R&S®SMA100B
RF and Microwave Signal Generator
Performance leadership without compromise

3 year warranty

ROHDE&SCHWARZ

Product Brochure | Version 03.00

R&S®SMA100B RF and Microwave Signal Generator

At a glance

The R&S®SMA100B RF and microwave signal generator delivers maximum performance without compromise. It provides purest output signals while maintaining the highest output power level, far outpacing the competition. As the world's leading signal generator, it can handle the most demanding component, module and system T&M tasks in the RF semiconductor, wireless communications and aerospace and defense industries.

The R&S®SMA100B is the first choice for all applications requiring extremely clean analog signals.

For LO substitution in radar applications, the R&S®SMA100B can generate microwave signals with extremely low close-in SSB phase noise, enabling radar systems to detect even very slow objects.

For testing analog-to-digital converters (ADC), the R&S®SMA100B produces signals with extremely low wideband noise.

In automated production environments, the R&S®SMA100B generator's ultra high output power eliminates the need for additional amplifiers while keeping harmonics extremely low.

The same signal generator can provide an extremely pure clock signal for the ADC. A second, independent output can provide clock signals for ADC testing with lowest wideband phase noise.

With the R&S®SMA100B, it is no longer necessary to choose between signal purity and high output power. It is the only signal generator that can supply signals with ultra high output power in combination with extremely low harmonic signal components, setting new standards for high-end analog signal generators.

The R&S®SMA100B covers all fields of application, from research and development to production, service and maintenance.

To meet the specific needs of any given application, the base unit's already excellent performance can be improved with options. Three levels of SSB phase noise and three levels of output power (standard, high power and ultra high power) can be selected.

Key facts

- Frequency range from 8 kHz to 3 GHz, 6 GHz, 12.75 GHz or 20 GHz
- Excellent SSB phase noise of –152 dBc (typ.) at 1 GHz and –132 dBc (typ.) at 10 GHz, each at 20 kHz offset
- Virtually no wideband noise (–162 dBc (meas.) at 10 GHz and an offset of 30 MHz)
- Ultra high output power
  - Up to 38 dBm with the 6 GHz instrument
  - Up to 32 dBm in the microwave frequency range with the 20 GHz instrument
  - Exceptionally low harmonics
- State-of-the-art GUI with touchscreen

R&S®SMA100B RF and Microwave Signal Generator

Benefits and key features

First-class devices thanks to first-class signals

- Purest signals
  - Excellent SSB phase noise in base unit: –119 dBc (typ.) for 10 GHz at an offset of 20 kHz
  - Outstanding SSB phase noise with option: –132 dBc (typ.) for 10 GHz at an offset of 10 kHz
  - Lowest close-in SSB phase noise: –83 dBc (typ.); f = 10 GHz, offset = 10 Hz
  - Virtually no wideband noise: –162 dBc (meas.) at 10 GHz and an offset of 30 MHz
- Lowest harmonic and nonharmonic signal components
  - Very low harmonic signal components over the entire frequency range (< –63 dBc) even at very high output power
  - Very low nonharmonic signal components of –90 dBc (meas.) at 10 GHz

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Very high output power without compromise

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

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User friendly in every detail

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

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R&S®LegacyPro: refresh your technology

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

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Applications

High-end ADC and DAC component tests
- Measure the true performance of your device
- Typical ADC test setup
- Compact ADC test setup for clock signals up to 6 GHz
- Typical DAC test setup

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ATE test system
- Simplify the ATE setup and improve reliability

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Base station receiver tests
- Purest signal source for blocking tests

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Radar receiver testing
- Overcome the challenge of level-controlled narrow pulses
- High-performance automatic level control
- Instantaneous pulse generation
- Pulse trains for complex test cases

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Generating chirped radar signals

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Simulation of scanning radar antennas

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Local oscillator substitution with lowest SSB phase noise

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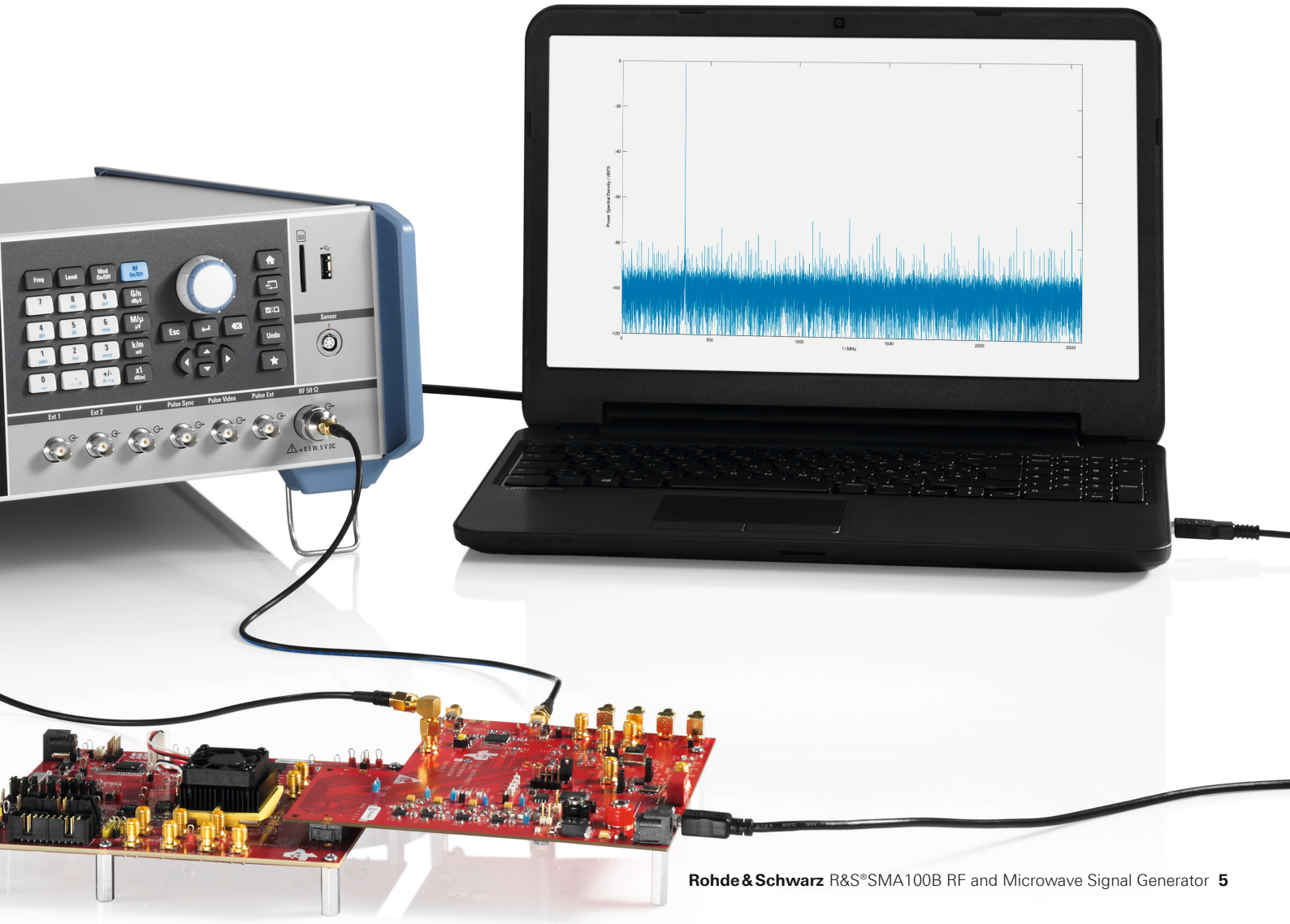


First-class devices thanks to first-class signals

The signal quality of a signal generator deserves special attention. In order to quantitatively measure a DUT, the signal quality of the signal generator must be significantly better than the DUT's performance. Only then can it be ensured that just the DUT is measured. The R&S®SMA100B sets new standards in excellent signal quality.

Extremely low SSB phase noise

Phase noise is a key aspect of signal quality. A distinction is made between close-in phase noise, phase noise with the typical carrier offset of 10 kHz or 20 kHz, and the behavior far from the carrier, i.e. wideband phase noise with a carrier offset of typically > 10 MHz.

To achieve top values, each of these areas was carefully considered when developing the R&S®SMA100B. Low phase noise options can be added to the R&S®SMA100B to meet all requirements. The R&S®SMAB-B1H high performance OCXO option achieves lower close-in phase noise than the base unit and has better stability versus temperature and time (aging).

The phase noise close to the carrier can be further improved with the R&S®SMAB-B710 improved close-in phase noise performance option. This is necessary for example when a radar needs to detect slow-moving objects (small Doppler of the reflected receive signal). The ultimate solution is the R&S®SMAB-B711 ultra low phase noise option, which sets new standards with its exceptionally low phase and wideband noise across the entire offset range.

Very low harmonic and nonharmonic signal components

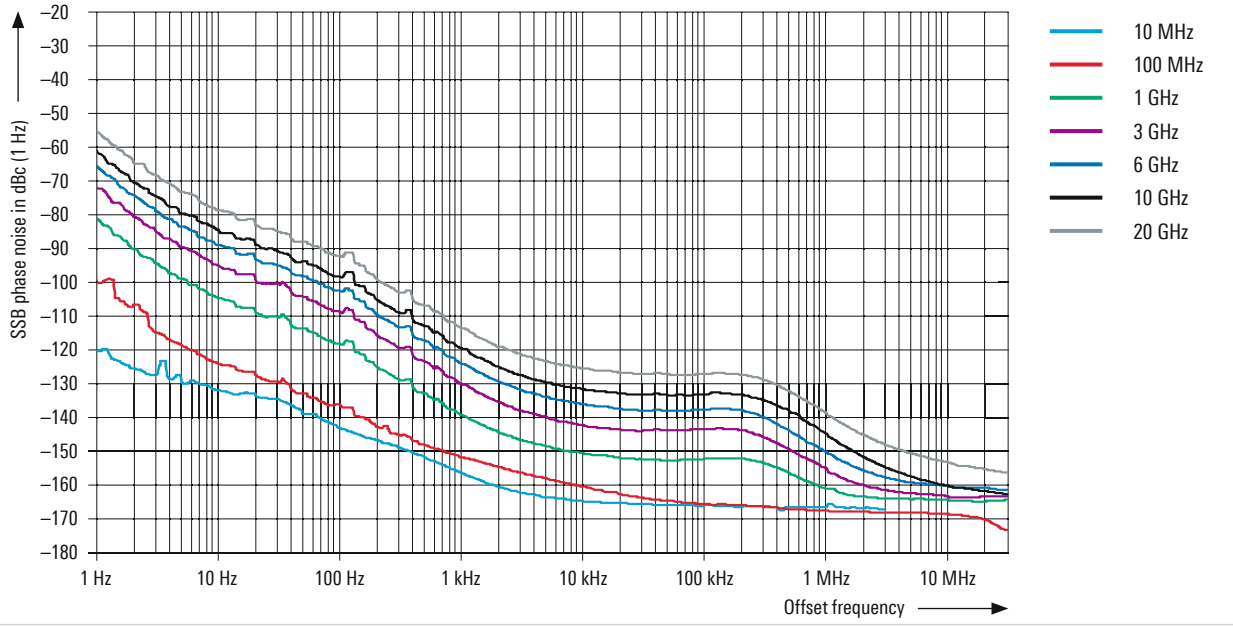
Very low harmonic signal components are another important signal generator characteristic. Often, high output power is required at the same time. The R&S®SMA100B impressively fulfills both requirements. Even at very high output powers, harmonics are suppressed by more than 70 dBc over a wide frequency range, an invaluable advantage when measuring an amplifier's harmonic signal components.

Nonharmonic signal components are equally important, e.g. when testing ADCs. Equipped with the R&S®SMAB-B711 option, the R&S®SMA100B has exceptionally low nonharmonic signal components of –110 dBc (meas.) at 1 GHz and –90 dBc (meas.) at 10 GHz.

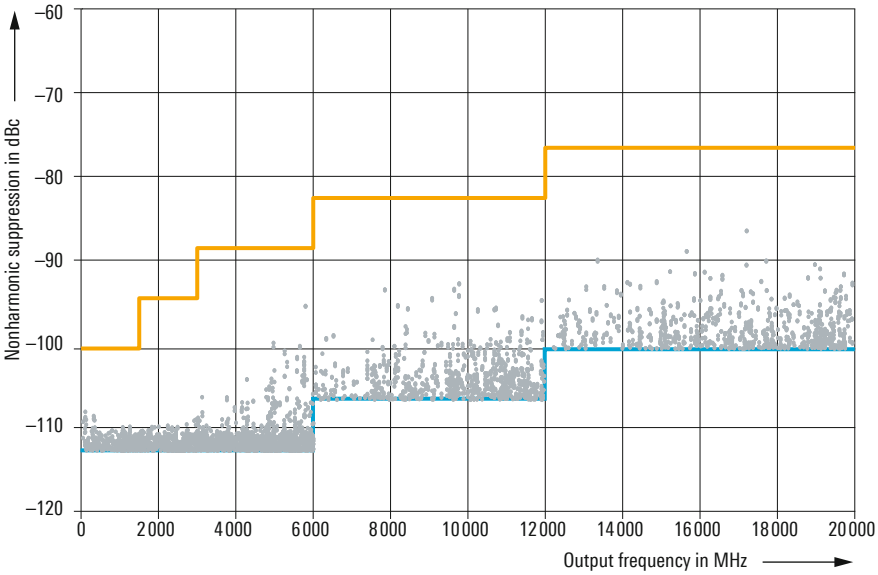
Purest 1 GHz reference output

The R&S®SMA100B also has a special 1 GHz reference output. The 1 GHz reference provides better phase-locked coupling of multiple R&S®SMA100B than the 10 MHz reference. This 1 GHz output also features phenomenal signal purity, as can be seen in the figure “Measured phase noise performance of 1 the GHz reference output”.

Measured SSB phase noise performance of the R&S®SMA100B with R&S®SMAB-B711(N) option

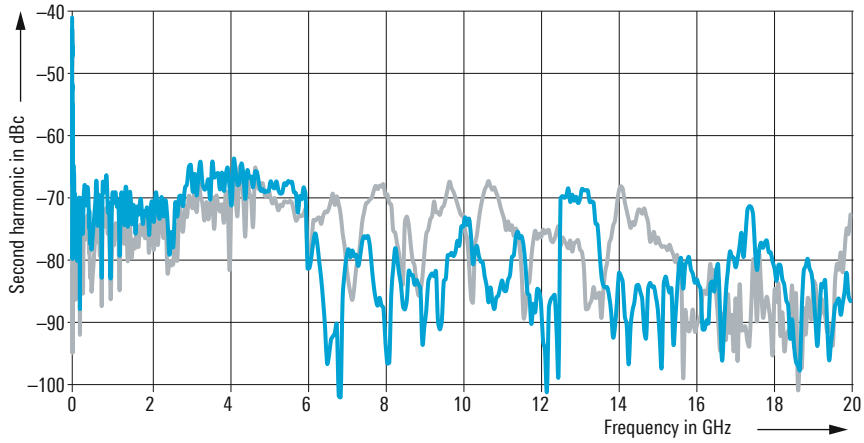


Measured values for nonharmonics



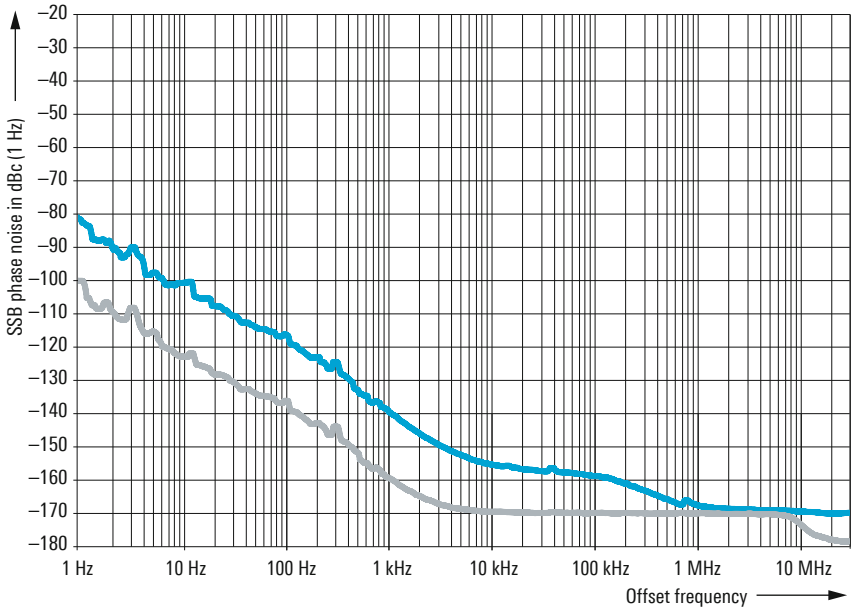
Measured nonharmonic suppression
Specified nonharmonic suppression
Lower test limit

Very low harmonics



R&S®SMAB-B120 + R&S®SMAB-K33 + R&S®SMAB-B34 (18 dBm)
R&S®SMAB-B120 + R&S®SMAB-K33 (13 dBm)

Measured phase noise performance of the 1 GHz reference output



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

1 GHz, R&S®SMAB-B710(N)/-B711(N) option
100 MHz, R&S®SMAB-B710(N)/-B711(N) option

Very high output power without compromise

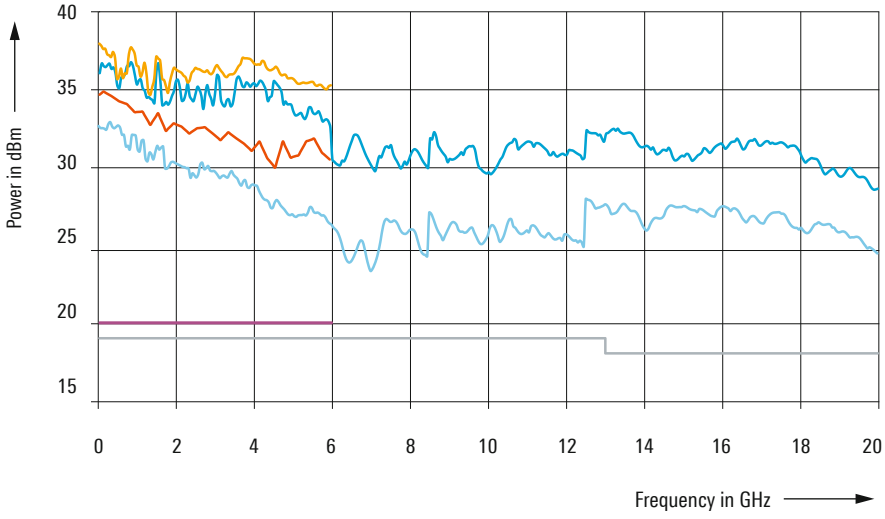
Very high output power without compromise is desirable but also a challenge. It requires a very large dynamic range, high absolute level accuracy, excellent level repeatability and a very short level settling time. It also requires outstanding signal purity, for example very low harmonics. The R&S®SMA100B meets all of these requirements.

Highest output power

Very high output power is often required, particularly in the microwave frequency range. This is because the higher the frequencies, the greater the attenuation. The R&S®SMA100B offers an ultra high output power option to compensate for these losses. As a result, no external amplifier is required downstream. Equipped with the appropriate options, a 6 GHz instrument generates up to 38 dBm RF output power, and a 20 GHz instrument generates up to 32 dBm in the microwave frequency range. Harmonics are extremely low across the entire frequency range; above 6 GHz they are even significantly lower than 70 dBc at 18 dBm output power.

R&S®SMA100B with connected Rohde&Schwarz power sensor.

Measured maximum available output power



Measured maximum available output power in the frequency ranges from 8 kHz to 6 GHz and 8 kHz to 20 GHz – for the base unit, with the high power option, and with the ultra high power option.

- R&S®SMAB-B32 ultra high power option
- R&S®SMAB-K31 high power option
- Standard output power up to 6 GHz
- R&S®SMAB-B34 ultra high power option
- R&S®SMAB-K33 high power option
- Standard output power up to 20 GHz

High absolute level accuracy

A signal generator's absolute level accuracy is just as important as its output power. A signal source must have very good absolute level accuracy in order to quantitatively characterize the nonlinear performance of an amplifier (the 1 dB compression point). The R&S®SMA100B excels with outstanding absolute level accuracy for exactly these applications.

Rarely is a DUT connected directly to the signal generator. There are often cables and other components between the generator and the DUT. This shifts the reference level from the generator's RF output to the DUT. A Rohde&Schwarz power sensor can be connected to the signal generator via USB to extremely precisely calibrate (tenth of a dB range) at this new reference level.

Unmatched level repeatability

Level repeatability also plays an important role. For frequently repeated test sequences where the level is frequently changed, it is essential to be able to reproduce each individual level value for each test sequence. Here again the R&S®SMA100B is best in class. The figure "Measured level repeatability" provides a detailed overview.

Level-controlled narrow pulses

A high absolute level accuracy is required not only for CW signals, but also for modulated signals, and most particularly for pulsed signals. The challenge is to absolutely and reproducibly control even very narrow pulses with a small duty cycle. The R&S®SMA100B provides level-controlled narrow pulses from 100 ns onwards and low duty cycles with exceptional level accuracy and level repeatability.

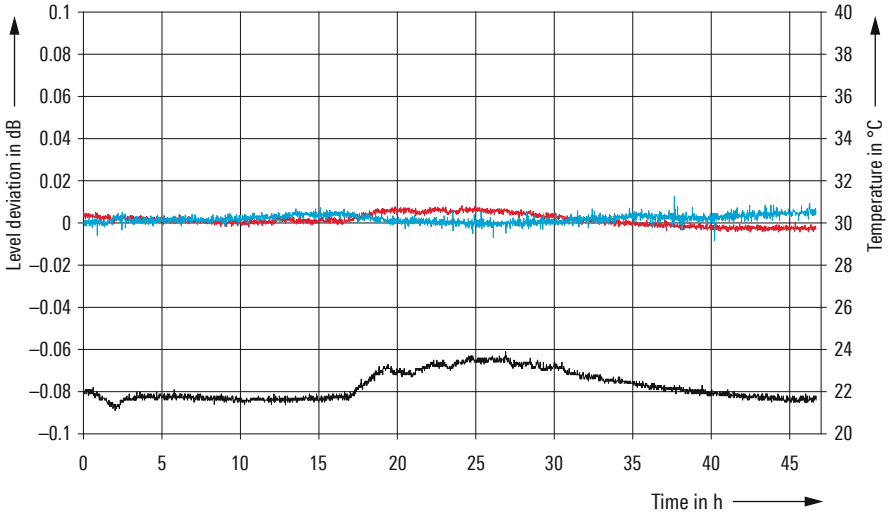
Fast settling times

Another important characteristic to be considered for the test sequences mentioned above is that test sequences should be quickly executed (e.g. in automated test equipment (ATE) systems). This requires short level settling times. If the level values are transmitted individually via GPIB, it typically takes 1 ms to set the new level.

Electronic step attenuator

The electronic step attenuator makes it possible to switch levels quickly. Up to 20 GHz, the R&S®SMA100B offers electronic attenuation as standard. As the contribution of the electronic step attenuator to the total settling time is in the range of microseconds, the R&S®SMA100B can achieve a 1 ms level settling time in the entire frequency range up to 20 GHz.

Measured level repeatability



Measured level repeatability and temperature changes over the very long time period of almost two days. The figure shows the accuracy with which a 15 dBm level is repeated (another level is selected between two 15 dBm settings).

- Level deviation (1 GHz, 15 dBm)
- Level deviation (10 GHz, 15 dBm)
- Temperature in °C

User friendly in every detail

How user friendly a signal generator is can be seen in how easily it can be integrated into existing test systems or in its innovative operating features that save the user development time.

Ergonomic operation thanks to state-of-the-art GUI with touch display

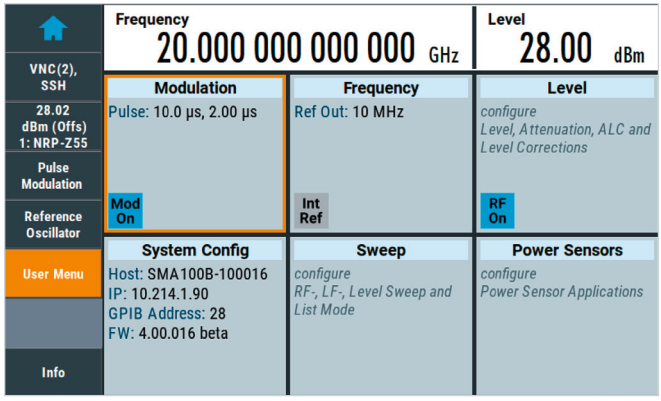
The graphical user interface with high-resolution touch display makes the R&S®SMA100B very ergonomic and practical to use. The main screen clearly displays all important parameters and information. There is no need to spend valuable time searching for frequently used setting parameters.

The ability to save a user menu on the R&S®SMA100B also saves time. Frequently used menu items can be added to the user menu so that the user can quickly and directly access all needed settings from a single menu.

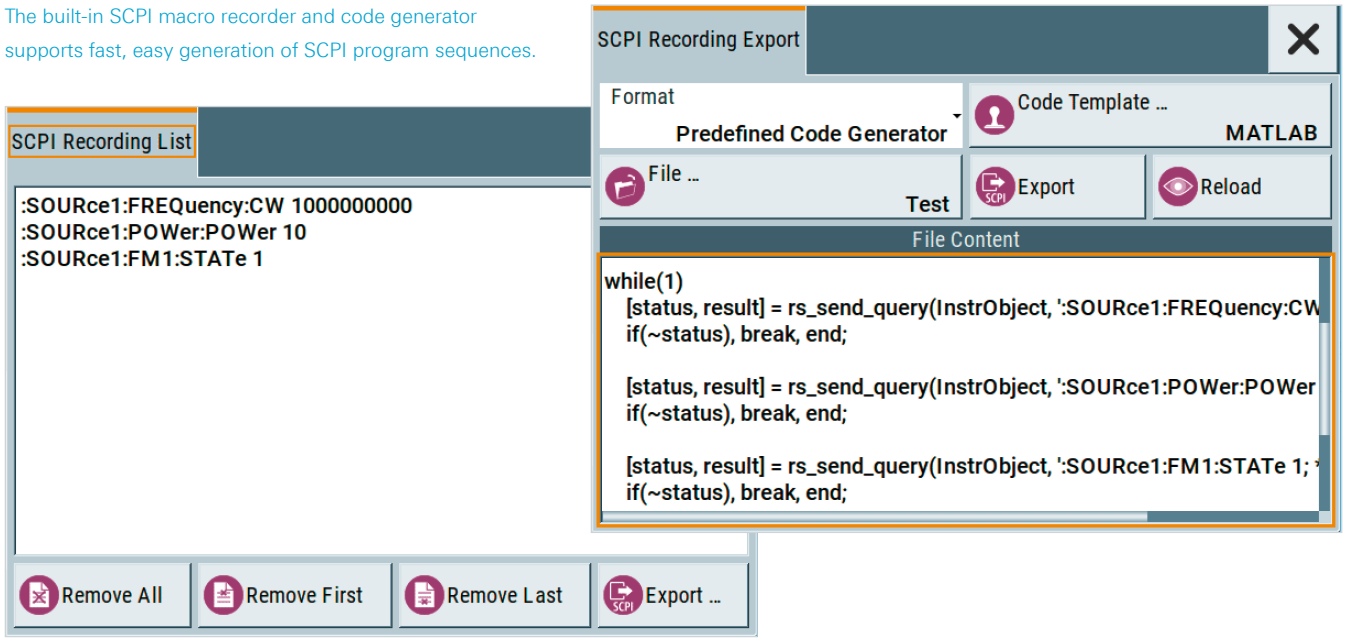
Context-sensitive online help provides comprehensive information. It describes parameters and setting menus in detail, identifies the setting range and shows the relevant remote control command. Users can also search for specific parameters in the user manual installed on the instrument.

In addition to the SCPI command itself, the R&S®SMA100B also offers an SCPI macro recorder with code generator that is used to automatically record manual settings and create an executable MATLAB® script.

The main screen with all key parameters and information.



The built-in SCPI macro recorder and code generator supports fast, easy generation of SCPI program sequences.



R&S®LegacyPro: refresh your technology

Trade in your outdated signal generator

For older test systems, the challenge of maintaining old test equipment is commonplace. When individual pieces of equipment become obsolete before the entire ATE system does, regular calibration and repair of the obsolete equipment becomes expensive and very time consuming. Replacing the obsolete test equipment with equivalent state-of-the-art instruments should be straightforward and require minimal hardware and software changes. In reality, it can be a challenging task. The R&S®SMA100B with R&S®LegacyPro code emulation makes this a straightforward task, reducing the workload and eliminating risks. R&S®LegacyPro enables the R&S®SMA100B to reliably emulate a wide range of legacy generators from vendors such as Keysight, Agilent, HP, Anritsu and Rohde&Schwarz. As a result, the R&S®SMA100B can be deployed in legacy systems without major software changes, effectively increasing uptime, lowering the cost of ownership and lengthening the serviceable life of the test system.

Flexible housing design

If the signal generator to be replaced is installed in an ATE rack, there needs to be enough room to accommodate its height. The R&S®SMA100B offers a unique solution. The R&S®SMA100B (up to 20 GHz) can be purchased in either 2 or 3 height units (HU), even when fully configured. To replace an R&S®SML100A or R&S®SMA100A (2 HU), the user only needs to choose the correct HU. The same applies when replacing products from other manufacturers. An R&S®SMA100B can easily replace an MXG or PSG from Keysight. The MXG can be replaced with an instrument with exactly the same number of HUs. A PSG can be replaced by up to two R&S®SMA100B generators, doubling the number of RF outputs in the same number of HUs.

The display area of a 3 HU instrument is twice as large as the display area of a 2 HU instrument, which makes manual operation in the lab much easier.

R&S®LegacyPro

Enjoy plug and play replacement of your outdated signal generator with the R&S®LegacyPro program and the R&S®SMA100B.

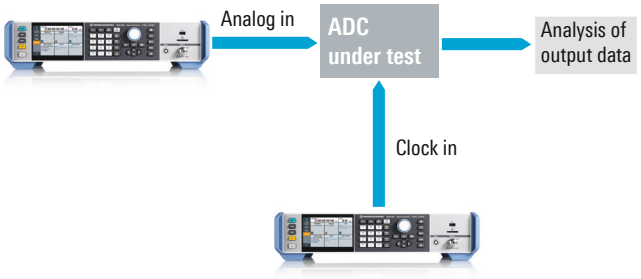
Size of the 2 HU instrument versus the 3 HU instrument with its additional front panel connectors

High-end ADC and DAC component tests

Measure the true performance of your device

With each new ADC generation, the analog input bandwidth increases, and with it the required clock frequency. In addition, the larger effective number of bits results in a larger signal-to-noise ratio. The most advanced DACs allow the reconstruction of wideband digitized signals up into the microwave range. This means that extremely clean, high-frequency signals that exceed the DUT performance are required to test ADCs and DACs. Its outstanding performance makes the R&S®SMA100B the benchmark solution, giving users a tool that is perfect not only for optimizing DUTs, but also for bringing them to the very edge of the technically feasible.

Typical ADC test setup



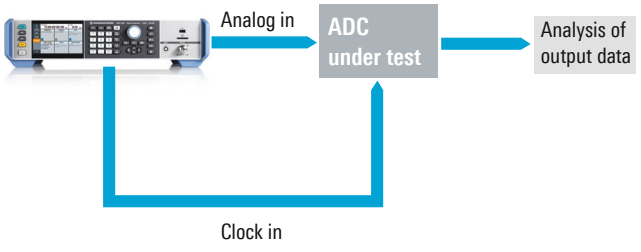
ADC test setup with two R&S®SMA100B as the signal sources for the analog input and for the clock input.

Typical ADC test setup

When testing ADCs, an analog input signal and an external clock signal are needed. At the analog input, the R&S®SMA100B supplies the ADC with extremely pure RF signals with extremely low SSB phase noise, the lowest harmonics and nonharmonics, and the lowest wideband noise. Since the signal source does not distort the measurement results, users can validate the spurious-free dynamic range and the signal-to-noise ratio of the most advanced ADCs.

Because ADCs are sampling systems, the wideband phase noise of the clock signal reduces the signal-to-noise ratio of the ADC. The R&S®SMA100B was optimized to provide clock signals with extremely low wideband phase noise for ADC tests. This is particularly important in the case of undersampling, i.e. the clock rate of the ADC is lower than twice the maximum RF input frequency.

Compact setup for clock signals up to 6 GHz

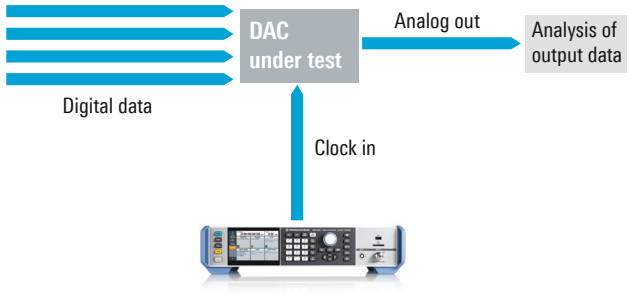


Compact ADC test setup with a single R&S®SMA100B with an integrated second source.

Compact ADC test setup for clock signals up to 6 GHz

Specifically for this application, the R&S®SMA100B supplements the RF output with another optional clock output up to 6 GHz with exceptionally low wideband noise for extremely clean clock signals. The frequency of the clock output can be selected independently of the RF output. The signal type (square wave or sine wave), the amplitude and a DC offset can be set for this output independently of the RF output in order to provide single-ended or differential signals for the clock input at the ADC.

Typical DAC test setup

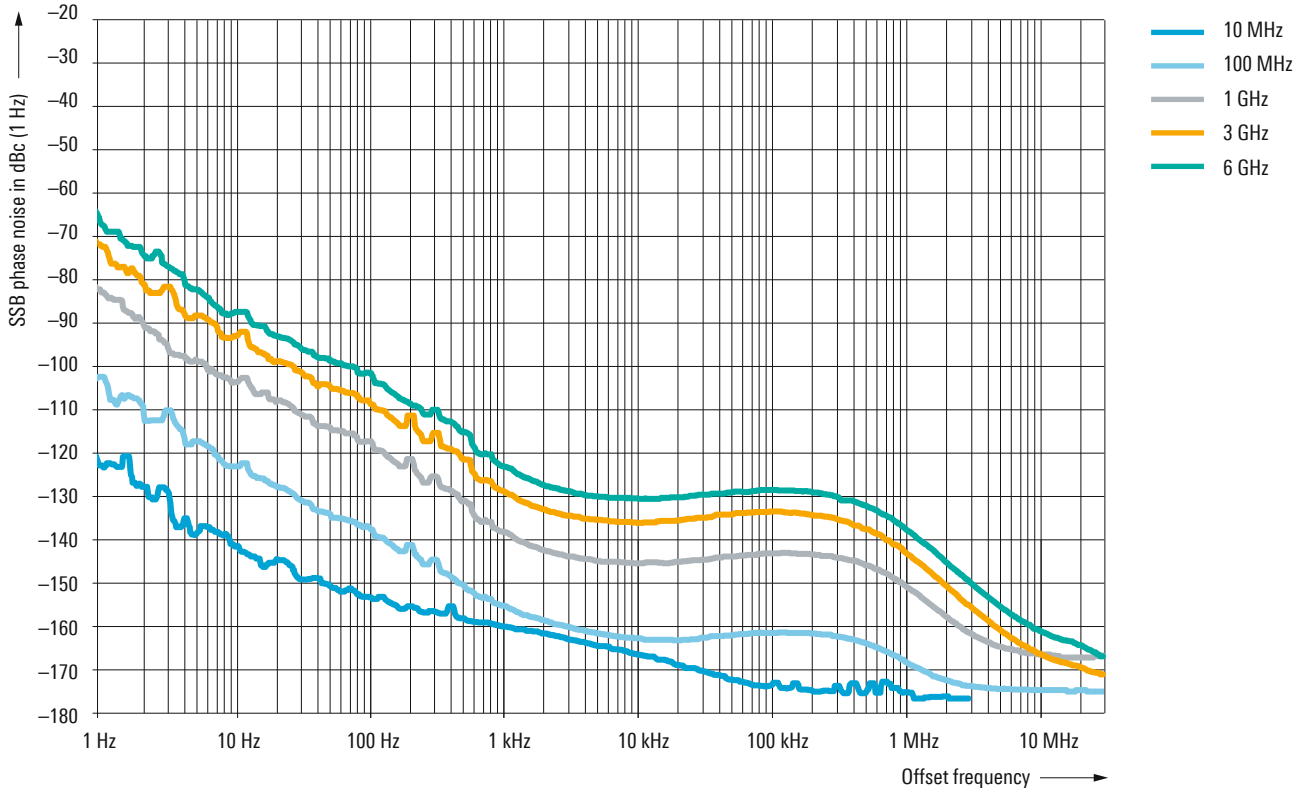


Typical test setup for verifying a DAC.

Typical DAC test setup

An extremely clean clock signal is also required to reconstruct the analog output signal when testing DACs. Thanks to its excellent characteristics, which include exceptionally low SSB phase noise and a large spurious-free dynamic range, the R&S®SMA100B can provide this signal so that the measurement results for these tests are not influenced by the signal source and the user can measure the DUT's true performance.

Measured SSB phase noise performance of the clock synthesizer output signal



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

ATE test system

Simplify the ATE setup and improve reliability

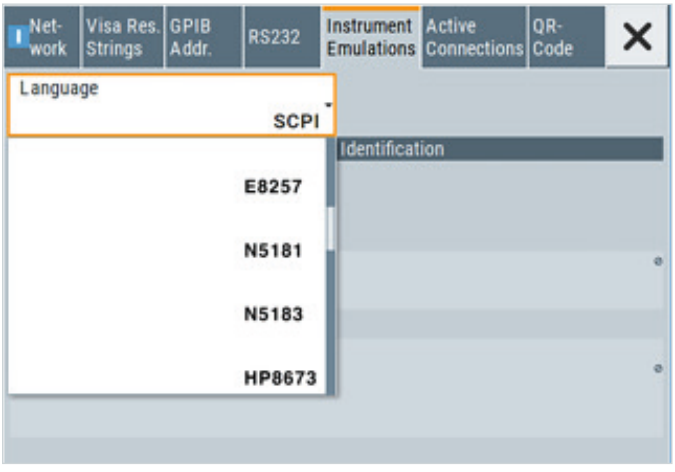
When developing or maintaining an ATE test system, there are four competing challenges that must be juggled. Does the test equipment have enough RF performance to meet the test specifications? Is the overall test time quick enough to meet the throughput requirements? Can the overall setup be simplified to reduce size and complexity? How can the system be designed to maximize uptime?

With its leading performance, the R&S®SMA100B can produce high-quality, accurate test signals that meet the toughest test requirements. With its ability to quickly switch frequency and amplitude, the R&S®SMA100B will ensure that these high-quality signals are quickly delivered to the DUT, minimizing test time.

In the ATE world, outstanding performance helps reduce the complexity of a system. One of the major factors that contributes to the complexity of a setup as well as to costs and long-term reliability are external components such as amplifiers. To achieve the correct power level at the DUT, amplifiers are used to overcome attenuation in components such as cables and splitters, which is especially problematic in the microwave range. With its ultra high output power option, the R&S®SMA100B has enough output power to overcome these losses, ensuring that the signal at the DUT is at the right power level. This allows external amplifiers to be eliminated from the setup. Eliminating these expensive, uncalibrated components saves money, simplifies the test station and reduces the overall measurement uncertainty.

An ATE system can be in operation 24/7, going through many different testing cycles at a number of different power levels. If the generator being used has a mechanical attenuator, each change in power level can require the relays in the attenuator to switch, a relatively time-consuming procedure. The R&S®SMA100B is the first signal generator to offer a fully electronic attenuator up to 20 GHz. This sophisticated attenuator technology ensures wear and tear free switching and very fast level settling times.

The R&S®SMA100B also offers a 3-year calibration period, rear connectors, a choice of form factors and R&S®LegacyPro (see page 11) – making it a complete solution for signal generation in an ATE environment.



Emulation of instruments with the R&S®SMA100B.

Base station receiver tests

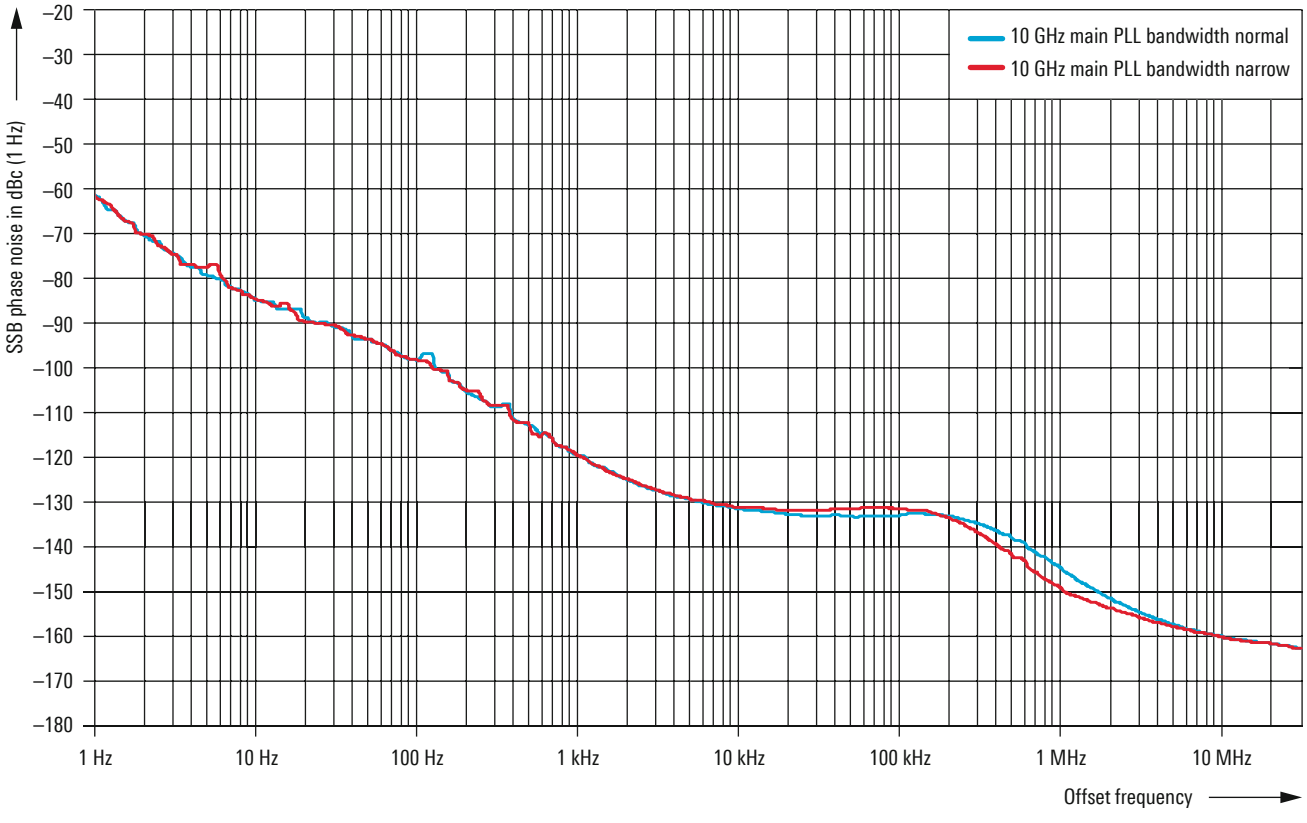
Purest signal source for blocking tests

During blocking tests, the selectivity of a receiver is measured, i.e. how well a receiver can suppress interferers outside the wanted channel. For example, cellular standards define different blocking scenarios that must be used to test a base station receiver. Usually both out-of-band blocking tests and in-band blocking tests are performed.

The interfering signals are usually stronger than the wanted signal. Signal generators that generate the blocking signals must therefore have very good spectral purity. Otherwise the phase noise or wideband noise from the interferer would cover the wanted signal in the receive channel.

The R&S®SMA100B meets even the highest standards here because it not only exhibits extremely low wideband noise but also provides excellent phase noise performance at all carrier offsets. The phase noise performance can be further optimized by switching the PLL bandwidth for certain carrier offset ranges. With the "narrow" setting, the phase noise at 10 GHz and an offset of 1 MHz improves by 7 dB.

SSB phase noise performance comparison



Measured SSB phase noise at 10 GHz in the "normal" and "narrow" setting (with the R&S®SMAB-B711 option).

Radar receiver testing

Overcome the challenge of level-controlled narrow pulses

To properly test the functionality and sensitivity of radar and EW receivers, the challenge is always the same. Accurate and repeatable test signals are needed to measure the true performance of the receiver, because these products are designed to work at the utmost technological limits. For this application, the quality of the pulsed CW signals is the key to verifying and optimizing performance. The signal generator has to produce unmodulated CW pulse signals that are accurate in terms of both frequency and power level. They must be repeatable over a large number of pulses and the pulse width has to be small enough to meet the requirements of the specific receiver.

The R&S®SMA100B is an ideal signal generator for this application since it can repeatably produce accurate narrow pulses, enabling engineers to reliably test the sensitivity and functionality of today's leading-edge receivers.

High-performance automatic level control

With its high-quality pulse modulator and digital automatic level control (ALC), the R&S®SMA100B can generate pulsed CW signals with exceptional accuracy, even when the pulse width is in the nanosecond range. This cutting-edge ALC design ensures that the pulse flatness and power level are consistent from pulse to pulse. In combination with the R&S®SMA100B microwave frequency options, engineers have a signal generator that they can rely on to produce accurate, repeatable pulses with widths ranging from less than 100 ns to 100 s in the typical radar frequency bands.

Instantaneous pulse generation

External pulse generators are typically used when the signal generator is integrated into a large test system. In this case, the key requirement for the signal generator is how quickly it can synchronize and modulate the incoming pulses. In other generators with analog ALCs, it can take some time for them to react to the incoming pulses. This means that there will be no RF output for the first tens of pulses.

Due to the modern, digital ALC section of the R&S®SMA100B, leveled pulse generation starts instantaneously, irrespective of whether the internal or an external pulse generator is used. When you expect a CW pulse out of the generator, that's what you will get with the R&S®SMA100B.

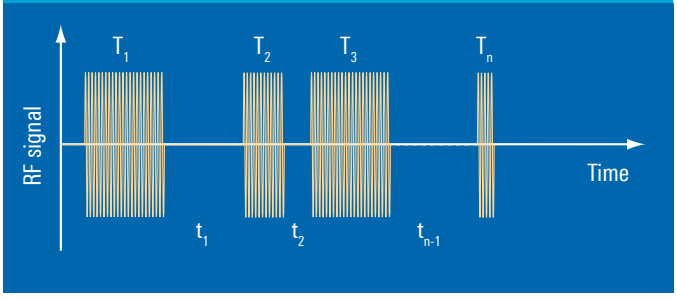
Pulse trains for complex test cases

When used as a standalone instrument, the R&S®SMA100B offers not only an internal pulse generator where the pulse width can be set, but also a pulse train option for more complex test cases. The graphical user interface makes it easy to combine a series of pulses with different widths and PRIs. Multiple test cases can be created, stored and recalled later.

Thanks to its exceptional RF performance, narrow pulse modulation and advanced pulse generation, the R&S®SMA100B not only produces high-quality narrow pulses to test sensitivity, it also delivers more advanced test cases for testing the functionality of the receiver. These complex pulse trains make it possible to test receiver capabilities such as the unambiguous range, coherent phase processing interval or range resolution. All in all, the R&S®SMA100B is a complete solution for testing radar and EW receivers.

Pulse modulation performance	
Minimum pulse width	< 20 ns
Rise/fall time	5 ns (typ.)
On/off ratio	> 80 dB
Minimum pulse width of closed-loop level-controlled pulses with table&on mode	100 ns

Pulse train

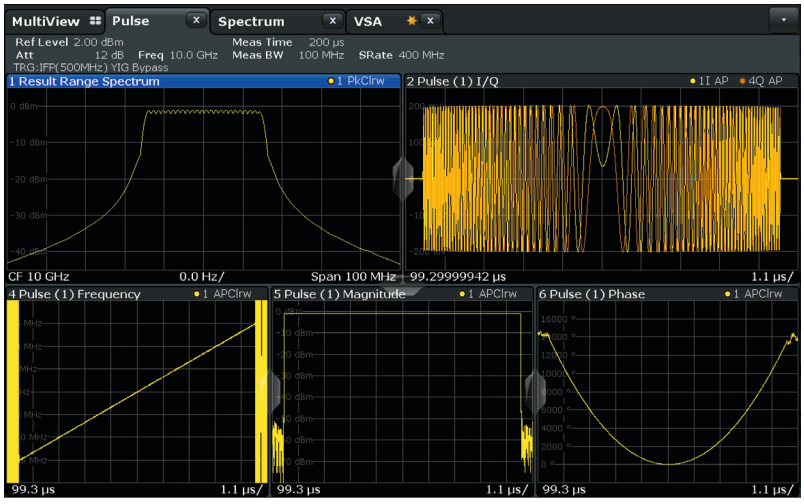


Generating chirped radar signals for advanced radar system testing with the multifunction generator

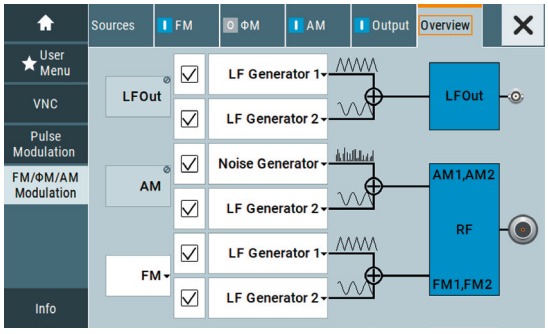
A wide variety of radar systems, e.g. weather radars or long-range surveillance radars, benefit from pulse compression techniques. Therefore, they use modulation on pulse such as linear frequency modulation (chirps). Radars profit from using chirped pulses, since range resolution then only depends on signal bandwidth. Also, processing gain is high while lower transmit power levels can be used. Consequently, the probability of interception of the radar's transmit signal is considerably lower.

In order to properly test radar receivers with pulse compression techniques, the signal generator needs to produce chirps that are accurate in terms of chirp rate, pulse length and power level. The R&S®SMA100B can generate chirped pulses very easily by combining a pulse-modulated signal with a linear FM-modulated signal from the multifunction generator (R&S®SMAB-K24 option). Thanks to the huge variety of setting options, the chirp is always perfectly tailored to the individual requirements. Large bandwidths and high chirp rates are no problem for the R&S®SMA100B. Impairments, such as noise, amplitude fluctuations or Doppler drifts, can be conveniently added. They are generated using amplitude and frequency modulation in one or more of the additional sources in the multifunction generator. This is a good method to model effects coming from real radar hardware.

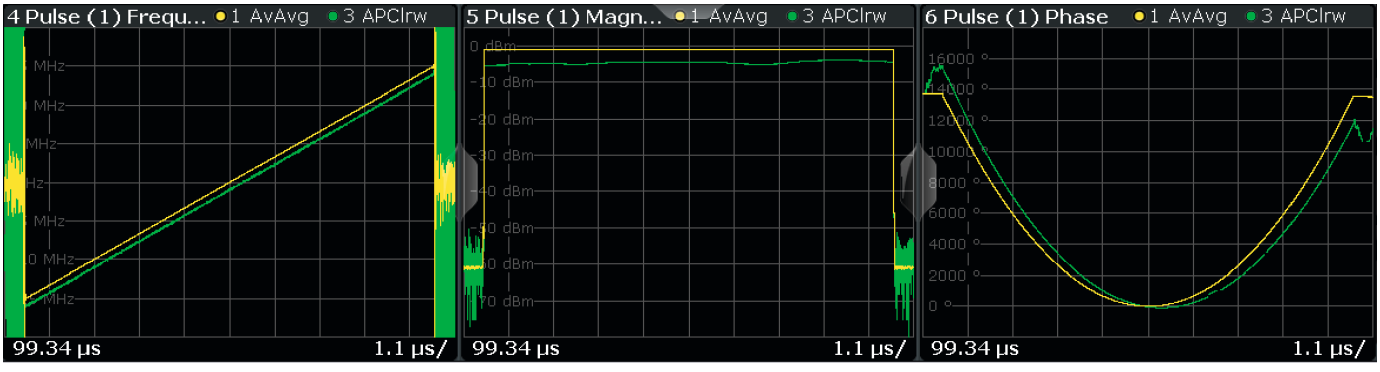
Chirped signal with a duration of 10 µs and a bandwidth of 30 MHz generated with the multifunction generator (R&S®SMAB-K24 option) in the R&S®SMA100B.



Up to five modulation sources (AM1/AM2, FM1/FM2, pulse modulation) and two LF function generators are available with the multifunction generator (R&S®SMAB-K24 option) in the R&S®SMA100B.



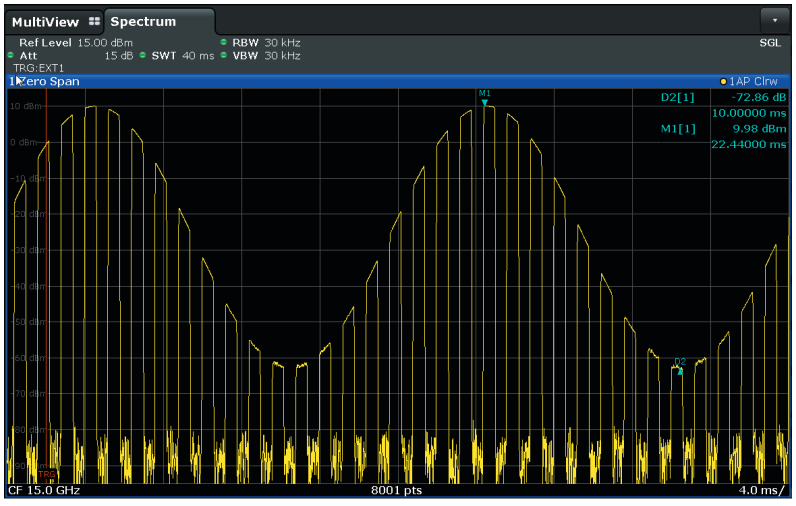
Impaired chirped pulse with added AM noise, AM drift and Doppler drift impairments (green) generated with the multifunction generator (R&S®SMAB-K24 option) in the R&S®SMA100B (left: Doppler drift; middle: AM drift/AM noise; right: Doppler drift).



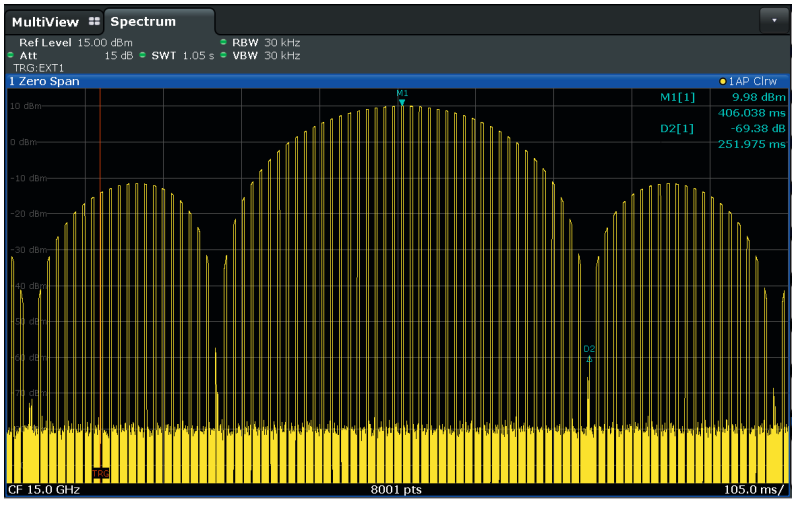
Simulation of scanning radar antennas with high dynamic range

Signals received by radar and EW receivers are often subject to simultaneous pulse and amplitude modulation. Whereas the pulse modulation is performed in the transmitter, the amplitude modulation results from the antenna scan and the antenna radiation pattern. Generation of realistic test signals is challenging, since the pattern of highly directive antennas often shows a narrow main beam, a significant sidelobe ratio and even nulls in some directions. A large dynamic range of the signal generator is therefore required to provide accurately level-controlled signals for meaningful receiver tests.

The R&S®SMA100B together with the R&S®SMAB-K721 scan modulation option is the perfect choice for this application. Thanks to its highly sophisticated RF output unit, it produces amplitude-modulated signals with a modulation depth larger than 70 dB. This allows very accurate simulation of peaks and nulls in complex antenna patterns. The outstanding attenuation accuracy of the R&S®SMA100B ensures repeatable and high-quality signal generation. This enables engineers to reliably test sensitivity and functionality of state-of-the-art radar and EW receivers.



Exponential amplitude modulation with the R&S®SMA100B using the internal LF generator for the sinusoidal modulation signal to produce a signal with 72 dB (meas.) modulation depth.



Pulse- and amplitude-modulated signal generated with the R&S®SMA100B. The sin(x)/x modulation signal is provided at the input for external analog modulation and produces a signal with 70 dB (meas.) modulation depth.

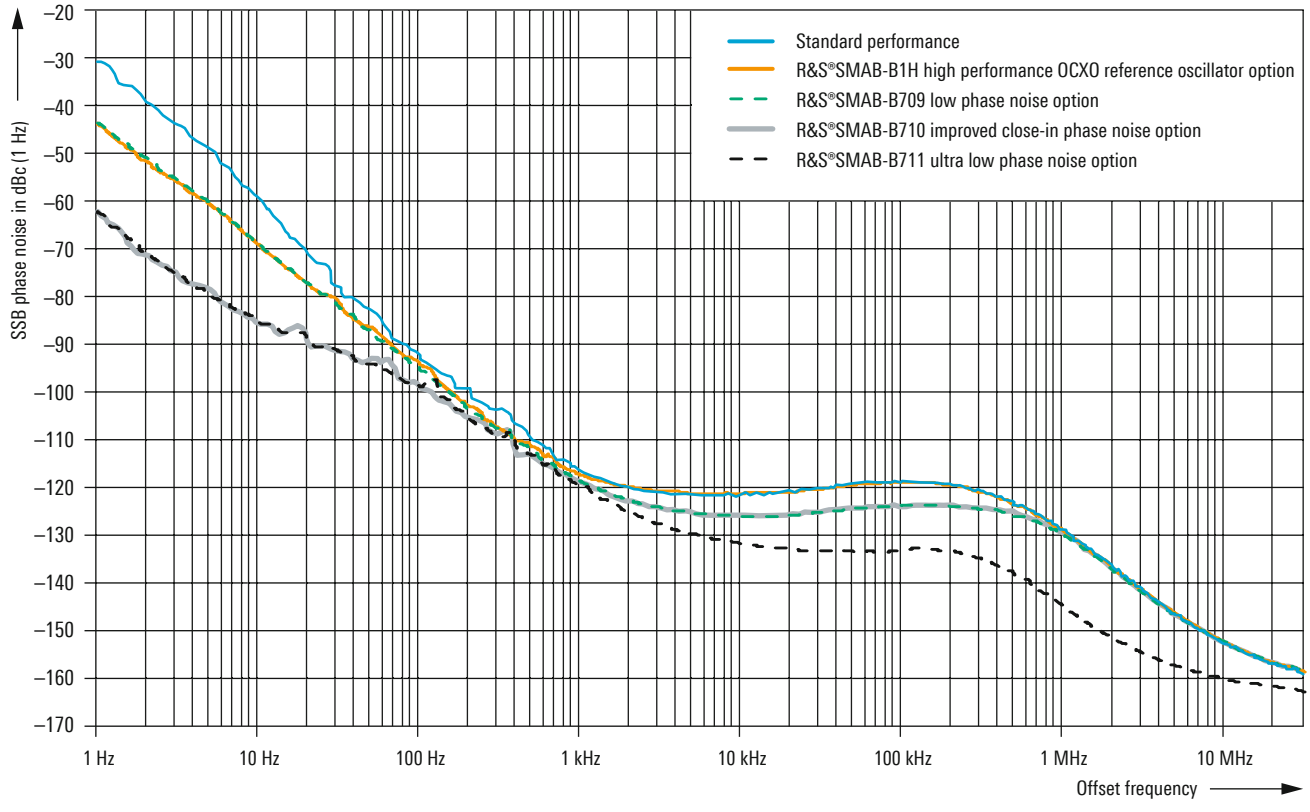
Local oscillator substitution with lowest SSB phase noise

The spectral purity of the local oscillator is key for the performance of each radar system. Radars receive the returns from the wanted object together with clutter echoes from the surroundings. The phase noise performance of the radar affects the accuracy and ability to detect and resolve radar echo signals. Small objects may go undetected in the vicinity of objects with large radar cross sections that could be caused for example by clutter. Echoes with low Doppler frequency shift could be hidden due to close-in phase noise. Therefore, low phase noise of the radar's local oscillator signal is the key to maximizing detection of radar echo signals. Any unwanted spurs in the local oscillator signal would immediately emerge as unwanted spectral components in the downconverted and digitized radar receive signal.

During system development, engineers are required to test system components before the complete system is integrated. These mock-up tests often require signal generators to act as a COHO or STALO replacement or to fulfill other, more general LO replacement roles. Thanks to outstanding signal purity with lowest harmonics and nonharmonics and its industry-leading phase noise performance, the R&S®SMA100B is the best choice for local oscillator substitution. It offers superior signal quality, also for high and ultra high output power levels that are often needed to drive mixers. With a height of only 2 HU, the R&S®SMA100B can easily be fitted into every test environment. Using the R&S®SMA100B as local oscillator substitution enables in-depth performance verification of the radar system with the best test accuracy.

The figure shows the SSB phase noise performance of the R&S®SMA100B equipped with the ultra low phase noise option for a carrier signal of 10 GHz. The close-in phase noise at 10 Hz offset frequency is only –80 dBc (1 Hz) and –100 dBc (1 Hz) at 100 Hz offset frequency. This enables best radar performance, especially for radars using long coherent integration intervals to resolve small differences in Doppler frequencies.

Measured SSB phase noise performance of the R&S®SMA100B for X-band radar signal



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

Specifications in brief

Specifications in brief		
Frequency		
Frequency range	R&S®SMAB-B103	8 kHz to 3 GHz
	R&S®SMAB-B106	8 kHz to 6 GHz
	R&S®SMAB-B112	8 kHz to 12.75 GHz
	R&S®SMAB-B120	8 kHz to 20 GHz
Level		
Maximum specified output power (PEP)	R&S®SMAB-B103/-B106, f = 6 GHz	
	standard	+19 dBm
	with R&S®SMAB-K31	+25 dBm
	with R&S®SMAB-K31 and R&S®SMAB-B32	+30 dBm
	R&S®SMAB-B112/-B120	
	standard	
	f = 13 GHz	+18 dBm
	f = 20 GHz	+17 dBm
	with R&S®SMAB-K33	
	f = 6 GHz	+23 dBm
	f = 20 GHz	+20 dBm
	with R&S®SMAB-K33 and R&S®SMAB-B34	
	f = 6 GHz	+28 dBm
	f = 20 GHz	+24 dBm
Spectral purity		
SSB phase noise	f = 1 GHz, 1 Hz measurement bandwidth	
	standard, carrier offset = 20 kHz	< –135 dBc, –139 dBc (typ.)
	with R&S®SMAB-B709, carrier offset = 10 kHz	< –140 dBc
	with R&S®SMAB-B710(N), carrier offset = 10 kHz	< –140 dBc, –145 dBc (typ.)
	with R&S®SMAB-B711(N), carrier offset = 10 kHz	< –147 dBc, –152 dBc (typ.)
	f = 10 GHz, 1 Hz measurement bandwidth	
	standard, carrier offset = 20 kHz	–115 dBc, –119 dBc (typ.)
	with R&S®SMAB-B709, carrier offset = 10 kHz	< –120 dBc
	with R&S®SMAB-B710, carrier offset = 10 kHz	–120 dBc, –125 dBc (typ.)
	with R&S®SMAB-B711, carrier offset = 10 kHz	–128 dBc, –132 dBc (typ.)

Rear view of 2 HU R&S®SMA100B.

Specifications in brief

Harmonics	10 MHz < f ≤ 6 GHz, P = 18 dBm for instruments equipped with R&S®SMAB-B32 and R&S®SMAB-B103/-B106 options	< –60 dBc
	10 MHz < f ≤ 20 GHz, P = 16 dBm for instruments equipped with R&S®SMAB-B34 and R&S®SMAB-B112/-B120 options	< –55 dBc
Nonharmonics	f = 1 GHz, > 10 kHz from carrier, 10 dBm	< –92 dBc
	f = 1 GHz, > 10 kHz from carrier, 10 dBm with R&S®SMAB-B711 option	< –100 dBc
Supported modulation modes	with R&S®SMAB-K720 option	AM, FM, φM
Pulse modulation	with R&S®SMAB-K22 option	
Rise/fall time	R&S®SMAB-K22, f > 700 MHz	< 10 ns, 5 ns (typ.)
On/off ratio	R&S®SMAB-K22	> 80 dB
Minimum pulse width	R&S®SMAB-K22	< 20 ns

Compatible command sets

These command sets can be used to emulate another instrument. A subset of common commands is supported.

Hewlett Packard
- HP8340, HP8341
- HP8360
- HP83620, HP83622, HP83623, HP83624
- HP83630, HP83640, HP83650
- HP8373
- HP83711, HP83712
- HP83731, HP83732
- HP8642, HP8643, HP8644, HP8645
- HP8647, HP8648
- HP8656, HP8657
- HP8662, HP8663, HP8664, HP8665
- HP8673

Agilent/Keysight Technologies
- E4421, E4422, E4428
- E8257, E8663
- N5161, N5181, N5183

Aeroflex (IFR/Marconi)
- 2023, 2024
- 2030, 2031, 2032
- 2040, 2041, 2042

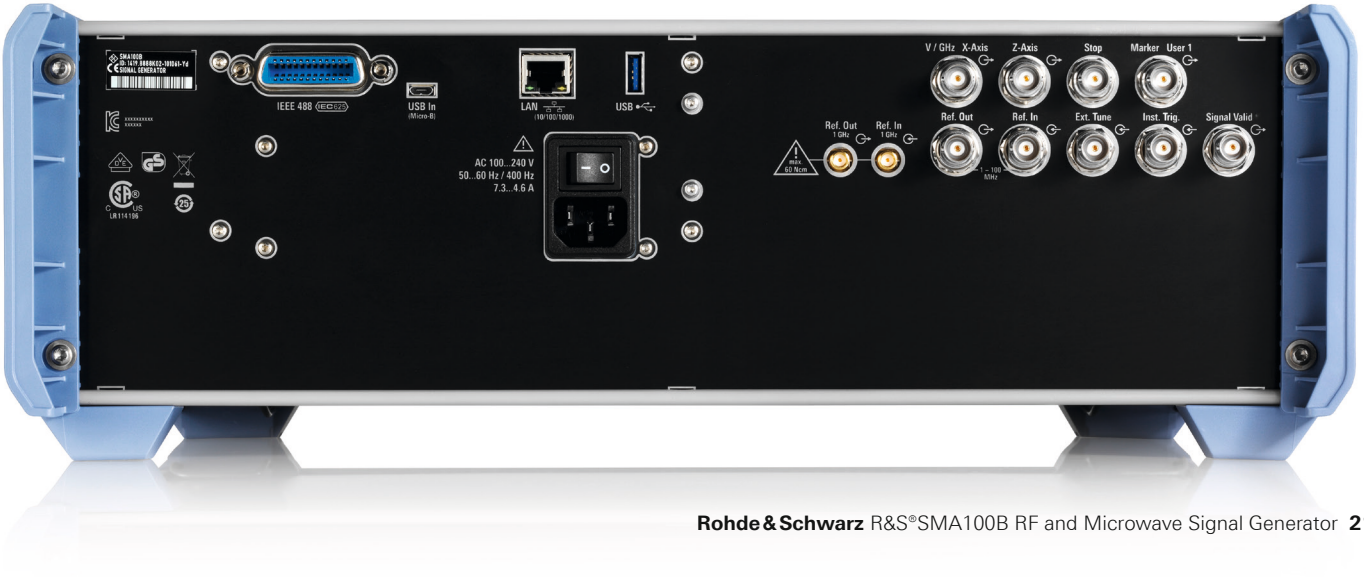
Anritsu
- 68017, 68037

Panasonic
- VP-8303A

Racal Dana
- 3102, 9087

Rohde&Schwarz
- R&S®SMA100A
- R&S®SME
- R&S®SMF100A
- R&S®SMG/SMH
- R&S®SMGU/SMHU
- R&S®SML/SMP/SMR
- R&S®SMT/SMY

Rear view of 3 HU R&S®SMA100B.



Ordering information

Designation	Type	Order No.
RF and microwave signal generator		
Signal Generator [1] including power cable and quick start guide	R&S®SMA100B	1419.8888.02
Options		
Frequency options		
8 kHz to 3 GHz	R&S®SMAB-B103	1420.8488.02
8 kHz to 6 GHz	R&S®SMAB-B106	1420.8588.02
8 kHz to 12.75 GHz	R&S®SMAB-B112	1420.8688.02
8 kHz to 20 GHz	R&S®SMAB-B120	1420.8788.02
Platform height options		
2 HU with 5" touch display	R&S®SMAB-B92	1420.8288.02
3 HU with 7" touch display	R&S®SMAB-B93	1420.8388.02
Phase noise performance and reference oscillator options		
High Performance OCXO Reference Oscillator [2]	R&S®SMAB-B1H	1420.8188.02
Low Phase Noise [2]	R&S®SMAB-B709	1420.9849.02
Improved Close-in Phase Noise Performance for R&S®SMAB-B106/-B112/-B120 [2]	R&S®SMAB-B710	1420.8007.02
Improved Close-in Phase Noise Performance for R&S®SMAB-B103 [2]	R&S®SMAB-B710N	1420.8107.02
Ultra Low Phase Noise for R&S®SMAB-B106/-B112/-B120 [2]	R&S®SMAB-B711	1420.8020.02
Ultra Low Phase Noise for R&S®SMAB-B103 [2]	R&S®SMAB-B711N	1420.8120.02
100 MHz, 1 GHz Reference Input and Output	R&S®SMAB-K703	1420.9761.02
Flexible Reference Input, 1 MHz to 100 MHz	R&S®SMAB-K704	1420.9778.02
Output power options		
High Output Power, 3 GHz/6 GHz	R&S®SMAB-K31	1420.7100.02
Ultra High Output Power, 3 GHz/6 GHz [3]	R&S®SMAB-B32	1420.7200.02
High Output Power, 12.75 GHz/20 GHz	R&S®SMAB-K33	1420.7300.02
Ultra High Output Power, 12.75 GHz/20 GHz [4]	R&S®SMAB-B34	1420.7400.02
Analog modulation options		
High Performance Pulse Modulator	R&S®SMAB-K22	1420.9710.02
Pulse Generator	R&S®SMAB-K23	1420.9726.02
Multifunction Generator	R&S®SMAB-K24	1420.9732.02
Pulse Train [5]	R&S®SMAB-K27	1420.9749.02
AM/FM/φM	R&S®SMAB-K720	1420.9790.02
Scan AM	R&S®SMAB-K721	1420.9784.02
Additional performance options		
Ramp Sweep	R&S®SMAB-B28	1420.6579.02
Differential Clock Synthesizer, 3 GHz	R&S®SMAB-B29	1420.8088.02
Clock Synthesizer Frequency Extension to 6 GHz [6]	R&S®SMAB-K722	1420.9810.02
Other options		
Rear Panel Connectors (3 GHz/6 GHz)	R&S®SMAB-B80	1420.6504.02
Rear Panel Connectors (12.75 GHz/20 GHz)	R&S®SMAB-B81	1420.6510.02
Removable Mass Storage	R&S®SMAB-B85	1420.6556.02
Remote Control GPIB and USB	R&S®SMAB-B86	1420.6562.02

[1] The base unit must be ordered with an R&S®SMAB-B1xx frequency option and an R&S®SMAB-B92 or R&S®SMAB-B93 platform height option.
[2] Only one of these six options can be installed.
[3] R&S®SMAB-B32 can only be ordered in combination with R&S®SMAB-K31.
[4] R&S®SMAB-B34 can only be ordered in combination with R&S®SMAB-K33.
[5] R&S®SMAB-K27 can only be ordered in combination with R&S®SMAB-K23.
[6] Only in combination with frequency option R&S®SMAB-B1xx (> 3 GHz). R&S®SMAB-B29 is a prerequisite.
[7] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

Designation	Type	Order No.
Recommended extras		
19" Rack Adapter for 2 HU model	R&S®ZZA-KNA21	1177.8026.00
19" Rack Adapter for 3 HU model	R&S®ZZA-KNA31	1177.8032.00
USB Serial Adapter for RS-232 Remote Control	R&S®TS-USB1	6124.2531.00
Spare SD Card	R&S®SMAB-Z10	1420.6662.02
Adapters for instruments with R&S®SMAB-B112/-B120 frequency option		
Test Port Adapter, 2.4 mm female		1088.1627.02
Test Port Adapter, 2.92 mm female		1036.4790.00
Test Port Adapter, 2.92 male		1036.4802.00
Test Port Adapter, N female		1036.4777.00
Test Port Adapter, N male		1036.4783.00
Documentation		
Documentation of Calibration Values	R&S®DCV-2	0240.2193.18
R&S®SMA100B Accredited Calibration	R&S®SMAB-ACA	1420.6740.02

Option identification: R&S®SMAB-Bxxx = hardware option, R&S®SMAB-Kxxx = software/keycode option.

Warranty		
Base unit		3 years
All other items [7)]		1 year
Options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde&Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty With Calibration Coverage, one year	R&S®CW1	
Extended Warranty With Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Accredited Calibration Coverage, one year	R&S®AW1	
Extended Warranty with Accredited Calibration Coverage, two years	R&S®AW2	

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PD 5215.1018.12 | Version 03.00 | October 2018 (ch)
R&S®SMA100B RF and Microwave Signal Generator
Data without tolerance limits is not binding | Subject to change

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