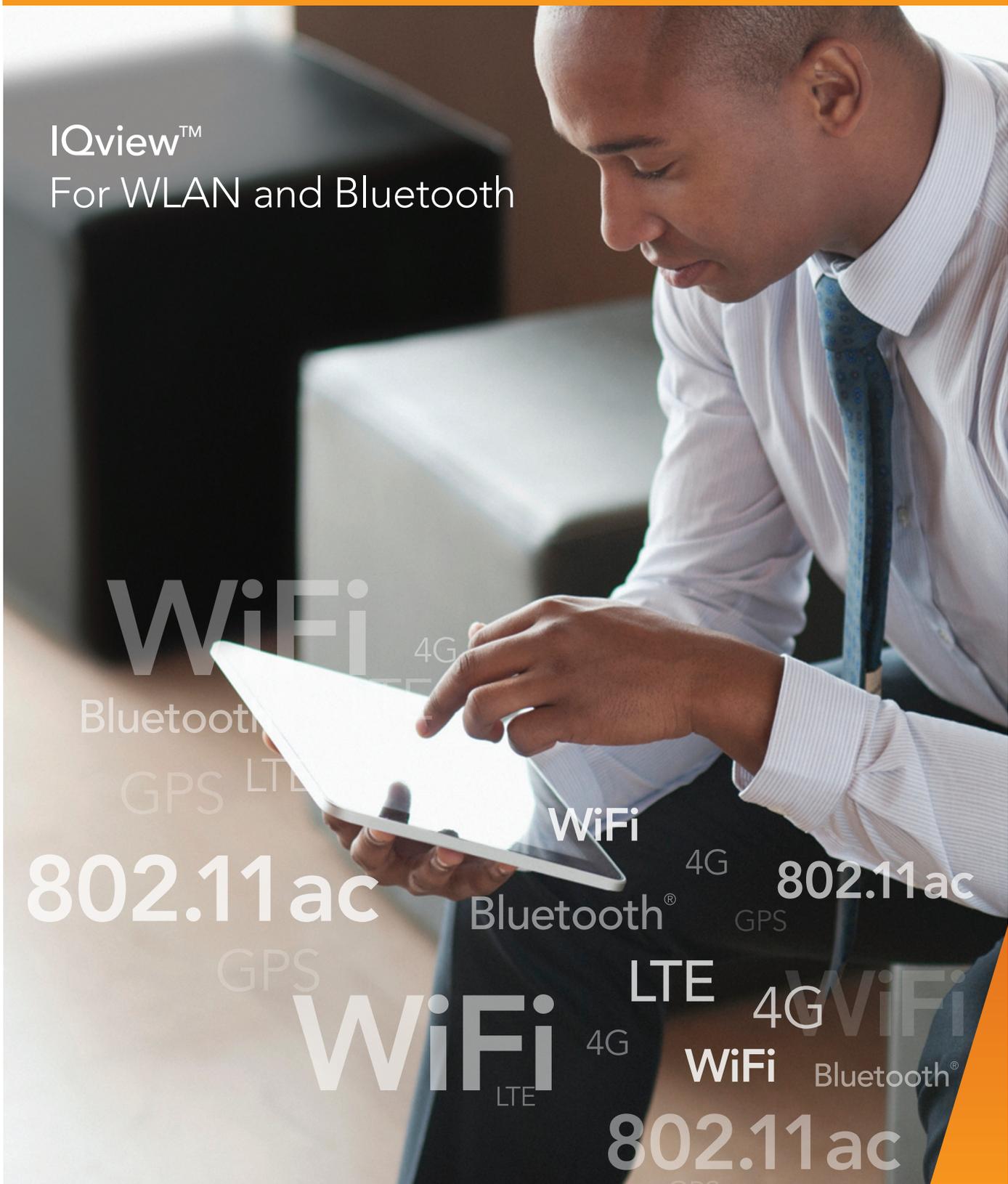


# iQview™ For WLAN and Bluetooth



The IQview™ 802.11a/b/g/n/j WLAN and Bluetooth Test Solution is an all-in-one test instrument developed specifically for RF testing of 802.11a/b/g/n/j WLAN and Bluetooth products. Suitable for both development and manufacturing environments, the IQview test system integrates a vector signal analyzer (VSA) and a vector signal generator (VSG) into a single instrument.

### Functionality

The IQview test system is expressly designed to test WLAN products, including network interface cards, access points, and embedded components.

The IQview test system's VSA capability replaces traditional spectrum analyzers and power meters, enabling the user to analyze a device under test's transmitter output and perform true error vector magnitude (EVM) measurements. Designed to receive large input signals without distortion, the IQview test system employs a wide-bandwidth Capture-Once Measure-All approach so that the device under test's transmit signal is sampled and stored in a single measurement for subsequent analysis of all desired parameters resulting in reduced test times.

Similarly, the IQview test system's VSG capability replaces traditional golden units with a test signal source of much higher quality, allowing detailed analysis of the receiver performance of the device under test. The IQview test system is designed to output high-quality test signals over the full expected operating range of a WLAN receiver.

The IQview test system supports testing in both the 2.4 GHz and 5 GHz frequency bands utilized worldwide for 802.11a/b/g/n/j products. Inputs and outputs at both RF and baseband are provided, enabling detailed testing of all aspects of a WLAN product's analog design.

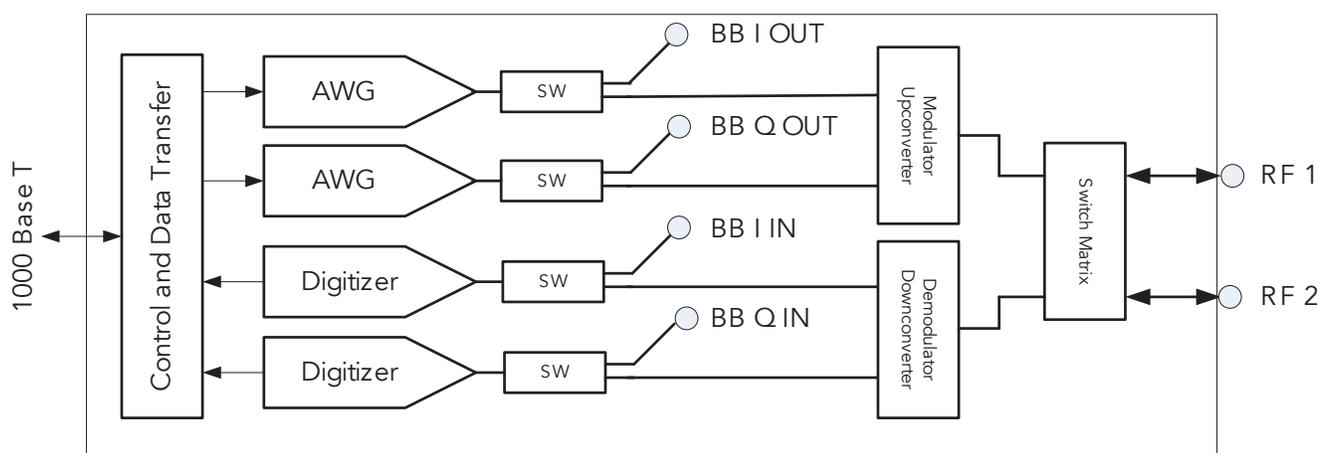


Figure 1: IQview Test System—Hardware Block Diagram

A vector signal analyzer (VSA) provides matching capabilities covering identical frequency bands as the VSG. Each VSA consists of two digitizer (DIG) channels (I and Q) and associated quadrature downconverter. The VSG consists of two arbitrary waveform generator (AWG) sections and a quadrature upconverter.

### Control Interfaces

The IQview test system is bundled with the IQsignal™ Signal Analysis Software Suite, a powerful 802.11a/b/g/n analysis toolbox. Operating on a Windows PC and connected to the IQview test system via TCP/IP over Ethernet, IQsignal provides an intuitive graphical user interface that is easy to master. Users can interactively control and analyze IQview's measurements and operation, either in real time or at their convenience. Because the tester control connection is Ethernet, the user can connect to the instrument from anywhere on their network, allowing seamless remote operation.

To allow automated testing, the IQview test system supports the LitePoint API, a complete command set and associated DLL files for the development of Visual C/C++ test scripts. Whether used for product characterization in the development process or for quality assurance in manufacturing, the LitePoint API supports test setup, data capture, signal analysis, and result-handling as well as general communications and error-handling functions.

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To facilitate debugging, especially in the development of test scripts with the LitePoint API, the IQview test system is supported by the IQdebug™ Monitor and Control Tool. IQdebug is a convenient stand-alone software tool with an easy-touch graphical interface that can monitor and control the test instrument and data captures.

### VSA Operation

The IQsignal software offers advanced analysis options that expand standard 802.11a/b/g/n/j analysis beyond basic power measurements, EVM measurements, or spectral measurements. For example, the IQsignal software can easily analyze frequency settling and phase noise that occurs during a burst transmission. Such capabilities significantly help in understanding and debugging RF performance-related issues. The IQview test system supports analysis of all the in-band transmit specifications required for compliance with the IEEE 802.11a/b/g/n/j standards. The IQsignal software provides graphical display of these tests, including spectral mask, symbol constellation (including EVM measurements), carrier leakage, spectral flatness (for 802.11a/g/n/j OFDM signals), power on/off ramp time (for 802.11b/g DSSS signals) and frequency error transmit power vs. time.

To support product debugging, various other graphical displays are supported by the IQsignal software, including:

- Phase noise (power spectral density versus time)
- CCDF (to support compression analysis)
- Spectrogram Frequency error versus time (to assess frequency settling)
- Variation of OFDM short training sequence (pretzel plot)
- Eye diagram EVM (versus OFDM subcarriers versus time)

Besides the graphical display of VSA measurements, the IQsignal software also presents relevant numerical data, including:

- EVM Power (peak, average)
- I/Q amplitude imbalance
- I/Q phase imbalance
- Frequency error
- Symbol timing error
- Integrated phase noise

The IQsignal software additionally provides a wide range of compensation methods that can be used for advanced analysis of a captured signal's sensitivity to certain impairments. For example, the available compensation methods when analyzing OFDM signals include:

- Phase tracking (off, slow; fast)
- Channel estimation (based on averaging of the long training sequence, averaging of the full packet, or a 2nd order polynomial fit to the long training sequence)
- Symbol timing tracking
- Frequency synchronization (based on the short training sequence, long training sequence, or full packet)
- Amplitude tracking

Similarly, when analyzing DSSS signals, available compensation methods include equalization and DC offset removal.

### VSG Operation

The IQsignal software also controls IQview's VSG capabilities. The user can select, among various pre-defined test signals, adjusting the transmit frequency, the output power, and whether the transmitter should operate continuously or only transmit a specific number of packets. Additionally, transmit impairments to the signal generated by the VSG, which could include the following, can be introduced in real time:

- I/Q amplitude imbalance
- I/Q phase imbalance
- I/Q group delay imbalance
- I- and Q-channel DC offsets

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## Supported WLAN Tests

The IQview supports key WLAN tests including:

- Phase noise (power spectral density versus time)
- CCDF (to support compression analysis)
- Spectrogram
- Frequency error versus time (to assess frequency settling)
- Variation of OFDM short training sequence (pretzel plot)
- Eye diagram
- EVM (versus OFDM subcarriers versus time)

## Supported Bluetooth (1.0, 2.0, 2.1) Hardware Tests

### Analyzer

- Input frequency range
- Input power range
- Measurement Bandwidth
- Quantization
- Input Return Loss
- Spurious
- Harmonics
- Integrated Phase Noise
- Signal to Noise Ratio
- Power Measurement Accuracy
- Waveform Capture Duration

### Generator

- Output frequency range
- Output power range
- Signal Bandwidth
- Quantization
- Output Return Loss
- Spurious
- Harmonics
- Integrated Phase Noise
- Signal to Noise Ratio
- Carrier leakage
- Power Accuracy
- Waveform Duration

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## Supported Bluetooth (1.0, 2.0, 2.1) Measurement Tests

- Measurement
- TX output power
- TX output spectrum
- 20 dB bandwidth
- Frequency deviation
- Carrier frequency
- Tolerance
- Carrier frequency drift
- Relative transmit Power (EDR)
- Carrier frequency stability (EDR)
- Receive sensitivity
- Bit error rate (BER)
- RMS EVM (EDR)
- Peak EVM (EDR)

## LitePoint IQwave—An Optional Software Tool

To simplify the generation of arbitrary 802.11a/b/g/n/j waveforms, LitePoint offers an optional PC-based tool, the IQwave™ WLAN Waveform Generator Software. Using IQwave software, the user can specify one or more complete packets as well as introduce impairments such as noise, fading, and frequency offset. The generated signals can then be loaded for transmission by the IQview test system by using the IQsignal software VSG control interface.

The IQwave software provides a simple GUI to specify the type of 802.11a/b/g/n/j transmit packets to be generated. The user can specify the contents of the preamble (e.g., the MAC address and SSID) as well as the actual payload data. As desired, IQwave then allows impairments to be introduced to the signal, including noise (a specific Eb/No), I/Q imbalances, frequency offsets, and channel models (for example, the ETSI Hiperlan/2 multipath channel models or a user-defined impulse response). Please contact LitePoint for more information about the IQwave software.

## Key Features

- Seamless analysis of DSSS (802.11b/g), OFDM (802.11a/g/n/j) WLAN and Bluetooth (1.0 / 2.0 / 2.1) signals
- Advanced Vector Signal Analyzer (VSA) and Vector Signal Generator (VSG) combined with the capabilities of a power meter and spectrum analyzer in a single instrument
- Operation in both 2.4 GHz and 5 GHz bands
- Baseband analog I/O facilitates product debugging (IQview)
- High-performance VSA
  - Wide bandwidth (60 MHz)
  - Capture-Once Measure-All operation
  - Graphical and numerical display of measurement results
- High-performance VSG
  - Pre-defined 802.11a/b/g/n/j and Bluetooth transmit test signals
  - Impairments can be introduced in real-time to the transmit test signal
  - Generation of arbitrary 802.11a/b/g/n/j waveforms simplified by optional IQwave WLAN Waveform software
- Simple control interfaces
  - IQsignal Signal Analysis Software Suite facilitates signal analysis, signal generation, and debugging
  - LitePoint API supports Visual C/C++ test scripts for use in manufacturing

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