

# Specifications Guide

## Agilent CSA Spectrum Analyzer



**Manufacturing Part Number: N1996-90021**  
**Supersedes: N1996-90004**

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Documentation is updated periodically. For the latest information about Agilent CSA spectrum analyzers, including firmware upgrades and application information, see:

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# 1 CSA Specifications



## Definitions and Requirements

This book contains specifications and supplemental information for the Agilent CSA spectrum analyzers. The distinction among specifications, typical performance, and nominal values are described as follows.

### 1.1 Definitions

- Specifications describe the performance of parameters covered by the product warranty (temperature = 0 to 50°C, unless otherwise noted).
- 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 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.

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

### 1.2 Conditions Required to Meet Specifications

- The analyzer is within its calibration cycle. See the General section.
- At least 2 hours of storage or operation at the operating temperature.
- Analyzer has been turned on at least 30 minutes.

### 1.3 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, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

## Frequency

Description	Specification	Supplemental Information
<p><b>Frequency Range</b> Option 503 Option 506</p>	<p>100 kHz to 3 GHz 100 kHz to 6 GHz</p>	
<p><b>Frequency Reference (10 MHz)</b> Accuracy  Aging Rate (25 °C) Temperature Stability (0-50 °C)</p>	<p><math>\leq \pm 5</math> ppm  <math>\leq \pm 2</math> ppm/year <math>\leq \pm 1</math> ppm</p>	<p>Within two years of adjustment  <math>\leq \pm 5</math> ppm/10 years nominal</p>
<p><b>Frequency Readout Accuracy</b> (start, stop, center, marker)</p>	<p><math>\pm</math> (freq indication <math>\times</math> frequency reference accuracy + 1% <math>\times</math> Span + 10% <math>\times</math> RBW + 0.5 <math>\times</math> horizontal resolution + 1Hz)<sup>a</sup></p>	<p>Horizontal resolution = span/(sweep points -1)</p>
<p><b>Frequency Span</b> Range  Resolution Accuracy</p>	<p>0 Hz (zero span), 1 kHz to maximum frequency  1 kHz <math>\pm</math> span / (sweep points -1)</p>	

a. Formula applies for RBW < 5 MHz

Description	Specification	Supplemental Information
<p><b>Sweep and Trace Update Time</b></p> <p>Sweep Time Setting Range (Zero Span)</p> <p style="padding-left: 20px;">Minimum</p> <p style="padding-left: 20px;">Maximum</p> <p>Sweep Time Setting Range<sup>a</sup> (Span &gt; 0, Manual coupled)</p> <p style="padding-left: 20px;">Minimum</p> <p style="padding-left: 20px;">Maximum</p> <p>Remote Sweep and Trace Transfer Speed (auto range off)</p> <p style="padding-left: 20px;">Span = 0 Hz</p> <p style="padding-left: 20px;">Span ≤ 100 MHz</p> <p><b>Trace Points</b></p>	<p>Maximum of 2/RBW or 1us</p> <p>Minimum of 102,400/RBW or 10s, but never less than 27.3 ms</p> <p>Settable, 2 to 1001</p>	<p>Settability of manually-coupled sweep time in non-zero span is dependent upon the RBW, VBW, span, detector, and sweep points.</p> <p>8.6ms or autocoupled sweep time, whichever is greater</p> <p>4000 s <sup>b</sup></p> <p>RBW auto-coupled, 501 pts</p> <p>120 ms minimum</p> <p>300 ms</p> <p>Defaults to 401</p>

- a. Manually-coupled sweep times are only available in non-zero spans with firmware revision ≥ A.02.00. Firmware revisions < A.02.00 only provide auto coupled sweep times in non-zero spans.
- b. The maximum sweep time is highly dependent upon the combination of span, RBW, VBW, and sweep points. As a result, there will be situations where a sweep time of 4000 s is not possible.

Description	Specification	Supplemental Information
<p><b>Trigger</b></p> <p>Trigger Resolution</p> <p>Delayed Trigger (external, RF burst, Video)</p> <p>  Range</p> <p>  Resolution</p> <p>RF Burst</p> <p>  Min Trigger Level (0 dB atten)</p> <p>    1 GHz, preamp off</p> <p>    2.7 GHz, preamp off</p> <p>    1 GHz, preamp on</p> <p>    2.7 GHz, preamp on</p> <p>  Resolution</p>	<p>Free run, External, RF burst, Video</p> <p>133.33 nsec or <math>1/(2 \times \text{RBW})</math></p> <p>-10 s to 10 s</p> <p>1 us</p> <p>0.1 dB</p>	<p>RBW and VBW dependent</p> <p>-29 dBm, nominal</p> <p>-35 dBm, nominal</p> <p>-51 dBm, nominal</p> <p>-53 dBm, nominal</p>

Description	Specification	Supplemental Information
<p><b>Resolution Bandwidth (RBW)</b> Range (-3 dB bandwidth) Non-zero Spans Firmware Revision ≤ A.01.99</p> <p>Firmware Revision ≥ A.02.00</p> <p>Zero Span</p> <p>Accuracy (3 dB Bandwidth) RBW ≤ 200 kHz Zero Span Span &gt; 0 RBW = 240 kHz, 250 kHz<sup>a</sup>, 300 kHz, 1 MHz, 3 MHz Zero Span Span &gt; 0 RBW = 5 MHz Zero Span Span &gt; 0 Selectivity (60 dB/ 3 dB bandwidth ratio) RBW ≤ 10 kHz Zero Span</p>	<p>10 Hz to 200 kHz in 1% settability (1 Hz minimum settability); 250 kHz, 300 kHz, 500 kHz, 1 MHz, 3 MHz, and 5 MHz</p> <p>10 Hz to 200 kHz in 10% settability, 24 steps per decade, in the following sequence: 1.0, 1.1, 1.2, 1.3, 1.5, 1.6, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3, 3.6, 3.9, 4.3, 4.7, 5.1, 5.6, 6.2, 6.8, 7.5, 8.2, 9.1,10; and 240 kHz, 300 kHz, 510 kHz, 1 MHz, 3 MHz, 5 MHz</p> <p>3 kHz to 5 MHz in 1-3-5 sequence , 240 kHz, 1.2<sup>a</sup> MHz</p>	<p>Step keys and knob change RBW in 1-3-10 sequence Maximum Span/RBW ratio is <math>5 \times 10^7</math></p> <p>Step keys and knob change RBW in 1-3-10 sequence Maximum Span/RBW ratio is <math>5 \times 10^7</math></p> <p>&lt; 2% nominal &lt; 7% nominal</p> <p>&lt; 5% nominal &lt; 5% nominal</p> <p>&lt; 14% nominal &lt; 14% nominal</p> <p>Digital, Approximately Guasian shape</p> <p>&lt; 6.5:1 nominal</p>
<p>Span &gt; 0 10 kHz &lt; RBW ≤ 200 kHz</p>		<p>&lt; 8.4:1 nominal</p>
<p>Zero Span</p>		<p>&lt; 3:1 nominal</p>

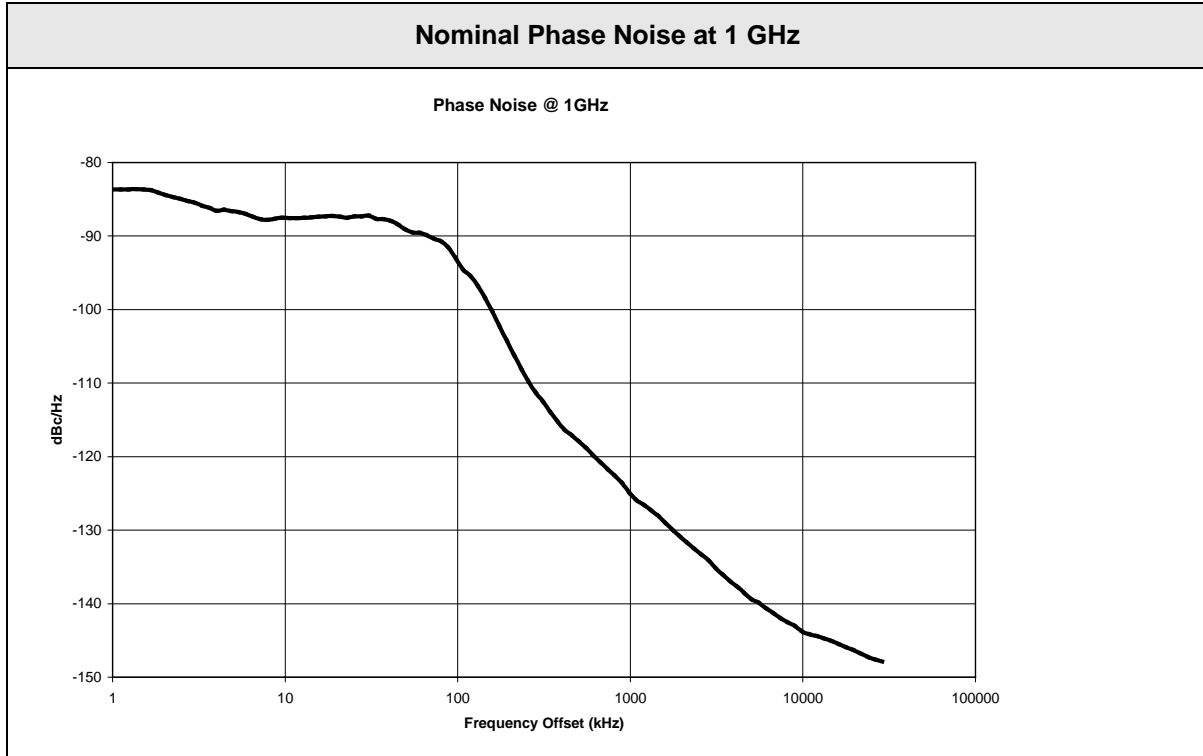
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Span > 0 RBW $\geq$ 240 kHz <sup>b</sup> Zero Span Span > 0		< 8.4:1 nominal  < 4.5:1 nominal  < 4.5:1 nominal
<b>Video Bandwidth (VBW)</b> <sup>c</sup> Range Settability	1 Hz to 8 MHz and 50 MHz (wide open)  1 Hz to 10 Hz in 1 Hz increments; 10 Hz to 3 MHz in 10% steps, 24 steps per decade, in the following sequence: 1.0, 1.1, 1.2, 1.3, 1.5, 1.6, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3, 3.6, 3.9, 4.3, 4.7, 5.1, 5.6, 6.2, 6.8, 7.5, 8.2, 9.1, 10; and 4, 5, 6, 8 and 50 MHz	RBW dependent

- a. For firmware revision <A.02.00, the 240 kHz and 1.2 MHz RBWs are replaced by the 250 kHz and 1.25 MHz RBWs, respectively.
- b. For firmware revision <A.02.00, the 240 kHz RBW is replaced by the 250 kHz RBW.
- c. Video Bandwidth (VBW) is only available in firmware revisions  $\geq$ A.02.00

Description	Specification	Supplemental Information
<b>Stability</b> Noise Sidebands 10 kHz offset <500 MHz 500 MHz to 2.5 GHz 2.5 GHz to 6 GHz  1 MHz offset 10 MHz to 2.2 GHz 2.7 GHz to 4.8 GHz) 10 MHz to 6 GHz  Residual FM		<-83 dBc/Hz typical <sup>l</sup> <-85 dBc/Hz typical <-82 dBc/Hz typical  -124 dBc/Hz nominal -124 dBc/Hz nominal -122 dBc/Hz nominal  <15 Hz p-p in 1 sec, 1 GHz center freq, 10 Hz RBW, internal ref <sup>a</sup> , characteristic

- a. Performance typically degrades when using an external reference



## Amplitude

Description	Specification	Supplemental Information
<p><b>Measurement Range</b></p> <p>Input Attenuator Range</p>	<p>Displayed Average Noise Level to Maximum Safe Input Level</p> <p>0 to 40 dB in 1 dB steps</p>	
<p><b>Maximum Safe Input Level</b></p> <p>Average Continuous Power (Input attenuation <math>\geq</math> 19 dB)</p> <p>Peak Pulse Power (for <math>&lt;</math> 10 <math>\mu</math>sec pulse width, <math>&lt;</math>1% duty cycle, and input attenuation <math>\geq</math> 19 dB)</p>	<p>+33 dBm</p> <p>+40 dBm</p>	
<p>DC</p> <p><b>1-dB Gain Compression</b> (Two-tone test, spacing <math>&gt;</math>15 MHz)</p> <p>Input Level, 0 dB Attenuation</p> <p>Pre-amplifier Off</p> <p>Pre-amplifier On (Options P03/P06)</p>	<p>50 Vdc</p>	<p>13 dBm at 1 GHz, nominal</p> <p>-10 dBm at 1 GHz, nominal</p>
<p><b>ADC Over Range</b></p> <p>Maximum mixer level<sup>a</sup></p>		<p>-3 dBm at 1 GHz characteristic<sup>b</sup></p>

a. Input mixer level = RF input level – input attenuation + preamplifier gain

b. ADC over range limit will vary with frequency.



Description	Specification	Supplemental Information
<p><b>Displayed Average Noise Level (DANL)</b> (10 Hz RBW, VBW auto coupled<sup>a</sup>, 50 Ω termination on input, 0 dB attenuation, sample detector, 25 averages)</p> <p>100 kHz to 500 kHz 500 kHz to 1 MHz 1 MHz to 10 MHz 10 MHz to 50 MHz 50 MHz to 2.7 GHz</p> <p>2.7 GHz to 6 GHz</p> <p>Preamplifier On (Options P03/P06)</p> <p>100 kHz to 500 kHz 500 kHz to 1 MHz 1 MHz to 10 MHz 10 MHz to 50 MHz 50 MHz to 2.7 GHz</p> <p>2.7 GHz to 6 GHz</p> <p><b>Display Range</b></p> <p>Log Scale</p> <p>Linear Scale</p> <p>Scale Units</p> <p><b>Marker Readout Resolution</b></p> <p>Log Scale</p> <p>Linear Scale</p>	<p>&lt; -95 dBm &lt; -110 dBm &lt; -125 dBm &lt; -123 + 3.79 × (frequency in GHz – 1 GHz) &lt; -125 + 3.37 × (frequency in GHz – 2.7 GHz)</p> <p>&lt; -115 dBm &lt; -130 dBm &lt; -145 dBm &lt; -143 + 3.66 × (frequency in GHz – 1 GHz) &lt; -141 + 2.63 × (frequency in GHz – 2.7 GHz)</p> <p>Ten divisions displayed; 1 dB/div to 20 dB/div in 1 dB steps</p> <p>Ten divisions</p> <p>dBm, dBmV, dBμV, W, V, A</p> <p>±0.01 dB ±0.01 % of ref level</p>	<p>&lt; -80 dBm nominal</p> <p>&lt; -128 + 3.79 × (frequency in GHz – 1 GHz) typical &lt; -131 + 3.37 × (frequency in GHz – 2.7 GHz) typical</p> <p>&lt; -90 dBm nominal</p> <p>&lt; -146 + 3.66 × (frequency in GHz – 1 GHz) typical &lt; -145 + 2.63 × (frequency in GHz – 2.7 GHz) typical</p>

a. Video BW (VBW) is only available with firmware revisions ≥ A.02.00.

Description	Specification	Supplemental Information
<b>Reference Level</b>		
Range	100 dBm to -150 dBm	
Resolution		
Log Scale	0.1 dB	
Linear Scale	0.2 % of reference level	
Accuracy	0 dB <sup>a</sup>	

Description	Specification	Supplemental Information
<b>Frequency Response<sup>b</sup></b>		
(relative to 50 MHz, 10 dB attenuation)		
100 kHz to 250 kHz		
20 to 30 °C	±1.50 dB	
0 to 55 °C	±1.61 dB	
250 kHz to 10 MHz		
20 to 30 °C	±0.70 dB	
0 to 55 °C	±0.75 dB	
10 MHz to 1 GHz		
20 to 30 °C	±0.44 dB	
0 to 55 °C	±0.53 dB	
1 GHz to 2.7 GHz		
20 to 30 °C	±0.60 dB	
0 to 55 °C	±0.88 dB	
2.7 GHz to 3 GHz		
20 to 30 °C	±0.69 dB	
0 to 55 °C	±1.20 dB	
3 GHz to 6 GHz		
20 to 30 °C	±1.12 dB	
0 to 55 °C	±1.60 dB	

- a. Because reference level affects only the display, not the measurement, it causes no additional error in measurement results from trace data or markers.
- b. For 240 kHz to 3 MHz RBW, add the following uncertainty:  $\pm 1.2 \times A^2$ , where  $A = \text{Span}/(100 \times \text{RBW})$ , maximum 0.5. Specification does not apply for RBW = 5 MHz.

Description	Specification	Supplemental Information
<p><b>Scale Fidelity</b> (relative to the reference condition of -10 dBm at the input mixer) Input Mixer Level<sup>a</sup> -10 dBm to -80 dBm 20 to 30 °C 0 to 55 °C</p> <p><b>Bandwidth Switching Uncertainty</b> (at tuned frequency, 10 Hz to 3 MHz RBW, referenced to 1 kHz RBW) 20 to 30 °C 0 to 55 °C</p> <p><b>Attenuator Switching Uncertainty</b> (relative to the 10 dB attenuator setting)</p> <p><b>Absolute Amplitude Accuracy</b> (peak detector, preamplifier off, input signal 0 dBm to -50 dBm, 10 dB Attenuation, 1 kHz RBW) At 50 MHz reference 20 to 30 °C 0 to 55 °C</p>	<p>±0.20 dB ±0.25 dB</p> <p>±0.32 dB ±0.45 dB</p> <p>± 0.38 dB ± 0.60 dB</p>	<p>&lt; 0.18 dB nominal</p>

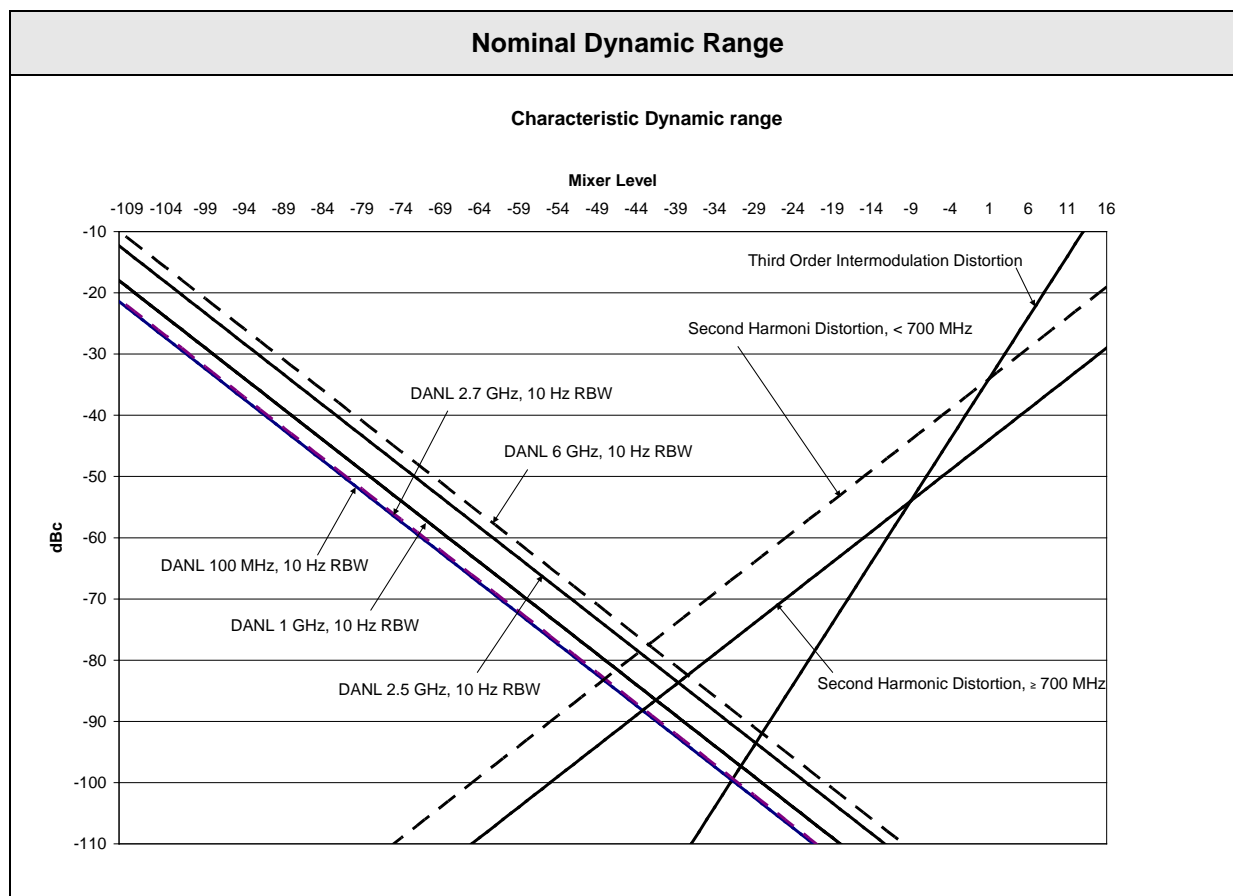
a. Input mixer level = RF input level – input attenuation + preamplifier gain

Description	Specification	Supplemental Information
<p><b>Overall Amplitude Accuracy</b> (peak detector, preamplifier off, input signal 0 dBm to -50 dBm, 10 dB Attenuation, RBW &lt; 3 MHz) 20 to 30 °C</p> <p>100 kHz to 250 kHz 250 kHz to 10 MHz 10 MHz to 1 GHz 1 GHz to 2.7 GHz 2.7 GHz to 3 GHz 3 GHz to 6 GHz</p> <p>0 to 55 °C</p> <p>100 kHz to 250 kHz 250 kHz to 10 MHz 10 MHz to 1 GHz 1 GHz to 2.7 GHz 2.7 GHz to 3 GHz 3 GHz to 6 GHz</p> <p><b>95% Confidence Absolute Amplitude Uncertainty<sup>a</sup></b> (20 to 30 °C degrees, peak detector, preamplifier off, input signal 0 dBm to -50 dBm, RBW ≤ 3 MHz)</p> <p>10 MHz to 1 GHz 1 GHz to 2.7 GHz 2.7 GHz to 3 GHz 3 GHz to 6 GHz</p>	<p>± 2.40 dB ± 1.54 dB ± 1.34 dB ± 1.51 dB ± 1.60 dB ± 2.02 dB</p> <p>± 3.00 dB ± 2.03 dB ± 1.83 dB ± 2.18 dB ± 2.50 dB ± 2.90 dB</p>	<p>± 0.53 dB ± 0.59 dB ± 0.64 dB ± 0.76 dB</p>

- a. Absolute Amplitude Accuracy for a wide range of signal and measurement settings, with 95% confidence, attenuation settings and frequency ranges shown. The value given is computed from the observations of a statistically significant number of instruments. The computation includes the root-sum-squaring of these terms: the absolute amplitude accuracy observed at 50 MHz, the frequency response relative to 50 MHz, RBW switching uncertainty, the attenuation switching uncertainty relative to 10 dB at 50 MHz, and the measurement uncertainties of these observations. To that root-sum-squaring result is added the environmental effects of 20 to 30 °C variation. The 95th percentiles are determined with 95% confidence.

Description	Specification	Supplemental Information
<p><b>RF Input VSWR</b> (at tuned frequency) Attenuator Setting 10 dB 100 kHz to 1 GHz 1 GHz to 4 GHz 4 GHz to 6 GHz ≥ 19 dB 100 kHz to 1.7 GHz 1.7 GHz to 4 GHz 4 GHz to 6 GHz</p> <p><b>Second Harmonic Distortion</b> (Measurement conditions:) &lt;700 MHz  &gt;700 MHz</p> <p><b>Third Order Intermodulation Distortion (TOI)</b></p> <p><b>Residual Responses</b> (0 dB input attenuation, no signal at input, input terminated in 50Ω) For frequency = 10 MHz × N, where N = integer from 1 to 40</p>		<p>≤ 1.2:1 nominal ≤ 1.4:1 nominal ≤ 1.8:1 nominal</p> <p>≤ 1.2:1 nominal ≤ 1.3:1 nominal ≤ 1.6:1 nominal</p> <p>&lt; -60 dBc for -30 dBm signal at input mixer, +30 dBm SHI, nominal</p> <p>&lt; -75 dBc for -30 dBm signal at input mixer, +45 dBm SHI, nominal</p> <p>+18 dBm (nominal) &lt; -90 dBm, nominal with exceptions as noted  &lt; -70 dBm, nominal</p>

Description	Specification	Supplemental Information
<p><b>Spurious Responses</b></p> <p>Input Mixer level -10 dBm</p> <p>First IF Image Response</p> <p style="padding-left: 20px;"><math>RF_{sig}=RF_{tune} + 2 \times 3435 \text{ MHz}</math> for <math>RF_{tune}</math> 1.7 to 2.7 GHz</p> <p style="padding-left: 20px;"><math>RF_{sig}=RF_{tune} + 2 \times 765 \text{ MHz}</math> for <math>RF_{tune} &gt; 2.7 \text{ GHz}</math></p> <p>Highband <math>\frac{1}{2}</math> IF Spur</p> <p style="padding-left: 20px;"><math>RF_{sig}=RF_{tune} + 765 \text{ MHz}/2</math> for <math>RF_{tune} &gt; 2.7 \text{ GHz}</math></p> <p>First IF Subharmonic</p> <p style="padding-left: 20px;"><math>RF_{sig}=3435 \text{ MHz}/2</math></p>		<p>&lt; -60 dBc, nominal with exceptions as noted below, internal batteries not being charged.</p> <p>&lt; -55 dBc, nominal</p> <p>&lt; -55 dBc, nominal</p> <p>&lt; -50 dBc, nominal</p> <p>&lt; -40 dBc, nominal</p>



## Power Measurements

Description	Specification		Supplemental Information
<p><b>Channel Power</b></p> <p>Accuracy (average detector, preamplifier off, input signal 0 dBm to -50 dBm, 10 dB Attenuation)</p> <p>20 to 30 °C</p> <p>100 to 250 kHz</p> <p>250 kHz to 10 MHz</p> <p>10 MHz to 1 GHz</p> <p>1 GHz to 2.7 GHz</p> <p>2.7 GHz to 3 GHz</p> <p>3 GHz to 6 GHz</p> <p>0 to 55 °C</p> <p>100 to 250 kHz</p> <p>250 kHz to 10 MHz</p> <p>10 MHz to 1 GHz</p> <p>1 GHz to 2.7 GHz</p> <p>2.7 GHz to 3 GHz</p> <p>3 GHz to 6 GHz</p>	<p><b>RBW ≤ 200 kHz</b></p> <p>±2.69 dB</p> <p>±1.83 dB</p> <p>±1.63 dB</p> <p>±1.80 dB</p> <p>±1.89 dB</p> <p>±2.31 dB</p> <p>±3.29 dB</p> <p>±2.32 dB</p> <p>±2.12 dB</p> <p>±2.47 dB</p> <p>±2.79 dB</p> <p>±3.19 dB</p>	<p><b>200 kHz &lt; RBW &lt; 3 MHz</b></p> <p>±2.57 dB</p> <p>±1.71 dB</p> <p>±1.51 dB</p> <p>±1.68 dB</p> <p>±1.77 dB</p> <p>±2.19 dB</p> <p>±3.17 dB</p> <p>±2.20 dB</p> <p>±2.00 dB</p> <p>±2.35 dB</p> <p>±2.67 dB</p> <p>±3.07 dB</p>	
<p><b>Occupied Bandwidth (OBW)</b></p> <p>Frequency Accuracy (<math>0.70 \times \text{Span} &lt; \text{OBW} &lt; 0.90 \times \text{Span}</math>; <math>\text{RBW} \leq \text{Span} / 100</math>)</p> <p>Power Accuracy (using average detector)</p>			<p>±(OBW indication × frequency reference accuracy + 2% × RBW + 2.0 × horizontal resolution + 0.5 digit) nominal</p> <p>±3.19 dB nominal</p>
<p><b>Adjacent Channel Power (ACP)</b></p> <p>Dynamic Range</p>			
<p>W-CDMA with 1 DCPH</p>			

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5 MHz offset		-60 dBc nominal
10 MHz offset		-62 dBc nominal
W-CDMA with Test Model 1		
5 MHz offset		-59 dBc nominal
10 MHz offset		-60 dBc nominal
Accuracy		
ACPR $\geq$ -40 dBc		$\pm$ 0.27 dB nominal
-40 dBc > ACPR $\geq$ -45 dBc		$\pm$ 0.30 dB nominal
-45 dBc > ACPR $\geq$ -50 dBc		$\pm$ 0.49 dB nominal
-50 dBc > ACPR $\geq$ -55 dBc		$\pm$ 1.22 dB nominal



## Hardware Options

Description	Specification	Supplemental Information
<b>Preamplifier            (Options P03/P06)</b> Frequency Range <i>Option P03</i> <i>Option P06</i> Gain	100 kHz to 3 GHz 100 kHz to 6 GHz	22 dB (nominal) 1 MHz to 2.7 GHz 18 dB (nominal) > 2.7 GHz

## General

Description	Specification	Supplemental Information
<p><b>Calibration Cycle</b></p> <p><b>Environmental Conditions</b></p> <p>Operating</p> <p>Altitude</p> <p>Temperature Range</p> <p>Operating</p> <p>AC Power</p> <p>Battery Power</p> <p>Storage</p> <p>Battery</p>	<p>1 year</p> <p>3000 Meters</p> <p>0 to 40°C</p> <p>0 to 50°C</p> <p>-40 to 70 °C</p> <p>-20 to 60 °C, ≤ 80%RH</p>	<p>This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 61010 664 respoectively.</p> <p>The battery packs should be stored in an environment with low humidity, free from corrosive gas at a recommended temperature range &lt;21°C. Extended exposure to temperatures above 45°C could degrade battery performance and life.</p>
<p><b>Acoustic Emissions (ISO 7779)</b></p> <p><b>EMI Compatibility</b></p> <p>Radiated Emissions</p> <p>Conducted Emissions</p>	<p>&lt; 55 dBA</p> <p>CISPR 11, Class A</p> <p>CISPR 11, Class A</p>	
<p><b>Immunity Testing</b></p> <p>Radiated Immunity</p> <p>Conducted Immunity</p> <p>ESD Immunity</p>	<p>IEC/EN 61000-4-3</p> <p>IEC/EN 61000-4-6</p> <p>IEC/EN 61000-4-2</p>	<p>Performance criterion A</p> <p>Performance criterion A</p> <p>Performance criterion B</p>
<p><b>Power Requirements</b></p>	<p>Dual battery or Agilent supplied power adaptor (150W)</p>	<p>Approx. 2 ½ hours battery operation</p>

Description	Specification	Supplemental Information
<b>Data Storage</b>		2 MB for user states and traces
<b>Display</b>	8.4" color XGA TFT-LCD	1024 x 768 with anti-glare coating
<b>Weight</b>		
Without batteries	7.5 kg	Not including power adapter (power adapter weight 0.9 kg)
With two batteries and impact cover installed	8.5 kg	
<b>Cabinet Dimensions</b>		
(H × W × D)		
Without bumpers or handle	177 × 426 × 200 mm	
With bumpers and handle in carry position	200 × 481 × 420 mm	
With bumpers and handle in storage position	223 × 481 × 248 mm	

## Front Panel Inputs & Outputs

Description	Specification	Supplemental Information
<b>RF Input</b> Connector Impedance LO Emissions Preamp Off, 0 dB attenuation Preamp On, 20 dB attenuation	Type N, female	50 $\Omega$ nominal  <-50 dBm, nominal <-75 dBm, nominal
<b>Probe Power Output</b>	+15 V at 150 mA -12 V at 150 mA	
<b>Tracking Generator Output</b> Connector Impedance	Type N, female	50 $\Omega$ nominal
<b>USB</b> USB-A (2 ports)	USB 1.1 (full speed)	Low-power devices only

## Rear Panel Inputs & Outputs

Description	Specification	Supplemental Information
<b>USB-A</b> USB-A (1 port) USB-B (1 port)	USB 1.1 USB 1.1	Low-power devices only Reserved for future use
<b>LAN</b>	10/100 base T RJ-45 connector	
<b>Timing LAN Opt</b>		Reserved for future use
<b>10 MHz Reference Out</b> Connector Level	BNC female	+5 dBm, 50 $\Omega$ nominal, AC coupled
<b>External Reference Input</b> Connector Input Frequency	BNC female 1 MHz, 2.048 MHz, 4.95 MHz, 10 MHz, 13 MHz, 15 MHz, 19.6608 MHz, 0.5 Hz (even second clock)	
Input Amplitude Range 1 MHz to 19.6608 MHz 0.5 Hz		-5 dBm to +10 dBm nominal TTL levels nominal
Impedance 1 MHz to 19.6608 MHz 0.5 Hz		50 $\Omega$ nominal 10 k $\Omega$ nominal
Lock Range		$\pm 10$ ppm of selected external frequency
Lock Time		15 seconds, 30 seconds for Even second clock

Description	Specification	Supplemental Information
<b>External Trigger Input</b> Connector Impedance Trigger Level Rising Edge Falling Edge Trigger Slope	BNC female      Rising/falling edge selectable	10 k $\Omega$ nominal   1.7 V nominal 1.0 V nominal
<b>GPS Antenna Input</b>		Reserved for future use
<b>Kensington Security Slot</b>		To prevent unauthorized removal of the spectrum analyzer, you can use a Kensington Slim MicroSaver security cable to attach the analyzer to an immovable object. Your spectrum analyzer has a Kensington Security Slot located on the instrument rear panel. For more information, visit <a href="http://www.microsaver.com">www.microsaver.com</a> .

## Regulatory Information

This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 61010 and 664 respectively.

This product has been designed and tested in accordance with IEC Publication 61010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.



The CE mark is a registered trademark of the European Community (if accompanied by a year, it is the year when the design was proven).



The CSA mark is the Canadian Standards Association safety mark.

ISM 1-A

This is a symbol of an Industrial Scientific and Medical Group 1 Class A product. (CISPR 11, Clause 4)



This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/ electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.

***Do not dispose in domestic household waste.***

***To return unwanted products, contact your local Agilent office, or see [www.agilent.com/environment/product/](http://www.agilent.com/environment/product/) for more information.***

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## Compliance with German Noise Requirements

Acoustic Noise Emission/Geraeuschemission	
LpA <70 dB	LpA <70 dB
Operator position	Am Arbeitsplatz
Normal position	Normaler Betrieb
Per ISO 7779	Nach DIN 45635 t.19

## Compliance with Canadian EMC Requirements

This ISM device complies with Canadian ICES-001.

Cet appareil ISM est conforme a la norme NMB du Canada.

## Declaration of Conformity

A copy of the Manufacturer's European Declaration of Conformity for this instrument can be obtained by contacting your local Agilent Technologies sales representative.





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## **2 Stimulus Response Measurement Suite (N8995A)**

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## Stimulus/Response <sup>a</sup>

Description	Specification	Supplemental Information
<p><b>Frequency Range</b>  <i>N8995A-SR3 or N1996A-TG3</i>  <i>N8995A-SR6 or N1996A-TG6</i></p>	<p>10 MHz to 3 GHz            10 MHz to 6 GHz</p>	
<p><b>Directivity</b>            Uncorrected                10 MHz to 3 GHz                3 GHz to 6 GHz            Corrected            (using option SRK, Stimulus            Response Calibration Kit)                10 MHz to 2 GHz                2 GHz to 3 GHz                3 GHz to 6 GHz</p>		<p>25 dB nominal            20 dB nominal              &gt; 49 dB nominal            &gt; 46 dB nominal            &gt; 40 dB nominal</p>
<p><b>Source match (RF Output)</b>            Uncorrected                10 MHz to 3 GHz                3 GHz to 6 GHz            Corrected            (using option SRK, Stimulus            Response Calibration Kit)                10 MHz to 2 GHz                2 GHz to 3 GHz                3 GHz to 6 GHz</p>		<p>20 dB, nominal            15 dB, nominal              34 dB, nominal            31 dB, nominal            27 dB, nominal</p>
<p><b>Frequency Resolution</b></p>		<p>60 Hz nominal</p>

- a. For firmware revisions  $\leq$  A.01.99, you must also have either N1996A Option TG3 or N1996A Option TG6. These options provide the tracking generator hardware and VSWR bridge necessary to make these measurements. The N8995A is the only means of controlling the tracking generator hardware. For firmware revisions  $\geq$  A.02.00, N8995A-SR3 and N8995A-SR6 provide the equivalent functionality

Description	Specification	Supplemental Information
<p><b>Return Loss (RF Output)</b>            (≥ 4 averages)</p> <p>Range</p> <p>10 MHz to 2 GHz</p> <p>2 GHz to 3 GHz</p> <p>3 GHz to 6 GHz</p> <p>Resolution</p> <p>Display Range</p> <p>SWR Range</p> <p>Accuracy            (using Stimulus/Response Calibration Kit, Option SRK, and calibration and measurement performed over the same frequency range and at the same reference plane)</p> <p>Range</p> <p>Return loss from 5 dB to 10 dB</p> <p>Return loss from 10 dB to 20 dB</p> <p>Return loss from 20 dB to 30 dB</p>	<p>0.1 dB</p> <p>-5 dB to +150 dB</p> <p>1 to 500</p>	<p>Return Loss      VSWR</p> <p>&gt; 49 dB nominal, &lt; 1.01:1</p> <p>&gt; 46 dB nominal &lt; 1.01:1</p> <p>&gt; 40 dB nominal &lt; 1.02:1</p> <p>(nominal)</p> <p>&lt; 2 GHz   &lt; 3 GHz   &lt; 6 GHz</p> <p>± 0.2 dB   ± 0.2 dB   ± 0.4 dB</p> <p>± 0.3 dB   ± 0.5 dB   ± 0.9 dB</p> <p>± 0.9 dB   ± 1.3 dB   ± 2.4 dB</p>

Description	Specification	Supplemental Information
<b>Insertion Loss</b>		
Dynamic Range (source level set to -15 dBm)		
10 MHz to 3 GHz		> 70 dB nominal
3 GHz to 5 GHz		> 50 dB nominal
5 GHz to 6 GHz		> 25 dB nominal
Source Level Range	-15 dBm to -30 dBm	
Accuracy due to limited isolation		
Frequency Range		< 3 GHz   < 5 GHz   < 6 GHz
DUT <sup>a</sup> Insertion Loss 10 dB		± 0.0 dB   ± 0.1 dB   ± 1.4 dB
DUT <sup>a</sup> Insertion Loss 20 dB		± 0.0 dB   ± 0.3 dB   ± 3.9 dB
DUT <sup>a</sup> Insertion Loss 30 dB		± 0.1 dB   ± 0.8 dB
DUT <sup>a</sup> Insertion Loss 40 dB		± 0.3 dB   ± 2.4 dB
DUT <sup>a</sup> Insertion Loss 50 dB		± 0.8 dB
Accuracy due to imperfect match		
Frequency Range		< 3 GHz   < 6 GHz
DUT <sup>a</sup> Return Loss 5 dB		± 1.0 dB   ± 1.6 dB
DUT <sup>a</sup> Return Loss 10 dB		± 0.5 dB   ± 0.9 dB
DUT <sup>a</sup> Return Loss 20 dB		± 0.2 dB   ± 0.3 dB
DUT <sup>a</sup> Return Loss 30 dB		± 0.1 dB   ± 0.1 dB
<b>Distance to Fault (Port 1)</b>		
Range	1 m to 300 m	
Resolution		$(1.5 \times 10^8) \times (VF) \times / (f_2 - f_1)$ Hz <sup>b</sup> , typically 1% of measurement distance
VSWR	1 to 500	

a. Device Under Test

b. VF is the relative propagation velocity of the cable;  $f_1$  and  $f_2$  are the start and stop frequencies, respectively.

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## **3 AM/FM Modulation Analysis Measurement Suite (N8996A)**

This chapter contains specifications for the N8996A AM/FM Modulation Analysis using the Agilent CSA including options:

- Option 1FP AM/FM analysis
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## AM Demodulation

Description	Specification	Supplemental Information
<b>Input Power Range</b>	-50 to +30 dBm with Auto-range On	
<b>Carrier Frequency Range</b>		
<i>Option 503</i>	100 kHz to 3 GHz	
<i>Option 506</i>	100 kHz to 6 GHz	
<b>Demodulation Bandwidth</b>	≤ 5MHz	(2 × Max. Mod. Rate) ≤ Max Demod BW
<b>Max Capture Memory</b>		160k samples
<b>Max Capture Time</b>		
Demodulation bandwidth (Max. capture time = Capture memory/Sample Rate)		Sampling rate / Max. measurement time
5 MHz		7.5 MHz / 21.845 ms
3 MHz		7.5 MHz / 21.845 ms
1.25 MHz		2.5 MHz / 65.536 ms
1.0 MHz		2 MHz / 81.92 ms
500 kHz		1 MHz / 163.84 ms
300 kHz		600 kHz / 273.067 ms
250 kHz		500 kHz / 327.68 ms
100 kHz		200 kHz / 819.2 ms
50 kHz		100 kHz / 1638.4 ms
30 kHz		60 kHz / 2730.7 ms
10 kHz		20 kHz / 8192.0 ms
5 kHz		10 kHz / 16.384 s
3 kHz		6 kHz / 27.3067 s
<b>Modulation Rate Range<sup>a</sup></b>		
100 kHz ≤ f <sub>c</sub> < 10 MHz	20 Hz to 10 kHz	
10 MHz ≤ f <sub>c</sub> < 3/6 GHz	50 Hz to 200 kHz	

- a. When the carrier frequency f<sub>c</sub> is equal or less than 2.6 MHz, to avoid the image that appears in the IF corresponding to the negative of signal frequency, the f<sub>c</sub> and IFBW must be chosen to satisfy IFBW < 2 × (f<sub>c</sub> - 100 kHz)

Description			Specification	Supplemental Information
<b>Modulation Rate Accuracy</b>				
Modulation Rate < 1 kHz				1 Hz nominal
Modulation rate >= 1 kHz				< 0.1% nominal
<b>Modulation Depth Range<sup>a</sup></b>			0 to 100%	
<b>AM Depth Accuracy<sup>b,c</sup></b>				± 3% of reading nominal
<b>Modulation Distortion Floor<sup>d</sup></b>				
Carrier Frequency	Modulation Rates	AM Depth		
250 kHz to 10 MHz	400 Hz	1% to 3%		< 1.5% nominal
10 MHz to 3/6 GHz	400 Hz	1% to 3%		< 2% nominal
250 kHz to 10 MHz, 10 MHz to 3/6 GHz	400 Hz	> 3%		< 0.6% nominal < 2.5% nominal
250 kHz to 10 MHz, 10 MHz to 3/6 GHz	1 kHz	1% to 3%		< 0.7% nominal
250 kHz to 10 MHz, 10 MHz to 3/6 GHz	1 kHz	> 3%		
<b>Residual AM (50 Hz to 3 kHz BW)</b>				< 0.1% (rms) nominal
<b>Detectors</b>				Available: +peak, -peak, ±peak/2, rms
<b>Burst/Sync Search</b>			None, RF Amplitude	
<b>SINAD Accuracy</b>				± 1 dB

- This is range over which AM depth measurements may be made. The accuracy characteristic applies only over the 0.5% to 99% range.
- For peak measurements only: AM accuracy may be affected by distortion generated by the spectrum analyzer. In the worst case this distortion can decrease accuracy by 0.1% of reading for each 0.1 % of distortion.
- If the measured AM depth is <2%, set IFBW to Manual rather than Auto for better results.
- The minimum IFBW (3 kHz) is used for distortion measurement.



## FM Demodulation

Description	Specification	Supplemental Information
<b>Input Power Range</b>	-50 to +30 dBm with Auto-range ON	
<b>Carrier Frequency Range</b>		
<i>Option 503</i>	100 kHz to 3 GHz	
<i>Option 506</i>	100 kHz to 6 GHz	
<b>Demodulation Bandwidth<sup>a</sup></b>	≤ 5MHz	
<b>Max Capture Memory</b>		160k samples
<b>Max Capture Time</b>		
Demoluation bandwidth		Sampling rate / Max. measurement time
5 MHz		7.5 MHz / 21.845 ms
3 MHz		7.5 MHz / 21.845 ms
1.25 MHz		2.5 MHz/ 65.536 ms
1.0 MHz		2 MHz / 81.92 ms
500 kHz		1 MHz / 163.84 ms
300 kHz		600 kHz / 273.067 ms
250 kHz		500 kHz / 327.68 ms
100 kHz		200 kHz / 819.2 ms
50 kHz		100 kHz / 1638.4 ms
30 kHz		60 kHz / 2730.7 ms
10 kHz		20 kHz / 8192.0 ms
5 kHz		10 kHz / 16.384 s
3 kHz		6 kHz / 27.3067 s
<b>Modulation Rate Range</b>		
100 kHz ≤ $f_c$ < 10 MHz	20 Hz to 10 kHz	
10 MHz ≤ $f_c$ < 3/6 GHz	50 Hz to 200 kHz	

- a. When the carrier frequency  $f_c$  is equal or less than 2.6 MHz, to avoid the image that appears in the IF corresponding to the negative of signal frequency, the  $f_c$  and IFBW must be chosen to satisfy  $IFBW < 2 \times (f_c - 100 \text{ kHz})$

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 AM/FM Modulation Analysis  
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Description				Specification	Supplemental Information
<b>Modulation Rate Accuracy</b>					
0.2 ≤ β ≤ 100, deviation ≤ 400 kHz		Modulation rate < 1 kHz			1 Hz nominal
		Modulation rate ≥ 1 kHz			< 0.1% nominal
<b>Peak Deviations</b>					
100 kHz ≤ f <sub>c</sub> ≤ 10 MHz				Max 40 kHz	
10 MHz ≤ f <sub>c</sub> ≤ 3/6 GHz				Max 400 kHz	
<b>FM Deviation Accuracy<sup>a</sup></b>					
Frequency range	Modulation Rate	Peak Deviation	β <sup>b</sup>		± 3% of reading, nominal
200 kHz to 10 MHz	20 Hz to 10 kHz	≤ 40 kHz	> 0.2		
10 MHz to 3/6 GHz	50 Hz to 200 kHz	≤ 400 kHz	> 0.5		
<b>Modulation Distortion Floor<sup>c</sup></b>					
Carrier Frequency	Modulation Rates	Deviation			< 1% nominal  < 0.9% nominal
250 kHz to 10 MHz	400 Hz or 1 kHz	1 kHz or 3 kHz			
10 MHz to 3/6 GHz	400 Hz or 1 kHz	1 kHz or 3 kHz			
<b>Detectors</b>					Available: +peak, -peak, ±peak/2, rms
<b>Burst/Sync Search</b>				None, RF Amplitude	
<b>SINAD Accuracy<sup>d</sup></b> (Meas Filter On and β > 1) <sup>e</sup>					± 1 dB nominal

- The peak deviations that the system is capable of measuring are governed by the instrument's IFBW (Information Bandwidth) setting. The relationship is described by the equation Peak deviation (in Hz) = IFBW/2 – modulation rate. If the measured frequency deviation β < 1, set IFBW to manual rather than auto to help satisfy this equation and yield better results.
- β is the ratio of frequency deviation to modulation rate (deviation/rate).
- If IFBW is greater than 3 kHz, Meas Filter must be On and the Demod Spectrum Span must be set to 3 kHz.
- Measured distortion must be greater than 3% for the FM SINAD accuracy to apply. For distortions less than 3%, the noise floor of the analyzer will begin to affect the accuracy of the measurement.
- SINAD accuracy will degrade when measuring signals with β ≤ 1. When measuring signals with β ≤ 1, some improvement may be possible by adjusting the Demod Spectrum Span (the span setting in the Demod Spectrum measurement controls the low-pass cutoff frequency of the measurement filter).