Agilent
Signal Generator Selection Guide

Setting Higher Standards for Signal Generation

Anticipate ___*Accelerate* ___*Achieve*
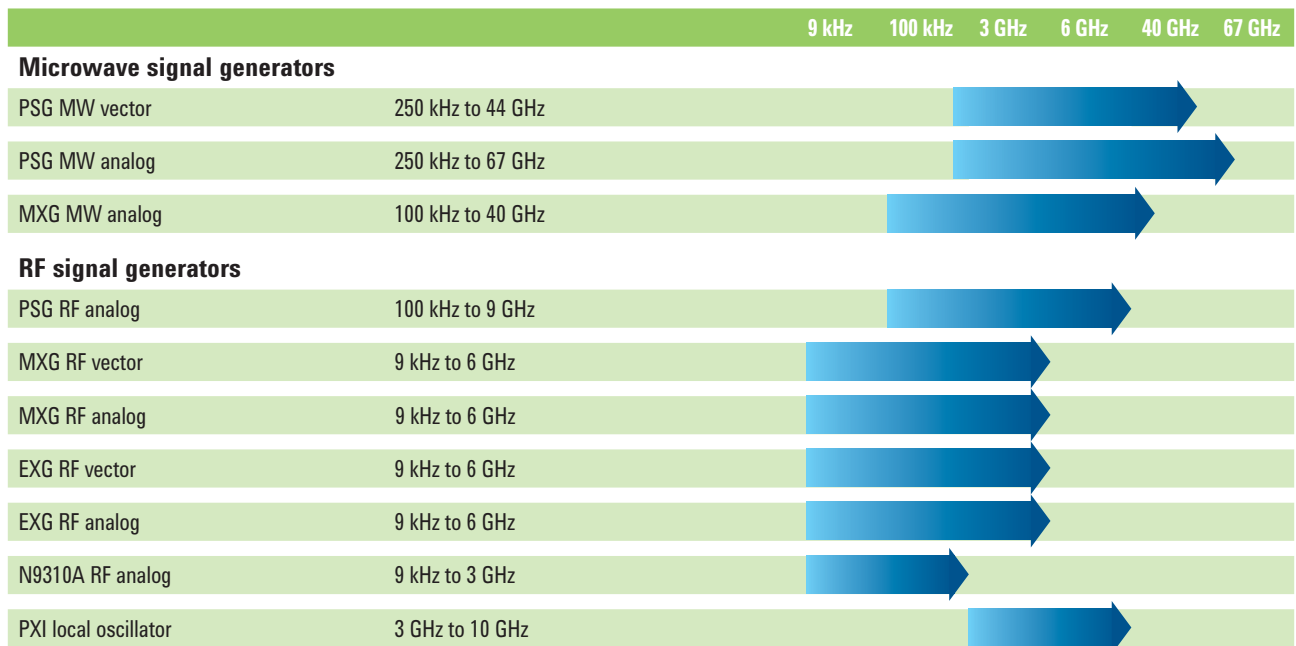
Agilent Technologies

Introduction

Agilent offers the widest selection of signal generators from baseband to 67 GHz, with frequency extensions to 500 GHz. From basic to advanced functionality, each signal generator delivers benchmark performance in its class to address the requirements in design and manufacture of radio transceivers and their components; and applications ranging from low-frequency navigation signals, through cellular mobile radio, to millimeter wave RADAR and satellite systems. Each offers synthesized frequency accuracy and stability, excellent calibrated level accuracy,

and remote programmability. Modulation capabilities vary from general-purpose AM, FM and digital I/Q to standard-specific formats such as GSM, W-CDMA, HSPA, LTE, GPS, and wireless LAN.

This selection guide provides an overview and side-by-side comparisons to help you determine which signal generator is right for you. It is intended to supplement online selection tools available at **www.agilent.com/find/siggen.**

Frequency coverage for Agilent signal generators

		9 kHz	100 kHz	3 GHz	6 GHz	40 GHz	67 GHz
Microwave signal generators							
PSG MW vector	250 kHz to 44 GHz						
PSG MW analog	250 kHz to 67 GHz						
MXG MW analog	100 kHz to 40 GHz						
RF signal generators							
PSG RF analog	100 kHz to 9 GHz						
MXG RF vector	9 kHz to 6 GHz						
MXG RF analog	9 kHz to 6 GHz						
EXG RF vector	9 kHz to 6 GHz						
EXG RF analog	9 kHz to 6 GHz						
N9310A RF analog	9 kHz to 3 GHz						
PXI local oscillator	3 GHz to 10 GHz						

Product Categories

Vector signal generators

Vector signal generators or digital signal generators have a built-in I/Q modulator to upconvert complex modulation formats such as QPSK and 64QAM. When combined with an IQ baseband generator, virtually any signal can be emulated and transmitted within the information bandwidth supported by the system.

Analog signal generators

Analog signal generators supply sinusoidal signals with optional capability to add AM, FM, ΦM and pulse modulation. The maximum frequency range for analog signal generators span from RF to microwave. Most generators feature step/list sweep modes for passive device characterization or calibration.

Baseband generator

Baseband generators (BBG) output complex I/Q signals such as QPSK, and can have several modes of operation:

- Waveform playback mode to play repetitive signals for component testing

- Real-time mode to transmit non-repeating/dynamic signals for receiver test

- Digital IQ input or output mode to stimulate FPGAs, DACs or ADCs

Channel emulator

Channel emulators are used to simulate the medium through which RF waves propagate. They can replicate multi-path and multi-channel fading for SISO or MIMO transceivers typically used to test the sensitivity, throughput or function of devices under test.

Signal creation software

Signal creation software products enable the generation of a wide range of application-specific test signals using vector signal generators. They can easily create signals to evaluate the performance of radio designs and the components that comprise them under various parametric and functional test conditions at baseband, RF and microwave frequencies. Agilent's Signal Studio software runs on a PC and embedded software runs directly on the signal generator.

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Modular products

Modular and software-defined building blocks provide flexible system configurations to meet diverse test needs. The PXI open-standard has seen rapid adoption in measurement and test automation applications, where compact form factor and modular channel expandability are required. PXI is used in many target applications in aerospace, military, automotive, digital, and wireless industries and domains.

Key Specifications Comparison – Vector Signal Generators

Specifications	PSG MW	MXG RF	EXG RF
Model number	E8267D	N5182B	N5172B
Frequency range (min. to max.)	100 kHz to 44 GHz	9 kHz to 6 GHz	9 kHz to 6 GHz
Frequency switching (list mode)	9 ms	800 µs	800 µs
Sweep mode	Step, list, ramp	Step, list	Step, list
Output power (minimum)	–130 dBm	–144 dBm	–144 dBm
Output power (maximum; at 1 GHz)	+22 dBm (at 20 GHz)	+27 dBm	+27 dBm
Harmonics (1 GHz)	–55 dBc	–35 dBc	–35 dBc
Non-harmonics (at 1 GHz)	–80 dBc	–96 dBc	–72 dBc
SSB phase noise (at 1 GHz; 20 kHz offset)	–143 dBc/Hz (at 10 kHz offset)	–146 dBc/Hz	–122 dBc/Hz
AM rate	DC to 100 kHz	DC to 50 kHz	DC to 50 kHz
FM deviation (maximum, at 1 GHz)	2 MHz	4 MHz	10 MHz
PM phase deviation (maximum, at 1 GHz)	20 rads	2 rads	5 rads
Narrow pulse width	20 ns	20 ns	20 ns
RF I/Q modulation bandwidth	Up to 2 GHz	Up to 300 MHz	Up to 300 MHz
Baseband generator bandwidth	80 MHz	160 MHz	120 MHz
Baseband generator mode	Waveform playback and real-time	Waveform playback and real-time	Waveform playback and real-time
Waveform playback memory	64 Msa	1024 Msa	512 Msa

Key Specifications Comparison – Analog Signal Generators

Specifications	PSG MW	MXG MW	PSG RF	MXG RF	EXG RF	RF	PXI local oscillator
Model number	E8257D	N5183A	E8663D	N5181B	N5171B	N9310A	M9302A
Frequency range (min. to max.)	100 kHz to 70 GHz	100 kHz to 40 GHz	100 kHz to 9 GHz	9 kHz to 6 GHz	9 kHz to 6 GHz	9 kHz to 3 GHz	3 GHz to 10 GHz
Frequency switching (list mode)	9 ms	600 μs	9 ms	800 μs	800 μs	10 ms	500 μs
Sweep mode	list, step, ramp	list, step	list, step, ramp	list, step	list, step	list, step	NA
Output power (minimun)	–135 dBm	–90 dBm	–135 dBm	–144 dBm	–144 dBm	–127 dBm	NA
Output power (at 1 GHz)	+26 dBm (at 20 GHz)	+19 dBm (at 20 GHz)	+23 dBm	+24 dBm	+21 dBm	+13 dBm	+16 dBm
Harmonics (at 1 GHz)	–55 dBc	–30 dBc	–55 dBc	–35 dBc	–35 dBc	–30 dBc	–20 dBc
Non-harmonics (at 1 GHz)	–88 dBc	–70 dBc	–88 dBc	–96 dBc	–72 dBc	–50 dBc	–70 dBc
SSB phase noise (1 GHz, 20 kHz offset)	–143 dBc/Hz	–116 dBc/Hz	–143 dBc/Hz	–146 dBc/Hz	–122 dBc/Hz	–95 dBc/Hz	–115 dBc/Hz (10 GHz, 10 kHz offset)
AM rate	DC to 100 kHz	DC to 10 kHz	DC to 100 kHz	DC to 50 kHz	DC to 50 kHz	20 Hz to 20 kHz	NA
FM deviation (max, at 1 GHz)	2 MHz	10 MHz	2 MHz	4 MHz	10 MHz	100 kHz	NA
PM phase deviation (max, at 1 GHz)	20 rad	5 rad	20 rad	2 rad	5 rad	10 rad	NA
Narrow pulse width	20 ns	20 ns	20 ns	20 ns	20 ns	100 μs	NA

Applications, Core Capabilities and Software Comparison

Applications and signal creation software	PSG MW vector	PSG MW analog	MXG MW analog	MXG and EXG RF vector	MXG and EXG RF analog	PSG RF analog	N9310 RF analog	PXB
Models	E8267D	E8257D	N5183A	N5182B and N5172B	N5181B and N5171B	E8663D	N9310A	N5106A
General purpose								
USB power meter			●	●	●			
Step/list sweep	●	●	●	●	●	●	●	●
Ramp sweep	●	●				●		
AM, FM, PM, pulse	●	●	●	●	●	●	●	
LF function generator	●	●		●	●	●	●	
Real-time custom modulation (PSK, QAM, FSK)	●			●				
Phase noise impairments (Opt 431)				●				
Multitone, NPR	●			●				
Noise (AWGN)	●			●				●
SystemVue, MATLAB	●			●				●
Fading								
Real-time fading								●
Cellular communications								
LTE & LTE-Advanced FDD/TDD, W-CDMA/HSPA+, cdma2000®, 1xEVDO, GSM/EDGE/Evo, TD-SCDMA	●			●				●
Real-time: LTE FDD/TDD, W-CDMA/HSPA+, cdma2000, GSM/EDGE				●				●
Wireless networking								
WLAN, Mobile WiMAX™	●			●				●
Fixed WiMAX, *Bluetooth*®	●			●				
UWB	●							
Audio/video broadcast								
ATSC /CMMB/ DTMB (CTTB), DVB-T/H/T2/C/S/S2, ISDB-T/ J.83 Annex A/B/C, DOCSIS DS	●			●				●
Real-time: DVB-T/H/T2/S/S2/C, J.83 Annex A/C, ISDB-T				●				●
T-DMB, DAB/DAB+/DMB-audio, FM stereo with RDS/RBDS				●				●
Detection, positioning, tracking, & navigation								
Pulse building	●							
Pulse Train			●	●	●			
GPS	●			●				●
GLONASS				●				●

Signal Studio Software

Simplify signal creation

Whether you are working on a single radio format or integrating multiple formats into a single device, easy access to the right test signals streamlines validation and helps ensure interoperability. Accelerate your work with Agilent Signal Studio software, a flexible suite of signal-creation tools that reduces the time you spend on signal simulation. Its performance-optimized reference signals, validated by Agilent, enhance the characterization and verification of your devices. Connect your vector source to Signal Studio – and simplify signal creation.

Configure Signal Studio to match your requirements

- Choose basic or advanced levels of capability with scalable option structure

- Select the license type that fits your specific use case and budget, including fixed, transportable, and 5- or 50-pack waveforms

- Connect to a wide range of Agilent instruments

- Runs on a PC

Leverage and customize built-in signals with flexible signal generation, additive impairments, graphs, convenient connectivity and automation, and embedded and online documentation. Control your vector signal generator directly from the software GUI and/or from the instrument front panel.

Signal Studio applications

General purpose
Jitter injection
Multitone, NPR
Waveform download utility

Cellular communications
LTE & LTE-Advanced FDD/TDD,
W-CDMA/HSPA+, cdma2000, 1xEVDO,
GSM/EDGE/Evo, TD-SCDMA

Wireless connectivity
802.11 WLAN
802.16 WiMAX
Bluetooth
UWB

Audio/video broadcasting
ATSC, CMMB, DTMB, DVB, S-DMB, T-DMB
ISDB-T, J.83 Annex A/B/C
DAB, DAB+, DMB
DOCSIS
FM Stereo, RDS/RBDS

Detection, positioning, tracking, and navigation
Pulse building
GPS, GLONASS, Radar

www.agilent.com/find/SignalStudio

Free Trial License
Free 14-day trials of Signal Studio software are available to evaluate the user interface and generate signals. Redeem a trial license online at
www.agilent.com/find/SignalStudio_trial

PSG Signal Generators

PSG microwave signal generators
E8267D vector and E8257D analog

Featuring the world's first integrated vector signal generator up to 44 GHz, first analog signal generator up to 67 GHz (operational to 70 GHz), and first microwave analog signal generator to break the one watt output power barrier, the PSG continues to accelerate innovation for your RF and microwave test applications in the aerospace, defense, and communications industries. When performing functional and parametric tests on advanced RF and microwave radio systems, analyzing the components that comprise them, or simply substituting a continuous-wave (CW) signal for a local oscillator, the PSG delivers high quality test signals with the power and performance you demand.

www.agilent.com/find/E8267D
www.agilent.com/find/E8257D

Aerospace and defense
• Radar and electronic warfare
• Secure communications
• Satellite communications

Commercial communications
• Broadband wireless access
• Point-to-point/multipoint digital microwave radio
• Mobile communications

General purpose
• Component analysis
• LO and clock substitution
• Interference generation

Key specifications	E8267D MW vector	E8257D MW analog
Frequency range (min. to max.)	100 kHz to 44 GHz	100 kHz to 70 GHz
Frequency switching	9 ms	9 ms
Output power (at 20 GHz)	+22 dBm	+26 dBm
Level accuracy	± 0.6 dB	± 0.6 dB
SSB phase noise (1 GHz; 10 kHz offset)	−143 dBc/Hz	−143 dBc/Hz
Harmonics	−55 dBc	−55 dBc
RF modulation bandwidth	Up to 2 GHz	N/A
Baseband generator mode	Waveform playback and real-time mode	N/A
Waveform playback memory	64 Msa	N/A

PSG RF signal generator
E8663D analog

The E8663D PSG RF analog signal generator provides the industry's lowest phase noise in a commercially-available signal generator. With optional analog modulation (AM, FM, ØM and pulse) capability, superior level accuracy and high output power, the E8663D is the right choice for demanding applications such as radar system development, satellite communications evaluation, or when a very low noise local oscillator or reference signal is needed. Built on the outstanding legacy of the 8663A, the E8663D delivers improved performance and is fully code compatible with its predecessor for seamless upgrades to existing test systems. Enhanced narrow pulse modulation and extended support life are optionally available.

Key specifications	
Frequency range (min. to max.)	100 kHz to 9 GHz
Frequency switching	9 ms
Output power	+23 dBm
Level accuracy	± 0.6 dB
SSB phase noise (1 GHz; 10 kHz offset)	–143 dBc/Hz
Harmonics	–55 dBc

www.agilent.com/find/E8663D

E8257DSxx series mm-wave source modules for PSG signal generators

The E8257DSxx series (available from OML, Inc. as the SxxMS-AG series) of external, high power, frequency banded mm-wave source modules, when paired with the high performance PSG, provide synthesized frequency performance, mm-wave test signals for waveguide bands from 50 to 500 GHz.

www.agilent.com/find/mmw_source_modules

X-Series Signal Generators

Generate true performance

To know your device's behavior, you'll take many paths. That's the idea behind Agilent's X-Series signal generators. They produce the signals you need – from simple to complex, from clean to impaired – to test your design within and beyond its limits. What's more, the X-Series is crafted to create signals capable of testing your very best devices. From the pure and precise MXG to the cost-effective EXG, the X-Series helps you generate true performance.

Unmatched performance

From 9 kHz to 6 GHz, the analog and vector MXG and EXG deliver unmatched performance in five key categories: phase noise and spectral purity, bandwidth, EVM, ACPR and output power. They also provide 1024 Msa of playback memory for vector signals.

www.agilent.com/find/X-Series_SG

Fast signal creation

To help you quickly create signals that meet the needs of specific standards and measurements, the MXG and EXG are compatible with Agilent Signal Studio software (real-time and waveform playback). Its suite of signal-creation tools addresses cellular communications, wireless connectivity, audio, video, positioning, tracking, and general-purpose applications.

Reduce cost of ownership

To reduce cost-of-ownership, the X-Series signal generators are designed for high reliability and fast, easy calibration, service and repair. Today's MXG and EXG leverage technology used in previous-generation MXG signal generators, which are among the most reliable signal sources in HP/Agilent history. The recommended three-year calibration cycle helps reduce maintenance costs and increase instrument availability.

Pure and precise MXGs

MXG analog   MXG vector

Cost-effective EXGs

EXG analog   EXG vector

X-Series Signal Generators

MXG RF signal generators
N5182B vector and N5181B analog

To help you reach better performance, the MXG X-Series vector and analog signal generators are fine-tuned to be your "golden transmitter" in R&D. Whether you're pushing for a linear RF chain or an optimized link budget, the MXG delivers what you need: phase noise, ACPR, channel coding, and much more. Reveal the true performance of your devices and test your designs within and beyond their limits with the MXG.

- Test radar receiver sensitivity or characterize ADC with industry-leading phase noise

- Characterize nonlinear PA behavior with industry-leading ACPR and output power

- Test 802.11ac with < 0.4% EVM, or characterize multi-carrier PAs with < ± 0.2 dB flatness across 160 MHz bandwidth

- Go beyond standard application requirements with sophisticated real-time and waveform-based Signal Studio software

www.agilent.com/find/N5182B
www.agilent.com/find/N5181B

EXG RF signal generators
N5172B vector and N5171B analog

To help you achieve faster throughput and greater uptime, the cost-effective EXG X-Series signal generators are optimized for manufacturing test. With analog and vector models, the EXG provides the signals you'll need for basic parameter testing of components and functional verification of receivers. Get "just enough" test at the right price with the EXG.

- Maximize test margins on the production line with industry-leading ACPR

- Maximize throughput with < 800 µs simultaneous switching of frequency, power and waveform type

- Enable rapid, accurate tests using Signal Studio's pre-defined, standards-based waveforms

- Shrink your test stand with two rack-unit height and integrated multi-function generator and USB power sensor interface

www.agilent.com/find/N5172B
www.agilent.com/find/N5171B

Key specifications	MXG RF vector N5182B	MXG RF analog N5181B	EXG RF vector N5172B	EXG RF analog N5171B
Frequency range (min. to max.)	9 kHz to 6 GHz	9 kHz to 6 GHz	9 kHz to 6 GHz	9 kHz to 6 GHz
Frequency switching	800 µs	800 µs	800 µs	800 µs
Output power	+24 dBm	+24 dBm	+21 dBm	+21 dBm
Level accuracy	± 0.6 dB	± 0.6 dB	± 0.6 dB	± 0.6 dB
SSB phase noise (1 GHz; 20 kHz offset)	−146 dBc/Hz	−146 dBc/Hz	−122 dBc/Hz	−122 dBc/Hz
Harmonics	−35 dBc	−35 dBc	−35 dBc	−35 dBc
EVM (LTE or 802.11ac)	0.4%	N/A	0.4%	N/A
ACPR (3GPP W-CDMA TM1 64 DPCH)	−73 dBc	N/A	−73 dBc	N/A
Waveform playback memory	1024 Msa	N/A	512 Msa	N/A

Analog Signal Generators

MXG microwave signal generator
N5183A analog

MXG microwave analog signal generators deliver the performance needed for broadband component manufacturing up to 40 GHz. It provides ≤ 600 µs frequency switching to improve test times for applications like antenna test and manufacturing, with a small size (2RU) to better utilize rack space. Excellent power and level accuracy make the MXG microwave a reliable stimulus for driving high power devices. The MXG microwave signal generator can be configured to meet your test needs today, from LO substitution and CW interferer to analog modulation for device characterization, and is easily upgraded to meet your needs in the future.

- Excellent output power

- Fast frequency switching

- High reliability and easy maintenance

RF signal generator
N9310A analog

The N9310A is a general-purpose RF signal generator covering a frequency range from 9 kHz to 3 GHz. With a low price, reliable performance, and multiple built-in functions, it's well-suited for manufacturing, education, and service maintenance.

Even the simplest of today's electronic products with RF content demand adequate and proper design verification. While you may occasionally need a full-function and high-performance signal generator, many times you only need a simple continuous wave (CW) source. For this application, the N9310A RF signal generator is ideal. Trimming your manufacturing costs without compromising product quality is essential. When you need the solution that provides just enough functionality at the lowest price select the N9310A RF signal generator.

- Optimized for low-cost consumer electronics manufacturing test, education and service and repair

- Optional I/Q modulator 40 MHz bandwidth (ext. I/Q inputs only)

- USB interface, with flash memory support

Key specifications	
Frequency range (min. to max.)	100 kHz to 40 GHz
Frequency switching	600 µs
Output power (at 20 GHz)	+19 dBm
Level accuracy	± 0.6 dB
SSB phase noise (1 GHz; 20 kHz offset)	–116 dBc/Hz
Harmonics	–30 dBc

www.agilent.com/find/N5183A

Key specifications	
Frequency range (min. to max.)	9 kHz to 3 GHz
Frequency switching	10 ms
Output power	+13 dBm
Level accuracy	± 1.0 dB
SSB phase noise (1 GHz; 20 kHz offset)	–95 dBc/Hz
Harmonics	–30 dBc

www.agilent.com/find/N9310A

Baseband Generator and Interface Module

PXB baseband generator and channel emulator N5106A

The PXB lets you customize test cases and validate designs under real-world conditions with the broadest range of test parameters. Create fully-parameterized signals for established and evolving standards with Agilent Signal Studio. In addition, the PXB lets you model the signal-propagation environment with fully-parameterized, real-time channel emulation (fading). With the largest play-back memory available, you can run longer test sequences to better approximate real-world signals. You can also capture signals up to 512 Msa from your own device for post processing.

- Up to 160 MHz modulation and signal capture bandwidth
- 512 Msa playback and signal capture memory per channel
- Up to six BBGs and 16 faders for interference, diversity and MIMO test

www.agilent.com/find/N5106A

Digital signal interface module N5102A

The N5102A digital signal interface module provides fast and flexible digital inputs and outputs for the E8267D PSG vector signal generator and N5106A PXB baseband generator and channel emulator. In output mode, you can deliver realistic complex-modulated signals such as LTE, HSPA, W-CDMA, GPS, WLAN, digital video, custom pulses and many others directly to your digital devices and subsystems. In the input mode, the interface module ports your digital input to the signal generator's baseband system, providing a quick and easy way of upconverting to calibrated analog IF, RF or µW frequencies.

In both operating modes, the interface module adapts to your device with the logic type, data format, clock features, and signaling you require. With its three-meter extension cable and a selection of connector types, the interface module connects easily to your device, in most cases eliminating the need for custom fixtures.

- Up to 400 MHz in serial mode, 100 MHz in parallel mode
- Provision for internal, external, or device clocking
- Independent data input and output rates; adjustable clock phase and skew

www.agilent.com/find/N5102A

Modular Products

PXI local oscillator
M9302A

The M9302A PXI local oscillator (LO) is optimized for fast settling time to allow for fast frequency down conversion in aerospace and defense applications, such as radar and wideband signal capture, and in wireless communications applications. The M9302A is a two-slot 3U PXI VCO-based 3 GHz to 10 GHz LO. The fast switching time and low phase noise of this LO make it an ideal component of a microwave vector signal analyzer. When integrated in the Agilent M9392A PXI vector signal analyzer, then combined with 89600 VSA software, the M9302A provides a complete signal analyzer solution enabling analysis of communications, radar and avionics signals to 26.5 GHz in a modular open-system standard.
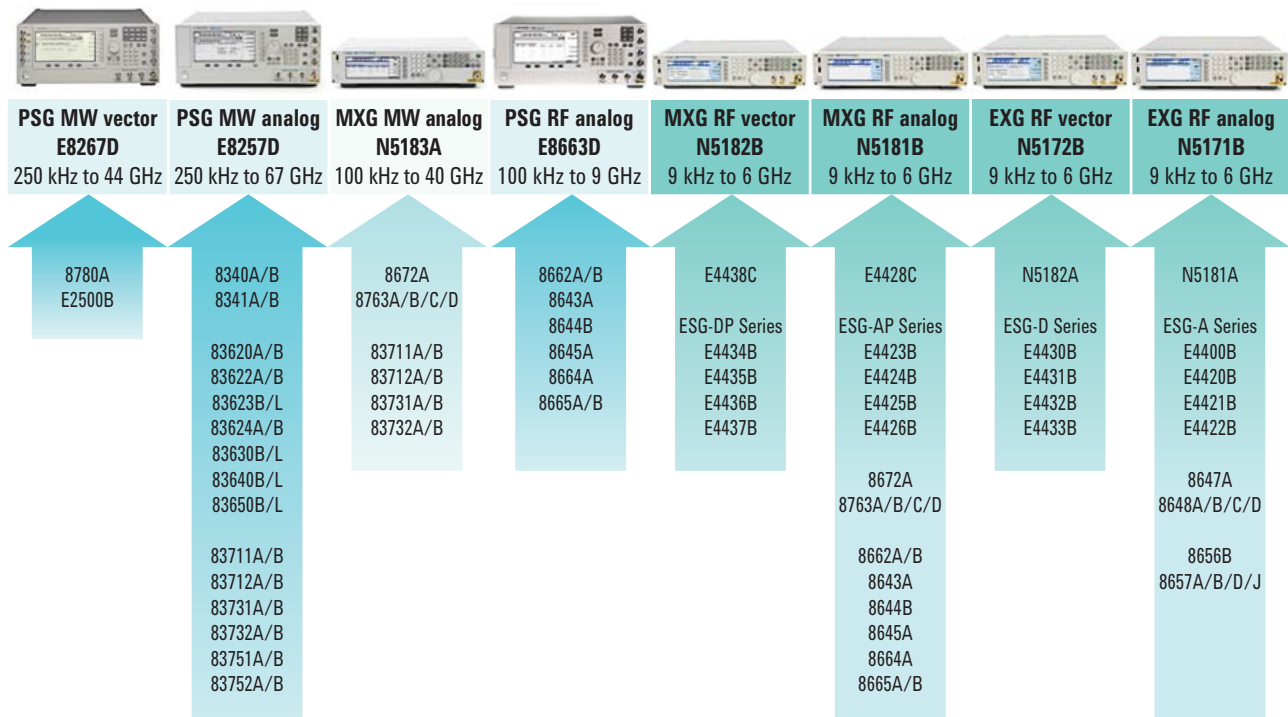
- ± 0.5 ppm frequency temperature stability (0 to 50 °C)
- 0.1 Hz tuning resolution
- PXI 2-slot 3U

Key specifications	
Frequency range (min. to max.)	3 GHz to 10 GHz
Frequency switching	1 ms
Output power	+16 dBm
Level accuracy	± 2 dB
SSB phase noise (10 GHz; 10 kHz offset)	–115 dBc/Hz
Harmonics	–20 dBc

www.agilent.com/find/M9302A

Migrating from Legacy Signal Generators

Carefully planned instrument migration and modernization can maximize your test-system efficiency, performance, and readiness, while minimizing risk and potential disruptions, keeping you at the leading edge in the competitive marketplace. The Agilent PSG and X-Series signal generators were designed as evolutionary replacements to their in-class predecessors. Take advantage of their performance, flexibility, speed and modern connectivity in replacing legacy Agilent signal generators.

PSG MW vector E8267D 250 kHz to 44 GHz	PSG MW analog E8257D 250 kHz to 67 GHz	MXG MW analog N5183A 100 kHz to 40 GHz	PSG RF analog E8663D 100 kHz to 9 GHz	MXG RF vector N5182B 9 kHz to 6 GHz	MXG RF analog N5181B 9 kHz to 6 GHz	EXG RF vector N5172B 9 kHz to 6 GHz	EXG RF analog N5171B 9 kHz to 6 GHz
8780A	8340A/B	8672A	8662A/B	E4438C	E4428C	N5182A	N5181A
E2500B	8341A/B	8763A/B/C/D	8643A				
			8644B	ESG-DP Series	ESG-AP Series	ESG-D Series	ESG-A Series
	83620A/B	83711A/B	8645A	E4434B	E4423B	E4430B	E4400B
	83622A/B	83712A/B	8664A	E4435B	E4424B	E4431B	E4420B
	83623B/L	83731A/B	8665A/B	E4436B	E4425B	E4432B	E4421B
	83624A/B	83732A/B		E4437B	E4426B	E4433B	E4422B
	83630B/L						
	83640B/L				8672A		8647A
	83650B/L				8763A/B/C/D		8648A/B/C/D
	83711A/B				8662A/B		8656B
	83712A/B				8643A		8657A/B/D/J
	83731A/B				8644B		
	83732A/B				8645A		
	83751A/B				8664A		
	83752A/B				8665A/B		

Move Up to the X-Series Signal Generators

Test your designs within and beyond their limits with the MXG.

www.agilent.com/find/ESG2MXG

Optimize manufacturing test with the cost-effective EXG.

www.agilent.com/find/MXG2EXG
www.agilent.com/find/8648toEXG

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Agilent
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Agilent Advantage Services is committed to your success throughout your equipment's lifetime. To keep you competitive, we continually invest in tools and processes that speed up calibration and repair and reduce your cost of ownership. You can also use Infoline Web Services to manage equipment and services more effectively. By sharing our measurement and service expertise, we help you create the products that change our world.

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Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
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Denmark	45 45 80 12 15
Finland	358 (0) 10 855 2100
France	0825 010 700*
	*0.125 €/minute
Germany	49 (0) 7031 464 6333
Ireland	1890 924 204
Israel	972-3-9288-504/544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
United Kingdom	44 (0) 118 927 6201

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