Agilent
ESA-L Series Spectrum Analyzers
Product Overview

When speed and accuracy
count as much as your budget

Available in 1.5 GHz, 3 GHz and 26.5 GHz

Agilent Technologies

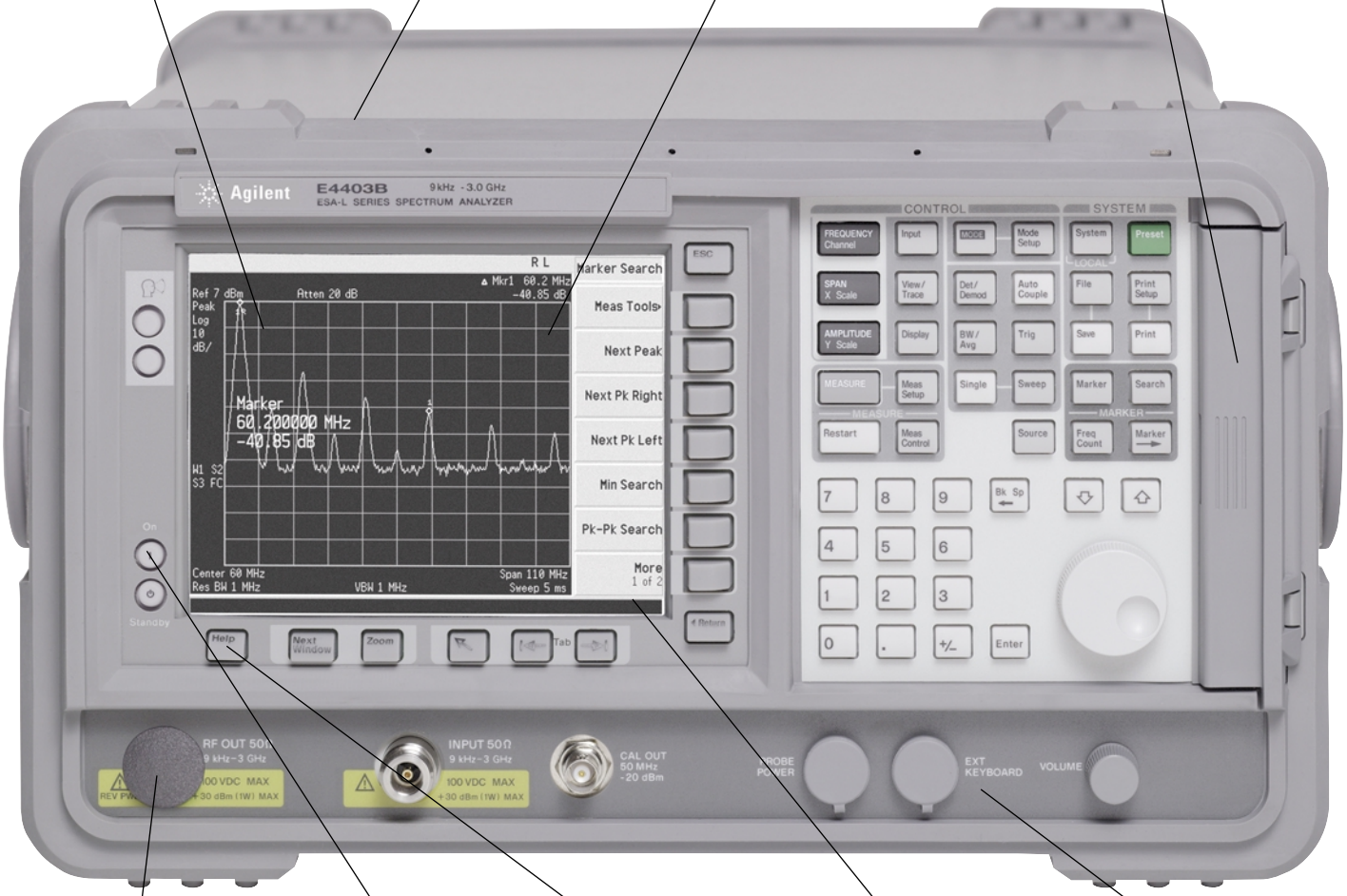
Speed, accuracy, affordability

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 hard-key/softkey functions on screen.

4 ms 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	1.5 GHz	±2 kHz	≤ –90 dBc/Hz	≤ 150 Hz peak-to-peak	1 kHz to 5 MHz	–119	±1.1 dB	≥ 76 dB/83 dB	≥ 35 updates/sec
E4403B	3 GHz					–117		≥ 79 dB/83 dB	≥ 30 updates/sec
E4408B	26.5 GHz					–116 to +30 dBm		≥ 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

Performance [1]

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.
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 [2]	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 [2]	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 [2]	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.
Disk drive	Makes saving and moving measurement results to your PC quick and easy.
One-button measurements	Save set-up and measurement time with one-button RF power measurements for all major 2G/3G and WLAN formats. Featured are multi-offset Adjacent Channel Power (ACPR), burst power, Occupied Bandwidth (OBW), channel power, harmonics table and 10 peak tables.
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.
IntuiLink software	PC software provides easy transfer of measurement results into MS Excel® and MS Word® applications. Included standard with Options 1AX and A4H.
BenchLink web remote control software [2]	Enables remote control of analyzer over the internet and intranet. Control basic analyzer functions, view

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.
2. 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 **VXI*plug&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 readouts.

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

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

Verify your designs with confidence

The ESA-L series offers ±1.1 dB amplitude accuracy, ±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 IntuiLink PC software .

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

Education

Save money and stay competitive

For education, provide 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. Offering 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
- VXI*plug&play* drivers
- IntuiLink PC software
- EEsof Advanced Design System instrument link
- BenchLink web remote control software
- 8590-series programming code compatibility

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		
50 Ω		9 kHz to 1.5 GHz
75 Ω (Option 1DP)		1 MHz to 1.5 GHz
E4403B		9 kHz to 3.0 GHz
E4408B		9 kHz to 26.5 GHz
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	±2x10^{-6}/year, *±1.0x10^{-7}/day, characteristic*
Settability	±5x10^{-7}
Temperature stability	±5x10^{-6}

Frequency readout accuracy

(Start, stop, center, marker)	±(frequency readout x frequency reference error[1] + 0.75% of span + 15% of RBW + 10 Hz + 1Hz x N^2)

Marker frequency counter

Accuracy	±(marker frequency x frequency reference error[1] + 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	±1% of span

Sweep time

Range	4 ms to 4000 sec.
Accuracy	±1%
Sweep trigger	Free run, single, line, video, offset, delayed trigger, and external
Offset trigger range	± 327 ms to ± 323 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		±15%
5 MHz RBW		±30%
Selectivity		
60 dB/3 dB bandwidth ratio		*<15:1, characteristic*

Video bandwidth range

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

Stability

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

≥10 kHz offset from CW signal	≤–90 dBc/Hz
≥20 kHz offset from CW signal	≤–100 dBc/Hz
≥30 kHz offset from CW signal	≤–102 dBc/Hz
≥100 kHz offset from CW signal	≤–112 dBc/Hz
E4403B, E4408B	
≥10 kHz offset from CW signal	≤–90 dBc/Hz + (20 Log N^2 for frequencies >6.7 GHz)
≥20 kHz offset from CW signal	≤–98 dBc/Hz + 20 Log N^2
≥30 kHz offset from CW signal	≤–100 dBc/Hz + 20 Log N^2
≥100 kHz offset from CW signal	≤–112 dBc/Hz + 20 Log N^2
Residual FM	
1 kHz RBW, 1 kHz VBW	≤150 Hz peak-to-peak x N^2 in 100 ms
System-related sidebands	
≥30 kHz offset from CW signal	≤–65 dBc + (20 Log N^2 for frequencies >6.7 GHz)

Amplitude specifications

Absolute amplitude accuracy

Overall amplitude accuracy[3]	±(0.6 dB +absolute frequency response)
20 °C to 30 °C	
At reference settings[6]	±0.4 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 (≥15 dB attenuation)	+30 dBm (1 W)
E4403B, E4408B	
(≥30 dB attenuation)	+30 dBm (1 W)
Peak pulse power	
E4411B (≥15 dB attenuation)	+30 dBm (1 W)
E4403B, E4408B	
(≥30 dB attenuation)	+50 dBm (100 W)

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	≤–115 dBm
10 MHz to 500 MHz	≤–119 dBm
500 MHz to 1.0 GHz	≤–117 dBm
1.0 GHz to 1.5 GHz	≤–113 dBm
E4411B (Option 1DP)	
1 MHz to 500 MHz	≤–65 dBmV
500 MHz to 1.0 GHz	≤–60 dBmV
1.0 GHz to 1.5 GHz	≤–53 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, ≤–60 kHz.
4. Mixer Power Level (dBm) = Input Power (dBm) – Input Attenuator. (dB).
5. For RBW ≤30 kHz, maximum input signal amplitude must be ≤ 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

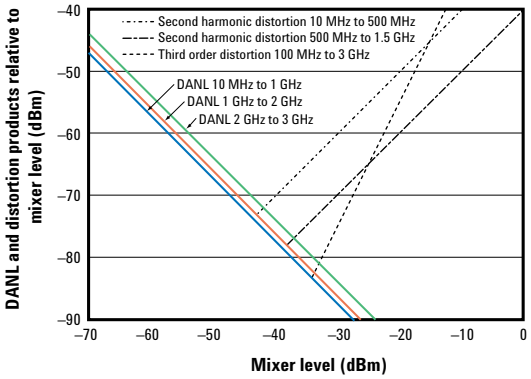
Maximum achievable third order dynamic range
- E4411B (at 1.0 GHz) 83 dB (+7.5 dBm T.O.I.)
- E4403B (at 1.0 GHz) 83 dB (+7.5 dBm T.O.I.)
- E4408B (at 1.0 GHz) 82 dB (+7.5 dBm T.O.I.)

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]

E4403B



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

General specifications

Measurement speed (characteristic)	**E4411B**	**E4403B**	**E4408B**
Local measurement and display update rate[4]	*≥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 reference[1]

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 level[2]

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 sweep[2]

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

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

ESA-L series spectrum analyzers

E4411B	9 kHz to 1.5 GHz
E4403B	9 kHz to 3.0 GHz
E4408B	9 kHz to 26.5 GHz

ESA-L series spectrum analyzers includes:

- GPIB and Centronics interface
- 50 ohm input impedance
- Type “N” input connector
- English manual set

Options

To add options to a product, use the following ordering scheme:

Model	E44xxB (xx = 11, 03 or 08)
Model options	E44xxB-Option 1 E44xxB-Option 2

Connectivity hardware

E44xxB-1AX	RS-232 and parallel (Centronics) interfaces (not compatible with standard GPIB interface)

Connectivity software

E44xxB-230	BenchLink web remote control software
E44xxB-B70	BenchLink spectrum analyzer software

Performance options

E44xxB-A4J	IF, sweep and video ports

Tracking generator

E44xxB-1DN	50 ohm tracking generator (9 kHz to 1.5 GHz for E4411B) (9 kHz to 3.0 GHz for E4403B and E4408B)
E44xxB-1DQ	75 ohm tracking generator (1 MHz to 1.5 GHz for E4411B, requires 1DP)

Input impedance

E44xxB-1DP	Replaces 50 ohm input impedance with 75 ohm input (1 MHz to 1.5 GHz for E4411B)

Input connector

E44xxB-BAB	Replaces type “N” input connector with APC 3.5 connector (E4408B only)

Code compatibility software

E44xxB-290	8590-series programming code compatibility

Accessories

E44xxB-042	Grey spectrum analyzer backpack
E44xxB-044	Yellow spectrum analyzer backpack
E44xxB-1D7	50 to 75 ohm matching pad (type n (m) to BNC (f))
E44xxB-A5D	12 Vdc power cable
E44xxB-AYT	Soft operating/carrying case (grey)
E44xxB-AYU	Soft operating/carrying case (yellow)
E44xxB-AXT	Hard transit case
E44xxB-UK9	Front-panel protective cover
E44xxB-1CP	Rack-mount kit with handles and slides

Documentation

E44xxB-0B0	Deletes printed manuals (retains CD-ROM manuals)
E44xxB-0B1	Additional manual set including CD-ROM
E44xxB-0BV	Component level service documentation
E44xxB-0BW	Assembly-level service guide with performance verification and adjustment software

Calibration documentation

E44xxB-UK6	Commercial calibration certificate with test data

Warranty and service

For warranty and service of 5 years, please order 60 months of R-51B (quantity=60).
Standard warranty is 36 months

R-51B	Return-to-Agilent warranty and service plan

Calibration[1]

For 3 years, order 36 months of the appropriate calibration plan shown below. For 5 years specify 60 months.

R-50C-001	Standard calibration
R-50C-002	Standards compliant calibration

1. Options not available in all countries

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)
IntuiLink software	http://www.agilent.com/find/IntuiLink
VXIplug&play	instrument drivers available via the Web at: http://www.agilent.com/find/inst_drivers (Click on VXIplug&play universal instrument drivers.)

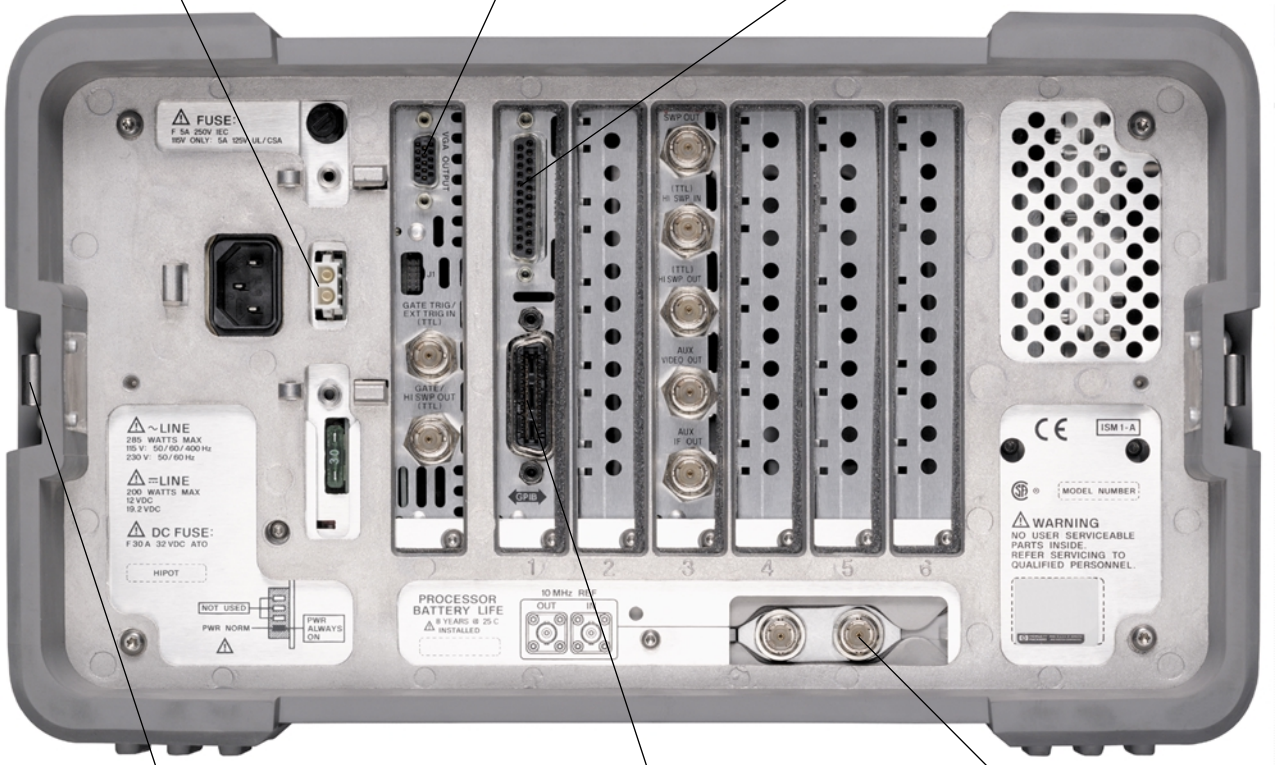
Literature

- *Spectrum Analyzer*, Selection Guide 5968-3413E
- *ESA/EMC Spectrum Analyzer,* Configuration Guide 5968-3412E
- *ESA-E Series Spectrum Analyzer,* Brochure 5968-3278E
- *ESA-E Series, Specifications* 5968-3386E
- *ESA Self-Guided Demo,* Product Note 5968-3658E
- *E1779A Rechargeable Battery Pack,* Product Overview 5966-1851E
- *ESA Cable TV Service and Installation Analyzer,* Product Overview 5980-0845E
- *IntuiLink Software, Data Sheet* 5980-3115EN
- *E4444A BenchLink Spectrum Analyzer,* Product Overview 5966-0676E
- *BenchLink Web Remote Control Software,* Product Overview 5988-2610EN
- *Spectrum Analysis Basics, AN 150* 5952-0292

12 Vdc operation with optional power cable

VGA connector for large screen monitor

Parallel printer port supports PCL 3/5 HP printers (optional)



Snap on battery pack for portability (optional)

GPIB or RS232 interfaces provide remote control and PC connectivity (optional)

Improve frequency accuracy with external frequency reference

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