2014 IEEE International Instrumentation and Measurement Technology Conference

Instrumentation and Measurement for Sustainable Development

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May 12-15, 2014 | | Montevideo, Uruguay

PROCEEDINGS

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IEEE Catalog Number: CFP14IMT-USB
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TABLE OF CONTENTS

09:55 - 12:20
PS1U (Poster Session): Measurement and Instrumentation for Industrial Applications (part 1)
Room: Picasso

09:55 - 12:20
PS1V (Poster Session): Signal & Image Processing Techniques (Part 1)
Room: Picasso

09:55 - 12:20
PS1W (Poster Session): Software Development for Measurement and Instrumentation Support
Room: Picasso

09:55 - 12:20
PS1X (Poster Session): Student Poster Contest
Room: Picasso

10:30 - 12:30
S1A: Energy and Power Systems (Part 1)
Room: Conference Room

10:30 - 12:30
S1B: Measurement Systems and Theory (Part 1)
Room: Gauguin

10:30 - 12:30
SS3: Emerging methods for measuring, modeling and instrumentation in medical applications
Room: Cezanne

10:30 - 12:30
S1D: Measurement of Electric and Magnetic Quantities
Room: Renoir D

10:30 - 12:30
S1E: Measurement Applications (Part 1)
Room: Renoir E

2:00 - 3:45
S2A: Energy and Power Systems (Part 2)
Room: Conference Room

2:00 - 3:45
S2B: Measurement Systems and Theory (Part 2)
Room: Gaugin

2:00 - 3:45
S2C: Measurement, Instrumentation & Methodologies Related to Healthcare Systems (Part 1)
Room: Cezanne

2:00 - 3:45
S2D: Measurement of Materials and Mechanical Quantities
Room: Renoir D

2:00 - 3:45
S2E: Measurement Applications (part 2)
Room: Renoir E

3:45 - 6:00
PS3T (Poster Session): Advances in Instrumentation and Measurement Developments and Techniques (part 2)
Room: Picasso

3:45 - 6:00
PS3U (Poster Session): Measurement and Instrumentation for Industrial Applications
Room: Pavilion

3:45 - 6:00
PS3V (Poster Session): Measurement Signal & Image Processing Techniques (part 2)
Room: Picasso

3:45 - 6:00
PS3W (Poster Session): Wireless Sensors (Part 1)
Room: Picasso

3:45 - 6:00
PS3X (Poster Session): Mesurement of Electric and Magnetic Quantities
Room: Picasso

3:45 - 6:00
PS3Y (Poster Session): Sensors and Sensor Fusion
Room: Picasso

4:15 - 6:00
S3A: Energy and Power Systems (Part 3)
Room: Conference Room

4:15 - 6:00
S3B: Measurement Systems and Theory (Part 3)
Room: Gauguin

4:15 - 6:00
S3C: Measurement, Instrumentation & Methodologies Related to Healthcare Systems (part 2)
Room: Cezanne

4:15 - 6:00
S3D: Real-Time Measurement
Room: Renoir D

Wednesday, May 14

09:15 - 10:30
S4A: Advances in Instrumentation and Measurement Developments and Techniques (part 1)
Room: Conference Room

SS2P1: Impedance Spectroscopy for Measurement and Sensor Solutions (part 1)
Room: Gauguin

S4D: Wireless Sensors (part 1)
Room: Renoir D

SS5P1: SS5: Smart Transducers and Sensors (part 1)
Room: Renoir E

10:30 - 12:45
PS5T: Energy and Power Systems (part 1)
Room: Picasso

10:30 - 12:45
PS5U: Measurement and Instrumentation for Industrial Applications (part 3)
Room: Picasso

10:30 - 12:45
PS5V: Signal & Image Processing Techniques (part 3)
Room: Picasso

10:30 - 12:45
PS5W: Measurement Applications (part 1)
Room: Picasso

10:30 - 12:45
PS5X: Measurement Systems and Theory
Room: Picasso

10:30 - 12:45
PS5Y: Measurement, Instrumentation & Methodologies Related to Healthcare Systems (part 1)
Room: Picasso

11:00 - 12:45
S5A: Advances in Instrumentation and Measurement Developments and Techniques (part 2)
Room: Conference Room

11:00 - 12:45
SS2P2: Impedance Spectroscopy for Measurement and Sensor Solutions (part 2)
Room: Gauguin

11:00 - 12:45
S5D: Wireless Sensors (part 2)
Room: Renoir D

11:00 - 12:45
SS5P2: SS5: Smart Transducers and Sensors (part 2)
Room: Renoir E

14:30 - 15:45
S6A: Advances in Instrumentation and Measurement Developments and Techniques (part 3)
Room: Conference Room

14:30 - 15:45
SS2P3: Impedance Spectroscopy for Measurement and Sensor Solutions (part 3)
Room: Gauguin

14:30 - 15:45
S6C: Non-invasive Measurement Techniques and Instrumentation (part 1)
Room: Cezanne

14:30 - 15:45
SS1P1: Nanotechnology applications in Measurement and Instrumentation (part 1)
Room: Renoir D

14:30 - 15:45
SS7P1: Energy Harvesting for Autonomous Measurement Systems: methodologies and devices (part 1)
Room: Renoir E

15:45 - 18:00
PS7T: Measurement of Materials and Mechanical Quantities
Room: Picasso

15:45 - 18:00
PS7U: Measurement and Instrumentation for Industrial Applications (part 4)
Room: Picasso

15:45 - 18:00
PS7V: Signal & Image Processing Techniques (part 4)
Room: Picasso

15:45 - 18:00
PS7W: Measurement Applications (part 2)
Room: Picasso

15:45 - 18:00
PS7X: Data Acquisition Systems and Techniques
Room: Picasso

15:45 - 18:00
PS7Y: Measurement, Instrumentation & Methodologies Related to Healthcare Systems (part 2)
Room: Picasso

16:15 - 18:00
S7A: Advances in Instrumentation and Measurement Developments and Techniques (part 4)
Room: Conference Room

16:15 - 18:00
S7C: Non-invasive Measurement Techniques and Instrumentation (part 2)
Room: Cezanne

16:15 - 18:00
SS1P2: Nanotechnology applications in Measurement and Instrumentation (part 2)
Room: Renoir D

16:15 - 18:00
SS7P2: Energy Harvesting for Autonomous Measurement Systems: methodologies and devices (part 2)
Room: Renoir E

Thursday, May 15

09:15 - 10:30
S8A: Signal & Image Processing Techniques (part 1)
Room: Conference Room

09:15 - 10:30
S8B: Measurement and Instrumentation for Industrial Applications (part 1)
Room: Gauguin

09:15 - 10:30
SS4P1: Sensors and Instrumentation for the Environment and Climate change Monitoring (part 1)
Room: Cezanne

09:15 - 10:30
S8D: Non-invasive Measurement Techniques and Instrumentation (part 3)
Room: Renoir D

09:15 - 10:30
S8E: Sensors and Sensor Fusion (part 1)
Room: Renoir E

10:30 - 12:45
PS9T: Energy and Power Systems (part 2)
Room: Picasso

10:30 - 12:45
PS9U: Advances in Instrumentation and Measurement Developments and Techniques (part 3)
Room: Picasso

10:30 - 12:45
PS9W: Measurement Applications (part 3)
Room: Picasso

10:30 - 12:45
PS9X: Non-invasive Measurement Techniques and Instrumentation (part 1)
Room: Picasso

10:30 - 12:45
PS9Y: Biomedical Systems
Room: Picasso

10:30 - 12:45
PS9Z: Real-Time Measurement
Room: Picasso

11:00 - 12:45
S9A: Signal & Image Processing Techniques (part 2)
Room: Conference Room

11:00 - 12:45
S9B: Measurement and Instrumentation for Industrial Applications (part 2)
Room: Gauguin

11:00 - 12:45
SS4P2: Sensors and Instrumentation for the Environment and Climate change Monitoring (part 2)
Room: Cezanne

11:00 - 12:45
S9D: Data Acquisition Systems and Techniques (part 1)
Room: Renoir D

11:00 - 12:45
S9E: Sensors and Sensor Fusion (part 2)
Room: Renoir E

14:00 - 15:45
S10A: Signal & Image Processing Techniques (part 3)
Room: Conference Room

14:00 - 15:45
S10B: Measurement and Instrumentation for Industrial Applications (part 3)
Room: Gauguin

14:00 - 15:45
SS4P3: Sensors and Instrumentation for the Environment and Climate change Monitoring (part 3)
Room: Cezanne

14:00 - 15:45
S10D: Data Acquisition Systems and Techniques (part 2)
Room: Renoir D

14:00 - 15:45
S10E: Energy and Power Systems (part 4)
Room: Renoir E

15:45 - 18:00
PS11U: Transducers
Room: Picasso

15:45 - 18:00
PS11V: Robotics and Controls
Room: Picasso

15:45 - 18:00
PS11W: Non-invasive Measurement Techniques and Instrumentation (part 2)
Room: Picasso

15:45 - 18:00
PS11X: Wireless Sensors and Systems (part 2)
Room: Picasso

16:15 - 18:00
S11A: Signal & Image Processing Techniques (part 4)
Room: Conference Room

16:15 - 18:00
S11B: Measurement and Instrumentation for Industrial Applications (part 4)
Room: Gauguin

16:15 - 18:00
S11D: Advances in Instrumentation and Measurement Developments and Techniques (part 5)
Room: Renoir D

Welcome Message from the Chairpersons

On behalf of the organizing, technical and local committees of IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2014), we welcome you to Montevideo. Here in Uruguay we are all concerned with sustainable development, and so it has been chosen as the theme of the conference. Our excellent and broad technical program covers the traditional span of instrumentation and measurement fields, and reflecting the main theme, the program also contains many sessions dealing with issues related to it.

As usual, we start with a full day of tutorials offering more than a dozen fascinating topics. We have three esteemed keynote speakers who set the tone for the three days of the conference which consists of five parallel tracks of oral and one track of poster presentations. They are Dr. Pasquale Arpaia, from the CERN, Dr. David Leibrandt from NIST and the recipient of the IEEE 2014 Keithley Award, Thomas Linnenbrik. We appreciate and we are very much thankful to them for coming and sharing their knowledge and experiences with us.

This is the first time the IMTC Conference is held in Latin-America and in the southern hemisphere as well. Our local chapter, one of the few and oldest IMS Chapters in Region 9, is very, very happy and proud of making history and hosting this Conference. Most appropriately, this year also marks the silver anniversary of the Uruguayan Section, and for our volunteers this Conference is the most significant part of the Celebration activities.

It is with a great satisfaction that we are honored to receive in our Country the presence of so many scientists and engineers from all over the world. Enjoy Montevideo; it is a nice city that strongly conserves its Spanish and European heritage. Just in front of the Conference hotel –which was built in the 50's and enlarged later– is the main square, with the old and the new President's houses, and the very nice, 160 years old, "Solis Theater" which bears the name of the Spanish ship captain that discovered our land. You will find the old city through the gate of the Citadel, the fort that protected the port and the old city that lies to the west. We also encourage you to visit the country.

Again, welcome, and please do enjoy the Conference and your stay.

Juan Carlos Miguez, General Chair

Daniel Slomovitz, Technical Chair

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Pasquale Arpaia
European Organization for Nuclear Research (CERN), Geneva, Switzerland
University of Sannio, Benevento, Itala

Keynote Tuesday, May 13, 2014
"Beyond the Higgs boson hunting: high-performance instrumentation and measurement technologies for testing and tuning particle accelerators at CERN"

David R. Leibrandt
National Institute of Standards and Technology, USA

Keynote Wednesday, May 14, 2014
"Optical atomic clocks - measurement at the 17th decimal place"

Thomas Linnenbrink
2014 Keithley Award Winner
Teqovations, LLC, USA

Keynote Thursday, May 15, 2014
"Realizing the Inherent Performance of Modern ADCs in Real Systems"

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UTE is a company of the Uruguayan State, which generates, transmits, distributes and commercializes electrical energy throughout the country. Its purpose is to work for the electric service within a framework of economic, social and environmental sustainability, to reach all households and activities of the country, reliably, with a level of quality that satisfies our society and at the lowest price possible.

30 years generating energy and linking two nations The Joint Technical Commission of Salto Grande is a binational organization created by Argentina and Uruguay in order to make necessary modifications to the use of the Uruguay river rapids in the Salto Grande.

Since its inception, it was responsible for studies and projects and later the construction and commissioning of the Salto Grande Hydroelectric Complex, which was the first hydraulic binational and multi-purpose facility in Latin America.

Our Mission is producing and supplying electrical energy through the use of the Uruguay River and the effective administration of the Salto Grande Hydroelectric Complex, preserving the environment, contributing to socioeconomic development and integration of Argentina and Uruguay.

Our Vision is to be a reliable, transparent and sustainable organization, a leader in the efficient supply of clean energy, recognized in the community and formed by a team of workers who are proud of belonging.

The National Research and Innovation Agency (ANII) is a Uruguayan government entity that promotes and encourages research and application of new knowledge to the productive and social realities.

Its most important goal is to be a key player in the continuous process of developing an equitable society. It is an agent of change, whit a unique vision of driving Uruguay´s productive and social development in such areas as science, technology, quality of work, social inclusion, and business innovation.

Its role is to promote and support the successful exchange between authorities, entrepreneurs and the research community. Provide funding, sustainment and the necessary tools required for building new business undertakings and projects. Act as the link between public and private organizations, coordinating and actively promoting dialog and generating productive guidelines among ministries, universities, business enterprises and social organizations.

Silver Patrons

UTE is a company of the Uruguayan State, which generates, transmits, distributes and commercializes electrical energy throughout the country. Its purpose is to work for the electric service within a framework of economic, social and environmental sustainability, to reach all households and activities of the country, reliably, with a level of quality that satisfies our society and at the lowest price possible.

With over 50 years in the area of test and measurement instrumentation, Coasin Instruments SA attends day to day needs of the scientific and technological communities of the country, promoting and giving support to premium brands.

I²MTC 2014 Exhibitors

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IEEE Instrumentation and Measurement Society
Outstanding Young Engineer Award

The I&M Outstanding Young Engineer Award recognizes an outstanding young I&M member who has distinguished him or herself through achievements, which are technical, of exemplary service to the I&M Society, or a combination of both, early in their career. The nominee must not have reached their 39th birthday and must be an I&M member at the time of nomination.

The 2013 Outstanding Young Engineer Award recipient is:

Mohammad Tayeb Ghasr
Missouri University of Science and Technology
USA

"For outstanding contributions to real-time microwave imaging and nondestructive testing systems development.

Mohammad Tayeb Ghasr (S'01 - M'10 – SM'12) received his B.S. in electrical engineering degree (*Magna Cum laude*) from the American University of Sharjah (AUS), Sharjah, in 2002 and his M.S. degree in electrical engineering from the University of Missouri-Rolla, Rolla, in 2004 and the Ph.D. degree in electrical engineering from Missouri University of Science and Technology (Missouri S&T), MO, USA in 2009.

Currently, he is an Assistant Research Professor with the Applied Microwave Nondestructive Testing Laboratory (*amntl*), Electrical and Computer Engineering Department, Missouri University of Science and Technology (Missouri S&T). He has over 85 journal papers, conference proceedings and presentations, and technical reports. He has nine awarded and pending patents to his credit. His research interests include microwave and millimeter-wave instrumentation and measurement, RF circuits, antennas, and numerical electromagnetic analysis. He is a recipient of the 2013 H. A. Wheeler Prize Paper Award of the IEEE Antennas and Propagation Society.

IEEE Instrumentation and Measurement Society
Technical Award

The I&M Technical Award is given to an individual or group of individuals for outstanding contribution or leadership in advancing instrumentation design or measurement technique.

The 2013 Technical Award recipient is:

Robert X. Gao
University of Connecticut
USA

"For significantly advancing the state-of-the-art in electrical capacitance tomography instrument design."

Robert Gao received his Ph.D. from the Technical University of Berlin, Germany, in 1991. His research aims to improve the observability of dynamical systems and processes for better understanding of the underlying physics and better control. Topics of his research include sensing methodology, design and characterization of instrument systems, multi-resolution analysis for time series and image processing, and energy-efficient sensor networks, with applications in health care, cyber physical systems, and intelligent manufacturing.

He has developed graduate courses on mechatronics and advanced measurement systems, and supervised over 40 Ph.D./M.S. students and postdocs. He is a PI/Co-PI of over 55 federal and industry-sponsored projects, a co-author/co-editor of two books and over 280 refereed journal and conference papers, and holds four patents.

Dr, Gao was an Associate Editor for the *IEEE Transactions on Instrumentation and Measurement* (2000–2008 and 2010–2013) and *Journal of Dynamic Systems, Measurement, and Control* (2005-2008) of the American Society of Mechanical Engineers (ASME). Currently he is an Associate Editor for the ASME *Journal of Manufacturing Science and Engineering*, and *Mechatronics*, a journal of the International Federation of Automatic Control (IFAC). He was a Distinguished Lecturer of the *IEEE Electron Devices Society* (2008-2013). His awards include the *Instrumentation and Measurement Society's* Technical Award (2013) and Outstanding Associate Editor Award (2012), the *US National Science Foundation CAREER* Award (1996), and several Best Paper/Best Student Paper awards. He is a Fellow of the IEEE and ASME, and an elected Member of the Connecticut Academy of Science and Engineering (CASE).

IEEE Instrumentation and Measurement Society
Career Excellence Award

The I&M Society Career Excellence Award is awarded to recognize a lifetime career of meritorious achievement and outstanding technical contribution by an individual in the field of instrumentation and measurement.

The 2013 Career Excellence Award recipient is:

Massimo D'Apuzzo
Universita' di Napoli Federico II
Italy

"For lifelong activity and outstanding achievement in pioneering the use of microcontrollers in electrical measurements."

Massimo D'Apuzzo has been Full Professor of Electrical and Electronic Measurements since 1986. He is currently affiliated with the Dept. of Electrical Engineering and Information Technologies of the University of Naples Federico II, Italy.

Massimo D'Apuzzo carried out a proficuous and intense scientific activity in the area of Instrumentation and Measurement. He has headed research groups involved in the research activities in the field of general metrology, as well as in the definition, design and experimental validation of innovative methodologies for the characterization and performance assessment of dynamic systems, analog-to-digital converters and transducers. His most innovative and influencing scientific contributions are referred to three themes: (i) use of microprocessor for measurements on electrical systems, (ii) automatic instrument fault detection and isolation and (iii) power measurement on wireless communication systems. Massimo D'Apuzzo has been academic tutor and scientific mentor of several PhD fellows and collaborators, most of whom are now leading academics of Electrical and Electronic Measurements in prestigious Italian universities or occupy managing positions in industrial companies. He has founded and is Director of the Center for Advanced Metrology Services of the University of Naples Federico II.

He was President of the Italian Group of Electrical and Electronic Measurements, Head of the Department of Electrical Engineering of the University of Naples Federico II, member of the Academic Senate and President of the Scientific and Technological School of the same University.

2013 I&M Society Fellows

Mohammad Alam
University of South Alabama
Mobile, AL, USA

"For contributions to pattern recognition and high resolution image reconstruction."

Kim Fowler
Kansas State University
Manhatta, KS, USA

"For contributions to mission-critical and safety-critical systems engineering."

2013 I&M Society Senior Member Elevations

Mudrik Alaydrus
Karl Anderson
Bruno Ando
Mohsen Ashourian
Mohammad Fazle Azeem
Keshav Bapat
Raja Boddu
Gopi Bulusu
Andrea Cataldo
Sebastian Catunda
Yuhua Cheng
Moitin Chew
Mario Cifrek
Jose De La Rosa
Fernando De Sousa
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Arthur Hartog
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Volodymyr Kochan
Mladen Koprivica
Juha Kostamovaara
Navneet Kothari
Cheryl Liss
Narendra Londhe
Don Martin
Erick Maxwell
Mart Min
Gerardo Miramontes De Leon
Vincenzo Paciello
Nicola Pasquino
Pedro M Ramos
Arun Rau
David Rick
Sergio Saponara
Peter Silbermann
Andrew Street
Laszlo Sujbert
Linas Svilainis
Chen Xiyuan

I²MTC Tradition

The first *IEEE Instrumentation and Measurement Technology Conference* was held in 1984 aboard the Queen Mary in Long Beach, California, but its origins stretch back nearly 20 years earlier to the *Electrical and Electronic Measurement and Test Instrument Conference* held each year from 1966 until 1981 in Ottawa, Canada. The latter was revived by the IEEE Instrumentation and Measurement Society with a new focus on all aspects of instrumentation and measurement. The following list contains locations and themes of the I²MTC conferences:

1984 – Long Beach, CA, USA, *Automation-Quality-Productivity*
1985 – Tampa, FL, USA, *Measurement Science*
1986 – Boulder, CO, USA, *Standards of Excellence*
1987 – Boston, MA, USA, *The Changing Face of I&M Technologies*
1988 – San Diego, CA, USA, *Intelligence in Instrumentation*
1989 – Washington, DC, USA, *Persuasive I&M Technology – A Resource*
1990 – San Jose, CA, USA, *Emerging Measurement Technologies*
1991 – Atlanta, GA, USA, *Enhancing Productivity with Instrumentation and Measurement Technologies*
1992 – Meadowlands, NJ, USA, *Smart People, Smart Instruments, Smart Measurements*
1993 – Irvine, CA, USA, *Innovative Ideas for Industry*
1994 – Hamamatsu, JAPAN, *Advanced Technologies in Instrumentation and Measurement*
1995 – Waltham, MA, USA, *I3C – Integrating Intelligent Instrumentation and Control*
1996 – Brussels, BELGIUM, *Quality Measurements – The Indispensable Bridge between Theory and Reality (No Measurements? No Science!)*
1997 – Ottawa, CANADA, *Sensing, Processing, Networking*
1998 – St. Paul, MN, USA, *Where Instrumentation is Going*
1999 – Venice, ITALY, *Measurements for the New Millennium*
2000 – Baltimore, MD USA, *Smart Connectivity: Integrating Measurement and Control*
2001 – Budapest, HUNGARY, *Rediscovering Measurement in the Age of Informatics*
2002 – Anchorage, AK, USA, *The Frontier of Instrumentation and Measurement*
2003 – Vail, CO, USA, *Instrumentation and Measurement at the Summit*
2004 – Lake Como, ITALY, *From the Electrometer to the Networked Instruments: A Giant Step toward a Deeper Knowledge*
2005 – Ottawa, CANADA, *The 22nd Reunion*
2006 – Sorrento, ITALY, *A View on the New Technologies for Instrumentation and Measurement*
2007 – Warsaw, POLAND, *Synergy of Science and Technology in Instrumentation and Measurement*
2008 – Victoria, British Columbia, CANADA, *Advances in the Science of Measurement Technology*
2009 – Singapore, *Always On: Instrumentation and Measurement in the Networked World*
2010 – Austin, TX, USA, *Innovative and Integrated Applications of I&M*
2011 – Binjiang, Hangzhou, CHINA, *Instrumentation and Measurement for Improving Quality of Life*
2012 – Graz, Austria, *Smart Measurements for a Sustainable Environment*
2013 – Minneapolis, MN, USA, *Instrumentation and Measurement for Life*

IEEE Instrumentation and Measurement Society

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Ruqiang Yan
Dario Petri

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Kristen Donnell
Wendy Van Moer
Jenny Wirandi

2013-2016
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Alessandra Flammini
Richard C. Hochberg
Mark Yeary

2014-2017
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Max Cortner
Ferdinanda Ponci
Shervin Shirmohammadi

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Society Management: Ruth A. Dyer, *Kansas State University, USA*

Technical Committees and Standards: Richard C. Hochberg, *Lanmark Technologies, USA*

I²MTC™ 2015 IEEE International Instrumentation and Measurement Technology Conference

MAY 11 - 14, 2015
PISA, ITALY

I²MTC 2015 spans research, development and applications in the field of instrumentation and measurement science and technology. This includes Industrial Tracks, where research merges with practical applications in industrial technology used every day. The Conference fosters the exchange of know-how between industry and academia. Paper contests will include a Conference Best Paper Award and Student Best Poster Awards. In addition to papers, the conference will also have Tutorials and Exhibits covering the entire range of Instrumentation and Measurement Technology. The Conference focuses on all aspects of instrumentation and measurement science and technology-research, development and applications. The program topics include:

- Advances in Instrumentation and Measurement Developments and Techniques
- Biomedical Systems
- Data Acquisition Systems and Techniques
- Energy and Power Systems
- Industrial Process Control
- Measurement and Instrumentation for Industrial Applications
- Measurement Applications
- Measurement of Electric and Magnetic Quantities
- Measurement of Materials and Mechanical Quantities
- Measurement, Instrumentation and Methodologies Related to Healthcare Systems
- Measurement Systems and Theory
- Non-invasive Measurement Techniques and Instrumentation
- Real-Time Measurement
- Robotics and Controls
- Sensors and Sensor Fusion
- Signal & Image Processing Techniques
- Software Development for Measurement and Instrumentation Support
- Techniques related to Instrumentation
- Transducers
- Virtual Measurement Systems
- Wireless Sensors and Systems

IMPORTANT DATES

September 15, 2014 - Submission of FULL PAPERS (**HARD Deadline**)
December 05, 2014 - Notification of paper acceptance, rejection or revision
January 12, 2015 - Submission of final version (**HARD Deadline**)
February 9, 2015 - Final notification of paper acceptance

Given that the 2015 conference's theme is "***The "measurable" of tomorrow: Providing a Better Perspective on Complex Systems***", we strongly encourage submissions in the areas of instrumentation and measurement for energy, transportation and communication systems.

Prospective Authors are invited to submit a FULL PAPER of typically 4-5 (maximum 6) pages IEEE format consisting of a complete description of the proposed technical content and applicable research results. Each paper should indicate appropriateness for the scope of the Conference, originality and quality of the technical content, whole organization and writing style. The paper should, moreover, explain the significance of the contribution and contain a list of key references. It must be prepared according to the paper preparation guidelines provided on the I^2MTC website. In case of revision, papers are accepted only upon condition that the changes requested by the Reviewers are satisfactorily addressed by the Authors in the final submitted papers. Final papers may be rejected if the Reviewers' remarks have not been properly addressed.

Papers presented at the conference will be published in the Conference Proceedings and via IEEE Xplore, reporting the following statement on each page: "The complete technical content of this paper was peer reviewed at the direction of IEEE I&M Society subject matter experts". A Student Poster Contest will be held for both graduate and undergraduate student papers, with cash awards for the best papers. Papers should be submitted by the students according to the rules posted on the website and should be identified as student papers.Check the website for detailed instructions and deadlines.

Special Sessions will provide a comprehensive discussion of specific challenging and emerging issues in the instrumentation and measurement area. Special Session organizers should submit their proposals within 10 August 2014.

Student Travel Awards will be made available. Check the website for detailed instructions, application, and deadlines.

Authors of accepted papers must register for the Conference and attend to present their papers. The authors of papers presented during I^2MTC 2015 will be allowed to submit expanded and extended versions of their papers to the Special Issue of IEEE Transactions on Instrumentation & Measurement on I^2MTC 2015 to be published in 2016.

CONFERENCE CHAIRS

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Local Arrangements Chair:
Mirko Marracci, *University of Pisa, Italy*

Tutorials - Monday, May 12

Session 1
09:00 - 10:30

Room: Conference Room
How to model measurement activity and define uncertainty
Alessandro M Ferrero (Politecnico di Milano, Italy)

Room: Gauguin
Biomedical instrumentation amplifiers
Alfredo Arnaud (Electrical Engineering Department at Universidad Catolica del Uruguay, Uruguay)

Room: Renoir E
Advanced Sensors and Instrumentation
Subhas Mukhopadhyay (Massey University, New Zealand)

Session 2
11:00 - 12:30

Room: Conference Room
Measurement Uncertainty Quantification
Daniel Watzenig (Graz University of Technology, Austria)

Room: Gauguin
Noise measurements in electronic devices
Fabien Pascal (Institut d'Electronique du Sud (IES laboratory), France)

Room: Renoir D
New developments in the field of atmospheric monitoring
Erna Frins (Instituto de Física, Facultad de Ingeniería, Universidad de la República, Uruguay)

Room: Renoir E
Reliable Flow Measurement
Anton Fuchs (Graz University of Technology & Virtual Vehicle, Austria)

Session 3
2:00 - 3:30

Room: Conference Room
Methodology of Measurement
Dario Petri (Department of Industrial Engineering, University of Trento, Italy)

Room: Gauguin
Noise in Classical and Quantum Measurements
Fabio da Silva (National Institute of Standards and Technology, USA)

Room: Renoir D
Advances in Microwave Materials Characterization for NDT of Complex Structures: Theory, Methods, and Applications
Kristen M.Donnell (Missouri University of Science and Technology, USA)

Room: Renoir E

Temperature Sensors: From sense of touch towards smart dust

Conrado Rossi-Aicardi (Universidad de la Republica & NanoWattICs, Uruguay)

Session 4
4:00 - 5:30

Room: Gauguin

Blind Signal Identification for Emerging Intelligent Radio Systems

Octavia Dobre (Memorial University of Newfoundland, Canada)

Room: Renoir D

Alkali atoms at the heart of photonic devices

Horacio Failache (Instituto de Física, Facultad de Ingeniería, Universidad de la Republica Uruguay)

Room: Renoir E

CMOS-based microsystems for biomedical applications

Diego Barretino (University of Applied Sciences of Southern Switzerland (SUPSI), Switzerland)