Signal Generators SMY

Versatility and low cost can go hand in hand

- Frequency resolution 1 Hz
- Level range –140 to +19 dBm, overrange up to 25 dBm (option)
- Level accuracy better than 1 dB
- SSB phase noise <–114 dBc at 1 GHz, Δf = 20 kHz
- AM, FM, φM and pulse modulation
- Modulation generator 1 Hz to 500 kHz
- Sweep capabilities
- Nonvolatile memory for 100 complete front-panel setups
- RF overload protection 30 W (SMY01) or 50 W (SMY02)
- Low RF leakage (<0.1 µV)
- Calibration at 3-year interval

ROHDE&SCHWARZ

SMY – the ideal generator for receiver measurements ...

Signal generators of the SMY family from Rohde&Schwarz are cost-effective instruments for testing AM, FM and φM receivers as well as for component measurements. Two models are available:

- SMY01 with a frequency range from 9 kHz to 1040 MHz
- SMY02 from 9 kHz to 2080 MHz.

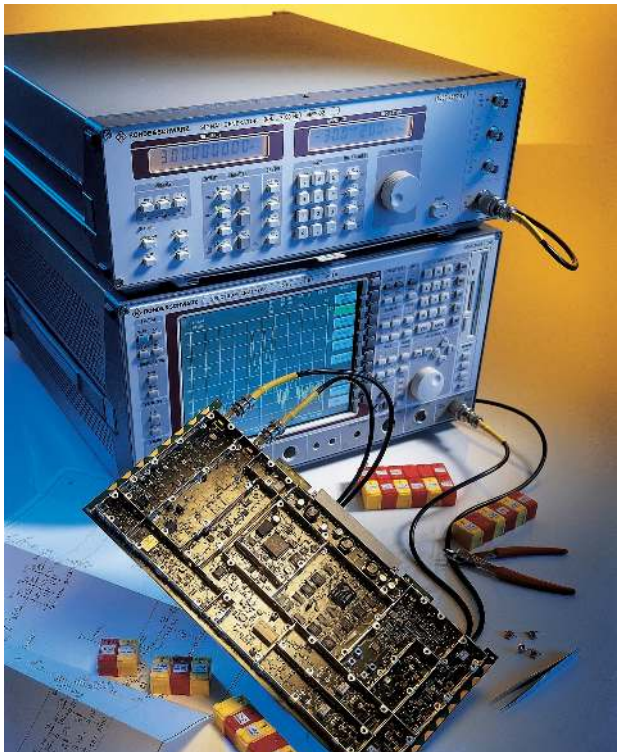
Designed exclusively for the main applications of signal generators by cutting out the unnecessaries, SMY features an outstanding price/performance ratio. Thanks to its comprehensive basic features and excellent signal characteristics, it is an economical solution for universal use in lab, production and servicing environments.

- Level range –140 dBm to +13 dBm (19 dBm overrange) *), sufficient even for receivers of highest sensitivity
- High level accuracy and low RF leakage allowing accurate and undegraded sensitivity measurements
- FM-DC with high accuracy of carrier frequency for testing pagers and receivers fitted with digital squelches
- Low SSB phase noise and high spurious rejection for all in-channel and blocking measurements
- Low residual FM affording ample of margin for S/N measurements
- Modulation generator 1 Hz to 500 kHz for modulation frequency response measurements
- Stereo channel separation of 50 dB and low harmonic distortion for testing FM stereo receivers

*) With option SMY-B40 –134 dBm to +19 dBm (25 dBm overrange)

... and for general-purpose applications

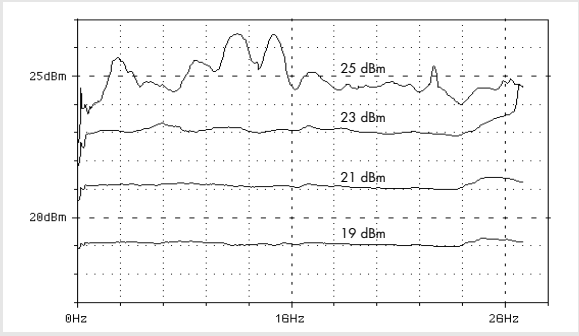
Thanks to the excellent spectral purity and the high accuracy of the carrier frequency with FM-DC, measurements on steep-edged crystal filters are possible without any problem.



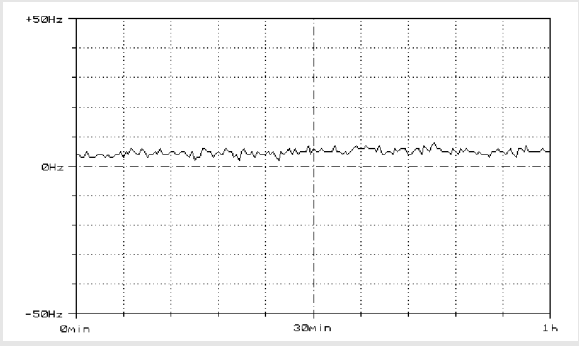
Certified Quality System
ISO 9001
DQS REG. NO 1954-04

- Non-interrupting level setting over a range of 20 dB for reproducible measurement of squelch hysteresis
- Frequency resolution 1 Hz, suitable also for narrowband test items
- FM-DC, deviation up to 20 MHz for VCO simulation
- FM bandwidth 2 MHz for fast FSK and telemetry applications
- High output level up to 19 dBm (25 dBm with option SMY-B40) for component and overdrive testing
- AF synthesizer 1 Hz to 500 kHz, separate use as AF signal source for external applications possible, eg recording of AF frequency response
- Remote-control interface IEC625/ IEEE488 for use in automatic test systems
- RF sweep
- Sequence function and SEQ input for semi-automatic use

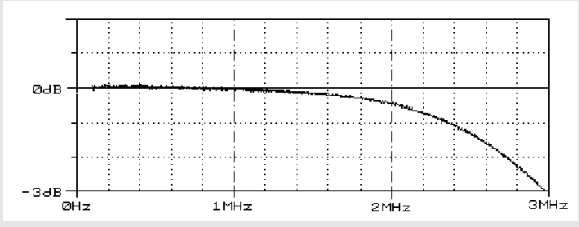
With option SMY-B40: The overrange feature for the output level allows measurements on high-level mixers. To the right: output level obtained with settings of 19 dBm, 21 dBm, 23 dBm and 25 dBm



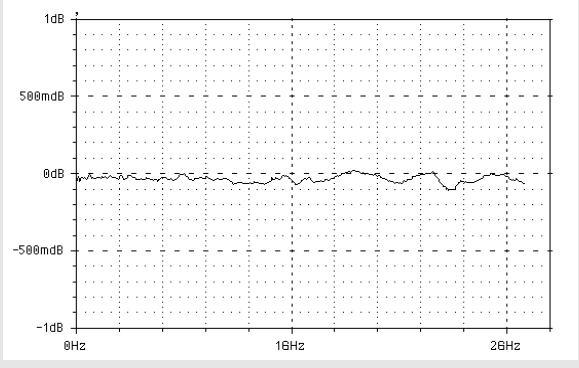
Accuracy of carrier frequency with FM-DC, long-term stability. Settings: carrier frequency = 1 GHz, FM deviation = 50 kHz, external FM-DC



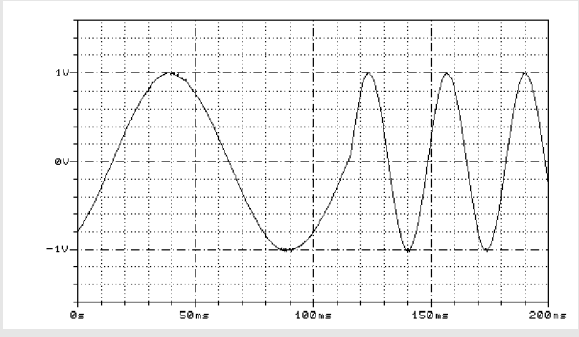
FM frequency response of SMY. Frequency modulation is possible even at full deviation up to high modulation frequencies



Level/frequency response at 0 dBm output level. The software-supported level correction reduces the frequency response to typically 0.1 dB



Phase-continuous frequency change of modulation generator. To the right: frequency change from 10 Hz to 40 Hz



Cost-saving synthesis concept

Single-loop synthesis is a concept that makes for simple and cost-effective circuit design and does not entail giving up high frequency resolution and short setting time. The fractional-N technique uses a fractional frequency division ratio, ie a frequency resolution of 1 Hz is obtained in spite of the high reference frequency. High reliability and light weight thanks to VLSI components are further advantages of this technique.

Operation

The panel controls are ergonomically arranged so that there is no time wasted for familiarization. Operation is from the left to the right: parameters, data, units; each control is at its right place.

The patented, magnetically locking spinwheel is just as practical. Although easy to turn, each setting step is felt exactly by the user. Thus for instance it is not really necessary to observe the SMY display in the case of stepwise tuning. This means that the annoying procedure of looking back and forth between a measuring instrument and the signal generator can be dispensed with. Naturally fast tuning and programming of the step width are also possible.

Frequently used settings can be stored and recalled any time. The memory saves up to 100 complete front-panel setups.

Low cost of ownership thanks to high reliability and easy maintenance

Like with all Rohde & Schwarz signal generators, the well-proven self-test facility is integrated in SMY monitoring continuously the signal generator status. If there are any malfunctions, these are immediately detected and reported in the form of error messages. The user thus has an effective protection against invalid measurements, should the generator ever fail.

Thanks to its advanced circuit design, SMY requires particularly little maintenance. Aging and drift are compensated for by control loops. Due to the few reference components, which are designed for maximum stability, calibration is required at intervals of 3 years only.

If the accuracy is required to be higher than the specified data, user-specific calibration values for frequency and level may be entered and stored at any time without opening the instrument.

Further development of proven technology

Signal Generators SMY from Rohde & Schwarz stands for the economy class of generators. Well-proven features have been improved and unnecessary details omitted. It is the sum of its characteristics which makes SMY so attractive. Tangible for the user are the variety of facilities and versatility at an excellent price/performance ratio. SMY is the economical solution for universal use in lab, production and servicing environments.

Rear-panel of SMY

Specifications

Frequency

Range	9 kHz to 1.04 GHz (SMY01) 9 kHz to 2.08 GHz (SMY02)
Underranging	
without guarantee of specs	down to 5 kHz
Resolution	1 Hz
Setting time (to within	
$<1 \times 10^{-7}$ for f >65 MHz or	
<70 Hz for f <65 MHz)	<60 ms

Reference frequency	**standard**	**option SMY-B1**
Aging (after 30 days of operation)	1×10^{-6}/year	$<1 \times 10^{-9}$/day
Temperature effect (0 to 55 °C)	2×10^{-6}	$<5 \times 10^{-8}$
Warmup time	–	10 min
Output for internal reference		
Frequency	10 MHz	
Level (EMF, sinewave)	1 V (rms)	
Source impedance	50 Ω	
Input for external reference		
Frequency	5 or 10 MHz ±5 x 10^{-6}	
Input level	0.2 to 2 V (rms)	
Input impedance	200 Ω	

Spectral purity	**standard**	**option SMY-B40**
Spurious		
Harmonics	<–30 dBc for levels <10 dBm	<–25 dBc for levels <16 dBm
Subharmonics		
f ≤1.04 GHz	none	
f >1.04 GHz	<–40 dBc	
Nonharmonics		
at >5 kHz from carrier		
f ≤1.04 GHz	<–70 dBc	
f >1.04 GHz	<–64 dBc	
Broadband noise with CW[1], carrier offset >1 MHz, 1 Hz bandwidth		
f = 1 to 65 MHz	<–135 dBc	
f >65 MHz	<–140 dBc	
SSB phase noise at 20 kHz from carrier, 1 Hz bandwidth, CW		
f <65 MHz	<–114 dBc	
100 MHz	<–132 dBc	
500 MHz	<–120 dBc	
1 GHz	<–114 dBc	
2 GHz	<–108 dBc	
Residual FM, rms, <1% of maximum deviation, f =1 GHz		
0.3 to 3 kHz (CCITT)	<10 Hz, typ. 3 Hz	
0.03 to 20 kHz	<20 Hz, typ. 7 Hz	
Residual AM, rms (0.03 to 20 kHz)[1]	<0.02%	

Level	**standard**	**option SMY-B40**
Range	–140 to +13 dBm	–134 to +19 dBm
Overranging without guarantee of specs	up to 19 dBm	up to 25 dBm, down to –140 dBm
Resolution	0.1 dB	
Total error for levels >–127dBm[1]		
f <1.04 GHz	<±1 dB	
f >1.04 GHz	<±1.5 dB	
Level flatness at 0 dBm[1]	<1 dB, typ. <0.3 dB	
Output impedance	50 Ω	
VSWR[1]	<1.5 for f ≤1.04 GHz <1.8 for f >1.04 GHz	
Setting time (IEC/IEEE bus)	<25 ms (<10 ms with electronic level setting)	
Non-interrupting level setting (ATTENUATOR MODE FIXED)		
Setting range	0 to –20 dB	

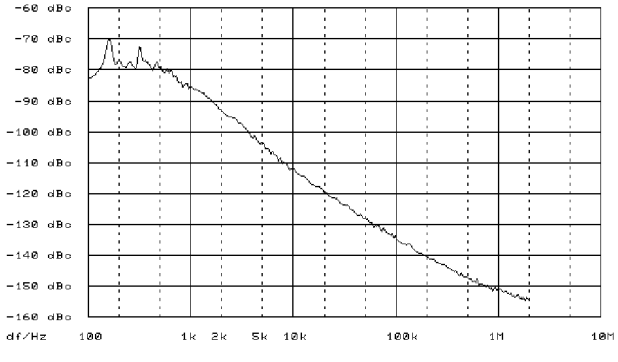
Overload protection protects the instrument against externally applied (50-Ω source) RF power and DC voltage

Max. RF power	
SMY01	30 W
SMY02	50 W
Max. DC voltage	35 V
Max. pulse loading capacity (pulse width <10 µs)	1 mWs or 150 V (V_p)

Simultaneous modulation any combination of AM, FM (φM) and pulse modulation

Amplitude modulation		
Modes	internal, external AC/DC	
Modulation depth	0 to 100%[2]	
Resolution	0.1%	
	standard	**option SMY-B40**
Setting error at 1 kHz (m <80%)[1]	<4% of reading ±1%	<4% of reading ±3%
AM distortion at 1 kHz[1]		
f <10 MHz		
m=30%	<1%	<3%
m=80%	<2%	<5%
f >10 MHz		
m=30%	<1%	<1%
m=80%	<2%	<2%
Modulation frequency response flatness (m=60%)[1] [3]		
30 Hz (DC) to 10 kHz	<0.4 dB	
10 Hz (DC) to 50 kHz	<3 dB	
Incidental φM with AM (30%), AF = 1 kHz	<0.2 rad <0.4 rad at f >1.04 GHz (SMY02)	
Modulation input (AM EXT)		
Input impedance	100 kΩ; 600 Ω jumper-selected	
Input voltage for selected modulation depth	1 V (peak) (for inaccuracy >3%: high/low indication)	

Frequency modulation	
Modes	internal, external AC/DC
Maximum deviation for carrier frequency	
<65 MHz	10 MHz
65 to 130 MHz	1.25 MHz
130 to 260 MHz	2.5 MHz
260 to 520 MHz	5 MHz
520 to 1040 MHz	10 MHz
1040 to 2080 MHz	20 MHz
Resolution	<1%, min. 10 Hz
Setting error at AF = 1 kHz	<3% of reading + 20 Hz
FM distortion at AF = 1 kHz and 3% of maximum deviation	<0.3%, typ. 0.1%
Modulation frequency response flatness	
10 Hz (DC) to 2 MHz	<3 dB, typ. 1 dB
Incidental AM at AF = 1 kHz, f >1 MHz, 40 kHz deviation	<0.1%
Stereo modulation at 40 kHz deviation, AF = 1 kHz	
Stereo separation[4]	>50 dB
S/N ratio	
unweighted	>76 dB
weighted	>70 dB
Harmonic distortion	typ. 0.1%
Carrier frequency offset with FM-DC[4]	<1 Hz + 0.1% of deviation
Modulation input	FM/φM EXT
Input impedance	100 kΩ; 600 Ω jumper-selected
Input voltage for selected deviation	1 V (peak) (for inaccuracy >3%: high/low indication for AF = 10 Hz to 100 kHz)



SSB phase noise at 1 GHz (CW)

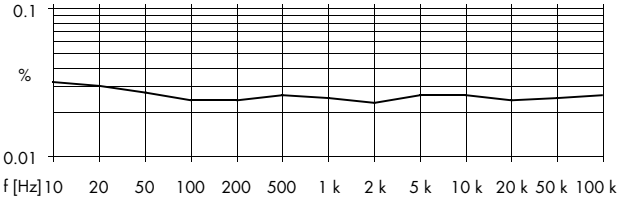
Phase modulation

Modes	internal, external AC
Maximum deviation for carrier frequency	
<65 MHz	200 rad
65 to 130 MHz	25 rad
130 to 260 MHz	50 rad
260 to 520 MHz	100 rad
520 to 1040 MHz	200 rad
1040 to 2080 MHz	400 rad
Resolution	<1%, min. 0.01 rad
Setting error at AF = 1 kHz	<5% of reading + 0.02 rad
FM distortion at AF = 1 kHz and half the maximum deviation	<0.5% (typ. 0.2%)
Modulation frequency response flatness	
20 Hz to 20 kHz	<3 dB (typ. 1 dB)
Modulation input	FM/φM EXT
Input impedance	100 kΩ; 600 Ω jumper-selected
Input voltage for selected deviation	1 V (peak) (for inaccuracy >3%: high/low indication)

Pulse modulation	**standard**	**option SMY-B40**
Mode	external	external
On/off ratio	>80 dB	>70 dB at 70 MHz, linearly decreasing to >65 dB at 520 MHz, >65 dB at 800 MHz, linearly decreasing to >35 dB at 2080 MHz
Rise/fall time (10/90%)	typ. 4 µs	<20 ns
Pulse delay	typ. 3.5 µs	<200 ns
Modulation input	BLANK	PULSE
Input impedance	10 kΩ	10 kΩ
Input level, standard	TTL/HC logic signal, polarity selectable	
Input level, option SMY-B40	TTL/HC logic signal, RF ON at high, RF ON at low jumper-selected	

Internal modulation generator

Frequency range	1 Hz to 500 kHz
Resolution	0.1 Hz
Display	7 digits, floating point
Frequency error	$<5 \times 10^{-5}$
Frequency response flatness	
up to 50 kHz	<0.2 dB
up to 100 kHz	<0.3 dB



Typical harmonic distortion of AF synthesizer as a function of frequency

THD (20 Hz to 100 kHz)	<0.1%
Output voltage	1 V (peak) ±1% (R_{out} <10 Ω, R_L >200 Ω)
Frequency setting time	<10 ms (after receiving last IEC/IEEE-bus character)

RF sweep	digital sweep in discrete steps
Mode	automatic, linear
Sweep range and step width	user-selected
Step duration	10 ms to 5 s
Resolution	1 ms

Memory	non-volatile, for 100 instrument setups

Remote control

System	IEC 625 (IEEE 488)
Connector	Amphenol, 24-contact
IEC/IEEE-bus address	0 to 30
Interface functions	SH1/AH1/T6/L4/SR1/RL1/PP0/DC1/DT0/C0

General data

Temperature range	
Guaranteed specs	0 to 55 °C; complying with IEC68-2-1 and IEC68-2-2
Storage temperature	–40 to +70 °C
Climatic conditions	
Humidity	95% relative humidity at +40 °C; complying with IEC68-2-3
Mechanical resistance	
Sinewave vibration	5 to 150 Hz, max. 2 g at 55 Hz, max. 0.5 g in range 55 to 150 Hz, complying with IEC68-2-6, IEC1010-1 and MIL-T-28800D, class 5
Electromagnetic compatibility	complying with EN50081-1 and EN50082-1 (EMC Directives of EU)
RF leakage	<0.1 µV (measured with a two-turn coil of 2.5 cm in diameter at a distance of 2.5 cm from any point of enclosure)
Radiated susceptibility	10 V/m
Power supply	100 V/230 V (AC) –10 to +15%, 120 V/220 V (AC) –12.5 to +10%, 47 to 440 Hz, max. 120 VA
Safety	complying with EN61010-1
Dimensions (W x H x D)	
SMY01	435 mm x 147 mm x 350 mm
SMY02	435 mm x 147 mm x 460 mm
Weight	12 kg (SMY01), 13 kg (SMY02)

Ordering information

Signal Generator	SMY01	1062.5502.11
	SMY02	1062.5502.12
Accessories supplied	power cord, operating manual	
Options		
Reference Oscillator OCXO	SMY-B1	1062.7505.02
Rear-Panel Connectors for RF and NF Pulse Modulator and	SMY-B10	1062.8001.02
High Output Power[5]	SMY-B40	1062.9008.02
Recommended extras		
19" Rack Adapter	ZZA-93	0396.4892.00
Service Kit	SMY-Z2	1062.7805.02
Service Manual		1062.5583.24

1) Valid for levels ≥–127 dBm (≥–121 dBm with option SMY-B40), not with special function »non-interrupting level setting«.
2) The modulation depth selectable within the guaranteed AM specifications linearly decreases for levels from 7 to 13 dBm (13 to 19 dBm with option SMY-B40). A status message appears if the modulation depth is too high.
3) Does not apply to special function »ALC – bandwidth, narrow«.
4) Valid after calibration for one hour and for temperature variations <5°C.
5) To be retrofitted by authorized service centers only.

Printed in Germany 1197 (Pe we)

PD 757.3805.21 · Printed on chlorine-free paper · Subject to change · Data without tolerances: typical values

ROHDE & SCHWARZ

ROHDE & SCHWARZ GmbH & Co. KG · Mühldorfstraße 15 · D-81671 München
P.O.B. 801469 · D-81614 München · Telephone +4989 4129-0 · Fax +4989 4129-3567 · Internet: http://www.rsd.de