HEWLETT® PACKARD
Expanding Possibilities

product overview

HP | ESA-L Series | Spectrum Analyzers

Expanded to 3 and 26.5 GHz!

When speed and accuracy count as much as your budget

Speed, Accuracy, Affordability

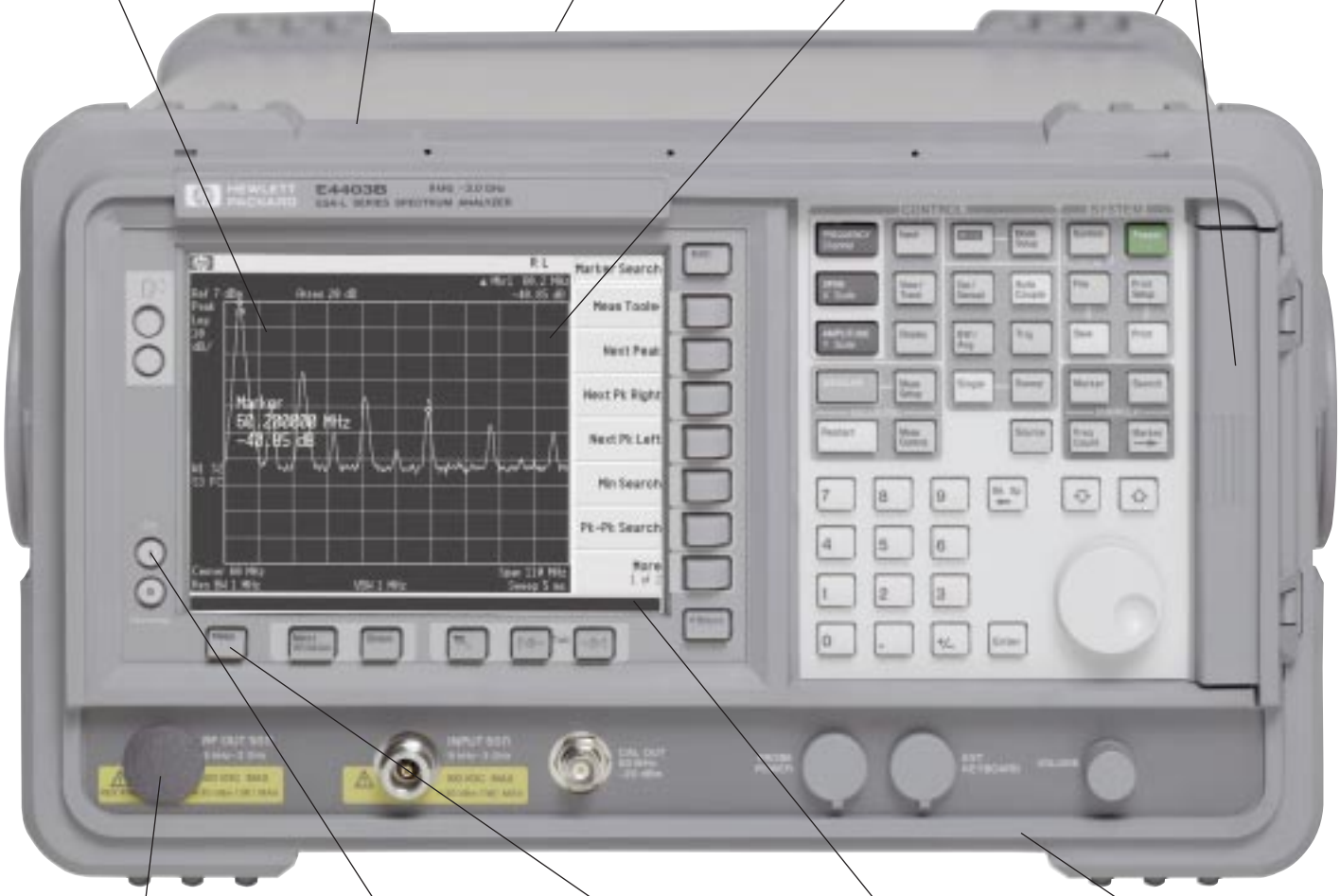
High-resolution, high-contrast monochrome display makes viewing multiple traces easy.

Rugged package with rubber-encased frames resists transportation stresses.

Snap-on battery for portability (optional).

Automatic background alignment eliminates calibration worries.

Disk drive and parallel printer port provide 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.

5ms sweep time and virtual real-time display update for easier circuit tuning.

Weather-resistant front panel allows operation in tough environments.

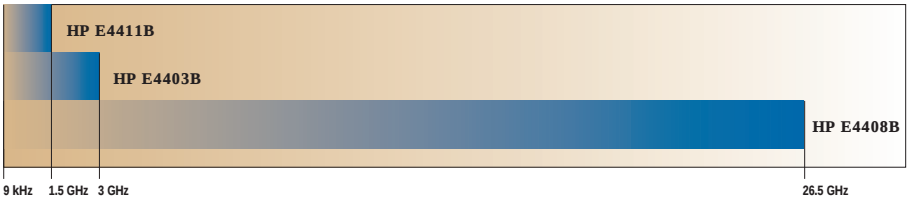
Designed for performance measurements

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. HP ESA-L series of portable spectrum analyzers have a remarkable five-millisecond full-span RF sweep time and virtual real-time measurement updates to the display or through HP-IB interface. With excellent accuracy and easy, reliable operation, the HP ESA-L series is full of innovations, like a 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 to display (characteristic)
HP E4411B **HP E4403B** **HP 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	≥77 dB/83 dB ≥79 dB/83 dB ≥78 dB/82 dB	>28 updates/sec

For complete specifications, see page 9. Ordering information is shown on page 12.

HP ESA-L series features and benefits

Performance[1]

5-ms full-span 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 (HP-IB)	Fast processing reduces measurement time in ATE environments (optional).
Fully synthesized design	Provides continuously phase-locked precision throughout the entire sweep. Assures frequency accuracy, stability, and measurement repeatability, eliminating drift.
Fast time-domain sweeps	Sweeps as fast as 2 microseconds per division in zero span (optional).
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 (HP E4411B only). One-button normalize function quickly the 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	16.5 cm, high-resolution monochrome display with wide viewing angle makes detailed VGA 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.
100 trace and 32 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 HP E4411B).
Automatic printer setup	Identifies connected HP printer models automatically.

1. **For higher performance requirements**, HP also offers the HP ESA-E series of spectrum analyzers. With its cardcage architecture, the HP 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 HP ESA family literature shown on page 12.

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

Eliminate measurement speed bottlenecks

With a combination of performance, speed and accuracy at an affordable price, the HP 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 5-millisecond full-span RF sweep time.

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

The HP ESA-L series is SCPI-compliant (Standard Commands for Programmable Instruments) and reduces test time by automating repetitive measurements using the HP-IB 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 HP 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 HP ESA-L series is manufactured in an ISO 9001-registered facility to HP's exacting standards.

Easy, worry-free field measurements

Designed for field applications, the HP 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.

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 HP 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 HP EEsof Advanced Design System instrument link/driver or HP BenchLink Spectrum Analyzer software.

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

Education

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

Save money and stay competitive

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 HP E4411B, guards against damage to the analyzer.

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

HP ESA-L series – a whole product solution

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

Pre-sales service
- Rentals, leasing, and financing
- Application engineering services
- Application notes
- Custom product modifications
- Custom downloadable programs

PC connectivity
- Floppy disk drive
- HP-IB or RS232 interfaces
- VXI *plug&play* drivers
- HP BenchLink spectrum analyzer software (32 bit)
- HP EEsof Advanced Design System driver (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

Product and peripheral interfaces
- HP 8590-series/ESA programming conversion guide
- Printer support

Software
- Programming examples on CD ROM
- SCPI (Standard Commands for Programmable Instruments)
- EMI PC software

Training and access to information
- Factory service training
- Web-based support of frequently asked questions
- Manuals on CD ROM and on the web

For the latest information on the HP ESA-L series see our web page at: **www.hp.com/go/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

HP E4411B		
50Ω		9 kHz to 1.5 GHz
75Ω(Opt. 1DP)		1 MHz to 1.5 GHz
HP E4403B		9 kHz to 3.0 GHz
HP 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] + span accuracy + 15% of RBW + 10 Hz)

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
HP E4411B	100 Hz to 1.5 GHz
HP E4403B	100 Hz to 3.0 GHz
HP E4408B	100 x N^2 Hz to 26.5 GHz
Resolution	Four digits or 2 Hz, whichever is greater
Accuracy	±1% of span

Sweep Time

Range	5 ms to 2000 sec.
Accuracy	±1%
Sweep Trigger	Free run, Single, Line, Video, Delayed Trigger, and External

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 1 MHz RBW		±10%
9 kHz, 120 kHz, 3 MHz		±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)

HP 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
HP E4413B, E4408B	
≥10 kHz offset from CW signal	≤–90 dBc/Hz + 20 Log N^2
≥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

Amplitude Specifications

Absolute Amplitude Accuracy

Overall Amplitude Accuracy[3]	±(0.6 dB +absolute frequency response)
20 to 30°C	
At reference settings[6]	±0.4 dB

Measurement Range — Displayed average noise level to maximum safe input level

Input Attenuator Range	
HP E4411B	0 to 60 dB, in 5 dB steps
HP E4403B, E4408B	0 to 65 dB, in 5 dB steps

Maximum Safe Input Level

Average Continuous Power	
HP E4411B (≥15 dB attenuation)	+30 dBm (1W)
HP E4403B, E4408B	
(≥5 dB attenuation)	+30 dBm (1W)
Peak Pulse Power	
HP E4411B (≥15 dB attenuation)	+30 dBm (1W)
HP E4403B, E4408B	
(≥5 dB attenuation)	+50 dBm (100W)

1-dB Gain Compression (total power at input mixer) [4, 5]

HP E4411B	0 dBm
HP E4403B	0 dBm
HP 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)

HP E4411B	
400 kHz to 1 MHz	≤–117 dBm
1 MHz to 500 MHz	≤–119 dBm
500 MHz to 1.0 GHz	≤–117 dBm
1.0 GHz to 1.5 GHz	≤–113 dBm
HP 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

HP 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

HP 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

HP E4411B
- 2 MHz to 750 MHz <–75 dBc for –40 dBm signal at input mixer[1]

HP 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
- HP E4411B (at 500 MHz) 77 dB
- HP E4403B (at 1 GHz) 79 dB
- HP E4408B (at 1 GHz) 78 dB

Third Order Intermodulation Distortion

HP E4411B
- 10 MHz to 1.5 GHz <–75 dBc for two –30 dBm signals at input mixer[1], >50 kHz separation

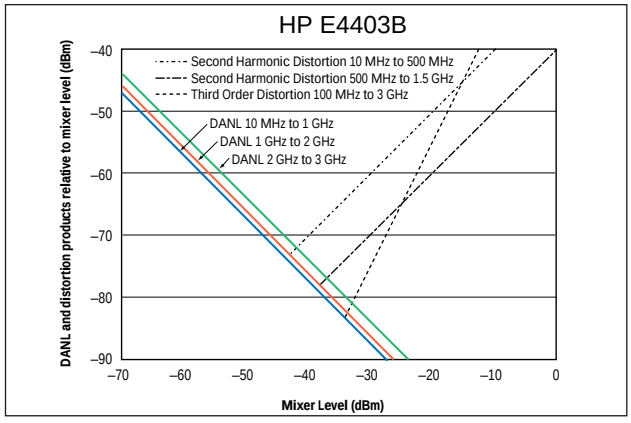
HP E4403B, E4408B
- 100 MHz to 6.7 GHz <–75 dBc for two –30 dBm signals at input mixer[1], >50 kHz separation
- 6.7 GHz to 26.5 GHz <–70 dBc for two –30 dBm signals at input mixer[1], >50 kHz separation

Maximum Achievable Third Order Dynamic Range
- HP E4411B (at 1.0 GHz) 83 dB
- HP E4403B (at 1.0 GHz) 83 dB
- HP E4408B (at 1.0 GHz) 82 dB

Other Input-Related Spurious

HP E4411B <–65 dBc, 30 kHz ≤ offset ≤1.2 GHz, for –20 dBm signal at input mixer[1]

HP 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, and W

Marker Readout Resolution

Log Scale 0.04 dB

Linear Scale 0.01% of reference level

Reference Level

Range adjustable over amplitude measurement range

Resolution
- Log Scale ±0.1 dB
- Linear Scale ±0.12% of reference level

Accuracy (at fixed frequency, a fixed attenuation, and reference to –30 dBm + attenuation setting)

Reference Level – Input Attenuation
- –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	±1.0 dB
6.7 GHz to 13.2 GHz	±2.0 dB	±1.7 dB
13.2 GHz to 25 GHz	±2.5 dB	±2.0 dB
25 GHz to 26.5 GHz	±3.0 dB	±2.0 dB

Resolution Bandwidth Switching Uncertainty

(Referenced to 3 kHz RBW, at reference level)

1 kHz, 10 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
- reference level ±0.4 dB/4 dB

Linear Accuracy ±2% of reference level

General Specifications

Measurement Speed

Local measurement and display update rate[4] *≥28 per second, characteristic*

Remote measurement and HP-IB transfer rate[4,5] *≥19 per second, characteristic*

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, 5 ms sweep time, fixed center frequency.
[5] Display Off, 401-point trace, and integer 32-bit data format, requires Option A4H.

Specifications, continued

Audible Noise (ISO 7779)

Sound Pressure at 25°C	<40 dB, (<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	<300W
Power Consumption, Standby	<5W
dc Voltage	12 to 20 Vdc
Power Consumption	<200W

Weight (without options)

HP E4411B	*12.6 kg (27.7 lb), characteristic*
HP E4403B	*14.9 kg (32.9 lb), characteristic*
HP E4408B	*16.2 kg (35.6 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 50 states, nominal*

Inputs/Outputs

Amplitude Reference[1]

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

Front Panel Connectors

Input	Type N (f), *50Ω nominal*
Option 1DP (HP E4411B)	BNC (f), *75Ω nominal*
Option BAB (HP E4408B)	APC 3.5 (m)
RF Out	
Option 1DN	Type N (f), *50Ω nominal*
Option 1DQ (HP E4411B)	BNC (f), *75Ω 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

Rear Panel Connectors

10 MHz Ref Output	BNC (f), *50Ω, >0 dBm, characteristic*
10 MHz Ref Input	BNC (f), *50Ω, –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*

HP-IB Interface

Option A4H	IEEE-488 bus connector

Serial Interface

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

Parallel Interface

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

Tracking Generator (Option 1DN and Option 1DQ)

Output Frequency Range

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

Output Power Level[2]

Range	
HP E4411B 50Ω	0 to –70 dBm
HP E4411B 75Ω	+42.76 to –27.24 dBmV
HP E4403B, E4408B 50Ω	–1 to –66 dBm
Vermier	
HP E4411B	
Range	10 dB
Output Attenuator Range	0 to 60 dB, 10 dB steps
HP E4403B, E4408B	
Range	9 dB
Output Attenuator Range	0 to 56 dB, 8 dB steps

Output Power Sweep[2]

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

Output Flatness

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

Spurious Output

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

Dynamic Range — Maximum output power level– displayed average noise level

Output Tracking

HP E4411B	
Drift	No error
Swept Tracking Error	No error for coupled sweep times
HP E4403B, E4408B	
Drift	*1.5 kHz/5 minute, characteristic*
Swept Tracking Error	*Usable in 1 kHz RBW after 5 minutes or warm up*

Output VSWR

HP E4411B	*<2.5:1, characteristic*
HP E4403B, E4408B	
0 dB attenuation	*<2.0:1, characteristic*
>8dB 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.

HEWLETT® PACKARD
Expanding Possibilities

Ordering information

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

Options

- ❑ **A4H** HP-IB 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 (not compatible with Option AYX)
- ❑ **1DN** 50-Ohm tracking generator (9 kHz to 1.5 GHz for HP E4411B) (9 kHz to 3.0 GHz for HP E4403B and HP E4408B)
- ❑ **1DP** 75-Ohm input impedance (1 MHz to 1.5 GHz) HP 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
- ❑ **0B0** Deletes manuals
- ❑ **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
- ❑ **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

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

Literature

❑ HP ESA Self-Guided Demo	5968-3658E
❑ Spectrum Analysis Basics, AN 150	5952-0292
❑ HP ESA-E series spectrum analyzer brochure	5968-3278E
❑ HP ESA-E series specifications	5968-3386E
❑ HP 8560 E-series spectrum analyzer brochure	5966-3559E
❑ HP E4444A BenchLink spectrum analyzer product overview	5966-0676E
❑ HP E1779A rechargable battery pack	5966-1851E