Agilent N9320A Spectrum Analyzer

Technical Overview

- 9 kHz to 3 GHz range
- 10 Hz to 1 MHz RBW
- –148 dBm DANL with pre-amp
- 9.2 ms non-zero span sweep time
- +13 dBm third-order intercept

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

N9320A Spectrum Analyzer

Agilent Technologies

N9320A
Spectrum Analyzer

Low-cost manufacturing

N9320A Spectrum Analyzer

Needing faster and more cost effective RF analysis of today's consumer electronics devices and components?

Maybe its low- or high-frequency RFID systems, or perhaps Wi-Net devices, or the latest in cordless phones you are manufacturing?

Or perhaps it is the RF components and devices that these items incorporate the filters, mixers, amplifiers or antennas that you develop and produce, and that you must evaluate and test?

RF component characterization

Filters – Mixers Antennas
- Distortion
- Frequency response
- Gain/Loss

Consumer and general electronic devices

Cordless phones – Wi-Net/WiMAX – RFID/DSRC – TV – Radio – DAB
- Spectrum tests
- Power measurements
- EMI/RFI evaluation

Whatever type of consumer or general-purpose RF electronics devices or components you are manufacturing, you know that spectrum analysis provides essential information on their performance, characteristics and interaction.

And in today's competitive world, you need this analysis to be fast, accurate, and reliable yet, most importantly, truly cost-effective.

That is what an Agilent N9320A spectrum analyzer brings you, whether you are identifying and eliminating sources of unwanted interference or checking the stability of circuit components or sub-assemblies.

You'll want to make just sufficient performance checks to develop fully your products, and to ensure first-rate product design and production quality while simultaneously reducing costs and time to market.

If you're wondering how to reduce manufacturing test overheads without compromising quality, your answer is here.

Powerful measurement set

- **Channel power**
- **Occupied bandwidth**
- **Adjacent channel power**
- **Intermodulation distortion (third-order intercept)**
- **Spectrum emission mask**

Simplify common power measurement tasks

Single-key auto-tuning allows you quickly to home in on the highest-level signal across the bandwidth. Centering this signal on the screen, the analyzer simultaneously reduces the frequency span. Auto-scaling and ranging enhance accurate, speedy measurement.

When you find yourself having repeatedly to make the same type of complex measurement or measurement sequence, it is useful to know some shortcuts. That's what we have provided for you in your N9320A spectrum analyzer.

You will find that the in-built suite of power measurements shortens routine test set up time by simplifying keypad/menu selection.

Selecting these directly from the soft-key menu also helps ensure accuracy of test set up.

The N9320A spectrum analyzer continues the Agilent tradition that today's testers should be easy to set up, and simple to use.

Those familiar with other Agilent spectrum analyzers will find similar, user interfaces here in this low-cost tester, allowing for simpler set up and making measurements.

Power measurements made easy using the measurement suite

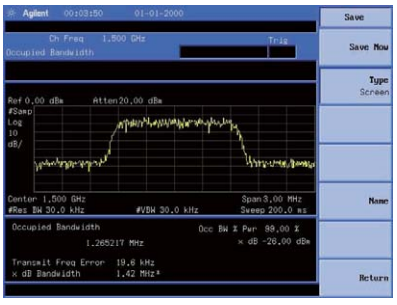
One of the most fundamental measurements performed by spectrum analyzers is the frequency-domain measurement of RF power. However, detailed analysis of a signal often requires standards-defined spectral mask tests or more complex power/bandwidth measurement combinations.

Channel power

Accuracy and speed of the integrated channel power and computed power spectral density from the RMS averaging detector.

Occupied bandwidth

Specifying the power percentage places markers at the upper and lower frequencies of the appropriate bandwidth representing this power.



Adjacent channel power (ACP)

Fast, accurate simultaneous filtered RMS power measurement in up to six offset power bands. Ideal for mobile telephony applications.

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 analyzer has one of the widest dynamic ranges for a tester in its price range.

Simple PC connection via USB or LAN

It is easy and convenient to operate your spectrum analyzer from a PC connected to the LAN or USB ports. USB ports on front and back panels make interconnection to a PC particularly straightforward.

Each analyzer comes with PC-based virtual panel software utilities and drivers. These replicate all controls and setup parameters of the large, full-color display on the analyzer's front panel. Analyzer control is then through the PC's virtual panel display

Furthermore, this software provides useful and straightforward data analysis productivity tools for you, allowing uncomplicated data logging and archiving of important test results, including graphics.

Built to perform – priced for you to compete

R&D

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

Limited on your R&D budget?

You'll find an N9320A spectrum analyzer equally versatile for low-budget R&D applications, too. It is equally suitable for new RF design verification or when initiating a low-cost project for product enhancements and extensions.

Wherever you deploy your engineering and hardware resources, everyone will find operating an N9320A spectrum analyzer straightforward.
Multi—language screens and manuals enhance usability as design and manufacturing services move around the world:shortly, other languages will follow.

Installation and maintenance

Your N9320A has all-round application in field installation and maintenance.
A strong, handy carrying case and front and rear transit bumpers protect your analyzer when in transit.

An effective, professional field installation and maintenance tool

Most installation and maintenance tasks demand fast, cost effective test solutions. Being small and lightweight, an N9320A spectrum analyzer is as functional and indispensable in low-cost bench repair applications as it is for field troubleshooting.

Detecting low signal levels whilst simultaneously resolving closely-spaced frequencies is a fundamental requirement for RF testing. Employing one of the best combinations of sensitivity and narrow resolution bandwidth (RBW) ensures that an N9320A spectrum analyzer will readily handle these tasks.

Bench repair

So whether it is to aid straightforward device tuning on the bench, or carrying out more complex repair or regular maintenance on base stations in the field, the N9320A spectrum analyzer will find a place in any RF technician's toolkit.

The N9320 can become portable with handle and bumper. It makes it an ideal choice for installation and maintenance.

Education

Using Agilent test equipment in your educational establishment guarantees you are upholding the highest standards for the future, for tomorrow's engineers.

Learning how to use test instrumentation, and understanding how RF signal interact are fundamentals for electronics studies. Spectrum analysis is one a test essential to good circuit design. It brings signal interactions to light for students and helps explain signal mixing processes.

The keen price/performance combination in this spectrum analyzer, part of the low-cost series from Agilent Technologies, means that you do not need to limit students to one or two pieces of equipment to a class.

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 now no need to compromise on the quality of their test equipment.

Educators hold Agilent testers in the highest esteem. Therefore, you can be confident and proud of your standards in the classroom: and your students will have confidence in their experimental results. Your students will be able to focus on RF circuit experimentation and signal analysis exercises, because spectrum analyzer operation is straightforward.

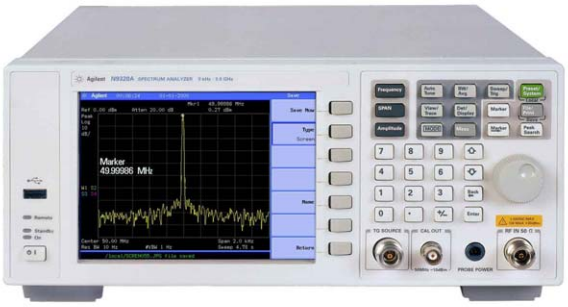
You'll find it has sufficient performance for many basic research projects, too, where you need an inexpensive, fast, high-quality, general-purpose RF signal analyzer.

Affordable, fast support

When you rely on Agilent test equipment for your manufacturing process, installation procedures, or maintenance programs, you need to know that you can call on superior customer support in case of problems.

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.

Take a closer look – see how cost-effective spectrum analysis performance can really be



One of Agilent Technologes' new test instruments in the compact, low-cost series.

You'll find an Agilent N9320A spectrum analyzer provides outstanding measurement speed and performance for its price – check out its availability today and buy with confidence.

Specifications

Specifications apply under the following conditions:

- *After a warm-up time of 45 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	AC coupled
	100 kHz to 3 GHz	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
	**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:	±(1 % of span) + 2(span/460)	
Phase noise		
Offset from CW signal:		f_c = 1 GHz;
10 kHz:	< –88 dBc/Hz	
	< –90 dBc/Hz	*Typical*
100 kHz:	< –100 dBc/Hz	
	< –102 dBc/Hz	*Typical*
1 MHz:	< –108 dBc/Hz	
	< –110 dBc/Hz	*Typical*
Residual FM	≤ 150 Hz	1 kHz RBW, 1 kHz VBW
Resolution bandwidth (RBW)	10 Hz to 1 MHz in 1-3-10 sequence	–3 dB bandwidth
Accuracy:	±20 %	1 kHz to 1MHz RBW
	±5 %	10 Hz to 300 Hz RBW
Resolution filter shape factor:	< 15	*Typical* ; 1 kHz to 1MHz RBW
	< 5	*Typical* ; 10 Hz to 300 Hz RBW

Video bandwidth (VBW)	1 Hz to 3 MHz in 1-3-10 sequence.	–3 dB bandwidth; single-pole low-pass RC filter

Amplitude

Measurement range

Displayed average noise level (DANL) to +30 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
Peak pulse power:	≥ +50 dBm (100 W)	For <10 µsec pulse width, <1 % duty cycle, and input attenuation ≥ 40 dB)
DC voltage:	50 VDC maximum	

Input protection switch opens at >33 dBm with ≥ 10 dB input attenuation

1 dB gain compression

Total power at input mixer:	> 0 dBm	*Typical* ; f_c ≥ 50 MHz; preamp off
Total power at the preamp:	> –20 dBm	*Typical* ; f_c ≥ 50 MHz; preamp on

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 100kHz	< –90 dBm	*Typical*
100 kHz to 1 MHz	< –90 dBm – 3 f (100kHz) dB	
1 MHz to 10 MHz	< –124 dBm	
10 MHz to 3 GHz	< –130 dBm + 3 f (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 f (100 kHz) dB	
1 MHz to 10 MHz	< –142 dBm	
10 MHz to 3 GHz	< –148 dBm + 3 f (GHz) dB	

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

Level display range

Log scale and units:	dBm, dBmV, dBµV, dBµA	
Linear scale and units:	µV, mV, V, µA, mA, A, µW, mW, W	
Measurement points:	461	
Marker level readout resolution:	0.03 dB 0.01 % of reference level	Log scale 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

100 kHz to 3.0 GHz: **Preamp off**	± 0.8 dB	10 dB attenuation, reference: 50 MHz, 20 to 30 °C.
1 MHz to 3.0 GHz: **Preamp on**	± 1.5 dB	0 dB attenuation, reference: 50 MHz, 20 to 30 °C.

Input attenuation switching uncertainty at 50 MHz

Attenuator setting:	0 to 70 dB in 1 dB steps	
0 to 60 dB attenuation:	±(0.3 dB + 0.01 x attenuator setting)	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 0 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.

Reference level

Setting range:	–60 dBm to +30 dBm, in steps of 1 dB, 2 dB, 5 dB or 10 dB	Preamp off
	–100 dBm to –10 dBm, in steps of 1 dB, 2 dB, 5 dB or 10 dB	Preamp on
Setting resolution:	0.1 dB	Log scale
	1 % of reference level	Linear scale

Reference level accuracy

+30 to –10 dBm	Same as attenuation accuracy
–10 to –30 dBm	± 0.3 dB
–30 to –60 dBm	± 0.5 dB
–60 to –80 dBm	± 0.7 dB
–80 to –90 dBm	± 0.9 dB

Center frequency 50 MHz; all auto, and referenced to –10 dBm (–30 dBm, preamp on).
When reference level > -80 dBm, RBW = 1 kHz, otherwise RBW = 10 Hz.

Level measurement uncertainty

10 MHz to 3 GHz:	± 2 dB	95 % confidence level; 20 to 30 °C; reference level 0 to –50 dBm; input attenuation 10 dB; RBW 1 kHz; VBW 1 kHz; amplitude scale log; log range 0 to –50 dB from reference level; sweep time coupled; signal input 0 to –50 dBm; after calibration; preamplifier off.

Spurious response

Second harmonic distortion: (second harmonic intercept)	+35 dBm	10 MHz ≤ f_c ≤ 500 MHz
	+43 dBm	500 MHz ≤ f_c ≤ 3 GHz Preamplifier off; mixer level: –30 dBm
Third-order intermodulation: (third order intercept)	+10 dBm	+13 dBm nominal; 100 MHz to 3 GHz
Input related spurious:	< –60 dBc	–30 dBm signal at input mixer
Residual response: (inherent)	< –80 dBm	Input terminated and 0 dB RF attenuation, preamplifier off

Sweep

Sweep time

Range:	9.2 ms to 4000 s	Span > 0 Hz
	20 µs to 4000 s	Span = 0 Hz (zero span)
Sweep mode:	Continuous; single	
Trigger source:	Free run; video; external	
Trigger slope:	Positive or negative edge; selectable	

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 1 dB steps	
Absolute accuracy:	± 0.8 dB	20 to 30 °C, at 50 MHz with coupled source attenuator, referenced to –10 dBm
Output flatness:		Referenced to 50 MHz, –10dBm
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: ≥10 dB

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 ± 0.3 dB
Frequency:	50 MHz
Accuracy:	Same as frequency reference
Connector and impedance:	N-type female; 50 ohm

Probe power

Voltage/current:	+15 V, 150 mA max
	–12 V, 150 mA max

USB host

Connector and protocol:	B plug; Version 1.1

Rear panel input/output connections

10 MHz reference output

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

External trigger input

Input amplitude:	5 V TTL level	
Connector and Input impedance:	BNC female; 10 k ohm	

LAN Interface

	10 Base-T	
USB connector and protocol:	A plug; Version 1.1	
Command set:	Device-specific, remote control	

VGA output:

	VGA analog RGB	31.5 kHz horizontal, 60 Hz vertical sync rates; non-interlaced
Connector:	D-sub 15-pin female	VGA compatible
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:	45 minute	
Temperature range:	+0 °C to + 45 °C	Operating
	–20 °C to + 70 °C	Storage
Weight:	9.1 kg (20 lb)	Net approximately; without options
Dimensions:	132.5 x 320 x 400 mm	Approximately; without handle
	5.2 x 12.6 x 15.7 in	

Ordering information

Model number	Description
N9320A	Spectrum analyzer 9 kHz to 3.0 GHz Accessories supplied as standard with each tester: · User's Guide Hard copy and on CD-ROM (Chinese for mainland China; English for other countries and regions) · Programming Reference Guide on CD-ROM (English language)
Manuals and CD	
N9320-845000	N9320A Help Kit
N9320-90000	Chinese User's Guide
N9320-90001	English User's Guide
Options	
N9320A-PA3	3 GHz preamplifier
N9320A-TG3	3 GHz tracking generator
N9320A-1HB	Handle and bumpers
N9320A-1CM	Rack-mount kit
N9320A-1TC	Hard transit case
Warranty and service	Standard warranty is one year.
R-51B-001-3C	1-year return-to-Agilent warranty extended to 3 years
Calibration	
R-50C-011-3	Agilent calibration upfront support plan, 3-year coverage

Agilent Technologies related product for manufacturing test, field maintenance and education

N9310A RF Signal Generator

Low-cost signal generator covering 9 kHz to 3 GHz, with I/Q modulation: an ideal companion signal source for the N9320A spectrum analyzer.

Find out today how this other Agilent products will help solve your test needs.

Agilent Technologies' Test and Measurement

Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

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