

*The IEEE Instrumentation & Measurement Magazine*  
*April 2017 Issue*

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*I&M around the World: Region 9 (Latin America)*

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*Editorial*

**I&M around the World**

Wendy Van Moer

Last year we decided to dedicate each April issue of *Instrumentation and Measurement Magazine* to a certain IEEE region. It allows the different regions to show to the rest of the world their work in the field of I&M. What kind of I&M research is going on in that particular region? What are the difficulties? Where do they put the focus?

April 2016 was dedicated to Region 10, the Asia Pacific Region. This year Region 9, Latin America, is given the opportunity to present their research. Our guest editor is Jorge Daher. He currently owns an engineering company that provides test and measurement services in medium and high voltage networks. He has served in a number of positions in IEEE, both in his country and internationally. He has been Chair of the local IMS Chapter and Section Chair in Uruguay, Vice President of Membership and President of the Instrumentation and Measurement Society. He is also a Distinguished Lecturer in the Power and Energy Society.

It was a great pleasure and honor to work with him on this issue, and I would like to take the opportunity to thank him for his dedication and valuable time.

Welcome to IEEE Region 9!

Groetjes,

Wendy

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*Guest Editorial*

## Highlighting Latin American Authors

Jorge Daher

In practically all engineering and science activities, one can see instruments helping engineers and researchers. To measure and know the most precise value for different parameters is fundamental for a great number of technical work, whether in a laboratory, industry, or in the field. The advancement in electronics and the reduction in costs have been helping engineers to develop and use more and more instruments and different measurements techniques all over the world. In Latin America, we can find many researchers working in measurements and in this issue of the *I&M Magazine*, we highlight several papers from authors in this region of the world. You will see a wide variety of applications, all of them with practical implications in industrial or everyday use. After a whole life of working in instrumentation and measurements, it is a great pleasure for me to write this column as a guest editor. You will find seven papers from authors in Latin America that show the degree of advancement in techniques and applications to different areas of engineering.

The paper written by John Soldera, Guilherme Schu, Lucas Schardosim, Eric Beltrão, Muhammad Farhan and Jacob Scharcanski describes several facial recognition techniques, their challenges, and applications. These techniques are important when there is the need to confirm an individual identity or his behavior. The authors mention future promising work and developments applicable to car driver behavior and interaction between smart phones, cars or auto service stations.

The paper written by Hugo Tenório, Débora Vieira and Cleonilson Protásio de Souza is related to the measurement techniques and instrumentation applied to evaluate the degradation of thermoelectric modules, which are important devices in new renewable energy technologies. It is well known that the problems associated with fossil fuel based power generation are pushing for the development of new sources of energy. This paper addresses one of the aspects directly related to testing devices that are starting to be used in renewable energy.

The paper written by Guilherme Bertelli, Anderson Santos, Ivanovitch Silva, Renato Fernandes, Dennis Brandão, Ivan Muller, João Neto, Jean Winter and Carlos Pereira is a good recollection of research activities developed in Brazil in the field of industrial wireless instrumentation. The groups of researchers work in three universities located in different parts of Brazil. This paper gives a brief report of their work, which they presented in many publications and symposiums around the world, including some of our Society conferences.

The paper written by Germán Álvarez-Botero, Fabián Barón, Camilo Cano, Oscar Sosa, and Margarita Varón deals with the use of optical sensing applied to temperature and strain measurements. It also describes the application of this technique to the measurement of the temperature in power transmission lines to determine the current capacity of wires. There is also a description of the application of strain measurements in the analysis of shrinkage in concrete structures.

The paper written by João Ferreira and Antonio Petraglia describes the architecture of an analog single-phase lock-in amplifier. The authors explain how they implemented the amplifier and then compared it to post-layout simulations and theoretical predictions. The goal of this work is to develop low power and low voltage devices for mobile applications.

The paper written by Rodrigo Murofushi and José Tavares describes the design and testing of a part selector bench based on RFID. The authors designed an indoor positioning system and used it to select different parts in an automated working station. The results are promising, although there is still some work to do to improve the accuracy of the part selection process.

The paper written by Marco Da Silva, Fernando Rangel de Sousa, Eduardo Nunes dos Santos, Daniel Pagano, Heron Ávila and Francisco da Mota describes the advancements in multiphase flow measurements in Brazil. Flow measurements in the presence of two or more different fluids are important to determine efficiency and safety in industrial plants like the ones used in the oil and gas industry. This research has been possible with the good interaction between industry and universities.

I hope you enjoy this special issue that describes what Latin America is doing in instrumentation and measurements research. This is just a sample of the work in this region. I was surprised by the very good response we had from many researchers. I would like to thank all of the authors who showed interest in our call for papers and the editorial board of the *I&M Magazine* for all of their support.

*Jorge*

**Jorge Fernández Daher** (j.daher@ieee.org) (SM) received his engineering degree from Universidad de la República, Uruguay in 1987. He worked for twenty years in the national electrical metrology laboratory. Currently, he is owner and director of an engineering company. He founded the IEEE Uruguay Section in 1987 and, he was the president from 2000 to 2001. He was the Chapter Chair of the I&M local chapter from 1998 to 1999. He was a member of the IEEE Standards Association from 1999 to 2007. He has been a member of the I&M Ad-Com since 2006 and is the senior past president of the I&M Society.

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## *Article Summaries*

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### *Facial Biometrics and Applications*

(Summary)

**John Soldera, Guilherme Schu, Lucas Royes Schardosim, Éric Tadiello Beltrão,  
Muhammad Farhan and Jacob Scharcanski**

Faces carry a lot of information to distinguish different individuals. In this context, biometrics-based verification systems play a major role in terms of recognizing (or confirming) an individual identity, relying on physiological and/or behavioral characteristics among a set of individual biometric traits. In particular, facial recognition is important because it has a relatively low cost (i.e., it can be carried out using standard cameras) and is one of the least intrusive biometric modalities available, since it does not require physical contact like fingerprint recognition or retina scanning. In this article, the authors discuss the challenges involved in facial recognition, including related topics such as face segmentation and some of its recent

applications. We review some representative face recognition approaches and indicate some promising directions in terms of related topics, such as face segmentation, face spoofing detection, and driver safety systems using facial biometrics.

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

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## *A Smart Approach to Calibration- Why We Should Forget Calendar-Based Calibrations*

(Summary)

Jean-Michel Pou

While it is true that measuring devices must be calibrated when we buy them, since this is essential to ensure that they operate correctly (possibly before paying them, to avoid legal disputes), industrial practice requires on a daily basis that the metrological performance of the measuring devices is assured to be within the required specifications. This article is not aimed at describing the method that allows acceptable performance limits to be defined. Instead, the author encourages readers to remember that measures should be established not only on the basis of the uncertainty budget (by determining the impact of the instrument with respect to other uncertainty contributions) but also consider the related acceptable customer and supplier risks in the ISO/IEC Guide 98-4:2012 – Uncertainty of Measurement - Part 4: Role of measurement uncertainty in conformity assessment.

*This summary includes text from the article.*

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## *Measurement of Parameters and Degradation of Thermoelectric Modules*

(Summary)

Hugo César Rocha Libório Tenório, Débora Albuquerque Vieira,  
and Cleonilson Protásio de Souza

A Thermoelectric Module (TEM) can operate as an electrical generator and as a cooling/heating device and is a valuable device for thermal-based energy harvesting systems. When working as

electrical generator, a TEM is a denominated Thermoelectric Generator (TEG). In this article, the authors discuss a real-time, bipolar thermal-cycling based testing platform that shows to be an effective way to apply thermal cycling and measure parameters of a thermoelectric module using the same structure. In this system, it is possible to degrade a module to evaluate its lifetime and periodically measure its parameters such as the Seebeck coefficient  $\alpha$ , thermal conductivity  $\lambda$ , electrical conductivity  $\sigma$ , figure of merit and others using the Harman method. The authors conclude that the main reason for TEG degradation by thermal cycling is caused by the degradation of the microstructures of TEG solder junctions, whereas the thermocouple pellet alloy microstructures are not altered.

*This summary includes text from the article.*

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## ***Research Activities on Industrial Wireless Instrumentation: Brazilian Perspective***

(Summary)

Guilherme Bertelli, Anderson Santos, Ivanovitch Silva, Renato Fernandes,  
Dennis Brandão, Ivan Muller, João Netto, Jean Winter, and Carlos Eduardo Pereira

This paper presents a general overview of some research activities developed in Brazil in industrial wireless instrumentation by research groups at the Federal University of Rio Grande do Norte, Federal University of Rio Grande do Sul, and University of São Paulo. Because sharing the large quantity of activities conducted by research groups is difficult, this work presents only selected themes that were shared with the scientific community through journals and symposiums. They included industrial wireless networks interoperability tests and driver implementation; process control through industrial wireless networks; development of wireless networks field devices and standards improvement proposals; and an application of wireless sensor networks in a street lighting system.

*This summary includes text from conclusion of the article.*

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## ***Optical Sensing Using Fiber Bragg Gratings:***

## *Fundamentals and Applications*

(Summary)

Germán Álvarez-Botero, Fabián E. Barón, C. Camilo Cano,  
Oscar Sosa, and Margarita Varón

Fiber Bragg Grating (FBG) technology has been used over the last few years, for a wide variety of sensing applications. In this article, FBG used to implement fiber sensors is explained and some applications in temperature and strain measurements are presented. In this article, the fundamentals and operation principles of FBGs are shown as well as optical fiber sensing interrogators. Applications in temperature measurements in power transmission lines, shrinkage measurements in concrete structures, and spatiotemporal variations of temperature between groundwater and surface water are presented.

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

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## *Analog Integrated Lock-In Amplifier for Optical Sensors*

(Summary)

João A. F. Ferreira and Antonio Petraglia

This work advances a topology for an analog integrated lock-in amplifier for optical sensors. A prototype has been developed for application in a plastic optical fiber sensor for measuring the refractive index in an aqueous medium. The design aims at the integration of all system components in silicon and the generation of a low power and low voltage circuit, to allow its use in portable applications. The amplifier topology features differential inputs and outputs to mitigate problems with noise and interference.

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

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## *Towards Fourth Industrial Revolution Impact: Smart Product Based on RFID Technology*

(Summary)

Rodrigo H. Murofushi and José J. P. Z. S. Tavares

One capable and feasible technology to build in intelligence to a product is RFID technology. These systems rely on two main components to fulfill their purpose: a reader coupled with an antenna that interrogates multiple tags. This article presents a case study based on a part separation bench, which aims to separate a smart product based on the stored information in the label and the location of the object on the conveyor belt. Each part has an RFID tag attached to it that contains its identification number, and when the tag is electromagnetically excited, the RFID reader measures the RSS so that the distance between the tagged object and the antennae can be estimated.

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

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## *Multiphase Flow Instrumentation and Measurement Research in Brazil*

(Summary)

*Marco José da Silva, Fernando Rangel de Sousa, Eduardo Nunes dos Santos, Daniel J. Pagano,  
Heron Eduardo de Lima Ávila, and Francisco R. M. da Mota*

In many industrial activities, the so-called multiphase flow is commonly found, which denotes the simultaneous stream of two or more distinct substances. A typical example is oil-gas and/or oil-water mixtures flowing through production pipelines in the petroleum industry. Flow behavior often determines the efficiency and safety of plants and equipment where multiphase flow is present. Multiphase flow instrumentation relies on a number of physical principles, including common instrumentation and measurements that are based on electrical, sonic or radiation methods. This paper shows three different sensors currently being developed in Brazil, which are based on electrical measurements. They range from a simple phase concentration measurement up to multiphase flow imaging. Each instrument offers a tailored solution with potential either for field applications or for detailed multiphase flow investigation in pilot plant studies.

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

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*Columns*

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## *Life after Graduation*

(Summary)

### **Mission Critical**

Max Cortner

Mission statements are common in organizations. It is important to explain to the world, what your company is trying to accomplish. It is even more important to explain the mission to employees. As you consider applying for a job, or changing jobs, you should spend at least a few minutes thinking about the company's mission and yours. Do they match? Is your participation something you will be proud of? Will it provide the much-needed motivation to keep you engaged in tough assignments?

*This summary includes text from the column's introduction.*

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## *Future Trends in I&M*

(Summary)

### **Biofeedback in Psychotherapy**

Virginica Dinut

This issue's guest author introduces instrumentation and measurement in biofeedback therapies, a field that utilizes a wide variety of specialized equipment, depending on the physiologic functions being monitored. These biofeedback sensor modalities provide data on: muscle tension (electromyographs); offer data on skin temperature (biofeedback thermometers); measure the electrical properties of the skin, which are often linked to the activity of the sweat glands (electrodermographs); measure brainwaves and other electrical brain activities (electroencephalographs); and provide data on blood flow through a digit (for example, a finger), blood volume pulse, heart rate, and heart rate variability (photoplethysmographs), etc.

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## *Basic Metrology*

(Summary)

### **From Telegraphy to the Revised SI**

*Richard Davis*

There were no convenient engineering units during the earliest days of telegraphy. Engineers were forced to create their own units, coining names that are now familiar: volt, ohm, ampere, watt, etc. It took almost a century, but the engineering units were finally incorporated into a complete system that includes the meter, kilogram, and second as the mechanical base units. This issue's column describes some of the obstacles that had to be overcome during this remarkable journey. It was the success of this effort that led to the International System of Units (SI), adopted in 1960 with the ampere included as a base unit. The SI itself continues to evolve. It is expected that the 1960 definition of the ampere will be updated in 2018 to take advantage of modern science and technology.

*This summary was written by the author.*

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## *Departments*

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### *New Products*

*Robert Goldberg*

Please send all "New Products" information to:

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**New Products**  
**Robert Goldberg**

**Integrated Solution for Battery-Drain Analysis**

Keysight Technologies, Inc. has announced the availability of a battery-drain analysis solution that delivers insight into critical applications for the energy, automotive and medical device industries. Keysight claims to be the only company that offers this integrated solution for accurate battery-drain analysis and provides the needed testing information required to manage the wide dynamic-current-range utilized by these devices.

A multitude of mobile, highly dispersed, battery-powered devices exist in energy, automotive and medical environments. Often, their power consumption is growing faster than their capabilities, and this results in battery run-time as the critical point in the operational life of a device.

Medical device manufacturers need to maximize battery life on monitors and sensors that interact directly with the human body and its functions. Energy companies often locate battery-powered devices remotely to collect information from water, gas and electric meters. Automotive engineers must confirm that on-board monitoring equipment will function without failing to ensure safety over many years.

Mobile, battery-powered devices often transition between sleep current, idle current pulses and active current pulses when in full transmit mode. Measuring low current and pulsing current with fast rise and fall times over a wide dynamic range is difficult. Previously available tools failed to provide accurate measurements when the current signal rapidly changes and the current varies depending on what tasks the device and sub-circuit is performing.

Keysight's integrated solution for battery-drain analysis includes a dc power analyzer modular mainframe, 2-quadrant source-measure unit, and control-and-analysis software that consists of:

- N6781A 2-Quadrant Source/Measure Unit for Battery Drain Analysis
- N6785A Source/Measure Unit for Battery Drain Analysis
- N6705B DC Power Analyzer

More information about Keysight's integrated solution for accurate battery-drain is available at [www.keysight.com/find/PowerCampaign](http://www.keysight.com/find/PowerCampaign). A video, "Keysight Battery Drain Analysis with

Seamless Measurement Ranging,” which describes the device impact of power usage, is available on YouTube at [www.youtube.com/watch?v=OSb\\_6Y2tg8Q](http://www.youtube.com/watch?v=OSb_6Y2tg8Q).

### **High Power RF Calibration System**

TEGAM has released a High Power RF Calibration System for directional power sensors and RF Wattmeters from virtually all manufacturers including Bird Technologies. The system operates from 250 kHz to 3 GHz and up to 250 W with combined uncertainty less than 1%. This frequency range covers the ISM, Land Mobile Radio and common mobile phone bands.

The TEGAM High Power Calibration System can be purchased as separate components to augment a customer’s existing hardware or as a turn-key system for immediate productivity. Properly configured, it can completely automate calibrating an RF Lab’s workload to meet or exceed the original manufacturers’ specifications. A fully optioned system includes: signal generation, amplification, filters, control software, working standards and an RF calorimeter.

The basis for the High Power Calibration System’s accuracy is TEGAM’s exclusive flow calorimeter designed to convert incident RF power into heat with low uncertainties and convenient traceability to SI units. System calibration is also fully automated and achieved on site through a portable ac power standard to minimize station down time. This standard can be sent to most national metrology institutes to provide traceability at the highest level.

To learn more about TEGAM’s High Power RF Calibration System, visit the TEGAM website [www.tegam.com](http://www.tegam.com) and search for “High Power RF.”

### **Over-The-Air Power Measurement Solution for 5G and Wireless Gigabit Components**

Rohde & Schwarz claims the NRPM OTA power measurement solution to be the first solution that measures transmit power over the air interface for 5G and wireless gigabit components. The solution enables users working in development and production to calibrate the output power of the antenna on a DUT and to test the DUT's beamforming function.

Base stations, access points, wireless devices and radio modules use phased array antennas to transmit 5G and wireless gigabit radio signals. Beamforming is used to control the direction of radiation of the transmit antenna to maximize the power level at the receiver. The R&S NRPM OTA power measurement solution now allows users to measure and calibrate the output power of a DUT as well as test its beamforming function – all with a single, simple test setup. The solution works in the frequency range from 27.5 GHz to 75 GHz and therefore covers the 28 GHz band currently being discussed for 5G as well as the frequency range from 55 GHz to 66 GHz for WLAN in line with IEEE 802.11ad and frequencies above 66 GHz in line with IEEE 802.11ay.

The R&S NRPM OTA power measurement solution consists of two core components: the antenna module and the three-channel sensor module. The R&S NRPM A66 antenna module is a simple, polarized Vivaldi antenna with an integrated diode detector for power measurements. Thanks to its high linearity, it measures the relative power with a measurement accuracy better than 0.2 dB. Because the power is measured directly on the antenna, the user does not need any additional RF cables, which also eliminates complex compensation for cable loss. With a single antenna module, the user can calibrate the output power on a DUT, for example. With several spatially offset antenna modules, it is possible to test a DUT's beamforming function.

The R&S NRPM3 three-channel sensor module processes measurements from up to three antenna modules. If more than three antennas are needed for a test setup, users can operate any number of sensor modules in parallel.

The free R&S Power Viewer Plus PC software from Rohde & Schwarz is available for evaluating and processing the measurement data.

For more information, go to [www.rohde-schwarz.com/ad/press/nrpm-ota](http://www.rohde-schwarz.com/ad/press/nrpm-ota).

**Tiny Hi-G Camera Offers Big Impact for Testing**

Vision Research has announced the Phantom® Miro® N-Series. With a camera head measuring in at just 32 mm x 32 mm x 29 mm, the Miro N-Series is the smallest model in Vision Research's line of digital high-speed cameras.

The Miro N5 camera head is detached from the body, can be mounted just about anywhere, and is Hi-G constructed to withstand impacts up to 150G. It is ideal for hostile and extreme environments, such as auto crash and aerospace. Despite its size, the Miro N5 offers the performance expected of a Phantom camera. At full resolution, 768 x 600, the camera delivers 560 frames-per-second (fps) and over 9,000 fps at lower resolutions. Many Phantom features, such as Extreme Dynamic Range (EDR) for exceptional image quality in high-contrast lighting conditions, are included. There is a fixed aperture that accepts readily available, miniature S-mount lenses, which come in a variety of fields of view. See a video using the Miro N-Series on the Vision Research YouTube channel.

The Phantom Miro N-Series is comprised of the camera head, a detached camera base, and a 10m CXP cable. Since data security is a concern while filming in harsh environments, the CoaxPress protocol and CXP cabling ensures that vital data is captured, instantly transferred, and stored in the base, even if the camera head or cable are damaged. Once transferred to the base, images can be stored on 8 GB of onboard RAM or 128 GB of non-volatile CineFlash memory. Moreover, in the event of power loss, the Miro N-JB base incorporates a battery backup to feed power until the images and the data are saved.

Due to the nature of high-impact testing, there is a high amount of damage risk to expensive high-speed cameras. The design and engineering of the Phantom Miro N-Series addresses that risk. All components of the Phantom Miro N-Series are interchangeable. The 10M CXP cable allows Miro N-JB base to be safely mounted away from the head. Should the camera head or CXP cable be destroyed, new ones can be purchased and swapped into existing setups at a nominal cost.

Learn more about the Phantom Miro N-Series at [www.phantomhighspeed.com/N5](http://www.phantomhighspeed.com/N5).

## **Rugged Temperature Measurement Device**

The RX1032 from VTI is a ruggedized version of the EX1000 series of LXI data acquisition instruments. This new addition can be easily integrated and synchronized with multiple devices to reduce the length of analog cable and minimize errors induced by noisy environments. VTI Instruments claims it is the most advanced full-featured data acquisition solution available on the market today.

The RX1032 Thermocouple Measurement Tool features:

- Advanced Cold Junction Compensation Implementation
- Precise Distributed Measurement Synchronization with IEEE-1588
- Ethernet Connectivity via XI Open Industry Standard
- 1000 Sample/ sec/channel Scan Rate
- 32-Channel Thermocouple Measurement System
- IP65 Environment Rating

The RX1032 thermocouple measurement system is also end-to-end self-calibrated. When a measurement system is self-calibrated, it is most accurate when it compensates for conditions like gain drifting, aging and temperature variations.

The RX1032 answers the needs of technicians looking to get more accurate and repeatability with fully integrated signal conditioning and advanced cold junction compensation. It uses military-grade connectors for power and connectivity; thermocouple and sensor inputs are routed through a protected entry to screw terminal panel for quick and easy connectivity.

The rugged construction of the RX1032 allows mounting the measurement system on test pylons, in test cells and in other harsh environments.

Typical applications include:

- Large Scale Engine Test
- Health Monitoring

- HALT/ HASS Test
- Rocket Motor Reliability
- Wind Tunnel Test

For more information, visit <http://marketing.vtiinstruments.com/e/12672/roducts-Services-RX-1032.aspx-/3ct2gy/662624932>.

### **Fast EMI Receivers**

The TDEMI eXtreme series (TDEMI X) from Gauss Instruments covers the frequency range from dc – 40 GHz and provides unique features such as 645 MHz CISPR compliant realtime bandwidth, Multi-GHz Real-time Scanning and a low displayed average noise level (DANL) at 40 GHz. It can now be equipped with an additional ultra-low noise pre-amplifier for the frequency range 30 MHz – 1 GHz. This novel pre-amp provides the lowest noise figure and highest dynamic range - both at the same time. High linearity and lowest displayed inherent noise are achieved by a patented technology using pre-amps with low noise figure, pre-selectors and a special circuit monitoring the linearity reserve of the pre-amp.

The achieved displayed average noise level with an IF bandwidth of 120 kHz is about -15 dB $\mu$ V over the entire frequency range up to 1 GHz. In comparison to other solutions available on the market, an improvement of the noise floor of 5 to 10 dB has been achieved. A further advantage is the possibility to scan within about 3-4 seconds with Quasi-Peak, CISPR-Average simultaneously over the complete frequency range.

The Automation Software Suite, EMI64k, fully supports all the vast number of advantages and features of the TDEMI X making EMC testing fast, highly reliable, and easy to use.

The combination of pre-selection, ultra-low noise amplifiers and a patented circuitry monitoring the linearity reserve of the pre-amp are the keys to provide the lowest DANL together with the highest linearity and fastest measurement speed.

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

### **Ultra-Small, 0.7 mm CMOS High-Performance Video Camera**

Toshiba America Information Systems, Inc.'s Imaging Systems Division has introduced the IK-CT2, an ultra-small, chip-on-tip video camera system. The innovative, 0.7 x 0.7mm back-side illuminated CMOS sensor features, 220 x 220 pixels, and integrated 120° field-of-view glass lens which supports a critical OEM component solution for a variety of small diameter, flexible and rigid scope applications.

The IK-CT2 features Toshiba's advanced color processing with its 12-channel color matrix adjustment, freeze frame, 5 user-programmable settings files, and can be controlled remotely through RS-232. The new system includes the CMOS sensor assembly which fits a 1.0 mm diameter tip, 120° field-of-view lens with a focal range of 3 mm to 50 mm. It comes with a 3.5 meter sensor cable, interface board, and camera control unit (CCU). The CCU delivers superior color accuracy and contrast at 59.94 Hz progressive scan using DVI-D and USB 2.0 outputs. The IK-CT2 is easy to integrate into industrial inspection systems or medical endoscopes.

For more information on the IK-CT2 ultra-small, advanced color video camera, please visit [www.toshibacameras.com/products/prod\\_detail\\_ikct2.jsp](http://www.toshibacameras.com/products/prod_detail_ikct2.jsp).

### **Ultra-High Density Reed Relays**

The Pickering Series 115, Series 116 and Series 117 represent three ranges of small Single Pole (1 Form A) reed relays designed for the construction of high density matrices or multiplexers. These three ranges have identical pin configurations, allowing a common PCB for all types while allowing the designer a range of switch ratings according to which part is fitted. The reed switches are vertical within the package which permits a common footprint with a board area of only 3.8 mm x 6.6 mm. Only the profile height changes with the increasing power or current ratings.

The Series 117 has a height of 9.5 mm and is rated at 0.5 Amps switching at 5 Watts. The Series 116 has a height of 12.5 mm and is rated at 0.5 Amps switching at 10 Watts. The Series 115 has a height of 15.5 mm and is rated up to a 1.0 Amp switching at 20 Watts. Double pole (2 Form A) versions are also available in the Series 116 and 117. One benefit of the very small size of these relays is that it often makes it possible to increase the functionality of existing designs without increasing the size of the printed circuit boards.

All feature instrumentation-grade reed switches with sputtered ruthenium contacts, making them an ideal choice for low level or ‘cold’ switching applications.

The relays have the option of an internal diode across the coil connections for Back EMF suppression and feature Pickering unique SoftCenter® construction as well as an internal mu-metal magnetic screen. Mu-metal has the advantage of a high permeability and low magnetic remanence and eliminates problems that would otherwise occur due to magnetic interaction.

To learn more, visit [www.pickeringrelay.com](http://www.pickeringrelay.com).

### **Ultralow Noise Rubidium Clock for Highly Dynamic Defense Platform Applications**

Spectratime has announced the launch of its new, rugged, anti-vibration, GPS/GNSS-lockable, ultralow noise Rubidium atomic clock for highly dynamic defense platform applications.

Next-generation defense airborne radars, drones, helicopters, secure shipboard and radio communications systems use high K-band frequencies which require ultralow noise performance. In tactical missions, ultralow noise performance can only be minimally degraded during exposure to dynamic vibration and high-G environments to maintain the integrity of the battlefield systems. Spectratime’s Force-2020 rubidium atomic oscillator supports these critical applications.

Product features:

- Output frequency up to 500MHz

- Use the patented SmarTiming+® technology, disciplining an external SAASM or a non-SAAMS GPS or GNSS 1PPS reference up to 100,000 seconds with an auto-adaptive loop time operating at 1ns resolution
- State-of-the-art frequency and timing signal stability performance
- Integration of an ultralow noise OCXO oscillator with optional low G-sensitivity and a single or dual vibration-isolated tray for the OCXO and/or the Rb oscillator to meet various dynamic application requirements.

For more information about the Force-2020 product, including its datasheet, go to:  
[www.spectratime.com/products/isync/antivib-low-noise-gps-rb/force-2020/](http://www.spectratime.com/products/isync/antivib-low-noise-gps-rb/force-2020/).

### **New System for 1/f Noise Measurement Systems**

ProPlus Design Solutions Inc. has introduced the 9812DX™ wafer-level 1/f noise characterization system, an enhanced version of its standard 9812D™. ProPlus claims it to be the fastest for measurement speed, system resolution and coverage of different types of measurement requirements.

The 9812DX is the most advanced, fastest and complete noise characterization system that ProPlus offers, with improved specifications and measurement capabilities from earlier noise measurement systems. The new system tackles increasing measurement challenges of various advanced process technologies and the exploding number of noise measurements to meet the needs of process quality monitoring, statistical noise analysis and advanced circuit designs. It includes a more than 10X increase in system resolution, as well as a speedup boost three-to-10 times faster than previous systems, supports higher voltage, up to 200V, and offers lower current support down to 0.1nA.

The 9812DX provides a true 10 megahertz (MHz) bandwidth for accurate on-wafer noise measurement and user can also measure very low-frequency noises starting at 0.03 Hz. It enables noise measurement of extreme low dc current at 0.1 nA, a requirement for advanced designs that

need to bias devices at weak inversion conditions, dark current noise of photodiodes or image sensors for many consumer, communication, automotive and industrial applications.

Additionally, it handles high-voltage device operations up to 200 V and a wider range of measurement conditions and device types. Those include bulk MOSFET, FinFET, FD-SOI, bipolar junction transistors (BJTs) and junction field effect transistors (JFETs) and various diodes, such as photo, laser and Zener diodes, wide range of resistors (10 to 10 M $\Omega$ ), including voltage-controlled resistors, and integrated circuits (ICs).

The 9812DX supports a complete range of impedance for both high and low impedance devices and works with the most advanced technology nodes, from 16-nanometer (nm) and 14nm to 10nm and 7nm technology development.

The 9812DX is at least three-to-10 times faster than 9812D, with typical noise measurement time of less than 10 seconds per bias. This performance boost is due to improved software algorithms and hardware architecture. Improved measurement speed enables rapid data collection to manage increasing amounts of noise measurements required by process quality monitoring, statistical variation analysis and advanced circuit designs.

Find more information at [www.proplussolutions.com/index.php](http://www.proplussolutions.com/index.php).

### **Multi-channel Universal Input Touch Screen Portable Data Logger**

The OM-DAQXL Series is a new Omega exclusive portable handheld data logger that delivers high performance and functionality. This series offers 8 or 16 universal analog inputs, fast sampling rates, large data storage, and a 7-inch TFT color touch screen display offering advantages such as an intuitive user interface, easy channel configuration, data logging and play back, and many more. This series is suited for a wide range of applications including R&D and industrial labs, chemical, process monitoring and strain measurement during physical testing of materials.

Find more information at [www.omega.com/pptst/OM-DAQXL.html](http://www.omega.com/pptst/OM-DAQXL.html).

### **Silicon Photodiode Backscatter Detectors**

OSI Optoelectronics has introduced Annular Quadrant Silicon Photodiodes. The new devices operate between 350 nm to 1100 nm and are used for backscatter reflectivity measurements.

The new silicon (Si) quadrant detector features an annular package design and includes a 200  $\mu\text{m}$  laser-cut hole on the chip and the header that enable a fiber to be coupled from the back of the detector. This ensures that the detector sensing area is always normal to the direction of the light, reducing the need for angular compensation during backscatter measurements. Available in TO-5 and TO-8 metal packages, the active area on each element is 1.6  $\text{mm}^2$  and 19.6  $\text{mm}^2$  respectively. The element gap between the segments is  $\sim 0.10$  mm. The spectral range is from 190 nm (min.) to 1100 nm (max.) with a typical peak wavelength of 980 nm.

The detector operates between  $-20$   $^{\circ}\text{C}$  and  $+60$   $^{\circ}\text{C}$ . Storage temperatures range from  $-20$   $^{\circ}\text{C}$  to  $+80$   $^{\circ}\text{C}$ .

For more information about OSI's new Annular Ring Silicon Detectors, please go to [osioptoelectronics.com/standard-products/new-products.aspx](http://osioptoelectronics.com/standard-products/new-products.aspx).