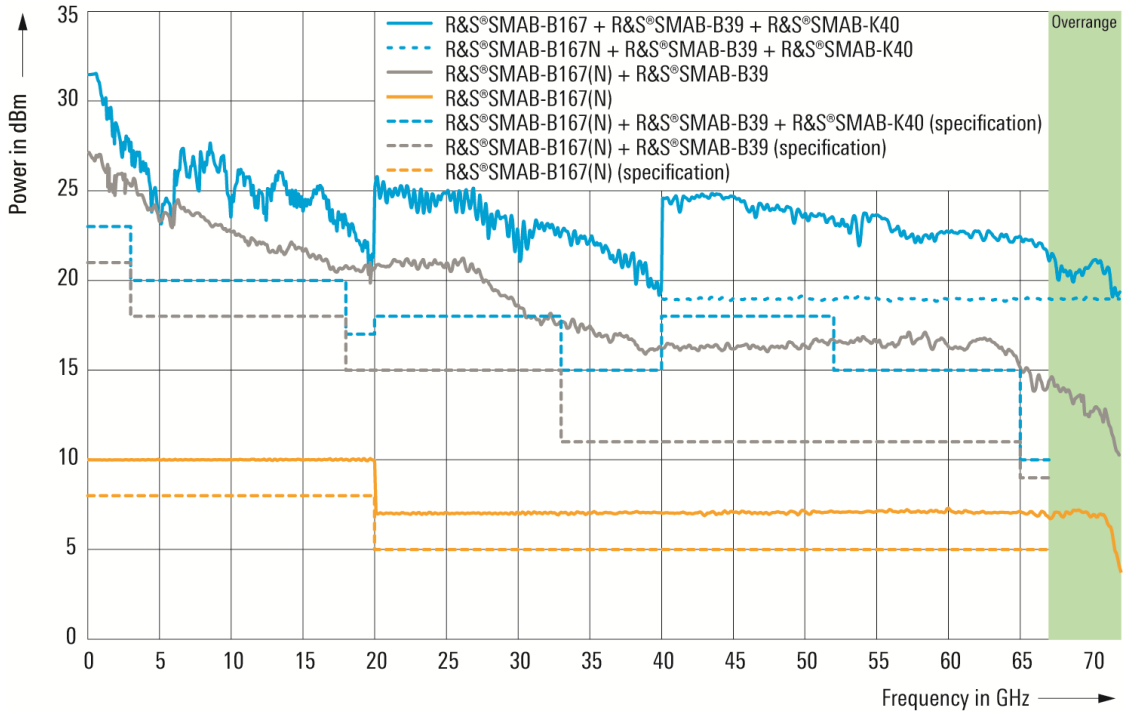
Measured maximum available output power versus frequency



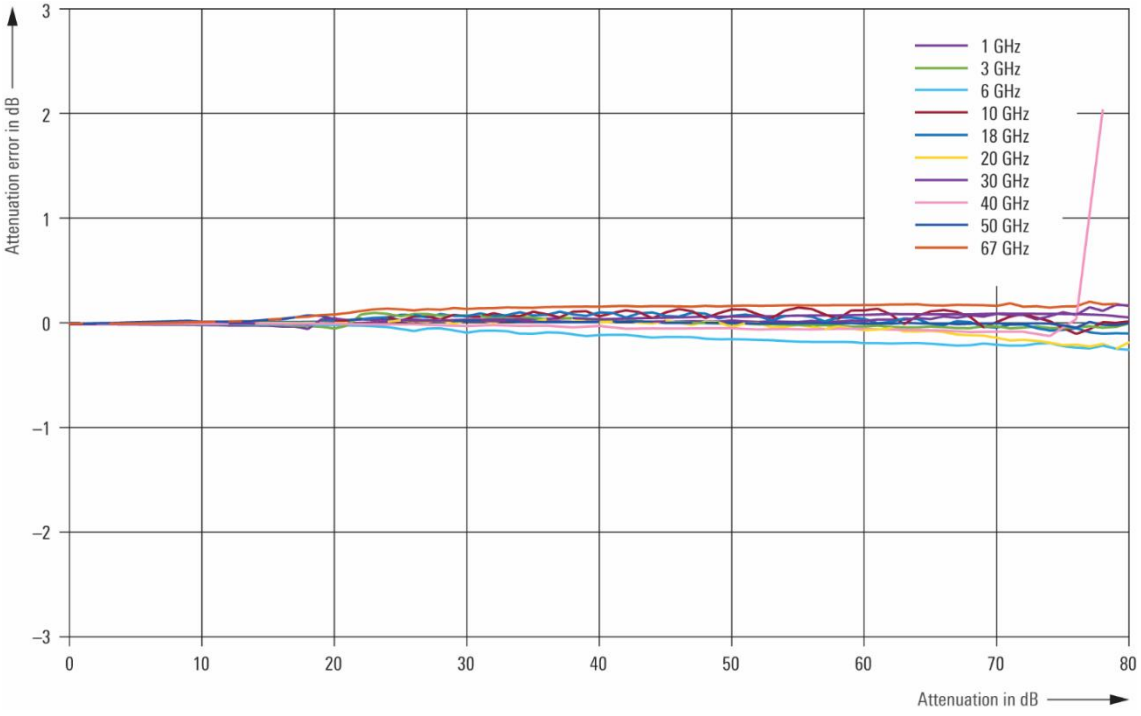
Measured maximum available output power versus frequency



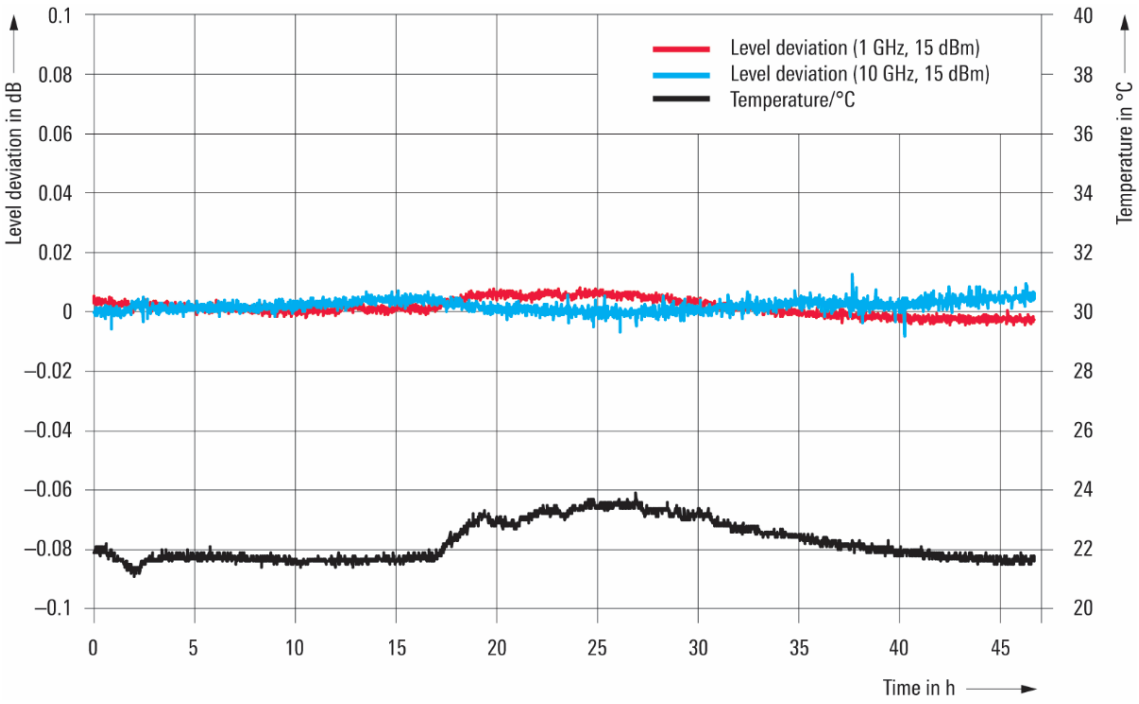
Specified and measured maximum available output power versus frequency



Specified and measured maximum available output power versus frequency



Measured level linearity of high dynamic uninterrupted level sweep with the R&S®SMAB-K724 option



Measured level repeatability and ambient temperature over 46 h. The figure shows the very high level repeatability at 15 dBm output level for 1 GHz and 10 GHz carrier frequency. During two consecutive measurements, the output level was set to different random level values

Reverse power

Reverse power (from 50 Ω source)	maximum permissible reverse RF power with R&S®SMAB-B103/-B106; 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
	maximum permissible reverse RF power with R&S®SMAB-B112/-B120/-B131/-B140/-B140N/-B150/-B150N/-B167/-B167N	
	1 MHz < f ≤ 67 GHz	0.5 W
Maximum permissible DC voltage	R&S®SMAB-B103/-B106	50 V
	R&S®SMAB-B112/-B120	5 V
	R&S®SMAB-B131/-B140/-B140N/-B150/-B150N/-B167/-B167N	1 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.)
	R&S®SMAB-B131/-B140/-B140N/-B150/-B150N/-B167/-B167N	
	200 kHz < f ≤ 3 GHz	< 1.9 (meas.)
	3 GHz < f ≤ 50 GHz	< 2.0 (meas.)

Frequency and level sweep

Operating mode		digital sweep in discrete steps
Sweep parameters		RF frequency, RF level, RF frequency and RF level
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 fcontrol
Sweep range		full specified frequency and level range
	interruption-free level sweep with attenuator mode fixed	0.01 dB to 20 dB
	high dynamic uninterrupted level sweep with R&S®SMAB-K724 option	
	f > 52 MHz	0.01 dB to 60 dB, 70 dB (typ.)
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	RF level sweep	3 ms to 100 s
	RF frequency sweep	3 ms to 100 s
	with R&S®SMAB-B711(N) option	5 ms to 100 s
Dwell time setting resolution		0.1 ms

Ramp sweep (R&S®SMAB-B28 option)

Operating mode		synthesized frequency sweep (up direction)
Trigger modes	execute sweep continuously	auto
	execute one full sweep	single
Trigger source		external trigger signal (INST TRIG at rear), rotary knob, touchpanel, remote control
Sweep span range		Ramp sweep frequency range
Maximum sweep rate	f ≤ 375 MHz	500 MHz/ms
	375 MHz < f ≤ 750 MHz	31.25 MHz/ms
	750 MHz < f ≤ 1500 MHz	62.5 MHz/ms
	1.5 GHz < f ≤ 3 GHz	125 MHz/ms
	3 GHz < f ≤ 6 GHz	250 MHz/ms
	6 GHz < f ≤ 12 GHz	500 MHz/ms
	12 GHz < f ≤ 24 GHz	1 GHz/ms
	24 GHz < f ≤ 48 GHz	2 GHz/ms
	48 GHz < f ≤ 67 GHz	4 GHz/ms
Frequency accuracy		(0.005 % of span) / (sweep time/s)
Sweep time		
Setting range		10 ms to 100 s
Setting resolution		0.1 ms
Frequency markers	number of frequency markers	10

List mode

Frequency and level values can be stored in a list and triggered by an internal timer or an external trigger.

Run mode		live
Operating modes	internal trigger, infinite	auto
	internal trigger, one sweep per trigger event	single
	internal trigger, one step per trigger event	step
	external trigger, one sweep per trigger event	extern single
	external trigger, one step per trigger event	extern step
Dwell time setting range	can be set individually for each step	1 ms to 100 s
Dwell time setting resolution		0.1 ms

Spectral purity

Harmonics [3]	CW	
R&S®SMAB-B103/-B106	level = 10 dBm; for instruments equipped with R&S®SMAB-B32 ultra high output power option: level = 18 dBm	
	100 kHz ≤ f ≤ 10 MHz	< –30 dBc
	f > 10 MHz	< –60 dBc
R&S®SMAB-B112/-B120	level = 10 dBm; for instruments equipped with R&S®SMAB-B34 ultra high output power option: level = 16 dBm	
	100 kHz ≤ f ≤ 10 MHz	< –30 dBc
	f > 10 MHz	< –55 dBc
R&S®SMAB-B131/-B140/-B140N/ -B150/-B150N/-B167/-B167N	level = 10 dBm or maximum specified output power, whichever is lower; for instruments equipped with high output power option, ultra high output power option or super ultra high output power option: level = 13 dBm	
	100 kHz ≤ f ≤ 10 MHz	< –30 dBc
	f > 10 MHz	< –55 dBc
Nonharmonics	CW, offset > 10 kHz from carrier, level = 10 dBm or maximum specified output power, whichever is lower	
	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 ≤ 24 GHz	< –68 dBc
	24 GHz < f ≤ 48 GHz	< –62 dBc
	f > 48 GHz	< –56 dBc
	for instruments equipped with R&S®SMAB-B711(N) ultra low phase noise option: CW, offset > 10 kHz from carrier, level = 10 dBm or maximum specified output power, whichever is lower	
	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 ≤ 24 GHz	< –76 dBc
	24 GHz < f ≤ 48 GHz	< –70 dBc
	f > 48 GHz	< –64 dBc
Subharmonics [4]	CW, level operating mode: auto, level = 10 dBm or maximum specified output power, whichever is lower	
	f ≤ 5 GHz	< –85 dBc, < –95 dBc with R&S®SMAB-B711(N) option
	5 GHz < f ≤ 20 GHz	< –60 dBc
	20 GHz < f ≤ 50 GHz	< –60 dBc
	f > 50 GHz	< –60 dBc (meas.)

[3] Specifications are not valid for harmonics beyond “specified frequency range” or above 50 GHz.

[4] Specifications are not valid for subharmonics beyond “specified frequency range” or above 50 GHz.

Wideband noise	level operating mode: auto, measurement bandwidth: 1 Hz, CW; level = 10 dBm or maximum available output power, whichever is lower	
	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: 40 MHz	
	6.0 GHz < f ≤ 12 GHz	< –150 dBc
	12 GHz < f ≤ 20 GHz	< –145 dBc
	20 GHz < f ≤ 40 GHz	< –145 dBc (typ.)
	40 GHz < f ≤ 50 GHz	< –140 dBc (typ.)
	f > 50 GHz	–142 dBc (meas.)
	instruments equipped with R&S®SMAB-B711(N) 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 (typ.)
	carrier offset: 40 MHz	
	16 GHz < f ≤ 20 GHz	< –152 dBc (typ.)
	20 GHz < f ≤ 40 GHz	< –145 dBc (typ.)
	40 GHz < f ≤ 50 GHz	< –140 dBc (typ.)
	f > 50 GHz	–142 dBc (meas.)
SSB phase noise	for standard instruments or equipped with R&S®SMAB-B1H, CW, carrier offset: 20 kHz, measurement bandwidth: 1 Hz, level = 10 dBm or maximum available output power, whichever is lower	
	f = 10 MHz [5]	< –158 dBc, –165 dBc (typ.)
	f = 100 MHz	< –154 dBc, –159 dBc (typ.)
	f = 1 GHz	< –135 dBc, –140 dBc (typ.)
	f = 2 GHz	< –129 dBc, –134 dBc (typ.)
	f = 3 GHz	< –125 dBc, –130 dBc (typ.)
	f = 4 GHz	< –123 dBc, –128 dBc (typ.)
	f = 6 GHz	< –119 dBc, –124 dBc (typ.)
	f = 10 GHz	< –115 dBc, –120 dBc (typ.)
	f = 20 GHz	< –109 dBc, –114 dBc (typ.)
	f = 40 GHz	< –103 dBc, –108 dBc (typ.)
	f = 50 GHz	< –101 dBc, –106 dBc (typ.)
	f = 67 GHz	< –98 dBc, –103 dBc (typ.)

[5] For instruments equipped with R&S®SMAB-B131/-B140(N)/-B150(N)/-B167(N) frequency options, the specified phase noise values at 10 MHz RF frequency show the typical performance.

SSB phase noise with R&S®SMAB-B709 option

Specified values in plain text, measured values in brackets *( ) and italics.*

SSB phase noise in dBc (1 Hz), CW, level = 10 dBm or maximum available output power, whichever is lower				
Offset frequency / Carrier frequency	**1 Hz**	**10 Hz**	**100 Hz**	**1 kHz**
f = 10 MHz [6]	*(–98)*	–120	–136	–147
f = 100 MHz	*(–79)*	–103	–124	–144
f = 1 GHz	*(–59)*	–83	–104	–124
f = 2 GHz	*(–53)*	–77	–98	–118
f = 3 GHz	*(–49)*	–73	–94	–114
f = 4 GHz	*(–47)*	–71	–92	–112
f = 6 GHz	*(–43)*	–67	–88	–108
f = 10 GHz	*(–39)*	–63	–84	–104
f = 20 GHz	*(–33)*	–58	–78	–98
f = 40 GHz	*(–27)*	–52	–72	–92
f = 50 GHz	*(–25)*	–50	–70	–90
f = 67 GHz	*(–22)*	–47	–67	–87

SSB phase noise in dBc (1 Hz), CW, level = 10 dBm or maximum available output power, whichever is lower				
Offset frequency / Carrier frequency	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**
f = 10 MHz [6]	–157	–160	–161	
f = 100 MHz	–155	–155	–162	–162
f = 1 GHz	–140	–138	–145	–160
f = 2 GHz	–134	–132	–139	–159
f = 3 GHz	–130	–128	–136	–159
f = 4 GHz	–128	–126	–133	–157
f = 6 GHz	–124	–122	–131	–156
f = 10 GHz	–120	–118	–124	–148
f = 20 GHz	–114	–112	–118	–142
f = 40 GHz	–108	–106	–112	–136
f = 50 GHz	–106	–104	–110	–134
f = 67 GHz	–103	–101	–107	–131

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

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

SSB phase noise in dBc (1 Hz), CW, level = 10 dBm or maximum available output power, whichever is lower				
Offset frequency / Carrier frequency	**1 Hz**	**10 Hz**	**100 Hz**	**1 kHz**
f = 10 MHz [6]	*(–116)*	–124 (–130)	–136 (–141)	–147 (–154)
f = 100 MHz	*(–101)*	–117 (–122)	–129 (–136)	–144 (–152)
f = 1 GHz	*(–82)*	–97 (–103)	–111 (–117)	–131 (–139)
f = 2 GHz	*(–76)*	–91 (–97)	–105 (–111)	–125 (–132)
f = 3 GHz	*(–72)*	–87 (–93)	–101 (–108)	–121 (–129)
f = 4 GHz	*(–70)*	–86 (–91)	–99 (–106)	–119 (–127)
f = 6 GHz	*(–66)*	–81 (–87)	–95 (–102)	–115 (–123)
f = 10 GHz	*(–62)*	–77 (–83)	–91 (–97)	–111 (–119)
f = 20 GHz	*(–56)*	–71 (–77)	–85 (–91)	–105 (–113)
f = 40 GHz	*(–50)*	–65 (–71)	–79 (–85)	–99 (–107)
f = 50 GHz	*(–47)*	–63 (–69)	–77 (–83)	–97 (–104)
f = 67 GHz	*(–44)*	–60 (–66)	–74 (–81)	–94 (–102)

[6] For instruments equipped with R&S®SMAB-B131/-B140(N)/-B150(N)/-B167(N) frequency options, the specified phase noise values at 10 MHz RF frequency show the typical performance.

SSB phase noise in dBc (1 Hz), CW, level = 10 dBm or maximum available output power, whichever is lower				
Offset frequency / Carrier frequency	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**
f = 10 MHz [7]	–157 (–163)	–160 (–165)	–161 (–166)	
f = 100 MHz	–155 (–161)	–155 (–160)	–162 (–166)	–162 (–169)
f = 1 GHz	–140 (–145)	–138 (–143)	–145 (–150)	–160 (–165)
f = 2 GHz	–134 (–139)	–132 (–137)	–139 (–144)	–159 (–165)
f = 3 GHz	–130 (–135)	–128 (–134)	–136 (–143)	–159 (–165)
f = 4 GHz	–128 (–133)	–126 (–131)	–133 (–138)	–157 (–161)
f = 6 GHz	–124 (–130)	–122 (–129)	–131 (–137)	–156 (–160)
f = 10 GHz	–120 (–125)	–118 (–123)	–124 (–130)	–148 (–153)
f = 20 GHz	–114 (–119)	–112 (–117)	–118 (–124)	–142 (–147)
f = 40 GHz	–108 (–113)	–106 (–111)	–112 (–118)	–136 (–141)
f = 50 GHz	–106 (–111)	–104 (–109)	–110 (–116)	–134 (–139)
f = 67 GHz	–103 (–110)	–101 (–106)	–107 (–113)	–131 (–136)

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

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

SSB phase noise in dBc (1 Hz), CW, level = 10 dBm or maximum available output power, whichever is lower				
Offset frequency / Carrier frequency	**1 Hz**	**10 Hz**	**100 Hz**	**1 kHz**
f = 10 MHz [7]	*(–116)*	–124 (–130)	–136 (–141)	–147 (–154)
f = 100 MHz	*(–101)*	–117 (–122)	–129 (–136)	–146 (–152)
f = 1 GHz	*(–82)*	–97 (–103)	–111 (–117)	–135 (–139)
f = 2 GHz	*(–76)*	–91 (–97)	–105 (–111)	–129 (–133)
f = 3 GHz	*(–72)*	–87 (–93)	–101 (–108)	–125 (–130)
f = 4 GHz	*(–70)*	–86 (–91)	–99 (–106)	–122 (–127)
f = 6 GHz	*(–66)*	–81 (–87)	–95 (–102)	–119 (–124)
f = 10 GHz	*(–62)*	–77 (–83)	–91 (–97)	–115 (–120)
f = 20 GHz	*(–56)*	–71 (–77)	–85 (–91)	–109 (–114)
f = 40 GHz	*(–50)*	–65 (–71)	–79 (–85)	–103 (–107)
f = 50 GHz	*(–47)*	–63 (–69)	–77 (–83)	–101 (–105)
f = 67 GHz	*(–44)*	–60 (–66)	–74 (–81)	–98 (–103)

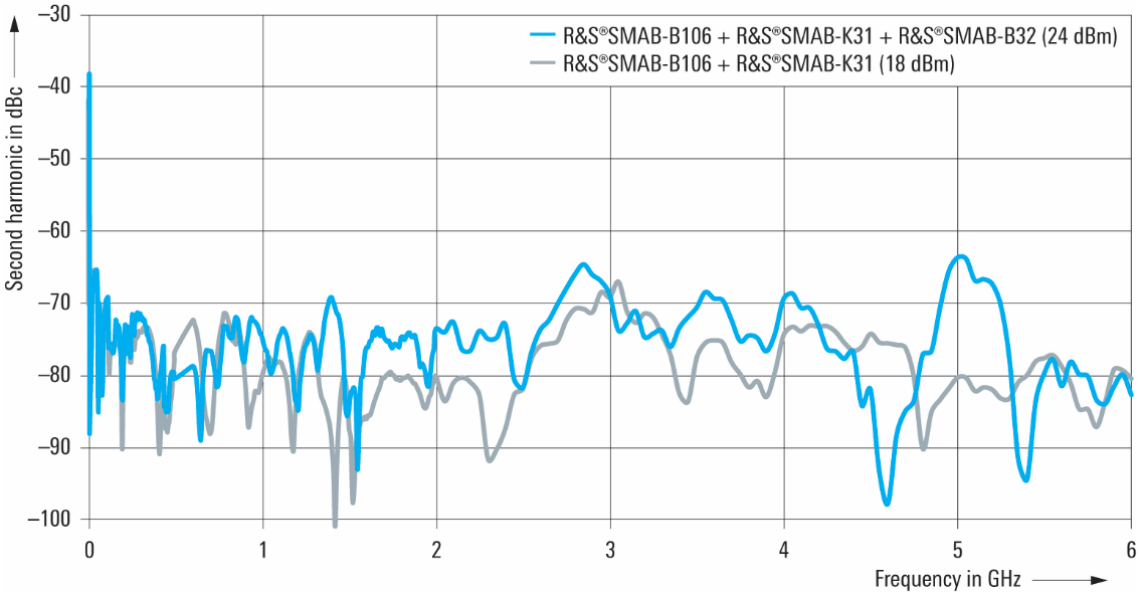
SSB phase noise in dBc (1 Hz), CW, level = 10 dBm or maximum available output power, whichever is lower				
Offset frequency / Carrier frequency	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**
f = 10 MHz [7]	–157 (–163)	–160 (–166)	–161 (–166)	
f = 100 MHz	–155 (–161)	–162 (–166)	–162 (–167)	–162 (–168)
f = 1 GHz	–147 (–151)	–148 (–153)	–157 (–162)	–160 (–165)
f = 2 GHz	–142 (–145)	–142 (–147)	–151 (–158)	–159 (–165)
f = 3 GHz	–138 (–142)	–138 (–144)	–148 (–157)	–159 (–164)
f = 4 GHz	–135 (–139)	–136 (–141)	–147 (–152)	–157 (–162)
f = 6 GHz	–132 (–136)	–132 (–138)	–144 (–151)	–155 (–161)
f = 10 GHz	–128 (–132)	–128 (–134)	–140 (–146)	–156 (–160)
f = 20 GHz	–122 (–126)	–122 (–128)	–134 (–140)	–148 (–153)
f = 40 GHz	–115 (–119)	–116 (–121)	–128 (–133)	–142 (–146)
f = 50 GHz	–112 (–116)	–114 (–119)	–126 (–130)	(–143) (*–145*)
f = 67 GHz	–110 (–114)	–111 (–117)	–123 (–128)	(–140) (*–142*)

[7] For instruments equipped with frequency options R&S®SMAB-B131/-B140(N)/-B150(N)/-B167(N), the specified phase noise values at 10 MHz RF frequency show the typical performance.

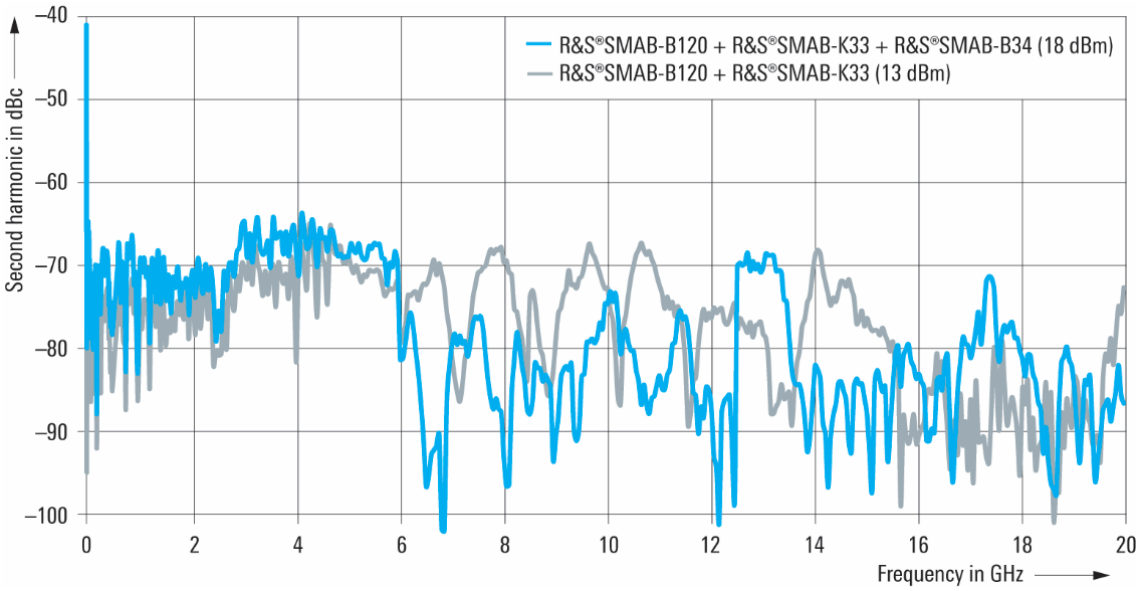
RMS jitter

Specifications above 3 GHz not applicable for R&S®SMAB-B710N and R&S®SMAB-B711N options.

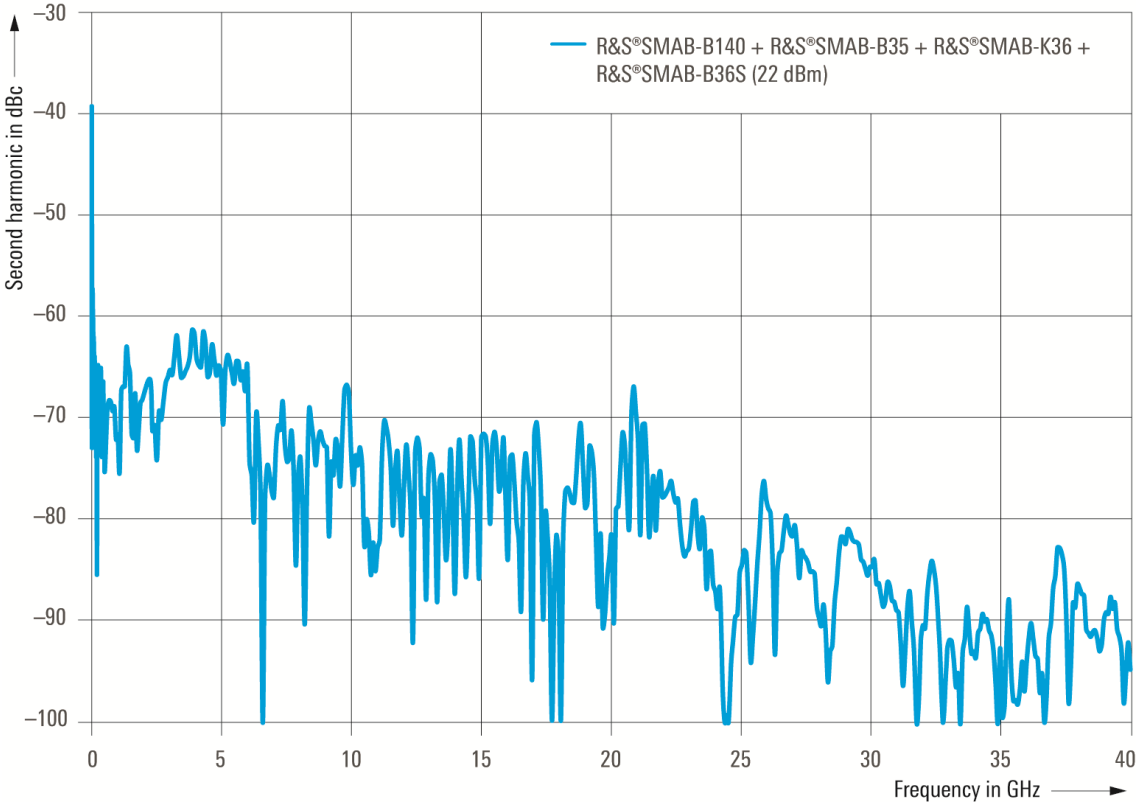
RMS jitter	f = 155 MHz, BW = 100 Hz to 1.5 MHz	20.1 fs (meas.)
	f = 622 MHz, BW = 1 kHz to 5 MHz	18.7 fs (meas.)
	f = 1 GHz, BW = 1 Hz to 10 MHz	558 fs (meas.)
	f = 2.488 GHz, BW = 5 kHz to 20 MHz	18.7 fs (meas.)
	f = 9.952 GHz, BW = 10 kHz to 80 MHz	18.5 fs (meas.)
With R&S®SMAB-B1H option	f = 155 MHz, 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.)
With R&S®SMAB-B709 option	f = 155 MHz, BW = 100 Hz to 1.5 MHz	18.5 fs (meas.)
	f = 622 MHz, BW = 1 kHz to 5 MHz	13.6 fs (meas.)
	f = 1 GHz, BW = 1 Hz to 10 MHz	129 fs (meas.)
	f = 2.488 GHz, BW = 5 kHz to 20 MHz	13.6 fs (meas.)
	f = 9.952 GHz, BW = 10 kHz to 80 MHz	13.1 fs (meas.)
With R&S®SMAB-B710(N) option	f = 155 MHz, BW = 100 Hz to 1.5 MHz	18.5 fs (meas.)
	f = 622 MHz, BW = 1 kHz to 5 MHz	13.6 fs (meas.)
	f = 1 GHz, BW = 1 Hz to 10 MHz	21.3 fs (meas.)
	f = 2.488 GHz, BW = 5 kHz to 20 MHz	13.6 fs (meas.)
	f = 9.952 GHz, BW = 10 kHz to 80 MHz	13.1 fs (meas.)
With R&S®SMAB-B711(N) 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, f ≤ 41 GHz, RMS value (0.03 kHz to 20 kHz)	< 0.02 %



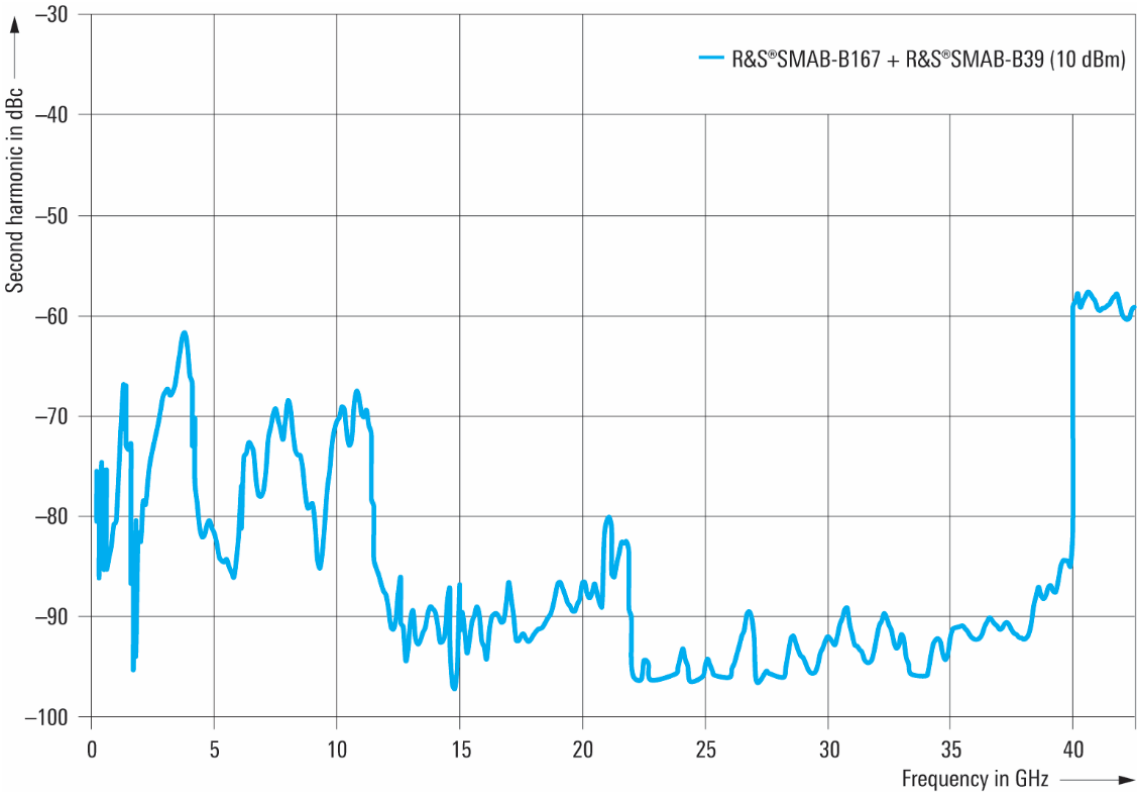
Measured harmonics versus carrier frequency with harmonic filter on for f ≤ 3.7 GHz



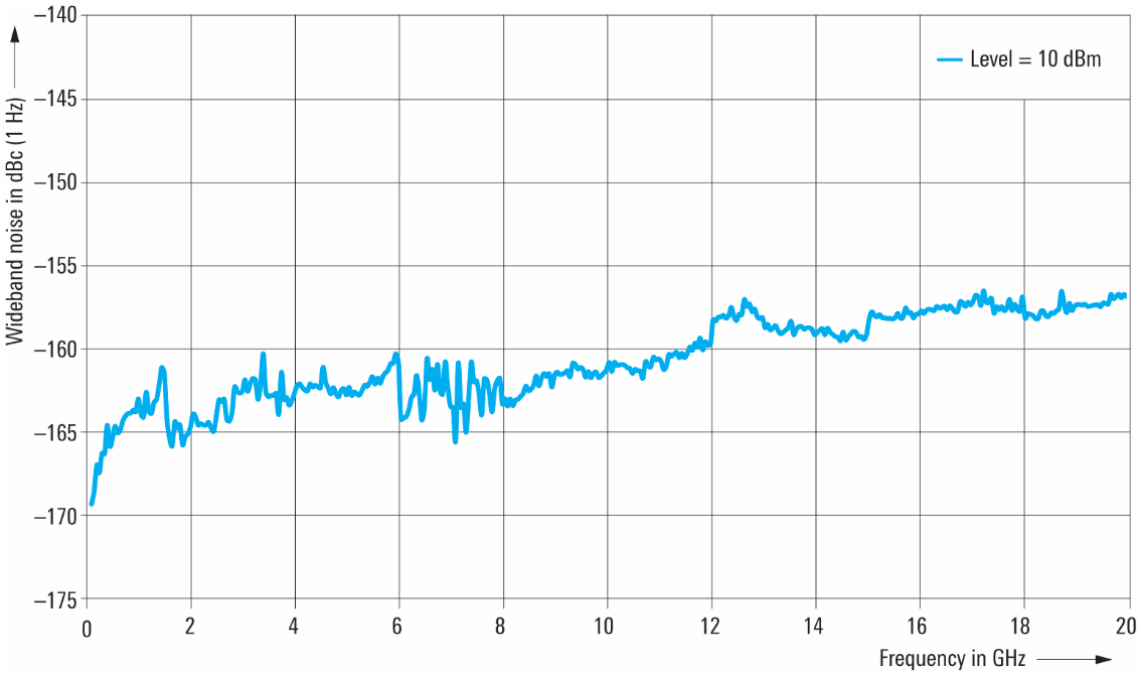
Measured harmonics versus carrier frequency with harmonic filter on for f ≤ 3.7 GHz



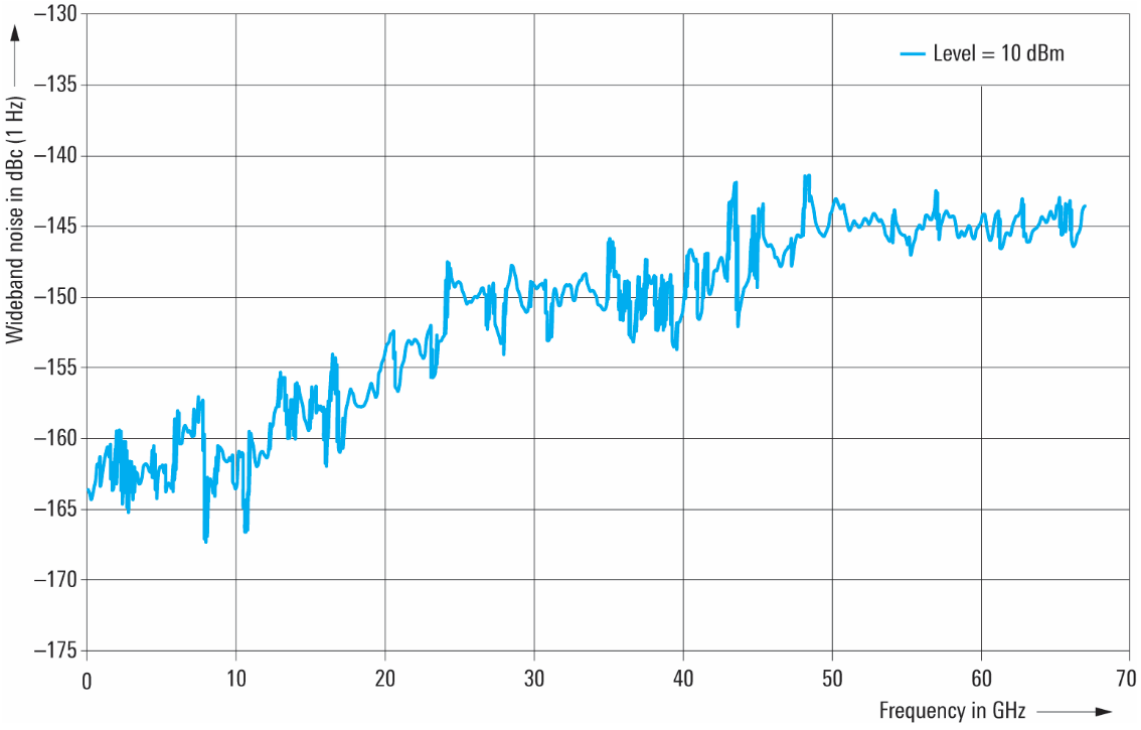
Measured harmonics versus carrier frequency with harmonic filter on for f ≤ 3.7 GHz



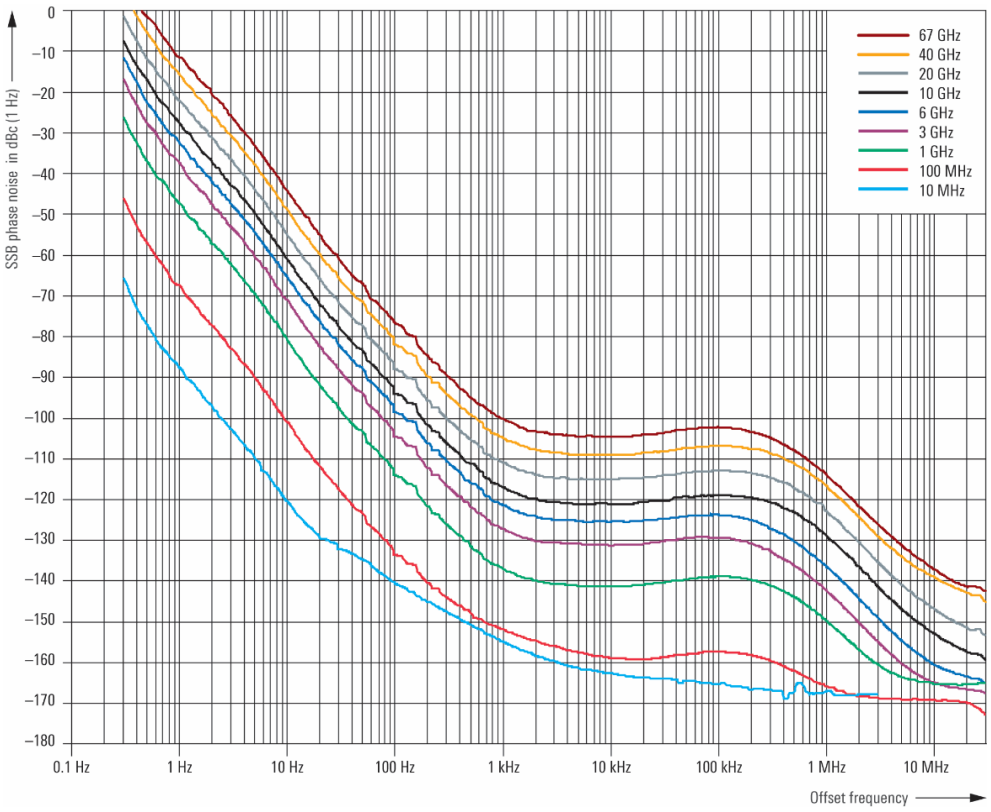
Measured harmonics versus carrier frequency with harmonic filter on for f ≤ 3.7 GHz



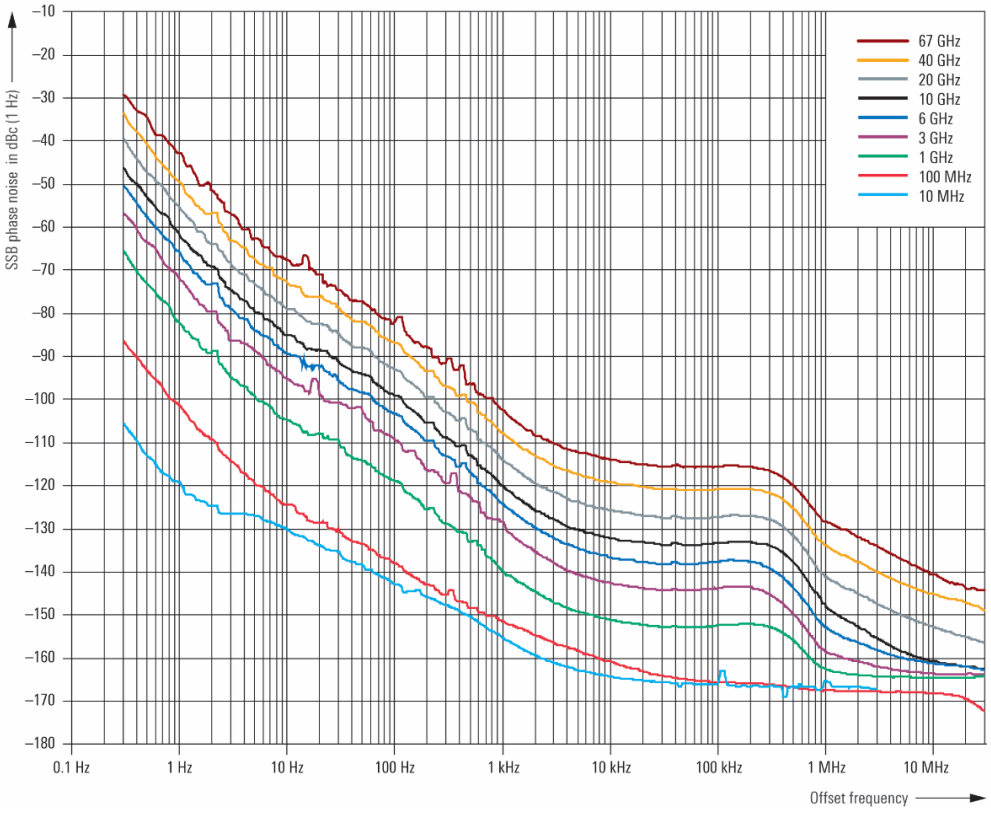
Measured wideband noise at 30 MHz offset and +10 dBm versus carrier frequency with the R&S®SMAB-B120, R&S®SMAB-B711 and R&S®SMAB-B34 options. Measured with the R&S®FSWP phase noise analyzer



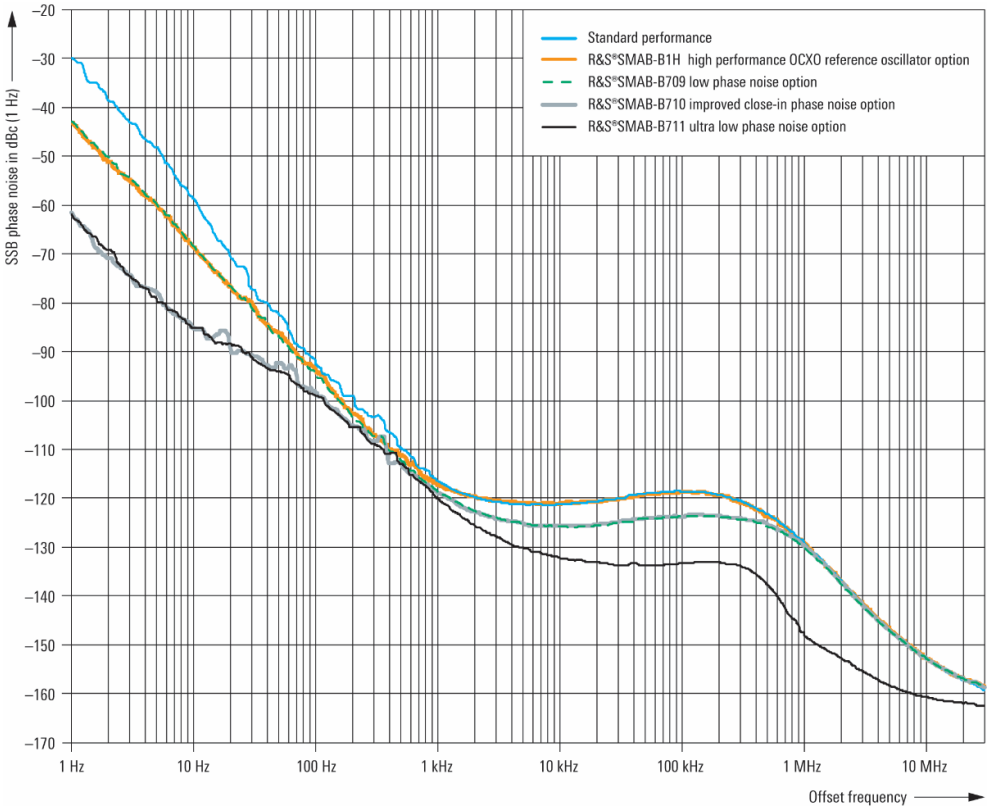
Measured wideband noise at 70 MHz offset and +10 dBm versus carrier frequency with the R&S®SMAB-B167, R&S®SMAB-B711 and R&S®SMAB-B39 options. Measured with the R&S®FSW85 spectrum analyzer



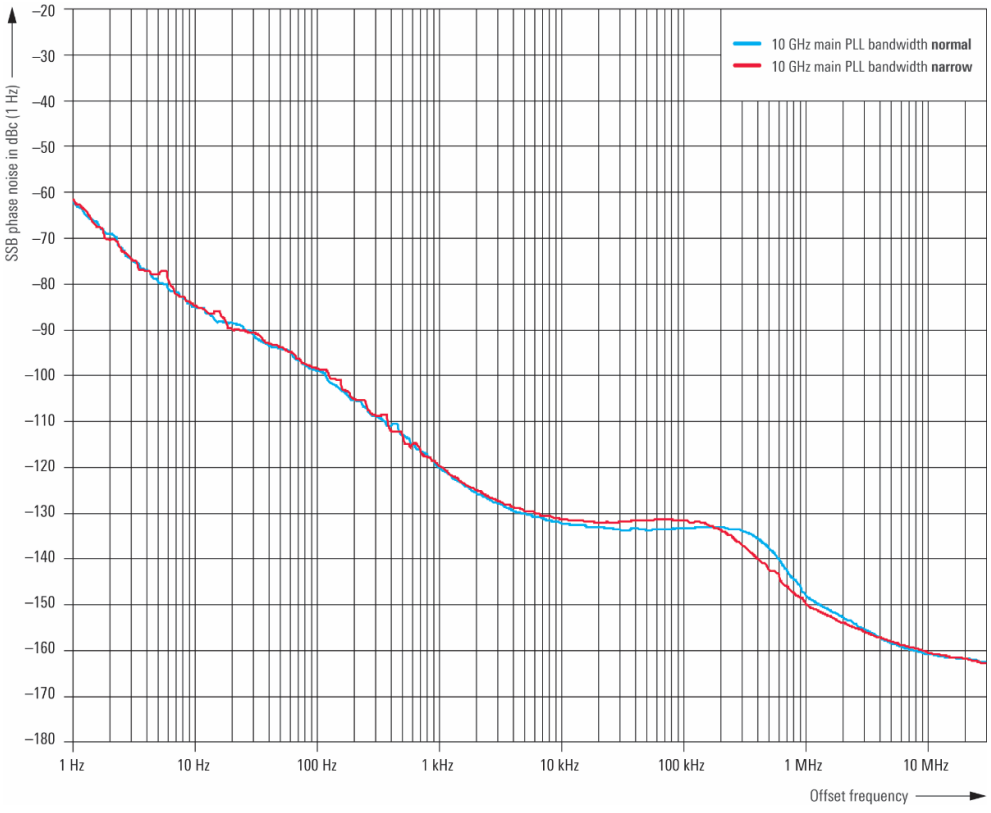
Measured SSB phase noise (standard performance)



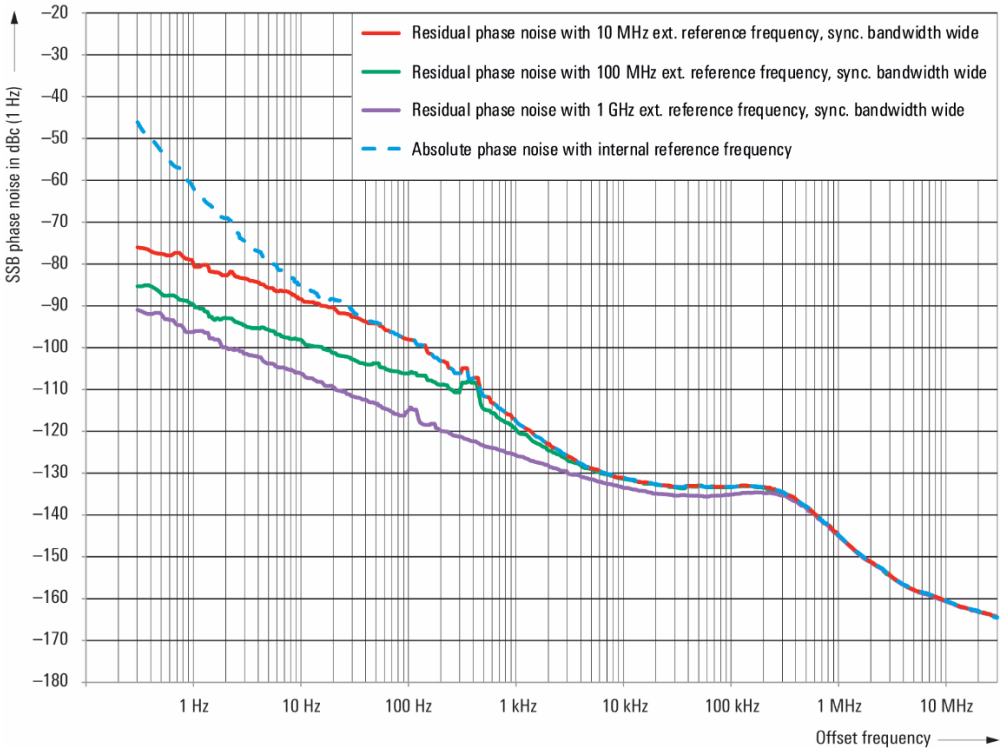
Measured SSB phase noise with the R&S®SMAB-B711(N) option



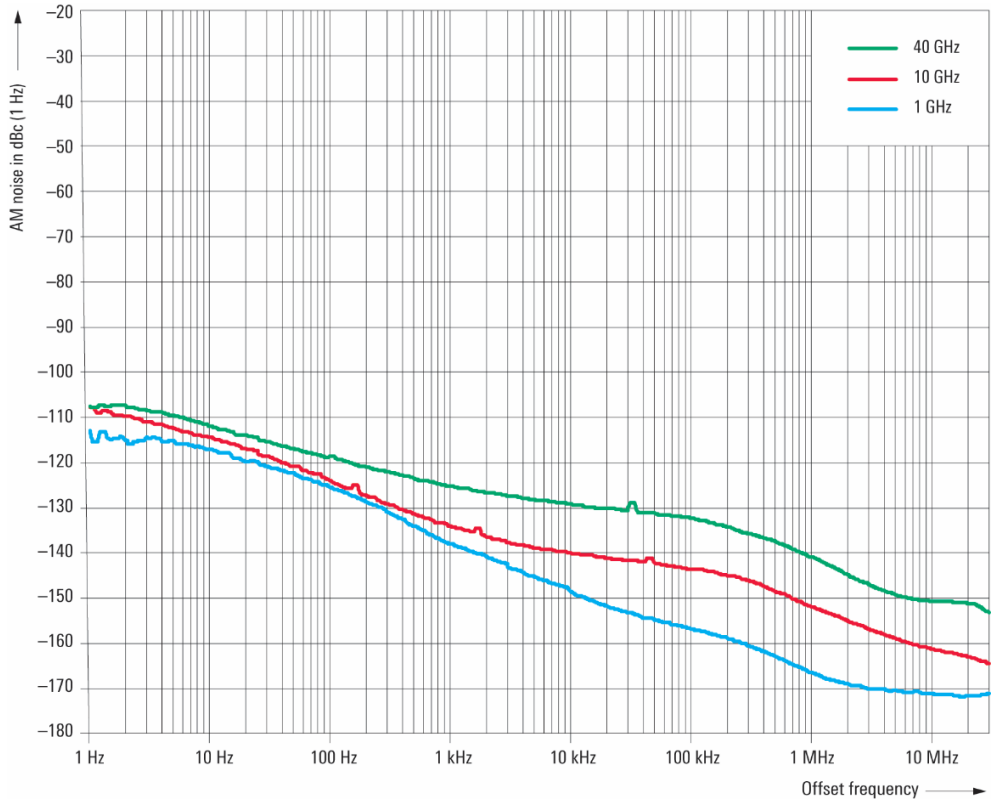
Measured SSB phase noise at f = 10 GHz, standard performance versus the R&S®SMAB-B1H, R&S®SMAB-B709, R&S®SMAB-B710 and R&S®SMAB-B711 options



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 against absolute phase noise



Measured AM noise at f = 1 GHz, 10 GHz and 40 GHz with the R&S®SMAB-B711 option

Analog modulation

Simultaneous modulation

Can be simultaneously combined with →	AM	Scan AM	FM	φM	Pulse modulation	Chirped pulses
AM	○	–	●	–	●	–
	○	–	●	–	–	●
	○	–	–	●	●	–
	○	–	–	●	–	●
Scan AM	–	○	●	–	●	–
	–	○	●	–	–	●
	–	○	–	●	●	–
	–	○	–	●	–	●
FM	●	–	○	–	●	–
	●	–	○	–	–	●
	–	●	○	–	●	–
	–	●	○	–	–	●
φM	●	–	–	○	●	–
	●	–	–	○	–	●
	–	●	–	○	●	–
	–	●	–	○	–	●
Pulse modulation or Chirped pulses	●	–	●	–	–	–
	●	–	–	●	–	–
	–	●	●	–	–	–
	–	●	–	●	–	–

● = compatible, – = incompatible, ○ = compatible with limitations

With certain types of avionics modulation (VOR, ILS, ADF), simultaneous modulation is not possible.

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

For f ≥ 100 kHz, attenuator mode: auto, level (PEP) [8] = 10 dBm or maximum available output power, whichever is lower.
Level = 15 dBm for instruments equipped with R&S®SMAB-B32/-B34 ultra high output power option.
At high levels, modulation is clipped when the maximum PEP is reached.

Modulation source		internal, external, internal + external
External coupling		AC, DC
AM type		linear, exponential
Linear AM depth		
Setting range	internal modulation source	0 % to 100 %
	external modulation source	0 %/V to 100 %/V
Setting resolution		0.01 %(/V)
AM depth (m) error	f_{mod} = 1 kHz and m < 80 %	< (3 % of reading + 1 %)
Exponential AM depth		
Setting range	internal modulation source	0 dB to 30 dB
	external modulation source	0 dB/V to 30 dB/V
Setting resolution		0.01 dB(/V)
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
	15 GHz < f ≤ 20 GHz	< 0.2 rad
	f > 20 GHz	< 0.2 rad (meas.)

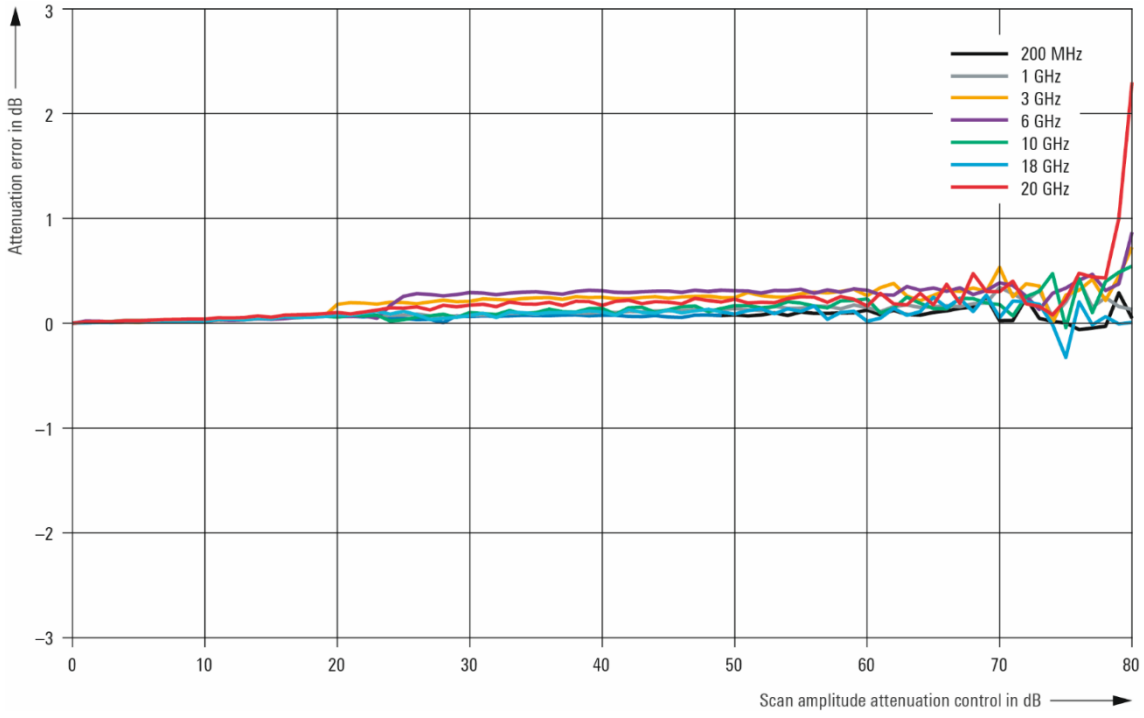
[8] PEP = peak envelope power.

Scan AM (R&S®SMAB-K721 option)

Level (PEP) [8] = 10 dBm or maximum available output power, whichever is lower.
Level = 15 dBm for instruments equipped with R&S®SMAB-B32/-B34/-B35/-B36S/-B37/-B39 ultra high output power option.
Scan AM is available for f > 52 MHz.

Prerequisite: R&S®SMAB-K720 option must be installed.

Modulation source		internal, external, internal + external
External coupling		DC
Scan AM depth		
Setting range	internal modulation source	0 dB to 100 dB
	external modulation source	0 to 100 dB/V
Resolution of setting		0.01 dB
Maximum attenuation		> 60 dB, 70 dB (typ.)
Attenuation error	level setting characteristic: auto, temperature range from +18 °C to +33 °C specifications are measured for f > 40 GHz	
	0 dB < m ≤ 10 dB	< 0.25 dB
	10 dB < m ≤ 20 dB	< 1 dB
	20 dB < m ≤ 40 dB	< 2 dB (typ.)
	40 dB < m ≤ 50 dB	< 3 dB (typ.)
	50 dB < m ≤ 60 dB	< 4 dB (typ.)
Rise/fall time	transition time: 10 % to 90 % (log) for RF amplitude step of 60 dB	< 10 µs (meas.)



Measured scan AM attenuation error with the R&S®SMAB-K721 option

Frequency bands for frequency modulation, phase modulation and chirped pulses

Multiplier N is used to define FM, φM and chirped pulses 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 ≤ 24 GHz	16
	24 GHz < f ≤ 48 GHz	32
	48 GHz < f ≤ 67 GHz	64
	FM mode: high bandwidth, φM mode: high bandwidth, high deviation, chirped pulses	
	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 ≤ 24 GHz	16
	24 GHz < f ≤ 48 GHz	32
	48 GHz < f ≤ 67 GHz	64

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 (external)	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	10 % to 90 % of RF amplitude	
	8 kHz < f ≤ 52 MHz	< 200 ns (meas.)
	52 MHz < f ≤ 700 MHz	< 10 ns, 5 ns (meas.)
	700 MHz < f ≤ 50 GHz	< 10 ns, 5 ns (typ.)
	f > 50 GHz	< 10 ns (meas.)
Minimum pulse width	f > 700 MHz, 50 % / 50 % of RF amplitude	
	R&S®SMAB-B103/-B106/-B112/-B120/ -B131/-B140/-B150/-B167	< 20 ns
	R&S®SMAB-B140N/-B150N/-B167N	30 ns
Pulse repetition frequency		0 Hz to 25 MHz
Video feedthrough	level below 10 dBm or maximum specified level, whichever is lower	
	f ≤ 6 GHz	< 10 % of RF
	f > 6 GHz	< 10 % of RF, < 2 mV (peak-to-peak), whichever is lower
Pulse overshoot		< 10 %
Pulse delay	pulse external trigger to RF	
	f ≤ 6 GHz	60 ns (meas.)
	6 GHz < f ≤ 20 GHz	50 ns (meas.)
	f > 20 GHz	45 ns (meas.)
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

Chirped pulses (R&S®SMAB-K725 option)

Prerequisite: R&S®SMAB-K22 (high performance pulse modulator), R&S®SMAB-K23 (pulse generator) and R&S®SMAB-K720 (AM/FM/φM) options must be installed.

Together with an ideal chirp signal, impairments such as noise, amplitude fluctuations or Doppler drifts can be conveniently added. They are generated using amplitude and frequency modulation on one or more of the additional sources provided by the multifunction generator (R&S®SMAB-K24).

Chirp bandwidth multiplier (N) for different frequency ranges	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 ≤ 24 GHz	16
	24 GHz < f ≤ 48 GHz	32
	48 GHz < f ≤ 67 GHz	64
Modulation source	internal	
Trigger modes	continuous trigger with internal trigger source	• auto • externally triggered • externally gated
Trigger slope	external trigger signal	positive, negative
Gate polarity	external gate signal	normal, inverse
Input impedance	external trigger/gate signal	50 Ω, 10 kΩ (nom.)
Chirp direction		up, down
Maximum bandwidth		N × 20 MHz
Pulse period setting range		1.0 µs to 100 s
Pulse width setting range		100 ns to 100 s, pulse width < (pulse period – 600 ns)
Pulse parameter setting resolution		5 ns
Maximum chirp rate		N × 20 MHz/µs (nom.)

VOR modulation (R&S®SMAB-K25 option)

Attenuator mode AUTO, level (PEP) [9] within specified level range.
VOR specification valid for carrier frequency range from 108 MHz to 118 MHz.

VOR operating modes	generation of VOR signal	NORM
	30 Hz VAR tone	VAR
	9.96 kHz carrier, unmodulated	subcarrier
	9.96 kHz carrier, modulated	subcarrier + FM
Modulation tones		
Frequency error	30 Hz (VAR, REF)	< (0.001 Hz + relative deviation of reference frequency × 30 Hz)
Frequency setting range	30 Hz REF	10 Hz to 60 Hz
	9.96 kHz FM carrier	5 kHz to 15 kHz
	COM/ID tone	0.1 Hz to 20 kHz
Frequency setting resolution		0.1 Hz
FM deviation setting range	9.96 kHz FM carrier	0 Hz to 960 Hz
FM deviation setting resolution	9.96 kHz FM carrier	1 Hz
FM deviation error	9.96 kHz FM carrier at 480 Hz deviation	< 1 Hz
External AM tone	input connector	Ext 1
Modulation depth Sum of modulation depths of 30 Hz (VAR) signal, 9.96 kHz FM carrier, COM/ID and external AM signal must not exceed 100 %.		
AM depth setting range		0 % to 100 %
AM depth setting resolution		0.1 %
AM depth error	30 Hz (VAR, REF), 30 % AM depth	< 0.5 % AM depth
	9.96 kHz FM carrier, 30 % AM depth	< 0.5 % AM depth
	COM/ID, tone = 1020 Hz, depth = 10 %	< 0.5 % AM depth
External AM tone	sensitivity	0.01 V/%

[9] PEP = peak envelope power.

Bearing angle		
Setting range		0° to 360°
	default setting	0.00°
Setting resolution		0.01°
Error		< 0.05°

ILS modulation (R&S®SMAB-K25 option)

Attenuator mode AUTO, level (PEP) [9] within specified level range.
ILS-LOC specification valid for carrier frequency range from 108 MHz to 118 MHz.
ILS-GS specification valid for carrier frequency range from 329 MHz to 335 MHz.

ILS modulation	generation of ILS localizer signal, COM/ID tone possible	ILS-LOC
	generation of ILS glideslope signal	ILS-GS
ILS operating modes	NORM	90 Hz + 150 Hz + COM/ID tone (ILS-LOC)
	90 Hz	suppression of 150 Hz modulation tone
	150 Hz	suppression of 90 Hz modulation tone
ILS modulation tones If the frequency of the 90 Hz or 150 Hz tone is varied, the other tone is automatically changed in proportion.		
Frequency error		< (0.02 Hz + relative deviation of reference frequency × ILS tone frequency)
Frequency setting range	90 Hz tone	60 Hz to 120 Hz
	150 Hz tone	100 Hz to 200 Hz
	COM/ID tone	0.1 Hz to 20 kHz
Frequency setting resolution	90 Hz tone	0.3 Hz
	150 Hz tone	0.5 Hz
	COM/ID tone	0.1 Hz
External AM tone	input connector	Ext 1
Modulation depth Sum of modulation depths of 90 Hz, 150 Hz, COM/ID and external AM signal must not exceed 100 %.		
Setting range	SDM of 90 Hz, 150 Hz, COM/ID tone	0 % to 100 %
	ILS-LOC default setting	40 %
	ILS-GS default setting	80 %
Setting resolution	SDM and COM/ID depth	0.1 %
AM depth error	SDM = 40 %	< 0.8 % AM depth
	SDM = 80 %	< 1.6 % AM depth
	COM/ID, tone = 1020 Hz, depth = 10 %	< 0.5 % AM depth
External AM tone	sensitivity	0.01 V/%
Difference in depth of modulation (DDM)		
Setting range		0 to ±SDM
Setting resolution		0.0001
Error		< 0.0003 + 2 % of set DDM
ILS phase		
Setting range		0° to 120°
Setting resolution		0.01°
Error		< 0.05°

Marker beacon (MKR BCN) (R&S®SMAB-K25 option)

Attenuator mode AUTO, level (PEP) within specified level range.
MKR-BCN specification valid for carrier frequency range from 74 MHz to 76 MHz.

Marker beacon modulation tones		
Frequency error		< (0.001 Hz + relative deviation of reference frequency × marker frequency)
Marker frequencies		400 Hz, 1300 Hz and 3000 Hz
COM/ID tone frequency setting range		0.1 Hz to 20 kHz
COM/ID tone frequency setting resolution		0.1 Hz
Marker beacon modulation depth Sum of modulation depths of marker tone and COM/ID signal must not exceed 100 %.		
AM depth setting range		0 % to 100 %
	marker tone default setting	95 %
AM depth setting resolution		0.1 %
AM depth error	marker tone	< 4 % AM depth
	COM/ID, tone = 1020 Hz	< 0.5 % AM depth

ADF mode (R&S®SMAB-K25 option)

The ADF mode provides a carrier frequency of 190 kHz with 30 % AM depth at 1 kHz modulation rate.

Frequency error	ADF tone	< (0.001 Hz + relative deviation of reference frequency × ADF frequency)
ADF frequency setting range		0.1 Hz to 20 kHz
ADF setting resolution		0.1 Hz
AM depth setting range		0 % to 100 %
AM depth setting resolution		0.1 %
	ADF tone default setting	30 %

Sources for analog modulation

Modulation sources for AM, Scan AM, FM and φM

3 different modulation sources are available as modulation signals:

- Internal modulation generator (standard feature)
- Multifunction generator (R&S®SMAB-K24 option)
- External modulation signals

The AM or Scan AM and FM or φM modulation sources 1 and 2 can be selected individually or simultaneously.
The LF generators 1 and 2 and the noise generator are part of the multifunction generator (R&S®SMAB-K24 option).

AM or Scan AM	
Modulation source 1 [10]	Modulation source 2 [10]
LF generator 1	LF generator 1
LF generator 2	LF generator 2
Noise	Noise
External 1	External 1
External 2	External 2

FM or φM	
Modulation source 1 [10]	Modulation source 2 [10]
LF generator 1	LF generator 1
LF generator 2	LF generator 2
Noise	Noise
External 1	External 1
External 2	External 2

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, square, pulse, triangle, trapezoid
	LF generator 2	sine, square, pulse, triangle, trapezoid
	noise generator (noise amplitude distribution)	Gaussian, uniform
Frequency range	sine	0.1 Hz to 10 MHz
	square	0.1 Hz to 1 MHz
	pulse, triangle, trapezoid	0.01 Hz to 1 MHz (displayed value)
	noise bandwidth	100 kHz to 10 MHz
Resolution of setting	sine, square	0.01 Hz
	pulse, triangle, trapezoid	10 ns
	noise bandwidth	100 kHz
Frequency error	sine	< (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 %

[10] One out of five sources can be selected.

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 setting resolution	linear	0.1 Hz
	logarithmic	0.01 %
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		digital signal with 0 V/4.2 V (nom.) with no load, source resistance: R_S = 50 Ω (nom.), load impedance: R_L ≥ 50 Ω
SYNC pulse width		5 ns (nom.)
VIDEO output	output of pulse generator signal	
Connector type	PULSE VIDEO output	BNC female
VIDEO output level		digital signal with 0 V/4.2 V (nom.) with no load, source resistance: R_S = 50 Ω (nom.), load impedance: R_L ≥ 50 Ω

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.

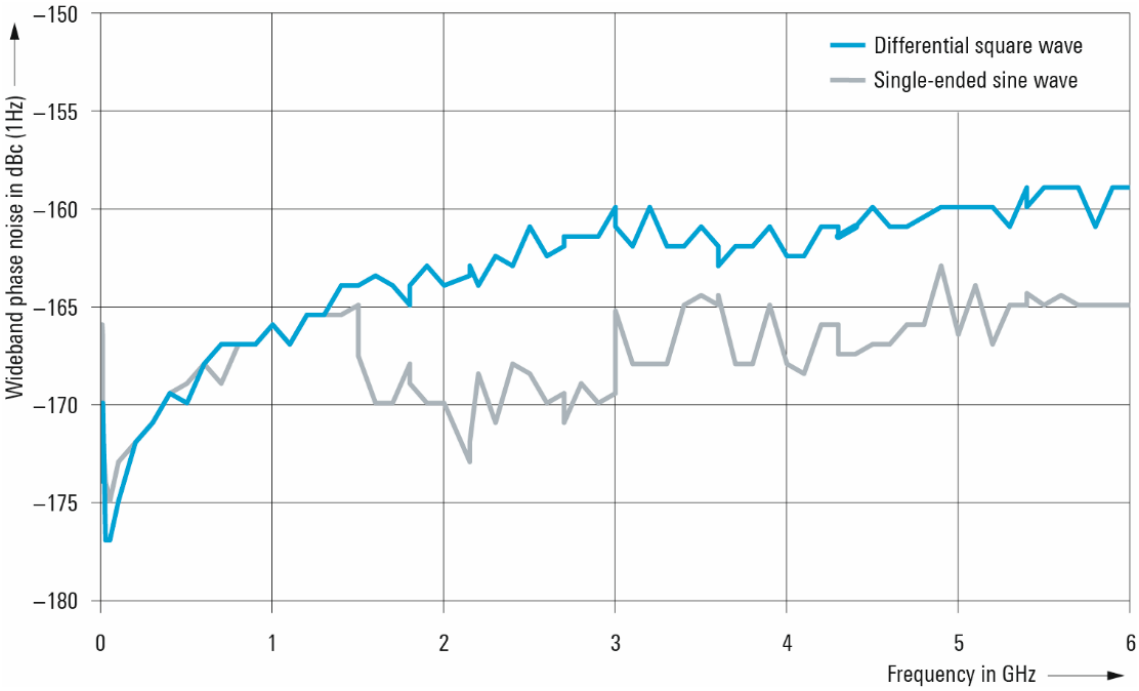
The R&S®SMAB-K722 option is not available for instruments equipped with the 3 GHz R&S®SMAB-B103 RF frequency option. The frequency of the clock synthesizer (R&S®SMAB-B29 option) can be set independently of the RF frequency of the R&S®SMAB100A.

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

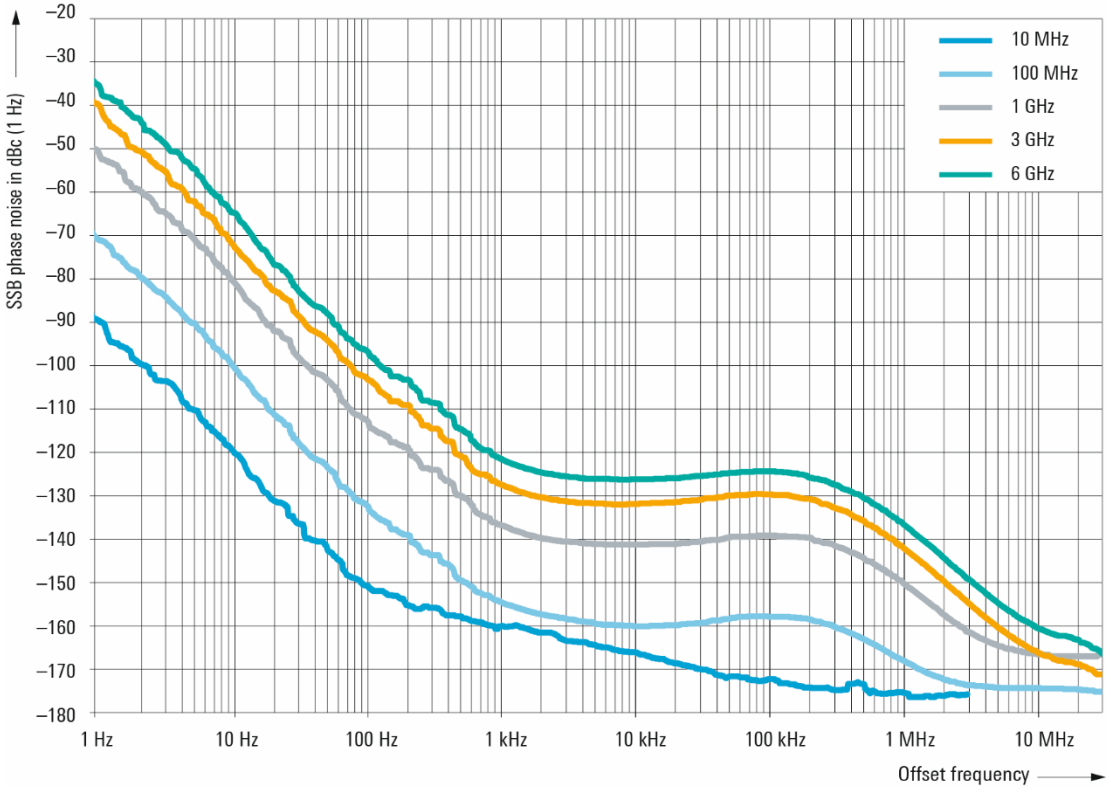
Output types		differential square wave, differential sine wave, single-ended sine wave, differential CMOS
Frequency		
Frequency range	differential square wave, single-ended sine wave	100 kHz to 3 GHz
	differential sine wave	10 MHz to 3 GHz
	with R&S®SMAB-K722 option	10 MHz to 6 GHz
	differential square 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 setting 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/-B82 rear panel connector option	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-B709/-B710(N)/-B711(N)	
	f ≤ 1.5 GHz	< –100 dBc
	1.5 GHz < f ≤ 3 GHz	< –94 dBc
	3 GHz < f ≤ 6 GHz	< –88 dBc

Subharmonics [11]	level = 10 dBm, sine wave	
	f ≤ 3 GHz	< –94 dBc
	3 GHz < f ≤ 6 GHz	< –88 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(N) 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, –162 dBc (typ.)
	f = 1 GHz	< –135 dBc, –142 dBc (typ.)
	f = 2 GHz	< –129 dBc, –136 dBc (typ.)
	f = 3 GHz	< –125 dBc, –133 dBc (typ.)
	f = 4 GHz	< –123 dBc, –130 dBc (typ.)
	f = 6 GHz	< –119 dBc, –126 dBc (typ.)
	instruments equipped with R&S®SMAB-B709/-B710(N)/-B711(N)	
	f = 10 MHz	< –163 dBc, –168 dBc (typ.)
	f = 100 MHz	< –158 dBc, –164 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, –130 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.)
With R&S®SMAB-B709 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	129 fs (meas.)
	f = 2.488 GHz, BW = 5 kHz to 20 MHz	13.6 fs (meas.)
With R&S®SMAB-B710(N) or R&S®SMAB-B711(N) 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.)

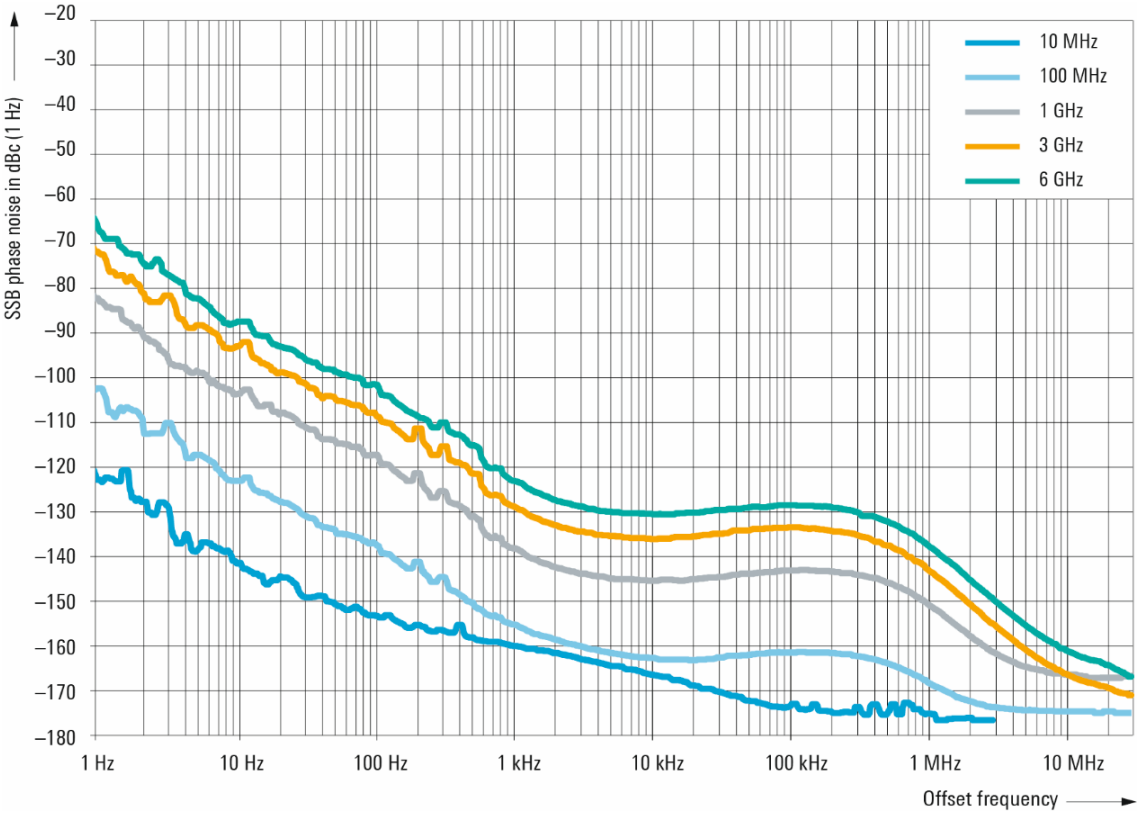
[11] Specifications are not valid for subharmonics beyond “specified frequency range”.



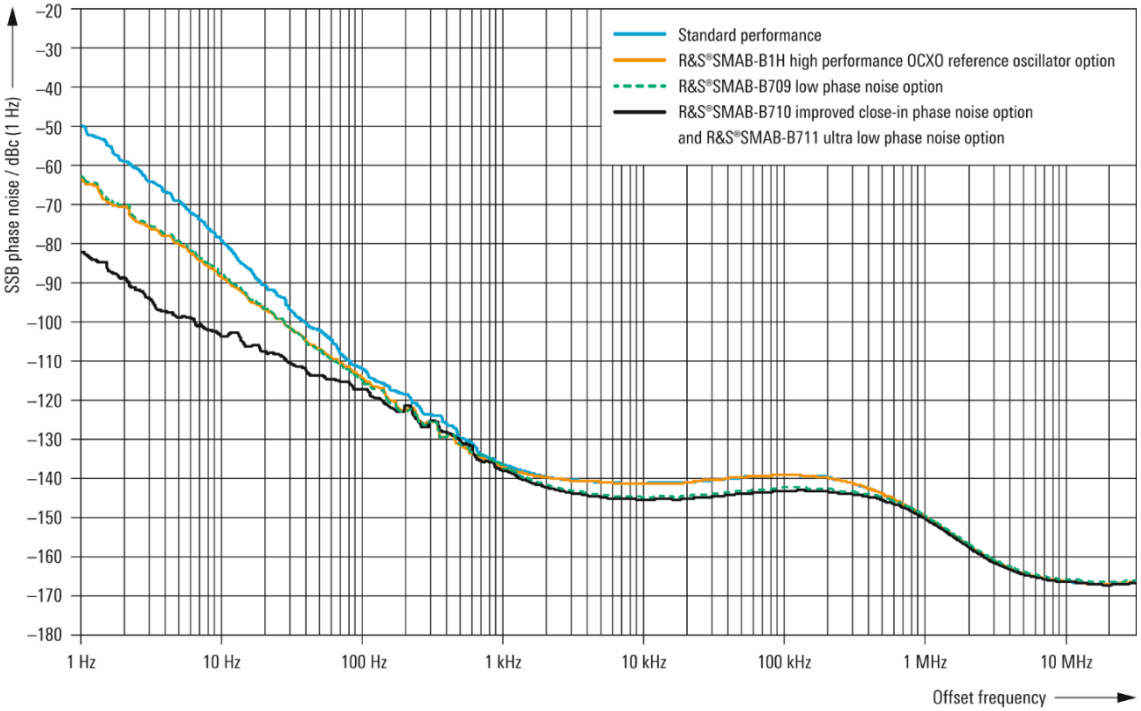
Measured wideband noise of clock synthesizer output at maximum output power versus carrier frequency with the R&S®SMAB-B29 and R&S®SMAB-K722 options. Measured with the R&S®FSWP phase noise analyzer



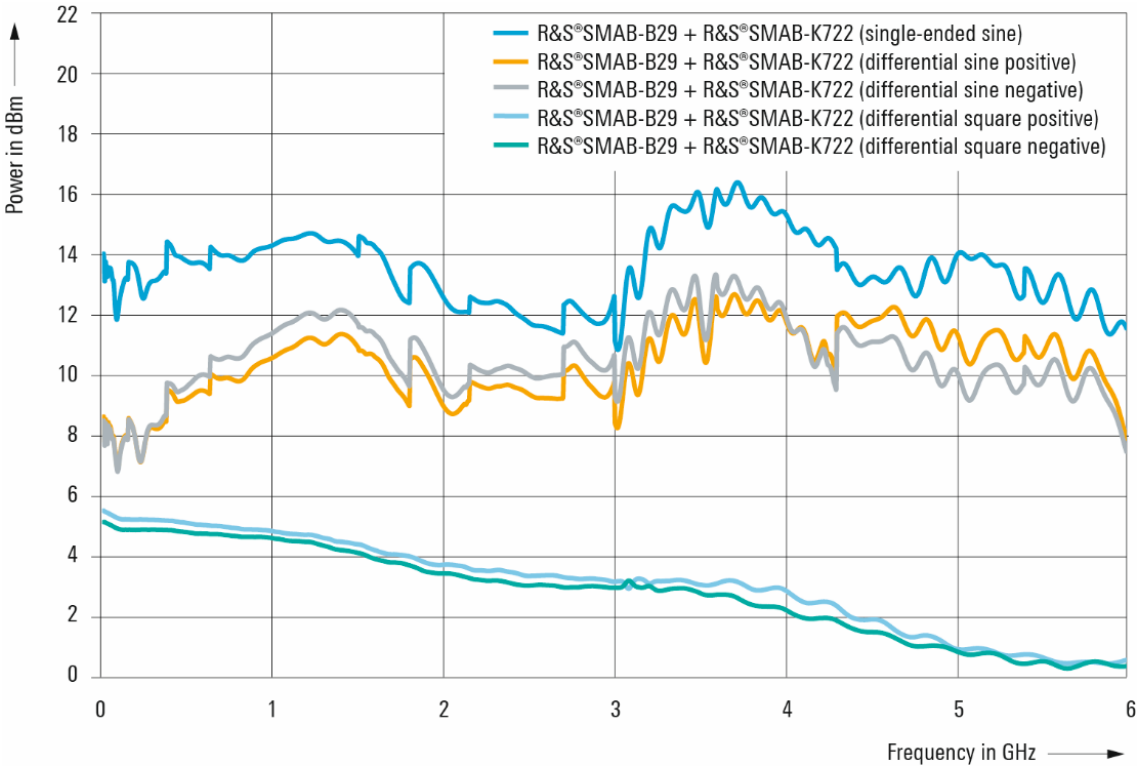
Measured SSB phase noise of clock synthesizer (standard performance) with the R&S®SMAB-B29 and R&S®SMAB-K722 options



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



Measured SSB phase noise of clock synthesizer at f = 1 GHz, standard performance versus the R&S®SMAB-B1H, R&S®SMAB-B709, R&S®SMAB-B710(N) and R&S®SMAB-B711(N) options



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

R&S®NRP-Z power analysis (R&S®SMAB-K28 option)

Overview of supported power sensor and functionalities

Latest power sensor firmware version is recommended.

Power sensor	Power versus frequency and power versus power	Power versus time	Pulse data measurement
R&S®NRP-Z81/-Z85/-Z86	●	●	●

● = supported, – = not supported.

Modes		• power versus frequency • power versus power • power versus time (trace mode)
General settings		
Number of points per sweep (= steps)		10 to 1000
Frequency range	depending on R&S®NRP-Zxx power sensor and R&S®SMA100B frequency option	full frequency range of signal generator or power sensor (whichever is lower); support of frequency-converting DUTs
Y-axis setting range		–200 dBm to +100 dBm
Uncertainty of measured power	determined by power sensor used and timing mode (noise)	see R&S®NRP data sheet (PD 3607.0852.22)
Sweep mode		• single • continuous
Number of traces	used for sensor data or as reference trace	4
Number of markers		4
Trace data export	supported file formats	JPG, BMP, XPM, PNG, CSV
Resolution of saved graphic file	for JPG, BMP, XPM and PNG file format	800 × 480 pixel (size of screen)

Power versus frequency mode		
Spacing		linear, logarithmic
Timing mode		fast, normal
Sweep time	depends on timing mode, number of steps and power sensor	set automatically
	e.g. R&S®NRP-Z81 timing mode FAST, 200 steps	approx. 2.5 s
Power versus power mode		
Spacing		dB steps
Timing mode		fast, normal
Sweep time	depends on timing mode, steps and power sensor	set automatically
	e.g. R&S®NRP-Z81 timing mode FAST, 200 steps	approx. 2.5 s
Power versus time mode (trace mode)		
Spacing		linear
Sweep time	R&S®NRP-Z81/-Z85/-Z86	
	setting range	100 ns to 1 s
	resolution (sweep time/steps) ≥ 12.5 ns	12.5 ns
	resolution (sweep time/steps) < 12.5 ns, periodic signals, trigger mode internally triggered	2 ns
Trace offset	with reference to trigger event	positive, negative
Average		1 to 1024
Trigger modes	internally triggered	auto, free run, internal
	externally triggered, R&S®NRP-Z3 required	external
Trigger level setting range	depends on power sensor used	see R&S®NRP data sheet (PD 3607.0852.22)
Trigger hysteresis setting range		0 dB to 10 dB
Trigger dropout time setting range		0 ns to 10 s
Available measurements in time mode		
Gate function		
Number of gates	user-selectable	2
Power measurements		peak power, average power
Pulse data measurement, only with R&S®NRP-Z81/-Z85/-Z86		
Timing measurements		duty cycle, pulse width, pulse period, pulse off time, rise time, pulse start time, overshoot, fall time, pulse stop time
Power measurements		peak power, average power, minimal power, top power, base power, distal power, mesial power, proximal power
Setting range for distal, mesial and proximal threshold	voltage or power-related	0 % to 100 %

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) [12]
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. For each emulated instrument, the *IDN? and *OPT? strings can be configured to meet the specific requirements. This is particularly useful for the Aeroflex/IFR/Marconi instruments since the manufacturer ID changed over time and for the Hewlett-Packard/Agilent instruments to adapt to a specific suffix and configuration.	**Hewlett Packard** • HP 8340, HP 8341 • HP 8360 • HP 83620, HP 83622, HP 83623, HP 83624 • HP 83630, HP 83640, HP 83650 • HP 8373 • HP 83711, HP 83712 • HP 83731, HP 83732 • HP 8642, HP 8643, HP 8644, HP 8645 • HP 8647, HP 8648 • HP 8656, HP 8657 • HP 8662, HP 8663, HP 8664, HP 8665 • HP 8673 **Agilent/Keysight Technologies** • E4421, E4422, E4428 • E8257, E8663 • N5161, N5181, N5183 • N5171, N5173 **Aeroflex (IFR/Marconi)** • 2023, 2024 • 2030, 2031, 2032 • 2040, 2041, 2042 **Anritsu** • 68017, 68037 **Panasonic** • VP-8303A **Racal Dana** • 3102, 9087 **Rohde & Schwarz** • R&S®SMA100A • R&S®SME02/03/06 • R&S®SMF100A • R&S®SMG/SMH • R&S®SMGU/SMHU • R&S®SML01/02/03 • R&S®SMP02/03/04 • R&S®SMR20/27/30/40 • R&S®SMT02/03/06 • R&S®SMY01/02
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

[12] Requires the R&S®TS-USB1 serial adapter (recommended extra).

Connectors

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

Model 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.

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

Model with 2 or 3 HU and equipped with an R&S®SMAB-B80/-B81/-B82 rear panel connector option: all except USB on the rear panel.

RF 50 Ω	RF output	
	R&S®SMAB-B103/-B106	N female
	R&S®SMAB-B112/-B120/-B131/ -B140/-B140N	test port adapter, PC 2.92 mm female (interchangeable port connector system)
	R&S®SMAB-B150/-B167/-B150N/ -B167N	1.85 mm female (instrument equipped with interchangeable 1.85 mm female/female wear and tear adapter, factory calibration plane is at the output of the adapter)
LF	LF generator output	BNC female
Ext 1, Ext 2	input for external analog modulation (AM, FM, φM, Scan AM)	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.)
Input voltage range	Scan AM	
	Ext 1	–6 V to 0 V
	Ext 2	–1 V to 0 V
Input damage voltage	50 Ω input impedance	< –7 V or > +7 V
	600 Ω and 100 kΩ input impedance	< –10 V or > +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 voltage	0 V to 2.0 V (nom.)
Input damage voltage		< –0.5 V or > +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 power sensor	6-pin ODU mini-snap series B, mechanically compatible with 8-pin ODU mini-snap series B
USB	USB 2.0 connector for external USB devices such as mouse, keyboard, R&S®NRP 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 Syn	clock synthesizer output	SMA female
Clk Syn_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, high state indicates that the instrument has settled to its final value	BNC female/digital signal
V/GHz X-Axis	with R&S®SMAB-B28 option, delivers voltage level proportional to absolute sweep frequency or sweep progress	BNC female
Load impedance		≥ 1 kΩ
Z-Axis	with R&S®SMAB-B28 option, delivers pulses with different levels to indicate frequency markers and blanking signals	BNC female
Load impedance		≥ 10 kΩ
Stop	with R&S®SMAB-B28 option, bidirectional signal to indicate halted sweep or to stop sweep by external device	BNC female/digital signal
Input polarity		low active
Marker User 1	with R&S®SMAB-B28 option, pulse output to mark selected frequencies	BNC female/digital signal
Input polarity	selectable	normal, inverse
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 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
IEEE-488	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	model 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)
	model with 3 HU (R&S®SMAB-B93 option)	7.3 A to 4.6 A (50 Hz to 60 Hz/400 Hz)
Rated power	model with 2 HU (R&S®SMAB-B92 option), when fully equipped	300 W (meas.)
	model with 3 HU (R&S®SMAB-B93 option), when fully equipped	380 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, 1.2 g (RMS) acceleration, 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	operating	0 °C to +55 °C
	operating, with R&S®SMAB-B36S option	0 °C to +45 °C
	storage	–40 °C to +71 °C, temperature gradient < 5 K/h
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 (W × H × D)	model with 2 HU (R&S®SMAB-B92 option)	460 mm × 107 mm × 503 mm (18.1 in × 4.21 in × 19.8 in)
	without front handles and feet	445 mm × 89 mm × 485 mm (17.5 in × 3.5 in × 19.1 in)
	model with 3 HU (R&S®SMAB-B93 option)	460 mm × 151 mm × 503 mm (18.1 in × 5.95 in × 19.8 in)
	without front handles and feet	445 mm × 133 mm × 485 mm (17.5 in × 5.24 in × 19.1 in)
Weight	model with 2 HU (R&S®SMAB-B92 option), when fully equipped	14.4 kg (31.7 lb)
	model with 3 HU (R&S®SMAB-B93 option), when fully equipped	18.0 kg (39.6 lb)
Display		
Resolution		800 × 480 pixel
Size	2 HU model	5" touch display
	3 HU model	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 [13] 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
8 kHz to 31.8 GHz	R&S®SMAB-B131	1420.8888.02
8 kHz to 40 GHz	R&S®SMAB-B140	1420.8988.02
8 kHz to 40 GHz	R&S®SMAB-B140N	1420.8965.02
8 kHz to 50 GHz	R&S®SMAB-B150	1420.9049.02
8 kHz to 50 GHz	R&S®SMAB-B150N	1420.9026.02
8 kHz to 67 GHz	R&S®SMAB-B167	1420.9149.02
8 kHz to 67 GHz	R&S®SMAB-B167N	1420.9126.02
Platform height options		
2 HU with 5" touch display	R&S®SMAB-B92	1420.8288.04
3 HU with 7" touch display	R&S®SMAB-B93	1420.8388.04
Phase noise performance and reference oscillator options		
High performance OCXO reference oscillator [14]	R&S®SMAB-B1H	1420.8188.02
Low phase noise [14]	R&S®SMAB-B709	1420.9849.02
Improved close-in phase noise performance for R&S®SMAB-B106/-B112/-B120/-B131/-B140/-B150/-B167 [14]	R&S®SMAB-B710	1420.8007.02
Improved close-in phase noise performance for R&S®SMAB-B103 [14]	R&S®SMAB-B710N	1420.8107.02
Ultra low phase noise for R&S®SMAB-B106/-B112/-B120/-B131/-B140/-B150/-B167 [14]	R&S®SMAB-B711	1420.8020.02
Ultra low phase noise for R&S®SMAB-B103 [14]	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 [15]	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 [16]	R&S®SMAB-B34	1420.7400.02
High output power 31.8 GHz/40 GHz [17]	R&S®SMAB-B35	1420.7500.02
Ultra high output power 31.8 GHz/40 GHz [18]	R&S®SMAB-K36	1420.9178.02
Super ultra high output power 31.8 GHz/40 GHz [19]	R&S®SMAB-B36S	1420.9190.02
High output power 50 GHz [17]	R&S®SMAB-B37	1420.7700.02
Ultra high output power 50 GHz [20]	R&S®SMAB-K38	1420.9255.02
High output power 67 GHz [17]	R&S®SMAB-B39	1420.7900.02
Ultra high output power 67 GHz [21]	R&S®SMAB-K40	1420.9278.02

[13] 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.

[14] Only one of the following six options can be installed: R&S®SMAB-B1H, R&S®SMAB-B709, R&S®SMAB-B710, R&S®SMAB-B710N, R&S®SMAB-B711, R&S®SMAB-B711N.

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

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

[17] Requires R&S®SMAB-B93 3 HU option.

[18] R&S®SMAB-K36 can only be ordered in combination with R&S®SMAB-B35.

[19] R&S®SMAB-B36S can only be ordered in combination with R&S®SMAB-B35 and R&S®SMAB-K36.

[20] R&S®SMAB-K38 can only be ordered in combination with R&S®SMAB-B37.

[21] R&S®SMAB-K40 can only be ordered in combination with R&S®SMAB-B39.

Designation	Type	Order No.
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
VOR/ILS	R&S®SMAB-K25	1420.9855.02
Pulse train [22]	R&S®SMAB-K27	1420.9749.02
AM/FM/φM	R&S®SMAB-K720	1420.9790.02
Scan AM [23]	R&S®SMAB-K721	1420.9784.02
Chirp signal generation [24]	R&S®SMAB-K725	1420.9861.02
Additional performance options		
Power analysis	R&S®SMAB-K28	1420.9755.02
Ramp sweep	R&S®SMAB-B28	1420.6579.02
Differential clock synthesizer 3 GHz	R&S®SMAB-B29	1420.8088.02
Clock synthesizer frequency extension to 6 GHz (not available for instruments equipped with R&S®SMAB-B103)	R&S®SMAB-K722	1420.9810.02
High dynamic uninterrupted level sweep [25]	R&S®SMAB-K724	1420.9832.02
Other options		
Rear panel connectors (3 GHz/6 GHz)	R&S®SMAB-B80	1420.6504.02
Rear panel connectors (12.75 GHz/20 GHz/31.8 GHz/40 GHz), PC 2.92 mm	R&S®SMAB-B81	1420.6510.02
Rear panel connectors (50 GHz/67 GHz), PC 1.85 mm	R&S®SMAB-B82	1420.6527.02
Removable mass storage	R&S®SMAB-B85	1420.6556.02
Remote control GPIB and USB	R&S®SMAB-B86	1420.6562.02
Spare SD card	R&S®SMAB-Z10	1420.6662.02
Recommended extras		
19" rack adapter for 2 HU model	R&S®ZZA-KNP21	1177.8803.00
19" rack adapter for 3 HU model	R&S®ZZA-KNP31	1177.8810.00
Transport case for 2 HU and 3 HU model	R&S®ZZK-CASE	1174.1443.02
USB serial adapter, for RS-232 remote control	R&S®TS-USB1	6124.2531.00
Adapters for instruments with an R&S®SMAB-B112/-B120/-B131/-B140(N) 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 mm male		1036.4802.00
Test port adapter, N female		1036.4777.00
Test port adapter, N male		1036.4783.00
Adapter for instruments with an R&S®SMAB-B150(N)/-B167(N) frequency option		
Wear and tear adapter, 1.85 mm female/female		3588.9654.00
Documentation		
Documentation of calibration values	R&S®DCV-2	0240.2193.18
R&S®SMA100B accredited calibration; up to 6 GHz	R&S®ACASMA100B	3598.3307.03
R&S®SMA100B accredited calibration; 12.75 GHz to 40 GHz	R&S®ACASMA100B	3598.3236.03
R&S®SMA100B accredited calibration; 50 GHz to 67 GHz	R&S®ACASMA100B	3598.3207.03

[22] Requires R&S®SMAB-K23 pulse generator option.

[23] Requires R&S®SMAB-K720 AM/FM/φM option. For instruments with a serial number < 102000, please contact the Rohde & Schwarz service department.

[24] Requires R&S®SMAB-K22 high performance pulse modulator option, R&S®SMAB-K23 pulse generator option and R&S®SMAB-K720 AM/FM/φM option. FW version > 4.70.xxx required.

[25] For instruments with a serial number < 102000, please contact the Rohde & Schwarz service department.

Warranty		
Base unit		3 years
All other items [26]		1 year
Service 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 [27]. 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 [27] 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 [27] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

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

[27] 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

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- ► Energy efficiency and low emissions
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