Rooms 318-320 — CLEO

8:00 a.m.–9:45 a.m.
CFA • Biomedical Microscopy I
Peter T. So; MIT, USA, Presider

CFA1 • 8:00 a.m.
Sequential *in vivo* Molecular Imaging with a Dual-Axes Confocal Microscope, *Hyejun Ra[1], Emilio Gonzalez[1], Wibool Piyawattanametha[1,2,3], Michael J. Mandella[1], Roger Kaspar[3], Christopher H. Contag[1], Gordon S. Kino[1], Olav Solgaard[1]; [1]Stanford Univ., USA, [2]Natl. Electronics and Computer Technology Ctr., Thailand, [3]Transderm Inc., USA.* We demonstrate sequential three-dimensional *in vivo* imaging in one mouse, monitoring siRNA silencing with a dual-axes confocal microscope. This opens up new possibilities in developing therapeutics for genetic disorders through better assessment of treatment efficiency.

CFA2 • 8:15 a.m.
Electro-Optical Imaging Microscopy of Dye Doped Lipid Bilayer, *Bassam Hajj[1], Sophie De Reguardati[2], Loïc Hugonin[2], Toshihisa Osaki[3], Shoji Takeuchi[3], Bruno Le Pioufle[2], Dominique Chauvat[1], Joseph Zyss[1]; [1]Lab de Photonique Quantique et Moléculaire, ENS Cachan- D'Alembert Inst., France, [2]Lab de Systèmes et Applications des Technologies de l'Information et de l'Energie, ENS Cachan-D'Alembert Inst., France, [3]Univ. of Tokyo, Japan.* We report the first imaging of a dye-doped artificial bilayer using electro-optical microscopy. The applied voltage dependence confirms the origin of the effect. This result is an important step towards a contactless optical patch-clamp.

CFA3 • 8:30 a.m.
Autofluorescence Microscopy for Real-Time Imaging of Human Esophageal Disease, *Bevin Lin[1], Shiro Urayama[2], Ramez M. G. Saroufeem[3], Dennis L. Matthews[1,4], Stavros G. Demos[1,5]; [1]Ctr. for Biophotonics Science and Technology, Univ. of California at Davis, USA, [2]Medical Ctr., Div. of Gastroenterology and Hepatology, Univ. of California at Davis, USA, [3]Medical Ctr., Dept. of Pathology, Univ. of California at Davis, USA, [4]Medical Ctr., Dept. of Neurological Surgery, Univ. of California at Davis, USA, [5]Lawrence Livermore Natl. Lab, USA.* Autofluorescence microscopy is explored for real-time imaging of human esophagus tissue and detection of disease associated modifications. This approach was also tested using a prototype endoscopy probe.

CFA4 • 8:45 a.m.
Dynamic Quantitative Phase Microscopy of Biological Cells, *Natan T. Shaked, Matthew T. Rinehart, Adam Wax; Duke Univ., USA.* We introduce a new fast and accurate method for dynamic quantitative phase imaging of biological cells. The method enables imaging of sub-millisecond dynamic biological phenomena with sub-nanometer temporal stability. Initial experimental results are given.

Rooms 321-323 — IQEC

8:00 a.m.–9:45 a.m.
IFA • Quantum Nano-Optics
Mark I. Stockman; Georgia State Univ., USA, Presider

IFA1 • 8:00 a.m.
Plasmon-Enhanced Single Photon Emission from a Nano-Assembled Metal-Diamond Hybrid Structure, *Stefan Schietinger, Michael Barth, Tim Schröder, Thomas Aichele, Oliver Benson; Humboldt-Univ. Berlin, Germany.* We demonstrate the controlled assembly of diamond nanocrystals and gold nanoparticles, thus enhancing the emission properties of single nitrogen-vacancy color centers and realizing an efficient and stable single photon source at room-temperature.

IFA2 • 8:15 a.m.
Multiexcitons in Colloidal Semiconductor Nanocrystals, *Ruth Osovsky[1], Dima Cheskis[1], Viki Kloper[1], Leonid Fradkin[1], Aldona Sashchiuk[1], Martin Kroner[2], Efrat Lifshitz[1]; [1]Russell Berrie Nanotechnology Inst., Technion-Israel Inst. of Technology, Israel, [2]Inst. of Quantum Electronics, ETH Zurich, Switzerland.* Multiexcitons were resolved in the micro-photoluminescence spectrum of a single CdTe/CdSe colloidal quantum dot. The multiexcitons were generated by a sequential filling of the s- and p-electronic shells increasing of a cw excitation power.

IFA3 • 8:30 a.m.
Fabry-Perot Measurements of InAs/GaAs Quantum Dots, *Michael B. Metcalfe[1,2], Glenn S. Solomon[1,2], John Lawall[1]; [1]NIST, USA, [2]Dept. of Physics, Univ. of Maryland, USA.* A scanning Fabry-Perot cavity is used to measure the photoluminescence of InAs/GaAs self-assembled quantum dots with linewidths as low as 1 GHz. This cavity is subsequently locked to the dot emission using PI control.

IFA4 • 8:45 a.m.
Purcell-Enhanced Spontaneous Emission of Colloidal PbS Quantum Dots in Slow-Light Silicon Photonic Crystal Waveguides at the Near-Infrared, *James F. McMillan[1], Mingbin Yu[2], Weon-kyu Koh[3], Christopher Murray[3], Dim-Lee Kwong[2], Chee-Wei Wong[1]; [1]Optical Nanostructures Lab, Columbia Univ., USA, [2]Inst. of Microelectronics, Singapore, [3]Dept. of Chemistry, Univ. of Pennsylvania, USA.* We present Purcell-enhanced spontaneous emission of colloidal near-infrared quantum dots in silicon photonic crystal waveguides. The lead sulfide quantum dots demonstrated slow-light enhancement from the large local density of states at the band edge.

Rooms 324-326 — CLEO

8:00 a.m.–9:45 a.m.
CFB • Advanced Fiber Laser Systems I
Norihiko Nishizawa; Osaka Univ., Japan, Presider

CFB1 • 8:00 a.m.
Intensity Noise of Mode-Locked Yb-Doped Fiber Lasers, *Levent Budunoğlu, Tolga Bagci, Coskun Ülgüdür, Kutan Gürel, Fatih Ö. Ilday; Bilkent Univ., Turkey.* Intensity noise is characterized at all mode-locking regimes over a wide range of parameters. Onset of noise outburst is reported beyond a threshold pump power. Moderate-power operation is preferable for seeding amplifiers for minimum-noise operation.

CFB2 • 8:15 a.m.
A Shot Noise Limited Fiber Laser Source, *Thanh T. H. Nguyen, Jong H. Chow, Conor M. Mow-Lowry, Timothy T. Y. Lam, David E. McClelland; Australian Natl. Univ., Australia.* We demonstrate a fiber laser source with shot noise limited performance above 1.5 MHz, by passive filtering with cascaded fiber ring cavities. The laser is kept resonant with the cavities via Pound-Drever-Hall frequency feedback control.

CFB3 • 8:30 a.m.
Non-Ideal Loop-Length-Dependence of Phase Noise in OEOs, *Olukayode Okusaga[1,2], Weimin Zhou[1], Etgar Levy[3], Moshe Horowitz[3], Gary Carter[2], Curtis Menyuk[2]; [1]ARL, USA, [2]Univ. of Maryland, Baltimore County, USA, [3]Technion-Israel Inst. of Technology, Israel.* We present an experimental study of the phase noise spectrum's dependence on the loop length in OEOs. As the loop length increases, the spectrum deviates significantly from the ideal dependence.

CFB4 • 8:45 a.m.
Ultrastable Fourier Domain Mode Locking Observed in a Laser Sweeping 1363.8 - 1367.3 nm, *Thilo Kraetschmer, Scott T. Sanders; Univ. of Wisconsin-Madison, USA.* We present an ultrastable Fourier domain mode locked (FDML) laser scanning 1363.8-1367.3 nm at 49.9 kHz repetition rate. Compared to typical FDML performance, this laser offers extremely low intensity noise and reduced spectral linewidth.

Room 314 — CLEO

8:00 a.m.–9:45 a.m.
CFC • Nonlinear Optics
Charles G. Durfee; Colorado School of Mines, USA, Presider

CFC1 • 8:00 a.m.
Spatio-Temporal Dynamics in Efficient Double-Crystal Cross Polarized Wave Generation, *Charles G. Durfee[1], Lorenzo Canova[2], Xiao-wei Chen[2], Alexandre Trisorio[2], Olivier Albert[2], Rodrigo Lopez-Martens[2]; [1]Colorado School of Mines, USA, [2]Lab d'Optique Appliquee, ENSTA-ParisTech, France.* Measurements and modeling of the propagation of the fundamental and the XPW signal emerging from a nonlinear crystal show how to manage self-phase modulation and self-focusing to improve conversion in a second crystal.

CFC2 • 8:15 a.m.
Stabilization of a Two Pulse Intracavity Pumped OPO, *Andreas Velten[1], Jean-Claude Diels[1], Alena Zavadilova[2], Vaclav Kubecek[2]; [1]Univ. of New Mexico, USA, [2]Czech Technical Univ., Czech Republic.* Experiments and simulation demonstrate an instability of the intracavity pumped optical parametric oscillator against bidirectional operation. It is shown that nonlinear losses inside the signal cavity can stabilize the bidirectional operation.

CFC3 • 8:30 a.m.
Near-Infrared Pulse-Front Matched Non-Collinear Optical Parametric Amplification in Bulk KTP, *Oleksandr Isaienko, Eric Borguet; Temple Univ., USA.* We apply pulse-front matching to a near-IR non-collinear optical parametric amplifier based on a bulk $KTiOPO_4$ crystal. Pulses as broad as ~32 THz at ~1200 nm with almost no angular dispersion could be produced.

CFC4 • 8:45 a.m.
High-Pulse-Energy Optical Parametric Oscillator in the Near- and Mid-Infrared, *Lukasz Kornaszewski, Tobias P. Lamour, Jinghua Sun, Derryck T. Reid; Heriot-Watt Univ., UK.* We report an extended-cavity femtosecond optical parametric oscillator, based on MgO:PPLN and synchronously pumped by a commercial Yb:fibre laser. Preliminary results show 15 MHz-repetition-frequency, 475 fs-duration pulses at 1.5 µm, with energies of 36 nJ.

Room 315 | Room 316 | Room 317

IQEC

CLEO

8:00 a.m.–9:45 a.m.
IFB • Advances in Trapped-Ion Science
Christopher Monroe; Univ. of Maryland and Joint Quantum Inst., USA, Presider

IFB1 • 8:00 a.m. Invited
Cavity QED Experiments with Ion Coulomb Crystals, *P. F. Herskind, A. Dantan, J. P. Marler, M. Albert, Michael Drewsen; Aarhus Univ., Denmark.* Cavity QED experimental results demonstrating collective strong coupling between ensembles of atomic ions cooled into Coulomb crystals and optical cavity fields have been achieved. Collective Zeeman coherence times of milliseconds have furthermore been obtained.

IFB2 • 8:30 a.m. Invited
A Heralded Quantum Gate between Remote Atoms, *David L. Hayes[1], D. N. Matsukevich[1], P. Maunz[1], S. Olmschenk[1], L. M. Duan[2], C. Monroe[1]; [1]Joint Quantum Inst. and Dept. of Physics, Univ. of Maryland, USA, [2]FOCUS Ctr. and Dept. of Physics, Univ. of Michigan, USA.* We implement a probabilistic entangling gate between two distant trapped ytterbium ions and measure an average gate fidelity of 90%.

8:00 a.m.–9:45 a.m.
CFD • High Peak Intensity Lasers
Daniel J. Ripin; MIT Lincoln Lab, USA, Presider

CFD1 • 8:00 a.m.
Diode-Pumped V-Shape Water-Cooled Yb:YAG Oscillator, *Wentao Duan, Haiwu Yu, Mingzhong Li, Dongbin Jiang, Xinying Jiang, Jiangang Zheng; Res. Ctr. of Laser Fusion, China Acad. of Engineering and Physics, China.* A diode-pumped V-shape water-cooled Yb:YAG oscillator is presented. The output energy of 3.3J at 10Hz and 41% slope efficiency have been achieved in free running regime for 12J incident pump energy at 940nm.

CFD2 • 8:15 a.m.
High Power and High Energy Yb:KYW Regenerative Amplifier Using a Chirped Volume Bragg Grating, *Anne-Laure Calendron, Katrin Wentsch, Joachim Meier, Max J. Lederer; High Q Laser Innovation GmbH, Austria.* We report a high power/high energy dual-crystal Yb:KYW regenerative amplifier using a single chirped volume Bragg grating (CVBG) as stretcher/compressor with more than 12W average power at repetition-rates >40kHz and compressed pulsewidths around 500fs.

CFD3 • 8:30 a.m.
High Energy Regenerative Thin Disk Amplifier with Sub 200 fs Pulses and 10 W Average Power, *Udo Bünting[1], Hakan Sayinc[1], Peter Wessels[1], Dieter Wandt[1], Uwe Morgner[1,2], Dietmar Kracht[1]; [1]Laser Zentrum Hannover, Germany, [2]Inst. of Quantum Optics, Leibniz Univ. Hannover, Germany.* An Yb:KYW femtosecond regenerative amplifier with combination of two partially overlapping gain spectra from a single thin disk, producing 500 µJ sub 200 fs pulses at a repetition rate of 20 kHz, is presented.

CFD4 • 8:45 a.m.
High Repetition Rate Diode Pumped CPA Thin Disk Laser of the Joule Class, *Johannes Tümmler, Robert Jung, Holger Stiel, Peter V. Nickles, Wolfgang Sandner; Max Born Inst., Germany.* An Yb:YAG diode-pumped CPA laser-system based on thin-disk technology has been set up. The system works at 100Hz repetition rate emitting 1ps pulses with several hundred mJ energy. Scalability allows upgrade to the Joule level.

8:00 a.m.–9:45 a.m.
CFE • Photonic Crystal Cavities
Armand Rosenberg; NRL, USA, Presider

CFE1 • 8:00 a.m.
Increasing the *Q* Factor and Controlling the Resonant Wavelength of Photonic Crystal Nanocavities, *Yasushi Takahashi, Tomaaki Sugiya, Shota Yamada, Yuki Taguchi, Takashi Asano, Susumu Noda; Dept. of Electronic Science and Engineering, Kyoto Univ., Japan.* We have succeeded in developing a nanocavity with *Q* factor over 3 million and arrayed nanocavities in which the variation of resonant wavelengths has a standard deviation as small as ~0.28 nm.

CFE2 • 8:15 a.m.
High Quality Factor 1-D Photonic Crystal Cavities in Silicon, *Parag B. Deotare, Murray W. McCutcheon, Ian W. Frank, Mughees Khan, Raji Shankar, Marko Lončar; Harvard Univ., USA.* Using a tapered photonic crysal cavity approach we designed cavities with theoretical Quality factors Q=2 x 10^7 and measured experimental Q= 7.5 x 10^5. Non-linear broadening of the cavity resonance has also been observed.

CFE3 • 8:30 a.m.
High Quality Factor Photonic Crystal Nanocavities in "Impossible Scenarios": Dual-Polarization, Low-Index Materials and Air-Band Modes, *Yinan Zhang, Murray W. McCutcheon, Marko Lončar; Harvard Univ., USA.* We for the first time present designs of high-*Q* photonic crystal nanocavities in the cases previously rendered "impossible", including an ultra-high *Q* dual-polarized nanocavities, high *Q/V* cavities based on low-index materials, and high-*Q* air-band-mode cavities.

CFE4 • 8:45 a.m.
Thermal Properties of Post-Size Controlled 12-Fold Quasi-Photonic Crystal Microcavity for Electrically-Driving, *Wei-De Ho, Yi-Hua Hsiao, Tsan-Wen Lu, Po-Tsung Lee; Dept. of Photonics and Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan.* We fabricate 12-fold quasi-photonic crystal microcavity with size-controlled post for electrically-driven structure by fine-tuning wet-etching time. Improved thermal properties of microcavities with different post sizes are investigated both in finite-element method simulations and experiments.

Friday, June 5

Room 336 — CLEO

8:00 a.m.–9:45 a.m.
CFF • Silicon Photonics
Carl B. Poitras; Cornell Univ., USA, Presider

CFF1 • 8:00 a.m. Tutorial
Silicon Photonic Waveguides and Devices, *Goran Mashanovich; Univ. of Surrey, UK.* Several silicon photonic waveguide geometries for both near- and mid-infrared wavelength regions are presented. These waveguides are basic building blocks of more complex photonic circuits such as modulators, detectors, filters, couplers or light sources.

Goran Mashanovich obtained his Dipl. Ing. and M.Sc. degrees in Electrical Engineering from the University of Belgrade, Serbia, and Ph.D. from the University of Surrey, UK. After working for 5 years as a Teaching and Research Assistant at the Faculty of Electrical Engineering, University of Belgrade, he joined the Silicon Photonics Group at the University of Surrey, in 2000. From 2006, he has been the manager of the group and he has been recently awarded a Royal Society Research Fellowship.

Room 337 — CLEO

8:00 a.m.–9:45 a.m.
CFG • Applications of Nonlinear Optics
Majid Ebrahim-Zadeh; ICFO, The Inst. of Photonic Sciences, Spain, Presider

CFG1 • 8:00 a.m.
Relaxation Oscillation Suppression in Intra-Cavity Optical Parametric Oscillators, *David J. M. Stothard, Malcolm H. Dunn; Univ. of St. Andrews, UK.* We describe a passive technique for the suppression of the relaxation oscillations exhibited by optical parametric oscillators pumped internal to laser cavities where gain media with long upper state lifetimes, such as Nd:YAG/YLF/YVO_4, are involved.

CFG2 • 8:15 a.m.
Dual-Wavelength-Pumped Supercontinuum Generation in an All-Fibre Device, *Chunle Xiong, William J. Wadsworth; Univ. of Bath, UK.* We demonstrate supercontinuum generation with a novel dual-wavelength pumping scheme. The dual-wavelength pump source and supercontinuum generation were realized one after another in a fusion spliced all-fibre device. The spectrum extends to 370 nm.

CFG3 • 8:30 a.m.
Multi-THz Bandwidth RF Spectrum Analysis of Femto-Second Pulses Using a Chalcogenide Photonic Chip, *Trung D. Vo, Mark D. Pelusi, Feng Luan, Steve J. Madden, Duk Y. Choi, Douglas A. P. Bulla, Barry Luther-Davies, Benjamin J. Eggleton; CUDOS, Australia.* Ultra-broad bandwidth (3.75THz) RF spectrum analysis of femtosecond optical pulses is reported for the first time, enabled by the use of a short 6cm length Chalcogenide waveguide designed for high nonlinearity and broadband low dispersion.

CFG4 • 8:45 a.m.
A Technique for Measuring B-Integral in Chirped-Pulse Amplifiers, *Vincent Bagnoud, Daniel Zimmer, Boris Ecker, Thomas Kuehl; GSI-Helmoltzzentrum für Schwerionenforschung GmbH, Germany.* We demonstrate a simple method for measuring the B-integral of CPA systems based on temporal diffraction. Two identical pulses sent into the amplifier under study create time replicas used to retrieve the B-integral accumulation.

Room 338 — JOINT

8:00 a.m.–9:45 a.m.
JFA • Ultrafast and Short Wavelength Technology
Jonathan Zuegel; Univ. of Rochester, USA, Presider

JFA1 • 8:00 a.m.
Generation of 5.1 fs, 0.5mJ Pulses with an Adaptive Phase Modulator, *He Wang, Yi Wu, Hiroki Mashiko, Chengquan Li, Steve Gilbertson, Zenghu Chang; Kansas State Univ., USA.* By improving the throughput of the 4*f* system and by increasing the input laser pulse energy, milli-joule level two cycle pulses were produced with a liquid crystal spatial light modulator for the first time.

JFA2 • 8:15 a.m.
High-Efficiency Single-Crystal XPW Temporal Filter for Contrast Enhancement and Pulse Shortening, *Aurelie Jullien[1], Jean-Philippe Rousseau[1], Brigitte Mercier[1], Laura Antonucci[1], Olivier Albert[1], Gilles Cheriaux[1], Stoyan Kourtev[2], Nikolai Minkovski[2], Solomon M. Saltiel[2]; [1]CNRS, France, [2]Sofia Univ., Bulgaria.* We propose an efficient scheme for femtosecond contrast filtering based on cross-polarized wave generation with a super-Gaussian-shaped beam. We reach 50% intensity transmission with a 2.2 time pulse shortening.

JFA3 • 8:30 a.m.
Carrier-Envelope Phase Control Using a Transmission Grating Compressor and an AOPDF, *Lorenzo Canova[1], Aurélie Jullien[1], Xiaowei Chen[1], Alexandre Trisorio[1], Rodrigo Lopez-Martens[1], Andreas Assion[2], Gabriel Tempea[2], Nicolas Forget[3], Thomas Oksenhendler[3], D. Kaplan[3]; [1]CNRS, France, [2]Femtolasers Produktions GmbH, Austria, [3]Fastlite, France.* Carrier-envelope phase (CEP) stabilization of a femtosecond CPA system featuring a transmission grating compressor is demonstrated. Out-of-loop control of the CEP using an AOPDF inside the laser chain is also shown for the first time.

JFA4 • 8:45 a.m.
Design of a Sub 100-Femtosecond X-Ray Streak Camera, *Bin Li[1], P. P. Rajeev[1], Gianluca Gregori[1,2], M. Benetou[1], B. Dobson[1], A. Cavalleri[2], L. Pickworth[1,3], P. Lau[2], P. Jaanimagi[4], F. Read[5], J. Lynn[2], D. Neely[1]; [1]Rutherford Appleton Lab, UK, [2]Oxford Univ., UK, [3]Imperial College London, UK, [4]Univ. of Rochester, USA, [5]CPO Ltd., Electronoptics, UK.* The temporal resolution of existing streak cameras are limited by electron transit time dispersion. Here we present a design compensating this to achieve a breakthrough of 100 fs time resolution.

Room 339 — CLEO

8:00 a.m.–9:45 a.m.
CFH • Novel Glass Fibers
Jean Toulouse; Lehigh Univ., USA, Presider

CFH1 • 8:00 a.m.
Novel Fabrication and Enhanced Photosensitivity of Semiconductor Nanofilament Arrays by Optical-Fiber Thermal Drawing, *Daosheng Deng, N. Orf, A. Abouraddy, Y. Fink; MIT, USA.* We report break-up of cylindrical shell into well-ordered filament arrays by optical-fiber thermal drawing. Enhanced photosensitivity of centimeter-long crystalline-Se nano-filaments is observed and the mechanism is discussed. This work paves a way to in-fiber nanodevices.

CFH2 • 8:15 a.m. Invited
Emerging Optical Fibers: New Fiber Materials and Structures, *Tanya Monro, S. Afshar, H. Ebendorff-Heidepriem, W. Q. Zhang, Y. Ruan; Univ. of Adelaide, Australia.* Progress in fiber design, fabrication and post-processing will be presented as well as recent advances including fibers with nanoscale structure, record fiber nonlinearity and developments in chemical and biological sensing.

CFH3 • 8:45 a.m.
Highly Ytterbium-Doped Phosphosilicate Fibers for Fiber Lasers and Amplifiers with High Peak Powers, *Shigeru Suzuki, Hugh A. McKay, Xiang Peng, Libin Fu, Liang Dong; IMRA America Inc., USA.* Ytterbium-doped phosphosilicate fibers with phosphate-like characteristics, lifetime and doping-levels are demonstrated, offering significantly increased peak powers from shorter fiber amplifiers. Efficient fibers with up to 4700dB/m peak absorption at 976nm and low photo-darkening are demonstrated.

8:00 a.m.–9:45 a.m.
CFI • Fabrication of Optical Components
Peter Herman; Univ. of Toronto, Canada, Presider

CFI1 • 8:00 a.m.
Spontaneous Micro-Lens Formation and Reduction of Multiphoton Ionization inside Dielectrics, *Marina Gertsvolf[1,2], David Grojo[1], Shuting Lei[3], Lora Ramunno[2], David M. Rayner[1], Paul B. Corkum[1,2]; [1]Natl. Res. Council Canada, Canada, [2]Univ. of Ottawa, Canada, [3]Kansas State Univ., USA.* By repeated optical breakdown with focused femtosecond pulses, we decrease the refractive index of fused silica by few percent. The subsequent micro-lens formation is associated with a reduction of multiphoton absorption in all dielectrics.

CFI2 • 8:15 a.m.
Femtosecond Laser Micromachining for Volume Optics Fabrication, *Tim D. Gerke, Rafael Piestun; Dept. of Electrical Engineering, Univ. of Colorado, USA.* A femtosecond laser is used to create a new type of volumetric diffractive optical element. The structured elements are designed to perform diffractive functions including pattern generation and angular multiplexing.

CFI3 • 8:30 a.m.
GRIN Lens and GRIN Lens Array Fabrication with Diffusion-Driven Photopolymer, *Chunfang Ye, Robert R. McLeod; Dept. of Electrical and Computer Engineering, Univ. of Colorado, USA.* We introduce a new method to make gradient index (GRIN) lenses and GRIN lens arrays by exposing diffusion-driven photopolymers using a low-power CW laser.

CFI4 • 8:45 a.m.
Rapidly Tunable Acoustic Gradient Index Lenses for Pulsed Imaging and Laser Processing, *Jin Yan, Alexandre Mermillod-Blondin, Euan McLeod, Craig B. Arnold; Princeton Univ., USA.* A MHz-rate device employing acoustic waves within a fluid is used to reshape or focus an incident laser beam. Rapidly changeable focal lengths and patterns can be formed for imaging and processing applications.

8:00 a.m.–9:45 a.m.
CFJ • Remote Sensing I
Waruna D. Kulatilaka; Spectral Energies LLC., USA, Presider

CFJ1 • 8:00 a.m.
The Lunar Orbiter Laser Altimeter (LOLA) on NASA's Lunar Reconnaissance Orbiter (LRO) Mission, *Haris Riris[1], John Cavanaugh[1], Xiaoli Sun[1], Luis Ramos-Izquierdo[1], Pete Liiva[2], Mike Rodriguez[2], Steve Schmidt[1], Jan McGarry[1], Carlton Peters[1], Glenn B. Jackson[1], David E. Smith[1]; [1]NASA Goddard Space Flight Ctr., USA, [2]Sigma Space Corp., USA.* We describe the Lunar Orbiter Laser Altimeter instrument on NASA's Lunar Reconnaissance Orbiter mission, scheduled to launch in April 2009, which will provide a precise lunar high-resolution global topographic map using laser altimetry.

CFJ2 • 8:15 a.m.
Laser Altimeter Measurements from MESSENGER's Recent Mercury Flybys, *Xiaoli Sun[1], Gregory A. Neumann[1], John F. Cavanaugh[1], Jan F. McGarry[1], David E. Smith[1], Maria T. Zuber[2]; [1]NASA Goddard Space Flight Ctr., USA, [2]MIT, USA.* The performance of the Mercury Laser Altimeter is reported from MESSENGER's flybys of Mercury in January and October 2008. The instrument ranged to 600 km at >60° incidence angle and 1600 km in nadir direction.

CFJ3 • 8:30 a.m.
Atmospheric Absorption Spectroscopy Using Supercontinuum Lasers, *Perry S. Edwards, David M. Brown, Andrea M. Wyant, Zhiwen Liu, C. Russell Philbrick; Pennsylvania State Univ., USA.* A supercontinuum absorption spectroscopy(SAS) approach for measurement of atmospheric constituents is extended offering increased capability of detecting concentrations of species for a 600m path length. Further developments to the SAS approach and measurements are presented.

CFJ4 • 8:45 a.m.
Modified PN Codes for Laser Remote Sensing Measurements, *James Abshire, Xiaoli Sun; NASA Goddard Space Flight Ctr., USA.* We describe a modified pseudo noise code for laser remote sensing measurements. Our experiments show it improves receiver signal to noise ratio and time resolution and is well suited for lasers with limited peak power.

8:00 a.m.–9:45 a.m.
CFK • Detectors and Imaging
Paul Juodawlkis; MIT Lincoln Lab, USA, Presider

CFK1 • 8:00 a.m.
Single Detector Single Shot High Resolution Imaging, *Qi Song, Feng Qian, en-Kuang Tien, Metin Akdas, Joerg Meyer, Ozdal Boyraz; Univ. of California at Irvine, USA.* We propose and demonstrate single detector real-time line imaging with up to 1µm resolution at 1 line/50ns capture rate. Experimentally we demonstrate real time line imaging of <25µm particles and patterns such as fingerprints.

CFK2 • 8:15 a.m.
Near Infrared Silicon Quantum Dots MOSFET Detector, *Jia-Min Shieh[1], Wen-Chien Yu[1], Chao-Kei Wang[1], Bau-Tong Dai[1], Hao-Chung Kuo[2], Jung Y. Huang[2], C-Ling Pan[2]; [1]Natl. Nano Device Labs, Taiwan, [2]Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan.* Fully Si-based MOSFET photodetector was demonstrated at optical telecommunication wavelengths by using a gate dielectric stack comprising of a Si quantum dots film. Illumination at wavelengths λ=1.55µm, photoresponse as high as 2.0A/W was measured.

CFK3 • 8:30 a.m.
Temporal Imaging System with Simple External Clock Synchronization, *Daniel H. Broaddus, Mark A. Foster, Onur Kuzucu, Amy C. Turner-Foster, Michal Lipson, Alexander L. Gaeta; Cornell Univ., USA.* We demonstrate a temporal-imaging system with simple synchronization to an external clock using a spectrally broadened time-lens pump. We implement the system in an ultrafast oscilloscope scheme and demonstrate 2ps resolution with 130ps record length.

CFK4 • 8:45 a.m.
Integrated Silicon Wavelength Division Demultiplexer with 40 GHz Germanium Photodetectors, *Long Chen, Michal Lipson; School of Electrical and Computer Engineering, Cornell Univ., USA.* We demonstrate a fast integrated germanium photodetector above 40 GHz and its integration with a silicon microring resonator-based wavelength division demultiplexer.

Rooms 318-320 — CLEO

CFA • Biomedical Microscopy I—Continued

CFA5 • 9:00 a.m.
Two-Wavelength Quantitative Phase Unwrapping of Dynamic Biological Processes, *Matthew T. Rinehart, Natan T. Shaked, Adam Wax; Duke Univ., USA.* We present two-wavelength phase unwrapping system designs on asynchronous and dynamic phase microscopy techniques developed in our laboratory. The use of two wavelengths in these systems enables quantitative phase imaging without 2π-ambiguities.

CFA6 • 9:15 a.m.
Harmonic Holographic Microscopy Using Nanoparticles as Probes for Three-Dimensional Cell Imaging, *Chia-Lung Hsieh[1,2], Rachel Grange[1,2], Ye Pu[1,2], Demetri Psaltis[1,2]; [1]Ecole Polytechnique Federale de Lausanne, Switzerland, [2]Dept. of Electrical Engineering, Caltech, USA.* We demonstrate the three-dimensional imaging capability of harmonic holographic microscopy by using the second harmonic generation from $BaTiO_3$ nanoparticles as the signal. Three-dimensional distributions of the $BaTiO_3$ nanoparticles in biological cells are recorded without scanning.

CFA7 • 9:30 a.m.
Absorption Spectroscopy and Selective Ablation of Lipids and Proteins *in vitro* Using a Mid-Infrared Supercontinuum Fiber Laser, *Kevin Ke[1], Chenan Xia[1], Mohammed N. Islam[1], Michael J. Welsh[1], Michael J. Freeman[2]; [1]Univ. of Michigan at Ann Arbor, USA, [2]Omni Sciences Inc., USA.* Using wavelengths between 2.6 and 3.8 microns from a fiber-based supercontinuum laser, lipids and proteins can be identified and selectively ablated. Absorption spectroscopy and selective ablation are conducted on atherosclerotic plaque constituents and adipose/fat tissues.

Rooms 321-323 — IQEC

IFA • Quantum Nano-Optics—Continued

IFA5 • 9:00 a.m.
Plasmonic Metal-Insulator-Metal Structures for Interaction with Silicon Nanocrystals, *Yiyang Gong, Szu-Lin Cheng, Yoshio Nishi, Jelena Vučković; Stanford Univ., USA.* We propose to use plasmonic modes in a periodic metal-insulator-metal configuration with metallic gratings to enhance emission from silicon nanocrystals. The modification of emission with a change in grating periodicity is experimentally demonstrated.

IFA6 • 9:15 a.m. Invited
Imaging Plasmonic Nanoparticles with a Narrow-Band Single-Photon Source, *Robert Lettow, Philipp Kukura, Michele Celebrano, Yves Rezus, Stephan Götzinger, Vahid Sandoghdar; ETH Zurich, Switzerland.* We report on interferometric imaging of single gold nanoparticles using narrow-band single photons resonant with the particle plasmon resonance.

Rooms 324-326 — CLEO

CFB • Advanced Fiber Laser Systems I—Continued

CFB5 • 9:00 a.m.
Dispersion Engineered Higher-Order Mode Fibers for Wavelength-Tunable Femtosecond Pulses, *Jennifer H. Lee[1], Chris Xu[1], Samir Ghalmi[2], Siddharth Ramachandran[2]; [1]Cornell Univ., USA, [2]OFS Labs, USA.* We demonstrate tuning of the output spectrum of an HOM fiber module by changing the dispersion curve. Spectral feature wavelengths can be changed systematically by changing the location of the zero-dispersion wavelength.

CFB6 • 9:15 a.m.
8 ns Pulses from a Compact Fiber Laser Q-Switched by MOEMS, *Marc Fabert, Aurelian Crunteanu, Vincent Kermène, Agnès Desfarges-Berthelemot, David Bouyge, Pierre Blondy; UMR CNRS, France.* We report on active Q-switching of Ytterbium-doped fibre laser using a new type of deformable micro-mirror. We obtained shorter pulses than 10 ns for frequencies up to 50 kHz.

CFB7 • 9:30 a.m.
Ultra-Wideband Tunable RGB Fiber Laser, *Hideyuki Okamoto, Ken Kasuga, Ikunari Hara, Yoshinori Kubota; Central Glass Co., Ltd., Japan.* We demonstrated over 100-nm RGB tunable laser operation (479-497, 515-546, 597-650 nm) using a single 9-cm Pr^{3+}-doped ZBLAN fiber pumped by a GaN-LD. The optimized laser cavity at 635 nm realized slope efficiency of 0.69.

Room 314 — CLEO

CFC • Nonlinear Optics—Continued

CFC5 • 9:00 a.m.
Two-Cycle Light Pulses in the Near and Mid Infrared by PPSLT-Based Optical Parametric Amplifiers, *Daniele Brida[1], Cristian Manzoni[1], Marco Marangoni[1], Stefano Bonora[2], Paolo Villoresi[2], Sandro De Silvestri[1], Giulio Cerullo[1]; [1]Dept. di Fisica, Politecnico di Milano, Italy, [2]Lab for Ultraviolet and X-Ray Optical Res.—CNR-INFM, D.E.I.-Univ. di Padova, Italy.* We present two ultra-broadband optical parametric amplifiers based on periodically poled stoichiometric lithium tantalate. Both systems produce two-cycle pulses, in the near-infrared (8.5 fs at 1.3 μm) and mid-infrared (25 fs at 3.5 μm), respectively.

CFC6 • 9:15 a.m.
10.5 Watts Time-Averaged Power Mid-IR Supercontinuum Generation with Direct Pulse Pattern Modulation, *Zhao Xu[1], Chenan Xia[1], Mohammed N. Islam[1,2], Fred L. Terry Jr.[1], Mike J. Freeman[2], Andy Zakel[2], Jeremiah Mauricio[2]; [1]Univ. of Michigan, USA, [2]Omni Sciences Inc., USA.* An all-fiber-integrated supercontinuum laser having time-averaged power scalable up to 10.5W with diffraction limited beam quality is demonstrated. The SC pulses can be generated with arbitrary modulation patterns having on/off durations as short as 10μS.

CFC7 • 9:30 a.m.
Ultra-Broadband Near-IR Non-Collinear Optical Parametric Amplification in Potassium Niobate and Lithium Niobate, *Oleksandr Isaienko, Eric Borguet; Temple Univ., USA.* We report on generation of ultra-broadband (>2900 cm^{-1}) near-IR pulses from a non-collinear optical parametric amplifier based on congruent lithium niobate and potassium niobate bulk crystals pumped at 800nm.

9:45 a.m.-10:15 a.m. Coffee Break, *Pratt Street Lobby, 300 Level*

NOTES

Room 315 | Room 316 | Room 317

IQEC | **CLEO**

IFB • Advances in Trapped-Ion Science—Continued

IFB3 • 9:00 a.m. Invited
Quantum Information with Trapped Ions, *Hartmut Häffner, Thomas Monz, Philipp Schindler, Michael Chwalla, Markus Hennrich, Wolfgang Hänsel, Christian Roos, Rainer Blatt; Univ. Innsbruck, Austria.* We will discuss the implementation of high fidelity entangling operations based on a global interaction of a single laser beam with a string of trapped ions.

IFB4 • 9:30 a.m.
A Trapped-Ion Phonon Laser, *Kerry Vahala[1,2], Maximillian Herrmann[2], Sebastian Knünz[2], Valentin Batteiger[2], Guido Saathoff[2], Theodor W. Hänsch[2], Thomas Udem[2]; [1]Caltech, USA, [2]Max Planck Inst. für Quantenoptik, Germany.* A cooled, trapped Mg^{+} ion is excited using a continuous, blue-detuned pump. Coherent oscillatory motion is observed. It is shown to result from stimulated emission of center-of-mass phonons, constituting the mechanical analog of a laser.

CFD • High Peak Intensity Lasers—Continued

CFD5 • 9:00 a.m.
Efficient, High-Power, Repeatable, Cryogenic Yb:YAG MOPA System, *Junji Kawanaka[1], Ryo Yasuhara[2], Stuart J. Pearce[1], Toshiyuki Kawashima[2], Hirofumi Kan[2]; [1]Osaka Univ., Japan, [2]Hamamatsu Photonics K. K., Japan.* A diode-pumped laser system in joule-class energy has been developed at 100Hz in nano-second to pico-second. A feasibility study has shown high slope efficiency of 44% and optical efficiency of 30% at 150mJ pulse energy.

CFD6 • 9:15 a.m. Invited
Laser Particle Acceleration, *Peter Norreys, A. P. L. Robinson, R. M. G. M. Trines; Rutherford Appleton Lab, UK.* In this talk, I will review the experimental progress that has been made in particle acceleration, and I will also examine what theoretical investigations suggest the future of this field will be.

CFE • Photonic Crystal Cavities—Continued

CFE5 • 9:00 a.m.
Demonstrations of an Air-Slot Photonic Crystal Nanocavity with Ultrasmall Mode Volumes for Enhanced Light-Matter Interactions, *Jie Gao[1], William M. J. Green[2], Yurii Vlasov[2], Solomon Assefa[2], Xiaodong Yang[1], Chee Wei Wong[1]; [1]Columbia Univ., USA, [2]IBM T.J. Watson Res. Ctr., USA.* We demonstrate experimentally a photonic crystal nanocavity with an ultrasmall modal volume of 0.01 cubic wavelengths. Coupling to the fabricated nanocavity is achieved with the tapered fiber, with applications to nonlinear optics and cavity QED.

CFE6 • 9:15 a.m.
Tuning of Coherent Interaction in a Resonant Photonic Crystal Using an External Electric Field, *David Goldberg[1], Lev Deych[1], Alexander A. Lisyansky[1], Vadim Tokranov[2], Michael Yakimov[2], Serge Oktyabrsky[2], Vinod M. Menon[1]; [1]Queens College, CUNY, USA, [2]College of Nanoscience and Engineering, SUNY Albany, USA.* We demonstrate the tunability of coherent interaction between exciton-lattice-polaritons and photonic crystal bandedge states in a $GaAs/Al_{0.22}Ga_{0.78}As$ double-quantum-well based photonic crystal in the presence of a variable external electric field.

CFE7 • 9:30 a.m.
Sub-Threshold Investigation of Two Coupled Photonic Crystal Cavities, *Martin Schubert[1], Lars H. Frandsen[1], Troels Suhr[1], Toke Lund-Hansen[1], Henri Thyrrestrup[1], Max Bichler[2], Jonathan J. Finley[2], Peter Lodahl[1], Jørn M. Hvam[1], Kresten Yvind[1]; [1]DTU Fotonik, Technical Univ. of Denmark, Denmark, [2]Walter Schottky Inst. and Physik Dept., Technische Univ. München, Germany.* The behavior of two coupled photonic crystal membrane cavities with quantum dots separated by different number of holes is investigated. The measured spectral splitting with increased coupling is verified by 3-D calculations and discussed.

9:45 a.m.-10:15 a.m. Coffee Break, *Pratt Street Lobby, 300 Level*

NOTES

Room 336 | Room 337 — CLEO

CFF • Silicon Photonics—Continued

CFF2 • 9:00 a.m.
Ambipolar Diffusion in Silicon-on-Insulator Studied by Opitcal Pump-Probe Based on Free Carrier Absorption, *Hui Zhao; Univ. of Kansas, USA.* Ambipolar diffusion coefficient in silicon-on-insulator is measured as functions of lattice temperature and carrier density by directly imaging the carrier dynamics by using a high resolution optical pump-probe technique based on free carrier absorption.

CFF3 • 9:15 a.m.
High Q Silicon Nitride Photonic Cavities, *Alexander Gondarenko, Jacob Levy, Michal Lipson; Cornell Univ., USA.* We demonstrate high confinement, low loss silicon nitride ring resonators with intrinsic Q of 4,000,000 in the telecommunication C-band. We measure the scattering and absorption losses to be below .08dB/cm and .02dB/cm, respectively.

CFF4 • 9:30 a.m.
Passive Modification of Free Carrier Lifetime in High-Q Silicon-on-Insulator Optics, *Thomas J. Johnson, Oskar J. Painter; Caltech, USA.* A simple chemical method for reducing free-carrier lifetime in silicon photonics while maintaining low optical loss is presented. Lifetimes of ~300ps for optical losses of ~0.4cm^{-1} are achieved. Ramifications for nonlinear optics are discussed.

CFG • Applications of Nonlinear Optics—Continued

CFG5 • 9:00 a.m.
Two-Photon Resonant Excitation of a Doubly Excited State in He Atoms by High-Harmonic Pulses, *Taro Sekikawa[1], Tatsuya Okamoto[1], Eisuke Haraguchi[1], Mikio Yamashita[1], Takashi Nakajima[2]; [1]Hokkaido Univ., Japan, [2]Inst. of Advanced Energy, Kyoto Univ., Japan.* We demonstrate the two-photon resonant excitation of the doubly excited $2p^2$ ^1S state in helium atoms by the combination of 29.5- and 32.6-eV harmonic photons. Our ab-initio calculation confirms the nonlinear excitation by high harmonics.

CFG6 • 9:15 a.m.
Generation of Visible 13-fs Pulses Using Raman-Nath like Multiple CARS Signals in $KTaO_3$, *Eiichi Matsubara[1,2], Yuta Kawamoto[1,2], Taro Sekikawa[1,2], Mikio Yamashita[1,2]; [1]Hokkaido Univ., Japan, [2]CREST, Japan Science and Technology Agency, Japan.* We demonstrate Fourier synthesis of RN-like multiple coherent anti-Stokes Raman-scattering signals in a $KTaO_3$ single crystal at room temperature. Isolated pulses with 13-fs duration and 520-690-nm wavelength range are generated without any active chirp compensator.

CFG7 • 9:30 a.m.
High Repetition Rate Two-Color Pump-Probe System Directly Pumped by a Femtosecond Ytterbium Oscillator, *Cristian Manzoni[1], Roberto Osellame[1], Marco Marangoni[1], Giulio Cerullo[1], Marcel Schultze[2], Uwe Morgner[2]; [1]Dept. di Fisica, Politecnico di Milano, Inst. di Fotonica e Nanotecnologie del Consiglio Natl. delle Ricerche, Italy, [2]Inst. für Quantenoptik, Leibniz Univ., Germany.* By exploiting optical parametric generation in periodically poled lithium niobate driven by a Yb:KYW laser, we realized a two-colour pump-probe system in the near- and mid-infrared with 1-MHz repetition rate, 300-fs resolution and 10^{-5} sensitivity.

Room 338 — JOINT

JFA • Ultrafast and Short Wavelength Technology—Continued

JFA5 • 9:00 a.m.
13.2 nm Table-Top Inspection Microscope for Extreme Ultraviolet Lithography Mask Defect Characterization, *Fernando Brizuela[1], Yong Wang[1], Courtney A. Brewer[1], Francesco Pedaci[1], Weilun Chao[2], Erik H. Anderson[2], Yanwei Liu[2], Kenneth A. Goldberg[2], Patrick Naulleau[2], Przemyslaw Wachulak[1], Mario C. Marconi[1], David T. Attwood[2], Jorge J. Rocca[1], Carmen S. Menoni[1]; [1]Colorado State Univ., USA, [2]Ctr. for X-Ray Optics, Lawrence Berkeley Natl. Lab, USA.* We report on a reflection microscope that operates at 13.2-nm wavelength with a spatial resolution of 55±3 nm. The microscope uses a table-top EUV laser to acquire images of photolithography masks in 20 seconds.

JFA6 • 9:15 a.m.
Table-Top Soft X-Ray Microscope Adopting a PMMA Phase-Reversal Zone Plate, *Jong Ju Park, Deuk Su Kim, Sang Chul Jeon, Juyun Park, Kyoung Hwan Lee, Jae-hwan Lee, Ki Nam Kim, Jung Jae Yoo, Chang Hee Nam; KAIST, Republic of Korea.* A table-top soft x-ray microscope, adopting a phase-reversal zone plate (PRZP) made of PMMA and high harmonic x-ray source, was constructed. The PMMA PRZP showed enhanced imaging efficiency compared to a metallic Fresnel zone plate.

JFA7 • 9:30 a.m.
Coherent Imaging Nano-Patterning with Extreme Ultraviolet Laser Illumination, *Artak Isoyan[1], Fan Jian[1], Yang-Chun Cheng[1], Przemyslaw Wachulak[2], Lukasz Urbanski[2], Jorge Rocca[2], Carmen Menoni[2], Mario C. Marconi[2], Franco Cerrina[1]; [1]Univ. of Wisconsin-Madison, USA, [2]Colorado State Univ., USA.* We present a high resolution extreme ultraviolet patterning approach based on Talbot self imaging and holographic projection imaging using for illumination a table top extreme ultraviolet laser.

Room 339 — CLEO

CFH • Novel Glass Fibers—Continued

CFH4 • 9:00 a.m.
Ultrashort Pulsed Raman Gain in Highly Nonlinear As_2Se_3 Chalcogenide Fiber, *Alessandro Tuniz, George A. Brawley, David J. Moss, Benjamin J. Eggleton; Univ. of Sydney, Australia.* We report an experimental study of pulsed Raman gain in As_2Se_3 chalcogenide fiber, for pump pulses between 1470nm and 1560nm, achieving the highest Raman gain at the longest pump wavelength, where two-photon absorption is lowest.

CFH5 • 9:15 a.m.
Nonlinear Spectral Broadening in Lead-Bismuth-Gallate Glass Photonic Crystal Fiber, *Nicolas Ducros[1], Georges Humbert[1], Sébastien Février[1], Ryszard Buczynski[2], Dariusz Pysz[3], Ryszard Stepien[3]; [1]Xlim - Univ. of Limoges, France, [2]Univ. of Warsaw, Poland, [3]Glass Lab, Inst. of Electronic Materials Technology, Poland.* Highly nonlinear, infrared transmitting lead-bismuth-gallate glass photonic crystal fiber is investigated. Hundred-fold increase in n_2 compared to silica and spectral broadening under 1.55 µm ps pumping in 12-cm long PCF are reported.

CFH6 • 9:30 a.m.
Tapered Fibers Embedded in Silica Aerogel, *Limin Xiao[1], Michael Grogan[1], Sergio G. Leon-Saval[1,2], Rhys Williams[1], Richard England[1], William Wadsworth[1], Tim Birks[1]; [1]Univ. of Bath, UK, [2]Univ. of Sydney, Australia.* We embedded thin (down to 2 µm diameter) tapered fibres in silica aerogel with low loss. The aerogel is rigid but behaves refractively like air, protecting the tapered fibre without disturbing light propagation along it.

9:45 a.m.-10:15 a.m. Coffee Break, *Pratt Street Lobby, 300 Level*

NOTES

CFI • Fabrication of Optical Components—Continued

CFI5 • 9:00 a.m.
Beam Shapers for High Power Lasers, Fabricated by Laser Micro-Machining, *Howard J. Baker[1], Christian Ott[1], Roy M. McBride[2], Josef J. Wendland[2], Denis R. Hall[2]; [1]Heriot-Watt Univ., UK, [2]PowerPhotonic Ltd, UK.* Beam shaping by arbitrary shaped refractive surfaces is achieved with laser micro-machined and smoothed silica. The technique provides custom circular and rectangular flat-tops beams suitable for high intensity, modern fibre lasers.

CFI6 • 9:15 a.m.
Inter- and Intrapulse Dynamics and Feedback Control for Laser Machining, *Paul J. L. Webster, Mitchell D. Anderson, Joe X. Z. Yu, James M. Fraser; Queen's Univ., Canada.* We demonstrate in situ observation of percussion drilling in stainless steel at axial rates of 40 kHz. The melt cycle is directly observed and imaging feedback is used to improve cut accuracy.

CFI7 • 9:30 a.m.
Ultrafast Light Blade, *Peter G. Kazansky[1], Yasuhiko Shimotsuma[2], Jiarong Qiu[3], Weijia Yang[1], Masaaki Sakakura[2], Martynas Beresna[1], Kiyotaka Miura[4], Kazuyuki Hirao[4]; [1]Optoelectronics Res. Ctr., Univ. of Southampton, UK, [2]Innovative Collaboration Ctr. of Kyoto Univ., Japan, [3]Dept. of Materials Science, Zhejiang Univ. and State Key Lab of High Field Laser Physics, Shanghai Inst. of Optics and Fine Mechanics, Chinese Acad. of Sciences, China, [4]Dept. of Material Chemistry, Graduate School of Engineering, Kyoto Univ., Japan.* Anisotropic sensitivity of *isotropic medium* to femtosecond laser radiation is observed. The phenomenon is explained by unusual anisotropy at the interface produced by ultrashort light pulses with tilted front and referred as ultrafast light blade.

CFJ • Remote Sensing I—Continued

CFJ5 • 9:00 a.m.
A Multi-Functional Fiber Laser Lidar for Earth Science and Exploration, *Michael Dobbs[1], Krabill William[2], Mike Cisewski[3], F. Wallace Harrison[3], C. K. Shum[4], Doug McGregor[1], Robert M. Neal[1], Sheldon Stokes[1]; [1]ITT Space Systems Div., USA, [2]NASA Wallops, USA, [3]NASA Langley Res. Ctr., USA, [4]Ohio State Univ., USA.* A multi-pixel laser altimeter using pseudo-random-noise-modulated fiber lasers has been developed under a NASA Instrument Incubator Program. We will present the instrument design, field campaign results and implementations for Earth Science Decadal Missions and Exploration.

CFJ6 • 9:15 a.m.
Photon-Counting, 3-D Imaging Lidars Operating at Megapixels per Second, *John J. Degnan, Roman Machan, Edward Leventhal, Gabriel Jodor, Christopher T. Field; Sigma Space Corp., USA.* We describe a scanning, photon-counting, 3-D imaging lidar which generates contiguous, high resolution, 3-D maps at rates up to 2.2 Megapixels per second and is readily scalable to high altitude aircraft or spacecraft.

CFJ7 • 9:30 a.m.
Applications of External Cavity Quantum Cascade Lasers: Broadband Mid-IR Laser Heterodyne Radiometry, *Gerard Wysocki[1], Damien Weidmann[2]; [1]Princeton Univ., USA, [2]Space Science and Technology Dept., STFC Rutherford Appleton Lab, UK.* Broadband thermal infrared heterodyne spectro-radiometry performed over a frequency range of more than 100 cm^{-1} at λ=8.4 µm using an external cavity quantum cascade laser as a tunable local oscillator will be reported.

CFK • Detectors and Imaging—Continued

CFK5 • 9:00 a.m.
The Bandwidth-Efficiency Product Enhancement of GaN Based Photodiodes by Launching a Low-Temperature-Grown Recombination Center in Photo-Absorption Region, *S.-H. Guol[1], M.-L. Lee[2], C.-S. Lin[3], J.-K. Sheu[4], Y.-S. Wu[3], C.-K. Sun[1], C.-H. Kuo[3], C.-J. Tun[3], J.-W. Shi[3]; [1]Natl. Taiwan Univ., Taiwan, [2]Southern Taiwan Univ., Taiwan, [3]Natl. Central Univ., Taiwan, [4]Natl. Cheng-Kung Univ., Taiwan.* We demonstrated a GaN-based p-i-n photodiode by inserting a thin low-temperature-grown-GaN layer between p-type $Al_{0.2}Ga_{0.8}N$ window and intrinsic GaN layer. As compared with control device, our demonstrated one can achieve 3 fold bandwidth-efficiency-products improvement.

CFK6 • 9:15 a.m.
Near Infrared Optical Upconverter Based on i-$In_{0.53}Ga_{0.47}As/C_{60}$ Photovoltaic Junction, *Jun Chen[1], Dayan Ban[1], Michael G.Helander[2], Zhenghong Lu[2], Marcel Graf[1,3], Anthony J. SpringThorpe[3], H.C. Liu[3]; [1]Dept. of Electrical and Computer Engineering, Univ. of Waterloo, Canada, [2]Dept. of Materials Science and Engineering, Univ. of Toronto, Canada, [3]Inst. for Microstructural Sciences, Natl. Res. Council, Canada.* We report a near-infrared to visible-light optical upconverter by the integration of an i-$In_{0.53}Ga_{0.47}As/C_{60}$ junction and organic light emitting diode. This device shows the photovoltaic effect of i-$In_{0.53}Ga_{0.47}As/C_{60}$ junction and application in optical upconverter.

CFK7 • 9:30 a.m.
Night Vision Enhancement Technology with Pyroelectric Field Driven Liquid Crystal Display, *Jingwen W. Zhang[1], Xiaomei Guo[1], Linsheng Fan[1], Yingyin K. Zou[1], Jason Craley[2]; [1]Boston Applied Technologies, Inc., USA, [2]Natick Soldier Res. Development and Engineering Ctr., USA.* A novel night vision enhancement technology based on IR to visible light translation was demonstrated with a specifically designed liquid crystal cell sandwiched with pyroelectric and glass plates, which can be viewed by naked eyes.

9:45 a.m.-10:15 a.m. Coffee Break, *Pratt Street Lobby, 300 Level*

NOTES

Rooms 318-320

CLEO

10:15 a.m.–12:00 p.m.
CFL • Biomedical Microscopy II
Gregory Faris; SRI Intl., USA, Presider

CFL1 • 10:15 a.m. Invited

Quantifying Binding of Focal Adhesion Proteins Using Fluorescent Spectral Microscopy, *Peter T. So; MIT, USA.* A central challenge of modern biology is the need to understand how the interactions of protein machines affect cellular physiology and the pathology. Optical imaging and spectroscopy afford unprecedented opportunities in studying these dynamical processes *in vivo*.

CFL2 • 10:45 a.m.

Background-Free, 3-D Vibrational Imaging by Stimulated Raman Scattering Microscopy, *Yasuyuki Ozeki[1], Fumihiro Dake[1], Shin'ichiro Kajiyama[2], Kiichi Fukui[1], Kazuyoshi Itoh[1]; [1]Osaka Univ., Japan, [2]Kinki Univ., Japan.* We propose and experimentally show that stimulated Raman scattering can realize novel 3-D nonlinear-optical Raman microscopy that is immune to nonresonant background signals. We demonstrate high-contrast molecular imaging of polystyrene beads and plant cells.

CFL3 • 11:00 a.m.

High-Throughput Screening of Small-Molecule Microarrays with Label-Free Optical Scanning Microscope, *Yiyan Fei[1], James P. Landry[1], Yung-Shin Sun[1], Xiaobing Wang[2], Juntao Luo[2], Kit S. Lam[2], Xiangdong Zhu[1]; [1]Dept. of Physics, Univ. of California at Davis, USA, [2]Dept. of Internal Medicine, Univ. of California at Davis, USA.* We investigated surface chemistry platforms for immobilizing two types of synthetic, small-molecule compound libraries, each with over 6000 compounds, and for screening these compounds for potential proteins ligands by a label-free optical scanning microscope.

Rooms 321-323

IQEC

10:15 a.m.–12:00 p.m.
IFC • Surface Plasmon Polaritons
Henri Lezec; NIST, USA, Presider

IFC1 • 10:15 a.m.

Phase-Sensitive Near-Field Study of Surface Plasmon Polaritons Launched by Chains of Subwavelength Holes in Gold Films, *Dries van Oosten, Marko Spasenović, Laurens Kobus Kuipers; Ctr. for Nanophotonics, FOM Inst. AMOLF, Netherlands.* A chain of subwavelength sized holes in a gold film is used to launch surface plasmon polaritons. We investigate how the field pattern close to the chain evolves into diffraction orders in the far field.

IFC2 • 10:30 a.m.

Observation of UV Surface Plasmon Interference, *Qiaoqiang Gan, Liangcheng Zhou, Volkmar Dierolf, Filbert J. Bartoli; Lehigh Univ., USA.* We present the first direct observation of the UV SPPs using a UV compatible near field scanning optical microscope system. Subwavelength interference phenomenon in 1-D and 2-D are both observed.

IFC3 • 10:45 a.m.

Surface Plasmon Enhanced Optical Force on Gold Nanoparticles, *Kai Wang, Ethan Schonbrun, Kenneth B. Crozier; School of Engineering and Applied Science, Harvard Univ., USA.* We experimentally demonstrate the pushing of gold nanoparticles by surface plasmon polaritons (SPPs). 2-D FDTD simulations indicate considerably enhanced optical forces due to SPPs and gold particle-film interaction, in comparison to total internal reflection illumination.

IFC4 • 11:00 a.m.

Surface Plasmon Polaritons in Silver-Gold Sandwich Structure, *G. Zhu[1], H. Li[1], C. Clavero[2], K. Yang[2], R. A. Lukaszew[2], V. A. Podolskiy[3], M. A. Noginov[1]; [1]Norfolk State Univ., USA, [2]College of William and Mary, USA, [3]Oregon State Univ., USA.* We propose to use silver/gold sandwich structures to combine the advantages of silver and gold - two materials of choice for nanoplasmonics and metamaterials. We report on the preparation and study of the proposed system.

Rooms 324-326

CLEO

10:15 a.m.–12:00 p.m.
CFM • Advanced Fiber Laser Systems II
Axel Schülzgen; Univ. of Arizona, USA, Presider

CFM1 • 10:15 a.m.

Power Scaling of Yb-Free, Er-Doped Fiber Laser with Resonant Clad Pumping, *Mark Dubinskii[1], Jun Zhang[1], Valerii Ter-Mikirtychev[2]; [1]ARL, USA, [2]NovaWave Technologies, Inc, USA.* We report resonantly cladding-pumped Yb-free Er-doped fiber laser delivering ~48 W of CW output at 1590 nm with ~57% efficiency. It is believed to be the highest power ever reported from Yb-free, Er-doped LMA fiber.

CFM2 • 10:30 a.m.

Diffraction Limited Amplification of Fundamental Mode in Er Fiber with 1800 µm^2 Effective Area, *Jayesh C. Jasapara[1], Anthony DeSantolo[1], Jeff W. Nicholson[1], Zoltan Várallyay[2]; [1]OFS Labs, USA, [2]FETI Ltd., Hungary.* Diffraction limited amplification of the fundamental mode in an Er fiber with 1800 µm^2 effective area is enabled by differential gain induced by launching the pump in the fundamental mode of the fiber.

CFM3 • 10:45 a.m.

All-Fiber Raman Lasers with Highly Nonlinear Photonic Crystal Fibers, *Guillaume Beck[1], Francois Anquez[1], Stephane Randoux[1], Laurent Bigot[1], Marc Douay[1], Gilles Melin[2], Anne Fleureau[2], Laurence Galkovsky[2], Simon Lempereur[2], Pierre Suret[1]; [1]Lab de Physique Atomes et Molecules, Univ. des Sciences et Technologies de Lille, France, [2]Draka, France.* Writing Bragg gratings inside the core of a photonic crystal fiber (PCF), we demonstrate an all-fiber Raman laser fully made with a highly nonlinear PCF. The laser delivers an output power of 4 Watt.

CFM4 • 11:00 a.m.

100W, Fully-Fiberised Ytterbium Doped Master Oscillator Power Amplifier Incorporating Adaptive Pulse Shaping, *Dejiao Lin[1], Shaif-ul Alam[1], Kangkang Chen[1], Andrew Malinowski[1], Steve Norman[2], David Richardson[1]; [1]Univ. of Southampton, UK, [2]SPI Lasers UK Ltd., UK.* We report a pulsed, fully-fiberised, Yb-doped MOPA with a maximum average output power of 100W. Adaptive pulse shaping was incorporated to reduce the impact of nonlinearities, delivering 2mJ flat-topped pulses with 20kW peak power.

Room 314

10:15 a.m.–12:00 p.m.
CFN • Short Wavelength
Sterling Backus; Kapteyn-Murnane Labs, USA, Presider

CFN1 • 10:15 a.m.

Isolated Attosecond Pulse Contrast Measurement and CEP Optimization for Optical Streaking in Molecules, *Thomas Pfeifer[1,2], Mark J. Abel[1,2], Phillip M. Nagel[1,2], Willem Boutu[1,2], M. Justine Bell[1,2], Daniel M. Neumark[1,2], Stephen R. Leone[1,2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA.* A method to access and control isolated attosecond pulse contrast is presented, based on scanning the carrier-envelope phase (CEP). The optimized pulses produced time-resolved streak-field photoelectron data in molecules (SF_6, N_2).

CFN2 • 10:30 a.m.

CEP Control of Few-Cycle Multi-mJ OPCPA System for Attosecond Harmonics Generation, *Shunsuke Adachi[1,2], Nobuhisa Ishii[1,2], Yutaka Nomura[1,2], Yohei Kobayashi[1], Atsushi Kosuge[1,2], Jiro Itatani[1], Teruto Kanai[1,2], Shuntaro Watanabe[1,2], Dai Yoshitomi[2,3], Kenji Torizuka[2,3]; [1]Inst. for Solid State Physics, Univ. of Tokyo, Japan, [2]CREST, JST, Japan, [3]AIST, Japan.* We controlled the carrier-envelope phase (CEP) of a 5.5-fs, 2.7-mJ optical parametric chirped-pulse amplification system at a 1-kHz repetition rate, and observed clear CEP dependence of high harmonics.

CFN3 • 10:45 a.m.

Separation of High Order Harmonics with Fluoride Windows, *Thomas K. Allison[1,2], Jeroen van Tilborg[2], Travis W. Wright[1,2], Marcus P. Hertlein[2], Roger W. Falcone[2,1], Ali Belkacem[2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA.* We demonstrate the use of fluoride windows to temporally separate the lower orders produced in high harmonic generation. We use this technique to conduct a VUV pump/IR probe experiment on the ethylene molecule.

CFN4 • 11:00 a.m.

High Order Harmonic Generation with Enhanced Near-Field by Localized Surface Plasmon, *Seungchul Kim[1], In-Yong Park[1], Joonhee Choi[1], Jonghan Jin[1,2], Seung-Woo Kim[1]; [1]KAIST, Republic of Korea, [2]Korea Res. Inst. of Standard and Science (KRISS), Republic of Korea.* We demonstrate a novel method that requires no extra cavities in high harmonic generation with the aid of localized surface plasmon. The harmonics up to 21th was observed by injection with gases onto gold nanostructures.

Room 315 | Room 316 | Room 317

IQEC

10:15 a.m.–12:15 p.m.
IFD • Cooling of Opto-Mechanical Systems
Tobias J. Kippenberg; Max-Planck-Inst. of Quantum Optics, Germany, Presider

IFD1 • 10:15 a.m. Invited

Cooling and Measurement of a Micromechanical Oscillator Close to the Quantum Limit, *Albert Schliesser[1], Remi Rivière[1], Olivier Arcizet[1], Tobias J. Kippenberg[1,2]; [1]Max-Planck-Inst. of Quantum Optics, Germany, [2]Ecole Polytechnique de Lausanne (EPFL), Switzerland.* Using resolved-sideband laser cooling, a micromechanical oscillator is cooled to an average occupation of 63±20 quanta, and simultaneously measured close to the limit imposed by the Heisenberg uncertainty principle.

IFD2 • 10:45 a.m. Invited

Sideband Opto-Mechanical Cooling of a Silica Micro-Resonator in a Cryogenic Environment, *Young-Shin Park, Hailin Wang; Univ. of Oregon, USA.* Sideband opto-mechanical cooling of vibrational modes in a silica microresonator is demonstrated in a cryogenic environment. Average phonon occupation numbers as low as 25 are obtained for mechanical modes with frequencies near 100 MHz.

CLEO

10:15 a.m.–12:00 p.m.
CFO • Short Pulse Lasers
Clifford R. Pollock; Cornell Univ., USA, Presider

CFO1 • 10:15 a.m.

A Compact kHz-Repetition-Rate 2-mJ sub-200-fs cw-Pumped Yb,Na:CaF_2 Amplifier, *Audrius Pugžlys[1], Giedrius Andriukaitis[1], Andrius Baltuška[1], Liangbi Su[2], Jun Xu[2], Ruxin Li[2], Wennjing Lai[3], Poh-Boon Phua[3], Andrius Marcinkevičius[4], Martin E. Fermann[4], Linas Giniūnas[5], Romualdas Danielius[5]; [1]Photonics Inst., Vienna Univ. of Technology, Austria, [2]Shanghai Inst. of Optics and Fine Mechanics, China, [3]Nanyang Technological Univ., Singapore, [4]IMRA America Inc., USA, [5]Light Conversion Ltd., Lithuania.* Using a novel Yb-doped crystal close-loop cooled at -130°C we demonstrate a 2-6-W multi-kilohertz amplifier delivering sub-200-fs pulses with energies up to 2 mJ. This technology is straightforwardly scalable toward a kHz-repetition-rate multi-mJ output.

CFO2 • 10:30 a.m.

100 GHz Passively Mode-Locked Er:Yb:glass Laser at 1.5 µm and Identification of Transverse Cavity-Mode Degeneracies, *Andreas E. H. Oehler[1], Thomas Südmeyer[1], Ursula Keller[1], Kurt J. Weingarten[2]; [1]ETH Zurich, Switzerland, [2]Time-Bandwidth Products, Switzerland.* A fundamentally mode-locked Er:Yb:glass laser with a record high repetition rate of 101 GHz generates 30 mW average power in 1.1-ps pulses in the 1.5-µm telecom window. Frequency degeneracies of transverse cavity-modes are investigated.

CFO3 • 10:45 a.m.

Continuous-Wave and Mode-Locked Laser Operations Based on Yb^{3+}:$(YGd_2)Sc_2(GaAl_2)O_{12}$ Disordered Ceramic, *Masaki Tokurakawa[1], Akira Shirakawa[1], Ken-ichi Ueda[1], Hideki Yagi[2], Takagimi Yanagitani[2], Alexander A. Kaminskii[3]; [1]Univ. of Electro-Communications, Japan, [2]Takuma Works, Konoshima Chemical Co. Ltd., Japan, [3]Inst. of Crystallography, Crystal Laser Physics Lab, Russian Acad. of Sciences, Russian Federation.* Yb^{3+}:$(YGd_2)Sc_2(GaAl_2)O_{12}$ disordered ceramic has been fabricated. 2.9-W average power with an optical-to-optical efficiency of 44% was achieved in a continuous-wave operation. 112-fs pulse duration with 860-mW average power was also achieved in a mode-locked operation.

CFO4 • 11:00 a.m.

Single-Walled Carbon Nanotube Saturable Absorber Mode-Locked Yb:$LuScO_3$ Laser, *Andreas Schmidt[1], Valentin Petrov[1], Uwe Griebner[1], Rigo Peters[2], Klaus Petermann[2], Günter Huber[2], Won Bae Cho[3], Jong Hyuk Yim[3], Soonil Lee[3], Fabian Rotermund[3]; [1]Max-Born-Inst., Germany, [2]Hamburg Univ., Germany, [3]Ajou Univ., Republic of Korea.* Mode-locking of the disordered cubic sesquioxide crystal Yb:$LuScO_3$ using a reflection-type single-walled carbon nanotube saturable absorber is demonstrated under diode pumping and compared with passive mode-locking by a commercial SESAM.

10:15 a.m.–12:00 p.m.
CFP • Photonic Crystal Technology and Applications
Ali Adibi; Georgia Tech, USA, Presider

CFP1 • 10:15 a.m.

Ultrafast Dynamics of Band-Edge Photonic Crystals Lasers, *Fabrice Raineri[1,2], Alejandro M. Yacomotti[1], Timothy J. Karle[1], Alexios Beveratos[1], Isabelle Sagnes[1], Rama Raj[1]; [1]LPN, CNRS, France, [2]Univ. Paris-Diderot, France.* Temporal characteristics of band-edge photonic crystal lasers were explored with high resolution up-conversion system. The InGaAs/InP photonic crystal laser operates at 1.55 µm with temporal responses indicating modulation speeds greater than 25GHz.

CFP2 • 10:30 a.m.

Thermal Dissipation Dynamics in an Optically Pumped Photonic Crystal Nano-Cavity, *Maia Brunstein[1], Remy Braive[1], Richard Hostein[1], Alexios Beveratos[1], Isabelle Robert[1], Isabelle Sagnes[1], Paul Monnier[1], Fabrice Raineri[1,2], Virginie Moreau[3], Alejandro Yacomotti[1], Rama Raj[1], Ariel Levenson[1]; [1]Lab de Photonique et de Nanostructures, CNRS, France, [2]Univ. Paris-Diderot, France, [3]Ecole Supérieure de Physique et Chimie Industrielles, France.* The heat dissipation time in an InP-based Photonic Crystal nano-cavity was measured. Our method is based on time-resolved reflectivity of a cw beam coupled through a tapered fiber. Dissipation times around 2 µs were obtained.

CFP3 • 10:45 a.m.

Conformal Coating of Tailored Photonic Crystals Fabricated Using Multiphoton Lithography, *Vincent W. Chen[1], Yunnan Fang[1], Yadong Zhang[1], Kelly J. Perry[2], Ken H. Sandhage[1], Joseph W. Perry[1]; [1]Georgia Tech, USA, [2]Focal Point Microsystems, USA.* Titania sol-gel and silver electro-less deposition processes were utilized to apply conformal coatings to multiphoton lithographically fabricated polymer photonic crystal templates, resulting in enhanced refractive index and stop band reflectivity.

CFP4 • 11:00 a.m.

1-D Photonic Crystal Sensor Integrated in a Microfluidic System, *Pedro S. Nunes[1], Niels A. Mortensen[2], Jörg P. Kutter[1], Klaus B. Mogensen[1]; [1]Dept. of Micro and Nanotechnology, Technical Univ. of Denmark, Denmark, [2]Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark.* A refractive index sensor was designed as a 1-D resonator incorporated in a microfluidic channel, where aqueous solutions were injected. A sensitivity of 480 nm/RIU and a minimum difference of Δn=0.002 were determined.

Friday, June 5

Room 336 / Room 337 — CLEO

10:15 a.m.–11:45 a.m.
CFQ • Organic Optoelectronics
Masashi Yoshimura; Osaka Univ., Japan, Presider

CFQ1 • 10:15 a.m.
Electro-Optic Modulation in High-Efficiency Crystalline OH1 Optical Waveguides, *Christoph Hunziker, Mojca Jazbinšek, Seong-Ji Kwon, O-Pil Kwon, Harry Figi, Peter Günter; ETH Zurich, Switzerland.* We report on a novel organic thin-film crystal OH1 with high electro-optic figure of merit n^3r=530 pm/V at 1319 nm, suitable for high-speed electro-optic modulation and hybrid integration with glass or silicon-on-insulator.

CFQ2 • 10:30 a.m.
Non-Traditional Cyanines: Candidate Materials for All-Optical Signal Processing Applications, *Joel M. Hales[1], Jonathan D. Matichak[1], Shino Ohira[1], Karl J. Thorley[2], Harry L. Anderson[2], Jean-Luc Brédas[1], Seth R. Marder[1], Joseph W. Perry[1]; [1]Georgia Tech, USA, [2]Univ. of Oxford, UK.* Development of non-traditional cyanine systems has allowed for improvements in the material properties required for all-optical signal processing applications: enhanced third-order nonlinearity, low nonlinear losses, improved processability, and controlled intermolecular interactions in the solid-state.

CFQ3 • 10:45 a.m.
Vapor Deposited Small Molecules as an Organic Nonlinear Optical Cladding for Silicon on Insulator Technology, *Ivan Biaggio[1], Michelle L. Scimeca[1], Bweh Esembeson[1], Tsuyoshi Michinobu[2], François Diederich[2], Christian Koos[3], Wolfgang Freude[3], Jürg Leuthold[3]; [1]Lehigh Univ., USA, [2]Lab für Organische Chemie, ETH Zürich, Switzerland, [3]Inst. of Photonics and Quantum Electronics, Univ. of Karlsruhe, Germany.* Silicon-organic hybrid waveguides are fabricated by vapor deposition of a small molecule with large third-order nonlinearity on silicon-on-oxide slotted waveguides. The deposited material fills the slot homogenously, and has high optical quality.

CFQ4 • 11:00 a.m.
Enhancement of Polymer Dye Lasers by Multifunctional Photonic Crystal Lattice, *Mads B. Christiansen[1], Sanshui Xiao[2], Niels Asger Mortensen[2], Anders Kristensen[1]; [1]DTU Nanotech, Dept. of Micro and Nanotechnology, Technical Univ. of Denmark, Denmark, [2]DTU Fotonik, Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark.* The light output of dye doped hybrid polymer band-edge lasers is increased more than 100 times by using a rectangular lattice photonic crystal, which provides both feedback and couples more pump light into the laser.

10:15 a.m.–12:00 p.m.
CFR • Semiconductor Nonlinear Optics
Konstantin Vodopyanov; Stanford Univ., USA, Presider

CFR1 • 10:15 a.m.
Design of Suspended AlGaAs Waveguides for Tunable Difference Frequency Generation in Mid-IR, *Jacob B. Khurgin[1], Todd H. Stievater[2], Marcel W. Pruessner[2], William S. Rabinovich[2]; [1]Johns Hopkins Univ., USA, [2]NRL, USA.* A birefringent phase-matching scheme for difference frequency generation in a slotted air-clad waveguide with tunable gap width is proposed and theoretically analyzed. Tunability of 300 cm^{-1} and efficiency of 200 $W^{-1}cm^{-2}$ is predicted.

CFR2 • 10:30 a.m. Invited
Low-Power and Fast Switching in III-V Photonic Crystals, *S. Combrié[1], C. Husko[2], Q. Tran[1], P. Colman[3,4], F. Raineri[3,4], C. W. Wong[2], Alfredo De Rossi[1]; [1]Thales Res. and Technology, France, [2]Columbia Univ., USA, [3]CNRS, France, [4]Univ. Paris Diderot, France.* We report on recent advancements in membrane photonic crystals based on III-V semiconductors. We fabricated highly nonlinear waveguides with low insertion losses and demonstrate ultra-fast all-optical response to ultra-low energy excitation in resonant cavities.

CFR3 • 11:00 a.m.
XPM-Based Wavelength Conversion at 80 Gb/s Using Intersubband Transition in InGaAs/AlGaAs/AlAsSb Coupled Double Quantum Wells, *Ryoichi Akimoto, Shin-ichiro Gozu, Teruo Mozume, Kazumichi Akita, Guangwei Cong, Toshifumi Hasama, Hiroshi Ishikawa; AIST, Japan.* We demonstrated all-optical wavelength conversion at 80 Gb/s using a cross-phase modulation of InGaAs/AlGaAs/AlAsSb coupled double quantum wells waveguide and a subsequent spectral filtering. Error free operation was demonstrated with power penalty of 1.5 dB.

Room 338 — JOINT

10:15 a.m.–12:00 p.m.
JFB • Laser Particle Acceleration
Csaba Toth; Lawrence Berkeley Natl. Lab, USA, Presider

JFB1 • 10:15 a.m.
Staged Laser Ion Acceleration, *Oliver Jäckel[1], Sebastian M. Pfotenhauer[1], Jens Polz[1], Sven Steinke[2], Hans-Peter Schlenvoigt[1], Jens Heymann[1], Alexander P. L. Robinson[3], Malte C. Kaluza[1]; [1]Inst. für Optik und Quantelektronik, Germany, [2]Max Born Inst., Germany, [3]Central Laser Facility, Rutherford-Appleton Lab, UK.* We report experimental results proving the possibility to use laser-driven ion acceleration in an additive manner. The observed proton spectra show well-defined characteristic modulations and this process was found to work extremely stable and controllable.

JFB2 • 10:30 a.m.
High-Brightness, Stable Electron Beams from a Laser Wakefield Accelerator Operating in the Matched Regime, *Sudeep Banerjee, Nathan Powers, Vidya Ramanathan, Nate C.-Smith, Kun Zhao, Bradley Shadwick, Donald P. Umstadter; Univ. of Nebraska, USA.* 400MeV quasi-monoenergetic electron beams are produced from a wakefield driven by 70 TW, 30 fs laser pulses. To our knowledge, these beams have the highest brightness to date from any laser accelerator, and 1-2% stability.

JFB3 • 10:45 a.m.
Vacuum Acceleration in a Regime Beyond Brunel Absorption, *Robin Marjoribanks[1], Jean-Paul Geindre[2], Patrick Audebert[2]; [1]Univ. of Toronto, Canada, [2]LULI, Ecole Polytechnique, France.* We describe a new regime of vacuum acceleration in laser-plasmas driven by ultrafast pulses of relativistic intensity, in which space-charge separation leads to strongly enhanced laser absorption and 20 MeV electrons accelerated outward.

JFB4 • 11:00 a.m.
Periodic Index-Modulated Plasma Waveguide, *Brian D. Layer, Andrew G. York, Sanjay Varma, Yu-Hsin Chen, Howard Milchberg; Univ. of Maryland, USA.* We demonstrate a wire-obstructed cluster flow technique for making periodically modulated plasma waveguides in hydrogen, nitrogen, and argon with sharp, stable voids as short as 50 µm with a period as small as 200 µm.

Room 339 — CLEO

10:15 a.m.–12:00 p.m.
CFS • Supercontinuum Generation and Fiber Nonlinearity
Liang Dong; IMRA America Inc., USA, Presider

CFS1 • 10:15 a.m.
Full Characterization of Femtosecond Pulses at 1225-1350 nm Produced by a High Power Fiber Optical Parametric Oscillator, *Christiane Goulart-Pailo, Chenji Gu, Jay E. Sharping; Univ. of California at Merced, USA.* We describe a fiber optical parametric oscillator operating at 1225 to 1350 nm in wavelength with 100 mW of average power. Characterization using SHG-FROG reveals linearly-chirped compressible pulses with duration of 250 fs.

CFS2 • 10:30 a.m.
The Effect of Pump-Pump Four-Wave Mixing on Gain of Two-Pump Phase Sensitive Optical Amplifiers, *Mingyi Gao, Kazuro Kikuchi; Dept. of Electrical Engineering and Information Systems, Univ. of Tokyo, Japan.* We develop a pump interaction model for two-pump phase sensitive optical amplifiers. It includes dominant pump-pump and signal-pump four-wave mixing and can be used to determine the optimal wavelength separation when amplifiers' parameters are given.

CFS3 • 10:45 a.m.
Intermodal Four-Wave Mixing in Structured-Core Photonic Crystal Fiber: Experimental Results, *Alexis Labruyère[1], Vincent Tombelaine[2], Philippe Leproux[1], Vincent Couderc[1], Frédérique Gérôme[1], Georges Humbert[1], Jens Kobelke[2], Kay Schuster[2], Hartmut Bartelt[2]; [1]XLIM Inst., UMR, France, [2]Inst. of Photonic Technology (IPHT), Germany.* Structuring the core of a photonic crystal fiber is used to fulfill the phase-matching condition required for broadband intermodal four-wave mixing. Experimental data show efficient red generation on LP_{01} mode from 1064 nm pumping.

CFS4 • 11:00 a.m.
Flat Supercontinuum in Suspended and Immobilized Short SF6 PCF Taper, *Peter Domachuk[1], Natalie A. Wolchover[1], Fiorenzo G. Omenetto[1], Alan K. George[2], Purnananda Nandi[2], Jonathan C. Knight[2]; [1]Tufts Univ., USA, [2]Univ. of Bath, UK.* We demonstrate low threshold, octave spanning spectrally flat, supercontinuum generation in a short length of tapered SF6 glass photonic crystal fiber. The short fiber is held stably and robustly with a polydimethyl-siloxane (PDMS) matrix.

10:15 a.m.–12:00 p.m.
CFT • Ultrafast Laser Waveguide Writing

Richard Haglund; Vanderbilt Univ., USA, Presider

CFT1 • 10:15 a.m. Invited

Femtosecond Laser Direct Writing of Waveguide Lattices, *Stefan Nolte[1,2], Alexander Szameit[1], Andreas Tünnermann[1,2]; [1]Friedrich Schiller Univ. Jena, Inst. of Applied Physics, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering IOF, Germany.* We review the basic principles of the femtosecond laser direct writing approach. This technology opens the possibility to specifically tune the light evolution in the linear as well as in the nonlinear regime.

CFT2 • 10:45 a.m.

Ultrafast-Laser Inscription of Active Devices in Glass, *Martin Ams, Graham D. Marshall, Peter Dekker, Michael J. Withford; Macquarie Univ., Australia.* Femtosecond laser-written active waveguide devices, namely waveguide amplifiers and DFB waveguide lasers were fabricated in doped phosphate glasses. Gain was achieved across the complete C-band and a laser with output power of 102mW was demonstrated.

CFT3 • 11:00 a.m.

High Refractive Index Contrast in Fused Silica Waveguides by Tightly Focused, High-Repetition Rate Femtosecond Laser, *Shane M. Eaton, Mi Li Ng, Tariq Rafique, Peter R. Herman; Univ. of Toronto, Canada.* A new domain of optical waveguide writing with record refractive index contrast (0.022) and small mode diameter is reported in fused silica by strong focusing of a 500-kHz repetition rate femtosecond laser with oil-immersion optics.

10:15 a.m.–12:00 p.m.
CFU • Remote Sensing II

Joseph Buck; Lockheed Martin Coherent Technologies, USA, Presider

CFU1 • 10:15 a.m. Invited

Standoff Chemical Detection Using Single-Beam CARS, *Steven Wolf, Paul J. Wrzesinski, Marcos Dantus; Michigan State Univ., USA.* We introduce an improved method for standoff chemical detection of films and residues on solid targets which scatter or reflect the incident light using single-beam Coherent anti-Stokes Raman Scattering.

CFU2 • 10:45 a.m.

Airborne Measurements of CO2 Column Absorption Using a Pulsed Wavelength-Scanned Laser Sounder Instrument, *James Abshire, Haris Riris, William Hasselbrack, Graham R. Allan, Clark J. Weaver, Jianping Mao; NASA Goddard Space Flight Ctr., USA.* We have demonstrated airborne measurements of the CO2 column absorption at 1571.4 nm from 10 km altitudes with a wavelength scanned lidar using a pulsed diode-seeded EDFA transmitter and a photon counting receiver.

CFU3 • 11:00 a.m.

Sub-Millimeter Resolution Laser Ranging at 9.3 Kilometers Using Temporally Stretched, Frequency Chirped Pulses from a Mode-Locked Laser, *Mohammad Umar Piracha[1], Dat Nguyen[1], Tolga Yilmaz[2], Dimitrios Mandridis[1], Sarper Ozharar[1], Peter J. Delfyett[1]; [1]CREOL, The College of Optics and Photonics, Univ. of Central Florida, USA, [2]Raydiance, Inc., USA.* A sub-millimeter resolution ladar is demonstrated with 9.3km delay using stretched pulses allowing amplification to high powers with negligible nonlinear effects. A coherent heterodyne detection scheme results in 30dB dynamic range.

10:15 a.m.–12:00 p.m.
CFV • Waveguides and Filter

Joyce Poon; Univ. of Toronto, Canada, Presider

CFV1 • 10:15 a.m.

Bandwidth- and Wavelength-Tunable Comb Filter Using PLC-Based Optical Transversal Filter, *Hoang Manh Nguyen, Koji Igarashi, Kazuhiro Katoh, Kazuro Kikuchi; Univ. of Tokyo, Japan.* We demonstrate bandwidth- and wavelength-tunable comb filters with sharp-cutoff and low-dispersion characteristics using a 16-tap PLC-based optical transversal filter. Such filters have no limitation of the wavelength-channel number owing to the cascaded Mach-Zehnder interferometer structure.

CFV2 • 10:30 a.m.

A Compact Wideband Flat-Band Filter for Silicon Photonic Applications, *Qing Li, Mohammad Soltani, Siva Yegnanarayanan, Ali Adibi; Georgia Tech, USA.* A compact coupled-resonators flat-band filter with a large bandwidth (~3.3nm), large free-spectral range (~18nm), low crosstalk (<-12dB) and negligible insertion loss (<0.5dB) is demonstrated on a silicon-on-insulator platform with focused applications for on-chip optical interconnects.

CFV3 • 10:45 a.m.

Modeling the Nonlinear Add-Drop Microring Filter, *Mark A. Schneider, Shayan Mookherjea; Univ. of California at San Diego, USA.* A new model is developed for the effects of the Kerr optical nonlinearity in a microring (racetrack) resonator coupled to input and output waveguides, which takes into account the nonlinearity in the couplers.

CFV4 • 11:00 a.m.

Wideband 1.5µm-Radius SOI Add-Drop Microring Filter for WDM on-Chip Interconnects, *Ashok M. Prabhu, Zhanghua Han, Alan Tsay, Vien Van; Univ. of Alberta, Canada.* We report an ultracompact SOI add-drop microring filter with a 1.5µm-radius, a wide FSR of 52nm, a wide bandwidth of 210GHz, with 2.9dB insertion loss and nearly 25dB extinction for on-chip optical interconnect applications.

Rooms 318-320 — CLEO

CFL • Biomedical Microscopy II—Continued

CFL4 • 11:15 a.m.
Three-Dimensional Nanoscopy of Biological Samples, *Alipasha Vaziri, Jianyong Tang, Hari Shroff, Charles V. Shank; Howard Hughes Medical Inst., USA.* We have demonstrated super-resolution imaging of protein distributions in cells at depth at multiple layers with a lateral localization precision better than 50nm. The approach is based on combining photoactivated localization microscopy with temporal focusing.

CFL5 • 11:30 a.m.
High Spatial Resolution Molecular Interferometric Imaging Study of Affinity Binding, *Ming Zhao, Xuefeng Wang, David D. Nolte; Purdue Univ., USA.* We have developed molecular interferometric imaging (MI2) for the fundamental study of affinity binding at surfaces, and present high-resolution data of intra-spot molecular kinetics under mass-transport limitations.

CFL6 • 11:45 a.m.
Single Molecule Interference: Towards Three-Dimensional Fluorescence Localization Microscopy at the Molecular Level, *Iwan Märki[1], Theo Lasser[1], Alberto Bilenca[2]; [1]Lab d'Optique Biomédicale, Ecole Polytechnique Fédérale de Lausanne, Switzerland, [2]Harvard Medical School, USA.* We demonstrate three-dimensional, nanometer-scale positioning precision of a single quantum-dot using single molecule interference and localization. We anticipate that our approach will lay the foundation for fluorescence microscopy with molecular resolution in all three dimensions.

Rooms 321-323 — IQEC

IFC • Surface Plasmon Polaritons—Continued

IFC5 • 11:15 a.m.
Simple Analytical Expression for the Dispersion of Plasmonic Structures with Coaxial Geometry, *Peter B. Catrysse, Shanhui Fan; Stanford Univ., USA.* We derived a simple analytical expression for the modal dispersion of deep-subwavelength coaxial plasmonic structures. Our approach provides an intuitive picture that allows a qualitative understanding and a quantitative prediction of the complete dispersion behavior.

IFC6 • 11:30 a.m.
Time-Resolved Behaviors of Surface Plasmon Coupling Features with a Light Emitter, *Jyh-Yang Wang, Wen-Hung Chuang, Yean-Woei Kiang, C. C. Yang; Natl. Taiwan Univ., Taiwan.* The transient behaviors of the dipole coupling with surface plasmons in an Ag/dielectric grating structure for understanding the characteristics of those dipole-coupling features are demonstrated. The major decay mechanisms of those coupling features are identified.

IFC7 • 11:45 a.m.
Extraordinary Acoustic Transmission through Acoustic Gratings with Very Narrow Apertures, *Ming-Hui Lu, Liang Feng, Yan-Feng Chen, Yong-Yuan Zhu, Shi-Ning Zhu, Nai-Ben Ming; Natl. Lab of Solid State Microstructures, Nanjing Univ., China.* Recently, extraordinary optical transmission (EOT) through subwavelength aperture arrays perforated in a metallic film has attracted much attention. Here, we investigate the subwavelength extraordinary acoustic transmission (EAT) analogous to EOT both theoretically and experimentally.

Rooms 324-326 — CLEO

CFM • Advanced Fiber Laser Systems II—Continued

CFM5 • 11:15 a.m.
Optically Coupled Rod-Type Fiber System: Oscillator versus Oscillator-Amplifier Behaviour, *Ramatou Bello Doua[1], François Salin[1], Eric Freysz[2]; [1]EOLITE Systems, France, [2]Univ. Bordeaux 1, France.* A Q-switched laser system which couples two ytterbium doped fibers is presented. Depending on the pump intensity this system yields either short or long nanosecond pulses. The gain competition accounts for the observed phenomena.

CFM6 • 11:30 a.m.
Tunable Yb-Doped Fibre Amplified Sontaneous Emission Source, *Pu Wang, W. A. Clarkson; Univ. of Southampton, UK.* Tunable narrow-linewidth operation of an Yb-doped fiber amplified-spontaneous-emission (ASE) source is reported. The source yielded 135mW output at 1040nm and could be tuned from 1034nm to 1084nm. The prospects for improvement in performance are considered.

CFM7 • 11:45 a.m.
Coherent Combining of Fiber Amplifiers through Atmospheric Turbulence: A Model, *Laurent Lombard, Véronique Jolivet, Pierre Bourdon, Baya Bennaï, Matthieu Valla, Guillaume Canat, Olivier Vasseur; ONERA, France.* We propose a model, based on speckle propagation, of the remote coherent combining of fiber amplifiers through atmospheric turbulence. The simulations show why, and under what conditions coherent beam combining through turbulence is possible.

Room 314 — CLEO

CFN • Short Wavelength—Continued

CFN5 • 11:15 a.m.
EUV Detection of High-Frequency Surface Acoustic Waves, *Mark Siemens[1], Qing Li[1], Margaret Murnane[1], Henry Kapteyn[1], Ronggui Yang[1], Erik Anderson[2], Keith Nelson[3]; [1]JILA, Univ. of Colorado, USA, [2]Ctr. for X-Ray Optics and Lawrence Berkeley Labs, USA, [3]MIT, USA.* We use coherent extreme ultraviolet radiation to probe surface acoustic wave propagation in nickel-on-sapphire nanostructures. We observe no acoustic dispersion over SAW wavelengths down to 200nm, meaning the SAW propagation is unaffected by the nanostructure.

CFN6 • 11:30 a.m.
Simultaneous Measurement of Structure and XUV Dielectric Constant of Nanoscale Objects Using Diffraction of High Harmonic Radiation, *Benjamin Mills[1], Chien F. Chau[2], Edward T. F. Rogers[1], James Grant-Jacob[1], Sarah L. Stebbings[3], Matthew Praegar[3], Ana M. de Paula[4], Chris A. Froud[5], Richard T. Chapman[6], Thomas J. Butcher[1], William S. Brocklesby[1], Jeremy G. Frey[6]; [1]Optoelectronics Res. Ctr., Univ. of Southampton, UK, [2]School of Electronics and Computer Science, Univ. of Southampton, UK, [3]School of Physics and Astronomy, Univ. of Southampton, UK, [4]Federal Univ. of Minas Gerais, Brazil, [5]Rutherford Appleton Lab, UK, [6]School of Chemistry, Univ. of Southampton, UK.* XUV diffraction using radiation generated by high harmonic generation is used simultaneously to determine both the structure and the complex refractive index of a partially ordered array of 196 nm diameter polystyrene spheres.

CFN7 • 11:45 a.m.
Generation of High-Energy Sub-20-fs DUV Pulses in Noble-Gas-Filled Hollow Fiber, *Tamas Nagy, Peter Simon; Laser-Lab Göttingen e.V., Germany.* Generation of high-energy sub-20-fs DUV pulses is reported by compression of 248.5nm pulses in noble-gas-filled hollow fibers. Bandwidths of 7nm and 10nm with energies of 0.45mJ and 0.25mJ were achieved in helium and neon, respectively.

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Room 315

IQEC

IFD • Cooling of Opto-Mechanical Systems—Continued

IFD3 • 11:15 a.m.
Squeezing Effects in Mechanical Oscillators, *Yacob Ben-Aryeh; Technion-Israel Inst. of Technology, Israel.* A slow 'pumping' of energy into the mechanical oscillator leads to increase of the amplitude and frequency with squeezing effects by which the noise in one quadrature is increasing and in the other decreasing.

IFD4 • 11:30 a.m.
Probing Optomechanical Correlations between Two Optical Beams down to the Quantum Level, *Pierre Verlot, Alexandros Tavernarakis, Tristan Briant, Pierre-François Cohadon, Antoine Heidmann; Lab Kastler Brossel, Univ. Pierre et Marie Curie, France.* We demonstrate correlation between intensity and phase of two light beam induced by optomechanical coupling.

IFD5 • 11:45 a.m.
Optical Tunneling from an On-Chip Resonator, *Matthew Tomes, Tal Carmon; Univ. of Michigan, USA.* We experimentally observe light emission from a region that is far away from our on-chip device. We photograph up to 10-µm tunneling distance; this gap is greater than 20% of the device size.

IFD6 • 12:00 p.m.
Experimental Optomechanics with Silicon Micro-Mirrors, *Chiara Molinelli, Aurelien Kuhn, Tristan Briant, Pierre-François Cohadon, Antoine Heidmann; Lab Kastler Brossel, Univ. Pierre et Marie Curie, France.* We present an experiment where the motion of a silicon micro-mechanical resonator is optically monitored in a high-finesse cavity with a quantum-limited sensitivity. Directs effects of intracavity radiation pressure are experimentally demonstrated.

Room 316

CLEO

CFO • Short Pulse Lasers—Continued

CFO5 • 11:15 a.m.
Generation of Continuous Mode-Locked Pulses in Nd:YVO_4 with an Adjustable Pulse Duration between 34 ps and 1 ns, *Markus Lührmann, Christian Theobald, Richard Wallenstein, Johannes A. L'huillier; Technische Univ. Kaiserslautern, Germany.* We report on highly stable active continuous mode-locking in diode-pumped Nd:YVO_4 with adjustable pulse durations between 34ps and 1ns. An average output power till 7.3W, an excellent beam quality M^2<1.1 and transform-limited pulses were obtained.

CFO6 • 11:30 a.m.
Generation of 1053-nm Femtosecond Pulses by Yb:YAG Laser, *Binbin Zhou[1], Zhiyi Wei[1], Dehua Li[1], Hao Teng[1], G. L. Bourdet[2]; [1]Inst. of Physics, Chinese Acad. of Sciences, China, [2]Lab pour l'Utilisation des Lasers Intenses, Ecole Polytechnique, CNRS, CEA, Univ. Pierre et Marie Curie, France.* Femtosecond Yb:YAG laser at 1053 nm was realized by optimized crystal length and doping concentration, stable mode-locking power of 180 mW was achieved under 2W pump. Measurement shows 21fs pulse duration and 7nm spectrum bandwidth.

CFO7 • 11:45 a.m.
Efficient Broadband-Spectrum Oscillation of Ultrashort-Pulse Kerr-Lens Mode-Locked Yb:YAG Laser with Intracavity Nonlinear Media Overcoming the Fluorescence Spectrum Limit, *Shinichi Matsubara[1,2], Masaki Takama[2], Masahiro Inoue[2], Hiroyuki Hitotsuya[2], Shinya Okuda[2], Mami Odahara[3], Sakae Kawato[1,2], Yuzo Ishida[4]; [1]Inst. of Physical and Chemical Res., RIKEN/SPring-8, Japan, [2]Graduate School of Engineering, Univ. of Fukui, Japan, [3]Faculty of Engineering, Univ. of Fukui, Japan, [4]Inst. of Physical and Chemical Res., Riken Wako Inst., Japan.* Efficient, high-average power broadband-spectrum oscillation of laser-diode pumped Kerr-lens mode-locked Yb:YAG laser was obtained. The spectrum was expanded to around 1040-nm to 1070-nm, much broader than the fluorescence spectrum at 1050 nm.

Room 317

CFP • Photonic Crystal Technology and Applications—Continued

CFP5 • 11:15 a.m.
Silk Fibroin Biosensor Based on Imprinted Periodic Nanostructures, *Jason J. Amsden[1], Ashwin Gopinath[2], Luca Dal Negro[2], David L. Kaplan[1], Fiorenzo G. Omenetto[1]; [1]Tufts Univ., USA, [2]Boston Univ., USA.* This paper presents a label free colorometric sensor fabricated by rapidly imprinting silk fibroin thin films with periodic nanoholes. The fabricated sensor is sensitive to index variations n = 0.007.

CFP6 • 11:30 a.m.
A Detailed Study of Transmission, Reflection and Scattering Losses in Spatially Graded Metamaterials in the Infrared, *Igal Brener[1,2], Michael B. Sinclair[1], Xomalin G. Peralta[1], Troy Ribaudo[3], David Adams[3], Daniel Wasserman[3], Joel R. Wendt[1], Amelia M. Sanchez[1], William L. Langston[1], Paul Davids[1], Lorena L. Basilio[1], Gregory A. Ten Eyck[1], Eric A. Shaner[1]; [1]Sandia Natl. Labs, USA, [2]Ctr. for Integrated Nanotechnologies, USA, [3]Univ. of Massachusetts at Lowell, USA.* We present angle resolved measurements of transmission, reflection and scattering of optical infrared metamaterials, both uniform and spatially graded. Understanding and managing losses is crucial for optical applications.

CFP7 • 11:45 a.m.
Optical Trapping and Fluorescence Collection Using a Dual-Wavelength Diffractive Optic, *Ethan Schonbrun, Winnie N. Ye, Kenneth B. Crozier; Harvard Univ., USA.* We demonstrate a silicon diffractive element that serves as an optical tweezer in the near infrared and as a fluorescence collector in the visible. The 1.3 NA lens is achromatic and has high diffraction efficiency.

Room 336	Room 337	Room 338	Room 339
CLEO		JOINT	CLEO

CFQ • Organic Optoelectronics—Continued

CFQ5 • 11:15 a.m.
Linear and Nonlinear Absorption Properties of D-π-A Polymethine Dyes, *Honghua Hu[1], Lazaro A. Padilha[1], Scott Webster[1], Davorin Peceli[1], Olga V. Przhonska[1,2], David J. Hagan[1,3], Eric W. Van Stryland[1,3], Andriy O. Gerasov[4], Mykola P. Shandura[4], Yuriy P. Kovtun[4], Alexei D. Kachkovski[4]; [1]CREOL, Univ. of Central Florida, USA, [2]Inst. of Physics, Natl. Acad. of Sciences, Ukraine, [3]Dept. of Physics, Univ. of Central Florida, USA, [4]Inst. of Organic Chemistry, Natl. Acad. of Sciences, Ukraine.* Linear and nonlinear absorption of a series of new donor-π-acceptor polymethines with different lengths of conjugation are investigated and include quantum chemical analysis. Two-photon absorption cross-sections as large as 11,000 GM and solvatochromism are observed.

CFQ6 • 11:30 a.m.
Improved Bulk-Heterojunction Polymer Solar Cells with Paraphenylenevinylene and Fullerene, *Yanfei Ding, Qiying Chen; Memorial Univ. of Newfoundland, Canada.* We report bulk-heterojunction solar cells consisting of poly [2-methoxy, 5 ethyl (2' hexyloxy) paraphenylenevinylene] (MEH-PPV) as a donor and [6,6]-phenyl-C61-butyric acid methyl ester (PCBM) as an acceptor with improved performance after optimization of device parameters.

CFR • Semiconductor Nonlinear Optics—Continued

CFR4 • 11:15 a.m. Invited
Frequency Conversion in Silicon Waveguides Over Two-Thirds of an Octave, *Amy C. Turner-Foster, Mark A. Foster, Reza Salem, Alexander L. Gaeta, Michal Lipson; Cornell Univ., USA.* We demonstrate ultra-broadband low-peak-power frequency conversion of continuous-wave light in a silicon photonic structure via four-wave mixing. Our process produces continuous conversion over two-thirds of an octave from 1241-nm to 2078-nm wavelength light.

CFR5 • 11:45 a.m.
Mid-Infrared Pulse Dynamics in Si Nanophotonic Wires Near the Two-Photon Absorption Edge, *Xiaoping Liu[1], Jeffrey B. Driscoll[1], Jerry I. Dadap[1], Richard M. Osgood, Jr.[1], Yurii A. Vlasov[2], William M. J. Green[2]; [1]Columbia Univ., USA, [2]IBM T. J. Watson Res. Ctr., USA.* We present an experimental and simulation study of the pulse dynamics in SOI nanophotonic wires at mid-infrared wavelengths beyond the telecommunications band, and illustrate the significantly reduced role of two-photon absorption.

JFB • Laser Particle Acceleration—Continued

JFB5 • 11:15 a.m.
Temporal Buildup of the He^+ Ion Channel Scanned by High-Order Harmonic Generation, *Josef Seres[1], Enikoe Seres[2], Christian Spielmann[2]; [1]Univ. Wuerzburg, Germany, [2]Friedrich Schiller Univ., Germany.* Double pulse scheme is used to study the dynamics of He^+ ion channel formation. At 300fs delay the ion channel is formed and the harmonic yield is increased by two orders of magnitude.

JFB6 • 11:30 a.m.
Laser-Plasma Generated Electron Beams for Radiographic Applications, *Vidya Ramanathan, Sudeep Banerjee, Nathan Powers, Kun Zhao, Nathaniel Cunningham, Nate Chandler-Smith, Donald Umstadter; Univ. of Nebraska, Lincoln, USA.* We investigate use of laser-accelerated electron beams for high resolution long standoff, radiographic applications and detection of shielded dense materials. For first time, radiographs with sub-millimeter resolution; of embedded gaps in dense materials are presented.

JFB7 • 11:45 a.m.
MeV Photoelectrons from Xenon in a Strong Laser Field, *Isaac Ghebregziabher, Jane M. Waesche, Anthony D. DiChiara, Nagitha Ekanayake, Bruce L. Wen, Barry C. Walker; Univ. of Delaware, USA.* Atomic xenon ionization in ultra-strong laser fields is measured to give mega-electron volt photoelectrons. The yields and angular distributions for electrons above the pondermotive energy are shown to be consistent with a semi-classical model.

CFS • Supercontinuum Generation and Fiber Nonlinearity—Continued

CFS5 • 11:15 a.m.
Supercontinuum Generation in Pure Silica Core Cut-off Shifted Single Mode Fibers, *Toshiki Taru[1], M. Hirano[1], T. Sasaki[1], J. C. Knight[2]; [1]Sumitomo Electric Industries, Ltd., Japan, [2]Univ. of Bath, UK.* Flat and single mode supercontinuum generation spanning from 700 to 2350 nm was demonstrated using a nanosecond microchip laser and conventional cut-off shifted SMF. This configuration is attractive as a simple and low-cost light source.

CFS6 • 11:30 a.m.
Quasi-Super-Continuum Generation Using Ultrahigh-Speed Wavelength-Tunable Soliton Pulses Based on 1.06 µm Ultrashort Pulse Laser System, *Kazuhiko Sumimura, Norihiko Nishizawa, Kazuyoshi Itoh; Osaka Univ., Japan.* Quasi super continuum generation at 1.1-1.4 µm is demonstrated using ultrahigh speed wavelength tuning of femtosecond soliton pulses for the first time. The center wavelength, bandwidth, and spectrum shape can be changed arbitrarily.

CFS7 • 11:45 a.m.
Tailored Soliton Statistics in Supercontinuum Generation, *Bertrand Kibler[1], Christophe Finot[1], John M. Dudley[2]; [1]Inst. Carnot de Bourgogne, France, [2]Inst. FEMTO-ST, France.* Stochastic simulation of supercontinuum generation in fiber with two zero dispersion wavelengths reveals that the long wavelength soliton probability distribution can be tailored to have Gaussian, uniform, or rogue wave characteristics depending on initial energy.

NOTES

CFT • Ultrafast Laser Waveguide Writing—Continued

CFT4 • 11:15 a.m.
Polarization Dependence of Photo-Ionization in Glasses and Applications to Direct-Write Photonics, *Douglas J. Little, Martin Ams, Peter Dekker, Graham D. Marshall, Judith M. Dawes, Michael J. Withford; Macquarie Univ., Australia.* Waveguides were written in glass using the femtosecond laser direct-write technique. The refractive index changes induced were found to be polarization dependent. We propose that photo-ionization rates are the origin of this polarization dependence.

CFT5 • 11:30 a.m.
Second Harmonic Generation by Electro-Poling in Femtosecond Laser Induced Micro-Structured Silver Containing Glass, *Jiyeon Choi[1,2], Kevin Bourhis[2], Thierry Cardinal[2], Matthieu Bellec[3], Lionel Canioni[3], Evelyne Fargin[2], Vincent Rodriguez[4], Marc Dussauze[4], Aurelien Delestre[2], Martin Richardson[1]; [1]Townes Laser Inst., The College of Optics and Photonics, Univ. of Central Florida, USA, [2]ICMCB, CNRS, Univ. Bordeaux, France, [3]CPMOH, Univ. Bordeaux, France, [4]ISM, Univ. Bordeaux, France.* Laser structuring and electro-poling has been carried out in silver containing glasses. The second-order NLO response after direct laser patterning has been investigated in the scope of developing further practical use of the material.

CFT6 • 11:45 a.m.
Second-Order Optical Nonlinearity in Thermally Poled Silica Waveguides Written by Femtosecond Laser Pulses, *Honglin An[1], Simon Fleming[1], Benjamin McMillen[2], Kevin P. Chen[2]; [1]Univ. of Sydney, Australia, [2]Univ. of Pittsburgh, USA.* Thermal poling was utilized to induce second-order nonlinearity in silica waveguides written by femtosecond laser pulses. Nonlinearity in the waveguides was found to be lower than non-modified regions.

CFU • Remote Sensing II—Continued

CFU4 • 11:15 a.m.
Atomic Oxygen Detection Using Radar REMPI, *Arthur Dogariu, James Michael, Emanuel Stockman, Richard B. Miles; Princeton Univ., USA.* We use a microwave scattering based resonantly enhanced multi-photon ionization scheme for monitoring the concentration of oxygen atoms in a flame. This technique allows for remote investigation of concentration of atomic species with nanosecond resolution.

CFU5 • 11:30 a.m.
Mid-Infrared Atomic and Molecular Laser-Induced Breakdown Spectroscopy Emissions from Solid Substances, *Clayton S.-C. Yang[1], Ei-Ei Brown[2], Uwe Hommerich[2], Sudhir Trivedi[3], A. Peter Snyder[4], Alan C. Samuels[4]; [1]Battelle Eastern Science and Technology Ctr., USA, [2]Hampton Univ., USA, [3]Brimrose Corp. of America, USA, [4]Edgewood Chemical Biological Ctr., USA.* The mid-infrared emission from laser-induced-breakdown processes on solid substances between 2-5.75 µm was probed. Atomic emission features from neutral atomic fragments and molecular emission features from partially dissociated molecular fragments have been successfully identified.

CFU6 • 11:45 a.m.
Superheating of Libs Plasma Electron Temperature by Addition of a CO_2 Laser Pulse onto Fe, Pb and Al Substrates for Remote Sensing Applications, *Avishekh Pal[1], Dennis Klillinger[1], Robert Waterbury[2], Ed Dottery[2]; [1]Univ. of South Florida, USA, [2]Alakai Engineering and Consulting, Inc., USA.* A 10.6 µm CO_2 laser pulse was used to enhance a remote LIBS emission. The temperature of the plasma was measured, and increased by 3,000 K due to the addition of the CO_2 laser pulse.

CFV • Waveguides and Filter—Continued

CFV5 • 11:15 a.m.
Demonstration of a Multimode Waveguide-Cavity Biosensor Based on Fringe Visibility Detection, *Alexander C. Ruege, Ronald M. Reano; Ohio State Univ., USA.* Fringe visibility modulation from a two-mode waveguide coupled to a single mode ring resonator exposed to glucose:H_2O demonstrates a visibility change of 1.57/wt%, compared to a transmission change of 0.19/wt% for single mode waveguide coupling.

CFV6 • 11:30 a.m.
Electro-Optic Integration of Liquid Crystal Cladding Switch with Multimode Passive Polymer Waveguides on PCB, *Joseph Beals IV, Oliver Hadeler, Stephen M. Morris, Timothy D. Wilkinson, Richard V. Penty, Ian H. White; Univ. of Cambridge, UK.* Optical switching functionality is demonstrated in PCB integrated multimode passive polymer waveguides using a localised liquid-crystal cladding structure. Waveguide switching contrast of 15 dB is achieved with only 0.5 dB of on-state excess loss.

CFV7 • 11:45 a.m.
Ultra-Low Loss Hollow-Core Waveguides Using High-Contrast Gratings, *Ye Zhou, Vadim Karagodsky, Forrest G. Sedgwick, Connie J. Chang-Hasnain; Univ. of California at Berkeley, USA.* A novel ultra-low loss single-mode hollow-core waveguide using high-contrast grating (HCG) is proposed and simulated. The loss can be as low as 0.006dB/m, three orders of magnitude lower than the state-of-art chip-scale waveguides.

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