Migrate to the new Agilent MXG X-Series signal generator and generate true performance

The new EXG offers more capability than the first-generation MXG, including reduced spurious levels, robust reverse power protection, and low frequency coverage to 9 kHz. Enjoy sub-millisecond frequency and amplitude switching speeds with this compact, 3.5 inch (89 mm) tall unit. For more information, visit **www.agilent.com/find/X-Series_SG**

Agilent N5181A MXG and N5161A MXG ATE Analog Signal Generators

Data Sheet

Optimized for performance and speed

- Fast switching speeds
- Simplified self-maintenance
- High output power

Agilent Technologies

Table of Contents

Definitions . . . 3
Frequency . . . 4
Amplitude . . . 6
Spectral Purity . . . 11
Analog Modulation . . . 13
- Frequency modulation . . . 13
- Phase modulation . . . 13
- Amplitude modulation . . . 13
- Internal analog modulation source . . . 14
- Pulse modulation . . . 14
- Narrow pulse modulation . . . 14
- Internal pulse generator (included with Option UNU or Option UNW) . . . 15
- Pulse train (Option 320) . . . 15
- External modulation inputs . . . 15
- Simultaneous modulation . . . 15

General Characteristics . . . 16
Ordering Information . . . 18
Archive Section . . . 19
Spectral Purity . . . 21
Related Literature . . . 22
- Application literature . . . 22
- Product literature . . . 22

Definitions

Specification (spec): Represents warranted performance of a calibrated instrument that has been stored for a minimum of 2 hours within the operating temperature range of 0 to 55 °C, unless otherwise stated, and after a 45 minute warm-up period. The specifications include measurement uncertainty. Data represented in this document are specifications unless otherwise noted. The specifications in this data sheet also apply to the N5181AEP MXG analog RF signal generator express configuration. For more information about the express MXG, see the technical overview 5990-7629EN.

Typical (typ): Represents characteristic performance, which 80% of the instruments manufactured will meet. This data is not warranted, does not include measurement uncertainty, and is valid only at room temperature (approximately 25 °C).

Nominal (nom): The expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ω connector. This data is not warranted and is measured at room temperature (approximately 25 °C).

Measured (meas): An attribute measured during the design phase for purposes of communicating expected performance, such as amplitude drift vs. time. This data is not warranted and is measured at room temperature (approximately 25 °C).

Note: All graphs contain measured data from several units at room temperature unless otherwise noted.

Frequency

Range

Option 501	100 kHz to 1 GHz
Option 503	100 kHz to 3 GHz
Option 506	100 kHz to 6 GHz

Minimum frequency 100 kHz [1]

Resolution 0.01 Hz

Phase offset Adjustable in nominal 0.01° increments

Frequency bands [2]

Band	*Frequency range*	*N*
1	100 kHz to < 250 MHz	1
2	250 to < 375 MHz	0.25
3	375 to < 750 MHz	0.5
4	750 to < 1500 MHz	1
5	1500 to < 3000.001 MHz	2
6	3000.001 to 6000 MHz	4

Switching speed [3, 4]

Type	*Standard*	*Option UNZ [5]*	*Option UNZ [5] (typical)*
SCPI mode	≤ 5 ms (typ)	≤ 1.15 ms	≤ 950 µs
List/Step sweep mode	≤ 5 ms (typ)	≤ 900 µs	≤ 700 µs

1. Performance below 250 kHz is unspecified except as indicated, for units with serial numbers ending with 4742xxxx or greater. For units with lower serial numbers refer to the Archive Section at end of this document.
2. N is a factor used to help define certain specifications within the document.
3. Time from receipt of SCPI command or trigger signal to within 0.1 ppm of final frequency or within 100 Hz, whichever is greater, and amplitude settled to within 0.2 dB.
4. Additional time may be required for the amplitude to settle within 0.2 dB when switching to or from frequencies < 500 kHz.
5. Specifications apply when status register updates are off.

Accuracy

± aging rate
± temperature effects
± line voltage effects

Internal time base reference oscillator aging rate

≤ ± 5 ppm/10 yrs, < ± 1 ppm/yr (nom) [1]

Temperature effects

± 1 ppm (0 to 55 °C) (nom)

Line voltage effects

± 0.1 ppm (nom); 5% to –10% (nom)

Reference output

Frequency	10 MHz
Amplitude	≥ +4 dBm (nom) into 50 Ω load

External reference input

Input frequency	*Standard*	*Option 1ER*
	10 MHz	1 to 50 MHz (in multiples of 0.1 Hz)
Lock range	± 1 ppm	
Amplitude	> –3.5 to 20 dBm (nom)	
Impedance	50 Ω (nom)	
Waveform	Sine or square	

Digital sweep modes

Operating modes	Step sweep (equally or logarithmically spaced frequency steps) List sweep (arbitrary list of frequency steps) Can also simultaneously sweep amplitude. See amplitude section for more detail.
Sweep range	Within instrument frequency range
Dwell time	100 µs to 100 s
Number of points	2 to 65535 (step sweep) 1 to 3201 (list sweep)
Step change	Linear or logarithmic
Triggering	Free run, trigger key, external, timer, bus (GPIB, LAN, USB)

1. Aging rate is determined by design as a function of the TCXO and is not specified.

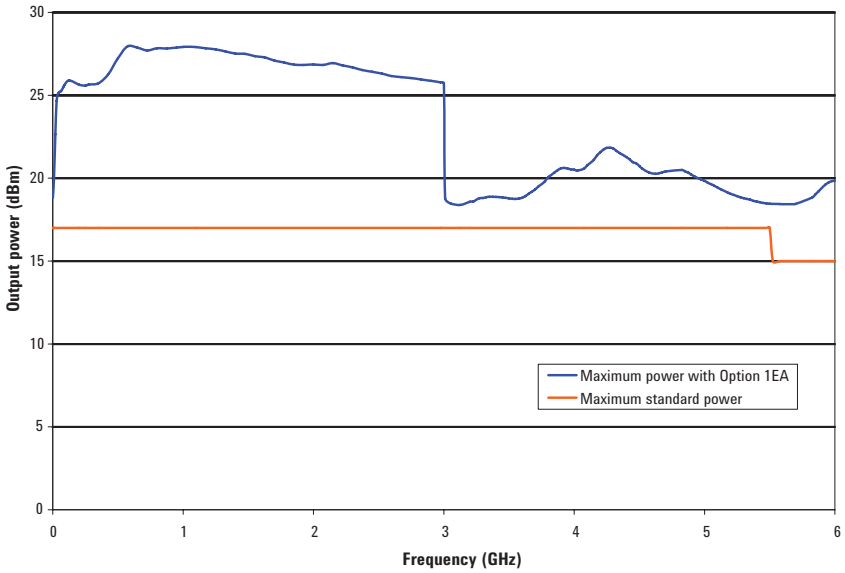
Amplitude

Output power [1]

Minimum output power	–110 dBm
with Option 1EQ [2]	–127 dBm

Maximum output power

Range	*Standard* [3]	*Option 1EA*
100 kHz to 250 kHz	+13 dBm	+15 dBm
> 250 kHz to 50 MHz	+13 dBm	+15 dBm
> 50 MHz to 3.0 GHz	+13 dBm	+23 dBm
> 3.0 GHz to 5.0 GHz	+13 dBm	+17 dBm
> 5.0 GHz	+11 dBm	+16 dBm



Resolution 0.01 dB (nom)

Step attenuator 0 to 130 dB in 5 dB steps, (110 dB without Option 1EQ) electronic type

Connector 50 Ω (nom)

SWR [4]

≤ 1.7 GHz	1.4:1 (typ)
> 1.7 to 3 GHz	1.55:1 (typ)
> 3 to 4 GHz	1.7:1 (typ)
> 4 to 6 GHz	1.6:1 (typ)

Maximum reverse power

Max DC voltage	50 VDC (nom)
100 kHz to 6 GHz	2 W (nom)

1. Quoted specifications between 20 and 30 °C. Maximum output power typically decreases by 0.04 dB/ °C for temperatures outside this range.
2. Settable to –144 dBm with option 1EQ, but unspecified below –127 dBm.
3. Specifications apply to units with serial numbers ending with 4818xxxx or greater. For units with lower serial numbers refer to the Archive Section at end of this document.
4. SWR values apply to units with serial numbers ending with 4818xxxx or greater. For units with lower serial numbers refer to the Archive Section at end of this document.

Switching speed [1, 2]

Type	*Standard*	*Option UNZ*	*Option UNZ (typical)*
SCPI mode	≤ 5 ms (typ)	≤ 750 µs	≤ 650 µs
List/Step sweep mode	≤ 5 ms (typ)	≤ 500 µs	≤ 400 µs

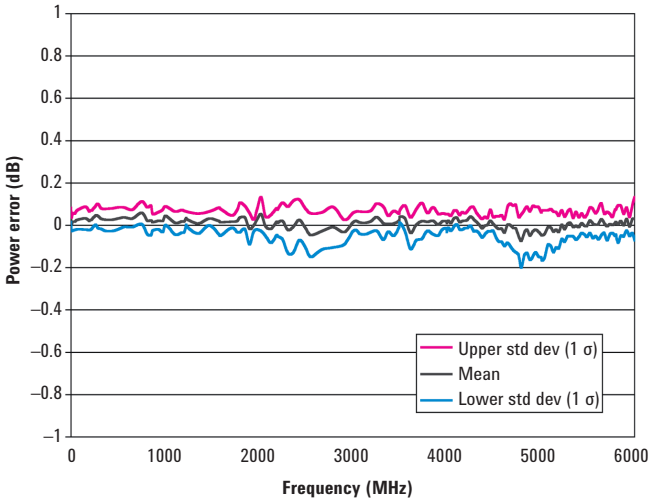
Absolute level accuracy [3] [ALC on]

	Standard		*Option 1EQ*
	+23 [4] to –60 dBm	< –60 to –110 dBm	< –110 to –127 dBm
100 kHz to 250 kHz [5]	±0.6 dB	±1.0 dB	—
> 250 kHz to 1 MHz	±0.6 dB	±0.7 dB	±1.7 dB
> 1 MHz to 1 GHz	±0.6 dB	±0.7 dB	±1.0 dB
> 1 to 3 GHz	±0.6 dB	±0.8 dB	±1.1 dB
> 3 to 4 GHz	±0.7 dB	±0.8 dB	±1.1 dB
> 4 to 6 GHz	±0.8 dB	±1.1 dB	±1.3 dB

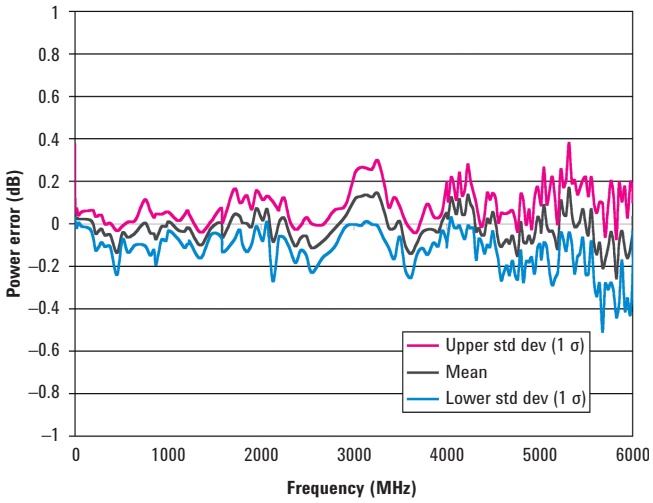
1. Time from receipt of SCPI command or trigger signal to amplitude settled within 0.2 dB. For units with serial numbers ending in 4742xxxx or less, switching speed is specified for power levels < +5 dBm.
2. Switching speed specifications apply when status register updates are off.
3. Quoted specifications between 20 °C and 30 °C. For temperatures outside this range, absolute level accuracy degrades by 0.005 dB/°C for frequencies ≤ 4.5 GHz and 0.01 dB/°C for frequencies > 4.5 GHz. Output power may drift up to .003 dB per g/Kg change in specific humidity (nom).
4. Or maximum specified output power, whichever is lower.
5. Specification applies to units with serial numbers ending with 4818xxxx or greater. For units with lower serial numbers refer to the Archive Section at end of this document.

Absolute level accuracy [ALC off, relative to ALC on] ±0.35 dB (typ)

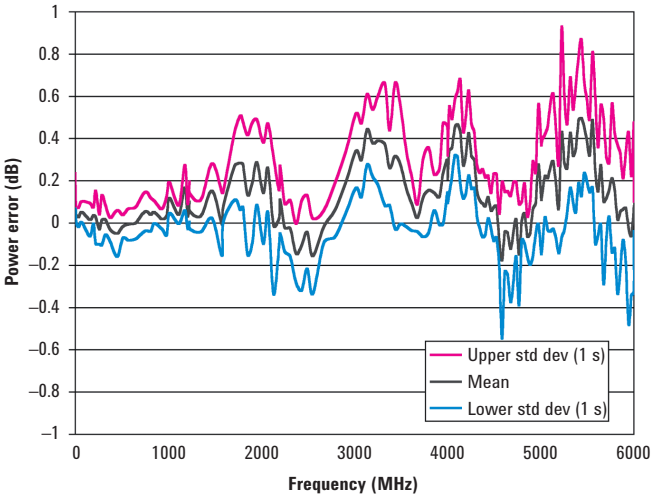
Level accuracy at –110 dBm

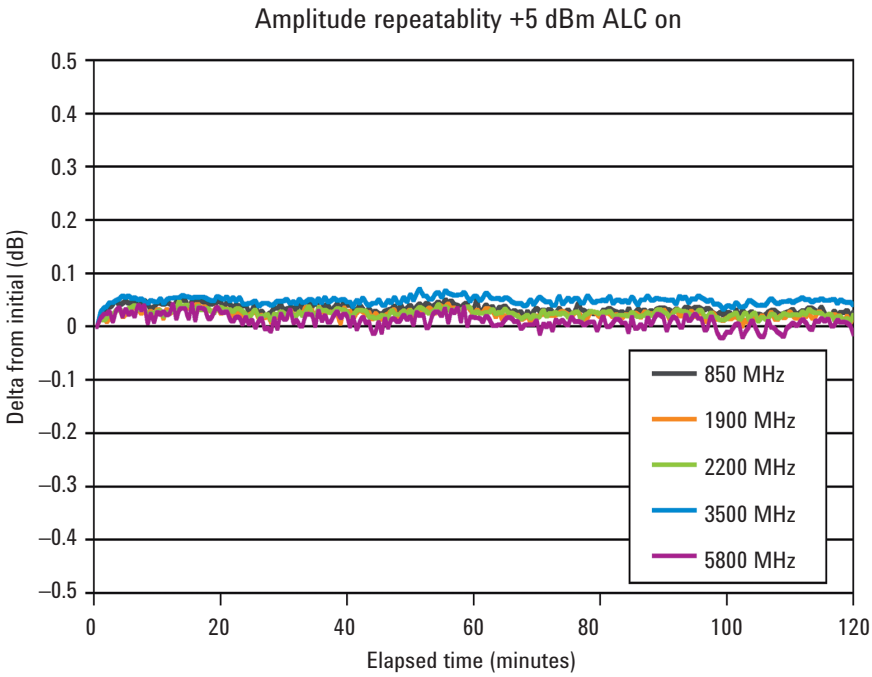


Level accuracy at –130 dBm

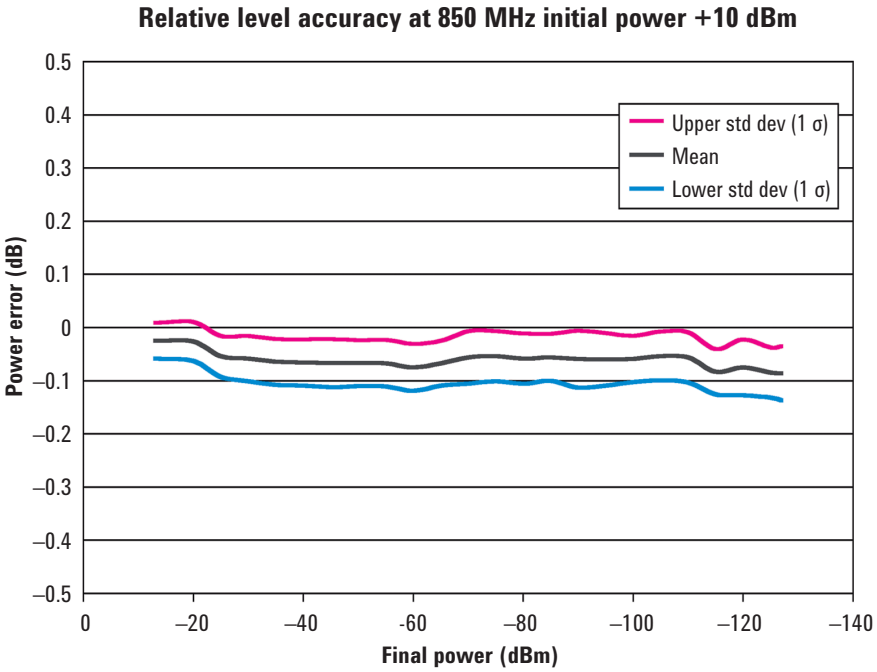


Level accuracy at –140 dBm



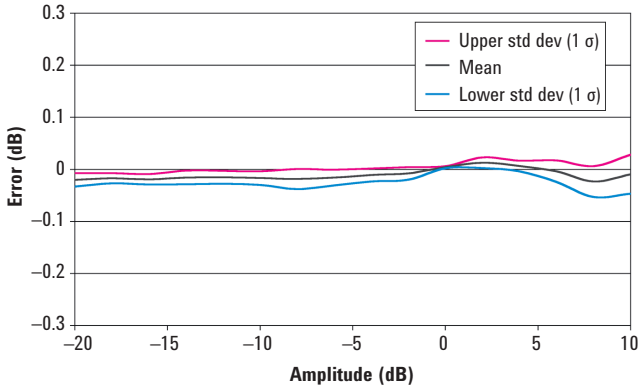


Repeatability measures the ability of the instrument to return to a given power setting after a random excursion to any other frequency and power setting. It should not be confused with absolute level accuracy.

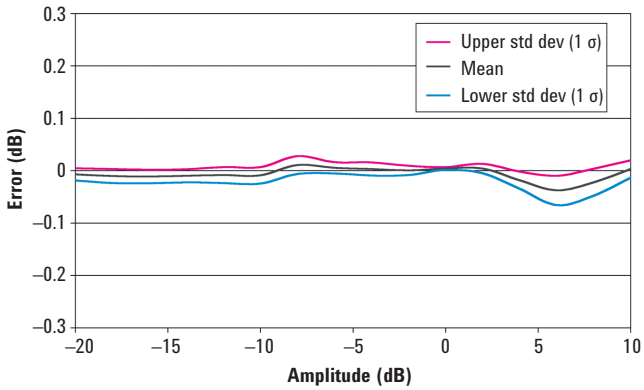


Relative level accuracy measures the accuracy of a step change from any power level to any other power level. This is useful for large changes (i.e. 5 dB steps).

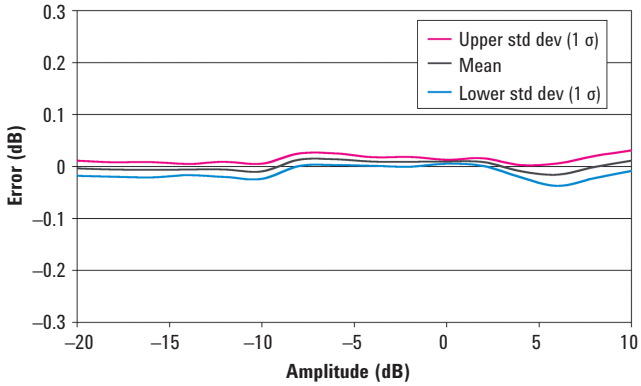
ALC linearity 850 MHz, CW, relative to 0 dBm



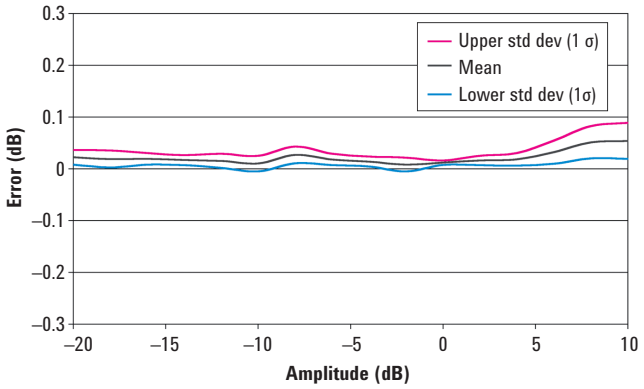
ALC linearity 1900 MHz, CW, relative to 0 dBm



ALC linearity 2200 MHz, CW, relative to 0 dBm

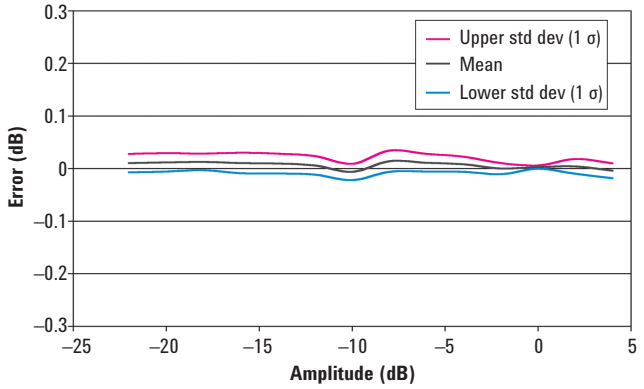


ALC linearity 3500 MHz, CW, relative to 0 dBm



Linearity measures the accuracy of small changes while the attenuator is held in a steady state. This is useful for fine resolution changes.

ALC linearity 5800 MHz, CW, relative to 0 dBm



User flatness correction

Number of points	3201
Number of tables	Dependent on available free memory in instrument; 10000 maximum
Entry modes	USB/LAN direct power meter control, LAN to GPIB and USB to GPIB, remote bus and manual USB/GPIB power meter control

Digital sweep modes

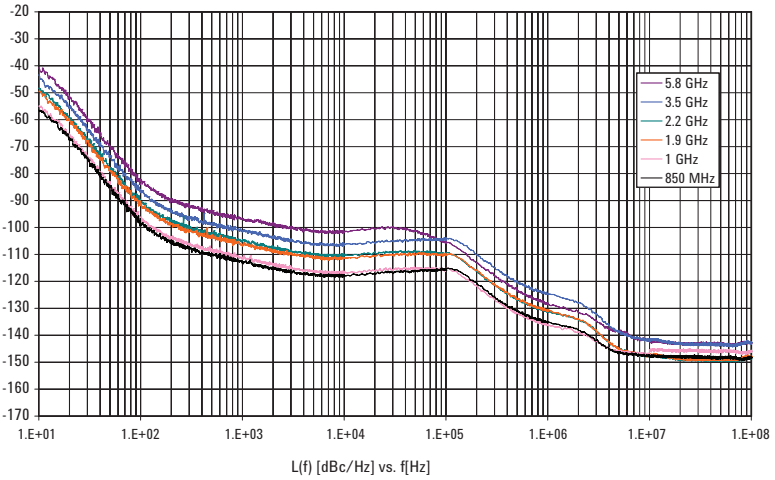
Operating modes	Step sweep (evenly spaced amplitude steps) List sweep (arbitrary list of amplitude steps) Can also simultaneously sweep frequency. See frequency section for more detail.
Sweep range	Within instrument amplitude range
Dwell time	100 µs to 100 s
Number of points	2 to 65535 (step sweep) 1 to 3201 (list sweep)
Step change	Linear
Triggering	Free run, trigger key, external, timer, bus (GPIB, LAN, USB)

Spectral Purity

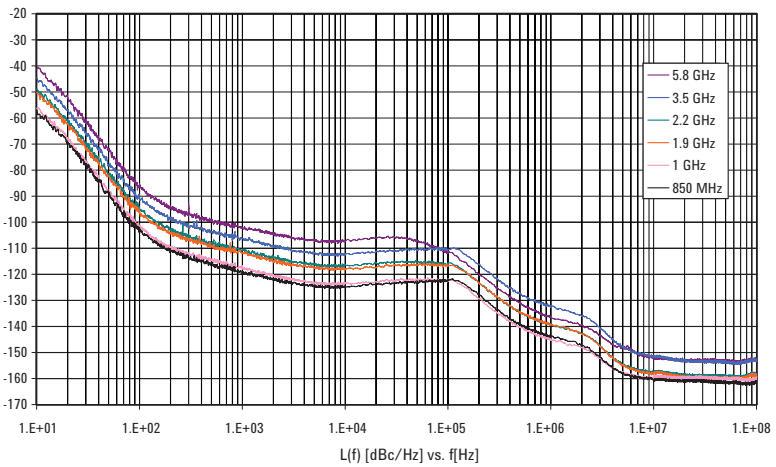
Single sideband phase noise [at 20 kHz offset]

500 MHz	≤ –126 dBc/Hz (typ)	3 GHz	≤ –110 dBc/Hz (typ)
1 GHz	≤ –121 dBc/Hz (typ)	4 GHz	≤ –109 dBc/Hz (typ)
2 GHz	≤ –115 dBc/Hz (typ)	6 GHz	≤ –104 dBc/Hz (typ)

Single sideband phase noise in CW mode

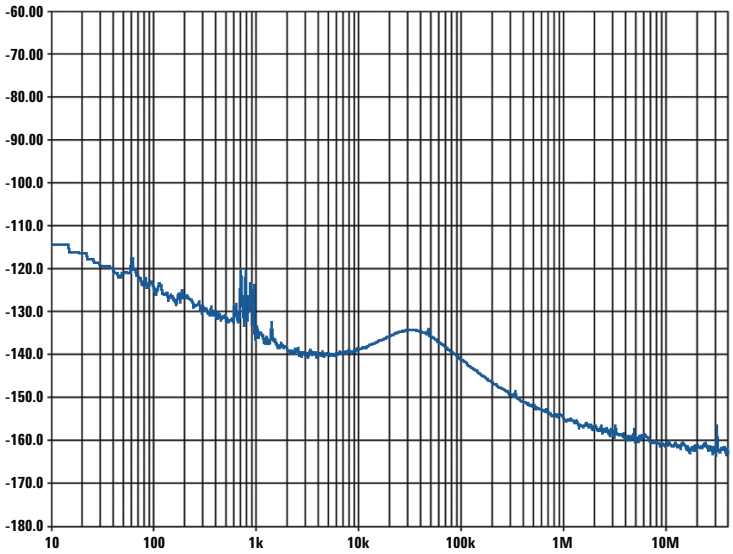


Single sideband phase noise optimized signal-to-noise floor mode[1]



1. Signal-to-noise optimized mode will improve broadband noise floor. In this mode, other specifications may not apply. Applies to instrument serial number prefix 4818xxxx or above.

AM noise at 1 GHz



Residual FM [CW mode, 300 Hz to 3 kHz BW, CCITT, rµs] < N x 2 Hz (typ)

Harmonics [1] [CW mode, output level]

Range	*(< +4 dBm)*	*1EA (< +12 dBm)*
250 kHz to 3 GHz	< –35 dBc	< –30 dBc
> 3 to 4 GHz	< –41 dBc (typ)	< –30 dBc (typ)
> 4 to 6 GHz	< –53 dBc (typ)	< –40 dBc (typ)

Nonharmonics [1] [CW mode]

	>10 kHz offset
250 kHz to 250 MHz	< –62 dBc, < –70 dBc (typ)
> 250 to 375 MHz	< –68 dBc, < –81 dBc (typ)
> 375 to 750 MHz	< –57 dBc, < –73 dBc (typ)
> 750 MHz to 3 GHz	< –54 dBc, < –62 dBc (typ)
> 3 to 6 GHz	< –47 dBc, < –56 dBc (typ)

Subharmonics [1] [CW mode]

250 kHz to 3.0 GHz	< –73 dBc
> 3.0 to 4.5 GHz	< –68 dBc
> 4.5 to 5.5 GHz	< –56 dBc
> 5.5 to 6 GHz	< –52 dBc

Jitter [2]

Carrier	SONET/SDH			
Frequency	*Data rate*	*rms jitter BW*	*µUI rms*	*Femtoseconds*
155 MHz	155 MB/s	100 Hz to 1.5 MHz	84	537
622 MHz	622 MB/s	1 kHz to 5 MHz	47	75
2.488 GHz	2488 MB/s	5 kHz to 20 MHz	178	72

1. Harmonics, subharmonics, and non-harmonics apply to instruments with serial numbers greater than 4818xxxx and are typical outside the frequency range of the instrument. Refer to the Archive Section at end of this document for specifications for units with lower serial numbers.
2. Calculated from phase noise performance in CW mode at +10 dBm. For other frequencies, data rates, or bandwidths, please consult your sales representative.

Analog Modulation

Frequency modulation [1]

(Option UNT)

Max deviation	N x 10 MHz (nom)	
Resolution	0.1% of deviation or 1 Hz, which ever is greater (nom)	
Deviation accuracy [1 kHz rate, deviation is N x 50 kHz]	< ±2% + 20 Hz	
Modulation frequency response [at 100 kHz deviation]		
	1 dB bandwidth	*3 dB bandwidth*
DC coupled	DC to 3 MHz (nom)	DC to 7 MHz (nom)
AC coupled	5 Hz to 3 MHz (nom)	5 Hz to 7 MHz (nom)
Carrier frequency accuracy relative to CW in DCFM	< ±0.2% of set deviation	+ (N x 1 Hz) [2] < ±0.06% of set deviation + (N x 1 Hz) (typ) [3]
Distortion [1 kHz rate, deviation is N x 50 kHz]		< 0.4%
Sensitivity when using external input		+1V peak for indicated deviation (nom)

Phase modulation [1]

(Option UNT)

Modulation deviation and frequency response:

	Max dev	*3 dB bandwidth*
Normal BW	N x 5 radians (nom)	DC to 1 MHz (nom)
High BW mode	N x 0.5 radians (nom)	DC to 4 MHz (nom)

Resolution	0.1% of deviation (nom)
Deviation accuracy [1 kHz rate, normal BW mode]	< +0.5% + 0.01 rad (typ)
Distortion [1 kHz rate, deviation normal BW mode]	< 0.2% (typ)
Sensitivity when using external input	+1V peak for indicated deviation (nom)

Amplitude modulation [4]

(Option UNT)

AM depth type	Linear or exponential
Depth	
Maximum	100%
Resolution	0.1% of depth (nom)
Depth accuracy [1 kHz rate]	< ±4% of setting +1% (typ)
Modulation rate [3 dB BW]	
DC coupled	0 to 10 kHz (typ)
AC coupled	5 Hz to 10 kHz (typ)
Distortion [1 kHz rate]	< 2% (typ)
Sensitivity when using external input	+1V peak for indicated depth (nom)

1. N is a factor used to define certain specifications in the document. Refer to page 4 for N values.
2. Specification valid for temperature changes of less than ± 5 °C since last DCFM calibration.
3. Typical performance immediately after a DCFM calibration.
4. AM is specified at carrier frequencies from 500 kHz to 3 GHz, power levels ≤ ±4 dBm, and with ALC on and envelope peaks within ALC operating range (–20 dBm to maximum specified power, excluding step-attenuator setting).

Internal analog modulation source

(Single sine wave generator for use with AM, FM, phase modulation. Requires Option UNT)

Waveform	Sine
Rate range	0.1 Hz to 2 MHz (tuneable to 3 MHz)
Resolution	0.1 Hz
Frequency accuracy	Same as RF reference source (nom)

Pulse modulation

(Option UNU) [1]

On/Off ratio	> 80 dB (typ)
Rise time	< 50 ns (typ)
Fall time	< 50 ns (typ)
Minimum width	
ALC on	≥ 2 µs
ALC off	≥ 500 ns
Resolution	20 ns (nom)
Pulse repetition frequency	
ALC on	DC to 500 kHz
ALC off	DC to 2 MHz
Level accuracy (relative to CW, ALC on or off)	< 1 dB (typ)
Video feedthrough	< 250 mV (typ) [2]
Pulse overshoot	< 15% (typ)
Pulse compression	5 ns (typ)
Pulse delay	
RF delay (video to RF output)	10 ns (nom)
Video delay (ext input to video)	30 ns (nom)
External input	
Input impedance	50 ohm (nom)
Level	+1 Vpeak = ON (nom)

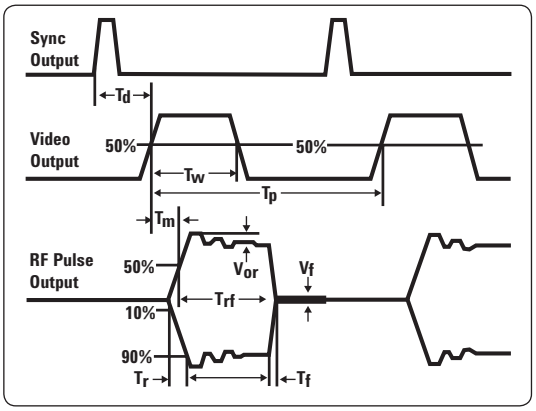
Narrow pulse modulation

(Option UNW) [1]

	500 MHz to 3.0 GHz	Above 3.0 GHz
On/Off ratio	> 80 dB (typ)	> 80 dB (typ)
Rise/Fall times (Tr, Tf)	< 10 ns; 7 ns (typ)	< 10 ns; 7 ns (typ)
Minimum pulse width		
Internally leveled	≥ 2 µs	≥ 2 µs
ALC off [3]	≥ 20 ns	≥ 20 ns
Repetition frequency		
Internally leveled	10 Hz to 500 kHz	10 Hz to 500 kHz
ALC off [3]	dc to 5 MHz	dc to 10 MHz
Level accuracy (relative to CW)		
Internally leveled	< ±1.0 dB	< ±1.0 dB
ALC off [3]	< ±1.0 dB (typ)	< ±1.0 dB (typ)
Width compression (RF width relative to video out)	< 5 ns (typ)	< 5 ns (typ)
Video feed-through [4]	< 50 mv (typ)	< 5 mv (typ)
Video delay (ext input to video)	20 ns (nom)	20 ns (nom)
RF delay (video to RF output)	10 ns (nom)	10 ns (nom)
Pulse overshoot	< 15% (typ)	< 15% (typ)
Input level	+1 Vpeak = RF On	+1 Vpeak = RF On
Input impedance	50 Ω (nom)	50 Ω (nom)

1. Pulse specifications apply to frequencies > 500 MHz. Operable down to 10 MHz.
2. Specification applies for power levels < 10 dBm.
3. With power search on.
4. Video feed through applies to power levels < +10 dBm.

Td Video delay (variable)
Tw Video pulse width (variable)
Tp Pulse period (variable)
Tm RF delay
Trf RF pulse width
Tf RF pulse fall time
Tr RF pulse rise time
Vor Pulse overshoot
Vf Video feedthrough



Internal pulse generator (included with Option UNU or Option UNW)

Modes	Free-run, square, triggered, adjustable doublet, trigger doublet, gated, and external pulse
Square wave rate	0.1 Hz to 10 MHz, 0.1 Hz resolution (nom)
Pulse period (UNU)	500 ns to 42 seconds (nom)
Pulse width (UNU)	500 ns to pulse period – 10 ns (nom)
Pulse period (UNW)	30 ns to 42 seconds (nom)
Pulse width (UNW)	20 ns to pulse period – 10 ns (nom)
Resolution	10 ns
Adjustable trigger delay:	–pulse period + 10 ns to pulse period to pulse width –10 ns
Settable delay	
Free run	–3.99 to 3.97 µs
Triggered	0 to 40 s
Resolution	
[delay, width, period]	10 ns (nom)
Pulse doublets	
1st pulse delay	
(relative to sync out)	0 to 42 s – pulse width – 10 ns
1st pulse width	500 ns to 42 s – delay – 10 ns
2nd pulse delay	
(relative to pulse 1)	0 to 42 s – (delay1 + width2) – 10 ns
2nd pulse width	20 ns to 42 s – (delay1 + delay2) – 10 ns

Pulse train (Option 320)

Number of pulse patterns: 2047
On/off time range (UNU): 500 ns to 42 sec
On/off time range (UNW): 20 ns to 42 sec

External modulation inputs [1]

Modulation types	FM, AM, phase mod, pulse mod
Input impedance	50 Ω (nom)

Simultaneous modulation [2]

All modulation types (FM, AM, ΦM and pulse modulation) may be simultaneously enabled except: FM and phase modulation can not be combined; two modulation types can not be simultaneously generated using the same modulation source. For example, AM and FM can run concurrently and will modulate the output RF. This is useful for simulating signal impairments.

1. Option UNT required for FM, AM and phase mod inputs. Option UNU or UNW required for pulse modulation inputs.
2. If AM or pulse modulation are on then phase and FM specifications do not apply.

General Characteristics

Remote programming

Interfaces	GPIB	IEEE-488.2, 1987 with listen and talk
	LAN	100BaseT LAN interface, LXI class C compliant
	USB	Version 2.0
Control languages	SCPI	Version 1997.0

Compatibility languages supporting 100% of commonly used commands [1]

Agilent Technologies	E4438C, E4428C, E442xB, E443xB, E8241A, E8244A, E8251A, E8254A, E8247C, E8257C/D, E8267C/D, 8648 series, 8656B, E8663B, 8657A/B
Aeroflex Incorporated	3410 series
Rohde & Schwarz	SMU200A, SMJ100A, SMATE200A, SMIQ, SML, SMV

Power requirements
100 or 120 VAC, 50 or 60 Hz, 400 Hz
220 or 240 VAC, 50 or 60 Hz
250 W maximum

Operating temperature range
0 to 55 °C

Storage temperature range
–40 to 70 °C

Operating and storage altitude
up to 15,000 feet

Environmental stress
Samples of this product have been type tested in accordance with the Agilent Environmental Test Manual and verified to be robust against the environmental stresses of Storage, Transportation and End-use; those stresses include but are not limited to temperature, humidity, shock, vibration, altitude and power line conditions. Test Methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3.

Safety
Complies with European Low Voltage Directive 73/23/EEC, amended by 93/68/EEC
- IEC/EN 61010-1
- Canada: CSA C22.2 No. 61010-1
- USA: UL 61010-1

EMC
Complies with European EMC Directive 89/336/EEC, amended by 93/68/EEC
- IEC/EN 61326
- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11:2002
- ICES/NMB-001

Memory
Memory is shared by instrument states, sweep list files, and other files. There are 4 GB of flash memory available in the N5181A MXG. Depending on how the memory is utilized, a maximum of 1000 instrument states can be saved.

Security (Option 006)
Memory sanitizing, memory sanitizing on power on, and display blanking

Self test
Internal diagnostic routines test most modules in a preset condition. For each module, if its node voltages are within acceptable limits, the module "passes" the test.

Weight
≤ 12.5 kg (27.5 lb.) net, ≤ 27.2 kg (60 lb.) shipping

Dimensions
88 mm H x 426 mm W x 432 mm L
[3.5 in H x 16.8 in W x 17 in L]

1. Firmware version A.01.10 and later.

Recommended calibration cycle	36 months. Agilent is committed to providing you with the lowest total cost to own and operate equipment. In support of this commitment, Agilent has verified that the stability of this product's architecture justifies a longer calibration interval of 3 years.
ISO compliant	The Agilent N5181A MXG is manufactured in an ISO-9001 registered facility in concurrence with Agilent Technologies' commitment to quality.
Front panel connectors [1]	
RF output [2]	Outputs the RF signal via a precision N type female connector.
USB 2.0	Used with a memory stick for transferring instrument states, licenses and other files into or out of the instrument. Also used with U2000 Series USB average power sensors. For a current list of supported memory sticks, visit **www.agilent.com/find/MXG**, click on Technical Support, and refer to FAQs: Waveform Downloads and Storage.
Rear panel connectors [1]	
RF output (Option 1EM or N5161A)	Outputs the RF signal via a precision N type female connector. Generates output voltage, 0 to +10 V when the signal generator is sweeping. This output can also be programmed to indicate when the source is settled or output pulse video and is TTL and CMOS compatible in this mode. Output impedance < 1 Ω, can drive 2 kΩ. Damage levels are ±15 V.
Sweep out	
AM	External AM input. Nominal input impedance is 50 Ω. Damage levels are ± 5 V.
FM	External FM input. Nominal input impedance is 50 Ω. Damage levels are ± 5 V.
Pulse	External pulse modulation input. This input is TTL and CMOS compatible. Low logic levels are 0 V and high logic levels are +1 V. Nominal input impedance is 50 Ω. Input damage levels are ≤ –0.3 V and ≥ +5.3 V.
Trigger in	Accepts TTL and CMOS level signals for triggering point-to-point in sweep mode. Damage levels are ≤ –0.3 V and ≥ +5.3 V.
Trigger out	Outputs a TTL and CMOS compatible level signal for use with sweep mode. The signal is high at start of dwell, or when waiting for point trigger in manual sweep mode; low when dwell is over or point trigger is received. This output can also be programmed to indicate when the source is settled, pulse synchronization, or pulse video. Nominal output impedance 50 ohms. Input damage levels are ≤ –0.3 V and ≥ +5.3 V.
Reference input	Accepts a 10 MHz reference signal used to frequency lock the internal timebase. Option 1ER adds the capability to lock to a frequency from 1 MHz to 50 MHz. Nominal input level –3.5 to +20 dBm, impedance 50 Ω, sine or square waveform.
10 MHz out	Outputs the 10 MHz reference signal used by internal timebase. Level nominally +3.9 dBm. Nominal output impedance 50 Ω. Input damage level is +16 dBm.
USB 2.0	The USB connector provides remote programming functions via SCPI.

1. All connectors are BNC unless otherwise noted.
2. All N5161A MXG ATE connectors located on rear panel.

LAN (100 BaseT)	The LAN connector provides the same SCPI remote programming functionality as the GPIB connector. The LAN connector is also used to access the internal web server and FTP server. The LAN supports DHCP, sockets SCPI, VXI-11 SCPI, connection monitoring, dynamic hostname services, TCP keep alive. This interface is LXI class C and B compliant. Trigger response time for the immediate LAN trigger is 0.5 ms (minimum), 4 ms (maximum), 2 ms typical; delayed/alarm trigger is unknown. Trigger output response time is 0.5 ms (minimum), 4 ms (maximum), 2 ms typical.
GPIB	The GPIB connector provides remote programming functionality via SCPI.

Ordering Information

Frequency	501	Frequency range from 100 kHz to 1 GHz
	503	Frequency range from 100 kHz to 3 GHz
	506	Frequency range from 100 kHz to 6 GHz
Performance enhancements	UNZ	Fast switching
	1EA	High output power
	1EQ	Low power (< –110 dBm)
	UNU	Pulse modulation
	UNW	Narrow pulse modulation
	320	Pulse train generator
	UNT	AM, FM, phase modulation
	006	Instrument security
	1ER	Flexible reference input (1 to 50 MHz)
	1EM	Move RF output to rear panel [1]
	UK6	Commercial calibration certificate with test data
	099	Expanded license key upgradeability [2]
Accessories	1CM	Rackmount kit
	1CN	Front handle kit
	1CP	Rackmount and front handle kit
	1CR	Rack slide kit
	AXT	Transit case
	800	Customer service kit front panel connector configuration
	801	Customer service kit rear panel connector configuration

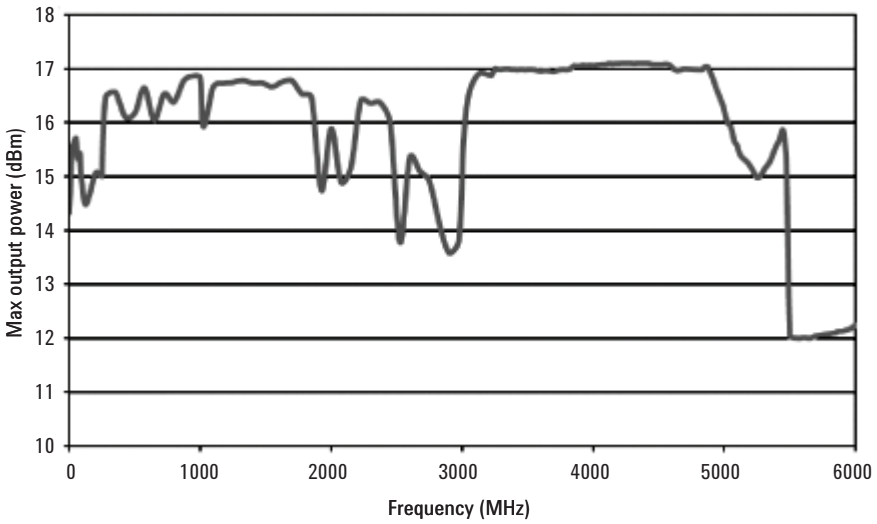
1. Not available on N5161A MXG ATE.
2. For more information on upgrades and Option 099 refer to *Agilent MXG Signal Generator* Configuration Guide, literature number 5989-5485EN.

Archive Section

Frequency Minimum frequency 100 kHz [1]

Output power (for serial number prefix 4742xxxx)	**Range** [2]	**Standard**	**Option 1EQ** [3]
	100 kHz to 250 kHz	–110 to +4 dBm	–127 to +4 dBm
	> 250 kHz to 2.5 GHz	–110 to +13 dBm	–127 to +13 dBm
	> 2.5 to 3.0 GHz	–110 to +10 dBm	–127 to +10 dBm
	> 3.0 to 4.5 GHz	–110 to +13 dBm	–127 to +13 dBm
	> 4.5 to 5.8 GHz	–110 to +10 dBm	–127 to +10 dBm
	> 5.8 to 6 GHz	–110 to +7 dBm	–127 to +7 dBm

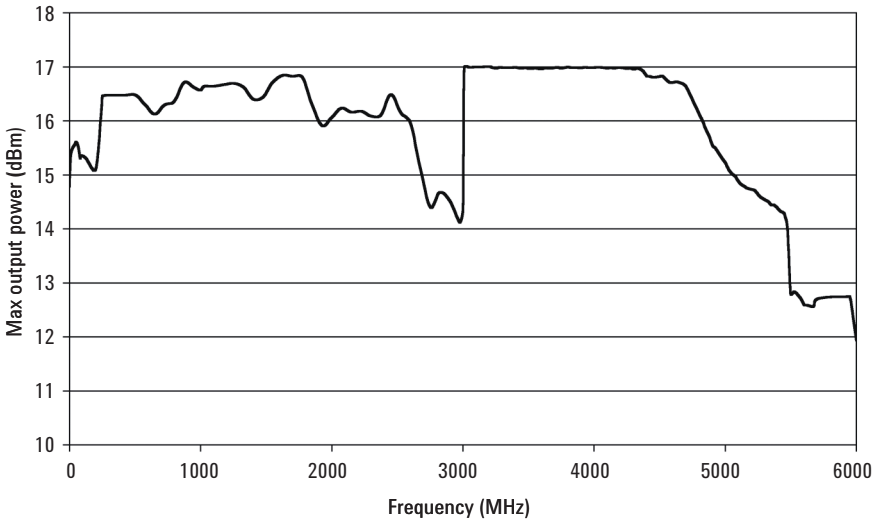
Measured maximum available output power



Output power (for serial number prefixes lower than 4742xxxx)	**Range** [2]	**Standard**	**Option 1EQ** [3]
	250 kHz to 2.5 GHz	–110 to +13 dBm	–127 to +13 dBm
	> 2.5 to 3.0 GHz	–110 to +10 dBm	–127 to +10 dBm
	> 3.0 to 4.5 GHz	–110 to +13 dBm	–127 to +13 dBm
	> 4.5 to 5.8 GHz	–110 to +10 dBm	–127 to +10 dBm
	> 5.8 to 6 GHz	–110 to +7 dBm	–127 to +7 dBm

1. Performance below 250 kHz is unspecified for units with serial numbers lower than 4742xxxx.
2. Quoted specifications between 20 and 30 °C. Maximum output power typically decreases by 0.2 dB/°C for temperatures outside of this range.
3. Settable to –144 dBm with Option 1EQ, but unspecified below –127 dBm.

Maximum available output power



SWR (for serial number prefix 4742xxxx)	≤ 2.1 GHz	1.4:1 (typ)
	> 2.1 GHz to 4 GHz	1.5:1 (typ)
	> 4.0 GHz 5.6 GHz	1.7:1 (typ)
	> 5.6 GHz to 6 GHz	2.0:1 (typ)
Maximum reverse power	Max DC voltage	50 VDC (nom)
	250 kHz to 6 GHz	2 W (nom)
SWR (for serial number prefixes lower than 4742xxxx)	≤ 1.4 GHz	1.7:1 (typ)
	> 1.4 GHz to 4 GHz	2.3:1 (typ)
	> 4.0 GHz 5.0 GHz	2.4:1 (typ)
	> 5.0 GHz to 6 GHz	2.2:1 (typ)
Maximum reverse power	Max DC voltage	50 VDC (nom)
	50 kHz to 6 GHz	2 W (nom)

Absolute level accuracy in CW mode [1] [ALC on]
(for serial number prefix 4742xxxx)

	Standard		**Option 1EQ**
	+7 [2] to –60 dBm	< –60 to –110 dBm	< –110 to –127 dBm
100 kHz to 250 kHz	±0.6 dB	±1.0 dB	---
> 250 kHz to 1 MHz	±0.6 dB	±0.7 dB	±1.7 dB
> 1 MHz to 1 GHz	±0.6 dB	±0.7 dB	±1.0 dB
> 1 GHz to 3 GHz	±0.7 dB	±0.9 dB	±1.4 dB
> 3 GHz to 4 GHz	±0.8 dB	±0.9 dB	±1.0 dB
> 4 GHz to 6 GHz	±0.8 dB	±1.1 dB	±1.3 dB

Absolute level accuracy in CW mode [1] [ALC on]
(for serial number prefixes lower than 4742xxxx)

	Standard		**Option 1EQ**
	+7 to –60 dBm	< –60 to –110 dBm	< –110 to –127 dBm
250 kHz to 1 MHz	±0.6 dB	±0.7 dB	±1.7 dB
> 1 MHz to 1 GHz	±0.6 dB	±0.7 dB	±1.0 dB
> 1 GHz to 3 GHz	±0.7 dB	±0.9 dB	±1.4 dB
> 3 GHz to 4 GHz	±0.8 dB	±0.9 dB	±1.0 dB
> 4 GHz to 6 GHz	±0.8 dB	±1.1 dB	±1.3 dB

1. Quoted specifications between 20 and 30 °C. For temperatures outside of this range, absolute level accuracy degrades by 0.01 dB/ °C for frequencies ≤ 4.5 GHz and 0.02 dB/ °C for frequencies > 4.5 GHz.
2. Level accuracy specified to +7 dBm or maximum specified output power, whichever is lower.

Spectral Purity

(for serial numbers lower than 4818xxxx)

Harmonics [1] [CW mode, output level < 4 dBm]

250 kHz to 3 GHz	< –30 dBc
> 3 GHz to 6 GHz	< –44 dBc (typ)

Nonharmonics [1] [CW mode], > 10 kHz offset

250 kHz to 250 MHz	< –54 dBc, < 70 dBc (typ)
> 250 MHz to 375 MHz	< –61 dBc, < –81 dBc (typ)
> 375 MHz to 750 MHz	< –55 dBc, < –73 dBc (typ)
> 750 MHz to 1.5 GHz	< –48 dBc, < –62 dBc (typ)
> 1.5 GHz to 3 GHz	< –48 dBc, < –62 dBc (typ)
> 3 GHz to 6 GHz	< –42 dBc, < –56 dBc (typ)

Subharmonics [1] [CW mode]

≤ 4 GHz	< –76 dBc
> 4 GHz to 5 GHz	< –64 dBc
> 5 GHz to 5.5 GHz	< –50 dBc
> 5.5 GHz to 6 GHz	< –46 dBc

1. Harmonics, sub-harmonics, and non-harmonics outside the frequency range of the instrument are typical.

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Related Literature

Application literature

- ***RF Source Basics, a self-paced tutorial*** (CD-ROM), literature number 5980-2060E.
- ***Accurate amplifier ACLR and ACPR testing with the Agilent MXG Vector Signal Generator,*** literature number 5989-5471EN
- ***Improving Throughput with Fast RF Signal Generator Switching,*** literature number 5989-5487EN
- ***Digital Modulation in Communications Systems-An Introduction***, Application Note 1298, literature number 5965-7160E.
- ***Testing CDMA Base Station Amplifiers***, Application Note 1307, literature number 5967-5486E.

Product literature

- ***Agilent MXG Signal Generator***, Brochure, literature number 5989-5074EN
- ***Agilent MXG Signal Generator***, Configuration Guide, literature number 5989-5485EN
- ***Agilent N5181A analog signal generator***, Data Sheet, literature number 5989-5311EN
- ***E4438C ESG Vector Signal Generator***, Brochure, literature number 5988-3935EN.
- ***E4438C ESG Vector Signal Generator***, Configuration Guide, literature number 5988-4085EN.
- ***E4438C ESG Vector Signal Generator,*** Data Sheet, literature number 5988-4039EN

1. Not available on N5161A MXG ATE.
2. For more information on upgrades and Option 099 refer to *Agilent MXG Signal Generator* Configuration Guide, literature number 5989-5485EN.

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