

# *The IEEE Instrumentation & Measurement Magazine*

## *June 2014 Issue*

---

### *Physician Meets Engineer*

---

#### *Editorial*

Wendy Van Moer

#### **Magic in the Air**

That's what happens when a physician meets an engineer! They speak a different language, come from a different planet, but they are a perfect couple! In this issue you will find the proof. If a physician and an engineer sit together magical inventions can be obtained (Prof. Kevin Bennet – Mayo Clinic, USA). Discover the dreams of a cardiologist (Prof. Shin-Ichi Ando, Japan). Read what a pacemaker designer (Dr. Pedro Arzuaga, Uruguay) can teach us. And there is much more to read and learn... I promised you new columns! Well, here they are:

- Legal metrology by Veronica Scotti - Fundamental metrology: "The measurement stick came before the wheel" by Bryan Kibble.
- What is our technical committee TC-25 doing?
- Why would our society need a president?

Enjoy this June issue and let me know what you think about our face-lift. See you all in August!

Groetjes,  
*Wendy*

#### **Presentation of the Editorial Board of the *IEEE I&M Magazine***

In the April 2014 issue, our new editorial board was briefly introduced. Now, it is time that we take a closer look on who they are. What are these people doing and why does the magazine need them? The major task of the editorial board is being a sounding board for the editor-in-chief. Are his/her ideas crazy enough but not too crazy? The editorial board is a clear mirror of our readers: academics, industrials, and advanced students. Their task is to support the EIC of the magazine by providing state-of-the-art topics, the best reviewers, industrial liaisons, and much more. On top of that, most of them are responsible for one of the newly introduced columns in the magazine. The editorial board meets every two months to discuss new topics and future directions.

Who are they?

1. AEIC: The right hand of the EIC, Shervin Shirmohammadi.
2. President: The person with a global overview and a large network, Reza Zoughi.
3. EIC TIM: A person who recognizes hot topics and creates a link with our transactions, Alessandro Ferrero.
4. VP publications: He/she is responsible for all publications of the society, Mark Yeary.
5. VP education: He/she is the link with students and educational issues, responsible for our column 'Life after PhD', Max Cortner.
6. VP Technical Committees: He/she is the link with our technical committees and is responsible for the column 'What are TC's doing?', Rich Hochberg.
7. VP conference: He/she is the link with our conference topics, Alessandra Flammini.
8. Legal expert: He/she is responsible for the legal metrology column, Veronica Scotti.
9. Outstanding Young Engineer: He/she is full of fresh ideas and has a different perspective on research, responsible for the column 'Future trends in IM', Simona Salicone.
10. Fundamental metrology: He/she is responsible for our fundamental metrology column, Bryan Kibble.
11. Industrial representatives: Responsible for providing topics, authors, and reviewers for forthcoming issues: Charles Nader, Lee Barford, and Kevin Bennet.

However, our magazine would not exist without the dedication and help of our administrative team. They are taking care of so many tasks! Communication, editing, formatting, scheduling, spreadsheets, organization, administration duties, the link with Allen Press, and much more. In short, everything that is needed to make the (sometimes very crazy) dreams of the editorial board come true. Who are they?: June Sudduth, Kristy Virostek, Gary Garvin, and Caitlin Woody.

So now you have an idea of who is working daily behind the scenes to provide you bi-monthly the *IEEE I&M Magazine*: our gateway with you, our readers!

*The print version of the magazine includes a short bio and photo of each of these individuals.*

---

## *Feature Articles*

---

### *Physician- Engineering Collaboration*

Kevin E. Bennet

The close collaboration of physicians and engineers provides many opportunities for innovation and improvement in devices and systems for medical care. This article presents an overview of the long-term collaborative effort implemented at the Mayo Clinic, where the Division of Engineering has been an embedded engineering organization whose roots can be traced to 1915. Citing examples from cardiac and neurosurgery, the author discusses how engineers and technologists have been collaborating with physicians, surgeons, and scientist to create and deploy devices and instrumentation for the benefit of patients. First and foremost is the value in the ability to provide devices and systems to improve the outcomes of medicine and surgery.

*This summary includes text from the article.*

---

### *What Does a Perfect Blood Pressure Meter Look Like from a Clinician Point of View?*

Shin-ichi Ando

In this article, the author gives an overview of some of the problems faced in measuring blood pressure and proposes components of an ideal blood pressure measurement machine or mechanism for a clinician to measure blood pressure as efficiently and comfortably as possible. The article reflects on the need for continuous, accurate and real data collection to diagnose and monitor hypertension, especially for the Japanese who have had more cerebrovascular disease than those in the western countries. Monitoring and reducing hypertension is a serious problem since hypertension is a well-known risk most closely related to cerebrovascular disease.

*This summary was written by K. Virostek using text from the article.*

---

## *Cardiac Pacemakers: Past, Present and Future*

Pedro Arzuaga

Pacemakers were the first active implantable devices. Being so commonly known nowadays, their use has been integrated to our daily lives, like the use of the aspirin or antibiotics. Only 60 years ago, people with heart diseases would have a very poor life quality or even die, but ever since the use of pacemakers, several heart diseases are not life threatening anymore. In this article, the author presents basic concepts about the physiology of the heart, the history of the development of cardiac pacemakers, and characteristics of today's pacemaker designs.

*This summary includes text from the article.*

---

## *Measurement and Sensors for Motion Tracking in Motor Rehabilitation*

Luca De Vito, Octavian Postolache, and Sergio Rapuano

Among the different fields of medicine and healthcare, the role of measurement and sensors is particularly significant in physical rehabilitation, where objective measurements are needed to evaluate and keep track of the motor capabilities of the patients needing or being subjected to a rehabilitation treatment. This paper presents a brief overview of the commercial solutions and the research proposals for measuring the patient's movements, offers a review of laboratory measurement equipment for the patient's mobility evaluation, and describes some proposals of portable measurement systems used to monitor the patient or track his/her progresses during treatment at home and in clinical environments.

*This summary includes text from the article.*

---

## *Camera as the Instrument: The Rising Trend of Vision Based Measurement*

Shervin Shirmohammadi and Alessandro Ferrero

Due to continuing and rapid advances of both hardware and software technologies in camera and computing systems, we continue to have access to cheaper, faster, higher quality, and smaller cameras and computing units. As a result, vision based methods consisting of image processing and computational intelligence can be implemented more easily and affordably than ever using a camera and its associated operations units. Among their various applications, such systems are

also being used more and more by researchers and practitioners as generic instruments to measure and monitor physical phenomena. In this article, the authors discuss this rising trend and how cameras and vision are being used for instrumentation and measurement and cast a glance at the metrological gauntlet thrown down by vision-based instruments.

*This summary includes text from the article.*

---

## *Columns*

---

### *Basic Metrology*

#### **The Measuring Stick Came Before the Wheel**

Bryan Kibble

The ‘measurement first, technological advance later’ situation has evolved over the centuries to the present day into a more symbiotic relationship where technical advancement often enables more accurate or simpler and more convenient measurements to be made, and in turn these better measurements benefit technology. The author of this column provides examples how all of this progress has necessitated more reproducible and coherent units for the various measurements which are available to everyone throughout the world. He assures metrologists that they should feel valued in their role in human progress and advancement similar to engineers, doctors, lawyers, bankers, and so on, for in the ultimate, these professions would be unable to function effectively without metrologists’ past and present labors.

*This summary includes text from the article.*

---

### *Legal Metrology*

#### **Liability in Measurement**

Veronica Scotti

It is well known that currently, medicine highly refers to analysis, tests, diagnostic means, and treatments that require the medical supervision and support of technical people to ensure the correct use of all necessary and often very complex equipment. Despite that most technical, in a very broad meaning, errors can be traced back to management issues (such as loss of samples to

be analyzed, sample exchange, loss of medical records, wrong administration of a medicine due to missing information among operators), situations occur where an incorrect management of the employed instruments (such as lack of calibration or missing checks) may harm patients who, if human fault is proved, may claim for damages. This article introduces situations in which technical people working in the medical system can be actually considered liable for the harm suffered by the patient if it can be attributed, even partially, to a technical error.

*This summary includes text from the article.*

---

## *People Behind the Scenes*

### **Duties of the President**

Reza Zoughi

In the Society Handbook, the responsibilities and objectives of the I&M Society President are summarized as being:

*...responsible for the protection of Society interests. The President is expected to lead the Society and the AdCom to promote the interests of the Society and its members in professional, technical, academic, societal, and political realms.*

In addition, the President is the primary Society point-of-contact with the IEEE, its various Boards, and other societies. Consequently, the President must also represent and protect the IEEE I&M Society's interests within the Institute and its various boards of governance, and is included as a member of the IEEE Technical Activities Board. The Society President projects the image and the overall quality associated with our Society.

The IM Society Strategic Plan guides our various Committees in setting goals, outlining detailed action plans and establishing benchmarks by which to measure our progress. This plan is comprehensive and requires interaction among all Society and AdCom Committees. The President and Executive Vice President are responsible for ensuring that all aspects of the Society business proceed accordingly. They must also ensure that this important document is annually updated based on our progress in achieving our goals and for setting new ones.

The President is an important liaison between the IM Society AdCom and the Society membership and all other constituencies. The President is the glue that brings and keeps everything together within the AdCom and ensures collegiality and effectiveness in facilitating

and executing AdCom businesses. However, we are very fortunate to have a diversely (in all respects) populated AdCom consisting of highly accomplished, genuinely interested, motivated, respected and respectful colleagues, which makes this part of the job joyful and extremely easy.

These are the Presidents of the IEEE IM Society since 1950:

Reza Zoughi	President- 2014 – 2015
Jorge F. Daher	Past President - 2012-2013; Jr. Past President - 2014-2015
Kim Fowler	Past President - 2010-2011; Senior Past President - 2014-2015
Alessandro Ferrero	Past President - 2008-2009
Stephen A. Dyer	Past President - 2006-2007 and 2000-2001
Robert C. Rassa	Past President - 2004-2005
Brian Wadell	Past President - 2002-2003
Stanley R. Booker	Past President - 1998-1999
J. Barry Oakes	Past President - 1996-1997; 1976
Milton G. Slade	Past President - 1994-1995
Raymond S. Turgel	Past President - 1992-1993
Michael S. P. Lucas	Past President - 1990-1991
David W. Braudaway	Past President - 1988-1989
Harold S. Goldberg	Past President - 1986-1987
Fred Liguori	Past President - 1985
Bernard P. Gollomp	Past President - 1983-1984
Reuven Kitai	Past President - 1982
A. Ray Howland	Past President - 1981
Richard F. Clark	Past President - 1980
James K. Skilling	Past President - 1979
Daniel H. Sheingold	Past President - 1978
H.S. Fosque	Past President - 1977
G.R. Partridge	Past President - 1975
William M. J. Moore	Past President - 1974
Joseph F. Keithley	Past President - 1973
Andrew R. Chi	Past President - 1972
Robert Soderman	Past President - 1971
Andrew Dunn	Past President - 1970
E.W. Houghton	Past President - 1969
Francis L. Hermach	Past President - 1967-1968

G.E. Schafer	Past President - 1965-1967
C.E. White	Past President - 1963-1965
H.W. Lance	Past President - 1961-1962
L.D. McClellan	Past President - 1962-1963
C.W. Little	Past President - 1960-1961
F.C. Smith	Past President - 1957-1960
F.G. Marble	Past President - 1955-1957
R.L. Sink	Past President - 1954-1955
Ivan Easton	Past President - 1953-1954
E. Weber	Past President - 1950-1953

---

### *TC- 25 Update*

#### **Technical Committee on Biological and Medical Measurements**

**Marco Parvis**

All medical applications include a measurement component connected to the acquisition, correction, and validation of the medical data. Medical measurements have to deal with the measurand variability, both over time and between patients, being caused by a multitude of intrinsic and extrinsic factors, some known and some unknown. The goal of the Technical Committee on Biological and Medical Measurements (TC-25) is to establish, develop, promote, and support the cooperation among researchers involved in the different fields of medical measurements, so that instrumentation and measurement, medical and biological fields all become highly aware of these problems. In this effort, the Committee promoted the development of the P1721 draft standard on “Objective Measurement of Systemic Arterial Blood Pressure in Humans,” which is now on the way for the first ballot. This is an example of fruitful cooperation within the medical field: blood pressure was measured in an empirical way since 1905, and the instrumentation and measurement field aimed at understanding its reliability, i.e., the uncertainty, of the blood pressure measurement.

Of course, the topics of cooperation cover a large area, and the scope of research includes the requirement for cooperation to:

- Develop new, more accurate, less invasive, less costly, sensors for the measurement of clinical and/or biological parameters.
- Develop new, either conventional or non-conventional, data processing for complex devices such as TAC and NMR, to help physicians to extract the most important features of each exam.
- Characterize instruments and measurement procedures that, differently from other fields, often embed human beings and therefore often lack standards.
- Establish instrument interoperability and interconnection.

Most diagnoses are obtained by combining tests results generated by different instruments. The data fusion is often performed by the physician only at the end of the measurement process, and an easier possibility to access raw data generated by the different instruments could greatly improve the diagnosis quality.

Also in the practical field, the instrumentation and measurement people can contribute towards:

- Measurement techniques for athletic performance and for the doping counteract.
- Instruments and devices for impaired and elderly people.

The advances in the digital processing and the micro and nanotechnology fields open new and surprising possibilities to help people in need. This is a highly ethical area of research to which everyone should be committed.

To help people interested in this field to get together at least once a year, the TC started a workshop series nine years ago known as Medical Measurement and Applications (MeMeA). Every year, this workshop collects people from academia, industry, and medical fields and about one hundred papers are presented for discussion each time. The MeMeA changes location each year and has been held in the following cities:

- Benevento, Italy, in 2006,
- Warsaw, Poland (2007),
- Ottawa, Canada, in 2008,
- Cosenza, Italy, in 2009,
- Ottawa, Canada, in 2010,
- Bari, Italy, in 2011,
- Budapest, Hungary in 2012, and

- Gatineau, Canada, in 2013.

Last year in Gatineau, MeMeA had about 70 contributions coming from all over the world, presented by authors from 22 different countries. This year, MeMeA 2014 will be in Lisbon, Portugal (<http://memea2014.ieee-ims.org/>) and is scheduled for June 11–12, 2014. The deadline for submitting the papers is over, and the review is taking place for almost 200 papers.

Next year, for its Tenth Anniversary, MeMeA will go back to Italy, where it started in Benevento in 2006. The location is Torino, and the workshop is scheduled for May, 8–9, 2015 just before the IEEE International Instrumentation and Measurement Technology Conference (I2MTC) 2015.

This committee is run by Marco Parvis ([marco.parvis@polito.it](mailto:marco.parvis@polito.it)) and Voicu Groza ([vgroza@ieee.org](mailto:vgroza@ieee.org)). More details can be found on the TC web site: <http://tc25.ieee-ims.org/tc25-home>. Help, suggestions, and proposals are all welcome.

*The print issue of this column includes diagrams about the geographic distribution of MeMeA 2013 authors and photos from past MeMeA workshop locations.*

---

## *Departments*

---

## *New Products*

Robert Goldberg

### **LTE – A Base Station Tester**

Aeroflex Limited has launched an extended version of its TM500 industry-standard base station tester capable of emulating several thousand LTE user equipments (UE), fading channel models, and LTE-A carrier aggregation functionality in a onebox benchtop unit. Aeroflex claims the TM500 Test Mobile delivers more leading edge LTE-A development capability with a higher UE density than any other solution on the market.

LTE-A carrier aggregation was first supported on the TM500 in early 2012 and has since been used by operators worldwide to demonstrate the real-world performance of carrier aggregation technology in field environments. The TM500 Test Mobile platform is the de facto industry

standard for testing LTE and LTE-A base stations and is used by all leading network infrastructure vendors. Aeroflex continues to work with mobile operators and infrastructure vendors to introduce the latest 3GPP features at the earliest opportunity, thus enabling them to develop and roll out the high bandwidth services promised by LTE-A in both FDD and TDD modes for operation.

The Aeroflex 7100 LTE Digital Radio Test Set is a complete one-box test system providing all of the tools required for the measurement and characterization of user equipment chip sets and mobile terminals to 3GPP LTE standards, including optional signal fading simulation.

For more information, please visit <http://www.aeroflex.com>.

### **USB Thermocouple Power Sensors**

Agilent Technologies Inc. announces the addition of two new models to its U8480 Series USB thermocouple power sensors. The U8480 Series now comes with improved specifications, including an expanded frequency range to 67 GHz and a measurement speed of 900 readings per second. Agilent claims the U8480 Series' status as the world's fastest USB thermocouple power sensors. Agilent also claims the U8480 Series' real-time measurement uncertainty feature is the first of its kind in the industry, significantly reducing overall test time by removing the need for time-consuming manual measurement uncertainty (MU) calculations. Users can now compute MU in real time and at any given point. The feature also allows them to display power measurements and their MU simultaneously, simplifying test measurement and increasing test accuracy.

The U8480 Series provides best accuracy and repeatability with thermocouple sensing technology and a power linearity of less than 0.8 percent. The new S-parameter and gamma correction functions further improve measurement accuracy by correcting the mismatch errors caused by inserted components between the device-under-test and the power sensor, making the U8480 Series suitable for applications such as test system or instrument calibration.

Like all Agilent USB power sensors, the U8480 Series can be used as an accessory for other Agilent instruments, allowing these instruments to perform specific power measurement applications without needing to connect to a PC or laptop. The U8480 Series is compatible with Agilent FieldFox RF analyzers and MXG signal generators, giving them power meter

functionalities. The power sensors also perform source power calibration with Agilent PNA, PNA-L and PNA-X network analyzers. With USB functionality and the bundled N1918A Power Panel software, the series allows high-frequency power measurements in applications ranging from high-volume manufacturing to calibration and field remote monitoring.

Information on the U8480 Series is available at [http:// www.agilent.com/find/usbthermosensor\\_pr](http://www.agilent.com/find/usbthermosensor_pr).

### **New Line of Precision Measurement Instruments**

Cole-Parmer introduces a comprehensive new line of test and measurement products to fill the technician's toolbelt. The Digi-Sense™ brand offers new technologies that deliver accurate readings while withstanding rigorous use. From environmental testing meters to performance monitoring equipment, many of the items are precalibrated to save time, cost, and effort. With products individually calibrated before shipment, the measurements provide an unrivaled level of confidence.

The Digi-Sense brand currently includes 25 models of thermometers, infrared devices, humidity meters, anemometers, light meters, and manometers. Additional products that fill other measurement needs will soon be available. Digi-Sense also features a comprehensive line of temperature probes with customization available for unique applications. The new suite of products is designed to meet the ongoing needs of technicians. View the Digi-Sense products at <http://www.coleparmer.com/>.

### **MEMS Accelerometers for Aerospace, Automotive, and Industrial Monitoring**

Silicon Designs Inc. (SDI) has announced the global market introduction of the compact, low-mass Model 2220 Series. The single-axis SDI Model 2220 is a higher performance version of the company's Model 2210, combining an integrated low-noise, nitrogen-damped, fully-calibrated MEMS VC (variable capacitive) accelerometer chip with high-drive, low impedance buffering. Each is contained in an epoxy-sealed rugged anodized aluminum housing that mounts via two M3 screws. This design is ideal for measuring acceleration within industrial and commercial environments, where low mass (10 g) and small size (1 x 0.5 x 0.44 in), or (2.5 x 1.3 x 1.1 cm) help to minimize mass loading effects.

Available in seven unique models, with measurement ranges from  $\pm 2$  g to  $\pm 200$  and a wide frequency response, the SDI Model 2220 series responds to both DC and AC acceleration, with either two analog  $\pm 4$  V (differential) or 0.5 to 4.5 V (single-ended) outputs that vary with acceleration. At zero acceleration, output differential voltage is nominally 0 VDC (DC response). Differential sensitivity ranges are from 2000 mV/g for the  $\pm 2$  g module to 20 mV/g for the  $\pm 2000$  g module, with typical 1% cross-axis sensitivity. Onboard voltage regulation also minimizes supply voltage variation effects. SDI Model 2220 series modules can withstand shock inputs of up to 2000 g and can reliably operate over a temperature range of  $-55$  °C to  $+125$  °C.

Each module is serialized for traceability and is fully calibrated. The combined low mass, small size, and low-impedance outputs of SDI Model 2220 make the series particularly ideal for flight test, vibration monitoring and analysis, robotics, biomechanics, machinery and equipment control, modal analysis, crash testing, and general in-laboratory applications.

To learn more about Silicon Designs and its available product technologies, please visit <http://www.silicondesigns.com>.

### **GPIB-Programmable Power Supplies**

Keithley Instruments, Inc. announces the addition of two multi-channel power supplies with GPIB interfaces to its line of programmable DC power supplies. Both the Model 2220G-30-1 dual-channel and 2230G-30-1 triple-channel power supplies combine the advantage of greater output accuracy at prices that are substantially lower.

The Model 2230G-30-1 power supply provides two output channels typically used for powering analog circuits, with each channel capable of outputting up to 30V/1.5A/45W, plus a 6V/5A/30W output channel, typically used for powering digital circuits. The Model 2220G-30-1 power supply provides two output channels, each capable of outputting up to 30V/1.5A/45W.

With basic voltage setting accuracy and voltage readback accuracy of 0.03% for each output channel, Series 2200 multichannel supply users can be confident that the exact voltage they program for any channel is the level applied at the output terminals. Each output channel is completely isolated, which allows the new power supplies to power two isolated circuits with different reference points, eliminating the need for a second power supply.

For applications that require supplying more than 30V or 1.5A, the new power supplies' 30V outputs can be combined in a variety of configurations, such as being wired in series to produce a 60V output with a maximum current output of 1.5A or wired in parallel to produce a 3A output at 30V. When configured this way, special display modes show the actual voltage and current for the combined pair. The new power supplies also allow configuring the 30V outputs to test a bipolar circuit or maintain a user-defined ratio between the two outputs when using Tracking mode. Several features help protect fragile or experimental DUTs (Devices Under Test) from damage during testing, including programmable voltage maximum values that prevent the accidental entry of a channel's voltage above the pre-set value.

These settings are in addition to the current limit setting function, which controls the level of current that can flow into the DUT, and each output channel's limit can be set independently. More information on the latest additions to the Series 2200 multi-channel power supply family is available on the Keithley website at <http://www.keithley.com/data?asset=57005>.

### **Low Noise Bridge Amplifier for Use with High Resolution Data Acquisition Systems**

iWorx Systems Inc. has introduced the IA-400D Bridge Amplifier for conditioning signals from low-bandwidth transducers such as those used to measure blood pressure or force as well as applications requiring wider bandwidth. The amplifier provides four channels of excitation power, gain, and noise filtration and exhibits low system noise and offset, making it suitable for use with high-resolution data acquisition systems. Each channel has a switch to allow selection of either a 40 Hz or 10 kHz low pass filter.

The IA-400D Bridge Amplifier incorporates a programming resistor in the DIN-8 connector to easily set the gain to the optimal value for a specific measurement. The low offset characteristic of bridge-style transducers combined with the high resolution of iWorx data acquisition systems dramatically minimizes the need for offset control to simplify operation.

The IA-400D is packaged in a low profile enclosure that provides both durability and noise immunity. The device has a small footprint measuring just 6.2in. x 5.3in. x 2.3in. (17.5cm x 13.5cm x 6cm) and multiple units are easily stacked to save bench space.

More information on iWorx research instruments can be found at <http://www.iworx.com>.

## **Test Solution for eCall In-Vehicle System Modules**

To ensure fast emergency response times to automobile accidents and save lives, automatic emergency call systems will be mandatory for all new vehicles in the EU starting in 2015. Rohde & Schwarz supports manufacturers today by offering a standard-compliant test solution for the wireless and GNSS-capable components of eCall in-vehicle systems.

The setup consists of the R&S CMW500 wideband radio communication tester and the R&S SMBV100A vector signal generator with integrated global navigation satellite system (GNSS) simulator. This setup allows manufacturers and suppliers of automatic in-vehicle system (IVS) to perform reliable and reproducible end-to-end conformance tests on their eCall modules. When an accident occurs, the IVS connects with a public safety answering point (PSAP) via the local wireless communications network and transmits a minimum set of data (MSD) that includes the GPS coordinates of the vehicle involved.

The Rohde & Schwarz test solution enables users to verify whether their IVS modem can successfully initiate an emergency call, transmit the correct MSD, and establish a voice connection with a PSAP. Rohde & Schwarz developed the R&S CMW-KA094 eCall application software specifically for this application. The software simulates a PSAP and controls the R&S CMW500 emulating a wireless communications network in the lab. It also controls the GNSS simulator supplying the coordinates required for localization. The test solution is fully automated thanks to the R&S CMWrun sequencer software and can be used right away. The user can test the RF interfaces and GNSS receiver and also check that the entire system is functioning properly.

With the advent of eCall, GSM and UMTS wireless communications technologies are now making their way into private vehicles. Rohde & Schwarz has spread its RF testing expertise to the automotive sector with its eCall test solution. The R&S CMW500 is a future-ready multistandard platform capable of testing RF interfaces such as WLAN, 2G, 3G, and LTE for tomorrow's traffic telematics modules. The R&S SMBV100A can also be used to test navigation systems and other applications that require position information. The GNSS simulator offers a range of flexible realtime scenarios with up to 24 dynamic satellites for GPS, Glonass, Galileo, and BeiDou.

Find more information at <http://rohde-schwarz.com>.

## **Surface Microphone for R&D Testing**

PCB Piezotronics announces the launch of its new surface microphone developed for test engineers and acoustic consultants taking measurements in spaces where traditional microphones won't fit or outdoor environments and wind tunnels, where the effects of wind noise on measurements are a concern. Designed using computational fluid dynamics (CFD) modeling, the new model is a low profile microphone and surface mount pad that greatly reduces the impact of undesired air pressure on the microphone during the measurement process.

Model 130B40 is an all-in-one, prepolarized microphone and preamplifier combination with a water and dust resistant cover. Key features are its maximum dynamic range allowing measurements up to 142 dB and a 32dBA low noise floor. Standard on this unit is TEDS v1.0. Typical applications include sound pressure measurements in space-constrained cavities, environmental testing, or Clear Air Turbulence (CAT), tornado research, wind tunnel testing, or general sound analysis where wind noise may be an issue. The surface microphone can be used in any flush mount application and can be embedded into a wall or mounted with adhesive on flat or curved surfaces. The height is 1/8in (3mm), making it an excellent choice for applications that require the microphone to have a low profile. Model 130B40 is a quality acoustic measurement sensor with a small footprint and a very competitive price.

For additional information, please visit <http://www.pcb.com/surfacemictest>.

## **Dual Coordinate Measuring Machine**

Hexagon Metrology introduces the new TESA MH3D-DUAL coordinate measuring machine. The MH3D-DUAL CMM offers a unique-to-the-market combination of manual and automatic measurement functionality for increased flexibility on the shop floor or in the quality laboratory. The patented, multipurpose coordinate measurement machine is easy to learn and simple to operate, making it very accessible to new and existing users of CMM technology.

A major feature of the MH3D-DUAL system is its fast, flexible TESA-REFLEX Dual data management software with seven measuring options; points, lines, circles, planes, cones, spheres, and cylinders. The system's built-in automatic feature recognition function assists the operator by suggesting the best solution to measure a small or large series of parts. The software

also automatically displays the characteristics linked to measured features. Non-specialists can become familiar with the software in just a few hours. The system offers guaranteed compatibility with Q-DAS and other standard formats. Measured data results can be quickly exported into a PDF file and printed for further analysis.

The CMM's shop hardened control panel is designed to withstand dust and oil particles found in industrial production environments. Another important feature is a new palette system that automatically measures a complete pallet of parts based on a manual sequence, adding even more efficiency to the measurement process. With a measurement accuracy of 2.5µm, the MH3D-DUAL can play a major role in the quality assurance of prototypes and mechanical parts produced in industries like automotive, aerospace, heavy industry, packaging, moldmaking, and more.

Learn more at <http://www.tesagroup.com>.

### **Safety Controller Provides Flexible Programming Capabilities**

Banner Engineering introduces the SC26-2 Programmable Safety Controller for PLC (Programmable Logic Control)-level capability and control without the programming complexity and steep learning curve of traditional PLCs. Designed to be more flexible and easier to use than other small footprint safety controllers, the SC26-2 uses safety function blocks, Boolean logic functions and a user-friendly programming environment for creating safety control logic.

With 26 input terminals and two redundant solid-state safety outputs, safety system design engineers are able to easily monitor a variety of input devices, such as e-stop buttons, rope pulls, interlock switches, safety light curtains, and other safety and non-safety input devices. The controller's free PC Graphical User Interface configuration software features pre-configured safety function blocks, including two-hand control, muting and enabling device to simplify application programming—and it includes a ladder logic diagram and a text-based summary of all of the input device and controller output settings.

The optional LCD displays IO status and actionable diagnostics like input fault information and device wiring details. This assists users during system integration and enables faster troubleshooting to minimize machine downtime.

Ethernet models are also available and have an embedded Ethernet node that provides up to 64 virtual status outputs. The Ethernet IO registers automatically populate based on the configuration and can also be pared down or customized depending on application requirements. For larger scale applications, Banner will offer expandable models in the future, which will allow users to add up to eight additional IO modules.

For more information on the SC26-2 Programmable Safety Controller, visit <http://www.bannerengineering.com>.

### **Multi-Octave Wilkinson Power Dividers**

Pasternack Enterprises, Inc. introduces a brand new line of Wilkinson power dividers (also referred to as Wilkinson power splitters). These multi-octave power dividers cover popular communications bands from 0.5 to 2.7GHz including 3G and 4G, plus Wi-Fi bands and are well suited for applications such as in-building distributed antenna systems (DAS) or test environments.

Pasternack is offering two Wilkinson designs covering 0.5 to 2GHz and 0.7 to 2.7GHz bands. The 0.5 to 2GHz band power dividers utilize SMA connectors and are available as 2-way, 4-way, and 8-way configurations. The 0.7 to 2.7GHz band power dividers are available with SMA or N connectors and are available in 2-way, 3-way, 4-way, and 8-way configurations.

Both Wilkinson splitter designs provide accurate performance across their designed frequency bands, making them ideal for many wireless applications including in-building DAS.

Pasternack's new offering of Wilkinson power splitters consists of eleven-part numbers total. Power ratings for the group range from 10 to 30W and have maximum insertion loss of 1.2dB. Maximum VSWR is 1.4:1 and phase balance ranges between 2 and 8 degrees. Each of the eleven new power dividers meets MIL-STD-348 standards and is RoHS compliant.

You can view information on these new products by visiting:

[http://www.pasternack.com/pages/Featured\\_Products/multi-octave-wilkinson-power-dividers.htm](http://www.pasternack.com/pages/Featured_Products/multi-octave-wilkinson-power-dividers.htm).

### **PXI RF Solid State 6GHz Multiplexers**

Pickering Interfaces is expanding its range of PXI RF solidstate 6GHz switching solutions with the introduction of two new multiplexer (MUX) versions (model #40-883). These versions include a SP8T (8:1) MUX occupying two PXI slots and a SP16T (16:1) MUX occupying three PXI slots. Each version uses solidstate switches that ensure fast switch operation time of 50 $\mu$ s, very repeatable performance, and an indefinite service life when used within ratings. The designs have been carefully optimized for VSWR performance and insertion loss. Particular attention has been paid to crosstalk and isolation to ensure that unselected switch paths have minimal output signal content. Each multiplexer can handle up to +30dBm of signal power and signal frequencies from 10MHz to above 6GHz. Unused ports are automatically terminated to manage VSWR effects in cables.

Find more information at <http://www.pickeringtest.com>.

---

## *Society News*

### **I&M IEEE Fellows Class of 2014**

Congratulations to the newly elevated I&M IEEE Fellows, Class of 2014!

**Kim Fowler:** for contributions to mission-critical and safety-critical systems engineering

Kim Fowler has spent 32 years in the design, development, and project management of medical, military, and satellite equipment. His interest is in the rigorous development of safety-critical and mission critical, embedded systems. Kim co-founded Stimsoft, a medical products company that he sold in 2003. He has also worked for the Johns Hopkins University Applied Physics Laboratory and a company now part of Curtiss-Wright Embedded Computing that built digital signal processing boards. He was President of the IEEE I&M society for 2010 and 2011 and has been an adjunct professor for the Johns Hopkins University Engineering Professional Program. He lectures internationally on systems engineering and developing real-time embedded products. Kim has published widely, written seven textbooks and is completing an eighth. He has 18 patents - granted, pending, or disclosed. Kim currently consults in technical product development for both commercial companies and government agencies and is a PhD graduate student in Electrical Engineering at Kansas State University.

**Mohammad Alam** for contributions to pattern recognition and high resolution image reconstruction

Dr. Mohammad S. Alam is a Professor and Chair of the ECE Department at the University of South Alabama (USA). He received his BS and MS degrees in electrical engineering from the Bangladesh University of Engineering and Technology (BUET) in 1983 and 1985, his MS degree in computer engineering from the Wayne State University in 1989, and his Ph.D. degree in electrical engineering from the University of Dayton in 1992. Prior to joining USA, he served on the faculty of BUET, Purdue University - Fort Wayne, and the University of Alabama.

His research interests include image processing, pattern recognition, ultrafast computing, and renewable energy. He authored or co-authored 500+ publications, including 185 articles in refereed journals, 300+ conference publications, 25+ research project reports, 15 book chapters, and a book on IPTV (IEC Press). He has also edited a reference book of selected papers on JTC (SPIE Press) and many conference proceedings. Over 4200 citations of his work have been reported in the Google Scholar. He received numerous excellence in research/teaching/service awards including the 1997 Faculty Colloquium on Excellence in Teaching Award (Statewide recognition) from the Indiana University, 2003 Scholar of the Year Award from Phi Kappa Phi Honor Society, 2005 Outstanding Scholar of the Year Award from the USA Alumni Association, 1998 Outstanding Engineer Award from Region 4 of IEEE, and 2013 Outstanding Engineer Award from Region 3 of IEEE. Most recently, he was recognized as one of the 50 faculty who made outstanding and lasting research and scholarship contributions in the 50-year history of USA.

Prof. Alam served/serves as the PI or Co-PI of many research projects totaling over \$14M, supported by National Science Foundation (NSF), Federal Aviation Administration (FAA), Department of Energy (DoE), Army Research Office (ARO), Air Force Office of Scientific Research (AFOSR), AFRL, SMDC, National Aeronautics and Space Administration (NASA), Wright-Patterson AFB, BP and ITT industry. He presented over 100 keynote/invited papers, seminars and tutorials at international conferences and research institutions in USA and abroad. He has organized and chaired many international conferences and serves as a Guest Editor for 4 professional journals. He supervised the research work of 55+ Masters/Ph.D. students and 22 post-docs and visiting scholars.

Prof. Alam serves as a consultant to industry and academic institutions. Currently, he serves on the International Advisory Board of the GIK Institute of Technology, Pakistan, and as an External Examiner for the International University - Malaysia, University of Engineering and Technology - Pakistan, Kuwait University, Multimedia University - Malaysia, University of Malaya, Anna University - India and Calcutta University - India. He also serves as an ABET (Accreditation Board for Engineering and Technology) evaluator.

Prof. Alam is an elected Fellow of eight professional societies: Institute of Electrical and Electronics Engineers (IEEE), Institution of Engineering and Technology (IET), Optical Society of America (OSA), SPIE - the International Society for Optical Engineering, Institute of Physics (IoP), Society for Imaging Science & Technology (IS&T), Bangladesh Computer Society (BCS), and the Institution of Engineers Bangladesh (IEB).

Dr. Alam serves as an OSA Fellows Travelling Lecturer. He was the Chairman of the Fort Wayne Section of IEEE during 1995-1996. He also serves as the President of the Southeastern ECE Department Heads Association during 2005 - 2006. Currently, he serves as the President of the Mobile Section of IEEE.

*The print issue includes photos of these honored individuals.*