

Agilent ESA Series Spectrum Analyzers

Data Sheet

The ESA family of spectrum analyzers have proven and guaranteed performance with the flexibility to select the right level of functionality for your test needs. Take advantage of the best overall performance on a mid-performance spectrum analyzer.

Express analyzer configurations

- Basic Analyzer
Express Option BAS
- Standard Analyzer
Express Option STD
- Communications Test Analyzer
Express Option COM

Industry best typical performance

- Warm up time: 5 minutes
- Third order intermodulation distortion: +16 dBm
- Sensitivity: -166 dBm
- Amplitude accuracy: ± 0.4 dB
- Overall phase noise (all carrier frequencies^a):
 - -101 dBc/Hz (10 kHz)
 - -122 dBc/Hz (100 kHz)
 - -136 dBc/Hz (1 MHz)

a. Add 20LogN for frequencies > 6.7 GHz, where N is the harmonic mixing mode.



Definitions and Conditions

The distinction between specifications and characteristics is described as follows.

- Specifications describe the performance of parameters covered by the product warranty. (The temperature range is 0 °C to 55 °C, unless otherwise noted.)
- Characteristics describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- Typical performance describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- Nominal values indicate the expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- N/A (not applicable) - Not specified for this configuration

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

- The analyzer is within the one year calibration cycle.
- If **Auto Align All** is selected:
 - After 2 hours of storage within the operating temperature range.
 - 5 minutes after the analyzer is turned on with sweep times less than 4 seconds.
- If **Auto Align Off** is selected:
 - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
 - After the analyzer is turned on for a minimum of 90 minutes and **Align Now All** has been run.
 - When **Align Now All** is run:
 - Every hour
 - If the ambient temperature changes more than 3 °C
 - If the 10 MHz reference changes
- If **Auto Align All but RF** is selected:
 - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
 - After the analyzer is turned on for a minimum of 90 minutes and **Align Now RF** has been run.
 - When **Align Now RF** is run:
 - Every hour
 - If the ambient temperature changes more than 3 °C

Table of Contents

Definitions and Conditions	2
Frequency Specifications	3
Amplitude Specifications	7
Tracking Generator Specifications	12
Quasi-Peak Detector Specifications	13
General Specifications	14
Option Ordering	16

Frequency Specifications

Frequency range	E4411B	E4403B	E4408B
BAS configuration	9 kHz - 1.5 GHz	9 kHz - 3 GHz	9 kHz - 26.5 GHz
Custom configuration	(75 Ω input Option 1DP) 1 MHz - 1.5 GHz	N/A	N/A

Frequency range	E4402B	E4404B	E4405B	E4407B
STD or COM configuration	9 kHz - 3 GHz	9 kHz – 6.7 GHz	9 kHz – 13.2 GHz	9 kHz - 26.5 GHz
Low frequency extension Option UKB				
Custom configuration	100 Hz ^a - 3 GHz	100Hz ^a - 6.7 GHz	100Hz ^a - 13.2 GHz	100Hz ^a - 26.5 GHz External mixing Option AYZ Add 18 GHz - 325 GHz

Frequency range	100 Hz - 3 GHz	2.85 - 6.7 GHz	6.2 - 13.2 GHz	12.8 – 19.2 GHz	18.7 – 26.5 GHz
Band	0	1	2	3	4
Harmonic (N^b) mixing mode	1-	1-	2-	4-	4-

a. 30 Hz characteristic.

b. N = LO harmonic mixing mode.

Frequency Specifications

	Basic analyzer	Standard analyzer	Communications test analyzer or ESA with Option 1D5
Frequency reference			
Frequency reference error = \pm [(aging rate x time since last adjustment) + settability + temperature stability]			
Frequency readout accuracy (start, stop, center, marker) = \pm (frequency indication x frequency reference error + SP ^c +15% of RBW + 10 Hz + 1 Hz x N ^a)			
Aging rate	$\pm 2 \times 10^{-6}/\text{year}$	$\pm 2 \times 10^{-6}/\text{year}$ $\pm 1 \times 10^{-7}/\text{year}$ (Opt. 1D5)	$\pm 1 \times 10^{-7}/\text{year}$
Temperature stability	$\pm 5 \times 10^{-6}/\text{year}$	$\pm 5 \times 10^{-6}/\text{year}$ $\pm 1 \times 10^{-8}/\text{year}^b$ (Opt. 1D5)	$\pm 1 \times 10^{-8}/\text{year}^b$
Settability	$\pm 5 \times 10^{-7}/\text{year}$	$\pm 5 \times 10^{-7}/\text{year}$ $\pm 1 \times 10^{-8}/\text{year}$ (Opt. 1D5)	$\pm 1 \times 10^{-8}/\text{year}$
Span coefficient (SP) ^c	0.75 % x span	[0.5 % + 1/ (sweep points - 1)] x span	[0.5 % + 1/ (sweep points - 1)] x span
External reference	10 MHz	10 MHz	1 - 30 MHz
Marker frequency counter^d			
Accuracy = \pm (marker frequency x frequency reference error + counter resolution) Counter resolution = selectable from 1 Hz to 100 kHz			
Frequency span			
Range = 0 Hz (zero span), 100 Hz to maximum frequency range of the analyzer			
Accuracy	Linear scale	1% of span	$\pm[0.5\% \times \text{span} + 2 \times \text{span}/(\text{sweep points} - 1)]$
	Logarithmic scale	N/A	2% of span, nominal

a. N = LO harmonic mixing mode.

b. 20 to 30 °C.

c. $+5\% \text{ of span} + \frac{\text{span}}{\text{sweep pts.} - 1}$. Sweep points fixed at 401 for basic analyzer.

d. Not available in RBW < 1 kHz (Option 1DR).

Frequency Specifications

		Basic analyzer	Standard analyzer or ESA with Option AYX	Communications test analyzer or ESA with Option B7D/B7E
Sweep time and trigger				
Range	Span = 0 Hz	4 ms – 4000 s	50 ns ^a – 4000 s	25 ns ^a - 4000 s
	Span ≥ 100 Hz	4 ms – 4000 s	1 ms– 4000 s	
Accuracy (Span = 0 Hz)		± 1%		
Trigger type ^b		Free Run, Single, Line, Video, Offset, Delayed, External		
		N/A	Gate (1D6)	
		N/A		RF burst (B7E)
Delayed trigger range		1 us to 400 s		
Sweep (trace) points				
Range	Span = 0 Hz	401	2 - 8192	
	Span ≥ 100 Hz	401	101 - 8192	

		Basic analyzer	Standard analyzer	Communications test analyzer or ESA with Option 1DR and 1D5
Resolution bandwidths (1-3-10 sequence)				
Range				
(-3 dB) (-6 dB EMI)	1 kHz – 5 MHz ^d 9 KHz, 120 kHz	1 kHz – 5 MHz ^d 9 KHz, 120 kHz	1 Hz to 5 MHz ^d 200 Hz, 9 kHz, 120 kHz	
With 1DR ^c (-3dB) (-6 dB EMI)	Add 100 Hz, 300 Hz Add 200 Hz	Add 10 Hz - 300 Hz Add 200 Hz	Included	
With 1DR and 1D5 ^e	N/A	Add 1 Hz and 3 Hz	Included	
Accuracy				
1 Hz to 300 Hz	± 10%			
1 kHz to 3 MHz	± 15%			
5 MHz	± 30%			
Selectivity (60 dB/3 dB bandwidth ratio)				
100 Hz to 300 Hz	< 5:1 digital, approximately Gaussian			
1 kHz to 5 MHz	< 15:1 synchronously tuned four poles, approximately Gaussian			
Video bandwidths (1-3-10 sequence)				
Range with 1DR	30 Hz to 3 MHz Adds 1, 3, 10 Hz for RBWs less than 1 kHz			

- a. RBW ≥ 1 kHz, 2 sweep points.
b. TV trigger available with option B7B in custom configuration for ESA-E.
c. Only available for spans < 5MHz.
d. For resolution bandwidths < 1 kHz or > 3 MHz, not compatible with the rms detector.
e. Firmware revision A.08.00 and later.

Frequency Specifications

	Basic analyzer		Standard and communications test analyzer	ESA-E with Option 120 ^a
	E4411B	E4403B/08B	E4402B/04B/05B/07B	
Stability				
Noise sidebands offset from CW signal with 1 kHz RBW, 30 Hz VBW and sample detector				
Offset from CW signal	Spec and typical dBc/Hz applies to all frequencies ≤ 6.7 GHz ^{b, c} <i>Italics indicate typical performance</i>			
≥ 1 kHz	N/A	N/A	-78 dBc/Hz (Option 1D5 and 1DR)	N/A
≥ 10 kHz	-93, -95 dBc/Hz	-90, -94 dBc/Hz	-98, -101 dBc/Hz (Option 1D5) ^d	N/A
≥ 20 kHz	-100, -102 dBc/Hz	-100, -105 dBc/Hz	-104, -107 dBc/Hz	N/A
≥ 30 kHz	-104, -106 dBc/Hz	-106, -112 dBc/Hz	-110, -113 dBc/Hz	N/A
≥ 100 kHz	-113, -116 dBc/Hz	-118, -122 dBc/Hz	-118, -122 dBc/Hz	N/A
≥ 1 MHz	N/A	N/A	-125, -127 dBc/Hz	-133, -136 dBc/Hz
≥ 5 MHz	N/A	N/A	-127, -129 dBc/Hz	-135, -139 dBc/Hz
≥ 10 MHz	N/A	N/A	-131, -136 dBc/Hz	-137, -141 dBc/Hz
Residual FM (peak-to-peak)				
1 kHz RBW, 1 kHz VBW (measurement time)	≤ 150 Hz x N ^c (100 ms) ≤ 30 Hz x N ^c (20 ms), Option 1DR		≤ 150 Hz x N ^c (100 ms) ≤ 10 Hz x N ^c (20 ms), Option 1DR ≤ 2 Hz peak-to-peak x N ^c , (20 ms), Option 1DR & 1D5	
Option 1D5 only 100 ms	N/A		≤ 100 Hz x N ^c	
Option 1DR only 20 ms	N/A		≤ 10 Hz x N ^c	
Option 1DR & 1D5 20 ms	N/A		≤ 2 Hz peak-to-peak x N ^c	
System related sidebands				
≥ 30 kHz offset from carrier CW signal	≤ -65 dBc + 20logN ^c			

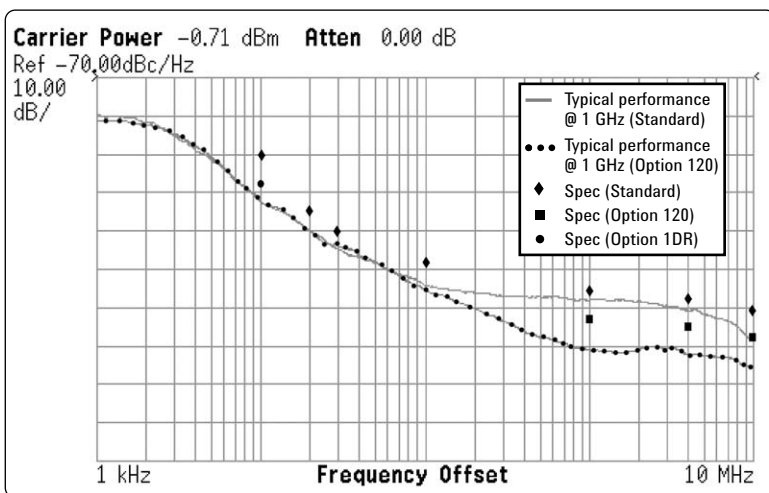


Figure 1. Typical ESA-E Series performance at 1 GHz

- Enhanced wide offset phase noise and ACPR dynamic range.
- Add 20log(N) for frequencies > 6.7 GHz.
- N=LO Harmonic mixing number.
- Option 1DR is required for phase noise measurements at frequency offsets of 10 kHz and less. Performance at the 10 kHz offset without Option 1DR is -90/-94 dBc/Hz.

Amplitude Specifications

		E4411B	E4403B/08B	E4402B	E4404B/05B	E4407B
Amplitude range						
Measurement range		Displayed average noise level (DANL) to maximum safe input level				
Input attenuator range (5 dB step)		0 – 60 dB	0 – 65 dB	0 – 75 dB	0 – 75 dB	0 – 65 dB
Maximum safe input level						
Input attenuator setting		≥ 15 dB	≥ 5 dB average continuous power; ≥ 30 dB peak pulse power			
Average continuous power		+30 dBm (1 W)	+30 dBm (1 W)	+30 dBm (1 W)		
Peak pulse power ^a			+50 dBm (100 W)	+50 dBm (100 W)		
DC voltage	DC coupled	N/A	N/A	0 Vdc (Option UKB)	0 Vdc	0 Vdc
	AC coupled	100 Vdc +75 dBmV (0.4 W) Option 1DP	100 Vdc	100 Vdc 50 Vdc (Opt. UKB)	50 Vdc	50 Vdc (Opt. UKB)
1 dB gain compression				Two tone		
Total power at input mixer ^b 50 MHz to 6.7 GHz 6.7 GHz to 13.2 GHz 13.2 GHz to 26.5 GHz		0 dBm to 1.5 GHz 46.75 dBmV (1DP)	0 dBm			
			-3 dBm			
			-5 dBm			

a. < 10 μs pulse width, < 1% duty cycle.

b. Mixer power level (dBm) = input power (dBm) minus input attenuation (dB).

Amplitude Specifications

	Basic analyzer			Standard analyzer		Communications test analyzer or ESA with 1DR and 1D5			
	E4411B	E4403B	E4408B	E4402B	E4404/05B/07B	E4402B	E4404/05/7B		
Displayed average noise level (dBm) (input terminated, 0 dB attenuation, sample detector) spec, typical									
Conditions	100 Hz RBW; 1 Hz VBW (Option 1DR);			10 Hz RBW/1 Hz VBW (Option 1DR)		1 Hz RBW/VBW (ESA with 1DR and 1D5)			
Frequency									
1 MHz - 10 MHz	-123, typ -129	typ -126	typ -129	typ -139	typ-137, -139 ^a	typ-146, -149 ^a	typ-147, -149 ^a		
10 MHz - 500 MHz	-127, typ -131	-125, typ -130	-124, typ -129	-136, typ -140	-135, typ -139	typ-150	typ -149		
500 MHz - 1 GHz	-125, typ -130						typ -150		
1 GHz - 1.5 GHz	-121, typ -128	-124, typ -130	-123, typ -130	-135, typ -140	-135, typ -140		typ -148		
1.5 GHz - 2 GHz	N/A	-122 typ -130	-120, typ -128	-133, typ -140	-131, typ -138	N/A	typ -147		
2 GHz - 3 GHz							N/A	-118, typ -127	N/A
3 GHz - 6 GHz		-115, typ -124	-126, typ -134	typ -142					
6 GHz - 12 GHz				-109, typ -122	-125, typ -132				
12 GHz - 22 GHz									
22 GHz - 26.5 GHz									
Displayed average noise level (dBm) with RF preamplifier^b									
1 MHz - 10 MHz	N/A			typ -152	typ -155	typ -162	typ -165		
10 MHz - 1 GHz				-152, typ -156	-151, typ -157	typ -166	typ -167		
1 GHz - 2 GHz				-152, typ -156	-151, typ -155	typ -166	typ -165		
2 GHz - 3 GHz				-151, typ -154	-149, typ -152	typ -164	typ -162		

a. Custom path only, Option 120, typical.

b. 20 to 30° C. For 0 to 55° C range, see specifications guide.

Amplitude Specifications

	Basic analyzer	Standard analyzer or ESA with Option AYX	Communications test analyzer or ESA with Option B7D/B7E
Display			
Display range	0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps (10 display divisions)		
Log scale			
RBW \geq 1 kHz	Calibrated 0 to -85 dB from reference level		
RBW \leq 300 Hz	Calibrated 0 to -120 dB ^a from reference level		
Linear scale	10 divisions		
Scale units	dBm, dBmV, dB μ V, dB μ A, A, V, and W	dBm, dBmV, dB μ V, dB μ A, A, V, W and Hz (Option BAA or AYQ)	
Trace detectors	Peak, negative peak, sample, rms ^b , video averaging		
Trace functions	Clear/write, max. hold, min. hold, view, blank, operations, normalize		
Marker readout resolution			
Log scale 0 to -85 dB	0.04		
0 to -120 dB (1DR)			
Linear scale	0.01% of reference level		
Reference level			
Range	-149.9 dBm to maximum mixer level + attenuator setting		
Resolution	± 0.1 dB		
Log scale			
Linear scale	$\pm 0.12\%$ of reference level		
Accuracy ^c			
For reference level (dBm) – input attenuator setting (dB) + preamp gain (dB)			
-10 dBm to > -60 dBm	± 0.3 dB		
-60 dBm to > -85 dBm	± 0.5 dB		
-85 dBm to > -90 dBm	± 0.7 dB		
Display scale switching uncertainty (referenced to 1 kHz RBW at reference level)			
Linear to log switching	± 0.15 dB at reference level		
Resolution bandwidth switching uncertainty (referenced to 1 kHz at reference level)			
1 Hz, 3 Hz RBW	N/A	± 0.3 dB (1DR, 1D5)	± 0.3 dB (1D5)
10 Hz, 30 Hz RBW	N/A	± 0.3 dB (1DR)	± 0.3 dB
100 Hz, 300 Hz RBW	± 0.3 dB (1DR)	± 0.3 dB (1DR)	± 0.3 dB
1 kHz to 3 MHz RBW	± 0.3 dB		
5 MHz RBW	± 0.6 dB		

- a. 0 to -70 dB range when span = 0 Hz, or when IF gain fixed.
b. Not available for RBW < 1 kHz or > 3 MHz.
c. 50 Ω , accuracy (at a fixed frequency, a fixed attenuator, and referenced to -35 dBm (-10 dBm, Preamp On (Option 1DS))).

Amplitude Specifications

	Basic analyzer	Standard, communications test analyzer or custom configuration
Input attenuator switching uncertainty (at 50 MHz)		
Attenuator setting 0 dB to 5 dB	± 0.3 dB	
10 dB	Reference	
15 dB	± (0.1 dB + 0.01 x attenuator setting)	
20 dB to 60 dB		
Frequency response (10 dB input attenuation)		
Absolute ^a /typical/relative ^b 100 Hz to 9 kHz ^c	N/A	± 0.5 dB/NA/± 0.5 dB
9 kHz to 3 GHz	± 0.5 dB/NA/± 0.5 dB	± 0.46 dB/± 0.14 dB/± 0.5 dB ± 0.5 dB/NA/± 0.5 dB ^a (Option UKB)
3 GHz to 6.7 GHz	± 1.5 dB/NA/± 1.3 dB	± 1.5 dB/± 0.38 dB/± 1.3 dB
6.7 GHz to 13.2 GHz	± 2 dB/NA/± 1.8 dB	± 2 dB/± 0.68 dB/± 1.8 dB
13.2 GHz to 26.5 GHz		± 2 dB/± 0.86 dB/± 1.8 dB
Absolute amplitude accuracy		
At reference settings ^d Preamp on	± 0.4 dB	± 0.34 dB, ± 0.13 dB typical
Overall amplitude accuracy ^e (95% confidence) ^f	± (0.6dB + absolute frequency response)	± (0.54 dB + absolute frequency response)
	N/A	± 0.4 dB (95%)
Display scale fidelity		
Log max cumulative dB below reference level RBW ≥ 1 kHz 0 dB reference	± (0.3dB + 0.01 x dB from reference level)	0 dB
> 0 to 10 dB		±0.3 dB, typ ±0.08 dB
> 10 to 20 dB		±0.4 dB, typ ±0.09 dB
> 20 to 30 dB		±0.5 dB, typ ±0.1 dB
> 30 to 40 dB		±0.6 dB, typ ±0.23 dB
> 40 to 50 dB		±0.7 dB, typ ±0.35 dB
> 50 to 60 dB		±0.7 dB, typ ±0.35 dB
> 60 to 70 dB		±0.8 dB, typ ±0.39 dB
> 70 to 80 dB		±0.8 dB, typ ±0.46 dB
> 80 to 85 dB	N/A	±1.15 dB, typ ±0.79 dB
RBW ≤ 300 Hz (Option 1DR) span > 0 Hz, auto range on 0 to 98 dB ^g	± (0.3dB + 0.01 x dB from reference level)	
> 98 to 120 dB	± 2.0 dB from reference level, characteristic	
Log incremental accuracy dB below reference level 0 to 80 dB ^g	± 0.4 dB / 4 dB	
Linear accuracy	± 2% of reference level	

- a. Frequency response values are referenced to the amplitude at 50 MHz (20 to 30 °C).
- b. Referenced to midpoint between highest and lowest frequency response deviations (20 to 30 °C).
- c. Custom path ESA-E only Option UKB, typical.
- d. Settings are: reference level -25 dBm; (75 Ω reference level +28.75 dBmV); input attenuation 10 dB; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; amplitude scale linear or log; span 2 kHz; frequency scale linear; sweep time coupled, sample detector, signal at reference level.
- e. For reference level 0 to -50 dBm; input attenuation 10 dB; RBW 1 kHz; VBW 1 kHz; amplitude scale log, log range 0 to -50 dB from reference level; frequency scale linear; sweep time coupled; signal input 0 to -50 dBm; span ≤ 20 kHz. (20 to 30 °C).

- f. Input frequency < 3GHz; -50 dBm ≤ input power ≤ 0 dBm; -50 dBm ≤ reference level ≤ 0 dBm; -20 dB ≤ input power - ref level ≤ 0 dB; input attenuation = 10 dB; 10 Hz ≤ RBW ≤ 1 MHz; (20 to 30 °C). Computed from the observation of a statistically significant number of instruments. Observations of the 50 MHz amplitude accuracy, a component of the computation of this number are performed immediately after invoking RF and IF alignments to minimize the effects of alignment drifts.
- g. 0 to 30 dB for RBW = 200 Hz.

Amplitude Specifications

	Basic analyzer E4411B/03B/08B	Standard, communications test analyzer or customer configuration E4402B/04B/05B/07B
Spurious responses		
Third order intermodulation distortion	For two -30 dBm signals at input mixer ^a and > 50 kHz separation	
10 MHz to 100 MHz	N/A	+7 dBm, characteristic
100 MHz to 3 GHz	< -75 dBc, + 7.5 dBm TOI	< -85 dBc, +12.5 dBm; typ +16 dBm TOI
3.0 GHz to 6.7 GHz		< -82 dBc, +11 dBm; typ +18 dBm TOI
6.7 GHz to 13.2 GHz		< -75 dBc, +7.5 dBm; typ +12 dBm TOI
13.2 GHz to 26.5 GHz		< -75 dBc, +7.5 dBm; typ +11 dBm TOI
Second harmonic distortion		
2 MHz to 750 MHz - 40 dBm tone at input mixer ^a	< -75 dBc, + 35 dBm SHI (E4411B)	
10 MHz to 500 MHz - 30 dBm tone at input mixer ^a	< -60 dBc, + 30 dBm SHI	< -65 dBc, + 35 dBm SHI
500 MHz to 1.5 GHz - 30 dBm tone at input mixer ^a	< -70 dBc, + 40 dBm SHI	< -75 dBc, + 45 dBm SHI
1.5 GHz to 2.0 GHz - 10 dBm tone at input mixer ^a	< -80 dBc, + 70 dBm SHI	< -85 dBc, + 75 dBm SHI
> 2 GHz - 10 dBm tone at input mixer ^a	≤ -95 dBc, + 85 dBm TOI	< -100 dBc, + 90 dBm SHI
WCDMA ACPR dynamic range^b Input terminated and 0 dB attenuation		
Offset frequency 5 MHz	N/A	-60 dBc, -65 dBc (Opt 120), -66.5 dBc noise correction on
10 MHz		-64.5 dBc, -65.5 dBc(Opt 120), -67 dBc noise correction on
Other input related spurious		
Inband > 30 kHz offset	< -65 dBc for -20 dBm tone at input mixer ^a	
Out of band responses	< -80 dBc -10 dBm tone at input mixer ^a	
Residual responses (Input terminated and 0 dB attenuation)		
50 Ω RF input impedance		
150 kHz to 1.5 GHz/6.7 GHz ^c	< -90 dBm	
75 Ω RF input impedance (Option 1DP only available on ESA-L Custom Configuration for the E4411B)		
1 MHz to 1.5 GHz	< -36 dBmV	

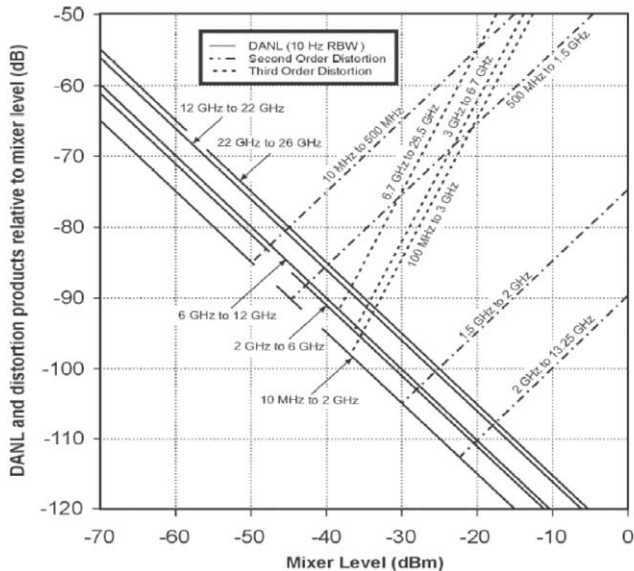


Figure 2. Specified dynamic range for E4407B spectrum analyzer

- Mixer power level (dBm) = input power (dBm) - input attenuation (dB).
- 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.
- Up to 1.5 GHz for models E4402B/03B/11B. Up to 6.7 GHz for models E4404B/05B/07B/08B.

Tracking Generator Specifications

Tracking generator Specifications (Options 1DN and 1DQ)	
Frequency range	
E4411B	
Option 1DN, (50 Ω)	9 kHz to 1.5 GHz
Option 1DQ, (75 Ω)	1 MHz to 1.5 GHz
E4402B/03B/04B/05B/07B/08B	
Option 1DN, (50 Ω)	9 kHz to 3.0 GHz
RBW range	1 kHz to 5 MHz
Output power level range	
E4411B	
Option 1DN	0 to -70 dBm
Option 1DQ	+42.75 to -27.25 dBmV
E4402B/03B/04B/05B/07B/08B	
Option 1DN	-2 to -66 dBm
Output vernier range	
E4411B	10 dB
E4402B/03B/04B/05B/07B/08B	8 dB
Output attenuator range	
E4411B	0 to 60 dB, 10 dB steps
E4402B/03B/04B/05B/07B/08B	0 to 56 dB, 8 dB steps
Output flatness	
E4411B	
Option 1DN, (50 W)	
9 kHz to 10 MHz	± 2.0 dB
10 MHz to 1.5 GHz	± 1.5 dB
Option 1DQ, (75 W)	
1 MHz to 10 MHz	± 2.5 dB
10 MHz to 1.5 GHz	± 2.0 dB
E4402B/03B/04B/05B/07B/08B	
9 kHz to 10 MHz	± 3.0 dB
10 MHz to 3.0 GHz	± 2.0 dB
Effective source match (characteristic)	
E4411B	< 2.5:1
E4402B/03B/04B/05B/07B/08B	< 2.0:1 (0 dB attenuator) < 1.5:1 (8 dB attenuator)
Spurious output	
Harmonic spurs	
E4411B	
(0 dBm output)	
9 kHz to 20 MHz	< -20 dBc
20 MHz to 1.5 GHz	< -25 dBc
E4402B/03B/04B/05B/07B/08B	
(-1 dBm output)	
20 kHz to 3 GHz	< -25 dBc
Non-Harmonic spurs	
E4411B	< -35 dBc
E4402B/03B/04B/05B/07B/08B	
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	
E4411B	
Option 1DN	(-15 dBm to 0 dBm) – (source attenuator setting)
Option 1DQ	(+27.75 dBmV to +42.75 dBmV) –(source attenuator setting)
E4402B/03B/04B/05B/07B/08B	
Option 1DN	(-10 dBm to -2 dBm) – (source attenuator setting)

Quasi-Peak Detector Specifications

Add a quasi-peak detector, Option AYQ, to the ESA custom analyzer configuration. Option AYQ also includes FM demodulation capability. The quasi-peak detector displays the quasi-peak amplitude of a pulse radio frequency on continuous wave signals.

Amplitude response conforms with Publication 16 of Comite International Special des Perturbations Radioelectrique (CISPR) Section 1, Clause 2, as indicated in the relative quasi-peak response table.

ESA Custom configuration with Option AYQ (requires Option 1DR)			
Relative quasi-peak response to a CISPR pulse (dB)			
Pulse repetition frequency (Hz)	120 kHz EMI BW .03 to 1 GHz	9 kHz EMI BW 0.150 to 30 MHz	200 Hz EMI BW 9 kHz to 150 kHz
1000	+8.0 ±1.0	+4.5 ±1.0	-----
100	0 dB reference ^a	0 dB reference ^a	+4.0 ±1.0
60	-----	-----	+3.0 ±1.0
25	-----	-----	0 dB reference ^a
20	-9.0 ±1.0	-6.5 ±1.0	-----
10	-14 ±1.5	-10.0 ±1.5	-4.0 ±1.0
5	-----	-----	-7.5 ±1.5
2	-26 ±2.0	-20.5 ±2.0	-13.0 ±2.0
1	-----	-22.5 ±2.0	-17.0 ±2.0
Isolated pulse	-----	-23.5 ±2.0	-19.0 ±2.0

a. Reference pulse amplitude accuracy relative a 66 µV CW signal < 1.5 dB as specified in CISPR Pub 16 CISPR reference pulse: 0.44 µVs for 30 MHz to 1 GHz, 0.316 µVs for 150 kHz to 30 MHz, 13.5 µVs for 9 kHz to 150 kHz

General Specifications

	Basic analyzer			Standard, communications test analyzer or custom configuration	
	E4411B	E4403B	E4408B	E4402B	E4404/05/07B
Temperature range					
Operating	0 °C to +55 °C				
Storage	-40 °C to +75 °C				
Disk drive	10 °C to +40 °C				
EMI compatibility	Conducted and radiated interference is in compliance with CISPR Pub. 11/1990 Group 1 Class A Conducted and radiated interference is in compliance with CISPR Pub. 11/1990 Group 1 Class B ^a (Option 060)				
Audible noise sound pressure at 25 °C	< 40 dBa pressure and < 4.6 bels power (ISODP7779)				
Military specifications	Type tested to the environmental specifications of MIL-PRF-28800F class 3				
Power requirements	Type tested to the environmental specifications of MIL-PRF-28800F class 3				
AC operation on (line)	90 to 132 V rms, 47 to 440 Hz 195 to 250 V rms, 47 to 66 Hz Power consumption < 300W				
Standby (line Ⓟ)	Power consumption < 5W				
DC operation	12 to 20 Vdc, < 200 W power consumption				
Data storage (nominal)					
Internal ^b	200 traces or states/8.0 MB				
External	3.5" 1.44 MB, MS-DOS				
Memory usage (nominal)					
State	16 kB ^c				
State plus 401- point trace	20 kB ^c				
Weight (without options)					
Kilograms	13.2 kg 29.1 lb	15.5 kg 34.2 lb	17.1 kg 37.7 lb	15.5 kg 34.2 lb	17.1 kg 37.7 lb
Measurement speed					
Local measurement rate	≥ 35/sec	≥ 30/sec	≥ 28/sec	≥ 45/sec	≥ 40/sec
Remote measurement and GPIB transfer	≥ 30/sec	≥ 30/sec	≥ 30/sec	≥ 45/sec	≥ 40/sec
RF center freq tuning time	≤ 90 ms	≤ 90 ms	≤ 90 ms	≤ 75 ms	≤ 75 ms
Display resolution^d	640 x 480				

a. Meeting class A performance during DC operation.

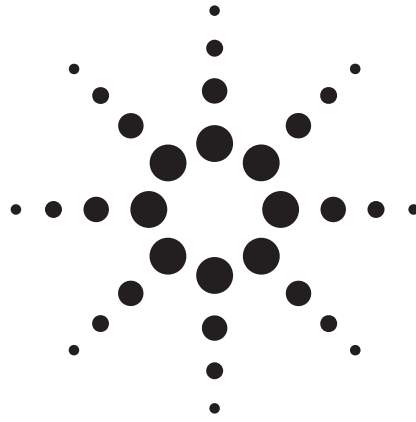
b. For serial numbers < US414400 or MY41440000, 1MB without Option B72, 8 Mb with Option B72.

c. 401 sweep points. The size of a state will increase depending on the installed application(s).

d. The LCD display is manufactured using high precision technology. However, there may be up to six bright points (white, blue, red or green in color) that constantly appear on the LCD screen. These points are normal in the manufacturing process and do not affect the measurement integrity of the product in any way.

General Specifications *(continued)*

Inputs/outputs	
Front panel	
Input	50 Ω type N (f); 75 Ω BNC (f) (Option 1DP); 50 Ω APC 3.5 (m) (Option BAB)
RF out	50 Ω type N (f); 75 Ω BNC (f) (Option 1DQ)
Probe power	+ 15 Vdc, -12.6 Vdc at 150 mA maximum (characteristic)
External keyboard	6-pin mini-DIN, PC keyboards (for entering screen titles and file names)
Headphone	Front panel knob controls volume
Power output	0.2 W into 4 Ω (characteristic)
AMPT REF out	50 Ω BNC (f) (nominal)
IF INPUT (Option AYZ)	50 Ω SMA (f) (nominal)
LO OUTPUT (Option AYZ)	50 Ω SMA (f) (nominal)
Rear panel	
10 MHz REF OUT	50 Ω BNC (f), > 0 dBm (characteristic)
10 MHz REF IN	50 Ω BNC (f), -15 to +10 dBm (characteristic)
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-interlaced 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 (uncorrected)
AUX VIDEO OUT	BNC (f), 0 to 1V, characteristic (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 ramp
GPIO 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
I/O connectivity software	IO Libraries Suite (www.agilent.com/find/iosuite/data-sheet)
Dimensions and weight for the ESA family of analyzers.	
Width to outside of instrument handle	416 mm (16.4 in.)
Width to outside of the shipping cover	373 mm (14.7 in.)
Overall height	222 mm (8.75 in.)
Depth from front frame to rear frame	409 mm (16.1 in.)
Depth with instrument handle rotated horizontal	516 mm (20.3 in.)
E4401B/11B	
Instrument Weight	13.2 kg (29.1 lbs.)
Shipping Weight	25.1 kg (55.4 lbs.)
E4402B/E4403B	
Instrument Weight	15.5 kg (34.2 lbs.)
Shipping Weight	27.4 kg (60.4 lbs.)
E4404B/E4405B	
Instrument Weight	17.1 kg (37.7 lbs.)
Shipping Weight	31.9 kg (70.3 lbs.)
E4407B/08B	
Instrument Weight	17.1 kg (37.7 lbs.)
Shipping Weight	31.9 kg (70.3 lbs.)



Agilent ESA/EMC Spectrum Analyzer

Configuration Guide



This configuration guide will help you select the right options to optimize the ESA or EMC analyzer for your application. In addition, it includes information for upgrading your existing ESA or EMC analyzer. For additional product and application information, please see the information listed at the end of this guide.

The ESA analyzer is available in three “express option” choices that each have a simplified set of the most frequently ordered options. Express options are favorably priced and provide faster delivery.

The EMC analyzer is available in two models, which include the most frequently ordered options.

For unique requirements, the ESA analyzer may be custom configured from the complete set of available options.



Express Analyzers - best delivery and price

Basic Analyzer – ESA-L Series (Express Option BAS/BTG)

Note: All basic analyzers include a 50 ohm RF input port.

Available models		
E4411B (9 kHz to 1.5 GHz)		The BAS express option is only available on the ESA-L Series models. For a basic analyzer with tracking generator, order Option BTG instead of Option BAS.
E4403B (9 kHz to 3.0 GHz)		
E4408B (9 kHz to 26.5 GHz)		
Included options		Comments
IF sweep, and video output ports	A4J	Occupies one expansion slot
GPIO connection	A4H	Occupies one expansion slot
IntuiLink PC connectivity software	***	Connects to Microsoft® Word and Excel
Available options		Comments
Replace GPIO connection (A4H) with serial port	1AX	Not compatible with Option A4H; occupies one expansion slot
Narrow resolution bandwidths	1DR	100 Hz minimum on ESA-L Series
50 ohm tracking generator (9 kHz to 3.0 GHz)	BTG	TG operates to 1.5 GHz on E4411B; equivalent to Option BAS with 1DN
8590 Series programming code compatibility	290	Free download on Web at www.agilent.com/find/esa ; no license required
Accessories shown on page 6		
Future upgrades		
Only limited upgrades are available on ESA-L Series		See page 8

Express Analyzers - best delivery and price

Standard Analyzer – ESA-E Series (Express Option STD/STG)

Available models		
E4402B (9 kHz to 3.0 GHz)		The STD express option is only available on the ESA-E Series models. For a standard analyzer with tracking generator, order Option STG instead of Option STD.
E4404B (9 kHz to 6.7 GHz)		
E4405B (9 kHz to 13.2 GHz)		
E4407B (9 kHz to 26.5 GHz)		
Included options		Comments
Fast time domain sweep, IF and video output ports	AYX	
FM demodulation / deviation	BAA	Occupies one expansion slot
GPIO Connection	A4H	Occupies one expansion slot
IntuiLink PC connectivity software	***	Connects to Microsoft Word and Excel
Available options		Comments
Performance option bundle	B75	Includes Options 1D5, 1DR, 1DS
Replace GPIO connection (A4H) with serial port	1AX	Not compatible with Option A4H; occupies one expansion slot
High stability frequency reference	1D5	
Time-gated spectrum analysis	1D6	
50 ohm tracking generator (9 kHz to 3.0 GHz)	STG	Equivalent to Option STD with 1DN
Narrow resolution bandwidths	1DR	10 Hz minimum with Option 1DR or 1 Hz minimum with Options 1DR and 1D5
Preamplifier built-in for enhanced sensitivity	1DS	
Noise figure measurement application	219	See Option 219 Technical Overview for recommended options
Cable fault location measurement application	225	Requires Option 1DN or STG; recommended Option B7K
Phase noise measurement application	226	For phase noise measurements ≤ 10 kHz requires Option 1DR
Cable TV service and installation application	227	
Benchlink Web remote control software	230	Requires Option A4H
HP 8566/68 programming code compatibility	266	Free download on Web at www.agilent.com/find/esa ; no license required
8590 Series programming code compatibility	290	Free download on Web at www.agilent.com/find/esa ; no license required
Accessories shown on page 6		
Future upgrades		
Available expansion slots in the “standard” analyzer for future upgrades: E4402B – 3 expansion slots E4402B with Option 219 – 2 expansion slots E4404/5/7B – 2 expansion slots E4404/5/7B with Option 219 – 1 expansion slot		Future upgrades on the “standard” analyzer are available, given the necessary configuration requirements are met. See page 7.

Express Analyzers - best delivery and price

Communications Test Analyzer – ESA-E Series (Express Option COM)

Available models		
E4402B (9 kHz to 3.0 GHz) E4404B (9 kHz to 6.7 GHz) E4405B (9 kHz to 13.2 GHz) E4407B (9 kHz to 26.5 GHz)		The COM express option is only available on the ESA-E Series models.
Included options		Comments
High stability frequency reference	1D5	
Narrow resolution bandwidths	1DR	1 Hz minimum
ESA to 89601A vector signal analysis software link utility	231	
FM demodulation /deviation	BAA	Occupies one expansion slot
Digital demodulation hardware	B7D/B7E	Occupies two expansion slots
GPIO connection	A4H	Occupies one expansion slot
IntuiLink PC connectivity software	***	Connects to Microsoft Word and Excel
Available options		Comments
Replace GPIO connection (A4H) with serial port	1AX	Not compatible with Option A4 or Option 231; occupies one expansion slot
Time-gated spectrum analysis	1D6	Recommended selection
Preamplifier built-in for enhanced sensitivity	1DS	Recommended selection
Noise figure measurement personality	219 ¹	See Option 219 Technical Overview for recommended options
Phase noise measurement personality	226 ¹	For phase noise measurements ≤ 10 kHz requires Option 1DR
Cable TV service and installation personality	227 ¹	
Modulation analysis personality	229 ¹	
Benchlink Web remote control software	230	Requires Option A4H
EDGE upgrade to GSM measurement personality	252 ¹	Requires Option BAH
cdmaOne measurement personality	BAC ¹	
GSM/GPRS measurement personality	BAH ¹	Requires Option 1D6
HP 8566/68 programming code compatibility	266 ¹	Free download on Web, www.agilent.com/find/esa ; no license required
8590-Series programming code compatibility	290 ¹	Free download on Web, www.agilent.com/find/esa ; no license required
Accessories shown on page 6		
Future upgrades		
Available expansion slots in “communications test” analyzer for future upgrades: E4402B – 2 expansion slots E4402B with Option 219 – 1 expansion cardslots E4404/5/7B – 1 expansion slot E4404/5/7B with Option 219 - no expansion slots		Future upgrades on the “communications test” analyzer are available given the necessary configuration requirements are met. See page 7.

1. If more than two or three measurement personalities are ordered, memory size limitations may limit the number that may be loaded into the ESA at any one time. For detailed information about memory size limits, please see the web site:
<http://sa.tm.agilent.com/ESA/memory/>

Custom Configurations

ESA-L Series

Note: All custom ESA-L Series configurations include a 75 ohm RF input port.

Available models		
E4411B (9 kHz to 1.5 GHz)		Custom configuration not available for E4403B or E4408B
Included options		Comments
GPIB connection	A4H	Standard on every instrument unless Option 1AX is ordered; occupies one expansion slot
IntuiLink PC connectivity software	***	Connects to Microsoft Word and Excel
75 ohm impedance	1DP	Not compatible with Option 1DN
Available options		Comments
Replace GPIB connection (A4H) with serial port	1AX	Not compatible with Option A4H; occupies one expansion slot
IF sweep, and video output ports	A4J	Occupies one expansion slot
Narrow resolution bandwidths	1DR	100 Hz minimum on ESA-L Series
75 ohm tracking generator (1 MHz to 1.5 GHz)	1DQ	Requires Option 1DP; not compatible with Option 1DN
8590 series programming code compatibility	290	Free download from www.agilent.com/find/esa ; no license required
Accessories shown on page 6		
Future Upgrades		
Only limited upgrades are available on ESA-L Series		See page 8

Custom Configurations

ESA-E Series

Available models		
E4402B (30 Hz to 3.0 GHz)		Frequency range shown is with Option UKB installed The E4402B has six expansion slots The E4404/5/7B have five expansion slots
E4404B (30 Hz to 6.7 GHz)		
E4405B (30 Hz to 13.2 GHz)		
E4407B (30 Hz to 26.5 GHz)		
Included options		Comments
GPIB connection	A4H	Standard on every instrument unless 1AX is ordered; occupies one expansion slot
IntuiLink PC connectivity software	***	Connects to Microsoft Word and Excel
Available options		Comments
High stability frequency reference	1D5	Recommended option
Narrow resolution bandwidths	1DR	1 Hz minimum; recommended option
Low emissions shielding	060	Not compatible with Option B7B
Wide offset phase noise improvement and ACPR dynamic range extension	120	Occupies one expansion slot
Replace GPIB connection (A4H) with serial port	1AX	Not compatible with Option A4H; occupies one expansion slot
Time-gated spectrum analysis	1D6	
50 ohm tracking generator (9 kHz to 3.0 GHz)	1DN	
Preamplifier built-in for enhanced sensitivity	1DS	
Noise figure measurement personality plus hardware	219 ¹	See Option 219 Technical Overview for recommended options
Cable fault location measurement personality	225 ¹	Requires Option 1DN; not compatible with Option BAH; recommended accessory Option B7K
Phase noise measurement personality	226 ¹	For phase noise measurements ≤ 10 kHz requires Option 1DR
Cable TV field service and analog broadcast measurement personality	227 ¹	
Modulation analysis personality	229 ¹	Requires Options B7D, B7E, A4H,1D5; includes capability of Option 231 ²
Benchlink Web remote control software	230	Requires Option A4H
ESA to 89601A vector signal analysis software link utility	231	Requires Options B7D, B7E, A4H,1D5; Option 229 includes capability of Option 231 ²
EDGE upgrade to GSM measurement personality	252 ¹	Requires Option BAH
HP 8566/68 programming code compatibility	266	Free download on Web, www.agilent.com/find/esa ; no license required
8590 Series programming code compatibility	290	Free download on Web, www.agilent.com/find/esa ; no license required
Bluetooth measurement analyzer FSK demodulator (Option 106) Bluetooth measurement personality (Option 228)	304 ¹	Includes Options 228, 106, B7D ³ , B7E, 1DS, 1D5; occupies three expansion slots
EMI detectors and FM demodulation	AYQ	Occupies one expansion slot; requires Option 1DR
Fast time domain sweep; IF, sweep, and video output ports	AYX ⁴	Occupies one expansion slot
External mixing	AYZ	Available on E4407B only
TV trigger and picture on screen	B7B	Requires Option BAA; not compatible with Option 060
Digital demodulation hardware	B7D ⁴ / B7E	Requires Option 1D5; occupies two expansion slots, must be ordered jointly
FM demodulation / deviation	BAA	Not compatible with Option 304, or 106; occupies one expansion slot
APC 3.5 mm input connector	BAB	Available on the E4407B only
cdmaOne measurement personality	BAC ¹	Requires Options B7D, B7E, 1D5
GSM/GPRS measurement personality	BAH ¹	Requires Options B7D, B7E, 1D5, 1D6; includes capability of Option 225
26.5 GHz uncalibrated built in preamp	H26	Performance not specified; available on E4407B only
70 MHz IF output	H70	Recommended for use with 89611A VSA; occupies one expansion slot
FM deviation personality enhancement	J36	Requires Option BAA. Measure peak-to-peak deviation, positive and negative peaks
100 Hz (30 Hz usable) frequency range extension	UKB	Requires Option 1DR
Accessories shown on page 6		

1. If more than two or three measurement personalities are ordered, memory size limitations may limit the number that may be loaded into the ESA at any one time. For detailed information about memory size limits, please see the web site: <http://sa.tm.agilent.com/ESA/memory/>
2. The 89601A software is available for download at: www.agilent.com/find/89600
3. Option B7D has the same fast ADC capability as Option AYX. Only order Option AYX with Option 304 if you need the IF, sweep, and video output ports.
4. Option AYX and B7D both have the same fast ADC capability.

Supplemental Option Information Equivalent Options and Bundles

Option	Equivalent Option(s)	Comments
<i>ESA-L Series</i>		
BAS - Basic analyzer	A4J	Order BAS or BTG to get best delivery and price
BTG - Basic analyzer with TG	A4J, 1DN	
<i>ESA-E Series</i>		
STD - Standard analyzer	AYX, BAA	Order STD, STG, or COM to get best delivery and price
STG - Standard analyzer with TG	AYX, BAA, 1DN	
COM - Communication test analyzer	B7D, B7E, 1D5, 1DR, BAA, 231	
B75 - Performance bundle	1DR, 1DS, 1D5	Only available with Express Analyzer Option STD or STG
304 - Bluetooth premium bundle	228, 106, B7D, B7E, 1DS, 1D5	Options 106 and 228 are not available outside of the Option 304 bundle

Express Analyzers

EMC Standard Analyzer - E7400A Series EMC Analyzer (Express Option STD/STG)

Available models		
E7402A (30 Hz to 3.0 GHz)		The standard EMC analyzer (option STD) contains all the included options listed below. To receive a standard analyzer with a tracking generator order options STG.
E7405A (30 Hz to 26.5 GHz)		
Included options		Comments
GPIB connection	A4H	Occupies one expansion slot
EMI detectors and FM demodulation	AYQ	Occupies one expansion slot
Fast time domain sweep, IF and video output ports	AYX	
100 Hz (30 Hz usable) frequency range extension	UKB	
Low emissions shielding	060	
Narrow resolution bandwidths	1DR	1 Hz resolution
Preamplifier built-in for enhanced sensitivity	1DS	Operates to 3 GHz
High stability frequency reference	1D5	
EMC measurement firmware	***	Automated EMC measurements
IntuiLink PC connectivity software	***	Connects to Microsoft Word and Excel
Available options		Comments
50 ohm tracking generator (9 kHz to 3.0 GHz)	STG	Equivalent to Option 1DN
Replace GPIB connection (A4H) with serial port	1AX	Not compatible with Option A4H or E7415A EMI measurement software: occupies one expansion slot
Time-gated spectrum analysis	1D6	
Accessories shown on page 6		
Future upgrades		
Available expansion slots in the standard analyzer for future upgrades:		
E7402A - 3 expansion slots		
E7405A - 2 expansion slots		

Accessories

ESA and EMC Accessories

Options	Description	Comment	Part number ¹
ESA specific accessories			
A5D	12 VDC power cable	DC power connection available on every ESA	E4401-60066
AXT	Hard transit case		E4401-60101
AYT	Gray soft carrying/operation case		E4401-60117
AYU	Yellow soft carrying/operation case		E4401-60118
B7K	Cable fault measurement kit (50 ohm)	Requires Option 1DN or STG, and Option 225 or BAH	
042	Gray backpack carrying case		9300-2465
044	Yellow backpack carrying case		9300-2470
1CP	Rack mount kit with handles	This kit is designed to fit into Agilent racks only. For non-Agilent racks, additional end brackets are required and are available by ordering part number: 1494-0061	E4401-60057
1D7	50 to 75 ohm minimum loss pad		0955-1020
E1779A	Rechargeable snap-on battery and charger	Order as separate model number, not option number	
UK9	Front panel cover		E4401-60193
Software / Firmware			
B70	Benchlink spectrum analyzer, PC software	Also orderable as E4444A; requires A4H or 1AX	
230	Benchlink Web remote control software	Requires A4H	
***	IntuiLink software (shipped with every instrument)	Available on Web site for download	
UE2	Firmware upgrade	Firmware updates also available on Web site for free download http://www.agilent.com/find/esa_firmware	
Documentation			
OB1	Add extra manual set	Available for Web download	
UK6	Commercial calibration certificate with test data		
OBO	Delete manual set (retains CD-ROM version)		
OBV	Service documentation, component level CLIP	Component level information package	
OBW	Service documentation, assembly level	Performance verification and adjustment software included	
AB0	Taiwan-Chinese user's guide	Available for Web download; www.agilent.com/find/esa	
AB1	Korea-Korean user's guide	Available for Web download; www.agilent.com/find/esa	
AB2	China-Chinese user's guide	Available for Web download; www.agilent.com/find/esa	
ABD	Germany-German user's guide	Available for Web download; www.agilent.com/find/esa	
ABE	Spain-Spanish user's guide	Available for Web download; www.agilent.com/find/esa	
ABF	France-French user's guide	Available for Web download; www.agilent.com/find/esa	
ABJ	Japan-Japanese user's guide	Available for Web download; www.agilent.com/find/esa	
ABZ	Italy-Italian user's guide	Available for Web download; www.agilent.com/find/esa	
AKT	Russia-Russian user's guide	Available for Web download; www.agilent.com/find/esa	
Warranty, service, and calibration (www.home.agilent.com/USeng/nav/-12217.0/pc.html)			
R-51B-001-C	1 year return-to-Agilent warranty and service	Standard	
R-51B-001-3C	3 year return-to-Agilent warranty and service	Default	
General spectrum analyzer accessories			
11970	Harmonic mixer series (26.5, 40, 50, 60, 75, 110 GHz)	For use in E4407B Option AYZ	
11974	Preselected millimeter mixer series (40, 50, 60, 75 GHz)	For use in E4407B Option AYZ	
11909A	Low noise amplifier to 1 GHz		
8447A/D	Amplifiers to 400 MHz and 1.3 GHz		
8449B	Preamplifier to 26.5 GHz		

Note: Pictures of certain accessories can be found in the ESA Series Brochure (5968-3278E).

1. For new instrument orders, accessories are ordered the same way as other options. For example, to order Option 1CP (rack mount and handle kit) for a new E4402B, order: E4402B-1CP.

There are two ways to order upgrades:

Method 1: Add the letter U to the end of the model number. For example, to order an Option 1CP for an existing E4402B, order: E4402BU-1CP

Method 2: Order the part number. For example, to order the rack mount and handle kit (equivalent to Option 1CP), order E4401-60057.

Depending on availability, faster delivery of upgrades may be possible by ordering the part number instead of the option number.

See www.agilent.com/find/sa_upgrades and www.parts.agilent.com for more information.

Upgrades ESA-L Series

Available models:			Customer upgradeable	Customer upgradeable w/ test	Self-maintainers with Option 0BW & N7811A software ¹	Return to service center	Return to factory
E4411BU (9 kHz to 1.5 GHz) E4403BU (9 kHz to 3.0 GHz) E4408BU (9 kHz to 26.5 GHz)		Options not listed are not available for upgrade on the ESA-L Series Analyzer					
Ordering instructions							
To upgrade an existing ESA-L Series spectrum analyzer, order the corresponding model number followed by a 'U' and the desired option number. Ex. E44xxBU-xxx		For more information see: http://www.agilent.com/find/esa-l_upgrades					
HW capabilities and performance							
Color display upgrade	049	Requires B72 plus firmware version A11.00 or higher	X				
Replace GPIB connection (A4H) with serial port	1AX	Not compatible with A4H; occupies one expansion slot		X		X	
GPIB connection	A4H	Not compatible with 1AX; occupies one expansion slot		X		X	
50 ohm tracking generator (9 kHz to 3.0 GHz)	1DN	Incompatible with 1DP; Operates to 1.5 GHz on E4411B; included in Option BTG		X		X	
75 ohm tracking generator (1 MHz to 1.5 GHz)	1DQ	E4411B only, requires Option 1DP		X		X	
Narrow resolution bandwidths	1DR	Requires B72 plus firmware version A11.00 or higher; 100 Hz minimum on ESA-L Series		X		X	
Memory extension to 10 MB	B72	Included on instrument prefixes ≥ US4144 or MY4144 Required for firmware version A.08.00 or higher	X			X	
IF sweep, video output ports	A4J	Included in all ESA-L analyzers with Option BAS or BTG; occupies one expansion slot		X		X	
APC 3.5 mm input connector	BAB	E4408B only			X	X	
Applications and firmware							
8590-series programming code compatibility	290	Available for Web download; www.agilent.com/find/esa	X				

Upgrades E7400A series EMC analyzer

Available models:			Customer upgradeable	Customer upgradeable w/ test	Self-maintainers with Option 0BW & N7811A software ¹	Return to service center	Return to factory
E7401AU (9 kHz to 1.5 GHz) E7402AU (30 Hz to 3.0 GHz) E7403AU (30 Hz to 6.7 GHz) E7404AU (30 Hz to 13.2 GHz) E7405AU (30 Hz to 26.5 GHz)		Options not listed are not available for upgrade on the EMC analyzers					
Ordering instructions							
To upgrade an existing EMC Series spectrum analyzer, order the corresponding model number followed by a 'U' and the desired option number. Ex. E740AU-xxx		For more information see: http://www.agilent.com/find/emc_upgrades					
HW capabilities and performance							
Replace GPIB connection (A4H) with serial port	1AX	Not compatible with A4H or E7415A; occupies one expansion slot		X		X	
GPIB connection	A4H	Not compatible with 1AX; occupies one expansion slot		X		X	
Time-gated spectrum analysis	1D6			X		X	
IF sweep, video output ports	A4J	Occupies one expansion slot		X		X	
50 ohm tracking generator (9 kHz to 3.0 GHz)	1DN	Operates to 1.5 GHz on E7401A;		X		X	
Fast time domain sweep; IF, sweep, and video output ports	AYX	Occupies one expansion slot, standard in all E7400 analyzers with Option STD or STG		X		X	
100 Hz (30 Hz usable) frequency range extension	UKB	Included in all E7400 analyzers with Option STD or STG			X	X	
APC 3.5 mm input connector	BAB	Available on the E7405A only			X	X	
High stability frequency reference	1D5	Included in all E7400 analyzers with Option STD or STG				X	

1. Self-maintainers are customers who service and calibrate their own instruments.
Information about the N7811A software can be found at: <http://calsw.tm.agilent.com/>