

Solid-State Sensor, Actuator and Microsystems Workshop
June 6 – 10, 2004
Crowne Plaza Resort
Hilton Head Island, South Carolina

Sunday, June 6

6:00 p.m. –
9:00 p.m. Registration and Welcome Reception

Monday, June 7

7:30 a.m. **Continental Breakfast**

8:15 a.m. **Invited Speaker**
OPTICAL MEMS: LEGACY OF THE TELECOM BOOM
J.E. Ford
University of California, San Diego

9:00 a.m. *ELECTROSTATIC ACTUATORS WITH MECHANICAL BRAKES*
J.D. Grade, K.Y. Yasumura, and H. Jerman
Iolon, Inc.

9:25 a.m. *CRYOGENIC CHARACTERIZATION AND TESTING OF MAGNETICALLY-
ACTUATED MICROSHUTTER ARRAYS FOR THE JAMES WEBB SPACE
TELESCOPE*
T.T. King¹, G. Kletetschka^{1,2}, M.A. Jah¹, M.J. Li¹, M.D. Jhabvala¹, L.L. Wang^{1,3},
M.A. Beamesderfer¹, A.S. Kuttyrev^{1,4}, R.F. Silverberg¹, D. Rapchun^{1,5},
D.S. Schwinger¹, G.M. Voellmer¹, S.H. Moseley¹, and L.M. Sparr¹
¹NASA Goddard Space Flight Center, ²The Catholic University of America,
³Swales Aerospace Co., ⁴Science Systems and Applications, Inc., and
⁵Global Science and Technology

9:50 a.m. *A WAFER-BONDED, FLOATING ELEMENT SHEAR-STRESS SENSOR USING
A GEOMETRIC MOIRÉ OPTICAL TRANSDUCTION TECHNIQUE*
S. Horowitz¹, T.-A. Chen¹, V. Chandrasekaran², K. Tedjojuwono³, L. Cattafesta¹,
T. Nishida¹, and M. Sheplak¹
¹University of Florida, ²Massachusetts Institute of Technology, and
³NASA-Langley Research Center

10:15 a.m. **Break**

10:40 a.m. *3D SILICON TRANSFORMATION USING HYDROGEN ANNEALING*
M.-C.M. Lee and M.C. Wu
University of California, Los Angeles

- 11:05 a.m. *A BATCH FABRICATED RUBIDIUM-VAPOR RESONANCE CELL FOR CHIP-SCALE ATOMIC CLOCKS*
C.-H. Lee¹, H. Guo¹, S. Radhakrishnam¹, A. Lal², C. Szekely³, T.A. McClelland², and A.P. Pisano³
¹Cornell University, ²Frequency Electronics Inc., and
³University of California, Berkeley
- 11:30 a.m. **Poster Shotgun Previews**
- 12:30 p.m. **Lunch**
- 2:00 p.m.-
5:00 p.m. **Contributed Posters** (see listing of Contributed Posters)

Tuesday, June 8

- 7:30 a.m. **Continental Breakfast**
- 8:15 a.m. **Invited Speaker**
EVOLUTION OF INTEGRATED INERTIAL MEMS TECHNOLOGY
M.W. Judy
Analog Devices, Inc.
- 9:00 a.m. *PHASE NOISE AMPLITUDE DEPENDENCE IN SELF-LIMITING WINE-GLASS DISK OSCILLATORS*
S. Lee and C.T.-C. Nguyen
University of Michigan
- 9:25 a.m. *DRY-RELEASED POST-CMOS COMPATIBLE CONTOUR-MODE ALUMINUM NITRIDE MICROMECHANICAL RESONATORS FOR VHF APPLICATIONS*
G. Piazza and A.P. Pisano
University of California, Berkeley
- 9:50 a.m. *A NEW MEMS-BASED QUARTZ RESONATOR TECHNOLOGY*
D.T. Chang, F.P. Stratton, D.J. Kirby, R.J. Joyce, T.-Y. Hsu, and R.L. Kubena
HRL Laboratories, LLC
- 10:15 a.m. **Break**
- 10:40 a.m. *REDUCTION IN THERMOELASTIC DISSIPATION IN MICROMECHANICAL RESONATORS BY DISRUPTION OF HEAT TRANSPORT*
R.N. Candler¹, M. Hopcroft¹, W.-T Park¹, S.A. Chandorkar¹, G. Yama², K.E. Goodson¹, M. Varghese³, A.E. Duwel³, A. Partridge², M. Lutz², and T.W. Kenny¹
¹Stanford University, ²Robert Bosch Corporation RTC, and
³Charles Stark Draper Laboratory

- 11:05 a.m. *A MASS SENSOR BASED ON PARAMETRIC RESONANCE*
W. Zhang and K.L. Turner
University of California, Santa Barbara
- 11:30 a.m. *MICROGEIGER: A MICROFABRICATED GAS-BASED BETA RADIATION DETECTOR*
C.G. Wilson and Y.B. Gianchandani
University of Michigan

Late News Papers Oral

- 11:55 a.m. *RESONANT MICROCANTILEVER GAS SENSOR FABRICATED IN CMOS TECHNOLOGY FOR THE DETECTION OF CHEMICAL AGENTS*
I. Voiculescu¹, M. Zaghoul¹, R.A. McGill², E.J. Houser², S. Stepnowski², E. Sokolovski², J. Stepnowski², J. Vignola², and G.K. Fedder³
¹George Washington University, ²Naval Research Laboratory, and ³Carnegie Mellon University
- 12:10 p.m. *INTERNAL ELECTROSTATIC TRANSDUCTION FOR BULK-MODE MEMS RESONATORS*
S.A. Bhawe and R.T. Howe
University of California, Berkeley

12:25 p.m. -
1:30 p.m.

Lunch

7:00 p.m. –
9:00 p.m.

Banquet

Wednesday, June 9

- 7:30 a.m. **Continental Breakfast**
- 8:15 a.m. **Invited Speaker**
A VERSATILE MEMS GAS CHROMATOGRAPH FOR DETERMINATIONS OF ENVIRONMENTAL VAPOR MIXTURES
E.T. Zellers¹, W.H. Steinecker¹, G.R. Lambertus¹, M. Agah¹, C.-J. Lu¹, H.K.L. Chan¹, J.A. Potkay¹, M.C. Oborny¹, J.M. Nichols¹, A. Astle¹, H.S. Kim¹, M.P. Rowe¹, J. Kim¹, L.W. da Silva¹, J. Zheng², J.J. Whiting¹, R.D. Sacks¹, S.W. Pang¹, M. Kaviany¹, P.L. Bergstrom², A.J. Matzger¹, Ç. Kurdak¹, L.P. Bernal¹, K. Najafi¹, and K.D. Wise¹
¹University of Michigan and ²Michigan Technological University
- 9:00 a.m. *A MEMS-BASED RENAL REPLACEMENT SYSTEM*
M. Kaazempur-Mofrad¹, J.P. Vacanti², N.J. Krebs³, and J.T. Borenstein³
¹Massachusetts Institute of Technology, ²Massachusetts General Hospital, and ³Charles Stark Draper Laboratory

- 9:25 a.m. *RAPID ON-CHIP SEPARATION OF PROTEINS AND IMMUNE COMPLEXES USING UV-INITIATED POLYACRYLAMIDE GELS*
A.E. Herr, A.A. Davenport, R. Shediak, and A.K. Singh
Sandia National Laboratories
- 9:50 a.m. *CORIOLIS MASS FLOW, DENSITY AND TEMPERATURE SENSING WITH A SINGLE VACUUM SEALED MEMS CHIP*
D. Sparks, R. Smith, S. Masoud-Ansari, and N. Najafi
Integrated Sensing Systems, Inc.
- 10:15 a.m. **Break**
- 10:40 a.m. *ADDRESSABLE MICROLENS ARRAY TO IMPROVE DYNAMIC RANGE OF SHACK-HARTMANN SENSORS*
H. Choo and R.S. Muller
University of California, Berkeley
- 11:05 a.m. *HIGH-RESOLUTION WAVEFRONT CONTROL USING MICROMIRROR ARRAYS*
J.A. Perreault and T.G. Bifano
Boston University
- 11:30 a.m. *SINGLE-CRYSTAL SILICON CONTINUOUS MEMBRANE DEFORMABLE MIRROR WITH PZT UNIMORPH MICROACTUATOR ARRAYS*
Y. Hishinuma and E.-H. Yang
NASA Jet Propulsion Laboratory
- 11:55 p.m. **Lunch**
- Late News Papers Oral**
- 1:15 p.m. *FEMTO-PHOTONICS: OPTICAL TRANSDUCERS UTILIZING NOVEL SUB-WAVELENGTH DUAL LAYER GRATING STRUCTURES*
D.W. Carr, G.R. Bogart, and B.E.N. Keeler
Sandia National Laboratories
- 1:30 p.m. *RF MEMS SWITCHES USING COPPER-BASED CMOS INTERCONNECT MANUFACTURING TECHNOLOGY*
N. Hoivik, C.V. Jahnes, J. Cotte, J.L. Lund, D. Seeger, and J.H. Magerlein
IBM T.J. Watson Research Center
- 1:45 p.m. *CARDIAC SIGNAL RECORDING USING ULTRASONIC SILICON MICROPROBES*
X. Chen, A. Lal, M.L. Riccio, and R.F. Gilmour
Cornell University
- 2:00 p.m. *MICROMACHINED AMPEROMETRIC NITRATE SENSOR WITH INTEGRATED MICROFLUIDICS*
D. Kim, I.B. Goldberg, and J.W. Judy
University of California, Los Angeles

- 2:15 p.m. *AN INTEGRATED MICROFLUIDIC INKING CHIP FOR SPM NANOLITHOGRAPHY*
K.S. Ryu, X. Wang, K. Shaikh, E. Goluch, D. Bullen, J. Zou, and C. Liu
University of Illinois, Urbana-Champaign
- 2:30 p.m. *A QUANTITATIVE UNDERSTANDING OF TRANSIENT BUBBLE GROWTH IN MICROCHANNELS USING μ PIV*
E.N. Wang, S. Devasenathipathy, C.H. Hidrovo, D.W. Fogg, J.-M. Koo, J.G. Santiago, K.E. Goodson, and T.W. Kenny
Stanford University
- 2:45 p.m. *PARAMAGNETIC CAPTURE MODE MAGNETOPHORETIC MICROSEPARATOR FOR BLOOD CELLS*
K.-H. Han and B. Frazier
Georgia Institute of Technology
- 6:00 p.m. –
8:00 p.m. **Open Poster**
- 8:00 p.m. –
10:00 p.m. **Rump Session**

Thursday, June 10

- 7:30 a.m. **Continental Breakfast**
- 8:15 a.m. **Invited Speaker**
MEMS REQUIREMENTS FOR AN EPI-RETINAL PROSTHESIS
R. Greenberg
Second Sight Medical Products Inc.
- 9:00 a.m. *A WIRELESS MICROSYSTEM FOR MULTICHANNEL NEURAL RECORDING MICROPROBES*
H. Yu, R.H. Olsson, K.D. Wise, and K. Najafi
University of Michigan
- 9:25 a.m. *A MICROMACHINED PLANAR PATCH-CLAMP CHIP WITH INTEGRATED MICROFLUIDICS*
B. Matthews and J.W. Judy
University of California, Los Angeles
- 9:50 a.m. *THE WIMS CUBE: A MICROSYSTEM PACKAGE WITH ACTUATED FLEXIBLE CONNECTIONS AND RE-WORKABLE ASSEMBLY*
A.B. Ucock, J.M. Giachino, and K. Najafi
University of Michigan
- 10:15 a.m. **Break**

- 10:40 a.m. *MAGNETICALLY-DRIVEN ACTUATION USING LIQUID-PHASE POLYMERIZATION (LPP) AND ITS APPLICATION: A PROGRAMMABLE MIXER*
A.K. Agarwal, S.S. Sridharamurthy, T.M. Pearce, G.A. Mensing,
D.J. Beebe, and H. Jiang
University of Wisconsin
- 11:05 a.m. *A MICROSCALE VAPOR-FED FORMIC ACID FUEL CELL*
J. Yeom, R.S. Jayashree, G.Z. Mozsgai, A. Asthana, E.R. Choban,
M. Mitchell, P.J.A. Kenis, and M.A. Shannon
University of Illinois, Urbana-Champaign
- 11:30 a.m. *MAGNETIC INDUCTION MACHINES EMBEDDED IN FUSION-BONDED SILICON*
D.P. Arnold¹, F. Cros¹, I. Zana¹, M.G. Allen¹ S. Das², and J.H. Lang²
¹Georgia Institute of Technology and ²Massachusetts Institute of Technology
- 11:55 a.m. *LIQUID-ROTOR ELECTRET MICROPOWER GENERATOR*
J.S. Boland and Y.-C. Tai
California Institute of Technology
- 12:20 p.m. **Closing Remarks**
- 12:20 p.m. –
2:00 p.m. **Lunch**

Contributed Posters

AN ULTRA HIGH EFFICIENCY PIEZOELECTRIC DIRECT CHARGING RADIOISOTOPE MICROPOWER GENERATOR

R. Duggirala, H. Li, and A. Lal
Cornell University

A MEMBRANE BREATHER FOR MICRO FUEL CELL WITH HIGH CONCENTRATION METHANOL

D.-S. Meng, T. Cubaud, C.-M. Ho, and C.-J. Kim
University of California, Los Angeles

INTEGRATED MICRO FUEL CELL POWER SUPPLY

A.D. Taylor and L.T. Thompson
University of Michigan

PIEZOELECTRIC MICRO POWER GENERATOR FOR ENERGY HARVESTING

R. Sood, Y.B. Jeon, J.H. Jeong, and S.G. Kim
Massachusetts Institute of Technology

ELECTRONIC COOLING SYSTEMS BASED ON FIXED-VALVE MICROPUMP NETWORKS

C.J. Morris¹, J.Y. Chung¹, P.E. Rahm¹, F.K. Forster¹, D. Faulkner², and R. Shekarriz²
¹University of Washington and ²MicroEnergy Technologies, Inc.

A LOW-POWER, LOW-LEAKAGE, BI-STABLE PLANAR ELECTROLYSIS MICRO GATE VALVE

J.A. Frank and A.P. Pisano
University of California, Berkeley

PIEZOELECTRIC LIQUID-COMPATIBLE MICROVALVE FOR INTEGRATED MICROPROPULSION

C. Lee and E.-H. Yang
NASA Jet Propulsion Laboratory

GEOMETRIC SURFACE MODIFICATION OF NOZZLES FOR COMPLETE TRANSFER OF LIQUID DROPS

U.-C. Yi and C.-J. Kim
University of California, Los Angeles

A FULLY-INTEGRATED MULTI-SITE PRESSURE SENSOR FOR WIRELESS ARTERIAL FLOW CHARACTERIZATION

A. DeHennis and K.D. Wise
University of Michigan

INTRACELLULAR NEURONAL RECORDING WITH FLEXIBLE MICRO-MACHINED PROBE IMPLANTS

A.V. Govindarajan, T.C. Chen, R.C. Wyeth, A.O.D Willows, and K.F. Böhringer
University of Washington

MEASUREMENT OF IN-SITU FLOW VELOCITY USING SINGLE-MOLECULE DETECTION FOR THE APPLICATION OF BIOMOLECULE QUANTIFICATION

S.-Y. Chao, C. Zhang, and T.-H. Wang
Johns Hopkins University

INTEGRATED INTERFACE TECHNOLOGY FOR MICROFLUIDIC SYSTEMS

K.-H. Han¹, R.D. McConnell², J.P. Ferrance², J.P. Landers², and A.B. Frazier¹
¹Georgia Institute of Technology and ²University of Virginia

ULTRASONIC MICROINJECTION CHARACTERIZED BY INTEGRATED MICRO-OPTICAL FORCE ENCODER

X. Zhang, S.F. Zappe, C.F. Quate, M.P. Scott, and O. Solgaard
Stanford University

RF MEMS SWITCHES WITH METAL ALLOY ELECTRIC CONTACTS

R.A. Coutu, Jr.¹, P.E. Kladitis¹, L.A. Starman², and R.L. Crane¹
¹Wright Patterson Air Force Base, ²Hanscom Air Force Base

SILICON CARBIDE FOR ENHANCED MEMS RELIABILITY

D. Gao, W.R. Ashurst, C. Carraro, R.T. Howe, and R. Maboudian
University of California, Berkeley

EXPERIMENTAL VALIDATION OF MECHANICS-BASED PROCESS MODELS FOR DIRECT WAFER BONDING

K.T. Turner and S.M. Spearing
Massachusetts Institute of Technology

A SACRIFICIAL-POLYMER-BASED TRENCH REFILL PROCESS FOR POST-DRIE SURFACE MICROMACHINING

C.G. Courcimault, M.G. Allen, J.P. Jayachandran, P.A. Kohl, and S.A. Bidstrup-Allen
Georgia Institute of Technology

TOWARDS INTEGRATED MICRO-MACHINED SILICON-BASED NANOPORES FOR CHARACTERIZATION OF DNA

H. Chang¹, F. Kosari², G. Andreadakis², G. Vasmatzis², E. Basgall³, A.H. King¹, and R. Bashir¹
¹Purdue University, ²Mayo Clinic, and ³Penn State University

SELF-ASSEMBLY OF MICRO PUMPS WITH HIGH UNIFORMITY IN PERFORMANCE

J. Fang, K. Wang, and K.F. Böhringer
University of Washington

CMOS/BICMOS SELF-ASSEMBLING AND ELECTROTHERMAL MICROACTUATORS FOR TUNABLE CAPACITORS, GAP-CLOSING STRUCTURES AND LATCH MECHANISMS

A. Oz and G.K. Fedder
Carnegie Mellon University

DYNAMIC ARRAY MANIPULATION OF MICROSCOPIC PARTICLES VIA OPTOELECTRONIC TWEEZERS

A.T. Ohta, P.-Y. Chiou, and M.C. Wu
University of California, Los Angeles

LOW-COST ELECTROPLATED VERTICAL COMB-DRIVE

Z. Li and N. Tien
University of California, Davis

BULK MICROMACHINED TITANIUM MICROMIRROR DEVICE WITH SLOPING ELECTRODE GEOMETRY

M.P. Rao, M.F. Aimi, and N.C. MacDonald
University of California, Santa Barbara

ELECTROTHERMAL SCS MICROMIRROR WITH LARGE-VERTICAL-DISPLACEMENT ACTUATION

A. Jain¹, H. Qu¹, S.T. Todd¹, G.K. Fedder², and H. Xie¹
¹University of Florida and ²Carnegie Mellon University

TIP-TILT-PISTON ACTUATORS FOR HIGH FILL-FACTOR MICROMIRROR ARRAYS

V. Milanovic, G.A. Matus, and D.T. McCormick
Adriatic Research Institute

OPTICAL AND MECHANICAL CHARACTERIZATION OF AN EVANESCENT COUPLER OPTICAL SWITCH

M.W. Pruessner, M. Datta, D.P. Kelly, and R. Ghodssi
University of Maryland

POLY-WIRE-COUPLED SINGLE CRYSTAL SILICON HARPSS MICROMECHANICAL FILTERS USING OXIDE ISLANDS

R. Abdolvand, G.K. Ho, and F. Ayazi
Georgia Institute of Technology

EFFECTS OF BORON CONCENTRATION ON $Si_{1-x}Ge_x$ PROPERTIES FOR INTEGRATED MEMS TECHNOLOGY

M.-A.N. Eyoom¹, Y.R. Su¹, B.L. Bircumshaw¹, D. Kouzminov², H. Takeuchi¹, R.T. Howe¹, and T.-J. King¹
¹University of California, Berkeley and ²Materials Analysis Service

A HIGH-Q WIDELY-TUNABLE GIGAHERTZ ELECTROMAGNETIC CAVITY RESONATOR

S.M. Hou, J.H. Lang, A.H. Slocum, A.C. Weber, and J.H. White
Massachusetts Institute of Technology

FABRICATION AND MEASUREMENT OF AN IC-COMPATIBLE GHZ-RANGE PIEZOELECTRIC LONGITUDINAL BAR RESONATOR

D.J.D Carter, J.-M. Kang, D.W. White, and A.E. Duwel
The Charles Stark Draper Laboratory

FABRICATION OF A HIGH SPEED MICROSCALE TURBOCHARGER

H. Li, N. Savoulides, L. Ho, S.A. Jacobson, R. Khanna, C.J. Teo, L. Wang, D. Ward, A.H. Epstein, and M.A. Schmidt,
Massachusetts Institute of Technology

A TRANSISTORLESS MICROMECHANICAL HIGH VOLTAGE GENERATOR USING A DC-POWERED SELF-OSCILLATING RELAY

K. Udeshi and Y.B. Gianchandani
University of Michigan

PALLADIUM-NANOSTRUCTURES ON PLATINUM-BLACK CATALYSTS INTEGRATED INTO A MICROFABRICATED SI-BASED MICRO-FUEL CELL

R.S. Jayashree, J. Spendelow, E.R. Choban, P.J.A. Kenis, J. Yeom, and M.A. Shannon,
University of Illinois, Urbana-Champaign

A ROBUST LOW-COST PDMS PERISTALTIC MICROPUMP WITH MAGNETIC DRIVE

E. Kai, T. Pan and B. Ziaie
University of Minnesota

CONTROLLED VESICLE SELF-ASSEMBLY IN CONTINUOUS TWO PHASE FLOW MICROFLUIDIC CHANNELS

A. Jahn, W.N. Vreeland, L.E. Locascio, and M. Gaitan
National Institute of Standards and Technology

A REMOTELY ADJUSTABLE MICROMACHINED CHECK-VALVE WITH A VARIABLE LENGTH CANTILEVER-BEAM STRUCTURE FOR IMPLANTABLE BIOMEDICAL MICROSYSTEMS

T. Pan and B. Ziaie
University of Minnesota

AN ELECTROSTATICALLY ACTUATED LOW-LEAKAGE SILICON MICROVALVE

J. Sihler, A.H. Slocum, and J.H. Lang
Massachusetts Institute of Technology

THREE-DIMENSIONAL TOWER STRUCTURES WITH INTEGRATED CROSS-CONNECTS FOR 3-D CULTURING OF NEURONS

Y. Choi¹, S. Choi¹, R. Powers¹, M.G. Allen¹, Y. Nam², B.C. Wheeler², A. Marr³, and G.J. Brewer³
¹Georgia Institute of Technology, ²University of Illinois, Urbana-Champaign, and ³Southern Illinois University School of Medicine

A MICROMACHINED STAINLESS STEEL CUFF FOR ELECTROMAGNETIC MEASUREMENT OF FLOW IN BLOOD VESSELS

K. Takahata and Y.B. Gianchandani
University of Michigan

MEMS CALORIMETER FOR REAL-TIME BIOCHEMICAL TESTING AND FLUID CHARACTERIZATION

Y. Zhang and S. Tadigadapa
Pennsylvania State University

INTEGRATED SILICA-BEAD SEPARATION COLUMN FOR ON-CHIP LC-ESI

Q. He¹, J. Xie¹, Y.-C. Tai¹, Y. Miao², and T.D. Lee²

¹California Institute of Technology and ²Beckman Research Institute of the City-of-Hope

A HIGH-PERFORMANCE TEMPERATURE-PROGRAMMED GAS CHROMATOGRAPHY COLUMN

M. Agah, J.A. Potkay, A.L. Elstro, G.R. Lambertus, R.D. Sacks, and K.D. Wise

University of Michigan

HIGH PERFORMANCE MEMS SENSOR FOR LOW DEW POINT HUMIDITY DETECTION

A. Zribi¹, A. Knobloch¹, W.-C. Tian¹, and C. Schultz²

¹General Electric Global Research Center and ²General Electric Instruments

IN SITU MONITORING OF NATIVE OXIDE FILM BEHAVIOR AT MEMS CONTACT INTERFACES THROUGH BASIC ELECTRICAL MEASUREMENTS

L. Kogut, A. Lumbantobing, and K. Komvopoulos

University of California, Berkeley

STICTION IN MICROFLUIDIC ENVIRONMENTS

E.E. Parker¹, W.R. Ashurst², C. Carraro², and R. Maboudian²

¹Honeywell Federal Manufacturing & Technologies, LLC and ²University of California, Berkeley

PATTERN DENSITY BASED PREDICTION FOR DEEP REACTIVE ION ETCH (DRIE)

T.F. Hill¹, H. Sun¹, H.K. Taylor², M.A. Schmidt¹, and D.S. Boning¹

¹Massachusetts Institute of Technology and ²Cambridge University

LEEDUS: A MICROMACHINING PROCESS FOR DIE-SCALE PATTERN TRANSFER IN CERAMICS WITH HIGH RESOLUTION AND THROUGHPUT

T. Li and Y.B. Gianchandani

University of Michigan

SURFACE MICROMACHINED ELECTROMAGNETICALLY RADIATING RF MEMS

Y.-K. Yoon, B. Pan, P. Kirby, J. Papapolymerou, M. Tentzeris, and M.G. Allen

Georgia Institute of Technology

POROUS POLYSILICON FORMED BY ELECTROCHEMICAL ETCHING FOR ON-CHIP VACUUM ENCAPSULATION

R. He, L. Fan, M.C. Wu, and C.-J. Kim

University of California, Los Angeles

MICROBOLOMETERS WITH ADAPTIVE DETECTIVITY USING ELECTROSTATIC ACTUATION

W.-B. Song and J.J. Talghader

University of Minnesota

LARGE-DEFLECTION STACKED MULTI-ELECTRODE ELECTROSTATIC ACTUATOR

H.S. Kim, A.B. Ucock, and K. Najafi

University of Michigan

BUCKLED BEAM LINEAR OUTPUT CAPACITIVE STRAIN SENSOR

J. Guo, H. Kuo, D.J. Young, and W.H. Ko
Case Western Reserve University

CAPACITIVE SENSE FEEDBACK CONTROL FOR MEMS BEAM STEERING MIRRORS

B. Cagdaser, A. Jog, M. Last, B.S. Leibowitz, L. Zhou, E. Shelton, K.S.J Pister, and B.E. Boser
University of California, Berkeley

TWO-AXIS GIMBALED MICROSCANNER IN DOUBLE SOI LAYERS ACTUATED BY SELF-ALIGNED VERTICAL ELECTROSTATIC COMBDRIVE

D. Lee and O. Solgaard
Stanford University

SILICON-ON-INSULATOR-BASED OPTICAL ADD-DROP MULTIPLEXERS

P. Gulvin, J. Kubby, J. Chen, J. Diehl, K. Feinberg, K. German, L. Herko,
N. Jia, P. Lin, X. Liu, J. Meyers, P. Nystrom, and Y.R. Wang
Xerox Wilson Center

POLY-SIGE HIGH FREQUENCY RESONATORS BASED ON LITHOGRAPHIC DEFINITION OF NANO-GAP LATERAL TRANSDUCERS

E.P. Quévy, S.A. Bhave, H. Takeuchi, T.-J. King, and R.T. Howe
University of California, Berkeley

ACTIVE TEMPERATURE COMPENSATION FOR MICROMACHINED RESONATORS

M. Hopcroft¹, R. Melamud¹, R.N. Candler¹, W.-T. Park¹, B. Kim¹, G. Yama², A. Partridge²,
M. Lutz², and T.W. Kenny¹
¹Stanford University and ²Robert Bosch Corporation

ENHANCEMENT OF DRIVE-MODE BANDWIDTH IN MEMS VIBRATORY GYROSCOPES UTILIZING MULTIPLE OSCILLATORS

C. Acar and A. Shkel
University of California, Irvine

HIGH FREQUENCY MICROMECHANICAL PIEZO ACTUATED DISK RESONATOR

L. Yan¹, W. Pang², J. Wu¹, W.C. Tang¹, and E.S. Kim²
¹University of California, Irvine and ²University of Southern California

NANORIBBED TORSIONAL OSCILLATORS OPTIMIZED FOR HIGH-FREQUENCY FORCE SENSING

B.W. Chui, C.T. Rettner, H.J. Mamin, R. Budakian, and D. Rugar
Almaden Research Center

Late News Posters

COMPENSATED TUNABLE CAPACITIVE THIN FILM HYDROGEN SENSOR

D.J. Kirby, J.J. Zinck, D.T. Chang, and F.P. Stratton
HRL Laboratories, LLC

DROPLET ARRAYS IN MICROFLUIDIC CHANNELS FOR COMBINATORIAL SCREENING ASSAYS

W.-C. Chao, J. Collins, M. Bachman, G.P. Li, and A.P. Lee
University of California, Irvine

TOWARDS INERTIAL GRADE VIBRATORY MICROGYROS: A HIGH-Q IN-PLANE SILICON ON-INSULATOR TUNING FORK DEVICE

M. Zaman, A. Sharma, B. Amini, and F. Ayazi
Georgia Institute of Technology

MEASUREMENT OF TRANSIENT THERMAL RESPONSE OF MICRO-MIRRORS

C.R. Forest¹, P. Reynolds-Browne², J. Harris², E. Novak², O. Blum-Spahn³, C.C. Wong³, S. Mani³, F. Peter³, and D. Adams³

¹Massachusetts Institute of Technology, ²Veeco Instruments, Inc., and ³Sandia National Laboratories

A CONTINUOUS METHOD FOR MANUFACTURING POLYMER STRINGS AND TUBES

W. Jeong¹, G. Mensing², S. Lee¹, and D.J. Beebe²
¹Dankook University, KOREA and ²University of Wisconsin

DEVELOPMENT OF A MICROFABRICATED VAPOR PRECONCENTRATOR FOR PORTABLE ION MOBILITY SPECTROSCOPY

M. Martin¹, M. Crain¹, K. Walsh¹, R.A. McGill², E.J. Houser², D. Mott², J. Stepnowski², S.V. Stepnowski², V. Nguyen², H.-D. Wu², S. Ross³, D.J. Nagel⁴, and I. Voicescu⁴

¹University of Louisville, ²Navel Research Laboratory, ³Dstl. Porton Down, UK, and ⁴George Washington University

18 μ M THICK HIGH FREQUENCY CAPACITIVE HARPSS RESONATORS WITH REDUCED MOTIONAL RESISTANCE

S. Pourkamali and F. Ayazi
Georgia Institute of Technology

MICRO MOLDED PDMS STRUCTURES FOR CARDIAC MYOCYTE RESTORING FORCE MEASUREMENTS

Y. Zhao, H. Yu, B. Li, and X. Zhang
Boston University

ISE ARRAYS WITH IMPROVED DYNAMIC RESPONSE AND LIFETIME

S.M. Martin¹, J. Ha², J.W. Kim², T.D. Strong¹, G.S. Cha², and R.B. Brown¹
¹University of Michigan and ²Kwangwoon University, KOREA

FABRICATION AND CHARACTERIZATION OF PHOTOPATTERNED POLYMER MEMBRANES FOR PROTEIN CONCENTRATION AND DIALYSIS IN MICROCHIPS

S. Song, A.K. Singh, T.J. Shepodd, and B.J. Kirby
Sandia National Laboratories

*ELECTROWETTING-ON-DIELECTRIC FOR ANALYSIS OF PEPTIDES AND PROTEINS BY MATRIX
ASSISTED LASER DESORPTION/IONIZATION MASS SPECTROMETRY*

A.R. Wheeler, R.L. Garrell, H. Moon, C.-J. Kim, and J.A. Loo

University of California, Los Angeles