

Agilent ESA-L Series Spectrum Analyzers

Product Overview

When speed and accuracy
count as much as your budget

Expanded to 3 and 26.5 GHz!



Agilent Technologies

Innovating the HP Way

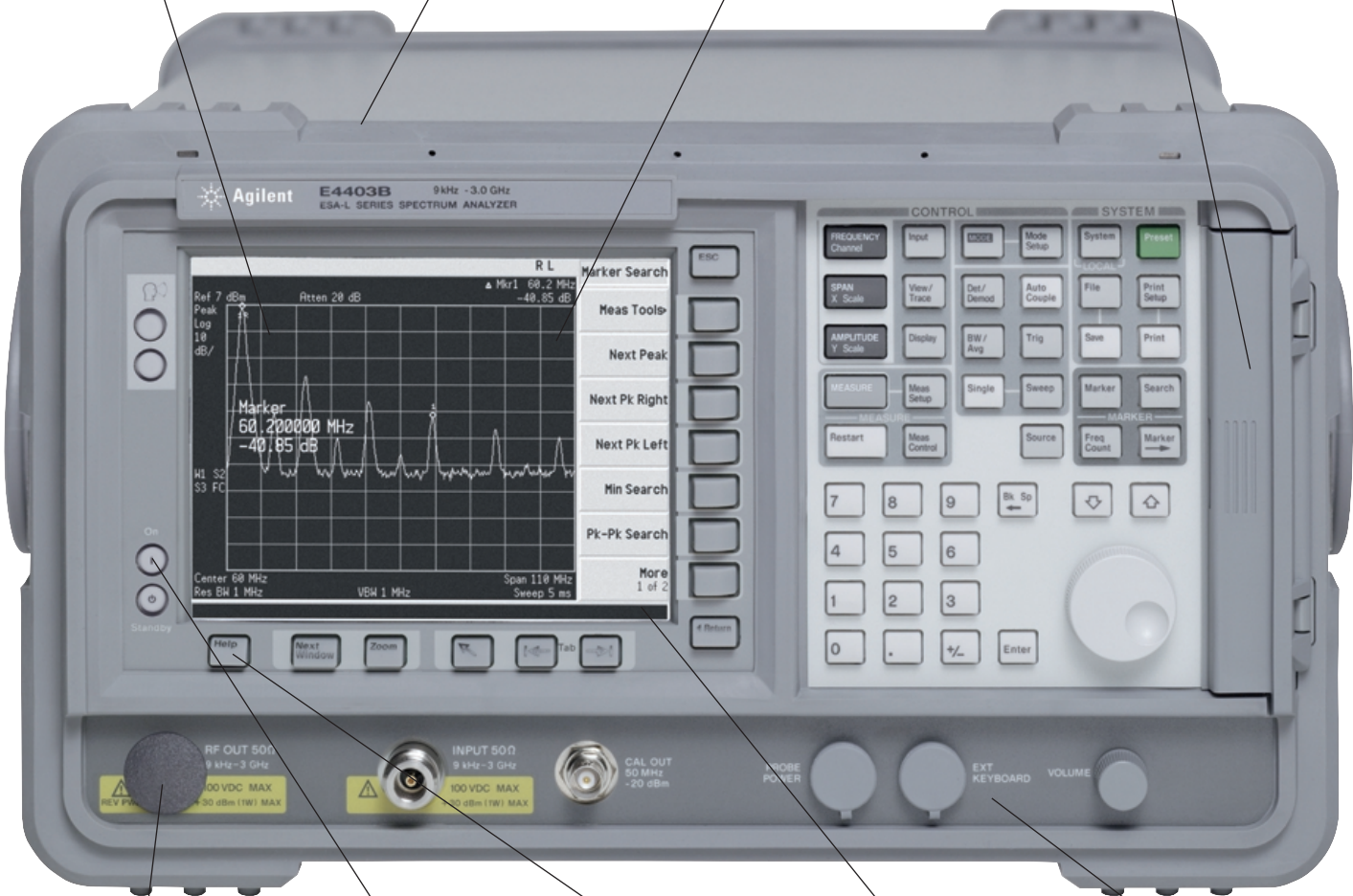
Speed, accuracy, affordability

High-resolution, high-contrast monochrome display makes viewing multiple traces easy.

Rugged package with rubber-encased frames resists transportation stresses.

Automatic background alignment helps eliminate calibration worries.

Disk drive provides PC compatibility and data archiving.



Built-in tracking generator provides an RF source for scalar network analysis (optional).*

Full measurement specifications after just a five minute warm-up.

Help key quickly communicates hardkey/softkey functions on screen.

4ms sweep time and virtual real-time display update for easier circuit tuning.

Weather-resistant front panel allows operation in tough environments.

* These options are available for an additional charge.

Designed for performance measurements

Your budget is limited – your test equipment doesn't have to be.

Now you can get the speed and accuracy you need and still have money left in your budget. The Agilent ESA-L series portable spectrum analyzers have a remarkable four-millisecond RF sweep time and virtual real-time measurement updates to the display or through GPIB interface. With excellent accuracy and easy, reliable operation, the ESA-L series is full of innovations, such as continuously phase-locked synthesizer, all at a surprisingly low cost.

- **Fast measurements**
- **Accurate results**
- **Rugged and reliable**
- **Quick and easy to use**

Available frequency ranges



Specification summary

	Frequency range 9 kHz to:	Frequency accuracy (at 1 GHz)	Phase noise (10 kHz offset)	Residual FM	Resolution bandwidth range	Maximum amplitude range	Overall amplitude accuracy	Maximum dynamic range (2 nd /3 rd order)	Measurement rate (characteristic)
E4411B E4403B E4408B	1.5 GHz 3 GHz 26.5 GHz	±2 kHz	≤-90 dBc/Hz	≤150 Hz peak to peak	1 kHz to 5 MHz	-119 -117 -116 to +30 dBm	±1.1 dB	≥76 dB/83 dB ≥79 dB/83 dB ≥78 dB/82 dB	≥28 updates/sec

For complete specifications, see page 10. Ordering information is shown on page 13.

ESA-L series features and benefits

Performance¹

4-ms RF sweep time	Combined with 28 measurements per second, provides virtual real-time updates. Responsive display makes circuit adjustment easier, while increasing the probability of intercepting intermittent signals.
High-speed data transfer (GPIB)*	Fast processing helps reduce measurement time in ATE environments (optional).
Fully synthesized design	Provides continuously phase-locked precision throughout the entire sweep. Improves frequency accuracy, stability, and measurement repeatability, eliminating drift.
Amplitude correction	Calibrates out frequency-related amplitude effects with built-in amplitude correction.
Automatic background alignment	Continuously calibrates the analyzer. Guarantees repeatability over changing temperatures.
85-dB calibrated display range	Allows simultaneous display of large and small signals.
Built-in tracking generator*	Combines spectrum and scalar test capability in a single instrument (optional). Synthesized design eliminates tracking drift (E4411B only). One-button normalize function for quick setup.
5-dB step attenuator	Optimizes distortion-free dynamic range.
Built-in frequency counter	With 1-Hz resolution, minimizes the need for an external frequency counter.

Portability

Fast warm-up	Provides full measurement accuracy after just five minutes.
Snap-on battery*	Eliminates the restrictions of power cords.
Rubber-encased front and rear frames	Provides impact protection in the field.
Rain-resistant front panel	Combined with louvered air vents, allows operation in diverse weather conditions.
12-Vdc power cable*	Allows direct operation from automotive and truck batteries.

Ease-of-use

Large, monochrome VGA display with output	16.8 cm, high-resolution VGA monochrome display with wide viewing angle makes detailed observations easy. Includes 15-pin VGA rear output connector for external monitor.
Parallel port*	Supports output to the most popular printers (optional).
Disk drive	Makes saving and moving measurement results to your PC quick and easy.
One-button measurements	Save set-up and measurement time with adjacent channel power, occupied bandwidth, channel power, peaks table, and harmonics table features.
AM demodulation	Combines with the built-in speaker for tune and listen applications.
200 trace or instrument state files	Provides internal storage of measurement data and setups for future analysis or comparison.
Marker functions	Provides digital resolution of measurement details through peak search, delta markers, marker table and carrier-to-noise ratio. Signal track keeps unstable signals centered on the screen while band power calculates total power between user-defined limits.
Softkey/hardkey interface	Provides a simple user interface while retaining access to sophisticated features.
Built-in help button with function display	Eliminates carrying manuals into the field to determine keypad and softkey functions.
Limit lines	Built-in-limit lines and pass/fail messages simplify testing.
Built-in clock/calendar	Provides storage of time stamps and printed data.
Automatic overload protection	Protects RF input from overly large signals (only available on the 1.5 GHz E4411B).
Automatic printer setup	Identifies connected printer models automatically.

The ESA-L series now comes with a standard THREE-YEAR warranty!

¹ For higher performance requirements, Agilent also offers the ESA-E series of spectrum analyzers. With its cardcage architecture, the ESA-E series is an investment in a flexible platform and a wider range of options, such as narrow-resolution bandwidth filters for viewing closely spaced signals and a built-in high-gain, low-noise preamplifier for better sensitivity measurements. For more information, order the ESA family literature shown on page 13.

* These options are available for an additional charge.

Eliminate measurement speed bottlenecks



With a combination of performance, speed and accuracy at an affordable price, the ESA-L series is ideal for manufacturing.

Increase manufacturing throughput

Get real-time measurement feedback for circuit tuning and adjustment with up to 28 measurement updates per second and 4-millisecond RF sweep time.

Speed up manual or automated testing with built-in limits lines and easy-to-interpret pass/fail messages.

The ESA-L series is SCPI-compliant (Standard Commands for Programmable Instruments) and reduces test time by automating repetitive measurements using the GPIB interface and *VXIplug&play* drivers.



Decrease training time

Save training time with the easy-to-use hardkey/softkey interface.

Reduce operator uncertainty with the easy-to-view, high-resolution digital display and numeric marker read-outs.

View large and small signals simultaneously on screen with 85-dB calibrated display range.

Enlarge the display by removing the softkey interface or connecting to an external VGA monitor.

Increase measurement confidence and reliability

With ± 1.1 dB amplitude accuracy, the ESA-L series instruments are fully synthesized and phase locked over the entire sweep for frequency accuracy, stability and repeatability.

Automatic background alignment improves accuracy and offers continuous calibration to assure measurement accuracy.

The ESA-L series is manufactured in an ISO 9001-registered facility to Agilent's exacting standards.

Easy, worry-free field measurements



Designed for field applications, the ESA-L series provides accurate performance in a wide variety of environments.

Take lab-grade performance into the field

Get fully synthesized performance in a rugged portable package for lasting accuracy in tough environments.

Continuous background alignment provides accuracy over varying temperatures.

The Analyzer conforms to the environmental specifications of MIL-PRF-28800F class 3.

Built-in help eliminates need to carry manuals into the field.

Calibrated field measurements in just FIVE minutes!

Easy-to-use, portable performance.

Snap-on rechargeable battery for up to 1.9 hours of cordless operation (optional).

12-Vdc power cable for running the analyzer on a vehicle battery (optional).

Built-in tracking generator and frequency counter means less equipment to carry (optional).

Flexible tilt handle for optimum viewing angles on the bench or floor.

Easy data transfer to a computer with built-in floppy disk drive.

Research and development



Verify your designs with confidence

The ESA-L series offers ± 1.1 dB amplitude accuracy, $\pm 1\%$ span accuracy, ± 2 kHz frequency accuracy, and a continuously phase-locked synthesizer for stability and repeatability.

Transfer measurement results directly to your computer with the help of the Agilent EEsof Advanced Design System instrument link/driver or BenchLink Spectrum Analyzer software.

Sophisticated performance at a budget price eliminates the need to share analyzers.

Now you don't have to buy a high-priced spectrum analyzer to get advanced technology on every engineer's bench.

Education

Save money and stay competitive

For education, equip your students with fast, accurate spectrum analyzers, at an affordable price.

Fully synthesized digital design provides accurate and repeatable measurements.

Rugged design, such as the input overload protection available on the 1.5 GHz E4411B, guards against damage to the analyzer.

Easy-to-understand interface simplifies operation and aids access to more sophisticated functions.



Provide students with fast and accurate spectrum analysis while conserving your budget.

ESA-L series – a whole product solution

The performance of the ESA-L series spectrum analyzer is only a small part of what you get from Agilent Technologies. Agilent strives to provide complete solutions that go beyond our customers' expectations. Only offers the depth and breadth of enhancements, software, services, connectivity, accessibility and support to help our customers reach their measurements objectives. Please contact us for more information.

Pre-sales service

- Rentals, leasing, and financing
- Application engineering services
- Application notes
- Custom product modifications

PC connectivity

- Floppy disk drive
- GPIB or RS232 interfaces
- *VXIplug&play* drivers
- BenchLink spectrum analyzer software
- EEsof Advanced Design System instrument link

Post-sales support

- Standard three-year global warranty
- Worldwide call center and service center support network
- One-year calibration intervals
- Firmware upgrades downloadable from the Web
- PC-based calibration software



Product and peripheral interfaces

- 8590-series/ESA programming conversion guide
- Printer support

Software

- Programming examples on CD ROM
- SCPI (Standard Commands for Programmable Instruments)

Training and access to information

- Factory service training
- Web-based support of frequently asked questions
- Manuals on CD ROM and on the Web
- User guides available in 9 languages

For the latest information on the ESA-L series see our Web page at: www.agilent.com/find/esa

Specifications

All specifications apply over 0 °C to +55 °C. The analyzer will meet its specifications five minutes after it is turned on, when the analyzer is within one year of calibration cycle, after two hours of storage within the operating temperature range, and Auto Align All is selected. *ITALICS* = supplemental information, characteristics, typical performance, or nominal values.

Frequency specifications

Frequency range

E4411B		9 kHz to 1.5 GHz
50 Ω		1 MHz to 1.5 GHz
75 Ω(Opt. 1DP)		9 kHz to 3.0 GHz
E4403B		9 kHz to 26.5 GHz
E4408B		
Band	LO harmonic = N	
0	1	9 kHz 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

Frequency reference

Aging rate	$\pm 2 \times 10^{-6}$ /year, $\pm 1.0 \times 10^{-7}$ /day, characteristic
Settability	$\pm 5 \times 10^{-7}$
Temperature stability	$\pm 5 \times 10^{-6}$

Frequency readout accuracy

(Start, Stop, Center, Marker)	$\pm(\text{frequency readout} \times \text{frequency reference error}^1 + 0.75\% \text{ of span} + 15\% \text{ of RBW} + 10 \text{ Hz} + 1 \text{ Hz} \times N^2)$
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Marker frequency counter

Accuracy	$\pm(\text{marker frequency} \times \text{frequency reference error}^1 + \text{counter resolution})$
Resolution	Selectable from 1 Hz to 100 kHz

Frequency span

Range	0 Hz (zero span), and
E4411B	100 Hz to 1.5 GHz
E4403B	100 Hz to 3.0 GHz
E4408B	100 Hz to 26.5 GHz
Resolution	2 Hz x N ²
Accuracy	$\pm 1\%$ of span

Sweep time

Range	4 ms to 4000 sec.
Accuracy	$\pm 1\%$
Sweep trigger	Free Run, single, line, video, offset, delayed trigger, and external
Offset trigger range	$\pm 327 \text{ ms to } \pm 323 \text{ Ks}$
Sweep (trace) points	401

Resolution bandwidth

Range	(-3 dB bandwidth)	1 kHz to 3 MHz in 1-3-10 sequence and 5 MHz
	(-6 dB bandwidth)	9 kHz and 120 kHz
Accuracy		
	1 kHz to 3 MHz RBW	$\pm 15\%$
	5 MHz RBW	$\pm 30\%$

Selectivity

60 dB/3 dB bandwidth ratio	<i><15:1, characteristic</i>
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Video bandwidth range

(-3 dB bandwidth)	30 Hz to 1 MHz in 1-3-10 sequence, 3 MHz, characteristic
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Stability

Noise sidebands (1 kHz RBW, 30 Hz VBW and sample detector)E4411B

$\geq 10 \text{ kHz offset from CW signal}$	$\leq -90 \text{ dBc/Hz}$
$\geq 20 \text{ kHz offset from CW signal}$	$\leq -100 \text{ dBc/Hz}$
$\geq 30 \text{ kHz offset from CW signal}$	$\leq -102 \text{ dBc/Hz}$
$\geq 100 \text{ kHz offset from CW signal}$	$\leq -112 \text{ dBc/Hz}$

E4403B, E4408B

$\geq 10 \text{ kHz offset from CW signal}$	$\leq -90 \text{ dBc/Hz} + (20 \text{ Log } N^2 \text{ for frequencies } > 6.7 \text{ GHz})$
$\geq 20 \text{ kHz offset from CW signal}$	$\leq -98 \text{ dBc/Hz} + 20 \text{ Log } N^2$
$\geq 30 \text{ kHz offset from CW signal}$	$\leq -100 \text{ dBc/Hz} + 20 \text{ Log } N^2$
$\geq 100 \text{ kHz offset from CW signal}$	$\leq -112 \text{ dBc/Hz} + 20 \text{ Log } N^2$

Residual FM

1 kHz RBW, 1 kHz VBW	$\leq 150 \text{ Hz peak-to-peak} \times N^2 \text{ in } 100 \text{ ms}$
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System-related sidebands

$\geq 30 \text{ kHz offset from CW signal}$	$\leq -65 \text{ dBc} + (20 \text{ Log } N^2 \text{ for frequencies } > 6.7 \text{ GHz})$
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Amplitude specifications

Absolute amplitude accuracy

Overall amplitude accuracy ³	$\pm(0.6 \text{ dB} + \text{absolute frequency response})$
20 °C to 30 °C	
At reference settings ⁶	$\pm 0.4 \text{ dB}$

Measurement range

Displayed average noise level to maximum safe input level	
Input attenuator range	
E4411B	0 to 60 dB, in 5 dB steps
E4403B, E4408B	0 to 65 dB, in 5 dB steps

Maximum safe input level

Average continuous power	
E4411B ($\geq 15 \text{ dB attenuation}$)	+30 dBm (1W)
E4403B, E4408B ($\geq 30 \text{ dB attenuation}$)	+30 dBm (1W)
Peak pulse power	
E4411B ($\geq 15 \text{ dB attenuation}$)	+30 dBm (1W)
E4403B, E4408B ($\geq 30 \text{ dB attenuation}$)	+50 dBm (100W)

1-dB gain compression (total power at input mixer)^{4,5}

E4411B	0 dBm	
E4403B	0 dBm	
E4408B		
	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

(Input terminated, 0 dB attenuation, sample detector, reference level = -70 dBm, 1 kHz RBW, 30 Hz VBW)

E4411B		
	400 kHz to 10 MHz	$\leq -115 \text{ dBm}$
	10 MHz to 500 MHz	$\leq -119 \text{ dBm}$
	500 MHz to 1.0 GHz	$\leq -117 \text{ dBm}$
	1.0 GHz to 1.5 GHz	$\leq -113 \text{ dBm}$
E4411B (Option 1DP)		
	1 MHz to 500 MHz	$\leq -65 \text{ dBmV}$
	500 MHz to 1.0 GHz	$\leq -60 \text{ dBmV}$
	1.0 GHz to 1.5 GHz	$\leq -53 \text{ dBmV}$

¹ Frequency reference error = (aging rate x period of time since adjustment + settability + temperature stability).

² N = Harmonic mixing mode. N = 1 for E4411B and E4403B.

³ For reference level 0 to -50 dBm: input attenuation, 10 dB; 50 MHz; RBW, 3 kHz; VBW, 3 kHz; log range 0 to 50 dB; sweep time coupled, signal input, 0 to -50 dBm; span, $\leq -60 \text{ kHz}$.

⁴ Mixer Power Level (dBm) = Input Power (dBm) - Input Attenuator. (dB).

⁵ For RBW $\leq 30 \text{ kHz}$, maximum input signal amplitude must be \leq reference level + 10 dB.

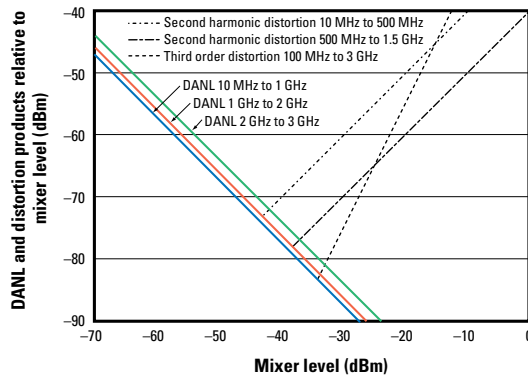
⁶ Settings are: reference level -25 dBm for E4411B, -20 dBm for E4403B and E4408B; input attenuation 10 dB; center frequency 50 MHz; resolution bandwidth 3 kHz; video bandwidth 3 kHz; span 2 kHz; sweep time coupled; signal at reference level.

Specifications, continued

E4403B	
10 MHz to 1.0 GHz	≤-117 dBm
1.0 GHz to 2.0 GHz	≤-116 dBm
2.0 GHz to 3.0 GHz	≤-114 dBm
E4408B	
10 MHz to 1.0 GHz	≤-116 dBm
1.0 GHz to 2.0 GHz	≤-115 dBm
2.0 GHz to 6.0 GHz	≤-112 dBm
6.0 GHz to 12.0 GHz	≤-110 dBm
12.0 GHz to 22.0 GHz	≤-107 dBm
22.0 GHz to 26.5 GHz	≤-101 dBm
Spurious responses	
Second harmonic distortion	
E4411B	
2 MHz to 750 MHz	<-75 dBc for -40 dBm signal at input mixer ¹
E4403B, E4408B	
10 MHz to 500 MHz	<-60 dBc for -30 dBm signal at input mixer ¹
500 MHz to 1.5 GHz	<-70 dBc for -30 dBm signal at input mixer ¹
1.5 GHz to 2.0 GHz	<-80 dBc for -10 dBm signal at input mixer ¹
2.0 GHz to 13.25 GHz	<-95 dBc for -10 dBm signal at input mixer ¹
Maximum achievable second order dynamic range	
E4411B (at 1 GHz)	76 dB (+35 dBm S.H.I.)
E4403B (at 1 GHz)	79 dB (+40 dBm S.H.I.)
E4408B (at 1 GHz)	78 dB (+40 dBm S.H.I.)
Third order intermodulation distortion	
E4411B	
10 MHz to 1.5 GHz	<-75 dBc for two -30 dBm signals at input mixer ¹ , >50 kHz separation
E4403B, E4408B	
100 MHz to 6.7 GHz	<-75 dBc for two -30 dBm signals at input mixer ¹ , >50 kHz separation
6.7 GHz to 26.5 GHz	<-70 dBc for two -30 dBm signals at input mixer ¹ , >50 kHz separation
Maximum achievable third order dynamic range	
E4411B (at 1.0 GHz)	83 dB (+7.5 dBm T.O.I.)
E4403B (at 1.0 GHz)	83 dB (+7.5 dBm T.O.I.)
E4408B (at 1.0 GHz)	82 dB (+7.5 dBm T.O.I.)
Other input-related spurious	
E4411B	<-65 dBc, 30 kHz ≤ offset ≤ 1.2 GHz, for -20 dBm signal at input mixer ¹
E4403B, E4408B	<-65 dBc, >30 kHz offset, for -20 dBm signal at input mixer ¹

Residual responses	
Input terminated and 0 dB attenuation	<-90 dBm
Display range	
Log scale	0 to -85 dB from reference level is calibrated; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps; ten divisions displayed.
Linear scale	10 divisions
Scale units	dBm, dBmV, dBμV, V, W, and Hz
Marker readout resolution	
Log scale	0.04 dB
Linear scale	0.01% of reference level
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 (at a fixed frequency, a fixed attenuation, and referenced to -35 dBm)	
Reference level - input attenuator setting	
-10 dBm to > -60 dBm	±0.3 dB
-60 dBm to > -85 dBm	±0.5 dB
-85 dBm to > -90 dBm	±0.7 dB
Frequency response (10 dB attenuation, 20 °C to 30 °C)	
	Absolute ² Relative ³
9 kHz to 3.0 GHz	±0.5 dB ±0.5 dB
3.0 GHz to 6.7 GHz	±1.5 dB ±1.3 dB
6.7 GHz to 26.5 GHz	±2.0 dB ±1.8 dB
Resolution bandwidth switching uncertainty (Referenced to 1 kHz RBW, at reference level)	
3 kHz to 3 MHz RBW	±0.3 dB
5 MHz RBW	±0.6 dB
Linear to log switching	
	±0.15 dB at reference level
Display scale fidelity	
Log maximum cumulative	
0 to -85 dB from reference level	±(0.3 dB + 0.01 x dB from reference level)
Log incremental accuracy	
0 to -80 dB from reference level	±0.4 dB/4 dB
Linear accuracy	±2% of reference level

E4403B



General specifications

Measurement speed (characteristic)			
Local measurement and display update rate ⁴	E4411B	E4403B	E4408B
	≥35/sec	≥30/sec	≥28/sec
Remote measurement and GPIB transfer rate ⁵	≥30/sec	≥30/sec	≥30/sec
RF center frequency ⁶ tuning time	≤90ms	≤90ms	≤90ms
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 emission is in compliance with CISPR Pub. 11/1990 Group 1 Class A		

¹ Mixer power level (dBm) = Input power (dBm) - Input attenuator. (dB).
² Referenced to amplitude at 50 MHz.
³ Referenced to midpoint between highest and lowest frequency response deviations.
⁴ Autoalign Off, fixed center frequency, factory preset, RBW = 1 MHz, stop frequency ≤ 3 GHz, span > 10 MHz and ≤ 600 MHz (E4411B: span > 102 MHz and ≤ 400 MHz)
⁵ Display Off, factory preset, fixed center frequency, single sweep, autoalign off, RBW = 1 MHz, stop frequency ≤ 3 GHz, span = 20 MHz, GPIB interface
⁶ Includes CF tuning + measurement + GPIB transfer time, stop frequency ≤ 3 GHz, factory preset, autoalign off, RBW = 1 MHz, span = 20 MHz, CF tune step size = 50 MHz

Specifications, continued

Audible noise (ISO 7779)

Sound pressure at 25 °C <40 dBA, (<5.3 Bels power)

Power requirements

ac Voltage 90 to 132 Vrms, 195 to 250 Vrms
 Frequency 47 to 440 Hz, 47 to 66 Hz
 Power consumption, on <300 W
 Power consumption, standby <5 W
 dc Voltage 12 to 20 Vdc
 Power consumption <200 W

Weight (without options)

E4411B 13.2 kg (29.1 lb), characteristic
 E4403B 15.5 kg (34.2 lb), characteristic
 E4408B 17.1 kg (37.7 lb), characteristic

Dimensions

Height 222 mm (8.75 in)
 Width 373 mm (14.7 in) without handle
 408 mm (16.1 in) with handle
 Depth 409 mm (16.1 in) without handle
 516 mm (20.3 in) with handle

Data storage

Internal 200 traces or states, nominal

Inputs/outputs

Amplitude reference¹

Internal
 E4411B -25 dBm, nominal
 E4411B, Option 1DP +28.75 dBmV, nominal
 External, BNC (f)
 E4403B, E4408B -20 dBm, nominal

Front panel connectors

Input Type N (f), 50 Ω nominal
 Option 1DP (E4411B) BNC (f), 75 Ω nominal
 Option BAB (E4408B) APC 3.5 (m)
 RF Out
 Option 1DN Type N (f), 50 Ω nominal
 Option 1DQ (E4411B) BNC (f), 75 Ω nominal
 Probe power, voltage/current +15 Vdc, -12.6 Vdc at 150 mA maximum
 Speaker Front-panel knob controls volume
 Headphone 3.5 mm (1/8 in) miniature audio jack
 External keyboard 6-pin mini-din

Rear panel connectors

10 MHz ref output BNC (f), 50 Ω, >0 dBm, characteristic
 10 MHz ref input BNC (f), 50 Ω, -15 to +10 dBm, characteristic
 External trigger input BNC (f), (5V TTL)
 VGA output VGA compatible, 15-pin mini D-SUB, 640 x 480 resolution

IF sweep and video ports (Option A4J)

Aux IF output BNC (f), 21.4 MHz, nominal -10 to -70 dBm (uncorrected), characteristic
 Aux video out BNC (f), 0 to 1 V (uncorrected), characteristic
 Hi swp in BNC (f), (5 V TTL)
 Hi swp out BNC (f), (5 V TTL)
 Swp out BNC (f), 0 to +10 V ramp, characteristic

GPIB interface

Option A4H IEEE-488 bus connector

Serial interface

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

Parallel printer interface

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

Tracking generator (Option 1DN and Option 1DQ)

Output frequency range

E4411B 50 Ω (Opt. 1DN) 9 kHz to 1.5 GHz
 E4411B 75 Ω (Opt. 1DQ) 1 MHz to 1.5 GHz
 E4403B, E4408B (Opt. 1DN) 9 kHz to 3.0 GHz

Output power level²

Range
 E4411B 50 Ω 0 to -70 dBm (20 °C to 30 °C)
 E4411B 75 Ω +42.75 to -27.25 dBmV
 E4403B, E4408B 50 Ω -2 to -66 dBm
 Vermier
 E4411B
 Range 10 dB
 Output attenuator range 0 to 60 dB, 10 dB steps
 E4403B, E4408B
 Range 9 dB
 Output attenuator range 0 to 56 dB, 8 dB steps

Output power sweep²

Range
 E4411B 50 Ω -15 dBm to 0 dBm - (source attenuator setting)
 +27.76 dBmV to +42.76 dBmV - (source attenuator setting)
 E4411B 75 Ω -10 dBm to -1 dBm - (source attenuator setting)
 E4403B, E4408B 50 Ω

Output flatness

E4411B 50 Ω (referenced to 50 MHz, 0 dB attenuation)
 10 MHz to 1.5 GHz ±1.5 dB
 E4411B 75 Ω (referenced to 50 MHz, 0 dB attenuation)
 10 MHz to 1.5 GHz ±2 dB
 E4403B, E4408B 50 Ω (referenced to 50 MHz, -20 dB signal level)
 10 MHz to 3.0 GHz ±2 dB

Spurious output

Harmonic spurs
 E4411B, 50 Ω (0 dBm output), 75 Ω (+42.8 dBmV output)
 20 MHz to 1.5 GHz <-25 dBc
 E4403B, E4408B 50 Ω (-1 dBm output)
 9 MHz to 3 GHz <-25 dBc

Dynamic range

Maximum output power level - displayed average noise level

Output tracking

E4411B
 Drift No error
 Swept tracking error No error for coupled sweep times
 E4403B, E4408B
 Drift 1.5 kHz/5 minutes, characteristic
 Swept tracking error Usable in 1 kHz RBW after 5 minutes of warm up

Output VSWR

E4411B <2.5:1, characteristic
 E4403B, E4408B
 0 dB attenuation <2.0:1, characteristic
 >8 dB attenuation <1.5:1, characteristic

¹ Amplitude reference actual power might differ from the nominal value. Actual calibration power is stored internally.

² E4411B: 20 °C to 30 °C.

Ordering information

- E4411B RF Spectrum Analyzer
9 kHz to 1.5 GHz
- E4403B RF Spectrum Analyzer
9 kHz to 3.0 GHz
- E4408B Microwave Spectrum Analyzer
9 kHz to 26.5 GHz

Options

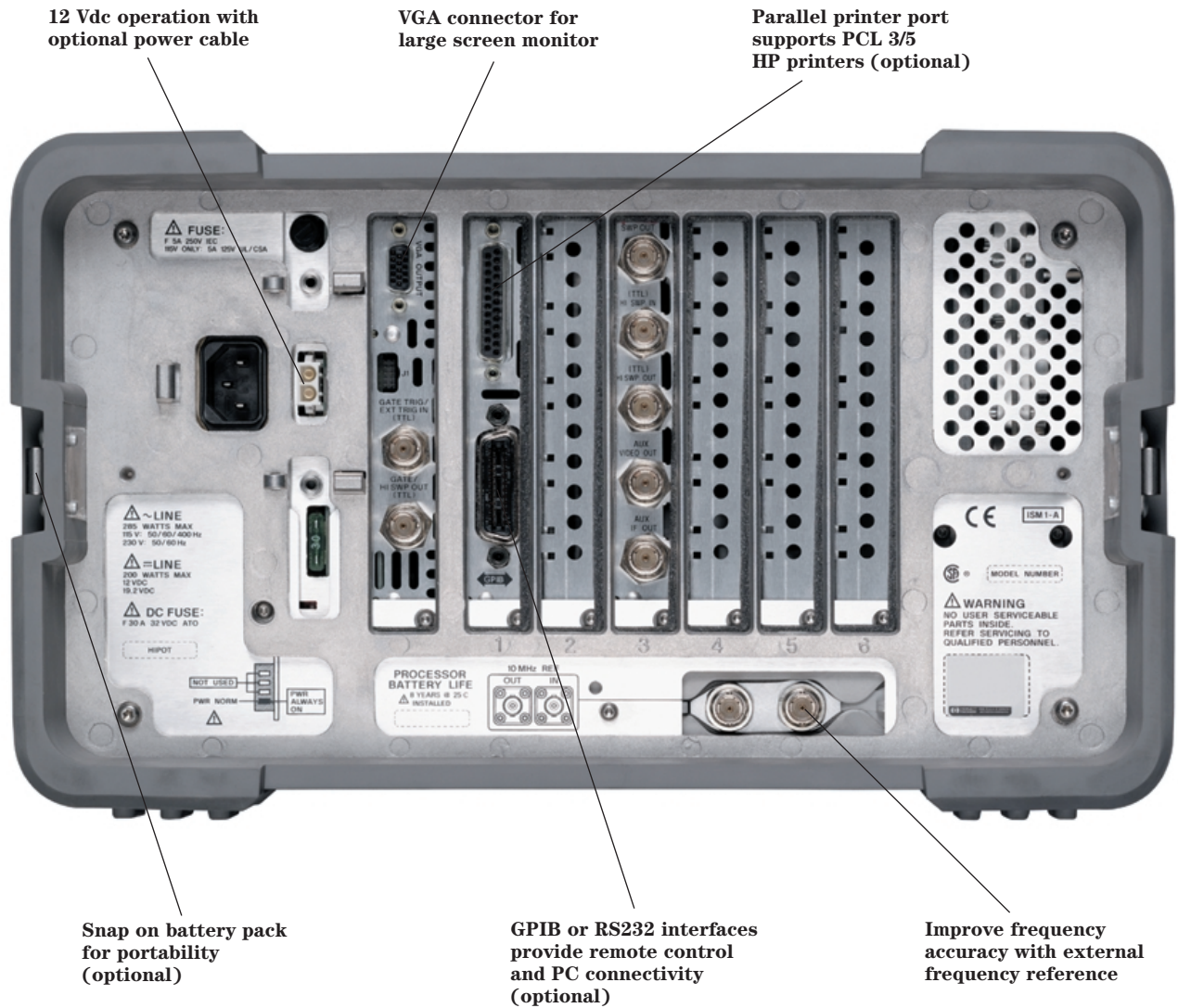
- A4H** GPIB and parallel (Centronics) interfaces
(not compatible with Option 1AX)
- 1AX** RS-232 and parallel (Centronics) interfaces
(not compatible with Option A4H)
- A4J** IF, sweep, and video ports
- BAB** APC 3.5mm input connector (E4408B only)
- 1DN** 50-Ohm tracking generator
(9 kHz to 1.5 GHz for E4411B)
(9 kHz to 3.0 GHz for E4403B and E4408B)
- 1DP** 75-Ohm input impedance
(1 MHz to 1.5 GHz) E4411B only
- 1DQ** 75-Ohm tracking generator
(1 MHz to 1.5 GHz) (requires Option 1DP)
- 1D7** 50 to 75-Ohm matching pad
(type n (m) to BNC (f))
- A5D** 12-Vdc power cable
- AYT** Soft operating/carrying case (grey)
- AYU** Soft operating/carrying case (yellow)
- AXT** Hard transit case
- UK9** Front-panel protective cover
- 1CP** Rack-mount kit with handles and slides
- 0B0** Deletes printed manuals (retains
CD-ROM manuals)
- 0BV** Component level service documentation
- 0B1** Additional user and calibration guides
- 0BW** Assembly-level service guide
- UK6** Commercial calibration certificate with data
- 8ZE** Refurbished spectrum analyzer (as available)
- W32** Three-year calibration
- W50/52** Additional two-year service and support/
five-year calibration

Accessories

- C2950A** Parallel printer cable (2 meter)
- 10833A** GPIB cable (1 meter)
- 24542U** RS-232 cable (3 meter, 9 pin
F to 9 pin F) (for serial 9 pin
PC connection to analyzer)
- 24542G** RS-232 cable (3 meter, 25 pin M
to 9 pin F) (for serial 25 pin PC
or printer connection to analyzer)
- 24542M** RS-232 cable (3 meter, 25 pin M
to 9 pin F) (for serial 25 pin modem
connection to analyzer)
- 87405A** Preamplifier (10 MHz to 3 GHz,
24 dB gain) (fastened to RF input,
powered from analyzer)
- 85905A** 75 Ohm preamplifier (45 MHz to
1 GHz, 20 dB gain) (powered
from analyzer)
- 41800A** Active probe (5 Hz to 500 MHz)
- 85024A** High frequency active probe
(300 kHz to 3 GHz)
- E1779A** Battery pack
- E4444A** BenchLink Spectrum Analyzer
software (PC image and data
transfer)
- VXIplug&play** instrument drivers available via the
World Wide Web at:
http://www.agilent.com/find/inst_drivers
(Click on *VXIplug&play* universal
instrument drivers.)

Literature

- ESA Self-Guided demo 5968-3658E
- Spectrum Analysis Basics, AN 150 5952-0292
- ESA-E series
spectrum analyzer brochure 5968-3278E
- ESA-E series specifications 5968-3386E
- 8560 EC-series
spectrum analyzer brochure 5968-9571E
- E4444A BenchLink
spectrum analyzer product overview 5966-0676E
- E1779A rechargeable battery pack 5966-1851E
- ESA cable TV service and
installation analyzer product overview 5980-0845E



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