DATA SHEET

N9322C Basic Spectrum Analyzer

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



KEYSIGHT TECHNOLOGIES

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

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
Frequency		
Range	9 kHz to 7 GHz	AC coupled
Resolution	1 Hz	
Frequency reference		
	Option PFR	**Standard**
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	$\pm 4 \times 10^{-8}$	$\pm 1 \times 10^{-6}$
Frequency readout accuracy (start, stop, center, marker)		
Marker resolution	(frequency span)/(number of sweep point – 1)	
Uncertainty	± (freq indication x freq reference uncertainty [1] + 1% x span +20% x resolution bandwidth + marker resolution + 1 Hz)	
Sweep point	461, fixed	
Marker frequency counter		
Resolution	1 Hz	
Accuracy	± [(marker freq x freq reference uncertainty [1]) + (counter resolution)]	RBW/Span ≥ 0.02 (Marker level to displayed noise level > 25 dB, frequency offset = 0 Hz)
Frequency span (FFT and swept mode)		
Range	0 Hz (zero span), 50 Hz to 7 GHz	
Resolution	1 Hz	
Accuracy	± (0.22% ×span + span/(sweep point –1)), nominal	
Sweep time and triggering		
Range	2 ms to 1000 s	Span ≥ 100 Hz
	600 ns to 1000 s	Span = 0 Hz (minimum resolution = 600 ns, when RBW ≥ 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	± 12 ms to ± 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
Time-gated sweep (Option TMG)		
Gate sources	External	
	Periodic timer	Sync sources include free and external
		Period 0 to 20 s (It should be gerater than gate delay plus gate length)
		Offset –5 to +5 s
Gate delay range	12 µs to 10 s	Resolution = 200 ns
Gate length range	84 µs to 10 s	Resolution = 200 ns
RBW range	≥ 1 kHz	VBW is fixed and equal to RBW for efficiency
Resolution bandwidth (RBW)		
Range (–3 dB bandwidth)	10 Hz to 3 MHz	In 1-3-10 sequence
Accuracy	± 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	± 10% nominal	
Resolution filter shape factor	< 5:1 nominal	–60 dB/–6 dB bandwidth ratio
Video bandwdith (VBW)		
Range	1 Hz to 3 MHz in 1-3-10 sequence	In 1-3-10 sequence
Accuracy	± 10%, nominal	VBW = 1 Hz to 1 MHz

Amplitude Specifications

		Supplemental information
Measurement range		
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	
Maximum damage level		
Average contunious power	≤ +33 dBm, 3 minutes maximum	Input attenuator setting ≥ 20 dB 2 MHz to 7 GHz
DC voltage	± 50 V_{DC} maximum	
Level display range		
Scale units	dBm, dBmV, dBµV, dBmV EMF, dBµV 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	
Frequency response		
20 to 30°C, 30% to 70% relative humidity, attenuation 20 dB, reference frequency 50 MHz		
9 to 100 kHz	± 0.5 dB nominal	Preamp off
100 kHz to 3 GHz	± 0.7 dB	Preamp off
3 to 4 GHz	± 0.85 dB	Preamp off
4 to 7 GHz	± 1.0 dB	Preamp off
100 kHz to 3 GHz	± 0.7 dB	Preamp on
3 to 4 GHz	± 0.9 dB	Preamp on
4 to 7 GHz	± 1.1 dB	Preamp on
Input attenuation switching uncertainty at 50 MHz		
20 to 30°C, attenuation ≥ 1 dB, preamp off		
1 to 50 dB attenuation	Typical ± 0.2 dB	Relative to 20 dB (reference setting)
Resolution bandwidth switching uncertainty		
20 to 30°C, 10 Hz to 3 MHz RBW	± 0.1 dB, nominal	
Total absolute amplitude accuracy		
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 ± 0.3 dB when sweep time rule is set to Speed		
At 50 MHz	± 0.3 dB	
At all frequencies	± (0.3 dB + frequency response)	
100 kHz to 3 GHz	± 0.60 dB	95th percentile
3 to 4 GHz	± 0.65 dB	95th percentile
4 to 7 GHz	± 0.80 dB	95th percentile
Preamp on		
At 50 MHz	± 0.4 dB	
At all frequencies	± (0.4 dB + frequency response)	
100 kHz to 3 GHz	± 0.60 dB	95th percentile
3 to 4 GHz	± 0.65 dB	95th percentile
4 to 7 GHz	± 0.90 dB	95th percentile
Preamplifier		
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 ≥ 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 Ω, 0 dB input attenuation, RBW = 1 kHz , RMS detector, average ≥ 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	< –100 dBc/Hz
	1 MHz	< –119 dBc/Hz	< –121 dBc/Hz

Residual FM	
20 to 30°C, RBW 100 Hz,	≤ 10 Hz p–p in 20 ms, nominal

Tracking Generator (Option TG7)

		Supplemental information
Output frequency		
Range	5 MHz to 7 GHz	
Resolution	1 Hz	
Resolution bandwidth	3 kHz to 3 MHz	
Output power level		
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	
Maximum safe reverse level		
Average total power	30 dBm (1W)	
DC voltage	± 50 V_{DC}	
Reflection measurement (Option RM7, requires Option TG7)		
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
Return loss		
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	
Voltage standing wave ratio		
Range	1 to 65	
Resolution	0.01	
Accuracy	Refer to return loss accuracy	
Insertion loss		
Range	0 to 30 dB	
Resolution	0.01 dB	
Distance-to-fault (DTF)		
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_P is the cable's relative propagation velocity
		F2 is the stop frequency
		F1 is the start frequency
Immunity to interference		
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	$1 \leq \beta \leq 20$ (β 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
Security features (Option SEC)		
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	
Task planner (Option TPN)		
Task plan execution mode	Auto, manual, and manual if fail	
Task plan file	*.TPN	Complementary task plan editor is available with Keysight HSA and BSA PC software
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 www.keysight.com/find/taskplanner	
USB average power sensor support (Option PWM)		
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
USB peak and average power senesor support (Option PWP)		
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	
Base band input (Option BB1)		
Frequency range		
	9 kHz to 10 MHz	
Frequency span		
	100 Hz to 9.997 MHz	
Frequency resolution		
	1 Hz	
Measurement range		
	DANL to +10 dBm (9 kHz to 2 MHz)	
	DANL to +20 dBm (2 MHz to 10 MHz)	
Overall amplitude accuracy		
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	
Displayed average noise level		
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	
Residual response		
	< –120 dBm, nominal	20 to 30°C, Ref level < –35 dBm
		50 Ω termination on input, 0 dB attenuation

Other Options (Continued)

	Supplemental information
Base band input (Option BB1) - Continued	
Phase noise	
Fc = 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
Second harmonic distortion	
F > 100 kHz, signal level –30 dBm, ref level –30 dBm, attenuation 0 dB	
	< –55 dBc nominal
Third order intermodulation distortion	
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
Front panel			
RF input connector	N-type female, 50 Ω, nominal		
VSWR	< 1.5 : 1, nominal	10 MHz to 3 GHz	Input attenuator ≥10 dB, or 20 dB fixed attenuation
	< 2.0 : 1, nominal	3 to 7 GHz	
Calibration output	Amplitude	–25 ± 0.25 dBm	
	Frequency	40 MHz	
	Connector and impedance	BNC-type female, 50 Ω, nominal	
Probe power	Voltage/Current	+15 V, 150 mA maximum	
		–12.6 V, 150 mA maximum	
RF output connector	N-type female, 50 Ω, nominal	Option TG7 installed	
USB interface (host)	A plug, version 1.1		
Rear panel			
10 MHz reference output	Output amplitude	> 0 dBm	
	Frequency	10 MHz ± (10 MHz × frequency reference accuracy)	
	Connector and impedance	BNC-type female, 50 Ω, nominal	
10 MHz reference input	Input amplitude	–5 to +10 dBm, nominal	
	Frequency	10 MHz	
	Connector and impedance	BNC-type female, 50 Ω, 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 Ω	
LAN TCP/IP interface	100Base-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

Temperature and relative humidity		Supplemental information
Operating temperature range	+5 to +45°C	
Storage temperature range	–20 to +70°C	
Relative humidity	< 95%	
EMC		
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 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	≤ 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

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

KEYSIGHT TECHNOLOGIES

This information is subject to change without notice. © Keysight Technologies, 2018, Published in USA, July 11, 2018, 5991-1167EN