Frequency Specifications

**Frequency range**

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4401B</td>
<td>9 kHz to 1.5 GHz</td>
</tr>
<tr>
<td>50 Ω</td>
<td>1 kHz to 1.5 GHz</td>
</tr>
<tr>
<td>75 Ω</td>
<td>9 kHz to 3.0 GHz</td>
</tr>
<tr>
<td>E4402B</td>
<td>100 Hz 1 to 3 GHz</td>
</tr>
<tr>
<td>dc coupled (Option UKB)</td>
<td>100 kHz to 3 GHz</td>
</tr>
<tr>
<td>ac coupled (Option UKB)</td>
<td>100 kHz to 3 GHz</td>
</tr>
<tr>
<td>E4404B</td>
<td>9 kHz to 6.7 GHz</td>
</tr>
<tr>
<td>dc coupled</td>
<td>100 Hz 1 to 6.7 GHz</td>
</tr>
<tr>
<td>dc coupled (Option UKB)</td>
<td>100 kHz to 6.7 GHz</td>
</tr>
<tr>
<td>Band 0</td>
<td>9 kHz to 3.0 GHz</td>
</tr>
<tr>
<td>(Option UKB)</td>
<td>100 Hz 1 to 3 GHz</td>
</tr>
<tr>
<td>1</td>
<td>2.85 GHz to 6.7 GHz</td>
</tr>
<tr>
<td>E4405B</td>
<td>9 kHz to 13.2 GHz</td>
</tr>
<tr>
<td>dc coupled</td>
<td>100 Hz 1 to 13.2 GHz</td>
</tr>
<tr>
<td>ac coupled</td>
<td>100 kHz to 13.2 GHz</td>
</tr>
<tr>
<td>Band N2</td>
<td>9 kHz to 3.0 GHz</td>
</tr>
<tr>
<td>0</td>
<td>100 Hz 1 to 3 GHz</td>
</tr>
<tr>
<td>0 (Option UKB)</td>
<td>2.85 GHz to 6.7 GHz</td>
</tr>
<tr>
<td>1</td>
<td>6.2 GHz to 13.2 GHz</td>
</tr>
<tr>
<td>2</td>
<td>2.85 GHz to 6.7 GHz</td>
</tr>
<tr>
<td>4</td>
<td>6.2 GHz to 13.2 GHz</td>
</tr>
<tr>
<td>E4407B</td>
<td>9 kHz to 26.5 GHz</td>
</tr>
<tr>
<td>Internal mixing</td>
<td>100 Hz 1 to 26.5 GHz</td>
</tr>
<tr>
<td>dc coupled (Option UKB)</td>
<td>10 MHz to 26.5 GHz</td>
</tr>
<tr>
<td>ac coupled (Option UKB)</td>
<td>2.85 GHz to 6.7 GHz</td>
</tr>
<tr>
<td>Band N2</td>
<td>9 kHz to 3.0 GHz</td>
</tr>
<tr>
<td>0</td>
<td>100 Hz 1 to 3 GHz</td>
</tr>
<tr>
<td>0 (Option UKB)</td>
<td>2.85 GHz to 6.7 GHz</td>
</tr>
<tr>
<td>1</td>
<td>6.2 GHz to 13.2 GHz</td>
</tr>
<tr>
<td>2</td>
<td>12.8 GHz to 19.2 GHz</td>
</tr>
<tr>
<td>3</td>
<td>18.7 GHz to 26.5 GHz</td>
</tr>
<tr>
<td>4</td>
<td>18.7 GHz to 325 GHz</td>
</tr>
<tr>
<td>External mixing (Option AYZ)</td>
<td>20 Hz to 325 GHz</td>
</tr>
</tbody>
</table>

---

1. 30 Hz characteristic
2. $N = \text{LO harmonic mixing load}$
### Frequency reference

<table>
<thead>
<tr>
<th></th>
<th>(Option 1D5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aging</td>
<td>±2 \times 10^{-6}/year</td>
</tr>
<tr>
<td>Temperature stability</td>
<td>±5 \times 10^{-6}</td>
</tr>
<tr>
<td>Settability</td>
<td>±5 \times 10^{-7}</td>
</tr>
</tbody>
</table>

### Frequency readout accuracy

(Start, Stop, Center, Marker)

\[ \pm (\text{frequency indication} \times \text{frequency reference error} + \text{span accuracy} + 15\% \text{ of RBW} + 10 \text{ Hz} + 1 \text{ Hz} \times N^2) \]

### Marker frequency counter

Accuracy

\[ \pm (\text{marker frequency} \times \text{frequency reference error} + \text{counter resolution}) \]

Counter resolution

Selectable from 1 Hz to 100 kHz

### Frequency span

Range

0 Hz (zero span), 100 Hz to the maximum frequency range of the analyzer

Resolution

2 Hz \times N^2

Accuracy (> 2000 sweep points)

### Sweep time

Range

| Span > 0 Hz | 1 ms to 4000 s |
| Span = 0 Hz | 10 µs to 4000 s |
| (Option AXY) | 50 ns to 4000 s |
| (Option B7D) | 25 ns to 4000 s |

Accuracy

\pm 1\%

Sweep trigger

Free Run, Single, Line, Video, External, delay, Offset, Gate (Option 1D6), and TV (Option B7B)

Delay trigger range

1 µs to 400 s

### Sweep (trace) point range

Span = 0 Hz

101 to 8192

2 to 8192

Resolution bandwidth

1 kHz to 5 MHz (–3 dB) in 1-3-10 sequence.

9 kHz and 120 kHz (–6 dB) EMI bandwidths.

Option 1DR

Adds 10, 30, 100, and 300 Hz (–3 dB) bandwidths, 200 Hz (–6 dB) EMI bandwidth.

Option 1DR and 1D5

Adds 1, 3 Hz (for spans ≤ 5 MHz)

### System-related sidebands

≥ 30 kHz offset from CW signal

\[ \leq 65 \text{ dBc} + 20 \log N^2 \]

1. Frequency reference error = (aging rate x period of time since adjustment + settability + temperature stability).
2. \(N = \) LO harmonic mixing mode.
3. Not available in RBW < 1 kHz (Option 1DR).
4. Marker level to DANL > 25 dB, RBW/span ≥ 0.002.
5. RBW ≥ 1 kHz, 2 sweep points.
6. Only available with firmware revision A.08.00 or later.
7. Characteristic
8. Add 20 log (N) for frequencies > 6.7 GHz.
### Amplitude Specifications

**Amplitude range**
- **Measurement range**: Displayed average noise level (DANL) to maximum safe input level
- **Input attenuator range**:
  - E4401B: 0 to 60 dB, in 5 dB steps
  - E4402B/04B/05B: 0 to 65 dB (75 dB¹), in 5 dB steps
  - E4407B: 0 to 65 dB, in 5 dB steps

**Trace detectors**: Peak, negative peak, sample, rms², average²

**Maximum safe input level**
- **Average continuous power**:
  - E4401B (Input attenuator ≥ 15 dB)
  - E4402B/04B/05B (Input attenuator ≥ 5 dB)

**Peak pulse power** (Input attenuator ≥ 30 dB):
- E4401B: +30 dBm (1 Ω)
- E4401B (75 Ω Option 1DP): +75 dBmV (0.4 Ω)
- E4402B/04B/05B/07B: +50 dBm (100 Ω)

**dc power**:
- E4401B, E4402B: 100 Vdc
- E4401B (75 Ω Opt. 1DP): 100 Vdc
- E4402B (Option UKB): 0 Vdc (dc coupled)
- E4404B, E4405B: 0 Vdc (dc coupled)
- E4407B: 0 Vdc

**1 dB gain compression** (total power at input mixer²)
- 50 MHz to 6.7 GHz: 0 dBm
- 6.7 GHz to 13.2 GHz: –3 dBm
- 13.2 GHz to 26.5 GHz: –5 dBm

**Displayed average noise level (DANL)** (dBm)
- (Input terminated, 0 dB attenuation, sample detector)
  - 1 kHz RBW; 30 Hz VBW
  - 10 Hz RBW; 1 Hz VBW (Option 1DR)
  - 1 Hz RBW; 1 Hz VBW (Option 1DR and 1D5)⁴

<table>
<thead>
<tr>
<th>Model</th>
<th>1 kHz RBW (Option 1DR)</th>
<th>10 Hz RBW (Option 1DR) (w/ preamp Option 1DS)</th>
<th>10 Hz RBW (Option 1DR) (w/ preamp Option 1DS) typical</th>
<th>1 Hz RBW (Option 1DR and 1D5)⁴ typical</th>
<th>1 Hz RBW (Option 1DR and 1D5)⁴ (w/ preamp Option 1DS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>400 kHz to 10 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>500 MHz to 1 GHz</td>
<td>≤ –117</td>
<td>≤ –136</td>
<td>≤ –152</td>
<td>≤ –156</td>
</tr>
<tr>
<td></td>
<td>1 GHz to 1.5 GHz</td>
<td>≤ –114</td>
<td>≤ –133</td>
<td>≤ –150</td>
<td>≤ –155</td>
</tr>
<tr>
<td></td>
<td>60 Hz to 100 kHz</td>
<td>≤ –117</td>
<td>≤ –136</td>
<td>≤ –152</td>
<td>≤ –150</td>
</tr>
<tr>
<td></td>
<td>1 MHz to 10 MHz⁴</td>
<td>≤ –117</td>
<td>≤ –136</td>
<td>≤ –152</td>
<td>≤ –150</td>
</tr>
<tr>
<td></td>
<td>10 MHz to 1 GHz</td>
<td>≤ –117</td>
<td>≤ –136</td>
<td>≤ –152</td>
<td>≤ –150</td>
</tr>
<tr>
<td></td>
<td>1 GHz to 2 GHz</td>
<td>≤ –116</td>
<td>≤ –135</td>
<td>≤ –153</td>
<td>≤ –150</td>
</tr>
<tr>
<td></td>
<td>9 kHz to 100 kHz²</td>
<td>≤ –116</td>
<td>≤ –136</td>
<td>≤ –157</td>
<td>≤ –150</td>
</tr>
<tr>
<td></td>
<td>100 kHz to 1 MHz³</td>
<td>≤ –116</td>
<td>≤ –136</td>
<td>≤ –157</td>
<td>≤ –150</td>
</tr>
<tr>
<td></td>
<td>1 MHz to 10 MHz³³</td>
<td>≤ –116</td>
<td>≤ –136</td>
<td>≤ –157</td>
<td>≤ –150</td>
</tr>
<tr>
<td></td>
<td>10 MHz to 1 GHz</td>
<td>≤ –116</td>
<td>≤ –136</td>
<td>≤ –157</td>
<td>≤ –150</td>
</tr>
<tr>
<td></td>
<td>6 GHz to 12 GHz</td>
<td>≤ –111</td>
<td>≤ –130</td>
<td>≤ –137</td>
<td>≤ –147</td>
</tr>
<tr>
<td></td>
<td>12 GHz to 22 GHz</td>
<td>≤ –107</td>
<td>≤ –126</td>
<td>≤ –134</td>
<td>≤ –147</td>
</tr>
<tr>
<td>E4407B (Option AYZ)</td>
<td>≤ –134</td>
<td>≤ –153</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
</tbody>
</table>

1. Characteristic
2. Detector not available in resolution bandwidth filters less than 1 KHz
3. Mixer power level (dBm) = input power (dBm) minus input attenuation (dB).
4. Only available with firmware revision A.08.00 or later.
5. Typical
6. Typical (Option 120)
7. 20 to 30 °C
Display range
Log scale
0.1, 0.2, 0.5 dB/division and
1 to 20 dB/division in 1 dB steps;
ten divisions displayed.

RBW ≥ 1 kHz
0 to –85 dB from reference level is
calibrated

RBW ≤ 300 Hz (Option 1DR)
0 to –120 dB from reference level
is calibrated

Linear scale
10 divisions

Scale units
dBm, dBmV, dBµV, Volts, dBµA, A,
and Watts

(Option BAA, 106)
Add Hz

Marker readout resolution
Log scale
0 to –85 dB 0.04 dB
0 to –120 dB (Option 1DR) 0.04 dB
Linear scale 0.01% of reference level

Fast sweep times for zero span (Option AYX)
(sweeptimes ≤ sweep points –1/100 kHz)
Log scale
0 to –85 dB 0.3 dB
Linear 0.3% of reference level

Resolution bandwidth switching uncertainty
(at reference level)
1 kHz RBW Reference
1 Hz to 3 Hz9 ±0.3 dB
10 Hz to 3 MHz RBW ±0.3 dB
5 MHz RBW ±0.6 dB

Reference level
Range –149.9 dBm to maximum mixer level
+ attenuator setting

Resolution
Log scale ±0.1 dB
Linear scale ±0.12% of reference level

Accuracy (reference level
– attenuator setting + preamp gain)
±0.3 dB (–10 dBm to –60 dBm)
±0.5 dB (–60 dBm to –85 dBm)
±0.7 dB (–85 dBm to –90 dBm)

Input attenuation switching uncertainty at 50 MHz
Attenuation setting
0 dB to 5 dB ±0.3 dB
10 dB reference
15 dB ±0.3 dB
20 to 60 dB (E4401B) ±0.1 dB + 0.01 x attenuator setting
20 to 60 dB (E4402B/04B/05B/07B) ±0.1 dB + 0.01 x attenuator setting

Absolute amplitude accuracy
At reference settings5
E4401B ±0.34 dB ±0.13 dB
Preamp on6 (Option 1DS) ±0.37 dB ±0.14 dB

External mixer (Option AYZ)
IF INPUT absolute amplitude accuracy + external mixer conversion loss accuracy7

Overall amplitude accuracy8 ±(0.54 dB + absolute frequency response)

RF input VSWR4 (at tuned frequency, 10 dB attenuation)
E4401B
1 MHz to 1.5 GHz 1.35:1

E4402B
100 Hz to 100 kHz 1.1:1 (Option UKB)
9 kHz to 100 kHz 2:1
100 kHz to 3 GHz 1.4:1

E4404B/05B
100 Hz to 100 kHz 1.1:1 (Option UKB)
9 kHz to 100 kHz 2:1
100 kHz to 6.7 GHz 1.3:1
6.7 GHz to 13.2 GHz 1.5:1

E4407B
100 Hz to 100 kHz 1.1:1 (Option UKB)
9 kHz to 6.7 GHz 1.3:1
6.7 GHz to 13.2 GHz 1.5:1
13.2 GHz to 22 GHz 2:1
22 GHz to 26.5 GHz 2.2:1

Frequency response (10 dB input attenuation)

<table>
<thead>
<tr>
<th></th>
<th>Absolute2</th>
<th>Typical</th>
<th>Relative flatness3</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4401B</td>
<td>±0.5 dB</td>
<td>na</td>
<td>±0.5 dB</td>
</tr>
<tr>
<td>E4402B/04B/05B/07B</td>
<td>±0.5 dB</td>
<td>na</td>
<td>±0.5 dB</td>
</tr>
<tr>
<td>9 kHz to 1.5 GHz</td>
<td>±0.46 dB</td>
<td>±0.14 dB</td>
<td>±0.5 dB</td>
</tr>
<tr>
<td>30 Hz to 3 GHz4 (Option UKB)</td>
<td>±1.5 dB</td>
<td>±0.38 dB</td>
<td>±1.3 dB</td>
</tr>
<tr>
<td>3.0 GHz to 6.7 GHz</td>
<td>±2.0 dB</td>
<td>±0.68 dB</td>
<td>±1.8 dB</td>
</tr>
<tr>
<td>6.7 GHz to 13.2 GHz</td>
<td>±2.0 dB</td>
<td>±0.86 dB</td>
<td>±1.8 dB</td>
</tr>
<tr>
<td>13.2 GHz to 26.5 GHz</td>
<td>±2.0 dB</td>
<td>±0.86 dB</td>
<td>±1.8 dB</td>
</tr>
</tbody>
</table>

RF input VSWR4 (at tuned frequency, 10 dB attenuation)
E4401B
1 MHz to 1.5 GHz 1.35:1

E4402B
100 Hz to 100 kHz 1.1:1 (Option UKB)
9 kHz to 100 kHz 2:1
100 kHz to 3 GHz 1.4:1

E4404B/05B
100 Hz to 100 kHz 1.1:1 (Option UKB)
9 kHz to 100 kHz 2:1
100 kHz to 6.7 GHz 1.3:1
6.7 GHz to 13.2 GHz 1.5:1

E4407B
100 Hz to 100 kHz 1.1:1 (Option UKB)
9 kHz to 6.7 GHz 1.3:1
6.7 GHz to 13.2 GHz 1.5:1
13.2 GHz to 22 GHz 2:1
22 GHz to 26.5 GHz 2.2:1

Resolution bandwidth switching uncertainty
(at reference level)
1 kHz RBW Reference
1 Hz to 3 Hz9 ±0.3 dB
10 Hz to 3 MHz RBW ±0.3 dB
5 MHz RBW ±0.6 dB

Reference level
Range –149.9 dBm to maximum mixer level
+ attenuator setting

Resolution
Log scale ±0.1 dB
Linear scale ±0.12% of reference level

Accuracy (reference level
– attenuator setting + preamp gain)
±0.3 dB (–10 dBm to –60 dBm)
±0.5 dB (–60 dBm to –85 dBm)
±0.7 dB (–85 dBm to –90 dBm)

Input attenuation switching uncertainty at 50 MHz
Attenuation setting
0 dB to 5 dB ±0.3 dB
10 dB reference
15 dB ±0.3 dB
20 to 60 dB (E4401B) ±0.1 dB + 0.01 x attenuator setting
20 to 60 dB (E4402B/04B/05B/07B) ±0.1 dB + 0.01 x attenuator setting

Absolute amplitude accuracy
At reference settings5
E4401B ±0.34 dB ±0.13 dB
Preamp on6 (Option 1DS) ±0.37 dB ±0.14 dB

External mixer (Option AYZ)
IF INPUT absolute amplitude accuracy + external mixer conversion loss accuracy7

Overall amplitude accuracy8 ±(0.54 dB + absolute frequency response)

1. 0 to –70 dB range when span = 0 Hz, when RBW = 200 Hz, or when auto ranging is off.
2. Referenced to 50 MHz amplitude reference (20 °C to 30 °C).
3. Referenced to midpoint between highest and lowest frequency response deviations (20 °C to 30 °C).
4. Characteristic
5. Reference level –25 dBm (E4401B) or –20 dBm (E4402B/04B/05B/07B);
   (75 Ω reference level + 28.75 dBmV); input attenuation 10 dB; center frequency
   50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled,
   sample detector; signal at reference level.
6. Reference level –30 dBm; (75 Ω reference level + 18.75 dBmV); input attenuation
   0 dB; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span
   2 kHz; sweep time coupled; signal at reference level.
7. Preselector centered with the Agilent 11974-series
8. For reference levels 0 to –50 dBm; input attenuation 10 dB; 1 kHz RBW; 1 kHz video
   BW; log scale; log range, 0 to 50 dB; coupled sweep time; sample detector; signal
   input, 0 to –50 dBm; span = 20 kHz; internal mixing (20 °C to 30 °C).
9. Only available with firmware revision A.08.00 or later.
### Display scale fidelity

Log maximum cumulative

<table>
<thead>
<tr>
<th>RBW ≥ 1 kHz</th>
<th>0 dB (reference)</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>dB below reference level</td>
<td>±0.00 dB</td>
<td>±0.00 dB</td>
</tr>
<tr>
<td>&gt; 0 to 10 dB</td>
<td>±0.30 dB</td>
<td>±0.08 dB</td>
</tr>
<tr>
<td>&gt; 10 to 20 dB</td>
<td>±0.40 dB</td>
<td>±0.09 dB</td>
</tr>
<tr>
<td>&gt; 20 to 30 dB</td>
<td>±0.50 dB</td>
<td>±0.10 dB</td>
</tr>
<tr>
<td>&gt; 30 to 40 dB</td>
<td>±0.60 dB</td>
<td>±0.23 dB</td>
</tr>
<tr>
<td>&gt; 40 to 50 dB</td>
<td>±0.70 dB</td>
<td>±0.35 dB</td>
</tr>
<tr>
<td>&gt; 50 to 60 dB</td>
<td>±0.70 dB</td>
<td>±0.35 dB</td>
</tr>
<tr>
<td>&gt; 60 to 70 dB</td>
<td>±0.80 dB</td>
<td>±0.39 dB</td>
</tr>
<tr>
<td>&gt; 70 to 80 dB</td>
<td>±0.80 dB</td>
<td>±0.46 dB</td>
</tr>
<tr>
<td>&gt; 80 to 85 dB</td>
<td>±1.15 dB</td>
<td>±0.79 dB</td>
</tr>
</tbody>
</table>

### RBW ≤ 300 Hz, (Option 1DR)(Span > 0 Hz)

| 0 dB to 98 dB | ±(0.3 dB + 0.01 x dB from reference level) |
| ≥ 98 to 120 dB | ±(2.0 dB from reference level) |

### Log incremental accuracy

| 0 dB to 80 dB | ±0.4dB/4dB from reference level |
| Linear accuracy | ±2% of reference level |

### Linear-to-log switching

| 0.15 dB at reference level |
| Uncertainty |

### W-CDMA adjacent channel

#### Power ratio

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Standard</th>
<th>Option 120</th>
<th>Option 120 with noise correction on</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 MHz</td>
<td>−60.0 dBc</td>
<td>−65.0 dBc</td>
<td>−65.0 dBc</td>
</tr>
<tr>
<td>10 MHz</td>
<td>−64.5 dBc</td>
<td>−65.5 dBc</td>
<td>−67.0 dBc</td>
</tr>
</tbody>
</table>

#### Spurious responses

<table>
<thead>
<tr>
<th>Offset frequency</th>
<th>Second harmonic distortion</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 MHz to 750 MHz</td>
<td>&lt; −75 dBc for −40 dBm tone at input mixer5 (+35 dBm SHI)</td>
</tr>
<tr>
<td>10 MHz to 500 MHz</td>
<td>&lt; −65 dBc for −30 dBm tone at input mixer5</td>
</tr>
<tr>
<td>500 MHz to 1.5 GHz</td>
<td>&lt; −75 dBc for −30 dBm tone at input mixer5 (+45 dBm SHI)</td>
</tr>
<tr>
<td>1.5 GHz to 2.0 GHz</td>
<td>&lt; −85 dBc for −10 dBm tone at input mixer5</td>
</tr>
<tr>
<td>&gt; 2.0 GHz</td>
<td>&lt; −100 dBc for −10 dBm tone at input mixer5 (or below displayed average noise level)</td>
</tr>
</tbody>
</table>

#### Third-order intermodulation distortion

| Offset frequency | < −87 dBc for two −30 dBm tones at input mixer5 and > 50 kHz separation. (+13.5 dBm TOI, +19 dBm typical) |
| 2 MHz to 750 MHz | < −85 dBc for two −30 dBm tones at input mixer5 and > 50 kHz separation. (+12.5 dBm TOI, +16 dBm typical) |
| 10 MHz to 500 MHz| < −85 dBc for two −30 dBm tones at input mixer5 and > 50 kHz separation. (+12.5 dBm TOI, +16 dBm typical) |
| 500 MHz to 1.5 GHz| < −82 dBc for two −30 dBm tones at input mixer5 and > 50 kHz separation. (+11 dBm TOI, +18 dBm typical) |
| > 3.0 GHz to 6.7 GHz| < −75 dBc for two −30 dBm tones at input mixer5 and > 50 kHz separation. (+11 dBm TOI, +18 dBm typical) |
| > 6.7 GHz       | < −75 dBc for two −30 dBm tones at input mixer5 and > 50 kHz separation. (+11 dBm TOI, +18 dBm typical) |

Other input-related spurious

| > 30 kHz offset | < −65 dBc for −20 dBm tone at input mixer5 |

### Residual responses (input terminated and 0 dB attenuation)

150 kHz to 6.7 GHz | < −90 dBm |

### Amplitude reference output

E4402B/04B/05B/07B | −20 dBm (nominal), 50 MHz |

### General Specifications

#### Temperature range

| Operating | 0 °C to + 55 °C |
| Storage   | −40 °C to + 75 °C |

#### EMI compatibility

- Conducted and radiated interference is in compliance with CISPR Pub. 11/1990 Group 1 Class A
- (Option 060)
- CISPR Pub. 11/1990 Group 1 Class B

#### Audible noise

< 40 dba pressure and < 4.6 bel power (ISODP7779)

#### Military specification

- Type tested to the environmental specifications of MIL-PRF-28800F class 3.

#### Power requirements

ON (line 1) 90 to 132 V rms, 47 to 440 Hz
195 to 250 V rms, 47 to 66 Hz
Power consumption < 300 Ω
Standby (line 0)
Power consumption < 5 Ω

dc operation
Voltage 12 to 20 Vdc

#### Data storage (nominal)

| Internal8 | 8.0 MB |
| External8 | 3.5" 1.44 MB, MS-DOS compatible floppy disk |

#### Memory usage (nominal)

State 16 kB
State plus 401-point trace 20 kB

#### Weight (without options)

| E4401B | 13.2 kg (29.1 lbs.) |
| E4402B | 15.5 kg (34.2 lbs.) |
| E4404B/05B/07B | 17.1 kg (37.7 lbs.) |

---

1. 0 to 30 dB for RBW = 200 Hz.
2. Characteristic
3. Firmware revision A.07.00 or higher.
4. Characteristic. Measured by selecting “Measure, ACP”. 20 to 30°C, 3GPP (3.1 Dec 1999) W-CDMA signal with 1 DPCH, channel power −9 dBm/3.84 MHz, integration bandwidth 3.84 MHz, carrier frequency 2 GHz, reference level −16 dBm, input attenuation 0 dB, RBW 30 kHz. Noise correction can be turned on by selecting Meas Setup, More, Noise Corr On.
5. Mixer power level (dBm) = input power (dBm) minus input attenuation (dB).
6. Not available in RBW < 1 kHz (Option 1DR).
7. Meeting class A performance during dc operation.
8. For serial numbers < US4144000 or < MY41440000, 1 MB without Option B72, 8 MB with Option B72. 401 sweep points. The size of a state will increase depending on the installed application(s).
Dimensions
Without handle: 222mm(H) x 409mm(D) x 373mm(W)
With handle (maximum): 222mm(H) x 516mm(D) x 416mm(W)

Measurement speed
<table>
<thead>
<tr>
<th></th>
<th>E4401B</th>
<th>E4402B</th>
<th>E4405B</th>
<th>E4407B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local measurement rate</td>
<td>≥ 50/sec</td>
<td>≥ 45/sec</td>
<td>≥ 40/sec</td>
<td></td>
</tr>
<tr>
<td>Remote measurement and GPIB transfer rate</td>
<td>≥ 45/sec</td>
<td>≥ 45/sec</td>
<td>≥ 40/sec</td>
<td></td>
</tr>
<tr>
<td>RF center frequency tuning time</td>
<td>≤ 75 ms</td>
<td>≤ 75 ms</td>
<td>≤ 75 ms</td>
<td></td>
</tr>
</tbody>
</table>

Inputs/Outputs

Front panel
- **INPUT**
  - 50 Ω Type N (f)
  - Option 1DP
  - 75 Ω BNC (f)
  - Option BAB
  - 50 Ω APC 3.5 (m)
- **RF OUT**
  - 50 Ω Type N (f)
  - Option 1DP
  - 75 Ω BNC (f)
- **PROBE POWER**
  - +15 Vdc, –12.6 Vdc at 150 mA maximum
- **EXT KEYBOARD**
  - 6-pin mini-DIN, PC keyboards (for entering screen titles and file menus)
- **Speaker**
  - front-panel knob controls volume
- **Headphone**
  - 3.5mm (1/8 inch) miniature audio jack
  - Power output: 0.2 Ω into 4 Ω^4
- **AMPTD REF OUT**
  - 50 Ω^5, BNC (f)
- **IF INPUT (Option AYZ)**
  - 50 Ω^5, SMA (f)
- **LO OUTPUT (Option AYZ)**
  - 50 Ω^5, SMA (f)

Rear panel
- **10 MHz REF OUT**
  - 50 Ω^5, BNC (f), > 0 dBm
- **10 MHz REF IN**
  - 50 Ω^5, BNC (f), –15 to +10 dBm
- **GATE TRIG/EXT TRIG IN**
  - BNC (f), 5 V TTL
- **GATE/HI SWP OUT**
  - BNC (f), 5 V TTL
- **VGA OUTPUT**
  - VGA compatible monitor, 15-pin mini D-SUB, (31.5 kHz horizontal, 60 Hz vertical sync rates, non-interfaced)
  - Analog RGB 640 x 480

**IF, sweep and video ports (Option A4 or AYX)**
- **AUX IF OUT**
  - BNC (f), 21.4 MHz, nominal –10 dBm^6 (uncorrected)
- **AUX VIDEO OUT**
  - BNC (f), 0 to 1 V^4 (uncorrected)
- **HI SWP IN**
  - BNC (f), low stops sweep, (5 V TTL)
- **HI SWP OUT**
  - BNC (f), (5 V TTL)
- **SWP OUT**
  - BNC (f), 0 to +10 V^4 ramp

**GPIB interface (Option A4H)**
- IEEE-488 bus connector

**Serial interface (Option 1AX)**
- RS-232, 9-pin D-SUB (m)

Parallel interface (Option A4H or 1AX)
- 25-pin D-SUB (f), printer port only

Option Specifications

**Option 1D6 time-gated spectrum analysis**
- **Gate delay/length**
  - 1 μs to 400 s
  - Resolution: < gate delay(s)/65000; rounded up to nearest μs
  - Accuracy: ±(500 ns + 0.01% x gate delay readout)

**Option 1DN and 1DQ tracking generator**
- **Frequency range**
  - E4401B
    - Option 1DN, (50 Ω)
      - 9 kHz to 1.5 GHz
    - Option 1DQ, (75 Ω)
      - 1 MHz to 1.5 GHz
  - E4402B/04B/05B/07B
    - Option 1DN, (50 Ω)
      - 9 kHz to 3.0 GHz
  - **RBW range**
    - 1 kHz to 5 MHz

- **Output power level range**
  - E4401B
    - Option 1DN
      - 0 to –70 dBm
    - Option 1DQ
      - +42.75 to –27.25 dBmV
  - E4402B/04B/05B/07B
    - Option 1DN
      - –2 to –66 dBm

- **Output vernier range**
  - E4401B
    - 10 dB
  - E4402B/04B/05B/07B
    - 8 dB

- **Output attenuator range**
  - E4401B
    - 0 to 60 dB, 10 dB steps
  - E4402B/04B/05B/07B
    - 0 to 56 dB, 8 dB steps

- **Output flatness**
  - E4401B
    - Option 1DN, (50 Ω)
      - 9 kHz to 10 MHz ±2.0 dB
        - 10 MHz to 1.5 GHz ±1.5 dB
      - Option 1DQ, (75 Ω)
        - 1 MHz to 10 MHz ±2.5 dB
        - 1 MHz to 3.0 GHz ±2.0 dB
    - E4402B/04B/05B/07B
      - 9 kHz to 10 MHz ±3.0 dB
        - 10 MHz to 3.0 GHz ±2.0 dB

**RF center frequency**
- **tuning time**
  - ≤ 75 ms

**Local measurement rate**
- ≥ 50/sec

**Remote measurement and GPIB transfer rate**
- ≥ 45/sec

**Measurement speed**
- ≥ 40/sec

**GPIB interface**
- (Option A4H or 1AX)
- IEEE-488 bus connector

**Serial interface**
- (Option 1AX)
- RS-232, 9-pin D-SUB (m)

**Option specifications**
1. Characteristic; factory preset, fixed center frequency, sweep points = 101, auto align off, RBW = 1 MHz, stop frequency ≤ 3 GHz, span > 10 MHz and ≤ 600 MHz (E4401B, span > 102 MHz and ≤ 400 MHz).
2. Characteristic; factory preset, fixed center frequency, sweep points = 101, auto align off, RBW = 1 MHz, stop frequency = 3 GHz, span = 20 MHz, GPIB interface, display and markers off, fixed center frequency, single sweep.
3. Characteristic; includes center frequency tuning + measurement + GPIB transfer times, stop frequency ≤ 3 GHz, sweep points = 101, display and markers off, single sweep.
4. Characteristic
5. Nominal
Effective source match (characteristic)
- E4401B: < 2.5:1
- E4402B/04B/05B/07B: < 2.0:1 (0 dB attenuator) < 1.5:1 (8 dB attenuator)

Spurious output
- Harmonic spurs
  - E4401B
    - (0 dBm output)
    - 9 kHz to 20 MHz: < -20 dBc
    - 20 MHz to 1.5 GHz: < -25 dBc
  - E4402B/04B/05B/07B
    - (-1 dBm output)
    - 20 kHz to 3 GHz: < -25 dBc
- Non-Harmonic spurs
  - E4401B: < -35 dBc
  - E4402B/04B/05B/07B
    - 9 kHz to 2 GHz: < -27 dBc
    - 2 GHz to 3 GHz: < -23 dBc

Dynamic range
- Maximum output power – displayed average noise level

Output power sweep range
- E4401B
  - Option 1DN: (-15 dBm to 0 dBm) – (source attenuator setting)
  - Option 1DQ: (+27.75 dBmV to +42.75 dBmV) – (source attenuator setting)
- E4402B/04B/05B/07B
  - Option 1DN: (-10 dBm to –2 dBm) – (source attenuator setting)

Option 1DS preamp
- Frequency range
  - E4401B: 100 kHz to 1.5 GHz
  - E4402B/04B/05B/07B: 1 MHz to 3 GHz
- Gain: +20 dB

Noise figure
- E4401B: 4 dB
- E4402B/04B/05B/07B: 5 dB

Option AYZ external mixing
- LO OUTPUT
  - Frequency range: 2.9 to 7.1 GHz
  - Power
    - 2.9 to 6.1 GHz: 15 to 17.5 dBm at the mixer
    - 2.9 to 7.1 GHz: 13 to 17.5 dBm
  - VSWR: < 1.9:1
- IF INPUT
  - Frequency range: 321.4 MHz ±5 MHz
  - Maximum safe input level: 10 dBm (ac), ±10 V (dc)
  - VSWR: < 1.9:1.6
- Absolute amplitude accuracy
  (reference levels from –10 to –60 dB)

Amplitude corrections

<table>
<thead>
<tr>
<th>Amplitude corrections</th>
<th>20 °C to 30 °C</th>
<th>0 °C to 55 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 to 30 dB</td>
<td>1.0 dB</td>
<td>1.5 dB</td>
</tr>
<tr>
<td>&gt; 30 to 50 dB</td>
<td>1.2 dB</td>
<td>1.7 dB</td>
</tr>
<tr>
<td>&gt; 50 to 60 dB</td>
<td>1.4 dB</td>
<td>1.9 dB</td>
</tr>
<tr>
<td>1 dB gain compression level</td>
<td>-20 dB with -10 dBm reference level and 0 dB</td>
<td></td>
</tr>
</tbody>
</table>

Mixer bias (IF INPUT)
- Voltage: ±3.3 V
- Maximum range: ±2 V

Current (0 Ω load)
- Range: ±10 mA
- Resolution: < 20 mA
- Accuracy: ± (3% + resolution)
- Output impedance: 490 Ω

Option BAA FM demodulation
- Optimum input level
  - ≥ (–60 dBm + attenuator setting– preamp gain) and
  - within 30 dB of the reference level
- FM deviation (FM gain)
  - Range: 10 kHz to 1 MHz
  - Resolution
    - provides 1 Hz display annotation resolution
  - Accuracy
    - < (2% of FM deviation range + 2 x resolution)
- FM bandwidth (–3 dB)
  - FM deviation range
    - 10 kHz to 40 kHz: 7.5 x FM deviation range
    - > 40 kHz to 200 kHz: 1.3 x FM deviation range
    - > 200 kHz to 1 MHz: 0.3 x FM deviation range

Option B7B TV trigger and picture on screen
- Amplitude requirements
  - TV source: SA T op 50% of linear display
  - TV source: EXT VIDEO IN 500 mVp-p to 2 Vp-p
- Compatible standards
  - NTSC-M, NTSC-Japan
- Field selection
  - Entire frame, even, odd
- TV trigger line selection
  - 1 to 625

1. Nominal
2. Characteristic
3. RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled; sample detector; signal at reference level.
4. In time-domain sweeps.
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