

Agilent E4401B, E4402B, E4404B, E4405B, and E4407B ESA-E Series Spectrum Analyzers

Data Sheet

All specifications apply over 0 °C to + 55 °C unless otherwise noted and are covered by the product warranty. The analyzer will meet its specifications when: it's within the one year calibration cycle, AUTO ALIGN [ALL] is selected, stored a minimum 2 hours within the operating temperature range, turned on for at least 5 minutes, Align Now RF has been run once every 24 hour period. Characteristics describe product performance that is useful in the application of the product, but is not covered by the product warranty. Typical performance is beyond specifications that 80% of the units exhibit 95% confidence level over 20 to 30 °C not including measurement uncertainty and is not covered by the product warranty.



These specifications apply to the Agilent Technologies E4401B, E4402B, E4404B, E4405B, and E4407B spectrum analyzers.

Frequency specifications

Frequency range

E4401B		
50 Ω		9 kHz to 1.5 GHz
75 Ω		1 MHz to 1.5 GHz
E4402B		
dc coupled (Option UKB)		9 kHz to 3.0 GHz
ac coupled (Option UKB)		30 Hz ⁶ to 3 GHz
E4404B		
dc coupled		9 kHz to 6.7 GHz
dc coupled (Option UKB)		30 Hz ⁶ to 6.7 GHz
ac coupled		100 kHz to 6.7 GHz
Band		
0		9 kHz to 3.0 GHz
(Option UKB)		100 Hz to 3.0 GHz
1		2.85 GHz to 6.7 GHz
E4405B		
dc coupled		9 kHz to 13.2 GHz
dc coupled (Option UKB)		30 Hz ⁶ to 13.2 GHz
ac coupled		100 kHz to 13.2 GHz
Band	N ⁴	
0	1–	9 kHz to 3.0 GHz
0	(Option UKB)	30 Hz ⁶ to 3.0 GHz
1	1–	2.85 GHz to 6.7 GHz
2	2–	6.2 GHz to 13.2 GHz
E4407B		
Internal mixing		9 kHz to 26.5 GHz
dc coupled (option UKB)		30 Hz ⁶ to 26.5 GHz
ac coupled (option UKB)		10 MHz to 26.5 GHz
Band	N ⁴	
0	1–	9 kHz to 3.0 GHz
0	(option UKB)	30 Hz ⁶ to 3.0 GHz
1	1–	2.85 GHz to 6.7 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 26.5 GHz
External mixing (Option AYZ)		18 GHz to 325 GHz

Frequency reference

		(Option 1D5)
Aging	$\pm 2 \times 10^{-6}/\text{year}$	$\pm 1 \times 10^{-7}/\text{year}$
Temperature stability	$\pm 5 \times 10^{-6}$	$\pm 1 \times 10^{-8}$ (20 to 30 °C)
Settability	$\pm 5 \times 10^{-7}$	$\pm 1 \times 10^{-8}$

Frequency readout accuracy

(Start, Stop, Center, Marker)	$\pm(\text{frequency indication} \times \text{frequency reference error}^1 + \text{span accuracy} + 15\% \text{ of RBW} + 10 \text{ Hz} + 1 \text{ Hz} \times N^4)$
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Marker frequency counter²

Accuracy ³	$\pm(\text{marker frequency} \mp \text{frequency reference error}^1 + \text{counter resolution})$
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 $\times N^4$
Accuracy (>2000 sweep points)	$\pm 0.5\%$ of span
Sweep type Lin	$\pm 0.5\%$ of span
Sweep type Log	$\pm 2.0\%$ of span (characteristic)

Sweep time

Range	
Span > 0 Hz	1 ms to 4000 s
Span = 0 Hz	10 μs^{24} to 4000 s
(Option AYX)	50 ns ²⁴ to 4000 s
(Option B7D)	25 ns ²⁴ 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 and 200 Hz (–6 dB) EMI bandwidth.
Option 1DR and 1D5 ²⁵	Adds 1, 3 Hz (for spans ≤ 5 MHz)
Accuracy	
1 kHz to 3 MHz	$\pm 15\%$
5 MHz	$\pm 30\%$
1 Hz to 300 Hz (Option 1DR)	$\pm 10\%$

Selectivity (characteristic)

–60 dB/–3 dB	
10 Hz to 300 Hz	$< 5:1^6$ digital, approximately Gaussian shape
1 kHz to 5 MHz	$< 15:1^6$ synchronously tuned four poles, approximately Gaussian shape

Video bandwidth range

	30 Hz to 3 MHz ⁶ in 1-3-10 sequence
Option 1DR	Adds 1 Hz, 3 Hz, and 10 Hz (for RBW < 1 kHz)

Stability

Noise sidebands (1 kHz RBW, 30 Hz VBW and sample detector)
Offset from CW signal **Typical**

E4401B

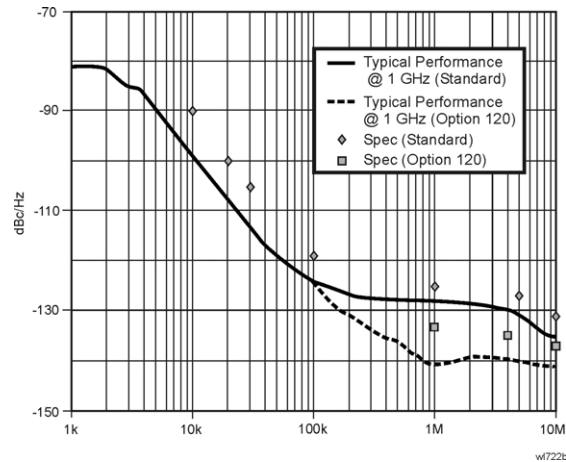
≥ 1 kHz	na	≤ -79 dBc/Hz (Option 1D5)
≥ 10 kHz	≤ -93 dBc/Hz	≤ -95 dBc/Hz
≥ 20 kHz	≤ -100 dBc/Hz	≤ -102 dBc/Hz
≥ 30 kHz	≤ -104 dBc/Hz	≤ -106 dBc/Hz
≥ 100 kHz	≤ -113 dBc/Hz	≤ -116 dBc/Hz

E4402/04/05/07B

≥ 1 kHz	na	≤ -78 dBc/Hz (Option 1D5)
≥ 10 kHz	≤ -90 dBc/Hz ²¹	≤ -94 dBc/Hz ²¹
≥ 20 kHz	≤ -100 dBc/Hz ²¹	≤ -105 dBc/Hz ²¹
≥ 30 kHz	≤ -106 dBc/Hz ²¹	≤ -112 dBc/Hz ²¹
≥ 100 kHz	≤ -119 dBc/Hz ²¹	≤ -122 dBc/Hz ²¹
≥ 1 MHz	≤ -125 dBc/Hz ²¹	≤ -127 dBc/Hz ²¹
≥ 5 MHz	≤ -127 dBc/Hz ²¹	≤ -129 dBc/Hz ²¹
≥ 10 MHz	≤ -131 dBc/Hz ²¹	≤ -136 dBc/Hz ²¹

Option 120

≥ 1 MHz	≤ -133 dBc/Hz ²¹	≤ -136 dBc/Hz ²¹
≥ 5 MHz	≤ -135 dBc/Hz ²¹	≤ -139 dBc/Hz ²¹
≥ 10 MHz	≤ -137 dBc/Hz ²¹	≤ -141 dBc/Hz ²¹



Residual FM

1 kHz RBW, 1 kHz VBW	$\leq 150 \times N^4$ Hz pk-pk in 100 ms
Option 1D5	$\leq 100 \times N^4$ Hz pk-pk in 100 ms
Option 1DR	$\leq 10 \times N^4$ Hz ⁶ pk-pk in 20 ms
Option 1DR and 1D5	$\leq 2 \times N^4$ Hz pk-pk in 20 ms
System-related sidebands	
≥ 30 kHz offset from CW signal	≤ -65 dBc + 20 Log N^4

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 dB ⁶), in 5 dB steps
E4407B	0 to 65 dB, in 5 dB steps

Trace detectors

peak, negative peak, sample rms*, average*

* detector not available in resolution bandwidth filters less than 1 KHz

Maximum safe input level

Average continuous power

	(input attenuator ≥ 15 dB)
E4401B	+30 dBm (1 W)
E4401B (75 Ω Option 1DP)	+75 dBmV (0.4 W)
	(input attenuator ≥ 5 dB)
E4402B/04B/05B/07B	+30 dBm (1 W)

Peak pulse power

	(input attenuator ≥ 30 dB)
E4401B	+30 dBm (1 W)
E4401B (75 Ω Option 1DP)	+75 dBmV (0.4 W)
E4402B/04B/05B/07B	+50 dBm (100 W)

dc

E4401B, E4402B	100 Vdc
E4401B (75 Ω Opt. 1DP)	100 Vdc
E4402B (Option UKB)	0 Vdc (dc coupled)
	50 V (ac coupled)
E4404B, E4405B	0 Vdc (dc coupled)
	50 V (ac coupled)
E4407B	0 Vdc

1 dB gain compression (total power at input mixer⁵)

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)²⁵

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 -120¹³ dB from reference level
is calibrated

Linear scale

10 divisions

Scale units

dBm, dBmV, dB μ V, Volts, dB μ A, 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 AYZ)

(sweeptimes \leq sweep points -1/100 kHz)

Log scale

0 to -85 dB

0.3 dB

Linear

0.3% of reference level

Fast sweep times for zero span (Option B7D)

(sweeptimes \leq sweep points -1/100 kHz)

sample rate < 40 MHz

Log scale

0 to -85 dB

0.2 dB

Linear

0.2% of reference level

sample rate ≥ 40 MHz

Log scale

0 to -85dB

0.3 dB

Linear

0.3% of reference level

	1 kHz RBW	10 Hz RBW (Option 1DR)	10 Hz RBW (Option 1DR) (w/preamp Option 1DS)	10 Hz RBW (Option 1DR) (w/preamp Option 1DS) typical	1Hz RBW (Option 1DR and 1D5) ²⁵ typical	1Hz RBW (Option 1DR and 1D5) ²⁵ (w/preamp Option 1DS) typical
E4401B						
400 kHz to 10 MHz	≤ -115	≤ -134	≤ -150	≤ -155	≤ -149	≤ -165
10 MHz to 500 MHz	≤ -119	≤ -138	≤ -154	≤ -156	≤ -151	≤ -166
500 MHz to 1 GHz	≤ -117	≤ -136	≤ -152	≤ -156	≤ -150	≤ -166
1 GHz to 1.5 GHz	≤ -114	≤ -133	≤ -150	≤ -155	≤ -148	≤ -165
E4402B						
30 Hz to 9 kHz ²² (Option UKB)	na	≤ -93	na	na	≤ -103	na
9 kHz to 100 kHz ²²	na	≤ -109	na	na	≤ -119	na
100 kHz to 1 MHz ²²	na	≤ -135	na	na	≤ -145	na
1 MHz to 10 MHz ²²	$\leq -120^{26}$	$\leq -139^{26}$	na	≤ -152	$\leq -149^{26}$	$\leq -162^{19}$
10 MHz to 1 GHz	≤ -117	≤ -136	$\leq -152^{19}$	≤ -156	≤ -150	$\leq -166^{19}$
1 GHz to 2 GHz	≤ -116	≤ -135	$\leq -153^{19}$	≤ -156	≤ -150	$\leq -166^{19}$
2 GHz to 3 GHz	≤ -114	≤ -133	$\leq -151^{19}$	≤ -154	≤ -150	$\leq -164^{19}$
E4404/05B/07B						
30 Hz to 9 kHz ²² (Option UKB)	na	≤ -93	na	na	≤ -103	na
9 kHz to 100 kHz ²²	na	≤ -109	na	na	≤ -119	na
100 kHz to 1 MHz ²²	na	≤ -135	na	na	≤ -145	na
1 MHz to 10 MHz ²²	$\leq -120^{26}$	$\leq -139^{26}$	na	≤ -155	$\leq -149^{26}$	$\leq -165^{19}$
10 MHz to 1 GHz	≤ -116	≤ -135	$\leq -151^{19}$	≤ -157	≤ -149	$\leq -167^{19}$
1 GHz to 2 GHz	≤ -116	≤ -135	$\leq -151^{19}$	≤ -155	≤ -150	$\leq -165^{19}$
2 GHz to 3 GHz	≤ -112	≤ -131	$\leq -149^{19}$	≤ -152	≤ -148	$\leq -162^{19}$
3 GHz to 6 GHz	≤ -112	≤ -131	na	≤ -138	≤ -148	na
6 GHz to 12 GHz	≤ -111	≤ -130	na	≤ -137	≤ -147	na
12 GHz to 22 GHz	≤ -107	≤ -126	na	≤ -134	≤ -107	na
22 GHz to 26.5 GHz	≤ -106	≤ -125	na	≤ -132	≤ -142	na
E4407B (Option AYZ)						
External mixer ⁶	$\leq -134 +$	$\leq -153 +$	na	na	na	na

external mixer

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Frequency response (10 dB input attenuation)
 Absolute⁷/Typical Relative flatness⁸

E4401B			
9 kHz to 1.5 GHz	±0.5 dB	na	±0.5 dB
E4402B/04B/05B/07B			
30 Hz to 3 GHz ⁶	±0.5 dB	na	±0.5 dB
(Option UKB)			
9 kHz to 3.0 GHz	±0.46 dB	±0.14 dB	±0.5 dB
3.0 GHz to 6.7 GHz	±1.5 dB	±0.38 dB	±1.3 dB
6.7 GHz to 13.2 GHz	±2.0 dB	±0.68 dB	±1.8 dB
13.2 GHz to 26.5 GHz	±2.0 dB	±0.86 dB	±1.8 dB

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 65 dB	±(0.1 dB + 0.01 x attenuator setting)	

Absolute amplitude accuracy

		Typical
At reference settings ¹⁵	±0.34 dB	±0.13 dB
E4401B	±0.30 dB	±0.10 dB
Preamp on ¹⁶ (Option 1DS)	±0.37 dB	±0.14 dB
External mixer (Option AYZ)	IF INPUT absolute amplitude accuracy + external mixer conversion loss accuracy ¹⁷	
Overall amplitude accuracy ⁹	±(0.54 dB + absolute frequency response)	

RF input VSWR⁶ (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 Hz ²⁵	±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)	±0.3 dB (-10 dBm to -60 dBm)
- attenuator setting	±0.5 dB (-60 dBm to -85 dBm)
+ preamp gain)	±0.7 dB (-85 dBm to -90 dBm)

Display scale fidelity

Log maximum cumulative		
RBW ≥ 1 KHz		
dB below reference level		Typical
0 dB (Reference)	±0.00 dB	±0.00 dB
> 0 to 10 dB	±0.30 dB	±0.08 dB
> 10 to 20 dB	±0.40 dB	±0.09 dB
> 20 to 30 dB	±0.50 dB	±0.10 dB
> 30 to 40 dB	±0.60 dB	±0.23 dB
> 40 to 50 dB	±0.70 dB	±0.35 dB
> 50 to 60 dB	±0.70 dB	±0.35 dB
> 60 to 70 dB	±0.80 dB	±0.39 dB
> 70 to 80 dB	±0.80 dB	±0.46 dB
> 80 to 85 dB	±1.15 dB	±0.79 dB

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) ⁶
Log incremental accuracy	
0 dB to 80 dB	±0.4dB/4dB from reference level
Linear accuracy	±2% of reference level

Linear-to-log switching Uncertainty

±0.15 dB at reference level

W-CDMA adjacent channel

Power ratio ²⁸

Dynamic range²⁹

Offset frequency	Standard	(Option 120)	(Option 120) With noise correction on
5 MHz	-60.0 dBc	-65.0 dBc	-66.5 dBc
10 MHz	-64.5 dBc	-65.5 dBc	-67.0 dBc

Spurious responses

Second harmonic distortion

E4401B	2 MHz to 750 MHz	<−75 dBc for −40 dBm tone at input mixer ⁵ . (+35 dBm SHI)
E4402/04/05/07B	10 MHz to 500 MHz	<−65 dBc for −30 dBm tone at input mixer ⁵ .
	500 MHz to 1.5 GHz	<−75 dBc for −30 dBm tone at input mixer ² . (+45 dBm SHI)
	1.5 GHz to 2.0 GHz	<−85 dBc for −10 dBm tone at input mixer ² .
	>2.0 GHz	<−100 dBc for −10 dBm tone at input mixer ⁵ (or below displayed average noise level).

Third-order intermodulation distortion

E4401B	10 MHz to 1.5 GHz	<−87 dBc for two −30 dBm tones at input mixer ⁵ and >50 kHz separation. (+13.5 dBm TOI, +19 dBm typical)
E4402B/04B/05B/07B	100 MHz to 3.0 GHz	<−85 dBc for two −30 dBm tones at input mixer ⁵ and >50 kHz separation. (+12.5 dBm TOI, +16 dBm typical)
	>3.0 GHz to 6.7 GHz	<−82 dBc for two −30 dBm tones at input mixer ⁵ and >50 kHz separation. (+11 dBm TOI, +18 dBm typical)
	>6.7 GHz	<−75 dBc for two −30 dBm tones at input mixer ⁵ and >50 kHz separation.

Other input-related spurious

>30 kHz offset	<−65 dBc for −20 dBm tone at input mixer ⁵ .
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Residual responses (input terminated and 0 dB attenuation)

150 kHz to 6.7 GHz	<−90 dBm
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Amplitude reference output

E4402B/04B/05B/07B	−20 dBm (nominal), 50 MHz
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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
CISPR Pub. 11/1990 Group 1 Class B²³

(Option 060)

Audible noise

<40 dBa pressure and <4.6 bels 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 W Power consumption <5 W
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Standby (line 0)

dc operation

Voltage	12 to 20 Vdc
Power consumption	<200 W

Data storage (nominal)

Internal ²⁷	8.0 MB
External ²⁷ (10 to 40° C)	3.5" 1.44 MB, MS-DOS "compatible floppy disk

Memory usage (nominal)

State	16 kB ²⁷
State plus 401-point trace	20 kB ²⁷

Weight⁶ (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.)

Dimensions

Without handle	222mm(H) x 409mm(D) x 373mm(W)		
With handle (maximum)	222mm(H) x 516mm(D) x 416mm(W)		
E4401B	E4402B	E4404B, E4405B E4407B	
Local measurement rate ¹⁰	≥50/sec	≥45/sec	≥40/sec
Remote measurement and GPIB transfer rate ¹¹	≥45/sec	≥45/sec	≥40/sec
RF center frequency tuning time ¹⁸	≤75 ms	≤75 ms	≤75 ms

Measurement speed

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 ⁶ maximum

EXT KEYBOARD 6-pin mini-DIN, PC keyboards (for entering screen titles and file menus)

Speaker front-panel knob controls volume

Headphone jack 3.5mm (1/8 inch) miniature audio

Power output 0.2 W into 4 Ω⁶

AMPTD REF OUT 50 Ω²⁰, BNC (f)

IF INPUT (Option AYZ) 50 Ω²⁰, SMA (f)

LO OUTPUT (Option AYZ) 50 Ω²⁰, SMA (f)

Rear panel

10 MHz REF OUT 50 Ω²⁰, BNC (f), >0 dBm⁶

10 MHz REF IN 50 Ω²⁰, BNC (f), −15 to +10 dBm⁶

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 interlaced)	vertical sync rates, non- Analog RGB 640 x 480
IF, sweep and video ports (Option A4J or AYX)	
AUX IF OUT	BNC (f), 21.4 MHz, nominal –10 to –70 dBm ²⁰ (uncorrected)
AUX VIDEO OUT	BNC (f), 0 to 1 V ⁶ (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 ⁶ 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	
Range	1 μ s to 400 s
Resolution	<gate delay(s)/65000; rounded up to nearest μ s.
Accuracy	$\pm(500 \text{ ns} + 0.01\% \times \text{gate delay}$ 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
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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 10 MHz	± 2.0 dB
E4402B/04B/05B/07B	
9 kHz to 10 MHz	± 3.0 dB
10 MHz to 3.0 GHz	± 2.0 dB

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 ²⁰
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Noise figure

E4401B	4 dB ⁶
E4402B/04B/05B/07B	5 dB ⁶

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 \pm 5 MHz
Maximum safe input level	10 dBm (ac), \pm 10 V (dc)
VSWR	<1.9:1.6
Absolute amplitude accuracy ¹⁴	(reference levels from –10 to –60 dB)

Amplitude corrections

	20 °C to 30 °C	0 °C to 55 °C
15 to 30 dB	1.0 dB	1.5 dB
>30 to 50 dB	1.2 dB	1.7 dB
>50 to 60 dB	1.4 dB	1.9 dB

1 dB gain compression level	–20 dBm with –10 dBm reference level and 0 dB
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Mixer bias (IF INPUT)

Voltage	
Maximum range	±3.3 V
Linear compliant range	±2 V
Current (0 Ω load)	
Range	±10 mA
Resolution	<20 mA
Accuracy	± (3% + resolution)
Output impedance	490 Ω ²⁰

Option BAA FM demodulation⁶

Optimum input level	≥(-60 dBm + attenuator setting-preamp gain) and within 30 dB of the reference level
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FM deviation (FM gain)

Range	10 kHz to 1 MHz
Resolution	provides 1 Hz display annotation resolution
FM deviation range	
10 kHz to 40 kHz	12 Hz
>40 kHz to 200 kHz	60 Hz
>200 kHz to 1 MHz	300 Hz
Accuracy ¹²	<(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 requirements⁶

TV source: SA	Top 50% of linear display
TV source: EXT VIDEO IN	500 mVp-p to 2 Vp-p

Compatible standards

NTSC-M, NTSC-Japan
PAL-M, PAL-B, D, G, H, I,
PAL-N, PAL-N combination,
SECAM-L

Field selection	Entire frame, even, odd
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TV trigger line selection	1 to 625
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Notes

1. Frequency reference error = (aging rate x period of time since adjustment + settability + temperature stability).
2. Not available in RBW <1 kHz (Option 1DR).
3. Marker level to DANL >25 dB, RBW/span ≥0.002.
4. N = LO harmonic mixing mode.
5. Mixer power level (dBm) = input power (dBm)–input attenuation (dB).
6. Characteristic
7. Referenced to 50 MHz amplitude reference (20 °C to 30 °C).
8. Referenced to midpoint between highest and lowest frequency response deviations (20 °C to 30 °C).

9. 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).
10. Characteristic; factory preset, fixed center frequency, sweep points = 101, auto align off, RBW = 1 MHz, stop frequency ≤3 GHz, span >10MHz and ≤600 MHz (E4401B, span >102 MHz and ≤400 MHz).
11. 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.
12. In time-domain sweeps.
13. 0 to -70 dB range when span = 0 Hz, or when auto ranging is off.
14. RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled; sample detector; signal at reference level.
15. Reference level -25 dBm (E4401B) or -20 dBm (E4402B/04B/05B/07B); (75 W 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.
16. Reference level -30 dBm; (75 W 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.
17. Preselector centered with the Agilent 11974-series mixers.
18. Characteristic; includes center frequency tuning + measurement + GPIB transfer times, stop frequency ≤3GHz, sweep points = 101, display and markers off, single sweep.
19. 20 to 30 °C
20. Nominal
21. Add 20 log (N) for frequencies >6.7 GHz.
22. Typical
23. Meeting class A performance during dc operation.
24. RBW ≥ 1 kHz, 2 sweep points.
25. Only available with firmware revision A-08-00 or later.
26. Typical (Option 120)
27. 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.
28. Firmware revision A.07.00 or higher.
29. 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.

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