

Smart Systems Integration 2009

**Brussels, Belgium
10-11 March 2009**

Editors:

T. Gessner

ISBN: 978-1-5108-8382-6

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (xxxx) by Mesago Messe Frankfurt GmbH
All rights reserved.

Printed by Curran Associates, Inc. (xxxx)

For permission requests, please contact Mesago Messe Frankfurt GmbH
at the address below.

Mesago Messe Frankfurt GmbH
Rotebuehlstrasse 83-85
70178 Stuttgart Germany

Phone: 49 711 619 460
Fax: 49 711 619 4690

info@mesago.com

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Table of contents

Keynote-Sessions

Smart Systems Integration and Private-Public Initiatives for R&D in Europe 2

Augusto de Albuquerque, EU-Commission, Belgium

The Future of Smart Systems

Klaus Schymanietz, Vice President EADS, Germany 3

Wearable healthcare applications of wireless sensor systems 4

Bert Gyselinckx, IMEC-NL, The Netherlands

From a Tube to a Chip - Application of Micro and Nanotechnology in Biotechnology, Veterinary and Life Sciences 5

Dang Duong Bang, Raghu Ram Dhumpa, Yuliang Liu, National Veterinary Institute, Technical University of Denmark, Denmark

M. Agirregabiria, Jesus Miguel Rruano, Ikerlan S. Coop, Spain

Rafal Walczak, Jan Dzuibak, Institute of Electron Technology, Poland

Mingiang Bu, Sun Yi, Anders Wolff, BioLabchip group, Technical University of Denmark, Denmark

A trip from a tube to a chip - Applications of Lab-on-a-chip systems for rapid detection and identification of pathogens in food, animal production and life sciences 13

Dang Duong Bang

Chip integrated fuel cells and fuel cell accumulators 14

Holger Reinecke, Mirko Frank, Claas Müller, University of Freiburg, IMTEK, Germany

Gilbert Erdler, Micronas GmbH, Freiburg, Germany

Conference Sessions

Session I: Reliability and Test of Components and Systems

Reliability Concepts for Microsystems Integration 24

B. Wunderle, B. Michel, Fraunhofer IZM, Germany

Non-Destructive Tests for Via Structures in Organic Multi Layer PCBs 32

R. Schacht, M. Abo Ras, D. May, B. Wunderle, B. Michel, Fraunhofer IZM, Germany

Characterization of eutectic wafer bonding using Gold and Silicon 40

Yu-Ching Lin, Masayoshi Esashi, Tohoku University, Japan

Mario Baum, Jörg Frömel, Maik Wiemer, Thomas Gessner, Fraunhofer ENAS, Germany

Marco Haubold, Chemnitz University of Technology, Germany

Electromagnetic Near-Field Scanning in Time and Frequency Domain for EMI Characterisation 48

Thomas Mager, Christian Hedayat, Fraunhofer ENAS ASE Paderborn, Germany
Christian Reinhold, University of Paderborn, Germany
Matthias Spang Friedrich-Alexander University Erlangen-Nuremberg, Germany
Göran Schubert, Continental Automotive Systems, Germany
Thomas Steinecke, Infineon Technologies AG, Germany
Thomas Gessner, Fraunhofer ENAS, Germany

Advanced dielectric charging characterization and modeling in Capacitive MEMS 56

George Papaioannou, Fabio Coccetti, Robert Plana, University of Toulouse LAAS-CNRS, France

Session II: Component and Systems Design

A 20 GHz Antenna Integrated RF MEMS based Router and Switching Networks made on Quartz 65

R. Malmqvist, B. Carlegrim, C. Samuelsson, FOI Swedish Defence Research Agency, Sweden
S. Cheng, A. Rydberg, Uppsala University, Sweden
P. Rantakari, T. Vähä-Heikkilä, J. Varis, VTT Technical Research Centre of Finland, Finland
H. Sagberg, B. Holter, SINTEF ICT, Norway
U. Hanke, Vestfold University College, Norway

MEMS-based Aluminum Nitride Piezoelectric Energy Harvesting Module 73

T. M. Kamel, R. Elfrink, D. Hohlfeld, M. Goedbloed, Y. van Andel, C. de Nooijer, M. Jambunathan, R. van Schaijk, IMEC-NL/Holst Centre, The Netherlands

Finite Element Simulation and Micro Deformation Measurements - Contributions to the Development of Advanced Packages with Hidden Dies 81

Sommer, J.-P., Michel, B., Fraunhofer ENAS, Germany
Noack, E., Seiler, B., Chemnitzer Werkstoffmechanik GmbH, Chemnitz, Germany
Uhlig, P., IMST GmbH, Kamp-Lintfort, German

Reliability Modeling of IC Package in Smart Card Applications 89

Bodin Kasemset, Christian Zenz, Ernst Eiper, NXP Semiconductors Styria, Austria
Willem van Driel, Daoguo Yang, NXP Semiconductors Nijmegen, The Netherlands

An Optimization Technique for Area Shrinking Problems Applied to MEMS Accelerometers 95

Manuel Engesser, Axel R. Franke, Matthias Maute, Daniel C. Meisel, Robert Bosch GmbH, Germany
Jan G. Korvink, University of Freiburg, IMTEK, Germany

Evolution of a microplasma chamber and an optical collector into a planarintegrated smart sensor for emission-spectroscopic gas analytics 103
Michael Bohling, Matthias Gruber, FernUniversitaet in Hagen, Germany
Richard Heming, Joachim Franzke, ISAS – Institute for Analytical Sciences, Germany

Session III: Nanotechnology and New Materials for Smart Systems

Integrated Printed Organic/Inorganic Optoelectronic Devices 111
Emil J. W. List, Technical University Graz, Austria

Multiple nanowire via interconnects in flexible printed circuit boards 112
Klas Hjort, Mikael Lindeberg, Uppsala University, Sweden

Influence of the crystallite and particle size of BaTiO₃ and SrTiO₃ on the dielectric properties of polyester reactive-resin composite materials 118
Benedikt Schumacher, Holger Geßwein, Thomas Hanemann, Jürgen Haußelt, Forschungszentrum Karlsruhe GmbH, Germany

Tin-silicate glass-ceramics: a promising material for smart photonic circuits 124
S. Berneschi, S. Pelli, G. C. Righini, G. Nunzi Conti "Nello Carrara" Institute of Applied Physics IFAC-CNR, Italy
S.N.B. Bhaktha, A. Chiasera, M. Ferrari, CSMFO Lab, Italy
M. Bouazaoui, B. Capoen, PhLAM, France.
C. Kinowski, S. Turrell, LASIR, France

Stand Alone Molecular Devices for Health and Enviroment 132
Petrus Santa-Cruz, Universidade Federal de Pernambuco, Brasil

Session IV: System Integration and Packaging I

3D Si-level integration in wireless sensor node 134
Piet van Engen, Ric van Doremale, Wouter Jochems, Ad Rommers, Philips Applied Technologies, The Netherlands
Shi Cheng, Anders Rydberg, University of Uppsala, Sweden
Thomas Fritzsch, Jürgen Wolf, Fraunhofer IZM, Germany
Walter De Raedt, Philippe Müller, IMEC, Belgium
Eduardo Alarcon, Mihai Sanduleanu, Philips Research, The Netherlands

Integration of Sensor Chips on ASIC Wafer: Selected Details 142
Peter Lange, Sven Gruenzig, Norman Marenco, Wolfgang Reinert, Stephan Warnat, Fraunhofer ISIT, Germany

Package design for seamless integration of electronic systems into smart objects 150

Maryna Lishchynska, Kieran Delaney, TEC Centre, Cork Institute of Technology, Ireland

Integration of Inertial MEMS Sensors in Active Smart RFID Labels for Transport Monitoring 158

Danny Reuter, Markus Nowack, Andreas Bertz, Chemnitz University of Technology, Germany

Maik Wiemer, Thomas Gessner, Fraunhofer ENAS, Germany

Robert Semar, Frank Kriebel, KSW Microtec AG, Germany

Karl-Friedrich Hopp, ELMOS Semiconductor AG, Germany

Stephan Dittrich, MAZ GmbH Brandenburg, Germany

Torsten Thieme, memsfab GmbH, Germany

Kai Herbst, Schenker Deutschland AG, Germany

Wafer Level Packaging (WLP) by Transfer Molding 166

Wilfred Gal, Harry Fierkens, Dr. Henk Wensink, Fico b.v., The Netherlands

Session V: Advanced Micro and Nano Technologies

Oxide based nano sensors an devices as smart systems building blocks 173

Guido Faglia, University of Brescia, Italy

Efficient integration of nanomaterials on microfabricated platforms by supersonic cluster beam deposition 174

E. Barborini, G. Bertolini, P. Repetto, M. Leccardi, S. Vinati, Tethis srl, Italy

L. Lorenzelli, M. Decarli, V. Guarneri, Fondazione Bruno Kessler, Italy

P. Milani, Università di Milano, Italy

Electrostatic vibration energy harvesters for wireless autonomous transducer systems 180

G. Altena, R. van Schaijk, IMEC / Holst Centre, The Netherlands

T. Sterken, IMEC, Belgium

R. Puers, KU Leuven, Belgium

Biomolecular self-assembly for micro-scale objects 188

Martin Alberti, Erwin Yacoub-George, Sabine Scherbaum, Karlheinz Bock, Fraunhofer IZM, Germany

Progress in development of magnetically soft amorphous microwires for microsensor applications 196

A. Zhukov, M. Ipatov, J. Gonzalez, J.M. Blanco, V. Zhukova, Basque Country University, Spain

Session VI: System Integration and Packaging II

Thermal sensor with integrated flow channel for differential pressure and flow measurement 205

S. Billat, K. Kliche, R. Gronmaier, P. Nommensen, F. Hedrich, M. Ashauer, R. Zengerle, HSG-IMIT, Germany

The microBUILDER technology platform: building a microfluidic flow sensor 212

Stephan Messner, Bernd Ehrbrecht, HSG-IMIT, Germany
Andreas Vogl, Liv Furuberg, SINTEF Microsystems and Nanotechnology, Norway
Daniel Lapadatu, Infineon SensoNor, Norway
Jay Taylor, Norbert Gottschlich, thinXXS microtechnology AG, Germany

Preparation of coated Au and Cu wires and investigation on their impact on the US wedge wedge bond process 220

C. Nobis, C. Klaus, H. Hiemann, C. Wenzel, J-W. Bartha, F. Rudolf, Chemnitz University of Technology, Germany

Wired interconnections for insertion of miniaturized chips in smart fabrics 227

Dominique Vicard, Jean Brun, Bruno Mourey, Benoit Lépine, Sophie Verrun CEA-LETI, France

Innovative PCB Integration Technologies for HDI Boards in Harsh Environment (IPITECH) 233

Arnaud Grivon, Michel Brizoux, Eric Monier-Vinard, Thales Corporate Services, France
Alexandre Amedeo, Victor Tissier, Thales Communications, France

Session VII: Assembly and Interconnect Technologies

A slim out-of-plane 3D implantable CMOS based probe array 242

A.A.A. Aarts, H.P. Neves, C. Van Hoof, IMEC, Belgium
R.P. Puers, S. Katholieke Universiteit, Belgium
Herwik, K. Seidl, P. Ruther University of Freiburg, IMTEK, Germany

Interconnection in 3-D for Smart Sensors/Abandoned Sensors 248

Christian Val, Pascal Couderc, Pierre Lartigues, 3D PLUS, France

Process optimization and reliability characterization of Ni-based Microinsert

Interconnections for Flip Chip. Evaluation in Multichip Prototype 258

Herve Boutry, Jean-Charles Souriau, Jean Brun, Rémi Franiatte, Antoine

Nowodzinski, Nicolas Sillon, Gilles Poupon, CEA-LETI Minatec, France

Béatrice Dubois-Bonvalot, Frédéric Depoutot, Hardware Security Research Group

Gemalto, France

Olivier Brunet, Smart Packaging Solutions (SPS), France

Alain Peytavy, ATMEL, France

Thermo compression bonding with gold interfaces 266

Jörg Frömel, Maik Wiemer, Thomas Geßner, Fraunhofer ENAS, Germany

Marco Haubold, Chemnitz University of Technology, Germany

HYDROMEL - A European Project for future hybrid Assembly 274

Alexander Steinecker, CSEM, Switzerland

Session VIII: Smart Med Tech

Super Chip Integration Technology for Three-Dimensionally Stacked

Retinal Prostheses Chips 283

Takafumi Fukushima, Tetsu Tanaka, Mitsumasa Koyanagi, Tohoku University,

Japan

Wireless body-powered electrocardiography shirt 291

Vladimir Leonov, Tom Torfs, Inge Doms, Refet F. Yazicioglu, Ziyang Wang, Chris

Van Hoof, IMEC, Belgium

Ruud J. M. Vullers, IMEC-NL / Holst Centre, The Netherlands

Microbioreactors with microfluidic control 299

A. Buchenauer, M. Funke, J. Büchs, W. Mokwa, U. Schnakenberg, RWTH Aachen
University, Germany

**Ultra-miniature implantable pressure sensor platform for medical
applications 307**

François Gardien, Antoine Filipe, Christian Pisella, Alain Roggi, François-Xavier
Boillot, Tronics Microsystems S.A., France

**Lowcost in-vitro diagnostic cartridges with integrated sensor, micropumps
and reagents 314**

Joerg Nestler, Martin Schueller, Andreas Morschhauser, Thomas Otto,

Thomas Gessner, Fraunhofer ENAS, Germany

Albrecht Brandenburg, Fraunhofer, Germany

Dirk Michel, Frank F. Bier, Fraunhofer IBMT, Germany

Session IX: Smart Systems for Automotive, Security and Aeronautics

Towards integrated hybrid microsystems: flexible distributed pressure sensing strips 323

Ch. Bosshard, N. Schmid, M. Fretz, H.F. Knapp, T. Burch, S. Bitterli, CSEM SA, Switzerland

F. Zimmermann, P. Sollberger, HSLU, Switzerland
T.G.Harvey, Epigem Limited, United Kingdom

HUMS used to monitor different parameters in an aircraft 330

Katell Moreau, Vincent Rouet, EADS France Innovation Works, France

Development of a novel diagnosis-sensor for hydraulic shock absorbers (SALT-Sensor) 338

Daniel Wibbing, Holger Bohm, Bruno Tassinari, Daniel Warkentin, Ute Gebhard,

Festo AG & Co. KG, Germany

Cheng Qifeng, University of Stuttgart, Germany

MST enabled gas-chromatography and spectroscopy for Security, Industry, Health and Environment: state-of-the art, trends and perspectives 346

Stefano Zampolli, Ivan Elmi, Gian Carlo Cardinali, Maurizio Severi, CNR-IMM, Italy

An integrated system for automated bacteria sampling, enrichment and detection in water 354

A. Friedberger, A. Helwig, U. Reidt, C. Heller, G. Müller, EADS Innovation Works; Germany

W. Hell, K. Neumeier, L. Meixner, Fraunhofer IZM, Germany

Session X: Systems for Logistic Applications

Printed Smart Objects Enter the Internet of Things 360

Reinhard R. Baumann; Chemnitz University of Technology, Germany

IR-Ethylene Concentration Measurement in Fruit Logistics 367

Adam Sklorz, Damian Mrugala, Walter Lang, University of Bremen, Germany

FreshScan - Microsystems based spectroscopic measurements for logistic chain monitoring in the meat industry 375

Rolf Thomasius, Volker Nestler, Jin-U Kim, Herbert Reichl, Technical University of Berlin, Germany

Grace Jordan, Henning Schröder, Fraunhofer IZM, Germany

Session XI: Sensor Networks

Self diagnostic functions for smart wireless sensor networks 384
Vincent Rouet, Bruno Foucher, EADS France – Innovation Works, France

SMart Antennas system for Radio Transceivers 390
Eric Munier , EADS Secure Networks, France

A Smart Care System for Elderly People to Support Independent Living: CONFIDENCE 398
Carlos Quemada, Iñaki, Val, IKERLAN-IK4, Spain
Michał M. Pietrzyk, Thomas von der Grün, Fraunhofer Institute for Integrated Circuits, Germany
Narciso González, Anna Kämäräinen, University of Jyväskylä, Finland
Igona Vélez, CEIT-IK4, Spain

Poster Session

An Optimized Single Mask Process for Movable Bulk Silicon Micromachining Devices 408
Ali Badar Alamin Dow, University of Bremen, Germany
Ivo Rangelow, University of Ilmenau, Germany

Reliability Issues in Modeling and Simulations of the Heterogeneous Integrated Systems 412
Tomasz Bieniek, Grzegorz Janczyk, Paweł Janus, Jerzy Szynka, Piotr Grabiec, Institute of Electron Technology, POLAND

Using of reactive multilayer systems for room temperature bonding of micro components 416
Jörg Bräuer, Mario Baum, Maik Wiemer, Thomas Gessner, Fraunhofer Institution for Electronic Nanosystems, Germany

A novel hybrid polymeric electrolyte for MEMS-compatible micro fuel cells 420
C. Cané, J.P. Esquivel, N. Sabaté, A. Tarancón, N. Torres-Herrero, D. Dávila, J. Santander, I. Gràcia, Instituto de Microelectrónica de Barcelona IMB-CNM, (CSIC), Spain

3D Packaging of Medical Devices using Flip Chip on foldable Flex 424
Tomasz Debski, Hans Burkard, Josef Link, Hightec MC AG, Switzerland
Anders E. Petersen, Oticon A/S, Denmark
Barbara Pahl, Thomas Löher, Technical University of Berlin, Germany

Experimental Design for the Development of Micro System Components 428
Gerhard Fotheringham, Ivan Ndip, Stephan Guttowski, Herbert Reichl, Fraunhofer IZM, Germany

Nanopatterning-enabled inductance behaviour and equivalent circuit properties of quasi 1-D array of titania nanowires 432
L. Francioso, C. De Pascali, S. Capone, E. Melissano, M. Catalano, P. Siciliano, Institute for Microelectronics and Microsystems, Italy

Integration of Scaffolds into Bio-Microsystems for Experiments in Tissue Engineering 436
U. Fröber, M. Stubenrauch, D. Voges, M. Hoffmann, H. Witte, Ilmenau University of Technology, Germany
T. Weiß, R. Schade, G. Hildebrand, K. Liefelth, Institute for Bioprocessing and Analytical Measurement Techniques, Germany
A. Berg, M. Schnabelrauch, INNOVENT Technologieentwicklung Jena e.V., Germany

Communication Network with Self-Sufficient and Sub-Meter Localization Capabilities 440
André Froß, Daniel Froß, Ulrich Heinkel, Chemnitz University of Technology, Germany

Assembly of compatible silicon wafer modules - a challenge and key to smart system innovation 444
Michael Hintz, Olaf Brodersen, Dieter Preuß and Arndt Steinke, CiS Forschungsinstitut für Mikrosensorik und Photovoltaik GmbH, Germany

A novel method for the fabrication of deep-submicron structure 448
Chenping Jia, Jürgen Grunert, Thomas Gessner, Technical University Chemnitz, Germany
Maik Wiemer, Thomas Otto, Fraunhofer ENAS, Germany

Smart data loggers for recording environmental conditions in logistic chain 452
Jin-U Kim, Rolf Thomasius, Technical University of Berlin, Germany
Grace Jordan, Fraunhofer IZM, Germany;

High Order Derivatives Technology in Advanced MEMS Modeling 456
Vladimir Kolchuzhin, Roman Forke, Wolfram Dötzel, Jan Mehner, Chemnitz University of Technology, Germany

A MEMS-based Weather Station 460
Chia-Yen Lee, Lung-Ming Fu, National Pingtung University of Science and Technology, Taiwan
Yu-Hsiang Wang, Da-Yeh University, Taiwan
Rong-Hua Ma, Chinese Military Academy, Taiwan
Po-Cheng Chou, Shu-Te University of Science and Technology, Taiwan
Wen-Cheng Kuo, National Kaohsiung First University of Science and Technology, Kaohsiung, Taiwan

Development of Interconnections for Multilayer Organic MCMs with Chip Embeded in Si Substrate at Millimeter Wave Frequencies 464

Le Luo, Xiaoyun Ding, Fei Geng, Shanghai Institute of Microsystems & Information Technology, China

A specification environment for MEMS 468

Erik Markert, Uwe Pross, Andreas Richter, Ulrich Heinkel, Chemnitz University of Technology, Germany

Time efficient test method for dimensional parameter determination based on resonant mode detection 472

Marco Meinig, Fraunhofer Steffen Kurth, Thomas Gessner, Fraunhofer ENAS, Germany

Alexey Shaporin, Chemnitz University of Technology, Germany
Sebastian Giessmann, Suss MicroTec Test Systems GmbH, Germany

Smart jacket as a computing system for automobile warehouse logistics 476

Damian Mrugala, Walter Lang, University of Bremen, Germany
Carmen Rutherford, Bernd Scholz-Reiter, Bremer Institut für Produktion und Logistik, Germany;

Opto-electronic emitter-receiver-device with ray shaping 480

R. Müller, CiS Forschungsinstitut für Mikrosensorik und Photovoltaik GmbH, Germany
E. Förster, Fraunhofer-Institut Angewandte Optik und Feinmechanik, Germany

Advanced Micro Machining using High-Power and/or Ultrashort Pulsed Lasers 484

Tino Petsch, Thomas Höche, 3D-Micromac AG, Germany

Comparison of different approaches for the packaging of the Artificial Accommodation System 488

Liane Rheinschmitt, Ingo Sieber, Ulrich Gengenbach, Georg Bretthauer, Forschungszentrum Karlsruhe GmbH, Germany

Physical Design Automation: Determining Substrate Parameters for Vertical Integrated SiP Using Technology Aware Wiring Estimation 492

Christian Richter, Holger Dembowski, Stephan Guttowski, Fraunhofer Institute for Reliability and Microintegration, Germany
Herbert Reichl, Technical University Berlin, Germany

Smart sensors for all over industrial application niches 496

Michel Saint-Mard, Bruno Heusdens, Fabrice Haudry, Véronique Rochus , Stefanie Gutschmidt, Jacques Destiné, Jean-Claude Golinval, University of Liege, Belgium

Integrable polymeric micropumps based on a diffusor-inmembrane configuration 500

Martin Schüller, Tomas Otto, Fraunhofer ENAS, Germany
Jörg Nestler, Andreas Morschhauser, TU Chemnitz, Germany

Novel Method for Parameter Identification and Characterization of Mechanical Stress for Microsystems 504

Alexey Shaporin, Ralf Schmiedel, Jan Mehner, Chemnitz University of Technology, Germany
Detlef Billep, Fraunhofer ENAS, Germany
Johann-Peter Sommer, Fraunhofer IZM, Germany
Wilfried Bauer, Polytec GmbH, Germany

A Capacitive Temperature Sensor Concept Realized in LTCCTechnology 508

Walter Smetana, Michael Unger, Thomas Koch, Vienna University of Technology, Wien, Austria
Goran Radosavljević, Ljiljana Živanov, Faculty of Technical Sciences Novi Sad, Serbia

AlN on Silicon Cantilever Resonators for Mass Sensing Fabricated Using ICP-DRIE 512

Ü. Sökmen, E. Peiner, A. Waag, Braunschweig University of Technology, Germany
A. Ababneh, H. Seidel, Saarland University, Germany
U. Schmid, Vienna University of Technology, Austria

Process development on large-topography microstructures for thermoelectric energy harvesters 516

Jiale Su, Ruud Vullers, Martijn Goedbloed, Yvonne van Andel, IMEC/Holst Centre, The Netherlands
Vladimir Leonov, IMEC, Belgium
Ziyang Wang, KUL, Belgium

Flexible wireless biopotential system with embedded ultra-thin chip 520

Tom Torfs, Wim Christiaens, Jan Vanfleteren, Refet Firat Yazicioglu, Steven Brebels, Chris Van Hoof, IMEC, Belgium
Wim Huwel, Wim Perdu, ACB, Belgium

A critical view on residual stress analysis for MEMS characterization 524

Dietmar Vogel, Bernd Michel, Fraunhofer ENAS, Germany
Astrid Gollhardt, Ingrid Maus, Ellen Auerswald, Fraunhofer IZM, Germany
Florian Schindler-Saefkow, Technical University Berlin, Germany

The limits and challenges for power optimization and system integration in state-of-the-art Wireless Autonomous Transducer Solutions 528

Ruud Vullers, Valer Pop, Luis Caballero, Julien Penders, Rob van Schaijk, Holst Centre / IMEC, The Netherlands

Harvesting RF energy using antenna structures on foil 532

Ruud J.M. Vullers, Huib J. Visser, Valer Pop, IMEC / Holst Centre, The Netherlands
Bert Op het Veld, Philips Research Laboratories, The Netherlands

Part Integrated Aiding Structures for Adhesive Bonding of Microstructures 536

Mario Wagner, Stefan Böhm, Technical University Braunschweig, Germany

Print technologies based manufacturing of electrical energy sources for smart systems 540

Andreas Willert, Reinhard Baumann, Fraunhofer ENAS, Germany

André Kreutzer, Ulrike Geyer, Chemnitz University of Technology, Germany

Development of thin wires with granular structure exhibiting GMR effect 544

V. Zhukova, J. Gonzalez, A. Zhukov, Basque Country University, Spain

Tutorial

Fluidic Assembly and Capillary Forces: modelling, experiments and case studies 549

Pierre Lambert, Université libre de Bruxelles, Belgium

Quan Zhou, Helsinki University of Technology, Finland