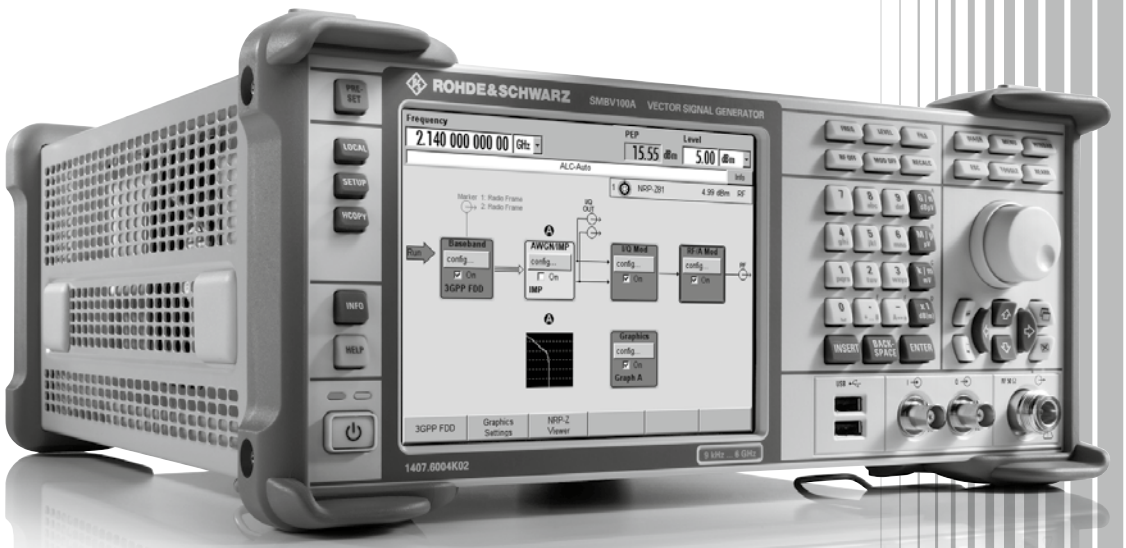
R&S®SMBV100A
Vector Signal Generator
Specifications



ROHDE&SCHWARZ

CONTENTS

Key features

Ready for future applications today

- Future-ready hardware concept
- RF section with high output level up to 6 GHz
- Wide RF signal bandwidth of up to 120 MHz during internal signal generation
- Maximum RF bandwidth of I/Q modulator exceeds 500 MHz
- Always up-to-date with software upgrades

Customized internal signal generation with optional baseband

- Baseband coder with realtime capabilities for direct signal generation
- Integrated ARB for playback of precalculated waveforms
- ARB-only versions with different bandwidths
- Memory depth of up to 256 Msample for long test sequences

Support of all important state-of-the-art digital standards

- Straightforward signal configuration due to easy-to-use GUI
- 2G/3G/LTE mobile radio standards
- Wireless standards incl. mobile WiMAX™ and WLAN IEEE 802.11n
- GNSS: GPS and Galileo

High-performance RF for all kinds of applications

- Excellent phase noise ensures low EVM with digital signals
- High output level compensates for losses in the test/system setup
- Fast settling time for quicker measurements
- Analog modulation for basic measurements

Flexible signal processing and baseband connectivity

- CW interference and AWGN simulation
- Analog and digital baseband outputs
- Support for R&S®EX-IQ-Box digital interface module

Low cost of ownership due to service concept

- Fast on-site servicing
- Long calibration interval (three years) minimizes service costs
- Straightforward modular design for short repair times

Allrounder and specialist at the same time

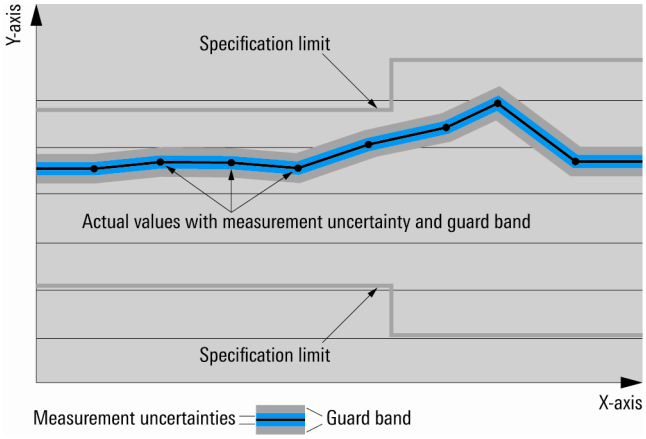
- Optimized for high production throughput
  - Multisegment waveform mode for fast switchover between test sequences
  - High level repeatability for stable test conditions
- Prepared for aerospace and defense applications
  - Versatile capabilities for generating unmodulated as well as complex modulated pulses
  - Coupling of multiple instruments for phase-coherent RF generation

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.

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

Specifications

RF performance

Frequency

Range	R&S®SMBV-B103	
	CW mode	9 kHz to 3.2 GHz
	I/Q mode	1 MHz to 3.2 GHz
	R&S®SMBV-B106	
	CW mode	9 kHz to 6 GHz
	I/Q mode	1 MHz to 6 GHz
Resolution of setting		0.001 Hz
Resolution of synthesis	f = 1 GHz	0.44 µHz (nom.)
Setting time	to within < 1×10^{-7} for f > 200 MHz or < 20 Hz for f ≤ 200 MHz	
	after IEC/IEEE bus delimiter	
	ALC state ON, CW mode	< 3 ms
	ALC state ON, I/Q mode	< 5 ms
	ALC state Table	< 2.5 ms
	ALC state S&H	< 7 ms
	after trigger pulse in List mode [1]	< 1 ms
Resolution of phase offset setting		0.1°

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	internal	timer
	external	external trigger signal (INST TRIG at rear), rotary knob, remote control
Trigger slope	external trigger signal	positive, negative
Sweep range		full frequency range
Sweep shape		triangle, sawtooth
Step spacing		linear, logarithmic
Step size	linear	full frequency range, minimum 0.001 Hz
	logarithmic	0.01 % to 100 %
Dwell time range		10 ms to 10 s
Dwell time resolution		0.1 ms

Reference frequency

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

[1] ALC state Sample & Hold (S&H) or ALC state Table.

Input for external reference		
Connector type	REF IN on rear panel	BNC female
Input frequency		5 MHz, 10 MHz
Frequency locking range		± 3 × 10^{-6}
Input level range		0 dBm to +16 dBm
Input impedance		50 Ω (nom.)

Level

Level setting modes:

The R&S®SMBV100A offers two different operating modes for level setting:

AUTO MODE: The step attenuator is switched over automatically.

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

ALC modes:

The R&S®SMBV100A has four different automatic level control (ALC) modes:

ALC STATE AUTO: The best suited ALC mode is set automatically.

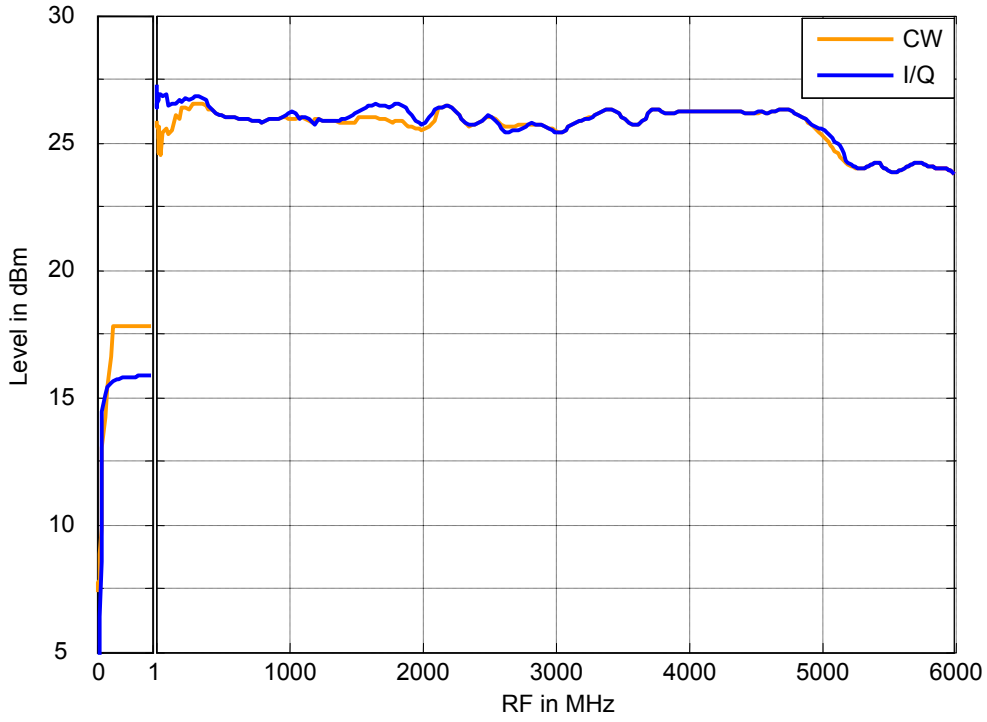
ALC STATE ON: The level control loop is closed. This mode is suitable for CW, AM and modulation signals with constant envelope.

ALC STATE SAMPLE & HOLD (S&H): At every frequency and level change, the level control loop is closed for about 1 ms and the level control voltage is sampled. The level control voltage is then clamped. This mode is used internally while in ALC state Auto for I/Q and pulse modulation.

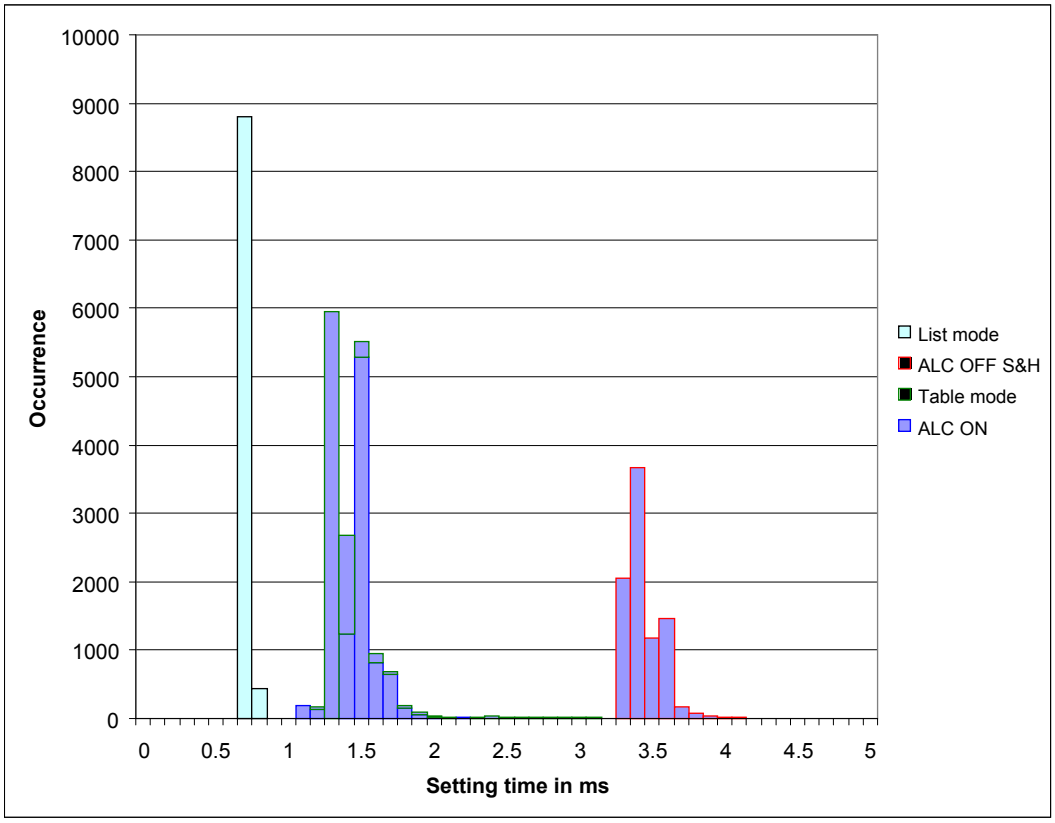
ALC STATE TABLE: The level control voltage is obtained during a learning cycle as a function of level and frequency at discrete points. At normal operation the level control voltage is interpolated between the obtained values and set. This mode is suitable for I/Q and pulse modulation. The setting times are significantly faster than in the S&H mode, but the absolute level accuracy is slightly inferior due to the interpolation error and temperature changes after the learning cycle.

Setting range	1 MHz ≤ f ≤ 6 GHz	–145 dBm to +30 dBm
	300 kHz ≤ f < 1 MHz	–145 dBm to +18 dBm
	100 kHz ≤ f < 300 kHz	–145 dBm to +13 dBm
	9 kHz ≤ f < 100 kHz	–145 dBm to +8 dBm
Specified level range	1 MHz ≤ f ≤ 6 GHz	–120 dBm to +18 dBm (PEP) [2]
	200 kHz ≤ f < 1 MHz	–120 dBm to +13 dBm (PEP)
Resolution of setting		0.01 dB
Level error	ALC state ON temperature range +18 °C to +33 °C in specified level range	
	200 kHz ≤ f ≤ 3 GHz	< 0.5 dB
	f > 3 GHz	< 0.9 dB
Additional level error	ALC state S&H	< 0.25 dB
	ALC state Table	< 0.5 dB
Output impedance VSWR in 50 Ω system	f > 200 kHz	< 1.8
Setting time	to < 0.1 dB deviation from final value, with GUI update stopped, temperature range +18 °C to +33 °C	
	after IEC/IEEE bus delimiter	
	ALC state ON	
	CW mode	< 2.5 ms
	I/Q mode	< 5 ms
	ALC state Table	< 2.5 ms
	ALC state S&H	< 7 ms
	in List mode after trigger pulse	< 1 ms
Interruption-free level setting range	Fixed mode, ALC state ON	0 dB to +20 dB
Reverse power (from 50 Ω source)	maximum permissible RF power in output frequency range of RF path for f ≥ 1 MHz	
	1 MHz ≤ f ≤ 1 GHz	50 W
	1 GHz < f ≤ 2 GHz	25 W
	2 GHz < f ≤ 6 GHz	10 W
Maximum permissible DC voltage		50 V

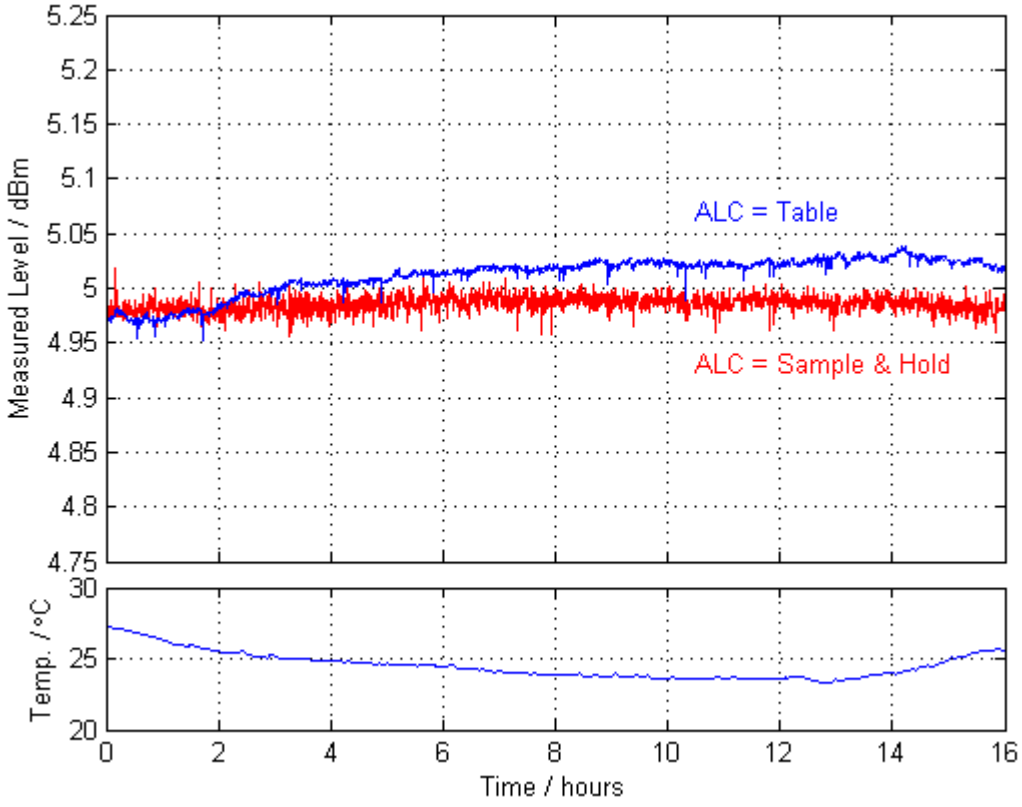
[2] PEP = peak envelope power.



Maximum available output level versus frequency (meas.).



Histogram of frequency setting times in I/Q mode for different ALC states and List mode (meas.).



Level repeatability 3GPP test model 1, 64 DPCHs, at 2.16 GHz, 5 dBm, ALC = Table and ALC = Sample & Hold (meas.).

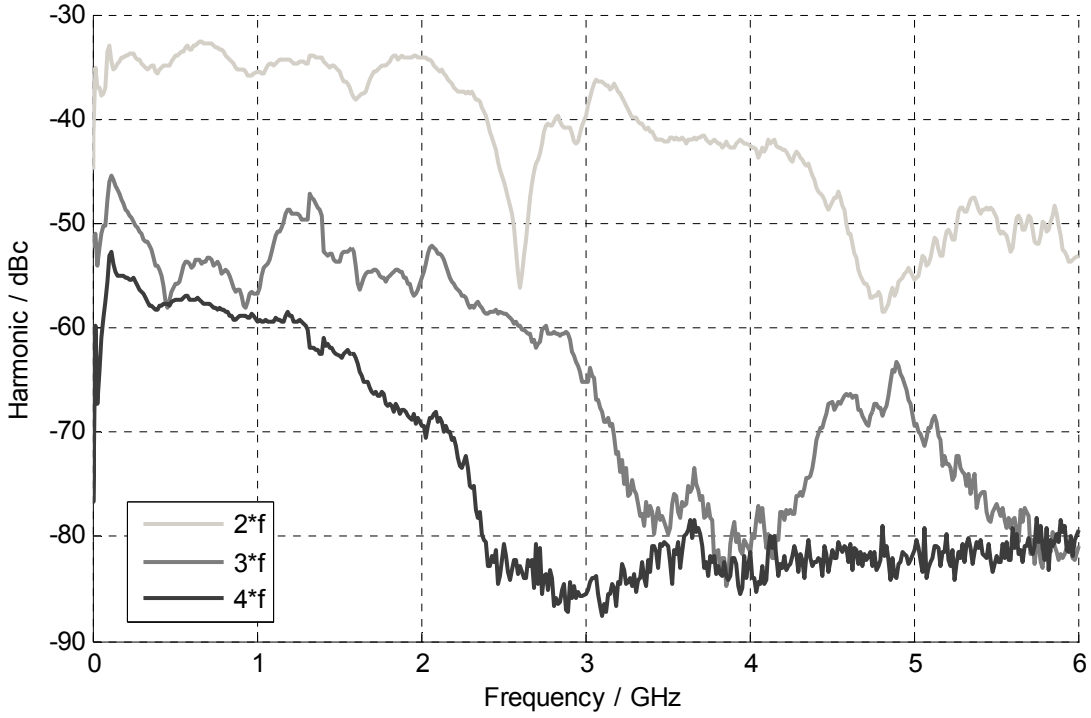
Level sweep

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	internal	timer
	external	external trigger signal (INST TRIG at rear), rotary knob, remote control
Trigger slope	with external trigger	positive, negative
Sweep range		full specified level range
	interruption-free	–20 dB to +20 dB
Sweep shape		triangle, sawtooth
Step spacing		logarithmic
Step size setting resolution		0.01 dB
Dwell time setting range		10 ms to 10 s
Dwell time setting resolution		0.1 ms

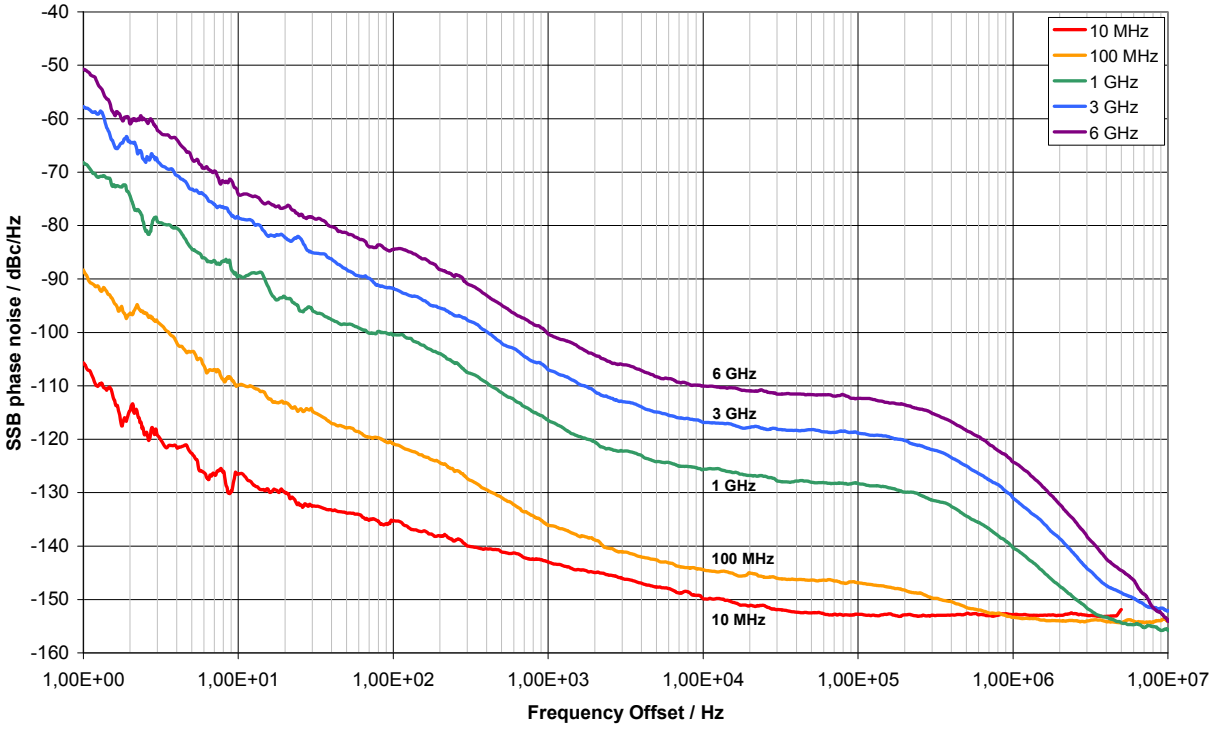
Spectral purity

Harmonics	CW, I/Q mode (full-scale DC input) f > 1 MHz, level ≤ 8 dBm	< –30 dBc [3]
Nonharmonics	CW, I/Q mode (full-scale DC input), level > –10 dBm, carrier offset > 10 kHz	
	f ≤ 1500 MHz	< –70 dBc, < –84 dBc (typ.)
	1500 MHz < f ≤ 3 GHz	< –64 dBc, < –78 dBc (typ.)
	f > 3 GHz	< –58 dBc, < –72 dBc (typ.)
Wideband noise	level operating mode AUTO level > 5 dBm, carrier offset > 10 MHz measurement bandwidth 1 Hz, CW	< –142 dBc
SSB phase noise	carrier offset 20 kHz, measurement bandwidth 1 Hz	
	f = 100 MHz	
	CW mode	< –141 dBc, –148 dBc (typ.)
	I/Q mode	< –121 dBc, –127 dBc (typ.)
	CW and I/Q mode	
	f = 1 GHz	< –122 dBc, –128 dBc (typ.)
	f = 2 GHz	< –116 dBc, –122 dBc (typ.)
	f = 3 GHz	< –112 dBc, –118 dBc (typ.)
	f = 4 GHz	< –110 dBc, –116 dBc (typ.)
	f = 6 GHz	< –106 dBc, –112 dBc (typ.)
RMS jitter	f = 1 GHz, bandwidth = 1 Hz to 10 MHz, CW	3.9 ps (meas.), (3.9 mUI)
	with R&S®SMBV-B1 option	1.1 ps (meas.), (1.1 mUI)
	f = 155 MHz, bandwidth = 100 Hz to 1.5 MHz, CW	83 fs (meas.), (12.9 µUI)
	f = 622 MHz, bandwidth = 1 kHz to 5 MHz, CW	63 fs (meas.), (39.2 µUI)
	f = 2.488 GHz, bandwidth = 5 kHz to 15 MHz, CW	55 fs (meas.), (137 µUI)
Residual FM	RMS value at f = 1 GHz, CW	
	0.3 kHz to 3 kHz	< 4 Hz, 0.25 Hz (typ.)
	0.03 kHz to 23 kHz	< 10 Hz, 1.3 Hz (typ.)
Residual AM	RMS value (0.03 kHz to 20 kHz) level = 8 dBm	< 0.02 %

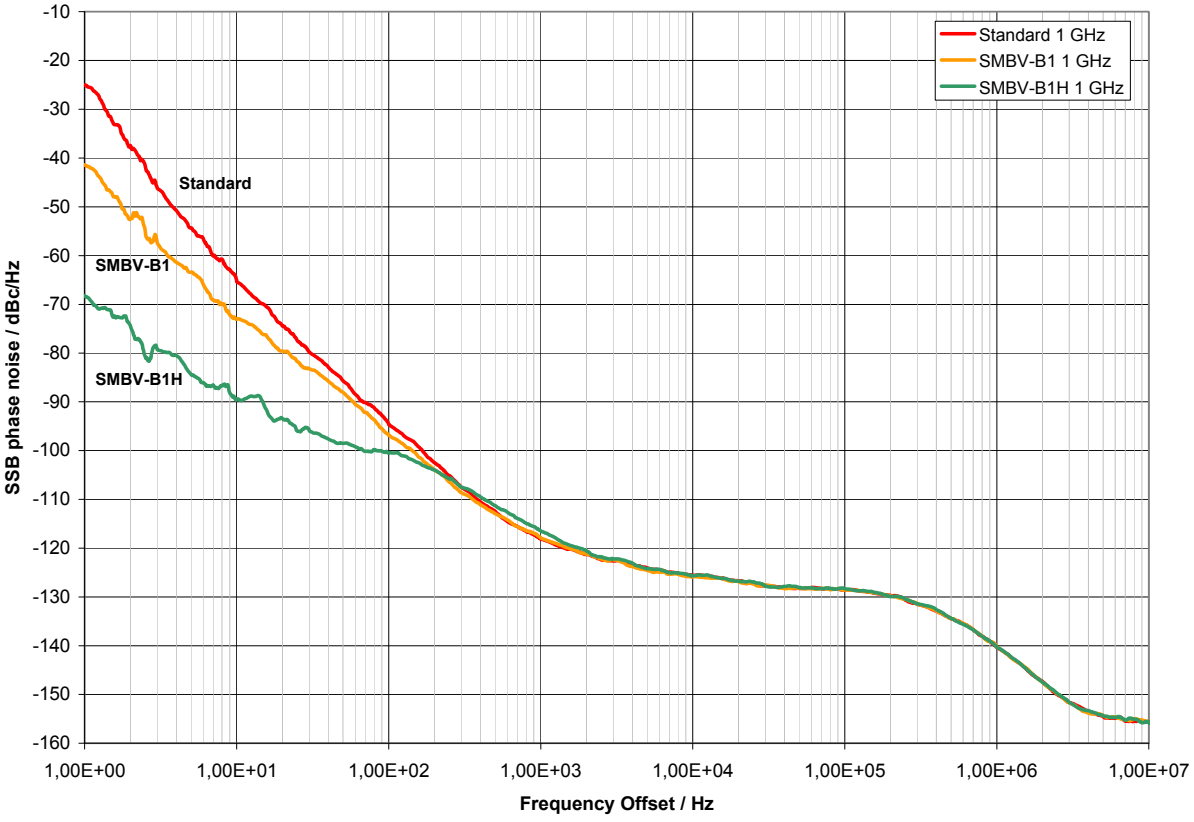
[3] Not valid in I/Q wideband mode.



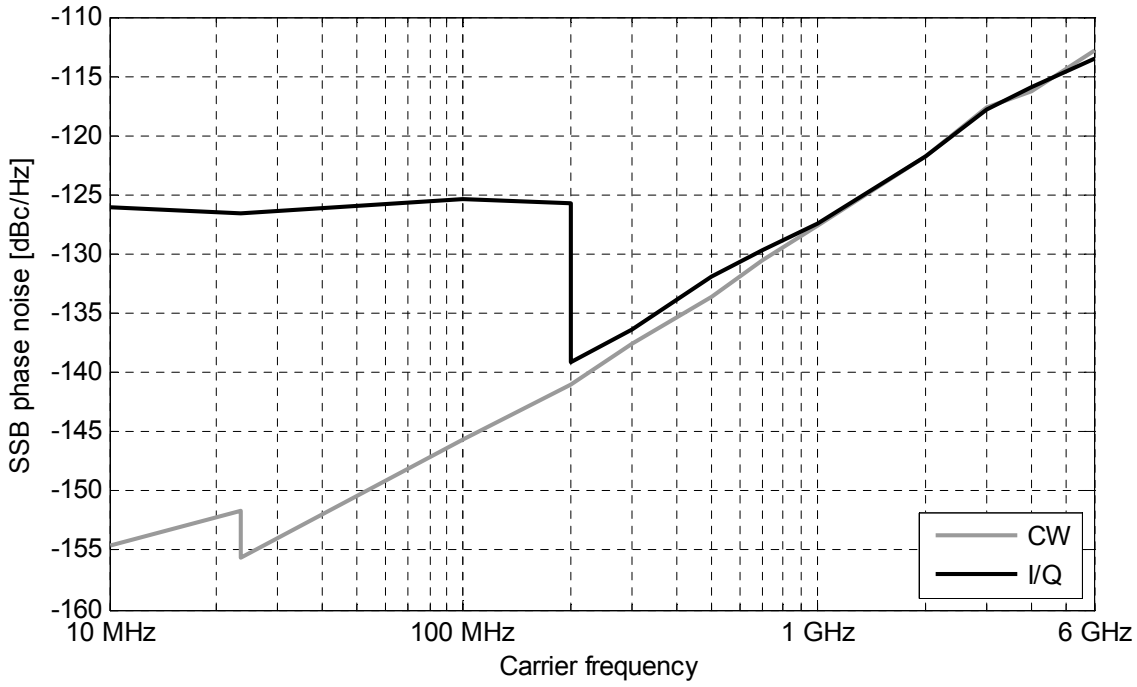
Harmonics versus carrier frequency at +18 dBm output level (meas.).



SSB phase noise with R&S®SMBV-B1H option (meas.).



SSB phase noise comparison with standard internal reference, R&S®SMBV-B1, R&S®SMBV-B1H (meas.).



SSB phase noise at 20 kHz offset versus carrier frequency (meas.).

List mode

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

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

Phase coherence (R&S®SMBV-B90 option)

The R&S®SMBV-B90 option enables phase-coherent RF outputs of two or more instruments in I/Q mode.

Frequency range	R&S®SMBV-B103	200 MHz < f ≤ 3.2 GHz
	R&S®SMBV-B106	200 MHz < f ≤ 6 GHz
LO coupling modes	This mode corresponds to internal LO operation. The LO OUT connector can provide the internal LO oscillator signal to enable phase-coherent coupling with other instruments.	internal
	This mode corresponds to external LO operation, provided at the LO IN connector. The LO OUT connector can provide the external LO oscillator signal to enable phase-coherent coupling with additional instruments.	external
LO OUT states	The active local oscillator signal can be routed to the LO OUT connector (in order to couple two or more instruments).	ON/OFF
Phase drift over temperature	when changing ambient temperature by +1 °C, f = 1.3 GHz, level = 0 dBm	0.075° (meas.)
Phase drift over time	f = 1.3 GHz, level = 0 dBm	0.02°/h (meas.)
Phase drift over level	attenuator mode Fixed, f = 6 GHz	0.12°/dB (meas.)
Phase setting range	using the baseband phase offset (not available for analog wideband I/Q input)	0.00° to 359.99°
Phase setting resolution		0.01°
Input of phase coherence signal		
Connector type	LO IN on rear panel	SMA female
Input impedance		50 Ω (nom.)
Input level range of external local oscillator signal		+7 dBm to +13 dBm
Output of phase coherence signal		
Connector type	LO OUT on rear panel	SMA female
Output impedance		50 Ω (nom.)
Output level range		+7 dBm to +13 dBm

Simultaneous modulation

	Amplitude modulation	Frequency modulation	Phase modulation	Pulse modulation	I/Q modulation
Amplitude modulation		●	●	○	–
Frequency modulation	●		–	●	●
Phase modulation	●	–		●	●
Pulse modulation	○	●	●		●
I/Q modulation	–	●	●	●	

● = compatible, – = incompatible,

○ = compatible with limitations: No specification applies to AM distortion, AM depth error and ON/OFF ratio with pulse modulation.

Analog modulation

Amplitude modulation

For f ≥ 100 kHz, level setting mode AUTO, level (PEP) within specified level range.

Modulation source		internal, external, internal + external
External coupling		AC, DC
AM depth setting range	At high levels, modulation is clipped when the maximum PEP is reached.	0 % to 100 %
Resolution of setting		0.1 %
AM depth (m) error	f_{mod} = 1 kHz and m < 80 %	
	f ≤ 23.4375 MHz	< (1 % of setting + 1 %)
	f > 23.4375 MHz	< (4 % of setting + 1 %)
AM distortion	f_{mod} = 1 kHz, f ≤ 23.4375 MHz	
	m = 30 %	< 0.25 %
	m = 80 %	< 0.5 %
	f_{mod} = 1 kHz, f > 23.4375 MHz	
	m = 30 %	< 1.5 %
	m = 80 %	< 3 %
Modulation frequency response	m = 60 % DC coupling: 0 Hz to 50 kHz AC coupling: 10 Hz to 50 kHz	< 3 dB
Synchronous φM at AM	m = 30 %, f_{mod} = 1 kHz, ±peak/2	< 0.2 rad

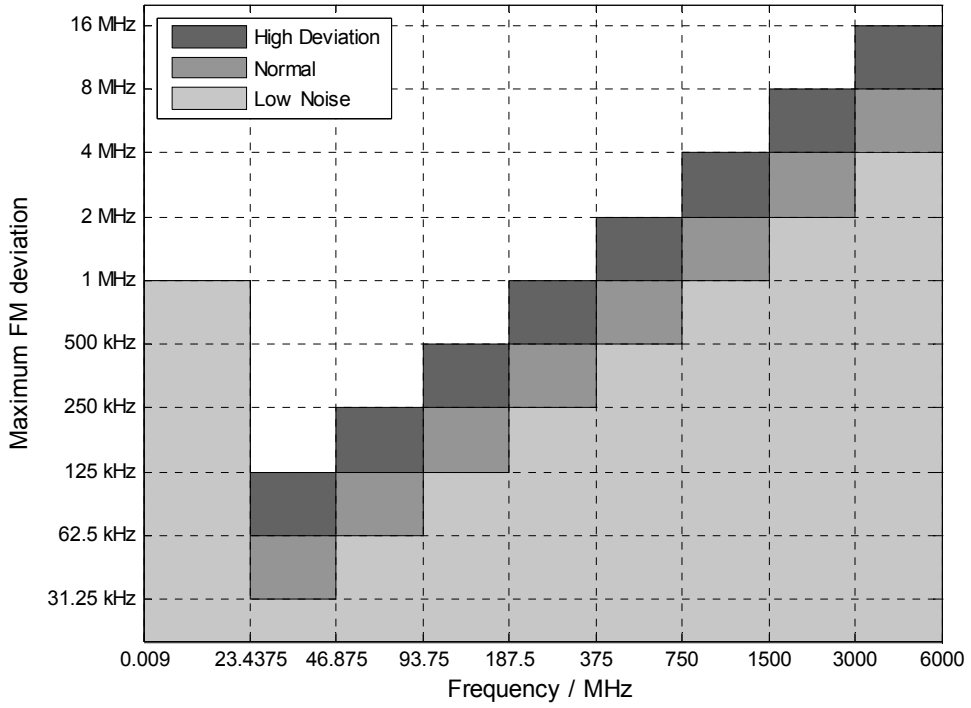
Frequency bands for frequency and phase modulation

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

Multiplier N for different frequency ranges	f ≤ 23.4375 MHz	1/4
	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 ≤ 1500 MHz	1
	1500 MHz < f ≤ 3 GHz	2
	3 GHz < f ≤ 6 GHz	4

Frequency modulation

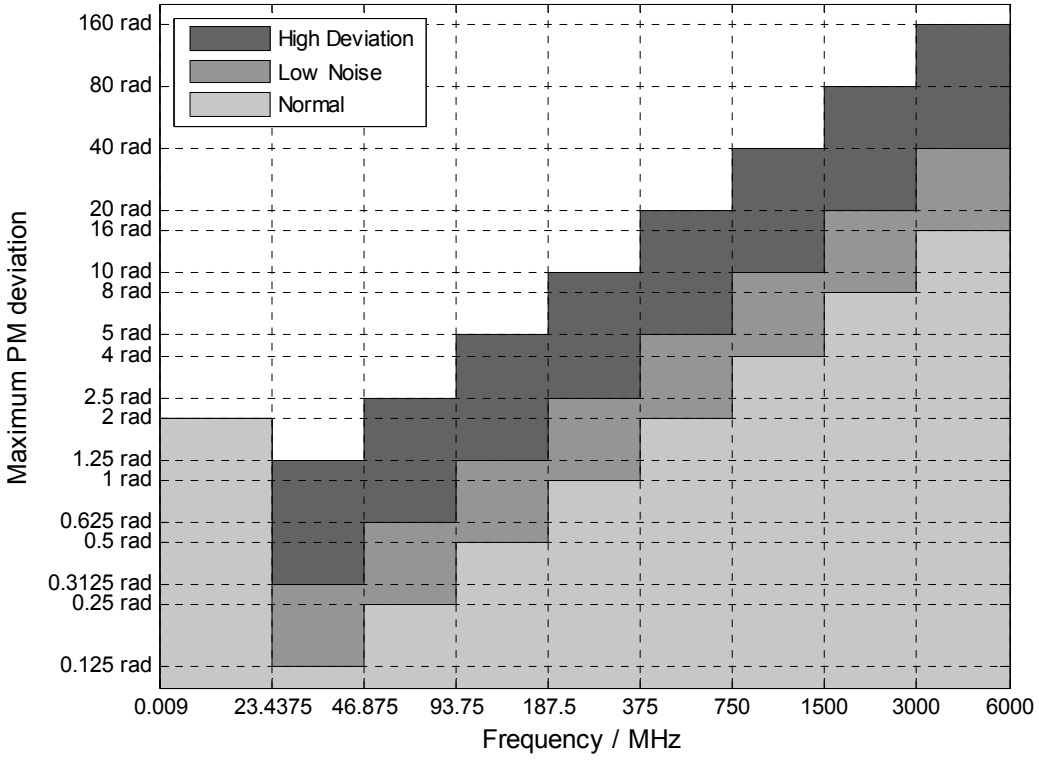
Modulation source		internal, external, internal + external
External coupling		AC, DC
Operating modes		FM mode Low Noise
		FM mode Normal
		FM mode High Deviation
Maximum deviation	f ≤ 23.4375 MHz	1 MHz
	f > 23.4375 MHz	
	FM mode Normal	N × 2 MHz
	FM mode Low Noise	N × 1 MHz
	FM mode High Deviation	N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



FM deviation versus frequency and operating mode.

Phase modulation

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



φM deviation versus frequency and operating mode.

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

When pulse modulation is activated, the R&S®SMBV100A automatically switches to the ALC mode S&H. In this case, the ALC loop is opened and the output level is set directly. In order to set the correct level, an S&H measurement is performed prior to each frequency and level setting.

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

Input for external analog modulation signals

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

Modulation sources

Internal modulation generator (LF)

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

LF frequency sweep

Operating mode		digital sweep in discrete steps
Trigger mode	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	internal	timer
	external	external trigger signal (INST TRIG at rear), rotary knob, remote control
Trigger slope	external trigger signal	positive, negative
Sweep range		full frequency range, minimum 0.1 Hz
Sweep shape		triangle, sawtooth
Step spacing		linear, logarithmic
Step size setting resolution	linear	0.1 Hz
	logarithmic	0.01 %
Dwell time setting range		10 ms to 10 s
Dwell time setting resolution		0.1 ms

Pulse generator (R&S®SMBV-K23 option)

The pulse generator is fully digital; the clock is derived directly from the instrument's reference frequency.

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

I/Q modulation

I/Q modulator

Operating modes		external I/Q, internal I/Q
RF frequency response	up to ±264 MHz at 3432 MHz, 3960 MHz and 4488 MHz, I/Q mode wideband	< 10 dB
	up to ±60 MHz	< 6 dB
	up to ±10 MHz	< 2 dB
	up to ±5 MHz	< 1 dB
Carrier leakage	without input signal, referenced to full-scale input [4]	< –50 dBc, < –65 dBc (typ.)
Suppression of image sideband	up to ±10 MHz	60 dB (meas.)
	up to ±60 MHz	48 dB (meas.)
External I/Q inputs	input impedance	50 Ω (nom.)
	VSWR up to 60 MHz	< 1.2
	nominal input voltage for full-scale input	$\sqrt{V_i^2 + V_q^2} = 0.5\ V$

[4] Value applies after internal readjustment.

Error vector	measured with 16QAM, filter root cosine α = 0.5, symbol rate 10 kHz RMS value	
	f ≤ 200 MHz	< 0.6 %
	f > 200 MHz	< (0.4 % + 0.2 % × f/GHz)
	peak value	
	f ≤ 200 MHz	< 1.2 %
	f > 200 MHz	< (0.8 % + 0.4 % × f/GHz)
3GPP FDD digital standard, adjacent channel leakage ratio (ACLR)	test model 1, 64 DPCHs level ≤ 13 dBm PEP frequency 1800 MHz to 2200 MHz	
	offset 5 MHz	> 65 dB, 69 dB (typ.)
	offset 10 MHz	> 67 dB, 70.5 dB (typ.)
I/Q impairments	I offset, Q offset	
	setting range	–10 % to +10 %
	resolution	0.05 %
	gain imbalance	
	setting range	–1 dB to +1 dB
	resolution	0.01 dB
	quadrature offset	
	setting range	–8° to +8°
	resolution	0.05°

I/Q inputs

Connector types	I, Q on front panel	BNC female
Input impedance		50 Ω (nom.)
VSWR	up to 100 MHz	< 1.2
Nominal input voltage for full-scale input		$\sqrt{V_i^2 + V_q^2} = 0.5$ V
Input damage voltage		±5 V

Internal baseband I/Q (with R&S®SMBV-B10/-B50/-B51 option)

These values apply to all digital modulations including arbitrary waveform mode and custom digital modulation.
R&S®SMBV-B10 requires the R&S®SMBV-B92 option (hard disk).

D/A converter	resolution	16 bit
Aliasing filter	with amplitude, group-delay and Si correction	
	bandwidth (drop to –0.1 dB)	60 MHz (nom.)
	D/A converter interpolation spectra	
	up to 10 MHz	< –80 dBc
	up to 60 MHz	< –60 dBc
I/Q impairments	I offset, Q offset	
	setting range	–10 % to +10 %
	resolution	0.01 %
	gain imbalance	
	setting range	–1 dB to +1 dB
	resolution	0.001 dB
	quadrature offset	
	setting range	–10° to +10°
	resolution	0.01°

I/Q outputs (with R&S®SMBV-B10/-B50/-B51 option)

R&S®SMBV-B10 requires the R&S®SMBV-B92 option (hard disk).

Output impedance	single-ended	50 Ω (nom.)
	differential	100 Ω (nom.)
Output voltage	EMF (output voltage depends on set modulation signal)	
	single-ended	
	setting range	20 mV to 1.50 V (V_p)
	resolution	1 mV
	differential	
	setting range	40 mV to 3.00 V (V_p)
	resolution	1 mV
Offset	EMF	< 1.0 mV
Frequency response	at R_L = 50 Ω (referenced to 1 MHz)	
	magnitude	
	up to 10 MHz	< 0.15 dB
	up to 30 MHz (R&S®SMBV-B51)	< 0.3 dB
	up to 60 MHz (R&S®SMBV-B10/-B50)	< 0.3 dB
	nonlinear phase	
	up to 10 MHz	200 ps (meas.)
	up to 30 MHz (R&S®SMBV-B51)	500 ps (meas.)
	up to 60 MHz (R&S®SMBV-B10/-B50)	500 ps (meas.)
I/Q imbalance [5]	at R_L = 50 Ω	
	magnitude	
	up to 10 MHz	< 0.05 dB
	up to 30 MHz (R&S®SMBV-B51)	< 0.15 dB
	up to 60 MHz (R&S®SMBV-B10/-B50)	< 0.15 dB
	nonlinear phase	
	up to 10 MHz	100 ps (meas.)
	up to 30 MHz (R&S®SMBV-B51)	300 ps (meas.)
	up to 60 MHz (R&S®SMBV-B10/-B50)	300 ps (meas.)
Spectral purity	SFDR (sine)	
	up to 2 MHz	> 70 dB, 74 dB (typ.)
	up to 20 MHz	> 60 dB, 68 dB (typ.)
	phase noise	
	10 MHz sine wave at 20 kHz offset	–135 dBc (meas.)
	wideband noise	
	10 MHz sine wave at 1 MHz offset	< –153 dBc, –162 dBc (typ.)

[5] "Optimize internal I/Q impairments for RF output" mode is switched OFF.

I/Q baseband generator (R&S®SMBV-B10/-B50/-B51 option) – arbitrary waveform mode

Waveform length	without R&S®SMBV-B55 option [6]	1 sample to 32 Msample in one-sample steps
	with R&S®SMBV-B55 option [6]	1 sample to 256 Msample in one-sample steps
Nonvolatile memory	with R&S®SMBV-B92 option	hard disk, 80 Gbyte
Waveform loading time	1 Msample	10 s (meas.)
Sample rate	R&S®SMBV-B10/-B50	400 Hz to 150 MHz
	R&S®SMBV-B51	400 Hz to 90 MHz
Sample resolution	equivalent to D/A converter	16 bit
Sample clock source		internal, external
Sample frequency error	internal clock	< (5 × 10^{-14} + reference frequency error) × sample rate (nom.)
Bandwidth (RF) using the maximum sample rate	R&S®SMBV-B10/-B50	120 MHz (nom.)
	R&S®SMBV-B51	60 MHz (nom.)
Bandwidth (RF) using a reduced sample rate (drop to –0.1 dB)	The waveform is automatically interpolated to the internal sample rate of 150 MHz.	
	R&S®SMBV-B10	0.62 × sample rate (nom.)
	R&S®SMBV-B50/-B51	0.66 × sample rate (nom.)
Frequency offset setting range	R&S®SMBV-B10/-B50	–60 MHz to 60 MHz
	R&S®SMBV-B51	–30 MHz to 30 MHz
Frequency offset resolution		0.01 Hz
Frequency offset error		< (5 × 10^{-10} + reference frequency error) × frequency offset (nom.)
Triggering	source	internal, external
	operating modes	Auto, Retrig, Armed Auto, Armed Retrig, Single, Next
	external trigger delay (in sample)	
	setting range	0 to (2^{16} – 1)
	resolution	0.01
	jitter	±3.3 ns (nom.)
	external trigger inhibit (in sample)	
	setting range	0 to (2^{26} – 1)
	resolution	1
	external trigger pulse width	> 20 ns (nom.)
Marker outputs	number	2
	level	LVTTL
	operating modes	Unchanged, Restart, Pulse, Pattern, Ratio, Trigger
	marker delay (in sample)	
	setting range	0 to (waveform length – 1)
	setting range without recalculation	0 to 2000
	resolution of setting	1

[6] R&S®SMBV-B55 requires the R&S®SMBV-B92 option (hard disk).

Multisegment and multicarrier arbitrary waveform mode

Multisegment waveform	number of segments	max. 100 segments
	changeover modes	GUI, remote control, external trigger
	extended trigger modes	same segment, next segment, next segment seamless, sequencer
	changeover time at 50 MHz clock rate (external trigger, without clock change)	5 µs (meas.)
	seamless changeover	output up to end of current segment, followed by changeover to next segment
	sequencer play list length	max. 1024
	sequencer segment repetitions	max. 65535
Multicarrier waveform	number of carriers	max. 32
	carrier spacing	
	setting range	depends on number of carriers and bandwidth (RF)
	resolution	0.01 Hz
	crest factor modes	maximize, minimize, OFF
	signal period modes	longest file, shortest file, user (max. 1 s)
	single carrier gain	
	setting range	–80 dB to 0 dB
	resolution	0.01 dB
	single carrier start phase	
	setting range	0° to 360°
	resolution	0.01°
	single carrier delay	
	setting range	0 s to 1 s
	resolution	1 ns

Operation with R&S®WinIQSIM2™:
The software supports download of I/Q data and control of the R&S®SMBV-B10/-B50/-B51.

I/Q baseband generator (R&S®SMBV-B10 option) – custom digital modulation

Types of modulation	ASK	
	modulation index	0 % to 100 %
	resolution	0.1 %
	FSK	2FSK, 4FSK, MSK
	deviation	up to 15 × f_{sym}
	maximum	40 MHz
	minimum	1 Hz
	resolution	0.1 Hz
	variable FSK	4FSK, 8FSK, 16FSK
	deviations	–15 × f_{sym} to +15 × f_{sym}
	maximum	40 MHz
	minimum	1 Hz
	resolution	0.1 Hz
	PSK	BPSK, QPSK, QPSK 45° offset, OQPSK, π/4-QPSK, π/2-DBPSK, π/4-DQPSK, π/8-D8PSK, 8PSK, 8PSK EDGE
	QAM	16QAM, 32QAM, 64QAM, 256QAM, 1024QAM
Coding	Not all coding methods can be used with every type of modulation.	OFF, Differential, Diff. Phase, Diff. + Gray, Gray, GSM, NADC, PDC, PHS, TETRA, APCO25 (PSK), PWT, TFTS, INMARSAT, VDL, EDGE, APCO25(FSK), ICO, CDMA2000®, WCDMA

Baseband filter	Any filter can be used with any type of modulation. The maximum bandwidth of the modulation signal is 45 MHz.	
	cosine, root cosine	
	filter parameter α	0.05 to 1.00
	Gaussian	
	filter parameter B × T	0.15 to 2.50
	cdmaOne, cdmaOne + equalizer	
	cdmaOne 705 kHz	
	cdmaOne 705 kHz + equalizer	
	CDMA2000® 3x	
	APCO25 C4FM	
	rectangular	
	split phase	
	filter parameter B × T	0.15 to 2.5
	resolution of filter parameter	0.01
Symbol rate	If an external clock is used, the applied data rate may deviate from the set clock rate by ±2 %.	
	clock source	internal, external
	setting range	
	ASK, PSK and QAM	400 Hz to 50 MHz
	FSK	400 Hz to 40 MHz
	resolution	0.001 Hz
	frequency error (internal)	< (5 × 10^{-14} + reference frequency error) × symbol rate (nom.)
	external clock modes	symbol, K × symbol
	clock divider K	1 to 64
	external clock rate	max. 150 MHz
Frequency offset	With the aid of the frequency offset, the center frequency of the modulation signal in the baseband can be shifted. The restrictions caused by the modulation bandwidth apply.	
	setting range	–60 MHz to 60 MHz
	resolution	0.01 Hz
	frequency error	< (5 × 10^{-10} + reference frequency error) × frequency offset (nom.)
Data sources	All 0, All 1	
	PRBS	
	sequence length	9, 11, 15, 16, 20, 21, 23
	pattern	
	length	1 bit to 64 bit
	data lists	
	output memory	8 bit to 2 Gbit
	nonvolatile memory	hard disk (with R&S®SMBV-B92 option)
Triggering	A trigger event restarts I/Q generation. The I/Q signal is then synchronous with the trigger (with a specific timing jitter).	
	source	internal, external
	operating modes	Auto, Retrig, Armed Auto, Armed Retrig, Single, Next
	external trigger delay (in symbol)	
	setting range	0 to (2^{16} – 1)
	resolution	0.01
	jitter	±3.3 ns (nom.)
	external trigger inhibit (in symbol)	
	setting range	0 to (2^{26} – 1)
	resolution	1
	external trigger pulse width	> 20 ns (nom.)

Marker outputs	number	2
	level	LVTTL
	operating modes	Control List, Pulse, Pattern, Ratio, Trigger
	marker delay (in symbol)	
	setting range	0 to 2^{24} – 1
	setting range without recalculation	0 to 2000
	resolution of setting	1
Level reduction	internal, using Control List: The signal switches between nominal and reduced level (without edge shaping).	
	setting range	0 dB to +60 dB
	additional level error in case of reduction	
	up to 30 dB	< 1 dB
	up to 50 dB	< 3 dB
Burst	internal, using Control List: The signal triggers the beginning of a power ramp. The positive edge starts power ramping from blank to full level, the negative edge ramping in the opposite direction from full level to blanking.	
	operating range	
	rise/fall time	
	setting range	0.5 symbol to 8 symbol
	resolution	¼ symbol
	ramp shape	cosine, linear
Trigger/clock inputs	The input impedance can be set separately for the trigger and the clock inputs.	
	input impedance	1 kΩ, 50 Ω (nom.)
	trigger/clock threshold	
	setting range	0.00 V to 2.00 V
	resolution	0.01 V
Clock output	level	LVTTL
Predefined settings	modulation, filter, symbol rate and coding in line with standard	
	standards	Bluetooth®, DECT, ETC, GSM, GSM/EDGE, NADC, PDC, PHS, TETRA, WCDMA 3GPP, TD-SCDMA, CDMA2000® Forward, CDMA2000® Reverse, Worldspace, TFTS

Modulation performance for custom digital modulation

Deviation error with 2FSK, 4FSK	deviation 0.2 to 0.7 × symbol rate Gaussian filter with B × T = 0.2 to 0.7	
	symbol rate up to 2 MHz	0.4 % (meas.)
	symbol rate up to 10 MHz	1.2 % (meas.)
Phase error with MSK	Gaussian filter with B × T = 0.2 to 0.7	
	bit rate up to 10 MHz	0.3° (meas.)
EVM with QPSK, OQPSK, π/4-DQPSK, 8PSK, 16QAM, 32QAM, 64QAM	cosine, root cosine filter with α = 0.2 to 0.7	
	symbol rate up to 5 MHz	0.5 % (meas.)
	symbol rate up to 20 MHz	2.0 % (meas.)

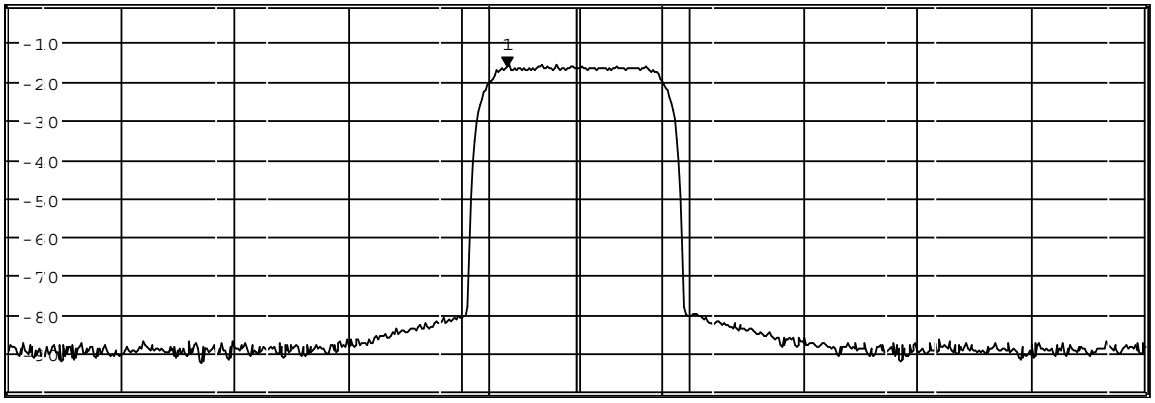
Modulation performance for main digital standards

Measured values except otherwise stated.

Standard	GSM	EDGE	WCDMA 3GPP		CDMA2000®	IEEE	WiMAX™		LTE
			1DPCH	TM1-64		802.11a/g	BW = 8.75 MHz	BW = 10 MHz	
Frequency	400 MHz to 2000 MHz	400 MHz to 2000 MHz	1800 MHz to 2200 MHz	1800 MHz to 200 MHz	800 MHz	2400 MHz to 2485 MHz 5150 MHz to 5825 MHz	2304 MHz	5000 MHz	1800 MHz to 2200 MHz
EVM	–	0.25 % (typ.)	0.4 % (typ.)	0.4 %	0.4 %	0.6 %	0.3 %	0.4 %	0.4 %
Phase error	0.15°	–	–	–	–	–	–	–	–
Adjacent channel power ratio (ACPR) in dB									
Channel spacing	200 kHz	200 kHz	5 MHz	5 MHz	30 kHz	20 MHz	–	–	–
In adjacent channel	–38	–38	–69	–69 (typ.)	–79 at 0.75 MHz	–42	–	–	–
In alternate channel	–70	–70	–74	–71 (typ.)	–91 at 1.98 MHz	–55	–	–	–
In 2nd alternate channel	–78	–78	–	–	–	–56	–	–	–

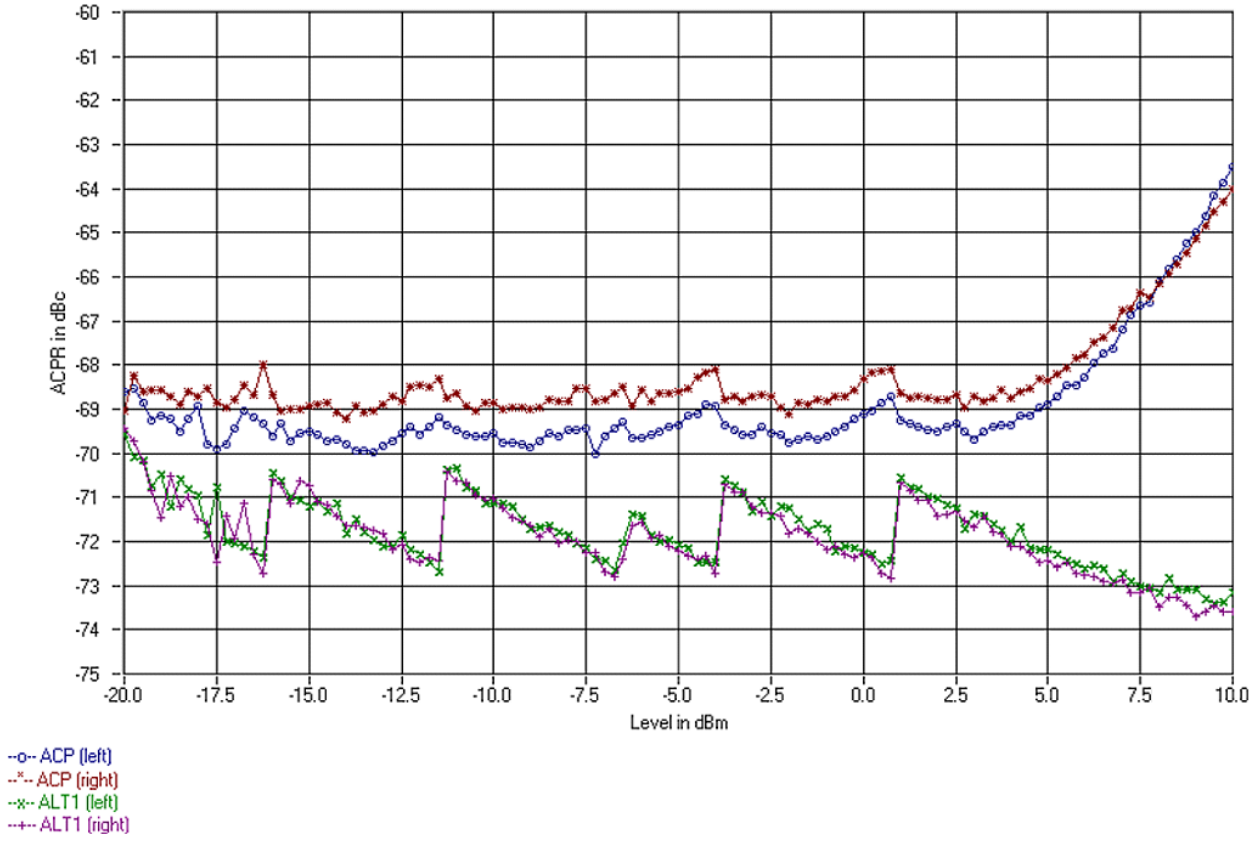
Modulation performance for GSM/EDGE and 3GPP FDD digital standards

GSM/EDGE	with R&S®SMBV-K40 option level ≤ 13 dBm PEP frequency range from 400 MHz to 2000 MHz	
Burst ON/OFF ratio		100 dB (meas.)
Phase error	MSK, Gaussian filter B × T = 0.3	
	RMS	< 0.4°, 0.15° (typ.)
	peak	0.4° (meas.)
Error vector magnitude	8PSK EDGE, Gaussian linearized filter, RMS	< 0.5 %, 0.25 % (typ.)
Power density spectrum	values measured with 30 kHz resolution bandwidth, referenced to level in band center without power ramping	
	200 kHz offset	< –34 dB, –38 dB (typ.)
	400 kHz offset	< –66 dB, –70 dB (typ.)
	600 kHz offset	< –74 dB, –78 dB (typ.)
3GPP FDD	with R&S®SMBV-K42 option level ≤ 13 dBm PEP frequency range from 1800 MHz to 2200 MHz	
Error vector magnitude	1 DPCH, RMS	< 0.8 %, 0.4 % (typ.)
Adjacent channel leakage ratio (ACLR)	test model 1, 64 DPCHs	
	offset 5 MHz	> 65 dB, 69 dB (typ.)
	offset 10 MHz	> 67 dB, 71.5 dB (typ.)



Tx Channel			**W-CDMA 3GPP FWD**
Bandwidth	3.84 MHz	Power	3.74 dBm
Adjacent Channel			
Bandwidth	3.84 MHz	Lower	-69.36 dB
Spacing	5 MHz	Upper	-69.00 dB
Alternate Channel			
Bandwidth	3.84 MHz	Lower	-72.29 dB
Spacing	10 MHz	Upper	-72.02 dB

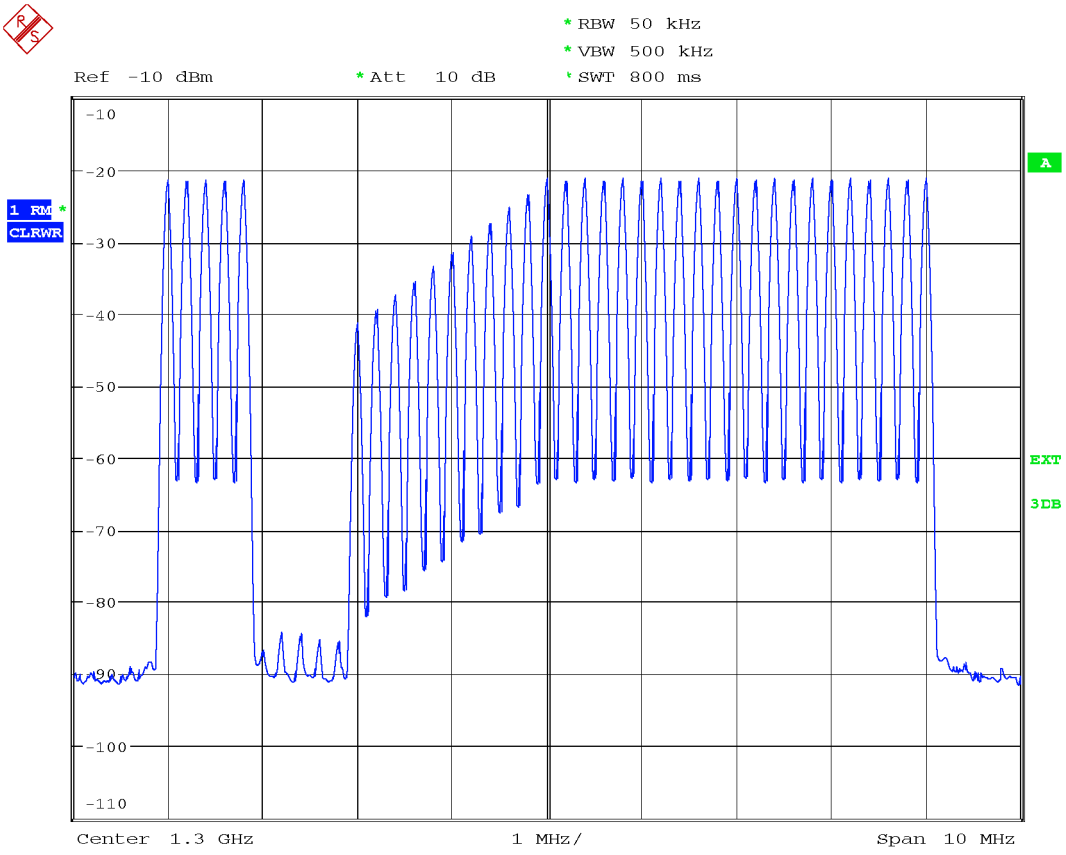
Digital standard 3GPP FDD test model 1, 64 DPCHs ACLR (meas.).



Digital standard 3GPP FDD test model 1, 64 DPCHs, ACLR as a function of carrier level at 2 GHz (meas.).

Modulation performance for multicarrier CW

Multicarrier CW	with R&S®SMBV-K61 option	
RF frequency response	up to 10 MHz	0.7 dB (meas.)
	up to 60 MHz	2.0 dB (meas.)
Suppression of unwanted carriers	up to 10 MHz	40 dB (meas.)
	up to 60 MHz	30 dB (meas.)



Example of multicarrier CW, with different carrier powers and some carriers switched off in the left half of the spectrum, I/Q level 0.5 V (meas.).

Internal digital standards (for R&S®SMBV-B10)

The options are described in the Digital Standards data sheet (PD 5213.9434.22) and in the GNSS data sheet (PD 5214.5284.22).

Standard	Option
GSM/EDGE digital standard	R&S®SMBV-K40
EDGE evolution digital standard	R&S®SMBV-K41
3GPP FDD digital standard	R&S®SMBV-K42
3GPP FDD enhanced BS/MS test including HSDPA	R&S®SMBV-K43
GPS 6 satellites	R&S®SMBV-K44
3GPP FDD enhanced BS/MS test including HSUPA	R&S®SMBV-K45
CDMA2000® digital standard	R&S®SMBV-K46
1xEV-DO digital standard	R&S®SMBV-K47
IEEE 802.11a/b/g digital standard	R&S®SMBV-K48
IEEE 802.16 WiMAX™ digital standard including IEEE 802.16e	R&S®SMBV-K49
TD-SCDMA (3GPP TDD LCR) digital standard	R&S®SMBV-K50
TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA	R&S®SMBV-K51
DVB-H digital standard	R&S®SMBV-K52
DAB/T-DMB digital standard	R&S®SMBV-K53
IEEE 802.11n digital standard	R&S®SMBV-K54
EUTRA/LTE digital standard	R&S®SMBV-K55
XM Radio digital standard	R&S®SMBV-K56
FM stereo modulation	R&S®SMBV-K57
Sirius digital standard	R&S®SMBV-K58
3GPP FDD HSPA+	R&S®SMBV-K59
Bluetooth® EDR digital standard	R&S®SMBV-K60
Multicarrier CW signal generation	R&S®SMBV-K61
Assisted GPS	R&S®SMBV-K65
Galileo 6 satellites	R&S®SMBV-K66
TETRA release 2 digital standard	R&S®SMBV-K68
GNSS extension to 12 satellites	R&S®SMBV-K91
GNSS enhanced (e.g. moving scenarios, multipath)	R&S®SMBV-K92

Digital system with external PC software (for R&S®SMBV-B10/-B50/-B51)

The option is described in the Digital Standards data sheet (PD 5213.9434.22).

Standard	Option
Pulse sequencer (external PC software)	R&S®SMBV-K6

The R&S®SMBV-K352 option is described in the HD Radio data sheet (PD 5214.2591.22).

Standard	Option
Playback of XM Radio waveforms [7]	R&S®SMBV-K256
Playback of HD Radio™ waveforms [8]	R&S®SMBV-K352

[7] Signal generation requires waveforms from XM Radio.

[8] HD Radio™ is a proprietary trademark of iBiquity Digital Corp., requires license from iBiquity Digital Corp.

Digital standards with R&S®WinIQSIM2™ (for R&S®SMBV-B10/-B50/-B51 ARB)

R&S®WinIQSIM2™ requires an external PC.
The options are described in the R&S®WinIQSIM2™ data sheet (PD 5213.7460.22).

Standard	Option
GSM/EDGE digital standard	R&S®SMBV-K240
EDGE evolution digital standard	R&S®SMBV-K241
3GPP FDD digital standard	R&S®SMBV-K242
3GPP FDD enhanced BS/MS test including HSDPA	R&S®SMBV-K243
GPS digital standard	R&S®SMBV-K244
3GPP FDD enhanced BS/MS test including HSUPA	R&S®SMBV-K245
CDMA2000® digital standard	R&S®SMBV-K246
1xEV-DO digital standard	R&S®SMBV-K247
IEEE 802.11a/b/g digital standard	R&S®SMBV-K248
IEEE 802.16 WiMAX™ digital standard including IEEE 802.16e	R&S®SMBV-K249
TD-SCDMA (3GPP TDD LCR) digital standard	R&S®SMBV-K250
TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA	R&S®SMBV-K251
DVB-H digital standard	R&S®SMBV-K252
DAB/T-DMB digital standard	R&S®SMBV-K253
IEEE 802.11n digital standard	R&S®SMBV-K254
EUTRA/LTE digital standard	R&S®SMBV-K255
3GPP FDD HSPA+	R&S®SMBV-K259
Bluetooth® EDR digital standard	R&S®SMBV-K260
Multicarrier CW signal generation	R&S®SMBV-K261
Additive white Gaussian noise (AWGN)	R&S®SMBV-K262
TETRA release 2	R&S®SMBV-K268

Digital baseband input/output (R&S®SMBV-K18 option)

The R&S®SMBV-K18 makes digital I/Q signals available on the rear panel of the instrument if set to output mode. External digital I/Q signals can be fed in to the baseband section at the same connector if set to input mode. The digital I/Q input/output can be used for the lossless connection of the R&S®SMBV100A to the digital I/Q input/output of other Rohde & Schwarz instruments (e.g. R&S®AMU200A baseband signal generator and fading simulator). One R&S®SMBV-K18 can be installed.

Output parameters:

Interface	standard	in line with Rohde & Schwarz TVR290, I/Q data and control signals, data and interface clock
	level	LVDS
	connector	26-pin MDR
	data rate	30 MHz to 100 MHz with 1 MHz resolution, 81.6 MHz
I/Q sample rate	With source ‘user-defined’, the sample rate must be entered via the parameter ‘sample rate’, no I/Q data clock being necessary. With source ‘digital I/Q out’, the sample rate will be estimated on the basis of the applied I/Q data clock.	
	source	user-defined, digital I/Q out
	sample rate	400 Hz to 100 MHz
		max. sample rate limited by actual interface data rate
	resolution (user-defined)	0.001 Hz
	frequency uncertainty (user-defined)	$< 5 \times 10^{-14}$
I/Q data	resolution	18 bit
	logic format	two’s complement
	physical signal level	
	setting range	0 to –60 dBFS
	resolution	0.01 dBFS
	bandwidth	
	sample rate = 100 MHz (no interpolation, user-defined)	60 MHz
	sample rate < 100 MHz (interpolation)	0.31 × sample rate
Control signals	markers	4
	data valid	valid samples marked in data stream

Input parameters:

Input level	peak level	
	setting range	–60 dB to +3 dB referenced to full scale
	resolution	0.01 dB
	crest factor	
	setting range	0 dB to +30 dB
	resolution	0.01 dB
	The adjust level function automatically determines the peak level and crest factor of the input signal.	
Frequency offset	With the aid of the frequency offset, the center frequency of the input signal can be shifted in the baseband. The restrictions caused by the modulation bandwidth apply.	
	setting range	–60 MHz to +60 MHz
	resolution	0.01 Hz
	frequency accuracy	< 5 × 10 – 10 × frequency offset + reference frequency error
I/Q swap	I and Q signals swapped	ON/OFF
Interface	standard	in line with Rohde & Schwarz TVR290, I/Q data and control signals, data and interface clock
	level	LVDS
	connector	26-pin MDR
	data rate	66 MHz to 100 MHz
I/Q sample rate	With source ‘user-defined’, the sample rate must be entered via the parameter ‘sample rate’, no I/Q data clock being necessary. With source ‘digital I/Q in’, the sample rate will be estimated on the basis of the applied I/Q data clock.	
	source	user-defined, digital I/Q in
	sample rate	400 Hz to 100 MHz max. sample rate depending on interface data rate
	resolution (user-defined)	0.001 Hz
	frequency uncertainty (user-defined)	$< 5 \times 10^{-14}$
I/Q data	resolution	18 bit
	logic format	two’s complement
	bandwidth	
	sample rate = 100 MHz (no interpolation, user-defined)	60 MHz
	sample rate < 100 MHz (interpolation)	0.31 × sample rate
Control signals	markers	4
	data valid	valid samples marked in data stream

Internal additive white Gaussian noise (AWGN, R&S®SMBV-K62 option)

As prerequisite, R&S®SMBV-B10/-B50/-B51 must be installed.

Addition of an AWGN signal of settable bandwidth and settable C/N ratio or E_b/N_0 to a wanted signal.

Noise	distribution density	Gaussian, statistical, separate for I and Q
	crest factor	> 15 dB
	periodicity	$> (2^{800} – 1)$/150 MHz
C/N, E_b/N_0	setting range	–30 dB to +30 dB
	resolution	0.1 dB
	uncertainty for system bandwidth = symbol rate –24 dB < C/N < 30 dB and crest factor < 12 dB	< 0.1 dB
System bandwidth	bandwidth for determining noise power	
	setting range	
	R&S®SMBV-B10/-B50	1 kHz to 120 MHz
	R&S®SMBV-B51	1 kHz to 60 MHz
	setting resolution	100 Hz

Remote control

Interfaces		IEC 60625 (GPIB IEEE 488.2) Ethernet/LAN (10/100BaseT) USB 2.0 (high speed) serial (RS-232-C) [9]
Command set		SCPI 1999.5 or compatible command sets
Compatible command sets	These command sets can be selected in order to emulate another instrument.	Agilent/HP 8643A Agilent/HP 8644A/B Agilent/HP 8647A Agilent/HP 8648A/B/C/D Agilent/HP 8656A/B Agilent/HP 8657A/B Agilent/HP E44xx ESG Agilent N51xx MXG Aeroflex/IFR 205x R&S®SML01, R&S®SML02, R&S®SML03
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 instrument to host file system)
Ethernet/LAN addressing		DHCP, Static support of ZeroConf and M-DNS to ease the direct connection to a system controller
USB protocol		VISA USB-TMC

Connectors

Front-panel connectors

RF 50 Ω	RF output	N female
I	I modulation input signal	BNC female
Q	Q modulation input signal	BNC female
USB (2 connectors)	USB 2.0 (high speed) connector for external USB devices, mouse and keyboard for enhanced operation, R&S®NRP-Zxx power sensors (with R&S®NRP-Z4 adapter cable) for external power measurements and level adjustment of instrument, memory stick for software update and data exchange, USB serial adapter for RS-232-C remote control	USB type A

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

Rear-panel connectors

LF	modulation generator output	BNC female
MOD EXT	input for external analog modulation	BNC female
REF IN	reference frequency input	BNC female
REF OUT	reference frequency output	BNC female
PULSE EXT	input for external pulse modulation	BNC female
PULSE VIDEO	pulse generator output	BNC female
INST TRIG	trigger input	BNC female
SIGNAL VALID	output for triggering external devices (low state indicates that the instrument has settled to its final value)	BNC female
LO IN	phase-coherent LO input	SMA female
LO OUT	phase-coherent LO output	SMA female
USB IN	USB 2.0 (high speed) remote control of instrument (USB-TMC)	USB type B
USB	USB 2.0 (high speed) connector for external USB devices, mouse and keyboard for enhanced operation, R&S®NRP-Zxx power sensors (with R&S®NRP-Z4 adapter cable) for external power measurements and level adjustment of instrument, memory stick for software update and data exchange, USB serial adapter for RS-232-C remote control	USB type A
LAN	provides remote control functionality and other services, see section “Remote control”	RJ-45
IEEE 488	remote control of instrument via GPIB	24-pin Amphenol series 57 female
Sensor	connector for R&S®NRP-Zxx power sensors with trigger functionality	six-pole ODU Mini-Snap® series B
I, $\overline{I}$	baseband output I, $\overline{I}$	BNC female
Q, $\overline{Q}$	baseband output Q, $\overline{Q}$	BNC female
MARKER 1, MARKER 2	marker from baseband	BNC female
BASEBAND DIGITAL	input or output for digital baseband signals	26-pin LVDS in line with Rohde & Schwarz TVR290 (not supported yet)
CLK OUT	clock output from baseband	BNC female
CLK IN	clock input for baseband	BNC female
NEXT	trigger for baseband multisegment mode	BNC female
TRIG	trigger for baseband	BNC female
DIGITAL IQ IN/OUT	digital input or output connectivity in line with R&S®Digital I/Q Interface to connect to the R&S®EX-IQ-Box, for example	26-pin MDR

General data

Power supply		
AC input voltage range		90 V to 264 V
AC supply frequency		45 Hz to 66 Hz
Max. input current		1.4 A (100 V) to 0.6 A (240 V)
Power consumption	when fully equipped	< 150 W
Power factor correction		in line with EN 61000-3-2
Electrical safety		
Compliance		in line with IEC 61010-1, EN 61010-1, CAN/CSA-C22.2 No. 61010-1-04, UL 61010-1
Test mark		VDE-GS, $_{C}$CSA$_{US}$
EMC		
Electromagnetic compatibility	emissions	in line with EN 55011 class B
	immunity to interfering field strength	in line with EN 61326-1 (industrial environment) EN 61326-2-1
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz, const. 0.5 g at 55 Hz to 150 Hz, 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, proc. I
Environmental conditions		
Temperature range	operating temperature range	0 °C to +55 °C in line with EN 60068-2-1, EN 60068-2-2
	operating temperature range when equipped with R&S®SMBV-B92	0 °C to +45 °C in line with EN 60068-2-1, EN 60068-2-2
	storage temperature range	–40 °C to +71 °C
	storage temperature range when equipped with R&S®SMBV-B92	–40 °C to +60 °C
Climatic resistance	+40 °C/95 % rel. humidity	in line with EN 60068-2-78
Altitude	operating altitude	up to 4600 m
	operating altitude when equipped with R&S®SMBV-B92	up to 3000 m
	storage altitude	up to 4600 m
Dimensions and weight		
Dimensions	W × H × D	344 mm × 155 mm × 368 mm (13.54 in × 6.10 in × 14.49 in)
Weight	when fully equipped	7.9 kg (17.4 lb)
Calibration interval		
Recommended calibration interval	when operated 40 h/week in the full range of the specified environmental conditions	3 years

Ordering information

Designation	Type	Order No.
Base unit		
Vector Signal Generator [10] including power cable, Quick Start Guide and CD-ROM (with operating and service manual)	R&S®SMBV100A	1407.6004.02
Options		
RF		
9 kHz to 3.2 GHz	R&S®SMBV-B103	1407.9603.02
9 kHz to 6 GHz	R&S®SMBV-B106	1407.9703.02
Reference Oscillator OCXO [11]	R&S®SMBV-B1	1407.8407.02
Reference Oscillator OCXO High Performance [11]	R&S®SMBV-B1H	1419.1602.02
Phase Coherence	R&S®SMBV-B90	1407.9303.02
Pulse Modulator	R&S®SMBV-K22	1415.8019.02
Pulse Generator	R&S®SMBV-K23	1415.8025.02
Baseband		
Baseband Generator with Digital Modulation (realtime) and ARB (32 Msample), 120 MHz RF bandwidth	R&S®SMBV-B10 [12]	1407.8607.02
Baseband Generator with ARB (32 Msample), 120 MHz RF bandwidth	R&S®SMBV-B50	1407.8907.02
Baseband Generator with ARB (32 Msample), 60 MHz RF bandwidth	R&S®SMBV-B51	1407.9003.02
Memory Extension for ARB to 256 Msample	R&S®SMBV-B55 [12]	1407.9203.02
Hard Disk (removable)	R&S®SMBV-B92	1407.9403.02
Digital Baseband Connectivity	R&S®SMBV-K18	1415.8002.02
Internal digital standards [13]		
Digital Standard GSM/EDGE	R&S®SMBV-K40	1415.8031.02
Digital Standard EDGE Evolution	R&S®SMBV-K41	1415.8460.02
Digital Standard 3GPP FDD	R&S®SMBV-K42	1415.8048.02
3GPP FDD Enhanced MS/BS Tests incl. HSDPA	R&S®SMBV-K43	1415.8054.02
GPS 6 Satellites	R&S®SMBV-K44	1415.8060.02
3GPP FDD HSUPA	R&S®SMBV-K45	1415.8077.02
Digital Standard CDMA2000® incl. 1xEV-DV	R&S®SMBV-K46	1415.8083.02
Digital Standard 1xEV-DO Rev. A	R&S®SMBV-K47	1415.8090.02
Digital Standard IEEE 802.11 (a/b/g)	R&S®SMBV-K48	1415.8102.02
Digital Standard IEEE 802.16	R&S®SMBV-K49	1415.8119.02
Digital Standard TD-SCDMA	R&S®SMBV-K50	1415.8125.02
TD-SCDMA Enhanced BS/MS Tests	R&S®SMBV-K51	1415.8131.02
Digital Standard DVB-H/DVB-T	R&S®SMBV-K52	1415.8148.02
Digital Standard DAB/T-DMB	R&S®SMBV-K53	1415.8154.02
Digital Standard IEEE 802.11 n	R&S®SMBV-K54	1415.8160.02
Digital Standard EUTRA/LTE	R&S®SMBV-K55	1415.8177.02
Digital Standard XM Radio	R&S®SMBV-K56	1415.8183.02
Digital Standard FM Stereo/RDS	R&S®SMBV-K57	1415.8190.02
Digital Standard SIRIUS Radio	R&S®SMBV-K58	1415.8202.02
Digital Standard HSPA+	R&S®SMBV-K59	1415.8219.02
Digital Standard Bluetooth® EDR	R&S®SMBV-K60	1415.8477.02
Multicarrier CW Signal Generation	R&S®SMBV-K61	1415.8225.02
Assisted GPS	R&S®SMBV-K65	1415.8560.02
Galileo 6 Satellites	R&S®SMBV-K66	1415.8590.02
Digital Standard TETRA Release 2	R&S®SMBV-K68	1415.8490.02
GNSS Extension to 12 Satellites	R&S®SMBV-K91	1415.8577.02
GNSS Enhanced (e.g. moving scenarios, multipath)	R&S®SMBV-K92	1415.8583.02

[10] The base unit can only be ordered with an R&S®SMBV-B10x frequency option.

[11] Only one of the options R&S®SMBV-B1 or R&S®SMBV-B1H can be installed.

[12] Requires the R&S®SMBV-B92 option (hard disk).

[13] Requires the R&S®SMBV-B10 option (realtime baseband generator).

Designation	Type	Order No.
Digital modulation systems using R&S®WinIQSIM2™ [14]		
Digital Standard GSM/EDGE	R&S®SMBV-K240	1415.8231.02
Digital Standard EDGE Evolution	R&S®SMBV-K241	1415.8454.02
Digital Standard 3GPP FDD	R&S®SMBV-K242	1415.8248.02
3GPP FDD Enhanced BS/MS Tests incl. HSDPA	R&S®SMBV-K243	1415.8254.02
Digital Standard GPS	R&S®SMBV-K244	1415.8260.02
3GPP FDD HSUPA	R&S®SMBV-K245	1415.8277.02
Digital Standard CDMA2000® incl. 1x EV-DV	R&S®SMBV-K246	1415.8283.02
Digital Standard 1xEV-DO Rev. A	R&S®SMBV-K247	1415.8290.02
Digital Standard IEEE 802.11 (a/b/g)	R&S®SMBV-K248	1415.8302.02
Digital Standard IEEE 802.16	R&S®SMBV-K249	1415.8319.02
Digital Standard TD-SCDMA	R&S®SMBV-K250	1415.8325.02
TD-SCDMA Enhanced BS/MS Tests	R&S®SMBV-K251	1415.8331.02
Digital Standard DVB-H	R&S®SMBV-K252	1415.8348.02
Digital Standard DAB/T-DMB	R&S®SMBV-K253	1415.8525.02
Digital Standard IEEE 802.11 n	R&S®SMBV-K254	1415.8354.02
Digital Standard EUTRA/LTE	R&S®SMBV-K255	1415.8360.02
Digital Standard HSPA+	R&S®SMBV-K259	1415.8377.02
Digital Standard Bluetooth® EDR	R&S®SMBV-K260	1415.8483.02
Multicarrier CW Signal Generation	R&S®SMBV-K261	1415.8383.02
Additive White Gaussian Noise (AWGN)	R&S®SMBV-K262	1415.8425.02
Digital Standard TETRA Release 2	R&S®SMBV-K268	1415.8502.02
Digital modulation systems using an external PC software or waveforms		
Pulse Sequencer [15]	R&S®SMBV-K6	1415.8390.02
Playback of XM Radio Waveforms [16]	R&S®SMBV-K256	1415.8402.02
Playback of HD Radio™ Waveforms [17]	R&S®SMBV-K352	1415.8431.02
Noise generation		
Additive White Gaussian Noise (AWGN)	R&S®SMBV-K62	1415.8419.02
Recommended extras		
19" Rack Adapter	R&S®ZZA-S334	1109.4487.00
Power Sensor, 9 kHz to 6 GHz	R&S®NRP-Z92	1171.7005.02
Keyboard with USB Interface (US character set)	R&S®PSL-Z2	1157.6870.04
Mouse with USB Interface, optical	R&S®PSL-Z10	1157.7060.03
USB Adapter for R&S®NRP-Zxx power sensors	R&S®NRP-Z4	1146.8001.02
USB Serial Adapter for RS-232-C remote control	R&S®TS-USB1	6124.2531.00

[14] R&S®WinIQSIM2™ requires an external PC.
[15] Pulse sequencer requires an external PC.
[16] Signal generation requires waveforms from XM Radio.
[17] Requires license by iBiquity Digital Corp.

Service options		
Two-Year Calibration Service	R&S®CO2SMBV100A	Please contact your local Rohde & Schwarz sales office.
Three-Year Calibration Service	R&S®CO3SMBV100A	
Five-Year Calibration Service	R&S®CO5SMBV100A	
One-Year Repair Service following the warranty period	R&S®RO2SMBV100A	
Two-Year Repair Service following the warranty period	R&S®RO3SMBV100A	
Four-Year Repair Service following the warranty period	R&S®RO5SMBV100A	

License information

The firmware of this device contains open source software. Details as well as license agreements can be found in release notes and the operating manual.

For product brochure, see PD 5214.1114.12 and www.rohde-schwarz.com

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- ISO 14001-certified environmental management system

Certified Quality System
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