

The IEEE Instrumentation & Measurement Magazine
June 2016 Issue

Women in Instrumentation and Measurement

Editorial

Women in Instrumentation and Measurement

Wendy Van Moer

This has been the most difficult Editorial for me to write... What can I say about women in instrumentation and measurement? Are they so different from men in instrumentation and measurement? We also have two legs, two arms, big brains (please behave, Gentlemen!)...

But we cannot ignore that, in some parts of the world and in many situations, it is still difficult for women to study, to be taken seriously, to do the 'job of a man'... Also, the combination of work and family is not always an evident task for women.

When speaking about work-related issues, I believe that it is important to think in terms of human beings and not in terms of men or women. This is especially true in one important field: scientific research. In this field, the only things that should matter are brilliant brains and a huge amount of dedication. And these attitudes are not confined to gentlemen or ladies: they belong to human beings. Unfortunately, as I wrote above, there are still many situations and parts of the world where this simple concept is not yet as clear as it should be.

The aim of this issue of the Instrumentation and Measurement Magazine is to prove through scientific articles, that women and men, in our I&M community, perform the same high-quality research and attain the same brilliant results. It will clearly show that discrimination, in this scientific field, has no reason to exist. This issue not only presents us state-of-the-art research performed by women in instrumentation and measurement, but also some interesting testimonies.

Our guest editor is Prof. Ferdinanda Ponci from the Institute for Automation of Complex Power Systems at the E.ON Research Center at RWTH Aachen University, Aachen, Germany. Her research activities are focused on measurements for monitoring and control of distribution systems with pervasive presence of renewables. Prof. Ponci is also a member of the Administrative Committee of the IEEE I&M Society. It was a great pleasure to work with her on this issue, and I would like to take the opportunity to thank her for her dedication and valuable time. Women in I&M, we are as strong as a diamond!

Groetjes,
Wendy

Greetings from IEEE WIE

Takako Hashimoto, Chair, IEEE Women In Engineering (2015-2016)

Dear all,

As the IEEE Women in Engineering (WIE) International Chair, I would like to express my sincere gratitude to the Instrumentation & Measurement Society for the challenge to lead in helping WIE and the IEEE with respect to women's participation within both IEEE and the profession. This opportunity to share resources allows us to align and build strong bonds across IEEE, which will inspire, engage, and empower female engineers. Let us work together to change the world!

With warm regards,
Takako
(takako@cuc.ac.jp)

Guest Editorial

A Measure of Progress

Ferdinanda Ponci

This issue of our Instrumentation and Measurement Magazine is dedicated to the contributions of women in this field of science and engineering. We hope that the readers will appreciate the technical contributions and the varied experiences and personalities of the contributors. And, we hope that they will recognize and remember them as role models who represent many others they

may know, who could not fit here. We can consider this issue a success if our readers, males and females, will recognize in their own female colleagues, students, teachers, bosses, acquaintances such precious, multi-faceted natures.

The normality of seeing women contributing and leading in science and engineering is the prerequisite for making sure that all those who want to get in, get educated, and pursue a career in the technical area can do so without limitations due to their gender. This means broadening the pool of talents, engaging a variety of different minds, and in the end getting more and better technology and science advancements and applications.

The contributions in this issue represent (though not comprehensively) a variety of topics in instrumentation and measurement (I&M): from setting the world time reference, to assessing image quality, to measuring wireless communications, to monitoring power systems. Our contributors are from industry, academia, and metrological institutes. Some of our contributors are at the beginning of their career, some have well established positions, and some have leadership positions. They reside in different IEEE regions around the world. This is how we try to give an impression of the diversity of women in I&M and a hint on how many more are out there. I want to thank all of the contributors for sharing with us not only their technical expertise but a bit of their stories and thoughts, which are collected in one single article in this issue.

This special issue is just one face of the engagement of women and men of the Instrument and Measurement Society (IMS) and IEEE towards the inclusion, recognition, and promotion of women engineers and scientists. Our volunteer officers and AdCom members, and our very own IMS President Ruth Dyer above all (whom I want to thank for being the constant reference she is), have been working on this challenge for years. And, not only with engaging speeches and exciting visions but also with very concrete actions. Enough to see the number of very active women involved in the administration of our society, which has increased in the past few years and is now well established, such that having a female President is no surprise to anyone now. Although it is a first in the history of our Society! An amazing catalyst of women's advocacy is the IEEE Women in Engineering Society (WIE), for which I serve as Society Liaison and have served as Region 8 Coordinator. The resources, ideas and inspiration that the WIE members, and

in particular the WIE Committee members, provide are invaluable to me and to the many Affinity Groups and Student Branches in the world. I invite our readers and contributors to spread this issue as much as they can. Leave a paper copy around in the office, show it to your students, daughters, colleagues, bosses, and teachers. Steps towards inclusion of gender diversity are also steps towards the inclusion of all other diversities.

Finally a big “thank you” to Prof. Wendy Van Moer, the Editor-in-Chief of this Magazine, for conceiving and supporting with her usual energy, this special issue.

Ferdinanda

President's Message

Women in the Instrumentation and Measurement Society

Ruth Dyer

It is wonderful to have the June 2016 issue of the I&M Magazine highlight and celebrate the many contributions and achievements of the women members of the IEEE Instrumentation and Measurement Society (IMS). Most of us are aware of the continuing challenge to increase the number of women in the science and engineering professions and to provide a welcoming and inclusive environment in which both they and the profession can thrive. We are very pleased to see both the significant growth in the number of women IMS members and the active manner in which they are participating in so many of our Society's activities.

Women are attending, giving presentations, serving on the technical-program committees, and chairing sessions at our conferences, workshops, and symposia. They serve on and chair some of the technical committees and IMS Chapters. They publish papers in the I&M Transactions, write articles and columns for the I&M Magazine, and serve as Associate Editors of IMS publications. One of our women members is currently serving as the Editor-in-Chief of the I&M Magazine.

Women have been elected to the IMS Administrative Committee (AdCom), and the undergraduate student, graduate student, and Young Professional positions on the AdCom have all been held by women appointees. Women AdCom members have served in leadership roles as

Chair of the I2MTC Tutorials, as Chair of the Distinguished Lecturers Program, and as the Chapter Chair Liaison. The IMS AdCom has a total of seven Vice Presidents, and every one of these Vice President positions has been held, at one time or another, by one of our women AdCom members. In fact, in 2012, five of the seven Vice President positions were held by women. A number of our women members also have received our Society awards, and some have been elevated to IEEE Fellow status.

I could keep listing contributions and achievements of our women members, but I hope this brief glimpse illustrates the range and quality of their involvement in, and the impact upon, the I&M Society.

We have experienced a significant change in the composition of the AdCom over the past ten years, and I especially want to acknowledge the efforts of our many active male advocates who deliberately and intentionally identify and include not only women but also those from other underrepresented groups on the AdCom and for leadership positions.

I am always impressed by the strength and excellence that result when we embrace and encourage diversity. Time and again, we discover that the most robust solutions are achieved when a plethora of perspectives are sought and incorporated. As the science and engineering disciplines continue to direct their attention and efforts toward increased inclusion, we know our Instrumentation and Measurement Society will continue to thrive and grow, because we are committed to fostering and reaping the benefits of an inclusive Society.

Ruth

Article Summaries

Instrumentation and Measurement for Power Systems in European Projects

(Summary)

Ferdinanda Ponci

This paper presents an overview of instrumentation and measurement (I&M) topics in power systems as they appear in recently completed and current projects funded by the European Commission. An overview helps to identify the evolutions to be expected in this technical area, which are considered critical to European competitiveness in the global landscape. In particular, this is achieved by exploiting I&M for securing the present and future sustainable energy supply, which will unlock markets (especially markets of services) to new and existing businesses.

This summary includes text from the introduction of the article.

The Coordinated Universal Time

(Summary)

Gianna Panfilo

The Time Department of the International Bureau of Weights and Measures (BIPM) is responsible for maintaining and disseminating the Coordinated Universal Time (UTC), the world time reference. UTC obtains its stability from several hundred atomic clocks located in more than 70 laboratories worldwide and its accuracy from primary and secondary frequency standards constructed and operated in about ten laboratories. The calculation of UTC relies on two main ingredients: the methods used to compare atomic clocks and the algorithms. This article reviews the present status of the UTC time scale computed at the BIPM after the implementation of the algorithms and includes the following: general definitions and descriptions of the time scales; predictions and the weighting procedures; a short presentation of the steering algorithm; a discussion of the dissemination of BIPM time scales; and a presentation of an analysis of the uncertainties published by the BIPM.

This summary includes text from introduction of the article.

A Human Visual “No Reference” Image Quality Measure

(Summary)

Karen Panetta, Long Bao, and Sos Agaian

In this article, the authors introduce a no-reference image quality measure. In the structure of this measure, a color pixel difference is utilized to combine the colorfulness and luminance

information in a straightforward and efficient manner. Based on this difference measure, a difference maximum filter is used to process the input image and calculate the final quality index. Experimental results and the measure's performance are compared to two existing measures: Color Root Mean Enhancement and Blind/Referenceless Image Spatial Quality Evaluator, and the authors show how the no-reference measure highly correlates with human vision from the Tampere Image Database 2013.

This summary includes text from introduction of the article.

MIMO OTA Test for a Mobile Station Performance Evaluation

(Summary)

Ya Jing, Hongwei Kong, and Moray Rumney

With multiple input multiple output (MIMO) technology being adopted by the wireless communication standards LTE and UMTS, there is a need for the introduction of MIMO over the air (OTA) performance requirements and test methods. Unlike single input single output systems where multipath fading is something to be overcome, MIMO takes advantage of the spatial diversity in fading channels to enable simultaneous transmission of multiple streams of data in the same time and frequency. This paper gives an overview of MIMO OTA test methods and introduces the details behind the two-stage MIMO OTA method. Recent results show that the MPAC and RTS test methods can produce nearly identical results despite the large differences in their methods.

This summary includes text from introduction of the article.

The IEEE IMS Faculty Award Recipient: The Automatic Measurement Systems Course at the University of Cagliari

(Summary)

Sara Sulis

This paper is a description of the course on Automatic Measurement Systems (SAM), which is mandatory for the students pursuing the master's degree in electronic engineering, known in Italy as Laurea Magistrale. The University of Cagliari, Cagliari, Italy has offered SAM once a year

since 2011. The author highlights and discusses the course proposal and objectives and the enhancement of the course provided by the IEEE IMS Faculty Award.

This summary includes text from introduction of the article.

Nonintrusive Appliance Load Monitoring for Smart Homes: Recent Advances and Future Issues

(Summary)

Lui Yu, Haibin Li, Xiaowei Feng, and Jizhong Duan

Appliance load monitoring (ALM) has become a key application in modern society for a better understanding of the usage and consumption of appliances, and it can be used to develop an energy-aware operation and detect abnormal operations of appliances for electrical safety. Two approaches exist for ALM: intrusive appliance load monitoring (IALM) and nonintrusive appliance load monitoring (NIALM). In this paper, the recent advance of NIALM methods and techniques of appliance recognition are discussed and analyzed, some existing problems are summarized and feasible solutions are proposed. Finally, future developments and extensive applications of NIALM are suggested.

This summary includes text from introduction of the article.

Columns

Women in I&M

(Summary)

Portraits of Instrumentation and Measurement Society Ladies

Ferdinanda Ponci

When it comes to diversity, personal acquaintance and friendships of individuals with diverse characteristics are keys to acceptance. This means having the ability to understand the differences, to learn to value them, and eventually, in professional engineering, to work and relate to others to benefit technical outcome, and human growth. The Instrumentation and Measurement Society (IMS) is well aware of this and actively implements this outlook whenever and wherever possible. In this column, the guest editor presents short portraits of eight of the

IMS's women scientists and engineers. The contributors provided brief descriptions of their careers and themselves, including: why they became scientific professionals in the I&M field; what advice they would like to pass on; what is the favorite part of their job; how their job benefits humanity and themselves; how they talk about their job with others not in a technical field; and how gender diversity has increased their awareness of diversity in general.

This summary includes text from the introduction of the column.

Legal Metrology

(Summary)

Women in Burkina Faso: Producing Handcrafted Shea Butter with Metrological Traces

Gianfranco Molinar Min Beciet and Veronica Scotti

With the help of an Italian nonprofit organization (SOLE Onlus), a group of 150 women from the small West-African country of Burkina Faso established an association called ASVT Dollebou (which means for tomorrow in the local Bissà language) to produce Shea butter and its by-products. This short article is not only a tribute to a group of African ladies who succeeded in producing high-quality products and placing them on a global market while preserving their tradition. It is also a tribute to a profession (Instrumentation and Measurement) that has always proven throughout the centuries its importance in advancing and improving human life.

This summary includes text from the column.

Future Trends in I&M

(Summary)

Future Trends in I&M Should Fill in the Gap between the Academic and Industrial Worlds

Simona Salicone

In this issue, the columnist gives credit to the contributors who wrote recent columns for *Instrumentation and Measurement Magazine*. Although they approach the field from varied perspectives, the authors share many fundamental concepts related to the growth in

instrumentation and measurement in both academic and industrial settings, spanning theoretical development and practical application.

This summary was written by K. Virostek,

Women in Microwave Research

(Summary)

Active Microwave Thermography – A New Twist on Microwave NDT

Kristen Donnell

The field of microwave nondestructive testing (NDT) includes numerous test and measurement techniques with a wide range of applications. This column introduces a new area of microwave NDT focusing on the integration of microwave and thermographic NDT, referred to as active microwave thermography (AMT). AMT utilizes the combination of microwave energy to generate controlled and localized heating and commercially-available infrared (thermal) cameras to capture surface thermal images of a structure under test in real-time. AMT has shown potential as an NDT solution for various applications in the transportation and aerospace industries, including detection of delamination and debonding in structures rehabilitated with carbon fiber reinforced composites, corrosion detection in steel-based materials, and characterization of steel fiber reinforced cement-based materials.

This summary includes text from the column.

Women in I&M

(Summary)

Uncertainty Evaluation for Raman Shift Measurement of Fullerene by Least Square Method

Lingling Ren

As a new kind of emerging semiconducting materials, fullerene nanofiber has been widely used in applications such as solar cells, MEMS, composite fillers, superconductors, etc. Raman spectroscopy is a commonly used technique for fullerene characterization, as the variations in Raman shifts potentially reveal the sub-structure and internal motions of fullerene. However, the

Raman shifts of fullerene are very sensitive to measurement conditions. The objective of this short column is to present a summary of the concepts related to fullerene characterization that would help develop a protocol of shifts calibration and uncertainty evaluation for reliable and accurate results, with repeatability and reproducibility.

This summary includes text from the column.

Basic Metrology

(Summary)

Don't Use Your Imagination!

Bryan Kibble

The author writes, “For this issue, I am temporarily deserting my set subject of basic metrology for basic mathematics to talk about complex numbers. My excuse for doing so is that this branch of mathematics is essential, not only for basic electrical metrologists but also for the much wider community of electrical engineers, some of whom read this magazine. New students of complex numbers often have subconscious worries about its logic, and particularly what $()^{-1}$ ‘means.’”

This summary includes text from the column's introduction.

IMS Members and Patents

(Summary)

The Value of Ideas—Intellectual Property

Keith Strassner

Dear I&M Society Members:

In the February 2016 issue of the *Instrumentation and Measurement Magazine*, we announced a new initiative related to recognizing and celebrating our members' technical achievements and contributions in patents, which generate intellectual property (IP). As we progress towards establishing and promoting this initiative, this article by Keith Strassner (Director of the Office of Technology and Economic Development at Missouri University of Science and Technology) will shine some light on the importance of and the value of ideas and IP, particularly those

generated at academic institutions. As we get this exciting initiative off the ground, we will regularly celebrate our members' accomplishments. Cheers!

Reza Zoughi
This text introduces the column.

Society News

Outstanding Young Engineer of the Year Award 2014

Melanie Ooi

First, I want to say that it was a great honour for me to be named the IEEE I&M Society (IMS) Outstanding Young Engineer of the Year Award for 2014. As I tell you about my experiences, you will see how it has changed my life.

I am an Asian female-engineer living and working in the fast evolving, challenging and yet often traditional socio-economic environment of Malaysia. I received my B.Eng. (Hons), M.Eng.Sc. and Ph.D. degrees in Electronics and Computing from Monash University, Melbourne, Australia, which is among the world's top educational institutions by major international rankings. I am currently an Associate Professor at the Heriot-Watt University, UK, in its Malaysia campus in the School of Engineering and Physical Sciences. I teach undergraduate and postgraduate courses and research in several subject fields including measurement uncertainty with applications to design and manufacturing. For over ten years, I have been a Member of the IMS and its Technical Committee 32 on Fault-Tolerant Measurement Systems. I am also a UK Chartered Engineer and Member of the Institution of Engineering and Technology. I am happily married and have two beautiful young daughters, ages five and two. On a less serious side, I enjoy playing Candy Crush when I am bored or tired, and I am a proud owner of an exceptionally large collection of LEGOs.

Commitment to IMS

I first joined the IEEE in 2005 as a Student Member. My very first experience at an international conference was the 2005 IEEE International Instrumentation and Measurement Conference

(I2MTC) held in Ottawa, Canada. I was extremely nervous, having practiced and practiced my presentation many times during the seventeen-hour flight and even on the morning of my session. It was a daunting experience to present my work for the first time to the very same people whose work I had been reading and referencing. Yet, despite all my initial fears, the experience was a pleasant one – the Conference was filled with very welcoming academics, research experts, and engineers who encouraged my efforts and provided me with recommendations on how to improve my work.

In 2007, I was elected the Secretary of the IMS Malaysia Chapter. Following that appointment, I attended the Annual IMS Chapter meeting in May 2007 in Warsaw, Poland during I2MTC. My involvement with the IMS and its Malaysia Chapter grew from then on. I helped to expand the membership and activities in Malaysia while holding several offices in the Chapter, including the Vice-Chair, Secretary, and Executive Committee member. Due to growing family commitments, I stepped down from the Chapter responsibilities for two years between 2013 and 2014. I re-joined IMS activities in 2014 as the Secretary and Member of the Technical Committee-32 (TC-32) on Fault Tolerant Measurement Systems and since then have worked on improving measurement tools and techniques. (Please refer to our new on-line tools on the Committee website: <http://tc32.ieee-ims.org/tc-32>).

What the Award Means to Me

I live and work in Malaysia. It is a fast developing country and hi-tech manufacturing hub with plenty of opportunities for applied researchers and practicing engineers. Yet, there are also several challenges that I have faced in my work. For example, the overall state resources available to support fundamental research activities are relatively limited while the local currency exchange rate is not particularly favourable. As a result, the research funds are not many and they are often of comparatively small sizes. This restricts the type of research projects that can be proposed and developed to somewhat smaller size problems. Unfortunately, in Malaysia, we do not have any real access to significant international research grant schemes; the industry support is often limited to the projects associated with immediate problems and needs.

There still exists elements of rudimentary lower acceptance within the traditional Asian society of engineering and research/technical leadership as a career profession path for females, thus sometimes gender inequality issues occur. The progress in this area in the recent decades has been significant and evident. Yet, it is still quite a long way to go before such inequality will be finally eliminated for good.

There have been a number of other objective and subjective obstacles on my professional way. However, the aim of this article is not about listing them and complaining about the hardships – they are mentioned just to illustrate that they have actually motivated me to work harder, and that has been the main recipe of success. I divide my work time roughly equally between research and education, as both are absolutely vital and complementary in my work as an academic and engineer. I believe that the engineering education in Asia needs to be industry-driven to produce engineers who can compete on a global scale. By focusing my efforts on improving the quality of engineering education in Malaysia, I hope to contribute towards producing more highly skilled graduates who will technologically transform my country further.

As I mentioned earlier, I have been a part of IMS for a decade and have always been in awe of the amount of talent, enthusiasm, professional institution activities, productivity in research, and engineering applications in the Society. Therefore, it was a huge honour to even be considered for the IEEE IMS Outstanding Young Engineer of the Year Award. When I was first told that I would be named the Outstanding Young Engineer for 2014, I was astounded. It took quite a while for the news to sink in.

When the news of the award was publicized in my workplace, I received many messages from female engineers and academics congratulating me and asking for an advice on whether they should put themselves forward for consideration for recognition in their respective fields. Possibly, their hesitation in doing so before had a lot to do with cultural norms in past years, whereby young females could be labelled as arrogant if we were to put ourselves forward. I was also interviewed by a major national newspaper that did a two-page spread on my career as a female engineer in Malaysia. It could be right to say that receiving the IEEE IMS Outstanding Young Engineer of the Year Award has positioned me as a kind of a role-model for women in

technical fields in Malaysia, thus making me a part of the gender equality development. I am exceedingly grateful to the Society for such recognition, and I will certainly work even harder from here on to do it justice.

The IEEE Malaysia Section and I&M Chapter in the country have always been very active. Bringing such a reputable award home to Malaysia gives an additional shot of confidence to the members of IEEE and the IMS, while also encouraging their greater participation in the professional activities. Having a belief in our ability to compete and succeed on an international level is half the battle won. I am confident that we will be able to attract many more members into the Malaysia IMS Chapter and to increase its contributions to the Society in the years to come.

This print article includes a photo of Melanie Ooi and Reza Zoughfi.

Society News

2016 Strategic Planning Meeting

Max Cortner

The 2016 Instrumentation and Measurement Society's (IMS) annual Strategic Planning Meeting, in which the Society officers and the Editors-in-Chief (EICs) participated, was held in Atlanta, GA during February 18-20. The opening remarks by Ruth Dyer, President, emphasized the importance of Vision, Mission and Goals as the IMS seeks to identify initiatives to pursue that will benefit our members. Our plans must stay aligned with our overall goals so that we make the most effective use of our resources. Our financial resources are important, but one most crucial resource that we have is the invaluable time voluntarily given by the IMS Officers, AdCom members, and active general members, all of whom work diligently to advance our Society goals. Ruth reminded the group of the upcoming comprehensive publications and Society review by the IEEE, which will take place in 2017. She challenged us to continue analyzing the recent IEEE membership survey results for ideas which would improve the value of our services to our members. Ruth's message focused on both the initiatives being undertaken by IEEE and those by

the IMS AdCom. She encouraged us to continue our efforts to improve our already highly and effective Society.

Max Cortner, Executive VP, led a review of the Vision and Mission of the Society. A strong connection to that vision pervaded the discussion in all areas. Our vision is to be the premier international professional Society in the Instrumentation and Measurement fields.

From this statement, we recognized the challenge of defining our field expansively.

Instrumentation and measurement (I&M) pervades every technology, and yet it is a distinct field in and of itself. The leaders of the IMS feel the need to be more proactive in clarifying what work is an advancement of the science of I&M and what work is primarily an application of I&M techniques. Clearly defining our field is not a move toward isolation but rather is a strategy that will highlight the unique contributions of the science of I&M. The officers of the IMS explored numerous initiatives to attract more engineers and more strongly engage and provide services to our members throughout the world.

Dario Petri, VP Finance, and Juan Manuel Ramirez-Cortes, Treasurer, reviewed the IEEE budgeting process and provided an overview of the IMS budget for 2016. Our budget is sound and continues a multi-year history of meeting the IEEE requirements for effective budget management. With four years of positive budgets, the emphasis is on wise spending for initiatives which provide enhanced benefit to our members.

Kristen Donnell, filling in for Shervin Shirmohammadi, the VP of Membership, reviewed the success of a wave of chapter formations spurred by our actions and supported by our strong Distinguished Lecturer Program (DLP). The Membership Committee plans to continue successful ongoing activities such as the Chapter Summit, chapter support and chapter funding programs, which encourage new chapters and engage existing ones. Continuing support for programs such as our Women In Engineering (WIE) initiative and the Region 10 Initiative encourages diversity in our membership. As part of our WIE program, this issue of the *Instrumentation and Measurement Magazine* focuses on the contributions of women engineers to the I&M field, and a future IEEE WIE Magazine issue will feature the IMS activities. In

response to the IEEE Africa initiative, the Membership Committee is exploring the formation of possible chapters in Africa as the next global extension of our Society. The Young Professionals program and the Industrial Relations initiative will further increase diversity in our membership.

Salvatore Baglio, VP of the Education Committee, proposed identifying “hot topics” in the I&M field that we would update periodically. The topics on this list would guide the decisions of the Education Committee as to what educational content will be of high interest to our members. These topics would influence the subject matter of existing programs such as the DLP, Tutorials, and Video Tutorials. Initiatives such as the proposed “Meet the Instrumentation and Measurement Society Days” would explore these topics through presentations by the Society DLs or tutorial speakers. These events would be held at selected universities, in conjunction with support from local chapters. The intent is to deliver relevant and cutting-edge content to our members employed by industry, at a convenient local event.

Mark Yeary, our VP of Conferences, led a discussion of how we might partner successfully, both technically and financially, with conferences of other organizations. Within conferences such as the I2MTC, we discussed cooperation with industry and regional organizations to engage members of these groups in our Society. An Industry Special Session is being organized at the I2MTC 2016 in Taipei as the next step of our continued effort to encourage engagement by members employed in industry. Mark also shared a plan to administer the IEEE-required charges for technically co-sponsored conferences.

Zheng Liu, VP of Publications, began with a reminder of the various ways in which we publish information for our members. The usual emphasis is on the *Transactions on Instrumentation and Measurement* (TIM) and the *Instrumentation and Measurement Magazine* (IAMM), but Zheng reminded us of the opportunities to increase the use of our Newsletter, our web list of I&M Books and our Video Tutorials to increase bandwidth and diversity of our communication to members. Zheng challenged the team to use continued care in controlling the costs of publications. The IMS depends financially on publications as well as conferences to fund our services and benefits to members. The Publications Committee is focused on efficiency as well as effectiveness of communication.

Alessandro Ferrero, TIM's EIC, focused on two strategic challenges to further improvements in the premier technical publication of our Society, the Transactions on Instrumentation and Measurement. First, the increasing number of out-of-scope papers received is presenting a great challenge to the TIM EIC and associate editors as they try to provide authors with timely review of their submissions. It is also a reflection of the challenge our Society faces in helping prospective authors better understand exactly what the I&M field is and to focus their submitted papers on how their research is advancing the state of the art in the I&M field. Alessandro asked for the help of all the other committees of the AdCom in addressing this issue. The Education, Conferences, Membership, and Technical Committees can all work together to promote a clearer understanding of the I&M culture and, consequently, the scope of the I&M field. These efforts can thereby reduce the number of authors who inadvertently submit papers that are not appropriately within the scope of the TIM. The second issue relates to challenges associated with the increase in the number of Open Access (OA) papers accepted. Access fees to our published papers via Xplore are a significant portion of the Society's income. However, the OA fees are not expected to generate the same income. In view of this potential impact on the Society's revenue, Alessandro asked the group to consider additional ideas that could provide revenue to support the activities of the Society.

For the IAMM, Wendy Van Moer, EIC, reviewed the publications plan for 2016 and 2017. Editions have focused on subjects that support the Society strategy, including a Region 10 focused issue and this Women in I&M issue. Actions for the editorial staff this year will focus on reducing costs while maintaining the quality of our magazine.

Ruqiang Yan, Technical and Standards Activity Committee VP, presented a positive program to support and encourage our 18 Technical Committees as Centers of Excellence in our Society. Plans include organizing an annual TC Chairs meeting and providing greater visibility to their work through special conference sessions and newsletter articles. Regular assessment of Technical Committees will identify those that can benefit from funding and those whose excellence deserves the Best TC Award to be given annually. The overall program is intended to

encourage participation of members in TCs and encourage TC participation in other Society activities.

Senior Past President Jorge Daher reported that the Awards Committee is focused on better communication of the callfor-nominations to increase the number of candidates and maintain the standards of recognition. Visibility of award winners who represent the ideals of the IMS professionalism will help us define the field at its best.

Reza Zoughi, Junior Past President, described the goal of the Nominations and Appointments Committee to seek the best candidates for the AdCom from a very diverse pool of potential candidates. Establishing and maintaining a solid succession plan for existing officers will improve continuity and assure that for the benefit of our members, our Society is managed well. Identifying a slate of candidates who are willing to become active leaders ensures a long term future for the Society.

The meeting was concluded with a discussion of Society Management including recommended revisions to our Strategic Plan, a reminder of the upcoming Society Review tasks and a review of action items from the meeting. In accordance with IMS' governing documents, changes to our plan will be recommended to the AdCom and acted upon at the upcoming May AdCom meeting in Taipei.

Departments

New Products

Robert Goldberg

Please send all "New Products" information to:

Robert M. Goldberg

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PXIe® Vector Network Analyzer Options

Keysight Technologies introduces a series of hardware and software options for the M9485A high-performance PXIe® multiport vector network analyzer (VNA). These options further enhance the modular nature of the M9485A VNA by adding a range of new capabilities in support of applications such as base transceiver station (BTS) component test and active multiport module test.

During production test, engineers face a number of challenges. For those testing handset front-end modules with active components and tuning BTS high-rejection filters/duplexers, the challenge involves utilizing instrumentation with the right mix of measurement performance and configuration flexibility. Also critical is the ability to measure active components. The M9485A's fast measurement speed and high-power handling capability, coupled with its new hardware and software options, make it well suited to address these challenges.

The Configurable Test Set option allows users to create their own combination of VNA receivers and adjust receiver performance as needed, to fit the needs of their specific application. 2-/4-/6-/8-/10-/12-port option is available.

The Direct Receiver Access (DRA) option allows engineers to configure mixed receiver systems by either using the DRA module in the M9485A system as one receiver, or with a coupler module to make a configurable test set port. 2-/4-/6-/8-/10-/12-port option is available.

These hardware options provide superior yield for the test of wireless components and modules with high-power handling or high-rejection performance via a tailored multiport network analysis system. As an added benefit, the easy upgrade process associated with the M9485A, whereby different type of receivers are combined modularly in one system, helps engineers better prepare for future device-under-test trends and updates.

The M9485A also features two new software options: a basic RF Pulse Measurements option and a Gain Compression Analysis option, each designed to help engineers evaluate active components. The Pulse Measurement option performs point-in-pulse and pulse profile measurements down to a pulse width on the order of one microsecond, while the Gain Compression Analysis option quickly and easily performs measurements to search for the gain compression point over frequency.

Keysight's M9485A PXIe multiport VNA supports a frequency offset mode, time domain analysis, basic RF pulse, gain compression and N-port calibrated measurements based on the same measurement science and calibration science as the PNA/ENA network analyzers.

More information on the M9485A PXIe VNA is available at www.keysight.com/find/m9485a.

Spectrum Analyzer Features Digital IF Technology

Siglent Technologies announces the introduction of a new line of digital spectrum analyzers. The SSA3000X Series includes two new models with frequency ranges from 9 kHz to 2.1 GHz and 9 kHz to 3.2 GHz. These new spectrum analyzers incorporate all-digital Intermediate Frequency (IF) technology for higher measurement accuracy and frequency resolution. With IF technology, the frequency conversion and filtering is accomplished with digital signal processing earlier in the signal path for more accurate and stable values.

This new family of SSA3000X spectrum analyzers include a 10.1 inch, 1024x600 resolution, WVGA display that is bright and easy to read. The minimum resolution bandwidth (RBW) is 10 Hz, average noise level displayed is -161 dBm/Hz, offset phase noise is -98 dBc/Hz @ 10 kHz, and total amplitude accuracy is < 0.7 dB. Initial calibration accuracy is < 0.2 ppm.

These new spectrum analyzers are lightweight, compact, and have a user-friendly interface. Options include a tracking generator, advanced measurement package, EMI measurement function with quasi-peak detection, and reflection (VSWR) measurement kit.

For more information, please visit www.siglentamerica.com.

New PC Scope Software Delivers Improved Waveform Analysis and Functionality

Pico Technology has introduced Release 6.11.7 of the PicoScope® software. This version of PicoScope provides significant new capabilities for engineers, scientists, technicians and researchers who are working on the latest generation of electrical and electronic technologies.

The new version of PicoScope addresses many challenges with the addition of new mathematical waveform processing tools, decoding of popular serial protocols, and improvements to FFT frequency domain plotting. For users with touchscreens, Pico has introduced pinch and zoom support to enable easy panning and positioning of captured waveforms.

Advanced waveform mathematics now includes user-configurable filters: High Pass, Low Pass, Band Pass and Band Stop. The filters can be used to model missing circuit elements on live waveforms, and to do “what-if” analysis using different design parameters.

Frequency and duty cycle versus time plotting is a new feature that enables analysis of “Big Waveform Data” at a glance. With those plots it is possible to measure clock jitter and wander, modulation depth and characteristics of FM signals on a cycle-by-cycle basis.

Serial buses are commonplace in embedded systems, with new standards frequently being introduced. PicoScope has support for a total of sixteen common protocols.

For more information, please visit www.picotech.com. Current users can download the latest software version at: www.picotech.com/downloads.

Family of Compact, Standalone DC Electronic Loads

Tektronix, Inc. introduces the Keithley Series 2380 family of compact, standalone DC Electronic Loads as a complement to the company’s complete set of power test and measurement solutions. Available in 200 W, 250 W and 750 W models, the new DC Electronic Loads offer excellent performance and versatility to handle a wide range of applications including performance

verification, stress test and environmental test of DC power sources, power components and batteries in power electronics, battery research and alternative energy.

Electronics engineers or test engineers developing or testing DC power supplies or batteries use DC Electronic Loads to quickly and easily simulate real-world loads in order to validate the performance of their devices under a range of conditions. The new Series 2380 DC Electronic Loads feature multiple operation modes and diverse auto test modes with up to 25 kHz dynamic load cycling mode, superior voltage/ current resolution and read back accuracy and multiple interface choices.

Using any of the Series 2380 models, engineers can test their device under multiple working modes using the same instrument. The operation modes include constant current (CC), constant voltage (CV), constant resistance (CR), and constant power (CP). The new instruments build confidence in measurement accuracy with 0.1 mV/0.01mA voltage/current read back resolution and 0.025%/0.05% voltage/current read back accuracy.

Other features include:

- A built-in CR-LED test that can simulate real LED lamps or LED strings
- Integrated facilities for easily measuring the voltage rise/ fall time of DC power sources
- An I-Monitor function that simplifies testing/monitoring of current drawn from the DUT
- List mode making it easier to create a wide range of load current changes
- Battery test function that simplifies battery life and capacity testing.

For more information, go to www.tek.com/dc-electronicload.

EMC Test and Measurement Equipment

Rohde & Schwarz demonstrates its expertise in electromagnetic compatibility (EMC) measurements by introducing its family of instruments. The company's portfolio includes EMI compliance and pre-compliance test receivers, highly sophisticated, harmonized system solutions, associated analysis software and broadband amplifiers.

R&S claims their EMI test receiver has the greatest dynamic range and level accuracy on the market. Rohde & Schwarz developed the EMI test receiver specifically for demanding certification and R&D measurements.

The test receivers of the R&S ESR series support frequency ranges from 9 kHz to 3.6 GHz/7 GHz/26.5 GHz, which are ideal for performing disturbance measurements in just a few seconds for standard compliant EMC certifications. The standardized R&S CEMS100 test platform is a flexible, reliable off-the-shelf solution for radiated EMS measurements in line with IEC / EN 61000-4-3. The R&S AdVISE (automated video inspection system for EMC) is a video based system for monitoring DUT reactions in automated EMC test environments. R&S AdVISE can complement an R&S EMC32 software based EMS system or operate as a standalone solution. Also in the portfolio are the R&S BBL200 and R&S BBA150 from its broadband amplifier family. These instruments cover power levels from 15 W to 10 kW in the frequency range from 9 kHz to 6 GHz.

When portability is desired, the R&S Spectrum Rider is a new handheld spectrum analyzer offering light weight and long battery life. This user friendly solution offers solid RF performance and good accuracy for measurements in the field and lab. Depending on requirements, a key code can extend its frequency range from the standard 5 kHz to 2 GHz up to 4 GHz.

Find more information at www.rohde-schwarz.com.

New Generation of Motion Sensors

Bosch Sensortec announces new generations of intelligent accelerometers and high performance gyroscopes. The new devices cover a wide range of requirements, from low power consumption for always-on applications such as step counting, to high performance optical image stabilization (OIS).

To meet these challenges, the new sensors from Bosch Sensortec integrate embedded intelligence functionality into standalone accelerometers. Adding intelligent features to an

accelerometer enables innovative applications, while minimizing power consumption by eliminating the need to wake up an application processor or an additional discrete sensor hub.

Power consumption of the new accelerometers is kept very low to extend battery life time, and the integrated Android 6.0 “Marshmallow” features minimize programming effort for users. Each device delivers outstanding accelerometer performance, most importantly, low offset, low temperature coefficient offset (TCO) and low noise levels.

Two new accelerometers are being launched. The BMA422 “all-rounder” is ideally suited for standard applications, while the BMA455 provides high performance for areas such as immersive activity-tracking. In addition, the high level of performance enables the most demanding applications covering augmented reality, virtual reality and other applications.

Mobile devices require gyroscopes for many applications. To provide the necessary performance, Bosch Sensortec’s new gyroscopes combine the most important parameters in a single device: low noise, low TCO and high bias stability.

Two three-axis gyroscopes are being introduced. The BMG250 provides low noise, low TCO and high bias stability, while the BMG280 delivers ultra-low noise optimized for OIS and includes a secondary interface for OIS, making it fit for use in camera modules.

The new devices are all provided in small packages. The BMA422 measures 2.0 x 2.0 x 0.95 mm, while the BMA455 is 2.0 x 2.0 x 0.65 mm. The BMG250 and BMG280 gyroscopes both measure 3.0 x 2.5 x 0.83 mm.

Find more information at www.bosch-sensortec.com.

Enhanced Version of VirtualBench All-in-One Instrument

NI announces a new, high performance model of VirtualBench. The software-based VirtualBench all-in-one instrument combines a mixed-signal oscilloscope, function generator, digital multimeter, programmable DC power supply and digital I/O. With 350 MHz of

bandwidth, four analog channels and Ethernet connectivity, the new version of VirtualBench offers increased functionality for engineers characterizing and debugging new designs or automated test systems.

Users still interact with VirtualBench through free upgradable software applications that run on PCs or iPads for an easy, unified software experience for all five instruments. Engineers and scientists interact with their instruments using multitouch displays, multicore processors, wireless connectivity and intuitive interfaces for increased productivity. Simplification and increased capability through software leads to more efficient circuit debugging and validation.

The key benefits of VirtualBench include:

- Enhanced mixed-signal oscilloscope with protocol analysis delivers 350 MHz of bandwidth and four analog channels for higher performance interactive test
- Higher wattage programmable DC power supply with up to 3 A for the 6 V output channel and up to 1 A for the 25 V and -25 V channels for higher current applications
- Convenient, unified view of all five instruments, visualization on larger displays and quick functionality to save data and screenshots
- Ethernet connectivity in addition to USB and WiFi compatibility for distributed measurements
- Integrates seamlessly with LabVIEW system design software.

To learn more about VirtualBench, visit www.ni.com/virtualbench.

Compact Series of Handheld Meters

OMEGA presents the HHC200 Series of portable rugged environmental meters for temperature, pressure, RPM/light intensity, air flow, humidity, dew point, and wet bulb measurement. This series of 7 meters offers fast and accurate readings for your environmental field monitoring needs, measuring outdoor or laboratory created conditions such as wind chill, humidity, dew point, illumination, and more.

The HHC201 and HHC210 digital thermometers are offered in two different models: infrared thermometer with laser sighting and dual thermocouple thermometer. The HHC230 and HHC250

light meter and optical RPM meter measure light intensity and non-contact optical RPM with accuracy and reliability. HHC261 hygro-anemometer for air flow and humidity measurement offers high accuracy with ambient measurement, wind chill indicator and integrated wet bulb flow vane. The HHC280 and HHC281 manometers are offered in two different models: absolute pressure and precision differential. All models include a protective bumper and hard cover shell for field use, plus auto power-off features, and CE approval.

Find more information at www.omega.com.

645 MHz Real-time Analysis Bandwidth for Radiated Emissions Compliance Testing

Measurements of radiated emissions in the frequency range up to 1 GHz are performed in a semi-anechoic chamber or on open area test sites (OATS). Such measurements are very time consuming. According to CISPR and FCC Standards, the measurements have to be performed at several antenna heights and all angular positions of the device under test. In the past the total test time was reduced by performing prescans with peak detector and short dwell times and final maximization carried out at individual frequencies only. During the pre-scan procedure overview measurements are performed to search for the frequencies with maximum emissions. A list of suspicious frequencies (peak list) is generated. Then, the final measurement is performed at these frequencies in single frequency mode with longer dwell times.

Using the TDEMI X of GAUSS INSTRUMENTS with a real-time analysis bandwidth of 645 MHz and fully gapless evaluation and visualizing (Option QC DSP-UG, 645M-UG), the final maximization can be performed at all frequencies simultaneously. The unique feature of the fully gapless real-time spectrogram mode combines all advantages of the single frequency mode of a traditional receiver with the possibility to carry out the measurement at all frequencies simultaneously. Two detectors are applied simultaneously, thus CISPR-Average and Quasi-peak detectors can be measured simultaneously in real-time and stored and visualized in real-time.

By applying the real-time analysis bandwidth of 645 MHz, the measurement is carried out first in the frequency range of 30 MHz to 645 MHz using Quasi-peak and CISPR-Average detectors including maximization at all angular positions and heights. After characterization in the range

from 30 MHz to 645 MHz, the second full maximization is performed in the range 645 MHz – 1 GHz. Both measurements are combined to the final test report.

By this method, e.g., all operation modes of a device under test can be easily measured in a very short total test time.

For more information, please visit www.gauss-instruments.com/.

Multimode Laser Diode with 20 Watt Peak Power @ 808 Nm

Eagleyard's new 808 nm broad area semiconductor laser diode delivers 20 Watt peak power under pulsed operation from a single emitter. Its high pulse energy and fast rise time makes this laser diode ideally suited for high resolution sensing applications in extreme harsh environments.

The diode features:

- 10 μ s pulse width @ 25 kHz repetition rate,
- Temperature Range: -40 °C to +80 °C,
- available in a hermetically sealed 9 mm TO-housing,
- upon request, also available with fast axis collimation (FAC).

The multimode laser diodes operate spatially and longitudinally multimode. In this product family it supports wavelengths between 650 and 1120 nm. The output power range is between 1 and 18 Watt in continuous mode. In pulse mode, it is up to 100 Watt. Stripe widths from 60 μ m to 400 μ m are available to optimize beam structure and power for various applications.

These laser diodes are used for sensing in space and defense applications, material processing, medical applications, LIDAR, or solid-state laser pumping.

For a datasheet, please visit www.eagleyard.com/fileadmin/downloads/data_sheets/EYP-BAL-0808-00020-1540-SOT23-0016.pdf.

Industrial Wireless Controller for Internet of Things Applications

Banner Engineering introduces the Sure Cross ® DXM100 industrial wireless controller, designed to facilitate communications for Ethernet connectivity or Industrial Internet of Things (IIoT) applications. Available with an internal Sure Cross DX80 Wireless Gateway or a MultiHop Data Radio, this powerful Modbus communications device reliably connects local wireless networks with the Internet and/ or host systems.

To satisfy multiple application requirements, the DXM100 controller offers several wired and wireless connectivity options to easily share data between local and remote equipment. The cellular modem option eliminates the need for IT infrastructures to connect remote equipment, while the integrated Sure Cross wireless radio option enables Modbus connectivity to equipment.

Banner's DXM100 wireless controller includes a logic controller with easy programming options for simple operation and guaranteed control. It can be programmed using action rules and ScriptBasic, allowing freedom when creating custom sensing and control sequences. The DXM100 also allows for secure email and text messaging for alarms, alerts and data log files.

The DXM100 incorporates several automation protocols into its system, including Modbus RTU, Modbus TCP and EtherNet/IP. The controller also features on-board universal and programmable I/O ports for simple connection to local sensors, indicators and control equipment.

Designed with an interactive, programmable user interface consisting of an LCD screen and four LED indicators, operators can quickly access system status and setup, view selected events or data and perform site surveys.

To learn more about Banner's Sure Cross DXM100 wireless controller, visit www.bannerengineering.com.

Near-Infrared Detectors

Opto Diode Corporation introduces the NXIR family of photodiodes, designed specifically for back-facet laser-monitoring applications that require improved performance in the nearinfrared (NIR) spectrum from 700 nm to 1100 nm. The new NXIR product line expands the company's

high performance SXUV and UVG photodiode series designed to maximize measurement repeatability and reliability in high-powered UV laser-monitoring systems with affordable products optimized for near-infrared wavebands.

The NXIR-RF36 and NXIR-RF70 near-IR/red-enhanced models offer reduced footprints and are ideally suited for integration with semiconductor lasers, notably Fabry-Perot (FP), distributed feedback (DFB), and vertical-cavity surface-emitting lasers (VCSELs). The new devices have high responsivity of 0.65 A/W @ 850 nm, low capacitance of 5 pico-farads (pF) at 0 volts, and high shunt resistance, greater than 200 MΩ. The NXIR-RF36 has an active area of 0.36 mm² ; the NXIR-RF70 has an active area of 0.70 mm² . The detectors are available in either waffle pack or dicing tape for high-volume shipments.

Opto Diode's third device in the series, the NXIR-5W, is optimal for high-power-laser monitoring that requires higher responsivity in the NIR spectrum. It can be utilized with YAG lasers used in medical equipment, fluid dynamics, manufacturing, and military applications. The NXIR-5W has high responsivity at 1064 nm with low reverse bias voltage of 10 V. Other features include high responsivity of 0.45 A/W at 1064 nm, low dark current of 1 nA, and low capacitance of 10 pF. The NXIR-5W is available in a hermetically-sealed, standard two-lead TO-5 package.

For more information on the NXIR series of photodetectors or for volume pricing quotes, please visit www.optodiode.com or contact sales@optodiode.com.