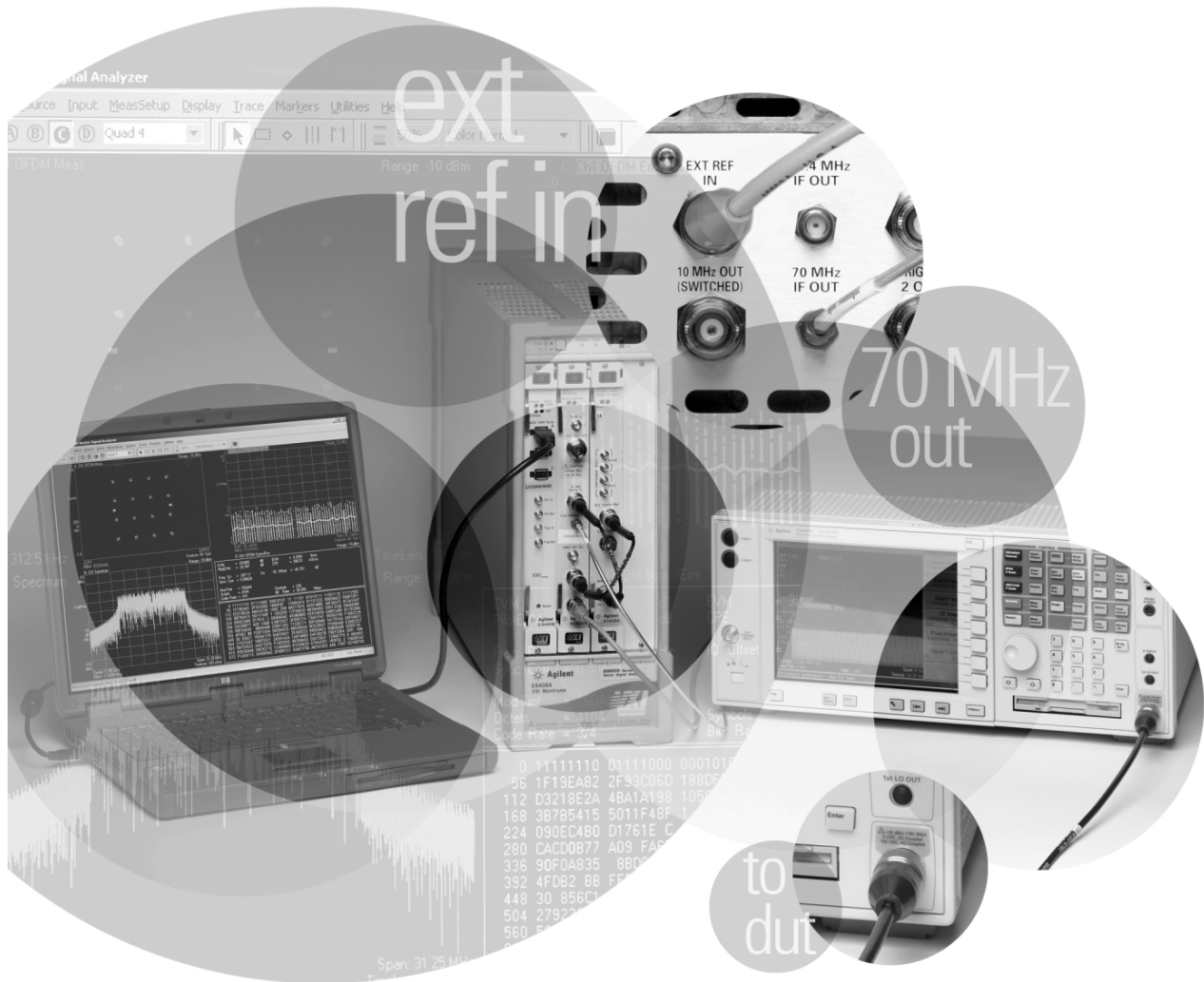


Agilent WLAN Transmitter Test Instrument/Software Combinations

Configuration Guide

**Measure 802.11a/b/g WLAN signals
with software and hardware combinations
offering a variety of performance and price choices**



Agilent Technologies

Table of Contents

- Introduction..... 3
- Selection Guide..... 3
- WLAN Transmitter Test Instrument/Software
 - Combinations..... 4
 - Combination A 4
 - Combination B..... 6
 - Combination C..... 8
 - Combination D 10
- Instrument/Software Combination Performance..... 12
- Appendix A: Instrument, Software and PC Configuration Requirements ... 16
- Appendix B: PC to Instrument Interface..... 19
- Appendix C: Instrument Overview 22
 - PSA performance spectrum analyzer 22
 - ESA-E Series spectrum analyzers 22
 - 54830 Series Infiniium oscilloscope 23
 - 89611 IF vector signal analyzer..... 23
- Appendix D: Software Overview 24
 - 89601A software 24
 - 89607A software 26
- Related Literature 27

Introduction

This guide characterizes the performance of four software/instrument combinations for measuring 802.11a/b/g WLAN signals. Each combination offers a different set of features and performance to meet your needs. The hardware used in these combinations includes models from Agilent's two spectrum analyzer lines, the vector signal analyzer family and the Infiniium oscilloscope line. The software used is the same PC-based analysis software used in Agilent's popular vector signal analyzer products.

Each combination uses a spectrum analyzer to down-convert the wideband WLAN signal. The vector signal analyzer or the oscilloscope digitizes the down-converted signal. The software provides control, display, and all analysis and test tools.

The selection guide, in the next section, compares the performance and features of each combination. The page numbers in the table indicate where more detailed information can be found, as does the table of contents.

Agilent's 89600 series of vector signal analyzers are also well suited to WLAN signal analysis. The 89641 VSA offers 6.0 GHz tuning range, 36 MHz of analysis bandwidth and the 89601 signal analysis software all in one four slot VXI mainframe. For more information on these products go to: www.agilent.com/find/89600

WLAN Transmitter Test Instrument/ Software Combination Selection Guide

	Combination A (page 4)	Combination B (page 6)	Combination C (page 8)	Combination D (page 10)
Main task	Chipset and component design	Reference circuit evaluation and integration		
Wideband down-converter	PSA spectrum analyzer Highest accuracy Fastest RF measurements Highest dynamic range Lowest phase noise	ESA spectrum analyzer Performance suited to test a complete WLAN card		
Wideband digitizer	89611 VSA Fastest measurement throughput 36 MHz bandwidth Very long time capture Optional baseband inputs		54830B Suits constrained budget Analog and digital oscilloscope based measurements Baseband inputs (some operational constraints)	
Software	89601 vector signal analysis software Extensive signal evaluation and troubleshooting Signal recording and playback for later diagnosis Links to Agilent's advanced design system 89607A WLAN test suite included			89607A WLAN test suite Suits constrained budget Standards based tests only Evaluation and pass/fail testing Does not require WLAN testing knowledge
Price range	++++	+++	++	+

WLAN Transmitter Test Instrument/ Software Combinations

Combination A

E4440A (H70)/89611 /89601



Wideband down-converter	E4440A* (26.5 GHz) PSA spectrum analyzer with special option H70 wideband 70 MHz IF output
Wideband digitizer	89611 IF vector signal analyzer
Software	89601 vector signal analysis software
Capabilities	Superior RF performance with advanced software tools for evaluating and troubleshooting WLAN signals. Includes WLAN standards based transmitter test software
Price Range	++++

*See appendix A for other PSA spectrum analyzers that can be used in this combination

This combination uses the E4440A as a wideband down-converter for the 89611 IF vector signal analyzer (VSA). The E4440A performs advanced RF spectrum analysis, spur searches, one-button RF power measurements, and more. The VSA provides wideband digitizing of the down-converted WLAN signal along with real time decimation filtering, and a deep signal capture memory. The 89601 software is included as part of the 89611, and provides hardware control, demodulation, advanced modulation evaluation and troubleshooting tools, and one button WLAN standards-based testing along with complete results displays.

The E4440A/89611/89601 combination requires a PC for the software's operation. Detailed configuration requirements for the instruments and software are provided in Appendix A. Appendix B contains information on GPIB and LAN interface hardware and the cables needed to connect the PC and instruments.

E4440A with Option H70 (Wideband 70 MHz IF output)

In this combination the E4440A PSA series spectrum analyzer, is controlled by 89601 VSA software. Users have control of the following features of the spectrum analyzer via the software:

Frequency: The center frequency of the spectrum analyzer is controlled and the software displays the current setting.

Span: Only zero span is available

Input attenuator and ADC gain: Available indirectly through the input range feature of the 89601 VSA software

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

External reference: 10 MHz (may be input to the 89611 or the spectrum analyzer)

Calibration

Overload detection

The controls and display of the spectrum analyzer are disabled while operating with the 89601 software. You can gain immediate, direct access to all of the analyzer's features by using the Disconnect capability on the VSA software's control menu.

89611/89601 features

The 89611 comes standard with the 89601 software. When used in this combination almost all of the features of the 89601 software are available.

These include:

- Powerful OFDM analysis tools and displays including: auto modulation type detect, EVM (dB, %), EVM by symbol/carrier, preamble frequency settling, pilot EVM, common pilot error, CCDF, complex time, complex spectrum, and others.
- Full DSSS analysis capability including: automatic detection, despreading, descrambling, and demodulation of the payload in all four mandatory 802.11b formats (1, 2, 5.5, 11 Mbps). Handles the optional PBCC modes, the optional short preamble and the CCK preamble of the CCK-OFDM format in 802.11g
- One-button standards-based tests including preset PHY layer transmitter tests for 802.11a/b/g, pass/fail testing, report generation and more.
- Baseband (I/Q) measurements (89611 must be configured with second baseband/IF channel)
- Recording of time waveforms, allowing you to re-analyze signals and store them for future comparisons
- Flexible marker capabilities including time gating, integrated band power, and offset (delta) markers
- A link to Agilent signal sources for download and playback of signals in the signal capture memory
- Complete save and recall of your trace data, and measurement screens
- Easy cut and paste to other PC applications
- Full Macro recording/playback capability and comprehensive COM interface and documentation

The spectrum analyzer application provided as part of the 89601 software is not supported in this combination.

Combination B

E4407B (H70)/89611/89601



Wideband down-converter	E4407B* (26.5 GHz) ESA spectrum analyzer with special option H70 wideband 70 MHz IF output
Wideband digitizer	89611 IF vector signal analyzer
Software	89601 vector signal analysis software
Capabilities	Moderate RF performance with advanced software tools for evaluating and troubleshooting WLAN signals. Includes WLAN standards based transmitter test software
Price range	+++

* See appendix A for other ESA spectrum analyzers that can be used in this combination

This combination uses the E4407B ESA-E series spectrum analyzer to perform general-purpose RF spectrum measurements such as spur searching, and to provide wideband down-conversion for the 89611 IF vector signal analyzer (VSA). The VSA provides wideband digitizing of the down-converted signal along with real time decimation filtering, and a deep signal capture memory. The 89601 software, included as part of the 89611, provides hardware control, demodulation, advanced modulation evaluation and troubleshooting tools, and one button WLAN standards-based testing along with complete results displays.

The E4407B/89611/89601 combination requires a PC for the software's operation. Detailed configuration requirements for the instruments and software are provided in Appendix A. Appendix B contains information on GPIB and LAN interface hardware and the cables needed to connect the PC and instruments.

E4407B (H70) feature availability

In this combination the E4407B is controlled by the 89601 VSA software. Users have control of the following spectrum analyzer features via the software:

Frequency: The center frequency of the spectrum analyzer is controlled and the software displays the current setting.

Span: Only zero-span is available.

Input attenuation: Available through input range feature of 89601 software.

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

External reference: 10 MHz

Calibration

Overload detection

All other functions, including display, markers, and all one-button tests are normally disabled. You can suspend the 89601 software operation and gain immediate front panel access to all spectrum analyzer features, including display, markers, and all one-button tests, using the Disconnect capability provided in the 89601 control menu.

89611/89601 feature availability

When used in this combination almost all of the features of the 89611/89601 software are available.

These include:

- Powerful OFDM analysis tools and displays including: auto modulation type detect, EVM (dB, %), EVM by symbol/carrier, preamble frequency settling, pilot EVM, common pilot error, CCDF, complex time, complex spectrum, and others.
- Full DSSS analysis capability including: automatic detection, despreading, descrambling, and demodulation of the payload in all four mandatory 802.11b formats (1, 2, 5.5, 11 Mbps). Handles the optional PBCC modes, the optional short preamble and the CCK preamble of the CCK-OFDM format in 802.11g
- One-button standards-based tests including preset PHY layer transmitter tests for 802.11a/b/g, pass/fail testing, report generation and more
- Baseband (I/Q) measurements (89611 must be configured with second baseband/IF channel)
- Recording of time waveforms, allowing you to re-analyze signals and store them for future comparisons
- Flexible marker capabilities including time gating, integrated band power, and offset (delta) markers
- A link to Agilent signal sources for download and playback of signals in the signal capture memory
- Complete save and recall of your trace data, and measurement screens
- Easy cut and paste to other PC applications
- Full Macro recording/playback capability and comprehensive COM interface and documentation

The spectrum analyzer application provided as part of the 89601 software is not supported in this combination.

Combination C

E4407B (H70)/54830B/89601



Wideband down-converter	E4407B* (26.5 GHz) spectrum analyzer with special option H70 wideband 70 MHz IF output
Wideband digitizer	54830B* Infiniium oscilloscope
Software	89601 vector signal analysis software
Capabilities	Economy performance with advanced software tools for evaluating and troubleshooting WLAN signals. Includes WLAN standards based transmitter test software
Price range	++

* See appendix A for the other ESA spectrum analyzers and Infiniium oscilloscopes that can be used in this combination

This combination uses the E4407B spectrum analyzer to provide general-purpose RF spectrum measurements such as spur searching, and to provide wideband down-conversion for the oscilloscope. The 54830B oscilloscope (operated at 1 GSa/s) digitizes the wideband down-converted signal and offers a full range of high performance oscilloscope functionality. The 89601 software provides hardware control, demodulation, advanced modulation evaluation and troubleshooting tools, and one button WLAN standards-based testing along with complete results displays.

The E4407B/54830B/89601 combination requires a PC for the software's operation. Detailed configuration requirements for the instruments and software are provided in Appendix A. Appendix B contains information on GPIB and LAN interface hardware and the cables needed to connect the PC and instruments.

E4407B (H70) feature availability

When the E4407B is controlled by 89601 software, users have control of the following features:

Frequency: The center frequency of the spectrum analyzer is controlled and the software displays the current setting.

Span: Only zero-span is available.

Input attenuation: Available through input range feature of software.

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

External reference: 10 MHz.

Calibration

Overload detection

All other functions, including display, markers, and all one-button tests are normally disabled. You can suspend the 89601 software operation and gain immediate front panel access to all spectrum analyzer features, including display, markers, and all one-button tests, using the Disconnect capability provided in the 89601 control menu.

54830B feature availability

When the 54830B is controlled by 89601 software all functions are normally disabled, the display is active. Baseband operation is allowed but not recommended. You can suspend the 89601 software operation and gain immediate front panel access to all oscilloscope features, including display, and markers using the Disconnect capability provided in the 89601 control menu.

89601 feature availability

When the 89601 software is used with the spectrum analyzer and oscilloscope, almost all of the features of the 89601 software are available.

These include:

- Powerful OFDM analysis tools and displays including: auto modulation type detect, EVM (dB, %), EVM by symbol/carrier, preamble frequency settling, pilot EVM, common pilot error, CCDF, complex time, complex spectrum, and others
- Full DSSS analysis capability including: automatic detection, despreading, descrambling, and demodulation of the payload in all four mandatory 802.11b formats (1, 2, 5.5, 11 Mbps). Handles the optional PBCC modes, the optional short preamble and the CCK preamble of the CCK-OFDM format in 802.11g
- One-button standards based tests including preset PHY layer transmitter tests for 802.11 a/b/g, pass/fail testing, report generation and more
- Recording of time waveforms, allowing you to re-analyze signals and store them for future comparisons
- Flexible marker capabilities including time gating, integrated band power, and offset (delta) markers
- A link to Agilent signal sources for download and playback of signals in the signal capture memory
- Complete save and recall of your trace data, and measurement screens
- Easy cut and paste to other PC applications
- Full Macro recording/playback capability and comprehensive COM interface and documentation

The spectrum analyzer application provided as part of the 89601 software is not supported in this combination.

Combination D

E4407B (H70)/54830B/89607A



Wideband down-converter	E4407B (26.5 GHz) spectrum analyzer with special option H70 wideband 70 MHz IF output
Wideband digitizer	54830B Infiniium oscilloscope
Software	89607A WLAN Test Suite
Capabilities	Economy performance with WLAN standards-based transmitter test software
Price range	+

This combination uses the E4407B to provide general-purpose RF spectrum measurements such as spur searching and to provide wideband down-conversion for the oscilloscope. The 54830B oscilloscope (operated at 1 GSa/s) digitizes the down-converted signal and offers a full range of high performance oscilloscope functionality. The 89607A software provides standards-based testing of WLAN transmitters as well as hardware control and results display.

The E4407B/54830B/89607 combination requires a PC for the software's operation. Detailed configuration requirements for the instruments and software are provided in Appendix A. Appendix B contains information on GPIB and LAN interface hardware and the cables needed to connect the PC and instruments.

Spectrum analyzer feature availability

When the E4407B is controlled by 89607A software, users have control of the following:

Frequency: The center frequency of the spectrum analyzer is controlled and software displays the current setting.

Span: Only zero-span is available.

Input attenuation: Available through input range feature of software.

Triggering: Channel, external TTL, level, delay, and slope.

External reference: 10 MHz.

Calibration

Overload detection

All other functions, including display, markers, and all one-button tests are normally disabled. You can suspend the 89607A software operation and gain immediate front panel access to all spectrum analyzer features using the Disconnect capability provided in the 89607 control menu.

54830B feature availability

When the 54830B is controlled by 89607A software all functions are normally disabled, the display is active. You can suspend the 89607A software operation and gain immediate front panel access to all oscilloscope features using the Disconnect capability provided in the 89607A control menu.

89607A feature availability

When the 89601 software is used with the spectrum analyzer and oscilloscope, all of the features of the 89607A software are available.

These include:

- Pre-sets for all 802.11a WLAN PHY layer transmitter tests
- Pre-sets for all 802.11b WLAN PHY layer transmitter tests
- 802.11g WLAN PHY layer transmitter tests
- Simple test set-up and activation
- Pass/Fail test with measured data
- Display of test values and test results
- Test report generation capability
- Complete help text

The spectrum analyzer application provided as part of the 89601 software is not supported in this combination.

Instrument/Software Combination Performance¹

	Combination A	Combination B	Combination C	Combination D
Wideband Down-converter⁵	E4440A (H70) (high-performance spectrum analyzer)	E4407B (H70) (mid-performance spectrum analyzer)	E4407B (H70) (mid-performance spectrum analyzer)	E4407B (H70) (mid-performance spectrum analyzer)
Wideband digitizer⁶	89611 (IF VSA)	89611 (IF VSA)	54830B⁴ (Infiniium oscilloscope)	54830B⁴ (Infiniium oscilloscope)
Software	89601⁷	89601⁷	89601⁷	89607A
Price range	++++	+++	++	+
RF and baseband capabilities				
RF frequency range	10 MHz to 26.5 GHz	10 MHz to 26.5 GHz	10 MHz to 26.5 GHz	10 MHz to 26.5 GHz
Baseband (I/Q) frequency range	DC to 39 MHz ³	DC to 39 MHz ³	—	—
Max analysis bandwidth	36 MHz	36 MHz	36 MHz	36 MHz
Residual constellation error (EVM), 802.11a	-43 dB/-45 dB ²	-43 dB/-45 dB ²	-40 dB/-42 dB ²	-40 dB
Residual RMS EVM, 802.11b	2%	2%	3%	3%
Spectral flatness	±0.2 dB	±0.2 dB	+0.4/-1.0 dB	+0.4/-1.0 dB
Signal capture memory	Up to 384 Msa (complex)	Up to 384 Msa (complex)	Up to 8 Msa	Up to 8 Msa
Software capabilities				
WLAN troubleshooting and evaluation tools	●	●	●	
802.11a/b/g standards-based testing	●	●	●	●
Test time 802.11a (using 89607A software)	3 to 13 sec	3 to 13 sec	6 to 41 sec	6 to 41 sec
Test time 802.11b (using 89607A software)	7 to 14 sec	7 to 14 sec	11 to 49 sec	11 to 49 sec

1. All specifications are typical.
2. Using channel estimation + payload equalizer mode.
3. 89611 must include additional IF/baseband channel.
4. Used at 1 GSa/s.
5. Specifications apply to any spectrum analyzer listed in appendix A.
6. Specifications apply to any Infiniium oscilloscope listed in appendix A.
7. Requires option B7R WLAN modulation analysis.

OFDM modulation analysis (option 89601-B7R)

Signal acquisition

Supported standards	802.11a, HiperLAN2, and 802.11g (OFDM)
Modulation format	BPSK, QPSK, 16QAM, 64QAM (auto detect or manual override)

Search length

Minimum	Result length + 6 symbol times (24 μ s)
Maximum	6,800 (89611), 316 (5483x) symbol times
Result length	Auto detect or adjustable from 1 to 1367 (89611), 310 (5483x) symbol times
Triggering	Single/continuous, free-run/channel/external
Measurement region	Length and offset adjustable within result length

Signal playback

Result length	Auto detect or adjustable, gap-free
Capture length	

89611A IF VSA		5483xB/D Infiniium oscilloscopes	
Memory size	Time (max sample rate)	Memory size	Time (1GSa/sec)
144 MB (48 MSa)	1 sec	2 MB (2 MSa)	2 ms
288 MB (96 MSa)	2 sec	4 MB (4 MSa)	4 ms
1.2 GB (384 MSa)	8 sec	8 MB (8 MSa)	8 ms

Adjustable parameters

Data format	IEEE802.11a, HiperLAN2
Single button presets	IEEE802.11a, HiperLAN2
I-Q normalize	On/Off
Sub-carrier spacing	Continuously adjustable
Symbol timing adjust	Adjustable between 0 and guard interval
Guard interval	1/4, 1/8 (HiperLAN2 only), adjustable between 0 and 1 in 1/64 increments
Pilot tracking	Phase, amplitude, timing
Carriers to analyze	All or single
Equalizer training	Channel estimation sequence, channel estimation sequence + data payload

Demodulation measurement results

I-Q measured	All carriers over all symbol times
I-Q reference	All carriers over all symbol times (reference computed from detected symbols)
Error vector	Time, spectrum (for each carrier and symbol in the frame)
RMS error vector	Time, spectrum
Common pilot error	Phase, magnitude
Preamble frequency error	Time
Symbol table and error summary	EVM, pilot EVM, CPE (common pilot error), IQ (origin) offset, frequency error, symbol clock error, sync correlation, number of symbols, modulation format, code rate, bit rate, IQ quadrature skew, IQ gain imbalance

Equalizer measurement results

Equalizer impulse response	Computed from preamble
Channel frequency response	Computed from preamble

Pre-demodulation measurement results

Time	Instantaneous
Spectrum	Instantaneous, average
Search time	Instantaneous
Other	CCDF, CDF, PDF

Display formats

Error vector spectrum	Error values for each symbol time plotted for each carrier
Error vector time	Error values for each carrier plotted for each symbol time

DSSS modulation analysis (option 89601-B7R)

Signal acquisition

Modulation format	Auto detect or manual override: Barker1, Barker2, CCK5.5, CCK11, PBCC5.5, PBCC11, PBCC22, PBCC33
Preamble	Auto detect (short, long)
Pulse search length	Adjustable between result length and 25 ms (89611), 1.28 ms (5483x)
Result length	Auto detect or adjust between 1 and 275,000 chips (25 ms, 89611), 14,000 chips (1.28 ms, 5483x)
Triggering	Single/continuous, free-run, channel, external
Measurement region	Interval and offset adjustable within result length

Signal playback

Result length	Auto detect or adjustable, gap-free
Capture length	

89611A IF VSA		5483xB/D Infiniium oscilloscopes	
Memory size	Time (max sample rate)	Memory size	Time (1GSa/sec)
144 MB (48 MSa)	1 sec	2 MB (2 MSa)	2 ms
288 MB (96 MSa)	2 sec	4 MB (4 MSa)	4 ms
1.2 GB (384 MSa)	8 sec	8 MB (8 MSa)	8 ms

Supported formats

Formats	IEEE 802.11b including optional short preamble and optional PBCC modes IEEE 802.11g/D3.0 including PBCC22 and PBCC33 modes
Single-button presets	DSSS/CCK/PBCC

Adjustable parameters

IQ normalize	On/Off
Mirror frequency spectrum	On/Off
Chip rate	Continuously adjustable
Clock adjust	Continuously adjustable between ± 0.5 chips
Equalizer	On/Off
Equalizer filter length	3 – 99 chips
Descrambler mode	On/off, preamble only, preamble, header only

Demodulation measurement results

IQ measured	IQ measured time, IQ measured spectrum, instantaneous IQ measured spectrum
IQ reference	IQ reference time, IQ reference spectrum, instantaneous IQ reference spectrum
Other IQ error traces	IQ magnitude error, IQ phase error
Error vector	Error vector time, error vector spectrum, instantaneous error vector spectrum
Despread symbols	Preamble, header, data
Symbol error table summary	802.11b 1,000-chip peak EVM, EVM, magnitude error, phase error, IQ offset, frequency error, symbol clock error, IQ quadrature skew, IQ gain imbalance, sync correlation, burst type, bit rate, number of data octets, data length

Equalizer measurement results

Equalizer impulse response	Computed from preamble
Channel frequency response	Computed from preamble

Pre-demodulation measurement results

Time	Main raw, search
Spectrum	Instantaneous
Other	CCDF, CDF, PDF

Display formats

Error vector spectrum	Error values for each symbol time plotted for each carrier
Error vector time	Error values for each carrier plotted for each symbol time

WLAN Test Suite (part of option 89601-B7R and 89607A)

OFDM (802.11a)

Supported standard	IEEE802.11a, 1999 PMD transmit specification
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Tests

Transmit power	Total power, peak power, power density, total power (low), power density (low), total power (mid), power density (mid), total power (high), power density (high)
Transmit center frequency tolerance	Center frequency tolerance
Transmit clock frequency tolerance	Clock frequency tolerance
Transmit modulation accuracy	Constellation error (EVM), center frequency leakage, spectral flatness margin, spectral flatness
Transmit spectral mask	Spectral mask margin, spectral mask, spectral mask reference level

DSSS (802.11b)

Supported standard	IEEE802.11b, 1999 PMD transmit specification
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Tests

Transmit power	Total power, peak power
Transmit center frequency tolerance	Center frequency tolerance
Chip clock frequency tolerance	Chip clock frequency tolerance
Transmit RF carrier suppression	Center frequency leakage, 18.4.7.7 predicted suppression
Transmit modulation accuracy	EVM, peak EVM
Transmit power up ramp	Power on interval, power time ramp
Transmit power down ramp	Power down interval, power time ramp
Transmit spectral mask	Spectral mask margin, spectral mask, spectral mask reference level

Appendix A: Instrument, Software, and PC Configuration Requirements

Compatible spectrum analyzers

The spectrum analyzers tested and qualified to work as wideband down-converters in a WLAN transmitter instrument/software combination are shown in the following table. Choose the model that meets your frequency range and budgetary needs.

Qualified PSA models

Model	Frequency range
E4440A	3 Hz to 26.5 GHz
E4443A	3 Hz to 6.7 GHz
E4445A	3 Hz to 13 GHz
E4446A	3 Hz to 44 GHz
E4448A	3 Hz to 50 GHz

Qualified ESA models

Model	Frequency range
E4404B	9 kHz to 6.7 GHz
E4407B	9 kHz to 26.5 GHz

To operate in a WLAN transmitter test combination the spectrum analyzer must have the options shown in the following table.

Required options

Model	Description
E4440A	(includes a LAN interface)
Opt H70	Wideband 70 MHz IF output
E4404B and E4407B	
Opt H70	Wideband 70 MHz IF output
Opt 1D5	High stability timebase
Opt A4H	GPIB and Centronic interface

Most of these options can be installed in the spectrum analyzer if you already own it. Contact your Agilent representative for more information.

Oscilloscope compatibility

The oscilloscopes tested and qualified to work as wideband digitizers in a WLAN transmitter instrument / software combination are shown in the following table.

Qualified Infiniium models

Model	Sample rate, frequency range
54830B/D	4 GSa/s, 600 MHz
54831B/D	4 GSa/s, 600 MHz
54832B/D	4 GSa/s, 1 GHz

To operate in a WLAN transmitter test instrument/software combination the 5483x must have firmware version A.02.20 or higher.

The 5483x comes standard with both GPIB and LAN interfaces.

Vector signal analyzer compatibility

The vector signal analyzers tested and qualified to work as a wideband digitizer in a WLAN transmitter instrument/software combination are shown in the following table.

Qualified models

Model	Frequency range	Notes
89611	52 to 88 MHz	Recommended
89640	DC to 2.7 GHz	Spectrum analyzer down-converter required for 802.11a
89641	DC to 6.0 GHz	No spectrum analyzers down-converter required

The following options are required in a VSA to work in a WLAN transmitter test combination.

Required options

Model	Description
89611	IF vector signal analyzer
Opt B7R	WLAN modulation analysis
89640	RF vector signal analyzer
Opt B7R	WLAN modulation analysis
89641	RF vector signal analyzer
Opt B7R	WLAN modulation analysis

All 89600 series vector signal analyzers come with 89601 vector signal analysis software. To work in a WLAN transmitter test combination the software must be version 5.00, or higher. To determine the version level of your software click on: [Help/About Agilent VSA](#).

Software compatibility

The software tested and qualified for the WLAN transmitter instrument/software combinations are shown in the following table. This software runs on any PC (see PC requirements). If you are using a 89600 series VSA in the combination then you do not need to order the 89601 software separately.

Qualified models

Model	Description
89601	Vector signal analysis software
89607A	WLAN test suite

To operate in a WLAN transmitter test combination the software must have the following version number.

Required software version

Model	Version
89601	5.00 or higher
89607A	5.00 or higher

To operate in a WLAN transmitter test combination the software must have the options shown in the following table. The 89601 WLAN option (B7R) includes the 89607A WLAN test suite software.

Required options

Model	Description
89601	Vector signal analysis software
Opt 200	Basic vector signal analysis
Opt 300	Hardware connectivity
Opt B7R	WLAN modulation analysis
89607A	WLAN test suite
Opt 100	Basic WLAN test (includes hardware connectivity)

To find whether these options are in software that you own click on:

Utilities/License/Options

If WLAN standards-based testing is all that is required, the 89607A software can be used by itself in any of the combinations.

PC requirements for 89601/89607A software

Any laptop or desktop PC may be used as long as it meets the following requirements.

Minimum requirements for a user-supplied desktop PC:

- 180 MHz Pentium®, or AMD-K6 CPU (>300 MHz CPU recommended)
- One empty PCI-bus slot (2 slots recommended)
- 192 MB RAM (256 MB recommended)
- 4 MB video RAM (8 MB recommended)
- Hard disk with 100 MB available space
- Microsoft Windows 2000® or XP Professional®
- CD-ROM drive (can be provided via network access)

Minimum requirements for a user-supplied laptop PC:

- > 300 MHz Pentium, or AMD-K6 CPU
- One empty Cardbus Type II slot (2 slots recommended)
- 192 MB RAM (256 MB recommended)
- 4 MB video RAM (8 MB recommended)
- Hard disk with 100 MB available space
- Microsoft Windows 2000 or XP Professional
- CD-ROM drive (can be provided via network access)
- IEEE 1394 Firewire interface if using 89611 IF VSA (may not be available in all areas worldwide). For a list of supported interfaces, go to www.agilent.com/find/iolib

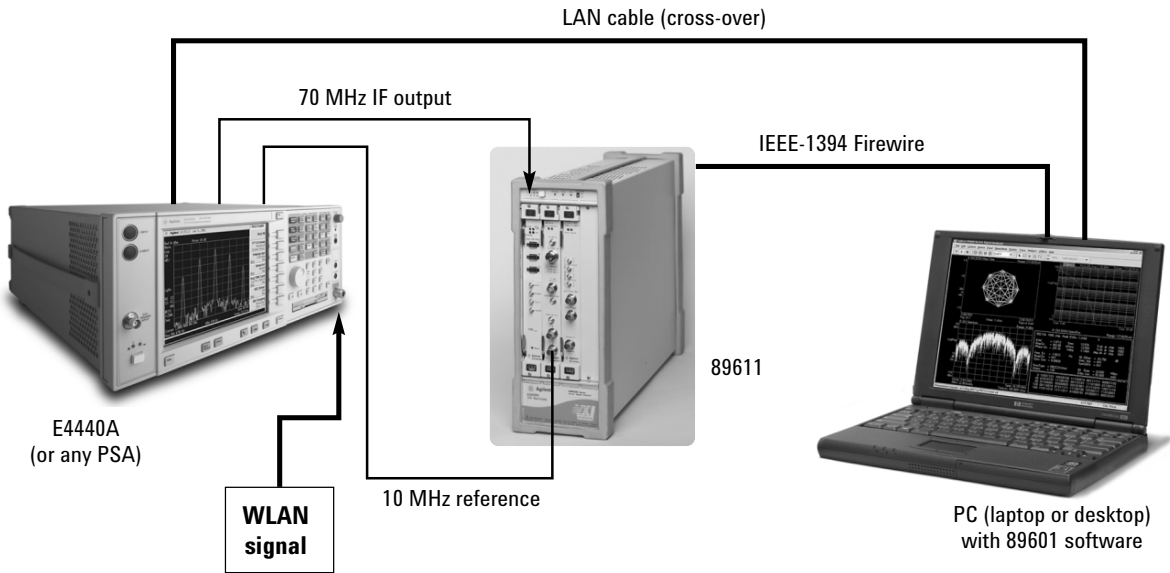
Appendix B: PC to Instrument Interface

Combination A interface configuration: E4440A/89611/89601

The following interface cards and cables are recommended for connecting this combination

PC interface and connection cables

Description	Part number	Notes
LAN cable (cross-over)	8121-0545	Available from Agilent
IEEE 1394 Firewire		For a list of supported interfaces, go to www.agilent.com/find/iolib or contact your local Agilent representative

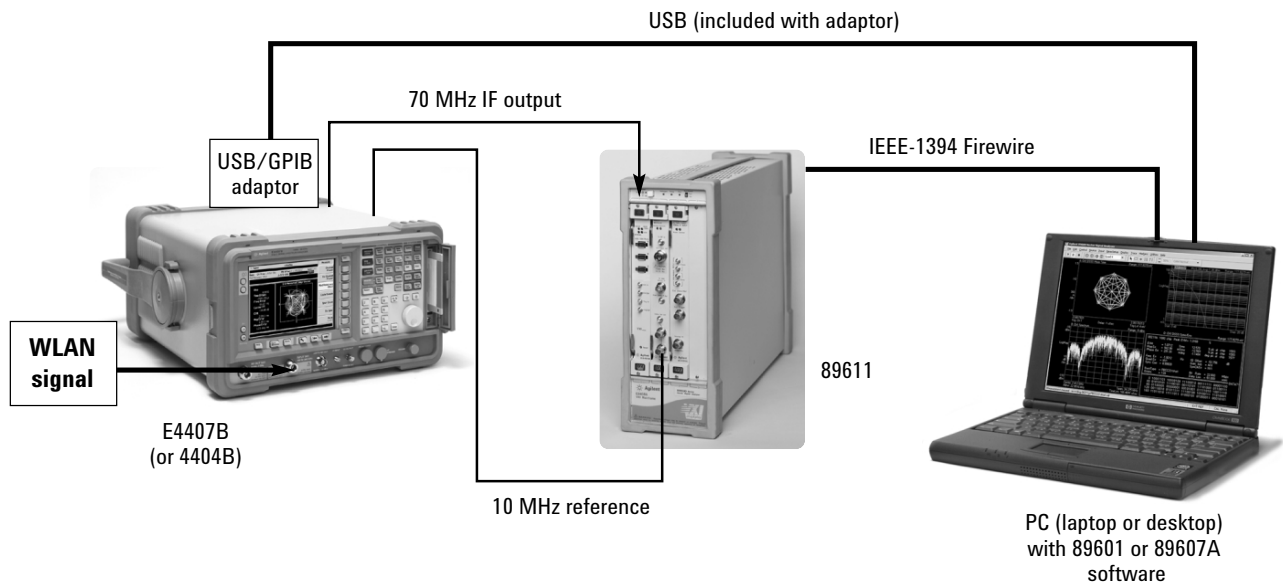


**Combination B interface configuration:
E4407B/89611/89601**

The following interface cards and cables are recommended for connecting this combination

PC interface and connection cables

Description	Part number	Notes
USB/GPIB	82357A	Requires GPIB cable (10833A), available from Agilent
IEEE 1394 Firewire		For a list of supported interfaces, go to www.agilent.com/find/iolib or contact your local Agilent representative

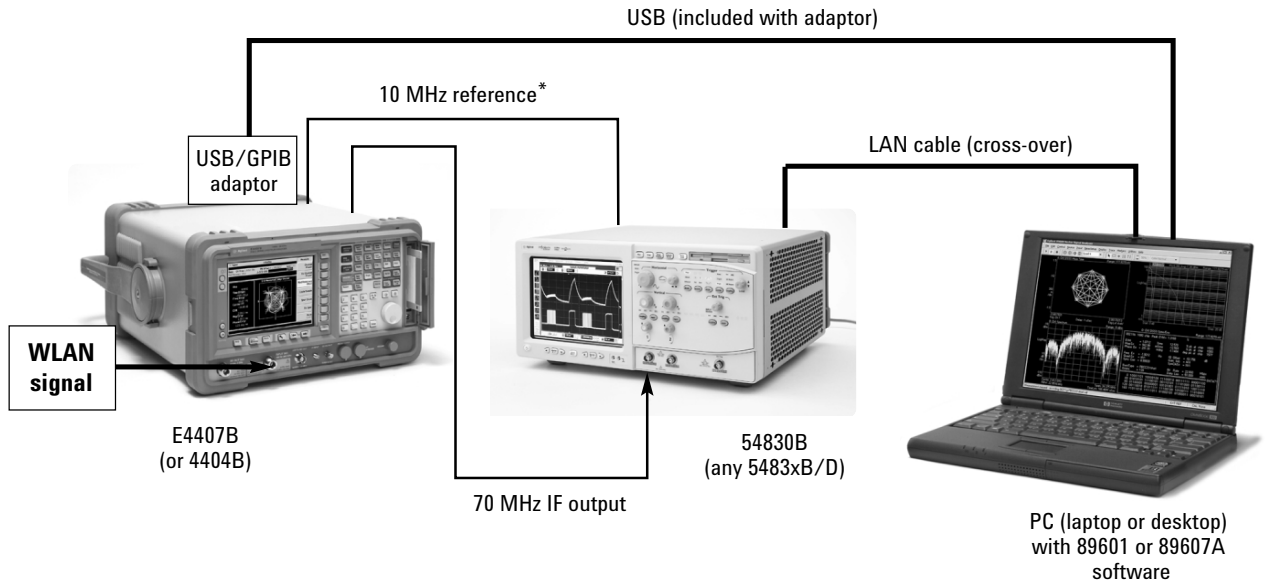


**Combinations C & D interface configurations:
E4407B/54830B/89601 or 89607A**

The following interface cards and cables are recommended for connecting this combination

PC interface and connection cables

Description	Part number	Notes
USB/GPIB	82357A	Requires GPIB cable (10833A), available from Agilent
LAN cable (cross-over)	8121-0545	Available from Agilent



* Oscilloscope reference is output only

Appendix C: Instrument Overview

PSA Series performance spectrum analyzer



The PSA Series of high performance spectrum analyzers offers the best dynamic range, speed, accuracy, and flexibility in spectrum analysis from Agilent. An all-digital 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). A standard suite of power measurements with standards-based setups makes advanced measurements with the press of a button. Measure phase noise quickly and easily with the phase noise measurement personality or perform modulation analysis on a variety of standard 2G and 3G digital cellular communications formats with the digital communications measurement personalities.

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

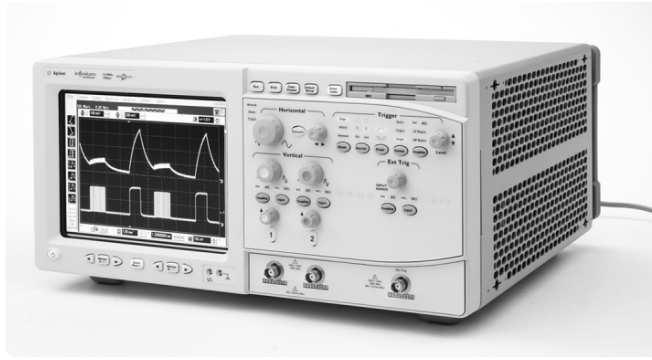
ESA-E Series spectrum analyzers



The ESA-E Series general purpose, portable spectrum analyzers offer a wide range of performance, features, and flexibility. The 1ms RF sweep time, and up to 40 measurements per second give you virtual real-time measurement response. A continuously phase-locked synthesizer operating over the entire sweep provides improved frequency accuracy, stability, and repeatability. Up to 108 dB typical third-order dynamic range (+12.5 dBm TOI) and the 5 dB step attenuator let you see low-level distortion. Analysis is enhanced by -166 dBm sensitivity (typical, with 1Hz RBW and optional built-in pre-amp) and fast measurement speed.

More information on this product is available on the Web at:
www.agilent.com/find/ESA

54830 Series Infiniium oscilloscope



The Infiniium oscilloscope provides the performance you need for your most demanding signals. This performance oscilloscope is a next-generation, deep memory oscilloscope with standard 4 Mpoints of memory (2 Mpoints on each channel). With advanced MegaZoom technology, you get instant response even with deep memory on, optimum resolution to reveal fast events, and affordable memory options up to 16 Mpoints. 600 MHz bandwidth and a sample rate of up to 4 GSa/s ensure fast, accurate capture of your waveforms.

More information on this product is available on the Web at:
www.agilent.com/find/Infiniium

89611 IF vector signal analyzer

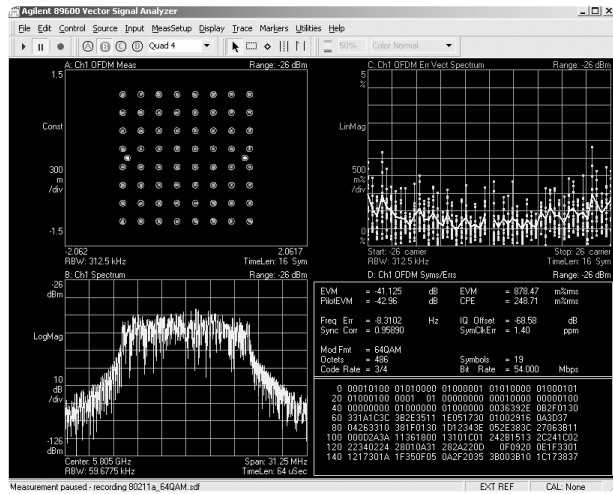


Analyze and troubleshoot digital communications signals, WLAN signals and more with Agilent's 89611 IF VSA. Designed for use with an external tuner, or spectrum analyzer in "zero span", this modular VXI instrument offers 36 MHz of analysis bandwidth, enough to analyze even double-bandwidth "turbo" mode WLAN chips, along with first-rate phase noise, dynamic range and amplitude accuracy. Combine this with an optional 384 MSa signal capture memory and you can easily analyze complex, time-varying signals ranging from 802.11g to GSM and NADC.

More information on this product is available on the Web at:
www.agilent.com/find/89600

Appendix D: Software Overview

Advanced WLAN signal analysis and troubleshooting tools: 89601A (option B7R)



Agilent is an industry leader in baseband, RF, and modulation quality measurements of WLAN signals. The 89600 VSA's WLAN analysis option B7R offers

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

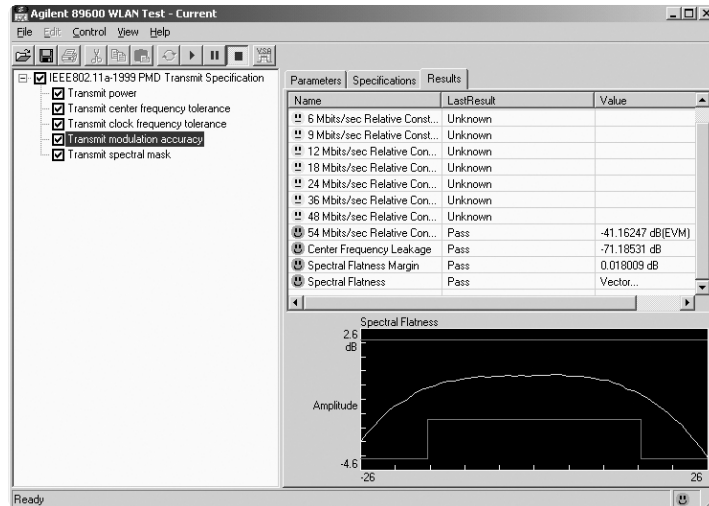
Two modes, DSSS/CCK/PBCC and OFDM, are offered with Option B7R WLAN analysis. Use these modes together to analyze 802.11g modulation; use them separately to analyze 802.11b or 802.11a signals.

Select the DSSS/CCK/PBCC (802.11b) mode and automatically detect, despread, 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. Examine the constellation diagram, measure EVM, frequency error, and more with the 89600 Series WLAN analysis option. Use the time domain measurement capability provided with the 89600 VSA to evaluate your signal's power versus time behavior. Use the gate time feature to analyze the spectrum of just a portion of the burst. All of these and more are available with the DSSS/CCK/PBCC mode for 802.11b analysis.

Demodulate and analyze 802.11a, 802.11g, and HiperLAN2 compatible signals with the OFDM modulation analysis mode. 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 (BPSK, QPSK, 16QAM, 64QAM) 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-testing tool. These features and more, combined with the analysis tools already offered in the 89600 VSAs provide you a powerful package for analyzing and troubleshooting OFDM signals.

More information on this product is available on the Web at: www.agilent.com/find/89600 and look for 89601 in the product comparison table.

802.11a/b/g standards-based test: 89607A WLAN test suite software



Speed standards based testing of your 802.11a/b/g WLAN transmitter with the 89607A WLAN test suite software. The test suite provides the convenience of automatic one-button test set-up and execution with the confidence of knowing your design is being tested based on the parameters and specifications set forth in the IEEE802.11a/b/g standards.

The 89607A WLAN test suite software is ideal for characterizing overall PHY layer performance of your WLAN transmitter. Evaluate your transmitter design against the IEEE standards. Take advantage of its standardized tests to qualify parts or do acceptance testing. Use the software for manufacturing test; you can even modify the pass/fail limits to add some margin between what IEEE requires and what you test to. All this and more is available from this software.

More information on this product is available on the Web at: www.agilent.com and enter 89607A in the search engine.

Related Literature

PSA Series - The Next Generation
Brochure, literature number 5980-1283E

PSA Series Datasheet, literature number 5980-1284E

ESA-E series spectrum analyzers
Data sheet, literature number 5968-3386E

89600 Vector Signal Analyzer
Brochure, literature number 5980-0723E

89600 Vector Signal Analyzer
Datasheet, literature number 5988-7811EN

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

Infiniium Oscilloscope Brochure, literature number 5988-3788EN

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