



# Agilent N9344C Handheld Spectrum Analyzer (HSA)

20 GHz

Data Sheet



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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 lets 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 temperatures ranging from  $-10$  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  $20$  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 occurs.

"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 of  $20$  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.

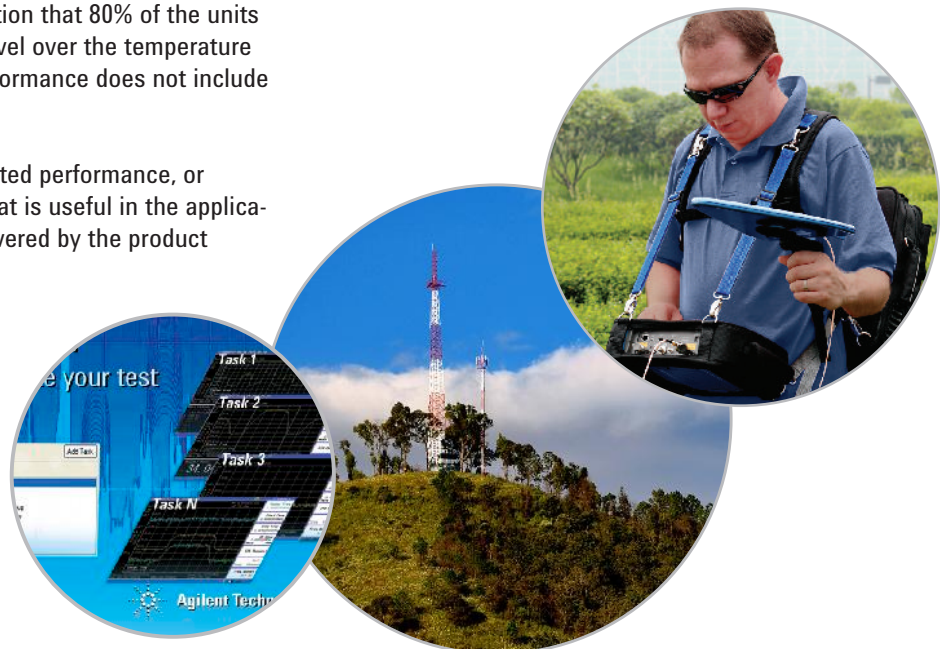
## Conditions required to meet specifications

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 (usable 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 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; 60 dB/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 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 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>	<b>Normalized to 1 Hz</b>	<b>Minimum RBW</b>
1 to 10 MHz	-125 dBm, typical -140 dBm	-115 dBm, typical -130 dBm
10 MHz to 3 GHz	-137 dBm, typical -142 dBm	-127 dBm, typical -132 dBm
3 to 7 GHz	-135 dBm, typical -140 dBm	-125 dBm, typical -130 dBm
7 to 10 GHz	-139 dBm, typical -142 dBm	-129 dBm, typical -132 dBm
10 to 13 GHz	-137 dBm, typical -140 dBm	-127 dBm, typical -130 dBm
13 to 16 GHz	-136 dBm, typical -139 dBm	-126 dBm, typical -129 dBm
16 to 18 GHz	-134 dBm, typical -139 dBm	-124 dBm, typical -129 dBm
18 to 20 GHz	-126 dBm, typical -131 dBm	-116 dBm, typical -121 dBm
<b>Preamp on</b>		
1 to 10 MHz	-140 dBm, typical -156 dBm	-130 dBm, typical -146 dBm
10 MHz to 3 GHz	-150 dBm, typical -154 dBm	-140 dBm, typical -144 dBm
3 to 6 GHz	-145 dBm, typical -150 dBm	-135 dBm, typical -140 dBm
6 to 13 GHz	-151 dBm, typical -155 dBm	-141 dBm, typical -145 dBm
13 to 16 GHz	-149 dBm, typical -153 dBm	-139 dBm, typical -143 dBm
16 to 18 GHz	-147 dBm, typical -151 dBm	-137 dBm, typical -141 dBm
18 to 20 GHz	-137 dBm, typical -142 dBm	-127 dBm, typical -132 dBm
<b>Level display range</b>		
Log scale	10 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	
Trace functions	Clear/write, maximum hold, minimum hold, average	

1. RMS detector, trace averaging > 40, 0 dB input attenuation, input terminated 50  $\Omega$ , 1 kHz resolution bandwidth, 20 to 30 °C.

## Specifications (continued)

Amplitude specifications (continued)			Supplemental information
<b>Level display range (continued)</b>			
Level measurement error	1 MHz to 7 GHz	Excluding input VSWR mismatch $\pm 1.3$ dB	
	7 to 18 GHz	$\pm 1.6$ dB	
	18 to 20 GHz	$\pm 1.8$ dB	
<ul style="list-style-type: none"> <li>• 20 to 30 °C, 30 to 70% RH, peak detector, preamp off, input signal <math>-50</math> to <math>0</math> dBm, 95% percentile</li> <li>• Swp Time Rule is set to Accuracy</li> <li>• Adds <math>\pm 0.3</math> dB when Swp Time Rule is set to Speed</li> <li>• Adds <math>\pm 0.3</math> dB with 5-minute warm-up</li> </ul>			
<b>Reference level <sup>2</sup></b>			
Setting range		$-100$ to $+30$ dBm	Steps of 1 dB
Setting resolution	Log scale	0.01 dB	
	Linear scale	Same as log ( $2.236 \mu\text{V}$ to $7.07$ V)	
Accuracy		0	
<b>RF input VSWR (at tuned frequency)</b>			
1 MHz to 7 GHz		$< 1.5:1$	Nominal, $\geq 10$ dB attenuation
7 to 18 GHz		$< 2:1$	
18 to 20 GHz		$< 2.5:1$	
<b>Spurious response</b>			
Second harmonic distortion		$< -65$ dBc, typical $< -70$ dBc, 50 MHz to 7 GHz $< -80$ dBc, typical $< -90$ dBc, 7 to 20 GHz	Mixer signal level at $-30$ dBm, input attenuation 0 dB, preamp off, 20 to 30 °C
Third order intermodulation distortion (third order intercept)		5-min warm-up	30-min warm-up
	50 to 300 MHz	$+6.5$ dBm, typical $+7.5$ dBm	$+8$ dBm, typical $+9$ dBm
	300 MHz to 8 GHz	$+7.5$ dBm, typical $+9.5$ dBm	$+9$ dBm, typical $+11$ dBm
	8 to 13 GHz	$+8.5$ dBm, typical $+10.5$ dBm	$+10$ dBm, typical $+12$ dBm
	13 to 20 GHz	$+11.5$ dBm, typical $+13.5$ dBm	$+13$ dBm, typical $+15$ dBm
Input related spurious		$< -60$ dBc, typical $< -70$ dBc	$< -59$ dBc, typical $< -69$ dBc
			<ul style="list-style-type: none"> <li>• <math>-30</math> dBm signal at input mixer, span <math>&lt; 2.9</math> GHz</li> <li>• Exception: <math>-55</math> dBc (<math>2 \times F1 =</math> center frequency <math>-5,890</math> MHz, <math>7</math> GHz <math>&lt;</math> center frequency <math>&lt; 10</math> GHz, with <math>F1</math> input frequency)</li> </ul>
Inherent residual response	1 MHz to 7 GHz	$< -93.5$ dBm, typical $-108.5$ dBm	$< -95$ dBm, typical $-110$ dBm
	7 GHz to 20 GHz	$< -83.5$ dBm, typical $-91.5$ dBm	$< -85$ dBm, typical $-93$ dBm
			Input terminated and 0 dB RF attenuation, preamplifier off

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 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 to 150 mA (nominal)	
	-12.6 Vdc, $\pm$ 10% at 0 to 150 mA (nominal)	
	GND	
<b>Connectivity</b>		
USB host	USB Type-A female, compatible with USB 2.0 full speed	
USB device	USB Type-mini AB female, compatible with USB 2.0 full speed	
LAN	RJ-45, 10 Base-T	
<b>General specifications</b>		Supplemental information
<b>Display</b>		
Resolution	640 pixels x 480 pixels	
Size and type	170 mm (6.5 in) TFT color display	
<b>Internal memory</b>		
System memory	64 MB	For system use. Not user accessible
User memory	64 MB	User accessible. Able to store about 14,000 traces
<b>Languages</b>		
On-screen GUI	English, Simplified Chinese, Traditional Chinese, French, German, Italian, Japanese, Korean, Russian, Spanish, Portuguese	

## Specifications (continued)

General specifications (continued)		Supplemental information
<b>Power requirements and calibration</b>		
Adaptor voltage	100 to 240 V AC, 50 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	5 minutes	
Calibration cycle	One year	
<b>Environmental and size</b>		
Temperature range	-10 to +50 °C	Operating (battery: 0 to 50 °C)
	-40 to +70 °C	Storage (battery: -20 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 (12.5 in × 8.15 in × 2.7 in)	Approximately (W × H × D)
<b>Option specifications</b>		<b>Supplemental information</b>
<b>Channel scanner (Option SCN)</b>		
Scan modes	Top N, bottom N, and list	
Channels displayed	1 to 20	
Display orientation	Vertical	Number of channels ≤ 5
	Horizontal	Number of channels > 5
Chart	Bar chart, and time chart	
Log file	.CSV and .KML	
<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 to -20 dBm	1 dB steps
VSWR	< 2.0:1	Nominal
Connector and impedance	Type-N female, 50 Ω	



## Specifications (continued)

Option specifications (continued)		Supplemental information
<b>AM/FM modulation analysis (Option AMA)</b>		
Frequency range	10 MHz to 20 GHz	
Carrier power accuracy	< 7 GHz, $\pm 1.5$ dB	Nominal
	7 to 18 GHz, $\pm 1.8$ dB	Nominal
	18 to 20 GHz, $\pm 2.0$ dB	Nominal
Carrier power range	-30 to +10 dBm	1 to 500 MHz
	-30 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	$\pm 4\%$	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	$\pm 4\%$	Nominal
<b>ASK/FSK modulation analysis (Option DMA)</b>		
Frequency range	2.5 MHz to 6 GHz	
Carrier power accuracy	$\pm 2$ dB	Nominal
Carrier power range	-30 to +20 dBm	
Carrier power displayed resolution	0.01 dBm	
<b>ASK measurement</b>		
Symbol rate range	100 Hz to 100 kHz	
Modulation depth/index	5 to 95%	
Accuracy	$\pm 4\%$	Nominal
Displayed resolution	0.1%	
<b>FSK measurement</b>		
FSK deviation	100 Hz to 400 kHz	
Symbol rate range	100 Hz to 20 kHz	$1 \leq \beta^* \leq 20$
	20 to 50 kHz	$1 \leq \beta \leq 8$
	50 to 100 kHz	$1 \leq \beta \leq 4$
Accuracy	$\pm 4\%$	Nominal
Displayed resolution	0.01 Hz	
<b>Time-gated spectrum analysis (Option TMG)</b>		
<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 $\mu$ s minimum

\*  $\beta$  is the ratio of frequency deviation to symbol rate (deviation/rate).



## Specifications (continued)

Option specifications (continued)		Supplemental information
<b>Time-gated spectrum analysis (Option TMG)</b>		
<b>Gated sweep (continued)</b>		
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 to 20.0 s <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 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.
<b>Built-in GPS receiver and GPS antenna (Option GPS)</b>		
GPS information tagging	Longitude, latitude, and altitude	
GPS antenna	Built-in	
Frequency accuracy with GPS on	± 50 ppb	
External GPS antenna connector	SMA-F	External GPS antenna, N934xC-GPA, is offered as an optional accessory
<b>USB peak and average power sensor support (Option PWP)</b>		
Power sensor supported	Agilent U2020 X-series USB peak and average power sensor	
Frequency range	50 MHz to 40 GHz	Sensor dependent
Peak power dynamic range	–30 to +20 dBm	
<b>USB average power sensor support (Option PWM)</b>		
Power sensor supported	Agilent U2000 Series USB power sensor	
Frequency range	9 kHz to 24 GHz	Sensor dependent
Dynamic range	–60 to +44 dBm	Sensor dependent
<b>Security features (Option SEC)</b>		
Security erase	Erase the entire user flash memory by writing single character “1” over all memory locations	Non-recoverable
Port control	Disable/enable LAN port or USB port	
<b>Task planner for test automation (Option TPN)</b>		
Task plan execution mode	Auto, manual, and manual if fail	
Task plan file	.TPN	Complementary task plan editor is available with HSA PC software
Number of tasks	Maximum 20 in a single .TPN file	
Measurements supported	Regular spectrum analysis and power suite (channel power, ACPR, and OBW)	

Visit [www.agilent.com/find/taskplanner](http://www.agilent.com/find/taskplanner) for more information.

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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