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9:10 AM - 10:00 AM

A1L-A: PLENARY 1

LOCATION: Grand Sierra A-C

SESSION CHAIR:

Venkat Bhethanabotla, University of South Florida

**EVENT DRIVEN PERSISTENT SENSING: OVERCOMING THE ENERGY AND LIFETIME LIMITATIONS IN UNATTENDED WIRELESS SENSORS .....1**

*Roy Olsson III{2}, Radoslav Bogoslovov{3}, Christal Gordon{1}*

*{1}Booz Allen Hamilton, United States; {2}Defense Advanced Research Projects Agency, United States;*

*{3}Defense Advanced Research Projects Agency / ECS Federal, LLC, United States*

10:30 AM - 12:00 PM

A2L-A: FUNDAMENTALS OF RESONATING SENSORS

LOCATION: Curacao 1-2

SESSION CHAIRS:

Michael Vellekoop, University of Bremen

David Elata, Technion - Israel Institute of Technology

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LOCATION: Curacao 3-4

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*{1}Nanyang Technological University, Singapore; {2}Robert Bosch (SEA) Pte Ltd, Singapore*

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*{1}École Polytechnique Fédérale de Lausanne, Switzerland; {2}Sapienza - Università di Roma, Italy*

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*{1}Universidade de São Paulo, Brazil; {2}Universidade Estadual Paulista Júlio de Mesquita Filho, Brazil*

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*{1}Jeju National University, United States; {2}Missouri University of Science and Technology, United States*

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LOCATION: Curacao 5-6

SESSION CHAIRS:

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Deepak Uttamchandani, University of Strathclyde

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<sup>{1}</sup>nanoplus Nanosystems and Technologies GmbH, Germany; <sup>{2}</sup>Universität Würzburg, Germany

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<sup>{1}</sup>Kyushu Dental University, Japan; <sup>{2}</sup>Kyushu Dental University / Waseda University, Japan; <sup>{3}</sup>Waseda University, Japan

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<sup>{1}</sup>Sheffield Hallam University, United Kingdom; <sup>{2}</sup>Sheffield University, United Kingdom

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LOCATION: Curacao 7-8

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*{1}Carnegie Mellon University, United States; {2}University of Pittsburgh, United States*

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*{1}University of Colorado, Boulder, United States; {2}University of Maryland, College Park, United States*

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*{1}Ceva D.S.P LTD, Israel; {2}Harman Becker GmbH, Germany; {3}KeyLemon S.A., Switzerland; {4}nViso S.A., Switzerland; {5}Softkinetic Software, Belgium; {6}Tobii Technology, Sweden; {7}Università degli Studi di Siena, Italy*

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**LOCATION: Bonaire 1-2**

**SESSION CHAIRS:**

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*<sup>{1}</sup>Pen-Tung Sah Institute of Micro-Nano Science and Technology of Xiamen University, China; <sup>{2}</sup>Xiamen University, China; <sup>{3}</sup>Xiamen University of Technology, China*

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LOCATION: Poster Area

SESSION CHAIR:

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LOCATION: Poster Area

SESSION CHAIR:

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*{1}University of Notre Dame , United States; {2}Western Michigan University, United States*

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*{1}Axion BioSystems Inc., United States; {2}University of Central Florida, United States*

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**LOCATION: Poster Area**

**SESSION CHAIR:**

**Jan Mitrovics, JLM Innovation**

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*Université Bourgogne - Franche-Comté, France*

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*{1}Deutsches Zentrum für Luft- und Raumfahrt e.V., Germany; {2}Leibniz-Institut für innovative Mikroelektronik, Germany; {3}Silicon Radar GmbH, Germany*

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*{1}Nanyang Technological University, Singapore; {2}Université de Bordeaux, France; {3}Université de Limoges, France; {4}Université Lille 1, France*

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*{1}Centralny Instytut Ochrony Pracy - Państwowy Instytut Badawczy, Poland; {2}Lodz University of Technology, Poland; {3}MAT Ltd., Poland*

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**Masayuki Sohgewa, Niigata University**

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*<sup>{1}</sup>Nanjing University of Science and Technology, China; <sup>{2}</sup>Shanghai Aerospace Control Technology Institute, China*

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*<sup>{1}</sup>Technische Universiteit Delft, Netherlands; <sup>{2}</sup>Texas Instruments, United States*

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**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Philip Feng, Case Western Reserve University**

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<i>{1}Pontificia Universidade Católica de Goiás, Brazil; {2}Universidade de Brasília, Brazil; {3}Universidade Federal de Goiás, Brazil</i>	
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LOCATION: Poster Area

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Robert Roberts, University of Hong Kong

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**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Christian Zorman, Case Western Reserve University**

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*{1}Nazarbayev University, Russia; {2}Università Campus Bio-Medico di Roma, Italy; {3}University of Limerick, Ireland*

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*{1}BC Cancer Agency, Canada; {2}University of the Fraser Valley, Canada*

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*{1}Nazarbayev University, Russia; {2}Università degli Studi di Napoli Federico II, Italy; {3}Università degli Studi di Napoli Parthenope, Italy*

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A3P-R: Actuators & Sensor Power Systems II

LOCATION: Poster Area

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Yuji Suzuki, The University of Tokyo

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<sup>{1}</sup>National Central University, Taiwan; <sup>{2}</sup>Université de Versailles Saint-Quentin-en-Yvelines, France

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<sup>{1}</sup>Fondazione Bruno Kessler, Italy; <sup>{2}</sup>Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration, Germany

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<sup>{1}</sup>Shaanxi Applied Physical Chemistry Research Institute, China; <sup>{2}</sup>Xi'an Jiaotong University, China

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<sup>{1}</sup>Analog Devices, Inc., United States; <sup>{2}</sup>Rice University, United States

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*{1}Korea Institute of Science and Technology, Korea, South; {2}Korea Testing Laboratory, Korea, South;*  
*{3}Yonsei University, Korea, South*

**1:00 PM - 3:00 PM**  
**A3P-T: Focused Session Posters: Piezoelectric Energy Harvesting**  
**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Fang Chen, State Key Lab of Transducer Technology**

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*{1}Fondazione Bruno Kessler, Italy; {2}Technische Universität Wien, Austria; {3}Università di Bologna, Italy*

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*{1}Laboratoire d'Analyse et d'Architecture des Systèmes / Université de Toulouse, France; {2}University of Exeter, United Kingdom*

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**SESSION CHAIRS:**  
**Ravinder Dahiya, University of Glasgow**  
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*{1}Emory University, United States; {2}Georgia Institute of Technology, United States*

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*{1}Tennessee Technical University, United States; {2}University of South Carolina, United States*

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<sup>{1}</sup>George Washington University, United States; <sup>{2}</sup>N5 Sensors Inc, United States; <sup>{3}</sup>University of Maryland, United States*

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LOCATION: Curacao 1-2

SESSION CHAIRS:

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Michael Vellekoop, University of Bremen

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{1}Danube University Krems / Technische Universität Wien, Austria; {2}Johannes Kepler University, Austria;  
{3}Justus Liebig University Gießen, Germany*

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{1}Albert-Ludwigs-Universität Freiburg, Germany; {2}Robert Bosch Research and Technology Center, United States*

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{1}CTR Carinthian Tech Research AG, Austria; {2}Fraunhofer-Institut für Integrierte Systeme und Bauelementetechnologie, Germany; {3}Infineon Technologies Austria AG, Austria*

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LOCATION: Curacao 3-4

SESSION CHAIRS:

Karthik Shankar, University of Alberta

Jacopo Iannacci, FBK, Trento, Italy

4:00

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*Iowa State University, United States*

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*{1}IMEC, Belgium; {2}IMEC / Université Catholique de Louvain, Belgium; {3}Université Catholique de Louvain, Belgium*

4:00 PM - 5:30 PM

A5L-C: Light Detection

LOCATION: Curacao 5-6

SESSION CHAIRS:

Eduardo Fontana, Universidade Federal de Pernambuco

Carlos Ruiz-Zamarreño, Public University of Navarra

4:00

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*{1}Technische Universität München, Germany; {2}Università degli Studi di Salerno, Italy*

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*Laboratoire d'Analyse et d'Architecture des Systèmes / Université de Toulouse, France*

4:45

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*{1}U.S. Naval Research Laboratory, United States; {2}University of South Carolina, United States*

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*University of Tennessee, United States*

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4:00 PM - 5:30 PM

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LOCATION: Curacao 7-8

SESSION CHAIRS:

Bernard Jakoby, Johannes Kepler University Linz, Austria

Jianzhen Ou, Royal Melbourne Institute of Technology, Australia

4:00

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*University of Manchester, United Kingdom*

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*Yizhen Wang<sup>{2}</sup>, Lingxiang Zheng<sup>{2}</sup>, Biyu Tang<sup>{2}</sup>, Ao Peng<sup>{2}</sup>, Lulu Yuan<sup>{2}</sup>, Qi Yang<sup>{2}</sup>, Haibin Shi<sup>{2}</sup>, Xiaoyang Ruan<sup>{2}</sup>, Huiru Zheng<sup>{1}</sup>*

*<sup>{1}</sup>University of Ulster, United Kingdom; <sup>{2}</sup>Xiamen University, China*

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*<sup>{1}</sup>California State University, Chico, United States; <sup>{2}</sup>Eastern Washington University, United States*

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*Universidad del País Vasco, Spain*

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*Olivier Mareschal, Basile Dufay, Sylvain Lebagry, Gilles Allègre, Matthieu Denoual, Didier Robbes*

*Université de Caen, France*

5:15

**CLICK CHEMISTRY BASED BIOMOLECULAR CONJUGATION MONITORING USING SURFACE-ENHANCED RAMAN SPECTROSCOPY MAPPING .....568**

*Mirko Palla<sup>{1}</sup>, Shiv Kumar<sup>{1}</sup>, Zengmin Li<sup>{1}</sup>, Steffen Jockusch<sup>{1}</sup>, James Russo<sup>{1}</sup>, Jingyue Ju<sup>{1}</sup>, Filippo Bosco<sup>{2}</sup>, Tomas Rindzevicius<sup>{2}</sup>, Tommy S. Alstrom<sup>{2}</sup>, Michael S. Schmidt<sup>{2}</sup>, Anja Boisen<sup>{2}</sup>*

*<sup>{1}</sup>Columbia University, United States; <sup>{2}</sup>Technical University of Denmark, Denmark*

4:00 PM - 5:30 PM

A5L-E: Focused Session: Wearables

LOCATION: Bonaire 1-2

SESSION CHAIRS:

Mark Ming-Cheng Cheng, Wayne State University

Zeynep Celik-Butler, University of Texas at Arlington

4:00

**TACTILE SENSORIZED GLOVE FOR FORCE AND MOTION SENSING .....571**

Joo Chuan Yeo<sup>{1}</sup>, Cassidy Lee<sup>{1}</sup>, Zhiping Wang<sup>{2}</sup>, Chwee Teck Lim<sup>{1}</sup>

<sup>{1}</sup>National University of Singapore, Singapore; <sup>{2}</sup>Singapore Institute of Manufacturing Technology, Singapore

4:15

**CMOS HALL SENSOR WITH REDUCED SENSITIVITY DRIFT BY SYNCHRONOUS EXCITATION CALIBRATION FOR WEARABLE BIOMAGNETIC SENSOR IN SYSTEM-ON-CHIP .....574**

Tiger Chang, Kai-Cheung Juang

Industrial Technology Research Institute, Taiwan

4:30

**ELECTRONIC BRACELET FOR MONITORING OF ALCOHOL LIFESTYLE .....577**

David Kinnamon<sup>{2}</sup>, Anjan Panneer Selvam<sup>{2}</sup>, Shalini Prasad<sup>{2}</sup>, Sriram Muthukumar<sup>{1}</sup>

<sup>{1}</sup>EnLiSense LLC., United States; <sup>{2}</sup>University of Texas at Dallas, United States

4:45

**WEARABLE ANEMOMETER FOR 2D WIND DETECTION .....580**

Shuai Zhao, Peng Jiang, Rong Zhu, Ruiyi Que

Tsinghua University, China

5:00

**FLEXIBLE SENSOR FOR MEASUREMENT OF SKIN PRESSURE AND TEMPERATURE IN A CLINICAL SETTING .....583**

John McNeill<sup>{2}</sup>, Matthew Crivello<sup>{2}</sup>, Yitzhak Mendelson<sup>{2}</sup>, Devdip Sen<sup>{2}</sup>, Raymond Dunn<sup>{1}</sup>, Kelli Hickle<sup>{1}</sup>

<sup>{1}</sup>University of Massachusetts Medical School, United States; <sup>{2}</sup>Worcester Polytechnic Institute, United States

5:15

**TEXTILE-BASED WEARABLE SENSORS USING METAL-NANOWIRE EMBEDDED CONDUCTIVE FIBERS .....586**

Jimi Eom, Woobin Lee, Yong-Hoon Kim

Sungkyunkwan University, Korea, South



4:00 PM - 5:30 PM

A5L-F: Chemical & Gas Sensing Devices

LOCATION: Bonaire 3-4

SESSION CHAIRS:

Massood Atashbar, Western Michigan University

Ramgopal Rao, IIT Delhi

4:00

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*Valipe Ramgopal Rao, Sandeep G Surya*

*Indian Institute of Technology Bombay, India*

4:30

**A NOVEL IN-LINE FIBRE-OPTIC SENSOR FOR THE DETECTION OF HYDRATE INHIBITORS WITHIN THE OIL AND GAS INDUSTRY .....592**

*Gary McDowell{2}, Mahesh Uttamlal{2}, Sheila Holmes-Smith{2}, Alan Graham{1}*

*{1}FMC Technologies, United Kingdom; {2}Glasgow Caledonian University, United Kingdom*

4:45

**RAMAN ENHANCED STRUCTURE WITH RECONFIGURED MOLECULARLY-IMPRINTED-POLYMER FOR GAS DETECTION .....595**

*Satoshi Araki, Masashi Watanabe, Fumihito Sassa, Kenshi Hayashi*

*Kyushu University, Japan*

5:00

**DETECTION OF AROMATIC COMPOUNDS IN ARTIFICIAL GASOLINE WITH HYBRID SURFACE ACOUSTIC WAVE SENSOR ARRAY AND A SHORT PACKED COLUMN (SAW-GC) .....598**

*Caroline Carriel Schmitt, Michael Rapp, Achim Voigt, Nicolaus Dahmen*

*Karlsruher Institut für Technologie, Germany*

5:15

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*Ye Chang{1}, Hemi Qu{1}, Xuexin Duan{1}, Luye Mu{2}, Mark Reed{2}*

*{1}Tianjin University, China; {2}Yale University, United States*

10:30 AM - 12:00 PM

**B2L-A: Physical Sensors I: Sensor Systems & Instrumentation**

**LOCATION: Curacao 1-2**

**SESSION CHAIRS:**

**Darrin Young, University of Utah**

**Robert Roberts, University of Hong Kong**

10:30

**INVITED: PACKAGED CAPACITIVE PRESSURE SENSOR SYSTEM FOR AIRCRAFT ENGINE HEALTH MONITORING .....604**

*Maximilian Scardelletti{2}, Christian Zorman{1}*

*{1}Case Western Reserve University, United States; {2}Glenn Research Center , United States*

11:00

**AN INSTRUMENTATION GRADE WALL SHEAR STRESS SENSING SYSTEM.....607**

*Casey Barnard{2}, Jessica Meloy{1}, Mark Sheplak{2}*

*{1}Boeing Company, United States; {2}University of Florida, United States*

11:15

**DOPPLER SENSING OF UNSTEADY DENSE PARTICULATE FLOWS .....610**

*Benjamin Chorpening{2}, Michael Spencer{2}, Richard Stehle{2}, Jared Charley{2}, David Greve{1}*

*{1}Carnegie Mellon University, United States; {2}United States Department of Energy, United States*

11:30

**LINEARLY CHIRPED FIBER-OPTIC BRAGG GRATING AS DISTRIBUTED TEMPERATURE SENSOR FOR LASER ABLATION .....613**

*Sanzhar Korganbayev{2}, Nurlan Zhakin{2}, Daniele Tosi{2}, Flavia Napoleoni{4}, Emiliano Schena{4}, Paola Saccomandi{4}, Riccardo Gassino{3}, Alberto Vallan{3}, Guido Perrone{3}, Michele Caponero{1}*

*{1}Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Italy; {2}Nazarbayev University, Russia; {3}Politecnico di Torino, Italy; {4}Università Campus Bio-Medico di Roma, Italy*

11:45

**A TWO-AXIS TACTILE SENSOR WITH 1 $\mu$ M DIAMETER TIP OF CONTACTOR FOR DETECTION ABILITY OF MICRO REGION SURFACE TEXTURE .....616**

*Kazuki Watatani, Ryogo Kozai, Kyohei Terao, Fusao Shimokawa, Hidekuni Takao*

*Kagawa University, Japan*

10:30 AM - 12:00 PM

B2L-B: Acoustic Sensors

LOCATION: Curacao 3-4

SESSION CHAIRS:

Eugene Hwang, Analog Devices

Jun Kondoh, Shizuoka University

10:30

**SILICON CAVITY RESONATOR BASED ON LOCALLY RESONANT PHONONIC CRYSTAL.....619**

*Wanli Jiang, Duan Feng, Dehui Xu, Bin Xiong, Yuelin Wang*

*Shanghai Institute of Microsystem and Information Technology / Chinese Academy of Sciences, China*

10:45

**3D PHONONIC-FLUIDIC CAVITY SENSOR FOR RESONANCE MEASUREMENTS OF VOLUMETRIC FLUID PROPERTIES.....622**

*Frieder Lucklum, Michael J. Vellekoop*

*Universität Bremen, Germany*

11:00

**NARROWBAND MEMS RESONANT INFRARED DETECTORS BASED ON ULTRATHIN PERFECT PLASMONIC ABSORBERS .....625**

*Zhenyun Qian, Sungho Kang, Vageeswar Rajaram, Matteo Rinaldi*

*Northeastern University, United States*

11:15

**DIRECTLY TRAPPING OF NANOSCALE BIOMOLECULES USING BULK ACOUSTIC WAVE RESONATORS .....628**

*Wenpeng Liu, Chongling Sun, Ji liang, Zifan Tang, Hongxiang Zhang, Hao Zhang, Wei Pang, Xuexin Duan*

*Tianjin University, China*

11:30

**A DIFFRACTION FREE PRESSURE WAVE SENSOR SETUP FOR THE ACOUSTIC VISCOSITY OF LIQUIDS .....631**

*Hannes Antlinger<sup>{2}</sup>, Stefan Clara<sup>{2}</sup>, Thomas Voglhuber-Brunnmaier<sup>{2}</sup>, Bernhard Jakoby<sup>{2}</sup>, Roman Beigelbeck<sup>{1}</sup>, Samir Cerimovic<sup>{3}</sup>, Franz Keplinger<sup>{3}</sup>*

*<sup>{1}</sup>Danube University Krems / Technische Universität Wien, Austria; <sup>{2}</sup>Johannes Kepler University, Austria;*

*<sup>{3}</sup>Technische Universität Wien, Austria*

11:45

**NOVEL MEASUREMENT METHOD OF POSITION AND SOUND VELOCITY OF A LIQUID DROPLET USING A SURFACE ACOUSTIC WAVE DEVICE .....634**

*Jun Kondoh, Michiyuki Yamada, Ken Sugiura*

*Shizuoka University, Japan*

10:30 AM - 12:00 PM

B2L-C: Optical Biosensors

LOCATION: Curacao 5-6

SESSION CHAIRS:

Huikai Xie, University of Florida

Wei-Chuan Shih, University of Houston

10:30

**INVITED: MICRO FBI: A MICROSYSTEM FOR FEEDBACK-BASED BIOFILM INHIBITION.....637**

*Sowmya Subramanian, Ryan Huiszoon, William Bentley, Reza Ghodssi*

*University of Maryland, United States*

11:00

**POROUS PHOTONIC CRYSTAL EXTERNAL CAVITY LASER BIOSENSOR FOR DRUG SCREENING .....640**

*Qinglan Huang, Jessie Peh, Paul J. Hergenrother, Brian T. Cunningham*

*University of Illinois at Urbana–Champaign, United States*

11:15

**SINGLE-MOLECULE FLUORESCENCE IMAGING OF KINESIN USING LINEAR ZERO-MODE WAVEGUIDES .....643**

*Yuki Morita{2}, Kazuya Fujimoto{2}, Ryota Iino{1}, Michio Tomishige{3}, Hirofumi Shintaku{2}, Hidetoshi Kotera{2}, Ryuji Yokokawa{2}*

*{1}Chinese Academy of Sciences, Japan; {2}Kyoto University, Japan; {3}University of Tokyo, Japan*

11:30

**SINGLE STRAND DNA DETECTION BY MEANS OF LOSSY MODE RESONANCE-BASED OPTICAL FIBER DEVICES .....646**

*Carlos Ruiz Zamarréño{2}, Pablo Zubiarte{2}, Pedro Sanchez{2}, Ignacio Raul Matias{2}, Francisco Javier Arregui{2}, Maria Antonia Ramos-Arroyo{1}, María Moreno-Igoa{1}, Blanca Hernández-Charro{1}*

*{1}Complejo Hospitalario de Navarra, Spain; {2}Universidad Pública de Navarra, Spain*

11:45

**GOLD NANOPARTICLE DECORATED AAO FILTER MEMBRANE FOR SERS SENSING OF URINE ACETAMINOPHEN .....649**

*Yu-Lung Sung, Fusheng Zhao, Jingting Li, Wei-Chuan Shih*

*University of Houston, United States*

10:30 AM - 12:00 PM

B2L-D: Sensing Applications II

LOCATION: Curacao 7-8

SESSION CHAIRS:

Cameron Riviere, The Robotics Institute, Carnegie Mellon University

Gerrit Dumstorff, IMSAS, Universitaet Bremen

10:30

**ON BED POSTURE RECOGNITION WITH PRESSURE SENSOR ARRAY SYSTEM .....652**

*Qingquan Sun<sup>{2}</sup>, Eli Gonzalez<sup>{2}</sup>, Yu Sun<sup>{1}</sup>*

*<sup>{1}</sup>California State Polytechnic University, Pomona, United States; <sup>{2}</sup>California State University, San Bernardino, United States*

10:45

**EVALUATION METHOD OF FABRICS BY VISUAL AND TACTILE TEXTURE INFORMATION USING MEMS COMBO SENSOR .....655**

*Kenta Takahashi<sup>{1}</sup>, Takashi Abe<sup>{1}</sup>, Masayuki Sohgewa<sup>{1}</sup>, Masanori Okuyama<sup>{2}</sup>, Haruo Noma<sup>{3}</sup>*

*<sup>{1}</sup>Niigata University, Japan; <sup>{2}</sup>Osaka University, Japan; <sup>{3}</sup>Ritsumeikan University, Japan*

11:00

**DEVELOPMENT OF A FUNGAL RISK MONITOR FOR THE NEXT GENERATION OF INTELLIGENT CONTAINERSAPER .....658**

*Roland Blank, Poornachandra P Vinayaka, Muhammad Waseem Tahir, Joanne Yong, Michael J. Vellekoop, Walter Lang*

*Universität Bremen, Germany*

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*Kei Hiroi, Nobuo Kawaguchi*

*Nagoya University, Japan*

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**A CONTACTLESS THREE-PHASE AUTONOMOUS POWER METER .....664**

*Clemente Villani<sup>{3}</sup>, Simone Benatti<sup>{3}</sup>, Davide Brunelli<sup>{2}</sup>, Luca Benini<sup>{1}</sup>*

*<sup>{1}</sup>Eidgenössische Technische Hochschule Zürich / Università di Bologna, Switzerland; <sup>{2}</sup>Università degli Studi di Trento, Italy; <sup>{3}</sup>Università di Bologna, Italy*

11:45

**FBG-BASED TRANSVERSE AND AXIAL FORCE-SENSING MICRO-FORCEPS FOR RETINAL MICROSURGERY .....667**

*Berk Gonenc, Iulian Iordachita*

*Johns Hopkins University, United States*

10:30 AM - 12:00 PM

B2L-E: Focused Session: 3D Printed Sensors

LOCATION: Bonaire 1-2

SESSION CHAIRS:

Gijs Krijnen, University of Twente

Eric MacDonald, University of Texas in El Paso

10:30

**INVITED: POLYMER COMPOSITES FOR 3D PRINTING OF FUNCTIONAL SENSORS AND**

**TRANSDUCERS .....670**

*Simon Leigh*

*University of Warwick, United Kingdom*

11:00

**FLEXIBLE, STRUCTURED MWCNT/PDMS SENSOR FOR CHRONIC VASCULAR ACCESS**

**MONITORING .....673**

*Steve Majerus{2}, Jeremy Dunning{2}, Joseph Potkay{1}, Kath Bogie{2}*

*{1}Ann Arbor VA Medical Center, United States; {2}Cleveland VA Medical Center, United States*

11:15

**3D PRINTED BIOMIMETIC WHISKER-BASED SENSOR WITH CO-PLANAR CAPACITIVE SENSING .....676**

*John Delamare, Remco Sanders, Gijs Krijnen*

*Universiteit Twente, Netherlands*

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**DESIGN AND DEVELOPMENT OF A NOVEL 3D PRINTED 1-DOF TACTILE SENSOR WITH**

**CONDUCTIVE POLYMER BASED SENSING ELEMENT .....679**

*A.H.T.E. De Silva{2}, W.H. Peshan Sampath{2}, N.H.L. Sameera{2}, T.D.I. Udayanga{2}, Y.W.R. Amarasinghe{2},*

*V. S. C. Weragoda{2}, A. Mitani{1}*

*{1}Sapporo City University, Japan; {2}University of Moratuwa , Sri Lanka*

11:45

**3D PRINTED PRESSURE SENSOR WITH SCREEN-PRINTED RESISTIVE READ-OUT .....682**

*Frieder Lucklum, Gerrit Dumstorff*

*Universität Bremen, Germany*

10:30 AM - 12:00 PM

B2L-F: Chemical & Gas Sensing at Nanoscale

LOCATION: Bonaire 3-4

SESSION CHAIRS:

Mona Zaghoul, George Washington University

Camilla Baratto, CNR National Institute of Optics

10:30

**CMOS INTEGRATED TUNGSTEN OXIDE NANOWIRE NETWORKS FOR PPB-LEVEL HYDROGEN**

**SULFIDE SENSING .....685**

Johanna Krainer<sup>{4}</sup>, Marco Deluca<sup>{4}</sup>, Eva Lackner<sup>{4}</sup>, Florentyna Sosada<sup>{4}</sup>, Robert Wimmer-Teubenbacher<sup>{4}</sup>, Anton Koeck<sup>{4}</sup>, Justyna Bekacz<sup>{2}</sup>, Anneliese Poenninger<sup>{2}</sup>, Christian Gspan<sup>{3}</sup>, Karl Rohrer<sup>{1}</sup>, Ewald Wachmann<sup>{1}</sup>, Martin Schrems<sup>{1}</sup>

<sup>{1}</sup>ams AG, Austria; <sup>{2}</sup>EV Group, Austria; <sup>{3}</sup>Institute for Electron Microscopy and Nanoanalysis, Austria; <sup>{4}</sup>Materials Center Leoben Forschung GmbH, Austria

10:45

**ROOM TEMPERATURE ACETONE SENSOR BASED ON NANOSTRUCTURED K<sub>2</sub>W<sub>7</sub>O<sub>22</sub> .....688**

Danling Wang<sup>{1}</sup>, Qifeng Zhang<sup>{2}</sup>

<sup>{1}</sup>North Dakota State University, United States; <sup>{2}</sup>University of Washington, United States

11:00

**SYNTHESIS OF ZNS URCHIN-LIKE NANOSTRUCTURES FOR ELECTROCHEMICAL**

**DETERMINATION OF URIC ACID .....691**

Yao Zhao<sup>{2}</sup>, Niancai Peng<sup>{2}</sup>, Xueyong Wei<sup>{2}</sup>, Zhuangde Jiang<sup>{2}</sup>, Winson Chun Hsin Kuo<sup>{1}</sup>

<sup>{1}</sup>Texas A&M University, United States; <sup>{2}</sup>Xi'an Jiaotong University, China

11:15

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**ELECTRODES .....694**

Aishwaryadev Banerjee, Navid Farhoudi, Chayanjit Ghosh, Carlos H Mastrangelo, Hanseup Kim, Samuel John Broadbent, Ryan E Looper

University of Utah, United States

11:30

**HIGH SENSITIVE GAS SENSORS REALIZED BY A TRANSFER-FREE PROCESS OF CVD GRAPHENE ....697**

Filiberto Ricciardella<sup>{2}</sup>, Sten Vollebregt<sup>{2}</sup>, Tiziana Polichetti<sup>{1}</sup>, Brigida Alfano<sup>{1}</sup>, Ettore Massera<sup>{1}</sup>, Pasqualina M. Sarro<sup>{2}</sup>

<sup>{1}</sup>Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Italy; <sup>{2}</sup>Technische Universiteit Delft, Netherlands

11:45

**DETECTION OF COCAINE USING GRAVURE PRINTED SILVER NANOPARTICLE BASED**

**SERS SUBSTRATE .....700**

Farah Aljanabi, Binu Narakathu, Sepehr Emamian, Mohammed Mohammed Ali, Bradley Bazuin, Paul Fleming, Massood Zandi Atashbar

Western Michigan University, United States

1:00 PM - 3:00 PM

B3P-G: Sensor Phenomenon, Modeling, & Evaluation II: Capacitive & Tomography

LOCATION: Poster Area

SESSION CHAIR:

Stefan Rupitsch, Friedrich-Alexander-Universität

**B-1-13**

**FAST ALGORITHM FOR IMAGE RECONSTRUCTION IN ADAPTIVE ELECTRICAL CAPACITANCE TOMOGRAPHY .....703**

*Zeeshan Zeeshan{1}, Fernando Teixeira{1}, Qussai Marashdeh{2}  
{1}Ohio State University, United States; {2}Tech4Imaging LLC, United States*

**B-1-27**

**DESIGN AND MODELING OF THREE-DIMENSIONAL TIP-CLEARANCE OPTICAL PROBE BASED ON TWO-CIRCLE REFLECTIVE COAXIAL FIBER BUNDLE.....706**

*Siyang Xie, Xiaodong Zhang  
Xi'an Jiaotong University, China*

**B-1-15**

**HIGH-POWER HANDLING CAPACITY AND OUTPUT RESPONSE OF A CAPACITIVE MICROWAVE POWER SENSOR.....709**

*Hao Yan, Xiaoping Liao, Zhenxiang Yi  
Southeast University, China*

**B-1-17**

**GLASS POLARIZATION INDUCED DRIFT OF CLOSED-LOOP MICROACCELEROMETER .....N/A**

*Wu Zhou{3}, Huijun Yu{3}, Bei Peng{3}, Ruiguo Yang{4}, Jianguo Cai{2}, Jiangbo He{1}, Xiaoping He{1}  
{1}China Academy of Engineering Physics, China; {2}Southeast University, China; {3}University of Electronic Technology and Science of China, China; {4}University of Nebraska-Lincoln, United States*

**B-1-19**

**A DECOUPLING CALIBRATION METHOD BASED ON GENETIC ALGORITHM FOR THREE DIMENSIONAL ELECTRIC FIELD SENSOR.....715**

*Bing Li, Chunrong Peng, Fengjie Zheng, Biyun Ling, Bo Chen, Shanhong Xia  
Chinese Academy of Sciences, China*

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**CHARACTERIZATION OF FADING OF A MOS-BASED SENSOR FOR OCCUPATIONAL RADIATION DOSIMETRY .....718**

*Charilaos Mousoulis{2}, Christian Elmiger{2}, Manik Singhal{2}, Yi Xuan{2}, Timothy McNamee{1}, James Thistlethwaite{1}, Paul Alexander Walerow{1}, Mark Salasky{1}, Sean Scott{1}, Daniel J. Valentino{1}, Dimitrios Peroulis{2}  
{1}Landauer, Inc., United States; {2}Purdue University, United States*

**B-1-23**

**ELECTRICAL TAGGING DEVICES FOR THE REMOVAL OF FAULT LOCATION AMBIGUITIES BY REFLECTOMETRY IN COMPLEX ELECTRICAL NETWORKS .....721**

*Florent Loete{1}, Michel Sorine{2}  
{1}CentraleSupélec, France; {2}Institut National de Recherche en Informatique et en Automatique, France*

**B-1-29**

**AUGMENTING RESOLUTION CAPABILITIES OF IMAGE RECONSTRUCTION IN ADAPTIVE ELECTRICAL CAPACITANCE TOMOGRAPHY .....724**

*Zeeshan Zeeshan{1}, Fernando Teixeira{1}, Qussai Marashdeh{2}  
{1}Ohio State University, United States; {2}Tech4Imaging LLC, United States*



**B-1-25**

**ANALYTICAL MODELING OF ROTATING FIELD EDDY CURRENT SENSOR FOR  
NONDESTRUCTIVE TESTING OF TUBES .....727**

*Darko Vasic{2}, Davorin Ambrus{2}, Vedran Bilas{2}, Pengfei Zhao{1}, Ze Liu{1}  
{1}Beijing Jiaotong University, China; {2}University of Zagreb, Croatia*

**1:00 PM - 3:00 PM**

**B3P-H: MEMS Devices: Design, Technology & Characterization**

**LOCATION: Poster Area**

**SESSION CHAIR:**

**Mehdi Javanmard, Rutgers University**

**B-2-32**

**A NOVEL PACKAGING STRESS ISOLATION STRUCTURE FOR SOI BASED MEMS GYROSCOPES .....730**

*Yongcun Hao, Weizheng Yuan, Jianbing Xie, Honglong Chang  
Northwestern Polytechnical University, China*

**B-2-35**

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*Fatemeh Edalatfar, Bahareh Yaghootkar, Abdul Qader Ahsan Qureshi, Soheil Azimi, Behraad Bahreyni  
Simon Fraser University, Canada*

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*Bahareh Yaghootkar, Soheil Azimi, Behraad Bahreyni  
Simon Fraser University, Canada*

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*Weibing Liu{1}, Anjie Ming{1}, Zhenxin Tan{2}, Qiulin Tan{3}, Xilong Sun{1}, Chaobo Li{1}, Chengyue Yang{1},  
Haiyang Mao{1}, Weibing Wang{1}, Jijun Xiong{3}, Dapeng Chen{1}  
{1}Chinese Academy of Sciences, China; {2}Jiangsu R&D Center for Internet of Things, China; {3}National Key  
Laboratory for Electronic Measurement Technology, North University of China, China*

**B-2-41**

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*Jayaprakash Reddy, Rudra Pratap  
Indian Institute of Science, India*

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*Thuhang Bui{1}, An Tran{1}, Bruno Morana{1}, Jia Wei{1}, Trinh Chu Duc{2}, Pasqualina M. Sarro{1}  
{1}Technische Universiteit Delft, Netherlands; {2}Vietnam National University, Hanoi, Vietnam*

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*Daniel Hohnloser<sup>{1}</sup>, Denis Shuklin<sup>{1}</sup>, Carsten Schmidt<sup>{2}</sup>, Michael Kreitmaier<sup>{2}</sup>, Mario Blasini<sup>{2}</sup>, Amelie Hagelauer<sup>{1}</sup>, Robert Weigel<sup>{1}</sup>*  
*<sup>{1}</sup>Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; <sup>{2}</sup>LFoundry S.r.l., Germany*

**B-2-50**  
**ZNO THIN FILMS FOR APPLICATIONS IN SURFACE ACOUSTIC WAVE ACTUATORS**.....751  
*Andrzej Nowek, Rafał Stankiewicz, Magdalena Baran, Izabela Zalewska, Ernest Brzozowski*  
*Institute of Electronic Materials Technology, Poland*

1:00 PM - 3:00 PM  
**B3P-J: Chemical & Gas Sensing: Devices and Systems**  
**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Binu Narakathu, Western Michigan University**

**B-3-62**  
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*A. S. M. Iftekhar Uddin, Gwi-y-Sang Chung*  
*University of Ulsan, Korea, South*

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*Patrick P. Neumann<sup>{1}</sup>, Matthias Bartholmai<sup>{1}</sup>, Detlef Lazik<sup>{2}</sup>*  
*<sup>{1}</sup>Bundesanstalt für Materialforschung und -prüfung, Germany; <sup>{2}</sup>Helmholtz Centre for Environmental Research, Germany*

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*Debin Guan, Fang Yang, Qi Liu, Kun Yu, Jie Sun*  
*China Academy of Engineering Physics, China*

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*<sup>{1}</sup>Massachusetts Institute of Technology, United States; <sup>{2}</sup>Singapore University of Technology and Design, Singapore; <sup>{3}</sup>Texas A&M University, United States; <sup>{4}</sup>University of Central Florida, United States*

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*<sup>{1}</sup>Clearview Traffic Group Limited, United Kingdom; <sup>{2}</sup>Ritsumeikan University, Japan; <sup>{3}</sup>Sumitomo Chemical*  
*Ltd, Japan; <sup>{4}</sup>Vietnam National University, Hanoi, Vietnam*

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*<sup>{1}</sup>CTR Carinthian Tech Research AG, Austria; <sup>{2}</sup>Philips Consumer Lifestyle, Austria; <sup>{3}</sup>Universität Ulm,*  
*Germany*

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*<sup>{1}</sup>Centro de Pesquisa e Desenvolvimento em Telecomunicações, Brazil; <sup>{2}</sup>Petróleo Brasileiro S.A., Brazil*

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*{1}Fujikin Inc., Japan; {2}Tohoku University, Japan*

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*{1}Massachusetts Institute of Technology, United States; {2}Singapore University of Technology and Design, Singapore*

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**LOCATION: Poster Area**

**SESSION CHAIR:**

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<i>{1}Johannes Kepler University, Austria; {2}voestalpine Stahl GmbH, Austria</i>	
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<i>Shahriar Jalal Nibir, Mehrdad Biglarbegian, Babak Parkhideh</i>	
<i>University of North Carolina at Charlotte, United States</i>	
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<b>1:00 PM - 3:00 PM</b>	
<b>B3P-P: Infrastructure Sensing Applications</b>	
<b>LOCATION: Poster Area</b>	
<b>SESSION CHAIR:</b>	
<b>Gijs Krijnen, University of Twente</b>	
<hr/>	
<b>B-10-260</b>	
<b>EKF-BASED STATE ESTIMATION FOR TRAIN LOCALIZATION .....</b>	<b>961</b>
<i>Damien Veillard, Frederick Mailly, Philippe Fraise</i>	
<i>Laboratoire d'Informatique, de Robotique et de Microélectronique de Montpellier / Université de Mont, France</i>	
<b>B-10-262</b>	
<b>WIRELESS SUBSURFACE SENSORS FOR REMOTE TRANSPORTATION INFRASTRUCTURE MANAGEMENT .....</b>	<b>964</b>
<i>Paul Fortier, Benjamin Viall</i>	
<i>University of Massachusetts Dartmouth, United States</i>	
<b>B-10-264</b>	
<b>MOBILE BRIDGE INTEGRITY ASSESSMENT .....</b>	<b>967</b>
<i>Maik Benndorf{1}, Maximilian Garsch{2}, Thomas Haenselmann{1}, Norbert Gebbeken{2}, Inna Videkhina{2}</i>	
<i>{1}Hochschule Mittweida, Germany; {2}Universität der Bundeswehr München, Germany</i>	
<b>B-10-266</b>	
<b>REAL TIME ELECTRICITY THEFT DETECTION IN MICROGRIDS THROUGH WIRELESS SENSOR NETWORKS.....</b>	<b>970</b>
<i>Muhammad Tariq, Vincent Poor</i>	
<i>Princeton University, United States</i>	
<b>B-10-268</b>	
<b>AIRSENSE: OPPORTUNISTIC CROWD-SENSING BASED AIR QUALITY MONITORING SYSTEM FOR SMART CITY .....</b>	<b>973</b>
<i>Joy Dutta, Firoz Gazi, Sarbani Roy, Chandreyee Chowdhury</i>	
<i>Jadavpur University, India</i>	

**B-10-276**  
**MATERIAL INTEGRATED SENSORS FOR AN OPTIMAL BASELINE SELECTION ON A WIRELESS SHM NETWORK** .....976  
*Mariugenia Salas{2}, Michael Koerdt{1}, Martina Hübner{3}, Maryam Kahali{3}, Walter Lang{3}*  
*{1}Faserinstitut Bremen e.V., Germany; {2}Friedrich-Wilhelm-Bessel-Institut Forschungsgesellschaft mbH, Germany; {3}Universität Bremen, Germany*

**B-10-270**  
**REAL TIME MEASUREMENT OF THE DYNAMIC DISPLACEMENT FIELD OF A LARGE-SCALE ARCH-TRUSS BRIDGE BY REMOTE SENSING TECHNOLOGY** .....979  
*Yang Yang, Xiong Yu*  
*Case Western Reserve University, United States*

**B-10-272**  
**PRELIMINARY RESULTS OF POWERLINE RECONSTRUCTION FROM AIRBORNE LIDAR FOR SAFE AUTONOMOUS LOW-ALTITUDE URBAN OPERATIONS OF SMALL UAS** .....982  
*Corey Ippolito{1}, Kalmanje Krishnakumar{1}, Sebastian Hening{2}*  
*{1}Ames Research Center, United States; {2}University of California, Santa Cruz, United States*

**B-10-274**  
**A UNIVERSAL SENSOR DATA PLATFORM MODELLED FOR REALTIME ASSET CONDITION SURVEILLANCE AND BIG DATA ANALYTICS FOR RAILWAY SYSTEMS** .....985  
*Tony Lee, May Tso*  
*MTR Corporation Limited, Hong Kong*

**1:00 PM - 3:00 PM**  
**B3P-Q: Focused Session Posters: Wearable Sensors for Monitoring Human Body Physiological Parameters**  
**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Rong Zhu, Tsinghua University**

**B-13-325**  
**DUAL TRI-AXIS ACCELEROMETERS FOR MONITORING PHYSIOLOGICAL PARAMETERS OF HUMAN BODY IN SLEEP** .....988  
*Peng Jiang, Rong Zhu*  
*Tsinghua University, China*

**B-13-327**  
**ECG MEASUREMENT BY USE OF PASSIVE CAPACITIVELY COUPLED ELECTRODES** .....991  
*Jens Kirchner, Nils Roth, Andreas Meyer, Georg Fischer*  
*Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany*

**B-13-333**  
**WEARABLE GRAPHENE-BASED SENSOR ARRAY FOR FINGER TRACKING** .....994  
*Andrea Rinaldi, Alessandro Proietti, Alessio Tamburrano, Maria Sabrina Sarto*  
*Sapienza - Università di Roma, Italy*

**B-13-335**  
**FLEXIBLE, SELF-POWERED, VISIBLE-LIGHT DETECTOR CHARACTERIZED USING A BATTERY-OPERATED, 3D-PRINTED MICROPLASMA OPERATED AS A LIGHT SOURCE** .....997  
*Ruifeng Yang, Andrei Sazonov, Vassili Karanassios*  
*University of Waterloo, Canada*

**B-13-329**  
**WIRELESS AND CONTINUOUS INTRAOCULAR PRESSURE SENSORS USING TRANSPARENT GRAPHENE** .....1000  
*Peng Zeng{1}, Qingsong Cui{2}, Michael Wu{2}, Pai-Yen Chen{2}, Mark Ming-Cheng Cheng{2}*  
*{1}Wayne State University, United States; {2}Wayne State University, United States*

**B-13-337**  
**ON-BODY SENSOR NODE LOCALIZATION USING REFERENCE RFID TAGS EMBEDDED IN WEARABLE WAVEGUIDE**.....1003  
*Akihito Noda, Hiroyuki Shinoda*  
*University of Tokyo, Japan*

**B-13-331**  
**MICRO-RADAR WEARABLE RESPIRATION MONITOR**.....1006  
*Ruthvik Kukkapalli, Nilanjan Banerjee, Ryan Robucci, Dan Kostov*  
*University of Maryland, Baltimore County , United States*

**1:00 PM - 3:00 PM**  
**B3P-R: Biomedical Interfaces**  
**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Darrin Young, University of Utah**

**B-11-299**  
**A 64-CHANNEL WIRELESS IMPLANTABLE SYSTEM-ON-CHIP FOR GASTRIC ELECTRICAL-WAVE RECORDING** .....1009  
*Ahmed Ibrahim{2}, Mehdi Kiani{2}, Aydin Farajidavar{1}*  
*{1}New York Institute of Technology, United States; {2}Pennsylvania State University, United States*

**B-11-301**  
**ENHANCING THE READOUT OF PASSIVE WIRELESS SENSORS BY USING LEFT-HANDED METAMATERIALS** .....1012  
*Lei Dong{2}, Li-Feng Wang{1}, Qing-An Huang{2}*  
*{1}Key Laboratory of MEMS of the Ministry of Education, Southeast University, China; {2}Southeast University, China*

**B-11-303**  
**LOW-ENERGY BIOMARKER DETECTION THROUGH CHARGE-BASED IMPEDANCE MEASUREMENTS** .....1015  
*Jun-Rui Zhang{1}, Adrian Ionescu{1}, Marco Mazza{2}*  
*{1}Ecole Polytechnique Fédérale de Lausanne, Switzerland; {2}University of Applied Science – Western Switzerland, Switzerland*

**B-11-305**  
**TOWARDS MOBILE HEALTH CARE: NEUROCOGNITIVE IMPAIRMENT MONITORING BY BCI-BASED GAME** .....1018  
*Valerio Francesco Annese, Giovanni Mezzina, Daniela De Venuto*  
*Politecnico di Bari, Italy*

**B-11-307**  
**A NOVEL METHOD BASED ON RF DETECTION ENABLING WIRELESS AND PASSIVE LC SENSING.....1021**  
*Qiuxu Wei{2}, Yanshuang Wang{3}, Deyong Chen{1}, Jian Chen{1}, Junbo Wang{1}*  
*{1}Chinese Academy of Sciences, China; {2}Chinese Academy of Sciences / University of Chinese Academy of Sciences, China; {3}University of Chinese Academy of Sciences, China*

**B-11-309**  
**BCG-MAPPING OF THE THORAX USING DIFFERENT SENSORS: FIRST EXPERIENCES AND SIGNAL QUALITY** .....1024  
*Nico Jähne-Raden{2}, Torsten Martin{2}, Michael Marscholke{2}, Karsten Heusser{1}, Jens Tank{1}{1}Medizinische Hochschule Hannover, Germany; {2}Peter L. Reichertz Institut für Medizinische Informatik / Technische Universität Braunschweig, Germany*

**B-11-311**  
**A PROOF-OF-CONCEPT CLASSIFIER FOR ACOUSTIC SIGNALS FROM THE KNEE JOINT ON A FPA** .....1027  
*Sahil Shah, Caitlin Teague, Omer Inan, Jennifer Hasler*  
*Georgia Institute of Technology, United States*

**1:00 PM - 3:00 PM**  
**B3P-T: Focused Session Posters: Low-Power Sensors & Power Conditioning**  
**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Francesco Orfei, University of Perugia**

**B-16-351**  
**SELF-POWERED LIGHTNING CURRENT SENSOR**.....1030  
*Disheng Wang, Lin Du, Shiyong Wang, Liman Ran*  
*Chongqing University, China*

**B-16-354**  
**DESIGN OF POWER MANAGEMENT ASIC FOR PIEZOELECTRIC ENERGY HARVESTER** .....1033  
*Hua Yu, Han Wu*  
*Chongqing University, China*

**B-16-357**  
**AN ANT-BASED LOW-POWER BATTERY-FREE WIRELESS CRYOGENIC TEMPERATURE PROBES FOR INDUSTRIAL PROCESS MONITORING** .....1036  
*Nithin Raghunathan{2}, Xiaofan Jiang{2}, Arnab Ganguly{1}, Dimitrios Peroulis{2}{1}IMA Life North America, United States; {2}Purdue University, United States*

**B-16-360**  
**VIBRATIONS POWERED LORA SENSOR: AN ELECTROMECHANICAL ENERGY HARVESTER WORKING ON A REAL BRIDGE** .....1039  
*Francesco Orfei, Chiara Benedetta Mezzetti, Francesco Cottone*  
*Università degli Studi di Perugia, Italy*

**B-16-363**  
**ULTRA-LOW-POWER RADFET SENSING CIRCUIT FOR WIRELESS SENSOR NETWORKS POWERED BY ENERGY HARVESTING** .....1042  
*Andrey Somov{2}, Zheng Jun Chew{2}, Tingwen Ruan{2}, Meiling Zhu{2}, Simon Platt{1}{1}University of Central Lancashire, United Kingdom; {2}University of Exeter, United Kingdom*

**B-16-366**  
**SYSTEM-LEVEL MODELLING AND VALIDATION OF A STRAIN ENERGY HARVESTING SYSTEM BY DIRECTLY COUPLING FINITE ELEMENT AND ELECTRICAL CIRCUITS** .....1045  
*Qiang Li, Yang Kuang, Meiling Zhu*  
*University of Exeter, United Kingdom*

**B-16-369**  
**AN 143NW RELAXATION OSCILLATOR FOR ULTRA-LOW POWER BIOMEDICAL SYSTEMS** .....1048  
*Huan Hu, Subhanshu Gupta, Martin Schiavenato*  
*Washington State University, United States*

**B-16-372**

**DEVELOPMENT OF ZERO-ENERGY COMMUNICATION SENSOR TAG SYSTEM USING AMBIENT WI-FI SIGNAL .....**

**1051**

*Young-Han Kim, Hyun-Seok Ahn, Changseok Yoon, Yongseok Lim, Seung-Ok Lim  
KETI (Korea Electronics Technology Institute), Korea, South*

**3:30 PM - 5:00 PM**

**B4L-A: Physical Sensors II: Crystalline & CMOS Sensors**

**LOCATION: Curacao 1-2**

**SESSION CHAIRS:**

**Hua Wang, Georgia Institute of Technology**

**Vikrant Gokhale, University of Michigan**

**3:30**

**INVITED: SIMULATION-BASED CHARACTERIZATION OF PIEZOCERAMIC MATERIALS.....1054**

*Stefan Rupitsch*

*Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany*

**4:00**

**COMPARISON OF REFERENCE SENSORS FOR NOISE CANCELLATION OF MAGNETOELECTRIC SENSORS.....1057**

*Jens Reermann, Christin Bald, Sebastian Salzer, Phillip Durdaut, André Piorra, Dirk Meyners, Eckhard Quandt, Michael Höft, Gerhard Schmidt*

*Christian-Albrechts-Universität zu Kiel, Germany*

**4:15**

**CHARACTERIZATION OF BIPOLAR TRANSISTORS FOR CRYOGENIC TEMPERATURE SENSORS IN STANDARD CMOS .....1060**

*Lin Song, Harald Homulle, Edoardo Charbon, Fabio Sebastiano*

*Technische Universiteit Delft, Netherlands*

**4:30**

**E-SKIN MODULE WITH HETEROGENEOUSLY INTEGRATED GRAPHENE TOUCH SENSORS AND CMOS CIRCUITRY .....1063**

*Hadi Heidari, Carlos García Núñez, Ravinder Dahiya*

*University of Glasgow, United Kingdom*

**4:45**

**HIGH-DENSITY CMOS MICROELECTRODE ARRAY SYSTEM FOR IMPEDANCE SPECTROSCOPY AND IMAGING OF BIOLOGICAL CELLS.....1066**

*Vijay Viswam, Raziye Bounik, Amir Shadmani, Jelena Dragas, Julia Alicia Boos, Axel Birchler, Jan Müller, Yihui Chen, Andreas Hierlemann*

*Eidgenössische Technische Hochschule Zürich, Switzerland*

3:30 PM - 5:00 PM

B4L-B: Ultrasound Sensors

LOCATION: Curacao 3-4

SESSION CHAIRS:

Matteo Rinaldi, Northeastern University

Songbin Gong, UIUC

3:30

**INVITED: A 700 KHZ ULTRASONIC LINK FOR WIRELESS POWERING OF IMPLANTABLE MEDICAL DEVICES.....1069**

*Raffaele Guida, Enrico Santagati, Tommaso Melodia  
Northeastern University, United States*

4:00

**ULTRASONICALLY POWERED HYDROGEL-BASED WIRELESS IMPLANTABLE GLUCOSE SENSOR ...1072**

*Hamid Basaeri, David Christensen, Shad Roundy, Yuechuan Yu, Tram Nguyen, Prashant Tathireddy, Darrin Young  
University of Utah, United States*

4:15

**HIGH-RESOLUTION ULTRASONIC SENSOR DEDICATED TO IN-SITU NUCLEAR FUEL SWELLING MEASUREMENTS .....1075**

*Ghita Zaz{2}, Emmanuel Le Clézio{2}, Meriem Chrifi Alaoui{2}, Gilles Despaux{2}, Yoann Calzavara{1}  
{1}Institut Laue-Langevin, France; {2}Université de Montpellier, France*

4:30

**HOUSING INFLUENCE ON MULTI-BAND DIRECTIONAL MEMS MICROPHONES INSPIRED BY ORMIA OCHRACEA .....1078**

*Ralf Bauer{3}, Yansheng Zhang{3}, Joseph Jackson{3}, William Whitmer{1}, William Brimijoin{2}, Michael Akeroyd{2}, Deepak Uttamchandani{3}, James Windmill{3}  
{1}MRC Institute of Hearing Resarch, United Kingdom; {2}MRC Institute of Hearing Research, United Kingdom;  
{3}University of Strathclyde, United Kingdom*

4:45

**IMPROVING EFFICIENCY OF ULTRASONIC DISTANCE SENSORS USING PULSE INTERVAL MODULATION .....1081**

*Seungin Shin, Min-Hyun Kim, Seibum Choi  
Korea Advanced Institute of Science and Technology, Korea, South*

3:30 PM - 5:00 PM

B4L-C: Optical Physical Sensors I

LOCATION: Curacao 5-6

SESSION CHAIRS:

Reza Ghodssi, University of Maryland

Long Que, Iowa State University

3:30

**FIBER LASER SENSOR FOR SIMULTANEOUS ACCELERATION AND MAGNETIC MEASUREMENT .....1084**

*Wentao Zhang, Zhaogang Wang, Wenzhu Huang, Fang Li*

*Chinese Academy of Sciences, China*

3:45

**HIGHLY SENSITIVE MINIATURE SCALAR OPTICAL GRADIOMETER .....1087**

*Rui Zhang, Kenneth Smith, Rahul Mhaskar*

*Geometrics, Inc., United States*

4:00

**DYNAMIC DISPERSIVE SPECTROMETER USING A FIBER BRAGG GRATING FOR HIGH PRESSURE MEASUREMENTS .....1090**

*Yohan Barbarin, Alexandre Lefrançois, Frédéric Sinatti, Alexandre Bey, Matthieu Balbarie, Antoine Osmont, Jérôme Luc*

*Commissariat à l'Énergie Atomique et aux Énergies Alternatives, France*

4:15

**SINGLE-SHOT BRILLOUIN OPTICAL TIME DOMAIN ANALYSIS FOR DISTRIBUTED FIBER SENSING ....1093**

*Jian Fang<sup>{2}</sup>, William Shieh<sup>{2}</sup>, Pengbai Xu<sup>{1}</sup>*

*<sup>{1}</sup>Harbin Institute of Technology, China; <sup>{2}</sup>University of Melbourne, Australia*

4:30

**A MEMS INFRARED THERMOPILE WITH PHONONIC CRYSTAL STRUCTURES AND CARBON NANOTUBE ABSORPTION LAYER .....1096**

*Kory Gray<sup>{2}</sup>, John Muth<sup>{2}</sup>, William Carr<sup>{1}</sup>*

*<sup>{1}</sup>New Jersey Microsystems, United States; <sup>{2}</sup>North Carolina State University, United States*

4:45

**EFFECTS OF MAGNETIC FIELD ON AN OPTICAL FIBRE RADIATION DOSIMETER .....1099**

*Sinead O'Keeffe<sup>{3}</sup>, Lingxia Chen<sup>{3}</sup>, Elfed Lewis<sup>{3}</sup>, Mark Grattan<sup>{2}</sup>, Alan Hounsell<sup>{2}</sup>, Glenn Whitten<sup>{2}</sup>, Giuseppe Schettino<sup>{1}</sup>*

*<sup>{1}</sup>National Physical Laboratory, United Kingdom; <sup>{2}</sup>Northern Ireland Cancer Centre, United Kingdom; <sup>{3}</sup>University of Limerick, Ireland*



3:30 PM - 5:00 PM

B4L-D: Medical Sensing Applications

LOCATION: Curacao 7-8

SESSION CHAIRS:

Robert Roberts, University of Hong Kong

Gerald Gerlach, Institut fuer Festkoerperelektronik, Technische Universitaet Dresden

3:30

**NON-INVASIVE INTEGRATED WIRELESS BREATHING MONITORING SYSTEM BASED ON A PYROELECTRIC TRANSDUCER.....1102**

Salvatore Andrea Pullano<sup>{1}</sup>, Antonino S. Fiorillo<sup>{1}</sup>, Ifana Mahbub<sup>{2}</sup>, Syed K. Islam<sup>{2}</sup>, Mark S. Gaylord<sup>{2}</sup>, Vichien Lorch<sup>{2}</sup>

<sup>{1}</sup>Università degli studi Magna Græcia di Catanzaro, Italy; <sup>{2}</sup>University of Tennessee, United States; <sup>{2}</sup>University of Tennessee , United States

3:45

**60GHZ VITAL SIGN RADAR USING 3D-PRINTED LENS .....1105**

Robert Ernst<sup>{1}</sup>, Emil Nilsson<sup>{1}</sup>, Per-Arne Viberg<sup>{2}</sup>

<sup>{1}</sup>Halmstad University, Sweden; <sup>{2}</sup>Swedish Adrenaline AB, Sweden

4:00

**A NEW CUFFLESS OPTICAL SENSOR FOR BLOOD PRESSURE MEASURING WITH SELF-ADAPTIVE SIGNAL PROCESSING .....1108**

Yung-Hua Kao, Paul Chang-Po Chao, Tse-Yi Tu, Keng-Yueh Chiang, Chin-Long Wey

National Chiao Tung University, Taiwan

4:15

**A LOW-POWER MULTI-PHYSIOLOGICAL MONITORING PROCESSOR FOR STRESS DETECTION .....1111**

Nasrin Attaran<sup>{2}</sup>, Justin Brooks<sup>{1}</sup>, Tinoosh Mohsenin<sup>{2}</sup>

<sup>{1}</sup>United States Army Research Laboratory, United States; <sup>{2}</sup>University of Maryland, Baltimore County , United States

4:30

**INTRALUMINAL PRESSURE AND TEMPERATURE SENSOR AIMED AT APPLICATION TO FLEXIBLE ENDOSCOPE OPERATION .....1114**

Yusaku Maeda, Kohei Maeda, Hideki Kobara, Hirohito Mori, Hidekuni Takao

Kagawa University , Japan

4:45

**AN ULTRASENSITIVE MAGNETOELECTRIC SENSOR SYSTEM FOR THE QUANTITATIVE DETECTION OF LIVER IRON .....1117**

Hao Xi, Meng-Chien Lu, Xiaoshi Qian, Qiming Zhang, Sebastian Rupprecht, Qing Yang

Pennsylvania State University, United States

3:00 PM - 5:00 PM

B4L-E: Focused Session: Resonators

LOCATION: Bonaire 1-2

SESSION CHAIRS:

Peter Hesketh, Georgia Institute of Technology

Oliver Brand, Georgia Institute of Technology

3:30

**INVITED: SUBSTRATE-DECOUPLED 3D MICRO-SHELL RESONATORS .....1120**

*Vahid Tavassoli, Benoit Hamelin, Farrokh Ayazi*

*Georgia Institute of Technology, United States*

4:00

**PROBING ANCHOR LOSSES IN ALN-ON-SI CONTOUR MODE MEMS RESONATORS THROUGH LASER DOPPLER VIBROMETRY .....1123**

*Cheng Tu<sup>{1}</sup>, Joshua En-Yuan Lee<sup>{1}</sup>, Astrid Frank<sup>{2}</sup>, Christoph Schäffel<sup>{2}</sup>, Uwe Stehr<sup>{3}</sup>, Matthias Hein<sup>{3}</sup>*

*<sup>{1}</sup>City University of Hong Kong, Hong Kong; <sup>{2}</sup>Institut für Mikroelektronik- und Mechatronik-Systeme gemeinnützige GmbH, Germany; <sup>{3}</sup>Technische Universität Ilmenau, Germany*

4:15

**AN ALN-ON-SI RESONANT IR SENSOR ARRAY WITH A LARGE TEMPERATURE COEFFICIENT OF FREQUENCY .....1126**

*Milad Moosavifar, Azadeh Ansari, Mina Rais-Zadeh*

*University of Michigan, United States*

4:30

**MICROWAVE RESONATOR SENSOR INTEGRATED WITH NANOSTRUCTURED SEMICONDUCTOR MEMBRANES FOR PHOTODETECTION AND CARRIER LIFETIME MEASUREMENT .....1129**

*Najia Mahdi, Ryan Kisslinger, Himani Sharma, Mohammad Hossein Zarifi, Mojgan Daneshmand, Karthik Shankar*

*University of Alberta, Canada*

4:45

**ANALYSIS OF THICKNESS AND QUALITY FACTOR OF A DOUBLE PADDLE OSCILLATOR AT ROOM TEMPERATURE .....1132**

*Hamza Shakeel<sup>{1}</sup>, Thomas Metcalf<sup>{2}</sup>, Josh Pomeroy<sup>{1}</sup>*

*<sup>{1}</sup>National Institute of Standards and Technology, United States; <sup>{2}</sup>Naval Research Laboratory, United States*

3:30 PM - 5:00 PM

B4L-F: Chemical & Gas Sensing from Fabrication to Application

LOCATION: Bonaire 3-4

SESSION CHAIRS:

Kourosh Kalantarzadeh, RMIT University

Omer Oralkan, North Carolina State University

3:30

**AMPLIFIED CHEMOMECHANICAL COMB GAS SENSOR .....1135**

*Rugved Likhite, Shashank S Pandey, Aishwaryadev Banerjee, Hanseup Kim, Carlos H Mastrangelo  
University of Utah, United States*

3:45

**DEVELOPMENT OF A PRINTED IMPEDANCE BASED ELECTROCHEMICAL SENSOR ON  
PAPER SUBSTRATE .....1138**

*Dinesh Maddipatla, Binu Narakathu, Bradley Bazuin, Massood Zandi Atashbar  
Western Michigan University, United States*

4:00

**ROOM TEMPERATURE SENSING OF VOCS BY ATOMIC LAYER DEPOSITION OF METAL OXIDE.....1141**

*Akhilesh Tanneeru, Steven Mills, Michael Lim, Marzana Mantasha Mahmud, James Dieffenderfer, Alper Bozkurt,  
Troy Nagle, Bongmook Lee, Veena Misra  
North Carolina State University, United States*

4:15

**ROOM TEMPERATURE IONIC LIQUID ELECTROCHEMICAL GAS SENSOR FOR RAPID  
OXYGEN DETECTION WITH TRANSIENT DOUBLE POTENTIAL AMPEROMETRY .....1144**

*Hao Wan, Heyu Yin, Andrew Mason  
Michigan State University, United States*

4:30

**CARBON DIOXIDE SENSOR FOR MOBILE DEVICES: A NOVEL APPROACH FOR  
LOW-POWER CONSUMING, HIGHLY SENSITIVE NDIR SENSORS .....1147**

*Louisa Scholz, Alvaro Ortiz Perez, Benedikt Bierer, Ponkanok Eaksen, Jürgen Wöllenstein, Stefan Palzer  
Albert-Ludwigs-Universität Freiburg, Germany*

4:45

**TOWARDS A NOVEL OPTICAL TRACE OXYGEN SENSOR FOR COMMERCIAL USE .....1150**

*Gary McDowell<sup>{1}</sup>, Francesca Farrow<sup>{1}</sup>, Mahesh Uttamlal<sup>{1}</sup>, Sheila Holmes-Smith<sup>{1}</sup>, Craig Mitchell<sup>{2}</sup>, Patrick  
Shannon<sup>{2}</sup>  
<sup>{1}</sup>Glasgow Caledonian University, United Kingdom; <sup>{2}</sup>SST Sensing Ltd, United Kingdom*

11:00 AM - 12:30 PM

C2L-A: Physical Sensors III: Magnetometers & Inertial Sensors

LOCATION: Curacao 1-2

SESSION CHAIRS:

Qing-An Huang, Southeast University

Philip Feng, Case Western Reserve University

11:00

**A FAST DETERMINATION METHOD FOR IDENTIFYING THE SPIN EXCHANGE RELAXATION  
FREE REGIME OF ATOMIC MAGNETOMETER .....1153**

*Yanzhang Wang, Xue Zhang, Jianan Qin, Chen Chen  
Jilin University, China*

11:15

**A DUAL QUANTIZATION ELECTROMECHANICAL SIGMA-DELTA MODULATOR VIBRATORY  
WHEEL GYROSCOPE.....1156**

*Bin Sheng{2}, Fang Chen{1}, Chao Qian{2}, Dacheng Xu{2}, Shuwen Guo{2}, Xinxin Li{1}  
{1}Shanghai Institute of Microsystem and Information Technology / Chinese Academy of Sciences, China;  
{2}Soochow University, China*

11:30

**A MEMS RESONANT TILT SENSOR WITH HIGH SENSITIVITY MAINTAINED IN THE WHOLE  
360° MEASUREMENT RANGE.....1159**

*Shudong Wang, Juan Ren, Tianyi Zhang, Yinsheng Weng, Zhuangde Jiang, Xueyong Wei  
Xi'an Jiaotong University, China*

11:45

**A DAMPING CONSTANT MODEL FOR PROOF-MASS STRUCTURE DESIGN OF MEMS INERTIAL  
SENSOR BY MULTI-LAYER METAL TECHNOLOGY .....1162**

*Toshifumi Konishi{1}, Teruaki Safu{1}, Katsuyuki Machida{1}, Daisuke Yamane{2}, Masato Sone{2}, Kazuya  
Masu{2}, Hiroshi Toshiyoshi{3}  
{1}NTT Advanced Technology Corporation, Japan; {2}Tokyo Institute of Technology, Japan; {3}University of  
Tokyo, Japan*

12:00

**A LOW 1/F-NOISE ACCELEROMETER FRONTEND USING CHOPPER STABILIZATION AT A  
FREQUENCY MATCHED WITH A NOTCH OF QUANTIZATION NOISE.....1165**

*Kazuo Ono, Daisuke Maeda, Takashi Oshima, Toshiaki Nakamura, Joan Giner, Tomonori Sekiguchi  
Hitachi Ltd., Japan; Hitachi Ltd., Spain*

12:15

**DEVELOPMENT OF 2V SENSITIVITY STATIC ELECTRICITY SENSOR WITH VERTICALLY  
MOUNTED LARGE ELECTRODE.....1168**

*Atsuya Ima, Yusaku Oka, Kyohei Terao, Fusao Shimokawa, Hidekuni Takao  
Kagawa University, Japan*

**11:00 AM - 12:30 PM**  
**C2L-B: Biomedical Sensors**  
**LOCATION: Curacao 3-4**  
**SESSION CHAIRS:**  
**Ryuji Yokokawa, Kyoto University**  
**Giuseppe Barillaro, Università di Pisa**

**11:00**  
**INVITED: CAVITAS SENSORS AND SNIFF-CAM FOR BIOMONITORING: SOFT CONTACT LENS & MOUTHGUARD SENSORS, OPTICAL BIO-SNIFFING OF HUMAN VOCS .....1171**  
*Kohji Mitsubayashi*  
*Tokyo Medical and Dental University, Japan*

**11:30**  
**ELECTROCHEMICAL DETECTION OF A NOVEL THERAPEUTIC COMPOUND FOR SCHIZOPHRENIA ...1174**  
*Tugba Kilic{1}, Sandro Carrara{1}, Valerie Brunner{2}, Laurent Audoly{2}*  
*{1}École Polytechnique Fédérale de Lausanne, Switzerland; {2}Laboratoires Pierre Fabre, France*

**11:45**  
**SELF-POWERED GLUCOSE BIOSENSOR OPERATING UNDER PHYSIOLOGICAL CONDITIONS .....1177**  
*Tanmay Kulkarni, Gymama Slaughter*  
*University of Maryland, Baltimore County, United States*

**12:00**  
**DETECTION OF ROTAVIRUS IN CLINICAL SPECIMENS USING AN IMMUNOSENSOR BASED ON THE PRINCIPLE OF FLUORESCENCE FLUCTUATION SPECTROSCOPY .....1180**  
*Makoto Hasegawa{1}, Yuka Inoue{1}, Nanami Kimura{1}, Ernest Wandera{2}, Yoshio Ichinose{2}*  
*{1}Nagahama Institute of Bioscience and Technology, Japan; {2}Nagasaki University, Japan*

**12:15**  
**STUDIES OF CELL BEHAVIORS IN 3D MICROTISSUES IN A MICROFLUIDIC DEVICE: GROWTH AND MIGRATION .....1183**  
*Xiangchen Che, Shenmin Gong, Long Que, Jacob Nuhn, Ian Schneider*  
*Iowa State University, United States*

11:00 AM - 12:30 PM

C2L-C: Machine Olfaction for Environmental Monitoring

LOCATION: Curacao 5-6

SESSION CHAIRS:

Troy Nagle, North Carolina State University

Susan Schiffman, North Carolina State University

11:00

**INVITED: SMART SENSORS FOR AIR QUALITY MONITORING: CONCEPTS AND NEW**

**DEVELOPMENTS .....1186**

*Jan Mitrovics*

*JLM Innovation GmbH, Germany*

11:30

**A NOVEL MICROPUMP DRIVER USED IN ENVIRONMENTAL SENSOR APPLICATIONS .....1188**

*Bernadette Kinzel<sup>{1}</sup>, Detlef Bonfert<sup>{1}</sup>, Florian Lippert<sup>{1}</sup>, Frank Vanselow<sup>{1}</sup>, Erkan Isa<sup>{1}</sup>, Doris Schmitt-Landsiedel<sup>{2}</sup>, Linus Maurer<sup>{3}</sup>*

*<sup>{1}</sup>Fraunhofer-Einrichtung für Mikrosysteme und Festkörper , Germany; <sup>{2}</sup>Fraunhofer-Einrichtung für Mikrosysteme und Festkörper / Technische Universität München, Germany; <sup>{3}</sup>Fraunhofer-Einrichtung für Mikrosysteme und Festkörper / Universität der Bundesw*

11:45

**A BATTERY-OPERATED WIRELESS MULTICHANNEL GAS SENSOR SYSTEM BASED ON A CAPACITIVE MICROMACHINED ULTRASONIC TRANSDUCER (CMUT) ARRAY .....1191**

*Chunkyun Seok, Marzana Mantasha Mahmud, Oluwafemi Adelegan, Xiao Zhang, Omer Oralkan*

*North Carolina State University, United States*

12:00

**DUAL CHANNEL MICROCANTILEVER HEATERS FOR SELECTIVE DETECTION AND QUANTIFICATION OF A GENERIC MIXTURE OF VOLATILE ORGANIC COMPOUNDS .....1194**

*Ifat Jahangir<sup>{2}</sup>, Goutam Koley<sup>{1}</sup>*

*<sup>{1}</sup>Clemson University, United Kingdom; <sup>{2}</sup>University of South Carolina, United States*

12:15

**UV EXCITED SNO<sub>2</sub> NANOWIRE BASED PRINTED E-NOSE: POTENTIAL APPLICATION AS BURNING SMELL DETECTOR AND EXPLOSIVE DETECTOR .....1197**

*Mustahsin Adib, Martin Sommer*

*Karlsruher Institut für Technologie, Germany*

11:00 AM - 12:30 PM

C2L-D: Electromagnetic Based Sensing Applications

LOCATION: Curacao 7-8

SESSION CHAIRS:

Gijs Krijnen, University of Twente

Cameron Riviere, The Robotics Institute, Carnegie Mellon University

11:00

**PULSE INDUCTION PARKING SENSOR.....1200**

*Stefano Guatieri, Giovanni Badaracco, Ivan Defilippis, Diego Barrettino*

*University of Applied Sciences and Arts of Southern Switzerland, Switzerland*

11:15

**UHF RFID SENSORS BASED ON FREQUENCY MODULATION.....1203**

*Md. Mazidul Islam{1}, Ville Viikari{1}, Joonas Nikunen{3}, Marko Reinikainen{2}*

*{1}Aalto University, Finland; {2}Espotel Oy, Finland; {3}Metso Automation, Finland*

11:30

**NON-CONTACT MEASUREMENT OF SILICON THIN WAFER WARPAGE BY THZ TOMOGRAPHY AND LASER TRIANGULATION.....1206**

*Thomas Arnold, Johannes Schicker, Martin Kraft, Christina Hirschl*

*CTR Carinthian Tech Research AG, Austria*

11:45

**A BATTERY-FREE RFID SENSOR TAG WITH FIBER-OPTIC TAMPER DETECTION .....1209**

*Alexander Hoang{3}, Kip Coonley{1}, Faranak Nekoogar{2}, Matthew Reynolds{3}*

*{1}Duke University, United States; {2}Lawrence Livermore National Laboratory, United States; {3}University of Washington, United States*

12:00

**PLASMA DIAGNOSTICS IN DIELECTRIC DEPOSITION PROCESSES .....1212**

*Christian Schulz, Ilona Rolfes*

*Ruhr-Universität Bochum, Germany*

12:15

**A NEW APPROACH FOR VELOCITY PROFILE MEASUREMENTS WITH ELECTROMAGNETIC FLOW TOMOGRAPHY .....1215**

*Jan Christoph Abrolat, Thomas Musch*

*Ruhr-Universität Bochum, Germany*

**11:00 AM - 12:30 PM**  
**C2L-E: Sensor Network, Method & Evaluation**  
**LOCATION: Bonaire 1-2**  
**SESSION CHAIRS:**  
**Huseyin Ugur Yildiz, TED University**  
**Jian Lu, AIST**

- 11:00**  
**PRECISE SYNCHRONIZATION TIME STAMP GENERATION FOR BLUETOOTH LOW ENERGY .....1218**  
*Carl Christian Rheinländer, Norbert Wehn*  
*Technische Universität Kaiserslautern, Germany*
- 11:15**  
**SIMULTANEOUS SENSOR LOCALIZATION VIA SYNTHETIC APERTURE RADAR (SAR) IMAGING .....1221**  
*Xiaojie Fu, Andreas Pedross-Engel, Daniel Arnitz, Matthew Reynolds*  
*University of Washington, United States*
- 11:30**  
**SOFTWARE-DEFINED QOS PROVISIONING FOR FOG COMPUTING ADVANCED WIRELESS  
SENSOR NETWORKS.....1224**  
*Lina Huang{1}, Gaolei Li{1}, Jun Wu{1}, Lan Li{1}, Jianhua Li{1}, Rosario Morello{2}*  
*{1}Shanghai Jiao Tong University, China; {2}Università degli Studi Mediterranea di Reggio Calabria, Italy*
- 11:45**  
**DISTRIBUTED DETECTION OF CRITICAL NODES IN WIRELESS SENSOR NETWORKS  
USING CONNECTED DOMINATING SET .....1227**  
*Orhan Dagdeviren{2}, Vahid Khaliipour Akram{2}, Bulent Tavli{4}, Huseyin Ugur Yildiz{3}, Can Atilgan{1}*  
*{1}Dokuz Eylul University, Turkey; {2}Ege University, Turkey; {3}TED University, Turkey; {4}TOBB University of  
Economics and Technology, Turkey*
- 12:00**  
**POWER-AWARE CHANNEL-HOPPING MAC MECHANISMS FOR BATTERY-OPERATED  
MULTI-HOP NETWORKS.....N/A**  
*Arvind Kandhalu, Arifon Xhafa, Ramanuja Vedantham, Xiaolin Lu*  
*Texas Instruments Incorporated, United States*
- 12:15**  
**MINIATURIZATION AND PACKAGING OF IMPLANTABLE WIRELESS SENSOR NODES FOR  
ANIMALS MONITORING .....1233**  
*Jian Lu{2}, Lan Zhang{2}, Sohei Matsumoto{2}, Hiroshi Hiroshima{2}, Kouichi Serizawa{4}, Masanori Hayase{3},  
Takafumi Gotoh{1}*  
*{1}Kyushu University, Japan; {2}National Institute of Advanced Industrial Science and Technology, Japan;  
{3}Tokyo University of Science, Japan; {4}Tokyo University of Science / National Institute of Advanced Industrial  
Science and Technology, Japan*



11:00 AM - 12:30 PM

C2L-F: Focused Session: Energy Harvesting & Low-Power Sensors I

LOCATION: Bonaire 3-4

SESSION CHAIRS:

Zeynep Celik-Butler, University of Texas at Arlington

Yuji Suzuki, The University of Tokyo

11:00

**INVITED: DESIGN OF METGLAS/POLYVINYLIDENE FLUORIDE MAGNETOELECTRIC LAMINATES**

**FOR ENERGY HARVESTING FROM POWER CORDS .....1236**

*Myung-Eun Song<sup>{3}</sup>, Yongke Yan<sup>{3}</sup>, Sreenivasulu Gollapudi<sup>{3}</sup>, Mirza Bichurin<sup>{1}</sup>, Vladimir Petrov<sup>{1}</sup>, Mohan Sanghadasa<sup>{2}</sup>, Shashank Priya<sup>{3}</sup>*

*{1}Novgorod State University, Russia; {2}U.S. Army Research, Development and Engineering Command, United States; {3}Virginia Polytechnic Institute and State University, United States*

11:30

**MEMS COMB-DRIVE ELECTRET ENERGY HARVESTER CHARGED AFTER PACKAGING .....1239**

*Seonwoo Kim, Yuji Suzuki*

*University of Tokyo, Japan*

11:45

**SELF-POWERED CMOS ACTIVE RECTIFIER SUITABLE FOR LOW-VOLTAGE MECHANICAL**

**ENERGY HARVESTERS .....1242**

*Abdallahman Sayed Herbawi, Fabio Velarde, Oliver Paul, Tzeno Galchev*

*Albert-Ludwigs-Universität Freiburg, Germany*

12:00

**DESIGN AND OPTIMIZATION OF AN ELECTROSTATIC ENERGY SCAVENGER FOR LOW**

**POWER ELECTRONICS .....1245**

*Shaikh Md Rubaiyat Tousif, Donald Butler, Zeynep Çelik-Butler*

*University of Texas at Arlington, United States*

12:15

**EMBEDDED ELASTIC WAVE MIRRORS FOR ENHANCED ENERGY HARVESTING .....N/A**

*Serife Tol, Fahad Vora, Levent Degertekin, Alper Erturk*

*Georgia Institute of Technology, United States*

1:30 PM - 3:30 PM

C3P-G: Sensor Phenomenon, Modeling, & Evaluation III: Sensors & Applications

LOCATION: Poster Area

SESSION CHAIR:

Stefan Rupitsch, Friedrich-Alexander-Universität

**C-1-2**

**KEY ASPECTS OF PHOTOPLETHYSMOGRAM SIGNALS FOR APPLICATION TO ALCOHOL-INTAKE DETECTION .....1251**

*Yasuhisa Omura, Hajime Ozaki*

*Kansai University, Japan*

**C-1-4**

**MICRONEEDLE THERMAL FLOW SENSOR.....1254**

*Hoon Lee{2}, Sangwoong Baek{1}, Eunyong Jeon{1}, Junghoon Lee{1}*

*{1}Seoul National University, Korea, South; {2}Seoul National University / Samsung Electronics Semiconductor R&D Center, Korea, South*

**C-1-6**

**DESIGN, MEASUREMENT AND EVALUATION FOR PLL APPLICATION OF A WIDEBAND MEMS PHASE DETECTOR.....1257**

*Juzheng Han, Xiaoping Liao*

*Southeast University, China*

**C-1-8**

**NOISE AND IMPEDANCE OF THE SIROF UTAH ELECTRODE ARRAY .....1260**

*Mohit Sharma, Avery Gardner, Jason Silver, Ross Walker*

*University of Utah, United States*

**C-1-10**

**SVR BASED DENSE AIR POLLUTION ESTIMATION MODEL USING STATIC AND WIRELESS SENSOR NETWORK .....1263**

*Ke Hu{3}, Vijay Sivaraman{3}, Hari Bhrugubanda{3}, Shiyong Kang{1}, Ashfaqur Rahman{2}*

*{1}Chinese University of Hong Kong, Hong Kong; {2}Commonwealth Scientific and Industrial Research Organisation, Australia; {3}University of New South Wales, Australia*

**C-1-12**

**A PRACTICAL SOLUTION FOR ACCURATE STUDIES OF NDIR GAS SENSOR PRESSURE DEPENDENCE: LAB TEST BENCH, SOFTWARE AND CALCULATION ALGORITHM .....1266**

*Bakhram Gaynullin, Maksym Bryzgalov, Christine Hummelgård, Henrik Rödjegård*

*SenseAir AB, Sweden*

**C-1-16**

**EXPERIMENTAL AND THEORETICAL ANALYSES OF EFFECT OF ZNO NANOWIRE GROWTH ON MECHANICAL PROPERTIES OF MICROCANTILEVERS FOR DYNAMIC SENSING APPLICATIONS.....1269**

*Nikhilendu Tiwary, Arindam Kushagra, Manoj Kandpal, Valipe Ramgopal Rao*

*Indian Institute of Technology Bombay, India*

**C-1-18**

**MODELING AND EXPERIMENTAL CHARACTERIZATION OF FLEXIBLE GRAPHENE COMPOSITE STRAIN SENSORS .....1272**

*Mohamed Serry, Mahmoud Sakr*

*American University in Cairo, Egypt*

<b>C-1-20</b>	
<b>MICROBIAL FUEL CELL AS A BIOSENSOR AND A POWER SOURCE FOR FLORA HEALTH MONITORING .....</b>	<b>1275</b>
<i>Davide Brunelli, Pietro Tosato, Maurizio Rossi</i>	
<i>Università degli Studi di Trento, Italy</i>	
<b>C-1-22</b>	
<b>LOW-COST AIR QUALITY MONITORS: MODELING AND CHARACTERIZATION OF SENSOR DRIFT IN OPTICAL PARTICLE COUNTERS .....</b>	<b>1278</b>
<i>Michael Taylor</i>	
<i>Carnegie Mellon University, United States</i>	
<b>C-1-24</b>	
<b>A SINGLE-CHIP ISFET BASED PH SENSOR.....</b>	<b>1281</b>
<i>Mst Shawkat, Nicole McFarlane</i>	
<i>University of Tennessee , United States</i>	
<b>C-1-26</b>	
<b>LD-MAC: A LOAD-DISTRIBUTED DATA TRANSMISSION IN BODY AREA NETWORK .....</b>	<b>1284</b>
<i>Tanmoy Maitra, Paramita Mallick, Sarbani Roy</i>	
<i>Jadavpur University, India</i>	
<b>C-1-28</b>	
<b>METAL OXIDE GAS SENSING CHARACTERIZATION BY LOW FREQUENCY NOISE SPECTROSCOPY ..</b>	<b>1287</b>
<i>Michael Lim, Abhishek Malhotra, Steven Mills, John Muth, Bongmook Lee, Veena Misra</i>	
<i>North Carolina State University, United States</i>	
<b>C-1-30</b>	
<b>FAST METHOD FOR THE CALCULATION OF SURFACE BENDING ON CIRCULAR MULTILAYERED PIEZOELECTRIC STRUCTURES .....</b>	<b>1290</b>
<i>Thomas Voglhuber-Brunnmaier<sup>{2}</sup>, Erwin K. Reichel<sup>{2}</sup>, Bernhard Jakoby<sup>{2}</sup>, Roman Beigelbeck<sup>{1}</sup>, Patrick Mayrhofer<sup>{3}</sup>, Ulrich Schmid<sup>{3}</sup></i>	
<i><sup>{1}</sup>Danube University Krems / Technische Universität Wien, Austria; <sup>{2}</sup>Johannes Kepler University, Austria; <sup>{3}</sup>Technische Universität Wien, Austria</i>	
<b>1:30 PM - 3:30 PM</b>	
<b>C3P-H: New Materials Platforms &amp; Nanostructures for Sensing</b>	
<b>LOCATION: Poster Area</b>	
<b>SESSION CHAIR:</b>	
<b>Mohammad Zarifi, University of Manitoba</b>	
<b>C-2-33</b>	
<b>CARBON NANOTUBE FOREST DEVICES WITH NEGATIVE POISSON'S RATIO .....</b>	<b>1293</b>
<i>Assaf Ya'akovovitz</i>	
<i>Ben-Gurion University of the Negev, Israel</i>	
<b>C-2-36</b>	
<b>SILK PIEZOELECTRIC THIN FILMS : MATERIALS TO DEVICES .....</b>	<b>1296</b>
<i>Jose Joseph, Sai Yaraj Saraswathi, Anshika Agarwal, Shiv Govind Singh, Siva Rama Krishna Vanjari</i>	
<i>Indian Institute of Technology Hyderabad, India</i>	
<b>C-2-39</b>	
<b>IMPROVING GAS-SENSING PERFORMANCE OF REDUCED GRAPHENE OXIDE USING POLYCRYSTALLINE SNO<sub>2</sub> NANOPARTICLES AS SENSITIZER.....</b>	<b>1299</b>
<i>Jie Sun<sup>{1}</sup>, Xi Yang<sup>{1}</sup>, Guoyuan Xiao<sup>{2}</sup></i>	
<i><sup>{1}</sup>China Academy of Engineering Physics, China; <sup>{2}</sup>Southwest University of Science and Technology, China</i>	

<b>C-2-42</b>	
<b>SELECTIVE DEPOSITION OF SILVER NANOWIRES AND ITS APPLICATION FOR WEARABLE PRESSURE SENSOR.....</b>	<b>1302</b>
<i>Gui-Shi Liu{2}, Jing-Shen Qiu{2}, Bo-Ru Yang{2}, Han-Ping David Shieh{1}</i>	
<i>{1}National Chiao Tung University, Taiwan; {2}Sun Yat-Sen University, China</i>	
<b>C-2-45</b>	
<b>STRAIN GAUGE PRINTED ON CARBON WEAVE FOR SENSING IN CARBON FIBER REINFORCED PLASTICS .....</b>	<b>1305</b>
<i>Gerrit Dumstorff, Walter Lang</i>	
<i>Universität Bremen, Germany</i>	
<b>C-2-48</b>	
<b>BIOMIMETIC HYDROGEL CUPULA FOR CANAL NEUROMASTS INSPIRED SENSORS.....</b>	<b>1308</b>
<i>Meghali Bora{4}, Ajay Giri Prakash Kottapalli{4}, Mohsen Asadnia{1}, Jianmin Miao{3}, Michael S. Triantafyllou{2}</i>	
<i>{1}Macquarie University, Australia; {2}Massachusetts Institute of Technology, United States; {3}Nanyang Technological University, Singapore; {4}Singapore-MIT Alliance for Research and Technology, Singapore</i>	
<b>C-2-58</b>	
<b>ZNO NANOPARTICLE-BASED OPTICAL SENSORS FABRICATED BY HIGH CURRENT DENSITY ELECTRODEPOSITION AND FLAME OXIDATION .....</b>	<b>1311</b>
<i>Xiaochen Wang, Christopher Hughes, Sanghoon Park, Xiangmeng Ma, Hyoung Jin Cho</i>	
<i>University of Central Florida, United States</i>	
<b>C-2-51</b>	
<b>FOIL-BASED STRAIN GAUGES WITH NANOGRANULAR PLATINUM STRUCTURES FOR THE INTEGRATION IN ELASTOMER GASKETS .....</b>	<b>1314</b>
<i>Daniel Gräbner{1}, Eva-Maria Meyer{2}, Walter Lang{2}</i>	
<i>{1}FWBI Friedrich-Wilhelm-Bessel-Institut Forschungs GmbH, Germany; {2}Universität Bremen, Germany</i>	
<b>C-2-54</b>	
<b>OPTIMIZATION OF METGLAS 2605SA1 AND PZT-5A MAGNETOELECTRIC LAMINATES FOR MAGNETIC SENSING APPLICATIONS .....</b>	<b>1317</b>
<i>Eugene Freeman, Joshua Harper, Nishit Goel, Steven J. Schiff, Srinivas Tadigadapa</i>	
<i>Pennsylvania State University, United States</i>	
<b>C-2-56</b>	
<b>NANOCELLULOSE ELECTRODES FOR INTERFACING PLANT ELECTROCHEMISTRY .....</b>	<b>1320</b>
<i>Kevin Keller{1}, Michael Wilkins{1}, James Reynolds{1}, James Dieffenderfer{1}, Charles Hood{1}, Michael Daniele{1}, Alper Bozkurt{1}, Meral Tunc-Ozdemir{2}</i>	
<i>{1}North Carolina State University, United States; {2}University of North Carolina, United States</i>	

1:30 PM - 3:30 PM

C3P-J: Chemical Sensing

LOCATION: Poster Area

SESSION CHAIR: Susan Schiffman, NC State University

C-3-63

**SMARTPHONE-BASED THIN LAYER CHROMATOGRAPHY FOR THE DISCRIMINATION OF  
FALSIFIED MEDICINES .....1323**

*Hojeong Yu{3}, Huy Le{3}, Steven Lumetta{3}, Brian T. Cunningham{3}, Eliangiringa Kaale{1}, Thomas Layloff{2}  
{1}Muhimbili University of Health and Allied Sciences, Tanzania; {2}Partnership for Supply Chain Management,  
Inc. / Management Sciences for Health, United States; {3}University of Illinois at Urbana–Champaign, United  
States*

C-3-66

**EPOXY EXPOSURE INDUCED ELECTRONIC PROPERTIES CHANGE OF GRAPHENE.....1326**

*Md Ahsan Uddin{1}, Ferhat Bayram{1}, Goutam Koley{1}, Yihao Zhu{2}, Amol Singh{2}, Ifat Jahangir{2}  
{1}Clemson University, United States; {2}University of South Carolina, United States*

C-3-69

**EXPERIMENTATION OF DIOXAZABOROCANE DERIVATIVE AS FLUORESCENT  
MATERIAL: APPLICATION TO THE TRACE DETECTION OF HYDROGEN PEROXIDE .....1329**

*Celine Frenois, Thomas Caron, Eric Pasquinet, Pascal Palmas, Franck Pereira, Rodrigue Rousier  
Commissariat à l'Énergie Atomique et aux Énergies Alternatives, France*

C-3-72

**FORMATION OF ORIENTED METAL NANOSTRUCTURES BY POLARIZED LIGHT IRRADIATION  
FOR OPTICAL SENSING .....1332**

*Masashi Watanabe, Fumihiko Sassa, Kenshi Hayashi  
Kyushu University, Japan*

C-3-75

**CALIXARENE-POLY(METHYL METHACRYLATE) COMPOSITES FOR ATR-IR SENSING OF  
WATER DISSOLVED AROMATIC COMPOUNDS .....1335**

*Charles Heath, Matthew Myers, Bobby Pejic  
Commonwealth Scientific and Industrial Research Organisation, Australia*

C-3-78

**DEVELOPMENT OF A FIBER-OPTIC CHEMICAL SENSOR FOR THE DETECTION OF CADMIUM.....1338**

*Thu Hien Nguyen, Stephen Wren, Tong Sun, Kenneth Grattan  
City University London, United Kingdom*

C-3-81

**DEVELOPMENT OF A NOVEL MINIATURIZED LTCC-BASED WIRELESS PH SENSING SYSTEM .....1341**

*Housseem Eddine Amor{1}, Ammar Kouki{1}, Paul Marsh{2}, Kyoung Tae Kim{2}, Hung Cao{2}  
{1}Ecole de Technologie Supérieure, Canada; {2}University of Washington, United States*

C-3-84

**GLUCOSE SENSING WITH GRAPHENE VARACTORS .....1344**

*Yao Zhang{2}, Rui Ma{2}, Yogish Kudva{1}, Philippe Bühlmann{2}, Steven Koester{2}  
{1}Mayo Clinic, United States; {2}University of Minnesota, United States*

**C-3-87**

**SUSPENDED CHALCOGENIDE MICROCAVITIES FOR ULTRA-SENSITIVE CHEMICAL DETECTION .....1347**

*Derek Kita{1}, Hongtao Lin{1}, Junying Li{1}, Zhaohong Han{1}, Peter Su{1}, Tian Gu{1}, Anu Agarwal{1}, Anupama Yadav{2}, Kathleen Richardson{2}, Juejun Hu{1}*  
*{1}Massachusetts Institute of Technology, United States; {2}University of Central Florida, United States*

**C-3-90**

**PARTS PER MILLION CH<sub>4</sub> CHEMORESISTOR SENSORS BASED ON MULTI WALL**

**CARBON NANOTUBES/METAL-OXIDE NANOPARTICLES .....1350**

*Michela Sainato{4}, Md Tanim Humayun{4}, Lara Gundel{2}, Paul Solomon{3}, Liliانا Stan{1}, Ralu Divan{1}, Igor Paprotny{4}*  
*{1}Argonne National Laboratory, United States; {2}Lawrence Berkeley National Laboratory, United States; {3}United States Environmental Protection Agency, United States; {4}University of Illinois at Chicago, United States*

**C-3-93**

**CORROSIVITY SENSOR BASED ON METALLIC NANOWIRES .....1353**

*Siddhardha Mohan Sakhamuri, Sai Prudhvi Kumar Gummadi, Ryan Toonen, Omar Rosas Camacho*  
*University of Akron, United States*

**1:30 PM - 3:30 PM**

**C3P-K: Biosensors**

**LOCATION: Poster Area**

**SESSION CHAIR:**

**Chung-Yu Chang**

**C-4-108**

**STUDY OF FABRICATION CONDITIONS OF ATP BIOSENSOR BASED ON SCREEN-PRINTED ELECTRODE .....1356**

*Qin Zhu, Bo Liang, Yanchuang Pei, Xuesong Ye, Xiao Liang*  
*Zhejiang University, China*

**C-4-125**

**GOLD NANOPARTICLES AMPLIFIED SURFACE ACOUSTIC WAVE BIOSENSORS FOR IMMUNODETECTION .....1359**

*Shuangming Li{1}, Ying Wan{1}, Yan Su{1}, Chunhai Fan{2}, Venkat Bhethanabotla{3}*  
*{1}Nanjing University of Science and Technology, China; {2}Nanjing University of Science and Technology / Chinese Academy of Sciences, China; {3}University of South Florida, United States*

**C-4-111**

**FIBER-OPTIC IMMUNOSENSOR BASED ON LOSSY MODE RESONANCES INDUCED BY INDIUM TIN OXIDE THIN-FILMS .....1362**

*Abian Socorro, Ignacio Del Villar, Jesus Corres, Francisco Javier Arregui, Ignacio Raul Matias*  
*Universidad Pública de Navarra, Spain*

**C-4-114**

**ZINC OXIDE NANOWIRE MODIFIED FLEXIBLE PLASTIC PLATFORM FOR IMMUNOSENSING .....1365**

*Brince Paul, R Ranga Reddy, Siva Rama Krishna Vanjari, Shiv Govind Singh*  
*Indian Institute of Technology Hyderabad, India*

**C-4-117**

**DIELECTRIC DISPERSION ANALYSIS OF INTERACTION WITH PLURAL PHOSPHOLIPID SPECIES OF LIPOSOME BY ARRAYED CELL SYSTEM USING SMALL OPEN-ENDED COAXIAL PROBE .....1368**

*Masahiro Kawasaki, Kaoru Yamashita, Minoru Noda*  
*Kyoto Institute of Technology, Japan*

**C-4-120**  
**HIGHLY SELECTIVE DETECTION OF MULTI-PHOSPHORYLATED PEPTIDES VIA ARTIFICIAL RECEPTOR-IMMOBILIZED ON MAGNETIC SPHERES.....1371**  
*Se Won Bae, Sangyong Kim, Seung-Han Shin, Dohoon Lee*  
*Korea Institute of Industrial Technology, Korea, South*

**C-4-123**  
**HIGH SENSITIVITY FLUORESCENCE DETECTION USING SMART PHONE CAMERAS .....1374**  
*Zhendong Cao, Hsiu-Yang Tseng, Katrina Salvante, Pablo Nepomnaschy, Ash Parameswaran*  
*Simon Fraser University, Canada*

**1:30 PM - 3:30 PM**  
**C3P-L: Acoustic & Ultrasound Sensors**  
**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Vikrant Gokhale, NIST**

**C-7-215**  
**THE RADAR MICROPHONE: A NEW WAY OF MONITORING HONEY BEE SOUNDS .....1377**  
*Herbert Aumann, Nuri Emanetoglu*  
*University of Maine, United States*

**C-7-216**  
**ACOUSTOELECTRIC CURRENT RESPONSE TO GAS MOLECULAR DOPING IN GRAPHENE .....1379**  
*Shijun Zheng, Daihua Zhang*  
*Tianjin University, China*

**C-7-217**  
**CONTINUOUS MEASUREMENT OF LIQUID CONCENTRATION USING SHEAR HORIZONTAL SURFACE ACOUSTIC WAVE SENSORS WITHOUT REFERENCE LIQUID .....1382**  
*Jun Kondoh, Kyosuke Tada*  
*Shizuoka University, Japan*

**C-7-218**  
**BIO-INSPIRED FREQUENCY AGILE ACOUSTIC SYSTEM.....1385**  
*José Guerreiro, Joseph Jackson, James Windmill*  
*University of Strathclyde, United Kingdom*

**C-7-219**  
**ANALYSIS OF IMPEDANCE-LOADED SAW SENSORS .....1388**  
*Ziwei Liu, Lili Fang, Chuanfang Zhang, Xuan Dai*  
*Beijing Institute of Technology, China*

**C-7-220**  
**PACKAGELESS ACOUSTIC WAVE SENSORS FOR WIRELESS BODY-CENTRIC APPLICATIONS.....1391**  
*Sami Hage-Ali{2}, Omar Elmazria{2}, Gaël Pierson{2}, Richard Kouitat{2}, Thierry Aubert{4}, Moïse Deroh{1}, Florian Bartoli{1}, Thierry Aubert{1}, Abdelkrim Talbi{3}*  
*{1}CentraleSupélec, France; {2}Université de Lorraine, France; {3}Université Lille 1, France; {4}Université Savoie Mont Blanc, France*

**C-7-221**  
**INTEGRATED SURFACE ACOUSTIC WAVE BASED SENSORS FOR FLUIDIC APPLICATIONS .....1394**  
*Burak Yildirim, Sukru Senveli, Rajapaksha Gajasinghe, Onur Tigli*  
*University of Miami, United States*

**C-7-222**

**A LOW-COST ACOUSTIC MICROSENSOR BASED SYSTEM IN PACKAGE FOR AIR QUALITY MONITORING .....1397**

*Sanju Thomas*{2}, *Marina Cole*{2}, *Farah Villa-Lopez*{2}, *Julian Gardner*{2}, *Jan Peters*{1}, *Jan Theunis*{1}  
{1}Flemish Institute of Technological Development, Belgium; {2}University of Warwick, United Kingdom

**C-7-223**

**SPEED-OF-SOUND BASED SENSORS FOR ENVIRONMENTAL MONITORING .....1400**

*Martin Doubek*{2}, *Vaclav Vacek*{3}, *Gregory Hallewell*{1}, *Ben Pearson*{4}  
{1}Aix-Marseille Université, France; {2}Czech Technical University in Prague, Czech Rep.; {3}Czech Technical University in Prague / Unicom College, Czech Rep.; {4}University of Oklahoma, United States

**1:30 PM - 3:30 PM**

**C3P-M: Physical Sensors VII: Mechanical, Force, Pressure**

**LOCATION: Poster Area**

**SESSION CHAIR:**

**Vikrant Gokhale, NIST**

**C-6-192**

**WIRELESS HYDROGEN PRESSURE DOSIMETER FOR NUCLEAR HIGH DOSE MONITORING .....1403**

*Emilie Debourg*{1}, *Julien Philippe*{1}, *Hervé Aubert*{1}, *Patrick Pons*{1}, *Izabela Augustyniak*{3}, *Pawel Knapkiewicz*{3}, *Jan Dziuban*{3}, *M. Matusiak*{2}, *Michal Olszacki*{2}  
{1}Laboratoire d'Analyse et d'Architecture des Systèmes / Université de Toulouse, France; {2}National Centre for Nuclear Research, Poland; {3}Wrocław University of Technology, Poland

**C-6-194**

**HIGH PERFORMANCE PIEZORESISTIVE LOW PRESSURE SENSORS.....1406**

*Lihua Li*, *Nickolai Belov*, *Michael Klitzke*, *Jong-Seung Park*  
Amphenol Advanced Sensor, United States

**C-6-196**

**CHARACTERIZATION OF 3D PRINTED PIEZOELECTRIC SENSORS: DETERMINATION OF D33 PIEZOELECTRIC COEFFICIENT FOR 3D PRINTED POLYVINYLIDENE FLUORIDE SENSORS .....1409**

*Max Kirkpatrick*{2}, *Joshua Tarbutton*{2}, *Tue Le*{2}, *Chabum Lee*{1}  
{1}Tennessee Technical University, United States; {2}University of South Carolina, United States

**C-6-198**

**PRINTED CARBON-BASED SENSORS ARRAY FOR MEASURING 2D DYNAMIC STRAIN DISTRIBUTION AND APPLICATION IN STRUCTURAL HEALTH MONITORING .....1412**

*Daniel Zymelka*{3}, *Kazuyoshi Togashi*{2}, *Takahiro Yamashita*{1}, *Takeshi Kobayashi*{1}, *Seiichi Takamatsu*{4}, *Toshihiro Itoh*{4}  
{1}National Institute of Advanced Industrial Science and Technology, Japan; {2}NMEMS Technology Research Organization / Dai Nippon Printing, Japan; {3}NMEMS Technology Research Organization / National Institute of Advanced Industrial Science and Techn, Ja

**C-6-200**

**A NOVEL INTEGRATED SENSOR BASED ON MEMS STRAIN GAUGE FOR MONITORING MILLING PROCESS .....N/A**

*Yafei Qin*, *Yulong Zhao*, *Yingxue Li*, *You Zhao*, *Peng Wang*  
Xi'an Jiaotong University, China

**C-6-202**

**CAPACITIVE SENSOR NETWORK FOR COMPOSITES PRODUCTION MONITORING .....1418**

*Yang Yang*, *Bart Plovie*, *Thomas Vervust*, *Jan Vanfleteren*  
Universiteit Gent, Belgium



**C-6-204**  
**INTEGRATION OF HIGHLY FLEXIBLE AND SENSITIVE FILMS ON KAPTON WITH GRAPHENE OXIDE-PLATINUM NANOCOMPOSITE FOR STRAIN SENSORS.....N/A**  
*Nagarjuna Neella, Venkateswarlu Gaddam, Konandur Rajanna, M.M. Nayak*  
*Indian Institute of Science, India*

**C-6-206**  
**THREE AXIS CAPACITIVE TOUCH SENSOR FOR CLINICAL BREAST EXAMINATION TRAINING.....1424**  
*Jayer Fernandes, Hongrui Jiang*  
*University of Wisconsin-Madison, United States*

**C-6-208**  
**MECHANICAL STRESS MEASUREMENT USING A SINGLE OCTAGONAL PIEZOTRANSDUCER.....N/A**  
*Jose Ramirez, Fabiano Fruett*  
*University of Campinas, Brazil*

**C-6-210**  
**FREQUENCY OUTPUT MEMS RESONATOR ON MEMBRANE PRESSURE SENSORS.....1430**  
*Vahid Qaradaghi, Mohammad Mahdavi, Varun Kumar, Siavash Pourkamali*  
*University of Texas at Dallas, United States*

**C-6-212**  
**NANO-PRECISION MICROMACHINED FREQUENCY OUTPUT PROFILOMETER .....1433**  
*Amin Abbasalipour, Mohammad Mahdavi, Varun Kumar, Siavash Pourkamali, Soheil Daryadel, Majid Minary*  
*University of Texas at Dallas, United States*

**C-6-214**  
**SILICON PRESSURE SENSOR WITH 1.5KVAC DIELECTRIC WITHSTAND-VOLTAGE CAPABILITY IN WATER .....N/A**  
*Tom Kwa*  
*DunAn Sensing LLC, United States*

**1:30 PM - 3:30 PM**  
**C3P-N: Sensor Network, Applications**  
**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Ryutaro Maeda, AIST**

**C-9-225**  
**SELF-POWERED EVENT-TRIGGERED WIRELESS SENSOR NETWORK FOR MONITORING SABOTAGE ACTIVITIES .....1439**  
*Chuan Dong{2}, Suiqiong Li{2}, Mengyang Li{2}, Qisheng He{1}, Dacheng Xu{2}, Xinxin Li{1}*  
*{1}Shanghai Institute of Microsystem and Information Technology / Chinese Academy of Sciences, China;*  
*{2}Soochow University, China*

**C-9-227**  
**A WIRELESS SENSOR NETWORK PLATFORM FOR WATER QUALITY MONITORING.....1442**  
*Tomoaki Kageyama{2}, Masashi Miura{2}, Akihiro Maeda{1}, Akihiro Mori{1}, Sang-Seok Lee{2}*  
*{1}Environment Sanitation Research Center, Japan; {2}Tottori University, Japan*

**C-9-236**  
**OPTIMAL TRANSMISSION POWER LEVEL SETS FOR LIFETIME MAXIMIZATION IN WIRELESS SENSOR NETWORKS.....1445**  
*Cagla Tantur{1}, Ugur Yildiz{2}, Sinan Kurt{1}, Bulent Tavli{3}*  
*{1}ASELSAN Inc. / TOBB University of Economics and Technology, Turkey; {2}TED University, Turkey; {3}TOBB University of Economics and Technology, Turkey*

<b>C-9-229</b>	<b>A STUDY ON LOW-LATENCY WIRELESS SENSING IN TIME-CRITICAL SATELLITE APPLICATIONS .....</b>	<b>1448</b>
	<i>Martin Drobczyk, Hauke Martens</i> <i>Deutsches Zentrum für Luft- und Raumfahrt e.V., Germany</i>	
<b>C-9-235</b>	<b>SPATIAL FOOTSTEP RECOGNITION BY CONVOLUTIONAL NEURAL NETWORKS FOR BIOMETRIC APPLICATIONS.....</b>	<b>1451</b>
	<i>Omar Costilla-Reyes{2}, Ruben Vera-Rodriguez{1}, Patricia J. Scully{2}, Krikor B. Ozanyan{2}</i> <i>{1}Universidad Autónoma de Madrid, Spain; {2}University of Manchester, United Kingdom</i>	
<b>C-9-234</b>	<b>LOCALIZATION AND AREA LOCALIZATION IN IMPULSE-RADIO WIRELESS SENSOR NETWORKS .....</b>	<b>1454</b>
	<i>Haruka Kubota, Jun-Nosuke Teramae, Naoki Wakamiya</i> <i>Osaka University, Japan</i>	
<b>C-9-230</b>	<b>LOW-POWER AND HIGH-SENSITIVE PH SENSOR FOR MONITORING OF COW-RUMEN IN REAL TIME .....</b>	<b>1457</b>
	<i>Lan Zhang{3}, Jian Lu{3}, Hironao Okada{3}, Hirofumi Nogami{1}, Toshihiro Itoh{4}, Shozo Arai{2}</i> <i>{1}Kyushu University, Japan; {2}National Agriculture and Food Research Organization, Japan; {3}National Institute of Advanced Industrial Science and Technology, Japan; {4}University of Tokyo / National Institute of Advanced Industrial Science and Technolo</i>	
<b>C-9-233</b>	<b>ANALYSIS ON FREQUENCY-DEPENDENCY OF CONDUCTIVE SIGNAL TRANSMISSION CHANNEL FOR BIOSENSOR NETWORK.....</b>	<b>1460</b>
	<i>Janghyun Lee, Kunho Park, Min Joo Jeong, Jong Jin Baek, Youn Tae Kim</i> <i>Chosun University, Korea, South</i>	
<b>C-9-231</b>	<b>DRITRI: AN IN-VEHICLE WIRELESS SENSOR NETWORK PLATFORM FOR DAILY HEALTH MONITORING .....</b>	<b>1463</b>
	<i>Xian Li, Hui Huang, Ye Sun</i> <i>Michigan Technological University, United States</i>	
<b>C-9-232</b>	<b>A MODULAR WIRELESS SENSOR NETWORK FOR ARCHITECTURE OF AUTONOMOUS UAV USING DUAL PLATFORM FOR ASSISTING RESCUE OPERATION.....</b>	<b>1466</b>
	<i>Heekyung Kim, Ken Choi</i> <i>Illinois Institute of Technology, United States</i>	

**1:30 PM - 3:30 PM**  
**C3P-O: Sensor Applications II**  
**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Robert Roberts, University of Hong Kong**

<b>C-10-278</b>	<b>RESPONSES OF SILICON PIN DIODE TO LOW ENERGY GAMMA RAYS .....</b>	<b>1469</b>
	<i>Seungcheol Lee, Hyebin Jeon, Hwanbae Park, Kookhyun Kang, Taehun Kim</i> <i>Kyungpook National University, Korea, South</i>	

<b>C-10-280</b>	
<b>QUANTIFYING HEAT PRODUCED DURING SPONTANEOUS COMBUSTION OF H<sub>2</sub>/O<sub>2</sub> NANOBUBBLES</b>	<b>1472</b>
<i>Shourya Jain{2}, Aamer Mahmood{1}, Li Qiao{2}</i>	
<i>{1}Hamad Bin Khalifa University, Qatar; {2}Purdue University, United States</i>	
<b>C-10-282</b>	
<b>EVALUATION OF LYOPHILISATES WITH TASTE-MASKING MICROSPHERES BY ELECTRONIC TONGUE</b>	<b>1475</b>
<i>Malgorzata Wesoly{2}, Patrycja Ciosek-Skibińska{2}, Aleksandra Amelian{1}, Katarzyna Winnicka{1}</i>	
<i>{1}Medical University of Bialystok, Poland; {2}Warsaw University of Technology, Poland</i>	
<b>C-10-284</b>	
<b>A 4.3μW 28NM-CMOS PIXEL FRONT-END WITH SWITCHED INVERTER-BASED COMPARATOR</b>	<b>1478</b>
<i>Federica Resta{2}, Alessandra Pipino{2}, Alessandro Pezzotta{2}, Marcello De Matteis{2}, Marco Croce{1}, Andrea Baschirotto{2}</i>	
<i>{1}Università degli Studi di Pavia, Italy; {2}Università degli Studi Milano-Bicocca, Italy</i>	
<b>C-10-286</b>	
<b>DEVELOPMENT OF PARTICLE CONTAMINANTS MONITOR SYSTEM FOR GEARBOX LUBRICANT PROGNOSTICS</b>	<b>1481</b>
<i>John Manyala, Massood Zandi Atashbar</i>	
<i>Western Michigan University, United States</i>	
<b>C-10-288</b>	
<b>AN LED-BASED IMAGE SENSOR WITH ENERGY HARVESTING AND PROJECTION CAPABILITIES</b>	<b>1484</b>
<i>Xiaozhe Fan{1}, Walter Leon-Salas{1}, Thomas Fischer{1}, Angel Perez-Olvera{2}</i>	
<i>{1}Purdue University, United States; {2}Universidad Tecnológica de Querétaro / Purdue University, Mexico</i>	
<b>C-10-290</b>	
<b>TACTILE SENSING METHOD FOR ESTIMATING THE INSERTION STATE OF A CONNECTOR</b>	<b>1487</b>
<i>Kouji Murakami</i>	
<i>Kyushu Sangyo University, Japan</i>	
<b>C-10-291</b>	
<b>UNSUPERVISED GAS DISCRIMINATION IN UNCONTROLLED ENVIRONMENTS BY EXPLOITING DENSITY PEAKS</b>	<b>1490</b>
<i>Han Fan, Victor Hernandez Bennetts, Erik Schaffernicht, Achim J. Lilienthal</i>	
<i>Örebro Universitet, Sweden</i>	
<b>C-10-292</b>	
<b>LIGHTWEIGHT SECURE SENSING USING HARDWARE ISOLATION</b>	<b>1493</b>
<i>Mengmei Ye, Nianhang Hu, Sheng Wei</i>	
<i>University of Nebraska-Lincoln, United States</i>	

1:30 PM - 3:30 PM

C3P-P: Medical Sensing Applications II

LOCATION: Poster Area

SESSION CHAIR:

Christian Zorman, Case Western Reserve University

**C-10-388**

**BIOMIMETIC FLOW SENSORS FOR BIOMEDICAL FLOW SENSING IN INTRAVENOUS TUBES .....1496**

Zhiyuan Shen<sup>{1}</sup>, Ajay Giri Prakash Kottapalli<sup>{1}</sup>, Vignesh Subramaniam<sup>{1}</sup>, Jianmin Miao<sup>{4}</sup>, Michael Triantafyllo<sup>{3}</sup>, Mohsen Asadnia<sup>{2}</sup>

<sup>{1}</sup>CENSAM, Singapore; <sup>{2}</sup>Macquarie University, Australia; <sup>{3}</sup>MIT, United States; <sup>{4}</sup>Nanyang Technological Univ., Singapore

**C-10-293**

**COMPARISONS BETWEEN NOVEL APPROACHES IN SILICA OPTICAL FIBRE AND PLASTIC FIBRE FOR USE IN CLINICAL IN-VIVO DOSIMETRY .....1499**

Lingxia Chen<sup>{2}</sup>, Elfed Lewis<sup>{2}</sup>, Peter Woulfe<sup>{1}</sup>, Sinead O'Keeffe<sup>{2}</sup>

<sup>{1}</sup>Galway Clinic, Ireland; <sup>{2}</sup>University of Limerick, Ireland

**C-10-294**

**WIRELESS PAPER-BASED BIOSENSOR READER FOR THE DETECTION OF INFECTIOUS DISEASES AT THE POINT OF CARE .....1502**

Evdokia Pilavaki, Claudio Parolo, Rachel McKendry, Andreas Demosthenous

University College London, United Kingdom

**C-10-295**

**DESIGN AND DEVELOPMENT OF CONTINUOUS CUFF-LESS BLOOD PRESSURE MONITORING DEVICES .....1505**

Devon Griggs<sup>{2}</sup>, Manuja Sharma<sup>{1}</sup>, Arian Naghibi<sup>{2}</sup>, Colton Wallin<sup>{1}</sup>, Victor Ho<sup>{1}</sup>, Karinne Barbosa<sup>{2}</sup>, Tadesse Ghirmai<sup>{1}</sup>, Hung Cao<sup>{1}</sup>, Sandeep K. Krishnan<sup>{1}</sup>

<sup>{1}</sup>University of Washington, United States; <sup>{2}</sup>University of Washington Bothell, United States

**C-10-296**

**SELF ASSEMBLED MONOLAYERS VERSUS IRON OXIDE NANOPARTICLES MODIFIED SURFACES: TWO FUNCTIONALIZATION STRATEGIES FOR FEMTOMOLAR DETECTION OF PROSTATE SPECIFIC ANTIGEN .....1508**

Nesrine Blel<sup>{3}</sup>, Najla Fourati<sup>{1}</sup>, Chouki Zerrouki<sup>{1}</sup>, Mina Souiri<sup>{3}</sup>, Nourdin Yaakoubi<sup>{4}</sup>, Asma Omezzine<sup>{2}</sup>, Ali Othmane<sup>{3}</sup>

<sup>{1}</sup>Conservatoire National des Arts et Métiers, France; <sup>{2}</sup>Hôpital Universitaire Sahloul, Tunisia; <sup>{3}</sup>Université de Monastir, Tunisia; <sup>{4}</sup>Université du Maine, France

**C-10-297**

**FBG-BASED LARGE DEFLECTION SHAPE SENSING OF A CONTINUUM MANIPULATOR: MANUFACTURING OPTIMIZATION .....1511**

Shahriar Sefati, Farshid Alambeigi, Iulian Iordachita, Mehran Armand, Ryan Murphy

Johns Hopkins University, United States

**C-10-298**

**CLOUD-BASED REAL-TIME HEART MONITORING AND ECG SIGNAL PROCESSING .....1514**

Fatima Bamarouf, Claire Crandell, Shannon Tsuyuki, Jose Sanchez, Yufeng Lu

Bradley University, United States

1:30 PM - 3:30 PM

C3P-Q: Focused Session Posters: Wearable Tactile/Pressure Sensors & Skin Monitoring

LOCATION: Poster Area

SESSION CHAIRS:

Mustafa Ilker Beyaz, Antalya International University

Hung Cao, University of Washington

**C-13-326**

**A FULLY-SHIELDED FLEXIBLE AND STRETCHABLE MICROWAVE TRANSMISSION-LINE**

**TACTILE PRESSURE SENSOR .....1517**

*Matthew D'Asaro, Daniel Sheen, Jeffrey Lang*

*Massachusetts Institute of Technology, United States*

**C-13-334**

**AN IR-BASED FACIAL EXPRESSION TRACKING SENSOR FOR HEAD-MOUNTED DISPLAYS .....1520**

*Jaekwang Cha, Jinhyuk Kim, Shiho Kim*

*Yonsei University, Korea, South*

**C-13-336**

**TEXTILE PIEZORESISTIVE SENSORS FOR ON-BODY MEASUREMENT OF SPINAL EXTENSION .....1523**

*Jennifer Deignan{1}, Matthew Jacobs{1}, Larisa Florea{1}, Shirley Coyle{1}, Dermot Diamond{1}, Maria Pacelli{2}, Rita Paradiso{2}*

*{1}Dublin City University, Ireland; {2}Smartex Srl, Italy*

**C-13-339**

**INKJET-PRINTING RAPID PROTOTYPING OF A ROBUST AND FLEXIBLE CAPACITIVE TOUCH**

**PANEL.....1526**

*Lisa-Marie Faller, Stephan Mühlbacher-Karrer, Hubert Zangl*

*Alpen-Adria-Universität Klagenfurt, Austria*

**C-13-338**

**WRIST-WEARABLE BIOELECTRICAL IMPEDANCE ANALYZER WITH CONTACT**

**RESISTANCE COMPENSATION FUNCTION .....1529**

*Myoung Hoon Jung, Kak Namkoong, Yeolho Lee, Young Jun Koh, Kunsun Eom, Hyeongseok Jang, Jungmok Bae, Jongae Park*

*Samsung Advanced Institute of Technology, Korea, South*

**C-13-328**

**HIGH ACCURACY WEARABLE BIOMETRIC DEVICES USING MULTI-WAVELENGTH SKIN TISSUE**

**OPTICS .....N/A**

*Young Chang Jo{1}, Hae Na Kim{1}, Hyuck Ki Hong{1}, Teon Shik Choi{1}, Suk Won Jung{1}, Jae-Hwan Kang{2}, Sung-Phil Kim{2}*

*{1}Korea Electronics Technology Institute, Korea, South; {2}Ulsan National Institute of Science and Technology, Korea, South*

**C-13-330**

**SOFT, FLEXIBLE 3D PRINTED FIBERS FOR CAPACITIVE TACTILE SENSING.....1535**

*Ashish Kapoor, Michael McKnight, Kony Chatterjee, Talha Agcayazi, Hannah Kausche, Tushar Ghosh, Alper Bozkurt*

*North Carolina State University, United States*

**C-13-332**

**A WEARABLE FABRIC-BASED RFID SKIN TEMPERATURE MONITORING PATCH .....N/A**

*Saisai Wen, Hadi Heidari, Anastasios Vilouras, Ravinder Dahiya*

*University of Glasgow, United Kingdom*

1:30 PM - 3:30 PM  
C3P-R: Wired & Wireless Sensor Systems  
LOCATION: Poster Area  
SESSION CHAIR:  
Shad Roundy, University of Utah

- C-11-300**  
**TRANSMISSION CHARACTERISTICS OF RFID SENSOR SYSTEMS EMBEDDED IN CONCRETE.....1541**  
*Matthias Bartholmai, Sergej Johann, Michael Kammermeier, Maximilian Mueller, Christoph Strangfeld*  
*Bundesanstalt für Materialforschung und -prüfung, Germany*
- C-11-302**  
**FREQUENCY-RESPONSE-ASSOCIATED DELAY-DISPERSION ISSUE IN TIME-DELAY MEASURING SENSORS .....1544**  
*Gibran Limi Jaya, Shoushun Chen*  
*Nanyang Technological University, Singapore*
- C-11-304**  
**WIRELESS PRESSURE MEASUREMENT IN AIR BLAST USING PVDF SENSORS .....1547**  
*Jérémie Fourmann{2}, Antony Coustou{2}, Hervé Aubert{2}, Patrick Pons{2}, Jérôme Luc{1}, Alexandre Lefrançois{1}, Maylis Lavayssière{1}, Antoine Osmont{1}*  
*{1}Commissariat à l'Énergie Atomique et aux Énergies Alternatives, France; {2}Laboratoire d'Analyse et d'Architecture des Systèmes / Université de Toulouse, France*
- C-11-306**  
**A NODE DEPLOYMENT MECHANISM ACCOUNTING INTO RECEIVED SIGNAL STRENGTH AND FREQUENCY DIVERSITY FOR A WIRELESS SENSOR NETWORK .....1550**  
*Mrinmoy Sen{1}, Indrajit Banerjee{1}, Mainak Chatterjee{2}, Tuhina Samanta{1}*  
*{1}Indian Institute of Engineering Science and Technology, Shibpur, India; {2}University of Central Florida, United States*
- C-11-308**  
**MODULAR SENSOR SYSTEM (MSS) FOR URBAN AIR POLLUTION MONITORING .....1553**  
*Wei-Ying Yi{1}, Kwong-Sak Leung{1}, Yee Leung{1}, Mei-Ling Meng{1}, Terrence Mak{2}*  
*{1}Chinese University of Hong Kong, Hong Kong; {2}University of Southampton, United Kingdom*
- C-11-310**  
**A STANDALONE STRUCTURED-LIGHT 3D CAMERA.....N/A**  
*Kukjin Han, Sukhan Lee*  
*Sung Kyun Kwan University, Korea, South*
- C-11-312**  
**A WIRELESS SAFETY DETECTION SENSOR SYSTEM .....1559**  
*Riad Kanan, Obaidallah Elhassan, Rofaida Bensalem, Abeer Husein*  
*Abu Dhabi University, U.A.E.*
- C-11-313**  
**ACTIVATION AND IDENTIFICATION OF FULLY PASSIVE WIRELESS SENSORS .....1562**  
*Colm Mc Caffrey, Nadine Pesonen, Pekka Pursula*  
*VTT Technical Research Centre of Finland, Finland*

**C-11-314**  
**A 1.3 MW, 12-BIT LOCK-IN AMPLIFIER BASED READOUT CIRCUIT DEDICATED TO PHOTO-ACOUSTIC GAS SENSING** .....1565  
*Franck Badets, Jean-Guillaume Coutard, Patrice Russo, Elisa Dina, Alain Glière, Sergio Nicoletti*  
*Commissariat à l'Énergie Atomique et aux Énergies Alternatives, France*

**C-11-315**  
**MEDIUM RANGE UNDERWATER COMMUNICATION DEVELOPMENT SYSTEM** .....1568  
*Anton Netchaev, Jordan Klein, Clayton Thurmer, Brandon Carver, James Evans*  
*U.S. Army Engineer Research and Development Center, United States*

**C-11-316**  
**CALIBRATION OF SMARTPHONE LIGHT SENSORS WITH A NEAR FIELD COMMUNICATION ENABLED REFERENCE** .....1571  
*Tore Leikanger, Christian Schuss, Juha Häkkinen*  
*University of Oulu, Finland*

**1:30 PM - 3:30 PM**  
**C3P-S: Focused Session Posters: Resonators**  
**LOCATION: Poster Area**  
**SESSION CHAIR:**  
**Vikrant Gokhale, University of Michigan**

**C-14-340**  
**THE EFFECT OF SHORT BEAM LENGTH AND GAP DISTANCE ON THE RESONANCE FREQUENCIES IN FISHBONE-SHAPED MICROELECTROMECHANICAL SYSTEM RESONATOR** .....1574  
*Ryo Takahashi, Hidetoshi Miyashita, Kentaro Kinoshita, Sang-Seok Lee*  
*Tottori University, Japan*

**C-14-348**  
**A 2D RESONANT MEMS SCANNER WITH AN ULTRACOMPACT WEDGE-LIKE MULTIPLIED ANGLE AMPLIFICATION FOR MINIATURE LIDAR APPLICATION** .....1577  
*Liangchen Ye<sup>{2}</sup>, Gaofei Zhang<sup>{2}</sup>, Zhen You<sup>{2}</sup>, Chi Zhang<sup>{1}</sup>*  
*<sup>{1}</sup>Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China; <sup>{2}</sup>Tsinghua University, China*

**C-14-341**  
**FULLY-DIFFERENTIAL ALN-ON-SI WINE GLASS MODE RESONATOR FOR ENHANCED CHARACTERIZATION IN WATER** .....1580  
*Abid Ali, Joshua En-Yuan Lee*  
*City University of Hong Kong, Hong Kong*

**C-14-342**  
**DEVELOPMENT OF OPTIMAL ELECTROPLATED PLATINUM-BLACK CATALYST FOR QUARTZ HYDROGEN SENSORS** .....1583  
*Hiroshi Oigawa<sup>{1}</sup>, Koichi Harima<sup>{1}</sup>, Fusao Kohsaka<sup>{2}</sup>, Tooru Tsuno<sup>{2}</sup>, Toshitsugu Ueda<sup>{2}</sup>*  
*<sup>{1}</sup>KOA Corporation, Japan; <sup>{2}</sup>Waseda University, Japan*

**C-14-343**  
**TORSIONAL NANO-RESONATOR: CHARACTERIZATION OF A NONLINEAR HARDENING BEHAVIOR AND NOISE ANALYSIS** .....1586  
*Ludovic Laurent, Jean-Jacques Yon, Jean-Sébastien Moulet, Pierre Imperinetti, Laurent Duraffourg*  
*Commissariat à l'Énergie Atomique et aux Énergies Alternatives, France*

**C-14-344**  
**ALGAN/GAN HFET EMBEDDED GAN MICROCANTILEVERS BASED POTENTIOMETRIC SENSOR.....1589**  
*Ferhat Bayram, Digangana Khan, Soaram Kim, Goutam Koley*  
*Clemson University, United States*

**C-14-349**  
**CONTACTLESS ASPHALTENE SOLID PARTICLE DEPOSITION MONITORING USING ACTIVE MICROWAVE RESONATORS .....1592**  
*Mohammad Abdolrazzaghi{2}, Mohammad Hossein Zarifi{2}, Mojgan Daneshmand{2}, Cedric F. A. Floquet{1}*  
*{1}Schlumberger DBR Technology Center, Canada; {2}University of Alberta, Canada*

**C-14-345**  
**A NOVEL CHARACTERIZATION METHOD FOR MEMS BASED ELECTROSTATIC RESONATORS FOR Q ENHANCEMENT AND FEEDTHROUGH CURRENT ELIMINATION .....1595**  
*Eren Aydin{1}, Mustafa Kangül{1}, Furkan Gökçe{1}, özge Zorlu{2}, Haluk Külah{1}*  
*{1}Middle East Technical University, Turkey; {2}Mikrobiyo Sistemler Elektronik Sanayi A.Ş., Turkey*

**C-14-346**  
**AN ACCURATE CONTACTLESS POSITION SENSOR WITH PLANAR RESONATORS.....1598**  
*Bingnan Wang, Koon Hoo Teo, Phil Orlik*  
*Mitsubishi Electric Research Laboratories, United States*

**C-14-347**  
**BILAYER NANO-WAVEGUIDE RESONATORS FOR SENSING APPLICATIONS .....1601**  
*Mayur Ghatge, Roozbeh Tabrizian*  
*University of Florida, United States*

**1:30 PM - 3:30 PM**

**C3P-T: Focused Session Posters: MEMS Energy Harvesting & Devices**

**LOCATION: Poster Area**

**SESSION CHAIR:**

**Qian Zhang, Analog Devices, Inc.**

**C-16-352**  
**ENERGY HARVESTING FROM MOVING DROPLET BY WATERSOLID SURFACE CONTACT ELECTRIFICATION WITH MEMS COMPATIBLE PROCESS TECHNOLOGY .....N/A**  
*Chaoran Liu{2}, Xiaofeng Zhou{1}, Lufeng Che{1}*  
*{1}Shanghai Institute of Microsystem and Information Technology / Chinese Academy of Sciences, China;*  
*{2}Shanghai Institute of Microsystem and Information Technology / University of Chinese Academy of Scie, China*

**C-16-355**  
**CONFIRMATION OF HIGH EFFICIENCY ON RECTENNA WITH HIGH IMPEDANCE ANTENNA AND OPTIMIZED GATE CONTROLLED DIODE FOR RF ENERGY HARVESTING .....1607**  
*Junpei Iwata, Jiro Ida, Takahiro Furuta, Keisuke Noguchi, Kenji Itoh*  
*Kanazawa Institute of Technology, Japan*

**C-16-358**  
**ON THE POWER OPTIMIZATION OF THE VIBRATION-BASED ENERGY HARVESTERS UNDER SWEPT INPUT ACCELERATION .....1610**  
*Thuy Le{1}, Binh Truong{2}, Cuong Le{2}, Sebastian Sager{1}*  
*{1}Otto-von-Guericke-Universität Magdeburg, Germany; {2}University College of Southeast Norway, Norway*



<b>C-16-361</b>	
<b>A MICROSCALE BIOPHOTOVOLTAIC DEVICE .....</b>	<b>1613</b>
<i>Xuejian Wei, Maedeh Mohammadifar, Weiyang Yang, Seokheun Choi</i>	
<i>State University of New York at Binghamton, United States</i>	
<b>C-16-364</b>	
<b>WIDEBAND MEMS ELECTROSTATIC ENERGY HARVESTER WITH DUAL RESONANT STRUCTURE .....</b>	<b>1616</b>
<i>Yulong Zhang, Anxin Luo, Yixin Xu, Tianyang Wang, Fei Wang</i>	
<i>South University of Science and Technology of China, China</i>	
<b>C-16-367</b>	
<b>AN ORIGAMI-INSPIRED MULTICELL BIOBATTERY STACK .....</b>	<b>1619</b>
<i>Maedeh Mohammadifar, Yang Gao, Seokheun Choi</i>	
<i>State University of New York at Binghamton, United States</i>	
<b>C-16-370</b>	
<b>NOVEL SCREEN PRINTED AND FLEXIBLE LOW FREQUENCY MAGNETO-ELECTRIC ENERGY HARVESTER .....</b>	<b>1622</b>
<i>Amer Chlahawi, Sepehr Emamian, Binu Narakathu, Bradley Bazuin, Massood Zandi Atashbar</i>	
<i>Western Michigan University, United States</i>	
<b>C-16-373</b>	
<b>MICROMACHINED “RANDOM MECHANICAL SWITCHING HARVESTER ON INDUCTOR” TO RECOVERY ENERGY FROM VERY LOW-AMPLITUDE VIBRATIONS WITH ZERO-VOLTAGE THRESHOLD .....</b>	<b>1625</b>
<i>Carlo Trigona, Salvatore Giuffrida, Bruno Andò, Salvatore Baglio</i>	
<i>Università degli Studi di Catania, Italy</i>	
<b>C-16-375</b>	
<b>KINETIC ENERGY HARVESTING USING IMPROVED ECCENTRIC ROTOR ARCHITECTURE FOR WEARABLE SENSORS.....</b>	<b>1628</b>
<i>Qian Zhang<sup>{1}</sup>, Lei Gu<sup>{1}</sup>, Ken Yang<sup>{1}</sup>, Miah Halim<sup>{2}</sup>, Robert Rantz<sup>{2}</sup>, Shad Roundy<sup>{2}</sup></i>	
<i><sup>{1}</sup>Analog Devices, Inc., United States; <sup>{2}</sup>University of Utah, United States</i>	

4:00 PM - 5:30 PM

C4L-A: Physical Sensors IV: Mechanical & Thermal Sensors

LOCATION: Curacao 1-2

SESSION CHAIRS:

Roman Beigelbeck, Krems University

Bernard Jakoby, Johannes Kepler University Linz, Austria

4:00

**DEVELOPING A PASSIVE DC CURRENT SENSOR.....1631**

Huan Liu<sup>{1}</sup>, Dingkang Wang<sup>{2}</sup>, Dong F. Wang<sup>{1}</sup>  
<sup>{1}</sup>Jilin University, China; <sup>{2}</sup>University of Florida, United States

4:15

**MICROPLASMA DRAWING OF THERMOCOUPLE SENSORS .....1634**

Ahmed M. Abdul-Wahed, Anindya Roy, Kenichi Takahata  
University of British Columbia, Canada

4:30

**FLUORESCENCE-BASED TEMPERATURE SENSOR FOR IN-SITU IMAGING LOCAL TEMPERATURE OF ALUMINUM NANOPARTICLES ON PLASMONIC GRATINGS.....1637**

Biyang Chen, Haisheng Zheng, Junsang Yoon, Sangho Bok, Cherian Mathai, Keshab Gangopadhyay, Shubhra Gangopadhyay, Matthew R. Maschmann  
University of Missouri, United States

4:45

**CHARACTERIZATION OF PIEZORESISTIVE AND ELECTROTHERMAL SENSORS IN MEMS DEVICES .....1640**

Mohammad Maroufi, S. O. Reza Moheimani  
University of Texas at Dallas, United States

5:00

**TOWARDS A TRI-AXIAL FLEXIBLE FORCE SENSOR FOR CATHETER CONTACT FORCE MEASUREMENT.....1643**

Hardik Pandya<sup>{1}</sup>, Jun Sheng<sup>{2}</sup>, Jaydev Desai<sup>{2}</sup>  
<sup>{1}</sup>Brigham and Women's Hospital / Harvard Medical School, United States; <sup>{2}</sup>Georgia Institute of Technology, United States

5:15

**GRAPHENE OXIDE BASED SENSOR WITH DIFFERENTIAL STRUCTURE FOR HUMIDITY AND TEMPERATURE DETECTION.....1646**

Xiaohui Leng, Xingwei Chen, Fei Wang  
South University of Science and Technology of China, China

4:00 PM - 5:30 PM

C4L-B: Physical Biosensors & Fluidics

LOCATION: Curacao 3-4

SESSION CHAIRS:

Paddy French, TU Delft

Michael Vellekoop, University of Bremen

4:00

**A HIGHLY INTEGRATABLE MICROFLUIDIC BIOSENSING CHIP BASED ON MAGNETOELASTIC-SENSOR AND PLANAR COIL.....1649**

*Qiushi Jiang{1}, Ping Chen{1}, Suiqiong Li{1}, Heming Zhao{1}, Yuzhe Liu{2}, Shin Horikawa{2}, Bryan Chin{2}*  
*{1}Soochow University, China, {2}Auburn University, United States*

4:15

**SENSITIVITY ENHANCEMENT OF SPLIT RING RESONATOR BASED LIQUID SENSORS .....1652**

*Mohammad Abdolrazzaghi, Mohammad Hossein Zarifi, Mojgan Daneshmand*  
*University of Alberta, Canada*

4:30

**A NOVEL SCREENING PLATFORM FOR ELECTROMICROBIOLOGY: A 3-D PAPER-BASED SENSING ARRAY WITH CONDUCTIVE PEDOT:PSS.....1655**

*Yang Gao{1}, Maedeh Mohammadifar{1}, Daniel Hassett{2}, Seokheun Choi{1}*  
*{1}State University of New York at Binghamton, United States; {2}University of Cincinnati College of Medicine, United States*

4:45

**RAPID DETECTION OF THEOPHYLLINE USING APTAMER-BASED NANOPORE THIN FILM SENSOR.....1658**

*Silu Feng, Xiangchen Che, Long Que, Changtian Chen, Wei Wang*  
*Iowa State University, United States*

5:00

**AN AUTOMATED MICROFLUIDIC ASSAY FOR THE DETECTION OF CANCER BIOMARKERS IN SERUM USING PHOTONIC CRYSTAL ENHANCED FLUORESCENCE.....1661**

*Lydia Kwon, Caitlin Race, Myles Foreman, Brian T. Cunningham*  
*University of Illinois at Urbana–Champaign, United States*

5:15

**ACHIEVING UNIFORMITY AND REPRODUCIBILITY FOR PHOTONIC CRYSTAL FLUORESCENCE ENHANCED DISEASE DIAGNOSTIC MICROARRAYS .....1664**

*Caitlin Race, Lydia Kwon, Brian T. Cunningham*  
*University of Illinois at Urbana–Champaign, United States*

4:00 PM - 5:30 PM

C4L-C: Wireless Sensors & Interfaces

LOCATION: Curacao 5-6

SESSION CHAIRS:

Mehdi Kiani, Penn State University

Ryutaro Maeda, AIST

4:00

**INVITED: WIRELESS HYDROGEL-BASED GLUCOSE SENSOR FOR FUTURE**

**IMPLANTABLE APPLICATIONS .....1667**

*Yuechuan Yu, Tram Nguyen, Prashant Tathireddy, Darrin Young, Shad Roundy*

*University of Utah, United States*

4:30

**SELF-POWERED AND TRANSPARENT ALL-GRAPHENE BIOSENSOR .....1670**

*Ali Shahini{2}, Mehdi Hajizadegan{2}, Maryam Sakhdari{2}, Mark Ming-Cheng Cheng{2}, Pai-Yen Chen{2}, Haiyu Huang{1}*

*{1}Maxim Integrated Inc., United States; {2}Wayne State University, United States*

4:45

**PASSIVELY-POWERED WIRELESS MICROMACHINED QUARTZ**

**MAGNETOFLEXOELASTIC MAGNETOMETER .....1673**

*Paul Nordeen{2}, Grergory P. Carman{2}, Eugene Freeman{1}, Gokhan Hatipoglu{1}, Srinivas Tadigadapa{1}*

*{1}Pennsylvania State University, United States; {2}University of California, Los Angeles, United States*

5:00

**AN EMBEDDED SYSTEM TO CONTROL CONDUCTING INTERPENETRATING POLYMER**

**NETWORKS ACTUATORS .....1676**

*Tien Anh Nguyen{3}, Luc Chassagne{3}, Barthélemy Cagneau{3}, Adelyne Fannir{2}, Kätlin Rohtlaid{2}, Tran Minh Giao Nguyen{2}, Cedric Plesse{2}, Frédéric Vidal{2}, Chia-Ju Peng{1}, Shih-Jui Chen{1}*

*{1}National Central University, Taiwan; {2}Université de Cergy-Pontoise, France; {3}Université de Versailles Saint-Quentin-en-Yvelines, France*

5:15

**PROGRAMMABLE MULTIMODE, MULTICHANNEL UNIVERSAL WIRELESS RECEIVER WITH**

**FFT-BASED MULTICARRIER DEMODULATOR FOR BATTERYLESS WIRELESS SENSORS .....1679**

*Hisashi Nishikawa, Kei Igarashi, Takeshi Nishihashi, Yuya Shimizu, Ryota Suematsu, Ami Tanaka, Takakuni Douseki*

*Ritsumeikan University, Japan*

4:00 PM - 5:30 PM

C4L-D: Sensors & Systems for Health Monitoring & Harsh Environments

LOCATION: Curacao 7-8

SESSION CHAIR:

Christian Zorman, Case Western Reserve University

4:00

**INVITED: WIRELESS BLADDER PRESSURE MONITOR FOR CLOSED-LOOP**

**BLADDER NEUROMODULATION.....1682**

Steve Majerus<sup>{3}</sup>, Anisha S. Basu<sup>{1}</sup>, Iryna Makovey<sup>{2}</sup>, Peng Wang<sup>{1}</sup>, Hui Zhui<sup>{3}</sup>, Christian Zorman<sup>{1}</sup>, Wen Ko<sup>{1}</sup>, Margot Damaser<sup>{3}</sup>  
<sup>{1}</sup>Case Western Reserve University, United States; <sup>{2}</sup>Cleveland Clinic, United States; <sup>{3}</sup>Cleveland VA Medical Center, United States

4:30

**MHEALTH DIPSTICK ANALYZER FOR MONITORING OF PREGNANCY COMPLICATIONS.....1685**

Karthik Konnaiyan<sup>{1}</sup>, Surya Cheemalapati<sup>{1}</sup>, Anna Pyayt<sup>{1}</sup>, Michael Gubanov<sup>{2}</sup>  
<sup>{1}</sup>University of South Florida, United States; <sup>{2}</sup>University of Texas at San Antonio, United States

4:45

**ROBUST IMPLANTABLE BLOOD PRESSURE SENSOR PACKAGING FOR LONG-TERM**

**LABORATORY ANIMALS MONITORING .....1688**

Xing Chen, Darrin Young  
University of Utah, United States

5:00

**MULTI-SENSOR MODULE FOR A MOBILE ROBOT OPERATING IN HARSH ENVIRONMENTS.....1691**

Guangfen Wei<sup>{1}</sup>, Julian Gardner<sup>{2}</sup>, Marina Cole<sup>{2}</sup>, Yuxin Xing<sup>{2}</sup>  
<sup>{1}</sup>Shandong Technology and Business University, China; <sup>{2}</sup>University of Warwick, United Kingdom

5:15

**GLASS MICROBUBBLE ON-CHIP PACKAGED FERROFLUID BASED**

**MAGNETOVISCOUS MAGNETOMETER..... N/A**

Chenchen Zhang, Eugene Freeman, Srinivas Tadigadapa  
Pennsylvania State University, United States

4:00 PM - 5:30 PM

C4L-E: Sensor Network, Applications and IoT

LOCATION: Bonaire 1-2

SESSION CHAIRS:

Fabien Josse, Marquette University

Sang-Seok Lee, Tottori University

4:00

**INVITED: ULTRA-THIN PIEZOELECTRIC STRAIN SENSOR ARRAY INTEGRATED ON FLEXIBLE PRINTED CIRCUIT FOR STRUCTURAL HEALTH MONITORING.....1697**

*Takahiro Yamashita{2}, Hironao Okada{2}, Takeshi Kobayashi{2}, Daniel Zymelka{3}, Kazuyoshi Togashi{1}, Seiichi Takamatsu{4}, Toshihiro Itoh{4}*  
*{1}Dai Nippon Printing Co., Ltd., Japan; {2}National Institute of Advanced Industrial Science and Technology, Japan; {3}NMEMS Technology Research Organization / National Institute of Advanced Industrial Science and Techn, Japan; {4}University of Tokyo / N*

4:30

**VIBRATING BEAM MEMS SEISMOMETER FOR FOOTSTEP AND VEHICLE DETECTION .....1700**

*Raphael Levy, Julien Moras, Benjamin Pannetier*  
*Office National d'Etudes et de Recherches Aérospatiales, France*

4:45

**INTEGRATION OF HIGH-SPEED VISUAL AND TACTILE SENSORS WITH SYNCHRONIZATION IN A SENSOR NETWORK SYSTEM.....1703**

*Yuji Yamakawa, Masatoshi Ishikawa, Makoto Shimojo, Akihito Noda*  
*University of Tokyo, Japan*

5:00

**WAGGLE: AN OPEN SENSOR PLATFORM FOR EDGE COMPUTING .....1706**

*Pete Beckman, Rajesh Sankaran, Charlie Catlett, Nicola Ferrier, Robert Jacob, Michael Papka*  
*Argonne National Laboratory, United States*

5:15

**A NEW DISTRIBUTED ALGORITHM FOR ENVIRONMENTAL MONITORING BY WIRELESS SENSOR NETWORKS WITH LIMITED COMMUNICATION .....1709**

*Jing Wang{1}, In Soo Ahn{1}, Yufeng Lu{1}, Gennady Staskevich{2}*  
*{1}Bradley University, United States; {2}U.S. Air Force Research Laboratory, United States*

4:00 PM - 5:30 PM

C4L-F: Focused Session: Energy Harvesting & Low-Power Sensors II

LOCATION: Bonaire 3-4

SESSION CHAIRS:

Shashank Priya, Virginia Tech

Ryohei Takei, National Institute of Advanced Industrial Science and Technology

4:00

**WIRELESS VIBRATION SENSING SYSTEM POWERED BY A PIEZOELECTRIC MEMS VIBRATION ENERGY HARVESTER .....1712**

*Ryohei Takei<sup>{2}</sup>, Hironao Okada<sup>{2}</sup>, Takeshi Kobayashi<sup>{2}</sup>, Daiji Noda<sup>{1}</sup>, Ryo Ohta<sup>{1}</sup>, Toshihiro Itoh<sup>{3}</sup>  
{1}Micromachine Center, Japan; {2}National Institute of Advanced Industrial Science and Technology, Japan;  
{3}University of Tokyo / National Institute of Advanced Industrial Science and Technology, Japan*

4:15

**FORCE IMPACT EFFECT IN CONTACT-MODE TRIBOELECTRIC ENERGY HARVESTERS: CHARACTERIZATION AND MODELING .....1715**

*Marco Lasagni, Paolo Pavan, Alessandro Bertacchini, Luca Larcher  
Università degli Studi di Modena e Reggio Emilia, Italy*

4:30

**A FULLY INTEGRATED ELECTROMAGNETIC ENERGY HARVESTING CIRCUIT WITH AN ON-CHIP ANTENNA FOR BIOMEDICAL IMPLANTS IN 180 NM SOI CMOS .....1718**

*Hamed Rahmani, Aydin Babakhani  
Rice University, United States*

4:45

**SELF-POWERED WIRELESS URINARY-INCONTINENCE SENSOR DETERMINES TIME FOR DIAPER CHANGE FROM SPACING BETWEEN SENSING SIGNALS .....1721**

*Ami Tanaka, Ryota Suematsu, Hiroya Sakamoto, Takakuni Douseki  
Ritsumeikan University, Japan*

5:00

**TEMPERATURE BEAT: PERSISTENT AND ENERGY HARVESTING WIRELESS TEMPERATURE SENSING SCHEME .....1724**

*Ryohei Takitoge, Shohei Ishigaki, Tsuyoshi Ishige, Koichiro Ishibashi  
University of Electro-Communications, Japan*

5:15

**HIGH PERFORMANCE PAPER-BASED MICROBIAL FUEL CELLS USING NANOSTRUCTURED POLYMERS .....1727**

*Maedeh Mohammadifar, Jing Zhang, Idris Yazgan, Victor Kariuki, Omowunmi Sadik, Seokheun Choi  
State University of New York at Binghamton, United States*

**AUTHOR INDEX**