



# Agilent N9310A RF Signal Generator

9 kHz to 3.0 GHz

Data Sheet

## Definitions and Conditions

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**” 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.



Agilent Technologies

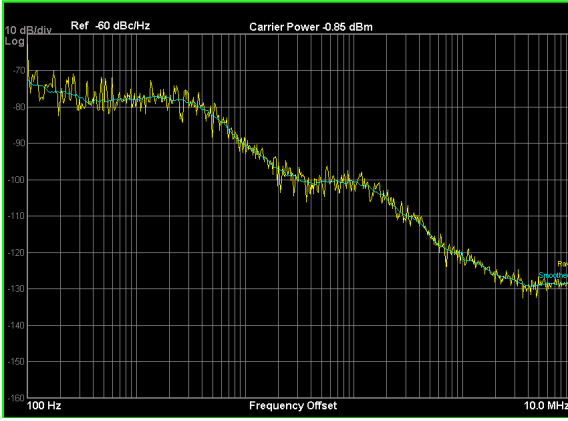
## Specifications

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

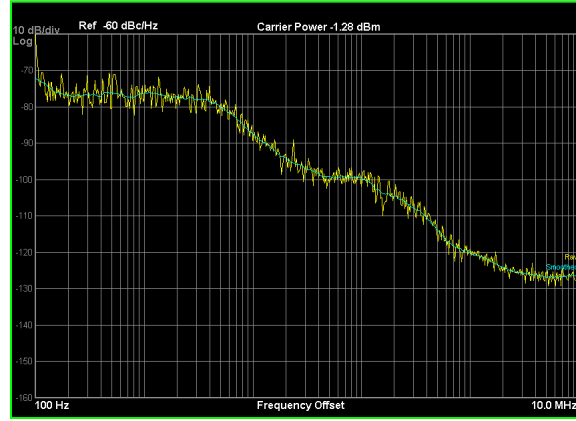
# Specifications (continued)

## 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 <sup>1</sup>

		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
<b>Amplitude modulation</b> ( $F_c \geq 100$ 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	< $\pm$ (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 V <sub>peak</sub>	Input voltage for 100% modulation depth
Input impedance	BNC; > 100 k $\Omega$	Nominal
<b>Frequency modulation</b> ( $F_c \geq 100$ 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	< $\pm$ (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 V <sub>peak</sub>	Input voltage for 100 kHz modulation deviation
Input impedance	BNC; > 100 k $\Omega$	Nominal
<b>Phase modulation</b> ( $F_c \geq 100$ kHz)		
Operating modes	Internal	
Phase deviation	0 to 10 rad	Rate $\leq$ 10 kHz
	0 to 5 rad	10 kHz < rate $\leq$ 20 kHz
Resolution	< 1%	
Rates	300 Hz to 20 kHz	
Deviation accuracy	< $\pm$ (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 k $\Omega$	Nominal
<b>Pulse modulation</b>		
Operating modes	Internal, external	
On/Off ratio	$\geq$ 40 dB	
Rise/Fall time	< 3 $\mu$ s	
Pulse width	100 $\mu$ s to 1 s	Internal, external
Pulse period	200 $\mu$ s to 2 s	Internal
Time resolution	1 $\mu$ s	
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 V <sub>peak</sub>	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 <sup>2</sup> ] <sup>3</sup>	
Temperature Stability		
20 to 30 °C	±1.5 × 10 <sup>-8</sup>	
5 to 50 °C	±5 × 10 <sup>-8</sup>	
Aging		
1 year	±1 × 10 <sup>-7</sup>	
2 years	±1.5 × 10 <sup>-7</sup>	
Achievable Initial Calibration Accuracy	±4 × 10 <sup>-8</sup>	
Output level	> +4 dBm	
Connector	BNC female, 50 Ω nominal, rear panel	
Calibration connection	Mini USB port, rear panel	
I/Q modulation (Option 001 only)		
Operating mode	External I/Q inputs	
VSWR	< 1.5	
Full scale input	$\sqrt{I_2 + Q_2} = 0.5 \text{ Vrms}$	
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
<b>USB connector</b>		
USB host interface	3 x A plug	V 1.1 protocol
USB device interface	1 x B plug	V 1.1 protocol
<b>General</b>		
Recommended calibration cycle	2-year	Agilent 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
<b>Display</b>		
Resolution	640 x 480	
Size	165.1 mm (6.5 in) diagonal (nominal)	
<b>Data storage</b>		
Internal	16 MB nominal	
External	Supports USB 2.0-compatible memory devices	
<b>EMC</b>		
Complies with European EMC Directive 2004/108/EC		
<ul style="list-style-type: none"> <li>• IEC/EN 61326-1 or IEC/EN 61326-2-1</li> <li>• CISPR Pub 11 group 1, class A</li> <li>• AS/NZS CISPR 11:2004</li> <li>• ICES/NMB-001:2004</li> </ul>		
This ISM device complies with Canadian ICES-001		
Cet appareil ISM est conforme à la norme NMB-001 du Canada		
<b>Safety</b>		
Complies with European Low Voltage Directive 2006/95/EC		
<ul style="list-style-type: none"> <li>• IEC/EN 61010-1 2nd Edition</li> <li>• Canada: CSA C22.2 No. 61010-1-04</li> <li>• USA: UL 61010-1 2nd Edition</li> </ul>		
<b>Audio noise</b>		
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	
<b>Environmental stress</b>		
Samples of this product have been type tested in accordance with the Agilent Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to, temperature, humidity, shock, vibration, altitude, and power line conditions. Test methods are aligned with IEC 60068-2 and levels are similar to MILPRF-28800F Class 3		



**myAgilent**

[www.agilent.com/find/myagilent](http://www.agilent.com/find/myagilent)

A personalized view into the information most relevant to you.

### Agilent Channel Partners

[www.agilent.com/find/channelpartners](http://www.agilent.com/find/channelpartners)

Get the best of both worlds: Agilent's measurement expertise and product breadth, combined with channel partner convenience.

### Agilent Education corner

[www.agilent.com/find/edu](http://www.agilent.com/find/edu)

Your one-stop education resource for college and university engineering educators, researchers and students.

### Agilent Product Registration

[www.agilent.com/find/register](http://www.agilent.com/find/register)

Register your instruments for service notifications, firmware update alerts, application notes and more. You have the Agilent edge. Register today and keep it sharp.



**Three-Year Warranty**

[www.agilent.com/find/ThreeYearWarranty](http://www.agilent.com/find/ThreeYearWarranty)

Agilent's combination of product reliability and three-year warranty coverage is another way we help you achieve your business goals: increased confidence in uptime, reduced cost of ownership and greater convenience.



**Agilent Advantage Services**

[www.agilent.com/find/AdvantageServices](http://www.agilent.com/find/AdvantageServices)

Accurate measurements throughout the life of your instruments.



[www.agilent.com/quality](http://www.agilent.com/quality)

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at: [www.agilent.com/find/contactus](http://www.agilent.com/find/contactus)

#### Americas

Canada	(877) 894 4414
Brazil	(11) 4197 3600
Mexico	01800 5064 800
United States	(800) 829 4444

#### Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 375 8100

#### Europe & Middle East

Belgium	32 (0) 2 404 93 40
Denmark	45 45 80 12 15
Finland	358 (0) 10 855 2100
France	0825 010 700* *0.125 €/minute
Germany	49 (0) 7031 464 6333
Ireland	1890 924 204
Israel	972-3-9288-504/544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
United Kingdom	44 (0) 118 927 6201

*For other unlisted countries:*

[www.agilent.com/find/contactus](http://www.agilent.com/find/contactus)

*(BP-3-1-13)*

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2013  
Published in USA, May 9, 2013  
5990-8116EN



**Agilent Technologies**