Tech Exchange - Testing Today's Devices

What do you consider the most critical service you provide to your customers to meet their testing project needs?

Dr. Tom Kite, VP of Engineering at Audio Precision **[1]:**

At Audio Precision we pride ourselves upon delivering the most trustworthy and well-integrated test solutions in a package that is intuitive and easy to use. We are 100% dedicated to audio test, and we bring countless man-years of experience in all aspects of the audio industry to our products. We understand our customers, and we want what they want.

Erik Org, Senior Marketing Manager at Azimuth Systems **[2]:**

Azimuth Systems' field-proven, automated wireless test solutions bring the real world in to the test lab more effectively and affordably than ever before. This is critical to our customers. Azimuth's ability to enable its customers to test what really matters – how their products will perform under dynamic, real-life conditions – truly sets us apart in the wireless test market. Being able to accurately replicate and then evaluate the user experience under real-world conditions in a controlled laboratory setting makes testing considerably more affordable and reliable.

Azimuth solutions, such as Azimuth Systems' Field-to-Lab (FTL) test solution, significantly reduces the need for multiple rounds of costly and time-consuming drive testing by allowing our customers to maximize the usefulness of data achieved through a single round of drive testing. That data can now be used as the basis for more comprehensive and effective testing in the lab and can be used to create a reference environment for apples to apples testing by multiple participants

in the value chain. Efficient real world performance testing across the entire product design cycle results in higher quality devices that perform as expected in the field.

David Hall, Senior Product Manager at National Instruments **[3]:**

National Instruments (NI) is a provider of software-defined, modular test equipment that supports the testing of a wide range of devices capabilities, including RF radio, battery, audio and video interfaces, and even display testing. For most of our customers testing mobile devices, we are generally able to lower their cost of test by reducing their capital expenditure and reducing overall test times.

NI also provides a wide range of software services to test customers as well. Our customers use NI's software packages such as NI TestStand and NI LabVIEW software to quickly and easily deploy new device testers. In some cases, you'll even find NI field engineers onsite in a manufacturing facility, helping our customers troubleshoot their test software.

Nigel Wright, Vice President of Marketing at Spirent **[4]:**

Wireless technologies are increasing in complexity and are rapidly pushing test requirements well beyond the scope addressed by standardized tests.

Spirent has a very unique position within the wireless testing arena. Being a pioneer in many of the wireless technologies and maintaining an active role in driving and authoring wireless testing standards, Spirent is able to serve as a trusted advisor to our clients and work closely with them across all phases of design, development and operator acceptance testing. The wireless industry has come to rely on Spirent for its understanding of the growing challenge of successfully testing new technologies and for providing the industry's most comprehensive test solutions.

Our experience has shown that it's not enough to just enable testing. If testing is too difficult to set up, errors will be introduced. If the test solution's coverage is not complete, bugs will be found in the field rather than in the lab. If it's too time-consuming or demands too many resources, it won't get done.

With this in mind we have simplified the way test equipment is controlled, we've ensured that our solutions offer valuable, easily interpreted feedback and we have streamlined some otherwise complicated test setup processes, and we have done this across several solution areas. Spirent's long-standing leadership and proven expertise continues to be the most critical service that enables our customers to successfully meet their ever evolving testing needs with the highest level of success and assurance.

How have you addressed the market's need for a single automated test solution for both analog and digital reproducible audio test results?

Dr. Tom Kite, Audio Precision:

With the APx line of audio analyzers we bring a modular approach that allows developers and designers to tailor the tools they purchase to precisely their needs in any combination. 2, 4, 8, or 16 channels of analog, Serial Digital, Bluetooth, HDMI, PDM – all of these interfaces can be installed into a single analyzer, controlled by a single, consistent software package. With APx, there is no need for external boxes or convertors in order to get the work done; it's all there, it's all calibrated and ready.

With APx500 v3.0, we're offering Perceptual Audio testing (PESQ) as an option directly in the software. When this is combined with our other interfaces, designers have a powerful toolset that addresses virtually every audio question in smartphone development.

Erik Org, Azimuth Systems:

Azimuth's solutions-focused wireless test equipment offers unparalleled automation capabilities. Azimuth's Field-to-Lab solution, for example, is the first and only solution in the industry that allows users to automate their entire test bed in a modular, non-programming environment, allowing even novice users to write automation modules.

Automation helps save even more time and money, while reducing the effort required and improving product quality, and, ultimately, enabling more widespread testing. Automation is essential since most laboratory testbeds are complex with many components that need to be controlled/configured and there are also large amounts of data to crunch. For Azimuth, end-to-end automation involves automating the entire testbed so that the whole test process - from initializing the equipment through to collecting the results – can be done automatically.

Automation plays a significant role in improving the product quality since the time savings enabled by effective automation allow users to do more testing and also reduces the chances of human error in the test process. The open, simple and powerful architecture of FTL's automation also means that users can share it not only within their company but across their entire supply eco-system, thus helping

drive consistency in the way things are tested and providing more reliable results.

David Hall, National Instruments:

Our primary philosophy for designing test solutions is based on the idea of using modular and reconfigurable test systems. We offer test equipment based on the PXI platform, which is a test equipment platform designed from PC standards such as PCI and PCI Express. By offering products for audio test, RF test, and video test, as separate modules, our customers are able to configure a single test solution that addresses all their test needs. Specific to audio test, our customers utilize NI AudioMASTER software with our analog audio and digital audio analyzer hardware to ensure audio quality in mixed signal applications. Most test configurations for mobile devices include an RF signal generator and analyzer for RF testing, a dynamic signal analyzer for acoustic audio testing of microphones and speakers, an HDMI analyzer for video output testing, and a battery simulator for DC testing and device power-on.

In what ways have today’s test equipment and software tools helped to reduce time to market and stay within budget?

Dr. Tom Kite, Audio Precision:

Increasingly, the audio devices being brought to market are profoundly multi-functional and multi-disciplinary. A modern smartphone, for example, contains audio signal paths that include digital MEMS mics, analog headphone outs, optical digital I/O, Bluetooth, HDMI and sometimes more. Telephony, perceptual audio and high fidelity audio must all be handled. Designers need to understand how each of these interfaces works and how they interact with the rest of the system.

AP’s approach saves time and money and reduces error by providing all the interfaces, tools, tests and reports in a single, reliable package with complete test automation, an intuitive PC-based UI and full integration with .NET and LabVIEW projects for a fast ramp-up. Engineers can take test suites directly from the bench and move them to the production line, where products like our APx515 can perform comprehensive test sequences in just a few seconds. Manufacturers get consistent reports they can trust at every stage of development and production from the recognized leader in audio test.

Erik Org, Azimuth Systems:

Effective testing solutions are critical to delivering products that will consistently work as expected by users, with no post-deployment surprises in quality or reliability -- which can be costly to fix and in some cases, may cause irreparable damage to a company’s reputation. The most effective testing solutions benchmark the end-users’ experience – after all, happy customers are a key element of business success. But replicating random dynamic field issues in the lab has always been difficult. Carriers, device vendors and infrastructure providers all perform drive testing, but duplicating a customer-reported issue by driving the route again and again and simply waiting for the failure to reoccur is both unreliable and resource-

intensive.

As we look back over the last few years, there have been limited alternatives for lab-based, real world wireless testing – until now. The introduction of solutions such as Azimuth Systems' Field-to-Lab test solution, allow the creation of more accurate real-world conditions in the lab, based on field data, using channel emulators. The ability of a field-to-lab method to remove the uncertainty from real world drive testing and then replace a significant portion of that drive testing with an equivalent lab-based test saves time and money. When combined with full end-to-end automation, a key aspect of Azimuth Systems' Field-to-Lab test solution, it can save even more time and money, while reducing the effort required to perform iterative testing such as benchmarking and troubleshooting.

Today's test tools are clearly essential elements in any company's strategy to reduce time-to- market and stay within budget. The more real world testing that operators and equipment vendors can do prior to product deployments, the more confident they can be that their customers will be happy. While perhaps a bit obvious, it's never been truer that better and more efficient real world testing leads directly to improved product quality and reduced time-to-market.

David Hall, National Instruments:

One major innovation National Instruments has made in the test equipment industry is the use of PC-based technology to reduce test time. Historically, if you analyzed the overall test time of many mobile devices, you'd observe that one major bottleneck was due to the measurement speed of the instrumentation. Today, by using PC-based measurement technology in conjunction with multicore CPUs and FPGAs, National Instruments is drastically reducing the test time of most measurements. In generally, our customers are finding that they can reduce test time by up to 10x by using PXI technology.

Nigel Wright, Spirent:

This is a huge topic at our end of the industry. We've found that putting the extra effort in our designs can result in equipment that literally pays for itself when time-to-market and engineering-hour savings are monetized and amortized over the equipment's life span.

As an example, as our customers were being asked to "do more with less", the complexity of advancing wireless technologies made receiver testing extremely complex. This drove the development of new architectures in the software used for our VR5 HD Spatial Channel Emulator, our MIMO-OTA Environment Builder, and our MIMO/Beamforming Test System. Now an engineer fresh out of college can confidently create and run testing scenarios that might otherwise require a significant amount of time from an experienced RF engineer.

As another example, our work with mobile device developers pointed to a huge opportunity for our customers. While the test labs used automated systems, DVT in the R&D labs often required engineers to spend weeks writing or maintaining scripts

that mimic network behavior. Even then, it’s been common for scripted solutions to not replicate real-world network behavior fully. Spirent adapted some of our technology to create the CS8 Device Tester specifically designed for the R&D engineer. In a recent demo, the engineer’s prototype UE attached to the emulated network within 5 minutes of unboxing the CS8. The customer told us it had taken weeks to get that far with the equipment he had previously been using.

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