

Table of Contents

Keynotes

- 01 INNPAPER: Innovative and Smart Printed Electronics based on Multifunctionalized Paper: from Smart Labelling to Point of Care Bioplatfroms 14**
 Dr. Larraitz Añorga, Graciela Martinez-Paredes, Pedro J. Lamas-Ardisana, Ana Viñuales, Yolanda Alesanco, Luis César Colmenares, Hans-Jurgen Grande, Fundacion Cidetec, ES

Conference Sessions

Session I: Design of Smart Integrated Systems

- 02 Integrated climate and water sensors for greenhouses 19**
 Rene Elfrink, Marcel Zevenbergen, Marcel Zevenbergen, Stichtig IMEC Nederland, NL
 Marieke Burghoorn, Herman Schoo, TNO, NL
- 03 LED actuated wax valves in lab-on-a-foil for bead-based diagnostic devices 27**
 Mireia Burdó, María Díaz-González, César Fernández-Sánchez, Antoni Baldi, Institut de Microelectrònica de Barcelona, ES
 Ana Sanchis, M.-Pilar Marco, Institute for Advanced Chemistry of Catalonia (IQAC) of the Spanish Council for Scientific Research (CSIC), ES
- 04 Low Power High Bandwidth Acceleration Sensors 30**
 Dr. Roman Forke, Karla Hiller, Thomas Otto, Fraunhofer Institute for Electronic Nano Systems ENAS, DE
 Susann Hahn, Sebastian Weidlich, Matthias Kuchler, Chemnitz University of Technology, DE
 Stefan Konietzka, Tim Motl, Alexander Praedicow, Electronic Design Chemnitz GmbH, DE
- 05 Modular lab on chip system integrating a gold nanoparticle-based electrochemical sensor for the on-line detection of arsenic in surface waters 38**
 Pablo Giménez-Gómez, Antoni Baldi, César Fernández-Sánchez, Instituto de Microelectrónica de Barcelona, ES

Session II: Open Access to Smart Systems Manufacturing Capabilities

- 06 Smart Systems manufacturing in small lot sizes 40**
 Prof. Alfons Dehé, Hahn-Schickard, DE
- 07 Research Fab Microelectronics Germany – Cooperative Development and Manufacturing of Smart Microsystems 41**
 Joerg Amelung, Michael Galetzka, Christoph Galle, Research Fab Microelectronics Germany FMD, DE
- 08 MICROPRINCE- Open access pilot line for Micro-Transfer-Printing of functional components on wafer level 46**
 Dr. Sebastian Wicht, Dr. Uwe Krieger, Daniela Guenther, Niclas Heise, X-FAB MEMS Foundry GmbH, DE
 Matthias Krojer, Dr. Gabriel Kittler, X-FAB Semiconductor Foundries GmbH, DE
 Falk Naumann, Frank Altmann, Fraunhofer IMWS, DE
 David Gomez, X-Celeprint, US
 Alin Fecioru, X-Celeprint, IE

09	Transfer printing for heterogeneous silicon PICs	48
	Gunther Roelkens, Jing Zhang, Sulakshna Kumari, Joan Juvert, Alexandros Liles, Grigorij Muliuk, Jeroen Goyvaerts, Bahawal Haq, Nayyera Mahmoud, Dries Van Thourhout, UGent – imec, CH	

Session III: System Integration I

10	Miniaturized Electronic Modules for Aggressive Environments	50
	Dr. Eckardt Bihler, Dr. Marc Hauer, DYCONEX AG, CH	
11	Miniaturized 24 GHz Radar Positioning Transponder Module	57
	Thomas Fritzsch, Christian Tschoban, Fraunhofer Institute for Reliability and Microintegration IZM, DE Dr. Mathias Böttcher, Dr. Frank Windrich, Fraunhofer IZM-ASSID, DE Gia Ngoc Phung, Ferdinand-Braun-Institut, DE Dr. Klaus-Dieter Lang, TU Berlin, DE	
12	Fiber-chip coupling for advanced microsystems	65
	Dr. Christian Möller, Hans-Georg Ortlepp, Kristin Neckermann, Thomas Klein, Thomas Ortlepp, CIS Forschungsinstitut für Mikrosensorik GmbH, DE	
13	Atom Chip technology for use under UHV conditions	69
	Alexander Kassner, Mathias Rechel, Marc C. Wurz, Hendrik Heine, Waldemar Herr, Ernst M. Rasel, Marc Christ, Markus Krutzik, Leibniz University Hannover, DE	

Session IV: Software for Smart Systems

14	When Blink Of An Eye Is Not Fast Enough: Low Latency Computing for Smart Systems	76
	Christoph Kögler, T-Systems Multimedia Solutions GmbH, DE	
15	Supporting the Self-Learning of Systems at the Network Edge with Microservices	77
	Kay Bierzynski, Pavel Lutskov, Infineon Technologies AG, DE Uwe Aßmann, TU Dresden, DE	
16	Towards Automated Prototyping of Gesture Recognition Systems for Wearable Devices using Inertial Sensors	85
	Johann-P. Wolff, Florian Grützmacher, Christian Haubelt, University of Rostock, DE Rainer Dorsch, Rolf Kaack, Lars Middendorf, Bosch Sensortec GmbH, DE	
17	Ultrasound technology for touchless HMI system: finger tracker	93
	Borja Saéz Mingorance, Infineon Technologies AG, DE Diego P. Morales, Encarnación Castillo, University of Granada, ES	

Session V: Test and Reliability

18	Reliability Methodologies and Prognostication of Failures – The Role of Sensing	101
	Dr. Klas Brinkfeldt, RISE, SE	
19	The Creation of a Validated Scheme for the Automated Optimization of Systems in Package Designs	102
	Ghanshyam Gadhiya, Birgit Brämer, Sven Rzepka, Thomas Otto, Fraunhofer Institute for Electronic Nano Systems ENAS, DE	
20	High frequency vibration testing of MEMS-Sensors	110
	Ingolf Leidert, SPEKTRA GmbH Dresden, DE	

Session VI: Smart Low Cost Approaches

- 21 Paper-based batteries as sustainable power source for disposable electronic devices 114**
Dr. Juan Pablo Esquivel, Marc Castellarnau, Sergi Gassó, Neus Sabaté, Fuelium, ES
- 22 Joining two worlds – hybrid integration of silicon based electronics and printed functionalities 118**
Frank Roscher, Robert Thalheim, Tobias Seifert, Soumya-Deep Paul, Ralf Zichner, Maik Wiemer, Thomas Otto, Fraunhofer Institute for Electronic Nano Systems ENAS, DE
- 23 An All-Inkjet-Printed Photosensor on Flexible Plastic Substrate for the Detection of Ultraviolet Radiation 126**
Robin Kaufhold, Manuel Baeuscher, Piotr Mackowiak, Oswin Ehrmann, Martin Schneider-Ramelow, Klaus-Dieter Lang, Ha-Duong Ngo, Fraunhofer Institute for Reliability and Microintegration IZM, DE
Bei Wang, University of Applied Sciences Berlin, DE

Session VII: Manufacturing

- 24 Integrated Optical Fiber Sensors in Additive Manufactured Metal Components for Smart Manufacturing Applications 134**
Dr. Åsa Claesson, Ola Lyckfeldt, Jonas Lindqvist, Victor Kardeby, Peter Ottosson, David Ohlsson, Klas Brinkfeldt, Seyed Hosseini, RISE, SE
Erik Lejon, Petter Ulfberg, Gestamp HardTech AB, SE
Helen Rendall, Gunnar Hedin, Proximion AB, SE
Anders Kvarned, Seshendra Karamchedu, Uddeholms AB, SE
- 25 Energy harvesting solutions for self-powered IoT 142**
Dr. Gonzalo Murillo, Marcos Duque, Jaume Esteve, Ramón Jané, Carles Cane, Microelectronic Institute of Barcelona, ES
- 26 Plasma Dicing Technology and Total Process 147**
James Weber, Shinji Sasaguri, Panasonic Industry Europe GmbH, DE

Session VIII: System Integration II

- 27 Very-Thin System-in-Package Technology for Structural Analysis 153**
Fabian Hopsch, Andy Heinig, Fraunhofer Institute for Integrated Circuits IIS, DE
Mathias Böttcher, Fraunhofer IZM-ASSID, DE
- 28 Ultra-thin flexible interposer – a flexible hybrid integration approach to replace wire bonds ... 161**
Dr. Erwin Yacoub-George, Nagarajan Palavesam, Waltraud Hell, Martin König, Robert Faul, Christof Landesberger, Fraunhofer Research Institution for Microsystems and Solid State Techn. EMFT, DE
- 29 Fabrication of Nano Porous Gold towards Wafer Level Packaging 169**
Silvia Hertel, Antje Jobke, Dr. Maik Wiemer, Prof. Dr. Thomas Otto, Fraunhofer Institute for Electronic Nano Systems ENAS, DE
Dr. Danny Reuter, TU Chemnitz, DE
- 30 Deep Through Silicon Via in Laser-Ablated CMOS Multi-Project Wafer for Surface-Mountable Integrated MEMS 177**
Yukio Suzuki, Hideki Hirano, Masanori Muroyama, Shuji Tanaka, Tohoku University, JP

Session IX: Smart Health and Wellbeing

- 31 Fully printable single use self-powered glucometer 181**
Dr. Irene Merino-Jimenez, Anna Llorella, Marina Navarro-Segarra, Juan Pablo Esquivel, Neus Sabaté, Institut de Microelectronica de Barcelona (IMB-CNM-CSIC), ES

- 32 Facilitating the translation of projects integrating KETs for smart healthcare solutions 186**
 Rui Sousa, TecMinho, PT
 Nicolas Gouze, VDI/VDE Innovation + Technik GmbH, DE
 Pedro Silva, Instituto de Medicina Molecular João Lobo Antunes, PT
- 33 Integrated Smart Insole for Preventive Foot Care in Diabetes 192**
 Gabriele Rescio, National Research council, IT
- 34 Analysing sweat to determine internal training load during an incremental exercise 193**
 Miguel Thomas, Andre Bossche, Jeroen Bastemeijer, Annemarijn Steijlen, Prof. P. J. French,
 Pim Groen, Delft University of Technology, FR

Session X: Success Stories / EU Projects

- 35 NEXTS: Next Europractice eXtended Technologies and Services 200**
 Dr. Romano Hoofman, IMEC, BE
 Giorgos Fagas, Peter O'Brien, University College Cork, IE
 John McLean, STFC, UK
 Thomas Drischel, Fraunhofer IIS, DE
 Jean-Christophe Crébier, Kholdoun Torki, CMP, FR
- 36 SARMENTI: Smart multisensor embedded and secure system for soil nutrient and gaseous emission monitoring 208**
 Dr. Suzanne Lesecq, CEA-Leti, FR
 A. Molnos, M. Gougis, E. Gouze, Univ. Grenoble Alpes, CEA, LETI, FR
 M. Correvon, G. Dudnik, CSEM SA, CH
 A. di Matteo, V. Di Palma, E. Alessi, STMicroelectronics Srl, IT
 A. O'Riordan, C. Ó'Murchú, P. Lovera, Tyndall National Institute, IE
 G. Ponsardin, E. Lapierre, Terrasolis, FR
 K. Daly, Teagasc, IE
 T. C. Balan, C. Dimitru, ATOS, RO
 G. Mailat, Spiro, RO
- 37 Ultra-Low Power Event-Based Camera for Autonomous Vehicle 212**
 Dr. Sylvain Saïghi, Luce Chiodelli, University of Bordeaux, FR
- 38 3D Inkjet-printed Smart Luminaires 214**
 Erik Beckert, Falk Kemper, Sabrina-Jasmin Wolleb, Maximilian Reif, Fraunhofer-Institute for Applied Optics and Precision Engineering (IOF), DE
 Ingo Wirth, Fraunhofer-Institute for Manufacturing Technology and Advanced Materials (IFAM), DE
 Frank Roscher, Fraunhofer-Institute for Electronic Nano Systems (ENAS), D

Session XI: Advanced Micro and Nano Technologies

- 39 Advanced Sensing with Assembled, Packaged and Embedded Technologies 222**
 Masaya Toda, Tohoku University, JP
- 40 A Low Power Sigma-Delta Modulator in an Advanced 22 nm FDSOI CMOS Process for Sensor Applications 227**
 Pragoti Pran Bora, David Borggreve, Frank Vanselow, Erkan Isa, Fraunhofer Research Institution for Microsystems and Solid State Technologies EMFT, DE
 Linus Maurer, Universität der Bundeswehr, DE
- 41 Hermetical Sealing of Pressure Sensor Diaphragms by CVD of Si1-XGeX with Minimized Cavity Deposition 234**
 Christian Walk, Alexander Netaev, Michael Görtz, Holger Vogt, Fraunhofer Institute for Microelectronic Circuits and Systems IMS, DE
 Wilfried Mokwa, RWTH Aachen, DE

42	Compact design of an all-silicon thermoelectric microgenerator	242
	Dr. Luis Fonseca, Marc Dolcet, Andrej Stranz, Marc Salleras, IMB-CNM (CSIC), ES	

Session XII: Smart Production

43	Machine Condition Monitoring for Pay-Per-Use Systems using Magnetoresistive Sensors	247
	Dr. Rolf Slatter, Sensitec GmbH, DE	
44	RFID – based Wireless Sensor Network for Semiconductor Manufacturing Equipment to enable Predictive Maintenance	255
	Dr. Thomas Moldaschl, Aleš Travník, Albert Frank, Jochen Bardong, Christina Hirschl, CTR – Carinthian Tech Research AG, AT Heinz Cramer, Herbert Kastberger, LAM Research AG Austria, AT Matthias Weitlaner, erfideo Software & Identifikations GmbH, AT Michael Jerne, Alexey Nazarov, NXP Semiconductors Austria GmbH, AT	
45	Printing Beyond Color – Towards the Integration of Digital Printing and Laser Technics into General Manufacturing Environments	262
	Dr. Ralf Zichner, Prof. Reinhard R. Baumann, Prof. Thomas Otto, Fraunhofer Institute for Electronic Nanosystems ENAS, DE	
46	Functional integration of piezoelectric sensor structures in Fiber Reinforced Plastics (FRP) ..	263
	Dr. Katharina Koschek, Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, DE	
47	Digital manufacturing processes for individual functionalization of automotive parts	264
	Moritz Frauendorf, Fraunhofer Institute for Machine Tools and Forming Technology IWU, DE	

Session XIII: Success Stories / EU Projects

48	Magnetic lab on Chip for Early Diagnostics	265
	Dr. Alessandro Surpi, CNR-ISMN, IT	
49	SmartVista: Smart Autonomous Multi Modal Sensors for Vital Signs Monitoring	266
	Dr. Kafil M. Razeed, Cian O’Murchu, Colm O’Dwyer, University College Cork, Tyndall National Institute, IE Aida Todri-Sanial, University of Montpellier, FR Fredrik Sebelius, Novosense, SE Indranil Bose, Fraunhofer EMFT, DE	
50	Food Analysis for All: The PhasmaFOOD Project Approach	274
	Dr. Stylianos Georgoulas, INTRASOFT Intl. S.A., GR Paraskevas Bourgos, WINGS ICT Solutions, GR Milenko Tomic, Vizlore Labs, RS Susanne Hintschich, Fraunhofer Institut für Photonische Mikrosysteme, DE Francesca Romana Bertani, Consiglio Nazionale delle Ricerche, IT Panos Tsakanikas, Agricultural University of Athens, GR Benedikt Gross, Freie Universitaet Berlin, DE Martin Alewijn, Stichting Wageningen Research, NL Eugenio Martinelli, Universita degli Studi di Roma Torvergata, IT	

51	INSPEX: Make environment perception available as a portable system	282
	Julie Foucault, S. Lesecq, O. Debicki, N. Mareau, L. Ouvry, CEA-Leti, FR	
	M. Correvo, G. Dudnik, CSEM SA, CH	
	J. Barrett, S. Rea, A. McGibney, Cork Institute of Technology, IE	
	F. Birot, H. de Chaumont, GoSense, FR	
	R. Banach, J. Razavi, School of Computer Science, UK	
	J. Herveg, F. Thiry, Univ. of Namur, BE	
	C. Jackson, S. Buckley, SensL, IE	
	A. di Matteo, V. Di Palma, M. Passoni, F. Quaglia, STMicroelectronics Srl, IT	
	C. Ó'Murchú, R. O'Keeffe, Tyndall National Institute, IE	
52	EnABLES: European Infrastructure Powering the Internet of Things	289
	Dr. Mike Hayes, Julie Donnelly, Giorgos Fagas, Tyndall National Institute, IE	
	Raphael Salot, CEA-Leti, FR	
	Guillaume Savelli, CEA-Liten, FR	
	Peter Spies, Fraunhofer IIS, DE	
	Gerd vom Boegel, Fraunhofer IMS, DE	
	Mario Konijnenburg, IMEC-NL, NL	
	Ben Breitung, KIT/HIU, Institute for Nanotechnology, DE	
	Claudio Gerbaldi, GAME Lab, IT	
	Aldo Romani, University of Bologna, IT	
	Luca Gammaitoni, University of Perugia, IT	
	Steve Beeby, University of Southampton, UK	

Poster Sessions

P01	Portable multi-sensing remote conductivity meter for health applications	297
	Albert Alcacer, Angelos Streklas, Joan Bausells, Institut de Microelectrónica de Barcelona (IMB-CNM, CSIC), ES	
	Selim Boudjaoui, Abdoullatif Baraket, Nadia Zine, Abdelhamid Errachid, Université de Lyon, ES	
P02	SAW sensors for CO₂ detection based on perovskite nanomaterials sensing layer	301
	Angela Baracu, V. Buiculescu, R. Müller, National Institute for Research and Development in Microtechnology IMT-Bucharest, RO	
	P. Sfirloaga, P. Vlazan, Institute for R&D in Electrochemistry and Condensed Matter, RO	
	C. Mitrea, S.C.ECONIRV SRL, RO	
P03	Increasing piezo micro diaphragm pump performance by optimizing piezo actuation	305
	Agnes Bußmann, L. Grünerbel, Fraunhofer Research Institution for Microsystems and Solid State Technologies EMFT, DE	
P04	3D applicable ALD film for humidity detection	309
	Özgü Dogan, Michael Görtz, Fraunhofer Institute for Microelectronic Circuits and Systems IMS, DE	
	Wilfried Mokwa, RWTH Aachen University, DE	
	Holger Vogt, University of Duisburg-Essen, DE	
P05	Smart sensor system for constant dosing with micro diaphragm pumps	313
	Johannes Haefner, Claudia Durasiewicz, T. Thalhofer, S. Kibler, C. Kutter, Fraunhofer Research Institution for Microsystems and Solid State Technologies EMFT, DE	
P06	Manufacturing Capability of Micro-Transfer Printing	317
	Dr. David Gomez, Tanya Moore, Matthew A. Meitl, Salvatore Bonafede, Andrew Pearson, Brook Raymond, Tiffany Weeks, Kevin Oswald, Erich Radauscher, David Kneeburg, Julia Roe, Christopher A. Bower, X-Celeprint Inc., US	
	Alin Fecioru, Steven Kelleher, Raja Fazan Gul, Alexandre Ferrell, António José Trindade, X-Celeprint Ltd., IE	

P07	Inkjet-printed wireless chemiresistive sensors	321
	Melinda Hartwig, Ralf Zichner, Fraunhofer Institute for Electronic Nano Systems ENAS, DE Hans Lesny, Yvonne Joseph, Technische Universität Bergakademie Freiberg, DE	
P08	Integration of plasmonic nanostructures for micro-opto-electro-mechanical systems	325
	Dr. Georg Heldt, A. Weiß, Chr. Helke, J. W. Erben, St. Kurth, M. Meinig, J. Martin, Fraunhofer Institute for Electronic Nano Systems ENAS, DE K. Hiller, D. Reuter, Th. Otto, Technische Universität Chemnitz, DE	
P09	Smart Petri Dish	332
	Hans Lesny, Christiane Oestreich, Prof. Yvonne Joseph, TU Bergakademie Freiberg, DE	
P10	PortForward: Creating the port of the future	336
	Gabriel Manteca Muñoz, Sergio Martínez Navas, LEITAT, ES	
P11	Spectrally tunable microsensor for gas analysis	340
	Nicole Thronicke, Dr. Christian Möller, Dennis Mitrenga, Dominik Karolewski, Thomas Klein, Kristin Neckermann, Hans-Georg Ortlepp, Thomas Ortlepp, CIS Forschungsinstitut für Mikrosensorik GmbH, DE Adrian Grewe, Stefan Sinzinger, TU Ilmenau, DE	
P12	SMARTProbe -: An informative biopsy needle with bioimpedance sensing for real-time breast lesion screening	344
	Justina A Ugwah, Eric Moore, Tyndall National Institute, IR Bill Bennett, Brian O'Donnell, Martin O'Sullivan, Cork University Hospital, IR	
P13	Use of Low-Cost Printed Sensors with RF Energy Harvesting for IoT	348
	Fernando Moreno Cruz, Infineon Technologies AG, DE Víctor Toral López, Francisco J. Romero, Diego P. Morales, Almudena Rivadeneyra, University of Granada, ES Christian Hambeck, eesy-innovation GmbH, DE	
P14	Manufacturing of conformal RF antenna modules using compression molding	352
	Thanh Duy Nguyen, M. Koch, K.-F. Becker, T. Braun, Fraunhofer Institute for Reliability and Microintegration IZM, DE M. Schneider-Ramelow, K.-D. Lang, Technical University Berlin, DE J. Mayer, T. Zwick, Karlsruhe Institute of Technology, DE J. Chen, M. Martina, Schweizer Electronic AG, DE	
P15	Miniaturized Low-Power Wearable System for Human Motion Tacking Incorporating Monocular Camera and Inertial Sensor Data Fusion for Health Applications	356
	Mariusz P. Wilk, Dr. Brendan O' Flynn, University College Cork, Tyndall National Institute, IE	
P16	Self-powered smart patch for sweat conductivity monitoring	360
	Laura Ortega Tañá, Anna Llorella, Juan Pablo Esquivel, Neus Sabaté, Institute of Microelectronics of Barcelona (IMB-CNM, CSIC), ES	
P17	RFID based sensor platform for industry 4.0 application	363
	Dmitry Petrov, University Paderborn, DE Marco Schmidt, Ulrich Hilleringmann, Christian Hedayat, Fraunhofer ENAS-ASE, DE Thomas Otto, Fraunhofer Institute for Electronic Nano Systems ENAS, DE	
P18	Wireless power supply for an RFID based sensor platform	367
	Marco Schmidt, Christian Hedayat, Ulrich Hilleringmann, Fraunhofer ENAS-ASE, DE Dmitry Petrov, University Paderborn, DE Thomas Otto, Fraunhofer Institute for Electronic Nano Systems ENAS, DE	

P19	Method of superposing a multiple driven magnetic field to minimize stray fields around the receiver for inductive wireless power transmission	371
	Sven Lange, Maik-Julian Bükler, Christian Hedayat, Thomas Otto, Fraunhofer Institute for Electronic Nano Systems ENAS, DE Denis Sievers, Jens Förstner, Ulrich Hilleringmann, Universität Paderborn, DE	
P20	Characterization of H-field Probes regarding Unwanted Field Suppression using Different Calibration Structures	375
	Dominik Schröder, Christian Hangmann, Christian Hedayat, Thomas Otto, Fraunhofer Institute for Electronic Nano Systems ENAS, DE Ulrich Hilleringmann, University of Paderborn, DE	
P21	HV Power Supply System Concept for Piezoelectric ZNMF Actuators in Aeronautics Applications	379
	Sylvain Chardon, Sylvain Duc, Gerald Aigouy, Frank Claeysen, Cedrat Technologies, Meylan, FR Martin Schüller, André Gratias, Silvana Schueller, TriSiTec UG (haftungsbeschränkt), DE	
P22	Optimized Micro-Mounting and Hybrid Integration of RF-Mixed-Signal Systems based on MID Technology	383
	Marius Wolf, Maximilian Barth, Wolfgang Eberhardt, André Zimmermann, Hahn-Schickard-Gesellschaft für angewandte Forschung e.V., DE Volker Geneiß, Christian Hedayat, Fraunhofer ENAS, DE Thomas Otto, Fraunhofer Institute ENAS, DE	
P23	Toward improved FOWLP manufacturing by using self-alignment process	387
	Sabine Scherbaum, Christof Landesberger, Fraunhofer Research Institution for Microsystems and Solid State Technologies EMFT, DE Benedikt Auer, Hannes Klingler, Birgit Brandstätter, Besi Austria GmbH, AT Elisabeth Brandl, Julian Bravin, EVG Group, AT	