

• **Thursday, May 20, 2010** •

CPDA • CLEO Postdeadline Session I

Room A6

**8:00 p.m.–10:00 p.m.**

*Paul Juodawolkis; MIT Lincoln Lab, USA, Presider*

**CPDA1 • 8:00 p.m.**

**Room Temperature Sub-Wavelength Plasmon Laser**, *Ren-Min Ma<sup>1</sup>, Rupert F. Oulton<sup>1</sup>, Volker J. Sorger<sup>1</sup>, Xiang Zhang<sup>1,2</sup>; <sup>1</sup>Univ. of California at Berkeley, USA, <sup>2</sup>Lawrence Berkeley Natl. Lab, USA*. We report plasmon lasers with optical confinement of 1/20th wavelength operating at room temperature. The strong confinement and efficient feedback arising from plasmonic total internal reflection enhance the spontaneous emission rate up to 20 times.

**CPDA2 • 8:10 p.m.**

**Unidirectional Semiconductor Ring Lasers Integrated with Semiconductor Optical Isolators**, *Hiromasa Shimizu, Yoshitaka Kono, Syunsuke Goto, Toshiaki Mori; Tokyo Univ. of Agriculture and Technology, Japan*. We have fabricated unidirectional semiconductor ring lasers integrated with semiconductor optical isolators for magnetically reconfigurable all optical signal processing. The fabricated device showed lasing intensity modulation by reversing the direction of optical isolator.

**CPDA3 • 8:20 p.m.**

**Characterization of Solar Cells with High Spatial Resolution**, *Michael Schwalm, Christoph Lange, Wolfgang Rühle, Wolfgang Stolz, Kerstin Volz, Sangam Chatterjee; Univ. of Marburg, Germany*. Characterization techniques based on measuring the photocurrent of a solar cell under local illumination are introduced. Experiments on test structures and numerical simulations proof the applicability and reliability under realistic conditions and show technical limits.

**CPDA4 • 8:30 p.m.**

**Fast Parallel Fabrication of Three-Dimensional Photonic Crystals Using the Dynamic Laser Printing Technique**, *Han Lin, Baohua Jia, Min Gu; Ctr. for Micro-Photonics and CUDOS, Faculty of Engineering and Industrial Sciences, Swinburne Univ. of Technology, Australia*. Fast parallel femtosecond laser fabrication of high quality three-dimensional polymeric photonic crystals with 90% void uniformity and more than 60% suppression in transmission using the dynamic laser printing technique is demonstrated.

**CPDA5 • 8:40 p.m.**

**Large Area Multi-material Plasmonic Nanostructures Fabricated by Replica Molding and Mechanical Sectioning**, *Mikhail A. Kats, Darren J. Lipomi, Philseok Kim, Sung H. Kang, Joanna Aizenberg, George M. Whitesides, Federico Capasso; Harvard Univ., USA*. We fabricated multi-material plasmonic nanostructures by a parallelizable process involving nanoskiving with polymeric spacer layers. We observed plasmonic resonances of concentric gold rings fabricated by this technique in the near- to mid-infrared.

**CPDA6 • 8:50 p.m.**

**Magnification of Photonic Crystal Fluorescence Enhancement via TM Resonance Excitation and TE Resonance Extraction on a Dielectric Nanorod Surface**, *Hsin-Yu Wu<sup>1</sup>, Wei Zhang<sup>2</sup>, Patrick C. Mathias<sup>3</sup>, Brian T. Cunningham<sup>1</sup>; <sup>1</sup>Dept. of Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA, <sup>2</sup>Dept. of Material Science and Engineering, Univ. of Illinois at Urbana-Champaign, USA, <sup>3</sup>Dept. of Bioengineering, Univ. of Illinois at Urbana-Champaign, USA*. We experimentally demonstrate that a 1-D photonic crystal surface incorporating a nanorod-structured layer reveals a 588-fold enhancement in fluorescence intensity through the use of resonance-enhanced excitation of Cy5 and resonance-enhanced extraction of Cy5 emission.

**CPDA7 • 9:00 p.m.**

**Monolithically Integrated Quad Mach-Zehnder IQ Modulator for Optical 16-QAM Generation**, *Guo-Wei Lu<sup>1</sup>, Takahide Sakamoto<sup>1</sup>, Akito Chiba<sup>1</sup>, Tetsuya Kawanishi<sup>1</sup>, Tetsuya Miyazaki<sup>1</sup>, Kaoru Higuma<sup>2</sup>, Masaaki Sudo<sup>2</sup>, Junichiro Ichikawa<sup>2</sup>; <sup>1</sup>Natl. Inst. of Information and Communications Technology, Japan, Japan, <sup>2</sup>New Technology Res. Labs, Sumitomo Osaka Cement, Japan*. We experimentally demonstrate a 16-QAM transmitter using a **monolithically-integrated** quad Mach-Zehnder in-phase/quadrature (QMZ-IQ) modulator with **binary** driving electronics.

**CPDA8 • 9:10 p.m.**

**Ultra-Wide-Range Multi-Rate DPSK Laser Communications**, *D. O. Caplan, H. Rao, J. P. Wang, D. M. Boroson, J. J. Carney, A. S. Fletcher, S. A. Hamilton, R. Kochhar, R. J. Magliocco, R. Murphy, M. Norvig, B. S. Robinson, R. T. Schulein, N. W. Spellmeyer; MIT Lincoln Lab, USA*. We propose and demonstrate a scalable high-sensitivity approach for achieving multi-rate DPSK using a single transmitter and fixed-interferometer-receiver design. Near-theoretical real-time performance is demonstrated over static and fading channels at rates from 2.4Mbps to 2.5Gbps.

CPDA9 • 9:20 p.m.

**Subpicosecond 200GHz Soliton Laser Based on a CMOS Compatible Integrated Microring Resonator,** *Marco Peccianti*<sup>1,2</sup>, *Alessia Pasquazi*<sup>1</sup>, *Yongwoo Park*<sup>1</sup>, *Brent E. Little*<sup>3</sup>, *Sai T. Chu*<sup>3</sup>, *David J. Moss*<sup>1,4</sup>, *Roberto Morandotti*<sup>1</sup>; <sup>1</sup>INRS Énergie, Matériaux et Télécommunications, Canada, <sup>2</sup>Inst. for Chemical and Physical Processes, CNR, "Sapienza" Univ., Italy, <sup>3</sup>Infinera Ltd., USA, <sup>4</sup>CUDOS, School of Physics, Univ. of Sydney, Australia. We present a subpicosecond, 200GHz-repetition rate, passively mode-locked laser based on high-harmonic four-wave mixing in an integrated CMOS-compatible high-Q nonlinear ring resonator.

CPDA10 • 9:30 p.m.

**Integrated MEMS Tunable High Quality Factor Optical Cavity for Optomechanical Transduction,** *Houxun Miao*<sup>1,2</sup>, *Kartik Srinivasan*<sup>1</sup>, *Vladimir Aksyuk*<sup>1,2</sup>; <sup>1</sup>NIST, USA, <sup>2</sup>Maryland NanoCtr., Univ. of Maryland, USA. We demonstrate a fully integrated optomechanical transducer achieving 580 ppm wavelength tuning of a high quality factor ( $Q=10^5$ - $10^6$ ) waveguide-coupled silicon microdisk by electrostatically actuating a dielectric membrane located in the evanescent field region above it.

CPDA11 • 9:40 p.m.

**Broadband CMOS-Compatible Silicon Photonic Electro-Optic Switch for Photonic Networks-on-Chip,** *Aleksandr Biberman*<sup>1</sup>, *Hugo L. R. Lira*<sup>2</sup>, *Kishore Padmaraju*<sup>1</sup>, *Noam Ophir*<sup>1</sup>, *Michal Lipson*<sup>2</sup>, *Keren Bergman*<sup>1</sup>; <sup>1</sup>Columbia Univ., USA, <sup>2</sup>Cornell Univ., USA. Error-free switching of up to 40-Gb/s data using a silicon photonic microring resonator electro-optic switch is demonstrated for the first time, with bit-error-rate and power penalty characterizations firmly establishing its feasibility for high-performance photonic networks-on-chip.

CPDA12 • 9:50 p.m.

**Digital Noise-tolerant Silicon Nanophotonic Switch,** *Joris Van Campenhout*, *William M. J. Green*, *Solomon Assefa*, *Yurii A. Vlasov*; IBM Res., T. J. Watson Res. Ctr., USA. Error-free switching performance of a digital electro-optic silicon switch based on multi-stage Mach-Zehnder lattice is demonstrated. Robust crosstalk levels of lower than -15dB are obtained for drive-voltage noise levels exceeding 300mV while maintaining error-free operation.

CPDB • CLEO Postdeadline Session II

Room A7

8:00 p.m.–10:00 p.m.

*Robert Fisher*; R. A. Fisher Associates, USA, *Presider*

CPDB1 • 8:00 p.m.

**Three-Dimensional Coherent X-Ray Diffractive Imaging from a Single View,** *Richard Sandberg*<sup>1,2</sup>, *Kevin S. Raines*<sup>3</sup>, *Sara Salha*<sup>3</sup>, *Huaidong Jiang*<sup>3</sup>, *Jose A. Rodriguez*<sup>4</sup>, *Benjamin P. Fahimian*<sup>3</sup>, *Henry C. Kapteyn*<sup>1</sup>, *Margaret M. Murnane*<sup>1</sup>, *Jincheng Du*<sup>5</sup>, *Jianwei Miao*<sup>3</sup>; <sup>1</sup>Dept. of Physics and JILA, Univ. of Colorado at Boulder, USA, <sup>2</sup>Physical Chemistry and Applied Spectroscopy, Los Alamos Natl. Lab, USA, <sup>3</sup>Dept. of Physics and Astronomy and California NanoSystems Inst., Univ. of California at Los Angeles, USA, <sup>4</sup>Molecular Biology Inst., Univ. of California at Los Angeles, USA, <sup>5</sup>Dept. of Materials Science & Engineering, Ctr. for Advanced Scientific Computing and Modeling, Univ. of North Texas, USA. We demonstrate that high numerical aperture coherent diffractive imaging enables three-dimensional imaging from a single exposure angle under certain conditions. We demonstrate this technique, called ankylography, with simulations and experiment from a tabletop soft-x-ray laser.

CPDB2 • 8:10 p.m.

**High-Harmonic Generation in Strongly Driven Bulk Periodic Solid,** *Shambhu Ghimire*<sup>1,2</sup>, *Anthony DiChiara*<sup>2</sup>, *Emily Sistrunk*<sup>2</sup>, *Louis F. DiMauro*<sup>2</sup>, *Pierre Agostini*<sup>2</sup>, *David A. Reis*<sup>1</sup>; <sup>1</sup>Stanford Univ. / SLAC Natl. Accelerator Lab, USA, <sup>2</sup>Dept. of Physics, Ohio State Univ., USA. We report on high-order harmonic generation from bulk zinc-oxide driven by a strong mid-infrared laser pulse. The harmonic spectra extend well above the band-gap and scales non-perturbatively with the laser intensity.

CPDB3 • 8:20 p.m.

**4% Conversion of Sub- $\mu$ J Near-IR Pulses to Deep UV in Fundamental Mode of Ar-filled PCF,** *Philipp Hölzer*<sup>1,2</sup>, *Johannes Nold*<sup>1,3</sup>, *Nicolas Y. Joly*<sup>1,3</sup>, *Kwan Leung G. Wong*<sup>1</sup>, *Michael Scharrer*<sup>1</sup>, *Sebastian P. Stark*<sup>1</sup>, *Wonkeun Chang*<sup>1</sup>, *Alexander Podlipensky*<sup>1</sup>, *Philip St.J. Russell*<sup>1,3</sup>; <sup>1</sup>Max Planck Inst. for the Science of Light, Germany, <sup>2</sup>School of Advanced Optical Technologies, Univ. of Erlangen-Nuremberg, Germany, <sup>3</sup>Dept. of Physics, Univ. of Erlangen-Nuremberg, Germany. We report extreme self-compression of sub- $\mu$ J 30 fs pulses at 800 nm in Ar-filled hollow-core PCF, resulting in 4% conversion to deep UV light in the fundamental guided mode, pressure-tunable from 220-270 nm.

**CPDB4 • 8:30 p.m.**

**Low Loss Broadband Transmission in Optimized Core-shape Kagome Hollow-core PCF, Yingying Wang,**

*Francois Couny, Peter J. Roberts, Fetah Benabid; Dept. of Physics, Gas-Phase Photonic Materials Group, Ctr. for Photonics and Photonic Materials, Univ. of Bath, UK* A Kagome-lattice hollow-core photonic crystal fiber with a hypocycloid-shaped core enhances the coupling-inhibition between the core- and cladding-modes, thus providing an optical attenuation <250dB/km. This rivals the state-of-the-art photonic bandgap hollow-core fibers is demonstrated.

**CPDB5 • 8:40 p.m.**

**Nanosecond Pulse Amplification in a Higher-Order-Mode Erbium-Doped Fiber Amplifier, Jeffrey W.**

*Nicholson<sup>1</sup>, Anthony M. DeSantolo<sup>1</sup>, Samir Ghalmi<sup>1</sup>, John M. Fini<sup>1</sup>, Jim Fleming<sup>1</sup>, Eric Monberg<sup>1</sup>, Frank DiMarcello<sup>1</sup>, Siddharth Ramachandran<sup>2</sup>; <sup>1</sup>OFS Labs, USA, <sup>2</sup>Boston Univ., USA.* The nonlinear properties of a nanosecond pulse in a higher-order-mode, Er-doped-fiber amplifier with 2440 $\mu\text{m}^2$  effective area are compared to a conventional 880 $\mu\text{m}^2$  area fiber. Both 1480nm pump and 1554nm signal propagate in the LP<sub>09</sub> mode.

**CPDB6 • 8:50 p.m.**

**Picosecond 10  $\mu\text{m}$  Pulse Amplification in Isotopic CO<sub>2</sub> Active Medium, Mikhail N. Polyanskiy, Igor V.**

*Pogorelsky, Vitaly Yakimenko; Brookhaven Natl. Lab, USA.* Using isotopically enriched carbon dioxide in a CO<sub>2</sub> laser amplifier we eliminated the splitting of a picosecond pulse during amplification that usually results from modulations in the periodical spectrum caused by the rotational line structure.

**CPDB7 • 9:00 p.m.**

**Mid-IR Supercontinuum in a Fluorozirconate Fiber Pumped by a Femtosecond CPA System at 1.6 $\mu\text{m}$ ,**

*Nicolas Ducros<sup>1</sup>, Alexis Labruyère<sup>1</sup>, Sébastien Février<sup>1</sup>, Franck Morin<sup>2</sup>, Frédéric Druon<sup>2</sup>, Marc Hanna<sup>2</sup>, Patrick Georges<sup>2</sup>; <sup>1</sup>Xlim - Univ. of Limoges, France, <sup>2</sup>Lab Charles Fabry de l'Inst. d'Optique, Univ. Paris-Sud, France.* Mid-IR supercontinuum is demonstrated in a step index fluorozirconate glass fiber pumped by a CPA system emitting 500 fs pulses at 1.6  $\mu\text{m}$ . Output power up to 60 mW is obtained over the supercontinuum bandwidth.

**CPDB8 • 9:10 p.m.**

**Broadband Terahertz Wave Remote Sensing Using Coherent Manipulation of Fluorescence from**

**Asymmetrically Ionized Gases, Jingle Liu<sup>1</sup>, Jianming Dai<sup>1</sup>, S.I. Chin<sup>2</sup>, X.-C. Zhang<sup>1</sup>; <sup>1</sup>Ctr. for Terahertz Res., Rensselaer Polytechnic Inst., USA, <sup>2</sup>Dept. of Physics, Ctr. for Optics, Photonics and Laser, Laval Univ., Canada.** We present an "all-optical" technique of broadband terahertz wave remote sensing by coherently manipulating the fluorescence emission from asymmetrically ionized gases. Coherent THz wave detection at a distance of 10 meters has been demonstrated.

**CPDB9 • 9:20 p.m. • CLEO: Applications •**

**Ppb Standoff Detection of Nitric Oxide in Air, Arthur**

*Dogariu, Richard B. Miles; Princeton Univ., USA.* We demonstrate standoff detection of NO in air with ppb resolution. The weakly ionized plasma produced by picosecond UV laser pulses via REMPI is detected remotely by a microwave scattering technique.

**CPDB10 • 9:30 p.m.**

**Fast and Accurate Comb-Based Spectral Analysis of a Frequency Agile CW Laser, Fabrizio R. Giorgetta, Ian**

*Coddington, Esther Baumann, William C. Swann, Nathan R. Newbury; Natl. Inst. of Standards and Technology, USA.* The time-resolved frequency spectrum of a frequency agile CW laser is measured with a 300  $\mu\text{s}$  update rate and 3 kHz resolution/accuracy over a 28 nm wavelength range with a coherent dual comb setup.

**CPDB11 • 9:40 p.m.**

**Mid-IR Frequency Comb Upconversion Spectroscopy**

*Todd A. Johnson, Scott A. Diddams; NIST, USA.* We present a mid-infrared frequency comb generated via difference frequency mixing of a Yb-femtosecond fiber laser. After passing through a methane gas sample, the MIR comb is upconverted and dispersed onto a CCD for detection.

**CPDB12 • 9:50 p.m.**

**First Experimental Studies of the Resonant Optoacoustic Detection Technique, James H.**

*Doty, Anatoliy A. Kosterev, Frank K. Tittel; Rice Univ., USA.* A novel technique for detecting optical absorption in gases is demonstrated. The technique called resonant optoacoustic detection (ROTADE) is based on energy transfer from the optical beam area to a mechanical oscillator via molecular diffusion.

Room A8

8:00 p.m.–10:00 p.m.

Hideo Mabuchi; *Stanford Univ., USA, Presider*

Hui Cao; *Yale Univ., USA, Presider*

**QPDA1 • 8:00 p.m.**

**Interaction of a Single Trapped Ion with Heralded**

**Single Photons**, *Joyee Ghosh, Nicolas Piro, Felix Rohde, Carsten Schuck, Marc Almendros, Jan Huwer, Albrecht Haase, Markus Hennrich, Francois Dubin, Juergen Eschner; ICFO-Inst. de Ciencias Fotoniques, Spain.* We demonstrate single trapped ion-single photon interaction by the detection of quantum jumps, strongly correlated with the detection of the quantum-correlated heralding photon. This is a step towards controlling single-photon absorption and transferring photon-to-atom entanglement.

**QPDA2 • 8:10 p.m.**

**Photon Blockade in Circuit Quantum Electrodynamics**,

*Anthony J. Hoffman<sup>1</sup>, Srikanth Srinivasan<sup>1</sup>, Lafe Spietz<sup>2</sup>, José Aumentado<sup>2</sup>, Andrew A. Houck<sup>1</sup>; <sup>1</sup>Princeton Univ., USA, <sup>2</sup>NIST, USA.* Photon-photon interactions mediated by a qubit are realized in a microwave resonator and result in the blocked transmission of photons. Transmission measurements versus source bandwidth reveal a photon staircase, a signature of a photon blockade.

**QPDA3 • 8:20 p.m.**

**Implementation of a Non-Deterministic Optical**

**Noiseless Amplifier**, *Franck Ferreyrol, Marco Barbieri, Rémi Blandino, Simon Fossier, Rosa Tualle-Broui, Philippe Grangier; Groupe d'Optique Quantique, Lab Charles Fabry, Inst. d'Optique, CNRS, Univ. Paris-Sud, France.* Quantum Physics imposes that any phase independent amplification introduces excess noise. Nevertheless this limitation could be ignored with conditioning. We report fully characterization with homodyne tomography of a non-deterministic noiseless amplification of a coherent state.

**QPDA4 • 8:30 p.m.**

**Super-Resolution Fingerprinting in the Far Field**,

*Leonid Alekseyev<sup>1,2</sup>, Evgenii Narimanov<sup>2</sup>, Jacob Khurgin<sup>3</sup>; <sup>1</sup>Princeton Univ., USA, <sup>2</sup>Purdue Univ., USA, <sup>3</sup>Johns Hopkins Univ., USA.* We describe a scheme for far-field subwavelength fingerprinting in the mid-IR and THz bands. The approach relies on evanescent wave retrieval, mediated by scattering on a subwavelength nanostructure.

**QPDA5 • 8:40 p.m.**

**Coherent Perfect Absorbers: Time-reversed Lasers**,

*Yidong Chong, Li Ge, Hui Cao, A. Douglas Stone; Dept. of Applied Physics, Yale Univ., USA.* We examine the precise conditions under which an arbitrary body can be made perfectly absorbing at discrete frequencies, under specific conditions of coherent monochromatic illumination, and discuss a possible implementation in silicon.

**QPDA6 • 8:50 p.m.**

**Darker than Black: Radiation-absorbing Metamaterial**,

*Evgenii Narimanov<sup>1</sup>, M. A. Noginov<sup>2</sup>, H. Li<sup>2</sup>, Yu. Barnakov<sup>2</sup>; <sup>1</sup>Purdue Univ., USA, <sup>2</sup>Ctr. for Materials Res., Norfolk State Univ., USA.* Taking advantage of the broadband “super-singularity” in the density of states of hyperbolic metamaterials, we develop a new approach to radiation-absorbing systems and present an experimental realization of this concept.

**QPDA7 • 9:00 p.m.**

**Cavity Quantum Electrodynamics in the Anderson-**

**localized Regime**, *Luca Sapienza, Henri Thyrrerstrup, Søren Stobbe, Pedro David Garcia, Stephan Smolka, Peter Lodahl; Technical Univ. of Denmark, Denmark.* We experimentally measure, by means of time-resolved photoluminescence spectroscopy, a 15-fold enhancement of the spontaneous emission decay rate of single semiconductor quantum dots coupled to disorder-induced Anderson-localized modes with efficiencies reaching 94%.

**QPDA8 • 9:10 p.m.**

**Photocurrent Spectroscopy and Luminescence of**

**GaN/AlN Quantum Discs in GaN Nanowires**, *Maria Tchernycheva<sup>1</sup>, Lorenzo Rigutti<sup>1</sup>, Gwenole Jacopin<sup>1</sup>, Andres De Luna Bugallo<sup>1</sup>, François Henri Julien<sup>1</sup>, Luiz Fernando Zagonel<sup>2</sup>, Odile Stephan<sup>2</sup>, Mathieu Kociak<sup>2</sup>, Rudeesun Songmuang<sup>3</sup>; <sup>1</sup>Inst. d'Electronique Fondamentale, Univ. of Paris Sud, France, <sup>2</sup>Lab de Physique des Solides, Univ. of Paris Sud, France, <sup>3</sup>CEA-CNRS, Inst. Neel, France.* We present optical studies of carrier confinement in GaN/AlN quantum discs in nanowires and their application to photodetection on the nanoscale. Single-nanowire UV photodetector relying on carrier generation in quantum discs is demonstrated.

**QPDA9 • 9:20 p.m.**

**The Dark Exciton in a Quantum Dot- A Novel Bright**

**Qubit with Very Long Coherence Time**, *Eilon Poem<sup>1</sup>, Yaron Kodriano<sup>1</sup>, Netanel H. Lindner<sup>2</sup>, Brian D. Gerardot<sup>3</sup>, Pierre M. Petroff<sup>4</sup>, David Gershoni<sup>1</sup>; <sup>1</sup>Technion, Israel, <sup>2</sup>Caltech, USA, <sup>3</sup>Herriot-Watt, UK, <sup>4</sup>Univ. of California at Santa Barbara, USA.* We demonstrate for the first time that the quantum dot confined dark exciton is a natural, coherent and long-lived qubit. We optically “write” its spin state and successfully “read” its subsequent coherent evolution.

**QPDA10 • 9:30 p.m.**

**Observation of Soliton Pulse Compression in Photonic Crystal Waveguides, Pierre Colman<sup>1,2</sup>, Chad Husko<sup>3</sup>, Sylvain Combrié<sup>1</sup>, Isabelle Sagnes<sup>2</sup>, Chee Wei Wong<sup>3</sup>, Alfredo De Rossi<sup>1</sup>; <sup>1</sup>Thales Res. and Technology, France, <sup>2</sup>Lab de Photonique et de Nanostructures (CNRS UPR 20), France, <sup>3</sup>Columbia Univ., USA.** We demonstrate soliton-effect pulse compression in mm-long photonic crystal waveguides resulting from strong anomalous dispersion and self-phase modulation. Compression from 3ps to 580fs, at low pulse energies (~10pJ), is measured via autocorrelation.

**QPDA11 • 9:40 p.m.**

**A Nano-scale Light-driven Plasmonic Motor, Ming Liu<sup>1</sup>, Thomas Zentgraf<sup>1</sup>, Yongmin Liu<sup>1</sup>, Guy Bartal<sup>1</sup>, Xiang Zhang<sup>1,2</sup>; <sup>1</sup>NSF Nano-scale Science and Engineering Ctr. (NSEC), Univ. of California at Berkeley, USA, <sup>2</sup>Lawrence Berkeley Natl. Lab, USA.** We show that a nano-scale plasmonic motor can generate a large and controllable torque. As demonstration, we rotate a dielectric particle which is 4,000 times larger in volume than the motor.

**QPDA12 • 9:50 p.m.**

**Phonon Laser Action in a Tunable, Two-level System, Ivan S. Grudinin, Hansuek Lee, Oskar Painter, Kerry J. Vahala; Caltech, USA.** We demonstrate a compound optical microcavity system, coupled to a radio-frequency mechanical mode, operating in close analogy to a two-level laser. Inversion produces gain, causing phonon laser action above a pump threshold of 7  $\mu$ W.

**NOTES**

