

N5185A MXG

Analog Signal Generator

Introduction

This data sheet provides key features and specifications for the N5185A MXG analog signal generator.



Table of Contents

Definitions and Conditions	3
Frequency	4
Frequency Reference.....	5
Output Power	6
Phase Noise	11
Spectral Purity	13
Pulse Modulation (Option PMR)	15
Analog Modulation	17
Corrections and De-Embedding (E7653APPC).....	20
Inputs and Outputs.....	21
Remote Programming	22
General Specifications	22
Related Literature.....	24

Definitions and Conditions

Specifications represent warranted performance of a calibrated instrument that has been stored for a minimum of 2 hours within the operating temperature 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) describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 80 percent of the units exhibit with a 90 percent confidence level at room temperature (approximately 25 °C). Typical performance does not include measurement uncertainty.

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

Measured (meas) describes 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).

Frequency

Frequency Options

Option	CW Frequency Range
N5186A-503	9 kHz to 3 GHz
N5186A-506	9 kHz to 6 GHz
N5186A-508	9 kHz to 8.5 GHz

Frequency Resolution

CW	0.00001 Hz
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Phase Adjustments

Adjustable in nominal 0.1° increments

Relative Phase Adjustments ¹ (Option PCH)

Relative phase offset range	± 180°
Relative phase offset resolution	0.001°
Relative phase repeatability	0.0001° (nom) ²

Frequency Switching Speed ³, () = Typical

	Standard	Option UNZ
CW Mode		
SCPI mode	(≤ 8 ms)	(≤ 8 ms)
Step/ list mode	(≤ 5 ms)	≤ 900 us (≤ 800 us)

¹ Channel 1 relative to Channel 2, for example.

² When tuning from f1 to f2 and back to f1.

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.

Frequency Reference

Frequency Resolution

Internal time base reference oscillator aging rate ⁴	< $\pm 30 \times 10^{-9}$ /year after 30 days < $\pm 0.5 \times 10^{-9}$ /day after 30 days
Initial achievable calibration accuracy	$\pm 4 \times 10^{-8}$ or ± 40 ppb
Adjustment resolution	< 1.3×10^{-11}
Temperature effects	< $\pm 1 \times 10^{-8}$, nominal
Line voltage effects	< $\pm 1 \times 10^{-9}$ for $\pm 5\%$ change, nominal

Reference Output

Frequency	10 MHz or 100 MHz, user selectable
Amplitude	$\geq +6$ dBm, nominal into 50 Ω load at 10 MHz reference output $\geq +8$ dBm, nominal into 50 Ω load at 100 MHz reference output

External Reference Input

Input frequency, standard	10 MHz
Stability	Follows stability of external reference input signal
Lock range	± 1 ppm
Amplitude	-3 dBm to +20 dBm, nominal
Impedance	50 Ω , nominal
Waveform	Sine or square

Sweep Modes (Frequency and Amplitude)

Operating modes	Step sweep	Equally spaced frequency and amplitude or logarithmically spaced frequency steps
	List sweep	Arbitrary list of frequency and amplitude steps
Sweep range	Within instrument frequency range	
Dwell time	100 μ s to 100 s	
Number of points	Step sweep	2 to 65535
	List sweep	1 to 3201
Step change	Linear or logarithmic	
Triggering	Free run, trigger key, global trigger, external, timer, bus (GPIO, LAN, USB)	

Multi-Channel Baseband Synchronization Primary/Secondary (Option PCH)

Global trigger delay range	0 μ s to 6.82 μ s
Global trigger delay resolution	± 1.67 ns
Global trigger jitter	± 1.67 ns
Channel-to-channel relative trigger repeatability	< ± 5 ps

⁴ Not verified by Keysight N78000B ETMS Calibration and Adjustments Software. Daily aging rate may be verified as a supplementary chargeable service, on request.

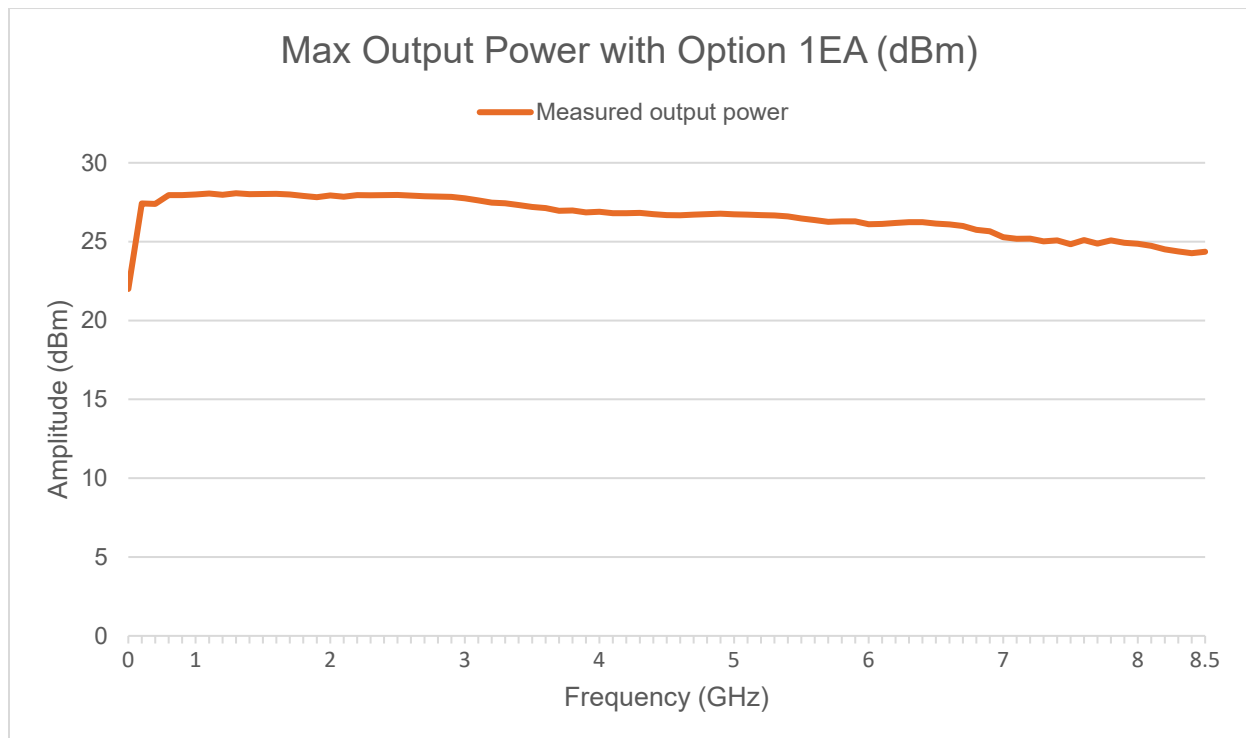
Output Power

Output Parameters

Settable range	+20 to -135 dBm (std) +30 to -135 dBm (option 1EA)
Resolution	0.01 dB
Connector ⁵	Type N 50 Ω , nominal
Maximum reverse power	20 W, 50 VDC (nom)
Attenuator type	Electronic

Maximum Output Power, () = Typical

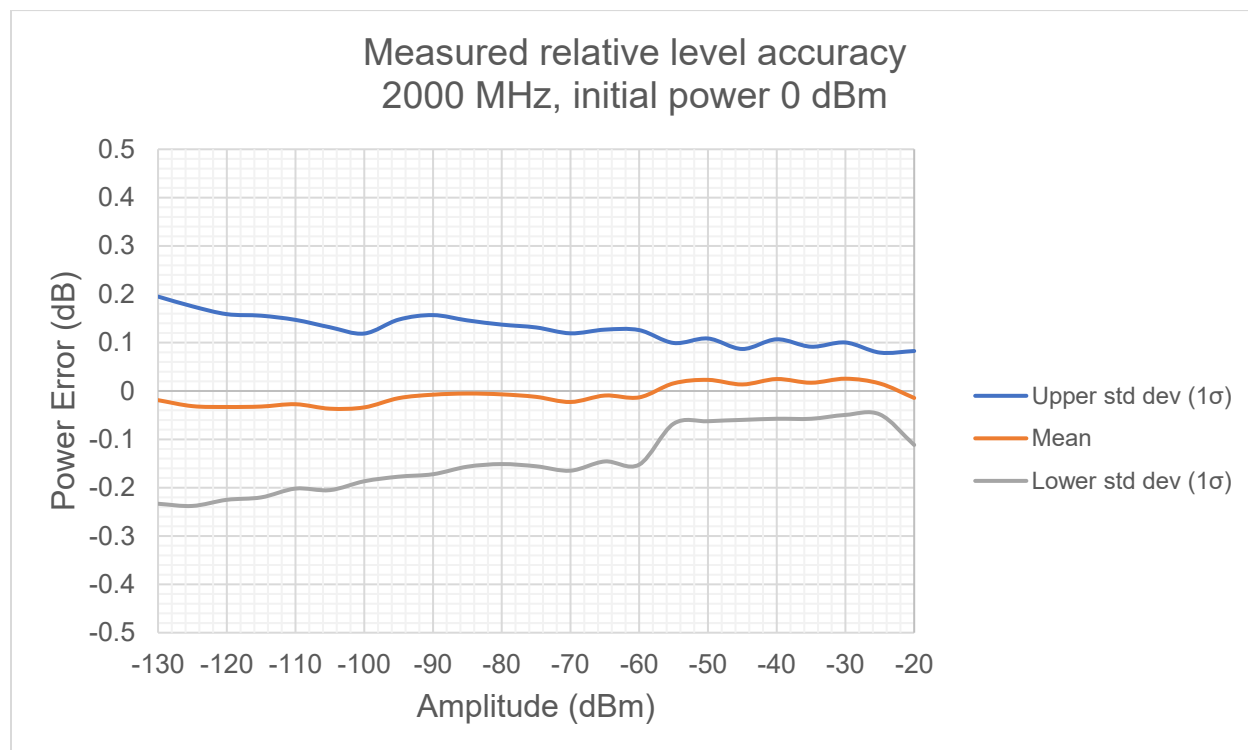
Frequency Range	Standard	Option 1EA
9 kHz to < 20 kHz	+1 dBm	+1 dBm (+4 dBm)
20 kHz to < 50 kHz	+7 dBm	+7 dBm (+10 dBm)
50 kHz to < 200 kHz	+12 dBm	+12 dBm (+14 dBm)
200 kHz to < 10 MHz	+15 dBm	+15 dBm (+19 dBm)
10 MHz to < 5 GHz	+18 dBm	+25 dBm (+26 dBm)
5 GHz to < 8 GHz	+18 dBm	+23 dBm (+25 dBm)
8 GHz to < 8.5 GHz	+18 dBm	+22 dBm (+24 dBm)



⁵ Connector type for configurations with options 1EM, 001, 002, 003, and 004 is 3.5 mm.

Absolute Level Accuracy (CW) ^{6, 7}, Temperature Range 20 To 30 °C, () = Typical

Frequency Range	+20 dBm to +15 dBm (Option 1EA)	< +15 dBm to +5 dBm	< +5 dBm to -60 dBm	< -60 dBm to -95 dBm	< -95 dBm to -110 dBm	< -110 dBm to -130 dBm (Option 1EQ)
9 kHz to < 100 kHz	-	-	± 3.1 dB (± 1.5 dB)	(± 2.7 dB)	-	-
100 kHz to 10 MHz	± 1.1 dB (± 0.5 dB)	± 0.8 dB (± 0.2 dB)	± 1.0 dB (± 0.5 dB)	± 1.5 dB (± 0.7 dB)	-	-
>10 MHz to < 270 MHz	± 2.3 dB (± 1.6 dB)	± 1.3 dB (± 0.6 dB)	± 1.2 dB (± 0.5 dB)	± 2.0 dB (± 1.2 dB)	± 2.7 dB (± 1.2 dB)	± 2.7 dB (± 1.2 dB)
270 MHz to < 800 MHz	± 0.9 dB (± 0.4 dB)	± 0.9 dB (± 0.3 dB)	± 0.8 dB (± 0.3 dB)	± 0.8 dB (± 0.3 dB)	± 0.9 dB (± 0.3 dB)	± 0.9 dB (± 0.3 dB)
800 MHz to < 5 GHz	± 0.8 dB (± 0.3 dB)	± 0.8 dB (± 0.3 dB)	± 0.8 dB (± 0.3 dB)	± 0.9 dB (± 0.3 dB)	± 1.3 dB (± 0.6 dB)	± 1.3 dB (± 0.6 dB)
5 GHz to < 7 GHz	± 1.0 dB (± 0.3 dB)	± 1.0 dB (± 0.3 dB)	± 1.0 dB (± 0.4 dB)	± 1.1 dB (± 0.5 dB)	± 1.5 dB (± 0.7 dB)	± 1.5 dB (± 0.7 dB)
7 GHz to 8.5 GHz	± 1.3 dB (± 0.5 dB)	± 1.2 dB (± 0.4 dB)	± 1.1 dB (± 0.5 dB)	± 1.4 dB (± 0.6 dB)	± 1.9 dB (± 0.8 dB)	± 1.9 dB (± 0.8 dB)

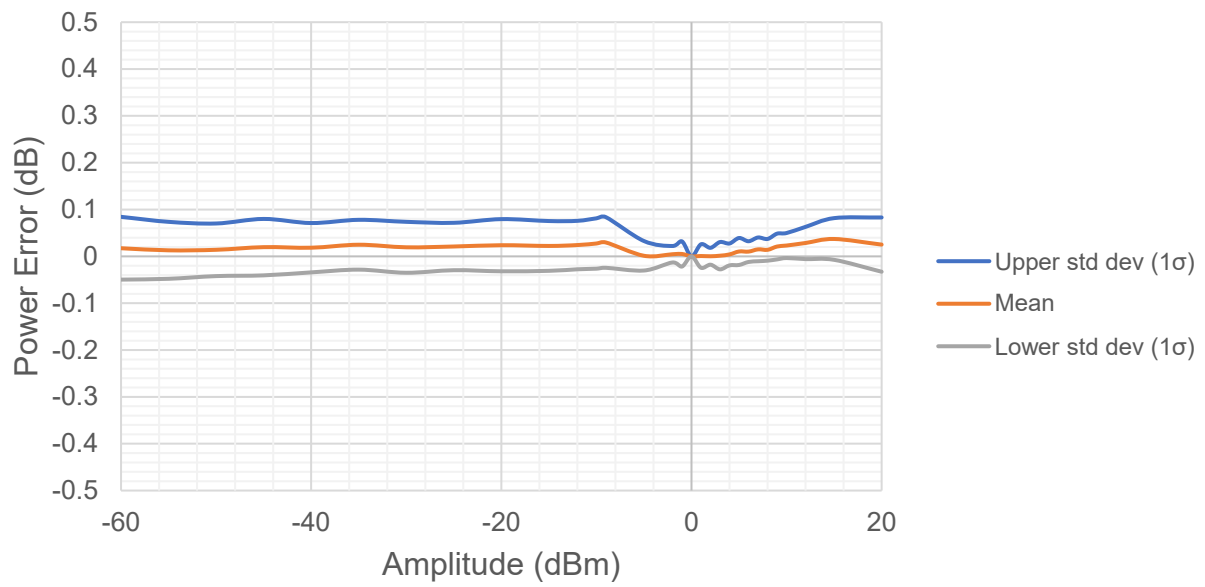


Relative level accuracy measures the accuracy of a step change from any power level to any other power level. This is useful for large changes (such as 5 dB steps).

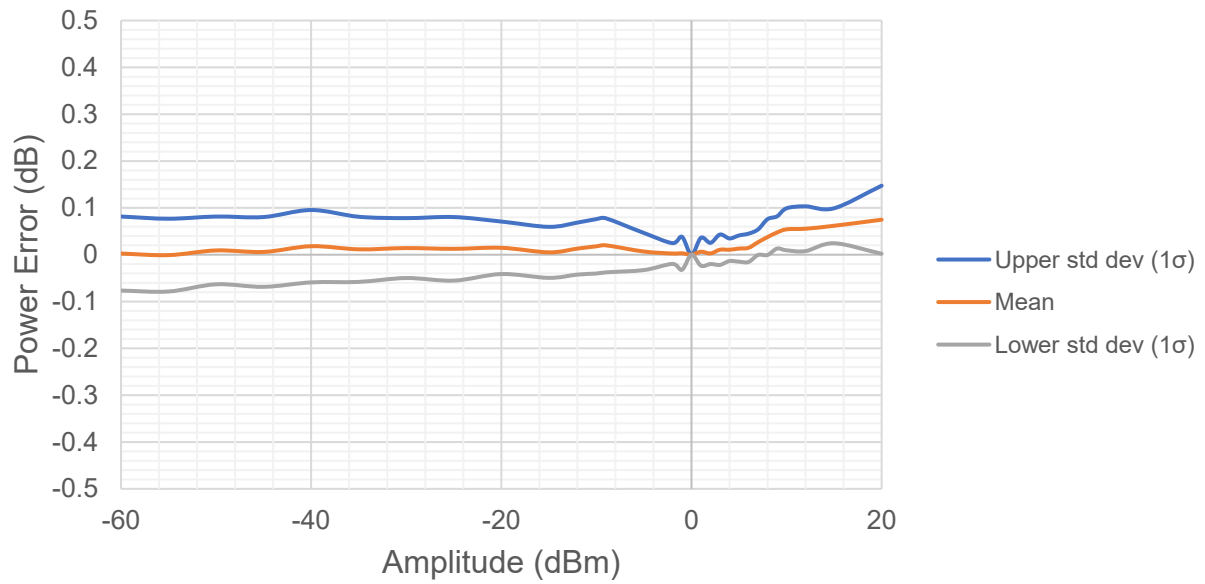
⁶ Specifications apply for power alignments > 800 MHz.

⁷ Performance operating below 20 kHz frequency is not warranted if the power level is set below -85 dBm.

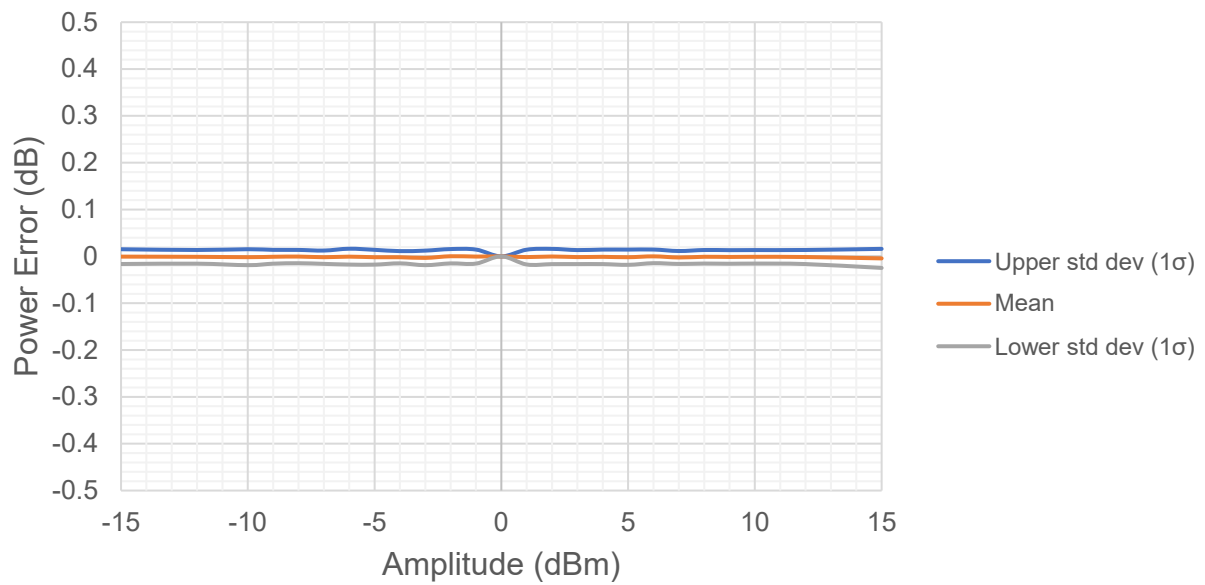
Measured linearity
840 MHz, CW, relative to 0 dBm



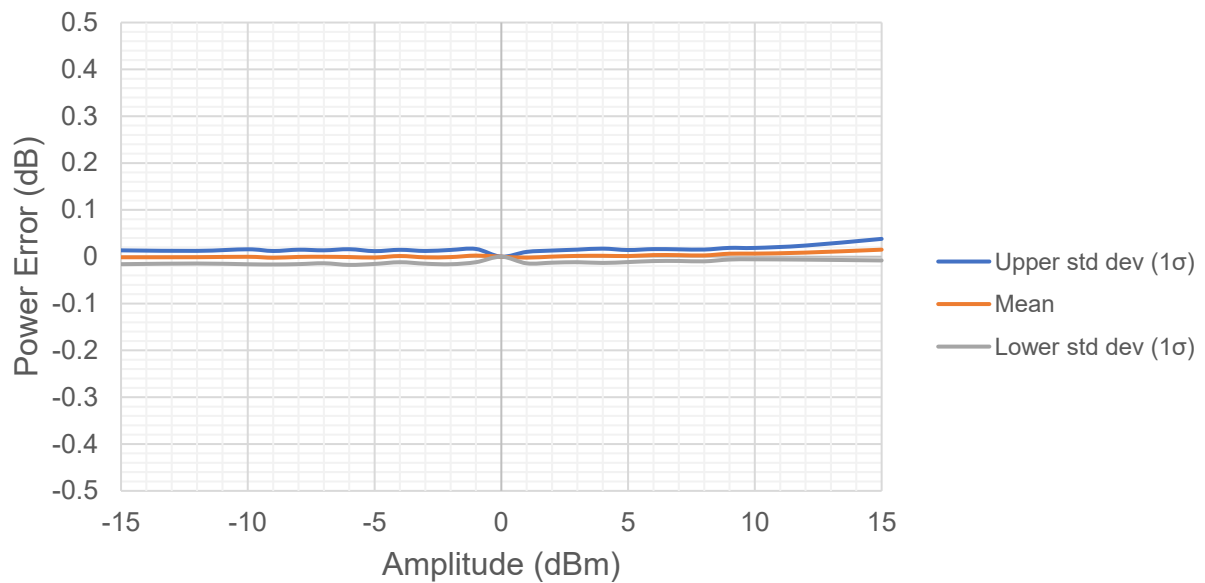
Measured linearity
2000 MHz, CW, relative to 0 dBm

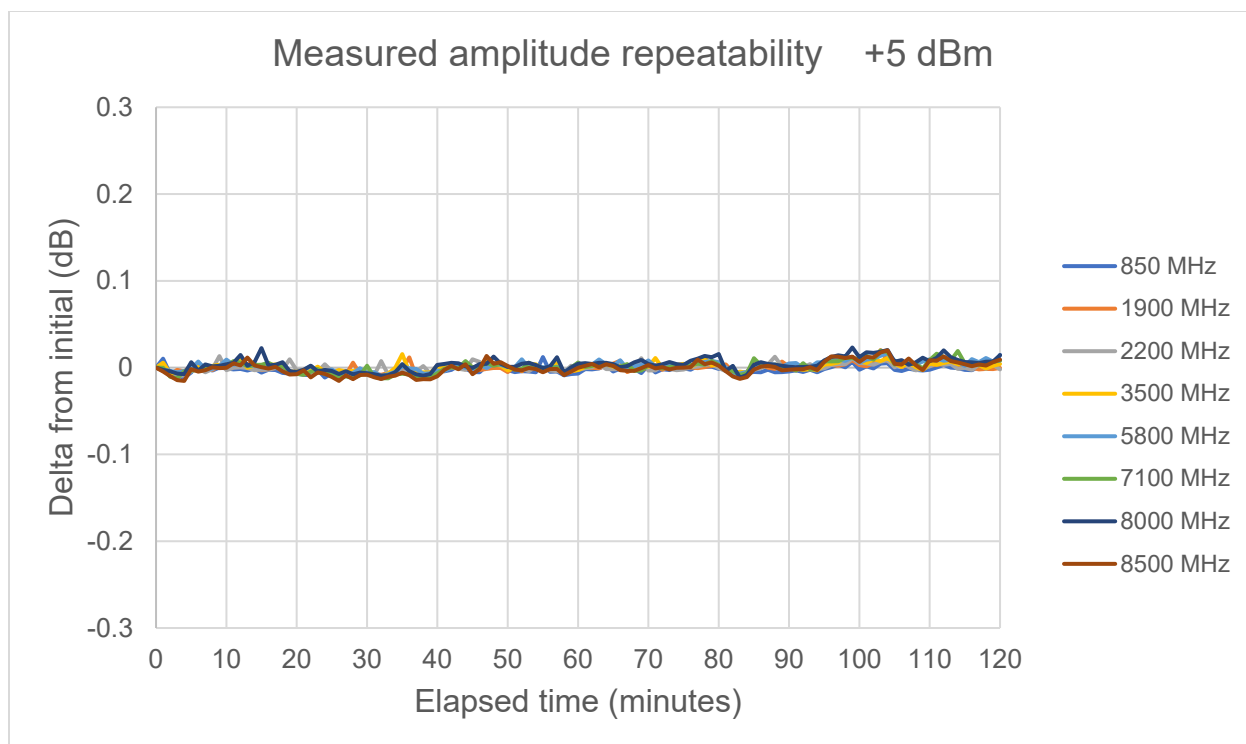


Measured linearity with all attenuator states held
840 MHz, CW, relative to 0 dBm



Measured linearity with all attenuator states held
2000 MHz, CW, relative to 0 dBm





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

VSWR, Measured

Frequency Range	Option UNM	Option 1EM
30 kHz to < 60 kHz	< 3.0:1	< 3.0:1
60 kHz to < 800 kHz	< 2.0:1	< 2.0:1
800 kHz to < 1 MHz	< 1.7:1	< 1.7:1
1 MHz to < 10 MHz	< 1.25:1	< 1.25:1
10 MHz to < 30 MHz	< 2.1:1	< 2.1:1
30 MHz to < 6.8 GHz	< 1.5:1	< 1.5:1
6.8 GHz to 8.5 GHz	< 1.9:1	< 1.7:1

Amplitude Switching Speed ⁸, () = Typical

CW Mode	Standard	Option UNZ
SCPI mode	(≤ 8 ms)	n/a
Step/ list mode	(≤ 5 ms)	≤ 500 us (≤ 400 us)

⁸ Time from receipt of SCPI command or trigger signal to amplitude settled within 0.2 dB.

Phase Noise

Absolute SSB Phase Noise (CW in Enhanced SNR Mode At +10 dBm) (Dbc/Hz), Standard, Temperature Range 20 To 30 °C, () = Typical

Frequency	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	100 MHz
100 MHz	(-89)	-103 (-110)	-120 (-126)	-140 (-146)	-143 (-148)	-143 (-148)	-141 (-149)	-141 (-148)	-
500 MHz	(-76)	-89 (-96)	-106 (-113)	-130 (-135)	-136 (-140)	-136 (-140)	-150 (-157)	-150 (-157)	(-157)
1 GHz	(-70)	-84 (-90)	-99 (-106)	-124 (-129)	-129 (-134)	-129 (-134)	-150 (-157)	-150 (-158)	(-158)
2 GHz	(-64)	-77 (-84)	-93 (-100)	-117 (-123)	-123 (-128)	-123 (-127)	-146 (-154)	-150 (-158)	(-158)
3 GHz	(-60)	-74 (-80)	-89 (-96)	-114 (-120)	-119 (-124)	-119 (-124)	-144 (-152)	-152 (-158)	(-158)
4 GHz	(-59)	-71 (-77)	-87 (-94)	-112 (-117)	-116 (-122)	-116 (-121)	-141 (-150)	-151 (-157)	(-158)
6 GHz	(-55)	-68 (-74)	-84 (-90)	-108 (-114)	-113 (-118)	-113 (-118)	-137 (-146)	-149 (-155)	(-155)
8 GHz	(-53)	-66 (-72)	-82 (-88)	-105 (-111)	-111 (-116)	-110 (-115)	-134 (-144)	-146 (-153)	(-153)

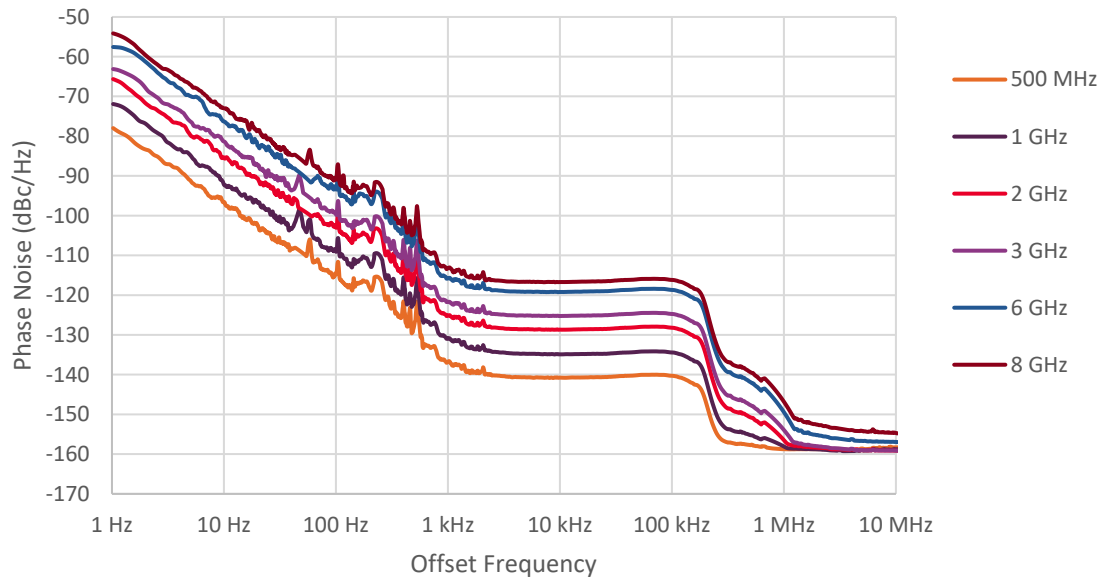
Absolute SSB Phase Noise (CW in Enhanced SNR Mode At +10 dBm) (Dbc/Hz), Option EP3, Temperature Range 20 To 30 °C, () = Typical

Frequency	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	100 MHz
100 MHz	(-90)	-103 (-110)	-120 (-126)	-140 (-146)	-143 (-149)	-143 (-149)	-141 (-149)	-141 (-148)	-
500 MHz	(-76)	-89 (-96)	-106 (-112)	-130 (-136)	-140 (-146)	-140 (-146)	-150 (-157)	-150 (-157)	(-157)
1 GHz	(-69)	-84 (-90)	-99 (-106)	-123 (-129)	-133 (-139)	-133 (-139)	-149 (-157)	-150 (-158)	(-158)
2 GHz	(-64)	-78 (-84)	-93 (-99)	-117 (-123)	-126 (-132)	-127 (-132)	-146 (-154)	-150 (-158)	(-158)
3 GHz	(-60)	-74 (-80)	-89 (-96)	-114 (-120)	-123 (-129)	-123 (-129)	-144 (-152)	-152 (-158)	(-158)
4 GHz	(-58)	-72 (-78)	-87 (-93)	-111 (-117)	-119 (-125)	-121 (-126)	-141 (-150)	-150 (-157)	(-157)
6 GHz	(-55)	-68 (-74)	-84 (-91)	-107 (-114)	-117 (-123)	-117 (-123)	-137 (-146)	-149 (-155)	(-156)
8 GHz	(-53)	-66 (-72)	-81 (-88)	-104 (-111)	-115 (-120)	-115 (-120)	-134 (-144)	-147 (-153)	(-153)

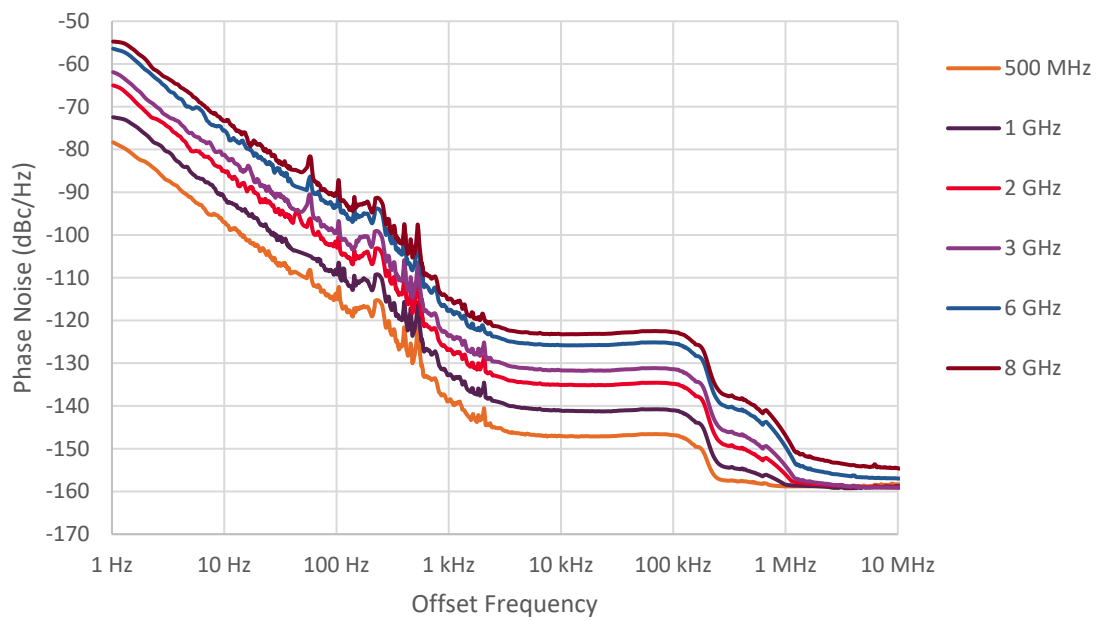
Absolute SSB Phase Noise (CW in Enhanced SNR Mode At +10 dBm) (Dbc/Hz), Option EP4, Temperature Range 20 To 30 °C, () = Typical

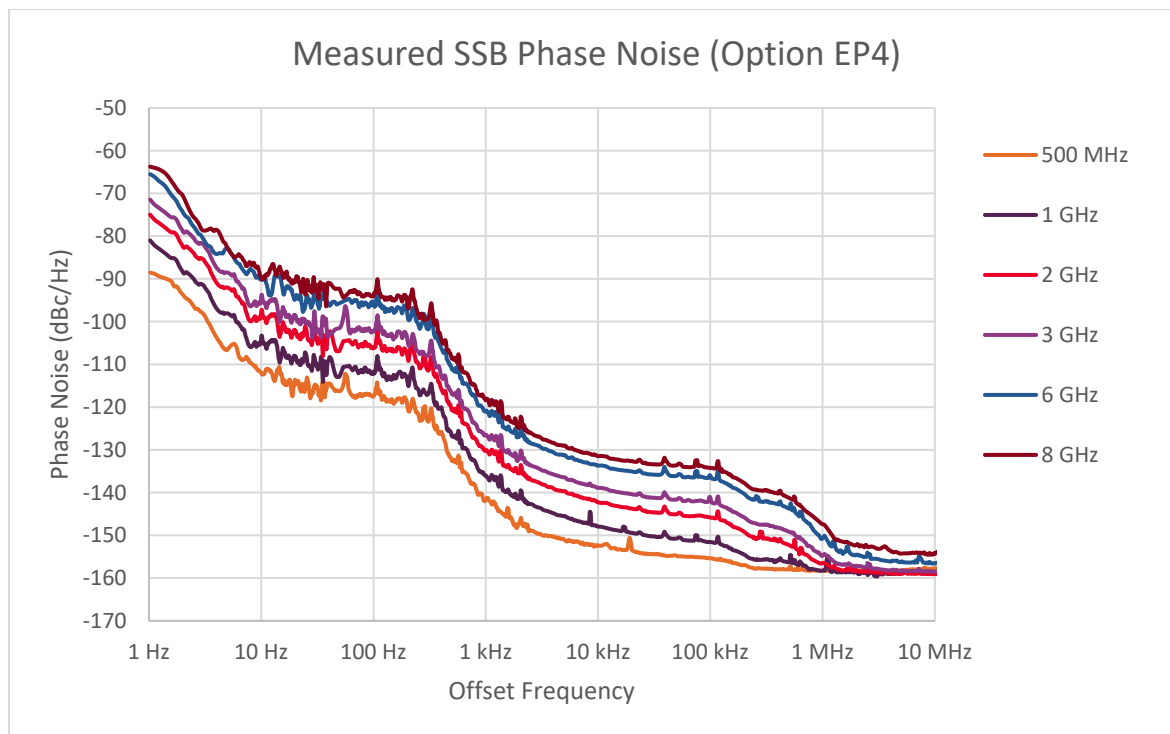
Frequency	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	100 MHz
100 MHz	(-92)	-111 (-118)	-121 (-127)	-139 (-146)	-148 (-152)	-148 (-153)	-146 (-153)	-145 (-152)	-
500 MHz	(-78)	-95 (-104)	-106 (-113)	-131 (-138)	-144 (-151)	-149 (-154)	-150 (-157)	-151 (-157)	(-157)
1 GHz	(-71)	-88 (-96)	-100 (-107)	-125 (-132)	-141 (-146)	-146 (-150)	-149 (-157)	-151 (-158)	(-158)
2 GHz	(-65)	-83 (-92)	-93 (-101)	-120 (-127)	-135 (-141)	-139 (-144)	-149 (-155)	-151 (-158)	(-158)
3 GHz	(-63)	-80 (-88)	-89 (-97)	-117 (-123)	-133 (-138)	-136 (-141)	-145 (-153)	-151 (-158)	(-158)
4 GHz	(-60)	-78 (-86)	-86 (-94)	-114 (-121)	-130 (-136)	-132 (-138)	-143 (-151)	-151 (-157)	(-158)
6 GHz	(-56)	-73 (-81)	-84 (-91)	-111 (-118)	-128 (-133)	-130 (-135)	-140 (-148)	-149 (-156)	(-156)
8 GHz	(-53)	-70 (-79)	-81 (-88)	-108 (-115)	-125 (-130)	-128 (-132)	-136 (-145)	-147 (-153)	(-154)

Measured SSB Phase Noise (Standard)



Measured SSB Phase Noise (Option EP3)





Spectral Purity

Harmonics (CW), () = Typical

Frequency Range	$\leq +10$ dBm	$\leq +12$ dBm
9 kHz to 100 kHz	(<-30 dBc) ⁹	n/a
> 100 kHz to 3 GHz	<-35 dBc (-41 dBc)	<-33 dBc (-39 dBc)
> 3 GHz to 4.25 GHz	<-30 dBc (-34 dBc)	(<-32 dBc)
> 4.25 GHz to 8.5 GHz	(<-34 dBc)	(<-32 dBc)

Non-Harmonics (CW), > 10 kHz Offset, +10 dBm, Temperature Range 20 to 30 °C, () = Typical

Frequency Range	Standard (+10 dBm)	Option EP3 / EP4
9 kHz to < 15 MHz	-52 dBc	-52 dBc (-59 dBc)
15 MHz to < 30 MHz	-60 dBc	-60 dBc (-68 dBc)
30 MHz to < 8.5 GHz	-75 dBc	-80 dBc

Subharmonics

None

⁹ Measured at 0 dBm or maximum specified power, whichever is less.

Fixed Spurs, +10 dBm

Frequency Range	
300 MHz	-77 dBc
DAC spur ($19.2 \text{ GHz} - 2f_{\text{out}}$)	-67 dBc
DAC spur ($3f_{\text{out}} - 19.2 \text{ GHz}$)	-69 dBc

Jitter ¹⁰, Measured

Carrier Frequency	RMS Jitter			$\mu\text{UI rms}$		
	Standard	Option EP3	Option EP4	Standard	Option EP3	Option EP4
155 MHz	30.8 fs	26.97 fs	26.83 fs	4.8	4.2	4.2
622 MHz	18.95 fs	12.8 fs	11.51 fs	11.8	8	7.2
2.488 GHz	16.14 fs	8.23 fs	6.17 fs	40.2	20.5	15.4

Secondary DDS Tone Generator (Option CW1)

Enables a secondary DDS tone generator that can reduce the 2nd harmonic tone. Compatible only with harmonic products of CW signals; not compatible with harmonic products of modulated signals.

Carrier Settings

Carrier frequency range	9 kHz to 8.5 GHz
Carrier amplitude range	+10 to -50 dBm (nom)

Secondary DDS Tone Generator Settings

Frequency range	9 kHz to 8.5 GHz
Amplitude range	-10 to -70 dBc (nom)
Phase range	-180° to +180° (nom)
Maximum tone improvement ¹¹	Up to 15 dB (nom)

¹⁰ Calculated from phase noise performance at +10 dBm (CW in enhanced SNR mode).

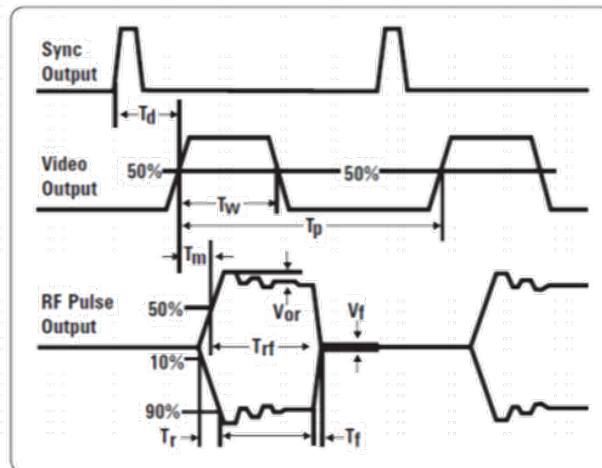
¹¹ Phase setting of the secondary DDS tone generator varies depending on the phase of the 2nd harmonic tone.

Pulse Modulation (Option PMR)

Pulse Modulation ¹², () = Typical

On/off ratio	(105 dB)	
Rise/fall times	10 ns (8 ns)	
Minimum pulse width	20 ns	
Level accuracy (relative to CW)	< ± 1 dB (± 0.3 dB)	
Width compression	(± 5 ns)	
Video feed-through ¹³	(< 85 mV)	
External video delay	Internal ¹⁴	320 ns, nominal
	External	120 ns, nominal
RF delay	5 ns, nominal	
Pulse overshoot	(< 15%)	
Input level	High-level	0.575 V, nominal
	Low-level	0.425 V, nominal

- T_d video delay (variable)
- T_w video pulse width (variable)
- T_p Pulse period (variable)
- T_m RF delay
- T_{rf} RF pulse width
- T_f RF pulse fall time
- T_r RF pulse rise time
- V_{or} pulse overshoot
- V_f video feedthrough



¹² Specifications apply to center frequencies ≥ 100 MHz and powers set to ≥ -10 dBm. Operable down to 9 kHz.

¹³ Applies to power level < +10 dBm.

¹⁴ Applies to externally triggered internal pulse modulation.

Internal Pulse Generator (Option PMR)

Modes	Square, free run, triggered, adjustable doublet	
Square wave rate	0.1 Hz to 25 MHz	
Signal routing	Pulse trigger input	Pulse In
	Pulse sync output	Event 1
	Pulse video output	Event 2
Pulse period	30 ns to 42 s	
Pulse width	20 ns to (42 s – 10 ns)	
Resolution	10 ns	
Settable delay	Square	(-10 ns + 10 ns) to (5 s – 10 ns)
	Free run	(-42 s + 10 ns) to (42 s – 30 ns)
	Triggered	0 to (42 s – 30 ns)
Pulse doublets	1 st pulse delay	0 to (42 s – 30 ns)
	1 st pulse width	20 ns to (42 s – 10 ns)
	2 nd pulse delay	0 to (42 s – 30 ns)
	2 nd pulse width	20 ns to (42 s – 10 ns)

Analog Modulation

Frequency Bands

Band #	Frequency Range
1	9 kHz to < 10 MHz
2	10 MHz to < 8.5 GHz

Frequency Modulation (Option UNT)

		Internal	External
Max deviation		± 500 MHz (nom)	
Resolution		0.1% of deviation or 1 Hz, whichever is greater (nom)	
Deviation accuracy @ 1 kHz rate	Deviation ≤ 1 MHz (Deviation ≤ 5 MHz, typical)	$< \pm 1.5\%$ of setting + 20Hz	$< \pm 1.5\%$ of setting + 20 Hz, typical
	5 MHz < deviation ≤ 10 MHz	$< \pm 2\%$ of setting + 20Hz, typical	$< \pm 2\%$ of setting + 20 Hz, typical
Modulation frequency response @ 100 kHz deviation	0.5 dB bandwidth	DC/50 kHz to 3 MHz (nom)	
	1 dB bandwidth	DC/50 kHz to 10 MHz (nom)	
Carrier frequency accuracy		$< \pm 0.2\%$ of set deviation (nom)	
Total harmonic distortion @ 1 kHz rate, 1 MHz deviation		$< 0.4\%$	$< 0.4\%$, typical

Phase Modulation (Option UNT)

		Internal	External
Max deviation		600MHz / rate or 12π , whichever is less (nom)	
Resolution		0.1% of deviation (nom)	
Frequency response, 3 rad deviation, 3 dB bandwidth		DC/50 kHz to 10 MHz (nom)	
Deviation accuracy @ 1 kHz rate		$< \pm 0.5\% + 0.01$ rad, typical	$< \pm 0.5\% + 0.01$ rad, typical
Total harmonic distortion @ 1 kHz rate, 1 rad deviation		$< 0.2\%$, typical	

Amplitude Modulation (Option UNT)

				Internal		External	
				Linear	Exponential	Linear	Exponential
Maximum depth				100% (nom)	40 dB (nom)	100% (nom)	40 dB (nom)
Depth resolution				0.1% (nom)	0.01 dB (nom)	0.1% (nom)	0.01 dB (nom)
Depth accuracy @ 1 kHz rate, ≤ 80% depth ^{15, 16}		f ≤ 3 GHz		< ± 1.5% of setting + 1% (0.5% of setting + 1%, typ)	< ± 1 dB (typ)	< ± 0.5% of setting + 1%, typ	< ± 1 dB (typ)
Total harmonic distortion @ 1 kHz rate		f < 5 MHz	30% depth	< 0.25% (typ)			
			80% depth	< 0.5% (typ)			
		5 MHz ≤ f < 2 GHz	30% depth	< 2%		< 2% (typ)	
			80% depth				
		2 ≤ f < 3 GHz	30% depth	< 2% (typ)			
			80% depth				
Frequency response, 30% depth, 1 dB bandwidth				DC/50 kHz to 10 MHz (nom)			

Simultaneous and Composite Modulation

Simultaneous modulation	All modulation types (I/O, FM, AM, Φ M, and pulse modulation) may be simultaneously enabled except: FM and phase modulation cannot be combined and two modulation types cannot 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).					
Composite modulation	AM, FM, and Φ M each consist of two modulation paths which are summed internally for composite modulation; modulation can be any combination of internal or external sources					
	AM	FM	PM	Pulse	Internal	External
AM	+	+	+	+	n/a	n/a
FM	+	+	-	+	n/a	n/a
PM	+	-	+	+	n/a	n/a
Pulse	+	+	+	-	n/a	n/a
Internal	n/a	n/a	n/a	n/a	n/a	n/a
External	n/a	n/a	n/a	n/a	n/a	n/a
+ = Compatible - = Not Compatible * = Internal and External						

EXT1 & EXT2 external analog modulation inputs

Channel 1 Only. Requires Option UNT.	
Modulation type	AM, FM, ΦM
Input amplitude	AM: -1 V for indicated depth, ±1 V range
	FM, ΦM: -1 V for indicated deviation, ±1 V range
	±5 V damage levels
Input impedance	50 Ω, 600 Ω, 100 kΩ, selectable
Coupling	DC- and AC-coupling, selectable

¹⁵ Specifications apply to power levels at -12 dBm and +10 dBm.

¹⁶ External exponential AM depth accuracy applies with a 1 VDC input signal.

Standard Internal Analog Modulation Source

(Single sine wave generator for use with AM, FM, phase modulation requires Option UNT or 303)

Waveform	Sine, square, triangle, positive ramp, negative ramp
Rate range	0.1 Hz to 2 MHz (tunable to 3 MHz)
Resolution	0.1 Hz
Frequency accuracy	Same as RF reference source, nominal
LF output	0 to 5 V peak into 50 Ω , -1V to 5 V offset, nominal. Applicable to channel 1 only.

Frequency Parameters

Sine wave	0.01 Hz to 100 MHz
Triangle, square, ramp, pulse	0.01 Hz to 10 MHz (nom)
Noise BW	10 MHz (nom)
Resolution	0.01 Hz

Multifunction Generator (Option 303)

The multifunction generator option (Option 303) consists of seven waveform generators that can be set independently with up to five simultaneously using the composite modulation features in AM, FM/PM, and LF out.

Function generator 1	Sine, triangle, square, ramp, pulse
Function generator 2	Sine, triangle, square, ramp, pulse
Dual function generator	Sine, triangle, square, ramp, phase offset, and amplitude ratio for Tone 2 relative to Tone 1
Swept function generator	Sine, triangle, square, ramp Trigger: free run, trigger key, bus, external, internal, global trigger (option PCH)
Noise generator 1	Uniform, Gaussian
Noise generator 2	Uniform, Gaussian
DC	Only for LF output -1 V to +5 V, nominal

Corrections and De-Embedding (E7653APPC)

User Defined Automatic Channel Response Correction and S-Parameter De-Embedding (E7653APPC)

Methods for Fixture Error Removal

Scatter parameters de-embedding/embedding files generated by a network analyzer or simulation

Automatic channel response correction using a power sensor or spectrum analyzer (amplitude and phase correction)

Scalar user flatness (absolute power correction)

Scatter Parameters

File format	.s2p, .csv
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Number of cascable calibration sets	4
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User Flatness

File format	.ufiat, .csv
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Entry modes	USB or LAN direct power meter control
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Inputs and Outputs

Front Panel Connectors

RF output	Outputs the RF signal via a precision Type-N female connector; see output section for reverse power protection information
USB 2.0	Type-A connector used with a memory stick for transferring instrument states, licenses and other files into or out of the instrument.
USB 3.0	Outputs 2 A at 15 V.

Rear Panel Connectors

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.		
RF output (Option 1EM)	1 channel configuration	Outputs the RF signal via a precision Type-N female connector
	2 channel configuration	Outputs the RF signal via a precision Type-N female connector
	4 channel configuration	Outputs the RF signal via a 3.5 mm female connector
EXT1 In	BNC connector accepts analog input signal for AM, FM, and Φ M. Selectable 50 Ω , 600 Ω , 100 k Ω nominal input impedance. Selectable DC- or AC- coupling. Damage levels are ± 5 V.	
EXT2 In	BNC connector accepts analog input signal for AM, FM, and Φ M. Selectable 50 Ω , 600 Ω , 100 k Ω nominal input impedance. Selectable DC- or AC- coupling. Damage levels are ± 5 V.	
Event 1-3	Channel 1	BNC connector. The marker signal can also be routed internally to control the RF blanking.
	Channels 2-4	SMB connector; only events 1-2. The marker signal can also be routed internally to control the RF blanking.
Trigger 1-5 / STrig In	Channel 1	BNC connector. Accepts CMOS signal with minimum pulse width of 10 ns. Damage levels are $> +5.5$ V and < -2 V.
	Channels 2-4	SMB connector, only triggers 1-5. Accepts CMOS signal with minimum pulse width of 10 ns. Damage levels are $> +5.5$ V and < -2 V.
Pulse In	Channel 1	BNC connector; see Internal Pulse Generator table for more information. Input threshold 0.5 V nominal. Damage levels are $> +5$ V and < -4.5 V.
	Channels 2-4	SMB connector; see Internal Pulse Generator table for more information. Input threshold 0.5 V nominal. Damage levels are $> +5$ V and < -4.5 V.
LF OUT / SWEEP OUT	BNC connector outputs the internal analog modulation source signal. -1V to +5V nominal output into 50 Ω . Nominal 50 Ω output impedance.	
Reference input	BNC connector; accepts a 10 MHz reference signal used to frequency lock the internal timebase. Input damage level is +16 dBm.	
10 MHz out (Ref Out)	BNC connectors outputs the 10 MHz reference signal used by internal timebase; level nominally +3.9 dBm; nominal output impedance 50 Ω .	
USB	Type-A	Copy files to and from removable storage devices.
	Type-B	Provides remote programming functions via SCPI over USBTMC/USB488.
LAN (1000 BaseT)	The LAN connector provides the same SCPI remote programming functionality as the GPIB connector and is also used to access the internal Web server and FTP server. Supports DHCP, sockets SCPI, VXI-11 SCPI, connection monitoring, dynamic hostname services, TCP keep alive. LXI class C compliant	
GPIB	The micro GPIB connector provides remote programming functionality via SCPI.	

Remote Programming

Remote Programming

Interfaces	VXI-11 HiSlip SOCKET USB-488 GPIB USB Version-488
Control languages	Control languages SCPI Version 1997.0
Keysight IO libraries	Keysight's IO Library Suite helps you quickly establish an error-free connection between your PC and instruments – regardless of the vendor. It provides robust instrument control and works with the software development environment you choose.

General Specifications

Environmental Specifications and Regulatory Compliance

Temperature	Operating	1 channel	0 to 55 °C
		2 channel	0 to 50 °C
		4 channel	0 to 50 °C
	Storage	-40 to +70 °C	
Maximum relative humidity (non-condensing)	95%RH up to 40 °C, decreases linearly to 45%RH at 55 °C		
Operating and storage altitude	Up to 4,600 meters		
Indoor use	For indoor use only		
Environmental testing	Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation and enduse; 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 MILPRF28800F Class 3		
Safety	Complies with European Low Voltage Directive 2006/95/EC	IEC/EN 61010-1 ¹⁷ Canada: CSA C22.2 No. 61010-1 USA: UL std no. 61010-1 German Acoustic statement	
		Acoustic noise emission LpA < 77.5 dB Operator position Normal position Per ISO 7779	
		Geraeuschemission LpA < 77.5 dB Am Arbeitsplatz Normaler Betrieb Nach DIN 45635 t.19	
	Complies with European EMC Directive 2004/108/EC	IEC/EN 61326-1or IEC/EN 61326-2-1 CISPR Pub 11 Group 1, class A AS/NZS CISPR 11 ICES/NMB-001 2This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.	

¹⁷ AC line voltage dropouts (IEC 61000-4-11) of duration greater than 5 ms will cause the RF output to turn off until it is re-enabled by the operator, in order to protect internal hardware.

Power Requirements

Number of Channels	Maximum Frequency	Power Requirements	Average Power Consumption
1 (opt. 001)	3/6/8.5 GHz (opt. 503/506/508)	100/120 VAC, 50/60/400 Hz 220/240 VAC, 50/60/400 Hz 650 W Max	270 W nom.
2 (opt. 001, 002)	3/6/8.5 GHz (opt. 503/506/508)	100/120 VAC, 50/60/400 Hz 220/240 VAC, 50/60/400 Hz 650 W Max	380 W nom.
4 (opt. 001, 002, 003, and 004)	3/6/8.5 GHz (opt. 503/506/508)	100/120 VAC, 50/60/400 Hz 220/240 VAC, 50/60/400 Hz 650 W Max	550 W nom.

Physical Specifications

Configuration		1 Channel (001)	2 Channel (001/002)	4 Channel (001/002/003/004)
Weight		16.09 kg (or 35.47 lbs)	17.9 kg (39.46 lbs)	21.73 kg (or 47.91 lbs)
Dimensions	Height	88.25 mm (without feet)		
		102 mm (with feet)		
	Width with handles	474.7 mm		
	Width without handles	425.5 mm		
	Length with handles (including connectors)	591.1 mm		
	Length without handles (including connectors)	501.9 mm		
Display	Resolution	1280 x 400		
	Size	190.08 mm x 59.44 mm		

Data Storage

Internal	Removable solid-state drive (256 GB)
External	Supports USB 3.0/2.0 compatible memory devices

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.

Recommended Calibration Cycle

1 year

Related Literature

Publication Title	Publication Number
N5185A MXG Configuration Guide	3124-1731.EN

Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at www.keysight.com.



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