Inside TRACK with Chris Ziomek,

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Interview by CHRIS DeMARTINO

CD: What are some of the challenges created by needing to support all of the latest wireless standards?

CZ: Wireless standards continue to evolve at a very rapid pace. The latest gadgets and apps constantly push for more bandwidth, which is constrained by available wireless spectrum. Consequently, system architects and engineers find clever ways to apply digital communication theory and techniques to deliver higher data rates.

This creates challenges for wireless-device designers and the test-equipment designers who serve them. Our focus is directed at helping our customers tame complex technology and get products to market quickly. We work closely with the newest chipsets, stay abreast of the latest technology, and focus on shortening the time-to-test for our customers.

CD: What are the latest requirements for power amplifier (PA) testing?

CZ: RF front ends are becoming much more complex. A front end for a world phone must support many more bands, modes, and antennas than it did just a few years ago. Also, multi-mode multi-band (MMMB) power amplifiers are being developed to shrink and reduce the cost of mobile-device designs. With the additional bands, modes, and antennas, the number of RF power amplifiers in a mobile device has grown quickly. At the same time, test coverage demands have become more challenging with testing requirements for carrier aggregation, MIMO, envelope-tracking, and digital pre-distortion (DPD).

For example, the latest IEEE 802.11ac Wave 2 chipsets add MU-MIMO, VHT-160, and possibly 1024-QAM. Also, Wave 2 chipsets may be the first WLAN chipsets to employ DPD to achieve desired EVM performance. A PA targeted for use with these Wave 2 chipsets must be characterized for the wider 160-MHz bandwidth, possibly with 80+80 MHz channels. We now see IEEE 802.11ac PAs for Tier1 mobile devices commonly being tested for use with DPD.

CD: What new testing requirements do you anticipate seeing in the near future?

CZ: The IEEE 802.11ac Wave 2 is the current push in WLAN, as described previously. For LTE, two-carrier aggregation for downlink is now common and three-carrier aggregation downlink has started rolling out. This increase in channel bandwidth pushes the performance requirements for front-end components, such as PAs. Another new initiative in LTE is the proposed use of LTE in the unlicensed 5-GHz band. LTE-Unlicensed will drive new requirements for cellular test equipment, which has traditionally been focused on the licensed cellular bands (<4 GHz).

CD: How difficult is it to maintain support of the diverse and numerous wireless chipsets being designed into products today and in the near future?

CZ: This is, of course, a big challenge. LitePoint has a dedicated team of engineers working with wireless chipset companies to assist them with the test and development of its latest generation of products. This win-win relationship gives the chipset designers access to test technology early. It also provides them with a partner to test their devices within a reference design.

CD: What software improvements are being implemented to advance automated wireless testing?

CZ: For our design verification testing (DVT) customers, it is all about time-to-test and time-to-verify a new design. To support them, we have integrated many standard test operations, sequences, and measurements into our software tools. Essentially, we are focusing on ease-of-use to enable our customers to start DVT testing immediately.

For production-test customers, we focus on providing optimized solutions to test multiple DUTs at the same time. If certain features within the test equipment architecture are harnessed to provide faster test times, factory floors will be more efficient. The cost of test also will be lowered.

Related to this, one of the challenges of multi-DUT test is that the number of RF connection points between the tester and the DUT is increasing—particularly in cellular devices. Each connection point is a potential failure mechanism in the factory. To address this challenge, we have introduced a suite of software tools to monitor the quality of the connection between the tester and DUT. These “Factory Efficiency” features detect changes in the RF path, which lead to failures. They also detect when the DUT has been properly placed in the test fixture, minimizing yield fallout due to poor connection. Such tools increase test station uptime while speeding the process of debugging a bad fixture when maintenance is required.

CD: What type of impact will the emergence of the Internet of Things (IoT) have on automated test requirements?

CZ: In the mobile-device market, there is a handful of chipsets manufacturers that supplies the wireless core of the vast majority of mobile devices. This is less so with IoT, where there are many more chipsets. Here, wireless connectivity appears in potentially millions of different products from different manufacturers ranging from home automation to wearables to automotive, etc. Often, the companies developing IoT products have little RF or wireless expertise.

One key differentiator for manufacturers of IoT devices is time to market. Because of the wide variety of products and chipsets, IoT device makers typically rely on good reference designs from the chipset companies. There are not enough RF engineers to re-engineer each product and test solution. We are providing reference test platforms for those reference designs and looking at smarter ways to address the specific needs of IoT products, as these products—particularly for the consumer market—are very cost-sensitive. The nature of the economics for high-mix, lower per-stock-keeping unit (SKU) volume of IoT devices compared to smartphones and tablets is driving new test methodologies.

“One of the main challenges with 5G today is how broad the definition has become.”

CD: What efforts are being made to prepare for 5G?

CZ: One of the main challenges with 5G today is how broad the definition has become. Unlike the previous transitions from 2G to 3G to 4G, 5G is not so much a “new wireless technology” as it is a new data-access technology. Technologies are being proposed as part of 5G that typically are not found in mobile devices, such as millimeter-wave radio frequencies. But these technologies have already been used with deployments in wireless backhaul and some early wireless video applications.

The main challenge of 5G will be the interoperability of existing technologies. With a common “always-on” connection to a traditional cellular network (such as LTE), devices in a “5G network” will need to be smarter to seek out the best option for data access. This could be through the existing cellular network, a nearby Wi-Fi hotspot, a commercial/enterprise “small cell” (femtocell), the proposed unlicensed-band, or an entirely new mobile device technology (such as millimeter-wave). Test solutions for each of these technologies have individually been in production many years. For instance, the launch of another millimeter-wave technology, IEEE 802.11ad, is scheduled for next year.

The challenge with 5G is really in testing the interoperability and seamless handover of these systems in the dense environment of a smartphone. This must be done without causing inter-system noise, effectively inducing de-sensitization of the devices and in turn reducing performance. The focus for 5G test challenges will be “user experience” testing.

Meanwhile, 4G still has significant lifespan and new technology deployments planned, such as more carrier aggregation (both inter-band and intra-band), heteronet topologies, etc. LTE penetration is high in the US, but is currently experiencing rapid growth in areas like China and India. We believe that there is still a significant need for test equipment and new test technology required for 4G—at least for the next few years.