ROOM 318-320	ROOM 321-323	ROOM 324-326	ROOM 314	ROOM 315	ROOM 316	ROOM 317	ROOM 336
CLEO							QELS

8:00 a.m. – 9:45 a.m.
CTuA • Applications of Nonlinear Optical Spectroscopy

Vladislav V. Yakovlev; Univ. of Wisconsin at Milwaukee, USA, Presider

CTuA1 • 8:00 a.m.
Second-Harmonic Generation from Aligned and Mono-Sized Single-Walled Carbon Nanotubes, *Huimin Su, Jianting Ye, Zhikang Tang, Kam Sing Wong; Hong Kong Univ. of Science and Technology, Hong Kong*. Second-harmonic generation (SHG) from monosized, and aligned single-walled carbon nanotubes is measured and the anisotropic dependence of SHG on the excitation polarizations are investigated. The results are in excellent agreement with the theory.

CTuA2 • 8:15 a.m.
Second-Harmonic Imaging of ZnO Nanoparticles, *Elder de la Rosa[1], Miguel Yacaman[1], Liangfeng Sun[2], Michael C. Downer[2], Luis A. Diaz Torres[3], Pedro Salas[4]; [1]Dept. of Chemical Engineering, Univ. of Texas at Austin, USA, [2]Dept. of Physics, Univ. of Texas at Austin, USA, [3]Ctr. de Investigaciones en Optica, Mexico, [4]Inst. Mexicano del Petroleo, Mexico*. ZnO nanocrystals with average crystallite size 20nm forming irregular nanoparticles with average size ~300nm were prepared. Strong brilliant second-harmonic generation from nanoparticles was obtained and imaged showing 5μm spots suggesting good potential for biomedical applications.

8:00 a.m. – 9:45 a.m.
CTuB • Optical Packet Switching

P.K.A. Wai; Hong Kong Polytechnic Univ., China, Presider

CTuB1 • 8:00 a.m. Tutorial
Scaling Packet Networks and Routers Using Optics, *David T. Neilson; Bell Labs, Alcatel-Lucent, USA*. Data networks face significant scaling challenges. We will discuss how fast optical switching can both enhance the scalability of core routers and allow adaptive bandwidth circuit switching for more efficient use of the optical network.

8:00 a.m. – 9:45 a.m.
CTuC • Ultrafast Sources I

Lawrence Shah; IMRA America, Inc., USA, Presider

CTuC1 • 8:00 a.m.
High Power and High Repetition Rate Pulse Generation Using Self Injection-Locking in Fabry-Perot Laser Diode, *Xiaobui Fang[1], P. K. A. Wai[1], C. Lu[1], H. Y. Tam[2], Xingyong Dong[2]; [1]Photonics Res. Ctr. and Dept. of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., Hong Kong, [2]Photonics Res. Ctr. and Dept. of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong*. A 139.6 GHz transform limited pulse train with peak power of 120 mW is generated using self injection-locking of a Fabry-Perot Laser diode. The pulsewidth is 1.6 ps and the time-bandwidth product is 0.34.

CTuC2 • 8:15 a.m.
77-GHz Pulse Train at 1.5 μm Directly Generated by a Passively Mode-Locked High Repetition Rate Er:Yb:Glass Laser, *Simon C. Zeller[1], Thomas Südmeyer[1], Ursula Keller[1], Kurt J. Weingarten[2]; [1]Swiss Federal Inst. of Technology, ETH Zürich, Switzerland, [2]Time-Bandwidth Products, Switzerland*. We demonstrate a passively mode-locked Er:Yb:glass laser operating at a record high repetition rate of 77 GHz. Its compactness and stability are attractive for future high-speed data transmission systems in the 1.5 μm telecom window.

8:00 a.m. – 9:45 a.m.
CTuD • Ultraviolet, Visible and Q-Switched Lasers

Martin Ostermeyer; Univ. of Potsdam, Germany, Presider

CTuD1 • 8:00 a.m.
12 W Continuous-Wave 266-nm Deep-UV Generation through 24 W Single-Frequency 1064-nm Light from a Fiber MOPA, *Thomas Sudmeyer[1,2], Yutaka Imai[1], Hisashi Masuda[1], Naoya Eguchi[1], Masaki Saito[1], Shigeo Kubota[1]; [1]Sony Corp., Japan, [2]ETH, Switzerland*. We present resonator-enhanced frequency conversion of a master-oscillator fiber power amplifier. 88%-efficient 2nd harmonic generation results in > 20W at 532nm. A low loss Czochralski-grown BBO generates record-high, > 12-W continuous-wave, 4th-harmonic radiation at 266nm.

CTuD2 • 8:15 a.m.
Development of a Single-Frequency Nanosecond Pulsed Deep-UV Coherent Light Source for Manipulating Silicon Atoms, *Yasutomo Sbiomi, Takeshi Yamamoto, Hirosbi Kumagai, Ataru Kobayasbi; Osaka City Univ., Japan*. A single-frequency nanosecond pulsed deep-ultraviolet coherent light source consisting of a frequency-tripled nanosecond pulsed Ti:sapphire laser injection-seeded by a single-frequency cw Ti:sapphire laser was developed successfully for manipulating silicon atoms.

8:00 a.m. – 9:45 a.m.
CTuE • Quantum and Interband Cascade Lasers

Daniel Wasserman; Princeton Univ., USA, Presider

CTuE1 • 8:00 a.m.
Quantum Cascade Lasers Emitting below 3 μm, *Jan Devenson, Roland Teissier, Olivier Cathabard, Alexei N. Baranov; Ctr. d'Electronique et de Microoptoëlectronique de Montpellier, Univ. Montpellier, France*. First quantum cascade lasers emitting below 3 μm are demonstrated. The lasers based on the InAs/AlSb material system emit at 2.95-2.97 μm at 83 K and operate up to room temperature.

CTuE2 • 8:15 a.m.
InGaAs-AlAsSb Quantum Cascade Lasers: Towards 3 μm Emission, *Dmitry G. Revin[1], John W. Cockburn[1], Luke R. Wilson[1], Matthew J. Steer[2], Robert J. Airey[2], Mark Hopkinson[2], Andrey B. Krysa[2]; [1] Dept. of Physics and Astronomy, Univ. of Sheffield, UK, [2]EPSRC Natl. Ctr. for III-V Technologies, Univ. of Sheffield, UK*. We report the first realization of lattice matched $In_{0.53}Ga_{0.47}As/AlAs_{0.56}Sb_{0.44}$/InP quantum cascade lasers emitting close to 3 μm and first demonstration of strain balanced InGaAs/AlAsSb/InP quantum cascade lasers operating at wavelengths near 4 μm.

8:00 a.m. – 9:45 a.m.
CTuF • Nonlinear Microscopy I

Sunney Xie; Harvard Univ., USA, Presider

CTuF1 • 8:00 a.m. Invited
Two-Photon Absorption Imaging of Hemoglobin, *Dan Fu[1], Thomas E. Mattbews[2], Tong Ye[2], Gunay Yurtsever[2], Warren S. Warren[2]; [1]Princeton Univ., USA, [2]Duke Univ., USA*. We demonstrated that both oxyhemoglobin and deoxyhemoglobin has sequential two-photon absorption properties that can serve as endogenous contrasts in microvasculature imaging. They can also be differentiated through their different excited state dynamics.

8:00 a.m. – 9:45 a.m.
CTuG • Nanophotonic Waveguide Technologies

Presider to Be Announced

CTuG1 • 8:00 a.m.
Efficient, Broadband and Compact Metal Grating Couplers for Silicon-on-Insulator Waveguides, *Stijn Scheerlinck, Jonathan Schrauwen, Dirk Taillaert, Dries Van Thourbout, Roel Baets; IMEC, Ghent Univ., Belgium*. Metal grating couplers for Silicon-on-Insulator waveguides are proposed. A silver grating coupler with 33% coupling efficiency is designed. A gold grating coupler prototype is fabricated using Focused Ion Beams demonstrating over 10% coupling efficiency.

CTuG2 • 8:15 a.m.
Polysilicon-on-Insulator Photonic Devices, *Kyle Preston, Michal Lipson; School of Electrical and Computer Engineering, Cornell Univ., USA*. We demonstrate ring resonators with Q = 4,000 using polycrystalline silicon annealed at a low temperature of 600°C, which is compatible with standard CMOS processes.

8:00 a.m. – 9:45 a.m.
QTuA • Nonlinear Phenomena and Localization

Stephen C. Rand; Div. of Applied Physics, Univ. of Michigan, USA, Presider

QTuA1 • 8:00 a.m.
Conical Diffraction and Gap Solitons in Honeycomb Photonic Lattices, *Or Peleg[1], Guy Bartal[1], Barak Freedman[1], Ofer Manela[1], Mordechai Segev[1], Demetrios Christodoulides[2]; [1]Technion, Israel, [2]College of Optics and Photonics, CREOL, USA*. We predict and present the first observation of conical diffraction arising from k-space singularities in the band-structure of a periodic potential. The experiments are carried out in honeycomb lattices, where we also generate "honeycomb gap-solitons."

QTuA2 • 8:15 a.m.
Observation of Embedded Lattice Solitons, *Xiaosheng Wang[1,2], Zhigang Chen[1,2], Jianke Yang[3]; [1]San Francisco State Univ., USA, [2]Nankai Univ., China, [3]Univ. of Vermont, USA*. We report the first demonstration of embedded lattice soliton trains. Such solitons arise from the X-symmetry points in the first Bloch band but still reside (embedded) in the first band of a 2-D photonic lattice.

QELS

CLEO

8:00 a.m. – 9:45 a.m. QTuB • Fundamental Nonlinear Optics

Jacob B. Khurgin; Johns Hopkins Univ., USA, Presider

QTuB1 • 8:00 a.m.
Cascade-Like Nonlinearity Caused by Local-Field Effects: Extending Bloembergen's Result, *Ksenia Dolgaleva[1], Robert W. Boyd[1], John E. Sipe[2]; [1]Inst. of Optics, USA, [2]Dept. of Physics, Univ. of Toronto, Canada.* We treated the saturation effect in a dense medium up to the fifth order of nonlinearity, and discovered that the expression for the local-field-corrected fifth-order susceptibility disagrees with what was understood to be Bloembergen's prediction.

QTuB2 • 8:15 a.m.
Multi-Photon Route to Ultraviolet Nanowire Lasers, *Chunfeng Zhang, Zhiwei Dong, Kangjun Liu, Guanjun You, Sbixiong Qian; Physics Dept., Fudan Univ., China.* Multi-photon absorption pumped ultraviolet ZnO nanolasers were demonstrated with femtosecond pulses at room temperature. Time resolved photoluminescence revealed that the exciton collision effect played an important role in the nonlinear lasing mechanisms.

8:00 a.m. – 9:45 a.m. QTuC • Spontaneous Parametric Down Conversion

Ian Walmsley; Univ. of Oxford, UK, Presider

QTuC1 • 8:00 a.m.
Narrowband Pulsed Polarization-Entangled Photon Source for Free-Space Quantum Key Distribution, *Onur Kuzucu, Franco N.C. Wong; MIT, USA.* We demonstrate a narrowband pulsed source of polarization-entangled photons based on parametric downconversion in a phase-stable Sagnac interferometer that is suitable for free-space quantum key distribution with high key generation rates.

QTuC2 • 8:15 a.m.
Joint Spectrum Mapping of Polarization Entanglement in Parametric Down-Conversion, *Hou Shun Poh[1], Chune Yang Lum[1], Ivan Marcikic[2], Antía Lamas-Linares[1], Christian Kurtsiefer[1]; [1]Natl. Univ. of Singapore, Singapore, [2]Temasek Labs, Singapore.* Spectral mapping of the polarization correlations of photon pairs from down-conversion in femtosecond regime reveals an imbalance between contributions from the two possible decay paths as the cause of low entanglement quality.

8:00 a.m. – 9:45 a.m. CTuH • Integrated Optics

John M. Fini; OFS Labs, USA, Presider

CTuH1 • 8:00 a.m. Invited
InP Waveguide Optical Isolator for Photonic Integrated Circuits, *Yoshiaki Nakano; RCAST, Univ. of Tokyo, Japan.* Abstract not available.

8:00 a.m. – 9:45 a.m. CTuI • Advanced Concepts for LED Lighting and Communications

Mary Crawford; Sandia Natl. Labs, USA, Presider

CTuI1 • 8:00 a.m.
Enhancement of Light Extraction in GaInN Light-Emitting Diodes with Graded-Index Indium Tin Oxide Layer, *Jong Kyu Kim, Martin F. Schubert, J.-Q. Xi, Frank W. Mont, E. Fred Schubert; Rensselaer Polytechnic Inst., USA.* Enhancement of light extraction in a GaInN light-emitting diode employing a graded-refractive index ITO anti-reflection coating deposited by oblique-angle electron-beam evaporation is presented.

CTuI2 • 8:15 a.m.
Enhanced Light-Extraction from InGaN Quantum Wells Using Refractive-Index-Matched TiO2, *Arthur J. Fischer1 Frank Mont2, Jong Kyu Kim2, E. Fred Schubert2, Daniel D. Koleske1, Mary H. Crawford1; 1Sandia Natl. Labs, USA, 2Rensselaer Polytechnic Inst., USA.* Enhancement of the overall luminescence efficiency in InGaN quantum wells by increasing the light-extraction efficiency is demonstrated by lateral patterning of refractive-index-matched TiO_2 films on InGaN quantum well samples.

8:00 a.m. – 9:45 a.m. CTuJ • Control and Characterization of Frequency Combs

Brian H. Kolner; Univ. of California at Davis, USA, Presider

CTuJ1 • 8:00 a.m.
Residual Stability of a Fiber-Based Frequency Comb, *William C. Swann, Ian Coddington, Luca Lorini, Jim Bergquist, Scott A. Diddams, Nate R. Newbury; NIST, USA.* We present measurements of the residual frequency stability across a fiber frequency comb by comparison through a Ti:sapphire frequency comb. We find 6×10^{-17} stability at one second and 1×10^{-18} at 1000 seconds.

CTuJ2 • 8:15 a.m.
Quantum-Noise Limit on the Linewidth of Frequency Combs, *Boaz Ilan[1], Mark J. Ablowitz[2], Steven T. Cundiff[3]; [1]Univ. of California at Merced, USA, [2]Univ. of Colorado at Boulder, USA, [3]JILA, NIST and Univ. of Colorado at Boulder, USA.* The linewidth of a mode-locked laser's frequency comb induced by spontaneous emission, or quantum noise, is shown to obey different scaling laws in the linear-dispersionless, i.e., Schawlow-Townes, nonlinear-dispersive, or pure soliton, and intermediate operating regimes.

NOTES

CTuA • Applications of Nonlinear Optical Spectroscopy—Continued

CTuA3 • 8:30 a.m.
Photonic Crystal Fiber Based Time-Resolved Coherent Anti-Stokes Raman Scattering Spectroscopy, *Arthur Dogariu[1], Yu Huang[1], Marlan O. Scully[1,2]; [1]Princeton Univ., USA, [2]Texas A&M Univ., USA.* We demonstrate a novel technique for three-color time-resolved coherent anti-Stokes Raman scattering using a Ti:Sapphire oscillator and four-wave mixing in a photonic crystal fiber. We measure vibrational coherence decays in calcite and several molecules.

CTuA4 • 8:45 a.m. Invited
New Nonlinear Electronic and Vibrational Spectroscopy to Study Liquid Interfaces, *Tahei Tahara; RIKEN, Japan.* New types of interface-specific even-order nonlinear spectroscopy, multiplex electronic sum-frequency generation (ESFG) and frequency-domain $\chi^{(4)}$ Raman spectroscopies, have been developed. They provide electronic and vibrational spectra of molecules adsorbed at interfaces with unprecedented high qualities.

CTuB • Optical Packet Switching—Continued

CTuC • Ultrafast Sources I—Continued

CTuC3 • 8:30 a.m.
Sub 6-fs Pulses Penerated from a Broadband 1-GHz Ti:sapphire Oscillator, *Yohei Kobayashi[1], Dai Yoshitomi[1], Kenji Torizuka[1], Tara Fortier[2], Scott Diddams[2]; [1]Natl. Inst. of Advanced Industrial Science and Technology (AIST), Japan, [2]NIST, USA.* We demonstrate 5.6 fs pulses from an compact and simple 1-GHz Ti:sapphire ring laser. These are the shortest pulses generated at such a high repetition rate.

CTuC4 • 8:45 a.m.
Pulse-Quasi-Crystal Formation in Mode-Locked Lasers, *Amir Rosen, Rafi Weill, Alexander Bekker, Vladimir Smulakovsky, Naum K. Berger, Omri Gat, Baruch Fischer; Technion, Israel.* Many-pulse formation in passively mode-locked fiber lasers is shown to exhibit self pulse-crystallization phenomena. We present experimental demonstrations and theoretical thermodynamic-like modeling.

CTuD • Ultraviolet, Visible and Q-Switched Lasers—Continued

CTuD3 • 8:30 a.m.
Powerful Pr^{3+}:$LiLuF_4$-Laser in the Visible and Ultraviolet Spectral Range, *André Richter[1], Vasiliy Ostroumov[2], Ernst Heumann[1], Wolf Seelert[2], Günter Huber[1]; [1]Univ. of Hamburg, Germany, [2]Coherent Lübeck GmbH, Germany.* Visible lasing and frequency doubling of semiconductor and diode laser pumped Pr^{3+}:$LiLuF_4$ will be presented. Output powers of 550 mW in the visible spectral region and 261 mW at 320 nm are demonstrated.

CTuD4 • 8:45 a.m.
218 W, M^2 = 20.2 Green Beam Generation by Intracavity- Frequency-Doubled Diode-Pumped Nd:YAG Laser, *Yong Bo, Qianjin Cui, Aicong Geng, Xiaodong Yang, Qinjun Peng, Yuanfu Lu, Dafu Cui, Zuyan Xu; Inst. of Physics, Chinese Acad. of Sciences, China.* By employing a thermally near-unstable cavity design with two-rod birefringence compensation, average power of 218 W with beam quality of M^2 = 20.2 was achieved by intracavity frequency doubling a diode-pumped Nd:YAG laser.

CTuE • Quantum and Interband Cascade Lasers—Continued

CTuE3 • 8:30 a.m.
Cascaded Emission from a Dual-Wavelength Quantum Cascade Laser, *Kale J. Franz[1], Daniel Wasserman[1], Anthony J. Hoffman[1], Claire Gmachl[1], Kuen-Ting Shiu[1,2], Stephen R. Forrest[1,2]; [1]Princeton Univ., USA, [2]Univ. of Michigan at Ann Arbor, USA.* We present evidence for "cascaded" laser emission in Quantum Cascade lasers, demonstrating a dual wavelength (~9.6 μm and ~8.2 μm) laser with two consecutive optical transitions in each active region.

CTuE4 • 8:45 a.m.
Current Injection Spiral-Shaped Chaotic Microcavity Quantum Cascade Lasers, *Ross M. Audet[1],Mikhail A. Belkin[1], Jonathan A. Fan[1], Federico Capasso[1], Evgenii Narimanov[2], D. Bour[3], S. Corzine[3], J. Zhu[3], G. Höfler[3]; [1]DEAS, USA, [2]Electrical Engineering Dept., Princeton Univ., USA, [3]Agilent Labs, USA.* We report room temperature operation of current-injection quantum cascade lasers with spiral-shaped chaotic microresonators, capable of directional, single mode emission, operating in pulsed mode with peak optical power in excess of 10 mW.

CTuF • Nonlinear Microscopy I—Continued

CTuF2 • 8:30 a.m.
Rapid Detection of Cryptosporidium Parvum Oocysts Using Coherent Anti-Stokes Raman Scattering (CARS) Microscopy, *Sangeeta Murugkar[1], Silvia Carrasco[2], Conor Evans[2], X. Sunney Xie[2], Hanan Anis[1]; [1]Univ. of Ottawa, Canada, [2]Harvard Univ., USA.* We demonstrate the application of CARS microscopy for the rapid, label-free detection of water-borne pathogen, Cryptosporidium parvum at the single oocyst level. Polarization sensitivity in E-CARS images can be used to positively identify the oocysts.

CTuF3 • 8:45 a.m.
Flexible Scanning MicroEndoscope for Two-Photon Fluorescence and SHG Imaging, *Xiaoli Li, Yuxin Leng, Daniel MacDonald, Danling Wang, Michael Cobb, Addie Warsen, Xingde Li; Dept. of Bioengineering, Univ. of Washington, USA.* We report an all-fiber-optic approach for beam delivery, collection, scanning and dispersion management in a microendoscope for nonlinear optical imaging. Preliminary result of *ex vivo* rat tail tendon imaging is presented.

CTuG • Nanophotonic Waveguide Technologies—Continued

CTuG3 • 8:30 a.m.
Ultra-Compact Silicon WDM Optical Filters with Flat-Top Response for On-Chip Optical Interconnects, *Fengnian Xia, Michael Rooks, Lidija Sekaric, Yurii Vlasov; IBM T. J. Watson Res. Ctr., USA.* Ultra-compact flat-top optical filters using cascaded micro-rings based on submicron silicon photonic wires are reported. 300GHz-wide passband with a flat-top response with over 30dB out-of-band rejection are realized with a device footprint below 0.0007mm².

CTuG4 • 8:45 a.m.
Investigation of Group Delay and Disorder in a Photonic Crystal Waveguide Using Low-Coherence Reflectometry, *Philippe Hamel[1], Yves Jaouën[1], Renaud Gabet[1], Sylvain Combrié[2], Nguyen-Vi-Quynh Tran[2], Evelin Weidner[2], Alfredo De Rossi[2,3], Anne Talneau[3]; [1]GET Telecom Paris, France, [2]Thales Res. and Technology, France, [3]CNRS, Lab de Photonique et de Nanostructures, France.* The Optical Low-Coherence Reflectometry technique is proposed for investigating photonic crystal slab waveguides. We show its ability of providing a direct measurement of the group delay and highlight the structural disorder resulting into TE/TM scattering.

QTuA • Nonlinear Phenomena and Localization—Continued

QTuA3 • 8:30 a.m.
Nonlinearity and Localization in Disordered Lattices, *Tal Schwartz, Guy Bartal, Shmuel Fishman, Mordechai Segev; Technion, Israel.* We present the first experimental study of Anderson Localization effects in a periodic potential in the presence of both disorder and nonlinearity, demonstrating that self-focusing enhances localization effects driven by disorder.

QTuA4 • 8:45 a.m.
Phasons and Pure Phason Strain in Nonlinear Photonic Quasicrystals, *Barak Freedman[1], Ron Lifshitz[2], Mordechai Segev[1]; [1]Technion, Israel, [2]Tel Aviv Univ., Israel.* We study defect dynamics in nonlinear photonic quasicrystals, and demonstrate experimentally that phasons survive longer than phonons. We show that nonlinear interactions in photonic quasicrystals can reduce the phason strain within the structure.

QTuB • Fundamental Nonlinear Optics—Continued

QTuB3 • 8:30 a.m. Invited

Quantum Limit in Nonlinear Optics, *Gerd Leuchs[1], Joel Heersink[1], Dominique Elser[4], Josip Milanovic[1], Alexander Huck[1], Rui-Fang Dong[1], Ulrik L. Andersen[2], Joel F. Corney[3], Peter D. Drummond[3]; [1]Inst. fur Optik, Information und Photonik, Germany, [2]Dept. of Physics, Technical Univ. of Denmark, Denmark, [3]ARC Ctr. of Excellence for Quantum-Atom Optics, School of Physical Sciences, Univ. of Queensland, Australia.* Optical non linear interactions changing the statistics of a light field are often counteracted by dissipative processes. Artificial structuring of the non linear medium can reduce dissipation and enhance the effect of the non linearity.

QTuC • Spontaneous Parametric Down Conversion—Continued

QTuC3 • 8:30 a.m.

A Bright and Compact Source of Polarization-Entangled Photons, *Marco Fiorentino, Raymond G. Beausoleil; Hewlett Packard Co., USA.* We present a source of polarization entangled photons that uses periodically poled potassium titanyl phosphate and interferometers based on polarization beam displacers to achieve stable operation with few critical alignments.

QTuC4 • 8:45 a.m.

Experimental Production of Pure Single-Photon States, *Peter J. Mosley, Jeff S. Lundeen, Piotr Wasylczyk, Hendrik Coldenstrodt-Ronge, Christine Silberhorn, Ian A. Walmsley; Univ. of Oxford, UK.* Parametric downconversion in KDP provides a method of producing heralded single photons in pure states. We present the theory behind this technique and our most recent experimental results.

CTuH • Integrated Optics—Continued

CTuH2 • 8:30 a.m.

Single Mode Operation of 1.5 μm TM-Mode Waveguide Optical Isolators Based on the Nonreciprocal-Loss Phenomenon, *Tomobiro Amemiya[1,2], Hiromasa Shimizu[1,2], Masafumi Yokoyama[2,3], P. N. Hai[2,3], Masaaki Tanaka[2,3], Yoshiaki Nakano[1,2]; [1]Res. Ctr. for Advanced Science and Technology, Japan, [2]Solution Oriented Res. for Science and Technology, Japan Science and Technology Agency, Japan, [3]Dept. of Electronic Eng., Univ. of Tokyo, Japan.* We developed a 1.5-μm-band, TM-mode waveguide optical isolator consisting of a semiconductor ridge waveguide combined with a ferromagnetic MnAs layer. The device shows *single mode operation with an isolation* ratio of 7.2dB/mm at 1.53-1.55μm wavelength.

CTuH3 • 8:45 a.m.

Enabling Technologies for the Monolithic Integration of Semiconductor Lasers and Waveguide Optical Isolators, *Barry M. Holmes, Josef J. Bregenzer, David C. Hutchings; Univ. of Glasgow, UK.* Technologies to implement a waveguide optical isolator, containing a continuous III-V semiconductor core, with a laser diode are developed. High efficiency, low-loss nonreciprocal and reciprocal mode converters are fabricated and characterised.

CTuI • Advanced Concepts for LED Lighting and Communications—Continued

CTuI3 • 8:30 a.m.

Enhancement of Light Extraction Efficiency of InGaN Quantum Wells LEDs Using SiO_2 Microspheres, *Yik-Khoon Ee, Pisist Kumnorkaew, Ronald A. Arif, James F. Gilchrist, Nelson Tansu; Lehigh Univ., USA.* Novel approach to improve the light extraction efficiency of InGaN quantum wells light emitting diodes (LEDs) using SiO_2 microspheres was presented, leading to ~232% increase of the LEDs output power.

CTuI4 • 8:45 a.m.

High Light-Extraction GaN-Based Vertical LEDs with Double Diffuse Surfaces, *Ya-Ju Lee, H. C. Kuo, T. C. Lu, S. C. Wang; Dept. of Photonics and Inst. of Electro-Optical Engineering, Taiwan.* High light-extraction (external quantum efficiency ~40%) 465-nm GaN-based vertical light-emitting diodes (LEDs) employing double diffuse surfaces were fabricated. The high scattering efficiency of double diffused surfaces could be responsible for the high light output power.

CTuJ • Control and Characterization of Frequency Combs—Continued

CTuJ3 • 8:30 a.m.

Spectral Line-by-Line Processing on an Optical Frequency Comb Generator, *Zhi Jiang[1], Chen-Bin Huang[1], Daniel E. Leaird[1], Andrew M. Weiner[1], Motonobu Kourogi[2], Kazuhiro Imai[2]; [1]Purdue Univ., USA, [2]Optical Comb, Inc, Japan.* We report spectral line-by-line processing of 64 frequency lines from an optical frequency comb generator. Transform-limited 1.6 ps pulses at 10 GHz rate are obtained. Arbitrary generated waveforms spanning the full time period are demonstrated.

CTuJ4 • 8:45 a.m.

Injection-Locked Femtosecond Ti:sapphire Lasers, *Qudsia Quraishi[1], Leo Hollberg[1], Scott Diddams[1], Yohei Kobayashi[2], Kenji Torizuka[2]; [1]NIST, USA, [2]AIST, Japan.* We demonstrate injection locking of 1 and 1.5 GHz femtosecond Ti:sapphire lasers by a second, physically separate and independent 1 GHz laser. In some cases, both the pulse envelopes and optical carriers are locked.

NOTES

CTuA • Applications of Nonlinear Optical Spectroscopy—Continued

CTuA5 • 9:15 a.m.
Single Pulse Time Resolved Coherent Anti-Stokes Raman Scattering, *Yuri Paskover, Ilya Sb. Averbukh, Yehiam Prior; Weizmann Inst. of Science, Israel.* We demonstrate single-pulse retrieval of coherent vibrational evolution of molecules by geometrical space-time mapping combined with non-linear signal imaging. The method is tested experimentally to yield spectrum of simple liquids.

CTuA6 • 9:30 a.m.
Remote Chemical Detection Using SUPER-CARS, *D. Ahmasi Harris, Janelle C. Shane, Vadim V. Lozovoy, Marcos Dantus; Michigan State Univ., USA.* We introduce a method for remote chemical detection that utilizes Single Ultrafast Pulse Excitation for Remote Coherent Anti-Stokes Raman Spectroscopy (SUPER-CARS).

CTuB • Optical Packet Switching—Continued

CTuB2 • 9:00 a.m.
Instantaneous-Locking 8-Channel Arrayed 10 Gbps Burst-Mode Optical Packet Receiver and 80 (8λ x 10) Gbps Wide-Colored Optical Packet Transmitter, *Hideaki Furukawa[1], Naoya Wada[1], Hiroshi Fujinuma[2], Hatsushi Iiduka[2], Tetsuya Miyazaki[1]; [1]Natl. Inst. of Information and Communications Technology, Japan, [2]NTT Electronics Co., Japan.* We develop novel instantaneous-locking (<1 ns) optical burst-mode receiver and wide-colored 80-Gbps (8λ x 10-Gbps) packet transmitter. Truly asynchronous optical packet-stream with 80-Gbps payload-data and arbitrary intervals is generated and received with low packet-loss-rate ($<10^{-5}$).

CTuB3 • 9:15 a.m.
Binary-Encoded Address for All-Optical Packet Switching, *C. C. Lee[1], L. F. K. Lui[1], Lixin Xu[1,2], P. K. A. Wai[1], H. Y. Tam[1]; [1]Hong Kong Polytechnic Univ., Hong Kong, [2]Univ. of Science and Technology of China, China.* We experimentally demonstrated the feasibility of binary-encoded packet address header in all-optical packet switching using Fabry-Perot laser diodes. The address length of a network with N output ports is reduced from N to $\log_2 N$ bits.

CTuB4 • 9:30 a.m.
Independent Delay Control and Synchronization of Multiple 2.5-Gb/s Channels within a Single SBS Slow-Light Medium, *Bo Zhang[1], L.-S. Yan[2], J.-Y. Yang[1], Irfan Fazal[1], Alan E. Willner[1]; [1]Univ. of Southern California, USA, [2]General Photonics, USA.* We demonstrate independent delay control and bit-level synchronization of multiple 2.5-Gb/s NRZ-OOK channels through a single broadband SBS-based slow-light element. Error free transmission on all synchronized channels with up to 112-ps delay is achieved.

CTuC • Ultrafast Sources I—Continued

CTuC5 • 9:00 a.m.
Resonant Saturable Absorbers for Dispersion Compensation in Compact Femtosecond Lasers, *Günter Steinmeyer[1], Uwe Griebner[1], Florian Saas[1], Mathias Moenster[1], Wolfgang Richter[2]; [1]Max-Born-Inst., Germany, [2]BATOP GmbH, Germany.* We theoretically analyze and experimentally demonstrate a semiconductor device that simultaneously acts as a mode-locker and provides substantial dispersion compensation, enabling the construction of extremely compact femtosecond lasers.

CTuC6 • 9:15 a.m.
Diode-Pumped Femtosecond Yb:KYW Laser Incorporating a Quantum-Dot Saturable Absorber, *Alexander A. Lagatsky[1], Fiona Bain[1], C.T.A. Brown[1], Wilson Sibbett[1], D.A. Livshits[2], G. Erbert[3], E.U. Rafailov[4]; [1]Univ. of St Andrews, UK, [2]NL-Nanosemiconductor GmbH, Germany, [3]Ferdinand-Braun-Inst., Germany, [4]Univ. of Dundee, UK.* Efficient passive mode locking of a diode-pumped Yb^{3+}:$KY(WO_4)_2$ laser using a quantum-dot saturable absorber is demonstrated. Pulses of 114fs centered around 1040nm were generated with an average output power of 0.5W.

CTuC7 • 9:30 a.m.
A Preconditioned Newton-Krylov Method for Computing Stationary Pulse Solutions of Mode-Locked Lasers, *Jonathan R. Birge, Franz X. Kärtner; MIT, USA.* We solve the periodic boundary value problem for a mode-locked laser cavity using a preconditioned matrix-implicit Newton-Krylov solver. Solutions are obtained two to three orders of magnitude faster than with standard tools.

CTuD • Ultraviolet, Visible and Q-Switched Lasers—Continued

CTuD5 • 9:00 a.m.
Watt-Level Single-Frequency Tunable Nd:YLF/PPKTP Red Laser for Silver Atom Cooling, *Rodolphe Sarrouf, Virginie Souza, Thomas Badr, Guibao Xu, Jean-Jacques Zondy; Inst. Natl. de Metrologie-CNAM, France.* Intracavity second-harmonic generation of a diode-pumped unidirectional Nd:$YLiF_4$ ring laser oscillating on the δ-polarized $^4F_{3/2}$ - $^4I_{13/2}$ transition (λ~1314nm) with a temperature-tuned PPKTP crystal is reported, yielding up to 0.92W tunable (656-658nm) single-frequency output.

CTuD6 • 9:15 a.m.
CW 795 nm Rb Vapor Laser Pumped by Volume Transmission Grating-Stabilized Diode Bar, *Randall J. Lane, Alan B. Petersen, John Gloyd; Spectra Physics Lasers, USA.* We have constructed an atomic Rb vapor laser operating at 795 nm. The laser is optically pumped by a CW laser diode bar, wavelength-controlled by a volume transmission grating. Output power is 260 mW.

CTuD7 • 9:30 a.m.
Single-Frequency, 55 W Average Power, 1-kHz Pulse Rate Nd:YLF MOPA System, *Yelena Isyanova, Peter F. Moulton; Q-Peak, Inc., USA.* We report on a single-frequency, Nd:YLF laser system producing 55-mJ, 10-nsec pulses at a 1-kHz rate. The system includes a passively Q-switched oscillator with a final amplifier employing a three-bar, 285-W, linear diode pump array.

CTuE • Quantum and Interband Cascade Lasers—Continued

CTuE5 • 9:00 a.m.
Quantum Cascade Microdisk Lasers for Mid Infrared Intra-Cavity Sensing, *Raviv Perahia[1], Oskar Painter[1], Virginie Moreau[2], Michael Babiz[2], Raffaele Colombelli[2], Andrey Krysa[3], John Cockburn[3], Luke Wilson[3], J. S. Roberts[3]; [1]Caltech, USA, [2]Univ. Paris-Sud, France, [3]Univ. of Sheffield, UK.* The design, fabrication, and testing of surface sensitive quantum cascade microdisk lasers in the mid-infrared for intra-cavity spectroscopy and integration with microfluidic delivery is presented.

CTuF • Nonlinear Microscopy I—Continued

CTuF4 • 9:00 a.m.
***In vivo* Molecular-Resonant Third Harmonic Generation Microscopy of Hemoglobin,** *Shih-Peng Tai[1], Che-Hang Yu[1], Tze-Ming Liu[1], Yu-Chiech Wen[1], Chi-Kuang Sun[1,2,3]; [1]Graduate Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan, [2]Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan, [3] Dept. of Electrical Engineering, Natl. Taiwan Univ., Taiwan.* Through molecular-resonant third-harmonic-generation (THG) in hemoglobin, *in vivo* molecular THG microscopy of erythrocytes can be realized without using fluorescence and exogenous contrast agents. Studies in live hamster oral cavity indicate its superiority to image angiogenesis.

CTuF5 • 9:15 a.m.
Selective Two-Photon Excitation for Biomedical Imaging, *Lindsay R. Weisel, Rebekah M. Martin, Laura T. Schelbas, Peng Xi, Marcos Dantus; Michigan State Univ., USA.* Shaped dispersion-compensated ultrashort laser pulses are used to produce selective excitation for biological imaging. Matrix diagonalization is used to optimize contrast making it possible to image subcellular components.

CTuF6 • 9:30 a.m.
Upconversion Fiber-Optic Confocal Microscopy Using a Near-Infrared Light Source, *Do-Hyun Kim[1], Jin U. Kang[2], Ronald W. Waynant[1], Ilko K. Ilev[1]; [1]US Food and Drug Administration, Ctr. for Devices and Radiological Health, USA,[2]Johns Hopkins Univ., USA.* An upconversion confocal microscope was developed and studied using rare-earth-doped glass sample powder. The process was highly efficient with upconversion efficiency of 2% with the pumping wavelength at 1550 nm and ensured high lateral resolution.

CTuG • Nanophotonic Waveguide Technologies—Continued

CTuG5 • 9:00 a.m.
Metallic-Contamination-Induced Optical Loss in Silicon Microphotonic Waveguides, *Tymon Barwicz, Charles W. Holzwarth, Peter T. Rakich, Milos A. Popovic, Erich P. Ippen, Henry I. Smith; MIT, USA.* We report on optical loss reaching 100 dB/cm observed in Si wire waveguides defined by reactive-ion etching in the proximity of metals with a low temperature of silicide formation.

CTuG6 • 9:15 a.m.
Breaking the Tradeoff between Speed and Extinction Ratio in Silicon Electro-Optic Modulators, *Sasikanth Manipatruni, Qianfan Xu, Michal Lipson; Cornell Univ., USA.* We propose a new silicon electro-optic device that breaks the tradeoff between extinction ratio and speed in silicon devices and enables operation at 40 Gbps with high extinction ratios (>15dB).

CTuG7 • 9:30 a.m.
Chiral 3-D Photonic Crystals as Compact Optical Isolators, *Michael Thiel[1], Martin Wegener[1], Sean Wong[2], Georg v. Freymann[2]; [1]Inst. für Angewandte Physik, Univ. Karlsrube, Germany, [2]Inst. für Nanotechnologie, Forschungszentrum Karlsrube, Germany.* We present a novel photonic heterostructure based on chiral 3-D photonic crystals allowing for non-reciprocal transmission of light. We fabricate various corresponding structures by means of direct laser writing.

QTuA • Nonlinear Phenomena and Localization—Continued

QTuA5 • 9:00 a.m.
Dispersive Shock Waves in Optical Lattices, *Shu Jia, Wenjie Wan, Jason W. Fleischer; Princeton Univ., USA.* We study dispersive shock waves in optical lattices. We characterize shock propagation as a function of lattice depth and observe nonlinear coupling between different Bloch modes of the array.

QTuA6 • 9:15 a.m.
Exact Dynamic Localization in Curved AlGaAs Optical Waveguide Arrays, *Rajiv Iyer[1], Jun Wan[2], Marc M. Dignam[2], C. Martijn de Sterke[3], J. Stewart Aitchison[1]; [1]Univ. of Toronto, Canada, [2]Queen's Univ., Canada, [3]Univ. of Sydney, Australia.* We present the first experimental observations of exact dynamic localization of an optical beam in periodically-curved strongly-coupled waveguide arrays. Spatial and spectral measurements of two and four period devices agree well with theory.

QTuA7 • 9:30 a.m.
Coupled-Cavity QED Using Planar Photonic Crystals, *Stephen Hughes; Queen's Univ., Canada.* A new technique for controlling cavity-QED by indirectly coupling two planar-photonic-crystal nanocavities through an integrated waveguide is presented. The resulting optical response of a single-quantum-dot is shown to be profoundly influenced by a distant cavity.

10:00 a.m. – 10:30 a.m. COFFEE BREAK, EXHIBIT HALL, 100 LEVEL **10:00 a.m. – 5:00 p.m. EXHIBIT HALL OPEN**

QELS

C L E O

QTuB • Fundamental Nonlinear Optics—Continued

QTuB4 • 9:00 a.m.
Effects of Dispersion on the Optical Drag Effect in a Laser Gyro, *Petr G. Eliseev, Marek Osinski; Univ. of New Mexico, USA.* The classical Fresnel form of optical drag coefficient is rederived for rotating dispersive media. Implications for the active ring laser gyro are considered, with strong enhancement of sensitivity near the points of critical anomalous dispersion.

QTuB5 • 9:15 a.m.
Four-Wave Mixing in a Diamond Configuration: Experiments with Rubidium Vapor, *R. T. Willis, F. E. Becerra, L. A. Orozco, S. L. Rolston; Univ. of Maryland, USA.* We investigate four-wave mixing in rubidium vapor using a diamond configuration that includes the 5s, 5p and 6s levels. A model that includes Doppler broadening qualitatively explains some of the observations.

QTuB6 • 9:30 a.m.
Characterizing a Bright Two-Photon Source Using a Polarization-Maintaining Microstructure Fiber, *Jingyun Fan, Alan Migdall; NIST, USA.* After characterizing the Raman scattering spectrum of a polarization-maintaining microstructure fiber, we produced a high brightness two-photon source with a two-photon coincidence/accidental (C/A) ratio of 1000 at 100 Hz.

QTuC • Spontaneous Parametric Down Conversion—Continued

QTuC5 • 9:00 a.m.
Studies of Ultra-Broadband Spontaneous Parametric Downconversion, *Kevin A. O'Donnell, Alfred B. U'Ren; CICESE Applied Physics Dept., Mexico.* We consider collinear downconversion in a type-1 configuration with degeneracy near the crystal's zero group-velocity dispersion frequency. A fractional frequency bandwidth of 0.53 is observed, corresponding to a 1080nm range about the 1885nm degenerate wavelength.

QTuC6 • 9:15 a.m.
Analysis of Entanglement in the Double Slit Interference Patterns of down Converted Photon Pairs, *Gen Taguchi, Takako Hirama, Katsuya Kasai, Tatsuo Dougakiuchi, Holger F. Hofmann, Yutaka Kadoya; Hiroshima Univ., Japan.* We investigate the non-classical correlation of two entangled photons passing through a pair of double slits. The quantum state is reconstructed using quantum tomography based on the correlated interference patterns and slit images.

QTuC7 • 9:30 a.m.
Stopping Single Photons in One-dimensional Circuit Quantum Electrodynamics Systems, *Jung-Tsung Shen, M. L. Povinelli, Sunil Sandbu, Shanhui Fan; Stanford Univ., USA.* We propose a mechanism to stop single photons in one-dimensional quantum electrodynamics systems. The circuit can be of deep sub-wavelength scale, and can stop and store two photons in the system at the same time.

CTuH • Integrated Optics—Continued

CTuH4 • 9:00 a.m.
Concave Low-Loss Total Internal Reflection Mirrors in Indium Phosphide for High Fabrication Tolerance, *Joseph A. Summers, Vikrant Lal, Milan L. Masanovic, Nadir Dagli, Daniel J. Blumenthal; Univ. of* California at Santa Barbara, USA. We report on a novel concave total internal reflection mirror fabricated in InP that allows larger mirror size and mask alignment tolerance. Average mirror loss measured was 0.56dB/mirror with a standard deviation of 0.14 dB/mirror.

CTuH5 • 9:15 a.m. Invited
Advances in Monolithic Integration of InP-Based Optoelectronics, *David Robbins; Bookham Technology, UK.* The maturity of design and processing techniques for the fabrication of photonic integrated circuits in InP is discussed. Manufacturing state-of-the-art is illustrated through examples in broadband tuneable lasers and broadband 10GBit/s transmitters.

CTuI • Advanced Concepts for LED Lighting and Communications—Continued

CTuI5 • 9:00 a.m. Invited
Visible Light Communications, *Masao Nakagawa; Keio Univ., Japan.* This paper shows that visible LED for lighting or indicating can be used for ubiquitous communication applications, for example, position finding, intelligent transport systems, and advertisement.

CTuI6 • 9:30 a.m.
High-Efficiency Light Emitters Using Gallium-Arsenide Deep-Centers for Long-Distance Fiber-Optics, *Janet Pan; Yale Univ., USA.* We demonstrate the first LEDs at 1.3-1.5μm using GaAs deep-centers having higher (70%) efficiencies, lower absorption loss, more temperature-insensitive luminescence, larger Einstein B-coefficient than bulk InGaAs. This is an enabling technology.

CTuJ • Control and Characterization of Frequency Combs—Continued

CTuJ5 • 9:00 a.m.
Improved Precision Measurement of the Refractive Indices of Gases Using Frequency Comb, *Jie Zhang, Zebuang Lu, Lijun Wang; Inst. of Optics, Information and Photonics, Germany.* We report improved high precision refractive index measurement of air and CO_2 using a Michelson interferometer setup with frequency combs as the light source. Our experiment has a sensitivity of 9.6×10^{-9}.

CTuJ6 • 9:15 a.m.
Analysis of Comb Frequency Offset Variations via Phase-Only Line-by-Line Pulse Shaping, *José Caraquitena, Zhi Jiang, Daniel E. Leaird, Andrew M. Weiner; School of Electrical and Computer Engineering, Purdue Univ., USA.* We investigate the effect of optical frequency comb shifts on time-domain and RF-domain signals generated using phase-only line-by-line pulse shaping. As an application, we estimate the comb frequency offset fluctuations of a harmonically mode-locked laser.

CTuJ7 • 9:30 a.m.
Self-Zooming Stable Stage with Sub-nm Resolution Using Femtosecond Comb, *Mariko Kajima, Hirokazu Matsumoto; Natl. Inst. of Advanced Industrial Science and Technology (AIST), Japan.* A positioning system based on self-zooming laser interferometer is presented. It uses diode lasers locked on two lines of fs-comb. It provides sub-nm resolution and sub-nm accuracy.

10:00 a.m. – 10:30 a.m. COFFEE BREAK, EXHIBIT HALL, 100 LEVEL **10:00 a.m. – 5:00 p.m. EXHIBIT HALL OPEN**

NOTES

ROOM 318-320	ROOM 321-323	ROOM 324-326	ROOM 314	ROOM 315	ROOM 316	ROOM 317	ROOM 336
CLEO							QELS

10:30 a.m. – 12:15 p.m.
CTuK • QPM Devices
Takunori Taira; Laser Res. Ctr. for Molecular Science, Japan, Presider

CTuK1 • 10:30 a.m.
Efficient Generation of Tunable CW Single Frequency Green Radiation by Second Harmonic Generation in Periodically-Poled $KTiOPO_4$, *Zhipei Sun[1], Goutam Kumar Samanta[1], G. R. Fayaz[1], Majid Ebrahim-Zadeh[1], C. Canalias[2], V. Pasiskevicius[2], F. Laurell[2]; [1]ICFO-The Inst. of Photonic Sciences, Spain, [2]Royal Inst. of Technology, Sweden*. Tunable continuous-wave single-frequency green radiation from 511.9 nm to 517.3 nm has been obtained by single-pass second harmonic generation in periodically poled $KTiOPO_4$ (PPKTP). A maximum output power of 1.2 W was achieved.

CTuK2 • 10:45 a.m.
Octave-Level Spectral Broadening in RPE PPLN Waveguides, *Carsten Langrock[1], Martin M. Fejer[1], Ingmar Hartl[2], Martin E. Fermann[2]; [1]Edward L. Ginzton Lab, USA, [2]IMRA America, Inc., USA*. We demonstrate octave-level spectral broadening of mode-locked Er- and Yb-doped femtosecond fiber lasers inside constant-period and chirped RPE PPLN waveguides. Chirped QPM gratings greatly improve spectral broadening of Yb-fiber lasers.

10:30 a.m. – 12:15 p.m.
CTuL • Organic LEDs and Lasers
Zakya Kafafi; NRL, USA, Presider

CTuL1 • 10:30 a.m. Tutorial
OLEDs Based on Quantum Dots, *Vladmir Bulovic; MIT, USA*. Abstract not available.

10:30 a.m. – 12:15 p.m.
CTuM • Ultrafast Sources II
Peter J. Delfyett; School of Optics, CREOL, USA, Presider

CTuM1 • 10:30 a.m.
High Energy and High Repetition Rate Diode-Pumped Solid-State Oscillator Enhances High-Field Physics Measurements, *T. Südmeyer[1], S.V. Marchese[1], S. Hasbimoto[1], U. Keller[1], G. Lépine[2], G. Gingras[2], B. Witzel[2]; [1]ETH Zurich, Switzerland, [2]Génie Physique et Optique, Univ. Laval, Canada*. Passively modelocked thin disk lasers can drive and even enhance high field physics measurements at >10-MHz repetition rate. Electron spectroscopy images in xenon confirm high signal-to-noise ratio and peak intensities of up to $6{\cdot}10^{13}$ W/cm^2.

CTuM2 • 10:45 a.m. Invited
Actively Mode-Locked Optical Parametric Oscillator, *Nicolas Forget[1], Jean-Michel Melkonian[2], Cyril Drag[3], Fabien Bretenaker[3,4], Michel Lefebvre[2], Emmanuel Rosencher[2,4]; [1]Fastlite, France, [2]ONERA, France, [3]Lab Aimé Cotton, CNRS, France, [4]Dept. de Physique, Ecole Polytechnique, France*. Continuous-wave active mode-locking of near degenerate singly and doubly resonant OPOs is reported. Transient and steady-state regimes are explored.

10:30 a.m. – 12:15 p.m.
CTuN • Eyesafe Lasers
John J. Zayhowski; MIT Lincoln Lab, USA, Presider

CTuN1 • 10:30 a.m.
Ultra-Low-Photon-Defect Cryo-Laser Performance of Resonantly Diode-Pumped Er^{3+}:YAG, *Mark Dubinskii, Nikolay Ter-Gabrielyan, Marly Camargo, George A. Newburgh, Larry D. Merkle; ARL, USA*. We report what is believed to be the first ultra-low-photon-defect resonantly diode-pumped Er:YAG cryo-laser. Quasi-CW laser performance at 85°K in this initial experiment was found to be 58% efficient. Quasi-CW power of ~22W was achieved.

CTuN2 • 10:45 a.m.
Development of a 1.5µm Er:Yb:Glass Laser for Use in a Coherent Laser Radar, *Matthew C. Heintze, Jesper Munch, Peter J. Veitch; Univ. of Adelaide, Australia*. We describe an injection-seeded Q-switched Er:Yb:glass laser that uses a novel resonator and produces transform-limited 500ns pulses. Experimental results of the laser performance and its suitability for use in coherent laser radar will be presented.

10:30 a.m. – 12:15 p.m.
CTuO • Quantum Cascade Lasers
Claire Gmachl; Princeton Univ., USA, Presider

CTuO1 • 10:30 a.m.
Narrow STRIPE-Width, Low-Ridge Configuration for High Power Quantum Cascade Lasers, *Arkadiy Lyakh[1], Peter Zory[1], Daniel Wasserman[2], Gary Sbu[2], Claire Gmachl[2], Mithun D'Souza[3], Dan Botez[3], Dave Bour[4]; [1]Univ. of Florida, USA, [2]Princeton Univ., USA, [3]Univ. of Wisconsin at Madison, USA, [4]BRIDGELUX Inc, USA*. Low-ridge-configuration, quantum-cascade lasers operating at 5.3µm provide, at 80K, 12W peak-pulsed power at 14A drive. A model of current spreading that takes into account the lateral variation in transverse conductivity adequately explains the results.

CTuO2 • 10:45 a.m.
Analysis of the Thermal Roll-over of Quantum Cascade Lasers, *Scott S. Howard, Zhijun Liu, Claire F. Gmachl; Princeton Univ., USA*. A description of thermal roll-over in room temperature continuous-wave operating quantum cascade lasers is presented. Models predicting maximum operating temperature and the power-current characteristics in their entirety are in excellent agreement with experimental results.

10:30 a.m. – 12:15 p.m.
CTuP • Nonlinear Microscopy II
Jeffrey Squier; Colorado School of Mines, USA, Presider

CTuP1 • 10:30 a.m.
Multiphoton Fluorescence Imaging of NADH to Investigate Metabolic Changes in Human Epileptic Tissue *in vitro*, *Thomas H. Chia, Anne Williamson, Dennis D. Spencer, Michael J. Levene; Yale Univ., USA*. NADH is an intrinsic fluorophore that provides cellular metabolic information. Abnormal neuronal-astrocytic metabolic coupling is hypothesized in temporal lobe epilepsy. We investigate metabolic pathologies in human and rodent epilepsy models using multiphoton microscopy of NADH.

CTuP2 • 10:45 a.m.
Molecular Imaging of Central Nervous System with Multi-Modal Nonlinear Optical Microscopy, *Haifeng Wang, Yan Fu, Riyi Shi, Ji-Xin Cheng; Purdue Univ., USA*. Coherent anti-Stokes Raman scattering (CARS) and sum-frequency generation (SFG) microscopy are combined on the same platform. Simultaneous SFG imaging of astroglial filaments and CARS imaging of myelin sheath in spinal cord are shown.

10:30 a.m. – 12:15 p.m.
CTuQ • Active Silicon Photonics
Michael Geis; MIT, USA, Presider

CTuQ1 • 10:30 a.m. Invited
Hybrid Silicon Evanescent Photonic Integrated Circuit Technology, *John Bowers[1], Alexander W. Fang[1], Hyundai Park[1], Richard Jones[2], Oded Cohen[3], Mario J. Paniccia[2]; [1]Univ. of California at Santa Barbara, USA, [2]Intel Corp., USA, [3]Intel Corp., Israel*. The hybrid silicon evanescent device platform utilizes III-V gain materials bonded to passive silicon waveguides. In this paper, we discuss this device platform, and present hybrid silicon evanescent laser and amplifier device results.

10:30 a.m. – 12:15 p.m.
QTuD • Metamaterials: Applications
Presider to Be Announced

QTuD1 • 10:30 a.m. Invited
Cloaking: A New Phenomenon in Electromagnetism and Elasticity, *Graeme W. Milton; Univ. of Utah, USA*. We show how collections of polarizable dipoles become cloaked (invisible) to time harmonic electromagnetic fields when placed in the proximity of a low loss superlens, and how transformation based approaches to cloaking extend to elasticity.

10:30 a.m. – 12:15 p.m.
QTuE • Nonlinear Femtosecond Phenomena
Yaron Silberberg; Weizmann Inst. of Science, Israel, Presider

QTuE1 • 10:30 a.m.
Spectrally Resolved Femtosecond Maker Fringes Technique, *Lino Misoguti[1], Ismael Andre Heisler[1], Sergio Carlos Zilio[1], Ernesto Valdes Rodriguez[2], Cid Bartolomeu de Araujo[2]; [1]Univ. of São Paulo, Brazil, [2]Univ. Federal de Pernambuco, Brazil.* We present a new femtosecond third-harmonic generation Maker fringes technique capable of determining the magnitude of nonlinearity and sample linear dispersion. This technique takes advantage of high intensity and broad spectrum of ultrafast pulses.

QTuE2 • 10:45 a.m.
Few-Cycle Optical Bullets with Stable Carrier-Envelope Phase in a Two-Component Medium, *Herve Leblond[1], Igor V. Mel'nikov[2,3], Dumitru Michalache[4], Francois Sanchez[1]; [1]Lab POMA, Univ. d'Angers, France, [2]High Q Labs, Inc, Canada, [3]Optolink, Ltd, Russian Federation, [4]Horia Hulubei Natl. Inst. for Physics and Nuclear Engineering, Romania.* We show how such backbone notions as carrier, envelope, phase and group velocities can be extended beyond the SVEA approximation. A two-cycle pulse is able to evolve into an optical bullet with stable carrier-envelope phase.

10:30 a.m. – 12:15 p.m.
QTuF • Entanglement and Squeezing I
Presider to Be Announced

QTuF1 • 10:30 a.m.
Preparation and Measurement of Few-Atom Number States with a Double-Well Atom Interferometer, *Benjamin L. Brown[1], Jennifer Sebby-Strabley[1], Marco Anderlini[1], Patricia J. Lee[1], Philip R. Johnson[2], William D. Phillips[1], Trey Porto[1]; [1]Joint Quantum Inst. and NIST, USA, [2]American Univ., USA.* We use a double-well optical lattice as an atom interferometer to load and measure number-squeezed states with N = 1 or 2 and Poissonian states with average N = 1 into the lattice ground state.

QTuF2 • 10:45 a.m.
Biphoton in a Two-Level Cooled Atomic Ensemble, *Jianming Wen[1], Shengwang Du[2], Morton H. Rubin[1]; [1]Univ. of Maryland, USA, [2]Stanford Univ., USA.* The temporal correlation of biphotons, generated from a two-level cooled atomic system, displays a photon anti-bunching effect, which corresponds to the interference between two types of nonlinear four-wave mixing processes occurring in such a medium.

10:30 a.m. – 12:15 p.m.
CTuR • Signal Processing
Christi Madsen; Texas A&M Univ., USA, Presider

CTuR1 • 10:30 a.m. Invited
Artificial Compound-Eye Camera and Its Application to Visual Information Processing, *Jun Tanida; Osaka Univ., Japan.* As an instance of information technology inspired by biological systems, an artificial compound-eye camera is studied. A CMOS camera equipped with a microlens array is fabricated and utilized for object distance detection and object extraction.

10:30 a.m. – 12:15 p.m.
CTuS • Large Mode Area Fibers
Liang Dong; IMRA, USA, Presider

CTuS1 • 10:30 a.m.
SBS Gain Efficiency Measurements in a 1714 μm² Effective Area LP_{08} Higher Order Optical Fiber, *Marc D. Mermelstein, Siddharth Ramachandran, Samir Ghalmi; OFS Labs, USA.* An SBS gain efficiency of 0.0088 $(m\text{-}W)^{-1}$ was measured in an LP_{08} higher order mode optical fiber with a 1714 μm^2 effective area at 1083 nm. The threshold power-length product is 2.4 kW-m.

CTuS2 • 10:45 a.m.
Energy Storage Saturation in Large Mode Area Fiber Lasers, *Ramatou Bello Doua[1], Julien Saby[1], François Salin[1], Johan Boullet[2], Inka Manek-Hönninger[2]; [1]Eolite, France, [2]CELIA-PALA, France.* We study the limitation in energy storage of LMA Yb-doped fibers and show the importance of the gain recovery time for high power nanosecond laser and amplifier design.

10:30 a.m. – 12:15 p.m.
CTuT • Optical Interferometry
James C. Wyant; Univ. of Arizona, USA, Presider

CTuT1 • 10:30 a.m.
Real-Time Optical Frequency-Domain Reflectometry, *Yongwoo Park, Tae-Jung Ahn, Jose Azaña, Jean-Claude Kieffer; INRS-EMT, Canada.* We propose and demonstrate an ultrafast optical frequency domain reflectometry based on real-time optical Fourier-transformation. Interferograms are captured over 50 ns time windows at a 20 MHz repetition rate with a 70 μm depth resolution.

CTuT2 • 10:45 a.m.
Enhancing the Spectral Sensitivity and Resolution of Interferometers Using Slow-Light Media, *Zhimin Shi[1], Robert W. Boyd[1], Daniel J. Gauthier[2], C. C. Dudley[3]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Physics and The Fitzpatrick Ctr. for Photonics and Communications Systems, Duke Univ., USA, [3]NRL, Remote Sensing Div., Code 7211, USA.* We demonstrate experimentally that the spectral sensitivity and resolution of an interferometer can be greatly enhanced by introducing a slow-light medium into it with an enhancement factor equal to the group index of the medium.

10:30 a.m. – 12:30 p.m.
PTuA • Lasers in Device Manufacturing
Ronald Schaeffer; PhotoMachining Inc., USA, Presider

PTuA1 • 10:30 a.m. Invited
An Overview of Laser Technologies in Medical Device Manufacturing for Cardiovascular Applications, *Arzu Ozkan; Abbott Vascular, USA.* The cardiovascular device market is a $12+ billion global industry with a growth rate of >10% annually. We present an overview of laser technologies used in medical device manufacturing for vascular intervention.

10:30 a.m. – 12:30 p.m.
PTuB • Threat Agent Detection and Identification Methods
Michael McLoughlin; Homeland Security Advanced Project Res. Agency, USA, Presider

PTuB1 • 10:30 a.m. Invited
Optical Measurements Used for BW Aerosol Detection: Current Methods, *Jay D. Eversole; NRL, USA.* A short history and overview of different optical methods for bioaerosol detection will be presented. A detailed description of a developmental system known as the Rapid Agent Aerosol Detector (RAAD) will be given as example.

10:30 a.m. – 12:30 p.m.
PTuC • Commercialization of Applied Research I
James M. Zavislan; Inst. of Optics, USA, Presider

PTuC1 • 10:30 a.m. Invited
A Primer on Commercialization, *MaryAnn Feldman; Univ. of Georgia, USA.* Abstract not available.

CTuK • QPM Devices—Continued

CTuK3 • 11:00 a.m. Invited
Nano- and Microdomain Engineering in KTP and Its Application, *Fredrik Laurell; Royal Inst. of Technology, Sweden.* Abstract not available.

CTuL • Organic LEDs and Lasers—Continued

CTuM • Ultrafast Sources II—Continued

CTuM3 • 11:15 a.m.
Intracavity Pumped Picosecond Optical Parametric Oscillator for Intracavity Interferometry, *Andreas Velten[1], Jean-Claude Diels[1], Vaclav Kubecek[2], Alena Zavadilova[2]; [1]Univ. of New Mexico, USA, [2]Czech Technical Univ., Czech Republic.* A picosecond pulse circulating inside a mode-locked vanadate laser, pumps twice/round-trip a $LiNbO_3$ crystal, creating two non-interacting signal pulses circulating in a resonant cavity. This configuration is ideal for intracavity interferometry applications.

CTuN • Eyesafe Lasers—Continued

CTuN3 • 11:00 a.m.
High-Brightness, Pulsed, Cladding-Pumped Raman Fiber Source at 1660 nm, *Christophe A. Codemard[1,2], Johan Nilsson[1,2], Jayanta Sahu[1,2]; [1]Optoelectronics Res. Ctr., Univ. of Southampton, UK, [2]SPI Lasers, UK.* We report the first demonstration of a pulsed cladding-pumped Raman fiber source, delivering up to 10μJ diffraction-limited pulses at 1660nm. The pulses are 620ns long with 16W peak-power and the pump-signal conversion efficiency is 36%.

CTuN4 • 11:15 a.m.
Asymmetric Time Constants, *Norman P. Barnes, Brian M. Walsh, Donald J. Reichle; NASA Langley Res. Ctr., USA.* Time constants for population density rise and decay are often unequal. Asymmetric time constants result from: ground state depletion, up conversion, and amplified spontaneous emission. All these effects were modeled and Tm:germanate experiments support model.

CTuO • Quantum Cascade Lasers—Continued

CTuO3 • 11:00 a.m.
Photon-Driven Transport in Quantum Cascade Lasers, *Hyunyong Choi[1], Zong-Kwei Wu[1], Theodore B. Norris[1], Laurent Diehl[2], Federico Capasso[2], Marcella Giovannini[3], Jérôme Faist[3]; [1]Univ. of Michigan at Ann Arbor, USA, [2]Harvard Univ., USA, [3]Univ. of Neuchâtel, Switzerland.* Ultrafast mid-infrared pump-probe experiments are used to study gain and transport dynamics in quantum cascade lasers below and above threshold. We observe for the first time how stimulated emission drives the current through cascade heterostructure.

CTuO4 • 11:15 a.m.
Temperature-Dependent Gain and Loss in High Performance Quantum Cascade Lasers at 8.2 and 10.3μm, *Zhijun Liu[1], Grace Silva[1,2], Jayson J. Paulose[1], Claire F. Gmachl[1], Liwei Cheng[2], Fow-Sen Choa[2], Rich Leavitt[3], Fred J. Towner[3], Xiaojun Wang[4], Jenyu Fan[4]; [1]Princeton Univ., USA, [2]Univ. of Maryland, Baltimore County, USA, [3]Maxion Technologies Inc., USA, [4]AdTech Optics, USA.* Temperature-dependent optical gain and waveguide loss were measured for Quantum Cascade lasers with wavelengths of ~8.2 and ~10.3μm. The nature of the temperature dependence of the loss indicates an extra mechanism of resonant intersubband absorption.

CTuP • Nonlinear Microscopy II—Continued

CTuP3 • 11:00 a.m.
Detecting the Optical Signature of Malignancy with Second Harmonic Imaging, *Karen M. Reiser[1], Carlos Rodriguez[2]; [1]Dept. of Neurological Surgery, Univ. of California at Davis, USA, [2]Dept. of Surgical and Radiological Sciences, School of Veterinary Medicine, Univ. of California at Davis, USA.* Since SHG is generated by specific macromolecules, it can potentially detect early disruptions of stromal architecture. Recent pilot data suggest that neoplastic changes in feline skin can be identified based on their SHG optical signature.

CTuP4 • 11:15 a.m.
***In vivo* Continuous Imaging of Vertebrate Cardiac Valves for Congenital Heart Disease Study and Medical Drug Screening Using Third Harmonic Generation Microscopy,** *Chun-Ta Kung[1], Chung-Cheng Chuang[1], Yu-Kai Huang[2], Huai-Jen Tsai[2], Chi-Kuang Sun[3,4]; [1]Graduate Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan, [2]Inst. of Molecular and Cellular Biology, Natl. Taiwan Univ., Taiwan, [3]Dept. of Electrical Engineering and Graduate Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan, [4]Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan.* Cr:forsterite-based third-harmonic-generation microscopy can easily provide *in vivo* continuous observation of cardiac valves in zebrafish embryos, which provides an ideal research model for human congenital heart diseases and for drug screening.

CTuQ • Active Silicon Photonics—Continued

CTuQ2 • 11:00 a.m.
12.5 Gbit/s Silicon Micro-Ring Silicon Modulators, *Qianfan Xu, Sasikanth Manipatruni, Brad Schmidt, Jagat Shakya, Michal Lipson; Cornell Univ., USA.* We show experimentally a scheme for achieving high-speed operation for a carrier-injection based silicon micro-ring modulator. The performance of the modulator is analyzed theoretically and a 12.5-Gbit/s modulation with 9-dB extinction ratio is demonstrated experimentally.

CTuQ3 • 11:15 a.m.
Silicon Modulator Based on Anti-Crossing between Paired Amplitude and Phase Tunable Microring Resonators, *William M.J. Green, Michael J. Rooks, Lidija Sekaric, Yurii A. Vlasov; IBM Thomas J. Watson Res. Ctr., USA.* A modulator design based upon anti-crossing between coupled silicon microrings with independent amplitude-phase functionality, is presented. The device has a footprint of 0.003mm^2, exhibits over 10x improvement in modulation sensitivity, and 14 dB extinction.

QTuD • Metamaterials: Applications—Continued

QTuD2 • 11:00 a.m.
Design of Non-Magnetic Optical Cloak, *Wenshan Cai, Uday K. Chettiar, Alexander V. Kildishev, Vladimir M. Shalaev; Purdue Univ., USA.* We present the design and analysis of a non-magnetic cloak operating at optical frequencies. The general recipe for the implementation of such a device is provided. The cloaking performance is illustrated with finite-element simulations.

QTuD3 • 11:15 a.m.
Optical "Hyperlens": Far-field Imaging beyond the Diffraction Limit, *Zubin Jacob, Leonid V. Alekseyev, Evgenii Narimanov; Princeton Univ., USA.* We propose a system for far-field optical imaging below the diffraction limit. As opposed to the "superlens" based on negative index materials, our approach allows image magnification and is robust with respect to material losses.

QTuE • Nonlinear Femtosecond Phenomena—Continued

QTuE3 • 11:00 a.m.
Observation of Polychromatic Gap Solitons Generated by Supercontinuum Light, *Dragomir N. Nesbev[1], Andrey A. Sukhorukov[1], Alexander Dreischuh[1,2], Robert Fischer[1], Sangwoo Ha[1], Wieslaw Z. Krolikowski[1], Jeremy Bolger[3], Ben J. Eggleton[3], Arnan Mitchell[4], Michael W. Austin[4], Yuri S. Kivshar[1]; [1]Australian Natl. Univ., Australia, [2]Sofia Univ., Bulgaria, [3]Univ. of Sydney, Australia, [4]RMIT Univ., Australia.* We present the first observation of simultaneous spatio-spectral localization and formation of a supercontinuum gap soliton in an optical waveguide array, demonstrating new possibilities for tunable reshaping of polychromatic light in nonlinear periodic photonic structures.

QTuE4 • 11:15 a.m.
Initial Dynamics of Supercontinuum Generation in Highly Nonlinear Photonic Crystal Fiber, *Jamison T. Moeser, Natalie Wolchover, Fiorenzo Omenetto; Tufts Univ., USA.* We analyze supercontinuum generation in photonic crystal fibers (PCF) composed of Schott-SF6 glass with experiments and simulation. We present for the first time the Raman response function of SF6 and validate theory with experimental data.

QTuF • Entanglement and Squeezing I—Continued

QTuF3 • 11:00 a.m.
Strong Relative Intensity Squeezing by Four-Wave Mixing in Rb Vapor, *Colin F. McCormick[1], Vincent Boyer[1], Alberto M. Marino[1], Ennio Arimondo[2], Paul D. Lett[1]; [1]NIST, USA, [2]Univ. di Pisa, Italy.* We have measured -6.3 dB of relative intensity squeezing at 795nm, generated by stimulated, nondegenerate four-wave mixing in a hot rubidium vapor. This scheme is of interest for experiments involving cold atoms or atomic ensembles.

QTuF4 • 11:15 a.m. Invited
Quantum Telecommunication with Atoms and Photons, *Dzmitry Matsukevich, Stewart Jenkins, Thierry Chaneliere, O. Austin Collins, Shau-Yu Lan, Corey Campbell, Ran Zhao, T. A. Brian Kennedy, Alex Kuzmich; Georgia Tech, USA.* For long distances direct quantum communication via optical fiber is not viable, due to fiber losses. We will outline our program on the use of atomic ensembles for long distance quantum networks.

CTuR • Signal Processing—Continued

CTuR2 • 11:00 a.m.
Time-Stretched Photonic Analog-to-Digital Sampling Using a CW Multi-Wavelength Source and Phase Modulation, *Bartosz J. Bortnik, Harold R. Fetterman; Univ. of California at Los Angeles, USA.* A simpler and more flexible photonically-assisted analog-to-digital conversion architecture that utilizes a CW multi-wavelength source, phase modulation, and fiber dispersion to generate sampling pulses is proposed and experimentally demonstrated.

CTuR3 • 11:15 a.m.
All-Optical NRZ-OOK to RZ-QPSK Conversion Using Parallel SOA-MZI OOK/BPSK Converters, *Ken Mishina[1], Suresh Malinda Nissanka[1], Akibiro Maruta[1], Shunsuke Mitani[2], Kazuyuki Ishida[2], Katsuhiro Shimizu[2], Tatsuo Hatta[2], Ken-ichi Kitayama[1]; [1]Osaka Univ., Japan, [2]Mitsubishi Electric Corp., Japan.* We propose a novel all-optical NRZ-OOK/RZ-QPSK modulation format converter using parallelized SOA-MZIs and demonstrate the proof-of-the-principle experiment at 10.7 GSymbol/s by using the test parallel SOA-MZI OOK/BPSK converters.

CTuS • Large Mode Area Fibers—Continued

CTuS3 • 11:00 a.m.
Resistance of Higher Order Modes to Bend-Induced Mode Coupling and Distortion, *John M. Fini, Siddharth Ramachandran; OFS Labs, USA.* Signal amplification in higher order modes with large mode area has been proposed to overcome power limitations in fiber amplifiers. Simulations and measurements demonstrate resistance of these modes to bend-induced distortion and coupling, respectively.

CTuS4 • 11:15 a.m.
Beam Quality and Modal Content for LMA Fiber Sources, *Stephan Wielandy; Lucent Technologies, USA.* It is shown that good beam quality in LMA fibers supporting several guided modes does not imply low Higher-Order-Mode content, and that this HOM content can lead to uncontrollable phase-dependent beam quality and pointing uncertainty.

CTuT • Optical Interferometry—Continued

CTuT3 • 11:00 a.m. Invited
Laser Interferometric Gravitational Wave Detectors on the Ground and in Space, *Karsten Danzmann; Max-Planck-Inst., Germany.* Abstract not available.

PTuA • Lasers in Device Manufacturing—Continued

PTuA2 • 11:00 a.m. Invited
Technological Platform for Cell Micro Array Based Biochips, *Udo Klotzbach; Fraunhofer Inst. Material and Beam Technology, Germany.* This biochip-technology is today an essential element of basic research, molecular medicine as well as genetic diagnostics and pharmacogenomics. Laser technology allows the build up of microfluidics, microvalves, systems of microreactors and surfacemodification of biochips.

PTuB • Threat Agent Detection and Identification Methods—Continued

PTuB2 • 11:00 a.m. Invited
Photonics for Biological-Agent Sensors, *Tom Jeys; MIT, USA.* The performance of real-time, optically-based, biological-agent detectors depend on the performance of integrated light sources and detectors. The relative merits of various sources and detectors will be discussed.

PTuC • Commercialization of Applied Research I—Continued

PTuC2 • 11:00 a.m. Invited
Moving Research into Practice, *Pat Jones; Univ. of Arizona, USA.* Abstract not available.

CTuK • QPM Devices—Continued

CTuK4 • 11:30 a.m.
1.5 W, Green-Pumped, Continuous-Wave, Singly-Resonant Optical Parametric Oscillator Based on MgO:sPPLT, *Goutam K. Samanta, Gholam Reza Fayaz, Zhipei Sun, Majid Ebrahim-Zadeh; ICFO - The Inst. of Photonic Sciences, Spain.* A continuous-wave, singly-resonant optical parametric oscillator based on MgO:sPPLT is reported. Pumped at 532nm, the oscillator can provide 1.51 W of idler power tunable over 848-1430nm at 25.2% extraction efficiency and 56.7% photon conversion efficiency.

CTuK5 • 11:45 a.m.
High-Energy Periodically Poled $MgO:LiNbO_3$ Optical Parametric System with a Bragg Grating, *Jiro Saikawa[1], Masaaki Fujii[1], Hideki Ishizuki[2], Takunori Taira[2]; [1]Tokyo Inst. of Technology, Japan, [2]Inst. for Molecular Science, Japan.* We report a large aperture periodically poled $MgO:LiNbO_3$ optical parametric system with Bragg grating. Narrow bandwidth pulses of <1nm at degeneracy point (2128nm) were amplified up to 30mJ.

CTuL • Organic LEDs and Lasers—Continued

CTuL2 • 11:30 a.m.
Gallium Nitride LEDs Incorporating Organic Semiconductor Heterojunctions, *Hyunjin Kim[1], Cuong Dang[1], Yoon-Kyu Song[1], Qiang Zhang[1], Kristina Davitt[1], Arto V. Nurmikko[1], Soon-Yong Kwon[2], K.-K. Kim[2], Jung Han[2]; [1]Brown Univ., USA, [2]Yale Univ., USA.* We report on incorporation of thin organic layers in InGaN blue LEDs. The integration of such contrasting classes of materials in a single device may offer new opportunities in the design of flexible optoelectronics.

CTuL3 • 11:45 a.m. Invited
Recent Advances in Polymer Lasers and Optical Amplifiers, *A. E. Vasdekis, G. Tsiminis, D. Amarasinghe, A. Ruseckas, M. Goossens, L. O'Faolain, T. F. Krauss, G. A. Turnbull, Ifor Samuel; Univ. of St. Andrews, UK.* Advanced polymer photonic devices are reported. These include a directly diode-pumped polymer laser, a femtosecond polymer laser, and a broadband solid state polymer optical amplifier.

CTuM • Ultrafast Sources II—Continued

CTuM4 • 11:30 a.m.
Spectral Phase and Amplitude Measurements of Parametric Transfer in a Synchronously Pumped OPO, *Hazel S. S. Hung, Jerry Prawibarjo, David C. Hanna, David P. Shepherd; Optoelectronics Res. Ctr., Univ. of Southampton, UK.* The sonogram technique is used to investigate the fidelity of near-infrared to mid-infrared parametric transfer of ultrashort pulse characteristics via difference frequency generation in a synchronously pumped optical parametric oscillator.

CTuM5 • 11:45 a.m.
Group-Velocity-Matched Noncollinear Optical Parametric Oscillation in Quasi-Phase Matched Gratings, *Ye Liu, Jean-Claude Diels; Univ. of New Mexico, USA.* We propose a novel scheme of noncollinear phase matching for femtosecond optical parametric oscillation in periodically poled gratings. Consequently, the parametric gain is enhanced by orders of magnitude and the threshold for oscillation reduced significantly.

CTuN • Eyesafe Lasers—Continued

CTuN5 • 11:30 a.m.
Highly Efficient Q-Switched Ho:YLF Laser Pumped by Tm:Fiber Laser, *Yingxin Bai[1], Jirong Yu[2], Mulugeta Petros[3], Paul J. Petzar[4], Bo C. Trieu[2], Hyung R. Lee[4], U. Singh[2]; [1]Science Systems and Applications, Inc., USA, [2]NASA Langley Res. Ctr., USA, [3]Science and Technology Corp., USA, [4]Natl. Inst. of Aerospace, USA.* A highly efficient Q-switched Ho:YLF laser pumped by a Tm:fiber laser has been designed and demonstrated. When the pump power is 30 W, the pulse energy is 30mJ at the repetition rate of 100Hz.

CTuN6 • 11:45 a.m.
CW Single-Frequency Tunable, CW Multi-Watt Polycrystalline, and CW Hot-Pressed-Ceramic Cr^{2+}:ZnSe Lasers, *Igor S. Moskalev, Vladimir V. Fedorov, Sergey B. Mirov; Univ. of Alabama at Birmingham, USA.* We demonstrate CW ultrafast-tunable (4 µm/s), 150 mW, single-longitudinal-mode (120 MHz); and CW multi-watt (2.7 W at 2.5 µm), highly efficient (39% real efficiency) polycrystalline Cr^{2+}:ZnSe lasers; and CW hot-pressed ceramic Cr^{2+}:ZnSe laser.

CTuO • Quantum Cascade Lasers—Continued

CTuO5 • 11:30 a.m.
Low-Threshold-Current-Density Room-Temperature Continuous-Wave Quantum-Cascade-Lasers Grown by Metal Organic Chemical Vapor Deposition, *Xiaojun Wang[1], Jenyu Fan[1], Tawee Tanbun-Ek[1], Fow-sen Choa[2]; [1]Adtech Optics, Inc., USA, [2]Dept. of Computer Science and Electrical Engineering, Univ. of Maryland, USA.* We report Buried-heterostructure QCLs of λ~5µm, grown by MOCVD, with extremely low CW room-temperature threshold-current-density of 0.75kA/cm^2. Slope efficiencies of 1079mW/A, output power of 116mW at 288K and internal loss of 1.84cm^{-1} have been achieved.

CTuO6 • 11:45 a.m.
Nonlinear Quantum Cascade Lasers: Toward Broad Tunability and Short-Wavelength Operation, *Feng Xie[1], Don Smith[1], Venkata R. Chaganti[1], Alexey Belyanin[1], Dan Wasserman[2], Claire Gmachl[2], Junichiro Kono[3], Mikhail Belkin[4], Federico Capasso[4]; [1]Texas A&M Univ., USA, [2]Princeton Univ., USA, [3]Rice Univ., USA, [4]Harvard Univ., USA.* We propose new designs for quantum-cascade lasers integrated with resonant intersubband nonlinearities, which promise ultra-broad spectral tuning and room-temperature operation in the hard-to-reach short-wavelength range λ ~2.5-4 µm.

CTuP • Nonlinear Microscopy II—Continued

CTuP5 • 11:30 a.m.
Noninvasive Long Term Observation and Evaluation of Mammal Oocytes and Embryos with a 3-D Subcellular Spatial Resolution, *Cho-Shuen Hsieh[1], Shee-Uan Chen[2], Yu-Shih Yang[2], Chi-Kuang Sun[1]; [1]Graduate Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan, [2]Dept. of Obstetrics and Gynecology, Natl. Taiwan Univ. Hospital and College of Medicine, Taiwan.* By using harmonic generation microscopy, we are able to noninvasive evaluate the health of pre-implantation mammalian embryos after *in vitro* fertilization (IVF) and before transferring to a mother with a high 3-D resolution.

CTuP6 • 11:45 a.m.
Development of Multiphoton Scanning Microscope for Simultaneous Imaging of Multiple Depths, *Ramon Carriles, Wafa Amir, Erich E. Hoover, Thomas A. Planchon, Jeff A. Squier; Colorado School of Mines, USA.* We present a two-photon absorption scanning microscope capable of imaging two or more focal planes simultaneously. We modify the microscope's excitation path, and use photon counting, to separate different depth images through their relative timing.

CTuQ • Active Silicon Photonics—Continued

CTuQ4 • 11:30 a.m.
Inducing Photonic Transitions between Discrete Modes in a Microcavity, *Po Dong, Stefan F. Preble, Jacob T. Robinson, Sasikanth Manipatruni, Michal Lipson; School of Electrical and Computer Engineering, Cornell Univ., USA.* We demonstrate that transitions between discrete cavity modes in optical microcavities can be induced when the resonance of cavity is tuned on a time scale shorter than the inverse of the frequency difference between modes.

CTuQ5 • 11:45 a.m.
Demonstration of 300 Gbps Error-Free Transmission of WDM Data Stream in Silicon Photonic Wires, *Xiaogang Chen[1], Benjamin G. Lee[1], Xiaoping Liu[1], Benjamin A. Small[1], Iwei Hsieh[1], Jerry Dadap[2], Keren Bergman[1], Richard M. Osgood[1], Fengnian Xia[3], William Green[3], Lidija Sekaric[3], Yurii Vlasov[3]; [1]Dept. of Electrical Engineering, Columbia Univ., USA, [2]Dept. of Applied Physics, Columbia Univ., USA, [3]IBM T. J. Watson Res. Ctr., USA.* We present the first experimental demonstration of error-free (bit error rates < 10^{-12}) transmission of a 300-Gbps WDM data stream through a 2-cm-long silicon photonic wire using 24 C-band channels, each modulated at 12.5 Gbps.

QTuD • Metamaterials: Applications—Continued

QTuD4 • 11:30 a.m.
Image Inversion and Magnification by Negative Index Prisms, *Qi Wu, Ethan Schonbrun, Wounjhang Park; Univ. of Colorado at Boulder, USA.* Prism structures with negative index materials were investigated for their novel focusing properties such as image inversion and magnification. They reinforce the functions of flat lens and broaden the applications of negative index materials.

QTuD5 • 11:45 a.m.
Super Resolution Fourier Microscopy in MID-IR, *Leonid Alekseyev[1], Evgenii Narimanov[1], Jacob Khurgin[2]; [1]Princeton Univ., USA, [2]Johns Hopkins Univ., USA.* We propose a novel scheme for subwavelength-resolved imaging in the mid-IR. Our approach relies on scattering from an acoustic grating and allows far-field detection of high spatial frequency Fourier components of the object under study.

QTuE • Nonlinear Femtosecond Phenomena—Continued

QTuE5 • 11:30 a.m.
Enhancement of Single High Harmonic Generation from Sn and Sb Ion in Laser-Ablation Plume at XUV Region, *Masayuki Suzuki[1], Motoyoshi Baba[1], Hiroto Kuroda[1], Rashid A. Ganeev[2], Luc Bertrand Elouga Bom[3], Tsuneyuki Ozaki[3]; [1]Inst. for Solid State Physics, Univ. of Tokyo, Japan, [2]Akadempribor Scientific Association, Acad. of Science of Uzbekistan, Uzbekistan, [3]Inst. Natl. de la Recherche Scientifique, Canada.* We demonstrated a single-high-harmonic enhancement at 47 and 37 nm by using the laser-ablation plume. Such an enhancement was caused by the mutiphoton resonance with the strong radiative transition of the Sn and Sb ions.

QTuE6 • 11:45 a.m.
High Harmonic Imaging of Conical Intersections, *Markus Guehr[1,2], Brian K. McFarland[1], Joseph P. Farrell[1], Philip H. Bucksbaum[1,2]; [1]Stanford PULSE Ctr., USA, [2]SLAC, USA.* We propose a new ultrafast method for observing molecular wave packets in conical intersections (CI), based on high harmonic generation (HHG). Electronic symmetry change and nuclear dynamics can be observed in the HHG spectra.

QTuF • Entanglement and Squeezing I—Continued

QTuF5 • 11:45 a.m.
Creation of Dicke States in Distant Qubits Using Linear Optics, *Christoph Thiel[1], Joachim von Zanthier[1], Thierry Bastin[2], Enrique Solano[3], Girish S. Agarwal[4]; [1]Inst. for Optics, Information and Photonics, Univ. of Erlangen-Nuremberg, Germany, [2]Inst. de Physique Nucléaire, Atomique et de Spectroscopie, Univ. de Liège au Sart Tilman, Belgium, [3]Physics Dept., ASC and CeNS, Ludwig-Maximilians-Univ., Germany, [4]Dept. of Physics, Oklahoma State Univ., USA.* We propose a method to generate long-lived symmetric Dicke states of distant particles requiring linear optics only. Thereby we grant access to genuine entanglement of any number of qubits via measurement using multifold detection techniques.

CTuR • Signal Processing—Continued

CTuR4 • 11:30 a.m.
10 Gb/s Wavelength Transparent All-Optical Memory Using PCF-Based Nonlinear Optical Loop Mirror, *C. C. Lee[1], P. K. A. Wai[1], H. Y. Tam[1], Lixin Xu[2], Chongqing Wu[3]; [1]Hong Kong Polytechnic Univ., Hong Kong, [2]Univ. of Science and Technology of China, China, [3]Beijing Jiaotong Univ., China.* We demonstrated a 10 Gb/s all-optical memory using a PCF-based NOLM. The data can be stored in a 29 m long fiber for 2.5 μs. The power penalty at BER of 10^{-9} is 3.5 dB.

CTuR5 • 11:45 a.m.
Implementation of Molecular Addressing Technique Based on Photoinduced Cleavage Reaction, *Naoya Tate[1], Yusuke Ogura[2], Jun Tanida[2], Masami Hagiya[3]; [1]Japan Science and Technology Agency, Japan, [2]Osaka Univ., Japan, [3]Univ. of Tokyo, Japan.* Photonic DNA memory is expected to be high-capacity memory overcoming diffraction limit of optics. We describe the reaction control of four-hairpin DNA on a microscopic bead by laser irradiation for implementation of photonic DNA memory.

CTuS • Large Mode Area Fibers—Continued

CTuS5 • 11:30 a.m. Invited
Ultra-Large Mode-Area Fibers, *Siddharth Ramachandran, Samir Ghalmi, Man F. Yan; OFS Labs, USA.* We review the performance and applications of a recently demonstrated platform that utilises higher-order modes in few-moded fibers to facilitate robust, bend-resistant, long-length light-propagation in ultra-large modal areas.

CTuT • Optical Interferometry—Continued

CTuT4 • 11:30 a.m.
An Ultra-High Resolution Spectrometer with Successive Combination of a Fabry-Perot Etalon and a Cylindrical Beam Volume Hologram, *Majid Badieirostami[1], Omid Momtahan[1], Chao Ray Hsieh[1], Ali Adibi[1], David J. Brady[2]; [1]Georgia Tech, USA, [2]Duke Univ., USA.* We have designed a compact spectrometer by cascading a simple Fabry-Perot etalon and a cylindrical beam volume hologram. Using this spectrometer, ultra-high resolution over a large bandwidth has been experimentally demonstrated for diffuse light sources.

CTuT5 • 11:45 a.m.
Improved Method for Two-Dimensional Determination of the Magnitude and Orientation of Weak Birefringence, *François Busque, Benoit Sévigny, Nicolas Godbout, Raman Kashyap, Suzanne Lacroix, Michel Meunier; École Polytechnique de Montréal, Canada.* A method for measuring refractive index anisotropy and orientation is described. Birefringence characterization of laser-written integrated optics devices is presented as an example application of the method.

PTuA • Lasers in Device Manufacturing—Continued

PTuA3 • 11:30 a.m.
Laser Micro-Processing for Industrial Production Applications, *Heather Booth, Philipp Grunewald, James Pedder; Oerlikon Evitech, UK.* The advantages of laser-micro-processing in device manufacture for the Solar, Displays and Microsystems industries have lead to the replacement of conventional manufacturing techniques in production environments. Tool advances and industrial production techniques will be discussed.

PTuA4 • 11:45 a.m. Invited
Laser Processing in Printform Fabrication, *Guido Hennig[1], Karl-Heinz Selbmann[1], Stephan Brüning[2]; [1]MDC Max Daetwyler AG, Switzerland, [2]MDC -Schepers GmbH, Germany.* Laser engraving is the fastest and most versatile process for gravure cylinder fabrication. New experiments with high power fiber lasers (cw lasers and pulsed MOPA systems) resulted in improved cell precision, screen resolution and efficiency.

PTuB • Threat Agent Detection and Identification Methods—Continued

PTuB3 • 11:30 a.m. Invited
MORPH - DARPAs Supermolecular Photonics Engineering Program, *Devanand Shenoy; DARPA, USA.* DARPA's MORPH program is developing high performance nonlinear optical materials for applications in RF photonics and sensor protection. The presentation highlights the achievements of the program and potential applications for the program's materials and devices.

PTuC • Commercialization of Applied Research I—Continued

PTuC3 • 11:30 a.m. Invited
Funding at NCI and NIH for Early Stage Medical Product, *Houston Baker; Natl. Cancer Inst./NIH, USA.* Abstract not available.

ROOM 318-320	ROOM 321-323	ROOM 324-326	ROOM 314	ROOM 315	ROOM 316	ROOM 317	ROOM 336
CLEO							QELS

CTuK • QPM Devices—Continued

CTuK6 • 12:00 p.m.
Engineered Quasi-Phase Matching Device for Unequally Spaced Multiple Wavelength Generation, *Masaki Asobe, Osamu Tadanaga, Takeshi Umeki, Tsutomu Yanagawa, Yoshiki Nishida, Katsuaki Magari, Hiroyuki Suzuki; NTT Photonics Labs, NTT Corp., Japan.* We propose a novel quasi-phase matched device that can generate unequally spaced multiple wavelengths. Utilizing 3.2-3.4 μm band difference frequency generation in a $LiNbO_3$ waveguide, we demonstrate the measurement of multiple absorption lines of CH_4.

CTuM • Ultrafast Sources II—Continued

CTuM6 • 12:00 p.m.
Divided-Pulse Amplification of Ultrashort Pulses, *Shian Zhou, Dimitre G. Ouzounov, Frank W. Wise; Cornell Univ., USA.* We demonstrate an approach to avoid nonlinear effects in the amplification. The initial pulse is divided into a sequence of lower-energy identical pulses. The low-intensity pulses are amplified and recombined to create a final pulse.

CTuN • Eyesafe Lasers—Continued

CTuN7 • 12:00 p.m.
Tm:ZBLAN Fiber Lasers and Their Use for Gain-Switched Cr^{2+}:ZnSe Lasers, *Marc Eichhorn; French-German Res. Inst. of Saint-Louis, France.* Highly efficient cw (49 % opt.-opt., 20 W) and Q-switched (9 W average) Tm:ZBLAN fiber lasers are reported. Used for pumping Cr^{2+}:ZnSe, 65 ns gain-switched pulses were achieved around 2.3 μm (1 W average).

CTuO • Quantum Cascade Lasers—Continued

CTuO7 • 12:00 p.m.
Comparative Analysis of THz Quantum Cascade Lasers, *Christian Jirauschek[1], Giuseppe Scarpa[1], Paolo Lugli[1], Miriam S. Vitiello[2], Gaetano Scamarcio[2]; [1]TUMünchen, Germany, [2]Univ. Degli Studi di Bari, Italy.* We present a comparative Monte-Carlo analysis of a set of GaAs-based THz quantum cascade lasers, allowing us to identify the effects limiting the device performance in the threshold region. Reasonable agreement with experiment is found.

CTuP • Nonlinear Microscopy II—Continued

CTuP7 • 12:00 p.m.
Enhanced Two-Photon *in vivo* Flow Cytometry with an Extended Cavity Laser, *Eric R. Tkaczyk, Jing Yong Ye, Steve Katnik, Kathryn Luker, Gary Luker, James R. Baker, Ted B. Norris; Univ. of Michigan, USA.* We use multiphoton *in vivo* flow cytometry to monitor multiple cell lines. With a reduced-repetition-rate (20-MHz) mode-locked oscillator, the signal is enhanced fourfold, enabling detection in blood of multiple cell lines expressing different GFP variants.

CTuQ • Active Silicon Photonics—Continued

CTuQ6 • 12:00 p.m.
Compact, Low-Power, High-Speed Silicon Electro-Optic Modulator, *Fuwan Gan[1], Steven J. Spector[2], Michael W. Geis[2], Matthew E. Grein[2], Robert T. Schulein[2], Jung UK Yoon[2], Theodore M. Lyszczarz[2], Franz X. Kärtner[1]; [1]MIT, USA, [2]Lincoln Lab, MIT, USA.* A 250 μm long, CMOS-compatible, PIN diode Mach-Zehnder modulator has been fabricated with response extending to 13GHz. Modeling shows that pre-compensation enables the fabrication of ultracompact 10GHz 3-DB-bandwidth, optically broadband modulators.

QTuD • Metamaterials: Applications—Continued

QTuD6 • 12:00 p.m.
Gain-Assisted Dispersion Management in Negative-Index Materials, *Viktor A. Podolskiy, Alexander A. Govyadinov; Oregon State Univ., USA.* We demonstrate that relatively weak material gain can be utilized as an effective tool to manipulate dispersion of negative index materials achieving, in particular, broadband impedance- or index-matching. Finite-size and unbounded media are discussed.

11:30 a.m. – 1:00 p.m. *PhAST* Networking & *PhAST* Power Lunch on Exhibit Hall Floor (12:00 p.m.)

12:15 p.m. – 1:00 p.m. LUNCH BREAK (concessions available on exhibit floor)

1:00 p.m. – 3:00 p.m. *PhAST* Business and Management Panel Discussion

QELS

QTuE • Nonlinear Femtosecond Phenomena—Continued

QTuE7 • 12:00 p.m.
Laser-Induced Surface Nano-Ripples as Manifestation of Wigner Excitons, *Alexander E. Kaplan[1], Kenzo Miyazaki[2]; [1]Johns Hopkins Univ., USA, [2]Kyoto Univ., Japan.* We developed a physical model of recently discovered sub-wavelength nano-ripples formed by fs pulses on solid-state surfaces. It predicts surface nano-stratification on the scale of a few tens of nanometers due to dipole-dipole electron interaction.

QTuF • Entanglement and Squeezing I—Continued

QTuF6 • 12:00 p.m.
Single-Photonics at Telecom Wavelengths Using Nanowire Superconducting Single Photon Detectors, *Carl Zinoni[1], Blandine Alloing[1], Lianbe Li[1], Francesco Marsili[1], Andrea Fiore[1], Lambertp Lungbi[2], Annamaria Gerardino[2], Yuri B. Vakhtomin[3], K. V. Smirnov[3], G. N. Gol'tsman[3], [1]Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, [2]Inst. of Photonics and Nanotechnology, CNR, Italy, [3]Moscow State Pedagogical Univ., Russian Federation.* Single-photon detectors based on NbN superconducting nanostructures promise orders-of-magnitude improvement over InGaAs APDs. We demonstrate this improved performance by measuring the $g^{(2)}(\tau)$ on single photon states produced by a quantum dot at telecom wavelength.

CLEO

CTuR • Signal Processing—Continued

CTuR6 • 12:00 p.m.
Analysis of Hierarchical Interconnects Using Optical Near-Fields Based on Angular Spectrum, *Makoto Naruse[1,2], Tetsuya Inoue[3], Hirokazu Hori[4]; [1]Natl. Inst. of Information and Communications Technology, Japan, [2]Univ. of Tokyo, Japan, [3]Yamanashi Industrial Technology College, Japan, [4]Univ. of Yamanashi, Japan.* We theoretically analyze the hierarchical coarse graining process, or hierarchical interconnects, using optical near-fields based on an angular spectrum representation, which allows explicit treatment in the sub-wavelength regime. Theoretical predictions agree well with numerical simulations.

CTuS • Large Mode Area Fibers—Continued

CTuS6 • 12:00 p.m.
Robustly Single-Mode Polarization Maintaining Er/Yb Co-Doped LMA Fiber for High Power Applications, *Adrian Carter[4], Julia Farroni[1], Kanishka Tankala[1], Bryce Samson[1], David Machewirth[1], Nils Jacobson[1], William Torruellas[2], Youming Chen[2,3], Ming-Yuan Cheng[3], Almantas Galvanauskas[3,4], Anthony Sanchez[4]; [1]Nufern, USA, [2]Fibertek, USA, [3]EECS Dept., Univ. of Michigan, USA, [4]AFRL/DELO, USA.* Demonstrate a large core diameter PM Er/Yb fiber incorporating unique raised inner-cladding which facilitates the use of conventional LMA mode selection techniques to achieve robustly single-mode operation, making it ideally suited to high power applications.

CTuT • Optical Interferometry—Continued

CTuT6 • 12:00 p.m.
Characterization of High-Frequency Surface Modulation Using the Transport-of-Intensity Equation, *Christophe Dorrer, Jonathan D. Zuegel; Lab for Laser Energetics, USA.* The transport-of-intensity equation is used to describe the influence of small-scale phase fluctuations present on the surface of optical elements, which can be characterized from the diffraction-induced modifications of the intensity of a coherent source.

PhAST

PTuA • Lasers in Device Manufacturing—Continued

PTuA5 • 12:15 p.m.
High Precision and High Speed Cutting of 4th Generation OLED Masks with LaserMicroJet, *Tuan Anh Mai, Bernold Richerzhagen; Synova S.A., Switzerland.* A new micro-machining technology - the water jet guided laser, also called as LaserMicroJet® technology - has been developed for the manufacturing of sophisticated and heat sensitive OLED masks.

PTuB • Threat Agent Detection and Identification Methods—Continued

PTuB4 • 12:00 p.m.
Detection of *B subtilis* spores via Hybrid CARS, *Dmitry Pestov, Robert K. Murawski, Ariunbold Gombojav, Xi Wang, Miaochan Zhi, Alexei V. Sokolov, Vladimir A. Sautenkov, Yuri V. Rostovtsev, Marlan O. Scully; Inst. for Quantum Studies and Depts. of Physics and Chemical Engineering, Texas A&M Univ., USA.* We report the first observation of endospores via a new technique, hybrid CARS, which identifies the endospore marker molecules by simultaneous measurement of several vibrational modes. The scheme holds promise for remote/stand-of detection applications.

PTuB5 • 12:15 p.m.
Chemical and Biological Warfare Agent and Explosives Detection Based on Femtosecond Pulse-Shaping Technology, *Marcos Dantus, Igor Pastirk; Biophotonic Solutions Inc., USA.* Breakthrough technology in remote femtosecond pulse characterization and accurate delivery of ultrashort shaped pulses to distances greater than 30 meters is being used to develop remote detection of explosives as well as biological warfare agents.

PTuC • Commercialization of Applied Research I—Continued

PTuC4 • 12:00 p.m. Invited
Aggressive Commercialization in a Sub-Critical Market, *Marion J. Soileau; Univ. of Central Florida, USA.* Optics, photonics, and lasers are key components of Florida's tech-based economy. This talk discusses the University of Central Florida's focused education, research, commercialization, and industry partnership programs to support and grow this economic sector.

11:30 a.m. – 1:00 p.m. *PhAST* Networking & *PhAST* Power Lunch on Exhibit Hall Floor (12:00 p.m.)

12:15 p.m. – 1:00 p.m. LUNCH BREAK (concessions available on exhibit floor)

1:00 p.m. – 3:00 p.m. *PhAST* Business and Management Panel Discussion

1:00 p.m. – 2:30 p.m.
JTuA • Poster Session I

JTuA1
Power Dissipation Requirements in Slow Light Devices, *Jacob B. Khurgin; Johns Hopkins Univ., USA.* Various slow light schemes are analyzed to determine power dissipation per stored bit. It is shown that required dissipated power increases quite nonlinearly reaching unsustainably high values for the storage capacities needed for optical buffers.

JTuA2
Spectral Properties of Entangled-Photons Generated via Type-I Spontaneous Parametric Downconversion, *So-Young Baek, Yoon-ho Kim; Pohang Univ. of Science and Technology, Republic of Korea.* Complete measurement of single-photon and two-photon joint spectral properties of entangled-photon pairs generated via type-I spontaneous parametric down-conversion under different phase-matching conditions are reported. A theoretical model is developed to explain the observed spectral properties.

JTuA3
Magneto-Optical Resonance in Counterpropagating Waves, *Sergei A. Zibrov[1,2], Yaroslav O. Dudin[1,2], Alexander G. Radnaev[1,2], Vitali V. Vasiliev[3], Vladimir L. Velichansky[1], Denis V. Brazhnikov[3], Alexey V. Taichenachev[3,4], Anatoliy M. Tumaikin[3], Valeriy I. Yudin[3]; [1]P.N. Lebedev Physical Inst. Russian Acad. of Sciences, Russian Federation, [2]Moscow Engineering Physics Inst. State Univ., Russian Federation, [3]Inst. of Laser Physics SB Russian Acad. of Sciences, Russian Federation, [4]Novosibirsk State Univ., Russian Federation.* Electromagnetically-induced absorption resonances in Hanle-configuration are experimentally and theoretically studied in the case of counterpropagating waves. A backward wave presence provides a significant increase of the amplitude. The results may be useful for precision magnetometry.

JTuA4
Quantum Imaging with Incoherent Photons, *Joachim von Zanthier[1], Christoph Thiel[1], Thierry Bastin[2], Enrique Solano[3], Girish S. Agarwal[4]; [1]Inst. for Optics, Information and Photonics, Germany, [2]Inst. for Optics, Information and Photonics, Belgium, [3]Physics Dept., ASC and CeNS, Ludwig-Maximilians-Univ., Germany, [4]Dept. of Physics, Oklahoma State Univ., USA.* We propose a technique to obtain sub-wavelength resolution in imaging with 100% visibility using incoherent light. We can in principle obtain a resolution of λ/N using coincidence-detection of N photons emitted from N excited atoms.

JTuA5
1.5-μm Band Hong-Ou-Mandel Experiment Using Photon Pairs Generated in Two Independent Optical Fibers, *Hiroki Takesue[1,2]; [1]NTT Basic Res. Labs, Japan, [2]CREST, Japan Science and Technology Agency, Japan.* I report the first Hong-Ou-Mandel experiment using two photon pairs in the 1.5-μm band that are generated in two independent dispersion shifted fibers. A quantum interference with 53% visibility was observed.

JTuA6
Negative Bi-Exciton Binding Energy in (211)B InAs/GaAs Piezoelectric Quantum Dots, *Giorgos Dialynas[1], Christina Xenogianni[1,2], Emmanouil Trichas[1,2], Pavlos Savvidis[1,2], Zacharias Hatzopoulos[1,3], Nikolaos Pelekanos[1,2], Giorgos Constantinidis[1]; [1]IESL-FORTH, Greece, [2]Dept. of Materials Science and Technology, Univ. of Crete, Greece, [3]Physics Dept., Univ. of Crete, Greece.* We report on isolated dot spectroscopy of polar (211)InAs/GaAs quantum dots grown by MBE. Exciton and biexciton peaks have been identified, revealing a negative biexciton binding energy attributed to the presence of strong piezoelectric field.

JTuA7
All-Optical Switching at Ultra-Low Light Levels, *Jiepeng Zhang, Gessler Hernandez, Yifu Zhu; Florida Intl. Univ., USA.* We report an experimental demonstration of all-optical switching with the signal and control light pulses containing about 20 photons each, corresponding to a control energy density of ~10-5 photons per atomic cross section $\lambda 2/(2\pi)$.

JTuA8
Narrow Linewidth Diode Laser System for Coherent Precision Spectroscopy, *Andreas Wicht[1], Nadine Strauss[1], Klaus Dõringshoff[1], Ingo Ernsting[1], Bernhard Roth[1], Jeroen Koelemeij[1], Stephan Schiller[1], Rolf-Herman Rinkleff[2], Karsten Danzmann[2]; [1]Univ. of Duesseldorf, Germany, [2]MPI for Gravitational Physics, Germany.* A new type of diode laser system for precision spectroscopy is presented. Its excellent passive stability eases locking to fs-frequency combs, which is demonstrated with high resolution spectroscopy of cold HD^+ ions.

JTuA9
Entangled Photon Generation from a Single Quantum Dot in Microcavity, *Hiroshi Ajiki[1,2], Hajime Ishihara[2,3]; [1]Dept. of Materials Engineering Science, Osaka Univ., Japan, [2]CREST, Japan Science and Technology Agency, Japan, [3]Dept. of Physics and Electronics, Osaka Prefecture Univ., Japan.* A biexciton plays only a minor role in entangled photon generation from a quantum dot in microcavity. The rate of entangled photons becomes almost 100% due to the photon blockade in the strong-coupling regime.

JTuA10
Giant Kerr Effect in Degenerate Closed Transitions, *Luca Spani Molella[1,2], Gerrit Kühn[1,2], Rolf-Hermann Rinkleff[1,2], Karsten Danzmann[1,2]; [1]Max-Planck-Inst. für Gravitationsphysik, Albert-Einstein-Inst., Germany, [2]Inst. für Gravitationsphysik, Leibnitz Univ. Hannover, Germany.* Giant Kerr nonlinearities about twelve orders of magnitudes greater than in glass were measured under negligible absorption conditions within two different closed transitions of the cesium D2 line characterized by electromagnetically induced transparency or absorption.

JTuA11
Compact and Robust Laser System for Rubidium Laser Cooling Based on Fibered Technology at 1560 nm and Second Harmonic Generation, *Fabien Lienhart[1], Salab Boussen[2], Olivier Carraz[1], Nassim Zahzam[1], Yannick Bidel[1], Alexandre Bresson[1]; [1]ONERA, France, [2]Faculte de Medecine de Lyon Nord, France.* We propose a compact and robust laser system for onboard laser cooling experiments like atomic clocks or atomic inertial sensors. Our system is based on the frequency doubling of a fiber bench at 1560 nm.

JTuA12
Mesoscopic Entanglement of Atomic Ensembles through Non-Resonant Stimulated Raman Scattering, *Wenbai Ji, Chunbai Wu, Steven J. van Enk, Michael G. Raymer; Oregon Ctr. for Optics, USA.* Atomic ensemble entanglement can be generated by measuring the Stokes fields and verified by measuring the readout anti-Stokes fields. We model the effects of practical factors and find achievable entanglement regimes at mesoscopic-level excitation.

JTuA13
High-Visibility Classical Multi-Photon Interference, *Ivan N. Agafonov, Maria V. Chekhova, Timur Sh. Iskhakov; Lomonosov Moscow State Univ., Russian Federation.* High-visibility multi-photon interference is usually considered as a signature of non-classical light. We show, theoretically and experimentally, that three-photon interference visibility can be as high as 81.8% for coherent light and 60% for thermal light.

JTuA14
Quantum-Dot-Photon Dynamics in a Coupled-Cavity Waveguide: A Platform for Bandedge Quantum Optics, *David P. Fussell, Marc M. Dignam; Queen's Univ., Canada.* We examine the strong-coupling quantum-dot-photon dynamics at the bandedge of a realistic, lossy, coupled-cavity waveguide and show that the signatures of bandedge coupling and Rabi oscillations are transmitted down the waveguide.

JTuA15
Coherent Association of Two-Component Atomic Condensate into Heteronuclear Molecular Condensate, *Lu Zhou[1], Weiping Zhang[1], Hong Y. Ling[2], Lei Jiang[3], Han Pu[3]; [1]East China Normal Univ., China, [2]Rowan Univ., USA, [3]Rice Univ., USA.* We study the dynamics of associating a two-component atomic condensate into a condensate of heteronuclear molecules. We compare the mean-field results with a full quantum mechanical treatment, emphasizing the effects of atomic population imbalance.

JTuA16
Effects of Polarization-Dependent Loss and Fiber Birefringence on Photon-Pair Entanglement in Fiber-Optic Channels, *Milja Medic, Prem Kumar; Northwestern Univ., USA.* Quantum communication requires that photon-pair entanglement be preserved as the photons are distributed to remote locations. We model the effects of loss and birefringence on polarization-entangled photon pairs propagating in optical fibers.

JTuA17
Is Entanglement Dispensable in Quantum Lithography? *Milena D'Angelo[1], Giuliano Scarcelli[2], Yanhua Shih[3]; [1]European Lab for Nonlinear Spectroscopy (LENS), Italy, [2]Harvard Medical School, USA, [3]Univ. of Maryland, Baltimore County, USA.* Can classical light simulate the effect of quantum lithography? The analysis of the two-photon image generated both by entangled two-photon and by chaotic radiation indicates that only entanglement can double the resolution of an image.

JTuA18
Two-Photon Spectral Coherency Matrix and Multi-Parameter Optical Entanglement, *Cristian Bonato[1,2], Alexander V. Sergienko[1], Babaa E. A. Saleh[1], Malvin C. Teich[1]; [1]Boston Univ., USA, [2]CNR-INFM LUXOR, Dept. of Information Engineering, Univ. of Padua, Italy.* We introduce the concept of two-photon spectral coherency matrix and spectral two-photon Stokes parameters as a counterpart to the classical coherency matrix of broadband polarized light. We discuss its use for characterizing frequency-polarization optical entanglement.

JTuA19
Exploring Non-Conservation of Angular Momentum in Spontaneous Parametric Down-Conversion, *Sheng Feng, Chao-Hsiang Chen, Geraldo A. Barbosa, Prem Kumar; Northwestern Univ., USA.* We propose an efficient method to measure the total angular momentum of the down-converted beams in the case that the angular momentum is not conserved due to azimuthal asymmetry in spontaneous parametric down-conversion.

JTuA20
Velocity-Selective Two-Photon Resonances with Blue and Red Detunings in a Cold Atomic Sample, *Matthew L. Terraciano, Spencer E. Olson, Mark Bashkansky, Zachary Dutton, Fredrik K. Fatemi; NRL, USA.* We explore a cooling mechanism that results from a two-photon Raman process resonant with a particular velocity class of atoms. We have seen evidence for cooling with both red and blue detuned light.

JTuA21
Realization of Loschmidt Echo in Atom Optics Billiard, *Tzabi Grunzweig, Yoav Sagi, Yanbang Wang, Yoni Hertzberg, Armin Ridinger, Nir Davidson; Weizmann Inst. of Science, Israel.* Loschmidt echo of atoms trapped in atom optics billiards with chaotic and mixed dynamics is realized by performing a microwave Ramsey sequence to to their internal state.

JTuA22
Violation of Bell's Inequality with Continuous Spatial Variables, *Ayman F. Abouraddy[1], Timothy Yarnall[2], Babaa E. a. Saleh[2], Malvin C. Teich[2]; [1]MIT, USA, [2]Boston Univ., USA.* We demonstrate an approach to violating Bell's inequality with the continuous spatial variables of entangled-photon pairs using simple optical components that manipulate the spatial parity of the transverse coordinate in one dimension.

JTuA23
Long-Range Spin-Qubit Interaction in Planar Microcavities, *Carlo Piermarocchi[1], Guillermo F. Quinteiro[1], Joaquin Fernandez-Rossier[2]; [1]Michigan State Univ., USA, [2]Univ. of Alicante, Spain.* We study theoretically the coupling between localized spins mediated by itinerant polaritons in a planar micro-cavity. Due to their photon-like mass, polaritons provide an extremely long spin-coupling range, useful for the realization of two-qubit operations.

JTuA24
Integrated Optics Technology for Quantum Information Processing in Atomic Systems, *Jungsang Kim, Changsoon Kim, Caleb Knoernschild, Bi Liu, Kyle S. McKay, Felix Lu; Duke Univ., USA.* Scalable quantum information processing in ion traps or neutral atoms requires highly integrated and functional optical systems for qubit manipulation and detection. We discuss and demonstrate integrated optics technologies that are relevant for this application.

JTuA25
Two-Photon Based Semiconductor Entanglement-Source for Quantum Communications, *Alex Hayat, Pavel Ginzburg, Meir Orenstein; Technion, Israel.* We propose a compact efficient room-temperature polarization-entangled photons source based on two-photon spontaneous emission from semiconductor quantum wells in a microcavity. Pair generation rate in GaInP/AlGaInP is $O(10^3)$ higher than for PDC sources.

JTuA26
Generation of Photon Pairs with Engineered Spectral Properties by Spontaneous Four-Wave Mixing, *Karina Garay-Palmett, Raul Rangel-Rojo, Rodger Evans, Santiago Camacho-López, Alfred B. U'Ren; CICESE, Mexico.* We study the generation of photon pairs by spontaneous four-wave mixing in microstructured optical fibers. We show that it is possible to engineer states with specific spectral entanglement properties suitable for quantum information processing applications.

JTuA27
Propagation of Two Photon States through Dispersive Media and Spectral Entanglement Migration, *Yasser Jeronimo-Moreno, Alfred B. U'Ren; CICESE, Mexico.* We study entanglement migration between modulus and phase for parametric down-conversion photon pairs which propagate through dispersive media. In addition, we discuss a related dispersion suppression effect which occurs for factorable, highly asymmetric states.

JTuA28
Optimized Photon Pair Generation by Parametric Downconversion in Nonlinear Photonic Crystals, *Maria Corona-Garcia-Cabral, Alfred B. U'Ren; CICESE, Mexico.* We explore the generation of photon pairs by the process of parametric downconversion in nonlinear photonic crystals. In particular, we show that careful design of the photonic crystal, can lead to nearly-factorable two-photon states.

1:00 p.m. – 2:30 p.m.
JTuA • Poster Session I—Continued

JTuA29
Multipartite Atom(s)-Field Entanglement in Cavity QED, *Perry Rice[1], James P. Clemens[1], Luis A. Orozco[2]; [1]Miami Univ., USA, [2]Univ. of Maryland, USA.* We consider the entanglement between a multi-level atom and two cavity modes for a cavity QED system, find that cross-correlations between the two modes are witness to atom-field entanglement. Concurrences and log-negativities are also calculated.

JTuA30
A New Scheme of Birefringent Optical Interleaver Employing Ring Cavity as Phase-Dispersion Element, *Chao-Wei Lee[1], Ruibo Wang[2], Pochi Yeh[3], Wood-Hi Cheng[1]; [1]Inst. of Electro-Optical Engineering, Natl. Sun Yat-sen Univ., Taiwan, [2]Accumux Technologies, USA, [3]Dept. of Electrical and Computer Engineering, Univ. of California at Santa Barbara, USA.* A new scheme of an optical interleaver using a ring cavity is proposed. A wide 0.5dB passband (0.91xbandwidth), a large 25dB stopband (0.78xbandwidth), and a high channel isolation (45dB) are obtained.

JTuA31
General Two-Dimensional Coupled-Cavity Microring Filter Architectures, *Asbok P. Masilamani, Vien Van; Univ. of Alberta, Canada.* Two-dimensional coupled-microring arrays of the most general topology are proposed for realizing optical filters with arbitrary spectral responses. A method for synthesizing these filters with optimal design is presented along with numerical examples.

JTuA32
Polymer Waveguide with 4-Channel Circular GI Cores toward High-Speed Optical Interconnects, *Yusuke Takeyoshi, Takaaki Ishigure; Faculty of Science and Technology, Keio Univ., Japan.* We fabricate polymer waveguides with 4-channel circular graded-index cores for the first time by the preform method. The new waveguide exhibits very low-loss (0.029dB/cm), high bandwidth (estimated 60Gbps for 1m) and low inter-channel crosstalk.

JTuA33
Laser-Assisted Electrical Gating in a Two-Terminal Device Based on Vanadium Dioxide Thin Film, *Yong Wook Lee, Bong-Jun Kim, Sungyoul Choi, Byung-Gyu Chae, Hyun-Tak Kim, In Gyoo Kim, Gyungock Kim; Electronics and Telecommunications Res. Inst., Republic of Korea.* In a two-terminal electrical device based on vanadium dioxide thin film, electrical gating has been demonstrated by illuminating a focused laser beam with a wavelength of ~1550 nm onto the selectively etched thin film.

JTuA34
Monitoring of Optical Signal-to-Noise Ratio Using Polarization Maintaining Fiber Bragg Grating, *Khurram Karim Qureshi, Lu Chao, Ping Kong Wai, Xinyong Dong, Hwa Y. Tam; Hong Kong Polytechnic Univ., China.* We present a simple all-optical in-band optical signal-to-noise ratio (OSNR) monitor based on orthogonal polarization detection using a polarization maintaining fiber Bragg grating.

JTuA35
Multimode SCM-Based PON Architecture for Computer Network Applications Using a Low-Cost Polymer 1x8 Splitter/Combiner, *Nikolaos Bamiedakis[1], Jin Yong Ha[1], Fan Yang[1], Adrian Wonfor[1], Richard V. Penty[1], Ian H. White[1], Jon V. Degroot Jr.[2], Terry V. Clapp[2]; [1]Univ. of Cambridge, UK, [2]Dow Corning Corp., USA.* A low-cost PON architecture based on sub-carrier multiplexing and an 8-way low loss multimode polymer splitter/combiner is presented operating at 850nm. Two-channel error-free operation with a Q-factor greater than 8 is observed.

JTuA36
Strain Induced Waveguide Electro-Optic Modulators in Barium Titanate Crystal, *Jiansheng Tang[1], Shujun Yang[2], Apichai Bhatranand[3]; [1]Hunan First Normal College, China, [2]Applied Materials, Inc., USA, [3]King Mongkut's Univ. of Technology Thonburi, Thailand.* Strain-induced waveguide electro-optic phase modulators in barium titanium ($BaTiO_3$) crystal are demonstrated. Low loss waveguide and low half-wave voltage length product are achieved at 1550nm wavelength regime.

JTuA37
Add-Drop Filters Based on Mode Conversion Cavities, *Jacob B. Khurgin[1], Marcel Pruessner[2], Todd Stievater[2], William S. Rabinovich[2]; [1]Johns Hopkins Univ., USA, [2]NRL, USA.* A resonator defined by mode-converting gratings in a waveguide is proposed. This resonator can exhibit narrow resonances similar to Fabry-Perot with an advantage of being a four-port device capable of serving as an add-drop filter.

JTuA38
Modelling Intersubband Electroabsorption Modulation, *Kuan-Meng Wong, Duncan W. Allsopp; Univ. of Bath, UK.* The scope for using intersubband absorption for electroabsorption modulation has been investigated. Rapid changes in intersubband absorption coefficient with electric field are predicted for modulation doped $In_{0.53}Ga_{0.47}As/AlAs$ deep single and coupled quantum wells.

JTuA39
Wavelength Exchange with Enhanced Extinction Ratio in Highly Nonlinear Dispersion-Shifted Fiber, *Rebecca W.L. Fung, Henry K.Y. Cheung, Bill P.P. Kuo, Kenneth K.Y. Wong; Univ. of Hong Kong, Hong Kong.* We demonstrate a simple approach to enhance the extinction ratio of wavelength exchange with a polarization-diversity technique. Over 25 dB of extinction ratio is attained with 6 dB improvement over that of the conventional configuration.

JTuA40
Fiber-Free Characterization of Photonics Integrated Circuits by Thermoreflectance Microscopy, *Maryam Farzaneh[1], Janice A. Hudgings[1], Rajeev J. Ram[2]; [1]Mount Holyoke College, USA, [2]MIT, USA.* We demonstrate the use of amplified spontaneous emission in thermoreflectance imaging of photonic integrated circuits for fiber-free characterization of the integrated cascaded semiconductor optical amplifiers.

JTuA41
Development of Planar Waveguide Based Integrated Optic SPR (Surface Plasmon Resonance) Sensor Array, *Hyungseok Pang, Patrick L. Likamwa, Hyoung J. Cho; Univ. of Central Florida, USA.* An integrated optic SPR biosensor array with on-substrate integrated photodetectors has been developed. The device is able to generate SPR electrical signal directly and has the potential for high throughput optical sensing.

JTuA42
Speckle Mechanism in Optical Coherence Imaging, *Haibo Lin, Ping Yu; Dept. of Physics and Astronomy, Univ. of Missouri at Columbia, USA.* Relation between holographic speckle size and mean free path of milk is studied in a holographic OCI system. Results indicate that speckle size is linearly depends on the mean free path of the turbid media.

JTuA43
Detection of *Bacillus thuringiensis* Spore Germination via CaDPA Biomarker Using Laser Tweezers Raman Spectroscopy, *Shu-shi Huang, De Chen, Yong-qing Li; East Carolina Univ., USA.* We report real-time observation of nutrient-trigged germination process of single Bacillus thuringiensis spores by detection of CaDPA biomarker using laser tweezers Raman spectroscopy. The time-to-germination was heterogeneous for spores and the distribution was measured.

JTuA44
High-Resolution Swept-Source Optical Coherence Tomography with the Frequency-Sweeping the Broadened Spectrum of a fs Cr:forsterite Laser, *Chih-Wei Lu, Meng-Tsan Tsai, Yih-Ming Wang, Cheng-Kuang Lee, Yean-Woei Kiang, C. C. Yang; Natl. Taiwan Univ., Taiwan.* We demonstrate a spectral-domain optical coherence tomography system, including a broadband frequency sweeping light source with the central wavelength around 1250 nm, to achieve an axial resolution of 2.4 μm in tissue.

JTuA45
Broadband, Low Intensity Noise Source for Optical Coherence Tomography at 1.8μm, *A. A. Ferin, A. B. Rulkov, J. C. Travers, S. V. Popov, J. R. Taylor; Femtosecond Optics Group, Imperial College, UK.* We report on a fibre-system, based on CW Er-ASE-source-pumped highly nonlinear fibre. As low as -120dBc/Hz intensity noise of the near-Gaussian >200nm bandwidth was obtained. The source can enable micron-scale OCT around low-scatter 1.8μm region.

JTuA46
Enhancement of Fluorescence and Raman Scattering in a Liquid-Core Optical Fiber Based on Hollow-Core Photonic-Crystal Fibers, *Li Huo[1], Chinlon Lin[1], Yick Keung Suen[2], Siu Kai Kong[2], Lei Jin[3], Guillaume Vienne[4]; [1]Dept. of Information Engineering, Chinese Univ. of Hong Kong, Hong Kong, [2]Dept. of Biochemistry, Chinese Univ. of Hong Kong, Hong Kong, [3]Dept. of Electrical Engineering, Chinese Univ. of Hong Kong, Hong Kong, [4]Dept. of Optical Engineering, Zhejiang Univ., China.* Fluorescence/Raman scattering in a liquid-core optical fiber waveguide based on hollow-core photonic-crystal fibers was demonstrated. 10 times of signal enhancement in a 6-cm long fiber was achieved. Different PCFs showed different enhancement factors.

JTuA47
Cancer Detection Using Infrared Transillumination, *Sanbita Dixit[1], Theresamai Le[1], Khalid Amin[1], Christopher Comstock[2], Gregory Faris[1]; [1]SRI Intl., USA, [2]Univ. of California at San Diego, USA.* The viability of a new infrared imaging modality for the detection of breast cancer is tested via whole animal imaging studies. The potential of this technique for imaging human breast tissue is also demonstrated.

JTuA48
A Novel Confocal Fiber-Optic Laser Method for Exact Intraocular Lens Dioptric Power Measurement, *Ilko K. Ilev, Robert Faaland, Don Calogero; U.S. Food and Drug Administration, Ctr. for Devices and Radiological Health, USA.* Based on a fiber-optic confocal design, we have developed a simple, accurate, objective and quick method for exact focal length measurement of both positive and negative intraocular lenses providing a spatial resolution exceeding 1 μm.

JTuA49
Acousto-Optic Tunable Filter-Based Spectropolarimetric Imagers for Biomedical Applications, *Neelam Gupta; ARL, USA.* Optical imagers that can detect both spectral and polarization signatures are needed in biomedical applications. Acousto-optic tunable filter (AOTF) based imagers are described that are ideally suited to provide both agile spectral and polarization signatures.

JTuA50
Single-Shot Two-Photon Action Cross Section Measurement, *Kebin Shi, Ahmed A. Heikal, Zhiwen Liu; Pennsylvania State Univ., USA.* We report on a one-shot approach for measuring two-photon action cross section without tuning the excitation wavelength. The results obtained by this method show good agreement with that obtained by conventional methods using tunable lasers.

JTuA51
An All-Fiber-Optic Confocal Interference Microscope Using Low-Coherence Near-Infrared Light Source, *Do-Hyun Kim[1], Ronald W. Waynant[1], Ilko K. Ilev[1], Jin U. Kang[2]; [1]U.S. Food and Drug Administration, Ctr. for Devices and Radiological Health, USA, [2]Johns Hopkins Univ., USA.* An all-fiber-optic confocal interference microscope using a broadband near-infrared light source is demonstrated. Detection of interference fringes increases sensitivity and usage of a broadband source reduces undesirable interference between optical components.

JTuA52
Quantitative Phase Contrast Imaging of Cells by Multi-Wavelength Digital Holography, *Alexander Khmaladze, Myung Kim; Univ. of South Florida, USA.* Quantitative phase contrast images of cells are generated by multi-wavelength phase imaging digital holography. Two or more wavelengths are used for simultaneous illumination of the cells and real-time acquisition of holographic images.

JTuA53
Characterization of Skin Incision Closure Using Diode Laser and ICG - Albumin Protein Solder, *Mohammad E. Khosroshahi, Mohammad Sadegh Nourbakhsh; Amirkabir Univ. of Technology, Iran.* The optical and thermal parameters are optimized for an invitro skin closure using a 10W diode laser at 800 nm. The results showed the effects of static and dynamic modes on tissue tensile strength.

JTuA54
Linear, Spatio-Temporal Characterization of UV Microscope Objectives for Nonlinear Imaging and Spectroscopy, *Dawn N. Schafer[1], Wafa Amir[1], Charles G. Durfee[1], Jeff Squier[1], Emily A. Gibson[2], Lauren Kost[2], Ralph Jimenez[2]; [1]Colorado School of Mines, USA, [2]JILA, NIST and Dept. of Chemistry and Biochemistry, Univ. of Colorado, USA.* Spectral interferometry coupled to numerical wave propagation is used to extract the spatial and temporal characteristics of an ultraviolet objective used for nonlinear imaging and spectroscopy.

JTuA55
Fourier Domain Common-Path Fiber OCT with Tunable Reference: Analysis and Optimization, *Jin U. Kang, Abner Rodríguez; John Hopkins Univ., USA.* We have built a Fourier-domain, fiber-optic, common-path OCT system with a tunable reference. We report our initial investigation of the performance of the system and analyze the results.

JTuA56
Optode Design on Flexible Print Circuit Board for a Portable Diffuse Optical Tomography System, *Chun-Ming Wu[1,2], Zong-Han Yu[1,2], Chia-Wei Sun[1], Cho-Pei Jiang[1], Kuo-Tong Ma[1], Jui-Che Tsai[1]; [1]Industrial Technology Res. Inst., Taiwan, [2]Natl. Taiwan Univ., Taiwan.* The optode scheme of DOT is designed for tissue oxygenation probing. The multiplexing illumination and image acquisition are operated with DAQ card interface. In experiments, the hemodynamic images are observed with *in vivo* measurements.

JTuA57
Cascaded Two Wavelength Lasers and Their Effects on C-Band Amplification Performance for Er^{3+}-Doped Fluoride Fiber, *Guanshi Qin, Tatsuya Yamashita, Yasutake Ohishi; Toyota Technological Inst., Japan.* We report cascaded two-wavelength 853nm and 1533nm lasing from Er^{3+}-doped fluoride fiber pumped at 974nm. A new way to get high efficiency and low noise C-band-amplifier is suggested for Er^{3+}-doped fibers with low phonon energy.

JTuA58
Experimental Demonstration of Raman Gain Efficiency and Chromatic Dispersion of Hole-Assisted Fiber: Influence of Bend, *Shailendra K. Varshney, Yukihiro Tsuchida, Kazuya Sasaki, Kunimasa Saitoh, Masanori Koshiba; Hokkaido Univ., Japan.* The Raman gain efficiency and chromatic-dispersion of a hole-assisted fiber with and without minimum allowable bending radius are measured. Numerical predictions from the theory are shown to be in good agreement with the experimental results.

JTuA • Poster Session I—Continued

JTuA59
Radiation Dose Enhancement in Photonic Crystal Fiber Bragg Gratings: Towards Photo-Ionization Monitoring of Irradiation Sources in Harsh Nuclear Power Reactors, *Nikolaos J. Florous, Kunimasa Saitoh, Tadashi Murao, Masanori Koshiba; Div. of Media and Network Technologies, Hokkaido Univ., Japan.* Using kinetic-based models we show that photonic crystal fiber Bragg gratings (PCF-BGs) can exhibit enhanced dose-rate absorption capabilities, in comparison to conventional BGs. The modeling aims to assess the physical-mechanisms defining the response to nuclear-radiation.

JTuA60
A New Compact Polarization Beam Splitter Based on Dual-Elliptical-Core Photonic Crystal Fiber, *Jung-Sheng Chiang; Dept. of Electrical Engineering, I-Shou Univ., Taiwan.* Based on a vectorial boundary element method and the normal mode coupled theory, there is an optimum design for achieving a compact polarization splitter with broad extinction ratio bandwidth by adjusting only one parameter.

JTuA61
Divalent Ytterbium in Ytterbium Doped Aluminosilicate Glass: Aspects on Photodarkening in Fiber Lasers, *Magnus Engholm, Lars Norin; Acreo FiberLab, Sweden.* We show that divalent ytterbium ions are present in ytterbium doped aluminosilicate glass. The presence of Yb^{2+}ions may influence the formation of induced color centers in ytterbium doped fiber lasers leading to reduced performance.

JTuA62
6.4W, Narrowline CW Bismuth-Doped Fiber Laser for Frequency Doubling to 590nm, *Andrey B. Rulkov[1], Anton A. Ferin[1], Sergei V. Popov[1], James R. Taylor[1], I. Razdobreev[2], L. Bigot[2], G. Bowmans[2]; [1]Femtosecond Optics Group, Imperial College London, UK, [2]Univ. des Sciences et Technologies de Lille, France.* 6.4W lasing output at 1178nm is obtained from a Bismuth-doped fiber laser pumped by 50W CW Ytterbium fiber laser. Narrow, below 0.2nm, linewidth shows a potential for frequency doubling to 589.

JTuA63
Optimizing Raman/EDFA Hybrid Amplifier Based on Dual-Order Stimulated Raman Scattering of a Single Pump, *Zhaohui Li[1], Yang Jing Wen[2], Changyuan Yu[3], Weifeng Rong[1], Yixin Wang[2], Tee Hiang Cheng[1]; [1]School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore, [2]Lightwave Dept., Inst. for Infocomm Res. (I²R), A-Star, Singapore, Singapore, [3]Dept. of Electrical and Computer Engineering, Natl. Univ. of Singapore, Singapore.* Based on dual-order stimulated-Raman-scattering of single pump laser, hybrid Raman/EDFA is realized by introducing Erbium doped fiber (EDF) within the span. Gain and noise performance can be improved by optimizing the position of EDF.

JTuA64
Er:Yb-Doped Waveguide Amplifier Fabricated in Oxyfluoride Silicate Glass Using Femtosecond Laser Inscription, *Nicholas D. Psaila[1], Robert R. Thomson[1], Henry T. Bookey[1], Ajoy K. Kar[1], Nicola Chiodo[2], Roberto Osellame[2], Giulio Cerullo[2], Animesh Jha[3], Shaoxiong Shen[3]; [1]Heriot-Watt Univ., UK, [2]Politecnico di Milano, Italy, [3]Univ. of Leeds, UK.* We report for the first time, net gain from a channel waveguide fabricated in Er:Yb doped oxyfluoride silicate glass using femtosecond waveguide inscription. Waveguides were fabricated using the multi-scan technique to control the waveguide cross-section.

JTuA65
Photonic Bandgaps in Photonic Crystal Fibers with Coated High-Index Inclusions, *Markus Hautakorpi, Hannu Hoffrén, Jouni Tiilikainen, Hanne Ludvigsen; Micronova, Helsinki Univ. of Technology, Finland.* We investigate the photonic bandgaps in photonic crystal fibers coated with cylindrical high-index inclusions. Besides numerical modeling, we are studying the feasibility of the atomic layer deposition technique for producing the inclusions.

JTuA66
FM Laser Operation in SOA Based Fiber Ring Lasers, *Simon Lambert Girard[1], Hongxin Chen[2], Gregory W. Schinn[2], Michel Piché[1]; [1]Univ. Laval, COPL, Canada, [2]EXFO Electro-Optical Engineering Inc., Canada.* We present methods for controlling both laser linewidth and lineshape via FM laser operation for tunable single frequency oscillated SOA-based fiber ring lasers, using either phase modulation, or amplitude modulation, or current modulation of SOA.

JTuA67
All-Fiber Integrated Assemblies Based on the Resonant Tunneling Effect in Multi-Core Photonic Band-Gap Fibers, *Kunimasa Saitoh, Nikolaos J. Florous, Shailendra K. Varshney, Masanori Koshiba; Hokkaido Univ., Japan.* We demonstrate the possibility of designing compact ultra-narrow band-pass filters to split four different wavelengths based on the phenomenon of non-proximity resonant tunneling in multi-core photonic band-gap fibers for resonance-sensing and wavelength-selective filtering applications.

JTuA68
Optical Amplification at 0.54 μm by Er^{3+}-Doped Fluoride Fiber, *Guansbi Qin, Tatsuya Yamashita, Yasutake Ohishi; Toyota Technological Inst., Japan.* We demonstrate a 16.5 dB all-fiber optical amplifier at 546 nm using Er^{3+}-doped fluoride fiber for -30 dBm signal powerby forward upconversion pumping of a 974 nm laser diode with power of 225mW.

JTuA69
Suppression of Stimulated Brillouin Scattering in a Photonic/Phononic Crystal Fiber, *Ravi S. Hegde, Herbert G. Winful, Almantas Galvanauskas; Univ. of Michigan, USA.* Analytical model has been developed, which predicts significant suppression of stimulated Brillouin scattering in a fiber structure, which provides photonic-bandgap guidance for optical waves and, simultaneously, phononic-bandgap suppression of electrostrictively driven acoustic waves.

JTuA70
High-Repetition-Rate Passively Q-Switched Ytterbium Doped Fiber Laser with Cr^{4+}:YAG Saturable Absorber, *Lei Pan, Ilya Utkin, Robert Fedosejevs; Univ. of Alberta, Canada.* We demonstrate a passively Q-switched ytterbium doped double-clad fiber laser with Cr^{4+}:YAG saturable absorber. At a pump power of 9.8W, 143ns duration output pulses with 18.5μJ energy are obtained at a repetition rate of 253KHz.

JTuA71
Paradoxical Features of Monochromatic Light Amplification in Multicore Fibers, *Anatoly P. Napartovich, Nikolay N. Elkin, Vera N. Trosbchieva, Dmitry V. Vysotsky; Troitsk Inst. for Innovation, Russian Federation.* It is numerically revealed and properly interpreted a phenomenon of predominant amplification of an optical mode with lower modal gain in 7-core fiber laser. Mode beating is a key factor responsible for this effect.

JTuA72
Extending S-band of EDFA to 1450 nm, *Charu Kakkar[1], K. Thyagarajan[2]; [1]Dept. of Physics, Kirori Mal College, Univ. of Delhi, India, [2]Dept. of Physics, Indian Inst. of Technology Delhi, India.* We show that it is possible to extend the operation of an erbium doped fiber amplifier to amplify in the conventionally inaccessible wavelength band of (1450-1480) nm, with >20 dB gain using reasonable pump power.

JTuA73
Optical Comb Filter Based on the Spectral Talbot Effect in Uniform Fiber Bragg Gratings, *Naum K. Berger, Boris Levit, Baruch Fischer; Technion–Israel Inst. of Technology, Israel.* We numerically and experimentally demonstrate a comb filter based on the analogy between the compression of phase modulated pulse trains and grating spectrum formation. Unchirped uniform fiber Bragg gratings are sufficient for implementing this filter.

JTuA74
The Fabrication of Laser Array by Holographic Interference Lithography, *Chuli Chao[1,2], Chi-Yu Ni[1], Rong Xuan[1,2], Hao-Chung Kuo[3]; [1]Dept. of Electrophysics, Natl. Chiao Tung Univ., Taiwan, [2]Industrial Technology Res. Inst., Taiwan, [3]Dept. of Photonics and Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan.* We have developed a novel method to produce different grating periods in one chip and applied this in the fabrication for laser array. The result shows accurate controllability of lasing wavelength and low threshold currents.

JTuA75
Bandwidth Tunable Band Rejection Filter Based on Helicoidal Fiber Grating Pair of Opposite Hellicity, *Woojin Shin[1], B.-A Yu[1], Y.L. Lee[1], T.J. Eom[1], Y.C. Noh[1], D.K. Ko[1], J. Lee[1], K. Oh[2]; [1]Advanced Photonics Res. Inst., Republic of Korea, [2]Yonsei Univ., Republic of Korea.* We propose a new type of all-fiber bandwidth tunable rejection filter using cascaded helicoidal long-period fiber gratings in single-mode optical fiber and report controllable broadband rejection characteristic with low insertion loss and polarization dependent loss.

JTuA76
Photodarkening and Photobleaching of an Ytterbium-Doped Silica Double-Clad LMA Fiber, *Johan Boullet[1], Inka Manek-Hönninger[1], Thierry Cardinal[2], François Guillen[2], Michael Podgorski[3], Sébastien Ermeneux[3], Ramatou Bello Doua[3], François Salin[3]; [1]CELIA-PALA, France, [2]ICMCB-CNRS, France, [3]Eolite, France.* We studied the temporal behaviour of photodarkening in an Yb-doped LMA fiber and show photobleaching of the same fiber. The absorption spectra and the influence on the lasing properties are shown.

JTuA77
One Centimeter Resolution Temperature Measurements from 25 to 850°C Using Rayleigh Scatter in Gold Coated Fiber, *Alexander K. Sang, Mark E. Froggatt, Dawn K. Gifford, Bryan D. Dickerson; Luna Technologies Inc., USA.* We present high resolution temperature measurements of up to 850°C over a fiber. The interrogation technique is based on measuring the spectral shift of the intrinsic Rayleigh backscatter signal along the optical fiber.

JTuA78
Microjoule Supercontinuum Generation by Prechirped Laser Pulses in a Large-Mode-Area Photonic-Crystal Fiber, *Aleksei Zheltikov, Aleksandr Mitrofanov, Aleksei Podshivalov, Anatoly Ivanov; Moscow State Univ., Russian Federation.* A photonic-crystal fiber with a mode area of 380 μm^2 transforms amplified prechirped Cr:forsterite laser pulses into a supercontinuum spanning from 700 to 1800 nm with a total energy of 1.15 μJ.

JTuA79
Dispersion Tuning of Chirped Sampled Fiber Bragg Gratings by Controlling only Duty Ratios, *Kien T. Dinh[1], Shinji Yamashita[2]; [1]Deparment of Frontier Informatics, Graduate School of Frontier Sciences, Univ. of Tokyo, Japan, [2]Dept. of Electronics Engineering, Univ. of Tokyo, Japan.* We show that the in-channel dispersion of the chirped sampled fiber Bragg gratings can be tuned by controlling the duty ratio, thus various in-channel dispersion values can be realized using a single chirped phase mask.

JTuA80
Ultra-Flat Spectrum, Multiwavelength Operation in an Erbium-Doped Fiber Laser Using Power-Clamping Effect, *Xinhuan Feng[1], H.Y. Tam[1], Chao Lu[2], P. K. A. Wai[2], D.Y. Tang[3]; [1]Photonics Res. Ctr. and Dept. of Electrical Engineering, Hong Kong Polytechnic Univ., China, [2]Photonics Res. Ctr. and Dept. of Electronics and Information Engineering, Hong Kong Polytechnic Univ., China, [3]School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore.* A novel mechanism which utilizes power-clamping effect to realize stable and uniform multiwavelength oscillations in an EDFL is proposed and demonstrated. Up to 50 wavelengths oscillations with wavelength spacing of 0.8 nm has been achieved.

JTuA81
Competition between 20th-Order Rational Harmonic Mode-Locking and Gain-Switching in Inverse Optical Comb Injected Semiconductor Optical Amplifier Fiber Ring Laser, *Jung-Jui Kang[1], Chao-Kuei Lee[1], Gong-Ru Lin[2,3]; [1]Inst. of Electro-Optical Engineering, Natl. Sun Yat-sen Univ., Taiwan, [2]Graduate Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan, [3]Dept. of Electrical Engineering, Natl. Taiwan Univ., Taiwan.* 20th-order rational harmonic mode-locked (RHML) pulses are demonstrated by using 1 GHz backward dark-optical comb injection semiconductor optical amplifier. A less pronounced high-order RHML mechanism than gain-switching is observed from red-shifted wavelength and reduced linewidth.

JTuA82
Collision of Orthogonally Polarized Solitons in Photonic Crystal Fiber, *Alexander Podlipensky, Przemyslaw Szarniak, Nicolas Joly, Chris Poulton, Philip St. J. Russell; Inst. of Optics, Information and Photonics, Max Planck Res. Group, Germany.* We study experimentally the propagation and collision of two orthogonally polarized solitons in a weakly-birefringent photonic crystal fiber. The collision occurs at a particular power and initiates energy transfer between the colliding solitons.

JTuA83
A Volume Bragg Grating Locked Nd:Fiber Laser, *Fredrik Laurell, Valdas Pasiskevicius, Pär Jelger; Royal Inst. of Technology, Sweden.* A Neodymium doped LMA fiber is locked with a volume Bragg grating for the first time, and compared to a conventional fiber laser setup. The efficiency is improved and the linewidth is drastically reduced.

JTuA84
EDFA Gain Stabilization with Fast Transient Behavior by Use of a Semiconductor Optical Amplifier, *Roger Ibrahim, Yaneck Gottesman, Badr-Eddine Benkelfat, Qin Zou; Inst. Natl. des Télécommunications, France.* We propose a solution to improve gain-clamped EDFA stabilization time by inserting in the conventional laser loop configuration an extra SOA. Experimental results demonstrate stabilization time as short as 0.2μs in a purposely-considered critical situation.

JTuA85
Power Scaling of Laser Systems Using Spectral Beam Combining with Volume Bragg Gratings in PTR Glass, *Oleksiy Andrusyak[1], Igor Ciapurin[1], Armen Sevian[1], Vadim Smirnov[2], George Venus[1], Leonid Glebov[1]; [1]CREOL, USA, [2]OptiGrate, USA.* Laser system power can be increased using volume Bragg gratings in PTR glass to combine multiple beams into a near-diffraction-limited beam. We present results of combining five fiber lasers and show achievability of multi-kW-level systems.

JTuA86
Gain Filtering for Single-Spatial-Mode Operation of Large-Mode-Area Fiber Amplifiers, *John R. Marciante; Univ. of Rochester, USA.* Gain filtering of higher-order modes in large-mode-area fibers is an extremely robust method for providing diffraction-limited performance regardless of core diameter or input-beam quality. These predictions extend to 100-μm cores to the 10-kW level.

JTuA • Poster Session I—Continued

JTuA87
Rare Event Simulation of the Performance of an Actively Mode-Locked Fiber Laser Model, *Graham M. Donovan, William L. Kath; Northwestern Univ., USA.* We demonstrate the application of importance sampling to Monte Carlo simulations of an actively mode-locked laser model. The method computes the probability of errors due to both amplitude drop-outs and pulse position shifts.

JTuA88
High Order-Mode Coupling in a Fiber Bragg Grating by Flexural Acoustic-Wave Modulations, *Ming-Yue Fu[1], Wen-Fung Liu[2], Lung Ai[3]; [1]R.O.C. Air Force Acad., Taiwan, [2]Feng-Chia Univ., Taiwan, [3]Chung Cheng Inst. of Technology, Natl. Defense Univ., Taiwan.* When two acoustic flexural waves with appropriate frequencies are launched to a tilted fiber Bragg grating, high-order acousto-optic modulations can be greatly improved by superimposing high-order harmonic acoustic waves.

JTuA89
Low-Loss Splicing Small-Core Photonic Crystal Fibers and Single-Mode Fibers by Repeated Arc Discharges, *Limin Xiao, Wei Jin, M. Suleyman Demokan; Hong Kong Polytechnic Univ., Hong Kong.* We demonstrated low-loss splicing small-core photonic crystal fibers (PCFs) and single-mode fibers by repeated arc discharges applied over the splicing joint to gradually collapse the air holes of the small-core PCF.

JTuA90
Discrimination between Strain and Temperature by Using Holey Fibers-Based Long-Period Fiber Gratings with Different Air Hole Size, *Subo Song[1], Young-Geun Han[1], Gil Hwan Kim[1], Je-Myung Jeong[1,2], Ju Han Lee[1], Sang Bae Lee[1], Chang Hyun Jeong[3], Chi Hwan Oh[3], Hee Jeon Kang[3]; [1]KIST, Republic of Korea, [2]School of ECE Div., Hanyang Univ., Republic of Korea, [3]Optomagic Co. Ltd., Republic of Korea.* We propose and experimentally demonstrate a simple and flexible scheme for simultaneous measurement of strain and temperature based on long-period fiber gratings inscribed in versatile holey fibers with various air-hole sizes.

JTuA91
Emission Intensity Improvement of InGaN Ultraviolet Light-Emitting Diodes Grown on Wet-Etched Sapphire Substrates, *Chang-Cbi Pan, Cbi-Hsun Hsieb, Jen-Inn Chyi; Dept. of Electrical Engineering, Natl. Central Univ., Taiwan.* 400 nm UV LEDs with output power enhancement as much as 87% have been demonstrated on the wet-etching stripe-PSSs, which is attributed to the reduction of dislocation density as well as increased light extraction efficiency.

JTuA92
Multiple Wavelength Emission from Semipolar InGaN/GaN Quantum Wells Selectively Grown by MOCVD, *Hongbo Yu, Taeil Jung, L. K. Lee, P. C. Ku; Univ. of Michigan, USA.* Multiple wavelength emission is experimentally observed from semipolar InGaN/GaN quantum wells selectively grown by MOCVD. Selective growth rates on different mask opening areas result in a multiple wavelength emission from the same wafer.

JTuA93
Carrier Concentration and Junction Temperature Dependencies of Illumination Efficiency of GaN Power Light-Emitting Diodes, *Michael Liao; DaYeb Univ., Taiwan.* Pulsed drive currents have helped us separate the effects that junction temperature and carrier concentration have on current-induced efficiency degradation of GaN Power LEDs. Carrier concentration and junction temperature dependencies of illumination efficiency are presented.

JTuA94
Electronically Tunable Photonic Crystals, *David R.E. Snoswell[1], Pavel Ivanov[1], Martin Cryan[1], Nils Elsner[2], John G. Rarity[1], Chris Bower[2], Brian Vincent[1]; [1]Univ. of Bristol, UK, [2]Kodak European Res., UK.* Electronically tunable diffraction gratings based on 2-D arrays of colloidal particles are presented and measured and modelled results show good agreement. Modelled results for 3-D arrays show tunable reflectivity is possible the visible wavelength range.

JTuA95
Efficient Point Defect Engineered Si Light-Emitting Diode at 1.218 μm, *Jiming Bao[1], Malek Tabbal[1,2], Taegon Kim[1], Supakit Charnvanichborikarn[3], James S. Williams[3], Michael J. Aziz[1], Federico Capasso[1]; [1]Harvard Univ., USA, [2]American Univ. of Beirut, Lebanon, [3]Australian Natl. Univ., Australia.* We have demonstrated a Si LED with an internal quantum efficiency ~ 10 % using a novel approach to enhance light emission based on point defect engineering, which uses state-of-the art technology.

JTuA96
Enhanced ZnO Band-Gap Emission of Electroluminescence from ZnO Nanoparticles/Organic Nanocomposites Using a Hole-Transporting Material, *Chun-Yu Lee[1], Yau-Te Haung[2], Wei-Fang Su[3,4], Cbing-Fub Lin[1,2,5]; [1]Graduate Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan, [2]Graduate Inst. of Electronics Engineering, Natl. Taiwan Univ., Taiwan, [3]Graduate Inst. of Materials Science Engineering, Natl. Taiwan Univ., Taiwan, [4]Dept. of Materials Science Engineering, Natl. Taiwan Univ., Taiwan, [5]Dept. of Electrical Engineering, Natl. Taiwan Univ., Taiwan.* We report electroluminescence from ZnO nanoparticle-based devices prepared by the spin-coating process. The TPD enhances electrons and holes to recombine in the ZnO nanoparticles. The optimal device exhibits a narrow spectrum at 392 nm.

JTuA97
Light Emission from Size Reduced Nanocrystal Silicon Quantum Dots, *Hea-Jeong Cheong, Atsushi Tanaka, Daibei Hippo, Kouichi Usami, Yoshisbige Tsuchiya, Hiroshi Mizuta, Shunri Oda; Tokyo Inst. of Technology, Japan.* We performed HF treatment to silicon quantum dots with diameter of 8nm±1nm fabricated by VHF plasma decomposition process. We observed PL wavelength shift from 750nm to 620nm for 8nm to 2.5nm diameter nc-Si dots.

JTuA98
Patterning and Integration of Polyfluorene Polymers on Micropixellated UV AlInGaN Light Emitting Diodes, *Benoit Guilhabert[1], Zheng Gong[1], Colin Belton[2], Allan Mackintosh[3], Erdan Gu[1], Paul Stavrinou[2], Donal Bradley[2], Dick Pethrick[3], Martin Dawson[1]; [1]Inst. of Photonics, Univ. of Strathclyde, UK, [2]Experimental Solid State Physics, Imperial College, UK, [3]Pure and Applied Chemistry Dept., Univ. of Strathclyde, UK.* The integration of polyfluorene polymer micro-pixels onto GaN-based micropixellated UV Light Emitting Diodes is demonstrated. Polymer down-converted visible emission from these hybrid organic/inorganic electroluminescent micro-arrays is achieved.

JTuA99
Deep Ultraviolet Light Generation at 266 nm by Quasi-Phase-Matched Quartz, *Muneyuki Adachi[1,2], Sunao Kurimura[1], Lenichi Hayashi[2], Kenji Kitamura[1]; [1]Natl. Inst. for Materials Science, Japan, [2]Nidek Co., Japan.* We demonstrated the finest twin structure ever reported in crystal quartz with a period of 17.8-mm. Second harmonic 266-nm light of 0.10-mW was obtained by the third-order QPM in quartz. from a ns-pulsed doubled Nd:YVO_4.

JTuA100
Fluorescent and Photoconductive Properties of Anthradithiophene and Pentacene Derivatives, *Andrew D. Platt[1], Jonathan Day[1], Mark J. Kendrick[1], Sankar Subramanian[2], John E. Anthony[2], Oksana Ostroverkhova[1]; [1]Oregon State Univ., USA, [2]Univ. of Kentucky, USA.* We present optical, fluorescent and photoconductive properties of high-performance anthradithiophene and functionalized pentacene derivatives. Fluorescence emission with lifetimes around or longer than ~10 ns is observed at visible and near-infrared wavelengths, depending on the molecule.

JTuA101
Impulse-Response Reconstruction of a Scattering Medium with the Kramers-Kronig Method, *Yossi Ben-Aderet, Er'el Granot, Shmuel Sternklar; College of Judea and Samaria, Israel.* The Kramers-Kronig (KK) algorithm is implemented for the first time to obtain the optical impulse response of a diffusive medium and detect a concealed object. We achieve sub-picosecond resolution with simple fiber-optic (c-band) test equipment.

JTuA102
Uniform Growth of 10-μm-Core Double-Clad Cr^{4+}:YAG Crystal Fiber, *Kuang-Yao Huang[1], Kuang-Yu Hsu[2], Ren-Chin Sbr[1], Yi-Da Huang[2], Sheng-Lung Huang[2,3], Yan-Sheng Lin[3]; [1]Inst. of Electro-Optical Engineering, Natl. Sun Yat-Sen Univ., Taiwan, [2]Graduate Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan, [3]Dept. of Electrical Engineering, Natl. Taiwan Univ., Taiwan, [4]Dept. of Electronic Engineering, I-Shou Univ., Taiwan.* An auxiliary sapphire tube serving as a heat capacitor was used in the co-drawing laser-heated pedestal growth system for fabricating small core crystal fibers. A factor of 3 improvement was achieved in 10-μm-core double-clad fibers.

JTuA103
Nondestructive Internal Device Characterization of an Oxide-Confined Vertical-Cavity Surface-Emitting Laser, *Victoria de Lange, Kuei Sun, Reuwen Gordon; Univ. of Victoria, Canada.* A nondestructive method is presented to determine the internal properties of vertical-cavity surface-emitting lasers. The refractive index and oxide radius are extracted from the laser modes and agree well with independently determined values.

JTuA104
Nd^{3+}: $(La_{1-x}Ba_x)F_{3-x}$ as Vacuum Ultraviolet Scintillator and New Laser Material, *Marilou M. Cadatal[1,2], Young-Seok Seo[3], Toshibiro Tatsumi[3], Minh Pham[1,2], Carlito Ponseca[1,2], Shingo Ono[4], Elmer Estacio[3], Yusuke Furukawa[3], Hidetoshi Murakami[3], Yasushi Fujimoto[3], Nobuhiko Sarukura[1,2,3], Masabiro Nakatsuka[3], Kentaro Fukuda[5], Rayko Simura[5], Toshibisa Suyama[6], Akira Yoshikawa[5], Tsuguo Fukuda[5]; [1]Laser Res. Ctr. Inst. for Molecular Science, Japan, [2]Graduate Univ. for Advanced Studies, Japan, [3]Inst. of Laser Engineering, Osaka Univ., Japan, [4]Opto-electronics Lab, Nagoya Inst. of Technology, Japan, [5]Inst. of Multidisciplinary Res. for Advanced Materials, Tohoku Univ., Japan, [6]Tokuyama Corp., Japan.* Nd^{3+}: $(La_{1-x}Ba_x)F_{3-x}$ as new scintillator and laser material is explored using efficient micro-PD method. Fluorescence peak located at 175 nm is better compared to Nd^{3+}:LaF_3 due to broader fluorescence and shorter VUV transmission edge.

JTuA105
Efficient CW Optical Limiting in a Nematic Liquid Crystal Twist Cell, *Kenneth D. Singer, Jessica Merlin, Katherine Poseidon; Case Western Reserve Univ., USA.* Highly efficient optical limiting is observed in a nematic liquid crystal twist cell constructed with photoconducting alignment surfaces. Limiting at the submilliwatt level is obtained. The effective optical Kerr coefficient is approximately $10cm^2/W$.

JTuA106
Investigating Charge Carrier Mobilities in Nanocrystal-Polymer Hybrid Photovoltaic Devices, *Fan Zhang, Jian Xu, Ting Zbu, Karthik Sarpatwari, Osama Awadelkarim, S. Ashok; Penn State Univ., USA.* We investigate the properties of charge separation and photo-carrier transport in P3HT/PbSe composites by employing ToF method under selective excitation conditions to study the ligand-effect on the photocarrier-trapping kinetics at the P3HT/PbSe interfaces.

JTuA107
Strong Nuclear Contribution to the Optical Kerr Effect in Niobium Oxide Containing Glasses, *Arnaud Royon[1,2], Lionel Canioni[1], Bruno Bousquet[1], Vincent Rodriguez[2], Michel Couzi[2], Clara Rivero[2,4], Thierry Cardinal[4], Evelyne Fargin[4], Martin Richardson[2], Kathleen Richardson[5]; [1]CPMOH Univ. Bordeaux 1, France, [2]College of Optics and Photonics, CREOL, Univ. of Central Florida, USA, [3]LPCM Univ. Bordeaux 1, France, [4]ICMCB-CNRS, France, [5]School of Material Science and Engineering, Clemson Univ., USA.* Electronic and nuclear contributions to nonlinear optical properties of niobium oxide-based glasses have been measured using THG and pump-probe techniques. Discrepancies with theory have been evidenced for niobium oxide concentrations above 30 mol%.

JTuA108
Evidence of Periodic Electric Fields Generated by Spatial Separation of Photogenerated Electron-Hole Pairs in Short-Period InAs/GaSb Type-II Superlattices, *Xiaodong Mu[1], Yujie J. Ding[1], Stefan P. Svensson[2], John Little[2], V. Swaminathan[2]; [1]Lehigh Univ., USA, [2]ARL, USA.* Under relatively high pump intensities, photoluminescence intensities across the miniband were greatly reduced, which was attributed to the existence of periodic electric fields caused by spatially-separated photogenerated electrons and holes in short-period type-II InAs/GaSb superlattices.

JTuA109
Shape Analysis of Laser Deformed Metallic Nanoparticles, *Heinrich Graener[1], Gerhard Seifert[1], Alexander Podlipensky[2], Bogdan Sepiol[3], Michael Leitner[3]; [1]Martin-Luther-Univ. Halle, Germany, [2]Univ. Erlangen-Nuremberg, Germany, [3]Univ. Wien, Austria.* High-intensity fs-laser pulses permanently change the form of silver nanoparticles in glass and result in optical dichroism. Optical and small angle X-ray scattering experiments are shown which clarify the 3-dimensional shape of the resulting particles.

JTuA110
Estimation of Refractive Index Distribution inside Transparent Materials by Use of Four-Wave Mixing Process, *Takebito Kawasumi, Keisuke Isobe, Takayuki Tamaki, Sbogo Kataoka, Yasuyuki Ozeki, Kazuyosbi Itoh; Osaka Univ., Japan.* By focusing a femtosecond laser pulse and measuring the resultant four-wave mixing (FWM) signal, we successfully estimate refractive index distribution inside a transparent sample based on the analytical expression for FWM intensity and refractive index.

JTuA111
Determination of Interband Transition Dipole Moment of InAs/InGaAs Quantum Dots from Modal Absorption Spectra, *Der Chin Wu, J. K. Kao, M. H. Mao, F. Y. Chang, H. H. Lin; Graduate Inst. of Electronics Engineering, Natl. Taiwan Univ., Taiwan.* Interband-transition dipole moment of InAs/InGaAs quantum dots is determined for the first time by the segmented-modal-absorption method. The extracted dipole moment near 1.3μm wavelength is 32±2 Debye consistent with those reported in the literature.

JTuA112
Doping Effect on Carrier Occupation and Transport in InAs/GaAs Quantum Dot Infrared Photodetectors: A Capacitance-Voltage Spectroscopy Study, *Zbiya Zbao, Kevin R. Lantz, Changhyun Yi, Adrienne D. Stiff-Roberts; Duke Univ., USA.* Impurity centers induced by dopants in InAs/GaAs quantum-dot systems affect energy level occupation and carrier transport in multi-layer QDIPs. In order to better understand doping effects and to optimize device performance, capacitance-voltage spectra are investigated.

JTuA113
Fabrication of Photonic Crystal by Two-Photon Single-Beam Laser Holographic Lithography, *Kam Sing Wong, Yongchun Zbong; Hong Kong Univ. of Science and Technology, Hong Kong.* In this report, we demonstrate the fabrication of photonic crystals by two-photon holographic lithography through a single laser beam by introducing a specially designed prism.

JTuA • Poster Session I—Continued

JTuA114
Linear Electro-Optic Coefficient in Multilayer Self-Organized InAs Quantum Dot Structures, *Imran Akca[1], Aykutlu Dana[1], Atilla Aydinli[1], Marco Rossetti[2], Lianhe Li[2], Nadir Dagli[3], Andrea Fiore[2]; [1]Bilkent Univ., Turkey, [2]Ecole Polytechnique Fédérale de Lausanne EPFL, Switzerland, [3]ECE Dept., Univ. of California at Santa Barbara, USA.* The electro optic properties of three and five layers of self-organized InAs quantum dot lasers which were grown by molecular beam epitaxy have been investigated. Enhanced electro-optic coefficients compared to bulk GaAs were obtained.

JTuA115
Threshold Analysis of Longitudinal Modes in Surface Emitting Organic Distributed Feedback Lasers, *Sidney S. Yang, Yun-Ching Chang; Inst. of Photonics Technologies, Natl. Tsing Hua Univ., Taiwan.* We present theoretical analysis of the mode discrimination and threshold gain of multiple longitudinal modes observed from a surface-emitting organic DFB laser. Based on the individual pumping threshold energy, the corresponding extraction ratio is estimated.

JTuA116
Polarization Dependence of SHG Efficiency in Periodically-Twinned QPM Quartz, *Masaki Harada[1], Sunao Kurimura[1], Kenji Kitamura[1], Ken-ichi Muramatsu[2], Motoi Ueda[2]; [1]Natl. Inst. for Materials Science, Japan, [2]Nikon Corp., Japan.* We examined second harmonic generation efficiency depending on input polarization state of the fundamental wave in crystal-quartz wavelength converter. We found the optimum polarization state for efficient SHG at 532 nm.

JTuA117
Fabrication of PPLT Crystal Fiber by the Method of Laser Heated Pedestal Growth, *Ta-Min Tai[1], Shan-Chuang Pei[2,3], Li-Min Lee[1], Sheng-Lung Huang[2,4], A. H. Kung[3,5]; [1]Inst. of Electro-Optical Engineering, Natl. Sun Yat-Sen Univ., Taiwan, [2]Graduate Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan, [3]Inst. of Atomic and Molecular Sciences, Academia Sinica, Taiwan, [4]Dept. of Electrical Engineering, Natl. Taiwan Univ., Taiwan, [5]Dept. of Photonics and Inst. of Electro-Optical Engineering, Natl. Chiao-Tung Univ., Taiwan.* The fabrication of a periodic poled Lithium Tantalate single crystal fibers were firstly achieved in-situ via the laser heated pedestal growth method. The spectrum of second harmonic generation was characterized.

JTuA118
Novel Full-Color Photorefractive Polymer for Photonics Applications, *Peng Wang[1], Tao Gu[1], Shuji Rokutanda[1], Michibaru Yamamoto[1], Robert Norwood[2], Nasser Peyghambarian[2]; [1]Nitto Denko Technical Corp., USA, [2]College of Optical Sciences, Univ. of Arizona, USA.* Full-color sensitive (488nm, 532nm, 633nm) photorefractive polymer system based on hole-transport polytetraphenyldiaminobiphenyl (TPD) is present. Several novel dynamic holographic applications have been demonstrated based on these materials.

JTuA119
Excited State Absorption Cross-Section Spectrum of Chlorophyll A, *Daniel S. Corrêa, Leonardo De Boni, Felippe J. Pavinatto, David S. dos Santos, Cleber R. Mendonça; Inst. de Física de São Carlos, Univ. de São Paulo, Brazil.* This paper reports on the nonlinear absorption (reverse saturation of absorption and saturation of absorption) spectrum of Chlorophyll A solution obtained through the white light continuum Z-scan technique.

JTuA120
Study of Transient Effects in Photo-Excited Semiconducting Polymer and Bulk Heterojunctions, *Yi-Hsing Peng, Weilou Cao, Min Du, Danilo Romero, Warren N. Herman, Chi H. Lee; Lab for Physical Sciences, Univ. of Maryland, USA.* Transient dynamics of photoexcited carriers in MEH-PPV, PCBM-C_{60} and their blend is investigated by THz-TDS using a 400nm pump and terahertz probe. Free and bound carriers are revealed in the measurement of the complex conductivity.

JTuA121
A Novel Anti-Reflecton Coated FP Laser Amplifier for 2.5Gbit/s DWDM-PON Transmission, *Yu-Sheng Liao[1], Yung-Jui Chen[2], Yin-Hsun Huang[3], Hai-Lin Wang[3], Sun-Chien Ko[3], Gong-Cheng Lin[3], Gong-Ru Lin[4]; [1]Dept. of Photonics and Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan, [2]Dept. of Computer Science and Electrical Engineering Univ. of Maryland, Baltimore County, USA, [3]Telecommunication Labs Advanced Technology Lab, Taiwan, [4]Graduate Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan.* A novel anti-reflection coated Fabry-Perot laser amplifier under side-mode injection-locking for 2.5Gbit/s DWDM-PON is demonstrated with SMSR >35dB, Q-factor 9.2, locking range of 30nm, power penalty of -0.7dB, and BER of 10^{-12} at -23.7dBm.

JTuA122
Real-Time PMD Monitoring Using a DOP Ellipsoid Based on PSO Technique, *Xiaoguang Zhang[1,2], Lixia Xi[1,2], Gaoyan Duan[1,2], Bojun Yang[1,2]; [1]Beijing Univ. of Posts and Telecommunications, China, [2]Key Lab of Optical Communications and Lightwave Technologies, Ministry of Education, China.* DOP ellipsoid can be used as PMD monitoring signal for automatic PMD compensation. We introduced the particle swarm optimization algorithm into obtaining real-time DOP ellipsoid with high precision only by 100 sampling SOP data.

JTuA123
Multiple-Wavelength Transmission Using FP-LD for Increasing Upstream Capacity in Asymmetric TDM-PON, *Manik Attygalle[1,2], Yang Jing Wen[2], Jaya Shankar[2], Thas Nirmalathas[1], Xiaofei Cheng[2], Yixin Wang[2]; [1]Natl. ICT Australia, Australia, [2]Inst. for Infocomm Res., Singapore.* We propose a new technique for multiple-wavelength upstream transmission in time division multiplexed-passive optical networks using FP-LDs at optical network units. The scheme increases upstream capacity without the use of costly higher speed burst-mode transceivers.

JTuA124
40 GHz All-Optical Clock Recovery Using Cross-Absorption in an Electro-Absorption Modulator Inside a Fiber Ring Laser , *L. F. K. Lui[1], Lixin Xu[1,2], C C Lee[1], P. K. A. Wai[1], C. Lu[1], H. Y. Tam[1]; [1]Hong Kong Polytechnic Univ., Hong Kong, [2]Dept. of Physics, Univ. of Science and Technology of China,, China.* We demonstrated 40 GHz all-optical clock recovery system using an erbium-doped fiber laser that incorporates a 10 GHz electro-absorption modulator and a linear optical amplifier. Stable pulses with pulsewidth of 6 ps are obtained.

JTuA125
Pulse Limiting Amplification by Saturation Effects in an SOA, *Giampiero Contestabile, Marco Presi, Roberto Proietti, Nicola Calabretta; Scuola Superiore Sant'Anna Pisa (Italy), Italy.* We study the limiting-amplification capability of a saturated SOA followed by an optical filter in case of amplitude-modulated 20GHz pulses. We report more than 25 dB amplitude-modulation-reduction for input modulating frequencies in the range 100KHz-3GHz.

JTuA126
All-Optical ASK-DPSK Signal Regeneration Using a Semiconductor Optical Amplifier, *Mable P. Fok[1], Chester Shu[1], Daniel J. Blumenthal[2]; [1]Chinese Univ. of Hong Kong, Hong Kong, [2]Univ. of California at Santa Barbara, USA.* We demonstrate 10-Gb/s and 20-Gb/s DPSK and ASK-DPSK signal regeneration based on cross-phase modulation in a SOA. The amplitude noise is reduced and the receiver sensitivity is improved by 3 dB.

JTuA127
Biasing a Diode Laser at the Self-Mixing Crossover Improves Immunity to Backreflection, *Silvano Donati, Enrico Randone; Dept. Elettronica, Italy.* Effects of back-reflection in diode lasers is substantially mitigated biasing the device at the self-mixing crossover, which is found by a simple setup. De-sesitization of reflection effects by a factor of 25 dB is reported.

JTuA128
A Fully Bi-Directional 2.4GHz Wireless-Over-Fibre System Using Photonic Active Integrated Antennas (PhAIAs), *Vitawat Sittakul, Martin Cryan; Univ. of Bristol, UK.* A Low cost Wireless-over-fibre system has been demonstrated over 300m of MMF. Throughput and SNR as a function of RF propagation distance are shown and successful streaming of video is achieved over a 10m range.

JTuA129
High Spectral Efficiency Phase Diversity Coherent Optical CDMA with Low MAI, *A Brinton Cooper, Jacob B. Khurgin, Shuangmei Xu, Jin U. Kang; Johns Hopkins Univ., USA.* Spectrally phase-coded optical code division multiple access (OCDMA), demodulated with phase and polarization diversity devices, exhibits high spectral efficiency and low Multiple Access Interference (MAI). Use in a passive optical network (PON) is discussed.

JTuA130
Theoretical Study on the Performance of Optical Phase Conjugation for Ultra Long-Haul Differential Phase-Shift-Keyed Transmission, *Nat Sarapa, Pasu Kaeuplung; Chulalongkorn Univ., Thailand.* The performances of optical phase conjugation (OPC) in reducing the nonlinear phase noise accumulation in DPSK transmission is theoretically analyzed and compared with that in the periodic dispersion-compensated (DC) system.

JTuA131
Sub-Clock Extraction of Optical Signals at High Rates Using an Opto-Electronic Phase-Locked Loop Based on Three-Wave Mixing in Periodically-Poled Lithium Niobate, *Fausto Gómez Agis, Cédric Ware, Didier Erasme; École Natl. Supérieure des Télécommunications, France.* Sub-clock extraction and clock synchronization of signals, at rates of 30 GHz and 10 Gbps, by an opto-electronic phase locked-loop based on three-wave mixing in periodically-poled lithium niobate, are demonstrated.

JTuA132
PMD Compensation with Coherent Reception and Digital Signal Processing, *Stefan Boehm, Knut Schumacher, Daniel Goelz, Peter Meissner; TU Darmstadt, Germany.* Coherent reception in optical communication systems enables PMD compensation by digital signal processing. An approach for broadband compensation is presented and the required oversampling ratio and resolution of the analog-digital conversion is examined.

JTuA133
Mitigation of Transient Response of Erbium-Doped Fiber Amplifier for Burst Traffic of High Speed Optical Packets, *Yoshinari Awaji[1], Hideaki Furukawa[1], Naoya Wada[1], Peter Chan[2], Ray Man[2]; [1]Natl. Inst. of Information and Communications Technology, Japan, [2]AMONICS Ltd., China.* We found that an EDFA which adopted the EDF with enhanced active erbium area can mitigate short-term transient response for sub-micro seconds caused by the traffic of high speed optical packets without any external controlling.

JTuA134
Suppression of Phase Noise Induced by Intrachannel Four-Wave Mixing Using Phase Noise Averagers, *Chia Chien Wei, Jason (Jyehong) Chen; Inst. of Electro-Optical Engineering, Natl. Chiao-Tung Univ., Taiwan.* This work investigates a novel phase noise averagers to suppress IFWM-induced phase noise of RZ-DPSK signals. Both analytical and simulation results confirm that the IFWM-induced phase noise will be converged, even after an ultra-long transmission.

JTuA135
Multi-Uplink Passive Optical Networks, *C.- Y. Li, P. K.A. Wai; Photonics Res. Ctr. and Dept. of Electronic and Information Engineering, Hong Kong Polytechnic Univ., Hong Kong.* We propose to use multiple uplinks in passive optical networks (PONs) to increase the optical transmission power from users to central office. The requirement of the PON receiver at the central office is discussed.

JTuA136
High Density FTTH Network Utilizing Asymmetric Data Transmission, *Tak-Chuen Luk, Ozdal Boyraz; Univ. of California at Irvine, USA.* A WDM-PON recycling incoming light to transmit upload stream has been proposed. Effect of Rayleigh scattering and uneven energy distribution are evaluated to achieve >60km bidirectional communication carrying 10Gb/s download and >300Mb/s upload data traffic.

JTuA137
Impact of Facet Reflectivity and Operation Condition on Injection-Locking Fabry-Perot Laser Diodes with Spectrum Sliced ASE Noise in WDM-PON, *Xiao-Fei Cheng, Yang Jing Wen, Zhaowen Xu, Yixin Wang, Jaya Shankar; Inst. for Infocomm Res., Singapore.* We evaluate performance of Fabry-Perot laser diodes (FPLDs) injection locked by spectrum sliced ASE noise. Results show that performance of injection locked FPLDs is significantly improved by optimizing their front-facet reflectivity, operation temperature and bias.

JTuA138
Depolarization of External Optical Feedback on VCSEL and Variation of Relative Intensity Noise, *Shinyoung Yoon[1], Dongsoo Lee[1], Youngsoon Heo[1], Sbinwook Lee[2], Byong-seong Ham[3]; [1]ETRI, Republic of Korea, [2]CREOL and FPCE, Univ. of Central Florida, USA, [3]Graduate School of Information and Communications, Inha Univ., Republic of Korea.* By using of optical depolarizer, polarization dependence of external optical feedback on VCSEL is drastically reduced. Relative intensity noise and transmission characteristics of VCSEL are experimentally investigated under various polarization states of external optical feedback.

JTuA139
High Repetition Rate Passively Q-Switched Erbium-Doped Fiber Laser Incorporating an Electro-Absorption Modulator, *Lixin Xu[1,2], L. F. K. Lui[1], P.K.A. Wai[1], H.Y. Tam[1], Chao Lu[1]; [1]Hong Kong Polytechnic Univ., China, [2]Dept. of Physics, Univ. of Science and Technology of China, China.* We report a novel passively Q-switched fiber laser using an electro-absorption modulator (EAM) as a saturable absorber. The fast response time of the EAM enables the Q-switched fiber laser to operate at high repetition rate.

JTuA140
Uncompensated 20 Gb/s Duobinary Polarization Division Multiplexing Transmission over 200 km, *Paolo Martelli[1], Pierpaolo Boffi[1,2], Maddalena Ferrario[1], Lucia Marazzi[1], Paola Parolari[1], Aldo Righetti[1], Rocco Siano[1], Mario Martinelli[1,2]; [1]CoreCom, Italy, [2]Politecnico di Milano, Dept. di Elettronica e Informazione, Italy.* Transmission of 20 Gb/s optical signal over 200 km of uncompensated SMF fiber is achieved. The duobinary format dispersion robustness has been exploited together with polarization division multiplexing to significantly increase the maximum uncompensated reach.

NOTES

ROOM 318-320	ROOM 321-323	ROOM 324-326	ROOM 314	ROOM 315	ROOM 316	ROOM 317	ROOM 336
CLEO	JOINT	CLEO					QELS

2:30 p.m. – 4:15 p.m.
CTuU • NLO Devices
Presider to Be Announced

CTuU1 • 2:30 p.m.
Efficient Single-Pass Optical Parametric Generator for Environmental Gas Sensing Based on Periodically Poled Stoichiometric Lithium Tantalate, *Nan Ei Yu[1], Yongboon Lee[1], Yeung Lak Lee[1], Changsoo Jung[1], Do-Kyeong Ko[1], Jongmin Lee[1], Kenji Kitamura[2], Shunji Takekawa[2], Jung Hoon Ro[3]; [1]Gwangju Inst. of Science and Technology, Republic of Korea, [2]Natl. Inst. for Materials Science, Japan, [3]Dept. of Biomedical Engineering, Pusan Nat'l Univ., Republic of Korea.* An efficient 1064 nm-pumped OPG that could be operated at room temperature using a PPMgSLT crystal is presented. 1.6 W total output for a 4.8 W input, power conversion of 50% was achieved.

CTuU2 • 2:45 p.m.
Fibered Laser System for Rubidium Laser Cooling Based on Telecom Technology at 1560 nm and Frequency Doubling, *Fabien Lienhart[1], Salah Boussen[2], Olivier Carraz[1], Nassim Zahzam[1], Yannick Bidel[1], Alexandre Bresson[1]; [1]ONERA, France, [2]Faculté de Medecine de Lyon Nord, France.* We propose a new compact and reliable laser system for rubidium laser cooling in onboard experiments. Our system is based on the frequency doubling of a telecom fiber bench at 1560 nm.

2:30 p.m. – 4:15 p.m.
JTuB • Symposium on Self-Phase Modulation I
William Bischel; Gemfire Corp., USA, Presider

JTuB1 • 2:30 p.m. Invited
Self-Phase Modulation: The Formative Years, *T. K. Gustafson; Univ. of California at Berkeley, USA.* An overview will be presented covering early initial observations and interpretation of self phase modulation in self-trapped filaments of light and mode-locked laser pulses, the subsequent evolution of the basic concepts, and various formative applications.

2:30 p.m. – 4:15 p.m.
CTuV • Novel Microscopy
Adam Wax; Dept. of Biomedical Eng., Duke Univ., USA, Presider

CTuV1 • 2:30 p.m.
The Role of Amplitude and Phase in Fluorescence Coherence Imaging: From Wide Field to Nanometer Depth Profiling, *Alberto Bilenca, Chulmin Joo, Aydogan Ozcan, Johannes F. de Boer, Brett E. Bouma, Guillermo J. Tearney; Harvard Medical School and Wellman Ctr. for Photomedicine, USA.* We investigate the amplitude and phase of fluorescence self-interference fields and their implication for new imaging strategies. Wide-field (y > 1mm, z > 100μm) high-resolution (micron-scale) imaging and phase-contrast profiling with nanometer sensitivity are demonstrated.

CTuV2 • 2:45 p.m.
Quantitative Phase Microscopy with Asynchronous Digital Holography System, *Kevin J. Chalut, William J. Brown, Neil Terry, Adam Wax; Duke Univ., USA.* We demonstrate a new method of measuring quantitative phase in biological materials. The method utilizes asynchronous digital holography, which uses a moving fringe created by acousto-optic modulators. Results are demonstrated on live cell samples.

2:30 p.m. – 4:15 p.m.
CTuW • Short Wavelength Generation and Applications
Randy Bartels; Colorado State Univ., USA, Presider

CTuW1 • 2:30 p.m.
Grating-Assisted Phase Matching in Extreme Nonlinear Optics, *Oren Cohen, Xiaoshi Zhang, Amy Lytle, Tenio Popmintchev, Margaret M. Murnane, Henry C. Kapteyn; JILA, Univ. of Colorado at Boulder, USA.* We propose a new technique for phase-matching frequency upconversion into the X-ray region. High harmonic generation in the presence of a weak counter-propagating quasi-CW beam is equivalent to low-order harmonic generation via grating-assisted phase-matching.

CTuW2 • 2:45 p.m.
Characterizing Spatio-Temporal Coupling of Extreme Ultraviolet Ultrashort Pulses from High Harmonic Generation, *Adam S. Wyatt[1], Tobias Witting[1], Antoine Monmayrant[1], Ian A. Walmsley[1], Charles Haworth[2], Joseph S. Robinson[2], John W. G. Tisch[2], Jonathon P. Marangos[2]; [1]Univ. of Oxford, UK, [2]Imperial College London, UK.* We demonstrate a tool for performing measurements of space-time coupling of ultrashort, extreme ultraviolet pulses from high harmonic generation which can be used to study propagation and phasematching effects during the generation process.

2:30 p.m. – 4:15 p.m.
CTuX • Novel VCSELs
Kent D. Choquette; Univ. of Illinois, USA, Presider

CTuX1 • 2:30 p.m.
Transverse Mode Control in High-Contrast Subwavelength Grating VCSEL, *Ye Zhou, Michael C.Y. Huang, Connie J. Chang-Hasnain; Dept. of Electrical Engineering and Computer Sciences, Univ. of California at Berkeley, USA.* We present the experimental study on transverse mode control in VCSEL utilizing finite-area single-layer high-index-contrast subwavelength grating. A 2mW, single transverse mode (30dB) emission can be obtained for HCG-VCSEL with oxide aperture up to 10μm.

CTuX2 • 2:45 p.m.
Two-Dimensional Electronic Beam-Steering with Implant-Defined VCSEL Arrays, *Ann C. Lehman, Dominic F. Siriani, Kent D. Choquette; Univ. of Illinois at Urbana-Champaign, USA.* By controlling injection current to each of three elements in a coherently coupled implant-defined triangular vertical cavity laser array, we are able to steer the main lobe of emission in two dimensions.

2:30 p.m. – 4:15 p.m.
CTuY • Silicon-Based Optical Materials
Mihaela Dinu; Bell Labs, Lucent Technologies, USA, Presider

CTuY1 • 2:30 p.m.
Neodymium Doped Ultrathin Sol-Gel Tapered Channel Waveguide Amplifier on Silicon Substrate, *Asher Peled, Menachem Nathan, Alexander Tsukernik, Shlomo Ruschin; Tel-Aviv Univ., Israel.* We report on a fully monolithic Neodymium doped sol-gel tapered rib waveguide amplifier. Signal and pump were coupled by grating couplers. A gain of 4.8dB (3.75dB net gain) was obtained from a 1cm long device.

CTuY2 • 2:45 p.m.
Buried As_2S_3 Strips for High-Mode-Confinement Optical Waveguiding, *Mehmet Solmaz, Robert Atkins, Jim Gardner, Christi K. Madsen; Texas A&M Univ., USA.* As_2S_3 strips were fabricated on thermal oxide using a lift-off procedure. Buried structures are formed by covering the strips with SiO_2, and initial optical testing confirms waveguiding.

2:30 p.m. – 4:15 p.m.
CTuZ • Photonic Structures for Emission and Detection
Roel Baets; Univ. of Ghent, IMEC, Belgium, Presider

CTuZ1 • 2:30 p.m.
Nano-Scale Nanocrystal Quantum Dot Photodetectors, *Michael C. Hegg, Lih Y. Lin; Univ. of Washington, USA.* We present the design, fabrication and testing results of a nano-scale quantum dot photodetector composed of quantum dots that are positioned between a nano-gap in electrodes and optically excited with CW light.

CTuZ2 • 2:45 p.m.
Photonic Crystal Infrared Photodetectors, *Stephan Schartner, Werner Schrenk, Sebastian Golka, Maximilian Austerer, Pavel Klang, Aaron Maxwell Andrews, Gottfried Strasser; Ctr. for Micro- and Nanostructures, TU Wien, Austria.* The photonic crystal enables response to surface incident radiation for intersubband-based QWIPs. The angular and polarization dependence of the spectral photocurrent is used to map the photonic band structure and to investigate polarization conversion effects.

2:30 p.m. – 4:15 p.m.
QTuG • Micro-Cavities and Random Media
Vasily N. Astratov; Univ. of North Carolina at Charlotte, USA, Presider

QTuG1 • 2:30 p.m.
Relaxation Oscillations in Neodymium Random Lasers, *G. Zhu, M. Baboura, M. A. Noginov; Norfolk State Univ., USA.* Using the developed analytical model, we adequately describe relaxation oscillations in the $Nd_{0.5}La_{0.5}Al_3(BO_3)_4$ random laser. Anomalously long series of stimulated emission pulses are observed in the $(Nd:BFAP)_{0.75}(Cr:YAG)_{0.25}$ random laser.

QTuG2 • 2:45 p.m.
Liquid Crystals Based Tunable High-*Q* Directional Random Laser from a Planar Random Microcavity, *Qinghai Song[1], Shumin Xiao[1], Xinchuan Zhou[1], Liying Liu[1], Lei Xu[1], Yonggang Wu[1], Zhansban Wang[2]; [1]Fudan Univ., China, [2]Tongji Univ., China.* Temperature tunable directional laser emission from a liquid crystal based planar random cavity laser is presented. The emitted laser is an ultra high *Q* factor (Q>20000), highly directional, and temperature dependent single mode laser.

QELS

CLEO

2:30 p.m. – 4:15 p.m.
QTuH • Slow and Fast Light and Other Phenomena
Presider to Be Announced

QTuH1 • 2:30 p.m.
Observation of Subluminal and Superluminal Regimes in Coupled Mode Optical Propagation, *Francesco Moricbetti[1,2], Andrea Melloni[2], Mario Martinelli[1,2]; [1]CORECOM, Italy, [2]Politecnico di Milano, Italy*. Attraction and repulsion of coupled modes with swinging subluminal and superluminal group velocity is directly observed, for the first time, at optical frequencies. The measurement technique combines polarization-sensitive low-coherence interferometry with light-trapping in a ring-resonator.

QTuH2 • 2:45 p.m.
Pulse Propagation near Exciton Resonance: Anomalous Transition between Slow and Fast Light, *Yan Guo, Susanta Sarkar, Hailin Wang; Univ. of Oregon, USA*. Experimental studies of optical pulse propagation near exciton absorption resonance in an optically thick GaAs quantum well reveal an anomalous transition between regimes of slow and fast light.

2:30 p.m. – 4:15 p.m.
QTuI • Entanglement and Squeezing II
Presider to Be Announced

QTuI1 • 2:30 p.m.
Teleporting below the Vacuum-Noise Level: Non-Local Transfer of Squeezing and Entanglement, *Hidebiro Yonezawa[1,2], Samuel L. Braunstein[3], Akira Furusawa[1,2]; [1]Univ. of Tokyo, Japan, [2]CREST, Japan Science and Technology Agency, Japan, [3]Univ. of York, UK*. We demonstrate the unconditional quantum teleportation of a squeezed state of light. We observe -0.8 ± 0.2dB of squeezing in the teleported state. Our experiment also demonstrates the first unconditional quantum teleportation of entanglement.

QTuI2 • 2:45 p.m.
9 dB Quadrature Squeezing at 860 nm with Periodically-Poled $KTiOPO_4$, *Yuisbi Takeno[1,2], Mitsuyoshi Yukawa[1,2], Hidebiro Yonezawa[1,2], Akira Furusawa[1,2]; [1]Univ. of Tokyo, Japan, [2]CREST, Japan Science and Technology Agency, Japan*. We generate a squeezed vacuum state at 860 nm with a periodically-poled $KTiOPO_4$ crystal as a nonlinear medium of an optical parametric oscillator. We observe -9.0±0.2 dB of squeezing with local oscillator phase locked.

2:30 p.m. – 4:15 p.m.
CTuAA • Microwave Photonics
Paul W. Juodawlkis; MIT Lincoln Lab, USA, Presider

CTuAA1 • 2:30 p.m. **Tutorial**
Microwave Photonic Signal Processing, *Robert A. Minasian; Univ. of Sydney, Australia*. Photonic signal processing offers a new, powerful paradigm for processing high bandwidth signals. This overview presents recent new methods in wideband signal processing using optical delay lines, including state-of-the-art results, and capabilities for high-resolution processing.

2:30 p.m. – 4:15 p.m.
CTuBB • Novel Fiber Designs
Siddharth Ramachandran; OFS Labs, USA, Presider

CTuBB1 • 2:30 p.m.
Er-Yb-Doped LMA Fiber Structures for High Energy Amplification of Narrow Linewidth Pulses at 1.5μm, *Guillaume Canat[1], Laurent Lombard[1], Sylvia Jetschke[2], Sonja Unger[2], Johan Kirchhof[2], Hans-Reiner Müller[2], Anne Durécu[1], Véronique Jolivet[1], Pierre Bourdon[1]; [1]ONERA/DOTA, France, [2]IPHT, Germany*. A high-energy (0.6mJ), narrow-linewidth fiber MOPA is built using Erbium-Ytterbium doped large-mode-area fibers. Pedestal and multifilament core fiber structures are compared. The multifilament fiber shows the best beam quality (M^2~1.9) and stability.

CTuBB2 • 2:45 p.m.
Gain Interaction in the Design of Bend-Resistant Large Mode Area Amplifier Fibers, *John M. Fini; OFS Labs, USA*. Fibers with very large mode area see degraded gain competition when bent for spooled-fiber operation. Simulations demonstrate that recently proposed bend-distortion-resistant designs are immune to gain degradation, as well as effective area reduction.

2:30 p.m. – 4:15 p.m.
CTuCC • THz Metamaterials and Photonic Crystals
Ajay Nahata; Univ. of Utah, USA, Presider

CTuCC1 • 2:30 p.m.
Terahertz Switch/Modulator Based on Metamaterials, *Hou-Tong Chen[1], Willie J. Padilla[2], Joshua M. Zide[3], Art C. Gossard[3], Richard D. Averitt[1], Toni J. Taylor[1]; [1]Los Alamos Natl. Lab, USA, [2]Boston College, USA, [3]Univ. of California at Santa Barbara, USA*. Real-time control of terahertz metamaterial has been experimentally demonstrated through an electrical approach. The THz switching and modulation capabilities are realized by the external voltage bias to a planar hybrid metamaterial-miconductor structure.

CTuCC2 • 2:45 p.m.
Properties of Novel Terahertz Electric Metamaterials, *John F. O'Hara[1], Evgenya Smirnova[1], Hou-Tong Chen[1], Antoinette J. Taylor[1], Richard D. Averitt[1], Clark Highstrete[2], Mark Lee[2], Willie J. Padilla[3]; [1]Los Alamos Natl. Lab, USA, [2]Sandia Natl. Labs, USA, [3]Boston College, USA*. Planar electric metamaterials are studied with terahertz time-domain spectroscopy in transmission and reflection. Energy absorption of 5-20% due to Ohmic losses within the metal patterning is observed at resonant frequencies. Finite-element simulations verify experimental results.

NOTES

ROOM 318-320	ROOM 321-323	ROOM 324-326	ROOM 314	ROOM 315	ROOM 316	ROOM 317	ROOM 336
CLEO	JOINT	CLEO					QELS

CTuU • NLO Devices—Continued

CTuU3 • 3:00 p.m.
Compact, All Solid-State, High Repetition Rate Intracavity Optical Parametric Oscillator and Its Application to the Spectroscopic Imaging of Gases and Liquids, *David J. Stothard, Cameron F. Rae, Mark Ross, Malcolm H. Dunn; Univ. of St. Andrews, UK.* We describe a compact pulsed optical parametric oscillator based upon room-temperature MgO:PPLN operating internal to a Q-switched Nd:YVO_4 mini-laser. Repetition rates of >300kHz were achieved at 150mW mean tuneable mid-infrared output power for 3W pump.

CTuU4 • 3:15 p.m.
Mid-Infrared Generation by Wavelength Conversion of a 10W, Linearly-Polarized, ns-Pulse Eye-Safe Fiber Source, *Fabio Di Teodoro, Sebastien Desmoulins; Aculight Corp., USA.* Average power in excess of 1W (at pulse repetition rate ~100 kHz) in the 3.8-4micron wavelength range was obtained by pumping an optical parametric oscillator with a 1545nm-wavelength pulsed fiber source.

JTuB • Symposium on Self-Phase Modulation I—Continued

JTuB2 • 3:00 p.m.
Multi-Watt Supercontinuum Generation from 0.3 to 2.4 μm in PCF Tapers, *J. C. Travers[1], A. B. Rulkov[1], S. V. Popov[1], J. R. Taylor[1], A. Kudlinski[2,3], A. K. George[2], J. C. Knight[2]; [1]Femtosecond Optics Group, Dept. of Physics, Imperial College, UK, [2]Ctr. for Photonics and Photonic Materials, Dept. of Physics, Univ. of Bath, UK, [3]Lab PbLAM, IRCICA, Univ. des Sciences et Technologies de Lille, France.* Supercontinua spanning 320-2400nm have been generated in long photonic-crystal-fiber tapers. Total average powers of over 3.5W and spectral-power-densities in the blue of over 5mW/nm are demonstrated. Use as a broadly-tunable pulse source is proposed.

JTuB3 • 3:15 p.m.
Self-Steepening without Self-Phase Modulation, *Jeffrey Moses, Frank W. Wise; Cornell Univ., USA.* A first optical manifestation of the Chen-Lee-Liu-type derivative nonlinear Schrodinger equation results in self-steepening of ultrashort pulses and shock formation without simultaneous self-phase modulation and spectral broadening. Experiments verify theory.

CTuV • Novel Microscopy—Continued

CTuV3 • 3:00 p.m.
Quantitative Phase Microscopy by Multi-wavelength Phase-Shifting Interference Microscopy, *Nilanthi Warnasooriya, Myung K. Kim; Univ. of South Florida, USA.* The phase-shifting interference microscopy is combined with the multi-wavelength optical phase unwrapping to obtain quantitative phase profiles of microscopic objects without 2π discontinuities. Due to broadband light sources, images are less affected by coherent noise.

CTuV4 • 3:15 p.m.
Bio-Imaging with Femtosecond Laser Induced Ionization Microscopy, *Youbo Zhao, Yanmei Liang, Jianjun Yang, Mingwei Wang, Xiaonong Zhu; Inst. of Modern Optics, Nankai Univ., China.* Bio-imaging with the recently proposed femtosecond laser induced ionization microscopy is introduced. This new nonlinear imaging technique shows the advantage of being highly sensitive to the internal microstructure or the surface profile of biological samples.

CTuW • Short Wavelength Generation and Applications—Continued

CTuW3 • 3:00 p.m. Invited
Complete Temporal Reconstruction of Attosecond Harmonic Pulses, *Chang Hee Nam, Kyung Taec Kim, Kyung Sik Kang, Dong Hyuk Ko, Ju Yun Park; KAIST, Republic of Korea.* Using the FROG CRAB method, complete temporal reconstruction of attosecond harmonic pulses was achieved. The compensation of intrinsic attosecond chirp was also demonstrated in the harmonic generation medium itself, thereby achieving transform-limited attosecond pulses.

CTuX • Novel VCSELs—Continued

CTuX3 • 3:00 p.m.
Beam Switching and Steering in VCSEL-Based Photonic Crystal Coupled Heterostructures, *Lars D. A. Lundeberg, Eli Kapon; Lab of Physics of Nanostructures, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland.* We demonstrate electrically controlled beam switching and steering in separate-contact photonic crystal heterostructures implemented with arrays of VCSELs. Switching from mutually incoherent to coherent operation is accompanied by wavelength tuning of the array elements.

CTuX4 • 3:15 p.m.
Characterization of Micro-Fluidic Vertical-Cavity Surface-Emitting Lasers, *Ansas M. Kasten, Joshua D. Sulkin, Paul O. Leisher, Kent D. Choquette; Univ. of Illinois at Urbana-Champaign, USA.* Micro-fluidic VCSELs are fabricated using a novel fluidic channel structure with etched trenches and fluid reservoirs surrounding each VCSEL. Pulsed and continuous wave measurements demonstrated a fluid induced lasing wavelength shift of 0.3 nm.

CTuY • Silicon-Based Optical Materials—Continued

CTuY3 • 3:00 p.m. Invited
Directly Pumped Silicon Lasing, *Sylvain G. Cloutier, Chih-Hsun Hsu, Pavel Kossyrev, Efi Rotem, Jeffrey Shainline, Jimmy Xu; Brown Univ., USA.* Enhanced photoluminescence and 1.28μm laser emission from nano-engineered silicon originating respectively from phonon k-selection rule breaking and point defect-mediated phononless recombination in an array of Emissive Structural Deformation zones in a SOI wafer are reported.

CTuZ • Photonic Structures for Emission and Detection—Continued

CTuZ3 • 3:00 p.m.
CMOS-Compatible High Frequency Infrared Photodiodes, *Michael W. Geis[1], Steven J. Spector[1], Matthew E. Grein[1], Robert T. Schulein[1], Jung U. Yoon[1], Donna M. Lennon[1], Sandra Deneault[1], Theodore M. Lyszczarz[1], Fuwan Gan[2], Franz X. Kaertner[2]; [1]MIT Lincoln Lab, USA, [2]MIT, USA.* CMOS-compatible, silicon waveguide photodiodes, responding to radiation from 1270 to 1740 nm (0.8 A W^{-1} at 1550 nm) with a 3 dB bandwidth of 10 to 20 GHz were formed by Si ion implantation.

CTuZ4 • 3:15 p.m.
Monolithic Integrated SiGe Optical Receiver and Detector, *Paul C. P. Chen, Anand M. Pappu, Alyssa B. Apsel; Cornell Univ., USA.* We present a monolithically integrated photodetector and optical receiver in a commercial SiGe process. Fabricating the receiver and detector on the same die, with a single low supply voltage, enables lower cost interchip optical interconnects.

QTuG • Micro-Cavities and Random Media—Continued

QTuG3 • 3:00 p.m.
Multiple Input and Random Medium Information Retrieval from Second Order Intensity Correlations, *Zhenyu Wang, Andrew M. Weiner, Kevin J. Webb; Purdue Univ., USA.* We demonstrate that relative delay and intensity information with two sources incident on a random medium can be retrieved from second order frequency intensity correlations. This interferometer may prove important in imaging applications.

QTuG4 • 3:15 p.m.
Possible Evidence for a Mobility Edge for Photons in Two Dimensions, *Ara A. Asatryan[1], Lindsay C. Botten[1], Michael A. Byrne[1,2], Ross C. McPhedran[2], Carell M. de Sterke[2]; [1]Univ. of Technology, Sydney, Australia, [2]Univ. of Sydney, Australia.* We have applied a renormalization group analysis to the study of Anderson localization of light in 2-D disordered PCs. Contrary to common belief, we find possible evidence of a mobility edge in two dimensions.

QELS

QTuH • Slow and Fast Light and Other Phenomena—Continued

QTuH3 • 3:00 p.m.
Superluminal Brillouin Amplification for Sub-Cycle Interactions of Modulated Light, *Sbmuel Sternklar, Tal Arditi, Er'el Granot; College of Judea and Samaria, Israel.* Superluminal Brillouin amplification is predicted and demonstrated for modulated pump and Stokes waves, for interaction lengths less than half the modulation wavelength. The group velocity increases by a factor G, the Brillouin exponential gain parameter.

QTuH4 • 3:15 p.m.
Pulse Broadening or Compression in Fast-Light Pulse Propagation through an Erbium-Doped Fiber Amplifier, *Heedeuk Shin[1], Aaron Schweinsberg[1], George Gehring[1], Katie Schwertz[1], Hye Jeong Chang[1,2], Q-Han Park[3], Daniel J. Gauthier[4], Robert W. Boyd[1]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Korean Intellectual Property Office, Republic of Korea, [3]Dept. of Physics, Korea Univ., Republic of Korea, [4]Dept. of Physics, Duke Univ., USA.* Pulse broadening or compression in an Er^{3+}-doped fiber amplifier is observed, and explained by gain recovery and pulse spectrum broadening effects. Maximal pulse advancement and minimal pulse distortion are obtained by optimizing these competing effects.

QTuI • Entanglement and Squeezing II—Continued

QTuI3 • 3:00 p.m.
Nonclassicality and Decoherence of Photon-Subtracted Squeezed States, *Asoka Biswas[1], G. S. Agarwal[2]; [1]Univ. of Southern California, USA, [2]Oklahoma State Univ., USA.* We discuss nonclassical properties of single-photon subtracted squeezed vacuum states and study its decoherence under different models. We find that the state is especially robust under phase diffusion model though its phase properties are lost.

QTuI4 • 3:15 p.m.
Generation of Telecom-Band Indistinguishable Photon Pairs in Dispersion-Shifted Fiber, *Jun Chen, Kim Fook Lee, Prem Kumar; Ctr. for Photonic Communication, Dept. of EECS, Northwestern Univ., USA.* We use a 50/50 Sagnac-loop configuration to spatially separate degenerate photon pairs created via four-photon scattering in dispersion-shifted fiber. A Hong-Ou-Mandel dip with visibility > 94% is observed.

CLEO

CTuAA • Microwave Photonics—Continued

CTuBB • Novel Fiber Designs—Continued

CTuBB3 • 3:00 p.m. Invited
Chirally Coupled Core Fibers at 1550-nm and 1064-nm for Effectively Single-Mode Core Size Scaling, *Chi-Hung Liu[1], Guoqing Chang[1], Natasha Litchinister[1], Doug Guertin[2], Nick Jacobson[2], Kanishka Tankala[2], Almantas Galvanauskas[1]; [1]EECS Dept., Univ. of Michigan, USA, [2]NUFERN, USA.* Novel index-guiding-core single-mode fibers with V >> 2.405 are demonstrated at 1550-nm and 1064-nm wavelengths. This fiber design is based on chirally-coupled core concept, which enables a new type of index-guiding and photonic-crystal fiber structures.

CTuCC • THz Metamaterials and Photonic Crystals—Continued

CTuCC3 • 3:00 p.m.
The Superprism Effect in a Metal-Clad Terahertz Photonic Crystal Slab, *Tusbar Prasad, Vicki L. Colvin, Zhongping Jian, Daniel M. Mittleman; Rice Univ., USA.* We demonstrate the superprism effect in a photonic crystal slab at terahertz frequencies. The observed angular dispersion cannot be explained unless the finite slab thickness and its metal cladding boundary conditions are taken into account.

CTuCC4 • 3:15 p.m.
A New Method for the Realization of a Tunable Terahertz Photonic Bandgap, *Yuguang Zhao, Daniel Grischkousky; Oklahoma State Univ., USA.* We report the experimental realization of a tunable terahertz photonic bandgap structure. The bandgap can be linearly controlled by adjusting the air gap between the top of the metallic photonic crystals and the cover plate.

NOTES

ROOM 318-320	ROOM 321-323	ROOM 324-326	ROOM 314	ROOM 315	ROOM 316	ROOM 317	ROOM 336
CLEO	JOINT	CLEO					QELS

CTuU • NLO Devices—Continued

CTuU5 • 3:30 p.m.
InGaAs/GaAs QD-Based 100 nm Bandwidth Electro-Optic Modulator for 1.55 µm Applications, *Gautier Moreau, Anthony Martinez, Kamel Merghem, Audrey Miard, Aristide Lemaitre, Paul Voisin, Abderrahim Ramdane; Lab for Photonics and Nanostructures, CNRS UPR, France.* We demonstrate the potential of InGaAs/GaAs Quantum Dot-based Electro-optic modulator for broadband (>100nm) applications at 1.55 µm.

CTuU6 • 3:45 p.m.
Progress in High Sensitivity Electro-Optic Field Sensors, *Anthony Garzarella[1], Dong Ho Wu[1], Randall J. Hinton[2]; [1]NRL, USA, [2]Temple Univ., USA.* Compact Electro-optic (EO) sensors for nonperturbative electric field detection are described, along with several interesting parasitic effects which can be suppressed or exploited to enhance the sensor responsivity.

JTuB • Symposium on Self-Phase Modulation I—Continued

JTuB4 • 3:30 p.m.
Narrow-Band Spectral Enhancement of a Self-Phase Modulated Pulse, *Dane R. Austin, Jeremy A. Bolger, C. Martijn de Sterke, Dong-Il Yeom, Thomas G. Brown, Benjamin J. Eggleton; CUDOS, School of Physics, Univ. of Sydney, Australia.* We develop a simple physical model to describe narrow-band enhancement of spectrally filtered ultrashort pulses in the presence of self-phase modulation. An experiment using pulse shaping and propagation in photonic crystal fibre confirms this model.

JTuB5 • 3:45 p.m. Invited
Self-Phase Modulation in Optical Fiber Communications: Good or Bad? *Govind Agrawal; Inst. of Optics, Univ. of Rochester, USA.* Self-phase modulation is often regarded as being harmful for optical communication systems. Here, I discuss its impact on such systems and focus on its useful applications related to signal processing, soliton formation, and optical regeneration.

CTuV • Novel Microscopy—Continued

CTuV5 • 3:30 p.m.
Three-Dimensional Brillouin Confocal Microscopy, *Giuliano Scarcelli, Seok H. Yun; Harvard Medical School and Wellman Ctr. for Photomedicine, Massachusetts General Hospital, USA.* We present Brillouin confocal microscopy for non-invasively measuring mechanical properties of material with three-dimensional spatial resolution and high sensitivity.

CTuV6 • 3:45 p.m.
Very Efficient Fluorescent Background Suppression in Confocal Raman Microscopy, *Vladislav V. Yakovlev; Univ. of Wisconsin at Milwaukee, USA.* Time-gated optical imaging is employed for the first time to achieve confocal Raman microscopy. The innovative laser design and a careful selection of the Kerr-gate material allows to reduce fluorescent background by 1000 times.

CTuW • Short Wavelength Generation and Applications—Continued

CTuW4 • 3:30 p.m.
Tabletop Lensless Imaging Using Coherent High Harmonic Beams, *Richard Sandberg[1], Ariel Paul[1], Daisy Raymondson[1], David Gaudiosi[1], James Holtsnider[1], Margaret Murnane[1], Henry Kapteyn[1], Changyong Song[2], Jianwei Miao[2]; [1]JILA, USA, [2]Univ. of California at Los Angeles, USA.* We present the first demonstration of lensless imaging using coherent high harmonic beams. This coherent imaging technique avoids traditional diffractive optics, and is transparently extendable to shorter wavelengths without aberrations.

CTuW5 • 3:45 p.m.
Soft X-Ray Contact Imaging of Thin Films by a Laser Plasma Source, *Salvatore Stagira[1], Francesca Calegari[1], Enrico Benedetti[1], Juan Cabanillas-Gonzalez[1], Mauro Nisoli[1], Giuseppe Sansone[1], Gianluca Valentini[1], Caterina Vozzi[1], Sandro De Silvestri[1], Luca Poletto[2], Paolo Villoresi[2], Anatoly Faenov[3], Tatiana Pikuz[3]; [1]ULTRAS, CNR-INFM, Politecnico di Milano, Italy, [2]Univ. di Padova, Italy, [3]MISDC of VNIIFTRI, Russian Federation.* Quantitative analysis of nanometric films is achieved by soft X-ray imaging using a laser-plasma source and LiF crystals as detectors. Excitation of color center fluorescence in exposed LiF allows image detection with submicron resolution.

CTuX • Novel VCSELs—Continued

CTuX5 • 3:30 p.m.
Modulation Characteristics of Single-Mode Implant-Confined Photonic Crystal VCSELs, *Paul O. Leisher[1], Chen Chen[1], Joshua D. Sulkin[1], Mohd Sharizal Alias[2], Khairul Anuar Sharif[2], Kent D. Choquette[1]; [1]Univ. of Illinois, USA, [2]Telekom Res. & Development, Malaysia.* Implant-confined VCSELs are fabricated with coplanar contacts on polyimide. Photonic crystals are etched into the top facet to stabilize the fundamental mode and improve performance. Optimized devices exhibit a record 15 GHz small-signal modulation bandwidth.

CTuX6 • 3:45 p.m.
Optical Decoupling in a Loss-Modulated Dual-Cavity VCSEL, *Jobert van Eisden[1], Michael Yakimov[1], Vadim Tokranov[1], Manasa Varanasi[1], Serge R. Oktyabrsky[1], Edris M. Mohammed[2], Ian A. Young[2]; [1] College of Nanoscale Science and Engineering, Univ. at Albany, USA, [2]Intel Corp., USA.* We have demonstrated the principle of optical decoupling in a loss-modulated VCSEL by use of a dual-cavity geometry. Adjusting detuning between cavities controls the decoupling amount. Flat (+/-3-Db) response up to 20 GHz is demonstrated.

CTuY • Silicon-Based Optical Materials—Continued

CTuY4 • 3:30 p.m.
Spatial Characterization of Germanium-on-Silicon C-Band PIN Photodiodes, *Jason S. Orcutt, Oluwamuyiwa O. Olubuyide, Judy L. Hoyt, Rajeev J. Ram; MIT, USA.* Spatially-resolved photoresponse and modulation measurements of vertically-illuminated germanium-on-silicon photodiodes are presented. It is shown that, even in a planar device, localized traps at the perimeter limit both quantum efficiency and modulation bandwidth.

CTuY5 • 3:45 p.m.
Wavelength Dependence of the Ultrafast Third-Order Nonlinearity of Silicon, *Mark A. Foster, Alexander L. Gaeta; Cornell Univ., USA.* We measure the wavelength dependence of the nonlinear index n_2 and two-photon absorption coefficients of bulk silicon below the band edge. In contrast to direct-bandgap semiconductors, silicon shows a positive n_2 throughout the band gap.

CTuZ • Photonic Structures for Emission and Detection—Continued

CTuZ5 • 3:30 p.m.
Thermal Microphotonic Focal Plane Array (TM-FPA) for Uncooled High Sensitivity Thermal Imaging, *Michael R. Watts, Michael J. Shaw, Gregory N. Nielson, Jeremy B. Wright, Karl Westlake, Igal Brener, Jeffery L. Rienstra, Frederick B. McCormick; Sandia Labs, USA.* We report on a new microphotonic technique for high-sensitivity, uncooled, thermal imaging. The technique, based on the massive thermo-optic effect in thermally isolated micro-resonators offers potential for significantly higher sensitivity than bolometric techniques.

CTuZ6 • 3:45 p.m.
Local Fields of Optical Antenna Structures, *Bradley M. Deutsch[1], Lukas Novotny[1], Ertugrul Cubukcu[2], Elizabeth J. Smythe[2], Federico Capasso[2], Rainer Hillenbrand[3]; [1]Univ. of Rochester, USA, [2]Harvard Univ., USA, [3]Max Planck Inst. Fur Biochemie, Germany.* Resonantly excited optical antennas are studied with near-field optical microscopy. The locally enhanced fields associated with antenna resonances are imaged by using a sharp metallic tip acting as a local scattering center.

QTuG • Micro-Cavities and Random Media—Continued

QTuG5 • 3:30 p.m.
Optical Whispering Gallery Mode Resonators with $Q>10^{11}$ and $F>10^{7}$, *Andrey B. Matsko, Anatoliy A. Savchenkov, Vladimir S. Ilchenko, Lute Maleki; JPL, USA.* We show that a proper thermal annealing leads to a significant increase of the quality factors of crystalline whispering gallery mode resonators. We have demonstrated a fluoride resonator with Q exceeding 10^{11} using the method.

QTuG6 • 3:45 p.m.
Direct Visualization of Stationary Interference Patterns of Several Running Whispering Gallery Modes, *Anatoliy A. Savchenkov, Andrey B. Matsko, Vladimir S. Ilchenko, Dmitry Strekalov, Lute Maleki; JPL, USA.* We report on the direct observation of stationary interference patterns of several running optical whispering gallery modes in an experiment with a fused silica microsphere immersed into a dye solution.

QTuH • Slow and Fast Light and Other Phenomena—Continued

QTuH5 • 3:30 p.m.
Spectral Broadening in Ultra-Long Raman Fibre Lasers by Optical Wave Turbulence, *Sergey A. Babin[1], Evgenii V. Podivilov[1], Vasileios Karalekas[2], Vladimir K. Mezentsev[2], Paul Harper[2], Sergei K. Turitsyn[2]; [1]Inst. of Automation and Electrometry, SB Russian Acad. of Sciences, Russian Federation, [2]Photonics Res. Group, School of Engineering and Applied Science, Aston Univ., UK.* Intra-cavity spectra of ultra-long (up to 84 km cavity length) Raman lasers have been measured and simulated. The results demonstrate FWM-induced turbulent-like (involving up to 108 modes) broadening of the spectrum with clear exponential tails.

QTuH6 • 3:45 p.m.
Selective Alignment of Spin Isomers: The Case of Ortho and Para Nitrogen, *Sharly Fleischer, Ilya Sh. Averbukh, Yehiam Prior; Weizmann Inst. of Science, Israel.* Double pulse excitation of fractional revivals of rotational wavepackets is demonstrated as an effective tool for spin-selective alignment in a multi-component mixture of molecular spin isomers.

QTuI • Entanglement and Squeezing II—Continued

QTuI5 • 3:30 p.m.
Technique for Photon Statistics Reconstruction by Using On/Off Detectors, *Marco Gramegna[1], Marco Genovese[1], Giorgio Brida[1], Matteo G. A. Paris[2], Andrea Rossi[2]; [1]INRiM, Inst. Nazionale Ricerca Metrologica, Italy, [2]Univ. of Milano, Italy.* Report on first experimental applications of a measurement scheme with variable quantum efficiency single-photon ON/OFF detectors for evaluating the diagonal elements of the density matrix for various quantum optical states, without involving photon counting.

QTuI6 • 3:45 p.m.
The Generation and Temporal Correlation Measurement of Triphoton, *Yu Zhou[1], Ping Xu[2], Shining Zhu[2], Yanhua Shih[1]; [1]Dept. of Physics, Univ. of Maryland, Baltimore County, USA, [2]Natl. Lab of Solid State Microstructures, Nanjing Univ., China.* A triphoton EPR-GHZ state, entangled in energy and momentum, is generated via a hexagonally poled photonic crystal. The measured third order correlation function G(3)(t1; t2; t3) clearly shows the entangled nature of the three-photon system.

CTuAA • Microwave Photonics—Continued

CTuAA2 • 3:30 p.m.
Photonic Downconversion and Linearization of an X-Band Fiber Optic Link Using Optical I/Q Demodulation, *Thomas R. Clark, Michael L. Dennis; JHU Applied Physics Lab, USA.* We experimentally demonstrate downconversion and simultaneous linearization of microwave frequency signals using photonic in-phase and quadrature detection with digital demodulation. Suppression of third-order intermodulation products by 20 dB is obtained.

CTuAA3 • 3:45 p.m.
Multi-Tap RF Transversal Filter Using AOTF Double Diffraction, *Farzan N. Ghauri, Nabeel A. Riza; College of Optics, CREOL, USA.* A programmable, broadband Radio Frequency transversal filter architecture is proposed and implemented using an Acousto-Optic Tunable Filter and a Chirped Fiber Bragg Grating for continuous control and selection of RF filter time delays and weights.

CTuBB • Novel Fiber Designs—Continued

CTuBB4 • 3:30 p.m.
Radial Index Tailoring for Reduced Intermodal Coupling in Large-Mode-Area Fiber Lasers and Amplifiers, *John R. Marciante; Univ. of Rochester, USA.* Low-order Gaussian index profiles result in increased modal index contrast. Intermodal coupling can be reduced by a factor of 10-100, with nonlinear thresholds increased by a factor of 3-7 due to larger effective areas.

CTuBB5 • 3:45 p.m.
Atomic Layer Deposition as a New Method for Rare-Earth Doping of Optical Fibers, *Lars Norin[1], Evgeny Vanin[2], Pekka Soininen[3], Matti Putkonen[3,4]; [1]Acreo FiberLab, Sweden, [2]Acreo, Sweden, [3]Beneq Oy, Finland, [4]Helsinki Univ. of Technology, Finland.* A new method enabling engineering of gain materials at an atomic-scale level is for the first time applied to manufacturing of rare-earth doped optical fibers.

CTuCC • THz Metamaterials and Photonic Crystals—Continued

CTuCC5 • 3:30 p.m.
An Optically Controlled Modulator of Terahertz Radiation Based on 1-D Photonic Crystal, *Filip Kadlec, Ladislav Fekete, Petr Kužel, Hynek Němec; Inst. of Physics, Czech Republic.* We present an agile modulator of terahertz radiation based on a one-dimensional photonic crystal with a GaAs platelet acting as a defect. Its transmission function is strongly dependent on the photoexcitation of the semiconductor.

CTuCC6 • 3:45 p.m.
Terahertz Surface Plasmon Polaritons on Periodic Metal Arrays, *Michael Martl, Juraj Darmo, Josef Kroell, Karl Unterrainer; Photonik Inst., Austria.* We studied coupling of the terahertz radiation to periodically structured metal arrays. The role of polarization, surface plasmon dispersion and attenuation are evaluated experimentally and modeled theoretically.

3:30 p.m. – 5:30 p.m. PTuD • Industrial Applications of Ultrafast Lasers

Rainer Paetzel; Coherent GmbH, Germany, Presider

PTuD1 • 3:30 p.m. Invited
Microfabrication with High Power Picosecond Fiber Laser, *Harry Asonen; CORELASE, Finland.* The use of fiber lasers have dramatically expanded in the last few years. We shall present examples of applications where picosecond fiber laser could offer high quality, faster and easier fabrication of the product.

3:30 p.m. – 5:15 p.m. PTuE • Ambient and Environmental Issues

Steve Guch; Full Spectrum Concepts, USA, Presider

PTuE1 • 3:30 p.m. Invited
A Real-Time Biothreat Simulation Process for Detect-to-Warn Sensor Architectures, *Dave Silcott; S3I, USA.* A biothreat simulation process will be presented that provides a means for the real-time spatio-temporal mapping of aerosol releases within a facility. The process is used as an aid in biological detect-to-warn sensor architecture design.

3:30 p.m. – 5:00 p.m. PTuF • Commercialization of Applied Research II

James M. Zavislan; Inst. of Optics, USA, Presider

PTuF1 • 3:30 p.m. Invited
A Case Study in Bringing a Medical Technology from Academia to Industry to the Patient, *Jay Eastman; Lucid, Inc, USA.* Abstract not available.

ROOM 318-320	ROOM 321-323	ROOM 324-326	ROOM 314	ROOM 315	ROOM 316	ROOM 317	ROOM 336
CLEO	JOINT	CLEO					QELS

CTuU • NLO Devices—Continued

CTuU7 • 4:00 p.m.
Noise Elimination of Intracavity Doubled Lasers by Single-Mode Operation with Volumetric Bragg Grating, *Sidney S. Yang[1], Te-yuan Chung[2], Cheng Wen Chen[1], Hung Chih Yang[1]; [1]Inst. of Photonics Technologies, Natl. Tsing Hua Univ., Taiwan, [2]Dept. of Optics and Photonics, Natl. Central Univ., Taiwan.* The green noise of a Nd:$GdVO_4$ laser intracavity-doubled by type-I crystal BIBO was demonstrated. The noise reduction by enforcing a single-mode operation by Volumetric Bragg Grating in a V-shaped cavity is first time reported.

CTuV • Novel Microscopy—Continued

CTuV7 • 4:00 p.m.
High-throughput Endpoint and Real-Time Detection of Biochemical Reactions in Microarrays Using Label-Free Oblique-Incidence Reflectivity Difference Microscopes, *James P. Landry, Y. S. Sun, K. S. Lam, X. D. Zhu; Univ. of California at Davis, USA.* We describe recently developed oblique-incidence reflectivity difference microscopes, a form of polarization-modulated imaging ellipsometry, for label-free detection of biochemical reactions in microarrays. Configurations enabling high-throughput endpoint and real-time detection on glass substrates are discussed.

CTuW • Short Wavelength Generation and Applications—Continued

CTuW6 • 4:00 p.m.
Generation of Intense Deep-Ultraviolet 10-fs Pulses by Four-Wave Mixing through Filamentation in Gases, *Takao Fuji, Takuya Horio, Toshinori Suzuki; Chemical Dynamics Lab, RIKEN, Japan.* Generation of intense and broadband deep-ultraviolet pulses by four-wave mixing through filamentation in neon gas is demonstrated. The pulses are successfully compressed down to 13 fs by a grating-based compressor.

CTuX • Novel VCSELs—Continued

CTuX7 • 4:00 p.m.
Nano Electromechanical Optoelectronic Tunable VCSEL, *Michael C.Y. Huang, Ye Zhou, Connie J. Chang-Hasnain; Dept. of Electrical Engineering and Computer Sciences, Univ. of California at Berkeley, USA.* We present nano-electromechanical optoelectronic (NEMO) tunable VCSELs utilizing an electrostatic-actuated single-layer, high-index-contrast subwavelength grating. Ultra-low threshold of 0.2mA and single mode emission with continuously wavelength tuning range of 6.5nm was experimentally obtained.

CTuY • Silicon-Based Optical Materials—Continued

CTuY6 • 4:00 p.m.
Fabrication of Silicon Inverse Woodpile Photonic Crystals, *Martin Hermatschweiler[1,2], Martin Wegener[1,2], Geoffrey A. Ozin[3], Alexandra Ledermann[4], Georg von Freymann[4]; [1]Univ. Karlsruhe, Germany, [2]DFG-Ctr. for Functional Nanostructures (CFN), Univ. Karlsruhe (TH), Germany, [3]Dept. of Chemistry, Univ. of Toronto, Canada, [4]Inst. für Nanotechnologie, Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft, Germany.* We fabricate silicon inverse woodpile structures for the first time. Direct laser writing of polymeric templates and a novel silicon-single-inversion procedure lead to structures with gap/midgap ratios of 14.2 % centered at 2.5 µm wavelength.

CTuZ • Photonic Structures for Emission and Detection—Continued

CTuZ7 • 4:00 p.m.
Widely-Tunable Nanostructured Leaky-Mode Resonant Pixels for the Visible Spectral Region, *Robert Magnusson, Mehrdad Shokooh-Saremi; Univ. of Connecticut, USA.* A tunable leaky-mode reflection device operating in the visible region is introduced. This element demonstrates ~100 nm tuning range with potential uses in tunable compact pixel structures for display systems.

QTuG • Micro-Cavities and Random Media—Continued

QTuG7 • 4:00 p.m.
Enhanced Coherent Thermal Emission of Coupled Resonant Cavities due to Surface Phonon-Polariton Excitation, *Erez Hasman, Nir Dahan, Vladimir Kleiner, Avi Niv, Gabriel Biener, Yuri Gorodetski; Technion-Israel Inst. of Technology, Israel.* We experimentally show a quasi-monochromatic and directional thermal source with a spatial coherence length in the far-field that is much larger than the predicted limit related to the surface phonon-polariton coherence of a flat surface.

4:15 p.m. – 4:45 p.m. COFFEE BREAK, EXHIBIT HALL, 100 LEVEL

QELS

QTuH • Slow and Fast Light and Other Phenomena—Continued

QTuH7 • 4:00 p.m.
Talbot Effect and Self-Pumped Phase Conjugation in Photorefractive Liquid Crystal Light-Valves, *Stefania Residori[1], Umberto Bortolozzo[2], Jean-Pierre Huignard[3]; [1]Inst. Non Linéaire de Nice, France, [2]Lab de Physique Statistique de l'ENS, France, [3]Thales Res. and Technology, France.* We show that Talbot effect can be used to enhance the two-wave mixing gain of two photorefractive liquid crystal light-valves in cascade and that self-pumped phase conjugation can be obtained in an optical feedback scheme.

QTuI • Entanglement and Squeezing II—Continued

QTuI7 • 4:00 p.m.
Experimental Three-Color Optical Quantum Correlations, *Katiuscia N. Cassemiro, Alessandro S. Villar, Paulo Valente, Marcelo Martinelli, Paulo A. Nussenzveig; Inst. de Fisica, Univ. de Sao Paulo, Brazil.* We produced and experimentally demonstrated quantum correlations between bright pump, signal, and idler beams in an optical parametric oscillator, all with different frequencies. Our group was the first to observe three-color optical quantum correlations.

CLEO

CTuAA • Microwave Photonics—Continued

CTuAA4 • 4:00 p.m.
Coherence Free High-Resolution RF Photonic Filter, *Cibby B. Pulikkaseril, Erwin H. W. Chan, Robert A. Minasian; Univ. of Sydney, Australia.* A new topology for a high-*Q* processor with extremely low phase noise generation is presented. It is based on a frequency-shifting loop. Results show a high-*Q* response with a large phase noise reduction of 41dB.

CTuBB • Novel Fiber Designs—Continued

CTuBB6 • 4:00 p.m.
Bandwidth Performance of W-Shaped Plastic Optical Fiber and Its Stability under Static Microbending, *Kenichi Aoyagi, Yorichika Ishiyama, Takaaki Ishigure, Yasubiro Koike; Graduate School of Science and Technology, Keio Univ., Japan.* Bandwidth performance stability of GI and W-shaped plastic optical fibers (POFs) under physical distortion (e.g. microbending) is compared. It is demonstrated W-shaped POF has higher stability of bandwidth than GI POF against fiber microbending.

CTuCC • THz Metamaterials and Photonic Crystals—Continued

CTuCC7 • 4:00 p.m.
Frequency Selective Surface for High-Sensitivity Terahertz Sensors, *Christian Debus, Peter Haring Bolivar; Inst. of High Frequency and Quantum Electronics, Siegen Univ., Germany.* We present a frequency selective surface (FSS) of asymmetric split-ring resonators for terahertz (THz) sensor applications. Multiple resonances of the rings combine to sharp edges in the FSS's frequency response to achieve high sensitivity.

4:15 p.m. – 4:45 p.m. COFFEE BREAK, EXHIBIT HALL, 100 LEVEL

PhAST

PTuD • Industrial Applications of Ultrafast Lasers—Continued

PTuD2 • 4:00 p.m. Invited
Compact, High Performance Femtosecond Laser Ablation System, *Eric Mottay[1], Antoine Courjaud[2], Patrick Chabassier[2], Christophe Pecheyran[3], Fanny Claverie[3], Olivier Donard[3]; [1]Amplitude Systemes, France, [2]Novalase, France, [3]Univ. de Pau, France.* We present a compact, industrial laser ablation system for trace element analysis. The system uses a high repetition rate femtosecond laser for material ablation and an inductively coupled mass spectrometer for analysis.

PTuD3 • 4:30 p.m.
The Impact of Ultrashort Femtosecond Pulse-Shaping Technology for Micromachining, *Marcos Dantus; Michigan State Univ., USA.* Ultrashort laser pulses improve micromachining but they suffer significant phase distortions when focused by microscope objectives. Breakthrough technology to correct high order phase distortions is used to improve the machining characteristics of metals and semiconductors.

PTuE • Ambient and Environmental Issues—Continued

PTuE2 • 4:00 p.m. Invited
A Robust Laser Diode-Based Fluorescence Trigger for Bio-Aerosol Monitoring and Detection, *Sarjit Bains, Darrick Niccum, Richard Remiarz; TSI, Inc., USA.* A third generation 405nm laser diode based biological trigger device will be described. The simple but effective design using single particle fluorescence measurement leads to robust field performance for continuous sampling, with good detection sensitivity and low false alarm rates.

PTuE3 • 4:30 p.m.
Real-Time Monitoring of Atmospheric Aerosol at New Haven, CT, for Fluorescence Spectra, Particle Size and Concentration, *Yong-Le Pan[1], Richard K. Chang[1], Ronald G. Pinnick[2], Steven C. Hill[2]; [1]Yale Univ., USA, [2]ARL, USA.* A real-time aerosol-particle monitoring system is developed to measure size, concentration, and UV-laser-induced-fluorescence spectra. Data for atmospheric particles at New Haven, CT, are measured over 48-hours and heirarchically cluster into various categories.

PTuF • Commercialization of Applied Research II—Continued

PTuF2 • 4:00 p.m. Invited
Affordable Diagnostics-Changing the Paradigm through Innovation, *Bala Manian; ReaMetrix, USA.* Abstract not available.

PTuF3 • 4:30 p.m. Invited
QED Technologies: Bringing a Radical Innovation to the Precision Optics Market, *Don Golini; QED Technologies Inc., USA.* Abstract not available.

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4:45 p.m. – 6:30 p.m.
CTuDD • Silicon Photonics
Armand Rosenberg; NRL, USA, Presider

CTuDD1 • 4:45 p.m. Tutorial
Silicon Nanophotonics and Its Applications in Sensing, *Roel Baets, D. Taillaert, W. Bogaerts, P. Dumon, K. De Vos, P. Debackere, S. Scheerlinck, D. Van Thourbout; Ghent Univ.-IMEC, Belgium.* We present photonic wire waveguides and basic components in Silicon-on-Insulator (SOI). A large number of these compact SOI devices fit on a single chip. We describe possible applications in biochemical sensing and strain sensing.

4:45 p.m. – 6:30 p.m.
JTuC • Symposium on Self-Phase Modulation II
Paul Kelley; Tufts Univ., USA, Presider

JTuC1 • 4:45 p.m. Invited
From Supercontinuum Generation to Carrier Shocks: Extreme Nonlinear Propagation in Photonic Crystal Fiber, *John Dudley[1], Bertrand Kibler[1], Goery Genty[2], Stephane Coen[3], Paul Kinsler[4]; [1]Univ. de Franche-Comte, France, [2]Helsinki Univ. of Technology, Finland, [3]Univ. of Auckland, New Zealand, [4]Imperial College London, UK.* We review supercontinuum generation in photonic crystal fiber and discuss the underlying spectral broadening processes from the femtosecond to the continuous wave regime. We also describe a new propagation model that integrates carrier dynamics.

4:45 p.m. – 6:30 p.m.
CTuEE • Cellular Imaging
James Tunnell; Univ. of Texas at Austin, USA, Presider

CTuEE1 • 4:45 p.m.
Three-Dimensional *in vivo* Reflectance and Fluorescence Imaging by a Handheld Dual-Axes Confocal Microscope, *Hyejun Ra[1], Wibool Piyawattanametha[1,2], Michael J. Mandella[1], Jonathan T. C. Liu[1], Larry K. Wong[1], Thomas D. Wang[1], Christopher H. Contag[1], Gordon S. Kino[1], Olav Solgaard[1]; [1]Stanford Univ., USA, [2]Natl. Electronics and Computer Technology Ctr., Thailand.* We demonstrate reflectance and fluorescence imaging with a handheld dual-axes confocal microscope based on a two-dimensional microelectromechanical system scanner. Three-dimensional imaging capability is shown in tissue, and *in vivo* imaging of a mouse is performed.

CTuEE2 • 5:00 p.m.
Endoscopic Fiber Confocal Microscopy Using a GRIN Lens, *Abner Rodriguez, Do-Hyun Kim, Jin U. Kang; Johns Hopkins Univ., USA.* We have built and analyzed the performance of a near-IR all-fiber confocal microscope with a flexible probe using a GRIN lens. This device operates at 1550 nm and exhibits ~2 µm lateral resolution.

4:45 p.m. – 6:30 p.m.
CTuFF • Ultrafast Pulse Shaping
Andrew Weiner; Purdue Univ., USA, Presider

CTuFF1 • 4:45 p.m.
All-Optical Dynamic Chirp Compensation of Few-Cycle Optical Pulses by Frequency-Domain Phase Conjugator, *Hajime Nishioka, Keisuke Hayakawa, Syuji Obta, Hitosbi Tomita, Ken-ichi Ueda; Inst. for Laser Science, Japan.* All-optical phase-correction of few-cycle optical pulse has been demonstrated by a frequency-domain phase conjugator (FDPC). Temporally varying group-delay-dispersion is dynamically compensated by two-photon formed gratings in a highly transparent photo-refractive material.

CTuFF2 • 5:00 p.m.
Semiconductor Waveguide Device for Picosecond Pulse Amplification and Spectral Shaping at 1560 nm, *Martijn Heck, Erwin A. Bente, Yoban Barbarin, Antigone Fryda, Hyun-Do Jung, Siang Oei, Richard Notzel, Daan Lenstra, Meint K. Smit; Technische Univ. Eindhoven, Netherlands.* Amplification of picosecond pulses with greatly reduced amplified spontaneous emission compared to a standard semiconductor amplifier (up to 30dB) and a large increase in coherent spectral bandwidth is demonstrated in devices we have fabricated.

4:45 p.m. – 6:30 p.m.
CTuGG • VCSELs and Integration
Fumio Koyama; Tokyo Inst. of Technology, Japan, Presider

CTuGG1 • 4:45 p.m. Invited
Monolithically Integrated III-Sb Superluminescent Light Emitting Diodes on Si (100) Substrates, *Diana Huffaker, G. Balakrishnan, M. Mehta, M. N. Kutty, P. Rotella, S. Krishna, L. R. Dauson; Ctr. for High Technology Materials, USA.* We report on recent monolithically integrated III-V on Si device developments including a room-temperature, superluminescent light emitting diode. The integration scheme is enabled by spontaneously-formed, interfacial misfit arrays (IMF).

4:45 p.m. – 6:30 p.m.
CTuHH • High Power Solid-State Lasers
Timothy J. Carrig; Lockheed Martin Coherent Technologies, USA, Presider

CTuHH1 • 4:45 p.m. Invited
Progress on the Development of High-Power Solid-State Lasers for Directed Energy Applications, *Mark Neice; High Energy Laser Joint Technology Office (HEL-JTO), USA.* The progress of Nd:YAG solid state lasers in the multi-tens of kilowatts power range with good beam quality is presented in this presentation.

4:45 p.m. – 6:30 p.m.
QTuJ • Micro-Resonators
Gennady Shvets; Univ. of Texas at Austin, USA, Presider

QTuJ1 • 4:45 p.m. Tutorial
Fundamental Physics and Applications of Whispering-Gallery Mode Resonators, *Lute Maleki; JPL, USA.* This tutorial will focus on a discussion of the fundamentals and applications of whispering gallery mode resonators, with an emphasis on recent developments in the field.

4:45 p.m. – 6:30 p.m.
QTuK • Near-Field Optics
Nabil Lawandy; Solaris Nanosciences, USA, Presider

QTuK1 • 4:45 p.m. Invited
A High-Intensity Bowtie Nano-Aperture Vertical-Cavity Surface-Emitting Laser for Near-Field Optics, *Zhilong Rao, Joseph A. Matteo, Lambertus Hesselink, James S. Harris; Stanford Univ., USA.* We demonstrated a record-high-intensity bowtie nano-aperture vertical-cavity surface-emitting laser (VCSEL) with near-field spot size of 65 nm. The bowtie aperture VCSEL is very promising to realize near-field applications such as ultradense optical data storage.

4:45 p.m. – 6:30 p.m.
QTuL • Quantum Dots and Wires
Alexandra Boltasseva; COM, Denmark, Presider

QTuL1 • 4:45 p.m.
Mid-IR Luminescence of Nanocrystalline II-VI Semiconductors Doped with Transition Metal Ions, *Changsu Kim, Dmitri V. Martyshkin, Vladimir V. Fedorov, Sergey B. Mirov; Univ. of Alabama at Birmingham, USA.* A novel method of transition metal (TM) (Cr, Co and Fe) doped II-VI nanocrystalline quantum dots (NCD) fabrication based on laser ablation was demonstrated. For the first time mid-IR luminescence from TM:II-VI NCD is reported.

QTuL2 • 5:00 p.m.
Raman Scattering from Individual, Isolated Metallic Carbon Nanotubes, *Yang Wu, Janina Maultzsch, Ernst Knoesel, Bbupesh Chandra, Mingyuan Huang, Matthew Y. Sfeir, Louis Brus, James Hone, Tony F. Heinz; Columbia Univ., USA.* We have obtained Raman spectra of the high-energy (or G) modes from individual metallic carbon nanotubes. The Raman lines are broadened to widths up to 100 cm^{-1}, indicating strong phonon damping by electron-hole pairs.

4:45 p.m. – 6:30 p.m.
QTuM • Cold Atoms
Rudolf Grimm; Inst. fur Experimentalphysik, Austria, Presider

QTuM1 • 4:45 p.m.
Spatial Selection of Atoms in Optical Billiard, *Yoni Hertzberg, Tzabi Grunzweig, Armin Ridinger, Yoav Sagi, Nir Davidson; Weizmann Inst. of Science, Israel.* By releasing ultra-cold atoms from a small red detuned Gaussian trap to an optical wedge billiard we reduce the energy broadening of the atoms and perform spatial selection on the initial occupied phase space.

QTuM2 • 5:00 p.m.
Spin Dynamics in an Antiferromagnetic Spin-1 Condensate, *Adam T. Black, Lincoln D. Turner, Eduardo Gomez, Sebastian Jung, Paul D. Lett; NIST, USA.* We observe coherent spin dynamics and measure ground state populations in an antiferromagnetic spin-1 Bose-Einstein condensate. At a critical value of the quadratic Zeeman shift, the oscillations display a resonance in oscillation period.

4:45 p.m. – 6:30 p.m.
JTuD • High-Field Science
Sterling Backus; Kapteyn-Murnane Labs, USA, Presider

JTuD1 • 4:45 p.m.
Practical Method for Calculating the Interferometric Autocorrelation Trace of an Attosecond Pulse Train, *Yasuo Nabekawa, Katsumi Midorikawa; RIKEN, Japan.* We show how to calculate the interferomtric autocorrelation trace of the attosecond pulse train (APT). Nonlinear interference fringes on the spatial profile of the spatially divided two replicas of the APT is essential.

JTuD2 • 5:00 p.m.
***In-situ* Probing of Coherence in Hollow Waveguide High-Order Harmonic Generation,** *Amy L. Lytle, Xiaosbi Zhang, Margaret M. Murnane, Henry C. Kapteyn, Oren Cohen; JILA/ Univ. of Colorado, USA.* We use counterpropagating light to observe the coherent buildup of harmonic generation in a hollow waveguide. By measuring the phase mismatch, we probe pressure-tuned phase matching and determine ionization levels at which harmonics are generated.

4:45 p.m. – 6:30 p.m.
CTuII • Waveguide Devices
Donnell Walton; Corning Inc., USA, Presider

CTuII1 • 4:45 p.m.
High Speed Data Amplification Using Hybrid Silicon Evanescent Amplifier, *Ying-hao Kuo[1], Hyundai Park[1], Alexander Fang[1], John Bowers[1], Richard Jones[2], Mario Paniccia[2], Oded Cohen[2]; [1]Univ. of California at Santa Barbara, USA, [2]Intel Corp., USA.* Data amplification using hybrid silicon evanescent amplifier is demonstrated at bit rates up to 40Gbps. The amplifier exhibits 13-DB on-chip gain with low power penalty of 0.5dB. Pattern effects due to carrier lifetime are investigated.

CTuII2 • 5:00 p.m.
Dynamic Range Studied for a Monolithic 2x2 Quantum Dot Switch , *Eng Tin Aw[1], Yuanliang Chu[1], Shidai Liu[1], Mark G. Thompson[1], Adrian Wonfor[1], Roman L. Seillin[1], Richard V. Penty[1], Ian H. White[1], Alexey R. Kovsh[2]; [1]Univ. of Cambridge, UK, [2]NL Nanosemiconductor GmbH, Germany.* The robustness of an integrated 2x2 quantum-dot switch is investigated for low penalty operation. Near penalty free operation of <0.2dB is demonstrated for IPDR of over 8dB, highlighting its potential for systems applications.

4:45 p.m. – 6:30 p.m.
CTuJJ • Terahertz Surface Plasmons and Near-Field Microscopy
Presider to Be Announced

CTuJJ1 • 4:45 p.m.
Frequency-Dependent Radiation Patterns Emitted by THz Plasmons on Cylindrical Metal Wires, *Jason A. Deibel[1], Nicholas Berndsen[1], Kanglin Wang[1], Daniel Mittleman[1], Nick C. J. van der Valk[2], Paul C. M. Planken[2]; [1]Rice Univ., USA, [2]Univ. of Technology Delft, Netherlands.* We report on the emission patterns from THz plasmons propagating along wire waveguides. Experimental results and numerical simulations show frequency-dependent diffraction occurring at the end of the cylindrical waveguide.

CTuJJ2 • 5:00 p.m.
Terahertz Near-Field Imaging of Subwavelength One-Dimensional Plasmonic Structures, *M. A. Seo[1], A. J. L. Adam[2], S. C. Jeoung[3], Paul C. m. Planken[2], D. S. Kim[1]; [1]Seoul Natl. Univ., Republic of Korea, [2]Delft Univ. of Technology, Netherlands, [3]Korea Res. Inst. of Standard and Science, Republic of Korea.* We have developed a terahertz near-field imaging system detecting both amplitude and phase of the electric field spatiotemporally. Imaging one-dimensional slits on metal substrate reveals both propagating and surface-bound waves, strongly dependent on the frequency.

PTuD • Industrial Applications of Ultrafast Lasers—Continued

PTuD4 • 4:45 p.m.
High Speed Production of Periodical Nanostructures Using Femtosecond Laser Radiation, *Dirk Wortmann, Ralph Wagner, Jens Gottmann; Lehrstuhl für Lasertechnik, Germany.* Subwavelength Ripples (spacing < λ/4) are obtained by scanning femtosecond laser radiation (τ=100fs & 400fs, λ=800nm & 1045nm) over various materials surfaces. The ripple patterns extend coherently over many overlapping laser pulses and scanning tracks.

PTuD5 • 5:00 p.m.
Advanced Femtosecomd Lasers in Manufacturing , *Hitosbi Sekita; Cyber Laser, Inc., Japan.* We solved the stability, life-time and cost problems of femtosecond lasers and opened the door to their huge commercial market in near future. Femtosecond lasers will be used in the semiconductor and LCD manufacturing factory.

PTuE • Ambient and Environmental Issues—Continued

PTuE4 • 4:45 p.m.
Elastic-Light Scattering for the Characterization of Respirable Aerosols, *Gustavo E. Fernandes[1], Yong-Le Pan[1], Kevin B. Aptowicz[2], Jean-Claude Auger[1], Richard K. Chang[1]; [1]Yale Univ., USA, [2]West Chester Univ., USA.* The latest technologies for measuring the elastic-light scattering patterns of respirable aerosols in real time are discussed. A technique for post-processing the data is presented which is useful in distinguishing among certain types of aerosols.

PTuE5 • 5:00 p.m.
Practical Anti-Microbial Surfaces on Nylon and Polyester by UV Photochemistry, *Michael J. Kelley, Zhengmao Zhu; Jefferson Lab, USA.* Surface radicals generated by deep UV light afford strongly antimicrobial amine functionality by grafting or transformation. They are broadly effective in the lab and significantly viable in the field.

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CLEO	JOINT	CLEO				QELS	

CTuDD • Silicon Photonics—Continued

JTuC • Symposium on Self-Phase Modulation II—Continued

JTuC2 • 5:15 p.m.
Cross-Phase Modulation in AlGaAs Photonic Nanowires, *David Duchesne[1], Roberto Morandotti[1], Georgios Siviloglou[2], Ramy El-Ganainy[2], George Stegeman[2], Demetrios Christodoulides[2], Daniele Modotto[3], Andrea Locatelli[3], Costantino De Angelis[3], Francesca Pozzi[4], Marc Sorel[4]; [1]Inst. Natl. de la Recherche Scientifique, Univ. du Quebec, Canada, [2]CREOL, Univ. of Central Florida, USA, [3]Inst. Nazionale per la Fisica della Materia, Italy, [4]Univ. of Glasgow, UK.* Cross-Phase modulation (XPM) is investigated in AlGaAs nanowires by way of cross-polarised co-propagating pulses. A XPM to SPM (Self-Phase Modulation) ratio of 0.92 is determined at 1557 nm.

JTuC3 • 5:30 p.m.
160-Gbit/s Optical Time-Division Demultiplexing Based on Cross-Phase Modulation in a 2-m-Long Dispersion-Shifted Bi_2O_3 Photonic Crystal Fiber, *Koji Igarashi[1], Kazubiro Katoh[1], Kazuro Kikuchi[1], Tatsuo Nagashima[2], Tomobaru Hasegawa[2], Seiki Obara[2], Naoki Sugimoto[2]; [1]Univ. of Tokyo, Japan, [2]Res. Ctr., Asabi Glass Co., Ltd., Japan.* Optical time-division demultiplexing of 160-Gbit/s optical signals is demonstrated by using a 2-m-long dispersion-shifted Bi_2O_3-based photonic crystal fiber. Power penalties are less than 6 dB for all 10-Gbit/s tributaries.

CTuEE • Cellular Imaging—Continued

CTuEE3 • 5:15 p.m.
Analysis and Measurement of Light Propagation in Coherent Fiber Bundles, *Kristen P L Reichenbach, Chris Xu; Cornell Univ., USA.* We show numerically and experimentally that strong core coupling that is dependent on the wavelength and the polarization can be observed in image fibers commonly used in endoscopes.

CTuEE4 • 5:30 p.m.
Fiber Optic Guided Functional Electrical Stimulation with Microscale Photovoltaic Neurostimulator Devices, *Yoon-Kyu Song, William R. Patterson, Christopher W. Bull, Jiayi Zhang, Candice R. Sheldon, Arto V. Nurmikko, John J. Stein, Mijail D. Serruya, John P. Donoghue; Brown Univ., USA.* We report on study of optically activated functional electrical stimulation using a high efficiency microscale photovoltaic device as a neurostimulator, integrated with a biocompatible, lossless, interference-free glass optical fiber for signal and energy transport.

CTuFF • Ultrafast Pulse Shaping—Continued

CTuFF3 • 5:15 p.m.
Efficient Temporal Shaping of Ultrashort Pulses with Birefringent Crystals, *Shian Zhou, Dimitre G. Ouzounov, Frank W. Wise, Ivan Bazarov, Charles Sinclair; Cornell Univ., USA.* A novel technique is demonstrated for temporal shaping for femtosecond and picosecond pulses with high efficiency. The pulse is divided into numerous pulses by a designed birefringent-crystal set. These divided pulses produce various shapes.

CTuFF4 • 5:30 p.m.
Birefringent Nonlinear Polarization Rotation Mirror for Pedestal Suppression of Ultrashort Pulse, *Noribiko Nishizawa, Atsushi Murayama; Nagoya Univ., Japan.* Pedestal elimination of ultrashort pulse is demonstrated using a new scheme of nonlinear polarization rotation mirror. Almost transform limited 143 and 318 fs ultrashort pulses without pedestal are successfully generated with high efficiency.

CTuGG • VCSELs and Integration—Continued

CTuGG2 • 5:15 p.m.
High Power Single Mode VCSELs Emitting at 1320nm Wavelength, *Vladimir Iakovlev[1], Andrei Mircea[1], Andrei Caliman[1], Alexandru Mereuta[1], G. Suruceanu[1], Claude-Albert Berseth[1], Paul Royo[1], Alexei Syrbu[1], Eli Kapon[1,2]; [1]BeamExpress S.A., Switzerland, [2]Ecole Polytechnique Federale De Lausanne, Switzerland.* We demonstrate polarization stable record high single mode power of 5.4mW and 3.1mW at 25° and 75°C wafer fused VCSELs operating at 1320nm wavelength with open eye diagrams showing 40ps fall time at 10Gb/s modulation.

CTuGG3 • 5:30 p.m.
Scaling Rules for High-Power 1.55 µm VCSEL Arrays, *Werner H. E. Hofmann[1], Gerhard Böhm[1], Markus Ortsiefer[2], Markus-Christian Amann[1]; [1]Walter Schottky Inst., Germany, [2]Vertilas GmbH, Germany.* Various 1.55 µm vertical-cavity surface-emitting lasers (VCSEL) and two-dimensional VCSEL arrays with output powers up to 100 mW are presented. In a detailed investigation we derive scaling rules for high-power arrays.

CTuHH • High Power Solid-State Lasers—Continued

CTuHH2 • 5:15 p.m.
A Highly Efficient Quasi-Continuous-Wave Diode-Pumped Nd: YAG Rod Laser with a 3.8 kW Output, *Qinjun Peng, Xiaodong Yang, Yong Bo, Qianjin Cui, Hongbo Zhang, Yuanpu Lu, Xiaofu Zhang, Jialin Xu, Dafu Cui, Zuyan Xu; Inst. of Physics, Chinese Acad. of Sciences, China.* A Quasi-Continuous-Wave (QCW) Nd:YAG-rod laser with a 3.8kW output and a 54% optical-optical efficiency is demonstrated by the stable zone control of resonator, which overcomes the limitations of thermal lens effect of Nd: YAG rod.

CTuHH3 • 5:30 p.m.
Measurement of the Self-Phase-Modulation-Induced Bandwidth in a 30-kJ-Class Laser-Amplifier Chain, *William R. Donaldson, Drew N. Maywar, John H. Kelly; Univ. of Rochester, USA.* Self-phase modulation in a multikilojoule laser system was detected spectroscopically and correlated with the time derivative of the intensity. An integrated nonlinear index of refraction was determined that facilitated improved modeling of the system.

QTuJ • Micro-Resonators—Continued

QTuK • Near-Field Optics—Continued

QTuK2 • 5:15 p.m.
Single Molecule Fluorescence Decay Rate Fluctuations in Complex Media, *Luis S. Froufe[1], J.J. Saenz[2], Rémi Carminati[1]; [1]Lab d'Energetique Moléculaire et Macroscopique, Combustion, Ecole Centrale Paris, CNRS, France, [2]Dept. Fisica de la Materia Condensada, Univ. Autonoma de Madrid, Spain.* Statistics of fluorescence decay-rate of single emitters in disordered clusters of nanoparticles are theoretically analyzed. We show how fluctuations depend on the local environment of the emitter, and are sensitive to local absorption and structure.

QTuK3 • 5:30 p.m.
Differential Near-Field Scanning Optical Microscopy, *Aydogan Ozcan[1], Ertugrul Cubukcu[2], Alberto Bilenca[1], Ken Crozier[2], Brett E. Bouma[1], Federico Capasso[2], Guillermo J. Tearney[1]; [1]Harvard Medical School, USA, [2]Div. of Engineering and Applied Sciences, Harvard Univ., USA.* A new aperture-type near-field-scanning-optical-microscopy (NSOM) technique, termed differential NSOM (DNSOM) is illustrated. DNSOM utilizes sharp corners of an aperture to beat diffraction-limit, and unlike conventional-NSOM, the size of the aperture does not determine the resolution.

QTuL • Quantum Dots and Wires—Continued

QTuL3 • 5:15 p.m.
Scanning Photocurrent Microscopy in Semiconducting Carbon Nanotube Transistors, *Yeonghwan Ahn[1], Jiwoong Park[2]; [1]Ajou Univ., Republic of Korea, [2]Cornell Univ., USA.* Scanning photocurrent measurements are demonstrated in individual carbon nanotube field effect transistors. Photocurrent images in conjunction with the electrical conductance measurement elucidate the properties of metal-CNT interfaces, especially the electron band alignment at the contact.

QTuL4 • 5:30 p.m.
Density Tuning of One-Dimensional Electron Gas in a T-Shaped Quantum Wire, *Toshiyuki Ihara[1], Masahiro Yoshita[1], Hidefumi Akiyama[1], Loren N. Pfeiffer[2], Ken W. West[2]; [1]Inst. for Solid State Physics, Univ. of Tokyo, and CREST, JST, Japan, [2]Bell Labs, Lucent Technologies, USA.* Variable-density one-dimensional electron gas was realized in a T-shaped quantum wire with an FET gate. We achieved photoluminescence-excitation measurements on a single wire and observed spectral evolution from degenerate to non-degenerate one-dimensional electron gas.

QTuM • Cold Atoms—Continued

QTuM3 • 5:15 p.m.
Changes in Excitation Line Shapes due to Beliaev Damping in a BEC, *Eitan E. Rowen, Nir Bar-Gill, Rami Pugatch, Nir Davidson; Weizmann Inst. of Science, Israel.* We quantitatively study the Beliaev decay of Bogoliubov quasi-particles of different energies and momenta in an elongated BEC. The structure of the continuum leads to a momentum dependent collisional shift of the excitation spectrum.

QTuM4 • 5:30 p.m.
Ultra Cold Bosons in Incommensurate Optical Lattices, *Nir Bar-Gill, Rami Pugatch, Eitan E. Rowen, Nir Davidson; Weizmann Inst. of Science, Israel.* We study the quantum phase diagram of ultra cold bosons in 1-D incommensurate optical lattices, as compared to commensurate lattices. We also examine the experimental implications of incommesurability and one spatial dimension.

JTuD • High-Field Science—Continued

JTuD3 • 5:15 p.m.
Single Attosecond Pulse Generation Using a Seed Harmonic Pulse Train, *Kenichi L. Ishikawa[1,2], Eiji J. Takahashi[3], Katsumi Midorikawa[3]; [1]Univ. of Tokyo, Japan, [2]PRESTO, JST, Japan, [3]RIKEN, Japan.* We theoretically present a new scheme of single attosecond pulse generation which does not require few-cycle lasers, based on enhanced harmonic generation by simultaneous irradiation of driving laser and seed harmonic pulse train.

JTuD4 • 5:30 p.m.
Wideband to Narrowband Pulse Shaping via a Chirp-Transform Scaling Technique, *Nicolas Forget[1], Arnaud Cotel[2], Thomas Oksenhendler[4], Catherine Le Blanc[2], Daniel Kaplan[1], Pierre Tournois[1]; [1]Fastlite, France, [2]LULI, Ecole Polytechnique, France.* We demonstrate a chirp-transform scaling technique to increase the spectral resolution of a pulse shaper by three orders of magnitude. Using this technique quasi-monochromatic pulses at 532nm are shaped on a picosecond time-scale.

CTuII • Waveguide Devices—Continued

CTuII3 • 5:15 p.m.
Mode-Locked and Single-Longitudinal-Mode Waveguide Lasers Fabricated by Femtosecond Laser Pulses in Er:Yb-Doped Phosphate Glass, *Roberto Osellame[1], Giuseppe Della Valle[2], Nicola Chiodo[2], Giulio Cerullo[2], Stefano Taccheo[2], Paolo Laporta[3], Orazio Svelto[2], Uwe Morgner[4], Alex Rozbin[5], Andrea C. Ferrari[5]; [1]IFN-CNR., Italy, [2]Dept. di Fisica, Politecnico di Milano, Italy, [3]Dept. di Fisica - Politecnico di Milano, Italy, [4]Inst. fuer Quantenoptik, Univ. of Hannover, Germany, [5]Engineering Dept., Cambridge Univ., UK.* Mode-locked and single-longitudinal-mode waveguide lasers, manufactured by femtosecond laser writing in Er-Yb-doped phosphate glasses, are presented. Transform-limited 1.6-ps pulses and a cw output power exceeding 50 mW have been obtained in the two regimes.

CTuII4 • 5:30 p.m.
Photoluminescence of Semiconductor Nanocrystal Quantum Dots at 1550 nm Wavelength in the Core of Photonic Bandgap Fiber, *Satoki Kawanishi[1], Tetsuro Komukai[1], Masato Ohmori[2], Hiroyuki Sakaki[2]; [1]NTT, Japan, [2]Inst. of Industrial Science, Univ. of Tokyo, Japan.* Photoluminescence is observed from PbSe nano-crystal quantum dots at 1550 nm wavelength filling in the core of a photonic bandgap fiber. Photoluminescence at 1554 nm is observed with 1535 nm, 10 mW pumping.

CTuJJ • Terahertz Surface Plasmons and Near-Field Microscopy—Continued

CTuJJ3 • 5:15 p.m. Invited
Resonantly Enhanced Terahertz Transmission through Aperiodic Arrays of Subwavelength Apertures, *Amit Agrawal, Tatsunosuke Matsui, Z. Valy Vardeny, Ajay Nahata; Univ. of Utah, USA.* We demonstrate that specific classes of aperiodic arrays of subwavelength apertures, designed using a general numerical approach, exhibit sharp, well-defined transmission resonances. The resonance frequencies directly correspond to the associated aperture array structure factor.

PTuD • Industrial Applications of Ultrafast Lasers—Continued

PTuD6 • 5:15 p.m.
Waveguide Lasers of Er:ZBLAN and Nd:GGG by Pulsed Laser Deposition and fs-Laser Microstructuring, *Dirk Wortmann, Dimitri Ganser, Leonid Moiseev, Larisa Starovoytova, Ion Vasilief, Jens Gottmann; Lehrstuhl für Lasertechnik, Germany.* Waveguide lasers are manufactured using laser radiation for the deposition of thin films and the micro structuring of the wave guiding structures. For the first time laser activity in fs-laser structured amorphous waveguides was achieved.

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CLEO | JOINT | CLEO | QELS

CTuDD • Silicon Photonics—Continued

CTuDD2 • 5:45 p.m.
All Optical Ultrafast Broadband Silicon Switch, *Po Dong, Stefan F. Preble, Michal Lipson; School of Electrical and Computer Engineering, Cornell Univ., USA.* We demonstrate 1X2 all-optical broadband switches using 200-μm-diameter ring resonators on a silicon chip with a rise time of 100 ps. The device can switch a large number (>10) of channels spaced by 0.9 nm.

CTuDD3 • 6:00 p.m.
High Directivity, Vertical Fiber-to-Chip Coupler with Anisotropically Radiating Grating Teeth, *Mingyan Fan, Milos Popovic, Franz X. Kaertner; MIT, USA.* Vertical grating-coupler designs based on antenna theory are proposed that allow near 50:1 up/down directivity using only two lithographic layers in high-index-contrast silicon waveguides. FDTD simulations predict single-mode-fiber-coupling efficiencies of 75% even for non-apodized gratings.

JTuC • Symposium on Self-Phase Modulation II—Continued

JTuC4 • 5:45 p.m.
Kerr Nonlinearity Induced Optical Frequency Comb Generation in Microcavities, *Pascal Del'Haye, Albert Schliesser, Tobias Wilken, Ronald Holzwarth, Tobias Kippenberg; Max Planck Inst. of Quantum Optics, Germany.* It is shown that optical sidebands generated via optical parametric oscillations in a monolithic silica microcavity are equidistant thus overcoming the cavity dispersion. This leads to the generation of optical frequency combs.

JTuC5 • 6:00 p.m. Invited
Bigger and Better: The Critical Role of Self-Phase Modulation in Ultraprecise Optical Frequency Combs, *Scott Diddams; NIST, USA.* Self-phase modulation (SPM) is crucial to the production and expansion of optical frequency combs based on mode-locked lasers. I will review how SPM makes bigger and better frequency combs and discuss some of their applications.

CTuEE • Cellular Imaging—Continued

CTuEE5 • 5:45 p.m.
Fluorescence Microscopic Mapping of Electrical Wave Propagation in an *in-vitro* Model of Skeletal Myoblast Cell Transplantation, *Yibing Zhang, Rajesh B. Sekar, Roselle M. Abraham, Leslie Tung; Johns Hopkins Univ., USA.* Electrical wave propagation at a multicellular level was mapped in an in-vitro model of skeletal myoblast cell transplantation using a fluorescence micromapping system; microheterogeneity of electrical conduction was observed, which may induce arrhythmias inside hearts.

CTuEE6 • 6:00 p.m.
Cancer Cell Filopodia Characterized by Super-Resolution Bright-Field Optical Microscopy, *Chau-Hwang Lee[1], Tsi-Hsuan Hsu[2], Wei-Yu Liao[3], Pan-Chyr Yang[3], Chun-Chieh Wang[4], Jian-Long Xiao[1]; [1]Academia Sinica, Taiwan, [2]Inst. of Biophotonics Engineering, Natl. Yang-Ming Univ., Taiwan, [3]Dept. of Internal Medicine, Natl. Taiwan Univ. Hospital and Natl. Taiwan Univ. College of Medicine, Taiwan, [4]Graduate Inst. of Physics, Natl. Chung Cheng Univ., Taiwan.* We use super-resolution bright-field optical microscopy of lateral resolution ~ 120 nm to measure the filopodium dynamics of lung cancer cells. The effects of epidermal growth factor on filopodium dynamics are characterized.

CTuFF • Ultrafast Pulse Shaping—Continued

CTuFF5 • 5:45 p.m.
Femtosecond Pulse Shaping Using a 2-D Liquid Crystal Spatial Light Modulator, *Eugene Frumker, Yaron Silberberg; Weizmann Inst. of Science, Israel.* We demonstrate a new scanning femtosecond pulse shaping technique that enables modulation of pulse-shapes at hundred of kilohertz rates. This technique is particularly useful for lock-in on the pulse shape measurements.

CTuFF6 • 6:00 p.m.
Pulse Shaping of Octave Spanning Femtosecond Laser Pulses, *Bingwei Xu, Yves Ceollo, Vadim V. Lozovoy, D.Abmasi Harris, Marcos Dantus; Michigan State Univ., USA.* Phase characterization, correction and shaping of an ultra-broad-bandwidth femtosecond laser were achieved using a grating-based pulse shaper. By using MIIPS, the compensated pulses generated a second harmonic spectrum spanning over 12,260 cm^{-1}.

CTuGG • VCSELs and Integration—Continued

CTuGG4 • 5:45 p.m.
Low Threshold VCSELs Recess-Integrated on Si-CMOS ICs, *James M. Perkins, Clifton G. Fonstad; MIT, USA.* VCSELs have been integrated as individual pills within the dielectric stack of commercially produced Si ICs. 1 mA threshold currents and thermal characteristics similar to those of native substate devices are reported.

CTuGG5 • 6:00 p.m.
Integrated Waveguide-Grating-Coupled VCSEL/Photodetector Arrays with High Coupled Power for Dense High-Speed Interconnects, *Kai Yang, Julian Cheng, Ketan M. Patel, Tyler J. Eustis, Duane A. Louderback, Xiaojun Jin, Jeff Schoengarth, Chung-yen Chao, Min-yi Shih, Peter S. Guilfoyle; OptiComp Corp., USA.* Integrated waveguide-grating-coupled VCSEL/RCEPD arrays with >1.4 mW/facet output power and VCSEL-to-photodetector data communication at >1.25 Gbps through integrated waveguide have been demonstrated. This technology will enable practical applications using VCSEL-based photonic integrated circuits.

CTuHH • High Power Solid-State Lasers—Continued

CTuHH4 • 5:45 p.m.
High Power CW Yb:YAG Cryogenic Laser, *David C. Brown, Joseph M. Singley, E. Yager, Jerry W. Kuper, Brett J. Lotito, Lonnie L. Bennett; Snake Creek Lasers LLC, USA.* We describe the operation of a compact CW liquid nitrogen cooled Yb:YAG laser with near diffraction-limited output > 200W and slope efficiency > 63%.

CTuHH5 • 6:00 p.m. Invited
15 kW Near-Diffraction-Limited Single-Frequency Nd:YAG Laser, *Shawn Redmond, S. McNaught, J. Zamel, L. Iwaki, S. Bammert, R. Simpson, S. B. Weiss, J. Szot, B. Flegal, T. Lee, H. Komine, H. Injeyan; Northrop Grumman Space Technology, USA.* Northrop Grumman has developed a compact high power near-diffraction-limited single frequency Nd:YAG laser. The laser achieved 15 kW with a beam quality <1.3xDL and a continuous runtime over 22 minutes on a ~1 m^2 bench.

QTuJ • Micro-Resonators—Continued

QTuJ2 • 5:45 p.m.
Observation of the Direct Evidence of Wave Interference in Chaotic Microlasers, *Wei Fang[1,2], Hui Cao[2]; [1]NIST, USA, [2]Northwestern Univ., USA.* We observed the lasing emission intensity oscillates with wavelength in polymer micro-stadium lasers. Our simulation results indicate that such oscillation is coming from the wave interference induced quality factor changes in chaotic system.

QTuJ3 • 6:00 p.m.
Percolation of Light in 3-D Lattices of Coupled Microspheres, *Vasily N. Astratov, Shashanka P. Ashili; Univ. of North Carolina at Charlotte, USA.* The propagation of light in systems of disordered coupled cavities with whispering gallery resonances is interpreted in terms of percolation theory. The existence of well connected clusters is demonstrated in scattering spectra of such lattices.

QTuK • Near-Field Optics—Continued

QTuK4 • 5:45 p.m.
Nanoscale Fluorescence Imaging Using a Single-Wall Carbon Nanotube, *Changan Xie, Chun Mu, Jonathan R. Cox, Jordan M. Gerton; Dept. of Physics, Utah Univ., USA.* A single-wall carbon nanotube attached to an AFM probe is used for near-field optical imaging of 20 nm diamete fluorescent spheres and 5 nm diameter CdSe quantum dots.

QTuK5 • 6:00 p.m.
Near-Field Imaging of the Evanescent Electric Field on the Surface of a Quantum Cascade Laser, *Virginie Moreau[1], Paul-Arthur Lemoine[2], Michael Babriz[1], Yannick De Wilde[2], Raffaele Colombelli[1], Raviv Perahia[3], Oskar Painter[3], Luke Wilson[4], Andrey Krysa[5]; [1]Inst. d'Electronique Fondamentale, France, [2]Lab d'Optique Physique - ESPCI, France, [3]Caltech, USA, [4]Dept. of Physics and Astronomy, Univ. of Sheffield, UK, [5]EPSRC Natl. Ctr. for III-V Technologies, Dept. of Electronic and Electrical Engineering, Univ. of Sheffield, UK.* We observed by scanning-near-field-optical-microscopy the evanescent electric field on the surface of a quantum-cascade mid-infrared laser. The devices are designed to let a consistent portion of the optical mode to leak-out of the top surface.

QTuL • Quantum Dots and Wires—Continued

QTuL5 • 5:45 p.m.
CdTe Quantum Dot in Tunable Hydrogel Nanocrystals, *Arup Neogi, Santaneel Ghosh, Brett Garner, Jianyou Li, Tong Cai, Zhibing Hu; Univ. of North Texas, USA.* Optical emission from CdTe quantum dots (QDs) embedded in poly-N-isopropylacrylamide hydrogel nanocrystallites can be enhanced over 100% using thermal and electrical stimulus. Relative distance amongst QDs was modified tuning the hydrogel facilitating resonant energy transfer.

QTuL6 • 6:00 p.m.
CdSe Quantum Dots in Single Plasmonic Nanocavities, *Yurij Fedutik[1], Vasily V. Temnov[1], Ulrike K. Woggon[1], Mikhail V. Artemyev[2]; [1]Univ. of Dortmund, Germany, [2]Inst. for Physico-Chemical Problems, Belorussian State Univ., Belarus.* A silver-wire nanocavity with CdSe quantum dots (QD) is optimized towards cavity-QED by varying cavity length and QD-wire distance. QD-plasmon coupling, enhancement of spontaneous emission and group velocities in the nanocavity of vG~0.5c are observed.

QTuM • Cold Atoms—Continued

QTuM5 • 5:45 p.m. Invited
Ultracold Atoms in Optical Lattice: From Precision Measurement to Quantum Optics, *Jun Ye; JILA, Univ. of Colorado and NIST, USA.* Ultracold atoms confined in an optical lattice offer an ideal platform for quantum manipulation and precison measurement. We report our latest results using fermionic isotope of Sr.

JTuD • High-Field Science—Continued

JTuD5 • 5:45 p.m.
97% Top Hat Efficiency, 4 J/cm² Damage Threshold Compression Gratings, *Federico Canova[1], Jean-Paul Chambaret[1], Olivier Uteza[2], Philippe Delaporte[2], Marc Tondusson[3], Eric Freysz[3], Olivier Parriaux[4], Manuel Flury[4], Svetlen Tonchev[4], Nikolai Lyndin[5]; [1]Lab d'Optique Appliquee - LOA, France, [2]LP³, France, [3]CPMOH, France, [4]Lab Hubert Curien, France, [5]Inst. of General Physics, Russian Federation.* High diffraction efficiency all-dielectric pulse compression grating is reported with a close to 100% flat top over more than 20 nm spectral width around 800 nm wavelength and more than 4 J/cm² damage threshold.

JTuD6 • 6:00 p.m.
Stable Long-Cavity Regenerative Amplifier with 10^{-11} ASE Contrast, *James Easter, Bixue Hou, Erik Power, John Nees; Ctr. for Ultrafast Optical Science, Univ. of Michigan, USA.* Design and measurements of a high-contrast millijoule regenerative amplifier are presented. Coupled with a preamplifier and saturable absorber, the amplifier and subsequent compressor produce 3.7 mJ, 33 fs pulses with nanosecond ASE contrast of 10^{-11}.

CTuII • Waveguide Devices—Continued

CTuII5 • 5:45 p.m.
Femtosecond Laser Inscription of Optical Waveguides in Bismuth Ion Doped Glass, *Nicholas D. Psaila[1], Robert R. Thomson[1], Henry T. Bookey[1], Ajoy K. Kar[1], Nicola Chiodo[2], Roberto Osellame[2], Giulio Cerullo[2], Graeme Brown[3], Shaoxiong Shen[4], Animesh Jha[4]; [1]Heriot-Watt Univ., UK, [2]Politecnico di Milano, Italy, [3]Gemfire Europe, UK, [4]Univ. of Leeds, UK.* We report on the fabrication of high quality embedded channel waveguides inside Bi-doped silicate glass using femtosecond waveguide inscription. When optically pumped, ultra-broadband fluorescence emission of 500 nm (FWHM) is detected, centered at 1.3 μm.

CTuII6 • 6:00 p.m.
$KY(WO_4)_2$:Tm^{3+} Planar Waveguide Laser, *Simon Rivier[1], Xavier Mateos[1], Valentin Petrov[1], Uwe Griebner[1], Yaroslav E. Romanyuk[2], Camelia N. Borca[2], Florent Gardillou[2], Markus Pollnau[2]; [1]Max-Born-Inst., Germany, [2]EPFL, Switzerland.* Waveguide lasing of monoclinic $KY(WO_4)_2$:Tm^{3+} grown by liquid-phase epitaxy is demonstrated in the 2 μm spectral range. The maximum continuous-wave output power achieved was 32 mW in the fundamental mode.

CTuJJ • Terahertz Surface Plasmons and Near-Field Microscopy—Continued

CTuJJ4 • 5:45 p.m.
Surface Plasmon Polariton-Based Coaxial Probe for Terahertz Near-Field Microscopy, *Dustin Surawicz[1], Peter Haring Bolivar[1], Heungjoo Shin[2], Boris Mizaikoff[2]; [1]Siegen Univ., Germany, [2]Georgia Tech, USA.* An enhanced sensitivity near-field Terahertz microscope concept is presented based on Surface Plasmon Polariton assisted tunneling through a sub-wavelength coaxial probe. A concentric metallo-dielectric coupling structure yields a field enhancement by two orders of magnitude.

CTuJJ5 • 6:00 p.m.
Plasmon-Enhanced Terahertz Near-Field Microscopy, *Victoria Astley, Hui Zhan, Daniel Mittleman, Feng Hao, Peter Nordlander; Rice Univ., USA.* Using terahertz apertureless near-field microscopy, we observe an electromagnetic field enhancement produced by a broadband plasmon resonance localized in the junction between a metal probe tip and a sub-micron-thick metallic substrate.

NOTES

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CLEO | JOINT | CLEO | QELS

CTuDD • Silicon Photonics—Continued

CTuDD4 • 6:15 p.m.
Low-Loss Silicon Wire Waveguides with 3-D Tapered Couplers Fabricated by Self Profile Transformation, *Ming-Chang M. Lee[1], Wei-Chao Chiu[1], Tse-Ming Yang[1], Chin-Hung Chen[1], Ming C. Wu[2]; [1]Inst. of Photonics Technologies, Natl. Tsing Hua Univ., Taiwan, [2]Dept. of Electrical Engineering and Computer Sciences, Univ. of California at Berkeley, USA.* A novel low-loss silicon wire waveguide and 3-D tapered couplers are demonstrated by self profile transformation for the first time. The experimental results show the propagation loss is 2dB/cm and the coupler loss is 1.2dB.

CTuEE • Cellular Imaging—Continued

CTuEE7 • 6:15 p.m.
Depolarized Raman Spectroscopy of Optically Trapped Cells for Rapid Identification of Microorganisms, *De Chen, Changan Xie, Yong-qing Li; East Carolina Univ., USA.* Depolarized Raman spectroscopy of single optically trapped cells is used for rapid identification of microorganisms in aqueous solution. Depolarization ratios provide new parameters for better discrimination of bacterial species, comparing with the normal Raman spectroscopy.

CTuFF • Ultrafast Pulse Shaping—Continued

CTuFF7 • 6:15 p.m.
Phase Characterization and Adaptive Pulse Compression Using MIIPS in Air, *D. Ahmasi Harris, Janelle C. Shane, Vadim V. Lozovoy, Marcos Dantus; Michigan State Univ., USA.* We introduce a noninterferometric single beam method for accurate characterization and adaptive compression of amplified femtosecond pulses. This new method, air-MIIPS, exploits the third harmonic generation in air to measure and compensate high-order phase distortions.

CTuGG • VCSELs and Integration—Continued

CTuGG6 • 6:15 p.m.
Shift Register Function in Optical Buffer Memory Using Polarization Bistable VCSELs, *Takashi Mori[1,2], Yuuki Sato[1], Hitoshi Kawaguchi[1,2,3]; [1]CREST, Japan Science and Technology Agency, Japan, [2]Nara Inst. of Science and Technology, Japan, [3]Optoelectronic Industry and Technology Development Association, Japan.* Shift register function in optical buffer memory was experimentally demonstrated using polarization bistable VCSELs. Input data stored as the polarization state of the first VCSEL were transferred to the polarization state of the second VCSEL.

QTuJ • Micro-Resonators—Continued

QTuJ4 • 6:15 p.m.
Observations of Whispering Gallery Modes in Asymmetric Optical Resonators with Rational Caustics, *Jie Gao[1], Pascal Heider[2], Charlton Chen[1], Xiaodong Yang[1], Chad Husko[1], Chee Wei Wong[1]; [1]Columbia Univ., USA, [2]Ctr. of Mathematics Res., Bell Labs, USA.* We investigate experimentally and numerically resonant whispering gallery modes of billiard-type optical resonators with rational caustics. Measurements observe distinct families and asymmetric emission; simulations highlight novel inner higher-periodic orbits for microcavity laser and CQED applications.

QTuK • Near-Field Optics—Continued

QTuK6 • 6:15 p.m.
Strong Light Extinction by a Single Molecule, *Gert Wrigge, Ilja Gerhardt, Jaesuk Hwang, Vahid Sandoghdar; ETH Zurich, Switzerland.* We present cryogenic experiments where the direct signature of a single molecule on an incident laser beam is demonstrated. Strong extinction larger than 10% is achieved in near and far-field geometries.

5:00 p.m. – 6:30 p.m. EXHIBITORS' RECEPTION

6:30 p.m. – 8:00 p.m. CONFERENCE WELCOME RECEPTION, BALLROOMS III/IV

QELS | JOINT | CLEO

QTuL • Quantum Dots and Wires—Continued

QTuL7 • 6:15 p.m.
Laser Emission from Quantum Dots in High-*Q* Micropillar Cavities, *Stephan Reitzenstein[1], Carolin Hofmann[1], Anatoli Bazhenov[2], Alexander Gorbunov[2], Steffen Münch[1], Andreas Löffler[1], Martin Kamp[1], Vladimir Kulakovskii[2], Alfred Forchel[1]; [1]Technische Physik, Univ. Würzburg, Germany, [2]Inst. for Solid State Physics, Russian Acad. of Science, Russian Federation.* We report on laser emission from a low number of InGaAs quantum dots embedded in high-*Q* micropillar laser structures. Resonance tuning of single quantum dots allows the observation of pronounced single dot lasing effects.

QTuM • Cold Atoms—Continued

QTuM6 • 6:15 p.m.
The Difference between a Photon's Momentum and an Atom's Recoil, *Kurt Gibble; Penn State Univ., USA.* We analyze the recoil shift for atoms in Gaussian laser beams and microwave cavities. The frequency shifts from the transverse photon recoils must be understood for the most accurate atom interferometers and atomic fountain clocks.

JTuD • High-Field Science—Continued

JTuD7 • 6:15 p.m.
Probing Attosecond Kinetic Physics in Strongly Coupled Plasmas, *Lora Ramunno[1], Christian Jungreuthmayer[1], Heidi Reinholz[2], Thomas Brabec[1]; [1]Univ. of Ottawa, Canada, [2]Univ. Rostock, Germany.* We investigate intense laser-cluster interaction via molecular dynamics, finding that laser intensity controls the plasma coupling strength. By observing the destruction of collective effects, we determined subfemtosecond collision frequencies for strongly coupled plasmas.

CTuII • Waveguide Devices—Continued

CTuII7 • 6:15 p.m.
Tunable Photonic Crystal Fiber Couplers Infiltrated with Highly-Thermo-Responsive Liquid Crystal Substances, *Kunimasa Saitoh, Nikolaos Florous, Shailendra Varshney, Masanori Koshiba; Hokkaido Univ., Japan.* We theoretically address the thermo-optical response of multi-core photonic crystal fiber (PCF) couplers infiltrated with nematic liquid crystals (LCs). The enhanced thermo-optical properties of LC-based PCF couplers are highly attractive for photo-thermal sensing applications.

CTuJJ • Terahertz Surface Plasmons and Near-Field Microscopy—Continued

CTuJJ6 • 6:15 p.m.
Terahertz Apertureless Near-Field Aicroscopy of a Vanadium Dioxide Thin Film, *Hui Zhan[1], Michael Hvasta[1], Victoria Astley[1], Jason A. Deibel[1], Daniel M. Mittleman[1], Y. S. Lim[2]; [1]Rice Univ., USA, [2]Konkuk Univ., Republic of Korea.* We report the application of terahertz apertureless near-field microscopy to vanadium dioxide thin films. We observe a enhancement of the terahertz amplitude due to the metal-insulator transition induce by voltage.

5:00 p.m. – 6:30 p.m. EXHIBITORS' RECEPTION

6:30 p.m. – 8:00 p.m. CONFERENCE WELCOME RECEPTION, BALLROOMS III/IV

NOTES