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**PSA Spectrum Analyzer**



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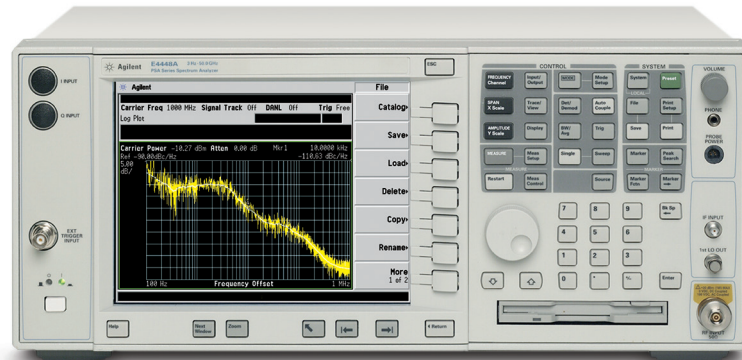
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# Agilent PSA Series Spectrum Analyzers

## Data Sheet

**40/80 MHz  
Analysis Bandwidth  
Now Available On  
50 GHz PSA!**



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.

### 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

*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/ps](http://www.agilent.com/find/ps)*

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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](http://www.agilent.com/find/psa)**

Then follow this selection process:

- Select “Technical Support” under Key Library Information
- Select “Manuals and Guides”
- Download specifications guide.

# Frequency Specifications

## Frequency range

|        |              |                               |              |                                 |
|--------|--------------|-------------------------------|--------------|---------------------------------|
| E4443A | (DC coupled) | 3 Hz to 6.7 GHz               | (AC coupled) | 20 MHz to 6.7 GHz               |
| E4445A | (DC coupled) | 3 Hz to 13.2 GHz              | (AC coupled) | 20 MHz to 13.2 GHz              |
| E4440A | (DC coupled) | 3 Hz to 26.5 GHz <sup>1</sup> | (AC coupled) | 20 MHz to 26.5 GHz <sup>1</sup> |
| E4447A | (DC coupled) | 3 Hz to 42.98 GHz             |              |                                 |
| E4446A | (DC coupled) | 3 Hz to 44 GHz <sup>1</sup>   |              |                                 |
| E4448A | (DC coupled) | 3 Hz to 50 GHz <sup>1</sup>   |              |                                 |

1. 325 GHz with external mixers

## Band Harmonic mixing mode (N)

|   |    |                       |
|---|----|-----------------------|
| 0 | 1– | 3 Hz to 3 GHz         |
| 1 | 1– | 2.85 GHz to 6.6 GHz   |
| 2 | 2– | 6.2 GHz to 13.2 GHz   |
| 3 | 4– | 12.8 GHz to 19.2 GHz  |
| 4 | 4– | 18.7 GHz to 26.8 GHz  |
| 5 | 4+ | 26.4 GHz to 31.15 GHz |
| 6 | 8– | 31.0 GHz to 50.0 GHz  |

## Frequency reference

|                                         |                                                                                                                                  |                        |                                      |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------------------|
| Accuracy                                | $\pm[(\text{time since last adjustment} \times \text{aging rate}) + \text{temperature stability} + \text{calibration accuracy}]$ |                        |                                      |
| Aging rate                              | $\pm 1 \times 10^{-7} / \text{year}$                                                                                             |                        |                                      |
| Temperature stability                   | 20 °C to 30 °C                                                                                                                   | $\pm 1 \times 10^{-8}$ | 0 °C to 55 °C $\pm 5 \times 10^{-8}$ |
| Achievable initial calibration accuracy | $\pm 7 \times 10^{-8}$                                                                                                           |                        |                                      |
| Example frequency reference accuracy    | $= \pm(1 \times 1 \times 10^{-7} + 1 \times 10^{-8} + 7 \times 10^{-8})$                                                         |                        |                                      |
| 1 year after last adjustment            | $= \pm 1.8 \times 10^{-7}$                                                                                                       |                        |                                      |

## Frequency readout accuracy (start, stop, center, marker)

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

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

## Marker frequency counter

|                        |                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------|
| Accuracy               | $\pm(\text{marker frequency} \times \text{frequency reference accuracy} + 0.100 \text{ Hz})$ |
| Delta counter accuracy | $\pm(\text{delta frequency} \times \text{frequency reference accuracy} + 0.141 \text{ Hz})$  |
| 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   | $\pm[0.2\% \times \text{span} + \text{span} / (\text{sweep points} - 1)]$ |

## Frequency Specifications (continued)

### Sweep time and triggering

|               |                                                                                    |                      |
|---------------|------------------------------------------------------------------------------------|----------------------|
| Range         | Span = 0 Hz                                                                        | 1 $\mu$ s to 6000 s  |
|               | Span $\geq$ 10 Hz                                                                  | 1 ms to 2000 s       |
| Accuracy      | Span $\geq$ 10 Hz, sweep                                                           | $\pm 0.01\%$ nominal |
|               | Span $\geq$ 10 Hz, FFT                                                             | $\pm 40\%$ nominal   |
|               | Span = 0 Hz                                                                        | $\pm 0.01\%$ nominal |
| Trigger       | Free run, line, video, RF burst, external front, external rear, frame (basic mode) |                      |
| Trigger delay | Span = 0 Hz, or FFT                                                                | –150 ms to +500 ms   |
|               | Span $\geq$ 10 Hz, swept                                                           | 1 $\mu$ s to 500 ms  |
|               | Resolution                                                                         | 0.1 $\mu$ s          |

### Sweep (trace) point range

|                   |             |
|-------------------|-------------|
| Span = 0 Hz       | 2 to 8192   |
| Span $\geq$ 10 Hz | 101 to 8192 |

### Gated sweep

|                   |                      |
|-------------------|----------------------|
| Gate length       | 10 $\mu$ s 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 $\pm$ 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    | 1 Hz to 51 kHz                               | $\pm 0.5\%$ ( $\pm 0.022$ dB) |
|                                         | 56 kHz to 100 kHz                            | $\pm 1.0\%$ ( $\pm 0.044$ dB) |
|                                         | 110 kHz to 240 kHz                           | $\pm 0.5\%$ ( $\pm 0.022$ dB) |
|                                         | 270 kHz to 1.1 MHz (< 3 GHz CF)              | $\pm 1.5\%$ ( $\pm 0.066$ dB) |
|                                         | 1.2 MHz to 2.0 MHz (< 3 GHz CF)              | $\pm 0.07$ dB nominal         |
|                                         | 2.2 MHz to 6.0 MHz (< 3 GHz CF)              | $\pm 0.2$ dB nominal          |
| Bandwidth accuracy (–3.01 dB) RBW range | 1 Hz to 1.5 MHz                              | $\pm 2\%$ nominal             |
| Selectivity (–60 dB/–3 dB)              | 4.1:1 nominal                                |                               |
| EMI bandwidths (CISPR compliant)        | 200 Hz, 9 kHz, 120 kHz, 1 MHz                |                               |
| EMI bandwidths (MIL STD 461E compliant) | 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz |                               |

## Frequency Specifications (continued)

### Analysis bandwidth<sup>1</sup>

|                              |        |
|------------------------------|--------|
| Maximum bandwidth            |        |
| with Option 140 <sup>2</sup> | 40 MHz |
| with Option 122 <sup>2</sup> | 80 MHz |
| with Option B7J              | 10 MHz |

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.

### Video bandwidth (VBW)

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

### Stability<sup>3</sup>

| Noise sidebands<br>(20 °C to 30 °C, CF = 1 GHz) | Offset                                                                        | Specification | Typical                            |
|-------------------------------------------------|-------------------------------------------------------------------------------|---------------|------------------------------------|
|                                                 | 100 Hz                                                                        | –91 dBc/Hz    | –96 dBc/Hz                         |
|                                                 | 1 kHz                                                                         | –103 dBc/Hz   | –108 dBc/Hz                        |
|                                                 | 10 kHz                                                                        | –116 dBc/Hz   | –118 dBc/Hz                        |
|                                                 | 30 kHz                                                                        | –116 dBc/Hz   | –118 dBc/Hz                        |
|                                                 | 100 kHz                                                                       | –122 dBc/Hz   | –124 dBc/Hz                        |
|                                                 | 1 MHz                                                                         | –145 dBc/Hz   | –147 dBc/Hz, –148 dBc/Hz nominal   |
|                                                 | 6 MHz                                                                         | –154 dBc/Hz   | –156 dBc/Hz, –156.5 dBc/Hz nominal |
|                                                 | 10 MHz                                                                        | –156 dBc/Hz   | –157.5 dBc/Hz, –158 dBc/Hz nominal |
| Residual FM                                     | < (1 Hz X N) p-p in 1 s, typical, see frequency range for N (harmonic number) |               |                                    |

3. For nominal values, refer to Figure 1.

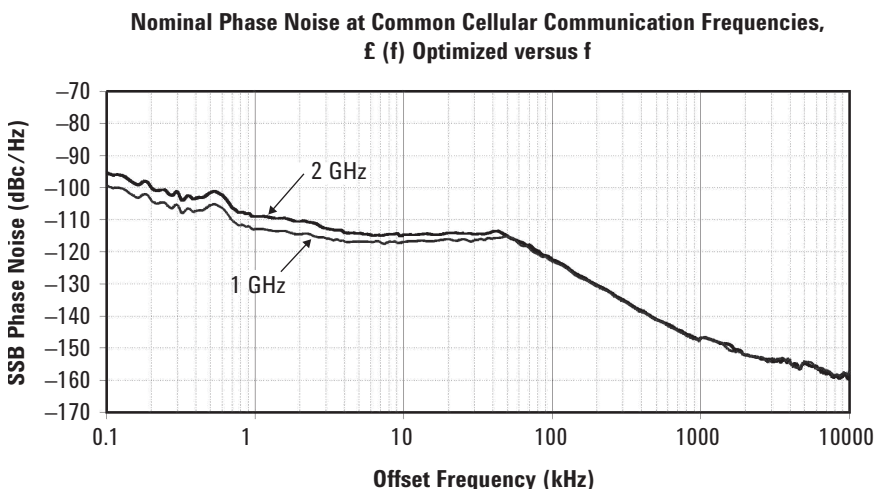


Figure 1. Nominal phase noise at common cellular frequencies

# Amplitude Specifications

## Amplitude range

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

## Maximum safe input level

|                            |                                                                                              |
|----------------------------|----------------------------------------------------------------------------------------------|
| Average total power        | +30 dBm (1 W)                                                                                |
| Preamp (Option E444xA-1DS) | +30 dBm                                                                                      |
| Preamp (Option E444xA-110) | +23 dBm                                                                                      |
| Peak pulse power           | < 10 $\mu$ s pulse width, < 1% duty cycle and input attenuation $\geq$ 30 dB +50 dBm (100 W) |
| DC volts                   | DC coupled < $\pm 0.2$ Vdc AC coupled (E4443A, E4445A, E4440A only) $\pm 100$ Vdc            |

## 1 dB gain compression (two-tone)

|                               |                     | Total power at input mixer |                 |
|-------------------------------|---------------------|----------------------------|-----------------|
|                               | 20 MHz to 200 MHz   | 0 dBm                      | +3 dBm nominal  |
|                               | 200 MHz to 3 GHz    | +3 dBm                     | +7 dBm nominal  |
|                               | 3 GHz to 6.6 GHz    | +3 dBm                     | +4 dBm nominal  |
|                               | 6.6 GHz to 26.5 GHz | -2 dBm                     | 0 dBm nominal   |
|                               | 26.5 GHz to 50 GHz  |                            | 0 dBm nominal   |
| Preamp on (Option E444xA-1DS) | 10 MHz to 200 MHz   |                            | -30 dBm nominal |
|                               | 200 MHz to 3 GHz    |                            | -25 dBm nominal |
| Preamp on (Option E444xA-110) | 10 MHz to 200 MHz   |                            | -24 dBm nominal |
|                               | 200 MHz to 3 GHz    |                            | -20 dBm nominal |
|                               | 3.0 GHz to 6.6 GHz  |                            | -23 dBm nominal |
|                               | 6.6 GHz to 30 GHz   |                            | -27 dBm nominal |
|                               | 30 GHz to 50 GHz    |                            | -24 dBm nominal |

## Typical gain compression (two-tone)

|  |                     | Mixer level | Compression |
|--|---------------------|-------------|-------------|
|  | 20 MHz to 200 MHz   | 0 dBm       | < 0.5 dB    |
|  | 200 MHz to 6.6 GHz  | +3 dBm      | < 0.5 dB    |
|  | 6.6 GHz to 26.5 GHz | -2 dBm      | < 0.4 dB    |



## Amplitude Specifications (continued)

### Displayed average noise level (DANL)

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

|                               |                     | Zero span and swept<br>normalized to 1 Hz<br>RBW and 0 dB<br>attenuation | Zero span and swept<br>normalized to 1 Hz<br>RBW 0 dB<br>attenuation (typical) | FFT only actual 1 Hz<br>RBW 0 dB attenuation |
|-------------------------------|---------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------|
| <b>E4443A/E4445A/E4440A</b>   | 3 Hz to 1 kHz       | —                                                                        | –110 dBm nominal                                                               | —                                            |
|                               | 1 kHz to 10 kHz     | —                                                                        | –130 dBm nominal                                                               | —                                            |
|                               | 10 kHz to 100 kHz   | –137 dBm                                                                 | –141 dBm                                                                       | –137 dBm                                     |
|                               | 100 kHz to 1 MHz    | –145 dBm                                                                 | –149 dBm                                                                       | –145 dBm                                     |
|                               | 1 MHz to 10 MHz     | –150 dBm                                                                 | –153 dBm                                                                       | –150 dBm                                     |
|                               | 10 MHz to 1.2 GHz   | –154 dBm                                                                 | –155 dBm                                                                       | –154 dBm                                     |
|                               | 1.2 GHz to 2.1 GHz  | –153 dBm                                                                 | –154 dBm                                                                       | –153 dBm                                     |
|                               | 2.1 GHz to 3.0 GHz  | –152 dBm                                                                 | –153 dBm                                                                       | –152 dBm                                     |
|                               | 3 GHz to 6.6 GHz    | –152 dBm                                                                 | –153 dBm                                                                       | –151 dBm                                     |
|                               | 6.6 GHz to 13.2 GHz | –150 dBm                                                                 | –152 dBm                                                                       | –149 dBm                                     |
|                               | 13.2 GHz to 20 GHz  | –147 dBm                                                                 | –149 dBm                                                                       | –146 dBm                                     |
|                               | 20 GHz to 26.5 GHz  | –143 dBm                                                                 | –145 dBm                                                                       | –143 dBm                                     |
| <b>Preamp ON (Option 1DS)</b> | 100 kHz to 200 kHz  | –159 dBm                                                                 | –162 dBm                                                                       | –158 dBm                                     |
|                               | 200 kHz to 500 kHz  | –159 dBm                                                                 | –162 dBm                                                                       | –158 dBm                                     |
|                               | 500 kHz to 1 MHz    | –163 dBm                                                                 | –165 dBm                                                                       | –162 dBm                                     |
|                               | 1 MHz to 10 MHz     | –166 dBm                                                                 | –168 dBm                                                                       | –165 dBm                                     |
|                               | 10 MHz to 500 MHz   | –169 dBm                                                                 | –170 dBm                                                                       | –168 dBm                                     |
|                               | 500 MHz to 1.1 GHz  | –168 dBm                                                                 | –169 dBm                                                                       | –167 dBm                                     |
|                               | 1.1 GHz to 2.1 GHz  | –167 dBm                                                                 | –168 dBm                                                                       | –166 dBm                                     |
|                               | 2.1 GHz to 3.0 GHz  | –165 dBm                                                                 | –166 dBm                                                                       | –165 dBm                                     |
| <b>Preamp ON (Option 110)</b> | 10 to 50 MHz        | –148 dBm                                                                 | –154 dBm                                                                       | –148 dBm                                     |
|                               | 50 to 500 MHz       | –153 dBm                                                                 | –164 dBm                                                                       | –153 dBm                                     |
|                               | 500 MHz to 2.1 GHz  | –166 dBm                                                                 | –168 dBm                                                                       | –166 dBm                                     |
|                               | 2.1 to 3 GHz        | –166 dBm                                                                 | –168 dBm                                                                       | –166 dBm                                     |
|                               | 3 to 6.6 GHz        | –165 dBm                                                                 | –166 dBm                                                                       | –165 dBm                                     |
|                               | 6.6 to 13.2 GHz     | –163 dBm                                                                 | –165 dBm                                                                       | –163 dBm                                     |
|                               | 13.2 to 16 GHz      | –162 dBm                                                                 | –165 dBm                                                                       | –162 dBm                                     |
|                               | 16 to 19 GHz        | –162 dBm                                                                 | –164 dBm                                                                       | –162 dBm                                     |
|                               | 19 to 26.5 GHz      | –159 dBm                                                                 | –161 dBm                                                                       | –159 dBm                                     |

## Amplitude Specifications (continued)

### Displayed average noise level (DANL)

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

|                               |                       | Zero span and swept<br>normalized to 1 Hz<br>RBW and 0 dB<br>attenuation | Zero span and swept<br>normalized to 1 Hz<br>RBW and 0 dB<br>attenuation (typical) | FFT only actual 1 Hz<br>RBW 0 dB attenuation |
|-------------------------------|-----------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------|
| <b>E4447A/E4446A/E4448A</b>   | 3 Hz to 1 kHz         | —                                                                        | –110 dBm nominal                                                                   | —                                            |
|                               | 1 kHz to 10 kHz       | —                                                                        | –130 dBm nominal                                                                   | —                                            |
|                               | 10 kHz to 100 kHz     | –137 dBm                                                                 | –141 dBm                                                                           | –137 dBm                                     |
|                               | 100 kHz to 1 MHz      | –145 dBm                                                                 | –150 dBm                                                                           | –145 dBm                                     |
|                               | 1 MHz to 10 MHz       | –150 dBm                                                                 | –155 dBm                                                                           | –150 dBm                                     |
|                               | 10 MHz to 1.2 GHz     | –153 dBm                                                                 | –154 dBm                                                                           | –152 dBm                                     |
|                               | 1.2 GHz to 2.1 GHz    | –152 dBm                                                                 | –153 dBm                                                                           | –151 dBm                                     |
|                               | 2.1 GHz to 3 GHz      | –151 dBm                                                                 | –152 dBm                                                                           | –150 dBm                                     |
|                               | 3 GHz to 6.6 GHz      | –151 dBm                                                                 | –152 dBm                                                                           | –150 dBm                                     |
|                               | 6.6 GHz to 13.2 GHz   | –146 dBm                                                                 | –149 dBm                                                                           | –146 dBm                                     |
|                               | 13.2 GHz to 20 GHz    | –144 dBm                                                                 | –146 dBm                                                                           | –143 dBm                                     |
|                               | 20 GHz to 22.5 GHz    | –143 dBm                                                                 | –146 dBm                                                                           | –143 dBm                                     |
|                               | 22.5 GHz to 26.8 GHz  | –140 dBm                                                                 | –144 dBm                                                                           | –140 dBm                                     |
|                               | 26.8 GHz to 31.15 GHz | –142 dBm                                                                 | –145 dBm                                                                           | –141 dBm                                     |
|                               | 31.15 GHz to 35 GHz   | –134 dBm                                                                 | –136 dBm                                                                           | –133 dBm                                     |
|                               | 35 GHz to 38 GHz      | –129 dBm                                                                 | –132 dBm                                                                           | –129 dBm                                     |
|                               | 38 GHz to 44 GHz      | –131 dBm                                                                 | –134 dBm                                                                           | –131 dBm                                     |
|                               | 44 GHz to 49 GHz      | –128 dBm                                                                 | –131 dBm                                                                           | –127 dBm                                     |
|                               | 49 GHz to 50 GHz      | –127 dBm                                                                 | –130 dBm                                                                           | –126 dBm                                     |
| <b>Preamp ON (Option 1DS)</b> | 100 kHz to 200 kHz    | –158 dBm                                                                 | –162 dBm                                                                           | –157 dBm                                     |
|                               | 200 kHz to 500 kHz    | –158 dBm                                                                 | –162 dBm                                                                           | –157 dBm                                     |
|                               | 500 kHz to 1 MHz      | –161 dBm                                                                 | –165 dBm                                                                           | –160 dBm                                     |
|                               | 1 MHz to 10 MHz       | –167 dBm                                                                 | –169 dBm                                                                           | –166 dBm                                     |
|                               | 10 MHz to 500 MHz     | –167 dBm                                                                 | –169 dBm                                                                           | –167 dBm                                     |
|                               | 500 MHz to 1.2 GHz    | –166 dBm                                                                 | –168 dBm                                                                           | –166 dBm                                     |
|                               | 1.2 GHz to 2.1 GHz    | –165 dBm                                                                 | –167 dBm                                                                           | –165 dBm                                     |
|                               | 2.1 GHz to 3.0 GHz    | –163 dBm                                                                 | –165 dBm                                                                           | –163 dBm                                     |
| <b>Preamp ON (Option 110)</b> | 10 to 50 MHz          | –148 dBm                                                                 | –158 dBm                                                                           | –148 dBm                                     |
|                               | 50 to 500 MHz         | –153 dBm                                                                 | –164 dBm                                                                           | –153 dBm                                     |
|                               | 500 MHz to 1.2 GHz    | –165 dBm                                                                 | –168 dBm                                                                           | –165 dBm                                     |
|                               | 1.2 to 2.1 GHz        | –165 dBm                                                                 | –168 dBm                                                                           | –165 dBm                                     |
|                               | 2.1 to 3 GHz          | –165 dBm                                                                 | –167 dBm                                                                           | –165 dBm                                     |
|                               | 3 to 6.6 GHz          | –165 dBm                                                                 | –167 dBm                                                                           | –165 dBm                                     |
|                               | 6.6 to 13.2 GHz       | –162 dBm                                                                 | –165 dBm                                                                           | –162 dBm                                     |
|                               | 13.2 to 19 GHz        | –161 dBm                                                                 | –163 dBm                                                                           | –161 dBm                                     |
|                               | 19 to 22.5 GHz        | –161 dBm                                                                 | –162 dBm                                                                           | –161 dBm                                     |
|                               | 22.5 to 26.8 GHz      | –155 dBm                                                                 | –160 dBm                                                                           | –155 dBm                                     |
|                               | 26.8 to 31.15 GHz     | –157 dBm                                                                 | –161 dBm                                                                           | –157 dBm                                     |
|                               | 31.15 to 35 GHz       | –152 dBm                                                                 | –156 dBm                                                                           | –152 dBm                                     |
|                               | 35 to 38 GHz          | –146 dBm                                                                 | –150 dBm                                                                           | –146 dBm                                     |
|                               | 38 to 41 GHz          | –146 dBm                                                                 | –150 dBm                                                                           | –146 dBm                                     |
|                               | 41 to 44 GHz          | –146 dBm                                                                 | –150 dBm                                                                           | –146 dBm                                     |
|                               | 44 to 45 GHz          | –143 dBm                                                                 | –150 dBm                                                                           | –143 dBm                                     |
|                               | 45 to 49 GHz          | –143 dBm                                                                 | –146 dBm                                                                           | –143 dBm                                     |
|                               | 49 to 50 GHz          | –140 dBm                                                                 | –145 dBm                                                                           | –140 dBm                                     |

## Amplitude Specifications (continued)

### 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, dBμV, dBmA, dBμA, V, W, A, dBμV/m, dBμA/m, dBpT, dBG |                                                          |

### Frequency response (10 dB input attenuation, 20 to 30 °C, preselector centering applied above 3 GHz)

|                                                                                  |                       |          |                      |
|----------------------------------------------------------------------------------|-----------------------|----------|----------------------|
| 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<br>(Atten = 20, 30, or 40 dB)          | 10 MHz to 2.2 GHz     | ±0.53 dB |                      |
|                                                                                  | 2.2 GHz to 3 GHz      | ±0.69 dB |                      |
| Preamp on (Option E444xA-1DS),<br>(for all models)                               | 100 kHz to 3 GHz      | ±0.70 dB | < (±0.30 dB typical) |
| Preamp on (Option E444xA-110,<br>0 dB input attenuation)<br>E4443A/E4445A/E4440A | 10 MHz to 3.0 GHz     | ±1.0 dB  | (±0.35 dB typical)   |
|                                                                                  | 3.0 to 6.6 GHz        | ±1.75 dB | (±0.8 dB typical)    |
|                                                                                  | 6.6 to 13.2 GHz       | ±3.0 dB  | (±1.0 dB typical)    |
|                                                                                  | 13.2 to 19 GHz        | ±3.0 dB  | (±1.2 dB typical)    |
|                                                                                  | 19 to 26.5 GHz        | ±4.0 dB  | (±2.0 dB typical)    |
| E4447A/E4446A/E4448A                                                             | 10 MHz to 3.05 GHz    | ±1.3 dB  | (±0.5 dB typical)    |
|                                                                                  | 3.0 to 6.6 GHz        | ±2.5 dB  | (±1.0 dB typical)    |
|                                                                                  | 6.6 to 13.2 GHz       | ±2.5 dB  | (±1.2 dB typical)    |
|                                                                                  | 13.2 to 19 GHz        | ±3.0 dB  | (±1.5 dB typical)    |
|                                                                                  | 19 to 26.5 GHz        | ±4.0 dB  | (±2.0 dB typical)    |
|                                                                                  | 26.5 to 31.15 GHz     | ±3.0 dB  | (±1.2 dB typical)    |
|                                                                                  | 31.15 to 50 GHz       | ±3.5 dB  | (±1.6 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) | ±0.19 dB                                                                  |
| Preamp on (Option E444xA-1DS)  | ± (0.36 dB + frequency response), ±(0.09 dB + frequency response) typical |
| Preamp on (Option E444xA-110)  | ± (0.40 dB + frequency response), ±(0.15 dB + frequency response) typical |

## Amplitude Specifications (continued)

### Input voltage standing wave ratio (VSWR) ( $\geq 8$ 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) ( $\geq 10$ dB attenuation) | < 1.2:1 nominal    |                  |
| Preamp on (Option E444xA-110)                           | 200 MHz to 6.6 GHz | < 1.4:1          |
| (> 10 dB input attenuation)                             | 6.6 to 13.2 GHz    | < 1.7:1          |
| E4443A/E4445A/E4440A                                    | 13.2 to 19.2 GHz   | < 1.5:1          |
|                                                         | 19.2 to 26.5 GHz   | < 1.8:1          |
| E4447A/E4446A/E4448A                                    | 200 MHz to 6.6 GHz | < 1.2:1          |
|                                                         | 6.6 to 13.2 GHz    | < 1.4:1          |
|                                                         | 13.2 to 19.2 GHz   | < 1.3:1          |
|                                                         | 19.2 to 31 GHz     | < 1.5:1          |
|                                                         | 31 to 50 GHz       | < 1.7:1          |

### Resolution bandwidth switching uncertainty (referenced to 30 kHz RBW)

|                      |               |
|----------------------|---------------|
| 1 Hz to 1 MHz RBW    | $\pm 0.03$ dB |
| 1.1 MHz to 3 MHz RBW | $\pm 0.05$ dB |
| 4, 5, 6, 8 MHz RBW   | $\pm 1.0$ 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

|                                        |                     |
|----------------------------------------|---------------------|
| $\leq -20$ dBm input mixer level       | $\pm 0.07$ dB total |
| $-20$ dBm < mixer level $\leq -10$ dBm | $\pm 0.13$ dB total |

### Spurious response (mixer level = –40 dBm)

|                  |                                                       |                                                          |
|------------------|-------------------------------------------------------|----------------------------------------------------------|
| General spurious | $100 \text{ Hz} \leq f < 10 \text{ MHz}$ from carrier | $(-73 + 20 \log N)$ dBc                                  |
|                  | $f \geq 10 \text{ MHz}$ from carrier                  | $(-80 + 20 \log N)$ dBc, $(-90 + 20 \log N)$ dBc typical |

See frequency range for  $N$

## Amplitude Specifications (continued)

### Second harmonic distortion (SHI)

| E4443A/E4445A/E4440A                             |                                             | Distortion (dBc) | SHI (dBm)   |
|--------------------------------------------------|---------------------------------------------|------------------|-------------|
|                                                  |                                             |                  |             |
| E4443A/E4445A/E4440A                             | 10 MHz to 460 MHz (–40 dBm mixer level)     | –82              | +42         |
|                                                  | 460 MHz to 1.18 GHz (–40 dBm mixer level)   | –92              | +52         |
|                                                  | 1.18 GHz to 1.5 GHz (–40 dBm mixer level)   | –82              | +42         |
|                                                  | 1.5 GHz to 2.0 GHz (–10 dBm mixer level)    | –90              | +80         |
|                                                  | 2.0 GHz to 13.25 GHz (–10 dBm mixer level)  | –100             | +90         |
| E4447A/E4446A/E4448A                             | 10 MHz to 460 MHz (–40 dBm mixer level)     | –82              | +42         |
|                                                  | 460 MHz to 1.18 GHz (–40 dBm mixer level)   | –92              | +52         |
|                                                  | 1.18 GHz to 1.5 GHz (–40 dBm mixer level)   | –82              | +42         |
|                                                  | 1.5 GHz to 2.0 GHz (–10 dBm mixer level)    | –90              | +80         |
|                                                  | 2.0 GHz to 3.25 GHz (–10 dBm mixer level)   | –94              | +84         |
|                                                  | 3.25 GHz to 13.25 GHz (–10 dBm mixer level) | –96              | +86         |
|                                                  | 13.25 GHz to 25 GHz (–10 dBm mixer level)   | –100 nominal     | +90 nominal |
| Preamp on (Option E444xA-1DS),<br>for all models | 10 MHz to 1.5 GHz (–45 dBm at preamp input) | –60 nominal      | +15 nominal |
| Preamp on (Option E444xA-110),<br>for all models | 10 to 460 MHz (–45 dBm at preamp input)     | –55 nominal      | +10 nominal |
|                                                  | 460 MHz to 25 GHz (–45 dBm at preamp input) | –60 nominal      | +15 nominal |

### Third-order intermodulation distortion

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

| E4443A/E4445A/E4440A                                                                     |                      | Distortion (dBc) | TOI (dBm)         |
|------------------------------------------------------------------------------------------|----------------------|------------------|-------------------|
|                                                                                          |                      |                  |                   |
| E4443A/E4445A/E4440A                                                                     | 10 MHz to 100 MHz    | –88              | +14 (+17 typical) |
|                                                                                          | 100 MHz to 400 MHz   | –90              | +15 (+18 typical) |
|                                                                                          | 400 MHz to 1.7 GHz   | –92              | +16 (+19 typical) |
|                                                                                          | 1.7 GHz to 2.7 GHz   | –94              | +17 (+19 typical) |
|                                                                                          | 2.7 GHz to 3.0 GHz   | –94              | +17 (+20 typical) |
|                                                                                          | 3.0 GHz to 6.0 GHz   | –90              | +15 (+18 typical) |
|                                                                                          | 6.0 GHz to 16 GHz    | –76              | +8 (+11 typical)  |
|                                                                                          | 16 GHz to 26.5 GHz   | –84              | +12 (+14 typical) |
| E4447A/E4446A/E4448A                                                                     | 10 MHz to 100 MHz    | –90              | +15 (+20 typical) |
|                                                                                          | 100 MHz to 400 MHz   | –92              | +16 (+21 typical) |
|                                                                                          | 400 MHz to 1.7 GHz   | –94              | +17 (+20 typical) |
|                                                                                          | 1.7 GHz to 2.7 GHz   | –96              | +18 (+21 typical) |
|                                                                                          | 2.7 GHz to 3.0 GHz   | –96              | +18 (+21 typical) |
|                                                                                          | 3.0 GHz to 6.0 GHz   | –92              | +16 (+21 typical) |
|                                                                                          | 6.0 GHz to 16 GHz    | –84              | +12 (+15 typical) |
|                                                                                          | 16.0 GHz to 26.5 GHz | –84              | +12 (+16 typical) |
| Preamp on (Option E444xA-1DS),<br>(for all models, two –45 dBm tones<br>at preamp input) | 10 MHz to 500 MHz    |                  | –15 nominal       |
|                                                                                          | 500 MHz to 3 GHz     |                  | –13 nominal       |
| Preamp on (Option E444x-110),<br>(two –45 dBm tones at preamp input)                     | 10 MHz to 3 GHz      |                  | –15 dBm nominal   |
|                                                                                          | 3 to 6.6 GHz         |                  | –21 dBm nominal   |
|                                                                                          | 6.6 to 13.2 GHz      |                  | –23 dBm nominal   |
|                                                                                          | 13.2 to 19 GHz       |                  | –23 dBm nominal   |
|                                                                                          | 19 to 26.5 GHz       |                  | –25 dBm nominal   |
| E4443A/E4445A/E4440A                                                                     | 10 MHz to 3 GHz      |                  | –15 dBm nominal   |
|                                                                                          | 3 to 6.6 GHz         |                  | –21 dBm nominal   |
|                                                                                          | 6.6 to 13.2 GHz      |                  | –23 dBm nominal   |
|                                                                                          | 13.2 to 19 GHz       |                  | –23 dBm nominal   |
|                                                                                          | 19 to 26.5 GHz       |                  | –25 dBm nominal   |
| E4447A/E4446A/E4448A                                                                     | 10 MHz to 3 GHz      |                  | –15 dBm nominal   |
|                                                                                          | 3 to 6.6 GHz         |                  | –21 dBm nominal   |
|                                                                                          | 6.6 to 13.2 GHz      |                  | –23 dBm nominal   |
|                                                                                          | 13.2 to 19 GHz       |                  | –23 dBm nominal   |
|                                                                                          | 19 to 26.5 GHz       |                  | –25 dBm nominal   |

## Amplitude Specifications (continued)

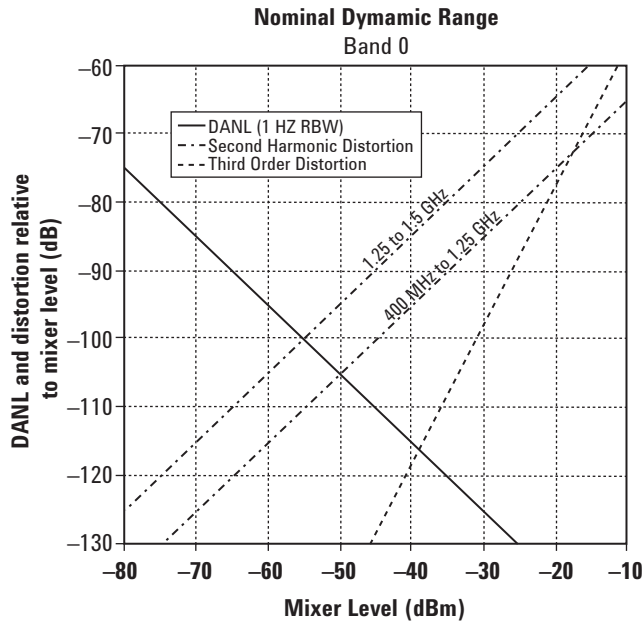


Figure 2. Nominal dynamic range – Band 0, for second and third order distortion, E4443A, E4445A, and E4440A – 3 Hz to 3 GHz

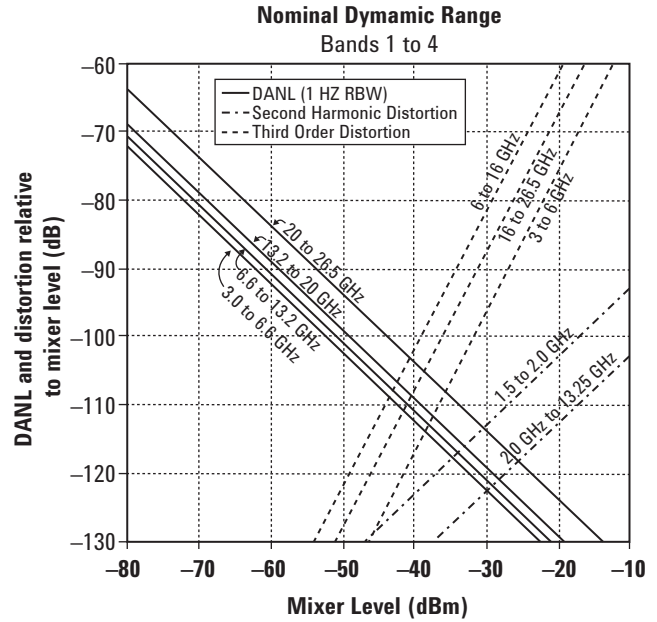


Figure 3. Nominal dynamic range – Bands 1 to 4, second and third order distortion, E4443A, E4445A, E4440A – 3 GHz to 26.5 GHz

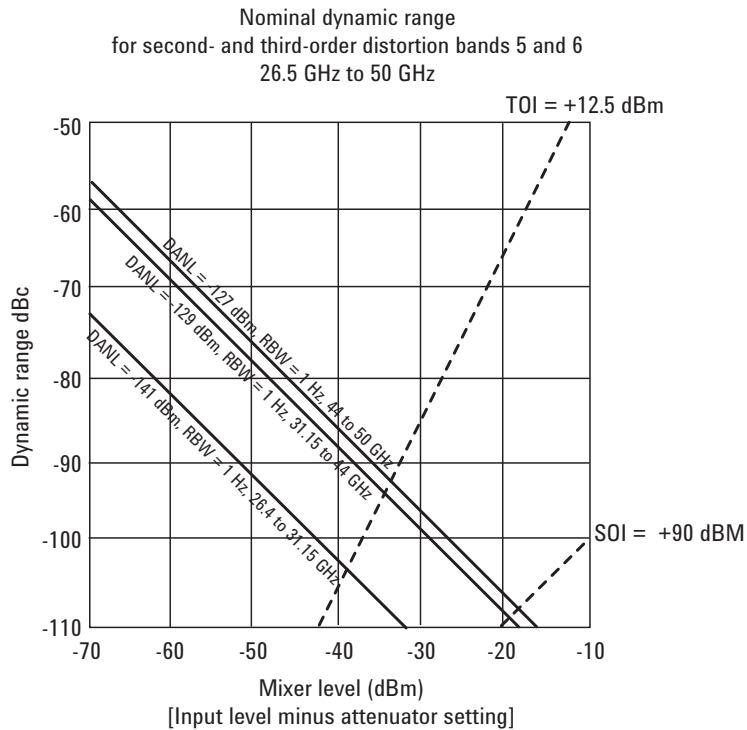


Figure 4. Nominal dynamic range – Bands 5 to 6, E4447A, E4446A, and E4448A 26.4 GHz to 50 GHz

## Amplitude Specifications (continued)

### 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     |

### Option E444xA-110, preamplifier

|                 |                    |                   |
|-----------------|--------------------|-------------------|
| Frequency range | 10 MHz to 50 GHz   |                   |
| Gain            | 10 MHz to 30 GHz   | 27 dB (nominal)   |
|                 | 30 to 50 GHz       | 24 dB (nominal)   |
| Noise figure    | 10.0 MHz to 30 MHz | 12.5 dB (nominal) |
|                 | 30 MHz to 3 GHz    | 7.8 dB (nominal)  |
|                 | 3 to 30 GHz        | 10.3 dB (nominal) |
|                 | 30 to 50 GHz       | 21.8 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 |
|                                           | 601 sweep points | ≥ 25/s nominal |

## Other Specifications

### Option AYZ, external mixing

|                             |                                                                 |                 |              |                      |
|-----------------------------|-----------------------------------------------------------------|-----------------|--------------|----------------------|
| Frequency range             | 18 to 325 GHz (to 110 GHz with the Agilent unpreselected 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                                               | 3.05 to 3.2 GHz | 14.5 dBm min | 20 dBm max           |
|                             |                                                                 | 3.2 to 6.7 GHz  | 14.5 dBm min | 18.8 dBm max         |
|                             |                                                                 | 6.7 to 6.89 GHz | 14.5 dBm min | 18.5 dBm max typical |
|                             | 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                       | ± 3.7 V (open circuit)                                          |                 |              |                      |
| Preselector tune voltage    | 1.5 V/GHz of LO nominal                                         |                 |              |                      |

### Option 123, preselector bypass <sup>1</sup>

|                 |                   |
|-----------------|-------------------|
| Frequency range |                   |
| E4440A          | 3.05 to 26.5 GHz  |
| E4443A          | 3.05 to 6.7 GHz   |
| E4445A          | 3.05 to 13.2 GHz  |
| E4446A          | 3.05 to 44 GHz    |
| E4447A          | 3.05 to 42.98 GHz |
| E4448A          | 3.05 to 50 GHz    |

1. When the preselector bypass option is installed and enabled, some aspects of the analyzer performance change. Please refer to the PSA specification guide for more details.



# Power Suite Measurement Specifications

## Channel power

|                                                                            |                              |
|----------------------------------------------------------------------------|------------------------------|
| Amplitude accuracy, W-CDMA or IS95<br>(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)<br>(at specific mixer levels and ACLR ranges)                                                                        | Adjacent | Alternate |
|----------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|
| MS                                                                                                                                           | ±0.12 dB | ±0.17 dB  |
| BTS                                                                                                                                          | ±0.22 dB | ±0.22 dB  |
| Dynamic range (typical)                                                                                                                      |          |           |
| Without noise correction                                                                                                                     | -74.5 dB | -82 dB    |
| With noise correction                                                                                                                        | -81 dB   | -88 dB    |
| Offset channel pairs measured ACP<br>speed (fast method). Data measurement<br>and transfer time 30 ms nominal (0.2 dB<br>standard deviation) | 1 to 6   |           |

## 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                                               | -66 dB nominal   |
| With noise correction                                       | -76 dB nominal   |
| ACPR accuracy<br>(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 % |

## 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 |

## Power Suite Measurement Specifications (continued)

### 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 (30 kHz RBW) | 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 (30 kHz RBW) | 87.3 dB (89.5 dB typical)       |
| 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

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 |
|-------------------------|-------------|

## Environmental conditions

Samples of this product have been type tested in accordance with the Agilent Environmental Test manual and verified to be robust against the environmental stresses of storage, transportation and end-use, those stresses include but are not limited to temperature, humidity, shock, vibration, altitude and power line conditions.

Test methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3.

## Power requirements

|                                 |                                                      |
|---------------------------------|------------------------------------------------------|
| Voltage and frequency (nominal) | 100 to 120 V, 50/60/400 Hz<br>200 to 240 V, 50/60 Hz |
| Power consumption               |                                                      |
| On                              | < 260 watts, no options, (< 450 watts, all options)  |
| Standby                         | < 20 watts                                           |

## Data storage

|                            |                           |
|----------------------------|---------------------------|
| Internal                   | 512 MB (nominal)          |
| Floppy drive (10 to 40 °C) | 3.5" 1.44 MB<br>(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

The E4440A, E4443A, E4445A, E4446A, E4447A, and E4448A are supplied with a three-year standard warranty.

## Calibration cycle

The recommended calibration cycle is two years. Calibration services are available through Agilent service centers.

# Inputs and Outputs

## Front panel

|                            |                                                                         |
|----------------------------|-------------------------------------------------------------------------|
| RF input                   |                                                                         |
| Connector                  |                                                                         |
| E4443A/E4445A              | Type-N female, 50 $\Omega$                                              |
| E4440A                     | Type-N female, 50 $\Omega$                                              |
| Option E4440A-BAB          | APC 3.5 male                                                            |
| E4447A/E4446A/E4448A       | 2.4 mm male, 50 $\Omega$                                                |
| Probe power                |                                                                         |
| Voltage/current (nominal)  | +15 Vdc, $\pm 7\%$ at 150 mA max<br>–12.6 Vdc, $\pm 10\%$ at 150 mA max |
| Ext trigger input          |                                                                         |
| Connector                  | BNC female                                                              |
| Impedance                  | 10 k $\Omega$ 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 $\Omega$                                                  |
| Output amplitude                | $\geq 0$ dBm nominal                                                     |
| Frequency accuracy              | 10 MHz $\pm$ (10 MHz x frequency reference accuracy)                     |
| Ext Ref In                      |                                                                          |
| Connector                       | BNC female, 50 $\Omega$                                                  |
| Input amplitude range           | –5 to +10 dBm nominal                                                    |
| Input frequency                 | 1 to 30 MHz nominal                                                      |
| Frequency lock range            | $\pm 5 \times 10^{-6}$ of specified external reference input frequency   |
| Trigger in                      |                                                                          |
| Connector                       | BNC female                                                               |
| External trigger input          | Impedance > 10 k $\Omega$ nominal<br>Trigger level range –5 to +5 V      |
| Trigger 1 and Trigger 2 outputs |                                                                          |
| Connector                       | BNC female                                                               |
| Trigger 1 output                | HSWP (high = sweeping)<br>Impedance 50 $\Omega$ nominal<br>Level 5 V TTL |
| Trigger 2 output                | Gate                                                                     |

## Inputs and Outputs (continued)

### Rear panel (continued)

|                                                                                        |                                                                                                                   |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 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)<br>Off < 1 V                                                                      |
| Remote programming                                                                     |                                                                                                                   |
| GPIB interface                                                                         | Connector IEEE-488 bus connector<br>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 Ethernet                                                                                                     |
| USB interface (Option 111, standard)                                                   | Slave mode/device-side only, USB 2.0 compliant, type B connector                                                  |
| Parallel printer interface connector                                                   | 25-pin D-SUB female                                                                                               |
| 321.4 MHz IF output <sup>1</sup>                                                       |                                                                                                                   |
| Connector                                                                              | SMA female, 50 Ω nominal                                                                                          |
| Frequency                                                                              | 321.4 MHz nominal                                                                                                 |
| Conversion gain                                                                        |                                                                                                                   |
| • Low band (3 Hz to 3.05 GHz)                                                          | +2 to +4 dB nominal                                                                                               |
| • High/mm band (2.85 GHz to PSA's upper frequency limit)                               | –6 to –8 dB nominal                                                                                               |
| • High/mm band (2.85 GHz to PSA's upper frequency limit); preselector off (Opt 123)    | –9 to –17 dB nominal                                                                                              |
| Bandwidth (–3 dBm)                                                                     |                                                                                                                   |
| • Low band (3 Hz to 3.05 GHz)                                                          | 40 MHz or 60 MHz <sup>2</sup> nominal                                                                             |
| • High band (2.85 to 26.5 GHz)                                                         | 35 to 70 MHz <sup>3</sup> nominal                                                                                 |
| • mm band (26.5 to 50 GHz)                                                             | 40 MHz or 60 MHz <sup>2</sup> nominal                                                                             |
| • High/mm band (2.85 GHz to PSA's upper frequency limit); preselector off (Option 123) | 240 MHz nominal                                                                                                   |
| Pre-sel tune output                                                                    |                                                                                                                   |
| Connector                                                                              | BNC female                                                                                                        |

1. Not available for the E4447A.

2. 40 MHz standard, 60 MHz with Option 122 or 140 installed in instrument. When Option 122 or 140 is installed, the IF output signal is now centered at 300 MHz and the BW of the output centered at 300 MHz is approximately 95 MHz.

3. The bandwidth in the microwave preselected bands increases approximately monotonically between the lowest and highest tuned frequencies. Refer to the PSA Specifications Guide (E4440-90606) for more details.

# PSA Series Ordering Information

For further information, refer to PSA Configuration Guide, 5989-2773EN

## 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

E444xA-1A7

Factory ISO 17025  
standard-compliant  
calibration

R-52A

Calibration software  
and licensing (ordered  
with PSA)

N7810A

PSA Series calibration  
application software  
(stand-alone order)

## 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

1. Options not available in all countries

## Warranty & Service

Standard warranty is three years.

R-51B-001-5C Warranty Assurance  
Plan, Return to Agilent,  
5 years

## Calibration<sup>1</sup>

Recommended calibration cycle is two years

Included Calibration Assurance  
Plan, Return to Agilent,  
3 years, standard

R-50C-011-5 Calibration Assurance  
Plan, Return to Agilent,  
5 years

R-50C-016-3 Agilent Calibration  
+ Uncertainties +  
Guardbanding, 3 years

R-50C-016-5 Agilent Calibration  
+ Uncertainties +  
Guardbanding, 5 years

AMG Agilent Calibration  
+ Uncertainties  
+ Guardbanding,  
accredited calibration

A6J ANSI Z540-1-1994  
Calibration

R-50C-021-3 ANSI Z540-1-1994  
Calibration, 3 years

R-50C-021-5 ANSI Z540-1-1994  
Calibration, 5 years

UK6 Commercial calibration  
certificate with data  
To be ordered with PSA

E444xA-0BW Service manual

E444xA-UK6 Commercial calibration  
certificate with test  
data

E444xA-A6J Factory ANSI Z540  
standard-compliant  
calibration

## Measurement Personalities

E444xA-226

Phase noise

E444xA-219

Noise figure

Requires Option IDS or 110  
to meet specifications

E444xA-241

Flexible digital modulation analysis

E444xA-BAF

W-CDMA

Requires B7J

E444xA-210

HSDPA/HSUPA (for W-CDMA)

Requires B7J and BAF

E444xA-202

GSM w/ EDGE

Requires B7J

E444xA-B78

cdma2000

Requires B7J

E444xA-214

1xEV-DV

Requires B7J and B78

E444xA-204

1xEV-DO

Requires B7J

E444xA-BAC

cdmaOne

Requires B7J

E444xA-BAE

NADC, PCD

Requires B7J

E444xA-217

WLAN

Requires 122 or 140

E444xA-211

TD-SCDMA power measurement

E444xA-212

TD-SCDMA modulation

E444xA-213

HSPA for TD-SCDMA

Requires Option 212

E444xA-215

External source control

E444xA-266

Programming code compatibility suite

E444xA-233

Built-in measuring receiver personality

E444xA-23A

AM/FM/PM triggering

Requires Option 233

E444xA-23B

CCITT filter

Requires Option 233

E444xA-239

N9039A RF preselector control

## PSA Series Ordering Information (continued)

For further information, refer to PSA Configuration Guide, 5989-2773EN

### Hardware

|            |                                                                                   |                                                                                                                          |
|------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| E444xA-1DS | RF internal preamplifier<br>(100 kHz to 3 GHz)                                    | Excludes 110                                                                                                             |
| E444xA-110 | RF/ $\mu$ W internal preamplifier (10 MHz<br>to upper frequency limit of the PSA) | Excludes 1DS                                                                                                             |
| E444xA-B7J | Digital demodulation hardware                                                     |                                                                                                                          |
| E444xA-122 | 80 MHz bandwidth digitizer                                                        | E4440A/43A/45A/46A/48A,<br>excludes 140, 107, H70                                                                        |
| E444xA-140 | 40 MHz bandwidth digitizer                                                        | E4440A/43A/45A/46A/48A,<br>excludes 122, 107, H70                                                                        |
| E444xA-123 | Switchable MW preselector bypass                                                  | Excludes AYZ (For E4446A/<br>48A, Option HY3 allows<br>coexistence of 123 and AYZ)                                       |
| E444xA-124 | Y-axis video output                                                               |                                                                                                                          |
| E444xA-AYZ | External mixing                                                                   | E4440A/47A/46A/48A only,<br>excludes 123 (For E4446A/<br>48A, Option HY3 allows<br>coexistence of 123 and AYZ)           |
| E444xA-107 | Audio input 100 k $\Omega$                                                        | Requires 233 to operate;<br>excludes 122, 140                                                                            |
| E444xA-111 | USB device side I/O interface                                                     | Shipped standard in all PSA<br>instruments with serial<br>number prefix $\geq$ MY4615<br>unless 117 license is activated |
| E444xA-115 | 512 MB user memory                                                                |                                                                                                                          |
| E444xA-117 | Secure memory erase                                                               | Excludes 115                                                                                                             |
| E4440A-BAB | Replaces type-N input connector<br>with APC 3.5 connector                         |                                                                                                                          |
| E444xA-H70 | 70 MHz IF output                                                                  | Excludes 122, 140. Not<br>available for E4447A                                                                           |
| E444xA-HYX | 21.4 MHz IF output                                                                | Available for all PSA models                                                                                             |
| E444xA-HY3 | Switched LO for Options AYZ and 123                                               | For E4446A/48A only                                                                                                      |

### PC Software

|            |                                                  |                                               |
|------------|--------------------------------------------------|-----------------------------------------------|
| E444xA-230 | BenchLink Web Remote Control<br>Software         |                                               |
| E444xA-235 | Wide BW digitizer external<br>calibration wizard | Requires 122 or 140<br>E4443A/45A/40A/46A/48A |

### Accessories

|            |                                             |
|------------|---------------------------------------------|
| E444xA-1CM | Rack mount kit                              |
| E444xA-1CN | Front handle kit                            |
| E444xA-1CP | Rack mount with handles                     |
| E444xA-1CR | Rack slide kit                              |
| E444xA-015 | 6 GHz return loss measurement accessory kit |
| E444xA-045 | Millimeter wave accessory kit               |
| E444xA-0B1 | Extra manual set including CD ROM           |

## Related Literature

| Publication Title                                                                                          | Publication Type        | Publication Number |
|------------------------------------------------------------------------------------------------------------|-------------------------|--------------------|
| <b>PSA in general</b>                                                                                      |                         |                    |
| <i>Selecting the Right Signal Analyzer for Your Needs</i>                                                  | Selection Guide         | 5968-3413E         |
| <i>PSA Series</i>                                                                                          | Brochure                | 5980-1284E         |
| <i>PSA Series</i>                                                                                          | Configuration Guide     | 5989-2773EN        |
| <i>Self-Guided Demonstration for Spectrum Analysis</i>                                                     | Product Note            | 5988-0735EN        |
| <b>Wide bandwidth and vector signal analysis</b>                                                           |                         |                    |
| <i>40/80 MHz Bandwidth Digitizer</i>                                                                       | Technical Overview      | 5989-1115EN        |
| <i>Using Extended Calibration Software for Wide Bandwidth Measurements, PSA Option 122 &amp; 89600 VSA</i> | Application Note 1443   | 5988-7814EN        |
| <i>PSA Series Spectrum Analyzer Performance Guide Using 89601A Vector Signal Analysis Software</i>         | Product Note            | 5988-5015EN        |
| <i>89650S Wideband VSA System with High Performance Spectrum Analysis</i>                                  | Technical Overview      | 5989-0871EN        |
| <b>Measurement personalities and applications</b>                                                          |                         |                    |
| <i>Phase Noise Measurement Personality</i>                                                                 | Technical Overview      | 5988-3698EN        |
| <i>Noise Figure Measurement Personality</i>                                                                | Technical Overview      | 5988-7884EN        |
| <i>External Source Measurement Personality</i>                                                             | Technical Overview      | 5989-2240EN        |
| <i>Flexible Digital Modulation Analysis Measurement Personality</i>                                        | Technical Overview      | 5989-1119EN        |
| <i>W-CDMA and HSDPA/HSUPA Measurement Personalities</i>                                                    | Technical Overview      | 5988-2388EN        |
| <i>GSM with EDGE Measurement Personality</i>                                                               | Technical Overview      | 5988-2389EN        |
| <i>cdma2000® and 1xEV-DV Measurement Personalities</i>                                                     | Technical Overview      | 5988-3694EN        |
| <i>1xEV-DO Measurement Personality</i>                                                                     | Technical Overview      | 5988-4828EN        |
| <i>cdmaOne Measurement Personality</i>                                                                     | Technical Overview      | 5988-3695EN        |
| <i>WLAN Measurement Personality</i>                                                                        | Technical Overview      | 5989-2781EN        |
| <i>NADC/PDC Measurement Personality</i>                                                                    | Technical Overview      | 5988-3697EN        |
| <i>TD-SCDMA Measurement Personality</i>                                                                    | Technical Overview      | 5989-0056EN        |
| <i>Built-in Measuring Receiver Personality/Agilent N5531S Measuring Receiver</i>                           | Technical Overview      | 5989-4795EN        |
| <i>BenchLink Web Remote Control Software</i>                                                               | Product Overview        | 5988-2610EN        |
| <i>IntuiLink Software</i>                                                                                  | Data Sheet              | 5980-3115EN        |
| <i>Programming Code Compatibility Suite</i>                                                                | Technical Overview      | 5989-1111EN        |
| <b>Hardware options</b>                                                                                    |                         |                    |
| <i>PSA Series Spectrum Analyzers Video Output (Option 124)</i>                                             | Technical Overview      | 5989-1118EN        |
| <i>PSA Series Spectrum Analyzers, Option H70, 70 MHz IF Output</i>                                         | Product Overview        | 5988-5261EN        |
| <b>Spectrum analyzer fundamentals</b>                                                                      |                         |                    |
| <i>Optimizing Dynamic Range for Distortion Measurements</i>                                                | Product Note            | 5980-3079EN        |
| <i>PSA Series Amplitude Accuracy</i>                                                                       | Product Note            | 5980-3080EN        |
| <i>PSA Series Swept and FFT Analysis</i>                                                                   | Product Note            | 5980-3081EN        |
| <i>PSA Series Measurement Innovations and Benefits</i>                                                     | Product Note            | 5980-3082EN        |
| <i>Spectrum Analysis Basics</i>                                                                            | Application Note 150    | 5952-0292          |
| <i>Vector Signal Analysis Basics</i>                                                                       | Application Note 150-15 | 5989-1121EN        |
| <i>8 Hints for Millimeter Wave Spectrum Measurements</i>                                                   | Application Note        | 5988-5680EN        |
| <i>Spectrum Analyzer Measurements to 325 GHz with the Use of External Mixers</i>                           | Application Note 1453   | 5988-9414EN        |
| <i>EMI</i>                                                                                                 | Application Note 150-10 | 5968-3661E         |





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