2015 International Conference on Optical MEMS and Nanophotonics (OMN 2015)

Jerusalem, Israel
2-5 August 2015

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Conference Program

Sunday, August 2, 2015

Welcome Reception (18:00 – 22:00) at the Israel Museum

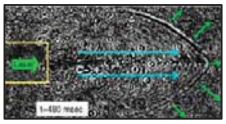
18:00 Assembly at restaurant Modern at the museum's entrance foyer, for refreshments and appetizers, followed by a guided museum tour and the special exhibit "A brief history of humankind." Dinner to follow.

Monday, August 3, 2015

Mo1 Plenary Session (8:20 – 10:00) Chair: Dan Marom, Hebrew University, Israel

8:20 Welcome and opening remarks

Mo1.1 8:30



Plenary I: *Complex Optofluidics: Controlling fluids with light and vice-versa*, Mordechai (Moti) Segev and Elad Greenfield, Physics Department, Technion, Israel. 1
We show that light can manipulate the mechanical properties of fluids and affect flow even in dense suspensions. The underlying mechanism involves the forces exerted by the light on nanoparticles suspended in the liquid. We discuss these ideas, present experiments, and suggest applications.

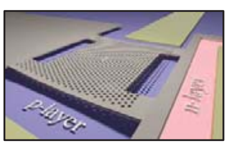
Mo1.2 9:15

Plenary II: *Multi-Dimensional Hyperspectral Imaging System*, David Mendlovic and Ariel Raz, Faculty of Engineering, Tel Aviv University, Israel. 2
Common Silicon-based imaging systems allow acquisition of spectral and/or depth information by paying a significant penalty in resolution. Computational cameras, however, reduce this penalty by applying compressed sensing techniques but require modified optical hardware and rely on preliminary knowledge. This article presents a new concept for imaging system that enables color imaging and hyperspectral imaging by both multiplexing and compressed sensing approaches.

Coffee Break (10:00 – 10:30)

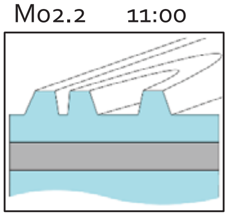
Mo2 Photonic cavities and resonances (10:30 – 12:30). Chair: Vladimir Aksyuk, NIST, USA

Mo2.1 10:30



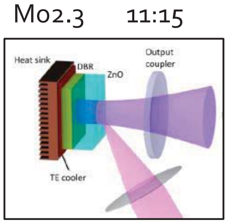
Invited Talk: *Electromechanically-tunable nanophotonic cavities*, Andrea Fiore, Maurangelo Petruzzella, Zarko Zobenica, Tian Xia, Leonardo Midolo, Rob Van Der Heijden, Francesco Pagliano, YongJin Cho, Frank Van Otten, Eindhoven University of Technology, Netherlands, Lianhe Li, Edmund Linfield, University of Leeds, U.K. 4
We present the design, fabrication and characterization of double-membrane photonic crystal cavities electromechanically tunable over >10 nm, and their application in integrated quantum photonics.

Mo2.2 11:00



Rib microring resonators in thin film lithium niobate, Shawn Yohanes Siew, Soham Sataparno Saha, Mankei Tsang, Aaron Danner, National University of Singapore, Singapore. 5
Ridge microring resonators were fabricated via electron beam lithography and ion milling in lithium niobate on insulator (LNOI). Measurement results show a Q-factor of 4,000 as well as propagation loss in the waveguide of 5.3dB/cm.

Mo2.3 11:15



The optical property of vertical external cavity surface-emitting laser, Yung-Chi Wu, Da-Wei Lin, Wen-Feng Hsieh, Yu-Pin Lan, National Chiao Tung University, Taiwan. 7
Under passive Q-switched laser pumping, a vertical-external-cavity surface-emitting laser consisted of a semiconductor gain medium with a high reflectivity dielectric

distributed Bragg reflection and an external mirror can achieve ultra-low threshold lasing at room temperature.

Mo2.4 11:30

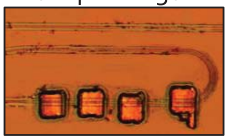
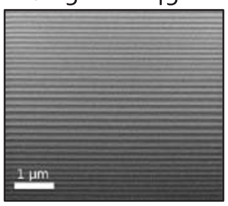


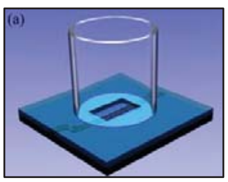
Photo-induced trimming of chalcogenide-on-silicon photonic integrated circuits, Ran Califa, Hadar Genish, Dvir Munk, Idan Bakish, Michael Rosenbluh, Avi Zadok, Bar-Ilan University, Israel. 9
Silicon-photonic devices are tuned by selective photo removal of chalcogenide glass upper claddings. Phase delays in Mach-Zehnder interferometers and coupling ratios of ring resonators are adjusted. The transfer functions of devices remain stable following trimming

Mo2.5 11:45



Narrowband chirped thin film filters with distributed cavity, Thomas Kusserow, Muhammad Taimoor, Sabrina Reuter, Hartmut Hillmer, Institute of Nanostructure Technologies and Analytics / CINSaT, University of Kassel, Germany. 11
We report on optical filters with chirped layers that own a distributed cavity. New design parameters and the mode distribution are discussed. Results of our numerical simulation, fabrication and characterization of chirped filters are shown.

Mo2.6 12:00

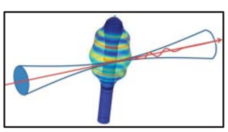


Invited Talk: *Light-matter interactions in a hybrid nanophotonic-atomic platform*, Liron Stern, Meir Grajower, Boris Desiatov, Roy Zektzer, Alex Naiman, Noa Mazurski and Uriel Levy, Dept. of Applied Physics, The Hebrew University, Jerusalem, Israel. 13
We demonstrate variety of light matter interactions in our nanophotonic-atomic hybrid system, considering both plasmonic and guided mode interaction with hot vapor.

Lunch (12:30 – 14:00)

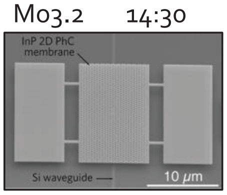
Mo3 Optomechanical interactions (14:00 – 16:30). Chair: Chengkuo (Vincent) Lee, National University of Singapore

Mo3.1 14:00



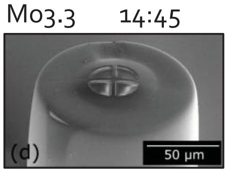
Invited Talk: *Liquid-Wall Optical MEMS*. Raphael Dahan, Leopoldo Martin, Shai Maayani and Tal Carmon, Department of Mechanical Engineering ,Technion, Israel. 15
We demonstrate a new type of optical MEMS that is having most of its walls made of liquids. Examples include (1) experimental demonstration of water-walled microfluidic devices with optical finesse over a million as well as (2) cavity optomechanics at 40 MHz vibrational rates in a droplet of oil.

Mo3.2 14:30



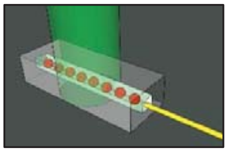
Dispersive and dissipative optomechanical coupling in heterogeneously integrated 2D photonic crystal system, Viktor Tsvirkun, Alessandro Surrente, Gregoire Beaudoin, Fabrice Raineri, Rama Raj, Isabelle Robert, Rémy Braive, CNRS-LPN, France. 16
We report on optomechanical effects in 2D photonic crystal cavities coupled to integrated silicon waveguides. By observing optical spring effects of mechanical modes, we demonstrate the dispersive and dissipative nature of optomechanical coupling.

Mo3.3 14:45



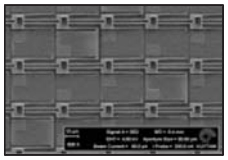
Cooling to heating transition in an optomechanical cavity, Oren Suchoi, Keren Shlomi, Lior Ella, Eyal Buks, Technion, Israel. 18
The time evolution of the transitions from an optomechanically cooled state to a state of self-excited oscillation is recorded using the technique of time-resolved state tomography.

Mo3.4 15:00 Tunable On Chip Optofluidic Laser, Avraham Bakal, Anders Kristensen, Uriel Levy, Dept. of Applied Physics, The Hebrew University, Jerusalem, Israel, and Dept. of Micro- and Nanotechnology, Technical University of Denmark, Lyngby, Denmark. 20



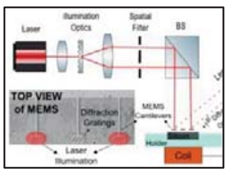
A chip scale optofluidic tunable laser is realized by generating a periodic bubble array within a microfluidic channel. By controlling the periodicity via external pressure the lasing frequency is tuned over a broad range.

Mo3.5 15:15 *MEMS bi-material IR sensor array with AC-coupled optical readout*, Ulas Adiyan, Koç University, Fehmi Civitci, Onur Ferhanoglu, Istanbul Technical University, Hamdi Torun, Bogazici University, Hakan Urey, Koç University, Turkey. 22



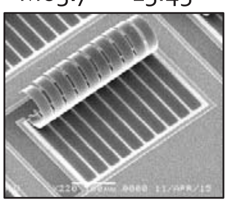
This paper demonstrates a 35-µm pixel pitch MEMS thermal sensor array with optical-readout. We implemented an AC-coupled readout method for a single MEMS pixel using a photodetector, which responds only to changes in the scene.

Mo3.6 15:30 *Cantilever array oscillators with nonlinear optical readout*, Sevil Zeynep Lulec, Ulas Adiyan, Koç University, Goksen Goksenin Yaralioglu, Ozyegin University, Yusuf Leblebici, École Polytechnique Fédérale de Lausanne, Hakan Urey, Koç University, Turkey. 24



MEMS array oscillators typically require a separate detector and feedback loop for each oscillator. We show that grating-based-optical-readout induces nonlinearity, which enables simultaneous operation of an array-of-oscillators using only one detector and single electronic feedback-loop.

Mo3.7 15:45 *Electrostatic roll-up blind array for house energy management systems*, Kentaro Mori, Kensuke Misawa, Satoshi Ihida, Takuya Takahashi, Hiroyuki Fujita, Hiroshi Toshiyoshi, Tokyo University, Japan. 26

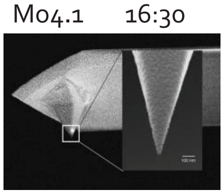


We report on an electrostatically reconfigurable roll-up micro shutter array by using the unimorph effect for initial deflection. The shutter array could be used as a tunable blind to control the incoming sunlight through windows.

Coffee and Snack Break (16:00 – 16:30)

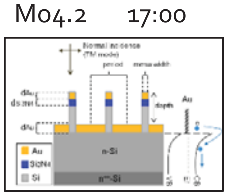
Mo4 Plasmonics (16:30 – 18:00). Chair: Yves-Alain Peter, Ecole Polytechnique de Montreal, Canada

Mo4.1 16:30 Invited Talk: *Nanophotonics with tip-enhanced Raman spectroscopy*, Prabhat Verma, Dept. of Applied Physics, Osaka University, Japan. 28



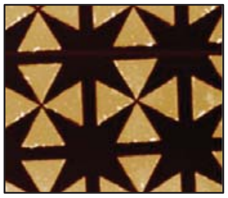
The metallic nano-tip used in tip-enhanced Raman spectroscopy strongly enhances and confines light to realize super-high spatial resolution. This enables to study a variety of physical, chemical and biological properties of a sample at nanoscale.

Mo4.2 17:00 *Design of high efficient dual-band Si near-infrared detectors*, Tsung-Ting Wu, Chia-Chien Hsieh, Yi-Ting Liao, Ming-Chang Lee, Institute of Photonics Technologies, National Tsing Hua University, Taiwan. 30



A new plasmonic grating structure is proposed to implement Si near-infrared photodiodes through plasmon-induced hot carrier injection. The power conversion efficiencies (photon-to-plasmon) are near 70% and 90% at the wavelength of 851nm and 1305nm, respectively.

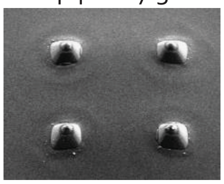
Mo4.3 17:15



Plasmonic cavity assisted dipolar resonance enhancement and optical magnetism at mid-IR, Dihan Hasan, Chong Pei Ho, Prakash Pitchappa, Chengkuo Lee, National University of Singapore, Singapore. 32

We demonstrate an approach to enhance dipolar resonance contrast and magnetic resonance in dense cross coupled bow-tie nanostructure. We further observe strong hybridization of the Fano effect with the vibrational mode of the organic substance.

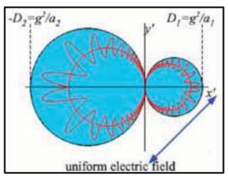
Mo4.4 17:30



Plasmonic Enhanced Schottky Detectors Based on Internal Photoemission in Nano Pyramids for Near IR Regime, Boris Desiatov, Ilya Goykhman, Noa Mazurski, Joseph Shappir, and Uriel Levy, Applied Physics Dept., Hebrew University, Jerusalem, Israel. 34

We demonstrate the detection of sub-bandgap light in silicon nano pyramid using the process of internal photoemission in Schottky diode. The quantum efficiency is enhanced by using metal coated silicon nano pyramids.

Mo4.5 17:45

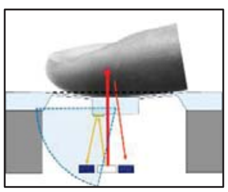


Nonlinear wave mixing in plasmonic structures: A transformation optics approach, Nireekshan Reddy Kothakap, Yonatan Sivan, Ben-Gurion University of the Negev, Beersheva, Israel, Antonio I. Fernandez-dominguez, Universidad Autonoma de Madrid, Spain. 36

We study analytically second order nonlinear effects using transformation optics, nano-optics and nonlinear optics. Our investigation shows that phase matching condition can play an important role in small systems.

Mo5 Poster Session (18:00 – 19:30)

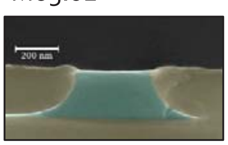
Mo5.01



Contact pressure measurement device with a laser micro-displacement sensor, Yuma Hayashida, Kota Harisaki, Toshihiro Takeshita, Nobutomo Morita, Kyushu University, Hideyuki Ando, Fuzzy Logic Systems Institute, Eiji Higurashi, Tokyo University, Hirohumi Nogami, Renshi Sawada, Kyushu University, Japan. 38

We propose a contact pressure sensor for stable measurement of blood flow using a transparent acrylic plate and a laser micro-displacement sensor. Our proposed sensor can be embedded into various optical sensors.

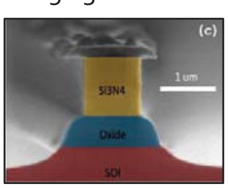
Mo5.02



Ultra-high Q silicon resonators in planarized LOCOS, Alex Naiman, Boris Desiatov, Liron Stern, Noa Mazurski, Joseph Shappir, and Uriel Levy, Dept. of Applied Physics, The Hebrew University, Jerusalem, Israel. 40

We describe a modified local oxidation of silicon process as a platform for the fabrication of waveguides and ultra-high Quality factor (5.3) silicon resonators, with nearly fully planar interface for multilayer silicon integration.

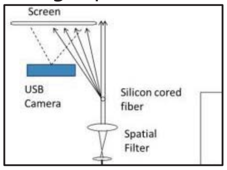
Mo5.03



Experimental demonstration of CMOS-compatible long-range dielectric-loaded surface plasmon-polariton waveguides (LR-DLSPPWs), Roy Zektzer, Boris Desiatov, Noa Mazurski, Uriel Levy, Dept. of Applied Physics, The Hebrew University, Jerusalem, Israel, and Sergey I. Bozhevolnyi, Department of Technology and Innovation, University of Southern Denmark, Odense, Denmark. 42

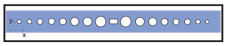
We demonstrate the design, fabrication and experimental characterization of long-range dielectric-loaded surface plasmon-polariton waveguides compatible with complementary metal-oxide semiconductor technology. The demonstrated waveguides feature good mode confinement together with long propagation at telecom wavelengths.

Mo5.04



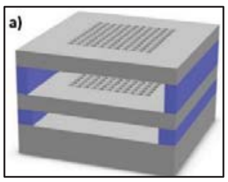
Silicon cored fiber diameter measurement, Yaoyu Chang, Lon A. Wang, National Taiwan University, Taiwan. 44
A non-destructive optical method is demonstrated to measure both core and cladding diameters of a silicon cored fiber. The accuracy of such diameter measurement can reach 95%.

Mo5.05



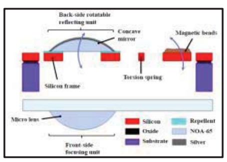
Novel one-dimensional photonic crystal air-slotted nanobeam cavity for gas sensing, 46
Tong Lin, Guangya Zhou, Yongchao Zou, Fook Siong Chau, National University of Singapore, Jie Deng, Institute of Materials and Research and Engineering, Singapore.
We have designed a novel photonic crystal air-slotted nanobeam cavity featuring high quality factor and small mode volume. The calculated high sensitivity and response factor pave the way for precise ambient gas sensing.

Mo5.06



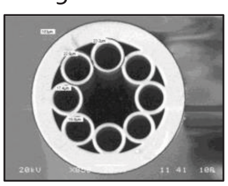
Polycrystalline silicon based photonic crystal Fabry-Perot etalon, Chong Pei Ho, Prakash Pitchappa, Chengkuo Lee, National University of Singapore, Singapore. 48
We demonstrated the design, fabrication and characterization of a polycrystalline silicon based photonic crystal Fabry-Perot etalon with a filtered transmission centered at 3.51μm. The high quality factor of 520 shows the possibility for high-resolution applications.

Mo5.07



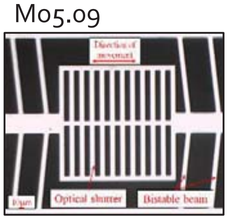
Magnetically-Actuated MEMS Cat's Eye Retroreflectors for Optical Identification, Tzu-yu Chen, Chih-chieh Chang, Shao-an Chien, Nai-wen Chang, Jui-che (Ted) Tsai, National Taiwan University, Taiwan. 50
We present a MEMS tunable cat's eye retroreflector consisting of a rotational concave reflecting micromirror which provides the modulation of the optical retroreflection intensity. The magnetically-actuated mirror achieves a large tilt angle.

Mo5.08



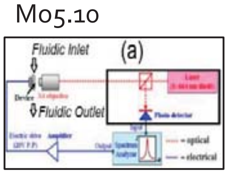
Impact of rotational symmetry of the core cladding boundary on optical properties of hollow core microstructured optical fibers, Andrey Pryamikov, Fiber Optics Research Center of Russian Academy of Science, Russia. 52
In this work we would like to open up a discussion on the problem of influence of rotational symmetry of the core cladding boundary on light guiding processes in hollow core microstructured optical fibers.

Mo5.09



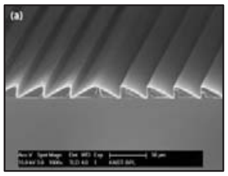
Miniature optical switches for flat-panel displays, Shao-An Chien, Yi-Hua Liang, Jui-che (Ted) Tsai, National Taiwan University, Taiwan. 54
Two MEMS optical switches are proposed for the flat panel display application - one with a bistable mechanism and the other with a latching mechanism. Both require no power at the stable positions.

Mo5.10



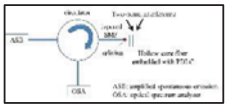
Liquid mass sensing of glucose in solution with resonating microplates, Yoav Linzon, Slava Krylov, Alexander Golberg, Tel Aviv University, Israel, Rob Ilic, Cornell University, USA. 56
We sense in aqueous environment water solution deposits on thin Silicon-on-Insulator micro-resonator membranes, where distinct discern to different glucose solution components is attained in terms of the flexural vibration mode's resonant frequency and quality factor.

Mo5.18



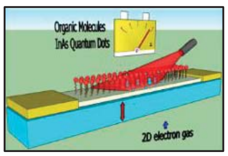
Microprism arrays based stereoscopic endoscope, Sung-Pyo Yang, Jae-jun Kim, Kyung-won Jang, Ki-Hun Jeong, KAIST, Republic of Korea. 72
This work presents microprism arrays (MPA) based stereoscopic endoscope for 3D imaging. The MPA were monolithically fabricated using geometry-guided resist reflow method and successfully mounted in front of a single endoscopic camera module.

Mo5.19



Feasibility study on fabricating an in-line wavelength tunable filter based on holographic polymer-dispersed liquid crystal, Chih-Hao Hsu, Wing-Kit Choi, Lon A. Wang, National Taiwan University, Taiwan. 74
An in-line electrically tunable wavelength filter for working in the communication band is demonstrated by forming a Bragg grating (BG) in a holographic polymer-dispersed liquid crystal embedded fiber, and connected externally with commercial single-mode fibers.

Mo5.20



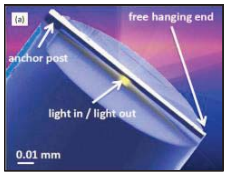
Highly Sensitive Hybrid Organic-Nanocrystal Detector, A. Neubauer, S. Yochelis and Y. Paltiel, Dept. of Applied Physics, The Hebrew University, Jerusalem, Israel. 76
The ability to integrate electronics with Nanocrystals (NCs) allows utilizing their unique properties for a future optoelectronic device. Combing top down approach using self-assembled hybrid organic-NCs systems, with bottom up components can revolutionize devices in future. Here we present an ultra-high light sensing device based on InAs NCs acting as an optical gate to high electron mobility transistor (HEMT) device. Using a very narrow channel the device quantum efficiency is high as 106V/W, while the single to noise ratio (SNR) enables high sensitivity photon detection. These results are compatible with our theoretical estimations.

Beer and Wine Reception

Tuesday, August 4, 2015

Tu1 Specialty fabrication (8:30-10:00). Chair: Eiji Higurashi, University of Tokyo, Japan

Tu1.1 8:30



Invited Talk: *From quantum mechanics to cardiomyocytes: Looking back at 10 years of optical fiber-top technology*, Davide Ianuzzi, Department of Physics and Astronomy and LaserLaB, VU University, Amsterdam, Netherlands. 78

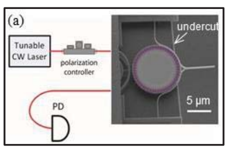
Carving MEMS structures directly on the cleaved end of an optical fiber enables the realization of devices designed for novel experiments in fundamental sciences and for the utilization in commercial applications (sensing, monitoring, nanocharacterization).

Tu1.2 9:00

Maskless fabrication of micro-optical elements on the optical fiber tips, Jae-Beom Kim, Ki-Hun Jeong, KAIST, Republic of Korea. 80

Simple and low-cost methods to pattern on the tip of optical fibers could enable many applications. We present a maskless fabrication method to generate of microstructures on the optical fiber tips using Digital Micromirror Device.

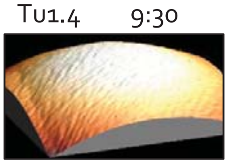
Tu1.3 9:15



Optomechanical transducer-based nanocantilever for application to atomic force microscopy, Sangmin An, Thomas Michels, Jie Zou, Daron Westly, Vladimir Aksyuk, National Institute of Standard and Technology, Maryland, USA. 82

We introduce an integrated silicon microdisk cavity optomechanical transducer-based nanocantilever for addressing a fast-scanning atomic force microscope (AFM) with a fast cantilever motion and sensitive near-field coupling detection.

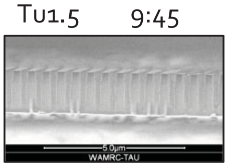
Tu1.4 9:30



Direct 3D nano-printing on optical fiber tip, Israel Weiss, Dan M. Marom, The Hebrew University of Jerusalem, Israel. 84

We present 3D nano printing process on optical fiber tip using the commercial Nanoscribe™ system. We optimized the printing process in terms of resolution, shape accuracy and surface roughness for fabrication of various optical elements.

Tu1.5 9:45



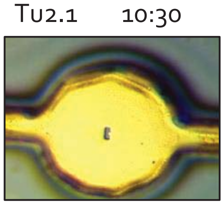
Chromatic dispersion in resonance domain diffractive lenses, Omri Barlev, Michael A. Golub, Tel Aviv University, Israel. 86

Strong lateral and longitudinal chromatic dispersion of resonance domain off-axis diffractive lens were studied. Experimental results of mercury-argon source, and a helium-neon laser path a technological way to compact spectral sensors and micro-spectrometers.

Coffee Break (10:00 – 10:30)

Tu2 Active photonics devices (10:30-12:30). Chair: Hakan Urey, Koc University, Turkey

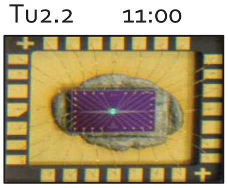
Tu2.1 10:30



Invited Talk: *High density heat-assisted magnetic recording (HAMR) with use of nano-aperture optics*, Sajid Hussain, Shreya Kundu, Aaron Danner, Yang Hyunsoo, Charanjit Bhatia, National University of Singapore, Singapore. 88

In this presentation, HAMR and related challenges in reaching high areal bit densities will be introduced, and specific results and successful demonstration of HAMR with C-shaped nano-apertures will also be presented.

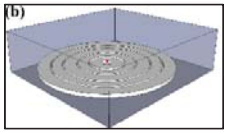
Tu2.2 11:00



Development, simulation and characterization of nanoscale silicon on insulator photo-activated modulator (SOIPAM) hybrid device, Avi Karsenty, Ariel Zev, Lev Academic Center (JCT), Israel, Avraham Chelly, Zeev Zalevsky, Bar-Ilan University, Israel. 90

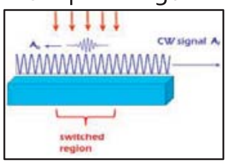
Real-time computing and optics communication combined trends lead to optoelectronic hybrid nano-devices' generation, allowing high-speed, reduced cross-talk, low-power. Such building-block device, sharing electronic data flow and optic modulation command, is presented towards optical silicon-based processors.

Tu2.3 11:15



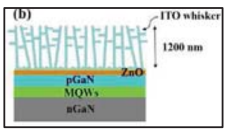
Directional emission of photons from nanocrystal quantum dots using a hybrid plasmonic-dielectric nanoantenna, Moshe Harats, Nitzan Livneh, Shira Yochelis, Yossi Paltiel, Ronen Rapaport, The Hebrew University of Jerusalem, Israel. 92
We design a hybrid circular plasmonic-dielectric nanoantenna for collimation of light emission from nanocrystal quantum dots. We show directional emission into a narrow beam of 4 degrees down to the single photon level.

Tu2.4 11:30



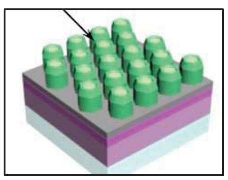
Short pulse generation based on ultrafast transient Bragg gratings, Aviran Halstuch, Avishay Shamir, Amiel Ishaaya, Yonatan Sivan, Ben-Gurion University, Israel. 94
We analyze analytically and numerically a configuration where a fs transverse pulse creates a Transient-Bragg-Grating in a fiber/waveguide. We characterize the reflected ultra-short pulses depending on the grating parameters.

Tu2.5 11:45



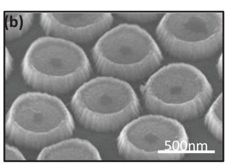
Optical influence of a hybrid ZnO / Indium-Tin-Oxide nanorod and whisker, Lung-Hsing Hsu, Da-Wei Lin, Hao-Chung Kuo, Chien-Chung Lin, National Chiao Tung University, Taiwan. 96
The nano-whisker and nano-rod of ITO deposited with oblique evaporation method has been investigated optically. This ITO hybrid structure above ZnO medium reduces optical reflection to 3.7% in the range between 365 and 800 nm.

Tu2.6 12:00



Purely sidewall InGaN/GaN core-shell nanorod green light-emitting diodes, Da-Wei Lin, Yung-Chi Wu, Yu-Pin Lan, Lung-Hsing Hsu, Hao-Chung Kuo, Gou-Chung Chi, National Chiao Tung University, Yang-Fang Chen, National Taiwan University, Taiwan. 98
A novel purely sidewall InGaN/GaN core-shell nanorod green light-emitting diode (LED) has been demonstrated by 3D dielectric passivation and selective epitaxial growth technologies. The LED device exhibits unprecedented stable emission wavelength and low efficiency droop.

Tu2.7 12:15

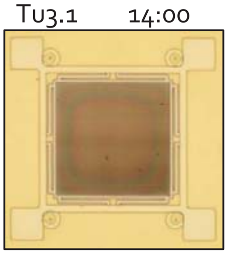


Wavelength Tunable Plasmon Enhanced Photoluminescence from Quantum Dots, Gauri Bhave, Fusheng Zhao, Jingting Li, and Wei-Chuan Shih, Dept. of Electrical and Computer Engineering, The University of Houston, Houston, Texas, USA. 100
We present a strategy for enhancing the photoluminescence intensity of semiconductor quantum dots (QDs) by plasmonic light concentration by nanodiscs. The enhancement can be tuned by tailoring the extinction spectrum of the nanostructures for the QD emission wavelengths.

Lunch (12:30 – 14:00)

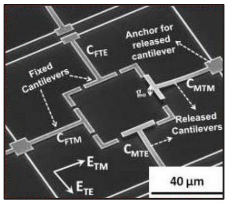
Tu3 Subwavelength light control (14:00 – 16:00). Chair: Ming-Chang Lee, National Tsing Hua University, Taiwan

Tu3.1 14:00



Invited Talk: *Taming blackbody radiation with MEMS metamaterials*, Willie Padilla, Xinyu Liu, Duke University, USA. 102
MEMS based metamaterials are an ideal architecture to provide dynamic electromagnetic properties in the infrared range of the electromagnetic spectrum. We detail several realizations of infrared MEMS metamaterials and discuss potential applications.

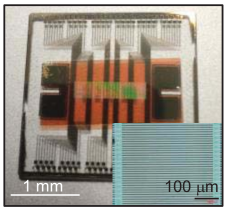
Tu3.2 14:30



Linear polarization switching in terahertz MEMS metamaterials, Prakash Pitchappa, Chong Pei Ho, Navab Singh, Chengkuo Lee, National University of Singapore, Singapore. 104

MEMS metamaterial with independent control of TE and TM mode response is experimentally reported. The metamaterial can be electrostatically reconfigured to be either TE-responsive, TM-responsive, polarization-insensitive or non-responsive to both polarization of incident THz waves.

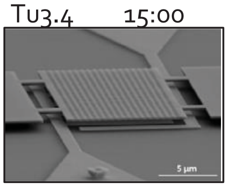
Tu3.3 14:45



Fabrication and evaluation of tunable submicron-thick monocrystalline silicon grating for integration on LSI circuit, Takashi Sasaki, Sawasdivorn Chernroj, Hiroshi Matsuura, Kazuhiro Hane, Dept. of Nanomechanics, Tohoku University, Japan. 106

We present a fabrication process and characteristics of tunable submicron thick monocrystalline silicon grating for integration of LSI wafer. The grating structure was successfully fabricated. The ribbon of the grating was successfully actuated.

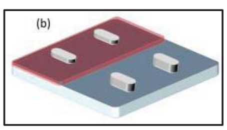
Tu3.4 15:00



Nonlinear mechanics of photonic crystal deformable mirrors actuated via electrostatic force, Avishek Chowdhury, Inah Yeo, Gregoire Beaudoin, Isabelle Robert, Rémy Braive, CNRS-LPN, France. 108

We study the nonlinear dynamics induced in suspended photonic crystal membrane (deformable mirror operating at normal incidence) by applying an electrostatic force (interdigitated electrodes integrated below the membrane). Bistability and high-order sub-harmonic resonances are observed.

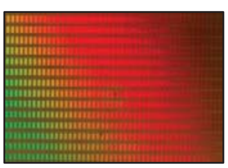
Tu3.5 15:15



Exciton-Plasmon Hybridization in J-aggregate-Aluminum Nanoantenna Metasurfaces, Elad Eizner, Ori Avayu, Ran Ditcovski and Tal Ellenbogen, Department of Physical Electronics, Fleischman Faculty of Engineering, Tel Aviv University, Tel Aviv, Israel. 110

We find that aluminum nanoantennas provide an excellent platform for the formation of hybrid exciton-localized surface plasmon modes. We show that the hybrid states can be polarized, and that they enhance the photoluminesence of the system.

Tu3.6 15:30



Invited Talk: *High-index dielectric Huygens metasurface*, Karim Ogando, Jonathan J. Foley IV, Daniel López, Center for Nanoscale Materials, Argonne National Laboratory, USA. 112

We describe a dielectric Huygens metasurface capable to manipulate light in the visible regime with 100% transmission efficiency. The metasurface is comprised of TiO_2 cylindrical nanoparticles embedded in a medium with lower refraction index.

Coffee and Snack Break (16:00 – 16:30)

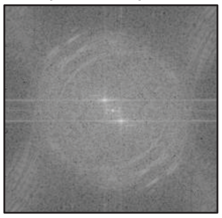
Tu4 Optical metrology and imaging (16:30 – 18:00). Chair: Wibool Piyawattanametha, KMITL, Thailand

Tu4.1 16:30

Invited Talk: *Large-scale phase retrieval for metrology*, Laura Waller, Lei Tian, Jingshan Zhong, Department of Electrical Engineering and Computer Sciences, University of California Berkeley, Ziji Liu, School of Optoelectronic Information, University of Electronic Science and Technology of China, China. 114

Two different microscope setups for achieving phase images in commercial microscopes using simple hardware are described. Both methods are implemented with simple hardware modifications and exhibit stable, accurate and robust quantitative phase inversion algorithms.

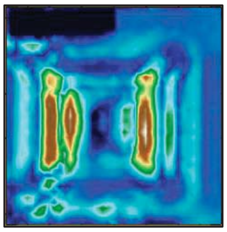
Tu4.2 17:00



High-speed optical interferometry of micro and nanothermal wave propagation induced by current flow in metal interconnect lines, Lucas Taylor, Joseph Talghader, University of Minnesota, USA. 116

Thermal deformation waves in a soda-lime-silica glass substrate were measured using high-speed Hilbert-phase interferometry during interconnect heating and Q-switched Nd:YAG irradiation. 100-microsecond thermal events were captured with 256x256 resolution over a 100 micron square area.

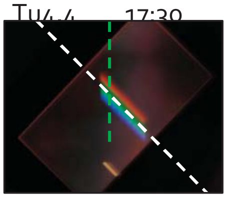
Tu4.3 17:15



Microheater controlled part-per-million-level absorption measurements using photothermal common path interferometry, Philip Armstrong, Andrew Brown, Kyle Olson, Joseph Talghader, University of Minnesota, USA. 118

By combing a photothermal common path interferometer with localized heating controlled by micromachined heaters it is possible to make free carrier absorption measurements at ppm levels vs temperature for the first time.

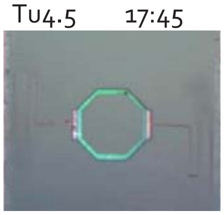
Tu4.4 17:30



Micromirror array – based programmable wide field spectrograph for Earth observation, Frederic Zamkotsian, Patrick Lanzoni, Laboratoire d'Astrophysique de Marseille (LAM), CNRS, Marseille, France, Arnaud Liotard, Thierry Viard, Thales Alenia Space, Cannes, France, Vincent Costes, Philippe-jean Hebert, CNES, Toulouse, France. 120

In Earth Observation, we propose an innovative reconfigurable instrument, a programmable wide-field spectrograph where both the FOV and the spectrum could be tailored thanks to a 2D micromirror array (MMA).

Tu4.5 17:45



Modeling of CMOS-SOI-NEMS thermal antenna for monolithic passive uncooled THz imagers, Alexander Svetlitza, Tanya Blank, Sara Stolyarova, Igor Brouk, Sharon Bar-lev, Yael Nemirovsky, Technion, Israel. *122*

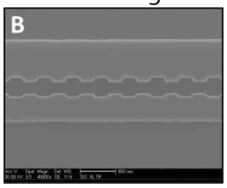
We present modeling and simulations of uncooled passive THz imaging sensor based on a thermal antenna. The 2D CMOS-SOI-NEMS imager pixel array constitutes a frequency selective surface tuned to the desired wavelength band.

Free evening / Steering and Program Committee Dinner

Wednesday, August 5, 2015

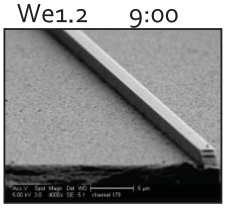
We1 Nanostructured guided light (8:30 – 10:00). Chair: Frederic Zamkotsian, LAM, Marseille, France

We1.1 8:30



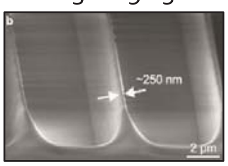
Invited Talk: *Nanophotonics: Technology and application*, Andrew Grieco, George Porter, Yeshaiahu Fainman, University of California, San Diego, USA. 124
Dense photonic integration requires miniaturization of materials, devices and subsystems, including passive components and active components. This paper discusses passive and active devices that recently have been demonstrated in our laboratory for chip-scale integration.

We1.2 9:00



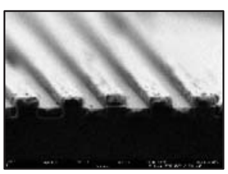
Polymeric waveguide with nanocomposite core of dispersed CdSe quantum dots, Moran Bin Nun, Yedidya Lior, Dan M. Marom, The Hebrew University of Jerusalem, Israel. 126
We present our design of nonlinear waveguides constructed of a nanocomposite core of nanoparticles in a polymer host. Initial results of proposed waveguide structure and nanocomposite are demonstrated.

We1.3 9:15



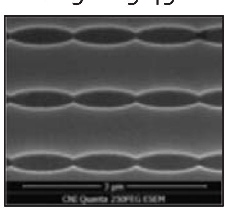
Photonic nanofences: Combining the advantages of photonic nanowires and slot waveguides, Víctor J. Cadarso, Helmut Schift, Paul Scherrer Institut (PSI), Switzerland, Andreu Llobera, Institut de Microelectrònica de Barcelona, Spain. 128
Subwavelength photonic nanofences are able to guide light with intense evanescent fields, up to above 90% of the coupled light, and with low losses (~12 dB/mm). This presents them as ideal candidates for sensing applications.

We1.4 9:30



Phase-resolved characterization of nanostructured reflective infrared quarter-wave plate, Wataru Nakagawa, Carol Baumbauer, Benjamin Moon, Orrin Boese, Jesse Lee, Skyler Rydberg, David L. Dickensheets, Electrical and Computer Engineering Dept., Montana State University, USA. 130
Phase-resolved interferometric characterization of a nanostructured reflective quarter-wave plate for 1550 nm wavelength is presented. This device consists of a subwavelength-period grating in silicon with evaporated gold coating, and is compatible with standard fabrication processes.

We1.5 9:45

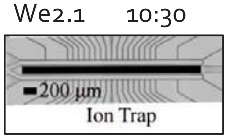


Transition from two dimensional photonic crystal slab to one dimensional corrugated grating, Raanan Gad, Wah Tung Lau, Costa Nicholaou, Soroosh Ahmadi, Iliya Sigal, Ofer Levi, University of Toronto, Canada. 132
Simultaneous tuning of quality factors, spectral responses, and field distributions was demonstrated, morphing 2D photonic crystal slab into 1D corrugated grating. A higher quality factor than conventional photonic crystal slabs and modes superposition were observed.

Coffee Break (10:00 – 10:30)

We2 Communications and Scanning (10:30 – 12:30). Chair: Joseph Talghader, University of Minnesota, USA

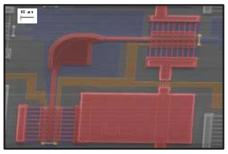
We2.1 10:30



Invited Talk: Application of OMEMS technology in trapped ion quantum computing, Stephen Crain, Emily Mount, So-young Baek, Jungsang Kim, Fitzpatrick Institute for Photonics, Electrical and Computer Engineering Department, Duke University, USA, 134
Peter Lukas Wilhelm Maunz, Sandia National Laboratories, USA.
A scalable MEMS beam steering system with movable micromirrors to focus multiple

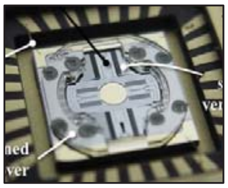
laser beams on individual trapped ions has switching speeds comparable to typical single qubit gate times, and negligible crosstalk on neighboring ions.

We2.2 11:00 *Row/column addressing of scalable silicon photonic MEMS switches*, Niels Quack, Tae Joon Seok, Sangyoon Han, Wencong Zhang, Richard S. Muller, Ming C. Wu, University of California, Berkeley, USA. 136



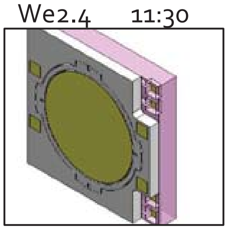
We present a scalable silicon photonic MEMS switch with an actuation scheme requiring only 2N electrical contacts for an N×N switch matrix. Unit cell size is 145μm × 145μm and switching loss 1.5dB at 1550nm.

We2.3 11:15 *An electrostatic two-axis gimbaled mirror scanner with tilted stationary vertical combs fabricated by self-aligned micro-assembly*, Seunghwan Moon, Jaekwon Lee, Dongseong Yang, Joho Yun, Juhun Lim, Jong-Hyun Lee, Gwangju Institute of Science and Technology (GIST), Republic of Korea, Min-Joo Gwak, Kyung-Su Kim, Korea Optron Corp. (KOC), Republic of Korea. 138



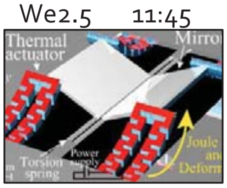
An electrostatic two-axis gimbaled mirror scanner was demonstrated using tilted stationary vertical combs and self-aligned micro-assembly. Side stability was enhanced and the optical scan angles were 6.8/15.4 degrees on the slow/fast axes, respectively.

We2.4 11:30 *Micro mirrors for MEMS based free space point to point indoor wireless optical network (IWON)*, Alex Shar, RIT Technology, Israel, Moshe Medina, David Kin, Inventcom, Israel, Slava Krylov, Tel Aviv University, Israel, Boris Glushko, RIT Technology, Israel. *140*



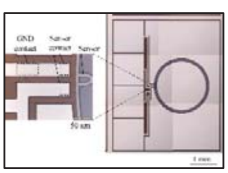
We report on a line of sight network combining wi-fi's ease of use with the advantages of cabling. Electrostatically actuated micro mirrors were used for the laser beam steering and robust close-loop controlled beam positioning.

We2.5 11:45 *Development of electrothermal MEMS mirror for low voltage micro optical diffusion sensor*, Yuki Kiuchi, Yoshihiro Taguchi, Yuji Nagasaka, Keio University, Japan. *143*



A novel micro optical diffusion sensor enabling a high-speed and a small sample volume measurement has been developed. In this paper, a device design and a validity of an electrothermal MEMS mirror are reported.

We2.6 12:00 *Piezoresistive displacement sensor Integrated in resonant varifocal mirror*, Kenta Nakazawa, Takashi Sasaki, Tohoku University, Japan, Hiromasa Furuta, Jiro Kamiya, Toshikazu Kamiya, Panasonic Industrial Devices SUNX Co., Ltd, Japan, Kazuhiro Hane Tohoku University, Japan. 145



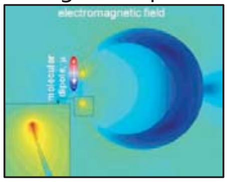
An electrostatically actuated resonant varifocal mirror monolithically integrated with piezoresistive displacement sensor is reported. The focal length of the varifocal mirror is monitored by the piezoresistive displacement sensor.

12:15 Introduction of OMN 2016

Lunch (12:30 – 14:00)

We3 Bio and Medical Devices (14:00 – 16:00). Chair: Ki-Hun Jeong, KAIST, Korea

We3.1 14:00



Invited Talk: *Quantum Bionanophotonics for Life Science and Medicine*, Luke P. Lee, Departments of Bioengineering, Electrical Engineering & Computer Science, and Biophysics Program, University of California Berkeley, USA. 147

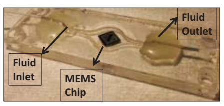
Quantum bionanophotonics is making headways into the life sciences, enabling in–vivo interrogation at the molecular level and in–vitro applications for diagnostics and analysis. These and other emerging biomedical application will be discussed.

We3.2 14:30

Mirau micro-interferometer for swept-source optical coherence tomography endomicroscopy, Przemyslaw Struk, Sylwester Bargiel, Nicolas Passilly, Jorge Albero, Christophe Gorecki, Institute Femto-ST, University of Franche-Comté, France. 149

We focus on the design and technology of Mirau micro-interferometer, which is a key part of MOEMS endomicroscopic probe, operating with Swept-Source Optical Coherence Tomography detection.

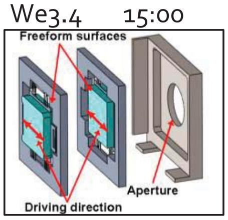
We3.3 14:45



Two cantilever based system for viscosity and density monitoring, Onur Cakmak, Erhan Ermek, Necmettin Kilinc, Koç University, Turkey, Goksen Goksenin Yaralioglu Ozyegin University, Turkey, Hakan Urey, Koç University, Turkey. 151

Real-time viscosity and density monitoring is challenging. Previous MEMS-based approaches use slow frequency-sweeps which are not real-time. We show that precision monitoring is possible by tracking frequencies of two cantilevers with different widths using Phase-Locked-Loop.

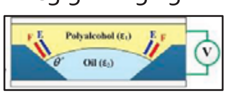
We3.4 15:00



Miniature adjustable-focus endoscope using a MEMS Alvarez lens, Yongchao Zou, Wei Zhang, Fook Siong Chau, Guangya Zhou, National University of Singapore, Singapore. 153

An adjustable-focus endoscope is reported. A dynamic tuning of optical power from 135 diopters to 205 diopters is experimentally achieved. Three targets located at different objective distances are focused by the endoscope successively.

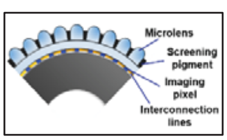
We3.5 15:15



Elliptical liquid lens for presbyopia glasses by using dielectric force, Kai-Wei Liao, Ru-chian Luo, Wei-jung Wang, J. Andrew Yeh, National Tsing Hua University, Taiwan. 155

This paper presents an elliptical dielectric liquid lens for presbyopia glasses. This lens provides the tunable diopter from 0.9D to 2.6D. The liquid lens's horizontal and vertical filed of view (FOV) are 26° and 20°.

We3.6 15:30



Invited Talk: *Recent advances on optoelectronic devices inspired by the compound eyes*, Young-min Song, Hyun Gi Park, Department of Electronics Engineering, Pusan National University, Republic of Korea. 157

We present optic design inspired by arthropods eye for advanced optoelectronic devices. Arthropods eye have extremely wide field of view without aberrations and nearly infinite depth-of-field. Biomimetic approach accelerates progress in science and practical applications.

Old City Excursion, Gala Dinner, and Tower of David Light Show (16:00 – 22:30)