

# *The IEEE Instrumentation & Measurement Magazine*

## *October 2012 Issue*

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### *Ongoing Education: Focusing on Today's Topics*

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#### *From the Editor's Bench*

Mike Gard

#### **Continuing Education and the IEEE *I&M Magazine***

The activities of a new school term are challenging parents and children in much of the world. Most of us are increasingly aware the holiday season is getting closer. The fiscal years of governments and organizations impose their own arbitrary, although significant deadlines on our busy lives. Some of the things we promised to do this year are still waiting for attention. Most of us have learned to cope; we are experienced in the arts of prioritizing and schedule juggling, and we get it done somehow. Schedules, deadlines, calendars, reports, meetings, estimates, proposals, and conflicts are parts of everyday life. They are so commonplace, they are unremarkable. Does a fish marvel that water is wet?

Despite our busy lives, we manage to invest in ourselves and our skills. We do this, in part, because we know we must: technology changes rapidly and our skills must change with it if we are to remain competitive in the professional marketplace. Despite the demands and turmoil, most of us invest in ourselves and our skills primarily because we enjoy what we do. We tolerate the demands that bombard us because, when can hold those demands at bay long enough, we get to do the creative things that attracted us to technology in the first place. We live for the moment of comprehension, we treasure the satisfaction of a simple solution to a complex problem, and we savor the moment when we not only meet specifications but exceeded them. The sense of accomplishment is intense. It is, in part, what keeps us going.

IEEE and the I&M Society exist to help you easily access information that will build and expand the scope of your technology skills. As you read this, AUTOTESTCON is just over. Two International Workshops are ready to begin (one concerned with Precision Clock Synchronization for Measurement, Control, and Communication and the other with Applied Measurements for Power Systems). A third International Symposium is less than a month away (Haptic, Audio and Visual Environments and Games). The Minneapolis conference committee is making decisions and arrangements for the May, 2013 International Instrumentation and Measurement Conference (I2MTC). Other conference committees are planning for 2014 and beyond. Please attend the events that appeal to you if you are able; you will find them enriching experiences.

Workshop and conference attendance isn't always possible. The *I&M Magazine* exists to facilitate technology sharing, self-education, and awareness of I&M Society activities through general-interest articles and tutorial pieces. We are serious about meeting these objectives, and we re-emphasize our intention to introduce new concepts and to seek applications-related articles for both academic and industrial practitioners. As the title of the present issue indicates, we want the *I&M Magazine* to be one component of your self-education and continuing education efforts.

While the IEEE's publications are important components of self-education, the I&M Society provides other meaningful opportunities for you to interact with colleagues around the world in a variety of technical pursuits. The I&M Society's Administrative Committee (AdCom) members soon will attend their October meeting. One item on the agenda – the Technical Committees – has recently received special attention and should be of interest to Society members. The Society's Technical Committees concern themselves with topics which may or may not include standards development. A list of existing technical committee subjects and chairs is available on the inside front cover of IEEE Transactions on Instrumentation and Measurement and on the Society web-site (<http://www.ieee-ims.org>). Some committees are very active, and the AdCom would like to reinvigorate, create, or consolidate others as appropriate.

If you wish to participate in a committee dealing with a topic of interest to you, please contact Mihaela Albu at [albu@ieee.org](mailto:albu@ieee.org). Conferencing is easy with an Internet connection and Skype or a similar service. Even if you are geographically isolated, technology allows you to work with colleagues around the world. Enjoy technology and share your knowledge with others.

More later,

*Mike*

*Please contact Mike at [IandMMagazineEIC@ieee.org](mailto:IandMMagazineEIC@ieee.org). His bio is available at <http://www.ieee-ims.org/publications/im-magazine>.*

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## *President's Perspectives*

### **Our Conferences: A Good Networking Opportunity**

Dear I&M Society Members, when I started writing this column, I had just returned from one of our most important conferences: the International Instrumentation and Measurement Technology Conference (I2MTC). This time, the conference was held in Graz, Austria in an excellent venue. More than 500 people attended the conference, and the organization worked very well. At this time, I would like to congratulate the Conference Chair, Georg Brasseur, and the Conference Co-Chair, Imre Rudas, for their efforts towards the success of such an important event.

The theme for I2MTC 2012 was "Smart Measurements for a Sustainable Environment." Nine tutorials about topics relevant to industry and academia were held Sunday, and almost 150 people attended. They were a very successful part of the conference. These tutorials were included in the registration fee, and topics about sustainable energy, environmental protection, and alternative vehicles were presented.

We started the first day by giving our Society Awards, and we were honored by the presence of IEEE Division II Director, Dr. Keith Nelson, who gave the 2012 Joseph F. Keithley award to Rik Pintelon from Vrije Universiteit Brussel, Belgium. The keynote speakers were from the U.S. Department of Energy, the British Ministry of State for Science and Innovation, and Volkswagen AG. This was an excellent opportunity to learn about very interesting topics presented by recognized authorities in these fields.

This conference introduced new features to encourage closer interaction between measurement science and industrial applications, one of the stated goals in the Society's strategic plan. This was achieved by presenting industrial specialists during the tutorials, keynote presentations for

industrial fields, and special sessions where technical papers very useful to industry engineers were presented.

To promote the relationship between our academic members and industry at the end of the meeting, everyone had the chance to attend any of the three company tours offered by the local organization team. The companies were: AVL GMBH, which develops and produces powertrain systems, simulation and engine instrumentation, and test systems for the automotive industry; Anton Paar GMBH, which develops and manufactures analytical instruments for quality control; and Austriamicrosystems, recently renamed AG, a global leader in the design and manufacture of high performance analog integrated circuits.

This conference was supported by many local and national Austrian organizations which showed the importance they assigned to I2MTC. Also, many private companies exhibited their products and services related to instrumentation and measurements.

I hope the success of this event will encourage you to attend other Instrumentation and Measurement Society's conferences. Next year, I2MTC will be held in Minneapolis, MN, USA from May 6 to 9, 2013. The 2013 conference theme will be "Instrumentation and Measurements for Life." It will be focused on the research and development of medical and biomedical instrumentation. You will also be able to attend the presentation of technical papers focused on industrial aspects of instrumentation and measurements specifically related to medical and biomedical fields, and you will also have the chance to hear presentations on regular topics as in previous I2MTCs.

We are improving our conferences, trying to broaden the interest, and attracting not only people from universities but also engineers and technologists from industry. These events are a good opportunity to interact with other professionals from different parts of the world who share a common interest in the science of measurement and its application to industry activities.

Start making your plans so that you can attend I2MTC in May, 2013 in Minneapolis. I am sure you will spend a wonderful time with your colleagues during the technical and social events in an excellent venue.

See you in Minneapolis!

*Jorge*

*Please contact Jorge at [j.daher@ieee.org](mailto:j.daher@ieee.org). His bio is available at <http://www.ieee-ims.org/contacts/officers>.*

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### *In Memoriam*

**James Roger Baker-Jarvis  
(1950 – 2011)**

It is with great sadness and extreme feeling of loss that I assemble this Memoriam. Dr. James Baker-Jarvis was much loved and respected by those with whom he came in contact, most of all by his family members who can best describe their feelings of love for him.

*Reza Zoughi*

*Note: The magazine has included accolades from the family blog created for Jim along with one from his wife, Karen, and an excerpt from his brother, Tom (reprinted with permission from Karen Baker-Jarvis). Following those, there are many grateful accolades from ones who knew him.*

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## *Article Summaries*

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### *Microsecond Accuracy at Multiple Sites: Is It Possible Without GPS?*

(Summary)

Michael A. Lombardi

This paper explores how GPS clocks meet the accuracy requirements of two critical-infrastructure applications: mobile telephone networks and the electric power grid. Both industries require time accurate to a microsecond at thousands of geographically dispersed sites and thus, rely upon thousands of GPS clocks. The paper also discusses the vulnerabilities of GPS clocks and reviews possible backup strategies for maintaining microsecond accuracy across a large geographic region when GPS is unavailable.

*This summary includes text from the article.*

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### *MICA: An Innovative Approach to Remote Data Acquisition*

(Summary)

Brian D. Hemond, Adam Wahab, Adam Spanbauer, Ian W. Hunter,  
Barbara J. Hughey, and Lynette A. Jones

An educational initiative called MICA (Measurement, Instrumentation, Control and Analysis) has been undertaken in the Department of Mechanical Engineering at the Massachusetts Institute of Technology (MIT) in the context of an undergraduate course called “Measurement and Instrumentation.” This has entailed developing a platform for a modular system of miniature digital sensors and generators that includes a user interface with a graphical display and auditory feedback. The MICA initiative will provide components for students to interact with demonstrations individually and/or in small teams. A “course kit,” consisting of a number of MICA sensors, generators, and passive elements has been fabricated and is being distributed by the department.

*This summary includes text from the article.*

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### *Thermal Performance of CMOS-SOI Transistors from Weak to Strong Inversion*

(Summary)

Maria Malits, Dan Corcos, Alexander Svetlitza,

Danny Elad, and Yael Nemirovsky

A promising solution to continue the complementary metal-oxide semiconductor (CMOS) scaling roadmap at the 22 nm technology node and beyond is CMOS-silicon on insulator (SOI), which is used especially in low-power and “system on chip” applications. This study focuses on partially depleted 0.18 RF CMOS-SOI technologies with emphasis on the weak and strong inversion regions. This process is suitable for mixed-signal design because of its maturity and relatively low cost, while the methodology and results presented in this paper may be extended to any advanced CMOS-SOI nano-transistors. The results of this study may provide a systematic approach to assessing the thermal behavior of CMOS-SOI transistors operating in a wide range of temperatures.

*This summary includes text from the article.*

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## *Measuring Small Air Pressure Gradients by a Flow Sensor*

(Summary)

Jacob Fraden

In the branches of engineering that deal with relatively large volumes of gases, it is often desirable to monitor small variations in pressure that may develop within such volumes. For example, it is important to balance the airflow in a HVAC system, detect the degree of clogging of an air filter, and monitor human movement in an enclosed space for security and “smart home” applications. In this article, the author discusses very small air pressure gradients: on the order of a millimeter of water (9.806 Pa, or 0.001422 psi). Conventional pressure sensors, as a rule, are not quite suitable for this purpose because their input signal spans are several orders of magnitude larger than the pressure gradients the author measures. The requirement for high gain amplification is discussed.

*This summary includes text from the introduction to the article.*

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## *Noise-Assisted Data Processing in Measurement Science: Part One: Tutorial 40*

(Summary)

Ruqiang Yan, Rui Zhao, and Robert X. Gao

In this two part tutorial, we introduce two noise-assisted data processing techniques: stochastic resonance (SR) in Part One and ensemble empirical mode decomposition in Part Two. We show their real-world applications in signal detection. In this article, the authors discuss how SR can be considered as a characteristic of stochastic relaxation in a modulated bistable or multistable system. When a periodic signal with additive noise is input to such a system, the interaction of the signal and noise causes a sharp frequency peak in the power spectrum of the system’s output signal.

*This summary includes text from the article.*

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### *Instrumentation Notes*

#### **Instrumentation and Measurement for Education**

(Summary)

Shlomo Engelberg

During an ultra-short summer semester course on Analog and Digital Electronics, the author used several interesting, hands-on demonstrations to allow the students to see that the quantities about which they had solved so many exercises were measurable and could come “alive” in the classroom using simple demonstration equipment and materials. In this article, he describes three demonstrations, including a circuit that let him demonstrate the superposition principle, a circuit that allowed him to characterize a diode, and a simple peak-catcher and how it can be used to show that assuming a 0.6 V drop across a forward-biased diode is not always a good idea.

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### *Tried and True*

#### **An Old Chapter and a New Chapter**

(Summary)

Kim Fowler

In this article, the author provides illustrations of some simple problems that exist in the engineering world and questions why problems keep occurring when they should have been solved a long time ago and why may have been forgotten. The author discusses that it may be that we think once a concept is understood by someone, we don't need to think about it again. We trivialize the concerns. Or it may be that these are areas outside of our own interests and expertise.

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### *My Favorite Experiment*

#### **Constructing a Thermoscope**

(Summary)

John Witzel

The author presents a brief history of the development of the modern thermometer, beginning with Galileos's thermoscope as a measurement tool. He discusses the creation of later

instruments developed by Fahrenheit and Celsius and finally presents the Kelvin scale, now recognized in the International System of Units (SI).

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## *Departments*

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### *New Products*

Robert Goldberg

#### **RFIU Switch System Family**

EADS North America Test and Services introduces its sixth-generation switch system family, the Racal Instruments 1257A RF Interface Units (RFIUs). The company is offering the units, which are scalable and modular, in sizes from 1U to 6U and with a range of customization options. Containing industry-standard interfaces, a rich SCPI command set, and IVI drivers, the RFIUs are easy to use and compatible with most software environments. In addition, all units include relay counters to monitor end of life, so the user will know when the relays need to be replaced. This ensures they will not fail during an important test.

The 1257A-1 through 1257A-4 high-density, front-pluggable COTS switch systems are scalable and offer a variety of topologies. For example, the 1U version accommodates up to 12 front-pluggable, non-terminated RF relays with choices from among dual SPDTs, transfer switches, SP4Ts, and SP6Ts at frequencies up to 18 GHz. The 2U through 4U versions can accommodate terminated or non-terminated relays with frequencies up to 40 GHz.

The 1257-D development versions of the system are intended for in-house development as a potential cost-saving mechanism. EADS North America Test and Services provides the software and hardware building blocks necessary to customize the RF system to meet the user's requirements. The user then assembles and configures the 1257-D, choosing from a wide variety of qualified RF component manufacturers.

When a custom-tailored solution is preferred, EADS North America Test and Services designs and builds the 1257A-C to the user's specifications, including full documentation and 100% reproducibility. With this unit, the user receives a secure, personalized website to monitor project progress, obtain project status and preliminary documentation, and download instrument drivers that enable him or her to begin coding immediately. Upon completion, this site becomes the support site for documentation, drivers, and more.

For more information, please visit [www.ts.eads-na.com](http://www.ts.eads-na.com).

#### **Highest Performance Mid-Range Vector Network Analyzer**

Agilent Technologies, Inc. introduces five new PNA-L vector network analyzer models, offering design and manufacturing engineers the highest performance (up to 50 GHz) in a mid-range VNA, along with lower cost and future-proof capabilities. Agilent's new N523xA PNA-L vector network analyzers replace existing N5230C models. They are available in five frequency models. Three frequency models start at 300 kHz, with two or four ports available for the 13.5 and 20 GHz models, and two ports available for the 8.5 GHz product. The other two frequency models, with two ports, start at 10 GHz and include the 43.5- and 50-GHz products. The models feature

both increased measurement range (5 dBm more output power and 20 dB more dynamic range) and speed (the result of a new synthesizer with faster frequency switching).

The new PNA-L models use the Agilent PNA-X's innovative components, including the CPU and display. Sharing a common hardware platform allows the PNA-L to realize continuous performance improvements as the PNA-X hardware improves. Moreover, PNA-L models can run applications previously only offered on the PNA-X platform, such as gain compression and fast continuous wave mode.

Providing a lower price alternative to the Agilent PNA and PNA-X network analyzers, the new PNA-L models are well suited for a range of applications, including S-parameters of passive components and simple active device measurements of amplifiers and frequency converters.

The Agilent PNA-L is part of the PNA family of network analyzers. The PNA family includes the PNA-L, PNA and PNA-X Series, covering frequencies from 300 kHz to 1.05 THz. The PNA-L is designed for general-purpose network analysis: the PNA is the world's highest performing vector network analyzer, and the PNA-X provides complete linear and nonlinear component characterization in a single instrument with a single connection. The PNA family offers: advanced connectivity via LAN, USB and GPIB; an easy-to-use open architecture based on the Microsoft Windows operating system; and an extensive embedded help system. The PNA family's CPU and operating system can be upgraded as technologies evolve.

More information on these PNA-L vector network analyzer models is available at [www.agilent.com/find/PNA](http://www.agilent.com/find/PNA).

### **High-Performance A/D Servo Inclinometers**

Meggitt Sensing Systems has introduced the Sensorex SX41100 series, a high-performance servo inclinometer family featuring analog/digital outputs and a maximum linearity error of less than  $\pm 0.02\%$  FS. The series is designed to provide high-precision angular measurements of structures and other leveling applications. With available ranges of  $\pm 1^\circ$  to  $\pm 70^\circ$ , the Sensorex SX41100 series is designed to provide an output signal proportional to the angle of measurement. The series is part of the company's Rugged Enhanced Digital Sensor (REDS) family, featuring Meggitt's own proprietary Sensorex digital hybrid compensation circuit design (HCN module) for high-performance inclinometers with  $\pm 5V$  analog, 4-20 mA, and RS232 or RS485 outputs. Units feature built-in active digital temperature compensation that operate reliably over a temperature range of  $-40^\circ$  to  $+85^\circ C$  ( $-40^\circ$  to  $+185^\circ F$ ).

Incorporation of an inertial mass with servo feedback, optical position pick-up and friction free mounting allows the Sensorex SX41100 series to provide high accuracy with excellent long term stability and high reliability. Because the inertial mechanism is immersed in oil, units have high shock and vibration resistance with a good damping factor. Units also operate from a 9-30 V unipolar power supply and feature IP65 environmental sealing.

Digital versions are delivered with software and digital data transmitted in ASCII format, allowing for direct communication with a standard PC, along with user-selectable parameters of data acquisition and display.

For detailed technical specifications, drawings, or additional information about the SX41100 series or other Sensorex inertial measurement products, visit <http://www.sensorex.fr> or <http://www.meggittsensing.com>.

## **Accelerometers Support Vibration Testing**

Kistler has announced the availability of its piezoelectric accelerometer technologies for cost-effective, high-accuracy support of aircraft, helicopter, rotorcraft, missile, satellite and unmanned aerial vehicle (UAV) ground vibration testing (GVT), as well as large-scale MIMO and SIMO aerospace structural monitoring.

Typical aerospace GVT requirements call for the use of high-performance piezoelectric accelerometers which offer a lower per channel cost while remaining compact and lightweight enough to reduce the effects of mass loading on the article under test. These transducers also must offer accurate frequency and phase response within its specified frequency range. Due to the large number of accelerometers in use, requirements also call for the use of IEEE P1451.4 Transducer Electronic Data Sheet (TEDS) capabilities, which are compatible with TEDS-compliant signal conditioning and data acquisition systems that minimize transcription errors and record keeping tasks.

The single axis Kistler Type 8640A is the company's dimensionally smallest, lowest mass PiezoBeam IEPE accelerometer. Weighing just 3.5 g, it is often specified for large-scale aircraft structural testing and monitoring, including modal analysis. Offered in ranges of  $\pm 5$  g,  $\pm 10$  g and  $\pm 50$  g, with sensitivities from 1000 to 100 mV/g, the sensor's ceramic cantilever beam sensing element is thermally compensated using patented methods, allowing it to emit an electrical charge when stressed during vibration exposure. The sensing element is enclosed within an hermetically sealed, welded titanium housing. This proprietary design provides low impedance output with outstanding amplitude and phase response over a wide frequency range, with low base strain sensitivity, and with exceptional measurement stability. Also available is the Kistler Type 8772A, a uniaxial PiezoSmart cube-shaped accelerometer, available in ranges of  $\pm 5$  g,  $\pm 10$  g and  $\pm 50$  g, with optional TEDS, for ease of use in larger channel applications.

For simultaneous vibration measurements in three orthogonal axes, Kistler offers the Type 8688A PiezoBeam IEPE triaxial accelerometer. It is the company's dimensionally smallest, lowest mass PiezoBeam model, weighing just 6.7 grams (for 1000 mV/g). Available in ranges of  $\pm 5$  g,  $\pm 10$  g and  $\pm 50$  g, with a choice of 1000 mV/g, 500 mV/g or 100 mV/g sensitivities, the sensor incorporates a ceramic cantilever beam sensing element enclosed within a lightweight, robust, welded titanium housing.

For additional details, drawings and specifications, please visit [www.kistler.com](http://www.kistler.com).

## **Rotary Single Axis Inclinometer Delivers 360 Degree Angle Monitoring**

TURCK introduces the new rotary single axis inclinometer, expanding its dual axis CANopen inclinometer offering for angular tilt detection. With a monitoring range of 360 degrees, the single axis inclinometer provides extended application flexibility, allowing operators to easily monitor mechanical arms, such as tensioners or moving components. Its CANopen communications also makes it ideally suited for mobile equipment, such as monitoring and reporting position of outriggers, booms or other vertically rotating parts.

The single axis inclinometer measures angular tilt in reference to gravity. At the heart of the TURCK inclinometer are MEMS (micro-electro-mechanical system) devices incorporating micro-electromechanical capacitive elements that utilize two parallel plate electrodes: one stationary and one attached to a spring-mass system. Movement causes acceleration that produces deflection in the non-stationary electrodes. This results in a measurable change in the

capacitance between the two plates that is proportional to the angle of deflection. The micro board design in the MEMS technology allows for a compact, precise inclinometer in a very robust, industrialized package.

TURCK single axis inclinometers offer rugged, IP68-rated housing and reliable operation in temperatures ranging from -40 to +70 °C.

For other TURCK product or technical information, please visit [www.turck.us.com](http://www.turck.us.com).

## **WLAN 802.11ac Signal Generation and Analysis Capability**

Aeroflex Limited announces that it has added IEEE 802.11ac capability to its S-Series RF signal generator and analyzer product line. Designed for use by engineers in wireless local area network (WLAN) research, design, and manufacturing, the new 802.11ac capability is available for the SGD RF digital signal generators (Option 119) and the SVA vector signal analyzers (Option 110).

Aeroflex claims that the S-Series product line's standard features include: the industry's widest bandwidth at 200 MHz; level and frequency settling times that are 5X faster than competitors at 100 µs; and very low phase noise performance (-135 dB/Hz at 1 GHz, 20 kHz offset). Combined with its 4U height and half-rack width, the S-Series is the most cost-effective combination of standard features and performance in a compact instrument.

The S-Series' wide bandwidth is ideal for WLAN R&D. For manufacturing, the fast settling times enable rapid device throughput. The large touch-screen and innovative user interface make complex measurements quick and easy. Using Aerolock, the S-Series instruments can be locked together to build complex test set-ups. Two instruments are combined within a width of 19", allowing both transmit and receive functions in one small space. Customers praise the S-Series for reducing the total time spent from measurement set-up to meaningful results.

The SVA offers high linearity, low noise, and excellent level accuracy and includes a built-in spectrum analyzer. The SVA's comprehensive WLAN Measurement Suite with 802.11ac capability includes measurement tools enabling analysis of WLAN OFDM, DSSS, and DSSS-OFDM RF signal characteristics in accordance with IEEE 802.11a, b, g, n, and ac. In addition, to support for 802.11ac, generic measurement capabilities are included as standard, and a range of optional modulation analysis suites extend measurement support to a wide variety of communications standards within the same application framework.

For more information and pricing, contact your local Aeroflex sales office by visiting or calling Aeroflex Sales at +1 800 835-2352 or [info-test@aeroflex.com](mailto:info-test@aeroflex.com).

## **New Options for Analyzing IEEE 802.11ac WLAN Signals**

Rohde & Schwarz equips today's development labs with T&M equipment for tomorrow's WLAN standards: the 20/40/80/160 MHz bandwidths defined in the IEEE Standard 802.11ac based on the proven orthogonal frequency division multiplying process. This signal and spectrum analyzer has the 256QAM modulation process, up to eight MIMO data streams, and bandwidths four times higher than that of previous standards, such as IEEE 802.11n. It supports data rates up to 6.9 Gbits/s. Wireless video transmissions in HD quality will soon be a reality.

The new R&S FSW-K91ac option provides an integrated demodulation bandwidth of 160 MHz, enabling the R&S FSW signal and spectrum analyzer to record and demodulate the full

bandwidth of a WLAN signal in line with IEEE Std 802.11ac. The error vector magnitude (EVM) is an important measure of the modulation quality. The IEEE Std 802.11ac requires an EVM of -32 dB for 256QAM modulation. To accurately measure this parameter, the T&M equipment itself must have a very low EVM, such as the R&S FSW with an EVM of less than -45 dB. Developers of components and modules for IEEE Standard 802.11ac will also appreciate the high measurement speed of less than 100 ms per measurement.

Rohde & Schwarz has also extended the functionality of its vector and baseband signal generators to include the IEEE Std 802.11ac. Equipped with the R&S SMx-K86 option, these instruments can generate signals in the defined 20 MHz, 40 MHz and 80 MHz bandwidths. The R&S WinIQSIM2 simulation software, together with the R&S SMx-K286 option, can also be used to generate signals. The combination of the R&S AFQ100B baseband generator and the R&S SGS RF signal source is an ideal solution for signals with contiguous and non-contiguous 80 MHz + 80 MHz or 160 MHz bandwidths.

Manufacturers and developers can use these generators to test individual chipsets, receivers and wireless devices. The Rohde & Schwarz solution is very advantageous for manufacturers of smartphone components, especially when testing interoperability and hand-over scenarios with other wireless standards.

Find more information at [www.rohde-schwarz.com](http://www.rohde-schwarz.com).

## **Force Gauges**

The new PCE-FG series force gauge of PCE Instruments UK Ltd. is a portable, as well as very accurate instrument. PCE Instruments UK has recently added the PCE-FG series force gauge to its portfolio to continue supporting its customers in the field of measuring traction and compression.

Force gauges determine the force which is pushing onto certain objects. They consist of two different parts: a force transducer and a display. The force transducer determines the working force and sends the measured value to the display where it is shown as a numerical value. The new PCE-FG series force gauge takes highly accurate measurements which are displayed very visibly.

Since it is very easy to handle with its light weight, it can be applied quickly and taken everywhere. Moreover, the PCE-FG series force gauges possess internal storage which enables quick storage of measurements. Optionally, the results can be printed and analyzed by connecting to a computer with the help of an RS-232 interface.

Force gauges are essential instruments in the fields of quality assurance. If you know how much pressure is applied on different materials, the material can be optimized to have a longer life-time.

Visit [www.industrial-needs.com/technical-data/forcegauge-pce-fg.htm](http://www.industrial-needs.com/technical-data/forcegauge-pce-fg.htm) for more information.

## **Mixed Signal Measurement Module**

JTAG Technologies has introduced the JT 2149/DAF, a compact, mixed-signal (Digital/Analog/Frequency) measurement module. The JT 2149/DAF is the first unit of its type to offer both digital and analog test access to PCBs via JTAG Technologies' widely-used QuadPod signal conditioning interface.

The JT 2149/DAF module has been designed to slot into JTAG Technologies' regular QuadPod transceiver system as used by the renowned DataBlaster series of boundary-scan/JTAG controller hardware. Capabilities of the JT 2149/DAF module include 16 dual-purpose digital pins capable of digital I/O stimulus and response at voltages of 1.0 to 3.6 V plus frequency measurements of up to 128 MHz on any pin.

Twelve additional analogue measurement channels can capture values from 0 to 33 V with better than 10 mV resolution. One further channel is available as a clock generator, programmable up to 64 MHz. The JT 2149/DAF can be controlled through an interactive panel (virtual instrument) within JTAG ProVision as well as through Python scripts.

Find more information at [www.jtag.com](http://www.jtag.com).

### **Intrinsic Sensors Ensure Efficiency and Reliable Measurement**

When the optical fiber itself forms the sensor element and, in addition, is used for transmitting measurement data, we speak of an intrinsic fiber-optic sensor. In specific applications, fiber Bragg grating-based strain gages are claimed to be superior to their electrical equivalents. HBM has completed its range of electrical and optical strain gages with the OptiMet by HBM system of fiber-optic components with and without integrated Bragg grating measurement function.

The OptiMet systems offer single mode optical fibers with integrated functional grids: OptiMet-OMF (Ormocer fiber) and OptiMet-PKF (coated fiber). In addition, passive components offer the useful features: OptiMet-TMF (patch cable, standard telecommunications fiber) and OptiMet-LAF (low attenuation fiber).

OptiMet offers the following advantages over strain gages:

- faster and more cost-efficient installation per measuring point,
- insensitivity to the influences of ambient humidity and water,
- enhanced stability against alternating load,
- better utilization of the testing system,
- no downtimes resulting from the replacement of electrical strain gages, and
- it has been tested for high strain up to and over 7000  $\mu\text{m}/\text{m}$ .

For more information, please visit [www.hbm.com](http://www.hbm.com).

### **An Alternative to TWTAs**

AR RF/Microwave Instrumentation has introduced a line of 1 - 2.5 GHz solid-state microwave amplifiers that can offer an alternative solution to traveling wave tube amplifiers (TWTAs) and provide additional benefits to users. Models 100S1G2z5 (100 W), 250S1G2z5 (250 W) and 500S1G2z5 (500 W) each cover the 1 - 2.5 GHz frequency range. Their cost and size is equivalent to TWTAs, but these new amplifiers also provide superior linearity, harmonic suppression, lower noise level, superior mismatch tolerance, and 100% rated power to any load.

All of which adds up to better value and a reduced cost of ownership. The new family of amplifiers is ideal for EMC/EMI, wireless, communication, multi-tone testing, radar, and research applications, as well as for those test applications where low distortion modulation envelopes are desired.

For more information, visit the AR RF/Microwave Instrumentation website at [www.arworld.us/](http://www.arworld.us/).

## Single-Point Operation for Pick-to-Light Applications

Banner introduces the EZ-LIGHT K50 Touch, a rugged, cost-effective lighted operator designed for easy and efficient pick-to-light and lean manufacturing processes. The K50 Touch provides simple performance, allowing users to easily change the light from green to red with the touch of a finger, hand or whole palm—with bare hands or work gloves—for bright, clear indication. Featuring an ergonomic design, the K50 Touch requires no physical pressure to operate, preventing stress on hands and wrists from constantly pressing buttons to verify correct picks during pick and place operations.

The feedback with the K50 Touch is clear-cut and shows workers exactly where they need to touch in order to function properly, which allows for streamlined operations. Providing flexible operating capabilities to solve a wide variety of applications, K50 Touch operators are available in 1-, 2- and 3-color models.

With a laser-marked surface and a housing rated to IP69K, the K50 Touch is extremely durable and can withstand harsh conditions and moisture for challenging environments. Plus, the self-contained device eliminates the need for an external controller. Solid-state technology allows for a very long service life compared to traditional mechanical solutions.

Learn more about the EZ-LIGHT K50 Touch lighted operators by visiting [www.bannerengineering.com](http://www.bannerengineering.com) or by watching the video at the following link: [www.youtube.com/watch?v=Utg961VwZ-0](http://www.youtube.com/watch?v=Utg961VwZ-0).

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## *Society News*

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### **News from the Administrative Committee**

The Instrumentation and Measurement Society's (IMS) Administrative Committee (AdCom) meets twice a year. This column is a new way to present a summary of the meetings from each Society Vice-President (VP) and Editor-in-Chief (EIC). This will give you a sense of what the AdCom does and what opportunities are available to you as a Society member.

This column highlights four committee meetings from the spring 2012 meeting at I2MTC in Graz and related activities. Other committee meetings will be highlighted in future issues of the *I&M Magazine*.

*Reza Zoughi*

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### **Membership Committee Highlights**

Defined by its vision of advancement in the professional field, our Society exists because its members have chosen to strengthen their values by sharing knowledge with their peers on all aspects of measurements. Many members value the collaboration on specific topics, including those with local relevance, and this is enhanced by various meetings, cooperation with other societies on common projects, organizing technical events, sponsoring contests, involving students and so on.

Recently, the Society's AdCom appointed a new member, Max Cortner, as Industry Liaison Officer. This new role within AdCom was established to assist in improving the support of our industry members and to foster the exchange of know-how between industry and academia, thereby accelerating transfer of novel scientific solutions into industrial applications. In the long run, we anticipate this should make IMS membership more attractive for people in industry. A well-balanced membership distribution between academia and industry would be beneficial for all.

This year's I<sup>2</sup>MTC followed some related initiatives by introducing industrial tracks to improve cross-linkages between measurement science and industrial applications. The general objectives of these new features were to make measurement specialists more aware of industrial needs and to make industrial participants more aware of relevant work in measurement science. Tutorial tracks on the first day of the conference introduced measurement specialists to contemporary application and measurement needs in these industries. Other tutorial tracks provided refresher information enabling industrial practitioners to engage more fully with technical papers by measurement specialists during the conference program. The new format was appreciated by the conference attendees, as 190 people registered for the tutorials and 546 people from 46 nations registered for the conference highlighted by the industrial tracks. The big success of the new format will be continued at the 2013 I<sup>2</sup>MTC May 6-9, 2013 in Minneapolis, Minnesota, USA.

All of these activities on industrial topics can be fostered by local chapters. Chapters can either be formed by members of the IMS active in a specific region or together with the members of other societies as a joint chapter. Chapters and joint chapters provide the most direct link with our members in action. Currently, our chapter chair liaison Kristen Donnell is in permanent dialog with our forty I&M Chapters (representing all ten Regions of IEEE) and with nineteen Joint Chapters, aiming to foster professional and technical networking for our members.

The Membership Committee offers a Chapter Funding program allowing Chapters to apply for funding for Chapter Events. Chapter Chairs are regularly encouraged to take advantage of the Distinguished Lecturer (DL) program. The DL Program supports the IMS leadership program, as our DLs are very carefully evaluated and chosen as representatives of our Society. Details regarding the Funding Program and contact information of the Chapter Chair Liaison are included on the IMS website at [http:// www.ieee-ims.org/](http://www.ieee-ims.org/).

IMS has an undergraduate and graduate student representative on the AdCom to help bring student perspectives into Society administration. These student appointees have helped implement the Graduate Student Panel Discussion at I<sup>2</sup>MTC (offered annually since 2008). IMS also has an appointed GOLD (graduate of the last decade) representative on the AdCom. In 2011, a program was developed to help new graduates (first-year GOLD members) maintain their involvement in the IMS.

Sarah Hatfield, our undergraduate student representative, is in the preliminary stages of developing a mentor program involving Chapters which wish to organize a mentor program for students within the Chapter and local community. The goal of this program is to facilitate mentorship at the local Chapter and community level and to give students the opportunities to explore and grow an interest in the field of Instrumentation and Measurement.

*Georg Brasseur*

*Please contact Georg with any questions at [georg.brasseur@tugraz.at](mailto:georg.brasseur@tugraz.at).  
Find Georg's bio at <http://www.ieee-ims.org/>.*

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## Conferences Report

Conferences are among the most important activities of the IEEE IMS because they provide members with opportunities to share new research results and exchange technical information, the chance to contact with their peers and build communities of common interests, and help develop and grow their professional careers. Conferences and Workshops are a perfect way to offer to our members a timely opportunity to become involved in advancements in the field of instrumentation and measurement science and technology, particularly in new, emerging areas and application domains. Additionally, an appreciable amount of new scientific results presented at Conferences and Workshops may find their way into the Society's IEEE *Transactions on Instrumentation and Measurement*.

The IMS has offered financial and technical support for these 2012 Conferences:

### 2012 Conferences Sponsored Financially

IEEE Sensors Applications Symposium (SAS)

07 Feb – 09 Feb Brescia Italy

IEEE Int. Instrumentation and Measurement Conf. (I2MTC)

13 May – 15 May Graz, Austria

IEEE Int. Symposium on Medical Measurement and Applications (MeMeA)

18 May – 19 May Budapest, Hungary

IEEE Int. Conference on Virtual Environments, Human-Computer Interfaces and Measurement Systems (VECIMS)

02 July – 04 July Tianjin, China

IEEE Int. Conference on Computational Intelligence for Measurement Systems and Applications (CIMSA)

02 July – 04 July Tianjin, China

IEEE Int. Symposium on Instrumentation and Control Technology (ISICT)

11 July – 13 July London, UK

IEEE Int. Conference on Imaging Systems and Techniques (IST)

16 July – 17 July Manchester, UK

AUTOTESTCON

10 Sep – 13 Sep Anaheim, CA

IEEE Inter. Symposium on Precision Clock Synchronization for Measurement, Control and Communication (ISPCS)

24 Sep – 28 Sep San Francisco, CA

IEEE Int. Workshop on Applied Measurements for Power Systems (AMPS)

26 Sep – 28 Sep Aachen, Germany

IEEE Int. Symposium on Haptic, Audio and Visual Environments and Games (HAVE)

08 Oct – 09 Oct Pisa, Italy

IEEE Int. Symposium on RObotic and SENSors Environments (ROSE)

16 Nov – 18 Nov Magdeburg, Germany

2012 Conferences Sponsored Technically

IEEE International Electric Vehicle Conference (IEVC)

04 Mar – 08 Mar Greenville, South Carolina, USA

International Multi-Conference on Systems, Signals and Devices (SSD)

20 Mar – 23 Mar Chemnitz, Germany

Measurement Science Conference (MSC)

22 Mar – 23 Mar Los Angeles, CA, USA

IEEE Conference on Prognostics and Health Management (PHM)

04 Jun – 07 Jun Denver, CO, USA

IEEE Workshop on Complexity in Engineering (COMPENG)

11 Jun – 13 Jun Aachen, Germany

Conference on Precision Electromagnetic Measurements (CPEM)

01 July – 07 July National Harbor, MD, USA

International Symposium on Instrum., Sensor Networks and Automation (IMSNA)

25 Aug – 28 Aug Sanya, Ainan, China

International Energy Conference & Exhibition (ENERGYCON)

09 Sep – 12 Sep Florence, Italy

Symposium on Neural Network Applications in Electrical Eng. (NEUREL)

20 Sep – 22 Sep Belgrade, Serbia

Future of Instrumentation International Workshop (FIIW)

08 Oct – 09 Oct Gatlinburg, TN, USA

International Conference on Sensing Technology (ICST)

18 Dec – 21 Dec Kolkata, India

The IMS Conferences Committee supervises the approval process of Society conferences. It reviews the Conference application form, which contains the Memorandum of Understanding and essential information about Conference motivation, organizing committees, location and other possible financial and technical sponsoring parties. The Conferences Committee then assesses the Conference application form on the basis of the IMS requirements.

Applications for a financially sponsored Conference require AdCom approval. Also, the AdCom will review and approve any budget revisions for previously approved sponsored Conference budgets.

*Dario Petri*

The Education Committee (EdCom) of the IMS ([http:// www.ieee-ims.org/education/education](http://www.ieee-ims.org/education/education)) provides educational activities for the professional development of the Society membership and for the profession. The EdCom held an in-person meeting on May 17, 2012, in conjunction with I2MTC 2012 in Graz, Austria and the Society's AdCom meeting. The Committee members discussed and assessed some of the activities sponsored by the IMS through the EdCom, organized primarily to serve the membership. Although the focus of this meeting was on the organization and review of ongoing, upcoming and future initiatives, there were some very tangible educational activities during the I2MTC week.

First of all, our Tutorials ([http://www.ieee-ims.org/education/ i2mtc-tutorial-program](http://www.ieee-ims.org/education/i2mtc-tutorial-program)) were held on Sunday, May 13 and coordinated for the EdCom by Mike Gard. Some updates to the tutorial format proved very successful in attracting 176 participants, approximately 34% of the conference attendees.

The I2MTC Tutorials now make Continuing Education Unit and Professional Development Hour (CEU/PDH) credits available to the participants. Another new aspect of this year's edition is that tutorials are feeders to the conference tracks, particularly the Industrial Tracks, which promise to seed a new season of synergy between the Society, industry and academia.

The 15 tutorials were organized in two academic tracks and three industrial tracks: "Drilling and Mining," "Enabling Alternative Vehicles," and "Protecting the Environment." Thanks to the efforts of the conference organizers, the cost of the Tutorials was included in the conference registration.

The EdCom is striving to capitalize on the experience and develop a "golden" format for I2MTC tutorials. For the 2013 edition, a tighter timing schedule should guarantee that the program will be available as early as December. This means more time to advertise to the membership and more time for interested members to get organized to participate.

The I2MTC "Chapter Chair/Distinguished Lecturer Meet-and-Greet" event was held on Tuesday, May 15 and was organized by the DL Program Chair, Kristen Donnell. This was a great opportunity for Chapter Chairs to meet each other and for the DLs to meet face to face with the coordinator. The DL Program ([http://www.ieee-ims.org/ education/distinguished-lecturers-program](http://www.ieee-ims.org/education/distinguished-lecturers-program)) matches requests for Lecturers, which originate for the most part from the Chapters, with the availability and competencies of the DLs of the IMS. Our Lecturers voluntarily go the extra mile (often literally, as they deliver lectures throughout the world) to disseminate to the membership (students, professionals or researchers) the latest advancements in their field.

Besides being experts in their discipline, they are exceptional orators who prepare their talks to be informative and understandable to the audience. The DL events are also great opportunities for local networking. Recently, Dr. Reza Zoughi lectured in New Zealand and China on Microwave NDT & Imaging, Dr. Wuqiang Yang lectured in Malaysia and Singapore, and Dr. Shervin Shirmohammadi lectured in Oregon on Social Virtual Environments and Massively Multiplayer Online Games.

In Graz, Austria, we also had the pleasure to announce the recipients of the Society educational awards for the year 2012. Two Graduate Fellowship Awards of \$15,000 were granted from nine applications, and two Faculty Course development Awards of \$10,000 were granted from five applications. The Graduate Fellowship Awards were presented to Hai Xiao and Jie Huang of the Missouri University of Science and Technology for the project titled "Novel Coaxial Cable

Interferometric Sensors for Distributed Measurement of Large Strain in Structural Health Monitoring” and to Kurt Barbé and Lee Gonzalez Fuentes of the Vrije Universiteit Brussel for the project titled “Density Estimation for the Disturbing Noise in Sampling Oscilloscopes.” One Faculty Course Development Award went to Serge Demidenko and Moi-Tin Chew of the Centre of Technology, RMIT International University Vietnam, in collaboration with Dr. Melanie Ooi and Dr. Ye Chow Kuang, of the Monash University Sunway Campus for the course titled “Electronic Testing, Instrumentation, and Measurement.”

The other Faculty Course Development Award was presented to Yang Wang, Kimberly Kurtis, and Dr. David W. Scott of the Georgia Institute of Technology for their course titled “Introduction to Non-Destructive Testing and Forensic Evaluation in Engineering Materials and Structures.” EdCom members are working to improve the offering of educational activities and materials such as video tutorials and strengthen the connection with the IEEE Educational Activities Board. Thanks to the involvement of the EdCom members in other committees, particularly the Membership Committee, the coordination and synergy is guaranteed.

The EdCom would like to welcome Liaison Max Cortner as a new committee member. The EdCom will shape the educational activities to best address the needs of the industrial portion of the membership and utilize the expertise of our professional volunteer speakers and lecturers. The numerous responsibilities of the EdCom are effectively sustained by a diverse group of active and enthusiastic members. For ideas, suggestions, questions, visit our webpage <http://www.ieee-ims.org/education/educationcommittee> or email the VP Education and EdCom Chair Ferdinanda Ponci at [ponci@ieee.org](mailto:ponci@ieee.org).

*Ferdinanda Ponci*

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### **EIC Report on *Transactions on Instrumentation and Measurement***

On December 31, 2011, the five-year term of Reza Zoughi as EIC of the IEEE Transactions on Instrumentation and Measurement (TIM) expired. Alessandro Ferrero was appointed EIC effective January 1, 2012. Thank you, Reza, for the wonderful work you did with TIM, and welcome on board Alessandro!

The TIM remains on a solid foundation with respect to its overall operation, review process timeliness and various established metrics. “Quality” remains the paramount goal and an important part of every aspect of our operations, including: the daily submission and quality control process, the technical review process and finally the published papers.

The society publications underwent a scheduled five-year review by the IEEE Technical Activities Board (TAB) Periodicals Review and Advisory Committee (PRAC) in 2012. The PRAC committee serves as an advisory body to the TAB Periodicals Committee on all matters relating to the review of IEEE Society/Council (S/C) sponsored periodicals. In preparation for this review, the Society prepared a comprehensive report regarding the quality, timeliness, relevance, financial health and plans for improvement of our two flagship periodicals, the IEEE TIM and the IEEE I&M Magazine.

Although we are awaiting the formal results of the PRAC review, the committee appreciates the enormous strides our publications have made in the last few years and are planning to publicize the methods we have adopted for quality improvement as “best practices” for other Societies to follow.

We also initiated a Special Issue on Measurement Principles, planned for publication in August 2012. Measurement practice is a scientific and technical activity that benefits from a systematic context into which it can be modeled, including a definition of the different steps that have to be performed to retrieve a meaningful measurement result from raw experimental data. There are several international organizations (mainly National Metrology Institutes) and academic institutions around the world involved in conducting research on a variety of measurement-related issues aimed at defining such context and model. Collecting some of the most interesting results of this work in a dedicated section of this journal will present our readers with a valuable reference of those who approach the challenging I&M fields and wish to find highly qualified guidance to frame their work in the proper context.

The following is the up-to-date, most recent summary of publications metrics and submission-to-publication timeliness data:

- 2011 Impact Factor (1.214);
- 2011 Impact Factor minus self-cites (0.888) and Five-Year Impact Factor (1.175);
- for regular papers the past twelve months average submission-to-initial decision (62 days), average submission- to-final decision (105 days), and percentage of accepted papers (46%);
- 2011 average time for submission-to-e.publication (Xplore) (30 weeks), 2011 average submission-to-print publication (9.6 months); and
- as of June 2012 average time for submission to e.publication (Xplore) (13 weeks).

Other and more detailed critical information including: upcoming issue table-of-contents of upcoming issues, submission guidelines, etc., is provided and regularly updated at <http://www.ieee-ims.org/publications/transactions-tim>. As always, none of our continued success would be possible if not for the tireless efforts of our associate editors, reviewers and our TIM administrators (Ms. Cam Ingelin and Ms. Reta Wehmeier). We welcome your comments and suggestions for improving our overall process. Please contact Professor Ferrero ([alessandro.ferrero@polimi.it](mailto:alessandro.ferrero@polimi.it)) with any comments, suggestions or issues of interest.

### **Andy Chi Best Paper Award Given at I2MTC 2012**

The I&M Society Andy Chi Best Paper Award is awarded to recognize an author or authors of a paper published in the IEEE *Transactions on Instrumentation and Measurement*. The authors of the paper, “Reputation-Enabled Self-Modification for Target Sensing in Wireless Sensor Networks” are the recipients of the 2010 Andy Chi Best Paper Award, and the authors are: Daowei Bi, Tsinghua University, P.R. China  
Liang Ding, Tsinghua University, P.R. China, and  
Xue Wang, Tsinghua University, P.R. China.

*Alessandro Ferrero*