



# Agilent N9344C Handheld Spectrum Analyzer (HSA)

1 MHz to 20 GHz (tunable to 9 kHz)

## Data Sheet



Field testing just got easier  
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If you are making measurements in the field, the Agilent N9344C handheld spectrum analyzer (HSA) makes your job easier. It's got the features you need for operating in tough field environments, and its measurement performance gives you confidence the job's been done right. The N9344C HSA let you automate routine tasks to save time and ensure consistent results. Field testing just got easier with the Agilent N9344C HSA.



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## Definitions and requirements

This data sheet contains specifications and supplemental information for Agilent N9344C handheld spectrum analyzer. The differences between specifications, typical performance, and nominal values are described as follows.

### Definitions

Specifications describe the performance of parameters covered by the product warranty and apply to temperature ranges -10 °C to 50 °C, unless otherwise noted.

95th percentile values indicate the breadth of the population (> 2) of performance tolerances expected to be met in 95% of the cases with a 95% confidence, for any ambient temperature in the range of 20 °C to 30 °C. In addition to the statistical observations of a sample of instruments, these values include the effects of the uncertainties of external calibration references. These values are not warranted. These values are updated occasionally if a significant change in the statistically observed behavior of production instruments is observed.

Typical 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 °C 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.

## Conditions required to meet specifications

The following conditions must be met for the analyzer to meet its specifications.

- The analyzer is within its calibration cycle.
- Under auto couple control, except when Swp Time Rule is set to Accuracy.
- Any analyzer that has been stored at a temperature range inside the allowed storage range but outside the allowed operating range must be stored at an ambient temperature within the allowed operating range for at least two hours before being turned on.
- The analyzer has been turned on at least 30 minutes.

## Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization (ISO) members.



# Specifications

| Specification   |   | Supplemental information   |                          |
|---|---|--|--------------------------|
| <b>Frequency</b>  |   |  |                          |
| Frequency range   | 1 MHz to 20 GHz (tunable to 9 kHz)  | AC coupled   |                          |
| <b>Internal 10 MHz frequency reference accuracy</b>                         |   |  |                          |
| Aging rate  | ± 1 ppm/year  |  |                          |
| Temperature stability   | ± 1 ppm   | Referenced to frequency reading at 25 °C. Temperature varied at max. of 2 °C per minute. Control voltage held at voltage control range midpoint. |                          |
| <b>Frequency readout accuracy with marker (start, stop, center, marker)</b> |   |  |                          |
| Marker resolution   | (frequency span)/(sweep points -1)  |  |                          |
| Uncertainty   | ± (frequency indication × frequency reference uncertainty +1% × span +20% × resolution bandwidth + marker resolution +1 Hz) | Frequency reference uncertainty = (aging rate × period of time since adjustment + temperature stability)   |                          |
| <b>Marker frequency counter</b>   |   |  |                          |
| Resolution  | 1 Hz  |  |                          |
| Accuracy  | ± (marker frequency × frequency reference uncertainty + counter resolution)   | RBW/span ≥ 0.02; marker level to displayed noise level > 25 dB; frequency offset 0 Hz  |                          |
| <b>Frequency span</b>   |   |  |                          |
| Range   | 0 Hz (zero span), 100 Hz to 20 GHz  |  |                          |
| Resolution  | 1 Hz  |  |                          |
| Accuracy  | ± (0.22% × span + span/(sweep points -1))   | Nominal  |                          |
| <b>SSB phase noise</b>  |   |  |                          |
| Carrier offset  | 30 kHz  | < -86 dBc/Hz, typical -89 dBc/Hz   | 20 °C to 30 °C           |
|   | 100 kHz   | < -97 dBc/Hz, typical -99 dBc/Hz   | Center frequency 500 MHz |
|   | 1 MHz   | < -115 dBc/Hz, typical -119 dBc/Hz   |                          |
| <b>Resolution bandwidth (RBW)</b>   |   |  |                          |
| -3 dB bandwidth   | 10 Hz to 3 MHz  | 1-3-10 sequence  |                          |
| Accuracy  | ± 5%, RBW = 10 Hz to 1 MHz  | Nominal  |                          |
|   | ± 10%, RBW = 3 MHz  |  |                          |
| Resolution filter shape factor  | < 5 : 1   | Nominal; 3 dB bandwidth ratio; digital, Gaussian-like  |                          |
| <b>Video bandwidth (VBW)</b>  |   |  |                          |
| -3 dB bandwidth   | 1 Hz to 3 MHz   | 1-3-10 sequence  |                          |
| Accuracy  | ± 10%, VBW = 1 Hz to 1 MHz  | Nominal  |                          |

## Specifications (continued)

| Amplitude specifications                          |   | Supplemental information                               |
|---|---|--|
| <b>Measurement range</b>                          |   |  |
| 1 MHz to 500 MHz                                  | Displayed average noise level (DANL) to +10 dBm                             | Preamp off   |
| 500 MHz to 20 GHz                                 | Displayed average noise level (DANL) to +20 dBm                             |  |
| Input attenuator range                            | 0 dB to 50 dB, in 5 dB steps  |  |
| <b>Maximum safe input level</b>                   |   |  |
| Average continuous power                          | +30 dBm, 3 minutes maximum  | Input attenuator setting $\geq$ 20 dB, 1 MHz to 20 GHz |
| DC voltage  | $\pm$ 50 VDC maximum  |  |
| <b>Displayed average noise level <sup>1</sup></b> |   |  |
| <b>Preamp off</b>                                 |   |  |
| 1 MHz to 10 MHz                                   | -125 dBm, typical -140 dBm  | Reference level $\leq$ -50 dBm                         |
| 10 MHz to 3 GHz                                   | -137 dBm, typical -142 dBm  |  |
| 3 GHz to 7 GHz                                    | -135 dBm, typical -140 dBm  |  |
| 7 GHz to 10 GHz                                   | -139 dBm, typical -142 dBm  |  |
| 10 GHz to 13 GHz                                  | -137 dBm, typical -140 dBm  |  |
| 13 GHz to 16 GHz                                  | -136 dBm, typical -139 dBm  |  |
| 16 GHz to 18 GHz                                  | -134 dBm, typical -139 dBm  |  |
| 18 GHz to 20 GHz                                  | -126 dBm, typical -131 dBm  |  |
| <b>Preamp on</b>                                  |   |  |
| 1 MHz to 10 MHz                                   | -140 dBm, typical -156 dBm  | Reference level $\leq$ -70 dBm                         |
| 10 MHz to 3 GHz                                   | -150 dBm, typical -154 dBm  |  |
| 3 GHz to 6 GHz                                    | -145 dBm, typical -150 dBm  |  |
| 6 GHz to 13 GHz                                   | -151 dBm, typical -155 dBm  |  |
| 13 GHz to 16 GHz                                  | -149 dBm, typical -153 dBm  |  |
| 16 GHz to 18 GHz                                  | -147 dBm, typical -151 dBm  |  |
| 18 GHz to 20 GHz                                  | -137 dBm, typical -142 dBm  |  |
| <b>Level display range</b>                        |   |  |
| Log scale   | 10 dB to 100 dB, 10 divisions displayed, 1, 2, 5, 10 dB/division            |  |
| Linear scale                                      | 0% to 100%, 10 divisions displayed  |  |
| Scale units                                       | dBm, dBmV, dB $\mu$ V, W, V, dBmV EMF, dB $\mu$ V EMF, V EMF                |  |
| Sweep (trace) points                              | 461   |  |
| Marker level readout resolution                   | Log scale   | 0.01 dB  |
|   | Linear scale  | $\leq$ 1% of signal level                              |
| Detectors   | Normal, positive peak, sample, negative peak, average (video, RMS, voltage) |  |
| Number of traces                                  | 4   |  |

1. RMS detector, trace averaging  $>$  40, 0 dB input attenuation, input terminated 50  $\Omega$ , 1 kHz resolution bandwidth, normalized to 1 Hz, 20  $^{\circ}$ C to 30  $^{\circ}$ C.

# Specifications (continued)

| Amplitude specifications (continued)                           |                  | Supplemental information   |  |
|--|------------------|--|--|
| <b>Level display range (continued)</b>                         |                  |  |  |
| Trace functions  |                  | Clear/write, maximum hold, minimum hold, average   |  |
| Level measurement error  | 1 MHz to 7 GHz   | Excluding input VSWR mismatch<br>± 1 dB, typical ± 0.6 dB  | <ul style="list-style-type: none"> <li>• 20 °C to 30 °C, peak detector, preamp off, input signal -50 dBm to 0 dBm, 95% percentile.</li> <li>• Swp Time Rule is set to Accuracy.</li> <li>• Adds additional ± 0.3 dB when Swp Time Rule is set to Speed.</li> </ul> |
|  | 7 GHz to 18 GHz  | ± 1.2 dB, typical ± 0.8 dB   |  |
|  | 18 GHz to 20 GHz | ± 1.5 dB, typical ± 1 dB   |  |
| <b>Reference level <sup>2</sup></b>                            |                  |  |  |
| Setting range  |                  | -100 dBm to +30 dBm  | Steps of 1 dB  |
| Setting resolution   | Log scale        | 0.01 dB  |  |
|  | Linear scale     | Same as log (2.236 µV to 7.07 V)   |  |
| Accuracy   |                  | 0  |  |
| <b>RF Input VSWR (at tuned frequency)</b>                      |                  |  |  |
| 1 MHz to 7 GHz   |                  | < 1.5 : 1  | Nominal, ≥ 10 dB attenuation   |
| 7 GHz to 18 GHz  |                  | < 2 : 1  |  |
| 18 GHz to 20 GHz   |                  | < 2.5 : 1  |  |
| <b>Spurious response</b>                                       |                  |  |  |
| Second harmonic distortion                                     |                  | < -65 dBc, typical < -70 dBc,<br>50 MHz to 7 GHz<br>< -80 dBc, typical < -90 dBc,<br>7 GHz to 20 GHz | Mixer signal level at -30 dBm, input attenuation 0 dB, preamp off, 20 °C to 30 °C.   |
| Third order intermodulation distortion (third order intercept) |                  | +8 dBm, typical +9 dBm,<br>50 MHz to 300 MHz   | Two -20 dBm tones at input mixer, spaced by 100 kHz, input attenuation 0 dB, preamp off, reference level ≥ -30 dBm, 20 °C to 30 °C.  |
|  |                  | +9 dBm, typical +11 dBm,<br>300 MHz to 8 GHz   |  |
|  |                  | +10 dBm, typical +12 dBm,<br>8 GHz to 13 GHz   |  |
|  |                  | +13 dBm, typical +15 dBm,<br>13 GHz to 20 GHz  |  |
| Input related spurious   |                  | < -60 dBc, typical < -70 dBc   | <ul style="list-style-type: none"> <li>• -30 dBm signal at input mixer, span &lt; 2.9 GHz</li> <li>• Exception:<br/>-55 dBc (2 x F1 = Center Frequency - 5890 MHz, 7 GHz &lt; Center Frequency &lt; 10 GHz, with F1 input frequency)</li> </ul>                    |
| Inherent residual response                                     |                  | < -95 dBm, typical -110 dBm,<br>1 MHz to 7 GHz   | Input terminated and 0 dB RF attenuation, preamplifier off.  |
|  |                  | < -85 dBm, typical -93 dBm,<br>7 GHz to 20 GHz   |  |

2. Reference level only affects the display not the measurement, so trace data markers do not cause additional errors in measurement results.

## Specifications (continued)

| Sweep specifications                           |   | Supplemental information                |
|--|---|---|
| <b>Sweep time</b>                              |   |   |
| Range  | 2 ms to 1000 s  | Span $\geq$ 100 Hz                      |
|  | 600 ns to 200 s   | Span = 0 Hz (zero span)                 |
| Sweep mode                                     | Continuous, single  |   |
| Sweep time rule                                | Accuracy, speed   |   |
| Trigger source                                 | Free run, video, external, RF burst   |   |
| Trigger slope                                  | Selectable positive or negative edge  |   |
| Trigger delay                                  | $\pm 12$ ms to $\pm 12$ s   | Nominal, span = 0 Hz (zero span)        |
| <b>Front panel input/output</b>                |   | Supplemental information                |
| <b>RF input</b>                                |   |   |
| Connector and impedance                        | Type-N female, 50 $\Omega$  | Nominal                                 |
| <b>10 MHz reference/external trigger input</b> |   |   |
| Reference input frequency                      | 10 MHz  |   |
| Reference input amplitude                      | 0 dBm to +10 dBm  |   |
| Trigger voltage                                | 5 V TTL level   | Nominal                                 |
| Connector                                      | BNC female, 50 $\Omega$   | Nominal                                 |
| <b>Probe power</b>                             |   |   |
| Voltage/current                                | +15 Vdc, $\pm 7\%$ at 0 mA to 150 mA (nominal)  |   |
|  | -12.6 Vdc, $\pm 10\%$ at 0 mA to 150 mA (nominal)   |   |
|  | GND   |   |
| <b>USB interface</b>                           |   |   |
| Host connector                                 | USB Type-A female   |   |
|  | Compatible with USB 2.0 full speed  |   |
| Device connector                               | USB Type-mini AB female   |   |
|  | Compatible with USB 2.0 full speed  |   |
| <b>General specifications</b>                  |   | Supplemental information                |
| <b>Display</b>                                 |   |   |
| Resolution                                     | 640 pixels x 480 pixels   |   |
| Size and type                                  | 6.5 inch (170 mm) TFT color display   |   |
| <b>Languages</b>                               |   |   |
| On-screen GUI                                  | English, Simplified Chinese, Traditional Chinese, French, German, Italian, Japanese, Korean, Russian, Spanish, Portuguese |   |
| <b>Power requirements and calibration</b>      |   |   |
| Adaptor voltage                                | 100 V to 240 V AC, 50 Hz to 60 Hz   | Auto-ranging                            |
|  | 15 V DC, 5.3 A, 80 W max  |   |
| Power consumption                              | 16 W  | Typical                                 |
| Battery operating time (fully charged battery) | 3.5 hours   | Tracking generator off, preamplifier on |
|  | 3 hours   | Tracking generator on, preamplifier on  |
| Charging time                                  | 3 hours   |   |
| Life time                                      | 300 to 500 charge cycles  |   |
| Warm-up time                                   | 30 minutes  |   |
| Calibration cycle                              | One year  |   |

## Specifications (continued)

| General specifications (continued)            |   | Supplemental information                                    |
|---|---|---|
| <b>Environmental and size</b>                 |   |   |
| Temperature range                             | -10 °C to +50 °C  | Operating (Battery: 0 °C to 50 °C)                          |
|   | -40 °C to +70 °C  | Storage (Battery: -20 °C to 50 °C)                          |
| Relative humidity                             | < 95%   |   |
| Weight  | 3.2 kg (7 lbs)  | Net (shipping) approximately, 3.6 kg (7.9 lbs) with battery |
| Dimensions                                    | 318 mm × 207 mm × 69 mm<br>(12.5 in x 8.15 in x 2.7 in)     | Approximately (W x H x D)                                   |
| <b>Option specifications</b>                  |   | <b>Supplemental information</b>                             |
| <b>Spectrum monitor (Option SIM)</b>          |   |   |
| Display modes                                 | Spectrogram   |   |
|   | Spectrum trace  |   |
|   | Combination of spectrogram and spectrum trace in one screen |   |
| <b>RF preamplifier (Option P20)</b>           |   |   |
| Frequency range                               | 1 MHz to 20 GHz   |   |
| Gain  | 15 dB   | Nominal   |
| <b>Tracking generator (Option TG7)</b>        |   |   |
| Frequency range                               | 5 MHz to 7 GHz  |   |
| Output level                                  | 0 dBm to -20 dBm  | 1 dB steps  |
| VSWR  | < 2.0 : 1   | Nominal   |
| Connector and impedance                       | Type-N female, 50 Ω   |   |
| <b>AM/FM modulation analysis (Option AMA)</b> |   |   |
| Frequency range                               | 10 MHz to 20 GHz  |   |
| Carrier power accuracy                        | < 7 GHz, ±1.2 dB  | Nominal   |
|   | 7 GHz to 18 GHz, ±1.5 dB                                    | Nominal   |
|   | 18 GHz to 20 GHz, ±1.8 dB                                   | Nominal   |
| Carrier power range                           | -30 dBm to +10 dBm  | 1 MHz to 500 MHz  |
|   | -30 dBm to +20 dBm  | 500 MHz to 20 GHz   |
| Carrier power displayed resolution            | 0.01 dBm  |   |
| <b>AM measurement</b>                         |   |   |
| 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   |
| <b>FM measurement</b>                         |   |   |
| Modulation rate                               | 20 Hz to 200 kHz  |   |
| Accuracy                                      | 1 Hz  | Nominal (modulation rate < 1 kHz)                           |
|   | < 0.1% modulation rate                                      | Nominal (modulation rate > 1 kHz)                           |
| Depth   | 20 Hz to 400 kHz  |   |
| Accuracy                                      | ± 4%  | Nominal   |

## Specifications (continued)

| Option specifications (continued)         |                  | Supplemental information  |
|---|------------------|---|
| Time-gated spectrum analysis (Option TMG) |                  |   |
| <b>Gated sweep</b>                        |                  |   |
| Span range                                | Any span         |   |
| RBW range                                 | > = 1 kHz        | VBW is fixed and equal to RBW <sup>3</sup>  |
| Gate delay range                          | 200 ns to 10.0 s | 200 ns resolution   |
| Gate length range                         | 200 ns to 10.0 s | 200 ns resolution, 12 us minimum  |
| Gate sources                              | External         |   |
|   | RF Burst         |   |
|   | Periodic Timer   | <ul style="list-style-type: none"> <li>• Sync sources include free, external, and RF Burst.</li> <li>• Period: 0 s to 20.0 s<br/><i>(It should be greater than Gate Delay plus Gate Length.)</i></li> <li>• Offset: -5 to +5 s</li> </ul> |
| <b>RF Burst</b>                           |                  |   |
| Level range                               |                  | -60 dBm to -20 dBm plus attenuation (nominal)   |
| Bandwidth (-10 dB)                        |                  | 8 MHz (nominal)   |
| Frequency limitations                     |                  | If the start or center frequency is too close to zero, LO feedthrough can degrade or prevent triggering. How close is too close depends on the bandwidth.   |

3. For efficiency and convenience, RBW is restricted to be equal to or greater than 1 kHz and VBW is restricted to be equal to RBW.





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