Agilent
89650S Wideband Vector Signal Analyzer System with High Performance Spectrum Analysis

Technical Overview

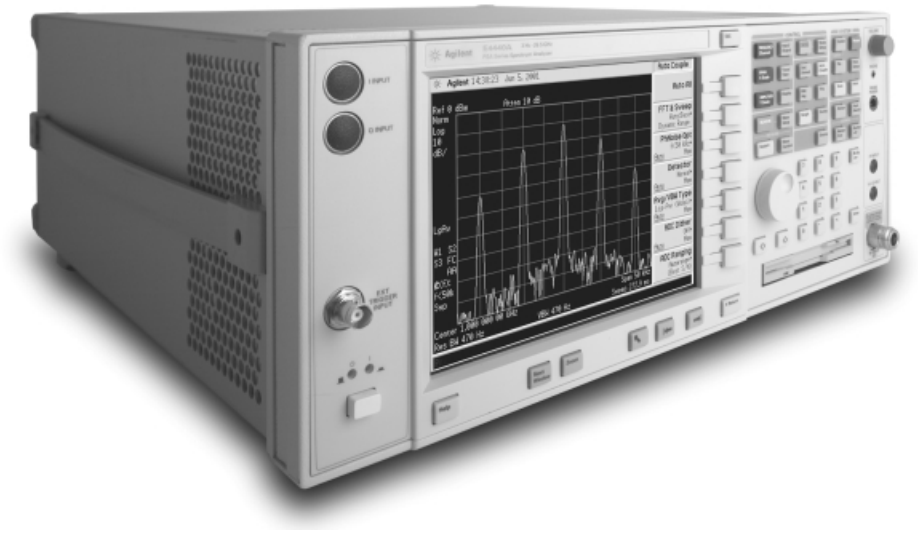
- Exceptional analysis bandwidth
- Excellent dynamic range, phase and amplitude flatness, and accuracy
- Advanced analysis of modulated signals
- Extended signal capture for playback and analysis

Agilent Technologies

Exceptional Signal Acquisition Hardware

Perform complete RF and modulation analysis from 3 Hz to 26.5 GHz with 80 MHz of analysis bandwidth and 75 dB of dynamic range using the 89650S vector signal analysis system.

The 89650S combines Agilent's high performance E4440A 26.5 GHz spectrum analyzer with the advanced 89601A vector signal analysis software, running on your PC. This package provides you one of the most advanced vector signal analysis capabilities on the market today.



E4440A PSA Series performance spectrum analyzer

The PSA Series of high performance spectrum analyzers, offers the remarkable dynamic range, speed, accuracy, and flexibility you expect in an Agilent spectrum analyzer. An all-digital 10 MHz bandwidth IF section gives the PSA Series the performance required to make advanced spectrum measurements both in a traditional swept mode or with fast fourier transforms (FFT).

In addition, as part of the 89650S, the E4440A comes equipped with an 80 MHz bandwidth ADC, offering the best combination of analysis bandwidth and dynamic range on the market today. Use this combination to capture and analyze 72 MHz wide satellite transponder signals, 18 MHz wide 802.11a signals, 60 MHz for multiple channels plus distortion components of W-CDMA signals and more. No matter the bandwidth, you are assured the dynamic range, phase and amplitude flatness, accuracy and flexibility you need for your most advanced signal evaluation and troubleshooting.

A suite of measurement personalities speeds the analysis of complicated signals. Measure phase noise or noise figure quickly and easily with the phase noise or noise figure measurement personalities. Perform power and digital modulation measurements on a variety of standard 2G and 3G digital cellular communications formats with the standards-based digital communications measurement personalities.

Additional information on this product is available on the web at:
www.agilent.com / find / PSA

Advanced Signal Analysis Software

The modulation analysis engine in the 89650S is the PC based 89601A vector signal analysis (VSA) software. For engineers working with today's emerging broadband communication systems, Agilent's 89601A VSA software is an indispensable tool for basic research, product development, manufacturing troubleshooting and field-testing.

Evaluate modulated signals, digital and analog, in detail. Analyze wideband and narrowband signals with equal ease. The 89601A VSA software used in the 89650S teams advanced demodulation algorithms with highly flexible scalar and vector analysis tools to help you develop, troubleshoot and verify the physical layer performance of your radio system.

Advanced digital demodulators

This VSA software offers a wide range of digital demodulators. These advanced technology demodulators do not require external filtering, coherent carrier signals, or symbol-clock timing signals to successfully demodulate a signal.

Precise analog demodulation

Characterize amplitude, frequency, and phase modulated signals in the frequency and time domains with the analog demodulation capabilities of the 89601A VSA software.

Use analog demodulation to analyze unintentionally as well as intentionally modulated signals. For example, use FM and PM demodulation to examine phase and frequency trajectories during frequency hops or to establish the phase-lock-loop lock-up time of oscillators and synthesizers.

High performance vector analysis tools

Analyze the time, frequency, and amplitude domain behavior of your signal with one of the most complete sets of vector analysis tools on the market today.

Use the time tools to measure the width and observe the shape of your TDMA signals. These tools are particularly useful for setting the trigger level, hold-off and delay on your pulsed signals. Use the Time Gate capability to select a portion of your signal, such as the preamble, for spectrum analysis.

Use the spectrum tools to measure the center frequency and bandwidth of your signal, find spurs, measure signal power and more. A complete set of marker functions complement the spectrum display.

Measure peak to average power ratio and more with the complementary cumulative distribution function (CCDF), probability distribution function (PDF) and cumulative distribution function (CDF) tools provided in Agilent's VSA software.

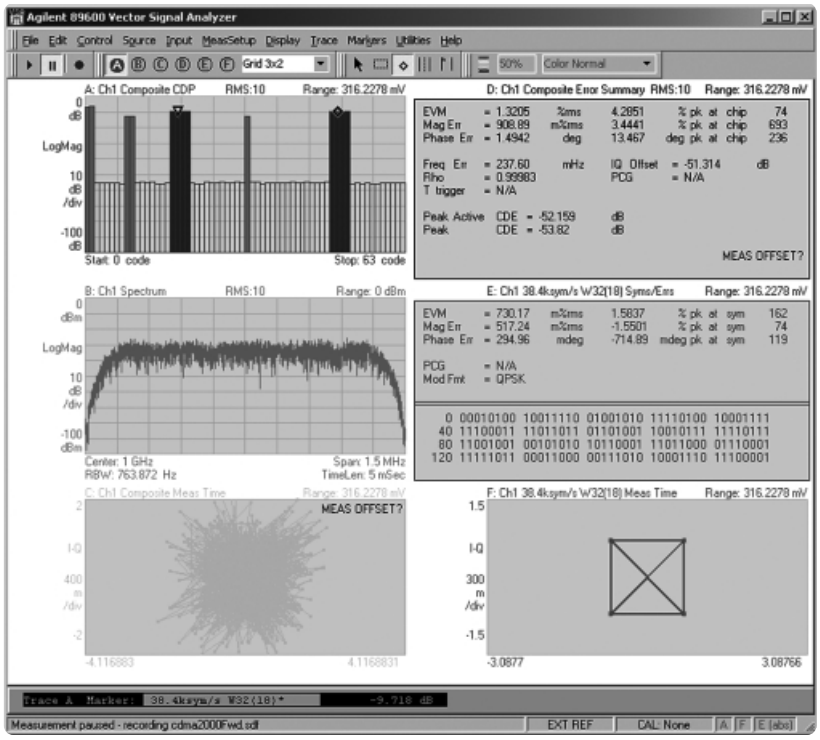


Figure 1. The 6-display format provides multiple views of the same signal simultaneously.

Display format and scaling

Scale your display the way you want, with the units you need. Select from a complete list of formats including log and linear displays of the signal magnitude, displays of only the real (I) or imaginary (Q) part of the signal, vector and constellation displays, eye displays, trellis displays and group delay.

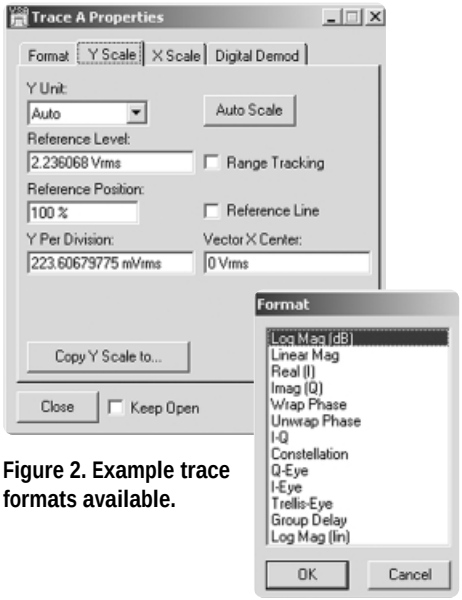


Figure 2. Example trace formats available.

Spectrogram display

Take advantage of the spectrogram display to view the behavior of your signal over time. This three-dimensional display is noted for its ability to track the frequency and amplitude behavior of signals, particularly those with poor signal-to-noise ratio and frequency hopping signals.

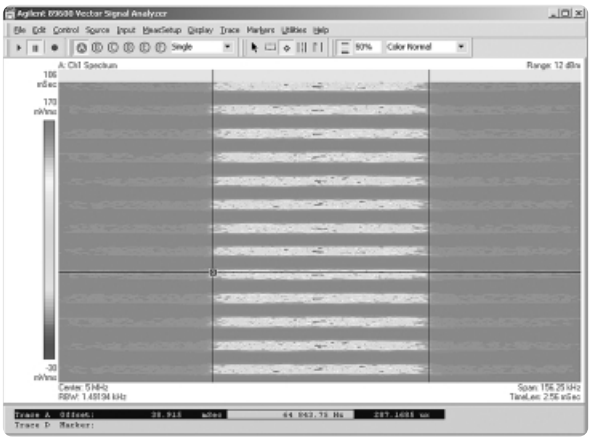


Figure 3. Spectrogram display showing pulsed signal.

Signal capture and playback

Capture your signal in the 128 MSa (complex) signal capture memory that is standard in the 89650S.

Why record signals?

- Gap-free processing - continuous time record even at full bandwidth
- Captured signals can be saved for future analysis and reference
- More analysis flexibility. Signal playback provides you tools such as overlap processing to give you more control of your analysis. This is particularly useful for analysis of transient signal problems.
- You can download your signal to Agilent EEsof Advanced Design System EDA software
- You can download your signal to Agilent's ESG and PSG signal generators and use it to stimulate prototype hardware.

You have full control of the playback including:

- Start and pause
- Back up and rewind
- Start point and stop point markers to indicate location in the recording and isolate the signal of interest
- Playback looping

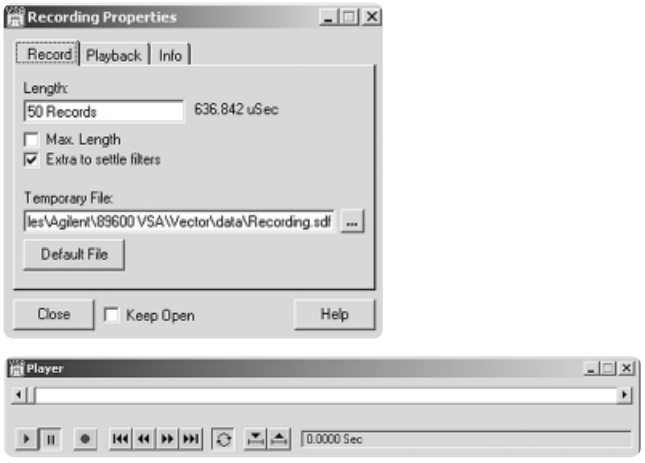


Figure 4. The signal recording user interface is familiar and simple to use.

Software update subscription service

The 89650S includes 12 months of software update subscription service to help you get the most out of your investment by keeping your 89601A software current with new enhancements. The update service provides automatic notification and shipment of new software upgrades as soon as they become available. A detailed installation procedure is included with each shipment to speed the software loading process.

Additional coverage may be purchased.

Help text

Over 2000 equivalent paper pages of help text, application information and tutorials are provided with the 89650S. A complete set of search tools and hot links provide ready access to all of this information.

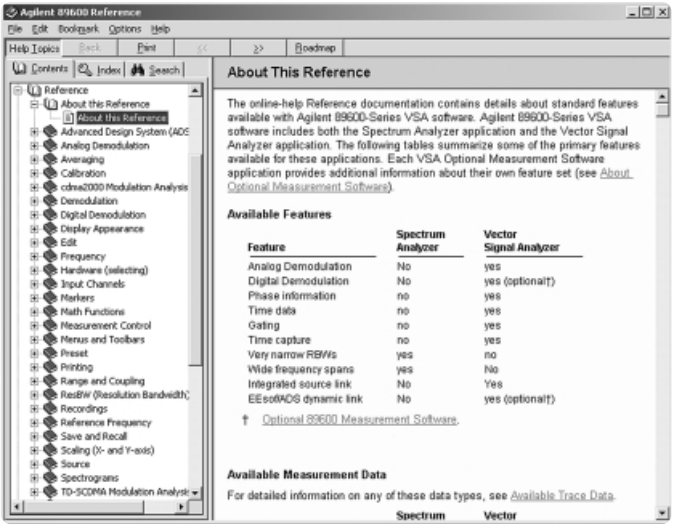


Figure 5. The help text provides tutorials, examples, key word searching, reference material, and more.

Link to design software

Link real world signals recorded with the 89650S to Agilent EESof Advanced Design system (ADS) circuit design and simulation software to provide an actual signal environment for your design stimulus.

Measure the output of prototype hardware with the 89650S VSA, and feed the results back to your simulation. This way you can evaluate your system even with missing hardware.

Or, with the instrument links from ADS to the Agilent ESG signal generators, you can take simulation output, download it to the ESG, and source it to your prototype hardware. Then measure the hardware with the 89650S, and compare it to its simulation results in ADS.

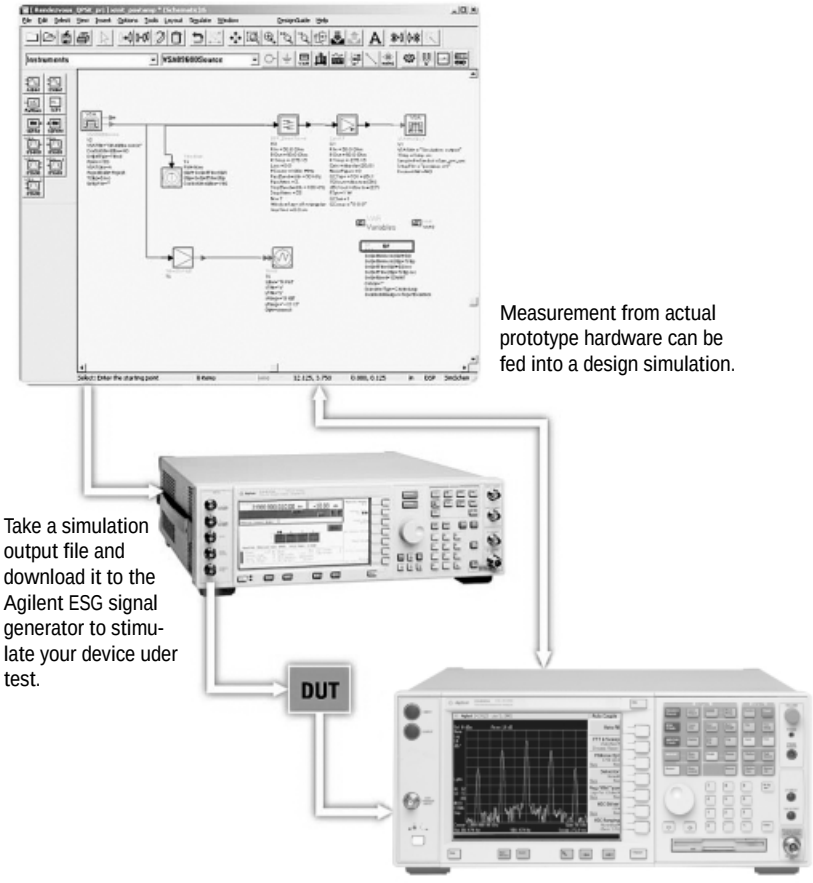


Figure 6. Link prototype hardware to ADS design simulations using Option 89601A-105.

Powerful Modulation Analysis Options for Your VSA software[1]

Team the modulation analysis options available in the VSA software with the optional standards-based wireless communications measurement personalities in the PSA to evaluate and troubleshoot your signal. Use the PSA measurement personalities to measure signal quality quickly and efficiently. Use the 89601A VSA software modulation analysis options to go beyond the PSA's standards-based tests to troubleshoot signal problems to their root cause.

Flexible modulation analysis

(Option 89601A-AYA)
Whether you are designing to a mainstream standard, a secondary standard, an emerging standard or a proprietary specification, the 89601A VSA flexible modulation analysis Option AYA has the tools you need to evaluate and characterize signal performance. It helps you uncover the root of modulation problems.

This flexible analysis package demodulates a wide range of single carrier signal types both continuous and pulsed (TDMA and radar). Demodulators range from 2FSK to 16FSK, BPSK to EDGE, 16QAM to 256QAM and are supported by a wide range of programmable filters.

Adaptive equalization

User programmable adaptive equalization is provided standard with Option AYA. Use this powerful troubleshooting tool to identify and remove group delay distortion, frequency response errors, and multi-path reflections from your measurements.

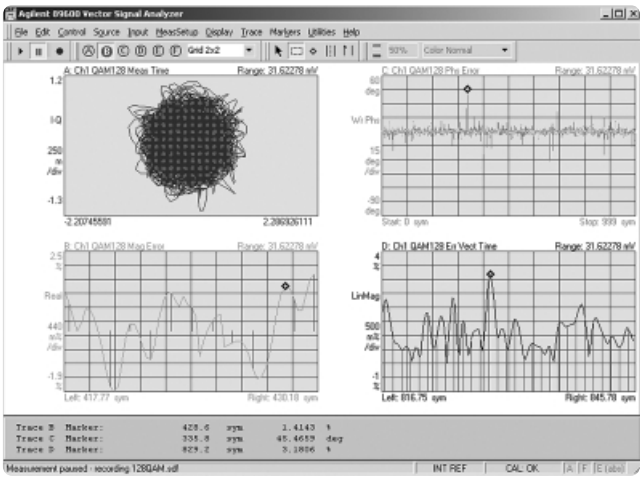


Figure 7. Option 89601A-AYA provides a wide range of modulation analysis tools and display formats.

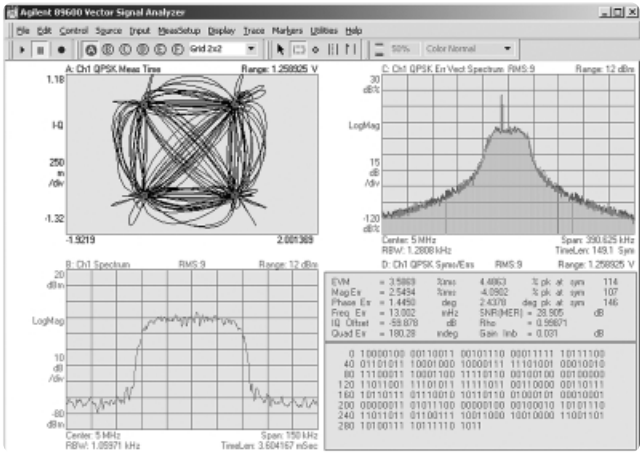


Figure 8. Use the error vector spectrum display to uncover interferers even when none are readily visible using other measurement techniques.

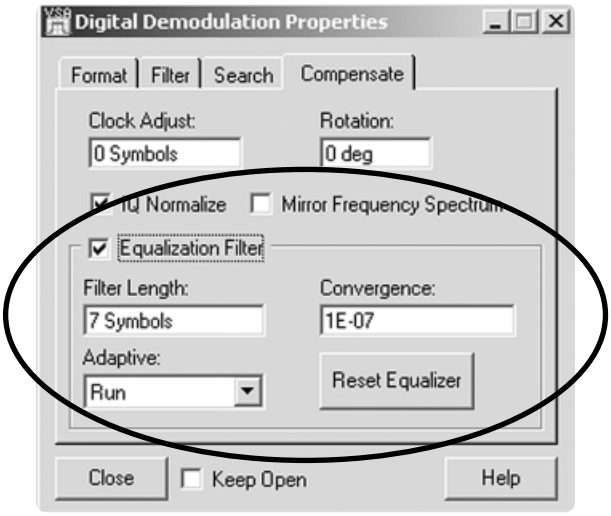


Figure 9. Adaptive equalizer set up menu.

1. These analysis options run in the PC.

3G modulation analysis

(Option 89601A-B7N)
Evaluate and troubleshoot your 3G modulated wireless communications signals with Option B7N 3G modulation analysis. Whether your signal is cdma2000 or W-CDMA, TD-SCDMA or 1xEV-DO, HSDPA or 1xEV-DV, the tools and analysis flexibility in Option B7N help you test your signal to its standard and troubleshoot the problem if the signal fails to meet its standard.

Use these tools to descramble, de-spread, and demodulate uplink and downlink signals. The analyzer automatically identifies all active channels regardless of the symbol rate or spread code-length.

Speed measurement set-up with standard pre-sets for uplink and downlink. Use the single layer and composite code-domain power and code-domain error displays (the composite display shows all code layers simultaneously) to determine the overall performance of your signal and the behavior of specific layers and channels.

Take advantage of the composite and single channel constellation, trellis and eye diagrams, IQ magnitude/phase error displays, and error vector traces to search out specific errors.

Use the measurement offset and interval controls to select specific data slots for analysis.

Measurement results include CDP (composite or layer specific), code domain error (composite or layer specific), EVM, IQ offset and rho.

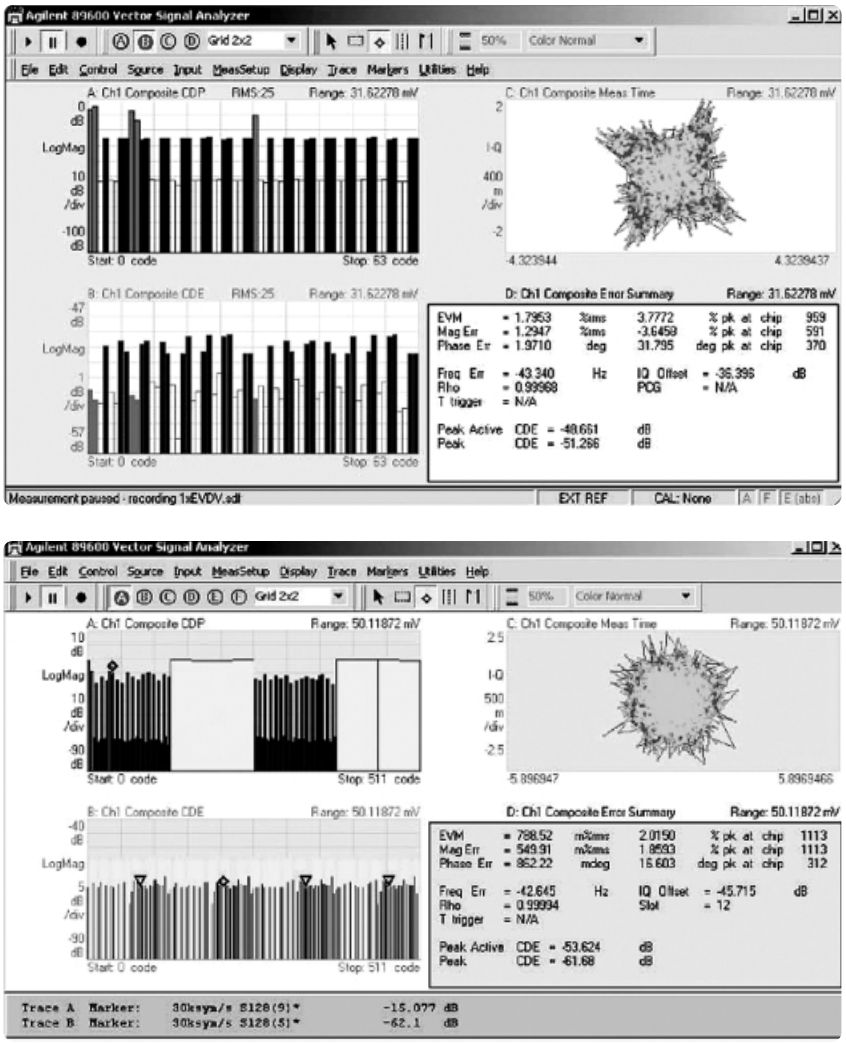


Figure 10. Option B7N 3G modulation analysis allows you to analyze a wide range of formats, such as 1xEV-DV (upper screen) or HSDPA (lower).

WLAN modulation analysis

(Option 89601A-B7R)
Agilent is an industry leader in WLAN signal analysis. The WLAN analysis option available with the 89650S offers:

- 802.11a OFDM modulation analysis
- 802.11b DSSS/CCK/PBCC modulation analysis
- 802.11g modulation analysis
- 802.11a/b/g standards-based testing

802.11b modulation analysis

Select the DSSS/CCK/PBCC mode and automatically detect, de-spread, descramble, and demodulate the payload in all four mandatory 802.11b formats (1, 2, 5.5, 11 Mbps). This mode handles the optional PBCC modes, the optional short preamble, and the CCK preamble of the CCK-OFDM format in 802.11g.

802.11a modulation analysis

Demodulate and analyze 802.11a, 802.11g, and HiperLAN2 compatible signals with the OFDM modulation analysis mode provided in Option B7R. This high performance capability supports demodulating OFDM bursts down to the bit level.

Use the compound constellation display to automatically determine and display all modulation formats present in the burst.

Evaluate modulation quality using EVM displays of the overall burst, of each symbol, or of each sub-carrier in a symbol. View all of this data in an efficient graphical display that reveals overall patterns in the EVM – a key to finding the root cause of signaling problems.

View the average phase and magnitude behavior of the pilot sub-carriers using the Common Pilot Error display.

Measure the magnitude and phase settling of the OFDM burst using the preamble error display.

These features and more, provide you a powerful package for analyzing and troubleshooting OFDM signals.

802.11a/b/g test suite

Speed the process of testing your 802.11a/b/g signal to its standard with the WLAN test suite (supplied as part of the WLAN analysis Option B7R). This separate applet automatically executes standards-based transmitter tests of your signal. You specify the tests to perform, set the center frequency and other signal parameters, and the applet does the rest.

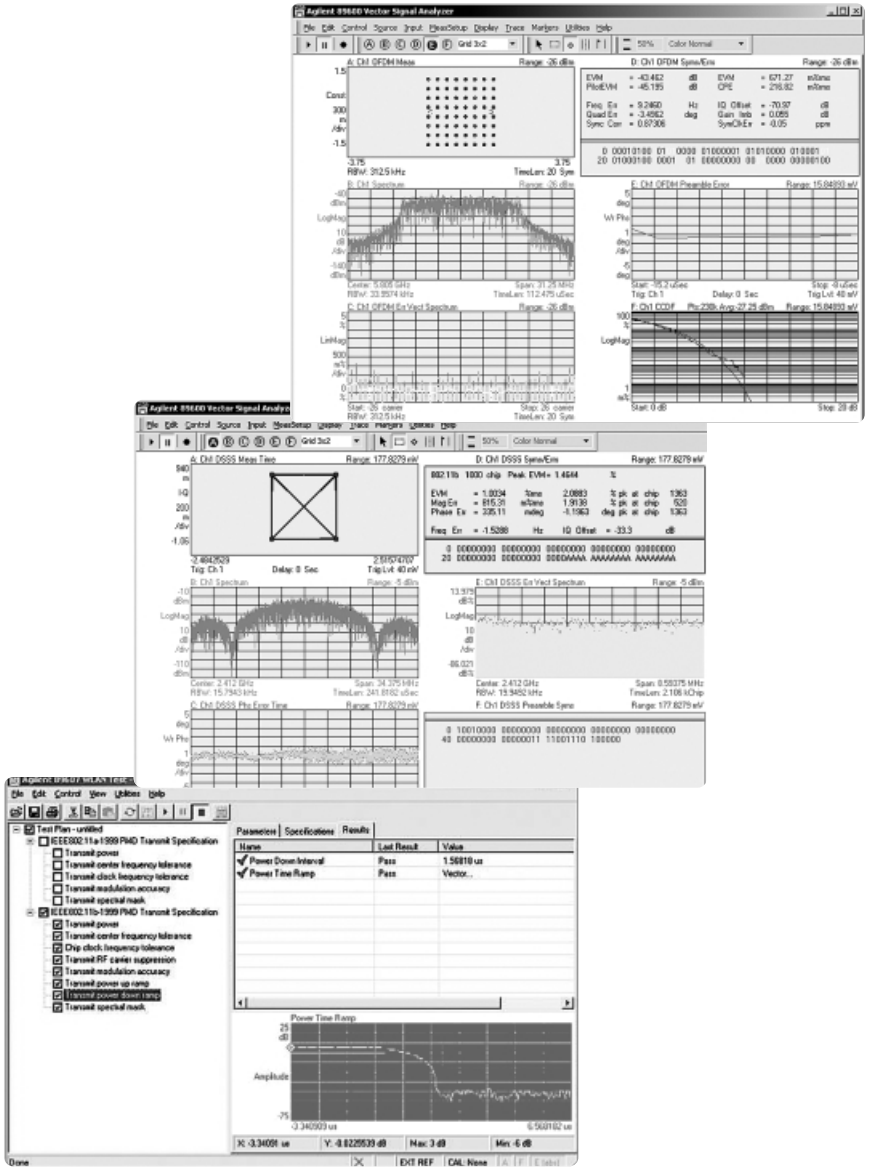


Figure 11. The WLAN modulation analysis Option 89601A-B7R lets you perform in-depth analysis on the signal. It includes the WLAN test suite for easy go/no-go testing to standard.

802.16-2004 OFDM (WiMAX) analysis (Option 89601A-B7S)

Agilent is the industry leader in base band, RF, and modulation quality measurements for IEEE-802.16-2004 (WiMAX) OFDM signals. Whether your measurements are on base band, IF or RF signals, or even simulated signals from ADS design simulations, the 89600 VSA software with Option B7S has the tools you need to troubleshoot your WiMAX designs today.

Analyzing OFDM signals requires developers to think in the time and frequency domains simultaneously. You need OFDM-specific signal analysis tools to help you manipulate and break down the signal in order to effectively troubleshoot the situation. The 89600 WiMAX vector signal analysis software helps you do this quickly and efficiently.

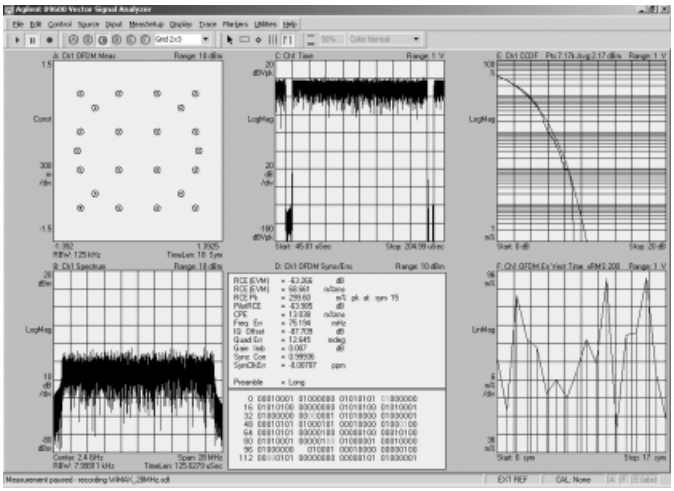


Figure 12. Familiar and new tools combine to provide invaluable troubleshooting information. Here the six displays simultaneously show (l to r) I-Q constellation, time, CCDF, spectrum, modulation error summary, and error vector vs. time.

Comprehensive WiMAX signal analysis

Option B7S provides comprehensive coverage of the IEEE-802.16-2004 standard:

- All 802.16-2004 modulation formats, including BPSK, QPSK, 16QAM, and 64QAM
- TDD, FDD, and H-FDD
- Uplink and downlink
- Bursted and continuous
- All frame lengths, guard intervals, and sampling factors
- Demodulation down to the raw bit level

In addition, the software allows you to set up and adjust the demodulator for the best analysis of your signal:

- Automatically detect the signal modulation type on sub-carriers, or you can manually override the auto-detect feature for specific troubleshooting needs
- Manually adjust the nominal signal bandwidth, guard interval, and sampling factor (Fs/BW ratio) (standard guard interval and sampling factors are provided)
- Adjust carrier pilot tracking to track amplitude, phase, or timing and identify errors that automatic pilot tracking can hide (these errors can cause you to inadvertently lower design margins)
- Verify your signal setup using the burst information provided —a text table conveniently shows burst power, modulation format, burst symbol length, and EVM

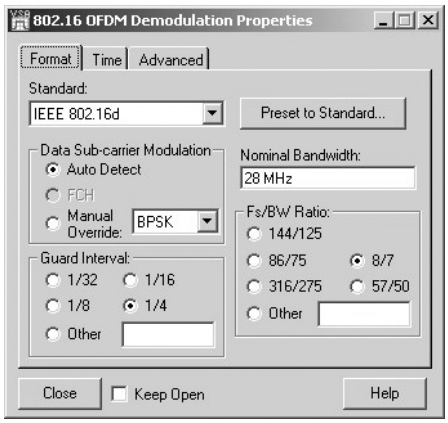


Figure 13. Setting up the 802.16 demodulator is as easy as presetting to the standard, or as sophisticated as manually entering the guard interval, Fs/BW ratio, and more.

OFDM- and WiMAX-specific measurements

New measurements specifically for OFDM and more specifically for WiMAX signals include:

- Relative constellation error (RCE) in % or dB
- RCE vs. symbol number
- RCE vs. sub carrier number
- Equalizer frequency and impulse response
- Error vector spectrum/time, including RMS error vector
- Quadrature skew, gain imbalance, I-Q offset
- Frequency error
- Symbol clock error
- Common Pilot Error (CPE)

In addition, these tools let you analyze your signal selectively by time or frequency for troubleshooting and uncovering problems that you've never been able to see before.

For instance, with the demodulation off, use time gating markers to analyze the desired portions of the time trace or spectrum of the signal, e.g., the short training signal, signal estimation sequences, signal symbol, etc. You can apply many other measurements to the time-gated area. This is especially useful when making measurements like peak to average power, when you may want to measure only the data portion of the burst, since including the timing and estimation sequences can bias the value lower.

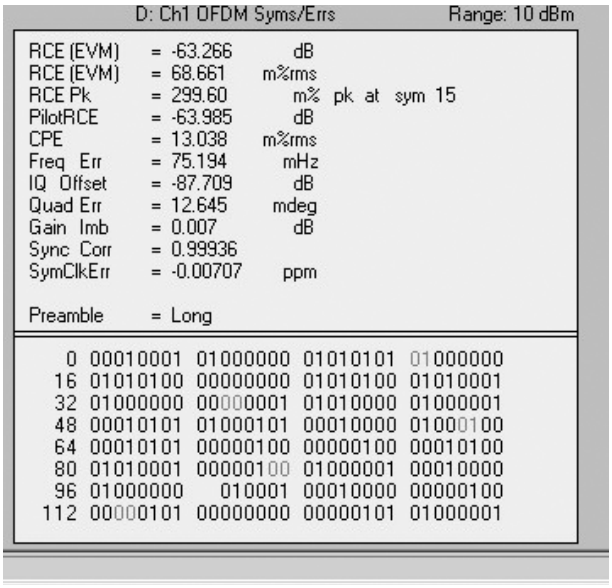


Figure 14. The modulation error analysis screen provides a wealth of information. Note that the RCE is provided in dB and %. The lower half of the display provides demodulated (encoded) bits. The pilot tones are shown in lighter colors. The error summary table also includes RCE for the pilot tones alone.

Spectrum Analyzer-based Measurement Personalities[1]

Phase noise suite (Option 226)

Whether you're in R&D or manufacturing the Option 226 phase noise measurement personality provides a comprehensive measurement solution for characterizing the phase noise behavior of your systems and components quickly and accurately.

This personality turns the PSA into a one-button phase noise tester. It offers the following capabilities:

- Log plot measurement for phase noise versus offset frequency of a specified carrier
- Spot frequency measurements of phase noise versus time at a particular offset frequency
- RMS jitter results in seconds in
- RMS phase deviations in degrees and radians
- Residual FM
- Phase noise cancellation to reduce the influence of the PSA's internal phase noise
- DANL optimization and DANL floor display to ensure valid phase noise measurements

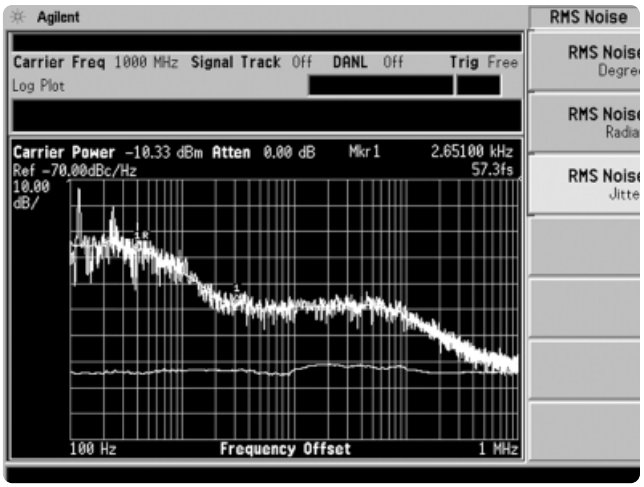


Figure 15. Swept phase noise analysis with Option 226.

1. These personalities run in the E4440A.

Noise figure (Option 219)

The Option 219 noise figure measurement personality provides fast, one-button noise figure and gain measurements from 200 kHz up to 26.5 GHz. DUT setup menus guide you through amplifier and mixer measurements, and a built-in measurement uncertainty calculator makes it easy to qualify your measurement system.

The noise figure personality runs in the PSA and offers:

- Automatic noise figure and gain measurements from 200 kHz to 26.5 GHz
- ±0.05 dB instrument uncertainty up to 3 GHz with the built-in preamplifier
- An internal measurement uncertainty calculator
- Operation with the Agilent 346 Series of noise sources

Standards-based wireless communication measurement personalities

The measurement personalities offer one-button power and modulation measurements to help you quickly and easily test your base stations and user equipment to their respective standards.

All of the major wireless communications standards are covered, and a flexible, easy-to-use digital modulation analysis personality provides modulation quality measurements on a wide range of standard and non-standard formats.

Team these personalities with the VSA software's modulation analysis options for the most effective analysis. Use the measurement personalities to evaluate the overall quality of your signal and the VSA analysis options to do the non-standard tests that are needed to troubleshoot to the root of your signal's problems.

Table 1. Measurement personalities

	Option
W-CDMA analysis	BAF
HSDPA analysis	210
cdma2000 analysis	B78
1xEV-DV analysis	214
1xEV-DO analysis	204
TD-SCDMA analysis	211
cdmaOne analysis	BAC
GSM and EDGE analysis	202
NADC/PDC analysis	BAE
Flexible modulation analysis	241

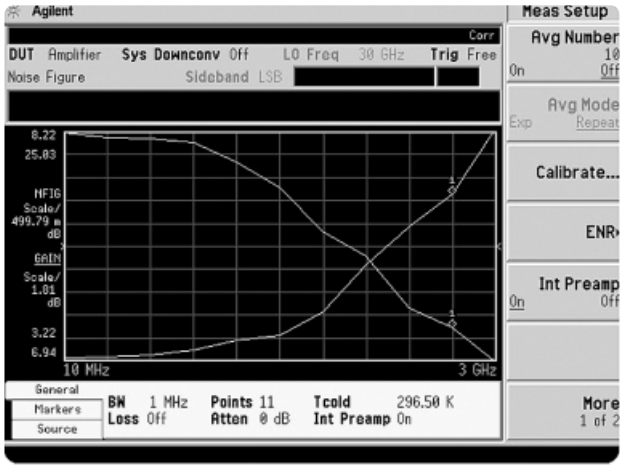


Figure 16. Swept noise figure and gain.

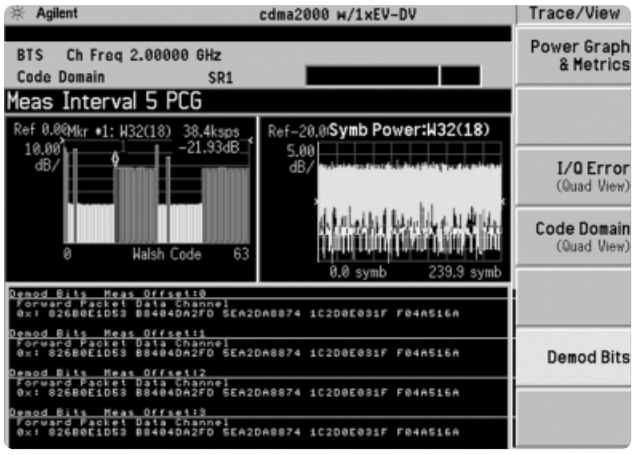


Figure 17. Standards-based testing of major wireless communication formats.

Performance Specification Summary

These specifications summarize the performance for the 89650S over 20° to 30 °C. Refer to the E4440A technical datasheet or the 89601A technical overview for more detailed specifications.

Frequency range	
Spectrum analysis	3 Hz to 26.5 GHz
Vector modulation analysis	36 MHz to 26.5 GHz (Preselector bypass (Option E4440A-123) recommended above 3GHz)
Frequency spans	< 1 kHz to 80 MHz[1]
Frequency points per span	
Calibrated	51-102401
Displayable	51-131072
Absolute amplitude accuracy (at 50 MHz)	±0.25 dB
Amplitude IF response (deviation from flat response, internal calibration, center frequency > 50 MHz, flat-top window, 10 dB input range, 0 dB IF gain)	
≤ 3 GHz, ≤ 30 MHz span:	±0.57 dB, ±0.25 dB typical
≤ 3 GHz, ≤ 60 MHz span:	±0.75 dB, ±0.45 dB typical
≤ 3 GHz, ≤ 80 MHz span:	±.83 dB, ±0.5 dB typical
> 3 GHz, 30 MHz span (Option 123 preselector bypass enabled)	±.18 dB, typical
> 3 GHz, 80 MHz span (Option 123 preselector bypass enabled)	±0.6 dB, typical
Amplitude flatness (extended calibration)	
> 3 GHz, ≤ 60 MHz span (Option 123 preselector bypass enabled)	±0.2 dB, nominal
Phase linearity (internal calibration)	
≤ 3 GHz, ≤ 30 MHz span	±1.6 °, typical
≤ 3 GHz, ≤ 60 MHz span	±4.0 ° , typical
> 3 GHz, ≤ 30 MHz span (Option 123 preselector bypass enabled)	±1.0 °, typical
Phase linearity (extended calibration)	
> 18 GHz, ≤ 60 MHz span (Option 123 preselector bypass enabled)	±0.3, nominal
3rd order intermodulation	
(≤ 3 GHz, ≤ 60 MHz span, –9 dBfs tones)	< –75 dBc, typical
Phase noise (1 GHz, 10 kHz offset)	–106 dBc / Hz
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 preselector 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 recommended Option 123 adds switching bypassing the YTF preselector enabling the full 80 MHz functionality.

Flexible modulation analysis[1] (typical)

Center frequency range

36 MHz to 26.5 GHz
(preselector bypass (Option E4440A-123) enabled above 3 GHz)

For formats other than FSK, 8/16 VSB, and OQPSK
Signal fully contained within the measurement span and at full scale, input range ≥ –20 dBm, random data sequence, alpha/BT > 0.3, (0.3 ≤ alpha ≤ 0.7 offset QPSK), result length = 150 symbols, averages = 10, symbol rate ≥ 1 kHz

Residual errors (max rms)

Span	100 kHz	1 MHz	10 MHz	28 MHz	36 MHz	80 MHz
EVM	0.5%	0.5%	1.0%	1.2%	1.6%	2.5%
Magnitude	0.3%	0.5%	1.0%	1.2%	1.5%	2.5%
Phase	0.3º	0.4º	0.6º	0.8º	1.2º	1.5º

Frequency error
(relative to frequency standard)
Symbol rate/500,000

I/Q origin offset
–60 dB

For 8/16 VSB
Full-scale signal, range ≥ –20 dBm, SNR ≥ 36 dB, symbol rate = 10.762 MHz, alpha = 0.115, span = 7 MHz, result length = 800 symbols, averages = 10

Residual EVM
≤ 1.5%

For 16,32,64,256 QAM
Full-scale signal, range >= –20 dBm, SNR ≥ 40 dB, symbol rate = 6.9 MHz, alpha = 0.15, span = 8 MHz, result length = 800 symbols, averages = 10

Residual EVM
≤ 1.0%

1. Requires Option 89601A-AYA.

WLAN modulation analysis[1] (typical)

802.11a / g (OFDM)

Frequency range	36 MHz to 26.5 GHz
Capture length (31.25 MHz span)	3.3 seconds
Residual EVM (20 averages)	
Equalizer training = chan est. seq. and data	≤ –47 dB
Equalizer training = chan est. seq.	≤ –45 dB
Carrier spacing	312.5 kHz (1.4 MHz max, user settable)
Lock range	±624 kHz (±2x sub-carrier spacing)
Accuracy	±8 Hz

802.11b / g (DSSS)

(Total signal power within 2 dB of full scale)

Frequency range	36 MHz to 26.5 GHz (Preselector bypass (Option E4440A-123) enabled above 3 GHz)
Capture length (34.375 MHz span)	3.0 seconds
Residual EVM (all modulation formats, 10 averages, reference filter = transmit filter)	≤ 1.0% (≤ 0.5% with equalizer enabled)
Frequency error (relative to frequency standard)	
Lock range	±2.5 MHz
Accuracy	±8 Hz

802.16 OFDM modulation analysis [2] (typical)

Center frequency range

Signal playback

Result length: Auto detect or adjustable from 1 to 1394 symbol times

Capture length: Gap free analysis at 0% overlap

Span	Memory	Max length
12.5 MHz	512 MB	2.9 s
36 MHz	512 MB	4.1 s

Accuracy

Residual EVM: 20 averages; input range within 2 dB of full scale

Equalizer training = chan est. seq. and data

Signal bandwidth	EVM
20 MHz	≤ –48 dBc
7 MHz	≤ –49 dBc

Equalizer training = chan est. seq. only

Signal bandwidth	EVM
20 MHz	≤ –46 dBc
7 MHz	≤ –47 dBc

Frequency error

Lock range

Signal bandwidth	Range
20 MHz	±135 kHz
7 MHz	±47.25 kHz

Frequency accuracy: ±10 Hz

1. Requires Option 89601A-B7R.
2. Requires Option 89061A-B7S.

3G modulation analysis[1] (typical)

Center frequency range 36 MHz to 26.5GHz
(preselector bypass (Option E4440A-123) enabled above 3 GHz)

W-CDMA / HSDPA
(Total signal power within 5 dB of full scale)

Capture length (gap free, 0% overlap, 5 MHz span)	> 15k slots
Code domain	
CDP accuracy	±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)
Composite EVM	
EVM floor (pilot only)	≤ 1.5%
EVM floor (test model 1 with 16 DPSH signal)	≤ 1.5%
Frequency error	
Range (CPICH synch type)	≤ 500 Hz
Accuracy	≤ 10 Hz

cdma2000 / 1xEV-DV
(Total signal power within 5 dB of full scale)

Capture length (gap free, 0% overlap, 2.6 MHz span)	> 16k PCGs
Code domain	
CDP accuracy	±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)
Composite EVM	
EVM floor (pilot only)	≤ 1.5%
EVM floor (9 active channels)	≤ 1.5%
EVM floor (16-qam, F-PDCH with 15 codes, 1xEV-DV enabled))	
Frequency error	
Range (CPICH synch type)	≤ 500 Hz
Accuracy	≤ 10 Hz

1xEV-DO
(Total signal power within 5 dB of full scale)

Capture length (gap free, 0% overlap, 1.5 MHz span)	> 20k slots
Code domain	
CDP accuracy	±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)
Composite EVM	
EVM floor	≤ 1.5%
Frequency error	
Lock range	≤ 500 Hz
Accuracy	≤ 5 Hz

TD-SCDMA

Capture length (gap free, 0% overlap, 1.6 MHz span)	> 6.5k sub-frames
Code domain	
CDP accuracy	±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)
Composite EVM	
EVM floor	≤ 1.5%
Frequency error	
Lock range	≤ 500 Hz
Accuracy	≤ 25 Hz

1 Requires Option 89601A-B7N.

Analog demodulation[1] (typical)

Center frequency range	36 MHz to 26.5 GHz (preselector bypass (Option E4440A-123) enabled above 3 GHz)

AM demodulation (typical)
(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	< .3% AM on an FM signal with 10 kHz modulation rate, 200 kHz deviation, cardinal spans

PM demodulation (typical)
(Modulation rate ≤ 1 MHz, deviation ≤ 180º)

Carrier locking	Automatic
Demodulator bandwidth	Same as selected measurement span
Modulation index accuracy	±3º
Dynamic range	–60 dBc
Cross demodulation	< 1º PM (80% modulation index AM signal, modulation rate ≤ 1 MHz)

FM demodulation (typical)
(Modulation rate ≤ 250 kHz, deviation ≤ 1 MHz)

Carrier locking	Automatic
Demodulator bandwidth	Same as selected measurement span
Modulation index accuracy	±1% of measurement span
Dynamic range	–60 dBc
Cross demodulation	< 0.5% of span of FM (80% modulation index AM signal, modulation rate ≤ 1 MHz)

Requirements

Operating system	Windows 2000, XP Professional
PC	300 MHz Pentium® or AMD-K6, 192 MB RAM (256 MB recommended), 4 MB video RAM (8 MB recommended), hard disk with 160 MB of available space, CD-ROM drive or 3.5-inch floppy disk drive (can be provided via network access), LAN interface (LAN cross-over cable supplied)

1 Requires Option 89601A-200.

Ordering Information

89650S VSA bundle includes:

E4440A	3 Hz to 26.5 GHz PSA Series spectrum analyzer
E4440A-122	80 MHz bandwidth ADC
89601A	Vector signal analysis software
89601A-200	Basic vector signal analysis software
89601A-300	Hardware connectivity

Options

Installed in the PSA Series spectrum analyzer[1]

E4440A-123	High band preselector bypass (recommended)
E4440A-226	Phase noise measurement personality
E4440A-219	Noise figure measurement personality
E4440A-BAF	W-CDMA measurement personality
E4440A-210	HSDPA measurement personality
E4440A-211	TD-SCDMA measurement personality
E4440A-B78	cdma2000 measurement personality
E4440A-204	1xEV-DO measurement personality
E4440A-214	1xEV-DV measurement personality
E4440A-BAC	cdmaOne measurement personality
E4440A-202	GSM w/EDGE measurement personality
E4440A-BAE	NADC, PDC measurement personality
E4440A-241	Flexible digital modulation analysis

Installed in the VSA software

89601A-AYA	Flexible modulation analysis
89601A-B7N	3G modulation analysis
89601A-B7R	WLAN modulation analysis
89601A-B7S	802.16 OFDM modulation analysis
89601A-105	Dynamic Link to EESof/ADS

Additional hardware

LTPC1	Laptop PC (89601A software installation included)

1. Additional options available, contact your Agilent representative for more information.

Related Literature

PSA Series Spectrum Analyzers, Brochure,
Literature number 5980-1283E

PSA Series Spectrum Analyzers, Data Sheet,
Literature number 5980-1284E

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

89600 Series Vector Signal Analysis Software 89601A/89601AN/89601N12 Technical Overview,
Literature number 5989-1679EN

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

89600 Series Vector Signal Analysis Software Measurement Platform Datasheet,
Literature number 5989-1753EN

89650S Wideband VSA with High Performance Spectrum Analysis, Configuration Guide,
Literature number 5989-1435EN

Spectrum Analysis Basics, Application Note 150,
Literature number 5952-0292

Vector Signal Analysis Basics, Application Note 150-15,
Literature number 5989-1121EN

Web Resources

For more information, go to:
www.agilent.com / find / psa
or
www.agilent.com / find / 89600

Order a free demo CD at
www.agilent.com / find / 89600

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