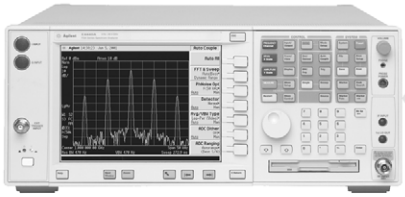
Hardware Measurement Platforms for the Agilent 89600 Series Vector Signal Analysis Software

Data Sheet

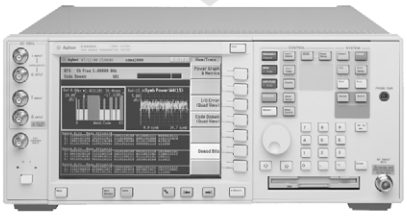
89600 Vector Signal Analysis Software

89600S VXI-Based Vector Signal Analyzers



PSA Series High Performance Spectrum Analyzers

ESA-E Series General Purpose Spectrum Analyzers



E4406A Transmitter Tester

Agilent Technologies

Contents

Introduction

The 89600 Series vector signal analysis software runs on a PC and works with a variety of hardware measurement platforms. These platforms include the 89600 VXI-based vector signal analysis systems, the 89650S 26.5 GHz vector signal analyzer, the PSA high performance spectrum analyzers, the ESA general purpose spectrum analyzers, and the E4406A transmitter tester. These platforms down convert and digitize the signal, provide signal capture capability, and move the data to the PC in a sequential stream of data blocks. The 89600 VSA software processes the data in the time, frequency and modulation domains.

This data sheet will help you select the hardware platform that will best meet your vector signal measurement and analysis needs.

Compatible Measurement Platforms

The 89600 VSA software runs on most Windows-based PCs and connects to the measurement platforms via GPIB, FireWire (IEEE-1394), or LAN. This data sheet documents the performance of the 89600 VSA software configured with Option 300 hardware connectivity, plus listed options, and the VXI, ESA, PSA, 89650S, and E4406A platforms.

VXI-based vector signal analysis systems

Agilent's 89610S, 89611S, 89640S and 89641S vector signal analyzers are VXI-based systems. These versatile systems consist of several VXI modules integrated at the factory. They offer a minimum of 36 MHz of analysis bandwidth and up to 6 GHz tuning range in 4-slot, 6-slot, and 13-slot VXI mainframes. The 89600 VSA software is a standard part of these systems.

Phase-coherent two channel baseband or RF operation is available as an option to the VXI systems.

ESA-E Series spectrum analyzers

The ESA-E Series general purpose, portable spectrum analyzers offer a wide range of performance, features, and flexibility with up to 26.5 GHz tuning range and 10 MHz of analysis bandwidth. Measurement control is via GPIB.

PSA Series high-performance spectrum analyzers

The Agilent PSA Series offers high performance spectrum analysis up to 50 GHz with powerful one-button measurements, a versatile feature set, and a leading-edge combination of flexibility, speed, accuracy, and dynamic range. Measurement control is via LAN or GPIB.

89650S vector signal analyzer

The 89650S, 26.5 GHz VSA, is Agilent's highest performance VSA. It pairs the E4440A, 26.5 GHz PSA spectrum analyzer and its 80 MHz analysis bandwidth option, with the 89600 VSA software.

E4406A VSA transmitter tester

Connect Agilent's E4406A VSA transmitter tester with the 89600 VSA software and you have two high performance instruments: a superior multi-format standards-based transmitter tester and a high performance, flexible digital demodulation and analysis tool.

Other measurement platforms

The following high performance products also work with the 89600 VSA software but are not covered in this data sheet.

Infiniium scopes

Combine the 89600 VSA software with Agilent's Infiniium oscilloscopes (some models) to analyze super wide bandwidth signals. The oscilloscopes provide up to 13 GHz of analysis bandwidth and are well suited to digitizing down-converted satellite, LMDS, and MMDS signals. The digitized signals are transferred to the 89600 software, running in the scope or on an external PC, where the frequency, time, and modulation analysis tools of the 89600 can be used to evaluate and troubleshoot the signal. For more information refer to *"Agilent Infiniium Oscilloscopes Performance Guide Using 89601A Vector Signal Analyzer Software"* (5988-4096).

ADS

The powerful, PC-based 89600 VSA software enables tight, interactive integration with Agilent's Advanced Design System (ADS) RF and microwave design and simulation software to analyze simulation results. The 89600 software can be dynamically linked to any point in the digital model to analyze data by simply dragging the VSA icon to the desired spot in the schematic. The 89600 software can also be used to import real-world signals into ADS simulations using any supported acquisition hardware.

N4010A wireless connectivity test set

The N4010A is a test set designed to quickly and accurately measure emerging wireless connectivity formats in the 2.4 GHz band. The N4010A offers two bandwidth selections of 5 and 22 MHz, making the N4010A an ideal test platform for *Bluetooth™* and WLAN RF measurements. The N4010A with *Bluetooth* Option 101 is an effective measurement tool for development, integration, pre-qualification, and volume manufacturing.

Signal generators

Any VSA system, with version 3.01 software or later, can control Agilent ESG and PSG Series signal generators. This control expands the usefulness of the VSA software for stimulus/ response measurements. The 89600 software controls the signal type, frequency, and level features of the signal generator. The software also downloads files to the signal generator arbitrary waveform source to simulate a wide range of digitally modulated signals. The files can be 89600 software signal captures, or even simulated waveforms from ADS design software.

Playback requires that the arbitrary waveform generator be installed in the signal generator. Signal playback bandwidth is limited by the bandwidth of the arbitrary waveform generator.

The signal generator can be controlled via GPIB or LAN.

Specifications

Performance

89610S, 89611S, 89640S, 89641S vector signal analyzer performance

The following specifications describe the warranted performance of standard 89610S, 89611S, 89640S, and 89641S VXI-based vector signal analyzer (VSA) systems integrated by Agilent Technologies.

The performance of 89610S systems is specified in the E8408A[1] four-slot, the E1421B[2] six-slot, and the E8403A[2] 13-slot VXI mainframes. The performance of the 89611S, 89640S, and 89641S systems is specified in the E8408A[1] four-slot, the E1421B[2] six-slot, and the E8403A[2] 13-slot VXI mainframes. These specifications also describe the nominal performance for other, non-standard 89600S configurations.

These specifications describe warranted performance over a temperature range of 20° to 30 °C and include a 30-minute warm-up from ambient conditions. Parameters identified as “typical” or “characteristic” are included for informational purposes only and are not warranted. To aid in understanding analyzer performance capabilities, measurement units and specification terms are provided in the glossary at the end of this document.

The Agilent 89600 Series VSA systems come standard with two sets of application software: vector signal analysis and spectrum analysis. The vector signal analysis application software is used to analyze complex signals in the time, frequency, and modulation domains. The spectrum analyzer application software emulates a traditional spectrum analyzer, providing fast, high-resolution signal magnitude measurements while sweeping across a user-defined frequency span. Unless otherwise indicated, the specifications in this data sheet apply to both sets of application software.

1. With backplane connector RF shielding (Option E8408-80900) and enhanced current supply (Option E8408-100).
2. With backplane connector RF shielding (Option E1401-80918)

89610S, 89611S, 89640S, 89641S vector signal analyzer performance (continued)

Frequency	**89610S (DC to 40 MHz)**	**89611S (70 MHz ±18 MHz)**	**89640S (DC to 2700 MHz)**	**89641S (DC to 6000 MHz)**
Frequency range				
Spectrum analysis mode				
RF/IF mode	—	Not available	36 to 2700 MHz[1]	36 to 6000 MHz[1]
Baseband mode	DC to 40 MHz	Not available	DC to 36 MHz[2]	DC to 36 MHz[2]
Vector analysis mode				
RF/IF mode	—	52 to 88 MHz[3]	36 to 2700 MHz[1]	36 to 6000 MHz[1]
Baseband mode	DC to 40 MHz	DC to 36 MHz[2]	DC to 36 MHz[2]	DC to 36 MHz[2]
Frequency tuning resolution	1 mHz	1 mHz	1 mHz	1 mHz
Frequency spans				
Spectrum analyzer application	< 1 kHz to 40 MHz	Not available	< 1 kHz to 2.7 GHz	< 1 kHz to 6 GHz
Vector signal analyzer application				
1 channel mode	< 1 Hz to 39.06 MHz	< 1 Hz to 36 MHz	< 1 Hz to 36 MHz	< 1 Hz to 36 MHz
2 channel mode	< 1 Hz to 39.06 MHz	< 1 Hz to 36 MHz	< 1 Hz to 36 MHz	< 1 Hz to 36 MHz
Ch1 + j*Ch2 mode	< 2 Hz to 78 MHz	< 2 Hz to 72 MHz	< 2 Hz to 72 MHz	< 2 Hz to 72 MHz
Frequency points per span				
Spectrum analyzer application	2 to 131,072	Not available	2 to 131,072	2 to 131,072
Vector signal analyzer application				
Calibrated points	51 to 102,401	51 to 102,401	51 to 102,401	51 to 102,401
Displayable points	51 to 131,072	51 to 131,072	51 to 131,072	51 to 131,072
Frequency accuracy	Frequency accuracy is the sum of initial accuracy, aging, and temperature drift.			
Initial accuracy	100 ppb	100 ppb	100 ppb	100 ppb
Aging	1 ppb/day 100 ppb/year	1 ppb/day 100 ppb/year	1 ppb/day 100 ppb/year	1 ppb/day 100 ppb/year
Temperature drift (0° to 50 °C)	50 ppb	50 ppb	50 ppb	50 ppb
Frequency stability				
Phase noise				
10 MHz signal (baseband input)				
100 Hz offset	< –108 dBc/Hz	< –108 dBc/Hz	< –108 dBc/Hz	< –108 dBc/Hz
1 kHz offset	< –118 dBc/Hz	< –118 dBc/Hz	< –118 dBc/Hz	< –118 dBc/Hz
> 10 kHz offset	< –120 dBc/Hz	< –120 dBc/Hz	< –120 dBc/Hz	< –120 dBc/Hz
80 MHz signal (IF input)				
100 Hz offset	—	< –92 dBc/Hz	—	—
1 kHz offset	—	< –102 dBc/Hz	—	—
> 10 kHz offset	—	< –110 dBc/Hz	—	—
1 GHz signal[4] (RF input)				
> 20 kHz offset	—	—	< –99 dBc/Hz	< –99 dBc/Hz
> 100 kHz offset	—	—	< –110 dBc/Hz	< –110 dBc/Hz

Resolution bandwidth filtering	**89610S (DC to 40 MHz)**	**89611S (70 MHz ±18 MHz)**	**89640S (DC to 2700 MHz)**	**89641S (DC to 6000 MHz)**
RBW range	The range of available RBW choices is a function of the selected frequency span and the number of calculated frequency points. Users may step through the available range in a 1-3-10 sequence, or enter an arbitrarily chosen bandwidth directly.			
Spectrum analyzer application	1 Hz to > 5 MHz	Not available	1 Hz to > 5 MHz	1 Hz to > 5 MHz
Vector signal analyzer application	< 1 Hz to 10 MHz	< 1 Hz to 10 MHz	< 1 Hz to 10 MHz	< 1 Hz to 10 MHz
RBW shape factor	The window choices below allow the user to optimize the RBW shape as needed for best amplitude accuracy, best dynamic range, or best response to transient signal characteristics.			

	Selectivity	*Passband flatness*	*Rejection*
Flat top	0.41	0.01 dB	> 95 dBc
Gaussian top	0.25	0.68 dB	> 125 dBc
Hanning	0.11	1.5 dB	> 31 dBc
Uniform	0.0014	4.0 dB	> 13 dBc

1. Under-range provided to 30 MHz. Specifications are typical for center frequencies below 36 MHz.
2. Over-range provided to 37.11 MHz
3. The 89611S can be configured to display and accept frequency settings based on the user's RF analysis bandwidth.
4. < 0.05 Grms random vibration, 5 - 500 Hz.

89610S, 89611S, 89640S, 89641S vector signal analyzer performance (continued)

Amplitude	**89610S (DC to 40 MHz)**	**89611S (70 MHz ±18 MHz)**	**89640S (DC to 2700 MHz)**	**89641S (DC to 6000 MHz)**
Input				
Full-scale range				
Baseband mode	–31 dBm to +20 dBm in 3 dB steps	–30 dBm to +20 dBm in 5 dB steps	–30 dBm to +20 dBm in 5 dB steps	–30 dBm to +20 dBm in 5 dB steps
IF/RF mode	—	–45 dBm to +20 dBm in 5 dB steps	–45 dBm to +20 dBm in 5 dB steps	–45 dBm to +20 dBm in 5 dB steps
Maximum safe input level	+24 dBm, ±5 VDC	+20 dBm, ±5 VDC	+20 dBm, ±5 VDC	+20 dBm, ±5 VDC
ADC overload (typical)				
Baseband mode	+10 dBfs	+9 dBfs	+9 dBfs	+9 dBfs
IF/RF mode	—	+10 dBfs	+10 dBfs	+10 dBfs
Input channels				
Standard	1	1	1	1
Optional	2 baseband	2 IF/baseband	2 RF/IF/baseband	2 RF/IF/baseband
Nominal impedance	50 ohms	50 ohms	50 ohms	50 ohms
Connector	BNC	Type N	Type N	Type N
Input coupling				
Baseband mode	AC or DC	AC or DC	AC or DC	AC or DC
IF/RF mode	—	AC	AC	AC
VSWR	*Return loss in measurement span*			
Baseband mode				
All ranges	1.33:1 (17 dB)	1.5:1 (14 dB)	1.5:1 (14 dB)	1.5:1 (14 dB)
IF/RF mode				
+20 dBm to –20 dBm ranges	—	2.1:1 (9 dB)	1.8:1 (10.7 dB)	2.0:1 (9.5 dB)
–25 dBm to –45 dBm ranges	—	2.1:1 (9 dB)	2.5:1 (7.3 dB)	3.1:1 (5.8 dB)
Amplitude accuracy	*Accuracy specifications apply with flat top window selected and are the sum of absolute full-scale accuracy and amplitude linearity.*			
Absolute full-scale accuracy				
Baseband mode				
0° to 50 °C	±0.8 dB	±0.8 dB	±0.8 dB	±0.8 dB
IF/RF mode (≤ 2.7 GHz)				
20° to 30 °C	—	±0.8 dB	±2 dB	±2 dB
0° to 50 °C	—	±0.8 dB	±2 dB (typical)	±2 dB (typical)
RF mode (> 2.7 GHz)				
20° to 30 °C	—	—	—	±2 dB
0° to 50 °C	—	—	—	±2.25 dB (typical)
Amplitude linearity				
0 to –30 dBfs	±0.10 dB	±0.10 dB	±0.10 dB	±0.10 dB
–30 to –50 dBfs	±0.15 dB	±0.15 dB	±0.15 dB	±0.15 dB
–50 to –70 dBfs	±0.20 dB	±0.20 dB	±0.20 dB	±0.20 dB
Amplitude accuracy correction	—	See footnote[1]	—	—
Residual DC (typical, 50 Ω)				
Baseband mode (Input range > –20 dBm)	< –40 dBfs	< –40 dBfs	< –40 dBfs	<–40 dBfs
Flatness	*Frequency response across the measurement span in vector signal analysis mode (included in amplitude specifications)*			
IF/RF mode				
Center frequency ±10 MHz	—	±0.2 dB (typical)	±0.2 dB (typical)	±0.2 dB (typical)
Center frequency ±18 MHz	—	±0.2 dB (typical)	±0.2 dB (typical)	±0.3 dB (typical)
Baseband mode	±0.2 dB (typical)	±0.2 dB (typical)	±0.2 dB (typical)	±0.2 dB (typical)
Flatness correction	—	See footnote[2]	—	—

1. External amplitude correction is available to correct for down-converter RF signal path amplitude. The user must provide a calibration trace file. Details are given in the 89611A online Help (under "89611, Setup" in the index).
2. Requires a manual procedure; see Help text. Required for external tuners only.

89610S, 89611S, 89640S, 89641S vector signal analyzer performance (continued)

Amplitude (continued)	**89610S (DC to 40 MHz)**	**89611S (70 MHz ±18 MHz)**	**89640S (DC to 2700 MHz)**	**89641S (DC to 6000 MHz)**
Channel match	*Multiple channels are available as options*			
Amplitude match	DC coupled, full-scale, matching input ranges			
Baseband	±0.25 dB	±0.25 dB	±0.25 dB	±0.25 dB
IF/RF		±0.25 dB	±1.2 dB	±1.2 dB[1]
Phase match	10 MHz input, full-scale, matching input ranges			
	±4°	—	—	—
Group delay match	Across measurement span, typical			
Baseband	±2 ns	±2 ns	±2 ns	±2 ns
IF/RF	—	±1.5 ns	±5.0 ns	±5.0 ns[1]
Stability (typical)				
Amplitude	—	0.006 dB/°C	0.006 dB/°C	0.006 dB/°C
Phase				
Baseband	—	1.0°/°C	1.0°/°C	1.0°/°C
IF/RF	—	1.0°/°C	2.0°/°C	2.0°/°C[1]
Dynamic range	Dynamic range indicates the amplitude range that is free of erroneous signals within the measurement span.			
Intermodulation distortion	Two input signals, each –6 to –10 dBfs, separation > 1 MHz, specified relative to either signal			
Third-order				
IF/baseband mode	< –70 dBc	< –70 dBc	< –70 dBc	< –70 dBc
RF mode	—	—	< –70 dBc	< –70 dBc
Harmonic distortion	Single input signal, 0 to –10 dBfs			
IF/baseband mode	< –70 dBc	< –68 dBc	< –68 dBc	< –68 dBc
RF mode	—	< –70dBc	< –55 dBc (typical)	< –55 dBc (typical)
Spurious responses	Full-scale input signal within analyzer measurement span			
IF/baseband mode	< –68 dBc	< –68 dBc	< –68 dBc	< –68 dBc
RF mode	—	—	< –65 dBc[2] (typical)	< –65 dBc[3] (typical)
	Full-scale input signal outside analyzer measurement span			
IF/baseband mode	< –70 dBc	< –68 dBc	< –68 dBc	< –68 dBc
RF mode		—	< –52 dBc (typical)	< –50 dBc (typical)
Spurious sidebands	Full-scale input signal			
Baseband mode (> 1 kHz offset)	< –70 dBc	< –70 dBc	< –70 dBc	< –70 dBc
RF mode (1 to 3 kHz offset)	—	< –70 dBc	< –65 dBc	< –65 dBc
RF mode (> 3 kHz offset)	—	< –70 dBc	< –70 dBc	< –70 dBc
Residual responses (> 10 kHz)	Input port terminated and shielded			
Baseband and IF/RF modes (maximum of)	–77 dBfs or –100 dBm	–77 dBfs or –100 dBm	–77 dBfs or –100 dBm	–77 dBfs or –100 dBm
Input noise density	Range ≥ –30 dBm			
Baseband mode (> 0.1 MHz)	< –121 dBfs/Hz	< –121 dBfs/Hz	< –121 dBfs/Hz	< –121 dBfs/Hz
IF/RF mode (< 1.2 GHz)	—	< –118 dBfs/Hz	< –116 dBfs/Hz	< –116 dBfs/Hz
RF mode (1.2 to 2.7 GHz)	—	—	< –114 dBfs/Hz	< –114 dBfs/Hz
RF mode (> 2.7 GHz)	—	—	—	< –113 dBfs/Hz
Sensitivity	Most sensitive range			
Baseband mode	< –151 dBm/Hz	< –151 dBm/Hz	< –151 dBm/Hz	< –151 dBm/Hz
IF/RF mode (< 1.2 GHz)	—	< –159 dBm/Hz	< –158 dBm/Hz	< –157 dBm/Hz
RF mode (1.2 to 2.4 GHz)	—	—	< –156 dBm/Hz	< –156 dBm/Hz
RF mode (> 2.4 GHz)	—	—	< –156 dBm/Hz	< –153 dBm/Hz
Phase	Measurements apply to vector signal analyzer function			
Linearity (typical)	Single channel group delay deviation across maximum measurement span[4], using flat-top window			
Baseband mode	±2 ns	±2 ns	±2 ns	±2 ns
IF/RF mode	—	±6 ns	±8 ns (RF)	±8 ns (RF)

1. For signal frequencies < 2.7 GHz.
2. Typical specification degraded by 10 dB for input frequencies within ±10 MHz of 1890.6 MHz
3. Typical specification degraded by 10 dB for input frequencies within ±10 MHz of 1890.6 MHz, 2909.4 MHz, 3200.0 MHz, 3709.4 MHz, 3733.3 MHz, 4509.4 MHz, and 5309.4 MHz.
4. ±17 MHz of center frequency (RF, IF), ≤ 35.5 MHz (baseband), ≤ 39.5 MHz (89610S)

89650S vector signal analyzer performance

These specifications summarize the performance of the 89650S over 20° to 30 °C. Refer to the E4440A and option 122, 80 MHz bandwidth ADC, technical data sheet or the 89650S technical overview for more detailed specifications.

	89650S		
Frequency range			
Spectrum analysis	3 Hz to 26.5 GHz		
Vector modulation analysis	36 MHz to 26.5 GHz Pre-selector bypass option recommended above 3 GHz		
Frequency spans	< 1 kHz to 80 MHz[1]		
Frequency points per span			
Calibrated	51 to 102,401		
Displayable	51 to 131,072		
Absolute amplitude accuracy	±0.25 dB At 50 MHz		
Amplitude IF response	Deviation from flat response, internal calibration, center frequency > 50 MHz, flat-top window, 10 dB input range, 0 dB IF gain		
	Frequency	*Span*	*Response*
	≤ 3 GHz	≤ 30 MHz	±0.57 dB (±0.25 dB, typical)
	≤ 3 GHz	≤ 60 MHz	±0.75 dB (±0.45 dB, typical)
	≤ 3 GHz	≤ 80 MHz	±0.83 dB (±0.5 dB, typical)
	> 3 GHz	30 MHz	±0.18 dB, typical
	Pre-selector bypass enabled		
	> 3 GHz	80 MHz	±0.6 dB, typical
	Pre-selector bypass enabled		
Amplitude flatness	After extended calibration performed		
	±0.2 dB, nominal Frequency > 3 GHz, span ≤ 60 MHz, pre-selector bypass enabled		
Phase linearity	After internal calibration performed		
	Frequency	*Span*	*Linearity (typical)*
	≤ 3 GHz	≤ 30 MHz	±1.6º
	≤ 3 GHz	≤ 60 MHz	±4.0º
	> 3 GHz	≤ 30 MHz	±1.0º
	Pre-selector bypass enabled		
Phase linearity	After extended calibration performed		
	±0.3º, nominal Frequency > 18 GHz, span ≤ 60 MHz, pre-selector bypass enabled		
3rd order intermodulation distortion	< –75 dBc, typical ≤ 3 GHz, span ≤ 60 MHz, two –9 dBfs tones		
Phase noise	–106 dBc/Hz 1 GHz, 10 kHz offset		
Memory size	128 MSa, complex 1.34 sec @ full span		

1. When operating above 3 GHz center frequency, a YIG-tuned filter (YTF) is normally used to prevent spurious responses due to out-of-span signals and mixer images. The bandwidth of the YTF pre-selector is a function of center frequency and its bandwidth will limit the wideband frequency span. The maximum useful frequency span is approximately 30 MHz at 3 GHz center frequency and increases to 60 MHz at 26.5 GHz. The pre-selector bypass, Option 123, adds a selectable bypass of the YTF pre-selector, enabling full 80 MHz functionality.

PSA spectrum analyzer performance

These specifications summarize the performance for the PSA spectrum analyzers (without Option 122, 80 MHz bandwidth ADC) when used with the 89600 vector signal analysis software. These are typical values, not warranted.

	PSA (typical)		
Frequency			
Range	10 MHz to 3 GHz Specified range, 3 GHz to PSA maximum frequency is allowed but not specified		
Center frequency tuning resolution	1 mHz		
Frequency span	< 10 Hz to 8 MHz		
Frequency points per span			
Calibrated points	51 to 102,401		
Displayable points	51 to 131,072		
Resolution bandwidth (RBW)	The range of available RBW choices is a function of the selected frequency span and the number of calculated frequency points. Users may step through the available range in a 1-3-10 sequence or directly enter an arbitrarily chosen bandwidth.		
Range	1 Hz to 2.3 MHz		
RBW shape factor	The window choices below (available on the PSA, ESA, and E4406A) allow the user to optimize the RBW shape as needed for best amplitude accuracy, best dynamic range, or best response to transient signal characteristics.		
	Selectivity	*Passband flatness*	*Rejection*
Flat top	0.41	0.01 dB	> 95 dBc
Gaussian top	0.25	0.68 dB	> 125 dBc
Hanning	0.11	1.5 dB	> 31 dBc
Uniform	0.0014	4.0 dB	> 13 dBc
Input	Full scale, combines attenuator setting and ADC gain[1]		
Range	–18 dBm to +22 dBm in 1 dB steps 89601A v3.00		
	–30 dBm to +30 dBm in 2 dB steps 89601A v4.00		
	–60 dBm to +30 dBm in 2 dB steps < 3 GHz, with preamp Option 1DS, 89601A v4.00		
ADC overload	+9 dBfs At 1 GHz		
Amplitude accuracy			
Amplitude linearity	*Range*	*Linearity*	*ADC dither*
	0 to –30 dBfs	±0.03 dB	On
	–30 to –50 dBfs	±0.1 dB	Off
IF Flatness	± 0.3 dB		
Sensitivity	At 1 GHz, most sensitive range		
	–152 dBm/Hz Without pre-amp		
	–165 dBm/Hz With pre-amp Option 1DS		
Dynamic range			
Third-order intermodulation distortion	*Input range*	*Distortion*	
	Range ≥ –30dBm	< –70 dBc or < –90 dBfs, whichever is greater	
	Range < –30dBm	< –68 dBc or < –90 dBfs, whichever is greater	
Noise density	At 1 GHz		
	Input range	*Density*	
	> –24 dBm	< –126 dBfs/Hz	
	–44 dBm to –24 dBm	< –122 dBfs/Hz	
IF residual responses	< –70 dBfs		
IF spurious responses	< –70 dBfs		
IF flatness	± 0.3 dB		

1. PSA ADC gain is set to 6 dB and attenuator is set to [89601A range (in dBm) + 18] dB.

ESA-E Series spectrum analyzer performance

These specifications summarize the performance for the ESA-E Series spectrum analyzers when used with the 89600 vector signal analysis software. These are typical values, not warranted.

	ESA[1,2] (typical)		
Frequency			
Range	Range of ESA-E model		
Center frequency tuning resolution	1 Hz		
Frequency span range	< 50 kHz to 10 MHz Alias protection enabled		
	< 50 Hz to 10 MHz Alias protection disabled, default		
Frequency points per span			
Calibrated points	51 to 102,401		
Displayable points	51 to 131,072		
Frequency stability (spectral purity)	1 GHz input, > 10 kHz offset		
Phase noise	–96 dBc/Hz[2]		
Resolution bandwidth (RBW)	The range of available RBW choices is a function of the selected frequency span and the number of calculated frequency points. Users may step through the available range in a 1-3-10 sequence or directly enter an arbitrarily chosen bandwidth.		
Range	< 500 Hz to > 2.8 MHz Alias protection enabled		
	< 1 Hz to > 2.8 MHz Alias protection disabled, default		
RBW shape factor	The window choices below allow the user to optimize the RBW shape as needed for best amplitude accuracy, best dynamic range, or best response to transient signal characteristics.		
	Selectivity	*Passband flatness*	*Rejection*
Flat top	0.41	0.01 dB	> 95 dBc
Gaussian top	0.25	0.68 dB	> 125 dBc
Hanning	0.11	1.5 dB	> 31 dBc
Uniform	0.0014	4.0 dB	> 13 dBc
Input range	–55 dBm to +30 dBm, 1 dB steps Without pre-amp, < 3 GHz		
	–75 dBm to +30 dBm, 1 dB steps With pre-amp Option 1DS		
ADC overload	+5.2 dBfs		
Amplitude accuracy	Nominal values, flat-top window, apply between 30 MHz and 3 GHz		
Absolute full-scale accuracy	±1.5 dB		
IF Flatness	±0.2 dB Frequency response across the measurement span included in amplitude accuracy value		
Sensitivity	At 1 GHz, most sensitive range		
With preamp	< –158 dBm/Hz		
Without preamp	< –144 dBm/Hz		
Dynamic range	Nominal values; apply between 30 MHz and 3 GHz; indicates amplitude range that is free of erroneous signals within the measurement span		
Third-order intermodulation distortion	–55 dBc Two signals in span, each –6.5 dBfs to –10 dBfs: separation > 100 kHz; referenced to either signal		
Noise density	< –120 dBfs/Hz[3] > –20 dBm range, at 1 GHz		
IF residual responses	–90 dBm Alias protection = on		
	< –60 dBfs or < –90 dBm, Alias protection = off		
IF spurious responses	< –45 dBc Applies to signals that are band-limited in the analysis span		

1. All RF-related values are using the ESA-E Series RF input and a maximum mixer level of –10 dBm.
2. These features apply using the internal reference or 10 MHz REF IN only. Using EXT REF IN and 10 MHz OUT ports degrades close-in (< 600 Hz) phase noise performance.
3. Noise and sensitivity are degraded by approximately 3 dB x $\log_2$ (10 MHz/span) when the alias protection parameter is set to false.

E4406A transmitter tester performance

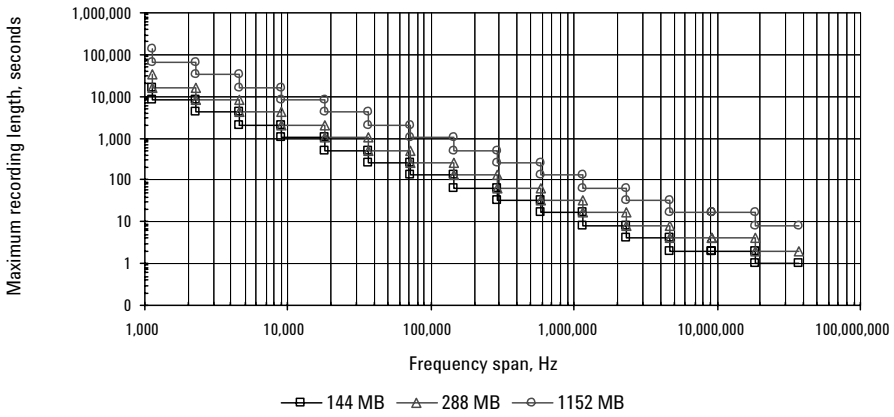
These specifications summarize the performance for the E4406A transmitter tester when used with the 89600 vector signal analysis software. These are typical values, not warranted.

	E4406A[1] (typical)		
Frequency	*RF*	*Baseband*	
Range	7 MHz to 314 MHz, 329 MHz to 4 GHz	DC to 5 MHz	
Center frequency tuning resolution	1 Hz	1 mHz	
Frequency span range			
1 channel mode	< 10 Hz to 8 MHz	< 15 Hz to 5 MHz (1 channel active)	
2 channel mode	NA	< 10 Hz to 5 MHz (2 channel active)	
Ch1 + jCh2 mode	NA	DC to 10 MHz	
Frequency points per span			
Calibrated points	51 to 102,401		
Displayable points	51 to 131,072		
Resolution bandwidth (RBW)	The range of available RBW choices is a function of the selected frequency span and the number of calculated frequency points. Users may step through the available range in a 1-3-10 sequence or directly enter an arbitrarily chosen bandwidth.		
Range	*RF*	*Baseband*	
	< 1 Hz to 2.3 MHz	< 1 Hz to 2.876 MHz	
RBW shape factor	The window choices below allow the user to optimize the RBW shape as needed for best amplitude accuracy, best dynamic range, or best response to transient signal characteristics.		
	Selectivity	*Passband flatness*	*Rejection*
Flat top	0.41	0.01 dB	> 95 dBc
Gaussian top	0.25	0.68 dB	> 125 dBc
Hanning	0.11	1.5 dB	> 31 dBc
Uniform	0.0014	4.0 dB	> 13 dBc
Input range	Full scale; combines attenuator setting and ADC gain[2]		
RF	–18 dBm to +22 dBm in 1 dB steps		
Baseband	–5 dBm to +13 dBm in 6 dB steps		
Amplitude accuracy			
IF Flatness	± 0.2 dB RF		
Dynamic range			
Third-order intermodulation distortion	*RF*	*Baseband*	
	< –70 dBc or < –90 dBfs, whichever is greater	< –60 dBc	
Noise density	*Range*	*Density*	
RF	All	< –124 dBfs/Hz	
Baseband	+13 dBm +7 dBm +1 dBm –5 dBm	–143 dBfs/Hz –142 dBfs/Hz –139 dBfs/Hz –135 dBfs/Hz	

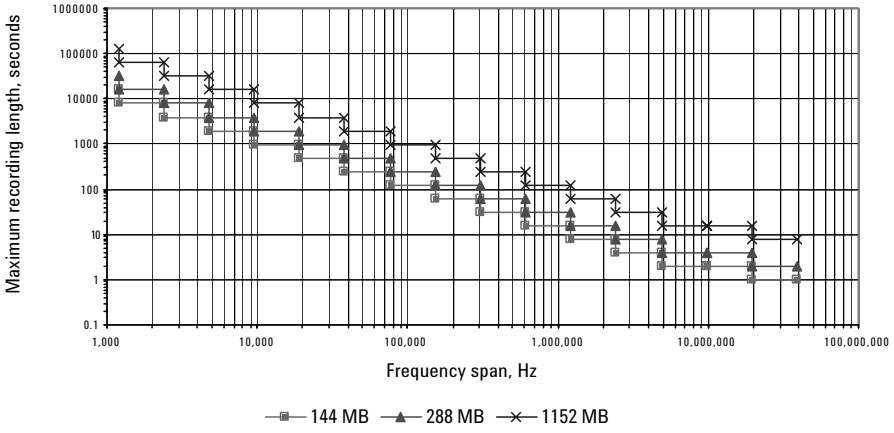
1. All RF-related values are using the E4406A with digital IF part number E4440-60025. Refer to the E4406A data sheet for more information.
2. For RF input, E4406A ADC gain is set to +18 dB and attenuator is set to [89601A range (in dBm) + 18] dB.

Time and waveform capture

	89610S/11S/40S/41S 89600S-144	89610S/11S/40S/41S 89600S-288	89610S/11S/40S/41S 89600S-120
Max capture size			
Bytes	144 MB	288 MB	1152 MB
Complex samples			
Span ≤ 18.55 MHz	24 MSa	48 MSa	192 MSa
Span > 18.55 MHz	48 MSa	96 MSa	384 MSa
Max capture span	36 MHz	36 MHz	36 MHz
Max capture time	At maximum capture span		
Span ≤ 18.55 MHz	0.5 s	1.01 s	4.04 s
Span > 18.55 MHz	1.01 s	2.02 s	8.08 s



89611S/89640S/89641S capture length

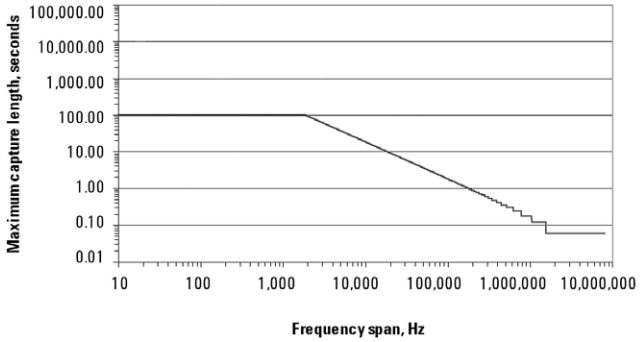


89610S capture length

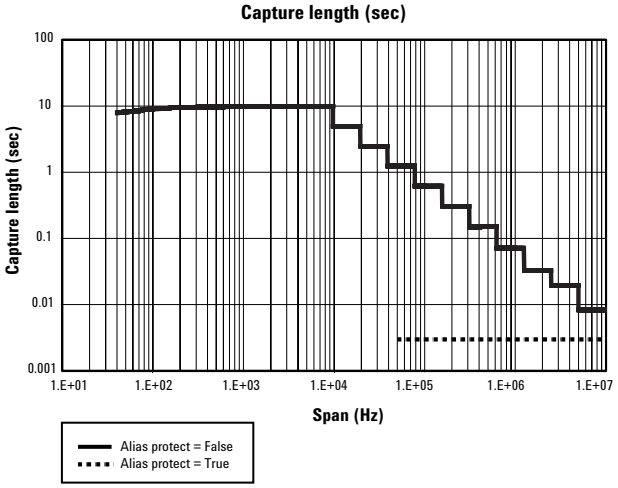
Time and waveform capture (continued)

	89650S
Max capture size	
Bytes	512 MB
Complex samples	128 MSa
Max capture span	80 MHz
Max capture time	1.34 sec (At maximum capture span)

	PSA	**ESA**	**E4406A**
Max capture size	Complex samples During time capture on spans < 1.55 MHz, the analyzer is set to the cardinal span that equals or exceeds the currently displayed span. For spans ≥ 1.55 MHz, the analyzer is set to 8 MHz.		Complex samples During time capture on spans < 1.55 MHz (< 755 kHz for baseband operation), the analyzer is set to the cardinal span that equals or exceeds the currently displayed span. For spans ≥ 1.55 MHz the analyzer is set to 8 MHz.
	900 kSa	124,388 Sa	***RF*** 900 kSa ***Baseband*** 900 kSa (Real samples, per channel)
Max capture span	8 MHz	10 MHz	***RF*** 8 MHz ***Baseband*** 5 MHz



PSA and E4406A capture length



ESA capture length

Analog modulation analysis (part of Option 200)

89610S, 89611S, 89640S, 89641S vector signal analyzers

	89610S/11S/40S/41S (typical)		
AM demodulation			
Demodulator bandwidth	Same as selected measurement span		
Modulation index accuracy	±1% Modulation ≤ 1 MHz		
Harmonic distortion	Modulation index ≤ 95%		
	Modulation bandwidth	*Distortion*	
	≤ 100 kHz	–60 dBc	
	> 100 kHz and ≤ 1 MHz	–55 dBc	
Spurious	Relative to 100% modulation index		
	Modulation bandwidth	*Distortion*	
	≤ 100 kHz	–60 dBc	
	> 100 kHz and ≤ 1 MHz	–55 dBc	
Cross demodulation	< 0.3% AM on an FM signal with 50 kHz modulation rate, 200 kHz deviation, cardinal spans		
PM demodulation			
Demodulator bandwidth	Same as selected measurement span		
Modulation index accuracy	±0.5° Deviation < 180°, modulation rate ≤ 500 kHz		
Harmonic distortion	Deviation ≤ 180°		
	Modulation bandwidth	*Distortion*	
	≤ 50 kHz	–60 dBc	
	≥ 50 kHz and ≤ 500 kHz	–55 dBc	
Spurious	Relative to 180° deviation		
	Modulation bandwidth	*Distortion*	
	≤ 50 kHz	–60 dBc	
	≥ 500 Hz and ≤ 500 kHz	–55 dBc	
Cross demodulation	< 1° PM on an 80% modulation index AM signal, modulation rate ≤ 1 MHz		
FM demodulation			
Demodulator bandwidth	Same as selected measurement span		
Modulation index accuracy	±0.1% of span Deviation ≤ 2 MHz, modulation rate ≤ 500 kHz		
Harmonic distortion	Cardinal spans		
	Modulation rate	*Deviation*	*Distortion*
	≤ 50 kHz	≤ 200 kHz	–60 dBc
	≤ 500 kHz	≤ 2 MHz	–55 dBc
Spurious	Cardinal spans		
	Modulation rate	*Deviation*	*Distortion*
	≤ 50 kHz	≤ 200 kHz	–50 dBc
	≤ 500 kHz	≤ 2 MHz	–45 dBc
Cross demodulation	< 0.5% of span of FM on 80% modulation index AM signal, modulation rate ≤ 1 MHz		

Analog modulation analysis (part of Option 200) (continued)

89650S vector signal analyzer

	89650S (typical)		
AM demodulation	Modulation rate ≤ 1 MHz, modulation index < 95%		
Demodulator bandwidth	Same as selected measurement span		
Modulation index accuracy	±1%		
Dynamic range	–60 dBc 100% modulation index		
Cross demodulation	< 0.3% AM on an FM signal with 10 kHz modulation rate, 200 kHz deviation, cardinal spans		
PM demodulation	Modulation rate ≤ 1 MHz, deviation ≤ 180°		
Demodulator bandwidth	Same as selected measurement span		
Modulation index accuracy	±3°		
Dynamic range	–60 dBc		
Cross demodulation	< 1° PM on an 80% modulation index AM signal, modulation rate ≤ 1 MHz		
FM demodulation	Modulation rate ≤ 250 kHz, deviation ≤ 1 MHz		
Demodulator bandwidth	Same as selected measurement span		
Modulation index accuracy	±1% of span		
Dynamic range	–60 dBc		
Spurious	*Modulation rate*	*Deviation*	*Distortion*
	≤ 500 kHz	≤ 2 MHz	–55 dBc
Cross demodulation	< 0.5% of FM on an 80% modulation index AM signal, modulation rate ≤ 1 MHz		

PSA spectrum analyzers

	PSA (typical)
AM demodulation	
Demodulator bandwidth	Same as selected measurement span
Modulation index accuracy	±1%
Dynamic range	60 dB 100% for a pure AM signal
Cross demodulation	< 0.3% AM on an FM signal with 10 kHz modulation, 200 kHz deviation
PM demodulation	
Demodulator bandwidth	Same as selected measurement span
Modulation index accuracy	±3°
Dynamic range	60 dB (rad) for a pure PM signal
Cross demodulation	< 1% PM on an 80% AM signal
FM demodulation	
Demodulator bandwidth	Same as selected measurement span
Modulation index accuracy	±1% of span
Dynamic range	60 dB (Hz) for a pure FM signal
Cross demodulation	< 0.5% of span FM on an 80% AM signal

Analog modulation analysis (part of Option 200) (continued)

ESA-E Series spectrum analyzers

	ESA (typical)
AM demodulation	
Modulation index accuracy	±1%
Dynamic range	55 dB 100% for a pure AM signal (distortion)
	45 dB 100% for a pure AM signal (spurious)
Cross demodulation	< 0.5% AM on an FM signal with 10 kHz modulation, 200 kHz deviation
PM demodulation	
Modulation index accuracy	±3º
Dynamic range	55 dB (rad) for a pure PM signal
Cross demodulation	< 1% PM on an 80% AM signal
FM demodulation	
Modulation index accuracy	±1% of span
Dynamic range	50 dB (Hz) for a pure FM signal (distortion)
	45 dB (Hz) for a pure FM signal (spurious)
Cross demodulation	< 0.5% of span FM on an 80% AM signal

E4406A transmitter tester

	E4406A (typical)
AM demodulation	
Demodulator bandwidth	Same as selected measurement span
Modulation index accuracy	±1%
Dynamic range	60 dB 100% for a pure AM signal
Cross demodulation	< 0.3% AM on an FM signal with 10 kHz modulation, 200 kHz deviation
PM demodulation	
Demodulator bandwidth	Same as selected measurement span
Modulation index accuracy	±3º
Dynamic range	60 dB (rad) for a pure PM signal
Cross demodulation	< 1% PM on an 80% AM signal
FM demodulation	
Demodulator bandwidth	Same as selected measurement span
Modulation index accuracy	±1% of span
Dynamic range	60 dB (Hz) for a pure FM signal
Cross demodulation	< 0.5% of span FM on an 80% AM signal

Vector modulation analysis (Option AYA)

89610S, 89611S, 89640S, 89641S, 89650S vector signal analyzers

	89610S/11S/40S/41S (typical)		89650S (typical)	
Accuracy	Formats other than FSK, 8/16VSB, and OQPSK. Full-scale signal, fully contained in the measurement span, baseband, IF[1], or RF inputs, random data sequence, range ≥ –25 dBm, start frequency ≥ 15% of span, alpha/BT ≥ 0.3 (0.3 to 0.7 for OQPSK), and symbol rate ≥ 1 kHz. For symbol rates < 1 kHz, accuracy may be limited by phase noise. Averaging = 10		Formats other than FSK, 8/16VSB, and OQPSK. Full-scale signal, fully contained in the measurement span, random data sequence, range ≥ –20 dBm, start frequency ≥ 15% of span, alpha/BT > 0.3 (0.3 to 0.7 for OQPSK), and symbol rate ≥ 1 kHz. For symbol rates < 1 kHz, accuracy may be limited by phase noise. Averaging = 10	
Residual errors	Results = 150 symbols		Results = 150 symbols	
Residual EVM			Maximum	
	Span	*EVM*	*Span*	*EVM*
	≤ 100 kHz	< 0.5% rms	100 kHz	0.5% rms
	≤ 1 MHz	< 0.5% rms	1 MHz	0.5% rms
	≤ 10 MHz	< 1.0% rms	10 MHz	1.0% rms
	> 10 MHz	< 2.0% rms	28 MHz	1.2% rms
			36 MHz	1.6% rms
			80 MHz	2.5% rms
Magnitude error			Maximum	
	Span	*EVM*	*Span*	*EVM*
	≤ 100 kHz	0.3% rms	100 kHz	0.3% rms
	≤ 1 MHz	0.5% rms	1 MHz	0.5% rms
	≤ 10 MHz	1.0% rms	10 MHz	1.0% rms
	> 10 MHz	1.5% rms	28 MHz	1.2% rms
			36 MHz	1.5% rms
			80 MHz	2.5% rms
Phase error	For modulation formats with equal symbol amplitude		Maximum	
	Span	*EVM*	*Span*	*EVM*
	≤ 100 kHz	0.3° rms	100 kHz	0.3° rms
	≤ 1 MHz	0.4° rms	1 MHz	0.4° rms
	≤ 10 MHz	0.6° rms	10 MHz	0.6° rms
	> 10 MHz	1.2° rms	28 MHz	0.8° rms
			36 MHz	1.2° rms
			80 MHz	1.5° rms
Frequency error	Symbol rate/500,000 (Added to frequency accuracy if applicable)		Symbol rate/500,000 (Relative to frequency standard)	
I-Q/origin offset	–60 dB		–60 dB	
Video modulation formats				
Residual EVM 8, 16 VSB	≤ 1.5% SNR ≥ 36 dB, symbol rate = 10.762 MHz, alpha = 0.115, IF or RF inputs, 7 MHz span, full-scale signal, range ≥ –25 dBm, result length = 800, averages = 10		≤ 1.5% SNR ≥ 36 dB, symbol rate = 10.762 MHz, alpha = 0.115, 7 MHz span, full-scale signal, range ≥ –20 dBm, result length = 800, averages = 10	
Residual EVM 16, 32, 64, or 256 QAM:	≤ 1.0% SNR ≥ 40 dB, symbol rate = 6.9 MHz, alpha = 0.15, IF or RF inputs, 8 MHz span, full-scale signal, range ≥ –25 dBm, result length = 800, averages = 10		≤ 1.0% SNR ≥ 40 dB, symbol rate = 6.9 MHz, alpha = 0.15, 8 MHz span, full scale signal, range ≥ –20 dBm, result length = 800, averages = 10	

1. For I+jQ analysis, user must compensate for I/Q delay of each channel.
For information on using calibration constants, please see topic "calibration constants" in Help text.

PSA spectrum analyzers, ESA spectrum analyzers, E4406A transmitter tester

	PSA (typical)		ESA (typical)		E4406A (typical)	
Accuracy						
	Formats other than FSK, 8/16VSB, and OQPSK; Conditions: Full scale signal, fully contained in the measurement span, frequency < 3 GHz, random data sequence, range ≥ –24 dBm, start frequency ≥ 15% of span, alpha/BT ≥ 0.3 (0.3 to 0.7 for OQPSK), and symbol rate ≥ 1 kHz. For symbol rates < 1 kHz, accuracy may be limited by phase noise. Averaging = 10		Formats other than FSK, 8/16VSB, and OQPSK; Conditions: Full scale signal, fully contained in the measurement span, frequency between 30 MHz and 3 GHz, random data sequence, range ≥ –20 dBm, start frequency ≥ 15% of span, alpha/BT ≥ 0.3 (0.3 to 0.7 for OQPSK), and symbol rate ≥ 1 kHz. For symbol rates < 1 kHz, accuracy may be limited by phase noise. Averaging = 10		Formats other than FSK, 8/16VSB, and OQPSK; Conditions: Full scale signal, fully contained in the measurement span, random data sequence, range ≥ –18 dBm, start frequency ≥ 15% of span, alpha/BT ≥ 0.3 (0.3 to 0.7 for OQPSK), and symbol rate ≥ 1 kHz. For symbol rates < 1 kHz, accuracy may be limited by phase noise. Averaging = 10	
Residual errors	Result = 150 symbols averages = 10		Result = 150 symbols		Result = 150 symbols averages = 10	
Residual EVM						
	Span ≤ 100 kHz ≤ 1 MHz ≤ 8 MHz	*EVM* < 0.5% rms < 0.5% rms < 1.0% rms	*Span* ≤ 100 kHz ≤ 1 MHz ≤ 8 MHz	*EVM* < 1.2% rms < 0.4% rms < 1.8% rms	*Span* ≤ 100 kHz ≤ 1 MHz ≤ 8 MHz[1]	*EVM* < 0.5% rms < 0.5% rms < 1.0% rms
Magnitude error						
	Span ≤ 100 kHz ≤ 1 MHz ≤ 8 MHz	*Error* 0.5% rms 0.5% rms 1.0% rms	*Span* ≤ 100 kHz ≤ 1 MHz ≤ 10 MHz	*Error* 0.6% rms 0.6% rms 1.3% rms	*Span* ≤ 100 kHz ≤ 1 MHz ≤ 8 MHz[1]	*Error* 0.3% (baseband) 0.5% rms (RF) 0.5% rms 1.0% rms
Phase error	For modulation formats with equal symbol amplitudes		For modulation formats with equal symbol amplitudes		For modulation formats with equal symbol amplitudes	
	Span ≤ 100 kHz ≤ 1 MHz ≤ 8 MHz	*Error* 0.3° rms 0.4° rms 0.6° rms	*Span* ≤ 100 kHz ≤ 1 MHz ≤ 10 MHz	*Error* < 0.7% rms < 0.5% rms < 0.8% rms	*Span* ≤ 100 kHz ≤ 1 MHz ≤ 8 MHz[1]	*Error* 0.3° rms 0.4° rms 0.6° rms
Frequency error	Added to frequency accuracy if applicable		Added to frequency accuracy if applicable		Added to frequency accuracy if applicable	
	Symbol rate/500,000		Symbol rate/500,000		Symbol rate/500,000	
I-Q/origin offset	–60 dB or better		–57 dB or better		–60 dB or better	
Video modulation formats					Applies for RF and composite I+jQ) modes only	
Residual EVM: 8/16 VSB	≤ 1.5% (SNR ≥ 36 dB)		≤ 1.7% (SNR ≥ 36 dB)		≤ 1.5% (SNR ≥ 36 dB)	
	Symbol rate = 10.762 MHz, α = 0.115, frequency < 3 GHz, 7 MHz span, full-scale signal, range ≥ –24 dBm, result length = 800, averages = 10		Symbol rate = 10.762 MHz, α = 0.115, frequency < 3 GHz, 8 MHz span, full-scale signal, range ≥ –24 dBm, result length = 800, averages = 10		Symbol rate = 10.762 MHz, α = 0.115, 7 MHz span, full-scale signal, range ≥ –18 dBm, result length = 800, averages = 10	
Residual EVM 16, 32, 64, or 256 QAM:	≤ 1.0% (SNR ≥ 40 dB)		≤ 1.5% (SNR ≥ 36 dB)		≤ 1.0% (SNR ≥ 40 dB)	
	Symbol rate = 6.9 MHz, α = 0.15, frequency < 3 GHz, 8 MHz span, full-scale signal, range ≥ –24 dBm, result length = 800, averages = 10		Symbol rate = 6.9 MHz, α = 0.15, 8 MHz span, full-scale signal, range ≥ –18 dBm, result length = 800, averages = 10		Symbol rate = 6.9 MHz, α = 0.15, 8 MHz span, full-scale signal, range ≥ –18 dBm, result length = 800, averages = 10	

1. For RF only, ≤ 5 MHz for baseband

3G modulation analysis (Option B7N)

89610S, 89611S, 89640S, 89641S, 89650S vector signal analyzers

	89610S/11S/40S/41S (typical)		89650S (typical)
W-CDMA / HSDPA			
Signal playback			
Result length	1 to 64 slots		—
Capture length	Gap free analysis at 0% overlap; 5 MHz span		Gap free analysis at 0% overlap; 5 MHz span
	144 MB memory 288 MB memory 1152 MB memory	3,000 slots 6,000 slots 24,000 slots	> 15,000 slots
Accuracy	Input range within 5 dB of total signal power		Input range within 5 dB of total signal power
Code domain			
CDP accuracy	±0.3 dB Spread channel power within 20 dB of total power		±0.3 dB Spread channel power within 20 dB of total power
Symbol power versus time	±0.3 dB Spread channel power within 20 dB of total power averaged over a slot		±0.3 dB Spread channel power within 20 dB of total power averaged over a slot
Composite EVM			
EVM floor (pilot only)	≤ 1.5%		≤ 1.5%
EVM floor (test model 1 with 16 DPCH signal)	≤ 1.5%		≤ 1.5%
Frequency error			
Lock range (CPICH synch type)	±500 Hz		≤ 500 Hz
Accuracy	±10 Hz		≤ 10 Hz
cdma2000 / 1xEV-DV			
Signal playback			
Result length	Forward link 1 to 64 PCGs	Reverse link 1 to 48 PCGs	—
Capture length	Gap free analysis at 0% overlap; 2.6 MHz span		Gap free analysis at 0% overlap; 2.6 MHz span
	144 MB memory 288 MB memory 1152 MB memory	3,200 PCGs 6,400 PCGs 25,600 PCGs	> 16,000 PCGs
Accuracy	Input range within 5 dB of total signal power		Input range within 5 dB of total signal power Code domain
Code domain			
CDP accuracy	±0.3 dB Spread channel power within 20 dB of total power		±0.3 dB Spread channel power within 20 dB of total power
Symbol power versus time	±0.3 dB Spread channel power within 20 dB of total power averaged over a PCG		±0.3 dB Spread channel power within 20 dB of total power averaged over a PCG
Composite EVM			
EVM floor (pilot only)	≤ 1.5%		≤ 1.5%
EVM floor	≤ 1.5% Test model 1 with 16 DPCH signal		≤ 1.5% 9 active channels
Frequency error			
Lock range	±500 Hz		≤ 500 Hz CPICH synch type
Accuracy	±10 Hz		≤ 10 Hz

3G modulation analysis (Option B7N) (continued)

89610S, 89611S, 89640S, 89641S, 89650S vector signal analyzers (continued)

	89610S/11S/40S/41S (typical)		89650S (typical)
1xEV-DO			
Signal playback			
Result length	Forward link 1 to 64 slots	Reverse link 1 to 64 slots	—
Capture length	Gap free analysis at 0% overlap; 1.5 MHz span		Gap free analysis at 0% overlap; 1.5 MHz span
	144 MB memory 288 MB memory 1152 MB memory	5,000 slots 10,000 slots 40,000 slots	> 20,000 slots
Accuracy	Input range within 5 dB of total signal power		Input range within 5 dB of total signal power
Code domain			
CDP accuracy	±0.3 dB Spread channel power within 20 dB of total power		±0.3 dB Spread channel power within 20 dB of total power
Symbol power versus time	±0.3 dB Spread channel power within 20 dB of total power		±0.3 dB Spread channel power within 20 dB of total power
Composite EVM			
EVM floor	≤ 1.5%		≤ 1.5%
Frequency error			
Lock range	± 500 Hz		≤ 500 Hz
Accuracy	± 5 Hz		≤ 5 Hz
TD-SCDMA			
Signal playback			
Result length	1 to 8 sub-frames		—
Capture length	Gap free analysis at 0% overlap; 1.6 MHz span		Gap free analysis at 0% overlap; 1.6 MHz span
	144 MB memory 288 MB memory 1152 MB memory	1,600 sub-frames 3200 sub-frames 12,800 sub-frames	> 6.5 sub-frames
Accuracy	Input range within 5 dB of total signal power		Input range within 5 dB of total signal power
Code domain			
CDP accuracy	±0.3 dB Spread channel power within 20 dB of total power		±0.3 dB Spread channel power within 20 dB of total power
Symbol power versus time	±0.3 dB Spread channel power within 20 dB of total power		±0.3 dB Spread channel power within 20 dB of total power
Composite EVM			
EVM floor	≤ 1.5%		≤ 1.5%
Frequency error			
Lock range	± 500 Hz		≤ 500 Hz
Accuracy	± 25 Hz		≤ 25 Hz

3G modulation analysis (Option B7N) (continued)

PSA spectrum analyzers, ESA spectrum analyzers, E4406A transmitter tester

	PSA (typical)	ESA (typical)	E4406A (typical)
W-CDMA / HSDPA			
Signal playback			
Result length	1 to 64 slots	1 to 27 slots[1]	1 to 64 slots[2]
Capture length	Gap free analysis at 0% overlap; 5 MHz span 88 slots	Gap free analysis at 0% overlap; 5 MHz span 27 slots[1]	Gap free analysis at 0% overlap; 5 MHz span 88 slots[2]
Accuracy (typical)	Input range ≥ –24 dBm, within 5 dB of total signal power, frequency < 3 GHz	Input range within 5 dB of total signal power	Input range within 5 dB of total signal power
Code domain			
CDP accuracy	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power
Symbol power versus time	±0.3 dB Spread channel power within 20 dB of total power averaged over a slot	±0.3 dB Spread channel power within 20 dB of total power averaged over a slot	±0.3 dB Spread channel power within 20 dB of total power averaged over a slot
Composite EVM			
EVM floor	≤ 1.5% Pilot only	≤ 1.6%	≤ 1.5% Pilot only
EVM floor	≤ 1.5% Test model 1 with 16 DPCH signal	≤ 1.6%	≤ 1.5% Test model 1 with 16 DPCH signal
Frequency error			
Range (CPICH sync type)	±500 Hz	±500 Hz	±500 Hz
Accuracy	±10 Hz	±10 Hz	±10 Hz

1. Alias protect = false; 11 slots when alias protect = true
2. 43 slots maximum for channel 1, baseband mode

3G modulation analysis (Option B7N) (continued)

PSA spectrum analyzers, ESA spectrum analyzers, E4406A transmitter tester (continued)

	PSA (typical)	ESA (typical)	E4406A (typical)
cdma2000 / 1xEV-DV			
Signal playback			
Result length	***Forward link*** 1 to 64 PCG ***Reverse link*** 1 to 48 PCG	***Forward link*** 1 to 64 PCGs[1] ***Reverse link*** 1 to 4 PCGs[1]	***Forward link, RF*** 1 to 64 PCG ***Reverse link, RF*** 1 to 48 PCG ***1 channel, baseband*** 1 to 22 PCG ***2 channels, baseband*** 1 to 46 PCG
Capture length	Gap free analysis at 0% overlap; 1.5 MHz span	Gap free analysis at 0% overlap; 1.5 MHz span	Gap free analysis at 0% overlap; 1.5 MHz span[1]
	94 PCG	24 PCG[1]	***RF*** 94 PCG ***1 channel, baseband*** 22 PCG ***2 channels, baseband*** 46 PCG
Accuracy	Input range ≥ –24 dBm, within 5 dB of total signal power, frequency < 3 GHz	Input range within 5 dB of total signal power	Input range within 5 dB of total signal power
Code domain			
CDP accuracy	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power
Symbol power versus time	±0.3 dB Spread channel power within 20 dB of total power averaged over a slot	±0.3 dB Spread channel power within 20 dB of total power averaged over a slot	±0.3 dB Spread channel power within 20 dB of total power averaged over a slot
Composite EVM			
EVM floor	≤ 1.5% Pilot only	≤ 1.6%	≤ 1.5% Pilot only
EVM floor	≤ 1.5% Test model 1 with 16 DPCH signal		≤ 1.5% Test model 1 with 16 DPCH signal
Frequency error			
Lock range (CPICH sync type)	± 500 Hz	± 500 Hz	± 500 Hz
Accuracy	± 10 Hz	± 10 Hz	± 10 Hz

1. For alias protect = false, 5 PCGs with alias protect = true

3G modulation analysis (Option B7N) (continued)

PSA spectrum analyzers, ESA spectrum analyzers, E4406A transmitter tester (continued)

	PSA (typical)	ESA (typical)	E4406A (typical)
1xEVD0			
Signal playback			
Result length	***Forward link*** 1 to 64 slots ***Reverse link*** 1 to 64 slots	***Forward link*** 1 to 18 slots[1] ***Reverse link*** 1 to 18 slots[1]	***Forward link*** 1 to 64 slots ***Reverse link*** 1 to 64 slots
Capture length	Gap free analysis at 0% overlap; 1.5 MHz span	Gap free analysis at 0% overlap; 1.5 MHz span	Gap free analysis at 0% overlap; 1.5 MHz span
	65 slots	18 slots[1]	70 slots
Accuracy	Input range ≥ –24 dBm, within 5 dB of total signal power	Input range within 5 dB of total signal power	Input range within 5 dB of total signal power
Code domain			
CDP accuracy	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power)
Symbol power versus time	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power
Composite EVM			
EVM floor	≤ 1.5%	≤ 1.6%	≤ 1.5%
Frequency error			
Lock range	± 500 Hz	± 500 Hz	± 500 Hz
Accuracy	± 5 Hz	± 10 Hz	± 5 Hz
TD-SCDMA		Alias protect = false	
Signal playback			
Result length	1 to 8 sub-frames	1 to 5 sub-frames[2]	1 to 8 sub-frames
Capture length	Gap free analysis at 0% overlap; 1.6 MHz span	Gap free analysis at 0% overlap; 1.6 MHz span	Gap free analysis at 0% overlap; 1.6 MHz span
	10 sub-frames	5 sub-frames[2]	10 sub-frames
Accuracy	10 MHz to 3 GHz, input range ≥ –24 dBm and within 5 dB of total signal power	Input range within 5 dB of total signal power	Input range within 5 dB of total signal power
Code domain			
CDP accuracy	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power
Symbol power versus time	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power	±0.3 dB Spread channel power within 20 dB of total power
Composite EVM			
EVM floor	≤ 1.5%	≤ 1.5%	≤ 1.5%
Frequency error			
Lock range	± 500 Hz	± 500 Hz	± 500 Hz
Accuracy	± 10 Hz	± 25 Hz	± 25 Hz

1. For alias protect = false, 3 slots for alias protect = true
2. Requires frequency span ≤ 2.5 MHz, sub-frame start boundary. Drops to 2 sub-frames for two frame start boundary.

WLAN modulation analysis (Option B7R)

89610S, 89611S, 89640S, 89641S, 89650S vector signal analyzers

	89610S/11S/40S/41S (typical)		89650S (typical)
802.11a/g OFDM			
Signal playback			
Result length	Auto detect or adjustable from 1 to 1367 symbol times		—
Capture length	Gap free analysis at 0% overlap; 31.25 MHz span		Gap free analysis at 0% overlap; 31.25 MHz span
	144 MB memory 288 MB memory 1152 MB memory	1.0 s 2.0 s 8.0 s	3.3 s
Accuracy	20 averages		20 averages
Residual EVM			
Equalizer training = chan est. seq. and data	≤ –45 dB		≤ –47 dB
Equalizer training = chan est. seq.	≤ –43 dB		≤ –45 dB
Frequency error			
Carrier spacing	312 kHz 1.4 MHz max, user settable		312 kHz 1.4 MHz max, user settable
Lock range	±624 kHz ±2 x sub-carrier spacing		±624 kHz ±2 x sub-carrier spacing
Frequency accuracy	±8 Hz		±8 Hz
802.11a/g DSSS			Pre-selector bypass enabled above 3 GHz, requires Option E4440A-123
Signal playback			
Result length	Auto detect or adjustable from 1 to 275,000 chips (25 ms)		—
Capture length	Gap free analysis at 0% overlap; 34.375 MHz span		Gap free analysis at 0% overlap; 34.375 MHz span
	144 MB memory 288 MB memory 1152 MB memory	1.0 s 2.0 s 8.0 s	3.0s
Accuracy	Input range within 5 dB of total signal power		Total power within 2 dB of full scale
Residual EVM	≤ 2% All modulation formats, 10 averages		≤ 1.0% ≤ 0.5% with equalizer enabled; All modulation formats, 10 averages, reference filter = transmit filter
Frequency error			Relative to frequency standard
Lock range	± 2.5 MHz		± 2.5 MHz
Frequency accuracy	± 8 Hz		± 8 Hz

802.16-2004 OFDM modulation analysis (Option B7S)

89610S, 89611S, 89640S, 89641S, 89650S vector signal analyzers

	89610S/11S/40S/41S (typical)			89650S (typical)		
Center frequency range						
Signal playback						
Result length	Auto detect or adjustable from 1 to 1745 symbol times			Auto detect or adjustable from 1 to 1394 symbol times		
Capture length	Gap free analysis at 0% overlap			Gap free analysis at 0% overlap		
	Span 12.5 MHz	*Memory* 144 MB 288 MB 1152 MB	*Max length* 2 s 4 s 16 s	*Span* 12.5 MHz	*Memory* 512 MB	*Max length* 2.9 s
	36 MHz	144 MB 288 MB 1152 MB	1 s 2 s 8 s	36 MHz	512 MB	4.1 s
Accuracy						
Residual EVM	20 averages; input range within 5 dB of full scale			20 averages; input range within 2 dB of full scale		
Equalizer training = chan est. seq. and data	*Signal bandwidth* 20 MHz 7 MHz		*EVM (REF)* *EVM (IF/BB)* ≤ –43 dB ≤ –45 dB ≤ –46 dB ≤ –49 dB	*Signal bandwidth* 20 MHz 7 MHz		*EVM* ≤ –48 dB ≤ –49 dB
Equalizer training = chan est. seq. only	*Signal bandwidth* 20 MHz 7 MHz		*EVM (REF)* *EVM (IF/BB)* ≤ –42 dB ≤ –44 dB ≤ –44 dB ≤ –48 dB	*Signal bandwidth* 20 MHz 7 MHz		*EVM* ≤ –46 dB ≤ –47 dB
Frequency error						
Lock range	*Signal bandwidth* 20 MHz 7 MHz		*Range* ±135 kHz ±47.25 kHz	*Signal bandwidth* 20 MHz 7 MHz		*Range* ±135 kHz ±47.25 kHz
Frequency accuracy	±10 Hz			±10 Hz		

PSA and ESA spectrum analyzers

	PSA (typical)		ESA (typical)	
Center frequency range				
Signal playback				
Result length	Auto detect or adjustable from 1 to 1394 symbol times		Auto detect or adjustable from 1 to 800 symbol times	
Capture length	Gap free analysis at 0% overlap; 8 MHz span 59 ms		Gap free analysis at 0% overlap; 10 MHz span 8 ms	
Accuracy				
Residual EVM	20 averages; input range within 5 dB of full scale		20 averages; input range within 5 dB of full scale	
Equalizer training = chan est. seq. and data	*Signal bandwidth* 7 MHz	*EVM* ≤ –49 dB	*Signal bandwidth* 10 MHz 7 MHz	*EVM* ≤ –39 dB ≤ –40 dB
Equalizer training = chan est. seq. only	*Signal bandwidth* 7 MHz	*EVM* ≤ –47 dB	*Signal bandwidth* 10 MHz 7 MHz	*EVM* ≤ –38 dB ≤ –39 dB
Frequency error				
Lock range	*Signal bandwidth* 7 MHz	*Range* ±33.75 kHz	*Signal bandwidth* 7 MHz 10 MHz	*Range* ±47.25 kHz ±67.5 kHz
Frequency accuracy	±10 Hz		±10 Hz	

General

89610S, 89611S, 89640S, 89641S

	89610S/11S/40S/41S
Hardware interfaces (characteristic)	
External trigger input	BNC, 1 kΩ impedance
External frequency reference	
Output 10 MHz	> 3 dBm
Input	10MHz or 13 MHz (±5 ppm), > 0 dBm
Safety and regulatory compliance	
Safety standards	EN 61010-1 (1993)
Radiated emissions	EN 61326-1
Immunity[1, 2]	EN 61326-1
Environmental	
Operating temperature range	
Warranted operation	20° to 30 °C
Maximum operation	0° to 50 °C
Storage	–40° to 70 °C
Humidity	10 to 90% at 40 °C
Maximum altitude	3,000 m
Warm up time	30 minutes
Calibration interval	2 year
Power requirements	
47 to 440 Hz operation	90 to 140 Vrms
47 to 66 Hz operation	90 to 264 Vrms
Maximum power dissipation	Mainframe maximum rating
E8408A 4-slot VXI mainframe	280 VA
E8403A 13-slot VXI mainframe	1500 VA
E1421B 6-slot VXI mainframe	450 W
Physical	Using E8408A 4-slot VXI mainframe
Weight	13 kg (29 lb)[3]
Dimensions (H x W x D mm)	
With protective bumpers	388 x 152 x 548
Without protective bumpers	362 x 133 x 540

1. Use a desktop PC for best immunity to electrostatic discharge.
2. Electrostatic discharge: Performance criteria B (when used with a desktop PC)
   Performance criteria C (when used with a laptop PC, may require operator intervention after ESD event)
3. 40 kg (87 lb) E8403A 13-slot mainframe with 2 RF channels

Appendix A: User-Supplied PC Requirements

Any laptop or desktop PC may be used to run the 89600 VSA software, as long as it meets or exceeds the following minimum requirements:

- > 300 MHz Pentium® or AMD-K6 processor
- 192 MB RAM (256 MB recommended)
- 4 MB video RAM (8 MB recommended)
- Hard disk with 170 MB of available space
- Microsoft Windows 2000® SP2 or XP Professional® (laptop or desktop) operating system
- CD-ROM drive to load the software (can be provided via network access), 3.5-inch floppy disk drive (can be provided via network access)
- LAN, GPIB or FireWire interface. (Hardware platform dependent, see Appendix B)

Appendix B: Software and Hardware Feature Availability and Requirements

89600 Series VSA software requirements

89601A VSA software

The 89601A vector signal analysis software requires Option 200, "Basic Vector Analysis," and Option 300, "Hardware Connectivity," to work with any hardware platform. The software version required to work with a specific platform is shown in the following tables:

89600S VXI platforms	89601A version
89610S	V1.00 or later
89611S	V1.00 or later
89640S	V1.00 or later
89641S	V1.00 or later

89650S platform	89601A version
89650S	V5.21 or later

PSA platforms	89601A version
E4440A opt B7J	V3.00 or later
E4440A opt 122	V5.21 or later
E4443A opt B7J	V3.00 or later
E4445A opt B7J	V3.00 or later
E4446A opt B7J	V4.00 or later
E4448A opt B7J	V4.00 or later

ESA platforms	89601A version
E4402B	V3.01 or later
E4404B	V3.01 or later
E4405B	V3.01 or later
E4407B	V3.01 or later

E4406A platform	89601A version
E4406A	V3.00 or later

89601AN/89601N12 VSA software

The 89601AN VSA software offers the same functions and features as the 89601A software; however its license resides on a network server (i.e. floating license) rather than in the PC. This allows one license to be shared between copies of the software being used by different users throughout an organization.

The 89601N12 VSA software also uses a floating license, but this license is valid for one year only.

The 89601AN vector signal analysis software requires Option 200, "Basic Vector Analysis," and Option 300, "Hardware Connectivity," to work with any hardware platform. The 89601N12 software comes standard with these options. The required version of the software is shown in the hardware specific tables:

Models	89601AN, 89601N12 version
89600S (all models)	V5.00 or later
89650S	V5.21 or later
PSA (all models)	V5.00 or later
PSA (all models with opt 122)	V5.21 or later
ESA (all models)	V5.00 or later

89600S VXI platforms

Configuration requirements

The 89600S VXI platforms (89610S, 89611S, 89640S, 89641S) are factory integrated systems and come standard with the 89600 VSA software, the VXI mainframe, and the VXI modules required to make measurements.

VXI requirements

The minimum hardware required is supplied standard as part of the factory integration process.

Software requirements

See the "89600S VXI platforms" table entry under "89600 Series VSA software requirements" at the beginning of Appendix B.

PC requirements

See Appendix A "User-supplied PC requirements."

PC to VXI interface

The connection to the PC is via IEEE-1394 FireWire. See www.agilent.com/find/iolib for approved laptop FireWire I/O cards.

Feature availability

All software and hardware features are available, including the 89600 scalar spectrum application.

89650S platform

Configuration requirements

The 89650S combination comes standard with a PSA Series spectrum analyzer and the 89600 VSA software (each with all required options), and interface cables.

PSA requirements

The 89650S requires the E4440A PSA Series spectrum analyzer with option E4440A-122, 80 MHz bandwidth ADC.

Software requirements

See the "89650S platform" table entry under "89600 Series VSA software requirements" at the beginning of Appendix B.

PC requirements

See Appendix A "User-supplied PC requirements."

PC to PSA interface

The PSA supports LAN I/O. Using a LAN cross-over cable is recommended (available from Agilent, part number 8120-0545) for the connection.

Feature availability

When the PSA is controlled by 89600 software, users have control of the following features of the spectrum analyzer using the software:

Frequency: The center frequency will be displayed on the 89600 software GUI

Span: ≤ 80 MHz

Input attenuator, preamp, and ADC gain: available indirectly through the input range feature of the 89600 software

Triggering: IF magnitude, external front/rear, hold-off, level, delay and slope

External reference: Selectable frequency (1 to 30 MHz)

Calibration

Overload detection

In addition, you can gain immediate, direct access to all of the spectrum analyzer's features by using the disconnect capability on the VSA software's control menu.

The 89600 software's scalar spectrum application is not supported.

PSA platforms

Configuration requirements

The PSA/89600 software combination requires a PSA Series spectrum analyzer and the 89600 vector signal analysis software (each with required options), a PC to run the software, and interface cables. The following are the detailed configuration requirements for each.

PSA requirements

The PSA/89600 software combination requires a PSA Series spectrum analyzer (model E4440A, E4443A, E4445A, E4446A, or E4448A) with Option E44xx-B7J, the digital demodulation hardware, to interface with the 89600 software.

Option 122, 80 MHz bandwidth ADC, may be used in place of Option B7J on the E4440A (see 89650S for performance specifications). This option is required for operation with Option B7R, WLAN modulation analysis.

Firmware version A.04 or later is required in the PSA analyzer.

Software requirements

See the "PSA platforms" table entry under "89600 Series VSA software requirements" at the beginning of Appendix B.

PC requirements

See Appendix A "User-supplied PC requirements."

PC to PSA interface

The PSA supports LAN I/O. Using a LAN cross-over cable is recommended (available from Agilent, part number 8120-0545) for the connection.

Feature availability

When the PSA is controlled by 89600 software, users have control of the following features of the spectrum analyzer using the software:

Frequency: The center frequency will be displayed on the 89600 VSA software GUI

Span: Only zero-span is available. Maximum setting is ≤ 8 MHz (≤ 80 MHz with Option 122, E4440A only). Zero span control and the display of its current setting are provided by the 89600 software.

Input attenuator, preamp, and ADC gain: Available indirectly through the input range feature of the 89600 software

Triggering: IF magnitude, external front/rear, hold-off, level, delay and slope

External reference: Selectable frequency (1 to 30 MHz)

Calibration

Overload detection

In addition, you can gain immediate, direct access to all of the PSA Series spectrum analyzer's features by using the disconnect capability on the VSA software's control menu.

The 89600 VSA software's scalar spectrum application is not supported.

ESA platforms

Configuration requirements

The ESA/89600 software combination requires an ESA-E Series spectrum analyzer and the 89600 vector signal analysis software (each with required options), a PC to run the software, and interface cables.

When ordering a new ESA-E Series spectrum analyzer

The ESA-E/89600 software combination works with any new ESA-E Series model E4402B, E4404B, E4405B, or E4407B with firmware version A.08.04 or higher.

One of the following option sets must be installed in the ESA-E.

Option	Description
COM	Communications test analyzer
A4H	GPIB and Centronic interfaces (default)

or:

Option	Description
B7D	Digital signal processing and fast ADC
B7E	RF communication hardware (ID117 or higher required for IF magnitude triggering)
1D5	High stability frequency reference
A4H	GPIB and Centronic interfaces
229*	Modulation analysis personality (version A.02.01 or higher)
231*	89600 VSA link personality (version A.02.00 or higher)

* Ordering at least one option is required.

Using an existing ESA-E Series spectrum analyzer

The following options are needed in an existing ESA-E Series spectrum analyzer for it to work with the 89600 software:

Option	Description
B7D	Digital signal processing and fast ADC
B7E	RF communication hardware ID 117 or higher required for IF magnitude triggering
1D5	High stability frequency reference
A4H	GPIB and Centronic interfaces
B72	Increase memory to 16 MB
229*	Modulation analysis personality (version A.02.01 or higher)
231*	89600 VSA link personality (version A.02.00 or higher)

* Ordering at least one option is required.

To find whether these options are in your ESA-E Series spectrum analyzer, press the following buttons on the front panel of the analyzer: [System] > [More] > [Show System].

Software requirements

See the "ESA platforms" table entry under "89600 Series VSA software requirements" at the beginning of Appendix B. Option B7R WLAN modulation analysis is not recommended, as WLAN signals require more analysis bandwidth than the ESA spectrum analyzers provide.

PC requirements

See Appendix A "User-supplied PC requirements."

PC to ESA interface

The ESA-E Series spectrum analyzers with Option E44xxA-A4H support GPIB I/O. The following interface cards and cables are recommended for connecting the ESA-E to a PC via GPIB.

Description	Part number	Notes
PCMCIA	778034-02	For laptop PCs; comes with a two-meter GPIB card GPIB cable. Available from National Instruments.
PCI GPIB interface card	82350	For desktop PCs; requires GPIB cable (10833A). Available from Agilent.
One-meter GPIB cable	10833A	Available from Agilent.
USB/GPIB	82357A	Available from Agilent.

LAN connection is available using the Agilent E2050A LAN/GPIB Gateway.

Feature availability

When the ESA-E is controlled by 89600 software, users have control of the following features via the 89600 software:

Frequency: The center frequency of the ESA-E is controlled and the 89600 software displays its current setting.

Span: Only zero-span is available. Maximum setting is 10 MHz. Zero span control and the display of its current setting are provided by the 89600 software.

Input attenuation: Available through input range feature of 89600 software.

Triggering: IF magnitude, external TTL, level, delay, and slope.

External reference: 10 MHz or 1 to 30 MHz.

Calibration

Overload detection

In addition, you can gain immediate, direct access to all of the ESA series spectrum analyzer's features by using the disconnect capability on the VSA software's control menu.

The 89600 VSA software's scalar spectrum application is not supported.

E4406A platform

Configuration requirements

The E4406A/89600 software combination requires an E4406A transmitter tester and the 89600 vector signal analysis software (each with required options), a PC to run the software, and interface cable.

E4406A requirements

The E4406A/89600 software combination requires an E4406A with version A.05.32, or later, firmware. Option E4406A-B7C, "I/Q inputs," is required for baseband measurements.

Software requirements

See the "E4406A platform" table under "89600 Series VSA software requirements" at the beginning of Appendix B.

PC requirements

See Appendix A "User-supplied PC requirements."

PC to E4406A interface

The E4406A supports both LAN and GPIB I/O. The table shows the interface cards and connection cables that are recommended for the PC.

Description	Part number	Notes
PCMCIA	778034-02	For laptop PCs, comes with a two-meter GPIB card GPIB cable. Available from National Instruments.
PCI GPIB interface card	82350	For desktop PCs, requires GPIB cable (10833A). Available from Agilent.
One-meter GPIB cable	10833A	Available from Agilent.
USB/GPIB	82357A	Available from Agilent.

A cross-over LAN cable (available from Agilent, part number 8120-0545) is recommended for the LAN connection.

Feature availability

When the E4406A is controlled by 89600 software, users have control of the following features via the 89600 software:

Frequency: The center frequency will be displayed on the 89600 software GUI

Span: Only zero-span is available. Maximum setting is 8 MHz. Zero span control and the display of its current setting are provided by the 89600 software.

Input attenuator and ADC gain: Available indirectly through the input range feature of the 89600 software

Triggering: IF magnitude, external front/rear, hold-off, level, delay, and slope

External reference: Selectable frequency

Calibration

Overload detection

Baseband operation (with Option B7C installed): Ch1 + jCh2 mode supported via 89600 VSA software.

In addition, you can gain immediate, direct access to all of the E4406A transmitter tester's features by using the disconnect capability on the VSA software's control menu.

The 89600 VSA software's swept spectrum application is not supported.

Glossary

dBc	dB relative to largest input signal
dBfs	dB relative to full-scale amplitude range setting, where full scale is approximately 10 dB below ADC overload
Fc or fc	Center frequency; typically the center of a spectrum trace. This parameter is set in the “Frequency” menu.
FS or fs	Full scale; synonymous with amplitude range or input range
ppb	Parts per billion
RBW	Resolution bandwidth

Glossary

89600 Series Vector Signal Analysis Software 89601A/89601AN/89601N12, Technical Overview, literature number 5988-1679EN

89600S Vector Signal Analyzer, CD, literature number 5980-1989E

89600 Series Vector Signal Analysis Software 89601A/89601AN/89601N12, Data Sheet, literature number 5989-1786EN

89600 Series Vector Signal Analyzers, VXI Configuration Guide, literature number 5968-9350E

89650S Wideband Vector Signal Analyzer System with High Performance Spectrum Analysis, Technical Overview, literature number 5989-0871EN

89650S Bandwidth Vector Signal Analyzer System with High Performance Spectrum Analysis, Configuration Guide, literature number 5989-1435EN

89607A WLAN Test Suite Software, Technical Overview, literature number 5988-9574EN

89604A Distortion Test Suite Software, Version 4.0, Technical Overview, literature number 5988-7812EN

Related Web Resources

For more information, visit:
www.agilent.com/find/89600

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Product specifications and descriptions in this document subject to change without notice.

Printed in USA, December 6, 2004
5989-1753EN

Agilent Technologies