Keysight Technologies
ESA-E Series Spectrum Analyzer

Data Sheet

Available frequency ranges:

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

KEYSIGHT TECHNOLOGIES

Introduction

Customers wanting to take advantage of the ESA flexibility, but who need a faster analyzer for the manufacturing line, or connectivity to LAN/USB in addition to GPIB, or want to do in depth signal analysis with 89600 VSA software, will benefit from the Keysight Technologies, Inc. EXA signal analyzer. For comparison convenience, the EXA specifications are shown in this ESA-E data sheet.

Customers looking for a general-purpose spectrum analyzer will appreciate the flexibility of the Keysight ESA-E Series spectrum analyzer, which can be used for a wide range of applications from aerospace and defense to the manufacturing line. With express analyzer configurations (STD/STG/COM), customers will benefit from faster delivery and its price advantage.

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Definition of Specifications

The ESA-E Series spectrum analyzers are tested to ensure they will meet their warranted performance. Unless otherwise stated, all specifications are valid over 0 to 55 °C. Supplemental characteristics, shown in italics, are intended to provide additional information that is useful in using the instrument. These typical (expected) or nominal performance parameters are not warranted but represent performance that 80 percent of the units tested exhibit with 95 percent confidence at room temperature (20 to 30 °C). This data sheet is intended as a quick reference to ESA-E spectrum analyzer specifications, and is by no means complete.

ESA-E Express Analyzer Options

The ESA-E Series spectrum analyzers have three express analyzer options: STD, STG, and COM.

ESA standard express analyzers (STD/STG): All standard express analyzers include fast time domain sweep, FM demodulation, and GPIB connection. To add the functionality of a tracking generator, only available on the ESA, order the STG option.

ESA communication express analyzers (COM): The ESA communication analyzer includes many additional options required to demodulate select wireless standards.

The EXA X-Series signal analyzer is a great alternative to the ESA-COM express analyzer. All demodulation hardware and speed advantages are standard. In addition, the EXA can run the 89600 VSA software internally to demodulate even the most difficult wireless signals. For a lower cost VSA alternative, many customers are now using the N9064A VXA measurement application for their remote demodulation needs with SCPI programming. The N9064A is only available on the X-Series signal analyzers and is not offered on the ESA spectrum analyzer.

This data sheet is a summary of the complete specifications and conditions, which are available in their entirety in the ESA Specification Guide and EXA Specification Guide. Each of these guides can be found online at www.keysight.com by searching for their respective publication numbers: E4401-90490 or N9010-90012.

Frequency Specifications

ESA-E spectrum analyzer		EXA signal analyzer (Comparable model number)	
Frequency range	Model	Frequency range	Model
9 kHz to 3.0 GHz	E4402B	10 Hz to 3.6 GHz	N9010A-503
9 kHz to 6.7 GHz	E4404B	10 Hz to 7.0 GHz	N9010A-507
9 kHz to 13.2 GHz	E4405B	10 Hz to 13.6 GHz	N9010A-513
9 kHz to 26.5 GHz	E4407B	10 Hz to 26.5 GHz	N9010A-526
	NA	10 Hz to 32.0 GHz	N9010A-532
	NA	10 Hz to 44.0 GHz	N9010A-544

Band break

ESA-E spectrum analyzer			EXA signal analyzer			
Frequency range	Band	Harmonic [Na] mixing mode	Frequency range	Band	Options	Harmonic [Nb] mixing mode
100 Hz to 3.0 GHz	0	1-	10 Hz to 3.6 GHz	0	503, 507, 513, 526, 532, 544	1-
2.85 to 6.7 GHz	1	1-	3.5 to 7.0 GHz	1	507	1-
6.2 to 13.2 GHz	2	2-	3.5 to 8.4 GHz	1	513, 526, 532, 544	1-
12.8 to 19.2 GHz	3	4-	8.3 to 13.6 GHz	2	513, 526, 532, 544	1- (LO doubled)
18.7 to 26.5 GHz	4	4-	13.5 to 17.1 GHz	3	526, 532, 544	2-
			17.0 to 26.5 GHz	4	526, 532, 544	2- (LO doubled)
			26.4 to 32.0 GHz	5	532	2- (LO doubled)
			26.4 to 34.5 GHz	5	544	2- (LO doubled)
			34.4 to 44.0 GHz	6	544	4- (LO doubled)

Measurement speed

Local measurement and display update rate	33 ms, (30/s)	Local measurement and display update rate	4 ms (250/s)
Remote measurement and GPIB transfer rate	33 ms, (30/s)	Remote measurement and LAN transfer rate	5 ms (200/s)
Marker peak search	300 ms	Marker peak search	1.5 ms
Center frequency tune and transfer (RF)	< 90 ms	Center frequency tune and transfer (RF)	20 ms
Center frequency tune and transfer (µW)	350 ms	Center frequency tune and transfer (µW)	47 ms

a. N is the harmonic mixing mode. For negative mixing modes (as indicated by the "–"), the desired first LO harmonic is higher than the tuned frequency by the first IF (3.9214 for the 9 kHz to 3 GHz band, 321.4 MHz for all other bands.)

b. N is the harmonic mixing mode. For negative mixing modes (as indicated by the "-"), the desired first LO harmonic is higher than the tuned frequency by the first IF (5.1225 GHz for band 0, 322.5 MHz for all other bands.

Frequency Specifications (continued)

	ESA-E spectrum analyzer		EXA signal analyzer	
	STD/STG standard express analyzer	COM express analyzer or ESA-E with Option 1D5	N9010A any frequency range	
Frequency reference				
	Frequency reference error = ±[(aging rate x time since last adjustment) + settability + temperature stability]		Frequency reference accuracy = ±[(aging rate x time since last adjustment) + temperature stability + calibration accuracy]	
	Frequency readout accuracy (start, stop, center, marker) = ±(frequency indication x frequency reference error + SP[a] + 15% of RBW + 10 Hz + 1 Hz x N[b])		Frequency readout accuracy = ±(marker frequency x frequency of reference accuracy + 0.25% x span + 5% of RBW + 2 Hz + 0.5 x horizontal resolution[c])	
Aging rate	±2 x 10–6/year ±1 x 10–7/year (Option 1D5)	±1 x 10–7/year	Option PFR ±1 x 10–7/year ±1.5 x 10–7/2 years	Standard ±1 x 10–6/year
Temperature stability	±5 x 10–6 ±1 x 10–8 [d] (Option 1D5)	±1 x 10–8 [d]	Option PFR ±1.5 x 10–8	Standard ±2 x 10–6
Settability (ESA-E) Internal calibration (EXA)	±5 x 10–7 ±1 x 10–8 (Option 1D5)	±1 x 10–8	Option PFR ±4 x 10–8	Standard ±1.4 x 10–6
Span coedfficient (SP)[a]	[0.5% + 1/ (sweep points - 1)] x span			
External reference	10 MHz	1 to 30 MHz		
Marker frequency counter[e]				
Accuracy	±(marker frequency x frequency reference error + counter resolution) Counter resolution = selectable from 1 Hz to 100 kHz		±(marker frequency x frequency reference accuracy + 0.100 Hz)	
Counter resolution	Selectable from 1 Hz to 100 kHz		0.001 Hz	
Frequency span				
Range	0 Hz (zero span), 100 Hz to maximum frequency range of the instrument		0 Hz (zero span), 10 Hz to maximum frequency of instrument	
Accuracy				
	Linear scale = ±[0.5% x span + 2 x span/(sweep points - 1)]		Swept = ±(0.25% x span + horizontal resolution)	
	Log scale = 2% of span, nominal		FFT = ±(0.10% x span + horizontal resolution)	

a. +5% of span + . Sweep points fixed at 401 for basic analyzer.
b. N is the harmonic mixing mode. For negative mixing modes (as indicated by the "–"), the desired first LO harmonic is higher than the tuned frequency by the first IF (3.9214 for the 9 kHz to 3 GHz band, 321.4 MHz for all other bands.)
c. Horizontal resolution is span/(sweep points - 1.)
d. 20 to 30 °C.
e. Not available in RBW < 1 kHz (Option 1DR.)

Frequency Specifications (continued)

		ESA-E spectrum analyzer		EXA signal analyzer
		STD/STG standard express analyzer or ESA-E with Option AYX	COM express analyzer or ESA-E with Option B7D/B7E	N9010A any frequency range
Sweep time and trigger				
Range	Span = 0 Hz	50 ns[a] to 4000 s	25 ns[a] to 4000 s	1 µs to 6000 s
	Span ≥ 100 Hz (ESA) Span ≥ 10 Hz (EXA)	1 ms to 4000 s		1 ms to 4000 s
Accuracy (Span = 0 Hz)		±1%		±0.01% nominal
Trigger type[b]		Free run, single, line, video, offset, delayed, external		Free run, line, video, external 1, external 2, RF burst, periodic timer
Time gating		Gate (1D6)		Gated LO, gated video, gated FFT
Burst trigger		NA	RF burst (B7E)	Standard
Sweep (trace) points				
Range	Span = 0 Hz	2 to 8192		1 to 40,001
	Span ≥ 100 Hz (ESA) Span ≥ 10 Hz (EXA)	101 to 8192		1 to 40,001

a. RBW ≥ 1 kHz, 2 sweep points.
b. TV trigger available with Option B7B in custom configuration for ESA-E.

Frequency Specifications (continued)

		ESA-E spectrum analyzer		EXA signal analyzer	
		STD/STG standard express analyzer	COM express analyzer or ESA-E with Option 1DR and 1D5	N9010A any frequency range	
Bandwidth					
Range	–3 dB –6 dB EMI	1 kHz to 5 MHz[a] 9 kHz, 120 kHz	1 Hz to 5 MHz[a] 200 Hz, 9 kHz, 120 kHz	N/A 200 MHz, 9 kHz, 120 kHz, 1 MHz (Opt EMC or N6141A required)	
	–3.01 dB			1 Hz to 3 MHz (10% steps), 4, 5, 6, 8 MHz	
	With 1DR[b] –3 dB –6 dB EMI	Add 10 Hz - 300 Hz Add 200 Hz	Included	Narrow RBW is standard in the EXA. Values are same as above	
	With 1DR and 1D5[c]	Add 1 Hz and 3 Hz	Included		
Resolution bandwidth accuracy					
Bandwidth	1 to 300 Hz	±10%		1 Hz to 750 kHz	±1.0% (±0.044 dB)
	1 kHz to 3 MHz	±15%		820 kHz to 1.2 MHz (< 3.6 GHz CF)	±2.0% (±0.088 dB)
	5 MHz	±30%		1.3 to 2.0 MHz (< 3.6 GHz CF)	±0.07 dB nominal
				2.2 to 3 MHz (< 3.6 GHz CF)	±0.15 dB nominal
				4 to 8 MHz (< 3.6 GHz CF)	±0.25 dB nominal
Selectivity (60 dB/3 dB) bandwidth ratio					
Bandwidth	100 to 300 Hz	< 5:1 digital, approximately Gaussian		4.1:1 nominal (all frequency ranges)	
	1 kHz to 5 MHz	< 15:1 synchronously tuned four poles, approximately Gaussian			
		Video bandwidths (1-3-10 sequence)		**Video bandwidth range**	
Range with 1DR		30 Hz to 3 MHz. Adds 1, 3, 10 Hz for RBWs less than 1 kHz		Narrow RBW is standard in the EXA	1 Hz to 3 MHz (10% steps), 4, 5, 6, 8 MHz, and wide open (labeled 50 MHz)

a. For resolution bandwidths < 1 kHz or > 3 MHz, not compatible with the rms detector.
b. Only available for spans < 5MHz.
c. Firmware revision A.08.00 and later.

Frequency Specifications (continued)

	ESA-E spectrum analyzer		EXA signal analyzer	
	STD/STG/COM express analyzers	ESA-E with Option 120[a]	All EXA configurations	
Noise sidebands (Phase noise)				
	CF = 1 GHz, 1 kHz RBW, 30 Hz VBW, sample detector, with signal ≤ –90 dBc/Hz from peak of the carrier		CF = 1 GHz	
Offset from carrier signal				
10 kHz	–98, –101 dBc/Hz (Option 1D5)[b]	NA	–101 dBc/Hz –105 dBc/Hz	
100 kHz	–118, –122 dBc/Hz	NA	–114 dBc/Hz –117 dBc/Hz	
1 MHz	–125, –127 dBc/Hz	–133, –136 dBc/Hz	–134 dBc/Hz –137 dBc/Hz	
10 MHz	–131, –136 dBc/Hz	–137, –141 dBc/Hz	–148 dBc/Hz (nominal)	
Residual FM (peak-to-peak)				
1 kHz RBW and 1 kHz VBW (measurement time)	≤ 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 and 1D5		Option PFR	≤ 0.25 Hz x N[c] (20 ms nominal)
Option 1D5 only 100 ms	≤ 100 Hz x N[c]		Standard	≤ 10 Hz x N[c] (20 ms nominal)
Option 1DR only 20 ms	≤ 10 Hz x N[c]			
Option 1DR and 1D5 only 20 ms	≤ 2 Hz peak-to-peak x N[c]			

a. Enhanced wide offset phase noise and ACPR dynamic range.
b. Option 1DR is required for phase noise measurements at frequency offsets of 10 kHz and less. Performance at 10 kHz offset without Option 1DR is –90 dBc/Hz.
c. N = LO Harmonic mixing number.

Amplitude Specifications

		ESA spectrum analyzer			EXA signal analzyer	
		E4402B	E4404B/05B	E4407B	All frequency ranges	
Amplitude range						
Measurement range		Displayed anverage noise level (DANL) to maximum safe input level			Displayed average noise level (DANL) to +23 dBm	
Mechanical input attenuator range		0 to 75 dB in 5 dB steps	0 to 75 dB in 5 dB steps	0 to 65 dB in 5 dB steps	Standard	0 to 60 dB in 10 dB steps
					Option FSA	0 to 60 dB in 2 dB steps
Electronic input attenuator range					Option EA3	0 to 24 dB in 1 dB steps
					Full attenuation range with EA3[a]	0 to 84 dB in 1 dB steps
Maximum safe input level						
Average continuous power		+30 dBm (1 W)			+30 dBm (1 W)	
Peak pulse power		+50 dBm (100 W)[b]			< 10 µs pulse width, < 1% duty cycle + 50 dBm (100 W) and input attenuation ≥ 30 dB	
DC voltage	DC coupled	0 Vdc (Option UKB)	0 Vdc	0 Vdc	±0.2 Vdc	
	AC coupled	100 Vdc 50 Vdc (Option UKB)	50 Vdc	50 Vdc (Option UKB)	±100 Vdc	
1 dB gain compression Total power at input mixer[c]		Two tone				
50 MHz to 6.7 GHz		0 dBm			Preamp on (P03) 10 MHz to 3.6 GHz	–14 dBm nominal
6.7 to 13.2 GHz		–3 dBm			20 MHz to 26.5 GHz	+9 dBm nominal
13.2 to 26.5 GHz		–5 dBm				

a. Full attenuation range 0 to 84 dB is mechanical + electronic attenuation.
b. < 10 µs pulse width, < 1% duty cycle.
c. Mixer power level (dBm) = input power (dBm) - input attenuation (dB).

Amplitude Specifications (continued)

	ESA spectrum analyzer				EXA signal analyzer
	STD/STG express analyzer		COM express analyzer or ESA with 1DR and 1D5		RF/µW (Option 503, 507, 513 or 526)
	E4402B	E4404/05B/07B	E4402B	E4404/05/7B	
Displayed average noise level (dBm) (input terminated, 0 dB attenuation, sample detector) specifications Typical values shown in italic					
Conditions	10 Hz RBW/1 Hz VBW (Option 1DR)		1 Hz RBW/VBW (ESA with Option 1DR and 1D5)		
Frequency					
1 to 10 MHz	–139	–137, –139[a]	–146, –149[a]	–147, –149[a]	–147, –149
10 to 500 MHz	–136, –140	–135, –139	–150	–149	–148, –150
500 MHz - 1 GHz					
1 to 1.5 GHz	–135, –140			–150	
1.5 to 2 GHz					
2 to 3 GHz	–133, –140	–131, –138		–148	–147, –149
3 to 6 GHz	NA		NA		–147, –149
6 to 12 GHz		–130, –137		–147	–143, –147
12 to 22 GHz		–126, –134		–144	–137, –142
22 to 26.5 GHz		–125, –132		–142	–134, –140
Displayed average noise level (dBm) with RF preamplifier[b]					
1 to 10 MHz	–152	–155	–162	–165	–161 dBm (nominal)
10 MHz to 1 GHz	–152, –156	–151, –157	–166	–167	–161, –163
1 to 2 GHz		–151, –155		–165	
2 to 3 GHz	–151, –154	–149, –152	–164	–162	–160, –162

a. Custom path only, Option 120, typical.
b. 20 to 30 °C. For 0 to 50 °C range see specification guide.

Amplitude Specifications (continued)

	ESA-E spectrum analyzer (express or custom configuration)	EXA signal analyzer
Spurious responses Typical values shown in italic		
Third order intermodulation distortion (TOI)[a]	For two –30 dBm signals at input mixer[b] and > 50 kHz separation	For two –30 dBm signals at input mixer with tone separation > 5 times IF prefilter bandwidth, 20 to 30 °C, see specification guide for IF prefilter bandwidths
10 to 100 MHz	7 dBm, characteristic	NA
100 to 400 MHz	< –85 dBc, +12.5 dBm; +16 dBm	< –86 dBc, +13 dBm, +17 dBm
400 MHz to 1. 7 GHz		< –88 dBc, +14 dBm, +18 dBm
1.7 to 3.0 GHz		
3.0 to 3. 6 GHz	< –82 dBc, +11 dBm; +18 dBm	
3.6 to 6.7 GHz		
6.7 to 7.0 GHz	< –75 dBc, +7.5 dBm; +12 dBm	
7.0 to 13.2 GHz		
13.2 to 13. 6 GHz	< –75 dBc, +7.5 dBm; +11 dBm	
13.6 to 26.5 GHz		< –84 dBc, +12 dBm, +16 dBm
Second harmonic distortion		
2 to 750 MHz - 40 dBm tone at input mixer[a]		See EXA Data Sheet or EXA Specification Guide for SHI details
10 to 500 MHz - 30 dBm tone at input mixer[a]	< –65 dBc, +35 dBm SHI	
500 MHz to 1.5 GHz - 30 dBm tone at input mixer[a]	< –75 dBc, +45 dBm SHI	
1.5 to 2.0 GHz - 10 dBm tone at input mixer[a]	< –85 dBc, +75 dBm SHI	
> 2 GHz - 10 dBm tone at input mixer[a]	< –100 dBc, +90 dBm SHI	

a. TOI = mixer tone level (in dBm) minus (distortion/2) where distortion is the relative level of the distortion tones in dBc.
b. Mixer power level (dBm) = input power (dBm) - input attenuation (dB).

Amplitude Specifications (continued)

	ESA spectrum analyzer		EXA signal analyzer
	STD/STG express analyzer or ESA with Option AYX	COM express analyzer or ESA with Option B7D/B7E	All frequency ranges
Display range			
Log scale	0.1, 0.2, 0.5 dB/division 1 to 20 dB/division in 1 dB steps (10 display divisions)		0.1 to 1 dB/division in 0.1 dB steps 1 to 20 dB/division in 1 dB steps (10 display divisions)
Linear scale	10 divisions		10 divisions
Scale units	dBm, dBmV, dBµV, dBµA, A, V, W, and Hz (Option BAA or AYQ)		dBm, dBmV, dBµV, dBmA, dBµA, V, W, and A
Trace detectors	Peak, negative peak, sample, rmsb, video averaging		Peak, negative peak, sample, normal, log power average, RMS average, and voltage average

	ESA spectrum analyzer		EXA signal analyzer	
	Standard analyzer or ESA with Option AYX	Communications test analyzer or ESA with Option B7D/B7E	All frequency ranges	
Resolution bandwidth switching uncertainty				
	Referenced to 1 kHz at reference level		Referenced to 30 kHz RBW	
1 Hz, 3 Hz RBW	±0.3 dB (Option 1DR, Option 1D5)	±0.3 dB (Option 1D5)	1 Hz to 3 MHz RBW	± 0.10 dB
10 Hz, 30 Hz RBW	±0.3 dB (Option 1DR)	±0.3 dB		
100 Hz, 300 Hz RBW	±0.3 dB (Option 1DR)	±0.3 dB		
1 kHz to 1.5 MHz RBW	±0.3 dB			
1.5 to 3 MHz RBW				
5 MHz RBW	±0.6 dB		4, 5, 6, 8 MHz RBW	±1.0 dB

Amplitude Specifications (continued)

ESA spectrum analyzer		EXA signal analyzer	
Express analyzer or custom analyzer configuration		RF/µW (Option 503, 507, 513 or 526)	
Frequency resolution			
Input attenuator switching uncertainty (at 50 MHz)			
ESA specifications vary with attenuation settings		EXA specifications vary with frequency range	
Attenuator setting		Frequency range	Nominal numbers
0 to 5 dB	±0.3 dB	9 kHz to 3.6 GHz	±0.3 dB
10 dB	Reference	3.5 to 7.0 GHz	±0.5 dB
15 to 60 dB	±(0.1 dB + 0.01 x attenuator setting)	7.0 to 13.6 GHz	±0.7 dB
		13.5 to 26.5 GHz	±0.7 dB
Frequency response (10 dB input attenuation)			
100 Hz to 9 kHz[a]	±0.5 dB	100 Hz to 9 kHz	NA
9 kHz to 3 GHz	±0.46 dB ±0.5 dB (Option UKB)	9 kHz to 10 MHz	±0.8 dB
		10 to 3.6 MHz	±0.6 dB
3 to 6.7 GHz	±1.5 dB	3.5 to 7.0 GHz	±2.0 dB
6.7 to 13.2 GHz	±2 dB	7.0 to 13.6 GHz	±2.5 dB
13.2 to 26.5 GHz	±2 dB	13.5 to 22.0 GHz	±3.0 dB
		22.0 to 26.5 GHz	±3.2 dB
Absolute amplitude accuracy			
At reference settings[b]	±0.34 dB, ±0.13 dB	At reference setting, 50 MHz	±0.40 dB
Preamp on	±0.37 dB, ±0.14 dB	Preamp on (100 kHz to 3.6 GHz)	±(0.39 dB + frequency response)
Overall amplitude accuracy[c]	±(0.54 dB + absolute frequency response)	At all frequencies	±(0.40 dB + frequency response)
95% confidence[d]	±0.4 dB (95%)	9 kHz to 3.6 GHz (95% confidence)	±0.27 dB

a. Custom path, Option UKB typical.
b. 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.
c. 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).
d. Input frequency < 3GHz; –50 dBm ≤ input power ≤ 0 dBm; –50 dBm ≤ reference level ≤ 0 dBm; –20 dB ≤ input power - reference 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 is performed immediately after invoking RF and IF alignments to minimize the effects of alignment drifts.

Amplitude Specifications (continued)

	ESA spectrum analyzer	EXA signal analyzer
	Express analyzer or custom analyzer configuration	All frequency ranges
Display scale fidelity Typical values shown in italic		
> 0 to 10 dB	±0.3 dB, ±0.08 dB	±0.15 dB
> 10 to 20 dB	±0.4 dB, ±0.09 dB	
> 20 to 30 dB	±0.5 dB, ±0.1 dB	
> 30 to 40 dB	±0.6 dB, ±0.23 dB	
> 40 to 50 dB	±0.7 dB, ±0.35 dB	
> 50 to 60 dB	±0.7 dB, ±0.35 dB	
> 60 to 70 dB	±0.8 dB, ±0.39 dB	
> 70 to 80 dB	±0.8 dB, ±0.46 dB	
> 80 to 85 dB	±1.15 dB, ±0.79 dB	NA
Residual responses (input terminated and 0 dB attenuation)		
50 Ω RF input impedance		
150 kHz to 1.5 GHz/6.7 GHz[a]	< –90 dBm	
200 kHz to 8.4 GHz (swept)		–100 dBm

a. Up to 1.5 GHz for E4402B. Up to 6.7 GHz for E4404B/05B/07B.

Tracking Generator

In order to gain tracking generator functionality, Option 1DN or express analyzer Option STG must be ordered with an ESA-E spectrum analyzer. Tracking generator functionality is not available on the EXA signal analyzer.

EXA offers Option ESC (external source control) for the scaler stimulus-response tests.

For other low cost tracking generator alternatives to the ESA spectrum analyzer customers should consider one of the following instruments:

- N9000A CXA signal analyzer
- N9340A handheld RF spectrum analyzer
- N9320B RF spectrum analyzer

Tracking generator specifications (Options 1DN and STG)	
	E4402B/04B/05B/07B
Frequency range	9 kHz to 3.0 GHz
RBW range	1 kHz to 5 MHz
Output power level range	–2 to –66 dBm
Output vernier range	8 dB
Output attenuator range	0 to 56 dB, 8 dB steps
Output flatness	
9 kHz to 10 MHz	±3.0 dB
10 MHz to 3.0 GHz	±2.0 dB
Effective source match (characteristic)	
	< 2.0:1 (0 dB attenuator)
	< 1.5:1 (8 dB attenuator)
Spurious output	
20 kHz to 3 GHz (–1 dBm output)	< –25 dBc
Non-harmonic spurs	
9 kHz to 2 GHz	< –27 dBc
2 to 3 GHz	< –23 dBc
Dynamic range	**Maximum output power - displayed average noise level**
Output power sweep range	(–10 to –2 dBm) - (source attenuator setting)

Quasi-Peak Detector

Add a quasi-peak detector, Option AYQ, to the ESA-E 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 to Publication 16 of the Comite International Special des Perturbations Radioelectrique (CISPR) Section 1, Clause 2, as indicated in the relative quasi-peak response table.

The EXA signal analyzer gains quasi-peak functionality with Option EMC. For more information refer to the EXA Specification Guide literature number: N9010-90012.

	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 0.03 to 1 GHz	9 kHz EMI BW 0.150 to 30 MHz	200 Hz EMI BW 9 to 150 kHz
1000	+8.0 ±1.0	+4.5 ±1.0	NA
100	0 dB reference[a]	0 dB reference[a]	+4.0 ±1.0
60	NA	NA	+3.0 ±1.0
25	NA	NA	0 dB reference[a]
20	–9.0 ±1.0	–6.5 ±1.0	NA
10	–14 ±1.5	–10.0 ±1.5	–4.0 ±1.0
5	NA	NA	–7.5 ±1.5
2	–26 ±2.0	–20.5 ±2.0	–13.0 ±2.0
1	NA	–22.5 ±2.0	–17.0 ±2.0
Isolated pulse	NA	–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

	ESA-E spectrum analyzer	EXA signal analyzer
	E4402B/E4404B/E4405B/E4407B	All frequency ranges
Temperature range		
Operating	0 to +55 °C	0 to +55 °C
Storage	–40 to +75 °C	–40 to +70 °C
Disk drive	10 to +40 °C	NA
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 Ba (Option 060)	Complies with European EMC Directive 2004/108/EC IEC/EN 61326-1 or IEC/EN 61326-2-1 CISPR Pub 11 Group 1, class A AS/NZS CISPR 11[a] ICES/NMB-001 This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.
Military specifications		
	Type tested to the environmental specifications of MIL-PRF-28800F Class 3	Test methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3
Power requirements		
AC operation on (line |)	90 to 132 Vrms, 47 to 440 Hz 195 to 250 V rms, 47 to 66 Hz Power consumption < 300 W	100 to 120 V, 50, 60 or 400 Hz 220 to 240 V, 50 or 60 Hz Power consumption < 350 W
Standby (line)	Power consumption < 5 W	Power consumption < 20 W
DC operation	12 to 20 Vdc, < 200 W power consumption	NA
Data storage (nominal)		
Internal[b]	200 traces or states/8.0 MB	
External	3.5” in, 1.44 MB, MS-DOS	80 GB Supports USB 2.0-compatible memory device
Memory usage (nominal)		
State	16 kB[c]	
State plus 401- point trace	20 kB[c]	
Display resolution[d]	640 x 480	1024 x 768

a. Meeting Class A performance during DC operation.
b. For serial numbers < US414400 or MY41440000, 1 MB 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 ESA-E 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)

	ESA-E spectrum analyzer	EXA signal analyzer
Inputs/Outputs		
Front panel		
Input RF	50 Ω type N (f), or 50 Ω APC 3.5 (m) (Option BAB)	50 Ω type N (f)
Probe power	+ 15 Vdc, –12.6 Vdc at 150 mA maximum (characteristic/ nominal)	+ 15 Vdc, –12.6 Vdc at 150 mA maximum (characteristic/nominal)
External keyboard	6-pin mini-DIN, PC keyboards (for entering screen titles and file names)	Compatible with USB 2.0
Rear panel		
10 MHz REF OUT	50 Ω BNC (f), > 0 dBm (characteristic)	50 Ω BNC (f), nominal
10 MHz REF IN	50 Ω BNC (f), –15 to +10 dBm (characteristic)	50 Ω BNC (f), nominal
GATE TRIG/EXT TRIG IN	BNC (f), 5 V TTL	BNC (f), 5 V TTL
GATE /HI SWP OUT	BNC (f), 5 V TTL	NA
VGA OUTPUT	VGA compatible monitor, 15-pin mini D-SUB	VGA compatible monitor, 15-pin mini D-SUB
Interfaces		
GPIB interface IEEE-488 bus connector	Option A4H	Standard
Serial interface	Option 1AX, RS-232, 9-pin D-SUB (m)	NA
Parallel interface	Option A4H or 1AX 25-pin D-SUB (f) printer port only	NA
I/O connectivity software		
	IO Libraries Suite (www.keysight.com/find/iosuite)	IO Libraries Suite (www.keysight.com/find/iosuite)
Dimensions		
Width to outside of instrument handle	416 mm (16.4 in)	426 mm (16.8 in)
Overall height	222 mm (8.75 in)	177 mm (7.0 in)
Depth from front frame to rear frame	409 mm (16.1 in)	368 mm (14.5 in)
Weight		

	E4402B	E4404B/E4405B/ E4407B	All EXA signal analyzers
Instrument	15.5 kg (34.2 lbs)	17.1 kg (37.7 lbs)	16 kg (35 lbs) nominal
Shipping	27.4 kg (60.4 lbs)	31.9 kg (70.3 lbs)	28 kg (62 lbs) nominal

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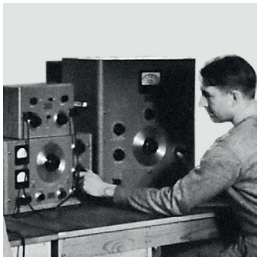

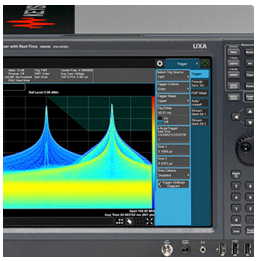

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