Advanced Test Equipment Corp.
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Agilent N5182A MXG and N5162A MXG ATE Vector Signal Generators

Data Sheet

Optimized for Performance and Speed

- Fast switching speeds
- Industry-best ACPR
- Simplified self-maintenance
- Signal Studio software
- High output power

Agilent Technologies

Table of Contents

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.

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 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 0.1 ° 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, 6]

Type	*Standard*	*Option UNZ* [5]	Option UNZ [5] (typical)
Digital modulation off			
SCPI mode	≤ 5 ms (typ)	≤ 1.15 ms	≤ 950 µs
List/Step sweep mode	≤ 5 ms (typ)	≤ 900 µs	≤ 700 µs
Digital modulation on			
SCPI mode	≤ 5 ms (typ)	≤ 1.15 ms	≤ 1.05 ms
List/Step sweep mode	≤ 5 ms (typ)	≤ 900 µs	≤ 800 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.
6. With Internal Channel Corrections on, the frequency switching speed is < 1 ms (measured) for list mode and SCPI mode cached frequency points. For the initial frequency point in SCPI mode the time is < 75 ms (measured). The instrument will automatically cache the most recently used 256 frequencies. There is no speed degradation for amplitude-only changes. Internal Channel Correction applies to FW A.01.60 or greater with Option N5162/82AK-R2C.

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 and waveforms. See amplitude and baseband generator sections 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, LXI LAN, LXI ALARM [2])

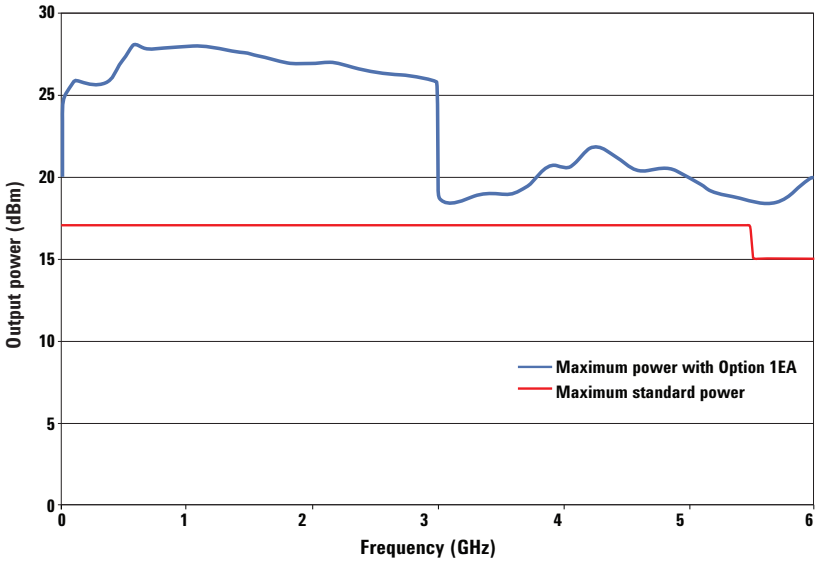
1. Aging rate is determined by design as a function of the TCXO. It is not specified.
2. LXI class B requires Option ALB. Standard on new instruments.

Amplitude

Output power [1]

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

Range	*Standard* [3]	*Option 1EA*
100 kHz to 50 MHz	+13 dBm	+15 dBm
> 50 MHz to 3 GHz	+13 dBm	+23 dBm
> 3 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 the 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*
Digital modulation off			
SCPI mode	≤ 5 ms (typ)	≤ 750 µs	≤ 650 µs
List/Step sweep mode	≤ 5 ms (typ)	≤ 500 µs	≤ 400 µs
Digital modulation on			
SCPI mode	≤ 5 ms (typ)	≤ 1.15 ms	≤ 950 µs
List/Step sweep mode	≤ 5 ms (typ)	≤ 900 µs	≤ 700 µs

Absolute level accuracy in CW mode [3] [ALC on]

	Standard		*Option 1EQ*
	+23 [5] to –60 dBm	< –60 to –110 dBm	< –110 to –127 dBm
100 kHz to 250 kHz [4]	±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

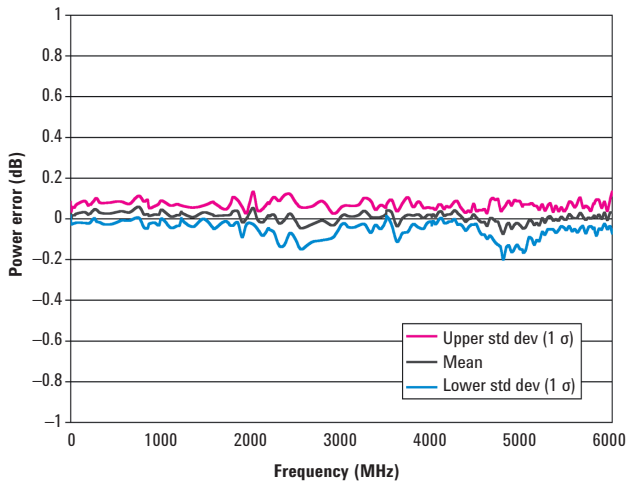
1. Time from receipt of SCPI command or trigger signal to amplitude settled within 0.2 dB. For units with serial numbers ending in 4742xxxx or less, switching speed is specified for power levels < +5 dBm.
2. Switching speed specifications apply when status register updates are off.
3. Quoted specifications 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. Specification applies to units with serial numbers ending with 4818xxxx or greater.
5. For units with lower serial numbers refer to the Archive Section at end of this document, or maximum specified output power, whichever is lower.

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

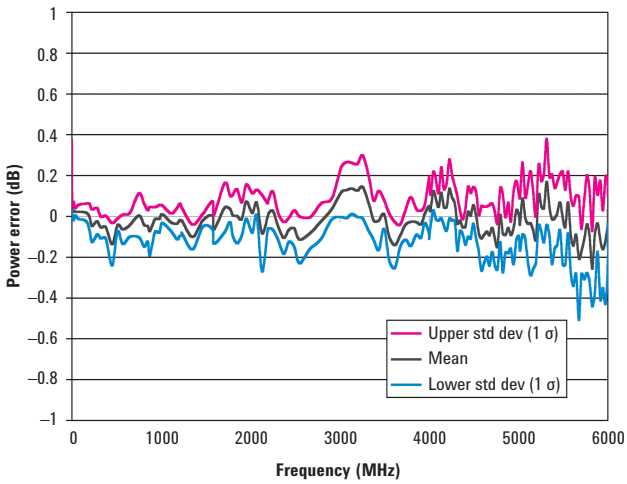
Absolute level accuracy in digital I/Q mode [ALC on, relative to CW]

300 MHz to 2.5 GHz	±0.25 dB
3.3 to 3.8 GHz	±0.45 dB
5.0 to 6.0 GHz	±0.25 dB

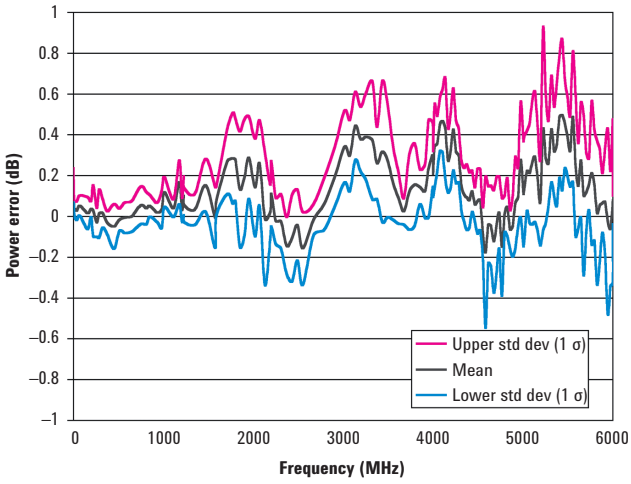
Level accuracy at –110 dBm



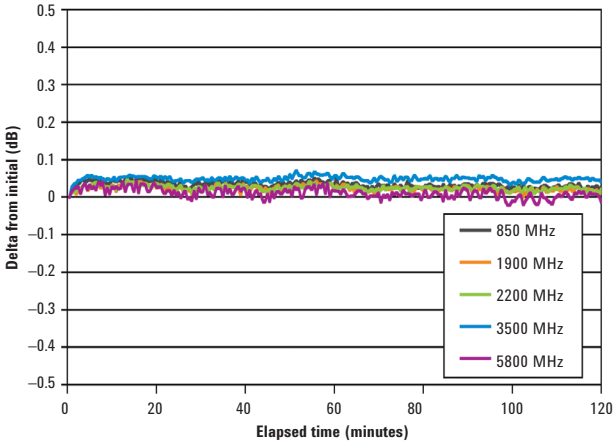
Level accuracy at –130 dBm



Level accuracy at –140 dBm

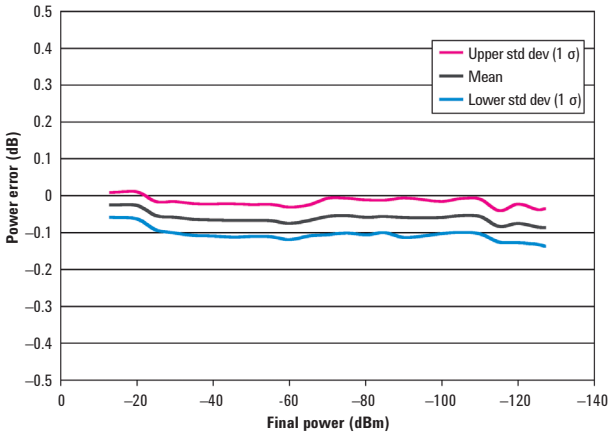


Amplitude repeatablity +5 dBm ALC on



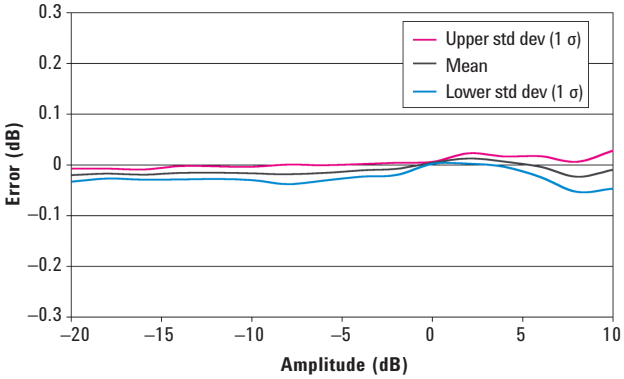
Repeatability measures the ability of the instrument to return to a given power setting after a random excursion to any other frequency and power setting. It should not be confused with absolute level accuracy.

Relative level accuracy at 850 MHz initial power +10 dBm

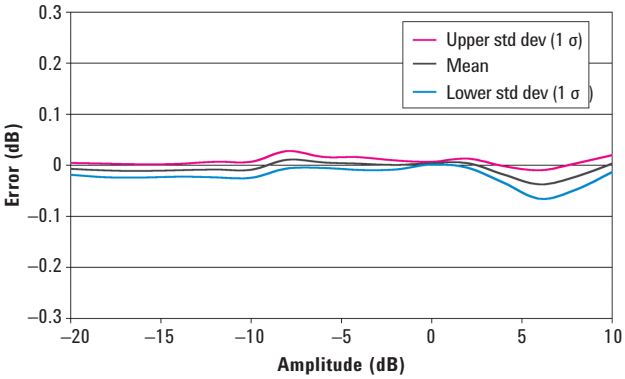


Relative level accuracy measures the accuracy of a step change from any power level to any other power level. This is useful for large changes (i.e. 5 dB steps).

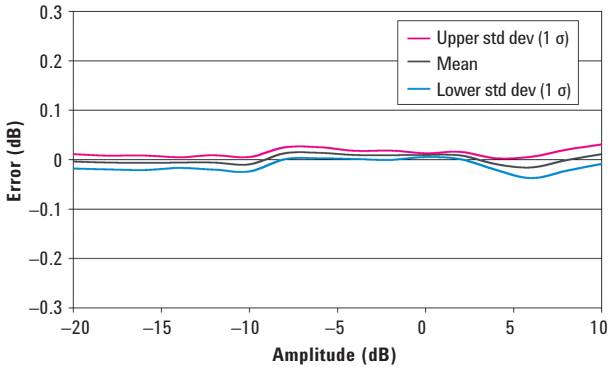
ALC linearity 850 MHz, CW, relative to 0 dBm



ALC linearity 1900 MHz, CW, relative to 0 dBm

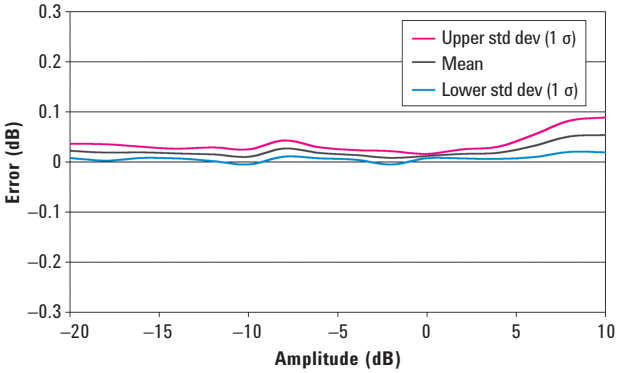


ALC linearity 2200 MHz, CW, relative to 0 dBm

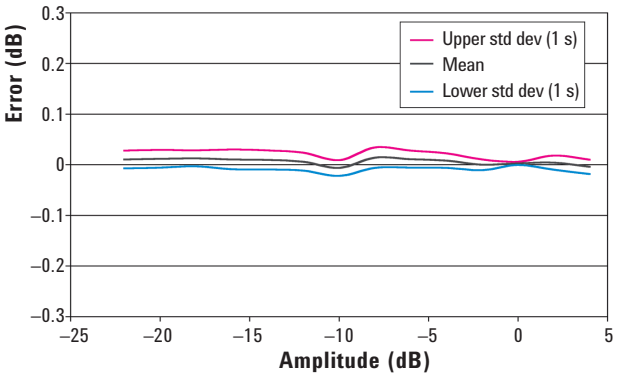


Linearity measures the accuracy of small changes while the attenuator is held in a steady state. This is useful for fine resolution changes.

ALC linearity 3500 MHz, CW, relative to 0 dBm



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; 10,000 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

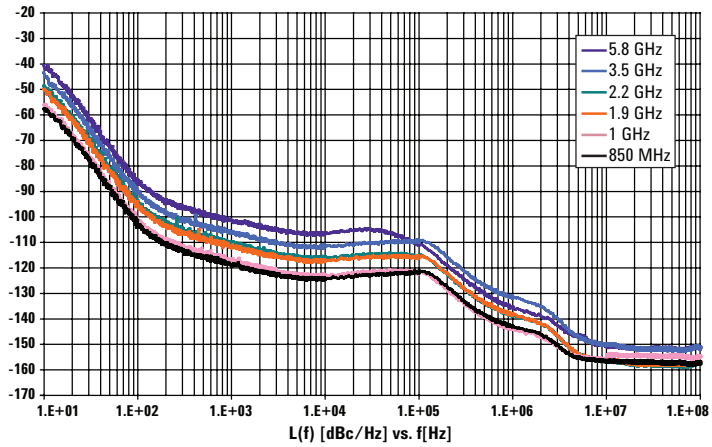
Operating modes	Step sweep (evenly spaced amplitude steps) List sweep (arbitrary list of amplitude steps) Can also simultaneously sweep frequency and waveforms. See frequency and baseband generator sections for more detail.
Sweep range	Within instrument amplitude range
Dwell time	100 µs to 100 s
Number 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

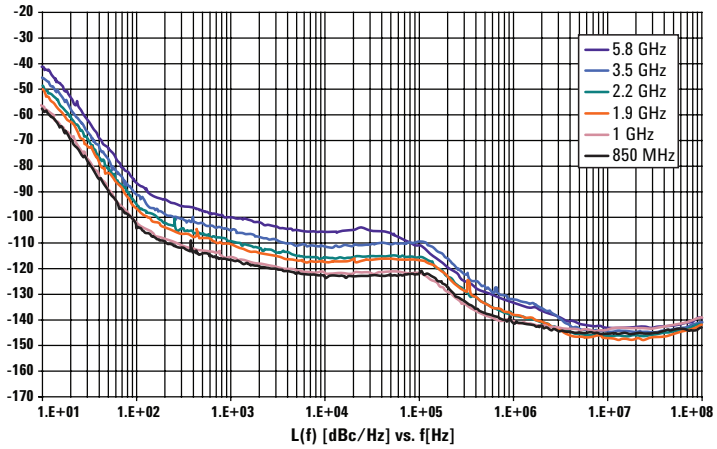
Single sideband phase noise [at 20 kHz offset]

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)

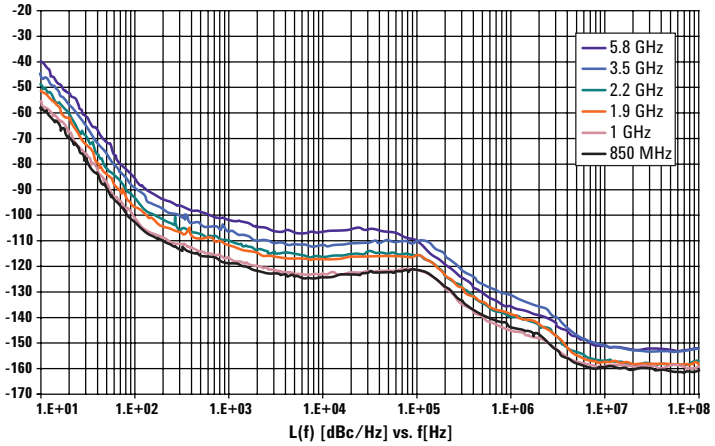
Single sideband phase noise in CW mode



Single sideband phase noise with I/Q modulation

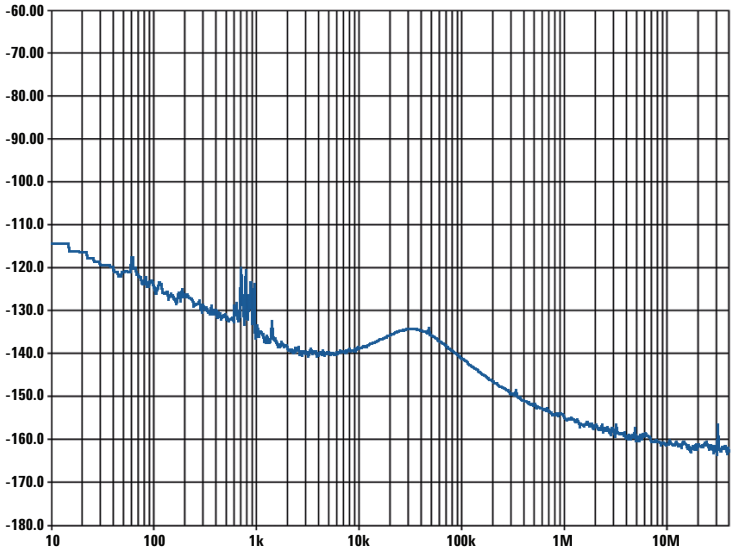


Single sideband phase noise optimized signal-to-noise floor mode[1]



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 (measured)



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

Phase coherence (Option 012)

LO input frequency range: 250 MHz to 6 GHz (nom)
LO input power: 0 dBm to +7 dBm (nom)
LO output frequency range: 250 MHz to 6 GHz (nom)
LO output power: 0 dBm to +7 dBm (nom)

1. Harmonics, subharmonics, and non-harmonics apply to instruments with serial number prefixes 4818xxxx or greater 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 × 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 rate]

	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 × 1 Hz) [2] < ±0.06% of set deviation + (N × 1 Hz) (typ) [3]
Distortion [1 kHz rate, deviation is N x 50 kHz]	< 0.4%
Sensitivity when using external input	+1 V peak for indicated deviation (nom)

Phase modulation [1]

(Option UNT)

Modulation deviation and frequency response:

	Max dev	*3 dB bandwidth*
Normal BW	N × 5 radians (nom)	DC to 1 MHz (nom)
High BW mode	N × 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	+1 V 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, 90% depth]	< 2% (typ)
Sensitivity when using external input	+1 V peak for indicated depth (nom)

Wideband AM

Rates	
ALC on	800 Hz to 50 MHz (nom)
ALC off	DC to 50 MHz (nom)
Wideband AM	
Sensitivity	0.25 V = 100%
Input Impedence	50 Ω, nominal

1. N is a factor used to help define certain specifications. Refer to page 4 for N value.
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 1 MHz 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 Ω (nom)
Level	+1 Vpeak = ON (nom)

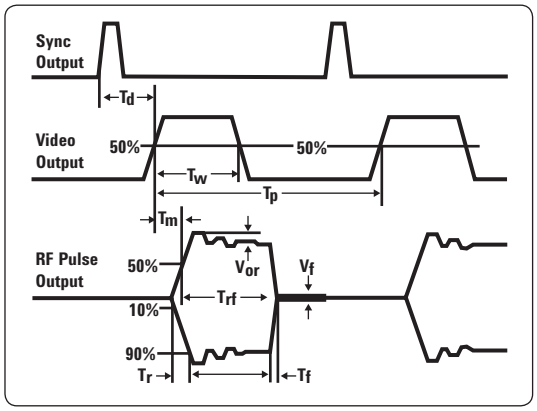
1. Pulse specifications apply to frequencies > 500 MHz. Operable down to 10 MHz.
2. Specification applies for power levels < 10 dBm.

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 [2]	≥ 20 ns	≥ 20 ns
Repetition frequency		
Internally leveled	10 Hz to 500 kHz	10 Hz to 500 kHz
ALC off [2]	dc to 5 MHz	dc to 10 MHz
Level accuracy (relative to CW)		
Internally leveled	< ±1.0 dB	< ±1.0 dB
ALC off [2]	< ±1.0 dB (typ)	< ±1.0 dB (typ)
Width compression	< 5 ns (typ)	< 5 ns (typ)
(RF width relative to video out)		
Video feed-through [3]	< 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)

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



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

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 the baseband generator, AM, and FM can run concurrently and all will modulate the output RF. This is useful for simulating signal impairments.

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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.

Vector Modulation

I/Q input and output data [1]

External I/Q inputs [2]

Impedance	50 Ω (nom)
Bandwidth	Up to 100 MHz baseband (nom)
	Up to 200 MHz RF (nom)
I offset	±100 mV
Q offset	±100 mV
Quadrature angle adjustment	±200 units

For optimum ACPR/EVM performance up to specified RF output power. [3]

Range	*I, Q (rms)*	*rss*
100 kHz to 1.2 GHz	132 mV	187 mV
1.2 GHz to 1.45 GHz	123 mV	174 mV
1.45 GHz to 2.2 GHz	114 mV	161 mV
2.2 GHz to 2.45 GHz	100 mV	141 mV
2.45 GHz to 3.0 GHz	81 mV	115 mV
3.0 GHz to 3.9 GHz	112 mV	158 mV
3.9 GHz to 4.5 GHz	132 mV	187 mV
4.5 GHz to 5.8 GHz	90 mV	127 mV
5.8 GHz to 6 GHz	25 mV	35 mV

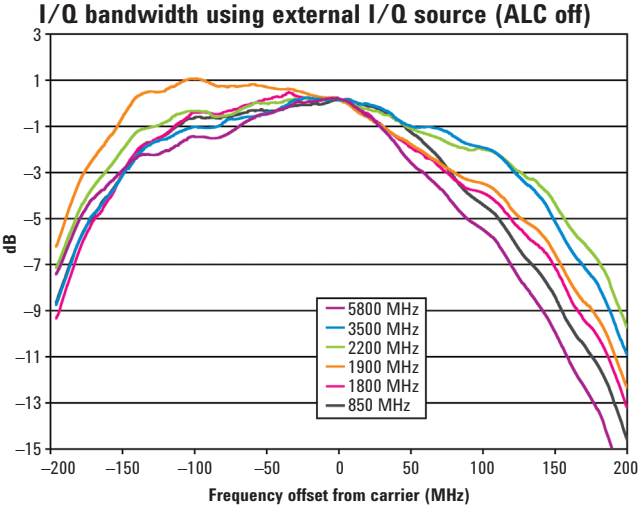
Internal I/Q from baseband generator [4]

I offset	±20%
Q offset	±20%
I/Q gain	±1 dB
Quadrature angle adjustment	±10 °
I/Q phase	±360.00 °
I/Q skew	±800.00 ns
I/Q delay	±400.00 ns
I/Q delay resolution	1 picosecond

External I/Q outputs

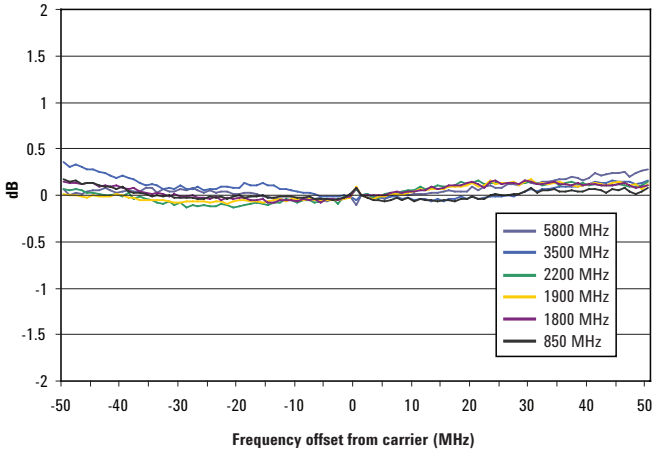
Impedance	50 Ω (nom) per output
	100 Ω (nom) differential output
Type	Single ended or differential (Option 1EL)
Maximum voltage per output	±2 V peak to peak; into high impedance
Bandwidth	50 MHz baseband (nom)
	100 MHz RF (nom)
Common mode I/Q offset	±2.5 V into high impedance
Differential mode I offset	±25 mV into high impedance
Differential mode Q offset	±25 mV into high impedance

I/Q bandwidth using external I/Q source (ALC off)

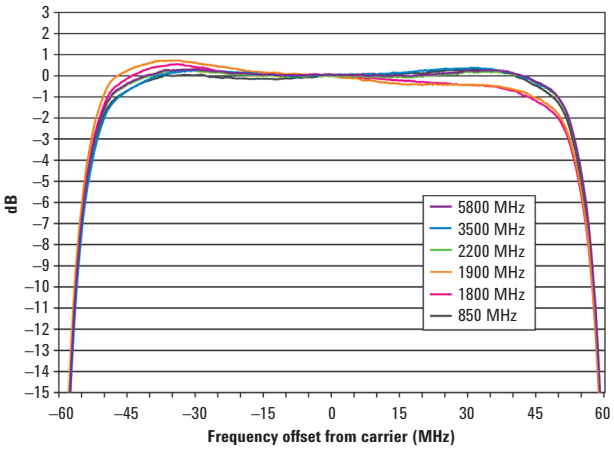


1. I/Q adjustments represent user interface parameter ranges and not "specifications."
2. ALC must be on while using external IQ inputs.
3. ACPR/EVM degrades beyond listed RF output power.
4. Internal IQ adjustments apply to RF out and IQ outputs simultaneously.

I/Q bandwidth plot using optional internal baseband generator (Internal Channel Corrections ON)[2]



I/Q bandwidth plot using optional internal baseband generator



Baseband Generator

(Options 651, 652, 654)

Channels	2 [I and Q]	
Sample rate and bandwidth	Clock rate	Bandwidth
Option 651	100 Sa/s to 30 MSa/s	24 MHz
Option 652	100 Sa/s to 60 MSa/s	48 MHz
Option 654	100 Sa/s to 125 MSa/s	100 MHz
Reconstruction filter	50 MHz	
Baseband frequency offset range	± 50 MHz	

Waveform switching speed

Type	*Standard*	*Option UNZ*
SCPI mode [1]	≤ 5 ms (typ)	≤ 1.2 ms (typ)
List/Step sweep mode	≤ 5 ms (typ)	≤ 900 µs (typ)

Digital sweep modes	In list sweep mode each point in the list can have independent waveforms along with user definable frequencies and amplitudes. See the amplitude and frequency sections for more detail.
Data transfer rates	
LAN to non-volatile storage	161 kSa/s (meas)
LAN to baseband generator	265 kSa/s (meas)
Non-volatile storage to baseband generator	262 kSa/s (meas)

1. SCPI mode switching speed applies when waveforms are pre-loaded in list sweep and sample rate ≥ 10 MSa/s.
2. Internal Channel Correction is available with firmware revision A.01.60 and Option N5182/62AK-R2C.

Arbitrary waveform memory	
Maximum playback capacity	8 MSa, 64 MSa (Option 019)
Maximum storage capacity including markers	800 MSa
Waveform segments	
Segment length	60 samples to 8 MSa 60 samples to 64 MSa (Option 019)
Maximum number of segments in baseband generator playback memory	1024, 8192 (Option 019)
Maximum number of segments in non-volatile memory	8192
Minimum memory allocation per segment	256 samples
Waveform sequences	
Maximum number of sequences	Up to 2000 depending on memory usage
Maximum number of segments/sequence	1024
Maximum number of repetitions	65535
Triggers	
Types	Continuous, single, gated, segment advance, LXI LAN, LXI ALARM [1]
Source	Trigger key, external, bus (GPIB, LAN, USB)
Modes	
Continuous	Free run, trigger and run, reset and run
Single	No retrigger, buffered trigger, immediate retrigger
Gated	Negative polarity or positive polarity
Segment advance	Single or continuous
External coarse delay time	8 ns to 30 s
External coarse delay resolution	8 ns
Trigger latency [2]	490 ns + 1 sample clock period (nom)
Trigger accuracy [2]	±4 ns (nom)

Multi-baseband generator synchronization:
- Fan out: 1 master and up to 15 slaves
- Trigger repeatability: < 1 ns (nom)
- Trigger accuracy: Same as normal mode
- Trigger latency: Same as normal mode
- Fine trigger delay range: See Internal IQ section
- Fine trigger delay resolution: See Internal IQ section
- IQ phase: See Internal IQ section

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1. LXI class B requires Option ALB. Standard on new instruments.
2. Single trigger mode only.

Markers

[Markers are defined in a segment during the waveform generation process, or from the front panel. A marker can also be routed to the RF blanking and ALC Hold functions]

Marker polarity	Negative, positive
Number of markers	4
Burst on / off ratio	> 80 dB (typ)
AWGN [Option 403]	
Type	Real-time, continuously calculated and played using DSP
Modes of operation	Standalone or digitally added to arbitrary waveform
Bandwidth [1]	1 Hz to 100 MHz
Crest factor	15 dB
Randomness	90 bit pseudo-random generation, repetition period 313 x 10^9 years
Carrier to noise ratio	± 100 dB when added to arbitrary waveforms
Carrier to noise ratio error	Magnitude error ≤ 0.2 dB at baseband I/Q outputs

1. Maximum bandwidth depends on installed baseband generator options.

Custom modulation (Option 431)

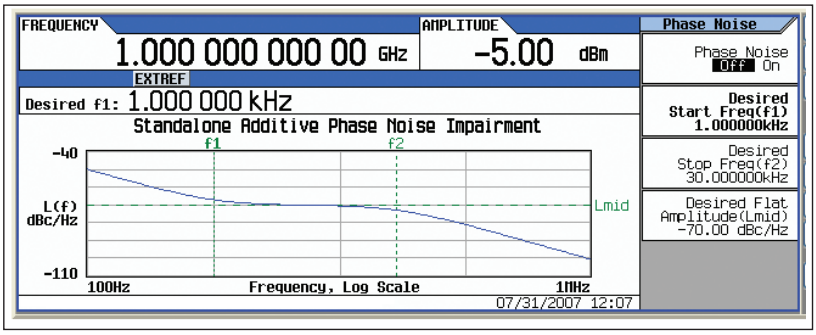
Multicarrier	
Number of carriers	Up to 100 [limited by a max bandwidth of 80 MHz depending on symbol rate and modulation type]
Frequency offset [per carrier]	–40 MHz to +40 MHz
Power offset [per carrier]	0 dB to –40 dB
Symbol rate	50 sps to 62.5 Msps
Filter types	Nyquist, Root Nyquist, Gaussian, Rectangular, APCO 25 C4EM, user
Modulation	
PSK	BPSK, QPSK, OQPSK, π/4DQPSK, 8PSK, 16PSK, D8PSK
QAM	4, 16, 32, 64, 128, 256
FSK	Selectable: 2, 4, 8, 16
MSK	
ASK	
Quick Setup modes	APCO 25w/C4FM, APCO25 w/CQPSK, *Bluetooth*, CDPD, DECT, EDGE, GSM, NADC, PDC, PHS, PWT, TETRA
Data	Random only

Multitone and two-tone (Option 430)

Number of tones	2 to 64, with selectable on/off state per tone
Frequency spacing	100 Hz to 100 MHz
Phase [per tone]	Fixed or random

Real-time Phase Noise Impairments (Option 432)

Close-in phase noise characteristics	–20 dB/decade slope
Far-out phase noise characteristics	–20 dB/decade slope
Mid frequency characteristics	
Start frequency (f1)	Offset settable from 0 to 48 MHz
Stop frequency (f2)	Offset settable from 0 to 48 MHz
Phase noise amplitude level (L(f))	User selected; max degradation dependent on f2



EVM performance data [1, 2]

Format	GSM	EDGE	cdma2000/1xEV-DO	W-CDMA	LTE FDD [3]
Modulation type	GMSK (bursted)	3pi/8 8PSK bursted)	QPSK	QPSK	64 QAM
Modulation rate	270.833 ksps	70.833 ksps	1.2288Mcps	3.84Mcps	
Channel configuration	1 timeslot	1 timeslot	pilot channel	1DPCH	
Frequency [4]	800 to 900 MHz 1800 to 1900 MHz	800 to 900 MHz 1800 to 1900 MHz	800 to 900 MHz 1800 to 1900 MHz	1800 to 2200 MHz	1800 to 2200 MHz
EVM power level	≤ 7 dBm	≤ 7 dBm	≤ 7 dBm	≤ 7 dBm	≤ 7 dBm
EVM power level with Option 1EA	≤ 13 dBm	≤ 13 dBm	≤ 13 dBm	≤ 13 dBm	≤ 13 dBm
EVM	Global phase error				

Spec	Type	Spec	Type	Spec	Type	Spec	Type	
ms 0.8 °	0.2 °	1.2%	0.7%	1.3%	0.8%	1.2%	0.8%	0.45% (measured)
peak 1.5 °	0.6 °							

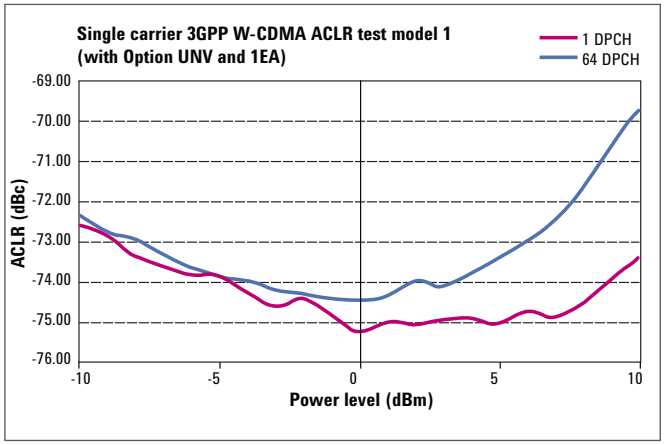
Format	802.11a/g	802.16e WiMAX [5]	QPSK [6]		16QAM [6]	
Modulation type	64QAM	64QAM	QPSK		16QAM	
Modulation rate	54 Mbps	–	4 MSps		4 MSps	
Frequency [4]	2400 to 2484 MHz	2300 to 2690 MHz	≤ 3 GHz	≤ 6 GHz	≤ 3 GHz	≤ 6 GHz
	5150 to 5825 MHz	3300 to 3800 MHz				
EVM power level	≤ –5 dBm	≤ 2 dBm	≤ 4 dBm	≤ 4 dBm	≤ 4 dBm	≤ 4 dBm
EVM power level with Option 1EA	≤ 2 dBm	≤ 8 dBm	≤ 10 dBm	≤ 10 dBm	≤ 10 dBm	≤ 10 dBm

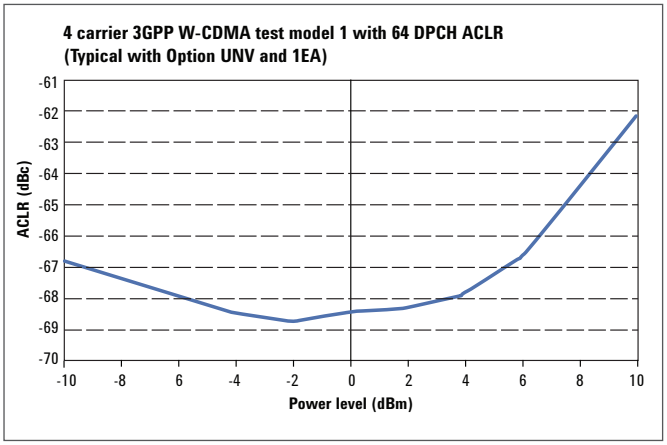
EVM			Spec	Type	Spec	Type	Spec	Type	Spec	Type
	.51% (measured)	0.4% (measured)	1.2%	0.8%	1.9%	1.1%	1.1%	0.6%	1.5%	0.9%

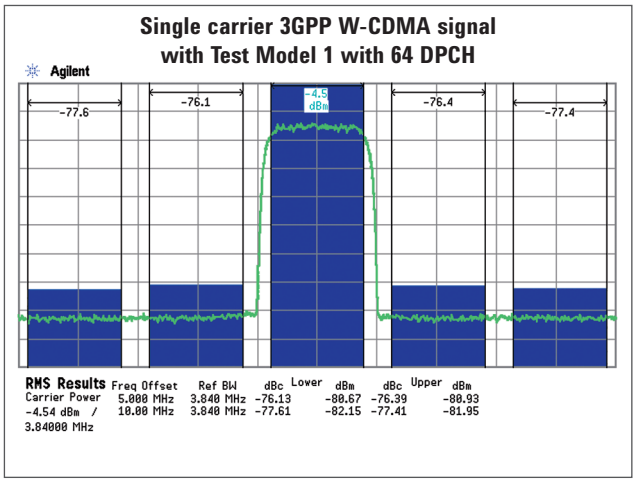
1. EVM specifications apply for the default ARB file setup conditions with the default ARB files supplied with the instrument.
2. EVM specifications apply after execution of an I/Q calibration when the instrument is maintained within ± 5 °C of the calibration temperature.
3. LTE FDD E-TM 3.1, 10 MHz, 64 QAM PDSCH, full resource block.
4. Performance evaluated at bottom, middle and top of bands shown.
5. 802.16e WiMAX signal configuration: bandwidth: 10 MHz, FFT: 1024, frame length: 5 ms, guard period: 1/8, symbol rolloff: 5%, content: 30 symbols of PN9 data.
6. The QPSK and 16QAM signals were tested with a root Nyquist filter with α = 0.2.

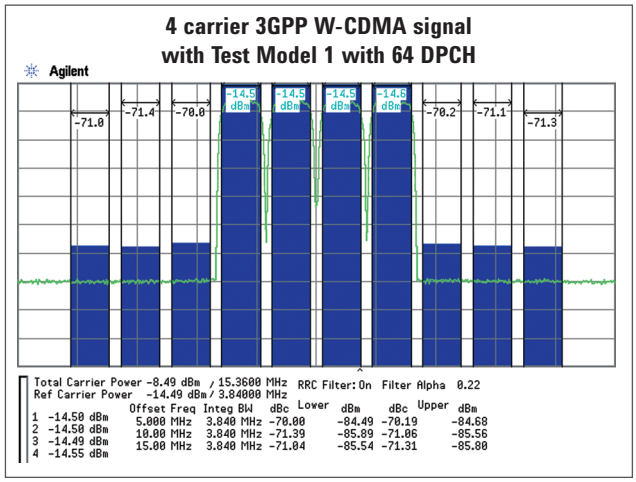
3GPP W-CDMA distortion performance

Offset	Configuration	Frequency	Standard		Option UNV		Option UNV with Option 1EA	
Power level			≤ –7 dBm [1]		≤ –7 dBm [1]		≤ 5 dBm [1]	
			Spec	Type	Spec	Type	Spec	Type
Adjacent (5 MHz)	1 DPCH, 1 carrier	1800 to 2200 MHz	–68 dBc	–70 dBc	–71 dBc	–73 dBc	–71 dBc	–73 dBc
Alternate (10 MHz)			–69 dBc	–70 dBc	–71 dBc	–75 dBc	–71 dBc	–75 dBc
Adjacent (5 MHz)	Test model 1 with 64 DPCH, 1 carrier	1800 to 2200 MHz	–64 dBc	–65 dBc	–71 dBc	–73 dBc	–71 dBc	–73 dBc
Alternate (10 MHz)			–67 dBc	–67 dBc	–71 dBc	–75 dBc	–71 dBc	–75 dBc
Adjacent (5 MHz)	Test model 1 with 64 DPCH, 4 carrier	1800 to 2200 MHz	–57 dBc	–59 dBc	–65 dBc	–67 dBc	–64 dBc	–66 dBc
Alternate (10 MHz)			–57 dBc	–60 dBc	–66 dBc	–68 dBc	–66 dBc	–66 dBc



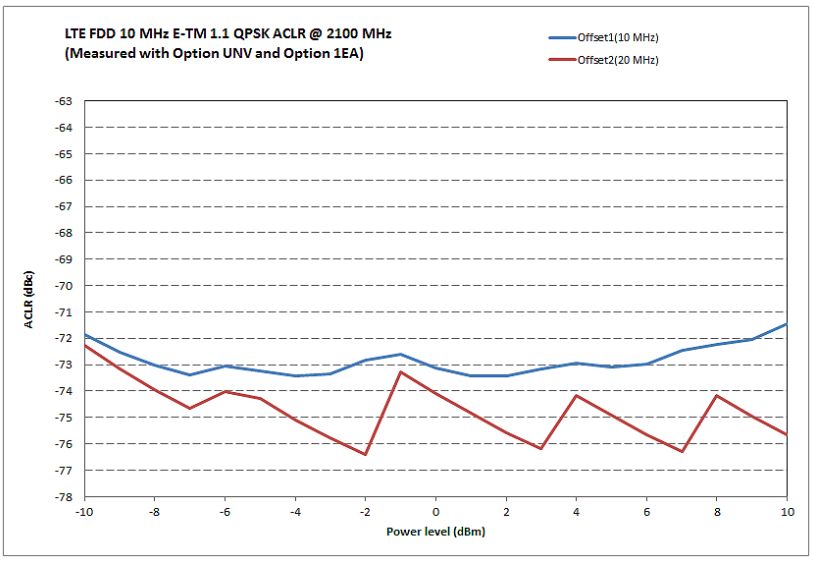




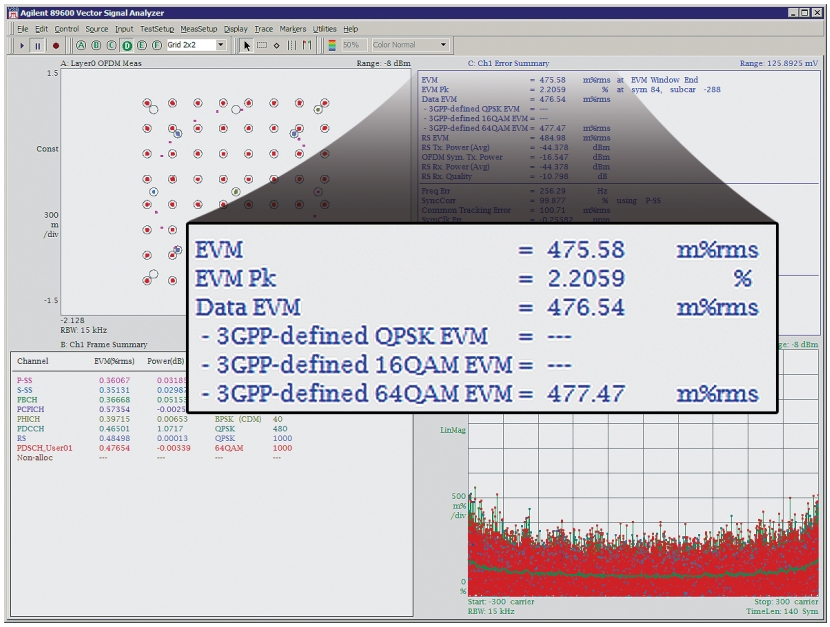


1. This is rms power. How to convert from rms to peak envelope power (PEP): PEP = rms power + crest factor. Example: 3GPP test model 1 with 64 DPCH has a crest factor >11 dB, therefore at +5 dBm rms, the PEP = 5 dBm + 11 dB = +16 dBm PEP.

LTE FDD distortion performance					
Power level	**Offset**	**Configuration [1,2]**	**Frequency**	**Standard (meas)**	**UNV (meas)**
≤ 5 dBm	10 MHz	E-TM 1.1	2.1 GHz	-68	-72
≤ 5 dBm	20 MHz	E-TM 1.1	2.1 GHz	-69	-73



3GPP LTE FDD E-TM 3.1 EVM performance



1. LTE FDD 10 MHz E-TM 1.1 QPSK.
2. Measurement configuration: reference channel integration BW: 9.015 MHz, offset channel integration BW: 9.015 MHz, channel offset: 10 MHz and 20 MHz

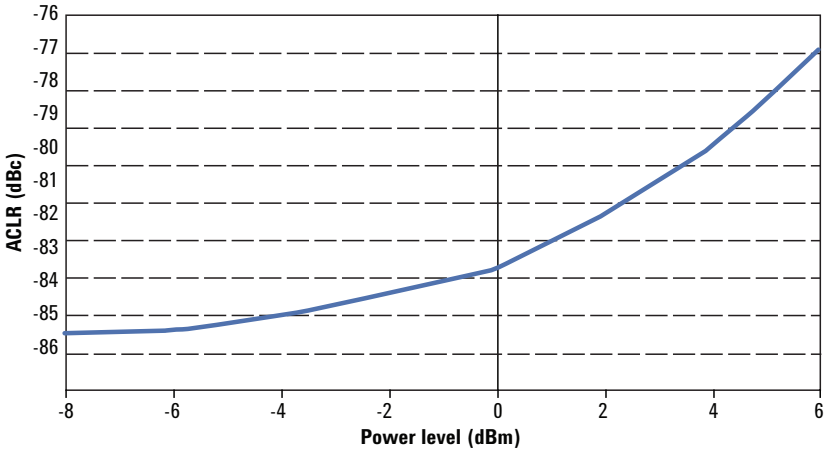
GSM / EDGE output RF spectrum (ORFS) [1]

Offset (typ)	Configuration	Frequency [2]	GSM		EDGE	
			Standard (typ)	Option UNV (typ)	Standard (typ)	Option UNV (typ)
200 kHz	1 normal timeslot, bursted	800 to 900 MHz 1800 to 1900 MHz	–33 dBc	–37 dBc	–35 dBc	–39 dBc
400 kHz			–67 dBc	–71 dBc	–67 dBc	–71 dBc
600 kHz			–79 dBc	–83 dBc	–78 dBc	–82 dBc
800 kHz			–80 dBc	–84 dBc	–80 dBc	–84 dBc
1200 kHz			–82 dBc	–86 dBc	–81 dBc	–85 dBc

3GPP2 cdma2000 distortion performance

Offset	Configuration	Frequency	Standard (typ)	Option UNV (typ)	Option UNV with Option 1EA (typ)
			Power ≤ –7 dBm [3]	Power ≤ –7 dBm [3]	Power ≤ 5 dBm [3]
885 kHz to 1.98 MHz	9 channel forward link	800 to 900 MHz 1800 to 2200 MHz	–78 dBc	–79 dBc	–77 dBc
> 1.98 to 4.0 MHz			–83 dBc	–87 dBc	–87 dBc
> 4.0 to 10 MHz			–88 dBc	–93 dBc	–93 dBc

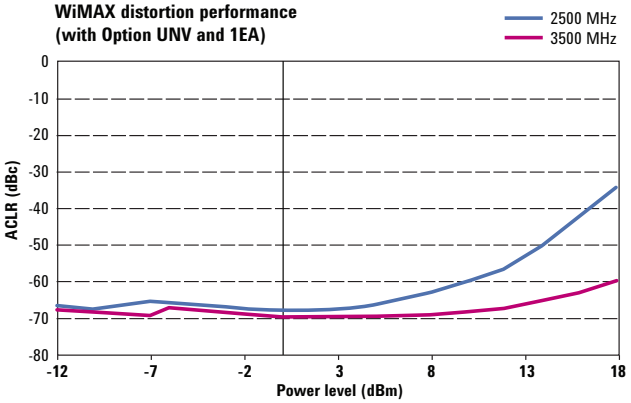
3GPP2 cdma2000 ACLR 9 channel forward link (with Option UNV and 1EA)



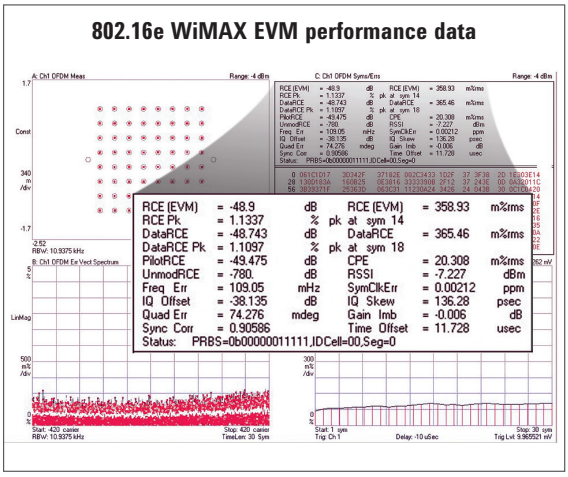
1. Specifications apply for power levels ≤ +7 dBm.
2. Performance evaluated at bottom, middle and top of bands shown.
3. This is rms power. How to convert from rms to peak envelope power (PEP): PEP = rms power + crest factor. Example: 3GPP Test model 1 with 64 DPCH has a crest factor >11 dB ,therefore at +5dBm rms the PEP = 5 dBm + 11dB = +16 dBm PEP.

802.16e mobile WiMAX distortion performance [1]

Power level	Offset	Configuration [1,2]	Frequency	Standard (meas)	UNV (meas)
< –7 dBm [3]	10 MHz	QPSK	2.5 and 3.5 GHz	–62 dBc	–66 dBc
Up to +5 dBm [3]	10 MHz	QPSK	3.5 GHz	–61 dBc	–65 dBc



Signal configuration: QPSK

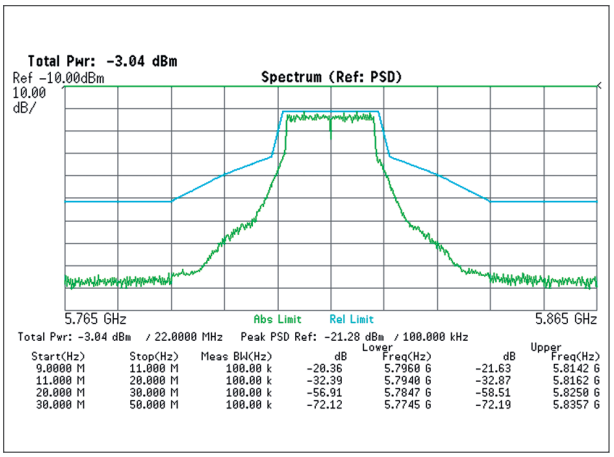


Signal configuration: Downlink signal, 30 symbols, 64QAM, 10 MHz bandwidth

Power level: –7 dBm

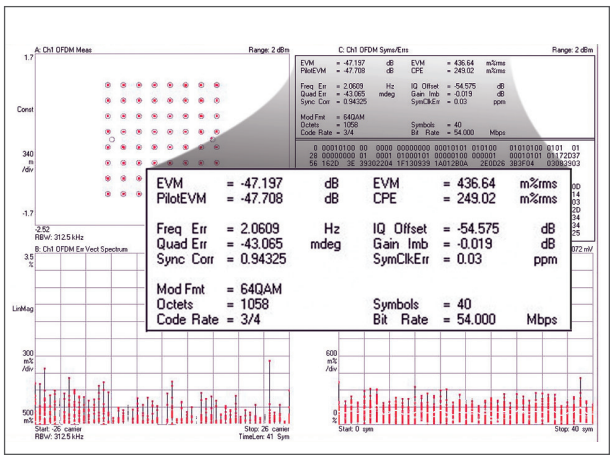
1. 802.16e WiMAX signal configuration: bandwidth: 10 MHz, FFT: 1024, frame length: 5 ms, guard period: 1/8, symbol rolloff: 5%, content: 30 symbols of PN9 data.
2. Measurement configuration: reference channel integration BW: 9.5 MHz, offset channel integration BW: 9 MHz, channel offset: 10 MHz.
3. This is rms power. How to convert from rms to peak envelope power (PEP): PEP = rms power + crest factor. Example: 3GPP test model 1 with 64 DPCH has a crest factor >11 dB, therefore at +5 dBm rms, the PEP = 5 dBm + 11 dB = +16 dBm PEP.

WLAN



Signal configuration: OSR: 4
Window length: 16
Power level: 0 dBm
Carrier frequency: 5.805 GHz

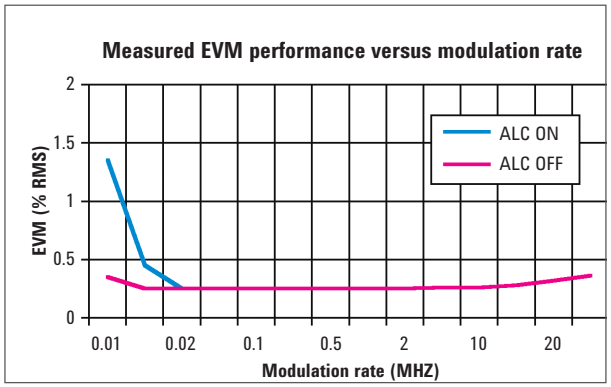
802.11a WLAN spectral mask performance



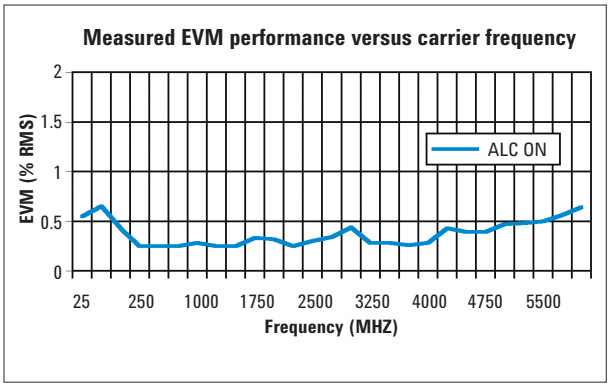
Signal configuration: OSR: 4
Window length: 16
Power level: 0 dBm
Carrier frequency: 5.805 GHz

802.11a WLAN EVM performance

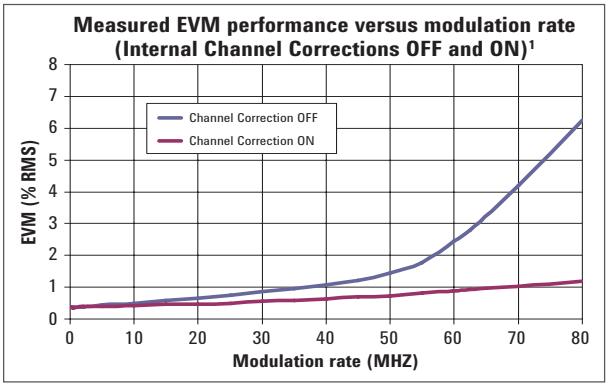
QPSK



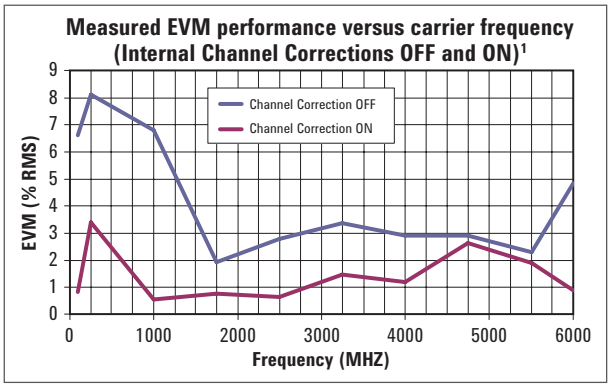
Signal configuration: QPSK modulation
Alpha: 0.25
Power level: +4 dBm
Carrier frequency 2.2 GHz



Signal configuration: QPSK modulation
Alpha: 0.25
Power level: +4 dBm
Symbol rate: 4 MSymb/s



Signal configuration: QPSK modulation
Alpha: 0.25
Power level: +4 dBm
Carrier frequency 2.2 GHz



Signal configuration: QPSK modulation
Alpha: 0.25
Power level: +4 dBm
Symbol rate: 62.5 MSymb/s

1. Internal Channel Correction is available with firmware revision A.01.60 and Option N5182/62AK-R2C.

General Characteristics

Remote programming

Interfaces	GPIB	IEEE-488.2, 1987 with listen and talk
	LAN	100BaseT LAN interface, LXI class C compliant [2]
	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, user data files, sweep list files, waveform sequences, and other files. There are 4 GB of flash memory available in the N5182A 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.

1. Firmware version A.01.10 and later.
2. LXI class B compliant with Option ALB.

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]
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 inte val of 3 years.
ISO compliant	The Agilent N5182A 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. Maximum reverse power is 2 W, 50 VDC.
I and Q inputs [2]	Accepts "in-phase" and "quadrature" input signals for I/Q modulation. Nominal input impedance is 50 Ω. Damage levels are 1 Vrms and 5 Vpeak.
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 N5162A)	Outputs the RF signal via a precision N type female connector.
I and Q inputs (Option 1EM or N5162A)	Accepts "in-phase" and "quadrature" input signals for I/Q modulation. SMB connector, nominal input impedance is 50 Ω. Damage levels are 1 Vrms and 5 Vpeak. Option 1EM and N5162A units will come with 2 SMB to BNC adapters.
I and Q outputs	Outputs the analog I/Q modulation signals from the internal baseband generator. Nominal output impedance 50 Ω, DC coupled. Damage levels ±2 V.
$\overline{I}$ and $\overline{Q}$ outputs (Option 1EL)	Outputs the complement of the I and Q signals for differential applications. Nominal output impedance is 50 Ω, DC-coupled. Damage levels are ±2 V.
EXT Clk	Reserved for future use.
Event 1	This connector outputs the programmable timing signal generated by marker 1. The marker signal can also be routed internally to control the RF blanking and ALC hold functions. This signal is also available on the AUX I/O connector. This output is TTL and 3.3 V CMOS compatible. Damage levels are > +8 V and < –4 V.
Pattern trigger	Accepts signal to trigger internal pattern generator to start single pattern output, for use with the internal baseband generator (Option 651, 652, 654). Accepts CMOS [3] signal with minimum pulse width of 100ns. Female BNC; Damage levels are > +8 V and < –4 V.
Sweep out	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.

1. All connectors are BNC unless otherwise noted.
2. All N5162A MXG ATE connectors located on rear panel.
3. Rear panel inputs and outputs are 3.3 V CMOS, unless indicated otherwise. CMOS inputs will accept 5 V CMOS, 3 V CMOS, or TTL voltage levels.

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.
LO in (Option 012)	Accepts a signal from a master signal generator that is used as the LO for MXG vector in order to configure a phase coherent system. Nominal input levels between 0 to +7 dBm. Nominal input impedance 50 Ω.
LO out (Option 012)	Outputs a reference signal that can be used in a phase coherent system. Nominal output levels between 0 to 7 dBm. Nominal output impedance 50 Ω.
Digital bus I/O	Reserved for future use.
Aux IO (50 pin SCSI II connector)	The AUX I/O connector provides additional digital signal outputs as follows. Event 1 - 4 (Pin 1 - 4) This connector outputs programmable timing signals generated by markers 1 - 4. The marker signals can also routed internally to control the RF blanking and ALC hold functions. This output is TTL and 3.3 V CMOS compatible. Damage levels are > +8 V and < –4 V.
USB 2.0	The USB connector provides remote programming functions via SCPI.
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 triger 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	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 (1-50 MHz)
	1EM	Move RF output to rear panel 1
	UK6	Commercial calibration certificate with test data
	099	Expanded license key upgradeability 2
	012	LO in/out for phase coherency
Vector specific options	651	Internal baseband generator (30 MSa/s, 8 MSa)
	652	Internal baseband generator (60 MSa/s, 8 MSa)
	654	Internal baseband generator (125 MSa/s, 8 MSa)
	019	Increase baseband generator memory to 64 MSa
	1EL	Differential I/Q outputs
	403	Calibrated AWGN
	UNV	Enhanced dynamic range
	430	Multitone and two-tone
	431	Custom digital modulation
	432	Phase noise impairments
	221-229	Waveform license 5-packs 1 to 9 (purchase up to 9 packs for 45 Signal Studio waveforms)
	250-259	Waveform license 50-packs 1 to 10 (purchase up to 10 packs for 500 Signal Studio waveforms)
Signal Studio software	N7600B	Signal Studio for 3GPP W-CDMA with HSDPA/HSUPA
	N7601B	Signal Studio for 3GPP2 CDMA
	N7602B	Signal Studio for GSM/EDGE
	N7606B	Signal Studio for Bluetooth
	N7611B	Signal Studio for broadcast radio
	N7612B	Signal Studio for TD-SCDMA
	N7613A	Signal Studio for 802.16-2004 (WiMAX)
	N7615B	Signal Studio for 802.16 WiMAX
	N7616B	Signal Studio for T-DMB
	N7617B	Signal Studio for 802.11 WLAN
	N7621B	Signal Studio for multitone distortion test
	N7622A	Signal Studio toolkit
	N7623B	Signal Studio for digital video
	N7624B	Signal Studio for 3GPP LTE
	N7625B	Signal Studio for 3GPP LTE TDD
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 RF connector configuration (Parts kit enables owners to repair the MXG on site, includes internal replacement parts, tools, and a calibrated RF module.)
	801	Customer service kit rear panel (1EM) RF connector configuration (Parts kit enables owners to repair the MXG on site, includes internal replacement parts, tools, and a calibrated RF module.)

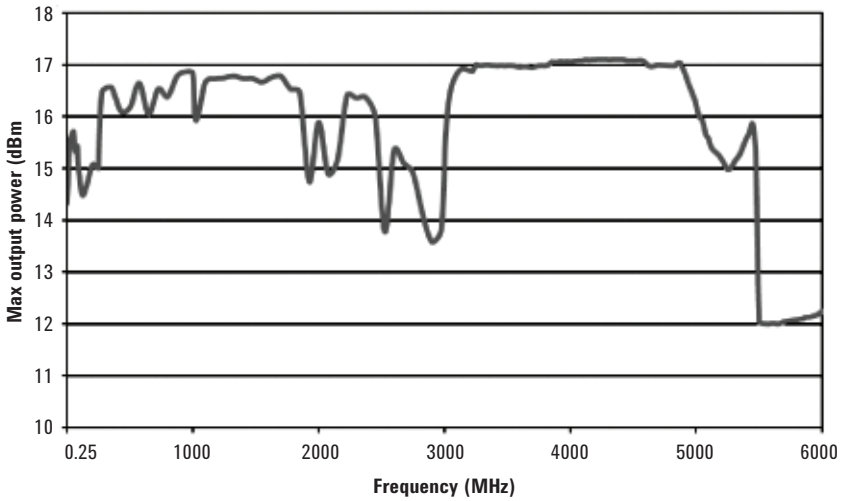
1. Not available on N5162A MXG ATE.
2. For more information on upgrades and Option 099 refer to Agilent MXG Signal Generator Configuration Guide, literature number 5989-5485EN.

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

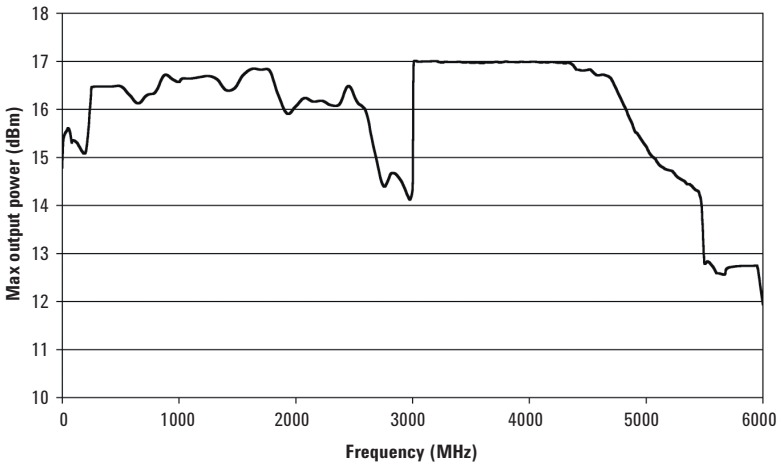
Measured maximum available output power



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.

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

Maximum available output power



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

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

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

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