Future of I&M

Editorial

The Future of I&M

Wendy Van Moer

Nobody knows what the future will bring us… I am still looking in my crystal ball…

However, in this issue you get a glimpse of the trends that are coming up in the field of Instrumentation and Measurement. What are we heading for in the different application fields?

This issue is quite diverse but contains a lot of innovating news. I would like to thank the authors for letting us take a look into their future.

And as we all know, the education of our students is very important for our own future. In this issue you can find two reports of the winners of our Faculty Course Development Award. One is in the field of Sensors and Systems (K. Fowler and S. Dyer) and one in the field of Industrial Electronics and Instrumentation (D. Macii and M. Hueller).

I would like to take the opportunity to share some good news with you… The impact factor of Instrumentation and Measurement Magazine raised from 1.438 in 2016 to 1.9 in 2017! It seems to me that the future looks quite bright!

Enjoy this issue.
Groetjes,
Wendy

President’s Message

Society Successes

J. Max Cortner
Greetings! I have the honor to lead the Instrumentation and Measurement Society (IMS), a dynamic professional organization which provides important services to our members and our profession. Our publications *Transactions on Instrumentation and Measurement* and the *I&M Magazine* are excellent sources of technical information about the state of the art in Instrumentation and Measurement (I&M).

Our transactions editorial team has worked hard for years to improve our review processes and, in turn, improve the quality of papers published. We have never focused on improving metrics as they are a result of quality. We are pleased to announce that according to the 2017 Journal Citation Report, IEEE *Transactions on Instrumentation and Measurement* (TIM) is the number 1 journal in the area of general I&M with an Impact Factor of 2.794. Its Impact Factor without Self-Cites of 2.201 and its 5-year Impact Factor of 2.711 are also the best among general I&M journals. Furthermore, TIM is the only general I&M journal in Quartile 1 (Q1) of the Instruments and Instrumentation category. In addition, according to the 2017 Scopus report, TIM is the number 1 general I&M journal with a CiteScore of 3.47 and SJR of 0.938. In terms of timeliness, TIM’s average duration of submission-to-first-decision and submission-to-online-publication of 57 days and 26 weeks, respectively, are among the very best in all of IEEE’s journals.

Because I&M engineers live on facts, I have included the full details of ratings in Table 1 [included in print magazine]. IEEE TIM is the flagship publication of the IMS and publishes papers that address innovative solutions to the development and use of electrical and electronic instruments and equipment to measure, monitor and/or record physical phenomena for the purpose of advancing measurement science, methods, functionality and applications. For more details, including submission instructions, please visit http://tim.ieee-ims.org.

The *Instrumentation and Measurement Magazine* focuses on technical yet broadly readable articles about hot topics of measurement research and unique applications of instrumentation. Our editorial staff has driven a planning cycle more than 18 months ahead to be able to plan themes, identify topics, select authors and review articles for relevance and quality. All of these efforts have increased the desirability of our magazine while making it available in electronic form has increased accessibility. The results are evident in a steady increase in the impact factor shown in Table 2 [included in the print magazine].

I personally enjoyed the recent issue focused on the socially important topic of STEM education, and I look forward to future issues on instrumentation for the IoT, automobiles, and the new standards system. The IMS website (ieee-ims.org) has a full list of future *Instrumentation and Measurement Magazine* themes under the publications tab. Please see that tab as well for details about how to submit an article.

These results in publications are to the credit of a great leadership team. Our Editors in Chief Dr. Shervin Shirmohammadi and Dr. Wendy Van Moer are backed by an excellent team of Assistant Editors, Editorial Board members and reviewers. We share our best practices with the entire IEEE through the expert representation of Professor Reza Zoughi who was just re-elected to the Publication Services and Products Board (PSPB). As a past EIC of the TIM, Dr. Zoughi is in a large part responsible for our success. He is personally responsible for author education.
programs that make it easier to write a paper which can successfully navigate our rigorous review cycle. Such efforts were recognized as best practices by the IEEE Society Review Board.

To these and the dozens of others who make our publications a success, I send my thanks. As President of the IMS, I am indeed honored to lead an organization with the publishing reputation you have built!

Max

Article Summaries

(Summary)

Jean-Michel Pou and Laurent Leblond

To make effective decisions we need, in addition to the traditional measured value, the associated uncertainty and the a priori, whether for global risks or specific risks. The metrologist must therefore make the effort to acquire knowledge of the a priori of the company's procedures, and this knowledge comes in very useful in the quest to move away from periodic calibration… Practitioners of Big Data, today principally still found in finance and marketing, have always known that their artificial intelligence algorithms only give results if the input data is reliable. In the industrial world, the greatest proportion of data used in the context of “digitalization” (conversion of data into digits and its treatment via artificial intelligence algorithms) consists of measured data. The metrologist has a major task and serious responsibilities when it comes to the industrial performance of companies… and to the future… a task that can be summed up as the production of reliable measured data. Bayesian inference, via knowledge of the a priori and measurement uncertainty, has never been of greater significance.

This text is from the conclusion of the article.

Healthcare Innovations for Low and Medium Income Countries or Environments Today and Visions for the Future
(Summary)

Sanna Gaspard

As the demand for quality healthcare grows around the world, innovations in instrumentation and measurements present a unique opportunity for social innovators, scientists, researchers,
governments, and NGOs to have a significant impact on the quality of life of millions of people around the world through the development of low cost and reliable sensors, medical devices, measurement techniques, and equipment. Innovation in this area is a win-win situation for all. The unique medical innovations designed specifically for low and medium income countries can often have a direct application towards improving care and lowering the cost of care in high income countries. From this perspective, low and medium income countries can act as innovation incubators for the development of novel, easy to use, low cost, robust, and reliable healthcare instruments and procedures that can improve care at a lower cost for all. To achieve this vision more awareness needs to be created around the unique healthcare needs faced by communities in low and medium income countries and rural environments. Educational programs can be used as catalyst to initiate innovation for these regions by acting as a bridge towards creating awareness.

*This text is from the conclusion of the article.*

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**2016 Faculty Course Development Award: Application-Oriented I&M Teaching Based on Industrial Electronics and Instrumentation at the University of Trento**

(Summary)

David Macii and Mauro Hueller

Measurement science and technologies play a key role in a variety of disciplines of Industrial Engineering. Even though the fundamentals of instrumentation and measurement (I&M) definitely require general and fully dedicated courses, there are situations in which, for context-specific educational needs or constraints, it is of primary importance to emphasize how the I&M body of knowledge is related to a given application domain. The teaching module “Industrial Electronics and Instrumentation,” which received the Faculty Course Development Award by the IEEE Instrumentation and Measurement Society (IMS) in 2016, is indeed based on this paradigm. The rationale of the course stems from the educational needs of industrial electronics which is also one of the key priorities for the development of next-generation smart manufacturing (usually labeled as “Industry 4.0” in Europe). The course has been officially included in the educational offering of the M.S. degree program in Mechatronics Engineering of the University of Trento, Italy since Academic Year 2016-2017.

*This text is from the introduction of the article.*

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**2015 Faculty Course Development Award: An Introductory Graduate Course in Sensors and Systems**

(Summary)
Kim Fowler and Stephen A. Dyer

This article outlines the delivery of a graduate-level course in sensors and systems of sensors at Kansas State University (KSU). We developed this course after receiving the Faculty Course Development Award from the IEEE Instrumentation and Measurement Society in May 2015. Several departments at KSU research and develop sensors and sensor systems for extreme environments, including those in agriculture, industrial process control, nuclear-reactor control, aerospace, and the rural environment. A coherent basis for selecting and applying sensors was needed as a foundation for developing complex systems. The course that [the authors] developed and offered through KSU’s department of electrical and computer engineering (ECE)—ECE 690/890 “Sensors and Systems”—provides just that basis.

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**Measuring the Motions of a Foucault Pendulum**

*(Summary)*

Steve Hutson, Simon Petts, and David Hudson

A Foucault pendulum, which has been fitted with a novel precession measurement system, is described. Examples of the ways in which the relatively simple data obtained gives students the opportunity to refine and extend their STEM skills and to gain a more real-world experience of scientific investigation are presented. Unlike the curriculum-based experiments which students are obliged to perform, the outcomes of any pendulum investigations are not known in advance. Students are free to form their own hypotheses regarding the various perturbations of the pendulum motion, design and make modifications to the pendulum installation, collect and analyze data, and finally investigate the extent to which their hypothesis is supported or refuted.

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**A Unipolar Pulse Electromagnetic Field Apparatus for Magnetic Therapy**

*(Summary)*

Yuxiang Jiang, Haiwei Dong, Houda Almansour, Hossam Mohamed, and Abdulmotaleb El Saddik

The National Aeronautics and Space Administration has spent years studying magnetic therapy and has built their own pulse electromagnetic field apparatus (PEMF). The concept of unipolar pulsed electromagnetic field (UPEMF) devices is presented; this device is an improved medical apparatus for magnetic therapy based on PEMF. A concentrator is designed to strengthen the magnetic field on the north pole and weaken the opposite field. The UPEMF device provides an
approximate unipolar electromagnetic field and meets the medical requirements of magnetic therapy in terms of frequency, shape, and intensity.

This text is from the introduction of the article.

**Measuring Fault Indicators in Electric Machines—Learning Experience**

(Summary)

Oladapo O. Ogidi, Paul S. Barendse, and Mohamed A. Khan

The authors read with keen interest an article in *Instrumentation and Measurement Magazine* titled, “Life after graduation: Africa—Where Metrology Began.” Therein some research works from Cape to Cairo which employed measurement techniques were spotlighted. In this short article, more insight and the learning experience in one of the papers reviewed, namely: “Development of a Test Rig for Eccentricity Fault Studies on an Axial-Flux Permanent Magnet (AFPM) Wind Generator,” is presented. The testrig serves as a tool and platform for analyzing fault signatures associated with the AFPM machine.

This text is from the introduction of the article.

**Columns**

**Life After Graduation**

An Unknown Territory to Explore!

(Summary)

Vincenzo Marletta

In his inaugural column, the author introduces himself and his research interests in the areas of metrology, measurements and sensors. He appeals to his peers to devote energy to research activities in numerous growing areas, including his area of smart multi-sensor aids for people with weaknesses like the elderly or visually impaired and people with neurological diseases, and to themes like autonomous sensors exploiting solutions for energy harvesting from renewable environmental sources, healthcare, environmental monitoring, smart cities, smart agriculture, robotics, physics, and space as they will continue to be hot topics and will continue to represent future trends for instrumentation and measurements.

This summary includes text from the column.
Future Trends in I&M

Bridging the I&M and Design Optimization Communities

(Summary)

Arvind Rajan

Note from Melanie Ooi: For this month's issue, we have one of last year's Graduate Fellowship Awards recipients, Mr. Arvind Rajan, to provide a fresh graduate's perspective on the future of instrumentation and measurement. Our future development lies in the hands of our student and graduate members, and therefore, it is crucial that we seek to understand the world of instruments and measurements from their eyes. He is currently a Monash University scholar pursuing his Ph.D. in the field of uncertainty evaluation, reliability analysis, and probabilistic engineering design.

Basic Metrology

Gustave Eiffel’s Wind Tunnel

(Summary)

Richard Davis

The Eiffel Tower having been completed for the 1889 Paris Exposition, Gustave Eiffel devoted the last decade of his life to advancing the new field of aeronautical engineering. He specialized in extracting engineering data from measurements made in a wind tunnel—specifically, an innovative wind tunnel of his own design that remains in commercial use to this day. This month’s column on Basic Metrology takes up the story.

Departments

Society News

The Bordeaux Student Branch
BEE Week: Bordeaux, France
Nov. 15-17, 2017

Daniel Pasquet
Founded in January, 2014 by Ph.D. students of the Integration from Material to Systems Laboratory, the BEE Branch is the IEEE Student Branch of Bordeaux. The BEE Branch aims at showing students in electronics engineering how they can benefit from the activities and membership in IEEE. For this sake, the BEE Branch organized three days of scientific interactions, featuring all of our students’ chapters, lecturers, workshops and poster sessions that align with the actual stakes in Electronic Engineering.

This event was called the BEE Week and took place in the historical cloister of the Domaine du Haut-Carré in the University of Bordeaux from November 15-17, 2017. BEE Week was organized into six half-day sessions. Each session was based on an IEEE Chapter theme related to an IEEE Society: Circuits and Systems (CAS-S), Solid State Circuits (SSC-S), Microwave Theory and Technique (MTT-S), Instrumentation and Measurement (IM-S), Antennas and Propagation (AP-S) and Engineering for Medicine and Biology (EMB-S). This event gathered nearly one hundred people over three days, including more than fifty IEEE members.

The day of MTT-S and IM-S was introduced by the President of IEEE France, Frédérique Vallée. His speech aimed at explaining to non-IEEE members what IEEE is and what benefits they could get by joining the organization.

The BEE Branch had the opportunity to have the Region 8 IM-S Representative Prof. Sergio Rapuano, 2017 Chapter Chair Liaison, present the IM-S activities and mission for 2018. Then, the Distinguished Lecturer Prof. Octavian Adrian Postolache provided a talk on “Smart Tailored Environments for Neuro-Motor Rehabilitation Monitoring in IoT Era.” Finally, the French IM-S Chapter took the opportunity to organize its general assembly which was moderated by Prof. Daniel Pasquet, French IM-S Chapter Chair.

The print article contains several photographs.

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**Departments**

**New Products**

Robert Goldberg

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**New Signal Generators Perform Up to 6 GHz**

With the predecessor signal generator models R&S SMB100A (analog model) and R&S SMBV100A (vector model), Rohde & Schwarz has established a portfolio of compact benchtop
signal generators up to 6 GHz that integrate high performance into approximately 3/4 of the rack width of 19". This successful family of signal generators has been further enhanced and improved to create two new models. The new R&S SMB100B analog RF signal generator and the R&S SMBV100B vector signal generator set standards in the midrange class. The instruments' excellent spectral purity and very low phase noise result in superior measurement accuracy. Their maximum output power tops all previous records. The compact, lightweight generators are easy to transport and take up minimal space in the lab.

The new signal generators are available in various configurations. With frequency ranges from 8 kHz to 1 GHz, 3 GHz and 6 GHz, they can be tailored to address diverse applications. Customers can choose from three different RF output power stages to scale the maximum output power to their specific needs. The generators can deliver up to +34 dBm output power (at 1 GHz carrier frequency) without an external amplifier, which simplifies the test setup and eliminates downtime due to calibration. The R&S SMB100B and the R&S SMBV100B offer precise, calibrated RF output power for all configurations.

The two signal generators feature excellent signal quality. This makes the R&S SMB100B analog RF signal generator ideal for radar and receiver tests in the aerospace and defense sector, as well as for CW-based production tests on wireless devices and infrastructure.

The R&S SMBV100B additionally offers superb signal quality for vector-modulated signals, with a powerful baseband section with up to 500 MHz bandwidth. It comes with options for all major digital communications standards, such as 5G, cellular IoT, LTE, WLAN IEEE 802.11a/b/g/n/ac/ax and Bluetooth 5.0. Signals for these digital standards can be generated directly on the instrument; no external PC is required.

The signal generators feature a well-conceived upgrade concept. Desired functions can, in most cases, be added via software keycodes. For example, modulation standards, output power, and with the R&S SMBV100B vector model, even the RF frequency range and modulation bandwidth can be upgraded as needed without requiring customers to send in their instrument to a Rohde & Schwarz service center.

For more information, visit www.rohde-schwarz.com.

**High-Performance Inertial Measurement Unit (IMU) for Virtual and Augmented Reality Applications**

Bosch Sensortec launches the BMI085, a high-performance 6-axis Inertial Measurement Unit (IMU). The BMI085 integrates a 3-axis, 16-bit MEMS acceleration sensor and a 3-axis, 16-bit MEMS gyroscope in a single compact package.

This powerful IMU is ideally suited for demanding virtual reality (VR) and augmented reality (AR) applications as well as other applications, such as navigation, body/human motion tracking and high-end gaming. The compact MEMS sensor package is filled with features, combining an extremely low-drift gyroscope with a low-noise accelerometer to significantly reduce the unpleasant motion sickness effect. Its ultra-precise instantaneous detection of head movements reduces time lag to an almost imperceptible minimum.
The exceptionally low latency of the new BMI085 enables headset manufacturers to eliminate image drifts and deliver a true real-life experience. The IMU delivers a low motion-to-photon latency of less than 3 ms and achieves near perfect stability in environments with high temperature fluctuations as often encountered in continuous HMD (head-mounted display) or AR headset scenarios. This further improves accuracy, which is critical in today's lightning fast high-definition AR/VR applications.

The sensor's accelerometer has solid temperature stability, delivering a low temperature coefficient offset (TCO) of typically less than 0.2 mg/K and temperature coefficient sensitivity (TCS) of only 0.002 %/K. Bias instability of the gyroscope is typically below 2 °/h.

The Gyroscope of the BMI085 features a robust closed-loop analog-to-digital conversion mechanism, which ensures low drift characteristics even in high-fluctuation temperature environments.

The IMU's accuracy is further boosted by data synchronization of the accelerometer and gyroscope. The BMI085 is housed in a compact 3.0 × 4.5 × 0.95 mm³ package and is pin-to-pin compatible with Bosch's BMI055 IMU, making design migration to the new BMI085 extremely smooth and effortless.

For more information, please visit www.bosch-sensortec.com.

5G Channel Emulation
Keysight Technologies, Inc. has announced PROPSIM F64 5G Channel Emulation Solution, claiming it as the industry's first 5G New Radio (NR)-ready channel emulation solution.

Keysight's PROPSIM F64 5G Channel Emulation Solution enables chipset, device, and network equipment manufacturers to characterize end-to-end system performance of the latest 4G and 5G base stations and mobile devices by emulating real-world radio conditions in the lab.

To address this growing need, Keysight's PROPSIM F64 5G Channel Emulation Solution supports all 5G NR signal bandwidths, carrier aggregation (CA) schemes, and offers the highest number of channels for massive MIMO channel emulation and testing. The solution integrates state-of-the-art channel modeling tools for user-defined 3D spatial scenarios and dynamic modeling of movement. It supports both conducted and Over-The-Air (OTA) testing across sub 6 GHz and mmWave frequencies.

The PROPSIM F64 5G integrates seamlessly with Keysight's end-to-end network emulation portfolio to address the entire device workflow from R&D to design validation to manufacturing. This enables users to validate protocol layers and radio frequency (RF) performance of a 5G NR device as well as gain access to key performance indicators for beam management, data throughput and stability under 5G fading channel conditions.

Additional information about Keysight's 5G design, test and measurement solutions is available at www.keysight.com/find/5G.
New Oscilloscopes Mixed Signal
Capability in a USB 3.0 PC Connected Instrument
Pico Technology has introduced the PicoScope 5000D Series FlexRes oscilloscopes and MSOs that feature up to 16 bits of vertical resolution with up to 200 MHz bandwidth and 1 GS/s sampling speed.

FlexRes hardware employs multiple high-resolution ADCs at the input channels in different time-interleaved and parallel combinations to optimize either the sampling rate to 1 GS/s at 8 bits, the resolution to 16 bits at 62.5 MS/s, or other combinations in between. PicoScope 5000D MSO models add 16 digital channels, providing the ability to accurately time-correlate analog and digital channels. Digital channels may be grouped and displayed as a bus with each bus value displayed in binary, hex, decimal or level (for DAC testing). Advanced triggers can be set across both the analog and digital channels.

PicoScope 5000D Series oscilloscopes have waveform capture memory up to 512 megasamples—many times larger than competing scopes. Deep memory enables the capture of long-duration waveforms at maximum sampling speed. PicoScope's DeepMeasure™ tool uses the deep memory to analyze every cycle contained in each triggered waveform acquisition.

PicoScope 5000D Series oscilloscopes feature a Super-Speed USB 3.0 connection, providing fast saving of waveforms while retaining compatibility with older USB standards. The PicoSDK® software development kit supports continuous streaming to the host computer at rates up to 125 MS/s. PicoScope software takes advantage of modern PC processing power with an equation editor that allows users to define complex waveform mathematical functions. These include filters (lowpass, highpass, bandpass and bandstop), trigonometry, exponentials, logarithms, statistics, integrals and derivatives. Waveform mathematics can also be used to plot live signals alongside historic peak, averaged or filtered waveforms.

The PicoSDK software development kit enables users to write their own applications for the PicoScope 5000D hardware. Drivers for Microsoft Windows, Apple Mac (macOS) and Linux (including Raspberry Pi and Beaglebone) are included.

Find more information at www.picotech.com.

Software Switch Path Manager is Updated
Pickering Interfaces has introduced version 6 of their signal routing software, Switch Path Manager™ (SPM), with a range of new capabilities as well as a new “lite” version. This signal routing software simplifies signal routing through complex switching systems and speeds up the development of switching system software.

The latest version, Switch Path Manager 6, offers two major updates:
  • The software evaluation period is now 14 days, but the time is based on the number of days the software is actually used rather than a fixed period of time; users are now able to fully evaluate the software as their schedule allows.
• The addition of Switch Path Manager Lite, a low-cost solution that is fully functional but with an operational limitation of two active switching modules in the configuration. Larger configurations with more than two modules can be created, loaded and edited—but not executed. In contrast to the SPM full license, SPM Lite is not connected to a dedicated computer—once purchased it can be used as a site license.

In addition to the major updates above, there is also a range of new capabilities including:
• An enhanced System Configurator Editor which gives the user the ability to apply standard functionality like copy, paste, delete, find, replace and cell manipulation. It also offers better filtering technology to filter dedicated pins, and it now has added display options, so the user can decide what will be displayed in the configurator.
• Introduction of Multipoint Routes: in the past, if a user wanted to create fixed routes for multipoints (e.g., A connect to B and C), two single routes (A-B, B-C) had to be created and combined into groups—this is now possible in one step.
• A new and very effective API function has been added: IsConnectedStatus (EndpointA, EndpointB). With only one simple function call, a user can find out whether given endpoints have been connected by SPM. This functionality is important when a route uses multiple relays, and on that route, there are more endpoints connected to each other than a user is thinking of. Example: A and B have been connected, but C is on the route and connected as well. It is not obvious the user would know about the route A-C-B unless you call IsConnectedStatus().

For more information on signal switching and simulation products please visit www.pickeringtest.com.

New Microphone for Measurements in Hazardous Areas
PCB Piezotronics, Inc. has released a prepolarized condenser microphone system—Model EX378B02—for use in hazardous areas. The new microphone system is compliant with explosive atmospheres and gaseous hazardous environments where standard microphones are restricted. Additionally, EX378B02 is compliant with intrinsic safety protection levels for all above ground applications globally; below ground very high (Ma) mine safety protection levels for all mining locations outside of North America; and below ground Mine Safety tests in Europe.

The EX378B02 is equipped with a free-field microphone cartridge. Featuring an industry-exclusive design, it has a frequency range of 3.75 to 20,000 Hz. With the low-end noisefloor measurement capability of 15.5 dBA, it can measure accurately to 137 dB at the top end. The extended range makes this acoustic measurement system an excellent choice for leak detection, gas tank testing, oil rig and machinery monitoring applications in areas where spark prevention is critical.

Visit www.pcb.com for additional information.

MEMS Mimic Human Organs through Bioengineering
Sensera Inc. is adapting its technology for new applications in bioengineering.
The company's MicroElectroMechanical Systems (MEMS) technology is now being used at Harvard University in the creation of microfluidic devices, which mimic the functions of living human organs, including the lung, intestine, kidney, skin, bone marrow and blood-brain barrier.

These hollow, microfluidic channels carry fluids in a way that accurately mimics various functions of the human body, including the respiratory, circulatory and digestive systems. Mechanical forces can be applied to emulate the physical microenvironments of living organs, including breathing motions in the lung and peristalsis-like deformations in the intestine.

For Wyss Institute and other customers, Sensera provides molds to manufacture the polymeric membranes that are assembled in the organ-on-a-chip microfluidic devices. Manufacturing these molds is a new challenge for Sensera. They have had to adapt our traditional MEMS processes and implement a very stringent quality management system that meets the demands of biomedical applications. Confidence in Sensera's microfluidic device market is supported by the fact that it is ISO 9001 certified and is working towards its ISO 13485 certification.

Find more information at www.sensera.com.

**Amplifier Family Covers the 10 KHz to 1000 MHz Frequency Range**

AR RF Microwave Instrumentation has introduced a new family of RF solid state Class A power amplifiers that cover a wide bandwidth that covers a wide range of applications.

Each of the “U” Universal Series instruments will instantaneously cover 10 kHz to 1000 MHz with a single band amplifier, making these ideal for EMC testing, laboratory testing, antenna and component testing, watt meter calibration, medical/physics research, and more. Custom versions are also available, so there is almost no limit to where these versatile amplifiers can be put to work.

The initial models include the 1U1000, 2.5U1000, 10U1000, and 25U1000 which provide a minimum of 1, 2.5, 10 and 25 watts of RF power when driven by a sweep generator. In addition to spanning the widest frequency range of any amplifier with comparable power, these innovative amplifiers are small and moderately priced, yet deliver the performance, durability and longevity on which AR has built its outstanding reputation.

For more information, visit the AR RF/Microwave Instrumentation website at www.arworld.us.

**SourceMeter Maximizes Rackspace**

Tektronix, Inc. has unveiled the Keithley Model 2606B System SourceMeter instrument that packs four 20-watt Source Measure Unit (SMU) channels into a single 1U form factor chassis. Targeting the fast-growing 3D sensing manufacturing industry, the rackspace-saving Model 2606B combines the capabilities of a precision power supply, true current source, 6½-digit DMM, arbitrary waveform generator, and pulse generator into one tightly integrated instrument.

With its patented series ranging topology, the Model 2606B delivers up to 20,000 operations per second, resulting from faster and smoother range changes and outputs that settle more quickly.
Over the next few years, 3D sensing technology is expected to become commonplace across consumer devices including smartphones and widely deployed in a range of automotive and industrial applications. Laser diodes based on verticalcavity surface-emitting laser (VCSEL) technology form the heart of 3D sensors and must be tested throughout the supply chain. Manufacturers face challenges to increase test capacity as demand grows while preserving floor space. The Model 2606B's compact form factor means test engineers and system integrators can significantly increase per-rack channel capacity without adding more racks of test equipment.

The new Model 2606B incorporates the equivalent of two Keithley Model 2602B System SourceMeters to form a fourchannel 1U full-rack unit. Floor space is a critical parameter for many system integrators testing laser diodes and moving to a higher density solution eliminates the need to add racks of test equipment. The Model 2606B's 1U form factor improves density by 3x since there is no need for a thermal spacer (for airflow) between units. For example, 12 Model 2606B SMU channels can be mounted in the same 3U rack space as only four SMU channels under the previous solution.

Find more information at www.TEK.COM.

**5.5 V Input, 6 A, Step-Down Converter Module with Integrated Inductor**

TI's new synchronous step-down power module delivers continuous 6A output current with up to 95% efficiency for space and height-constrained point-of-load power supplies. The TPSM82480 DC/DC converter offers an optional automatic power save mode to maintain high efficiency across the full load range. In addition, it features adjustable soft start, VSEL to support multiple processor stages, a power-good indicator, and a thermal-good output to alert the system to reduce power before overheating.

The TPSM82480 is a synchronous step-down DC-DC converter module for low profile point-of-load power supplies. The input voltage range of 2.4 to 5.5 V enables operation from typical 3.3 V or 5 V interface supplies as well as from backup circuits dropping down as low as 2.4 V.

The output current is up to 6 A continuously provided by two phases of 3 A each, which run out-of-phase, reducing pulse current noise significantly.

The TPSM82480 provides an automatically entered power save mode to maintain high efficiency down to very light loads. This incorporates an automatic phase adding and shedding feature using both or only one phase according to the actual load. The power save mode can be switched off using the MODE feature.

The device offers a Power Good signal and an adjustable soft start. Also, the device features a Thermal Good signal to indicate excessive internal temperature. The output voltage can be changed to a preselected value by VSEL pin. TPSM82480 is able to operate in 100% duty cycle mode.

For more information, visit www.TI.com.

**Image Analysis Software**
Cognex Corporation has announced the worldwide availability of VisionPro® ViDi™, deep learning-based image analysis software optimized for factory automation. VisionPro ViDi combines artificial intelligence with Cognex's VisionPro machine vision software to solve manufacturing's most challenging applications.

Manufacturers often perform complex inspections manually due to unpredictable defects and deviations that are too difficult to program and maintain using traditional machine vision. VisionPro ViDi combines human visual inspection capabilities with the reliability, repeatability, and speed of an automated system to solve applications that have previously been difficult to automate.

ViDi expands VisionPro's core library of location, inspection, and classification tools with a new deep learning-based optical character recognition capability. The new ViDi OCR tool reads standard text without complex font training. For the first time, many challenging date and lot codes and embossed or etched text can be read reliably in an industrial environment.

For more information, visit www.cognex.com/ViDi.

**Ultrasonic Flowmeter**
Endress+Hauser introduces the Proline Prosonic Flow E 100 ultrasonic flowmeter for measurement of flow, temperature and volume of process water—regardless of conductivity, pressure, density or temperature.

The all-stainless-steel Prosonic Flow E 100 works in process pressures up to 363 psi and in temperatures from 32 to 302 degrees F. It is available in line sizes from 2 to 6 inches for measuring flows up to 1680 gal/min with accuracy of ±0.5% fs. Accuracy is based on accredited calibration rigs according to ISO 17025.

The flowmeter measures volume flow rate by combining all of the flow velocities determined by its sensor pairs within the cross-sectional area of the meter body with extensive knowledge of fluid flow dynamics.

The design of the sensors and their position ensures that only a short straight run of pipe upstream of the meter is required after typical flow obstructions, such as bends in one or two planes.

A local display has a 4-line liquid crystal display with 16 characters per line, white background lighting, and switches that turn to red in event of device errors. Heartbeat Technology is integrated into the flowmeter, providing self-diagnostics, extensive monitoring of the values measured, and a certified and metrologically traceable verification during operation. The operator does not need to be present in the field for most commissioning and operations activities, improving safety.

For more information on the Prosonic Flow E 100, visit www.us.endress.com/Prosonic-E-100.