M9383A PXIe Microwave Signal Generator

1 MHz to 14, 20, 31.8 or 44 GHz

Introduction

This data sheet provides key features and specifications for the M9383A PXIe microwave signal generator.

KEYSIGHT

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Overview

The M9383A PXIe microwave signal generator is a compact modular instrument that provides frequency coverage from 1 MHz to 44 GHz, up to 1 GHz RF modulation bandwidth with an internal baseband generator, and over 2 GHz RF modulation bandwidth with external I/Q inputs. Based on the PXIe industry standard, the M9383A is highly configurable and expandable. The smallest configuration, a 14 GHz analog signal generator, can be used in simple LO or blocking applications, and the largest configuration, a 44 GHz vector signal generator, can be used for 5G applications. Many other configurations are possible, allowing the M9383A PXIe microwave signal generator to be customized for specific application requirements.

The compact PXIe form factor allows a customized M9383A signal generator to be placed side-by-side other PXIe instruments to provide a complete stimulus and response solution. The M9019A PXIe chassis has 18 available slots with one slot dedicated to the M9037A high-performance embedded controller. With the M9383A PXIe microwave signal generator installed in the M9019A PXIe chassis, 5 to 13 empty slots remain available for installing other PXIe modules. Keysight Technologies, Inc. has an extensive PXIe portfolio including vector signal analyzers, vector network analyzers, oscilloscopes, digitizers, multimeters, digital-to-analog converters, data acquisition units, and more. As technology moves forward, new PXIe modules can be installed to provide new capability in the M9019A chassis.

The PXIe platform provides a high-performance foundation for developing advanced measurement solutions. The high-speed, Gen3 backplane in the M9019A chassis moves data quickly between the controller and the M9383A modules, resulting in fast waveform loading and tuning speed. The M9037A high-performance embedded controller has the power to run the newest instrument control software. The configurability of PXIe modules provides customizable measurement solutions for market-specific needs. Use the power of PXIe to build up the system you need today with the confidence that it can be expanded with additional capability when your requirements change tomorrow.

Block Diagram

M9383A-F20

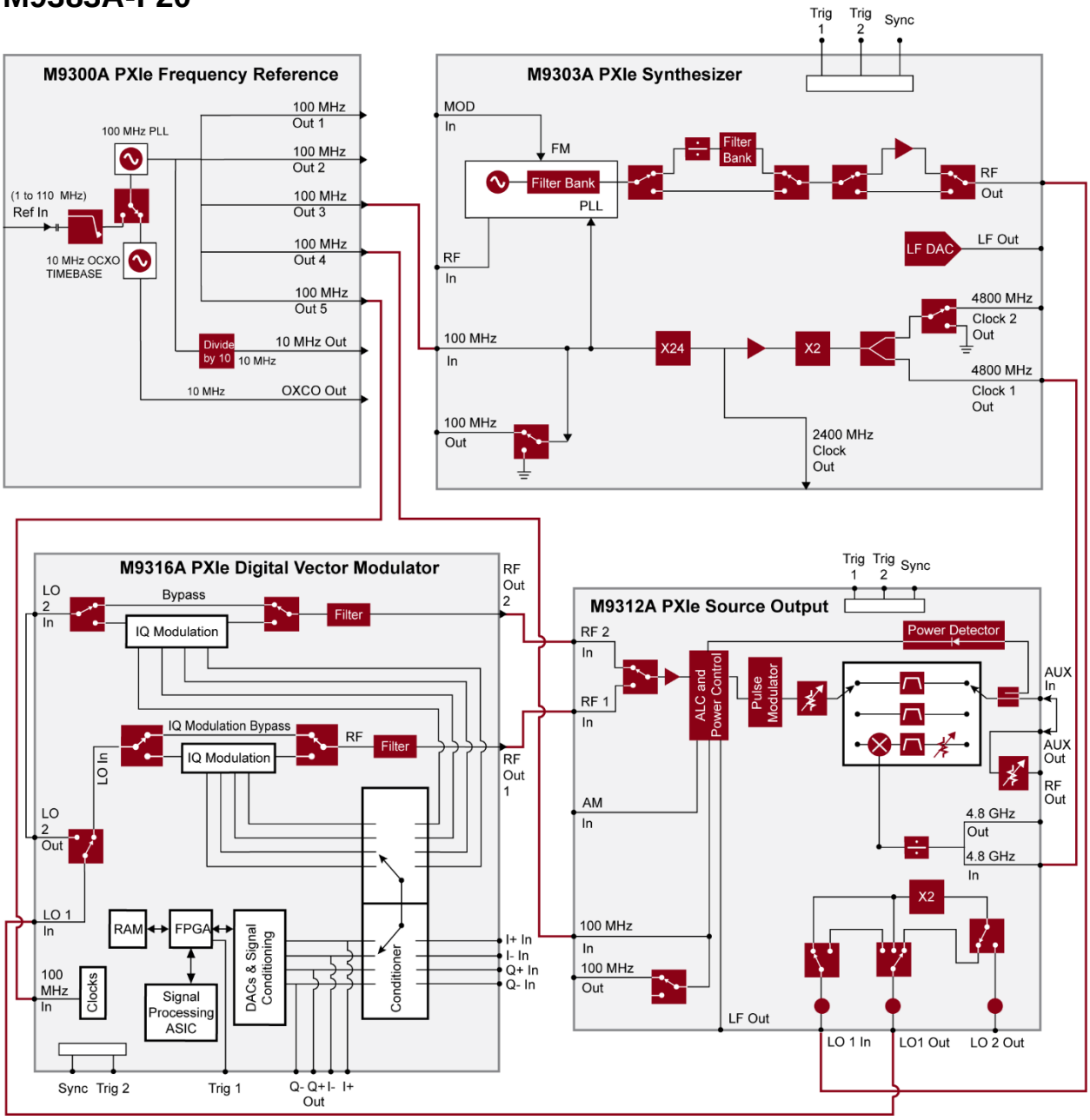


Figure 1. Block diagram for a 20 GHz signal generator (M9383A-F20) with 160 MHz bandwidth.

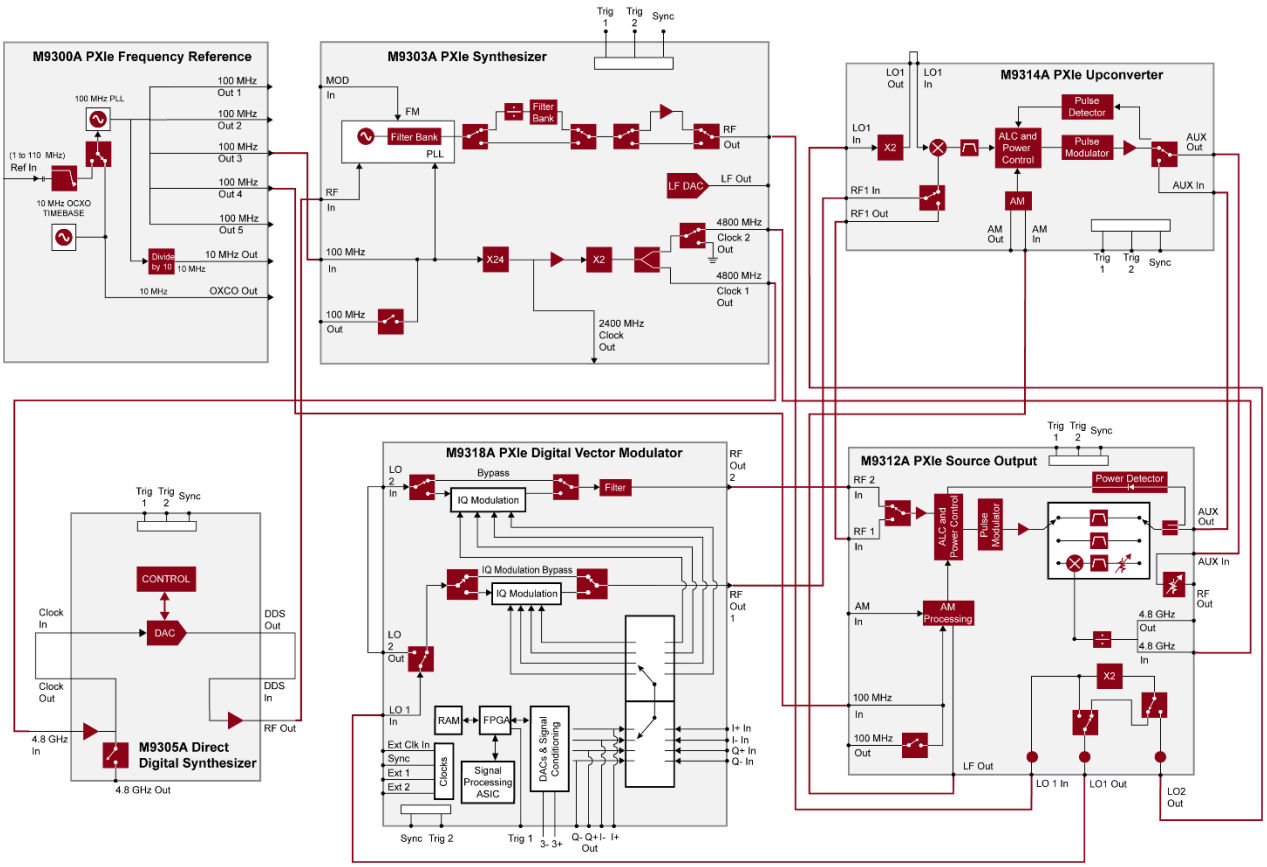


Figure 2. Block diagram for a 44 GHz signal generator (M9383A-F44) with 1 GHz bandwidth and enhanced phase noise.

Definitions and Conditions

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 50 °C, unless otherwise stated, and after a 1 hour warm-up period. Specifications apply when used with the Keysight M9300A frequency reference and Keysight interconnect cables. 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% of the units exhibit with a 95% confidence level at room temperature (approximately 25 °C). Typical performance does not include measurement uncertainty. Typical performance is not warranted.

Nominal (nom)

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

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 measured at room temperature (approximately 25 °C). Measured performance is not warranted.

Additional Information

All data are measured from multiple units at room temperature and are representative of product performance within the operating temperature range unless otherwise noted. All of the above apply when using the instrument in its default settings unless otherwise stated. The specifications contained in this document are subject to change.

Frequency

Frequency		
Range	Option F14	1 MHz to 14 GHz
	Option F20	1 MHz to 20 GHz
	Option F32	1 MHz to 31.8 GHz
	Option F44 with 1EB	1 MHz to 40 GHz
	Option F44 without 1EB	1 MHz to 44 GHz
Resolution	0.01 Hz	
Frequency bands		
Band	Frequency	N [1]
1	1 MHz to < 400 MHz	1/4
2	400 MHz to < 706.25 MHz	1/8
3	706.25 MHz to < 1.4125 GHz	1/4
4	1.4125 GHz to < 2.825 GHz	1/2
5	2.825 GHz to < 5.65 GHz	1
6	5.65 GHz to < 11.3 GHz	2
7	11.3 GHz to 44 GHz	4

1. N is a multiplicative factor used throughout this document.

Frequency Reference

Frequency			
Range	100 MHz out (out 1 through 5)	Amplitude	≥ 10 dBm, 13 dBm, typical
		Connectors	5 SMB snap-on
		Impedance	50 Ω, nominal
	10 MHz out	Amplitude	9.5 dBm, nominal
		Connectors	1 SMB snap-on
		Impedance	50 Ω, nominal
	OCXO out	Amplitude	11.5 dBm, nominal
		Connectors	1 SMB snap-on
		Impedance	50 Ω, nominal
Frequency accuracy	Same as accuracy of internal time base or external reference input		
Internal time base			
Accuracy	± (time since last adjustment x aging rate) ± temperature effects ± calibration accuracy		
Frequency stability - aging rate	Daily	< ± 0.5 ppb/day, after 72 hours warm-up	
	Yearly	< ± 0.1 ppm/year, after 72 hours warm-up	
	Total 10 years	< ± 0.6 ppm/10yrs, after 72 hours warm-up	
Achievable initial calibration accuracy (at time of shipment)	± 5 x 10-8		
Temperature effects	20 to 30 °C	< ± 10 ppb	
	Full temperature range	< ± 50 ppb	
Warm up	5 minutes over +20 to +30 °C, with respect to 1 hour	< ± 0.1 ppm	
	5 minutes over +20 to +30 °C, with respect to 1 hour	< ± 0.1 ppm	
External reference input			
Frequency	1 to 110 MHz, sine wave		
Lock range	± 1 ppm, nominal		
Amplitude	0 to 10 dBm, nominal		
Connector	1 SMB snap-on		
Impedance	50 Ω, nominal		

Power

Step attenuator (Option 1E1)

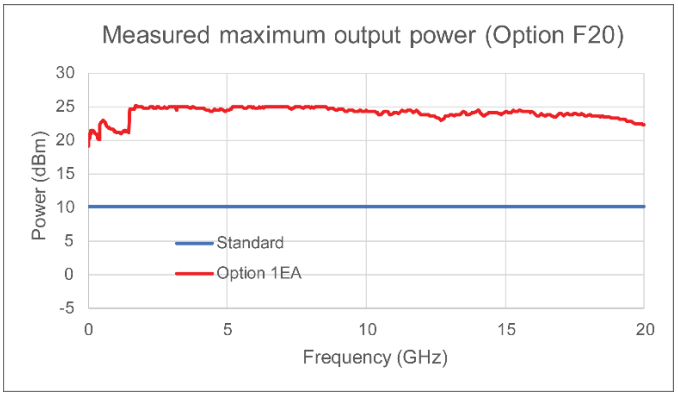
Range	0 dB to 70 dB in 10 dB steps
Attenuator hold	On = manual, off = automatic
Power range with attenuator hold on	-40 dBm to maximum output power with step attenuator set to 0 dB. Offset by attenuation for other steps of the attenuator.

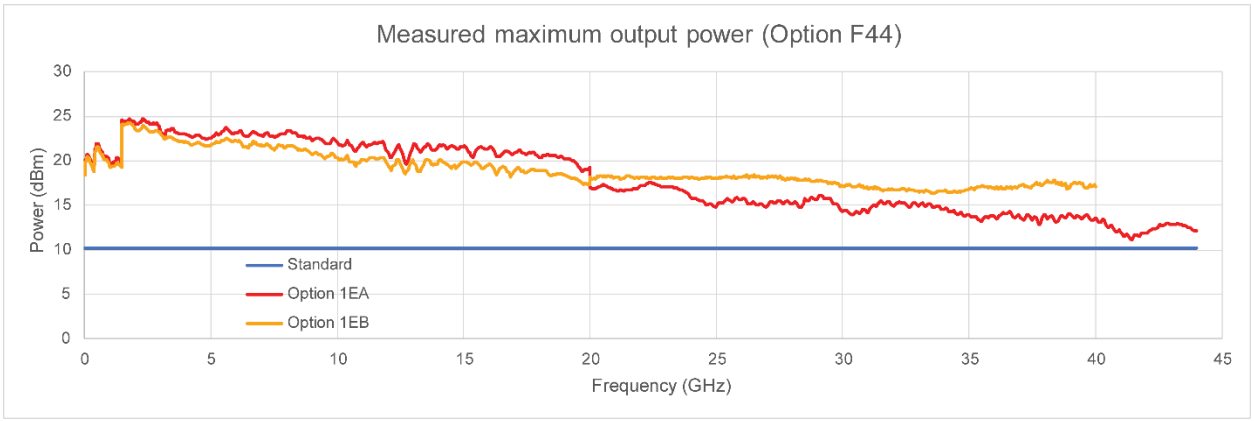
Maximum output power (Option F14 or F20), specifications apply from 20 to 30 °C

Frequency	Standard	Option 1EA
10 MHz to < 20 MHz	10 dBm	14 dBm
20 MHz to < 200 MHz	10 dBm	17 dBm
200 MHz to 400 MHz (1EH Filters on)	10 dBm	13 dBm
> 400 MHz to 1.5 GHz (1EH Filters on)	10 dBm	12 dBm
> 1500 MHz to 2 GHz (1EH Filters on)	10 dBm	21 dBm
200 MHz to 400 MHz (1EH Filters off)	10 dBm	18 dBm
> 400 MHz to 1.5 GHz (1EH Filters off)	10 dBm	19 dBm
> 1.5 GHz to 2 GHz (1EH Filters off)	10 dBm	22 dBm
> 2 GHz to 3.6 GHz	10 dBm	22 dBm
> 3.6 GHz to 10 GHz	10 dBm	22 dBm
> 10 GHz to 16 GHz	10 dBm	21 dBm
> 16 GHz to 20 GHz	10 dBm	20 dBm

Maximum output power (Option F32 or F44), specifications apply from 20 to 30 °C

Frequency	Standard	Option 1EA	Option 1EB
10 MHz to < 20 MHz	10 dBm	14 dBm	16 dBm
20 MHz to < 200 MHz	10 dBm	16 dBm	16 dBm
200 MHz to 400 MHz (1EH filters On)	10 dBm	12 dBm	12 dBm
> 400 MHz to 1.5 GHz (1EH filters On)	10 dBm	10 dBm	10 dBm
> 1.5 GHz to 2 GHz (1EH filters On)	10 dBm	18 dBm	18 dBm
200 MHz to 400 MHz (1EH filters Off)	10 dBm	16 dBm	16 dBm
> 400 MHz to 1.5 GHz (1EH filters Off)	10 dBm	16 dBm	16 dBm
> 1.5 GHz to 2 GHz (1EH filters Off)	10 dBm	20 dBm	20 dBm
> 2 GHz to 3.6 GHz	10 dBm	20 dBm	20 dBm
> 3.6 GHz to 10 GHz	10 dBm	17 dBm	16 dBm
> 10 GHz to 16 GHz	10 dBm	15 dBm	14 dBm
> 16 GHz to 20 GHz	10 dBm	13 dBm	11 dBm
> 20 GHz to 34 GHz	10 dBm	11 dBm	13 dBm
> 34 GHz to 40 GHz	10 dBm	10 dBm	12 dBm
> 40 GHz to 44 GHz	8 dBm	8 dBm	





Settable output power range (nom)

		Standard	Option 1E1	Option 1EA or Option 1EB	Option 1E1/1EA or Option 1E1/1EB
Maximum settable		+10.7 dBm	+10.7 dBm	+25 dBm	+25 dBm
Minimum settable	≤ 20 GHz	-40 dBm	-110 dBm	-40 dBm	-110 dBm
	> 20 GHz	-40 dBm	-120 dBm	-40 dBm	-120 dBm

ALC

Modes		On, Off, Off with Power Search
Bandwidths		Very slow, Slow, Medium, Fast
ALC hold modes		Off, Track on trigger, Hold on trigger, Use pulse generator
ALC usage	≤ 20 GHz	CW
	> 20 GHz	CW and many modulated signals

Level accuracy (ALC On or ALC Off with power search)

Specifications apply from 20 to 30 °C with attenuator hold off. Specifications do not apply above the maximum specified output power. Specifications apply at the carrier frequency. With ALC Off, specifications apply after a power search. [1]

Frequency	> 5 dBm	5 to -40 dBm	< -40 to -80 dBm	< -80 to -90 dBm
10 MHz to < 200 MHz	± 1.0 dB	± 1.0 dB	± 1.7 dB	± 1.7 dB
200 MHz to < 400 MHz	± 0.8 dB	± 1.0 dB	± 1.1 dB	± 1.6 dB
400 MHz to < 3.6 GHz	± 1.1 dB	± 1.0 dB	± 1.2 dB	± 2.1 dB
3.6 GHz to < 16 GHz	± 2.0 dB	± 1.3 dB	± 1.3 dB	± 1.5 dB
16 GHz to 20 GHz	± 2.6 dB	± 1.7 dB	± 1.7 dB	± 1.9 dB
> 20 GHz to < 34 GHz	± 1.9 dB	± 1.4 dB	± 1.5 dB	± 1.9 dB
34 GHz to 44 GHz	± 2.3 dB	± 2.1 dB	± 2.2 dB	± 3.0 dB

1. Power search is an internal alignment routine that improves level accuracy with ALC off.

SWR

SWR (meas) with Option F20

Frequency	SWR
10 MHz to 400 MHz	1.2 : 1
> 400 MHz to 3.2 GHz	1.2 : 1
> 3.2 GHz to 10 GHz	1.3 : 1
> 10 GHz to 20 GHz	1.4 : 1

SWR (meas) with Option F44 but without Option 1EB

Frequency	SWR
10 MHz to 400 MHz	1.2 : 1
> 400 MHz to 3.2 GHz	1.2 : 1
> 3.2 GHz to 10 GHz	1.3 : 1
> 10 GHz to 20 GHz	1.5 : 1
> 20 GHz to 44 GHz	1.5 : 1

SWR (meas) with Option F44 and Option 1EB

Frequency	> -6 dBm	-6 to -8 dBm	< -8 dBm
10 MHz to 400 MHz	1.6 : 1	1.6 : 1	1.1 : 1
> 400 MHz to 3.2 GHz	1.6 : 1	1.6 : 1	1.2 : 1
> 3.2 GHz to 10 GHz	1.6 : 1	1.6 : 1	1.4 : 1
> 10 GHz to 20 GHz	1.6 : 1	1.6 : 1	1.6 : 1
> 20 GHz to 37 GHz	1.7 : 1	1.9 : 1	1.9 : 1
> 37 GHz to 40 GHz	1.7 : 1	2.3 : 1	2.3 : 1

Other power characteristics

Power search time	< 20 ms, nominal
Resolution	0.01 dB
Output impedance	50 Ω, nominal
Maximum reverse power	1/2 Watt, 0 VDC, nominal
Units	dBm, dBmV, dBµV

Step Mode

Step mode

Operating modes	Step	Frequency start and stop (linear or logarithmic steps)
		Frequency center and span (linear or logarithmic steps)
		Power start and stop
Step time	Entry time	100 µs to 1 s
	Dwell time	100 µs to 1 s
Number of points	Step	1 to 3200
Input triggering	Start step	Immediate, external trigger, software trigger or software trigger button
	End step	Dwell time, entry time, external trigger, last segment, software trigger or software trigger button
Output triggering	Step out	Trigger when stepping
	Settled out	Trigger when settled
Timeout		1 ms to 2000000 s

Spectral Purity

Harmonics

Measured at 5 dBm or maximum specified power, whichever is lower. Performance is unspecified for harmonics beyond the specified frequency range.

Fundamental frequency	Harmonic level
< 50 MHz	-28 dBc (-30 dBc typ)
50 MHz to < 220 MHz	-31 dBc (-40 dBc typ)
220 MHz to < 2 GHz (Option 1EH filters Off)	-25 dBc (-30 dBc typ)
220 MHz to < 2 GHz (Option 1EH filters On)	-46 dBc (-48 dBc typ)
2 GHz to < 3.2 GHz	-55 dBc (-60 dBc typ)
3.2 GHz to < 3.4 GHz	-43 dBc (-45 dBc typ)
3.4 GHz to < 16 GHz	50 dBc (-55 dBc typ)
16 GHz to 22 GHz	-40 dBc (-52 dBc typ)

Sub-harmonics

Measured at 9 dBm or maximum specified power, whichever is lower. Sub-harmonics are defined as Carrier Freq * (k/m), where k and m are integers, but excluding harmonics. Does not apply to non-harmonic spurs which may overlap sub-harmonic spurs. Performance is unspecified for sub-harmonics beyond the specified frequency range.

Fundamental frequency	Sub-harmonic level
< 4.5 GHz	-55 dBc (-57 dBc typ)
4.5 GHz to < 5.2 GHz	-38 dBc (-47 dBc typ)
5.2 GHz to 20 GHz	-49 dBc (-55 dBc typ)
> 20 GHz to 44 GHz	-55 dBc (-57 dBc typ)

Non-harmonics

Measured at 10 dBm or maximum specified power, whichever is lower. Non-harmonic spurs include mixing products for frequencies below 400 MHz, synthesizer spurs, and other miscellaneous chassis and power supply products. Performance is unspecified for non-harmonics beyond the specified frequency range. With option ST4, excludes 9.6 GHz and harmonics of 9.6 GHz with software earlier than 2.1.243.0.

Fundamental frequency	Sub-harmonic level
1 MHz to 20 GHz	-45 dBc (-55 dBc typ)
> 20 GHz to 44 GHz	-45 dBc (-50 dBc typ)

Phase noise

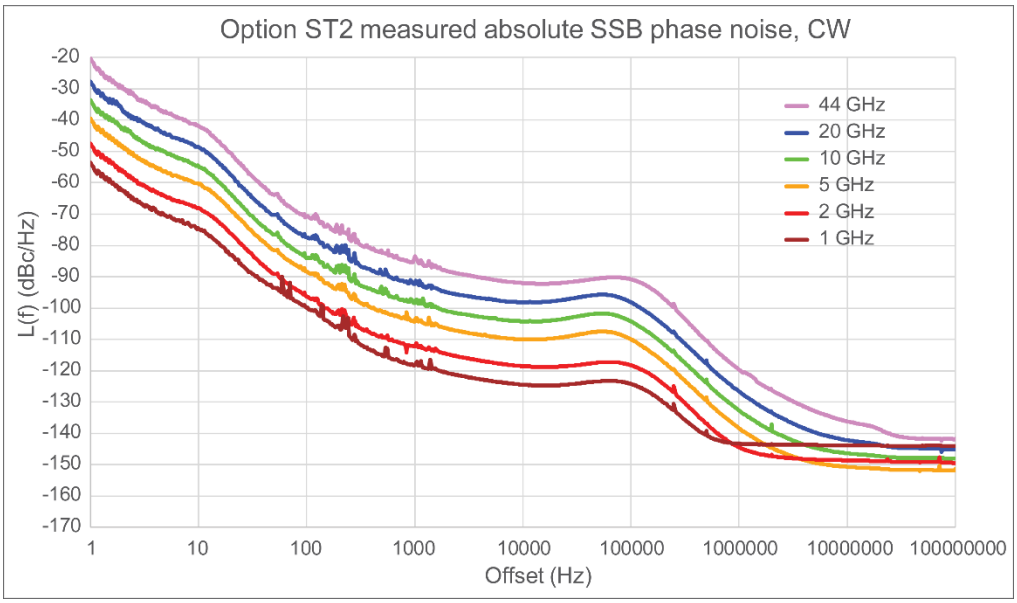
Phase noise is measured with ALC off using a CW signal at +10 dBm or maximum specified power, whichever is less. Phase noise specifications exclude external mechanical vibration.

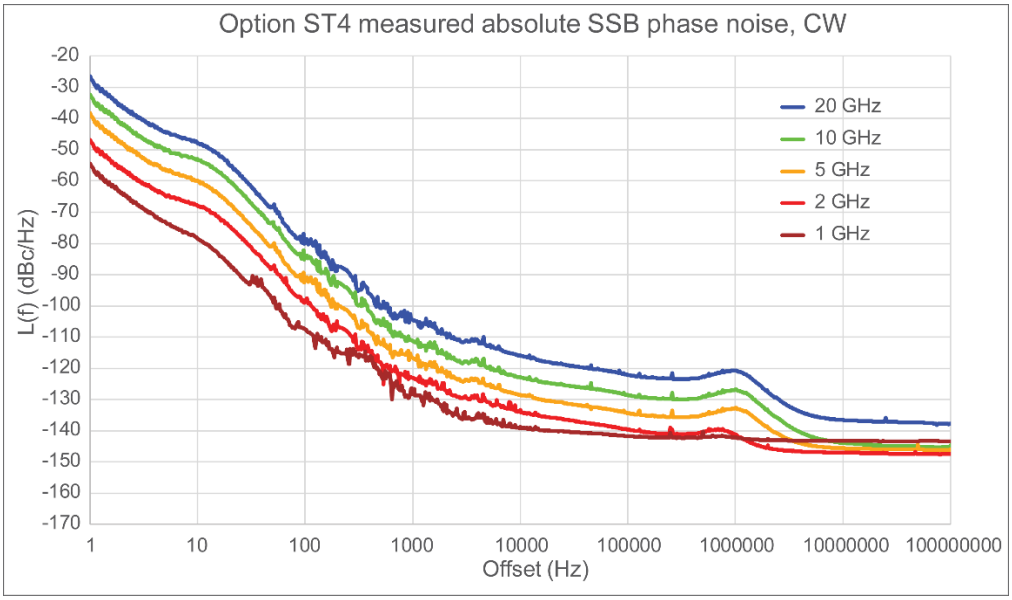
Option ST2: Absolute SSB phase noise (dBc/Hz), spec (typ)

	Offset from carrier							
Frequency	**10 Hz**	**100 Hz**	**1 kHz**	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**	**100 MHz**
10 to 400 MHz	(-75)	(-95)	(-110)	(-117)	(-116)	(-136)	(-137)	(-135)
> 400 MHz to 10 GHz	-40 (-51)	-64 (-79)	-91 (-97)	-97 (-103)	-97 (-102)	-124 (-126)	-128 (-141)	127 (-142)
> 10 GHz to 20 GHz	-34 (-45)	-60 (-73)	-84 (-91)	-92 (-97)	-91 (-97)	-117 (-125)	-120 (-140)	-119 (-142)
> 20 GHz to 26.5 GHz	(-38)	(-68)	(-88)	(-95)	(-94)	(-119)	(-136)	(-147)
> 26.5 GHz to 44 GHz	(-31)	(-59)	(-80)	(-84)	(-85)	(-114)	(-124)	(-125)

Option ST4: Absolute SSB phase noise (dBc/Hz), spec (typ)

	Offset from carrier							
Frequency	**10 Hz**	**100 Hz**	**1 kHz**	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**	**100 MHz**
10 to 400 MHz	(-78)	(-107)	(-121)	(-130)	(-134)	(-134)	(-136)	(-134)
> 400 MHz to 10 GHz	-38 (-51)	-65 (-80)	-95 (-106)	-109 (-118)	-117 (-125)	-119 (-123)	-133 (-142)	-133 (-143)
> 10 GHz to 20 GHz	-30 (-44)	-58 (-74)	-87 (-100)	-101 (-113)	-111 (-119)	-113 (-119)	-125 (-139)	-123 (-141)
> 20 GHz to 26.5 GHz	(-41)	(-70)	(-98)	(-110)	(-117)	(-117)	(-134)	(-141)
> 26.5 GHz to 44 GHz	(-23)	(-53)	(-84)	(-102)	(-110)	(-110)	(-125)	(-125)





Switching Speed

Frequency switching speed (nominal) [1]

Frequency	Standard	Option UNQ	Option UNZ
400 MHz to < 3.2 GHz	16 ms	300 µs	300 µs
3.2 GHz to < 10 GHz	16 ms	7 ms	7 ms
10 GHz to < 20 GHz	16 ms	7 ms	7 ms
20 GHz to < 31.8 GHz	6 ms	250 µs	250 µs
31.8 GHz to 37 GHz	6 ms	750 µs	250 µs
> 37 GHz to 44 GHz	6 ms	250 µs	250 µs

1. Measured at 0 dBm in step mode with ALC off from a trigger until frequency is settled within 1 ppm or 100 Hz of final value, whichever is greater, and amplitude is settled within 0.2 dB of final value.

Pulse Modulation (Option PM1 or PM2)

Specifications apply with attenuator hold off (default mode) and output level ≤ 10 dBm from 20 to 30 °C.

Pulse modulation

Pulse paths	Internal pulse generator, external input		
Minimum pulse width	**Mode**	**Option PM1**	**Option PM2**
	ALC on	1 µs	1 µs
	ALC off, 10 MHz to 20 GHz	100 ns	100 ns
	ALC off, > 20 GHz	30 ns	20 ns
On/Off ratio without I/Q modulation	**Frequency**	**Option F14 or F20**	**Option F32 or F44**
	10 MHz to 10 GHz	70 dB	70 dB
	> 10 GHz to 20 GHz	60 dB (typ)	60 dB (typ)
	> 20 GHz to 44 GHz	n/a	80 dB
On/Off ratio with I/Q burst aligned to pulse (Option B04, B05, B16, B17, C05, C06, C10 or C11)	**Frequency**	**Option F14 or F20**	**Option F32 or F44**
	10 MHz to 10 GHz	80 dB (nom)	80 dB (nom)
	> 10 GHz to 20 GHz	80 dB (nom)	80 dB (nom)
	> 20 GHz to 44 GHz	n/a	80 dB (nom)
Rise/fall times (Tr and Tf)	ALC off	10 ns (typ)	
Level accuracy (relative to CW) [1]	10 MHz to 30 GHz	± 1 dB (typ)	
	> 30 GHz	± 1.5 dB (typ)	
Width accuracy	RF width relative to setting	± 16 ns	
Width compression (Trf-Tw)	RF width relative to video out	± 19 ns (meas)	
Video feed-through (Vf) [2]	0.4 GHz to 3.2 GHz	< 200 mV pk-pk (typ)	
	> 3.2 GHz to 5.2 GHz	< 100 mV pk-pk (typ)	
	> 5.2 GHz to 44 GHz	< 30 mV pk-pk (typ)	
Pulse overshoot	≤ 3.2 GHz	< 15% (typ)	
	> 3.2 GHz	< 5% (typ)	
External input level		+1 V = RF on	
		0 V = RF off	
External input impedance		50 Ω (nom)	

1. For pulse width ≥ 1 us with ALC on and for pulse width ≥ 50 ns with ALC off after power search.
2. With step attenuator in 0 dB position. Video feed-through decreases directly with step attenuator setting.

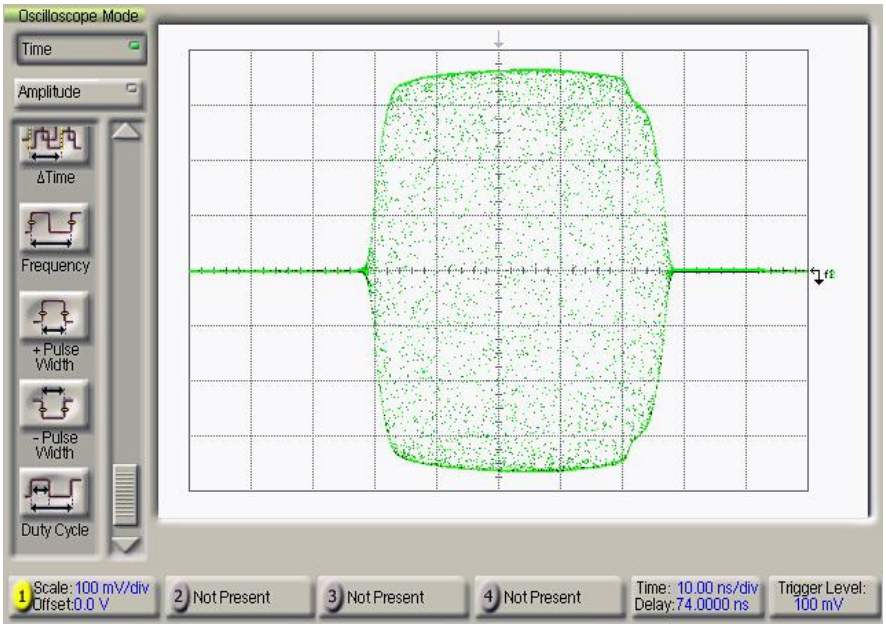


Figure 3. Measured pulse shape; Frequency = 9 GHz, power = 5 dBm, amplitude = 5 dBm, ALC off, pulse width = 50 ns, pulse period = 200 ns. The oscilloscope is protected by a 10 dB pad and the timescale is set to 10 ns/div.

Internal pulse generator (Option PM1 or PM2)

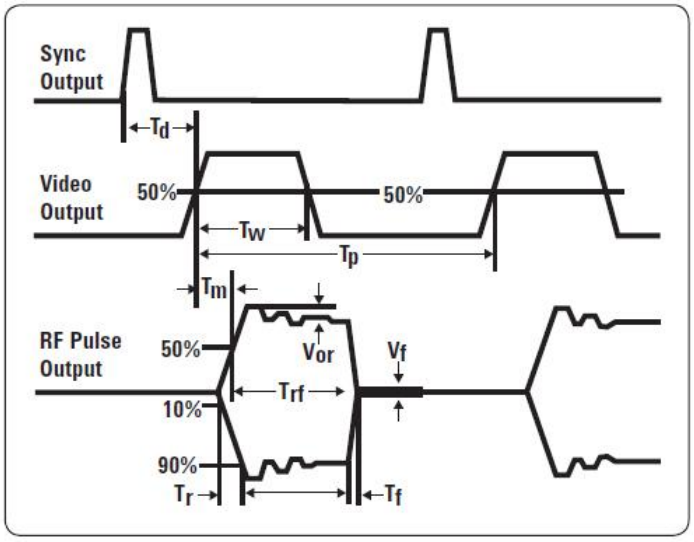
Internal pulse generator

Modes	Square, adjustable doublet, pulse train
Triggering	Free run, triggered, gated, and external pulse
Triggers	Trig 1, Trig 2, Backplane 0-7
Signal routing	Sync to Sync, Trig/Pulse in to TRIG1, video out to TRIG2
Square wave rate	(50 MHz)/k from 0.1 Hz to 50 MHz where k is an integer (nom)

Timing

		Option PM1	Option PM2
Pulse period (PRI) (Tp)		30 ns to 41.99 s	20 ns to 41.99 s
Pulse width (Tw)		30 ns to 41.99 s	20 ns to 41.99 s
Video delay (Td)	Free run	± 4 µs	± 4 µs
	Triggered modes	0 to 42 s	0 to 42 s
RF delay (Tm)		0 to 42 s	0 to 42 s
Sync trigger		30 ns to 3.99 µs	20 ns to 3.99 µs
Pulse doublets	Delay 1	0 to 42 s	0 to 42 s
	Pulse width 1	30 ns to 60 ns	20 ns to 60 ns
	Delay 2	60 ns to 42 s	60 ns to 42 s
	Pulse width 2	30 ns to 42 s	20 ns to 42 s
Pulse train	Repetitions	1 to 2046	1 to 2046
	On time	30 ns to 42 s	20 ns to 42 s
	Off time	30 ns to 42 s	20 ns to 42 s

- 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



Analog Modulation (AM, FM, PM)

Frequency modulation (Option UNT)

Refer to the N value in the table of frequency bands. With Option ST4 and FM on, the effective phase noise and spectral purity are equivalent to Option ST2. Using FM through the ”ARB Modulation” subsystem does not have this limitation.

Frequency modulation

Maximum peak deviation		± N × 10 MHz, nominal	
Deviation resolution		0.1% of deviation or 1 Hz, whichever is greater (nom)	
Deviation accuracy	Measured at a 1 kHz rate with deviation ≤ 100 kHz, freq ≤ 20 GHz, 20 to 30 °C	±(3.5% of deviation + 20 Hz)	
Distortion	Measured at a 1 kHz rate with deviation ≤ N × 0.8 MHz	< 3.5% (typ)	
Modulation frequency response [1]	Mode	1 dB bandwidth	3 dB bandwidth
	DC coupling	DC to 100 kHz (nom)	DC to 10 MHz (nom)
	AC coupling	5 Hz to 100 kHz (nom)	5 Hz to 10 MHz (nom)
External DC FM carrier offset [2]		± (0.2% of set deviation + N x 8 Hz) (typ)	
External input sensitivity		± 1 V_{peak} for indicated deviation	
		± 1.2 V max	
External input impedance		50 Ω, 600 Ω or 1 MΩ, selectable (nom)	
Paths		Internal FM generator, external input.	
Waveforms		See Internal modulation sources (Option UNT)	

1. Measured at N × 1 MHz deviation.
2. At the calibrated deviation and carrier frequency, within 5° C of ambient temperature at time of user calibration.

Frequency modulation (Option B04, B05, B16, B17, C05, C06, C10 or C11)

This section describes frequency modulation through the “ARB Modulation” subsystem. For frequency modulation through the synthesizer subsystem, see “Frequency modulation (Option UNT)”. The ARB Modulation subsystem provides wider bandwidths but does not provide external inputs.

Frequency modulation

Peak deviation		
Option	**Frequency < 3.2 GHz**	**Frequency ≥ 3.2 GHz**
B04 or B05	0 Hz to 12.5 MHz	0 Hz to 12.5 MHz
B16 or B17	0 Hz to 50 MHz	0 Hz to 50 MHz
C05 or C06	0 Hz to 50 MHz	0 Hz to 160 MHz
C10 or C11	0 Hz to 50 MHz	0 Hz to 320 MHz
Rate		
Option	**Frequency < 3.2 GHz**	**Frequency ≥ 3.2 GHz**
B04 or B05	1 Hz to 12.5 MHz	1 Hz to 12.5 MHz
B16 or B17	1 Hz to 50 MHz	1 Hz to 50 MHz
C05 or C06	1 Hz to 50 MHz	1 Hz to 160 MHz
C10 or C11	1 Hz to 50 MHz	1 Hz to 320 MHz
Paths	Internal FM generator	
Waveforms	Sine, dual-sine, triangle, ramp up, ramp down, square	

Phase modulation (Option UNT)

Refer to the N value in the table of frequency bands. With Option ST4 and phase modulation on, the effective phase noise and spectral purity are equivalent to Option ST2. Using phase modulation through the “ARB Modulation” subsystem does not have this limitation.

Phase modulation

Maximum peak deviation		± N × 2 rad (nom)	
Deviation resolution		0.1% of set deviation (nom)	
Deviation Accuracy	Measured at a 1 kHz rate, freq ≤ 20 GHz, 20 to 30 °C, deviation >= 0.2 rad	±(5% of deviation + 0.01 rad)	
Distortion [1]		Total harmonic distortion	
Modulation frequency response [2]	Mode	Normal bandwidth mode	High bandwidth mode
	DC coupling	DC to 100 kHz (nom)	DC to 1 MHz (nom)
	AC coupling	5 Hz to 100 kHz (nom)	5 Hz to 1 MHz (nom)
External input sensitivity		± 1 V_{peak} for indicated deviation	
		± 1.2 V max	
External input impedance		50 Ω, 600 Ω or 1 MΩ, selectable (nom)	
Paths		Internal ΦM generator, external input	
Waveforms		See Internal modulation sources (Option UNT)	

1. Measured in normal bandwidth mode at a 1 kHz rate with deviation ≤ N × 1 rad.
2. 3 dB bandwidth measured at N × 1 rad deviation.

Phase modulation (Option B04, B05, B16, B17, C05, C06, C10 or C11)

This section describes phase modulation through the ”ARB Modulation” subsystem. For phase modulation through the synthesizer subsystem, see ”Phase modulation (Option UNT)”. The ARB Modulation subsystem provides wider bandwidths but does not provide external inputs.

Phase modulation

Rate		
Option	**Frequency < 3.2 GHz**	**Frequency ≥ 3.2 GHz**
B04 or B05	1 Hz to 12.5 MHz	1 Hz to 12.5 MHz
B16 or B17	1 Hz to 50 MHz	1 Hz to 50 MHz
C05 or C06	1 Hz to 50 MHz	1 Hz to 160 MHz
C10 or C11	1 Hz to 50 MHz	1 Hz to 320 MHz
Peak deviation	0 to 10 rad (nom)	
Paths	Internal ΦM generator	
Waveforms	Sine, dual-sine, triangle, ramp up, ramp down, square	

Amplitude modulation (Option UNT)

AM performance is not specified with attenuator hold on, above 20 GHz or when AM peaks exceed maximum specified power. With ALC Off, specifications apply after power search is executed.

Amplitude modulation

		Linear mode	Exponential (log) mode
Depth	Maximum (ALC off)	99%	40 dB
	Settable range	0 to 100%	0 to 40 dB
	Resolution	0.1%	0.01 dB
Depth accuracy	ALC on, 1 kHz rate, depth ≤ 80%, 20 to 30 °C	±(6% of setting + 2%)	n/a
External input	Polarity	Selectable	Downward modulation only
	Sensitivity for indicated depth	± 1 V (nom)	-1 V (nom)
	Maximum voltage range	± 1.2 V (nom)	-1.2 V to 0 V (nom)
Modulation frequency response [1]	DC coupling	DC to 70 kHz (nom)	
	AC coupling	5 Hz to 70 kHz (nom)	
Distortion	30% AM, 1 kHz rate	< 2.0% total harmonic distortion (typ)	
	60% AM, 1 kHz rate	< 2.5% total harmonic distortion (typ)	
External Input Impedance	50 Ω, 600 Ω or 1 MΩ, selectable (nom)	External Input Impedance	
Paths	Internal AM generator, external input.	Paths	
Waveforms		See Internal modulation sources (Option UNT)	

1. 3 dB bandwidth measured with depth ≤ 30%.

Amplitude modulation (Option B04, B05, B16, B17, C05, C06, C10 or C11)

This section describes amplitude modulation through the “ARB Modulation” subsystem. For amplitude modulation through the output subsystem, see “Amplitude modulation (Option UNT)”. The ARB Modulation subsystem provides better amplitude accuracy but does not provide external inputs. AM performance is not specified with attenuator hold on, above 20 GHz or when AM peaks exceed maximum specified power. With ALC Off, specifications apply after power search is executed.

Amplitude modulation

Rate		
Option	**Frequency < 3.2 GHz**	**Frequency ≥ 3.2 GHz**
B04 or B05	1 Hz to 25 MHz	1 Hz to 25 MHz
B16 or B17	1 Hz to 100 MHz	1 Hz to 100 MHz
C05 or C06	1 Hz to 100 MHz	1 Hz to 320 MHz
C10 or C11	1 Hz to 100 MHz	1 Hz to 640 MHz
Depth	0 to 100%	
Paths	Internal AM generator	
Waveforms	Sine, dual-sine, triangle, ramp up, ramp down, square	

Internal modulation sources (Option UNT)

Internal modulation sources

Dual function generators		
AM function generator	Provides one signal for use with AM or M9312A LF output.	
FM function generator	Provides one signal for use with FM, ΦM or M9303A LF output.	
Output	Internal 1, internal 2, noise generator 1, noise generator 2	
Monitoring	Provides monitoring of function generators when used for AM, FM, or ΦM	
Output impedance	50 Ω (nom)	
Waveforms		
Types	Sine, pulse, positive ramp, negative ramp, triangle, noise, dual sine, dual ramp, dual triangle	
Rate range	Sine	0.1 Hz to 10 MHz
	Other waveforms	0.1 Hz to 1 MHz
Rate resolution	0.1 Hz	Rate resolution
Rate accuracy	Same as PXIe backplane reference	Rate accuracy
Phase offset	-6.29 rad to +6.29 rad	Phase offset
Pulse duty cycle	0% to 100%	Pulse duty cycle
Noise type	Uniform, gaussian	Noise type

Vector Modulation (Option B04, B05, B16, B17, C05, C06, C10 or C11)

External I/Q inputs (Option 016)

Type	Differential: $I, \overline{I}, Q, \overline{Q}$
Input impedance	50 Ω (nom)
Recommended input level	-1 dBm or $\sqrt{I^2 + Q^2} = 0.2\ V_{rms}$ (nom)
Input level range	Different RMS levels are accommodated by adjusting the internal I/Q modulator attenuator which may be either manually or automatically set. The minimum input level required to maintain RF level accuracy is $\sqrt{I^2 + Q^2} = 0.1\ V_{rms}$. Minimum 0.1 V_{rms}, maximum 1 V_{peak}

External I/Q bandwidth (Option 016)

Frequency	Baseband frequency range	RF modulation bandwidth
< 3.2 GHz	DC to 80 MHz (nom)	160 MHz (nom)
≥ 3.2 GHz	DC to 1 GHz (nom)	2 GHz (nom)

I/Q adjustments

I and Q offset adjustment		± 50% (nom)
I/Q quadrature skew adjustment	< 3.2 GHz	none
	≥ 3.2 GHz	± 20° (nom)
I/Q gain balance adjustment		± 10 dB (nom)
Delay adjustment	Option B04 or B05	± 125 ns (nom)
	Option B16 or B17	± 250 ns (nom)
	Option C05 or C06	± 19 ns (nom)
	Option C10 or C11	± 39.1 ns (nom)

I/Q input adjustments (Option 016 with Option C05, C06, C10 or C11)

I Offset	± 50 mV (nom)
Q Offset	± 50 mV (nom)

I/Q baseband output[1]

Type	Differential: $I, \overline{I}, Q, \overline{Q}$
Frequency range	DC to 80 MHz (nom) for 1 dB bandwidth
DC offset adjustments	± 3 V
DC offset resolution	1 mV
Common-mode I/Q offset	± 200 mV (nom)
Differential mode I or Q offset	± 50 mV (nom)

I/Q baseband output amplitude[1]

Internal I/Q modulation	0.8 V_{rms} (typ)
External I/Q modulation	Variable from 0.8 to 1.8 V_{rms} (typ)

1. All output voltages measured with a 50 Ω load.

Internal Baseband Generator (Option B04, B05, B16, B17, C05, C06, C10 or C11)

Internal baseband generator

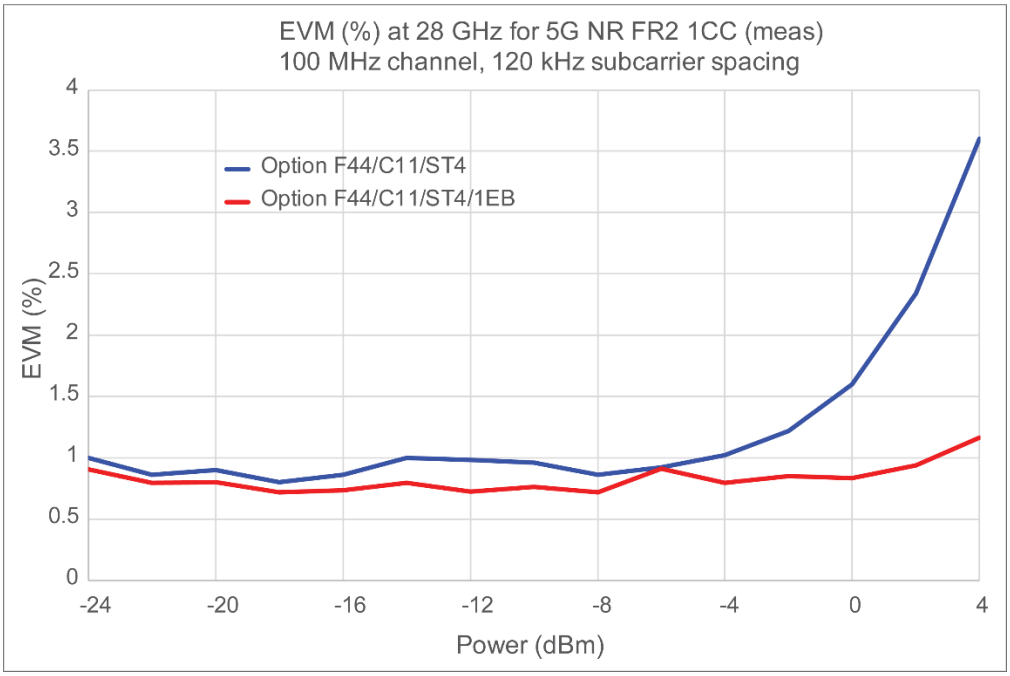
Channels	Option B04, B05, B16 or B17	In-phase and Quadrature (I and Q)	
	Option C05, C06, C10 or C11	In-phase and Quadrature (I and Q) and a third channel (3)	
Resolution		16 bits [1/65536]	
RF bandwidth			
Option		**Frequency < 3.2 GHz**	**Frequency ≥ 3.2 GHz**
B04 or B05		40 MHz	40 MHz
B16 or B17		160 MHz	160 MHz
C05 or C06		160 MHz	500 MHz
C10 or C11		160 MHz	1 GHz
Sample rate			
Option		**Frequency < 3.2 GHz**	**Frequency ≥ 3.2 GHz**
B04 or B05		50 MSa/s	50 MSa/s
B16 or B17		200 MSa/s	200 MSa/s
C05 or C06		200 MSa/s	625 MSa/s
C10 or C11		200 MSa/s	1.28 GSa/s
Waveform memory			
Option M01		32 MSa	
Option M05		512 MSa	
Option M10		1024 MSa	
Spectral inversion			
Invert I, Swap I and Q			
Frequency offset range (Option B04, B05, B16 or B17)			
B04 or B05		-20 MHz to +20 MHz	
B16 or B17		-80 MHz to +80 MHz	
Real-time additive noise impairment (AWGN) (Option B04, B05, B16 or B17)			
Type		Real-time, continuously calculated, and played using DSP	
Carrier-to-noise ratio		0 dBc to 70 dBc	
Bandwidth	Option B04 or B05	1 Hz to 40 MHz	
	Option B16 or B17	1 Hz to 160 MHz	

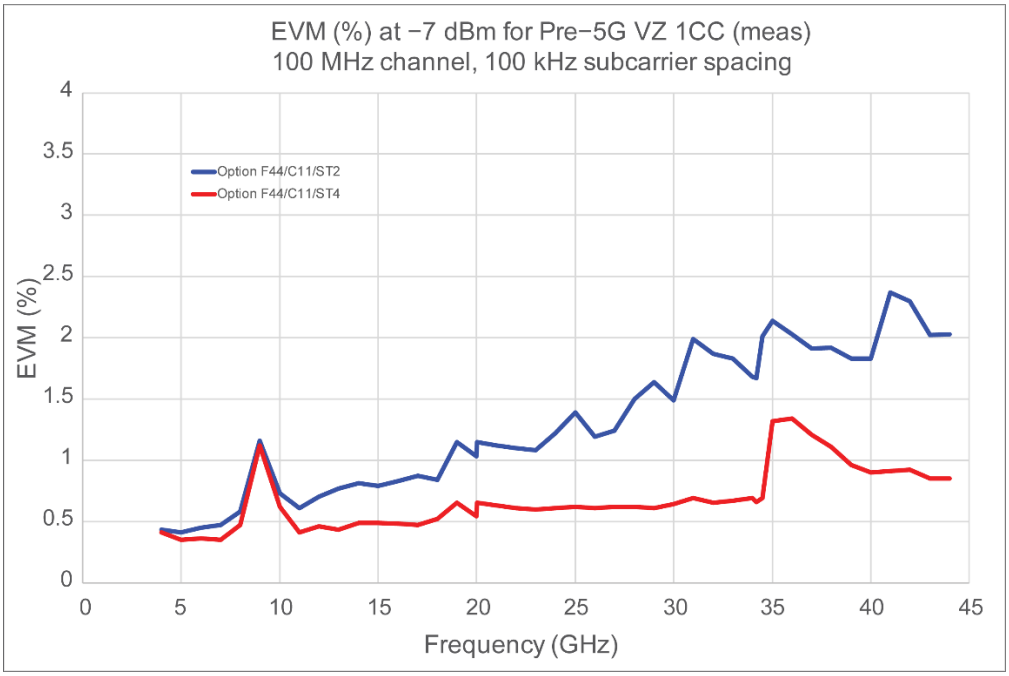
Internal baseband generator

Real-time phase noise impairment (Option B04, B05, B16 or B17)		
Close-in phase noise characteristics		-20 dB per decade
Far-out phase noise characteristics		-20 dB per decade
Mid-frequency characteristics	Start frequency (f1)	Offset settable from 0 to 20 MHz
	Stop frequency (f2)	Offset settable from 0 to 20 MHz
	Phase noise amplitude level (L(f))	User selected; max degradation dependent on f2
Triggers		
Play start trigger		Immediate, external, software trigger, software trigger button
ALC hold trigger		None, Marker 1, Marker 2, Marker 3, Marker 4
Pulse trigger		None, Marker 1, Marker 2, Marker 3, Marker 4
Sync output trigger	Option B04, B05, B16 or B17	None, Per waveform, Marker 1, Marker 2, Marker 3, Marker 4
	Option C05, C06, C10 or C11	None, Marker 1, Marker 2, Marker 3, Marker 4
Markers		
Markers can be routed to the ALC hold function and the pulse modulator		
Marker polarity		Negative, positive
Number of markers		4
Multitone		
Number of tones		2 to 1000
Frequency spacing [1]	Option B04 or B05	100 Hz to 50 MHz
	Option B16 or B17	100 Hz to 100 MHz
	Option C05 or C06	100 Hz to 320 MHz
	Option C10 or C11	100 Hz to 640 MHz

1. Number of tones at selected spacing cannot exceed RF bandwidth.

Vector accuracy





Auxiliary waveform generator (Option C05, C06, C10 or C11)

Auxiliary waveform generator

Channel name	3+ and 3- (Aux Awg)	
Sample rate		
Option	**Frequency < 3.2 GHz**	**Frequency ≥ 3.2 GHz**
B04 or B05	50 MSa/s	50 MSa/s
B16 or B17	200 MSa/s	200 MSa/s
C05 or C06	200 MSa/s	625 MSa/s
C10 or C11	200 MSa/s	1.28 GSa/s
Settings		
Modes	Free run, synchronous with I/Q channels	
Delay	0 s to 1 s	
Level	0 V to 600 mV	
Offset	-100 mV to 100 mV	
Common offset	0 V	
Load impedance	48.5 to 51.5 Ω	
Output types	Single-ended positive, differential	

Simultaneous modulation

All modulation types can be operated independently and simultaneously, except:

1. Frequency and phase modulation (FM and ΦM)
2. Linear and exponential amplitude modulation (AM)
3. Internal and external I/Q modulation

Remote Programming

Remote programming

Software drivers	IVI.NET, IVI-COM, IVI-C
Interfaces	GPIB (IEEE-488.2,1987) with listen and talk, and 1000BaseT LAN interface.
Control languages	SCPI version 1997.0.
IEEE-488 functions	SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT0, C0, E2
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.

Environmental and Physical Specifications

Environmental specifications and regulatory compliance

Temperature	Operating Non-operating (storage)	0 to 50 °C −40 to +70 °C
Humidity [1]	Type tested at 95%, +40 °C (non-condensing)	
Shock/vibration [1]	Operating random vibration Survival random vibration Functional shock Bench handling	Type tested at 5 to 500 Hz, 0.21 g rms Type tested at 5 to 500 Hz, 2.09 g rms Type tested at half-sine, 30 g, 11 ms Type tested per MIL-PRF-28800F
Altitude	Up to 15,000 feet (4,572 meters) [2]	
EMC	Complies with European EMC Directive 2004/108/EC • IEC/EN 61326-2-1 • CISPR Pub 11 Group 1, class A • AS/NZS CISPR 11 • ICES/NMB-001 This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.	
Warm-up time	45 minutes	
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 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. Phase noise specifications are not warranted in a vibrating environment.	
ISO compliant	This family of signal generators is manufactured in an ISO-9001 registered facility in concurrence with Keysight's commitment to quality.	
Self-test	Internal diagnostic routine tests most modules in a preset condition. If a module's node voltages are within acceptable limits, then the module passes the test.	

1. 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 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.
2. At 15,000 feet, the maximum environmental temperature is de-rated to 40 °C.

Physical specifications

Module	Size	Length	Width	Height	Weight	Weight
M9300A	1 PXIe slot	210 mm	22 mm	130 mm	0.55 kg	1.22 lbs
M9303A	1 PXIe slot	210 mm	22 mm	130 mm	0.57 kg	1.25 lbs
M9305A	2 PXIe slots	210 mm	42 mm	130 mm	0.91 kg	2.00 lbs
M9312A	3 PXIe slots	210 mm	62 mm	130 mm	1.86 kg	4.10 lbs
M9314A	2 PXIe slots	210 mm	42 mm	130 mm	1.21 kg	2.67 lbs
M9316A	3 PXIe slots	210 mm	62 mm	130 mm	1.70 kg	3.75 lbs
M9318A	3 PXIe slots	210 mm	62 mm	130 mm	1.70 kg	3.75 lbs
M9405A	1 PXIe slot	210 mm	22 mm	130 mm	0.57 kg	1.25 lbs
M9155CH40	1 PXIe slot	210 mm	22 mm	130 mm	0.40 kg	0.88 lbs

DC power requirements

Module	5 V	5 V VIO	12 V	3.3 V	-12 V	5 V Aux	Total
M9300A	0 W	0 W	17 W	2 W	0 W	0 W	19 W
M9303A	0 W	0 W	38 W	10 W	0 W	0 W	48 W
M9305A	0 W	0 W	21 W	5 W	0 W	0 W	26 W
M9312A	0 W	0 W	82 W	2 W	0 W	0 W	84 W
M9314A	0 W	0 W	44 W	2 W	0 W	0 W	46 W
M9316A	0 W	0 W	64 W	15 W	0 W	0 W	79 W
M9318A	0 W	0 W	95 W	15 W	0 W	0 W	110 W
M9405A	0 W	0 W	3 W	0 W	0 W	0 W	3 W
M9155CH40	0.1 W	0 W	5 W	2 W	0 W	0 W	7.1 W

System Requirements

System requirements

Operating systems	Windows 7 (32-bit and 64-bit), Windows 10 (32-bit and 64-bit)
Processor speed	1 GHz 32-bit (x86), 1 GHz 64-bit (x64) (no support for Itanium 64)
Available memory	4 GB minimum 8 GB or greater recommended
Available disk space	1.5 GB available hard disk space
Video	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA graphics is supported)
Browser	Microsoft Internet Explorer 7 or greater
Keysight IO libraries	Version 16.3.17914 or later

Input and Output Connections

The connection diagram is found in the M9383A Startup Guide, M9383-90001

M9300A PXIe frequency reference - 1 slot

See the M9300A datasheet (5991-0898EN) for the table of input and output connectors

M9303A PXIe synthesizer - 1 slot

RF Out	SMA (f) connector. Outputs the primary RF signal of the synthesizer. Nominal frequency range is 187.5 MHz to 13.7 GHz. Nominal power range is 0 to 15 dBm from 187.5 MHz to 10 GHz and 0 to 10 dBm from 10 GHz to 13.7 GHz. 50 Ω nominal impedance. Damage level is 30 dBm.
RF In	SMA (f) connector. Accepts an RF signal which can be routed to RF Out. Nominal frequency range is 10 MHz to 6 GHz. Nominal power is 5 dBm. 50 Ω nominal impedance. Damage level is 30 dBm.
FM In	SMP (m) connector. Drives either FM or ΦM , selectable. Nominal frequency range is DC to 10 MHz for FM and DC to 1 MHz for ΦM . Nominal impedance is 50 Ω, 600 Ω, and 1MΩ, selectable. Damage level is ±5 V.
2.4 GHz Clock Out	APC 3.5 mm (f) connector. Outputs the internal 2.4 GHz clock derived from the 100 MHz clock input. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 20 dBm.
4.8 GHz Clock 2 Out	APC 3.5 mm (f) connector. Outputs the internal 4.8 GHz clock derived from the 100 MHz clock input. Output can be switched on or off. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 20 dBm.
4.8 GHz Clock 1 Out	APC 3.5 mm (f) connector. Outputs the internal 4.8 GHz clock derived from the 100 MHz clock input. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 20 dBm.
100 MHz In	SMP (m) connector. Accepts a 100 MHz clock input as a timebase for the synthesizer. Nominal power is 13 dBm. 50 Ω nominal impedance.
100 MHz Out	SMP (m) connector. Outputs a copy of the 100 MHz clock input for use in a daisy chain of multiple modules. Nominal power is 12 dBm. 50 Ω nominal impedance.
LF out	SMP (m) connector. Outputs the waveform from the internal function generator or a copy of the FM modulation. Nominal frequency range is DC to 10 MHz. Nominal voltage is 0 to 5 V peak into 50 Ω with a -5 V to 5 V offset. 50 Ω nominal impedance.
Trig 1	SMP (m) connector. Bidirectional signal for trigger and events. When configured as an output, VOL < 0.4 V, VOH is 2.8 V to 3.3 V into high impedance. When configured as an input, trigger level is adjustable from -2.1 V to +4.1 V. 50 Ω nominal impedance. Damage level is ± 5 V.
Trig 2	SMP (m) connector. Bidirectional signal for trigger and events. When configured as an output, VOL < 0.4 V, VOH is 2.8 V to 3.3 V into high impedance. When configured as an input, trigger level is adjustable from -2.1 V to +4.1 V. 50 Ω nominal impedance. Damage level is ± 5 V.
Sync	SMP (m) connector. Bidirectional signal for synchronization with other modules. 50 Ω nominal impedance. Damage level is ± 5 V.
Status	LED indicator. Green = functioning properly. Red = fault condition.

M9305A PXIe digital direct synthesizer - 2 slots

RF Out	SMA (f) connector. Provides the RF Output. Nominal frequency range is 150 MHz to 1.2 GHz. Nominal power is 5 dBm. 50 Ω nominal impedance. Damage level is 17 dBm.
DDS In	SMA (f) connector. Accepts the DDS signal for use by the module. Nominal frequency range is 150 MHz to 1.2 GHz. Nominal power is -5 dBm. 50 Ω nominal impedance. Damage level is 17 dBm.
DDS Out	SMA (f) connector. Outputs a copy of the signal from DDS In. Nominal frequency range is 150 MHz to 1.2 GHz. Nominal power is 5 dBm. 50 Ω nominal impedance. Damage level is 17 dBm.
4.8 GHz In	SMA (f) connector. Accepts a 4.8 GHz reference clock. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 25 dBm.
4.8 GHz Out	SMA (f) connector. Outputs a copy of the signal from 4.8 GHz In. Output can be switched on or off. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 14 dBm.
Clock In	SMA (f) connector. Accepts a clock for use by the DDS system. Nominal frequency is 4.8 GHz. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 17 dBm.
Clock Out	SMA (f) connector. Provides a copy of the signal from Clock In. Nominal frequency is 4.8 GHz. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 14 dBm.
Trig 1	SMP (m) connector. Bidirectional signal for trigger and events. 1 MΩ nominal impedance. Damage level is 10 V_{peak}, 5 V rms.
Trig 2	SMP (m) connector. Bidirectional signal for trigger and events. 1 MΩ nominal impedance. Damage level is 10 V_{peak}, 5 V rms.
Sync	SMP (m) connector. Bidirectional signal for synchronization with other modules. 1 MΩ nominal impedance. Damage level is 10 V_{peak}, 5 V rms.
Status	LED indicator. Green = functioning properly. Blue = software not connected. Red = fault condition.
USB connector	Unlabeled. Reserved for future use. Not for use with USB devices.

M9312A PXIe source output - 3 slots

RF 1 In	SMA (f) connector. Accepts a 3.2 to 20 GHz IF signal. 50 Ω nominal impedance.
RF 2 In	SMA (f) connector. Accepts a 400 MHz to 3.2 GHz IF signal. 50 Ω nominal impedance.
Aux In	SMA (f) connector. Accepts an output signal from 1 MHz to 44 GHz. Normally Aux Out and Aux In are connected by a jumper. 50 Ω nominal impedance.
Aux Out	SMA (f) connector. Provides the output signal before the output attenuator. 50 Ω nominal impedance.
LO 1 In	SMA (f) connector. Accepts an LO signal between 400 MHz and 10 GHz. 50 Ω nominal impedance.
LO 1 Out	SMA (f) connector. Outputs either a copy of LO 1 In or a doubled copy of LO 1 In (selectable). 50 Ω nominal impedance.
RF Out	2.4 mm (f) connector. Provides an RF output signal between 1 MHz and 20 GHz when Aux Out is connected to Aux In. Otherwise, outputs the signal on Aux Out attenuated by the selected attenuation value. Nominal frequency range is 1 MHz to 44 GHz. 50 Ω nominal impedance.
4.8 GHz In	APC 3.5 mm (f) connector. Accepts a 4.8 GHz reference clock. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 25 dBm.
4.8 GHz Out	APC 3.5 mm (f) connector. Outputs a copy of the signal from 4.8 GHz In. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 14 dBm.
LO 2 Out	APC 3.5 mm (f) connector. Outputs either a copy of LO 1 In or a doubled copy of LO 1 In (selectable). 50 Ω nominal impedance.
100 MHz In	SMP (m) connector. Accepts a 100 MHz clock input as a timebase for the module. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 20 dBm.
100 MHz Out	SMP (m) connector. Provides a copy of the 100 MHz clock input. Nominal power is 10 dBm. 50 Ω nominal impedance. Damage level is 20 dBm.
LF Out	SMP (m) connector. Outputs the waveform from the internal function generator or a copy of the AM modulation. Nominal frequency range is DC to 10 MHz. Nominal voltage is 0 to 5 V peak into 50 Ω with a -5 V to 5 V offset. 50 Ω nominal impedance.
AM In	SMP (m) connector. Accepts an external amplitude modulation signal. Nominal frequency range is DC to 1 MHz. 1 MΩ nominal impedance.
Trig 1	SMP (m) connector. Bidirectional signal for trigger and events. When configured as an output, VOL < 0.4 V, VOH is 2.8 V to 3.3 V into high impedance. When configured as an input, trigger level is adjustable from -2.1 V to +4.1 V. 50 Ω nominal impedance. Damage level is ± 5 V.
Trig 2	SMP (m) connector. Bidirectional signal for trigger and events. When configured as an output, VOL < 0.4 V, VOH is 2.8 V to 3.3 V into high impedance. When configured as an input, trigger level is adjustable from -2.1 V to +4.1 V. 50 Ω nominal impedance. Damage level is ± 5 V.
Sync Out	SMP (m) connector. Bidirectional signal for synchronization with other modules. 50 Ω nominal impedance. Damage level is ± 5 V.
Status	LED indicator. Green = functioning properly. Red = unleveled power or fault condition.

M9314A PXIe upconverter - 2 slots

Aux Out	2.4 mm (f) connector. Provides the RF output as either the upconverted signal from RF1 In or the Aux In signal. Nominal frequency range is 1 MHz to 44 GHz. Nominal power range is -50 to +20 dBm. 50 Ω nominal impedance. Damage level is 27 dBm.
Aux In	SMA (f) connector. Accepts a 1 MHz to 20 GHz signal from M9312A. This signal is not upconverted. Nominal frequency range is 1 MHz to 20 GHz. Nominal power range is -50 to +20 dBm. 50 Ω nominal impedance. Damage level is 26 dBm.
RF1 In	SMA (f) connector. Accepts the IF signal between 400 MHz and 20 GHz. Nominal power range is -5 to +15 dBm. 50 Ω nominal impedance. Damage level is 25 dBm.
RF1 Out	SMA (f) connector. Provides a copy of the signal at RF 1 In below 20 GHz. Nominal frequency range is 400 MHz to 20 GHz. Nominal power range is -5 to +15 dBm. 50 Ω nominal impedance. Damage level is 25 dBm.
LO 1 In	2.4 mm (f) connector. Accepts a 22 to 38 GHz LO signal for the upconverter. Normally LO 1 Out is connected to LO 1 In by a jumper. Nominal power is 20 dBm. 50 Ω nominal impedance. Damage level is 23 dBm.
LO 1 Out	2.4 mm (f) connector. Outputs a doubled version of LO 2 In. Nominal frequency range is 22 to 38 MHz. Nominal power is 20 dBm. 50 Ω nominal impedance. Damage level is 25 dBm.
LO 2 In	SMA (f) connector. Accepts a 11 to 19 GHz signal which is doubled and then used as the LO for the upconversion. Nominal power is 0 dBm. 50 Ω nominal impedance. Damage level is 20 dBm.
Trig 1	SMP (m) connector. Bidirectional signal for trigger and events. 1 MΩ nominal impedance. Damage level is 10 V_{peak}, 5 V rms.
Trig 2	SMP (m) connector. Bidirectional signal for trigger and events. 1 MΩ nominal impedance. Damage level is 10 V_{peak}, 5 V rms.
Sync	SMP (m) connector. Bidirectional signal for synchronization with other modules. 1 MΩ nominal impedance. Damage level is 10 V_{peak}, 5 V rms.
AM In	SMP (m) connector. Accepts an external amplitude modulation signal with 50%/Volt or 20 dB/Volt, selectable. Nominal frequency range is DC to 1 MHz. 1 MΩ nominal impedance. Damage level is 10 V_{peak}, 5 V rms.
AM Out	SMP (m) connector. Provides a copy of the signal at AM In. Nominal frequency range is DC to 1 MHz. 50 Ω nominal impedance. Damage level is 10 V_{peak}, 5 V rms.
Status	LED indicator. Green = functioning properly. Red = fault condition.

M9316A PXIe vector modulator - 3 slots

RF 1 Out	APC 3.5 mm (f) connector. Outputs the modulated RF signal from the 3.2 to 20 GHz modulator. Output can be switched on or off. Nominal power is -5 dBm modulated or -6 dBm CW. 50 Ω nominal impedance. Damage level is 20 dBm.
RF 2 Out	SMA (f) connector. Outputs the modulated RF signal from the 0.4 to 3.2 GHz modulator. Nominal power is -5 dBm modulated or -6 dBm CW. 50 Ω nominal impedance. Damage level is 20 dBm.
LO 2 In	SMA (f) connector. Accepts an LO signal from 400 MHz to 3.2 GHz for use by the 400 MHz to 3.2 GHz modulator. Nominal power is 8 dBm. 50 Ω nominal impedance. Damage level is 30 dBm.
LO 2 Out	APC 3.5 mm (f) connector. Outputs a copy of the LO 1 In signal from 400 MHz to 3.2 GHz. This output is normally connected to LO 2 In by a jumper. Nominal power is 8 dBm. 50 Ω nominal impedance. Damage level is 30 dBm.
LO 1 In	APC 3.5 mm (f) connector. Accepts an LO signal from 0.4 to 20 GHz for use by the 3.2 to 20 GHz modulator. The range from 0.4 to 3.2 GHz is only usable by the LO 2 Out. Nominal power is 13 dBm. 50 Ω nominal impedance. Damage level is 20 dBm.
I+ Output	SMP (m) connector. Outputs the I+ signal, one of four signals provided by the internal baseband generator. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is ± 2 V.
I- Output	SMP (m) connector. Outputs the I- signal, one of four signals provided by the internal baseband generator. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is ± 2 V.
Q+ Output	SMP (m) connector. Outputs the Q+ signal, one of four signals provided by the internal baseband generator. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is ± 2 V.
Q- Output	SMP (m) connector. Outputs the Q- signal, one of four signals provided by the internal baseband generator. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is ± 2 V.
I+ Input	SMP (m) connector. Accepts the I+ signal, one of four signals required for external differential I/Q. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is 5 V_{peak}, 1 V rms.
I- Input	SMP (m) connector. Accepts the I- signal, one of four signals required for external differential I/Q. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is 5 V_{peak}, 1 V rms.
Q+ Input	SMP (m) connector. Accepts the Q+ signal, one of four signals required for external differential I/Q. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is 5 V_{peak}, 1 V rms.
Q- Input	SMP (m) connector. Accepts the Q- signal, one of four signals required for external differential I/Q. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is 5 V_{peak}, 1 V rms.
Trig 1	SMP (m) connector. Bidirectional signal for trigger and events. When configured as an output, VOL < 0.4 V, VOH is 2.8 V to 3.3 V into high impedance. When configured as an input, trigger level is adjustable from -2.1 V to +4.1 V. 50 Ω nominal impedance. Damage level is ± 5 V.
Trig 2	SMP (m) connector. Bidirectional signal for trigger and events. When configured as an output, VOL < 0.4 V, VOH is 2.8 V to 3.3 V into high impedance. When configured as an input, trigger level is adjustable from -2.1 V to +4.1 V. 50 Ω nominal impedance. Damage level is ± 5 V.
Sync	SMP (m) connector. Bidirectional signal for synchronization with other modules. 50 Ω nominal impedance. Damage level is ± 5 V.
100 MHz In	SMP (m) connector. Accepts a 100 MHz clock input as a timebase for the modulator. Nominal power is 10 dBm. 50 Ω nominal
Status	Two LED indicators. Green = functioning properly. Red = fault condition.

M9318A PXIe vector modulator - 3 slots

RF 1 Out	APC 3.5 mm (f) connector. Outputs the modulated RF signal from the 3.2 to 20 GHz modulator. Output can be switched on or off. Nominal power is -5 dBm modulated or -6 dBm CW. 50 Ω nominal impedance. Damage level is 20 dBm.
RF 2 Out	SMA (f) connector. Outputs the modulated RF signal from the 0.4 to 3.2 GHz modulator. Nominal power is -5 dBm modulated or -6 dBm CW. 50 Ω nominal impedance. Damage level is 20 dBm.
LO 2 In	SMA (f) connector. Accepts an LO signal from 400 MHz to 3.2 GHz for use by the 400 MHz to 3.2 GHz modulator. Nominal power is 8 dBm. 50 Ω nominal impedance. Damage level is 30 dBm.
LO 2 Out	APC 3.5 mm (f) connector. Outputs a copy of the LO 1 In signal from 400 MHz to 3.2 GHz. This output is normally connected to LO 2 In by a jumper. Nominal power is 8 dBm. 50 Ω nominal impedance. Damage level is 30 dBm.
LO 1 In	APC 3.5 mm (f) connector. Accepts an LO signal from 0.4 to 20 GHz for use by the 3.2 to 20 GHz modulator. The range from 0.4 to 3.2 GHz is only usable by the LO 2 Out. Nominal power is 13 dBm. 50 Ω nominal impedance. Damage level is 20 dBm.
I+ Output	SMP (m) connector. Outputs the I+ signal, one of four signals provided by the internal baseband generator. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is ± 2 V.
I- Output	SMP (m) connector. Outputs the I- signal, one of four signals provided by the internal baseband generator. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is ± 2 V.
Q+ Output	SMP (m) connector. Outputs the Q+ signal, one of four signals provided by the internal baseband generator. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is ± 2 V.
Q- Output	SMP (m) connector. Outputs the Q- signal, one of four signals provided by the internal baseband generator. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is ± 2 V.
I+ Input	SMP (m) connector. Accepts the I+ signal, one of four signals required for external differential I/Q. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is 5 V_{peak}, 1 V rms.
I- Input	SMP (m) connector. Accepts the I- signal, one of four signals required for external differential I/Q. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is 5 V_{peak}, 1 V rms.
Q+ Input	SMP (m) connector. Accepts the Q+ signal, one of four signals required for external differential I/Q. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is 5 V_{peak}, 1 V rms.
Q- Input	SMP (m) connector. Accepts the Q- signal, one of four signals required for external differential I/Q. Nominal frequency range is DC to 540 MHz. 50 Ω nominal impedance. Damage level is 5 V_{peak}, 1 V rms.
Trig 1	SMP (m) connector. Bidirectional signal for trigger and events. When configured as an output, VOL < 0.4 V, VOH is 2.8 V to 3.3 V into high impedance. When configured as an input, trigger level is adjustable from -2.1 V to +4.1 V. 50 Ω nominal impedance.
Trig 2	SMP (m) connector. Bidirectional signal for trigger and events. When configured as an output, VOL < 0.4 V, VOH is 2.8 V to 3.3 V into high impedance. When configured as an input, trigger level is adjustable from -2.1 V to +4.1 V. 50 Ω nominal impedance. Damage level is ± 5 V.
Sync (lower center)	SMP (m) connector. Bidirectional signal for synchronization with other modules. 50 Ω nominal impedance. Damage level is ± 5 V.
Sync (upper left)	Reserved for future use.

M9318A PXIe Vector Modulator - 3 slots (continued)

Ext 1	SMB (m) connector. Bidirectional signal for trigger and events. 50 Ω nominal output impedance, 10 kΩ nominal input impedance. ± 5 V maximum input level.
Ext 2	SMB (m) connector. Bidirectional signal for trigger and events. 50 Ω nominal output impedance, 10 kΩ nominal input impedance. ± 5 V maximum input level.
3+	SMB (m) connector. Provides a third output channel synchronized with the I and Q outputs. Nominal frequency range is DC to 540 MHz. Nominal voltage is 0 Vpp to 1.65 Vpp without corrections and 0 Vpp to 1.26 Vpp with corrections. 100 Ω nominal impedance.
3-	SMB (m) connector. Provides a third output channel synchronized with the I and Q outputs. Nominal frequency range is DC to 540 MHz. Nominal voltage is 0 Vpp to 1.65 Vpp without corrections and 0 Vpp to 1.26 Vpp with corrections. 100 Ω nominal impedance.
Ext Clk In	Reserved for future use.
Aux port	Reserved for future use.
USB	Reserved for future use. Not for use with USB devices.
Status	Three LED indicators. Blue or Green = functioning properly. Red = fault condition.

Setup and Calibration Services

Assistance

One day startup assistance	Gain access to a technical expert who will help you get started quickly with the M9383A Microwave Signal Generator and its powerful software tools. The flexible instruction format is designed to get you to your first measurements and familiarize you with ways to adapt the equipment to a specific application.	Included in base configuration

Calibration and traceability

Calibration cycle	A one year calibration cycle is recommended.	
Keysight calibration status utility	The Keysight calibration status utility helps ensure your M9383A is calibrated by managing the calibration interval and providing messages regarding instrument and module calibration status.	Included in base configuration

Support and Warranty

Warranty		
Global warranty	• All parts and labor necessary to return to full specified performance • Recalibration for products supplied originally with a calibration certificate • Return shipment	Included
Self-test utility	A self-test utility runs a set of internal tests which verifies the health of the modules and reports their status.	Included in base configuration

Related Literature

- M9383A Configuration Guide