Agilent
N9320B RF Spectrum Analyzer

9 kHz to 3.0 GHz

Data Sheet

Agilent Technologies

Definitions and Conditions

The spectrum analyzer will meet its specifications when:

- It is within its calibration cycle
- It has been turned on at least 30 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 has been stored previously 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.

Frequency and Time Specification

		Supplemental information
Frequency		
Range	9 kHz to 3 GHz	AC coupled
	100 kHz to 3 GHz	Preamp on
Resolution	1 Hz	
Internal 10 MHz frequency reference		
Aging rate	± 1 ppm/year	
Temperature stability	± 1 ppm	5 to +45 °C, reference 25 °C
Supply voltage stability	± 0.3 ppm	
Residual FM	≤ 100 Hz p-p in 100 ms nominal	RBW = 1 kHz, VBW = 1 kHz
Frequency readout accuracy (start, stop, center, marker)		
Marker resolution	(freq span)/(number of sweep point -1)	
Uncertainty	± (freq indication x freq reference uncertainty[1] + 1% x span + 20% x resolution bandwidth + marker resolution)	
Sweep point	461, fixed	
Marker frequency counter		
Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz	Selectable
Accuracy	± [(marker freq x freq reference uncertainty[1]) + (counter resolution)]	
Frequency span (FFT and swept mode)		
Range	0 Hz (zero span), 100 Hz to 3.0 GHz	
Resolution	1 Hz	
Accuracy	± span/(swept points -1)	
Sweep time and triggering		
Span range	10 ms to 1000 s	Span > 0 Hz
	6 µs to 200 s	Span = 0 Hz (minimum resolution = 6 µs)
Mode	Continuous, single	
Trigger	Free run, video, external	
Trigger slope	Positive or negative edge	Selectable
Trigger delay	0 to 80 sweep time	
Resolution bandwidth (RBW)		
Range (-3 dB bandwidth)	10 Hz to 1 MHz, in 1-3-10 sequence	
Accuracy	± 5% nominal	
Resolution filter shape factor	< 5:1 nominal	
Range (-6 dB bandwidth)	200 Hz, 9 kHz, 120 kHz, 1 MHz	EMI bandwidth (CISPR 16-1-1 complaint), requires Option EMF
Accuracy	± 10% nominal	
Resolution filter shape factor	< 5:1 nominal	-60 dB/-6 dB bandwidth ratio
Video bandwidth (VBW)		
Range	1 Hz to 1 MHz in 1-3-10 sequence	-3 dB bandwidth

1. Frequency reference uncertainty = Aging rate x period since adjustment + supply voltage stability + temperature stability.

Amplitude Specifications

		Supplemental information
Amplitude range		
Measurement range	10 MHz to 3 GHz: Displayed average noise level (DANL) to +30 dBm	
(PA OFF)	1 to 10 MHz: DANL up to 23 dBm	
	100 kHz to 1 MHz: DANL up to 20 dBm	
Input attenuator range	0 to 70 dB, in 1 dB steps	
Maximum damage level		
Average continuous power	≤ +37 dBm	Input attenuator setting ≥ 10 dB, 3 minutes maximum
Peak pulse power	≤ +50 dBm (100 W)	For < 10 µs pulse width, < 1% duty cycle, and input attenuation ≥ 40 dB
DC voltage	50 VDC maximum	
Level display range		
Log scale units	dBm, dBmV, dBµV, dBµA	
Linear scale units	µV, mV, V, µA, mA, A, µW, mW, W	
Marker level readout	0.01 dB	Log scale
Resolution	0.01% of reference level	Linear scale
Number of traces	4	
Detectors	Positive-peak, negative-peak, sample, normal, RMS	
Trace function	Clear/write, maximum hold, average, minimum hold, view	
Frequency response		
10 dB input attenuation, reference: 50 MHz, 20 to -30 °C		
200 kHz to 2.0 GHz	± 0.5 dB	Preamp off
2.0 to 3.0 GHz	± 0.7 dB	Preamp off
1 MHz to 2.0 GHz	± 0.6 dB	Preamp on
2.0 to 3.0 GHz	± 0.8 dB	Preamp on
Input attenuation switching uncertainty at 50 MHz		
Attenuation > 2 dB, preamp off		
0 to 60 dB attenuation	± 0.4 dB	Relative to 10 dB (reference setting)
Absolute amplitude accuracy		
Center frequency 50 MHz, RBW 1 kHz, VBW 1 kHz, amplitude scale log, span 100 kHz, sweep time coupled, peak detector, signal at reference level		
Preamp off	± 0.3 dB	Reference level -10 dB, input attenuation 10 dB
Preamp on	± 0.4 dB	Reference level -30 dB, input attenuation 10 dB

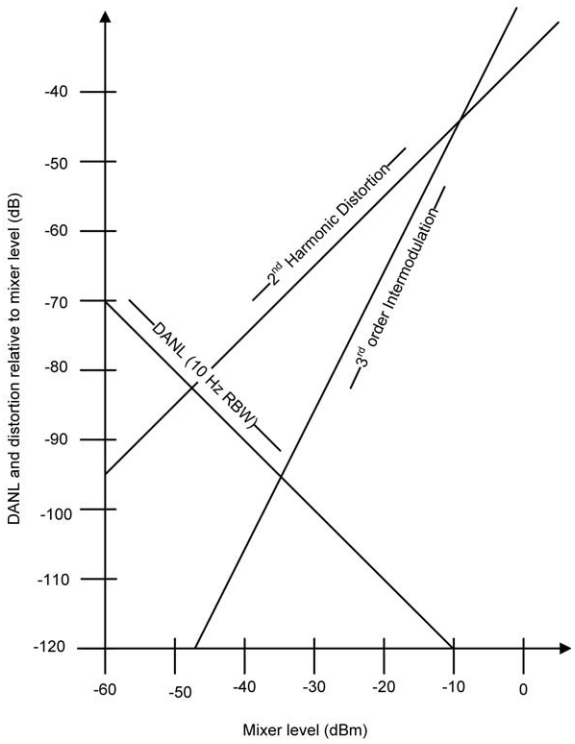
Amplitude Specifications (continued)

		Supplemental information
Level measurement uncertainty		
20 to -30 °C; frequency > 1 MHz; signal input 0 to -50 dBm; reference level 0 to -50 dBm; input attenuation 20 dB; RBW 1 kHz, VBW 1 kHz; after calibration; preamp off		
Overall amplitude accuracy	± 1.5 dB	
	± 0.5 dB, typical	
Level display range		
Log scale units	dBm, dBmV, dBµV, dBµA	
Linear scale and units	W, mW, µW, A, mA, µA, V, mV, µV	
Marker level readout	0.01 dB	
Resolution	0.01% of reference level	Log scale
Number of traces	4	Linear scale
Detectors	Positive-peak, negative-peak, sample, normal, RMS	
Trace functions	Clear/write, maximum hold, average, minimum hold, view	
Preamplifier		
Frequency range	1 MHz to 3.0 GHz	
Gain	18 dB nominal	

Dynamic Range Specifications

		Supplemental information
1 dB gain compression		
Preamp off	50 MHz to 3.0 GHz	> 0 dBm, typical; total power at input mixer
Preamp on	50 MHz to 3.0 GHz	> -20 dBm, typical; total power at the preamp *Total power at the preamp = total power at the input (dBm) - input attenuation (dB)*
Displayed average noise level (DANL)		
Input terminated, 0 dB RF attenuation, RBW = 10 Hz, VBW = 1 Hz, sample detector		
Preamp off	9 to 100 kHz	< -90 dBm, nominal
	100 kHz to 1 MHz	< -90 dBm – 3 x (f/100 kHz) dB
	1 to 10 MHz	< -124 dBm
	10 MHz to 3 GHz	< -130 dBm + 3 x (f/1 GHz) dB
Preamp on	100 kHz to 1 MHz	< -108 dBm – 3 x (f/100 kHz) dB
	1 to 10 MHz	< -142 dBm
	10 MHz to 3 GHz	< -148 dBm + 3 x (f/1 GHz) dB
Spurious response		
Preamp off, signal input -30 dBm, 0 dB RF attenuation		
Second harmonic distortion	10 to 200 MHz	+30 dBm
	200 to 500 MHz	+35 dBm
	500 MHz to 3 GHz	+43 dBm
Preamp off, signal input -30 dBm, 0 dB RF attenuation		
Third-order intermodulation (TOI)	300 MHz to 3 GHz	+10 dBm; +13 dBm nominal

Nominal Dynamic Range at 1 GHz



Dynamic Range Specifications (continued)

		Supplemental information	
Spurious response (continued)			
Input related spurious	< -60 dBc	-30 dBm signal at input mixer, 20 to 30 °C	
Residual response (inherent)	< -83 dBc	Input terminated and 0 dB RF attenuation, preamp off	
Phase noise		Specification	Typical
Offset from CW signal	10 kHz	< -88 dBc/Hz	< -90 dBc/Hz
Fc = 1 GHz, RBW = 1 kHz, VBW = 10 Hz, and sample detector, log average, average times > 40	100 kHz	< -100 dBc/Hz	< -102 dBc/Hz
	1 MHz	< -110 dBc/Hz	< -112 dBc/Hz
Residual FM	≤ 100 Hz peak-to-peak in 100 ms	1 kHz RBW, 1 kHz VBW	

Tracking Generator Specifications *(Option TG3 required)*

		Supplemental information
Output frequency		
Range	100 kHz to 3 GHz	Settable to 9 kHz
Resolution	1 Hz	
Output power level		
Range	-30 to 0 dBm	
Resolution	0.1 dB	
Absolute accuracy	± 0.75 dB	20 to 30 °C, at 50 MHz with coupled source attenuator, referenced to -20 dBm
Output flatness	± 3 dB	100 kHz to 10 MHz
	± 2 dB	10 MHz to 3 GHz
VSWR	< 1.5:1	300 kHz to 3 GHz, input attenuator ≥ 12 dB
Connector and impedance	N-type female, 50 Ω	
Maximum safe reverse level		
Average total power	30 dBm (1 W)	
AC coupled	0 VDC MAX	

Modulation Analysis Specifications

		Supplemental information
Demodulation		
Frequency range	10 MHz to 3 GHz	
Carrier power accuracy	± 2 dB	± 1 dB typical
Input power	-30 to +20 dBm	Auto attenuation
Carrier power displayed resolution	0.01 dBm	
AM measurement (included in Option AMA)		
Modulation rate	20 Hz to 100 kHz	
Accuracy	1 Hz, nominal	Modulation rate < 1 kHz
	< 0.1% modulation rate, nominal	Modulation rate ≥ 1 kHz
Depth	5 to 95%	
Accuracy	± 4% nominal	
FM measurement (included in Option AMA)		
Modulation rate	20 Hz to 200 kHz	
Accuracy	1 Hz, nominal	Modulation rate < 1 kHz
	< 0.1% modulation rate, nominal	Modulation rate ≥ 1 kHz
Deviation	20 Hz to 400 kHz	
Accuracy	± 4% nominal	
ASK measurement (included in Option DMA)		
Symbol rate range	200 Hz to 100 kHz	
Modulation depth/index range	10 to 90%	
Accuracy	± 4% of reading, nominal	
Displayed resolution	0.1%	
FSK measurement (included in Option DMA)		
Symbol rate range	1 to 100 kH	
FSK deviation range	1 to 400 kHz	
Accuracy	± 4% nominal	β ≥1 and β≤4, β is the ratio of frequency deviation to symbol rate
Displayed resolution	0.01 Hz	

Inputs and Outputs

		Supplemental information
Front panel		
RF input connector	N-type female, 50 Ω	
VSWR	< 1.5:1	300 kHz to 3 GHz, input attenuator ≥ 10 dB
Calibration output	Amplitude	-10 dBm ± 0.3 dB
	Frequency	50 MHz
	Accuracy	Same as the frequency reference
	Connector and impedance	BNC-type female, 50 Ω
Probe power	Voltage/current	+15 V, 150 mA maximum
		-12.6 V, 150 mA maximum
RF output connector	N-type female, 50 Ω	Option TG3 installed
USB interface (host)	A plug, version 1.1	
Rear panel		
10 MHz reference output	Output amplitude	> 0 dBm
	Connector and impedance	BNC-type female, 50 Ω
10 MHz reference input	Input amplitude	-5 to +10 dBm
	Frequency lock range	± 5 ppm of specified external reference input frequency
	Connector and impedance	BNC-type female, 50 Ω
External trigger input	Input amplitude	5 V TTL level
	Connector and impedance	BNC-type female, 10 kΩ
VGA output	VGA analog RGB	31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced
	D-sub 15-pin female connector	VGA compatible
	640 x 480 screen resolution	
LAN TCP/IP interface	10Base, RJ-45 connector	
USB interface (device)	B plug, version 1.1	
GPIB interface	IEEE-488 bus connector	Optional G01 installed

General

	Supplemental information	
Temperature range		
Operating	+5 to +45 °C	
Storage	-20 to +70 °C	
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		
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		
LpA < 70 dB		
Operator position		
Normal position		
Per ISO 7779		
Environmental stress		
Samples of this product have been type tested in accordance with the Agilent 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		
Power requirements		
Voltage and frequency (nominal)	100 to 240 VAC, 50 to 60 Hz	Auto ranging
Power consumption	< 65 W	
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	

General (continued)

		Supplemental information
Weight (without options)		
Net	8.4 kg (18 lbs) nominal	
Shipping	14.5 kg (32 lbs) nominal	
Dimensions		
Height	132.5 mm (5.2 in)	3U rack height
Width	320 mm (12.6 in)	
Length	400 mm (15.7 in)	
Warranty		
The N9320B spectrum analyzer is supplied with a one-year warranty		
Calibration cycle		
The recommended calibration cycle is one year. Calibration services are available through Agilent Service Centers		

Related Literature

- Agilent N9320B RF Spectrum Analyzer, Brochure, literature number 5990-8118EN
- Agilent N9320B RF Spectrum Analyzer, Configuration Guide, literature number 5990-8120EN

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