Preliminary Program

SOLID-STATE SENSORS, ACTUATORS, AND MICROSYSTEMS WORKSHOP

HILTON HEAD Sonesta Resort

2 – 6 June 2024 South Carolina, USA

2024

Sponsored by the

TRANSUDER RESEARCH FOUNDATION connecting big ideas and small tech
Sunday, 2 June

Workshop 1  MEMS Know Howe
10:00 - 12:00  Morning Session
12:00 - 13:00  Break for Lunch
13:00 - 15:00  Afternoon Session

Workshop 2  Small-Scale Robots: From One to a Swarm
11:00 - 13:00  Morning Session
13:00 - 15:30  Break for Lunch
15:30 - 15:00  Afternoon Session

Monday, 3 June

07:00  Breakfast

07:45  Welcome
  TRF President - Reza Ghodssi, University of Maryland
  Workshop Chair - Jenna Chan, DEVCOM Army Research Laboratory
  Program Chair - Swaminathan Rajaraman, University of Central Florida

Plenary Speaker I
  Session Chair: Shawana Tabassum, University of Texas, Tyler, USA

08:15  IoT4Ag SENSORS AND SYSTEMS FOR PRECISION AGRICULTURE
  University of Pennsylvania, USA

Session 1 - Microsystems for Biosensing
  Session Chair: Igor Paprotny, University of Illinois, Chicago, USA

08:55  INGESTIBLE DEVICE FOR NOISE-RESILIENT BIOIMPEDANCE MONITORING IN GASTROINTESTINAL TRACT
  Brian M. Holt\(^1\), Justin M. Stine\(^1\), Luke A. Beardslee\(^1\),
  Pankaj J. Pasricha\(^2\), and Reza Ghodssi\(^1\)
  \(^1\)University of Maryland, USA and \(^2\)Mayo Clinic, USA,

09:15  MICROFABRICATION AND CHARACTERIZATION OF A NOVEL 3D MITOCHONDRIA BIOSENSOR
  Randall James, Isaac Johnson, Ji Chang, Jorge Manrique Castro, and Swaminathan Rajaraman
  University of Central Florida, USA
09:35  SMART TRACEABLE ELECTRONIC-FREE CAPSULE FOR GASTROINTESTINAL MICROBIOME MONITORING
Sina Nejati, Devendra Sarnaik, Sarath Gopalakrishnan, Venkat Kasi, Akshay Krishnakumar, Samuel Hyde, Robyn McCain, Kinam Park, Jay S. Johnson, and Rahim Rahimi
Purdue University, USA

09:55  ULTRA-SENSITIVE ON-CHIP GRAPHENE-BASED ELECTRO-OPTIC SENSOR ARRAYS FOR MULTIPLEXED NEURAL SIGNAL DETECTION
Xiang Li, Zabir Ahmed, Harshvardhan Gupta, Kanika Sarna, Vishal Jain, and Maysam Chamanzar
Carnegie Mellon University, USA

10:15 am  Break and Tabletop Inspection

10:44 am  Wen Ko Technical Leadership Award Announcement

Invited Speaker I
Session Chair: Kirsten Kaplan, Facebook, USA

10:45  FORTY YEARS OF MEMS INNOVATION AT HILTON HEAD WORKSHOP: FROM EMERGING TECHNOLOGIES TO COMMERCIAL PRODUCTS
Alissa M. Fitzgerald
AMFitzgerald, USA

Session 2 - Industrial, Higher TRL Microsystems
Session Chair: Thomas Li, NXP Semiconductors, USA

11:15  CARDIOPULMONARY AUSCULTATION SYSTEM ENABLED BY A NOVEL BEYOND-RESONANCE SENSING ACCELEROMETER
Tzeno Galchev¹, Longwei Xiao², Wenyong Zhang², Haozhe Dong², Jianglei Zhang¹, James Lin¹, Zhengxin Zhao¹, Adam Spirer¹, Jin Peng³, Hua Jiang⁴, Khiem Nguyen¹, and Sang Zhang⁴
¹Analog Devices Inc., USA, ²Catron Inc., USA, ³Sichuan University, CHINA, and ⁴Sichuan Provincial People’s Hospital, CHINA

11:35  A MEMS-BASED ANALOG COMPUTER FOR EDGE AI COMPUTING
David Lin¹, Johan Reimann¹, Dorin Calbaza¹, Robert MacDonald¹, Zhihui Yang¹, Abdallah Al Zubi², Mohammad Megdadi², and Fadi AlSaleem²
¹GE Aerospace Research, USA and ²University of Nebraska-Lincoln, USA
11:55  **NESTED-MEMS TEMPERATURE COMPENSATED SINGLE-CRYSTALLINE SILICON OSCILLATOR**  
Amir Rahafrooz, Diego E. Serrano, Ryan Hennessy,  
William McDonald, Duane Younkin, Kieran Nunan, Stanley Che,  
and Ijaz Jafri  
*Panasonic Massachusetts Laboratory, USA*

12:15  **Oliver Brand Remembrance**

12:20  **Poster Preview – Session 1**  
Session Chairs: Hengky Chandrahaliim, Air Force Institute of Technology, USA and  
Siddhartha Ghosh, Northeastern University, USA

12:45 - 14:15  **Networking Lunch**

14:15  **Poster Session 1**  
Session Chair: Reza Ghoddsi, University of Maryland, USA

14:15  **Contributed and Late News**  
See page 13 for listing of poster presentations

16:45 pm  **End of Day**
Tuesday, 4 June

07:30  Breakfast
08:00  Announcements

Plenary Speaker II
Session Chair: Amit Lal, Cornell University, USA

08:05  HYBRID LOW LOSS INTEGRATED PHOTONICS: FROM CHIPSCALE FREQUENCY COMBS, FREQUENCY AGILE LASERS, ERBium AMPLIFIERS TO CRYOGENIC QUANTUM INTERCONNECTS
Tobias Kippenberg
Swiss Federal Institute of Technology Lausanne (EPFL), SWITZERLAND

Session 3 - Resonators, Oscillators and Micromotors
Session Chairs: Azadeh Ansari, Georgia Institute of Technology, USA and Vikrant Gokhale, Navy Research Laboratory, USA

08:45  Q-FACTOR ENHANCEMENT OF PIEZO-ON-SILICON MEMS RESONATORS THROUGH MODE-COUPLING AND TOPOLOGICAL TANK CONFIGURATIONS
Suaid Tariq Balghari, Abid Ali, and Frederic Nabki
Ecole de Technologie Superieure, CANADA

09:05  ULTRA-STABLE MEMS OSCILLATOR WITH 42 PPT FRACTIONAL FREQUENCY STABILITY AT 85 SECONDS
Jintark Kim¹, Rakibul Islam¹, Jiheng Jing¹, Jie Yan¹, Juneau Larson¹, Gabrielle Vukasin², Ryan Kwon², Saurabh Saxena¹,³, Thomas W. Kenny², Pavan K. Hanumolu¹, and Gaurav Bahl¹
¹University of Illinois, Urbana-Champaign, USA, ²Stanford University, USA, and ³Indian Institute of Technology, INDIA

09:25  ANALOG MICRO DELTA (µΔ) MOTOR: COMPLIANT MECHANISM ENABLED MEMS BIDIRECTIONAL TRANSMISSION-CAPABLE GAP CLOSING ARRAY
Alexander N. Alvara¹,², Yichen Liu¹,², Liwei Lin¹,², and Kristofer S. J. Pister¹,²
¹University of California, Berkeley, USA and ²Berkeley Sensor & Actuator Center, USA,

9:55 am  Break and Tabletop Inspection
10:14 am  Denice Denton Mentorship Award Announcement

Invited Speaker II
Session Chair: Ravi Selvaganapathy, McMaster University, CANADA

10:15  CHANGING THE COURSE OF HEART FAILURE DISEASE MANAGEMENT USING MEMS - A CardioMEMS STORY
Michael Fonseca
StethX Microsystems, USA

Session 4 - Chemical and Environmental Sensing
Session Chairs: Daniela Diaz-Alonso, Center for Engineering and Industrial Development (CIDESI), MEXICO and Rahim Rahimi, Purdue University, USA

10:45  AN ELECTROLYTIC-INDUCED BUBBLE-BASED DISSOLVED CO2 SENSOR
Steven Tran, Seungbeom Noh, and Hanseup Kim
University of Utah, USA

11:05  MULTI-MODAL MEMS SENSING MODULE FOR EXTRATERRESTRIAL OCEANOGRAPHIC EXPLORATION
Zhijian Hao¹, Yue Zheng¹, Ethan W. Schaler², and Azadeh Ansari¹
¹Georgia Institute of Technology, USA and
²Jet Propulsion Laboratory, California Institute of Technology, USA,

11:25  PAPER-BASED WEARABLE MOIST-ELECTRIC GENERATORS WITH EFFICIENT ATMOSPHERIC WATER CAPTURE
Yang Gao and Seokheun Choi
State University of New York, Binghamton, USA

11:45  Hilton Head Education, History, and Conservation Talk
The Civil War on Hilton Head Island: Local History, National Impact, Enduring Legacy
Jan McKelvey
Lean Ensemble Theater, USA

12:15 - 13:30  Networking Lunch

14:00 - 16:00  MSIG Industry Session

14:00 - 16:00  Workshop: Beyond Technical Expertise: Dealing with Sources of Personal and Professional Stress
14:00 - Recreational Activities (on your own)
19:00

18:00 - Graduate Student Networking Event
19:00

19:00 - Banquet
22:00
Wednesday, 5 June

7:15 am  Women in MEMS Breakfast (Savannah Jr. Ballroom)

7:30 am  Breakfast

8:10 am  Announcements

Plenary Speaker III
Session Chair: Reza Ghodssi, University of Maryland, USA

08:15  THE FUTURE OF JOINT REPLACEMENT SURGERY: HARNESSING SENSORS, ROBOTICS, AND AI FOR BETTER OUTCOMES
Christopher J. Cannova
Aligned Orthopedic Partners, USA

Session 5 - Medical MEMS
Session Chairs: Kevin Daniels, University of Maryland, USA and Virgilio Valente, Toronto Metropolitan University, CANADA

08:55  AN APPROACH FOR 3D MICROPRINTING OF SOFT ROBOTIC BIOPSY TOOL AT 1 FRENCH LENGTH SCALE VIA EX SITU DIRECT LASER WRITING
Sunandita Sarker, Declan Fitzgerald, Olivia M. Young, Bailey M. Felix, and Ryan D. Sochol
University of Maryland, USA

09:15  FLEXIBLE MICROINJECTOR FOR RAPID LOCALIZED DRUG DELIVERY FROM INGESTIBLE DEVICES
Joshua A. Levy, Michael A. Straker, and Reza Ghodssi
University of Maryland, USA

09:35  MAGNETIC FIELD SENSING WITH A MINIATURE ELECTRO-OPTIC SENSOR FOR INTERVENTIONAL MAGNETIC RESONANCE IMAGING
Alp A. Derin¹, Abhiram Pulavarthi¹, Jordan Edmunds², Jack Guida¹, Siddartha Ghosh¹, and Soner Sonmezoglu¹
¹Northeastern University, USA and ²University of California, Berkeley, USA

09:55  ULTRASOUND-BASED TELEMETRY OF IMPLANTED MICROFLUIDICS FOR INTRACRANIAL PRESSURE SENSING
Cecilia A. Luna¹,², Saeyoung Kim², Adeoye Olomodosi², Nicholas Au Yong¹,², Brooks Lindsey¹,², and David R. Myers¹,²
¹Emory University, USA and ²Georgia Institute of Technology, USA,
10:15 Break and Tabletop Inspection

10:44 Mark Shannon Grand Challenges Award Announcement

Invited Speaker III
Session Chair: Shaurya Prakash, Ohio State University, USA

10:45 EMPOWERING PEOPLE TO TAKE CONTROL OF HEALTH
Joshua Windmiller
Dexcom, USA

Session 6 - Novel Devices
Session Chair: Farnaz Niroui, Massachusetts Institute of Technology, USA

11:15 POSS-ENABLED MECHANICAL ENHANCEMENT FOR 3D-NANOPRINTED HIGH-ASPECT-RATIO MICROINJECTION NEEDLES
Adira Colton¹, Sunandita Sarker¹, A. Muhaymin Chowdhury¹, Prableen Chowdhary², Joshua A. Levy¹, Katie L. Ruland¹, Reza Ghodssi¹, Rachel Brewster², Kinneret Rand-Yadin³, and Ryan D. Sochol¹
¹University of Maryland, College Park, USA, ²University of Maryland, Baltimore County, USA, and ³SeeTrue Technology, USA

11:35 AFTER 90 YEARS: CMOS-BASED HAFNIA-ZIRCONIA NANOMECHANICAL RESONATOR EXCEEDING AT-CUT QUARTZ TEMPERATURE STABILITY
Troy Tharpe, Moumita Chakraborty, and Roozbeh Tabrizian
University of Florida, USA

11:55 ULTRACOMPACT AND HIGH-GAIN THIN-FILM BULK ACOUSTIC RESONATOR MAGNETOELECTRIC ANTENNA ARRAY
Bin Luo¹, Xianfeng Liang¹, Huaihao Chen¹, Neville Sun¹, Hwaider Lin², and Nian-Xiang Sun¹
¹Northeastern University, USA and ²Winchester Technologies LLC, USA,

12:15 Poster Preview – Session 2
Session Chairs: Mary Beth Galanko Klemash, DEVCOM Army Research Laboratory, USA and Swami Rajaraman, University of Central Florida, USA

13:00 - Networking Lunch

14:30
Poster Session 2
Session Chair: Jenna Chan, DEVCOM Army Research Laboratory, USA

14:30  Contributed and Late News
See page 21 for listing of poster presentations

17:00 -  Free Time

Poster Session 3 and Reception
Session Chair: Sina Askari, ECS/DARPA, USA

18:30  Commercial and Open Posters
See page 29 for listing of poster presentations

20:00 -  Rump Session
22:00
Thursday, 6 June

07:30  Breakfast

08:10 m  Announcements

Plenary Speaker IV
Session Chair: Kari Moran, Naval Information Warfare Center Pacific, USA

08:15  MICRO INNOVATIONS, MACRO IMPACT:
MEMS AT THE FOREFRONT OF OUR ENERGY FUTURE
Evelyn N. Wang
ARPA-E, USA

Session 7 - Novel Devices and Processes
Session Chair: Logan Sorenson, HRL Laboratories, USA

08:55  FABRICATION OF SUPERHYDROPHOBIC STRUCTURES VIA
AEROSOL JET PRINTING
Jace Rozsa¹, Ke Zhong¹, Dinesh Patel¹, Lining Yao²,
Mohammad Islam¹, and Gary K. Fedder¹
¹Carnegie Mellon University, USA and
²University of California, Berkeley, USA,

09:15  TRANSLATION AND ELECTRICALLY CONTROLLED ROTATION
OF LARGE ZEBRAFISH EMBRYO BY ACOUSTIC TWEEZERS
Baptiste Neff, Kianoush Sadeghian Esfahani, Akash Roy,
Matin Barekatain, and Eun Sok Kim
University of Southern California, USA

09:35  LOCALIZED AND CONFORMAL STRAIN ENGINEERING OF 2D
MATERIALS FOR SCALABLE, FUNCTIONAL DEVICES
Sarah O. Spector, Weikun Zhu, Alex Quach, Peter F. Satterthwaite,
and Farnaz Niroui
Massachusetts Institute of Technology, USA

09:55  Break and Tabletop Inspection

Invited Speaker IV
Session Chair: Vladimir Aksyuk, National Institute of Standards and Technology, USA

10:25  DECADES OF MEMS TIMING
Ginel Hill
SiTime, USA
Session 8 - Late News
Session Chair: Kimberly Harrison, AMFitzgerald, USA

10:55  A NOVEL THIN FILM ENDOVASCULAR ELECTRODE ARRAY FOR MINIMALLY INVASIVE NEURAL RECORDING
Brianna Thielen¹, Huijing Xu¹, Pradeep Selvan², Charles Liu¹, William J. Mack¹, Dong Song¹, and Ellis Meng¹
¹University of Southern California, USA and
²Lundquist Institute for Biomedical Innovation, USA

11:15  AN AGING-COMPENSATED ALSCN-ON-SI BULK ACOUSTIC WAVE OSCILLATOR TOWARDS TACTICAL-GRADE CLOCK GENERATION
Banafsheh Jabbari, Shaurya Dabas, Dicheng Mo, Eitan Hershkovitz, Honggyu Kim, and Roozbeh Tabrizian
University of Florida, USA

11:35  INGESTIBLE BIOIMPEDANCE SENSING DEVICE FOR LOCALIZED FEEDBACK-DRIVEN DRUG DELIVERY
Mateo Lim, Brian M. Holt, Joshua A. Levy, Justin M. Stine, Luke A. Beardslee, and Reza Ghodssi
University of Maryland, USA

12:10  Award Ceremony

12:10  Closing Remarks
Workshop Chair - Jenna Chan, DEVCOM Army Research Laboratory
Program Chair - Swaminathan Rajaraman, University of Central Florida

12:45 - Networking Lunch
14:15  Workshop Adjourns
Chemical or Biological Sensors, Actuators or Systems

MP-01 A HIGHLY SENSITIVE FLEXIBLE AG NPS/MWCNTS/NAFION-RU(NH3)63+/2+ ELECTRODE WITH SU-8 MICROPILLARS FOR REAL-TIME HYDROGEN SULFIDE MONITORING IN LIQUIDS
Chih-Hsiang Su¹, Mu-Yi Fang¹, Ting-Wei Huang¹, Yu-Ting Cheng¹, Hsiao-En Tsai², and Yih-Shurng Chen²
¹National Yang Ming Chiao Tung University, TAIWAN and
²National Taiwan University Hospital (NTUH), TAIWAN,

MP-02 ADVANCED PAPER-BASED ORGANIC ELECTROCHEMICAL TRANSISTORS: A NOVEL APPROACH FOR RAPID POINT-OF-CARE ANTIBIOTIC SUSCEPTIBILITY TESTING
Zahra Rafiee, Maryam Rezaie, and Seokheun Choi
State University of New York, Binghamton, USA

MP-03 DUAL-MODE SENSING PLATFORM FOR DETECTION OF INFLAMMATORY BIOMARKER IN MONITORING ORGAN TRANSPLANT REJECTION
Atul Sharma, Nafize Ishtiaque Hossain, and Sameer Sonkusale
Tufts University, USA

MP-04 EXTENDED FLIGHT DURATION SMALL-SCALE QUADROTBORS POWERED BY HIGH-ENERGY-DENSITY, HIGH-POWER-DENSITY MICRO ALUMINUM-AIR BATTERIES
Yanghang Huang, Haoxuan Lyu, Mark G. Allen, and Sue Ann Bidstrup Allen
University of Pennsylvania, USA

MP-05 FLEXISENSE SYSTEM: PH-GUIDED WOUND MONITORING AND PRECISION DRUG DELIVERY USING FLEXIBLE ELECTRONIC TECHNOLOGY
Akshay Krishnakumar¹,², Muhammad Masud Rana¹,², Sarath Gopalakrishnan¹,², Jose Waimin¹,², and Rahim Rahimi¹,²
¹Brick Nanotechnology Center, USA and ²Purdue University, USA

MP-06 INTEGRATION OF HYDROGEL MICROFIBERS FOR HYBRID LEAD SEQUESTRATION AND SENSING IN CROP PLANTS: A NOVEL APPROACH FOR PHYTOREMEDIATION
Rhythem Tahrin, Francisco Perez, Mohammad Solaiman, Md Najmul Islam, Shah Z. Riam, and Shawana Tabassum
University of Texas, Tyler, USA
MP-07  NFC-ENABLING SMARTPHONE-BASED PORTABLE PHOTOTHERMAL SENSING INTEGRATED WITH PAPER-BASED MICROFLUIDIC DEVICES FOR ENZYME-FREE GLUCOSE DETECTION
Kawin Khachornsakkul, Ruben Del-Rio-Ruiz, Cihan Asci, and Sameer Sonkusale
Tufts University, USA

MP-08  PROBIOTIC-POWERED INGESTIBLE CAPSULES: A NOVEL APPROACH TO VIBRATIONAL THERAPY
Maryam Rezaie and Seokheun Choi
State University of New York, Binghamton, USA

MP-09  RAPID, LOW-COST CARBAPENEMASE DETECTION USING A SELF-COALESCING STICKER MICROFLUIDIC FOR ENHANCED MANAGEMENT OF CARBAPENEMASE-PRODUCING ORGANISMS IN HEALTHCARE SETTINGS
Anjana Dissanayaka¹,², Ali Haider¹, Lily Kamat¹,², Priscilla Delgado¹,², Jesse J. Waggoner¹, and David R. Myers¹,²
¹Emory University, USA and ²Georgia Institute of Technology, USA,

MP-10  SERS-ENHANCED OPTICAL FIBER BIOSENSORS FOR ULTRASENSITIVE SALMONELLA DIAGNOSTICS
Mai Abuhelwa¹, Arshdeep Singh¹, Jiayu Liu¹, Morey Amit², Lakshmikantha H. Channaiah¹, and Mahmoud Almasri¹
¹University of Missouri, Columbia, USA and
²Auburn University, USA,

MP-11  ULTRA THIN SMART ELECTROPALATOGRAPHY SYSTEM TO ASSIST LINGUISTIC AND MEDICAL DIAGNOSIS
Ziqi Jia, Sunghyun Hwang, Saeyeong Jeon, and Ariel David Cerpa
University of Florida, USA

Physical Sensors, Actuators, or Systems

MP-12  2 TO 16 GHZ FUNDAMENTAL SYMMETRIC MODE ACOUSTIC RESONATORS IN PIEZOELECTRIC THIN-FILM LITHIUM NIOBATE
Vakhtang Chulukhadze¹, Jack Kramer¹, Tzu-Hsuan Hsu², Omar Barrera¹, Ian Anderson¹, Sinwoo Cho¹, and Joshua Campbell¹
¹University of Texas, Austin, USA and
²National Tsing Hua University, TAIWAN,
A LOW-PHASE NOISE OSCILLATOR EMPLOYING CONTOUR-MODE LITHIUM TANTALATE RESONATORS WITH HIGH TURNOVER TEMPERATURE
Tanvir Hasan, Yasaman Majd, Hamed Atashbar, Hannanah Mahdavi, Hakhamanesh Mansoorzare, and Reza Abdolvand
University of Central Florida, USA

A PARAMETRIC FREQUENCY COMB GENERATOR IMPROVING BY 10X THE LIMIT-OF-DETECTION OF 120 MHZ ALSCN-BASED IR DETECTORS
Hussein M. E. Hussein, Farah Ben Ayed, Aurelio Venditti, Pietro Simeoni, Cristian Cassella, and Matteo Rinaldi
Northeastern University, USA

AI-DRIVEN SCANNING GHZ ULTRASONIC IMAGING BASED MEMS METROLOGY
Karan Jha¹, Anuj Baskota¹, Justin Kuo¹, Serhan Ardanuç¹, Scott Zimmerman¹, and Amit Lal¹,²
¹Geegah Inc, USA and ²Cornell University, USA

CO-RESONANT CANTILEVERS AS HIGHLY SENSITIVE MASS SENSORS
Ioannis Lampouras and Julia Körner
Leibniz University Hannover, GERMANY

DESIGN AND FABRICATION OF A NOVEL THERMALLY-ACTUATED NO ELECTRIC POWER EVENT-DRIVEN MEMS SENSOR FOR IOT APPLICATIONS
Dilan Ratnayake and Kevin Walsh
University of Louisville, USA

DESIGN AND FABRICATION OF SWITCH-BASED BIO-INSPIRED AIRFLOW SENSORS
Bram Miller, Regan Kubicek, and Sarah Bergbreiter
Carnegie Mellon University, USA

ENHANCING TEMPERATURE STABILITY OF LAMÉ-MODE SILICON RESONATOR USING ELASTIC NONLINEARITY
Dicheng Mo, Shaurya Dabas, Banafsheh Jabbari, and Roozbeh Tabrizian
University of Florida, USA

FLUX CONCENTRATOR OPTIMIZATION EXPLOITING SATURATION FOR MICROMACHINED AC MAGNETIC FIELD SENSORS
Xuan Wang, Sydney Sofronici, Roy H. Olsson, and Mark G. Allen
University of Pennsylvania, USA
MP-21 GRAVIMETRIC PARTICULATE MATTER SENSING WITH PIEZOELECTRIC PAPER
Anindya L. Roy, Kanagasubbulakshmi Sankaralingam, Konrad Walus, and Boris Stoeben
University of British Columbia, CANADA

MP-22 INTERNAL RESONANCE OF A T-SHAPED LEVITATION ACTUATOR
Mohammad Alzgool, Yu Tian, Mohammad Younis, and Shahrzad Towfighian
Binghamton University, USA

MP-23 MEMS LITHIUM NIOBATE TRANSFORMER FOR LOW FREQUENCY PASSIVE GAIN WITH HIGH CAPACITIVE LOADS IN ATMOSPHERE
Justin R. Phelps and Reza Abdolvand
University of Central Florida, USA

MP-24 MID-AIR PARTICLE MANIPULATIONS BY A 2X2 PMUT ARRAY
Wei Yue1, Megan Teng1, Yande Peng1, Fan Xia1, Peggy Tsao1, Yuan Gao1, Shinsuke Ikeuchi2, Yasuhiro Aida2, Seiji Umezawa2, and Liwei Lin1
1University of California, Berkeley, USA and
2Murata Manufacturing Co., Ltd., JAPAN

MP-25 NONLINEAR INTERNAL RESONANCE FOR GAS SENSING
Wagner B. Lenz1, Rodrigo T. Rocha1,2, Fahimullah Khan1,3, Carlos A. Grande1, and Mohammad I. Younis1,4
1King Abdullah University of Science and Technology (KAUST), SAUDI ARABIA, 2Silicon Austria Labs (SAL), AUSTRIA, 3International Iberian Nanotechnology Laboratory Braga, PORTUGAL, and 4State University of New York, Binghamton, USA

MP-26 PARASITIC-IMMUNE REAL-TIME TRACKING OF A MEMS FREQUENCY REFERENCE
Jie Yan1, Jintark Kim1, Rakibul Islam1, Jiheng Jing1, Dongsuk D. Shin2, Saurabh Saxena1,3, Pavan K. Hanumolu1, Thomas W. Kenny2, and Gaurav Bahl1
1University of Illinois, Urbana-Champaign, USA, 2Stanford University, USA, and 3Indian Institute of Technology, INDIA

MP-27 SCANDIUM ALUMINUM NITRIDE OVERMODED BULK ACOUSTIC RESONATORS FOR FUTURE WIRELESS COMMUNICATION
Walter Gubinelli, Pietro Simeoni, Ryan Tetro, Luca Colombo, and Matteo Rinaldi
Northeastern University, USA
MP-28 SPARSE ARRAY OF THERMAL RESONATORS FOR INFRARED DETECTION AND IMAGING
Isabel H. Rodrigues¹, Clifford F. Frez¹, Savannah R. Eisner²,³, Debbie G. Senesky², and Mina Rais-Zadeh¹
¹California Institute of Technology, USA, ²Stanford University, USA, and ³Columbia University, USA

MP-29 TRAMPOLINE Si₃N₄ MAGNETOMETERS WITH 330 PT/√Hz SENSITIVITY
Massood Tabib-Azar and Brian Baker
University of Utah, USA

MP-30 ULTRA-WIDEBAND TAPERED TRANSDUCERS IN THIN-FILM LITHIUM NIOBATE ON SILICON CARBIDE
Jack Kramer, Tzu-Hsuan Hsu, Joshua Campbell, and Ruochen Lu
University of Texas, Austin, USA

Technology, Materials, Packaging, and CAD

MP-31 A 3D PRINTED MICRO LIQUID THERMAL REGULATOR (MLTR) FOR IN-VIVO CHRONIC PAIN APPLICATIONS
Jazune Madas, Andre Childs, Lei Zhai, Zixi Cheng, and Swaminathan Rajaraman
University of Central Florida, USA

MP-32 ADVANCING MILLIMETER-WAVE TECHNOLOGIES: HIGH-EFFICIENCY 3D AIR-LIFTED INDUCTORS MADE OF A HIGHLY MANUFACTURABLE CU/CO METACONDUCTOR
Saeyeong Jeon, Alexander Wilcher, Ariel David Cerpa, and Yong-Kyu Yoon
University of Florida, USA

MP-33 ANALYSIS OF DIFFERENT MICROFLUIDIC PIN-FIN STRUCTURES IN METAL ADDITIVELY MICROFABRICATED PACKAGES FOR THERMAL MANAGEMENT OF MICROSYSTEMS
Bhushan Lohani², Ryan M. Price¹, Peter Sanchez¹, and Robert C. Roberts¹
¹University of Texas, El Paso, USA and ²Pennsylvania State University, USA

MP-34 ENABLING CUT-RESISTANT SUPERHYDROPHOBIC SURFACES USING A HIGHLY ENTANGLED SOFT POLYMERIC SUBSTRATE
Junce Cheng and Tingyi Liu
University of Massachusetts, Amherst, USA
MP-35  HIGHLY EFFICIENT, FLEXIBLE, AND SELF-HEALABLE MOISTURE-DRIVEN ENERGY HARVESTER BASED ON 2D VANADIUM PENTOXIDE NANOSHEETS
Kundan Saha and Sameer Sonkusale
Tufts University, USA

MP-36  LONG-LASTING LEVOTHYROXINE SODIUM MICRONEEDLE PATCH FOR HASHIMOTO’S THYROIDITIS TREATMENT
Diana V. Rodriguez De Francisco, Edwin Davidson Barahona, Omar S. Cepeda Torres, and Swaminathan Rajaraman
University of Central Florida, USA

MP-37  ON-DEMAND TRANSDERMAL DRUG DELIVERY PLATFORM BASED ON HOLLOW-GROOVE MICRONEEDLE ARRAY
Jihyun Kim, Danilo M. dos Santos, Hasika Suresh, and Sameer Sonkusale
Tufts University, USA

MP-38  SHRINKABLE SILICONE THIN MEMBRANES AND THEIR INTEGRATION IN 3D PRINTED MICROFLUIDIC OXYGENATORS
Anand Sojan, Ponnambalam Ravi Selvaganapathy and Islam Hassan
McMaster University, CANADA

MP-39  SUPERHARMONIC RESONANT RESPONSE MEASUREMENT (SRRM): A NEW METHOD FOR MEASURING SPONTANEOUS POLARIZATION
Vishnu Kumar¹, Shreeraj Joshi¹, Sudhanshu Tiwari¹,², Upanya Khandelwal¹, Rudra Pratap¹,³, Pavan Nukala¹, and Saurabh Chandorkar¹
¹Indian Institute of Science, Bengaluru, INDIA,
²Purdue University, USA, and ³Plaksha University, INDIA

MP-40  TAILORING ENHANCEMENT OF SILICON-DI-OXIDE ADHESION TO POLYCARBONATE SUBSTRATES FOR 3D MICROELECTRODE ARRAYS (3D MEAS) AND OTHER BIOSENSORS
Surbhi Tidke, Omar S. Cepeda-Torres, Brian E. Butkus, Andre Childs, and Swaminathan Rajaraman
University of Central Florida, USA

MP-41  TRANSFERRING SOFT DOUBLY RE-ENTRANT MICROSTRUCTURES FOR MECHANICALLY RESILIENT OMNIPHOBIC SURFACES
Qingyang Sun and Tingyi L. Liu
University of Massachusetts, Amherst, USA
Late News - Chemical or Biological Sensors, Actuators or Systems

MP-43 FLEXIBLE BIODEGRADABLE LEAF-WEARABLE SENSOR FOR MONITORING STRESS-INDUCED METHANOL EMISSION FROM PLANTS
Elvis Sangmen¹, AKM Sarwar Inam¹, Shah Z. Riam¹, Md Najmul Islam¹, Ariba Siddiqui², Mitradip Bhattacharjee², and Shawana Tabassum¹
¹University of Texas. Tyler, USA and ²Indian Institute of Science Education and Research (IISER), INDIA

Late News - Physical Sensors, Actuators, or Systems

MP-44 INTEGRATION OF GRAPHENE-POLYMER HETEROSTRUCTURE MEMBRANES INTO A MULTI-USER MEMS FABRICATION PROCESS
Katherine Smith¹, Daniel M. Armada¹, Aidan Retallick¹, Alaaeldin Elhady², Samed Kocer², Matthias Heil¹, Eihab Abdel-Rahman², and Aravind Vijayaraghavan¹
¹University of Manchester, UK, and ²University of Waterloo, CANADA

MP-45 SENSITIVITY CONSIDERATIONS FOR A SMART HYDROGEL-BASED MICROSENSOR FOR CATHETER APPLICATIONS
Benozir Ahmed¹, Christopher F. Reiche¹, Florian Solzbacher¹, and Julia Körner¹,²
¹University of Utah, USA and ²Leibniz University Hannover, GERMANY

MP-46 X-BAND FREQUENCY SCALING OF A₀ AND S₀ FOCUSED LAMB MODES FOR ACOUSTIC DELAY LINES IN 30% SCANDIUM ALUMINUM NITRIDE
Jack Guida, Gabriel Giribaldi, Matteo Rinaldi, and Siddhartha Ghosh
Northeastern University, USA

Late News - Technology, Materials, Packaging, and CAD

MP-47 DEVELOPMENT OF ADVANCED DIABETIC ORTHOTICS: FROM FINITE ELEMENT MODELING TO PRESSURE SENSOR IMPLEMENTATION
Jorge Manrique Castro¹, Monisha Elumalai¹, Diana Rodriguez De Francisco¹, Isaac Johnson¹, Swaminathan Rajaraman¹, and Charles M. Didier¹,²
¹University of Central Florida, USA and ²Orthomerica Products Inc., USA
MP-48 FIRST CONTACT: DESIGN AND FABRICATION OF THE FIRST 3D PRINTED MEMS G-SWITCH
Regan Kubicek¹, Joshua Tyler², Harvy Tsang², Gabriel Smith², Daniel Jean², Sarah Bergbreiter¹, and Cristian Cassella¹
¹Carnegie Mellon University, USA and
²DEVCOM Army Research Laboratory, USA

MP-49 TOPOLOGICALLY PROTECTED FANO RESONANCE IN A 80 MHZ SC-DOPED ALN THIN FILM RESONATOR WITH A QUALITY FACTOR LARGER THAN 10K
Xuanyi Zhao¹, Jacopo M. De Ponti², Tommaso Magioli¹, Marco Colangelo¹, and Richard Craster³
¹Northeastern University, USA, ²Polytechnic University of Milan, ITALY, and ³Imperial College London, UK
Chemical or Biological Sensors, Actuators or Systems

**WP-01**  
A PIEZOELECTRIC MIDDLE-EAR MICROPHONE FOR COCHLEAR IMPLANTS  
Emma F. Wawrzynek¹, John Z. Zhang¹, Ioannis Kymissis², Elizabeth S. Olson², Hideki Heidi Nakajima³,⁴, and Jeffrey H. Lang¹  
¹Massachusetts Institute of Technology, USA, ²Columbia University, USA, ³Harvard University, USA, and ⁴Mass Eye and Ear, USA

**WP-02**  
AUTONOMOUS MICROFLUIDIC DEVICE FOR THE NAKED-EYE DETECTION OF BENZODIAZEPINES IN ADULTERATED BEVERAGES  
Isabel Poves-Ruiz, Enrique Azuaje-Hualde, Igor Corchado-Gonzalez, Lourdes Basabe-Desmonts, and Fernando Benito-Lopez  
University of the Basque Country, SPAIN

**WP-03**  
ELECTROCHEMICAL SENSORS FOR HEAVY METAL DETECTION USING PYROLYTIC CARBON AND GOLD ELECTRODES  
Yingming Xu, Peng Zhou, Terrence Simon, and Tianhong Cui  
University of Minnesota, USA

**WP-04**  
FABRICATION OF TUNABLE SUBMICRON METAMATERIAL INFRARED ABSORBERS FOR GAS SENSING USING OPTICAL CONTACT LITHOGRAPHY  
Amirali Nikeghbal, Md Rabiul Hasan, Adwait Deshpande, Fatemeh Momeni, Seungbeom Noh, Hanseup Kim, and Carlos H. Mastrangelo  
University of Utah, USA

**WP-05**  
INTEGRATION OF HYDROGEL ADHESIVE AND MICROSTRUCTURED DEVICE FOR VAGUS NERVE STIMULATION  
Jae Young Park, Jongcheon Lim, Carl R. Russell, Pei-Lun Chen, Seokkyoon Hong, Chi Hwan Lee, and Hyowon Lee  
Purdue University, USA

**WP-06**  
MULTIFUNCTIONAL FINGERPRINTING OF INDIVIDUAL FIBROBLASTS USING MEMS-BASED DEVICES  
Ji Chang, Guntis Rutins, Omar Cepeda Torres, Saqib Shahzad, Swaminathan Rajaraman, and Laurene Tetard  
University of Central Florida, USA
WP-07  NOVEL PASSIVE INTRACRANIAL PRESSURE SENSOR USING ULTRASOUND READOUT  
Colleen A. Chemerka, Juan P. Botero-Torres, Navid Farhoudi,  
Prattay D. Kairy, Simon Binder, Florian Solzbacher,  
Lars B. Laurentius, and Christopher F. Reiche  
*University of Utah, USA*

WP-08  RAPID POINT-OF-CARE DIAGNOSTICS FOR ORAL HEALTH USING SURFACE ENHANCED RAMAN DETECTION IN LATERAL FLOW ASSAYS  
Daewoo Han, Lyndsay Kissell, Der Vang, Pietro Strobbia, and Andrew Steckl  
*University of Cincinnati, USA*

WP-09  SCALABLE ELECTROPOLYMERIZATION OF VERTICAL GRAPHENE OXIDE ELECTRODES AS A PHYSICAL/CHEMICAL BIOSENSOR PLATFORM  
Amani Salim¹, Farihin Adzlan¹, Haris Lotfi¹, Iman Ismail¹,  
Adam Zahanuddin¹, Sazwin Ishak¹, Malini Kanapathy¹,  
Pretha Selvam¹, Iqbal Shamsul¹, and D. Marshall Porterfield²  
¹nanoSkunkWorkX, MALAYSIA and ²Purdue University, USA

WP-10  TRI-COMPARTMENT CHIP WITH MICROELECTRODE ARRAY AND DR1-GLASS GROOVES FOR NEURONAL CELL ALIGNMENT  
Tomi Ryynänen, Chiara Fedele, Anna-Mari Moilanen,  
Jorma Vihinen, Lassi Sukki, Kaisa Tornberg, Saara Haikka,  
Susanna Narkilahti, Arri Priimagi, and Pasi Kallio  
*Tampere University, FINLAND*

WP-11  VERTICAL MICRO-NANOCHANNEL INTEGRATION FOR RELATIVE SURFACE PROTEIN ABUNDANCE QUANTIFICATION ON LIPOSARCOMA EXTRACELLULAR VESICLES  
Premanshu Kumar Singh, Ali Fahad Usmani, Patricia Sarchet,  
Raphael Pollock, and Shaurya Prakash  
*Ohio State University, USA*

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WP-12  2-SNESAT: SCALABLE BEHAVIOR-DIFFERENTIATED CONTROL FOR SWARMS OF PROGRAMMABLE MEMS MICROROBOTS  
Ratul Majumdar Majumdar, Milos Zefran, and Igor Paprotny  
*University of Illinois, Chicago, USA*
WP-13 A METHOD TO EXTRACT AND MODEL STRUCTURAL ASYMMETRIES IN DUAL-SHELL RESONATOR GYROSCOPES TO STUDY FREQUENCY DEGENERACY
Lois Meira Lopez, Danmeng Wang, Austin R. Parrish, and Andrei M. Shkel
University of California, Irvine, USA

WP-14 A SELF-POWERED MICRO TRIBOELECTRIC ACCELEROMETER WITH HIGH SENSITIVITY
Mohammad Alzgool\textsuperscript{1}, Yu Tian\textsuperscript{1}, Benyamin Davaji\textsuperscript{2}, and Shahrzad Towfighian\textsuperscript{1}
\textsuperscript{1}Binghamton University, USA and \textsuperscript{2}Northeastern University, USA,

WP-15 CMOS-COMPATIBLE MICROFABRICATION OF LAMINATED NIFE CORES FOR WIRELESS POWER TRANSFER
Xuan Wang, Sida Chen, Zihan Zhang, Lei Gu, and Mark G. Allen
University of Pennsylvania, USA

WP-16 DEMONSTRATION OF FABRY-PEROT INTERFEROMETRY FOR PHOTOLITHOGRAPHY MASKS
Md Iftekharul Islam\textsuperscript{1}, Amrid Amnache\textsuperscript{1}, Richard Beaudry\textsuperscript{2}, Maurice Delafosse\textsuperscript{2}, Serge Ecoffey\textsuperscript{1}, and Luc G. Fréchette\textsuperscript{1}
\textsuperscript{1}Université\textsuperscript{©} de Sherbrooke, CANADA and \textsuperscript{2}Digitho Technologies Inc., CANADA,

WP-17 DESIGN AND FABRICATION OF LIQUID METAL TACTILE SENSORS WITH ENHANCED SENSITIVITY AND MECHANICAL ROBUSTNESS
Sung M. Kang, Andrew T. Bender, Karl F. Böhringer, Mohammad H. Malakooti, and Jonathan D. Posner
University of Washington, USA

WP-18 EFFECTS OF LOW FREQUENCY SIGNAL UP-CONVERSION ON FREQUENCY STABILITY IN CAPACITIVELY TRANSDUCED MICORESONATORS
James ML. Miller\textsuperscript{1}, Nicholas E. Bousse\textsuperscript{2}, Hyun-Keun Kwon\textsuperscript{3}, Gabrielle D. Vukasin\textsuperscript{4}, Steven W. Shaw\textsuperscript{5}, and Thomas W. Kenny\textsuperscript{2}
\textsuperscript{1}Trine University, USA, \textsuperscript{2}Stanford University, USA, \textsuperscript{3}Apple Inc., USA, \textsuperscript{4}Robert Bosch Research and Technology Center, USA, and \textsuperscript{5}Florida Institute of Technology

WP-19 FLEXIBLE ELECTROMAGNETIC ACTUATORS FOR WEARABLE HAPTIC DEVICES
Naji Tarabay\textsuperscript{1}, Ananya Renuka Balakrishna\textsuperscript{2}, Tianshu Liu\textsuperscript{3}, Priyanshu Agarwal\textsuperscript{3}, and Camilo Velez\textsuperscript{1}
\textsuperscript{1}University of California, Irvine, USA, \textsuperscript{2}University of California, Santa Barbara, USA, and \textsuperscript{3}Meta Platforms Inc., USA
WP-20 GENERALIZED MACHINE LEARNING METHOD TO EXTRACT FREQUENCY-COMPLIANCE COEFFICIENTS FROM MEMS RESONATOR MODEL
Rahul Singaram Senthilkumar¹, Yinuo Enoch Zhao², and Xing Haw Marvin Tan³
¹St. Joseph Institution, SINGAPORE, ²Hwa Chong Institution, SINGAPORE, and ³Agency for Science, Technology and Research (A*STAR), SINGAPORE

WP-21 IMPROVED PERFORMANCE OF PASSIVE LAYER-FREE CURVED PMUT ARRAY
Chichen Huang¹, Shubham P. Khandare², Sri-Rajasekhar Kothapalli², and Srinivas Tadigadapa¹
¹Northeastern University, USA and ²Pennsylvania State University, USA,

WP-22 MAGNETICALLY COUPLED RESONATORS FOR WIRELESS POWER TRANSMISSION TO INSECT SIZED FLAPPING WING ROBOTS
Johannes M. James, Xingyi Shi, Joshua R. Smith, and Sawyer B. Fuller
University of Washington, USA

WP-23 METHODOLOGY TO QUANTIFY CONTRIBUTION OF VARIOUS FEEDTHROUGH SOURCES IN EPI-SEALED DEVICES
Disha Chugh
Indian Institute of Science, Bangalore, INDIA

WP-24 NON-RESONANT VIBRATION ENERGY HARVESTER FOR SUBHERTZ AND SUB-G VIBRATION
Junyi Wang, Aobo Zhang, Diana Cantini, and Eun Sok Kim
University of Southern California, USA

WP-25 OPERATING FREQUENCY RANGES OF ULTRASOUND-BASED IMPLANTABLE GLUCOSE-SENSITIVE RESONATORS FOR IMPROVED SENSITIVITY AND LINEARITY
Prattay Deepta Kairy, Simon Binder, Navid Farhoudi, Florian Solzbacher, and Christopher F. Reiche
University of Utah, USA

WP-26 PROBING NONLINEARITY IN SUPERLATTICE HAFNIA-ZIRCONIA-ALUMINA NANOELECTROMECHANICAL RESONATORS
S M Enamul Hoque Yousuf, Troy Tharpe, Roozbeh Tabrizian, and Philip X.-L. Feng
University of Florida, USA
WP-27 SIMULTANEOUS DETECTION OF FLUID VISCOSITY AND DENSITY VIA PMUTS ASSISTED BY MACHINE LEARNING
Pei-Chi Tsao¹, Megan Teng¹, Yande Peng¹, Vivek K. Premanadhan², Ting Chen³, Samantha Averrit¹, Wei Yue¹, Jong Ha Park¹, Huicong Deng⁴, Fan Xia¹, Yuan Gao¹, and Liwei Lin¹
¹University of California, Berkeley, USA, ²Synergy Marine Group, SINGAPORE, ³Contributor, TAIWAN, and ⁴University of Chinese Academy of Sciences, CHINA

WP-28 THE REALIZATION AND TESTING OF A SAPPHIRE PRESSURE SENSOR MANUFACTURED BY LASER MICROMACHINING AND THERMOCOMPRESSION BONDING
Austin L. Vera¹, David A. Mills², and Mark Sheplak¹
¹University of Florida, USA and ²Interdisciplinary Consulting Corporation, USA,

WP-29 ULTRA-COMPACT, LOW-NOISE, AMPLITUDE-SENSITIVE AND PHASE-SENSITIVE INTEGRATED THIN-FILM GIANT MAGNETOIMPEDANCE SENSORS
Bin Luo¹, Xianfeng Liang¹, Huaihao Chen¹, Cai Müller², Paul Raschdorf², Phillip Durdaut², Michael Höft², Jeffrey McCord², and Nian-Xiang Sun¹
¹Northeastern University, USA and ²Kiel University, GERMANY,

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WP-30 A 13.56 MHZ METAMATERIAL VIA THE INCORPORATION OF POLYIMIDE BASED FPCB AND NIZN FERRITE FOR WIRELESS POWER TRANSMISSION ENHANCEMENT
Pin-Cheng Tseng, Mei-Syuan Wu, Wen-Hsiang Huang, Yu-Ting Cheng, Ming-Dou Ker, and Chung-Yu Wu
National Yang Ming Chiao Tung University, TAIWAN

WP-31 A COMPACT ISOLATION FRAME FOR MITIGATING PACKAGING STRESS AND ANCHOR LOSS IN MICROACOUSTIC RESONATORS
Maliha Sultana, Tanvir Hasan, Jennyfer Vivas Gomez, Kevin Chan, Hakhamanesh Mansoorzare, and Reza Abdolvand
University of Central Florida, USA

WP-32 AN SOI-PCB WITH THERMOCOMPRESSION BONDED CMOS, MULTILAYER WIRING, AND NATIVE MEMS
Yichen Liu, Daniel Lovell, and Kristofer Pister
University of California, Berkeley, USA
WP-33  CONDUCTIVE DIRECT BONDING OF IN-SITU DOPED POLYSILICON FOR MEMS WAFER-LEVEL PACKAGING
Vincent Pares¹, Amrid Amnache¹, Romain Stricher¹, Simon Landry², Paul Gond-Charton², Thierry Courcier¹, Serge Ecoffey¹, and Luc G. Fréchette¹
¹Université de Sherbrooke, CANADA and
²Teledyne Dalsa Semiconducteur Inc. (TDSI), CANADA,

WP-35  INCREASE IN LONGIVITY OF IMPLANTABLE NEURAL DEVICE USING NOVEL MATERIAL
Sandeep Negi¹,² and Rajmohan Bhandari¹,²
¹Blackrock Neurotech, USA and ²University of Utah, USA,

WP-36  MONOLITHIC ELECTROWETTING PRISM FOR STRUCTURED ILLUMINATION MICROSCOPY
Eduardo J. Miscles¹, Catherine A. Saladrigas¹, Mo Zohrabi¹, Vikrant Kumar², Ioannis Kymissis², Juliet T. Gopinath¹, and Victor M. Bright¹
¹University of Colorado Boulder, USA and
²Columbia University, USA

WP-37  SELF-ALIGNED SUB 15 NANOMETER NANOGAP AND NANOWIRE FORMATION ON SAPPHIRE
Dean de Boer, Erwin Berenschot, and Niels Tas
University of Twente, NETHERLANDS

WP-38  STRETCHABLE EUTECTOFIBERS VIA ROTARY WET-SPINNING FOR WEARABLE STRAIN SENSORS
Danilo M. dos Santos¹, Ji hyun Kim¹, Mario Wyrsch², Mathias Bonmarin², and Sameer Sonkusale¹
¹Tufts University, USA and ²Zurich University of Applied Sciences Technikumstrasse, SWITZERLAND,

WP-39  TAILORED FOREST MICRONEEDLES USING CROSS OVER LINES LASER LITHOGRAPHY FOR SIMULTANEOUS DELIVERY OF MULTIPLE DRUGS
Hasika Suresh, Danilo M. Dos Santos, Atul Sharma, Darian Myers, Sanjana Vissapragada, and Sameer Sonkusale
Tufts University, USA

WP-40  TOWARDS A 3D PRINTED MICROFLUIDIC PIN-FIN COOLER USING TWO PHOTON POLYMERIZATION (TPP)
Peter Sanchez, Ryan M. Price, and Robert C. Roberts
University of Texas, El Paso, USA
VARIABLE-SLOPE REFLECTIVE SURFACES FOR OPTICAL SYSTEM TESTING VIA NOVEL DIRECT LASER WRITING-BASED MICROREPLICATION
Declan M. Fitzgerald¹, Ryan D. Sochol¹, and Anant Agrawal²
¹University of Maryland, USA and
²Food and Drug Administration, USA

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GLUCOSE FACTOR IN THE TEST OF ISCHEMIA HEART DISEASE FOR DIABETIC PATIENTS USING MOLECBULARLY IMPRINTED POLYMER / METHYLENE BLUE SENSING ELECTRODES
Cheng-Yu Tsai¹, Yu-Ting Cheng¹, and Hsiao-En Tsai²
¹National Yang Ming Chiao Tung University, TAIWAN and
²National Taiwan University Hospital Hsin-Chu Branch, TAIWAN

MICRONEEDLE-INTEGRATED ELECTROCHEMICAL SENSOR TOWARD DETECTION OF BASOLATERAL SEROTONIN IN THE GI TRACT
Sydney N. Overton, Joshua A. Levy, Michael A. Straker, Jinjing Han, and Reza Ghodssi
University of Maryland, USA

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HIGH-QUALITY FACTOR, HIGH TCF SCANDIUM ALUMINUM NITRIDE MEMS RESONATOR FOR LOW-NOISE INFRARED SENSING
Farah Ben Ayed, Aurelio Venditti, Pietro Simeoni, Zhenyun Qian, and Matteo Rinaldi
Northeastern University, USA

LOW-POWER THERMOMECHANICAL MODULE FOR TARGETED INGESTIBLE DEVICE BIOPSY
Michael Straker, Joshua Levy, and Reza Ghodssi
University of Maryland, USA

TEMPERATURE-INSENSITIVE 2D RESONANT GAP-BASED STRAIN SENSOR
Xintian Liu and Clark T.-C. Nguyen
University of California, Berkeley, USA
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WP-47 A SELF-AMPLIFIED SILICON-GERMANIUM NANOMECHANICAL RESONATOR WITH PIEZORESISTIVE HEAT ENGINES
Faysal Hakim¹, Normarieli M. Passalacqua-Alvarado¹, Keshab R. Sapkota², Aleem Siddiqui², Xuebin Li³, Kevin S. Jones¹, George T. Wang², and Roozbeh Tabrizian¹
¹University of Florida, USA, ²Sandia National Laboratories, USA, and ³Applied Materials, USA

WP-48 DIRECT VAN DER WAALS INTEGRATION OF 2D MATERIALS FOR HIGH-PERFORMANCE CHEMICAL SENSORS
Peter F. Satterthwaite, Sarah O. Spector, Jaekang Song, and Farnaz Niroui
Massachusetts Institute of Technology, USA

WP-49 MULTI-MATERIAL PALETTE FOR 3D MICROELECTRODE ARRAYS FOR A VARIETY OF 3D ELECTROGENIC MICROPHYSIOLOGICAL SYSTEMS
Omar S. Cepeda Torres, Connor Edmonds, Diana V. Rodríguez De Francisco, Edwin Davidson Barahona, Charles Didier, and Swaminathan Rajaraman
University of Central Florida, USA

WP-50 ULTRA-HIGH THERMAL CONVERSION EFFICIENCY IN A PROTOTYPE LIGHT SOURCE BASED ON PHONONIC MEMS STRUCTURE
Sunghyun Hwang¹, James D. Overmeyer¹, S M Enamul Hoque Yousuf¹, William N. Carr², Philip X.-L. Feng¹, and Yong-Kyu Yoon¹
¹University of Florida, USA and ²Phononic MEMS Inc, USA
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WCP-51 PIEZOELECTRIC MEMS-ACTUATORS BASED ON ALSC40%N AND PZT
Yanfen Zhai¹, Andrea Bancora¹, Andrey Voloshin², Anat Siddharth², Sébastien Leni¹, and Tobias J. Kippenberg²
¹DeepLight SA, SWITZERLAND and ²Swiss Federal Institute of Technology Lausanne (EPFL), SWITZERLAND

WCP-52 SENSIBLE SENSORS WITH UNINTERRUPTED OPERATION AND UNPRECEDENTED ACCURACY
Zhenyun Qian, Matteo Rinaldi, Nabid Hossain, and Kritank Kalyan
Zepsor Technologies Inc., USA

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WCP-53 CUSTOMIZED MEMS SOLUTIONS FROM PROTOTYPE TO PRODUCTION VOLUMES
Arne Leinse and Albert Prak
LioniX International, BV, NETHERLANDS

WCP-54 DIE-TO-WAFER BONDING TECHNOLOGY FOR ADVANCED PACKAGING
Viorel Dragoi, Mariana Pires, and Tobias Wernicke
EV Group E. Thallner GmbH, AUSTRIA

WCP-55 HIGH-Q MEMS RESONATORS CHARACTERIZATION BY 4D DIGITAL HOLOGRAPHIC MICROSCOPE (DHM®)
Frank Liu, François Mendels, Jean-Marc Collagrossi, Shenqi Xie, and Yves Emery
Lyncee Tec SA, SWITZERLAND

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WCP-57 MPO 100 - 3D LITHOGRAPHY SYSTEM FOR ADVANCING SENSORS AND ACTUATORS RESEARCH
Yashica Brown, Benedikt Stender, and Willi Mantei
Heidelberg Instruments, USA
THE COMPLETE DESIGN-TO-PRODUCTION SOLUTION FOR PZT MEMS
Andrew O. Fung¹, Mario Kiuchi², Gen Matsuoka², Tsuyoshi Takemoto², and Alissa M. Fitzgerald¹
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²Sumitomo Precision Products Co., Ltd., JAPAN