

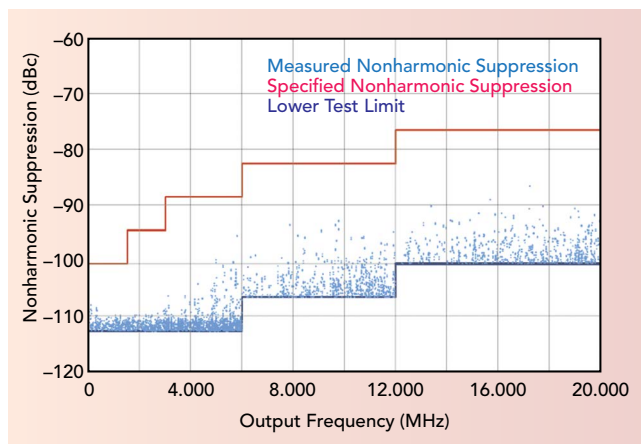
Microwave Journal



Redefining High-End RF and Microwave Signal Generation

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In research and development, designers often push their designs almost beyond possible limits in order to attain utmost performance, and sometimes they do not initially know how far they need to go. In the test and verification phase, often an analog signal source is the first method of choice to prove the performance of a design. Ideally, it should not limit the design margins or test results but, in reality, it often does. For example, engineers testing state-of-the-art analog-to-digital (A/D) and digital-to-analog (D/A) converters seek the highest spurious-free dynamic range and the lowest broadband noise available, while radar engineers require the lowest possible phase noise. And in large test setups with long cabling, the output power of the signal source often seems too low.



▲ Fig. 1 Measured nonharmonic suppression of the R&S SMA100B with the R&S SMAB-B711 option.

When Rohde & Schwarz decided to develop a successor to its R&S SMA100A and R&S SMF100A high-end RF and microwave signal generators, the design engineers set themselves a simple yet very challenging goal: to deliver the best possible performance for each key parameter, without any compromises or the requirement for customers to make tough decisions. The result is the R&S SMA100B, which can deliver the cleanest signals at the highest output power without any compromise. The new microwave signal generator strongly benefits three key applications:

A/D AND D/A TESTING

Integrated A/D and D/A converters deliver higher clock rates and an effective number of bits (ENOB) with each generation. Testing their performance requires clock and test signal sources exceeding the spurious-free dynamic range of device under test (DUT). Clean clock signals provide the best spectral purity for a D/A converter's analog output signal. The new R&S SMA100B specifies nonharmonics < 100 dBc for a 1 GHz carrier frequency and < 80 dBc for a 10 GHz carrier frequency, an improvement of 10 to 18 dB over its predecessors. **Figure 1** shows actual measurement results that are significantly lower.

High sampling frequencies and high ENOB require a signal source with very low broadband noise. Clock signals with low wideband noise do not degrade the signal-to-noise ratio (SNR) of the sampled input signal of an A/D converter. With the R&S SMA100B, an optimized RF design and a new, all digital level control loop provide a typical broad-

Most Valuable Product

band noise of -160 dBc/Hz at 10 GHz carrier frequency, a value formerly achieved only by a few highly specialized signal sources.

Testing A/D converters often requires two signal sources: one for the DUT's clock and one for the analog signal. The microwave signal generator facilitates this by offering a high performance clock synthesizer option with ultra-low phase and broadband noise up to 6 GHz. The frequency of this additional synthesizer can be set independently of the main RF frequency. Sharing a common 1 GHz reference signal achieves very high phase stability between the output clock signal and the main synthesizer signal. To support single-ended and differential clock interfaces, the waveform, level and DC offset are programmable.

HIGH-END RADAR DESIGN

When designing and testing high-end radar systems, detection sensitivity is often limited by the phase noise of the RF signal source. The R&S SMA100B offers several low phase noise options to satisfy even the toughest requirements (see **Figure 2**). Close-in phase noise performance can be as low as -60 dBc/Hz (typical) at 1 Hz offset and 10 GHz carrier frequency. For applications requiring the lowest possible pedestal phase noise, the signal generator offers a dedicated YIG oscillator option that enables -132 dBc/Hz (typical) at 10 kHz to 100 kHz offsets and 10 GHz carrier frequency. The R&S SMA100B defines a new, unprecedented high-end class in phase noise performance.

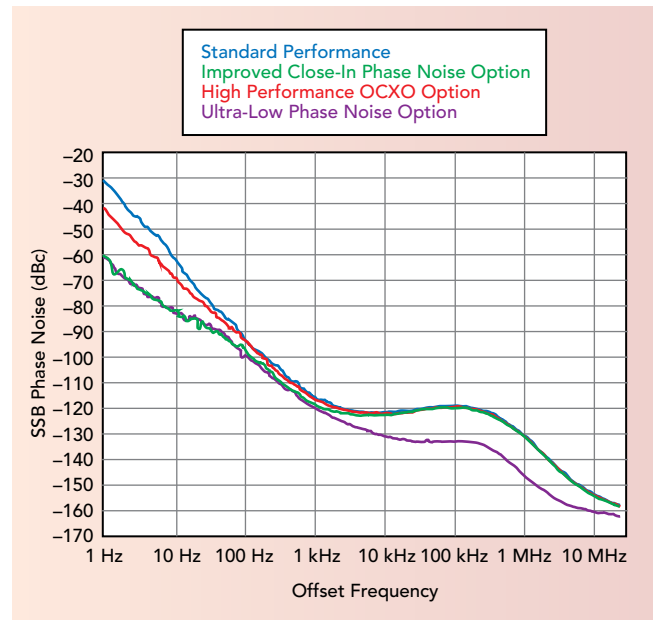
When testing radar systems, fast and well-controlled RF pulses are essential. With 5 ns (typical) rise/fall time and >80 dB on/off ratio, the R&S SMA100B pulse modulator is suitable for all radar applications. Modern radar equipment must be tested with leveled short pulses that have high level accuracy and level repeatability. The pulse modulator of the new R&S SMA100B has been designed for that. It can deliver leveled short pulses with high level accuracy and repeatability down to the nanosecond range.

PRODUCTION MEASUREMENT OF MICROWAVE AMPLIFIERS

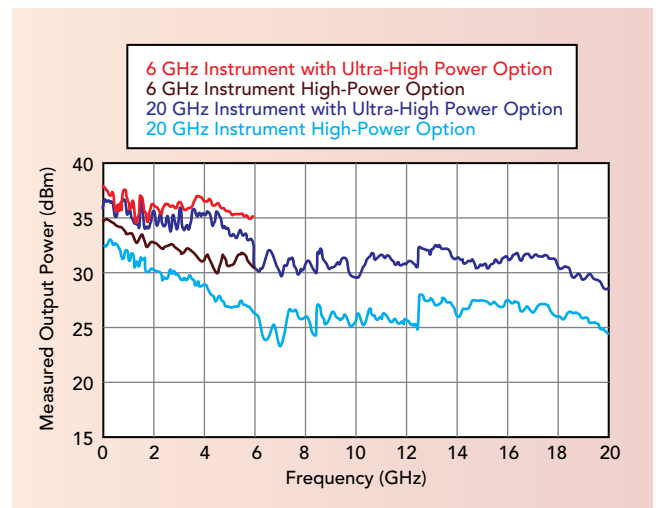
When testing high-power amplifiers, sufficient drive power is crucial. To satisfy cost-sensitive as well as highly demanding applications, the R&S SMA100B offers a three-stage output power option. A high output power option up to $+35$ dBm can be activated with an option key, even in the field. The factory fit ultra-high output power option offers power levels up to $+38$ dBm for the 6 GHz model (see **Figure 3**), a performance previously unavailable from any general-purpose signal generator on the market, according to Rohde & Schwarz.

In addition, due to built-in filters, a harmonics suppression of -65 dBc (typical) is available up to high-power levels for all output power options. With this combination of very high output power, low harmonics and extremely low wideband noise, the R&S SMA100B makes external amplifiers and filters unnecessary and saves the customer from using complicated and expensive test setups consisting of multiple boxes.

In a production environment, it is important to keep downtime caused by service needs or malfunction of the automatic test equipment (ATE) system to a minimum. For signal generators up to 6 GHz, an electronic solid-state step attenuator has therefore been a de-facto standard for more than a decade. The R&S SMA100B now carries this technology into the world of



▲ Fig. 2 Measured single sideband phase noise performance of the R&S SMA100B at 10 GHz.



▲ Fig. 3 Measured maximum available output power of the R&S SMA100B.

microwave signal generators, offering solid-state switching for all frequency options up to 20 GHz as standard, allowing very fast and wear-free level switching.

All these features fit into a compact 19 in, 2 HU housing saving rack space. All R&S SMA100B signal generators are equipped with a convenient touch display and an easy-to-use graphical user interface (GUI), which makes operating the instrument very easy. For benchtop operation, users can optionally select a 19 in, 3 HU housing with increased 7 in touch display.



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