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
Low-cost manufacturing

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

**RF component characterization**
- Filters – Mixers
- Antennas
  - Distortion
  - Frequency response
  - Gain/Loss

**Consumer and general electronic devices**
  - Spectrum tests
  - Power measurements
  - EMI/RFI evaluation
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

It is easy and convenient to operate your spectrum analyzer from a PC connected to the 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
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.

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.

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.

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 N9320A can become portable with handle and bumper. It makes the N9320A an ideal choice for installation and maintenance.
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 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

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.

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**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**

<table>
<thead>
<tr>
<th>Aging rate</th>
<th>±1 ppm / year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature stability</td>
<td>±1 ppm</td>
</tr>
<tr>
<td>Supply voltage stability</td>
<td>± 0.3 ppm</td>
</tr>
<tr>
<td></td>
<td>0 °C to +50 °C; reference 25 °C</td>
</tr>
<tr>
<td></td>
<td>± 5 %</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Marker resolution</th>
<th>(frequency span)/(number of sweep points – 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainty</td>
<td>±(frequency indication x frequency reference uncertainty*+1% x span + 20% x resolution bandwidth + marker resolution)</td>
</tr>
</tbody>
</table>

**Marker frequency counter**

<table>
<thead>
<tr>
<th>Resolution</th>
<th>0.1 Hz, 1 Hz, 10 Hz, 100 Hz, 1 kHz Selectable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>±((marker frequency) RBW/span ≥ 0.02; Marker level to displayed noise level&gt;30 dB(RBW≥1 kHz) + (counter resolution)) Marker level to displayed noise level&gt;40 dB (RBW&lt;1 kHz)</td>
</tr>
</tbody>
</table>

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

**Frequency span**

<table>
<thead>
<tr>
<th>Range</th>
<th>0 Hz (zero span), 100 Hz to 3 GHz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>1 Hz</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±(1 % of span) + 2(span/460)</td>
</tr>
</tbody>
</table>

**Phase noise**

<table>
<thead>
<tr>
<th>Offset from CW signal</th>
<th>&lt; −88 dBC/Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 kHz</td>
<td>&lt; −90 dBC/Hz</td>
</tr>
<tr>
<td>100 kHz</td>
<td>&lt; −100 dBC/Hz</td>
</tr>
<tr>
<td>1 MHz</td>
<td>&lt; −110 dBC/Hz</td>
</tr>
</tbody>
</table>

| f_r = 1 GHz;          | Typical      |
|                       | Typical      |

**Residual FM**

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

**Resolution bandwidth (RBW)**

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>10 Hz to 1 MHz in 1-3-10 sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>−3 dB bandwidth</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>1 kHz to 1 MHz RBW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 Hz to 300 Hz RBW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resolution filter shape factor</th>
<th>&lt; 15 Nominal; 3 kHz to 1 MHz RBW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 20 Nominal; 1 kHz RBW</td>
</tr>
<tr>
<td></td>
<td>&lt; 5 Nominal; 10 Hz to 300 Hz RBW</td>
</tr>
</tbody>
</table>

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Supplemental information
**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**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average continuous power</td>
<td>≥ +40 dBm</td>
</tr>
<tr>
<td>Peak pulse power</td>
<td>≥ +50 dBm (100 W)</td>
</tr>
<tr>
<td>DC voltage</td>
<td>50 VDC maximum</td>
</tr>
</tbody>
</table>

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

**1 dB gain compression**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total power at input mixer</td>
<td>&gt; 0 dBm</td>
</tr>
<tr>
<td>Total power at the preamp</td>
<td>&gt; −20 dBm</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 kHz to 100 kHz</td>
<td>&lt; −90 dBm</td>
</tr>
<tr>
<td>100 kHz to 1 MHz</td>
<td>&lt; −90 dBm − 3 x (f /100kHz) dB</td>
</tr>
<tr>
<td>1 MHz to 10 MHz</td>
<td>&lt; −124 dBm</td>
</tr>
<tr>
<td>10 MHz to 3 GHz</td>
<td>&lt; −130 dBm + 3 x (f /1 GHz) dB</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kHz to 1 MHz</td>
<td>&lt; −108 dBm − 3 x (f /100kHz) dB</td>
</tr>
<tr>
<td>1 MHz to 10 MHz</td>
<td>&lt; −142 dBm</td>
</tr>
<tr>
<td>10 MHz to 3 GHz</td>
<td>&lt; −148 dBm + 3 x (f /1 GHz) dB</td>
</tr>
</tbody>
</table>

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

**Level display range**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log scale and units</td>
<td>dBm, dBmV, dBμV, dBMμA</td>
</tr>
<tr>
<td>Linear scale and units</td>
<td>μV, mV, V, μA, mA, A, μW, mW, W</td>
</tr>
<tr>
<td>Measurement points</td>
<td>461</td>
</tr>
<tr>
<td>Marker level readout</td>
<td>0.03 dB</td>
</tr>
<tr>
<td>resolution</td>
<td>0.01 % of reference level</td>
</tr>
<tr>
<td>Number of traces</td>
<td>4</td>
</tr>
<tr>
<td>Detectors</td>
<td>Positive-peak, negative-peak, sample, normal, RMS</td>
</tr>
<tr>
<td>Trace functions</td>
<td>Clear/write; maximum hold; average; minimum hold; view</td>
</tr>
</tbody>
</table>

**Frequency response**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kHz to 3.0 GHz</td>
<td>± 0.8 dB</td>
</tr>
<tr>
<td>Preamp off</td>
<td>10 dB attenuation, reference: 50 MHz, 20 to 30 °C.</td>
</tr>
<tr>
<td>1 MHz to 3.0 GHz</td>
<td>± 1.5 dB</td>
</tr>
<tr>
<td>Preamp on</td>
<td>0 dB attenuation, reference: 50 MHz, 20 to 30 °C.</td>
</tr>
</tbody>
</table>
**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 10 dB

Center frequency 50 MHz; RBW 1 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
  - –100 dBm to –10 dBm, in steps of 1 dB, 2 dB, 5 dB or 10 dB
- **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:**
  - +35 dBm 10 MHz ≤ f ≤ 500 MHz
  - +43 dBm 500 MHz < f ≤ 3 GHz
- **Third-order intermodulation:**
  - +10 dBm
- **Input related spurious:**
  - < –60 dBc –30 dBm signal at input mixer
- **Residual response:**
  - < –83 dBm Input terminated and 0 dB RF attenuation, preamplifier off

**Sweep**
- **Sweep time**
  - **Range:** 9.2 ms to 4000 s
  - 20 µs to 4000 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
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
- **Output flatness:** ±3 dB for 100 kHz to 10 MHz, ±2 dB for 10 MHz to 3 GHz
- **Connector and impedance:** N-type female; 50 ohm
- **VSWR:** <1.5 : 1
- **Calibration output**
  - **Amplitude:** –10 dBm ±0.3 dB
  - **Frequency:** 50 MHz
  - **Accuracy:** Same as frequency reference
  - **Connector and impedance:** BNC-type female; 50 ohm

Front panel input/output

- **RF Input**
  - **Connector and impedance:** N-type female; 50 ohm
  - **VSWR:** <1.5 : 1
  - **Output Impedance:** BNC-type female; 50 ohm

Calibration output

- **Amplitude:** –10 dBm ±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
### External trigger input

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

### VGA output

- **Connector:** D-sub 15-pin female
- **Screen resolution:** 640 x 480
- **Input amplitude:** 5 V TTL level
- **VGA analog RGB:** 31.5 kHz horizontal, 60 Hz vertical sync rates; non-interlaced VGA compatible

### 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:**
  - Operating: +0 °C to + 45 °C
  - Storage: –20 °C to + 70 °C
- **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

<table>
<thead>
<tr>
<th>Model number</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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 other Agilent products will help solve your test needs.

Remove all doubt

Our repair and calibration services will get your equipment back to you, performing like new, when promised. You will get full value out of your Agilent equipment throughout its lifetime. Your equipment will be serviced by Agilent-trained technicians using the latest factory calibration procedures, automated repair diagnostics and genuine parts. You will always have the utmost confidence in your measurements.

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