



August 8-11, 2011 - Istanbul-TURKEY

2011 International Conference on Optical MEMS & Nanophotonics

Sunday, August 7		Monday, August 8		Tuesday, August 9		Wednesday, August 10		Thursday, August 11		
		8:00	Registration desk open	8:00	Registration desk open	8:00	Registration desk open	8:00	Registration desk open	
		9:00	Opening	9:00	OPTOFLUIDIC DEVICES AND SYSTEMS SESSION CHAIR: Arda Yalcinkaya	9:00	NANOSCALE INTERACTION AND INTERFERENCE DEVICES SESSION CHAIR: Hartmut Hillmer	9:00	MICROMIRROR ARRAYS AND GRATINGS SESSION CHAIR: Harald Schenk	
		9:15		9:15		9:15		9:15		
		9:30	LIGHT BEAM CONTROL SESSION CHAIR: Selim Unlu	9:30		9:30		9:30		9:30
		9:45		9:45		9:45		9:45		
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		10:30		10:30	10:30	10:30	10:30	10:30		
		10:45	Coffee break	10:45	Coffee break	10:45	Coffee break	10:45	Coffee break	
		11:00		11:00	NANOFABRICATION, MANIPULATION, AND MEASUREMENT SESSION CHAIR: Michal Lipson	11:00	PERIODIC NANOSTRUCTURES AND DEVICES CHAIR: Luca Dal Negro	11:00	FABRICATION AND PROCESSING SESSION CHAIR: Wilfried Noell	
		11:15	SENSING DEVICES AND SYSTEMS SESSION CHAIR: Hiroshi Toshiyoshi	11:15		11:15		11:15		11:15
		11:30		11:30		11:30		11:30		
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		12:30		12:30	LUNCH	12:30	LUNCH	12:30	Conference Adjourn	
		12:45	LUNCH	12:45		12:45		12:45		12:45
		13:00		13:00		13:00		13:00		
		13:15		13:15		13:15		13:15		
		13:30		13:30		NANOSCALE BIOMANIPULATION AND IMAGING SESSION CHAIR: Ulrich Rant		13:30		
		13:45	NANOPLASMONICS AND APERIODIC STRUCTURES SESSION CHAIR: Thomas Bifano	13:45	13:45		13:45	13:45		
		14:00		14:00	14:00		14:00			
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		14:30	14:30	14:30	14:30		14:30	14:30		
		14:45		14:45	OPTOMECHANICS AND MICROSCOPY SESSION CHAIR: Hiroshi Miyajima	14:45	Coffee break	14:45		
		15:00	COFFEE BREAK	15:00		15:00		15:00		15:00
		15:15		15:15		15:15		15:15		
		15:30		15:30	15:30	15:30				
		15:45		15:45	COFFEE BREAK	15:45	BIOSENSING Session Chair: David Dickensheets	15:45		
		16:00	SCANNERS AND OSCILLATORS SESSION CHAIR: Hans Zappe	16:00		16:00		16:00		16:00
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		16:45	16:45	16:45		16:45		16:45		16:45
		17:00		17:00	SHUTTERS AND WAVELENGTH SELECTIVE DEVICES SESSION CHAIR: Andrew Yeh	17:00	POSTER SESSION	17:00		
		17:15		17:15		17:15		17:15		17:15
						17:30		17:30		17:30
						17:45		17:45		17:45
						18:00		18:00		18:00
19:00-21:00	Welcome Cocktail (Pool Bar)	18:00-23:00	BOSPHORUS CRUISE DINNER			18:30-23:00	Hiking and GALA Dinner			

MONDAY, AUG 8, 2011

9:00 - Welcome Address by Koç University President Umran Inan

9:05 - Opening by the Conference Chairs

**9:15 - 10:30 SESSION:
LIGHT BEAM CONTROL**

(Session Chair: Prof. Selim Unlu, Boston University)

**9:15 – 10:00 Plenary:
MEMS Deformable Mirrors for Wavefront Control**

Prof. Thomas Bifano
(Boston University, USA)

Abstract: *This talk will describe design, modeling, and application of deformable mirrors made using microelectromechanical systems technology (MEMS-DMs). These devices have enabled rapid advances in wavefront control, and aberration compensation over the past several years.*

10:00 – 10:15 Dynamically Deformable Micromirror Array for Defined Laser Beam Shaping and Homogenizing

¹Jonathan Masson, ¹Roland Bitterli, ²Andreas Bich, ¹Wilfried Noell, ²Reinhard Voelkel, ²Kenneth Weible, ¹Nico F. de Rooij
(¹EPFL, Switzerland; ²SUSS MicroOptics SA, Switzerland)

Abstract: *We present a dynamic laser beam shaper that generates*

smooth flat top and Gaussian intensity profiles. It consists of a 100% fill factor deformable membrane mirror array fabricated on a scanning stage using parylene refilling.

10:15 – 10:30 Fast Optical Line Shaper for Ultrashort-Pulse Laser Nanomachining

¹Jens Brunne, ¹Ulrike Wallrabe, ²Alexander Treffer, ²Martin Bock, ²Rüdiger Grunwald

(¹University of Freiburg-IMTEK, Germany; ²Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Germany)

Abstract: *We present a fast and robust optical line shaping mirror for advanced nano-machining applications. The mirror acts as a biprism and is actuated by a piezoelectric actuator. Light propagation and pulse transfer have been characterized*

**11:00-12:30 SESSION:
SENSING DEVICES AND SYSTEMS**

(Session Chair: Prof. Hiroshi Toshiyoshi, University of Tokyo)

**11:00 – 11:30 Invited Paper:
“High-Performance Infrared Micro-Bolometer Arrays Manufactured using Very Large Scale Heterogeneous System Integration”**

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Prof. Frank Niklaus
(KTH Royal Institute of
Technology, Sweden)

Abstract: *This paper reports on the implementation and characterization of arrays of uncooled infrared bolometers containing mono-crystalline Si/SiGe quantum well (QW) thermistors. The bolometer arrays are integrated on silicon fanout wafers using very-large scale heterogeneous integration that is compatible with standard CMOS wafers. Infrared bolometer arrays with 320x240 pixels and pixel pitches of 25 μm x 25 μm and 17 μm x 17 μm have been implemented, respectively.*

11:30 – 11:45 MEMS Fourier Transform IR Spectrometer

¹N. Pelin Ayerden, ¹Sven Holmstrom, ¹Huseyin R. Seren, ¹Selim Olcer, ¹Jaibir Sharma, ²Stephan Luettjohann, ³Thilo Sandner, ¹Hakan Urey

(¹Koç University, Turkey; ²Bruker Optics Ettlingen, Germany; ³Fraunhofer IPMS Dresden, Germany)

Abstract: *A comb-actuated MEMS lamellar grating FTIR spectrometer with maximum OPD of 652 μm and clear aperture area of 9.6mm² is developed. Laser and IR interferograms in 2.5-16 μm wavelength band are acquired at ambient pressure.*

11:45 – 12:00 Multi-Wavelength Selective IR emission Using Surface Plasmon Polariton for CO₂ Gas Sensing

Katsuya Masuno, Takahiro Sawada, Shinya Kumagai, Minoru Sasaki
(Toyota Technological Institute, Japan)

Abstract: *New wavelength selective IR emitter is proposed. Surface plasmon polariton is excited by IR having the wavelength nearly equals to the grating pitch (4.0 and 4.3 μm). CO₂ gas is confirmed to absorb the output IR.*

12:00 – 12:15 VOA-Based Optical MEMS Accelerometer

¹Kazem Zandi, ²Jing Zou, ²Brian Wong, ²Roman V. Kruzelecky, ¹Yves-Alain Peter
(¹École Polytechnique de Montréal, Canada; ²MPB Communications Inc., Canada)

Abstract: *A novel iA novel in-plane double SOI optical-MEMS accelerometer based on variable optical attenuator is presented. It is designed for micro-satellite navigation applications and uses multimode waveguides integrated with MEMS providing a compact and reliable device.*

12:15 – 12:30 Built-in Optical Angular Position Sensing Mechanism for High-Resolution Vibratory Grating Scanner

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Kelvin K.L. Cheo, Guangya Zhou,
Yu Du, Fook Siong Chau
(National University of Singapore,
Singapore)

Abstract: *A built-in angular sensing mechanism unique to the vibratory grating scanner is demonstrated through utilizing the non-scanning 0^{th} -order beam, of which the intensity variation is affected by the angular position of the grating platform.*

12:30 – 13:30 Lunch

**13:30-15:00 SESSION:
NANOPLASMONICS AND
APERIODIC STRUCTURES**

*(Session Chair: Prof. T. Bifano,
Boston University, USA)*

**13:30 – 14:00 Invited Paper:
“Photons in a Labyrinth:
Challenges and Opportunities in
Aperiodic Nanophotonics”**

Prof. Luca Dal Negro
(Boston University, USA)

Abstract: *In this talk, I will present our work on the engineering of aperiodic optical nanostructures for nanophotonics applications. Results on broadband energy concentration, harvesting, light emission, and nonlinear enhancement of optical interactions will be discussed.*

**14:00 – 14:15 Talbot Lithography
using Aperiodic Structures**

Hyungryul J. Choi, Hanhong Gao,
Lei Tian, Chih-Hao Chang, Jeong-
Gil Kim, Chih-Hung Hsieh, George
Barbastathis
(Massachusetts Institute of
Technology, USA)

Abstract: *We propose a phase-mask lithography scheme employing the Talbot field generated from aperiodic structures. A grating with fixed period and spatially varying duty-cycle is used to generate a 3-dimensional aperiodic intensity pattern, recorded by photoresist.*

**14:15 – 14:30 Metallodielectric
Nanopatch Cavity with Extended
Metal Shields**

Jong-Bum You, Wook-Jae Lee,
Kyoungsik Yu
(KAIST Daejeon, Korea)

Abstract: *We report that the radial extension of parallel metal plates can significantly suppress the radiation losses from the cylindrical metallodielectric nanopatch cavities. The improved quality factor can be obtained analytically, and therefore systematically optimized.*

**14:30 – 14:45 Angularly
Independent Structural Color of
Nanostructured Metal Surfaces**

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Sylvanus Y. Lee, Luca Dal Negro
(Boston University, USA)

Abstract: *We design and demonstrate angularly insensitive structural color from nanostructured metal surfaces. Plasmon-enhanced light scattering of aperiodic pinwheel gold nanoparticles on gold thin film is observed in green by dark-field scattering and variable-angle reflection spectroscopies.*

14:45 – 15:00 30 nm Metallic Slot Array for Sensing: Theoretical and Experimental Study

Qing Tan, Armando Cosentino, Matthieu Roussey, Hans Peter Herzig
(EPFL, Switzerland)

Abstract: *The simulation, fabrication and characterization of a metallic slot grating on a silicon waveguide are presented. This device is attempting to be a sensor for refractive index variation measurements with theoretical sensitivity of 750 nm/RIU.*

15:00 – 15:30 Coffee Break

**15:30-17:15 SESSION:
SCANNERS & OSCILLATORS**
(Session Chair: Prof. Hans Zappe,
University of Freiburg-IMTEK)

**15:30 – 16:00 Invited Paper:
“Cavity Optomechanics:
Coupling Photons to Phonons”**

Prof. Tobias Kippenberg
(Max Planck Institute for Quantum Optics, Germany)

Abstract: *Using optical sideband cooling, a micromechanical oscillator is cooled to a phonon occupancy below 10 phonons, corresponding to a probability of finding it in its quantum ground state more than 10% of the time.*

16:00 – 16:15 Microscanner with Vertical Out of Plane Comdrive

Thilo Sandner, Denis Jung, David Kallweit, Thomas Grasshoff, Harald Schenk
(Fraunhofer IPMS Dresden, Germany)

Abstract: *This paper reports a new concept of quasi-static micro scanning mirrors enabling large static deflections and linearized scanning using vertical out-of-plane comb drives.*

16:15 – 16:30 A High-Frequency Comb-Actuated Resonant MEMS Scanner for Microdisplays

¹Sertan Kutal Gokce, ¹Sven Holmstrom, ²Dean Brown, ²Wyatt O. Davis, ¹Hakan Urey
(¹Koc University, Turkey; ²Microvision Inc., USA)

Abstract: *A high frequency novel torsional MEMS scanner is*

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developed for high resolution projection display systems employing a multi-frame geometry. For the torsional mirror, 26.7° and 36.1° total-optical-scan-angle are achieved at resonance, at atmospheric pressure and vacuum respectively.

16:30 – 16:45 MEMS Rotary Stage with Linear Stiffness

U. Baran, W.O. Davis, S. Holmström, D. Brown, J. Sharma, S. Gokce, H. Urey
(Koc University, Turkey)

Abstract: *A comb-actuated rotary MEMS stage with a novel spring structure to achieve linear spring stiffness is presented. At resonance the present stages have mechanical rotation angles of $\pm 7^\circ$ and $\pm 4.5^\circ$ at vacuum and ambient pressure, respectively.*

16:45 – 17:00 2-Axis MEMS Scanner for a Laser Range Finder

¹I. Aoyagi, ¹K. Shimaoka, ¹S.Kato, ²W. Makishi, ²Y. Kawai, ²S. Tanaka, ²T. Ono, ²M. Esashi, K. Hane
(¹TOYOTA Central R&D labs, Japan; ²Tohoku University, Japan)

Abstract: *A moving-magnet-type 2-axis MEMS scanner with a rotation angle detector has been developed. The fabricated MEMS scanner demonstrated a raster*

scan and 2-axis rotation angles detection with one Hall sensor.

17:00 – 17:15 A 2-D Raster Scanning Mirror Driven by Piezoelectric Cantilever Actuator Array in Combinational Mode - Bending and Torsional

¹Kah How Koh, ²Takeshi Kobayashi, ¹Chengkuo Lee
(¹National University of Singapore, Singapore; ²National Institute of Advanced Industrial Science and Technology, Japan)

Abstract: *A novel actuation mechanism for a gold-coated MEMS mirror driven by 1x10 piezoelectric Pb(Zr,Ti)O₃ actuators integrated with silicon cantilever beam has been developed and demonstrated for 2-D raster scanning applications.*

18:30 – 22:30 Cruise Dinner

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**9:00 - 10:30 SESSION:
OPTOFLUIDIC DEVICES &
SYSTEMS**

(Session Chair: Prof. Arda D.
Yalcinkaya, Bogazici University)

**09:00 – 09:30 Invited Paper:
“Electrowetting Optics and
Displays: Materials Implications
on Performance and Reliability”**

Prof. Jason Heikenfeld
(University of Cincinnati, USA)

***Abstract:** Careful selection of all three electrowetting materials: dielectric, polar phase, and non-polar phase, allows for increased performance and reliability for electrowetting devices.*

**09:30 – 09:45 Closed-Loop
Pressure Control of an Adaptive
Single Chamber Membrane Lens
With Integrated Actuation**

Jan Draheim, Tobias Burger,
Robert Kamberger and Ulrike
Wallrabe
(University of Freiburg-IMTEK,
Germany)

***Abstract:** We introduce a closed-loop pressure control of an adaptive membrane lens to eliminate piezoelectric hysteresis. Therefore a pressure sensor is integrated into the lens measuring the chamber pressure as a function of the refractive power.*

**09:45 – 10:00 Development of
Optical Device for Novel Micro
Optical Diffusion**

Tetsuhiro Oka, Koichi Itani,
Yoshihiro Taguchi, Yuji Nagasaka
(Keio University, Japan)

***Abstract:** A novel micro optical diffusion sensor device has been developed, which enables high-speed measurement with a small sample volume and on-site sensing and without using any additives.*

**10:00 – 10:15 Optical Micro-
System With Highly Flexible
Tunability for Endoscopic Micro-
Probes**

Niklas Weber, Hans Zappe, and
Andreas Seifert
(University of Freiburg-IMTEK,
Germany)

***Abstract:** A highly flexible tunable optical micro-system has been developed and characterized for its use in endoscopic optics, such as optical coherence tomography. By using two individually tunable lenses, various optical arrangements can easily be realized.*

**10: 15 – 10:30 Micro-Assembly
Using Optically Controlled
Bubbles**

Wenqi Hu, Kelly S. Ishii, Aaron T.
Ohta
(University of Hawaii at Manoa,
USA)

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Abstract: *An optically controlled bubble microrobot is presented here, and used to manipulate glass microbeads at up to 350 $\mu\text{m/s}$. The bubble microrobots were used to pull and push micro-objects into place, demonstrating micro-assembly.*

10:30 – 11:00 Coffee Break

**11:00 – 12:30 SESSION:
NANOFABRICATION,
MANIPULATION &
MEASUREMENT**

(Session Chair: Prof. Michal Lipson, Cornell University, USA)

**11:00 – 11:30 Invited Paper:
“Photothermal Nanoblade for
Single Cell Surgery and Large
Cargo Delivery”**

Prof. Eric Pei-Yu Chiou
(UCLA, USA)

Abstract: *We report a photothermal nanoblade that utilizes a metallic nanostructure to harvest short laser pulse energy to generate highly localized explosive vapor bubbles for rapid cell membrane cutting. The cavitation bubble pattern is controlled by the metallic structure configuration, laser pulse duration and energy. Integrating the metallic nanostructure with a micropipette, the nanoblade can generate a micron-sized membrane access port for large cargo delivery with*

high efficiency (46%) and cell viability (>90%) into mammalian cells.

**11:30 – 11:45 Development of
Nanometer Scale Temperature
Measurement Method with
Polarized Near-field Light**

Shunsuke Hosaka, Jumpei Nitta,
Yoshihiro Taguchi, Toshiharu
Saiki, Yuji Nagasaka
(Keio University, Japan)

Abstract: *We report on the development of a temperature measurement method at the nanoscale using polarized near-field light. In this method, temperature measurement is accomplished by detecting the near-field polarization change in illumination-collection mode operation.*

**11:45 – 12:00 A Plastic Lens
with Anti-reflective Structures
Using a Nanoporous Alumina
Template with Lens Curvature**

Young-Seop Lee, Jae-Jun Kim and
Ki-Hun Jeong
(Korea Advanced Institute of
Science and Technology, Korea)

Abstract: *This work presents the anti-reflective lens for illumination and imaging system using curved alumina template. The lens is made by molding from curved alumina template, and the template is fabricated by two-step anodizing.*

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12:00 – 12:15 Nanoscale Patterned Sapphire Substrates with Cortex-Like Nanostructures for GaN-Based LEDs

Yu-Sheng Lin, J. Andrew Yeh
(National Tsing Hua University, Taiwan)

Abstract: *A new morphology of nanopatterned sapphire substrates (NPSS) was presented, which applied in LEDs exhibited an output power of 33.1 mW, higher than that on flat substrates 2.4-fold, owing to void-embedded NPSS with cortex-like nanostructures.*

12:15 – 12:30 Antireflective Subwavelength Gratings on the End Faces of Optical Fibers Fabricated by UV Nanoimprint Lithography

Yoshiaki Kanamori, Masaaki Okochi, Kazuhiro Hane
(Tohoku University, Japan)

Abstract: *Antireflective subwavelength gratings with 700-nm-period binary cross-sectional shapes were fabricated on the end faces of optical fibers by using UV nanoimprint lithography. A dedicated UV nanoimprinting machine was developed. Their optical characteristics were measured.*

12:30 – 14:00 Lunch

14:00 – 15:30 SESSION: OPTOMECHANICS & MICROSCOPY

(Session Chair: Dr. Hiroshi Miyajima, Olympus, Japan)

14:00 – 14:30 Invited Paper: “Optomechanics on a Silicon Chip”

Prof. Michal Lipson
(Cornell University, USA)

14:30 – 14:45 Light Propagation Mapping in Surface Waveguides Using Nano Carbon Probe Grown on Polymer Tipped Optical Fiber

Zohreh Sedaghat, Anna Rumyantseva, Aurelien Bruyant, Serguei Kochtcheev, Sylvain Blaize, Safi Jradi, Renaud Bachelot
(Université de Technologie de Troyes, France)

Abstract: *A high resolution near-field imaging of surface waveguides is achieved by carbon nano-probes grown on the apex of polymer-tipped optical fibres. This combination shows a confocal-like detection of the light scattered by the carbon needle.*

14:45 – 15:00 3-D MEMS Scanning System For Dual-Axis Confocal Microendoscopy

Jae-Woong Jeong, Michael J. Mandella, Gordon S. Kino,

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Christopher H. Contag, Olav Solgaard
(Stanford University, USA)

Abstract: *This paper describes a 3-D MEMS scanning system for 3.2mm-diameter dual-axis confocal microendoscopes. Co-operation of a 2-D lateral scanner and a 1-D depth scanner enables fast 3-D microscopy over a volume that measures 340 μ m—236 μ m—286 μ m.*

15:00 – 15:15 A High Speed MEMS Scanner for 140-kHz SS-OCT

¹Keiji Isamoto, ¹Kohki Totsuka, ¹Tooru Sakai, ¹Takuya Suzuki, ¹Atsushi Morosawa, ¹Changho Chong, ²Hiroyuki Fujita, ²Hiroshi Toshiyoshi
(¹Santec Corporation, Japan; ²University of Tokyo, Japan)

Abstract: *We present an electrostatic vertical comb-drive MEMS optical scanner with the angle magnifier mechanism developed for a 140-kHz wavelength tunable-laser in the swept-source OCT system of a 2 ms/frame visualization capability.*

15:15 – 15:30 MEMS Scanner Based Handheld Imaging Guided Mohs Surgery System

Youmin Wang, Yongchang Jang, Gloria Chao, Quinn M Flemming, Milan Raj, Kunal Bhutani, Xiaojing Zhang
(University of Texas Austin, USA)

Abstract: *A handheld imaging-projection coupled system has been demonstrated for Mohs surgery. A handheld probe was made consisting of: a microscope for confocal in-vivo imaging, a macroscopic imaging system for real-time tracking, and a projection subsystem.*

15:30 – 16:00 Coffee Break

16:00 – 17:15 SESSION: SHUTTERS AND WAVELENGTH SELECTIVE DEVICES

(Session Chair: Prof. J. Andrew Yeh, National Tsing Hua University, Taiwan)

16:00 – 16:15 Electrostatically Addressable Visored Shutter Array by Electroplating for Astronomical Spectrography

¹T. Takahashi, ¹M. Mita, ¹K. Motohara, ¹N. Kobayashi, ²N. Kashikawa, ¹H. Fujita, ¹H. Toshiyoshi
(¹University of Tokyo, Japan; ²National Astronomical Observatory of Japan, Japan)

Abstract: *We report a new structure of electrostatically addressable and latchable multi-slit shutter array for the astronomical spectrograph with an improved optical and electromechanical performance using the electroplated visors.*

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16:15 – 16:30 Wavelength Filtering using MEMS Actuated Coupling from Optical Fibres to Spherical Resonators

R. Blue, Li Li, G. M. H. Flockhart, D. Uttamchandani
(University of Strathclyde, United Kingdom)

Abstract: *A MEMS electrothermally actuated platform is described to allow tunable coupling between optical spherical resonators and optical waveguides. The platform is experimentally characterised and selective wavelength dropping from an optical fibre waveguide is demonstrated.*

16:30 – 16:45 Optical Characterization Of Photonic Crystals As Polarizing Structures For Tunable Optical MEMS Devices

R. Zamora, M. Benes, T. Kusserow, H. Hillmer, U. Akcakoca, B. Witzigmann
(University of Kassel / CINSaT, Germany)

Abstract: *We present 2D Photonic Crystals fabricated in an InP membrane to provide polarization selectivity to InP/Air-gap Fabry-Perot filters. The characterization setup and preliminary results of the polarization properties of the photonic crystal structure are reported.*

16:45 – 17:00 A Fabry-Perot Refractometer For Chemical Vapor Sensing by Solid-Phase Microextraction

¹R. St-Gelais, ²G. Mackey, ²J. Saunders, ²J. Zhou, ¹A. Leblanc-Hotte, ¹A. Poulin, ²J.A. Barnes, ²H.-P. Loock, R. S. Brown, ¹Y.-A. Peter
(¹Ecole Polytechnique de Montréal, Canada; ²Queen's University, Canada)

Abstract: *Fabry-Perot refractometers are coated with siloxane polymers to detect vapor analytes by solid-phase microextraction. Preliminary characterization of polymers exposed to xylenes vapors yields a sensitivity of 0.015 nm/ppm and a detection limit below 120 ppm.*

17:00 – 17:15 Energy Harvesting and Data Transmitting Microsystem Using a Light Emitting Diode

Iskender Haydaroglu, Senol Mutlu
(Bogazici University, Turkey)

Abstract: *A proof of concept system that harvests optical energy and transmits optical data on separate wavelengths using the same light emitting diode (LED) is presented, an optical analogue to radio frequency identification (RFID) tag systems.*

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**9:00 - 10:30 SESSION:
NANOSCALE INTERACTION
& INTERFERENCE DEVICES**

(Session Chair: Prof. Harmut Hillmer, Univ. Kassel, Germany)

**09:00 – 09:30 Invited Paper:
“Switchable DNA Interfaces”**

Prof. Ulrich Rant
(Walter Schottky Institut,
Technische Universität München,
Germany)

**09:30 – 09:45 Precise Control of
DNA Orientation for Improved
Functionality in Protein Binding
Microarrays**

¹Philipp Spuhler, ²Laura Sola,
¹Xirui Zhang, ¹Margo Monroe,
¹Joseph Greenspun, ²Marcella
Chiari, ¹M. Selim Unlu
(¹Boston University, USA; ²Italian
National Research Council, Italy)

Abstract: *We demonstrate controlled orientation of surface anchored DNA and utilize spectral self-interference fluorescent microscopy (SSFM) to measure fluorophore height with sub-nm precision to precisely quantify DNA orientation and conformation.*

**09:45 – 10:00 Silicon
Subwavelength Gratings for
Reflective Color Filters with
Wide Viewing Angle**

Toshikazu Ozaki, Yoshiaki
Kanamori, Kazuhiro Hane
(Tohoku University, Japan)

Abstract: *We designed and fabricated three primary color filters by sub-wavelength gratings. Fabricated red, green and blue filters have pitches of 400, 340 and 300 nm, and wide viewing angles of 50 deg, respectively.*

**10:00 – 10:15 Widely Tunable
Laser Composed of Compact
Polymer Add/Drop Filter
Reflector and Reflective
Semiconductor Optical Amplifier**

Oh-Sang Kwon, Youngchul Chung
(Kwangwoon University, Korea)

Abstract: *A compact add/drop filter reflector is realized in polymer material and applied to implement a widely tunable laser through hybrid-integration with reflective semiconductor optical amplifier. The tuning range and SMSR are 40nm and 45dB, respectively.*

**10: 15 – 10:30 Double-Layer
Silicon Photonic Crystal Fiber
Tip Sensor**

Bryan Park, Il Woong Jung, J
Provine, Gary Shambat, Jelena
Vuckovic, Roger T. Howe, Olav
Solgaard
(Stanford University, USA)

Abstract: *We demonstrate a double-layer monolithic silicon photonic crystal fiber tip sensor fabricated using GOPHER process and epoxy bonding has sharper*

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resonances and higher sensitivity to refractive index than previous single-layer photonic crystal fiber tip sensors.

10:30 – 11:00 Coffee Break

**11:00 – 12:30 SESSION:
PERIODIC
NANOSTRUCTURES &
DEVICES**

(Session Chair: Prof. Luca Dal Negro, Boston University, USA)

**11:00 – 11:15 Enhanced
photonic resonance tuning
through coupling of PhC-based
triple-beam nanocavities**

Xiongyeu Chew, Guangya Zhou,
Fook Siong Chau
(National University of Singapore,
Singapore)

Abstract: *A resonance tuning method utilizing mode coupling among three photonic-crystal-based nanocavities is proposed. A wide spectral tuning range of 24.4 nm was experimentally demonstrated using on-chip-integrated microactuators with low actuation voltage and power consumption.*

**11:15 – 11:30 Tight-Binding
Mechanism in Slow Light
Regime**

A.E. Akosman, M. Mutlu, H. Kurt,
E. Ozbay

(Nanotam, Bilkent University,
Turkey)

Abstract: *Tight-binding formalism is applied to a photonic crystal coupled cavity structure to investigate the characteristics of ultra slow light modes. The resulting group indices obtained from the tight-binding formalism and numerical results are compared.*

**11:30 – 11:45 Efficient and
Compact Coupling to Slow Light
Structures**

K. Ustun, H. Kurt
(TOBB Ekonomi ve Teknoloji
University, TURKEY)

Abstract: *We present coupling structures designed for two different slow light photonic crystal waveguides. These slow light structures provide group indices of 1200 and 950. The improvements lie on the optimization of the tapered input/output transitions.*

**11:45 – 12:00 Dynamical
Properties of a Coupled
Nonlinear Dielectric Waveguide
Surface-Plasmon System As a
New Type of Josephson
Junction**

Yasa Eksioglu, Ozgur E.
Mustecaplioglu, Kaan Guven
(Koc University, Turkey)

Abstract: *We demonstrate that a weakly-coupled nonlinear dielectric waveguide surface-plasmon system can be formulated as in*

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analogy to BJJ of atomic condensates, yet the inherently dynamic coupling parameter generates novel features in phase space.

12:00 – 12:15 Macroscopic Photoconductive Nanowire Arrays

M. Bayindir, M. Yaman, E. Ozgur, O. Aktas, T. Khudiyev, M. Kanik, H. Deniz
(UNAM, Bilkent University, Turkey)

***Abstract:** A novel high-throughput fabrication technique to produce polymer embedded functional chalcogenide nanowire arrays is demonstrated. Indefinitely-long selenium nanowire arrays are obtained and their size dependent photo-conductivity is investigated. Logarithmic increase in photo-conductance is observed.*

12:15 – 13:15 Lunch

**13:15 – 14:30 SESSION:
NANOSCALE
BIOMANIPULATION &
IMAGING**

(Session Chair: Prof. Ulrich Rant, Walter Schottky Institut, Technische Universität München, Germany)

**13:15 – 13:45 Invited Paper:
“Flexible Plasmonics and
Metamaterials”**

Prof. Hatice Altug
(Boston University, USA)

***Abstract:** I will present our work on flexible plasmonic and metamaterials for advanced nanophotonics applications. In particular, I will introduce our nanofabrication approach that can exploit wide range of flexible, stretchable and bio-compatible substrates.*

13:45 – 14:00 Integrated Organic Optoelectronic System for Refractometric Measurements

D. Threm, Y. Nazirzadeh, A. Pradana, M. Radler, J. Mikat, M. Gerken
(Christian-Albrechts-University at Kiel, Germany)

***Abstract:** We present a compact optical measurement system with wet-processed organic light-emitting diodes (OLEDs) and organic photo diodes (OPDs) placed on a single substrate. Refractometric measurements based on changed waveguiding properties are demonstrated.*

14:00 – 14:15 Miniature Photoacoustic Imaging Probe Using MEMS Scanning Micromirror

W. Liao, W. Liu, L. Xi, J. Sun, Y. Zhu, L. Wu, H. Jiang, H. Xie
(University of Florida, Gainesville, USA)

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Abstract: *This paper presents the design and characterization of an electrothermally actuated high-fill-factor tip-tilt-piston (TTP) micromirror and its application to three-dimensional (3D) photoacoustic imaging (PAI).*

14:15 – 14:30 Deformable Nanoplasmonic Membrane for Highly Sensitive Surface-enhanced Raman Spectroscopy

Min-Hee Kang, Jae-Jun Kim, Ki-Hun Jeong
(Korea Advanced Institute of Science and Technology, Daejeon, Korea)

Abstract: *This work presents a novel active plasmonic method for highly sensitive surface-enhanced Raman spectroscopy (SERS) by employing a deformable membrane with metal nanostructures.*

14:30 – 15:00 Coffee Break

**15:00 – 16:00 SESSION:
BIOSENSING**

(Session Chair: David Dickensheets, Montana State University, USA)

15:00 – 15:15 Interferometric Reflectance Imaging Sensor for Point-of-Care Viral Identification

G. G. Daaboul, A. Yurt, C. Lopez, J. H. Connor, B. Goldberg, S. Unlu
(Boston University, USA)

Abstract: *We show single virus detection using Interferometric Reflectance Imaging Sensor (IRIS) can be a sensitive and affective virus detector. Also we demonstrate how size and shape filtering affects sensitivity of the sensor.*

15:15 – 15:30 Microdroplet Application in Protein Sensing

Tzu-Chun Liao , J. Andrew Yeh
(National Tsing Hua University, Taiwan)

Abstract: *A new type protein sensor is presented. The sensor is made by a micro silicon oil droplet on the gold film with self assembled monolayer. The surface tension dominates the sensor reaction.*

15:30 – 15:45 Label-free Pathogen Sensing: Microarray Studies for Clinical and Research Applications

Carlos A. Lopez, George G. Daaboul, Chunxiao Yu, Caroline A. Genco, Thomas W. Geisbert, John H. Connor, Bennett B. Goldberg, M. Selim Unlu
(Boston University, USA)

Abstract: *Studies were performed to investigate the potential of using the Interferometric Reflectance Imaging Sensor (IRIS), a label-free biodetection platform, for microarray-based clinical and*

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*research applications demanding
detection of whole pathogens and
microbial proteins.*

**15:45 – 16:00 Artificial Olfaction
Inside Nanostructured Infrared
Fiber Arrays**

M. Yaman, A. Yildirim, M. Bayindir
(UNAM, Bilkent University, Turkey)

Abstract: *Nanostructured hollow
core fibers are used to
demonstrate a new artificial nose.
The sensor unit of the array is a
hollow core fiber that selectively
guides incident blackbody radiation
and enhances absorption for
enhanced sensitivity.*

**16:00 – 18:00 POSTER
SESSION**

**18:30 – 22:30 Hiking and Gala
Dinner**

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**9:00 - 10:30 SESSION:
MICROMIRROR ARRAYS &
GRATINGS**

*(Session Chair: Dr. Harald Schenk,
Fraunhofer-IPMS, Germany)*

**09:00 – 09:15 Addressable
MEMS Slit mask for Multi-Object
Spectroscopy Based on Multi-
Wafer Stacking**

M. Canonica, F. Zamkotsian, P.
Lanzoni, W. Noell, Nico de Rooij
(EPFL, Switzerland)

Abstract: *MEMS-based
programmable slit masks are
developed for multi-object
spectroscopy in astronomy.
Devices with 2048 tiltable
micromirrors were fabricated using
multiple wafer-level bonding and
implemented with individual
addressing of each element.*

**09:15 – 09:30 MEMS Spatial
Light Modulator for Spectral
Phase and Amplitude
Modulation**

J. Dunayevsky, D. M. Marom
(Hebrew University, Jerusalem,
Israel)

Abstract: *We present a new
Micro-Electro-Mechanical-System
(MEMS) spatial light modulator
with micromirrors designed to
piston. This diffractive MEMS
modulator is to be used for
independently applying amplitude
attenuation and phase control
along one dimension.*

**09:30 – 09:45 A Dual-Axis High
Fill-Factor Micromirror Array for
High Thermal Loads**

C. Ataman, S. Lani, W. Noell, F.
Jutzi, D. Bayat, N. de Rooij
(EPFL, Switzerland)

Abstract: *A high fill-factor, dual-
axis micromirror array with novel
spring and actuator design is
developed for high thermal load
applications. Each pixel can attain
an omnidirectional mechanical DC
rotation angle of ± 4 degrees.*

**09:45 – 10:00 Microfabrication
and Characterization of Fully
Programmable Optical MEMS
Gratings with Long Low-Stress
Micro-Mirrors**

B. Timotijevic, M. Tormen, R.
Lockhart, M. Lutzelschwab, R. P.
Stanley, F. Zamkotsian, P.
Lanzoni, M. Canonica, W. Noell
(EPFL, Switzerland)

Abstract: *We have fabricated and
characterized fully programmable
MEMS diffraction gratings with
long, low-stress, low cross-talk and
optically flat micro-mirrors, which
can be vertically displaced up to
0.7 μ m.*

**10:00 – 10:15 Convolution
Spectrometer Demonstration
using Programmable Diffraction
Grating**

¹Frederic Zamkotsian, ¹Patrick
Lanzoni, ²Thierry Viard
(¹Lab. d'Astrophysique de

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Marseille, CNRS, France; ²Thales
Alenia Space, Cannes, France)

Abstract: *We demonstrate experimentally the concept of a convolution spectrometer exhibiting enhanced performance. It is based on a programmable diffraction grating for generating a shifting spectral window. The scene spectral density is obtained by deconvolution process.*

10:15– 10:30 Microtribometer Based on a Rotational Grating Displacement Sensing Mechanism

H. Yu, G. Zhou, F. S. Chau, S. K. Sinha, Leong Jonathan Y
(National University of Singapore, Singapore)

Abstract: *A novel microtribometer based on an in-plane rotational grating displacement sensing is developed, with which the adhesion force and the coefficients of kinetic friction on the sidewall of as-fabricated MEMS device have been successfully measured.*

10:30 – 11:00 Coffee Break

**11:00 - 12:45 SESSION:
FABRICATION &
PROCESSING**

(Session Chair: Dr. Wilfried Noell, EPFL, Switzerland)

11:00– 11:15 Monolithic Polymer Microlens Arrays with Anti-reflective Structures Using a Metal Annealed Mask

H. Jung, C. Song, K.H. Jeong
(Korea Advanced Institute of Science and Technology, Korea)

Abstract: *This work presents a simple nanofabrication of antireflective structures on the polymer microlens arrays by a metal annealed mask and isotropic etching. The reflection of AR microlens is 83% lower than that of conventional microlens.*

11:15– 11:30 Fabrication of a Quasistatic-Resonant Microscanner by Implementing a Vertical Combedrive through Wafer Assembly Actuation

D. Kallweit, D. Jung, T. Sandner, H. Schenk
(Fraunhofer-IPMS, Germany)

Abstract: *This paper reports on the fabrication and first results on the operation performance of a new developed quasistatic resonant micromirror capable of performing very fast resonant sinusoidal as well as slow linear and even static scanning.*

11:30 – 11:45 A Deformable Mirror with Perforated Backplate for High-Speed Operation with Controlled Damping

M. J. Moghimi, K. N. Chattergoon, M. J. Strathman, C. Wilson, D. L.

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Dickensheets

(Montana State University, USA)

Abstract: *Cryogenic deep silicon etching creates through-wafer perforations in the backplane of a MEMS deformable mirror in order to control air damping and achieve wide-bandwidth actuation. Design methods, fabrication and characterization are shown.*

11:45– 12:00 Cantilever Actuator Processing to Control the Photoluminescence of Quantum Wells Coupled across Nanoscale Air Gaps

W. S. Chan, M. J. Saarinen, J. J. Talghader
(Univ. of Minnesota, USA)

Abstract: *A collapsed-cantilever electrostatic actuator was designed and fabricated to control the spacing between heterostructures whose electron states are coupled across air gaps. The fabrication process and preliminary device design characteristics are described.*

12:00– 12:15 Development of CMOS MEMS Thermal Bimorph Actuator for Driving Microlens

Kah How Koh, Chengkuo Lee, Jyun-Hong Lu and Chii-Chang Chen
(National University of Singapore, Singapore)

Abstract: *A CMOS MEMS based thermal actuator is developed by*

using bimorph with embedded SiO₂ and inverted-connected metal line adopted from CMOS materials. Vertical displacement of 47 μ m and power consumption of 139mW is obtained at 3Vdc.

12:15– 12:30 Vertical Flaps of Arbitrary Shape For Reflective MEMS Displays and Optical Modulators

Fabio Jutzi, Wilfried Noell, Nico de Rooij
(EPFL, Switzerland)

Abstract: *A novel technological platform is presented for the fabrication of vertical flaps and gratings of arbitrary shape. The torsional flaps are actuated electrostatically at voltages as low as 10V. The main application is a high contrast reflective display.*

12:30– 12:45 A Process for Fabricating Robust Electrothermal Micromirrors With Customizable Thermal Response Time and Power Consumption

Sagnik Pal, Huikai Xie
(Univ. of Florida, USA.)

Abstract: *A novel fabrication process for robust electrothermal MEMS is reported and micromirrors are fabricated. Device parameters are chosen to customize speed and power requirements. Aluminum and tungsten constitute the bimorphs*

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*and polyimide provides thermal
isolation.*

12:45 Conference Adjourn

POSTER SESSION

PO1-10013302

Integrating Microfluidic Sample Concentrator With Interferometric Reflectance Imaging Sensor For Point-of-Care Viral Identification

Jane Yuqian Zhang, George Gaby/Jr. Daaboul, John H. Connor, Selim Ünlü, Catherine M. Klapperich
(Boston University, USA)

Abstract: *We integrated a portable, disposable, simple to fabricate, and highly effective polymeric microfluidic viral sample concentration device to the Interferometric Reflectance Imaging Sensor (IRIS) to increase infectious disease diagnostic speed and sensitivity at the point-of-care.*

PO2-10018350

A Symmetric Hybrid MEMS Scanner with Electrothermal and Electrostatic Actuators

Li Li, Ralf Bauer, Gordon Brown, and Deepak Uttamchandani
(Centre for Microsystems and Photonics, University of Strathclyde, Scotland, UK)

Abstract: *A hybrid two-axis scanner combining both electrostatic and electrothermal actuators was fabricated using the SOIMUMPs. Experimental evaluation shows the device is capable of three degree-of-freedom movement, and can be programmed to generate two-axis scan patterns.*

PO3-10024037

Near-field optical transducer for nanomechanical resonators

^{1,2}Onur Basarir, ¹Suraj Bramhavar, ¹Kamil L. Ekinci
(¹Boston University, USA; ²Fakultaet fuer Physik, Ludwig-Maximilians-Universitaet, Germany)

Abstract: *We demonstrate a near-field interface in the form of a tapered-fiber waveguide for transduction of nanomechanical motion. Small oscillations of a nanomechanical resonator are actuated by dipole forces and detected by scattering of evanescent waves.*

PO4-10031438

Measurement of the Taper Angle and X-ray Reflectivity of MEMS-based Silicon Mirrors

Tomohiro Ogawa, Yuichiro Ezo, Teppi Moriyama, Takaya Ohashi, Ikuyuki Mitsuishi, Kazuhisa Mitsuda, Yoshiaki Kanamori, Hitomi Greenslet, Raul Riveros
(Tokyo Metropolitan University, Japan)

Abstract: *A taper angle and X-ray reflectivity of MEMS-Based silicon X-ray mirrors is quantitatively measured using a parallel X-ray beam at Al K α 1.49 keV.*

PO5-10024890

Enhanced CF₄ Plasma Treated Polymer Film For Flexible Display Application

G. Tortissier, P. Ginet, B. Kim, H. Fujita, H. Toshiyoshi
(University of Tokyo, Japan)

Abstract: A MEMS flexible display device, based on transparent and flexible PEN substrate, is fabricated by inkjet printing associated with CF₄ plasma surface treatment.

PO6-10004628

A robust, Non-Resonant Piezoelectric Micromirror

Thor Bakke and Ib-Rune Johansen (SINTEF ICT, Norway)

Abstract: A highly planar, robust 2D mirror with piezoelectric actuation is presented. The mirror can be operated in a wide frequency range including static deflection. It is ideally suited for target tracking and free-space optical communication.

PO7-10008237

Whispering Gallery Modes Intrinsic Quality Factor and Coupling Regime Extraction Using Stokes Parameters

Francis Vanier, Cecilia La Mela, Ahmad Hayat, Yves-Alain Peter (Ecole Polytechnique de Montreal, Canada)

Abstract: We propose a novel method to characterize Whispering Gallery Modes and ring-type optical resonators. Based on a Stokes parameters analysis, the intrinsic Q-factor and the coupling Q-factor can be distinctly identified for any coupling regime.

PO8-10011780

Fabrication and evaluation of polymer MEMS mirror based on the mechanical characteristic of

polymer containing magnetic particles

Takuya Miura, Takaaki Suzuki, Kyouhei Terao, Hidekuni Takao, Fumikazu Oohira, Yoshinori Kaibara, Takahiro Namazu (Kagawa University, Japan)

Abstract: We have evaluated the characteristics of the SU-8 containing magnetic particles and then, we have fabricated the mirror device based on the characteristics of the SU-8 containing magnetic particles and evaluated the deflection characteristic.

PO9-10012633

Beat Signal Transmission Through Whispering-Gallery-Mode Resonator

Yen Ling Yu, Masashi Fukuhara, Takuma Aihara, Mitsuo Fukuda, Kenzo Yamaguchi (Toyohashi University of Technology, Japan)

Abstract: Optical frequency signal transmission through whispering gallery mode (WGM) was numerically analyzed and experimentally demonstrated by combining the resonance phenomena of light in a silica microsphere with optical heterodyne technique.

PO10-10031513

Selectively Thinned Stainless Steel Scanners Through Electrical Discharge Machining

B. Kucukakarsu Usta, Y.D. Gokdel, A.D. Yalcinkaya (Bogazici University, Turkey)

Abstract: A simple method using EDM is exploited for three-dimensional fabrication of stainless steel scanners. Fast and slow axis total optical scan angles are measured as 1.6° at 10.875 kHz and 78° at 236 Hz, respectively.

PO11-10003565

Three-Leaf Trefoil-Type MEMS Tunable Corner Cube Retro-Reflector

Yu-fan Chen, Bing-jun Yang, Yi-jen Lin, Keng-hsing Chao, Chih-chieh Chang, Jia-hong Huang, and Jui-che Tsai (corresponding author) (National Taiwan, Taiwan)

Abstract: A three-leaf trefoil-type corner cube retro-reflector fabricated by the PolyMUMPs process is presented. Its (1, 1, 1) direction, i.e. the direction along which the retro-reflection efficiency is maximum, is perpendicular to the substrate surface.

PO12-10016921

Design and Fabrication of polymer MEMS Mirror Based on the Mechanical Characteristic Evaluation of Polyimide Materials

Osamu Sasaki, Kyouhei Terao, Takaaki Suzuki, Hidekuni Takao, Fumikazu Oohira, Yoshinori Kaibara, Takahiro Namazu (Kagawa University, Japan)

Abstract: The tensile specimens made of photosensitive polyimide was fabricated and evaluated in the temperature range of $-50\sim 300\text{deg C}$. Based on the mechanical properties, the

simulated deflection angle showed good agreement with the measured angle.

PO13-10019723

Surface Profiling and Characterization of Microlenses Utilizing a Shack-Hartmann Wavefront Sensor

Chenhui Li, Gunnsteinn Hall, Bader Aldalali, Difeng Zhu, Kevin Eliceiri, Hongrui Jiang (University of Wisconsin-Madison, USA)

Abstract: We report on the characterization of microlenses utilizing the three-dimensional (3D) surface profile obtained from a Shack-Hartmann wavefront sensor. This method can be applied to most types of microlenses, especially liquid ones.

PO14-10026230

Hysteresis comparison of framed and frameless electrostatic X/Y scanning micromirrors

Ralf Bauer, Gordon Brown, Deepak Uttamchandani (University of Strathclyde, Scotland, UK)

Abstract: Dynamic behavior hysteresis of framed and frameless comb-drive actuated 2D MEMS scanning micromirrors is experimentally compared, with framed micromirrors showing reduction or even elimination of hysteretic frequency responses along one of their principal motion axes.

PO15-10027385

Flip-Up Micro Scanning Mirror with Vertical Comb Drive Assembled by Simple Push Operations

Cheng-An Chen, Yi Chiu
(National Chiao Tung University, China)

Abstract: *A novel flip-up micro scanning mirror is fabricated in SOI substrates with SU8 vertical comb drive actuators. The device is assembled by simple push operation. The design and fabrication of the device is presented.*

PO16-10009457

Fabry-Perot Fiber Sensors with Reproducible High Displacement Sensitivities

Onur Can Akkaya, Onur Kilic, Michel J. F. Digonnet, Gordon S. Kino, Olav Solgaard
(Stanford University, USA)

Abstract: *An all-silica design and silicate bonding are used to demonstrate a Fabry-Perot acoustic fiber sensor for large-scale array applications with a high sensitivity, high thermal stability, and excellent reproducibility in displacement sensitivity (± 0.6 dB).*

PO17-10012473

An RF Front-End with Optically Powered CMOS Power Supply

B. Sarioglu, O. Aktan, U. Cindemir, S. Mutlu, G. Dundar, A.D. Yalcinkaya
(Bogazici University, Turkey)

Abstract: *A monolithic CMOS optoelectronic power supply for on-*

chip RF front-end circuits is presented. The RF front-end circuit which uses fully optical link is demonstrated by using the test chip fabricated in 0.18-um CMOS process.

PO18-10004064

Laser Speckle Reduction by Using a Binary Micro Mirror Array (BMMA): Theory and Design

Zhaomin Tong, and Xuyuan Chen
(Vestfold University, Norway)

Abstract: *Speckle contrast can be reduced by introducing binary phase masks, which is realized by using a Binary Micro Mirror Array (BMMA). Performances of the BMMA are simulated, and its implementation in laser projectors is proposed.*

PO19-10007686

Simulation-based Study of A MEMS Wolter Type-I X-ray Telescope

Yuichiro Ezoe, Kensuke Ishizu, Teppei Moriyama, Tomohiro Ogawa, Ikuyuki Mitsuishi, Kazuhisa Mitsuda
(Tokyo Metropolitan University; Japan Aerospace Exploration Agency, Japan)

Abstract: *Design and performance estimation of a 4-inch MEMS-based Wolter type-I X-ray telescope using numerical simulations are reported. Optics parameters are optimized to maximize an effective area in consideration of the technical feasibility*

PO20-10027276

Silicon Microsphere Based Filtering Application for Near-Infrared Optical Fiber Based Telecommunication

Huzeyfe Yılmaz, Ulaş Sabahattin Gökay, Mehmet Selman Tamer, Oğuzhan Gürlü, Ali Serpengüzel (Koc University, Turkey)

Abstract: *We demonstrate an optical filter based on the resonances of a silicon microsphere in near-IR O- Band. 1300 nm laser is coupled to a silicon microsphere and optical resonances are observed as dips in the transmission.*

PO21-10001258

Particle Swarm Optimization on a New Parametric Model of a Deformable Membrane Lens

Dirk Strohmeier, Jan Draheim, Matthieu Domaszewski, Andreas Greiner, Ulrike Wallrabe and Jan. G. Korvink (University of Freiburg, Germany)

Abstract: *The particle swarm optimization method is on new parametric lens model based on Zernike polynomials. A fluid membrane lens is optimized to yield a particular focal length. Measurements on a prototype verify the results.*

PO22-10013613

Static and dynamic characterization of poly-SiGe Grating Light Valves

S. Rudra, J. De Coster, R. Van Hoof, A. Witvrouw, D. Van Thourhout

(Ghent University - INTEC, Belgium)

Abstract: *We present the fabrication and the characterization results of poly-SiGe grating light valves showing excellent contrast. We also discuss the different dimensional parameters that affect the switching time of the device through squeeze film damping.*

PO23-10020409

Smoothing Sidewalls of A MEMS-based Silicon X-ray Optics

Teppey Moriyama, Yuichiro Ezoe, Tomohiro Ogawa, Takaya Ohashi, Ikuyuki Mitsuishi, Makoto Mita, Kazuhisa Mitsuda, Yoshiaki Kanamori, Akio Maeda (Tokyo Metropolitan University, Japan)

Abstract: *To achieve a better angular resolution of X-ray optics, the silicon dry etching and annealing processes are conditioned. The surface roughness of sidewalls were measured. It has been improved by a factor of four.*

PO24-20003831

Surface Plasmon Polariton-Enhanced Schottky-Type Photodetector

Takuma Aihara, Kyohei Nakagawa, Masashi Fukuhara, Yen Ling Yu, Kenzo Yamaguchi, Mitsuo Fukuda (Toyoashi University of Technology, Japan)

Abstract: *We propose a novel Au-Si Schottky-type photodetector with a multi-slit grating inducing*

surface plasmon polaritons and demonstrate that the detector can operate at a 1.55- μm wavelength at which light is scarcely absorbed in Si.

PO25-20007499

Transmission Color Control by Stacked Wire-Grid Polarizers with In-plane Rotation

Akio Higo, Taelim Lee, Satoshi Maruyama, Hiroyuki Fujita, Yoshiaki Nakano, and Hiroshi Toshiyoshi

(University of Tokyo, Japan)

Abstract: *We present a new method of tuning transmission colors in the visible wavelength range through a stacked pair of sub-wavelength wire-grid polarizers made of EB-patterned 100-nm thick aluminum on glass substrate.*

PO26-20007966

Improvement in Light Emission of Si Nanocrystal LED using Surface Plasmons

Chul Huh, Bong Kyu Kim, Wanjoong Kim, Jongcheol Hong, Sang Hyeob Kim, Byoung-Jun Park, Eun Hye Jang, Kyu-Sang Shin, Gun Yong Sung
(IT Convergence Technology Research Laboratory, Republic of Korea)

Abstract: *We investigate the effects of surface plasmons (SPs) by Au nanopartilces (NPs) on performance of silicon nanocrystals light-emitting diodes. The light emission was enhanced*

due to the localized SPs by Au NPs.

PO27-20024658

Robustness Investigation of Nanoslit-based Plasmonic lenses

Yiting Yu, Hans Zappe
(University of Freiburg - IMTEK, Germany)

Abstract: *Plasmonic lenses based on subwavelength metallic nanostructures show a superfocusing capability. We report here a new property, the robustness of focusing performance to various imperfections introduced during the development of a practical plasmonic lens.*

PO28-20000199

High Performace Three Channel Ultra compact Demultiplexer

Fatemeh Davoodi and Omid Reza Bagheri

(K. N. Toosi University of Technology, Tehran, Iran)

Abstract: *we have proposed a new ultra-compact optical demultiplexer based on metal-insulator-metal waveguides aperture-coupled to the ring resonators. Our proposed device has high performance, small footprint, and has potential to integrate and develop to more channels.*

PO29-20014587

Low-Loss Optical Switch using Brewster Angle

Mustafa Kaykisiz, Erdal Bulgan
(Ozyegin University, Turkey)

Abstract: *Fabrication and actuation errors of submicron silicon waveguide optical switches are within sub-100 nm levels, causing high loss at the on-state. Elliptical tip geometries using Brewster's effect are studied and found to reduce high-loss.*

PO30-20015021

Manipulating of Light Propagation Using Crescent-Shaped Photonic Crystals

Mirbek Turduev, Hamza Kurt
(TOBB University of Economics and Technology, Turkey)

Abstract: *We present the optical investigation of crescent-shaped dielectric pillars that comprise a periodic structure named as crescent-photonic crystals (CPC). The degree of freedom to manipulate light propagation occurs due to the CPC rotational sensitivity.*

PO31-20023821

Two-dimensional Quasi-Bessel Beam Creation

Hamza Kurt, Mirbek Turduev
(TOBB University of Economics and Technology, Turkey)

Abstract: *We propose a two-dimensional photonic crystal structure for creation of quasi-Bessel beam. The optimization of the rod position at the tip of the structure creates quasi-Bessel beam that is diffraction free over propagation distance.*

PO32-20005565

Photonic Crystal Based Multi-Mode High-Q Cavity

A. E. Akosman, M. Mutlu, H. Kurt,
and E. Ozbay
(Bilkent Universitesi, Turkey)

Abstract: *An optical race-track has been investigated in order to obtain a multi resonant structure with high-Q factors. Photonic crystal based structure provides strong field confinement and scalability in the dimensions of the structure.*

PO33-20001154

Power Consumption Improvement in Nonlinear Photonic Switch Based on Kerr Effect

A. TaherRahmati , N. Granpayeh
(K. N. Toosi University of Technology, Iran)

Abstract: *In this paper, the self phase modulation (SPM) and cross phase modulation (XPM) Kerr nonlinear effect is utilized to induce the nonlinearity and changing the coupling length in the nonlinear photonic crystal directional coupler.*

PO34-20020513

Guidance Condition Correction into the Design of Two Dimensional Nanophotonic Devices

Hanhong Gao, Baile Zhang,
Steven G. Johnson, George
Barbastathis
(MIT, USA)

Abstract: *We quantify the importance of including finite*

thickness effects into the design of two dimensional nanophotonic metamaterial devices. Direct band diagram method and analytical guidance condition method are introduced and verified with nanostructured Luneburg lens.

PO35-20006155

Analysis and Simulation of InAs/GaAs Quantum Dot for Spectral Linewidth Improvement

Sadreddin Behjati Ardakani,
Hassan Kaatuzian
(Amirkabir University of
Technology, Iran.)

Abstract: *In present paper we have analyzed a single InAs/GaAs Quantum Dot ; we have first simulated an InAs Quantum Dot in the GaAs matrix. next we propose a structure for improvement of Linewidth of absorption spectra.*

PO36-20006663

Velocity Estimation of Mobile Single Molecules for Improved Position Accuracy

M. Yavuz Yüce, Alper T. Erdoğan,
Alper Kiraz
(Koc University, Turkey)

Abstract: *Imaging of single molecules has been modeled as a non-homogenous Poisson process. Model parameters including molecule's velocity are estimated from individual frames with maximum likelihood estimation. Velocity information is shown to improve the position accuracy.*

PO37-20027764

Synthesis and Characterization of Cadmium Telluride Nanocrystals for Using Hybrid Solar Cell

Jeongmi Kim, Hong Tak Kim,
Chinho Park
(Yeungnam University, Korea)

Abstract: *The CdTe nanocrystals (NCs) were synthesized by the paraffin route method. Synthesis of NCs was carried out using the solvents with high melting point in order to improve the quality of NCs.*

PO38-30003977

A high-throughput biosensor for detection and quantification of protein induced DNA bending

¹Xirui Zhang, ¹Philipp Spuhler,
²Laura Sola, ²Marcella Chiari, ¹M.
Selim Ünlü

(¹Boston University, USA; ²Istituto di Chimica del Riconoscimento Molecolare, Italy)

Abstract: *The functions of genes depend on interactions with DNA-binding proteins. DNA bends or kinks upon specific binding with proteins. This biosensor measures binding-induced conformational changes of DNA in a high-throughput manner with sub-nanometer accuracy.*

PO39-30007277

Multiplexed, Rapid, Point of Care Device to Quantify Allergen-Specific IgE

Margo R. Monroe, Alex

Reddington, Austin Collins, Craig LaBoda, Marina Cretich, Marcella Chiari, Frederic Little, Selim Ünlü (Boston University, USA)

Abstract: *Variation of probe immobilization on microarrays hinders the ability to make quantitative and assertive conclusions needed in immunodiagnosics. Addressing this problem, we have developed a calibrated, enhanced fluorescence (CaFE) point-of-care platform to quantify allergen-specific IgE.*

PO40-30005869

Ultrasensitive Label-Free Microcavity Biosensors with High Selectivity

Erol Ozgur, Ozan Aktas, Mehmet Bayindir (Bilkent Universitesi UNAM Bilkent Cankaya Ankara)

Abstract: *The selectivity of high quality factor whispering gallery mode sensors among different types of analytes is an important issue. We demonstrate a surface modification strategy for fabrication of high selectivity and sensitivity microcavity biosensors.*

PO41-30004097

Human Cardiac Biomarker Sensors Based On Microsphere Raman Laser

maryam saliminasab, alireza bahrampour, mohammad hosein zandi (Kerman Graduate University Of Technology, Iran)

Abstract: *field enhancement in high quality factor microspheres*

reduces the threshold of nonlinear effects in the materials near around the microsphere. in this paper, an ultra high sensitivity sensor for the TroponinI enzyme is proposed.

PO42-30014822

Fluorescence detection system with miniaturized integrating sphere

Kyungmook Kwon, Byounghun Park, Jaeho Shim, and Kyoungsik Yu

(KAIST, Republic of Korea)

Abstract: *We report on the use of non-imaging reflectors to improve the collection efficiency of fluorescence detection systems. Half-sphere mirrors redirect the isotropic fluorescent emission toward the photodetector, and significantly enhance the fluorescence signal.*

PO43-30026745

Recent Advances in Microcavity Biosensing

¹Frank Vollmer, ²Melik Demirel, ²Miguel Cordoba, ³Svetlana Boriskina

(¹Max Planck Institute, Germany;

²Pennsylvania State University, University Park, USA; ³Boston University, USA)

Abstract: *I will give an overview of our recent advances in microcavity biosensing which include the coupling of WGMs to plasmonic nanoparticles for protein detection.*

PO44-30010832

Enhancing the sensitivity of

**dynamic label-free detection of
low molecular weight protein**

Sunmin, Ahn, David S. Freedman,
M. Selim Unlu, Mario Cabodi
(Boston University, USA)

Abstract: Dynamic label-free monitoring of protein interaction was achieved with the Interferometric Reflectance Imaging Sensor. The quantification of the desorption of the capturing antibodies, and mass amplification increased the sensitivity by two orders of magnitude.

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6-9 August 2012

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