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TECHNOLOGIES



INTERNATIONAL
YEAR OF LIGHT
2015



MICRO TECHNOLOGIES.

TECHNICAL
PROGRAMME

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Conferences:
4-6 May 2015

Hotel Alimara
Barcelona, Spain



INTERNATIONAL
YEAR OF LIGHT
2015

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2015 MICRO TECHNOLOGIES.

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TECHNICAL CONFERENCES

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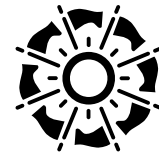
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SPIE would like to express its deepest appreciation to the symposium chairs, conference chairs, programme committees, session chairs, and authors who have so generously given their time and advice to make this symposium possible.

The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members. This programme is based on commitments received up to the time of publication and is subject to change without notice.



Welcome

It is our pleasure to welcome your attendance at SPIE 7th SPIE Microtechnologies. Five exciting conferences in the field of microtechnologies have been linked together. Take advantage of the synergies created by engineers, scientists, researchers, and managers working on various aspects of microtechnologies. The symposium presents a unique opportunity to hear about the latest advances in microtechnologies for smart sensors, energy harvesting and smart power, reconfigurable hardware, low-power electronics and wireless communication for cyber physical systems, network on a chip, nano fabrication and self-assembly, hybrid nanosystems, biomedical applications and bioinspired systems, microfluidics and lab on a chip, silicon and nano photonics, quantum communication, and many other cutting-edge R&T results.

Exchange new ideas, address your shared concerns, and get access to information not yet published in these topical areas. Your paper is permanently archived in the SPIE Digital Library, where it will be available to others in the international scientific community who seek to learn, make discoveries, and innovate.

We welcome you to feel at home in Barcelona, Spain, while attending the meeting. The programme promises an exciting week, with excellent science and technology in a setting conducive to international interchange, networking, and exchanging ideas.

Lastly, join us in celebrating the International Year of Light and Light-based Technologies in Barcelona in 2015!

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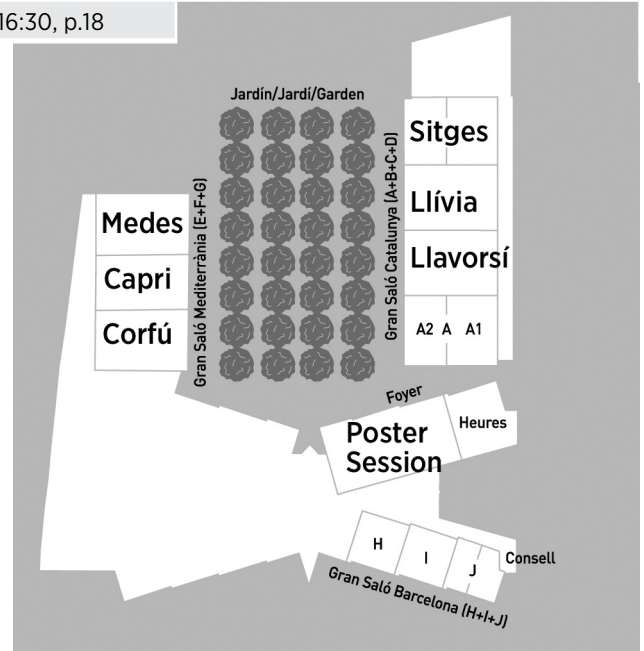


Jacopo Iannacci
Fondazione Bruno Kessler (Italy)

DAILY SCHEDULE

MONDAY	TUESDAY	WEDNESDAY
Conferences		
PLENARY PRESENTATION: Microsystems: From Smart Sensors to Cyberphysical Systems , Robert Plana, Alstom S.A. (France), 10 to 11, p. 4	PLENARY PRESENTATION: And the next big thing is...the future of personalized medicine , Stefan Harrer, IBM Research (Australia), 9 to 10, p. 4	PLENARY PRESENTATION: Miniaturized dielectric elastomer actuators: towards intelligent soft machines , Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland), 9 to 10, p. 5
Conf. 9517A: Smart Sensors, Actuators, and MEMS VII , Sánchez-Rojas p. 8		
SESSION 1: Harvesting , 11:00 to 12:40, p.6	SESSION 4: Optical Devices , 10:30 to 12:10, p.7	SESSION 7: Characterization , 10:30 to 11:50, p.9
SESSION 2: Materials and Processes , 13:40 to 15:00, p.6	SESSION 5: Modeling , 13:10 to 14:30, p.7	SESSION 8: Systems , 13:30 to 15:10, p.9
SESSION 3: Resonators , 15:30 to 17:30, p.6	Tuesday Posters , 14:30 to 16:30, p.7	SESSION 9: Chemical Sensors , 15:40 to 17:20, p.9
	SESSION 6: Devices , 16:30 to 17:50, p.8	Closing Remarks , 17:20 to 17:30, p.9
Conf. 9517B: Cyber Physical Systems , p. 12		
SESSION 10: Energy Harvesting and Low Power Design , 11:10 to 12:30, p.10	SESSION 1: Neural and Wireless Interfaces , 10:30 to 11:50, p.11	SESSION 4: Microfluidics and Lab-on-a-Chip II , 10:30 to 12:10, p.12
SESSION 11: Embedded Systems Applications , 13:40 to 15:00, p.10	SESSION 2: Microfluidics and Lab-on-a-Chip I , 11:50 to 13:10, p.11	SESSION 5: Biosensors and Medical Sensors II , 13:30 to 15:10, p.12
SESSION 12, Networking and Embedded Computing , 15:30 to 16:30, p.10	Tuesday Posters , 14:30 to 16:30, p.11	SESSION 6: Microfluidics and Lab-on-a-Chip III , 15:10 to 15:40, p.13
	SESSION 3: Biosensors and Medical Sensors I , 6:30 to 17:30, p.12	Closing Remarks , 17:00 to 17:10, p.13
Conf. 9519: Nanotechnology VII p. 16		
SESSION 1: Nanophotonics and Plasmonics , 11:20 to 12:50, p.14	SESSION 4: Applications in Nano-Biomedicine , 10:30 to 12:00, p.15	SESSION 6: Synthesis, Surface Modification, Nano-Devices and Reliability , 10:30 to 12:20, p.16
SESSION 2: Quantum Dots, Nanocrystals and Nanowires , 12:50 to 14:00, p.14	SESSION 5: Microfabrication , 13:00 to 14:40, p.15	
SESSION 3: Aerographite, Graphene, Carbon Nanotubes , 16:10 to 17:30, p.14	Tuesday Posters , 14:30 to 16:30, p.15	
Conf. 9520: Integrated Photonics: Materials, Devices, and Applications III p. 19		
SESSION 1: Nonlinear Optics and Quantum Photonics , 11:00 to 12:20, p.17	SESSION 4: Spectroscopy and Optical Forces , 10:50 to 11:50, p.17	SESSION 6: Light Emission , 10:30 to 12:10, p.18
SESSION 2: Bio Photonics and Resonators , 14:00 to 15:00, p.17	SESSION 5: Photonic Circuits , 13:10 to 14:30, p.18	SESSION 7: Materials and Nanostructuring , 13:30 to 16:10, p.18
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HOTEL ALIMARA Room Locations



PLENARY EVENTS

Monday 4 May.

09:30 · Location: SITGES/LLÍVIA

OPENING REMARKS

Ulrich Schmid, Technische Wien (Austria)

09:30

WELCOME

Local Co-chair, **Carles Cané**, Ctr. Nacional de Microelectronica (Spain)

09:40

UPDATE ON IT RESEARCH AND BUSINESS IN CATALUNYA

Mariona Sanz Ausàs, Director, Unit of Innovation and Internationalization of the Competitiveness Agency (ACCIO), Catalan Government (Spain)

10:00 to 11:00 am

MICROSYSTEMS: FROM SMART SENSORS TO CYBERPHYSICAL SYSTEMS



Robert Plana,

Alstom S.A. (France)

It is understood today that data represent the next industrial revolution and this motivates research and innovation in the field of sensors, actuators, but also in the way the data are conveyed and processed. During the last twenty years, we have seen a dramatic evolution from centralized sensors systems featuring more and more functionalities to fleet of sensors distributed generating massive amount of data locally or centrally processed to form relevant information for almost all the industrial sectors. This is sometimes called Internet of Things revolution (IoT). The communication will present the technologies that are under discussion today and more precisely how the nanotechnologies and the surface states understanding allow the development of new types of sensors featuring high resolution and sensitivity. It will be also outline the architectures that are envisioned to handle fleet of sensors all connected simultaneously. Some important issues will be assessed as miniaturization, high density of integration, power consumption and autonomy and cybersecurity. In a second part, it will be shown the applications targeted by advanced microsystems in almost all the industrial sectors. Finally in a third part, it will be shown that beside the hardware architectures, data processing, storing, visualization will play a major role in the emerging Internet of Things defining a new category of systems called "Cyberphysical systems".

Dr. Robert Plana obtained his PhD in 1993 at LAAS-CNRS and Paul Sabatier University in Toulouse in the field of Microelectronic devices circuits and systems. From 1993, he has been working on the exploration of Silicon based devices for advanced wireless applications. In 2000 he has been appointed as a full professor at Toulouse University and Institut Universitaire de France and he has created a research group focussing on Micro and Nanosystems for wireless communications. From 2004 to 2006, he has been appointed as Scientific Director of the Information and Communication Department at CNRS. From 2007 to 2009, he has been working with National Research Agency in charge of the nanotechnology initiative. From 2009 to 2012, He has been heading the strategy for research and innovation at the Ministry of higher education and research. He joined Alstom group in January 2013 and has been working as a R&D and university relations director where he is in charge of coordinating the R&D and innovations activities.

Tuesday 5 May.

9:00 to 10:00 · Location: SITGES/LLÍVIA

AND THE NEXT BIG THING IS...THE FUTURE OF PERSONALIZED MEDICINE



Stefan Harrer,

IBM Research (Australia)

The first industrial revolution was about machines, the second one was about life – the third one has just started and connects the life sciences to novel sensor devices through the power of big data analytics and biomedical engineering. Its foundation are the two codependent core tasks of generating and analysing big data. Thereby novel sensing technologies from wearable biometric devices to lab-on-a-chip platforms for exploratory fundamental research on single-molecule characterization and design occupy a key role in the data generation realm. The groundbreaking potential of these novel nano- and microsensor technologies is leveraged through recent advances in analytical techniques for life sciences, healthcare and genomics applications: DNA-sequencing is approaching the 1000-Dollar-Genome milestone allowing for decoding a complete human genome with unmatched speed and at low cost. Increased sequencing efficiency yields massive amounts of sequencing data. Analysis of such data eventually enables understanding the roles of genes and their correlation with an individual's risk of developing a certain disease. Access to this information triggers fundamental questions for doctors and patients alike: What are the chances of an outbreak? Which drugs are available and how should they be applied? In order to provide answers, technologies for discovering novel drugs, for improving existing drugs, and for their intelligent use in an increasingly complex and customized environment will have to be revolutionized. The path from fast and cheap personalized sequencing via smart genomics towards personal prevention and treatment is reshaping medicine as we know it. Integrated sensing technologies closely linked to big data generation and analytics thereby constitute the backbone of personalized medicine, the Next Big Thing emerging from marrying nano- and microtechnology, biotechnology, and big data. In this talk I will describe IBM's involvement in personalized medicine research with a special focus on two bionanosensor projects in the next-generation DNA-sequencing and drug discovery space.

Stefan holds B.Sc., Diploma, and Ph.D. degrees in EECS from the Technical University Munich and an Honors Masters Certificate in technology management from the Technical University Munich and the Ludwig-Maximilians University Munich. He was a Research Scholar at UC Berkeley and a Visiting Graduate Student at the Massachusetts Institute of Technology before he joined IBM Research as a process engineer in the Advanced Lithography Group, Albany, USA. He then became a research scientist in the IBM T. J. Watson Research Center, Yorktown Heights, USA. He is currently the Lead of BioNanotechnology Research for IBM Research Australia, Science Technical Assistant to the Lab Director, and also an Honorary Associate Professor at the University of Melbourne.

Wednesday 6 May.

9:00 to 10:00 · Location: SITGES/LLÍVIA

MINIATURIZED DIELECTRIC ELASTOMER ACTUATORS: TOWARDS INTELLIGENT SOFT MACHINES



Herbert R. Shea,
Ecole Polytechnique Fédérale de
Lausanne (Switzerland)

Abstract: Dielectric Elastomer Actuators (DEAs), often referred to as artificial muscles, are stretchable soft transducers consisting of an elastomer membrane sandwiched between two compliant electrodes. DEAs can be used as actuators with strains of over 200%, but also for energy harvesting, as sensors, switches and as lightweight structural elements. These attributes make them particularly well suited for intelligent deformable machines.

Our research centers on μm - to cm -scale miniaturized DEAs. We present the microfabrication, design and operation of a wide range of DEA devices, based on soft silicone elastomers and printed silicone-based conductive inks. Our devices cover a wide range of applications, including compliant grippers for grabbing small space debris, foldable control surfaces for small drones, arrays of $100 \times 100 \mu\text{m}^2$ actuators to apply mechanical strain to biological cells, and fast ($150 \mu\text{s}$) tunable polymer lenses.

Our research goal is fully flexible smart machines that are reliable, self-powered, incorporating high strain, high energy-density silicone elastomers actuators, with integrated sensing and flexible printed control circuitry.

Herb Shea is a professor at the EPFL in Switzerland, leading a team of a dozen scientists developing miniaturized elastomer-based actuators. After receiving a Ph.D. (1997) in physics at Harvard University, he spent 2 years a post-doctoral fellow at IBM's T.J. Watson Research Center, then he joined Lucent Technologies' Bell Labs, becoming the technical manager of the Microsystems Technology group. In 2004 Herb founded the Microsystems for Space Technologies Laboratory (LMTS) at the EPFL. His current research topics include elastomer-based actuators, sensors, and energy harvesters, micromachined ion propulsion, and tactile displays.



Welcome Reception

Monday 4 May 2015 19:00 to 20:30

Join your colleagues for a networking event with light refreshments at Casa Milà "La Pedrera", the Gaudi house.

Casa Milà "La Pedrera" has been a UNESCO Cultural World Heritage site since 1984 because of its exceptional universal value.

For more information visit
<https://www.lapedrera.com/en/la-pedrera-heritage>.

TO GET THERE:

Please use Metro Line 3 from the Hotel stop (Mundet) to the Casa Mila stop (Diagonal).

ADDRESS: Provença, 261 - 265. 08008, Barcelona.

Bus: 7, 16, 17, 22, 24 and V17.

Metro: lines 3 and 5, estació Diagonal.

FGC: Provença-La Pedrera.

RENFE: Passeig de Gràcia.

Interactive Poster Session

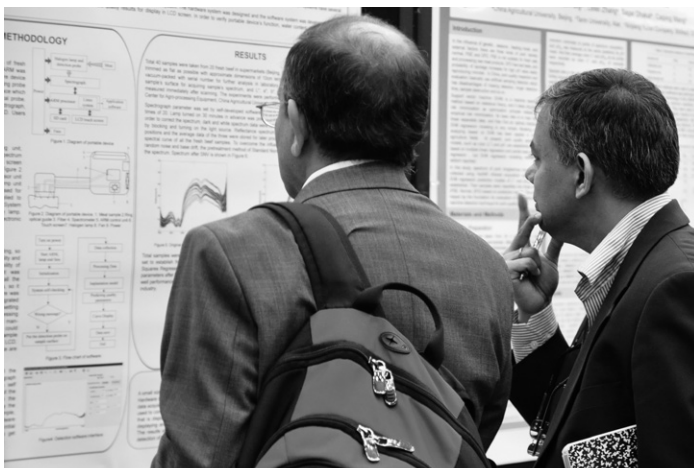
Hotel Alimara Conference Foyer

Tuesday 5 May 2015 • 14:30 to 16:30

Setup

Authors are encouraged to display their posters beginning at 10:00 on Monday for extended viewing. Each poster author will have a 1m x 1m (39 inches x 39 inches) area in which to display their poster presentation.

Conference attendees are invited to attend the Poster Session on Tuesday afternoon. Come view posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.



CONFERENCE 9517A

LOCATION: SITGES/LLÍVIA

Monday - Wednesday 4 - 6 May 2015 • Proceedings of SPIE Vol. 9517A

Smart Sensors, Actuators, and MEMS VII

Conference Chair: **José Luis Sánchez-Rojas**, Univ. de Castilla-La Mancha (Spain)

Conference Co-Chairs: **José Correia**, Univ. do Minho (Portugal); **Erwin Peiner**, Technische Univ. Braunschweig (Germany)

Program Committee: **Francisco J. Arregui**, Univ. Pública de Navarra (Spain); **Joan Bausells**, Ctr. Nacional de Microelectrónica (Spain); **Achim Bittner**, Technische Univ. Wien (Austria); **Christian Bolzmacher**, Commissariat à l'Énergie Atomique (France); **Lionel Buchaillet**, IEMN, Univ. Lille 1 (France); **Viorel Dragoi**, EV Group (Austria); **Isabelle Dufour**, IMS, Univ. Bordeaux 1 (France); **Guido Faglia**, Univ. degli Studi di Brescia (Italy); **Carles Ferrer Ramis**, Univ. Autònoma de Barcelona (Spain); **Maximilian Fleischer**, Siemens AG (Germany); **Sören Fricke**, Robert Bosch GmbH (Germany); **Gerald Gerlach**, Technische Univ. Dresden (Germany); **Teodor P. Gotszalk**, Wrocław Univ. of Technology (Poland); **Moustapha Hafez**, Commissariat à l'Énergie Atomique (France); **Jorge Hernando García**, Univ. de Castilla-La Mancha (Germany); **Henning Heuer**, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren (Germany); **Martin Hoffmann**, Technische Univ. Ilmenau (Germany); **Carmen Horrillo-Guemes**, CSIC (Spain); **Jacopo Iannacci**, Fondazione Bruno Kessler (Italy); **Enrique Iborra**, Univ. Politécnica de Madrid (Spain); **Bernhard Jakoby**, Johannes Kepler Univ. Linz (Austria); **Konrad Kapser**, Infineon Technologies AG (Germany); **Roy Knechtel**, X-FAB Semiconductor Foundries AG (Germany); **Kai P. Kolari**, VTT Technical Research Ctr. of Finland (Finland); **Robert J. Lad**, Univ. of Maine (USA); **Jeong-Bong Lee**, The Univ. of Texas at Dallas (USA); **Michael Leitner**, ams AG (Austria); **Anita Lloyd Spetz**, Linköping Univ. (Sweden); **Dean P. Neikirk**, The Univ. of Texas at Austin (USA); **Gianluca Piazza**, Carnegie Mellon Univ. (USA); **Patrick Pons**, Lab. d'Analyse et d'Architecture des Systèmes, CNRS (France); **Michele Pozzi**, Newcastle Univ. (United Kingdom); **Angel Rodriguez**, Univ. Politécnica de Catalunya (Spain); **Gabriele Schrag**, Technische Univ. München (Germany); **Andreas Schütze**, Univ. des Saarlandes (Germany); **Ashwin Seshia**, Univ. Cambridge (United Kingdom); **Pietro Siciliano**, Istituto per la Microelettronica e Microsistemi (Italy), Consiglio Nazionale delle Ricerche (Italy); **Gabriel Vanko**, Slovak Academy of Sciences (Slovakia); **Jürgen Wöllenstein**, Fraunhofer-Institut für Physikalische Messtechnik (Germany)

MONDAY 4 MAY

MONDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA MON 09:30 TO 11:00

Session Chair: **Ulrich Schmid**, Technische Univ. Wien (Austria)

- 09:30: **Welcome and Opening Remarks**
Ulrich Schmid, Technische Univ. Wien (Austria); **Carles Cane**, Ctr. Nacional de Microelectronica (Spain)
- 09:40: **Update on IT Research and Business in Catalunya**
Mariona Sanz Ausàs, Director, Unit of Innovation and Internationalization of the Competitiveness Agency (ACCIO), Catalan Government (Spain)
- 09:40: **Microsystems: from smart sensors to cyberphysical systems (Plenary Presentation)**
Robert Plana, Alstom S.A. (France)



See page 4 for details

SESSION 1

LOCATION: SITGES/LLÍVIA MON 11:00 TO 12:40

Harvesting

Session Chair: **José Luis Sánchez-Rojas Aldavero**, Univ. de Castilla-La Mancha (Spain)

- 11:00: **Vibration energy harvesting: fabrication, miniaturisation and applications (Invited Paper)**, Stephen P. Beeby, Dabin Zhu, Univ. of Southampton (United Kingdom) [9517-1]
- 11:40: **Influence of process parameters on properties of piezoelectric AlN and AlScN thin films for sensor and energy harvesting applications**, Stephan Barth, Hagen Bartzsch, Daniel Gloess, Peter Frach, Thomas Modes, Olaf Zywitzki, Fraunhofer-Institut für Elektronenstrahl- und Plasmatechnik (Germany); Gunnar Suchanek, Gerald Gerlach, Technische Univ. Dresden (Germany) [9517-2]
- 12:00: **From MEMS to macro-world: a micro-milling-machined wideband vibration piezoelectric energy harvester**, Jacopo Iannacci, Guido Sordo, Fondazione Bruno Kessler (Italy) [9517-3]
- 12:20: **Low-profile and wearable energy harvester based on plucked piezoelectric cantilevers**, Michele Pozzi, Newcastle Univ. (United Kingdom); Heather J. A. Almond, Glenn J. T. Leighton, Cranfield Univ. (United Kingdom); Rory J. Moriarty, Newcastle University (United Kingdom) [9517-4]
- Lunch Break Mon 12:40 to 13:40

SESSION 2

LOCATION: SITGES/LLÍVIA MON 13:40 TO 15:00

Materials and Processes

Session Chair: **Joan Bausells**, Ctr. Nacional de Microelectrónica (Spain)

- 13:40: **High temperature performance of sputter-deposited piezoelectric aluminium nitride thin films**, Manuel Gillinger, Achim Bittner, Michael Schneider, Technische Univ. Wien (Austria); Pascal Nicolay, Carinthian Tech Research AG (Austria); Ulrich Schmid, Technische Univ. Wien (Austria) [9517-5]
- 14:00: **Wafer bonding technology for new generation vacuum MEMS: challenges and promises**, Viorel Dragoi, EV Group (Austria); Eric F. Pabo, EV Group Inc. (USA) [9517-6]
- 14:20: **3D integration approaches for MEMS and CMOS sensors based on a Cu through-silicon-via technology and wafer level bonding**, Lutz Hofmann, Fraunhofer-Institut für Elektronische Nanosysteme (Germany); Sophia Dempwolf, X-FAB Semiconductor Foundries AG (Germany); Danny Reuter, Fraunhofer ENAS (Germany); Ramona Ecke, Knut Gottfried, Stefan E. Schulz, Fraunhofer-Institut für Elektronische Nanosysteme (Germany); Roy Knechtel, X-FAB Semiconductor Foundries AG (Germany); Thomas Gessner, Fraunhofer-Institut für Elektronische Nanosysteme (Germany) [9517-7]
- 14:40: **Design and fabrication of indium phosphide air-bridge waveguides with MEMS functionality**, Wing H. Ng, Univ. College London (United Kingdom); Nina Podoliak, Peter Horak, Univ. of Southampton (United Kingdom); Jiang Wu, Huiyun Liu, Univ. College London (United Kingdom); William J. Stewart, Univ. of Southampton (United Kingdom); Anthony J. Kenyon, Univ. College London (United Kingdom) [9517-8]
- Coffee Break Mon 15:00 to 15:30

SESSION 3

LOCATION: SITGES/LLÍVIA MON 15:30 TO 17:30

Resonators

Session Chair: **Lionel Buchaillet**, IEMN, Univ. Lille 1 (France)

- 15:30: **Electrothermal piezoresistive cantilever resonators for personal measurements of nanoparticles in workplace exposure**, Hutomo S. Wasisto, Technische Univ. Braunschweig (Germany) and Lab. of Emerging Nanometrology (Germany); Wenze Wu, Technische Univ. Braunschweig (Germany); Erik Uhde, Fraunhofer- Wilhelm-Klauditz-Institut (Germany); Andreas Waag, Erwin Peiner, Technische Univ. Braunschweig (Germany) and Lab. of Emerging Nanometrology (Germany) [9517-9]
- 15:50: **Out-of-plane piezoelectric microresonator and oscillator circuit for monitoring engine oil contamination with diesel**, Javier Toledo Serrano, Tomás Manzanera García, Victor Ruiz Diez, Univ. de Castilla-La Mancha (Spain); Martin Kucera, Georg Pfusterschmied, Ulrich Schmid, Technische Univ. Wien (Austria); José Luis Sánchez de Rojas Aldavero, Univ. de Castilla-La Mancha (Spain) [9517-10]
- 16:10: **FBAR-on-diaphragm type electro-acoustic resonant micro-accelerometer**, Yang GAO, China Academy of Engineering Physics (China); Wan-jing He, Southwest Univ. of Science and Technology (China); Jun-ru Li, Chongqing Univ. (China); Wei Su, China Academy of Engineering Physics (China); Zhen-hua Huang, Chongqing Univ. (China) [9517-11]

16:30: **Complexity in multimode dynamics of self-excited optomechanical resonators**, Eyal Hollander, Oded Gottlieb, Technion-Israel Institute of Technology (Israel) [9517-12]

16:50: **Influence of electrode materials and thicknesses on AlN Lamb wave resonator characteristics**, Jie Zou, Univ. of California, Berkeley (USA); Albert P. Pisano, Univ. of California, Berkeley (USA) and Univ. of California, San Diego (USA) [9517-13]

17:10: **Experimental investigation of creep in gold RF-MEMS microstructures**, Aurelio Somà, Giorgio De Pasquale, Mubasher M. Saleem, Politecnico di Torino (Italy) [9517-29]

TUESDAY 5 MAY

TUESDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA TUE 09:00 TO 10:00

Session Chairs: **Sander van den Driesche**, Univ. Bremen (Germany);
Ion M. Tiginyanu, Academy of Sciences of Moldova (Moldova)

09:00:



Measuring life: sensors and analytics for precision medicine (Plenary Presentation)
Stefan Harrer, IBM Research (Australia)

See page 4 for details

Coffee Break Tue 10:00 to 10:30

SESSION 4

LOCATION: SITGES/LLÍVIA TUE 10:30 TO 12:10

Optical Devices

Session Chair: **José Correia**, Univ. do Minho (Portugal)

10:30: **The next generation of MEMS-based optical microspectrometers (Invited Paper)**, Reinoud F. Wolffenbuttel, Technische Univ. Delft (Netherlands) [9517-14]

11:10: **Input-shaped actuation of electromagnetic MEMS mirrors**, Jörg Reitterer, Franz Fidler, Gerhard Schmid, TriLite Technologies GmbH (Austria); Christian Hambeck, Technische Univ. Wien (Austria); Ferdinand Saint Julien-Wallsee, TriLite Technologies GmbH (Austria); Walter R. Leeb, Ulrich Schmid, Technische Univ. Wien (Austria) [9517-15]

11:30: **2D stepping microdrive for hyperspectral imaging**, Csaba Endrödy, Hannes Mehner, Adrian Grewe, Stefan Sinzinger, Martin Hoffmann, Technische Univ. Ilmenau (Germany) [9517-16]

11:50: **Design and fabrication of an endomicroscopic imaging module for minimally invasive medical devices**, Catarina G. Costa, José M. Gomes, Univ. do Minho (Portugal); Reinoud F. Wolffenbuttel, Jose H. Correia, Technische Univ. Delft (Netherlands) [9517-17]

Lunch Break Tue 12:10 to 13:10

SESSION 5

LOCATION: SITGES/LLÍVIA TUE 13:10 TO 14:30

Modeling

Session Chair: **Michele Pozzi**, Newcastle Univ. (United Kingdom)

13:10: **Acoustic high-frequency effects inside the package of capacitive silicon microphones and their impact on the device performance**, Gabriele Schrag, Thomas Kuenzig, Technische Univ. München (Germany); Duy Pham, Christoph Glaser, Alfons Dehé, Infineon Technologies AG (Germany); Gerhard Wachutka, Technische Univ. München (Germany) [9517-18]

13:30: **Assessment of MEMS energy harvester for medical applications**, Jan Smilek, Zdenek Hadas, Brno Univ. of Technology (Czech Republic) [9517-50]

13:50: **Optimization method for designing multimodal piezoelectric MEMS energy harvesters**, Guido Sordo, Jacopo Iannacci, Enrico Serra, Fondazione Bruno Kessler (Italy); Ulrich Schmid, Technische Univ. Wien (Austria) .. [9517-20]

14:10: **Scaling effects for piezoelectric energy harvesters**, Dibin Zhu, Stephen P. Beeby, Univ. of Southampton (United Kingdom) [9517-21]

POSTERS TUESDAY

LOCATION: FOYER TUE 14:30 TO 16:30

Conference attendees are invited to attend the Poster Session on Tuesday afternoon. Come view posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

POSTER SETUP INSTRUCTIONS: Poster authors are encouraged to display their posters beginning at 10:00 on Monday for extended viewing and should stand with their posters to answer questions during the interactive poster session on Tuesday afternoon. Posters must be displayed at least 30 minutes before the poster session to be considered presented. Posters not removed at the end of the poster session will be considered unwanted and will be discarded.

View the Poster Presentation Guidelines at <http://spie.org/x30965.xml> for additional information.

An active reference spring array for in-situ calibration of the normal spring constant of AFM cantilevers, Sai Gao, Physikalisches Technische Bundesanstalt (Germany) [9517-41]

Noise spectroscopy of nano- and microscopic periodic material structures, Andrea Nasswetrova, Brno Univ. of Technology (Czech Republic) and Brno Univ. of Technology (Czech Republic); Pavel J Fiala, Brno Univ. of Technology (Czech Republic); Petr Drexler, Jan Seginak, Dusan Nespors, Martin G. Friedl, Petr Marcon, Brno Univ. of Technology (Czech Republic) [9517-42]

Novel Ge nanowire-based gas sensor fabricated by localized growth on microhotplates, Albert Romano-Rodriguez, Jordi Samà, Juan Daniel Prades, Univ. de Barcelona (Spain); Michael Seifner, Technische Univ. Wien (Austria); Olga Casals, Univ. de Barcelona (Spain); Isabel Gracia, Carles Cané, Consejo Superior de Investigaciones Científicas (Spain) [9517-43]

High temperature stability of ScxAl_{1-x}N (x=0.27) thin films, Patrick M. Mayrhofer, Achim Bittner, Ulrich Schmid, Technische Univ. Wien (Austria) [9517-44]

Nanopatterning of titanium oxide thin films using inductively coupled plasma for gas detection, Ivan Hotovy, Slovenska Technicka Univ. (Slovakia); Ivan Kostic, Stefan Hascik, Slovak Academy of Sciences (Slovakia); Vlastimil Rehacek, Martin Predanoc, Slovenska Technicka Univ. (Slovakia) [9517-45]

Impact of titanium layer and silicon substrate properties on the microstructure of c-axis oriented AlN thin films, Elisabeth Wistrela, Achim Bittner, Ulrich Schmid, Technische Univ. Wien (Austria) [9517-46]

Nonlinear numerical modelling and experimental validation of multilayer piezoelectric vibration energy scavengers, David Blažević, Saša Zelenika, Univ. of Rijeka (Croatia) [9517-47]

Relaxation phenomena in nematic liquid crystals with multiwall carbon nanotubes adding, Cristina C. Cirtoaje, Emil Petrescu, Cornelia Motoc, Victor Stoian, Univ. Politehnica of Bucharest (Romania) [9517-48]

Efficiency of electromagnetic vibration energy harvesting system, Zdenek Hadas, Vojtech Vetiska, Jan Smilek, Ondrej Andrs, Vladislav Singule, Brno Univ. of Technology (Czech Republic) [9517-49]

Finite element analysis of AlGaIn/GaN micro-diaphragms with diamond coating, Jaroslav Dzuba, Gabriel Vanko, Institute of Electrical Engineering (Slovakia); Marián Vojs, Institute of Electronics and Photonics (Slovakia); Ivan Rýger, Institute of Electrical Engineering (Slovakia); Tibor Ižák, Vit Jirásek, Institute of Physics of the ASCR, v.v.i. (Czech Republic); Vladimír Kutíš, Slovenska Technicka Univ. (Slovakia); Tibor Lalinsky, Institute of Electrical Engineering (Slovakia) [9517-51]

In-liquid characterization of high order out-of-plane modes in piezoelectric square plates, Víctor Ruiz-Diez, Javier Toledo, Tomás Manzaneque García, Jorge Hernando-García, Univ. de Castilla-La Mancha (Spain); Abdallah Ababneh, Yarmouk Univ. (Jordan); Helmut Seidel, Univ. des Saarlandes (Germany); Jose Luis Sánchez-Rojas Aldavero, Univ. de Castilla-La Mancha (Spain) [9517-52]

Numerical Model a Graphene Component for the Sensing of Weak Electromagnetic Signals, Pavel J. Fiala, Dusan Nespors, Petr Drexler, Brno Univ. of Technology (Czech Republic); Miloslav Steinbauer, Pavel J. Fiala, Brno Univ. of Technology (Czech Republic) [9517-53]

Modeling distributed electrostatic effects in silicon microphones and their impact on the performance, Thomas Kuenzig, Gabriele Schrag, Technische Univ. München (Germany); Alfons Dehé, Infineon Technologies AG (Germany); Gerhard Wachutka, Technische Univ. München (Germany) [9517-54]

Optical characterization of MEMS-based multiple air-dielectric blue-spectrum distributed Bragg reflectors, Mohammad Amir Ghaderi, N. Pelin Ayerden, Ger de Graaf, Reinoud F. Wolffenbuttel, Technische Univ. Delft (Netherlands) [9517-55]

Optical design and characterization of a gas filled MEMS Fabry-Perot filter, N. Pelin Ayerden, Mohammad Amir Ghaderi, Ger de Graaf, Reinoud F. Wolffenbuttel, Technische Univ. Delft (Netherlands) [9517-56]

CONFERENCE 9517A

LOCATION: SITGES/LLÍVIA

Low loss optomechanical cavities based on silicon oscillator. Antonio L. Borrielli, Istituto dei Materiali per l'Elettronica ed il Magnetismo (Italy); Antonio Pontin, Francesco S. Cataliotti, Lorenzo Marconi, Francesco Marin, Univ. degli Studi di Firenze (Italy); Francesco Marino, Istituto Nazionale di Ottica (Italy); Gregory Pandraud, Technische Univ. Delft (Netherlands); Giovanni A. Prodi, Univ. degli Studi di Trento (Italy); Enrico Serra, Trento Institute for Fundamental Physics and Application (Italy); Michele Bonaldi, Istituto dei Materiali per l'Elettronica ed il Magnetismo (Italy) [9517-57]

Optoelectronic sensor device for monitoring ethanol concentration in winemaking applications. Francisco Jiménez-Márquez, Javier Vázquez del Real, Juan Úbeda Iranzo, José Luis Sánchez-Rojas Aldavero, Univ. de Castilla-La Mancha (Spain) [9517-58]

Force monitoring transducers with more than 100,000 scale intervals. Vladimir T. Stavrov, AMG Technology Ltd. (Bulgaria) and SIMEMSYS Ltd. (Bulgaria); Assen A. Shulev, Institute of Mechanics (Bulgaria); Dimiter Chakarov, Institute of Mechanics (Bulgaria); Galina S. Stavreva, AMG Technology Ltd. (Bulgaria) [9517-59]

Passive microsensor for binary counting of numerous threshold events. Hannes Mehner, Silvan Schwebke, Steffen Leopold, Martin Hoffmann, Technische Univ. Ilmenau (Germany) [9517-60]

Soft magnetic properties of permalloy thin films on polyimide-based substrates. Johannes Rittinger, Piriya Taptimthong, Leibniz Univ. Hannover (Germany); Lisa Jogschies, Leibniz Universität Hannover (Germany); Marc C. Wurz, Lutz Rissing, Leibniz Univ. Hannover (Germany) [9517-61]

Technology towards a SAW based phononic crystal sensor. Marc-Peter Schmidt, Aleksandr Oseev, Ralf Lucklum, Otto-von-Guericke- Univ. Magdeburg (Germany); Soeren Hirsch, Fachhochschule Brandenburg (Germany) [9517-62]

Parameters influencing focalization spot in time reversal of acoustic waves. Harald Zophoniasson, Christian Bolzmacher, Moustafa Hafez, Commissariat à l'Énergie Atomique (France) [9517-63]

Experimental verification of a novel MEMS multi-modal vibration energy harvester for ultra-low power remote sensing nodes. Jacopo Iannacci, Guido Sordo, Enrico Serra, Fondazione Bruno Kessler (Italy); Martin Kucera, Ulrich Schmid, Technische Univ. Wien (Austria) [9517-64]

A comparative study between SMF-MMF-SMF interferometers and LMR optical fiber devices for sensing. Abian B. Socorro, Miguel Hernaez, Ignacio del Villar, Jesus M. Corres, Ignacio R. Matias, Francisco J. Arregui, Univ. Pública de Navarra (Spain) [9517-65]

High-sensitive lossy mode resonance-based optical fiber refractometers by means of sputtered indium oxide thin-films. Pedro Sanchez, Univ. Pública de Navarra (Spain); Karina Gonzalez, Univ. Autónoma de Tamaulipas (Mexico); Carlos Ruiz Zamarreño, Miguel Hernaez, Ignacio R. Matias, Francisco J. Arregui, Univ. Pública de Navarra (Spain) [9517-66]

Optical fiber pH sensor based on gold nanoparticles into polymeric coatings. Abian B Socorro, Public University of Navarra (Spain); Pedro J. Rivero, Miguel Hernández, Javier Goicoechea, Ignacio R. Matias, Francisco J. Arregui, Univ. Pública de Navarra (Spain) [9517-67]

Development of silicon microforce sensors integrated with double meander springs for standard hardness test instruments. Hutomio S. Wasisto, Technische Univ. Braunschweig (Germany) and Lab. of Emerging Nanometrology (Germany); Lutz Döring, Physikalisch-Technische Bundesanstalt (Germany); Alwin Daus, ETH Zürich (Switzerland); Uwe Brand, Physikalisch-Technische Bundesanstalt (Germany); Thomas Frank, CiS Forschungsinstitut für Mikrosensorik und Photovoltaik GmbH (Germany); Erwin Peiner, Technische Univ. Braunschweig (Germany) and Lab. of Emerging Nanometrology (Germany) [9517-68]

Optimal design of piezoelectric microtransducers for static response. David Ruiz, Alberto Donoso, José Carlos Bellido, Univ. de Castilla-La Mancha (Spain); Martin Kucera, Institute of Sensor and Actuator Systems, Vienna University of Technology (Austria) and Austrian Center of Competence for Tribology, AC2T research GmbH (Austria); Ulrich Schmid, Institute of Sensor and Actuator Systems, Vienna University of Technology (Austria); José Luis Sánchez-Rojas Aldavero, Univ. de Castilla-La Mancha (Spain) [9517-69]

Features design and manufacturing technology in microelectromechanical encapsulated devices. Natalia Korobova, Oleg Britkov, Sergey P. Timoshenkov, Stanislav Shepelev, National Research Univ. of Electronic Technology (Russian Federation); Andrey Mikheev, MIET (Russian Federation) [9517-70]

Fabrication of microfluidic chips using lithographic patterning and adhesive bonding of the thick negative photoresist AZ 125 nXT. Thorsten Knoll, Fraunhofer-Institut für Biomedizinische Technik (Germany); Andreas Bergmann, Fachhochschule Kaiserslautern (Germany); Dominic Nußbaum, Fraunhofer-Institut für Biomedizinische Technik (Germany) [9517-71]

Laser ablation for membrane processing of AlGaIn/GaN- and micro structured ferroelectric thin film SiC based MEMS and pressure sensors for extreme conditions. Johann Zehetner, FH Vorarlberg (Austria); Gabriel Vanko, Jaroslav Dzuba, Institute of Electrical Engineering (Slovakia); Manuel Benkler, Univ. of Freiburg (Germany); Michal Lucki, Czech Technical Univ. in Prague (Czech Republic); Ivan R?ger, Tibor Lalinsk?, Institute of Electrical Engineering (Slovakia) [9517-72]

Microstructures replication using high frequency excitation. Arvydas Palevicius, Giedrius Janusas, Elingas Cekas, Rokas Sakalys, Ieva Paleviciute, Evaldas Ramoska, Kaunas Univ. of Technology (Lithuania) [9517-73]

Fabrication of wear-resistant silicon microprobe tips for high-speed surface roughness scanning devices. Hutomio S. Wasisto, Technische Univ. Braunschweig (Germany) and Lab. of Emerging Nanometrology (Germany); Feng Yu, Technische Univ. Braunschweig (Germany); Lutz Döring, Physikalisch-Technische Bundesanstalt (Germany); Stefan Völlmeke, CiS Forschungsinstitut für Mikrosensorik und Photovoltaik GmbH (Germany); Uwe Brand, Physikalisch-Technische Bundesanstalt (Germany); Andrey Bakin, Andreas Waag, Erwin Peiner, Technische Univ. Braunschweig (Germany) and Lab. of Emerging Nanometrology (Germany) [9517-74]

Wafer edge protection kit for MEMS and TSV Si-etching. Robert J. Wieland, Uwe Seidelmann, Kim Nguyen, Fraunhofer-Einrichtung für Modulare Festkörper-Technologien EMFT (Germany); Michael Scholz, Gabriele Schrag, Technische Univ. München (Germany) [9517-75]

Research and development of capacitive transducer with linear acceleration. Natalia Korobova, Elena Kochurina, Sergey P. Timoshenkov, National Research Univ. of Electronic Technology (Russian Federation); Yuriy Chaplygin, Stepan Anchutin, Andrey Kosolapov, MIET (Russian Federation) [9517-76]

Characterization of down-state capacitance degradation in capacitive RF MEMS switch with rough dielectric layer. Yang Gao, China Academy of Engineering Physics (China); Jun-ru Li, Southwest Univ. of Science and Technology (China); Wei Su, China Academy of Engineering Physics (China); Wan-jing He, Xun Cai, Chongqing Univ. (China) [9517-77]

Characterization of cross-spring pivots for micropositioning applications. Kristina Marković, Saša Zelenika, Univ. of Rijeka (Croatia) [9517-78]

Modeling and simulation of the multiphase flow involving magnetophoresis-based microfluidic systems. Saud A. Khashan, United Arab Emirates Univ. (United Arab Emirates); Anas Alazzam, Bobby Mathew, Khalifa Univ. of Science, Technology and Research (United Arab Emirates) [9517-79]

Electrospray ionization deposition of BSA under vacuum conditions. Dominic Hecker, Technische Univ. Dresden (Germany) and Fraunhofer-Institut für Elektronenstrahl- und Plasmatechnik (Germany); Daniel Gloess, Peter Frach, Fraunhofer-Institut für Elektronenstrahl- und Plasmatechnik (Germany); Gerald Gerlach, Technische Univ. Dresden (Germany) [9517-81]

Numerical analysis of a smart composite material mechanical component using an embedded long period grating fiber sensor. Dan M. Savastru, Sorin I. Miclos, Roxana S. Savastru, Ion I. Lancranjan, National Institute of Research and Development for Optoelectronics (Romania) [9517-82]

Design of a smart superstructure FBG torsion sensor. Sorin I. Miclos, Dan M. Savastru, Roxana S. Savastru, Ion I. Lancranjan, National Institute of Research and Development for Optoelectronics (Romania) [9517-83]

SESSION 6

LOCATION: SITGES/LLÍVIA TUE 16:30 TO 17:50

Devices

Session Chair: **Jacopo Iannacci**, Fondazione Bruno Kessler (Italy)

16:30: **Thermal cycling reliability of RF-MEMS switches.** Viviana Mulloni, Guido Sordo, Benno Margesin, Fondazione Bruno Kessler (Italy) [9517-22]

16:50: **Microsystem integration from RF to millimeter wave applications.** Tauno Vaha-Heikkilä, Markku Lahti, VTT Technical Research Ctr. of Finland (Finland) [9517-23]

17:10: **Tailoring design and fabrication of capacitive RF MEMS switch for K-band applications.** Fabio Quaranta, Anna Persano, Giovanni Capoccia, Antonietta Taurino, Adriano Cola, Pietro Siciliano, Andrea Lucibello, Romolo Marcelli, Emanuela Proietti, Consiglio Nazionale delle Ricerche (Italy); Alvise Bagolini, Benno Margesin, Pierluigi Bellutti, Jacopo Iannacci, Fondazione Bruno Kessler (Italy) [9517-24]

17:30: **Investigation of diaphragm deflection of an absolute MEMS capacitive polysilicon pressure sensor.** Christian Walk, Andreas Goehlich, André Giese, Michael Goertz, Holger Vogt, Michael Kraft, Fraunhofer-Institut für Mikroelektronische Schaltungen und Systeme (Germany) [9517-25]

WEDNESDAY 6 MAY

WEDNESDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA WED 09:00 TO 10:00

Session Chairs: **José Luis Sánchez-Rojas**,
Univ. de Castilla-La Mancha (Spain);
Jacopo Iannacci, Fondazione Bruno Kessler (Italy)

09:00:



**Miniaturized dielectric elastomer actuators:
towards intelligent soft machines**
(Plenary Presentation)

Herbert R. Shea, Ecole Polytechnique Fédérale de
Lausanne (Switzerland)

See page 5 for details

Coffee Break Wed 10:00 to 10:30

SESSION 7

LOCATION: SITGES/LLÍVIA WED 10:30 TO 11:50

Characterization

Session Chair: **Erwin Peiner**,
Technische Univ. Braunschweig (Germany)

10:30: **Smart sensors and calibration standards for high precision metrology** (Invited Paper), Uwe Brand, Sai Gao, Zhi Li, Lutz Doering, Min Xu, Sebastian Bueteffisch, Physikalisch-Technische Bundesanstalt (Germany); Erwin Peiner, Technical University Carolo-Wilhelmina at Braunschweig, Institute for Semiconductor Technology (Germany); Joachim Fruehauf, SiMETRICS GmbH (Germany); Karla Hiller, Chemnitz University of Technology, Center for Microtechnologies (Germany) [9517-26]

11:10: **Characterization of a dispersion-controlled approach to surface profilometry on wafers using a white-light interferometer**, Christopher Taudt, Westsächsische Hochschule Zwickau (Germany) and Technische Univ. Dresden (Germany); Alexander S. Augenstein, Univ. of Pittsburgh (USA); Tobias Baselt, Westsächsische Hochschule Zwickau (Germany); Heiko Assmann, Infineon Technologies Dresden GmbH (Germany); Andreas Greiner, Infineon Technologies Dresden (Germany); Edmund Koch, Technische Univ. Dresden (Germany); Peter Hartmann, Westsächsische Hochschule Zwickau (Germany) [9517-27]

11:30: **Piezoresistive position microsensors with a ppm-accuracy**, Vladimir T. Stavrov, AMG Technology Ltd. (Bulgaria); Assen A. Shulev, Institute of Mechanics (Bulgaria); Galina S. Stavreva, AMG Technology Ltd. (Bulgaria); Vencislav M. Todorov, Techproject Co. (Austria) [9517-28]

Lunch Break Wed 11:50 to 13:30

SESSION 8

LOCATION: SITGES/LLÍVIA WED 13:30 TO 15:10

Systems

Session Chair: **José Luis Sánchez-Rojas**,
Univ. de Castilla-La Mancha (Spain)

13:30: **Multifunctional thin film sensor system as monitoring system in production**, Saskia N. Biehl, Christian Rumposch, Nancy Paetsch, Fraunhofer-Institut für Schicht- und Oberflächentechnik (Germany) ... [9517-30]

13:50: **Real-time synchronization of wireless sensor network by 1-PPS signal**, Marco Giammarini, Loccioni Group (Italy); Marco Pieralisi, Univ. Politecnica delle Marche (Italy); Daniela Isidori, Enrico Concettoni, Cristina Cristalli, Matteo Fioravanti, Loccioni Group (Italy) [9517-40]

14:10: **Car glass microphones using piezoelectric transducers for external alarm detection and localization**, Christian Bolzmacher, Valentin Le Guelvouit, Commissariat à l'Énergie Atomique (France) [9517-32]

14:30: **The micro unmanned air vehicles (micro UAVs) In ISR missions In the operation area**, Hüseyin Türk, Fatih Buyruk, Harp Akademileri Komutanligi (Turkey) [9517-33]

14:50: **Autonomous solutions for powering wireless sensor nodes in rivers**, Ervin Kamenar, Senka Macesic, Goran Gregov, David Blažević, Saša Zelenika, Kristina Marković, Vladimir Glazar, Univ. of Rijeka (Croatia) [9517-34]

Coffee Break Wed 15:10 to 15:40

SESSION 9

LOCATION: SITGES/LLÍVIA WED 15:40 TO 17:20

Chemical Sensors

Session Chair: **Jürgen Wöllenstein**, Fraunhofer-Institut für
Physikalische Messtechnik (Germany)

15:40: **The effect of sensor temperature and MO_x layer thickness on the sensitivity of SnO₂- and WO₃-based chemiresistive sensors to ethylene gas**, Matic Krivec, Raimund Leitner, Carinthian Tech Research AG (Austria); Roland Waldner, Philips Consumer Lifestyle Klagenfurt (Austria); Florian Überall, Johanna Gostner, Medizinische Univ. Innsbruck (Austria) [9517-35]

16:00: **MEMS-based platform optimized for inkjet printing of nano-sized, gas sensitive functional metal oxides to enable the measurement of gas induced changes of the heating power**, Benedikt Bierer, Janosch Kneer, Jürgen Wöllenstein, Stefan Palzer, Univ. of Freiburg (Germany) [9517-36]

16:20: **Photoacoustic CO₂ sensor system with potential for further miniaturization and integration in silicon**, Jochen Huber, Fraunhofer-Institut für Physikalische Messtechnik (Germany); Jürgen Wöllenstein, Fraunhofer-Institut für Physikalische Messtechnik (Germany) and Univ. of Freiburg (Germany) [9517-37]

16:40: **Novel SH-SAW gas sensor based on Graphene**, Ioannis Nikolaou, Hamida Hallil, Univ. Bordeaux 1 (France); George Deligeorgis, Foundation for Research and Technology-Hellas (Greece); Veronique Conedera, Lab. d'Analyse et d'Architecture des Systèmes (France); Hermenegildo Garcia, Univ. Politècnica de Valencia (Spain); Corinne Dejous, Dominique Rebière, Univ. Bordeaux 1 (France) [9517-38]

17:00: **Nearly zero-power consuming gas sensor devices based on individual metal oxide nanowires**, Albert Romano-Rodríguez, Jordi Samà, Juan Daniel Prades, Univ. de Barcelona (Spain); Francisco Hernández-Ramírez, Univ. de Barcelona (Spain) and Institute de Recerca en Energia de Catalunya (Spain); Olga Cassals, Univ. de Barcelona (Spain) [9517-39]

CLOSING REMARKS

LOCATION: SITGES/LLÍVIA 17:20 TO 17:30

CONFERENCE 9517B

LOCATION: MEDES

MONDAY 4 May 2015 • Proceedings of SPIE Vol. 9517B

Cyber Physical Systems

Conference Chair: **Riccardo Brama**, CMC Labs. (Italy)

Conference Co-Chairs: **Alessandro Bertacchini**, Univ. degli Studi di Modena e Reggio Emilia (Italy); **Florian Hammer**, Linz Ctr. of Mechatronics (Austria)

Program Committee: **Alessandro Abate**, Univ. of Oxford (United Kingdom); **Eduard Alarcon**, Univ. Politècnica de Catalunya (Spain); **Lynne Baillie**, Glasgow Caledonian Univ. (United Kingdom); **Steve P. Beeby**, Univ. of Southampton (United Kingdom); **Bernhard Bergmair**, Linz Ctr. of Mechatronics (Austria); **Gennaro Boggia**, Politecnico di Bari (Italy); **Patricio Bulić**, Univ. of Ljubljana (Slovenia); **João Canas Ferreira**, Univ. do Porto (Portugal); **Jian-Jia Chen**, Technischen Univ. Dortmund (Germany); **Christian Claudel**, King Abdullah Univ. of Science and Technology (Saudi Arabia); **Stefano D'Amico**, Univ. del Salento (Italy); **Valerio Frascolla**, Intel GmbH (Germany); **Felix Gerdes**, Cisco Optical GmbH (Germany); **Dip Goswami**, Technische Univ. Eindhoven (Netherlands); **Johannes Klingmayr**, Linz Ctr. of Mechatronics (Austria); **Michail E. Kiziroglou**, Imperial College London (United Kingdom); **Xenofon Koutsoukos**, Vanderbilt Univ. (USA); **Roberto Manione**, Taskscript.com (Italy); **Ian Marsh**, Swedish Institute of Computer Science (Sweden); **Sebastian Möller**, Technische Univ. Berlin (Germany); **Simone Orcioni**, Univ. Politecnica delle Marche (Italy); **Ioannis Papaefstathiou**, Foundation for Research and Technology-Hellas (Greece); **Jorge Portilla**, Univ. Politècnica de Madrid (Spain); **Maria Prandini**, Politecnico di Milano (Italy); **Christophe Prieur**, Gipsa-lab (France); **Angel Rodriguez-Vazquez**, Univ. de Sevilla (Spain); **Marco Raggio**, Univ. degli Studi di Genova (Italy); **Pachamuthu Rajalakshmi**, Indian Institute of Technology Madras (India); **Kashif Saeed**, AMMROC – Mubdala Aerospace (United Arab Emirates); **Sergio Saponara**, Univ. di Pisa (Italy); **Luciano Tarricone**, Univ. del Salento (Italy); **Stavros Toumpis**, Athens Univ. of Economics and Business (Greece); **Klaus Witrisal**, Technische Univ. Graz (Austria)

MONDAY 4 MAY

MONDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA MON 09:30 TO 11:00

Session Chair: **Ulrich Schmid**, Technische Univ. Wien (Austria)

09:30: **Welcome and Opening Remarks**

Ulrich Schmid, Technische Univ. Wien (Austria); **Carles Cane**, Ctr. Nacional de Microelectrónica (Spain)

09:40: **Update on IT Research and Business in Catalunya**

Mariona Sanz Ausàs, Director, Unit of Innovation and Internationalization of the Competitiveness Agency (ACCIO), Catalan Government (Spain)

10:00: **Microsystems: from smart sensors to cyberphysical systems (Plenary Presentation)**
Robert Plana, Alstom S.A. (France)



See page 4 for details

SESSION 10

LOCATION: MEDES MON 11:10 TO 12:30

Energy Harvesting and Low Power Design

Session Chair: **Alessandro Bertacchini**, Univ. degli Studi di Modena e Reggio Emilia (Italy)

11:10: **Interdigitated design of a thermoelectric microgenerator based on silicon nanowire arrays**, Inci Donmez, Instituto de Microelectrónica de Barcelona, Centro Nacional de Microelectrónica (IMB-CNM, CSIC) (Spain); Marc Salleras, Carlos A. Calaza Cabanas, Instituto de Microelectrónica de Barcelona (Spain); José Domingo Santos, Institut de Recerca en Energia de Catalunya (Spain) and Ctr. Nacional de Microelectrónica (Spain); Gerard Gadea, Alex Morata, Institut de Recerca en Energia de Catalunya (Spain); Diana Dávila, Instituto de Microelectrónica de Barcelona (Spain); Albert Tarancón, Institut de Recerca en Energia de Catalunya (Spain); Luis Fonseca, Instituto de Microelectrónica de Barcelona (Spain) [9517-101]

11:30: **Fabrication and characterization of a fuel flexible micro-reformer fully integrated in silicon for micro-solid oxide fuel cell applications**, Dolors Pla, Institut de Recerca en Energia de Catalunya (Spain); Marc Salleras, Ctr. Nacional de Microelectrónica (Spain); Iñigo Garbayo, Alex Morata, Institut de Recerca en Energia de Catalunya (Spain); Neus Sabaté, Ctr. Nacional de Microelectrónica (Spain); Núria J. Divins, Jordi Llorca, Univ. Politècnica de Catalunya (Spain); Albert Tarancón, Institut de Recerca en Energia de Catalunya (Spain) [9517-102]

11:50: **An efficient start-up circuitry for de-energized ultra-low power energy harvesting systems**, Leander B. Hoermann, Achim Berger, Lukas Salzburger, Linz Ctr. of Mechatronics (Austria); Peter Priller, AVL List GmbH (Austria); Andreas Springer, Johannes Kepler Univ. Linz (Austria) [9517-103]

12:10: **Scaling of dynamic thermoelectric harvesting devices in the 1-100 cm³ range**, Michail E. Kiziroglou, Imperial College London (United Kingdom); Alexandros Elefsiniotis, Nikolaos Kokorakis, Airbus Group (Germany); Steve W. Wright, Tzern Toh, Paul D. Mitcheson, Imperial College London (United Kingdom); Ulrich Schmid, Technische Univ. Wien (Austria); Thomas Becker, Airbus Group (Germany); Eric M. Yeatman, Imperial College London (United Kingdom) [9517-105]

Lunch Break Mon 12:30 to 13:40

SESSION 11

LOCATION: MEDES MON 13:40 TO 15:00

Embedded Systems Applications

Session Chair: **Florian Hammer**, Linz Ctr. of Mechatronics (Austria)

13:40: **Computationally efficient models enabling behaviour exploration of large scale cyber physical systems by simulations**, Peter Waegli, Dr. P. Waegli-Research (Switzerland) [9517-106]

14:00: **On improving low-cost IMU performance for online trajectory estimation**, Risang G. Yudanto, Agusman P. Ompusunggu, Abdellatif Bey-Temsamani, Flanders Make (Belgium) [9517-107]

14:20: **Ultra-low power sensor for autonomous non-invasive voltage measurement in IoT solutions for energy efficiency**, Clemente Villani, Domenico Balsamo, Univ. degli Studi di Bologna (Italy); Davide Brunelli, Univ. degli Studi di Trento (Italy); Luca Benini, ETHZ (Switzerland) [9517-108]

14:40: **Use of a prototype pulse oximeter for time series analysis**, Erika A. Gonzalez, Jehu Lopez-Aparicio, Mathieu Hautefeuille, Victor Velázquez, Tamara Del Moral, Univ. Nacional Autónoma de México (Mexico) [9517-109]

Coffee Break Mon 15:00 to 15:30

SESSION 12

LOCATION: MEDES MON 15:30 TO 16:30

Networking and Embedded Computing

Session Chair: **Valerio Frascolla**, Intel GmbH (Germany)

15:30: **Abstraction of communication resources in model-based design frameworks for CPS**, Roberto Manione, Media on Line (Italy) [9517-110]

15:50: **Gbps wireless transceiver for high bandwidth interconnections in distributed cyber physical systems**, Sergio Saponara, Bruno Neri, Univ. di Pisa (Italy) [9517-111]

16:10: **Embedded system for supervision analysis and control of photovoltaic power plants**, Paolo Lambruschini, Marco Raggio, Univ. degli Studi di Genova (Italy); Alberto Cabitto, unige (Italy) [9517-112]

CONFERENCE 9518

LOCATION: MEDES

Tuesday - Wednesday 5 - 6 May 2015 • Proceedings of SPIE Vol. 9518

Bio-MEMS and Medical Microdevices II

Conference Chair: **Sander van den Driesche**, Univ. Bremen (Germany)

Conference Co-Chairs: **Manuel Delgado-Restituto**, Instituto de Microelectrónica de Sevilla (Spain); **Ioanna Giouroudi**, Technische Univ. Wien (Austria)

Program Committee: **Ryan C. Bailey**, Univ. of Illinois at Urbana-Champaign (USA); **Nikos Chronis**, Univ. of Michigan (USA); **Artur Dybko**, Warsaw Univ. of Technology (Poland); **Michael Kraft**, Univ. Duisburg-Essen (Germany); **Laura Maria Lechuga**, Ctr. d' Investigacions en Nanociència i Nanotecnologia (Spain); **Konstantinos Misiakos**, National Ctr. for Scientific Research Demokritos (Greece); **Ioannis Raptis**, National Ctr. for Scientific Research Demokritos (Greece); **Niclas Roxhed**, Royal Institute of Technology (Sweden); **Ramón Ruiz-Merino**, Univ. Politècnica de Cartagena (Spain); **Josep Samitier Martí**, Univ. de Barcelona (Spain); **Uwe Schnakenberg**, RWTH Aachen (Germany); **Winnie E. Svendsen**, Technical Univ. of Denmark (Denmark); **Angeliki Tseripi**, National Ctr. for Scientific Research Demokritos (Greece); **Thomas Velten**, Fraunhofer-Institut für Biomedizinische Technik (Germany); **Sabeth Verpoorte**, Univ. of Groningen (Netherlands); **Fernando Vidal-Verdú**, Univ. de Málaga (Spain)

TUESDAY 5 MAY

TUESDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA TUE 09:00 TO 10:00

Session Chairs: **Sander van den Driesche**, Univ. Bremen (Germany); **Ion M. Tiginyanu**, Academy of Sciences of Moldova (Moldova)

09:00:



Measuring life: sensors and analytics for precision medicine (Plenary Presentation)
Stefan Harrer, IBM Research (Australia)

See page 4 for details

Coffee Break Tue 10:00 to 10:30

SESSION 1

LOCATION: MEDES TUE 10:30 TO 11:50

Neural and Wireless Interfaces

Session Chair: **Manuel Delgado-Restituto**, Instituto de Microelectrónica de Sevilla (Spain)

10:30: **A SU-8 based flexible microprobe for close and distal recordings from the cortical network**, Xavier Illa, Ctr. de Investigación Biomédica en Red en Bioingeniería, Biomateriales y Nanomedicina (Spain) and Ctr. Nacional de Microelectrónica (Spain); **Beatriz Rebollo**, Institut d'Investigacions Biomèdiques Agustí Pi Sunyer (Spain); **Gemma Gabriel**, Ctr. Nacional de Microelectrónica (Spain) and Ctr. de Investigación Biomédica en Red en Bioingeniería, Biomateriales y Nanomedicina (Spain); **Maria V. Sanchez-Vives**, Institut d'Investigacions Biomèdiques Agustí Pi Sunyer (Spain) and Institut Catalana de Recerca i Estudis Avançats (Spain); **Rosa Villa**, Ctr. Nacional de Microelectrónica (Spain) and Institut d'Investigacions Biomèdiques Agustí Pi Sunyer (Spain) [9518-1]

10:50: **A remotely operated drug delivery system with an electrolytic pump and magnetically triggered thermoresponsive valve**, Ying Yi, King Abdullah Univ. of Science and Technology (Saudi Arabia) [9518-2]

11:10: **A low power on-chip class-E power amplifier for remotely powered implantable sensor systems**, Kerim Ture, Enver G. Kilinc, Catherine Dehollain, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [9518-3]

11:30: **A 64-channel ultra-low power system-on-chip for local field and action potentials recording**, Manuel Delgado-Restituto, Instituto de Microelectrónica de Sevilla (Spain); **Alberto Rodríguez-Pérez**, Ctr. Nacional de Microelectrónica (Spain); **Ángel B. Rodríguez-Vázquez**, Instituto de Microelectrónica de Sevilla (Spain) [9518-4]

Lunch Break Tue 11:50 to 13:10

SESSION 2

LOCATION: MEDES TUE 13:10 TO 14:30

Microfluidics and Lab-on-a-Chip I

Session Chair: **Sander van den Driesche**, Univ. Bremen (Germany)

13:10: **Building better organ chips using microtechnologies (Invited Paper)**, Sabeth Verpoorte, Univ. of Groningen (Netherlands) [9518-5]

13:50: **Biological implications of Lab-on-a-Chip devices fabricated using multi-jet modelling and stereolithography processes**, Feng Zhu, RMIT Univ. (Australia); **Niall MacDonald**, Univ. of Glasgow (United Kingdom); **Joanna Skommer**, Donald Wlodkowic, RMIT Univ. (Australia) [9518-6]

14:10: **Magnetic microfluidic system for isolation of single cells**, Richard Mitterboeck, Georgios Kokkinis, Theocharis Berris, Franz Keplinger, Ioanna Giouroudi, Technische Univ. Wien (Austria) [9518-7]

POSTERS TUESDAY

LOCATION: FOYER TUE 14:30 TO 16:30

Conference attendees are invited to attend the Poster Session on Tuesday afternoon. Come view posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

POSTER SETUP INSTRUCTIONS: Poster authors are encouraged to display their posters beginning at 10:00 on Monday for extended viewing and should stand with their posters to answer questions during the interactive poster session on Tuesday afternoon. Posters must be displayed at least 30 minutes before the poster session to be considered presented. Posters not removed at the end of the poster session will be considered unwanted and will be discarded. View the Poster Presentation Guidelines at <http://spie.org/x30965.xml> for additional information.

Design of the charge push-through electronics for fully implantable artificial cochlea, Jaromir Zak, Zdenek Hadas, Daniel Dusek, Jan Pekarek, Vojtech Svatos, Ludek Janak, Jan Prasek, Brno Univ. of Technology (Czech Republic) [9518-9]

System of polarization correlometry of polycrystalline layers of bile in the differentiation of systemic pathologies, Olexander V. Dubolazov, Alexander G. Ushenko, Yuriy Fedkovych Chernivtsi National Univ. (Ukraine) [9518-24]

Rapid prototyping of integrated biochips for on-demand 3D cell culture, Mathieu Hautefeuille, Catalina Stern-Forghach, Univ. Nacional Autónoma de México (Mexico) and GEISST Bio (Mexico); **Jehu Lopez-Aparicio**, Lucia Cabriales, Edgar Jimenez-Diaz, Marina Macias-Silva, Marcela Sosa-Garrocho, Univ. Nacional Autónoma de México (Mexico); **Aczel Sanchez-Cedillo**, Mario Vilatoba-Chapa, Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán (Mexico) and GEISST Bio (Mexico); **David Kershenobich-Stalnikowitz**, Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán (Mexico) [9518-25]

Experimental studies of an ablation plasma for laser micromachining of the MEMS elements, Mateusz Tański, Robert Barbucha, Marek Kocik, The Szwalski Institute of Fluid-Flow Machinery (Poland) [9518-26]

Impedance spectroscopy for detection of mold in archives with an integrated reference measurement, Poornachandra Papireddy Vinayaka, Sander van den Driesche, Steffen Janßen, Univ. Bremen (Germany); **Mathias Froidl**, microFAB Bremen GmbH (Germany); **Roland Blank**, Filippo Cipriani, Walter Lang, Michael J. Vellekoop, Univ. Bremen (Germany) [9518-27]

CONFERENCE 9518

LOCATION: MEDES

Simulation and characterization of hollow microbridge resonators for label-free biosensing, Salomon E. Marquez, Mar Alvarez, David Fariña, Institut Català de Nanociència i Nanotecnologia (ICN2) (Spain); Carlos Dominguez, Ctr. Nacional de Microelectrónica (Spain); Laura M. Lechuga, Institut Català de Nanociència i Nanotecnologia (ICN2) (Spain) [9518-28]

Fiber optics, label-free biophotonic diagnostic tool for cardio vascular disease, Cristina Rius Leiva, Ctr. Nacional de Investigaciones Cardiovasculares (Spain); Tobias N. Ackermann, Ctr. Nacional de Microelectrónica (Spain); Beatriz Dorado, Ctr. Nacional de Investigaciones Cardiovasculares (Spain); Xavier Munoz-Berbel, Ctr. Nacional de Microelectrónica (Spain); Vicente Andres, Ctr. Nacional de Investigaciones Cardiovasculares (Spain); Andreu Llobera, Ctr. Nacional de Microelectrónica (Spain) [9518-29]

GMR microfluidic biosensor for low concentration detection of Nanomag-D beads, Jagannath Devkota, Univ. of South Florida (USA); Georgios Kokkinis, Technische Univ. Wien (Austria); Manh-Huong Phan, Hari Srikanth, Univ. of South Florida (USA); Susana Cardoso, Filipe Arroyo Cardoso, INESC-ID (Portugal); Ioanna Giouroudi, Technische Univ. Wien (Austria) [9518-30]

Trajectory of microscale entities in a microdevice for field-flow fractionation based on dielectrophoresis, Bobby Mathew, Anas Alazzam, Khalifa Univ. of Science, Technology and Research (United Arab Emirates); Saud A. Khashan, United Arab Emirates Univ. (United Arab Emirates); Bashar S. El-Khasawneh, Khalifa Univ. of Science, Technology and Research (United Arab Emirates) [9518-31]

Merging of droplets in micro-channel independent of the droplets size and inter-droplet separation, Mahmuda Akhtar, Mohammad T. Rabhani, Michael J. Vellekoop, Univ. Bremen (Germany) [9518-32]

Small-volume multiparametric electrochemical detection at low cost polymeric devices featuring nanoelectrodes, Maria Kitsara, Instituto de Microelectrónica de Barcelona (Spain); Josep Maria Cirera, Miguel Aller-Pellitero, Neus Sabaté, Instituto de Microelectrónica de Barcelona, IMB-CNM (CSIC) (Spain); Jordi Colomer-Farrarons, Pere Miribel-Català, Discrete to Integrate Lab (D2I), Department of Electronics, Bioelectronics and Nanobioengineering R (Spain); F. Javier del Campo, Instituto de Microelectrónica de Barcelona (Spain) [9518-33]

Characterization of small particles in liquid suspension by fiber-optofluidic platform, Zoran V. Djinic, Austrian Ctr. for Medical Innovation and Technology (Austria); Milos C. Tomic, Univ. of Belgrade (Serbia); Marijana Stojkovic, Martin Milojkovic, Austrian Ctr. for Medical Innovation and Technology (Austria) [9518-35]

Fabrication of parylene channels embedded in silicon using a single parylene deposition step, Elena Tolstosheeva, João V. Pimentel, Andreas Schander, Ludger Kempen, Michael J. Vellekoop, Walter Lang, Univ. Bremen (Germany) [9518-36]

GammarusChip: innovative lab-on-a-chip technology for ecotoxicological testing using marine amphipod *Allorchestes compressa*, Rhys Cartledge, Dayanthi Nugegoda, Donald Wlodkowic, RMIT Univ. (Australia) [9518-37]

Lab-on-a-chip technology for a non-invasive and real-time visualisation of metabolic activities in larval vertebrates, Feng Zhu, RMIT Univ. (Australia); Daniel Baker, Vancouver Island Univ. (Canada); Joanna Skommer, RMIT Univ. (Australia); Mary Sewell, The Univ. of Auckland (New Zealand); Donald Wlodkowic, RMIT Univ. (Australia) [9518-38]

An integrated, micromechanical large particle in-flow sorter (MILPIS), Nurul M. Fuad, Joanna Skommer, RMIT Univ. (Australia); Timo Friedrich, Jan Kaslin, Monash Univ. (Australia); Donald Wlodkowic, RMIT Univ. (Australia) . . . [9518-39]

SESSION 3

LOCATION: MEDES TUE 16:30 TO 17:30

Biosensors and Medical Sensors I

Session Chair: **Sander van den Driesche**, Univ. Bremen (Germany)

16:30: **A biopsymeter to support the diagnostic procedure of skin samples**, Valeria Fioravanti, Shailendra Chandrashekar, Lukas Brandhoff, Univ. Bremen (Germany); Daniela Pucciarelli, Medizinische Univ. Wien (Austria); Sander van den Driesche, Univ. Bremen (Germany); Heimo Breiteneder, Christine Hafner, Medizinische Univ. Wien (Austria); Michael J. Vellekoop, Univ. Bremen (Germany) [9518-8]

16:50: **Multifunctional biosensing with three-dimensional plasmonic nanoantennas**, Michele Dipalo, Gabriele C. Messina, Hayder Amin, Fabio Moia, Rosanna La Rocca, Victoria Shalabaeva, Alessandro Maccione, Luca Berdondini, Francesco De Angelis, Istituto Italiano di Tecnologia (Italy) [9518-10]

17:10: **Out-of-plane stainless steel microneedle array for drug delivery application**, K. B. Vinayakumar, Indian Institute of Science (India) . . . [9518-11]

WEDNESDAY 6 MAY

WEDNESDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA WED 09:00 TO 10:00

Session Chairs: **José Luis Sánchez-Rojas**, Univ. de Castilla-La Mancha (Spain); **Jacopo Iannacci**, Fondazione Bruno Kessler (Italy)

09:00:



Miniaturized dielectric elastomer actuators: towards intelligent soft machines (Plenary Presentation)

Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

See page 5 for details

Coffee Break Wed 10:00 to 10:30

SESSION 4

LOCATION: MEDES WED 10:30 TO 12:10

Microfluidics and Lab-on-a-Chip II

Session Chair: **Ioanna Giouroudi**, Technische Univ. Wien (Austria)

10:30: **Creation of hydrophilic microfluidic devices for bio-medical application through stereo-lithography**, Lukas Brandhoff, Sander van den Driesche, Frieder Lucklum, Michael J. Vellekoop, Univ. Bremen (Germany) [9518-12]

10:50: **High-throughput microfluidic device for circulating tumor cell isolation from whole blood**, Daniel K. Yang, Lydia L. Sohn, Serena Leong, Univ. of California, Berkeley (USA) [9518-13]

11:10: **Integrated microfluidic technology for sub-lethal and behavioral marine ecotoxicity biotests**, Yushi Huang, RMIT Univ. (Australia); Carlos Reyes-Aldasoro, City Univ. London (United Kingdom); Guido Persoone, Univ. Gent (Belgium); Donald Wlodkowic, RMIT Univ. (Australia) [9518-14]

11:30: **Miniaturized devices towards an Integrated Lab-on-a-chip Platform for DNA diagnostics**, Georgia Kaprou, National Ctr. for Scientific Research Demokritos (Greece) and Univ. of Crete (Greece); George Papadakis, Foundation for Research and Technology-Hellas (Greece) and National Ctr. for Scientific Research Demokritos (Greece); George Kokkoris, Vasileios Papadopoulos, Ioanna Kefala, Dimitrios Papageorgiou, National Ctr. for Scientific Research Demokritos (Greece); Electra Gizeli, Univ. of Crete (Greece) and Foundation for Research and Technology-Hellas (Greece); Angeliki Tserepi, National Ctr. for Scientific Research Demokritos (Greece) [9518-15]

11:50: **Hydrodynamic stretching for prostate cancer detection**, Yuri Belotti, Michael Conneely, Scott Palmer, Tianjun Huang, Paul A. Campbell, Stephen J. McKenna, Ghulam Nabi, David McGloin, Univ. of Dundee (United Kingdom) [9518-16]

Lunch Break Wed 12:10 to 13:30

SESSION 5

LOCATION: MEDES WED 13:30 TO 15:10

Biosensors and Medical Sensors II

Session Chair: **Sander van den Driesche**, Univ. Bremen (Germany)

13:30: **Monitoring dynamic cell-to-cell interactions of tumor, tissue and stem cells in multifunctional lab-on-a-chip systems** (Invited Paper), Peter Ertl, AIT Austrian Institute of Technology GmbH (Austria) [9518-17]

14:10: **Monolithic silicon optical microchips for broad-band Mach-Zehnder interferometry and highly sensitive label free immunosensing**, Konstantinos Misiakos, Ioannis Raptis, Alexandros Salapatas, Maria Anastasopoulou, Antonia Malainou, National Ctr. for Scientific Research Demokritos (Greece); Nikos Chronis, Univ. of Michigan (USA); Gerhard Jobst, Jobst Technologies GmbH (Germany) [9518-18]

14:30: **Imaging label-free biosensor with microfluidic system**, Sabrina Jahns, Pia Glorius, Mirko Hansen, Yousef Nazirizadeh, Martina Gerken, Christian-Albrechts-Univ. zu Kiel (Germany) [9518-19]

14:50: **Hybrid microneedles devices for diagnostic and therapeutic applications: fabrication and preliminary results**, Principia Dardano, Alessandro Calió, Istituto per la Microelettronica e Microsistemi (Italy); Vincenza Di Palma, Andrea Di Matteo, Maria Fortuna Bevilacqua, STMicroelectronics (Italy); Jane Politi, Maurizio Casalino, Istituto per la Microelettronica e Microsistemi (Italy); Ilaria Rea, Istituto per la Microelettronica e i Microsistemi (Italy); Ivo Rendina, Luca De Stefano, Istituto per la Microelettronica e Microsistemi (Italy) [9518-20]

Coffee Break Wed 15:10 to 15:40

SESSION 6

LOCATION: MEDES WED 15:40 TO 17:00

Microfluidics and Lab-on-a-Chip III

Session Chair: **Manuel Delgado-Restituto**, Instituto de Microelectrónica de Sevilla (Spain)

15:40: **Living photonics: monitoring light propagation through cells (LIPHOS)**, Damien King, Dublin City Univ. (Ireland); Heidi Schou Knudsen, Aarhus Univ. (Denmark); Tobias N. Ackermann, Ctr. Nacional de Microelectrónica (Spain); Cristina Rius Leiva, Ctr. Nacional de Investigaciones Cardiovasculares (Spain); Xavier Munoz-Berbel, Ctr. Nacional de Microelectrónica (Spain); Heidi Knudsen, Aarhus Univ. (Denmark); Isaac Rodriguez-Rodriguez, Ctr Nacional de Microelectrónica (Spain); Beatriz Dorado, Ctr. Nacional de Investigaciones Cardiovasculares (Spain); Erica Alvarez, Ctr Nacional de Microelectrónica (Spain); Jens Ducreé, Dublin City Univ. (Ireland); Vicente Andres, Ctr. Nacional de Investigaciones Cardiovasculares (Spain); Ulf Simonsen, Aarhus Univ. (Denmark); Andreu Llobera, Ctr. Nacional de Microelectrónica (Spain) [9518-21]

16:20: **A novel strategy to monitor microfluidic in-vitro blood brain barrier models using impedance spectroscopy**, Jose Yeste Lozano, Ctr. Nacional de Microelectrónica (Spain) and Ctr. de Investigación Biomédica en Red en Bioingeniería, Biomateriales y Nanomedicina (Spain); Xavier Illa, Ctr. de Investigación Biomédica en Red en Bioingeniería, Biomateriales y Nanomedicina (Spain) and Ctr. Nacional de Microelectrónica (Spain); Anton Guimerà, Institut de Microelectrónica de Barcelona, IMB-CNM (CSIC) (Spain) and CIBER-BBN, Networking Center on Bioengineering, Biomaterials and Nanomedicine (Spain); Rosa Villa, Ctr. Nacional de Microelectrónica (Spain) and Ctr. de Investigación Biomédica en Red en Bioingeniería, Biomateriales y Nanomedicina (Spain) [9518-22]

16:40: **Microfabrication of multi-Layered electrodes for dielectrophoresis based field flow fractionation**, Bobby Mathew, Anas Alazzam, Khalifa Univ. of Science, Technology and Research (United Arab Emirates); Saud A. Khashan, United Arab Emirates Univ. (United Arab Emirates) [9518-23]

CLOSING REMARKS

LOCATION: MEDES 17:00 TO 17:10

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CONFERENCE 9519

LOCATION: LLAVORSÍ

Monday - Wednesday 4 - 6 May 2015 • Proceedings of SPIE Vol. 9519

Nanotechnology VII

Conference Chair: **Ion M. Tiginyanu**, Academy of Sciences of Moldova (Moldova)

Conference Co-Chairs: **Rainer Adelung**, Christian-Albrechts-Univ. zu Kiel (Germany); **Hidenori Mimura**, Shizuoka Univ. (Japan)

Program Committee: **Adrian Bachtold**, ICFO - Institut de Ciències Fotòniques (Spain); **Necmi Biyikli**, Bilkent Univ. (Turkey); **Nicolas Grandjean**, Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Jürgen Gutowski**, Univ. Bremen (Germany); **Roger A. Lewis**, Univ. of Wollongong (Australia); **Jan Linnros**, Royal Institute of Technology (Sweden); **Teresa Monteiro**, Univ. de Aveiro (Portugal); **Hadis Morkoç**, Virginia Commonwealth Univ. (USA); **Thierry Pauporté**, Ecole Nationale Supérieure de Chimie de Paris (France); **Ionel V. Vlad**, The Romanian Academy (Romania); **Vladimir A. Yuryev**, A. M. Prokhorov General Physics Institute (Russian Federation); **Anatoly V. Zayats**, King's College London (United Kingdom)

MONDAY 4 MAY


MONDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA MON 09:30 TO 11:00

Session Chair: **Ulrich Schmid**, Technische Univ. Wien (Austria)

09:30: **Welcome and Opening Remarks**
Ulrich Schmid, Technische Univ. Wien (Austria); **Carles Cane**, Ctr. Nacional de Microelectronica (Spain)

09:40: **Update on IT Research and Business in Catalunya**
Mariona Sanz Ausàs, Director, Unit of Innovation and Internationalization of the Competitiveness Agency (ACCIO), Catalan Government (Spain)

10:00:  **Microsystems: from smart sensors to cyberphysical systems (Plenary Presentation)**
Robert Plana, Alstom S.A. (France)

See page 4 for details

OPENING REMARKS

LOCATION: LLAVORSÍ 11:10 TO 11:20

Ion Tiginyanu, Academy of Sciences of Moldova (Republic of Moldova);
Rainer Adelung, Christian-Albrechts-Univ. zu Kiel (Germany);
Hidenori Mimura, Shizuoka University (Japan)

SESSION 1

LOCATION: LLAVORSÍ MON 11:20 TO 12:50

Nanophotonics and Plasmonics

Session Chair: **Ion M. Tiginyanu**, Academy of Sciences of Moldova (Moldova)

11:20: **Tubular nanomembranes: 3D architectures for photonics, electronics, energy storage and micro-biorobotics (Invited Paper)**,
Oliver G. Schmidt, Leibniz-Institut für Festkörper- und Werkstofforschung Dresden (Germany) [9519-1]

11:50: **ALD tuned titanium dioxide nanophotonics**, **Markus Häyrynen**, **Arijit Bera**, **Matthieu Roussey**, **Markku Kuittinen**, **Seppo K. Honkanen**, Univ. of Eastern Finland (Finland) [9519-2]

12:10: **Fabrication of photonic crystal circuits based on GaN ultrathin membranes by maskless lithography**, **Olesea Volciuc**, Univ. Bremen (Germany); **Fiodor T. Braniste**, Technical Univ. of Moldova (Moldova); **V. Sergentu**, Institute of Applied Physics (Moldova); **Ursaki Veaceslav**, **Ion M. Tiginyanu**, Academy of Sciences of Moldova (Moldova); **Jürgen Gutowski**, Univ. Bremen (Germany) [9519-3]

12:30: **Self-organized nano-voids in strained SiGe/Si hetero-structures for plasmonic application**, **Peter Gaiduk**, Belarusian State Univ. (Belarus); **Arne Nylandsted Larsen**, Aarhus Univ. (Denmark) [9519-5]

Lunch Break Mon 12:50 to 14:00

SESSION 2

LOCATION: LLAVORSÍ MON 14:00 TO 15:40

Quantum Dots, Nanocrystals and Nanowires

Session Chair: **Rainer Adelung**, Christian-Albrechts-Univ. zu Kiel (Germany)

14:00: **Defect luminescence in oxides nanocrystals**, **Teresa Monteiro**, **Joana Rodrigues**, **Maria Rosa Soares**, **Nuno F. Santos**, **Tiago Holz**, **Nabiha Ben Sedrine**, **Claudio Nico**, **António José S. Fernandes**, **Armando J. Neves**, **Florinda M. Costa**, Univ. de Aveiro (Portugal) [9519-6]

14:20: **Self-assembly of semiconductor nanocrystals for optoelectronic applications**, **Francesco Di Stasio**, **Angelo Accardo**, **Joel Q. Grim**, **Vladimir Lesnyak**, **Prachi Rastogi**, **Liberato Manna**, **Iwan Moreels**, **Roman Krahne**, Istituto Italiano di Tecnologia (Italy) [9519-7]

14:40: **Hybrid core-shell SnO₂/GaN@Ga₂O₃ nanoheterostructures for photodetectors**, **Oleg Lupan**, Christian-Albrechts-Univ. zu Kiel (Germany); **Lidia Ghimpu**, Academy of Sciences of Moldova (Moldova); **Fiodor T. Braniste**, **Vasilii Cretu**, Technical Univ. of Moldova (Moldova); **Mao Deng**, **Ingo Paulowicz**, **Arnim Schuchardt**, **Leonard Siebert**, **Dawit Gedamu**, Christian-Albrechts-Univ. zu Kiel (Germany); **Yogendra K. Mishra**, Christian-Albrechts-Univ. zu Kiel (Germany) and Institute for Materials Science (Germany); **Lorenz Kienle**, **Rainer Adelung**, Christian-Albrechts-Univ. zu Kiel (Germany); **Ion M. Tiginyanu**, Academy of Sciences of Moldova (Moldova) [9519-8]

15:00: **Ultrannarrow luminescence linewidth of silicon nanocrystals and influence of matrix**, **Ilya Sychugov**, **Anna Fucikova**, **Federico Pevero**, KTH Royal Institute of Technology (Sweden); **Jonathan G. Veinot**, Univ. of Alberta (Canada); **Jan Linnros**, KTH Royal Institute of Technology (Sweden) [9519-9]

15:20: **Electrochemical characterization of different carbon additives in silicon microwire anodes**, **Sandra Noehren**, Christian-Albrechts-Univ. zu Kiel (Germany); **Enrique Quiroga-Gonzalez**, Benemérita Univ. Autónoma de Puebla (Mexico); **Jürgen Carstensen**, **Rainer Adelung**, **Helmut Föll**, Christian-Albrechts-Univ. zu Kiel (Germany) [9519-32]

Coffee Break Mon 15:40 to 16:10

SESSION 3

LOCATION: LLAVORSÍ MON 16:10 TO 17:30

Aerographite, Graphene, Carbon Nanotubes

Session Chair: **Hidenori Mimura**, Univ. of Shizuoka (Japan)

16:10: **Mechanical resonators based on nanotubes and graphene**, **Adrian Bachtold**, ICFO - Institut de Ciències Fotòniques (Spain) [9519-11]

16:30: **Potentials of 3D interconnected networks synthesized by flame transport synthesis approach: from ultra-light Aerographite material to multifunctional hybrid networks**, **Yogendra K. Mishra**, **Arnim Schuchardt**, **Jorit Gröttrup**, **Sören Kaps**, Christian-Albrechts-Univ. zu Kiel (Germany); **Fiodor T. Braniste**, Technical Univ. of Moldova (Moldova); **Mao Deng**, Christian-Albrechts-Univ. zu Kiel (Germany); **Matthias Mecklenburg**, Technische Univ. Hamburg-Harburg (Germany); **Oleg Lupan**, Christian-Albrechts-Univ. zu Kiel (Germany); **Marion A. Stevens-Kalceff**, The Univ. of New South Wales (Australia); **Simion Raevschi**, State Univ. of Moldova (Moldova); **Karl Schulte**, Technische Univ. Hamburg-Harburg (Germany); **Lorenz Kienle**, Christian-Albrechts-Univ. zu Kiel (Germany); **Ion M. Tiginyanu**, Technical Univ. of Moldova (Moldova) and Institute of Electronic Engineering and Nanotechnologies (Moldova); **Rainer Adelung**, Christian-Albrechts-Univ. zu Kiel (Germany) [9519-12]

16:50: **Morphology and cathodoluminescence characterization of ZnO nanostructured layers deposited on Aerographite**, **Lidia Ghimpu**, Institute of Electronic Engineering and Nanotechnologies (Moldova); **Marion A. Stevens-Kalceff**, The Univ. of New South Wales (Australia); **Arnim Schuchardt**, Christian-Albrechts-Univ. zu Kiel (Germany); **Matthias Mecklenburg**, Technische Univ. Hamburg-Harburg (Germany); **Yogendra K. Mishra**, **Rainer Adelung**, Christian-Albrechts-Univ. zu Kiel (Germany); **Karl Schulte**, Technische Univ. Hamburg-Harburg (Germany); **Ion M. Tiginyanu**, Academy of Sciences of Moldova (Moldova) [9519-13]

17:10: **Photoinduced conductivity enhancement in quantum dot/graphene nanostructures**, Yulia A. Gromova, Ivan A. Reznik, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); Andrei V. Alaferdov, Univ. Estadual de Campinas (Brazil); Anna O. Orlova, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); Stanislav A. Moshkalev, Univ. Estadual de Campinas (Brazil); Alexander V. Baranov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); Anatoly V. Fedorov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); S. Gregory Jones, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); Titania A. R. Schmidt, Univ. Estadual de Campinas (Brazil); Kenneth M. Suzuki, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [9519-14]

TUESDAY 5 MAY

TUESDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA TUE 09:00 TO 10:00

Session Chairs: **Sander van den Driesche**, Univ. Bremen (Germany); **Ion M. Tiginyanu**, Academy of Sciences of Moldova (Moldova)

09:00:



Measuring life: sensors and analytics for precision medicine (Plenary Presentation)
Stefan Harrer, IBM Research (Australia)

See page 4 for details

Coffee Break Tue 10:00 to 10:30

SESSION 4

LOCATION: LLAVORSÍ TUE 10:30 TO 12:00

Applications in Nano-Biomedicine

Session Chair: **Andrei Sarua**, Univ. of Bristol (United Kingdom)

10:30: **Nanobiosensors for diagnostics (Invited Paper)**, Arben Merkoçi, Institut Català de Nanotecnologia (Spain) [9519-15]

11:00: **Optical detection of two-color-fluorophore barcode for nanopore DNA sensing**, Miao Zhang, Torsten Schmidt, Ilya Sychugov, Jan Linnros, KTH Royal Institute of Technology (Sweden) [9519-16]

11:20: **Complexation of porphyrins with nanoparticles of zeolite**, Anna G. Gyulkhandanyan, Anna A. Zakoyan, Institute of Biochemistry (Armenia); Robert K. Ghazaryan, Yerevan State Medical Univ. (Armenia); Hakob O. Sargsyan, Institute of Biochemistry (Armenia); Marina H. Paronyan, Scientific and Production Ctr. "Armbiotechnology" (Armenia); Grigor V. Gyulkhandanyan, Institute of Biochemistry (Armenia) [9519-39]

11:40: **Oxide-bioceramic coatings obtained on titanium items by the induction heat treatment and modified with hydroxyapatite nanoparticles**, Aleksandr A. Fomin, Marina A. Fomina, Igor V. Rodionov, Vladimir A. Koshuro, Yuri Gagarin State Technical Univ. of Saratov (Russian Federation); Natalia V. Petrova, Alexander A. Skaptsov, Vsevolod S. Atkin, N.G. Chernyshevsky Saratov State Univ. (Russian Federation) [9519-18]

Lunch Break Tue 12:00 to 13:00

SESSION 5

LOCATION: LLAVORSÍ TUE 13:00 TO 14:40

Microfabrication

Session Chair: **Necmi Biyikli**, Bilkent Univ. (Turkey)

13:00: **Novel micro-column using a multi-gated field emitter**, Hidenori Mimura, Yoichiro Neo, Toru Aoki, Shizuoka Univ. (Japan); Masayoshi Nagao, National Institute of Advanced Industrial Science and Technology (Japan) [9519-19]

13:20: **Metal silicide/Si thin-film Schottky-diode bolometers**, Vladimir A. Yuryev, Kirill V. Chizh, Valery V. Chapnin, Victor P. Kalinushkin, A. M. Prokhorov General Physics Institute (Russian Federation) [9519-20]

13:40: **Bio-inspired Nanofur for oil spill cleanup and underwater drag reduction**, Claudia Zeiger, Maryna N. Kavalenka, Matthias Worgull, Hendrik Hölscher, Karlsruher Institut für Technologie (Germany) [9519-21]

14:00: **A 2D nanoparticle sorter: towards an 'on-chip' quantification and full characterization of nanoparticles**, Cléo Desmet, Andrea Valsesia, Sinan Muldur, Valentina Spampinato, Giacomo Ceccone, Pascal Colpo, François Rossi, European Commission Joint Research Ctr. (Italy) [9519-22]

14:20: **C-IOP/NiO/Ni7S6 composite with the inverse opal lattice as an electrode for supercapacitors**, Nadezhda S. Sukhinina, Vladimir M. Masalov, Andrey A. Zhokhov, Gennadi A. Emelchenko, Institute of Solid State Physics (Russian Federation); Irina I. Zverkova, Institute of Solid State Physics RAS (Russian Federation) [9519-23]

POSTERS TUESDAY

LOCATION: FOYER TUE 14:30 TO 16:30

Conference attendees are invited to attend the Poster Session on Tuesday afternoon. Come view posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

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Novel Nanoplasmonic Biosensor Integrated in a Microfluidic Channel, Veronica Irais Solis Tinoco, Institut Català de Nanociència i Nanotecnologia (CN2) (Spain); Borja Sepúlveda, Laura M. Lechuga, CN2 (Spain) [9519-17]

The development of double polarity GaN growth for fabrication of the GaN QPM crystal, Takayuki Nakano, Kenta Kuze, Yoku Inoue, Univ. of Shizuoka (Japan) [9519-29]

Angular ellipsometry of indium tin oxide films, Taras Hanulia, Snizhana Bilonoga, Olga Lopatynska, Leonid V. Poperenko, Vasyi Lendel, National Taras Shevchenko Univ. of Kyiv (Ukraine) [9519-34]

Generation-recombination processes in InGaAs/GaAs heterostructures with one-dimensional nanostructures, Marianna Kovalova, Sergey V. Kondratenko, National Taras Shevchenko Univ. of Kyiv (Ukraine); Colin Furrow, Vasyi P. Kunets, Morgan Ware, Gregory J. Salamo, Univ. of Arkansas (USA); Artem Yakovlev, National Taras Shevchenko Univ. of Kyiv (Ukraine) [9519-36]

Reduced QCSE in InGaN-based LEDs by patterned sapphire substrates with enlarging the diameter of hexagonal hole, Yen-Pu Chen, Vincent Su, Ming-Lun Lee, Yao-Hong You, Po-Hsun Chen, National Taiwan Univ. (Taiwan); Ray-Ming Lin, Chang Gung Univ. (Taiwan); Chieh-Hsiung Kuan, National Taiwan Univ. (Taiwan) [9519-37]

Recombination of charge carriers in heterostructures Si/Ge with Ge nanoislands, Anastasiia A. Mykytiuk, Sergey V. Kondratenko, National Taras Shevchenko Univ. of Kyiv (Ukraine); Yu. N. Kozzyrev, Chuiko Institute of Surface Chemistry (Ukraine) [9519-38]

Spectral and dielectric properties of nematic liquid crystal doped semiconductor quantum dots CdSe/ZnS, Marharyta Kurachkina, Dmitry Shcherbinin, Elena Konshina, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [9519-40]

Mathematical modeling of sustainability of porous Al₂O₃ growth during two stage anodization process, Elizabeth M. Aryslanova, Anton V. Alfimov, Sergey A. Chivilikhin, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [9519-41]

An analytical model of multi-particle electric double-layer interaction between identical spherical colloid nanoparticles, Anton V. Alfimov, Elizabeth M. Aryslanova, Sergey A. Chivilikhin, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [9519-42]

Polymers embedded with ZnO tetrapods: Fabrication of 3D-Lightscattering composite materials for lighting applications, Mathias Hoppe, Iris Hölken, Fabian Schütt, Yogendra K. Mishra, Rainer Adelung, Christian-Albrechts-Univ. zu Kiel (Germany) [9519-43]

Infrared absorption properties of sodium nitrate on silver/diamond powder (Ag/DP) composites, Guang Yuan, Mingchan Xu, Chun Li, Jiasheng Wang, Ocean Univ. of China (China) [9519-44]

Nanotechnology and discovery new factor that influences on permeability erythrocytes and eryptosis, Andrey N. Belousov M.D., Lab. of Applied Nanotechnology of Belousova (Ukraine) [9519-45]

Atomic layer deposition of Al₂O₃ on NF₃-pre-treated graphene, Marcel Junige, Tim Oddoy, Technische Univ. Dresden (Germany); Rositza Yakimova, Vanya Darakchieva, Linköping Univ. (Sweden); Christian Wenger, IHP-microelectronics (Germany); Lupina Grzegorz, IHP GmbH (Germany); Matthias Albert, Johann W. Bartha, Technische Univ. Dresden (Germany) [9519-46]

HRTEM observation of interface states between ZnO epitaxial film and Si(111) substrate, Yoichiro Nakanishi, Univ. of Shizuoka (Japan); H. Kominami, Shizuoka Univ. (Japan) [9519-47]

Production of porous oxide coatings with ultrafine crystalline structure on medical implants fabricated from alloy 12Cr18Ni9Ti, Igor V. Rodionov, Aleksandr A. Fomin, Marina A. Fomina, Saratov State Technical Univ. (Russian Federation); Elena Yu. Poshivalova, Yuri Gagarin State Technical Univ. of Saratov (Russian Federation); Andrey M. Zakharevich, Saratov State Medical Univ. (Russian Federation) [9519-48]

CONFERENCE 9519

LOCATION: LLAVORSÍ

Electrodynamical properties of the nanocarbon/polymer composites with aligned by magnetic field secondary non-conductive component. Mykola Melnichenko, Olena Yakovenko, Ludmila Matzui, Physics Faculty of Taras Shevchenko National University of Kyiv (Ukraine); Vilen Launetz, National Taras Shevchenko University of Kyiv (Ukraine); Victor Oliynyk, National Taras Shevchenko Univ. of Kyiv (Ukraine); Ludmila Vovchenko, Physics Faculty of Taras Shevchenko National University of Kyiv (Ukraine) [9519-49]

Light absorption of cylindrical quantum dot with Morse potential in the presence of parallel electrical and magnetic fields. D. B. Hayrapetyan, E. M. Kazaryan, T. V. Kotanjyan, H. K. H. Tevosyan, Russian-Armenian (Slavonic) Univ. (Armenia) [9519-50]

WEDNESDAY 6 MAY

WEDNESDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA WED 09:00 TO 10:00

Session Chairs: **José Luis Sánchez-Rojas**, Univ. de Castilla-La Mancha (Spain);

Jacopo Iannacci, Fondazione Bruno Kessler (Italy)

09:00:



Miniaturized dielectric elastomer actuators: towards intelligent soft machines (Plenary Presentation)

Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

See page 5 for details

Coffee Break Wed 10:00 to 10:30

SESSION 6

LOCATION: LLAVORSÍ WED 10:30 TO 12:20

Synthesis, Surface Modification, Nano-Devices and Reliability

Session Chair: **Teresa Monteiro**, Univ. de Aveiro (Portugal)

10:30: **Focus on GaN electronics nanostructures: thermal management and reliability** (Invited Paper), Andrei Sarua, Athikom Manoi, Roland Baranyai, Gernot Riedel, Nikole Killat, Huarui Sun, James W. Pomeroy, Michael J. Uren, Martin Kuball, Univ. of Bristol (United Kingdom) [9519-24]

11:00: **Template-assisted synthesis of III-nitride and metal-oxide nano-heterostructures using low-temperature atomic layer deposition**, Necmi Biyikli, Cagla Ozgit-Akgun, Ali Haider, Seda Kizir, Eda Goldenberg, Tamer Uyar, Ali Kemal Okyay, Hamit Eren, Mustafa Ozgur Guler, Bilkent Univ. (Turkey) [9519-25]

11:20: **Surface modification of CdTe by nano-second laser for radiation detector**, Toru Aoki, Univ. of Shizuoka (Japan) and ANSeeN Inc. (Japan); Akifumi Koike, ANSeeN Inc. (Japan) and Univ. of Shizuoka (Japan); Volodymyr A. Gnatyuk, V.E. Lashkaryov Institute of Semiconductor Physics (Ukraine); Hidenori Mimura, Univ. of Shizuoka (Japan) [9519-26]

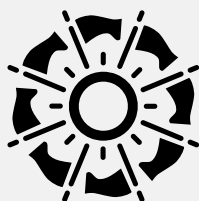
11:40: **Optical properties of heavy noble gas ion irradiated nanoporous InP membranes**, Julian A. Steele, K. Radhanpura, Roger A. Lewis, Univ. of Wollongong (Australia) [9519-27]

12:00: **GaN grown by MOCVD and HVPE: morphology of porous layers fabricated by electrochemical etching techniques**, Ion M. Tiginyanu, Academy of Sciences of Moldova (Moldova); Veaceslav Popa, Fiodor T. Braniste, Technical Univ. of Moldova (Moldova); Denis Martin, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Andrei Sarua, James Thomas, Hugo D. Andrade, Univ. of Bristol (United Kingdom); Jean-François Carlin, Nicolas Grandjean, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [9519-28]

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CONFERENCE 9520

LOCATION: CORFU

Monday - Wednesday 4 - 6 May 2015 • Proceedings of SPIE Vol. 9520

Integrated Photonics: Materials, Devices, and Applications III

Conference Chair: **Jean-Marc Fédéli**, CEA-LETI (France)

Conference Co-Chair: **Laurent Vivien**, Institut d'Électronique Fondamentale (France)

Program Committee: **Pavel Cheben**, National Research Council Canada (Canada); **Patrice Féron**, Ecole Nationale Supérieure des Sciences Appliquées et de Technologie (France); **Norbert Grote**, Fraunhofer-Institut für Nachrichtentechnik Heinrich-Hertz-Institut (Germany); **Giovanni Isella**, Lab. for Epitaxial Nanostructures on Silicon and Spintronics (Italy); **Erich Kasper**, Univ. Stuttgart (Germany); **Laura Maria Lechuga**, CIN2 (Spain); **Andrea I. Melloni**, Politecnico di Milano (Italy); **Iñigo Molina-Fernandez**, Univ. de Málaga (Spain); **Richard V. Penty**, Univ. of Cambridge (United Kingdom); **Lorenzo Pavesi**, Univ. degli Studi di Trento (Italy); **Andrew W. Poon**, Hong Kong Univ. of Science and Technology (Hong Kong, China); **Günther Roelkens**, Univ. Gent (Belgium); **Kazumi Wada**, The Univ. of Tokyo (Japan); **Dan-Xia Xu**, National Research Council Canada (Canada)

MONDAY 4 MAY

MONDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA MON 09:30 TO 11:00

Session Chair: **Ulrich Schmid**, Technische Univ. Wien (Austria)

09:30: **Welcome and Opening Remarks**

Ulrich Schmid, Technische Univ. Wien (Austria); **Carles Cane**, Ctr. Nacional de Microelectronica (Spain)

09:40: **Update on IT Research and Business in Catalunya**

Mariona Sanz Ausàs, Director, Unit of Innovation and Internationalization of the Competitiveness Agency (ACCIO), Catalan Government (Spain)

10:00: **Microsystems: from smart sensors to cybersystems (Plenary Presentation)**

Robert Plana, Alstom S.A. (France)



See page 4 for details

SESSION 1

LOCATION: CORFU MON 11:00 TO 12:20

Nonlinear Optics and Quantum Photonics

Session Chair: **Jean-Marc Fedeli**, CEA-LETI (France)

11:00: **Silicon integrated quantum circuits (Invited Paper)**, Mark G. Thompson, Univ. of Bristol (United Kingdom) [9520-1]

11:40: **Study of Pockels effect in strained silicon waveguides**, Pedro A. Damas, Xavier Le Roux, Eric Cassan, Delphine Marris-Morini, Laurent Vivien, Institut d'Électronique Fondamentale (France) [9520-2]

12:00: **Quantum random number generator based on silicon nanocrystals LED**, Zahra Bisadi, Alessio Meneghetti, Giorgio Fontana, Univ. degli Studi di Trento (Italy); Georg Pucker, Fondazione Bruno Kessler (Italy); Paolo Bettotti, Lorenzo Pavesi, Univ. degli Studi di Trento (Italy) [9520-3]

Lunch Break Mon 12:20 to 14:00

SESSION 2

LOCATION: CORFU MON 14:00 TO 15:00

Bio Photonics and Resonators

Session Chair: **Laura Maria Lechuga**, CIN2 (Spain)

14:00: **Advances in label-free biosensing using CMOS photonic technologies (Invited Paper)**, Dan-Xia Xu, Siegfried Janz, Martin Vachon, Shurui Wang, Nicaulas Sabourin, Pavel Cheben, Jens Schmid, Jean Lapointe, National Research Council Canada (Canada); Robert Halir, Gonzalo Wangüemert Pérez, Carlos Alonso-Ramos, Alejandro Ortega Moñux, Inigo Molina-Fernandez, University of Malaga, Spain (Spain); Jean-Marc Fedeli, CEA-LETI (France) [9520-4]

14:40: **Off-diagonal photonic Lamb shift in reactively coupled waveguide-resonator system**, Martino Bernard, Fondazione Bruno Kessler (Italy) and Univ. degli Studi di Trento (Italy); Fernando Ramiro-Manzano, Univ. degli Studi di Trento (Italy); Nikola Prtljaga, The Univ. of Sheffield (United Kingdom); Georg Pucker, Fondazione Bruno Kessler (Italy); Lorenzo Pavesi, Iacopo Carusotto, Univ. degli Studi di Trento (Italy); Mher Ghulinyan, Fondazione Bruno Kessler (Italy) [9520-6]

Coffee Break Mon 15:00 to 15:30

SESSION 3

LOCATION: CORFU MON 15:30 TO 16:30

Systems

Session Chair: **Jean-Marc Fedeli**, CEA-LETI (France)

15:30: **Calibration method for synchronizing the viewing zones of a large-scale autostereoscopic multi-view laser display**, Jörg Reitterer, Franz Fidler, Gerhard Schmid, TriLite Technologies GmbH (Austria); Christian Hambeck, Technische Univ. Wien (Austria); Ferdinand Saint Julien-Wallsee, TriLite Technologies GmbH (Austria); Walter R. Leeb, Ulrich Schmid, Technische Univ. Wien (Austria) [9520-7]

15:50: **Precise micromachining of materials using femtosecond laser pulses**, Katarzyna Garasz, Mateusz Tański, Marek Kocik, Robert Barbuca, The Szwalski Institute of Fluid-Flow Machinery (Poland) [9520-8]

16:10: **Solderjet bumping technique used to manufacture a compact and robust green solid-state laser**, Pol Ribes Pleguezuelo, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) and Friedrich-Schiller-Univ. Jena (Germany); Thomas Burkhardt, Marcel Hornaff, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Sumera Kousar, Friedrich-Schiller-Univ. Jena (Germany); Diana Burkhardt, Erik Beckert, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Marta Gilaberte, Denis Guilhot, David Montes, Miguel Galan, Sergi Ferrando, MONOCROM S.L. (Spain); Marco Laudisio, LIDAX (Spain); Thomas Belenguer, Sergio Ibarria, Paloma Gallego, National Institute of Aerospace Technology INTA (Spain); Jose Antonio Rodríguez, Engineering Systems for the Defense of Spain ISDEFE (Spain); Ramona Eberhardt, Andreas Tünnermann, Fraunhofer IOF (Germany) . . . [9520-9]

TUESDAY 5 MAY

TUESDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA TUE 09:00 TO 10:00

Session Chairs: **Sander van den Driesche**, Univ. Bremen (Germany); **Ion M. Tiginyanu**, Academy of Sciences of Moldova (Moldova)

09:00: **Measuring life: sensors and analytics for precision medicine (Plenary Presentation)**



Stefan Harrer, IBM Research (Australia)

See page 4 for details

Coffee Break Tue 10:00 to 10:30

SESSION 4

LOCATION: CORFU TUE 10:50 TO 11:50

Spectroscopy and Optical Forces

Session Chair: **Dan-Xia Xu**, National Research Council Canada (Canada)

10:50: **IR spectroscopy sensing with nanoplasmonic enhancement (Invited Paper)**, Hatice Altug, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [9520-10]

11:30: **Microfluidic generation and optical manipulation of ultra-low interfacial tension droplets**, Guido Bolognesi, Imperial College London (United Kingdom); Alex Hargreaves, Durham Univ. (United Kingdom); Andrew D. Ward, STFC Rutherford Appleton Lab. (United Kingdom); Andrew K. Kirby, Colin D. Bain, Durham Univ. (United Kingdom); Oscar Ces, Imperial College London (United Kingdom) [9520-11]

Lunch Break Tue 11:50 to 13:10

CONFERENCE 9520

LOCATION: CORFU

SESSION 5

LOCATION: CORFU TUE 13:10 TO 14:30

Photonic Circuits

Session Chair: **Laurent Vivien**,
Institut d'Électronique Fondamentale (France)

13:10: **Waveguide germanium avalanche photodiode on silicon**, Léopold Viot, Paul Crozat, Institut d'Électronique Fondamentale (France); Jean-Marc Fedeli, Jean-Michel Hartmann, CEA-LETI (France); Delphine Marris-Morini, Eric Cassan, Institut d'Électronique Fondamentale (France); Frederic Boeuf, STMicroelectronics (France); Laurent Vivien, Institut d'Électronique Fondamentale (France) [9520-13]

13:30: **Integrated silicon photodetector for lab-on-chip sensor platforms**, Alina Samusenko, Georg Pucker, Mher Ghulinyan, Francesco Ficorella, Fondazione Bruno Kessler (Italy); Lorenzo Pavesi, Romain Guider, Davide Gandolfi, Univ. degli Studi di Trento (Italy) [9520-14]

13:50: **SiN-assisted, polarization-insensitive multicore fiber to silicon photonics interface**, Giannis N. Pouloupoulos, Dimitrios Kalavrouziotis, National Technical Univ. of Athens (Greece); Paul Mitchell, John R. Macdonald, Optoscribe Ltd. (United Kingdom); Paraskevas Bakopoulos, Hercules Avramopoulos, National Technical Univ. of Athens (Greece) [9520-15]

14:10: **A PEDA approach for monolithic photonic BiCMOS technologies**, Stefan Simon, Georg Winzer, IHP GmbH (Germany); Helmut Roßmann, TexEDA Design GmbH (Germany); Lars Zimmermann, Thomas Mausolf, Marcel Kroh, IHP GmbH (Germany) [9520-16]

POSTERS TUESDAY

LOCATION: CORFU TUE 14:30 TO 16:30

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Multi-diode laser system for UV exposure of the photoresists, Robert Barbucha, Mateusz Tariski, Marek Kocik, The Szwedzki Institute of Fluid-Flow Machinery (Poland) [9520-26]

Measurement of nonlinear refractive index based on multiple configuration of FBG in generating multi wavelength, Mohd Nizam Abdullah, Sahbudin B. H. Shaari, Abang Annuar Ehsan, Susthitha Menon, Univ. Kebangsaan Malaysia (Malaysia) [9520-27]

Comparison of femtosecond laser induced micro/nano structures on silicon fabricated at room temperature and 400°C, Guoliang Deng, Xianheng Yang, Guoying Feng, Shouhuan Zhou, Sichuan Univ. (China) [9520-28]

Modeling of HgCdTe focal plane array spectral inhomogeneities, Salima Mouzali, Sidonie Lefebvre, Sylvain Rommeluère, Yann Ferrec, Jérôme Primot, ONERA (France) [9520-29]

Calculation of accurate channel spacing of an AWG optical demultiplexer applying proportional method, Dana Seyringer, Edin Hodzic, FH Vorarlberg (Austria) [9520-30]

A new equalizer for 2 Gb/s short-reach SI-POF links, Cecilia Gimeno Gazca, Erick Guerrero Rodriguez, Carlos Sánchez-Azqueta, Guillermo Royo, Concepcion Aldea, Santiago Celma Pueyo, Univ. de Zaragoza (Spain) [9520-31]

CMOS front-end for duobinary data over 50-m SI-POF links, Javier Aguirre, Erick Guerrero Rodriguez, Cecilia Gimeno Gazca, Carlos Sánchez-Azqueta, Santiago Celma Pueyo, Univ. de Zaragoza (Spain) [9520-32]

A multi-rate continuous-time adaptive equalizer for high-speed serial links, Erick Guerrero Rodriguez, Cecilia Gimeno Gazca, Carlos Sánchez-Azqueta, Javier Aguirre, Santiago Celma Pueyo, Univ. de Zaragoza (Spain) [9520-33]

A CMOS merged CDR and continuous-time adaptive equalizer, Carlos Sánchez-Azqueta, Javier Aguirre, Cecilia Gimeno Gazca, Concepcion Aldea, Santiago Celma Pueyo, Univ. de Zaragoza (Spain) [9520-34]

WEDNESDAY 6 MAY

WEDNESDAY PLENARY SESSION

LOCATION: SITGES/LLÍVIA WED 09:00 TO 10:00

Session Chairs: **José Luis Sánchez-Rojas**,
Univ. de Castilla-La Mancha (Spain);
Jacopo Iannacci, Fondazione Bruno Kessler (Italy)

09:00:



Miniaturized dielectric elastomer actuators: towards intelligent soft machines
(Plenary Presentation)

Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

See page 5 for details

Coffee Break Wed 10:00 to 10:30

SESSION 6

LOCATION: CORFU WED 10:30 TO 12:10

Light Emission

Session Chair: **Kazumi Wada**, The Univ. of Tokyo (Japan)

10:30: **Ge/GeSn direct band gap laser on silicon** (Invited Paper), Richard Geiger, Paul Scherrer Institut (Switzerland); Stephan Wirths, Forschungszentrum Jülich GmbH (Germany); Zoran Ikonc, Univ. of Leeds (United Kingdom); Dan M. Buca, Forschungszentrum Jülich GmbH (Germany); Hans C. Sigg, Paul Scherrer Institut (Switzerland) [9520-17]

11:10: **Organosilicate thin films: a new candidate for lighting and photonic applications?**, Cédric Thys, Vincent Jousseau, Jean-Baptiste Jager, Vincent Calvo, Christophe Licitra, Olivier Renault, Denis Rouchon, Commissariat à l'Énergie Atomique (France); Anne-Marie Jurduc, Univ. Claude Bernard Lyon 1 (France); Pierre Noe, Commissariat à l'Énergie Atomique (France) [9520-18]

11:30: **Light emission from carbon nanotubes integrated in silicon ring resonator**, Adrien Noury, Xavier Le Roux, Laurent Vivien, Nicolas Izard, Institut d'Électronique Fondamentale (France) [9520-19]

11:50: **Towards AIN optical cladding layers for thermal management in hybrid lasers**, Ian Mathews, Shenghui Lei, Kevin Nolan, Bell Labs. Research Ctr. Ireland (Ireland); Guillaume Levaufre, Alexandre Shen, III-V Lab. (France); Brian Corbett, Tyndall National Institute (Ireland); Ryan Enright, Bell Labs. Research Ctr. Ireland (Ireland) [9520-20]

Lunch Break Wed 12:10 to 13:30

SESSION 7

LOCATION: CORFU WED 13:30 TO 15:10

Materials and Nanostructuring

Session Chair: **Jean-Marc Fedeli**, CEA-LETI (France)

13:30: **Luminescence yield in Al and Tb³⁺ delta-doped oxide thin films fabricated by electron beam evaporation**, Oriol Blázquez, Joan Manel Ramírez, Julian López-Vidrier, Yonder Berencén, Sergi Hernández, Univ. de Barcelona (Spain); Pablo Sanchis, Univ. Politècnica de València (Spain); Blas Garrido, Univ. de Barcelona (Spain) [9520-21]

13:50: **Ridge channel waveguides in NLO (Yb,Nb):RbTiOPO₄/RbTiOPO₄(001)**, Muhammad A. Butt, Maria Cinta Pujol Baiges, Rosa M. Solé, Airán Ródenas, Univ. Rovira i Virgili (Spain); Ginés Lifante, Univ. Autónoma de Madrid (Spain); Magdalena Aguiló, Francesc Díaz, Univ. Rovira i Virgili (Spain) [9520-22]

14:10: **Colour performance and stack optimisation in phase change material based nano-displays**, Peiman Hosseini, Harish Bhaskaran, Univ. of Oxford (United Kingdom) [9520-23]

14:30: **A study of physical vapor deposition silicon nitride for dense wavelength division multiplexing on silicon wafer**, Ziyi Zhang, The Univ. of Tokyo (Japan); Papichaya Chaisakul, The Univ. of Tokyo (Japan) and Univ. Paris-Sud 11 (France); Motoki Yako, Ju Kan, The Univ. of Tokyo (Japan); Koji Yamada, Tai Tsuchizawa, Hiroshi Fukuda, Nippon Telegraph and Telephone Corp. (Japan); Delphine Marris-Morini, Laurent Vivien, Univ. Paris-Sud 11 (France); Naoyuki J. Kawai, Kazumi Wada, The Univ. of Tokyo (Japan) [9520-24]

14:50: **Self-assembly 'micro-origami' photon cages as hollow micro-resonators**, Alexandre Danescu, Univ. de Lyon (France); Céline Chevalier, UMI LN2 (Canada); Rémy Artinyan, Philippe Régnery, Geneviève Grenet, Ségolène Callard, Pedro Rojo-Romeo, Xavier Letartre, Jean Louis Leclercq, Univ. de Lyon (France) [9520-25]

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GENERAL INFORMATION

Registration

Onsite Registration and Badge Pick-Up Hours

Hotel Alimara Conference Foyer

Sunday 3 May 2015.....	15:00 to 17:00
Monday 4 May 2015.....	07:30 to 17:00
Tuesday 5 May 2015.....	08:00 to 17:00
Wednesday 6 May 2015	08:00 to 16:00

Conference Registration

Includes admission to all conference sessions, plenaries, panels, and poster sessions, admission to the Exhibition, Welcome Reception, coffee breaks, and a choice of proceedings publication. Student pricing does not include proceedings publication.

SPIE Member, SPIE Student Member, and Student Pricing

- SPIE Members receive conference registration discounts. Discounts are applied at the time of registration.
- Student registration rates are available only to undergraduate and graduate students who are enrolled full time and have not yet received their Ph.D. Post-docs may not register as students. A student ID number or proof of student status is required with your registration.

Press Registration

For credentialed press and media representatives only. Please email contact information, title, and organization to media@spie.org.

SPIE Cashier

Registration Area

Open during registration hours

Registration Payments

If you are paying by cash or cheque as part of your onsite registration, wish to add a special event requiring payment, or have questions regarding your registration, visit the SPIE Cashier.

Receipts and Certificate of Attendance

Preregistered attendees who did not receive a receipt or attendees who need a Certificate of Attendance may obtain those from the SPIE Cashier.

Badge Corrections

Badge corrections can be made by the SPIE Cashier. Please have your badge removed from the badge holder and marked with your changes before approaching the counter.

Refund Information

There is a €40 service charge for processing refunds. Requests for refunds must be received by 20 April 2015; all registration fees will be forfeited after this date. Membership dues, SPIE Digital Library subscriptions or Special Events purchased are not refundable

Government Credit Cards

Government credit card users: have your purchasing officer contact the credit card company and get prior authorization before attempting to register. Advise your purchasing agent that SPIE is considered a 5968 company for authorization purposes.

Internet Access

Complimentary Internet will be available. Connection speeds will depend on the number of users. Please read the SPIE Wireless Internet Service Policy found in the SPIE Event Policy on page 27.

SPIE Conference App

Download the free SPIE Conference App, available for iPhone and Android phones. Search and browse the programme, special events, participants, exhibitors, and more.

SPIE Luggage + Coat Check

Hotel Alimara Concierge Desk

Luggage, package, and coat storage are available at the concierge desk.

Urgent Message Line

An urgent message line is available during registration hours: +34 - 93 - 427 0000 and ask to be directed to the SPIE Microtechnologies Registration Desk. Attendees should check the message board in the registration area for any messages held for them.

Airline Check-In and Boarding Pass Kiosk

Hotel Alimara Front Desk

Use this service to check in for your flight and print your boarding pass. The charge is €0.10 per page for black and white copies and €0.20 per page for colour copies.

Author/Presenter Information

Speaker Check-In and Preview Station

Hotel Alimara Conference Foyer

Monday through Wednesday
Open during registration hours.

All conference rooms have a computer workstation, projector, screen, lapel microphone, and laser pointer. All presenters are requested to come to their conference room during the breaks with their memory devices or laptops to confirm their presentation display settings.

Poster Setup Instructions

Hotel Alimara Conference Foyer

Monday 4 May 2015. 10:00

Poster Setup Instructions: Poster authors are encouraged to display their posters beginning at 10:00 on Monday for extended viewing and should stand with their posters to answer questions during the interactive poster session on Tuesday afternoon. Posters must be displayed at least 30 minutes before the poster session to be considered presented. Posters not removed at the end of the poster session will be considered unwanted and will be discarded.

View the Poster Presentation Guidelines at <http://spie.org/x30965.xml> for additional information.

Food and Beverage Services

Coffee Breaks

Conference Foyer

Complimentary coffee will be served twice daily, at 10:00 and 15:00 hrs. Check individual conference listings for exact times and locations.

Food & Refreshments for Purchase

The Hotel Alimara offers lunch to guests at the hotel. Please use the hotel reservation form to book the lunch direct with the hotel. There are some restaurants available in the area where lunch can be bought.

SPIE EVENT POLICIES

Acceptance of Policies and Registration Conditions

The following Policies and Conditions apply to all SPIE Events. As a condition of registration, you will be required to acknowledge and accept the SPIE Registration Policies and Conditions contained herein.

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To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued Photo ID at registration to collect registration materials.

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Payment Method

Registrants for paid elements of the event, who do not provide a method of payment, will not be able to complete their registration. Individuals with incomplete registrations will not be able to attend the conference until payment has been made. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks and wire transfers. Onsite registrations can also pay with Cash.

Authors/Coauthors

By submitting an abstract, you agree to the following conditions:

- An author or coauthor (including keynote, invited, and solicited speakers) will register at the author registration rate, attend the meeting, and make the presentation as scheduled.
- A manuscript (minimum 6 pages) for any accepted oral or poster presentation will be submitted for publication in the SPIE Digital Library, printed conference Proceedings, and CD. (Some SPIE events have other requirements that the author is made aware of at the time of submission.)
- Only papers presented at the conference and received according to publication guidelines and timelines will be published in the conference Proceedings and SPIE Digital Library (or via the requirements of that event).

Audio, Video, Digital Recording Policy

Conferences, courses, and poster sessions: For copyright reasons, recordings of any kind are prohibited without prior written consent of the presenter or instructor. Attendees may not capture or use the materials presented in any meeting/course room or in course notes on display without written permission. Consent forms are available at Speaker Check-In. Individuals not complying with this policy will be asked to leave a given session and/or asked to surrender their recording media.

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Persons under the age of 18 including babies, carried or in strollers, and toddlers are not allowed in technical or networking events. Anyone 18 or older must register as an attendee. All technical and networking events require a valid conference badge for admission.

SPIE EVENT POLICIES

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For safety and insurance reasons:

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- All children younger than 14, including babies in strollers and toddlers, are not allowed in the exhibition area at any time.

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Unauthorized solicitation in the Exhibition Hall is prohibited. Any non-exhibiting manufacturer or supplier observed to be distributing information or soliciting business in the aisles, or in another company's booth, will be asked to leave immediately.

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Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

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At SPIE events where wireless is included with your registration, SPIE provides wireless access for attendees during the conference and exhibition but cannot guarantee full coverage in all locations, all of the time. Please be respectful of your time and usage so that all attendees are able to access the internet.

Excessive usage (e.g., streaming video, gaming, multiple devices) reduces bandwidth and increases cost for all attendees. No routers may be attached to the network. Properly secure your computer before accessing the public wireless network. Failure to do so may allow unauthorized access to your laptop as well as potentially introduce viruses to your computer and/or presentation. SPIE is not responsible for computer viruses or other computer damage.

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Mobile phones, tablets, laptops, pagers, and any similar electronic devices should be silenced during conference sessions. Please exit the conference room before answering or beginning a phone conversation.

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For the health and consideration of all attendees, smoking, including e-cigarettes, is not permitted at any event elements, such as but not limited to: plenaries, conferences, workshops, courses, poster sessions, hosted meal functions, receptions, and in the exhibit hall. Most facilities also prohibit smoking and e-cigarettes in all or specific areas. Attendees should obey any signs preventing or authorizing smoking in specified locations.

Hold Harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

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If for some unforeseen reason SPIE should have to cancel the event, registration fees processed will be refunded to registrants. Registrants will be responsible for cancellation of travel arrangements or housing reservations and the applicable fees.

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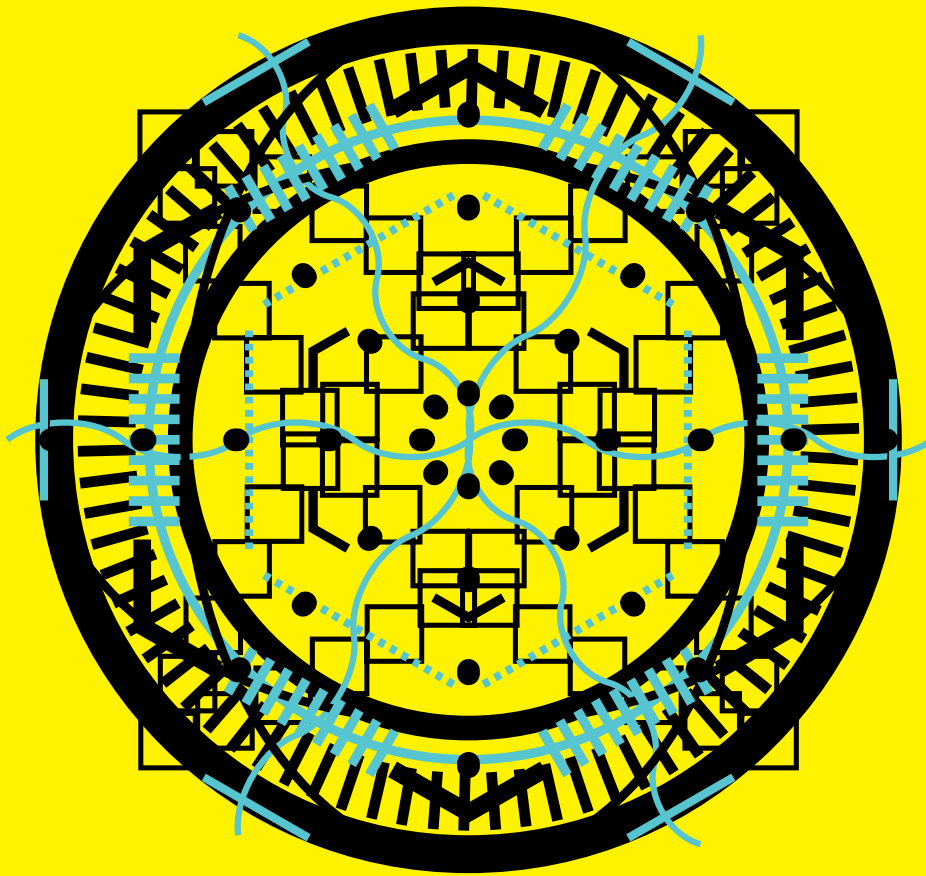
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