## TABLE OF CONTENTS

# MESSAGE FROM THE CHAIRMEN

Dear IEEE SENSORS 2013 participants,

Welcome to Baltimore, Maryland, and to the 12th IEEE SENSORS conference. In addition to an outstanding technical program, an informative tutorial session, and an exciting location, this year we are delighted to present a special industrial panel and an open poster session. This conference promises to be one of the best, if not the best to date.

Consistent with the broad and multidisciplinary technical scope that the IEEE Sensors Council fosters, the IEEE SENSORS Conference strives to offer attendees a wide array of technical subjects covering nine topical areas: (1) Phenomena, Modeling and Evaluation, (2) Chemical and Gas Sensors, (3) Biosensors, (4) Optical Sensors, (5) Mechanical, Magnetic, and Physical Sensors, (6) Sensor/Actuator Systems, (7) Sensor Networks, (8) Applications, and (9) Materials, Processes, Circuits, Signals, and Interfaces.

This year, a total of 913 abstracts were submitted, including 48 late news submissions. Of these, 236 will be presented in lecture sessions and 256 in poster sessions. An additional 16 invited lecture presentations and 22 open posters round out the program. It is important to note that the poster and lecture presentations have undergone identical peer reviews. In which session a paper is presented has no relationship to its quality; it depends only on where the paper best fits into the program. To stay relevant with rapidly evolving commercial trends, this year the program also features a special Industry Panel Session on Tuesday, Nov. 5, to address an exciting and timely topic – Wearable Sensors: the Good, the Bad, and the Alluring. Based on the pre-registrations, the attendance is expected to be between 700 and 800.

The highlights of this year's social program will be the welcome reception and the banquet. The reception will be held on Sunday, Nov. 3, at the Renaissance Harborplace Hotel on the 6th Floor with a view of Baltimore harbor and Ft. McHenry, site of a pivotal Naval battle during the War of 1812. The banquet will be held on Tuesday, Nov. 5, at the historic B&O Railroad Museum which is recognized universally as the birthplace of American railroading (circa 1829).

We wish to recognize and thank our outstanding Keynote Speakers: Professor Masayoshi Esashi of Tohoku University, Japan; Professor Robert Puers of Katholieke Universiteit Leuven, Belgium; and Dr. Kenneth S. Johnson, Senior Scientist at the Monterey Bay Aquarium Research Institute. We are also deeply grateful to our 16 invited speakers. We appreciate their expertise and willingness to share their time with us in Baltimore.

The success of IEEE SENSORS 2013 is due to the dedication of a number of volunteers. The Technical Program Committee (TPC) included 111 volunteers, to whom we are very grateful. Special thanks to Track Chairs Svetlana Tatic-Lucic and Srinivas Tadigadapa (Track 1); Massood Atashbar and Ponnambalam Selvaganapathy (Track 2); Yu-Cheng Lin and Hongrui Jiang (Track 3); Ignacio Matias and Xiaojing Zhang (Track 4); Kukjin Chun and David Elata (Track 5); Oliver Paul and Gijs Krijnen (Track 6); Thomas Newe (Track 7); David Horsley (Track 8), and Kenichi Takahata (Track 9) – their diligence and insight were invaluable to the paper selection process. Special thanks also to Tutorial Chair Massood Tabib-Azar; Industry Panel Organizers Andrew DeHennis, Brain Jamieson, and Andy Oliver; Industrial Panel publicist Walt Besio; Open Poster Chair Troy Nagle (who contributed tirelessly in many other roles as well); Publicity Chair Eddie Grant; and Conference Treasurer Mike McShane.

We also wish to thank the professional conference organizers of Conference Catalysts, LLC, under the leadership of Chris Dyer. Chris, Judy Scharmann and the rest of their team played a vital role in organizing this conference.

The locations of IEEE SENSORS conferences rotate each year; Asia/Pacific to Europe/Africa to the Americas. Next year, IEEE SENSORS 2014 will be held in Valencia, Spain, Nov. 2-5, 2014. We hope to see you there.

IEEE sponsored or cosponsored more than 1000 conferences, and published more than 100 journals last year. The successes of IEEE are due to the more than 200,000 volunteers who serve IEEE each year.

Robert Trew
General Co-Chair

Elliott Brown
General Co-Chair

Yogesh Gianchandani
Technical Program Chair

## GENERAL INFORMATION

**Registration & Information Desk**
The Registration and Information Desk will be open during the following times:

| | |
|---|---|
| Sunday, November 3 | 7 AM - 5:30 PM |
| Monday, November 4 | 7 AM - 5 PM |
| Tuesday, November 5 | 7 AM - 5 PM |
| Wednesday, November 6 | 7 AM - 5 PM |

**Meeting Room Locations**
Concurrent Sessions A: Maryland Salon F
Concurrent Sessions B: Maryland Salon E
Concurrent Sessions C: Maryland Salon A
Concurrent Sessions D: Maryland Salon D
Concurrent Sessions E: Watertable ABC
Concurrent Sessions F: Homeland
Poster Sessions: Baltimore AB

**Name Badges**
All attendees must wear their name badges at all times to gain admission to all Conference events.

**Electronic Proceedings**
One copy of the Electronic Proceedings will be provided to you on a flash drive. Additional copies may be purchased at the Conference Registration Desk. The purchase price of the Electronic Proceedings will increase after the Conference, so be sure to order your additional copies in advance.

Additional Electronic Proceedings: $85 USD IEEE Member
Additional Electronic Proceedings: $100 USD Non Member

**Message and Job Market Board**
The Message and Job Market Board will be located near the Conference Registration Desk. Posting is allowed by job seekers. Recruiters are not allowed to post.

**Conference Attire**
Attire during the duration of the Conference is business casual.

**Traveler's Checks and Credit Cards**
Credit cards, including MasterCard®, Visa® and American Express®, and traveler's checks are accepted at most hotels, restaurants, and souvenir shops.

**Tipping Standards**
Tipping of 15% is standard for good service and 20% for outstanding service.

**Smoking**
All meeting rooms and seated functions are smoke free. Please adhere to the smoking policy of the Renaissance Baltimore Harborplace Hotel.

**Cellular Phones**
As a courtesy to your fellow attendees, please turn off your cell phone ringer during the conference

# SOCIAL PROGRAM

## Sunday, November 3

**Event:** Tutorial Lunch
**Time:** 12:00 PM - 1:30 PM
**Location:** Baltimore AB

**Lunch Speaker**: Dr. Steven LeBoeuf, Valencell, Inc.
"Starting a Medical Monitoring Company from Scratch"

**Event:** Welcome Reception
**Time:** 6:30 PM - 8:30 PM
**Location:** Maryland/Baltimore Foyer

Join us for the Welcome Reception on Sunday, November 3, 2013 at the Renaissance Harborplace Hotel on the 6th Floor. Cocktails and hors d'oeuvres will served beginning at 6:30 p.m., with Welcome Remarks at 7:00 p.m.

## Monday, November 4

**Event:** Conference Lunch
**Time:** 12:45 PM - 2:15 PM
**Location:** Maryland Salon BC

## Tuesday, November 5

**Event:** Industry Panel Lunch
**Time:** 12:00 PM – 2:00 PM
**Location:** Maryland Salon BC

**Event:** Conference Dinner
**Time:** 7:00 PM – 10:00 PM
**Location:** B&O Railroad Museum

Our Conference Gala dinner will be held at The Historic B&O Railroad Museum. Located among Baltimore City's historic southwest neighborhoods, at the original site of the historic Mt. Clare Shops, the B&O Railroad Museum is recognized universally as the birthplace of American railroading. There will be pre-dinner cocktails served as you will have the chance to tour the museum and rail cars. Dinner will follow and you will be treated to the world-class Wayne Goins Jazz Trio, throughout the night!

Transportation will be provided. The first departing bus will leave at 6 PM to take attendees to the B&O Railroad Museum from in front of the conference hotel. Busses will take attendees back to the conference hotel starting at 9 PM.

Your paid registration fee includes one banquet ticket. Guest tickets can be purchased for $65.00 USD each at the Registration Desk.

## Wednesday, November 6

**Event:** Conference Awards Lunch
**Time:** 12:15 PM – 2:00 PM
**Location:** Maryland Salon BC

## IEEE SENSORS 2013 COMMITTEE

### General Co-Chairs
Robert Trew, *North Carolina State University, USA*
Elliott Brown, *Wright State University, USA*

### Technical Program Chair
Yogesh Gianchandani, *University of Michigan, Ann Arbor, USA*

### Tutorial Chair
Massood Tabib-Azar, *NSF, USA*

### Publicity Chair
Eddie Grant, *North Carolina State University, USA*

### Treasurer
Mike McShane, *Texas A&M University, USA*

### Industry Panel Moderators
Andrew DeHennis, *Sensors for Medicine and Science, Inc., USA*
Brian Jamieson, *Scientific & Biomedical Microsystems, USA*

### Industry Subcommittee
Andrew DeHennis, *Sensors for Medicine and Science, Inc., USA*
Brian Jamieson, *Scientific & Biomedical Microsystems, USA*
Yogesh Gianchandani, *University of Michigan, Ann Arbor, USA*
Andy Oliver, *University of Michigan, Ann Arbor, USA*
Walt Besio, *University of Rhode Island, USA*
Troy Nagle, *North Carolina State University, USA*
Elliott Brown, *Wright State University, USA*

## IEEE SENSORS 2013 TRACK CHAIRS

### Track 1 – Phenomena, Modeling and Evaluation

Srinivas Tadigadapa, *Penn State University, USA*
Svetlana Tatic-Lucic, *Lehigh University, USA*

### Track 2 – Chemical and Gas Sensors

Massood Atashbar, *Western Michigan University, USA*
Ponnambalam Ravi Selvaganapathy, *McMaster University, USA*

### Track 3 – Biosensors

Yu-Cheng Lin, *National Cheng Kung University, Taiwan*
Hongrui Jiang, *University of Wisconsin, Madison, USA*

### Track 4 – Optical Sensors

Ignacio R. Matias, *Universidad Publica de Navarra, Spain*
Xiaojing (John) Zhang, *University of Texas at Austin, USA*

### Track 5 – Mechanical, Magnetic, and Physical Sensors

Kukjin Chun, *Seoul National University, Korea*
David Elata, *Technion – Israel Institute of Technology, Israel*

### Track 6 – Sensor/Actuator Systems

Oliver Paul, *IMTEK, University of Freiburg, Germany*
Gijs Krijnen, *MESA+ Research Institute for Nanotechnology, University of Twente, Netherlands*

### Track 7 – Sensor Networks

Thomas Newe, *University of Limerick, Ireland*

### Track 8 – Applications

David A. Horsley, *University of California, Davis, USA*

### Track 9 – Other Sensor Topics – Materials, Processes, Circuits, Signals & Interfaces, etc

Kenichi Takahata, *University of British Columbia, Canada*

## ASIA/OCEANIA TPC

Takashi Abe, *Nigata University, Japan*
Jong-Uk Bu, *Senplus Inc., South Korea*
Hyung-Gi Byun, *Kangwon National University, South Korea*
Chia-Tai Chan, *National Yang-Ming University, Taiwan*
Yu-Ting Cheng, *National Chiao Tung University, Taiwan*
Young-Ho Cho, *KAIST, Daejeon, South Korea*
Kukjin Chun, *Seoul National University, South Korea*
Wan-Young Chung, *Pukyong National University, South Korea*
Golla Eranna, *Central Electronics Engineering Research Institute, India*
I-Yu Huang, *National Sun Yat-sen University, Taiwan*
Qing-An Huang, *Southeast University, China*
Kourosh Kalantar-Zadeh, *RMIT University, Australia*
Seong Ho Kong, Kyungpook *National University, South Korea*
Dong-Weon Lee, *Chonnam National University, South Korea*
Dae-Sik Lee, *ETRI, South Korea*
Chengkuo Lee, *National University of Singapore, Singapore*
Xin Xin Li, *Shanghai Institute of Microsystem and Information Technology, China*
Zhihong Li, *Peking University, China*
Sheng-Shian Li, *National Tsing Hua University, Taiwan*
Geunbae Lim, *Pohang University of Science and Technology, South Korea*
Yu-Cheng Lin, *National Cheng Kung University, Taiwan*
Michael, Shiang-Cheng Lu, *National Tsing Hua University, Taiwan*
Yoshinori Matsumoto, *Keio University, Japan*
Kazusuke Maenaka, *University of Hyogo, Japan*
Jianmin Miao, *Nanyang Technological University, Singapore*
Kohji Mitsubayashi, *Tokyo Medical and Dental University, Japan*
Mohamed Sultan Mohamed Ali, *Universiti Teknologi Malaysia, Malaysia*
Yuji Murakami, *Toyahashi University of Technology, Japan*
Yutaka Nonomura, *Toyota Central R&D Labs, Japan*
Konandur Rajanna, *Indian institute of Science, India*
Wen-Pin Shih, *National Taiwan University, Taiwan*
Mitsuhiro Shikida, *Nagoya University, Japan*
Daoheng Sun, *Xiamen University, China*
Hidekuni Takao, *Kagawa University, Japan*
Adisorn Tuantranont, *National Electronics and Computer Technology Center, Thailand*
Zheyao Wang, *Tsinghua University, China*
Yuelin Wang, *Shanghai Institute of Microsystem and IT, CAS, China*
Weizheng Yuan, *Polytechnical University, China*

## EUROPE / AFRICA TPC

Bassam Alfeeli, *Kuwait Institute for Scientific Research, Kuwait*
Francisco J. Arregui, *University Publica de Navarra, Spain*
José Manuel Baptista, *University of Madeira, Funchal, Portugal*
Giuseppe Barillaro, *University of Pisa, Italy*
Danick Briand, *EPFL, Switzerland*
David Boyle, *Imperial College London, UK*
Victor Cionca, *Tyndall National Institute, Ireland*
Olga Conde, *University of Cantabria, Spain*
Lucia Curri, *CNR IPCF Italian National Research Council Istituto per I Processi Chimico Fisici, Italy*
Andrea Cusano, *Optoelectronic Group University of Sannio, Italy*
David Elata, *Technion - Israel Institute of Technology, Israel*
Vittorio Ferrari, *University of Brescia, Italy*
Paddy French, *TU Delft,, The Netherlands*
Mikael Gidlund, *ABB Corporate Research, Sweden*
Luc Hebrard, *University of Strasbourg, France*
Stephen James, *Cranfield University, United Kingdom*
Jurgen Kosel, *King Abdullah University of Science and Technology, Saudi Arabia*
Michael Kraft, *University of Duisburg-Essen, Germany*
Gijs Krijnen, *MESA+ Research Institute for nanotechnology, University of Twente, Enschede, The Netherlands*
Haluk Kulah, *METU, Turkey*
Dirk Lehmhus, *University of Bremen, Germany*
Elfed Lewis, *University of Limerich, Ireland*
Ignacio R. Matias, *Universidad Publica de Navarra, Spain*
Francesc Murano-Perez, *IMB-CNM, Spain*
Thomas Newe, *University of Limerick, Ireland*
Patricia Nieva, *University of Waterloo, Canada*
Oliver Paul, *IMTEK, University of Freiburg, Germany*
Michiel AP Pertijs, *Delft University of Technology, The Netherlands*
Marco Petrovich, *University of Southhampton, United Kingdom*
Patrick Pons, *LAAS-CNRS, France*
Joannis Raptis, *NCSR 'Demokritos', Greece*
Libor Rufer, *University of Grenoble, France*
Patrick Ruther, *University of Freiburg, Germany*
José Luis Santos, *University of Porto, Portugal*
Ulrich Schmid, *Vienna University of Technology, Austria*
Harrie A. Tilmans, *IMEC, Belgium*
Deepak Uttamchandani, *University of Strathclyde, United Kingdom*
Guillermo Villanueva, *EPFL, Switzerland*

## THE AMERICAS TPC

Massood Atashbar, *Western Michigan University, USA*
Gaurav Bahl, *University of Illinois at Urbana-Champaign, USA*
Alper Bozkurt, *North Carolina State University, USA*
Oliver Brand, *Georgia Institute of Technology, USA*
Victor Bright, *University of Colorado, USA*
Elliott Brown, *Wright State University, USA*
Venkata Chivukula, *RF Micro Devices, USA*
Geoffrey Cranch, *Naval Research Laboratory, USA*
Shawn Cunningham, *Wispry, USA*
Jose Mireles Garcia, *Universidad Autonoma de Ciudad Juarex, USA*
Yogesh Gianchandani, *Univeristy of Michigan, Ann Arbor, USA*
Joan Hoffmann, *Johns Hopkins University, USA*
David Horsley, *UC Davis, USA*
Jun (Tony) Huang, *The Pennsylvania State University, USA*
Eugene Hwang, *Analog Devices, Inc., USA*
Hongrui Jiang, *University of Wisconsin, Madison, USA*
Eric Johnson, *Clemson University, USA*
Goutam Koley, *University of South Carolina, USA*
Jeong Bong Lee, UT Dallas, *University of Texas at Dallas, USA*
Tao Li, *University of Michigan, Ann Arbor, USA*
Michel Maharbiz, UC Berkeley, *University of California, Berkeley, USA*
Shamus McNamara, *University of Louisville, USA*
Christopher Meyer, *US Army Research Laboratory, USA*
Tamal Mukherjee, *Carnegie Mellon University, USA*
Tingrui Pan, *University of California, USA*
Siavash Pourkamali, *University of Texas at Dallas, USA*
Marcel Pruessner, *Naval Research Laboratory, USA*
Long Que, *Louisiana Tech University, USA*
Mina Rais-Zadeh, *University of Michigan, Ann Arbor, USA*
Christopher Salthouse, *University of Massachusetts, USA*
Ponnambalam Ravi Selvaganapathy, *McMaster University, Canada*
Leyla Soleymani, *McMaster University, Canada*
Srinivas Tadigadapa, *Penn State University, USA*
Kenichi Takahata, *University of British Columbia, Canada*
Svetlana Tatic-Lucic, *Lehigh University, USA*
Huikai Xie, *University of Florida, USA*
Yong Xu, *Wayne State University, USA*
EH Yang, *Stevens Institute of Technology, USA*
Hong Yu, *Arizona State University, USA*
Mona Zaghloul, *The George Washington University, USA*
Xin Zhang, *Boston University, USA*
Xiaojing (John) Zhang, *The University of Texas at Austin, USA*
Christian Zorman, *Case Western Reserve University, USA*
Babak Ziaie, *Purdue University, USA*

# IEEE SENSORS COUNCIL OFFICIALS

## ExCOM & AdCOM

**President (2012-2013)**
Vladimir Lumelsky, *NASA – University of Wisconsin - Madison, USA*

**President Elect (2012-2013)**
H. Troy Nagle, *North Carolina State University, USA*

**Past-President (Immediate)**
Christina M. Schober, *Honeywell, Inc., USA*

**Past-Past-President**
Mona E. Zaghloul, George Washington University, USA

**Vice President - Finances (2013-2014)**
Mike McShane, *Texas A&M University, USA*

**Vice President - Publications (2013-2014)**
John Vig, *Consultant, USA*

**Vice President - Conferences (2012-2013)**
Michael Shur, *Rensselaer Polytechnic Institute, USA*

**Vice President - Technical Operations (2012-2013)**
Tom Wiener, *The Forté Consultancy, USA*

**Secretary - Treasurer (2013)**
David Horsley, *University of California, Davis, USA*

**IEEE Sensors Journal Editor-In-Chief (2012-2014)**
Krikor B. Ozanyan, *University of Manchester, UK*

**Member-at-Large (2012-2013)**
Elfed Lewis, *University of Limerick, Ireland*

**Member-at-Large (2012-2013)**
Paul C. P. Chao, *National Chiao Tung University, Taiwan*

**Member-at-Large (2013-2014)**
Hulya Kirkici, *Auburn University, USA*

**Member-at-Large (2013-2014)**
Anil K. Roy, *DA-IICT, India*

**GOLD Committee Chair (2013)**
Venkata Chivukula, *Intel Corporation, USA*

**Publicity Chair (2013)**
Edward Grant, *North Carolina State University, USA*

**Web EIC (2013)**
John Vig, *Consultant, USA*

**Web Based Newsletter Editor-in-Chief (2013)**
M. Nurul Abedin, *NASA – Langley Research Center, USA*

# IEEE SENSORS COUNCIL OFFICIALS

**IEEE Fellows Committee Chair (2013)**
Michael Shur, *Rensselaer Polytechnic Institute, USA*

**Distinguished Lecturer Program Chair (2013)**
Tom Wiener, *The Forté Consultancy, USA*

**Awards Chair (2013)**
H. Troy Nagle, *North Carolina State University, USA*

**Nominations Committee Chair (2013)**
Christina M. Schober, *Honeywell, Inc., USA*

## Past Presidents

**Past-President (2010-2011)**
Christina M. Schober, *Honeywell, Inc., USA*

**Past-President (2008-2009)**
Mona E. Zaghloul, *George Washington University, USA*

**Past-President (2006-2007)**
Robert T. Bannon, *Bannon International Consulting LLC, USA*

**Past President (2004-2005)**
Tom Wiener, *The Forté Consultancy, USA*

**Past President (2002-2003)**
Franco Maloberti, *University of Texas, Dallas, USA*

**Founding President (2000-2001)**
John Vig, *Consultant, USA*

## Member Societies and their AdCom Appointees

**Aerospace and Electronic Systems**
Michael C. Wicks, *Air Force Research Laboratory, USA*

**Antennas and Propagation**
Amir Zaghloul, *Virginia Tech, USA*

**Broadcast Technology**
Jin Zhang, *Mitsubishi Electric Research Laboratories, USA*

**Circuit and Systems**
Sandro Carrara, *École Polytechnique Fédérale de Lausanne, Switzerland*

**Communications**
Kiseon Kim, *GIST, Korea*

**Computer**
Kathy Land, *Missile Defense Agency, USA*

**Components, Packaging and Manufacturing Technology**
Tolga Tekin*, Technical University of Berlin, Germany*

## IEEE SENSORS COUNCIL OFFICIALS

**Dielectrics and Electrical Insulation**
Greg Stone, *IRIS Power, Canada*

**Electromagnetic Compatibility**
John Norgard, *NASA/JSC, USA*

**Electron Devices**
Amit Lal, *Cornell University, USA*

**Engineering in Medicine and Biology**
Walt Besio, *University of Rhode Island, USA*

**Industrial Electronics**
Thilo Sauter, *Austrian Academy of Sciences, Austria*

**Industry Applications**
Robert D. Lorenz, *University of Wisconsin-Madison, USA*

**Instrumentation and Measurement**
Georg Brasseur, *Graz University of Technology, Austria*

**Magnetics**
Pavel Ripka, *Czech Technical University in Prague, Czech Republic*

**Microwave Theory and Techniques**
Reynold S. Kagiwada, *Northrup Grumman, USA*

**Nuclear and Plasma Sciences**
*Vacant*

**Oceanic Engineering**
Robert T. Bannon, *Bannon International Consulting, USA*

**Photonics**
Robert Dahlgren, *San Jose State University, USA*

**Power and Energy**
Arun G. Phadke, *Virginia Tech, USA*

**Robotics and Automation**
Cecilia Laschi, *Scuola Superiore Sant'Anna, Italy*

**Signal Processing**
Randolf Moses, *Ohio State University, USA*

**Solid State Circuits**
Darrin Young, *University of Utah, USA*

**Ultrasonics, Ferroelectrics, and Frequency Control**
Venkat R. Bhethanabotla, *University of South Florida, USA*

**Vehicular Technology**
Fabrice Labeau, *McGill University, Canada*

# IEEE SENSORS COUNCIL OFFICIALS

## Council Support

**Executive Assistant**
Judy Scharmann, *Conference Catalysts, LLC, USA*

**Conference Management Company**
*Conference Catalysts, LLC, USA*

**Webmaster**
Anil K. Roy, *DA-IICT, India*

**Technical Program Papers Support**
Tom Wehner, *Alliance Management, USA*

## IEEE SENSORS 2014 Conference Chairs

**General Chair**
Càndid Reig, *University of Valencia, Spain*

**General Co-Chair**
Lina Sarro,*TUDelft, The Netherlands*

**Technical Program Chair**
Ignacio R. Matias, *Public University of Navarra, Spain*

## EXHIBITORS

**ASSIST**


The NSF sponsored Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST) is developing nano-enabled energy harvesting and storage, ultra-low power electronics, radios and sensors to create innovative battery-free, body-powered, and wearable health and environment monitoring systems. ASSIST devices will monitor individual health parameters and personal environmental exposures. Long-term sensing will enable patients, doctors, and scientists to make direct correlations between health and environmental toxins leading to chronic disease prediction, management and treatment. ASSIST advances will accelerate environmental health research and clinical trials as well as inform environmental policy.

**CST of America, Inc.**


Better Sensor through Simulation! CST EM STUDIO ® is a 3D electromagnetic simulation software that can help engineers to design and optimize sensors, coils, magnets, actuators, shielding, biomedical devices, magnetic recording, induction heating and transformers. Comprehensive mechanical imports complement robust solving technology and allow many operating conditions to be assessed. Outputs include electric and magnetic field and current distribution, force, torque, inductance, capacitance, flux linkage, heating and mechanical deformation.

**GaTech – Institute for Electronics and Nanotechnology**


GaTech – Institute for Electronics and Nanotechnology (IEN) is comprised of multiple Electronics and Nanotechnology Research Centers, each offering a unique intellectual focus ranging from basic discovery and innovation to systems realization. IEN provides advanced Nano, Micro, and Bio Laboratories valued in excess of $400M, with dedicated process and tool support expertise. These open-user, fee based laboratories are available to global academic, industry, and government clientele, offering a unique and comprehensive laboratory and teaming environment. The exhibit booth will provide information and consultation related to the resources available at IEN to the researchers both from Industry and academia.

**IEEE GOLD**


IEEE Graduates of the Last Decade (GOLD) is a vibrant community of engineers, scientists, and technical experts with member representation across the globe and throughout IEEE societies. It is a membership program to help students transition to young professionals within the larger IEEE community. IEEE young professionals are automatically added to the GOLD member community as they graduate.

**IEEE SENSORS Council**


The IEEE Sensors Council's purpose is to advance and coordinate work in the field of sensors carried out throughout the IEEE. The Council sponsors the annual IEEE Sensors Conference is responsible for the publication of the IEEE Sensors Journal. The Council's official field of interest is the theory, design, fabrication, manufacturing and application of devices for sensing and transducing physical, chemical, and biological phenomena, with emphasis on the electronics, physics and reliability aspects of sensors and integrated sensor-actuators. More information about the Sensors Council is available at www.ieee-sensors.org

**Measurement Science and Technology Journal**


With 12 issues per year, Measurement Science and Technology publishes articles on new measurement techniques and associated instrumentation. Papers that describe experiments must represent an advance in measurement science or measurement technique rather than the application of established experimental technique. Authors must make this novel aspect clear, bearing in mind the multidisciplinary readership of the journal. Subject coverage includes the theory, practice and application of measurement in physics, chemistry, engineering and the environmental and life sciences from inception to commercial exploitation.

**SPIE**

SPIE is the international society for optics and photonics, and organizes dozens of conferences annually, including SPIE Photonics West and SPIE Defense, Security, and Sensing. The SPIE Digital Library houses more than 400,000 technical papers in cutting-edge technologies such as sensors, lasers, imaging, robotics, nanotechnology, solar energy, biophotonics, and communications.

**TeraPico**

TeraPico is a new start-up company located in Dayton, OH and specializing in THz Sensor Technology. This includes novel THz sources such as 1550-nm driven photoconductive switches and photomixers, novel THz components such as structured-surface-plasmonic wire-grid polarizers and filters, and novel instruments such as THz impulse generators and ultrawideband tunable sweep oscillators. In addition, TeraPico intends to engage in the development of biomedical and biological sensor systems in collaboration with strategic research partners such as U.S. Medical Schools.

**Texas Instruments**

Engineering a Smarter Grid - TI is your global smart grid systems partner for secure, economical and future-proof grid infrastructure, smart meter and home or building automation solutions. -Grid Infrastructure -Smart Electricity Meters -Smart Flow Meters for Gas, Water and Heat -Smart Buildings and IoT -Communication With millions of energy meter ICs shipped over the past decade, Texas Instruments is the global systems provider for innovative, secure, economical and future-proof solutions for the worldwide smart grid. TI offers the industry's broadest smart grid portfolio of metrology expertise, application processors, communication systems, RFID and analog components in readily available silicon with advanced software, tools and support for compliant solutions. Learn more at www.ti.com/smartgrid.

# INDUSTRY PANEL

**"Wearable Sensors: the Good, the Bad, and the Alluring"**

This special Industry Lunch Panel will be held on Tuesday, November 5th from 12:30 p.m. - 2:00 p.m. in Maryland Ballroom BC at the Renaissance Harborplace Hotel (IEEE SENSORS 2013 hotel) on the topic of wearable sensors. Lunch will begin at 12:00 NOON.

**Our distinguished group of panelists include:**
Ross Alcazar, *XM Squared*
Abhi Chavan, *Corventis Inc*
Kevin M. Haley, *Under Armour, Inc.*
Amar Kendale, *MC10*
Maurizio Macagno, *Heapsylon*
Babak Parviz, *Google*

**Industry Panel Moderators**
Andrew DeHennis, *Sensors for Medicine and Science, Inc., USA*
Brian Jamieson, *Scientific & Biomedical Microsystems, USA*

**Overview:**
With their ability to provide real-time feedback about our bodies, our movements, our activities, and our interaction with the world around us, wearable sensors promise to be a pervasive part of our everyday lives. Embedded systems provide wearable sensors with wireless connectivity and grant them a level of computing power undreamed of just a few years ago. This panel will facilitate a discussion about the possibilities for this emerging market as well as some remaining technology challenges, the solution to which will usher in this new revolution.

The panel discussion will focus on are various factors that must guide the design and development process for wearable sensors. In addition to the more common tradeoffs such as battery life, integration level, and feature set, these systems need to address human factors that will allow these devices to become an accepted (or even sought-after) feature of our daily attire. The panelists have a wide variety of approaches and applications for wearable technology and the session will highlight the benefits of their technology and platforms and lessons learned through the development process.

# TECHNICAL PROGRAM INFORMATION

The technical program consists of three Keynote Sessions, six parallel Lecture/Special Sessions of contributed papers, and three Poster Sessions that include Late News and Open Posters.

**Guide to Understanding Session Numbering**

Each session in the technical program is assigned a unique number, which clearly indicates when and where the session is presented. The number of each session is shown before the session title. A typical number is shown below:

Typical Session Number*****: **B2L-A**

The first character (i.e., B) indicates the day of the Conference:

**A** = Monday; **B** = Tuesday; **C** = Wednesday

The second character (i.e., 2) indicates the session time:

**1** = morning; **2** = mid-morning; **3** = afternoon; **4** = late-afternoon

The third character (i.e., L) indicates what type of paper the session is:

**L** = Lecture Session **P** = Poster Session

The fourth character (i.e., A) indicates which room the session is held in:

**A**= Maryland Salon F
**B**= Maryland Salon E
**C**= Maryland Salon A
**D**= Maryland Salon D
**E**= Watertable ABC
**F**= Homeland

***Please see the session grids, starting on page 21***

## TECHNICAL PROGRAM - POSTER INFORMATION

**Poster Sessions**
Three poster sessions will be held in Baltimore AB, from 2:15 p.m. - 3:45 p.m. on Monday, 2:00 p.m. - 3:30 p.m. on Tuesday, and 10:15 a.m. - 12:15 p.m. on Wednesday. Posters will be on display and authors will be available for questions during their appointed time. All poster papers are listed in this program on the day that they are on display.

**Guide to Understanding Poster Numbering**
Each poster in the technical program is assigned a unique number, which clearly indicates when and where the poster is presented. The number of each poster is shown on the left-hand side, before the title. A typical number is shown below:

Typical Poster Number*****: **B3P-K**

The first character (i.e., B) indicates the day of the Conference that the poster will be on display:

**A** = Monday; **B** = Tuesday; **C** = Wednesday

The second character (i.e., 3) indicates the time of the day the session is held:

**1** = morning; **2** = mid-morning; **3** = afternoon; **4** = late-afternoon

The third character (i.e., P) indicates that the paper is a poster.

The fourth character (i.e. K) indicates the category of the poster for that day. ***Please see the poster room layouts, starting on page 28***

**MONDAY**
G= Chemical and Gas Sensors
H= Biosensors
J= Mechanical, Magnetic, and Physical Sensors
K= Optical Sensors
L= Sensor/Actuator Systems
M= Other Sensor Topics - Materials, Processes, Circuits, Signals & Interfaces, etc.

**TUESDAY**
G= Chemical and Gas Sensors
H= Biosensors
J= Mechanical, Magnetic, and Physical Sensors
K= Phenomena, Modeling and Evaluation
L= Sensor Networks
M= Applications
N= Open Posters

**WEDNESDAY**
G= Chemical and Gas Sensors
H= Applications
J= Mechanical, Magnetic, and Physical Sensors
K= Optical Sensors
L= Sensor Networks
M= Other Sensor Topics - Materials, Processes, Circuits, Signals & Interfaces, etc.
N= Open Posters

# SESSION GRID - SUNDAY, NOVEMBER 3RD - TUTORIALS

| | TRACK A: NOVEL TRENDS IN SENSING<br>ROOM: HOMELAND | TRACK B: INERTIAL MEASUREMENT<br>ROOM: FEDERAL HILL | TRACK C: BIOELECTRONICS<br>ROOM: FELLS POINT |
|---|---|---|---|
| 7:00 AM - 8:30 AM | TUTORIAL REGISTRATION AND CHECK-IN – MARYLAND FOYER | | |
| 8:30 AM - 5:30 PM | CONFERENCE REGISTRATION – MARYLAND FOYER | | |
| 8:30 AM - 10:20 AM | COLD ATOM GYROS | MEMS INERTIAL SENSORS: A TECHNOLOGY OVERVIEW | BIOELECTRONICS: ITS FUTURE IN YOUR HEALTH AND WELL BEING<br>ENERGY CONSIDERATIONS AND SELF-POWERED DEVICES |
| 10:20 AM - 10:40 AM | COFFEE BREAK – MARYLAND FOYER | | |
| 10:40 AM - 12:00 PM | FAST DNA SEQUENCING BY ELECTRICAL MEANS | DESIGN AND ANALYSIS OF MEMS GYROSCOPES | TECHNOLOGIES FOR WIRELESS BIOSYSTEMS |
| 12:00 PM - 1:30 PM | LUNCH – BALTIMORE AB<br>“STARTING A MEDICAL MONITORING COMPANY FROM SCRATCH” | | |
| 1:30 PM - 2:50 PM | ULTIMATE MEMS SENSORS | DESIGN AND ANALYSIS OF MEMS ACCELEROMETERS | TECHNOLOGIES FOR AN IMPLANTABLE NANO-BIO-SENSING LABORATORY |
| 2:50 PM - 3:10 PM | COFFEE BREAK – MARYLAND FOYER | | |
| 3:10 PM - 5:00 PM | OPTOMECHANICAL SENSORS | INTERFACE CIRCUITS AND SYSTEMS FOR INERTIAL SENSORS | SYSTEM-INTEGRATION: EXAMPLES OF INNOVATIVE HEALTH PRODUCTS |
| 5:00 PM - 5:30 PM | | | DEMONSTRATIONS OF MHEALTH MEDICAL DEVICES AND APPS |
| 6:30 PM - 8:30 PM | WELCOME RECEPTION – MARYLAND/BALTIMORE FOYER | | |

# SESSION GRID – MONDAY, NOVEMBER 4TH

| | MARYLAND F | MARYLAND E | MARYLAND A | MARYLAND D | WATERTABLE ABC | HOMELAND |
|---|---|---|---|---|---|---|
| 7:00 AM - 5:00 PM | REGISTRATION – MARYLAND FOYER | | | | | |
| 8:00 AM - 8:30 AM | OPENING REMARKS – MARYLAND BC | | | | | |
| 8:30 AM - 9:15 AM | KEYNOTE PRESENTATION 1 – MARYLAND BC<br>"INTEGRATED MEMS BY ADHESIVE BONDING"<br>PROFESSOR MASAYOSHI ESASHI | | | | | |
| 9:30 AM - 10:45 AM | A1L-A: GAS CHROMATOGRAPHY | A1L-B: PHOTONICS | A1L-C: PHYSICAL SENSORS I | A1L-D: OPTICAL SENSORS IN HEALTHCARE | A1L-E: SENSOR SYSTEMS | A1L-F: SENSING TECHNIQUES |
| 10:45 AM - 11:15 AM | COFFEE BREAK – MARYLAND FOYER | | | | | |
| 11:15 AM - 12:45 PM | A2L-A: GAS SENSORS I | A2L-B: ELECTROCHEMICAL/ MICROWAVE | A2L-C: INERTIAL SENSORS | A2L-D: OPTICAL SENSORS FOR PHYSICAL MEASUREMENTS | A2L-E: SYSTEMS FOR HEALTH MONITORING | A2L-F: MISCELLANEOUS SENSORS |
| 12:45 PM - 2:15 PM | LUNCH – MARYLAND BC | | | | | |
| 2:15 PM - 3:45 PM | POSTER SESSION – POSTER AREA – BALTIMORE AB | | | | | |
| 3:45 PM - 5:00 PM | A4L-A: GAS SENSORS II | A4L-B: BIOMOLECULAR | A4L-C: MAGNETIC SENSORS | A4L-D: OPTICAL SENSORS FOR CHEMICAL ANALYSES | A4L-E: ACTUATOR SYSTEMS | A4L-F: MATERIALS & FABRICATION I |

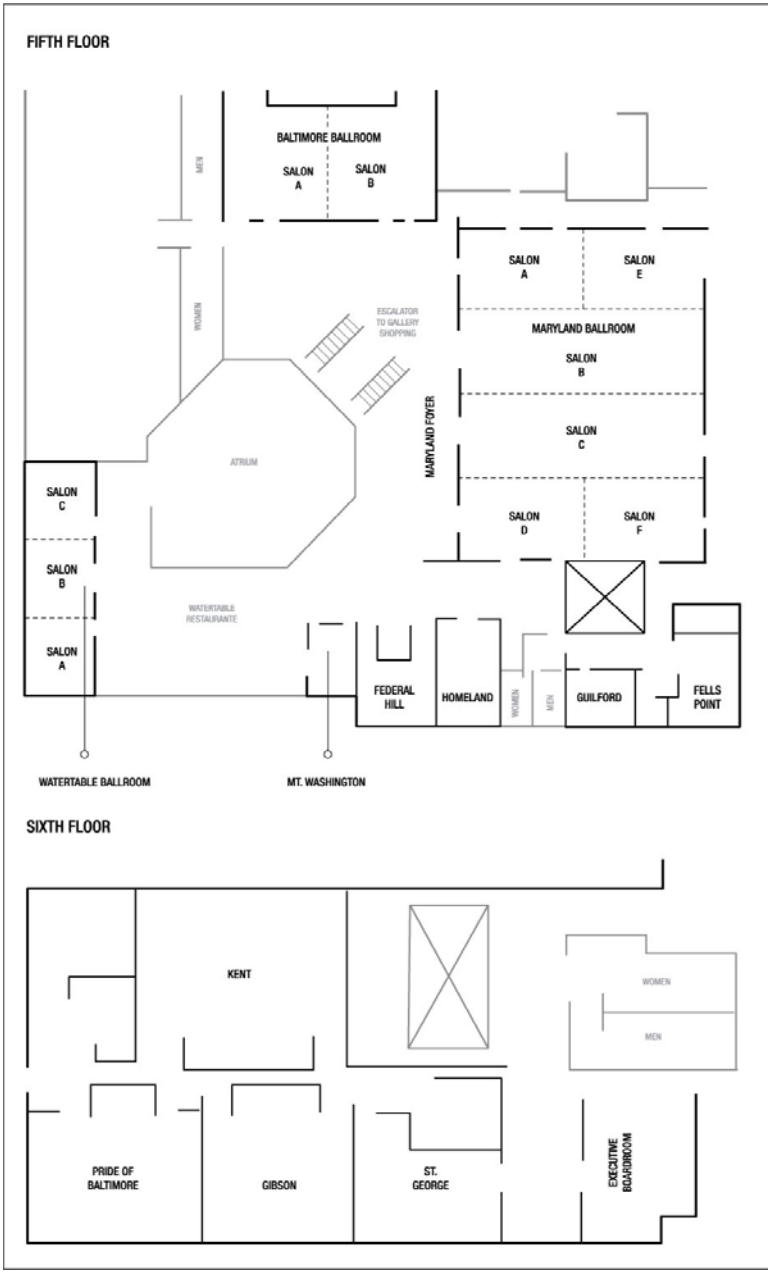
# SESSION GRID - TUESDAY, NOVEMBER 5TH

| | MARYLAND F | MARYLAND E | MARYLAND A | MARYLAND D | WATERTABLE ABC | HOMELAND |
|---|---|---|---|---|---|---|
| 7:00 AM - 5:00 PM | REGISTRATION – MARYLAND FOYER | | | | | |
| 8:00 AM - 8:45 AM | KEYNOTE PRESENTATION 2 – MARYLAND BC<br>"IMPLANTABLE CHIPS & SENSORS: QUO VADIS?"<br>PROFESSOR ROBERT PUERS | | | | | |
| 9:00 AM - 10:15 AM | B1L-A: HUMIDITY SENSORS | B1L-B: INTERFACE | B1L-C: ACOUSTIC SENSORS | B1L-D: ELECTROMAGNETIC SENSORS & PHENOMENA | B1L-E: WIRELESS SENSOR NETWORKS FOR HEALTH I | B1L-F: INDUSTRIAL & ENVIRONMENTAL |
| 10:15 AM - 10:45 AM | COFFEE BREAK – MARYLAND FOYER | | | | | |
| 10:45 AM - 12:00 PM | B2L-A: LIQUID BASED SENSORS | B2L-B: MECHANICAL | B2L-C: TACTILE SENSORS | B2L-D: SENSORS PHENOMENA | B2L-E: WIRELESS SENSOR NETWORKS FOR HEALTH II | B2L-F: MICROSYSTEMS APPLICATIONS |
| 12:00 PM - 2:00 PM | INDUSTRY PANEL LUNCH – MARYLAND BC<br>"WEARABLE SENSORS: THE GOOD, THE BAD, AND THE ALLURING" | | | | | |
| 2:00 PM - 3:30 PM | POSTER SESSION – POSTER AREA – BALTIMORE AB | | | | | |
| 3:30 PM - 5:00 PM | B4L-A: CARBON NANOTUBES & GRAPHENE | B4L-B: INTEGRATION | B4L-C: PRESSURE SENSORS | B4L-D: INERTIAL SYSTEMS MODELING | B4L-E: WIRELESS SENSOR NETWORKS FOR ENVIRONMENTAL MONITORING | B4L-F: MEDICAL APPLICATIONS |
| 7:00 PM - 10:00 PM | CONFERENCE DINNER – B&O RAILROAD MUSEUM<br>TRANSPORTATION TO B&O RAILROAD MUSEUM BEGINS AT 6:00PM – PICKUP LOCATION IS IN FRONT OF THE HOTEL | | | | | |

# SESSION GRID – WEDNESDAY, NOVEMBER 6TH

| | MARYLAND F | MARYLAND E | MARYLAND A | MARYLAND D | WATERTABLE ABC | HOMELAND |
|---|---|---|---|---|---|---|
| 7:00 AM - 5:00 PM | REGISTRATION – MARYLAND FOYER | | | | | |
| 8:00 AM - 8:45 AM | KEYNOTE PRESENTATION – MARYLAND BC<br>"BIOARGO: A GLOBAL SCALE CHEMICAL SENSOR NETWORK TO OBSERVE CARBON, OXYGEN, AND NITROGEN CYCLES IN THE OCEAN"<br>DR. KENNETH S. JOHNSON | | | | | |
| 9:00 AM - 10:15 AM | C1L-A: ELECTROCHEMICAL SENSORS | C1L-B: POWER APPLICATIONS | C1L-C: VISCOSITY, DENSITY AND FLOW SENSORS | C1L-D: OPTICAL IMAGING SENSORS | C1L-E: WIRELESS SENSOR NETWORKS FOR TARGETS & OBJECTS | C1L-F: MATERIALS & FABRICATION II |
| 10:15 AM - 12:15 PM | POSTER SESSION – POSTER AREA – BALTIMORE AB | | | | | |
| 12:15 PM - 2:00 PM | CONFERENCE AWARDS LUNCH – MARYLAND BC | | | | | |
| 2:00 PM - 3:15 PM | C3L-A: CHEMICAL & GAS SENSORS I | C3L-B: SENSOR APPLICATIONS FOR LIFE AND SOCIETY | C3L-C: PHYSICAL SENSORS II | C3L-D: OPTICAL SENSORS ON SILICON | C3L-E: LATE NEWS I | C3L-F: HARVESTING & CONVERTERS |
| 3:15 PM - 3:45 PM | COFFEE BREAK – MARYLAND FOYER | | | | | |
| 3:45 PM - 5:00 PM | | | | C4L-D: OPTICAL SENSOR SIGNAL ANALYSES | C4L-E: LATE NEWS II | C4L-F: CHARACTERIZATIO N & TESTING |
| 5:00 PM | CONFERENCE ADJOURNS | | | | | |

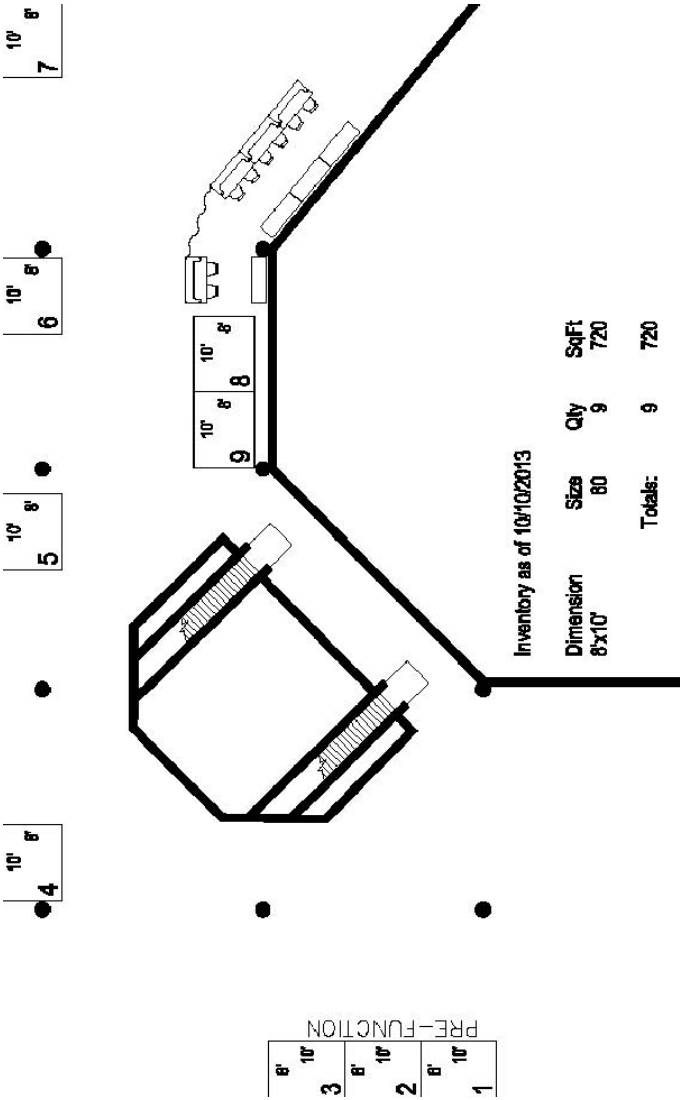
# RENAISSANCE BALTIMORE HARBORPLACE
# FLOOR PLAN



# EXHIBITOR FLOOR PLAN

Exhibitors are listed below as of October 7th, 2013.

Booth # 1 – CST of America, Inc
Booth # 2 – Measurement Science and Technology Journal
Booth # 3 – SPIE
Booth # 4 – TeraPico
Booth # 5 – Texas Instruments
Booth # 6 – IEEE GOLD
Booth # 7 – IEEE Sensors Council
Booth # 8 – GaTech – Institute for Electronics and Nanotechnology
Booth # 9 – ASSIST



## MONDAY POSTER SESSION FLOOR PLAN

The Monday poster session floor plan shows the position of each numbered poster. The three letter and number prefix of each poster has been omitted from this diagram. The following groups, or tracks, are featured in this poster session:

G= Chemical and Gas Sensors
H= Biosensors
J= Mechanical, Magnetic, and Physical Sensors
K= Optical Sensors
L= Sensor/Actuator Systems
M= Other Sensor Topics - Materials, Processes, Circuits, Signals & Interfaces, etc.

***Please reference the Poster Numbers from the program listing starting on page 49. (Ex. The 1st paper listed on page 49 of this program book is G1 and this poster is located in front-right area of the poster room as indicated on the diagram on the following page.)***

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M14 | M13 | L21 | L20 | L5 | L4 | K1 | J11 | H11 | H10 | G9 | G8 | | | | |
| M15 | M10 | L22 | L19 | L6 | L3 | K2 | J10 | H12 | H9 | G10 | G7 | | | | |
| M16 | M9 | L23 | L18 | L7 | L2 | K3 | J9 | H13 | H8 | G11 | G6 | | | | |
| M17 | M8 | L24 | L17 | L8 | L1 | K4 | J8 | H14 | H7 | G12 | G5 | | | | |
| | M7 | L25 | L16 | L9 | K12 | K5 | J7 | H15 | H6 | G13 | G4 | | | | |
| | M6 | M1 | L15 | L10 | K11 | K6 | J6 | J1 | H5 | G14 | G3 | | | | |
| | M5 | M2 | L14 | L11 | K10 | K7 | J5 | J2 | H4 | H1 | G2 | | | | |
| | M4 | M3 | L13 | L12 | K9 | K8 | J4 | J3 | H3 | H2 | G1 | | | | |

# TUESDAY POSTER SESSION FLOOR PLAN

The Tuesday poster session floor plan shows the position of each numbered poster. The three letter and number prefix of each poster has been omitted from this diagram. The following groups, or tracks, are featured in this poster session:

G= Chemical and Gas Sensors
H= Biosensors
J= Mechanical, Magnetic, and Physical Sensors
K= Phenomena, Modeling and Evaluation
L= Sensor Networks
M= Applications
N= Open Posters

***Please reference the Poster Numbers from the program listing starting on page 75. (Ex. The 1st paper listed on page 75 of this program book is G1 and this poster is located in front-right area of the poster room as indicated on the diagram on the following page.)***

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N5 | N4 | | M6 | M5 | | K17 | K16 | | K1 | J14 | | H14 | H13 | | G9 | G8 |
| N6 | N3 | | M7 | M4 | | K18 | K15 | | K2 | J13 | | H15 | H12 | | G10 | G7 |
| N7 | N2 | | M8 | M3 | | K19 | K14 | | K3 | J12 | | J1 | H11 | | G11 | G6 |
| N8 | N1 | | M9 | M2 | | L1 | K13 | | K4 | J11 | | J2 | H10 | | H1 | G5 |
| N9 | M17 | | M10 | M1 | | L2 | K12 | | K5 | J10 | | J3 | H9 | | H2 | G4 |
| | M16 | | M11 | L8 | | L3 | K11 | | K6 | J9 | | J4 | H8 | | H3 | G3 |
| | M15 | | M12 | L7 | | L4 | K10 | | K7 | J8 | | J5 | H7 | | H4 | G2 |
| | M14 | | M13 | L6 | | L5 | K9 | | K8 | J7 | | J6 | H6 | | H5 | G1 |

## WEDNESDAY POSTER SESSION FLOOR PLAN

The Wednesday poster session floor plan shows the position of each numbered poster. The three letter and number prefix of each poster has been omitted from this diagram. The following groups, or tracks, are featured in this poster session:

G= Chemical and Gas Sensors
H= Applications
J= Mechanical, Magnetic, and Physical Sensors
K= Optical Sensors
L= Sensor Networks
M= Other Sensor Topics - Materials, Processes, Circuits, Signals & Interfaces, etc.
N= Open Posters

***Please reference the Poster Numbers from the program listing starting on page 98. (Ex. The 1st paper listed on page 98 of this program book is G1 and this poster is located in front-right area of the poster room as indicated on the diagram on the following page.)***

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N11 | N10 | M13 | M12 | L6 | L5 | K3 | K2 | H13 | H12 | G9 | G8 |
| N12 | N9 | M14 | M11 | L7 | L4 | K4 | K1 | H14 | H11 | G10 | G7 |
| N13 | N8 | M15 | M10 | L8 | L3 | K5 | J12 | J1 | H10 | G11 | G6 |
| | N7 | M16 | M9 | L9 | L2 | K6 | J11 | J2 | H9 | G12 | G5 |
| | N6 | M17 | M8 | M1 | L1 | K7 | J10 | J3 | H8 | H1 | G4 |
| | N5 | M18 | M7 | M2 | K13 | K8 | J9 | J4 | H7 | H2 | G3 |
| | N4 | N1 | M6 | M3 | K12 | K9 | J8 | J5 | H6 | H3 | G2 |
| | N3 | N2 | M5 | M4 | K11 | K10 | J7 | J6 | H5 | H4 | G1 |

# KEYNOTE SPEAKERS

## Monday, November 4th - Professor Masayoshi Esashi

*"Integrated MEMS by Adhesive Bonding"*

Professor Masayoshi Esashi received the B.E. degree in electronic engineering in 1971 and the Doctor of Engineering degree in 1976 at Tohoku University. He served as a research associate from 1976 and an associate professor from 1981 at the Department of Electronic Engineering, Tohoku University. Since 1990 he has been a professor and he is now in The World Premier International Research Center Advanced Institute for Materials Research (WPI-AIMR) and concurrently in Micro System Integration Center (μSIC) (director) in Tohoku University. He was a President of Sensor-Micromachine Society in Institute of Electrical Engineers in Japan (2002-2003), a President of Japan Society of Next Generation Sensor Technology (2010~), and a Chairman of MEMS Park Consortium in Sendai (2004). He served as a general co-chairman of the 4th IEEE Micro Electro Mechanical Workshop in 1991 held in Nara, Japan, a general chairman of the 10th International Conference on Solid-State Sensors and Actuators (Transducers 99) in 1999 held in Sendai, Japan and also as the Technical Program Chairman of IEEE Sensors 2006 held in Daegu, Korea. He has been studying microsensors and integrated microsystems.

## Tuesday, November 5th - Professor Robert Puers

*"Implantable chips and sensors: quo vadis?"*

Robert (Bob) Puers recieved his Ph.D. in 1986 at the Katholieke Universiteit te Leuven. He is a European pioneer in the research on micromachining, MEMS and packaging techniques, mainly for biomedical implantable systems. To this purpose, he installed a dedicated clean room for sensor and electronic packaging technology, that now runs for more than 25 years under his guidance. In 2014, a new research facility will house his research team. Recently, microfluidic and optical MEMS based on polymers have been added to the backbone of his sensor research. Besides MEMS, his work also focuses on low power systems, smart interfaces, inductive power and wireless communication. Devices developed range from bladder pressure and eye pressure monitoring, over instrumented orthopedic implants, to implanted pumps for assisted blood perfusion. One spinout of this research team are the design guidelines to improve the efficiency of power induction (with coil systems), that have been bundled in two books. He took major efforts to increase the impact of MEMS and Microsystems in both the international research community as well as in industry. He helped to launch three spin-off companies, ICSense, Zenso and MinDCet. Dr. Puers is also an IEEE and IoP fellow.

**Wednesday, November 6th - Dr. Kenneth S. Johnson**

*"BioArgo: a global scale chemical sensor network to observe carbon, oxygen, and nitrogen cycles in the ocean"*

Kenneth S. Johnson is a Senior Scientist at the Monterey Bay Aquarium Research Institute. He received his B.S. in Chemistry and Oceanography from the University of Washington and his Ph.D. in Oceanography from Oregon State University. His research interests are focused on the development of chemical sensors that can be deployed in large scale, wireless sensor networks and application of these tools to studies of chemical cycling throughout the ocean. His lab group has developed sensors for a variety of seawater nutrients, pH and field portable, analytical systems for trace elements such as iron, cobalt, manganese and zinc. The sensors are integrated into commercially available platforms and sensor networks are deployed throughout the coastal ocean and in remote regions of the open ocean where they report back to the Internet in real time. These sensors and analyzers have been used in a variety of pioneering studies, including the first open ocean iron fertilization experiments. He is author of more than 130 papers in scientific journals, including 16 papers in the journals Science and Nature. Johnson was elected Fellow of the American Geophysical Union in 2011.

## SUNDAY, NOVEMBER 3RD - TUTORIALS

**7:00 AM - 8:30 AM**
**REGISTRATION**
**Maryland Foyer**

**8:30 AM - 10:20 AM**
**Track A: Novel Trends in Sensing**
**Room: Homeland**

**COLD ATOM GYROS**
Todd Gustavson, *AOSense, Inc.*

**8:30 AM - 10:20 AM**
**Track B: Inertial Measurement**
**Room: Federal Hill**

**MEMS INERTIAL SENSORS: A TECHNOLOGY OVERVIEW**
Farrokh Ayazi, *Georgia Tech Institute*

**8:30 AM - 9 AM**
**Track C: Bioelectronics**
**Room: Fells Point**

**BIOELECTRONICS: ITS FUTURE IN YOUR HEALTH AND WELL BEING**
Veena Misra, *NCSU ERC for Advanced Self-Powered Systems of Integrated Sensors and Technologies*

**9:00 AM - 10:20 AM**
**Track C: Bioelectronics**
**Room: Fells Point**

**ENERGY CONSIDERATIONS AND SELF-POWERED DEVICES**
John Muth, *NCSU ERC for Advanced Self-Powered Systems of Integrated Sensors and Technologies*

**10:20 AM - 10:40 AM**
**Coffee Break**
**Room: Maryland Foyer**

**10:40 AM - 12 PM**
**Track A: Novel Trends in Sensing**
**Room: Homeland**

**FAST DNA SEQUENCING BY ELECTRICAL MEANS**
Massimiliano Di Ventra, *UC San Diego*

**10:40 AM – 12:00 PM**
**Track B: Inertial Measurement**
**Room: Federal Hill**

**DESIGN AND ANALYSIS OF MEMS GYROSCOPES**
Faisal Zaman, *Qualtré*

**10:40 AM - 12 PM**
**Track C: Bioelectronics**
**Room: Fells Point**

**TECHNOLOGIES FOR WIRELESS BIOSYSTEMS**
Maysam Ghovanloo, *Georgia Institute of Technology*

**12:00 PM - 1:30 PM**
**Lunch**
**Room: Baltimore AB**

**Luncheon Speaker:** Dr. Steven LeBoeuf, *Valencell, Inc*.

**STARTING A MEDICAL MONITORING COMPANY FROM SCRATCH**

**1:30 PM - 2:50 PM**
**Track A: Novel Trends in Sensing**
**Room: Homeland**

**ULTIMATE MEMS SENSORS**
Siavash Pourkamali, *University of Texas at Dallas*

**1:30 PM - 2:50 PM**
**Track B: Inertial Measurement**
**Room: Federal Hill**

**DESIGN AND ANALYSIS OF MEMS ACCELEROMETERS**
Diego E. Serrano, *Qualtré*

**1:30 PM - 2:50 PM**
**Track C: Bioelectronics**
**Room: Fells Point**

**TECHNOLOGIES FOR AN IMPLANTABLE NANO-BIO-SENSING LABORATORY**
Sandro Carrara, *Swiss Federal Institute of Technology – Lausanne*

**2:50 PM - 3:10 PM**
**Coffee Break**
**Room: Maryland Foyer**

**3:10 PM – 5:00 PM**
**Track A: Novel Trends in Sensing**
**Room: Homeland**

**OPTOMECHANICAL SENSORS**
Gaurav Bahl, *University of Illinois at Urbana-Champaign, USA*

**3:10 PM – 5:00 PM**
**Track B: Inertial Measurement**
**Room: Federal Hill**

**INTERFACE CIRCUITS AND SYSTEMS FOR INERTIAL SENSORS**
Arashk N. P. Shirazi, *Georgia Tech University*

**3:10 PM – 5:00 PM**
**Track C: Bioelectronics**
**Room: Fells Point**

**SYSTEM-INTEGRATION: EXAMPLES OF INNOVATIVE HEALTH PRODUCTS**
James Weiland, *USC ERC for Biomimetic MicroElectronic Systems*

**5 PM - 5:30 PM**
**Track C: Bioelectronics**
**Room: Fells Point**

**DEMONSTRATIONS OF MHEALTH MEDICAL DEVICES AND APPS**
Amy Schiffman, *Capital Health Advocates & Capital House Calls*
H. Troy Nagle, *NC State*

**6:30 PM – 8:30 PM**
**Welcome Reception**
**Room: Maryland/Baltimore Foyer**

**8:00 AM – 8:30 AM**
**Maryland BC**
**OPENING REMARKS**

**8:30 AM - 9:15 AM**
**PLENARY – KEYNOTE – PROFESSOR MASAYOSHI ESASHI**
**Maryland BC**
**Session Chair: Elliott Brown (Wright State University, USA)**

**INTEGRATED MEMS BY ADHESIVE BONDING**
Masayoshi Esashi, Shuji Tanaka
*Tohoku University, Japan*

**9:30 AM - 10:45 AM**
**A1L-A: GAS CHROMATOGRAPHY**
**Maryland F**
**Session Chairs: Massood Atashbar (Western Michigan University, USA), Ponnambalam Ravi Selvaganapathy (McMaster University, Canada)**

**9:30 AM**
**INVITED TALK: SMART MULTI-DIMENSIONAL GAS CHROMATOGRAPHY**
Xudong Fan
*University of Michigan, United States*

**10:00 AM**
**WIDTH-MODULATED MICROGAS CHROMATOGRAPHY SEPARATION COLUMNS WITH SILICA NANOPARTICLES STATIONARY PHASE**
Hamza Shakeel, Dong Wang, Randy Heflin, Masoud Agah
*Virginia Tech, United States*

**10:15 AM**
**DETECTION OF EXPLOSIVES USING ORTHOGONAL GAS SENSORS**
Yun Chu, Daniel Mallin, Matin Amani, Otto Gregory
*University of Rhode Island, United States*

**10:30 AM**
**MICROSENSOR ANALYSES FOR TRACE TARGETS OVER EXTENDED TIMES IN A SIMULATED MARTIAN ENVIRONMENT**
Kurt D. Benkstein[1], Philip H. Rogers[1], Christopher B. Montgomery[1], Steve Semancik[1], C. Jerry Jin[2], Baranidharan Raman[2]
*[1]National Institute of Standards and Technology, United States; [2]Washington University in St. Louis, United States*

**9:30 AM - 10:45 AM**
**A1L-B: PHOTONICS**
**Maryland E**
**Session Chairs: Chrisopher Salthouse (University of Massachusetts, Amherst, USA), Zheyao Wang (Tsinghua University, China)**

**9:30 AM**
**INVITED TALK: ELECTRONIC LABEL-FREE BIOSENSING ASSAYS**
Mark Reed
*Yale University, United States*

**10:00 AM**
**FABRICATION AND CHARACTERIZATION OF A DUAL-MODE SPR/SERS SENSOR BASED ON PLASMONIC NANODOME ARRAYS**
Charles Choi, Steve Semancik
*National Institute of Standards and Technology, United States*

**10:15 AM**
**LABEL-FREE PLASMONIC IMMUNOSENSING FOR PLASMODIUM IN WHOLE BLOOD**
Sang-Yeon Cho[1], Jayson Briscoe[1], Immo Hansen[1], Jesse Smith[1], Yoomi Chang[1], Igal Brener[2]
*[1]New Mexico State University, United States; [2]Sandia National Laboratories, United States*

**10:30 AM**
**COMPACT, LOW COST CMOS INTEGRATED SPR BIOSENSOR SYSTEM**
Santosh Koppa, Youngjoong Joo
*University of Texas at San Antonio, United States*

**9:30 AM - 10:45 AM**
**A1L-C: PHYSICAL SENSORS I**
**Maryland A**
**Session Chairs: Mitsuhiro Shikida (Nagoya University, Japan), David Elata (Technion - Israel Institute of Technology, Israel)**

**9:30 AM**
**MEMS ELECTRIC-FIELD SENSOR WITH LEAD ZIRCONATE TITANATE (PZT)-ACTUATED ELECTRODES**
Simon Ghionea, Gabriel Smith, Jeffrey Pulskamp, Sarah Bedair, Christopher Meyer, David Hull
*US Army Research Laboratory, United States*

**9:45 AM**
**A MICRODISCHARGE-BASED NEUTRON RADIATION DETECTOR UTILIZING SPUTTERED GADOLINIUM FILMS FOR NEUTRON CONVERSION**
Ravish Malhotra, Yogesh B. Gianchandani
*University of Michigan, United States*

**10:00 AM**
**GRANULAR RADIO ENERGY-SENSING NODE (GREEN): A 0.56 CM³ WIRELESS STICK-ON NODE FOR NON-INTRUSIVE ENERGY MONITORING**
Rafael Send[1], Qiliang Richard Xu[1], Igor Paprotny[2], Richard White[1], Paul Wright[1]
*[1]University of California, Berkeley, United States; [2]University of Illinois, United States*

**10:15 AM**
**INTEGRATED PASSIVE AND WIRELESS SENSOR FOR MAGNETIC FIELDS, TEMPERATURE AND HUMIDITY**
Bodong Li, Omar Yassine, Jürgen Kosel
*King Abudllah University of Science and Technology, Saudi Arabia*

**10:30 AM**
**A NOVEL IN-LINE TYPE FREQUENCY DETECTOR BASED ON MEMS MEMBRANE FOR X-BAND APPLICATION**
Zhenxiang Yi, Xiaoping Liao
*Southeast University, China*

---

**9:30 AM - 10:45 AM**
**A1L-D: OPTICAL SENSORS IN HEALTHCARE**
**Marlyand D**
**Session Chairs: Elfed Lewis (University of Limerick, Ireland)**
**Candid Reig (University of Valencia, Spain)**

---

**9:30 AM**
**TACTILE AND HYPERSPECTRAL IMAGING SENSORS FOR MAMMARY TUMOR CHARACTERIZATION**
Amrita Sahu, Firdous Saleheen, Vira Oleksyuk, Yi Chen, Chang-Hee Won
Temple University, United States

**9:45 AM**
**A FABRY-PEROT INTERFEROMETRY BASED MRI-COMPATIBLE MINIATURE UNIAXIAL FORCE SENSOR FOR PERCUTANEOUS NEEDLE PLACEMENT**
Weijian Shang, Hao Su, Gang Li, Cosme Furlong, Gregory Fischer
*Worcester Polytechnic Institute, United States*

**10:00 AM**
**HIGH RESOLUTION FLUORESCENCE-BASED TEMPERATURE SENSOR FOR STAND-OFF DETECTION IN PHYSIOLOGICAL RANGE**
Timothy Kuester, Ryan Robucci, Hung Lam, Govind Rao, Yordan Kostov
*University of Maryland Baltimore County, United States*

**10:15 AM**
**THE CONTACTLESS ACTIVE OPTICAL SENSOR FOR VEHICLE DRIVER FATIGUE DETECTION**
Krzysztof Murawski[2], Tadeusz Sondej[2], Krzysztof Rózanowski[1], Olaf Truszczynski[1], Marian Macander[1], Lukasz Macander[1]
*[1]Military Institute of Aviation Medicine, Poland; [2]Military University of Technology, Poland*

**10:30 AM**
**CMOS CHIP WITH MULTI JUNCTION PHOTO DETECTOR FOR SENSING BIOMEDICAL SIGNALS**
Stefan Schidl, Eugenijus Kaniusas, Horst Zimmermann
*Technische Universität Wien, Austria*

**9:30 AM - 10:45 AM**
**A1L-E: SENSOR SYSTEMS**
**Watertable ABC**
**Session Chairs: Konandur Rajanna (IIS Bangalore, India), Oliver Paul (University of Freiburg - IMTEK, Germany)**

**9:30 AM**
**FLOW MEASUREMENT IN OPEN CHANNELS BY USING AN ULTRASONIC PHASED ARRAY SENSOR**
Manuel Haide, Wolfgang Schroer
*Ulm University of Applied Sciences, Germany*

**9:45 AM**
**QUANTIFYING MODAL SHAPES IN SMART PIEZOELECTRIC ULTRASONIC TRANSDUCER ARRAY: MODELING AND EXPERIMENT**
M.A. Matin[1], K. Ozaki[2], Y. Numata[2], D. Akai[2], K. Sawada[2], M. Ishida[2]
*[1]Bangladesh University of Engineering and Technology, Bangladesh; [2]Toyohashi University of Technology, Japan*

**10:00 AM**
**ROOM TEMPERATURE IONIC-LIQUID ELECTROCHEMICAL GAS SENSOR ARRAY SYSTEM FOR REAL-TIME MINE SAFETY MONITORING**
Haitao Li[1], Xiaoyi Mu[1], Zhe Wang[2], Min Guo[2], Xiangqun Zeng[2], Andrew Mason[1]
*[1]Michigan State University, United States; [2]Oakland University, United States*

**10:15 AM**
**HIGH SENSITIVITY ACCELEROMETER OPERATING ON THE BORDER OF STABILITY WITH DIGITAL SLIDING MODE CONTROL**
Elie Hanna Sarraf, Ahmad Sharkia, Siamak Moori, Mrigank Sharma, Edmond Cretu
*University of British Columbia, Canada*

**10:30 AM**
**PULSED EDDY CURRENT IMAGING DEVICE FOR NON DESTRUCTIVE EVALUATION APPLICATIONS**
Pierre-Yves Joubert[2], Yohan Le Diraison[1], Zhou Xi[1], Eric Vourc'h[1]
*[1]École Normale Supérieure de Cachan, France; [2]Université Paris Sud, France*

**9:30 AM - 10:45 AM**
**A1L-F: SENSING TECHNIQUES**
**Homeland**
**Session Chairs: Hong Yu (Arizona State University, USA), Gaurav Bahl (University of Illinois at Urbana-Champaign, USA)**

**9:30 AM**
**A STANDARD LOW-NOISE SENSOR INTERFACE FOR 0.66NJ/STEP-ENERGY-EFFICIENT, MOBILE BAROMETRIC-PRESSURE-BASED ALTITUDE SENSING**
Marko Mailand, Stefan Getzlaff, Raik Richter, Steffen Apel, Daniel Breitmeyer, Ute Meyer, Enno Böhme, Ronald Schreiber, Kornelius Töws, Dieter Günther
*Zentrum Mikroelektronik Dresden AG, Germany*

**9:45 AM**
**READOUT SCHEME FOR RESISTIVE CHIPLESS WIRELESS SENSORS**
Martin Schüßler, Bernd Kubina, Christian Mandel, Rolf Jakoby
*Technische Universität Darmstadt, Germany*

**10:00 AM**
**ANALYSIS AND EFFICIENT ONSET TIME DETECTION OF ACOUSTIC EMISSION SIGNALS WITH POWER CONSTRAINED SENSOR PLATFORMS**
Benjamin Babjak, Sandor Szilvasi, Peter Volgyesi, Ozgur Yapar, Prodyot K. Basu
*Vanderbilt University, United States*

**10:15 AM**
**POSFET TACTILE SENSING CHIPS USING CMOS TECHNOLOGY**
Ravinder S. Dahiya[3], Andrea Adami[1], Cristian Collini[1], Maurizio Valle[2], Leandro Lorenzelli[1]
*[1]Fondazione Bruno Kessler, Italy; [2]Università degli Studi di Genova, Italy; [3]University of Glasgow, United Kingdom*

**10:30 AM**
**TERAHERTZ EMISSION AND DETECTION USING TWO DIMENSIONAL PLASMONS IN SEMICONDUCTOR NANO-HETEROSTRUCTURES FOR SENSING APPLICATIONS**
Taiichi Otsuji[3], Takayuki Watanabe[3], Stephane Boubanga Tombet[3], Tetsuya Suemitsu[3], Victor Ryzhii[3], Vyasheslav Popov[2], Wojciech Knap[1]
*[1]University of Montpellier-CNRS, France; [2]Kotelnikov Institute of Radio Engineering and Electronics (Saratov Branch), Russia; [3]Tohoku University, Japan*

**11:15 AM - 12:45 PM**
**A2L-A: GAS SENSORS I**
**Maryland F**
**Session Chairs: Oliver Brand (Georgia Institute of Technology, USA), Goutam Koley (University of South Carolina, USA)**

**11:15 AM**
**DEVELOPMENT OF MICRO-HOTPLATE WITH TAN HEATER BASED CU-DOPED SNO2 GAS SENSOR FOR LOW CONCENTRATION OF H2S GAS**
Jin-Chern Chiou[1], Shang-Wei Tsai[1], Chia-Yang Lin[1]
*[1]National Chiao-Tung University, Taiwan; [2] China Medical University, Taiwan*

**11:30 AM**
**MOLECULARLY IMPRINTED POLYMER COATED AU NANOPARTICLE SENSOR FOR ALPHA-PINENE VAPOR DETECTION**
Bin Chen, Chuanjun Liu, Xiao Sun, Kenshi Hayashi
*Kyushu University, Japan*

**11:45 AM**
**A DUAL MODE SOI CMOS MEMS BASED THERMAL CONDUCTIVITY AND IR ABSORPTION GAS SENSOR**
Sohab Sarfraz, Vasant Kumar, Florin Udrea
*University of Cambridge, United Kingdom*

**12:00 PM**
**A MICRO HELIUM-DISCHARGE PHOTOIONIZATION DETECTOR FOR GAS SENSING**
Shree Narayanan[1], Masoud Agah[1], Gary Rice[2]
*[1]Virginia Tech, United States; [2]College of William and Mary, United States*

**12:15 PM**
**FULLY INTEGRATED SYSTEM-ON CHIP GAS SENSOR IN CMOS TECHNOLOGY**
Christoph Gamauf[3], Martin Siegele[3], Alexander Nemecek[3], Giorgio Mutinati[2], Stephan Steinhauer[2], Elise Brunet[2], Anton Köck[2], Jochen Kraft[1], Joerg Siegert[1], Franz Schrank[1]
*[1]ams AG, Austria; [2]Austrian Institute of Technology GmbH, Austria; [3]University of Applied Sciences Wiener Neustadt, Austria*

**12:30 PM**
**THERMALLY-ASSISTED TRANSIENT ANALYSIS FOR REDUCING THE RESPONSE TIME OF MICROHOTPLATE GAS SENSORS**
Alexander Vergara, Kurt D. Benkstein, Steve Semancik
*National Institute of Standards and Technology, United States*

**11:15 AM - 12:45 PM**
**A2L-B: ELECTROCHEMICAL/MICROWAVE**
**Maryland E**
**Session Chairs: Long Que (Louisiana Tech University, USA), Zhihong Li (Peking University, China)**

**11:15 AM**
**RAPID DETECTION OF PROGESTERONE BY COMMERCIALLY AVAILABLE MICROELECTRODE CHIPS**
Haochen Cui, Cheng Cheng, Jayne Wu, Shigetoshi Eda
*University of Tennessee, Knoxville, United States*

**11:30 AM**
**THE EFFECT OF VITAMIN C FOR POINT-OF-CARE BLOOD ANALYSIS APPLICATIONS USING AN ELECTROCHEMICAL BIOSENSOR**
Hadar Ben-Yoav[1], Sheryl Chocron[1], Thomas Winkler[1], Eunkyoung Kim[1], Gregory Payne[1], Reza Ghodssi[1], Deanna Kelly[2]
*[1]University of Maryland, United States; [2]University of Maryland School of Medicine, United States*

**11:45 AM**
**HIGH THROUGHPUT LOW COST ELECTROCHEMICAL DEVICE FOR S.AUREUS BACTERIA DETECTION**
Mohammadali Safavieh, Minhaz Uddin Ahmed, Mohammed Zourob
*Universitié du Quebéc, Canada*

**12:00 PM**
**A CELL IMPEDANCE SENSOR CHIP FOR CANCER CELLS DETECTION WITH SINGLE CELL RESOLUTION**
Tien Anh Nguyen, Tsung-I Yin, Gerald Urban
*IMTEK, University of Freiburg, Germany*

**12:15 PM**
**THZ SIGNATURES OF DNA IN NANOCHANNELS UNDER ELECTROPHORETIC CONTROL**
Elliott Brown[3], Edgar Mendoza[1], Yulia Kuznetsova[2], Alexander Neumann[2], Steven Brueck[2]
*[1]Redondo Optics, Inc., United States; [2]University of New Mexico, United States; [3]Wright State University, United States*

**12:30 PM**
**A NEW DIELECTRIC DISPERSION ANALYSIS USING MICROWAVE BIO-MICROSENSOR FOR MINUTE DROPLET OF LIPOSOME SUSPENSION WITH TARGET BIOMOLECULES BY S-PARAMETER METHOD**
Keisuke Takada, Kaoru Yamashita, Minoru Noda
*Kyoto Institute of Technology, Japan*

**11:15 AM - 12:45 PM**
**A2L-C: INERTIAL SENSORS**
**Maryland A**
**Session Chairs: Kukjin Chun (Seoul National University, South Korea), David Horsley (University of California, Davis, USA)**

**11:15 AM**
**INVITED TALK: BIOINSPIRED TOUCH SENSORS FOR MEDICAL APPLICATIONS**
Chang Liu
*Northwestern University, United States*

**11:45 AM**
**MEMS DISK RESONATOR GYROSCOPE WITH INTEGRATED ANALOG FRONT-END**
Tsang-Hung Su[2], Sarah Nitzan[2], Parsa Taheri-Tehrani[2], Mitchell Kline[1], Bernhard Boser[1], David Horsley[2]
*[1]University of California, Berkeley, United States; [2]University of California, Davis, United States*

**12:00 PM**
**DESIGN, FABRICATION AND CHARACTERISATION OF A BIOMIMETIC ACCELEROMETER INSPIRED BY THE CRICKET'S CLAVATE HAIR**
Harmen Droogendijk, Meint de Boer, Remco Sanders, Gijs J.M Krijnen
*University of Twente, Netherlands*

**12:15 PM**
**SUB-1G MEMS ACCELEROMETER**
Daisuke Yamane[2], Toshifumi Konishi[1], Takaaki Matsushima[1], Gou Motohashi[2], Ken Kagaya[2], Hiroyuki Ito[2], Noboru Ishihara[2], Hiroshi Toshiyoshi[3], Katsuyuki Machida[1,2], Kazuya Masu[2]
*[1]NTT Advanced Technology Corporation, Japan; [2]Tokyo Institute of Technology, Japan; [3]University of Tokyo, Japan*

**12:30 PM**
**A SENSITIVE THREE-AXIS MICROMACHINED ACCELEROMETER BASED ON AN ELECTROSTATICALLY SUSPENDED PROOF MASS**
Fengtian Han[2], Boqian Sun[2], Linlin Li[2], Gaoyin Ma[1]
*[1]Beijing Institute of Aerospace Control Device, China; [2]Tsinghua University, China*

**11:15 AM - 12:45 PM**
**A2L-D: OPTICAL SENSORS FOR PHYSICAL MEASUREMENTS**
**Maryland D**
**Session Chairs: Francisco J. Arregui (Universidad Publica de Navarra, Spain), Yong-Lae Park (Carnegie Mellon University, USA)**

**11:15 AM**
**INVITED TALK: OPTOELECTRONIC TWEEZERS AND LIGHT ACTUATED MICROFLUIDICS**
Ming Wu
*University of California, Berkeley, United States*

**11:45 AM**
**MICRO-MACHINED FABRY-PÉROT INTERFEROMETER FOR THERMAL INFRARED**
Mikko Tuohiniemi[2], Antti Näsilä[2], Jarkko Antila[2], Heikki Saari[2], Martti Blomberg[1]
*[1]VTT Memsfab Ltd, Finland; [2]VTT Technical Research Centre of Finland, Finland*

**12:00 PM**
**A LOW MODE CONFINEMENT INTEGRATED WAVEGUIDE PLATFORM FOR HIGH RESOLUTION DISPLACEMENT SENSING**
Marcel Pruessner, Doewon Park, Todd Stievater, William Rabinovich
*Naval Research Laboratory, United States*

**12:15 PM**
**OPTICAL SENSOR TECHNOLOGY FOR SIMULTANEOUS MEASUREMENT OF PARTICLE SPEED AND CONCENTRATION OF MICRO SIZED PARTICLES**
Casper Clausen, Anpan Han, Martin Kristensen, Anders Bentien
*Aarhus University, Denmark*

**12:30 PM**
**OPTICAL BACKSCATTER MEASUREMENT OF CLOUD PARTICULATES**
Rahul Dixit[2], Walter Zheng[2], Ashley Hatfield[2], J. Gerardi[2], G. Hickman[2], William Doak[1], Paul Chiarot[1], David Klotzkin[1]
*[1]Binghamton University, United States; [2]Innovative Dynamics Inc., United States*

---

**11:15 AM - 12:45 PM**
**A2L-E: SYSTEMS FOR HEALTH MONITORING**
**Watertable ABC**
**Session Chairs: Tarun Bhattacharya (Indian Institute of Technology, Kharagpur, India), Mitsuhiro Shikida (Nagoya University, Japan)**

---

**11:15 AM**
**GLUCOSE SENSING AND DRIVEN "ORGANIC ENGINE" WITH CO-IMMOBILIZED ENZYME MEMBRANE FOR ACTUATION BY BLOOD SUGAR IN DIABETES**
Munkhbayar Munkhjargal, Kumiko Miyajima, Yuki Matsuura, Kohdai Hatayama, Ming Ye, Takahiro Arakawa, Hiroyuki Kudo, Kohji Mitsubayashi
*Tokyo Medical and Dental University, Japan*

**11:30 AM**
**EMBEDDED DEVICE FOR SIMULTANEOUS RECORDING AND STIMULATION FOR RETINA IMPLANT RESEARCH**
Mario Schloesser, Oscar Cota, Roger Heil, Janis Brusius, Andreas Offenhäusser, Stefan van Waasen, Michael Schiek
*Forschungszentrum Juelich GmbH, Germany*

**11:45 AM**
**A CONTACT LENS SENSOR SYSTEM WITH A MICRO-CAPACITOR FOR WIRELESS INTRAOCULAR PRESSURE MONITORING**
Yu-Chieh Huang[1], Guan-Ting Yeh[1], Tzu-Sen Yang[1], Jin-Chern Chiou[1,2]
*[1]National Chaio Tung University, Taiwan; [2]China Medical University Hospital, Taiwan*

**12:00 PM**
**AN IMPACT SENSING PLATFORM FOR SPINAL CORD INJURY EXPERIMENTS**
Manuel Ochoa, Rahim Rahimi, Babak Ziaie, Riyi Shi
*Purdue University, United States*

**12:15 PM**
**SKIN-SURFACE-COUPLED PERSONAL HEALTH MONITORING SYSTEM**
Yu-Pin Hsu, Darrin Young
*University of Utah, United States*

**12:30 PM**
**ACTIVE SENSING OF INDOOR HUMAN SCENARIOS THROUGH MOBILE PYROELECTRIC INFRARED SENSORS**
Rui Ma[2], Qi Hao[2], Xueyong Li[1]
*[1]Shandong University, China; [2]University of Alabama, United States*

---

**11:15 AM - 12:45 PM**
**A2L-F: MISCELLANEOUS SENSORS**
**Homeland**
**Session Chairs: Kenichi Takahata (University of British Columbia, Canada), Andrew Mason (Michigan State University, USA)**

---

**11:15 AM**
**PASSIVE DISPLACEMENT SENSING USING BACKSCATTER RFID WITH MULTIPLE LOADS**
Jonathan Becker, Matthew Trotter, Joshua Griffin
*Disney Research, United States*

**11:30 AM**
**MWCNT/COTTON-BASED FLEXIBLE ELECTRODE FOR ELECTROCARDIOGRAPHY**
Chee Leong Lam, Nik Nur Zuliyana Rajdi, Dedy Wicaksono
*Universiti Teknologi Malaysia, Malaysia*

**11:45 AM**
**LOW-COST FLUORESCENCE-BASED TEMPERATURE SENSING SYSTEM FOR NEONATAL CARE**
Kirit Chatterjee, Hung Lam, Ryan Robucci, Govind Rao, Yordan Kostov
*University of Maryland Baltimore County, United States*

**12:00 PM**
**WIRELESS HIGH-TEMPERATURE SENSING WITH A CHIPLESS TAG BASED ON A DIELECTRIC RESONATOR ANTENNA**
Bernd Kubina, Martin Schüßler, Christian Mandel, Arshad Mehmood, Rolf Jakoby
*Technische Universität Darmstadt, Germany*

**12:15 PM**
**ENERGY-EFFICIENT MRAM ACCESS SCHEME USING HYBRID CIRCUITS BASED ON SPIN-TORQUE SENSORS**
Mrigank Sharad, Rangharajan Venkatesan, Xuanyao Fong, Anand Raghunathan, Kaushik Roy
*Purdue University, United States*

**12:30 PM**
**MULTICOLOR COLLOIDAL QUANTUM DOT BASED LIGHT EMITTING DIODES USING A SOLUTION PROCESSED ELECTRON TRANSPORTING LAYER**
Gauri Bhave, Youngkyu Lee, Kazunori Hoshino, Xiaojing Zhang
*University of Texas, Austin, United States*

**2:15 PM - 3:45 PM**
**A3P-G: GAS SENSORS III**
**Poster Area - Baltimore AB**
**Session Chairs: Marcel Pruessner (Naval Research Laboratory, USA), I-Yu Huang (National Sun Yat-sen University, Taiwan)**

**A3P-G1**
**DETECTION OF STYRENE BY SAW SENSOR BASED ON HYDROGEN-BOND ACIDIC POLYMER**
Yang Wang, Xiaosong Du, Yin Long, Yi Li, Yadong Jiang
*University of Electronic Science and Technology of China, China*

**A3P-G2**
**FERRITE MATERIALS FOR GAS SENSING APPLICATIONS**
Thanasak Sathiwitayakul[3], Emma Newton[3], Ivan Parkin[3], Maxim Kuznetsov[1], Russell Binions[2]
*[1]All-Russian Research Institute on Problems of Civil Defence and EMERCOM, Russia; [2]Queen Mary, University of London, United Kingdom; [3]University College London, United Kingdom*

**A3P-G3**
**SIC GAS SENSOR ARRAYS FOR EXTREME ENVIRONMENTS**
Sandip Roy, Ben Furnival, Neal Wood, Konstantin Vassilevski, Nick Wright, Alton Horsfall, Chris O'Malley
*Newcastle University, United Kingdom*

**A3P-G4**
**INN NANOWIRES BASED MULTI-MODAL ENVIRONMENTAL SENSORS**
Alina Wilson, Ifat Jahangir, Ehtesham Quddus, Amol Singh, Goutam Koley
*University of South Carolina, United States*

**A3P-G5**
**ULTRATHIN RECONFIGURABLE MOLECULAR FILTER FOR GAS-SELECTIVE SENSING**
Masahiro Imahashi, You Chiyomaru, Kenshi Hayashi
*Kyushu University, Japan*

**A3P-G6**
**ENHANCED AMMONIA SENSING PROPERTIES USING AU DECORATED ZNO NANORODS**
V.P. Dinesh[2], P. Biji[2], Arun K. Prasad[1], Ashok K. Tyagi[1]
*[1]Indira Gandhi Centre for Atomic Research, India; [2]PSG Institute of Advanced Studies, India*

**A3P-G7**
**VOLATILE ORGANIC COMPOUNDS OPTICAL FIBER GAS SENSOR BASED ON EVANESCENT FIELD COUPLING AND SOLVATOCHROMISM**
Jae-Sung Lee[2], Sang-Won Lee[2], Hyun-Min Jeong[2], Sung-Woo Lim[2], Eun-Yoon Jang[2], Na-Rae Yoon[2], Dae-Hyuk Kwon[1], Shin-Won Kang[2]
*[1]Kyungil University, Korea, South; [2]Kyungpook National University, Korea, South*

**A3P-G8**
**HIERARCHICAL POROUS SNO2 TOPOLOGICALLY TRANSFERRED FROM TIN OXALATE FOR FAST RESPONSE SENSORS TO TRACE FORMALDEHYDE**
Keng Xu, Dawen Zeng
*Huazhong University of Science and Technology, China*

**A3P-G9**
**OPERATING TEMPERATURE EFFECT IN W03 FILMS FOR GAS SENSING**
Malcolm Govender[1], David Motaung[1], Bonex Mwakikunga[1], Siva Umapathy[2], Sanchita Sil[2], Arun K. Prasad[3], Augusto Machatine[4], Herbert Kunert[4]
*[1]Council for Scientific and Industrial Research, South Africa; [2]Indian Institute of Science, India; [3]Indira Gandhi Centre for Atomic Research, India; [4]University of Pretoria, South Africa*

**A3P-G10**
**RESPONSE ENHANCEMENT OF WO3 GAS SENSORS BY METALLIC NANOGRAINS**
Mehdi Othman[1,3], Dave Lollman[1], Khalifa Aguir[1], Philippe Ménini[2], Wajdi Belkacem[3], Najeh Mliki[3]
*[1]IM2NP, Aix Marseille Université, France; [2]LAAS-CNRS, France; [3]Université Tunis El Manar, Tunisia*

**A3P-G11**
**METHODS FOR OPTIMIZING AND EXTENDING THE PERFORMANCE OF CHEMIRESISTIVE GAS MICROSENSORS**
Kurt D. Benkstein[1], Alexander Vergara[1], Christopher B. Montgomery[1], Steve Semancik[1], Baranidharan Raman[2]
*[1]National Institute of Standards and Technology, United States; [2]Washington University in St. Louis, United States*

**A3P-G12**
**CHEMOSELECTIVE SENSOR DEVELOPMENT USING CARBON MEMS MICROSYSTEMS**
Cody M. Washburn, Mike Rector, Patrick S. Finnegan, D. Bruce Burckel, Lee T. Massey, Greg V. White II, Robert Bernstein, Timothy N. Lambert
*Sandia National Laboratories, United States*

**A3P-G13**
**ANALYSIS OF BIOLOGICAL AND ARTIFICIAL CHEMICAL SENSOR REPSONSES TO ODOR MIXTURES**
Nalin Katta, Debajit Saha, Kevin Leong, Junnan Wu, Naveen Gandra, Wei-Ning Wang, Parag Banerjee, Srikanth Singamenni, Pratim Biswas, Baranidharan Raman
*Washington University in St. Louis, United States*

**A3P-G14**
**FAST QUARTZ RESONANT METHOD FOR HIGH HUMIDITY MEASUREMENT**
Jing Nie, Xiaofeng Meng
*Beihang University, China*

**2:15 PM - 3:45 PM**
**A3P-H: BIOSENSORS I**
**Poster Area - Baltimore AB**
**Session Chairs: Yu-Cheng Lin (National Cheng Kung University, Taiwan)**

**A3P-H1**
**CHARACTERIZATION OF A NEEDLE-TYPE PROBE GMR SENSOR FOR BIOMEDICAL APPLICATIONS**
Hamidreza Shirzadfar[2], Mustapha Nadi[2], Djilali Kourtiche[2], Sotoshi Yamada[1]
*[1]Kanazawa University, Japan; [2]Université de Lorraine – CNRS, France*

**A3P-H2**
**NON-CONTACT, CAPACITIVE BIOSENSOR ELECTRODES FOR ELECTROSTATIC CHARGE REDUCTION**
Guochen Peng, Mark Sterling, Mark Bocko
*University of Rochester, United States*

**A3P-H3**
**A GLUCOSE SENSOR WITH RELAY-RELEASED MECHANISM FOR LONG TIME GLUCOSE MONITORING**
Lu Fang, Bo Liang, Qin Zhu, Bobo Huang, Xuesong Ye
*ZheJiang University, China*

**A3P-H4**
**ELECTROWETTING ENABLED MAGNETIC PARTICLE IMMUNOASSAY WITH ON-CHIP MAGNETIC WASHING**
Nikhil Bhalla[1,3], Wen Yaw Danny Chung[1], Kerwin Wang[2], Teddy Lessmana[1], Pedro Estrela[3]
*[1]Chung Yuan Christian University, Taiwan; [2]National ChangHua University of Education, Taiwan; [3]University of Bath, United Kingdom*

**A3P-H5**
**HIGH SENSITIVITY CMOS PORTABLE BIOSENSOR WITH FLEXIBLE MICROFLUIDIC INTEGRATION**
Hasan Göktas, Mona Zaghloul
*George Washington University, United States*

**A3P-H6**
**3 MM DEEP MICROELECTRODE NEEDLE ARRAY BASED ON ALUMINUM FOR NEURAL APPLICATIONS**
Alexandre Peixoto[1], Beatriz Goncalves[1], Alexandre Silva[1], Nuno Dias[1,2], José Correia[1]
*[1]University of Minho, Portugal; [2]Polytechnic Institute of Cavado and the Ave, Portugal*

**A3P-H7**
**ORGANIC AND AQUEOUS DISPERSIBLE TETRAPODS FOR BIOSENSING APPLICATIONS**
Mayur Sadawana, Arpit Katiyar, Roshni Ramachandran, Jayesh Bellare, Rohit Srivastava
*Indian Institute of Technology Bombay, India*

**A3P-H8**
**FEMTO-MOLAR SENSITIVE FIELD EFFECT TRANSISTOR BIOSENSORS BASED ON SILICON NANOWIRES AND ANTIBODIES**
Francesca Puppo[1], Marie-Agnès Doucey[3], Thomas Moh[2], Gregory Pandraud[2], Pasqualina M. Sarro[2], Giovanni De Micheli[1], Sandro Carrara[1]
*[1]École Polytechnique Fédérale de Lausanne, Switzerland; [2]Delft University of Technology, Netherlands; [3]Université de Lausanne, Switzerland*

**A3P-H9**
**ELECTROCHEMICAL DETECTION OF DOPAMINE AT OVEROXIDIZED POLYPYRROLE/GRAPHENE/AU ELECTRODE ARRAY**
Yuhua Yu, Jianfeng Chen, Guowei Tao, Jia Zhou
*Fudan University, China*

**A3P-H10**
**REAL-TIME SENSING OF E.COLI BIOFILM GROWTH USING EPITAXIAL GRAPHENE**
Kevin Daniels, Nirupam Aich, Kristen Miller, Joseph Andrews, Shamaita Shetu, B. K. Daas, Tangali Sudarshan, Alan Decho, Navid Saleh, Mvs Chandrashekhar
*University of South Carolina, United States*

**A3P-H11**
**A PORTABLE IMPEDANCE BIOSENSOR FOR DETECTION OF MULTIPLE AVIAN INFLUENZA VIRUSES**
Benhua Zhang[1,2], Ronghui Wang[1], Yixiang Wang[1], Yanbin Li[1]
*[1]University of Arkansas, United States; [2]Shenyang Agriculture University, United States*

**A3P-H12**
**APPLICATION OF ION SENSITIVE FIELD EFFECT TRANSISTORS (ISFET) FOR ION CHANNEL DRUG DISCOVERY**
Yihao Zhu, Nicholas Deroller, Amol Singh, Ahsan Uddin, Kenneth Walsh, Goutam Koley
*University of South Carolina, United States*

**A3P-H13**
**USING THE BIOSENSOR BASED ON IMPEDANCE MEASUREMENT AND SANDWICH IMMUNOASSAY FOR CARCINOEMBRYONIC ANTIGEN DETECTION**
Chia-Hsien Yeh[2], Kuan-Feng Su[2], Yu-Cheng Lin[2], Pi-Lan Shen[1]
*[1]Firstep Bioresearch, Inc., Taiwan; [2]National Cheng Kung University, Taiwan*

**A3P-H14**
**IN-VIVO SENSING OF GLUTAMATE LEVELS IN THE BASOLATERAL AMYGDALA ACROSS SLEEP-WAKE STATES**
Min Kim[2], Hargsoon Yoon[2], Laurie Wellman[1], Larry Sanford[1]
*[1]Eastern Virginia Medical School, United States; [2]Norfolk State University, United States*

**A3P-H15**
**COMPACT SILICON BIOSENSOR FOR THE CLINICAL RANGE ESTIMATION OF BLOOD SERUM TRIGLYCERIDE**
Mohanasundaram Sulur Veeramani, Noel Prashant Ratchagar, Enakshi Bhattacharya, Shanthi Pavan, Shyam Prakash, Anju Chadha
*Indian Institute of Technology Madras, India*

**2:15 PM - 3:45 PM**
**A3P-J: PHYSICAL, INERTIAL & MAGNETIC SENSORS**
**Poster Area - Baltimore AB**
**Session Chairs: Joan Hoffmann (Johns Hopkins University, USA), Tao Li (University of Michigan, USA)**

**A3P-J1**
**ENHANCED SENSITIVITY OF A NEW SURFACE ACOUSTIC WAVE BASED RATE SENSOR INCORPORATING METALLIC DOT ARRAYS**
Wen Wang, Xiuting Shao, Shitang He
*Chinese Academy of Sciences, China*

**A3P-J2**
**NET-OVERHANG COUPLED MICROCANTILEVERS FOR SENSITIVE MASS DETECTION**
Guibing Cai, Rui Zhang, Zhiqiang Wang, Lurui Zhao, Wengang Wu
*Peking University, China*

**A3P-J3**
**A RELATIVE GRAVIMETER FEATURING A SUPERCONDUCTING PLANAR SPRING AND THE ELECTROMAGNETIC LEVITATION**
Sang Woo Lee[1], Myeong-Jong Yu[1], Chan Seok Kang[2], In Sun Kim[2]
*[1]Agency for Defense Development, Korea, South; [2]Korea Research Institute of Standards and Science, Korea, South*

**A3P-J4**
**MODAL COUPLING ERROR SUPPRESSION IN MICROMACHINED GYROSCOPES BY UV LASER TRIMMING**
Zhanqiang Hou, Xuezhong Wu, Dingbang Xiao, Songqi Hu, Xinghua Wang, Zhihua Chen
*National University of Defense Technology, China*

**A3P-J5**
**SOFT-MATTER ELECTRONICS WITH STENCIL LITHOGRAPHY**
James Wissman, Tong Lu, Carmel Majidi
*Carnegie Mellon University, United States*

**A3P-J6**
**A MINIATURIZED NON-RADIOACTIVE ELECTRON EMITTER INCLUDING A VACUUM PRESSURE GAUGE BASED ON ELECTRIC RETARDING FIELD ION CURRENTS**
Philipp Cochems, Daniel Mazarin, Stefan Zimmermann
*Leibniz University Hannover, Germany*

**A3P-J7**
**MAGNETIC TUNNEL JUNCTION (MTJ) SENSORS FOR INTEGRATED CIRCUITS (IC) ELECTRIC CURRENT MEASUREMENT**
Maria-Dolores Cubells[4], Càndid Reig[4], Andrea De Marcellis[3], Andrés Roldán[2], Juan-Bautista Roldán[2], Susana Cardoso[1], Paulo P. Freitas[1]
*[1]INESC-MN, Portugal; [2]University of Granada, Spain; [3]University of L'Aquila, Italy; [4]University of València, Spain*

**A3P-J8**
**A MICROMACHINED VIBRATING WHEEL GYROSCOPE WITH FOLDED BEAMS**
Qiancheng Zhao, Longtao Lin, Zhenchuan Yang, Liguo Dong, Guizhen Yan
*Peking University, China*

**A3P-J9**
**MULTILAYER GIANT MAGNETO-IMPEDANCE SENSOR FOR LOW FIELD SENSING**
Saman Nazari Nejad, Arash Akhavan Fomani, Raafat Mansour
*University of Waterloo, Canada*

**2:15 PM - 3:45 PM**
**A3P-K: OPTICAL SENSORS I**
**Poster Area - Baltimore AB**
**Session Chair: John X.J. Zhang (University of Texas at Austin, USA)**

**A3P-K1**
**C-REACTIVE PROTEIN APTASENSOR FOR EARLY SEPSIS DIAGNOSIS BY MEANS OF AN OPTICAL FIBER DEVICE**
Carlos Ruiz Zamarreño[1], Ignacio Ardaiz[1], Leyre Ruete[1], Francisco Muñoz[1,2], Ignacio Raul Matías[1], Francisco Javier Arregui[1]
*[1]Public University of Navarra (UPNA), Spain; [2]CSIC/GN, Spain*

**A3P-K2**
**LOW DRIFT AND HIGH RESOLUTION MINIATURE OPTICAL FIBER COMBINED PRESSURE- AND TEMPERATURE SENSOR FOR CARDIO-VASCULAR AND OTHER MEDICAL APPLICATIONS**
Sven Poeggel, Daniele Tosi, Gabriel Leen, Elfed Lewis
*University of Limerick, Ireland*

**A3P-K3**
**PALMTOP WAVEGUIDE-MODE SENSOR: COMPARISON OF SENSITIVITY AND SUBTYPING OF INFLUENZA VIRUSES WITH SPR, ELISA AND IMMUNOCHROMATOGRAPHY**
Koichi Awazu, Makoto Fujimaki, Subash C.B. Gopinath
*National Institute of Advanced Industrial Science and Technology (NIST), Japan*

**A3P-K4**
**MEASUREMENT OF PROJECTILE ATTITUDE ANGLES USING A LASER SCANNING SYSTEM**
Harbans Dhadwal, Jahangir Rastegar, Daichi Horimai, Neha Aggarwal
*Omnitek Partners, LLC, United States*

**A3P-K5**
**IDENTIFICATION OF ADULTERATED VEGETABLE COOKING OILS USING FLUORESCENCE QUENCHING METHOD WITH AQUEOUS CTAB-COATED CDSE/ZNS QUANTUM DOTS AS PROBES**
Lizhou Xu[3], Xiahong Xu[3], Hua Xiong[2], Lingxin Chen[1], Yanbin Li[3,4]
*[1]Chinese Academy of Sciences, China; [2]Nanchang University, China; [3]ZheJiang University, China; [4]University of Arkansas, China*

**A3P-K6**
**HUMAN AND VEHICLE CLASSIFICATION USING A PYROELECTRIC INFRARED DETECTOR**
Dongfeng Xie, Baoqing Li, Qianwei Zhou, Enliang Song, Xiaobing Yuan
*Shanghai Institute of Microsystem and Information Technology, China*

**A3P-K7**
**RAPID DETECTION OF ACRYLAMIDE IN FOOD USING A FLUORESCENT SENSING METHOD BASED ON FUNCTIONAL CDSE/ZNS QUANTUM DOTS**
Qinqin Hu[1], Xiahong Xu[1], Zhanming Li[1], Ying Zhang[1], Jianping Wang[1], Yanbin Li[1,2]
*[1]Zhejiang University, China; [2]University of Arkansas, United States*

**A3P-K8**
**DETECTION OF HOGWASH OIL IN CHINESE SOYBEAN OILS USING DUAL-BAND ABSORPTION MEASUREMENTS**
Anna Grazia Mignani[1], Leonardo Ciaccheri[1], Andrea Azelio Mencaglia[1], Jian Xing[2], Xing-Hua Yang[2], Weimin Sun[2], Libo Yuan[2]
*[1]CNR Istituto di Fisica Applicata "Nello Carrara", Italy; [2]Harbin Engineering University, China*

**A3P-K9**
**ADVANCED PLANAR-OPTICAL SPR BASED BIOSENSOR USING MAGNETIC-DIELECTRIC CORE-SHELL-PARTICLES AS MOBILE SUBSTRATE**
Toni Haugwitz, Niels Neumann, Tobias Schuster, Dirk Plettemeier
*Technische Universität Dresden, Germany*

**A3P-K10**
**NOVEL FIBER-OPTIC PROBE BASED ON SINGLE-MULTI-MODE FIBER COUPLER FOR FLUORESCENCE DETECTION**
Feng Long[1], Anna Zhu[2], Hanchang Shi[2]
*[1]Renmin University of China, China; [2]Tsinghua University, China*

**A3P-K11**
**DISPOSABLE AND MINIMAL INVASIVE OPTICAL FIBER SENSORS FOR THE MEASUREMENT OF PH AND DISSOLVED OXYGEN**
N. Deepa, U.V. Dharani Kumar, A. Balaji Ganesh
*Velammal Engineering College, India*

**A3P-K12**
**SELECTIVITY AND REUSABILITY STUDY OF FUNCTIONALIZED ALD TIO2 EVANESCENT WAVE SENSORS**
Agung Purniawan, Paddy French, Marinka Almering, Gregory Pandraud, Pasqualina M. Sarro
*Delft University of Technology, Netherlands*

**2:15 PM - 3:45 PM**
**A3P-L: SENSOR/ACTUATOR SYSTEMS**
**Poster Area - Baltimore AB**
**Session Chair: Gijs Krijnen (University of Twente, MESA+ Research Institute, The Netherlands)**

**A3P-L1**
**A LOW-POWER NEUROMORPHIC CMOS SENSOR CIRCUIT FOR THE IMPLANTED BIOMOLECULAR DETECTIONS**
Yang-Guo Li, Mohammad Haider
*University of Alabama at Birmingham, United States*

**A3P-L2**
**CONTACT SENSING IN A BIO-INSPIRED WHISKER DRIVEN BY ELECTROACTIVE POLYMER ARTIFICIAL MUSCLES**
Tareq Assaf, Jonathan Rossiter, Martin Pearson
*University of Bristol and University of West of England, United Kingdom*

**A3P-L3**
**INTEGRATED ELECTROCHEMICAL SENSOR BASED ON ELECTROWETTING-ON-DIELECTRIC MICROFLUIDIC CHIP**
Jianfeng Chen, Yuhua Yu, Jia Zhou
*Fudan University, China*

**A3P-L4**
**A NOVEL APPROACH FOR DROPLET POSITION SENSING IN ELECTROWETTING DEVICES**
Shiraz Sohail, Karabi Biswas
*Indian Institute of Technology, India*

**A3P-L5**
**TEST AND EVALUATION OF A SILICON RESONANT ACCELEROMETER IMPLEMENTED IN SOI TECHNOLOGY**
Guo-ming Xia, An-ping Qiu, Qin Shi, Yan Su
*Nanjing University of Science and Technology, China*

**A3P-L6**
**DEVELOPMENT OF A TRI-AXIS VORTEX CONVECTIVE GYROSCOPE WITH SUSPENDED SILICON THERMISTORS**
Honglong Chang, Pingwei Zhou, Xianghui Gong, Jianbing Xie, Weizheng Yuan
*Northwestern Polytechnical University, China*

**A3P-L7**
**NANO-PRECISION FORCE AND DISPLACEMENT MEASUREMENTS USING MEMS RESONANT STRUCTURES**
Emad Mehdizadeh[2], Xiaobo Guo[2], Siavash Pourkamali[2], Arash Hajjam[1], Amir Rahafrooz[1]
*[1]University of Denver, United States; [2]University of Texas at Dallas, United States*

**A3P-L8**
**QUANTUM DOTS/POLYMER COMPOSITE SYSTEM FOR TURN-ON FLUORESCENT DETECTION OF PEROXIDE HYDROGEN**
Defeng Zhu, Kangyi Hua, Qingguo He, Jiangong Cheng, Huimin Cao,
*Chinese Academy of Sciences, China*

**A3P-L9**
**SHAPED COMBS AND PARAMETRIC AMPLIFICATION IN INERTIAL MEMS SENSORS**
Mrigank Sharma, Elie Hanna Sarraf, Edmond Cretu
*University of British Columbia, Canada*

**A3P-L10**
**A TUNABLE HIGH PERFORMANCE MICROWAVE EQUALIZER BASED ON RF MEMS SWITCHES**
Lei Han, Wen Jiang, Yan-Qing Zhu, Ming-Xia Jiang
*Southeast University, China*

**A3P-L11**
**A ROBUST AND RELIABLE RF-MEMS SWITCH FABRICATED THANKS TO AN ORIGINAL DIELECTRIC FREE DESIGN AND AN INNOVATIVE PROCESS FLOW**
Frederic Souchon[1], Bruno Reig[1], Christel Dieppedale[1], Henri Sibuet[1], Benjamin Blampey[2], Jean-Marc Duchamp[2]
*[1]CEA-LETI, MINATEC Campus, France; [2]Grenoble INP, MINATEC Campus, France*

**A3P-L12**
**OPEN CAVITY SENSORS FOR ATTITUDE CONTROL USING A SCANNING REFERENCE SOURCE**
Harbans Dhadwal, Jahangir Rastegar
*Omnitek Partners, LLC, United States*

**A3P-L13**
**MULTILAYER SAW DEVICE FOR FLOW RATE SENSING IN A MICROFLUIDIC CHANNEL**
Bui Thu Hang, Chu Duc Trinh
*Vietnam National University, Vietnam*

**A3P-L14**
**3D PRINTED CAPACITIVE SENSORS**
Corey Shemelya, Fernando Cedillos, Efrain Aguilera, Elaine Maestas, Jorge Ramos, David Espalin, Dan Muse, Ryan Wicker, Eric Macdonald
*University of Texas at El Paso, United States*

**A3P-L15**
**A NEW CIRCUITAL SOLUTION FOR POWER HARVESTING FROM RANDOM AND LOW-AMPLITUDE VOLTAGES BY USING BISTABLE MECHANICAL SWITCH**
Fabio Giusa, Carlo Trigona, Bruno Andò, Salvatore Baglio
*Università degli Studi di Catania, Italy*

**A3P-L16**
**NOVEL SWITCHED CAPACITOR (SC) APPROACH BASED ON THE BISTABLE MECHANICAL SWITCHES**
Alessio Noto, Carlo Trigona, Bruno Andò, Salvatore Baglio
*Università degli Studi di Catania, Italy*

**A3P-L17**
**A 0.85%-PRECISION, 6-DECADE-RANGE, I2C -PROGRAMMABLE FRONT-END ASIC FOR RESISTIVE GAS-SENSOR ARRAYS WITH 20-INPUT ANALOG MUX, DIGITAL OUTPUT, AND 1.5°C-ACCURACY DYNAMIC TEMPERATURE SYNTHESIS**
Fabrizio Conso[2], Marco Grassi[2], Claudio De Berti[2], Piero Malcovati[2], Andrea Baschirotto[1]
[1]University of Milano - Bicocca, Italy; [2]University of Pavia, Italy

**A3P-L18**
**ELECTRICAL CHARACTERIZATION OF 26 X 26 GROUND REACTION SENSOR ARRAY INTERFACED WITH TWO PARALLEL ELECTRONIC DETECTION CHANNELS**
Qingbo Guo, Rajesh Surapaneni, Yu-Pin Hsu, Carlos Mastrangelo, Darrin Young
*University of Utah, United States*

**A3P-L19**
**A NOVEL SELF-CHARGING CAPACITIVE DETECTION SCHEME FOR MEMS SENSORS WITH IMPROVED TEMPERATURE ROBUSTNESS**
Dingbang Xiao, Xinghua Wang, Zhihua Chen, Xuezhong Wu, Zhanqiang Hou
*National University of Defense Technology, China*

**A3P-L20**
**TORWARDS A FULLY-INTEGRATED CMOS MICROCALORIMETER WITH ON-CHIP QUASI-DIGITAL OUTPUT SIGNAL**
Francisco Muñoz-Contreras[2], Jaume Verd[2], Jaume Segura[2], Arantxa Uranga[1], Martí Riverola[1], Núria Barniol[1]
*[1]Universitat Autònoma de Barcelona, Spain; [2]Universitat de les Illes Balears, Spain*

**A3P-L21**
**CAPACITIVE CONTROL OF AN ISFET USING DIELECTRIC COATED ELECTRODES**
Philip Gordon, Krishna Jayant, Joshua Phelps, Edwin Kan
*Cornell University, United States*

**A3P-L22**
**A CO-PLANAR, NEAR FIELD COMMUNICATION TELEMETRY LINK FOR A FULLY-IMPLANTABLE GLUCOSE SENSOR USING HIGH PERMEABILITY FERRITES**
Szymon Tankiewicz, Joshua Schaefer, Andrew Dehennis
*Senseonics, Incorporated, United States*

**A3P-L23**
**MINIATURIZED LOW COST WIRELESS DATA LOGGER FOR VIBRATION RECORDING OF PHYSIOLOGICAL ACTIVITIES**
Issa Jaafar, Zachary Czarnecki
*Assiniboine Community College, Canada*

**A3P-L24**
**NONINVASIVE CHARACTERIZATION OF GLUCOSE AQUEOUS SOLUTIONS BASED ON CONTINUOUS-WAVE PHOTOACOUSTIC TECHNIQUES: A PHANTOM-BASED APPROACH**
Serge Camou, D. Stevens, Y. Higuchi, H. Koizumi
*NTT Corp., Japan*

**A3P-L25**
**NONLINEAR MECHANICAL SENSITIVITY OF UN-SYMMETRICALLY LAYERED AND PRE-STRESSED PIEZOELECTRIC PLATE IN LARGE DEFLECTION DUE TO LATERAL LOAD**
Chun-Fu Chen, I-Wei Li
*Chung-Hua University, Taiwan*

---

**2:15 PM - 3:45 PM**
**A3P-M: OTHER SENSORS TOPICS I**
**Poster Area - Baltimore AB**
**Session Chairs: Christopher Salthouse (University of Massachusetts, Amherst, USA), Kenichi Takahata (University of British Columbia, Canada)**

---

**A3P-M1**
**DESIGN OF A DUAL-MODE 1.8 V 62 UW CMOS SENSOR INTERFACE FOR INKJET-PRINTED SENSOR**
Shenjie Wang, Francisco Molina-Lopez, Kerem Kapucu, Danick Briand, Catherine Dehollain
*École Polytechnique Fédérale de Lausanne, Switzerland*

**A3P-M2**
**BIO-MIMETIC STRATEGIES FOR TACTILE SENSING**
Wang Wei Lee, John-John Cabibihan, Nitish Thakor
*National University of Singapore, Singapore*

**A3P-M3**
**SMART IMAGE SENSING SYSTEM**
Jie Yang, Cong Shi, Zhongxiang Cao, Ye Han, Liyuan Liu, Nanjian Wu
*Chinese Academy of Sciences, China*

**A3P-M4**
**A READOUT CIRCUIT FOR WIRELESS PASSIVE RESONANT-CIRCUIT SENSORS**
Kaikai Bao, Deyong Chen, Qiang Shi, Jian Chen, Junbo Wang
*Chinese Academy of Sciences, China*

**A3P-M5**
**IMPROVING ENERGY EFFICIENCY IN SENSING SUBSYSTEMS VIA NEAR-THRESHOLD COMPUTING AND DEVICE AGING**
*James Bradley Wendt, Miodrag Potkonjak*
*University of California, Los Angeles, United States*

**A3P-M6**
**DIAGNOSIS SENSOR FUSION FOR WIRE FAULT LOCATION IN CAN BUS SYSTEMS**
Wafa Ben Hassen[1], Fabrice Auzanneau[1], François Pérès[2], Ayeley Tchangani[2]
*[1]CEA- LIST, France; [2]Université de Toulouse, France*

**A3P-M7**
**SIMULATION OF THE BOSCH PROCESS WITH THE NARROW BAND LEVEL SET METHOD**
Bei Chen, Zai-Fa Zhou, Xiaoqian Li, Qing-An Huang
*Southeast University, China*

**A3P-M8**
**ERROR MODEL FOR A SENSOR INTERFACE SYSTEM BASED ON THE 1ST ORDER DELTA-SIGMA MODULATOR DUE TO THE NONLINEARITY OF THE SENSOR**
Tommy Halim, Karsten Leitis
*Technische Hochschule Mittelhessen, Germany*

**A3P-M9**
**MILLIMETER-WAVE INTERFEROMETRIC IMAGING SENSORS**
Jeffrey Nanzer
*Johns Hopkins University, United States*

**A3P-M10**
**INTEGRATED SENSOR FOR SINGLE-PHOTON READOUT OF AVALANCHE DIODES IN STANDARD CMOS**
Babak Nouri, Pamela Abshire
*University of Maryland, United States*

**A3P-M11**
**PULSE WIDTH MODULATION CIRCUIT FOR ISFET DRIFT RESET**
Sahil Shah, Jennifer Blain Christen
*Arizona State University, United States*

**A3P-M12**
**A MIXED-SIGNAL LOW-COMPLEXITY CIRCUIT FOR ON-SENSOR COMPRESSION**
Suvradip Ghosh[2], Hsuan-Tsung Wang[2], Walter Leon-Salas[1]
*[1]Purdue University, United States; [2]University of Missouri-Kansas City, United States*

**A3P-M13**
**CMOS POTENTIOSTAT FOR CHEMICAL SENSING APPLICATIONS**
Tao Luo[1], Hongyi Wang[2], Hongjiang Song[1], Jennifer Blain Christen[1]
*[1]Arizona State University, United States; [2]Xi'an Jiaotong University, China*

**A3P-M14**
**A LOW-POWER, LOW-NOISE BIOINSPIRED BANDPASS BIOPOTENTIAL AMPLIFIER-FILTER BANK FOR IMPLANTABLE BIO-SENSOR**
Qingyun Ma, Mohammad Haider
*University of Alabama at Birmingham, United States*

**A3P-M15**
**FABRICATION OF Z-AXIS ACCELEROMETER WITH GALVANIC ETCH STOP AND ANTIFUSE ISOLATION**
Xiang Jiang, Heng Yang, Yanhong Wu, Xinxin Li, Yuelin Wang
*Chinese Academy of Sciences, China*

**A3P-M16**
**A TWO-DIMENSIONAL ULTRASONIC TRANSDUCER HAVING PLANAR BACKING ARRAY ELECTRODES**
Chang-Geun Ahn, Inbum Lee, Hyungwook Noh, Sooyeul Lee, Won Ick Jang, Bong Kyu Kim
*Electronics and Telecommunications Research Institute, Korea, South*

**A3P-M17**
**DESIGN OF CMOS CAPACITANCE TO FREQUENCY CONVERTER FOR HIGH-TEMPERATURE MEMS SENSORS**
Yucai Wang, Vamsy Chodavarapu
*McGill University, Canada*

**3:45 PM - 5:00 PM**
**A4L-A: GAS SENSORS II**
**Maryland F**
**Session Chairs: Hong Yu (Arizona State University, USA), Dae-sik Lee (ETRI, South Korea)**

**3:45 PM**
**DETECTING TRACE-LEVEL CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS WITH METAL OXIDE GAS SENSORS**
Marco Schüler[2], Nikolai Helwig[2], Andreas Schütze[2], Tilman Sauerwald[2], Gabriela Ventura[1]
*[1]Universidade do Porto, Portugal; [2]Saarland University, Germany*

**4:00 PM**
**DESIGNING CHEMICALLY SELECTIVE MICROSENSOR ARRAYS USING IONIC LIQUID DOPED IONOMERS**
Hwall Min, Gokhan Hatipoglu, Srinivas Tadigadapa
*Pennsylvania State University, United States*

**4:15 PM**
**CAVITY-ENHANCED MID-INFRARED ON-CHIP CHEMICAL SENSING USING HIGH-Q CHALCOGENIDE GLASS RESONATORS**
Hongtao Lin[2], Yesh Chillakuru[2], Kati McLaughlin[2], Lan Li[2], Yi Zou[2], Fei Deng[2], Chaoying Ni[2], Sylvain Danto[1], J. David Musgraves[3], Kathleen Richardson[1], Juejun Hu[2]
*[1]University of Central Florida, United States; [2]University of Delaware, United States, [3]IRradiance Glass Inc, United States*

**4:30 PM**
**DETECTING VOLATILE ORGANIC COMPOUNDS IN THE PPB RANGE WITH PLATINUM-GATE SIC-FIELD EFFECT TRANSISTORS**
Christian Bur[1], Mike Andersson[1], Anita Lloyd Spetz[1], Nikolai Helwig[2], Andreas Schütze[2]
*[1]Linköping University, Sweden; [2]Saarland University, Germany*

**4:45 PM**
**LOVE WAVE SENSOR BASED ON THIN FILM MOLECULARLY IMPRINTED POLYMER : MIP LAYER MORPHOLOGY AND NUCLEOSIDES ANALOGS DETECTION**
Nima Omar-Aouled[1], Hamida Hallil[1], Bernard Plano[1], Dominique Rebière[1], Corinne Dejous[1], Raphael Delépée[2], Luigi Agrofoglio[2]
*[1]Université Bordeaux, France; [2]University of Orléans, France*

**3:45 PM - 5:00 PM**
**A4L-B: BIOMOLECULAR**
**Maryland E**
**Session Chairs: Xinxin Li (Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, China), Alper Bozkurt (North Carolina State University, USA)**

**3:45 PM**
**A MICROFLUIDIC NANOSTRUCTURED FLUORESCENCE SENSOR FOR BIOMOLECULAR BINDING DETECTION**
Xiang Li, Haocheng Yin, Long Que
*Louisiana Tech University, United States*

**4:00 PM**
**A MICROFLUIDIC SENSOR OF BOTULINUM NEUROTOXIN TYPE A UTILIZING SNAP-25 INCORPORATED RESPONSIVE HYDROGEL**
Xiudong Wu, Chensha Li, Xuezhen Huang, Hongrui Jiang, Guangyun Lin, William Tepp, Eric A. Johnson
*University of Wisconsin-Madison, United States*

**4:15 PM**
**FLUORESCENT IMMUNOASSAY SYSTEM**
Xiaoqun Zhou[1], Weihua Hu[2], Changming Li[2]
*[1]Institute for Infocomm Research, Singapore; [2]Nanyang Technological University, Singapore*

**4:30 PM**
**DIRECT VISUALIZATION OF ELECTROGENIC BECTERIA IN A MICROFABRICATED MICROBIAL FUEL CELL**
Chunhui Dai, Simeng Chen, Arwa Fraiwan, Seokheun Choi
*State University of New York - Binghamton, United States*

**4:45 PM**
**AN AUTOMATED MINIATURIZED CREATININE SENSING SYSTEM**
Son Lai, David Gaddes, Srinivas Tadigadapa
*Pennsylvania State University, United States*

---

**3:45 PM - 5:00 PM**
**A4L-C: MAGNETIC SENSORS**
**Maryland A**
**Session Chairs: Oliver Brand (Georgia Institute of Technology USA), Jürgen Kosel (King Abudllah Univ. of Science & Technology, Saudi Arabia)**

---

**3:45 PM**
**FULLY SYMMETRIC VERTICAL HALL DEVICES IN CMOS TECHNOLOGY**
Christian Sander[2], Roiy Raz[2], Patrick Ruther[2], Oliver Paul[2], Timo Kaufmann[1], Martin Cornils[1], Maria-Cristina Vecchi[1]
*[1]Micronas GmbH, Germany; [2]IMTEK, Germany*

**4:00 PM**
**DUAL-CORE FLUXGATE GRADIOMETER WITH GRADIENT FEEDBACK**
Michal Janosek[2], Antonin Platil[2], Jan Vyhnanek[2], Jan Brinek[1]
*[1]Czech Space Research Centre Ltd., Czech Rep.; [2]Czech Technical University in Prague, Czech Rep.*

**4:15 PM**
**MAGNETIC FLUX MODULATION WITH A PIEZOELECTRIC SILICON BRIDGE FOR 1/F NOISE REDUCTION IN MAGNETORESISTIVE SENSORS**
Jiafei Hu, Wugang Tian, Hongfeng Pang, Jianqiang Zhao, Wenyin Li, Dixiang Chen, Mengchun Pan
*National University of Defense Technology, China*

**4:30 PM**
**AMR PROXIMITY SENSOR WITH INHERENT DEMODULATION**
Pavel Ripka, Jan Vyhnanek, Michal Janosek, Jan Vcelak
*Czech Technical University, Czech Republic*

**4:45 PM**
**OPTIMIZATION OF LORENTZ-FORCE MEMS MAGNETOMETERS USING RAREFIED-GAS-THEORY**
Attilio Frangi[1], Biagio De Masi[1], Giacomo Langfelder[1], Dario Paci[2]
*[1]Politecnico di Milano, Italy; [2]ST Microelectronics, Italy*

**3:45 PM - 5:00 PM**
**A4L-D: OPTICAL SENSORS FOR CHEMICAL ANALYSES**
**Maryland D**
**Session Chairs: Ignacio R. Matias (Universidad Publica de Navarra, Spain), Anna G. Mignani (CNR IFAC, Italy)**

**3:45 PM**
**HIGH SENSITIVITY OPTICAL FIBER PH SENSOR USING POLY(ACRYLIC ACID) NANOFIBERS**
Jesus Corres[2], Francisco Javier Arregui[2], Ignacio Raul Matías[2], Yoany Rodríguez[1]
*[1]University of Pinar del Rio, Cuba; [2]Public University of Navarra, Spain*

**4:00 PM**
**GRAVURE PRINTED PAPER BASED SUBSTRATE FOR DETECTION OF HEAVY METALS USING SURFACE ENHANCED RAMAN SPECTROSCOPY (SERS)**
Ali Eshkeiti, Morteza Rezaei, Binu Baby Narakathu, Sai Guruva Reddy Avuthu, Sepehr Emamian, Massood Zandi Atashbar
*Western Michigan University, United States*

**4:15 PM**
**RAMAN PROBE FOR THE SIMULTANEOUS MEASUREMENT OF ANION CONCENTRATION IN MIXTURES OF SALT SOLUTIONS**
Thomas H. Kauffmann, Kawther Ben Mabrouk, Marc D. Fontana
*University of Lorraine and Supélec, France*

**4:30 PM**
**OPTIMIZING SENSOR DESIGN FOR POLYMER FIBRE OPTIC OXYGEN SENSORS**
Rongsheng Chen[2], Hanne McPeak[2], Federico Formenti[2], Clive Hahn[2], Andrew Farmery[2], Andrew Obeid[1]
*[1]Oxford Optronix Ltd, United Kingdom; [2]University of Oxford, United Kingdom*

**4:45 PM**
**MICROFLUIDIC OPTOELECTRONIC SENSOR ARRAY FOR DETECTION OF DISSOLVED CO2 BASED ON HALOCROMIC DYE-DOPED POLYMERIC MICROBEADS**
Yael Zilberman, Shideh Kabiri Ameri, Sameer Sonkusale
*Tufts University, United States*

**3:45 PM - 5:00 PM**
**A4L-E: ACTUATOR SYSTEMS**
**Watertable ABC**
**Session Chairs: Gijs Krijnen (University of Twente, MESA+ Research Institute, The Netherlands), Oliver Paul (University of Freiburg - IMTEK, Germany)**

**3:45 PM**
**INVITED TALK: CMUT BASED CHEM/BIO SENSORS**
Pierre Khuri-Yakub
*Stanford University, United States*

**4:15 PM**
**MAGNETIC CIRCUITS BASED ON POLYMER COMPOSITES FOR CONTROLLED ACTUATION OF A FERROMAGNETIC SPHERE AT A MICROFLUIDIC JUNCTION**
Wolfgang Hilber, Stefan Clara, Bernhard Jakoby
*Johannes Kepler University Linz, Austria*

**4:30 PM**
**SMART PNEUMATIC ARTIFICIAL MUSCLE ACTUATOR WITH EMBEDDED MICROFLUIDIC SENSING**
Yong-Lae Park[1], Robert Wood[2]
*[1]Carnegie Mellon University, United States; [2]Harvard University, United States*

**4:45 PM**
**A NOVEL LOW-VOLTAGE LARGE-DISPLACEMENT BULK SILICON COMB-DRIVE ACTUATOR BASED ON POST-CMOS PROCESS**
Chun-Hua Cai, Ming Qin
*Southeast University, China*

---

**3:45 PM - 5:00 PM**
**A4L-F: MATERIALS & FABRICATION I**
**Homeland**
**Session Chairs: Eric Johnson (Clemson University, USA), Long Que (Louisiana Tech University, USA)**

---

**3:45 PM**
**INVITED TALK: MICROSYSTEMS FOR SENSING AND CHARACTERIZATION OF BACTERIAL BIOFILMS**
Reza Ghodssi, Mariana T. Meyer, Young W. Kim
*University of Maryland, United States*

**4:15 PM**
**MICROFABRICATION OF CAPACITIVE PRESSURE SENSORS USING FERROFLUID SACRIFICIAL LAYERS**
Babak Assadsangabi, Xing Chen, Daniel Brox, Kenichi Takahata
*University of British Columbia, Canada*

**4:30 PM**
**APPLICATION OF AEROSOL JET TECHNOLOGY IN THROUGH-VIA METAL INTERCONNECTION FOR MEMS WAFER-LEVEL PACKAGING**
Zhan Zhan, Mengyue Chen, Lingke Yu, Xiaochun Qiu, Jin Wei, Xiaoping Wang, Daoheng Sun, Lingyun Wang
*Xiamen University, China*

**4:45 PM**
**HOMOGENEOUS AND SHARP SI NANOPROBE ARRAY FABRICATED ON (111) SILICON WAFER**
Xiao Zhang, Xiao Yu, Yi Wang, Tie Li, Yuelin Wang
*Chinese Academy of Sciences, China*

**8:00 AM - 9:00 AM**
**Plenary – KEYNOTE – PROFESSOR ROBERT PUERS: IMPLANTABLE CHIPS & SENSORS: QUO VADIS?**
**Maryland BC**
**Session Chair: Robert Trew (North Carolina State University, USA)**

**8:00 AM**
**IMPLANTABLE CHIPS AND SENSORS: QUO VADIS?**
Robert Puers
*KULeuven, ESAT-MICAS, Belgium*

**9:00 AM - 10:15 AM**
**B1L-A: HUMIDITY SENSORS**
**Maryland F**
**Session Chair: Zheyao Wang (Tsinghua University, China)**

**9:00 AM**
**ELECTRICAL AND HUMIDITY-SENSING CHARACTERIZATION OF INKJET-PRINTED MULTI-WALLED CARBON NANOTUBES FOR SMART PACKAGING**
Yi Feng[1], Li Xie[1], Matti Mäntysalo[2], Qiang Chen[1], Li-Rong Zheng[1,3]
*[1]Royal Institute of Technology, Sweden; [2]Tampere University of Technology, Finland; [3]State Key Lab of ASICs and Systems, ICT School, China*

**9:15 AM**
**INKJET PRINTED HUMIDITY THRESHOLD MONITORING SENSOR SOLUTION WITH IRREVERSIBLE RESISTANCE CHANGE FOR PASSIVE RFID APPLICATIONS**
Sebastian Sauer[2], Alexander Türke[2], Andreas Weder[1], Wolf-Joachim Fischer[1]
*[1]Fraunhofer IPMS, Germany; [2]Technische Universität Dresden, Germany*

**9:30 AM**
**THE OPTIMIZED SAW HUMIDITY SENSOR WITH NANOFILMS OF GRAPHENE OXIDE**
Sergey Balashov, Olga Balachova, Ana Valéria Braga, Maria Cecilia Bazetto, Aristides Pavani Filho
*Center for Information Technology Renato Archer - CTI, Brazil*

**9:45 AM**
**FULLY PRINTED ORGANIC THIN FILM TRANSISTORS (OTFT) BASED FLEXIBLE HUMIDITY SENSORS**
Sai Guruva Reddy Avuthu, Binu Baby Narakathu, Ali Eshkeiti, Bradley Bazuin, Margaret Joyce, Massood Zandi Atashbar
*Western Michigan University, United States*

**10:00 AM**
**SENSITIVITY, SELECTIVITY AND NANO-DIMENSIONAL EFFECTS IN GOLD NANOCLUSTER VAPOR SENSORS**
Arthur Snow, Mario Ancona
*Naval Research Laboratory, United States*

**9:00 AM - 10:15 AM**
**B1L-B: INTERFACE**
**Maryland E**
**Session Chairs: Tony Jun Huang (Pennsylvania State University, USA), Joannis Raptis (NCSR Demokritos, Greece)**

**9:00 AM**
**CHANNEL LENGTH DEPENDENT SENSOR RESPONSE OF SCHOTTKY-BARRIER FET PH SENSORS**
Sebastian Pregl[1,2], Felix Zörgiebel[2], Larysa Baraban[2], Gianaurelio Cuniberti[2], Thomas Mikolajick[1,2], Claudia Richter[1], Walter Weber[1]
*[1]Namlab GmbH, Germany; [2]Technische Universität Dresden, Germany*

**9:15 AM**
**THE DNA TRANSISTOR INTERFACE: THE INTERPLAY BETWEEN PH, ELECTRIC FIELD AND MEMBRANE SCREENING DICTATES SENSITIVITY**
Krishna Jayant, Kshitij Auluck, Edwin Kan
*Cornell University, United States*

**9:30 AM**
**A MICRO-FABRICATED NON-ENZYMATIC URINE GLUCOSE SENSOR USING NAFION COATED NANOPOROUS PT COMPOSITE ELECTRODES**
Su Jin Lee, Yijae Lee, Jae Young Park
*Kwangwoon University, Korea, South*

**9:45 AM**
**MAMMARY CANCER CELL MANIPULATION WITH EMBEDDED PASSIVATED-ELECTRODE INSULATOR-BASED DIELCTROPHORESIS (EPIDEP)**
Tyler Shake, Vaishnavi Srinivasaraghavan, Phillip Zellner, Masoud Agah
*Virginia Tech, United States*

**10:00 AM**
**THREE STAGE SAMPLE PREPARATION FOR PURIFICATION OF PROTEINS FROM COMPLEX BIOLOGICAL SAMPLES**
Mehdi Javanmard, Sam Emaminejad, Ron Davis, Chaitanya Gupta, Roger Howe
*Stanford University, United States*

**9:00 AM - 10:15 AM**
**B1L-C: ACOUSTIC SENSORS**
**Maryland A**
**Session Chairs: Geoffrey Cranch (Naval Research Laboratory, USA), Gijs Krijnen (University of Twente, MESA+ Research Institute, The Netherlands)**

**9:00 AM**
**A THREE PZT SETUP FOR DETERMINING PHYSICAL LIQUID PROPERTIES UTILIZING ACOUSTIC PRESSURE WAVES**
Hannes Antlinger[1], Stefan Clara[1], Bernhard Jakoby[1], Roman Beigelbeck[2], Samir Cerimovic[2], Franz Keplinger[2]
*[1]Johannes Kepler University, Austria; [2]Vienna University of Technology, Austria*

**9:15 AM**
**A TWO-STAGE AEROSOL IMPACTOR WITH EMBEDDED MEMS RESONANT MASS BALANCES FOR PARTICULATE SIZE SEGREGATION AND MASS CONCENTRATION MONITORING**
Emad Mehdizadeh[2], Varun Kumar[2], Siavash Pourkamali[2], Jonathan Gonzales[1], Reza Abdolvand[1]
*[1]Oklahoma State University, United States; [2]University of Texas at Dallas, United States*

**9:30 AM**
**A CROSSED-WIRE 2-DIMENSIONAL ACOUSTIC PARTICLE VELOCITY SENSOR**
Olti Pjetri, Remco J Wiegerink, Theo S. J Lammerink, Gijs J.M Krijnen
*University of Twente, Netherlands*

**9:45 AM**
**DUAL HIGH-FREQUENCY SURFACE ACOUSTIC WAVE RESONATOR FOR ULTRAFINE PARTICLE SENSING**
Sanju Thomas, Zoltán Rácz, Marina Cole, Julian Gardner
*University of Warwick, United Kingdom*

**10:00 AM**
**MINIATURIZATION OF ACOUSTIC VECTOR SENSORS ENABLED BY VISCOUS FLUIDS: TOWARDS FIBER LASER HAIR SENSORS**
Janet Lou[1], Geoffrey Cranch[2], Gary Miller[2], Clay Kirkendall[2]
*[1]Sotera Defense Solutions, Inc., United States; [2]US Naval Research Laboratory, United States*

---

**9:00 AM - 10:15 AM**
**B1L-D: ELECTROMAGNETIC SENSORS & PHENOMENA**
**Maryland D**
**Session Chair: Harrie Tilmans (Imec, Belgium)**

---

**9:00 AM**
**INVITED TALK: MULTI-SENSOR DATA INTEGRATION FOR PERSONAL NAVIGATION**
Tamal Mukherjee
*Carnegie Mellon University, United States*

**9:30 AM**
**NUMERICAL MODELING OF THE ELECTROMAGNETIC COUPLING EFFECTS FOR PHASE ERROR CORRECTION IN EIT BOREHOLE MEASUREMENT**
Yulong Zhao[1], Egon Zimmermann[1], Sander Huisman[1], Andrea Treichel[1], Bernd Wolters[1], Stefan van Waasen[1], Andreas Kemna[2]
*[1]Forschungszentrum Jülich GmbH, Germany; [2]University of Bonn, Germany*

**9:45 AM**
**ASSESSMENT OF THE SPINNING-CURRENT EFFICIENCY IN CANCELLING THE 1/F NOISE OF VERTICAL HALL DEVICES THROUGH ACCURATE FEM MODELING**
Morgan Madec, Laurent Osberger, Luc Hébrard
*University of Strasbourg - CNRS, France*

**10:00 AM**
**THE MULTIPOLE RESONANCE PROBE: EVOLUTION OF A PLASMA SENSOR**
Christian Schulz, Ilona Rolfes, Tim Styrnoll, Peter Awakowicz, Jens Oberrath, Thomas Mussenbrock, Ralf Peter Brinkmann, Robert Storch, Thomas Musch
*Ruhr-University Bochum, Germany*

---

**9:00 AM - 10:15 AM**
**B1L-E: WIRELESS SENSOR NETWORKS FOR HEALTH I**
**Watertable ABC**
**Session Chair: Tracie Severson (US Naval Academy, USA)**

---

**9:00 AM**
**INVITED TALK: IN-SITU SOIL MOISTURE SENSING: FROM PHYSICAL MODELS TO OPTIMAL CONTROL TO SYSTEM DEPLOYMENT**
Mingyan Liu
*University of Michigan, United States*

**9:30 AM**
**WIDE AND HIGH ACCESSIBLE MOBILE HEALTHCARE SYSTEM IN IP-BASED WIRELESS SENSOR NETWORKS**
Sang-Joong Jung, Wan-Young Chung
*Pukyong National University, Korea, South*

**9:45 AM**
**RECONFIGURABLE DIFFERENTIAL ACCELEROMETER PLATFORM FOR INERTIAL BODY SENSOR NETWORKS**
Jiaqi Gong, John Lach
*University of Virginia, United States*

**10:00 AM**
**A NON-CONTACT WEARABLE WIRELESS BODY SENSOR NETWORK FOR MULTIPLE VITAL SIGNAL DETECTION**
Ye Sun, Junliang Tao, Guangxi Wu, Xiong Yu
*Case Western Reserve University, United States*

---

**9:00 AM - 10:15 AM**
**B1L-F: INDUSTRIAL & ENVIRONMENTAL**
**Homeland**
**Session Chair: Thilo Sauter (Danube University Krems, Austria)**

---

**9:00 AM**
**A PORTABLE MULTI-MEGABIT OPTICAL FIBRE SONAR SENSOR SYSTEM**
Ching Man[1], Brian Moss[1], Elfed Lewis[3], Rodney Coates[2]
*[1]Analog Devices, Ireland; [2]Seiche Ltd, United Kingdom; [3]University of Limerick, Ireland*

**9:15 AM**
**LARGE ANIMAL DETECTION AND CONTINUOUS TRAFFIC MONITORING ON HIGHWAYS**
Abir Mukherjee, Svetlana Stolpner, Xia Liu, Ulsi Vrenozaj, Chuhong Fei, Abhijit Sinha
*A.U.G. Signals Ltd., Canada*

**9:30 AM**
**SYSTEM FOR OXYGEN MEASUREMENTS IN A FISH FARM**
Ruby Ghosh, Reza Loloee
*Michigan State University, United States*

**9:45 AM**
**MEMS HARSH ENVIRONMENT SENSOR ARRAY-ENABLED HOT SPRING MAPPING**
Jonathon Oiler, Everett Shock, Hilairy Hartnett, Hongyu Yu
*Arizona State University, United States*

**10:00 AM**
**A MEASURING METHOD FOR THE MASS FLOW DETERMINATION IN A PNEUMATIC CONVEYING SYSTEM**
Christoph Baer[2], Philipp Mertmann[2], Thomas Musch[2], Timo Jaeschke[2], Nils Pohl[1]
*[1]Fraunhofer FHR, Germany; [2]Ruhr-University Bochum, Germany*

---

**10:45 AM - 12:00 PM**
**B2L-A: LIQUID BASED SENSORS**
**Maryland F**
**Session Chair: James Stephen (Cranfield University, UK)**

---

**10:45 AM**
**MEMS BASED MICROSTRUCTURE ARRAY DESIGN AND ITS QUANTITATIVE ANALYSIS OF MICROPRECONCENTRATOR FOR CANCER BIOMARKER DIAGNOSIS**
Naoki Kakita[2], Hidetoshi Miyashita[2], Satoru Kishida[2], Jeong-O Lee[1], Sang-Seok Lee[2]
*[1]Korea Research Institute of Chemical Engineering, Korea, South; [2]Tottori University, Japan*

**11:00 AM**
**CANTILEVER-BASED RESONANT GAS SENSORS WITH INTEGRATED RECESSES FOR LOCALIZED SENSING LAYER DEPOSITION**
Christopher Carron[1], Patrick Getz[1], Jin-Jyh Su[1], David Gottfried[1], Oliver Brand[1], Fabien Josse[2], Stephen Heinrich[2]
*[1]Georgia Institute of Technology, United States; [2]Marquette University, United States*

**11:15 AM**
**TUNGSTEN OXIDE NANOWIRE SENSORS GROWN BY COLD WALL REACTOR AEROSOL ASSISTED CHEMICAL VAPOUR DEPOSITION**
Fatima-Ezahra Annanouch[2], Eduard Llobet[2], Russell Binions[1]
*[1]Queen Mary, University of London, United Kingdom; [2]Universitat Rovira I Virgili, Spain*

**11:30 AM**
**OPTO-ELECTROCHEMICAL BASED DUAL DETECTION OF HEAVY METAL COMPOUNDS USING A NOVEL FLOW CELL**
Binu Baby Narakathu, Sai Guruva Reddy Avuthu, Ali Eshkeiti, Bradley Bazuin, Massood Zandi Atashbar
*Western Michigan University, United States*

**11:45 AM**
**TIN DIOXIDE NANO-WIRE DEVICE FOR SENSING KINETICS OF ACETONE AND ETHANOL TOWARDS DIABETES MONITORING**
Bonex Mwakikunga[1,4], Suprakas Ray[1], Malose Mokwena[2], John Dewar[2], Irina Geibelhaus[3], Trilok Singh[3], Thomas Fischer[3], Sanjay Mathur[3]
*[1]DST/CSIR National Centre for Nano-Structured Materials, South Africa; [2]University of South Africa, South Africa; [3]University of Cologne, Germany; [4]University of Malawi – The Polytechnic*

---

**10:45 AM - 12:00 PM**
**B2L-B: MECHANICAL**
**Maryland E**
**Session Chairs: Dae-sik Lee (ETRI, South Korea), Geunbae Lim (Pohang University of Science & Technology, South Korea)**

---

**10:45 AM**
**OSCILLATION-BASED TEST APPLIED TO CELL CULTURE MONITORING**
Gloria Huertas[1], Andrés Maldonado[1], Alberto Yúfera[1,2], Adoración Rueda[1], José Luis Huertas[1]
*[1]Instituto de Microelectronica de Sevilla, CSIC, Spain; [2]Universidad de Sevilla*

**11:00 AM**
**DETECTION OF INTERACTION BETWEEN BIOLOGICAL PROTEINS AND IMMOBILIZED LIPOSOMES BY A MICRO-CANTILEVER WITH NICR THIN FILM STRAIN GAUGE**
Masayuki Sohgawa[2], Takashi Fujimoto[1], Keisuke Takada[1], Kaoru Yamashita[1], Minoru Noda[1]
*[1]Kyoto Institute of Technology, Japan; [2]Niigata University, Japan*

**11:15 AM**
**A NOVEL, MULTIPARAMETRIC, FLEXIBLE MICROSENSOR FOR METABOLIC MONITORING IN VIVO**
Andreas Weltin, Barbara Enderle, Jochen Kieninger, Gerald Urban
*University of Freiburg, IMTEK, Germany*

**11:30 AM**
**MEMS BASED BLOOD PLASMA VISCOSITY SENSOR WITHOUT ELECTRICAL CONNECTIONS**
Onur Cakmak[2], Erhan Ermek[2], Hakan Urey[2], Goksenin G. Yaralioglu[3], Necmettin Kilinc[1]
*[1]Gebze Institute of Technology, Turkey; [2]Koc University, Turkey; [3]Ozyegin University, Turkey*

**11:45 AM**
**A NEW NON-INVASIVE CUFF-LESS BLOOD PRESSURE SENSOR**
Tse-Yi Tu[2], Paul C.-P. Chao[2], Yung-Pin Lee[1]
*[1]MedSense Inc., Taiwan; [2]National Chaio Tung University, Taiwan*

**10:45 AM - 12:00 PM**
**B2L-C: TACTILE SENSORS**
**Maryland A**
**Session Chairs: Rajanna Konandur (Indian Institute of Science, India), Siavash Pourkamali (University of Texas at Dallas, USA)**

**10:45 AM**
**INVITED TALK: CMOS TACTILE SENSOR SYSTEMS**
Patrick Ruther[1], Felix Becker[1], Matthias Herrmann[1], Christian Sander[1], Falco Schmidt[2], Bernd Lapatki[2], Oliver Paul[1]
*[1]University of Freiburg, Germany; [2]University of Ulm, Germany*

**11:15 AM**
**LARGE AREA ALL-ELASTOMER CAPACITIVE TACTILE ARRAYS**
Peter Block, Sarah Bergbreiter
*University of Maryland, United States*

**11:30 AM**
**A VERY HIGH DENSITY FLOATING ELECTRODE FLEXIBLE SENSOR ARRAY FOR HIGH-RESOLUTION MEASUREMENTS OF CONTACT FORCES**
Rajesh Surapaneni, Qingbo Guo, Darrin Young, Carlos Mastrangelo
*University of Utah, United States*

**11:45 AM**
**SELF-POWERED, TACTILE PRESSURE SENSING SKIN USING CRYSTALLINE ZNO NANOROD ARRAYS FOR ROBOTIC APPLICATIONS**
Bhargav Nabar, Zeynep Celik-Butler, Donald P. Butler
*University of Texas at Arlington, United States*

**10:45 AM - 12:00 PM**
**B2L-D: SENSORS PHENOMENA**
**Maryland D**
**Session Chairs: Luc Hebrard (CNRS - ICube, France), Venkata Chivukula (RF Micro Devices, USA)**

**10:45 AM**
**META-MATERIALS APPROACH TO SENSITIVITY ENHANCEMENT OF MEMS BAW RESONANT SENSORS**
Xavier Rottenberg[2], Roelof Jansen[2], Vladimir Cherman[2], Ann Witvrouw[2], Harrie Tilmans[2], Mohamed Zanaty[3], Ahmed Khaled[3], Mohammed Abbas[1]
*[1]Assiut University, Egypt; [2]Imec, Belgium; [3]CENA, Belgium*

**11:00 AM**
**NONLINEAR ANALYSIS OF ELECTROTHERMAL POSITION SENSORS WITH CONTOURED HEATERS**
Ali Bazaei, Anthony G. Fowler, S.O. Reza Moheimani
*University of Newcastle, Australia*

**11:15 AM**
**OPTIMISATION OF A TOMOGRAPHY SENSOR FOR IMAGING OF TEMPERATURE IN A GAS TURBINE ENGINE**
Michael Wood, Krikor Ozanyan
*University of Manchester, United Kingdom*

**11:30 AM**
**PROPOSAL OF ADVANCED NONLINEAR SIGNAL MODEL TO ANALYZE PHOTOPLETHYSMOGRAM SIGNALS**
Hajime Ozaki, Yasuhisa Omura
*Kansai University, Japan*

**11:45 AM**
**ULTRASONIC FLOW MEASUREMENT BY TRACKING STREAMLINES IN PIPES**
Manuel Haide
*University of Applied Sciences, Germany*

---

**10:45 AM - 12:00 PM**
**B2L-E: WIRELESS SENSOR NETWORKS FOR HEALTH II**
**Watertable ABC**
**Session Chairs: Elfed Lewis (University of Limerick, Ireland), Paddy French (TU Delft, The Netherlands)**

---

**10:45 AM**
**DEVELOPMENT OF A POTENTIALLY IMPLANTABLE PRESSURE SENSING PLATFORM WITH RFID INTERFACE**
Michele Caldara, Benedetta Nodari, Valerio Re
*University of Bergamo, Italy*

**11:00 AM**
**ULTRA LOW POWER CH4 MONITORING WITH WIRELESS SENSORS**
Maurizio Rossi, Davide Brunelli
*University of Trento, Italy*

**11:15 AM**
**WIRELESS SENSOR NETWORK FOR STRUCTURAL HEALTH MONITORING USING SYSTEM-ON-CHIP WITH ANDROID SMARTPHONE**
Won-Jae Yi, Spenser Gilliland, Jafar Saniie
*Illinois Institute of Technology, United States*

**11:30 AM**
**MULTI-AGENT BASED WIRELESS PYROELECTRIC INFRARED SENSOR NETWORKS FOR MULTI-HUMAN TRACKING AND SELF-CALIBRATION**
Jiang Lu, Jiaqi Gong, Qi Hao, Fei Hu
*University of Alabama, United States*

**11:45 AM**
**TOWARDS THE WORLD SMALLEST WIRELESS SENSOR NODES WITH LOW POWER CONSUMPTION FOR 'GREEN' SENSOR NETWORKS**
Jian Lu[1,2], Hironao Okada[1,2], Toshihiro Itoh[1,2], Ryutaro Maeda[1,2], Takeshi Harada[2]
*[1]National Institute of Advanced Industrial Science and Technology, Japan; [2]NMEMS Technology Research Organization, Japan*

**10:45 AM - 12:00 PM**
**B2L-F: MICROSYSTEMS APPLICATIONS**
**Homeland**
**Session Chair: Alper Bozkurt (North Carolina State University, USA)**

**10:45 AM**
**MICROFLUIDIC DEVICE FOR TRIGGERED CHIP TRANSIENCE**
Niladri Banerjee, Yan Xie, Hanseup Kim, Carlos Mastrangelo
*University of Utah, United States*

**11:00 AM**
**MICROFABRICATED TWO-DIMENSIONAL (2D) HEXAGONAL LATTICE TRAP**
Hwanjit Rattanasonti[1], Prasanna Srinivasan[1], Michael Kraft[1], Robin Sterling[2], Sebastian Weidt[2], Kimberley Lake[2], Simon Webster[2], Winfried Hensinger[2]
*[1]University of Southampton, United Kingdom; [2]University of Sussex, United Kingdom*

**11:15 AM**
**DURABLE AND COST-EFFECTIVE 3-D MICROFORCE SENSOR FOR MUSICAL TUNING ENHANCED MICRO PALPATION OF BIOLOGICAL ENTITIES**
Yudong Luo, Yantao Shen, Nithya Mohan
*University of Nevada, Reno, United States*

**11:30 AM**
**FACTORS AFFECTING BLIND LOCALIZATION OF A GLASS MICROPIPETTE USING A HIGH-DENSITY MICROELECTRODE ARRAY**
Marie Engelene Obien[2], Andreas Hierlemann[1], Urs Frey[1,2]
*[1]ETH Zürich, Switzerland; [2]RIKEN, Japan*

**11:45 AM**
**DROPLET MIXING AND LIQUID PROPERTY TRACKING USING AN ELECTRODYNAMIC PLATE RESONATOR**
Erwin K. Reichel, Martin Heinisch, Bernhard Jakoby
*Johannes Kepler University, Austria*

**2:00 PM - 3:30 PM**
**B3P-G: CHEMICAL & GAS SENSORS IV**
**Poster Area - Baltimore AB**
**Session Chair: Bassam Alfeeli (Kuwait Institute for Scientific Research, Kuwait)**

**B3P-G1**
**INKJET PRINTED ELECTRODES FOR DETERMINATION OF SULFUR DIOXIDE AND ASCORBIC ACID IN WINE**
Marion Schneider[1], Alexander Türke[1], Wolf-Joachim Fischer[1], Paul Kilmartin[2]
*[1]Technische Universität Dresden, Germany; [2]University of Auckland, New Zealand*

**B3P-G2**
**FABRICATION OF PH-SENSING IRIDIUM OXIDE NANOTUBES ON PATTERNED ELECTRODES USING ANODIC ALUMINUM OXIDE NANOTEMPLATE**
Cuong Nguyen, Indra Gurung, Hung Cao, Smitha Rao, Jung-Chih Chiao
*University of Texas at Arlington, United States*

**B3P-G3**
**A NOVEL ELECTROCHEMICAL SYNTHESIS ROUTE FOR COPPER NANOWIRE FORMATION**
Cindy Schmädicke[1], Markus Pötschke[1], Lars David Renner[1], Gianaurelio Cuniberti[2]
*[1]Technische Universität Dresden, Germany; [2]POSTECH*

**B3P-G4**
**WIRELESS AND PORTABLE SENSOR SYSTEM TO DIFFERENTIATE MUSTS OF DIFFERENT GRAPE VARIETIES AND DEGREE OF GRAPE RIPENESS**
Manuel Aleixandre[1], Enrique Montero[1], Jose Pedro Santos[1], Isabel Sayago[1], María Del Carmen Horrillo[1], Juan Mariano Cabellos[2], Teresa Arroyo[2]
*[1]ITEFI-CSIC, Spain; [2]IMIDRA, Spain*

**B3P-G5**
**A CMOS PLATFORM FOR THE INTEGRATION OF HETEROGENEOUS ARRAYS OF CARBON NANOTUBES AND GRAPHENE CHEMIRESISTORS**
Samuel MacNaughton, Sameer Sonkusale
*Tufts University, United States*

**B3P-G6**
**TEMPERATURE-CONTROLLED ELECTROCHEMICAL MICROWELL PLATFORM FOR STUDYING BIOMOLECULAR INTERACTIONS**
Zuliang Shen[2], Herman Sintim[2], Steve Semancik[1]
*[1]National Institute of Standards and Technology, United States; [2]University of Maryland, United States*

**B3P-G7**
**SELF-TUNING POROUS SILICON CHEMITRANSISTOR GAS SENSORS**
Giovanni M Lazzerini, Lucanos M Strambini, Giuseppe Barillaro
*Università di Pisa, Italy*

**B3P-G8**
**IN-SITU GROWN CARBON NANOTUBES FOR ENHANCED CO2 DETECTION IN NON-DISPERSIVE-INFRA-RED SYSTEM**
Andrea De Luca[2], Zoltan Rácz[4], Matthew Cole[2], Zeeshan Ali[1], Florin Udrea[1,2], Julian Gardner[4], William Milne[2,3]
*[1]Cambridge CMOS Sensors Ltd, United Kingdom; [2]University of Cambridge, United Kingdom; [3]Kyung Hee University, United Kingdom; [4]University of Warwick, United Kingdom*

**B3P-G9**
**A LOW-COST, FLEXIBLE ELECTROCHEMICAL SENSOR FOR MONITORING SILVER ION CONCENTRATION IN ALGINATE WOUND DRESSINGS**
Rahim Rahimi, Manuel Ochoa, Babak Ziaie
*Purdue University, United States*

**B3P-G10**
**EXTENDING UPPER CUTOFF FREQUENCY OF ELECTROCHEMICAL SEISMOMETER BY USING EXTREMELY THIN SU8 INSULATING SPACERS**
Wentao He, Deyong Chen, Junbo Wang, Jian Chen, Tao Deng
*Chinese Academy of Sciences, China*

**B3P-G11**
**NOVOLAC-MODIFIED SELF-SENSING PIEZOELECTRIC MICROCANTILEVER GAS SENSOR**
Masoud Khabiry, Nader Jalili, Srinivas Sirdhar
*Northeastern University, United States*

**2:00 PM - 3:30 PM**
**B3P-H: BIOSENSORS II**
**Poster Area - Baltimore AB**
**Session Chairs: Yu-Cheng Lin (National Cheng Kung University, Taiwan), Hongrui Jiang (University of Wisconsin, USA)**

**B3P-H1**
**WATER TOXICITY DETECTION USING CELL-BASED HYBRID BIOSENSORS**
Fei Liu[1], Ioana Voiculescu[1], Anis Nurashikin Nordin[2], Fang Li[3]
*[1]City College of New York, United States; [2]International Islamic University Malaysia, Malaysia; [3]New York Institute of Technology, United States*

**B3P-H2**
**HRP BIOSENSOR BASED ON CARBONIZED MAIZE TASSEL-MWNTS MODIFIED ELECTRODE FOR THE DETECTION OF DIVALENT TRACE METAL IONS**
Mambo Moyo[2], Jonathan Okonkwo[2], Nana Agyei[1]
*[1]University of Limpopo, South Africa; [2]Tshwane University of Technology, South Africa*

**B3P-H3**
**A CONFORMAL SENSOR FOR WIRELESS SWEAT LEVEL MONITORING**
Pinghung Wei, Briana Morey, Timothy Dyson, Nick McMahon, Yung-Yu Hsu, Sasha Gazman, Lauren Klinker, Barry Ives, Kevin Dowling, Conor Rafferty
*MC10 Inc., United States*

**B3P-H4**
**PRECISION TRANSDUCER FOR FLUORESCENCE-BASED IMMUNOASSAYS**
Arash Ghadar, Julian Gardner, Chris Dowson
*University of Warwick, United Kingdom*

**B3P-H5**
**APPLICATION OF CHEMILUMINESCENCE INVOLVING FLOW INJECTION ANALYSIS TO DETERMINATION OF GLUCOSE, GLUTAMIC ACID AND LACTIC ACID FOR FOOD ANALYSIS**
Xin Wang[1], Naoko Ishii[3], Ming Ye[1], Munkhbayar Munkhjargal[1], Kumiko Miyajima[1], Takahiro Arakawa[1], Hirokazu Saito[2], Hiroyuki Kudo[1], Hideaki Endo[3], Kohji Mitsubayashi[1]
*[1]Tokyo Medical and Dental University, Japan; [2]Tokyo National College of Technology, Japan; [3]Tokyo University of Marine Science and Technology, Japan*

**B3P-H6**
**IMPLANTABLE SIC BASED RF ANTENNA BIOSENSOR FOR CONTINUOUS GLUCOSE MONITORING**
Shamima Afroz, Sylvia Thomas, G. Mumcu, S.E. Saddow
*University of South Florida, United States*

**B3P-H7**
**SLOPE AND CANTILEVER TYPE ELECTRODE FABRICATION FOR MEASUREMENT OF NEUROSPHEROID SIGNAL**
Ju-Young Jin[1], Boo-Yong Lee[1], Jin You[1], Jinseok Kim[1], Jungyul Park[4], Yu-Shik Hwang[2], Kukjin Chun[3]
*[1]Korea Institute of Science and Technology, Korea, South; [2]Kyung Hee University, Korea, South; [3]Seoul National University, Korea, South; [4]Sogang University, Korea, South*

**B3P-H8**
**ULTRA LOW POWER WIRELESS ECG SENSOR TAG WITH WEARABLE ANTENNA**
Hitoshi Kitayoshi, Kunio Sawaya, Hiroki Kuwano
*Tohoku University, Japan*

**B3P-H9**
**TERAHERTZ CONICAL HORN WAVEGUIDE COUPLER FOR SPECTROSCOPIC ANALYSIS OF BIOMATERIALS**
Weidong Zhang, Elliott Brown, Leamon Viveros
*Wright State University, United States*

**B3P-H10**
**LIQUID HEATING CAN CAUSE DENATURATION OF SENSING LAYER IN SAW BIOSENSORS**
Kamlesh Suthar[1], Subramanian Sankaranarayanan[1], Mandek Richardson[2], Venkat Bhethanabotla[2]
*[1]Argonne National Laboratory, United States; [2]University of South Florida, United States*

**B3P-H11**
**PHOTOMETRIC APTASENSOR USING BIOFUNCTIONALIZED PHOTONIC CRYSTAL SLABS**
Sabrina Jahns, Yousef Nazirizadeh, Björn-Ole Meyer, Martina Gerken, Sören Gutekunst, Christine Selhuber-Unkel
*Christian-Albrechts-Universität zu Kiel, Germany*

**B3P-H12**
**DIELECTRIC CHARACTERIZATION OF IMATINIB RESISTANT K562 LEUKEMIA CELLS THROUGH ELECTROROTATION WITH 3-D ELECTRODES**
Garsha Bahrieh, Hatice Ceylan Koydemir, Murat Erdem, Ebru Özgür, Ufuk Gündüz, Haluk Külah
*Middle East Technical University (METU), Turkey*

**B3P-H13**
**ENZYME BIOTRANSDUCERS FORMED FROM CONDUCTIVE ELECTROACTIVE POLYMERS**
Guneet Bedi, Christian Kotanen, Olukayode Karunwi, Amanda Nguyen, Ferhat Bayram, Brian Hudson, Yu Zhao, Anthony Guiseppi-Elie
*Clemson University, United States*

**B3P-H14**
**ORGANOPHOSPHATE PESTICIDES DETERMINATION BASED ON LABEL-FREE LOCALIZED SURFACE PLASMON RESONANCE**
Jie-Hui Li, Hong-Yan Dou, Xin-Ming Ji
*Fudan University, China*

**B3P-H15**
**EFFECTS OF ACID OXIDATION ON CARBON NANOTUBE BASED ELECTRODES FOR DETECTION OF OXIDIZED LDL**
Seiji Takeda, Toshihiro Sakurai, Futaba Ohkawa, Shigeki Jin, Shu-Ping Hui, Hirotoshi Fuda, Koichi Mukasa, Hitoshi Chiba, Kazuhisa Sueoka
*Hokkaido University, Japan*

**2:00 PM - 3:30 PM**
**B3P-J: PIEZOELECTRIC, TACTILE & PRESSURE SENSORS**
**Poster Area - Baltimore AB**
**Session Chairs: Christian Zorman (Case Western Reserve University, USA), Libor Rufer (TIMA Laboratory, France)**

**B3P-J1**
**SENSITIVITY-ENHANCED ULTRASONIC MICROSENSORS ON BUCKLED DIAPHRAGMS THROUGH STRESS BALANCE CONTROL OF MULTILAYERED STRUCTURE**
Kaoru Yamashita, Hikaru Tanaka, Yi Yang, Minoru Noda
*Kyoto Institute of Technology, Japan*

**B3P-J2**
**A PIEZORESISTIVE PRESSURE SENSOR WITH IMPROVED SENSITIVITY IN LOW PRESSURE CONDITION**
Huiyang Yu, Ming Qin, Jianqiu Huang
*Southeast University, China*

**B3P-J3**
**ONE SIDE ELECTRODE TYPE FLUIDIC BASED CAPACITIVE PRESSURE SENSOR**
Mohd Norzaidi Mat Nawi, Asrulnizam Abdul Manaf, Mohamad Faizal Abd Rahman, Mohd Rizal Arshad, Othman Sidek
*Universiti Sains Malaysia, Malaysia*

**B3P-J4**
**A MICRO-PRESSURE SENSOR WITH HIGH SENSITIVITY AND OVERLOAD RESISTANCE**
Zhongliang Yu, Yulong Zhao, Cun Li, Yan Liu, Guanwu Zhou, Bian Tian
*Xi'an Jiaotong University, China*

**B3P-J5**
**STATIC AND DYNAMIC RESPONSES OF GAN PIEZORESISTIVE MICROCANTILEVER WITH EMBEDDED ALGAN/GAN HFET FOR SENSING APPLICATIONS**
Abdul Talukdar[2], Muhammad Qazi[1], Goutam Koley[2]
*[1]Intel Corp., United States; [2]University of South Carolina, United States*

**B3P-J6**
**A DIFFERENTIAL RESONANT BAROMETRIC PRESSURE SENSOR USING SOI-MEMS TECHNOLOGY**
Zhenyu Luo, Deyong Chen, Junbo Wang, Jian Chen
*Chinese Academy of Sciences, China*

**B3P-J7**
**HIGH SENSITIVITY SQUARE RING CHANNEL SHAPED MOSFET EMBEDDED PRESSURE SENSOR INTEGRATED WITH A CURRENT MIRROR READOUT CIRCUITRY**
Pradeep Kumar Rathore[1], Brishbhan Singh Panwar[1], Hardik Jeetendra Pandya[2]
*[1]Indian Institute of Technology Delhi, India; [2]University of Maryland, United States*

**B3P-J8**
**FABRICATION AND CHARACTERIZATION OF FLEXIBLE PRESSURE SENSOR ARRAYS MADE BY FILM TRANSFER TECHNOLOGY**
Thi-Hong-Nhung Dinh, Pierre-Yves Joubert, Emile Martincic, Elisabeth Dufour-Gergam
*Université Paris-Sud, France*

**B3P-J9**
**MICRO SENSORS WITH POLYMER MEMBRANE FOR ACCURATE 3D FORCE AND DISPLACEMENT MEASUREMENTS**
Nelson Ferreira[1], Thomas Krah[1], Andreas Dietzel[1], Stephanus Büttgenbach[1], Alejandro Sierra Granada[2], Jose Antonio Albajez García[2]
*[1]Technische Universität Braunschweig, Germany; [2]Universidad de Zaragoza - EINA, Spain*

**B3P-J10**
**THREE-AXIAL FORCE SENSOR WITH CAPACITIVE READ-OUT USING A DIFFERENTIAL RELAXATION OSCILLATOR**
Robert Brookhuis, Remco J Wiegerink, Theo S. J Lammerink, Gijs J.M Krijnen
*University of Twente, Netherlands*

**B3P-J11**
**A SURFACE MICROMACHINED MEMS CAPACITIVE MICROPHONE WITH BACK-PLATE SUPPORTING PILLARS**
Chang Han Je, Jaewoo Lee, Woo Seok Yang, Jong-Kee Kwon
*Electronics and Telecommunications Research Institute (ETRI), Korea, South*

**B3P-J12**
**DESIGNS OF PLANAR SENSING INDUCTOR ON INVERSE-MAGNETOSTRICTIVE TYPE PRESSURE SENSOR**
Heng-Chung Chang, Sheng-Chieh Liao, Hsieh-Shen Hsieh, Jung-Hung Wen, Chao-Lin Cheng, Su-Jhen Lin, Chih-Huang Lai, Weileun Fang
*National Tsing Hua University, Taiwan*

**B3P-J13**
**FORCE INTENSITY AND DIRECTION MEASUREMENT IN REAL TIME USING MINIATURE TACTILE SENSOR WITH MICROCANTILEVERS EMBEDDED IN PDMS**
Hokuto Yokoyama[3], Masayuki Sohgawa[1,3], Takeshi Kanashima[3], Masanori Okuyama[3], Takashi Abe[1], Haruo Noma[4], Teruaki Azuma[2]
*[1]Niigata University, Japan; [2]Nitta Corporation, Japan; [3]Osaka University, Japan; [4]Ritsumeikan University, Japan*

**B3P-J14**
**A LATERAL-AXIS MEMS TUNING FORK GYROSCOPE WITH NOZZLE-OPTIMIZED SQUEEZE-FILM SENSING ELEMENT**
Minghao Nie, Dachuan Liu, Liguo Dong, Qiancheng Zhao, Zhenchuan Yang, Guizhen Yan
*Peking University, China*

**2:00 PM - 3:30 PM**
**B3P-K: PHENOMENA, MODELING & EVALUATION**
**Poster Area - Baltimore AB**
**Session Chairs: Svetlana Tatic-Lucic (Lehigh University, USA), Srinivas Tadigadapa (Pennsylvania State University, USA)**

**B3P-K1**
**NANOMACHINED PYROELECTRIC DETECTOR WITH LOW THERMAL CONDUCTANCE - DESIGN AND CONCEPTS**
Md Muztoba[1], Noureddine Melikechi[1], Mukti Rana[1], Donald P. Butler[2]
*[1]Delaware State University, United States; [2]University of Texas at Arlington, United States*

**B3P-K2**
**2-D MODEL OF THE INDIRECTLY-HEATED TYPE MICROWAVE POWER SENSOR BASED ON GAAS MMIC PROCESS**
Zhenxiang Yi, Xiaoping Liao, Hao Wu
*Southeast University, China*

**B3P-K3**
**ENHANCED COUPLING OF PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCERS WITH INITIAL STATIC DEFLECTION**
Firas Sammoura[1,2], Sina Akhbari[3], Liwei Lin[3], Sang Gook Kim[2]
*[1]Masdar Institute of Science and Technology, U.A.E.; [2]Massachusetts Institute of Technology, United States; [3]University of California, Berkeley, United States*

**B3P-K4**
**SIZE-DEPENDENT THERMAL EXPANSION PROPERTIES OF SILICON NANOWIRES**
Wei-Wei Zhang[1], Hua Zhang[1], Xu-Dong Li[1], Yan-Ru Li[1], Hong Yu[2], Qing-An Huang[2]
*[1]Jiangsu Academy of Science & Technology for Development, China; [2]Southeast University, China*

**B3P-K5**
**THE ROLE OF INTERFACE IN UNPASSIVATED SI3-XGEX HETEROSTRUCTURE NANOWIRES ALONG THE <111> DIRECTION**
Yi Li, Shuang-Ying Lei, Rui-Feng Han, Hong Yu, Jie Chen, Qing-An Huang
*Southeast University, China*

**B3P-K6**
**MICROFLUIDICS-BASED ACOUSTIC MICROBUBBLE BIOSENSOR**
Ying Zhou, Ashwin A. Seshia, Elizabeth A. H. Hall
*University of Cambridge, United Kingdom*

**B3P-K7**
**FOUR-PROBE BRIDGES FOR IN SITU DETERMINATION OF GEOMETRICAL PARAMETERS OF SURFACE MICROMACHINED THIN FILMS**
Hai-Yun Liu, Wei-Hua Li, Zai-Fa Zhou, Qing-An Huang
*Southeast University, China*

**B3P-K8**
**INTERFACE DISSIPATION IN PIEZOELECTRIC MEMS RESONATORS: AN EXPERIMENTAL AND NUMERICAL INVESTIGATION**
Attilio Frangi[1], Massimiliano Cremonesi[1], Antti Jaakkola[2], Tuomas Pensala[2]
*[1]Politecnico di Milano, Italy; [2]VTT Technical Research Centre of Finland, Finland*

**B3P-K9**
**DIMENSION OPTIMIZATION FOR A MINIATURE HIGH-FREQUENCY QUARTZ RESONATORE**
Jing Ji, Meng Zhao, Yupeng Zhang, Satoshi Ikezawa, Toshitsugu Ueda
*Waseda University, Japan*

**B3P-K10**
**ELECTRIC FIELD SENSING: WHAT IS BROUGHT BY DUALITY FROM FLUX GATES?**
Didier Robbes[2], Corentin Jorel[2], Emmanuel Olivier[2], Laurence Méchin[2], Sylvain Lebargy[2], Rachid Bouregba[1], Gilles Poullain[1], Christophe Cibert[1]
*[1]ENSICAEN, France; [2]UNICAEN, France*

**B3P-K11**
**TERAHERTZ DETECTION OF BACILLUS THURINGIENSIS SPORES IN DIPEL®**
Leamon Viveros, Weidong Zhang, Elliott Brown
*Wright State University, United States*

**B3P-K12**
**DESIGN AND OPTIMIZATION OF AN ELECTROSTATIC MICRO-HARVESTER FOR SENSORS APPLICATIONS**
Yi Li, Zeynep Celik-Butler, Donald P. Butler
*University of Texas at Arlington, United States*

**B3P-K13**
**THICKNESS DEPENDENT ADHESION FORCE AND ITS CORRELATION TO SURFACE ROUGHNESS IN MULTILAYERED GRAPHENE**
Hoorad Pourzand, Pradeep Pai, Massood Tabib-Azar
*University of Utah, United States*

**B3P-K14**
**MODELING OF MOVING COIL CAPACITANCE IN AN IRONLESS INDUCTIVE POSITION SENSOR**
Alessandro Danisi[1], Alessandro Masi[1], Roberto Losito[1], Luca Sabato[2]
*[1]European Organization for Nuclear Research (CERN), Switzerland; [2]Universita degli Studi del Sannio, Italy*

**B3P-K15**
**ENHANCING THE ACOUSTIC STREAMING INDUCED REMOVAL OF NON-SPECIFICALLY BOUND PROTEINS IN QUARTZ BASED SAW BIOSENSORS USING A ZNO WAVEGUIDE**
Kamlesh Suthar[1], Subramanian Sankaranarayanan[1], Gayathri Mistri[2], Mandek Richardson[3], Venkat Bhethanabotla[3]
*[1]Argonne National Laboratory, United States; [2]University of Illinois at Chicago, United States; [3]University of South Florida, United States*

**B3P-K16**
**MODELING OF PIEZOELECTRIC TUBE RESONATORS FOR LIQUID SENSING APPLICATIONS**
Thomas Voglhuber-Brunnmaier[1], Hannes Antlinger[1], Bernhard Jakoby[1], Roman Beigelbeck[2]
*[1]Johannes Kepler University, Austria; [2]Vienna University of Technology, Austria*

**B3P-K17**
**EFFECT OF DESIGN PARAMETERS ON THE ROTATIONAL RESPONSE OF A NOVEL DISK RESONATOR FOR LIQUID-PHASE SENSING: ANALYTICAL RESULTS**
Mohamad Sotoudegan[2], Stephen Heinrich[2], Fabien Josse[2], Nicholas Nigro[2], Isabelle Dufour[3], Oliver Brand[1]
*[1]Georgia Institute of Technology, United States; [2]Marquette University, United States; [3]Universite de Bordeaux, France*

**B3P-K18**
**SYMMETRY BREAKING OSCILLATIONS IN ELECTROSTATIC MEMS UNDER SUPERHARMONIC EXCITATION**
Anindya Lal Roy, Tarun Kanti Bhattacharyya
*Indian Institute of Technology, India*

**B3P-K19**
**HIGH PERFORMANCE NEMS ULTRAHIGH SENSITIVE RADIATION SENSOR BASED ON PLATINUM NANORODS CAPACITOR**
Abdelhameed Sharaf[1,2], Asmaa Gamal[1], Mohamed Serry[1]
*[1]The American University in Cairo, Egypt; [2]NCRRT, Egyptian Atomic Energy Authority, Egypt*

**2:00 PM - 3:30 PM**
**B3P-L: SENSOR NETWORKS I**
**Poster Area - Baltimore AB**
**Session Chair: Elliott Brown (Wright State University, USA)**

**B3P-L1**
**A LOW-POWER WIRELESS UHF / LF SENSOR NETWORK WITH WEB-BASED REMOTE SUPERVISION - IMPLEMENTATION IN THE INTELLIGENT CONTAINER**
Nils Heidmann, Nico Hellwege, Dagmar Peters-Drolshagen, Steffen Paul, Alexander Dannies, Walter Lang
*University of Bremen, Germany*

**B3P-L2**
**TIMESTAMPING AND LATENCY ANALYSIS FOR MULTI-SENSOR PERCEPTION SYSTEMS**
Mohamed Brahmi[2], Kai Schueler[3], Essayed Bouzouraa[1], Markus Maurer[2], Karl-Heinz Siedersberger[1], Ulrich Hofmann[1]
*[1]AUDI AG, Germany; [2]Technische Universität Braunschweig, Germany; [3]Technische Universität München, Germany*

**B3P-L3**
**A HOME MONITORING SYSTEM FOR ELDERLY PEOPLE BASED ON MEMS SENSORS AND WIRELESS NETWORKS**
Fangxiu Jia, Yujia Sun, Jiyan Yu, Xiaoming Wang
*Nanjing University of Science and Technology, China*

**B3P-L4**
**RECONFIGURABLE ARCHITECTURE FOR SMART SENSOR NODE BASED ON IEEE 1451 STANDARD**
Arturo Fatecha, Jean Guevara, Enrique Vargas
[1]Catholic University Asuncion, Paraguay

**B3P-L5**
**COVERAGE ESTIMATION IN HETEROGENOUS FLOORPLAN VISUAL SENSOR NETWORKS**
*Ahmad Movahedian Attar[1], Shantia Yarahmadian[2], Shadrokh Samavi[1]*
*[1]Isfahan University of Technology, Iran; [2]Mississippi State University, United States*

**B3P-L6**
**A SEMANTICALLY-ADAPTIVE STRATEGY FOR ENERGY-EFFICIENCY IN WIRELESS MEDICAL MONITORING DEVICES**
Vishwa Goudar, Miodrag Potkonjak
*University of California, Los Angeles, United States*

**B3P-L7**
**DEVELOPMENT OF SERVICE NETWORK FOR WEARABLE TYPE ACUTE MYOCARDIAL INFARCTION DIAGNOSIS SYSTEM**
Jaehyo Jung, Jihwan Lee, Jihoon Lee, Youn Tae Kim
*Chosun University, Korea, South*

**B3P-L8**
**DESIGN AND VALIDATION OF A WIRELESS SENSOR NODE FOR LONG TERM STRUCTURAL HEALTH MONITORING**
Fabio Federici, Roberto Alesii, Andrea Colarieti, Fabio Graziosi, Marco Faccio
*University of L'Aquila, Italy*

---

**2:00 PM - 3:30 PM**
**B3P-M: APPLICATION I**
**Poster Area - Baltimore AB**
**Session Chair: David Horsley (University of California, Davis, USA)**

---

**B3P-M1**
**OPTICAL CHARACTERIZATION OF MICROPATTERNED ANODIC ALUMINUM OXIDE (AAO) USING UV LIGHT FOR ITS FLUORESCENCE APPLICATIONS**
Xiang Li, Haocheng Yin, Tingting Wang, Long Que
*Louisiana Tech University, United States*

**B3P-M2**
**MEASUREMENT OF HUMAN BODY STIFFNESS FOR LIFTING-UP MOTION GENERATION USING NURSING-CARE ASSISTANT ROBOT - RIBA**
Ming Ding[2], Ryojun Ikeura[1], Yuki Mori[2], Toshiharu Mukai[2], Shigeyuki Hosoe[2]
*[1]Mie University, Japan; [2]RIKEN, Japan*

**B3P-M3**
**NON CONTACT MEASUREMENT OF BODY TEMPERATURE FOR THE IDENTIFICATION OF THERMOREGULATION ABILITIES IN PRETERM PATIENTS**
Ilaria Ercoli, Paolo Marchionni, Lorenzo Scalise, Enrico Primo Tomasini, Virgilio Paolo Carnielli
*Università Politecnica delle Marche, Italy*

**B3P-M4**
**DETERMINATION OF BURN DEPTH ON BIOLOGICAL TISSUES BY DIELECTRIC MEASUREMENT AT MICROWAVE FREQUENCIES**
Matthieu Brusson[2], Jérome Rossignol[2], Stéphane Binczak[2], Gabriel Laurent[1]
*[1]Centre Hospitalier Universitaire, France; [2]Université de Bourgogne, France*

**B3P-M5**
**DEVELOPMENT AND PERFORMANCE EVALUATION OF PORTABLE BRAILLE SCANNER USING SIMPLE PLATE SPRING SENSOR**
Hiroyuki Takanashi[1], Ryosuke Mimura[1], Tetsushi Mimuro[1], Hiroyuki Kodama[2], Takeshi Ito[2]
*[1]Akita Prefectural University, Japan; [2]Akita Techno Design Co, Ltd, Japan*

**B3P-M6**
**METAL-LENGTH SENSOR WITH ANTENNA RESONANT DETECTOR FOR PRESCRIPTION GUIDANCE OF ORAL PILL MEDICATION**
Hisashi Nishikawa, Takahiro Yamanaka, Hirofumi Yoshioka, Ami Tanaka, Takakuni Douseki
*Ritsumeikan University, Japan*

**B3P-M7**
**EEG-FMRI FEATURES ANALYSIS IN ODORANTS STIMULI WITH CITRALVA AND 2-MERCAPTOETHANOL**
Won-Seok Kang[1], Hyung-Oh Kwon[1], Cheil Moon[1], Jin Kook Kim[2], Sanghun Yun[1], Samhwan Kim[1]
*[1]Daegu Gyeongbuk Institute of Science and Technology, Korea, South; [2]Konkuk University Medical Center, Korea, South*

**B3P-M8**
**PAPER-BASED SUPER-CAPACITOR USING MICRO AND NANO PARTICLE DEPOSITION FOR PAPER-BASED DIAGNOSTICS**
Pooria Mostafalu, Sameer Sonkusale
*Tufts University, United States*

**B3P-M9**
**STRUCTURAL RELIABILITY AND THERMAL INSULATION PERFORMANCE OF FLEXIBLE THERMOELECTRIC GENERATOR FOR WEARABLE SENSORS**
Luca Francioso[1], Chiara De Pascali[1], Pietro Siciliano[1], Ruben Bartali[2], Elisa Morganti[2], Leandro Lorenzelli[2], Arturo De Risi[3]
*[1]Institute for Microelectronics and Microsystems, Italy; [2]FBK Bruno Kessler Foundation, Italy; [3]University of Salento, Italy*

**B3P-M10**
**USING TACTILE SENSORS TO ESTIMATE CARE RECEIVER POSITION ON DUAL ARMS OF ROBOT**
Yuki Mori[2], Ryojun Ikeura[1], Ming Ding[2]
*[1]Mie University, Japan; [2]RIKEN, Japan*

**B3P-M11**
**MONITOR COLOR SENSING USING LOW-COST FILTER ARRAY SPECTRUM SENSOR**
Cheng-Chun Chang[2], Chia-Jui Chuang[2], Yung-Chi Chuang[2], Byung Il Choi[1], Kwansik Lee[1], Seongsu Woo[1]
*[1]nanoLambda Incorporated, Korea, South; [2]National Taipei University of Technology, Taiwan*

**B3P-M12**
**AN EVALUATION OF ELECTRIC FIELD SENSORS FOR PROJECTILE DETECTION**
Cassandra Browning[2], Stephen Vinci[2], Maciej Noras[1], Jack Zhu[2], David Hull[2]
*[1]University of North Carolina at Charlotte, United States; [2]US Army Research Laboratory, United States*

**B3P-M13**
**IN-SITU SOOT PARTICLE SENSING IN AN AERO-ENGINE EXHAUST PLUME**
David McCormick[2], Krikor Ozanyan[2], John Black[1], Yutong Feng[3]
*[1]Rolls-Royce plc, United Kingdom; [2]University of Manchester, United Kingdom; [3]University of Southampton, United Kingdom*

**B3P-M14**
**SENSOR DESIGN FOR WATER HARDNESS DETECTION**
Tonmoy Bhattacharjee, Hongrui Jiang, Nader Behdad
*University of Wisconsin-Madison, United States*

**B3P-M15**
**MYOELECTRIC CONTROL METHOD FOR CONTROLLABLE ELECTROLARYNX**
Katsutoshi Ooe, Reina Kishimoto, Yuya Hasimoto
*Daiichi Institute of Technology, Japan*

**B3P-M16**
**UTILIZING TACTILE FEEDBACK FOR BIOMIMETIC GRASPING CONTROL IN UPPER LIMB PROSTHESES**
Luke Osborn[2], Nitish Thakor[2], Rahul Kaliki[1]
*[1]Infinite Biomedical Technologies, United States; [2]Johns Hopkins University, United States*

**B3P-M17**
**A NOVEL WIRELESS MOTION SENSOR FOR ANALYZING GOLF SWING**
Zhijian Yin[2], Haojie Ning[2], Yoshio Inoue[3], Meimei Han[1], Tao Liu[2,3]
*[1]INSENCO R&D Lab. Inc., Japan; [2]Jiangxi Science & Technology Normal University, Japan; [3]Kochi University of Technology, Japan;*

**2:00 PM - 3:30 PM**
**B3P-N: OPEN POSTER I**
**Poster Area - Baltimore AB**
**Session Chair: Troy Nagle (North Carolina State University, USA)**

**B3P-N1**
**REMOTE IDENTIFICATION AND WIRELESS TEMPERATURE SENSING BASED ON UWB PASSIVE CHIPLESS TIME-CODED RFID TAGS WITH LOS AND NLOS SCENARIOS**
Mina Wahib[1], Martin Schüßler[2], Bernd Kubina[2], Rolf Jakoby[2]
*[1]German University in Cairo, Egypt, Egypt; [2]Technical University of Darmstadt, Germany*

**B3P-N2**
**A WEARABLE SYSTEM FOR NON-INVASIVE BEAT-TO-BEAT BLOOD PRESSURE ESTIMATIONS**
Marcus Pietzsch[1], Martin Zimmerling[1], Wolf-Joachim Fischer[2]
*[1]Frauhofer IPMS, Germany; [2]TU Dresden, Germany*

**B3P-N3**
**NON-INVASIVE ASSESSMENT OF SKIN HYDRATION**
Jose Abraham
*Kimberly Clark Corporation, United States*

**B3P-N4**
**EMBEDDED DAQ SYSTEM FOR SENSOR EVALUATION AND MOBILE AUTARKIC APPLICATIONS IN RESEARCH AND EDUCATION**
Roger Heil, Mario Schlösser, Stefan van Waasen, Michael Schiek
*ZEA-2, Germany*

**B3P-N5**
**PH SENSOR BASED ON LOW-LIGHT FLUORESCENCE DETECTION FOR DIAGNOSIS OF GASTROESOPHAGEAL REFLUX DISEASE**
Paul Mintchev, Raymond Turner, Orly Yadid-Pecht
*University of Calgary, Canada*

**B3P-N6**
**USING MACHINE OLFACTION TO ASSIST HUMAN ODOR PANELS**
Susan Schiffman, Troy Nagle
*North Carolina State University, United States*

**B3P-N7**
**MOS TUNNELING CURRENT SENSING FOR RESONANT SENSORS**
Li Zhu, Bryan Snatchko, Shamus McNamara
*University of Louisville, United States*

**B3P-N8**
**A NON-INVASIVE ACTIVE DRY ELECTRODE FOR WIRELESS HUMAN-TO-COMPUTER INTERFACING**
Jeong A Lee[1], Olufemi Adeluyi[1], Kiseon Kim[2]
*[1]Chosun University, Nigeria; [2]GIST, Korea, South*

**B3P-N9**
**MONITORING YOUTH SOCCER PLAYER PERFORMANCE TO REDUCE INJURY AND OPTIMA SUBSTITUTION STRATEGIES**
Phil Attoh-Okine[1], Yaw Adu-Gyamfi[2]
*[1]Archmere Academy, United States; [2]University of Virginia, United States*

**3:30 PM - 5:00 PM**
**B4L-A: CARBON NANOTUBES & GRAPHENE**
**Maryland F**
**Session Chairs: EH Yang (Stevens Institute of Technology, USA), Joan Hoffmann (Johns Hopkins University, USA)**

**3:30 PM**
**INVITED TALK: ULTRANANOCRYSTALLINE DIAMOND: NEW OPPORTUNITIES FOR THE FABRICATION OF NOVEL SENSORS**
Anirudha V. Sumant
*Argonne National Laboratory, United States*

**4:00 PM**
**CNT SENSOR ARRAYS WITH P-I-N DIODES**
Thomas Charisoulis[2], Abbas Jamshidi-Roudbari[2], Nack-Bong Choi[2], Miltos Hatalis[2], Yijiang Lu[1], Jing Li[1]
*[1]NASA Ames Research Center, United States; [2]Lehigh University, United States*

**4:15 PM**
**PT-FUNCTIONALIZED GRAPHENE/SI HETEROSTRUCTURE FOR HYDROGEN SENSING**
Ahsan Uddin, Amol Singh, Tangali Sudarshan, Goutam Koley
*University of South Carolina, United States*

**4:30 PM**
**GAS SENSING BY GRAPHENE/SILICON HETROSTRUCTURE**
Amol Singh, Ahsan Uddin, Tangali Sudarshan, Goutam Koley
*University of South Carolina, United States*

**4:45 PM**
**TUNABLE GRAPHENE/INDIUM NITRIDE HETEROSTRUCTURE DIODE SENSOR**
Alina Wilson[2], Ifat Jahangir[2], Amol Singh[2], Nick Sbrockey[1], Elane Coleman[1], Gary Tompa[1], Goutam Koley[2]
*[1]Structured Materials Industries, Inc., United States; [2]University of South Carolina, United States*

**3:30 PM - 5:00 PM**
**B4L-B: INTEGRATION**
**Maryland E**
**Session Chairs: Hongrui Jiang (University of Wisconsin - Madison, USA), Babak Ziaie (Purdue University, USA)**

**INVITED TALK: 3:30 PM**
**CARBON-NANOTUBE BASED FLEXIBLE ELECTRODES FOR RETINAL RECORDING AND STIMULATION**
Moshe David-Pur, Lilach Bareket-Keren, Giora Beit-Yaakov, Dorit Raz-Prag, David Rand, Yael Hanein
*Tel-Aviv University, Israel*

**4:00 PM**
**MULTIPLE SENSOR ARRAYS FOR SINGLE CELL METABOLIC ANALYSIS**
Ganquan Song, Rishabh Shetty, Haixin Zhu, Shashanka Ashili, Liqiang Zhang, Grace Kim, Andrew Shabilla, Wacey Teller, Qian Mei, Laimonas Kelbauskas, Yanqing Tian, Hong Wang, Roger H. Johnson, Deirdre R. Meldrum
*Arizona State University, United States*

**4:15 PM**
**FABRICATION OF MICRODEVICES FOR SEPARATION OF CIRCULATING TUMOR CELL USING LATERAL MAGNETOPHORESIS AND IMMUNOMAGNETIC NANOBEADS**
Dae-Sik Lee, Jeong Won Park, Nae-Lim Lee, Mun Yeon Jung, Sung-Mok Cho
*Electronics Telecommunications Research Institute (ETRI), Korea, South*

**4:30 PM**
**A LOW POWER AUTO-RECONFIGURABLE PIPELINED ADC FOR IMPLANTABLE BIOMEDICAL APPLICATIONS**
Terence Randall, Ifana Mahbub, Syed Kamrul Islam
*University of Tennessee, Knoxville, United States*

**4:45 PM**
**A NEW GAS SENSOR OF A THIN-FILM DIODE AND LOW-POWER, AREA-EFFICIENT READOUT CIRCUIT**
Hung-Che Chen, Paul C.-P. Chao, Wei-Chu Lin, Hsiang-Fang Sun, Ming-Zhi Dai, Hsiao-Wen Zan
*National Chiao Tung University, Taiwan*

---

**3:30 PM - 5:00 PM**
**B4L-C: PRESSURE SENSORS**
**Maryland A**
**Session Chairs: Bernhard Jakoby (Johannes Kepler University Linz, Austria), Paddy French (TU Delft, The Netherlands)**

---

**3:30 PM**
**A WIRELESS PRESSURE SENSOR BASED ON SURFACE TRAPPED FERROFLUID PLUG**
Albert Kim, Babak Ziaie, Girish Chitnis
*Purdue University, United States*

**3:45 PM**
**A MONOCRYSTALLINE ABSOLUTE PRESSURE SENSOR WITH A PSEUDO-MOSFET READ-OUT DEVICE FOR LIFE-SCIENCE APPLICATIONS**
Sven Ebschke, Remigius Poloczek, Klaus Kallis, Horst Fiedler
*TU Dortmund, Germany*

**4:00 PM**
**DISTRIBUTED PIEZOELECTRIC THIN FILM SENSOR ARRAY FOR MONITORING IMPACT EVENTS**
Sudeep Joshi, Manjunath M Nayak, Konandur Rajanna
*Indian Institute of Science, India*

**4:15 PM**
**WEARABLE AND FLEXIBLE PEDOBAROGRAPHIC INSOLE FOR CONTINUOUS PRESSURE MONITORING**
Stefano Stassi[1,2], Giancarlo Canavese[1], Valentina Cauda[1], Carmelo Fallauto[2], Simone Corbellini[2], Paolo Motto[2], Danilo Demarchi[1], Candido Fabrizio Pirri[1,2]
*[1]Istituto Italiano di Tecnologia, Italy; [2]Politecnico di Torino, Italy*

**4:30 PM**
**ALL-ELASTOMER IN-PLANE MEMS CAPACITIVE TACTILE SENSOR FOR NORMAL FORCE DETECTION**
Alexi Charalambides, Sarah Bergbreiter
*University of Maryland, United States*

**3:30 PM - 5:00 PM**
**B4L-D: INERTIAL SYSTEMS MODELING**
**Maryland D**
**Session Chair: Qing-An Huang (Southeast University, China)**

**3:30 PM**
**EFFECTS OF IMPERFECTIONS ON SOLID-WAVE GYROSCOPE DYNAMICS**
Erdal Yilmaz, David Bindel
*Cornell University, United States*

**3:45 PM**
**ADVANCED METHODS FOR CALCULATING QUADRATURE ERRORS OF MEMS GYROSCOPES**
Steven Kehrberg[2], Markus Dorwarth[2], Markus Heitz[2], Carsten Geckeler[2], Jan Mehner[1]
*[1]Chemnitz University of Technology, Germany; [2]Robert Bosch GmbH, Germany*

**4:00 PM**
**EUTECTIC TRIMMING OF POLYSILICON MICRO HEMISPHERICAL RESONATING GYROSCOPE**
Benoit Hamelin, Vahid Tavassoli, Farrokh Ayazi
*Georgia Institute of Technology, United States*

**4:15 PM**
**AN IN-SITU MEASUREMENT METHOD FOR THERMALLY INDUCED PACKAGING STRESS IN DISTRIBUTED RF MEMS PHASE SHIFTERS**
Cheng Zhao, Jing Song, Lifeng Wang, Lei Han, Qing-An Huang
*Southeast University, China*

**4:30 PM**
**IMPACT OF MECHANICAL STRESS ON BIPOLAR TRANSISTOR CURRENT GAIN AND EARLY VOLTAGE**
Richard Jaeger, Safina Hussain, Jeffrey Suhling, Parameshwaran Gnanachchelvi, Bogdan Wilamowski, Michael Hamilton
*Auburn University, United States*

**4:45 PM**
**A PERFECT ELECTROSTATIC ANTI-SPRING**
Shai Shmulevich, Inbar Hotzen, David Elata
*Technion - Israel Institute of Technology, Israe*l

**3:30 PM - 5:00 PM**
**B4L-E: WIRELESS SENSOR NETWORKS FOR ENVIRONMENTAL MONITORING**
**Watertable ABC**
**Session Chair: Hong Yu (Arizona State University, USA)**

**3:30 PM**
**QUANTIFYING SPATIAL DISTRIBUTION OF SOIL MOISTURE USING A COSMIC RAY AND CAPACITANCE SENSOR NETWORK**
Auro Almeida[1], Craig Baillie[1], Dale Worledge[1], Philip Smethurst[1], Ritaban Dutta[1], Andrew Terhorst[1], Trenton Franz[2]
*[1]Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia; [2]University of Arizona, United States*

**3:45 PM**
**BACKSCATTER SENSOR NETWORK FOR EXTENDED RANGES AND LOW COST WITH FREQUENCY MODULATORS: APPLICATION ON WIRELESS HUMIDITY SENSING**
Eleftherios Kampianakis, John Kimionis, Konstantinos Tountas, Christos Konstantopoulos, Eftichios Koutroulis, Aggelos Bletsas
*Technical University of Crete, Greece*

**4:00 PM**
**QUAD-TREE APPROACH FOR OBSTACLE DISCOVERY AND TRACKING IN WIRELESS SENSOR NETWORKS**
Prasenjit Chanak, Tuhina Samanta, Indrajit Banerjee
*Bengal Engineering and Science University, Shibpur, India*

**4:15 PM**
**DETECTION OF TARGETS USING DISTRIBUTED MULTI-MODAL SENSORS WITH CORRELATED OBSERVATIONS**
Thyagaraju Damarla[2], Asif Mehmood[1]
*[1]Booz Allen Hamilton, United States; [2]US Army Research Laboratory, United States*

**4:30 PM**
**ACCURATE AND EARLY DETECTION OF LOCALIZED HEAVY RAIN BY INTEGRATING MULTIVENDOR SENSORS IN VARIOUS INSTALLATION ENVIRONMENTS**
Kei Hiroi[1], Yoshihito Seto[2], Futoshi Matsumoto[2], Yuzo Taenaka[3], Hideya Ochiai[4], Haruo Ando[2], Hitoshi Yokoyama[2], Masaya Nakayama[3], Hideki Sunahara[1]
*[1]Keio University, Japan; [2]Tokyo Metropolitan Research Institute for Environmental Protection, Japan; [3]University of Tokyo, Japan; [4]VLSI Design and Education Center, University of Tokyo, Japan*

**4:45 PM**
**STRUCTURAL DAMAGE DETECTION OF NUCLEAR REACTOR SITES USING SENSOR NETWORKS**
Sainath Chidambar Munavalli, Niki Pissinou, Leonel Lagos, Xinyu Jin
*Florida International University, United States*

**3:30 PM - 5:00 PM**
**B4L-F: MEDICAL APPLICATIONS**
**Homeland**
**Session Chair: Elfed Lewis (University of Limerick, Ireland)**

**3:30 PM**
**AN EMG BIOFEEDBACK DEVICE FOR VIDEO GAME USE IN FOREARM PHYSIOTHERAPY**
Hayes Converse, Teressa Ferraro, Daniel Jean, Laura Jones, Vikas Mendhiratta, Emily Naviasky, Mang Par, Thomas Rimlinger, Steven Southall, Jason Sprenkle, Pamela Abshire
*University of Maryland, United States*

**3:45 PM**
**HALL-EFFECT MAGNETIC TRACKING DEVICE FOR MAGNETIC RESONANCE IMAGING**
Jean-Bapstiste Schell, Loic Cuvillon, Daniel Gounot, Elodie Breton, Jean-Baptiste Kammerer, Luc Hébrard, Michel de Mathelin
Université de Strasbourg (CNRS), France

**4:00 PM**
**BIOPSY ANALYSIS USING A QUADRUPLE INFRARED SENSOR**
Valeria Fioravanti[2], Emanuel Weber[2], Sander van Den Driesche[2], Michael Johannes Vellekoop[2], Daniela Pucciarelli[1], Heimo Breiteneder[1], Christine Hafner[1]
*[1]Medical University of Vienna, Austria; [2]University of Bremen, Germany*

**4:15 PM**
**QUANTIFICATION OF EDEMA IN HUMAN BRAIN TISSUE BY DETERMINATION OF ELECTROMAGNETIC PARAMETERS**
Tobias Reinecke[2], Lars Hagemeier[1], Verena Schulte[2], Michael Klintschar[1], Stefan Zimmermann[2]
*[1]Hannover Medical School, Germany; [2]Leibniz University Hannover, Germany*

**4:30 PM**
**CHARACTERISATION OF RADIOLUMINESENCE BASED OPTICAL FIBRE DOSIMETER IN RADIOTHERAPY BEAM APPLICATIONS**
Peter Woulfe[2,3], Sinead O'Keeffe[3], Denis McCarthy[3], Mark Grattan[1], Alan Hounsell[1], John Cronin[2], Elfed Lewis[3]
*[1]Belfast City Hospital, United Kingdom; [2]Galway Clinic, Ireland; [3]University of Limerick, Ireland*

**4:45 PM**
**IDENTIFICATION OF DIFFERENT RESPIRATORY RATE BY A PIEZO POLYMER BASED NASAL SENSOR**
Roopa G. Manjunatha, N. Ranjith, Y.V. Meghashree, Konandur Rajanna, D. Roy Mahapatra
*Indian Institute of Science, India*

**8:00 AM - 8:45 AM**
**PLENARY – KEYNOTE – DR. KENNETH S. JOHNSON: BIOARGO: A GLOBAL SCALE CHEMICAL SENSOR NETWORK TO OBSERVE CARBON, OXYGEN, AND NITROGEN CYCLES IN THE OCEAN**
**Maryland BC**
**Session Chair: Yogesh Gianchandani (University of Michigan, Ann Arbor, USA)**

**8:00 AM**
**BIOARGO: A GLOBAL SCALE CHEMICAL SENSOR NETWORK TO OBSERVE CARBON, OXYGEN, AND NITROGEN CYCLES IN THE OCEAN**
Kenneth S. Johnson
*Monterey Bay Aquarium Research Institute, United States*

**9:00 AM - 10:15 AM**
**C1L-A: ELECTROCHEMICAL SENSORS**
**Maryland F**
**Session Chairs: Joannis Raptis (NCSR Demokritos, Greece), Babak Ziaie (Purdue University, USA)**

**9:00 AM**
**ACOUSTIC TWEEZERS: MANIPULATING PARTICLES, CELLS, AND ORGANISMS USING STANDING SURFACE ACOUSTIC WAVES (SSAW)**
Tony Jun Huang
*Pennsylvania State University, United States*

**9:30 AM**
**MICROSTRUCTURING CONDUCTING POLYMERS AND MOLECULARLY IMPRINTED POLYMERS BY LIGHT-ACTIVATED ELECTROPOLYMERIZATION ON MICROMACHINED SILICON. APPLICATIONS IN ELECTROCHEMICAL SENSING**
Elisabetta Mazzotta[1], Cosimino Malitesta[1], Salvo Surdo[2], Giuseppe Barillaro[2]
*[1]Università del Salento, Italy; [2]Università di Pisa, Italy*

**9:45 AM**
**SCALE-DOWN EFFECTS: TOWARDS MINIATURIZATION OF AN ELECTROCHEMICAL SENSOR USING BIOMOLECULES**
Faheng Zang, Xiao Zhu Fan, Konstantinos Gerasopoulos, Hadar Ben-Yoav, Adam Brown, James Culver, Reza Ghodssi
*University of Maryland, United States*

**10:00 AM**
**ULTRA-HIGH SCANNING SPEED CHEMICAL IMAGE SENSOR BASED ON LIGHT ADDRESSABLE POTENTIOMETRIC SENSOR WITH ANALOG MICRO-MIRROR**
Anirban Das, Tsung-Cheng Chen, Yi-Ting Lin, Chao-Sung Lai, Yuan-Hui Liao, Chia-Ming Yang
*Chang Gung University, Taiwan*

**9:00 AM - 10:15 AM**
**C1L-B: POWER APPLICATIONS**
**Maryland E**
**Session Chairs: Mitsuhiro Shikida (Nagoya University, Japan), Ruby Ghosh (Michigan State University, USA)**

**9:00 AM**
**DEVELOPMENT OF A THIN-FILM THERMOCOUPLE MATRIX FOR IN-SITU TEMPERATURE MEASUREMENT IN A LITHIUM ION POUCH CELL**
Nora Martiny[2], Jan Geder[2], Yuxi Wang[2], Werner Kraus[1], Andreas Jossen[1]
*[1]Technical University of Munich, Germany; [2]TUM CREATE, Singapore*

**9:15 AM**
**A FLUIDIC MICROENERGY GENERATOR ENABLED BY HYBRID NANOMATERIAL NANOFLUIDS**
Yuan He, Shiva Vasiraju, Long Que
*Louisiana Tech University, United States*

**9:30 AM**
**ACHIEVING MAXIMUM POWER EFFICIENCY OF A NOVEL RECTIFIER CHARGE PUMP BY IMPEDANCE MATCHING IN AN ENERGY HARVESTER SUITED FOR SELF-POWERED SENSORS**
Paul C.-P. Chao, Chao-Te Chiang, Tzu-Chia Huang, Chun-Kai Chang
*National Chiao Tung University, Taiwan*

**9:45 AM**
**HIGH-VOLTAGE GENERATION USING A CMOS IMAGE SENSOR WITH DUAL PHOTO-SENSING AND ENERGY HARVESTING CAPABILITIES**
Hsuan-Tsung Wang[2], Walter Leon-Salas[1]
*[1]Purdue University, United States; [2]University of Missouri-Kansas City, United States*

**10:00 AM**
**A SELF-POWERED PHOTOSENSOR SWITCH DETECTS ONLY RISING EDGE OF INFRARED-LIGHT PULSE FOR WIRELESS ZERO-STANDBY-POWER WAKE-UP RECEIVER**
Fumiyasu Utsunomiya, Ami Tanaka, Takakuni Douseki
*Ritsumeikan University, Japan*

**9:00 AM - 10:15 AM**
**C1L-C: VISCOSITY, DENSITY AND FLOW SENSORS**
**Maryland A**
**Session Chair: Patrick Ruther (University of Freiburg, Germany)**

**9:00 AM**
**EXPERIMENTAL AND THEORETICAL EVALUATION OF THE ACHIEVABLE ACCURACIES OF RESONATING VISCOSITY AND MASS DENSITY SENSORS**
Martin Heinisch, Thomas Voglhuber-Brunnmaier, Erwin K. Reichel, Bernhard Jakoby
*Johannes Kepler University, Austria*

**9:15 AM**
**VISCOSITY AND DENSITY SENSOR PRINCIPLE BASED ON DIAMAGNETIC LEVITATION USING PYROLYTIC GRAPHITE**
Stefan Clara, Hannes Antlinger, Wolfgang Hilber, Bernhard Jakoby
*Johannes Kepler University, Austria*

**9:30 AM**
**MODELING APPROACHES FOR ELECTRODYNAMICALLY DRIVEN VISCOSITY AND MASS DENSITY SENSORS OPERATED IN THE KHZ RANGE AND EXPERIMENTAL VERIFICATIONS**
Martin Heinisch, Thomas Voglhuber-Brunnmaier, Erwin K. Reichel, Bernhard Jakoby
*Johannes Kepler University, Austria*

**9:45 AM**
**LOW PRESSURE SPHERICAL THERMAL ANEMOMETER FOR SPACE MISSIONS**
Lukasz Kowalski, Vicente Jiménez, Manuel Domínguez-Pumar, Sergi Gorreta, Santiago Silvestre, Luis Castañer
*Universitat Politècnica de Catalunya (UPC), Spain*

**10:00 AM**
**A NEW METHOD FOR THE VELOCITY MEASUREMENT OF GAS-LIQUID TWO-PHASE FLOW**
Ying Zhou, Zhiyao Huang, Baoliang Wang, Haifeng Ji, Haiqing Li
*ZheJiang University, China*

---

**9:00 AM - 10:15 AM**
**C1L-D: OPTICAL IMAGING SENSORS**
**Maryland D**
**Session Chairs: John X.J. Zhang (University of Texas at Austin, USA), Michiel Vellekoop (University of Bremen - IMSAS, Germany)**

---

**9:00 AM**
**TRENDS IN SMALL-FORMAT INFRARED ARRAY SENSORS**
Masafumi Kimata
*Ritsumeikan University, Japan*

**9:30 AM**
**A HIGH-SPEED POLAR-SYMMETRIC IMAGER FOR REAL-TIME CALIBRATION OF ROTATIONAL INERTIAL SENSORS**
Ben Johnson, Changhyuk Lee, Sriram Sivaramakrishnan, Al Molnar
*Cornell University, United States*

**9:45 AM**
**A COMBINED TACTILE AND PROXIMITY SENSING EMPLOYING A COMPOUND-EYE CAMERA**
Kazuhiro Shimonomura, Hiroto Nakashima
*Ritsumeikan University, Japan*

**10:00 AM**
**CMOS SENSOR FOR SUN TRACKING**
Hongyi Wang[2], Tao Luo[1], Hongjiang Song[1], Jennifer Blain Christen[1]
*[1]Arizona State University, United States; [2]Xi'an Jiaotong University, China*

**9:00 AM - 10:15 AM**
**C1L-E: WIRELESS SENSOR NETWORKS FOR TARGETS & OBJECTS**
**Watertable ABC**
**Session Chairs: Geoffrey Cranch, Tracie Severson (US Naval Academy, USA)**

**9:30 AM**
**ITERATIVE INTERFERENCE MANAGEMENT IN CODED PASSIVE WIRELESS SENSORS**
Ali Abedi[2], Kristen Zyck[1]
*[1]University of Florida, United States; [2]University of Maine, United States*

**9:45 AM**
**DISTRIBUTED MULTI-TARGET SEARCH AND TRACK ASSIGNMENT USING CONSENSUS-BASED COORDINATION**
Tracie Severson, Derek Paley
*University of Maryland, United States*

**10:00 AM**
**TOWARDS A PERPETUAL WIRELESS SENSOR NODE**
Ariton Xhafa[1], Bradford Campbell[2], Srinath Hosur[1]
*[1]Texas Instruments, Inc., United States; [2]University of Michigan, United States*

**9:00 AM - 10:15 AM**
**C1L-F: MATERIALS & FABRICATION II**
**Homeland**
**Session Chairs: Tao Li (University of Michigan, USA), Eugene Hwang (Analog Devices, USA)**

**9:00 AM**
**TITANIUM NITRIDE (TIN) AS A GATE MATERIAL IN BICMOS DEVICES FOR BIOMEDICAL IMPLANTS**
Nishant Lawand[2], Henk van Zeijl[2], Paddy French[2], Jeroen Briaire[1], Johan Frijns[1]
*[1]Leiden University Medical Centre, Netherlands; [2]Delft University of Technology, Netherlands*

**9:15 AM**
**A CMOS-COMPATIBLE METAMATERIAL TO ENHANCE THE FRONT TO BACK RADIATION RATIO IN TERAHERTZ ANTENNA FOR SENSING APPLICATION**
Giuseppe Fiorentino, Waqas Syed, Fabio Santagata, Marco Spirito, Gregory Pandraud, Andrea Neto, Pasqualina M. Sarro, Aurele J.L. Adam
*Technische Universiteit Delft, Netherlands*

**9:30 AM**
**POLYCRYSTALLINE DIAMOND CIRCULAR RESONANT DIAPHRAGMS WITH LOW ONSET OF NONLINEAR RESPONSE**
Andrew Barnes, Christian Zorman
*Case Western Reserve University, United States*

**9:45 AM**
**NOVEL IMPEDANCE MATCHING MATERIALS AND STRATEGIES FOR AIR-COUPLED PIEZOELECTRIC TRANSDUCERS**
Tomas Gómez Álvarez-Arenas, Luis Díez
*Spanish National Research Council (CSIC), Spain*

**10:00 AM**
**DESIGN AND IMPLEMENTATION OF COLLAGEN-BASED CAPACITIVE RELATIVE HUMIDITY SENSORS**
Steven Shapardanis, Mathew Hudspeth, Tolga Kaya
*Central Michigan University, United States*

**10:15 AM - 12:15 PM**
**C2P-G: CHEMICAL & GAS SENSORS V**
**Poster Area - Baltimore AB**
**Session Chairs: Giuseppe Barillaro (University of Pisa, Italy), EH Yang (Stevens Institute of Technology, USA)**

**C2P-G1**
**N719-DYE SENSITIZED AMORPHOUS ZINC OXIDE FILMS FOR NO2 DETECTION UNDER VISIBLE-LIGHT ILLUMINATION**
Chao Zhang, Marjorie Olivier, Marc Debliquy
*University of Mons, Belgium*

**C2P-G2**
**ODOR SPATIAL DISTRIBUTION VISUALIZED BY A FLUORESCENT IMAGING SENSOR**
Chuanjun Liu, Ryohei Yokoyama, Seiichi Uchida, Koji Nakano, Kenshi Hayashi
*Kyushu University, Japan*

**C2P-G3**
**GAS SENSING STUDIES OF AN N-N HETEROJUNCTION METAL OXIDE SEMICONDUCTOR SENSOR ARRAY BASED ON WO3 AND ZNO COMPOSITES**
Anupriya Naik[2], Ivan Parkin[2], Russell Binions[1]
*[1]Queen Mary University of London, United Kingdom; [2]University College London, United Kingdom*

**C2P-G4**
**INVESTIGATION OF SH-SAW SENSORS FOR TOXIC HEAVY METAL DETECTION**
Zeinab Ramshani, Binu Baby Narakathu, Sepehr Emamian, Sai Guruva Reddy Avuthu, Massood Zandi Atashbar
*Western Michigan University, United States*

**C2P-G5**
**TOWARDS THE REALIZATION OF A MEMS-BASED PHOTOACOUSTIC CHEMICAL SENSOR USING ULTRACOMPACT EC-QCL (SPRITEIR)**
Ellen Holthoff, Logan Marcus, Paul Pellegrino
*US Army Research Laboratory, United States*

**C2P-G6**
**DIELECTRIC POWDER CHARACTERIZATION BY RADIO FREQUENCY MEASUREMENTS TECHNIQUE FOR HYDROGEN SENSOR APPLICATIONS: APPLICATION TO IRON OXIDE**
Naimi Boubekeur, Hatem El Matbouly, Frederic Domingue
*Université du Québec à Trois-Rivières, Canada*

**C2P-G7**
**FUNCTIONALIZED SINGLE ZNO-METAL JUNCTION AS A PH SENSOR**
Paolo Motto[2], Valentina Cauda[1], Stefano Stassi[2], Giancarlo Canavese[2], Danilo Demarchi[1,2]
*[1]Istituto Italiano di Tecnologia, Italy; [2]Politecnico di Torino, Italy*

**C2P-G8**
**CALIBRATION OF SMALL RESISTIVE COMMERCIAL SENSORS TO MEASURE OZONE WITH THE INTERFERENCE OF TEMPERATURE AND HUMIDITY**
Manuel Aleixandre[1], Maria Del Carmen Horrillo[1], Michel Gerboles[2], Laurent Spinelle[2]
*[1]ITEFI-CSIC, Spain; [2]Joint Research Centre, Italy*

**C2P-G9**
**CU2O BASED ELECTROCHEMICAL SENSOR FOR DIRECT GLUCOSE DETECTION**
Petra Majzlikova[1], Jan Prasek, Jana Chomoucka[1], Jana Drbohlavova[1], Jan Pekarek[1], Radim Hrdy[1], Jaromir Hubalek[1], Libuse Trnkova[2]
*[1]Brno University of Technology, Czech Republic; [2]Masaryk University, Czech Republic*

**C2P-G10**
**ATOMIC LAYER DEPOSITED TIO2 THIN FILMS FOR ENVIRONMENTAL GAS SENSING**
Steven Mills, Bongmook Lee, Veena Misra
*North Carolina State University, United States*

**C2P-G11**
**SELECTIVE MULTIMODAL GAS SENSING IN EPITAXIAL GRAPHENE BY FOURIER TRANSFORM INFRARED SPECTROSCOPY**
Shamaita Shetu, B. K. Daas, Kevin Daniels, Tangali Sudarshan, Goutam Koley, Mvs Chandrashekhar
*University of South Carolina, United States*

**C2P-G12**
**POLYNUCLEOTIDE-FUNCTIONALIZED GOLD NANOPARTICLES AS CHEMIRESISTIVE VAPOR SENSING ELEMENTS**
Kan Fu[2], Wyatt Pedrick[2], Han Wang[2], Andrew LaMarche[2], Xiaoqiang Jiang[2], Brian Willis[2], Shihui Li[1], Yong Wang[1]
*[1]Pennsylvania State University, United States; [2]University of Connecticut, United States*

**10:15 AM - 12:15 PM**
**C2P-H: APPLICATIONS II**
**Poster Area - Baltimore AB**
**Session Chair: David Horsley (University of California, Davis, USA)**

**C2P-H1**
**A CMOS INTELLIGENT LIGHT SENSING CHIP FOR AUTOMATIC BRIGHTNESS TUNING APPLICATIONS**
Cheng-Ta Chiang, Jia-Yao Liou
*National Chia Yi University, Taiwan*

**C2P-H2**
**DUAL SIX-PORT BASED DIRECTION-OF-ARRIVAL DETECTOR FOR FMCW RADAR TRACKING IN THE ISM BAND AT 24 GHZ**
Gabor Vinci[2], Stefan Lindner[1], Sebastian Mann[1], Francesco Barbon[1], Robert Weigel[1], Alexander Koelpin[1]
*[1]University of Erlangen-Nuremberg Germany; [2]InnoSenT GmbH, Germany*

**C2P-H3**
**A WIRELESS LASER SENSOR WEB FOR HUMAN GAIT DISORDER RECOGNITION BASED ON THE BUFFONS NEEDLE MODEL**
Rui Ma, Qi Hao
*University of Alabama, United States*

**C2P-H4**
**SUPERVISED MACHINE LEARNING SCHEME FOR TRI-AXIAL ACCELEROMETER-BASED FALL DETECTOR**
Alessandro Leone, Gabriele Rescio, Pietro Siciliano
*CNR-Institute for Microelectronics and Microsystems, Italy*

**C2P-H5**
**MOBILE APPLICATION BASED SUSTAINABLE IRRIGATION WATER USAGE DECISION SUPPORT SYSTEM: AN INTELLIGENT SENSOR CLOUD APPROACH**
Cecil Li[1], Ritaban Dutta[1], Corné Kloppers[1], Claire D'Este[1], Ahsan Morshed[1], Auro Almeida[1], Aruneema Das[2], Jagannath Aryal[2]
*[1]Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia; [2]University of Tasmania, Australia*

**C2P-H6**
**ROCK COLLAPSE FORECASTING: A NOVEL APPROACH BASED ON THE CLASSIFICATION OF MICRO-ACOUSTIC SIGNALS IN THE WAVELET DOMAIN**
Stavros Ntalampiras, Manuel Roveri
*Politecnico di Milano, Italy*

**C2P-H7**
**S³MD, STRESS SENSITIVE SURFACE MOUNTED DEVICES FOR IN-SITU MONITORING OF MECHANICAL PROCESSES IN PCB MANUFACTURING**
Soeren Majcherek, Soeren Hirsch, Bertram Schmidt
*Otto-von-Guericke-University Magdeburg, Germany*

**C2P-H8**
**SELF-POWERED WIRELESS DIGITAL TACHOMETER SCHEME WITHOUT SENSORS FOR MEASURING SPIN OF YO-YO**
Itaru Asakura, Ami Tanaka, Hisashi Nishikawa, Takakuni Douseki
*Ritsumeikan University, Japan*

**C2P-H9**
**SELF-POWERED WIRELESS DIGITAL TACHOMETER SCHEME WITHOUT SENSORS FOR MEASURING SPIN OF YO-YO**
Itaru Asakura, Ami Tanaka, Hisashi Nishikawa, Takakuni Douseki
*Ritsumeikan University, Japan*

**C2P-H10**
**DETECTION OF TATP PRECURSORS WITH MOX GAS SENSORS COMBINED WITH SOLID PHASE MICRO EXTRACTION**
Jesús Lozano, José Ignacio Suárez, José Manuel Ordiales, Teodoro Aguilera
*University of Extremadura, Spain*

**C2P-H11**
**PARTICLE FILTERING TO IMPROVE THE DYNAMIC ACCURACY OF ELECTROMAGNETIC TRACKING**
Hasan Sen, Peter Kazanzides
*Johns Hopkins University, United States*

**C2P-H12**
**COMPARATIVE STUDY OF MOISTURE MEASUREMENTS BY TIME DOMAIN TRANSMISSOMETRY**
Bianca Will, Ilona Rolfes
*Ruhr-University Bochum, Germany*

**C2P-H13**
**WATER VELOCIMETER AND TURBIDITY-METER USING VISIBLE LIGHT COMMUNICATION MODULES**
Cheng-Chun Chang[2], Chien-Ta Wu[2], Yung-Bin Lin[1], Meng-Huang Gu[1]
*[1]National Center for Research on Earthquake Engineering, Taiwan; [2]National Taipei University of Technology, Taiwan*

**C2P-H14**
**WEARABLE MULTI-SENSOR GESTURE RECOGNITION FOR PARALYSIS PATIENTS**
Alexander Nelson[2], Prashanth Shyamkumar[1], William Wilkins[1], David Lachut[2], Nilanjan Banerjee[2], Sami Rollins[3], James Parkerson[1], Vijay Varadan[1]
*[1]University of Arkansas, United States; [2]University of Maryland, Baltimore County, United States; [3]University of San Francisco, United States*

**C2P-H15**
**A WIRELESS-ENABLED SENSOR SYSTEM FOR DISTRIBUTED RADIATION DETECTION ON ANDROID CELLPHONES**
Yu Sui, Tao Li
*University of Michigan, United States*

**10:15 AM - 12:15 PM**
**C2P-J: FLUIDIC AND MISCELLANEOUS SENSORS**
**Poster Area - Baltimore AB**
**Session Chair: Babak Ziaie (Purdue University, USA)**

**C2P-J1**
**METALLIC AND CERAMIC THIN FILM THERMOCOUPLES FOR GAS TURBINE ENGINE APPLICATIONS**
Ian Tougas, Otto Gregory
*University of Rhode Island, United States*

**C2P-J2**
**AIRBORNE ULTRASONIC SENSOR NODE FOR DISTANCE MEASUREMENT**
Enrique A. Vargas Cabral, Isidro Valdez
*Catholic University Asuncion, Paraguay*

**C2P-J3**
**TEMPERATURE-COMPENSATED CATHETER FLOW SENSOR AND ITS APPLICATION TO BREATHING MEASUREMENT IN A MOUSE**
Takayuki Yamada, Yudai Yamazaki, Takuya Matsuyama, Mitsuhiro Shikida, Miyoko Matsushima, Tsutomu Kawabe
*Nagoya University, Japan*

**C2P-J4**
**ORBITING SPHERE VISCOMETER OPERATED IN RESONANT ORBITING MODE**
Stefan Clara, Hannes Antlinger, Wolfgang Hilber, Bernhard Jakoby
*Johannes Kepler University, Austria*

**C2P-J5**
**PROPOSAL OF SHEAR STRESS SENSOR BASED ON OPTICAL DETECTION**
Yuta Eto, Syunji Shibata, Mitsuhiro Shikida
*Nagoya University, Japan*

**C2P-J6**
**PARAMETRIC AMPLIFICATION IN A MICRO CORIOLIS MASS FLOW SENSOR: REDUCTION OF POWER DISSIPATION WITHOUT LOSS OF SENSITIVITY**
Jarno Groenesteijn, Harmen Droogendijk, Remco Wiegerink, Theo S. J Lammerink, Joost Lötters, Remco Sanders, Gijs J.M Krijnen
*University of Twente, Netherlands*

**C2P-J7**
**WIDE SPAN THERMAL WIND SENSOR SYSTEM WITH DUAL CHIPS**
Lin Zhou, Sheng-Qi Cheng, Tian-Yu Xiang, Ming Qin, Bei Chen, Qing-An Huang
*Southeast University, China*

**C2P-J8**
**A NEW SENSOR FOR THE VOID FRACTION MEASUREMENT OF GAS-LIQUID TWO-PHASE FLOW**
Ya Chang, Zhiyao Huang, Baoliang Wang, Haifeng Ji, Haiqing Li
*ZheJiang University, China*

**C2P-J9**
**GAS CONCENTRATION AND FLOW SPEED MEASUREMENTS USING A POLYMER-BASED MEMBRANE SENSOR**
Christoph Hepp[1], Florian Krogmann[1], Gerald Urban[2]
*[1]Innovative Sensor Technology IST AG, Switzerland; [2]Universitty of Freiburg, Germany*

**C2P-J10**
**ENERGY-EFFICIENT, 0.1 NJ/CONVERSION TEMPERATURE SENSOR WITH TIME-TO-DIGITAL CONVERTER AND 1 °C ACCURACY IN -6 TO 64 °C RANGE**
Oleg Nizhnik[1], Kohei Higuchi[1], Kazusuke Maenaka[1], Travis Bartley[2]
*[1]Japan Science and Technology Agency, Japan; [2]Tohoku University, Japan*

**C2P-J11**
**PAPER-BASED MEMS HAIR CELL ARRAY**
Kevin Crowley, Diana Nakidde, Jeffrey Travis, Masoud Agah
*Virginia Tech, United States*

**C2P-J12**
**MICROWAVE DOPPLER FLOW SENSOR FOR CHEMICAL LOOPING COMBUSTION SYSTEMS**
David Greve[1], Irving Oppenheim[1], Benjamin Chorpening[2], Jared Charley[2,3]
*[1]Carnegie Mellon University, United States; [2]National Energy Technology Laboratory, United States; [3]URS Corporation, United States*

**10:15 AM - 12:15 PM**
**C2P-K: OPTICAL SENSORS II**
**Poster Area - Baltimore AB**
**Session Chairs: Carlos Ruiz-Zamarreno (Universidad Publica de Navarra, Spain), Ignacio R. Matias (Universidad Publica de Navarra, Spain)**

**C2P-K1**
**TEMPERATURE EFFECTS IN CHROMATIC CONFOCAL DISTANCE SENSORS**
Garry Berkovic, Shlomo Zilberman, Ehud Shafir
*Soreq NRC, Israel*

**C2P-K2**
**AN EVENT-DETECTION HIGH DYNAMIC RANGE CMOS IMAGE SENSOR**
Gözen Köklü, Dechao Sun, Yusuf Leblebici, Giovanni De Micheli, Sandro Carrara
*Swiss Federal Institute of Technology (EPFL), Switzerland*

**C2P-K3**
**DISTRIBUTED TEMPERATURE MONITORING USING OFDR-BASED RAYLEIGH BACKSCATTERING FOR LIQUID SODIUM LEAKAGE DETECTION**
Romain Cotillard[1], Guillaume Laffont[1], Ekaterina Boldyreva[1], Pierre Ferdinand[1], Denis Cambet[2], Serge Albaladéjo[2], Pierre Charvet[2], Jean-Philippe Jeannot[2], Gilles Rodriguez[2]
*[1]CEA, LIST, France; [2]CEA, DTN, France*

**C2P-K4**
**OPTOFLUIDIC OUT-OF-PLANE INTERFEROMETER**
Lukas Brandhoff, Michael Johannes Vellekoop
*University of Bremen, Germany*

**C2P-K5**
**SENSITIVITY ENHANCEMENT OF A HUMIDITY SENSOR BASED ON POLY(SODIUM PHOSPHATE) AND POLY(ALLYLAMINE HYDROCHLORIDE)**
Miguel Hernaez, Diego Lopez-Torres, Cesar Elosua, Ignacio Raul Matías, Francisco Javier Arregui
*Public University of Navarra, Spain*

**C2P-K6**
**VIBRATION MONITORING WITH A SILICON MICRO-FABRICATED DEVICE COUPLED TO AN OPTICAL FIBER**
Jose Mireles Jr.[2], Angel Sauceda[2], Juan Ibarra[2], Ivan Muñoz[2], Gustavo Lara[2], Roberto Ambrosio[2], Abimael Jimenez[2], Estrada V. Horacio[1]
*[1]Centro Nacional de Metrologia, Mexico; [2]Universidad Autonoma de Ciudad Juarez, Mexico*

**C2P-K7**
**DEFECT-ASSISTED PLASMONIC SENSING**
Jayson Briscoe[1], Sang-Yeon Cho[1], Igal Brener[2]
*[1]New Mexico State University, United States; [2]Sandia National Laboratories, United States*

**C2P-K8**
**A 3T LINEAR-LOGARITHMIC CMOS IMAGE SENSOR**
Santosh Koppa, Youngjoong Joo
*University of Texas at San Antonio, United States*

**C2P-K9**
**A 10.6μM X 10.6μM CMOS SPAD WITH INTEGRATED READOUT**
Khandaker A. Al Mamun, Mohammad Habib, David Bishai, Nicole McFarlane
*University of Tennessee, Knoxville, United States*

**C2P-K10**
**PLASMONIC AND BOLOMETRIC TERAHERTZ GRAPHENE SENSORS**
Michael Shur[2], Andrey Muraviev[2], Sergey Rumyantsev[2], Wojtech Knap[3], Guanxiong Liu[1], Alexander Balandin[1]
*[1]University of California, Riverside, United States [2]Rensselaer Polytechnic Institute, United States; [3]Université Montpellier 2, France*

**C2P-K11**
**PORTABLE OPTICAL SENSOR USING TUNABLE OPTICAL MULTILAYERS**
Andras Kovacs, Aina Malisauskaite, Alexey Ivanov, Ulrich Mescheder
*Hochschule Furtwangen University, Germany*

**C2P-K12**
**IN-FIBER INTERFEROMETERS FOR TEMPERATURE CORRECTED REFRACTIVE INDEX SENSING WITH GUIDED AND LEAKY MODES**
Jeremie Harris, Ping Lu, Hugo Larocque, Liang Chen, Xiaoyi Bao
*University of Ottawa, Canada*

**C2P-K13**
**DISCRIMINATION OF TEMPERATURE AND AXIAL STRAIN USING DISPERSION EFFECTS OF HIGH-ORDER-MODE FIBERS**
Yanping Xu[2], Ping Lu[1,2], Jia Song[2], Liang Chen[2], Xiaoyi Bao[2], Xiaopeng Dong[3]
*[1]National Research Council Canada, Canada; [2]University of Ottawa, Canada; [3]Xiamen University, China*

**10:15 AM - 12:15 PM**
**C2P-L: SENSOR NETWORKS II**
**Poster Area - Baltimore AB**
**Session Chairs: Elliott Brown (Wright State University, USA)**

**C2P-L1**
**EFFECT OF LOCATION ON THE LATENCY IN CLUSTER-BASED WSNS**
Deepa Padmanabhan, Fabrice Labeau
*McGill University, Canada*

**C2P-L2**
**DEVELOPMENT OF SUSPENDED PLANAR TWO PORT MICRO TRANSFORMER FOR RF WIRELESS APPLICATION**
I-Yu Huang, Wen-Hui Huang, Chian-Hao Sun
*National Sun Yat-sen University, Taiwan*

**C2P-L3**
**A NEW NON-INVASIVE VOLTAGE MEASUREMENT METHOD FOR WIRELESS ANALYSIS OF ELECTRICAL PARAMETERS AND POWER QUALITY**
Domenico Balsamo[2], Danilo Porcarelli[2], Luca Benini[2], Davide Brunelli[1]
*[1]University of Trento, Italy; [2]University of Bologna, Italy*

**C2P-L4**
**PERFORMANCE OF DMSA ALGORITHM IN HYBRID SENSOR NETWORKS**
Ariton Xhafa, Xiaolin Lu, Ryan Nuzzaci, Jianwei Zhou
*Texas Instruments, Inc., United States*

**C2P-L5**
**LIGHTWEIGHT DIGITAL HARDWARE RANDOM NUMBER GENERATORS**
Teng Xu, Miodrag Potkonjak
*University of California, Los Angeles, United States*

**C2P-L6**
**VOLTAGE-BASED ESTIMATION OF RESIDUAL BATTERY ENERGY IN WIRELESS SENSOR SYSTEMS**
Jaeung Kim, Dong Kun Noh
*Soongsil University, Korea, South*

**C2P-L7**
**CLUSTER HEAD LOAD DISTRIBUTION SCHEME FOR WIRELESS SENSOR NETWORKS**
Prasenjit Chanak, Tuhina Samanta, Indrajit Banerjee
*Bengal Engineering and Science University, Shibpir, India*

**C2P-L8**
**DISTRIBUTED CLUSTERING ALGORITHM FOR MOBILE WIRELESS SENSORS NETWORKS**
Fatiha Djemili[2], Wessam Ajib[1], Abdellatif Obaid[1]
*[1]Université du Quebec a Montréal, Canada; [2]Badji Mokhtar-Annaba University, Algeria*

**C2P-L9**
**REGION BASED THREE DIMENSIONAL REAL-TIME ROUTING PROTOCOL FOR WIRELESS SENSOR NETWORKS**
Sarab Al Rubeaai, Brajendra Singh, Mehmmood Abd, Kemal Tepe
*University of Windsor, Canada*

**10:15 AM - 12:15 PM**
**C2P-M: OTHER SENSORS TOPICS II**
**Poster Area - Baltimore AB**
**Session Chair: Goutam Koley (University of South Carolina, USA)**

**C2P-M1**
**CALIBRATION OF GRADIOMETER BY SOLVING NONLINEAR EQUATIONS AND ITS PARAMETERS GENERALITY TEST**
Hongfeng Pang, Mengchun Pan, Jiafei Hu, Dixiang Chen, Feilu Luo
*National University of Defense Technology, China*

**C2P-M2**
**ANALYSIS OF MECHANICAL STRENGTHENING OF SI CANTILEVER BY CHEMICAL KOH ETCHING**
Yosuke Niimi, Tatsuya Hasegawa, Tomoaki Sugino, Satoshi Hamaoka, Kenji Fukuzawa, Mitsuhiro Shikida
*Nagoya University, Japan*

**C2P-M3**
**STUDY OF NON-SPECIFIC PROTEIN ABSORPTION OF GLUCOSE SENSORS COATED WITH ELECTRO-POLYMERIZED ZWITTERIONIC HYDROGEL**
Yichuan Hu, Guang Yang, Bo Liang, Lu Fang, Keda Shi, Xuesong Ye
*ZheJiang University, China*

**C2P-M4**
**DESIGN AND IMPLEMENTATION OF A SELF-CALIBRATING, COMPACT MICRO STRIP SENSOR FOR IN-SITU DIELECTRIC SPECTROSCOPY AND DATA TRANSMISSION**
Gunjan Pandey, Ratnesh Kumar, Robert Weber
*Iowa State University, United States*

**C2P-M5**
**THE EFFECT OF TRUE HUMAN SYNOVIAL FLUID ON THE FUNCTIONALITY OF AN IN VIVO PRESSURE SENSOR ELEMENT**
Ingelin Clausen, Lars Geir Whist Tvedt, Sigurd Moe, Andreas Vogl
*SINTEF, Norway*

**C2P-M6**
**AN EXOTHERMAL ENERGY RELEASE LAYER FOR MICROCHIP TRANSIENCE**
Shashank Pandey, Carlos Mastrangelo
*University of Utah, United States*

**C2P-M7**
**ACOUSTIC AND ELECTRICAL PROPERTIES OF CA3TAGA3SI2O14 PIEZOELECTRIC RESONATORS AT ELEVATED TEMPERATURES**
Ward Johnson[2], Michal Schulz[1], Holger Fritze[1]
*[1]Clausthal University of Technology, Germany; [2]National Institute of Standards and Technology, United States*

**C2P-M8**
**DEEP NLD PLASMA ETCHING OF FUSED SILICA AND BOROSILICATE GLASS**
Mohammed Jalal Ahamed, Doruk Senkal, Alexander Trusov, Andrei Shkel
*University of California, Irvine, United States*

**C2P-M9**
**LONG-TERM THERMAL MECHANICAL STABILITY OF PECVD AMORPHOUS SILICON CARBIDE FILMS FOR HARSH ENVIRONMENT MICROELECTROMECHANICAL SYSTEMS**
Michael LaBarbera[1], Christian Zorman[1], Maximilian Scardelletti[2]
*[1]Case Western Reserve University, United States; [2]NASA GLenn Research Center, United States*

**C2P-M10**
**TIOX MEMRISTORS WITH VARIABLE TURN-ON VOLTAGE USING FIELD-EFFECT FOR NON-VOLATILE MEMORY**
Pradeep Pai, Faisal Chowdhury, Tien-Vinh Dang-Tran, Massood Tabib-Azar
*University of Utah, United States*

**C2P-M11**
**MOX GAS SENSORS USING MULTILAYER AEROGEL**
Sanjay Kumar, Mohammad Madani, Mohammad Seyedjalali
*University of Louisiana at Lafayette, United States*

**C2P-M12**
**A ROBUST VACNF PLATFORM FOR ELECTROCHEMICAL BIOSENSOR**
Khandaker A. Al Mamun[2], Fahmida S. Tulip[2], Kimberly MacArthur[2], Nicole McFarlane[2], Syed Kamrul Islam[2], Dale Hensley[1], Ivan I. Kravchenko[1]
*[1]Oak Ridge National Laboratory, United States; [2]University of Tennessee, Knoxville, United States*

**C2P-M13**
**SHORT-RANGE REMOTE POWERING FOR LONG-TERM IMPLANTED SENSOR SYSTEMS IN FREELY MOVING SMALL ANIMALS**
Enver G. Kilinc[1], Franco Maloberti[2], Catherine Dehollain[1]
*[1]Ecole Polytechnique Federale de Lausanne, Switzerland; [2]Università degli Studi di Pavia, Italy*

**C2P-M14**
**POWER-ERROR ANALYSIS OF SENSOR ARRAY REGRESSION ALGORITHMS FOR GAS MIXTURE QUANTIFICATION IN LOW-POWER MICROSYSTEMS**
Yuning Yang, Jinfeng Yi, Rong Jin, Andrew Mason
*Michigan State University, United States*

**C2P-M15**
**A BULK MICROMACHINED SILICON NEURAL PROBE WITH NANOPOROUS PLATINUM ELECTRODE FOR LOW IMPEDANCE RECORDING**
Yijae Lee, Su Jin Lee, Hyosang Yoon, Jae Young Park
*Kwangwoon University, Korea, South*

**C2P-M16**
**ENHANCING MEASUREMENT ACCURACY OF POSITION SENSITIVE DETECTOR (PSD) SYSTEMS USING THE KALMAN FILTER AND DISTORTION RECTIFYING**
Yudong Luo, Yantao Shen, Jose Cordero, Josette Zaklit
*University of Nevada, Reno, United States*

**C2P-M17**
**SPECTRAL ESTIMATION USING DUAL SENSORS WITH UNCORRELATED NOISE**
Andrew Fleming, Brett Ninness, Adrian Wills
*University of Newcastle, Australia*

**C2P-M18**
**RESOLUTION OF SENSORS WITH CAPACITIVE SOURCE IMPEDANCE**
Yik Ren Teo, Andrew Fleming
*University of Newcastle, Australia*

---

**10:15 AM - 12:15 PM**
**C2P-N: OPEN POSTER II**
**Poster Area - Baltimore AB**
**Session Chairs: Troy Nagle (North Carolina State University, USA)**

**C2P-N1**
**OPTICAL PHASE-SHIFT EFFECTS FROM SURFACE ADSORPTION IN TRANSPARENT POLYMERS: APPLICATION OF WAVEFRONT DISTORTION MEASUREMENTS TO CHEMICAL SENSORS**
Donald Snyder
*Easten Michigan University, United States*

**C2P-N2**
**ROGOWSKI COIL SENSOR AND INTEGRATOR: OPERATION AND DEPENDENCE ON VARIOUS PHYSICAL PARAMETERS**
Arash Hajjam, Sam Seyfi, C. Scott Brown, George Langer, Mitch Morse
*Magnelab Inc, United States*

**C2P-N3**
**FREQUENCY DOMAIN MEASUREMENTS FOR VIBRATIONAL NOISE REMOVAL**
William Wilson[1], Gary Atkinson[2]
*[1]NASA Langley Research Center, United States; [2]Virginia Commonwealth University, United States*

**C2P-N4**
**DEVELOPMENT OF A HIGH SPEED AIR-COUPLED DUAL-CHANNEL IMPULSE GROUND PENETRATING RADAR FOR TRANSPORTATION INFRASTRUCTURE SAFETY INSPECTION**
Yu Zhang, Anbu Venkatac, Tian Xia, Dryver Huston
*University of Vermont, United States*

**C2P-N5**
**IMAGE-BASED SPECTROSCOPY FOR ENVIRONMENTAL MONITORING**
Alpha Mansaray, Rosalind Wynne, Eduard Bachmakov, Carolyn Molina
*Villanova University, United States*

**C2P-N6**
**WEBCAM AND SMART-PHONE FOR PASSIVE EMISSION COLORIMETRIC SENSORS OF FORMALDEHYDE**
Jietae Lee[3], Seungjae Lee[2], Young Hoon Na[3], Sin Kim[3], Jiryang Lee[1]
*[1]Corny Tech Inc., Korea, South; [2]Johns Hokins University, United States; [3]Kyungpook National University, Korea, South*

**C2P-N7**
**AC/DC LINEAR MAGNETIC SCANNER FOR BUILDING INDUSTRY**
Ales Zikmund[2], Jan Vyhnanek[2], Michal Janosek[1]
*[1]FEE, CTU in Prague, Czech Republic; [2]UCEEB, CTU in Prague, Czech Republic*

**C2P-N8**
**FLEXIBLE NEEL EFFECT CURRENT SENSOR**
Eric Vourc'H[3], Pierre-Yves Joubert[1], Lionel Cima[2]
*[1]IEF CNRS, France; [2]Neelogy, France; [3]SATIE CNRS, France*

**C2P-N9**
**WORK FUNCTION FLUCTUATIONS FOR SENSING BY POLYANILINE FILMS**
Ryan West[2], Mira Josowicz[1], Jiri Janata[1]
*[1]Georgia Institute of Technology, United States; [2]National Institute of Standards and Technology, United States*

**C2P-N10**
**DESIGN AND ELECTRO-THERMAL ANALYSIS OF SURFACE MICROMACHINED PERFORATED MEMBRANE HOTPLATE FOR CHEMICAL GAS SENSOR APPLICATIONS**
Amit Kumar, Golla Eranna
*CSIR-CEERI, India*

**C2P-N11**
**A COMPACT, VERSATILE SIX-PORT RADAR SENSOR FOR INDUSTRIAL AND MEDICAL APPLICATIONS**
Sarah Linz[2], Gabor Vinci[1], Stefan Lindner[2], Sebastian Mann[2], Francesco Barbon[2], Robert Weigel[2], Alexander Koelpin[2]
*[1]InnoSenT GmbH, Germany; [2]University of Erlangen-Nuremberg, Germany*

**C2P-N12**
**TRL: RAY TRACING-ASSISTED SENSOR LOCALIZATION FOR UNDERWATER ACOUSTIC SENSOR NETWORKS**
Y Kim, C Kim
*GIST, Korea, South*

**C2P-N13**
**THICKNESS MEASUREMENT OF HEAVY & LIGHT OIL USING BLUE LIGHTS**
Sangwoo Oh, Moonjin Lee
*KIOST, Korea, South*

**2:00 PM - 3:15 PM**
**C3L-A: CHEMICAL & GAS SENSORS I**
**Maryland F**
**Session Chair: Don L. DeVoe (University of Maryland, USA)**

**2:00 PM**
**A NOVEL SMECTITE-POLYMER NANOCOMPOSITE (SPN) MICROSTRIP SENSOR FOR RAPID QUANTITATIVE DETECTION OF AFLATOXINS**
He Hu, Jun Zou, Youjun Deng
*Texas A&M University, United States*

**2:15 PM**
**CONTROLLED DRUG RELEASE IN A MICROFLUIDIC DEVICE WITH DROPLET MERGING AND STORAGE FUNCTIONS**
Wen-Chuan Cheng, Yuan He, Long Que
*Louisiana Tech University, United States*

**2:30 PM**
**SENSITIVE DETECTION OF MELAMINE WITH SILICON NANOWIRE FIELD EFFECT TRANSISTOR BIOSENSOR**
Ruhai Tian[2], Suresh Regonda[2], Serena Greene[1], Gang Zhi[3], Jiahuan Ding[1], Walter Hu[2]
*[1]Diagtronix Inc., United States; [2]University of Texas at Dallas, United States; [2]Global Foundry, United States; [3]National Institute of Biological Sciences, China*

**2:45 PM**
**DEVELOPMENT OF A LOW COST HEMIN BASED DISSOLVED OXYGEN SENSOR WITH ANTI-BIOFOULING COATING FOR WATER MONITORING**
Huan-Hsuan Hsu, P. Ravi Selvaganapathy
*McMaster University, Canada*

**3:00 PM**
**FREE-STANDING PARYLENE C THIN FILMS AS FLEXIBLE PH SENSING MEMBRANES**
Tatiana Trantidou, Mehvesh Tariq, Yu-Chun Chang, Christofer Toumazou, Themistoklis Prodromakis
*Imperial College London, United Kingdom*

**2:00 PM - 3:15 PM**
**C3L-B: SENSOR APPLICATIONS FOR LIFE AND SOCIETY**
**Maryland E**
**Session Chairs: Geoffrey Cranch (Naval Research Laboratory, USA), Tao Li (University of Michigan, USA)**

**2:00 PM**
**RANDOM WALK AND LIGHTING CONTROL**
Matthew Aldrich, Akash Badshah, Brian Mayton, Nan Zhao, Joseph Paradiso
*Massachusetts Institute of Technology, United States*

**2:15 PM**
**WIRELESS SENSOR NODE FOR BACKSCATTERING ELECTRICAL SIGNALS GENERATED BY PLANTS**
Christos Konstantopoulos, Eleftherios Kampianakis, Eftichios Koutroulis, Aggelos Bletsas
*Technical University of Crete, Greece*

**2:30 PM**
**COTS-BASED STICK-ON ELECTRICITY METERS FOR BUILDING SUBMETERING**
Michael Lorek[2], Fabien Chraim[2], Steven Lanzisera[1], Kristofer Pister[2]
*[1]Lawrence Berkeley National Laboratory, United States; [2]University of California, Berkeley, United States*

**2:45 PM**
**PARETO-OPTIMAL SIGNAL PROCESSING ON LOW-POWER MICROPROCESSORS**
Peter Christ, Gregor Sievers, Julian Einhaus, Thorsten Jungeblut, Mario Porrmann, Ulrich Rückert
*Bielefeld University, Germany*

**3:00 PM**
**IMAGE SENSING SYSTEM FOR NAVIGATING VISUALLY IMPAIRED PEOPLE**
Thomas Gonnot, Jafar Saniie
*Illinois Institute of Technology, United States*

---

**2:00 PM - 3:15 PM**
**C3L-C: PHYSICAL SENSORS II**
**Maryland A**
**Session Chairs: Goutam Koley (University of South Carolina, USA), Gaurav Bahl (University of Illinois at Urbana-Champaign, USA)**

---

**2:00 PM**
**FATIGUE CRACK DETECTION OF CFRP COMPOSITE PRESSURE VESSEL USING MECHANOLUMINESCENT SENSOR**
Naohiro Ueno[3], Chao-Nan Xu[2,4], Shogo Watanabe[1]
*[1]HyTReC, Japan; [2]National Institute of Advanced Industrial Science and Technology (AIST), Japan; [3]Saga University, Japan, [4]Kyushu University*

**2:15 PM**
**A PASSIVE, WIRELESS STRAIN SENSOR USING A MICROFABRICATED MAGNETOELASTIC BEAM ELEMENT**
Venkatram Pepakayala, Yogesh B. Gianchandani
*University of Michigan, United States*

**2:30 PM**
**MULTI-POINT BEARING CAGE WIRELESS TEMPERATURE SENSOR**
Amir Shahidi, Lokesh Gupta, Dimitrios Peroulis
*Purdue University, United States*

**3:00 PM**
**FABRICATION OF A SANDWICH TYPE THREE AXIS CAPACITIVE MEMS ACCELEROMETER**
Serdar Tez, Tayfun Akin
*Middle East Technical University, Turkey*

**2:00 PM - 3:15 PM**
**C3L-D: OPTICAL SENSORS ON SILICON**
**Maryland D**
**Session Chair: Michael Shur (Rensselaer Polytechnic Institute, USA)**

**2:00 PM**
**SILICON PHOTOMULTIPLIER TECHNOLOGY FOR LOW-LIGHT INTENSITY DETECTION**
Massimo Mazzillo, Ferenc Nagy, Delfo Sanfilippo, Giusy Valvo, Beatrice Carbone, Angelo Piana, Giorgio Fallica
*STMicroelectronics, Italy*

**2:15 PM**
**A NEW POSITION-SENSITIVE SILICON PHOTOMULTIPLIER WITH SUBMILLIMETER SPATIAL RESOLUTION FOR PHOTON-CLUSTER IDENTIFICATION**
Ilaria Sacco[2], Peter Fischer[2], Alberto Gola[1], Claudio Piemonte[1]
*[1]Fondazione Bruno Kessler, Italy; [2]Heidelberg University, Germany*

**2:30 PM**
**OUTPUT RESPONSE CHARACTERISTICS OF RESONANT-TYPE GUIDED-WAVE OPTICAL ACOUSTIC EMISSION SENSOR**
Sotaro Tachibana, Masashi Ohkawa, Takashi Sato
*Niigata University, Japan*

**2:45 PM**
**OPTICAL SPECTRAL RESPONSE FOR RELATIVE HUMIDITY MEASURED WITH POLYVINYLPYRROLIDONE-COATED MACH-ZEHNDER INTERFEROMETER**
Myoung Jin Kim, Eun Joo Jung, Woo Jin Lee, Sung Hwan Hwang, Byung Sup Rho
*Korea Photonics Technology Institute, Korea, South*

**3:00 PM**
**UV-SENSITIVE LOW DARK-COUNT PUREB SINGLE-PHOTON AVALANCHE DIODE**
Lin Qi[2], K.R.C. Mok[2], Edoardo Charbon[2], Lis K. Nanver[2], Mahdi Aminian[1]
*[1]Ecole Polytechnique Fédérale de Lausanne, Switzerland; [2]Delft University of Technology, Netherlands*

**2:00 PM - 3:15 PM**
**C3L-E: LATE NEWS I**
**Watertable ABC**
**Session Chair: Usha Varshney (National Science Foundation, USA)**

**2:00 PM**
**DIRECT DETECTION OF ADENOVIRUS IN ENVIRONMENTAL WASTE WATERS BY PORTABLE OPTICAL FIBER SENSOR PLATFORM**
Nimet Yildirim[1], Dan Li[2], Feng Long[2], April Gu[1]
*[1]Northeastern University, United States; [2]Tsinghua University, China*

**2:15 PM**
**LOW-NOISE SMART SENSOR BASED ON SILICON NANOWIRE FOR MEMS RESISTIVE MICROPHONE**
Jamel Nebhen[2], Eric Savary[2], Wenceslas Rahajandraibe[2], Christian Dufaza[2], Stephane Meillère[2], E. Kussener[2], Herve Barthelémy[2], J. Czarny[1], Arnaud Walther[1]
*[1]CEA-LETI, France; [2] Aix Marseille University, France*

**2:30 PM**
**POLYMER-BASED MICROFLUIDIC DEVICES FOR RARE CELL DETECTION BY ULTRASOUNDS**
Itziar Gonzalez[1], Victor Acosta[1], Maria Tijero[3], Javier Berganzo[3], Adela Castillejo[2], Jose Luis Soto[2], Alain Martin[4], Mounir Bouali[4]
*[1]CSIC, Spain; [2]Hospital General Universitario de Elche, Spain; [3]IKERLAN, Spain; [4]University Politecnica Mondragon, Spain*

**2:45 PM**
**A NOVEL INKJET-PRINTED CHIPLESS RFID-BASED PASSIVE FLUID SENSOR PLATFORM**
Sangkil Kim[2], James Cooper[2], Manos Tentzeris[2], Robert Herre[1], Sijia Gu[3], Tuami Lasri[3]
*[1]Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; [2]Georgia Institute of Technology, United States; [3]Université Lille 1, France*

**3:00 PM**
**PLATINUM FUNCTIONALIZED TITANIA NANOTUBE ARRAY SENSOR FOR DETECTION OF TRICHLOROETHYLENE IN WATER**
Harikrishnan Jayamohan, York Smith, Bruce Gale, Manoranjan Misra, Swomitra Mohanty
*University of Utah, United States*

---

**2:00 PM - 3:15 PM**
**C3L-F: HARVESTING & CONVERTERS**
**Homeland**
**Session Chairs: Christopher Salthouse (University of Massachusetts Amherst, USA), Christian Zorman (Case Western Reserve University, USA)**

---

**2:00 PM**
**A MULTI-ANODE PAPER-BASED MICROBIAL FUEL CELL FOR DISPOSABLE BIOSENSORS**
Arwa Fraiwan, Seokheun Choi
*Binghamton University, United State*s

**2:15 PM**
**AN ULTRA-LOW-POWER ACTIVE AC-DC CMOS CONVERTER FOR SUB-1V INTEGRATED ENERGY HARVESTING APPLICATIONS**
Abdalrahman Sayed Herbawi, Oliver Paul, Tzeno Galchev
*University of Freiburg, Germany*

**2:30 PM**
**PERFORMANCE METRICS FOR THERMOELECTRIC ENERGY HARVESTING STUDIED USING A NOVEL PLANAR 65 NM SILICON CMOS-BASED THERMOPILE**
Hal Edwards, Jeff Debord, Toan Tran, Dave Freeman, Ken Maggio
*Texas Instruments, Inc., United States*

**2:45 PM**
**SCHEME FOR IMPROVED INTEGRATION AND LIFETIME FOR PIEZOELECTRIC ENERGY HARVESTERS**
Alwyn Elliott[1], James Dicken[1], Lindsay Miller[2], Paul Wright[2], Paul Mitcheson[1]
*[1]Imperial College London, United Kingdom; [2]University of California, Berkeley, United States*

**3:00 PM**
**TOWARDS A SELF-SUSTAINED MOISTURE AND TEMPERATURE MONITORING SYSTEM USING SOIL ENERGY**
Fu-To Lin[1], Jen-Chien Hsieh[1], Fu-Chun Wen[1], Wei-Kuan Wang[1], Huang-Chen Lee[1], Yu-Te Liao[1,2]
*[1]National Chung-Cheng University, Taiwan; [2]National Chiao-Tung University*

---

**3:45 PM - 5:00 PM**
**C4L-D: OPTICAL SENSOR SIGNAL ANALYSES**
**Maryland D**
**Session Chairs: Paddy French (TU Delft, The Netherlands), Carlos Ruiz-Zamarreno (Universidad Publica de Navarra, Spain)**

---

**3:45 PM**
**MRI-COMPATIBLE OPTICALLY-SENSED CELLO**
Avrum Hollinger, Marcelo Wanderley
*McGill University, Canada*

**4:00 PM**
**SIGNAL PROCESSING FOR ELECTRO-OPTIC VOLTAGE SENSOR**
Olivier Steiger[1], Sergio Marchese[1], Joris Pascal[1], Klaus Bohnert[1], Stephan Wildermuth[2]
*[1]ABB Switzerland Inc., Switzerland; [2]ABB Germany Inc., Germany*

**4:15 PM**
**A COMPARISON OF TECHNIQUES FOR EXTRACTING TRANSVERSE SPEED FROM PHOTON DOPPLER VELOCIMETRY SIGNAL CONTENT**
Erik Moro, Matthew Briggs, Lawrence Hull
*Los Alamos National Laboratory, United States*

**4:30 PM**
**SILICON NITRIDE BASED MID-INFRARED MICROPHOTONICS FOR SENSOR APPLICATIONS**
Pao Lin, Vivek Singh, Lionel Kimerling, Anuradha Agarwal
*Massachusetts Institute of Technology, United States*

**3:45 PM - 5:00 PM**
**C4L-E: LATE NEWS II**
**Watertable ABC**
**Session Chairs: Usha Varshney (National Science Foundation, USA)**

**3:45 PM**
**A MIXED APPROACH LOAD BALANCING AND EFFICIENT ENERGY FOR MULTI-PATH ROUTING IN MOBILE AD HOC NETWORKS**
Fatiha Djemili, Cherif Tolba
*Badji Mokhtar-Annaba University, Algeria*

**4:00 PM**
**INDOOR POSITIONING WITH MAXIMUM LIKELIHOOD CLASSIFICATION OF WI-FI SIGNALS**
Noah Pritt
*Frederick Community College, United States*

**4:15 PM**
**MICROCONTROLLER-BASED POWER MANAGEMENT FOR NANOWATT AND MICROWATT ENERGY HARVESTERS**
Dusan Vuckovic
*DELTA – IdemoLab/Technical University of Denmark, Denmark*

**4:30 PM**
**DESIGN AND PERFORMANCE OF A REAL-TIME ACOUSTIC BEAMFORMING SYSTEM**
Alaa Abdeen, Laura Ray
*Dartmouth College, United States*

**4:45 PM**
**OPEN ARCHITECTURE FOR WSN BASED ON RUNTIME RECONFIGURABLE SYSTEMS AND THE IEEE 1451**
Jean Guevara[1], Enrique Vargas[1], Fernando Brunetti[1], Federico Barrero[2]
*[1]Universidad Catolica Nuestra Señora de la Asuncion, Paraguay; [2]Universidad de Sevilla, Spain*

**3:45 PM - 5:00 PM**
**C4L-F: CHARACTERIZATION & TESTING**
**Homeland**
**Session Chairs: Babak Ziaie (Purdue University, USA), Christian Zorman (Case Western Reserve University, USA)**

**3:45 PM**
**WAVELENGTH DISPERSION OF VERDET CONSTANT IN E-FIELD ORIENTED IRON OXIDE DOPED POLYMER NANOCOMPOSITES**
Ganapathy Kumar, Satish Mahajan
*Tennessee Technological University, United States*

**4:00 PM**
**HETEROGENEOUS INTEGRATION OF AN INAS NANOWIRE WITH ENERGY-EFFICIENT CMOS DELTA-SIGMA MODULATOR**
Kenji Michimata, Hiroaki Kotani, Tatsuro Watanabe, Hiroaki Funayama, Shin Murakami, Kazuhiko Shimomura, Takao Waho
*Sophia University, Japan*

**4:15 PM**
**IMPACT OF GAMMA RADIATION ON RANGE FINDING SENSOR PERFORMANCE**
Zachary Diggins, Nagabhushan Mahadevan, Dan Herbison, Eric Barth, Arthur Witulski
*Vanderbilt University, United States*

**4:30 PM**
**A NEW APPROACH ON MEMS SENSOR BATCH TESTING USING AN ANALOGUE PARALLEL TEST METHODOLOGY FOR MASSIVE REDUCTION OF TEST TIME**
Florian Oesterle, Robert Weigel, Alexander Koelpin
*University of Erlangen-Nürnberg, Germany*

**4:45 PM**
**DEVELOPMENT OF NOVEL POLYMERIC SENSORS FOR TASTE SENSING: ELECTRONIC TONGUE**
Basudam Adhikari[2], Manmatha Mahato[2], Tridib Sinha[2], Arnab Halder[2], Nabarun Bhattacharya[1]
[1]*Centre For Development Of Advanced Computing (C-DAC), India;*
[2]*Indian Institute of Technology Kharagpur, India*

# AUTHOR INDEX

## A

# B

# C

# D

# E



# F

# G

# H

# I

# J

# K

# L

# M

# N

# O

# P

# Q



# R

# S

# T

# U



# V

# W

# X



# Y

# Z