

Agilent N9320B RF Spectrum Analyzer

Technical Overview

Professional spectrum analysis from 9 kHz-3 GHz

- Measurement speed:
minimum non-zero span sweep time: < 10 ms
- Resolving power: RBW: 10 Hz to 1 MHz in 1-3-10 steps
- Sensitivity: DANL: -148 dBm with preamp

Robust measurement features for characterizing your product easily

- Built-in power measurements:
channel power, OBW, ACP, SEM and TOI
- Built-in power meter function with Agilent U2000 series power sensor support
- Optional tracking generator and preamplifier



All the essentials of an
Agilent spectrum analyzer
with a price/performance
that's easy to afford



Agilent Technologies

Agilent N9320B spectrum analyzer

– Built to perform, priced for you to compete

Regardless of whether your application is electronics' manufacture, bench repair, R&D projects, or RF related education, you need a spectrum analyzer that is equipped with the essential functionality and required performance at an affordable price. The N9320B is designed to be the right answer for you.

Power measurement and automated test programming features

- The accuracy of frequency selective power measurements when characterizing your products is very important. With a newly featured digital IF, the N9320B enables dramatic improvements in power measurement accuracy.
- Power meter functionality is also built-in with Agilent U2000 series power sensor support for highly accurate RF and MW power measurements.
- The built-in 1-button power measurement suite offers channel power, ACP, OBW, SEM and TOI measurements.
- For automated test programming, the N9320B provides industry standard SCPI language support and flexible connectivity choices with USB, LAN. Plus, SCPI code compatibility with Agilent ESA-L series for easy instrument replacement.

Engineered for the best spectrum visibility

In your R&D, QA or university research lab, you want to know as much measurement detail as possible about your products and designs. The N9320B offers the best-in-class spectrum visibility. The 10 Hz minimum RBW distinguishes closely spaced signals easily, the -148 dBm DANL reveals low level signals clearly, and combined with the 4 trace display and 12 markers allows you easily identify and compare signal details.

Integrated solution for the modern RF teaching lab

One of the best ways to improve students' learning efficiency for RF related curriculums is to combine lectures with hands-on labs. The N9320B is an excellent price-performance fit for educational purposes. Whether you wish to combine the N9320B analyzer with the Agilent N9310A RF signal generator for basic RF concept labs, or enhance your RF circuit labs with the N9320B and its optional RF training kit (option code: N9320B-TR1), you will find adopting Agilent's RF education solution efficient and effective.

USB interface offers convenient data storage via USB flash disk

6.5-inch high resolution screen provides vivid spectral view from any angle

logically arranged function keys and soft keys provides intuitive access for each operational step



Tracking generator output enables frequency response measurement

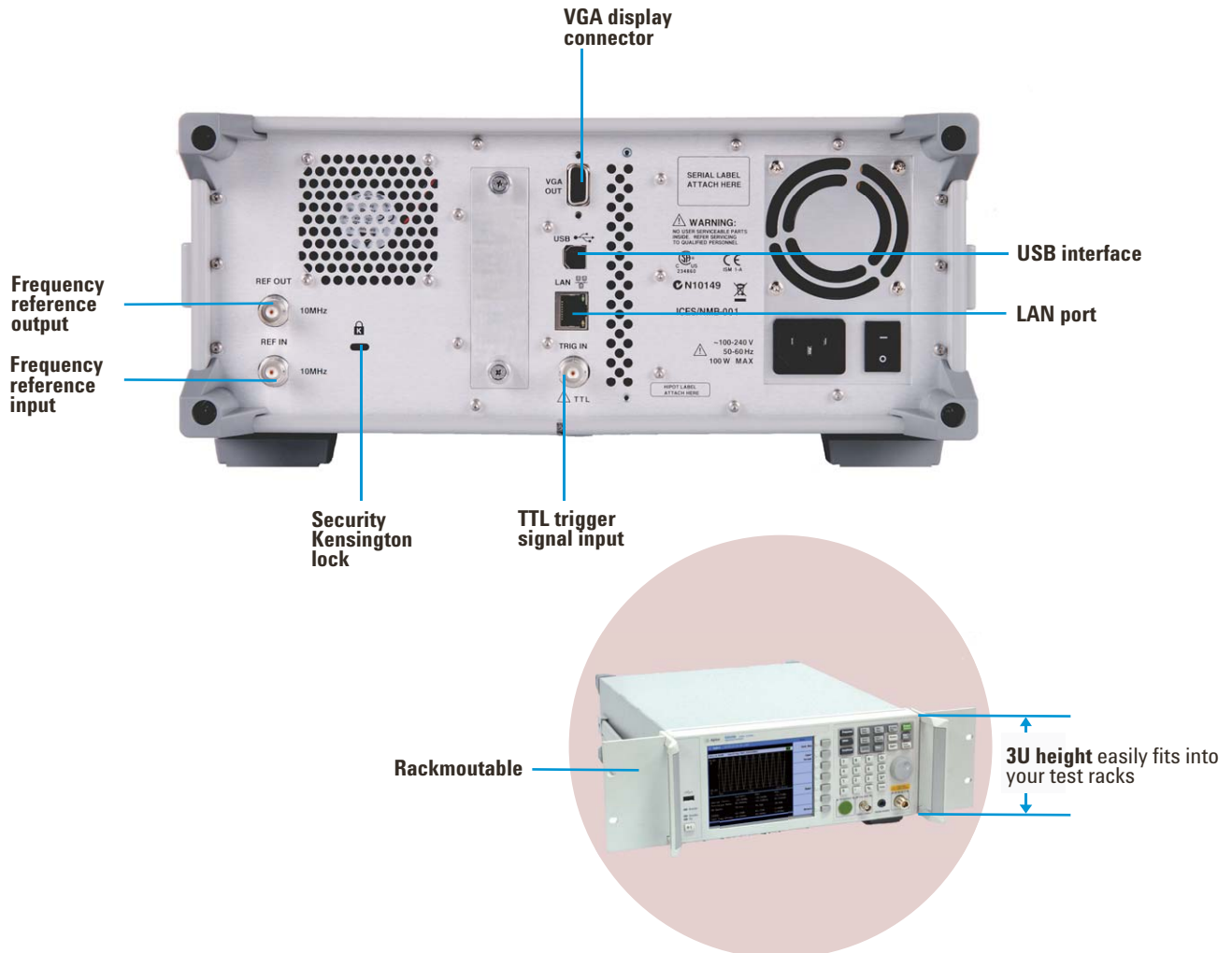
Cal Out (50 MHz, -10 dBm)

Probe power for high-impedance RF probes

RF input (N type, female)

What's new on N9320B?

New Features	Overview	Option number
AM/FM demodulation metrics	Offers modulation data including carrier power, modulation rate, AM depth or FM deviation, SINAD and carrier frequency offset	N9320B-AMA
LAN interface	Provides LAN connection for auto test or remote control.	Standard feature
SCPI command compatibility for Agilent ESA-L series	Able to distinguish and interpret Agilent ESA-L SCPI commands, reducing programming effort for ESA-L replacement with N9320B	Standard feature
Power meter function	When connecting with an Agilent U2000 series USB power sensor, the N9320B can be used as a power meter for high accuracy power measurements	Standard feature
RF training kit	Special for educational purposes. The RF training kit consists of a transceiver trainer, control panel software and lab sheets	N9320B-TR1



Electronics manufacturing

When you need faster and more cost effective RF analysis tools for testing today's consumer electronics products and components - look no further!

Regardless of whether you are manufacturing a wireless mouse, keyboards, GPS devices, or RF components such as mixers, filters or amplifiers, you need to measure their RF characteristics to insure they work properly within their design parameters like frequency bandwidth and output power range. Too little RF power may decrease the wireless operating distance, while too much power can drain batteries quickly, reducing operation time and cause excessive heat in the device.

In today's competitive world, you need to verify your product's RF performance fast and accurately as well as lower your cost of ownership. The affordable N9320B is designed to help achieve all these goals. So, why not take a closer look at the N9320B spectrum analyzer?

Boost productivity by decreasing test time

The throughput rate of a test station is generally one of the key factors limiting the productivity of a manufacturing line. You almost always want to test your products in the shortest possible time. The sweep time of a spectrum analyzer is often the most important performance specification contributing to your RF analysis test time. The N9320B analyzer provides you with 10 ms non-zero span sweep time, the fastest in its class

Testing and validating your products with confidence

The N9320B equipped with a new digital IF section tests your product with improved frequency and amplitude accuracy and stability. It provides essential information for your products' performance and characteristics with increased confidence.

We have optimized the N9320B to meet your needs in performance and cost

- 10 ms minimum, non-zero span sweep time
- ± 1.5 dB overall amplitude accuracy, typical ± 0.5 dB
- 10 Hz minimum resolution bandwidth
- Sensitivity is -148 dBm DANL with preamplifier
- Multiple language user interface improves ease-of-use and reduces training time by utilizing your local language



Best-in-class performance ensures your test station is operating quickly without compromising quality



Accelerate time to market while simultaneously reducing costs.

Simplify common measurement tasks

When you find yourself having repeatedly to make the same type of complex measurement or measurement sequence, it is useful to know that some shortcuts are available. That's what we have provided for you in the N9320B spectrum analyzer.

The N9320B spectrum analyzer continues the Agilent tradition that test equipment should be easy to set up and simple to use. Those familiar with other Agilent spectrum analyzers will find a similar user interface in the N9320B, allowing for a shorter learning curve and easier operation.

One button auto-tuning allows you to quickly find and accurately analyze the highest level signal anywhere in the analyzer's frequency range. Centering this signal on the screen, the analyzer simultaneously optimizes the frequency span, resolution and video bandwidths, auto-scales the amplitude, sets a marker on the signal peak and displays the measurement results.

Power measurements made easy using the one-button measurement suite

You will find that the one-button power measurement suite shortens routine test set up time by simplifying the keypad/menu selection.

Selecting these one-button routines directly from the softkey menu also helps ensure accuracy and repeatability of the test set up and measurement no matter who presses the button.

One of the most fundamental measurements performed by spectrum analyzers is the frequency domain measurement of RF power. However, detailed analysis of a signal often requires standards-defined spectral masks or more complex power/bandwidth/detector measurement combinations.

Channel power

Precise, rapid integrated channel power with computed power spectral density utilizing from the RMS averaging detector.

Occupied bandwidth

Selecting the percentage of the signal's power to be measured places markers at the upper and lower frequencies of the waveform representing the bandwidth utilized by that percentage of power.

Adjacent channel power (ACP)

Fast, accurate simultaneous filtered RMS power measurement of a carrier relative to its leakage in up to six offset bands or channels.

Spectrum emission mask (SEM)

The spectrum emission mask (SEM) is a set of complex limit lines forming a mask for out-of-channel emissions measurement. The SEM is defined relatively to in-channel power. You can set the parameters of the main channel, out of channel frequency bands and the limit lines. Included is Pass/Fail testing for the overall spectrum emission mask and each individual out-of-channel frequency range.

Of course, you retain the flexibility to tailor each measurement task to your specific needs when necessary. And you'll find it easy to distinguish between signals having large level differences since the N9320B has one of the widest dynamic ranges for an analyzer in its price range.

High accuracy power measurements

The N9320B now supports high accuracy, USB plug-and-play power measurements as standard when connected to an Agilent U2000 series USB power sensor. Make true average power measurements for all signal types with wide dynamic range up to 18 GHz with just the push of a button. The Agilent U2000 series USB power sensors require no external power supplies and with internal zeroing eliminate the need for external calibration. Without the need for additional boxes, the user can easily set up, calibrate and control the power sensor via the analyzer's USB port. Two display modes are available: either the meter or the chart mode to log power measurements over time.



The combination of spectrum analyzer and power meter

Bench repair

— An effective, professional bench repair tool

Most bench repair tasks demand fast, cost effective test solutions. Being small and lightweight, the N9320B spectrum analyzer is as functional and indispensable in low-cost bench repair applications as it is for field troubleshooting.

Detecting low signal levels while simultaneously resolving closely spaced frequencies is a fundamental requirement for RF testing. Employing one of the best combinations of sensitivity and narrow resolution bandwidths (RBW) ensures that an N9320B spectrum analyzer will readily handle these tasks.

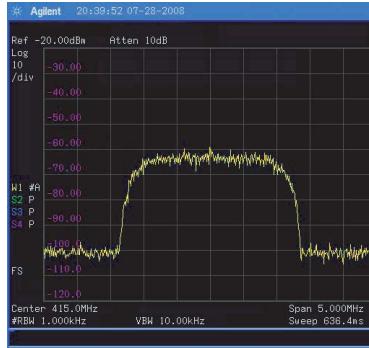
When it comes to receiving the best return from your R&D equipment budget, turn to Agilent's new generation of low-cost analyzers and sources.

Limited on your R&D budget?

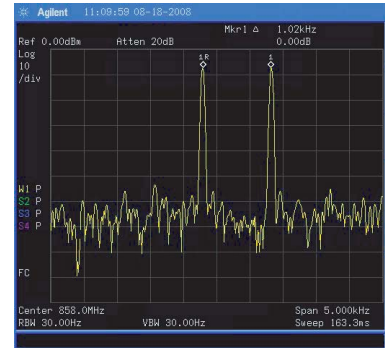
You'll find an N9320B spectrum analyzer equally versatile for budget sensitive R&D applications. It is also suitable for RF design verification or when initiating a low cost project for product enhancements and extensions.

Wherever you deploy your engineering resources, they will find operating an N9320B spectrum analyzer easy to use.

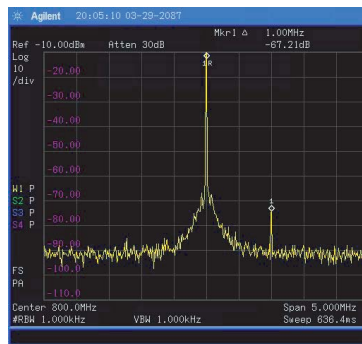
The low displayed average noise floor and narrow resolution bandwidths provide optimum spectral visibility and resolution of small signals.



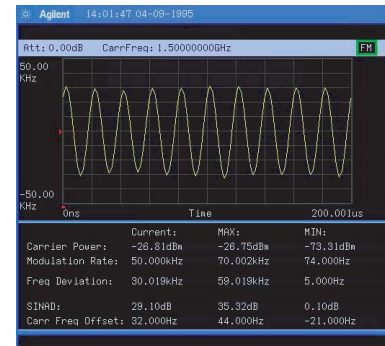
Scale indicator for quick vertical axis readout



Narrow RBW clearly distinguishes two close-in signals



Easy to distinguish low level signal



AM/FM demodulation metrics accurately reports the signal property



Additional features that make spectrum analysis easier.

- Four traces and up to 12 markers allow optimum flexibility for complex troubleshooting in multi-signal environments
- Marker table lists the frequency and amplitude matrix from all active markers, including delta markers
- Frequency counter offers more accurate frequency readout
- USB flash memory stick support provides quick save or recall of measurement data

Education

Whether you are mentoring your graduate students for completion of an important research project, or leading under-graduates in hands-on experiments in your campus electronics lab, using Agilent test equipment in your educational institution guarantees you are upholding the highest standards for the future of tomorrow's engineers.

Learning how to use test instrumentation, and understanding how RF signals interact are fundamental to the study of electronics. Spectrum analysis is essential to RF circuit design. It sheds an intuitive light on signal interactions and mixing processes for students.



The combination of the affordable price and performance in the N9320B spectrum analyzer, part of the low-cost test equipment series from Agilent Technologies, means that you do not need to limit students access to professional RF equipment in the classroom.

Now you have the opportunity to put Agilent's renowned quality and precision into every student's hands. Help your students and trainees gain the edge. There is no longer a need to compromise on the performance of their test equipment.

Educators hold Agilent test equipment in the highest esteem. Therefore, you can be confident of upholding high standards in the classroom and insure your students will have confidence in their experimental results. In addition, they will be able to focus more time on RF circuit experimentation and signal analysis exercises, because Agilent spectrum analyzer operation is straightforward.

You'll find the N9320B has sufficient performance for many basic research projects, where you need an inexpensive, fast, high-quality, general-purpose RF signal analyzer.

Teacher's special: Display projection

When you are ready to show frequency domain phenomena to your students or even the instrument operation, you may want to display the instrument screen in a larger format for all the students in the lab or classroom to observe. The N9320B supports VGA output and can display the instrument's screen on a larger monitor or video projector simultaneously.

Affordable, fast support

Buying test equipment from Agilent's new low-cost series puts you in touch with top-line service and support should you need it. So, you can be confident that you are making the right choice for the right price.

Typical RF teaching lab solution

- N9320B RF spectrum analyzer
- N9310A RF signal generator
- N9320B-TR1: RF training kit



RF education solution from Agilent

One of the best ways to improve your students' learning efficiency for RF related curriculums is to combine teaching with hands-on labs. We also suspect you may want to save precious instructor time by leveraging an RF teaching lab that's already well designed and yet inexpensive. The N9320B spectrum analyzer and its educational kit (Ordering code: N9320B-TR1), together with Agilent's basic signal generator N9310A offer a new and systematic RF teaching environment for you and your students. You can design or deploy almost any RF circuit experiment for your students, from transmitters and receivers to key individual RF components, such as mixers, amplifier and filters.

The RF training kit consists of two boards. One acts as a TX circuit, another one acts as a RX circuit. The major RF components on each board can be separately used as standalone components. We designed the flexibility into the kit and you'll find using Agilent's RF education solution convenient, time saving and cost effective.

When you talk about the concept of frequency domain, carrier frequency and its harmonics or frequency selective power measurements, you can use the N9320B spectrum analyzer and N9310A RF signal generator as the basic configuration in your RF/microwave lab.

When you need to communicate the features of a typical RF circuit, such as the TX and RX paths, and how they deliver signals, simply use the RF training kit and its courseware to design an effective hands-on lab for your students.

When your students need to take a closer look at those RF components, such as mixer, filters and amplifiers, the RF training kit allows you to separately utilize its individual components

Specifications

Specifications apply under the following conditions:

- After a warm-up time of 30 minutes,
- At an ambient temperature specified in the data sheet, and within a valid calibration period.

Supplemental information

Frequency

Frequency

Range:	9 kHz to 3 GHz 100 kHz to 3 GHz	AC coupled Preamp on
Set-up resolution:	1 Hz	

Internal 10 MHz frequency reference

Aging rate:	±1 ppm / year	
Temperature stability:	±1 ppm	0 °C to +50 °C; reference 25 °C
Supply voltage stability:	± 0.3 ppm	± 5 %

Frequency readout accuracy (start, stop, center, marker)

Marker resolution:	(frequency span)/(number of sweep points – 1)
Uncertainty:	± (frequency indication x frequency reference uncertainty* + 1% x span + 20% x resolution bandwidth + marker resolution)

Marker frequency counter

Resolution:	1 Hz, 10 Hz, 100 Hz, 1 kHz	Selectable
Accuracy:	±{(marker frequency) (frequency reference uncertainty*) + (counter resolution)}	RBW/span ≥ 0.02; Marker level to displayed noise level > 30 dB (RBW ≥ 1 kHz) Marker level to displayed noise level > 40 dB (RBW < 1 kHz)

*Frequency reference uncertainty = (aging rate)(period since adjustment) + (Supply voltage stability) + (temperature stability).

Frequency span

Range:	0 Hz (zero span), 100 Hz to 3 GHz.
Resolution:	1 Hz
Accuracy:	±span/(sweep points – 1)

Phase noise

Offset from CW signal:		$f_c = 1 \text{ GHz}$; RBW=1 kHz, VBW=10 Hz and sample detector
10 kHz:	< –88 dBc/Hz < –90 dBc/Hz	Typical
100 kHz:	< –100 dBc/Hz < –102 dBc/Hz	Typical
1 MHz:	< –110 dBc/Hz < –112 dBc/Hz	Typical

Residual FM

≤ 100 Hz peak to peak in 100 ms	1 kHz RBW, 1 kHz VBW
---------------------------------	----------------------

Resolution bandwidth (RBW)	10 Hz to 1 MHz in 1-3-10 sequence	-3 dB bandwidth
Accuracy:	±5 %	Nominal
Resolution filter shape factor:	< 5:1	Nominal

Video bandwidth (VBW)	1 Hz to 1 MHz in 1-3-10 sequence	-3 dB bandwidth
------------------------------	----------------------------------	-----------------

Amplitude

Measurement range	10 MHz - 3 GHz: Displayed average noise level (DANL) to +30 dBm 1 MHz - 10 MHz: DANL up to 23 dBm 9 kHz - 1 MHz: DANL up to 20 dBm
--------------------------	--

Input attenuator range	0 to 70 dB, in 1 dB steps
-------------------------------	---------------------------

Maximum damage level

Average continuous power:	≥ +40 dBm	Input attenuator setting ≥ 10 dB For <10 µsec pulse width, <1 % duty cycle, and input attenuation ≥ 40 dB)
Peak pulse power:	≥ +50 dBm (100 W)	
DC voltage:	50 VDC maximum <i>Input protection switch opens at >33 dBm with ≥ 10 dB input attenuation</i>	

1 dB gain compression

Total power at input mixer:	> 0 dBm	<i>Typical ; f_c ≥ 50 MHz; preamp off</i>
Total power at the preamp:	> -20 dBm	<i>Typical ; f_c ≥ 50 MHz; preamp on</i>

Mixer power level (dBm) = input power (dBm) - input attenuation (dB).

Total power at the preamp (dBm) = total power at the input (dBm) - input attenuation (dB).

Displayed average noise level

Preamp off:		
9 kHz to 100 kHz	< -90 dBm	<i>Nominal</i>
100 kHz to 1 MHz	< -90 dBm - 3 x (f / 100kHz) dB	
1 MHz to 10 MHz	< -124 dBm	
10 MHz to 3 GHz	< -130 dBm + 3 x (f / 1 GHz) dB	

0 dB RF attenuation; RBW 10 Hz; VBW 1 Hz, sample detector; reference level - 60 dBm.

Preamp on:	
100 kHz to 1 MHz	< -108 dBm - 3 x (f / 100kHz) dB
1 MHz to 10 MHz	< -142 dBm
10 MHz to 3 GHz	< -148 dBm + 3 x (f / 1 GHz) dB

0 dB RF attenuation; RBW 10 Hz; VBW 1 Hz, sample detector; reference level - 70 dBm.

Level display range

Log scale units:	dBm, dBmV, dBµV, dBµA	
Linear scale and units:	µV, mV, V, µA, mA, A, µW, mW, W	
Measurement points:	461	
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 functions:	Clear/write; maximum hold; average; minimum hold; view	

Frequency response

200 kHz to 2.0 GHz:	± 0.5 dB	10 dB attenuation, reference: 50 MHz, 20 to 30°C.
2.0 GHz to 3.0 GHz:	± 0.7 dB	
Preamp off		
1 MHz to 2.0 GHz:	± 0.6 dB	10 dB attenuation, reference: 50 MHz, 20 to 30°C.
2.0 GHz to 3.0 GHz:	± 0.8 dB	
Preamp on		

Input attenuation switching uncertainty at 50 MHz

Attenuator setting:	0 to 70 dB in 1 dB steps	
0 to 60 dB attenuation:	± 0.4 dB	Reference 10 dB

Absolute amplitude accuracy

Preamp off:	± 0.3 dB	Reference level -10 dBm; input attenuation 10 dB
Preamp on:	± 0.4 dB	Reference level -30 dBm; input attenuation 10 dB

Center frequency 50 MHz; RBW1 kHz; VBW 1 kHz; amplitude scale log; span 100 kHz; sweep time coupled, sample detector, signal at reference level.

Level measurement uncertainty

Overall amplitude accuracy:	± 1.5 dB	20 to 30°C; frequency > 1 MHz; signal input 0 to -50 dBm; reference level 0 to -50 dBm; input attenuation 10 dB; RBW 1 kHz; VBW 1 kHz; after calibration; preamplifier off
	± 0.5 dB	<i>Typical</i>

Resolution bandwidth switching uncertainty

10 Hz - 1 M Hz:	± 0.15 dB	Reference:RBW=1 kHz, at reference level
------------------------	---------------	---

Spurious response

Second harmonic distortion: (second harmonic intercept)	+30 dBm +35 dBm +43 dBm	10 MHz $< f_c \leq 200$ MHz 200 MHz $< f_c \leq 500$ MHz 500 MHz $< f_c \leq 3$ GHz Preamplifier off; signal input -30 dBm;
Third-order intermodulation: (third order intercept)	+10 dBm	+13 dBm nominal; 300 MHz to 3 GHz preamplifier off; signal input -30 dBm
Input related spurious: Residual response: (inherent)	< -60 dBc < -83 dBm	-30 dBm signal at input mixer; 20 to 30°C Input terminated and 0 dB RF attenuation, preamplifier off

Sweep

Sweep time

Range:	10 ms to 1000 s 6 μ s to 200 s	Span > 0 Hz Span = 0 Hz (zero span)
Sweep mode:	Continuous; single	
Trigger source:	Free run; video; external	
Trigger slope:	Positive or negative edge; selectable	

Front panel input/output

RF Input

Connector and impedance:	N-type female; 50 ohm	
VSWR:	<1.5 : 1	100 kHz to 3.0 GHz, input attenuator: ≥ 10 dB

Calibration output

Amplitude:	-10 dBm \pm 0.3 dB
Frequency:	50 MHz
Accuracy:	Same as frequency reference
Connector and impedance:	BNC-type female; 50 ohm

Probe power

Voltage/current:	+15 V, 150 mA max -12.6 V, 150 mA max
-------------------------	--

USB host

Connector and protocol:	A plug; Version 1.1
--------------------------------	---------------------

Rear panel input/output connections

10 MHz reference output

Output amplitude:	>0 dBm
Connector and Output Impedance:	BNC-type female; 50 ohm

10 MHz reference input

Input amplitude:	-5 dBm to +10 dBm
Frequency lock range:	± 5 ppm of specified external reference input frequency
Connector and input impedance:	BNC-type female; 50 ohm

USB device

Connector and protocol: B plug; version 1.1

LAN TCP/IP interface

ID Base RJ-45 connector

External trigger input

Input amplitude: 5 V TTL level

Connector and

Input impedance: BNC female; 10 k ohm

VGA output:

VGA analog RGB

31.5 kHz horizontal,
60 Hz vertical sync rates; non-interlaced
VGA compatible

Connector: D-sub 15-pin female
Screen resolution: 640 x 480

General

Internal data storage: 16 MB nominal

Power supply: 100-240 VAC; 50 to 60 Hz

Auto-ranging

Power consumption: < 65 W

Warm-up time: 30 minute

Temperature range: +5 °C to + 45 °C
–20 °C to + 70 °C

Operating
Storage

Weight: 8.4 kg (18 lb)

Net approximately; without options

Dimensions: 132.5 x 320 x 400 mm
5.2 x 12.6 x 15.7 in

Approximately; without handle

Options

RF preamplifier (Option PA3)

Frequency range:	1 MHz to 3 GHz	
Peak pulse power:	18 dB	<i>Nominal</i>

Tracking generator source output (optional)

Warm-up:	45 minutes	
Output frequency range:	9 kHz to 3.0 GHz	
Output power level Range:	–30 dBm to 0 dBm in 0.1 dB steps	
Absolute accuracy:	± 0.75 dB	20 to 30 °C, at 50 MHz with coupled source attenuator, referenced to –20 dBm
Output flatness:		Referenced to 50 MHz, –20 dBm
100 kHz to 10 MHz	± 3 dB	
10 MHz to 3 GHz	± 2 dB	
Connector and impedance:	N-type female; 50 ohm	
VSWR:	< 1.5 : 1	100 kHz to 3.0 GHz, input attenuator: ≥12 dB

Demodulation

Frequency range:	10 MHz to 3 GHz	
Carrier power accuracy:	±2 dBm ±1 dBm	<i>Typical</i>
Carrier power displayed resolution:	0.01 dBm	

AM measurement

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%	<i>Nominal</i>

FM measurement

Modulation rate:	20 Hz to 200 kHz	Modulation rate < 1 kHz
Accuracy:	1 Hz, nominal <0.1% modulation rate, nominal	Modulation rate ≥ 1 kHz
Deviation:	20 Hz to 400 kHz	20 to 30 °C.
Accuracy:	±4%	<i>Nominal</i>

Typical performance describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% 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 is not covered by the product warranty.

Ordering information

Model number	Description
N9320B	Spectrum analyzer 9 kHz to 3.0 GHz Accessories supplied as standard with each analyzer: <ul style="list-style-type: none">· Quick Start Guide· Documentation CD-ROM· USB cable (A-B)· N-BNC adapter· BNC cable· Power cord
Manuals and CD	
N9320-84502	N9320B Help Kit
N9320B-AB2	Chinese User's Guide
N9320B-ABA	English User's Guide
Options	
N9320B-PA3	3 GHz preamplifier
N9320B-TG3	3 GHz tracking generator
N9320B-AMA	AM/FM demodulation metrics
N9320B-TR1	RF training kit
N9320B-1HB	Handle and bumpers
N9320B-1CM	Rack-mount kit
N9320B-1TC	Hard transit case
N9320B-UK6	Commerical calibration certificate with testing data
Warranty and service	
R-51B-001-3C	Standard warranty is one year. 1-year return-to-Agilent warranty extended to 3 years
Calibration	
R-50C-011-3	Agilent calibration upfront support plan, 3-year coverage