iQxel

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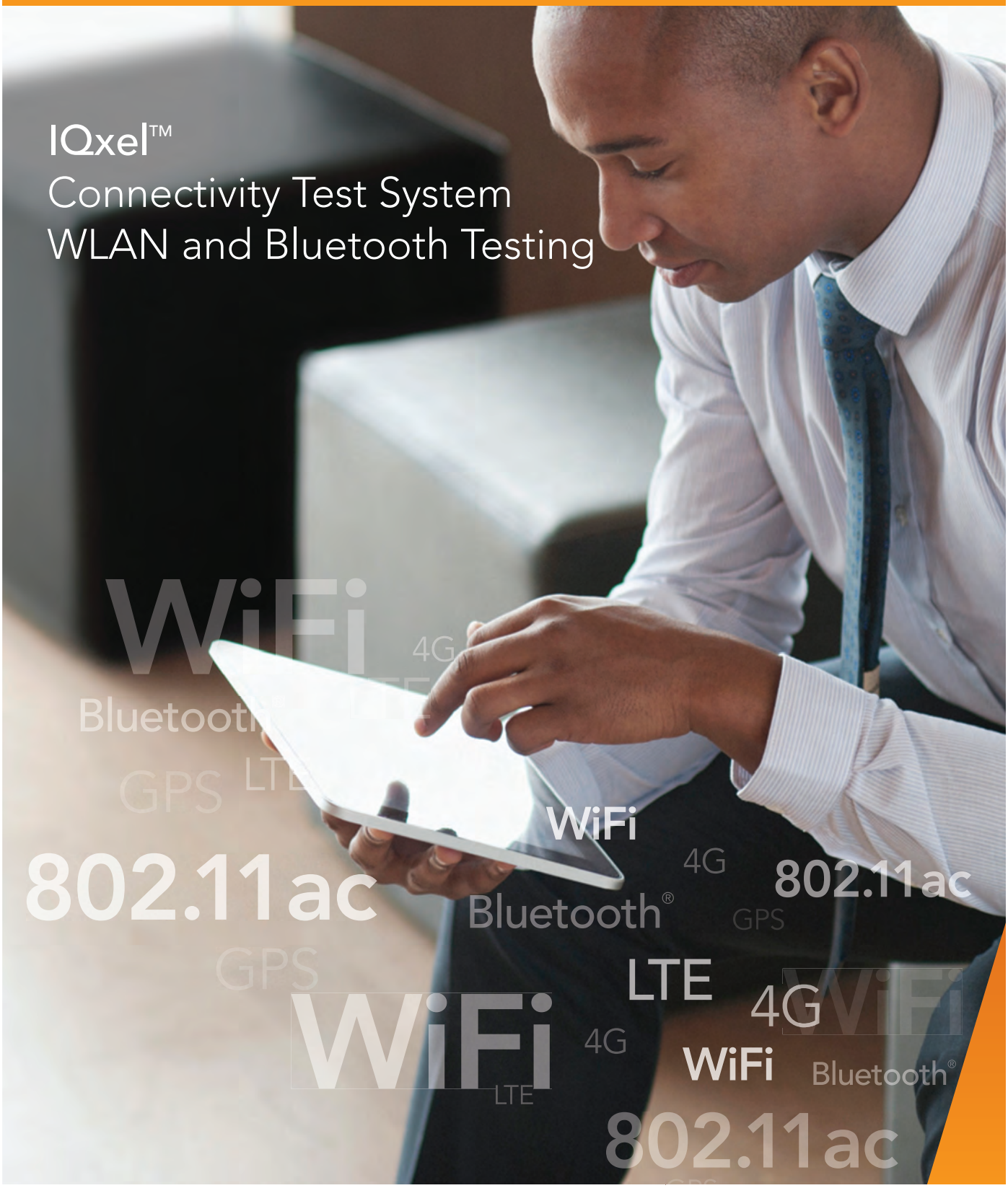

IQxel™
Connectivity Test System
WLAN and Bluetooth Testing

LITEPOINT

Testing for the Full Range of 802.11 WLAN and Bluetooth Devices

Designed for Manufacturing

IQxel™ is the first One Box Tester (OBT) for 802.11ac devices. Its rugged design makes it simple to deploy automated test solutions in high-volume device manufacturing applications. IQxel delivers the quickest and easiest factory test capabilities because of its simple but robust architecture that uses a compact 2U high chassis. It requires no external PC for processing of captured measurements, and utilizes standard gigabit Ethernet communication and SCPI-compliant control commands.

Figure 1: LitePoint's IQxel Test System

IQxel uses native dual-DUT RF connections, providing built-in ping-pong test capability and eliminating the need for external RF components that can degrade accuracy and cause reliability concerns in manufacturing environments. In addition, the IQxel160 can be used to test two 80 MHz devices in parallel, doubling device throughput and therefore enhancing operational cost savings.

Ready for 802.11ac

The LitePoint IQxel is designed around the challenging performance needs of 802.11ac-enabled devices that support both greater bandwidth and higher modulation order to meet the ever-increasing demands for data throughput. IEEE 802.11ac requires the capability to support the analysis of 80 MHz signals and optionally support modulation and demodulation of 160 MHz contiguous and 80+80 MHz non-contiguous signals.

In addition to increased bandwidth capabilities, the 802.11ac specification also requires more stringent mask measurements than previous standards—240 MHz bandwidth for the 80 MHz version and 480 MHz bandwidth for the 160 MHz version. Additionally, 256-QAM modulation requires even greater signal-to-noise ratio (SNR) and distortion performance for the test system to be able to meet the stricter requirements related to EVM measurements for this standard. This translates to a more sophisticated RF design of the tester. IQxel, with its unique RF front-end architecture, is designed to exceed the demanding performance requirements of 802.11ac devices.

IQxel is also designed to test both classic and low energy Bluetooth® devices in compliance with the Bluetooth SIG specifications using non-link test mode, saving test time and test cost for the devices.

The flexible IQxel architecture supports MIMO testing in both R&D and manufacturing environments. In an R&D environment, IQxel provides true MIMO measurement capabilities by using both single and multiple, synchronized testers. In manufacturing environments, a composite EVM methodology can be employed using a single tester to minimize deployment cost. An R&D environment can have up to 8 IQxel units synchronized to enable generation of up to 8 independent signal streams to the DUT and 8 independent signal captures from the DUT. IQxel also has a scalable architecture that allows SISO units to be added and synchronized to each other over time as the MIMO order expands.

IQxel offers RF and differential analog baseband inputs / outputs for device characterization. The range of I/O enables IQxel to meet both RF transceiver and System on Chip (SoC) verification needs.

Seamless Transition from Existing LitePoint WLAN Test Systems to 802.11ac Testing

IQxel allows re-use of existing test scripts and software developed on the industry standard LitePoint WLAN/Bluetooth testers including IQview®, IQflex®, and IQ2010™. IQxel ensures a fast and easy transition to 802.11ac testing, while still enabling existing 802.11 a/b/g/n test programs to be run on the IQxel without having to rewrite software and by taking advantage of the use of LitePoint's extensive library of IQfact™ chipset calibration and verification software.

IQxel provides users the option of developing test software in either a Windows® C/C++ API environment (IQapi) or using a Standard Commands for Programmable Instruments (SCPI) interface. The SCPI interface provides an operating system independent interface that easily interfaces with scripting languages like Python running under Windows®, Linux, or Mac® based operating systems.

The system also supports programming graphically with platforms such as LabVIEW™ using LitePoint software libraries.

System Capabilities and Features

Supports full range of WLAN and Bluetooth device testing

- Ability to fully test enchanced capabilities of IEEE 802.11ac specification that demands increased bandwidth, higher modulation order, and more stringent EVM requirements
- Ability to test all existing IEEE 802.11 specifications that includes 802.11 a/b/g/n/p
- Fully backward compatible with existing LitePoint WLAN test systems
- Ability to test all Bluetooth device standards (1.0 to 4.0)
- Ability to support 256-QAM constellation mapping

Scalable MIMO support

- Expandable architecture that supports up to 8x8 MIMO
- Supports testing of all key IEEE 802.11ac MIMO specification enhancements including MU-MIMO

Support for Analog Baseband I/O

- Includes differential baseband I/O for transceiver I/Q measurements and signal stimulus

Built-in Waveform Generation

- Ability to generate WLAN waveforms with custom MAC addresses directly in the tester

Flexible Programming Interface

- Ability to leverage API test routines within existing LitePoint systems and program using LitePoint IQapi
- Ability to program over Ethernet using text-based SCPI programming
- Ability to program graphically using platforms such as LabVIEW

Available Turnkey Test Software Solutions

- Availability of LitePoint IQfact software solutions for customized testing of leading WLAN / Bluetooth chipsets
- Ability to calibrate and verify the chipsets

Specification Highlights

Wide Range of Supported Wireless Standards

- 802.11b/g/n/p
- 802.11a/n/ac
- Bluetooth 1.x, 2.x, 3.0, 4.0 (Optional)

Frequency Range

- 2200 to 2600 MHz (RF1, RF2)
- 4900 to 6000 MHz (RF1, RF2)

Instrument IF Bandwidth

- 120 MHz (IQxel80)
- 120+120 MHz (IQxel160)

Output Power (Maximum)

- +9 dBm (2200 to 2600 MHz)
- +7 dBm (4900 to 6000 MHz)

Ready for robust testing of IEEE 802.11ac standards

LitePoint has been a leader in wireless device testing and brings deep expertise in the comprehensive testing of WLAN IEEE specifications. With the IEEE 802.11ac standard, LitePoint offers the IQxel80 and IQxel160 systems that have been designed to fully handle all challenges of IEEE 802.11ac technology to deliver cost-effective, accurate, complete test coverage in less test time.

Support for testing increased bandwidth

IEEE 802.11ac presents new and significant challenges in testing because of increased bandwidth support that effectively makes existing test systems that have combined vector signal analyzer and vector signal generator (VSA/VSG) in a single box obsolete. The built-in support for very wide IF bandwidth in the IQxel test system family ensures full support for testing the transmission of 160 MHz contiguous and 80+80 MHz non-contiguous signals defined by the 802.11ac specification.

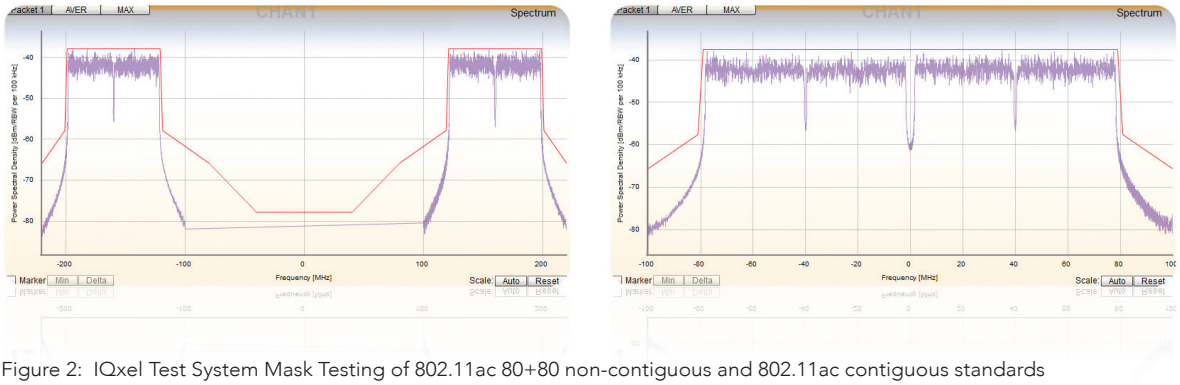

Figure 2: IQxel Test System Mask Testing of 802.11ac 80+80 non-contiguous and 802.11ac contiguous standards

Support for testing enhanced MIMO capabilities

Not only does 802.11ac present a bandwidth challenge, it also drives enhanced MIMO test requirements. The new standard allows support for up to 8 spatial streams and has several other enhancements to improve performance over existing 802.11n MIMO systems. Accurate MIMO testing requires that signal capture and generation be performed independent of each other. IQxel80 and IQxel160 systems are not only fully capable of performing independent signal capture and generation, but they also provide the flexibility to be expanded up to an 8x8 unit that also includes support for all key 802.11ac MIMO enhancements.

Support for testing 256-QAM constellation mapping

LitePoint IQxel80 and IQxel160 test systems support the newest IEEE 802.11ac optional requirement for 256-QAM constellation mapping. This mapping can be used for both 80 MHz and 160 MHz transmissions, as well as for all other key features and enhancements built into the technology to improve the user experience of existing WiFi networks.

Supports Versatile Development Platforms for Customization

The IQxel test system includes software libraries specific to the particular communication standard of interest. A variety of signal creation and analysis routines are provided and are available through either a graphical user interface (GUI), C++ API, or SCPI. All measurement functions are accessible from the GUI and also through the C++ API or SCPI commands that enables custom test-program automation in a manufacturing or design characterization testing.

Multiple remote users can simultaneously view data captured on a single the IQxel test system that is sent to a LAN interface using TCP/IP. This is particularly advantageous in an R&D environment where multiple users can share the same station from different locations.

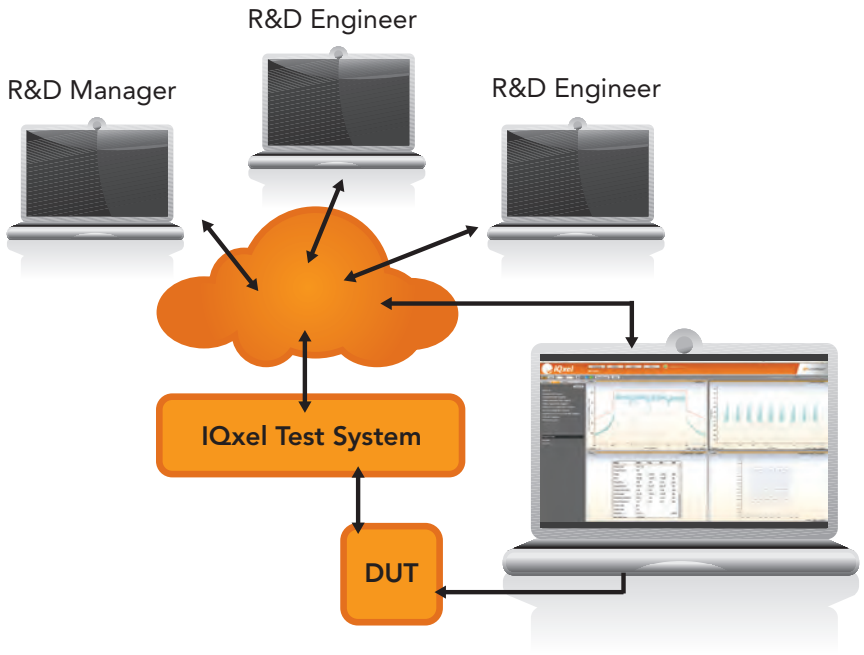

Figure 3: IQxel Test System—Connected to the control PC and to multiple users' PCs via LAN interface using TCP/IP

IQxel's browser-based, platform-independent Graphical User Interface (GUI) allows seamless display of data and instrument control over virtually any operating system using a TCP/IP connection and a web browser. This powerful interface simplifies characterization and debugging in R&D environments, with easy to use built-in graphical tools, tables, and plots.

The IQxel's GUI also includes waveform generation capabilities. These capabilities simplify the generation of 802.11 test signals for volume-production of your devices without compromising quality by verifying the conformance and interoperability, in typical and worst-case conditions, in a controlled and fully repeatable way.

Figure 4: IQxel's Graphical User Interface

IQxel160 not only has the capability to test the additional bandwidth requirements needed for the 160 and 80+80 MHz standards but also gives more flexibility to the user with these additional features:

- Support for 80 MHz 2x2 True MIMO in a single tester
- Support for 80 MHz – 2 DUT full parallel testing
- Support for 80+80/160 MHz – 2 DUT Dual head (ping-pong) testing

Figure 5a: IQxel160 testing an 80 MHz, 802.11ac, 2x2 MIMO device using True-MIMO method
Figure 5b: IQxel160 testing two 80 MHz, 802.11ac SISO devices in parallel or two 160 MHz, 802.11ac SISO devices in ping-pong

Flexible MIMO Support

LitePoint IQxel provides the flexibility to add up to 8 units to support full 802.11ac MIMO capability that can expand up to an 8x8 system. This flexibility provides the key benefit of scalability without commitment to prior capital expenditure based on the needs for MIMO testing that can change over time.

The highly flexible architecture of IQxel allows for each test system in a MIMO set up to act as a standalone system for SISO measurements where the configurations can be switched in minutes to suit laboratory or manufacturing purposes.

Figure 6: IQxel systems may be combined for MIMO applications as needed

Ease of Development

IQxel comes with the following pre-defined test functions for common 802.11 measurements that simplifies the testing of all supported WiFi standards:

- Error Vector Magnitude (EVM)
- Spectral Mask (SEM)
- Packet Error Rate (PER)
- RMS Phase Noise
- Power Spectral Density (PSD)
- Spectral Flatness
- I/Q Phase Error
- I/Q Amplitude Error

Ease of Field Maintenance

Wireless device manufacturing environments must optimize equipment utilization to minimize the cost of testing very large volumes, and any downtime incurred due to instrument maintenance is a costly wasted resource. IQxel guarantees ease of field maintenance and minimization of operational costs with its innovative architecture that comes with fully serviceable RF modules. Each module is calibrated at a LitePoint service center or factory, can be replaced in less than 30 minutes, and would require no subsequent calibration until the standard warranty period expires.

Figure 7: IQxel's Fully Calibrated, Replaceable RF Module

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Doc: 1075-0022-001
February 2013 Rev 5