LitePoint IQmax™ 750

WiMAX and WiFi Test System

Wireless Test System

Introduction

The LitePoint IQmax-750 is a MIMO-ready WiMAX and WiFi test system tailored to the needs of manufacturing and Design Verification Test (DVT) for WiMAX (802.16d/e) and WiFi (802.11a/b/g/n) devices.

IQmax-750 supports multiple standards including:
WiMAX (802.16e, 802.16d)
WiFi (802.11 a/b/g/n)
Bluetooth (1.0 and EDR)
Zigbee (802.15.4)

The test system offers focused frequency coverage to maximize performance of the key communication frequency bands while minimizing cost. Supported frequency ranges include:
2.15 to 2.7 GHz
3.3 to 3.8 GHz
4.9 to 6.0 GHz

In addition, the IQmax-750 includes baseband I/O. This broad range of coverage supports all international WiMAX, WiFi, and Bluetooth frequency ranges, offering a wide degree of flexibility in test coverage of varying devices and maximizing capital equipment utilization.

Features

Application areas

- Mass Production Testing
- Product Development
- Design Verification Test
- System Test
- Quality Assurance/Quality Control

Features

- Complete one-box PHY-layer test solution for wireless (single standard or combo) devices
- Supported frequency ranges: 2.15 to 2.7 GHz, 3.3 to 3.8 GHz and 4.9 to 6.0 GHz.
- Integrated VSA and VSG resources for fast test times
- Independent, simultaneous receive and transmit measurements
- WiMAX 802.16e-2005 / WirelessMAN-OFDMA and 802.16-2004 / WirelessMAN-OFDM
- WiFi 802.11a/b/g, Bluetooth and Zigbee
- Easy to use IQsignal for WiMAX graphical user interface
- C++ API interface for automated testing
- Supports IQfact automated production test programs: chipset specific turnkey automated test programs

IQmax-750 includes powerful software tools for both analysis and creation of WiMAX, WiFi, and Bluetooth signals. A comprehensive C++ API provides all of this functionality through Ethernet connectivity for automated production line environments. In addition to standard software tools, LitePoint offers turnkey test programs, such as IQfact, for leading WiMAX and WiFi chipset vendors. The result is rapid deployment and ramp into production with a minimum of test program development expertise.

Please contact your local LitePoint Sales Representative for further information and a demonstration. For a current list of local sales resources, go to www.litepoint.com and click on **Contact**.

Figure 1. IQmax-750 MIMO-ready test instrument

Basic Functionality Description

The IQmax-750 Test System is a complete PHY-layer test solution for mobile and fixed WiMAX and WiFi products.

To test WiMAX devices, the IQmax-750 Test System supports generating and analyzing all 802.16e-2005 / WirelessMAN-OFDMA and 802.16-2004 / WirelessMAN-OFDM PHY waveforms in the 2.15 to 2.7 GHz, 3.3 to 3.8 GHz and 4.9 to 6.0 GHz frequency bands. For WiFi, the system provides equivalent capabilities for 802.11a/b/g/n PHY waveforms in the 2.4 to 2.5 GHz and 4.9 to 6.0 GHz frequency bands. The instrument is optimized for non-link-based testing, which enables fast testing and simple test setups.

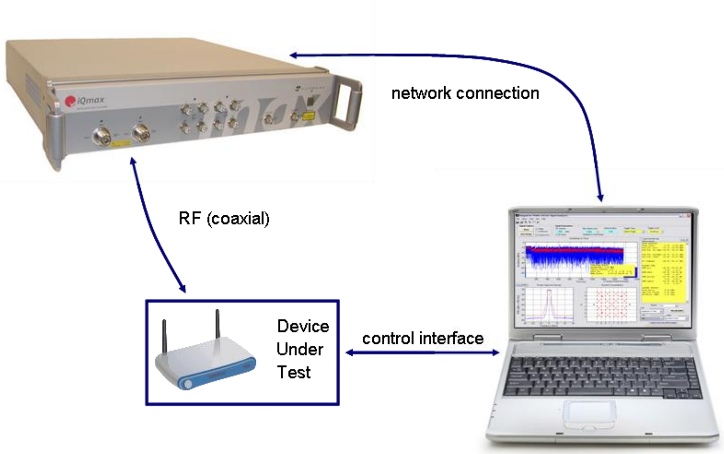

Figure 2. Typical IQmax-750 R&D setup (non-link-based)

Volume manufacturing applications can benefit from LitePoint IQfact test programs, enabling immediate automated out-of-the-box testing, optimized for low-cost manufacturing test, with the flexibility to modify test flow and test limits or create additional tests to run with the IQfact program using the IQmeasure™ interface included with IQfact programs.

Customers wishing to develop complete custom test programs can use the LitePoint C++ API containing all of the measurement and instrument control routines. Developers can make use of the easy-to-use graphical interface supplied with the IQsignal tools, showing visual and numerical results from the VSA along with complete control of the VSG and instrument set up.

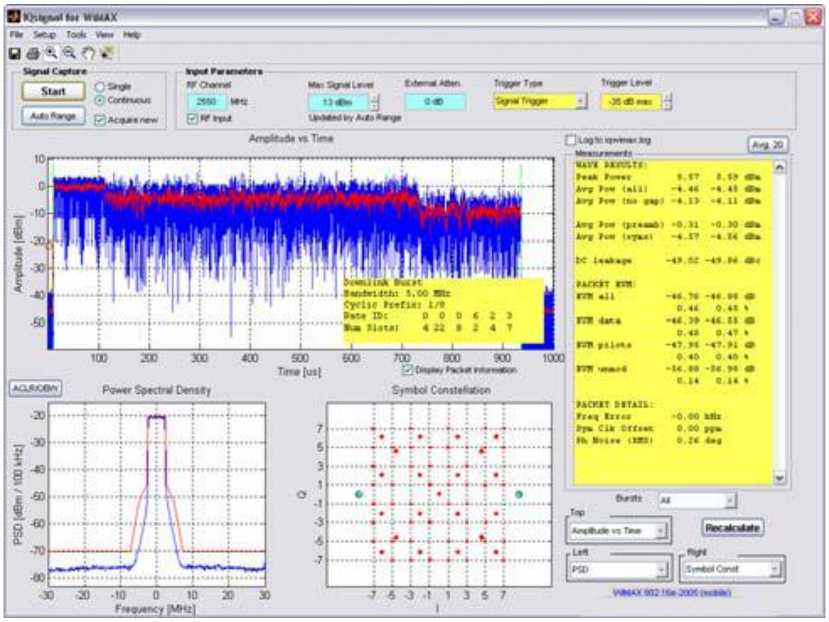

Figure 3. The IQsignal for WiMAX analysis screen

The IQmax-750 Test System interfaces with the RF ports of the Device Under Test (DUT) through the instrument's RF Switch Matrix and integrated VSA and VSG subsystems. The physical connection for RF signals is through two n-type connectors on the front of the instrument. Through software control, these ports may be configured to act as an input to the VSA or as an output to the VSG.

A PC is used to run the IQsignal analysis software and is typically also used to control the DUT through the IC vendor's driver. The interface between the PC and the IQmax-750 Test System is via a 10/100/1000 TCP/IP Ethernet port using a fixed, configurable IP address. For automated testing or for manufacturing, a C++ software API is provided. The installation program on the included IQmax Applications CD loads all software, associated documentation, and any required files.

Hardware Description

The IQmax-750 Test System is a MIMO-ready manufacturing and R&D-oriented WiMAX and WiFi test system. This system also includes a GUI to facilitate R&D test environments. The IQmax-750 also includes baseband I and Q inputs and outputs.
Note: MIMO-capability requires a synchronization unit and MIMO software, which can be purchased separately.

The IQmax-750 Test System hardware is packaged in a 19-inch rack-compatible case (2U high) and comes assembled with front mount handles for convenient laboratory use. Rack-mounting brackets are included with the instrument for conversion to rack mounting. N-type RF ports, BNC I&Q ports and the main power switch are located on the front panel. A 10 MHz reference clock input, an external RF LO source input, a trigger input port and marker output ports are provided on the back of the instruments. Connection to the external PC is made through the rear panel Ethernet port, which supports 10, 100 and 1000 Gigabit connections—for best performance, LitePoint recommends using an external PC that supports a Gigabit Ethernet Connection. AC mains power is supplied to the connection on the rear panel. The AC cable supplied is for USA-style AC plugs or can be easily replaced for local conditions. The instrument will auto-configure for all common AC voltage and frequency mains. While there are no high-power dissipation components contained in the instrument, it is always good practice to keep the ventilation ports at the sides and the fan at the rear free from obstructions. There are no user-serviceable components inside the instrument case. Opening of the instrument's case by unauthorized persons voids the instrument certification and hardware warranty.

Switch Matrix

The two RF ports are connected internally to the VSA and VSG resources via a RF switch matrix. This allows either RF port to be connected to the VSA, which acts as the input, or VSG, which acts as the output, using software control and without manually having to reconnect the cables in the test set-up. Care should be taken when connecting to these ports as they contain sensitive RF components. Note the warning labels on the instrument for signal conditions that may damage the instrument.

VSA

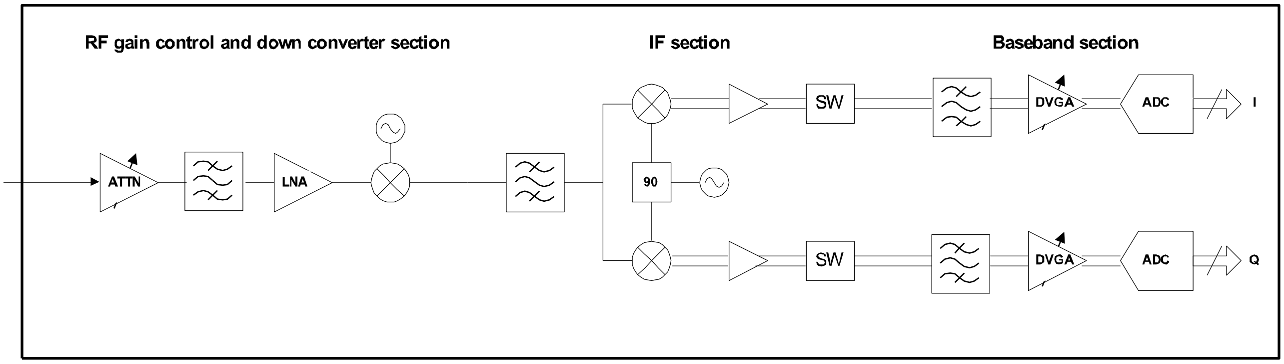

Figure 4. Simplified VSA Block Diagram

The Vector Signal Analyzer RF block has a common path for the 2, 3 and 5GHz bands, which is automatically set up based on the choice of the frequency channel.

VSG

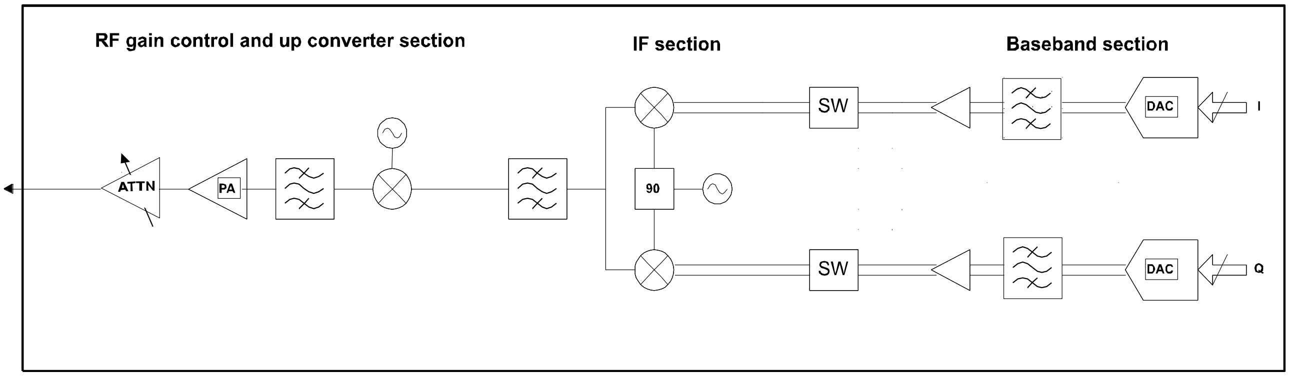

Figure 5. Simplified VSG Block Diagram

The Vector Signal Generator RF block also has a common path for 2, 3 and 5GHz bands, which is automatically set up based on the choice of the frequency channel.

Triggers

An advanced trigger system has been implemented on the VSA and VSG. This system supports a number of sequential operation modes for capturing and generating RF signals. The VSA can operate in free-run, external trigger, and signal trigger modes. Transmissions from the VSG can occur in free-run mode, or triggered by a second external trigger input; the VSG also generates a marker signal which is synchronized with the waveform generation.

Calibration

The instrument is fully calibrated and certified at the factory. The recommended calibration cycle is 12 months. LitePoint offers various post-purchase calibration programs to support this activity.

Software Description

IQsignal for WiMAX GUI

The IQsignal software offers advanced analysis of waveforms captured by the VSA or retrieved from file, including a range of EVM and spectral measurements. For example, IQsignal 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.

IQsignal also controls the IQmax-750 Test System's VSG capabilities. The user can load any WiMAX signal waveform from file, apply optional impairments, and control the transmit characteristics. The software comes with a rich library of pre-defined WiMAX test signals, but the user can also load previously captured-and-saved waveforms. As a third option, it is possible to load WiMAX waveforms that have been generated with the optional LitePoint IQwave™ utility. Once the waveform file has been loaded on to the VSG, specific signal impairments such as phase error or I&Q amplitude imbalance can be introduced. The VSG control utility allows adjusting the transmit frequency and whether the transmitter should operate continuously or transmit only a specific number of packets. Typically the packets are transmitted in free-run mode, but an external trigger input signal can be optionally used to control the transmission of packets.

The IQmax-750 Test System with IQsignal supports in-band transmit analysis through a graphical display of tests, which includes:

- Spectrum (PSD) and mask display. With an active spectrum or mask display, the program can also provide OBW and ACLR results.
- Symbol constellation; either for an entire zone or for individual bursts
- Spectral flatness and delta spectral flatness
- Waveform display in the time domain

To support product debugging, various graphical displays are supported by IQsignal, which includes:

- Phase noise versus time
- Frequency error versus time
- CCDF (to support compression analysis)
- Spectrogram
- EVM (versus OFDM subcarriers; versus time)

Besides the graphical display of VSA measurements, IQsignal also presents relevant numerical data, which includes:

- EVM (all, data, pilots); either for an entire zone or for individual bursts
- Power (peak, average)
- CINR (preamble, data)
- Frequency error
- Symbol timing error
- Integrated phase noise
- I/Q imbalance (amplitude, phase)
- Reed-Solomon errors (if applicable)

The IQsignal software also allows display of the average of numerical data over multiple captures; i.e., it allows a sliding window of configurable size. IQsignal 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, fast)
- Channel estimation (based on averaging of the long training sequence, or averaging of the full packet)
- Symbol timing tracking

- Frequency synchronization (based on long training sequence, or full packet)
- Amplitude tracking

The IQsignal application can be controlled remotely using text commands or scripts. The software includes a TCP/IP-based command server for this purpose, which supports text commands equivalent to GUI operations.

LitePoint Unified API (IQapi)

Supporting the need to automate testing routines, the IQmax-750 Test Systems come with a comprehensive C++ software API. The API supports all general instrument set-up functions, VSG set-up and control, and VSA set-up, measurement and analysis.

Additional Software

A number of additional software programs are provided with the IQmax-750 Test Instrument, along with the IQmax Applications CD, which include:

- IQtest™ Solutions Administration Tool for general setup of the instrument
- IQdebug™ tool for debugging and monitoring the instrument and making basic measurements
- IQdiagnostic™ program that verifies the functional operation of the instrument systems
- IQsignal for WiFi and Bluetooth application; requires WiFi option
- IQsignal for Zigbee application; requires Zigbee option

Optional Software

Other optional LitePoint software:

- IQwave™ software for waveform generation. Both, WiFi and WiMAX versions are available.
- LabView API software interface for IQnxn, IQview, IQflex and IQmax
- IQfact family of automated test programs for manufacturing and DVT

Applications Information

Developers

For developers of wireless products, the IQmax-750 Test System offers the capability to analyze the functionality and performance of the DUT through the intuitive and powerful GUI of the IQsignal software applications. All key radio parameters of a prototype can be verified using a single instrument. The VSA function of the instrument can be used for transmitter analysis, while the VSG allows verification of the receiver by generating well-defined and customizable test signals.

For more advanced and/or automated product or design verification, for example, in QA or DVT testing, the system offers the LitePoint Unified (C++) API as a standardized interface. A developer can build custom test scripts or complete automated test programs, taking full advantage of the capabilities of the IQmax-750 instrument. This provides a powerful means to automate product characterization, regression testing, etc.

Manufacturing

In manufacturing, the IQmax-750 Test System offers a convenient and complete solution for production test and calibration of wireless products. The system supports all tests that are typically used in manufacturing, and allows for complete test coverage at optimized test times, using a single test instrument that integrates all required functionality.

Customers can develop their own optimized production code, using the LitePoint Unified (C++) API as a standardized interface, or they can use one of the IQfact production test programs as a turnkey, yet, customizable solution.

Hardware Specifications

VSA Performance

Parameters		Value
Frequency[1]		• 2150 - 2700 MHz • 3300 - 3800 MHz • 4900 - 6000 MHz
Frequency resolution		250 kHz
Analog bandwidth		60 MHz (± 30 MHz quadrature)
Quantization		14 bits
Sampling frequency		80 MHz at ADC
Sampling resolution		1 sample
Acquisition buffer		2^{20} samples (~1,000,000 samples)
Pre-trigger capture		(2^{20} – 1) samples (~1,000,000 samples)
Sampling filter amplitude variation		≤ 0.25 dB (0 – 10 MHz offset frequency)
Sampling filter group delay variation		≤ 300 ps (0 – 10 MHz offset frequency)
RF port	Input power level	-40 to +30 dBm (some exceptions below)
	Power measurement accuracy	• specification: ± 1.0 dB (valid for extended input power level range: -50 to +30 dBm) • typical: ± 0.5 dB
	Residual EVM	• specification: ≤ -40 dB • specification (input power level ≥ -30 dBm): ≤ -43 dB • typical: ≤ -46 dB, phase tracking enabled
	Noise level (at lowest attenuation setting)	• noise floor: ≤ -70 dBm (in 60 MHz BW) = -148 dBm/Hz • noise figure: ≤ 25 dB
	Amplitude flatness	≤ 0.2 dB (0 – 10 MHz offset frequency)
	Integrated phase noise	typical: ≤ 0.5 degrees (100 Hz – 1 MHz)
	Input return loss	≥ 10 dB
baseband port	input voltage level	• 5 - 1000 mVrms • ± 1.5 V peak
	residual EVM	• 5 mVrms ≤ baseband input ≤ 150 mVrms • specification: ≤ -48 dB
	noise level (at lowest attenuation setting)	• noise floor: ≤ -70 dBm (in 60 MHz BW) • noise figure: ≤ 25 dB
	residual I/Q DC offset	≤ 2 mV
	residual I/Q amplitude imbalance	typical: 1% (f<10MHz)
	residual I/Q phase imbalance	typical: 0.5 degrees (f<10MHz)
	integrated phase noise	typical: ≤ 0.1 degrees (100 Hz – 1 MHz)

Note: all performance specified at 25°C

[1] Setting VSA and VSG to different frequencies is not supported

VSG Performance

Parameters		Value
Frequency[1]		• 2150 - 2700 MHz • 3300 - 3800 MHz • 4900 - 6000 MHz
Frequency resolution		250 kHz
Analog bandwidth		70 MHz (± 35 MHz quadrature)
Quantization		14 bits
Sampling frequency		80 MHz
Sampling resolution		1 sample
Waveform length		2^{20} samples (~1,000,000 samples)
Pre-trigger capture		(2^{20} – 1) samples (~1,000,000 samples)
DAC filter amplitude variation		Typical: ≤ 0.25 dB (0 – 20 MHz offset frequency)
DAC filter group delay variation		Typical: ≤ 400 ps (0 – 20 MHz offset frequency)
RF port	Output power level	• -95 to 0 dBm (modulated signal) • -95 to +10 dBm (CW)
	Power accuracy	• specification: ± 1.0 dB • typical: ± 0.6 dB
	EVM	≤ -43 dB (output level -95 to 0 dBm)[2]
	SNR	• 100 kHz resolution BW • Specification: ≥ 55 dB (output level ≥ -15 dBm) • Typical: 70 dB
	Undesired sideband	≤ -45 dBc (0.1 – 10 MHz; CW output)
	Carrier leakage	≤ -45 dBc (CW output) ≤ -90 dBm (between packets, when enhanced gap rejection condition enabled)
	Spurious	• Specification: ≤ -50 dBc (in-band) • Typical ≤ -20 dBc out-of-band (harmonics, to 0 dBm output level) ≤ -35 dBc or ≤ -80 dBm (whichever is higher) out-of-band (non-harmonic)
	Integrated phase noise	Typical: ≤ 0.5 degrees (100 Hz – 1 MHz)
	Output return loss	≥ 10 dB
baseband port	output voltage level	• ≤ 1000 mVrms • ± 1.5 V peak
	dynamic range	≥ 60 dB
	EVM	≤ -48 dB
	SNR	• 100 kHz resolution BW ≥ 65 dB
	I/Q DC offset	≤ 2 mV immediately after automatic DC offset calibration (upon any level change)
	I/Q amplitude imbalance	typical: 1% (f<10MHz)
	I/Q phase imbalance	typical: 0.5 degrees (f<10MHz)
	integrated phase noise	typical: ≤ 0.1 degrees (100 Hz – 1 MHz)

Note: all performance specified at 25°C

[2] With “gap power off” function disabled

IQsignal for WiMAX Measurement, Display and Control Parameters

VSA Measurement Parameters

Parameters	Value	Description
Capture mode	Single / continuous	Enables one-shot or non-stop data capture and analysis
Sample interval	100 µs, 200 µs, 300 µs, 400 µs, 500 µs, 1 ms, 2 ms, 3 ms, 4 ms, 5 ms, 10 ms	The sample interval is limited by the 2^{20} buffer size and 80 MHz A/D sample rate.
Signal type	• 802.16-2004 / WirelessMAN-OFDM (fixed WiMAX)	• Automatically detected: Signal type (up- / downlink subframe), Bandwidth, Modulation / coding, Cyclic Prefix length
	• 802.16e-2005 / WirelessMAN-OFDMA (mobile WiMAX)	• Automatically detected: Signal type (up- / downlink subframe), Bandwidth, Modulation / coding, Cyclic Prefix length, Uplink fields. • Supported modes: PUSC, FUSC, AMC2x3. • The software can be set to do automatic detection of the up- and downlink maps, or these can be user-defined (GUI)
Decode	On / off	Enables payload decoding
Input mode	RF	Selects type of signal input and enables appropriate ports
IQ swap	On / off	Interchanges I and Q channel signals on input ports
Triggers	• Free-run • External trigger • Signal trigger (RF input mode only)	• Data capture trigger mechanism • Signal trigger requires input power ≥ -30 dBm
Max signal level	• RF input: -60 to +30 dBm in 1 dB increments	• Peak signal level at instrument input, affecting display ranges • Can be determined automatically (Auto Range function) • Limited by VSA performance
External attenuation	-25.0 to 125.0 dB with 0.1 dB resolution	• Attenuation between DUT output and IQmax-750 input (applied as a correction to measurements) • RF input mode only
Acquire new	On / off	Acquire new signal capture for analysis or reload current capture from test instrument
EVM & power averaging	1, 10, 20, 40, 60, 80, 100	• Number of measurements (captures) used to calculate average EVM and power • LitePoint API allows arbitrary number of measurements to be used
Rx IF	0 MHz, 5 MHz, 10 MHz, 11 MHz	• To assess Tx performance at IF, down convert the signal to 5 MHz, 10 MHz, or 11 MHz • To assess Tx performance at a supported RF channel, set to 0 MHz
RF channel (RF mode only)	• User-defined center frequency (resolution is HW dependent)	
Phase tracking / correction	• Off • Symbol-by-symbol correction	• Phase tracking method • Symbol-by-symbol correction is specified by IEEE standard for EVM calculation but will mask measurement of Tx phase noise

Channel estimate	• Raw (averaging over long training sequence) • raw (averaging over full packet)	• Channel estimation method • Averaging over long training sequence is most common in practical receiver implementations
Symbol timing tracking	On / off	• Enable timing jitter correction • Symbol timing tracking is specified by IEEE standard
Frequency sync	• Long training sequence (includes short training sequence if present) • Full data packet	• Carrier frequency error estimation method • Estimation based on short or long training sequence is most common in practical receiver implementations
Amplitude tracking	On / off	Enable automatic gain control

Note: the specified corrections are implemented prior to measurement taking; for example, EVM is calculated after any specified corrections are applied, thereby affecting the results.

VSA Measurement Results – Graphical Display

Parameters	Description
Amplitude vs. time	Instantaneous, and peak power averaged over a symbol duration (dBm) versus time
Spectrogram	• 3D plot of power spectral density versus time • Time is displayed on x-axis; frequency offset on y-axis; color coding represents power (maximum strength is red; minimum strength is green)
PSD	• Power spectral density (dBm/Hz) versus frequency offset • Spectrum mask per IEEE 802.16 for 10 and 20 MHz channels (scaled for other bandwidths) • Center frequency ± 30 MHz • Resolution bandwidth 100 kHz (LitePoint API produces 1024-point FFT) • Function to calculate OBW and ACLR results (user enters parameters)
Symbol constellation	Visual display of each demodulated symbol in the I/Q complex plane (color of data symbols depends on stream; pilot tones are green). Shown for individual (selected) burst or all combined.
Spectral flatness	Variation from average energy as a function of OFDM subcarrier number (dB)
Spectral delta	Power delta between adjacent subcarriers (dB).
Phase noise (PSD)	Phase noise power spectral density (dBc/Hz) versus frequency offset
Phase error (time)	Integrated phase error of pilot tones (degrees) versus time
CCDF (complementary cumulative distribution function)	Probability of peak signal power being greater than a given power level versus peak-to-average power ratio (dB). Shown over all data or payload only.
I & Q signals	I/Q signal voltages (Vrms) versus time
Frequency error	• Frequency error (kHz) versus time • frequency error during short and long training sequences
EVM versus carrier	Error Vector Magnitude averaged over all symbols for each subcarrier (dB) versus OFDM subcarrier number
EVM versus time	Error Vector Magnitude averaged over all subcarriers (dB) versus time

VSA Measurement Results – Numerical Data

Parameters	Description
Packet information	• Signal type, down and uplink • Bandwidth, cyclic prefix • Modulation and coding per burst (rate ID) • Number of symbols (fixed WiMAX) or slots (mobile WiMAX) for each rate ID type
Peak power	Peak power over all symbols (dBm)
Average power (all)	Average power of complete data capture (dBm)
Average power (no gap)	Average power over all symbols after removal of any gap between packets (dBm)
Average power (preamble)	Average preamble power (dBm)
Average power (syms)	Average power over all symbols, excluding preamble (dBm)
LO (DC) leakage	Variation from center carrier (dBc)
EVM all	EVM averaged over all symbols and all subcarriers (dB; %)
EVM data	EVM averaged over all symbols and all data subcarriers (dB; %)
EVM pilots	EVM averaged over all symbols and all pilot subcarriers (dB; %)
EVM unmod	EVM averaged over all unmodulated subcarriers (dB; %) (mobile WiMAX only)
CINR (preamble)	Carrier to Interference plus Noise Ratio (dB) of preamble
CINR (data)	Carrier to Interference plus Noise Ratio (dB) of data zone
I/Q amplitude error	I/Q amplitude imbalance (%)
I/Q phase error	I/Q phase imbalance (degrees)
Frequency error	Carrier frequency error (kHz)
Symbol clock offset	Symbol clock frequency error (ppm)
RMS phase noise	Integrated phase noise (degrees)
OFDMA ranging	Ranging code and power level of initial and periodic ranging bursts (mobile WiMAX and if present only)
Reed-Solomon errors	Number of symbols with RS errors (valid only if payload decoding is enabled; fixed WiMAX only)

VSG Signal Parameters

Parameters	Value	Description
Tx mode	Continuous / # packets (1 to 65,334)	Enables continuous transmission or transmission of the specified number of repetitions of the stored waveform
RF channel (RF output mode only)	User-defined value (in MHz)	Channel center frequency (resolution is HW dependent)
CW signal	• On / off • Frequency offset	To generate CW signal (instead of waveform) at configurable offset from center frequency
IQ swap	On / off	Interchanges I and Q channel signals on output ports
RF output	On / off	Generate signal on RF port
Signal level	• -98.0 dBm to 10.0 dBm with 0.1 dB resolution • -98.0 dBV to 10.0 dBV with 0.1 dB resolution	• Desired average signal level of output signal • Reference level is preamble power (16e downlink signal) or data power (all others)
VSG offset	User defined value (in dB)	• Power offset for individual VSG (IQmax-750), relative to VSG1
Transmit trigger	• Free-run • External trigger	• Packet transmission trigger mechanism
Gap power off	Yes / no	Drop transmitted power to zero during gaps between packets
Signal impairments	• I/Q amplitude imbalance: -10.00% to +10.00% with resolution of 0.01% • I/Q phase imbalance: -10.00 degrees to +10.00 degrees with resolution of 0.01 degrees • I/Q group delay imbalance: -1.00 ns to +1.00 ns with resolution of 0.01 ns • I-channel DC offset: -1.00 to +1.00 with resolution of 0.001 dBV for RF output • Q-channel DC offset: -1.00 to +1.00 with resolution of 0.001 dBV for RF output	

Interfaces

Caution: all front and rear connector interfaces are ESD sensitive

	IQmax-750		
	RF ports (2)	type N female	• RF signal • Software configurable as input or output • 50 Ohms • RF input: 1 Watt maximum (+30 dBm) • DC Voltage: 30 Vdc maximum, Inputs DC blocked • Port to port isolation: ≥ 50 dB
	Power	Pushbutton	• On/off (safe shutdown)
Rear panel	10/100/1000 Mbps Ethernet (2)	RJ-45	TCP/IP connectivity
	USB ports (4)	USB Type B	USB 2.0 compatible
	10 MHz reference	BNC female	• External 10 MHz reference clock input connector • 1 kΩ • 0.1 to 2.0 Vrms input level
	RF LO in	SMA female	Proprietary interface; from IQmax Synchronization Unit only
	Trigger input 1	BNC female	• Rising-edge input trigger signal for VSA • 5V TTL/CMOS interface • Input voltage ≥ 0.5V, ≤ 5.5V • Pulse width ≥ 25 ns
	Trigger input 2	BNC female	• Rising-edge input trigger signal for VSG • 5V TTL/CMOS interface • Input voltage ≥ 0.5V, ≤ 5.5V • Pulse width ≥ 25 ns
	Marker output	BNC female	• Rising-edge output trigger signal • TTL/CMOS-compatible interface • Pulse width ≥ 25 ns • Delay to 1st sample output = 12.5 ns + 1 sample
	AC in	15A IEC connector	• For use with country-specific cord and plug • 90–132 VAC or 198-264 VAC (automatically switched) • 47–63 Hz
	0 / 1	Switch	Master AC power switch
	Unused ports	• 15-pin D-sub (VGA monitor port) • 6-pin mini-DIN female (PS2 keyboard port) • 6-pin mini-DIN female (PS2 mouse port) • 36-pin D-sub (1284-C) parallel port • DB-9 female RS-232 serial port	FOR USE BY AUTHORIZED PERSONNEL ONLY

General

Control interfaces		• IQsignal Signal Analysis Software Applications—Windows-based tools on external PC connected via Ethernet • TCP/IP command server for automated, remote control—capabilities equivalent to IQsignal GUI • LitePoint API —command set with DLL interface to support C++ programming of test scripts and automated test software • IQdebug —a Windows-based debugging tool on external PC connected via Ethernet
Connectivity		• TCP/IP over 10/100/1000 BaseT Ethernet • Default IP address: 192.168.100.254 • Ports 4000, 5001, 5002 must be open for access through a firewall
Internal reference oscillator	Frequency	10.000 MHz
	Initial accuracy	± 0.1 ppm
	Short term accuracy (1 second)	≤ 1×10^{-12}
	Temperature stability	± 0.15 ppm (0°C to +55°C)
	Aging	± 0.25 ppm/year

Physical and Environmental

Dimensions	450 mm x 100 mm x 500 mm (with handles installed)
Weight	8.2 kg
Power consumption	300W maximum
Operating temperature	0°C to +55°C (IEC 68-2-1, 2, 14)
Storage temperature	-40°C to +70°C (IEC 68-2-1, 2, 14)
Operating humidity	15% to 95% relative humidity, non-condensing (IEC 68-2-30)
Recommended calibration cycle	12 months
Warranty	12 months hardware, 12 months software updates

External PC System Minimum Requirements

PC	Intel Pentium processor or compatible, 500MHz (1GHz or higher recommended)
Operating system	Microsoft Windows 2000 (SP3 or higher), Windows XP (SP1 or higher) US English versions
Memory	512MB of RAM
Disk space	500MB of available hard disk space
Monitor	1024 x 768 resolution
Connectivity	TCP/IP over 10/100BaseT Ethernet

Compliance

EMI compatibility	• 89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC • EN55011/ CISPR 11: 1998 + A1+A2 • EN61326-1: 1997 + A1 + A2 • FCC Part 15 Class A / 04.99 • IC CS003
Safety	• 73/23/EEC revised by 93/68/EEC • EN61010-1: 1993 + A2: 1995 • UL 61010A R4.02 • CAN/CSA c22.2 No. 1010

Order Information

ORDER CODE	PRODUCT DESCRIPTION
IQ-MAX-750	LitePoint MIMO-ready WiMAX and WiFi Test System with GUI

LitePoint Corporation - Corporate Headquarters

575 Maude Court, Sunnyvale, CA 94085 | +1.408.456.5000 | www.litepoint.com | sales@litepoint.com

LITEPOINT

February 2011 Doc. #1075-0004-005