

# Keysight N9320B

## RF Spectrum Analyzer

9 kHz to 3.0 GHz

Data Sheet



## 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 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.

## Frequency and Time Specification

		Supplemental Information
<b>Frequency</b>		
Range	9 kHz to 3 GHz 100 kHz to 3 GHz	AC coupled Preamp on
Resolution	1 Hz	
<b>Internal 10 MHz frequency reference</b>		
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
<b>Frequency readout accuracy (start, stop, center, marker)</b>		
Marker resolution	(freq span)/(number of sweep point -1)	
Uncertainty	± (freq indication x freq reference uncertainty <sup>1</sup> + 1% x span + 20% x resolution bandwidth + marker resolution)	
Sweep point	461, fixed	
<b>Marker frequency counter</b>		
Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz	Selectable
Accuracy	± [(marker freq x freq reference uncertainty <sup>1</sup> ) + (counter resolution)]	
<b>Frequency span (FFT and swept mode)</b>		
Range	0 Hz (zero span), 100 Hz to 3.0 GHz	
Resolution	1 Hz	
Accuracy	± span/(swept points -1)	
<b>Sweep time and triggering</b>		
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	
<b>Resolution bandwidth (RBW)</b>		
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
<b>Video bandwidth (VBW)</b>		
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
<b>Amplitude range</b>		
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	
<b>Maximum damage level</b>		
Average continuous power	$\leq +37$ dBm	Input attenuator setting $\geq 10$ dB, 3 minutes maximum
Peak pulse power	$\leq +50$ dBm (100 W)	For $< 10$ $\mu$ s pulse width, $< 1\%$ duty cycle, and input attenuation $\geq 40$ dB
DC voltage	50 VDC maximum	
<b>Level display range</b>		
Log scale units	dBm, dBmV, dB $\mu$ V, dB $\mu$ A	
Linear scale units	$\mu$ V, mV, V, $\mu$ A, mA, A, $\mu$ W, 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	
<b>Frequency response</b>		
10 dB input attenuation, reference: 50 MHz, 20 to $-30$ $^{\circ}$ C		
200 kHz to 2.0 GHz	$\pm 0.5$ dB	Preamp off
2.0 to 3.0 GHz	$\pm 0.7$ dB	Preamp off
1 MHz to 2.0 GHz	$\pm 0.6$ dB	Preamp on
2.0 to 3.0 GHz	$\pm 0.8$ dB	Preamp on
<b>Input attenuation switching uncertainty at 50 MHz</b>		
Attenuation $> 2$ dB, preamp off		
0 to 60 dB attenuation	$\pm 0.4$ dB	Relative to 10 dB (reference setting)
<b>Absolute amplitude accuracy</b>		
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	$\pm 0.3$ dB	Reference level $-10$ dB, input attenuation 10 dB
Preamp on	$\pm 0.4$ 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	$\pm 1.5$ dB
	$\pm 0.5$ dB, typical

#### Level display range

Log scale units	dBm, dBmV, dB $\mu$ V, dB $\mu$ A	
Linear scale and units	W, mW, $\mu$ W, A, mA, $\mu$ A, V, mV, $\mu$ V	
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	

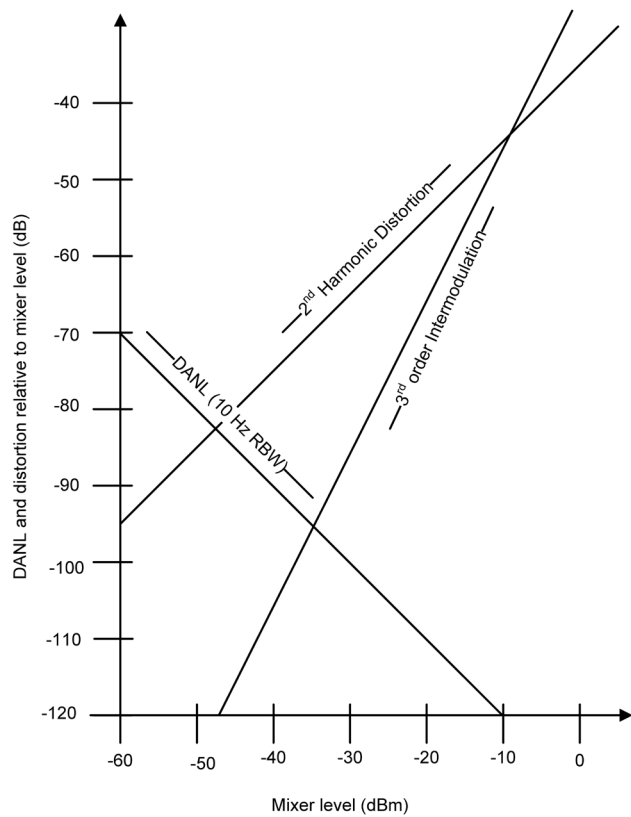
#### Preamplifier

Frequency range	1 MHz to 3.0 GHz
Gain	18 dB nominal

## Dynamic Range Specifications

		Supplemental Information
<b>1 dB gain compression</b>		
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
		<b>Total power at the preamp = total power at the input (dBm) - input attenuation (dB)</b>
<b>Displayed average noise level (DANL)</b>		
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
<b>Spurious response</b>		
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	
<b>Spurious response (continued)</b>			
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	
<b>Phase noise</b>		<b>Specification</b>	<b>Typical</b>
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	
<b>Output frequency</b>			
Range	100 kHz to 3 GHz	Settable to 9 kHz	
Resolution	1 Hz		
<b>Output power level</b>			
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		
<b>Maximum safe reverse level</b>			
Average total power	30 dBm (1 W)		
AC coupled	0 VDC MAX		

## Modulation Analysis Specifications

		Supplemental Information
<b>Demodulation</b>		
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	
<b>AM measurement (included in Option AMA)</b>		
Modulation rate	20 Hz to 100 kHz	
Accuracy	1 Hz, nominal < 0.1% modulation rate, nominal	Modulation rate < 1 kHz Modulation rate ≥ 1 kHz
Depth	5 to 95%	
Accuracy	± 4% nominal	
<b>FM measurement (included in Option AMA)</b>		
Modulation rate	20 Hz to 200 kHz	
Accuracy	1 Hz, nominal < 0.1% modulation rate, nominal	Modulation rate < 1 kHz Modulation rate ≥ 1 kHz
Deviation	20 Hz to 400 kHz	
Accuracy	± 4% nominal	
<b>ASK measurement (included in Option DMA)</b>		
Symbol rate range	200 Hz to 100 kHz	
Modulation depth/index range	10 to 90%	
Accuracy	± 4% of reading, nominal	
Displayed resolution	0.1%	
<b>FSK measurement (included in Option DMA)</b>		
Symbol rate range	1 to 100 kHz	
FSK deviation range	1 to 400 kHz	
Accuracy	± 4% nominal	$b \geq 1$ and $b \leq 4$ , b is the ratio of frequency deviation to symbol rate
Displayed resolution	0.01 Hz	



## Inputs and Outputs

		Supplemental Information
<b>Front panel</b>		
RF input connector	N-type female, 50 $\Omega$	
VSWR	< 1.5:1	300 kHz to 3 GHz, input attenuator $\geq$ 10 dB
Calibration output	Amplitude	-10 dBm $\pm$ 0.3 dB
	Frequency	50 MHz
	Accuracy	Same as the frequency reference
	Connector and impedance	BNC-type female, 50 $\Omega$
Probe power	Voltage/current	+15 V, 150 mA maximum
		-12.6 V, 150 mA maximum
RF output connector	N-type female, 50 $\Omega$	Option TG3 installed
USB interface (host)	A plug, version 1.1	
<b>Rear panel</b>		
10 MHz reference output	Output amplitude	> 0 dBm
	Connector and impedance	BNC-type female, 50 $\Omega$
10 MHz reference input	Input amplitude	-5 to +10 dBm
	Frequency lock range	$\pm$ 5 ppm of specified external reference input frequency
	Connector and impedance	BNC-type female, 50 $\Omega$
External trigger input	Input amplitude	5 V TTL level
	Connector and impedance	BNC-type female, 10 k $\Omega$
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
<b>Temperature range</b>		
Operating	+5 to +45 °C	
Storage	-20 to +70 °C	
<b>EMC</b>		
<ul style="list-style-type: none"> <li>- Complies with European EMC Directive 2004/108/EC</li> <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		
<b>Safety</b>		
<ul style="list-style-type: none"> <li>- Complies with European Low Voltage Directive 2006/95/EC</li> <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		
LpA < 70 dB		
Operator position		
Normal position		
Per ISO 7779		
<b>Environmental stress</b>		
Samples of this product have been type tested in accordance with the Keysight Technologies, Inc. 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		
<b>Power requirements</b>		
Voltage and frequency (nominal)	100 to 240 VAC, 50 to 60 Hz	Auto ranging
Power consumption	< 65 W	
<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>Weight (without options)</b>		
Net	8.4 kg (18 lbs) nominal	
Shipping	14.5 kg (32 lbs) nominal	
<b>Dimensions</b>		
Height	132.5 mm (5.2 in)	3U rack height
Width	320 mm (12.6 in)	
Length	400 mm (15.7 in)	
<b>Warranty</b>		
The N9320B spectrum analyzer is supplied with a three-year warranty		
<b>Calibration cycle</b>		
The recommended calibration cycle is one year. Calibration services are available through Keysight Service Centers		

## Related Literature

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

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