Keysight N9310A
RF Signal Generator
9 kHz to 3.0 GHz

Data Sheet

KEYSIGHT TECHNOLOGIES

Definitions and Conditions

"**Specifications**" describe the performance of parameters covered by the product warranty and apply to the full temperature range of 5 to 45 °C, unless otherwise noted.

"**Typical**" values describe 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 95 percent confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.

"**Nominal**" values indicate expected performance, or describe product performance that is useful in the application of the product, but are not covered by the product warranty.

The signal generator will meet its specifications when:

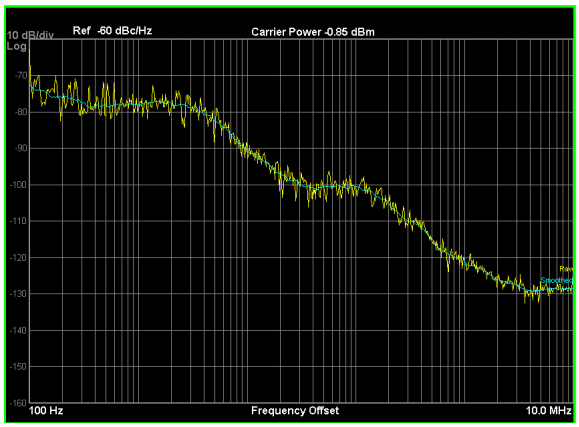
- It is within its calibration cycle
- It has been turned on at least 45 minutes
- It has been stored at an ambient temperature within the allowed operating range for at least two hours before being turned on; if it had previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range

Specifications

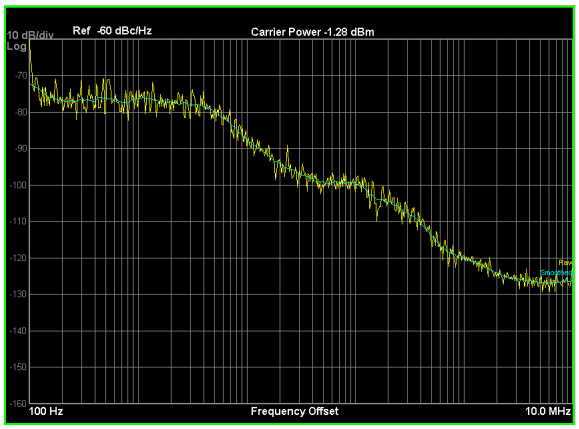
		Supplemental information
Frequency		
Range	9 kHz to 3.0 GHz	
Resolution	0.1 Hz	
Switching speed	< 10 ms	Typical; Within 0.1 ppm of final frequency
Frequency reference		
	Option PFR	Standard
Aging rate	± 1 ×10^{-7} /year	± 1 ×10^{-6} / year
	± 1.5 ×10^{-7} /2 years	
Temperature stability	± 1.5 ×10^{-8} (20 to 30 °C)	± 1 ×10^{-6} (5 to 45 °C)
	± 5 ×10^{-8} (5 to 50 °C)	
Timebase reference output		
Frequency	10 MHz	
Amplitude	> 0.35 Vrms level into 50 Ω	
Connector	BNC female	
External reference input		
Range	2 MHz, 5 MHz, 10 MHz	
Amplitude	0.5 to 2 Vrms	
Connector and impedance	50 Ω; BNC female	
Output		
Power	–127 to +13 dBm	+20 dBm settable
Resolution	0.1 dB	
Accuracy	< ± 1 dB	Fc ≥ 100 kHz, –120 ≤ Level ≤ +13 dBm, 20 to 30 °C
Switching speed	< 10 ms	Typical; < 0.3 dB deviation
VSWR (typical)	< 1.6	1.5 MHz ≤ Fc ≤ 2.5 GHz
	< 1.8	2.5 GHz ≤ Fc ≤ 3 GHz
Output connector and impedance	N-type; 50 Ω nominal	
Reversal power protection		
DC voltage	30 V	
RF power	+36 dBm	1 minute; the warning for reversed power protection is nominally at +25 dBm
Spectral purity		
SSB phase noise	< –95 dBc/Hz	Typical, Fc = 1 GHz at 20 kHz offset
Residual FM	< 30 Hz rms; < 90 Hz peak	CW mode, Fc = 1 GHz; BW = 0.3 to 3 kHz
	< 20 Hz rms	Res FM optimized mode
Harmonics	< –30 dBc	Level ≤ 0 dBm, Fc ≥ 1 MHz
Non-harmonics	< –50 dBc	Level ≤ 0 dBm, ≥ 10 kHz from carrier

Specifications (continued)

	Supplemental information
Characteristic SSB phase noise	



fc = 1,000 MHz



fc = 2,000 MHz

Sweep modes RF and LF	
LF sweep range	20 Hz to 80 kHz
RF sweep range	9 kHz to 3 GHz
Sweep points	2 to 1,001
Dwell time	10 ms to 1 s
Amplitude	
Sweep range	–127 to +13 dBm
Sweep points	2 to 1,001
Dwell time	10 ms to 1 s

Simultaneous modulation [1]

		AM		I/Q	FM		ØM	Pulse	
		Internal	External		Internal	External		Internal	External
AM	Internal	–	•	–	•	•	•	–	–
	External	•	–	–	•	•	•	–	–
I/Q		–	–	–	•	•	•	•	•
FM	Internal	•	•	•	–	•	–	•	•
	External	•	•	•	–	–	–	•	•
ØM		•	•	•	–	–	–	•	•
Pulse	Internal	–	–	•	•	•	•	–	–
	External	–	–	•	•	•	•	–	–

1. The N9310A has one external modulation input connector. The simultaneous external modulations are applied to the same input signal.

Specifications (continued)

		Supplemental information
Amplitude modulation	**(Fc ≥ 100 kHz)**	
Operating modes	Internal, external AC	
Range	0 to 100%	Envelope peak < maximum specified power
Resolution	0.1%	
Rates	20 Hz to 20 kHz	
Accuracy	< ± (5% of setting +0.2%)	1 kHz, 0 dBm and 80% modulation, 0.3 to 3 kHz bandwidth
Distortion	< 2%	1 kHz, 0 dBm and 80% modulation, 0.5 to 15 kHz bandwidth
External input	MOD IN connector	
Sensitivity	0.5 Vpeak	Input voltage for 100% modulation depth
Input impedance	BNC; > 100 kΩ	Nominal
Frequency modulation	**(Fc ≥ 100 kHz)**	
Operating modes	Internal, external AC	
Frequency deviation	20 Hz to 100 kHz	
Resolution	< 1%	Minimum 1 Hz
Rates	20 Hz to 80 kHz	
Distortion	1%	1 kHz rate, 0.3 to 3 kHz bandwidth, deviation = 50 kHz
Deviation accuracy	< ± (5% of FM deviation +300 Hz)	1 kHz, 0 dBm and 50 kHz deviation, 0.3 to 3 kHz bandwidth
Carrier frequency deviation	< 200 Hz	Relative to carrier; external mode
External input	MOD IN connector	
Sensitivity	0.5 Vpeak	Input voltage for 100 kHz modulation deviation
Input impedance	BNC; > 100 kΩ	Nominal
Phase modulation	**(Fc ≥ 100 kHz)**	
Operating modes	Internal	
Phase deviation	0 to 10 rad	Rate ≤ 10 kHz
	0 to 5 rad	10 kHz < rate ≤ 20 kHz
Resolution	< 1%	
Rates	300 Hz to 20 kHz	
Deviation accuracy	< ± (5% of FM deviation +0.2 rad)	1 kHz rate, 0.3 to 3 kHz bandwidth
Distortion	< 1.5%	1 kHz rate, 0.3 to 3 kHz bandwidth, deviation = 5 rad
Input impedance	BNC; > 100 kΩ	Nominal
Pulse modulation		
Operating modes	Internal, external	
On/Off ratio	≥ 40 dB	
Rise/Fall time	< 3 µs	
Pulse width	100 µs to 1 s	Internal, external
Pulse period	200 µs to 2 s	Internal
Time resolution	1 µs	
Input connector and voltage level	BNC female; TTL	

Specifications (continued)

		Supplemental information
Internal modulation source	**Provides a modulation signal for AM, FM, phase modulation, and LF out**	
Waveform	Sine	
Frequency range	20 Hz to 80 kHz	
Resolution	0.1 Hz	
Accuracy	0.005%	Typical
LF out (Internal modulation source)		
Amplitude	0 to 3 Vpeak	Level to high impedance
Output voltage resolution	< 1%	1 mV minimum resolution
Frequency response	< ± 0.2 dB	20 Hz to 20 kHz
Total harmonic distortion	< 0.1%	Typical; 20 Hz to 20 kHz, 30 kHz low pass filter
Connector and impedance	BNC female; < 1Ω	Front panel
Precision frequency reference (option PFR)		
Output frequency	10 MHz	
Accuracy	± [(time since last adjustment × aging rate) + temperature stability+ calibration accuracy [2]] [3]	
Temperature Stability		
20 to 30 °C	$\pm 1.5 \times 10^{-8}$	
5 to 50 °C	$\pm 5 \times 10^{-8}$	
Aging		
1 year	$\pm 1 \times 10^{-7}$	
2 years	$\pm 1.5 \times 10^{-7}$	
Achievable Initial Calibration Accuracy	$\pm 4 \times 10^{-8}$	
Output level	> +4 dBm	
Connector	BNC female, 50 Ω nominal, rear panel	
Calibration connection	Mini USB port, real panel	
I/Q modulation (Option 001 only)		
Operating mode	External I/Q inputs	
VSWR	< 1.5	
Full scale input	$\sqrt{I_2 + Q_2} = 0.5$ Vrms	
Modulation frequency range	DC to 20 MHz	At 3 dB points
Carrier suppression	40 dBc	Typical; modulation frequency = 10 kHz
QPSK EVM	3%	Typical; 1 Msps; 0.22 RRC filter
GMSK phase error	1.2 °rms	Typical; 1 Msps; BT = 0.5
Connector and impedance	BNC female; 50 Ω	Rear panel

2. Calibration accuracy depends on how accurately the frequency standard was adjusted to 10 MHz. If the adjustment procedure is followed, the calibration accuracy is given by the specification of the achievable initial calibration accuracy.
3. The specification applies after the generator has been powered on for four hours.

Specifications (continued)

		Supplemental information
USB connector		
USB host interface	3 x A plug	V 1.1 protocol
USB device interface	1 x B plug	V 1.1 protocol
General		
Recommended calibration cycle	2-year	Keysight Technologies, Inc. has verified that the stability of this product's architecture justifies a longer calibration interval of 2 years.
Power requirement	100 to 240 Vac; 50 to 60 Hz	Auto-ranging
Power consumption	65 W	
Temperature range	5 to 45 °C	Operating
	–20 to 70 °C	Storage
Weight	9.2 kg	Nominal
Dimensions	132.5 x 320 x 400 mm	H x W x D
Display		
Resolution	640 x 480	
Size	165.1 mm (6.5 in) diagonal (nominal)	
Data storage		
Internal	16 MB nominal	
External	Supports USB 2.0-compatible memory devices	
EMC		
Complies with European EMC Directive 2004/108/EC – IEC/EN 61326-1 or IEC/EN 61326-2-1 – CISPR Pub 11 group 1, class A – AS/NZS CISPR 11:2004 – ICES/NMB-001:2004		
This ISM device complies with Canadian ICES-001		
Cet appareil ISM est conforme à la norme NMB-001 du Canada		
Safety		
Complies with European Low Voltage Directive 2006/95/EC – IEC/EN 61010-1 2nd edition – Canada: CSA C22.2 No. 61010-1-04 – USA: UL 61010-1 2nd edition		
Audio noise		
Acoustic noise emission	Geraeuschemission	
LpA < 70 dB	LpA < 70 dB	
Operator position	Am Arbeitsplatz	
Normal position	Normaler Betrieb	
Per ISO 7779	Nach DIN 45635 t.19	
Environmental stress		
Samples of this product have been type tested in accordance with the Keysight Environmental Test Maunal 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 MILPRF-28800F Class 3		

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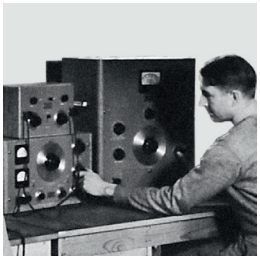

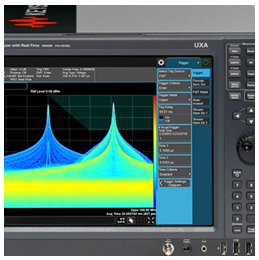

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