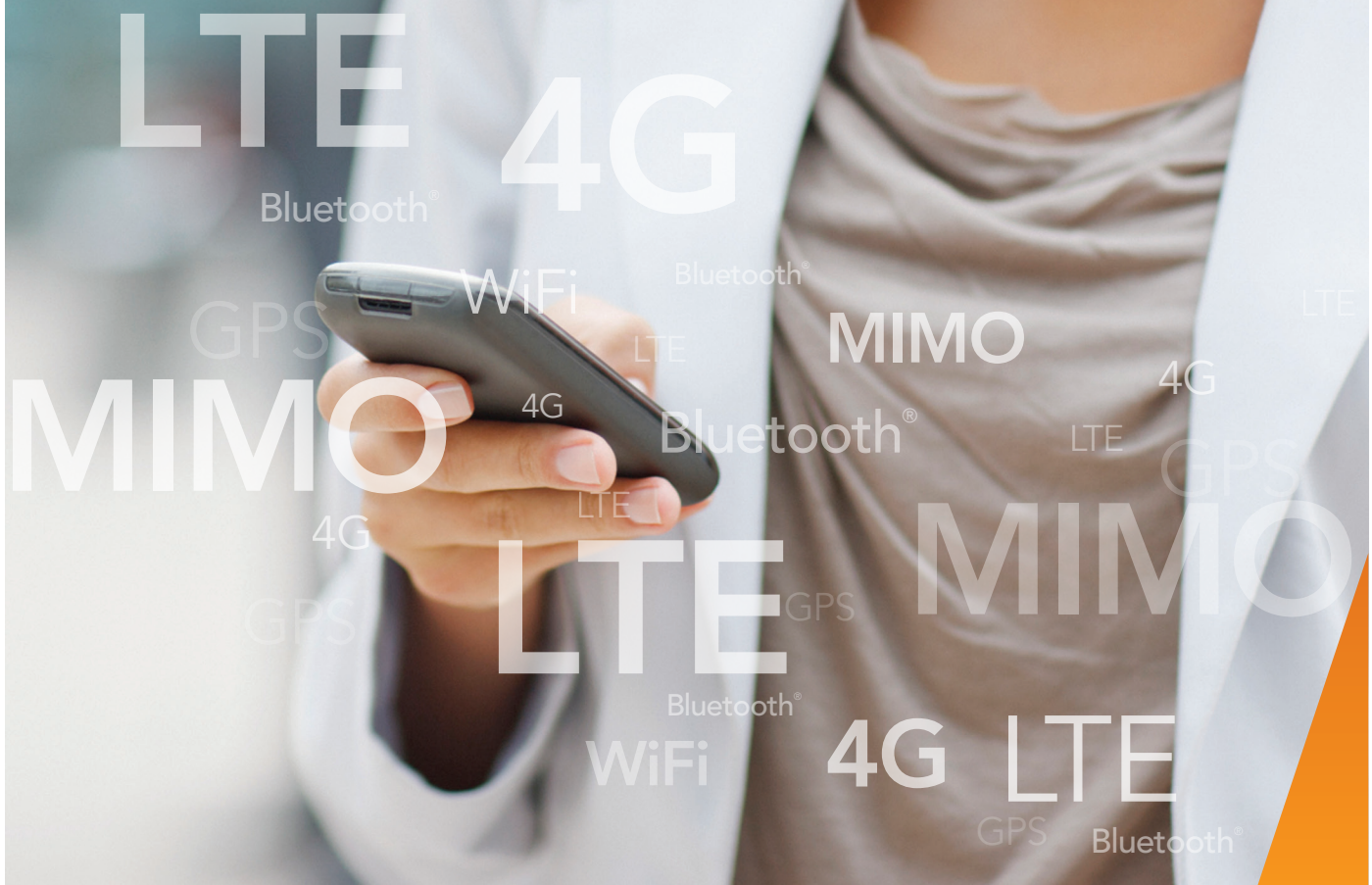


iQxstream®
Multi-DUT Cellular
Test System



Introduction

IQxstream is a manufacturing oriented, physical layer communication system tester, tailored to verifying performance in high-volume production environments without the cost and performance burden of the additional software layers associated with R&D and conformance testing. It addresses all major mobile technologies and RF bands, including LTE, W-CDMA / HSPA / HSPA+, GSM / EDGE, CDMA2000 / 1xEV-DO and TD-SCDMA.

As a production test solution targeted at the smartphone/tablet/data-card markets, IQxstream dramatically reduces test time by focusing on the core metrics of production test utilizing a high-performance, production-optimized architecture. It provides support for testing of up to eight DUTs (Device Under Test) in parallel, typically in the same time that it takes to test a single DUT using traditional methods.

IQxstream provides a future-proof solution both in terms of standards and band allocations. It features a 400 MHz to 3.8 GHz frequency range, 100 MHz Vector Signal Generator (VSG) and Vector Signal Analyzer (VSA) bandwidths, and a fully programmable architecture that allows new bands to be added and standards to evolve. This power and flexibility enables IQxstream to protect your test equipment investment.

Available in two production test configurations -- single or dual Cellular Test Modules (CTMs) -- IQxstream meets the needs of today's standards and provides a viable growth path with the ability to support a variety of antenna configurations, from a single antenna, to dual antennae with diversity, to advanced MIMO systems.

For production test integration, IQxstream is supported by industry-standard tools and a development support package based on IEEE 488.2 - Standard Commands for Programmable Instruments (SCPI) over a TCP-IP socket interface. For manufacturers who do not have an existing Production Test System or for those who prefer an off-the-shelf solution, LitePoint provides IQvector, a software companion product to IQxstream. IQvector provides a complete test integration platform including DUT drivers and it installs with a default test plan based on a given chipset. IQvector provides the fastest route to high-volume production.



Key Features

Wide range of supported cellular standards

- LTE (FDD / TDD)
- W-CDMA / HSPA / HSPA+
- GSM / EDGE
- CDMA2000 / 1xEV-DO rev. 0, A, B
- TD-SCDMA

Test Performance

- 8-DUT testing – test eight in the same time as a single DUT using traditional methods
- Support for sequence-based testing; speed is limited only by the DUT, not IQxstream

Complete Physical Layer Test Solution

- Full Uplink waveform measurement and analysis
- Downlink waveform generation
- Dynamic Power analysis
- Support for Downlink BER and other RX measurements (requires DUT support)
- Play arbitrary waveforms in support of other wireless standards, e.g., GPS, GLONASS
- Per path user-definable fixture loss calibration automatically managed by the tester
- Support for DUT RF calibration
- Multiple antenna capable - Diversity, MIMO

Future Proof

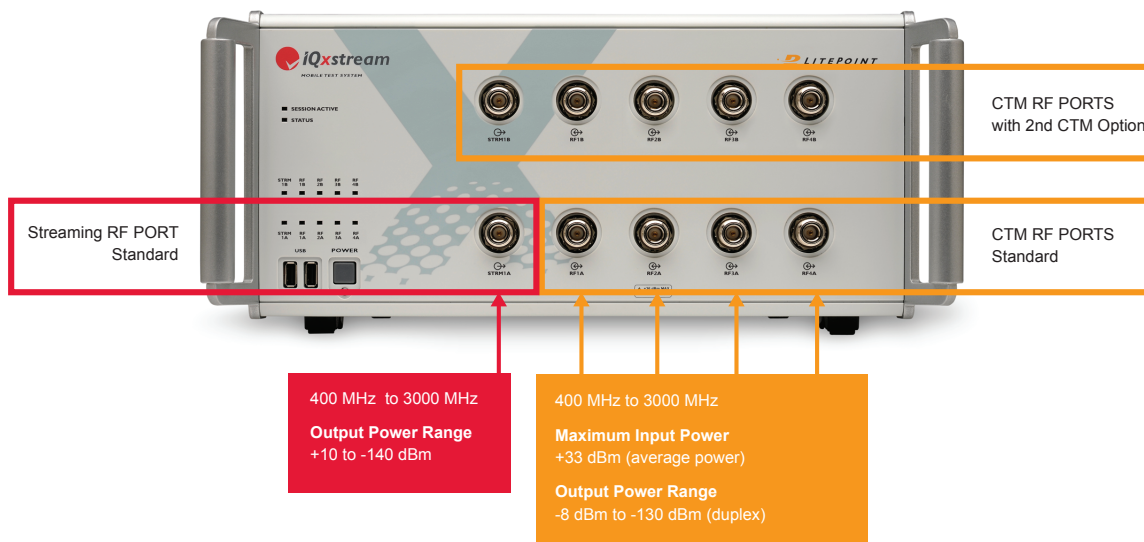
- 4G capable today
- MIMO ready
- 400 MHz to 3 GHz (3.8 GHz optional) – Coverage for all cellular bands
- Up to 100 MHz Channel Bandwidth – Hardware ready for LTE Advanced
- Software updatable
- Field upgradeable

Test Platform Integration

- SCPI over TCP-IP
- IQvector Production Test Platform
- Platform-independent, browser-based graphical user interface

Ease of Maintenance

- Modular design
- Extensive self diagnostics for fast issue identification
- Calibration contained within replacement modules
- Fast repair, in as little as 10 minutes



System Overview

IQxstream is a high-performance physical layer production test solution focused on mobile terminal testing. It contains all the hardware and software necessary to integrate smoothly into a production test environment. As per Figure 1, it consists of the following components.

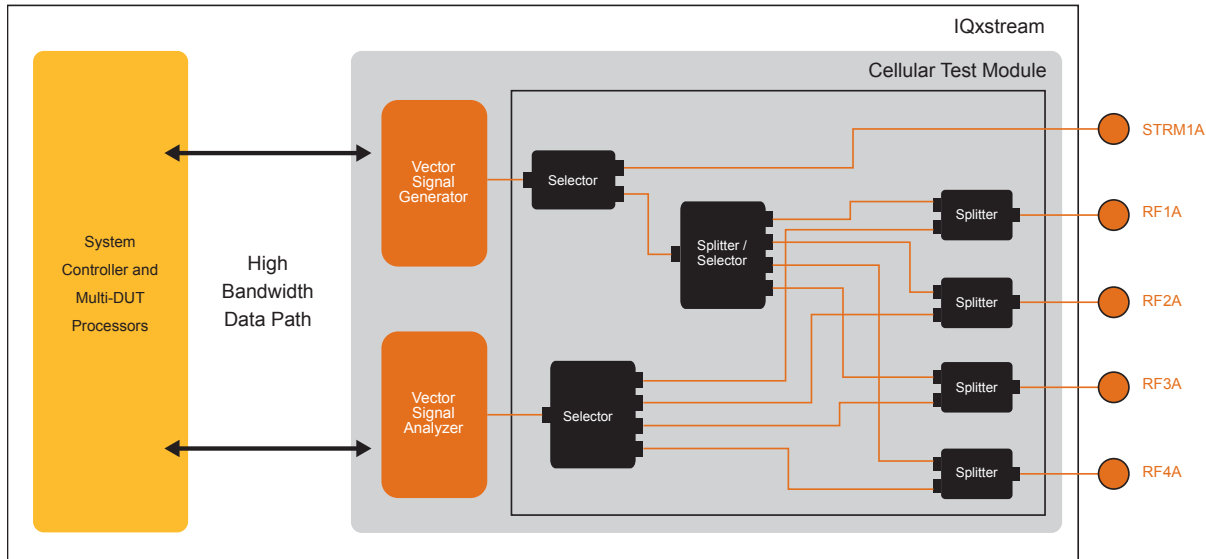


Figure 1: IQxstream Block Diagram

Cellular Test Module (CTM). At the heart of the IQxstream is the Cellular Test Module, which includes a Vector Signal Analyzer (VSA), a Vector Signal Generator (VSG) and a Multi-DUT Interface. This unit is responsible for generating and distributing the downlink signals to the DUT(s) and for capturing and analyzing the uplink signals generated by the DUT(s). An IQxstream may be configured with one or two CTMs, depending upon the capabilities required in production test. CTMs are fully calibrated from the factory and require no further calibration when installed in an IQxstream.

The **Vector Signal Generator (VSG)** is a high-performance general purpose signal generator that can generate all of the waveforms for current standards and is flexible enough to meet the needs of future generations of wireless standards. With a 100 MHz bandwidth and wide dynamic range, the VSG can emulate today's complex wide band signals for both RX sensitivity measurements and for RX max power measurements.

As the counterpart to the VSG, the **Vector Signal Analyzer (VSA)** is responsible for capturing the signals generated by the DUT(s) before passing them to the Multi-DUT Processors for analysis. With a 100 MHz measurement bandwidth and wide dynamic range, the VSA is capable of meeting the needs of both current and future wideband signals, such as LTE and LTE Advanced.

The **Multi-DUT Interface** connects the VSA and VSG to the front panel. As per Figure 1, the output from the VSG can be sent either directly to the STRM1A port, to one of the RF ports (duplex mode), or be broadcast across all four ports. The VSA can be connected to any one of the four RF ports.

The STRM1A port can be used for such diverse uses as to send a GPS signal to the DUT to verify functionality of internal GPS receivers, or to supply a signal to a diversity RX port for RSSI or BER testing.

Critical to the measurement of modern communication devices is the ability of the instrument to handle and produce a wide range of signals. CDMA2000, WCDMA and LTE all operate over wide ranges of input and output power. The Cellular Test Module meets this challenge without the need for external attenuators for high-power signals or amplifiers for low-power signals.

System Controller. Another key to IQxstream’s performance is the System Controller and Signal Processing Platform. It consists of an industry standard, multi-core, high-performance computing platform, a state-of-the-art Signal Processing Package, and LitePoint’s Measurement Controller and Scheduling platform (MCaS).

MCaS differentiates IQxstream by freeing test developers from worrying about potential timing conflicts in a multi-DUT testing environment. To a developer, each DUT can appear as though it is attached to a single device virtual instrument. MCaS ensures that the commands are executed in the correct sequence without conflict and without overwriting data before it is completely used by the analysis engines.

The System Controller also runs a Web server to provide the external user interface via a Web browser over TCP-IP. This allows the IQxstream to be controlled locally or remotely by a wealth of platforms running a variety of operating systems from anywhere.

The **Signal Processing Platform** is a series of air interface specific technology modules that generate test waveforms and perform the signal processing analysis associated with measurements. These signal processing modules reside within the instrument and are optimized for execution on the signal processing engines. There is no requirement to do any signal processing on the host system making performance requirements of the host minimal.

Single Cellular Test Module Configuration – 4 DUT with Diversity and GPS

IQxstream’s advanced, built-in signal routing enables testing of multiple DUTs with a minimum of external hardware and cables. Figure 2 illustrates a typical test scenario, where a single Cellular Test Module IQxstream is used to test 4 DUTs. In this case, the streaming port is being used to send either a GPS signal or a diversity cell signal to a combined GPS/diversity antenna.



Figure 2: Typical Use Case – Single CTM

In this configuration, both the TX and RX signals on the primary antenna are tested, as is a diversity RX signal through the simple addition of an external splitter and a cable to the diversity antenna port. Since in this scenario, that same DUT antenna port carried the GPS signal, without changing connections, the GPS receiver of the DUT can also be verified provided the DUT supports the capability to report GPS information via its external data port.

Dual Cellular Test Module Configuration – MIMO Testing

As an option, the IQxstream is available with a second Cellular Test Module providing two independent VSGs and two independent VSAs. The second Cellular Test Module configuration provides for a full second set of RF interfaces making it possible to test up to 8 DUTs simultaneously. This configuration can also be used for MIMO testing where two independent streams are sent over different antennae.

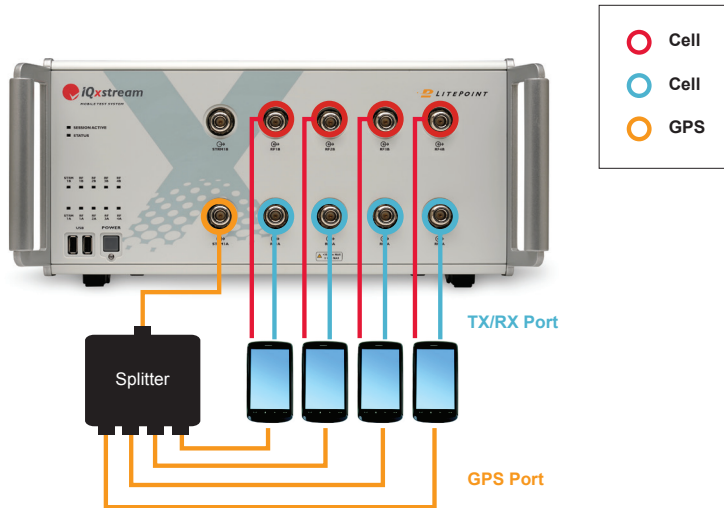


Figure 3: Dual CTM Configuration

In the dual Cellular Test Module configuration, the IQxstream is capable of coherently generating two separate waveforms supporting 1x2 and 2x2 MIMO devices.

Production Test Integration

IQxstream is at its best when integrated into an automated production test environment, where its four-DUT and rapid test capabilities be fully employed. LitePoint supports several paths to production test integration, meeting the needs of a diverse customer base.

IQvector. For those customers who do not have an existing Production Test System or for those who prefer an off-the-shelf solution, LitePoint provides IQvector, a software companion product to IQxstream. IQvector provides a complete test integration platform, including DUT control software, and it installs with a default test plan based on a given modem chipset.

IQvector provides the fastest route to high-volume production, and LitePoint can provide a variety of support packages for IQvector/IQxstream, from an off-the-shelf “shrink wrap” model, to a customized, turnkey, fully supported integration effort.

Integration into an Existing Production Test Platform. For those customers who have an existing production test environment, IQxstream supports industry standard IEEE 488.2 Standard Commands for Programmable Instruments (SCPI) for controlling its operation by a host test controller. Communication occurs over a TCP-IP socket from the test controller to the IQxstream leveraging standard networking equipment and cabling, which eliminates the need for a dedicated connection between the controller and an IQxstream.

Simple ASCII-based SCPI is used to control and receive measurement data from the IQxstream. This structure permits virtually any platform to act as a production test controller including Windows, Linux, OSX or any of the multiple platforms that support TCP-IP networking.

With its extensive signal processing library, support for SCPI over TCP-IP, and MCA's ability to simplify multi-DUT testing, IQxstream is the ideal platform for advanced production test environments.

Ready for the Future

iQxstream builds upon LitePoint's long legacy in the WiFi marketplace. This has provided LitePoint with the technical expertise to support 4G systems based on OFDM, wideband signal formats, and Time Division Duplex (TDD) operation.

This expertise led to the design decision to start with a platform with 100 MHz of source and capture bandwidth. This 100 MHz bandwidth allows ACLR measurements for a 20 MHz LTE channel to be made in a single capture. Where others are following the standards, LitePoint is out front with its wideband system spanning the full usable mobile frequency range from 400 MHz to 3.8 GHz.

As LTE Advanced moves into the marketplace, the 100 MHz bandwidth of iQxstream guarantees a long life. Should standards evolve beyond its current capabilities, iQxstream's modular design enables an upgrade path.

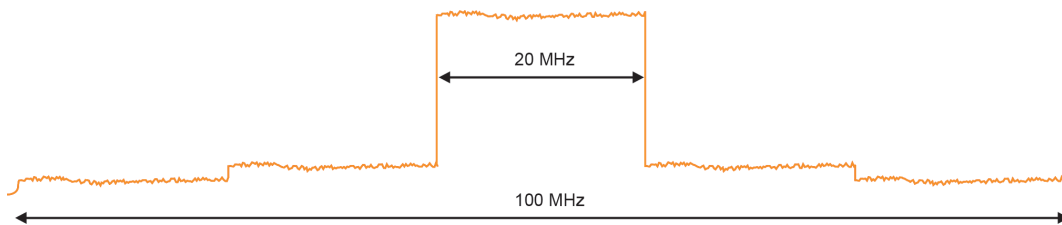


Figure 4: 100 MHz iQxstream Bandwidth – 20 MHz LTE Signal Capture

Fundamentally iQxstream is a software-based platform. Whether generating a waveform or analyzing a signal capture, everything is programmable. So as standards evolve or new bands are added, new capabilities can be added to iQxstream through simple software updates.



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