FiO

8:00 a.m.–10:00 a.m.
FWA • Biomedical Applications of Ultrafast Lasers
Csaba Toth; Lawrence Berkeley Natl. Lab, USA, Presider

FWA1 • 8:00 a.m. Invited

Nanosurgery with Femtosecond Lasers, *Samuel Chung, Valeria Nuzzo, Eric Mazur; Harvard Univ., USA.* Femtosecond laser pulses make it possible to ablate cell structures at the submicrometer scale. We apply this technique to study biological processes in living cells and to help identify the function of neurons in nematodes.

FWA2 • 8:30 a.m. Invited

Improvements in Two-Photon Fluorescence Microscopy, *Kengyeh K. Chu, Tom Bifano, Jerome Mertz; Boston Univ., USA.* We present a technique called differential aberration imaging (DAI) to improve the performance of two-photon microscopy. Theory and experimental results are presented.

8:00 a.m.–10:00 a.m.
FWB • Optical Information Processing and Transport in the Age of Nanophotonics and Metamaterials
Kevin Kelly; Rice Univ., USA, Presider

FWB1 • 8:00 a.m. Invited

Optofluidic Nano-Plasmonics for Biochemical Sensing, *Yeshaiahu Fainman, Lin Pang, Boris Slutsky, Joanna Ptasinski; Univ. of California at San Diego, USA.* We explore metal-dielectric nano-plasmonic structures for localization and resonant transmission of optical fields, investigate fabrication and integration of optofluidic nano-plasmonic systems and explore their applications for biochemical sensing.

FWB2 • 8:30 a.m.

Protocol for Obtaining Noise-Immune Absolute Ellipsometric Measurements with High Spatial Resolution, *Santosh Tripathi, Kimani C. Toussaint, Jr.; Univ. of Illinois at Urbana-Champaign, USA.* A protocol that utilizes Stokes parameters and inverse methods for obtaining noise immune absolute ellipsometric measurements with high spatial resolution is proposed. It is applicable for arbitrary scalar and vector beam inputs.

FWB3 • 8:45 a.m.

Modeling of Quantum Computing Based on Magneto-Optical Elastic Fiber Containing Organic Liquid Core with Aromatic Rings, *Shukhrat Egamov; Samarkand State Univ., Uzbekistan.* Faraday rotation spectra for different transparent liquids were reviewed for data processing applications. Magneto-optical elastic fibers with a core filled by aromatic liquids were used as a model of a basic element of computing devices.

8:00 a.m.–10:00 a.m.
FWC • Extraordinary Transmission and Structured Surface
Zhimin Shi; Inst. of Optics, Univ. of Rochester, USA, Presider

FWC1 • 8:00 a.m.

Resonant Transmission of THz Waves through Rectangular Apertures in Single-Walled Carbon Nanotube Film, *Doo-Jae Park[1], Jin-Young Moon[1], Soonil Lee[1], Rotermund Fabian[1], Yeong-Hwan Ahn[1], Dai-Sik Kim[2]; [1]Ajou Univ., Republic of Korea, [2]Seoul Natl. Univ., Republic of Korea.* We demonstrate fabrication of single-walled carbon nanotube films with good metallic properties and a Drude-like dispersion. Using the films with subwavelength hole arrays, we obtain enhanced terahertz transmission which is assisted by shape resonance.

FWC2 • 8:15 a.m.

Enhanced Transmission in Plasmonic Crystals: Interactions of Cavity Resonance and Surface Mode, *Wan Kuang[1], Alex English[1], Z.-C. Chang[2], Min-Hsiung Shih[3], William B. Knowlton[1], Jeunghoon Lee[1], William L. Hughes[1], Bernard Yurke[1]; [1]Boise State Univ., USA, [2]Natl. Tsing Hua Univ., Taiwan, [3]Academia Sinica, Taiwan.* Transmission of periodically modified Ag film is studied experimentally and numerically. Both cavity resonance and guided surface modes are identified as the sources of enhanced optical transmissions. Their interactions lead to anti-crossing behavior spectrally.

FWC3 • 8:30 a.m. Invited

Terahertz Nanogap Devices for Field Enhancement and Control, *D. S. Kim[1], M. A. Seo[1], H. R. Park[1], J. S. Kyoung[1], S. M. Koo[1], N. K. Park[1], O. K. Suwal[2], S. S. Choi[2]; [1]Seoul Natl. Univ., Republic of Korea, [2]Sun Moon Univ., Republic of Korea.* We show that terahertz electromagnetic waves transmit through λ/10,000 nanogap devices. Both non-resonant and resonant field enhancement are observed in nanogap and nanoantenna. We discuss applications of these structures.

8:00 a.m.–10:00 a.m.
FWD • Turbulence and Other Nonlinear Phenomena
Peter Janssen; European Ctr. for Medium-Range Weather Forecasts, UK, Presider

FWD1 • 8:00 a.m. Invited

Thermodynamic Approach of Statistical Nonlinear Optics, *B. Kibler[1], B. Barviau[1], S. Coen[2], J. Fleischer[3], A. Kudlinski[4], P. Aschieri[5], G. Millot[1], A. Picozzi[1]; [1]Univ. de Bourgogne, France, [2]Univ. of Auckland, New Zealand, [3]Princeton Univ., USA, [4]Univ. de Lille, France, [5]Univ. de Nice Sophia Antipolis, France.* The coherence properties of random nonlinear optical fields can be described in detail by thermodynamic arguments based on the wave turbulence theory. We shall review recent progress on this kinetic approach of statistical nonlinear optics.

FWD2 • 8:30 a.m.

Observation of Soliton Turbulence via Coupled Bump-on-Tail Instabilities, *Dmitry V. Dylov, Can Sun, Jason W. Fleischer; Princeton Univ., USA.* We experimentally observe the algebraic k^{-2} spectrum of soliton turbulence via the coupled interaction of two all-optical bump-on-tail instabilities. The observation confirms predictions of energy equipartition based on wave kinetic theory.

FWD3 • 8:45 a.m.

Universal Correlations in a Nonlinear Periodic 1-D System, *Yaron Silberberg[1], Yoav Lahini[1], Yaron Bromberg[1], Eran Small[1], Roberto Morandotti[2]; [1]Weizmann Inst. of Science, Israel, [2]INRS, Canada.* We study the statistical properties of thermal fields propagating in a nonlinear periodic 1-D lattice. We find that for strong nonlinearities universal field correlations emerge, and experimentally observe a signature of these correlations.

8:00 a.m.–9:45 a.m.
FWE • Novel Fiber Devices II
Jose M. Chavez Boggio; Univ. of California San Diego, USA, Presider

FWE1 • 8:00 a.m. Invited

Multimaterial Fiber Devices and Systems, *Ofer Shapira; MIT, USA.* Recent advances in the development of optoelectronic fibers enabled the fabrication of semiconductor devices over meters-long fiber resulting in a momentous increase in device density, paving the way to unprecedented complex functionalities of fiber systems.

FWE2 • 8:30 a.m.

Fiber Optic Color Synthesizer for Micro Scanning Display, *Hesam Arabi, S. An, K. Oh; Yonsei Univ., Republic of Korea.* In this paper we report a display including of RGB sources, a fiber optic color synthesizer, and a two-dimensional micro scanning mirror. We further report a micro collimator which can enhance image resolution.

FWE3 • 8:45 a.m.

Real-Time SLM for Fiber Excitation, *Edward J. Grace[1], Steffan A. E. Lewis[2]; [1]Imperial College London, UK, [2]GSI Group, UK.* We present a novel technique for direct real-time preferential excitation of fiber modes by use of digital holograms generated on a GPU.

For Fall Congress presentations on Wednesday, see pages 125-131.

FiO

8:00 a.m.–9:45 a.m.
FWF • Photonic Bandgap Devices
Peng Zhang; San Francisco State Univ., USA, Presider

FWF1 • 8:00 a.m. Invited
Why Use Photonic Crystal Fibers for Sensing? *Jonathan Knight; Univ. of Bath, UK.* Optical fibers with holes in them, either in their cladding or forming a core, can be used as fiber sensors. We describe the physics and related technologies enabling new and improved sensor configurations.

FWF2 • 8:30 a.m.
Luminescence of PbS Quantum Dots Entrained in Silica Microstructured Fiber Samples, *E. F. Chillcce, L. C. Barbosa, R. L. Braga, R. E. Ramos-Gonzales, A. C. Bordonalli; Univ. of Campinas, Brazil.* A preliminary luminescence spectral analysis of micro-structured silica fibers whose core regions are surrounded by PbS-core quantum-dots is presented. Dual core fiber samples with different quantum dot sizes and a 785nm pump laser were used.

FWF3 • 8:45 a.m.
Birefringence of Photonic Crystal Fibers with a General Lattice, *Arash Mafi[1], Karl W. Koch[2]; [1]Univ. of Wisconsin-Milwaukee, USA, [2]Corning Inc., USA.* We report on the influence of lattice shape on the birefringence properties of photonic crystal fibers and show novel properties such as very large or vanishing birefringence in nonsymmetric lattices and cores.

8:00 a.m.–10:00 a.m.
FWG • Photonic Sensing Devices
Jacques Albert; Carleton Univ., Canada, Presider

FWG1 • 8:00 a.m. Invited
Optical Manipulation Using Silicon Nanophotonics, *David Erickson; Cornell Univ., USA.* In this paper I review our work on the use of silicon nanophotonics for optical manipulation of nanoparticles and biomolecules, focusing on ways in which these techniques represent an improvement over free space manipulation.

FWG2 • 8:30 a.m.
Range Finding Using a Masked Folded Optic Imager, *Brett R. Nadler, Eric J. Tremblay, Jason H. Karp, Joseph E. Ford; Univ. of California at San Diego, USA.* High-resolution images of an unfocused laser beam were obtained by masking the aperture of an annular folded optic imager. Image processing yielded calibrated distance measurements correlated to the separation of the beam spots.

FWG3 • 8:45 a.m.
Sensing the Microwave Poynting Vector with a Cadmium Manganese Telluride Electric/Magnetic Field Sensor, *Chia-Chu Chen, John F. Whitaker; Univ. of Michigan, USA.* A map of the microwave Poynting vector along a 50-Ω microstrip was experimentally determined using a single cadmium manganese telluride crystal that exhibits both the Pockels and Faraday effects.

LS

8:00 a.m.–10:00 a.m.
LSWA • Single-Molecule Biophysics I
Christine Payne; Georgia Tech, USA, Presider

LSWA1 • 8:00 a.m. Invited
Single-Molecule Biophysical Imaging, Superresolution, and Trapping, *W. E. Moerner; Stanford Univ., USA.* Single-molecule emitters provide nanoscale light sources yielding unprecedented new information about biological systems. Novel methods and molecules, including superresolution imaging in three dimensions and anti-Brownian electrokinetic trapping of single biomolecules in solution, will be reviewed.

LSWA2 • 8:30 a.m. Invited
Fluorescence Nanoscopy: FPALM Breaks the Diffraction Limit, *Samuel Hess; Univ. of Maine, USA.* Localization microscopy methods image many small subsets of single molecules, determine the coordinates of each molecule by localization, and combine data from many molecules to create a fluorescence image of the sample with resolution (10-40 nm) significantly better than the diffraction-limited resolution. Biological applications of such methods are presented.

8:00 a.m.–10:00 a.m.
LSWB • Second-Order Nonlinear Optics I
Garth J. Simpson; Purdue Univ., USA, Presider

LSWB1 • 8:00 a.m. Invited
Sum Frequency Generation (SFG) Vibrational Spectroscopy and Its Application in Surface Science and Catalysis, *Gabor A. Somorjai, George J. Holinga; Univ. of California at Berkeley, USA.* SFG was applied to investigate adsorbed molecules at the solid-gas (liquid) interfaces and reaction intermediates of catalytic reactions at metal surfaces. SFG was used to characterize polymer films, electrochemical interfaces, and biomolecule adsorption.

LSWB2 • 8:30 a.m. Invited
Nonlinear Optical Studies of Conjugated Polymer Films and Interfaces, *Ian M. Craig, Benjamin J. Schwartz; Univ. of California at Los Angeles, USA.* The electronic structure of the conjugated polymer/metal interfaces that are present in polymer-based optoelectronic devices are poorly understood. In this talk, we present preliminary results of non-linear optical measurements aimed at characterizing conjugated polymer/metal interfaces.

8:00 a.m.–10:00 a.m.
LSWC • Multidimensional Spectroscopy I
Munira Khalil; Univ. of Washington, USA, Presider

LSWC1 • 8:00 a.m. Invited
Investigating the Major Light Harvesting Complex of Photosystem II with 2-D Electronic Spectroscopy, *G. S. Schlau-Cohen, T. R. Calhoun, N. S. Ginsberg, G. R. Fleming; Univ. of California at Berkeley, USA.* Two-dimensional electronic spectroscopy experiments on the major light harvesting complex of photosystem II, the most abundant light harvester, monitor ultrafast dynamics and reveal the design principles behind the functionality of this pigment protein complex.

LSWC2 • 8:30 a.m. Invited
Coherence in Electronic Energy Transfer: The Intermediate Coupling Regime, *Gregory D. Scholes, Elisabetta Collini; Univ. of Toronto, Canada.* We report a study of the role of coherence dynamics in the intermediate coupling regime of electronic energy transfer. Theoretical developments as well as the results of two-dimensional electronic spectroscopy will be described.

For Fall Congress presentations on Wednesday, see pages 125-131.

FWA • Biomedical Applications of Ultrafast Lasers—Continued

FWA3 • 9:00 a.m. Invited

Tissue Imaging with Shaped Femtosecond Laser Pulses, *Warren S. Warren; Duke Univ., USA.* Rapid laser pulse shaping permit detection of novel molecular signatures such as self- and cross-phase modulation or nonlinear absorption. These effects are used to discriminate between different melanins in tissue and to monitor neuronal activation.

FWA4 • 9:30 a.m.

Microprisms for *in vivo* Multiphoton Microscopy of Mouse Cortex, *Thomas Chia, Michael J. Levene; Yale Univ., USA.* Microprisms inserted into the cortex of mouse enable *in vivo* multiphoton microscopy, rotating the field-of-view from parallel to perpendicular to the surface of cortex and allowing imaging of the full cortical thickness.

Thank you for attending FiO/LS/Fall Congress. Look for your post-conference survey via email and let us know your thoughts on the program.

FWB • Optical Information Processing and Transport in the Age of Nanophotonics and Metamaterials—Continued

FWB4 • 9:00 a.m.

Slow and Fast Light Propagation in Semiconductor Quantum Dots, *Qiguang Yang[1], JaeTae Seo[1], Bagher Tabibi[1], William Yu[2]; [1]Hampton Univ., USA, [2]Worcester Polytechnic Inst., USA.* The group velocity of a laser pulse in semiconductor quantum dots has been investigated and both slow and fast light propagation were observed experimentally. The phenomena will be explained directly in time-domain in this paper.

FWB5 • 9:15 a.m.

Electrically Driven Optical Modulator with a Strongly Coupled Quantum Dot, *Andrei Faraon[1], Arka Majumdar[1], Hyochul Kim[2], Pierre Petroff[2], Jelena Vučković[1]; [1]Stanford Univ., USA, [2]Univ. of California at Santa Barbara, USA.* The frequency of a quantum-dot strongly coupled to a photonic-crystal cavity was electrically controlled. Electro-optic modulation (150MHz) of a coherently coupled probe laser is demonstrated. Operation at 10GHz and ~1fJ/bit are achievable with this device.

FWB6 • 9:30 a.m.

Confocal Microscopy Measurement of Light Squeezed in Sub-Wavelength Plasmonic Hole on Thin Metal Film, *Hyungjin Ma, Jun Xu, Nicholas Fang; Univ. of Illinois at Urbana-Champaign, USA.* We measured the phase delay of the squeezed light emerging from individual plasmonic holes on thin metal film by confocal microscope. A large phase shift has been observed, beyond prediction from earlier theoretical models.

FWC • Extraordinary Transmission and Structured Surface—Continued

FWC4 • 9:00 a.m.

Extraordinary Optical Transmission (EOT) through Multi-Layered Systems of Corrugated Metallic Thin Films, *Choon How Gan, Greg Gbur; Univ. of North Carolina at Charlotte, USA.* Optical transmission through multi-layered systems of metallic structures was investigated numerically. We find that these structures can significantly impede the field decay, often leading to EOT even for thicknesses much greater than the skin depth.

FWC5 • 9:15 a.m.

Sub-Wavelengh Sized Optical Cavity Resonators with Fishnet, *Jingjing Li[1], Lars Thylen[1,2,3], Alex Bratkovski[1], Shih-Yuan Wang[1], Stanley Williams[1]; [1]Hewlett-Packard Res. Lab, USA, [2]KTH Dept of Microelectronics and Applied Physics, Royal Inst. of Technology, Sweden, [3]Joint Res. Ctr. of Photonics of the Royal Inst. of Technology and Zhejiang Univ., China.* An optical cavity resonator of deep sub-wavelength size is demonstrated numerically by inserting a single layer of "fishnet" structure of negative refractive index into a Fabry-Perot cavity composed of two gold films.

FWC6 • 9:30 a.m.

Extraordinary Transmission and Nonlinear Response for Semiconductors in the UV Range, *Maria Antonietta Vincenti[1,2], Antonella D'Orazio[1], Domenico de Ceglia[2], Michael Scalora[2], Mark J. Bloemer[2]; [1]Politecnico di Bari, Italy, [2]Charles M. Bowden Res. Ctr. AMSRD-AMR-WS-ST, US Army RDECOM, USA.* We investigate the correlation between linear and nonlinear responses in single slits carved on semiconductor substrates to highlight the differences between nonlinear response produced in metals and a SH signal mostly generated by χ_2 contribution.

FWD • Turbulence and Other Nonlinear Phenomena—Continued

FWD4 • 9:00 a.m. Invited

Gravity-Like Effects on Light and Fiber Supercontinuum, *Dmitry Skryabin; Univ. of Bath, UK.* I'll describe how an intriguing gravity-like force created by optical solitons traps and blue-shifts light. This phenomenon plays paramount role in supercontinuum generation in optical fibers and may have other practical and fundamental applications.

FWD5 • 9:30 a.m.

Casimir-Like Light Pulse Interaction Induced by Amplified Spontaneous Noise in Laser Cavities, *Rafi Weill[1], Omri Gat[2], Vladimir Smulakovsky[1], Alexander Bekker[1], Baruch Fischer[1]; [1]Technion-Israel Inst. of Technology, Israel, [2]Hebrew Univ., Israel.* We present a new mechanism for light pulse interaction in mode-locked lasers induced by amplified spontaneous noise. It is a time-light domain Casimir-like mechanism. We show experimental evidence for this unique effect.

FWE • Novel Fiber Devices II—Continued

FWE4 • 9:00 a.m.

Soft-Landing of Preselected Single Nanoparticles on Optical Fiber Tapers for Spectroscopy and Detection, *Alexander Kuhlicke, Markus Gregor, Oliver Benson; Humboldt Univ. of Berlin, Germany.* We use a segmented linear Paul-trap to deposit single preselected microparticles on optical fiber tapers. Beyond detection and spectroscopy of these particles, this offers a new method to functionalise fiber tapers.

FWE5 • 9:15 a.m.

Color Filter Incorporating a Fabry-Perot Etalon, *Yeo-Taek Yoon[1], Hong-Shik Lee[1], Sang-Shin Lee[1], Byoung-Su Lee[2]; [1]Kwangwoon Univ., Republic of Korea, [2]SiliconFile Technologies, Republic of Korea.* Three color filters based on a simple Fabry-Perot etalon, which consists of an oxide thin film sandwiched in between two silver films, were demonstrated with no additional infrared cutoff filter included.

FWE6 • 9:30 a.m.

The Transition between Superluminal and Subluminal for Multiple Microspheres Optical Fiber System, *Yundong Zhang, Jing Zhang, Xuenan Zhang, Ping Yuan; Harbin Inst. of Technology, China.* The transition between superluminal and subluminal is investigated by adjusting the parameters of the outermost microsphere in doping gain medium. It is applied to the resonators with different parity number respectively.

For Fall Congress presentations on Wednesday, see pages 125-131.

FWF • Photonic Bandgap Devices—Continued

FWF4 • 9:00 a.m.
Photonic Interactions of Resonant Cesium Atoms and Opal Photonic Crystals, *Allard P. Mosk[1], Philip J. Harding[1,2], Pepijn W. H. Pinkse[3], Willem L. Vos[1,2]; [1]Univ. Twente, Netherlands, [2]FOM Inst. AMOLF, Netherlands, [3]Max-Planck-Inst. für Quantenoptik, Germany.* We present the first experiments on resonant atoms, Cesium vapor, in photonic crystals. The atomic transitions are strongly modified by photonic band structures of opal. Results are interpreted with an improved transfer-matrix model.

FWF5 • 9:15 a.m.
Direct, Efficient Coupling into Slow Light Photonic Crystal Waveguide: Role of Evanescent Modes, *Carel M. de Sterke[1], Kokou B. Dossou[2], Tom P. White[3], Lindsay C. Botten[2], Ross C. McPhedran[1]; [1]Univ. of Sydney, Australia, [2]CUDOS, School of Mathematical Sciences, Univ. of Technology, Sydney, Australia, [3]Univ. of St. Andrews, UK.* Efficient coupling between fast and slow PC waveguide modes is possible if strong evanescent modes are needed to match the fields across the interface. This occurs when the propagating modes have substantially different modal fields.

FWF6 • 9:30 a.m.
Very High Efficiency Bends for Low Group Velocities in Photonic Crystal Waveguides, *Murtaza Askari, Ali Adibi; Georgia Tech, USA.* We present experimental demonstration of high efficiency bends for low group velocity modes in photonic crystal waveguides. We show that careful modification of bend region can help improve bend bandwidth by 15nm for 1.55μm wavelength.

FWG • Photonic Sensing Devices—Continued

FWG4 • 9:00 a.m. Invited
Fiber Optic Sensors Based on Surface Plasmon Resonance, *Banshi D. Gupta; Indian Inst. of Technology Delhi, India.* Surface plasmon resonance based fiber optic sensors with different probe designs are presented. The modeling of each probe is carried out using ray optics. The performance of each probe is evaluated in terms of sensitivity.

FWG5 • 9:30 a.m.
Uniformity of Concentration Factor and BFL in Microlens Array for Image Detectors Applications, *Giuseppe Martini, Enrico Randone, Mohammad Fathi, Silvano Donati; Univ. Pavia, Italy.* We report a 35x gain for a 32x32, 50-micron diameter polymer cast microlens array used to recover fill-factor loss in a SPAD array. Concentration spread is < 6% and BFL spread is <0.5μm.

LSWA • Single-Molecule Biophysics I—Continued

LSWA3
Paper Withdrawn

LSWA4 • 9:15 a.m.
Watching Photophysics in Action: Single-Molecule Solution-Phase Studies of a Trapped Photosynthetic Antenna Protein, *Randall H. Goldsmith, Yan Jiang, W. E. Moerner; Stanford Univ., USA.* Simultaneous fluorescence intensity and lifetime fluctuations are observed in single molecules of Allophycocyanin in solution, allowing observation of different photophysical processes which suggest conformational heterogeneity. An electrokinetic trap that cancels Brownian motion enables solution-phase measurement.

LSWA5 • 9:30 a.m. Invited
Structured-Illumination Microscopy of Live Cells, *Mats Gustafsson; Univ. of California at San Francisco, USA.* Abstract not available.

LSWB • Second-Order Nonlinear Optics I—Continued

LSWB3 • 9:00 a.m.
Atto-Joules, High Bandwidth All Optical Modulation with a Nano-Fiber Embedded in Alkali Vapor, *Kenneth Salit, Mary Salit, Subramanian Krishnamurthy, Ye Wang, Prem Kumar, Selim M. Shahriar; Northwestern Univ., USA.* We report an all-optical modulator with 75 photons at 2 GHz, using a tapered nanofiber embedded in an alkali vapor. The switching energy is 19 atto-Joules, a record low value for modulation at this speed.

LSWB4 • 9:15 a.m.
Analysis of Aberrations Effect in Nonlinear Processes for Femtosecond Laser Pulses, *Rocio Borrego Varillas[1], Carolina Romero[1], Benjamin Alonso[1], Cruz Méndez[2], Javier R. Vázquez de Aldana[1], Emilio J. Gualda[3], Juan M. Bueno[3], Pablo Artal[3], Luis Roso[1,2]; [1]Univ. de Salamanca, Spain, [2]Ctr. de Láseres Pulsados Ultracortos Ultraintensos, Spain, [3]Lab de Óptica, Univ. de Murcia, Spain.* A method for the analysis and control of femtosecond pulse wavefronts generated in non-linear crystals by three-wave mixing processes is presented. The possibility to improve the efficiency of these processes is discussed.

LSWB5 • 9:30 a.m. Invited
Resonant UV SHG Studies of Ion Adsorption at Aqueous Interfaces, *Richard J. Saykally[1,2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA.* By exploiting the strong charge-transfer-to-solvent (CTTS) resonances characteristic of all anions in aqueous electrolytes, their interfacial properties are measured using SHG spectroscopy in the deep ultraviolet.

LSWC • Multidimensional Spectroscopy I—Continued

LSWC3 • 9:00 a.m. Invited
Optical Two-Dimensional Fourier Transform Spectroscopy of Semiconductors, *S. T. Cundiff, A. D. Bristow, D. Karaiskaj, X. Dai; JILA, NIST, Univ. of Colorado, USA.* Optical two-dimensional Fourier transform spectroscopy is used to study excitonic resonances in semiconductor nanostructures. The spectra show the dominance of many-body contributions. Two-quantum coherences are observed due to both biexcitons and many-body states.

LSWC4 • 9:30 a.m. Invited
Exciton Relaxation and Energy Transfer Dynamics in Size Selected Polythiophenes, *Andrew T. Healy, Nathan P. Wells, Bryan W. Boudouris, Marc A. Hillmyer, David A. Blank; Univ. of Minnesota, USA.* Using fluorescence upconversion and two-color photon echo spectroscopy we have investigated the initial relaxation and subsequent energy transfer dynamics in a series of size-selected polythiophenes with and without fullerene termination.

For Fall Congress presentations on Wednesday, see pages 125-131.

FWA • Biomedical Applications of Ultrafast Lasers—Continued

FWA5 • 9:45 a.m.
Multiphoton Histology of Entire Intact Mouse Organs, *Sonia Parra, Joseph P. Zinter, Michael J. Levene; Yale Univ., USA.* We present multiphoton fluorescence microscopy and second harmonic imaging of entire intact, fixed and optically cleared mouse organs. We achieved imaging depths of several millimeters in mouse intestine, heart, lung, brain and other organs.

FWB • Optical Information Processing and Transport in the Age of Nanophotonics and Metamaterials—Continued

FWB7 • 9:45 a.m.
Controlled Blinking Statistics of Single Colloidal Quantum Dots in a Half Cavity, *Ningning Xu[1,2], Vamsi K. Komarala[1], Yanpeng Zhang[1], Min Xiao[1]; [1]Univ. of Arkansas, USA, [2]Nankai Univ., China.* The blinking statistics of single CdSe/ZnS quantum dots can be modified and controlled by an optical mirror. We study the modified statistical and correlation properties of single quantum dots as a function of dot-mirror distance.

FWC • Extraordinary Transmission and Structured Surface—Continued

FWC7 • 9:45 a.m.
Theory and Simulations of Enhanced Transmission through Plasmonic Sub-Wavelength Structures, *Jan Fiala, Ivan Richter; Faculty of Nuclear Sciences and Physical Engineering, Czech Technical Univ. in Prague, Czech Republic.* The interaction of an electromagnetic wave with various classes of plasmonic sub-wavelength structures, including the apertures with/without supporting corrugations is theoretically studied and modeled, using several approximate and rigorous numerical approaches.

FWD • Turbulence and Other Nonlinear Phenomena—Continued

FWD6 • 9:45 a.m.
Nonlinear Focusing and Defocusing of Partially-Coherent Spatial Beams, *Can Sun, Dmitry V. Dylov, Jason W. Fleischer; Princeton Univ., USA.* We consider, experimentally and theoretically, the propagation of a partially-coherent spatial beam in both self-focusing and self-defocusing nonlinear media. Measurements of beam widths confirm the dynamical scaling predicted by a nonlinear Gaussian-Schell model.

9:00 a.m.–12:00 p.m. Export Regulation Fundamentals for the Optics and Photonics Industry, *Sainte Claire Room, Sainte Claire Hotel*

10:00 a.m.–10:30 a.m. Coffee Break, *Imperial Ballroom, Fairmont Hotel*

10:00 a.m.–4:00 p.m. Exhibit Hall Open, *Imperial Ballroom, Fairmont Hotel*

NOTES

For Fall Congress presentations on Wednesday, see pages 125-131.

Glen Ellen	Atherton	Sacramento	Piedmont	Hillsborough
FiO		**LS**		
	FWG • Photonic Sensing Devices—Continued	**LSWA • Single-Molecule Biophysics I—Continued**	**LSWB • Second-Order Nonlinear Optics I—Continued**	**LSWC • Multidimensional Spectroscopy I—Continued**

FWG6 • 9:45 a.m.
Temperature Insensitive Dual Chirped LPG Bend Sensor, *Umesh K. Tiwari[1,2], K. Thyagarajan[1], M. R. Shenoy[1,2], Vandana Mishra[2], Nahar Singh[2], S.C. Jain[2], Pawan Kapur[2]; [1]Indian Inst. of Technology Delhi, India, [2]Central Scientific Instruments Organization, India.* Experimental measurements on a novel dual chirped LPG design is presented which exhibits very low temperature sensitivity and high bend sensitivity. Sensing properties of the proposed design are entirely different from normal LPG.

9:00 a.m.–12:00 p.m. Export Regulation Fundamentals for the Optics and Photonics Industry, *Sainte Claire Room, Sainte Claire Hotel*

10:00 a.m.–10:30 a.m. Coffee Break, *Imperial Ballroom, Fairmont Hotel*

10:00 a.m.–4:00 p.m. Exhibit Hall Open, *Imperial Ballroom, Fairmont Hotel*

NOTES

For Fall Congress presentations on Wednesday, see pages 125-131.

10:30 a.m.–12:15 p.m.
FWH • Coherence and Fundamental Optics I
Boris Y. Zeldovich; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, Presider

FWH1 • 10:30 a.m.
Bases for the Description of Focused Electromagnetic Fields, *Nicole J. Moore[1], Miguel A. Alonso[2]; [1]Beloit College, USA, [2]Univ. of Rochester, USA.* Discrete bases for the efficient modeling of high numerical aperture fields are described. Several simple test cases are presented, including monochromatic fields with linear, radial and azimuthal polarization and a partially coherent field.

FWH2 • 10:45 a.m.
Structure Determination of Stochastic Media from Scattering Experiments, *Mayukh Lahiri, Emil Wolf; Univ. of Rochester, USA.* The classic method for determining the structure of crystalline media from X-ray and neutron diffraction experiments is generalized to determine the correlation functions of scattering potentials of stationary random media from scattering experiments.

FWH3 • 11:00 a.m.
The Generalized Wolf Shift for Cyclostationary Fields, *Robert W. Schoonover, Brynmor J. Davis, P. Scott Carney; Univ. of Illinois at Urbana-Champaign, USA.* Correlation-dependent, propagation-induced shifts in the generalized spectra of cyclostationary, random fields are predicted. This result generalizes the Wolf shift for stationary fields and is applicable to periodic trains of fast pulses.

10:30 a.m.–12:00 p.m.
FWI • Optics in Information Sciences
Monika Ritsch-Marte; Innsbruck Medical Univ., Austria, Presider

FWI1 • 10:30 a.m.
Compound Optical Receiver for Field of View Enhancement, *Bahareh Haji-Saeed[1], Jed Khoury[1], Charles Woods[1], John Kierstead[2]; [1]Sensors Directorate, AFRL, USA, [2]Solid State Scientific Corp., USA.* We propose using the smart antenna principle as the basis of a new design for smart optical receivers in LADAR systems. Our design was modeled in Simulink® using the fuzzy-logic maximum operation on video data.

FWI2 • 10:45 a.m.
Generation of Resolved Phonon Sidebands in a Self-Assembled Quantum Dot, *Michael B. Metcalfe[1,2], Stephen Carr[1], Solomon S. Glenn[1,2], John R. Lawall[1]; [1]NIST, USA, [2]Univ. of Maryland, USA.* InAs quantum dots (QD) are modulated with a surface acoustic wave inducing phonon sidebands of the fluorescence. This constitutes an important step towards sideband cooling of a nanomechanical resonator via coupling to an embedded QD.

FWI3 • 11:00 a.m.
Optical Delay Line Elements Based on Leaky-Mode Resonance Structures, *Mehrdad Shokooh-Saremi, Xin Wang, Robert Magnusson; Univ. of Texas at Arlington, USA.* Leaky-mode resonance bandpass filters are designed with particle swarm optimization. The spectral phase properties of these elements are studied. It is shown that these elements can operate as optical delay lines.

10:30 a.m.–12:15 p.m.
FWJ • Quantum Optics in Waveguides II
Alfred B. U'Ren; Univ. Nacional Autónoma de México, Mexico, Presider

FWJ1 • 10:30 a.m.
Modal, Spectral, and Polarization Entanglement in Guided-Wave Parametric Down-Conversion, *Mohammed F. Saleh[1], Bahaa E. A. Saleh[1,2], Malvin C. Teich[1,3]; [1]Dept. of Electrical and Computer Engineering, Boston Univ., USA, [2] CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, [3]Dept. of Physics, Boston Univ., USA.* We offer a comprehensive theoretical study of the properties and applications of modal, spectral, and polarization entanglement of biphotons generated via spontaneous parametric down-conversion in 1-D planar and 2-D circular waveguides using continuous pumping.

FWJ2 • 10:45 a.m.
Generation of Polarization Entangled Photons from Type-II Domain Engineered PPLN Waveguides, *Krishna Thyagarajan[1], Kanupriya Sinha[2], Jasleen Lugani[1], Sankalpa Ghosh[1], Olivier Alibart[3], Dan Ostrowsky[3], Sebastian Tanzilli[3]; [1]Indian Inst. of Technology Delhi, India, [2]Univ. of Maryland, USA, [3]LPMC, CNRS UMR 6622, Univ. of Nice Sophia Antipolis, France.* We propose a new scheme of domain engineering in Lithium Niobate for generating non degenerate polarization entangled photon pairs by simultaneously satisfying the conditions for two different SPDC processes.

FWJ3 • 11:00 a.m. Invited
Photon Pair Generation in Birefringent Fiber: A Route to Better Photons, *Jeff S. Lundeen[1], Offir Cohen[2], Pierre Mahou[2], Brian J. Smith[2], Ian A. Walmsley[2]; [1]Inst. for Natl. Measurement Standards, Natl. Res. Council Canada, Canada, [2]Clarendon Lab, Univ. of Oxford, UK.* We show that birefringent waveguides, such as optical fibers, allow us to produce photons with desired spectral and spatial characteristics. Tailoring these characteristics is crucial for high-fidelity operation of waveguide quantum logic gates.

10:30 a.m.–12:00 p.m.
FWK • All-Optical Signal Processing III
Alexander Gaeta; Cornell Univ., USA, Presider

FWK1 • 10:30 a.m. Invited
Nonlinear Optics on a Chip: Breaking the Terabit per Second Barrier, *Benjamin J. Eggleton; Univ. of Sydney, Australia.* This paper reviews our recent progress in developing photonic integrated circuits based on highly nonlinear chalcogenide waveguides. Application to high speed performance monitoring will be discussed.

FWK2 • 11:00 a.m.
Widely-Tunable Cavity-Less 40 GHz Picosecond Pulse Source, *Bill Ping Piu Kuo, Andreas O. J. Wiberg, Camille-Sophie Bres, Evgeny Myslivets, Nikola Alic, Stojan Radic; Univ. of California at San Diego, USA.* We demonstrate a wavelength tunable 40 GHz optical pulse source using a cavity-less architecture. High-quality 2.2 ps picosecond pulses with SNR exceeding 30 dB are obtained over a wide - 95 nm tunable range.

10:30 a.m.–12:00 p.m.
FWL • Optical Communication Devices
Nikola Alic; Univ. of California at San Diego, USA, Presider

FWL1 • 10:30 a.m.
Ultra-Low Jitter Frequency Stabilized Mode-Locked Laser, *Ibrahim T. Ozdur[1], Mehmetcan Akbulut[1], Nazanin Hoghooghi[1], Dimitrios Mandridis[1], Sarper Ozharar[2], Franklyn Quinlan[3], Peter J. Delfyett[1]; [1]CREOL and FPCE, College of Optics and Photonics, Univ. of Central Florida, USA, [2]Northwestern Univ., USA, [3]NIST, USA.* We report a low noise, frequency stabilized, semiconductor based, 10.287 GHz actively mode-locked laser with 1000 finesse intracavity etalon, with a timing jitter (1Hz - 100MHz) of 3 fs and optical linewidth <1 kHz.

FWL2 • 10:45 a.m.
Ultra-Low Noise, Sub-100MHz Pulse Train Based on a Temporally Demultiplexed Mode-Locked Laser, *Dimitrios Mandridis[1], Ibrahim Ozdur[1], Peter J. Delfyett[1], Jason J. Plant[2], Paul W. Juodawlkis[2]; [1]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, [2]MIT Lincoln Lab, USA.* A semiconductor low-noise, sub-100*MHz* repetition rate laser source is developed by time demultiplexing a harmonically mode-locked 2.56GHz, SCOWA-based mode-locked laser to the cavity fundamental frequency. The laser source is suitable for time-stretched photonic ADC.

FWL3 • 11:00 a.m.
A Novel Ellipse Model for Optically Injection-Locked VCSELs, *Peng Guo[1,2], Wei Jian Yang[1], Devang Parekh[1], Connie J. Chang-Hasnain[1]; [1]Dept. of Electrical Engineering and Computer Sciences, Univ. of California at Berkeley, USA, [2]State Key Lab of Advanced Optical Communication Systems and Networks, School of Electronics Engineering and Computer Science, Peking Univ., China.* A novel ellipse graphic tool is established based on injection-locked rate equations to analyze the cavity mode behavior of injection-locked vertical-cavity surface-emitting lasers. Calculation based on this model shows excellent agreement with the experimental results.

For Fall Congress presentations on Wednesday, see pages 125-131.

10:30 a.m.–11:45 a.m.
FWM • Optical Trapping and Micromanipulation I
Carlos López-Mariscal; NIST, USA, Presider

FWM1 • 10:30 a.m. Invited
Optical Trapping and Manipulation Using Microfabricated Optical Tweezers Based on Diffractive Optics and Surface Plasmons, *Kenneth B. Crozier; Harvard Univ., USA.* Microfabricated optical tweezers are reviewed. Fresnel zone plates are shown to offer comparable performance to traditional optical tweezers, when diffraction efficiency is taken into account. We demonstrate the manipulation of nanoparticles using surface plasmon polaritons.

FWM2 • 11:00 a.m.
Determining Single-Molecule ATP Binding Stoichiometry in a Multi-Subunit Enzyme with a Hardware-Based Anti-Brownian Electrokinetic Trap, *Yan Jiang[1,2], Adam Cohen[1,3], Nick Douglas[4], Judith Frydman[4], W. E. Moerner[1]; [1]Dept. of Chemistry, Stanford Univ., USA, [2]Dept. of Applied Physics, Stanford Univ., USA, [3]Dept. of Chemistry and Chemical Biology, Harvard Univ., USA, [4]Dept. of Biological Sciences, Stanford Univ., USA.* We developed a high-speed Anti-Brownian Electrokinetic trap capable of trapping sub-10nm fluorescent objects in solution. Single chaperonin enzymes loaded with Cy3-ATP are trapped, and display stepwise photobleaching intensity traces corresponding to the ATP binding stoichiometry.

10:30 a.m.–12:00 p.m.
FWN • Silicon Photonics II
Luca Dal Negro; Boston Univ., USA, Presider

FWN1 • 10:30 a.m. Invited
Photonic Signal Processing in CMOS-Compatible Silicon, *Mahmoud S. Rasras; Bell Labs, Alcatel Lucent, USA.* CMOS compatible photonics creates new information processing and transport solutions through monolithic electronic/photonic integration. Optical filters provide significant insight into the viability of this technology. We will present recent developments in this area.

FWN2 • 11:00 a.m.
Electronic-Nanophotonic Integration, *Yadong Wang[1], Qian Wang[1], Chongyang Liu[1], Ng Doris[1], Yongqiang Wei[1], Yingyan Huang[2], Seng-Tiong Ho[3]; [1]Data Storage Inst., Agency for Science, Technology and Res., Singapore, [2]OptoNet Inc., USA, [3]Northwestern Univ., USA.* Nanophotonic integration of III-V on silicon based on top-down coupling is presented. Light can be coupled up for amplification/absorption or coupled down for passive processing. Interlayer wafer bonding for this integration is described.

10:30 a.m.–12:00 p.m.
LSWD • Single-Molecule Biophysics II
Ahmet Yildiz; Univ. of California at Berkeley, USA, Presider

LSWD1 • 10:30 a.m. Invited
Real-Time 3-D Single-Particle Tracking Spectroscopy for Cellular Dynamics, *Haw Yang; Princeton Univ., USA.* Biological macromolecules and organelles can move in all directions inside a cell, making it extremely challenging to follow biochemical processes with molecular resolution. We discuss a new technique that can potentially overcome this difficulty.

LSWD2 • 11:00 a.m.
Photoactivatable Push-Pull Fluorophores for Single-Molecule Imaging in and out of Cells, *Samuel J. Lord[1], Hsiao-lu D. Lee[1], Nicholas R. Conley[1], Marissa K. Lee[1], Michael A. Thompson[1], Reichel Samuel[2], Ryan Weber[2], Na Liu[2], Robert J. Twieg[2], W. E. Moerner[1]; [1]Stanford Univ., USA, [2]Kent State Univ., USA.* We have designed a series of photoactivatable push-pull organic fluorophores, single molecules of which can be imaged in living cells. Photoactivatable probes are needed for superresolution imaging schemes that require active control of single-molecule emission.

10:30 a.m.–12:00 p.m.
LSWE • Second-Order Nonlinear Optics II
Anne M. Kelley; Univ. of California at Merced, USA, Presider

LSWE1 • 10:30 a.m. Invited
Nonlinear Optics in Metamaterials, *David Cho[1], Wei Wu[2], Feng Wang[1], Xiang Zhang[3], Yuen-Ron Shen[1]; [1]Physics Dept., Univ. of California at Berkeley, USA, [2]Quantum Science Res., Hewlett-Packard Labs, USA, [3]Dept. of Mechanical Engineering, Univ. of California at Berkeley, USA.* We describe spectroscopic studies of ultrafast photomodulation of the negative refraction of a fishnet metamaterial and resonant wave mixing processes in the metamaterials of fishnet and Cheveron structures.

LSWE2 • 11:00 a.m. Invited
New Perspectives in Vibrational Sum-Frequency Spectroscopy, *John T. Fourkas; Univ. of Maryland at College Park, USA.* Vibrational sum-frequency generation (VSFG) is a powerful technique for probing the organization of molecules at interfaces. We will discuss how different processes, including reorientation and energy transfer, can lead to new interpretations of VSFG spectra.

10:30 a.m.–12:00 p.m.
LSWF • Multidimensional Spectroscopy II
Munira Khalil; Univ. of Washington, USA, Presider

LSWF1 • 10:30 a.m. Invited
Water and Hydrogen-Bond Dynamics in Aqueous Solutions, *Damien Laage[1], Guillaume Stirnemann[1], Fabio Sterpone[1], James T. Hynes[1,2]; [1]École Normale Supérieure, France, [2]Univ. of Colorado, USA.* The water and hydrogen-bond dynamics is investigated in aqueous solutions. Based on numerical simulations and analytic models, we offer an interpretation for the recent time-resolved vibrational spectroscopy experiments.

LSWF2 • 11:00 a.m. Invited
Watching Ultrafast Molecular Dynamics: 2-D IR Chemical Exchange Spectroscopy, *Michael D. Fayer; Stanford Univ., USA.* Ultrafast 2-D IR vibrational echo chemical exchange spectroscopy is described. The measurements enable observation of molecule processes under thermal equilibrium conditions. Applications to molecular isomerization, hydrogen bond dynamics, and proteins structural substate switching are presented.

10:30 a.m.–12:00 p.m.
JWB • Advances in Adaptive Optics Imaging of the Living Retina I
Stephen A. Burns; Indiana Univ., USA, Presider

JWB1 • 10:30 a.m.
Off-Axis Estimation of Ocular Aberrations via Scanning Shack-Hartmann Wavefront-Sensor, *Xin Wei, Larry N. Thibos; School of Optometry, Indiana Univ., USA.* We developed a Scanning Hartmann Shack wavefront sensor by coupling the Shack Hartmann aberrometer with a scanning system. This instrument measures off-axis aberration of the human eye accurately and precisely in an efficient manner.

JWB2 • 10:45 a.m.
Optimal Correction of Subject Prescription on an Adaptive Scanning System for Retinal Imaging, *David Merino, Austin Roorda; School of Optometry, Univ. of California at Berkeley, USA.* The effect on image quality of subject's prescription on an AOSLO is assessed. Models considering different configurations available in literature have been studied. Factors to consider when implementing these configurations on real systems are addressed.

JWB3 • 11:00 a.m. Invited
Adaptive Optics Psychophysics, *Heidi Hofer; Univ. of Houston, USA.* Adaptive optics allows imaging of individual photoreceptors *in vivo* and viewing of arbitrary stimuli nearly free of optical blur. Combining these abilities has created new opportunities to study the retinal and neural limits on vision.

For Fall Congress presentations on Wednesday, see pages 125-131.

FWH • Coherence and Fundamental Optics I—Continued

FWH4 • 11:15 a.m.
A Topological Charge Selection Rule for Phase Singularities, *Miguel-Angel Garcia-March[1], Mario Zacarés[1], Javier Vijande[2], Albert Ferrando[3]; [1]Inst. de Matematica Pura y Aplicada, Univ. Politecnica de Valencia, Spain, [2]Dept. de Física Atómica, Molecular y Nuclear, Univ. de Valencia and IFIC (UV-CSIC), Spain, [3]Departament d'Optica, Univ. de Valencia (UV), Spain.* We present a study of the dynamics and decay pattern of phase singularities due to the action of a system with a discrete rotational symmetry of finite order. A topological charge conservation rule is identified.

FWH5 • 11:30 a.m.
Physical Evidence for New Characteristic Vector of Light Beams, *Chun-Fang Li; Dept. of Physics, Shanghai Univ., China.* The experimental data reported in Science 319, 787 (2008) are shown to demonstrate the existence of a new characteristic vector of light beams advanced in a previous paper Physical Review A 78, 063831 (2008).

FWH6 • 11:45 a.m.
Creating Polarization Singularities with an *N*-Pinhole Interferometer, *Robert W. Schoonover[1], Taco D. Visser[2]; [1]Univ. of Illinois Urbana-Champaign, USA, [2]Delft Univ. of Technology, Netherlands.* Electromagnetic fields diffracted by an *N*-pinhole interferometer are investigated. For *N* larger than two, a rich structure of polarization singularities is found even when the location of the pinholes is arbitrary.

FWH7 • 12:00 p.m.
Spatio-Temporal Characterization of Nonlinear Propagation, *Daniel E. Adams, Charles G. Durfee, Jeff A. Squier; Colorado School of Mines, USA.* We use Spatially Resolved Spectral Interferometery (SRSI) to investigate nonlinear propagation of ultrashort pulses in Kerr materials. SRSI provides phase and amplitude information from two spatial dimensions and fully characterizes the temporal profile of pulses.

FWI • Optics in Information Sciences—Continued

FWI4 • 11:15 a.m.
Factoring Different Numbers in a Single Run, *Vincenzo Tamma[1,2], Heyi Zhang[1], Xehua He[1], Augusto Garuccio[2], Yanhua Shih[1]; [1]Univ. of Maryland, Baltimore County, USA, [2]Univ. degli Studi di Bari, Italy.* We present the experimental realization of a new Gauss sums factorization algorithm, which, respect to the past realizations, avoids the pre-checking of the trial factors and allows obtaining the factors in a single run.

FWI5 • 11:30 a.m.
Applications of Similariton in Ultrafast Optics: Spectral Interferometry and Spectrotemporal Imaging, *Aram Zeytunyan[1], Garegin Yesayan[1], Levon Mouradian[1], Frederic Louradour[2], Alain Barthélémy[2]; [1]Yerevan State Univ., Armenia, [2]XLIM Inst. de Recherche, France.* We report on the comparative study of novel similariton-referencing methods of spectral interferometry and parabolic lensing - spectrotemporal imaging for femtosecond scale temporal measurements, based on the generation of nonlinear-dispersive similariton.

FWI6 • 11:45 a.m.
Competing Effects of Environment and Inter-Qubit Interactions in the Entanglement Dynamics of Two Qubits, *Sumanta Das, Girish Agarwal; Oklahoma State Univ., USA.* We show that coherent qubit-qubit interactions lead to bright and dark periods in the entanglement dynamics of two entangled qubits in contact with an environment. This behavior is further found to be generic in nature.

FWJ • Quantum Optics in Waveguides II—Continued

FWJ4 • 11:30 a.m.
Indistinguishability of Photons Produced by Raman Scattering, *Charles Santori, David Fattal, Kai-Mei C. Fu, Paul E. Barclay, Raymond G. Beausoleil; Hewlett-Packard Labs, USA.* The quantum indistinguishability of photons produced by Raman scattering in the presence of excited-state dephasing is analyzed. Increasing the laser detuning can help significantly if the noise correlation timescale falls within a certain window.

FWJ5 • 11:45 a.m. Invited
Quantum Logic Gates with Fiber-Generated Entanglement in the Telecommunications Band, *Prem Kumar, Monika Patel, Milja Medic, Matthew A. Hall, Joseph B. Altepeter; Northwestern Univ., USA.* Quantum states and gates in the 1.5-micron wavelength range can leverage the existing telecommunications infrastructure for communications-based quantum information processing. We present the latest results on characterization of a telecommunications-wavelength linear optics quantum controlled-NOT gate.

FWK • All-Optical Signal Processing III—Continued

FWK3 • 11:15 a.m.
Flexible All-Fiber Generation of Ultra-Wideband Signals via Pulse Compression and Differential Detection, *Avi Zadok[1], Xiaoxia Wu[2], Jacob Sendowski[1], Amnon Yariv[1], Alan E. Willner[2]; [1]Caltech, USA, [2]Univ. of Southern California, USA.* A flexible and simple scheme for generating ultra-wideband waveforms is proposed, using pulse compression in highly nonlinear fiber and differential detection. Center frequencies of 25 GHz, as well as FCC mask compliant waveforms, are demonstrated.

FWK4 • 11:30 a.m.
Addressable Optical Buffer via Angular Multiplexing in an Electromagnetically Induced Transparency Solid, *Yanfei Tu[1,2], Guoquan Zhang[1,2], Zhaohui Zhai[1,2], Jingjun Xu[1,2]; [1]MOE Key Lab of Weak Light Nonlinear Photonics, Nankai Univ., China, [2]Photonics Ctr., College of Physics Science, Nankai Univ., China.* We introduced angular multiplexing in light storage via electromagnetically induced transparency in a Pr^{3+}:Y_2SiO_5 crystal. Multi-channel buffer memory and addressable all-optical routing were demonstrated by selectively reading out stored pulses without cross-talk between neighboring channels.

FWK5 • 11:45 a.m.
Simultaneous Optical Pulse Multiplication and Shaping Based on the Amplitude-Assisted Phase-Only FBG Filter, *Xuxing Chen, Hongpu Li; Dept. of Electrical and Electronic Engineering, Shizuoka Univ., Japan.* A novel all-optical simultaneous pulse multiplication and shaping approach is proposed, which is based on the simultaneous utilization of two amplitude-assisted phase-only spectral filters realizable by using a short fiber Bragg grating.

FWL • Optical Communication Devices—Continued

FWL4 • 11:15 a.m.
A Bias Free, Quantum Random Number Generator, *Wei Wei, Hong Guo; School of Electronics Engineering and Computer Science, Peking Univ., China.* Based on the random photon emission of laser diode, we propose a new approach for true random number generation with convenient implementation, which is intrinsically bias free and suitable for high speed applications.

FWL5 • 11:30 a.m.
Nanophotonic Interconnects and 3-D Stacked Technology for Future Many-Core Architectures, *Xiang Zhang, Ahmed Louri; Univ. of Arizona, USA.* We explore silicon photonics and 3-D stacked technology to implement a photonic network-on-chips. The proposed scheme provides 2.56 Tb/sec bandwidth with a much reduced power consumption and latency compared to any leading on-chip photonic networks.

FWL6 • 11:45 a.m.
Large-Scale Tunable Optical Filter via Dynamic Stark Effect, *Yundong Zhang, Zhusong He, Hao Wu, Ping Yuna, Shuangqiang Liu; Harbin Inst. of Technology, China.* An optical filter scheme with a large tunability is proposed via dynamic Stark effect. Theory predicts that the tunability can reach over 100 GHz, what is important for laser communication and lidar systems.

For Fall Congress presentations on Wednesday, see pages 125-131.

FWM • Optical Trapping and Micromanipulation I—Continued

FWM3 • 11:15 a.m.
Time Averaged Optical Traps for the Investigation of Superfluidity in BEC, *Sebastian K. Schnelle, Kristian Weegink, Erik D. van Ooijen, Matthew J. Davis, Norman R. Heckenberg, Halina Rubinsztein-Dunlop; School of Physical Sciences, Univ. of Queensland, Australia.* We present the realization of a time averaged optical trap for the use with Bose-Einstein condensates. The trap is able to spatially scan a laser beam to create arbitrary two dimensional static or dynamic potentials.

FWM4 • 11:30 a.m.
Microfluidic Device for the 3-D Electrokinetic Manipulation of Single Molecules, *Jason K. King[1], Lloyd M. Davis[1], Brian K. Canfield[1], Philip C. Sampson[2], William H. Hofmeister[1]; [1]Univ. of Tennessee Space Inst. at Tullahoma, USA, [2]Vanderbilt Inst. for Integrative Biosystems Res. and Education, Vanderbilt Univ., USA.* We discuss the construction and characterization of a microfluidic device for the electrokinetic manipulation of sub-micron particles. A tetrahedral arrangement of four electrodes with 100-micron separation is used to provide control in three dimensions.

FWN • Silicon Photonics II—Continued

FWN3 • 11:15 a.m. Invited
Cascaded Silicon Raman Laser Using Tunable Ring Resonator, *Haisheng Rong[1], Omri Raday[2], Mario Paniccia[1]; [1]Intel Corp., USA, [2]Intel Corp., Israel.* We demonstrate a cascaded silicon Raman laser using a tunable ring resonator cavity whose resonance frequency and coupling coefficient can be tuned to their optimal values post fabrication to achieve desired lasing performance.

FWN4 • 11:45 a.m.
Integrated Fresnel Lens Structure in a Si-Slab Waveguide, *Masato Hata, Daiki Tanaka, Hiroyuki Tsuda; Graduate School of Science and Technology, Keio Univ., Japan.* We have proposed an integrated Fresnel lens with multiple slits in a Si slab waveguide. The slit width and the slit spacing were optimized and the integrated lens had a reflective loss of 0.38 dB.

LSWD • Single-Molecule Biophysics II—Continued

LSWD3 • 11:15 a.m.
Tracking Single Potassium Channels in Live Mammalian Cells, *Aubrey V. Weigel, Michael M. Tamkun, Diego Krapf; Colorado State Univ., USA.* Single molecule tracking in concert with mean square displacement and cumulative distribution function analysis is used to study Kv2.1 ion channel dynamics. Results show the channels are confined to clusters and they undergo anomalous subdiffusion.

LSWD4 • 11:30 a.m. Invited
Tracking Fluorescence Correlation Spectroscopy of Individual Biomolecules, *Kevin McHale[1,2], Andrew Berglund[3], Ke Zhang[1], Charles Limouse[1], Chandra Raman[1,4], Hideo Mabuchi[1]; [1]Stanford Univ., USA, [2]Lab of Chemical Physics, NIDDK, NIH, USA, [3]CNST Nanofabrication Res. Group, NIST, USA, [4]Georgia Tech, USA.* I will describe our group's ongoing research utilizing feedback microscopy to obtain tens-of-seconds per-molecule observation times in solution FCS and FRET assays. Results of recent studies on DNA mechanics will be presented.

LSWE • Second-Order Nonlinear Optics II—Continued

LSWE3 • 11:30 a.m. Invited
Polarization-Rotation and Two-Dimensional IR-Visible Sum Frequency Generation Spectroscopy for Surface Analysis, *Keng C. Chou; Univ. of British Columbia, USA.* Polarization-rotation and two-dimensional IR-visible sum frequency generation spectroscopy will be discussed for studying surface phase transitions of amorphous polymers and surface electronic states of conjugated polymers.

LSWF • Multidimensional Spectroscopy II—Continued

LSWF3 • 11:30 a.m. Invited
Ultrafast Dynamics of Hydrogen Bond Exchange in Aqueous Ionic Solutions, *Sungnam Park[1,2], Michael Odelius[3], Kelly J. Gaffney[2]; [1]Korea Univ., Republic of Korea, [2]Stanford Univ., USA, [3]Stockholm Univ., Sweden.* In aqueous perchlorate solutions, water-water and water-anion H-bond structures are spectrally well-separated. H-bond exchange dynamics of water is studied by 2DIR spectroscopy and molecular dynamics simulations.

JWB • Advances in Adaptive Optics Imaging of the Living Retina I—Continued

JWB4 • 11:30 a.m.
Experimental Test of Simulated Retinal Images Using Adaptive Optics, *Pablo De Gracia, Carlos Dorronsoro, Lucie Sawides, Enrique Gambra, Susana Marcos; Inst. de Óptica, Spain.* Ocular degradation is frequently assessed convolving images with the ocular point-spread-function, estimated from the wave-aberration. Comparisons of visual acuity measured using aberrated targets (viewed through adaptive-optics corrected aberrations) and under natural aberrations reveal consistent discrepancies.

JWB5 • 11:45 a.m.
High Resolution Wavefront Sensing and Mirror Control for Vision Science by Quantitative Phase Imaging, *Alaster J. Meehan, Phillip Bedggood, Brendan Allman, Keith A. Nugent, Andrew B. Metha; Univ. of Melbourne, Australia.* Quantitative Phase Imaging displays attractive features for ocular wavefront aberrometry. An adaptive-optics mirror control algorithm for ophthalmoscopy is demonstrated that takes advantage of its superior lateral resolution and similar accuracy compared to Hartmann-Shack systems.

For Fall Congress presentations on Wednesday, see pages 125-131.

12:00 p.m.–1:30 p.m.
JWC • Joint FiO/LS Poster Session

Optical Design and Instrumentation Posters

JWC1
Design of an Accurate Auto-Focusing Method by Using Elliptic Optical Apparatus, *Yung-Hsing Wang, Pin-Hao Hu, Meng-Che Tsai, Chia-Hsu Chen, Yang-Cheng Lin, Yu-Hsiu Chang, Ji-Bin Horng; Industrial Technology Res. Inst., Taiwan.* A novel auto-focusing measuring method by using elliptic mirror is proposed to improve detecting accuracy and miniaturize optical apparatus. The method is especially effective in machining and inspection for rough surface material, like solar cell.

JWC2
Two Techniques for Generating a Secondary Source with Desired Statistical Properties, *Andrey S. Ostrovsky[1,2], Miguel A. Olvera-Santamaría[1], Carolina Rickenstorff-Parrao[1], Gabriel Martínez-Niconoff[2], Victor Arrizón[2]; [1]Univ. Autonoma de Puebla, Mexico, [2]INAOE, Mexico.* Two complementary techniques for generating a secondary source with desired degree of polarization and transverse coherence length are proposed. The potentialities of these techniques are discussed and illustrated by examples of possible applications.

JWC3
A New LED Light Source for Display Cases, *Carsten Dam-Hansen, Paul Michael Petersen; DTU Fotonik, Technical Univ. of Denmark, Denmark.* We report a new LED light source suitable for illumination of gold objects. It has a variable correlated color temperature from 2760 K to 2200 K with a high color rendering index up to 97.

JWC4
Pattern Transfer by Diffractive Photomask, *Giuseppe A. Cirino[1], Ronaldo D. Mansano[2], Patrick Verdonck[3], Lucila H. Cescato[4], Euclydes Marega Jr[5], Luiz G. Neto[1]; [1]EESC, Dept. of Electrical Engineering, São Paulo Univ., Brazil, [2]PSI, Polytechnic School, Univ. of São Paulo, Brazil, [3]IMEC, Belgium, [4]Gleb Wataghin Physics Inst., Campinas State Univ., Brazil, [5]IFSC, Univ. of São Paulo, Brazil.* A phase-shift lithographic photomask for operation in proximity printing mode is fabricated based on a Fresnel computer-generated hologram. The results show an improvement of the achieved resolution as good as 1 μm.

JWC5
360-Degree Viewable Traditional Disk-Type Multiplex Holography, *Yih-Shyang Cheng, Shie-Hen Lin; Natl. Central Univ., Taiwan.* By tilting both the object and the film planes in hologram-recording process, the resulted traditional multiplex hologram can be viewed by the observers around the hologram simultaneously. Method for compensation of image distortion is proposed.

JWC6
Reliability of Content-Addressable Search in a Defocused Volume Holographic Data Storage System, *Bhargab Das, Joby Joseph, Kehar Singh; Indian Inst. of Technology Delhi, India.* The characteristics of correlation signals in a defocused holographic storage system depend on the similarities among the stored data sets. We achieve reliable performance by using data pages with sparseness values of 0.25 or less.

JWC7
Design of a Device for Synthetizing RGB Color Rainbow Holograms, *Jakub Svoboda, Pavel Fiala; Czech Technical Univ. in Prague, Czech Republic.* According to the needs of creating RGB color rainbow holograms of 3-D computer models, an original device for synthetizing non focused holograms has been designed. The device and the principle of the method is presented.

JWC8
Wide Emitting Freeform Lenses for Illumination, *Nikolai I. Petrov, Georgy Tananaev, Emil Aslanov; LG Technology Ctr., Moscow, Russian Federation.* Reflective and refractive type of lenses for LED emitting into circle and square illumination areas are proposed. Lens surface profiles for extended sources are obtained from the solution of the first order differential equations.

JWC9
Real Time Optical Vibrocardiography Using Image Processing, *Chester Wildey, Duncan MacFarlane; Univ. of Texas at Dallas, USA.* Optical remote sensing of heartbeats using image processing is reported. The system utilizes a single ccd camera, DSP and an adhered disc fiducial to realize real time measurement at rates of 13 Hz.

JWC10
Spatio-Temporal Amplitude and Phase Reconstruction of Complex Beams by Means of Fourier-Transform Spectral Interferometry, *Benjamín Alonso[1], Oscar Varela[1], Íñigo Sola[1], Rocío Borrego Varillas[1], Cruz Méndez[1,2], Julio San Román[1], Camilo Prieto[1], Amelle Zaïr[1], Luis Roso[1,2]; [1]Univ. of Salamanca, Spain, [2]Ctr. de Láseres Pulsados Ultracortos y Ultraintensos, Spain.* A compact device performing spatio-temporal amplitude and phase reconstruction of laser pulses based on spectral interferometry is presented, available for complex beams characterization as those produced by nonlinear effects or non-trivial optic systems.

JWC11
Accurate Measurement of Refractive Indices of Optical Wafers by Using Fabry-Perot Type Interference, *Hee Joo Choi[1], Hwan Hong Lim[1], In-Ho Bae[1], Han Seb Moon[1], Myoungsik Cha[1], Tae Bong Eom[2], Jung Jin Ju[3]; [1]Pusan Natl. Univ., Republic of Korea, [2]Korea Res. Inst. of Standards and Science, Republic of Korea, [3]Electronics and Telecommunications Res. Inst., Republic of Korea.* We investigated Fabry-Perot type interference from optical wafers to measure the refractive indices. This method is accurate (~10^{-5} for fused silica), insensitive to environmental perturbation, and simple to implement, compared to the conventional index-measurement methods.

Laser Science Posters

JWC12
Characteristic Study of Si_3N_4 in the Enrichment of Hardness in AISI 304 SS by Laser Surface Modification Technique, *Petchimuthu Rajarajan[1], Dillibabu Sastikumar[2], Rakesh Kaul[3], Asish Kumar Nath[4]; [1]Angel College of Engineering and Technology, India, [2]Natl. Inst. of Technology, India, [3]India Inst. of Technology, India, [4]Raja Ramanna Ctr. for Advanced Technology, India.* AISI 304 SS with preplaced Si_3N_4-Zr-Ni coating was laser treated for topological character modification. Smooth and crack free surface conditions with enhanced hardness (850HV) prevailed while the substrate was laser processed at 59 J/mm^2.

JWC13
Strong Visible Upconversion in Rare Earth Ion-Doped $NaYF_4$ Crystals, *Darayas N. Patel[1], Calvin Vance[1], Newton King[1], Malcolm Jessup[1], Lekara Green[1], Sergey Sarkisov[2]; [1]Oakwood Univ., USA, [2]SSS Optical Technologies, LLC, USA.* $NaYF_4$:Er^{3+},Yb^{3+}crystals were prepared by simple synthetic method. Under 980nm laser excitation, 408nm, 539nm and 655nm upconversion signals were recorded. Laser power and signal intensities of the upconverted emissions were obtained to understand the upconversion mechanisms.

JWC14
Generating Ultra-Short Pulses from a Q-Switched Microchip Laser, *Alex C. Butler, David J. Spence, David W. Coutts; Dept. of Physics, Macquarie Univ., Australia.* A numerical model, based on the laser rate equations, was used to predict the performance of passively Q-switched microchip lasers. The resulting designs were realised and shown to exhibit pulses of ~ 140 ps duration.

JWC15
980nm Pulsed High Peak Power VCSEL, *Zhenhua Tian, Shi Jingjing, Yan Zhang, Qin Li, Yongqiang Ning, Lijun Wang; Chinese Acad. of Sciences, China.* We have fabricated 980nm VCSEL of 400 μm and 600 μm diameters respectively, the output power reach more than 20 w when under pulsed condition. The current pulse and optical pulse were recorded and analyzed.

JWC16
Anti-Brownian ELectrokinetic (ABEL) Trapping of Single High Density Lipoprotein (HDL) Particles, *Samuel Bockenhauer[1], Alexandre Fürstenberg[1], Quan Wang[1], Michael Bokoch[2], Xiao Jie Yao[2], Brian DeVree[3], Roger K. Sunahara[3], Brian K. Kobilka[2], W. E. Moerner[1]; [1]Dept. of Chemistry, Stanford Univ., USA, [2]Dept. of Molecular and Cellular Physiology, Stanford Univ., USA, [3]Dept. of Pharmacology, Univ. of Michigan Medical School, USA.* The Anti-Brownian ELectrokinetic (ABEL) trap uses voltage feedback to electrokinetically cancel the Brownian motion of single particles in solution in microfluidic geometries. This allows trapping of single high density lipoprotein (HDL) particles for extended observation.

JWC17
Simple Device for Measuring Ultrashort Pulses in the Visible, *Dongjoo Lee, Rick Trebino; Swamp Optics, USA.* We demonstrate an extremely simple frequency-resolved-optical-gating (FROG) device (GRENOUILLE) ideal for measuring visible ultrashort pulses. By angle-tuning a thick crystal, its range includes almost the entire visible spectrum.

JWC18
Multielemental Mapping of Archeological Samples by Laser-Induced Breakdown Spectroscopy (LIBS), *Michaela Galiová[1], Jozef Kaiser[2], Karel Novotný[1], Radomír Malina[2], Aleš Hrdlička[1], Jan Novotný[2], David Procházka[2], Miroslav Liška[2], Viktor Kanický[1]; [1]Masaryk Univ., Czech Republic, [2]Brno Univ. of Technology, Czech Republic.* The capability of Laser-Induced Breakdown Spectroscopy for multi-elemental mapping of archeological samples with high-spatial resolution is discussed. The outcomes of double- and single pulse LIBS techniques are compared.

JWC19
Mapping of Nutrition Elements and Heavy Metals in Plant Tissue Slices by Laser-Induced Breakdown Spectroscopy, *Karel Novotný[1], Michaela Galiová[1], Lucie Krajcarová[1], Jozef Kaiser[2], Viktor Kanický[1], René Kizek[3], Vojtěch Adam[3], Miroslav Liška[2]; [1]Masaryk Univ., Czech Republic, [2]Brno Univ. of Technology, Czech Republic, [3]Mendel Univ. of Agriculture and Forestry, Czech Republic.* Double pulse LIBS was utilized for mapping the nutrition elements and the accumulation of the heavy metals in a plant tissue slices. Elemental maps obtained by this technique were compared with images from fluorescence microscopy.

JWC20
Auxiliary Locking System for the Advanced LIGO Gravitational Wave Interferometer, *Aidan F. Brooks, David Yeaton-Massey, Rana Adhikari; Caltech, USA.* The advanced LIGO gravitational wave interferometer requires an auxiliary locking system to prepare its main optical cavities for operation in a controlled deterministic way. This presentation will discuss research and development of that system.

For Fall Congress presentations on Wednesday, see pages 125-131.

JWC • Joint FiO/LS Poster Session—Continued

Optical Sciences Posters

JWC21
Slow Light Delay Predictions and Measurements in Hot Cesium Vapor, *Monte D. Anderson; Air Force Inst. of Technology, USA.* Tunable optical delays are observed in alkali vapor near resonant absorption lines. Pulses delayed across cesium D_2 ± 20GHz are measured and compared to model predictions.

JWC22
Microscopic Observation of Photodoping Process in Multilayer Ag/GeS_2 Film, *Takahiro Iijima[1], Moriaki Wakaki[1], Yoshihisa Murakami[2], Norihide Takeyama[3], Yoshikazu Kanai[3]; [1]Tokai Univ., Japan, [2]Tsukuba Univ. of Technology, Japan, [3]Genesia Corp., Japan.* The photodoping characteristics of multilayer films, GeS_2/Ag/GeS_2 and Ag/GeS_2/Ag, were analyzed and compared with the conventional two layer films. The feasibility to apply three layered films to optical memory and waveguide were discussed.

JWC23
Electronic Model for VCSELs: Switching Mode, Control of Threshold Current and Saturation, *J. H. Talla Mbe, P. Woafo; Univ. of Yaoundé, Cameroon.* We build an electronic model of VCSELs based on the mathematical rate equations of Danckaert et *al.*[1]. That electronic device generates polarization switching and also reduces the threshold current.

JWC24
Light Beam Travel around a Line Heat Source in Water, *Aditya Bhakta[1], George Barbastathis[1,2]; [1]MIT, USA, [2]Singapore-MIT Alliance for Res. and Technology, Singapore.* A heat source placed in quiescent fluid gives rise to a laminar convective plume. We compute the evolution of a laser beam due to the resultant index of refraction changes induced by the temperature profile.

JWC25
On Simultaneous Measurement of Polarization and Orbital Angular Momentum of Light, *Meenakshi Kohli, K. T. Kapale; Western Illinois Univ., USA.* We have theoretically devised and are experimentally implementing schemes for simultaneous measurement of polarization and orbital angular momentum (OAM) of light with the aim of understanding light carrying OAM emitted by rapidly rotating astrophysical objects.

JWC26
Terahertz Propagation on Plasmonic Crystal Surface, *Eui Su Lee, Young Bin Ji, Sang Hoon Kim, Tae-In Jeon; Korea Maritime Univ., Republic of Korea.* We present experimental and theoretical studies on terahertz surface plasmon propagation on slit and rectangular aperture arrays in an aluminum sheet. Terahertz waves are coupled onto the plasmonic structures via a parallel plate waveguide.

JWC27
Determination of the Beam Coherence-Polarization Matrix for an Expanded Laser Beam, *Bhaskar Kanseri[1], Hem C. Kandpal[1], Shyama Rath[2]; [1]Natl. Physical Lab, India, [2]Univ. of Delhi, India.* The Beam Coherence-Polarization (BCP) matrix for a pair of points in the cross-section of an expanded laser beam is investigated theoretically and determined experimentally using polarizers and rotators in a modified version of Young's interferometer.

Quantum Electronics Posters

JWC28
Atmospheric Propagation of Fiber and Solid State Lasers in Maritime Environments, *Timothy O. Murphy, Matthew A. Leigh, Andrew Baronavski, Adin Kawate; Envisioneering, Inc., USA.* We report atmospheric propagation measurements for lasers in maritime environments at the Pacific Missile Range Facility. Visible and near-IR lasers were directed along shorelines, into a boat, into a helicopter, and to a neighboring island.

JWC29
Observation of Interaction and Circular Motion of Solitons in Bessel-Like Ring Lattices, *Simon Huang, Xiaosheng Wang, Zhigang Chen; San Francisco State Univ., USA.* We demonstrate particle-like soliton interaction and rotation in Bessel-like photonic lattices. Attractive and repulsive rotations as well as planet-like orbiting of two solitons were observed with different initial phase relations.

JWC30
Nonclassical Nature of Counting Probabilities in the Detection of Light from the DPO, *Arnab Mitra, Reeta Vyas, Surendra Singh; Univ. of Arkansas, USA.* We show that both photon number and photoelectron counting probabilities can be used directly to demonstrate the nonclassical nature of light from the degenerate parametric oscillator.

JWC31
Construction of CNOT Using $SWAP^{1/2}$ Gates, *Subramanian Balakrishnan, Ramasubramanian Sankaranarayanan; Natl. Inst. of Technology-Tiruchirappalli, India.* We found that $SWAP^{\alpha}$ gates with $0 \leq \alpha \leq 1$ constitute one edge of Weyl chamber, the geometric structure of nonlocal two-qubit gates. In this family, $SWAP^{1/2}$ is the only perfect entangler and capable of constructing controlled-NOT.

JWC32
Symmetry-Broken Diffraction and Self-Trapping of Multi-Vortex Beams in Triangle Photonic Lattices, *Sheng Liu, Peng Zhang, Xuetao Gan, Jianlin Zhao; Inst. of Optical Information Science and Technology, Northwestern Polytechnical Univ., China.* We study the linear and nonlinear propagation dynamics of multi-vortex beams in a triangle photonic lattice. The symmetry-broken diffraction and moving self-trapping state of the input multi-vortex beam are observed.

JWC33
Polarization Dynamics of Individual Transverse Modes of a Vertical-Cavity Surface-Emitting Laser Subject to Optical Feedback, *Hong Lin, Erik G. Born, Nola J. Palombo, Madeline C. White; Bates College, USA.* We have experimentally studied polarization dynamics of transverse modes in a vertical-cavity surface-emitting laser with optical feedback. Correlation property of orthogonally polarized components of the first-order mode is different from that in the fundamental mode.

JWC34
Timing Jitter in Prelase-Initiated, Single-Mode Pulses from a Repetitively Q-Switched, Diode-Pumped, Nd:YAG Laser, *Henry Baker, Spencer Kimori, John R. Thompson, Thomas Shaffner, Troy J. Siemers; Virginia Military Inst., USA.* Single-mode pulses from an Nd:YAG laser display substantial timing jitter relative to the opening of the Q-switch, which is driven by prelase intensity fluctuations proximate to the opening of the Q-switch.

JWC35
Multi-Normal-Mode Splitting of a Cavity in the Presence of Atoms Towards the Superstrong Coupling Regime, *Jing Zhang[1], Xudong Yu[1], Min Xiao[2]; [1]Inst. of Opto-Electronics, China, [2]Univ. of Arkansas, USA.* Multi-normal-mode splitting peaks are experimentally observed in a system with doppler-broadened two-level atoms inside a relatively long optical cavity in the "superstrong coupling" regime.

Photonics Posters

JWC36
High Sensitivity Recording of Dynamic Population Gratings in Saturable Yb-Doped Fibers at 976nm, *Daniel García-Casillas, Serguei Stepanov; CICESE, Mexico.* High sensitivity recording of population gratings in Yb-doped fiber at typical pumping wavelength λ≈976nm is reported. Effective mixed (amplitude and phase) dynamic gratings with formation times below 1ms were recorded at sub-mW CW power level.

JWC37
Optical Switching by Long Period Grating Inscribed in Panda Fiber for Application in Fiber Communication, *Gagandeep Purohit, Bibhuti Bhushan Padhy, Sandipan Nalawade, Harneet Thakur; Defence Inst. of Advanced Technology, India.* LPGs by electric arc method in panda fiber at different exposure angles are inscribed. The peculiarity of the inscription process made the LPG to behave as thermo-optic switch for its application in communication.

JWC38
Bandwidth Enhancement in Multimode Fibers, *Arash Mafi; Univ. of Wisconsin at Milwaukee, USA.* We report on a substantial improvement in the bandwidth of graded index multimode fibers caused by a controlled intentional mode coupling. Scattering from micron size core inclusions induce the mode coupling with minimum power loss.

JWC39
Arbitrary Shuffler Using Cross-Point Waveguide Mirrors, *Yoichi Taira, Hidetoshi Numata; IBM Res., Tokyo Res. Lab, Japan.* Dual layer waveguides are used to realize an arbitrary channel shuffler. The channel mapping of two parallel waveguides is determined by the positions of optical vias, which consist of laser processed two 45 degree mirrors.

JWC40
Critical Wavelength in SMS Structures Employing GeO_2 Doped MMF, *Saurabh M. Tripathi[1], Emmanuel Marin[2], Arun Kumar[1], Jean-Pierre Meunier[2]; [1]Indian Inst. of Technology Delhi, India, [2]Lab Hubert Curien, Univ. de Lyon, France.* We demonstrate experimentally and explain theoretically that SMS structures employing GeO_2 doped multimode fibers are most sensitive near a critical wavelength and show opposite spectral shift around it with respect to change in ambient temperature.

JWC41
Fiber Optic Bending Sensor Based on Multimode Interference (MMI) Effects, *Daniel Lopez-Cortes[1], Jose R. Guzman-Sepulveda[2], Ivan Hernandez-Romano[1], Miguel Torres-Cisneros[2], Jose J. Sanchez-Mondragon[1], Daniel A. May-Arrioja[1]; [1]INAOE, Mexico, [2]Nanobiophotonics Group, DICIS, Univ. de Guanajuato, Mexico.* Here we report a fiber bending sensor based on multimode interference effects. Sensing is achieved through losses induced in the propagating modes, which directly affects the intensity of the imaged formed by the multimode fiber.

JWC42
Adaptive Interferometer for Detection of Laser Ultrasonic Signals Using Saturable Yb-Doped Fiber at 1064 nm, *Jesus A. Nuñez Quintero, Serguei Stepanov; Ctr. de Investigación Científica y de Educación Superior de Ensenada, Mexico.* Application of two waves mixing via dynamic population gratings in Yb-doped fibers with saturable absorption at 1064 nm for detecting laser induced ultrasonic signals in the linear configuration of an adaptive interferometric vibrometer is reported.

JWC43
Hartmann-Shack Wavefront Sensing of Zernike Polynomials for Nonlinear Materials Characterization, *Diego Rativa[1], Renato de Araujo[2], Brian Vohnsen[1]; [1]School of Physics. Univ. College of Dublin, Ireland, [2]Dept. of Electronics and Systems, Federal Univ. of Pernambuco, Brazil.* We propose a technique exploiting the Hartmann-Shack wavefront sensor as a tool for nonlinear optical characterization. Unlike the conventional Z-scan method, the presented technique is not so sensitive to misalignment, linear scattering, and sample imperfections.

JWC44
Long-Range Surface-Plasmon Waveguide Sensors with μ-Fluidic Channel, *Yang Joo[1], Seok Song[1], Daryl Ussery[2], Kyu Lee[2], Robert Magnusson[2]; [1]Dept. of Physics, Univ. of Hanyang, Republic of Korea, [2]Dept. of Electrical Engineering, Univ. of Texas at Arlington, USA.* Long-range surface-plasmon waveguide sensors consisting of asymmetric double metalfilms, a resonance grating and μ-fluidic channel sandwiched between the metal layers are described. 10^{-6} index resolution and sub-nm detection limit for sensing biomolecules are achievable.

For Fall Congress presentations on Wednesday, see pages 125-131.

JWC • Joint FiO/LS Poster Session—Continued

JWC45
Dependence of Parametric Gain on Crystal Parameters in Unidirectional Photorefractive Ring Cavity, *Mahendra K. Maurya, Tarun Kumar Yadav, Ram Anjore Yadav; Banaras Hindu Univ., India.* The dependence of parametric gain due to the two-beam coupling on absorption coefficient of materials and modulation ratio has been studied. Such amplification of signal beam is responsible for the oscillations.

JWC46
Fiber-Optic RF Phase Shifter, *Alex Mulvihill, Azad Siahmakoun; Physics and Optical Engineering, Rose-Hulman Inst. of Technology, USA.* A photonic RF phase shifter based on optical modulation and switching with capability of continuous 0°-360° phase-shifting is demonstrated. Experimental results for phase shifting in 50 MHz steps up to 0.5 GHz will be presented.

JWC47
Impact of the Gain Saturation on Steady States of Bright Optical Pulses in an Erbium-Doped Single-Mode Fiber Amplifier, *Mauro Sánchez Sánchez[1], Alexandre S. Shcherbakov[2]; [1]Univ. del Papaloapan Campus Loma Bonita, Mexico, [2]Inst. Nacional de Astrofisica, Óptica y Electrónica, Mexico.* Steady ultrashort bright optical pulses, which are originating in single-mode erbium-doped amplifier operating within a nonlinear transmission, are investigated. The amplitude and frequency distributions are estimated, and the impact of the gain saturation is revealed.

JWC48
All-Optical TE-TM Polarization Mode Conversion at 500Gb/s by Using Nonlinearities in SOAs, *Claudio Crognale, Antonella Di Giansante; Technolabs S.p.A., Italy.* Extreme optical gain nonlinear features in SOAs have been numerically investigated analyzing the performances of an interferometric SOA-based scheme capable to perform the all-optical polarization conversion of a 500Gb/s data-stream without any pattern-dependence.

JWC49
Bit Error Control for Optical Chaotic Communication by Applying Low-Frequency Noise, *Satoshi Ebisawa[1], Shinichi Komatsu[2]; [1]Gakushuin Univ., Japan, [2]Waseda Univ., Japan.* We numerically study the effect of channel noise in the chaotic laser diode transmitter-receiver array scheme, and show that the bit error rate can be decreased by applying low-frequency noise.

JWC50
CAD Analysis of Four Co-Propagating Spatial Domain Multiplexed (SDM) Channels of Same Wavelength in Optical Fibers, *Syed H. Murshid, Abhijit Chakravarty, Raka Biswas; Florida Inst. of Technology, USA.* A four channel spatially multiplexed optical system has been designed using commercially available CAD software. Two dimensional intensity plot and three dimensional beam profiles with CAD simulated output data are presented in this paper.

JWC52
Detection of Eavesdropping for Point-to-Multipoint Optical Chaotic Communication, *Kengo Suyama[1], Satoshi Ebisawa[2], Shinichi Komatsu[1]; [1]Waseda Univ., Japan, [2]Gakushuin Univ., Japan.* Based on the characteristics of point-to-multipoint optical chaotic communication system, we discuss the effect of parameter mismatch between the transmitter and receiver laser diodes and propose a new method for reasonably efficient of detecting eavesdropping.

JWC53
Design and Fabrication of Multilayer Si/SiO_2 Super-High N.A. GRIN Lens for Nanowaveguide to Optical Fiber Coupling, *Ter-Hoe Loh[1], Qian Wang[1], Keh-Ting Ng[1], Yingyan Huang[2], Seng-Tiong Ho[3]; [1]Data Storage Inst., Singapore, [2]OptoNet Inc., USA, [3]Northwestern Univ., USA.* Compact multilayer Si/SiO_2 asymmetric GRIN lens (length:10~20μm) for vertical optical mode-size transformation from sub-0.5μm of nanowaveguide to ~10μm of single-mode-fiber, is proposed and designed. We report success in deposition and etching of 6~8μm multilayer Si/SiO_2.

JWC54
Plasmonic Light Beaming Properties of Dual Sub-Wavelength Slits with Dielectric Surface Gratings, *Seyoon Kim, Junghyun Park, Yongjun Lim, Byoungho Lee; Seoul Natl. Univ., Republic of Korea.* We numerically examine beaming properties of dual sub-wavelength slits with dielectric surface gratings. The dual sub-wavelength slits are used to generate two plasmonic sources having different phases for exciting plural surface plasmon polariton modes.

JWC55
Study of Electromagnetic Waves Propagation through Metamaterials, *Héctor Kinto Ramírez[1], Martha Alicia Palomino Ovando[1], Felipe Ramos Mendieta[2]; [1]Benemérita Univ. Autónoma de Puebla, Mexico, [2]Univ. Autónoma de Sonora, Mexico.* We calculate transit time of electromagnetic Gaussian packets traversing a periodic structure of alternate layers of dielectric-metamaterial, the packets are tuned at the tunneling modes that appear in the gap and we find superluminal phenomenon.

JWC56
Fabrication of Surface Plasmon-Polariton Couplers and Waveguide Devices, *Daryl Ussery[1], Hahn Young Song[1], Kyu Jin Lee[1], Robert Magnusson[1], Seok Ho Song[2]; [1]Univ. of Texas at Arlington, USA, [2]Hanyang Univ., Republic of Korea.* Described is holographic stepping-lithography fabrication of grating couplers and waveguide platforms for efficient surface plasmon-polariton (SPP) excitation on metallic structures. This provides consistent coupling with design flexibility and high efficiency for various SPP nanophotonic devices.

JWC57
Guided-Mode Resonances in Surface Plasmonic Waveguides, *Hahn Y. Song[1], Sangin Kim[2], Kyu J. Lee[3], Robert Magnusson[3]; [1]KAIST, Republic of Korea, [2]Ajou Univ., Republic of Korea, [3]Univ. of Texas at Arlington, USA.* Guided-mode resonances in single- and double-layer thin metal films with periodic slits have been investigated theoretically. The excitation of the surface plasmons (SPs) and resonance tuning through SP mode coupling are presented.

JWC58
Hole Depth Studies in Single-Defect Photonic Crystal Vertical-Cavity Surface-Emitting Lasers Using 3-D FDTD Simulations, *Kirk Ingold, Lisa Shay, Gregory Kilby; United States Military Acad., USA.* Three-dimensional finite difference time domain calculations are performed on single defect photonic crystal vertical-cavity surface emitting lasers. Simulation results are presented in comparison with measured near- and far-field radiation patterns and optical spectrum measurements.

JWC59
New Distributions with Soliton-Type Behavior and Their Waveguide Properties in Kerr Media, *Daysi Ramírez Martínez, Maribel M. Méndez Otero, M. Luis Arroyo Carrasco, Marcelo D. Iturbe Castillo; Benemérita Univ. Autónoma de Puebla, Mexico.* Novel field distributions for a positive and negative nonlinear Kerr media are propagated numerically obtaining a spatial soliton-like behavior. Their waveguide properties are analyzed and compared with ideal solitons.

Optics in Biology and Medicine Posters

JWC60
Optical Tweezing near and Far from Resonance, *Brooke C. Hester[1], Rani Kishore[1], Kristian Helmerson[1], Carly Levin[2], Naomi Halas[2]; [1]NIST, USA, [2]Dept. of Electrical and Computer Engineering, Rice Univ., USA.* We study the effects of optical tweezing near and far from the optical resonance of the trapped object. Single particles are manipulated and studied using a single-focus optical trap with variable wavelength.

JWC61
Analysis of Interference Patterns of Optical Vortices in Monochromatic and Polychromatic Light, which Passed Stochastic Screen, *Vladlen G. Shvedov, Vladimir I. Shostka, Nataliya V. Shostka; Taurida Natl. V. Vernadsky Univ., Ukraine.* The possibility of diagnostic phase singularities using stochastic screen, made from a number of couples of points with various orientation and equal length, joining centers of each couple of holes, is described in our work.

JWC62
Spatial Beam Endorsed Optical Trapping of Multiple Au Nanoparticles/*E. coli* and Gateway to Plasmonic Sensors, *Ranjeet Kumar, Chandra Shakher, Dalip Singh Mehta; Indian Inst. of Technology Delhi, India.* We demonstrate multiple trapping of Au nanoparticles (253 nm.) and also low refractive index microorganism *E.coli* bacteria, which is made possible by intra-cavity generated spatially inhomogeneous laser beam in optical tweezers.

JWC63
Superresolution Imaging and Force Characterization of Optical Tweezers Using High-Speed Cameras, *Juan P. Staforelli, Jose M. Brito, Esteban Vera, Carlos Saavedra, Sergio Torres; Univ. of Concepcion, Chile.* We propose a novel approach for using a high-speed camera for the characterization of optical tweezers by registering the trapped particle subpixel motion, while still providing simultaneous high resolution imaging by using multiframe superresolution.

JWC64
Compact Optical Tweezers Based on SLM for Real-Time Optical Trapping and Manipulation, *Martin Nyvlt, Marek Skeren; Czech Technical Univ. in Prague, Czech Republic.* We report a compact holographic optical tweezers based on an LCoS SLM. Optical traps are generated by diffraction of light on the Fresnel-type hologram generated by a fast parallel algorithm that enables real-time 3-D manipulation.

JWC65
The Multilayered Biological Structure Optical Characteristic Mathematical Modeling by Intracavity Laser Spectroscopy Method, *Kirill Kulikov; St. Petersburg Polytechnical State Univ., Russian Federation.* A mathematic model is constructed for predicting of the absorption spectrum and dispersion of a section of a biological structure in the cavity of an optical resonator.

JWC66
A Study of Fibroblast Growth Factor and Its Receptor Complex Using Light Scattering, *Pallavi Sharma, Dakshinamurthy Rajalingam, T. K. S. Kumar, Surendra Singh; Univ. of Arkansas, USA.* Dynamical light scattering technique was used to study the interaction of fibroblast growth factor and its receptor proteins in solution.

JWC67
Digital-Optical Experimental Set up for *in vitro* Cell Tracking Based on Cross Correlation Technique, *Irais V. Solís[1], Miguel Torres-Cisneros[1], Juan G. Aviña-Cervantes[1], Oscar G. Ibarra-Manzano[1], Eduardo Aguilera-Gómez[1], Hector Plascencia-Mora[1], Javier J. Sanchez-Mondragón[2]; [1]Nanobiophotonics Group, DICIS, Univ. de Guanajuato, Mexico, [2]Photonics and Physical Optics Lab, Inst. Nacional de Astrofisica, Óptica y Electrónica, Mexico.* An automatic cell tracking system based in the NCC technique is proposed. Image operations were performance by a FPGA while Fourier transforms were done by an optical correlator. The time consuming was reduced about 70%.

JWC68
Fluorescence Immunoassay for the Detection of Latent Tuberculosis Antigens with Single Molecule Sensitivity, *Barbara S. Smith, Michael S. Scherman, Aubrey V. Weigel, Kristen L. Jevsevar, Jarvis W. Hill, John S. Spencer, Michael R. McNeil, Diego Krapf; Colorado State Univ., USA.* The successful identification and detection at the single molecule level of Antigen 85b, an antigen released by tuberculosis, was accomplished using a fluorescence-based immunoassay. This work enables a method for the diagnosis of latent tuberculosis.

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JWC69
Development of Lipid Targeted Raman Probes for *Caenorhabditis elegans*, *Shobhit Charan[1,2,3], Fan-Ching Chien[3], Narendra Singh[3], Peilin Chen[3]; [1]Dept. of Chemistry, Natl. Taiwan Univ., Taiwan, [2]Taiwan Intl. Graduate Program, Nanoscience and Technology Program, Academia Sinica, Taiwan, [3]Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan.* We have developed a nanoparticle based Raman probe (Ag@ Nile Red), which was capable of targeting the lipids, therefore, revealing the location of lipid droplets in live *Caenorhabditis elegans (C. elegans)*.

JWC70
Pseudo-Periodic Pattern for Absolute Bidimensional Position Retrieval of a Zone of Interest under Microscope, *July A. Galeano Zea, Patrick Sandoz; Univ. de Franche-Comte, France.* Vision system is used for absolute position measurement of a zone of view under microscope using pseudo-periodic pattern. Superimposition of recorded images in a common position reference system with subpixel accuracy is obtained by phase-computation.

JWC71
Towards Deformable Mirror Calibration Using Phase Diversity in Objective Coupled Planar Illumination Microscopy, *Diwakar Turaga, Timothy E. Holy; Washington Univ. School of Medicine, USA.* We have introduced a deformable mirror (DM) in the emission path of an OCPI microscope to allow for adaptive optics using phase diversity imaging. Currently we are implementing phase diversity algorithms to calibrate the DM.

JWC72
Super-Resolution Localization Microscopy by Quantum Dot Blinking, *Fan-Ching Chien, Peilin Chen; Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan.* The blinking effects of quantum dots have been utilized to localize individual quantum dots, which couldn't be resolved by conventional microscopy. It has been demonstrated that quantum dots could be localized with sub-10 nanometer resolution.

JWC73
Study of the Transversal Misalignment of an Axicon, *Pascal Dufour, Gabrielle Thériault, Yves De Koninck, Nathalie McCarthy; Univ. Laval, Canada.* We calculated the effect of the misalignment of a Gaussian beam with respect to an axicon and found that for small displacements, the focal line preserves its resolution and remains parallel to the optical axis.

JWC74
Noninvasive Estimation of Cultured Cell Conditions by a Laser Speckle Microscopy, *Yasuyuki Hirakawa[1], Yukihiro Fukunaga[2], Norio Miyoshi[2]; [1]Kurume Natl. College of Technology, Japan, [2]Univ. of Fukui, Japan.* Microscopic laser speckle observations of three types of human prostate cancers revealed that the laser speckle fluctuated differently depending not only on the cell line but also on the cell's ability to divide.

JWC75
Development of an Integrated Multiplexed Low Coherence Interferometer and Fluorescence Clinical Endoscope, *Kyu Hyun Kim, Tyler K. Drake, Michael G. DeSoto, Marcus H. Henderson, David F. Katz, Adam Wax; Duke Univ., USA.* The performance of a novel clinical endoscope with integrated multiplexed LCI and fluorescence measurements is evaluated. Feasibility and accuracy for measuring microbicidal gel distribution and thickness in the vaginal tract will be assessed.

JWC76
Formation and Functionalization of Metallic Nanoparticles with Biomimetic Multifunctional Catechols, *Kvar C. L. Black, Jose G. Rivera, Kelly M. Luckasevic, Zhongqiang Liu, Phillip B. Messersmith; Northwestern Univ., USA.* Catechols are employed by many organisms for diverse functions such as photoprotection, adhesion, immunity, and neuromodulation. We report the use of catechol-containing molecules as a biomimetic strategy to form and functionalize optically-active metallic nanoparticles (NPs).

Vision and Color Posters

JWC77
Spectral and Spatial Characteristics of the First Stiles-Crawford Effect: Experiment and Theory, *Brian Vohnsen, Diego Rativa; Univ. College Dublin, Ireland.* The first Stiles-Crawford effect describes a pupil-dependent visibility of a narrow light beam. Here new experiments are compared with theoretical analysis of retinal waveguiding across the visible spectrum to elucidate the influence of cone pigments.

JWC78
A Potential S-Cone Dominated ERG Response Shows Robust Delays in Type 1 Diabetes, *Tom Wright[1,2], Josefin Nilsson[2], Michelle McFarlane[1,3], Carol A. Westall[1,3]; [1]Hospital For Sick Children, Canada, [2]Sahlgrenska Acad., Sweden, [3]Dept. of Ophthalmology and Vision Sciences, Univ. of Toronto, Canada.* Diabetic retinopathy is a common, irreversible outcome of diabetes. Early detection is essential for successful intervention. A new s-cone dominated ERG response shows robust delays in adolescents with Type 1 diabetes prior to retinopathy.

JWC79
Validation of Computational Model for Predicting Visual Acuity from Wavefront Aberration Measurements, *Azadeh Faylienejad, Vasudevan Lakshminarayanan; Univ. of Waterloo, Canada.* Predictions of visual acuity by a model are evaluated by comparing to experimental results. Different levels of internal noise and thresholds were used. This template matching model gives good results in the presence of aberrations.

JWC80
A New Fast Scanning Infrared Photoretinoscope to Measure Peripheral Refraction as a Function of Accommodation, *Juan Tabernero, Frank Schaeffel; Inst. for Ophthalmic Res. Tubingen, Germany.* A new instrument designed to provide fast measurements (4 seconds) of the peripheral refraction (±45° horizontal field) is presented. Peripheral refraction in the vertical pupil meridian was measured as a function of the accommodative state.

JWC81
Strehl Ratio and Visual Acuity in a Pre-School Population, *Damber Thapa, Andre Fleck, William R. Bobier, Vasudevan Lakshminarayanan; Univ. of Waterloo, Canada.* Strehl ratios were calculated from MTFs obtained from Hartmann-Shack images. These were compared to three visual acuity groups of 6/6, 6/9 and 6/12. No significant differences in Strehl ratios were observed.

Optics in Information Science Posters

JWC82
Novel Colored Pulse Lasers Photography for High Speed Imaging, *Chien-Sheng Liu, Chia-Hsu Chen, Chia-Chao Chung, Po-Heng Lin, Kung-Hsuan Lin; Industrial Technology Res. Inst., Taiwan.* This study proposes a colored laser photography to obtain color images. Based on the RGB synthesis technique, a novel colored pulse lasers photography is designed for high speed imaging.

JWC83
3-D Field Correlation of Speckles Generated by Pupils with Multiple Apertures, *Alberto Lencina, Myrian Tebaldi, Néstor Bolognini; CIOp (CONICET La Plata - CIC), Argentina.* 3-D field correlation of objective speckles is evaluated for systems whose pupils have multiple apertures. Minimal suppositions were made on speckle and pupil properties. As a particular case, longitudinal correlations for square apertures are analyzed.

JWC84
Orbital Angular Momentum of Light in the Radio Range of the Electromagnetic Spectrum, *Jacob E. Brown, K. T. Kapale; Dept. of Physics, Western Illinois Univ., USA.* We study generation and detection of orbital angular momentum (OAM) of light in the radio range of the electromagnetic spectrum with potential application to understand OAM light that emitted by radio-active astrophysical objects.

12:00 p.m.–1:30 p.m. Lunch Break *(on your own)*

For Fall Congress presentations on Wednesday, see pages 125-131.

JOINT FiO/LS

1:30 p.m.–3:30 p.m.
JWD • Entanglement Generation and Measurement III
Kevin J. Resch; Inst. for Quantum Computing, Canada, Presider

JWD1 • 1:30 p.m. Invited

Strong Interactions of Single Atoms and Photons with Toroidal Micro-Resonators, *H. Jeff Kimble; Caltech, USA.* Strong radiative coupling between one atom and photon has been achieved with high-Q micro-toroidal resonators, thereby providing capabilities for diverse advances in quantum information science, including an efficient router for single photons and atom-atom interactions catalyzed by one photon.

JWD2 • 2:00 p.m.

Quantum Entanglement, Antibunching and Saturation of Atoms in Dipole Blockade, *Jeremie Gillet[1], Girish Agarwal[2], Thierry Bastin[1]; [1]Univ. de Liège, Belgium, [2]Oklahoma State Univ., USA.* We show how dipole blockade leads to quantum entanglement and antibunching of atoms. We further show how dipole blockade can be lifted by saturating the optical transitions.

FiO

1:30 p.m.–3:30 p.m.
FWO • OSA Topical Meeting Highlights I
Michael Duncan; NRL, USA, Presider

FWO1 • 1:30 p.m. Invited

Active Terahertz Metamaterials, *Hou-Tong Chen, John F. O'Hara, Abul K. Azad, Antoinette J. Taylor; Los Alamos Natl. Lab, USA.* We demonstrate THz metamaterials exhibiting either amplitude/phase control, via carrier injection or depletion in the active semiconductor substrate or frequency control, via photoexcitation of carriers into active semiconducting materials incorporated into the sub-wavelength metamaterial structure. (Nonlinear Optics, 2009)

FWO2 • 2:00 p.m. Invited

Photonics in Supercomputing: The Road to Exascale, *Jeffrey Kash; IBM Res., USA.* Optical interconnects in present and future supercomputers are reviewed, emphasizing Exaflop performance circa 2020, which is 1000X today's Petaflop computers. Power, density and cost requirements become increasingly stringent, ultimately driving the need for on-chip optics. (Integrated Photonics and Nanophotonics Research and Applications, 2009)

1:30 p.m.–3:30 p.m.
FWP • Metamaterials III
Yeonghwan Ahn; Ajou Univ., Republic of Korea, Presider

FWP1 • 1:30 p.m. Invited

Ultrafast Optical Nonlinearities in Hybrid Metal-J-Aggregate Nanostructures, *Christoph Lienau; Carl von Ossietzky Univ., Germany.* We study for the first time, the ultrafast optical nonlinearities of hybrid, metal-J-aggregate nanostructures using angle-resolved pump-probe-spectroscopy. Our results demonstrate that the strong coupling between surface plasmon polaritons and excitons drastically alters the polariton dynamics.

FWP2 • 2:00 p.m.

Characterization of the Loss in Plasmonic Modes of Metal-Insulator-Metal Waveguides by a Prism-Coupling Approach, *Chien-I Lin, Thomas K. Gaylord; Georgia Tech, USA.* A prism-coupler-based method is presented for characterizing plasmonic modes in metal-insulator-metal waveguides from the reflected power in a transverse configuration. The loss is obtained without physically changing the waveguide length as in conventional methods.

1:30 p.m.–3:15 p.m.
FWQ • Phase Space Optics—Optical System Theory for the 21st Century I
Markus Testorf; Dartmouth College, USA, Presider

FWQ1 • 1:30 p.m. Tutorial

Wigner Distribution, Partial Coherence, and Phase Space Optics, *Martin J. Bastiaans; Dept. of Electrical Engineering, Eindhoven Univ. of Technology, Netherlands.* The Wigner distribution is presented as a perfect means to treat partially coherent optical signals and their propagation through first-order optical systems from a radiometric and phase-space optical perspective.

Martin J. Bastiaans received an M.Sc. degree in electrical engineering (with honors) and a Ph.D. degree in technical sciences from Eindhoven University of Technology, Netherlands, in 1969 and 1983, respectively. In 1969, he became an assistant professor and, since 1985, he has been an associate professor with the Department of Electrical Engineering, Eindhoven University of Technology, currently in the Signal Processing Systems Group. His research covers different aspects in the general field of signal and system theory and includes a signal-theoretical approach of all kinds of problems that arise in Fourier optics. His main current research interest is in describing signals by means of a local frequency spectrum (such as the Wigner distribution) and related issues. Dr. Bastiaans is a Fellow of OSA and a senior member of IEEE. He is the author and co-author of more than 175 papers in international scientific journals, books and proceedings of scientific conferences.

1:30 p.m.–3:30 p.m.
FWR • Novel Optical Architectures in Emerging Technologies I
R. John Koshel; Photon Engineering LLC and College of Optical Sciences, Univ. of Arizona, USA, Presider

FWR1 • 1:30 p.m. Invited

Biomolecular Sensing with Ultrafine Optical Fibers and Plasmonic Nanostructures, *Donald J. Sirbuly[1], Sarah Baker[3], Sanja Zlatanovic[2], Jason Steiner[1], Sadik Esener[1,2], [1]NanoEngineering Dept., Univ. of California at San Diego, USA, [2]Electrical and Computer Engineering, Univ. of California at San Diego, USA,[3]Physical and Life Sciences Directorate, Lawrence Livermore Natl. Lab, USA.* Unique optical properties of one-dimensional semiconductor nanostructures will be presented and their use in compact evanescent field bio-detection systems discussed. These optical cavities are integrated into microfluidic flow cells for chemical functionalization, and multiplexed sensing.

FWR2 • 2:00 p.m. Invited

Advances in Microendoscope Design and Application, *Arthur Gmitro, Houssine Makhlouf, Andrew Rouse; Univ. of Arizona, USA.* Significant advances have been made in the design and application of confocal microendoscope systems for *in vivo* imaging of the human body. This presentation will review progress in the field and highlight important clinical applications.

For Fall Congress presentations on Wednesday, see pages 125-131.

FiO

1:30 p.m.–3:30 p.m.
FWS • Optical Trapping and Micromanipulation II
Presider to Be Announced

FWS1 • 1:30 p.m. Invited

High-Resolution, High-Stability, High-Frequency Optical Tweezers Methods with a Simple Video Camera, *Wesley Wong; Rowland Inst., Harvard Univ., USA.* We have developed a number of optical tweezers techniques for performing high-resolution (3-D, angstrom-level), high-stability (1-2 nm long-term), high-frequency (> 100 kHz) measurements using inexpensive video microscopy. Experimental demonstrations include quantification of protein folding kinetics.

FWS2 • 2:00 p.m.

Development of a Compact and High-Throughput Laser Trap Raman System for Fully Automated Single Cell Analysis, *Rui Liu[1], Tobias Moritz[1], Douglas Taylor[1,2], Dennis Matthews[1,3,4], James Chan[1,3]; [1]NSF Ctr. for Biophotonics Science and Technology, Univ. of California at Davis, USA, [2]Dept. of Pediatrics, Univ. of California at Davis Medical Ctr., USA, [3]Lawrence Livermore Natl. Lab, USA, [4]Dept. of Applied Science, Univ. of California at Davis, USA.* The translation of laser tweezers Raman spectroscopy is impeded by several instrumentation limitations. This paper presents our latest work in developing a faster (< 10s acquisition time), compact system for fully automated single cell analysis.

1:30 p.m.–3:15 p.m.
FWT • Plasmonic Sensors
Banshi D. Gupta; Indian Inst. of Technology Delhi, India, Presider

FWT1 • 1:30 p.m. Invited

Plasmonics on Optical Fibers: New Tools for Biochemical Sensing, *Jacques Albert, Maria Derosa, Anatoli Ianoul, Yanina Shevchenko, Alexander Beliaev, David A. D. Blair, Nur Ahamad; Carleton Univ., Canada.* Standard optical fibers coated with metal layers support plasmonic resonances at near infrared wavelengths. We use a fiber Bragg grating to measure their response to surface biochemical reactions involving DNA and proteins.

FWT2 • 2:00 p.m.

Surface-Enhanced Raman Spectroscopy with Gold Nanoring Dimers, *Mohamad G. Banaee, Kenneth B. Crozier; School of Engineering and Applied Science, Harvard Univ., USA.* Surface-enhanced Raman scattering of benzenethiol on gold nanoring dimers with 20 nm gaps was studied. The localized surface plasmon resonance wavelength was determined using reflection spectroscopy. A SERS enhancement factor of 2.0×10^6 was obtained.

LS

1:30 p.m.–3:30 p.m.
LSWG • Ultrafast Spectroscopy I
Marc Achermann; Univ. of Massachusetts Amherst, USA, Presider

LSWG1 • 1:30 p.m. Invited

Ultrafast Photoemission Electron Microscopy: Imaging Nonlinear Plasmonic Phenomena on the Femto/Nano Scale, *Hrvoje Petek; Univ. of Pittsburgh, USA.* By time-resolved two-photon photoemission electron microscopy, we generate movies with <50 nm spatial resolution and 330 as frame rate of surface plasmon dynamics defined by lithographically formed nano-optical elements in silver films.

LSWG2 • 2:00 p.m. Invited

New Interface-Selective Electronic Spectroscopy and Its Extension to Femtosecond Time-Resolved Measurements, *Tahei Tahara; RIKEN, Japan.* We report multiplex electronic sum-frequency generation (ESFG) spectroscopy and its extension to femtosecond time-resolved measurements (TR-ESFG), which provide unprecedentedly high-quality electronic spectral data containing rich information on static and dynamic properties of interfacial molecules.

1:30 p.m.–3:15 p.m.
LSWH • Second-Order Nonlinear Optics III
Ben Schwartz; Univ. of California at Los Angeles, USA, Presider

LSWH1 • 1:30 p.m. Invited

Imaging Nonlinear Optical Stokes Ellipsometry for Thin Film and Microparticle Characterization, *Nathan J. Begue, Garth J. Simpson; Purdue Univ., USA.* Nonlinear optical Stokes ellipsometry (NOSE) is shown to routinely provide precision of a few parts in 1000 in 12 ms acquisition times for determination of the $\chi^{(2)}$ tensor elements of thin films, enabling imaging applications with detailed polarization characterization.

LSWH2 • 2:00 p.m. Invited

Electronically Resonant Hyper-Raman Scattering in Solution, *Anne M. Kelley; Univ. of California at Merced, USA.* The theory and phenomenology of electronically resonant hyper-Raman scattering from organic molecules in solution is reviewed and its relationship to other electronically resonant nonlinear vibrational spectroscopies is discussed.

1:30 p.m.–3:00 p.m.
LSWI • Multidimensional Spectroscopy III
David Blank; Univ. of Minnesota, USA, Presider

LSWI1 • 1:30 p.m. Invited

Femtosecond Vibrational Optical Activity and IR Photon Echo Studies of Small Organic Molecules, *MinHaeng Cho; Korea Univ., Republic of Korea.* Ultrafast characterization of vibrational circular dichroism and optical rotatory dispersion is shown to be experimentally feasibly by using heterodyned spectral interferometric detection of the phase and amplitude of infrared optical activity free-induction-decay field in time.

LSWI2 • 2:00 p.m. Invited

Correlating Energy Transport Time on a Molecular Level with Distance Using Relaxation-Assisted 2DIR, *Igor V. Rubtsov[1], Valeriy M. Kasyanenko[1], Zhiwei Lin[1], Christopher S. Keating[1], Grigory I. Rubtsov[2], James P. Donahue[1]; [1]Tulane Univ., USA, [2]Inst. for Nuclear Res., Russian Federation.* A relaxation-assisted two-dimensional infrared spectroscopy method in discussed that relies on energy transport on a molecular level and shows strong cross-peak amplifications in various molecular systems, including peptides, model compounds, and transition metal complexes.

For Fall Congress presentations on Wednesday, see pages 125-131.

JOINT FiO/LS

JWD • Entanglement Generation and Measurement III—Continued

JWD3 • 2:15 p.m.
Quantum Chemistry on a Quantum Computer: First Steps and Prospects, *B. P. Lanyon[1], J. D. Whitfield[2], G. G. Gillett[1], M. E. Goggin[1], M. P. Almeida[1], I. Kassal[2], J. D. Biamonte[2], M. Mohseni[2], B. J. Powell[1], M. Barbieri[1], A. Aspuru-Guzik[2], Andrew G. White[1]; [1]Univ. of Queensland, Australia, [2]Harvard Univ., USA.* We use a photonic quantum computer to simulate the hydrogen molecule. This is the first experimental demonstration of efficient quantum chemistry, which promises to be a powerful new tool in biology, chemistry, and materials science.

JWD4 • 2:30 p.m.
Continuous Variable EPR Paradox for Angle and Orbital Angular Momentum, *Jonathan Leach[1], Barry Jack[1], Jacq Romero[1], Bob Boyd[2], Anand Jha[2], Steve M. Barnett[3], Sonja Franke-Arnold[1], Miles Padgett[1]; [1]Univ. of Glasgow, UK, [2]Univ. of Rochester, USA, [3]Univ. of Strathclyde, UK.* We demonstrate the Einstein-Podolsky-Rosen paradox for angle and orbital angular momentum states of light. We show strong angular position and orbital angular momentum correlations therefore demonstrating the quantum nature of the entangled light field.

JWD5 • 2:45 p.m.
Energy-Time Entanglement between Photons and Photon-Holes, *Serge Rosenblum, Meir Orenstein; Technion-Israel Inst. of Technology, Israel.* We propose a source that creates photon-holes in coherent beams. As a byproduct, the photon-hole creation is accompanied by emission of a photon that is energy-time entangled with the hole, allowing violation of Bell's inequality.

FiO

FWO • OSA Topical Meeting Highlights I—Continued

FWO3 • 2:30 p.m. Invited
Optical Manipulation of Femtoliter Aqueous Droplets for Nanochemistry Applications, *Ana Jofre, Ben Faulk, Jason Case; Univ. of North Carolina at Charlotte, USA.* We control and observe femtoliter volume reactions within aqueous nanodroplets. Chemical reagents sequestered in the nanodroplets mix when the nanodroplets are fused via optical manipulation. The subsequent reaction is probed by means of fluorescence excitation. (Optical Trapping Applications, 2009)

FWP • Metamaterials III—Continued

FWP3 • 2:15 p.m.
Soliplasmon Excitations at Metal/Dielectric/Kerr Structures, *Albert Ferrando[1,2], Yuri P. Bliokh[3], Konstantin Yu Bliokh[4,5], Mario Zacarés[2], Carles Milián[2,6], Daniel E. Ceballos[7]; [1]Dept. d'Òptica, Univ. de València, Spain, [2]Inst. Universitario de Matemática Pura y Aplicada (IUMPA), Univ. Politécnica de Valencia, Spain, [3]Technion-Israel Inst. of Technology, Israel, [4]Inst. of Radio Astronomy, Ukraine, [5]Dept. of Experimental Physics. Natl. Univ. of Ireland, Ireland, [6]ITACA, Univ. Politécnica de Valencia, Spain, [7]Ctr. de Investigaciones en Óptica A.C., Mexico.* We present novel optical phenomena based on the existence of a new type of quasi-particle excitation in metal/dielectric/Kerr structures. We discuss the possibility of excitation of surface plasmon polaritons via spatial solitons in these systems.

FWP4 • 2:30 p.m. Invited
Tailoring Polarization States of Visible Light through Metallic Nanostructures, *J.-Y. Laluet, E. Laux, E. Lombard, A. Drezet, C. Genet, Thomas W. Ebbesen; Univ. de Strasbourg and CNRS, France.* We focus on the possibility offered through the control of surface plasmons by metallic nanostructures (in particular chiral structures) to design optical devices with specific polarization properties. Our systems operate in the visible range.

FWQ • Phase Space Optics—Optical System Theory for the 21st Century—Continued

FWQ2 • 2:15 p.m. Invited
The Connection between Rays and Waves, *Miguel A. Alonso; Inst. of Optics, Univ. of Rochester, USA.* A survey of several ways of understanding the connection between the ray and wave models is presented, and many standard methods for estimating the propagation of waves based on rays are described and compared.

FWQ3 • 2:45 p.m. Invited
Novel Optical Devices for Extended Field of View, *Jorge Ojeda-Castañeda; Univ. of Guanajuato, Mexico.* We apply the ambiguity function for identifying and for analyzing a novel family set of phase-only masks that extend the depth of field, in a tunable fashion.

FWR • Novel Optical Architectures in Emerging Technologies I—Continued

FWR3 • 2:30 p.m.
Head Tracking for Real-Time Motion Correction in the MRI Environment Using a Single Camera, *Chester Wildey, Duncan MacFarlane; Univ. of Texas at Dallas, USA.* An optical head tracker for the MRI environment is reported. The system utilizes a single ccd camera, DSP and a 3-dimensional fiducial to realize real time 6-DOF motion measurement at rates of 10 Hz.

FWR4 • 2:45 p.m.
Enhanced Light Collection from a Point Fluorescent Source Using Multiscale Optics, *Rachel Noek, Justin Migacz, Caleb Knoernschild, Taehyun Kim, Jungsang Kim; Duke Univ., USA.* We have demonstrated enhancement of point source light collection by a factor of 18 over a traditional f/2.55 imaging system (~17%) across a 15 mm object space by integrating a high numerical aperture micromirror.

For Fall Congress presentations on Wednesday, see pages 125-131.

FiO

FWS • Optical Trapping and Micromanipulation II—Continued

FWS3 • 2:15 p.m.
Optical Manipulation with Particles Using the Holographic Optical Tweezers on Special Microfluidic Substrates, *Marek Škereň, Martin Nývlt, David Najdek, Pavel Fiala; Czech Technical Univ., Czech Republic.* Optical manipulation is presented with various micro-particles on special relief substrates working as the microfluidic devices. The substrates are prepared using the laser lithography. The manipulation is realized using the holographic optical tweezers.

FWS4 • 2:30 p.m. Invited
Optical Phase Conjugation for Tissue Turbidity Suppression, *Changhuei Yang, Meng Cui, Emily McDowell; Caltech, USA.* We will discuss our recent findings on the use of optical-phase-conjugation to undo optical tissue scatterings. Amongst other results, we discovered that light scattered hundreds of times still retains sufficient memory to enable path retracing.

FWT • Plasmonic Sensors—Continued

FWT3 • 2:15 p.m.
Wavelength and Pd Thickness Optimization for SPR-Based Hydrogen Sensors, *Gustavo O. Cavalcanti[1], Sergio C. Oliveira[2], Eduardo Fontana[1], Antonio Azevedo[1]; [1]Univ. Federal de Pernambuco, Brazil, [2]Univ. de Pernambuco, Brazil.* We investigate both theoretically and experimentally the performance of Pd films for hydrogen detection based on the surface plasmon resonance effect. Results yield important findings for the design of SPR-based H_2 sensors with maximum sensitivity.

FWT4 • 2:30 p.m.
Interfering SPR Sensor with Radial Polarization, *Tzu-Hsiang Lan, Chung-Hao Tien; Natl. Chiao Tung Univ., Taiwan.* For a collinear SPR sensor, the refractive-index-sensing range was constrained by objective lens. Utilizing the interfering SPPs, we demonstrated a new scheme to extend the measured range from 1.3 to 1.5 in a 1.45-NA microscopy.

FWT5 • 2:45 p.m.
Surface-Enhanced Raman Scattering from a Double-Resonance Plasmon Structure, *Yizhuo Chu, Mohamad G. Banaee, Kenneth B. Crozier; Harvard Univ., USA.* We report surface-enhanced Raman scattering measurements of a benzenethiol monolayer on a double resonance surface plasmon structure. The device enhances excitation and Raman scattered light simultaneously. The largest enhancement factor is measured to be 1.1×10^8.

LS

LSWG • Ultrafast Spectroscopy I—Continued

LSWG3 • 2:30 p.m.
ZnO Thin Films for Optoelectronic Applications, *T. Prasada Rao, M. C. Santhosh Kumar; Dept. of Physics, Natl. Inst. of Technology, India.* Effects of substrate temperature on crystallization behavior, optical, and electrical properties of the films was studied. Visible asymmetrical emission was observed in photoluminescence spectra. Electrical resistivity and carrier concentration are decreasing and increasing, respectively.

LSWG4 • 2:45 p.m.
Nanohybrid POSS-Copolymers as Advanced Solid-State Lasers, *Angel Costela[1], Inmaculada García-Moreno[1], Luis Cerdán[1], Olga García[2], Virginia Martín[1], Roberto Sastre[2]; [1]Inst. de Química Física Rocasolano, CSIC, Spain, [2]Inst. de Ciencia y Tecnología de Polímeros, CSIC, Spain.* We report on efficient and highly photostable solid-state lasers based on dye-doped polymer crosslinked with polyhedral oligomeric silsesquioxane (POSS) nanoparticles. Mechanisms for the improved laser action induced by the POSS presence will be discussed.

LSWH • Second-Order Nonlinear Optics III—Continued

LSWH3 • 2:30 p.m. Invited
Title to Be Announced, *Steven Baldelli; Univ. of Houston, USA.* Abstract not available.

LSWI • Multidimensional Spectroscopy III—Continued

LSWI3 • 2:30 p.m.
Optical Pulse Sequence Generation and Characterization via Phase-Only Multiple Independent Comb Shaping (MICS), *Dmitry Pestov, Vadim V. Lozovoy, Marcos Dantus; Michigan State Univ., USA.* We describe a pulse shaping technique for synthesis of optical pulse sequences, deemed suitable for pump-probe experiments and multidimensional spectroscopy. It enables straightforward programming, manipulation, and self-characterization of multi-pulse waveforms via one-dimensional phase-only shaping.

LSWI4 • 2:45 p.m.
Excited State Spectroscopy, Coherence, and Control in the Isomerization of Polyenes in Solution, *Kuo-Chun Tang, Kenneth G. Spears, Roseanne J. Sension; Univ. of Michigan, USA.* UV-Visible transient absorption spectroscopy has been used to study the excited-state reaction dynamics of 7-dehydrocholesterol and cis-stilbene in solution. UV-pulse-shaping has been used to manipulate the excitation pulse and influence reaction dynamics.

For Fall Congress presentations on Wednesday, see pages 125-131.

JOINT FiO/LS

FiO

JWD • Entanglement Generation and Measurement III—Continued

JWD6 • 3:00 p.m. Invited

Measurement-Based Entanglement and Quantum Information Processing with Remote Ions, *Peter Maunz, Steven Olmschenk, David Hayes, Dzmitry N. Matsukevich, Christopher Monroe; Joint Quantum Inst., Univ. of Maryland and NIST, USA.* We implement a probabilistic entangling gate between two remote trapped ytterbium ions and measure an average gate fidelity of 89%. The entangled state of the ions violates a Bell inequality.

FWO • OSA Topical Meeting Highlights I—Continued

FWO4 • 3:00 p.m. Invited

Fourier Domain Mode Locking (FDML): A New Laser Operating Regime and Applications for Biomedical Imaging, Profilometry, Ranging and Sensing, *Robert Huber; Ludwig-Maximilians-Univ. München, Germany.* Fourier Domain Mode Locking (FDML) is a new stationary operating regime of lasers, generating narrowband, rapidly wavelength swept output waveforms. The FDML mechanism and applications for biomedical imaging, coherent sensing and spectroscopy are discussed. (Advanced Solid-State Photonics, 2009)

FWP • Metamaterials III—Continued

FWP5 • 3:00 p.m.

High Sensitive Optical Displacement Sensor by Using Surface Plasmons, *Zhaogang Dong[1,2], Ying Zhang[1], Yeng Chai Soh[2]; [1]Singapore Inst. of Manufacturing Technology, Singapore, [2]School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore.* We present a new optical-displacement sensor, using surface plasmons, that measures the displacement using the resonant incident angle. An analytical expression relating the displacement and the resonant-incident-angle is derived, and the sensitivity is studied.

FWP6 • 3:15 p.m.

Creation of Hybridized Plasmonic Excitations in Nanocavities through Surface Propagating Plasmons, *Ahmet A. Yanik, Ronen Adato, Shyamsunder Erramilli, Hatice Altug; Boston Univ., USA.* We experimentally demonstrate that hybridized plasmonic excitations can be created in nanocavities in metal films through surface propagating plasmons. We show that nanocavities radiate in coherence and act as an efficient nanoantenna array.

FWQ • Phase Space Optics—Optical System Theory for the 21st Century—Continued

FWR • Novel Optical Architectures in Emerging Technologies I—Continued

FWR5 • 3:00 p.m.

Ring-Down Absorption Spectroscopy in an Integrating Cavity, *Michael T. Cone[1], Edward S. Fry[1], Joseph A. Musser[2]; [1]Texas A&M Univ., USA, [2]Dept. of Physics and Astronomy, Stephen F. Austin State Univ., USA.* A new diffuse reflector has been developed whose reflectivity in the 250 nm to 1 micron spectral region is so high that ring-down spectroscopy of scattering aerosols in an integrating cavity is now possible.

FWR6 • 3:15 p.m.

Design of an Optimal LED Coupler, *Anurag Gupta; Optical Res. Associates, USA.* A design procedure for LED couplers is described that uses initial layout, parameterization, and optimization to create a design that achieves the theoretical maximum coupling. Performance limitations imposed by manufacturing and packaging constraints are included.

3:30 p.m.–4:00 p.m. Coffee Break/Exhibits, *Imperial Ballroom, Fairmont Hotel*

NOTES

For Fall Congress presentations on Wednesday, see pages 125-131.

FiO

FWS • Optical Trapping and Micromanipulation II—Continued

FWS5 • 3:00 p.m.
Optical Manipulation of Hydrosomes, *Carlos López-Mariscal, Kristian Helmerson; NIST, USA.* We present a novel implementation of optical tweezers and microfluidics that allow for the controlled production and manipulation of monodisperse water droplets in an immiscible phase - hydrosomes.

FWS6 • 3:15 p.m.
Controlling Fluorescent Proteins by Manipulating the Local Density of Photonic States, *Allard P. Mosk[1], Christian Blum[1], Yanina Cesa[1], Johanna M. van den Broek[1], Willem L. Vos[1,2], Vinod Subramaniam[1]; [1]Univ. Twente, Netherlands, [2]FOM Inst. AMOLF, Netherlands.* We demonstrate nanophotonic control of the emission rate of fluorescent proteins by variation of the local density of states. The observed strong variations of the emission rate allow us to determine the emission dipole moment.

FWT • Plasmonic Sensors—Continued

FWT6 • 3:00 p.m.
Periodic Plasmonic/Dielectric Structures for SERS Applications, *Jingjing Li, David Fattal, Zhiyong Li; Hewlett-Packard Res. Lab, USA.* We discuss a rational design towards amplifying the local electromagnetic (EM) filed by integrating plasmonic optical antennas with periodic dielectric structures. The radiation process of an excited molecule on such devices is also studied.

LS

LSWG • Ultrafast Spectroscopy I—Continued

LSWG5 • 3:00 p.m. Invited
Ultrafast Hybrid Plasmonics: New Routes to Nanoscale Imaging and Energy Propagation, *Gary Wiederrecht; Argonne Natl. Lab, USA.* Efforts in our group for the imaging and ultrafast spectroscopy of hybrid plasmonic nanostructures are discussed, specifically applied to plasmonic continuum spectroscopy, metal nanoparticle photoluminescence, and the unique optical states that arise from coupled nanostructures.

LSWH • Second-Order Nonlinear Optics III—Continued

LSWH4 • 3:00 p.m.
Record Second-Harmonic Conversion Efficiency in Improved $Al_xGa_{1-x}As$ Bragg Reflection Waveguides, *Payam Abolghasem, Junbo Han, Bhavin J. Bijlani, Arghavan Arjmand, Amr S. Helmy; Univ. of Toronto, Canada.* We report the observation of second-harmonic generation with a conversion efficiency of 1.14×10^4 $\%W^{-1}cm^{-2}$ in type-II monolithic matching layer-enhanced Bragg reflection waveguides for a 2 picosecond pump with 3.3 mW average power.

3:30 p.m.–4:00 p.m. Coffee Break/Exhibits, *Imperial Ballroom, Fairmont Hotel*

NOTES

For Fall Congress presentations on Wednesday, see pages 125-131.

FiO | FiO | JOINT | FiO | FiO

4:00 p.m.–5:30 p.m.
FWU • Coherence and Fundamental Optics II
Jason Fleischer; Princeton Univ., USA, Presider

FWU1 • 4:00 p.m.
Coupling of Stochastic Electromagnetic Beams into Optical Fibers, *Mohamed F. Salem[1], Govind P. Agrawal[1,2]; [1]Dept. of Physics and Astronomy, Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA*. A general expression for the coupling efficiency is derived for the case when a partially coherent electromagnetic beam is coupled into an optical fiber. We illustrate the result with a numerical example.

FWU2 • 4:15 p.m.
Evolution of Singularities in a Partially Coherent Vortex Beam, *Thomas van Dijk[1], Hugo F. Schouten[1], Taco D. Visser[1,2]; [1]Free Univ., Netherlands, [2]Delft Univ. of Technology, Netherlands.* We study the evolution of singularities in a vortex beam. The beam starts off with a phase singularity that gradually disappears on propagation. At the same time coherence singularities are found to develop.

FWU3 • 4:30 p.m.
The Concept of Statistical Similarity of Light Vibrations and Its Role in the Theories of Coherence and Polarization of Light, *Emil Wolf; Univ. of Rochester, USA*. It will be shown that the notion of statistical similarity between light vibrations reveals a close analogy between coherence and polarization.

FWU4 • 4:45 p.m.
Spatial Coherence Properties of Monochromatic Electromagnetic Beams and of Laser Modes, *Mayukh Lahiri, Emil Wolf; Univ. of Rochester, USA*. We show that, contrary to common belief, monochromatic light beams may not be spatially completely coherent. We cite experiments with laser modes which confirm this result.

4:00 p.m.–5:30 p.m.
FWV • OSA Topical Meeting Highlights II
Michael Duncan; NRL, USA, Presider

FWV1 • 4:00 p.m. Invited
Deflectometry Challenges Interferometry: 3-D-Metrology from Nanometer to Meter, *Gerd Häusler[1,2], M. C. Knauer[1], C. Faber[1], C. Richter[1], S. Peterhänsel[1], C. Kranitzky[1], K. Veit[2]; [1]Univ. of Erlangen-Nuremberg, Germany, [2]3D-Shape GmbH, Germany.* We will discuss deflectometry from the physicist's and from the information theoretical point of view. The intrinsic features of deflectometry -incoherence, source encoding, high dynamical range, simplicity, and scalability- enable new sensors and unexpected applications. (Digital Holography and Three-Dimensional Imaging, 2009)

FWV2 • 4:30 p.m. Invited
Manipulating Slow Light by Ultrahigh-Q Nanocavities and Their Coupled Arrays, *Masaya Notomi, T. Tanabe, E. Kuramochi, H. Taniyama; NTT Basic Res. Labs, Japan*. We investigate ultrahigh-*Q* nanocavities in photonic crystals for manipulating slow light. First, we study applicability of coupled nanocavities for realizing ultimate slow-light waveguides. Second, we exploit dynamic tuning of slow-light media for read/write processes. (Slow and Fast Light, 2009)

4:00 p.m.–6:00 p.m.
JWE • Entanglement Generation and Measurement IV
Warren Grice; Oak Ridge Natl. Lab, USA, Presider

JWE1 • 4:00 p.m. Invited
Hyperentangled Photons for Communication and Metrology, *Paul Kwiat[1], Julio Barreiro[1,2]; [1]Univ. of Illinois at Urbana-Champaign, USA, [2]Univ. Innsbruck, Austria.* Photons from spontaneous downconversion may be simultaneously entangled in multiple degrees of freedom ("hyperentangled"), enabling new capabilities in quantum communication and metrology. We present one example-remote preparation of entangled polarization/spatial-mode states-and discuss possible applications.

JWE2 • 4:30 p.m.
Efficient Entanglement Distribution over 200 Kilometers Fiber Using Self-Differencing InGaAs Avalanche Photodiodes, *James F. Dynes[1], Hiroki Takesue[2], Zhiliang Yuan[1], Andrew W. Sharpe[1], Ken-Ichi Harada[2], Toshimori Honjo[2], Hidehiko Kamada[2], Osamu Tadanaga[3], Yoshiki Nishida[3], Masaki Asobe[3], Andrew J. Shields[1]; [1]Toshiba Res. Europe Ltd., Cambridge Res. Lab, UK, [2]NTT Basic Res. Labs, NTT Corp., Japan, [3]NTT Photonics Labs, NTT Corp., Japan.* Practical and low-cost self-differencing InGaAs avalanche photodiodes have been successfully applied to ultra-long distance and efficient entanglement distribution over 200 kilometers of optical fiber.

JWE3 • 4:45 p.m.
Defeating Passive Eavesdropping with Quantum Illumination, *Jeffrey H. Shapiro; MIT, USA*. Quantum illumination permits Alice and Bob to communicate at 50 Mbit/s over 50 km of low-loss fiber with error probability less than 10^{-6} while the optimum passive eavesdropper's error probability must exceed 0.28.

4:00 p.m.–5:30 p.m.
FWW • Phase Space Optics—Optical System Theory for the 21st Century II
Miguel A. Alonso; Inst. of Optics, Univ. of Rochester, USA, Presider

FWW1 • 4:00 p.m. Invited
Wigner Cross-Terms in Sampled and Other Periodic Signals, *William T. Rhodes[1], John J. Healy[2], John T. Sheridan[2]; [1]Florida Atlantic Univ., USA, [2]Univ. College Dublin, Ireland.* A sampled wave field is periodic in frequency. We examine the cross-terms that occur between the periodic replicas in the Wigner-Ville distribution function of such a signal and present analytic results for Gaussian signals.

FWW2 • 4:30 p.m. Invited
The Radon-Wigner Transform and Its Application to First-Order Optical Systems, *Genaro Saavedra, Walter D. Furlan; Univ. de València, Spain*. The Radon-Wigner transform is presented as a tool for the description of 1st-order optical systems. The input/output relationships for this phase-space representation are obtained and their application in analysis and design tasks is pointed out.

4:00 p.m.–5:30 p.m.
FWX • Novel Optical Architectures in Emerging Technologies II
Arthur Gmitro; Univ. of Arizona, USA, Presider

FWX1 • 4:00 p.m. Invited
Miniaturization of Adaptive Optics Scanning Laser Ophthalmoscope, *Austin Roorda[1], David Merino[1], Kaccie Y. Li[1], Yuhua Zhang[2]; [1]Univ. of California at Berkeley, USA, [2]Univ. of Alabama, Birmingham, USA*. An important step to facilitate dissemination of adaptive optics systems for ophthalmoscopy is to design and demonstrate robust and compact systems. We will present the design and results from a MEM-based AO scanning laser ophthalmoscope.

FWX2 • 4:30 p.m.
Fabrication of GHz/THz Volumetric Optics via Rapid Prototyping, *Wei-Ren Ng, Ziran Wu, Hao Xin, Michael E. Gehm; Univ. of Arizona, USA*. Rapid prototyping technology is now capable of high-resolution fabrication suitable for producing volumetric optics in the GHz/THz range. We will report on our successful fabrication of photonic crystal structures and discuss other components under study.

FWX3 • 4:45 p.m.
An Instrument to Measure the Backscattering Coefficient b_b for Arbitrary Phase Functions, *David Haubrich[1], Edward S. Fry[1], Joseph A. Musser[2]; [1]Dept. of Physics, Texas A&M Univ., USA, [2]Dept. of Physics and Astronomy, Stephen F. Austin State Univ., USA*. We present the ocean optics community with the first instrumentation to directly measure the backscattering coefficient of natural waters for arbitrary phase functions. It is suitable for *in situ* applications and has the requisite resolution.

For Fall Congress presentations on Wednesday, see pages 125-131.

FiO

4:00 p.m.–5:30 p.m.
FWY • Optical Trapping and Micromanipulation III
Kenneth B. Crozier; Harvard Univ., USA, Presider

FWY1 • 4:00 p.m. Invited
Multimode Light in Action, *Roberta Zambrini; IFISC (UIB-CSIC), Univ. Illes Balears, Spain.* Mechanical properties of beams resulting from superposition and interference of different modes are studied. Local energy and angular momenta of such multimode beams can be tuned. We propose some experiments and an interferometric measurement scheme.

FWY2 • 4:30 p.m.
Brownian Vortex Induced by Optical Tweezers, *Bo Sun, Alexander Grosberg, David Grier; New York Univ., USA.* Previously overlooked non-conservative force exerted by optical tweezers drives a trapped particle into a Brownian vortex. When continuously changing power or temperature, the Brownian vortex reverse its flux.

FWY3 • 4:45 p.m.
Integrated Coupling to Whispering Gallery Modes of Microspheres in a Microfluidic Platform, *Arthur Nitkowski, Michal Lipson; Cornell Univ., USA.* We demonstrate excitation of whispering gallery modes in dielectric microspheres using optical trapping with silicon nitride waveguides. Resonances are measured from waveguide transmission thus providing an integrated platform for using microspheres in lab-on-a-chip biosensing applications.

4:00 p.m.–5:30 p.m.
FWZ • Silicon Photonics III
Mario Paniccia; Intel Corp., USA, Presider

FWZ1 • 4:00 p.m. Invited
Green Integrated Photonics, *Sasan Fathpour; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* Harvesting the optical energy lost to two-photon absorption in integrated photonic devices offers two advantages: reduced optical loss and simultaneous electrical power generation. This nonlinear photovoltaic effect may pave the path towards green integrated photonics.

FWZ2 • 4:30 p.m.
Athermal Operation in Polymer-Clad Silicon Microdisk Resonators, *Payam Alipour, Ehsan Shah Hosseini, Ali Asghar Eftekhar, Babak Momeni, Ali Adibi; Georgia Tech, USA.* A method for thermal-stabilization of silicon microdisk resonators, based on thermo-optic polymer coatings, is proposed. Two orders of magnitude improvement in thermal stability is observed. Effects on Q and major fabrication challenges are discussed.

FWZ3 • 4:45 p.m.
Maximization of Phase and Group Birefringence of Single-Mode Silicon-on-Insulator Waveguides, *Tarek A. Ramadan; Kuwait Univ., Kuwait.* The parameters of silicon-on-insulator waveguides are optimized for maximum phase and group birefringence under single-mode condition. Two strip-loaded designs are reported with phase and group birefringence of 1.03 and 1.64, respectively.

LS

4:00 p.m.–6:15 p.m.
LSWJ • Ultrafast Spectroscopy II
Hrvoje Petek; Univ. of Pittsburgh, USA, Presider

LSWJ1 • 4:00 p.m. Invited
Visualization of Nuclear and Electron Motion by Ultrafast Electron Diffraction, *Peter Baum[1,2]; [1]Max-Planck-Inst. of Quantum Optics, Germany, [2]Ludwig-Maximilians-Univ. München, Germany.* Ultrashort electron pulses allow visualizing atomic-scale motions in all four dimensions of space and time. We report on structural pathways during ultrafast phase-transformations and present concepts for reaching into the domain of attosecond electron motion.

LSWJ2 • 4:30 p.m. Invited
Ultrafast Laser-Induced Magnetization Dynamics, *Bert Koopmans; Eindhoven Univ. of Technology, Netherlands.* Recent developments in ultrafast laser-induced magnetization dynamics will be presented. Particular emphasis will be on efforts aiming at a fundamental understanding of microscopic processes, and laser-induced spin momentum transfer in especially engineered magnetic multilayers.

4:00 p.m.–5:45 p.m.
LSWK • Second-Order Nonlinear Optics IV
Keng Chang Chou; Univ. of British Columbia, USA, Presider

LSWK1 • 4:00 p.m. Invited
Vibrationally-Electronically Doubly-Resonant Sum-Frequency Generation Spectroscopy of Molecular Thin Films, *Taka-aki Ishibashi; Hiroshima Univ., Japan.* Vibrationally-electronically doubly-resonant sum-frequency generation (DR-SFG) is a powerful technique for studying structures of molecular thin films. Electronic resonance enhances the sensitivity and selectivity. Our instrumentation and some applications of DR-SFG spectroscopy will be presented.

LSWK2 • 4:30 p.m. Invited
Measurement of Surface Chirality with Nonlinear Spectroscopy: A Quantitative Approach, *Yan-yan Xu, Feng Wei, Yuan Guo, Hongfei Wang; Inst. of Chemistry, Chinese Acad. of Sciences, China.* Quantitative measurement on enantiomer states and degree of chiral excess (DCE) of chiral surfaces can be achieved in surface second order nonlinear spectroscopy. Examples are given with second harmonic and sum-frequency surface studies.

JOINT FiO/AO

4:00 p.m.–5:30 p.m.
JWF • Advances in Adaptive Optics Imaging of the Living Retina II
Jungtae Rha; Medical College of Wisconsin, USA, Presider

JWF1 • 4:00 p.m. Invited
Adaptive Optics Instrumentation, *Stephen A. Burns[1], Zhangyi Zhong[1], Weiyao Zou[1], Cong Deng[1], Daniel Ferguson[2], Xiaofeng Qi[1]; [1]Indiana Univ., USA, [2]Physical Sciences Inc., USA.* Adaptive optics imaging of the retina presents unusual design challenges. AO instruments allowing steering of the beam across the retina, large amounts of defocus, and variable pupil sizes will be discussed.

JWF2 • 4:30 p.m.
A New Ferrofluid Mirror for Vision Science Applications, *Denis Brousseau[1], Ermanno F. Borra[1], Anna M. Ritcey[1], Melanie C. Campbell[2,3], Simon Thibault[1], Julie Drapeau[1], Azadeh Naderian[1]; [1]Univ. Laval, Canada, [2]Univ. of Waterloo, Canada, [3]Guelph Waterloo Physics Inst., Canada.* We present a novel ferrofluid mirror design which will result in an inexpensive adaptive optics element with large stroke for use in ophthalmic imaging.

JWF3 • 4:45 p.m. Invited
Adaptive Optics-OCT Imaging of the Retina, *Donald T. Miller; Indiana Univ., USA.* Ultrahigh resolution OCT with adaptive optics provides unprecedented 3-D resolution of the cellular retina *in vivo*. Here we investigate the utility of this instrument for imaging individual retinal nerve fiber bundles, retinal capillaries, and photoreceptors.

For Fall Congress presentations on Wednesday, see pages 125-131.

FiO | JOINT | FiO

FWU • Coherence and Fundamental Optics II—Continued

FWU5 • 5:00 p.m.
Properties of Quasihomogeneous Isotropic Electromagnetic Sources, *Asma Al-Qasimi, Daniel F. V. James; Univ. of Toronto, Canada.* We study the properties of quasihomogeneous isotropic electromagnetic sources, a model for partially-coherent secondary light sources beyond the scalar and paraxial approximations. Our results include polarization properties in the far zone and the realizability condition.

FWU6 • 5:15 p.m.
Scattering of a Focused Shifted Laser Beam by a Lossy Spheroidal Particle, *Elsayed Esam M. Khaled[1], Hany L. Ibrahim[2]; [1]Electrical Engineering Dept., Assiut Univ., Egypt, [2]Telecom Egypt, Egypt.* Scattering intensities of elongated spheroidal particles illuminated with an arbitrary laser beam are calculated using the T-matrix and plane waves spectrum methods. Absorption and beam shift effects on angular scattering intensities are illustrated.

FWV • OSA Topical Meeting Highlights II—Continued

FWV3 • 5:00 p.m. Invited
Wide Field, Minimally Invasive OCT: Recent Advances and Clinical Implications, *Ben Vakoc, Brett E. Bouma; Massachusetts General Hospital, USA.* Recent advances in minimally-invasive probes and illumination and detection strategies for optical coherence tomography have enabled dramatically faster imaging speeds and open the possibility of high-resolution diagnostic imaging of entire organ epithelial and endothelial surfaces. (Novel Techniques in Microscopy, 2009; originally presented by *Brett Bouma; Harvard Medical School and Massachusetts General Hospital, USA*)

JWE • Entanglement Generation and Measurement IV—Continued

JWE4 • 5:00 p.m. Invited
Quantum Field State Control and Measurement in a Cavity, *J. M. Raimond, S. Deléglise, C. Sayrin, X. Zhou, I. Dotsenko, S. Gleyzes, M. Brune, S. Haroche; École Normale Supérieure, France.* We realize a Quantum Non Demolition measurement of the photon number in a cavity. We evidence quantum jumps of light, Zeno effect and we reconstruct the field's state. This tool is promising for quantum feedback.

JWE5 • 5:30 p.m.
Cavity-Enhanced Two-Photon Processes in Quantum Dots and Applications to Quantum Information Science, *Ziliang Lin, Jelena Vučković; Stanford Univ., USA.* We present two-photon transition rate enhancement in quantum dots coupled to photonic crystal cavities. We show that cavity-assisted two-photon absorption and emission are efficient methods to coherently excite quantum dots and generate indistinguishable single photons.

JWE6 • 5:45 p.m.
Decoherence and Disentanglement for Two Qubits in a Common Squeezed Reservoir, *Maritza Hernandez, Miguel Orszag; Pontificia Univ. Católica de Chile, Chile.* We study the relation between the sudden death and revival of the entanglement of two qubits in a common squeezed bath and the decoherence.

FWW • Phase Space Optics—Optical System Theory for the 21st Century II—Continued

FWW3 • 5:00 p.m. Invited
Design of Rotating Beams, *Tatiana Alieva[1], Eugeny Abramochkin[2]; [1]Univ. Complutense de Madrid, Spain, [2]PN Lebedev Physical Inst., Samara Branch, Russian Federation.* Based on the ray transformation matrix formalism, a simple method for generation of paraxial beams anisotropically rotating in phase space during their propagation through isotropic optical systems is proposed.

FWX • Novel Optical Architectures in Emerging Technologies II—Continued

FWX4 • 5:00 p.m.
Range Resolved, Sub-Millimeter Resolution Lidar Using Temporally Stretched, Frequency Chirped Pulses, *Mohammad Umar Piracha[1], Dat Nguyen[1], Dimitrios Mandridis[1], Ibrahim Ozdur[1], Tolga Yilmaz[2], Sarper Ozharar[1], Peter J. Delfyett[1]; [1]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, [2]Radiance, Inc., USA.* A temporally stretched, frequency chirped pulsed lidar system employing a phase modulation heterodyne scheme for range resolved measurements with sub-millimeter resolution at a range of 4.65km with 30dB dynamic range is demonstrated.

FWX5 • 5:15 p.m.
Analytic Theory of Light Reflection from a Chirped Volume Bragg Grating, *Leonid B. Glebov[1], Sergiy V. Mokhov[1], Vadim I. Smirnov[2], Boris Ya. Zeldovich[1]; [1] CREOL, College of Optics and Photonics, Univ. of Central Florida, USA, [2]OptiGrate, USA.* We present and study solutions of the equations for counter-propagating waves coupled by Chirped Bragg Gratings (CBG). Analytic expression for amplitude and phase of reflection is found, confirming the results of numerical modeling of CBG.

6:30 p.m.–8:00 p.m. FiO Postdeadline Paper Sessions, *See the Postdeadline Papers Book in your registration bag for exact times and locations*

For Fall Congress presentations on Wednesday, see pages 125-131.

FWY • Optical Trapping and Micromanipulation III—Continued

FWY4 • 5:00 p.m.
Effects of Polarization in Optical Binding, *David P. Haefner, Sergey Sukhov, Aristide Dogariu; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We investigate the influence of incident field polarization on dynamics of optically bound particles. The existence of torques due to optical interaction in the multi-particle system is demonstrated and applications to nano-rotator machines are discussed.

FWY5 • 5:15 p.m.
Development of Dynamic Phase Demodulation Technique to Investigate Live-Cell Dynamics, Using Heterodyne Mach-Zehnder Interferometer, *Shiju Joseph[1], Jean-Michel Gineste[2], Maurice Whelan[2], David Newport[1]; [1]Stokes Res. Inst., Univ. of Limerick, Ireland, [2]Inst. for Health and Consumer Protection, European Commission DG Joint Res. Ctr., Italy.* A Heterodyne Mac-Zehnder interferometer to extract phase images of cells and demodulation method to retrieve instantaneous frequency of a phase object, undergoing sinusoidal modulation (amplitude-200 nm and frequency-30 Hz and mimicking cell vibration) is presented.

FWZ • Silicon Photonics III—Continued

FWZ4 • 5:00 p.m.
Subwavelength Silicon Microdisks with High Quality Factors, *Jeffrey M. Shainline, Gustavo Fernandes, Zhijun Liu, Jimmy Xu; Brown Univ., USA.* We present a study of the first subwavelength silicon micro-cavities and to our knowledge the smallest micro-cavities to be probed with tapered fiber spectroscopy or directly coupled to a waveguide.

FWZ5 • 5:15 p.m.
Slot Waveguide Incorporating a Sub-Core, *Yinying Xiao-Li[1], Lin Zhang[1], Yang Yue[1], Raymond G. Beausoleil[2], Alan E. Willner[1]; [1]Univ. of Southern California, USA, [2]HP Labs, USA.* We propose a slot waveguide in which a sub-core is incorporated into the slot itself. We numerically simulate the waveguide under various conditions and show that the guided-wave can exhibit highly enhanced two-dimensional confinement.

LSWJ • Ultrafast Spectroscopy II—Continued

LSWJ3 • 5:00 p.m.
Ultrafast THz Studies of Few-Layer Epitaxial Graphene, *Hyunyong Choi[1], Ferenc Borondics[1], David A. Siegel[1,2], Shuyun Zhou[1,2], Michael C. Martin[1], Alessandra Lanzara[1,2], Robert A. Kaindl[1]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Univ. of California at Berkeley, USA.* We report the broadband optical conductivity and ultrafast THz dynamics of few-layer epitaxial graphene, revealing electrodynamics consistent with a dense Dirac electron plasma and a transient THz response dominated by recombination of excess hole carriers.

LSWJ4 • 5:15 p.m. Invited
Dynamic Signatures of Exciton-Plasmon Interactions in Hybrid Semiconductor-Metal Nanostructures, *Marc Achermann; Univ. of Massachusetts at Amherst, USA.* We study the coupling between excitons and surface plasmons (SPs) in assemblies of semiconductor nanocrystals and metal nanostructures. We will discuss SP-coupled emission dynamics, SP-mediated energy transfer in donor-acceptor systems, and SP-induced radiative rate enhancements.

LSWJ5 • 5:45 p.m. Invited
One-Dimensional Exciton Dynamics in Carbon Nanotubes, *Tobias Hertel, Zipeng Zhu, Dominik Stich, Jared Crochet; Univ. of Wurzburg, Germany.* We discuss femtosecond time-resolved pump-probe investigations of exciton dynamics in structurally sorted carbon nanotubes and carbon nanotube aggregates.

LSWK • Second-Order Nonlinear Optics IV—Continued

LSWK3 • 5:00 p.m.
Highly Efficient Second Harmonic Generation of Super Strong Femtosecond Laser Pulses, *Sergey Mironov, Vladimir Lozhkarev, Vladislav Ginzburg, Efim Khazanov; Inst. of Applied Physics, Russian Acad. of Sciences, Russian Federation.* The 60% energy conversion efficiency of second harmonic generation process in 1mm KDP crystal at input peak intensity 0.6TW/cm^2 has been experimentally achieved.

LSWK4 • 5:15 p.m.
Microchip Green Laser Source Based on Second-Harmonic Generation in Periodically Poled, MgO-Doped Lithium Niobate, *Andrei Shchegrov[1], John Khaydarov[1], Stepan Essaian[1], Greg Nemet[1], Suren Soghomonyan[2], Hakob Danielyan[2], Gevorg Gabrielyan[2]; [1]Spectralus Corp., USA, [2]Spectralus CJSC, Armenia.* We present a microchip green laser source based on PPMgOLN crystal. This architecture achieves wall-plug efficiency of 12% for output power levels of 50-150mW and fits into a small package suitable for pico-projectors.

LSWK5 • 5:30 p.m.
Coupled Dipole Model for Nonlinear Scattering, *Naveen K. Balla[1], Peter T. C. So[2], Colin J. R. Sheppard[1]; [1]Natl. Univ. of Singapore, Singapore, [2]MIT, USA.* We address the problem of nonlinear scattering by scatterers of irregular shapes. Our approach assumes the scatterer to be made up of coupled dipoles which interact among themselves and with the incident field.

JWF • Advances in Adaptive Optics Imaging of the Living Retina II—Continued

JWF4 • 5:15 p.m.
First-Order Design of Off-Axis Reflective Ophthalmic Adaptive Optics Systems Using Afocal Telescopes, *Alfredo Dubra[1], Armando Gómez-Vieyra[2], Daniel Malacara-Hernández[2], David R. Williams[1]; [1]Univ. of Rochester, USA, [2]Ctr. de Investigaciones en Optica AC, Mexico.* Expressions for minimal astigmatism in image and pupil planes in off-axis reflective afocal telescopes formed by pairs of spherical mirrors are presented and evaluated for small angles of incidence.

6:30 p.m.–8:00 p.m. FiO Postdeadline Paper Sessions, *See the Postdeadline Papers Book in your registration bag for exact times and locations*

For Fall Congress presentations on Wednesday, see pages 125-131.