The Agilent PSA Series offers high-performance spectrum analysis, up to 50 GHz, with powerful one-button measurements, a versatile feature set, and a leading-edge combination of flexibility, speed, accuracy, analysis bandwidth, and dynamic range. From millimeter wave and phase noise measurements to spur searches and modulation analysis, the PSA Series offers unique and comprehensive high-performance solutions to R&D and manufacturing engineers in cellular and emerging wireless communications, aerospace, and defense.

For more information regarding the PSA wide analysis bandwidth, see the 40/80 MHz BW digitizers, Option 140/122, technical overview at www.agilent.com/find/PSA

Models
E4443A  3 Hz to 6.7 GHz
E4445A  3 Hz to 13.2 GHz
E4440A  3 Hz to 26.5 GHz *
E4447A  3 Hz to 42.98 GHz
E4446A  3 Hz to 44 GHz *
E4448A  3 Hz to 50 GHz *

*325 GHz With external mixing
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Definitions and Conditions

Specifications describe the performance of parameters covered by the product warranty and apply over 0 to 55 °C unless otherwise noted. Typical describes 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 is not covered by the product warranty.

The analyzer will meet its specifications when:

- stored a minimum of two hours within the operating temperature range and turned on for at least 30 minutes with Auto Align On selected.
- the instrument is within its one year calibration cycle.
- Align All Now has been performed within the past 24 hours or when the temperature changes 3 °C.
- the instrument is under auto couple control, except that Auto Sweep Time = Accy.
- DC coupling applied if center frequency is < 20 MHz.

This PSA Series data sheet is a summary of the complete specifications and conditions, which are available in the PSA Series Spectrum Analyzers Specification Guide.

The PSA Series Spectrum Analyzers Specification Guide can be obtained on the web through: www.agilent.com/find/psa

Then follow this selection process:

- Select “Manuals, Guides & Services Notes” from “In the Library”.
- Select “PSA Series Spectrum Analyzers Specifications Guide”.
- Download specifications guide.
Frequency Specifications

**Frequency range**

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4443A</td>
<td>(DC coupled)</td>
<td>3 Hz to 6.7 GHz</td>
</tr>
<tr>
<td>E4443A</td>
<td>(AC coupled)</td>
<td>20 MHz to 6.7 GHz</td>
</tr>
<tr>
<td>E4445A</td>
<td>(DC coupled)</td>
<td>3 Hz to 13.2 GHz</td>
</tr>
<tr>
<td>E4445A</td>
<td>(AC coupled)</td>
<td>20 MHz to 13.2 GHz</td>
</tr>
<tr>
<td>E4440A</td>
<td>(DC coupled)</td>
<td>3 Hz to 26.5 GHz</td>
</tr>
<tr>
<td>E4447A</td>
<td>(DC coupled)</td>
<td>3 Hz to 42.98 GHz</td>
</tr>
<tr>
<td>E4446A</td>
<td>(DC coupled)</td>
<td>3 Hz to 44 GHz</td>
</tr>
<tr>
<td>E4448A</td>
<td>(DC coupled)</td>
<td>3 Hz to 50 GHz</td>
</tr>
<tr>
<td>E4449A</td>
<td>(DC coupled)</td>
<td>3 Hz to 60 GHz</td>
</tr>
<tr>
<td>E4450A</td>
<td>(DC coupled)</td>
<td>3 Hz to 70 GHz</td>
</tr>
<tr>
<td>E4453A</td>
<td>(DC coupled)</td>
<td>3 Hz to 80 GHz</td>
</tr>
<tr>
<td>E4454A</td>
<td>(DC coupled)</td>
<td>3 Hz to 100 GHz</td>
</tr>
</tbody>
</table>

**Band Harmonic mixing mode (N)**

<table>
<thead>
<tr>
<th>Band</th>
<th>Harmonic</th>
<th>Mixing mode (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1–</td>
<td>3 Hz to 3 GHz</td>
</tr>
<tr>
<td>1</td>
<td>1–</td>
<td>2.85 GHz to 6.6 GHz</td>
</tr>
<tr>
<td>2</td>
<td>2–</td>
<td>6.2 GHz to 13.2 GHz</td>
</tr>
<tr>
<td>3</td>
<td>4–</td>
<td>12.8 GHz to 19.2 GHz</td>
</tr>
<tr>
<td>4</td>
<td>4–</td>
<td>18.7 GHz to 26.8 GHz</td>
</tr>
<tr>
<td>5</td>
<td>4+</td>
<td>26.4 GHz to 31.15 GHz</td>
</tr>
<tr>
<td>6</td>
<td>8–</td>
<td>31.0 GHz to 50.0 GHz</td>
</tr>
</tbody>
</table>

**Frequency reference**

Accuracy: 
\[
\pm \left( (\text{time since last adjustment} \times \text{aging rate}) + \text{temperature stability} + \text{calibration accuracy} \right)
\]

Aging rate: 
\[
\pm 1 \times 10^{-7} \text{ / year}
\]

Temperature stability: 
- 20 °C to 30 °C: \( \pm 1 \times 10^{-4} \)
- 0 °C to 55 °C: \( \pm 5 \times 10^{-4} \)

Achievable initial calibration accuracy: \( \pm 7 \times 10^{-4} \)

Example frequency reference accuracy 1 year after last adjustment:
= \( \pm (1 \times 1 \times 10^{-7} + 1 \times 10^{-4} + 7 \times 10^{-4}) \)
= \( \pm 1.8 \times 10^{-7} \)

**Frequency readout accuracy**

\( \pm (\text{marker frequency} \times \text{frequency reference accuracy} + 0.25\%) \times \text{span} + 5\% \times \text{RBW} + 2\% + 0.5 \times \text{horizontal resolution} \)

*Horizontal resolution is \( \text{sweep points} - 1 \)*

**Marker frequency counter**

Accuracy: \( \pm (\text{marker frequency} \times \text{frequency reference accuracy} + 0.100\%) \)

Delta counter accuracy: \( \pm (\text{delta frequency} \times \text{frequency reference accuracy} + 0.141\%) \)

Counter resolution: 0.001 Hz

**Frequency span (FFT and swept mode)**

Range: 0 Hz (zero span), 10 Hz to maximum frequency of model

Resolution: 2 Hz

Accuracy: \( \pm (0.2\% \times \text{span} + \text{span} / \text{sweep points} - 1) \)

1. 325 GHz with external mixers

Sweep time and triggering

**Range:**
- Span = 0 Hz: 1 µs to 6000 s
- Span ≥ 10 Hz: 1 ms to 2000 s

**Accuracy:**
- Span = 10 Hz, sweep: ±0.01% nominal
- Span ≥ 10 Hz, FFT: ±0.40% nominal
- Span = 0 Hz: ±0.01% nominal

**Trigger:**
- Free run, line, video, RF burst, external front, external rear, frame (basic mode)
- Span = 0 Hz, or FFT: –150 ms to +500 ms
- Span ≥ 10 Hz, swept: 1 µs to 500 ms

**Resolution:** 0.1 µs

**Sweep (trace) point range**

<table>
<thead>
<tr>
<th>Span</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Hz</td>
<td>2 to 8192</td>
</tr>
<tr>
<td>≥ 10 Hz</td>
<td>101 to 8192</td>
</tr>
</tbody>
</table>

**Gated sweep**

Gate length: 10 µs to 500 ms

Gate delay range: 0 to 500 ms

Gate delay jitter: 33.3 ns p-p nominal

**Gated FFT**

Delay range: –150 to +500 ms

Delay resolution: 100 ns or 4 digits whichever is more

Gate duration: 1.83 / RBW ±2% nominal

**Resolution bandwidth (RBW)**

Range (~3.01 dB bandwidth): 1 Hz to 3 MHz (10% steps), 4, 5, 6, 8 MHz

Bandwidth accuracy (power): | RBW range | ±0.5% (±0.022 dB) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hz to 51 kHz</td>
<td>±0.5% (±0.022 dB)</td>
<td></td>
</tr>
<tr>
<td>56 kHz to 75 kHz</td>
<td>±1.0% (±0.044 dB)</td>
<td></td>
</tr>
<tr>
<td>82 kHz to 330 kHz</td>
<td>±0.5% (±0.022 dB)</td>
<td></td>
</tr>
<tr>
<td>360 kHz to 1.1 MHz (&lt; 3 GHz CF)</td>
<td>±1.0% (±0.044 dB)</td>
<td></td>
</tr>
<tr>
<td>1.2 MHz to 2.0 MHz (&lt; 3 GHz CF)</td>
<td>±0.07 dB nominal</td>
<td></td>
</tr>
<tr>
<td>2.2 MHz to 6.0 MHz (&lt; 3 GHz CF)</td>
<td>±0.2 dB nominal</td>
<td></td>
</tr>
</tbody>
</table>

Bandwidth accuracy (~3.01 dB): | RBW range | ±2% nominal |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hz to 1.5 MHz</td>
<td>±2% nominal</td>
<td></td>
</tr>
</tbody>
</table>

Selectivity (~60 dB/~3 dB): 4.1:1 nominal

EMI bandwidths (CISPR compliant): | 200 Hz, 9 kHz |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>120 kHz, 1 MHz</td>
<td>----------------</td>
</tr>
</tbody>
</table>

EMI bandwidths (MIL STD 461E compliant): | 10 Hz, 100 Hz, 1 kHz, 10 kHz |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kHz, 1 MHz</td>
<td>-------------------------------</td>
</tr>
</tbody>
</table>

**Resolution bandwidth (–3.01 dB):** | RBW range | ±0.5% (±0.022 dB) |
<table>
<thead>
<tr>
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<td>1 Hz to 51 kHz</td>
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Bandwidth accuracy (~3.01 dB): | RBW range | ±2% nominal |
<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hz to 1.5 MHz</td>
<td>±2% nominal</td>
<td></td>
</tr>
</tbody>
</table>

Selectivity (~60 dB/~3 dB): 4.1:1 nominal

EMI bandwidths (CISPR compliant): | 200 Hz, 9 kHz |
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<tr>
<td>120 kHz, 1 MHz</td>
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EMI bandwidths (MIL STD 461E compliant): | 10 Hz, 100 Hz, 1 kHz, 10 kHz |
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kHz, 1 MHz</td>
<td>-------------------------------</td>
</tr>
</tbody>
</table>
Analysis bandwidth

- Maximum bandwidth: 10 MHz
  - with Option 140: 40 MHz
  - with Option 122: 80 MHz
- I/Q waveform digital output bandwidth (Option E444xA-B7J): 10 MHz
- 321.4 MHz IF output: 2
  - –1 dB bandwidth: 20 to 30 MHz nominal
    - Option 123 (> 2.85 GHz): 200 MHz nominal
  - –3 dB bandwidth: 30 to 60 MHz nominal
- 70 MHz IF output (Option E444xA-H70): 10 MHz
  - –1 dB bandwidth: 20 to 30 MHz nominal
  - –3 dB bandwidth: 30 to 60 MHz nominal

Video bandwidth (VBW)

- Range: 1 Hz to 3 MHz (10% steps), 4, 5, 6, 8 MHz and wide open
- Accuracy: ± 6% nominal

Stability

Noise sidebands (20 °C to 30 °C, CF = 1 GHz)

<table>
<thead>
<tr>
<th>Offset</th>
<th>Specification</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 Hz</td>
<td>–91 dBc/Hz</td>
<td>–96 dBc/Hz</td>
</tr>
<tr>
<td>1 kHz</td>
<td>–103 dBc/Hz</td>
<td>–108 dBc/Hz</td>
</tr>
<tr>
<td>10 kHz</td>
<td>–116 dBc/Hz</td>
<td>–118 dBc/Hz</td>
</tr>
<tr>
<td>30 kHz</td>
<td>–116 dBc/Hz</td>
<td>–118 dBc/Hz</td>
</tr>
<tr>
<td>100 kHz</td>
<td>–122 dBc/Hz</td>
<td>–124 dBc/Hz</td>
</tr>
<tr>
<td>1 MHz</td>
<td>–145 dBc/Hz</td>
<td>–147 dBc/Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–148 dBc/Hz nominal</td>
</tr>
<tr>
<td>6 MHz</td>
<td>–154 dBc/Hz</td>
<td>–156 dBc/Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–156.5 dBc/Hz nominal</td>
</tr>
<tr>
<td>10 MHz</td>
<td>–156 dBc/Hz</td>
<td>–157.5 dBc/Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–158 dBc/Hz nominal</td>
</tr>
</tbody>
</table>

Residual FM: < (1 Hz X N) p-p in 1 s, typical

See frequency range for N (harmonic number)

Amplitude Specifications

Amplitude range

- Measurement range: Displayed average noise level (DANL) to maximum safe input level
- Input attenuator range: 0 to 70 dB in 2 dB steps
  - (3 Hz to 50 GHz)

Maximum safe input level

- Average total power
  - Preamp (Option E444xA-1DS): +30 dBm (1 W)
  - Preamplifier (Option E444xA-1DS): +30 dBm (1 W)
- Peak pulse power
  - < 10 µs pulse width, < 1% duty cycle and input attenuation ≥ 30 dB: +50 dBm (100 W)
- DC volts:
  - DC coupled: < ±0.2 Vdc
  - AC coupled: ±100 Vdc

1 dB gain compression (two-tone)

<table>
<thead>
<tr>
<th>Total power at input mixer</th>
<th>Mixer level</th>
<th>Compression</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 MHz to 200 MHz</td>
<td>0 dBm</td>
<td>+3 dBm</td>
</tr>
<tr>
<td>200 MHz to 3 GHz</td>
<td>+3 dBm</td>
<td>+7 dBm</td>
</tr>
<tr>
<td>3 GHz to 6.6 GHz</td>
<td>+3 dBm</td>
<td>+4 dBm</td>
</tr>
<tr>
<td>6.6 GHz to 26.5 GHz</td>
<td>–2 dBm</td>
<td>0 dBm nominal</td>
</tr>
<tr>
<td>26.5 GHz to 50 GHz</td>
<td>0 dBm</td>
<td>0 dBm nominal</td>
</tr>
</tbody>
</table>

Preamp on (Option E444xA-1DS)

<table>
<thead>
<tr>
<th>Total power at input mixer</th>
<th>Mixer level</th>
<th>Compression</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to 200 MHz</td>
<td>–30 dBm</td>
<td>–25 dBm</td>
</tr>
<tr>
<td>200 MHz to 3 GHz</td>
<td>–25 dBm</td>
<td>–25 dBm</td>
</tr>
</tbody>
</table>

Typical gain compression (two-tone)

<table>
<thead>
<tr>
<th>Total power at input mixer</th>
<th>Mixer level</th>
<th>Compression</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 MHz to 200 MHz</td>
<td>0 dBm</td>
<td>&lt; 0.5 dB</td>
</tr>
<tr>
<td>200 MHz to 6.6 GHz</td>
<td>+3 dBm</td>
<td>&lt; 0.5 dB</td>
</tr>
<tr>
<td>6.6 GHz to 26.5 GHz</td>
<td>–2 dBm</td>
<td>&lt; 0.4 dB</td>
</tr>
</tbody>
</table>

1. Analysis bandwidth is the instantaneous bandwidth available around a center frequency over which the input signal can be digitized for further analysis or processing in the time, frequency, or modulation domain.

2. Not available for E4447A.

3. For nominal values, refer to Figures 1 and 2 on page 6.
Figure 1. Nominal phase noise at common cellular frequencies

Figure 2. Nominal phase noise at various center frequencies
### Displayed Average Noise Level (DANL)

*(Input terminated, sample or average detector, averaging type = Log, 20 to 30 °C)*

<table>
<thead>
<tr>
<th></th>
<th>Zero span and swept normalized to 1 Hz RBW and 0 dB attenuation</th>
<th>Zero span and swept normalized to 1 Hz RBW and 0 dB attenuation (typical)</th>
<th>FFT only actual 1 Hz RBW 0 dB attenuation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E4443A/E4445A/E4440A</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Hz to 1 kHz</td>
<td>—</td>
<td>—110 dBm nominal</td>
<td>—</td>
</tr>
<tr>
<td>1 kHz to 10 kHz</td>
<td>—</td>
<td>—130 dBm nominal</td>
<td>—</td>
</tr>
<tr>
<td>10 kHz to 100 kHz</td>
<td>−137 dBm</td>
<td>−141 dBm</td>
<td>−137 dBm</td>
</tr>
<tr>
<td>100 kHz to 1 MHz</td>
<td>−145 dBm</td>
<td>−149 dBm</td>
<td>−145 dBm</td>
</tr>
<tr>
<td>1 MHz to 10 MHz</td>
<td>−150 dBm</td>
<td>−153 dBm</td>
<td>−150 dBm</td>
</tr>
<tr>
<td>10 MHz to 1.2 GHz</td>
<td>−154 dBm</td>
<td>−155 dBm</td>
<td>−154 dBm</td>
</tr>
<tr>
<td>1.2 GHz to 2.1 GHz</td>
<td>−153 dBm</td>
<td>−154 dBm</td>
<td>−153 dBm</td>
</tr>
<tr>
<td>2.1 GHz to 3.0 GHz</td>
<td>−152 dBm</td>
<td>−153 dBm</td>
<td>−152 dBm</td>
</tr>
<tr>
<td>3 GHz to 6.6 GHz</td>
<td>−152 dBm</td>
<td>−153 dBm</td>
<td>−151 dBm</td>
</tr>
<tr>
<td>6.6 GHz to 13.2 GHz</td>
<td>−150 dBm</td>
<td>−152 dBm</td>
<td>−149 dBm</td>
</tr>
<tr>
<td>13.2 GHz to 20 GHz</td>
<td>−147 dBm</td>
<td>−149 dBm</td>
<td>−146 dBm</td>
</tr>
<tr>
<td>20 GHz to 26.5 GHz</td>
<td>−143 dBm</td>
<td>−145 dBm</td>
<td>−143 dBm</td>
</tr>
<tr>
<td><strong>Preamplifier ON (Option 1DS)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 kHz to 200 kHz</td>
<td>−159 dBm</td>
<td>−162 dBm</td>
<td>−158 dBm</td>
</tr>
<tr>
<td>200 kHz to 500 kHz</td>
<td>−159 dBm</td>
<td>−162 dBm</td>
<td>−158 dBm</td>
</tr>
<tr>
<td>500 kHz to 1 MHz</td>
<td>−163 dBm</td>
<td>−165 dBm</td>
<td>−162 dBm</td>
</tr>
<tr>
<td>1 MHz to 10 MHz</td>
<td>−166 dBm</td>
<td>−168 dBm</td>
<td>−165 dBm</td>
</tr>
<tr>
<td>10 MHz to 500 MHz</td>
<td>−169 dBm</td>
<td>−170 dBm</td>
<td>−168 dBm</td>
</tr>
<tr>
<td>500 MHz to 1.1 GHz</td>
<td>−168 dBm</td>
<td>−169 dBm</td>
<td>−167 dBm</td>
</tr>
<tr>
<td>1.1 GHz to 2.1 GHz</td>
<td>−167 dBm</td>
<td>−168 dBm</td>
<td>−166 dBm</td>
</tr>
<tr>
<td>2.1 GHz to 3.0 GHz</td>
<td>−165 dBm</td>
<td>−166 dBm</td>
<td>−165 dBm</td>
</tr>
<tr>
<td><strong>E4447A/E4446A/E4448A</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Hz to 1 kHz</td>
<td>—</td>
<td>—110 dBm nominal</td>
<td>—</td>
</tr>
<tr>
<td>1 kHz to 10 kHz</td>
<td>—</td>
<td>—130 dBm nominal</td>
<td>—</td>
</tr>
<tr>
<td>10 kHz to 100 kHz</td>
<td>−137 dBm</td>
<td>−141 dBm</td>
<td>−137 dBm</td>
</tr>
<tr>
<td>100 kHz to 1 MHz</td>
<td>−145 dBm</td>
<td>−149 dBm</td>
<td>−145 dBm</td>
</tr>
<tr>
<td>1 MHz to 10 MHz</td>
<td>−150 dBm</td>
<td>−153 dBm</td>
<td>−150 dBm</td>
</tr>
<tr>
<td>10 MHz to 1.2 GHz</td>
<td>−154 dBm</td>
<td>−155 dBm</td>
<td>−154 dBm</td>
</tr>
<tr>
<td>1.2 GHz to 2.1 GHz</td>
<td>−153 dBm</td>
<td>−154 dBm</td>
<td>−153 dBm</td>
</tr>
<tr>
<td>2.1 GHz to 3.0 GHz</td>
<td>−152 dBm</td>
<td>−153 dBm</td>
<td>−152 dBm</td>
</tr>
<tr>
<td>3 GHz to 6.6 GHz</td>
<td>−152 dBm</td>
<td>−153 dBm</td>
<td>−151 dBm</td>
</tr>
<tr>
<td>6.6 GHz to 13.2 GHz</td>
<td>−150 dBm</td>
<td>−152 dBm</td>
<td>−149 dBm</td>
</tr>
<tr>
<td>13.2 GHz to 20 GHz</td>
<td>−147 dBm</td>
<td>−149 dBm</td>
<td>−146 dBm</td>
</tr>
<tr>
<td>20 GHz to 26.5 GHz</td>
<td>−143 dBm</td>
<td>−145 dBm</td>
<td>−143 dBm</td>
</tr>
<tr>
<td>26.5 GHz to 31.15 GHz</td>
<td>−140 dBm</td>
<td>−144 dBm</td>
<td>−140 dBm</td>
</tr>
<tr>
<td>31.15 GHz to 35 GHz</td>
<td>−142 dBm</td>
<td>−145 dBm</td>
<td>−141 dBm</td>
</tr>
<tr>
<td>35 GHz to 38 GHz</td>
<td>−134 dBm</td>
<td>−136 dBm</td>
<td>−133 dBm</td>
</tr>
<tr>
<td>38 GHz to 44 GHz</td>
<td>−129 dBm</td>
<td>−132 dBm</td>
<td>−129 dBm</td>
</tr>
<tr>
<td>44 GHz to 49 GHz</td>
<td>−128 dBm</td>
<td>−131 dBm</td>
<td>−127 dBm</td>
</tr>
<tr>
<td>49 GHz to 50 GHz</td>
<td>−127 dBm</td>
<td>−130 dBm</td>
<td>−126 dBm</td>
</tr>
<tr>
<td><strong>Preamplifier ON (Option 1DS)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 kHz to 200 kHz</td>
<td>−158 dBm</td>
<td>−162 dBm</td>
<td>−157 dBm</td>
</tr>
<tr>
<td>200 kHz to 500 kHz</td>
<td>−158 dBm</td>
<td>−162 dBm</td>
<td>−157 dBm</td>
</tr>
<tr>
<td>500 kHz to 1 MHz</td>
<td>−161 dBm</td>
<td>−165 dBm</td>
<td>−160 dBm</td>
</tr>
<tr>
<td>1 MHz to 10 MHz</td>
<td>−167 dBm</td>
<td>−169 dBm</td>
<td>−166 dBm</td>
</tr>
<tr>
<td>10 MHz to 500 MHz</td>
<td>−167 dBm</td>
<td>−169 dBm</td>
<td>−167 dBm</td>
</tr>
<tr>
<td>500 MHz to 1.2 GHz</td>
<td>−166 dBm</td>
<td>−168 dBm</td>
<td>−166 dBm</td>
</tr>
<tr>
<td>1.2 GHz to 2.1 GHz</td>
<td>−165 dBm</td>
<td>−167 dBm</td>
<td>−165 dBm</td>
</tr>
<tr>
<td>2.1 GHz to 3.0 GHz</td>
<td>−163 dBm</td>
<td>−165 dBm</td>
<td>−163 dBm</td>
</tr>
</tbody>
</table>
Display range
Log scale 0.1 to 1 dB/division in 0.1 dB steps
1 to 20 dB/division in 1 dB steps
(10 display divisions)
Linear scale 10 divisions
Scale units dBm, dBmV, dBBV, dBmA, dBBA, V, W, A,
dBBV/m, dBmA/m, dBpT, dBG

Frequency response
(10 dB input attenuation, 20 to 30 °C, preselector centering applied)

**E4443A/E4445A/E4440A**
- 3 Hz to 3 GHz ±0.38 dB (±0.11 dB typical)
- 3 GHz to 6.6 GHz ±1.50 dB (±0.6 dB typical)
- 6.6 GHz to 22 GHz ±2.00 dB (±1.0 dB typical)
- 22 GHz to 26.5 GHz ±2.50 dB (±1.3 dB typical)

**E4447A/E4446A/E4448A**
- 3 Hz to 3 GHz ±0.38 dB (±0.15 dB typical)
- 3 GHz to 6.6 GHz ±1.50 dB (±0.6 dB typical)
- 6.6 GHz to 22 GHz ±2.00 dB (±1.2 dB typical)
- 22 GHz to 26.8 GHz ±2.50 dB (±1.3 dB typical)
- 26.4 GHz to 31.15 GHz ±1.75 dB (±0.6 dB typical)
- 31.15 GHz to 50 GHz ±2.50 dB (±1.0 dB typical)

Frequency response at attenuation ≠ 10 dB
(After = 20, 30, or 40 dB)
- 10 MHz to 2.2 GHz ±0.53 dB
- 2.2 GHz to 3 GHz ±0.89 dB

Preamp on (Option E444xA-1DS), (for all models)
- 100 kHz to 3 GHz ±0.70 dB < (±0.30 dB typical)

Input attenuation switching uncertainty
(Attenuator setting ≥ 2 dB)
At 50 MHz ±0.18 dB ±0.053 dB typical
- 3 Hz to 3 GHz ±0.3 dB nominal
- 3 GHz to 13.2 GHz ±0.5 dB nominal
- 13.2 GHz to 26.5 GHz ±0.7 dB nominal
- 26.5 GHz to 50 GHz ±1.0 dB nominal

Total absolute amplitude accuracy
(10 dB attenuation, 20 to 30 °C, 10 Hz ≤ RBW ≤ 1 MHz, input signal
–10 to –50 dBm, all settings auto-coupled except Auto Swp Time = Accy,
any reference level, any scale)
At 50 MHz ±0.24 dB (±0.06 dB typical)
At all frequencies ± (0.24 dB + frequency response) ± (0.06 dB + frequency response) typical
3 Hz to 3 GHz (95% confidence) ±0.24 dB

Preamp on (Option E444xA-1DS) ± (0.36 dB + frequency response)
± (0.09 dB + frequency response) typical

Input voltage standing wave ratio (VSWR)
(≥ 8 dB input attenuation)
- 50 MHz to 3 GHz < 1.2:1 nominal
- 3 GHz to 18 GHz < 1.6:1 nominal
- 18 GHz to 26.5 GHz < 1.9:1 nominal
- 26.5 GHz to 50 GHz < 1.57:1 nominal

Preamp on (50 MHz to 3 GHz)
(≥ 10 dB attenuation) < 1.2:1 nominal

Resolution bandwidth switching uncertainty
(referenced to 30 kHz RBW)
- 1 Hz to 1 MHz RBW ±0.03 dB
- 1.1 MHz to 3 MHz RBW ±0.05 dB
- 4, 5, 6, 8 MHz RBW ±1.0 dB

Reference level
- Range:
  - Log scale –170 dBm to +30 dBm in 0.01 dB steps
  - Linear scale 707 pV to 7.07 V in 0.1% steps
  - Accuracy 0 dB

Display scale switching uncertainty
- Switching between
  - linear and log 0 dB
  - Log scale/div switching 0 dB

Display scale fidelity
- ≤ –20 dBm input mixer level ±0.07 dB total
- –20 dBm < mixer level ≤ –10 dBm ±0.13 dB total

Spurious response (mixer level = –40 dBm)
General spurious:
- 100 Hz ≤ f < 10 MHz from carrier (–73 + 20 log N) dBc
- f ≥ 10 MHz from carrier (–80 + 20 log N) dBc
- (–90 + 20 log N) dBc typical

See frequency range for N
<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Distortion (dBc)</th>
<th>SHI (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to 460 MHz</td>
<td>-82</td>
<td>+42</td>
</tr>
<tr>
<td>(–40 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460 MHz to 1.18 GHz</td>
<td>-92</td>
<td>+52</td>
</tr>
<tr>
<td>(–40 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.18 GHz to 1.5 GHz</td>
<td>-82</td>
<td>+42</td>
</tr>
<tr>
<td>(–40 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 GHz to 2.0 GHz</td>
<td>-90</td>
<td>+80</td>
</tr>
<tr>
<td>(–10 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0 GHz to 13.25 GHz</td>
<td>-100</td>
<td>+90</td>
</tr>
<tr>
<td>(–10 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

E4447A/E4446A/E4448A

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Distortion (dBc)</th>
<th>SHI (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to 460 MHz</td>
<td>-82</td>
<td>+42</td>
</tr>
<tr>
<td>(–40 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460 MHz to 1.18 GHz</td>
<td>-92</td>
<td>+52</td>
</tr>
<tr>
<td>(–40 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.18 GHz to 1.5 GHz</td>
<td>-82</td>
<td>+42</td>
</tr>
<tr>
<td>(–40 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 GHz to 2.0 GHz</td>
<td>-90</td>
<td>+80</td>
</tr>
<tr>
<td>(–10 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0 GHz to 3.25 GHz</td>
<td>-94</td>
<td>+84</td>
</tr>
<tr>
<td>(–10 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.25 GHz to 13.25 GHz</td>
<td>-96</td>
<td>+86</td>
</tr>
<tr>
<td>(–10 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.25 GHz to 25 GHz</td>
<td>-100</td>
<td>+90</td>
</tr>
<tr>
<td>(–10 dBm mixer level)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Preamp on (Option E444xA-1DS), (for all models)
(input preamp level = –45 dBm)

10 MHz to 1.5 GHz     | -60 nominal      | +15 nominal |
(–45 dBm mixer level) |                  |           |

Figure 3. Nominal dynamic range - Band 0, for second and third order distortion, E4443A, E4445A, and E4440A - 3 Hz to 3 GHz
Third-order intermodulation distortion (TOI)

(two ~30 dBm tones at input mixer with tone separation
> 15 kHz, 20 to 30 °C)

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Distortion (dBc)</th>
<th>TOI (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4443A/E4445A/E4440A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 MHz to 100 MHz</td>
<td>-88</td>
<td>+14 (+17 typical)</td>
</tr>
<tr>
<td>100 MHz to 400 MHz</td>
<td>-90</td>
<td>+15 (+18 typical)</td>
</tr>
<tr>
<td>400 MHz to 1.7 GHz</td>
<td>-92</td>
<td>+16 (+19 typical)</td>
</tr>
<tr>
<td>1.7 GHz to 2.7 GHz</td>
<td>-94</td>
<td>+17 (+19 typical)</td>
</tr>
<tr>
<td>2.7 GHz to 3.0 GHz</td>
<td>-94</td>
<td>+17 (+20 typical)</td>
</tr>
<tr>
<td>3.0 GHz to 6.0 GHz</td>
<td>-90</td>
<td>+15 (+18 typical)</td>
</tr>
<tr>
<td>6.0 GHz to 16 GHz</td>
<td>-76</td>
<td>+8 (+11 typical)</td>
</tr>
<tr>
<td>16 GHz to 26.5 GHz</td>
<td>-84</td>
<td>+12 (+14 typical)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E4447A/E4446A/E4448A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 MHz to 100 MHz</td>
<td>-90</td>
<td>+15 (+20 typical)</td>
</tr>
<tr>
<td>100 MHz to 400 MHz</td>
<td>-92</td>
<td>+16 (+21 typical)</td>
</tr>
<tr>
<td>400 MHz to 1.7 GHz</td>
<td>-94</td>
<td>+17 (+20 typical)</td>
</tr>
<tr>
<td>1.7 GHz to 2.7 GHz</td>
<td>-96</td>
<td>+18 (+21 typical)</td>
</tr>
<tr>
<td>2.7 GHz to 3.0 GHz</td>
<td>-96</td>
<td>+18 (+21 typical)</td>
</tr>
<tr>
<td>3.0 GHz to 6.0 GHz</td>
<td>-92</td>
<td>+16 (+21 typical)</td>
</tr>
<tr>
<td>6.0 GHz to 16 GHz</td>
<td>-84</td>
<td>+12 (+15 typical)</td>
</tr>
<tr>
<td>16.0 GHz to 26.5 GHz</td>
<td>-84</td>
<td>+12 (+16 typical)</td>
</tr>
<tr>
<td>26.5 GHz to 50 GHz</td>
<td>-85 nominal</td>
<td>+12.5 nominal</td>
</tr>
</tbody>
</table>

Preamp on (Option E444xA-1DS), (for all models, two ~45 dBm tones at preamp input)

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Distortion (dBc)</th>
<th>TOI (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to 500 MHz</td>
<td>-15 nominal</td>
<td></td>
</tr>
<tr>
<td>500 MHz to 3 GHz</td>
<td>-13 nominal</td>
<td></td>
</tr>
</tbody>
</table>
Residual responses
Input terminated and 0 dB attenuation
200 kHz to 6.6 GHz  –100 dBm
6.6 GHz to 26.8 GHz  –100 dBm nominal
26.8 GHz to 50 GHz  –90 dBm nominal

Trace detectors
Normal, peak, sample, negative peak, log power average, RMS average, and voltage average

EMI detectors
CISPR: Peak, quasi-peak and average
MIL-STD: Peak

Option E444xA-1DS, preamplifier
Frequency range 100 kHz to 3 GHz
Gain 28 dB nominal
Noise figure 7 dB nominal

Measurement speed
Local measurement and display update rate ≥ 50/s nominal
Remote measurement and GPIB transfer rate
101 sweep points ≥ 45/s nominal
401 sweep points ≥ 30/s nominal
801 sweep points ≥ 25/s nominal

Option AYZ, external mixing
Frequency range 18 to 325 GHz (to 110 GHz with the Agilent unpreselcted mixer)
LO output
Frequency range 3.05 GHz to 6.89 GHz
Power output (20 to 30 °C)
E4440A 14.5 dBm min 18.5 dBm max
E4446A and E4448A 14.5 dBm min 20 dBm max
3.05 to 3.2 GHz 14.5 dBm min 18.8 dBm max
3.2 to 6.7 GHz 14.5 dBm min 18.5 dBm max typical
6.7 to 6.89 GHz 14.5 dBm min 18.5 dBm max
VSWR 2.0:1 nominal
IF input
Frequency 321.4 MHz ±30 MHz
Maximum safe input range 10 dBm
Absolute amplitude accuracy ± 1.2 dB (20 to 30 °C)
VSWR 1.5:1 nominal
Mixer bias current
Range ± 10 mA
Resolution 0.01 mA
Accuracy ± 0.02 mA nominal
Output impedance 477 Ω nominal
Mixer bias voltage
Range 1.5 V/GHz of LO nominal
Preselector tune voltage ± 3.7 V (open circuit)

Nominal dynamic range
for second- and third-order distortion bands 5 and 6
26.5 GHz to 50 GHz
TOI = +12.5 dBm
SOI = +90 dBm

Figure 5. Nominal dynamic range – Bands 5 to 6, E4447A, E4446A, and E4448A
26.4 GHz to 50 GHz
Power Suite Measurement Specifications

Channel power
Amplitude accuracy, W-CDMA or IS95
(20 to 30 °C, mixer level < –20 dBm) ±0.68 dB (±0.18 dB typical)

Occupied bandwidth
Frequency accuracy ± [span/600] nominal

Adjacent channel power
Accuracy, W-CDMA (ACLR) (at specific mixer levels and ACLR ranges):

<table>
<thead>
<tr>
<th></th>
<th>Adjacent</th>
<th>Alternate</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS</td>
<td>±0.12 dB</td>
<td>±0.17 dB</td>
</tr>
<tr>
<td>BTS</td>
<td>±0.22 dB</td>
<td>±0.22 dB</td>
</tr>
<tr>
<td>Dynamic range (typical):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without noise correction</td>
<td>–74.5 dB</td>
<td>–82 dB</td>
</tr>
<tr>
<td>With noise correction</td>
<td>–81 dB</td>
<td>–88 dB</td>
</tr>
<tr>
<td>Offset channel pairs measured</td>
<td>1 to 6</td>
<td></td>
</tr>
<tr>
<td>ACP speed (fast method)</td>
<td>Data measurement and transfer time (0.2 dB standard deviation)</td>
<td></td>
</tr>
</tbody>
</table>

Multi-carrier power and ACP
ACPR dynamic range, W-CDMA (5 MHz offset, RRC weighted, 3.84 MHz noise bandwidth):
Two carriers –70 dB nominal
Four carriers –68 dB nominal
With noise correction –76 dB nominal
ACPR accuracy (two carriers, 5 MHz offset, –48 dBc ACPR) ±0.38 dB nominal
Multiple number of carriers measured Up to 12

Power statistics CCDF
Histogram resolution 0.1 dB

Harmonic distortion
Maximum harmonic number 10th
Results Fundamental power (dBm), relative harmonics power (dBc), total harmonic distortion in percent

Intermod (TOI)
Measure the third-order products and intercepts from two tones

Burst power
Methods Power above threshold, power within burst width
Results Single burst output power, average output power, maximum power, minimum power within burst, burst width

Spurious emission
W-CDMA (1980 MHz region, 1.2 MHz RBW)
Table driven spurious signals; search across regions.
Relative dynamic range 80.6 dB (82.4 dB typical)
Absolute sensitivity –89.7 dBm (–91.7 dBm typical)

Spectrum emission mask (SEM)
cdma2000 (750 kHz offset):
Relative dynamic range 85.3 dB (88.3 dB typical)
Absolute sensitivity –105.7 dBm (–107 dBm typical)
Relative accuracy ±0.09 dB
3GPP W-CDMA (2.515 MHz offset):
Relative dynamic range 87.3 dB (89.5 dB typical)
(30 kHz RBW)
Absolute sensitivity –105.7 dBm (–107.7 dBm typical)
Relative accuracy ±0.10 dB
General Specifications

Temperature range
Operating 0 °C to +55 °C
Storage –40 °C to +70 °C

EMI compatibility
Conducted interference is in compliance with CISPR Pub 11/1990 Group 1 Class A
Radiated and conducted emission is in compliance with CISPR Pub 11/1996 Class B

Radiated immunity
Complies with the radiated electromagnetic field immunity requirements in IEC/EM 61326 using performance criteria B.

Audio noise
ISO 7779 sound pressure Lp < 55 dBA

Military specification
Type tested to environmental specifications MIL-PRF-28800F Class 3

Power requirements
Voltage and frequency (nominal):
100 to 120 V, 47 to 66 Hz/360 to 440 Hz
220 to 240 V, 47 to 66 Hz
Power consumption:
On < 260 watts, no options
(< 450 watts, all options)
Standby < 20 watts

Data storage
Internal 64 MB (nominal)
Floppy drive (10 to 40°C) 3.5" 1.44 MB (nominal)

Weight (without options)
E4443A/E4445A/E4440A
Net 23 kg (50 lbs) nominal
Shipping 33 kg (73 lbs) nominal
E4447A/E4446A/E4448A
Net 24 kg (53 lbs) nominal
Shipping 33 kg (73 lbs) nominal

Dimensions
Height 177 mm (7.0 in)
Width 426 mm (16.8 in)
Length 483 mm (19 in)

Warranty

Calibration cycle
The recommended calibration cycle is one year. Calibration services are available through Agilent service centers.

Input and Outputs

Front panel
RF input
Connector:
E4443A/E4445A Type-N female, 50 Ω
E4440A Type-N female, 50 Ω
Option E4440A-BAB APC 3.5 mm male
E4447A/E4446A/E4448A 2.4 mm male, 50 Ω

Probe power
Voltage/current (nominal) +15 Vdc, ±7% at 150 mA max
–12.6 Vdc, ±10% at 150 mA max

Ext trigger input
Connector BNC female
Impedance 10 kΩ nominal
Trigger level range –5 to +5 V

1st LO output (Option AYZ)
Connector SMA female
Frequency range 3 to 7 GHz

IF input (Option AYZ)
Connector SMA female
Frequency 321.4 MHz
Rear panel
10 MHz OUT (switched)
Connector | BNC female, 50 Ω
Output amplitude | ≥ 0 dBm nominal
Frequency accuracy | 10 MHz ± (10 MHz x frequency reference accuracy)

Ext Ref In
Connector | BNC female, 50 Ω
Input amplitude range | –5 to +10 dBm nominal
Input frequency | 1 to 30 MHz nominal
Frequency lock range | ± 5 x 10⁻⁶ of specified external reference input frequency

Trigger in
Connector | BNC female
External trigger input:
Impedance | > 10 kΩ nominal
Trigger level range | –5 to +5 V

Trigger 1 and Trigger 2 outputs
Connector | BNC female
Trigger 1 output:
Impedance | 50 Ω nominal
Level | 5 V TTL
Trigger 2 output | Gate

Monitor output
Connector | VGA compatible, 15-pin mini D-SUB
Format | VGA (31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced) Analog RGB
Resolution | 640 X 480

Noise source drive output (used by Option 219)
Connector | BNC female
Output voltage
On | 28.0 ± 0.1 V (60 mA maximum)
Off | < 1 V

Remote programming
GPIB interface:
Connector | IEEE-488 bus connector
GPIB codes | SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3, and C28, DT1, L4, C0
Serial interface connector | 9-pin D-SUB male (factory use only)
LAN TCP/IP interface | RJ45 Ethertwist
Parallel printer interface connector
25-pin D-SUB female

321.4 MHz IF output¹
Connector | SMA female, 50 Ω nominal
Frequency | 321.4 MHz nominal
Conversion gain | +2 to +4 dB nominal

Pre-sel tune output
Connector | BNC female

¹. Not available for the E4447A.
PSA Series Ordering Information

PSA Series spectrum analyzer
- E4443A 3 Hz to 6.7 GHz
- E4445A 3 Hz to 13.2 GHz
- E4440A 3 Hz to 26.5 GHz
- E4447A 3 Hz to 42.98 GHz
- E4446A 3 Hz to 44 GHz
- E4448A 3 Hz to 50 GHz

Options
To add options to a product, use the following ordering scheme:
Model E444xA (x = 0, 3, 5, 6, 7 or 8)
Example options  E4440A-B7J, E4448A-1DS

PSA Series Ordering Information

Measurement Personalities
- E444A-226 Phase noise
- E444A-219 Noise figure
- E444A-241 Flexible digital modulation analysis
- E444A-210 HSDPA
- E444A-202 GSM w/ EDGE
- E444A-214 1xEV-DV
- E444A-204 1xEV-DO
- E444A-BAE NADC, PCD
- E444A-217 WLAN
- E444A-215 External source control
- E444A-266 Programming code compatibility suite

Hardware
- E444A-1DS 100 kHz to 3 GHz built-in preamplifier
- E444A-B7J Digital demodulation hardware
- E444A-122 80 MHz bandwidth digitizer
- E444A-140 40 MHz bandwidth digitizer
- E444A-123 Switchable MW preselector bypass
- E444A-124 Y-axis video output
- E444A-AYZ External mixing
- E444A-1CM Rack mount kit
- E444A-1CN Front handle kit
- E444A-1CP Rack mount with handles
- E444A-1CR Rack slide kit
- E444A-015 6 GHz return loss measurement accessory kit
- E444A-045 Millimeter wave accessory kit
- E444A-0B1 Extra manual set including CD ROM

1. Options not available in all countries
Product Literature

**PSA in general**
- Selecting the Right Signal Analyzer for Your Needs, Selection Guide, literature number 5968-3413E
- PSA Series, Brochure, literature number 5080-1283E
- PSA Series, Configuration Guide, literature number 5989-2773EN
- Self-Guided Demonstration for Spectrum Analysis, Product Note, literature number 5988-0735EN

**Wide bandwidth and vector signal analysis**
- 40/80 MHz Bandwidth Digitizer, Technical Overview, 5988-1115EN
- Using Extended Calibration Software for Wide Bandwidth Measurements, PSA Option 122 & 89600 VSA, Application Note 143, 5988-7814EN
- 89650S Wideband VSA System with High Performance Spectrum Analysis, Technical Overview, literature number 5989-0871EN

**Measurement personalities and applications**
- Phase Noise Measurement Personality, Technical Overview, 5988-3698EN
- Noise Figure Measurement Personality, Technical Overview, 5988-7884EN
- External Source Measurement Personality, Technical Overview, 5989-2240EN
- Flexible Modulation Analysis Measurement Personality, Technical Overview, literature number 5989-1119EN
- W-CDMA and HSDPA Measurement Personalities, Technical Overview, literature number 5988-2388EN
- GSM with EDGE Measurement Personality, Technical Overview, 5988-2389EN
- cdma2000 and 1xEV-DV Measurement Personalities, Technical Overview, literature number 5988-3694EN
- 1xEV-DO Measurement Personality, Technical Overview, 5988-4828EN
- cdmaOne Measurement Personality, Technical Overview, 5988-3695EN
- WLAN Measurement Personality, Technical Overview, 5988-2781EN
- NADC/PDC Measurement Personality, Technical Overview, 5988-3697EN
- TD-SDCMA Measurement Personality, Technical Overview, 5989-0505EN
- Agilent N5530S Measuring Receiver System, Technical Overview, 5989-1113EN
- BenchLink Web Remote Control Software, Product Overview, 5988-2610EN
- IntuLink Software, Data Sheet, 5986-3115EN
- Programming Code Compatibility Suite, Technical Overview 5989-1111EN

**Hardware options**
- PSA Series Spectrum Analyzers Video Output (Option 124), Technical Overview, literature number 5989-1118EN
- PSA Series Spectrum Analyzers, Option H70, 70 MHz IF Output, Product Overview, literature number 5988-5261EN

**Spectrum analyzer fundamentals**
- Optimizing Dynamic Range for Distortion Measurements, Product Note, literature number 5980-3079EN
- PSA Series Amplitude Accuracy, Product Note, literature number 5980-3080EN
- PSA Series Spline and FFT Analysis, Product Note, 5980-3081EN
- PSA Series Measurement Innovations and Benefits, Product Note, 5980-3082EN
- Spectrum Analysis Basics, Application Note 150, literature number 5952-0392
- Vector Signal Analysis Basics, Application Note 150-15, 5989-1211EN
- 8 Hints for Millimeter Wave Spectrum Measurements, Application Note, 5988-5680EN
- Spectrum Analyzer Measurements to 325 GHz with the Use of External Mixers, Application Note 1453, literature number 5988-9414EN
- EMI, Application Note 150-10, literature number 5988-3661E

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