

• **Wednesday, October 14, 2009** •

Empire Room, Fairmont San Jose Hotel

6:30 p.m.–8:18 p.m.

PDPA • FiO Postdeadline Papers I

Tom Carruthers; Natl. Science Foundation, USA, Presider

PDPA1 • 6:30 p.m.

Ultrafast Demagnetization Probed at Elemental M-Edges Using Tabletop High-Order Harmonic EUV Light, *Chan La-O-Vorakiat¹, Stefan Mathias^{1,2}, Patrik Grychtol³, Roman Adam³, Mark E. Siemens¹, Justin M. Shaw⁴, Hans Nembach⁴, Claus M. Schneider³, Martin Aeschlimann², Thomas J. Silva⁴, Margaret M. Murnane¹, Henry C. Kapteyn¹*; ¹JILA, Univ. of Colorado, USA, ²Univ. of Kaiserslautern, Germany, ³Inst. of Solid State Res., Jülich Res. Ctr., Germany, ⁴Electromagnetics Div., NIST, USA. We use high EUV harmonics generated from tabletop laser to detect the ultrafast demagnetization at M-absorption edge of Fe and Ni. The magnetization is reduced by 60% during the first 250 fs after pump pulses.

PDPA2 • 6:42 p.m.

Demonstration of an All-Diode-Pumped Soft X-Ray Laser, *Federico J. Furch, Brendan A. Reagan, Bradley M. Luther, Alden H. Curtis, Shaun P. Meehan, Jorge J. Rocca*; Colorado State Univ., USA. Demonstration of the first all-diode-pumped soft X-ray laser is reported. Lasing was achieved in the 18.9 nm line of Ni-like molybdenum. The pump laser produces 8.5 ps pulses with 1 J energy at 10 Hz.

PDPA3 • 6:54 p.m.

Carrier Dynamics Investigation in Quantum Cascade Lasers Using Femtosecond Mid-IR Pulses, *Sheng Liu, Elaine Lalanne, Robinson Kuis, Anthony Johnson*; Univ. of Maryland, Baltimore County, USA. Femtosecond mid-IR pulses are coupled into a pulsed biased, room temperature QCL. Gain recovery due to depletion by pump-pulses is observed using time-delayed probe-pulses to investigate the carrier dynamics of the QCL.

PDPA4 • 7:06 p.m.

39 W Narrow Linewidth Raman Fiber Amplifier with Frequency Doubling to 26.5 W at 589 nm, *Yan Feng, Luke R. Taylor, Domenico Bonaccini Calia, Ronald Holzlöhner, Wolfgang Hackenberg*; European Southern Observatory, Germany. We report on a 39 W SBS-suppressed narrow-linewidth (<1.5 MHz) Raman fiber amplifier at 1178 nm, which is frequency doubled to 589 nm for laser guide star application (26.5 W generated in a preliminary test).

PDPA5 • 7:18 p.m.

Efficient Nonlinear Idler Generation by Simultaneous Parametric Oscillation and Signal-to-Idler Conversion, *Gil Porat, Ofer Gayer, Ady Arie*; Tel Aviv Univ., Israel. We experimentally demonstrate an optical parametric oscillator, whose signal pumps another difference frequency generation process. Engineered idler frequency coincidence of both processes in a single quasiperiodic crystal improves pump-to-idler conversion (slope) efficiency by 16.6% (52.8%).

PDPA6 • 7:30 p.m.

A Compiled Version of Shor's Quantum Factoring Algorithm on a Waveguide Chip, *Jonathan C. F. Matthews, Alberto Politi, Jeremy L. O'Brien*; Univ. of Bristol, UK. We report the realization of a compiled version of Shor's quantum factoring algorithm on an integrated waveguide chip. This demonstration serves as an illustration to the importance of using integrated optics for quantum optical experiments.

PDPA7 • 7:42 p.m.

Characterizing Multipartite Entanglement with Uncertainty Relations, *Scott B. Papp¹, Kyung S. Choi¹, Hui Deng¹, Akihisa Goban¹, Pavel Lougovski², Steven J. van Enk², H. Jeff Kimble¹*; ¹Caltech, USA, ²Univ. of Oregon, USA. We report the characterization of multipartite photonic entanglement consisting of a single photon shared among four optical paths using uncertainty relations. We discuss an extension of this method to detect entanglement of four atomic ensembles.

PDPA8 • 7:54 p.m.

Time-Resolved Upconversion of Entangled Photon Pairs, *Kevin A. O'Donnell¹, Alfred B. U'Ren²*; ¹CICESE, Mexico, ²Univ. Nacional Autónoma de México, Mexico. In the process of spontaneous parametric downconversion, pump photons are converted to signal/idler photon pairs. We present measurements of the reverse process (upconversion) rate as a function of signal-idler delay, yielding a 27.9fs width.

PDPA9 • 8:06 p.m.

Scalable Generation of Multi-Photon Path Entanglement, *Itai Afek, Oron Ambar, Yaron Silberberg*; Weizmann Inst. of Science, Israel. We experimentally realize a scheme for generation of maximally path entangled multi-photon states. Sub-wavelength Mach-Zehnder interference is measured for two, three and four photons. The results are simply scalable to higher numbers.

• Wednesday, October 14, 2009 •

Crystal Room, Fairmont San Jose Hotel

6:30 p.m.–8:06 p.m.

PDPB • FiO Postdeadline Papers II

Lahsen Assoufid; Argonne Natl. Lab, USA, Presider

PDPB1 • 6:30 p.m.

Chalcogenide Glass Metamaterial Optical Switch, Zsolt L. Sármón¹, Kevin F. MacDonald¹, Francesco De Angelis², Giorgio Adamo¹, Kenton Knight¹, Chung-Che Huang¹, Dan W. Hewak¹, Enzo Di Fabrizio², Nikolay I. Zheludev¹; ¹Univ. of Southampton, UK, ²Univ. of Magna Graecia, Italy. The technology behind rewritable optical disks offers a new switching paradigm for metamaterials. A switch comprising resonant plasmonic metamaterial and electro-optic chalcogenide glass layers provides 75% optical transmission modulation in a device of sub-wavelength thickness.

PDPB2 • 6:42 p.m.

Single-Carbon-Nanotube-Based Fluorescent Nanoprobe, Yaoshun Jia, Yong Xu; *Virginia Tech, USA*. We proposed and fabricated a new carbon-nanotube-based fluorescent nanoprobe for non-perturbative optical near field imaging. Utilizing such nanoprobe, we developed a near field scanning approach based on the processing of images.

PDPB3 • 6:54 p.m.

Mid-Infrared Four-Wave Mixing in Silicon Waveguides Using Telecom-Compatible Light Sources, Jung S. Park¹, Sanja Zlatanovic¹, Slaven Moro¹, Jose M. Chavez-Boggio¹, Ivan B. Divliansky², Shayan Mookherjee¹, Stojan Radic¹; ¹Univ. of California at San Diego, USA, ²CREOL, College of Optics and Photonics, Univ. of Central Florida, USA. We report four-wave mixing in silicon waveguides in the spectral region beyond 2 μm using infrared signals derived from telecom-compatible fiber-optic sources. We measure a high value of the nonlinear parameter $\gamma = 103/(\text{Wm})$.

PDPB4 • 7:06 p.m.

Ultrafast Photodetection in an All-Silicon Chip Enabled by Two-Photon Absorption, Jorge Bravo-Abad, Erich P. Ippen, Marin Soljačić; *MIT, USA*. We show that, by dramatically enhancing two-photon absorption in silicon, optical microresonators can act as efficient on-chip photodetectors for light at telecom wavelengths, which could pave the way for a new class of integrated photodetectors.

PDPB5 • 7:18 p.m.

An Ultra-Low Power All CMOS Si Photonic Transmitter, Xuezhe Zheng¹, Jon Lexau², Ying Luo¹, Hiren Thacker¹, Thierry Pinguet³, Attila Mekis³, Guoliang Li¹, Jing Shi¹, Philip Amberg², Nathaniel Pinckney², Kannan Raj¹, Ron Ho², John E. Cunningham¹, Ashok V. Krishnamoorthy¹; ¹Sun Microsystems, Inc., USA, ²Sun Labs, USA, ³Luxtera Inc., USA. We report the first 400fJ/bit all-CMOS silicon photonic transmitter made of CMOS depletion ring modulator flip-chip integrated with CMOS driver, and demonstrate error-free 5Gbps transmission of over 1.5Pbits of data without closed-loop ring resonance tuning.

PDPB6 • 7:30 p.m.

Single Photon Gun: Radiative Decay Engineering with Metamaterials, Zubin Jacob¹, Igor Smolyaninov², Evgenii Narimanov¹; ¹Purdue Univ., USA, ²Univ. of Maryland at College Park, USA. We propose a new approach to single-photon sources based on metamaterials with hyperbolic dispersion. Highly directional emission and dramatic reduction in spontaneous-emission lifetime due to the singularity in density-of-states leads to an ideal photon gun.

PDPB7 • 7:42 p.m.

Giant Frequency-Pulling in Sub-Wavelength Plasmon Lasers, Volker J. Sorger¹, Rupert F. Oulton¹, Thomas Zentgraf¹, Chris Gladden¹, Guy Bartal¹, Ren-Min Ma², Lun Dai², Xiang Zhang^{1,3}; ¹Univ. of California at Berkeley, USA, ²State Key Lab for Mesoscopic Physics and School of Physics, Peking Univ., China, ³Materials Sciences Div., Lawrence Berkeley Natl. Lab, USA. We report the observation of strong gain-induced dispersion manifested as a giant frequency-pulling in sub-wavelength plasmon lasers operating below the diffraction limit. We observe gain clamping for these nanolasers at about 9000 cm^{-1} .

PDPB8 • 7:54 p.m.

Doping-Tunable Metamaterials in the Mid-Infrared, Xiaoyu Miao^{1,2}, Brandon Passmore¹, Aaron Gin^{1,2}, Shivashankar Vangala³, William Goodhue³, Eric Shaner¹, Igal Brener^{1,2}; ¹Sandia Natl. Labs, USA, ²Ctr. for Integrated Nanotechnologies, Sandia Natl. Labs, USA, ³Dept. of Physics and Applied Physics, Univ. of Massachusetts at Lowell, USA. We demonstrate tunable metamaterials for the mid-infrared (8-12 μm) based on split ring resonators fabricated on doped InSb semiconductor substrates.

• Wednesday, October 14, 2009 •

Gold Room, Fairmont San Jose Hotel

6:30 p.m.–8:06 p.m.

PDPC • FiO Postdeadline Papers III

Gregory Quarles; VLOC, USA, Presider

PDPC1 • 6:30 p.m.

Investigation of Residual Anisotropy in Photoelastic Modulator by Temporal Phase Analysis, Kuan-Yi Li, Hsiu-Ming Tsai, Yu-Faye Chao; Dept. of Photonics, Natl. Chiao Tung Univ., Taiwan. The temporal phase of photoelastic modulator has been analyzed under different azimuth angle of analyzer. In addition to the residual stress and circular dichroism in the optical crystal, we also investigate its harmonic oscillations.

PDPC2 • 6:42 p.m.

Fabrication of Polarization Holograms Controlling Amplitude and Phase, Markus Fratz^{1,2}, Dominik M. Giel², Peer Fischer^{1,2}; ¹Fraunhofer Inst. for Physical Measurement Techniques IPM, Germany, ²Rowland Inst. at Harvard, Harvard Univ., USA. We demonstrate complex holograms that impart arbitrary amplitude and phase profiles onto a transmitted beam and thereby open new possibilities in the control of optical beams. An efficient means of generating vortex beams is shown.

PDPC3 • 6:54 p.m.

On the Designing of Planar Optical Lens Based on High Contrast Gratings, Jingjing Li, David Fattal, Raymond G. Beausoleil; Hewlett-Packard Labs, USA. We present the method of engineering the phase front shape of the reflected or transmitted optical wave from a dielectric grating, so that planar device but work as concave or convex lenses can be designed.

PDPC4 • 7:06 p.m.

Phase Space Distributions for Dispersive Media, Jonathan C. Petrucci, Miguel A. Alonso; Inst. of Optics, Univ. of Rochester, USA. Phase space descriptions of pulses in 1-D transparent dispersive media are presented. Unlike the standard Wigner function, spatial propagation/temporal evolution is described exactly by a free-particle-like transformation (e.g. phase space shearing) for any dispersion relation.

PDPC5 • 7:18 p.m.

A Proposed Quantum Mechanics Mechanism for (e⁻, h⁺) Charges Separation Applied to Photosynthesis and Energy Production Efficiency Improvement, Marco Sacilotti¹, Euclides Almeida², Claudia Brainer Mota², Frederico Dias Nunes³, Michael Sundheimer⁴; ¹Univ. de Bourgogne-Dijon France, France, ²Dept. de Fisica-Univ. Federal de Pernambuco, Brazil, ³Depto de Eletrônica e Sistemas-CTG-Univ. Federal de Pernambuco, Brazil, ⁴Depto de Fisica - Univ. Federal Rural de Pernambuco, Brazil. Based on concepts in semiconductor band gap engineering (the staggered one), a qualitative model is proposed for the first step mechanism in artificial catalysis and natural systems such as photosynthesis in green leaves.

PDPC6 • 7:30 p.m.

Optical Trapping of Nanoparticles in Resonant Cavities: Optical Tweezers with Single Particle Selectivity, Juejun Hu¹, Lionel C. Kimerling¹, Shiyun Lin², Kenneth Crozier²; ¹Micro Photonics Ctr., MIT, USA, ²School of Engineering and Applied Science, Harvard Univ., USA. We present the first theoretical analysis on the opto-mechanical interactions between a nanoparticle and the optical field inside an optical resonant nano-cavity. We illustrate single particle trapping from monodispersed particles based on size-dependent trapping dynamics.

PDPC7 • 7:42 p.m.

High-Throughput Cell Deformation Cytometry in a Microfluidic Flow with a Single-Emitter Laser Diode, Ihab Sraj¹, Justin Chichester², Erich Hoover², Ralph Jimenez³, Jeff Squier², Charles D. Eggleton¹, David W. M. Marr²; ¹Univ. of Maryland, Baltimore County, USA, ²Colorado School of Mines, USA, ³JILA, NIST, Univ. of Colorado, USA. We demonstrate cell stretching with optical forces in a microfluidic flow at rates 10-100 times faster than previous methods. The elastic modulus of each cell can be determined from measurements of the equilibrium deformation.

PDPC8 • 7:54 p.m.

Optical Trapping Using Planar Silicon Micro-Ring Resonators, Shiyun Lin, Kenneth Crozier; Harvard Univ., USA. We demonstrate optical trapping with a micro-ring resonator, the first experimental demonstration to the best of our knowledge. Optical resonance enhancement effect leads to five-fold optical force increase compared to waveguide trapping.