RFIC Testing Using PXI Synthetic Instrumentation

By C. D. Ziomek, President
M. T. Hunter, CTO
ZTEC Instruments

RFIC Testing Background

Reducing the cost of test through faster test times is the holy grail of Automated Test Equipment (ATE). With the increasing prevalence of wireless devices, fast testing is now necessary for Radio Frequency Integrated Circuit (RFIC) devices. Historically, RF testing and characterization has been accomplished using un-modulated single-frequency RF signals. Single-frequency RF tests, involving spectral masks or noise figure measurements, is time consuming but requires relatively simple RF test equipment.

For RFIC devices capable of modern communication protocols such as Wi-Fi, WiMAX, and LTE, test requirements extend beyond single frequency testing. There is much published research on achieving rapid and extensive test coverage using comprehensive measurements such as error vector magnitude (EVM) [1]. In order to perform high-coverage measurements, modulated-signal testing replaces single-frequency testing. Unfortunately, adding the necessary instantaneous bandwidths (IBW) and modulation capabilities to general-purpose test equipment can be cost prohibitive. The underlying need is the ability to optimize tests for speed and coverage while minimizing test equipment capital expense. This need has led to the emergence of one-box testers, which are essentially "golden radios" using a well characterized RFIC device similar to the device under test (DUT). One-box testers offer the ability to test RFIC devices in a limited and known fashion. Whereas this may be adequate for production test of a particular device, testing of devices employing a new protocol or comprehensive device characterization requires much more flexible RF instrumentation.

Synthetic Instrumentation using PXI

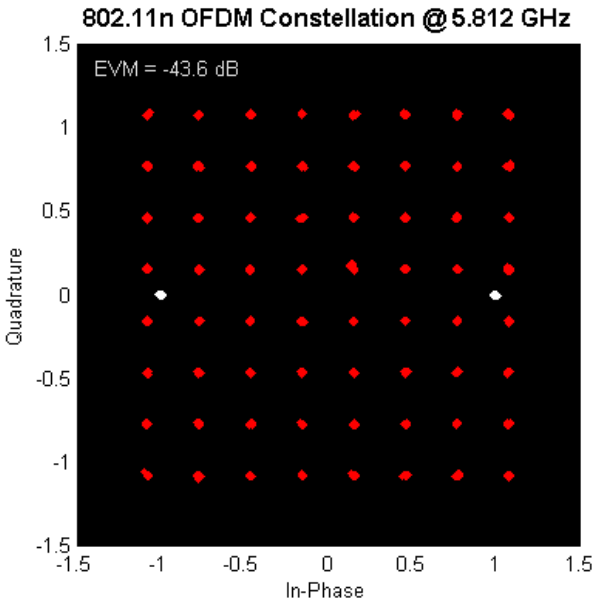
Modular instrumentation or Synthetic Instrumentation (SI) is a term used for flexible, software-reconfigurable instrumentation built of generic hardware modules [2-3]. The PXI or PXIe modular architectures are ideally suited for SI configurations. For RFIC characterization, SI offers the flexibility and capabilities required for modulated signal analysis. At the same time, SI can maintain a reasonable price point by optimizing functionality for RFIC device testing. ZTEC Instruments' ZT8651 PXI 6 GHz Vector Signal Analyzer (VSA) is an example of an SI that optimizes the size, speed, price point, and functionality for RFIC device testing and characterization.

Emerging Wireless Standards Require New, Enhanced Tools

The new 802.11ac Wi-Fi standard will achieve a 1 Gbps data rate by increasing the instantaneous bandwidth to 160 MHz and by using MIMO channels. With In-Stat studies expecting that one billion 802.11ac devices will ship by 2015, engineers must be prepared to meet market demands and test these devices with adequate and accurate tools. To test the 802.11ac

Wi-Fi standard, engineers need high-performance instruments to provide a combination of instantaneous bandwidth, performance, and functionality. PXI Synthetic instrumentation combines the easy-to-use, protocol-specific processing of a one-box tester with the modularity, programmability and flexibility of a software-defined SI. This functionality gives engineers a flexible solution to meet the demands of emerging standards like 802.11ac.

A Flexible Solution for Test Engineers



With PXI synthetic instrumentation, engineers have a software-defined SI that easily and efficiently achieves accurate design verification, characterization and test of RF and microwave integrated devices, circuits, and systems. In addition to instantaneous bandwidth and high dynamic range capabilities, a PXI SI VSA provides on-instrument data processing, protocol-specific demodulation, and advanced triggering and synchronization. On-instrument data processing offers engineers real-time processing including digital downconversion (DDC), zoom FFT, RBW-optimized windowing, and marker measurements to increase test throughput and ease the development of automated tests. With protocol-specific processing, engineers can achieve demodulation, symbol extraction and intelligent measurements such as EVM, ACLR, and IM3 for next-generation wireless standards. In addition, advanced triggering and synchronization provides the ability to extract and measure symbols of the digital modulation coding, as well as the ability to capture other pulsed or time-domain modulated signals. In summary, the ZT8651 PXI or PXIe VSA instruments address the current and future challenges that test engineers face in testing RFIC devices based upon the new communication standards such as the 802.11ac Wi-Fi, WiMAX and LTE protocols.

References

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Authors

C. D. Ziomek, President, ZTEC Instruments, cziomek@ztecinstruments.com
M. T. Hunter, CTO, ZTEC Instruments, mhunter@ztecinstruments.com