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and Microsystems & Eurosenors
XXXIII
(TRANSDUCERS & EUROSENSORS XXXIII)**

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MONDAY PROGRAM

24 JUNE

08:30 - 09:10	Welcome Address General Chair: Christofer Hierold, <i>ETH Zürich, SWITZERLAND</i> Technical Program Introduction Program Chair: Jürgen Brugger <i>École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND</i>
09:00 - 09:45	Plenary Presentation I Session Chair: Karl Bohringer, <i>University of Washington, USA</i> M1A.P01 HUMAN ORGANS-ON-CHIPS N/A Donald Ingber <i>Harvard University, USA, Harvard Medical School, USA, and Boston Children's Hospital, USA</i>
09:45 - 10:00	2019 IEEE Daniel E. Noble Award for Emerging Technologies Recipient Thomas W. Kenny <i>Stanford University, USA</i>
10:00 - 10:15	2019 Transducers Early Career Award Recipient Dana Weinstein <i>Purdue University, USA</i>
10:15 - 11:00	Break and Exhibit Inspection

monday



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Session Co-Chairs: Jochen Kieninger, *University of Freiburg, GERMANY*
and Andreu Llobera, *Carl Zeiss Vision, GERMANY*

Convention Hall I - A/B

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¹*China-Japan Friendship Hospital, CHINA* and ²*Beijing University of Chemical Technology, CHINA*

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¹*Chinese Academy of Sciences (CAS), CHINA* and ²*University of Chinese Academy of Sciences, CHINA*

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¹*Sharp Corporation, JAPAN*, ²*University of Tokyo, JAPAN* and ³*Japan Science and Technology Agency (JST), JAPAN*

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²Veterans Administration Ann Arbor Healthcare System, USA

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¹Iowa State University, USA and ²University of Nebraska-Lincoln, USA

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Session Co-Chairs: Leland "Chip" Spangler, *Aspen Microsystems, LLC, USA*
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¹*University of Washington, USA, ²Deurion LLC, USA, and*

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University of Grenoble, Alpes, CEA LETI, FRANCE



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Session Co-Chairs: Danick Briand, *École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND* and Wei Wang, *Peking University, CHINA*

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¹*Chinese Academy of Sciences (CAS), CHINA*, ²*Shanghai Normal University, CHINA* and ³*Sun Yat-Sen University, CHINA*

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Industrial Stage Session 1 (Exhibit Hall)
Chair: Dave Monk, *NXP, USA*

- 1a** Heidelberg Instruments & SwissLitho, GERMANY
- 1b** scia Systems GmbH, GERMANY
- 1c** i-ROM GmbH, GERMANY
- 1d** Innovative Sensor Technology IST AG, SWITZERLAND

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Poster Session M3P and Exhibit Inspection
(refreshments will be served)
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Adjourn for the Day

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Monday Evening at the Orangerie
Charlottenburg Palace

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Berlin Oberbaumbrücke

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TUESDAY PROGRAM

25 JUNE

08:30 - 09:15	Plenary Presentation II Session Chair: Eric Yeatman, <i>Imperial College London, UK</i> T1A.P02 LEARNING CAUSAL MECHANISMS N/A Bernhard Schölkopf <i>Max Planck Institute for Intelligent Systems, GERMANY</i>
09:15 - 09:30	Transducers 2021 Announcement
09:30 - 09:45	Transition

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Statue in Berlin

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Session T1A - Lab on a Disc

Session Co-Chairs: Victor J. Cadarso, *Monash University, AUSTRALIA*
and Michael Vellekoop, *University of Bremen, GERMANY*

Convention Hall I - A/B

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¹*Hahn-Schickard, GERMANY* and ²*University of Freiburg, GERMANY*

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¹*University of California, Berkeley, USA* and
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¹*Hahn-Schickard, GERMANY* and ²*University of Freiburg, GERMANY*

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Panorama photo Berlin – House of Cultures

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Session Co-Chairs: Alissa Fitzgerald, *A.M. Fitzgerald & Associates, LLC, USA*
and Pietro Siciliano, *Institute for Microelectronics and Microsystems IMM-CNR, ITALY*

Convention Hall I - C

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²Shenzhen CoilEasy Technologies Limited, CHINA,
³University of Electronic Science and Technology of China, CHINA, and
⁴Mornsun Guangzhou Science & Technology Co., Ltd., CHINA

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University of Leuven (KU Leuven), BELGIUM

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Session Co-Chairs: Donatella Puglisi, *Linköping University, SWEDEN*
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Session T1E - Fabrication Technologies I

Session Co-Chairs: Michel Despont, *CSEM SA, SWITZERLAND*
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¹Toyohashi University of Technology, JAPAN and

²Japan Science and Technology Agency (JST), JAPAN

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¹Physikalisch-Technische Bundesanstalt, GERMANY and

²Technical University Braunschweig, GERMANY

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Leo Tsai, Vincent Teng, Chih-Ming Chen, Terrence Yu,
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Taiwan Semiconductor Manufacturing Company (TSMC), TAIWAN

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¹Chinese Academy of Sciences (CAS), CHINA and

²University of Chinese Academy of Sciences, CHINA

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Session T2A - Microfluidics I

Session Co-Chairs: Uwe Schnakenberg, *RWTH Aachen University, GERMANY*
and Niels Tas, *University of Twente, THE NETHERLANDS*

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¹*Vietnam National University, VIETNAM*, ²*Hanoi University of
Science and Technology, VIETNAM*, ³*Ritsumeikan University,
JAPAN*, ⁴*University of Southern Queensland, AUSTRALIA*, and
⁵*Griffith University, AUSTRALIA*

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Dakshitha B. Anandakumar, and A. Fatih Sarioglu
Georgia Institute of Technology, USA

11:45 - 12:00

T2A.003 MICROFLUIDIC FABRICATION OF LIQUID-MEDIATED MATERIALS INTO MULTIPLE HETEROGENEOUS AND NETWORKED NANOSTRUCTURES 206

Juyeol Bae, Jun Gyu Park, and Taesung Kim
Ulsan National Institute of Science and Technology (UNIST), KOREA

12:00 - 12:15

T2A.004 PICOLITER DROPLET GENERATION FOR FAST MONITORING THE BRAIN CHEMISTRY WITH SCALED SILICON NANODIALYSIS PROBE 209

Yan Zhang, Ari Esters, Oscar Bi, and Yurii Vlasov
University of Illinois, Urbana-Champaign, USA

12:15 - 12:30

T2A.005 Z-AXIS CONTROLLABLE MILLE-FEUILLE ELECTRODE ELECTROROTATION DEVICE UTILIZING LEVITATION EFFECT 213

Yuki Okamoto¹, Taku Tsuchiya¹, Charles Moslonka⁵, Yu-Sheng Lin²,
Sung Tsang³, Frédéric Marty⁴, Ayako Mizushima¹, Chen-li Sun³,
Hsiang-Yu Wang², Agnès Tixier-Mita¹, Olivier Français³,
Bruno Le Pioufle⁵, and Yoshio Mita¹
¹*University of Tokyo, JAPAN*, ²*National Tsing Hua University, TAIWAN*,
³*National Taiwan University, TAIWAN*, ⁴*ESIEE Paris, FRANCE*, and
⁵*École normale supérieure Paris-Saclay, FRANCE*

12:30 - 12:45

T2A.006 SOFT SPIRAL-SHAPED MICRO-SWIMMER WITH PROPULSION FORCE CONTROL BY PITCH CHANGE 217

Koki Yoshida and Hiroaki Onoe
Keio University, JAPAN



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Session T2B - E&M Field Sensors II

Session Co-Chairs: Honglong Chang, *Northwestern Polytechnical University, CHINA* and Franz Laermer, *Robert Bosch GmbH, GERMANY*

Convention Hall I - C

11:15 - 11:45

- T2B.001 INVITED SPEAKER**
QUANTUM SENSORS IN DIAMOND: TECHNOLOGY ROADMAP **N/A**
Christian Degen¹, Gabriel Puebla-Hellmann^{1,2}, and Jan Rhensius^{1,2}
¹ETH Zürich, SWITZERLAND and ²QZabre LLC, SWITZERLAND



tuesday

11:45 - 12:00

- T2B.003 A MICROASSEMBLED TRIANGULAR-PRISM-SHAPE THREE-DIMENSIONAL ELECTRIC FIELD SENSOR** **222**
Biyun Ling^{1,2}, Chunrong Peng¹, Ren Ren¹, Fengjie Zheng¹, Zhaozhi Chu¹, Zhouwei Zhang^{1,2}, Hucheng Lei^{1,2}, and Shanhong Xia^{1,2}
¹Chinese Academy of Sciences (CAS), CHINA and
²University of Chinese Academy of Sciences, CHINA

12:00 - 12:15

- T2B.004 A MODE-LOCALIZED VOLTMETER WITH RESOLUTION OF 46.8 NANOVOLTS** **226**
Jiaju Liang, Yongcun Hao, Hao Kang, Bing Ruan, and Honglong Chang
Northwestern Polytechnical University, CHINA

12:15 - 12:30

- T2B.005 INTEGRATING MICROSYSTEMS WITH METAMATERIALS TOWARDS METADEVICES**.....**230**
Xiaoguang Zhao, Chunxu Chen, Aobo Li, Guangwu Duan, Joseph Paller, and Xin Zhang
Boston University, USA

End of Session T2B - E&M Field Sensors II



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Session T2C - Ultrasonic II

Session Co-Chairs: Nuria Barniol, *Universitat Autònoma de Barcelona, SPAIN*
and Yu-Ting Cheng, *National Chiao Tung University, TAIWAN*

Convention Hall I - D

11:15 - 11:30

- T2C.001 **FULLY TRANSPARENT PIEZOELECTRIC ULTRASONIC
TRANSDUCER WITH 3D PRINTED SUBSTRATE** 234

Sedat Pala and Liwei Lin
University of California, Berkeley, USA

11:30 - 11:45

- T2C.002 **SPURIOUS MODE FREE HEXAGONAL PMUT ARRAY** 238

Yuri Kusano, Guo-Lun Luo, and David A. Horsley
University of California, Davis, USA

11:45 - 12:15

- T2C.003 **INVITED SPEAKER
MEMS TRANSDUCERS FOR NON-INVASIVE ULTRASOUND
BRAIN STIMULATION** 242

Hyungguk Kim, Seongyeon Kim, Sang-Mok Lee, Byung Bum Kang,
Yehhyun Jo, Geon Kook, Chaerin Oh, Mi Kyung Kim, Hyojung Kim,
and **Hyunjoo J. Lee**
Korea Advanced Institute of Science and Technology (KAIST), KOREA

tuesday



12:15 - 12:30

- T2C.005 **CHARACTERIZATION OF EPITAXIAL-PZT/SI PIEZOELECTRIC
MICROMACHINED ULTRASONIC TRANSDUCER (PMUT)
AND ITS PHASED ARRAY SYSTEM** 246

Ziyi Liu¹, Shinya Yoshida¹, Toshiaki Horie², Shoji Okamoto²,
Ryouichi Takayama², and Shuji Tanaka¹
¹ *Tohoku University, JAPAN* and ² *Panasonic Corporation, JAPAN*

12:30 - 12:45

- T2C.006 **FLEXIBLE SOI-BASED PIEZOELECTRIC MICROMACHINED
ULTRASOUND TRANSDUCER (PMUT) ARRAYS** 250

Sina Sadeghpour, Bram Lips, Michael Kraft, and Robert Puers
University of Leuven (KU Leuven), BELGIUM



Session T2D - Nanoscale Devices & Experiments

Session Co-Chairs: Joan Bausells, *CSIC, SPAIN*
and Jongbaeg Kim, *Yonsei University, KOREA*

Hall Europa

11:15 - 11:30

- T2D.001 FREQUENCY TUNING OF TWO-DIMENSIONAL NANO-ELECTROMECHANICAL RESONATORS VIA COMB-DRIVE MEMS ACTUATORS** 254

Yong Xie^{1,2}, Jaesung Lee¹, Hao Jia¹, and Philip X.-L. Feng¹

¹Case Western Reserve University, USA and ²Xidian University, CHINA

11:30 - 11:45

- T2D.002 AN ULTRABROADBAND INFRARED OPTICAL MODULATOR OF 3D NANOANTENNA FABRICATED BY FOCUSED ION BEAM - STRESS INDUCED DEFORMATION** 258

Xiaoyu Chen, Yifei Mao, Zhuojie Chen, Shengxiao Jin, Wengang Wu, Jun Xu, and Rui Zhu

Peking University, CHINA

11:45 - 12:00

- T2D.003 MICRO-REACTOR CHIP FOR REAL-TIME OBSERVING METAL-ORGANIC FRAMEWORK (MOF) NANOCRYSTALS GROWN UNDER *IN-SITU* TRANSMISSION ELECTRON MICROSCOPY** 262

Xueqing Wang^{1,2}, Pengcheng Xu¹, Haitao Yu¹, and Xinxin Li¹

¹Chinese Academy of Sciences (CAS), CHINA and

²University of Chinese Academy of Sciences, CHINA

12:00 - 12:15

- T2D.004 ENGINEERING TUNABLE STRAIN FIELDS IN SUSPENDED GRAPHENE BY MICRO ELECTROMECHANICAL SYSTEMS** 266

Jens Sonntag^{1,2}, Matthias Goldsche^{1,2}, Tymofiy Khodkov¹,

Gerard Verbiest¹, Sven Reichardt³, Nils von den Driesch²,

Dan Buca², and Christoph Stampfer^{1,2}

¹RWTH Aachen University, GERMANY, and ²Forschungszentrum

Jülich, GERMANY, and ³University of Oxford, UK

12:15 - 12:30

- T2D.005 CONCENTRATION MATCH BASED DILUTION FOR CLOGGING-FREE FILTRATION THROUGH MICROPORE ARRAYS** 270

Yaoping Liu¹, Xinyue Deng^{1,2}, Jingquan Liu³, and Wei Wang^{1,3}

¹Peking University, CHINA, ²Peking University Health Science

Center, CHINA, and ³Shanghai Jiao Tong University, CHINA

12:30 - 12:45

- T2D.006 ENRICHMENT OF EXTRACELLULAR VESICLES VIA LIPID NANOPROBE-FUNCTIONALIZED NANOSTRUCTURED SILICA MICRODEVICE** 273

Yuan Wan^{1,2}, Mackenzie Maurer², Hong-Zhang He², Yi-Qiu Xia²,

Wen-Long Zhang², Si-Jie Hao², Nelson Yee³, and Si-yang Zheng²

¹Binghamton University, USA, ²Pennsylvania State University, USA, and

³Penn State College of Medicine, USA

tuesday



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Session T2E - Fabrication Technologies II

Session Co-Chairs: Nicole Kerness, *Kionix, USA*
and Frank Niklaus, *KTH Royal Institute of Technology, SWEDEN*

Room 1 (upstairs)

tuesday

11:15 - 11:30

- T2E.001 A NOVEL METHOD FOR MEMS WAFER-LEVEL PACKAGING: SELECTIVE AND RAPID INDUCTION HEATING FOR COPPER-TIN SLID BONDING** 277
Christian Hofmann¹, Alexander Froehlich², Jonas Kimme²,
Maik Wiemer¹, and Thomas Otto^{1,2}
¹Fraunhofer ENAS, GERMANY and ²Chemnitz University of
Technology, GERMANY

11:30 - 11:45

- T2E.002 CHARACTERIZATION OF ORIENTATION-DEPENDENT ETCHING PROPERTIES AND SURFACE MORPHOLOGY OF SAPPHIRE CRYSTAL IN WET ETCHING** 281
Yan. Xing¹, Zhiyue. Guo¹, Guorong Wu¹, and Miguel A. Gosálvez²
¹Southeast University, CHINA and
²University of the Basque Country, SPAIN

11:45 - 12:00

- T2E.003 MOLDING/ENCAPSULATION/INTEGRATION APPROACH FOR TACTILE-BUMP AND SENSING-INTERFACE OF INDUCTIVE TACTILE SENSOR** 285
Sheng-Kai Yeh and Weileun Fang
National Tsing Hua University, TAIWAN

12:00 - 12:15

- T2E.004 A GENERIC CMOS COMPATIBLE PIEZOELECTRIC MULTILAYER ACTUATOR APPROACH BASED ON PERMANENT FERROELECTRIC POLARIZATION INVERSION IN AL1-X SCXN** 289
Simon Fichtner^{1,2}, Dirk Kaden¹, Fabian Lofink¹,
and Bernhard Wagner^{1,2}
¹Fraunhofer ISIT, GERMANY and ²University of Kiel, GERMANY

12:15 - 12:45

- T2E.005 INVITED SPEAKER**
EVOLVING FUNCTIONALITY IN DISORDERED NANOSYSTEMS N/A
Wilfred G. van der Wiel
University of Twente, THE NETHERLANDS



12:45 - 14:30 Lunch on Own in Exhibit Hall



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13:30 - 14:30

Industrial Stage Session 2 (Exhibit Hall)

Chair: Francois Dion, *Teledyne DALSA, CANADA*

- 2a SPTS Technologies LTD, UK
- 2b Robert Bosch GmbH, GERMANY
- 2c IntelliSense Software Corp., USA
- 2d Nanoscribe GmbH, GERMANY

14:30 - 16:30

Poster Session T3P and Exhibit Inspection

(refreshments will be served)

Poster presentations are listed by topic category with their assigned number starting on page 51.



Berlin Cathedral, Berliner Dom

tuesday

Session T4A - *In-Vivo* Sensing

Session Co-Chairs: Ryuji Yokokawa, *Kyoto University, JAPAN*
and Wei Wang, *Peking University, CHINA*

Convention Hall I - A/B

tuesday

16:30 - 16:45

- T4A.001 BIODEGRADABLE POLYMER MICRO ACTUATOR WITH MULTI-DEGREES OF FREEDOM MOTION AND MULTI-STAGE RESPONSE FOR COMPLETE IMPLANTABLE MEDICAL DEVICE AND ROBOTS** 294

Yoshinori Inoue^{1,2}, Shigeki Narushima¹, Masashi Ikeuchi¹,
and Koji Ikuta^{1,2}

¹University of Tokyo, JAPAN and ²Osaka University, JAPAN

16:45 - 17:00

- T4A.002 A WIRELESS FLEXIBLE WEARABLE BIOPOTENTIAL ACQUISITION SYSTEM UTILIZING PARYLENE BASED MICRONEEDLE ARRAY** 298

Dong Huang¹, Hancong Wang², Junshi Li¹, Yufeng Chen¹,
and Zhihong Li¹

¹Peking University, CHINA and ²University of Electronic
Science and Technology of China, CHINA

17:00 - 17:15

- T4A.003 FLOATING 5- μ M-DIAMETER NEEDLE FOR LOW INVASIVE CHRONIC RECORDING** 302

Koji Yamashita¹, Hirohito Sawahata², Shota Yamagiwa¹,
Rika Numano¹, Kowa Koida¹, and Takeshi Kawano¹

¹Toyohashi University of Technology, JAPAN and ²National Institute
of Advanced Industrial Science and Technology (AIST), JAPAN

17:15 - 17:30

- T4A.004 FABRICATION OF CONTACT LENS DEVICE WITH INTEGRATED MICROTUBES FOR *IN SITU* EXTENDED DRUG DELIVERY FOR OCULAR DISEASE TREATMENT** 306

Xiaoke Ding, Chao Song, and Long Que
Iowa State University, USA

17:30 - 17:45

- T4A.005 TESTING A MULTI-SENSOR SYSTEM FOR HYDROCEPHALUS MONITORING IN EXTERNAL VENTRICULAR DRAINS** 310

Trevor Hudson¹, Alexander Baldwin¹, Eisha Christian¹,
J. Gordon McComb², and Ellis Meng¹

¹University of Southern California, USA and

²Children's Hospital Los Angeles, USA

17:45 - 18:00

- T4A.006 INTEGRATED CAPSULE SYSTEM FOR GASTROINTESTINAL PH TRIGGERED SAMPLING AND SENSING** 314

George E. Banis, Luke A. Beardslee, Justin M. Stine,
Rajendra Mayavan Sathyam, and Reza Ghodssi
University of Maryland, USA



Session T4B - Hydrogen Sensing

Session Co-Chairs: Karl Bohringer, *University of Washington, USA*
and Thomas Maeder, *EPFL, SWITZERLAND and MIPT, RUSSIA*

Convention Hall I - C

16:30 - 16:45

- T4B.001 SYNERGISTIC ENHANCEMENT EFFECT OF PALLADIUM-SILVER ALLOY NANOPARTICLE CATALYSTS TOWARDS HIGH-SENSITIVE HYDROGEN DETECTION** 318

Dongsheng Xu^{1,2}, Dan Zheng², Pengcheng Xu¹, Ying Chen¹,
and Xinxin Li¹

¹Chinese Academy of Sciences (CAS), CHINA and

²Shanghai Institute of Technology, CHINA

16:45 - 17:00

- T4B.002 A CMOS-BASED THERMO-ELECTROCATALYTIC GAS SENSOR FOR SELECTIVE AND LOW-LEVEL DETECTION OF CARBON MONOXIDE AND HYDROGEN** 322

Claudio Zuliani¹, Richard Hopper¹, Marco Musto¹,

Andrea De Luca², Claudio Falco², and Florin Udrea²

¹ams Sensors UK, UK and ²University of Cambridge, UK

17:00 - 17:15

- T4B.003 HIGHLY SENSITIVE AND SELECTIVE HYDROGEN GAS SENSOR WITH PLATINUM NANOPARTICLES LINKED BY 4,4''-DIAMINO-P-TERPHENYL (DATER)** 326

Anmona S. Pranti, Daniel Loof, Sebastian Kunz, Volkmar Zielasek,

Marcus Bäumer, and Walter Lang

University of Bremen, GERMANY

17:15 - 17:30

- T4B.004 HYDROGEN ION IMAGE SENSOR WITH BARREL-ARRAY DIFFUSION SUPPRESSOR AND HIPPOCAMPAL SLICE IMAGING** 330

Yuuta Ogaeri¹, Chinatsu Kawakami¹, Takeshi Hizawa¹,

Eiji Shigetomi², Youichi Shinozaki², Tatsuya Iwata¹,

Toshihiko Noda¹, Kazuhiro Takahashi¹, Schuichi Koizumi²,

and Kazuaki Sawada¹

¹Toyohashi University of Technology, JAPAN and

²University of Yamanashi, JAPAN

17:30 - 17:45

- T4B.005 SELF-POWERED, ULTRA-RELIABLE HYDROGEN SENSOR EXPLOITING CHEMOMECHANICAL NANO-TRANSDUCER AND SOLAR-CELL** 334

Min-Ho Seo, Kyungnam Kang, Jae-Shin Lee, Yongrok Jeong,

Seunghye Lee, Inkyu Park, and Jun-Bo Yoon

Korea Advanced Institute of Science and Technology (KAIST), KOREA

17:45 - 18:00

- T4B.006 INTEGRATED RESONANT DUAL-MICROCANTILEVERS COMBINED SENSOR WITH ACCURATE IDENTIFICATION AND HIGHLY-SENSITIVE DETECTION TO H₂S GAS** 338

Lei Tang^{1,2}, Pengcheng Xu¹, Ming Li¹, Haitao Yu¹, and Xinxin Li¹

¹Chinese Academy of Sciences (CAS), CHINA and

²Shanghai Normal University, CHINA

tuesday

Session T4C - Energy & Power MEMS I

Session Co-Chairs: Peter Enoksson, *Chalmers University of Technology, SWEDEN*
and Xiaohong Wang, *Tsinghua University, CHINA*

Convention Hall I - D

tuesday

16:30 - 16:45

- T4C.001 STUDY ON THE INFLUENCE OF FERROELECTRIC MATERIALS ON THE OUTPUT PERFORMANCE OF TRIBOELECTRIC NANOGENERATORS** 342
Xin Chen¹, Lingxiao Gao¹, Junfei Chen¹, Mengke Qi¹,
Dongxiao Li¹, Shaokun Zeng², and Xiaojing Mu¹
¹Chongqing University, CHINA and ²Chongqing University of
Science and Technology, CHINA

16:45 - 17:00

- T4C.002 A CONDITIONING SYSTEM FOR HIGH-VOLTAGE ELECTROSTATIC/TRIBOELECTRIC ENERGY HARVESTERS USING BENNET DOUBLER AND SELF-ACTUATED HYSTERESIS SWITCH** 346
Hemin Zhang¹, Dimitri Galayko², and Philippe Basset¹
¹University Paris-Est, FRANCE and ²Sorbonne Université, FRANCE

17:00 - 17:15

- T4C.003 MEMS PIEZOELECTRIC ENERGY HARVESTER POWERED WIRELESS SENSOR MODULE DRIVEN BY NOISY BASE EXCITATION** 350
Sijun Du^{1,2}, Yu Jia³, Emmanuelle Arroyo¹, Sandra Fernandez⁴,
Stephen T. Riches⁵, and Ashwin A. Seshia¹
¹University of Cambridge, UK, ²University of California, Berkeley,
³Aston, University, UK, ⁴McLaren Applied Technologies, UK, and
⁵Tribus-D, UK

17:15 - 17:30

- T4C.004 BROADBAND ENERGY HARVESTING USING BI-STABILITY AND FREQUENCY UP-CONVERSION FOR SELF-POWERED SENSING IN INTERNET OF THINGS** 354
Hailing Fu, Zahra Sharif Khodaei, and M.H. Ferri Aliabadi
Imperial College London, UK

17:30 - 17:45

- T4C.005 A MEMS-BASED BI-STABLE ELECTROMAGNETIC ENERGY HARVESTER WITH A FULLY INTEGRATED NICKEL-BASED CLOSED MAGNETIC CIRCUIT** 358
Kai Wang, Xuhan Dai, Xiaojian Xiang, Guifu Ding, and Xiaolin Zhao
Shanghai Jiao Tong University, CHINA

17:45 - 18:00

- T4C.006 A 1.3 MILLIWATTS ELECTROSTATIC VIBRATIONAL ENERGY HARVESTER WITH MINIMAL REACTIVE POWER THROUGH REDUCED INTERNAL STRAY CAPACITANCES** 362
Hiroaki Honma, Yukiya Tohyama, and Hiroshi Toshiyoshi
University of Tokyo, JAPAN



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Session T4D - Wearable Sensors

Session Co-Chairs: Beomjoon Kim, *University of Tokyo, JAPAN*
and Yao-Joe Yang, *National Taiwan University, TAIWAN*

Hall Europa

16:30 - 16:45

- T4D.001** **HIGHLY SENSITIVE AND RELIABLE STRAIN SENSOR BASED ON MoS₂-DECORATED LASER-SCRIBED GRAPHENE FOR WEARABLE ELECTRONICS** 366

Ashok Chhetry, Hyosang Yoon, Md. Sharifuzzaman, and Jae Y. Park
Kwangwoon University, KOREA

16:45 - 17:00

- T4D.002** **HIGHLY SENSITIVE CHARGE-COUPLE DEVICE-BASED FLEXIBLE PH SENSOR FOR WEARABLE HEALTH CARE APPLICATION** 370

Mao Shiomi, Shogo Nakata, Yusuke Fujita, Takayuki Arie, Seiji Akita, and Kuniharu Takei
Osaka Prefecture University, JAPAN

17:00 - 17:15

- T4D.003** **WIDE RANGE-SENSITIVE, BENDING-INSENSITIVE PRESSURE DETECTION AND APPLICATION TO WEARABLE HEALTHCARE DEVICE** 374

Seunghwan Kim¹, Morteza Amjadi², Tae-Ik Lee¹, Yongrok Jeong¹, Donguk Kwon³, Min Seong Kim¹, Kyuyoung Kim¹, Taek-Soo Kim¹, Yong Suk Oh^{1,3}, and Inkyu Park¹
¹*Korea Advanced Institute of Science and Technology (KAIST), KOREA*,
²*Max-Planck Institute for Intelligent Systems, GERMANY* and
³*Northwestern University, USA*

17:15 - 17:30

- T4D.004** **TRANSIENT EPIDERMAL ELECTRONIC AND OPTOELECTRONIC DEVICES FOR MULTIDIMENSIONAL PHYSIOLOGICAL MONITORING** 378

Yujia Zhang¹, Long Sun¹, Shan Zhang¹, Feihong Xu², and Tiger H. Tao^{1,3,4}
¹*Chinese Academy of Sciences (CAS), CHINA*, ²*Northwestern Polytechnic University, CHINA*, ³*University of Chinese Academy of Sciences, CHINA* and ⁴*Shanghai Technical University, CHINA*

17:30 - 17:45

- T4D.005** **A FLEXIBLE PRESSURE SENSOR WITH HIGH SENSITIVITY AND BROAD MEASURING RANGE** 381

Shuai Zhao and Rong Zhu
Tsinghua University, CHINA

17:45 - 18:00

- T4D.006** **THERMAL IMPRINTED SELF-POWERED TRIBOELECTRIC FLEXIBLE SENSOR FOR SIGN LANGUAGE TRANSLATION** 385

Pukar Maharjan, Trilochan Bhatta, and Jae Yeong Park
Kwangwoon University, KOREA

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Session T4E - Assembly & Self-Assembly

Session Co-Chairs: Max Fleischer, *Siemens AG, GERMANY*
and Man Wong, *Hong Kong University of Science & Technology, HONG KONG*

Room 1 (upstairs)

16:30 - 17:00

- T4E.001 INVITED SPEAKER**
PRECISE PLACEMENT OF NANO-SPHERES AND -WIRES
UTILIZING BROWNIAN MOTORS IN A TUNABLE
NANOFLUIDIC CONFINEMENT **N/A**
Armin W. Knoll, Christian Schwemmer, Stefan Fringes,
and Colin Rawlings
IBM Research, SWITZERLAND



17:00 - 17:15

- T4E.003 PROGRAMMABLE MICRO-OBJECT ASSEMBLY**
WITH TRANSFER **390**
Eugene M. Chow
PARC, USA

17:15 - 17:30

- T4E.004 HIGH-ASPECT-RATIO NEEDLE-SHAPED MOLD FABRICATION**
USING ROSENWEIG INSTABILITY IN FERROFLUIDS **394**
Babak Assadsangabi, Sayed Mohammad Hashem Jayhooni,
Tynan Stack, and Kenichi Takahata
University of British Columbia, CANADA

17:30 - 17:45

- T4E.005 RAPID ASSEMBLY OF DNA ORIGAMI IN MICROFLUIDIC**
TEMPERATURE GRADIENT **398**
Kentaro Kawai¹, Keita Hara¹, Ryota Nakamura¹, Kenta Arima¹,
Kazuya Yamamura¹, and Osamu Tabata²
¹*Osaka University, JAPAN* and ²*Kyoto University, JAPAN*

17:45 - 18:00

- T4E.006 FLUIDIC SELF-ASSEMBLY TRANSFER TECHNOLOGY**
FOR MICRO-LED DISPLAY **402**
Seongkyu Cho¹, Daewon Lee¹, and Sunghoon Kwon^{1,2}
¹*Seoul National University, KOREA* and
²*Seoul National University Hospital, KOREA*

18:00

Adjourn for the Day

tuesday



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Industry Start-Up Session

Session Chair:

Felix Mayer, SENSIRION - The Sensor Company, SWITZERLAND

Hall Europa

18:15 - 18:35

T5D.001 KEYNOTE SPEAKER

THE NEW RISE OF HARD TECH STARTUPS - PERSPECTIVES OF A VENTURE CAPITAL INVESTOR

Steffen Wagner

investiere - Venture Capital, SWITZERLAND

18:35 - 18:45

T5D.002 A UNIVERSITY SPIN-OFF EXPERIENCE: FROM THE IDEA TO THE FIRST SAMPLES

Andrea De Luca

Flusso, UK

18:45 - 18:55

T5D.003 memetis - FROM MODEL TRAINS TO LAB ON A CHIP

Marcel Gültig

memetis GmbH, GERMANY

18:55 - 19:05

T5D.004 MuVaP: HIGH-PERFORMANCE MICRO-VALVES-AND-PUMPS

Ardavan Shabanian

muVaP GmbH, GERMANY

19:05 - 19:15

T5D.005 MEMS-CASTING TECHNOLOGY AND ITS APPLICATIONS

Jiebin Gu

Shanghai MCT semiconductors, Co., Ltd., CHINA

19:15 - 19:25

T5D.006 FILM BULK ACOUSTIC RESONATOR (FBAR) AS NEXT GENERATION MULTI-APPLICATION SENSOR

Mario De Miguel Ramos

Sorex Sensors Ltd., UK

19:25 - 19:35

T5D.007 MEMS-BASED SPECTROCHIP IMPLEMENTED TO HOME HEALTHCARE, FOOD SAFETY, AND BLOCKCHAIN APPLICATION

Cheng-Hao Ko

Spectrochip Inc., TAIWAN

19:35 - 19:50

T5D.008 INVITED SPEAKER

MEMS, SENSORS, AND MICROTECHNOLOGY STARTUPS: CURRENT AND EMERGING TRENDS

Mike Pinelis

Microtech Ventures, USA

19:50 - 20:30

Mixer

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WEDNESDAY PROGRAM

26 JUNE

08:30 - 09:15	Plenary Presentation III Session Chair: Man Wong, Hong Kong University of Science & Technology, HONG KONG W1A.P03 FROM ARECIBO TO FAST, THE KINSHIP BETWEEN IMPOSSIBLE DREAMS N/A Di Li ^{1,2} and the FAST Team ¹ Chinese Academy of Sciences (CAS), CHINA and ² University of Chinese Academy of Sciences, CHINA
09:15 - 09:30	EUROSENSORS 2020 Announcement
09:30 - 09:45	Transition

wednesday



TV tower and World Clock at Alexanderplatz

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Session W1A - Bio Mechanics

Session Co-Chairs: Michel Despont, *CSEM SA, SWITZERLAND*
and Andreas Dietzel, *Technische Universität Braunschweig, GERMANY*

Convention Hall I - A/B

09:45 - 10:00

- W1A.001 A MONOLITHIC POLYDIMETHYLSILOXANE PLATFORM FOR ZOOSPORE CAPTURE, GERMINATION AND SINGLE HYPHA FORCE SENSING 409**
Yiling Sun, Ayelen Tayagui, Ashley Garrill, and Volker Nock
University of Canterbury, NEW ZEALAND

10:00 - 10:15

- W1A.002 SHAPE DEFORMATION ANALYSIS OF SINGLE CELL IN 3D TISSUE UNDER MECHANICAL STIMULI 413**
Keitaro Kasahara¹, Yuta Kurashina², Shigenori Miura³,
Shogo Miyata¹, and Hiroaki Onoe¹
¹*Keio University, JAPAN*, ²*Tokyo Institute of Technology, JAPAN*, and
³*University of Tokyo, JAPAN*

10:15 - 10:30

- W1A.003 TENSILE CHARACTERIZATION OF THIN BIOMEMBRANE 417**
Shinya Sakuma, Yuhao Gao, Yuichi Murozaki, and Fumihito Arai
Nagoya University, JAPAN

10:30 - 10:45

- W1A.004 A MICROTAS FOR LIQUID SAMPLE BULK MODULUS SCREENING 421**
Xi Zhang, Yao Lu, Menglun Zhang, Hongxiang Zhang,
Qingrui Yang, and Wei Pang
Tianjin University, CHINA

wednesday



The Reichstag building or Deutscher Bundestag

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Session W1B - Accelerometers and Gyros I

Session Co-Chairs: Clark Nguyen, University of California, Berkeley, USA
and Shuji Tanaka, Tohoku University, JAPAN

Convention Hall I - C

09:45 - 10:15

W1B.001 INVITED SPEAKER

FREQUENCY MODULATED MEMS GYROSCOPES: RECENT DEVELOPMENTS, CHALLENGES AND OUTLOOK 425

Giacomo Langfelder, Paolo Minotti, Valentina Zega,
Claudia Comi, Cristiano R. Marra, Mauro Leoncini,
and Marco Bestetti
Politecnico di Milano, ITALY



10:15 - 10:30

W1B.003 3-AXIS CATCH-AND-RELEASE GYROSCOPE WITH PANTOGRAPH VIBRATION FOR LOW-POWER AND FAST START-UP APPLICATIONS 430

Akiko Yuzawa¹, Ryunosuke Gando¹, Kei Masunishi¹,
Etsuji Ogawa¹, Hiroki Hiraga¹, Yasushi Tomizawa¹,
Tetsuro Itakura¹, and Tamio Ikehashi²

¹ Toshiba Corporation, JAPAN and ² Waseda University, JAPAN

10:30 - 10:45

W1B.004 A NOVEL MICRO SHELL RESONATOR GYROSCOPE WITH SIXTEEN T-SHAPE MASSES 434

Wei Li, Xiang Xi, Kun Lu, Yan Shi, Zhanqiang Hou, Yulie Wu,
Xuezhong Wu, and Dingbang Xiao

National University of Defense Technology, CHINA

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The Potsdamer Platz

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Session W1C - RF MEMS I

Session Co-Chairs: Farrokh Ayazi, *Georgia Institute of Technology, USA*
and Alfons Dehé, *Hahn-Schickard Gesellschaft, GERMANY*

Convention Hall I - D

09:45 - 10:00

**W1C.001 ANALYTICAL MODEL AND EXPERIMENTS OF PHASE NOISE
IN OVEN-CONTROLLED MEMS RESONATORS 438**

Heng Yang¹, Ke Sun¹, Binbin Pei^{1,2}, Peng Zhong^{1,2}, and Xinxin Li²

¹*Chinese Academy of Sciences (CAS), CHINA and*

²*University of Chinese Academy of Sciences, CHINA*

10:00 - 10:15

**W1C.002 IMAGING MULTIMODE VIBRATIONS IN HIGH-FREQUENCY
ALUMINUM NITRIDE PIEZOELECTRIC
NANOMEMBRANE RESONATORS 442**

Hao Jia¹, Matthew H. Matheny², Michael L. Roukes²,
and Philip X.-L. Feng¹

¹*Case Western Reserve University, USA and*

²*California Institute of Technology, USA*

10:15 - 10:30

**W1C.003 HIGH-Q UHF AND SHF BULK ACOUSTIC WAVE RESONATORS
WITH TEN-NANOMETER HF0.5ZR0.5O2
FERROELECTRIC TRANSDUCER 446**

Mayur Ghatge, Glen Walters, Toshikazu Nishida,
and Roozbeh Tabrizian

University of Florida, USA

10:30 - 10:45

**W1C.004 A 10 GHZ SINGLE-CRYSTALLINE SCANDIUM-DOPED
ALUMINUM NITRIDE LAMB-WAVE RESONATOR 450**

Mingyo Park¹, Zhijian Hao¹, Dea Gyu Kim¹, Andrew Clark²,
Rytis Dargis², and Azadeh Ansari¹

¹*Georgia Institute of Technology, USA and* ²*IQE Plc, USA*

wednesday



Panoramic image of Berlin Cathedral and Museum Island in Berlin during sunrise.

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Session W1D - Tactile Sensors I

Session Co-Chairs: Amy Duwel, *Draper, Inc., USA* and
Jun-Bo Yoon, *Korea Advanced Institute of Science and Technology (KAIST), KOREA*

Hall Europa

09:45 - 10:00

- W1D.001** **SIMULTANEOUS MEASUREMENT OF SURFACE TEXTURE
AND ELASTICITY USING TACTILE SENSOR WITH
DIFFERENTLY PROTRUDED CONTACTOR ARRAY** **454**
Kazuki Watatani, Kyohei Terao, Fusao Shimokawa, and Hidekuni Takao
Kagawa University, JAPAN

10:00 - 10:15

- W1D.002** **A HIGHLY SENSITIVE CAPACITIVE PRESSURE SENSOR
WITH MICRODOME STRUCTURE FOR ROBOT
TACTILE DETECTION** **458**
Shan Wang, Kuan-Hua Huang, and Yao-Joe Yang
National Taiwan University, TAIWAN

10:15 - 10:45

- W1D.003** **INVITED SPEAKER
ADVANCEMENTS IN POLYMERIC CAPACITIVE
TACTILE SENSORS** **462**
Cheng-Yao Lo
National Tsing Hua University, TAIWAN

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Session W1E - Optical Elements & Systems

Session Co-Chairs: Adrian Neild, *Monash University, AUSTRALIA*
and Man Wong, *Hong Kong University of Science & Technology, HONG KONG*

Room 1 (upstairs)

09:45 - 10:00

- W1E.001 ASSESSMENT OF ADDITIVE MANUFACTURING PROCESSES FOR MONOLITHIC DIFFRACTIVE-REFRACTIVE MICRO-COMPONENTS** 466

Johannes Wolf¹, Susanne Grützner¹, Margit Ferstl²,
Arne Schleunitz¹, and Gabi Grützner¹

¹Micro Resist Technology GmbH, GERMANY and

²Fraunhofer HHI, GERMANY

10:00 - 10:15

- W1E.002 NEXT GENERATION OF HIGHLY MINIATURIZED BULK-MEMS FABRY-PÉROT FILTERS FOR INFRARED MICROSPECTROMETERS** 470

Martin Ebermann¹, Norbert Neumann¹, Silke Hoppe¹,

Karla Hiller², Jan Seiler², Christian Helke²,

Marco Meinig³, and Steffen Kurth³

¹InfraTec GmbH, GERMANY, ²Technische Universität Chemnitz,

GERMANY, and ³Fraunhofer ENAS, GERMANY

10:15 - 10:30

- W1E.003 HIGH-RESOLUTION PIEZOELECTRIC MEMS SCANNER FULLY INTEGRATED WITH FOCUS-TUNING AND DRIVING ACTUATORS** 474

Shunsuke Inagaki, Yuki Okamoto, Akio Higo, and Yoshio Mita

University of Tokyo, JAPAN

10:30 - 10:45

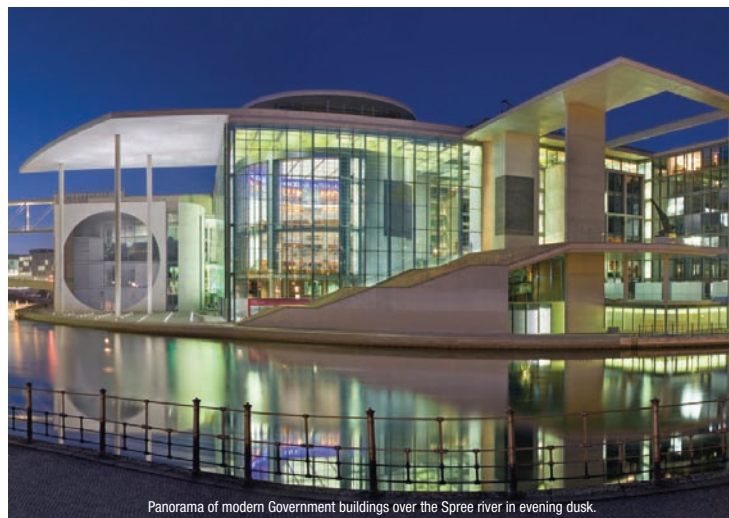
- W1E.004 WAVEGUIDE GRATING COLOR REFLECTOR USING GERMANIUM TELLURIDE** 478

Mohsen Jafari¹, L. Jay Guo¹, and Mina Rais-Zadeh^{1,2}

¹University of Michigan, USA and ²NASA JPL, USA

10:45 - 11:15 Break and Exhibit Inspection

wednesday



Panorama of modern Government buildings over the Spree river in evening dusk.

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Session W2A - Cell on a Chip I

Session Co-Chairs: Olivier Francais, *ESIEE PARIS, FRANCE*
and Srinivas Tadigadapa, *Northeastern University, USA*

Convention Hall I - A/B

11:15 - 11:30

- W2A.001 PAIRING AND ELECTROFUSION OF LIPOSOMES IN A DYNAMIC MICROARRAY DEVICE** 482

Keisuke Sugahara, Sho Takamori, and Shoji Takeuchi
University of Tokyo, JAPAN

11:30 - 11:45

- W2A.002 THERAPEUTIC AND SIDE EFFECTS MODELING OF ELECTROLYTIC CANCER ABLATION THERAPY USING ORGAN-ON-A-CHIP** 484

Moon chul Park¹, Jong man Yoo², and Albert Kim¹
¹ Temple University, USA and ² Cha University, KOREA

11:45 - 12:00

- W2A.003 A MICROFLUIDIC SYSTEM COMBINING VALVE AUTOMATION AND SPHEROID CULTURES TO CHARACTERIZE HEPATIC GLUCOSE METABOLISM DURING HORMONAL STIMULATION** 488

Diana F. Cedillo-Alcántar¹, Gulnaz Stybayeva¹,
José M. de Hoyos-Vega¹, Yong Duk Han²,
Jonghoon Choi², José L. García-Cordero¹,
and Alexander Revzin²
¹ Centro de Investigación y de Estudios Avanzados del IPN, MEXICO and ² Mayo Clinic, USA

12:00 - 12:15

- W2A.004 IN-DROPLET CELL SEPARATION BASED ON LATERAL DIELECTROPHORESIS RESPONSE** 492

Can Huang, Song-I Han, and Arum Han
Texas A&M University, USA

12:15 - 12:45

- W2A.005 INVITED SPEAKER UNLOCKING BIOMEDICAL DISCOVERIES THROUGH VOLUME PRODUCTION OF NANOPATTERNED MATERIALS** 496

Neil Convery, John Stormonth-Darling, and **Nikolaj Gadegaard**
University of Glasgow, UK

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Session W2B - Accelerometers and Gyros II

Session Co-Chairs: Peng Shao, *NXP Semiconductors, USA*
and Shuji Tanaka, *Tohoku University, JAPAN*

Convention Hall I - C

11:15 - 11:30

- W2B.001 A MEMS GRAVIMETER QUALIFIED FOR EARTH TIDES MEASUREMENT** 499
ShiHao Tang, HuaFeng Liu, ShiTao Yan, XiaoChao Xu,
WenJie Wu, and LiangCheng Tu
Huazhong University of Science and Technology, CHINA

11:30 - 11:45

- W2B.002 A PIEZOELECTRIC RESONANT ACCELEROMETER FOR ABOVE 140DB LINEAR DYNAMIC RANGE HIGH-G APPLICATIONS** 503
Seungyong Shin, Anosh D. Daruwalla, Minxiang Gong,
Haoran Wen, and Farrokh Ayazi
Georgia Institute of Technology, USA

11:45 - 12:00

- W2B.003 GRATING-BASED ACCELERATION SENSORS WITH OPTICAL INTERFEROMETRIC READOUT AND CLOSED-LOOP CONTROL** 507
Randall P. Williams¹, Neal A. Hall¹, and Brad D. Avenson²
¹University of Texas, Austin, USA and ²Silicon Audio, Inc., USA

12:00 - 12:15

- W2B.004 EARTH TREMORS OBSERVATION BY A DIAMAGNETIC LEVITATION BASED INERTIAL SENSOR** 511
Qiu Wang, Xiaofang Ren, Shitao Yan, Shimin Jiao, Xiaochao Xu,
Xiaozhou Lei, Qiangwei Xu, Chenyuan Hu, Zhilin Xu, Huafeng Liu,
Pengshun Luo, and Liangcheng Tu
Huazhong University of Science and Technology, CHINA

12:15 - 12:30

- W2B.005 INTEGRATION OF A COMPLIANT THERMAL ACTUATOR FOR UNLATCHING IN A MEMS LATCH ACCELEROMETER** 515
Murugappan Ramanathan and Rudra Pratap
Indian Institute of Science

12:30 - 12:45

- W2B.006 AN ELECTROCHEMICAL MICROSEISMOMETER BASED ON A NEW ELECTROLYTE SYSTEM TO IMPROVE THE LOW-FREQUENCY PERFORMANCES** 519
Bowen Liu^{1,2}, Junbo Wang^{1,2}, Deyong Chen^{1,2}, Jian Chen^{1,2},
Chao Xu^{1,2}, Wenjie Qi^{1,2}, Xichen Zheng^{1,2}, Hua Wei¹,
and Guoqing Zhang¹
¹Chinese Academy of Sciences (CAS), CHINA and
²University of Chinese Academy of Sciences, CHINA

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Session W2C - RF MEMS II

Session Co-Chairs: Nuria Barniol, *Universitat Autònoma de Barcelona, SPAIN*
and Amit Lal, *Cornell University, USA*

Convention Hall I - D

11:15 - 11:45

- W2C.001 INVITED SPEAKER**
**3G – 4G – 5G: HOW BAW FILTER TECHNOLOGY ENABLES
A CONNECTED WORLD** 523
Robert Aigner and Gernot Fattinger
Qorvo Inc., USA



11:45 - 12:00

- W2C.003 AN ULTRA-HIGH-QUALITY FACTOR SILICON
DISK RESONATOR** 527
Guillermo Sobrevela, Xudong Zhou, Chun Zhao,
Milind Pandit, and Ashwin A. Seshia
University of Cambridge, UK

12:00 - 12:15

- W2C.004 A GENERIC TIN-C PROCESS FOR CMOS FEOL/BEOL-EMBEDDED
VERTICALLY-COUPLED CAPACITIVE AND
PIEZORESISTIVE RESONATORS** 531
Chao-Yu Chen¹, Anurag A. Zope¹, Ming-Huang Li²,
and Sheng-Shian Li¹
¹*National Tsing Hua University, TAIWAN* and
²*University of Illinois Urbana-Champaign, USA*

12:15 - 12:30

- W2C.005 FDSOI ON LITHIUM NIOBATE USING Al₂O₃ WAFER-BONDING
FOR ACOUSTOELECTRIC RF MICRODEVICES** 535
Siddhartha Ghosh
Massachusetts Institute of Technology, USA

12:30 - 12:45

- W2C.006 SUPER HIGH FREQUENCY LATERAL-FIELD-EXCITED
ALUMINUM NITRIDE CROSS-SECTIONAL
LAMÉ MODE RESONATORS** 539
Guofeng Chen and Matteo Rinaldi
Northeastern University, USA

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Session W2D - Tactile Sensors II

Session Co-Chairs: Jungwook Choi, *Yeungnam University, KOREA*
and Amy Duwel, *Draper, Inc., USA*

Hall Europa

11:15 - 11:30

- W2D.001 ELECTRONIC SKIN-INTEGRATED SOFT ROBOTIC HAND 543**
Takafumi Yamaguchi, Takayuki Arie, Seiji Akita, and Kuniharu Takei
Osaka Prefecture University, JAPAN

11:30 - 11:45

- W2D.002 TACTILE SENSING FROM BACKSIDE OF FLEXIBLE PRINTED
CIRCUIT USING LSI-INTEGRATED SENSOR WITH ELASTIC
DOME STRUCTURE 547**
Tatsuki Teranishi, Hideki Hirano, and Shuji Tanaka
Tohoku University, JAPAN

11:45 - 12:00

- W2D.003 A FLEXIBLE TACTILE SENSOR TO DETECT STIFFNESS
DISTRIBUTION WITHOUT MEASURING DISPLACEMENT 551**
Tatsuho Nagatomo and Norihisa Miki
Keio University, JAPAN

12:00 - 12:15

- W2D.004 SELF-POWERED TRANSPARENT STRETCHABLE 3D
MOTION SENSOR 554**
Hang Guo, Xuexian Chen, Liming Miao, Haobin Wang,
Ji Wan, and Haixia Zhang
Peking University, CHINA

12:15 - 12:30

- W2D.005 A BLOOD PRESSURE MONITORING DEVICE WITH TACTILE
AND TENSION SENSORS ASSISTED BY MACHINE
LEARNING TECHNIQUE 558**
Kuan-Hua Huang, Fu Tan, Tzung-Dau Wang, and Yao-Joe Yang
National Taiwan University, TAIWAN

12:30 - 12:45

- W2D.006 TACTILE SENSING SYSTEM MODULE WITH MULTIPLE
CMOS-MEMS INTEGRATED SENSORS ON 16 MBPS
HIGH SPEED SHARED SERIAL BUS LINE 562**
Chenzhong Shao¹, Hideki Hirano¹, Munetaka Nomoto¹,
Hiroshi Miyaguchi¹, Takahiro Nakayama², Yoshiyuki Hata³,
Motohiro Fujiyoshi³, Masanori Muroyama¹, and Shuji Tanaka¹
¹ *Tohoku University, JAPAN*, ² *Toyota Motor Corporation, JAPAN*, and
³ *Toyota Central R&D Labs., Inc., JAPAN*

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Session W2E - Optical Biosensors

Session Co-Chairs: Karl Bohringer, *University of Washington, USA*
and Long Que, *Iowa State University, USA*

Room 1 (upstairs)

11:15 - 11:30

- W2E.001 RAPID PATHOGEN DETECTION AND ANTIMICROBIAL SUSCEPTIBILITY ASSESSMENT FROM URINE SAMPLES VIA AMPLIFICATION-FREE DETECTION OF RIBOSOMAL RNA OF SINGLE BACTERIA** 566
Aniruddha M. Kaushik, Kuangwen Hsieh, Thomas DiSorbo, and Tza-Huei Wang
Johns Hopkins University, USA

11:30 - 11:45

- W2E.002 CHIP-SCALE WHISPERING GALLERY MODE GLASS SHELL RESONATORS FOR CALORIMETRIC BIOSENSING APPLICATIONS** 570
Vedant P. Sumaria, Sandeep Inampudi, and Srinivas Tadigadapa
Northeastern University, USA

11:45 - 12:15

- W2E.003 INVITED SPEAKER INTEGRATING MICROSYSTEMS WITH METAMATERIALS TOWARDS METADEVICES** 574
Xiaoguang Zhao, Aobo Li, Guangwu Duan, Chunxu Chen, and **Xin Zhang**
Boston University, USA

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12:15 - 12:30

- W2E.005 DETECTION OF AUTOANTIBODIES FOR TYPE 1 DIABETES USING LABEL-FREE OPTICAL SENSORS** 578
Subin Mao, Silu Feng, and Long Que
Iowa State University, USA

12:30 - 12:45

- W2E.006 DNA APTAMER-LINKED STRUCTURAL-COLOR HYDROGEL FOR REPEATABLE BIOCHEMICAL SENSING** 582
Tomoki Hayashi¹, Masahiro Takinoue², and Hiroaki Onoe¹
¹ *Keio University, JAPAN* and ² *Tokyo Institute of Technology, JAPAN*

12:45 - 14:30 Lunch on Own in Exhibit Hall



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13:30 - 14:30

Industrial Stage Session 3 (Exhibit Hall)

Chair: Udo-Martin Gomez, *Robert Bosch GmbH, GERMANY*

3a Helbling Technik Bern AG, SWITZERLAND

3b Polytec GmbH, GERMANY

3c Accurion GmbH, GERMANY

3d Lam Research Corporation, USA

14:30 - 16:30

Poster Session W3P and Exhibit Inspection

(refreshments will be served)

Poster presentations are listed by topic category with their assigned number starting on page 51.



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Session W4B - Accelerometers and Gyros III

Session Co-Chairs: Farrokh Ayazi, *Georgia Institute of Technology, USA*
and Philippe Robert, *CEA-LETI, FRANCE*

Convention Hall I - C

16:30 - 16:45

- W4B.001 A NOVEL NONLINEARITY REDUCTION METHOD IN DISK RESONATOR GYROSCOPES BASED ON THE VIBRATION AMPLIFIER EFFECT** 586
Qingsong Li, Jiangkun Sun, Yi Xu, Peng Wang, Xin Zhou,
Kuo Lu, Xuezhong Wu, and Dingbang Xiao
National University of Defense Technology, CHINA

16:45 - 17:00

- W4B.002 SHAPE MEMORY FOIL-BASED ACTIVE MICRO DAMPING FOR PORTABLE APPLICATIONS** 590
Kiran Jacob¹, Shahabeddin Ahmadi², Frank Wendler²,
Shuichi Miyazaki³, and Manfred Kohl¹
¹*Karlsruhe Institute of Technology (KIT), GERMANY,*
²*Friedrich-Alexander-Universität Erlangen-Nürnberg, GERMANY, and*
³*University of Tsukuba, JAPAN*

17:00 - 17:15

- W4B.003 AGC-LESS OPERATION OF HIGH-STABILITY LISSAJOUS FREQUENCY-MODULATED MEMS GYROSCOPES** 594
Elia Bordiga, Marco Bestetti, and Giacomo Langfelder
Politecnico di Milano, ITALY

17:15 - 17:30

- W4B.004 A BACKGROUND CALIBRATION TECHNIQUE FOR I/Q PHASE MISMATCH IN MEMS VIBRATORY GYROSCOPE** 598
Yoshikazu Furuta¹, Ippei Takahashi¹, Nobuaki Matsudaira¹,
Chao Chen¹, Takashi Katsuno¹, Tomohiro Nezuka¹,
and Yong Ping Xu²
¹*DENSO Corporation, JAPAN and* ²*National University of Singapore, SINGAPORE*

17:30 - 17:45

- W4B.005 SMALL SIZE AND HIGHLY SENSITIVE DIFFERENTIAL MEMS ACCELEROMETER BASED ON DOUBLE-ENDED TUNING FORK RESONATORS** 602
Eurico E. Moreira^{1,2}, Burkhard Kuhlmann³, João Gaspar²,
and Luis A. Rocha^{1,2}
¹*University of Minho, PORTUGAL,* ²*International and Iberian Nanotechnology Laboratory (INL), PORTUGAL, and*
³*Robert Bosch GmbH, GERMANY*

End of Session W4B -Accelerometers and Gyros III

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Session W4C - Cell/Bio Sensing

Session Co-Chairs: Peter Hesketh, *Georgia Institute of Technology, USA*
and Andreu Llobera, *Carl Zeiss Vision, GERMANY*

Convention Hall I - D

16:30 - 16:45

- W4C.001 LEUKEMIA-ON-CHIP - ELECTRICAL IMPEDANCE SPECTROSCOPY AS AN ONLINE READOUT TO INVESTIGATE DRUG-CANCER INTERACTION** 606
Furkan Gökçe, Paolo S. Ravaynia, Alicia J. Kaestli, Mario M. Modena, Andreas Hierlemann, and Kasper Renggli
ETH Zürich, SWITZERLAND

16:45 - 17:00

- W4C.002 A COMBINED PROCESS OF SILICON SHADOW MASKING AND INKJET PRINTING (SSMP) FOR GRAPHENE OXIDE AND REDUCED GRAPHENE OXIDE MICROSTRUCTURES FOR SELECTIVE CELL CULTURING APPLICATIONS** 609
Che-Hao Kang, Yu-Min Fu, Ching Chuan Kao, Jia-Wei Yang, Ming-Liang Tseng, Zih-Yu Yu, Yu-Ting Cheng, Guan-Yu Chen, Pu-Wei Wu, and Chung-Yu Wu
National Chiao Tung University, TAIWAN

17:00 - 17:15

- W4C.003 NON-ENZYMATIC ELECTROCHEMICAL DETECTION OF GLUTAMATE USING TEMPLATED POLYMER-BASED TARGET RECEPTORS** 613
Habib M.N. Ahmad, Bo Si, Gaurab Dutta, John R. Csoros, William Rudolph Seitz, and Edward Song
University of New Hampshire, USA

17:15 - 17:30

- W4C.004 LABEL-FREE REAL-TIME IMAGING OF EXTRACELLULAR LACTATE FROM A HIPPOCAMPAL SLICE BASED ON CHARGE-TRANSFER-TYPE POTENTIOMETRIC REDOX SENSOR ARRAYS** 617
Hideo Doi¹, Tomoko Horio¹, Eiji Shigetomi², Youichi Shinozaki², You-Na Lee¹, Tatsuya Yoshimi¹, Tatsuya Iwata¹, Toshihiko Noda¹, Kazuhiro Takahashi¹, Toshiaki Hattori¹, Schuichi Koizumi², and Kazuaki Sawada¹
¹Toyohashi University of Technology, JAPAN and
²University of Yamanashi, JAPAN

17:30 - 17:45

- W4C.005 RAPID PURIFICATION, ENRICHMENT, AND DETECTION OF BIOMOLECULES USING BULK ACOUSTIC WAVE RESONATORS** 621
Weiwei Cui¹, Luye Mu², Wei Pang¹, Mark Reed², and Xuexin Duan¹
¹Tianjin University, CHINA and ²Yale University, USA

17:45 - 18:00

- W4C.006 DUAL-FUNCTION INTRAVASCULAR CATHETER FOR ATHEROSCLEROSIS DIAGNOSTICS** 625
Yuan Luo¹, Parinaz Abiri², Rene R.S. Packard², Tzung K. Hsiai², and Yu-Chong Tai¹
¹California Institute of Technology, USA and
²University of California, Los Angeles, USA

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Session W4D - IR Detectors

Session Co-Chairs: Bernhard Jakoby, *Johannes Kepler University Linz, AUSTRIA*
and Eric Yeatman, *Imperial College London, UK*

Hall Europa

16:30 - 16:45

- W4D.001 INFRARED DETECTOR USING ORGANIC NANO-PILLAR ARRAYS** 629
Yoshiharu Ajiki¹, Tetsuo Kan², Masayuki Yahiro³, Akiko Hamada³,
Junji Adachi³, and Chihaya Adachi³
¹*Olympus Corporation, JAPAN*, ²*University of Electro-Communications, JAPAN*, and ³*Kyushu University, JAPAN*

16:45 - 17:00

- W4D.002 INFRARED PHOTODETECTOR WITH COPPER RESONATOR IN SILICON NANO HOLE ARRAY** 633
Shun Yasunaga¹, Tetsuo Kan², Hidetoshi Takahashi¹,
Tomoyuki Takahata¹, and Isao Shimoyama¹
¹*University of Tokyo, JAPAN* and ²*University of Electro-Communications, JAPAN*

17:00 - 17:15

- W4D.003 THRESHOLD-TRIGGERED MEMS-CMOS INFRARED RESONANT DETECTOR WITH NEAR-ZERO STANDBY POWER CONSUMPTION** 637
Sila Deniz Caliskan, Sungho Kang, Vageeswar Rajaram,
Zhenyun Qian, and Matteo Rinaldi
Northeastern University, USA

17:15 - 17:30

- W4D.004 MICROMACHINED UNCOOLED $\text{Si}_x\text{Ge}_{1-x}\text{y}$ MICROBOLOMETER INTEGRATED METASURFACE FOR UNCOOLED INFRARED DETECTION** 641
Amjed Abdullah¹, Akshay Koppula¹, Omar Alkorjia¹,
Cameron Warder¹, Tao Liu², Edward Kinzel²,
and Mahmoud Almasri¹
¹*University of Missouri, USA* and
²*Missouri University of Science and Technology, USA*

17:30 - 17:45

- W4D.005 NANOPLASMONICS ENHANCED BROADBAND ULTRA-SENSITIVE MID-IR SENSOR ARRAY INTEGRATED WITH MICROFLUIDICS** 645
Zhihao Ren, Jingxuan Wei, Dihan Hasan, Bowei Dong,
Guangya Zhou and Chengkuo Lee
National University of Singapore, SINGAPORE

17:45 - 18:00

- W4D.006 3-D THERMAL RADIATION SENSORS ON OPTICAL FIBER TIPS FABRICATED USING ULTRASHORT LASER PULSES** 649
Jonathan W. Smith¹, Joe S. Suelzer², Nicholas G. Usechak²,
Vincent P. Tondiglia², and Hengky Chandralim¹
¹*US Air Force Institute of Technology, USA* and
²*Air Force Research Laboratory, USA*

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Session W4E - Mixed Session

Session Co-Chairs: Franz Laermer, *Robert Bosch GmbH, GERMANY*
and Dinesh Pamunuwa, *University of Bristol, UK*

Room 1 (upstairs)

16:30 - 17:00

- W4E.001 INVITED SPEAKER**
**HIGH PERFORMANCE PIEZOELECTRIC AIN MEMS RESONATORS
FOR LIQUID SENSING AND BEYOND – THE POTENTIAL
OF PIEZOMEMS** 653
Ulrich Schmid and Michael Schneider
Vienna University of Technology, AUSTRIA



17:00 - 17:15

- W4E.003 AIN PIEZOELECTRIC MICROMACHINED ULTRASONIC
TRANSDUCER ARRAY MONOLITHICALLY FABRICATED
ON TOP OF PRE-PROCESSED CMOS SUBSTRATES** 655
Eyglis Ledesma¹, Ivan Zamora¹, Francesc Torres¹,
Arantxa Uranga¹, Vassil Tzanov¹, Nuria Barniol¹,
Eloi Marigo², and Mohan Soundara-Pandian²
¹*Electronics Eng. Dept, Universitat Autònoma de Barcelona, SPAIN and*
²*Silterra Malaysia Sdn. Bhd, MALAYSIA*

17:15 - 17:30

- W4E.004 A PIEZORESISTIVE MEMS BAROMETER WITH
THERMOMECHANICAL STRESS REJECTION** 659
Enri Duqi, Lorenzo Baldo, Mikel Azpeitia Urquia,
and Giorgio Allegato
ST Microelectronics, ITALY

17:30 - 17:45

- W4E.005 NOVEL HINGE MECHANISM FOR VACUUM TRANSDUCTION
HIGH PERFORMANCE CAPACITIVE MEMS MICROPHONES** 663
Samer Dagher^{1,2}, Carine Ladner¹, Stéphane Durand²,
and Loic Joet¹
¹*University of Grenoble, Aples CEA-Leti, FRANCE and*
²*LAUM UMR-CNRS, FRANCE*

wednesday

End of Session W4E -Mixed Session

18:00	Adjourn for the Day
19:00 - 22:00	Transducers/EUROSENSORS Conference Banquet Convention Hall I-A/B



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THURSDAY PROGRAM

27 JUNE

08:30 - 09:15	Plenary Presentation IV - EUROSENSORS 2018 Fellow Session Chair: Jürgen Brugger, <i>École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND</i>
	Th1A.P04 DIAMOND: A NEW CHEMICAL SENSOR'S BEST FRIEND? 667 Emmanuel Scorsone <i>CEA-LIST, FRANCE</i>
09:15 - 09:30	EUROSENSORS 2019 Fellow Announcement
09:30 - 09:45	Transition



Bode Museum on Museum Island

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Session Th1A - Flexible Substrate Sensors

Session Co-Chairs: Yao-Joe Yang, *National Taiwan University, TAIWAN*
and Alice Zhang, *Peking University, CHINA*

Convention Hall I - A/B

09:45 - 10:00

- Th1A.001 A PRINTED FLEXIBLE SENSOR BASED SILK-FIBROIN FOR DISTINGUISHING THE EXISTING STATES OF WATER: LIQUID OR GASEOUS? 673**
Danliang Wen, Xin Liu, Haitao Deng, Deheng Sun,
and Xiaosheng Zhang
University of Electronic Science and Technology of China, CHINA

10:00 - 10:15

- Th1A.002 INTEGRATING METAMATERIAL AND MICROCHANNEL ONTO FLEXIBLE PAPER AS MINIATURIZED BIOCHEMICAL SENSING PLATFORM 677**
Hong Zhou¹, Cheng Yang², Donglin Hu¹, Dongxiao Li¹,
Xindan Hui¹, Yongjie Yi¹, and Xiaojing Mu¹
¹Chongqing University, CHINA and
²Third Military Medical University, CHINA

10:15 - 10:30

- Th1A.003 TWO-DIMENSIONAL TUNGSTEN DISELENIDES INTEGRATED ON PAPER SUBSTRATE FOR HIGHLY FLEXIBLE AND SENSITIVE GAS SENSOR 681**
Woo Sung Lee and Jungwook Choi
Yeungnam University, KOREA

10:30 - 10:45

- Th1A.004 DIGITAL MICROFABRICATION ON PAPER AND CLOTH FOR HEAVY METAL DETECTION AND REMEDIATION 685**
Arshya Bamshad and Hyoung Jin Cho
University of Central Florida, USA



Berlin Cathedral at sunrise – German Berliner Dom on Museum Island

thursday

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Session Th1B - Water Sensors

Session Co-Chairs: Isabelle Dufour, *University of Bordeaux, FRANCE*
and Cosmin Roman, *ETH Zürich, SWITZERLAND*

Convention Hall I - C

09:45 - 10:00

- Th1B.001 A NOVEL FLEXIBLE MICROWAVE SENSOR CHIP FOR SIMULTANEOUS MONITORING OF OIL ACIDITY AND WATER CONTENT** 689

Xiecheng Tang^{1,2}, Qiannan Xue¹, Haitao Liu², and Xuexin Duan¹

¹Tianjin University, CHINA and ²Civil Aviation University of China, CHINA

10:00 - 10:15

- Th1B.002 DESIGN OF CHEMICAL SENSOR COATINGS BASED ON BLENDS OF A SINGLE POLYMER-PLASTICIZER PAIR FOR DETECTION OF SINGLE OR MULTI-ANALYTE AQUEOUS SOLUTIONS** 693

Nicholas Post¹, Kartick Sothivelr¹, Florian Bender¹, Fabien Josse¹, Antonio Ricco², and Edwin Yaz¹

¹Marquette University, USA and ²Stanford University, USA

10:15 - 10:30

- Th1B.003 DRAGONFLY-LIKE MICRO SAMPLING DEVICE FOR EXTRACTING NANO-LITER SAMPLE FROM PLANTS** 697

Panpan Gao¹, Toshihiro Kasama¹, Maia Godonoga¹, Yoshishige Endo¹, Tetsushi Koide², Atsushi Ogawa³, and Ryo Miyake¹

¹University of Tokyo, JAPAN, ²Hiroshima University, JAPAN, and

³Akita Prefectural University, JAPAN

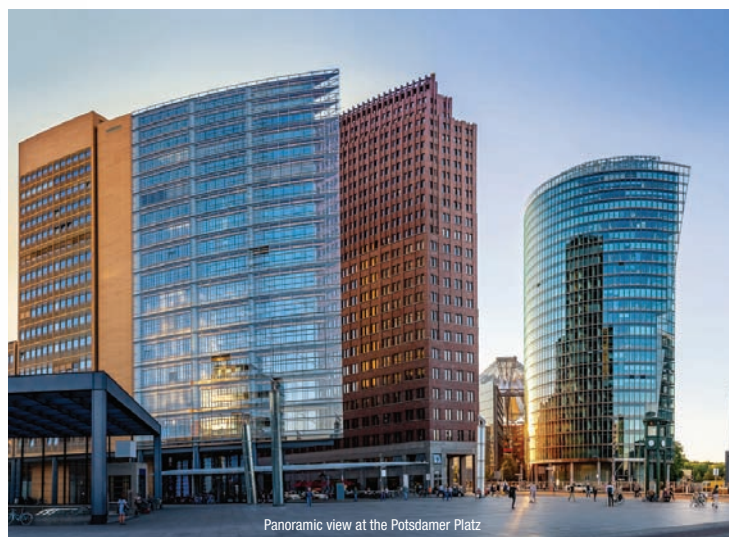
10:30 - 10:45

- Th1B.004 SMART BIOSENSOR FOR RAPID AND SIMULTANEOUS DETECTION OF WATERBORNE PATHOGENS IN TAP WATER** 701

Sura A. Muhsin¹, Muthana Al-Amidie¹, Zahar Mlaji¹, Zhenyu Shen¹, Amjed Abdullah¹, Jiayu Liu¹, Ferris Dweik¹, Ibrahim Jasim¹, Majed El-Dweik², Shuping Zhang¹, and Mahmoud Almasri¹

¹University of Missouri, USA and ²Lincoln University, USA

thursday



Panoramic view at the Potsdamer Platz

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Session Th1C - RF MEMS III

Session Co-Chairs: Sarah Bedair, *US Army Research Laboratory, USA*
and Gabriele Schrag, *Technical University of Munich, GERMANY*

Convention Hall I - D

09:45 - 10:00

Th1C.001 **A PLANAR SINGLE-ACTUATOR BI-STABLE SWITCH BASED ON LATCH-LOCK MECHNISM** 705

Yang Gao¹, Toshiki Ema², Zeyuan Cao³, Sheng Ni¹,
Elena Y.L. Chan¹, Osamu Tabata², Toshiyuki Tsuchiya²,
Xiaohong Wang³, and Man Wong¹
¹*Hong Kong University of Science and Technology, HONG KONG,*
²*Kyoto Univeristy, JAPAN, and* ³*Tsinghua University, CHINA*

10:00 - 10:15

Th1C.002 **PARALLEL LOGICS USING MULTIMODE EXCITATION OF A SINGLE MEMS RESONATOR** 709

Nizar Jaber^{1,2}, Saad Ilyas², and Mohammad Younis²
¹*Purdue University, USA and* ²*King Abdullah University of Science and Technology (KAUST), SAUDI ARABIA*

10:15 - 10:30

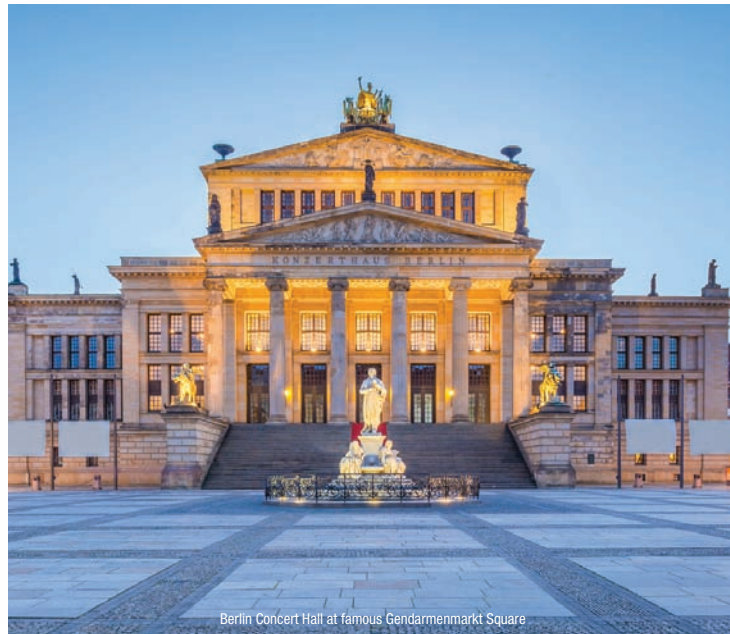
Th1C.003 **MECHANICALLY MODULATED MICROWAVE CIRCULATOR** 713

Mustafa Mert Torunbalci¹, Suresh Sridaran², Richard C. Ruby²,
and Sunil A. Bhawe¹
¹*Purdue University, USA and* ²*Broadcom Ltd., USA*

10:30 - 10:45

Th1C.004 **SWITCHABLE MECHANICAL RESONANCE INDUCED BY HYSTERETIC PIEZOELECTRICITY IN FERROELECTRIC CAPACITORS** 717

Yanbo He¹, Bichoy Bahr², Mengwei Si¹, Peide Ye¹,
and Dana Weinstein¹
¹*Purdue University, USA and* ²*Texas Instruments, USA*



Berlin Concert Hall at famous Gendarmenmarkt Square

thursday

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Session Th1D - Image Sensing

Session Co-Chairs: Alissa Fitzgerald, *A.M. Fitzgerald & Associates, LLC, USA*
and Xiaosheng Zhang, *University of Electronic Science and Technology of China, CHINA*

Hall Europa

09:45 - 10:00

Th1D.001 A NOVEL MICROFLUIDIC PLATFORM FOR LABEL-FREE 3D IMAGING OF BIOLOGICAL CELLS 721

Rahul Singh Kotesa¹, Saransh Arora², G.K. Ananthasuresh¹,
and Prosenjit Sen¹

¹Indian Institute of Science, INDIA and

²Birla Institute of Technology and Science, Pilani, INDIA

10:00 - 10:15

Th1D.002 HIGH-COLOR-PURITY MICROFLUIDIC QUANTUM DOTS LIGHT-EMITTING DIODES USING THE ELECTROLUMINESCENCE OF THE LIQUID ORGANIC SEMICONDUCTOR BACKLIGHT 724

Masahiro Kawamura¹, Hiroyuki Kuwae¹, Takumi Kamibayashi¹,
Juro Oshima², Takashi Kasahara³, Shuichi Shoji¹, and Jun Mizuno⁴

¹Waseda University, JAPAN, ²Nissan Chemical Corporation, JAPAN,

³Hosei University, JAPAN, and ⁴Research Organization for Nano and Life Innovation, JAPAN

10:15 - 10:30

Th1D.003 LIGHT DRIVING OF ON-CHIP MICRO-GEL ACTUATOR TOWARDS MASSIVE INTEGRATION 728

Yuha Koike¹, Yoshiyuki Yokoyama², and Takeshi Hayakawa¹

¹Chuo University, JAPAN and ²Toyama Industrial Technology Research and Development Center, JAPAN

10:30 - 10:45

Th1D.004 HYDROGEN ION MICROSCOPE USING 2 μ m PITCH PH IMAGE SENSOR AND ANALYSIS OF MOUSE HIPPOCAMPAL SLICE 732

Chinatsu Kawakami¹, You-Na Lee¹, Hideo Doi¹, Tomoko Horio¹,

Yasuyuki Kimura¹, Eiji Shigetomi², Youichi Shinozaki²,

Toshihiko Noda¹, Tatsuya Iwata¹, Kazuhiro Takahashi¹,

Schuichi Koizumi², and Kazuaki Sawada¹

¹Toyohashi University of Technology, JAPAN and

²University of Yamanashi, JAPAN

thursday

10:45 - 11:15 Break



Session Th2A - Cell on a Chip II

Session Co-Chairs: Victor J. Cadarso, *Monash University, AUSTRALIA*
and Andreas Hierlemann, *ETH Zürich, SWITZERLAND*

Convention Hall I - A/B

11:15 - 11:30

- Th2A.001** **IN VITRO DEVELOPMENT OF THE EMBRYO IN A MICROFLUIDIC DEVICE FOR AUTOMATIC EMBRYO TRAPPING AND CO-CULTURE WITH ENDOMETRIAL CELLS** 736

Shalaka Bhosale¹, Mushou Chen², and Cheng-Hsien Liu¹

¹National Tsing Hua University, TAIWAN and

²Chang Gung Medical Foundation, TAIWAN

11:30- 11:45

- Th2A.002** **ON-CHIP PRE-TREATMENT OF BIOLOGICAL SAMPLES FOR THE ISOLATION OF ADIPOSE STEM CELLS (ASCs)** 740

Marion Valette^{1,2,3}, Mathias Bouguelmouna³, Mélanie Mariotte^{1,5},

Rémi Courson¹, Marie-Charline Blatché¹, Amandine Girousse⁴,

Coralie Sengenès⁴, Karine Reybier^{2,3}, and Anne-Marie Gué^{1,3}

¹LAAS-CNRS, FRANCE, ²PharmadeV, FRANCE, ³Université Toulouse III

Paul Sabatier, FRANCE, ⁴Stromalab, FRANCE, and ⁵Univeristy of

Limoges, FRANCE

11:45 - 12:00

- Th2A.003** **AN INTEGRATED DEVICE FOR MONITORING SINGLE CELL METABOLISM** 744

Bocheng Yu, Yuting Wu, Peng Yu, Dong Huang, and Zihong Li

Peking University, CHINA

12:00 - 12:15

- Th2A.004** **ASPIRATION AND MASS MEASUREMENT OF MICROPARTICLES AND UNICELLULAR ORGANISMS VIA MICROPIPETTE RESONATORS** 748

Juhee Ko¹, Donghyuk Lee², Bong Jae Lee¹, Taewook Kang³,

Sangkeun Kauh⁴, and Jungchul Lee¹

¹Korea Advanced Institute of Science and Technology (KAIST), KOREA,

²Samsung Electronics, KOREA, ³Sogang University, KOREA, and

⁴Seoul National University, KOREA

12:15 - 12:30

- Th2A.005** **ECM-BASED STRETCHABLE MICROFLUIDIC SYSTEM FOR IN VITRO 3D TISSUE CULTURE** 752

Azusa Shimizu¹, Wei Huang Goh², Michinao Hashimoto²,

Shigenori Miura³, and Hiroaki Onoe¹

¹Keio University, JAPAN, ²Singapore University of Technology

and Design, SINGAPORE, and ³University of Tokyo, JAPAN

12:30 - 12:45

- Th2A.006** **STUDIES OF NEUROSPHERES CULTURED USING ADULT HIPPOCAMPAL PROGENITOR CELLS UNDER OFF-CHIP MAGNETIC STIMULATION** 756

Renyuan Yang, Emily Kozik, Bhavika Patel, David Jiles,

Donald Sakaguchi, and Long Que

Iowa State University, USA

thursday

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Session Th2B - Gas Sensors

Session Co-Chairs: Isabelle Dufour, *University of Bordeaux, FRANCE*
and Wouter Olthuis, *University of Twente, THE NETHERLANDS*

Convention Hall I - C

11:15 - 11:45

- Th2B.001 INVITED SPEAKER**
SMART ENVIRONMENTAL SENSOR SYSTEMS FOR A DIGITAL AND SUSTAINABLE WORLD **N/A**
Markus Graf
Sensirion Automotive Solutions AG, SWITZERLAND



11:45 - 12:00

- Th2B.003 RESISTANCE-TYPE HUMIDITY SENSOR USING CNTS SENSING MATERIAL WITH Al_2O_3 CONFORMAL COATING FOR ENHANCED SENSITIVITY** **761**
Chien-Ya Hung¹, Wei-Lun Sung², Sih-Chieh Chen³,
and Weileun Fang¹
¹*National Tsing Hua University, TAIWAN*, ²*imec TW, TAIWAN*, and
³*Industrial Technology Research Institute, TAIWAN*

12:00 - 12:15

- Th2B.004 FLEXIBLE GAS SENSOR ARRAY BASED ON MATRIX OF MOLECULARLY IMPRINTED MATERIALS AND FULL PRINTING PROCESS** **765**
Lingpu Ge, Fumihiro Sassa, and Kenshi Hayashi
Kyushu University, JAPAN

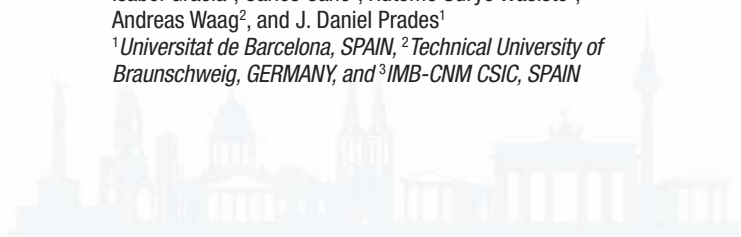
12:15 - 12:30

- Th2B.005 A SENSITIVE RESONANT GAS SENSOR BASED ON MULTIMODE EXCITATION OF A BUCKLED BEAM** **769**
Amal Hajja¹, Nizar Jaber^{1,2}, Nouha Alcheikh¹,
and Mohammad I. Younis¹
¹*King Abdullah University of Science and Technology (KAUST), SAUDI ARABIA* and ²*Purdue University*

12:30 - 12:45

- Th2B.006 A LIGHT-ACTIVATED MICROPOWER GAS SENSOR FOR THE DETECTION OF NO₂ DOWN TO THE PARTS PER BILLION (PPB) RANGE** **773**
Olga Casals¹, Nicolai Markiewicz^{1,2}, Cristian Fabrega¹,
Isabel Gracia³, Carles Cane³, Hutomo Suryo Wasisto²,
Andreas Waag², and J. Daniel Prades¹
¹*Universitat de Barcelona, SPAIN*, ²*Technical University of Braunschweig, GERMANY*, and ³*IMB-CNM CSIC, SPAIN*

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Session Th2C - Energy & Power MEMS II

Session Co-Chairs: Peter Woias, *University of Freiburg, GERMANY*
and Eric Yeatman, *Imperial College London, UK*

Convention Hall I - D

11:15 - 11:30

- Th2C.001 HIGH MASS-LOADING AND MECHANICAL STRENGTH SUPERCAPACITOR BY GRAPHENE/CARBON FIBER COMPOSITES** 777
Yuanyuan Huang^{1,2}, Caiwei Shen^{1,3}, Zirong Tang²,
Sunxiang Zheng¹, Tielin Shi², and Liwei Lin¹
¹*University of California, Berkeley, USA,*
²*Huazhong University, CHINA and*
³*University of Massachusetts Dartmouth, USA*

11:30 - 11:45

- Th2C.002 A NOVEL ANODE IN HIGH-PERFORMANCE LITHIUM-ION BATTERY BASED ON ADVANCED NANOMATERIALS AND NANOFABRICATION TECHNOLOGY** 781
Bingmeng Hu, Xinyan Jia, and Xiaohong Wang
Tsinghua University, CHINA

11:45 - 12:15

- Th2C.003 INVITED SPEAKER**
PIEZOELECTRIC PZT THIN FILMS: DEPOSITION, EVALUATION AND THEIR APPLICATIONS 785
Isaku Kanno
Kobe University, JAPAN



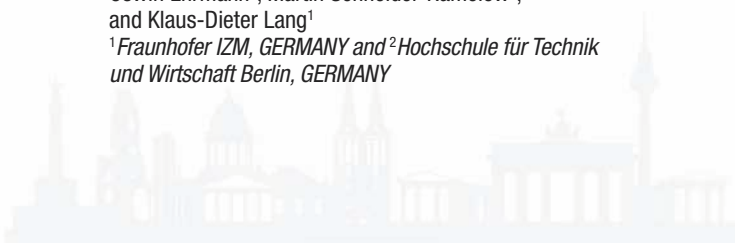
12:15 - 12:30

- Th2C.005 INTEGRATED FABRICATION OF SERIALY-CONNECTED HIGH VOLTAGE MICROBATTERIES VIA MULTILAYER ELECTRODEPOSITION** 789
Michael Synodis, James Pikul, Sue Ann Bidstrup Allen,
and Mark Allen
University of Pennsylvania, USA

12:30 - 12:45

- Th2C.006 MEMS MASS FLOW CONTROLLER FOR LIQUID FUEL SUPPLY TO HCCI-DRIVEN ENGINE** 793
Michael Schiffer¹, Piotr Mackowiak¹, Ha-Duong Ngo^{1,2},
Oswin Ehrmann¹, Martin Schneider-Ramelow¹,
and Klaus-Dieter Lang¹
¹*Fraunhofer IZM, GERMANY and* ²*Hochschule für Technik und Wirtschaft Berlin, GERMANY*

thursday



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Session Th2D - Microfluidic II

Session Co-Chairs: Jungyul Park, *Sogang University, KOREA*
and Niels Tas, *University of Twente, THE NETHERLANDS*

Hall Europa

11:15 - 11:30

- Th2D.001 NANOPARTICLE CAPTURE USING ULTRASONIC ACTUATION** 797
Ruhollah Habibi and Adrian Neild
Monash University, AUSTRALIA

11:30 - 11:45

- Th2D.002 ON-CHIP CAVITATION GENERATION BASED ON ULTRA-HIGH-SPEED FLOW CONTROL** 801
Yusuke Kasai, Shinya Sakuma, and Fumihito Arai
Nagoya University, JAPAN

11:45 - 12:00

- Th2D.003 MICROFABRICATED AIR-MICROFLUIDICS VIRTUAL IMPACTOR WITH GROOVE-BASED ENVELOPE-FLOW PARTICLE FOCUSING SYSTEM** 805
Omid Mahdavi pour, Dorsa Fahimi and Igor Paprotny
University of Illinois, Chicago, USA

12:00 - 12:15

- Th2D.004 ESTABLISHMENT OF TREATMENT OF RETINAL VEIN OCCLUSION BY PHYSICAL STIMULI OF ELECTRICALLY-INDUCED BUBBLES** 809
Mei Sumimoto¹, Daisuke Matsumura¹, Keita Ichikawa¹,
Keiko Miwa¹, Hideyasu Oh², Yasuhiro Moriizumi³,
and Yoko Yamanishi¹
¹*Kyushu University, JAPAN*, ²*Hyogo Prefectural Amagasaki General Medical Center, JAPAN*, and ³*BEX co., Ltd, JAPAN*

12:15 - 12:30

- Th2D.005 MAXIMUM PRESSURE CAUSED BY DROPLET IMPACT IS DEPENDENT ON THE DROPLET SIZE** 813
Thanh-Vinh Nguyen¹ and Isao Shimoyama²
¹*National Institute of Advanced Industrial Science and Technology (AIST), JAPAN* and ²*Toyama Prefecture University, JAPAN*

12:30 - 12:45

- Th2D.006 A NOVEL WEARABLE SWEAT RATE SENSOR FOR BOTH DOMINANT AND RECESSIVE SWEAT RATE MEASUREMENT** 817
Kunpeng Gao, Xiaolin Wang, Bin Yang, Xiang Chen,
Xiuyan Li and Jingquan Liu
Shanghai Jiao Tong University, CHINA

12:45 - 13:00 Transition

13:00 - 13:30 Best Paper Award Ceremony and Closing Remarks
Convention Hall I - A/B

13:30 Conference Adjourns

thursday

POSTER PRESENTATIONS

Convention Hall II

MONDAY
14:30 - 16:30

TUESDAY
14:30 - 16:30

WEDNESDAY
14:30 - 16:30

POSTER CATEGORIES

Acoustic Microdevices and RF MEMS

Bio-Sensors and Bio-Microsystems

Chemical and Environmental Sensors and Microsystems

Energy and Power MEMS

Integrated Photonics and Optical MEMS

Materials, Fabrication and Packaging Technologies

Mechanical/Physical Sensors and Microsystems

Medical Microsystems

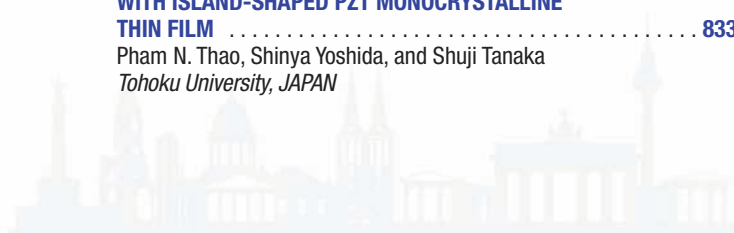
Microfluidics (Non-Bio)

Nanoscale Devices and Nanomaterials

Transducers with Soft, Flexible or Composite Materials

MONDAY - Acoustic Microdevices and RF MEMS

- M3P.001 A MICRO-RESONATOR BASED DIGITAL TO ANALOG CONVERTER FOR ULTRA-LOW POWER APPLICATIONS 821**
Sally Ahmed, Xuecui Zou, and Hossein Fariborzi
King Abdullah University of Science and Technology (KAUST), SAUDI ARABIA
- M3P.002 AIN PMUT WITH CROSSED-CAVITY FOR BETTER ACOUSTIC PRESSURE OUTPUTS IN LIQUID AT HIGH FREQUENCY 825**
Eyglis Ledesma¹, Vassil Tzanov¹, Iván Zamora¹, Francesc Torres¹, Arantxa Uranga¹, Núria Barniol¹, Eloi Marigó², and Mohan Soundara-Pandian²
¹*Universitat Autònoma de Barcelona, SPAIN and*
²*Silterra Malaysia Sdn. Bhd., MALAYSIA*
- M3P.003 APPLICATION OF MEMS ENABLED EXCITATION AND DETECTION SCHEMES TO PHOTOACOUSTIC IMAGING 829**
Jonas Kusch, Gordon M.H. Flockhart, Ralf Bauer, and Deepak Uttamchandani
University of Strathclyde, UK
- M3P.004 DEVELOPMENT OF MECHANICALLY-ROBUST PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCER (PMUT) WITH ISLAND-SHAPED PZT MONOCRYSTALLINE THIN FILM 833**
Pham N. Thao, Shinya Yoshida, and Shuji Tanaka
Tohoku University, JAPAN



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- M3P.005 FULL-SYSTEM SIMULATION OF AIRBORNE CAPACITIVE MEMS TRANSDUCERS OPERATING IN THE AUDIBLE AND ULTRASONIC REGIME** 837
Gabriele Bosetti¹, Johannes Manz², Ulrich Krumbein², and Gabriele Schrag¹
¹Technical University of Munich, GERMANY and
²Infineon Technologies AG, GERMANY
- M3P.006 PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCERS WITH CORRUGATED DIAPHRAGMS USING SURFACE MICROMACHINING** 841
Guo-Lun Luo and David A. Horsley
University of California, Davis, USA
- M3P.007 RESEARCH OF A MINIATURIZED BROADBAND MEMS PHASE DETECTOR AND ITS TEMPERATURE EFFECT FOR APPLICATION IN PHASE-LOCKED LOOPS** 845
Juzheng Han and Rushan Chen
Nanjing University of Science and Technology, CHINA
- M3P.008 ULTRA LOW ACOUSTIC LOSS BUTTERFLY LAMB WAVE RESONATOR** 849
Jie Zou^{1,2}, Anming Gao³, and Albert P. Pisano^{2,4}
¹Lambwave LLC, USA, ²University of California, Berkeley, USA,
³University of Illinois, Urbana-Champaign, USA, and
⁴University of California, San Diego, USA

TUESDAY - Acoustic Microdevices and RF MEMS

- T3P.001 A BISTABLE ULTRASONIC MEMS DEVICE WITH AN INTEGRATED PIEZOELECTRIC SCANDIUM-AIN THIN FILM ACTUATOR FOR SWITCHING** 853
Manuel Dorfmeister, Michael Schneider, and Ulrich Schmid
Vienna University of Technology, AUSTRIA
- T3P.002 A PIEZOELECTRIC MEMS LOUD SPEAKER BASED ON CERAMIC PZT** 857
Haoran Wang¹, Mengyuan Li², Yuanyuan Yu¹, Zhenfang Chen³, Yingtao Ding², Huabei Jiang⁴, and Huikai Xie^{1,2}
¹University of Florida, USA, ²Beijing Institute of Technology, CHINA,
³MEMS Engineering and Materials Inc., USA, and
⁴University of South Florida, USA
- T3P.003 AIN PMUT-BASED ULTRASONIC POWER TRANSFER LINKS FOR IMPLANTABLE ELECTRONICS** 861
Bernard Herrera, Flavius Pop, Cristian Cassella, and Matteo Rinaldi
Northeastern University, USA
- T3P.004 BROADBAND ACOUSTICAL MEMS TRANSCIEVERS FOR SIMULTANEOUS RANGE FINDING AND MICROPHONE APPLICATIONS** 865
Sebastian Anzinger^{1,2}, Christian Bretthauer², Johannes Manz², Ulrich Krumbein², and Alfons Dehé^{1,3}
¹University of Freiburg, GERMANY, ²Infineon Technologies AG, GERMANY, and ³Hahn-Schickard, GERMANY

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T3P.005	DISTRIBUTED MULTICONTACT RF MEMS SWITCH FOR POWER HANDLING CAPABILITY IMPROVEMENT	869
	Yulong Zhang, Zhuohao Gong, Huiliang Liu, and Zewen Liu <i>Tsinghua University, CHINA</i>	
T3P.006	OFF-RESONANCE DYNAMICS BEHAVIOR OF PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCER	873
	Xinxin Liu, Xuying Chen, Dengfei Yang, Xianhao Le, Lei Yang, and Jin Xie <i>Zhejiang University, CHINA</i>	
T3P.007	PZT MICROMACHINED PIEZOELECTRIC ULTRASONIC TRANSDUCERS WITH GOOD COUPLING TO SOLIDS	877
	Tingting Yang, Yijia Du, Zhanqiang Xing, Weiliang Ji, Yu Chen, Xiangyu Sun, Dongdong Gong, and Lifang Liu <i>China Academy of Engineering Physics, CHINA</i>	
T3P.008	SIGNAL ENHANCEMENT IN MEM RESONANT SENSORS USING PARAMETRIC SUPPRESSION	881
	James M.L. Miller, Nicholas E. Bousse, Dongsuk D. Shin, Hyun-Keun Kwon, and Thomas W. Kenny <i>Stanford University, USA</i>	
T3P.009	ULTRA-SENSITIVE AND BROAD RANGE PHONONIC-FLUIDIC CAVITY SENSOR FOR DETERMINATION OF MASS FRACTIONS IN AQUEOUS SOLUTIONS	885
	Frieder Lucklum and Michael J. Vellekoop <i>University of Bremen, GERMANY</i>	

WEDNESDAY - Acoustic Microdevices and RF MEMS

W3P.001	A FULLY DIFFERENTIAL THIN FILM PIEZO ON SILICON FLEXURAL MODE RING RESONATOR WITH EXCEPTIONAL QUALITY FACTOR	889
	Gayathri Pillai, Mei-Feng Lai, and Sheng-Shian Li <i>National Tsing Hua University, TAIWAN</i>	
W3P.002	ACOUSTIC MICRO-OPTO-MECHANICAL TRANSDUCERS FOR CRACK WIDTH MEASUREMENT ON CONCRETE STRUCTURES FROM AERIAL ROBOTS	893
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¹Toyohashi University of Technology, JAPAN and
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¹China Marine Development and Research Center, CHINA and

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- T3P.057 STUDY ON THE APPLICABILITY OF RESONANT MODE MEMS DC/DC CONVERTERS** 1455
Benjamin Arnold, Henry Schmidt, and Jan E. Mehner
University of Technology Chemnitz, GERMANY

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Tiantong Xu¹, Jiamian Sun¹, Hanxiao Wu¹, Haiwang Li¹, Hanqing Li², Jingchao Xia¹, Zhi Tao¹, and Martin A. Schmidt²
¹*Beihang University, CHINA* and ²*Massachusetts Institute of Technology, USA*
- W3P.052 BANDWIDTH ENHANCEMENT OF VIBRATIONAL ENERGY HARVESTERS BY A VOLTAGE-BOOST RECTIFIER CIRCUIT** 1463
Yukiya Tohyama¹, Hiroaki Honma¹, Noboru Ishihara², Hiroshi Toshiyoshi¹, and Daisuke Yamane^{2,3}
¹*University of Tokyo, JAPAN*, ²*Tokyo Institute of Technology, JAPAN*, and ³*Japan Science and Technology Agency (JST), JAPAN*
- W3P.053 CASCADED SMA-FILM BASED ELASTOCALORIC COOLING** 1467
Florian Bruederlin¹, Lars Bumke², Eckhard Quandt², and Manfred Kohl¹
¹*Karlsruhe Institute of Technology (KIT), GERMANY* and ²*Kiel University, GERMANY*
- W3P.054 DUAL-STAGE-ELECTRODE-ENHANCED EFFICIENT SSHI FOR ROTATIONAL ELECTRET ENERGY HARVESTER** 1471
Yiran Liu¹, Adrien Badel², Tomoya Miyoshi¹, and Yuji Suzuki¹
¹*University of Tokyo, JAPAN* and ²*Université Savoie Mont Blanc, FRANCE*

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Naoki Nobunaga¹, Shinya Kumagai¹, Katsuya Masuno², Hiroki Ishihara², Makoto Ishii², and Minoru Sasaki¹
¹Toyota Technological Institute, JAPAN and
²Yazaki Corporation, JAPAN
- W3P.056 SELF POLED, FLEXIBLE PIEZOELECTRIC ENERGY HARVESTER BY PLACING HIGHLY CHARGED PDMS-rGO LAYER BETWEEN P(VDF-TrFE)-PMN-PT COMPOSITE SHEETS** 1479
Usman Yaqoob¹, Md Habibur Rahaman¹, Kyeong-Keun Choi², and Hyeon Cheol Kim¹
¹University of Ulsan, KOREA and
²Pohang University of Science and Technology (POSTECH), KOREA
- W3P.057 TEMPERATURE DIFFERENCE MEASUREMENT ACROSS MEMS BASED NANOGAP CREATED BY CLEAVAGE OF SILICON FOR THERMIONIC GENERATION** 1483
Masaki Shimofuri, Yoshikazu Hirai, Toshiyuki Tsuchiya, and Osamu Tabata
Kyoto University, JAPAN

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Ssu-Han Chen, Aron Michael, and Chee Yee Kwok
University of New South Wales, AUSTRALIA
- M3P.058 AC RELIABILITY OF INTEGRATED LOW-TEMPERATURE PVD PZT FILMS** 1491
Daniel Monteiro Diniz Reis¹, Sven Rzepka², and Karla Hiller³
¹Robert Bosch GmbH, GERMANY, ²Fraunhofer ENAS, GERMANY, and
³Technische Universität Chemnitz, GERMANY
- M3P.059 BIREFRINGENCE MODULATION OF RECONFIGURABLE METASURFACE BASED ON THERMAL BIMORPH ACTUATOR AT THE VISIBLE RANGE** 1495
Takashi Shimura and Kentaro Iwami
Tokyo University of Agriculture and Technology, JAPAN
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Jürgen Hasselbach^{1,2}, Frank Kästner¹, Remigius Has¹, Siegwart Bogatscher¹, and Christian Rembe²
¹Robert Bosch GmbH, GERMANY and
²Clausthal University of Technology, GERMANY
- M3P.061 FABRICATION OF BIOMIMETIC ARTIFICIAL COMPOUND EYES** 1503
Boshen Zhang, Jing Hua, Yang Zhao, Jimmy Ching-Ming Chen, and Mark Ming-Cheng Cheng
Wayne State University, USA



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- M3P.062** **MAGNETICALLY DRIVEN ACTUATORS FOR VECTOR SCANNING MEMS MIRRORS** 1507
Shanshan Gu-Stoppel, Florian Niekiet, Marec Timmermann, Thomas Lisec and Fabian Lofink
Fraunhofer ISIT, GERMANY
- M3P.063** **METAMATERIAL EMBEDDED OPTICAL DEVICES FOR MILLIMETER WAVE AND TERAHERTZ APPLICATIONS** 1511
Aydin Sadeqi, Hojatollah Rezaei Nejad, Rachel Owyeung, and Sameer Sonkusale
Tufts University, USA
- M3P.064** **ON-CHIP PARALLEL ARCHITECTURE MEMS FTIR SPECTROMETERS ENABLING HIGH SPECTRAL RESOLUTION FOR ENVIRONMENTAL GAS ANALYSIS** 1515
Alaa Fathy^{2,3}, Yasser M. Sabry^{1,2}, Tarik Bourouina³, and Diaa Khalil^{1,2}
¹*Ain Shams University, EGYPT*, ²*Si-Ware Systems, EGYPT*, and ³*ESIEE-Paris EST University, FRANCE*
- M3P.065** **PIEZOELECTRIC SCANNING MICROMIRROR WITH LARGE SCAN ANGLE BASED ON THIN FILM ALUMINUM NITRIDE** 1518
Katja Meinel¹, Chris Stoecke^{1,2}, Marcel Melzer¹, Sven Zimmermann^{1,2}, Roman Forke², Karla Hiller^{1,2}, and Thomas Otto^{1,2}
¹*Chemnitz University of Technology, GERMANY* and ²*Fraunhofer Institute for Electronic Nano Systems, (ENAS) GERMANY*
- M3P.066** **TUNABLE BROADBAND MEMS FABRY-PÉROT NEAR INFRARED FILTER BASED ON DOUBLE-MEMBRANE SILICON/AIR MIRRORS** 1522
Christoph Krämmer, Reinhold Rödel, Christian Huber, Marc Schmid, and Thomas Buck
Robert Bosch GmbH, GERMANY

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- T3P.058** **A COMPACT OMNIDIRECTIONAL LASER SCANNER BASED ON AN ELECTROTHERMAL TRIPOD MEMS MIRROR FOR LIDAR** 1526
Dingkang Wang¹, Connor Watkins¹, Sanjeev Koppal¹, Mengyuan Li², Yingtao Ding², and Huikai Xie^{1,2}
¹*University of Florida, USA* and ²*Beijing Institute of Technology, CHINA*
- T3P.059** **A REFLECTION TYPE VAPOR CELL BASED ON LOCAL ANODIC BONDING OF 45° MIRRORS FOR MICRO ATOMIC CLOCKS** 1530
Hitoshi Nishino¹, Masaya Toda¹, Yuichiro Yano², Masatoshi Kajita², Tetsuya Ido², Motoaki Hara², and Takahito Ono¹
¹*Tohoku University, JAPAN* and ²*National Institute of Information and Communications Technology, JAPAN*
- T3P.060** **A SILICON PHOTONIC MEMS MATRIX SWITCH USING DIRECTIONAL COUPLERS IN COMPARISON WITH THAT USING ADIABATIC COUPLERS** 1533
Takumi Nagai and Kazuhiro Hane
Tohoku University, JAPAN

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Jeong-Yeon Hwang and Chang-Hyeon Ji
Ewha Womans University, KOREA
- T3P.062 EXPERIMENTAL DETECTION OF PIEZO-TUNABLE MICRO-LENS PERFORMANCES BY SPOT OPTICAL MEASUREMENTS 1541**
Sabina Merlo¹, Eleonora Crisà¹, Marco Ferrera², and Marco Soldo²
¹*University of Pavia, ITALY* and ²*STMicroelectronics, ITALY*
- T3P.063 FUNCTIONAL PLASMONIC FIBER-OPTIC BASED SENSORS USING LOW-COST MICROSPHERE PHOTOLITHOGRAPHY 1545**
Jiayu Liu¹, Ibrahim Jasim¹, Muhammad Roman², Yuyao Yang¹, Chuang Qu², Jie Huang², Edward Kinzel³, and Mahmoud Almasri¹
¹*University of Missouri, USA*, ²*Missouri University of Science and Technology, USA*, and ³*University of Notre Dame, USA*
- T3P.064 INTEGRATED AIR SPACED TERAHERTZ METAMATERIAL ABSORBER WITH HIGH QUALITY FACTORS 1549**
Chunxu Chen¹, Sultan Can^{1,3}, Jacob Schalch², Xiaoguang Zhao¹, Guangwu Duan¹, Richard Averitt², and Xin Zhang¹
¹*Boston University, USA*, ²*University of California San Diego, USA*, and ³*Ankara University, TURKEY*
- T3P.065 LARGE SCALE MANUFACTURING OF HYBRID TERAHERTZ METAMATERIAL SURFACES VIA WAFER-LEVEL WATER LITHOGRAPHY 1553**
Zhen Liu^{1,2}, Zhitao Zhou¹, Keyin Liu¹, Ting Xiao², Tiger H. Tao¹, and Jianjuan Jiang¹
¹*Chinese Academy of Sciences (CAS), CHINA* and ²*Shanghai Normal University, CHINA*
- T3P.066 OUT-OF-PLANE DIRECTION THERMAL ACTUATER FOR OPTICAL MEMS 1556**
Mario Kiuchi, Naoki Okimoto, Yasuyuki Hirata, Gen Matsuoka, and Osamu Torayashiki
Sumitomo Precision Products Co., Ltd., JAPAN
- T3P.067 S/N IMPROVEMENT OF AU/SI NANO-ANTENNA PHOTODETECTOR USING SMALL DEVICE AREA AND CONVERGING LENS 1560**
Kazuki Kobayashi¹, Yoshiharu Ajiki², and Tetsuo Kan¹
¹*University of Electro-Communications, JAPAN* and ²*Olympus Corporation, JAPAN*
- T3P.068 ULTRASMALL LINE SCAN NONLINEAR OPTICAL MICROSCOPE USING 1D DICHROIC MEMS SCANNER AND SIOB ASSEMBLY 1564**
Jin Cheng¹, Weiguo Liu¹, Shun Zhou¹, Naitao Xu², Murat Yildirim³, and Yingshun Xu³
¹*Xi'an Technological University, CHINA*, ²*China Key System Integrated Circuit Co., Ltd. (CKS), CHINA*, and ³*Massachusetts Institute of Technology, USA*

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- W3P.058 A HYBRID PNEUMATIC AND PIEZOELECTRIC 3D MICRO SCANNER FOR CANCER IMAGING** 1568
 Ran Fan¹, Ali Moallemi¹, Yunshan Zhang¹, Lei Chen¹, Yuan Zhao², Zhenguo Wu¹, Ryoza Nagamune¹, Keng Chou¹, Haishan Zeng², and Mu Chiao¹
¹University of British Columbia, CANADA and
²BC Cancer Agency Research Center, CANADA
- W3P.059 AN ALIGNMENT SCHEME FOR LOW COST AND HIGH PRECISION SIOB FABRICATION USING AN ELECTROMAGNETIC MICROACTUATOR WITH 5 DOF** 1572
 Chih-Chung Chen, Yu-Min Fu, Hsin Feng Hsu, and Yu-Ting Cheng
 National Chiao Tung University, TAIWAN
- W3P.060 AU NANO-SPIRAL STRUCTURE FOR CIRCULAR DICHROIC FILTER IN VISIBLE REGION** 1576
 Gaku Furusawa¹, Takashi Sekiya², Hiroaki Nakamura², and Tetsuo Kan¹
¹University of Electro-Communications, JAPAN and
²Idemitsu Kosan Co., Ltd., JAPAN
- W3P.061 CMOS COMPATIBLE FABRICATION OF MID INFRARED MICROSPECTROMETERS BASED ON AN ARRAY OF METAMATERIAL ABSORBERS** 1580
 Mohammad Amir Ghaderi¹, Peter Enoksson¹, and Reinoud F. Wolffenbuttel²
¹Chalmers University of Technology, SWEDEN and
²Delft University of Technology, THE NETHERLANDS
- W3P.062 FABRICATION AND INTEGRATION OF BINARY PHASED FRESNEL LENS AND MICRO LINEAR ACTUATOR FOR IR LASER BEAM SCANNING APPLICATION** 1584
 Hsueh-Yu Lu, Chi-En Lu, Zi-Rong Huang, Shihwei Lin, Sung-Cheng Lo, Rongshun Chen, and Weileun Fang
 National Tsing Hua University, TAIWAN
- W3P.063 IMPROVED PERFORMANCE OF FIBER-OPTIC LOCALIZED SURFACE PLASMON RESONANCE SENSOR VIA GOLD CAPPING AND ANTI-REFLECTION SURFACE** 1588
 Hyeon-Min Kim¹, Se-Woong Bae¹, Jae-Hyoung Park¹, Dae Hong Jeong², Ho-Young Lee³, and Seung-Ki Lee¹
¹Dankook University, KOREA, ²Seoul National University, KOREA, and
³Seoul National University Bundang Hospital
- W3P.064 LIQUID MICROLENS ENABLING TUNABLE FOCUS AND TILT FOR RESOLUTION ENHANCEMENT OF 3D IMAGE** 1592
 Seungwan Seo, Sung Keun Yoo, Jeong A. Kim, Dongjun Moon, and Seungwan Seo
 Osong Medical Innovation Foundation, KOREA



- W3P.065** **NANOSTRUCTURED AL SWG REFLECTORS ON THIN LP-Si₃N₄ MEMBRANES AS (TiO₂/SiO₂) BRAGG REFLECTOR ALTERNATIVE FOR VIS FABRY-PÉROT INTERFEROMETERS** 1596
Christian Helke¹, Karla Hiller¹, Jan Seiler¹, Jens Wolfram Erben², Thomas Werner², Danny Reuter², Marco Meinig², Steffen Kurth², and Thomas Otto²
¹Chemnitz University of Technology, GERMANY and
²Fraunhofer ENAS, GERMANY
- W3P.066** **PHOTO-REGULATED RECONFIGURABLE ARITHMETIC CIRCUITS USING PHYSICALLY TRANSIENT DIFFRACTIVE OPTICS** 1600
Xiaoqing Cai^{1,2}, Zihan Gao³, Tiger H. Tao^{1,2}, and Jianjuan Jiang¹
¹Chinese Academy of Sciences (CAS), CHINA,
²University of Chinese Academy of Sciences, CHINA, and
³Shanghai University, CHINA
- W3P.067** **TRACEABLE LASER POWER MEASUREMENT USING A MICRO-MACHINED FORCE SENSOR WITH SUB-PICONEWTON RESOLUTION** 1603
Zhi Li¹, Sai Gao¹, Uwe Brand¹, Karla Hiller², Susan Hahn², and Helmut Wolff¹
¹Physikalisch-Technische Bundesanstalt, GERMANY and
²Technical University Chemnitz, GERMANY

MONDAY - Materials, Fabrication and Packaging Technologies

- M3P.067** **A CONTINUOUS CELLULAR AUTOMATON SIMULATION MODEL OF FOCUSED ION BEAM INDUCED DEPOSITION PROCESS FOR MICRO/NANO STRUCTURES** 1607
Chen Fang, Qianhuang Chen, Qing Chai, Yan Xing, and Xiaohui Lin
Southeast University, CHINA
- M3P.068** **A SCALABLE 3-D PRINTED BIOLOGICAL ASSEMBLY TECHNOLOGY** 1611
Sangwook Chu, Adam D. Brown, James N. Culver, and Reza Ghodssi
University of Maryland, USA
- M3P.069** **EMBEDDED COMPONENT PACKAGING FOR WAFER-LEVEL ENCAPSULATED AND INTEGRATED RF MEMS** 1615
Rameen Hadizadeh¹, Anssi Laitinen¹, David Molinero¹, Shawn Cunningham¹, Christian Vockenberger², and Gerald Weis²
¹WiSpry, Inc., USA and
²Austria Technologie und Systemtechnik, AUSTRIA
- M3P.070** **FABRICATION OF PARTLY ENCAPSULATED VERTICAL NANO-ELECTRODES FOR AN INTRACELLULAR MICROELECTRODE ARRAY** 1619
Sonja Allani, Andreas Jupe, Holger Kappert, and Holger Vogt
Fraunhofer IMS, GERMANY
- M3P.071** **FINE-PITCH BONDING METHODS FOR INTEGRATING ASICS WITH FLEXIBLE POLYMER MEMS** 1623
James J. Yoo and Ellis Meng
University of Southern California, USA

- M3P.072 HIGH-YIELD TRIPLE-STACK BONDING FABRICATION PROCESS FOR MICROMACHINED MICROMOTORS WITH CONTACTLESS ROTOR** 1627
Boqian Sun, Shunyue Wang, Yidong Tan and Fengtian Han
Tsinghua University, CHINA
- M3P.073 INTEGRATION OF MEMS FLOW SENSOR, ELECTRICAL WIRING, AND TUBE STRUCTURE ONTO COPPER ON POLYIMIDE SUBSTRATE** 1631
Ryusei Takigawa¹, Yoshihiro Hasegawa¹, Kazuhiro Taniguchi¹, Miyoko Matsushima², Tsutomu Kawabe², and Mitsuhiro Shikida¹
¹*Hiroshima City University, JAPAN* and ²*Nagoya University, JAPAN*
- M3P.074 LOW-COST, METAL-BASED MICRO-NEEDLE ELECTRODE ARRAY (M-MNEA): A THREE-DIMENSIONAL INTRACORTICAL NEURAL INTERFACE** 1635
Junshi Li, Dong Huang, Yufeng Chen, and Zhihong Li
Peking University, CHINA
- M3P.075 METAL-ASSISTED CHEMICAL ETCHING METHOD SUBJECTED TO MICRO/NANO DEVICE FABRICATION** 1639
Nguyen Van Toan¹, Xiaoyue Wang¹, Naoki Inomata¹, Masaya Toda¹, Ioana Voiculescu², and Takahito Ono¹
¹*Tohoku University, JAPAN* and ²*City of New York, USA*
- M3P.076 MICROMETER-SIZED SUCTION CUP ARRAY WITH STRONG ADHESION TO WET SURFACE** 1643
Thanh-Vinh Nguyen¹ and Isao Shimoyama²
¹*National Institute of Advanced Industrial Science and Technology (AIST), JAPAN* and ²*Toyama Prefecture University, JAPAN*
- M3P.077 NANOFABRICATION OF CHALCOGENIDE GLASS FOR INFRARED SENSORS** 1647
Le Wei, Liang Dong, and Meng Lu
Iowa State University, USA
- M3P.078 ROOM TEMPERATURE DIRECT WRITING OF ULTRATHIN ZINC OXIDE PIEZOELECTRIC FILMS VIA NEAR-FIELD ELECTROHYDRODYNAMIC JETTING FOR HIGH-FREQUENCY FLEXIBLE ELECTRONICS** 1651
Brenda García-Farrera^{1,2} and Luis Fernando Velásquez-García¹
¹*Massachusetts Institute of Technology, USA* and ²*Tecnológico de Monterrey, MEXICO*
- M3P.079 SiC CANTILEVERS FOR GENERATING UNIAXIAL STRESS** 1655
Boyang Jiang¹, Noah Opondo¹, Gary Wolfowicz², Pen-Li Yu¹, David D. Awschalom², and Sunil A. Bhave¹
¹*Purdue University, USA* and ²*University of Chicago, USA*
- M3P.080 THERMAL SENSATION DISPLAY WITH CONTROLLABLE THERMAL CONDUCTIVITY** 1659
Seiya Hirai and Norihisa Miki
Keio University, JAPAN
- M3P.081 TITANIUM NITRIDE NANOTUBES ELECTRODES USED FOR CHRONIC NEURAL STIMULATION** 1662
Gui Chen, Marcella Gatti, and Mark Ming-Cheng Cheng
Wayne State University, USA

- M3P.082 TSV-FREE VERTICAL INTERCONNECTION TECHNOLOGY USING AU-SI EUTECTIC BONDING FOR MEMS WAFER-LEVEL PACKAGING** 1666
Hengmao Liang^{1,2}, Song Liu^{1,2}, and Bin Xiong¹
¹Chinese Academy of Sciences (CAS), CHINA and
²University of Chinese Academy of Sciences, CHINA

- M3P.083 WAFER-LEVEL FABRICATION PROCESS FOR MICRO HEMISPHERICAL RESONATORS** 1670
Yan Shi, Xiang Xi, Yulie Wu, Wei Li, Kun Lu, Zhanqiang Hou, Xuezhong Wu, and Dingbang Xiao
National University of Defense Technology, CHINA

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- T3P.069 A MICROMACHINED IONIC LIQUID ION SOURCE WITH FLOW-CONTROLLED SEGMENTED ANNULAR CHANNELS** 1674
Nguyen-Van Chinh, Le-Van Minh, Takahito Ono, and Hiroki Kuwano
Tohoku University, JAPAN

- T3P.070 COMPARISON OF DEEP ETCHED BOROSILICATE GLASSES IN A FLUORINE BASED PLASMA** 1678
Christoph Weigel¹, Stefan Sinzinger¹, and Martin Hoffmann²
¹Technische Universität Ilmenau, GERMANY and
²Ruhr-Universität Bochum, GERMANY

- T3P.071 FABRICATION OF HIGH ASPECT-RATIO MICROSTRUCTURE ON IMPROVED TITANIUM SUBSTRATE WITH EXCELLENT ADHESIVE STRENGTH AND SU-8 PHOTORESIST** 1682
Liyan Lai, Yongpeng Wu, Yunna Sun, Zhuoqing Yang, Guifu Ding, and Xiaolin Zhao
Shanghai Jiao Tong University, CHINA

- T3P.072 FACILE, PACKAGING SUBSTRATE-AGNOSTIC, MICROFABRICATION AND ASSEMBLY OF SCALABLE 3D METAL MICROELECTRODE ARRAYS FOR IN VITRO ORGAN-ON-A-CHIP AND CELLULAR DISEASE MODELING** 1686
Charles M. Didier, Avra Kundu, and Swaminathan Rajaraman
University of Central Florida, USA

- T3P.073 GAN MICROSPHERE WITH HIERARCHICAL 3D DANDELION-LIKE STRUCTURE FOR HUMIDITY SENSOR WITH EXCELLENT LINEARITY RESPONSE** 1690
Manimuthu Veerappan, Xiaohui Leng, Ramachandran Rajendran and Fei Wang
Southern University of Science and Technology, CHINA

- T3P.074 INDUSTRIAL GRADE FABRICATION OF NANOWIRE SENSOR DEVICE EXPLOITING SACRIFICIAL SHADOW PATTERNING METHOD** 1694
Min-Seung Jo, Min-Ho Seo, Kwang-Wook Choi, Jae-Shin Lee, Jae-Young Yoo, Hyeon-Joo Song, and Jun-Bo Yoon
Korea Advanced Institute of Science and Technology (KAIST), KOREA

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- T3P.075 MAGNETOSTRICTIVE PERFORMANCE OF ELECTRODEPOSITED TBXDY(1-X)FEY THIN FILM 1698**
 Hang Shim¹, Kei Sakamoto¹, Naoki Inomata¹, Masaya Toda¹,
 Nguyen Van Toan^{1,2}, Yunheub Song², and Takahito Ono¹
¹Tohoku University, JAPAN and ²Hanyang University, KOREA
- T3P.076 METHOD FOR STRONG PARYLENE-C BONDING TO SURFACES CONTAINING GOLD AND SILICON DIOXIDE 1701**
 Sander van den Driesche, Christian Habben,
 André Bödecker, and Michael J. Vellekoop
 University of Bremen, GERMANY
- T3P.077 MICROPOWDER BLASTING SIMULATION WITH BLASTING MICROPOWDER SIZE AND MASK EROSION USING CELLULAR AUTOMATON 1705**
 Yoshitaka Nagase and Hiromasa Yagyu
 Kanto Gakuin University, JAPAN
- T3P.078 NANO-ELECTROMECHANICAL LOGICAL GATES UTILISING SELECTIVE TUNGSTEN CHEMICAL VAPOR DEPOSITION 1709**
 Nguyen Van Toan¹, Dong Zhao¹, Naoki Inomata¹,
 Masaya Toda¹, Yunheub Song², and Takahito Ono¹
¹Tohoku University, JAPAN and ²Hanyang University, KOREA
- T3P.079 NOVEL DESIGN AND FABRICATION OF SILICON NANOWIRE ARRAY ON (111) SOI 1712**
 Zicheng Lu^{1,2}, Yuelin Wang¹, and Tie Li¹
¹Chinese Academy of Sciences (CAS), CHINA and
²University of Chinese Academy of Sciences, CHINA
- T3P.080 STRAIN SENSOR BASED ON OPTICAL INTENSITY CHANGE THROUGH THE CARBON NANOTUBE EMBEDDED ELASTOMER 1716**
 Jimin Gu, Donguk Kwon, Junseong Ahn, and Inkyu Park
 Korea Advanced Institute of Science and Technology (KAIST), KOREA
- T3P.081 THREE DIMENSIONAL CORE-SHELL MICRONEEDLE-ELECTRODE FOR MULTISITE NEURONAL RECODING 1720**
 Shinnosuke Idogawa¹, Yoshihiro Kubota¹, Shota Yamagiwa¹,
 Hirohito Sawahata², Rika Numano¹, Kowa Koida¹,
 and Takeshi Kawano¹
¹Toyohashi University of Technology, JAPAN and ²National Institute of Advanced Industrial Science and Technology, JAPAN
- T3P.082 TOWARDS NANOSCALE 3D PRINTING OF PDMS-LIKE POLYMERS 1724**
 Anpan Han, Ding Zhao, Liyun Yu and Anne Ladegaard Skov
 Technical University of Denmark, DENMARK
- T3P.083 TWO-DIMENSIONAL CURVING TECHNIQUES FROM FLAT DIFFRACTION GRATING TO CONCAVE DIFFRACTION GRATING 1728**
 Takanori Aono¹, Yoshisada Ebata², Kenta Yaegashi²,
 and Shigeru Matsui²
¹Hitachi, Ltd., JAPAN and ²Hitachi High Technologies Corporation, JAPAN

- T3P.084 ZERO INSERTION FORCE MEMS SOCKET: 3D MULTI-CHIP ASSEMBLY FOR MICROROBOTICS** 1732
 Hani C. Gomez, Craig B. Schindler, Harry L. Clark Jr,
 Joseph T. Greenspun, and Kristofer S.J. Pister
University of California, Berkeley, USA

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- W3P.068 A RESONANT PRESSURE MICRO SENSOR BASED ON SUSPENDED ASSEMBLY** 1736
 Yulan Lu^{1,2}, Bo Xie¹, Yadong Li^{1,2}, Deyong Chen¹, Junbo Wang¹,
 Jian Chen¹, Hua Wei¹, and Guoqing Zhang¹
¹Chinese Academy of Sciences (CAS), CHINA and
²University of Chinese Academy of Sciences, CHINA

- W3P.069 ADVANCED MEMS-ELASTOMER CONFIGURATION FOR ENHANCED SURFACE PLASMON RESONANCE** 1740
 Kuo-Feng Chiu¹, Yu-Tang Hu¹, Subodh Kumar²,
 and Cheng-Yao Lo¹
¹National Tsing Hua University, TAIWAN and
²Universite de Lyon, FRANCE

- W3P.070 ANALYSIS AND CHARACTERIZATION OF SOFT-LITHOGRAPHY-COMPATIBLE PARALLEL-ELECTRODE-SENSORS IN MICROFLUIDIC DEVICES** 1744
 Ruxiu Liu, Chia Heng Chu, Mert Boya, Dohwan Lee,
 Ozgun Civelekoglu, Hang Chen, and A. Fatih Sarioglu
Georgia Institute of Technology, USA

- W3P.071 DEVELOPMENT OF A MICRO-MAGNET FOR THE ELECTROMAGNETIC TRANSDUCTION OF MEMS** 1748
 Pierre Moritz^{1,2}, Fabrice Mathieu², David Bourrier²,
 Daisuke Saya², Thomas Blon¹, Klaus Hasselbach³,
 Roman Kramer³, Liviu Nicu², Lise-Marie Lacroix¹,
 Guillaume Viau¹, and Thierry Leichle²
¹LPCNO - INSA Toulouse, FRANCE, ²LAAS - CNRS, FRANCE, and
³University of Grenoble, Alpes, FRANCE

- W3P.072 FABRICATION OF LITHIUM NIOBATE BULK ACOUSTIC RESONATOR FOR 5G FILTERS** 1752
 Muhammad Faizan¹, Annalisa De Pastina¹, Soumya Yandrapalli¹,
 Patrick J. Turner³, Robert B. Hammond³, Victor Plessky²,
 and Luis Guillermo Villanueva¹
¹École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND,
²Resonant Inc., USA, and ³GVR Trade SA, SWITZERLAND

- W3P.073 FALSE NEGATIVE FREE NANOPORE FABRICATION VIA ADAPTIVE LEARNING OF THE CONTROLLED DIELECTRIC BREAKDOWN** 1756
 Kamyar Akbari Roshan, Zifan Tang, and Weihua Guan
Pennsylvania State University, USA

- W3P.074 FOUR-SIDED TIP-SEPARABLE MICRO-NEEDLE DEVICE WITH LARGE BARB FORMED BY ANISOTROPIC WET ETCHING FOR TRANS-DERMAL DRUG DELIVERY SYSTEM** 1760
 Mizuki Sakamoto, Yoshihiro Hasegawa, Kazuhiro Taniguchi,
 and Mitsuhiro Shikida
Hiroshima City University, JAPAN

- W3P.075 HIGH ASPECT RATIO VIA FILLING BY ELECTROLESS DEPOSITION ENABLED BY SUPERCRITICAL CARBON DIOXIDE** 1764
Ho-Chiao Chuang, Tun-Sheng Chang, and Jorge E. Sánchez
National Taipei University of Technology, TAIWAN
- W3P.076 INTEGRATED HIGH POWER MICRO MAGNETS FOR MEMS SENSORS AND ACTUATORS** 1768
Thomas Lisec¹, Mani Teja Bodduluri², Arne-Veit Schulz-Walsemann¹, Lars Blohm¹, Isa Pieper¹, Shanshan Gu-Stoppel¹, Florian Niekief¹, Fabian Lofink¹, and Bernhard Wagner¹
¹Fraunhofer ISIT, GERMANY and ²Christian Albrecht University of Kiel, GERMANY
- W3P.077 MEMS ENABLED FAST TIME-RESOLVED X-RAY DIFFRACTION CHARACTERIZATION PLATFORM FOR COPPER NANOPARTICLE SINTERING IN HETEROGENEOUS INTEGRATION APPLICATION** 1772
Boyao Zhang, Jia Wei, Amarante J. Böttger, Henk W. van Zeijl, Pasqualina M. Sarro, and Guoqi Zhang
Delft University of Technology, THE NETHERLANDS
- W3P.078 MICRO HEAT SINK STRUCTURE WITH HIGH THERMAL CONDUCTIVE COMPOSITE VIA MICROMACHINING PROCESS** 1776
Yongpeng Wu, Liyan Lai, Yan Wang, Zhuoqing Yang, Hong Wang, and Guifu Ding
Shanghai Jiao Tong University, CHINA
- W3P.079 MULTI-HYDROGEL 4D PRINTING FOR DEFORMATION CONTROL** 1780
Takuya Uchida and Hiroaki Onoe
Keio University, JAPAN
- W3P.080 NANONEEDLE-ELECTRODE ARRAY PACKAGED WITH AMPLIFIERS FOR RECORDING BIOLOGICAL-SIGNALS WITH A HIGH VOLTAGE GAIN** 1784
Shuhei Tsuruhara¹, Yoshihiro Kubota¹, Hiroshi Kubo¹, Hirohito Sawahata², Shota Yamagiwa¹, Shinnosuke Idogawa¹, and Takeshi Kawano¹
¹Toyohashi University of Technology, JAPAN and ²National Institute of Advanced Industrial Science and Technology (AIST), JAPAN
- W3P.081 PDMS-BASED DUAL-CHANNEL PNEUMATIC MICROACTUATOR USING SACRIFICIAL MOLDING FABRICATION TECHNIQUE** 1788
Tariq Rehman¹, Ahmad Athif Faudzi¹, Marwan Nafea², and Mohamed Sultan Mohamed Ali¹
¹Universiti Teknologi, MALAYSIA and ²University of Nottingham, MALAYSIA
- W3P.082 STRETCHABLE WAVY PIEZOELECTRIC SENSOR FABRICATED BY MICRO-CORRUGATION PROCESS** 1792
Michitaka Yamamoto, Kazuki Hiraoka, Seiichi Takamatsu, and Toshihiro Itoh
University of Tokyo, JAPAN

- W3P.083 TIME AND COST EFFECTIVE FABRICATION OF STRETCHABLE MICRO-SUPERCAPACITOR PATCHES USING A VINYL CUTTER** 1796
Renxiao Xu¹, Yuanyuan Huang¹, Peisheng He¹, Pinghsun Lee¹, Mohan Sanghadasa², and Liwei Lin¹
¹University of California, Berkeley, USA and ²US Army, USA
- W3P.084 TRANSPARENT PZT MIM CAPACITORS ON GLASS FOR PIEZOELECTRIC TRANSDUCER APPLICATIONS** 1800
Gwenael Le Rhun, Christel Dieppedale, Baba Wague, Corentin Querne, Gregory Enyedi, Pierre Perreau, Pierre Montmeat, Christophe Licitra, and Stephane Fanget
University of Grenoble, Alpes, CEA-LETI, FRANCE
- W3P.085 UNIQUE METHOD OF SI LENSES FABRICATION FOR WAFER LEVEL PACKAGING** 1803
Amit Kulkarni, Norman Laske, Pauline Malaurie, and Ralf Dudde
Fraunhofer ISIT, GERMANY

MONDAY - Mechanical/Physical Sensors and Microsystems

- M3P.084 A 0.1 μ M-RESOLUTION SILICON TACTILE SENSOR WITH PRECISELY DESIGNED PIEZORESISTIVE SENSING STRUCTURE** 1807
Tsubasa Nakashima, Kazuki Watatani, Kyohei Terao, Fusao Shimokawa, and Hidekuni Takao
Kagawa University, JAPAN
- M3P.085 A FINGERTIP-SHAPED TACTILE SENSOR WITH MACHINE-LEARNING-BASED SENSOR-TO-INFORMATION PROCESSING** 1811
Jan Kuehn¹ and Yiannos Manoli^{1,2}
¹University of Freiburg, GERMANY and ²Hahn Schickard, GERMANY
- M3P.086 A MODE-LOCALIZED LORENTZ FORCE MAGNETOMETER WITH RESOLUTION OF 1.6 μ T/ $\sqrt{\text{Hz}}$** 1815
Zimu Yan, Yongcun Hao, Wenmu Li, Zhao Zhang, and Honglong Chang
Northwestern Polytechnical University, CHINA
- M3P.087 A NOVEL MEMS 3-AXIS THERMAL ACCELEROMETER WITH 5-WIRE STRUCTURE USING PLANAR STACKING METHOD** 1819
Zhe Li, Wenhan Chang, Shoule Sun, Chengchen Gao, and Yilong Hao
Peking University, CHINA
- M3P.088 A NOVEL QCM MASS SENSING SYSTEM INCORPORATED WITH A 3-DOF MODE LOCALIZED COUPLED RESONATOR STIFFNESS SENSOR** 1823
Yuan Wang¹, Chen Wang¹, Chun Zhao², Huafeng Liu², Delphine Cericca¹, Mathieu Baijot³, François Dupont¹, Serguei Stoukatch¹, and Michael Kraft³
¹University of Liege, BELGIUM, ²Huazhong University of Science & Technology, CHINA, and ³University of Leuven (KU Leuven), BELGIUM

- M3P.089 AN AMBIENT TEMPERATURE COMPENSATED MICROTHERMAL CONVECTIVE ACCELEROMETER WITH HIGH SENSITIVITY STABILITY** 1827
 Xiaoyi Wang¹, Wei Xu², Izhar¹, and Yi-Kuen Lee¹
¹Hong Kong University of Science and Technology, HONG KONG and ²Shenzhen University, CHINA
- M3P.090 AUTOMATED FREQUENCY AND QUALITY FACTOR MISMATCH COMPENSATION METHOD FOR MEMS RATE INTEGRATING GYROSCOPE** 1831
 Takashiro Tsukamoto and Shuji Tanaka
 Tohoku University, JAPAN
- M3P.091 CMOS-MEMS TRI-AXIAL PIEZO-RESISTIVE TACTILE SENSOR WITH MONOLITHICALLY/ VERTICALLY INTEGRATED INDUCTIVE PROXIMITY SENSOR** 1835
 Jia-Horng Lee, Sheng-Kai Yeh, and Weileun Fang
 National Tsing Hua University, TAIWAN
- M3P.092 DESIGN AND CHARACTERIZATION OF ACOUSTIC PARTICLE VELOCITY SENSORS FABRICATED WITH A COMMERCIAL POST-CMOS MEMS PROCESS** 1839
 Massimo Pioletto¹, Andrea Ria¹, Domenico Stanzial², and Paolo Bruschi¹
¹University of Pisa, ITALY and ²CNR-IMM, ITALY
- M3P.093 EFFECT OF SUBSTRATE THICKNESS ON ANCHOR DAMPING IN MEMS DEVICES** 1843
 Gabrielle D. Vukasin¹, Veronica K. Sanchez¹, Christopher P. Cameron¹, Hyun-Keun Kwon¹, Janna Rodriguez², Ian B. Flader³, Yunhan Chen⁴, and Thomas W. Kenny¹
¹Stanford University, USA, ²Intel, USA, ³Invensense, USA, and ⁴Apple Inc., USA
- M3P.094 ENHANCING PARAMETRIC SENSITIVITY USING MICRO-LEVER COUPLER IN MECHANICAL COUPLING MODE-LOCALIZED MEMS ACCELEROMETER** 1846
 Wang Zheng^{1,2}, Xingyin Xiong¹, Zhitian Li¹, Kunfeng Wang^{1,2}, Wuhao Yang¹, and Xudong Zou^{1,2}
¹Chinese Academy of Sciences (CAS), CHINA and ²University of Chinese Academy of Sciences, CHINA
- M3P.095 EXPERIMENTS AND SOLUTION OF ASYMMETRY EFFECT FOR MEMS THERMAL WIND SENSOR** 1850
 Run Tian¹, Zhenxiang Yi¹, Lei Han¹, Ming Qin¹, Qing-An Huang¹, and Kewen Long²
¹Southeast University, CHINA and ²Foshan Chuandong Magnetic Electronic Co., Ltd., CHINA
- M3P.096 FABRICATION AND EVALUATION OF TACTILE PINS FOR PASSIVE TYPE TACTILE DISPLAYS USING HIGH FORMABILITY SHAPE MEMORY ALLOYS** 1854
 Keita Nambara, Keiichirou Iki, Chiemi Oka, Seichi Hata, and Junpei Sakurai
 Nagoya University, JAPAN

- M3P.097 GEOMETRIC COMPENSATION OF (100) SCS VIBRATING RING GYROSCOPE FOR MODE-MATCHING ACHIEVING HIGH IMMUNITY TO FABRICATION IMPERFECTIONS 1858**
Zesen Bai, Jian Cui, Qiancheng Zhao, Yinpeng Wang,
and Zhenchuan Yang
Peking University, CHINA
- M3P.098 HERMETICITY OF $Si_{1-x}Ge_x$ DIAPHRAGMS FOR THE FABRICATION OF A CAPACITIVE POST-CMOS PRESSURE SENSOR 1862**
Christian Walk¹, Alexander Netaev¹, Matthias Wiemann¹,
Michael Görtz¹, Holger Vogt¹, Wilfried Mokwa²,
and Karsten Seidl^{1,3}
¹Fraunhofer IMS, GERMANY, ²RWTH Aachen University,
GERMANY, and ³University of Duisburg-Essen, GERMANY
- M3P.099 HIGH SENSITIVITY SURFACE ACOUSTIC WAVE STRAIN SENSOR BASED ON PMN-PT THICK FILM 1866**
Qing Li, Lijun Lu, Yingwei Tian, Zhiran Yi,
Jingquan Liu, and Bin Yang
Shanghai Jiao Tong University, CHINA
- M3P.100 HIGH-ENERGY DENSITY MICRO-MACHINED CELLULAR ARRAYS OF ELECTROSTATIC ACTUATORS 1870**
Amin Abbasalipour, Prithviraj Palit, and Siavash Pourkamali
University of Texas, Dallas, USA
- M3P.101 HIGHLY SENSITIVE DETECTION OF FINE ELECTROSTATIC ATTRACTION BY RESONANCE-DRIVEN SILICON-HAIR DEVICE 1874**
Kohki Hamamoto¹, Yusaku Maeda^{1,2}, Kyohei Terao¹,
Fusao Shimokawa¹, Fumikazu Oohira^{1,3}, and Hidekuni Takao¹
¹Kagawa University, JAPAN, ²National Institute of Technology,
Kagawa, JAPAN, and ³Open University of Japan, JAPAN
- M3P.102 IN-SITU MEASUREMENT OF STRESS IN THIN FILMS USING MICROMACHINED QUARTZ RESONATORS 1878**
Nishit Goel¹ and Srinivas Tadigadapa²
¹Invensense-TDK Inc., USA, and ²Northeastern University, USA
- M3P.103 INTEGRATION OF STAINLESS-STEEL TACTILE BUMP WITH INDUCTIVE TACTILE SENSOR ARRAY FOR 3D MICRO JOYSTICK-BUTTON APPLICATION 1882**
Sheng-Kai Yeh and Weileun Fang
National Tsing Hua University, TAIWAN
- M3P.104 MASS SENSITIVITY MEASUREMENTS OF A NOVEL HIGH Q-FACTOR DISK RESONATOR FOR LIQUID-PHASE SENSING APPLICATIONS 1886**
Habiba Begum, Abid Ali, and Joshua En-Yuan Lee
City University of Hong Kong, HONG KONG
- M3P.105 MICROACOUSTIC SENSORS WITH INTEGRATED CARBON NANOTUBES FOR HIGH VOC SENSITIVITY 1890**
Teona Mirea, Jimena Olivares, and Marta Clement
Universidad Politécnica de Madrid, SPAIN

- M3P.106 MONOLITHIC SILICON-ON-NOTHING FIBER-BASED PRESSURE SENSORS** 1893
Simon Lorenzo, Yu-Po Wong, and Olav Solgaard
Stanford University, USA
- M3P.107 NONLINEARITY OF DEGENERATELY DOPED FLEXURAL MODE SILICON MICROMECHANICAL RESONATORS** 1897
Saisneha Koppaka¹, Anne L. Alter¹, Gabrielle D. Vukasin¹, Dongsuk D. Shin¹, Ian B. Flander¹, Yunhan Chen², and Thomas W. Kenny¹
¹*Stanford University, USA* and ²*Apple Inc., USA*
- M3P.108 ON FRESNEL-BASED SINGLE AND MULTI SPECTRAL SENSORS FOR INSECTS' WINGBEAT RECORDING** 1901
Ilyas Potamitis¹, Iraklis Rigakis², and Nicolaos-Alexandros Tattas²
¹*Technological Educational Institute of Crete, GREECE* and ²*University of West Attica, GREECE*
- M3P.109 PIEZOELECTRIC MICROMACHINED ACOUSTIC TRANSDUCER WITH ELECTRICALLY-TUNABLE RESONANT FREQUENCY** 1905
Alessandro Nastro¹, Libor Rufer², Marco Ferrari¹, Skandar Basrour², and Vittorio Ferrari¹
¹*University of Brescia, ITALY* and ²*Université Grenoble, Alpes, FRANCE*
- M3P.110 ROBUST AND FLEXIBLE THERMAL SENSOR USING THE 3-OMEGA-METHOD TO INVESTIGATE THERMAL PROPERTIES OF FLUIDS** 1909
Ralf E. Bernhardsgrütter^{1,3}, Christoph J. Hepp¹, Katrin Schmitt^{2,3}, Martin Jäggle², Hans F. Pernau², and Jürgen Wöllestein^{2,3}
¹*Innovative Sensor Technology IST AG, SWITZERLAND*, ²*Fraunhofer Institute for Physical Measurement Techniques, GERMANY*, and ³*University of Freiburg, GERMANY*
- M3P.111 SELF-HEATED THERMORESISTIVE FLOW SENSOR COATED WITH PARALENE-C FOR RELIABILITY ENHANCEMENT BY USING 0.35μM CMOS MEMS TECHNOLOGY** 1913
Wei Xu¹, Xiaoyi Wang², Basant Mousa², Maria Paszkiewicz^{2,3}, and Yi-Kuen Lee²
¹*Shenzhen University, CHINA*, ²*Hong Kong University of Science and Technology, HONG KONG*, and ³*Karlsruhe Institute of Technology (KIT), GERMANY*
- M3P.112 SPATIALLY-RESOLVED 3Ω THERMAL FLOW SENSING FOR MICROFLUIDICS AND BIOLOGY** 1917
Claude Meffan¹, Nicolas Cheradame¹, Mathieu Sellier¹, Emilio P. Calius², and Volker Nock¹
¹*University of Canterbury, NEW ZEALAND* and ²*Callaghan Innovation, NEW ZEALAND*
- M3P.113 SURFACE ACOUSTIC WAVE GENERATION AND PROPAGATION ON POLAR GLASS-CERAMIC FOR HIGH TEMPERATURE SENSORS** 1921
Florian Dupla¹, Marie-Sophie Renoirt¹, Maurice Gonon¹, Nikolay Smagin², Marc Duquennoy², Grégory Martic³, and Mohamed Rguiti⁴
¹*University of Mons, BELGIUM*, ²*IEMN-DOAE UPHF, FRANCE*, ³*CRIBC INISMA, FRANCE*, and ⁴*LMCPA UPHF, FRANCE*

- M3P.114 TACTILE SENSOR USING MICROCANTILEVER EMBEDDED IN FLUOROPOLYMER FOR WATER AND ETHANOL RESISTANCE** 1925
Takumi Takahashi¹, Shuhei Sato¹, Takashi Abe¹, Haruo Noma², and Masayuki Sohagawa¹
¹Niigata University, JAPAN and ²Ritsumeikan University, JAPAN
- M3P.115 TEMPLATED SELF-ASSEMBLY OF MICROCOMPONENTS USING WATER-OIL INTERFACE** 1929
Ryo Hamano and Hiroaoki Suzuki
Chuo University, JAPAN
- M3P.116 TOWARDS 3-AXIS FM MEMS GYROSCOPES: MECHANICAL DESIGN AND EXPERIMENTAL VALIDATION** 1933
Valentina Zega¹, Claudia Comi¹, Elia Bordiga¹, Giacomo Langfelder¹, Luca G. Falorni², and Alberto Corigliano¹
¹Politecnico di Milano, ITALY and ²STMicroelectronics, ITALY

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- T3P.085 A BIOINSPIRED PIEZOELECTRIC CILIA ARRAY FOR SENSING OF HYDRODYNAMIC FLOW** 1937
Le-Giang Tran, Dong-Hyun Joo, and Woo-Tae Park
Seoul National University of Science and Technology, KOREA
- T3P.086 A DISPOSABLE ARRAY CHIP USING TEMPERATURE-RESPONSIVE COLOR CHANGE TO RECORD TEMPERATURE HISTORY IN TERMINAL COLD CHAIN TRANSPORTATION** 1941
Fengyi Zheng and Zhihong Li
Peking University, CHINA
- T3P.087 A FRONT-SIDE MICRO-FABRICATED TINY-SIZE THERMORESISTIVE GAS FLOW SENSOR WITH LOW COST, HIGH SENSITIVITY, AND QUICK RESPONSE** 1945
Dan Xue¹, Wei Zhou¹, Zao Ni¹, Jiachou Wang^{1,2}, and Xinxin Li^{1,2}
¹Chinese Academy of Sciences (CAS), CHINA and ²University of Chinese Academy of Sciences, CHINA
- T3P.088 A NEW SIMPLE FABRICATION METHOD FOR SILICON NANOWIRE-BASED ACCELEROMETERS** 1949
Taeyup Kim¹, Seohyeong Jang¹, Bobaro Chang¹, Jinwoo Sung¹, Seunghyun Lee¹, Hyoungho Ko², Kyo-in Koo³, and Dong-il D. Cho¹
¹Seoul National University, KOREA, ²Chungnam National University, KOREA, and ³University of Ulsan, KOREA
- T3P.089 A NOVEL OUT-OF-PLANE ELECTROTHERMAL BISTABLE MICROACTUATOR** 1953
Liang Zhou and Huikai Xie
University of Florida, USA



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- T3P.090 A PIEZOELECTRIC RESONANT HUMIDITY SENSOR WITH ENHANCED SENSITIVITY BASED ON HIGH MODE DRIVEN BY INTERDIGITAL TRANSDUCERS COATED WITH UNIFORM GRAPHENE OXIDE FILM 1957**
Jintao Pang, Xianhao Le, and Jin Xie
Zhejiang University, CHINA
- T3P.091 ANGULAR RATE SENSING BY CIRCULATORY VORTEX FLOW: DESIGN, SIMULATION AND EXPERIMENT 1961**
Hoa Thanh Phan¹, Thien Xuan Dinh³, Canh-Dung Tran⁴, Trinh Chu Duc¹, Tung Thanh Bui², Phuc Hong Pham¹, and Van Thanh Dau⁵
¹Hanoi University of Industry, VIETNAM, ²VNU University of Engineering and Technology, VIETNAM, ³Ritsumeikan University, JAPAN, ⁴University of Southern Queensland, AUSTRALIA, and ⁵Griffith University, AUSTRALIA
- T3P.092 BIO-INSPIRED FLOW SENSOR USING 3-D GRAPHENE AEROGEL SPHERES 1965**
Renwei Mao, Weiquan Yao, Yang Xu, Weiqiu Chen, and Huan Hu
Zhejiang University, CHINA
- T3P.093 COMPACT MEMS THERMAL WIND SENSOR USING DUAL POLYSILICON LAYERS WITH IMPROVED ACCURACY 1969**
Shang Wang, Zhenxiang Yi, Ming Qin, and Qing-an Huang
Southeast University, CHINA
- T3P.094 DOUBLE FUNCTIONAL PIEZOELECTRIC FILM BASED STRETCHABLE AND FLEXIBLE ACOUSTIC EMISSION SENSOR WITH UNIQUE MAGNETIC REPULSION SENSING ENHANCEMENT AND CONTACT FORCE SELF-DETECTABILITY 1973**
Guo-Hua Feng and Cheng-Yen Chiang
National Chung Cheng University, TAIWAN
- T3P.095 ELECTRICAL ONLY CALIBRATION OF BAROMETRIC PRESSURE SENSORS USING MACHINE LEARNING 1977**
Hadi Najjar
Texas Instruments, Inc., USA
- T3P.096 ESTIMATING THE SURFACE ADHESION FORCE USING PULL-IN/ -OUT HYSTERESIS IN COMB-DRIVE DEVICES 1981**
João Mouro¹, Sunil Rana¹, Jamie Reynolds², Harold Chong², and Dinesh Pamunuwa¹
¹University of Bristol, UK and ²University of Southampton, UK
- T3P.097 GAN CURRENT TRANSDUCERS FOR HARSH ENVIRONMENTS 1985**
Soroush Farammehr¹, Nebojsa Jankovic², and Petar Igic¹
¹Coventry University, UK and ²University of Nis, SERBIA
- T3P.098 GROUND REACTION FORCE SENSING IN MILLIGRAM-SCALE LEGGED MICROROBOTS 1989**
Ryan St. Pierre¹, Babak Eslami², and Sarah Bergbreiter¹
¹Carnegie Mellon University, USA and ²Widener University, USA

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- T3P.099 HIGH SENSITIVE MICRO FLEXIBLE THERMAL SENSOR FOR FLOW SEPARATION MEASUREMENTS ON AIRFOIL 1993**
Baoyun Sun, Binghe Ma, Jinjun Deng, Jian Luo, Pengbin Wang, Yuchao Yan, Weizheng Yuan, and Chengyu Jiang
Northwestern Polytechnical University, CHINA
- T3P.100 HIGH WITHSTAND VOLTAGE PRESSURE SENSORS BASED ON SILICON STRAIN GAUGES-ON-A-GLASS SUBSTRATE 1997**
Joon Hyub Kim¹, Ki Bum Kim¹, Sang Ki Lee¹, Nam Ki Min¹, and Chan won Park²
¹Korea University, KOREA and ²Kangwon University, KOREA
- T3P.101 HOW TO DEFEAT ELECTRIC NOISE IN MEASUREMENT ACQUISITION USING A MICROMECHANICAL ANALOG-TO-DIGITAL CONVERTER 2001**
Philip Schmitt and Martin Hoffmann
Ruhr University Bochum, GERMANY
- T3P.102 IN-SITU SELF-COMPENSATED PT-ITO THIN FILM STRAIN GAGE WITH A NANO LAMINATED STRUCTURE 2005**
Shenyong Yang, Congchun Zhang, Zhuoqing Yang, Hong Wang, Xiaolin Zhao and Guifu Ding
Shanghai Jiao Tong University, CHINA
- T3P.103 LARGE STRAIN MEASUREMENTS BY VACUUM-PACKAGED MEMS RESONATORS MANUFACTURED ON ULTRATHIN SILICON CHIPS 2009**
Luca Belsito, Matteo Ferri, and Alberto Roncaglia
CNR-IMM, ITALY
- T3P.104 LOW FREQUENCY SOUND PRESSURE LEVEL IMPROVEMENT OF PIEZOELECTRIC MEMS MICRO-SPEAKER USING NOVEL SPIRAL SPRING WITH DUAL ELECTRODE 2013**
Hsu-Hsiang Cheng¹, Zi-Rong Huang¹, Mingching Wu², and Weileun Fang¹
¹National Tsing Hua University, TAIWAN and ²GlobalMEMS Co. LTD, TAIWAN
- T3P.105 MEMS MICRO-PUMP FOR AIR SAMPLING APPLICATION 2017**
Oskar Z. Olszewski¹, Jan Kubik², and Ruth Houlihan¹
¹University College Cork, IRELAND and ²Analog Devices, Inc., IRELAND
- T3P.106 MICROFABRICATED MEMBRANES FOR RADIATIVE NEAR FIELD MEASUREMENTS 2021**
Olivier Marconot, Ivan Latella, Alexandre Juneau-Fecteau, Julien Sylvestre, and Luc G. Frechette
Université de Sherbrooke, CANADA
- T3P.107 MINIATURIZED SOIL SENSOR FOR CONTINUOUS, IN-SITU MONITORING OF SOIL WATER POTENTIAL 2025**
Yuncong Chen, Yang Tian, Xinran Wang, and Liang Dong
Iowa State University, USA
- T3P.108 ON-CHIP PRECISION RESIDUAL STRAIN DIAGNOSTIC BASED ON GAP-DEPENDENT ELECTRICAL STIFFNESS 2029**
Alper Ozgurluk and Clark T.-C. Nguyen
University of California, Berkeley, USA

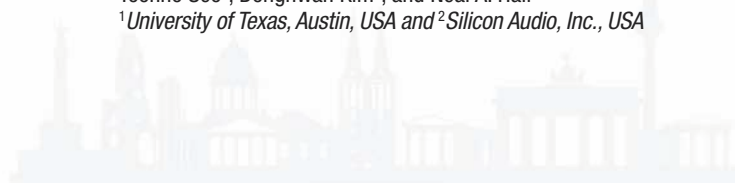
- T3P.109 BATCH FABRICATION OF MULTILAYER POLYMER CANTILEVERS WITH INTEGRATED HARD TIPS FOR HIGH-SPEED ATOMIC FORCE MICROSCOPY 2033**
 Nahid Hosseini¹, Matthias Neuenschwander¹,
 Santiago H. Andany¹, Jonathan D. Adams²,
 and Georg E. Fantner¹
¹*École Polytechnique Fédérale de Lausanne (EPFL),
 SWITZERLAND* and ²*ETH Zürich, SWITZERLAND*
- T3P.110 ROOM AND CRYOGENIC TEMPERATURE BEHAVIOUR OF MAGNETIC SENSORS BASED ON GAN/SI SINGLE SAW RESONATORS 2037**
 Alexandra Nicoloiu¹, Florin Ciubotaru², Claudia Nastase¹,
 Adrian Dinescu¹, Sergiu Iordanescu¹, Hasnain Ahmad²,
 Philipp Pirro³, Christoph Adelmann², and Alexandru Muller¹
¹*IMT-Bucharest, ROMANIA*, ²*IMEC, BELGIUM*, and
³*University of Kaiserslautern, GERMANY*
- T3P.111 SHORTENING BIAS WARM-UP TIME WITH ACTIVE CONTROL OF THE COUPLING STIFFNESS FOR MEMS GYROSCOPES 2041**
 Jian Cui, Qiancheng Zhao, Yinpeng Wang,
 and Guizhen Yan
Peking University, CHINA
- T3P.112 SUB-MICRON MEMS ACCELEROMETER WITH HANDLE-LAYER PATTERNING FOR DAMPING ENHANCEMENT USING TIME TRANSDUCTION 2045**
 Inês S. Garcia^{1,2}, Eurico E. Moreira^{1,2}, Rosana A. Dias²,
 João Gaspar², Filipe S. Alves², and Luis A. Rocha^{1,2}
¹*University of Minho, PORTUGAL* and ²*International and
 Iberian Nanotechnology Laboratory (INL), PORTUGAL*
- T3P.113 TEMPERATURE DRIFTS OF THE FLOATING ELEMENT WALL SHEAR STRESS SENSOR WITH CAPACITIVE SENSING 2049**
 Guanghui Ding, Binghe Ma, Jinjun Deng, Jian Luo,
 Weizheng Yuan, and Jiahao Yao
Northwestern Polytechnical University, CHINA
- T3P.114 THE ELECTROCHEMICAL SEISMOMETER BASED ON A NOVEL DESIGNED SENSING ELECTRODE FOR UNDERSEA EXPLORATION 2053**
 Chao Xu^{1,2}, Junbo Wang^{1,2}, Deyong Chen^{1,2}, Jian Chen^{1,2},
 Bowen Liu^{1,2}, Wenjie Qi^{1,2}, Xichen Zheng^{1,2}, Hua Wei¹,
 and Guoqing Zhang¹
¹*Chinese Academy of Sciences (CAS), CHINA* and
²*University of Chinese Academy of Sciences, CHINA*
- T3P.115 ULTRA-SENSITIVE OPTO-PIEZORESISTIVE SENSORS UTILISING 3C-SIC/SI HETEROSTRUCTURES 2057**
 Thanh Nguyen, Toan Dinh, Abu Riduan Md Faisal,
 Hoang-Phuong Phan, Tuan-Khoa Nguyen,
 Nam-Trung Nguyen, and Dzung Viet Dao
Griffith University, AUSTRALIA

WEDNESDAY - Mechanical/Physical Sensors and Microsystems

- W3P.086 A MEMS PRESSURE SENSOR BASED ON DOUBLE- ENDED TUNING FORK RESONATOR WITH ON-CHIP THERMAL COMPENSATION 2061**
 Dongxiang Han¹, Jian Wang², Shenfang Yuan¹, Ting Yang³,
 Bihai Chen², Gang Teng², Wei Luo², Yufan Chen², Yong Li²,
 Mingming Wang², Yugang Yin², Xiaofeng Jin²,
 Shiming Zhang², and Jian Feng²
¹Nanjing University of Aeronautics and Astronautics, CHINA,
²Beijing Research Institute of Telemetry, CHINA, and
³Tsinghua University, CHINA
- W3P.087 A NOVEL PHOTOACOUSTIC MICROSENSOR FOR ENHANCED QUALITY FACTOR DETECTION OF LOW CONCENTRATION ANALYTES 2065**
 Imran Latif, Zhonglie An, Masaya Toda and Takahito Ono
 Tohoku University, JAPAN
- W3P.088 ACOUSTIC PROPELLER BASED ON AIR JETS FROM ACOUSTIC STREAMING 2068**
 Yongkui Tang and Eun S. Kim
 University of Southern California, USA
- W3P.089 AN OVEN-CONTROLLED MEMS OSCILLATOR (OCMO) WITH SUB 10MW, ± 1.5 PPB STABILITY OVER TEMPERATURE 2072**
 Hyun-Keun Kwon¹, Lizmarie Comenencia Ortiz¹,
 Gabrielle D. Vukasin¹, Yunhan Chen²,
 Dongsuk D. Shin¹, and Thomas W. Kenny¹
¹Stanford University, USA and ²Apple Inc., USA
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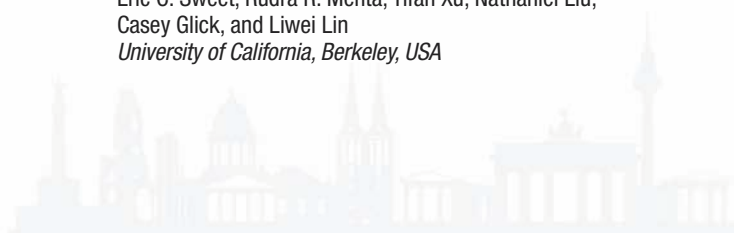
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¹*Instituto de Microelectronica de Barcelona, SPAIN and* ²*Institut des Sciences Analytiques (ISA), Lyon, FRANCE*

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¹*Chinese Academy of Sciences (CAS), CHINA and* ²*University of Chinese Academy of Sciences, CHINA*

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¹Tsinghua University, CHINA, ²University of California, Berkeley, USA, and ³Beihang University, CHINA

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¹Korea Advanced Institute of Science and Technology (KAIST), KOREA and ²Northwestern University, USA
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²Sookmyung Women's University, KOREA



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