

The IEEE Instrumentation & Measurement Magazine
October 2014 Issue

Weather Forecasting

Editorial

Spring is in the Air

That was what we all were thinking in January 2014 in Belgium. Instead of having cold and cleaning up some snow, we were wearing short-sleeves and light jackets. Nature got confused. Very unusual...For the first time, no white Christmas 2013 in Gävle, Sweden. But, many states in the U.S. were freezing. Very exceptional...40 degrees Celsius in Monterey, California, in April 2014. The past year the weather has been behaving like a real out-lyer, far outside the uncertainty boundsAlthough the weather can be very unpredictable and uncontrollable, each day weather forecasters are trying hard to be able to predict the weather and warn us for the unpredictable forces of nature. Weather forecasting is one of the most difficult sciences! One has to develop powerful models dealing with a huge amount of variables and taking into account a big uncertainty.

This part of science clearly deserves some attention because it can save a lot of lives. Think about the destroying power of hurricanes, tsunamis... In this issue of our IEEE Instrumentation and Measurement Magazine, you can read all about research issues in weather forecasting. Furthermore, we introduce one more new column: Life after education... Here you can read each month the testimony of a freshly promoted PhD How did she or he experience their PhD time and what changed when they graduated? Is a PhD useful or a burden? Enjoy this October issue and see you all in December!

Groetjes,

Wendy

Article Summaries

Forecasting Severe Windgusts in Belgian Thunderstorms

(Summary)

David P. Dehenuw

Some weather models can detect a risk of strong convective winds (tornadoes or downbursts) in Belgium. However, explicit and detailed downburst or tornado forecasts are at this stage impossible with any operational mesoscale model. The author introduces several physical measurement indices used in predicting severe weather, including wind shear, convection, vertical velocity and environmental helicity and discusses the complexity of developing a timely prediction model. Two case studies of severe storms in Belgium are presented.

This summary was written by K. Virostek and includes text from the article.

A Brief Overview of Weather Radar Technologies and Instrumentation

(Summary)

Mark Yeary, Boon L. Cheong, James M. Kurdzo, Tian-You Yu, and Robert Palmer

Weather radar, owing to operational wavelengths of approximately 3 cm to 10 cm (i.e., approximately 10 GHz to 3 GHz) is ideal for penetrating regions of precipitation while providing meaningful returns for weather phenomenon characterization. Technologies that have already *emerged* are dual-polarization, multiple wavelengths, phased array radar (military, single polarization), and gap filling radars (non-adaptive). This article presents the development and current implementation of these technologies and how forecasting tools using new generation radar applications have matured and are transitioning from scientific demonstration tools into operational systems.

This summary includes text from the introduction of the article.

Climate Network: A Climatological Network for Energy Applications in Urban Areas

(Summary)

Sergio Borghi, Maurizio Favaron, and Giuseppe Frustaci

The authors present an assessment of a new meteorological central data gathering and analysis facility located downtown Milano and 37 stations spanning several urban areas of Northern and Central Italy. After the system design and calibration are introduced, the accuracy, resolution, traceability and comparability of the data are discussed, using several specific locations as case studies. During the next implementation phase, the authors' attention will be concentrated on variables immediately related to weather forecasting, namely wind, temperature, humidity and precipitation. Assimilation experiments involving Climate Network data into high resolution models will be eventually performed to set up an integrated efficient observational and forecasting tool to be used to better spatialize the collected data.

This summary was written by K. Virostek and includes text from the article.

Testing Nacelles of Wind Turbines with a Hardware in the Loop Test Bench

(Summary)

Alexander Helmedag, Timo Isermann, Uwe Jassmann, Dominik Radner,
Dirk Abel, Georg Jacobs, and Antonello Monti

Testing of wind energy converters at ground level in contrast to an in-field setup has increased in the last years. As it is an approach which is fundamentally different to in field-testing, it requires significant modifications of the measurement environment and the layout of the sensor system. To increase the reliability of the converters, a detailed investigation of the status of various electrical and mechanical values is necessary because good condition monitoring guarantees a well-controlled state of the turbine in the desired point of operation. This leads to an appropriate maintenance strategy that enhances the lifetime of the converter. Crucial physical values can be identified easier at ground level testing than with an in-field setup. This article addresses the realization of Hardware in the Loop concepts on signal and power level for the use in wind energy converter nacelle testing. The functionality of the 1 MW demonstrator test bench operating in HIL mode with a DUT controlled by the original nacelle controller is shown.

This summary includes text from the introduction of the article.

The Mathematical Theory of Evidence and Measurement Uncertainty Expression and Combination of Measurement

Results via the Random-Fuzzy Variables

(Summary)

Simona Salicone

This is the second in a series of three papers. In the previous paper, it was proved how total ignorance can be effectively represented, in Shafer's theory of evidence, by a rectangular possibility distribution. In addition, it was shown how this concept can be usefully employed to mathematically represent situations that are often met in the measurement practice, especially in the industrial world. The aim of this new paper is to show how possibility distributions can be effectively used to represent any kind of knowledge, from total ignorance to total evidence, and combine different contributions, if necessary.

This summary includes text from the introduction of the article.

Columns

Basic Metrology

(Summary)

Bryan Kibble

G-Up (or Down?)

All masses attract one another, be it ever so slightly. The force F between two isolated masses, M_1 and M_2 that are a distance r apart is $G M_1 M_2 / r^2$ where G is the universal gravitational constant, equal to about $6.67 \times 10^{-11} \text{m}^3 \text{s}^{-2} \text{kg}^{-1}$. One unfortunate fact about G is that no present theory connects it with any other physics and another lies in the word about. It would be nice to have a more accurate value of G for astronomical calculations, and metrologists have been trying hard for the past two centuries to measure one. The author presents an argument that it is likely that some additional force other than gravitational attraction is acting on the masses.

This summary includes text from the article.

Life after Education

Charles Nader

The True Value of a PhD in the Eyes of Industry

No matter if it is a startup or a large-scale company, the challenges are similar at different scales. Joining a company with a PhD title puts the holder directly under the pressure of showing leadership skills, criticizing, and investigating current systems, offering differentiating ideas, and stepping into new directions where others might object for the sake of the change. With the five skill packages gained during the PhD studies, it is much easier to discuss, debate, convince and pass information to technical colleagues and project/program managers about new ideas, solutions, and implementations which can be key differentiators in products to be delivered within a highly dynamic market.

This summary includes text from the article.

My Favorite Experiment

(Summary)

John Witzel

Recreating the Double Slit Experiment at Home

In his column, the author presents the basics for one of his favorite physics experiments, conducted by Thomas Young (1773–1829) when he demonstrated that light consists of waves by showing that the distribution of brightness by interfering beams could be explained by the additive and subtractive interference of the wavefronts. Proving light has wave like properties is simple enough to demonstrate in your living room; a laser pointer, a few clothespins, a business card and an optional soot covered piece of glass are all that's required.

This summary includes text from the article.

Future Trends in I&M

(Summary)

Simona Salicone

Future Trends in I&M

In her inaugural column, the author states that innovative proposals are the heart of scientific advancement and, to be accepted, they have to pass criticism. There is no doubt that criticism is an important part of innovation, since it is determinant in changing a good, promising idea into

a solid theory, aware of its limitations. I&M is an experimental field by its nature. We should be open to experiment. When we face something new, we should try to understand it. We should try to put it in practice, and find if and how it works. Finally, we should understand its limitations and maybe try to overcome them.

This summary includes text from the article.

News from the Chapters

(Summary)

Ian Woodhead

IMS in New Zealand

New Zealand is a relatively small country of approximately five million people and has a predominantly agriculturally based economy. Belonging to IEEE Region 10, it has 1041 members in three IEEE sections: North, Central, and South that are headquartered in Auckland, Wellington, and Christchurch, respectively. The IEEE IMS New Zealand Chapter covers all three sections.

At I2MTC 2008, Jorge Daher (then President of IMS), asked Prof. Subhas Mukhopadhyay of Massey University in New Zealand to investigate establishing an IMS Chapter in New Zealand. In December 2009, a petition was lodged with support from fifteen members to form the chapter, which was then inaugurated in 2010 with Dr Mukhopadhyay as Chair, and an inaugural workshop was held on 15th April 2010. The one-day workshop on Sensors and Instrumentation Research in New Zealand was attended by 23 people, and six months later a workshop on Sensors and Instrumentation in Environmental, Health, and Agricultural Applications was held in Wellington and attended by 37 people. Keynote speaker Dr. D. Preethichandra from Central Queensland University, Australia presented “Conducting Polymer-based Nano-biosensors.” We gratefully acknowledge the support from IMS in assisting with establishing the chapter and supporting the workshops.

The New Zealand Chapter of the IEEE IMS now has 38 members and was awarded the Best Chapter in 2011 at Graz, Austria during IEEE I2MTC 2012. The current officers include the Chair, Dr. Ian Woodhead of Lincoln Agritech Ltd, Vice-Chair Asst. Prof. Rainer Kunnemeyer of Waikato University, Secretary Dr. Andrew Taberner of the Auckland (University) Bioengineering Institute, Treasurer Dr. Ramesh Rayudu of Victoria University Wellington and

Industry Liaison Dr. Robin Dykstra of Magritek Inc. Wellington. Prof. Subhas Mukhopadhyay, as inaugurator of IMS NZ, holds a special place on the committee.

Seminars have included presentations from:

- Dr. Voicu Groza, FIEEE, Chair of the Ottawa Chapter of the IEEE I&M and Professor of Computer Engineering at the University of Ottawa on “Non-invasive Blood Pressure Monitoring: Challenges and Solutions;”
- Dr. Ian Grout of the Department of Electronic and Computer Engineering at the University of Limerick, Ireland, “Design and Development of an Online Laboratory;”
- Prof. Reza Zoughi, DL, IEEE IMS “Microwave and Millimeter Wave Imaging for NDE Applications: – Past, Present and Future” (3 seminars);
- IEEE IMS President Mr. Kim Fowler:, “A Perspective on Future Instrumentation and Measurement” (two seminars);
- Dr. Kailash Thakur, Landcare Research, “Ohm’s Law for Superconductors;”
- Prof. Tong Sun, City University London, UK, Basics of optical fibre sensors and their applications
- Dr. Goutam Chattopadhyay, Jet Propulsion Laboratory, USA, “Terahertz Radar for Stand-Off Through-Clothes Imaging;”
- Prof. Elfed Lewis, University of Limerick, Ireland, “Optical Non-Invasive Monitoring of Total Haemoglobin Concentration Monitoring in Real-Time;”
- Mr. Asaf Grosz, Ben-Gurion University, Low-Frequency Magnetometer; and
- Prof. XiaoQi Chen, University of Canterbury, “Biomimetic Locomotion and Sensing Control in Field Robots.”

Workshops have included:

- 2011. A two-day workshop held at Auckland University of Technology on Smart Sensors, Measurements & Instrumentation in 2011, with 32 presentations over two days. More than 50 people attended the workshop.
- 2012. The 2012 annual IEEE IMS NZ Chapter workshop, Smart Sensors, Measurements and Instrumentation for Agricultural and Environmental Monitoring, was held at Lincoln University and attended by 27 researchers and students. IEEE IMS supported the workshop technically and financially, Lincoln Ventures Ltd (LVL) ran the event, and financial sponsorship was from LVL and the three NZ Sections, North, Central and South.

Dr. Ian Woodhead welcomed all attendees and outlined the workshop theme and the relevance of I&M to agricultural and environmental monitoring and industry. Prof. Subhas Mukhopadhyay promoted the I&M society and its activities, gave a brief history of the IEEE IMS NZ Chapter, and presented a paper on the internet of things. The two-day workshop provided papers on many interesting topics ranging from a laser based fruit firmness sensor to composition measurement in a range of products. In line with the workshop theme, a visit to the commercially operated Lincoln University dairy farm and a presentation by Prof Keith Cameron provided valuable insight into sensors and management of production and pasture and environmental impacts of a large modern dairy farm operation.

- 2013. Our 2013 annual workshop was held at the University of Waikato, Hamilton and was organized by Asst. Prof. Rainer Kunemeyer. 62 people attended, and there were 34 presentations over two days with very good participation from industry. The keynote speaker included Yuri R. Montanholi, of the University of Guelph, Ontario.
- Also in 2013, an IEEE IMS NZ workshop on smart sensors was held at Auckland University of Technology (AUT). The one-day event was organized by Akbar Ghobakhlou and Prof. Phillip Sallis and opened by AUT Vice-Chancellor Derek McCormack. The event had 30 registrants and eighteen technical presentations covering diverse topics such as wireless sensor networks for irrigation scheduling and optical coherence tomography for imaging cardiac trabeculae.

- 2014. An early 2014 highlight was the 9th IEEE Sensors Applications Symposium (SAS 2014) which was held at Rydges Lakeland Resort, Queenstown, NZ, for the first time outside North America and Europe. More than 110 papers were submitted for the conference, of which 76 were accepted for presentation, and 88 delegates from nineteen countries attended.

Sponsored by the IEEE IMS, the conference was co-chaired by Asst. Prof G. Sen Gupta with Associate Technical Program Chair Prof. Serge Demidenko, both of Massey University. The keynote speaker was the world-renowned scientist Dr. Alan Finkel, AM, Chancellor of Monash University, Australia, and President of the Australian Academy of Technological Sciences and Engineering. He spoke on the topic “Characterization of Currents in Nature’s Ion-flow Nanomachines Underpins Development of New Medicines.” Several special sessions, including one on Environmental and Agritech-related Sensors by current IMS Chair Dr. Ian Woodhead of Lincoln Agritech Ltd, were organized. A Sensor Application Development Workshop and a competition using the Sensibility Testbed were also held.

We have two additional workshops planned for 2014 in July and November.

The print article includes photos from various workshops and keynote addresses.

T-26 Update

Mark Yeary

Recent Activities of TC-26: Radar Cross-Section Measurements

This TC is the only one that is devoted to radar related measurements in the I&M Society. The Radar Cross-Section Measurements (RCS) committee has people from industry and academia. It is worth mentioning that detailed RCS measurements are now possible at the Advanced Radar Research Center (ARRC) at the University of Oklahoma (OU) for both on-campus groups and off-campus groups. My research partners at OU have worked to develop the specifications of two anechoic chambers at the University of Oklahoma (note: a special thanks to Dr. Jessica Ruyle). The most exciting recent development for OU’s radar program is the construction of the Radar Innovations Laboratory (RIL) building, which is located adjacent to the National Weather Center and was completed in March of 2014. Temporary visitor offices are available in

the RIL to external people wishing to complete collaborative experiments. For example, NASA has plans to visit to complete some low-frequency phased-array antenna measurements.

This 35,000 ft² (3.252 km²) state-of-the-art facility houses all of OU's radar faculty, staff, and students, and affords several new capabilities and opportunities for research. The building has two precision anechoic chambers, both with isolation of at least 100 dB up to 18 GHz of operation. The smaller chamber can also support measurements up to 40 GHz with slightly less isolation. A few more details are: the large chamber is 34 x 24 x 24 ft (10.4 x 7.3 x 7.3 m), with isolation of 300 GHz to 18 GHz. There is a >1.5 m cube quiet zone at 300 MHz, and a >2 m cube quiet zone > 900 MHz, a full Az/EI positioner. There are RCS measurement capabilities and complete target characterization.

The small chamber is 26 x 13 x 13 ft (7.9 x 4 x 4 m) with isolation of 2 GHz to 40 GHz. There is a >1.5 m cube, a precision near-field antenna system, a full Az/EI positioner, and a polarization positioner. It has RCS measurement capabilities and complete target characterization.

Related equipment includes:

- Agilent PNA and PNA-X network analyzers (up to 50 GHz for two ports, 26.5 GHz for 16-port analysis) with an electronic calibration module;
- Agilent PSA and EXA spectrum analyzers with phase noise and noise figure personalities (up to 50 GHz);
- a Tektronix real-time spectrum analyzer with 110 MHz of instantaneous bandwidth (up to 14 GHz);
- Agilent PSG analog signal generator (up to 50 GHz); and
- an Agilent PSG vector signal generator (up to 31.8 GHz).

The facilities will support a variety of experiments ranging from wideband ISAR to intricate multi-polarization RCS measurements. Contact: Mark Yeary, yeary@ou.edu.

Legal Metrology

(Summary)

Veronica Scotti and Ted Vosk

Weather Forecasting

The authors discuss how weather forecasting and emergency management are related to the I&M field and can help to prevent casualties and mitigate damages caused by catastrophic weather events. This has given rise to a debate concerning the liability of those responsible for emergency management as well as weather forecasting and leads to a more interesting question: Can weather forecasters be liable for wrong or inaccurate forecasts? Although cases have been limited, the authors present some US court rulings and legal precedents in this area.

This summary includes text from the introduction of the article.

Departments

New Products

Robert Goldberg

Powerful Failsafe Controller

Siemens Industry introduces the SIMATIC® S7-1518F failsafe controller available with a bit performance of 1 nanosecond. Designed to increase flexibility, safety, efficiency and productivity at the plant floor level, the new controller is suitable for high-end standard and safety-related machine and plant automation applications.

The S7-1518F has four communication interfaces: a Profinet interface with a 2-port switch for communication with the field level, two Profinet interfaces and one Profibus interface. The failsafe controller also accommodates up to 128 drive axes, operates isochronously in 250 microseconds and has 10 MB of memory.

Siemens has also introduced the SIMATIC® S7-1516F CPU that supplements the range of failsafe CPUs. Programs are easily created with the powerful Step 7 Safety Advanced V13 engineering tool, which includes drag & drop, project-wide cross-reference list, safety administration editor, online/offline comparator and additional integrated system support functions. The tool efficiently creates fail-safe applications, delivering the same engineering and operating concepts for both standard and safety-related tasks.

Both failsafe CPUs are certified to EN 61508 (2010) for functional safety and are suitable in safety-relevant applications up to SIL 3 according to IEC 62061 and PL e according to ISO

13849. Additional password protection has been set up for F-configuration and F-program for IT security.

For more information, go to: <http://www.siemens.com/S7-1500F>.

GSM Monitoring Receiver for Government, Military and Homeland Security Systems

Pentek, Inc. announces the newest member of its Cobalt® family: the Model 52663, a full spectrum GSM channelizer 3U VPX module. Using a highly-optimized IP core for the Xilinx Virtex-6 FPGA, the 52663 is ideal for mobile monitoring systems that must capture some or all of the 1100 uplink and downlink signals in both upper and lower GSM bands. This full global system for mobile communications spectrum monitoring targets homeland security, government and military applications.

The Model 52663 accepts four analog inputs from an external analog RF tuner, such as the Pentek Model 8111, where the GSM RF bands are down converted to an IF frequency. These IF signals are then digitized by four A/D converters and routed to four channelizer banks, which perform digital down-conversion of all GSM channels to baseband. Two of the banks handle 175 channels for the lower GSM transmit/receive bands and two banks handle 375 channels for the upper bands. The DDC channels within each bank are equally spaced at 200 kHz.

Each DDC output is re-sampled to a 4x symbol rate of 1.08333 MHz to simplify symbol recovery. Every four DC outputs are combined into a frequency-division “superchannel” that allows transmission of all 1100 channels across the PCIe Gen 2 x 8 interface.

The GSM channelizer IP core is supported with additional factory-installed FPGA functions including packet formation, time stamping, four DMA controllers, gating and triggering. Baseband super-channel packets are sent via DMA controllers to processor memory where customers apply processing algorithms.

The 3U VPX form factor of the Model 52663 is ideal for mobile platforms. Ground or airborne monitoring platforms can now scan the entire GSM spectrum for all uplink and downlink signals. The small size and complete spectrum coverage makes it easier to deploy small systems near cell phone towers. Rugged and conduction cooled packages address the needs of extreme environment platforms.

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

Low-Cost Hipot and Safety Testers

Global Test Solutions (GTS) announces the next generation of Sefelec's low-cost, high potential (hipot), and safety testers, the Premier 2800 Series. The Series is designed for making many safety tests required for IEC, EN, UL, CSA, GB, JIS and others, including hipot/dielectric strength, insulation resistance, and continuity.

The instruments are designed for engineers in R&D and production technicians who are involved in almost any type of electronic product or assembly testing. There is an increased demand by safety and consumer organizations for safety testing on any device with a plug. The Premier Series 2800 is ideal when meeting today's basic safety standards.

The Premier 2800 Series includes the Premier 2801, 2802, 2803, and 2804. The Premier 2801 is able to perform an AC withstanding test; the Premier 2802 is capable of performing both AC and DC withstanding tests; the Premier 2803 is a 3-1 model capable of performing AC withstanding, DC withstanding as well as insulation resistance tests; the Premier 2804 is a 4-1 model that can perform AC withstanding, DC withstanding, insulation resistance, and ground bond tests.

The Premier 2800 Series is equipped with a simple control panel and a bright LCD display with color LED indicators that allow operators to interpret measurement results quickly. To learn more about the Premier 2800 Series, download the data sheet at <http://www.sefelec.fr/upload/produits/fiches/premier-28xx-series-uk.pdf>.

Computed Tomography (CT) Inspection Systems for Non-Destructive Testing of Materials

YXLON announces the new YXLON FF20 CT and FF35 CT systems for the non-destructive testing and measurement of materials. Conventional computed tomography scanners on the market are complex systems involving sophisticated operation—even for experienced users. In contrast, the new YXLON Geminy software platform intuitively supports all levels of users with simplistic operation that delivers the best data quality in three-dimensional inspection via the platform's system intelligence.

An outstanding feature of the new CT systems is the new smart touch operating concept that involves two monitors. One of them is arranged in a horizontal format, while the other is in a vertical format. This not only increases work ergonomics, but it also simplifies operational

workflows. While one monitor is used for control and input, the other monitor displays current results on an ongoing basis.

The YXLON FF35 CT combines precision with versatility. With the large inspection envelope and two different X-ray tube sources, the system can take a close, critical look at large objects or scan the details of an inspection series of smaller items with a high degree of accuracy. While doing so, the directional tube head is enhanced via the new transmission tube head FXE190.61, which is optional.

The YXLON FF20 CT, the FF35 CT's little brother, equally fulfills the highest demands for CT system precision. It is designed to work with highly specific computed tomography data for smaller objects, such as those found in electronics and communications technology.

Operation via the YXLON Gemini platform differs greatly from that of conventional computed tomography systems. The system is controlled via icons and can be operated almost completely without reading text. The intuitive operation helps staff members to acclimate quickly during initial training so that operators are able to work productively with the equipment within a short period of time. The system settings are regulated incrementally via user profiles. The individual inspections steps, along with the imaging chain contained within them, are composed of 'smart touch' graphic symbols in a block diagram.

Unlike the configuration of conventional CT systems, the communication between YXLON FF35 CT or YXLON FF20 CT users does not end when they literally leave the system. The operator can obtain information according to his or her needs via remote access using a wireless device such as a tablet or be updated automatically via push messages.

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

Handheld Thermal Imager and Insulation Resistance Testers for Predictive and Preventive Maintenance Applications

Agilent Technologies Inc. announces the addition of two new ranges of instruments to its portfolio of handheld tools. The U5855A TrueIR thermal imager provides clear and sharp thermal images with its unique Fine Resolution capability. The U1450A/60A Series offers five models of insulation resistance testers with wireless testing and report generation capability.

With the shift toward predictive maintenance, the U5855A TrueIR thermal imager allows engineers to safely and efficiently identify potential faults without shutting down the systems or disrupting the productivity of an industrial plant.

The U5855A comes with Fine Resolution capability, which enhances the quality of thermal images by reconstructing the image based on multiple continuously captured infrared frames. This allows the U5855A to achieve an effective image resolution of 320 x 240 pixels from a 160 x 120 pixel detector.

With this feature, the U5855A provides four times more resolution than typical 160 x 120 thermal imagers. Together with a 4x digital zoom, the U5855A reveals finer details, especially when inspecting small cracks on industrial pipelines even from a distance away.

The U5855A's light and ergonomic design allows engineers to comfortably use the thermal imager for longer periods of time and operate it single-handedly in tight locations. Users can also easily change settings or access frequently used functions such as torch light and laser pointer, auto scaling or trigger with quick access buttons. With in-camera monitoring and analysis capabilities, the U5855A saves time by eliminating the need to connect to a PC. For more in-depth analysis and report generation, engineers can use the TrueIR Analysis and Reporting Tool PC software, which can be downloaded free of charge by visiting http://www.agilent.com/find/TrueIR_ART.

The U1450A/60A Series are 1 kV insulation resistance testers that measure leakage current and insulation resistance for preventive maintenance applications, such as checking the integrity of windings or cables in motors, transformers and electrical installations. The U1450A/60A Series comes with report-generation software that engineers can use to produce error-free automated test reports in table and graph forms. All five models are certified to IP 67 and are compatible with the Agilent remote link solution, enabling wireless remote insulation testing.

For applications that require unique test voltages, the U1450A/60A Series offers two models with adjustable test voltage ranges from 10 V to 1.1 kV, with 1 V step increments. A two-in-one insulation tester model with a 4.5 digit full-featured digital multimeter is also available.

More information is available at http://www.agilent.com/find/hhgowireless_pr.

Real-time Spectrum Analyzer

Signal Hound announces the Signal Hound BB60C, successor to the popular Signal Hound BB60A. The Signal Hound BB60C is a real-time spectrum analyzer and RF recorder. It has significantly enhanced performance compared to the BB60A. The BB60C has a frequency range of 9 kHz to 6 GHz, an instantaneous bandwidth (IBW) of 27 MHz, and the ability to sweep the RF spectrum at 24 GHz per second.

The Signal Hound BB60C has improved SFDR (Spurious-Free Dynamic Range) by typically 20 dB; the noise floor has been flattened by reducing frequency band transitions more than 8 dB; operating temperatures have been extended down to -40 °C and up to +65 °C; and streaming I/Q (In-phase Quadrature) bandwidth is now selectable from 250 kHz to 27 MHz.

By adding custom software and a low-cost Intel i5 NUC vPro-enabled computer, model DC53427HYE, the user can also remotely perform spectrum analysis, manage system recovery, turn on and off the BB60C, and update software, all over the Ethernet.

The Signal Hound BB60C ships with a fully documented API written in C++. The open source spectrum analyzer software provides excellent examples of efficient techniques for creating new functions and interfacing the API when writing customized applications.

The Signal Hound spectrum analyzers are compact and simple to use. The Signal Hound BB60C is ideal for real-time spectrum monitoring, manufacturing process control, interference hunting, spread spectrum signal analysis, capturing intermittent events, and general-purpose spectrum analysis.

Industry is using the spectrum analyzers for process monitoring and embedding them in specialty products. Government is using them for spectrum monitoring. Electronic repair technicians, engineering students, ham radio enthusiasts, and electronics hobbyists are all finding them useful.

Although they are small and affordable, they have the sensitivity, accuracy, and dynamic range expected from expensive and bulky test equipment.

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

Radio Test Set for Analog Radios

The new Rohde & Schwarz CMA180 radio test set uses state of the art digital measurement technology for testing analog radios. Rohde & Schwarz designed the R&S CMA180 radio test set especially for analog radio production and maintenance. Equipped with a touchscreen for easy operation, the new tester can generate any test signal of up to 20 MHz bandwidth and process high input power levels of up to 150 W. It offers all of the functions of a high-end device at an attractive price.

The R&S CMA180 radio test set enables manufacturers and service technicians to test analog radios in the 100 kHz to 3 GHz frequency range. Its large touchscreen and straightforward menu provide for especially simple and fast operation.

The R&S CMA180 uses an integrated ARB generator for software implemented test signal generation. Users can generate any output signal with a bandwidth of up to 20 MHz; a feature normally offered only in radio-communications testers several times more expensive.

Rohde & Schwarz claims the CMA180 to be the world's first radio-communications tester that allows users to generate additional signals with just a few mouse clicks, such as interfering signals for co channel rejection measurements. Service technicians and test engineers can also use the instrument's integrated sequencer to configure and run automatic test sequences.

The R&S CMA180 radio test set is designed for 100 W continuous input power and 150 W peak input power and R&S claims it is the only tester in its price class capable of processing such high input levels. Thanks to digital signal processing, the R&S CMA180 delivers extremely precise measurement results and is ideal for testing software defined radios.

For high precision power measurements, Rohde & Schwarz offers optional extremely linear power sensors that can also be used with the R&S CMA180.

For details, go to <http://www.rohde-schwarz.com/ad/press/cma180>.

Ultra-Compact 2 – 6 GHz Power Amplifier

Diamond Microwave is extending its range of GaN-based solid-state power amplifiers (SSPA) to include a 2 – 6 GHz model that can be operated in either pulsed or CW mode. The DM SC50 01 is an ultra-compact broadband amplifier that complements Diamond Microwave's existing

SSPAs in X-Band and Ku-Band. All of Diamond Microwave's amplifiers are ideal for use in demanding defense, aerospace and communications applications.

The DM SC50 01 is demonstrating 100 W peak power in pulsed mode at 2GHz and an average power capability of 50 W across the full band. It measures only 120 x 100 x 20 mm excluding the heat sink. The compact pulsed amplifiers are similar in size to a smartphone and achieve pulsed power output levels of up to 150 W in narrowband X and Ku-band designs, with the potential for pulsed outputs up to 1kW and multi-octave bandwidths.

The amplifier designs are flexible in layout and architecture, and are fully customizable to meet individual specifications for electrical, mechanical and environmental parameters. Amplifiers with pulsed power outputs in excess of 1kW, and with multi-octave performance are also under development.

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

Unmanned Vehicle Optics for Gimbaled Systems and Outboard Protection

Custom fabricated sapphire, germanium, and zinc selenide optics for use in gimbaled systems and front surface protection in unmanned air and undersea vehicles are available from Meller Optics. Meller Optics for unmanned vehicles feature sapphire which is second only to diamond in terms of hardness and provides outboard surface protection for imaging sensors by withstanding sand, saltwater, and other fast moving particulates.

Optics for gimbaled systems include sapphire, germanium, and zinc selenide for applications from the mid to far IR, and they can all be fabricated to customer specifications as lenses, mirrors, and windows.

Available in a wide range of shapes and sizes from 0.25 in. to 10 in. (6.35 mm to 25.4 cm) diameter with varying wall thicknesses, Meller Optics for UAV and UUV applications can incorporate stepped edges and elliptical edge shaping, holes, slots, and wedges for mounting. Flatness can be held to 1/10th wave in the visible and < 2 arc sec. in/in parallelism, with surface finishes from 60-40 to 10-5 scratch-dig, depending upon material and configuration.

Meller Optics for unmanned vehicles are priced according to material, configuration, and quantity. For more information, visit <http://www.melleroptics.com>.

Self-Monitoring 18-Slot PXI Express Hybrid Chassis Addresses High Power ATE System Requirements

VTI Instruments introduces the CMX18, a high power hybrid PXIe chassis designed for ATE test systems. Leveraging the company's experience in designing and providing high power VXI mainframes for ATE, the CMX provides extensive built-in health monitoring, giving the user feedback of temperature, fan speed (airflow) and supply line monitoring to help reduce the mean-time to repair (MTTR), or shut down the system in realtime if a fault condition occurs.

Cooling has been designed to satisfy ATE rack cooling conventions, pulling air from the sides and bottom, evenly distributing, and exhausting to the rear. Rack mount kits provide recessing the mainframe to accommodate cable harnesses as well as seamless integration with mass interconnect systems.

Designed with a 1000 Watt power supply, the CMX18 operates at 91% power efficiency, easily satisfying the most power hungry application requirements. For multi-channel data acquisition applications, when combined with the EMX-2500 LXI-PXIe interface, The CMX18 provides IEEE-1588 time source distribution to all slots providing for a time-stamped deterministic multi-channel solution. The clock synchronization between a single master instrument and multiple slaves is achieved using standard Ethernet cables, resulting in simplified installation and maintenance.

For more information on the CMX18, please visit <http://vtiinstruments.com>.

Vibration Tested Thermistor Probes

Omega introduces its new series of thermistor probes with a high temperature rating of 200 degrees Celsius (392 Fahrenheit) and M12 connections. These thermistor sensors can be used in applications previously out of reach of epoxy coated thermistor sensors. The TH-22 series are constructed with the 55000 series glass encapsulated thermistor elements which provide excellent stability and accuracy.

For spec sheets and more information, please visit <http://www.omega.com/pptst/TH-22.html>.

New 2 Watt, 40 GHz Attenuators

Pasternack Enterprises, Inc. announces their new line of 2 Watt, 40 GHz attenuators (part number PE7395-xx). This new line of high frequency, millimeter wave attenuators is perfect for applications requiring reliable broadband performance ranging from DC to 40 GHz (Ka microwave band). Pasternack's new 40 GHz fixed attenuators are designed with 2.92mm connectors and allow input power of 2 Watts.

This selection of broadband, high frequency attenuators are available from 0 to 20 dB attenuation depending on the model. The attenuation value is denoted by the number following the hyphen in the Pasternack part number. The new 2.92 mm attenuators from Pasternack are used in many RF-related applications including test labs, research facilities, military electronics, telecommunications equipment, security devices, production line testing and many others.

A total of 14 new 40 GHz, 2 W attenuators have been added to the company's expansive range of millimeter wave products. These RF attenuators are constructed with passivated stainless steel bodies and Beryllium Copper (BeCu) contacts, meaning they are designed to withstand continued use in demanding environments.

For additional information and details about these millimeter wave attenuators, please visit http://www.pasternack.com/pages/Featured_Products/2-watt-40-ghz-attenuators.htm.

Announcing an error in the New Products column from the August 2014 *IEEE Instrumentation & Measurement Magazine* on page 58: In the new product write-up from JTAG Technologies, the heading was "High Integrity Interface to MAC-Panel." The heading should be "**High Integrity Interface to VPC.**"

Thank you for taking note of the change.