



Agilent N9320B RF Spectrum Analyzer

9 kHz to 3.0 GHz

Data Sheet



Agilent Technologies

Definitions and Conditions

The spectrum 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 has been stored previously at a temperature range inside the allowed storage range, but outside the allowed operating range

“**Specifications**” describe 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**” values describe 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**” values indicate expected performance, or describe product performance that is useful in the application of the product, but are not covered by the product warranty.

Frequency and Time Specification

| Supplemental information | | |
|--|--|---|
| Frequency | | |
| Range | 9 kHz to 3 GHz | AC coupled |
| | 100 kHz to 3 GHz | Preamp on |
| Resolution | 1 Hz | |
| Internal 10 MHz frequency reference | | |
| Aging rate | ± 1 ppm/year | |
| Temperature stability | ± 1 ppm | 5 to +45 °C, reference 25 °C |
| Supply voltage stability | ± 0.3 ppm | |
| Residual FM | ≤ 100 Hz p-p in 100 ms nominal | RBW = 1 kHz, VBW = 1 kHz |
| Frequency readout accuracy (start, stop, center, marker) | | |
| Marker resolution | (freq span)/(number of sweep point -1) | |
| Uncertainty | ± (freq indication x freq reference uncertainty ¹ + 1% x span + 20% x resolution bandwidth + marker resolution) | |
| Sweep point | 461, fixed | |
| Marker frequency counter | | |
| Resolution | 1 Hz, 10 Hz, 100 Hz, 1 kHz | Selectable |
| Accuracy | ± [(marker freq x freq reference uncertainty ¹) + (counter resolution)] | |
| Frequency span (FFT and swept mode) | | |
| Range | 0 Hz (zero span), 100 Hz to 3.0 GHz | |
| Resolution | 1 Hz | |
| Accuracy | ± span/(swept points -1) | |
| Sweep time and triggering | | |
| Span range | 10 ms to 1000 s | Span > 0 Hz |
| | 6 μs to 200 s | Span = 0 Hz (minimum resolution = 6 μs) |
| Mode | Continuous, single | |
| Trigger | Free run, video, external | |
| Trigger slope | Positive or negative edge | Selectable |
| Trigger delay | 0 to 80 sweep time | |
| Resolution bandwidth (RBW) | | |
| Range (-3 dB bandwidth) | 10 Hz to 1 MHz, in 1-3-10 sequence | |
| Accuracy | ± 5% nominal | |
| Resolution filter shape factor | < 5:1 nominal | |
| Range (-6 dB bandwidth) | 200 Hz, 9 kHz, 120 kHz, 1 MHz | EMI bandwidth (CISPR 16-1-1 complaint), requires Option EMF |
| Accuracy | ± 10% nominal | |
| Resolution filter shape factor | < 5:1 nominal | -60 dB/-6 dB bandwidth ratio |
| Video bandwidth (VBW) | | |
| Range | 1 Hz to 1 MHz in 1-3-10 sequence | -3 dB bandwidth |

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

Amplitude Specifications

| Supplemental information | | |
|--|--|---|
| Amplitude range | | |
| Measurement range | 10 MHz to 3 GHz: Displayed average noise level (DANL) to +30 dBm | |
| (PA OFF) | 1 to 10 MHz: DANL up to 23 dBm | |
| | 100 kHz to 1 MHz: DANL up to 20 dBm | |
| Input attenuator range | 0 to 70 dB, in 1 dB steps | |
| Maximum damage level | | |
| Average continuous power | ≤ +37 dBm | Input attenuator setting ≥ 10 dB, 3 minutes maximum |
| Peak pulse power | ≤ +50 dBm (100 W) | For < 10 μs pulse width, < 1% duty cycle, and input attenuation ≥ 40 dB |
| DC voltage | 50 VDC maximum | |
| Level display range | | |
| Log scale units | dBm, dBmV, dBμV, dBμA | |
| Linear scale units | μV, mV, V, μA, mA, A, μW, mW, W | |
| 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 function | Clear/write, maximum hold, average, minimum hold, view | |
| Frequency response | | |
| 10 dB input attenuation, reference: 50 MHz, 20 to -30 °C | | |
| 200 kHz to 2.0 GHz | ± 0.5 dB | Preamp off |
| 2.0 to 3.0 GHz | ± 0.7 dB | Preamp off |
| 1 MHz to 2.0 GHz | ± 0.6 dB | Preamp on |
| 2.0 to 3.0 GHz | ± 0.8 dB | Preamp on |
| Input attenuation switching uncertainty at 50 MHz | | |
| Attenuation > 2 dB, preamp off | | |
| 0 to 60 dB attenuation | ± 0.4 dB | Relative to 10 dB (reference setting) |
| Absolute amplitude accuracy | | |
| Center frequency 50 MHz, RBW 1 kHz, VBW 1 kHz, amplitude scale log, span 100 kHz, sweep time coupled, peak detector, signal at reference level | | |
| Preamp off | ± 0.3 dB | Reference level -10 dB, input attenuation 10 dB |
| Preamp on | ± 0.4 dB | Reference level -30 dB, input attenuation 10 dB |

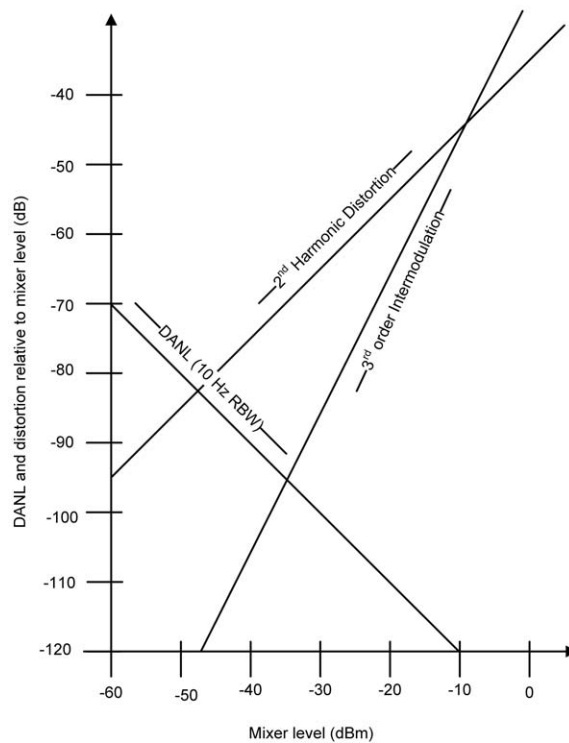
Amplitude Specifications (continued)

| | | Supplemental information |
|--|--|--------------------------|
| Level measurement uncertainty | | |
| 20 to -30 °C; frequency > 1 MHz; signal input 0 to -50 dBm; reference level 0 to -50 dBm; input attenuation 20 dB; RBW 1 kHz, VBW 1 kHz; after calibration; preamp off | | |
| Overall amplitude accuracy | ± 1.5 dB | |
| | ± 0.5 dB, typical | |
| Level display range | | |
| Log scale units | dBm, dBmV, dB μ V, dB μ A | |
| Linear scale and units | W, mW, μ W, A, mA, μ A, V, mV, μ V | |
| Marker level readout | 0.01 dB | |
| Resolution | 0.01% of reference level | Log scale |
| Number of traces | 4 | Linear scale |
| Detectors | Positive-peak, negative-peak, sample, normal, RMS | |
| Trace functions | Clear/write, maximum hold, average, minimum hold, view | |
| Preamplifier | | |
| Frequency range | 1 MHz to 3.0 GHz | |
| Gain | 18 dB nominal | |

Dynamic Range Specifications

| Supplemental information | | |
|---|-------------------|---|
| 1 dB gain compression | | |
| Preamp off | 50 MHz to 3.0 GHz | > 0 dBm, typical; total power at input mixer |
| Preamp on | 50 MHz to 3.0 GHz | > -20 dBm, typical; total power at the preamp <i>Total power at the preamp = total power at the input (dBm) - input attenuation (dB)</i> |
| Displayed average noise level (DANL) | | |
| Input terminated, 0 dB RF attenuation, RBW = 10 Hz, VBW = 1 Hz, sample detector | | |
| Preamp off | 9 to 100 kHz | < -90 dBm, nominal |
| | 100 kHz to 1 MHz | < -90 dBm - 3 x (f/100 kHz) dB |
| | 1 to 10 MHz | < -124 dBm |
| | 10 MHz to 3 GHz | < -130 dBm - 3 x (f/1 GHz) dB |
| Preamp on | 100 kHz to 1 MHz | < -108 dBm - 3 x (f/100 kHz) dB |
| | 1 to 10 MHz | < -142 dBm |
| | 10 MHz to 3 GHz | < -148 dBm - 3 x (f/1 GHz) dB |
| Spurious response | | |
| Preamp off, signal input -30 dBm, 0 dB RF attenuation | | |
| Second harmonic distortion | 10 to 200 MHz | +30 dBm |
| | 200 to 500 MHz | +35 dBm |
| | 500 MHz to 3 GHz | +43 dBm |
| Preamp off, signal input -30 dBm, 0 dB RF attenuation | | |
| Third-order intermodulation (TOI) | 300 MHz to 3 GHz | +10 dBm; +13 dBm nominal |

Nominal Dynamic Range at 1 GHz



Dynamic Range Specifications (continued)

| Supplemental information | | | |
|--|---------------------------------|--|---------------|
| Spurious response (continued) | | | |
| Input related spurious | < -60 dBc | -30 dBm signal at input mixer, 20 to 30 °C | |
| Residual response (inherent) | < -83 dBc | Input terminated and 0 dB RF attenuation, preamp off | |
| Phase noise | | Specification | Typical |
| Offset from CW signal | 10 kHz | < -88 dBc/Hz | < -90 dBc/Hz |
| F _c = 1 GHz, RBW = 1 kHz, VBW = 10 Hz, and sample detector, log average, average times > 40 | 100 kHz | < -100 dBc/Hz | < -102 dBc/Hz |
| | 1 MHz | < -110 dBc/Hz | < -112 dBc/Hz |
| Residual FM | ≤ 100 Hz peak-to-peak in 100 ms | 1 kHz RBW, 1 kHz VBW | |

Tracking Generator Specifications (Option TG3 required)

| Supplemental information | | | |
|----------------------------|---------------------|--|--|
| Output frequency | | | |
| Range | 100 kHz to 3 GHz | Settable to 9 kHz | |
| Resolution | 1 Hz | | |
| Output power level | | | |
| Range | -30 to 0 dBm | | |
| Resolution | 0.1 dB | | |
| Absolute accuracy | ± 0.75 dB | 20 to 30 °C, at 50 MHz with coupled source attenuator, referenced to -20 dBm | |
| Output flatness | ± 3 dB | 100 kHz to 10 MHz | |
| | ± 2 dB | 10 MHz to 3 GHz | |
| VSWR | < 1.5:1 | 300 kHz to 3 GHz, input attenuator ≥ 12 dB | |
| Connector and impedance | N-type female, 50 Ω | | |
| Maximum safe reverse level | | | |
| Average total power | 30 dBm (1 W) | | |
| AC coupled | 0 VDC MAX | | |

Modulation Analysis Specifications

| | | Supplemental information |
|---|---------------------------------|--|
| Demodulation | | |
| Frequency range | 10 MHz to 3 GHz | |
| Carrier power accuracy | ± 2 dB | ± 1 dB typical |
| Input power | -30 to +20 dBm | Auto attenuation |
| 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 measurement (included in Option DMA) | | |
| Symbol rate range | 200 Hz to 100 kHz | |
| Modulation depth/index range | 10 to 90% | |
| Accuracy | ± 4% of reading, nominal | |
| Displayed resolution | 0.1% | |
| FSK measurement (included in Option DMA) | | |
| Symbol rate range | 1 to 100 kHz | |
| FSK deviation range | 1 to 400 kHz | |
| Accuracy | ± 4% nominal | $\beta \geq 1$ and $\beta \leq 4$, β is the ratio of frequency deviation to symbol rate |
| Displayed resolution | 0.01 Hz | |

Inputs and Outputs

| | | Supplemental information |
|-------------------------|-------------------------------|--|
| Front panel | | |
| RF input connector | N-type female, 50 Ω | |
| VSWR | < 1.5:1 | 300 kHz to 3 GHz, input attenuator \geq 10 dB |
| Calibration output | Amplitude | -10 dBm \pm 0.3 dB |
| | Frequency | 50 MHz |
| | Accuracy | Same as the frequency reference |
| | Connector and impedance | BNC-type female, 50 Ω |
| Probe power | Voltage/current | +15 V, 150 mA maximum |
| | | -12.6 V, 150 mA maximum |
| RF output connector | N-type female, 50 Ω | Option TG3 installed |
| USB interface (host) | A plug, version 1.1 | |
| Rear panel | | |
| 10 MHz reference output | Output amplitude | > 0 dBm |
| | Connector and impedance | BNC-type female, 50 Ω |
| 10 MHz reference input | Input amplitude | -5 to +10 dBm |
| | Frequency lock range | \pm 5 ppm of specified external reference input frequency |
| | Connector and impedance | BNC-type female, 50 Ω |
| External trigger input | Input amplitude | 5 V TTL level |
| | Connector and impedance | BNC-type female, 10 k Ω |
| VGA output | VGA analog RGB | 31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced |
| | D-sub 15-pin female connector | VGA compatible |
| | 640 x 480 screen resolution | |
| LAN TCP/IP interface | 10Base, RJ-45 connector | |
| USB interface (device) | B plug, version 1.1 | |
| GPIB interface | IEEE-488 bus connector | Optional G01 installed |

General

| Supplemental information | | |
|--|--|--------------|
| Temperature range | | |
| Operating | +5 to +45 °C | |
| Storage | -20 to +70 °C | |
| EMC | | |
| Complies with European EMC Directive 2004/108/EC | | |
| <ul style="list-style-type: none">• IEC/EN 61326-1 or IEC/EN 61326-2-1• CISPR Pub 11 group 1, class A• AS/NZS CISPR 11:2004• ICES/NMB-001:2004 | | |
| This ISM device complies with Canadian ICES-001 | | |
| Safety | | |
| Complies with European Low Voltage Directive 2006/95/EC | | |
| <ul style="list-style-type: none">• IEC/EN 61010-1 2nd Edition• Canada: CSA C22.2 No. 61010-1-04• USA: UL 61010-1 2nd Edition | | |
| Audio noise | | |
| Acoustic noise emission | | |
| LpA < 70 dB | | |
| Operator position | | |
| Normal position | | |
| Per ISO 7779 | | |
| Environmental stress | | |
| Samples of this product have been type tested in accordance with the Agilent 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 | < 65 W | |
| Display | | |
| Resolution | 640 x 480 | |
| Size | 165.1 mm (6.5 in) diagonal (nominal) | |
| Data storage | | |
| Internal | 16 MB nominal | |
| External | Supports USB 2.0 compatible memory devices | |

General (continued)

| Supplemental information | | |
|---|--------------------------|----------------|
| Weight (without options) | | |
| Net | 8.4 kg (18 lbs) nominal | |
| Shipping | 14.5 kg (32 lbs) nominal | |
| Dimensions | | |
| Height | 132.5 mm (5.2 in) | 3U rack height |
| Width | 320 mm (12.6 in) | |
| Length | 400 mm (15.7 in) | |
| Warranty | | |
| The N9320B spectrum analyzer is supplied with a one-year warranty | | |
| Calibration cycle | | |
| The recommended calibration cycle is one year. Calibration services are available through Agilent Service Centers | | |

Related Literature

- Agilent N9320B RF Spectrum Analyzer, Brochure, literature number 5990-8118EN
- Agilent N9320B RF Spectrum Analyzer, Configuration Guide, literature number 5990-8120EN



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