

# Select the Right Agilent Signal Analyzer for Your Needs

Selection Guide



## Models

ESA-L Series  
ESA-E Series  
856x EC Series  
PSA Series  
89600 Series  
89400 Series  
E4406A  
8591C



Agilent Technologies

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## How a vector signal analyzer differs from a spectrum analyzer

Traditional spectrum analyzers have a swept-tuned architecture, a higher frequency range and wider dynamic range than vector signal analyzers, and usually better RF characteristics overall.

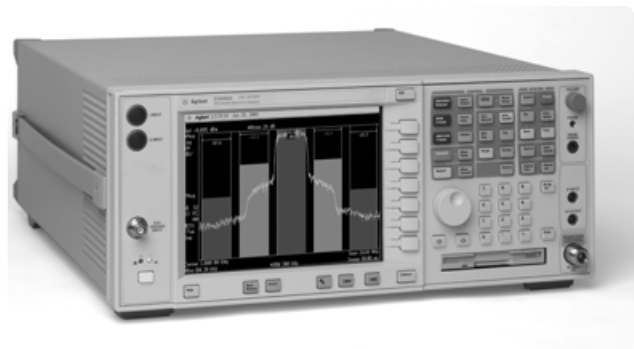
A vector signal analyzer's strength lies in its ability to perform signal analysis separately from signal acquisition, its ability to demodulate complex and time-varying signals, and to preserve both the magnitude and phase information of a signal in order to perform advanced time-, frequency-, and modulation-domain analysis.

## Analyzer Family Overviews

### Spectrum analyzers

#### PSA Series

- Agilent's most advanced high-performance spectrum analyzer
- up to 50 GHz frequency ranges
- leading edge performance, flexibility, and connectivity
- comprehensive spectrum and one-button format-based modulation analysis for 2G/3G communications systems and components
- Power Suite toolset allows for fast and accurate one-button, format-based power measurements
- general-purpose and communication-focused measurement personalities
- 8566B/8568B programming code compatibility for ease of migration
- link to 89601A PC software for flexible in-depth vector modulation analysis



E4440A

## Analyzer Family Overviews, continued

### 856x EC Series

- high-performance portable analyzers suited for R&D, field service, and manufacturing
- up to 50 GHz frequency ranges
- adaptable to specific applications with optional measurement personality cards
- outstanding phase noise and sensitivity
- rugged portability, color display, 1 Hz RBW



8563EC

### ESA-E Series

- scalable, mid-performance platform with excellent speed, accuracy, and dynamic range
- up to 26.5 GHz frequency ranges
- general-purpose and communication-focused measurement personalities plus 6-slot card cage to accept optional hardware cards
- portable, ideal for field installation and maintenance
- 8566B/8568B and 8590 Series programming code compatibility for ease of migration
- link to 89601A PC software for flexible in-depth vector modulation analysis



E4407B

### ESA-L Series

- Agilent's most affordable solution for basic spectrum analysis needs
- rugged, reliable, and easy to use
- fast, accurate results
- built-in floppy disk drive
- ready-to-go with minimal options



E4408B

### 8591C

- cable TV analyzer for dedicated non-interfering RF and video measurements
- one-button FCC proof of performance
- rugged, portable, weather-resistant package



8591C

## Vector signal analyzers

### E4406A

- optimized for wireless manufacturing and final design verification with one-button standards-based measurements
- measure signals at up to 4 GHz
- fast measurements and ease of use allow for increased production and throughput
- optional measurement personalities support up to eight wireless formats
- baseband IQ inputs allow you to test the complete signal path
- link to 89601A PC software for flexible in-depth vector modulation analysis



E4406A

### 89600 Series

- flexible in-depth vector modulation analysis
- PC software with VXI front end hardware to 6.0 GHz
- 36 MHz analysis bandwidth
- powerful time, frequency, and modulation domain analysis
- extensive, flexible demodulation tools
- seamless integration with PC-based tools for unparalleled flexibility in simulation, troubleshooting, and diagnostics
- test your system even with missing hardware through links to Agilent's Advanced Design System (ADS) software simulation tools
- bridge the gap between virtual design world and real physical hardware



89640A

### 89400 Series

- flexible in-depth vector modulation analysis
- optimized for in-depth R&D diagnostic analysis and troubleshooting
- quickly identify and quantify modulation impairments with extensive, flexible built-in tools
- superb phase noise, built in arbitrary source
- 8 MHz information bandwidth from DC up to 2.65 GHz



89441A

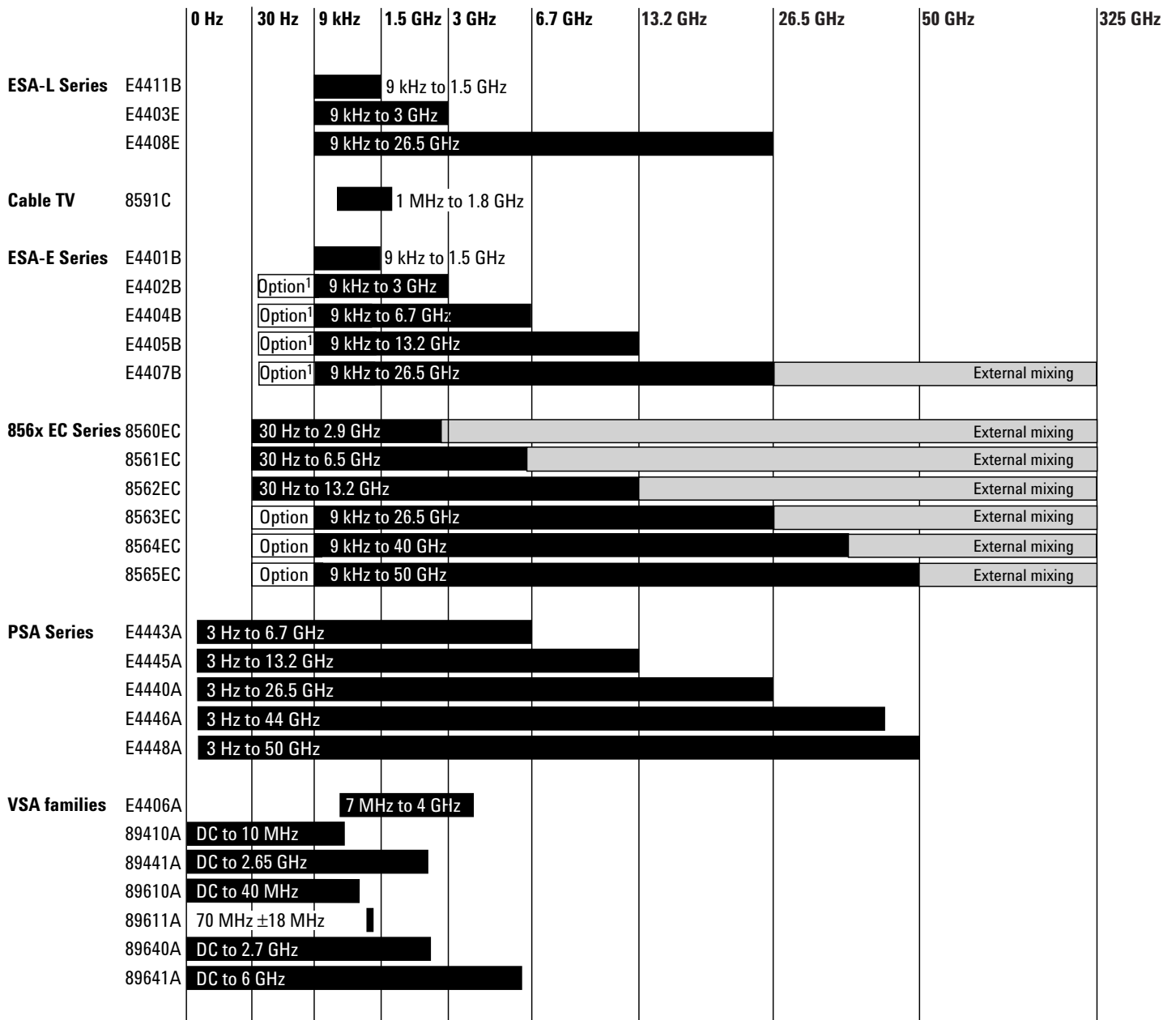
### 89601A software link to E4406A, ESA-E Series, PSA Series

- use the E4406A, ESA-E or PSA as an RF front end for 89601A software
- flexible in-depth vector modulation analysis and one-button wireless standards-based design tests with one configuration
- extend modulation analysis capabilities of E4406A, ESA-E and PSA analyzers with the modulation troubleshooting tools of 89601A
- add time gating and signal capture with playback



E4407B with 89601A software

# Frequency Ranges at a Glance



Note 1: 100 Hz option

# Recommended Solutions for Your Application

## Spectrum analysis solutions

### Optional application-specific measurement personalities<sup>1</sup>

	ESA-L Series	8591C	ESA-E Series	856x EC Series	PSA Series
<i>Bluetooth™</i>			●		
Broadcast TV		●	●		
Cable TV	●	● <sup>4</sup>	●		
Cable fault location			●		
cdma2000					●
cdmaOne			●		●
Digital radio				●	
EDGE					●
EMI Precompliance			● <sup>2</sup>		
GSM/DCS1800/PCS1900			●		●
GPRS			●		
Modulation analysis (EVM)			●		● <sup>3</sup>
NADC (includes PCS)					●
Noise figure					●
PDC					●
Phase noise			●	●	●
PHS					
Spurious response				●	
W-CDMA					●
HSDPA (W-CDMA)					Future
1xEV-DO					●
1xEV-DV					Future
8566B/8568B programming code compatibility			●		●
8590x Series programming code compatibility			●		

1. Generally available as a combination of optional hardware and measurement personalities
2. Available in E7400 Series
3. Available as format-based measurements in individual measurement personalities
4. Non-interfering measurements

## Vector signal analysis solutions

<b>Application-specific solutions</b>	<b>E4406A</b>	<b>89400 Series</b>	<b>89600 Series</b>
Flexible vector/digital modulation analysis <sup>1</sup>	89601A link	●	●
Wideband R&D analysis			●
Narrowband R&D troubleshooting		●	●
Standard-compliant production and design verification	●	●	● <sup>3</sup>
Non-standard signal analysis		●	●
Software simulation, integration, and analysis <sup>2</sup>			●
Base station transmitter test	●		●
Mobile transmitter test	●		●
<b>Standards-based preset measurements <sup>4</sup></b>			
1xEV-DO	●		●
1xEV-DV	Future		
HSDPA (W-CDMA)	Future		
802.11a			●
802.11b			●
802.11g			●
APCO 25		●	●
<i>Bluetooth</i>		●	●
cdma2000	●		●
cdmaOne	●	●	
CDPD		●	●
DECT		●	●
DTV8 (VSB8)		●	●
DTV16 (VSB16)		●	●
DVB16 (QAM16)		●	●
DVB32 (QAM32)		●	●
DVB64 (QAM64)		●	●
DVB-T			●
EDGE	●	●	●
GSM	●	●	●
HIPERLAN Type 1 (high bit rate)			●
HIPERLAN Type 1 (low bit rate)			●
HIPERLAN Type 2			●
iDEN	●		
NADC	●	●	●
PDC	●	●	●
PHP (PHS)		●	●
TD-SCDMA			●
TETRA		●	●
W-CDMA	●	●	●

1. Flexible modulation analysis refers to an analyzer's ability to demodulate non-standard or custom-made signals

2. With link to Agilent Advanced Design System (ADS)

3. Wireless LAN 802.11a/b/g

4. Available on E4406A through optional measurement personalities

# Feature and Specification Comparison Tables

## Spectrum analyzers

	<b>ESA-L Series</b> Basic spectrum analysis	<b>8591C</b> Cable TV analyzer	<b>ESA-E Series</b> Mid-performance platform	<b>856x EC Series</b> High performance portable	<b>PSA Series</b> Advanced high performance platform
<b>Overview</b>					
Performance	★	★★	★★★	★★★★	★★★★★
Price	\$	\$\$	\$\$\$	\$\$\$\$	\$\$\$\$\$
Application specific solutions		★	★★★★	★	★★★★
Expandable platform		Standard	Standard		Standard
Performance options		Available	Available	Standard	Standard
Frequency range	9 kHz to 26.5 GHz	9 kHz to 1.8 GHz	30 Hz to 26.5 GHz <sup>1</sup>	30 Hz to 50 GHz	3 Hz to 50 GHz
with external mixing			30 Hz to 325 GHz <sup>1,2</sup>	30 Hz to 325 GHz <sup>1,2</sup>	Future
<b>Specification summary</b>					
<b>Speed</b>					
Minimum RF sweep time	4 ms	20 ms	1 ms	50 ms	1 ms
Minimum zero span sweep time	4 ms	20 μs	25 ns <sup>1</sup>	50 ms	1 μs
Local measurement rate <sup>11</sup>	≥ 28/second	9/second	≥ 40/second	10/second	≥ 50/second
Remote measurement rate over GPIB <sup>11</sup>	≥ 30/second	7/second	≥ 40/second	7/second	≥ 45/second
RF center frequency tuning time <sup>11</sup>	≤ 90 ms		≤ 75 ms		
Warm-up time	5 minutes	30 minutes	5 minutes	5 minutes	30 minutes
<b>Phase noise/stability</b>					
Phase noise at 1 GHz (10 kHz offset)	-90 dBc/Hz	-90 dBc/Hz	-90 dBc/Hz	-113 dBc/Hz	-114 dBc/Hz
Phase noise at 1 GHz (1 MHz offset)			-133 dBc/Hz <sup>1</sup>	-132 dBc/Hz <sup>10</sup>	-144 dBc/Hz
Phase noise at 1 GHz (10 MHz offset)			-137 dBc/Hz <sup>1</sup>		-151 (-157 <sup>11</sup> ) dBc/Hz
<b>Dynamic range</b>					
Maximum third-order dynamic range at 1 GHz	83 dB	88 dB	108 dB <sup>1, 10</sup>	108 dB	113 dB
Maximum second-order dynamic range at 1 GHz	78.5 dB	78.5 dB	97.5 dB <sup>1, 10</sup>	95 dB	103 dB
1 dB gain compression <sup>5</sup>	0 dBm	-5 dBm	0 dBm	-5 dBm	+3 dBm
Maximum safe input	+30 dBm	+30 dBm	+30 dBm	+30 dBm	+30 dBm
Attenuator range and step size	0 to 65 dB <sup>3</sup> in 5 dB steps	0 to 70 dB in 10 dB steps	0 to 65 dB <sup>3</sup> in 5 dB steps	0 to 70 dB <sup>4</sup> in 10 dB steps	0 to 70 dB in 2 dB steps
Displayed average noise level (DANL) at 1 GHz	-117 dBm	-98 dBm <sup>1</sup>	-150 dBm <sup>1,10</sup> /-166 dBm <sup>6,10</sup>	151 dBm <sup>1</sup>	-154 dBm / -168 dBm <sup>6</sup>
Calibrated display range (log amplifier)	85 dB	70 dB	85 dB to 120 dB <sup>1</sup>	100 dB <sup>7</sup>	> 110 dB
<b>Accuracy</b>					
Overall amplitude accuracy (9 kHz to 3 GHz)	± 1.1 dB	± 2.1 dB	± 1.0 dB	± 1.9 dB	± 0.62 dB (±0.24 dB <sup>12</sup> )
Span accuracy	± 1.0 %	± 2% to ± 3%	± 0.5 %	± 1% to ± 5%	± 0.2%
Frequency accuracy at 1 GHz <sup>9</sup>	± 2001 Hz	± 210 Hz	± 101 Hz	± 103 Hz	± 100 Hz
<b>Resolution</b>					
RBW range	1 kHz to 5 MHz	30 Hz <sup>1</sup> to 3 MHz	1 Hz <sup>1</sup> to 5 MHz	1 Hz to 2 MHz	1 Hz to 8 MHz
Best selectivity	15:1	10:1	5:1	5:1	4.1:1
RBW step size	1, 3, 10	1, 3, 10	1, 3, 10	1, 3, 10	10% steps <sup>8</sup>
Residual FM	≤ 150 Hz	≤ 30 Hz <sup>1</sup>	≤ 2 Hz <sup>1</sup>	< 1 Hz	< 1 Hz
EMI resolution bandwidths	9 kHz & 120 kHz	200 Hz <sup>1</sup> , 9 & 120 kHz	200 Hz <sup>1</sup> , 9 & 120 kHz		
Information bandwidth					10 MHz <sup>11</sup>
Maximum IF bandwidth			> 30 MHz <sup>11,14</sup>		> 30 MHz <sup>11,13</sup> 80 MHz <sup>15</sup>

1. Optional  
2. To 110 GHz with Agilent mixers  
3. 0 to 60 dB in 1.5 GHz models  
4. 0 to 60 dB for 40 & 50 GHz models  
5. At frequencies < 3 GHz

6. With optional built-in preamp  
7. RBW ≤ 100 Hz, 90 dB for RBW ≥ 300 Hz  
8. From 1 Hz to 3 MHz  
9. Doesn't include settability or temperature stability  
10. Typical

11. Nominal  
12. 95% confidence  
13. Option E444xA-H70  
14. Option E440xB-H55  
15. Option E444xA-HNQ/HN8 (AKA PSA-80BW)



## Spectrum analyzers, continued

Features	ESA-L Series	8591C	ESA-E Series	856x EC Series	PSA Series
<b>Performance</b>					
AM/FM demodulation	AM only	Standard	Available	Standard	Via 89601A link
Background auto-alignment	Standard		Standard	Standard	Standard
Battery (snap-on)/12 V DC operation	Available		Available		
Card cage for optional hardware		4-slots	6-slots		2-slots
Digital demodulation			Standards-based		Standards-based
Flexible in-depth vector modulation analysis			Via 89601A link		Via 89601A link
FFT function – AM analysis		Standard		Standard	
High stability frequency reference		Standard	Available	Standard	Standard
Measurement personalities		Standard	Available	Available	Available
Preamplifier built-in		Standard	Available (3, 26.5 GHz)		Available (3 GHz)
RMS detector	Standard		Standard		Standard
Time gating		Gated video <sup>1</sup>	Gated video <sup>1</sup>	Gated video	Gated sweep, FFT
Tracking generator built-in	Available	Available	Available	Available <sup>2</sup>	
TV trigger		Standard	Available		
Weight (nominal)	13.2 to 17.1 kg (29.1 to 37.7 lbs)	15.4 to 17.7 kg (34 to 39 lbs)	13.2 to 17.1 kg (29.1 to 37.7 lbs)	20 kg (44 lbs)	23 kg (50 lbs)
Zero span offset trigger	Pre/post		Pre/post	Pre/post	Pre/post
<b>Connectivity</b>					
Agilent ADS software link	Available		Available		
BenchLink PC software	Available	Available	Available	Available	
BenchLink Web Remote software	Available		Available		Available
IntuiLink PC connectivity software	Standard		Standard		Standard
8566B/8568B programming code compatibility			Available		Available
8590 programming code compatibility	Available		Available		
Monitor output	VGA	NTSC or PAL	VGA	VGA	VGA
Remote interface	GPIO, RS-232 <sup>1</sup>	GPIO, RS-232	GPIO, RS-232 <sup>1</sup>	GPIO	GPIO, LAN
Remote programming	SCPI	Standard	SCPI	Standard	SCPI
Removable storage media	3.5" floppy disk	Memory card	3.5" floppy disk	Memory card	3.5" floppy disk
VXI plug&play drivers	Standard	Standard	Standard	Standard	Standard
IVI COM drivers	Standard		Standard		Standard
<b>Display</b>					
Display size	Monochrome 16.8 cm	Monochrome 13.5 cm	Color 16.8 cm	Color 16 cm	Color 21.3 cm
Expandable display	Standard		Standard	Standard	Standard
Segmented sweep			Standard		
Log sweep			Standard		
Split-screen display	Standard	Standard	Standard		
Sweep (trace) points	401	401	101 to 8192 <sup>4</sup>	601	101 to 8192 <sup>4</sup>
<b>Support</b>					
Calibration interval	1 year	1 year	1 year	2 years <sup>3</sup>	1 year
Calibration / adjustment software	Available	Available	Available	Available	Available
Help built-in	Standard		Standard		
Standard warranty	3 year global	1 year global	3 year global	1 year global	3 year global

1. Optional

2. 8560-EC only

3. 1 year for 8564-EC and 8565-EC

4. 2 to 8192 for zero span

5. Time gating via 89601A software link

## Spectrum analyzers, continued

### Power Suite one-button measurements<sup>7</sup>

Measurement	ESA-L Series	8591C	ESA-E Series	856x EC Series	PSA Series
Channel power	●	●	●	●	●
Occupied bandwidth	●	●	●	●	●
Multicarrier, multi-offset ACP	●	● <sup>8</sup>	●	● <sup>1</sup>	●
Multicarrier power	●		●	● <sup>1</sup>	●
CCDF	●		●		●
Harmonic distortion	●		●		●
Burst power	●		●		●
Intermod (TOI)	●	●	●		●
Spurious emissions	●		●		●
Spectrum emission mask	●		●		●

## Vector signal analyzers

Specification summary	E4406A	89400 Series	89600 Series
Frequency range	7 MHz to 314 MHz, 329 MHz to 4 GHz	DC to 2.65 GHz	DC to 6.0 GHz
Analysis bandwidth	8 MHz	8 MHz	36 MHz (> 1 GHz with links <sup>6</sup> )
RBW range	10 Hz to 7.5 MHz	< 1 Hz to 3 MHz	< 1 Hz to 10 MHz
Phase noise at 1 GHz (10 kHz offset)	-96 dBc/Hz	-116 dBc/Hz	-99 dBc/Hz <sup>2</sup>
Third order intercept	17 dBm <sup>3</sup>	6.5 dBm	4.0 dBm
Time capture	> 900 ksamples <sup>3</sup>	1 Msample	1.2 Gigasamples
Sensitivity at 1 GHz	-136 dBm/Hz <sup>4</sup>	-159 dBm/Hz	-159 dBm/Hz
Maximum safe input	+ 35 dBm	+ 25 dBm	+ 20 dBm
Attenuator range and step size	0 to 40 dB in 1 dB steps	0 to 75 dB in 5 dB steps	0 to 75 dB in 5 dB steps
Amplitude accuracy	± 0.6 dB	± 1.1 dB	± 2.1 dB
Frequency accuracy <sup>4</sup>	± 100 Hz <sup>5</sup>	± 100 Hz	± 100 Hz
RBW step size	arbitrary	arbitrary	arbitrary
Warm-up time	1 hour	30 minutes	30 minutes

### Features

Agilent ADS software link		Standard (file Only)	Dynamic <sup>1</sup>
Analog demodulation		AM/FM/PM	AM/FM/PM
Calibration interval	1 year	1 year	2 years
Digital demodulation	Standards-based <sup>1</sup>	Flexible	Flexible
Flexible vector modulation analysis	Via 89601A link	Available	Available
Help built-in		Standard	Standard
Monitor output	VGA	VGA	User PC
Preamplifier built-in		Standard	Standard
Remote interface	GPIB, LAN	GPIB, RS232, LAN	GPIB, RS232, LAN
Removable storage	3.5" floppy disk	3.5" floppy disk	User PC
Source		Internal source <sup>1</sup>	Via ESG link
Spectrogram	Via 89601A link	Available	Available
Split-screen display	Available	Standard	Standard
Time gating	Via 89601A link	Standard	Standard
User interface	Front panel	Front panel	User PC
Warranty (standard)	3-year global	1-year global	3-year global
Weight	19 kg (42 lbs)	25 kg (55 lbs)	16 kg (36 lbs)
Baseband IQ inputs	Available		Available
Oscilloscope/analyzer links			E4406A, ESA-E, PSA and Infiniium oscilloscopes (54810A, 54845A/B, 54830B/D, 54846B, 54831B/D, 54832B/D)
IVI COM drivers	Standard		Not applicable

1. Optional
2. Typical
3. Nominal
4. With +24 dB ADC gain
5. Does not include temperature drift, or settability
6. Links to 54810A, 54830A, 54845A, 54846A oscilloscopes

7. Supported one-button, wireless format setups:  
PSA: cdmaOne, cdma2000, GSM/EDGE, W-CDMA, NADC, PDC, *Bluetooth*, Tetra, 802.11 a/b/g, HiperLAN/2, DVB-T  
ESA-L/E: cdmaOne, cdma2000, GSM/EDGE, W-CDMA, NADC, PDC, *Bluetooth*, Tetra, 802.11 a/b, HiperLAN/2
8. Single carrier and one offset

## 89601A vector modulation analysis software/hardware links<sup>1</sup>

The 89601A vector signal analysis software is PC-based and can be “linked” by LAN, IEEE 1394, or GPIB cable to Agilent VXI hardware, spectrum analyzers, signal analyzers, and high-speed oscilloscopes. These combinations of Agilent hardware and the vector modulation analysis software from the 89600 can provide a broad array of analysis and measurement capabilities, dynamic range and bandwidths.<sup>2</sup>

Model	Frequency range	Maximum analysis bandwidth	Residual EVM (typical)	3rd order dynamic range (typical)	Connection	Memory
<b>PSA Series spectrum analyzers</b>						
E4440A	3 Hz – 26.5 GHz	8 MHz (26 MHz <sup>3</sup> , 80 MHz <sup>5</sup> )	< 1.0% rms	< -70 dBc	LAN	900 ksa
E4443A	3 Hz – 6.7 GHz	Same	< 1.0% rms	< -70 dBc	LAN	900 ksa
E4445A	3 Hz – 13.2 GHz	Same	< 1.0% rms	< -70 dBc	LAN	900 ksa
E4446A	3 Hz – 44.0 GHz	Same	< 1.0% rms	< -70 dBc	LAN	900 ksa
E4448A	3 Hz – 50.0 GHz	Same	< 1.0% rms	< -70 dBc	LAN	900 ksa
<b>ESA-E Series spectrum analyzers</b>						
E4402B	9 kHz – 3.0 GHz	10 MHz	< 1.8% rms	-55dBc	GPIB	124 ksa
E4404B	9 kHz – 6.7 GHz	10 MHz	< 1.8% rms	-55dBc	GPIB	124 ksa
E4405B	9 kHz – 13.2 GHz	10 MHz	< 1.8% rms	-55dBc	GPIB	124 ksa
E4407B	9 kHz – 26.5 GHz	10 MHz	< 1.8% rms	-55dBc	GPIB	124 ksa
<b>E4406A VSA</b>						
E4406A	7 MHz – 4 GHz	8 MHz	< 1% rms	< -70 dBc	LAN or GPIB	900 ksa
<b>Infiniium oscilloscopes</b>						
54810A	DC – 390 MHz	390 MHz	< 2% rms	≤ -40 dBc	LAN or GPIB	32 ksa
54845A/B	DC – 1.56 GHz	1.56 GHz	< 2% rms	≤ -40 dBc	LAN or GPIB	64 ksa
54846B	DC – 2.2G Hz	2.2 GHz	< 2% rms	≤ -40 dBc	LAN or GPIB	2 Msa
54830B/D	DC – 780 MHz	780 MHz	< 2% rms	≤ -40 dBc	LAN or GPIB	2 Msa
54831B/D	DC – 780 MHz	780 MHz	< 2% rms	≤ -40 dBc	LAN or GPIB	2 Msa
54832B/D	DC – 1.0 GHz	1.0 GHz	< 2% rms	≤ -40 dBc	LAN or GPIB	2 Msa
<b>89600 VXI bundled systems</b>						
89610A	DC – 39 MHz	39 MHz	< 1% rms	< -70 dBc	IEEE 1394	48 Msa (384 Msa available)
89611A <sup>4</sup>	52 – 88 MHz	36 MHz	< 1% rms	< -70 dBc	IEEE 1394	Same
89640A <sup>4</sup>	DC – 2.7 GHz	36 MHz	< 1% rms	< -65 dBc	IEEE 1394	Same
89641A <sup>4</sup>	DC – 6 GHz	36 MHz	< 1% rms	< -65 dBc	IEEE 1394	Same



1. 89600 software also links with Agilent ESG Series signal generators and EEsof Advanced Design Software.
2. For more information on hardware performance using the 89601A software, please reference the appropriate performance guide available on the product Web page: ESA – p/n 5988-4097E; PSA – p/n 5988-5015EN; E4406A – p/n 5988-2906EN; Infiniium – p/n 5988-4096EN.
3. With Option E444xA-H70 and when combined with a 89611A.
4. All measurements made in zero span; however, the width of this span is adjustable.
5. With Option E444xA-HN0/HN8 (AKA PSA-80BW) and when combined with a 89610A.

## Information Resources

For the latest product and support information including brochures, datasheets, manuals, application notes, and frequently asked questions, please visit our product Web pages:

<http://www.agilent.com/find/psa>  
<http://www.agilent.com/find/esa>  
<http://www.agilent.com/find/8560>  
<http://www.agilent.com/find/8590>  
<http://www.agilent.com/find/89400>  
<http://www.agilent.com/find/89600>  
<http://www.agilent.com/find/vsa>  
<http://www.agilent.com/find/emc>  
<http://www.agilent.com/find/IntuiLink>  
<http://www.agilent.com/find/eesof>

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