Tektronix helps PMTC with compliance tests on high-speed buses.

Solution Summary

Challenge	To enable one of Europe's leading multimedia test houses carry out compliance testing on high-speed serial buses including USB2, Serial ATA and PCI Express.
Solution	A suite of instruments based around a Tektronix TDS6154C high-speed digital oscilloscope provides all the necessary features for testing, analysis and documentation.
Benefits	Only the 15 GHz bandwidth of the Tektronix oscilloscope offered the capability to test present and future high-speed buses. In addition, the software packages and interconnectivity of the instrument meant that comprehensive analysis and archiving could be carried out quickly and easily.

PMTC (Professional Multimedia Test Centre), based on a high-technology university campus in Hasselt, Belgium, is active in a number of sectors including certification and testing, multimedia content creation and intelligent display solutions. Originally spun off from a division of Philips set up to develop CD-i technology, PMTC is now one of the leading multimedia test centres in Europe, and numbers among its customers many worldwide market leaders in the electronics and multimedia sectors, including Microsoft, Intel, Philips, Nokia and BenQ.

PMTC is particularly well established in the evaluation and compliance testing of high-speed PC bus systems,

and an important part of its work is the certification of USB bus based products. PMTC is the only officially recognised (by relevant standards bodies) test laboratory in Europe for USB and FireWire certification, and it has extended its expertise in this sector to carry out pre-certification on other high-speed buses including PCI Express, Serial ATA, HDMI, DVI and Ethernet plus low-speed automotive serial buses such as CAN, LIN and MOST (Media Oriented System Transport). The company is well on the way to gaining standards body certification for Serial ATA and PCI Express compliance, and the eventual aim is that it will become the reference site in Europe for official certification of other bus systems.

In testing for compliance with the various bus standards, PMTC looks at the key areas of functionality and compatibility, which involves examining the bus signals in detail. Since some of the buses are operating in the multi-gigahertz region (Serial ATA Generation 3 operates at 6 GHz, for example), there is a requirement for test instruments - in particular, oscilloscopes - that operate at even higher speeds.

PMTC has been a long-term user of Tektronix oscilloscopes and has a good relationship with local distributor C.N.Rood, and so it was natural to turn to Tektronix for a measurement solution to answer the challenges of these high-speed buses. "We are aware of the products offered by other manufacturers," says Johan Craeybeckx, Business Development Manager at PMTC, "but we felt that Tektronix offered a more mature solution to meet our requirements."

The test system proposed by Tektronix and installed by PMTC is based on a TDS6154C digital storage oscilloscope with a bandwidth of 15 GHz. Also included in the measurement set-up are two P7313 Z-Active™ differential probes, a CSA8200 communications signal analyser, two 80E04 electrical sampling modules, iConnect software and an AWG710B arbitrary waveform generator. Already on site was a TDS654 oscilloscope which has been retained for lower-speed testing. Although the speed and performance of the TDS6154C make it the key product for the high-speed bus tests, the CSA8200 is important for signal-path analysis using time-domain reflectometry and return-loss measurements, while the AWG710B provides the customised signals needed for stimulus/response testing. All the instruments are in the process of being networked using an Ethernet system, and LabView

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measurement software will be installed to aid the display and analysis of results.

In addition to its 15 GHz bandwidth, the TDS6154C offers a number of features that make it ideally suited to testing high-speed serial buses. It incorporates the versatile Tektronix Pinpoint™ triggering system, which offers over 1400 combinations to address virtually any triggering situation. In particular, serial pattern triggering can be carried out at up to 3.125 Gbit/s, and serial data analysis and compliance testing is possible at rates of 6.25 Gbit/s and above. The use of OpenChoice® software with a built-in Microsoft Windows XP operating system means that the oscilloscope can be networked with other instruments or with PCs for the archiving and analysis of test results, and also means that it is possible to run application software packages to simplify critical tasks.

Tektronix offers a number of technology specific software solutions for applications such as serial data analysis, jitter testing, communications and power measurements, including targeted bus measurements and analysis for PCI Express, Serial ATA, HDMI, Ethernet, DVI and USB2.0, and the PMTC installation

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incorporates all of these.

Of particular interest to the PMTC team is the TDSUSB2 physical layer verification and compliance test package, which eliminates the tedium of manually setting up the oscilloscope by providing predefined oscilloscope setups for various USB2.0 tests, allowing proper characterisation of their designs and verification of compliance to industry standards. Characterisation of these electrical signals includes mask testing as well as parametric testing at rates of up to 480 Mbit/s. Users can quickly perform all recommended tests, such as eye diagram and parametric testing for low-speed, full-speed and high-speed hosts, devices and hubs. The comprehensive test fixture supports a wide range of tests.

Parameters tested by the TDSUSB2 application include signal quality, receiver sensitivity, chirp, reset, resume, suspend, packet parameter and monotonicity. Automatic rise and fall time measurements increase test throughput, while automatic de-skew helps to ensure accuracy. An online 'help' facility fully documents test procedures, while functions such as reporting formats

and measurement limits for tolerance testing are user configurable.

Quick 'pass/fail' tests substantiated with results make the TDSUSB2 application an ideal solution for USB2.0 physical layer validation. In-depth analysis is possible with the statistical information about the tests performed. The user-defined measurement limits also help to perform tolerance testing on a design.

"Not only does the application software speed complex tasks that would be time-consuming for a human operator," says Craeybeckx: "It also ensures accuracy and reproducibility, so that we get the same result every time." This means that test results can be replicated - by customers who have the same equipment, for example. This ability to exchange test results interactively - even with users in other countries or continents - is seen by both PMTC and Tektronix as a major benefit of this latest generation of network-enabled test instrumentation.

An important ongoing element of PMTC's compliance test activities is that, as part of their consultancy work, they help customers with the evaluation and debugging of their bus-based designs. Customers can bring their products in for detailed analysis, 'sit in' on the test session, and make modifications interactively to optimise their design.

This process offers benefits to both PMTC and Tektronix, who both view their relationship as a long-term partnership. The performance and communications capabilities of the Tektronix instrument suite allow PMTC to work closely with key customers – both within the PMTC laboratory environment and remotely via web links. The ability to carry out this process rapidly and interactively is helping PMTC to win new customers in the expanding markets for high-speed serial bus based devices.