R&S®SMB100A
Microwave Signal Generator
Versatile, compact, up to 40 GHz; 170 GHz with upconverter

ROHDE&SCHWARZ

Product Brochure | Version 07.00

R&S®SMB100A Microwave Signal Generator

At a glance

The compact, versatile R&S®SMB100A microwave signal generator with a frequency range up to 40 GHz provides outstanding spectral purity and high output power. In addition, it features easy operation, comprehensive functionality and low cost of ownership.

The R&S®SMB100A provides microwave characteristics that are exceptional in its class, making it an excellent general-purpose instrument. These outstanding characteristics plus its compact size and low weight make the instrument ideal for a wide range of applications. The R&S®SMB100A is optimally suited for use in development, production and service, or, to put it even simpler: wherever an analog microwave signal is required.

Its wide frequency range covers a large number of challenging applications. The R&S®SMB100A is the perfect choice for applications in the important ISM bands up to 5.7 GHz.

Furthermore, the R&S®SMB100A can be ideally used for measuring the blocking characteristic up to a CW frequency of 12.75 GHz, as specified in various telecommunications standards. When it comes to frequently changing level settings, this is the first time that a wear-free electronic step attenuator is used in this frequency range.

Four frequency options up to 12.75 GHz, 20 GHz, 31.8 GHz and 40 GHz are available to cover the microwave range. These options are suitable for tests on radar systems and antennas in the X and K bands, for example for wideband receiver tests.

For even higher frequencies, the frequency range of the R&S®SMB100A can be easily extended with the R&S®SMZ frequency multiplier. The R&S®SMB100A plus R&S®SMZ solution combines easy handling with precise, adjustable output levels in the frequency range from 50 GHz to 110 GHz (adjustable output levels are not possible with R&S®SMZ170).

In addition to pure CW signals, the R&S®SMB100A also provides the most common analog AM and FM/φM modulation modes as standard. Moreover, the R&S®SMB100A can be equipped with an excellent pulse generator and pulse modulator that makes it possible to generate user-programmable pulse scenarios, also referred to as pulse trains.

Key facts

- Wide frequency range from 100 kHz to 40 GHz
- Excellent signal characteristics with low SSB phase noise of typ. –128 dBc (at 1 GHz, 20 kHz offset)
- High output power of typ. up to +27 dBm
- All important analog modulations with AM, FM/φM and pulse modulation supported
- Compact size with only two height units and low weight

R&S®SMB100A Microwave Signal Generator

Benefits and key features

All-purpose signal source

- Wide frequency range from 100 kHz to 12.75/20/31.8/40 GHz covering the main frequency bands for microwave applications
- Frequency extension from 50 GHz to 170 GHz in combination with the R&S®SMZ frequency multiplier
- All important analog modulations with AM, FM/φM and pulse modulation supported
- Support of R&S®NRP-Zxx power sensors
- Reverse power protection for high operational reliability (optionally available for the 12.75 GHz model)
- Intuitive user interface with graphical display of signal flow for easy operation
- Remote control via LAN, USB and GPIB including emulation modes for legacy instruments
- Low weight and compact design for a wide range of applications, including mobile applications

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Best signal quality in the mid-range

- Very low SSB phase noise of typ. –128 dBc at 1 GHz and typ. –108 dBc at 10 GHz carrier frequency (20 kHz carrier offset, 1 Hz measurement bandwidth)
- Optional internal low harmonic filters for the 20 GHz and 40 GHz model to lower the harmonics to less than –50 dBc for frequencies above 150 MHz
- Innovative DDS-based synthesizer concept

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High output power and wide level range

- High power over a wide frequency range
- Low level range down to –120 dBm (for instruments equipped with step attenuator) with no compromise in quality
- High harmonics suppression of < –30 dBc even at high output power

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Ideal for production

- Wear-free electronic attenuator up to 12.75 GHz ensuring long life even in the case of heavy use in production
- High level accuracy and repeatability for high production yield
- Closed loop power control ensures highly accurate and very stable input power to the DUT irrespective of unwanted power drifts in the test setup (e.g. caused by a power amplifier in between the signal generator and the DUT)
- Short frequency and level settling times which can be further reduced in List mode
- Low power consumption

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Frequency extension from 50 GHz to 170 GHz

- R&S®SMB100A signal generator (≥ 20 GHz) plus an external R&S®SMZ frequency multiplier controlled via USB
- An internal attenuator (mechanically or electronically controlled) can be integrated into the same housing as the frequency multiplier

▷ page 13

Ready for aerospace and defense applications

- Optional pulse modulator with typ. > 90 dB ON/OFF ratio and rise/fall time of typ. < 5 ns and pulse generator with minimum pulse width of 10 ns for radar system testing
- Flexible generation of pulse trains for simulating complex pulse scenarios (optional)
- Wide temperature range of 0 °C to +55 °C and high permissible operating altitude of 4600 m for use even under extreme conditions
- Sanitizing of user data for secured areas
- High-quality shielding

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User-defined correction of external frequency responses

▷ page 16

Closed loop power control

▷ page 17

Flexible service concept

- Servicing on-site or at a Rohde & Schwarz service center
- Built-in selftest of modules to support troubleshooting
- Complete calibration recommended only every three years

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Hardware and software option concept for the R&S®SMB100A.

The table provides an overview of the frequency ranges as well as of functionalities and options.

Model overview

Frequency range	100 kHz to 12.75 GHz	100 kHz to 20 GHz	100 kHz to 31.8 GHz	100 kHz to 40 GHz
With electronic step attenuator	○	–	–	–
Without electronic step attenuator	○	–	–	–
With mechanical step attenuator	–	○	○	○
Without mechanical step attenuator	–	○	–	○
High power	●	○	○	○
Low harmonic filter	–	○	○	○
OCXO reference oscillator [1]	○	○	○	○
OCXO reference oscillator, high performance [1]	○	○	○	○
Reverse power protection	○	–	–	–
Pulse modulator	○	○	○	○
Pulse generator	○	○	○	○
Pulse train	○	○	○	○

The R&S®SMB100A (20 GHz , 31.8 GHz or 40 GHz model) in combination with one of the R&S®SMZ frequency multipliers below covers the frequency range from 50 GHz up to 170 GHz.

Model overview

Frequency multiplier	R&S®SMZ75	R&S®SMZ90	R&S®SMZ110	R&S®SMZ170
Frequency range	50 GHz to 75 GHz	60 GHz to 90 GHz	75 GHz to 110 GHz	110 GHz to 170 GHz
With mechanically controlled attenuator [2]	○	○	○	–
With electronically controlled attenuator [2]	○	○	○	–

● Standard
○ Optional
– Not available

[1] Only one of the following options can be installed: R&S®SMB-B1 (OCXO reference oscillator) or R&S®SMB-B1H (OCXO reference oscillator, high performance).
[2] Only one of the following options can be installed: the mechanically or the electronically controlled attenuator.

All-purpose signal source

Wide frequency range from 100 kHz to 40 GHz

The signal generator's wide frequency range, high output power and a wide variety of modulations make it a flexible signal source for a broad scope of applications. Its frequency option up to 12.75 GHz covers ISM bands as well as all important mobile radio bands. In addition, the frequency options up to 20 GHz and 40 GHz cover numerous microwave applications that require high spectral purity and high output power.

Frequency extension from 50 GHz to 170 GHz in combination with the R&S®SMZ frequency multiplier

In the frequency range of 50 GHz to 170 GHz the R&S®SMB100A in combination with the R&S®SMZ frequency multiplier is the ideal solution. It can be used in diverse applications, e.g. in the automotive sector with distance radars, in astronomy with sophisticated telescopes and in radar interferometry for analyzing the earth's surface.

All important analog modulations with AM, FM/φM and pulse modulation supported

The R&S®SMB100A handles the important analog AM, FM/φM modulation modes and pulse modulation with excellent characteristics. In AM and FM/φM modulation, the RF carrier is modulated with the internal LF generator or also with external signals. The two different sources of modulation can be internally added to generate two-tone-modulated signals. Due to its digital modulation processing, the R&S®SMB100A implements the modulation modes with high accuracy and minimum distortion.

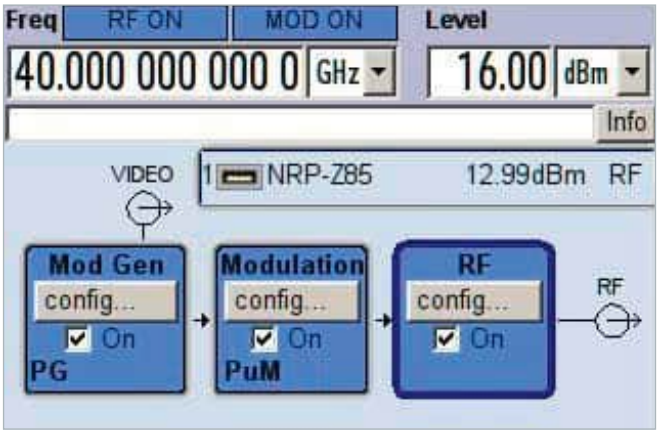
Support of R&S®NRP-Zxx power sensors

The R&S®SMB100A supports a wide variety of R&S®NRP-Zxx USB power sensors. The R&S®NRP-Z92 is a power sensor that ideally complements the frequency and level range of the generator up to 6 GHz. Equipped with such a power sensor, the R&S®SMB100A fully automatically performs external level correction or precisely measures the power in the test setup. The R&S®NRP-Z55 power sensor can be used with the 12.75 GHz, 20 GHz or 40 GHz frequency option of the R&S®SMB100A for the same purpose.

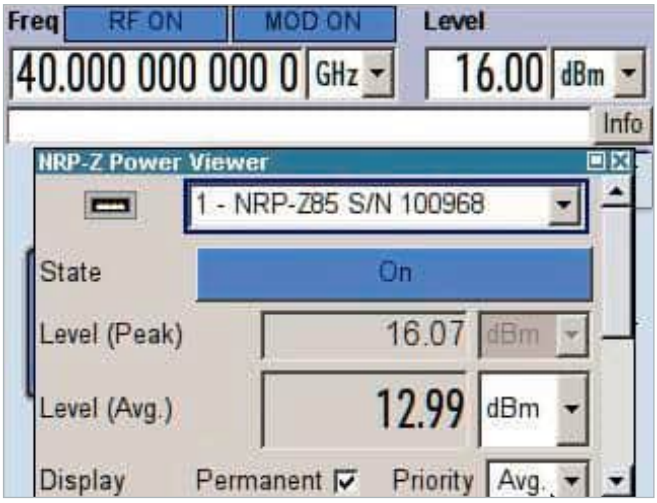
Reverse power protection for high operational reliability

The reverse power protection protects the R&S®SMB100A from high external voltages and high power at the RF output. This feature shields the RF output against unwanted high reverse power and ensures a high degree of operational reliability. The R&S®SMB-B30 reverse power protection is available for the R&S®SMB-B112/R&S®SMB-B112L 12.75 GHz frequency options.

Pulse-modulated signal measured with the R&S®NRP-Z85 wideband power sensor.



Details of the measurement with the R&S®NRP-Z85 wideband power sensor (peak and average).



Intuitive user interface

Intuitive operation via the graphical user interface and the integrated help system facilitate the optimum use of the R&S®SMB100A for the application at hand. To support graphical operation, a mouse can be connected via USB.

Remote control via LAN, USB and GPIB including emulation modes

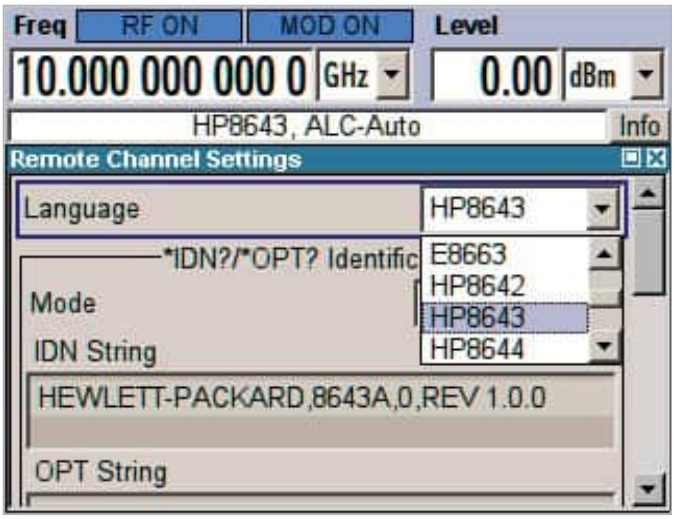
The R&S®SMB100A is also ideally equipped with regard to the remote control interface. In addition to conventional GPIB, it also supports LAN and USB as standard. This is especially advantageous in environments such as service labs where there is often no GPIB.

Signal generators are often used in automated test environments. Replacing them, e.g. due to malfunctions or standard replacement procedures, requires special care. The replacement part and the replaced part must be compatible at least in terms of electrical features and remote control features. Legacy instruments often use a proprietary remote control language. Direct replacement therefore requires language emulation capability in the software of the replacement part. To meet these requirements, the R&S®SMB100A signal generator comes with a language emulation feature. By selecting the desired language emulation, the signal generator acts as the original replaced instrument. The language list already includes a large number of emulated instruments and will be updated on a regular basis.

Low weight and compact design

The R&S®SMB100A has a compact size of only two height units and ¾ 19" width. This form factor plus its low weight of max. 6.9 kg for the 40 GHz model make it ideal for mobile use. It easily fits in any lab and service center, where space is often at a premium.

The emulation mode can be set in the remote setup menu of the R&S®SMB100A.



Best signal quality in the mid-range

Phase noise, harmonics, nonharmonic spurious and wideband noise are key parameters when it comes to characterizing the spectral properties of analog signal generators. Many measurements focus on more than one aspect simultaneously. For example, in blocking measurements, nonharmonics together with phase noise are essential in generating the usually unwanted RFI power in the adjacent channel.

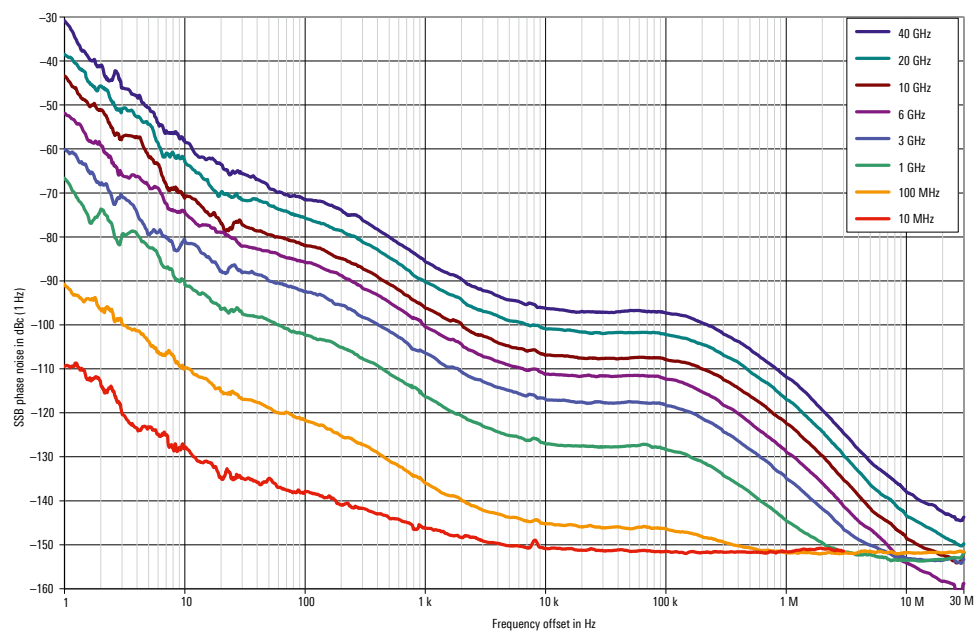
Very low SSB phase noise

When it comes to SSB phase noise performance, the R&S®SMB100A consistently achieves excellent values over the entire frequency range from from 100 kHz to 40 GHz. This is due to its remarkable concept. Below 3 GHz, the R&S®SMB100A works down to 23.3475 MHz with frequency dividers. Below this value, the integrated DDS synthesizer generates the output signal directly. In contrast to conventional designs that use a mixer range below approx. 250 MHz, the innovative Rohde & Schwarz solution leads to a much better phase noise performance at low frequencies.

The R&S®SMB100A is therefore the ideal replacement in test circuits for fixed-frequency high-end crystal oscillators that are often used as a reference signal. The R&S®SMB100A combines equal or even improved signal performance with adjustable frequency and adjustable level, which is highly beneficial as it can be ideally adapted to the DUT. Moreover, the R&S®SMB100A makes it possible to define the DUT tolerance range relative to the reference by varying these parameters.

To further improve the close-in phase noise and frequency stability, two different OCXO reference oscillators are available as options. Especially the R&S®SMB-B1H offers excellent performance that is unprecedented in this class.

SSB phase noise



Measured SSB phase noise with the R&S®SMB-B1H OCXO option for the 12.75/20/31.8/40 GHz model.

Optional internal low harmonic filters for the 20 GHz and 40 GHz model to lower the harmonics to less than –50 dBc

The harmonics of the R&S®SMB100A microwave signal generator can be significantly reduced with the optional low harmonic filters (the R&S®SMB-B25 for the 20 GHz model and the R&S®SMB-B26 for the 40 GHz model). The low harmonic filter generally improves measurement accuracy in the entire setup for frequencies higher than 150 MHz.

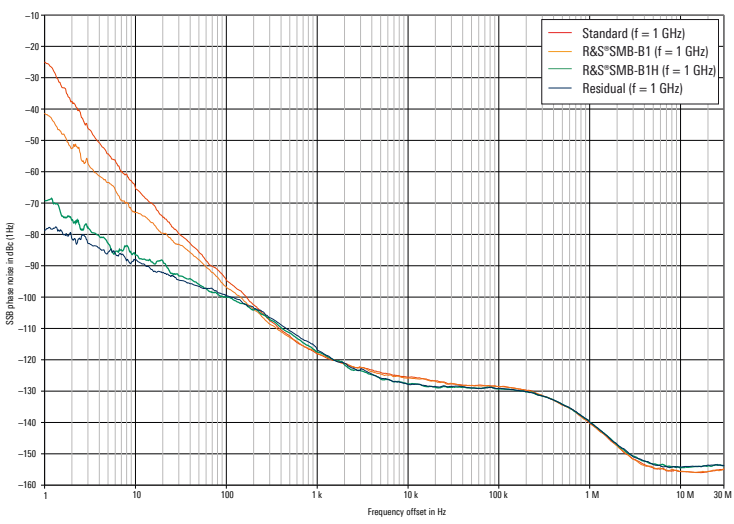
Devices which are affected by bad harmonics are, for example, wideband receivers. During blocking tests, the harmonics of the signal generator could fall into the desired band and interfere the measurement result.

Another critical application is the total harmonic distortion (THD) measurement of a power amplifier. The setup comprises a signal generator generating the input signal, the DUT and a spectrum analyzer for measuring the amplifier performance. Here, the harmonics must be low enough to ensure that the harmonic distortion of the device under test is measured and not the harmonics of the signal source. And last but not least: for scalar network analysis, good dynamic range of the overall setup is essential. Bad harmonics from the signal source will limit this, since the harmonics are unintentionally measured, too.

Innovative DDS-based synthesizer concept

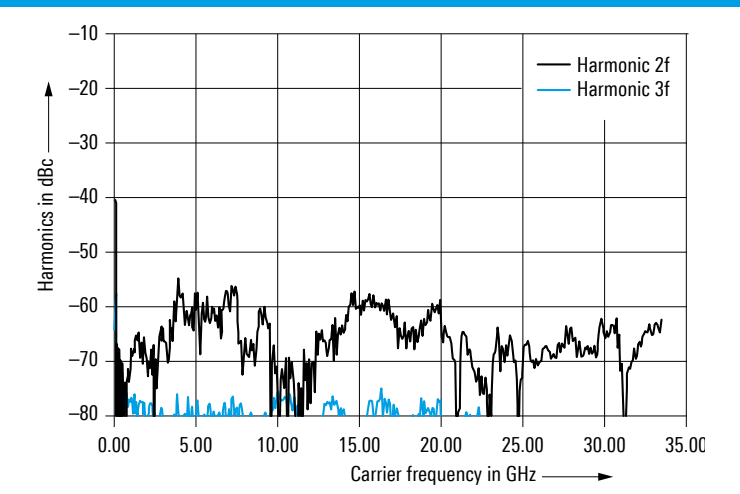
The R&S®SMB100A superbly handles high signal-quality requirements. Due to its innovative DDS-based synthesizer concept, the R&S®SMB100A yields unsurpassed values in all parameters called for in the mid-range, thereby setting new standards.

SSB phase noise



Measured SSB phase noise with standard reference, the R&S®SMB-B1 option and the R&S®SMB-B1H option.

Harmonics



Harmonics versus carrier frequency at +10 dBm output level with R&S®SMB-B140 option and R&S®SMB-B32 (meas.).

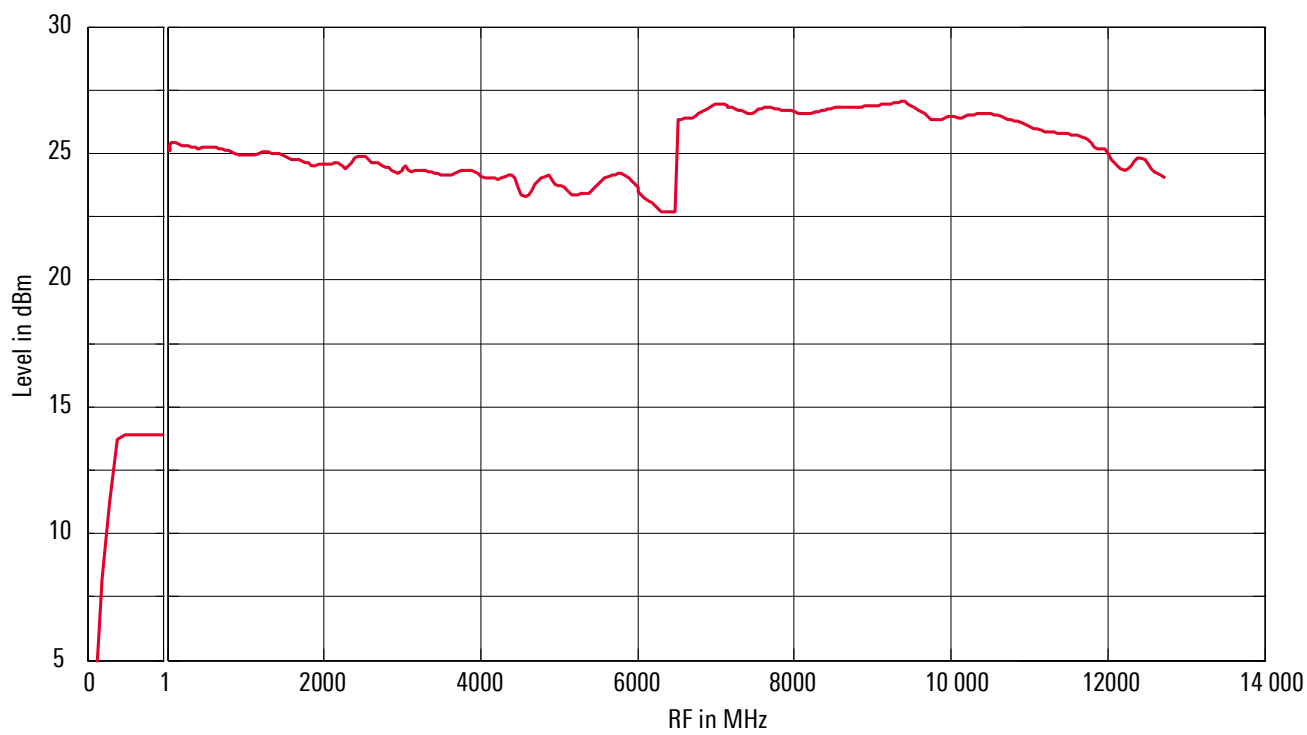
High output power and wide level range

High power over a wide frequency range

The R&S®SMB100A combines excellent signal quality with a high output power of > +18 dBm as standard, which is unique in this instrument class, over a wide frequency range of 1 MHz to 12.75 GHz. The maximum available output power is up to +27 dBm, offering sufficient power reserve to easily compensate for level loss in a test setup. The R&S®SMB-B31 high power option for the 20 GHz model delivers a specified output power of +19 dBm while the R&S®SMB-B32 high power option for the 40 GHz model achieves +16 dBm over a wide frequency range up to 20 GHz and 40 GHz, respectively. These values are even outperformed in overrange. This usually eliminates the need for an additional external amplifier, which saves space and also drastically reduces costs for a test system. In applications, users additionally benefit from the high level accuracy that the R&S®SMB100A provides – a level accuracy that is not necessarily provided if an external amplifier is used.

Measured maximum output power versus frequency of the R&S®SMB100A 12.75 GHz instrument.

Maximum output power



Low level range with no compromise in quality

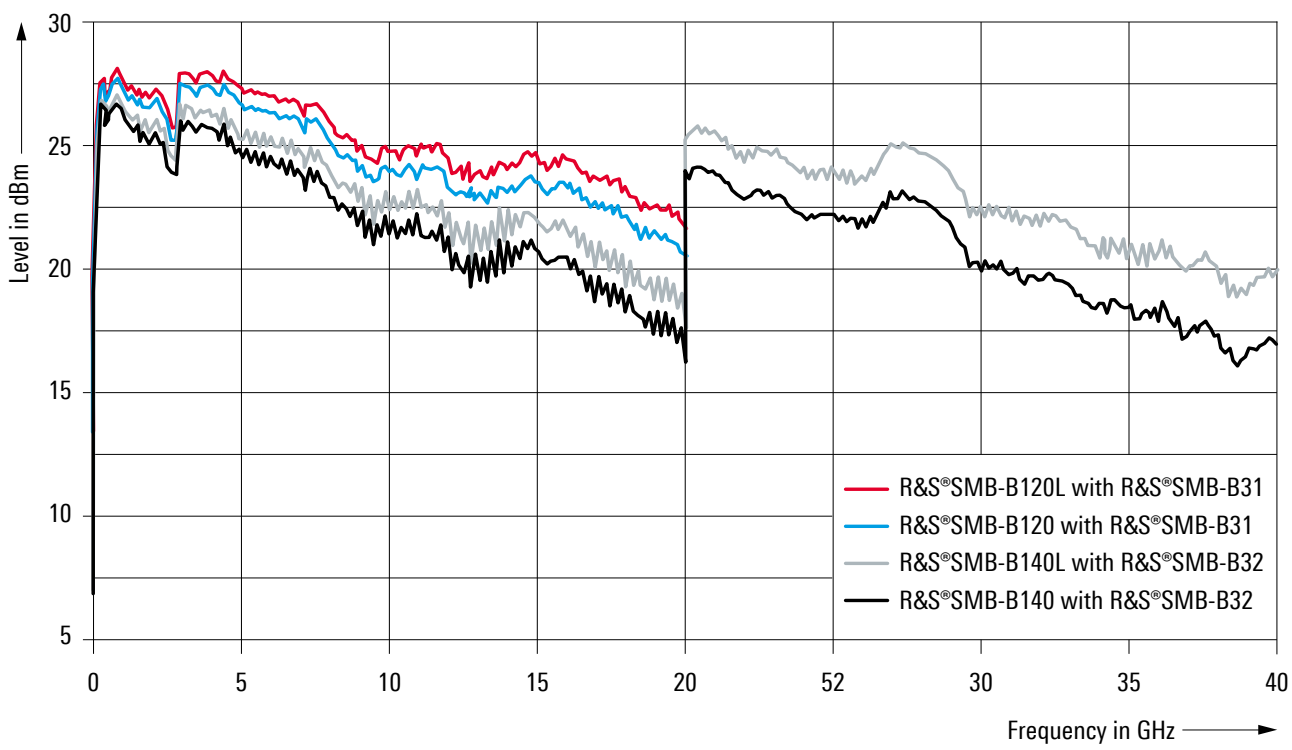
Even in the lower level range, the R&S®SMB100A makes no compromise in quality. The RF level is specified down to –120 dBm when a step attenuator is installed. This makes the generator ideal for sensitivity measurements on receivers.

High harmonics suppression of < –30 dBc even at high output power

What is special about the R&S®SMB100A is that harmonics are still suppressed with < –30 dBc even at high output power, ideal for amplifier design applications up to 40 GHz. The nonharmonics are even suppressed by e.g. typ. < –78 dBc at 3 GHz or typ. < –66 dBc at 10 GHz.

Typical measurement of the R&S®SMB100A high-power 20 GHz and 40 GHz models, with and without optional step attenuator.

Maximum output power with high power option

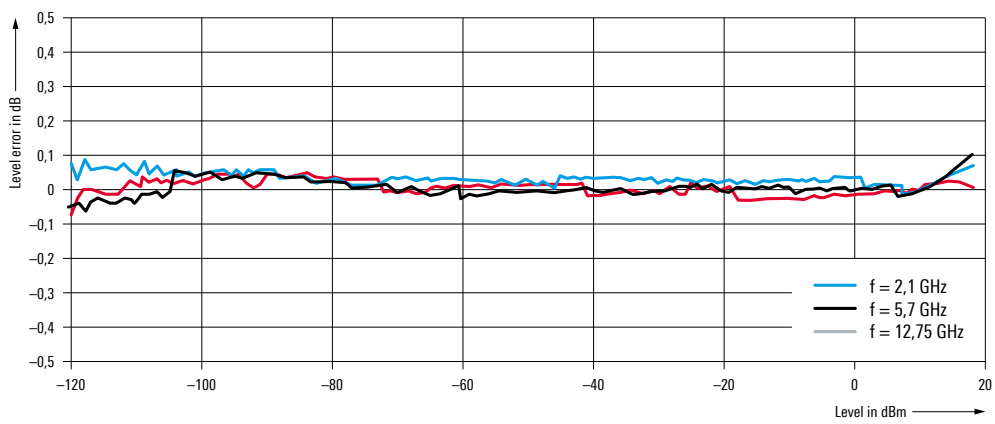


Ideal for production

Wear-free electronic attenuator with reverse power protection

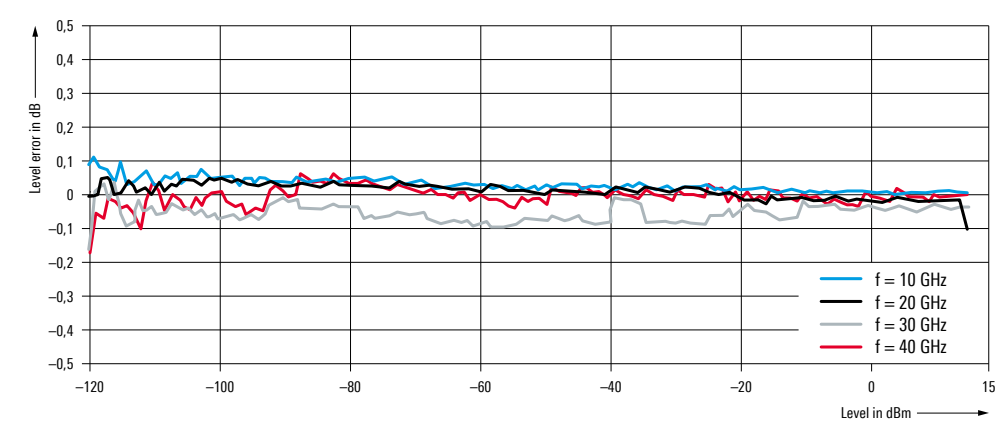
The wear-free electronic attenuator – in the frequency range up to 12.75 GHz – of the R&S®SMB100A functions reliably, even if the level values frequently change. As a result, high availability in the test system is ensured together with long service intervals even in the case of heavy use in production. Moreover, the reverse power protection (optionally available for the 12.75 GHz model) shields the R&S®SMB100A against high reverse power or DC voltage on the RF line.

Level linearity



Measured level linearity, ALC ON (with the R&S®SMB-B112 12.75 GHz frequency option).

Level linearity



Measured level linearity, ALC ON (with the R&S®SMB-B140 40 GHz frequency option and the R&S®SMB-B32 high power option).

High level accuracy and repeatability for high production yield

The R&S®SMB100A offers high level accuracy and repeatability, as well as a very high level sweep range over the entire range. Measurements within narrow limits can be performed with high reproducibility, boosting production yield.

Closed loop power control

Highly accurate and stable power for testing DUTs is a very important performance requirement in many applications. The real power directly applied to the DUT is affected by cables, modules and components inbetween the signal generator and the DUT. By measuring the incident power to the DUT with a R&S®NRP power sensor and feeding the measurement result back to the R&S®SMB100A signal generator, the R&S®SMB100A can compensate for losses or drifts in the entire set up.

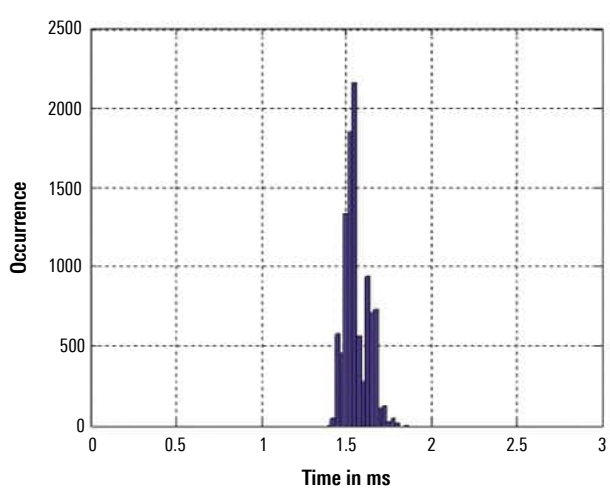
Short frequency and level settling times

Another criterion in production is the short settling time of the test instrument in order to achieve high throughput. The R&S®SMB100A meets this requirement by achieving short frequency (< 3 ms) and level (< 2.5 ms) settling times up to 40 GHz. Plus, it features the List mode as standard, which reduces the settling times to well below 1 ms. In this mode, settling parameters for the frequency and level pairs recorded in a list are precalculated and stored in order to speed up switchover.

Low power consumption

The R&S®SMB100A combines very low power consumption and effective heat dissipation. Its power consumption of only 140 W (40 GHz model) reduces expenditures for cooling in a production line rack. The efficient design of the R&S®SMB100A also has a positive impact on the MTBF.

Frequency settling time



Measured frequency settling time statistics for remote control over 10 000 settings (with the R&S®SMB-B112 frequency option).

Frequency extension from 50 GHz to 170 GHz

Frequencies in the range from 50 GHz to 170 GHz can be easily generated with the R&S®SMB100A signal generator (20 GHz, 31.8 GHz or 40 GHz model) plus an external R&S®SMZ frequency multiplier. The frequency multiplier family consists of the models R&S®SMZ75 (from 50 GHz to 75 GHz), R&S®SMZ90 (from 60 GHz to 90 GHz), R&S®SMZ110 (from 75 GHz to 110 GHz) and the R&S®SMZ170 (from 110 GHz to 170 GHz). In order to change the output power of the frequency multiplier, an additional attenuator is necessary (not available for R&S®SMZ170). For simpler handling, the attenuator is integrated into the same housing as the frequency multiplier.

The R&S®SMB100A signal generator directly controls the R&S®SMZ frequency multiplier via USB. This combination operates as a single unit, allowing users to enter the wanted frequency and the target level at the R&S®SMZ output directly on the R&S®SMB100A.

Compared with conventional setups, this one-box solution significantly simplifies setup and operation. The R&S®SMB100A receives all necessary data from the connected R&S®SMZ, such as the configuration, the multiplication factor and in particular the precalibrated frequency response. The R&S®SMB100A is able to perform automatic correction, which ensures that the frequency and level values set on the R&S®SMB100A will actually be available at the R&S®SMZ output. Costly, error-prone and time-consuming level measurement using level detectors or power sensors, which is common for conventional setups, is no longer required.

Signals in the frequency range from 50 GHz to 170 GHz are used in both the civil sector and in aerospace & defense applications. Here, the R&S®SMB100A microwave signal generator in combination with the R&S®SMZ frequency multiplier is mainly used as a local oscillator (LO). An ideal CW signal with high spectral purity and an accurate level is required. The easiest way to obtain this signal is to use the R&S®SMB100A plus the R&S®SMZ frequency multiplier with built-in electronically controlled attenuator: The frequency and the level are set on the R&S®SMB100A and measurement can begin immediately.

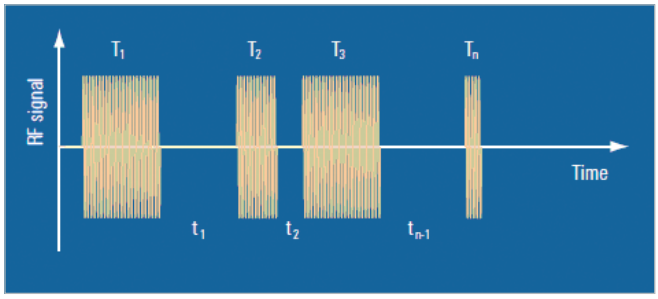
Test setup containing the R&S®SMB100A microwave signal generator (20 GHz or 40 GHz model) and the R&S®SMZ110 frequency multiplier with built-in electronically controlled attenuator.

Ready for aerospace and defense applications

Optional high-performance pulse modulator and pulse generator

Pulsed signals are frequently required in aerospace and defense applications to test radar systems. To meet this need, the R&S®SMB100A can be equipped with an integrated pulse modulator (R&S®SMB-K21) and a pulse generator (R&S®SMB-K23) with superb characteristics such as a minimum pulse width of 10 ns for radar system testing. The pulse modulator, for example, makes it possible to perform radar tests with a high ON/OFF ratio of > 80 dB and very short rise/fall times of typ. < 5 ns. The pulse modulator is either controlled by an external pulse signal or it is supplied with single or double pulses or pulse trains as modulation signals by the internal pulse generator.

Pulse train: combination of pulses with different pulse widths and pulse pauses.



Editing pulse train data.

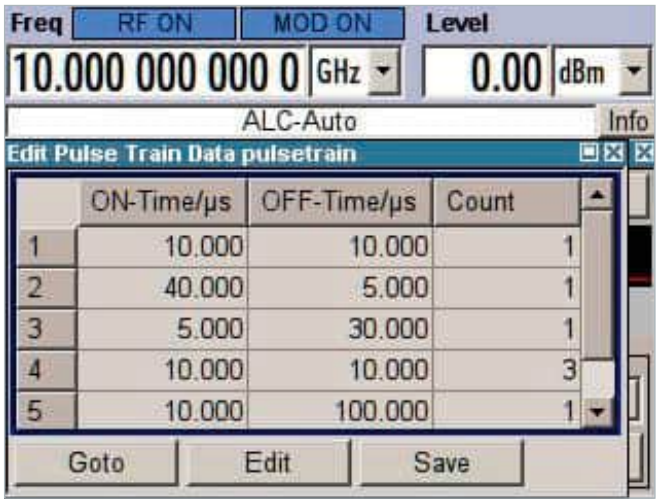
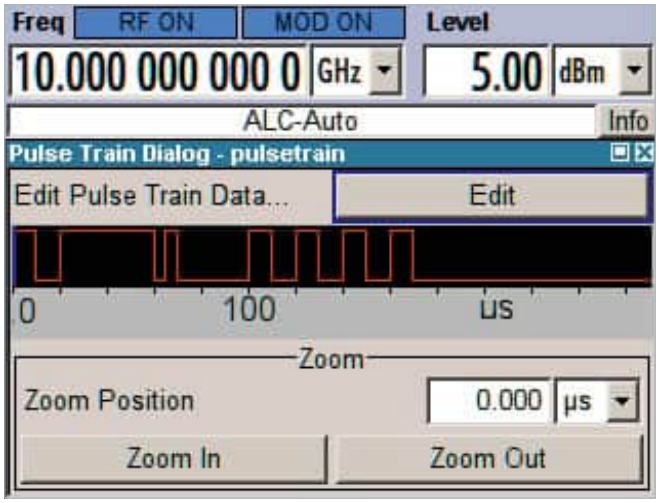


Diagram of the pulse train.



Versatile pulse trains

An optional feature of the built-in pulse generator is the possibility to generate pulse trains (R&S®SMB-K27 option), which are commonly used for radar applications. An example of a pulse train is shown in the figure on the left. In contrast to a single or double pulse, a pulse train is a combination of different pulses, which can be a periodical or non-periodical set of pulses. Pulse width and pulse pause can be set independently and separately for each pulse. This makes it possible to generate staggered pulses or to apply jitter to pulse width and pulse pause. Up to 2047 different pulses with a repetition of 1 to max. 65 535 are possible. This yields very long pulse train sequences for testing.

Wide temperature range and high permissible operating altitude

The R&S®SMB100A functions reliably under extreme conditions owing to its wide temperature range of 0 °C to +55 °C and a maximum permissible operating altitude of 4600 m above sea level.

Sanitizing of user data for secured areas

To meet requirements for secured areas, an erase and sanitize procedure has been developed that reliably erases user data from the instrument. This ensures that no sensitive data will leave the secured area. Moreover, LAN and USB ports can be disabled by means of a security password and the display can be disabled as well.

High-quality shielding

Sensitivity measurements on low-noise satellite receivers can only be made with RF-leakage-proof signal sources. The comprehensive shielding of the R&S®SMB100A based on sophisticated technologies ensures low RF leakage exactly for this purpose.

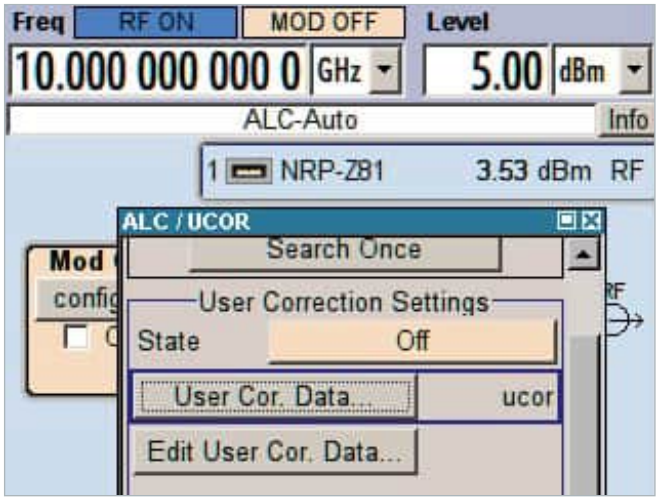
Rear view of the R&S®SMB100A.

User-defined correction of external frequency responses

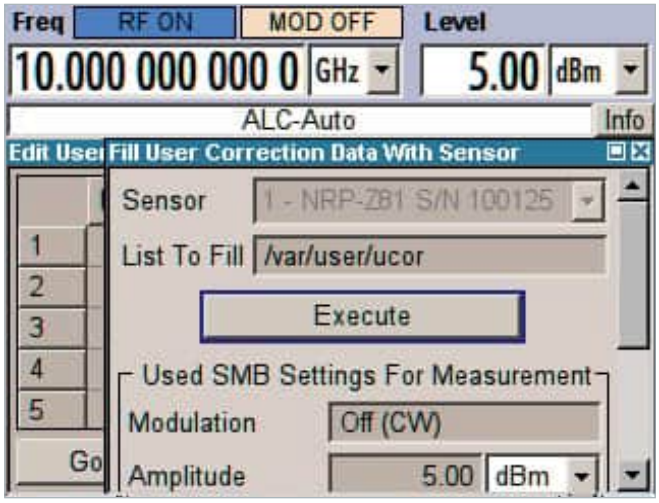
Test setups including cables, power amplifiers or filters always have frequency responses. The signal generator can compensate for the frequency response. The R&S®SMB100A features the User Correction function for precisely this purpose. For a known frequency response that needs to be corrected, the user can enter the level correction values as a function of the frequency. Automatic interpolation of the correction values is performed between these frequency points. To simplify this, the R&S®SMB100A can also automatically include the level correction values at the press of a button by using a directly connected R&S®NRP-Zxx power sensor.

The screenshots show the frequency response correction for an RF cable in the range from 8 GHz to 10 GHz. Without frequency response correction, the level error (measured with the R&S®NRP-Z81) amounts to approx. 1.5 dB at 10 GHz due to cable loss. After the correction values in the range from 8 GHz to 10 GHz have been automatically measured and stored with the R&S®NRP-Z81, the level error will be automatically compensated for when the User Correction function is activated.

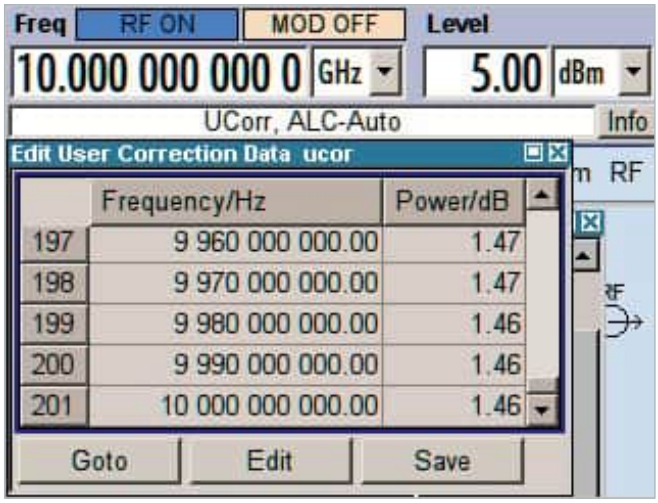
Without frequency response correction of the RF cable, the level error (measured with the R&S®NRP-Z81 power sensor) amounts to approx. 1.5 dB at 10 GHz (nominal value: 5 dBm).



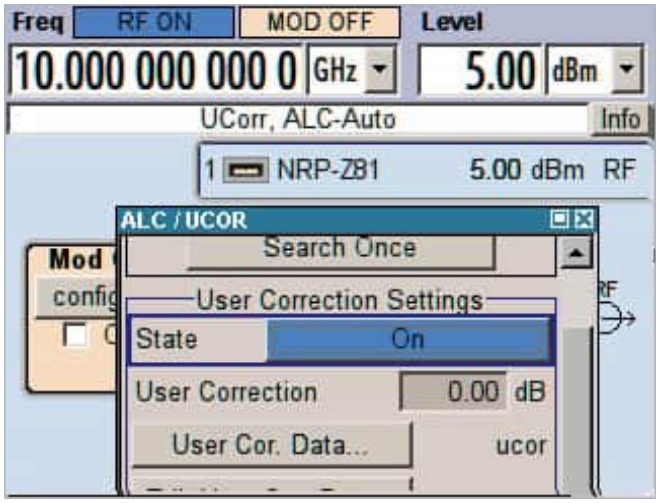
The connected R&S®NRP-Z81 power sensor automatically measures and stores the frequency response of the RF cable.



The measured level correction values are stored in a table together with the user-selected frequencies.



After the User Correction table has been activated, the R&S®SMB100A adapts its output power in order to compensate for the frequency response of the RF cable.



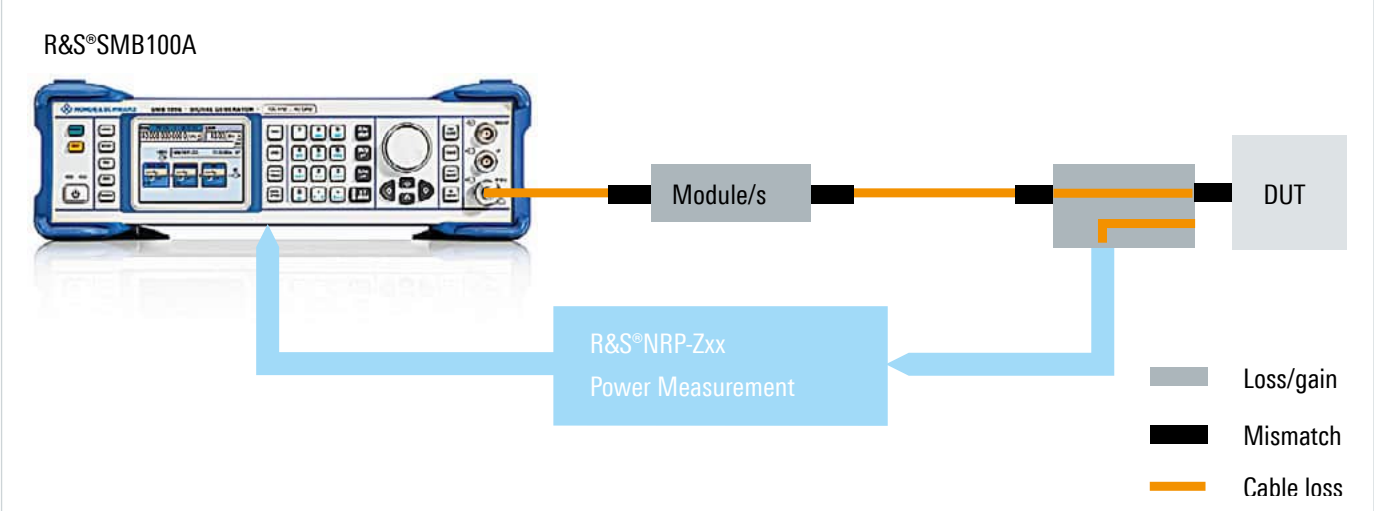
Closed loop power control

One important performance requirement in many applications is the generation of highly accurate and stable power for testing DUTs (e.g. power amplifiers). This is not a trivial task since the real power directly applied to the DUT is affected by the level accuracy of the signal generator, the losses due to cables, the losses due to modules or components and, last but not least, by mismatching. In addition, the frequency response of an amplifier in the setup might show an unwanted temperature dependency.

The best solution to this problem is "closed loop power control" in realtime – a standard feature of the R&S®SMB100A. In the setup below, it ensures highly accurate and very stable input power to the DUT, irrespective of unwanted power drifts or changes in the setup.

For measuring the DUT input power, a directional coupler plus the R&S®NRP-Zxx power sensor connected to the directional coupler can be used. An attractive alternative to the directional coupler plus the R&S®NRP-Zxx power sensor is the R&S®NRP-Z28 level control sensor. The measurement result from the R&S®NRP-Zxx or the R&S®NRP-Z28 is fed back to the R&S®SMB100A, which immediately adjusts its output power to compensate for the discrepancy between wanted and measured level.

Closed loop power control ensures highly accurate and stable input power to the DUT irrespective of unwanted power drifts or changes in the setup



Closed loop power control with directional coupler plus R&S®NRP-Zxx power sensor.

Closed loop power control with R&S®NRP-Z28 level control sensor.

Flexible service concept

Servicing on-site or at a Rohde & Schwarz service center

The R&S®SMB100A is designed for maximum reliability and easy servicing to maximize uptime in all application fields and significantly reduce cost of ownership. Customers can choose between calling on a certified Rohde & Schwarz service center as usual or servicing the instrument themselves.

Built-in selftest of modules to support troubleshooting

A built-in selftest carries out an operational check of the instrument and serves as a troubleshooting aid during servicing. The simple and straightforward architecture with very few modules cuts the time required for troubleshooting and repair to a minimum. A simple function check is usually sufficient to ensure the outstanding specifications of the R&S®SMB100A. Do-it-yourself servicing can be completed in just 45 minutes on average.

Complete calibration only every three years

A complete calibration is recommended for the R&S®SMB100A only every three years and can, of course, also be performed on-site.

Specifications in brief

Specifications in brief		
Frequency		
Frequency range	R&S®SMB-B112/-B112L	100 kHz to 12.75 GHz
	R&S®SMB-B120/-B120L	100 kHz to 20 GHz
	R&S®SMB-B131	100 kHz to 31.8 GHz
	R&S®SMB-B140/-B140L/-B140N	100 kHz to 40 GHz
Settling time	SCPI mode	< 3 ms
	List mode	< 1 ms
Level		
Maximum specified output power (PEP)	R&S®SMB-B112/-B112L, 1 MHz < f ≤ 12.75 GHz	+18 dBm
	R&S®SMB-B120 with R&S®SMB-B31, 50 MHz < f ≤ 20 GHz	+16 dBm
	R&S®SMB-B120L with R&S®SMB-B31, 100 MHz < f ≤ 20 GHz	+19 dBm
	R&S®SMB-B131/-B140/-B140N with R&S®SMB-B32, 50 MHz < f ≤ 40 GHz	+13 dBm
	R&S®SMB-B140L with R&S®SMB-B32, 50 MHz < f ≤ 40 GHz	+16 dBm
Minimum specified output power	R&S®SMB-B112/-B120/-B131/-B140/-B140N	–120 dBm
	R&S®SMB-B112L	–5 dBm
	R&S®SMB-B120L/-B140L	0 dBm
Settling time (without switching of the mechanical attenuator)	SCPI mode	< 2.5 ms
	List mode	< 1 ms
Spectral purity		
SSB phase noise	f = 1 GHz, carrier offset = 20 kHz, 1 Hz measurement bandwidth	< –122 dBc, typ. –128 dBc
	f = 10 GHz, carrier offset = 20 kHz, 1 Hz measurement bandwidth	< –102 dBc, typ. –108 dBc
Harmonics		
R&S®SMB-B112/-B112L	1 MHz < f ≤ 6 GHz; level ≤ 13 dBm [1], f > 6 GHz; level ≤ 10 dBm [1]	< –30 dBc
R&S®SMB-B120/-B120L/-B131/-B140/-B140N/-B140L	standard; level ≤ 8 dBm [1]	
	f > 1 MHz	< –30 dBc
	with R&S®SMB-B25/-B26 low harmonic option, low harmonic filter on, level ≤ 10 dBm [1]	
	1 MHz < f ≤ 150 MHz	< –30 dBc
	150 MHz < f ≤ 3 GHz	< –58 dBc
	3 GHz < f ≤ 20 GHz	< –50 dBc
	f > 20 GHz	< –60 dBc (meas.)
Supported modulation modes		
AM		standard
AM depth		0% to 100%
FM/φM		standard
Maximum FM deviation	f = 10 GHz	32 MHz
Maximum φM deviation	f = 10 GHz	320 rad
Pulse	R&S®SMB-K21/-K22 pulse modulator	
Rise/fall time		< 20 ns, typ. < 5 ns
ON/OFF ratio		> 80 dB
Minimum pulse width of pulse generator output		10 ns
Connectivity		
Remote control		GPIB IEEE-488.2, Ethernet (TCP/IP), USB
Peripherals		USB

[1] Or maximum specified output power, whichever is lower.

Ordering information

Designation	Type	Order No.
Base unit		
Microwave signal Generator [1]	R&S®SMB100A	1406.6000.02
Including power cable, quick start guide and CD-ROM (with operating and service manual)		
Options		
RF path/frequency option		
100 kHz to 12.75 GHz, with electronic step attenuator	R&S®SMB-B112	1407.2109.02
100 kHz to 12.75 GHz, without step attenuator	R&S®SMB-B112L	1407.2150.02
100 kHz to 20 GHz, with mechanical step attenuator	R&S®SMB-B120	1407.2209.02
100 kHz to 20 GHz, without step attenuator	R&S®SMB-B120L	1407.2250.02
100 kHz to 31.8 GHz, with mechanical step attenuator	R&S®SMB-B131	1407.2280.02
100 kHz to 40 GHz, with mechanical step attenuator	R&S®SMB-B140	1407.2309.02
100 kHz to 40 GHz, with mechanical step attenuator, minimum pulse width limited	R&S®SMB-B140N	1407.2380.02
100 kHz to 40 GHz, without step attenuator	R&S®SMB-B140L	1407.2350.02
OCXO reference oscillator [2]	R&S®SMB-B1	1407.3005.02
OCXO reference oscillator, high performance [2]	R&S®SMB-B1H	1407.3070.02
Harmonic filter option		
150 MHz to 20 GHz (only available with R&S®SMB-B120/-B120L)	R&S®SMB-B25	1407.1660.02
150 MHz to 40 GHz (only available with R&S®SMB-B131/-B140/-B140N/-B140L)	R&S®SMB-B26	1407.1760.02
Reverse power protection (only available with R&S®SMB-B112/-B112L)	R&S®SMB-B30	1407.1160.02
High power option		
50 MHz to 20 GHz (only available with R&S®SMB-B120/-B120L)	R&S®SMB-B31	1407.1260.02
50 MHz to 40 GHz (only available with R&S®SMB-B131/-B140/-B140N/-B140L)	R&S®SMB-B32	1407.1360.02
Pulse modulator for R&S®SMB-B112/-B112L/-B120/-B120L/-B131/-B141/-B140/-B140N/-B140L	R&S®SMB-K21	1407.3811.02
Pulse generator	R&S®SMB-K23	1407.3786.02
Pulse train [3]	R&S®SMB-K27	1407.3828.02

[1] The base unit must be ordered together with an R&S®SMB-B112/-B112L/-B120/-B120L/-B131/-B140/-B140N/-B140L frequency option.
[2] Only one of the R&S®SMB-B1 or R&S®SMB-B1H options can be installed.
[3] Requires the R&S®SMB-K23 option; only available for instruments with serial number > 102400.

Designation	Type	Order No.
Recommended extras		
19" rack adapter	R&S®ZZA-S234	1109.4493.00
Power sensor, 9 kHz to 6 GHz, for levels up to 33 dBm; incl. USB adapter cable	R&S®NRP-Z92	1171.7005.42
Power sensor, DC to 40 GHz, for levels up to 20 dBm	R&S®NRP-Z55	1138.2008.03
Power sensor, 10 MHz to 18 GHz, for levels up to 33 dBm	R&S®NRP-Z22	1137.7506.02
Keyboard with USB interface (US character set)	R&S®PSL-Z2	1157.6870.04
Mouse with USB interface, optical	R&S®PSL-Z10	1157.7060.03
USB adapter for R&S®NRP-Zxx power sensors	R&S®NRP-Z4	1146.8001.02
USB serial adapter for RS-232 remote control	R&S®TS-USB1	6124.2531.00
Adapters for instruments with an R&S®SMB-B112/-B112L/-B120/-B120L frequency option		
Test port adapter, PC 3.5 mm female		1021.0512.00
Test port adapter, PC 3.5 mm male		1021.0529.00
Test port adapter, N female		1021.0535.00
Test port adapter, N male		1021.0541.00
Adapters for instruments with an R&S®SMB-B131/-B140/-B140N/-B140L frequency option		
Test port adapter, 2.4 mm female		1088.1627.02
Test port adapter, 2.92 mm female		1036.4790.00
Test port adapter, 2.92 male		1036.4802.00
Test port adapter, N female		1036.4777.00
Test port adapter, N male		1036.4783.00
Frequency multipliers		
Frequency multiplier, 50 GHz to 75 GHz	R&S®SMZ75	1417.4004.02
Frequency multiplier, 60 GHz to 90 GHz	R&S®SMZ90	1417.4504.02
Frequency multiplier, 75 GHz to 110 GHz	R&S®SMZ110	1417.5000.02
Frequency multiplier, 110 GHz to 170 GHz	R&S®SMZ170	1417.5500.02
Including waveguide-to waveguide adapter, DC power adapter, USB cable, hex ball driver 3/32, operating manual, CD-ROM with operating manual		
Options		
Mechanically controlled attenuator for the R&S®SMZ75	R&S®SMZ-B75M [1]	1417.6007.02
Electronically controlled attenuator for the R&S®SMZ75	R&S®SMZ-B75E [1]	1417.6107.02
Mechanically controlled attenuator for the R&S®SMZ90	R&S®SMZ-B90M [1]	1417.6507.02
Electronically controlled attenuator for the R&S®SMZ90	R&S®SMZ-B90E [1]	1417.6607.02
Mechanically controlled Attenuator for the R&S®SMZ110	R&S®SMZ-B110M [1]	1417.7003.02
Electronically controlled attenuator for the R&S®SMZ110	R&S®SMZ-B110E [1]	1417.7103.02
Documentation		
Documentation of calibration values	R&S®DCV-2	0240.2193.18
Accredited calibration	R&S®ACASMB100A	3596.9508.03

[1] Option factory fitted (only mechanically or electronically controlled attenuators can be fitted).

Warranty		
Base unit		3 years
All other items		1 year
Options		
Extended warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended warranty, two years	R&S®WE2	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	

For data sheet, see PD 5213.8396.22 and www.rohde-schwarz.com

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