Agilent N5182A MXG Vector Signal Generator

Data Sheet

Performance optimized for manufacturing

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

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 0.01° increments

Frequency bands [2]

Band	*Frequency range*	*N*
1	100 kHz to < 250 MHz	0.5
2	250 to < 375 MHz	0.125
3	375 to < 750 MHz	0.25
4	750 to < 1500 MHz	0.5
5	1500 to < 3000.001 MHz	1
6	3000.001 to 6000 MHz	2

Switching speed [3, 4]

Type	*Standard*	*Option UNZ*
Digital modulation off		
SCPI mode	≤ 5 ms (typ)	≤ 1.15 ms
List/Step sweep mode	≤ 5 ms (typ)	≤ 900 µs
Digital modulation on		
SCPI mode	≤ 5 ms (typ)	≤ 1.15 ms
List/Step sweep mode	≤ 5 ms (typ)	≤ 900 µs

1. Performance below 250 kHz is unspecified except as indicated.
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.

Accuracy

± aging rate
± temperature effects
± line voltage effects

Internal time base reference oscillator aging rate

≤ ± 5 ppm/10 yrs, < ± 1 ppm/yr

Temperature effects

± 1 ppm (0 to 55 °C)

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)	

Digital sweep modes

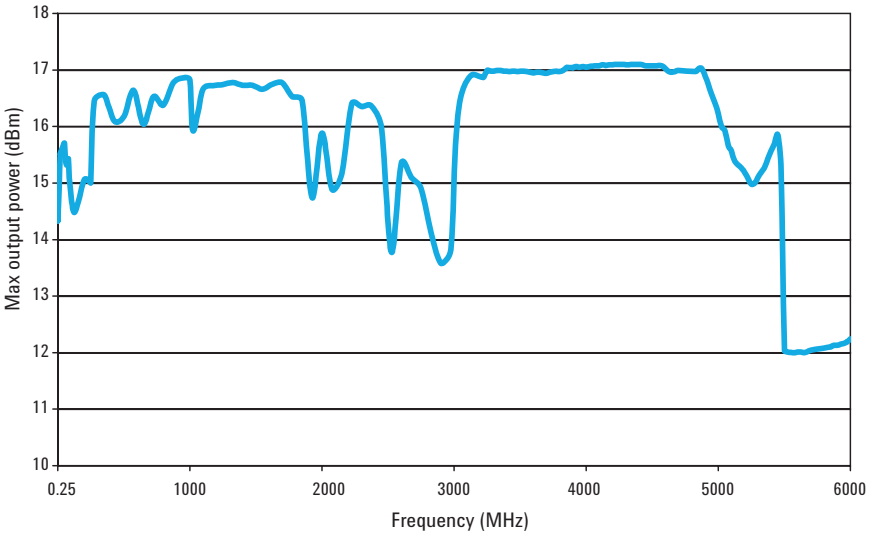
Operating modes	Step sweep (equally or logarithmically spaced frequency steps) List sweep (arbitrary list of frequency steps) Can also simultaneously sweep amplitude and waveforms. See amplitude and baseband generator sections for more detail.
Sweep range	Within instrument frequency range
Dwell time	100 µs to 100 s
Number of points	2 to 65535 (step sweep) 1 to 1601 (list sweep)
Step change	Linear or logarithmic
Triggering	Free run, trigger key, external, timer, bus (GPIB, LAN, USB)

Amplitude

Output power

Range [1]	*Standard*	*Option 1EQ* [2]
100 kHz to 250 kHz [3]	–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



Resolution 0.02 dB (nom)

Step attenuator 0 to 130 dB in 5 dB steps, electronic type

Connector 50 Ω (nom)

SWR [4]

≤ 2.1 GHz	1.4:1 (typ)
> 2.1 GHz to 4 GHz	1.5:1 (typ)
> 4.0 GHz to 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)

1. Quoted specifications between 20 and 30 °C. Maximum output power typically decreases by 0.2 dB/ °C for temperatures outside this range.
2. Settable to –144 dBm with option 1EQ, but unspecified below –127 dBm.
3. Specification from 100 to 250 kHz applies to units with serial numbers ending with 47400000 or greater. For units with lower serial numbers refer to the data sheet shipped with the unit.
4. SWR values apply to units with serial numbers ending with 47400000 or greater. For units with lower serial numbers refer to the data sheet shipped with the unit.

Switching speed [1]

Type	*Standard*	*Option UNZ*
Digital modulation off		
SCPI mode	≤ 5 ms (typ)	≤ 750 µs
List/Step sweep mode	≤ 5 ms (typ)	≤ 500 µs
Digital modulation on		
SCPI mode	≤ 5 ms (typ)	≤ 1.15 ms
List/Step sweep mode	≤ 5 ms (typ)	≤ 900 µs

Absolute level accuracy in CW mode [2] [ALC on]

	Standard		*Option 1EQ*
	+7 [3] 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	±0.7 dB	±0.9 dB	±1.4 dB
> 3 to 4 GHz	±0.8 dB	±0.9 dB	±1.0 dB
> 4 to 6 GHz	±0.8 dB	±1.1 dB	±1.3 dB

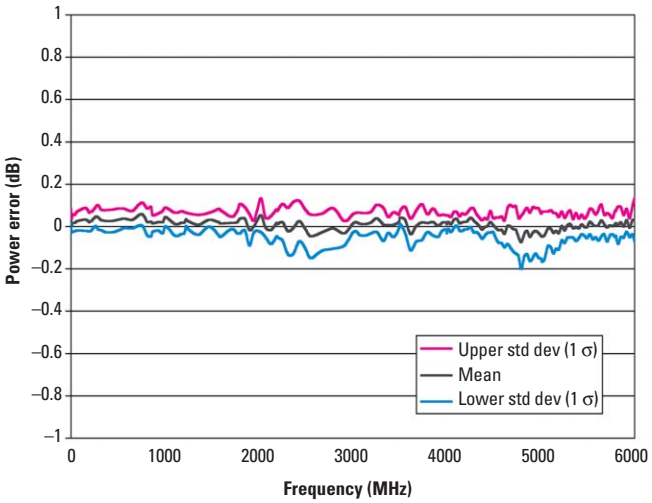
1. Time from receipt of SCPI command or trigger signal to amplitude settled within 0.2 dB. For units with serial numbers ending in 47400000 or less, switching speed is specified for power levels < +5 dBm.
2. Quoted specifications between 20 °C and 30 °C. For temperatures outside this range, absolute level accuracy degrades by 0.01 dB/°C for frequencies ≤ 4.5 GHz and 0.02 dB/°C for frequencies > 4.5 GHz.
3. Level accuracy specified to +7 dBm or maximum specified output power, whichever is lower.
4. Specification from 100 to 250 kHz applies to units with serial numbers ending with 47400000 or greater. For units with lower serial numbers refer to the data sheet shipped with the unit.

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

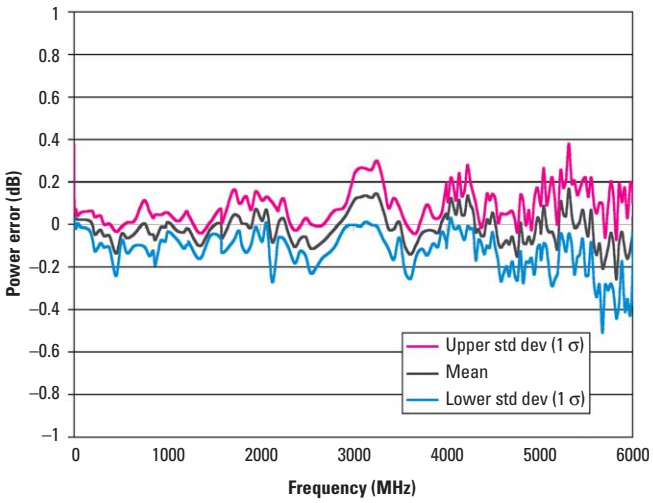
Absolute level accuracy in digital I/Q mode [ALC on, relative to CW]

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

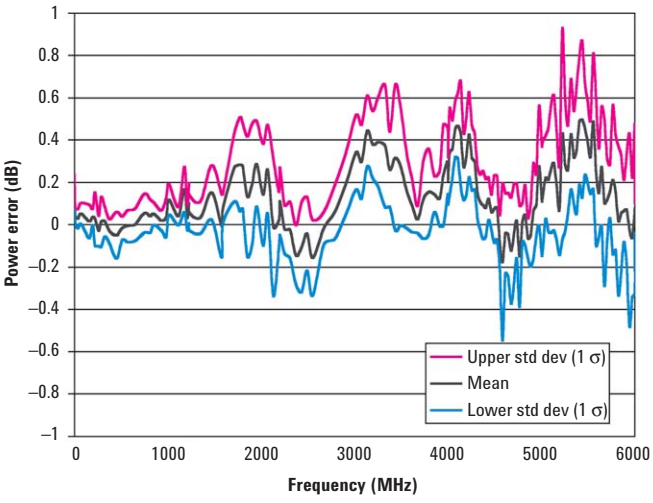
Level accuracy at –110 dBm

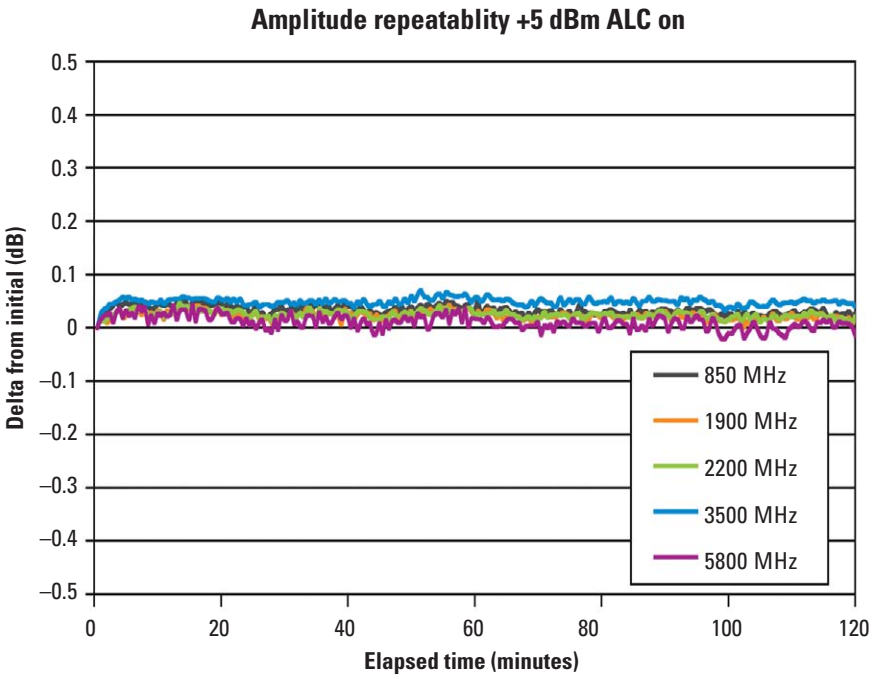


Level accuracy at –130 dBm

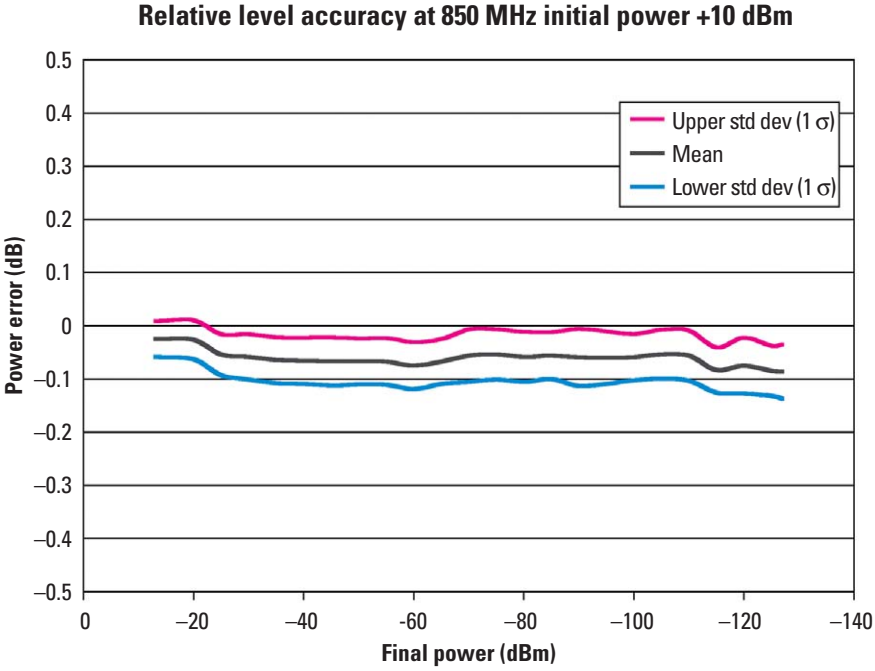


Level accuracy at –140 dBm



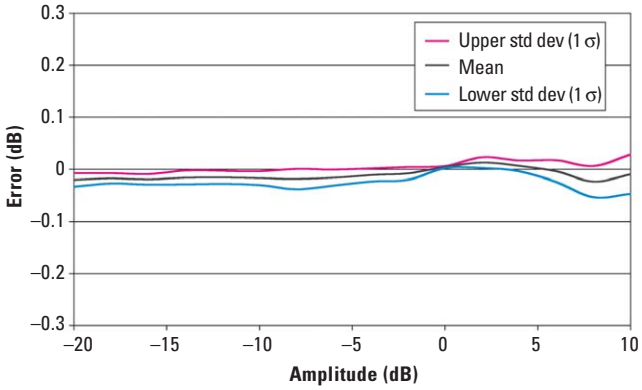


Repeatability measures the ability of the instrument to return to a given power setting after a random excursion to any other frequency and power setting. It should not be confused with absolute level accuracy.

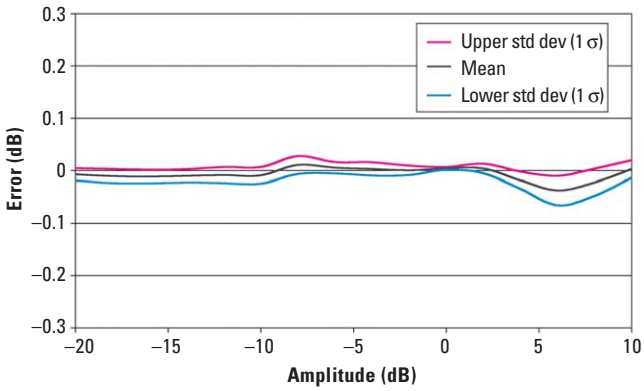


Relative level accuracy measures the accuracy of a step change from any power level to any other power level. This is useful for large changes (i.e. 5 dB steps).

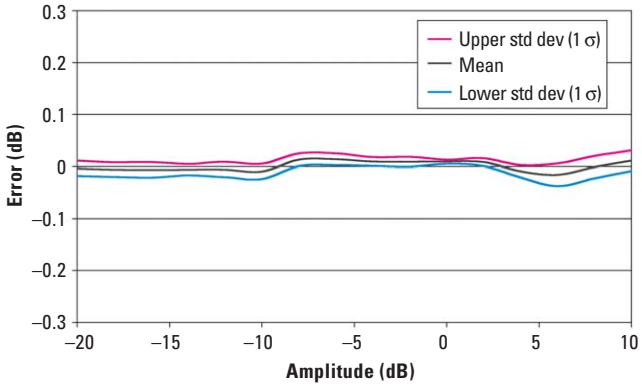
ALC linearity 850 MHz, CW, relative to 0 dBm



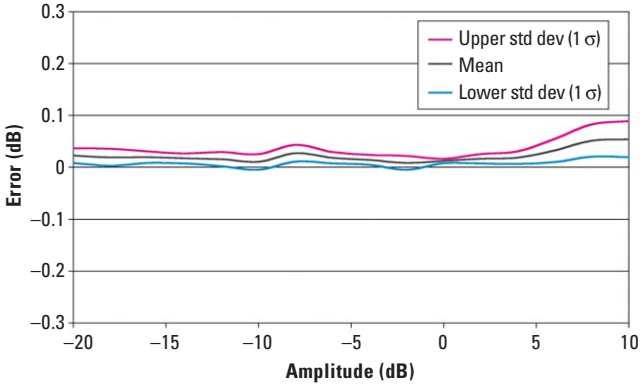
ALC linearity 1900 MHz, CW, relative to 0 dBm



ALC linearity 2200 MHz, CW, relative to 0 dBm

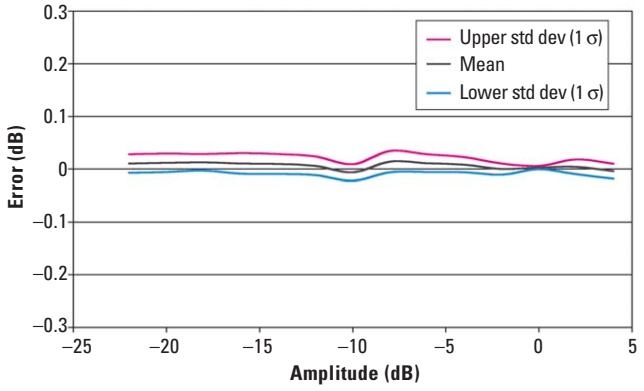


ALC linearity 3500 MHz, CW, relative to 0 dBm



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	1601
Number of tables	Dependent on available free memory in instrument

Digital sweep modes

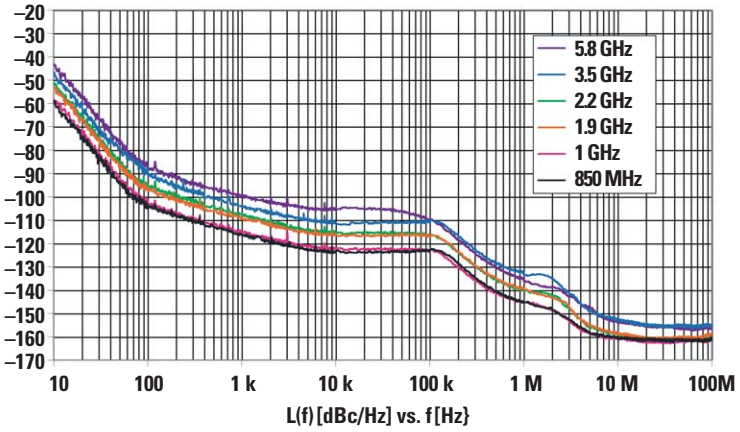
Operating modes	Step sweep (evenly spaced amplitude steps) List sweep (arbitrary list of amplitude steps) Can also simultaneously sweep frequency and waveforms. See frequency and baseband generator sections for more detail.
Sweep range	Within instrument amplitude range
Dwell time	100 µs to 100 s
Number of points	2 to 65535 (step sweep) 1 to 1601 (list sweep)
Step change	Linear
Triggering	Free run, trigger key, external, timer, bus (GPIB, LAN, USB)

Spectral Purity

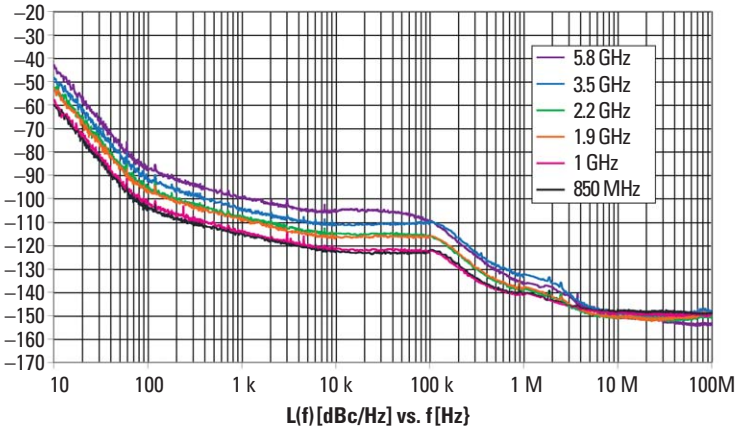
Single sideband phase noise [at 20 kHz offset]

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



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

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

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

Nonharmonics [1] [CW mode]

	> 10 kHz offset
250 kHz to 250 MHz	< –54 dBc, < –70 dBc (typ)
> 250 to 375 MHz	< –61 dBc, < –81 dBc (typ)
> 375 to 750 MHz	< –55 dBc, < –73 dBc (typ)
> 750 MHz to 1.5 GHz	< –48 dBc, < –62 dBc (typ)
> 1.5 to 3 GHz	< –48 dBc, < –62 dBc (typ)
> 3 to 6 GHz	< –42 dBc, < –56 dBc (typ)

Subharmonics [1] [CW mode]

250 kHz to 4 GHz	< –68 dBc
> 4 to 5 GHz	< –64 dBc
> 5 to 5.5 GHz	< –50 dBc
> 5.5 to 6 GHz	< –46 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	155 MB/s	1 kHz to 5 MHz	47	75
2.488 GHz	2488 MB/s	5 kHz to 20 MHz	178	72

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

(Option UNT)

Max deviation	N times 20 MHz (nom)	
Resolution	0.1% of deviation or 1 Hz, which ever is greater (nom)	
Deviation accuracy [1 kHz rate, deviation is N x 100 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 + (Nx1 Hz) [1]
		< ±0.06% of set deviation + (Nx1 Hz) (typ) [2]
Distortion [1 kHz rate, deviation is N x 100 kHz]		< 0.4%
Sensitivity when using external input		+1V peak for indicated deviation (nom)

Phase modulation

(Option UNT)

Modulation deviation and frequency response:

	Max dev	*3 dB bandwidth*
Normal BW	N times 10 radians (nom)	DC to 1 MHz (nom)
High BW mode	N time 1 radian (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 [3]

(Option UNT)

AM depth type	Linear or exponential
Depth	
Maximum	90%
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. Specification valid for temperature changes of less than ± 5 °C since last DCFM calibration.
2. Typical performance immediately after a DCFM calibration.
3. AM is specified at carrier frequencies from 500 kHz to 3 GHz, power levels ≤ ±4 dBm, and depths ≤ 90%.

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 (typ)
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)
Pulse overshoot	< 15% (typ)
Pulse compression	15 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	+1Vpeak = ON (nom)
Internal pulse generator	
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	500 ns to 42 seconds (nom)
Pulse width	500 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

Narrow pulse modulation

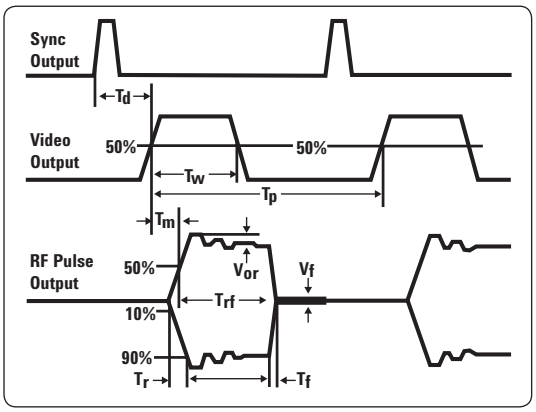
(Option UNW) [1]

	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)	< 10 ns (7 ns)
Minimum pulse width		
Internally leveled	≥ 2 us (typ)	≥ 2 us (typ)
ALC off [2]	≥ 20 ns (typ)	≥ 20 ns (typ)

1. Pulse specifications apply to frequencies > 500 MHz. Operable down to 10 MHz.
2. With power search on.

Repetition frequency		
Internally leveled	10 Hz to 500 kHz	10 Hz to 500 kHz
ALC off [1]	dc to 5 MHz	dc to 10 MHz
Level accuracy (relative to CW)		
Internally leveled	< ±1.0 dB	< ±1.0 dB
ALC off [1]	< ±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 [2]	< 250 mv (typ)	< 10 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



Internal analog modulation source

(Option UNT)

Waveform	Sine
Rate range	100 mHz to 2 MHz
Resolution	1 mHz
Frequency accuracy	Same as RF reference source (nom)

External modulation inputs

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

Simultaneous modulation [3]

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.

1. With power search on.
2. Video feed through applies to power levels < +10 dBm.
3. 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)*	*sqrt [$I^2 + Q^2$] (rss)*	*RF output power* [4]
100 kHz to 250 MHz	132 mV	187 mV	0 dBm
> 250 MHz to 4.5 GHz	132 mV	187 mV	7 dBm
> 4.5 to 5.9 GHz	88 mV	124 mV	7 dBm
> 5.9 to 6 GHz	172 mV	243 mV	–1 dBm

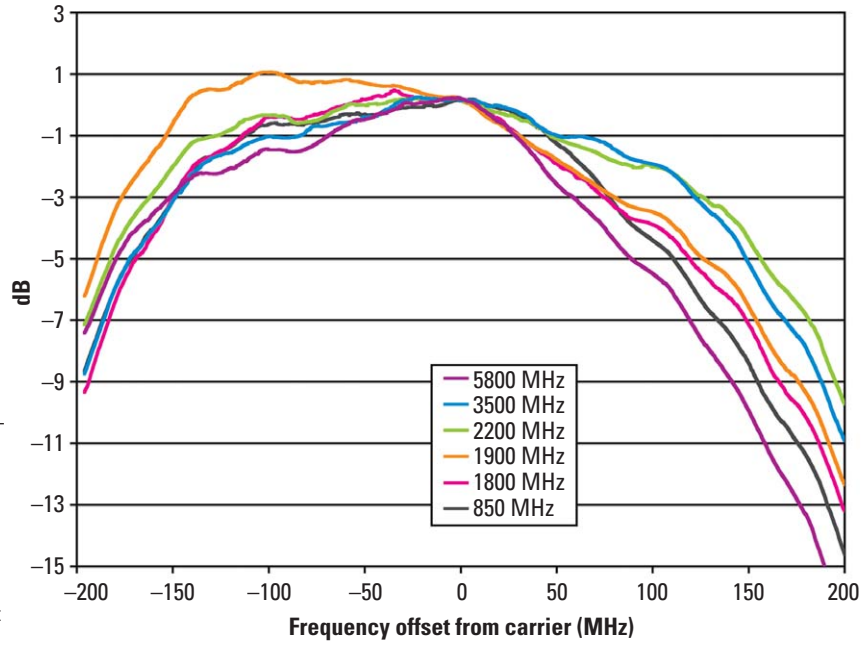
Internal I/Q from baseband generator

I offset	±20%
Q offset	±20%
I/Q gain	±1 dB
Quadrature angle adjustment	±10 °
I/Q skew	±800 ns
I/Q delay	±400 ns

External I/Q outputs

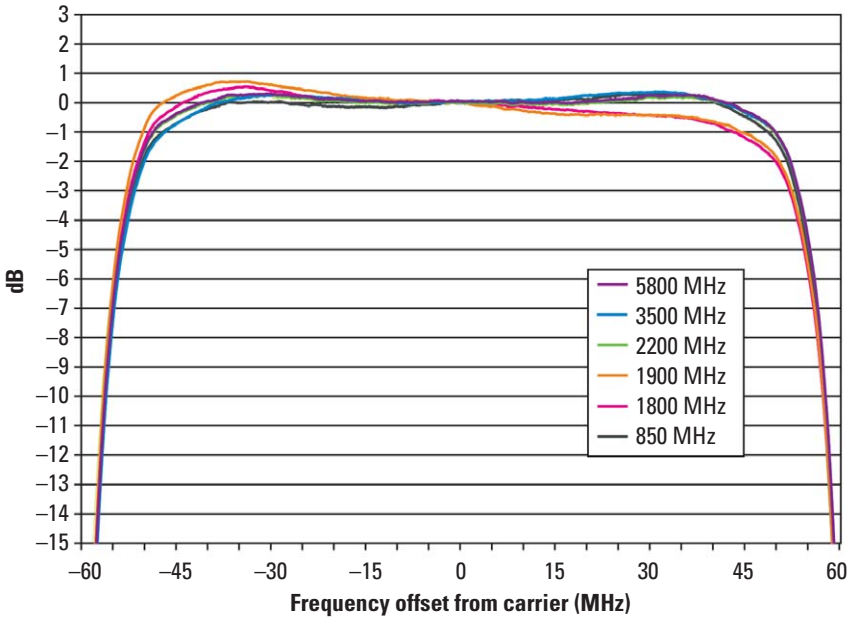
Impedance	50 Ω (nom) per output
	100 ohm (nom) differential output
Type	Single ended or differential (Option 1EL)
Maximum voltage per output	±2 V peak to peak; into high impedance
Bandwidth	50 MHz baseband (nom)
	100 MHz RF (nom)
Common mode I/Q offset	±5 V into high impedance
Differential mode I offset	±50 mV into high impedance
Differential mode Q offset	±50 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. A 1 dB increase in IQ drive levels is required for each dB increase in RF Output power above the values listed.

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	1 kSa/s to 30 MSa/s	24 MHz
Option 652	1 kSa/s to 60 MSa/s	48 MHz
Option 654	1 kSa/s to 125 MSa/s	100 MHz
Effective DAC resolution	11 bits	
	16 bits (Option UNV)	
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)

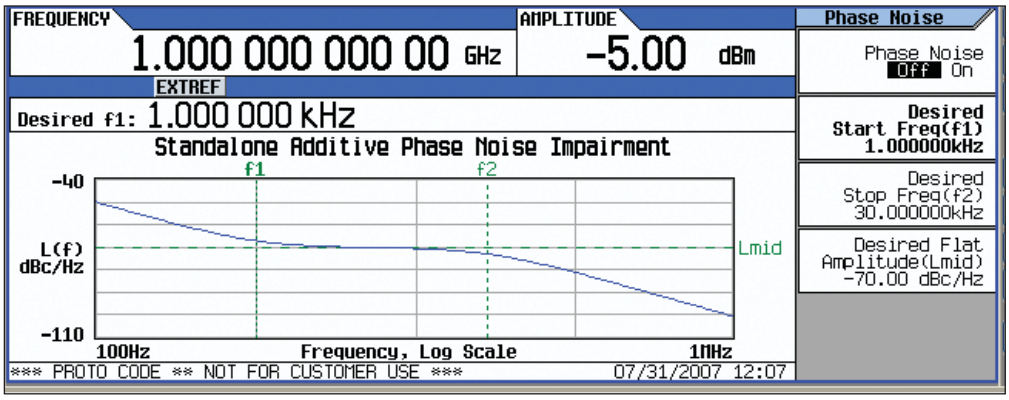
Digital sweep modes	In list sweep mode each point in the list can have independent waveforms along with user definable frequencies and amplitudes. See the amplitude and frequency sections for more detail.
Data transfer rates	
LAN to non-volatile storage	161 kSa/s (meas)
LAN to baseband generator	265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

Arbitrary waveform memory	
Maximum playback capacity	8 Msa, 64 Msa (Option 019)
Maximum storage capacity including markers	100 Msa
Waveform segments	
Segment length	60 samples to 8 MSa 60 samples to 64 MSa (Option 019)
Maximum number of segments in playback memory	1024, 8192 (Option 019)
Maximum number of segments in non-volatile memory	1024
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
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 delay time	8 ns to 30 s
External delay resolution	8 ns
Trigger latency	490 ns + 1 sample clock period (nom)
Trigger accuracy	±4 ns (nom)
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	1 ksps 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 80 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-D0	W-CDMA
Modulation type	GMSK (bursted)	3pi/8 8PSK (bursted)	OQPSK	QPSK
Modulation rate	270.833 ksps	270.833 ksps	1.2288 Mcps	3.84 Mcps
Channel configuration	1 timeslot	1 timeslot	pilot channel	1 DPCH
Frequency [3]	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
EVM power level	≤ 7 dBm	≤ 7 dBm	≤ 7 dBm	≤ 7 dBm
EVM	Global phase error Spec Typ rms 0.8 ° 0.2 ° peak 1.5 ° 0.6 °	Spec Typ 1.2% 0.7%	Spec Typ 1.3% 0.8%	Spec Typ 1.2% 0.8%

Format	802.11a/g	802.16e WiMAX [4]	QPSK [5]		16QAM [5]	
Modulation type	64QAM	64QAM	QPSK		16QAM	
Modulation rate	54 Mbps	—	4 MSps		4 MSps	
Frequency [3]	2400 to 2484 MHz 5150 to 5825 MHz	2300 to 2690 MHz 3300 to 3800 MHz	≤ 3 GHz	≤ 6 GHz	≤ 3 GHz	≤ 6 GHz
EVM power level	≤ –5 dBm	≤ 2 dBm	≤ 4 dBm	≤ 4 dBm	≤ 4 dBm	≤ 4 dBm
EVM	0.5% (measured)	0.4% (measured)	Spec Typ 1.2% 0.8%	Spec Typ 1.9% 1.1%	Spec Typ 1.1% 0.6%	Spec Typ 1.5% 0.9%

3GPP W-CDMA distortion performance

Offset	Configuration	Frequency [6]	Standard		Option UNV	
			Spec	Typ	Spec	Typ
Adjacent (5 MHz)	1 DPCH, 1 carrier [7]	1800 to 2200 MHz	–68 dBc	–70 dBc	–71 dBc	–73 dBc
Alternate (10 MHz)			–69 dBc	–70 dBc	–71 dBc	–75 dBc
Adjacent (5 MHz)	Test model 1 with	1800 to 2200 MHz	–64 dBc	–65 dBc	–71 dBc	–73 dBc
Alternate (10 MHz)	64 DPCH,1 carrier [7]		–67 dBc	–67 dBc	–71 dBc	–75 dBc
Adjacent (5 MHz)	Test Model 1 with	1800 to 2200 MHz	–57 dBc	–59 dBc	–65 dBc	–67 dBc
Alternate (10 MHz)	64 DPCH, 4 carrier [8]		–57 dBc	–60 dBc	–66 dBc	–68 dBc

3GPP2 cdma2000 distortion performance [7]

Offset	Configuration	Frequency [6]	Standard (typ)	Option UNV (typ)
885 kHz to 1.98 MHz	9 channel forward link	800 to 900 MHz 1800 to 1900 MHz	–78 dBc	–79 dBc
1.98 to 4 MHz			–83 dBc	–87 dBc
4 to 10 MHz			–88 dBc	–93 dBc

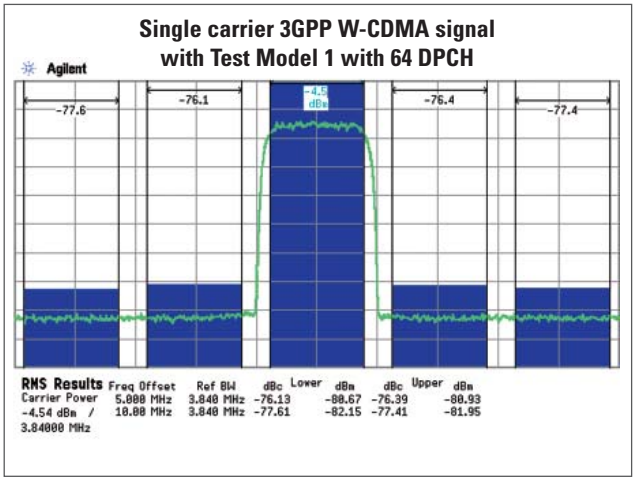
1. EVM specifications apply for the default ARB file setup conditions with the default ARB files supplied with the instrument.
2. EVM specifications apply after execution of an I/Q calibration when the instrument is maintained within ±5 °C of the calibration temperature.
3. Performance evaluated at bottom, middle and top of bands shown.
4. 802.16e WiMAX signal configuration: bandwidth: 10 MHz, FFT: 1024, frame length: 5ms, guard period: 1/8, symbol rolloff: 5%, content: 30 symbols of PN9 data.
5. The QPSK and 16QAM signals were tested with a root Nyquist filter with $\alpha = 0.25$.
6. Performance evaluated at bottom, middle and top of bands shown.
7. Specifications apply for power levels ≤ –7 dBm.
8. Specifications apply for power levels ≤–8 dBm.

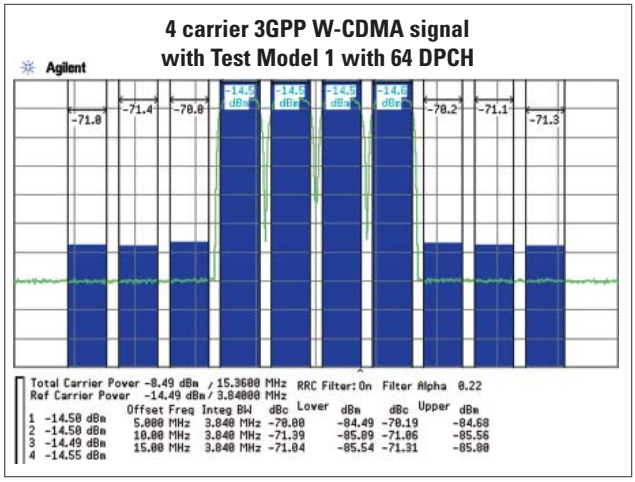
GSM / EDGE output RF spectrum (ORFS) [1]

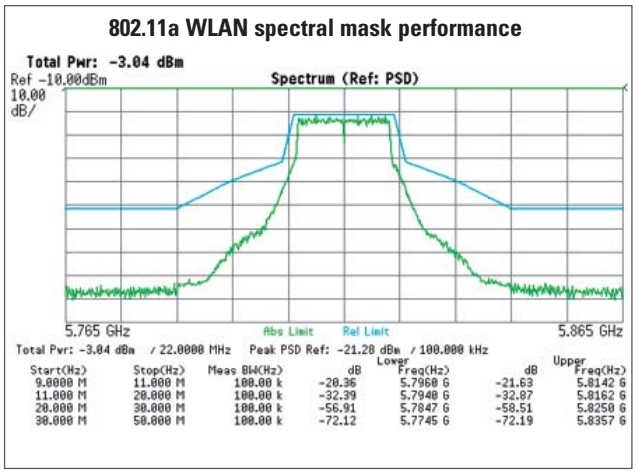
Offset	Configuration	Frequency [2]	GSM		EDGE	
			Standard (typ)	Option UNV (typ)	Standard (typ)	Option UNV (typ)
200 kHz	1 normal timeslot, bursted	800 to 900 MHz	–33 dBc	–37 dBc	–35 dBc	–39 dBc
400 kHz			–67 dBc	–71 dBc	–67 dBc	–71 dBc
600 kHz		1800 to 1900 MHz	–79 dBc	–83 dBc	–78 dBc	–82 dBc
800 kHz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

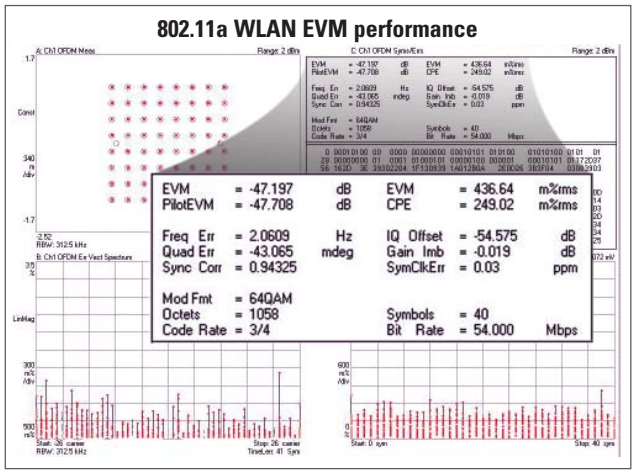
802.16e mobile WiMAX distortion performance [3]

Offet	Configuration [4, 5]	Frequency	Standard	Option UNV
10 MHz	QPSK modulation	2.5 and 3.5 GHz	–62 dBc (measured)	–66 dBc (measured)







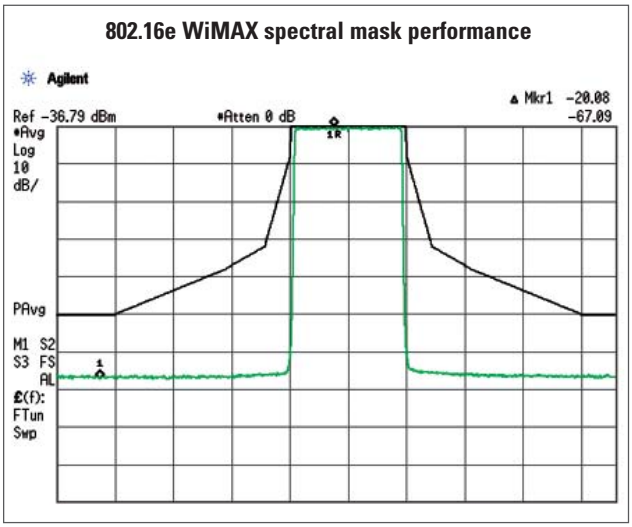


Signal configuration: OSR: 4
Window length: 16
Power level: 0 dBm
Carrier frequency: 5.805 GHz

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

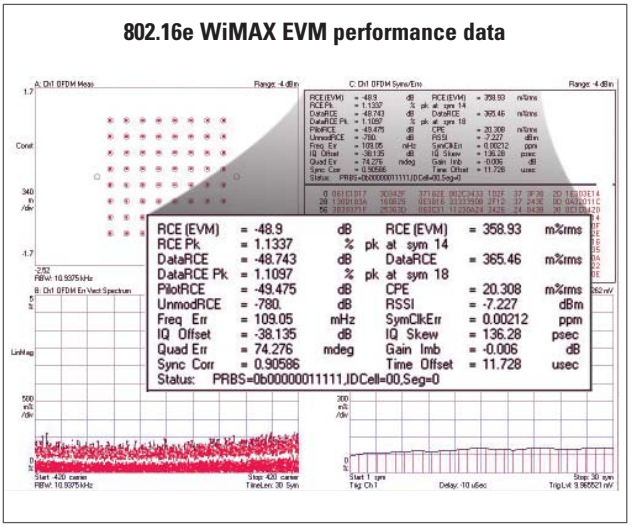
1. Specifications apply for power levels ≤+7 dBm.
2. Performance evaluated at bottom, middle and top of bands shown.
3. Specifications apply for power levels ≤ –7 dBm.
4. 802.16e WiMAX signal configuration: bandwidth: 10 MHz, FFT: 1024, frame length: 5ms, guard period: 1/8, symbol rolloff: 5%, content: 30 symbols of PN9 data.
5. Measurement configuration: reference channel integration BW: 9.5 MHz, offset channel integration BW: 9 MHz, channel offset: 10 MHz.

802.16e WiMAX spectral mask performance



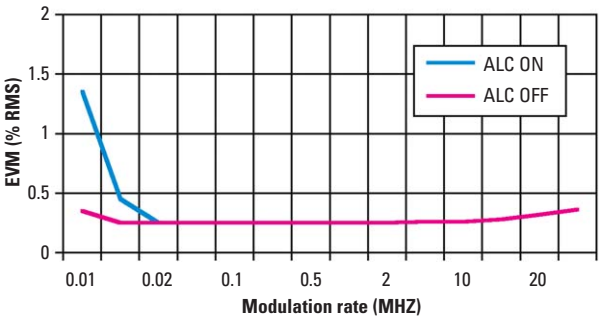
Signal configuration: Downlink signal, 30 symbols, QPSK, 10 MHz bandwidth
Power level: –7 dBm

802.16e WiMAX EVM performance data



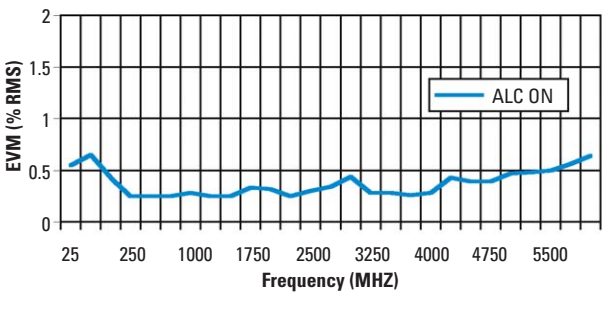
Signal configuration: Downlink signal, 30 symbols, 64QAM, 10 MHz bandwidth
Power level: –7 dBm

Measured EVM performance versus modulation rate



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

Measured EVM performance versus carrier frequency



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

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 a subset of common 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 to 120 VAC, 50 to 60 Hz
220 to 240 VAC, 50 to 60 Hz
250 W maximum

Operating temperature range
0 to 55 °C

Storage temperature range
–40 to 70 °C

Operating and storage altitude
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 is 512 MB 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.

Weight	≤ 12.5 kg (27.5 lb.) net, ≤ 27.2 kg (60 lb.) shipping
Dimensions	103 mm H x 426 mm W x 432 mm L [4.07 in H x 16.8 in W x 17 in L]
Recommended calibration cycle	24 months
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	Outputs the RF signal via a precision N type female connector.
I and Q inputs	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 waveforms, instrument states, and other files into or out of the instrument. Licenses can only be transferred into the instrument. 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)	Outputs the RF signal via a precision N type female connector.
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). This input is TTL and CMOS compatible. 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 2k Ω. Damage levels are ±15 V.
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.

1. All connectors are BNC unless otherwise noted.

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.
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.
Digital bus I/O	Reserved for future use.
Aux IO (25 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 compliant.
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
	1EQ	Low power (<-110 dBm)
	UNU	Pulse modulation
	UNW	Narrow pulse modulation
	UNT	AM, FM, phase modulation
	006	Instrument security
	1ER	Flexible reference input (1-50 MHz)
	1EM	Move RF output to rear panel
	UK6	Commercial calibration certificate with test data
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
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
	N7612A	Signal Studio for 802.16-2004 (WiMAX)
	N7612B	Signal Studio for TD-SCDMA
	N7615B	Signal Studio for 802.16 WiMAX
	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
Accessories	1CM	Rackmount kit
	1CN	Front handle kit
	1CP	Rackmount and front handle kit
	1CR	Rack slide kit
	ATX	Transit case

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

See the Agilent MXG Web page for the latest information

Get the latest news, product and support information, application literature, firmware upgrades and more.

www.agilent.com/find/MXG

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Agilent Open simplifies the process of connecting and programming test systems to help engineers design, validate and manufacture electronic products. Agilent offers open connectivity for a broad range of system-ready instruments, open industry software, PC-standard I/O and global support, which are combined to more easily integrate test system development.

LXI

www.lxistandard.org

LXI is the LAN-based successor to GPIB, providing faster, more efficient connectivity. Agilent is a founding member of the LXI consortium.

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