

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

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*I&M in Industry*

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*Editorial*

**I&M in Industry**

Wendy Van Moer

A few more weeks and we will say goodbye to 2017... A year to remember with a lot of fun but also some sadness again. At this exact moment, September 2017, writing this editorial, I received the very sad news that we lost a good colleague and friend, Professor Sergey Kharkovsky. Sergey was an Associate Editor for our *Transactions* since 2008 and also Associate Editor-in-Chief in 2014. But above all of that, he was a splendid researcher and a dedicated person, ready to help at all times. We will all truly miss him.

In these four years of being Editor-in-Chief, I have been writing too many 'Goodbyes' for all of our colleagues and friends we have lost. It makes me realize that we should enjoy life as much as we possibly can and really take some time to listen and talk to each other. So please, put down this magazine for a moment, take a coffee break and talk to some colleagues about daily things instead of work related issues.

Afterwards come back, because you will also enjoy this issue of *Instrumentation and Measurement Magazine*, which is all about industry! Our guest editor is Professor Simone Corbellini from the Politecnico di Torino. He was responsible for the Industry Day at the 2017 International Instrumentation and Measurement Conference (I2MTC). It was a great pleasure and honor to work with him, and I would like to take the opportunity to thank him for his dedication and valuable time.

We don't know what 2018 will bring us, but we know for sure that our *Magazine* will handle interesting topics!

I wish you all a peaceful ending of 2017 and a splendid beginning to 2018!

Groetjes,

Wendy

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## *Guest Editorial*

### **The Pervasive Role of Measurements in the Industrial World**

Simone Corbellini

Something that often delights researchers working in the measurement field is the strong multidisciplinary nature that characterizes applied metrology. The diversity of contexts and aims makes this measurement discipline always amazing and stimulating. This becomes much more evident when dealing with the challenging problems and requirements typically encountered in real industrial situations. In these cases, the crucial role of metrology fully comes into the spotlight, becoming the real referee between quality and cost, and at the same time, the only player able to provide industries with some of the instruments necessary to reach their goal.

The Industry Day at the 2017 IEEE International Instrumentation and Measurement Technology Conference (I2MTC), which collected papers focused on new applications of instrumentation, methods and measurement technologies connected with the industrial world, was by no means different.

The examples in this issue, which are taken from this broad industry field, span from topics close to our daily life on Earth to those apparently more far from us, connected with space and astrodynamics. A paper presents an innovative bench for measuring parameters that characterize performance and reliability of drones, whose use is greatly increasing in our lives. Another paper deals with laser metrology for the next generation of gravity satellites, whose challenging aim is

to monitor temporal variations of the Earth's gravity field, related for example, to internal geophysical processes or to mass transport produced by the water cycle.

These applications clearly show the importance of a continuous collaboration between metrologists, academia and industry researchers, especially when uncertainty and reliability of data are critical elements. In this scenario, a third paper deals in detail with metrology of decisions and the importance of Smart Metrology in the 4.0 industrial world of the Big Data era in which we live.

Enjoy the reading!

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### *In Memoriam*

**Sergey Kharkovsky (1952-2017)**

**Reza Zoughi**

It is with great sadness, sorrow and heavy hearts that we inform you of the passing of our dear friend and colleague Dr. Sergey Kharkovsky. Sergey was a longtime supporter of the I&M Society who selflessly contributed to its well-being in many capacities.

*The print magazine includes tributes contributed by thirteen IMS colleagues of Sergey.*

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### *Article Summaries*

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#### *DronesBench: An Innovative Bench to Test Drones*

(Summary)

**Pasquale Daponte, Luca De Vito, Francesco Lamonaca, Francesco Picariello,  
Maria Riccio, Sergio Rapuano, Luca Pompetti and Mauro Pompetti**

In the literature, the systems used for testing drones are mainly used for measuring parameters related to each component of the drone itself (such as control board, propeller, motor, and so on).

These measurement systems are designed for testing each drone subsystem, and they do not allow assessing the reliability of a drone as a whole system. The DronesBench is currently at the pre-series stage, with academic, educational and commercial collaborations in progress. In this paper, the first outcomes of the collaboration between the Laboratory for the Signal Processing and Measurement Information (LESIM) research group and the company DPM Elettronica S.r.l. (Foggia, Italy) are reported. The DronesBench platform is described, and a first model referring to thrust force measurements is presented. Furthermore, an automatic procedure for evaluating the FoM is proposed. The first results obtained from the characterization of a commercial drone using DronesBench are also reported.

*This text is from introduction of the article.*

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## *Laser Metrology for Next Generation Gravity Mission*

(Summary)

Luciana Bonino, Stefane Cesare, Luca Massotti, Sergio Mottini, Kolja Nicklaus,  
Marco Pisani and Pierluigi Silvestrin

The studies and research activities of the last years have paved the way towards the development and implementation of a Next Generation Gravity Mission that is potentially able to improve the knowledge and monitoring of geophysical phenomena related to Earth's gravity field well beyond the already excellent results achieved by the GOCE and GRACE missions. The key instrument of NGGM is a laser interferometer which shall measure the distance variation of two spacecraft separated by 100 km with the resolution of few nanometers. Two concepts of this interferometer that are suitable to meet the NGGM measurement requirements have been identified and defined together with their auxiliary metrology system for the optical link acquisition.

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## *Smart Metrology: The Importance of Metrology of Decisions in the Big Data Era*

(Summary)

Annarita Lazzari, Jean-Michel Pou, Christophe Dubois, and Laurent Leblond

The beginning of the 21st century has seen the birth of a new industrial revolution, the digital revolution: the ability to store data from various sources (in particular through related items) in unprecedented big quantities and to exploit them through more and more high computing capabilities using artificial intelligence techniques. In this new scenario called “Big Data,” data reliability becomes an indispensable property: the large amount of data collected and their analysis are completely useless if untrusted information is stored that cannot help understanding a complex reality. Here is the role of metrology: to ensure the reliability of measured data. Smart Metrology is the implementation of a revised metrological function, oriented to reliability, rather than simply on complying with standards: ensuring reliability of measurements, knowing and mastering measurement uncertainty to make relevant decisions. This paper is a summary of issues for business metrology.

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## *MEMS Barometers and Barometric Altimeters in Industrial, Medical, Aerospace, and Consumer Applications*

(Summary)

Dimosthenis E. Bolanakis

Nowadays, MEMS sensors are considered a highly efficient technology, which is found in abundant industrial, medical, aerospace, and consumer applications. This article discusses the importance and pervasiveness of MEMS sensors in our daily lives and identifies the challenges and limitations of integrating barometric pressure sensors in cutting-edge applications. While inertial sensors (i.e., accelerometers and gyroscopes) have been thoroughly explored, little effort has been devoted to the explicit examination of MEMS barometers and barometric altimeters. An overview of the potential applications of MEMS barometric sensors as well as the critical issues that affect system performance, along with recommendations on different prototype platforms for research and educational practices, are presented in this article.

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## *Fault Diagnostics in Rotary Machines through Spectral Vibration Analysis Using Low-Cost MEMS Devices*

(Summary)

Luciane Agnoletti dos Santos Pedotti, Ricardo Mazza Zago, and Fabiano Fruett

The present work shows a low-cost instrument, based on a microelectromechanical systems accelerometer which costs less than US\$ 1.20/unit and is designed to analyze unbalance in rotating machines. The acceleration signals were acquired using two perpendicular axes on a free wheel shaft, which were used to analyze the shaft vibration in the frequency domain by its Fast Fourier Transform. These signals from orthogonal accelerometers were also used to calculate the shaft unbalance. The instrument prototype was mounted on the shaft of an electrical bicycle motor wheel, rotating in a range of 60 to 270 rpm. Composing the characterization apparatus, some weights were introduced at the ends of rim spokes to simulate a mechanical wheel unbalance. The experimental results showed that both vibration and unbalance can be measured successfully and that this instrument is a suitable low-cost solution to measure vibration and unbalance in rotating machines.

*This summary includes text from the article.*

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## *Vision-Based Fall Detection System for Improving Safety of Elderly People*

(Summary)

Fouzi Harrou, Nabil Zerrouki, Ying Sun, and Amrane Houacine

Recognition of human movements is very useful for several applications, such as smart rooms, interactive virtual reality systems, human detection and environment modeling. The objective of this work focuses on the detection and classification of falls based on variations in human silhouette shape, a key challenge in computer vision. In this study, the detection is achieved with a multivariate exponentially weighted moving average (MEWMA) monitoring scheme, which is effective in detecting falls because it is sensitive to small changes. A classification stage based on a support vector machine (SVM) is applied on detected sequences. To validate this methodology, two fall detection datasets have been tested: the University of Rzeszow fall

detection dataset (URFD) and the fall detection dataset (FDD). The results of the MEWMA-based SVM are compared with three other classifiers: neural network (NN), naïve Bayes and K-nearest neighbor (KNN). These results show the capability of the developed strategy to distinguish fall events, suggesting that it can raise an early alert in the fall incidents.

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## *Development of a Magnetoinductive Lens for Magnetic Resonance Imaging*

(Summary)

Jie Wu and Bing Nan Li

In this article, the authors present a magnetoinductive lens (MIL) with negative permeability by using metamaterials to enhance the signal-to-noise ratio (SNR) of MRI surface coils. The metamaterial capacitor-loaded metallic rings are designed and fabricated on a thin slab to guide the propagation of near-field electromagnetic waves. This metamaterial MIL is able to focus the  $B_1$  field at the Larmor frequency nearby 297.2 MHz for 7.0 T MRI. The results of MRI scanning with and without MIL show that the surface coil is enhanced about three times in terms of SNR. Its potentials in spatial resolution and penetration depth are preliminarily demonstrated as well.

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## *Columns*

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### *Future Trends in I&M*

(Summary)

#### **The Role of Measurement in Smart Cities Pilot Projects**

Stefano Rinaldi

The target is clear: create a pervasive sensors network that can be used to *measure* and *control* the flows of energy and people in Smart Cities using existing technologies and infrastructures. The challenges are also clear: device interoperability, data integrity, cyber-security, node identification, network self-organization and management, user privacy, user interface, data

storage and processing, just to mention the most important ones. The IoT paradigm applied to the Smart Cities scenario cannot ignore the specific requirements that different applications have. Each of the Smart City applications has specific challenges to be faced and specific constraints of the IoT domain.

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## *Basic Metrology*

(Summary)

### **Yardsticks of Science: The Origins and Future of the International Unit**

Jackie Ferguson and Chris Burns

The historical trend of extracting, purifying, characterizing and in some cases, then chemically synthesizing, biological medicines is changing. Biological molecules which do not have a natural or native counterpart can be designed to exhibit the desired binding, bioactivity or retention time in the body. Gene therapy to correct malfunctioning genetic information and regenerative medicine based on delivering whole cells suggest that even with the analytical capabilities of the twenty-first century, modern medicine will look to ever more intricate solutions to alleviate disease. As it was first intended, the International Unit will remain a pragmatic, practical solution to ensure safety and consistency in facilitating the application of these advanced therapies.

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## *Life After Graduation*

(Summary)

### **By the Numbers!**

J. Max Cortner

For success, take charge of the appearance of your data as well as the integrity of your data. Think about learning styles: Visual, Aural, Reading/Writing, and Kinesthetic. People who are better at visual learning may struggle at seeing the point of a nicely bulleted presentation of



words and numbers. These learning styles aren't exclusive, so present information in many formats, even if one may seem to be slower and less exciting. If you understand the learning style of your boss, you can tailor the presentation, but if you have a broader audience, you need to cover the possibilities. A hybrid presentation that includes seemingly duplicative information using different styles vastly increases the chances of success.

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## *Society News*

### **Chapter Chair Summit 2017**

**Sergio Rapuano**

The fifth Chapter Chair Summit 2017 was held at the Politecnico di Torino, Turin, Italy, on May 22, 2017. In the tradition of the previous editions, the Summit was a parallel event of the IEEE International Instrumentation and Measurement Technology Conference (I2MTC), held one day in advance of the conference at the same venue. The Chapters of Instrumentation and Measurement Society (IMS) have been consistently increasing in number during the last two years, numbering 55 Chapters and 8 Student Branch Chapters in May 2017. The most prolific region was R10, the IEEE Asia Pacific Region.

The Chapter Chair Summit was originally launched in 2013 with an agenda based on a classical one-to-many interaction that started with an introduction of IMS Representatives, the VP of Membership or the Chapter Chair Liaison, followed by several simultaneous one-to-one interactions among the Chapter Chairs about a specific hot topic suggested by the IMS Rep. A final session collected the suggestions and comments from the Chairs about the hot topics and future agendas. During the following years, by continuously collecting the Chapter Chairs' suggestions and steering the contents in the directions requested by them, the agenda was enriched with several new interventions of the Chairs of the IMS Standing Committees who presented IMS programs and interacted with the attendees. A session where the Chapter Chairs present their best practices to their colleagues and the AdCom members attending the summit was also introduced. Several Distinguished Lecturers attended the summits, too, to network with

the Chapter Chairs. During each summit, the actions taken by the AdCom in response to the suggestions and comments cast during the previous year were presented to the Chairs who validated the issues and provided new comments. As a result of this continuous improvement process, the duration has been extended to a full day and the attendance has doubled. For the fifth consecutive year, in fact, the number of attending Chairs increased, and this year included 16 Chapter Chairs or representatives, many of whom have attended the summit from the very first edition in 2013, and others who attended for the first time. All of the IEEE Regions from 7 to 10 were represented in Turin.

A specific example of new policy designed as a result of the interaction with Chapter Chairs is the Chapter Outreach Program. Started in 2015, the program has the twofold aims of boosting the activities of newborn chapters and revitalizing the inactive ones. The program foresees the designation of an advisor from AdCom who will nurture the chapter and help organize meetings and visit the chapter at least two times in three years. This approach has been thought to simplify the start-up of the new chapters by a one-to-one interaction with experienced AdCom members and to provide more direct support to the chapters which had previously exhausted their propulsion force.

The IMS President Ruth Dyer opened the Chapter Chair Summit 2017 by addressing the attendees. Society Committees presented a review of their activities, mainly in the morning. Kristen Donnell introduced the IMS Distinguished Lecturer Program and the Chapter Outreach Program. Chi Hung Hwang, VP of Conferences, presented the conference organization opportunities and rules. The Technical Activities and Standards Committee was represented by the VP Ruqiang Yan. The discussions about the AdCom member presentations involved the Chapter Chairs for the whole morning. Then, Salvo Baglio, VP for Education, presented the Education Activities of the IMS and, in particular, the new IEEE International "Sensors and Measurement" Student Contest that joins the efforts of the IMS and the Sensors Council.

The rest of the day was devoted to the round table about hot topics for IMS and chapters, the traditional opportunity of reviewing IMS policy about chapters from the Chairs' points of view and vice-versa, and the presentation of the chapters' best practices. Also, this year the Chairs

provided useful feedback, comments and suggestions to be discussed in the following AdCom meetings. Since the very first edition, this part of the summit provided very valuable information that allows the AdCom to define a series of requested improvements leading to new plans and actions. For example: (i) the guidelines and policies about the chapters, like the Chapter Development Program, were redesigned between 2013 and 2014 and are now easier to follow; (ii) forms were redesigned to be easier and reduce the time for applications; (iii) the Outstanding Chapter Award was redesigned in 2015, according to a list of best practices that were provided and discussed by the Chapter Chairs; and (iv) the new Best Student Chapter Award, started as initiative in 2016, was designed to recognize the activities of IMS Student Branch Chapters to encourage the expansion of a positive trend in the formation of Student Branch Chapters.

### **Opening of the New IMS Chapter in New South Wales**

The IEEE Instrumentation and Measurement Society (IMS) New South Wales (NSW) Chapter was approved by the IEEE HQ on June 21, 2017. The new chapter currently has 25 IMS members. Prof. Subhas Mukhopadhyay of Macquarie University took the initiative of opening the chapter. He contacted the IMS NSW members, got the necessary support and submitted the petition to form the IMS NSW Chapter on May 9, 2017. The chapter was officially approved, and the opening ceremony was held on July 20, 2017 at Macquarie University, North Ryde campus. The Chair of the IEEE NSW section, Prof. Karu Esselle welcomed the attendees, talked about the NSW section and announced the section congress which was held August 8-9, 2017 in Sydney.

Prof. Subhas Mukhopadhyay presented details of the IMS and its varied activities. He also elaborated on the different recognitions to which the volunteers could aspire. The founding Executive Committee members for the IEEE IMS NSW Chapter were selected and include:

- Subhas Mukhopadhyay
- Ediz Cetin
- Mohsen Asandia
- Dimitrios Georgakopoulos
- Paritosh Giri

- Bill Solomon and
- Nasrin Afsarimanesh

The opening ceremony was graced by the presence of the Distinguished Lecturer of IEEE IMS Prof. Andrew Taberner of Auckland University, New Zealand who travelled to Sydney to deliver a lecture entitled “Measurement and Instrumentation at the Tissue- Machine Interface.” There was a huge amount of interest among the audience and a good interaction took place.

The IEEE IMS NSW Chapter would like to express their thanks to IEEE HQ, the IEEE IMS, the IEEE NSW Section, Prof. Andrew Taberner, and the IEEE IMS New Zealand Chapter for their financial support to Prof. Andrew Taberner. For more information, please contact Prof. Subhas Mukhopadhyay ([Subhas.Mukhopadhyay@mq.edu.au](mailto:Subhas.Mukhopadhyay@mq.edu.au)).

*The print article includes photos.*

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### **Activities of IEEE IMS Puebla, Mexico Chapter**

**IMS Puebla Chapter Chair: Dr. Juan Manuel Ramirez**  
**IMS Puebla Chapter Advisor: Dr. Kristen Donnell**

The initiative to create this new chapter in Puebla, Mexico started in 2013 when Jorge Daher, who in that year was IMS President, visited Puebla to deliver a technical talk at an event organized by the Institute of Astrophysics, Optics, and Electronics. As part of its Strategic Plan for that year, the IMS Administrative Committee established a program to develop new chapters, and Puebla had the opportunity to participate in the program with Kristen Donnell as Chapter Advisor and Juan Manuel Ramirez as founding Chapter Chair.

Puebla City is located 120 km southeast of Mexico City. Enthusiastic members of IEEE Puebla Section from the local industry and academic institutions constitute the IMS Puebla Chapter. Since forming, the chapter has received the visits from Octavian Postolache and Andrew Taberner under the IMS Distinguished Lecturer program. They participated as keynote speakers in an academic event called Seminar on Electronics and Advanced Design, organized annually by the Electronics Department of the National Institute of Astrophysics, Optics (INAOE) in coordination with IEEE Puebla Section.

In March 2017, an event called IEEE Mexican Humanitarian Technology Conference (MHTC2017) was organized by the IEEE Puebla Section. MHTC is a biannual cross-discipline conference to present and discuss technological solutions to social challenges. This year, resulting from the efforts of Salvatore Baglio, IMS Education VP, a series of “Meetings and IMS Workshops” are being carried out around the world. The IMS Puebla Chapter participated in this initiative by organizing the Meet IMS Panel on Environmental Monitoring during MHTC 2017, inviting Dr. Pedro Silva Girao as IMS Distinguished Lecturer. In addition, a series of activities involving colleagues and students from several institutions in the local area are continuously organized. We truly consider that being a part of the IEEE IMS community constitutes a big plus to accomplish our professional duties.

*The print article includes photos.*

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## **IEEE Bahia Section IMS/CASS Joint Chapter Report**

**Sebastian Yuri Catunda**

The Brazilian IEEE IMS/CASS Joint Chapter from the Bahia Section was created in August 2013 by chapter officers Sebastian Yuri Catunda (President) and Vincent Bourguet (Vice-President), from the Federal University of Rio Grande do Norte– UFRN, and Malone Castro (Secretary), from the Federal Institute of Paraiba– IFPB. Their objective was to gather researchers in the field of instrumentation together with circuits and systems and foster their interactions.

From the beginning, the chapter has supported the realization of the annual Brazilian Northeastern School of Microelectronics (EMICRO-NE) which had its 8th, 9th, 10th and 11th editions held in the cities of Natal (RN), São Luis (MA), Campina Grande (PB) and João Pessoa (PB), respectively, from 2013 to 2016. Also, for the first time, the school was replicated in the city of Manaus (AM) in the Northern region, in 2014. In 2017, the 12<sup>th</sup> School was held in Maracanau (CE) from August 26 to 28.

The EMICRO-NE offers nearly 70 hours of short-courses and talks from about 20 lecturers in the areas of manufacturing process, analog design and instrumentation, digital design and radio

frequency design. It brings together around 200 participants, most of them undergraduate students, but also graduate students and professionals.

In 2014 and 2015, the chapter promoted the 1<sup>st</sup> and 2<sup>nd</sup> Workshops on Circuits and Systems for Instrumentation (WCSI) in the city of Natal (RN). These two-day-long events aimed to promote discussion and exchange of knowledge between researchers and students on the topic of circuits and systems focused on instrumentation.

The WCSI was the precursor of the 2016 1st International Symposium on Instrumentation Systems, Circuits and Transducers (INSCIT) that was jointly supported by the Bahia Section IMS/CASS and the South Brazil Section IMS/CASS/ComSoc Chapters. The INSCIT is sponsored by the Brazilian Microelectronics Society– SBMicro, technically sponsored by the IEEE IMS and co-sponsored by the Brazilian Society of Physics – SBF and Brazilian Society of Automatics – SBA. The 2016 1st INSCIT was held in Belo Horizonte (MG) within the Multiconference “Chip on the Mountains.” In its first edition, the event had a submission of 46 papers, from which 31 papers were accepted. It was organized into eight sessions and featured two invited talks.

The 2017 2nd INSCIT was held within the same multiconference, although with a slightly different name, “Chip on the Sands,” in Fortaleza (CE) from August 28 to September 1, 2017. The 2nd INSCIT had a 15% increase in the number of submissions, with 53 papers submitted of which 30 were accepted.

*The print article includes photos.*

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*Departments*

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*New Products*

Robert Goldberg

Please send all “New Products” information to:  
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### **PXI Microwave Multiplexers**

Pickering Interfaces has expanded its 40-785B PXI Microwave Multiplexers range with new 50 GHz modules. These new modules are single or dual 6-channel multiplexers with relays mounted on the front panel. They are suitable for switching 50  $\Omega$  signals up to 50 GHz. The single slot version can support up to three remotely mounted multiplexers. Channel setting for all options is indicated by LEDs, a feature widely supported in earlier rack and stack solutions.

The 40-785B microwave multiplexer range is compatible with any PXI chassis and can be fitted to PXI hybrid slots in a PXIe chassis. It can also be used in Pickering's Ethernet controlled LXI modular chassis with a choice of 18 and 7 slots, as well as their 2-slot USB/LXI chassis for remote mount relay requirements.

The product range is also supported by Pickering's signal routing software Switch Path Manager, for simplified signal routing through complex switching systems.

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

### **New ATE Core Configurations**

National Instruments (NI) announces new ATE Core Configurations which deliver core mechanical, power and safety infrastructure to help users accelerate the design and build of automated test systems in industries ranging from semiconductor and consumer electronics to aerospace and automotive.

ATE Core Configurations help simplify the design, procurement, assembly, and deployment of smarter test systems at a lower cost and shorter time to market by empowering test organizations with a platform for standardization. These 19-in, rack-based configurations are available in various rack-unit heights and offer scalable power profiles to match the needs of nearly any application and geography.

Key features and benefits include:

- Highly customizable– Choose what is included in the system, and where within the rack, including PXI instrumentation, signal conditioning, kW power supplies, cooling and more
- Streamlined procurement– Simplify bill of materials management with consolidated part numbers and fewer vendor transactions
- Readily deployable– Benefit from IEC 61010 certified systems which are backed by more than 1,500 NI sales, system and support engineers worldwide
- Expansive ecosystem– Work directly with NI Alliance Partners to specify a turn-key system, including mass interconnect and fixturing, test software development, system maintenance, lifecycle support and more

ATE Core Configurations also benefit from NI's high-performance PXI instrumentation and extensive test software portfolio. This includes more than 600 PXI instruments ranging from DC to mm Wave featuring high-throughput data movement using PCI Express Gen 3 bus interfaces and sub-nanosecond synchronization with integrated timing and triggering. ATE Core Configurations can also include TestStand test management software and LabVIEW code module development software, extensive API and example program support for PXI instruments, and more than 13,000 instrument drivers for third-party box instruments.

For more information, visit [www.ni.com/ate-core-configurations](http://www.ni.com/ate-core-configurations).

### **Triple-Output Power Supplies Reduce Power Issues**

Keysight Technologies announces the introduction of the E36300 Series triple-output programmable DC power supplies. With a large color display, intuitive user interface, modern device connections via LAN (LXI, USB and optional GPIB), the E36300 matches the performance of more expensive system power supplies.

The E36300 Series' low "normal mode" noise specifications assure quality power for precision circuitry applications, enabling engineers to power their designs with confidence. In addition, the power supplies are acoustically quiet. Each model provides excellent line/load regulation of 0.01



percent, fast transient response time of less than 50  $\mu$ s, low-range current measurement, and over-voltage, over-current and over-temperature protection to prevent damage to the device under test.

Keysight's BenchVue software supports the E36300 Series, enabling control of power supplies to set parameters and status alerts, visualize power output, and log changing voltage and current over time. The included Test Flow capabilities let users quickly automate power-supply setups and measurements into test sequences.

More information about the E36300 Series triple-output programmable DC power supplies is available at [www.keysight.com/find/e36300](http://www.keysight.com/find/e36300).

### **Laser Diode for (Rb) Rubidium Spectroscopy/Optically Pumped Atomic Clocks**

The 795 nm DFB laser is the latest addition to eagleyard's product portfolio. Next to the 780 nm DFB lasers and the gain chips for extended cavity setups (ECDL) the new laser enlarges the choice for Rubidium spectroscopy and the related application such as optically pumped atomic clocks.

The 14-pin butterfly package adds ready-to-use single-frequency-emission features by comprising thermoelectric cooler and thermistor enabling precise wavelength tuning. The package complying with industry standard is designed to provide electrical input as well as optical output in the same layer. It allows the convenient use of standard peripheral equipment such as mounts and drivers.

Major performance parameters are:

- wavelength: 795 nm (for Rb D1 line at 794.98 nm)
- line width: < 1 MHz
- mode-hop-free tuning range: >10 GHz
- output power: 80 mW
- 14-pin windowed butterfly package with integrated beam collimation
- optional integrated micro-isolator available

Single Frequency Laser Diodes have a wavelength-selective grating integrated in the laser chip. Thus, they operate on a single resonator mode emitting quasi-monochromatic radiation with a very small line width and low phase noise. The lasers can have very low-intensity noise because of the lack of mode partition noise. Due to the Gaussian mode, the output is diffraction-limited. The choice of a DFB design instead of a similar DBR structure guarantees even a broader smooth tuning range around the operational point w/o the risk of experiencing spectral issues known as mode-hops, as these are given by design of a DBR diode, making the latter less suitable for the needs of atom spectroscopy.

For more information or to check out other variants in detail, please go to:  
[www.eagleyard.com/products/single-frequency-laser-diodes/](http://www.eagleyard.com/products/single-frequency-laser-diodes/).

### **MEMS Inertial Sensors Overcome Stiction Problems**

Nanusens has announced that it has solved the problem of stiction in its MEMS inertial sensors. CMOS nano-sensor technology has been successfully used to solve the problem, which is a major source of failure for this type of sensor.

The problem of stiction in MEMS is caused by attractive forces that occur on microscopic levels such as Van der Waals and Casimir. These are surface area dependent and not mass dependent. In an inertial sensor design, there is a proof mass connected to a spring. This mass moves when there is an acceleration and the movement is detected by the mass acting as one electrode and the change in capacitance is measured relative to a second fixed electrode. However, if there is a large movement such as from a shock or collision, the mass goes beyond the normal range of travelling and touches a surface enclosing the sensor where it 'sticks' due to the attractive forces and stops working. This can be countered by having stronger springs, but this reduces the sensitivity of the sensor. A solution to increase the sensitivity could be to increase the mass, but this results in a greater surface area for the mass and so, unfortunately, more attractive forces.

The approach used by Nanusens is to reduce the sensor design by an order of magnitude from Micro Electro-Mechanical Systems (MEMS) with linear feature sizes of 1-2  $\mu\text{m}$  to Nano Electro-

Mechanical Systems (NEMS) where the features are 0.3  $\mu\text{m}$ . This reduces the attractive forces significantly as the surface area reduction is in two dimensions, i.e., almost two orders of magnitude reduction. Reducing the proof mass could result in decreased sensitivity except this is offset by reducing the gap between it and the fixed electrode. The size reduction also means that the energy stored on the proof mass when it hits the surface in case of a shock is much less and the travelling gap is small. A shock with less energy is also easier to detach.

The new nano-sensors are made using standard CMOS processes and mask techniques. As only standard CMOS processes are used, and the sensors can be directly integrated with active circuitry as required, the sensors can potentially have high yields similar to CMOS devices.

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

### **Miniature Accelerometer**

PCB's new UHT-12™ miniature accelerometer was designed for applications that demand minimal sensitivity change across a wide temperature range. Model 320C53 features a sensitivity of 1 mV/g to complement the Model 320C52 sensitivity of 10 mV/g. Both models feature a UHT-12™ sensing element which provides a stable sensitivity over large thermal shifts.

Small and lightweight, these sensors weigh just 1.85 g with a size of 9.6 mm x 17.3 mm. They are hermetically sealed in a rugged titanium housing and feature easy to install thru-hole mounting. The accelerometers attach to test structures with an insulated mounting screw.

Both models have an operating temperature range of -100 to +325 °F (-73 to +163 °C). Model 320C52 has a frequency range from 1 to 10 kHz (+/- 5%) and Model 320C53 has a frequency range from 1 to 5,000 Hz (+/- 5%). A single pole low pass filter, with a corner frequency set to  $\geq 20$  kHz, is incorporated into each model which reduces the potential for saturation or clipping.

Built-in ICP® microelectronics provide a low noise, low impedance output signal capable of being transmitted over cable lengths of hundreds of feet. Any ICP® signal conditioner or data

acquisition system that incorporates an ICP® constant current excitation can be used to power the accelerometers.

For additional information, visit [www.pcb.com/TestMeasurement/Accelerometers/Stability](http://www.pcb.com/TestMeasurement/Accelerometers/Stability).

### **Lightweight Vector Network Analyzer Simplifies Accurate S-Parameter Measurements**

Rohde & Schwarz has launched the R&S ZNLE vector network analyzer to address the requirements of customers looking to perform RF measurements to characterize components such as antennas, attenuators, filters and PCBs. The new standalone instrument weighs only 6 kg and has a footprint of just 408 mm x 235 mm, saving up to two thirds of space on the workbench compared with competitive VNAs.

The two-port vector network analyzer not only saves space but also provides quick and accurate measurements, due to its easy-to-use S-parameter wizard. The R&S ZNLE performs bidirectional measurements of the S11, S21, S12 and S22 S parameters. An optional GPIB interface is available for remote control of the analyzer. The instrument comes in two models with frequency ranges from 1 MHz to 3 GHz (R&S ZNLE3) and to 6 GHz (R&S ZNLE6).

The R&S ZNLE offers RF performance with a wide dynamic range of typically 120 dB and measurement bandwidths from 1 Hz to 500 kHz. Measurement time is just 9.6 ms for 201 points at 100 kHz measurement bandwidth, for a 200 MHz span, with two-port TOSM/SOLT calibration. For stable, repeatable measurements, the R&S ZNLE produces low trace noise of typically 0.001 dB.

The R&S ZNLE features a large 10.1-in WXGA touchscreen, providing good visibility of all traces. The touchscreen supports zooming in and out of traces using multitouch gestures. The well-structured user interface makes it possible to access every function with a minimum number of steps. Undo/Redo softkeys are available to cancel and restore user entries. Context-sensitive help menus for the diverse functions and parameters facilitate interactive operation.

Calibration of the instrument is straightforward. The R&S ZNLE incorporates the well-known calibration wizard used in other Rohde & Schwarz R&S ZNx analyzers. To make life even easier, the "Start Auto Cal" function delivers automatic calibration at the touch of a button.

For more information, visit [www.rohde-schwarz.com/ad/press/znle](http://www.rohde-schwarz.com/ad/press/znle).

### **New Life for Legacy Semiconductor Test Systems**

The new Marvin Test Expansion Kit (MTEK) platform breathes new life into legacy semiconductor test systems with a PXI-based add-on solution that easily adds capability without the expense of replacing the entire system.

Part of a suite of semiconductor test solutions ideal for engineering and production applications as well as incoming inspection and failure analysis, the MTEK Series is a flexible, scalable test system upgrade for both wafer and packaged device test.

The MTEK platform offers a cost-effective, performance solution and that addresses common legacy test system challenges:

- Existing test systems are 20+ years old with dated and limited capabilities
- Customers require new test capabilities for testing and characterizing new designs
- Cost of new test systems are prohibitive
- New test systems require learning new tools
- Porting tests to new test systems can be costly

By incorporating the MTEK solution into an existing ATE platform including Teradyne, LTX/Credence and Verigy installations, extended functionality and benefits are realized including:

- Easy implementation, the PXI chassis becomes an extension of the host CPU
- Easy integration with existing test programs via DLL calls to the new MTS instruments which are compatible with a wide range of programming languages

- Easy integration with test floor data collection, data analysis, etc.
- Little or no additional training for production personnel
- Multisite capability for both wafer sort and package test

MTEK eliminates the trouble and capital expense of replacing your entire legacy semiconductor ATE. MTEK allows users to configure the ideal solution with the performance RF, digital and/or analog test capabilities your legacy system lacks.

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

### **Software Analyzes Shocks**

The new MSR ShockViewer data logger software, which specializes in analyzing shock events and jolts, allows you to clearly present extensive measured data, as well as quickly analyze and conclusively document critical events.

During transport, cargo is subjected to a multitude of external impacts that may cause it to sustain damage. Mini data loggers and the new MSR ShockViewer software, which is manufactured by the MSR Electronics GmbH Company in Seuzach, Switzerland, can be used to record, store and analyze the most important physical impacts on cargo (acceleration, temperature, relative humidity, air pressure, light) or other applications where shock data needs to be measured.

The most important physical parameters that should be monitored in a transport and logistics chain are accelerations, shock events, jolts and vibrations, as they may have a very negative impact on the mechanical structure of any industrial object or commodity. This is done in all three geometric axes (x, y, z) to obtain acceleration values in all directions. The 3-axis acceleration sensor starts recording data either when an acceleration threshold is exceeded or at a set time.

The logger data can then be analyzed very accurately using the new, intuitive MSR ShockViewer software. All measured values are given an exact “timestamp,” which can subsequently be used to reconstruct the time of an event accurately to the second.

For further information on the MSR ShockViewer software, please visit, [www.msr.ch/en/support/datalogger-msr-shockviewer-software.html](http://www.msr.ch/en/support/datalogger-msr-shockviewer-software.html).

### **Solid State Amplifier and Antenna Combinations Generate Up to 50 Volts per Meter**

AR RF/Microwave Instrumentation has introduced a line of state-of-the-art solid state field generating systems for numerous applications. These products now offer an attractive alternative to using Traveling Wave Tube Amplifiers (TWTAs) driving separate antennas to generate field strength up to 50 V/m. Performance characteristics of this magnitude (both in frequency and output power) were previously dominated by low MTBF, short warranty TWTAs; however, these new solid-state designs offer better performance, increased reliability, and a 3-year warranty.

The amplifier and horn antenna combination form one completely housed unit which may be tripod mounted. These new “AA” series systems produce field strengths up to 50 V/m in two band-specific models over the 18 to 40 GHz frequency range when driven with a suitable signal generator. A separate rack mounted unit (AA1000) contains the power supply and control circuitry (RF and DC cables included) for interfacing with these products. The rack mounted assembly can be used for any of the AA series designs. AR can supply the AA model(s) and AA1000, in addition to a signal generator for a complete turnkey system. Standard products cover 18 to 26.5 GHz and 26.5 to 40 GHz frequency ranges.

Applications include EMC Radiated Susceptibility for MIL-STD-461 Testing, Radar Systems, Communications, and TWT Replacements.

Products offered:

- AA18G26-20 : 18 to 26.5 GHz, producing a field strength of 20 V/m at 1 meter
- AA18G26-50 : 18 to 26.5 GHz, producing a field strength of 50 V/m at 1meter

- AA26G40-20 : 26.5 to 40 GHz, producing a field strength of 20 V/m at 1 meter
- AA26G40-50 : 26.5 to 40 GHz, producing a field strength of 50 V/m at 1 meter
- AA1000 : Rack mounted Power Supply, control circuitry, and fault monitoring

For more information, visit [www.arworld.us](http://www.arworld.us).

### **Digital Platform Connects Machinery**

thyssenkrupp connects machinery via a new digital platform. Thanks to “toii” all machines can communicate with each other. Due to predictive maintenance, the platform is also supposed to forecast the necessity of machine services in the future. The name chosen by the business area is a double play on words-- it spells IIoT backwards, the abbreviation for “Industrial Internet of Things”-- and it is pronounced like the word “toy,” an indication of how the new platform makes linking heterogeneous machines to existing IT structures “child’s play.”

The machines perform a wide range of tasks, were made by various manufacturers and differ in age. Now toii makes it possible to connect bandsaws and bending machines, mobile objects like cranes and forklifts and even complex production facilities such as slitting and cut to length lines and sophisticated processing solutions through milling machines and laser systems digitally in line with the Industrial Internet of Things. The digital platform allows the machines to share data and communicate with one another and with the IT systems. Processes can be planned and coordinated optimally and flexibly– across locations, worldwide.

An international Materials Services team of IT professionals from Germany, India and the USA worked together to develop toii. Alongside various projects in Germany, there are already plans to deploy the system in the UK and the USA.

For more information, visit the company blog at <https://engineered.thyssenkrupp.com/en/>.

### **Auto-Test Library Now Includes Harris Radios**



Cobham has announced that automated test and alignment capabilities for Harris XG-75M mobile radios have been added to both the Cobham AvComm 3920B and 8800SX Radio Test Sets.

Option 111 for the 8800SX provides test and alignment of the Harris P25 XG-75 Series portables, and now mobiles, along with the P7300 and P5500 Radio Series. Option 616 for the 3920B provides the same test and alignment capabilities.

Cobham continues its commitment to providing the industry with expansive Auto-Test and Alignment libraries. By working directly with the OEMs and having a dedicated team of software engineers, Cobham is able to react quickly to changes in the market place by adding new models as they are released as well as making updates to existing applications as OEMs make changes to their software.

These software options, like all options for the 8800SX and 3920B, are field upgradeable. For more information, contact your local Cobham AvComm sales office by calling Cobham AvComm Sales at +1(800) 835-2352 or emailing [avocmm.techsales@cobham.com](mailto:avocmm.techsales@cobham.com).