

# N9322C Basic Spectrum Analyzer

Easy on your budget. Tough to beat performance,  
efficiency and simplicity.



# Definitions and Conditions

## Learn more about the product

Reference these frequently-used documents:

- Brochure (5991-1166EN)
  - Introduces the product features
- Configuration Guide (5991-1168EN)
  - Describes ordering information

For the latest revision of product related documents or more information, visit the website:

[www.keysight.com/find/n9322c](http://www.keysight.com/find/n9322c)

## Specification

Describes 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

Describes 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

Indicates expected performance, or describe product performance that is useful in the application of the product, but are not covered by the product warranty.

The 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 had previously been stored 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 7 GHz	AC coupled
Resolution	1 Hz	
<b>Frequency reference</b>		
	<b>Option PFR</b>	<b>Standard</b>
Nominal frequency	10 MHz	10 MHz
Aging rate	$\pm 1 \times 10^{-7}$ /Year	$\pm 1 \times 10^{-6}$ /Year
Temperature stability		
20 to 30°C	$\pm 1.5 \times 10^{-8}$	
5 to 45°C	$\pm 5 \times 10^{-8}$	$\pm 1 \times 10^{-6}$
Achievable initial calibration accuracy	$\pm 4 \times 10^{-8}$	$\pm 1 \times 10^{-6}$
<b>Frequency readout accuracy (start, stop, center, marker)</b>		
Marker resolution	(frequency span)/(number of sweep point – 1)	
Uncertainty	$\pm$ (freq indication x freq reference uncertainty <sup>1</sup> + 1% x span + 20% x resolution bandwidth + marker resolution + 1 Hz)	
Sweep point	461, fixed	
<b>Marker frequency counter</b>		
Resolution	1 Hz	
Accuracy	$\pm$ [(marker freq x freq reference uncertainty <sup>1</sup> ) + (counter resolution)]	RBW/Span $\geq$ 0.02 (Marker level to displayed noise level > 25 dB, frequency offset = 0 Hz)
<b>Frequency span (FFT and swept mode)</b>		
Range	0 Hz (zero span), 50 Hz to 7 GHz	
Resolution	1 Hz	
Accuracy	$\pm$ (0.22% x span + span/(sweep point – 1)), nominal	
<b>Sweep time and triggering</b>		
Range	2 ms to 1000 s 600 ns to 1000 s	Span $\geq$ 100 Hz Span = 0 Hz (minimum resolution = 600 ns, when RBW $\geq$ 30 kHz)
Mode	Continuous, Single	
Sweep time rule	Accuracy or Speed	
Trigger	Free run, video, external, RF burst	
Trigger slope	Selectable positive or negative edge	
Trigger delay	$\pm$ 12 ms to $\pm$ 12 s, nominal	Span = 0 Hz

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

## Frequency and Time specification (Continued)

		Supplemental information
<b>Time-gated sweep (Option TMG)</b>		
Gate sources	External	
	Periodic timer	Sync sources include free and external Period 0 to 20 s (It should be greater than gate delay plus gate length) Offset -5 to +5 s
Gate delay range	12 $\mu$ s to 10 s	Resolution = 200 ns
Gate length range	84 $\mu$ s to 10 s	Resolution = 200 ns
RBW range	$\geq$ 1 kHz	VBW is fixed and equal to RBW for efficiency
<b>Resolution bandwidth (RBW)</b>		
Range (-3 dB bandwidth)	10 Hz to 3 MHz	In 1-3-10 sequence
Accuracy	$\pm$ 5%, nominal	< 10% when RBW = 3 MHz
Resolution filter shape factor	< 5 : 1, nominal	60 dB/3 dB bandwidth ratio, digital, Gaussian-like
EMI bandwidth (CISPR compliant)	200 Hz, 9 kHz, 120 kHz, 1 MHz	Option EMC required
Accuracy	$\pm$ 10% nominal	
Resolution filter shape factor	< 5:1 nominal	-60 dB/-6 dB bandwidth ratio
<b>Video bandwidth (VBW)</b>		
Range	1 Hz to 3 MHz in 1-3-10 sequence	In 1-3-10 sequence
Accuracy	$\pm$ 10%, nominal	VBW = 1 Hz to 1 MHz

# Amplitude Specifications

		Supplemental information
<b>Measurement range</b>		
100 kHz to 1 MHz	Displayed average noise level (DANL) to +10 dBm	Preamp off
1 MHz to 7 GHz	Displayed average noise level (DANL) to +20 dBm	
Input attenuator range	0 to 50 dB, in 1 dB steps	
<b>Maximum damage level</b>		
Average continuous power	$\leq +33$ dBm, 3 minutes maximum	Input attenuator setting $\geq 20$ dB
DC voltage	$\pm 50 V_{DC}$ maximum	2 MHz to 7 GHz
<b>Level display range</b>		
Scale units	dBm, dBmV, dB $\mu$ V, dBmV EMF, dB $\mu$ V EMV, V, W, V EMF	
Marker level readout	0.01 dB	Log scale
Resolution	< 1% of signal level	Linear scale
Number of traces	4	
Detectors	Positive-peak, negative-peak, sample, normal, average (video, RMS, voltage), quasi-peak (option EMC required)	
Trace function	Clear/write, maximum hold, average, minimum hold	
<b>Frequency response</b>		
20 to 30°C, 30% to 70% relative humidity, attenuation 20 dB, reference frequency 50 MHz		
9 to 100 kHz	$\pm 0.5$ dB nominal	Preamp off
100 kHz to 3 GHz	$\pm 0.7$ dB	Preamp off
3 to 4 GHz	$\pm 0.85$ dB	Preamp off
4 to 7 GHz	$\pm 1.0$ dB	Preamp off
100 kHz to 3 GHz	$\pm 0.7$ dB	Preamp on
3 to 4 GHz	$\pm 0.9$ dB	Preamp on
4 to 7 GHz	$\pm 1.1$ dB	Preamp on
<b>Input attenuation switching uncertainty at 50 MHz</b>		
20 to 30°C, attenuation $\geq 1$ dB, preamp off		
1 to 50 dB attenuation	Typical $\pm 0.2$ dB	Relative to 20 dB (reference setting)
<b>Resolution bandwidth switching uncertainty</b>		
20 to 30°C, 10 Hz to 3 MHz RBW $\pm 0.1$ dB, nominal		
<b>Total absolute amplitude accuracy</b>		
20 to 30°C, 30% to 70% RH, peak detector, RBW 1 kHz, VBW 300 Hz, sweep time Accuracy, input signal $-50$ to 0 dBm, preamp off; attenuation 20 dB. Add additional $\pm 0.3$ dB when sweep time rule is set to Speed		
At 50 MHz	$\pm 0.3$ dB	
At all frequencies	$\pm (0.3 \text{ dB} + \text{frequency response})$	
100 kHz to 3 GHz	$\pm 0.60$ dB	95th percentile
3 to 4 GHz	$\pm 0.65$ dB	95th percentile
4 to 7 GHz	$\pm 0.80$ dB	95th percentile
<b>Preamp on</b>		
At 50 MHz	$\pm 0.4$ dB	
At all frequencies	$\pm (0.4 \text{ dB} + \text{frequency response})$	
100 kHz to 3 GHz	$\pm 0.60$ dB	95th percentile
3 to 4 GHz	$\pm 0.65$ dB	95th percentile
4 to 7 GHz	$\pm 0.90$ dB	95th percentile
<b>Preamplifier</b>		
Frequency range	9 kHz to 7 GHz	
Gain	25 dB, nominal (100 kHz to 7 GHz)	
	15 dB, nominal (9 to 100 kHz)	

# Dynamic Range Specifications

1 dB gain compression			Supplemental information
20 to 30°C, frequency $\geq$ 50 MHz, Ref level $>$ -20 dBm			
Preamp off	50 to 200 MHz 200 to 500 MHz 500 MHz to 7 GHz	+ 2 dBm nominal + 4 dBm nominal + 7 dBm nominal	Mixer power level (dBm) = input power (dBm) – input attenuation (dB)
Preamp on	$>$ -32 dBm nominal; total power at the preamp		Total power at the preamp = total power at the input (dBm) – input attenuation (dB)
Displayed average noise level (DANL)	Normalized to 1 Hz	With 10 Hz RBW	
20 to 30°C, input terminated 50 $\Omega$ , 0 dB input attenuation, RBW = 1 kHz, RMS detector, average $\geq$ 40			
Preamp off	9 to 100 kHz	-100 dBm, nominal	-90 dBm, nominal
	100 kHz to 1 MHz	-108 dBm, -127 dBm typical	-98 dBm, -117 dBm typical
	1 to 10 MHz	-128 dBm, -146 dBm typical	-118 dBm, -136 dBm typical
	10 to 500 MHz	-142 dBm, -146 dBm typical	-132 dBm, -136 dBm typical
	500 to 2.5 GHz	-141 dBm, -145 dBm typical	-131 dBm, -135 dBm typical
	2.5 to 4 GHz	-140 dBm, -144 dBm typical	-130 dBm, -134 dBm typical
	4 to 6 GHz	-138 dBm, -140 dBm typical	-128 dBm, -130 dBm typical
	6 to 7 GHz	-136 dBm, -138 dBm typical	-126 dBm, -128 dBm typical
Preamp on	9 to 100 kHz	-110 dBm, nominal	-100 dBm, nominal
	100 kHz to 1 MHz	-131 dBm, -150 dBm typical	-121 dBm, -140 dBm typical
	1 to 10 MHz	-148 dBm, -163 dBm typical	-138 dBm, -153 dBm typical
	10 to 500 MHz	-161 dBm, -164 dBm typical	-151 dBm, -154 dBm typical
	500 to 2.5 GHz	-159 dBm, -162 dBm typical	-149 dBm, -152 dBm typical
	2.5 to 4 GHz	-158 dBm, -161 dBm typical	-148 dBm, -151 dBm typical
	4 to 6 GHz	-155 dBm, -158 dBm typical	-145 dBm, -148 dBm typical
	6 to 7 GHz	-150 dBm, -154 dBm typical	-140 dBm, -144 dBm typical
Spurious response			
Input terminated and 0 dB input attenuation, preamp off 20 to 30°C			
Residual response	$<$ -90 dBm, typical -98 dBm		
-30 dBm signal at input mixer 20 to 30°C			
Input related spurious	$<$ -75 dBc		
Exceptions:			
-65 dBc (F1 - 21.4 MHz, with F1 input frequency)			
-65 dBc (F1 - 5.35 MHz, with F1 input frequency)			
-65 dBc (F1 = 4155 MHz, with F1 input frequency)			
Mixer signal level at -30 dBm, input attenuation 0 dB, preamp off, 20 to 30°C			
Second harmonic distortion	50 MHz to 3 GHz	$<$ -65 dBc	
	3 to 7 GHz	$<$ -70 dBc	
Two -20 dBm tones at input mixer, spaced by 100 kHz, input attenuation 0 dB, preamp off, reference level $>$ -20 dBm, 20 to 30°C			
Third-order intercept (TOI)	50 to 300 MHz	+9 dBm, +12 dBm typical	
	300 MHz to 7 GHz	+11 dBm, +15 dBm typical	
Phase noise	Specification	Typical	
20 to 30°C, center frequency = 1 GHz			
Offset from CF signal	10 kHz	$<$ -90 dBc/Hz	
	100 kHz	$<$ -98 dBc/Hz	
	1 MHz	$<$ -119 dBc/Hz	
Residual FM			
20 to 30°C, RBW 100 Hz,	$\leq$ 10 Hz p-p in 20 ms, nominal		

## Tracking Generator (Option TG7)

Supplemental information		
<b>Output frequency</b>		
Range	5 MHz to 7 GHz	
Resolution	1 Hz	
Resolution bandwidth	3 kHz to 3 MHz	
<b>Output power level</b>		
Range	-20 to 0 dBm	
Resolution	1 dB	
Output flatness	± 2 dB, nominal	
VSWR	< 2 : 1, nominal	5 MHz to 7 GHz, input attenuator ≥ 12 dB
Dyanmic range	Max. output power – DANL with 3 kHz RBW	
Connector and impedance	N-type female, 50 Ω	
<b>Maximum safe reverse level</b>		
Average total power	30 dBm (1W)	
DC voltage	± 50 V <sub>DC</sub>	
<b>Reflection measurement (Option RM7, requires Option TG7)</b>		
Frequency range	5 MHz to 7 GHz	
Frequency resolution	100 kHz	
Output power	-4 to +2 dBm, nominal	
Measurement speed	2 s (full span 5 MHz to 7 GHz)	
Number of data points	461	
Directivity of calibrator	> 40 dB	Mechanical OSL calibrator
<b>Return loss</b>		
Range	0 to 60 dB	
Accuracy	$20 \times \log_{10} (1.1 + 10^{-(D-RL)/20}) +$ $0.016 \times 10^{-(RL/20)} + 10^{-(3+RL/20)}$	Nominal, after average
	D: Directivity of calibrator	
	RL: Return loss value of the DUT	
Resolution	0.01 dB	
<b>Voltage standing wave ratio</b>		
Range	1 to 65	
Resolution	0.01	
Accuracy	Refer to return loss accuracy	
<b>Insertion loss</b>		
Range	0 to 30 dB	
Resolution	0.01 dB	
<b>Distance-to-fault (DTF)</b>		
Vertical range	0 to 60 dB	Return loss
	1 to 65	VSWR
Range	(Number of data points – 1) × resolution	Number of data points = 461
Resolution (meter)	$(1.5 \times 10^8) \times (V_p)/(F_2 - F_1)$ Hz	V <sub>p</sub> is the cable's relative propagation velocity
		F2 is the stop frequency
		F1 is the start frequency
<b>Immunity to interference</b>		
On-channel	+17 dBm, nominal	
On-frequency	-5 dBm, nominal	

## Other Options

AM/FM modulation analysis (Option AMA)		Supplemental information
Frequency range	10 MHz to 7 GHz	
Carrier power accuracy	± 1.8 dB, nominal	
Carrier power range	-30 to +10 dBm	100 kHz to 2 MHz
	-30 to +20 dBm	2 MHz to 7 GHz
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/FSK modulation analysis (Option DMA)		
Frequency range	2.5 MHz to 6 GHz	
Carrier power accuracy	± 2 dB, nominal	
Carrier power range	-30 to +20 dBm, nominal	
Carrier power displayed resolution	0.01 dBm	
ASK measurement (included in Option DMA)		
Symbol rate range	100 Hz to 100 kHz	
Modulation depth/index range	5 to 95%	
Accuracy	± 4% of reading, nominal	
Displayed resolution	0.1%	
FSK measurement (included in Option DMA)		
FSK deviation	100 Hz to 400 kHz	
Symbol rate range	100 Hz to 20 kHz	$1 \leq \beta \leq 20$ ( $\beta$ is the ratio of frequency deviation to symbol rate (deviation/rate))
	20 to 50 kHz	$1 \leq \beta \leq 8$
	50 to 100 kHz	$1 \leq \beta \leq 4$
Accuracy	± 4%, nominal	
Displayed resolution	0.01 Hz	
Channel scanner (Option SCN)		
Scan modes	Top N, bottom N, and list	
Channels displayed	1 to 20	
Displayed orientation	Vertical	Number of channels ≤ 5
	Horizontal	Number of channels > 5
Chart	Bar chart, and time chart	
Log file	*.csv	
Spectrum monitor (Option MNT)		
Display modes	Spectrogram	
	Spectrum trace	
	Combination of spectrogram and spectrum trace in one screen	



## Other Options (Continued)

		Supplemental information
<b>Security features (Option SEC)</b>		
Security erase method	Erase the entire user flash memory by writing single character "1" over all memory locations	Non-recoverable
Port control	Disable or enable LAN or USB connectors	
<b>Task planner (Option TPN)</b>		
Task plan execution mode	Auto, manual, and manual if fail	
Task plan file	*.TPN	Complementary task plan editor is available with <b>Keysight HSA and BSA PC software</b>
Number of tasks	Maximum 20 in a single .TPN file	
Measurements supported	Regular spectrum analysis and power suite (channel power, ACPR and OBW)	
	For more information, visit <a href="http://www.keysight.com/find/taskplanner">www.keysight.com/find/taskplanner</a>	
<b>USB average power sensor support (Option PWM)</b>		
Power sensor supported	Keysight U2000 Series USB power sensor	
Frequency range	9 kHz to 24 GHz	Sensor dependent
Dynamic range	-60 to +44 dBm	Sensor dependent
<b>USB peak and average power sensor support (Option PWP)</b>		
Power sensor supported	Keysight U2020 and U2042/44 X-Series USB peak and average power sensor	
Frequency range	50 MHz to 40 GHz	Sensor dependent
Dynamic range	-30 to +20 dBm	
<b>Base band input (Option BB1)</b>		
<b>Frequency range</b>		
	9 kHz to 10 MHz	
<b>Frequency span</b>		
	100 Hz to 9.997 MHz	
<b>Frequency resolution</b>		
	1 Hz	
<b>Measurement range</b>		
	DANL to +10 dBm (9 kHz to 2 MHz)	
	DANL to +20 dBm (2 MHz to 10 MHz)	
<b>Overall amplitude accuracy</b>		
20 to 30°C, 30 to 70% RH, peak detector, input signal -50 to 0 dBm, 95th percentile		
9 to 100 kHz	± 2.5 dB	
100 kHz to 10 MHz	± 1.5 dB	
<b>Displayed average noise level</b>		
20 to 30°C, 30 to 70% RH, 10 Hz RBW, 1 Hz VBW, 50 Ω termination on input, 0 dB attenuation, RMS detector, Trace average > 40, reference level < -35 dBm		
9 to 100 kHz	-135 dBm, nominal	
100 kHz to 10 MHz	-145 dBm	
<b>Residual response</b>		
	< -120 dBm, nominal	20 to 30°C, Ref level < -35 dBm
		50 Ω termination on input, 0 dB attenuation

## Other Options (Continued)

Supplemental information	
<b>Base band input (Option BB1) - Continued</b>	
<b>Phase noise</b>	
F <sub>c</sub> = 5 MHz, RBW = 1 kHz, VBW = 30 Hz. Ref level -30 dBm, input attenuation 0 dB, input signal -20 dBm, average > 40	
Offset 30 kHz	-120 dBc/Hz, nominal
Offset 100 kHz	-127 dBc/Hz, nominal
Offset > 200 kHz	-130 dBc/Hz, nominal
<b>Second harmonic distortion</b>	
F > 100 kHz, signal level -30 dBm, ref level -30 dBm, attenuation 0 dB	
	< -55 dBc nominal
<b>Third order intermodulation distortion</b>	
F > 100 kHz, -20 dBm tones at 100 kHz apart, ref level -20 dBm, attenuation 0 dB	
	< -55 dBc, nominal

## Inputs and Outputs

		Supplemental information
<b>Front panel</b>		
RF input connector	N-type female, 50 $\Omega$ , nominal	
VSWR	< 1.5 : 1, nominal	10 MHz to 3 GHz
	< 2.0 : 1, nominal	3 to 7 GHz
Calibration output	Amplitude	-25 $\pm$ 0.25 dBm
	Frequency	40 MHz
	Connector and impedance	BNC-type female, 50 $\Omega$ , nominal
Probe power	Voltage/Current	+15 V, 150 mA maximum
		-12.6 V, 150 mA maximum
RF output connector	N-type female, 50 $\Omega$ , nominal	Option TG7 installed
USB interface (host)	A plug, version 1.1	
<b>Rear panel</b>		
10 MHz reference output	Output amplitude	> 0 dBm
	Frequency	10 MHz $\pm$ (10 MHz $\times$ frequency reference accuracy)
	Connector and impedance	BNC-type female, 50 $\Omega$ , nominal
10 MHz reference input	Input amplitude	-5 to +10 dBm, nominal
	Frequency	10 MHz
	Connector and impedance	BNC-type female, 50 $\Omega$ , nominal
External trigger input	Input amplitude	5 V TTL level; -12.6 V, 150 mA max (nominal)
	Connector and impedance:	BNC-type female, 10 k $\Omega$
LAN TCP/IP interface	10Base-T, RJ-45 connector	
USB interface (device)	B plug, version 1.1	
Mini USB (device)	Mini-AB female, version 1.1	
GPIB interface	IEEE-488 bus connector	Optional G01 installed

## General

<b>Temperature and relative humidity</b>		Supplemental information
Operating temperature range	+5 to +45°C	
Storage temperature range	-20 to +70°C	
Relative humidity	< 95%	
<b>EMC</b>		
Complies with European EMC Directive 2004/108/EC		
IEC/EN 61326-1 / IEC/EN 61326-2-1		
CISPR Pub 11 group 1, class A		
AS/NZS CISPR 11:2004		
ICES/NMB-001:2006		
This ISM device complies with Canadian ICES-001		
Cet appareil ISM est conforme à la norme NMB-001 du Canada		

## General (Continued)

### Safety

Complies with European Low Voltage Directive 2006/95/EC

· IEC/EN 61010-1 3rd 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 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

### Power requirements

Voltage and frequency (nominal)            100 to 240 VAC, 50 to 60 Hz                      Auto ranging

Power consumption                               $\leq 25$  W, < 20 W, typical

### Display

Resolution                                         640 x 480

Size     165.1 mm (6.5 inch) diagonal (nominal)

### Data storage

Internal    64 MB nominal

External     Supports USB 3.0 compatible memory devices

### Weight (without options)

Net     7.9 kg (17.4 lbs), nominal

Shipping                                         14.5 kg (30.9 lbs), nominal

### Dimensions

Height     132.5 mm (5.2 inch)                                 Occupies 3U height in a rack

Width    320 mm (12.6 inch)

Length     400 mm (15.7 inch)

### Warranty

The N9322C spectrum analyzer is supplied with a three-year warranty

### Calibration cycle

The recommended calibration cycle is one year. Calibration services are available through Keysight service centers

Learn more at: [www.keysight.com](http://www.keysight.com)

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