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# Vector Signal Generator R&S® SMATE200A

The production solution based on the R&S® SMU200A



**ROHDE & SCHWARZ**

# The new standard in production



Based on the successful R&S®SMU200A platform, the R&S®SMATE200A is specifically designed for production environments. As such, the display and front panel user interface have been removed, the connectors moved to the rear, and performance has been optimized for fastest setting times to improve factory throughput. Like the R&S®SMU200A, however, the two-generators-in-one concept has been kept, occupying four height units – a plus for production where space is at a premium. All of this is available without compromising the

excellent RF performance and base-band flexibility synonymous with the R&S®SMU200A.

Speaking of flexibility, the modular design concept of the R&S®SMATE200A means that the R&S®SMATE200A can easily be adapted to the needs of any application. Users have the choice of either 3 GHz or 6 GHz RF outputs in one or two paths and may opt for up to two completely independent baseband sources. As in the R&S®SMU200A, these sources may be used to produce complex signals in real-

time or output preloaded waveforms from the internal arbitrary waveform generator.

In addition to its inherent speed, the R&S®SMATE200A also offers a special function to permit fast switching between different test signals. The multisegment waveform function allows users to easily combine waveforms, such as GSM and WCDMA, during test setup for even faster tests in production. This is just one of the R&S®SMATE200A's numerous adaptations to the special requirements of the production environment.

## Designed for production

- ◆ Very short setting times for frequency and level (e.g. for frequency changes <2 ms over GPIB and <400  $\mu$ s in List mode)
- ◆ Fast Hop mode offering flexibly addressable frequency/level pairs; as fast as normal List mode
- ◆ Multisegment waveform function enables fast switching between different test signals in waveform generator
- ◆ Special hardware triggers for basic functions
- ◆ Electronic attenuator for entire frequency and level range
- ◆ Status LEDs on front, connectors on rear
- ◆ Revised cooling concept for longer life in production

## Outstanding signal quality

- ◆ Very low SSB phase noise (typ.  $-135$  dBc/Hz at  $f = 1$  GHz, 20 kHz offset; typ.  $-140$  dBc/Hz with low phase noise option)
- ◆ Wideband noise of typ.  $-153$  dBc (>5 MHz carrier offset,  $f = 1$  GHz, 1 Hz measurement bandwidth)
- ◆ High output power of typ.  $+26$  dBm with high-power output option
- ◆ Very high level repeatability of typ. 0.05 dB
- ◆ I/Q modulator with 200 MHz RF bandwidth
- ◆ Excellent ACLR performance of typ.  $+70$  dB with 3GPP FDD

## Two signal generators in one

- ◆ Up to two completely independent signal generators in one unit
- ◆ Choice of 3 GHz or 6 GHz frequency options in one or two paths
- ◆ Up to two independent baseband sources that not only support real-time signal generation but also offer arbitrary waveform generation with up to 64 Msamples each

## Connectivity

- ◆ Remote-controllable via LAN (Gigabit Ethernet) and GPIB
- ◆ User-definable triggers and markers combined in one SCSI connector
- ◆ USB connectors for keyboard, mouse and memory stick
- ◆ VGA connector for an external display

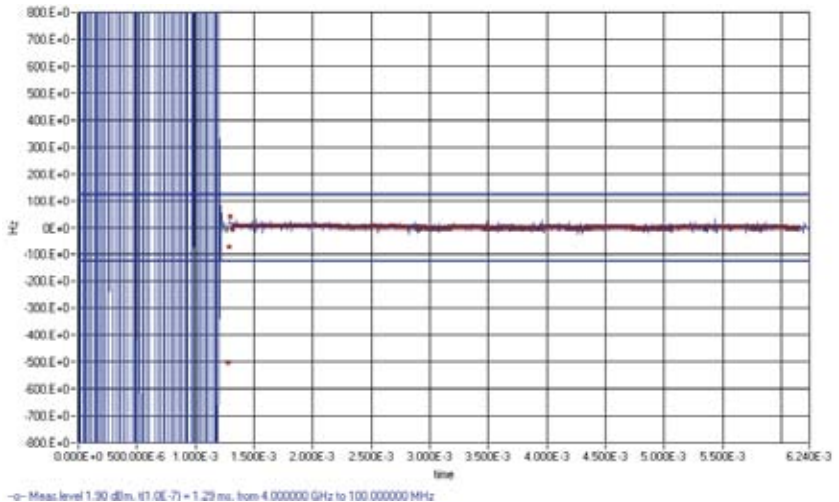


# Designed for production

Designed for speed, the R&S®SMATE200A is ideal for production lines where time is critical. In remote control operation via the IEC/IEEE bus, setting times are <2 ms and even faster in List mode (<400 μs) where predetermined changes in frequency and level outputs may be specified in advance. New with the R&S®SMATE200A, the Fast Hop mode improves List mode capability by allowing users to arbitrarily address up to 10 000 frequency/level pairs in any sequence via a serial bus, maximizing flexibility for test engineers. To further reduce test times, special hardware triggers are also added, allowing control of frequently used functions, including RF ON/OFF and MODULATION ON/OFF. All of these enhancements are designed to reduce the total cost of ownership in production environments.

Instrument size and connectivity are also crucial elements in production. After all, lower space requirements mean lower costs – particularly in a clean-room environment. Owing to its two-path concept, the R&S®SMATE200A occupies as little as 50 % of the space required by a single-channel instrument. To allow easy rack installation, the R&S®SMATE200A is equipped with rear connectors as standard.

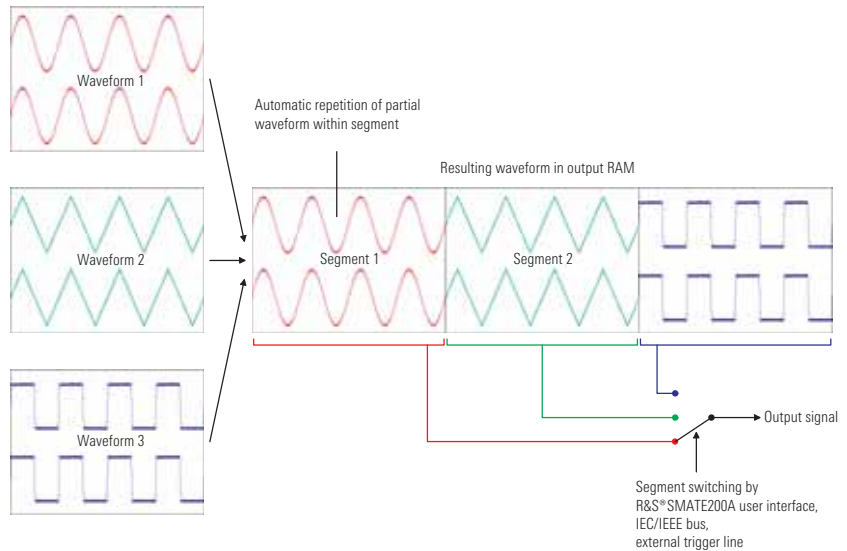
Since production conditions require robust instruments, the R&S®SMATE200A is designed for longer life. Its wear-free, electronic attenuator significantly lengthens product life over those instruments employing mechanical attenuators. Other measures affording longer life include an optimized cooling system to keep the instrument's internal temperatures as low as possible even when installed in a rack with elevated ambient temperature. Lower temperatures reduce component stress, thus increasing their lifespan.



**Setting time after a change in frequency**



In production, one problem facing test engineers is the tradeoff between test time and the need to stimulate each DUT with varying, complex signals. The R&S® SMATE200A has the answer: the multisegment waveform function. This feature allows users to combine up to 100 waveforms stored simultaneously in memory, making it possible to switch between waveforms without first having to load each one separately. This not only saves time during setup, but more importantly reduces the time for switching between waveforms to around 5  $\mu$ s. Users even have the option to specify seamless linking of waveforms to ensure phase stability – for example, during receiver tests where resynchronization can now be avoided.



**Multisegment waveform concept**

Another time-saving feature for test engineers, the Remote Desktop Connection of Microsoft’s Windows XP operating system, may be used via Gigabit LAN interface to check and modify test software as needed without having to be physically in front

of the R&S® SMATE200A. Of course, users on site may also access the R&S® SMATE200A user interface by means of the VGA output and a USB mouse and keyboard, same as for the R&S® SMU200A.

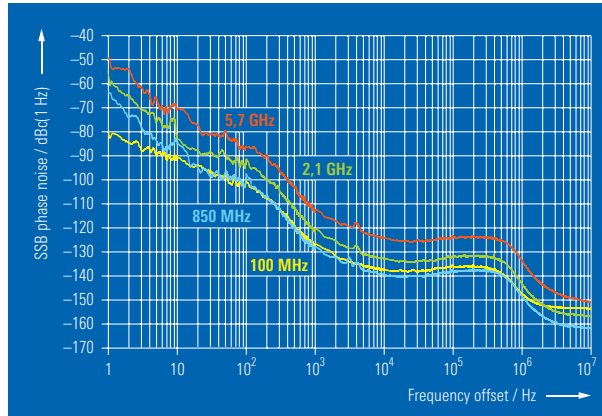


# Outstanding signal quality

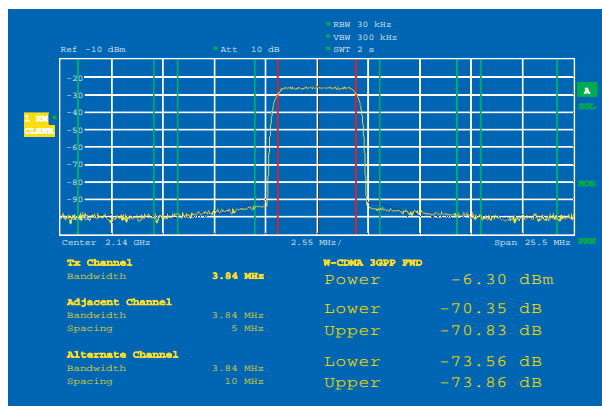
Just because the R&S®SMATE200A is designed for speed doesn't mean it lacks in performance. The R&S®SMATE200A ships standard with the same excellent RF characteristics as the R&S®SMU200A, typically  $-135$  dBc/Hz for a 1 GHz carrier at 20 kHz offset. In addition, users may opt for the low phase noise option to achieve even higher phase noise suppression, typically 5 dBc/Hz improvement. The superior combination of speed and signal quality makes the R&S®SMATE200A the ideal LO substitute.

This low phase noise performance coupled with the highly linear I/Q modulator lends itself to the R&S®SMATE200A's excellent ACLR and EVM measurement capability. Both parameters are especially important to power amplifier manufacturers – even more so with implementation of advanced, complex modulation schemes. It is also worth mentioning that excellent ACLR and EVM characteristics may be achieved simultaneously using the same test signal. Again, the advantage is greater measurement speed.

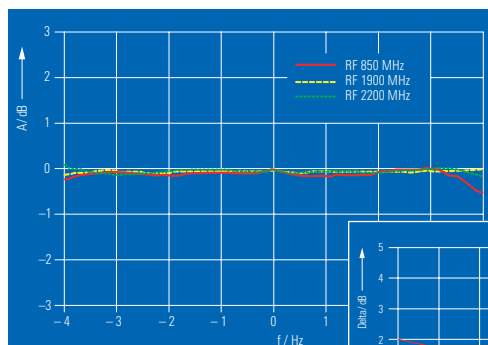
Like the R&S®SMU200A, the R&S®SMATE200A offers internal base-band generation of signals with up to 80 MHz RF bandwidth. A flat frequency response across this bandwidth is a prerequisite for generating signals with good modulation characteristics such as EVM, and the R&S®SMATE200A makes no compromises. For RF bandwidth requirements up to 200 MHz, users may input analog I/Q signals to each RF path independently. The R&S®SMATE200A offers all of this plus the same high spurious suppression that has come to be known in the R&S®SMU200A.



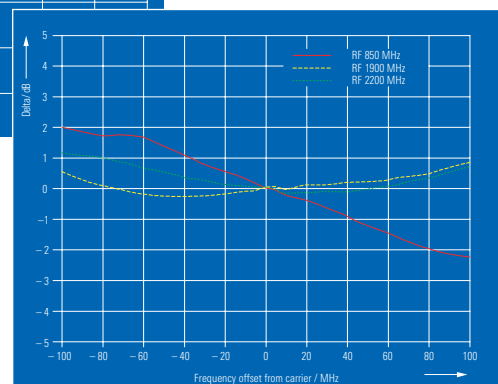
Typical single sideband phase noise at 100 MHz, 850 MHz, 2.1 GHz and 5.7 GHz with the low phase noise option



ACLR performance for 3GPP FDD (test model 1, 64 DPCHs)



Frequency response of internal base-band

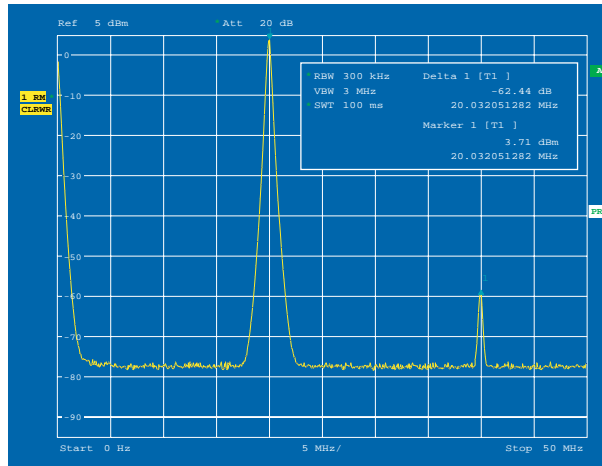


Frequency response (mode: external wideband I/Q)

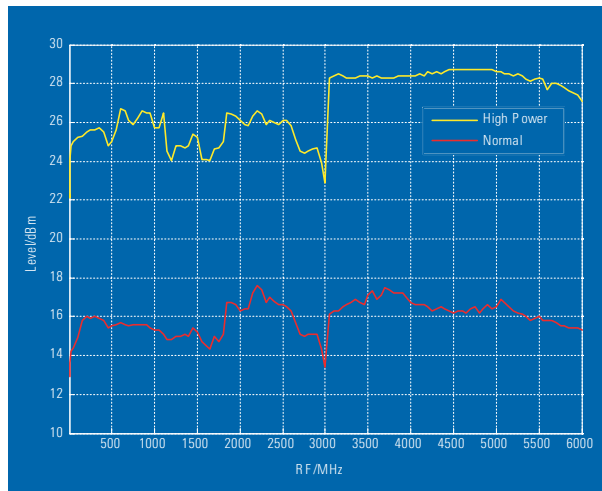
With its two-path concept, the R&S® SMATE200A not only offers two independent RF sources, but also up to two independent baseband generators whose signals can be digitally added internally. The result is a single instrument containing two units specifically designed to work together. This eliminates the need for external cabling, making setup both simple and compact.

In production, it is not uncommon to have many lossy elements between the signal generator and the DUT. To compensate, the generator must have sufficient output power. The R&S® SMATE200A with its high-power output option provides levels of typically +26 dBm. Opting for the high-power output option does not involve replacing the electronic attenuator. It is thus able to conserve the wide output level range.

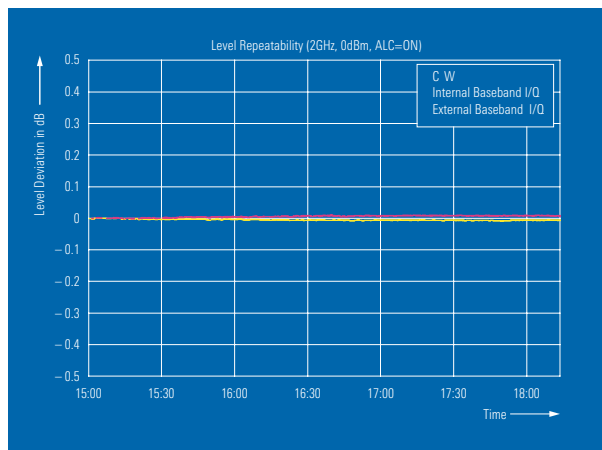
The high-precision level control of the R&S® SMATE200A is based on a temperature-controlled RMS detector. This not only translates to high precision, but also to high level repeatability, typically around 0.05 dB. This characteristic is especially important in production, because it allows the exact same test conditions to be established repeatedly over a long period of time.



**Spurious suppression of the internal baseband generators**



**Typical maximum output power over frequency (with high-power output option)**



**Level repeatability of the R&S® SMATE200A**

# Connectivity

Versatile connectivity of the R&S® SMATE200A combines classic RF BNC outputs with additional inputs and outputs through SCSI connectors. These connectors further simplify and speed up installation during setup.

An external keyboard and a mouse or memory stick can be connected via USB interfaces on the rear panel. Likewise, a VGA output is available for connecting an external display.

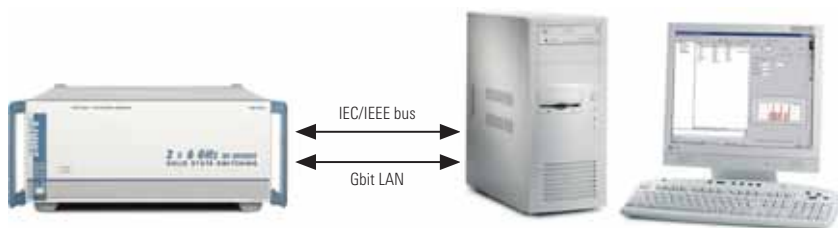
The R&S® SMATE200A can be remote-controlled via GPIB or LAN interfaces. With the introduction of the R&S® SMATE200A, the capability to utilize a Gigabit Ethernet is offered, yielding shorter test times during production.



*SCSI connectors*



*Connectors for PC peripherals*



*Remote control of the R&S® SMATE200A via IEC/IEEE bus or Gigabit Ethernet LAN*

# Modular design

Owing to its modular design, the R&S® SMATE200A may be adapted to virtually any requirement. As users require new functionality, the appropriate options may be added later.

Low total cost of ownership is more than just a motto with the R&S® SMATE200A – it applies to every aspect of the instrument, including its three-year calibration cycle. This translates to significant cost savings and reduces system down time.



*Look inside the R&S® SMATE200A*



# Condensed data

<b>Frequency</b>	
Frequency range	100 kHz to 3 GHz / 6 GHz
Setting time	<2 ms
Setting time in List mode	<400 $\mu$ s
<b>Level</b>	
Range	-144 dBm to +13 dBm (PEP) [+16 dBm in overrange]
Range with high-power output option	-144 dBm to +19 dBm (PEP) [+26 dBm in overrange]
Setting time	<2 ms for $f \leq 3$ GHz <4 ms for $f > 3$ GHz
<b>Spectral purity (f = 1 GHz)</b>	
Nonharmonics	
Carrier offset >10 kHz	<-80 dBc
Carrier offset >850 kHz	<-86 dBc
SSB phase noise (20 kHz carrier offset, 1 Hz measurement bandwidth)	typ. -135 dBc typ. -140 dBc with low phase noise option
Wideband noise (carrier offset >5 MHz, 1 Hz measurement bandwidth)	typ. -153 dBc (CW) typ. -149 dBc (I/Q modulation)
<b>ACLR performance</b>	
3GPP FDD test model 1, 64 DPCHs	typ. 70 dB
<b>I/Q bandwidth (RF)</b>	
Internal	80 MHz
External	200 MHz
<b>Arbitrary waveform generator</b>	
Memory depth	16 Msamples / 64 Msamples
Interfaces	IEEE 488.2, LAN (Gigabit Ethernet), 2 $\times$ USB, 1 $\times$ USB slave, VGA

# Ordering information

Designation	Type	Order No.
<b>Vector Signal Generator <sup>1)</sup></b>		
Including power cable, Quick Start Guide and CD-ROM (with operating and service manual)	R&S® SMATE200A	1400.7005.02
<b>Options</b>		
RF Path A		
100 kHz to 3 GHz	R&S® SMATE-B103	1401.1000.02
100 kHz to 6 GHz	R&S® SMATE-B106	1401.1200.02
Low Phase Noise and analog modulation FM/ΦM	R&S® SMATE-B22	1401.2507.02
High-Power Output	R&S® SMATE-B31	1401.1800.02
RF Path B		
100 kHz to 3 GHz	R&S® SMATE-B203	1401.1400.02
100 kHz to 6 GHz	R&S® SMATE-B206	1401.1600.02
Low Phase Noise and analog modulation FM/ΦM	R&S® SMATE-B22	1401.2507.02
High-Power Output	R&S® SMATE-B36	1401.2107.02
Baseband		
Baseband Generator with ARB (64 Msamples) and Digital Modulation (realtime)	R&S® SMATE-B10	1401.2707.02
Baseband Generator with ARB (16 Msamples) and Digital Modulation (realtime)	R&S® SMATE-B11	1401.2807.02
Baseband Main Module	R&S® SMATE-B13	1401.2907.02
Differential I/Q Output	R&S® SMATE-B16	1401.2407.02
Digital modulation systems		
Digital Standard GSM/EDGE	R&S® SMATE-K40	1404.5107.02
Digital Standard 3GPP FDD	R&S® SMATE-K42	1404.5207.02
3GPP Enhanced MS/BS Tests incl. HSDPA	R&S® SMATE-K43	1404.5307.02
Digital Standard GPS	R&S® SMATE-K44	1404.5407.02
Digital Standard CDMA2000 <sup>® 2)</sup> incl. 1xEV-DV	R&S® SMATE-K46	1404.5507.02
Digital Standard IEEE 802.11 (a/b/g)	R&S® SMATE-K48	1404.6703.02
Digital Standard IEEE 802.16 (d)	R&S® SMATE-K49	1404.6803.02
Multicarrier CW Signal Generation	R&S® SMATE-K61	1404.5707.02
Digital modulation systems using R&S® WinIQSIM <sup>TM 3)</sup>		
Digital Standard IS-95 (with R&S® WinIQSIM <sup>TM</sup> )	R&S® SMATE-K11	1404.5907.02
Digital Standard CDMA2000 <sup>®</sup> (with R&S® WinIQSIM <sup>TM</sup> )	R&S® SMATE-K12	1404.6003.02
Digital Standard 3GPP TDD (with R&S® WinIQSIM <sup>TM</sup> )	R&S® SMATE-K13	1404.6090.02
Digital Standard TD-SCDMA (with R&S® WinIQSIM <sup>TM</sup> )	R&S® SMATE-K14	1404.6203.02
User-Defined OFDM Signals (with R&S® WinIQSIM <sup>TM</sup> and R&S® WinIQOFDM)	R&S® SMATE-K15	1404.6303.02
Digital Standard 1xEV-DO (with R&S® WinIQSIM <sup>TM</sup> )	R&S® SMATE-K17	1404.6403.02
Digital Standard IEEE 802.11 (a/b/g) (with R&S® WinIQSIM <sup>TM</sup> )	R&S® SMATE-K19	1404.6503.02
Digital Standard 3GPP FDD incl. HSDPA (with R&S® WinIQSIM <sup>TM</sup> )	R&S® SMATE-K20	1404.6603.02
Digital modulation systems using external PC software		
<i>Bluetooth</i> <sup>® 4)</sup> (with external software)	R&S® SMATE-K5	1404.7000.02
Noise		
Additive White Gaussian Noise (AWGN)	R&S® SMATE-K62	1404.5807.02

**Recommended extras**

Hardcopy manuals (in English, US)	R&S®SMATE-M	1401.0940.39
19" Rack Adapter	R&S®ZZA-411	1096.3283.00
Adapter for Telescopic Sliders	R&S®ZZA-T45	1109.3774.00
BNC Adapter Board for AUX I/O Connector	R&S®SMU-Z5	1160.4545.02
Keyboard with USB Interface (US assignment)	R&S®PSL-Z2	1157.6870.03
Mouse with USB Interface, optical	R&S®PSL-Z10	1157.7060.02
External USB CD-RW Drive	R&S®PSP-B6	1134.8201.12

<sup>1)</sup> The base unit can only be ordered with an R&S®SMU-B10x frequency option.

<sup>2)</sup> CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA -USA).

<sup>3)</sup> R&S®WinIQSIM™ requires an external PC.

<sup>4)</sup> The *Bluetooth*® word mark and logos are owned by the Bluetooth SIG, Inc. and any use of such marks by Rohde&Schwarz is under license.

For specifications, see PD 0758.1893.22  
and [www.rohde-schwarz.com](http://www.rohde-schwarz.com)  
(search term: SMATE200A)



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