

Vector Signal Generator R&S®SMJ 100A

The all-purpose generator that redefines the medium segment

First the R&S®SMU200A vector signal generator, followed by the R&S®SMATE200A production specialist (page 27) – and now Rohde & Schwarz is launching the third member of this family: the R&S®SMJ 100A, which is definitely an all-purpose generator.

High-end signal quality in the upper medium segment

In a way, the R&S®SMJ 100A (FIG 1) might be considered the R&S®SMU200A's "little brother", since it is essentially based on the concept of the R&S®SMU200A. The R&S®SMJ 100A has adopted the R&S®SMU200A's platform plus its successful operating concept (FIG 2).

With its strictly single-path design, the R&S®SMJ 100A primarily caters to users who are looking for a no-frills, first-rate vector signal generator. Its scope of functions has been consistently designed to cover the mainstream applications of vector signal generators. Spe-

cial features such as two-path capability and fading were waived in favor of attractive pricing.

In many aspects, the RF characteristics of the new R&S®SMJ 100A generator come very close to those of the R&S®SMU200A. Featuring an SSB phase noise of typically -133 dBc (1 GHz carrier frequency, 20 kHz carrier offset, 1 Hz measurement bandwidth) and a wideband noise of -153 dBc at 1 GHz, the R&S®SMJ 100A redefines the upper medium segment.

With a 3GPP signal (test model 1, 64 DPCHs), for example, these basic characteristics allow the new generator to achieve typical ACLR values of 69 dB

FIG 1 The R&S®SMJ 100A cuts a good figure, not only when testing WLAN cards.



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in the first, and of 71 dB in the second adjacent channel – at an outstanding composite EVM of typically 0.5%.

Plus, the generator achieves superb setting times and exceptional level accuracy: With its frequency setting time of <5 ms, the R&S®SMJ100A outperforms most of its competitors. In List mode, a frequency hop takes even less than 450 μs. The R&S®SMJ100A has a level accuracy of <0.7 dB at $f \leq 3$ GHz, and of <0.9 dB at $f > 3$ GHz.

Flexible baseband with all major standards

The R&S®SMJ100A does not compromise on baseband quality: It has embraced the R&S®SMU200A's state-of-the-art baseband generator with a universal coder and arbitrary waveform generator (ARB). The baseband generator is available with an ARB memory depth of 16 Msamples or 64 Msamples.

The tried-and-tested graphical user interface (GUI) is also from the R&S®SMU200A. Owing to the built-in transients recorder, the baseband signal can be displayed in realtime (FIG 3). The R&S®SMJ100A provides nearly all common representations such as I(t), Q(t), constellation or vector diagram plus power spectrum; these are all functions that are particularly useful with complex signals.

Like the R&S®SMU200A, the R&S®SMJ100A can also generate signals for all major mobile radio standards such as GSM/EDGE, 3GPP FDD including HSDPA and CDMA2000®. The GSM/EDGE option allows the R&S®SMJ100A to change modulation between GMSK and 8PSK in realtime; moreover, it provides all common timeslot formats of the standard plus up to eight different timeslot levels.

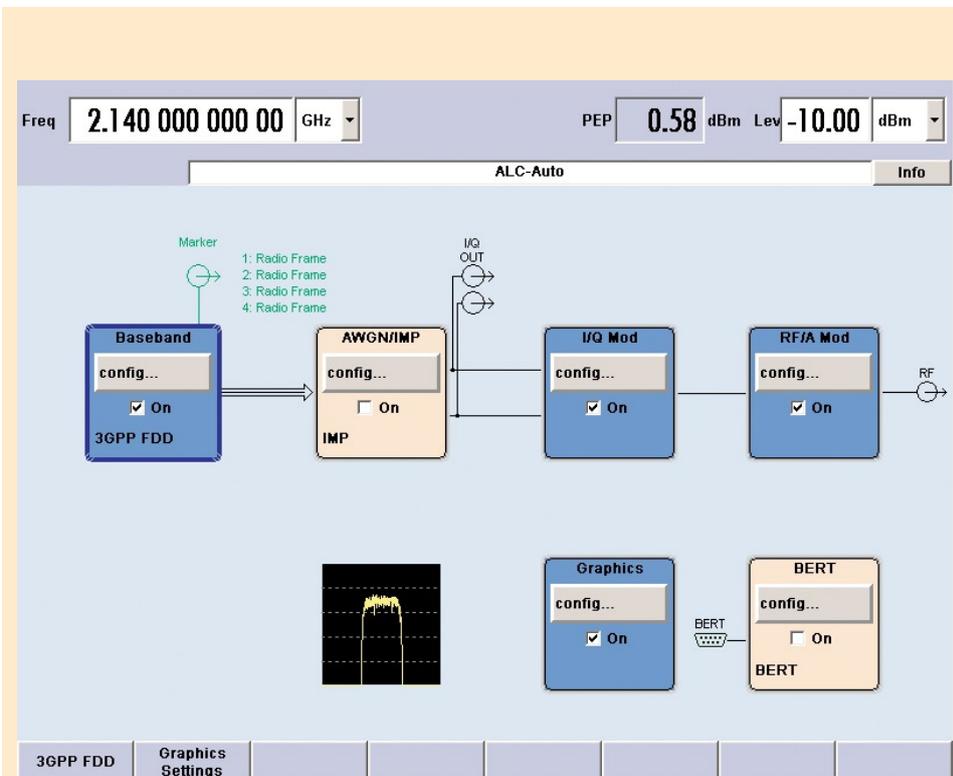


FIG 2 The GUI of the R&S®SMJ100A with the block diagram as the key element.

Condensed data of the R&S®SMJ100A

Frequency	
Frequency range	100 kHz to 3 GHz / 6 GHz
Setting time	<5 ms
Setting time in List mode	<450 μs
Level	
Range	-144 dBm to +13 dBm (PEP) [+16 dBm in overrange]
Setting time	<5 ms
Spectral purity (at f = 1 GHz)	
SSB phase noise (20 kHz carrier offset, 1 Hz measurement bandwidth)	typ. -133 dBc
Wideband noise (carrier offset >5 MHz, 1 Hz measurement bandwidth)	typ. -153 dBc (CW) typ. -146 dBc (I/Q modulation)
ACLR performance	
3GPP FDD test model 1, 64 DPCHs	typ. 69 dB
I/Q bandwidth (RF)	
Internal	80 MHz
External	200 MHz
Arbitrary waveform generator	
Memory depth	16 Msamples / 64 Msamples
Supported standards and digital systems	
GSM/EDGE, 3GPP FDD, 3GPP TDD, TD-SCDMA, cdmaOne, CDMA2000®, 1xEV-DO, 1xEV-DV, IEEE 802.11 a/b/g, IEEE 802.16d, Bluetooth™, GPS, AWGN, multicarrier CW, custom digital modulation	

► For 3GPP, the R&S®SMJ100A offers up to four code channels in realtime, including channel coding. In the downlink, a maximum of four base stations with 128 code channels each can be simulated, and in the uplink up to 68 mobile stations. The generator is thus able to generate the reference measurement channels in accordance with 3GPP TS25.141 and TS25.104, which are required for tests on base stations and terminals. Moreover, the R&S®SMJ100A supports HSDPA in accordance with the 3GPP Release 6.

The R&S®SMJ100A provides just as much functionality for the CDMA2000® standard where it simulates the physical layer, including channel coding, both in the forward link and the reverse link. Up to four base stations and up to 68 mobile stations can be simulated. The special 1xEV-DV mode for high data rates, also referred to as Radio Configuration 10 (RC 10), is supported as well.

What's more, the generator also covers the standards for wireless data transmission such as WLAN or WiMAX, which

are gaining increasing importance. For example, options for WLAN 802.11 a / b / g and WiMAX 802.16 d are available – and also for GPS, where up to four satellites can be simulated.

Of course, you can also use the generator in combination with the tried-and-tested R&S WinIQSIM™ simulation software; all standards of this software are provided for the R&S®SMJ100A.

AWGN and differential I/Q outputs

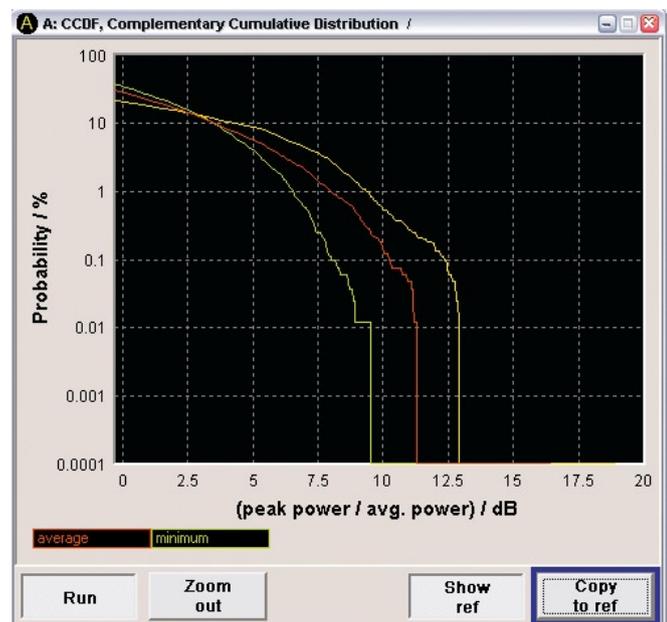
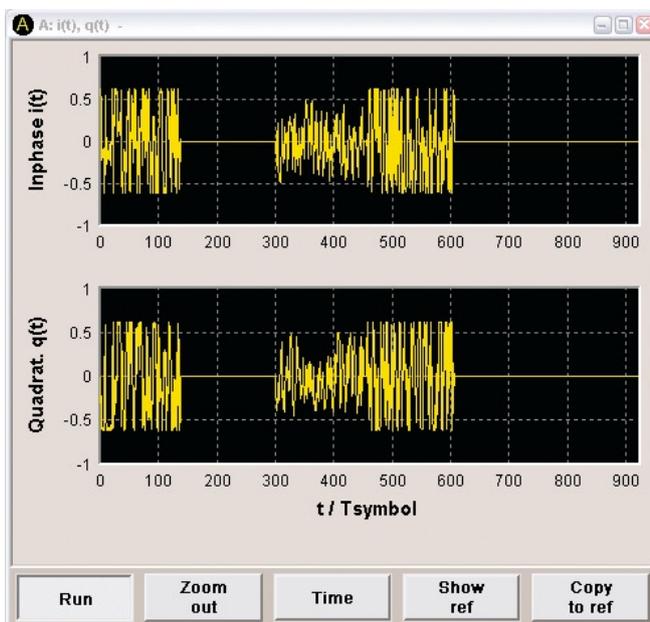
The generator's scope of functions is complemented by the AWGN option (known from the R&S®SMU200A); in addition to additive white Gaussian noise, the R&S®SMJ100A can now generate CW noise signals, which is a useful extra feature for receiver tests. Right from the start, the R&S®SMJ100A also offers differential I/Q outputs as an option. This makes the generator suitable for tests on baseband chips and modules – in addition to its main task as an RF signal source.

Competent in all fields of application

Powerful, flexible and future-proof, the R&S®SMJ100A is the ideal signal generator for developing mobile radio terminals and modules or WLAN and WiMAX instruments. But also when used in production, the generator cuts an excellent figure, especially if it is only required as a signal source. For example, it can be used for inline tests in mobile radio base station production, where usually neither fading nor noise signals are required.

Another asset that applies to the entire family of generators is their 100% compatibility with regard to remote-control commands. For example, if you use an R&S®SMU200A in R&D, you can easily transfer the remote-control programs specially written for this generator to production, provided the R&S®SMATE200A or the R&S®SMJ100A are used there.

FIG 3 The built-in transients recorder can sample the baseband signals of the R&S®SMJ100A in realtime and offers various representations such as I/Q diagram, CCDF and constellation diagram (see below).



Summary

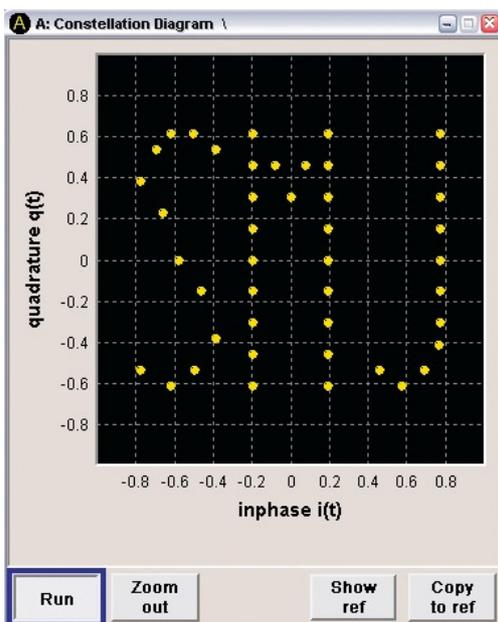
Launching the R&S®SMJ100A, Rohde&Schwarz offers a vector signal generator in the upper medium segment that ideally complements the generator family. Together with the R&S®SMU200A and the R&S®SMATE200A, you now have a portfolio of models that cover virtually all conceivable requirements in R&D or in production.

Dr René Desquiotz

More information and data sheet at
www.rohde-schwarz.com
 (search term: type designation)

REFERENCES

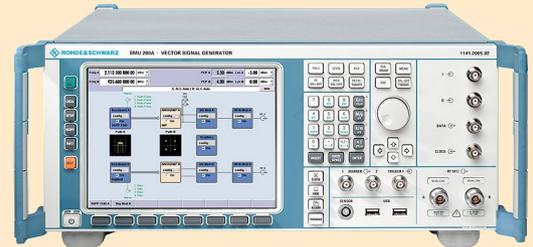
Vector Signal Generator R&S®SMU200A:
 The art of signal generation. News from
 Rohde & Schwarz (2003) No. 180, pp 21–27



The generator family at a glance

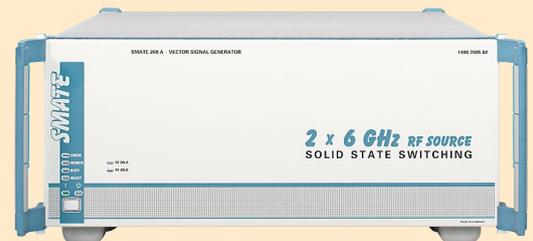
The R&S®SMU200A – the artist

- ◆ One or two RF paths
- ◆ Optionally up to two baseband generators
- ◆ Digital addition possible in the baseband with frequency offset and gain
- ◆ Optional fading simulator with up to 40 fading paths
- ◆ Options for low phase noise and high output power
- ◆ Intuitive operating concept with GUI (block diagram)



The R&S®SMATE200A – the workhorse

- ◆ One or two RF paths (6 GHz possible twice)
- ◆ Optionally with up to two baseband generators
- ◆ Digital addition possible in the baseband with frequency offset and gain
- ◆ Options for low phase noise and high output power
- ◆ Flexible hardware List mode with direct addressing



The R&S®SMJ100A – the allrounder

- ◆ One RF path
- ◆ Optional baseband generator
- ◆ Intuitive operating concept with GUI (block diagram)

