AUTOTESTCON 2010 Technical Highlights
Jointly presented by the IEEE Instrumentation & Measurement and IEEE Aerospace & Electronic Systems Societies

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From the Editor's Bench
Shlomo Engelberg

Measuring the Right Parameters

All of us spend a lot of time making sure the measurements we make are accurate enough to meet our needs. Sometimes we hyper-focus on the quality of our measurements and do not consider the relative importance of the measurements. Rather than focusing immediately on the quality of our measurements, we ought to start by asking ourselves what we are really trying to measure and whether or not we are trying measure what really ought to be measuring.

When faced with evaluating how well a unit is performing, we try to measure the unit's performance. If the unit under test (UUT) is expected to perform several tasks, we try to measure how well it performs each task. In such cases, we must decide how much to invest in evaluating each facet of the UUT's performance. Before we decide how much to invest in each evaluation, we ought to take a step back and consider which evaluations are most important. When evaluating less important facets, we should expend less effort, and when examining the most critical elements of the UUT's performance, we must expend more effort.

I am a college professor, and recently I was a member of a committee considering someone's promotion. The committee was charged with examining the candidate's performance and determining whether or not the candidate was worthy of promotion. Before that decision could be made, the members of the committee read their letters of appointment carefully and decided what they were being requested to measure and evaluate. Only after this determination was made, did the committee decide what information to request and how much effort to put into the evaluation of each of the facets of the candidate's performance.

As is often the case in "real life," the determination could not be made in a totally scientific fashion. By their nature, academic institutions serve many purposes. In most colleges, professors are expected to teach undergraduate (and often graduate) students, to perform research, and to take part in the administrative tasks that must be performed to run the college. Before a committee can start examining a candidate, the committee has to decide how important each area is – and this can lead to some lively discussions. The importance of the three factors – teaching, research, and service to the institution – vary from college to college. Before time is expended on making the "measurements" that will be used in the evaluation, the folks making the evaluation have to work out what the relative importance of each of the factors is, what measurements should be made, how much effort should be spent on each type of measurement, and how much weight to give each measurement in the report the committee prepares about the candidate.

A good magazine article takes an important subject and presents it to the magazine's readers in a fashion that makes it accessible to much of the magazine's readership, informative, and, hopefully, enjoyable.

At the IEEE Instrumentation & Measurement Magazine, when we receive a submission, we try to determine, to measure, its quality. This requires balancing all the different factors that go into a good magazine article and deciding whether a particular submission will serve the magazine's purposes and be accessible to a large fraction of our readership. While preparing each year's AUTOTESTCON issue, I try to read through most of the articles in the Proceedings to determine which of the articles seem best for the magazine. Though time consuming, I find it very interesting to read about the kinds of problems the authors face and to see the solutions they have found. I hope that you, too, will appreciate reading some of the best written and most interesting articles reprinted from the Proceedings of AUTOTESTCON 2010.

Enjoy!

Shlomo

Greetings from Kim Fowler, the Instrumentation and Measurement Society President

AUTOTESTCON is a premier conference for military, aerospace, and industrial instrumentation. Its primary and perennial theme is automated test systems for military equipment. The Instrumentation and Measurement Society, IMS, is very pleased to co-sponsor AUTOTESTCON with the IEEE Aerospace and Electronic Systems Society, AESS.

AUTOTESTCON and I2MTC are the largest conferences that IMS sponsors. Both conferences address concerns and issues related to instrumentation and measurement and have complementary markets. AUTOTESTCON tends to be more applications-focused within the military and industrial markets, while I2MTC tends to have a more academic focus. Both conferences are extremely important venues for presenting and exchanging ideas and advances in instrumentation and measurement.

Over the years, AUTOTESTCON has been very successful, drawing 200 to 300 exhibitor booths and upwards of a thousand attendees. This year should be no exception. AUTOTESTCON's Board of Directors and Conference Committee have been diligent in preparing a remarkably successful conference. I commend them on their ongoing efforts and thank them, as well as the General Chairs and the Technical Program Chairs, for hosting AUTOTESTCON.

This issue of the I&M Magazine contains selected paper reprints from AUTOTESTCON 2010. I trust you will find them interesting, and that you will consider attending a future AUTOTESTCON.

Kim

Welcome to AUTOTESTCON 2011 from Marina Ruggieri, the IEEE Aerospace and Electronic Systems Society President

The focus of the Aerospace and Electronic Systems Society (AESS) is the organization, systems engineering, design, development and operation of space, air, ocean, and ground complex systems through the effective interaction among the three pillars of the aerospace, electronics, and defence sector: industry, institutions, and research centers.

AUTOTESTCON is very well framed within the field of interest of AESS. It is a successful conference for the military, aerospace, and industrial instrumentation communities. AUTOTESTCON provides an excellent example of enhancement and dissemination of the culture of complex systems through the international community, bringing a large and beneficial exchange of experience and achievements among our members. AESS is extremely proud to be a primary sponsor of AUTOTESTCON – since its founding in 1964 – and partner with IEEE in one of its most successful application-focused conferences.

AESS is also pleased to share the sponsorship with the Instrumentation and Measurement Society (IMS). It is a good opportunity to thank the IMS for its support and for this special AUTOTESTCON issue of the *IEEE I&M Magazine*. A special thank-you goes to the AUTOTESTCON Conference Committee and the AUTOTESTCON Board for their extraordinary effort to make AUTOTESTCON 2011 a great event for the whole engineering community!

Marina

Article Summaries

Reducing Obsolescence of Linux-Based ATEs with Virtualization

(Summary)

Casey Weltzin and Sarah Schlonsky

This paper presents an overview of virtualization technology and explains how it can be used with Linux-based automated test equipment to maximize code reuse, enable support for a wide variety of commercial off-the-shelf hardware devices, and ultimately reduce the risk of obsolescence. Tradeoffs of virtualization, including potential performance impacts, are also discussed.

This summary includes text from the article.

Fundamentals of Modern Spectral Analysis

(Summary)

Matthew T. Hunter, Achilleas G. Kourtellis, Christopher D. Ziomek, and Wasfy B. Mikhael

In this paper, the authors cover several of the fundamental or key design parameters affecting the performance of a spectrum analyzer. A high level overview of the spectrum analyzer dynamic range is presented, and the authors show how it can be achieved with both Fast Fourier

Transform-based spectral analysis and Swept Spectrum Analyzer-specific signal processing. The effect of instantaneous bandwidth on system flexibility and measurement speed are discussed, and the authors explore the importance of image rejection and anti-aliasing and how the lack thereof can lead to false measurements.

Miniature MEMS-based Data Recorder for Prognostics and Health Management (PHM)

(Summary)

Sonia Vohnout, Matt Engelman, and Eniko Enikov

In this paper, the authors present an innovative design for a prognostics and health management (PHM) data recorder that will facilitate sense-and-response logistics and provide a small and inexpensive package. This low-cost, low-power, and lightweight solution is based largely on commercial off-the-shelf (COTS) components; it is implemented using a standard low-power lightweight microcontroller core and COTS microelectromechanical systems sensors to record and process local temperature and vibration data, and status reporting is implemented using a short range wireless transceiver.

Army Repair Depot Automated Test System Modernization

(Summary)

David R. Carey

With advancing technology and increasingly complex electronic systems, unique Automated Test Systems (ATS) has become a problem of maintenance test strategies at the depots, given the high costs of modernizing or replacing ATS and its potential effect on meeting mission success requirements. The aging testers are becoming increasingly out of date and more difficult to support. When the testers do not work properly, maintenance can suffer, and mission readiness can be adversely affected. This paper analyzes the problem and presents a plan for modernization of ATS at the Army depots that satisfies Army Regulation, AR750-43, and the U.S. Department of Defense (DoD) ATS acquisition policy.

Bridging Design and Implementation for a More Practical Condition-Based Maintenance Plus (CBM+) Solution

(Summary)

Mark P. Zachos and Karl E. Schohl

This paper is a technology update, describing the use of the newest vehicle diagnostics system, the Smart Wireless Internal Combustion Engine (SWICE) "At Platform" Test System interface, which can be used as a mini-vehicle computer system. SWICE consists of hardware devices, software applications, and other interface components, and supports the Army's product director-test measurement and diagnostic equipment division. The objective of this system is to further enhance Condition-Based Maintenance Plus secure diagnostics, data logging, prognostics and sensor integration to support improvement of the U.S. military ground vehicle fleet's uptime to enhance operational readiness.

This summary includes text from the article.

A Current-Controlled Variable Inductor

(Summary)

Rich Hooper, Bill Guy, and Rick Perrault

The paper begins by looking at different techniques for implementing a variable inductor: moving cores, switched decade boxes, gyrator circuitry and saturable core reactors. The authors present the pros and cons of the different technologies and then the development of a saturable core reactor as the chosen technology. Fundamental formulae used during the development of the variable inductor, test results for a number of developed prototypes, and the development of a highly-accurate control loop used to precisely maintain the value of the controlled inductance are presented. The paper concludes with a brief discussion of the ATS that ultimately housed the variable inductor.

This summary includes text from the article.

Columns

Recalibration

First in a Series on the Evolution of Time Measurement:
Celestial, Flow, and Mechanical Clocks

(Summary)

Michael A. Lombardi

In this article, the first of a four-part series, the author discusses how time measurement has evolved throughout history. Beginning by describing some early clocks and the first attempts to measure and keep time, he discusses that timekeeping is fundamentally different and more challenging than other measurements because it requires continuity. Because the passage of time never stops, a stopped clock is useless. To become useful again, it must be restarted and

synchronized with another clock that continued to measure time during its absence. The author discusses how time, as we know it, is an agreed upon standard.

Departments

New Products

New Keithley E-Handbook: Making Precision Low Current and High Resistance Measurements

Testing and characterizing the newest materials and devices requires making current measurements at nanoamp levels and below. Either the generated current is low, or very low power materials must operate with very low currents to minimize power dissipation and destruction due to self-heating. Similarly, high resistance measurements on insulators, polymers, ceramics, and lightly doped semiconductors also demand the ability to measure very low currents.

Keithley has published a new e-handbook that covers these low current measurement topics:
‣ Measurement Circuit
‣ Leakage Currents and
Guarding
‣ Noise and Source Resistance
‣ Zero Drift
‣ Generated Currents
‣ Overload Protection
‣ AC Interference and Damping
‣ Using a Coulombmeter to Measure Low Current
And it also covers these high resistance measurement topics:
‣ Constant-Voltage Method
‣ Constant-Current Method
‣ Guarding
‣ Settling Time

To download your copy, please go to http://gw1.vtrenz.net/?HBNASXNCAV:UDG7ZQEXTJ.

Common-Core Platform provides Scalable and Reconfi gurable Signal Switching for RF and Microwave ATE

Giga-tronics Incorporated announces the release of the new Giga-tronics ASCOR Common-Core based signal switching solutions, the Series 8800. This family of products provides a modular RF/ LF/DC switching platform that is scalable and reconfigurable to meet existing and emerging test requirements, covering the DC to 50 GHz frequency range.

Scalability and reconfigureability are achieved in a number of ways:
‣ Configurable switch modules. The standard Series 8800 has twelve switch modules which can be equipped with various relay configurations, including multiple SPDT through SPnT (n=3 to 6) relays, both terminated and non-terminated varieties. Other relay configurations are available. Modules can be added or replaced when test requirements change.

‣Component integration area. Should other signal conditioning components be required, there is a place to add components such as programmable attenuators, amplifiers, filters, circulators / isolators, and power dividers / combiners.

‣Removable front and rear panels. Front and rear panels can be tailored to a specific application, including with custom labels for intuitive RF interconnection. Relays can also be mounted directly to the panel to maximize relay performance (relative to internally integrated relays which will have additional cable loss and increased path VSWR).

‣GT-8300A integration.

The Series 8800 integrates the Gigatronics ASCOR model GT-8300A. This mainframe accepts the wide variety of Series 3000 modules. With nearly 200 existing designs available, users can supplement the RF switching capability with DC and low frequency switching as well as digital I/O and DMM functionality.

Find more information at www.gigatronics.com.

High Performance Millimeter-Wave Signal Analyzer

Agilent Technologies Inc. claims the PXA signal analyzer to be the industry's highest performance millimeter-wave signal analyzer, covering frequencies up to 50 GHz. With external mixing, it can cover 325 GHz and beyond. The result is easier, more accurate millimeter-wave measurements.

Its ability to measure small signals in the presence of very large signals is unparalleled and enables customers to develop the most advanced radar, surveillance and wireless communications systems. Extending this performance to 325 GHz and beyond allows customers to develop technology for advanced radio astronomy research and new imaging techniques used in the medical and air travel industries.

The robust hardware design of the PXA delivers outstanding sensitivity and wide dynamic range. To further enhance these inherent hardware capabilities, the PXA uses exclusive technologies like low noise path and Noise Floor Extension (NFE) to remove distortion noise and further widen dynamic range. This allows the PXA to measure the smallest of signals in the presence of very large signals, a task that has challenged test engineers and is critical to designing and testing leading-edge millimeter wave systems.

The lower noise offered in all measurement configurations allows the PXA to achieve the same sensitivity as other analyzers at a resolution bandwidth that is 10 times greater, resulting in sweep times that are one hundred or more times faster. For added flexibility, the PXA's frequency coverage can be extended to 325 GHz and beyond with external mixing.

The PXA supports Agilent's new M1970V/W waveguide harmonic mixers, which provide higher performance, up to 110 GHz, and dramatically improve ease of use in millimeterwave measurements. These smart mixers use a simple USB plug-and-play connection to automatically configure the PXA for the specific mixer connected, including downloading conversion loss data.

For more information on the millimeter wave PXA or Agilent smart mixers, go to www.agilent.com/find/X-Series_enhancements and www.agilent.com/find/smartmixers, respectively.

Innovative Measurement Arm

FARO Technologies, Inc. introduces the FARO Edge and V4 Laser Line Probe. The FARO Edge is a portable measurement arm that allows manufacturers to easily verify their product quality by performing inspections, tool certifications, CAD-topart analysis, and reverse engineering via hard probing and non-contact laser scanning.

The Edge improves production, quality, and reverse engineering processes by rapidly verifying or scanning parts with confidence and accuracy. The new Arm also simplifies the user experience with improved performance, portability and reliability.

The all new Edge features the first ever integrated personal measurement assistant. With its built-in touch screen and on-board operating system, the Edge revolutionizes portable metrology by providing stand-alone basic measurement capability. Available in three popular working volumes and7-axis configuration, the Edge is the perfect fit for any portable measurement application, eliminating the guess work of which length is right for the job.

Seven axes of rotation ensures you always get the most flexibility out of your device. Additional capability includes:
▸▸Enhanced Connectivity – *Bluetooth*, WiFi, USB, and Ethernet ready to provide multiple device management through networking.
▸▸ Smart Sensor Technology – Improved sensors warn against excessive external loads, correct for thermal variations, and detect possible setup problems.
▸▸Ergonomics – Improved weight distribution and balance for reduced strain and ease-of-use. Patented internal counterbalancing provides comfortable, stress-free use.
▸▸Multi-Function Handle Port – Seamless and interchangeable accessory integration. Quick-change handle. Expandable capability.

The all new FARO V4 Laser Line Probe's wider laser stripe significantly increases scan coverage without sacrificing accuracy, while variable capture rates can produce over 45,000 points per second for exceptional speed and feature definition. Taking advantage of the Edge's multi-function, quickchange handle port, the V4 Laser Line Probe integrates seamlessly and instantly becomes part of the arm. It is lighter weight, amazingly compact and completely unobtrusive. Learn more about the FARO Edge at www.faro.com/edge.

Food-Handling Robotic Tool Changer

ATI Industrial Automation has developed a Robotic Tool Changer that meets the stringent requirements of the food industry. The QC-77 Tool Changer includes a stainless-steel design that resists attack by organic and inorganic compounds while withstanding the aggressive wash-down cleaning methods used in the food industry. Featuring ATI's patented Fail-Safe Locking Mechanism, the new Tool Changer has Lock and Unlock sensing integrated into its design for safe Coupling and Uncoupling. Other size Food-Handling Tool Changers are currently under development.

Product Features Include:
▸▸ Stainless Steel design with high strength.
▸▸No-Touch Locking technology allows up to 0.08 in (2.0mm) plate separation when locking.
▸▸ Internal proximity sensors are designed into the body of the Master plate to verify the Lock/Unlock position of the piston and cam. Sensors provide the Lock and Unlock (L/U) signals through the sensor cables provided.
▸▸ 440C Stainless Steel locking mechanism for increased corrosion resistance.
For more information, please visit www.ati-ia.com.

Wireless Process Transmitter

Omega's new wireless process transmitter for sensors with voltage or current output converts process signal to wireless up to 120 m. It accepts 0 to 1 V, 0 to 5 V, 0 to 10 V and 4 to 20 mA signals.

Free software for monitoring, recording, and data logging is included. This product features a low power operation/ sleep mode for long battery life and works with Omega's UWTC-REC family of wireless receivers.

For further information, please visit www.omega.com/pptst/UWPC-2-NEMA.html.

Analyzer for Automated 10/100/1000BaseT Ethernet Physical Layer Testing

The PhyView Analyzer from Sifos Technologies introduces a brand new concept in the verification of 10/100/1000 BaseT Ethernet ports. The PhyView Analyzer is plug-n-play, fully-automated, multiport, multi-pair and a true physical layer test & measurement solution.

Sifos claims the PhyView Analyzer provides highly automated insights into 10/100/1000 BaseT Ethernet interface performance and will present an attractive alternative to traditional methods of Ethernet Physical Layer and Packet Testing to verify 10/100/1000BaseT Ethernet port functionality.

Key Features of the Phyview Analyzer family include the following:
▸▸Fully Automated Live Link Analysis of 10/100/1000BaseT PHYs
▸▸One-Button Comprehensive PHY Testing and Graphical Reporting
▸▸Radically New Plug-n-Test PHY Transmission Measurements
▸▸Versatile, Programmable Impairments for LAN Receiver Testing
▸▸ Stressed Receiver Assessment Measurements
▸▸Up to 24 Test Ports (96 Gigabit Pairs) per PowerSync Analyzer Chassis
▸▸Portable 2-Port Compact PhyView Analyzer Model
▸▸PoE Impairment Testing Using Sifos PoE Test Cards
▸▸Combine PhyView Analyzer Impairments with Packet Analyzers

Visit **www.sifos.com** for further information or contact the company at +1 978 640-4900.

LTE Test Mobile Adds Support for Beamforming and 4 x 2 MIMO

Aeroflex Limited announces the TM500 LTE test mobile has increased the number of modes it supports to include user equipment (UE) beamforming and 4 x 2 MIMO, as specified in Release 8 of the Third Generation Partnership Project (3GPP) Long Term Evolution (LTE) standard.

The TM500 test mobile allows engineers developing LTE base stations (eNodeB) or physical layers (PHY) for eNodeB to perform beamforming and 4 x 2 MIMO (transmit diversity and spatial multiplexing) measurements either in the laboratory or over the air in a trial LTE network. Beamforming and transmit diversity techniques are used in LTE networks to improve cell coverage and spectrum efficiency. Dual-layer beamforming (Rel-9) can also boost cell average throughput by allowing multiple devices, under the appropriate operating conditions to share the same base station resources.

Aeroflex claims the TM500 test mobile is the most widely used instrument worldwide for testing the performance of base stations. Designated as Transmission (Tx) Mode 7 in LTE Release 8 (Rel-8), beamforming is very important to achieving the best performance from LTE. Although the technique is mainly applicable to Time Division Duplex (TDD) modulation, the TM500 can support beamforming in both TDD and Frequency Division Duplex (FDD) modulation schemes. MIMO is applicable to both TDD and FDD, and the TM500 supports the 4 x 2 MIMO feature when operating in either mode.

Find more information at www.aeroflex.com.

New Oscilloscope Series

ZTEC Instruments has developed the ZT4620 Oscilloscope series as an updated, improvement solution for the ZT1428VXI, the original replacement for the Agilent E1428A (equivalent in form, fit and function). The ZT4620 series is engineered specifically to provide forward-thinking capability and headroom for future challenges.

Improvements and new features of the new ZT4620 series include a 3X reduction in RMS noise over the ZT1428, and a 2X increase in bandwidth. The ZT4620 series come with the ZScope™ GUI to simplify system integration and debugging. Other new features versus the ZT1428 include: FFT capability, deep and segmented multi-capture memory, more measurements, more waveform math and acquisition modes, comprehensive selftest and calibration functionality, advanced analog and digital triggering, as well as additional comprehensive drivers: IVI, C/C++, PnP (Plug and Play), LabVIEW, and COM.

This ZT4620 series includes total legacy instrument compatibility such as signal I/O, feature set, data processing, command interface, connector location, etc. For example, in order to support a legacy CASS test requirement, the 30 MHz analog filter roll-off is specified and tested to enable a CASS TPS to use a specific signal response within the filter stopband.

ZTEC claims the ZT4620 series functionality exceeds that of the original ZT1428, and consequently the Agilent E1428A, in almost all specifications. Key specifications for the ZT4620 series include an input of 8mVpp to 50 Vpp ranges, +/- 250 V offset adjustment, sampling rates of 10 S/s to 2 GS/s, equivalent time sampling rates of 2.5 GS/s to 100 GS/s, and a maximum capture length of up to 256M Samples.

For more information, please visit www.ztecinstruments.com.

New Streamline Manufacturing ProcessUses Apple® Ipad® Systems

Racine Federated Inc. (RFI) has introduced the EMAP (Electronic Management of Assembly Process) program as the next element in the corporate efficiency plan. The new EMAP system includes the deployment of several Apple iPads to the flow meter production line, including assembly, testing and shipping operations.

EMAP eliminates virtually all paperwork, moving RFI further in the direction of a paperless and sustainable operation. RFI initiated a comprehensive sustainability program in 2005, through the consolidation of all divisional operations into one new Racine facility. Subsequently, RFI began to develop other programs to increase efficiency and encourage economical and environmental improvements. The EMAP program is one of these developments supporting paperless efforts.

EMAP operates with each person obtaining an iPad from a charging station and logging in. The system will then instruct personnel on the type, quantity and priority of flow meters to build for that day. When assembly is complete, product is moved to testing/calibration and then on to shipping. Each department follows a similar process using the individual's iPad. Included in EMAP process software are pick-lists, inventory locations and individual work instructions.

RFI's sustainability programs are being developed to improve operations including energy consumption, recycling, streamlining processes, and paper reduction. Energy reduction programs have focused on improvements to the HVAC systems, improvements in lighting, temperature control, boiler monitoring and insulation. Future programs include broader based recycling programs and additional energy efficiency improvements.

For further information, see individual website links at www.racinefed.com.

USB RS-485 Serial Adapter Designed For Extreme Environments

Sealevel Systems, Inc. announces the SeaLINK+485- DB9, a new single-port USB to RS-485 serial adapter that utilizes Sealevel's expertise in military-grade designs by incorporating a ruggedized, overmolded enclosure. The SeaLINK+ 485-DB9 offers fast, reliable serial communication for even the toughest environments, including factory floor, mobile, and outdoor applications.

The serial port appears as a standard COM port to the host computer enabling easy setup and providing compatibility with legacy software. The SeaLINK+485-DB9 features programmable baud rate and data formats with 128- byte transmit and 384-byte receive buffers for fast, error-free communication.

SeaLINK+485-DB9 is compatible with all standard PC baud rates and supports high-speed communication to 921.6K bps. The adapter is powered by the USB port, and status LEDs molded into the enclosure indicates serial data activity and connection to the host.

All SeaLINK USB serial adapters ship with Sealevel Systems SeaCOM™ suite of Windows drivers and diagnostic utilities. WinSSD, a full-featured application providing powerful testing and diagnostic capabilities, is also included. Use WinSSD for Bit Error Rate Testing (BERT), throughput monitoring, and transmitting test pattern messages.

To meet the demands of working in harsh industrial environments, the SeaLINK+485-DB9 operates over an extended temperature range of -40 to +85°C. The attached 44 in (111.8cm) cable is fully shielded to protect the adapter from RF and EMI interference, which are common in mobile and industrial environments.

For more information, please visit www.sealevel.com.

Smaller Power Inductors for High Frequency Application

The Alpha-Core Division of Bridgeport Magnetics Group Inc. introduces a line of high power inductors for high frequency applications with a minimum 30% size and weight reduction using high performance gapped amorphous ribbon cores instead of conventional cores of silicon steel or powdered iron.

Alpha-Core's new amorphous core power inductors combine high inductance and current levels with low losses at frequencies in the 20 kHz range. High wattage switching mode power supplies

benefit from the compact design and much reduced weight. Other applications include power factor correction and harmonics filtering in UPS systems, variable frequency inverters and on-grid solar and wind power systems.

Alpha-Core power inductors are box shaped and fully encapsulated in black epoxy resin. The insulation system is class F (155º F). The two leads exit from the short end.

Initially, Alpha-Core offers inductance values ranging from 100 µH to 5,000 µH and RMS current ratings up to 60 A.
For more information, please visit www.alphacoredirect.com.

New Generation of 3D White Light Measurement Systems

Hexagon Metrology, Inc. announced today the immediate availability of their new white light measurement products in North America. The Cognitens WLS400M manual measurement system and the Cognitens WLS400A automated measurement system replace all former white light products from Hexagon Metrology.

Hexagon Metrology developed both hardware and software for these new systems. Customers can choose between a portable configuration and an automated system which can be operated with all common industrial robots. Cognitens systems are always turnkey solutions including the CoreView software suite by Hexagon Metrology. CoreView version 5.0 software has been configured to achieve improved utilization of the operating system, memory management, and thirdparty 64-bit software. This enhancement is critical in speeding up large point cloud processing and CAD utilization. In one case study, processing time was cut by 80%.

The new product generation comes with innovative, reliable, and safe Blue Light LED technology which enables a greater variety of surface finishes to be measured or reverse engineered. This advancement virtually eliminates the use of spray-on developers in all but the most extreme cases.

For more information, please visit www.HexagonMetrology.us.

The Electronics Explorer – An All-In-One Personal Circuit Design Station

Digilent Inc. announces the launch of the Electronics Explorer Board (EE Board), a powerful, all-in-one personal circuit design station. The EE Board is an affordable product designed for students, hobbyists, and engineering professionals and includes everything needed to build and test a wide range of analog and digital circuits right on the desktop, without the need for any other equipment.

The EE Board incorporates a solderless breadboard, a triple-output programmable power supply, a suite of test and measurement devices, and a high-speed USB2 port to connect to the users' own PC. The station works in conjunction with WaveForms™, a free software product that provides intuitive and easy to use interfaces to EE Board test and measurement devices.

Using only the EE Board and accompanying instrument pack, a wide variety of circuits can be constructed and tested by connecting to any one of the six included test and measurement devices, including: four-channel, 40 MSa oscilloscope, two-channel arbitrary waveform generator, triple-output power supply (two programmable), four-channel voltmeter, two programmable reference voltages, 32-channel logic analyzer, 32-channel pattern generator, and an assortment of digital I/O devices.

The EE Board is powered by PC-based WaveForms, a free software product that provides intuitive and easy to use interfaces to acquire, store, analyze, produce, and reuse analog and digital signals. A high-speed USB2 connection ensures all instruments respond in near real-time.

Find more information at www.digilentinc.com.

TC News

Technical Standards Activities:
Highlights Through the First Quarter of 2011

John Schmaltzel

What Technical Standards and Activities Do

Technical Standards and Activities is the component of IMS that is concerned with technical standards and related activities. Originally, *Technical Committees* (TCs) were formed to develop, maintain, and promulgate those standards within their chartered interest areas. Later, TCs were formed without a standards agenda; these TCs function more as technical interest groups with activities ranging from workshop planning to technical paper preparation and review.

To form a TC, a charter proposal is submitted to the AdCom by a group of interested people for review and approval. Alternatively, the AdCom may elect to charter a TC in order to capitalize on a perceived standards opportunity. Organizationally, a TC consists of a Chair, a co-Chair, and members. A TC may also create Subcommittees (SCs) to reflect subdivisions of interest within the TC; for example, as in the case of TC-10 (see below), there is a SC for each of the standards within TC-10's domain of interest. A list of the Society's nearly 40 TCs, their missions, and Chairs is maintained on the IMS website: http://www.ieee-ims.org. Once formed, a TC is reviewed biennially to determine its vitality and relevance; low-activity TCs are sun-setted.

This update provides samples of the many activities of the IMS TC portfolio. In addition, expanded details are given for several of the most active TCs.

TCs: Standards Development/Maintenance

TC-4, High Frequency Measurements and Connectors
Chair: Yeou-Song (Brian) Lee
Ron Ginley appointed as Chair for the Working Group for revision of IEEE STD 287-2007.

TC-9, Sensor Technology
Chair: Kang Lee
TC-9 is actively developing and promoting the following standards:
‣ IEEE STD 1451.0 – 2007, IEEE Standard for a Smart Transducer Interface for Sensors and Actuators Common Function, Communication Protocols, and Transducer Electronic Data Sheet (TEDS) Formats
‣ IEEE STD 1451.1 – 1999, Standard for A Smart Transducer Interface for Sensors and Actuators Network Capable Application Processor Information Model. Project P1451.1
‣ IEEE STD 1451.2 – 1997, Standard for A Smart Transducer Interface for Sensors and Actuators Transducer to Microprocessor Communication Protocols and TEDS Formats. Project P1451.2

‣IEEE STD 1451.3 – 2003, Standard for A Smart Transducer Interface for Sensors and Actuators Digital Communication & TEDS Formats for Distributed Multidrop Systems (withdrawn)

‣IEEE STD 1451.4 – 2004, Standard for A Smart Transducer Interface for Sensors and Actuators Mixed-Mode Communication Protocols & TEDS Formats. Project P1451.4

‣IEEE STD 1451.5 – 2007, Standard for A Smart Transducer Interface for Sensors and Actuators Wireless Communication Protocols & TEDS Formats. Project P1451.5 (to allow modifi cation at ISO's request)

‣IEEE STD 1451.7 – 2010, Standard for A Smart Transducer Interface for Sensors and Actuators Transducers to RFID Systems Communication Protocols & TEDS Formats. ISO/IEC/IEEE 21451 – 7 Project P1451.7 (to enhance 21451 – 7)

‣‣IEEE STD 1588 – 2008, IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems. ISO 61588:2004

Some activity highlights include:
TC-9 joined the IEEE Computer Society/Test Technology Committee to co-sponsor a Project Authorization Request (PAR) to develop a "Draft Standard for Design Criteria of Integrated Sensor-based Test Applications for Household Appliances." Any interested party may join TC-9 to work on this standard.

The IEEE 1451.1, .2, and .4 working groups conducted meetings to update their respective standards. The IEEE 1588 subcommittee met to resolve interpretation questions. IEEE 1451 members participated in the ISO/IEC/JTC1/WG7 Standards Working Group on Sensor Networks meeting held at NIST. They emphasized the harmonization of standards and avoidance of duplication.

The latest Sensor Standards Harmonization meetings were held in December 2010; others are planned for 2011. Those interested in participating may contact the TC-9 chair, Kang Lee (Kang.Lee@nist.gov).

A major activity of TC-9 is the continued planning for the highly successful IEEE Symposium on Precision Clock Synchronization (ISPCS) for Measurement, Control, and Communication. Included in ISPCS is a "plug-fest," which gives manufacturers an opportunity to demonstrate equipment interoperability and compliance with IEEE STD 1588. The next ISPCS will be held on September 12-16, 2011 in Munich, Germany. Organizing committee meetings will be conducted monthly to work out the final symposium details.

TC-10, Waveform Generation, Measurement & Analysis
Chair: Tom Linnenbrink
TC-10 is actively developing and promoting five standards:
‣‣IEEE STD 181-2003, Standard on Transitions, Pulses, and Related Waveforms
‣‣IEEE STD 1057-2007, Standard for Digitizing Waveform Recorders
‣‣IEEE STD 1241-2000, Standard for Terminology and Test Methods for Analog-to-Digital Converters
‣‣IEEE STD P1658, Standard for Terminology and Test Methods for Digital-to-Analog Converter Devices
‣‣IEEE STD P1696, Standard for Terminology and Test Methods for Electronic Probes
TC-10 Subcommittee on Pulse Techniques (SCOPT), (IEEE STD 181)
Chair: Nick Paulter
The revision process of the IEEE STD 181 is synchronized with that of the IEC 60469-1 through coordination by Nick Paulter, who chairs IEEE TC-10's SCOPT and IEC TC85's MT-18. The

MT-18 is the IEC technical committee responsible for IEC 60469-1 and -2, which were copies of the IEEE STDs 181-1974 and 194-1974. N. Paulter is the 'D liaison' to the IEC TC85 for the IEEE TC10 SCOPT. SCOPT will not include eye-diagram terms and definitions in the 181 revision because it was agreed that the 181 should remain independent of application; eye diagrams are specific to digital communications. SCOPT introduced the 'shorth' method for computing state levels, which are the parameters from which all other waveform parameters are computed. The IEEE STD 181 presently contains several other methods for computing state levels. The most widely used methods use histogram techniques.

TC-10 Subcommittee on Waveform Recorders (IEEE STD 1057)
Chair: Bill Boyer
The Waveform Recorder Subcommittee of TC-10 completed work on an updated version of IEEE STD 1057 on testing waveform recorders, which was published in 2008. The SC has been in low activity mode, awaiting the next maintenance cycle.

TC-10 Subcommittee on ADCs (IEEE STD 1241)
Chair: Steve Tilden
Work on the PAR for IEEE STD 1241 was completed in late 2010; it was approved by IEEE in December. IEEE STD 1241 2010 was published in January, 2011. The SC is focusing its efforts on getting the word out at conferences and through various publications.

TC-10 Subcommittee on DACs (IEEE STD 1658)
Chair: Steve Tilden
A PAR extension was approved to extend the development effort to December 2011. Estimated publication of IEEE-STD-1658-2011 is during calendar third quarter 2011. S. Tilden attended the IEC General meeting in Seattle, Washington, at the convening of TC47/SC47A/WG-4 for the purpose of kicking off an IEC standard on Dynamic DAC testing. Copyright release from IEEE was requested to allow the use of portions of the P1658 draft as a basis for this international standard. Based on the effort and cycle time history of the IEEE-STD-1241-2000 process to generate an IEC ADC dynamic test standard, this IEC effort is expected to take three to four years.

TC-10 Subcommittee on Probe Standards
Chair: Travis Ellis
The committee has been active with the standard and made some progress. Additional time requested to complete the standard since a significant amount of work remains.

TC-38, Space Measurements
Chair: John Schmalzel
This TC focuses on aspects related to instrumentation and measurements for space applications with emphasis on smart/intelligent sensors and integrated systems health management (ISHM).

TCs Other Non-Standards Activities
TC-9 Subcommittee on Capacitive Sensors
Chair: Georg Brasseur
This SC organizes courses and workshops related to the topic of capacitive sensors. Recent accomplishments include: (1) the development of a universal capacitive-sensor interface with a variety of options, such as supporting high-resolution capacitive sensors or connecting leaky or grounded capacitors; (2) preparation of a chapter on "Electrical Capacitance Tomography" for the Springer Book *New Developments and Applications in Sensing Technology*; (3) comparison of ultrasound and capacitive proximity sensors for automotive and safety applications; (4) improvement of human body models for the simulation of capacitive proximity and occupancy

sensors; and (5) development of a measurement method for the precise determination of humidity, temperature and pressure impact on the permittivity of thin layers of foams.

J. Schmalzel is chair of the Working Group for the revision of IEEE STD 1451.1, which is one of the TC-9 standards. The P1451.1 PAR is being revised to extend the development timeline to the end of 2011.

TC-19, Imaging Systems & Measurements
Chair: George Giakos; Co-Chair: George Zentai
This TC focuses on international dissemination of imaging principles, physical phenomenology, metrology, and design aspects of imaging systems with applications ranging from defense to healthcare. TC-19 promotes the use of a variety of imaging techniques and methodologies in the field of instrumentation, calibration, design, development, measurement, and testing, such as optical imaging, multispectral imaging, polarimetry, electromagnetic impedance, microwave scattering, single photon computed tomography (SPECT), positron emission tomography, x-ray computed tomography, magnetic resonance imaging, x-ray digital radiography, and nano-instrumentation imagery. TC-19 also seeks to develop standards for new imaging techniques as appropriate.

Recent activities include the planning and organization of the IEEE International Conference on Imaging Systems and Techniques (IST2011), Malaysia, May 17-18, 2011, immediately following I2MTC 2011. TC members are also organizing several Special Issues in high-reputation technical journals. The Committee is working towards establishing links with Government and Industry.

TC-19 co-organizes the LiSSA'11 IEEE-NIH Workshop on Imaging, Washington, D.C.

TC-20, Transportation Systems
Co-Chairs: Georg Brasseur and Frans Groen
The Committee is promoting basic research on instrumentation and measurement in transportation systems; sensor data processing, interpretation and fusion in intelligent transportation systems; instrumentation and measurement in alternative energy vehicles and driver assist systems; and incorporating instrumentation, measurement and sensor data interpretation in curricula for automotive and transportation systems.

Recent accomplishments include: (1) establishment of the IEEE Austria Subsection on Instrumentation and Measurement; (2) research work on electrical flywheel systems as robust electrical energy storage devices with high peak power capabilities for train, truck, bus and car applications; (3) establishment of a large database of automotive stereo video sequences in urban environments in collaboration with TNO (Dutch National Research institute for Applied Research) in The Hague; (4) supported the setup of collaboration between different disciplines in the Netherlands on Sensor Intelligence for Mobility Systems (SI4MS) with a focus on Cooperative driving and Coordinated Traffic management; and (5) provided technical co-sponsorship of conference planned on Information and Communication Technology (ICT-2011) in Automotive, Transport & Logistics with a focus on safety, mobility, and sustainability.

TC-31, I&M for Homeland Security
Co-Chairs: Kang Lee, Brian Wadell
This TC has no standards under development but is evaluating the possibility of chemical, biological, radiological, and nuclear (CBRN) sensor/equipment interface standards. Recent activities include Sensor Standards Harmonization Working Group (SSHWG) meetings at NIST to discuss CBRN sensor/equipment interface standards to meet homeland security needs.

TC-36, Industrial Inspection
Chair: Zheng Liu
This TC is a co-organizer of the IEEE 2011 Prognostics and Health Management Conference
(Denver, CO, June 2011) and is also organizing a workshop on "Advanced Sensor
Technologies" for the 24th Canadian Conference on Electrical and Computer Engineering.
It is also continuing work on inspection data formats which may develop into a future standard.

TC Opportunities

Browse the list of Technical Committees and their related Subcommittees to find one that best
matches your interests. Contact the TC/SC Chair, and ask how you can participate. If you are
interested in immediate leadership opportunities, note the following open Chair positions:
▸▸TC-1, Measurement Precision, Sensitivity & Noise,
▸▸TC-3, Frequency & Time, and
▸▸TC-35, Netcentric Operations Interoperability.

To Find Out More

Visit the IMS website, http://www.ieee-ims.org/main/ and select the "Tech Committees" tab. For
information about IEEE standards in general, visit http://standards.ieee.org/findstds/. For
information about ISPCS, please visit http://www.ispcs.org.

Future Column

The process of developing a standard is straightforward—to those who have developed them. For
others, it may not be so obvious how best to proceed. In the next installment of TC News, I'll
briefly outline the steps required. In the meantime, please contact me with your questions and
interests—I would like nothing better than to put you in touch with the TC that could use your
help in advancing their standards development! If you have an idea for a standard and can't wait
until the next TC News update, contact me so we can discuss it further.
 John L. Schmalzel (j.schmalzel@ieee.org)