Nonlinear Optics (NLO) Abstracts

• Sunday, 17 July, 2011

Kauai Court, **14:00 – 18:00, Registration Open**

• Monday, 18 July, 2011

Kauai Court, **07:00 – 18:30, Registration Open**

Kauai Ballroom: Kona, **08:00 – 08:15, Opening Remarks**

NMA • Materials I

Kauai Ballroom, Kona
08:15–10:00
Carlota Canalias; KTH, Sweden, Presider

NMA1 • 08:15 Plenary
Quasi-phasematching: Spatial and Spectral Engineering of Nonlinear Optics, Martin Fejer[1]; [1]*Stanford Univ., USA.* Abstract not available.

NMA2 • 09:00
New Nonlinear Crystal for Three-wave Interactions with Transmission Extending from 1.7 to 25 μm., Valeriy Badikov[1], Dmitrii Badikov[1], Galina Shevyrdyaeva[1], Aleksey Tyazhev[2], Georgi Marchev[2], Vladimir Panyutin[2], Frank Noack[2], Valentin Petrov[2], Albert Kwasniewski[3]; [1]*High Technologies Laboratory, Russian Federation;* [2]*Max-Born-Institute, Germany;* [3]*Institute for Crystal Growth, Germany.* We have grown single crystals of PbIn6Te10, with clear transparency from 3 to 20 μm, and showed that it possesses sufficient birefringence for phase-matching of three-wave parametric interactions and a nonlinear coefficient of 51 pm/V.

NMA3 • 09:15
IR Broadband Generation in the New Crystal CdSiP2., Benoît Boulanger[1]; [1]*Joseph Fourier University, France.* We performed the direct measurement of the phase-matching tuning curves of the new nonlinear crystal CdSiP2. These data enable to establish very accurate Sellmeier equations showing the ability of CdSiP2 for broad band infrared generation.

NMA4 •09:30
Fabrication of Slant Quasi Phase Matching Structure in Mg-doped Congruent LiNbO3., Hideki Ishizuki[1], Takunori Taira[1]; [1]*Institute for Molecular Science, Japan.* We fabricated slant quasi-phase-matching structure in 2-mm-thick Mg-doped LiNbO3 crystal at 65° slant angle with 75-μm surface period. Slant QPM has a possibility of wafer-scale-aperture device, suitable for handling high power/energy lasers.

NMA5 • 09:45
Fabrication of a New Walk-off Compensating BBO Periodic Structure by Use of the Room-temperature-bonding Technique., Kenjiro Hara[1], Konosuke Takayanagi[1], Shinnosuke Matsumoto[1], Maki Nakajima[1], Ichiro Shoji[1]; [1]*Chuo University, Japan.* We have succeeded in developing a new walk-off compensating BBO periodic structure using the room-temperature-bonding technique, which generates twice the second-harmonic ultraviolet power of a bulk BBO with the same length.

NMB • Quantum Optics I

Kauai Ballroom, Kona
10:30-12:30
Yiwen Chu; Harvard Univ., USA, Presider

NMB1 • 10:30 **Invited**
The Wonderful World of Weak Values, John Howell[1], David J. Starling[1], Paul B. Dixon[1], Andrew Jordan[1]; *[1]Department of Physics and Astronomy, University of Rochester, USA.,* An introduction to weak values will be given along with experimental results in precision beam deflection, signal to noise ratio, phase amplification and precision frequency measurements.

NMB2 • 11:00
Frequency-upconversion Photon-number-resolving Detector for Wavelengths around 1 μm., Kun Huang[1], Xiaorong Gu[1], Min Ren[1], Yi Jian[1], Haifeng Pan[1], Guang Wu[1], E. Wu[1], Heping Zeng[1]; *[1]State Key Laboratory of Precision Spectroscopy, East China Normal University, China.* We demonstrated the photon-number-resolving detection at 1.04 μm by coincidence frequency upconverison. A total detection efficiency of 3.2% was achieved with a quite low background noise probability of 0.0002 per pulse.

NMB3 • 11:15
Efficient Frequency Downconversion at the Single Photon Level from 738 nm to 1557 nm, Sebastian Zaske[1], Andreas Lenhard[1], Christoph Becher[1]; *[1]FR7.2 Experimentalphysik, Universität des Saarlandes, Germany.* We report on quantum frequency downconversion using a ZnO:PPLN ridge waveguide. An internal conversion efficiency of 73% is achieved. We identify Raman scattering to be the dominant noise source in the frequency converter.

NMC • Terahertz

Kauai Ballroom, Halele'a
10:30–12:30
Alfred Leitenstorfer; Univ. of Konstanz, Germany, Presider

NMC1 • 10:30
3.4 THz generation based on DAST-DFG pumped by an all solid-state dual-wavelength Nd:YAG laser, Kouji Nawata[1], Atsushi Sato[2], Kazuhiro Asai[2], Hiromasa Ito[1], Hiroaki Minamide[1]; *[1]RIKEN, Japan; [2]Tohoku institute of technology, Japan.* We developed a compact and efficient THz-wave source based on a DAST-DFG pumped by an all solid-state dual-wavelength Nd:YAG laser. Output energy of the Nd:YAG laser was 9 mJ and 3.4 THz-wave was observed.

NMC2 • 10:45
Efficient THz Emission from the Acoustic Surface Plasmons in InAs Nanowires, Denis Seletskiy[1,4], Michael Hasselbeck[1], Chia-Yeh Li[1], Jeffrey Cederberg[2], Aaron Katzenmeyer[3], Maria Toimil-Molares[3], Francois Leonard[3], Albert Talin[3], Mansoor Sheik-Bahae[1]; *[1]University of New Mexico, USA; [2]Sandia National Laboratories, USA; [3]Sandia National Laboratories, USA; [4]Air Force Research Laboratory, USA.* We observe efficient THz emission from an ensemble of free-standing InAs nanowires. The emitted spectrum is consistent with the presence of low-energy acoustic surface plasmons. The predicted electron concentration agrees with separate transconductance measurements.

NMC3 • 11:00 **Invited**
Wideband terahertz generation using nonlinear optical waveguide, Kodo Kawase[1,2], Takayuki Shibuya[1,2], Koji Suizu[1]; *[1]Nagoya University, Japan; [2]RIKEN, Japan.* We obtained a wideband terahertz generation using a prism-coupled Cherenkov phase-matching method, in which a prism with a suitable refractive index at terahertz frequencies is coupled to a thin nonlinear optical crystal.

NMB • Quantum Optics I (cont.)

NMB4 • 11:30
Quantum input-output formalism for few-photon nonlinear transport in nanophotonic circuits, Shanhui Fan[1], Jung-Tsung Shen[2], Sukru E. Kocabas[1]; [1]*Electrical Engineering, Stanford University, USA;* [2]*Electrical and System Engineering, Washington Unversity St. Louis, USA.* We introduce a quantum input-output formalism, which greatly simplifies the theoretical treatment of nonlinear quantum transport of few-photon Fock state in nanophotonic circuits.

NMB5 • 11:45
Generation, manipulation, and characterization of highly-discrete coherent spectrum, Masayuki Katsuragawa[1]; [1]*University of Electro-Communications, Japan.* We report on a stable generation of a highly-discrete comb-like spectrum and its manipulation and precise characterization of the spectral phase.

NMB6 • 12:00
Lossless Single Photon Shaping via Heralding., Yuping Huang[1], Kahraman Köprülü[1], Geraldo A. Barbosa[1], Prem Kumar[1]; [1]*Center for Photonic Communication and Computing, EECS Department, Northwestern, USA.* Using spontaneous optical parametric down-conversion, we analyze and experimentally demonstrate heralded generation of shaped single photons, whose modes are losslessly tailored via amplitude modulation on the pump field that drives the down-conversion process.

NMB7 • 12:15
Photon Pair Generation and Quantum Walks in Arrays of Quadratic Nonlinear Waveguides, Alexander S. Solntsev[1], Andrey A. Sukhorukov[1], Dragomir N. Neshev[1], Yuri S. Kivshar[1]; [1]*Nonlinear Physics Centre, The Australian National University, Australia.* We study photon pair generation through spontaneous parametric down conversion accompanied by quantum walks in arrays of quadratic nonlinear waveguides and investigate various ways to control output photon correlations.

NMC • Terahertz (cont.)

NMC4 • 11:30
Improving optical-to-THz conversion efficiency using a binary phase mask, Xavier Ropagnol[1], Roberto Morandotti[2], Tsuneyuki Ozaki[3], Matt Reid[4]; [1]*INRS, Canada;* [2]*Universite du Quebec, INRS, Canada;* [3]*INRS, Canada;* [4]*University of Northern British Columbia, Canada.* We demonstrate efficient generation of quasi-single-cycle THz pulses using an interdigitated GaAs Large Area Photoconductive Antenna (LAPCA) with a binary phase mask which allow the generation of a single cycle THz pulse.

NMC5 • 11:45
Optimization of Broadly Tunable BNA-DFG Terahertz-Wave Source, Takashi Notake[1], Yuye Wang[1], Kouji Nawata[1], Hiroshi Kawamata[1], Hiroaki Minamide[1]; [1]*RIKEN, Japan.* Broadly tunable terahertz wave source utilizing difference frequency generation in a organic BNA crystal is developed. By using dual KTP-OPO optimized for phase matching condition, wideband THz-wave generation from sub- to 20 THz is achieved.

NMC6 • 12:00
Withdrawn

NMC7 • 12:15
Towards Generation of mJ-Level Ultrashort THz Pulses by Optical Rectification, Jozsef A. Fülöp[1], Zoltán Ollmann[1], László Pálfalvi[1], Gábor Almási[1], János Hebling[1]; [1]*Department of Experimental Physics, University of Pecs, Hungary.* According to calculations THz pulses energies on the 10-mJ level and peak electric fields of 100 MV/cm can be reached by optimal pump pulse durations with a contact grating, and cooling the LN crystal.

On Your Own, **Free Afternoon, 12:30 – 19:30**

NMD • Nonlinear Absorption and Magnetization

Kauai Ballroom, Kona
19:30–21:30
Wayne Knox; Univ. of Rochester, USA, Presider

NMD1 • 19:30
Few-Photon Switching via Two-Photon Absorption in Rb-Filled Photonic Bandgap Fibers, Vivek Venkataraman[1], Kasturi Saha[1], Pablo Londero[1], Alex Gaeta[1]; *[1]Applied and Engg. Physics, Cornell University, USA.* We show 20% all-optical modulation with less than 2 nW total power via non-degenerate two-photon absorption in Rb vapor confined to a photonic bandgap fiber. This corresponds to about 15 photons of switching energy.

NMD2 • 19:45
Electric Field Induced Quantum Interference in Semiconductors, Steven Cundiff[1,2], Jared Wahlstrand[1], Haipeng Zhang[1,2], Soobong Choi[1], John Sipe[1,3]; *[1]JILA, University of Colorado and National Institute of Standards and Technology, USA; [2]Electrical, Computer and Energy Engineering Department, University of Colorado, USA; [3]Department of Physics, University of Toronto, Canada.* Pump-probe experiments on a biased (100) GaAs sample show that a constant electric field enables quantum interference between one and two photon absorption. This effect can be ascribed to the nonlinear optical Franz-Keldysh effect.

NMD3 • 20:00
Femtosecond-scale pulse compression by the intrinsic nonlinearity of a semiconductor two-photon amplifier, Amir Nevet[1], Alex Hayat[1], Meir Orenstein[1]; *[1]Electrical Engineering, Technion, Israel.* Ultrafast compression of pulses by two-photon gain in an electrically-driven AlGaAs waveguide is measured and analyzed. Dynamic control of pulse width from 240 to 140 fs is achieved by varying the current injection levels.

NMD4 • 20:15
Extremely Nondegenerate Two-Photon Absorption and Detection in Direct Gap Semiconductors, Claudiu Cirloganu[1,2], Dmitry A. Fishman[1], Scott Webster[1], Lazaro A. Padilha[1,3], Morgan Monroe[1], David J. Hagan[1,4], Eric W. Van Stryland[1,4]; *[1]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA; [2]Ctr for Organic Photonics and Electronics, Georgia Inst. of Tech., USA; [3]Los Alamos National Lab., USA; [4]Dept. of Physics, Univ. of Central Florida, USA.* Two-to-Three orders of magnitude enhancement of nondegenerate 2-photon absorption (2PA) compared to degenerate 2PA are observed. Femtosecond gated detection of low power mid-IR radiation using ultraviolet gating pulses using a GaN detector at room temperature is demonstrated.

NME • Lasers and OPOs

Kauai Ballroom, Halele'a
19:30–21:30
Robert Byer; Stanford Univ., USA, Presider

NME1 • 19:30
Lasers Running in Reverse: Optical Refrigeration below NIST-Cryogenics, Mansoor Sheik-Bahae[1], Denis Seletskiy[1]; *[1]Physics, Univ. New Mexico, USA.* We report new milestones in the solid-state laser cooling by demonstrating cooling Yb:YLF below 123K (NIST-defined cryogenic) at the E4-E5 Stark resonance. Furthermore, we show impedance-matched cavity-enhanced cooling geometry truly mimics a laser running in reverse.

NME2 • 19:45
Megawatt Level UV Output from <110> Cr4+:YAG Passively Q-Switched Microchip Laser, Rakesh Bhandari[1], Takunori Taira[1]; *[1]Laser Research Center, Institute for Molecular Science, Japan.* > 2 MW peak power, 260 ps, 100 Hz pulses at 266nm are obtained by fourth harmonic conversion of a linearly polarized Nd:YAG microchip laser passively Q-switched with <110> cut Cr4+:YAG.

NME3 • 20:00
Withdrawn.

NME4 • 20:15
Twin Degenerate OPO for Quantum Random Bit Generation, Alireza Marandi[1], Nick Leindecker[1], Konstantin Vodopyanov[1], Robert Byer[1]; *[1]Stanford University, USA.* We propose a new quantum random bit generator based on degenerate synchronously pumped optical parametric oscillators. The intrinsic randomness is due to the phase of noise photons. The resulting bit sequence satisfies statistical randomness tests.

NMD • Nonlinear Absorption and Magnetization (cont.)

NMD5 • 20:30
3D Knife-edge Characterization of Two-Photon Absorption Volume in Silicon for Integrated Circuit Testing, Kai Shao[1], Vincent Pouget[1], Emeric Faraud[1], Camille Larue[1], Dale McMorrow[2], Dean Lewis[1]; *[1]IMS, University Bordeaux 1, France; [2]Naval Research Laboratory, USA.* We have performed three-dimensional characterization of the TPA effective laser spot size in silicon using an integrated knife-edge sensor. The TPA-induced response of a CMOS integrated circuit is analyzed based on these results.

NMD6 • 20:45
Withdrawn

NMD7 • 21:00
Optical manipulation of magnetization vector in multi-dimensional space, Natsuki Kanda[1], Takuya Higuchi[1], Hirokatsu Shimizu[1], Kuniaki Konishi[1,2], Kosuke Yoshioka[1,3], Makoto Kuwata-Gonokami[1,2]; *[1]Department of Applied Physics, The University of Tokyo and CREST(JST), Japan; [2]Photon Science Center, The University of Tokyo, Japan; [3]Department of Physics, The University of Tokyo, Japan.* We demonstrated arbitrarily polarized magnetization control in an antiferromagnet by stimulated Raman processes with time- and polarization- controlled double pulses. This technique has lead to a new concept of vectorial control of magnetization by light.

NMD8 • 21:15
Selection Rules for Light-Induced Magnetization through Stimulated Raman Process, Takuya Higuchi[1,2], Natsuki Kanda[1,2], Hiroharu Tamaru[1], Makoto Kuwata-Gonokami[1,2]; *[1]Univ. of Tokyo, Japan; [2]CREST-JST, Japan.* We highlight the role of the crystals' symmetry in coherent light-magnetism interaction, in that the rotational analogue of the Umklapp process opens a new route to access magnetization by linearly polarized laser pulses.

NME • Lasers and OPOs (cont.)

NME5 • 20:30
Near-degenerate cw OPO for THz Generation, Markku Vainio[1,2], Lauri Halonen[1]; *[1]Dpt. of Chemistry, University of Helsinki, Finland; [2]Centre for Metrology and Accreditation, Finland.* Single-mode operation of a singly-resonant near-degenerate cw optical parametric oscillator is demonstrated. The signal-idler difference frequency can be tuned from 1 to 4 THz. The total optical output power is 0.8 W.

NME6 • 20:45
Withdrawn

NME7 • 21:00
Longwave-IR Optical Parametric Oscillator in Orientation-Patterned GaAs, Rita Peterson[1], Ryan Feaver[1,2], Peter Powers[2]; *[1]AFRL/RYMWA, Air Force Research Lab, USA; [2]Electro-Optics, University of Dayton, USA.* OPO performance was measured between three different grating periods in five samples and two separate cavity configurations while being pumped by a Q-switched 2micron Tm,Ho:YLF laser. Similar results were obtained between the two cavity configurations while experimental spectra data is confirmed with calculations.

NME8 • 21:15
A 243mJ, Eye-Safe, Injection-Seeded, KTA Ring-Cavity Optical Parametric Oscillator, Robert Foltynowicz[1]; *[1]USURF, USA.* We have demonstrated a 243mJ, 1.535micron, injection-seeded, non-critically phase-matched, singly resonant oscillator, KTA ring-cavity optical parametric oscillator pumped with a single mode Nd:YAG. The conversion efficiency was 27% and a seeding range of 853MHz FWHM.

• Tuesday, 19 July, 2011 •

Kauai Court, **07:30 – 18:00, Registration Open**

NTuA • Plasmons and Solitons

Kauai Ballroom, Kona
08:00–10:00
Demetrios Christodoulides; Univ. Central Florida, Presider

NTuA1 • 08:00 **Invited**
Nonlocal solitons, Stefan Skupin[3], Ole Bang[1], Wieslaw Krolikowski[2]; [1]*DTU Fotonik, Technical University of Denmark, Denmark;* [2]*Australian National University, Australia;* [3]*Max Planck Institute for the Physics of Complex Systems, Germany.* We review recent developments in the physics of wave localization in media with spatially nonlocal nonlinear response. In particular we discuss here the impact of nonlocality on the modulational instability of plane waves, the collapse of finite-size beams, and the formation, stability and interaction of spatial nonlocal solitons.

NTuA2 • 08:30
All-optical and electro-optical active plasmonic telecom components, Sukanya Randhawa[1], Jan Renger[1], Alexey Krasavin[2], Anatoly Zayats[2], Lacheze Sebastien[3], Alex Bouhelier[3], Romain Quidant[1]; [1]*The Insitute of Photnic sciences, Spain;* [2]*Department of physics, King's College, United Kingdom;* [3]*Institut Carnot de Bourgogne, France.* We demonstrate numerically and experimentally nonlinear switching of the SPP transmission at telecom wavelengths. The plasmonic component consists of a compact and highly sensitive ring resonator which has high sensitivity to the refractive index changes

NTuB • Nonlinear Spectroscopy I

Kauai Ballroom, Halele'a
08:00–10:00
Pierre Béjot; Univ. of Geneva, Switzerland, Presider

NTuB1 • 08:00
Coherence Transfer of Time-bin Pulse to a Semiconductor Quantum Dot Ensemble using Photon Echo Technique, Junko Ishi-Hayase[1,2], Kouichi Akahane[3], Naokatsu Yamamoto[3], Kazuhiro Ema[4], Masahide Sasaki[3]; [1]*Keio University, Japan;* [2]*PRESTO, JST, Japan;* [3]*NICT, Japan;* [4]*Sophia University, Japan.* We experimentally demonstrated the coherence transfer/retrieval of time-bin pulse to a semiconductor quantum dot ensemble using a photon-echo technique at the telecommunication wavelength. The interference visibility of the retrieved pulse exceeded 95 percent.

NTuB2 • 08:15
Nonlinear Electronic Excitation Routes in Dissociative Ionization of Ethanol under Intense Femtosecond UV Laser Fields, Fumihiko Kannari[1], Tomoya Ikuta[1], Ryuji Itakura[2], Kouichi Hosaka[2], Hiroshi Akagi[2], Kaoru Yamanouchi[3,2], Atsushi Yokoyama[2]; [1]*Electronics & Electrical Engineering, Keio University, Japan;* [2]*Quantum Beam Science Directorate, Kansai Photon Science Institute, Japan;* [3]*Chemistry, School of Science, Univ. Tokyo, Japan.* Photoelectron-photoion coincidence measurement is performed for investigating electronic excitation of ethanol in intense UV laser fields. It is elucidated that the electronic excitation mechanism varies depending on the laser field intensity.

NTuB3 •08:30
Tailoring the geometry of nanoplasmonic antennas for optimal chip-scale nonlinear infrared spectroscopy, Shawn Sederberg[1], Abdul Elezzabi[1]; [1]*University of Alberta, Canada.* We theoretically investigate many nanoplasmonic antenna geometries and develop empirical rules governing their operation. The application of these antennas to on-chip nonlinear infrared spectroscopy of molecular vibration modes is discussed.

NTuA • Plasmons and Solitons (cont.)

NTuA3 • 08:45

Ultrafast light field control of electric currents in metal-dielectric interfaces, Tim Paasch-Colberg[1], Agustin Schiffrin[1], Daniel Gerster[2], Sascha Mühlbrandt[1], NIcholas Karpowicz[1], Joachim Reichert[2], Johannes Barth[2], Ralph Ernstorfer[3], Reinhard Kienberger[1,2], Ferenc Krausz[1,4]; *[1]Abteilung fürAttosekundenphysik, Max Planck Inst. of Quantum Optics, Germany; [2]Technische Universitaet Muenchen, Germany; [3]Fritz Haber Inst., Germany; [4]Ludwig-Maximilians-Universitaet, Germany.* The fast oscillating electric field of intense few-cycle near-infrared laser pulses with well-defined carrier-envelope phase is exploited to generate charge carriers and control their ultrafast motion within heterogeneous nanoscaled solid-state interfaces.

NTuA4 • 09:00

Nonlinear Response of Metallodielectric Stacks, Nkorni Katte[1], Joseph W. Haus[1], Peter Powers[1], Andrew Sarangan[1], Jian Gao[1], Michael Scalora[2]; *[1]Electro-Optics Program, University of Dayton, USA; [2]U.S. Army Aviation and Missile Command, USA.* We report simulations of third-order response and Z-scan experiments in heterogeneous metallodielectric stacks (MDSs) where nonlinear absorption is dominant. Experimental results on two MDS samples are examined at selected frequencies and correlated with optical features.

NTuA5 • 09:15

Near-infrared dissipative three-dimensional spatial solitons in CS2, Cid B. de Araújo[1], Edilson L. Falcão-Filho[1], Georges Boudebs[2], Hervé Leblond[2], Vladimir Skarka[2]; *[1]Physics, Universidade Federal de Pernambuco, Brazil; [2]Laboratoire de Photoniques d`Angers, Université d`Angers, France.* We demonstrate three-dimensional spatial solitons excited by near-infrared femtosecond pulses in liquid carbon disulfide. Solitons were obtained at 920 nm owing to the presence of the fifth-order susceptibility that prevented catastrophic collapse.

NTuA6 • 09:30

Pulse Delays Through Metallic Aperture Arrays, Kam Sing Wong[1], Huimin Su[1], Zsolt Marcet[1,2], Ho Bun Chan[1,2], Zhi Hong Hang[1], Che Ting Chan[1]; *[1]The Hong Kong Univ. of Science and Technology, Hong Kong; [2]Dept. of Physics, Univ. of Florida, USA.* Pulse propagation delays of 60-100fs through metallic aperture arrays were measured using an up-conversion technique, which are suggested to be originated from the coupling between surface plasmons waves on multiple metal/dielectric interfaces.

NTuA7 • 09:45

Optical Cherenkov radiation by cascaded nonlinear interaction: an efficient source of few-cycle near- to mid-IR pulses, Morten Bache[1], Ole Bang[1], Binbin Zhou[1], Jeffrey Moses[2], Frank Wise[3]; *[1]DTU Fotonik, Dept of Photonics Engineering, Tech. Univ. of Denmark; [2]Optics and Quantum Electronics Group, MIT, USA; [3]Applied and Engineering Physics, Cornell University, USA.* Through cascaded second-harmonic generation, few-cycle solitons can form that resonantly emit strongly red-shifted optical Cherenkov radiation. Numerical simulations show that such dispersive waves can be an efficient source of near- to mid-IR few-cycle broadband pulses.

NTuB • Nonlinear Spectroscopy I

NTuB4 • 08:45 **Invited**

Few-cycle nonlinear optics with electronic charge and spin excitations, Alfred Leitenstorfer[1]; *[1]Department of Physics, University of Konstanz, Germany.* Advanced quantum photonics studies with ultrabroadband femtosecond fiber lasers are presented. First experiments are aiming at few-photon nonlinear optics with single solid-state nanosystems. The new fields of terahertz nonlinear and quantum optics are featured subsequently.

NTuB5 • 09:15

Fingerprinting of Si Surface Bonds Using Nonresonant Optical Second-Harmonic Generation, Robert Ehlert[1], Adrienne Prem[1], Loucas Loumakos[1], Michael C. Downer[1]; *[1]Physics, The University of Texas at austin, USA.* Optical fingerprinting of surface bonds by nonresonant, but rotationally anisotropic, second-harmonic generation (RA-SHG) is achieved by identifying suitable experimental geometries using a bond charge model and accurate knowledge of bond axis orientation.

NTuB6 • 09:30 **Invited**

Coherent spectroscopy and coherent control through spatiotemporal femtosecond pulse shaping, Keith A. Nelson[1]; *[1]MIT, USA.* Spatiotemporal phase/amplitude shaping specifies all beams, pulse delays and phases for high-order spectroscopy. Multiple-quantum exciton and exciton-polariton coherences are observed. High-order THz spectroscopy and control are also realized.

Kauai Court, **Coffee Break & Exhibit Time, 10:00 – 10:30**

NTuC • Solitons

Kauai Ballroom, Kona

10:30–12:30

Wieslaw Krolikowski; Australian Nat. Univ., Australia, Presider

NTuC1 • 10:30 **Invited**

Discrete solitons, Demetrios Christodoulides[1]; [1]*University of Central Florida, USA.* We provide an overview of recent activities in the area of linear and nonlinear interactions in discrete systems like optical arrays and lattices. Both classical and quantum arrangements will be considered in this talk.

NTuC2 • 11:00

Observation of discrete-continuous three-dimensional X-waves, Matthias Heinrich[1], Robert Keil[1], Felix Dreisow[1], Stefan Nolte[1], Alexander Szameit[1]; [1]*Physics, Friedrich-Schiller-Universität, Germany.* We report on the experimental observation of discrete-continuous three-dimensional X-waves. This type of an optical space-time dynamical wave emerges due to the interplay of discrete diffraction, normal dispersion and focusing Kerr nonlinearity.

NTuC3 • 11:15

Disorder-Enhanced Transport in Photonic Lattices, Liad Levi[1], Mikael Rechtsman[1], Barak Freedman[1], Yevgeny Krivolapov[1], Tal Schwartz[1], Ofer Manela[1], Mordechai Segev[1], Shmuel Fishman[1]; [1]*Physics, Technion, Israel.* We demonstrate, experimentally and theoretically, disordered-enhanced transport in photonic quasicrystals, and hyper-transport of light in photonic media with evolving disorder: a new regime of transport in which transport is faster than ballistic.

NTuD • Materials II

Kauai Ballroom, Halele'a

10:30–12:30

Benoît Boulanger; Joseph Fourier Univ., France, Presider

NTuD1 • 10:30

Quartz Revisits Nonlinear Optics: Vacuum-UV Emission in Phase Matching, Sunao Kurimura[1], Masaki Harada[1,2], Ken-ichi Muramatsu[2], Motoi Ueda[2], Muneyuki Adachi[1,3], Tsuyoshi Yamada[3], Tokio Ueno[3]; [1]*Nat'l Inst. for Mat. Sci, Japan;* [2]*Nikon Corp., Japan;* [3]*Nidek Co.,Ltd., Japan.* First material used in optical mixing revisits NLO with cutting-edge polarity-control technology by stress-induced twinning. Periodically twinned quartz with modulated polarity demonstrates QPM SHG emitting vacuum UV light at 193 nm.

NTuD2 • 10:45

Controlling Nonlinearity with Structured Metamaterials, David R. Smith[1], Ekaterina Poutrina[1], Da Huang[1], Alec Rose[1], Stephane Larouche[1]; [1]*Center for Metamaterials and Integrated Plasmonics, Duke University, USA.* Artificially structured media can exhibit a wider range of both linear and nonlinear electromagnetic properties than are supported in conventional media. We discuss the design techniques and impact of these new emerging nonlinear metamaterials.

NTuD3 • 11:00

Angle-Tuned Third-Harmonic Generation in Direct-Bonded Periodically-Poled Congruent Lithium Niobate Crystal, Myoungsik Cha[1], Byoung Joo Kim[1], Hee Joo Choi[1]; [1]*Pusan National University, Republic of Korea.* We demonstrated third-harmonic generation (THG) in direct-bonded periodically-poled congruent lithium niobate. Efficient THG was obtained by cascaded second-harmonic generation and sum-frequency mixing. The two quasi-phase-matching conditions were satisfied simultaneously by angle tuning in xz-plane.

NTuD4 • 11:15 **Invited**

Sub-micrometer Quasi-Phased-Matched Devices, Carlota Canalias[1], Andrius Zukauskas[1], Valdas Pasiskevicius[1], Fredrik Laurell[1]; [1]*Applied Physics, KTH, Sweden.* We present the fabrication of bulk sub-micrometer ferroelectric domain gratings in KTiOPO4 for QPM counter-propagating interactions. We demonstrate that bulk Rb-doped KTiOPO4 is a promising candidate for fine-pitch periodic poling.

NTuC • Solitons (cont.)

NTuC4 • 11:30
Control of soliton collision-induced enhancement of supercontinuum bandwidth in photonic crystal fiber fiber by variation of pump pulse duration, Marco Andreana[1], Alexis Labruyère[1], Alessandro Tonello[1], Stefan Wabnitz[2], Philippe Leproux[1], Vincent Couderc[1], Charles Duterte[3], Andras Cserteg[3], Anthony Bertrand[3], Yves Hernandez[3], Domenico Giannone[3], Stéphane Hilaire[4], Guillaume Huss[4]; *[1]XLIM - Université de Limoges, France; [2]Dipartimento di Ingegneria dell'Informazione, Università di Brescia, Italy; [3]Multitel asbl, Belgium; [4]Leukos, France.* We investigate experimentally and theoretically the impact of input pulse width varying from 500 fs to 10 ps on supercontinuum generation. We show that the spectral broadening is dramatically extended for the longer input pulses.

NTuC5 • 11:45
Non-linear Control of Surface Plasmon Polaritons with Photorefractive Liquid Crystal Cells, Stephen Abbott[1], David C. Smith[1], Keith R. Daly[2], Gaimpaolo D'Alessandro[2], Malgosia Kaczmarek[1]; *[1]School of Physics and Astronomy, University of Southampton, United Kingdom; [2]School of Mathematics, University of Southampton, United Kingdom.* Photorefractive liquid crystal cells with a spatially varying refractive index are used to couple energy between surface plasmon modes. Presented are details on maximising this energy transfer and the behaviour of our liquid crystal cells.

NTuC6 • 12:00
Akhmediev breather evolution in optical fiber for realistic initial conditions, Miro Erkintalo[1], Goëry Genty[1], Benjamin Wetzel[2], John M. Dudley[2]; *[1]Tampere University of Technology, Finland; [2]Université de Franche-Comté, France.* We study numerically Akhmediev breather dynamics in optical fibers under experimentally realistic initial conditions that do not correspond to an ideal infinitesimal modulation on a plane wave field.

NTuC7 • 12:15
Hamiltonian Description of Spatial Solitons, Hanhong Gao[1], Lei Tian[2], Baile Zhang[3], George Barbastathis[2,3]; *[1]Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, USA; [2]Department of Mechanical Engineering, Massachusetts Institute of Technology, USA; [3]Singapore-MIT Alliance for Research and Technology (SMART) Centre, Singapore.* We describe how to apply Hamiltonian equations to a Kerr medium given the nonlinear index profile. Ray tracing of spatial solitons is presented and verified using the Wigner distribution function.

NTuD • Materials II (cont.)

NTuD5 • 11:45
Thermal Management in High Power CW SHG Characterized by PMC, Hwan Hong Lim[1], Toshio Katagai[2], Sunao Kurimura[1], Noriaki Ohmae[3], Norikatsu Mio[3], Takahiro Shimizu[2], Ichiro Shoji[2]; *[1]National institute for material science (NIMS), Japan; [2]Department of Electrical, Electronic, and Communication Engineering, Chuo University, Japan; [3]Department of Advanced Materials Science, University of Tokyo, Japan.* We investigated thermal properties depending on boundary conditions of wavelength conversion crystals. With a tight aperture, we demonstrated 19-W single-pass 532-nm SHG at a conversion efficiency of 26.5% in a 10-mm-long PPMgSLT crystal without saturation.

NTuD6 • 12:00
Efficient Ultra-Wideband Wavelength Converters Based on Double-Pass Cascaded SFG + DFG Using Engineered QPM Gratings, Amirhossein Tehranchi[1], Raman Kashyap[1,2]; *[1]Electrical Engineering Dept., Ecole Polytechnique, University of Montreal, Canada; [2]Engineering Physics Dept., Ecole Polytechnique, University of Montreal, Canada.* Investigating wavelength converters based on double-pass cascaded sum- and difference-frequency generation using engineered QPM gratings, unlike ones using uniform gratings, efficient flattop responses with bandwidths >141 nm for grating lengths <1 cm can be achieved.

NTuD7 • 12:15
Third Harmonic Generation in Silica Microfibres, Timothy Lee[1], Yongmin Jung[1], Christophe Codemard[1], Gilberto Brambilla[1], Neil G. Broderick[2]; *[1]Optoelectronics Research Centre, University of Southampton, United Kingdom; [2]Physics, University of Auckland, New Zealand.* We theoretically and experimentally study third harmonic generation in silica microfibres. Phase matching at critical diameters was achieved by intermodal-coupling with higher order third harmonic modes, which were successfully generated using 4ns 1.55um pump pulses.

On Your Own, **Free Afternoon, 12:30 – 19:30**
Kauai Court, **Evening Registration, 19:00 – 21:00**

NTuE • Waveguides

Kauai Ballroom, Kona
19:30–21:30
Marin Soljacic; MIT, USA, Presider

NTuE1 • 19:30 **Invited**

Highly Nonlinear Chalcogenide Glass Waveguides for All-optical Signal Processing, Barry Luther-Davies[1]; [1]*Laser Physics Centre, Australian National University, Australia.* I describe the development of highly nonlinear chalcogenide glass waveguides for photonics and their application as nonlinear optical devices for high speed processing and monitoring of telecommunications signals.

NTuE2 • 20:00

Efficient CW SHG in AlGaAs/AlOx waveguides, Marc Savanier[1], Aristide Lemaître[2], Christophe Manquest[1], Filippo Ghiglieno[1], Ivan Favero[1], Sara Ducci[1], Giuseppe Leo[1]; [1]*MPQ Laboratory, Paris Diderot University, France;* [2]*LPN, CNRS, France.* We report on Type-I CW SHG in AlGaAs/AlOx waveguides, with pump wavelength around 1.55 μm and 2.8% W-1 conversion efficiency. This result is encouraging toward integrated spontaneous parametric downconversion in the telecom range.

NTuF • Biophotonics, Optomechanics & Optofluidics

Kauai Ballroom, Halele'a
19:30-21:30
Martin Fejer; Stanford Univ., USA, Presider

NTuF1 • 19:30

Exogenous and Endogenous two-photon absorption for Intratissue Refractive Index Shaping (IRIS) in corneal tissue, Lisen Xu[1], Krystel R. Huxlin[2,3], Wayne H. Knox[1,3]; [1]*The Institute of Optics, University of Rochester, USA;* [2]*Flaum Eye Institute, University of Rochester, USA;* [3]*Center for Visual Science, University of Rochester, USA.* Both exogenous and endogenous two-photon absorption were shown to significantly enhance femtosecond laser micromachining in corneal tissue. Comparison with previous results without two-photon enhancement demonstrated a much larger refractive index change up to 0.037.

NTuF2 • 19:45

Spectral Oscillation in Chlorophyll a Revealed by Ultrafast Real-time Vibrational Spectroscopy, Juan Du[1,2], Takahiro Teramoto[1,2], Takayoshi Kobayashi[1,2]; [1]*Advanced Ultrafast Laser Research Center, and Department of Engineering Science, Faculty of Informatics and Engineering, University of Electro-Communications, Japan;* [2]*Core Research for Evolutional Science and Technology (CREST), Japan Science and Technology Agency, Japan.* Broadband real-time vibrational spectroscopy was used to investigate the vibronic dynamics in Chl-a for the first time. Spectral distribution of the vibrational amplitudes was observed and interpreted as energy exchange intermediated by vibrational coherence.

NTuF3 • 20:00

Near IR Nonlinear Optics of an Organic Supermolecule, Steven Flom[1], San-Hui Chi[1], Armand Rosenberg[1], Animesh Nayak[2,3], Timothy V. Duncan[3], Michael J. Therien[3], James J. Butler[4], Steven R. Montgomery[5], Guy Beadie[1], James S. Shirk[1]; [1]*Optical Sciences Division, Naval Research Lab, USA;* [2]*Chemistry, University of Pennsylvania, USA;* [3]*Chemistry, Duke University, USA;* [4]*Physics, Pacific University, USA;* [5]*Physics, US Naval Academy, USA.* Two-photon accessed excited state absorption is shown to be an important mechanism in the near-IR nonlinear response of an organic supermolecule. This mechanism also provides an enhanced nonlinear absorption in an optical waveguide configuration.

NTuE3 • 20:15
Impact of Photoelastic Effect on Phase-Matching Wavelengths in Periodically-Inverted AlGaAs Waveguides, Koji Amazuttsumi[1], Junya Ota[1], Tomonori Matsushita[1], Takashi Kondo[1]; *[1]Department of Materials Engineering, The University of Tokyo, Japan.* We have shown that photoelastic effect alters the phase-matching wavelengths of Type-I and Type-II quasi-phase-matched second-harmonic generation in a periodically-inverted AlGaAs waveguide through the uniaxial strain in the pseudomorphic AlGaAs layers.

NTuE4 • 20:30
Periodic modulation of Al composition in a periodically-inverted AlGaAs waveguide, Tomonori Matsushita[1], Kazuhiro Iwamoto[1], Junya Ota[1], Takashi Kondo[1]; *[1]Department of Materials Engineering, The University of Tokyo, Japan.* We have investigated a periodically-inverted AlGaAs layer in a quasi-phase-matching AlGaAs waveguide using cathodoluminescence spectroscopy, and found that Al-composition modulation is formed by the anisotropic diffusion of Al/Ga atoms during the molecular-beam epitaxy growth process.

NTuE5 • 20:45
Generation and Coherent Detection of Broadband Terahertz Radiation in Phase-Matched Microstrip Waveguides, Amit Agrawal[1], Xiang Shou[1], Ajay Nahata[1]; *[1]Electrical Engineering, Univ. of Utah, USA.* We describe novel waveguide devices that simultaneously allow for single-mode propagation of optical pump and probe beams and broadband THz radiation. We demonstrate generation and coherently detection of broadband THz radiation with <10 mW average optical power.

NTuE6 • 21:00
Transonic flow in an optical analogue of the Laval nozzle, Moshe Elazar[1], Victor Fleurov[1], Shimshon Barad[1]; *[1]School of Physics and Astronomy, Tel Aviv University, Israel.* We study the flow through an optical Laval nozzle by launching a laser beam into a suitably shaped waveguide with Kerr-type defocusing nonlinearity. The experimental design lends itself to laboratory experiments on black hole physics.

NTuE7 • 21:15
Propagation Length Independent Nonlinearity Threshold in Stokes-Wave Suppressed SRS in Chirally-Coupled-Core Fibers, Xiuquan Ma[1], I-Ning Hu[1], Almantas Galvanauskas[1]; *[1]EECS, Univ of Michigan at Ann Arbor, USA.* We show that Stokes-wave suppressed Stimulated Raman Scattering exhibits propagation-length independent threshold and demonstrate how such suppression of nonlinear interactions can be implemented in specially designed fibers.

NTuF4 • 20:15 **Invited**
Laser cooling of a microresonator and Optomechanically Induced Transparency, Samuel Deleglise[1], Stefan Weis[1], Rémi Rivière[1], Albert Schliesser[1,2], Ewold Verhagen[1], Emanuel Gavartin[1], Xiao qing Zhou[1], Pierre Verlot[1], Leonard Neuhaus[1], Tobias J. Kippenberg[1,2]; *[1]Ecole Polytechnique Fédérale de Lausanne, Switzerland; [2]Max Planck Institute fur Quantenoptik, Germany.* A micromechanical oscillator is cooled close to the quantum ground state using a laser tuned to its lower mechanical sideband. This highly coupled system allows to optically control the transmission of a weak probe beam.

NTuF5 • 20:45
Biomedical diagnosis in water concentration of thin biotissues using tunable THz-wave parametric oscillator, Yuye Wang[1], Takashi Notake[1], Kouji Nawata[1], Hiroshi Kawamata[1], Hiromasa Ito[1], Hiroaki Minamide[1]; *[1]Tera-Photonics Laboratory, ASI, Riken, Japan.* A novel method for water volume concentration and distribution measurement in thin fresh biotissue with THz-wave is presented. The reliability of this method is validated. Measurement results using THz-wave are in good agreement with the measurement results based on the quantitative method.

NTuF6 • 21:00
Complex Nonlinear Opto-Fluidics, Mordechai Segev[1]; *[1]Physics, Technion, Israel.* We demonstrate symbiotic dynamics of light and nano-particles suspended in liquid. The light-force varies the local particle-density, modifies the fluid properties (surface-tension, viscosity), inducing flow in the fluid, causing synergetic nonlinear-dynamics of light and fluid.

NTuF7 • 21:15
Tunable Optomechanical Cavities, Michal Lipson[1], Gustavo Wiederhecker[1], Sasikanth Manipatruni[1], Sunwoo Lee[1]; *[1]Cornell, USA.* We demonstrate broadband tuning of a silicon nitride optomechanical microcavity optical resonance by over 32 nm. The relative static mechanical displacement induced by optical gradient forces is estimated to be as large as 60 nm.

• Wednesday, 20 July, 2011 •

Kauai Court, **07:30 – 17:30, Registration Open**

NWA • Symposium Celebrating the 50th Anniversary of Nonlinear Optics I

Kauai Ballroom, Kona,
08:00-10:00
Takunori Taira; Inst. for Molecular Science, Japan, Presider

NWA1 •08:00 Plenary
Long and Short Entangled Photons, Steve Harris[1]; [1]*Stanford University, USA.* We use slow light and electromagnetically induced transparency to make and modulate single photons. Using spread spectrum technology we describe how a single photon may be hidden in an environment of noise photons.

NWA2 • 09:00 Invited
The Birth of Nonlinear Optics, Nicolaas Bloembergen[1]; [1]*Optical Science, Univ. of Arizona, USA.* The first two years of nonlinear optics will be reviewed, starting with the second harmonic generation obtained in 1961 by Franken and coworkers of light with a ruby laser pulse in quartz crystal.

NWA3 • 09:30 Invited
The Beginnings of Quantum Nonlinear Optics and Optical Phase Conjugation; Answers to Communication Challenges, Amnon Yariv[1]; [1]*California Institute of Technology, USA.* The advent of quantum mechanics led early in the 20th century to a rigorous quantitative description of the phenomenon of spontaneous emission from excited atomic states. The fields of nonlinear electronics and nonlinear optics (NLO) have gone through a conceptually similar process. The quantum formulation of the optical parametric amplifier and oscillator led to the prediction and soon afterwards to the demonstration of parametric spontaneous fluorescence (PSF).

Kauai Court, **Coffee Break & Exhibit Time, 10:00 – 10:30**

NWB • Symposium Celebrating the 50th Anniversary of Nonlinear Optics II

Kauai Ballroom, Kona
10:30-12:30
Daniel Gauthier; Duke Univ., USA, Presider

NWB1 • 10:30 Invited
Surface Nonlinear Optics, Y. Ron Shen[1]; [1]*Physics, Univ. California, Berkeley, USA.* Early work on nonlinear optical reflection at surfaces and interfaces has led to the development of surface nonlinear optical spectroscopy as a powerful technique for surface and interface studies.

NWB2 • 11:00 Invited
50 Years of Nonlinear Optics, Tunable sources from OPOs to Coherent X-rays, Robert Byer[1]; [1]*E L Ginzton Lab, Stanford University, USA.* A look back at the early days of the laser and nonlinear interactions will be contrasted to the recent breakthroughs in solid state lasers and the applications to fundamental science of gravitational wave detection, laser acceleration, and laser inertial fusion for energy production.

NWB3 • 11:30 Invited
Nonlinear Optics: from Quartz to Vacuum, Gérard Mourou[1]; [1]*Lab d'Optique Appliquée, Ecole Polytechnique, France.* Optical nonlinearity was demonstrated at the University of Michigan with the generation of the second harmonic of ruby in quartz. It gave birth to nonlinear spectroscopy that deepened our understanding of ponderable materials. A similar experiment will be attempted in vacuum where a 100PW laser will be focused in vacuum to reveal its nonlinearity up to its breakdown in e+e-, with the goal to understand the vacuum texture.

NWB4 • 12:00 Invited
Optical parametric amplifiers : from broadly tunable past to highly powerful future, Algis Piskarskas[1]; [1]*Vilnius Univ., Lithuania.* Abstract not available.

On Your Own, **12:30 – 14:00, Lunch Break**

NWC • Quantum Optics II

Kauai Ballroom, Kona
14:00--15:30
John Howell; Univ. of Rochester, USA, Presider

NWC1 • 14:00 **Invited**
Quantum control of single spins and photons in diamond, Yiwen Chu[1], Emre Togan[1], Mikhail Lukin[1]; *[1]Physics, Harvard University, USA.* The nitrogen-vacancy (NV) color center in diamond shows great promise as an optically addressable solid-state qubit amenable to many quantum-optics applications. Using the NV center, we have demonstrated spin-photon entanglement and manipulation of nuclear spins through coherent population trapping.

NWC2 • 14:30
Applications of Nonlinear Optics in Quantum Imaging and Quantum Communication, Robert Boyd[1,2], Heedeuk Shin[1]; *[1]University of Rochester, USA; [2]University of Ottawa, Canada.* The nonlinear optical process of spontaneous parametric downconversion is a standard procedure for generating entangled photons. Entanglement is a crucial resource for quantum information studies. We describe our recent results including the application of entangled photons to superresolution and to quantum communication.

NWC3 • 14:45
Polarization Entangled Photons at X-Ray Energies, Sharon Shwartz[1], Steve Harris[1]; *[1]Edward L. Ginzton Laboratory, Stanford University, USA.* We propose a technique, based on parametric down conversion, for generating each of the four Bell polarization states at x-ray wavelengths.

NWD • Frequency Comb Generation

Kauai Ballroom, Halele'a
14:00--15:30
Claude Fabre; LKB, ENS Paris, France, Presider

NWD1 • 14:00
New Features in Frequency Combs by Limit Cycle Oscillations in Dispersive Nonlinear Fiber Ring Resonators, Michael Kues[1], Nicoletta Brauckmann[1], Petra Gross[1], Carsten Fallnich[1]; *[1]Institute of Applied Physics, Westhälische Wilhelms-Universität Münster, Germany.* We reveal that in dispersive nonlinear ring resonators pulse delay in combination with anomalous dispersion are basic prerequisites for the occurrence of limit cycle oscillations. These oscillations accomplish tunable sidebands within the generated frequency comb.

NWD2 • 14:15
Group Velocity Dispersion and Stability of Resonant Hyper-Parametric Oscillations, Andrey Matsko[1], Anatoliy Savchenkov[1], Wei Liang[1], Vladimir Ilchenko[1], David Seidel[1], Lute Maleki[1]; *[1]OEwaves Inc, USA.* We theoretically study the stability conditions of hyper-parametric oscillation in continuously pumped nonlinear optical resonators. We show that the oscillation can be stable irrespective of the sign of group velocity dispersion of the resonator, if the frequency of the external optical pump is properly selected.

NWD3 • 14:30 **Invited**
Frequency Divide-and-Conquer Approach to Creating Ultra-broadband Optical Frequency, Konstantin Vodopyanov[1]; *[1]Appl Phys, Stanford University, USA.* Octave-wide phase- and frequency-locked combs in the mid-infrared can be generated using a degenerate OPO which downconverts the spectrum of a pump frequency comb to its subfrequency and has intriguing coherence properties studied by interferometry

NWC • Quantum Optics II (cont.)

NWC4 • 15:00
Preservation of High-Order Photon Correlations Following Frequency Up-conversion, Lijun Ma[1], Matthew Rakher[1], Martin Stevens[2], Oliver Slattery[1], Kartik Srinivasan[1], Xiao Tang[1]; *[1]NIST, USA; [2]NIST, USA.* We demonstrate an efficient approach to measure temporal correlations for near-infrared photons using frequency up-conversion and observe that photon statistics are preserved during this process. The influence of noise photons on the measurement is studied.

NWC5 • 15:15
Fast quantum dot single photon source triggered at telecommunications wavelength, Kelley Rivoire[1], Sonia Buckley[1], Arka Majumdar[1], Hyochul Kim[2], Pierre Petroff[2], Jelena Vuckovic[1]; *[1]Stanford, USA; [2]University of California Santa Barbara, USA.* We demonstrate a 100 MHz quantum dot single photon source at 900 nm triggered by a telecommunications wavelength laser. The quantum dot is excited by on-chip-generated second harmonic radiation, resonantly enhanced by a photonic nanocavity.

NWD • Frequency Comb Generation (cont.)

NWD4 • 15:00 **Invited**
Control and characterization of picosecond pulse trains from a microresonator frequency comb, Scott Papp[1], Scott Diddams[1]; *[1]Time and Frequency, NIST, USA.* Using disk-like quartz microresonators we generate an optical frequency comb with 36 GHz mode spacing at 1560 nm. By addressing the amplitude and phase of comb lines we observe near transform-limited 2.5 ps pulses.

NWE • NLO Poster Session

Puna Ballroom
Wednesday, 20 July, 2011
15:30-17:30

NWE1
Fredkin Gates in $\chi(2)$ Microdisks via Quantum Zeno Blockade, Yuping Huang[1], Prem Kumar[1]; [1]*Center for Photonic Communication and Computing, EECS Department, Northwestern, USA.* Using the quantum Zeno effect, we present a quantum optical Fredkin gate in LiNbO3 microdisks for telecom applications. Such gates can operate with sub-femtojoule pumps and, in the ideal limit, without any energy dissipation.

NWE2
Enhancement of coherent magnetic dipole radiation by cavity effect in the terahertz regime, Jia Li[1], Takuya Higuchi[1], Natsuki Kanda[1], Kuniaki Konishi[1], Makoto Kuwata-Gonokami[1]; [1]*The University of Tokyo and Core Research for Evolutional Science and Technology, Japan.* We demonstrated strong enhancement of coherent magnetic dipole radiation by a factor of up to ~9 in antiferromagnetic NiO with the direct phase manipulation by cavity effect. The results are reproduced well by FDTD calculation.

NWE3
Generation and measurement of polarization shaped pulse trains in the ultraviolet, Marco T. Seidel[1], Zhengyang Zhang[1], Suxia Yan[1], Howe-Siang Tan[1]; [1]*School of Physical & Mathematical Sciences, Division of Chemistry & Biological Chemistry, Nanyang Technological University, Singapore.* We demonstrate the generation and measurement of amplitude, phase and polarization shaped pulse trains tunable in the ultraviolet (UV) by means of sum-frequency generation and with interferometric phase stability.

NWE4
Dark Solitons in Nematic Liquid Crystals, Armando Piccardi[1], Alessandro Alberucci[1], Gaetano Assanto[1], Nelson Tabiryan[2]; [1]*Electronics Engineering, University of Rome ROMA TRE, Italy;* [2]*Beam Engineering for Advanced Measurements Company, USA.* We demonstrate the formation of dark spatial solitons in nematic liquid crystals, with an azo-dye dopant providing the self-defocusing response. A collinear copolarized beam is used to probe the guiding properties of the soliton.

NWE5
Second-Order Nonlinear Optical Properties of Fibrillar Proteins, Adam E. Tuer[1,2], Nicole Prent[1,2], Richard Cisek[1,2], Daaf Sandkuijl[1,2], Brian Wilson[3], Virginijus Barzda[1,2]; [1]*Physics and Institute for Optical Sciences, University of Toronto, Canada;* [2]*Chemical and Physical Sciences, University of Toronto Mississauga, Canada;* [3]*Medical Biophysics, University of Toronto, Canada.* Quantum mechanical calculation of collagen-like protein model's first hyperpolarizability aided in predicting the second-order nonlinear optical properties of collagen in tissue. Polarization dependent second harmonic generation microscopy experiments confirmed the model's predictions.

NWE6
Femtosecond scale photon-triplet counting and third order autocorrelations in a photomultiplier tube, Amir Nevet[1], Alex Hayat[1], Meir Orenstein[1]; [1]*Electrical Engineering, Technion, Israel.* Three-photon counting at ultrashort timescale by ultrasensitive three-photon absorption is demonstrated experimentally. This is a unique tool for ultrafast quantum state characterization as well as for complete determination of temporal photon-shapes.

NWE7
Spatial Solitons in a Self-focusing Medium with Tunable Nonlinearity, Malgosia Kaczmarek[1], Gaetano Assanto[2], Armando Piccardi[2], Alessandro Alberucci[2]; [1]*University of Southampton, United Kingdom;* [2]*CNISM and University "Roma Tre", Italy.* We employ a suitably designed planar cell with inter-digitated electrodes and nematic liquid crystals to investigate the role of nonlinearity in generation and propagation of spatial solitons.

NWE8
Ultra-bright Backward Wave Biphoton Source, Chih-Sung Chuu[1], Steve Harris[1]; [1]*Edward L. Ginzton Laboratory, Stanford University, USA.* We calculate the propoerties of a novel biphoton source based on resonant backward wave spontaneous parametric down-conversion. We show that the biphotons are generated in a single longitudinal mode having a subnatural linewidth and a correlation time exceeding 65 ns.

NWE9
Five-order SRSs and supercontinuum generation by a tapered tellurite microstructured fiber, Meisong Liao[1], Xin Yan[1], Weiqing Gao[1], Zhongchao Duan[1], Takenobu Suzuki[1], Yasutake Ohishi[1]; *[1]Toyota Technological Institute, Japan.* For the first time five-order SRSs, and more than one octave stable supercontinuum are observed from a tapered tellurite microstructured fiber. The tapered segment increases the nonlinearity, and mitigates the walk-off of SRS peaks.

NWE10
Over 10% conversion efficiency, single-crystal third-harmonic generation in BIBO, Kentaro Miyata[1,2], Valentin Petrov[1], Frank Noack[1]; *[1]Max-Born Institute, Germany; [2]Megaopto co., ltd., Japan.* Third-harmonic generation with a maximum conversion efficiency larger than 10% has been demonstrated in a single-crystal of BIBO (BiB3O6) by using high-energy femtosecond pulses from a Ti:Sapphire laser pumped noncollinear optical parametric amplifier system.

NWE11
Multiply Resonant High Quality Photonic Crystal Nanocavities, Sonia Buckley[1], Kelley Rivoire[2], Jelena Vuckovic[3]; *[1]Stanford University, USA; [2]Stanford University, USA; [3]Stanford University, USA.* A photonic crystal cavity allowing at least two separately tunable resonances is designed. Both frequency degenerate structures and structures with frequency separations of up to 506 nm are experimentally demonstrated.

NWE12
Pulsewidth and Wavelength Dependent Optical Nonlinearities of Carbon Disulfide, Honghua Hu[1], Dmitry A. Fishman[1], Scott Webster[1], Marcus Seidel[1], Lazaro A. Padilha[1,2], David J. Hagan[1,3], Eric W. Van Stryland[1,3]; *[1]CREOL, College of Optics and Photonics, University of Central Florida, USA; [2]Los Alamos National Laboratory, USA; [3]Department of Physics, University of Central Florida, USA.* The dispersion of the nonlinear refractive index, "n2", of carbon disulfide by femto-, pico-, and nano-second pulses, and its two-photon absorption spectrum are measured. The pulsewidth dependence of "n2" is also determined.

NWE13
Characteristics of Amplitude-Equalized Rational Harmonic Mode-Locked Short-Cavity Fiber Ring Laser Using a Bismuth-Oxide-Based Erbium-Doped Fiber and a Bismuth-Oxide-Based Highly Nonlinear Fiber, Yutaka Fukuchi[1], Joji Maeda[1]; *[1]Department of Electrical Engineering, Tokyo University of Science, Japan.* We demonstrate an amplitude-equalized rational harmonic mode-locked short-cavity laser employing a bismuth-based erbium-doped fiber and a bismuth-based nonlinear fiber. Stable short pulses up to 40GHz are obtained over the wavelength tuning range covering the CL-band.

NWE14
Numerical study of Maker's fringe effects in high numerical aperture nonlinear microscopy, Daaf Sandkuijl[1,3], Danielle Tokarz[1,4], Virginijus Barzda[1,2]; *[1]Department of Chemical and Physical Sciences, University of Toronto Mississauga, Canada; [2]Institute for Optical Sciences, Canada; [3]Department of Physics, University of Toronto, Canada; [4]Department of Chemistry, University of Toronto, Canada.* We calculate third harmonic generation from a glass wedge structure filled with benzene imaged with high numerical aperture, which confirms Maker's fringes and coherent enhancement of the third harmonic signal at a specific wedge spacing.

NWE15
Absolute measurement of the quadratic nonlinear susceptibility of lithium niobate in waveguides, Roland Schiek[1]; *[1]Electrical and Information Engineering, FH Regensburg, Germany.* The quadratic nonlinear susceptibility of lithium niobate is measured with absolutely scaled SHG experiments in titanium-indiffused waveguides with QPM gratings for phase matching at 1520 nm.

NWE16
Influence of Two Photon Absorption on Soliton Self-Frequency Shift, Henrik Steffensen[1], Karsten Rottwitt[1], Peter U. Jepsen[1], Ole Bang[1]; *[1]DTU Fotonik, Denmark.* The creation of mid-infrared supercontinua necessitates the use of soft-glass fibers. However, some materials, like chalcogenide, have a substantial two photon absorption. We introduce a model for soliton self-frequency shift that successfully includes this effect.

NWE17
Discrete solitons with competing second harmonic components in lithium niobate waveguide arrays, Frank Setzpfandt[1], Andrey A. Sukhorukov[2], Thomas Pertsch[1]; *[1]Institute of Applied Physics, Friedrich-Schiller-Universität Jena, Germany; [2]Nonlinear Physics Center, Australian National University, Australia.* We describe soliton families in waveguide arrays supported by quadratic nonlinear interactions between one fundamental and two second-harmonic modes, and apply our results to explain experimentally observed nonlinear propagation effect.

NWE18
Second-order NLO of non-electrically-poled choromophore-doped amorphous ferroelectric polymers, Atsushi Sugita[1], Masashi Morimoto[1], Yasuaki Tamaki[1], Nobuyuki Mase[1], Kawata Yoshimasa[1], Shigeru Tasaka[1]; *[1]Shizuoka Unviersity, Japan.* We succeed in obtaining second-order NLO susceptibilities in host-guest NLO polymers with thickness as wide as a few ten micrometer with by non-electrical poling method, taking advantage of polarization self-organization properties of amorphous ferroelectric polymers.

NWE19
Strong Nonlinear Optical Absorption of Diphenylphosphino-Substituted Bithiophenes in the Violet-Blue Spectral Region, Jianwei Wang[1], Yuanli Zhang[1], Qun Zhao[2], Gary M. Gray[2], Christopher M. Lawson[1]; *[1]Physics, University of Alabama at Birmingham, USA; [2]Chemistry, University of Alabama at Birmingham, USA.* Diphenylphosphine-substituted bithiophenes exhibit strong NLO absorption for picosecond laser pulses at 430 nm but are transparent in the violet-blue spectral region. The solubilities and NLO absorptions depend on the number and type of diphenylphosphine substituents.

NWE20
Laser oscillator with nonlinear saturable absorber: A pump to signal noise transfer function model, Parviz Elahi[1], Ibrahim Levent Budunoglu[1], Kutan Gürel[1], Fatih Ilday[1]; *[1]Physics, Bilkent University, Turkey.* We report a model to describe the characterization of pump noise transfer in an laser oscillator consist of nonlinear saturable absorber. At the first, we obtained a linear superposition relation for modulation transfer function of amplifier part. By using the nonlinear characteristics of saturable absorber, a nonlinear quadratic equation for MTF of laser oscillator obtained . The theory then validate with experiment and good consistency observed.

NWE21
Optimization of Z-scan technique inside a 4f system, Georges Boudebs[1], Kamil Fedus[1]; *[1]Universite d'Angers, France.* Signal optimization is performed using Z-scan or EZ-scan techniques inside a 4-f system. Third-order nonlinear optical measurements are based on simple expressions obtained by simulation using Helmholtz wave equation through the imaging system.

NWE22
A Reduced Dimensional Model for the Multi-Pulsing Transition in a Waveguide Array Mode-Locked Laser, Matthew Williams[1], Eli Shlizerman[1], J. Nathan Kutz[1]; *[1]Department of Applied Mathematics, University of Washington, USA.*The onset of multi-pulsing is studied using a reduced-order model based on the proper orthogonal decomposition. This model completely characterizes the transition and agrees qualitatively with previous numerical studies and experimental results.

NWE23
High-power, Single-longitudinal-mode Terahertz-wave Generation Pumped by a Microchip Nd:YAG Laser, Shin'ichiro Hayashi[1], Hiroshi Sakai[2], Takunori Taira[3], Hiroaki Minamide[1], Kodo Kawase[4,1]; *[1]RIKEN ASI, Japan; [2]Hamamatsu Photonics K. K., Japan; [3]Institute for Molecular Science, Japan; [4]Nagoya University, Japan.* We have developed injection-seeded terahertz-wave parametric generator pumped by a microchip Nd:YAG laser. This generated high peak power, tunable, narrow-linewidth terahertz wave with injection seeding by an external cavity diode laser. We observed terahertz wave, peak power of more than 30 W, tunable range from 0.9 to 3.1 THz, linewidth of less than 10 GHz.

NWE24
Cleaning of femtosecond pulses by a self-diffraction process in a Kerr bulk medium, Jun Liu[1]; *[1]University of Electro-communication, Japan.* We cleaned and improved the temporal contrast of a femtosecond pulse by more than four orders magnitude using self-diffraction process in a 0.5-mm-thick glass plate. The energy transform efficiency is about 12%.

Luau Gardens (Rain back-up: Ka Mala), **18:00 – 21:00, Luau**

• Thursday, 21 July, 2011 •

Kauai Court, **07:30 – 12:30, Morning Registration**

NThA • High Intensities

Kauai Ballroom, Kona
08:00–10:00
Gerard Mourou; ENSTA/Ecole Polytechnique France, Presider

NThA1 • 08:00 Plenary
Nonlinear Optics at the Timescale of the Electron - Ultra Broadband Coherent X-Rays and Applications, Tenio Popmintchev[1], Andrius Baltuška[1], Margaret Murnane[1], Henry C. Kapteyn[1]; [1]*JILA/Univ. of Colorado, USA.* We demonstrate bright coherent X-ray supercontinua at photon energies >1.6keV (<7.8Å) on a tabletop. Full phase matching of high harmonic generation up to the 5031st order is possible using mid-IR driving lasers, supporting attosecond-to-zeptosecond pulses.

NThA2 • 08:45 Invited
Frequency doubling and tripling for future fusion drivers, Gabriel Mennerat[1], O. Bonville[1], B. Le Garrec[1], Ph. Villeval[1], S. Durst[1], D. Lupinski[1], A. Kokh[1], N. Kononova[1], V. Vlezko[1], K. Kokh[1]; [1]*Commissariat a l Energie Atomique, France.* Very-high average power frequency conversion is a key issue regarding laser driven inertial confinement fusion reactors. The merits of common non-linear crystals are discussed. The potential of lithium triborate is demonstrated by frequency doubling 235 J of infrared radiation at 1053 nm with 92% conversion efficiency. We also report on third harmonic generation of 360 J of ultraviolet at 351 nm with 80% efficiency.

NThA3 •09:15 Invited
Attosecond Nonlinear Optics, Katsumi Midorikawa[1]; [1]*RIKEN, Japan.* XUV nonlinear multiphoton processes in atoms and molecules by high-order harmonic radiation and its application to attosecond nonlinear spectroscopy are reported.

NThA4 • 09:45
Ultrahigh Resolution EUV imaging using a Tabletop High Harmonic Light Source, Matthew D. Seaberg[1], Daniel E. Adams[1], Chien-Chun Chen[2], Jianwei Miao[2], William F. Schlotter[3], Yanwei Liu[4], Carmen Menoni[5], Margaret Murnane[1], Henry C. Kapteyn[1]; [1]*Department of Physics and JILA, University of Colorado, USA;* [2]*Department of Physics, University of California, USA;* [3]*SLAC National Accelerator Laboratory, USA;* [4]*Center for X-ray Optics, Lawrence Berkeley National Laboratory, USA;* [5]*Department of Electrical Engineering, Colorado State University, USA.* Using a tabletop setup employing high-order harmonic generation of ultrafast laser pulses, we implement Coherent Diffractive Imaging (CDI) with near-wavelength limited ~20 nm resolution using coherent light at 13nm.

Kauai Court, **10:00 – 10:30, Coffee Break & Exhibit Time**

NThB • Photonic Crystal and Waveguides Arrays

Kauai Ballroom, Kona
10:30--12:30
Demetrios Christodoulides; Univ. Central Florida, USA, Presider

NThB1 • 10:30 **Invited**
Nonlinear optical processes in group III-V and silicon planar photonic crystal membrane structures, Jeff Young[1], Haijun Qiao[1], Keith A. Abel[2], Andras G. Pattantyus-Abraham[1], Murray W. McCutcheon[1], Georg W. Reiger[1], Charles Foell[1], Ellen Schelew[1], Frank van Veggel[2]; [1]*Department of Physics and Astronomy, University of British Columbia, Canada;* [2]*Chemistry, University of Victoria, Canada.* High-index-contrast, wavelength scale texture in thin semiconductor membranes can be used to resonantly enhance a variety of nonlinear optical processes. Several experimental demonstrations in III-V, and silicon membranes incorporating PbSe nanocrystals will be described.

NThB2 • 11:00
Broadband time-reversal of optical pulses using a switchable photonic-crystal mirror, Yonatan Sivan[1], John B. Pendry[1]; [1]*Imperial College London, United Kingdom.* We propose a new time-reversal scheme for optical pulses which overcomes the limitations of exisitng schems. We demonstrate highly efficient and broadband reversal of pulses of 100 fs and 10 ps duration.

NThB3 • 11:15
Plasmonic Quantum Dots for Nonlinear Optical Applications, Mike Klopfer[1], L. Wang[1], R. K. Jain[1]; [1]*University of New Mexico, USA.* This presentation describes the design of novel plasmonic quantum dots for nonlinear applications, including labels for TPAF-based biomedical imaging, with projected fluorescence intensities >1000X higher than currently-used fluorescent labels.

NThB4 • 11:30
Slow-Light Enhanced Optical Forces between Shifted Photonic-Crystal Nanowire Waveguides, Yue Sun[1,2], Thomas P. White[1,2], Andrey A. Sukhorukov[1]; [1]*Nonlinear Physics Centre, RSPE, Australian National University, Australia;* [2]*Laser Physics Centre, RSPE, Australian National University, Australia.* We reveal that slow-light enhanced optical forces between side-coupled photonic-crystal waveguides strongly depend on a longitudinal shift, facilitating transverse force tuning from repulsive to attractive and enabling longitudinal force which is absent in unshifted structures.

NThC • Modelocked Lasers and Continuum Generation

Kauai Ballroom, Halele'a
10:30-12:30
Andrew Weiner; Purdue University, USA, Presider

NThC1 • 10:30
Femtosecond operation and self-doubling of Cr:ZnS laser, Evgeni Sorokin[1], Nikolai Tolstik[2], Irina T. Sorokina[2]; [1]*Vienna University of Technology, Austria;* [2]*Physics Department, Norwegian University of Science and Technology, Norway.* Prismless dispersion-controlled Cr:ZnS laser generates first femtosecond (110 fs) pulses at 180 MHz repetition rate around 2400 nm with average power 200 mW. Co-propagating second-harmonic pulse at 1200 nm is simultaneously generated in ceramic sample.

NThC2 • 10:45
Semi-Analytic Theory of Similariton Amplifiers and Laser Oscillators Using a Shape-Adaptive Model Pulse, Christian Jirauschek[1], Fatih Ilday[2]; [1]*Institute for Nanoelectronics, TU Muenchen, Germany;* [2]*Department of Physics, Bilkent University, Turkey.* A semi-analytic theory for similariton lasers and amplifiers is presented. The key is a shape-adaptive model pulse which can be continuously tuned to represent pulse shapes ranging from parabolic to Gaussian to sech-squared intensity profiles.

NThC3 • 11:00
Energy Enhancement of Mode-Locked Fiber Lasers with Sinusoidal Transmission,
J. Nathan Kutz[1], Edwin Ding[1]; [1]*Applied Mathematics, University of Washington, USA.* A generalized master mode-locking model is shown to support high-energy pulses that are not predicted by the master mode-locking theory, thus providing a platform for optimizing high-energy laser performance.

NThC4 • 11:15 **Invited**
Dissipative Soliton Fiber Lasers, Frank Wise[1]; [1]*Applied Physics, Cornell University, USA.* Short-pulse fiber lasers based on dissipative-soliton formation offer major performance and practical advantages over prior fiber lasers. Recent developments will be reviewed.

NThB • Photonic Crystal and Waveguides Arrays (cont.)

NThB5 • 11:45
Nonlinear Optical Properties of ZnSe Nanowires Investigated with SHG Polarization Microscopy, Richard Cisek[1], Nehad Hirmiz[1], Ankur Saxena[2], Alexander Shik[2], Harry Ruda[2], Virginijus Barzda[1]; *[1]Department of Chemical and Physical Sciences, University of Toronto, Canada; [2]Centre for Advanced Nanotechnology, University of Toronto, Canada.* The SHG polarization microscopy differentiates crystal lattice structures in ZnSe nanowires. The crystal lattice orientation and structural heterogeneities are visualized along single nanowires demonstrating a convenient method to study organization in various nanostructures.

NThB6 • 12:00
Superluminally Decaying Light Bullets in Periodic Media, Falk Eilenberger[1], Stefano Minardi[1], Frank Setzpfandt[1], Thomas Pertsch[1]; *[1]Institute of Applied Physics, Friedrich Schiller University, Germany.* We investigate the wavelength-depending, discrete diffraction's impact on the dynamics of Light Bullets in a periodic medium leading to spatiotemporal coupling. This leads to acceleration during decay which we investigate analytically and in experiment.

NThB7 • 12:15
Nonlinear evolution of laser pulses in lithium niobate waveguide arrays, Frank Setzpfandt[1], Andrey A. Sukhorukov[2], Dragomir N. Neshev[2], Roland Schiek[3], Alexander S. Solntsev[2], Falk Eilenberger[1], Stefano Minardi[1], Raimund Ricken[4], Yoohong Min[4], Wolfgang Sohler[4], Yuri S. Kivshar[2], Thomas Pertsch[1]; *[1]Friedrich-Schiller-Universität Jena, Germany; [2]Nonlinear Physics Center, RSPE, Australian National University, Australia; [3]University of Applied Sciences Regensburg, Germany; [4]Applied Physics, Universität Paderborn, Germany.* We study experimentally and numerically the spatiotemporal evolution of short pulses in quadratic nonlinear waveguide arrays with coupled second-harmonic modes, revealing complex spectral transformations involving generation of new frequency components at the Brillouin zone edge.

NThC • Modelocked Lasers and Continuum Generation (cont.)

NThC5 • 11:45
Parametric Kerr-lens mode-locking of a 888 nm pumped Nd:YVO4 laser using cascaded second order nonlinearities, Christoph Schäfer[1], Christian Fries[1], Johannes A. L'huillier[1]; *[1]Photonik-Zentrum Kaiserslautern e.V., Germany.* We report on a parametric Kerr-lens mode-locked Nd:YVO4 laser using cascaded second order nonlinearities. Pulses as short as 5.7 ps and average output powers as high as 15.4 W @ 1064 nm have been achieved.

NThC6 • 12:00
Seeded Supercontinuum Generation in Gases and Condensed Matter, Trenton R. Ensley[1], Dmitry A. Fishman[1], Scott Webster[1], David J. Hagan[1,2], Eric W. Van Stryland[1,2]; *[1]CREOL & FPCE: The College of Optics & Photonics, University of Central Florida, USA; [2]Department of Physics, University of Central Florida, USA.* We measure a fourfold increase in femtosecond supercontinuum integrated spectral irradiance using extremely weak seeding (~10^-3) in Kr gas. We present data on the effect of seeding on supercontinuum in other gases, liquids, and solids.

NThC7 • 12:15
A minute-continuous-wave-stabilized picosecond supercontinuum source for ultrafast serial time-encoded amplified microscopy (STEAM), Chi Zhang[1], Yi Qiu[1], Jianbing Xu[1], Kenneth K. Y. Wong[1], Kevin K. Tsia[1]; *[1]Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong.* A stabilized picosecond supercontinuum source, by a minute continuous-wave trigger, is utilized to improve the ultrafast imaging quality of serial time-encoded amplified microscopy (STEAM) with a frame rate of 4.9 MHz.

On Your Own, **12:30 – 19:30, Free Afternoon**
Kauai Court, **19:00 – 21:00, Evening Registration Open**

NThD • Nanophotonics

Kauai Ballroom, Kona
19:30–21:30
Jeff Young; Univ. of British Columbia, Vancouver, Canada, Presider

NThD1 •19:30 Invited
Silicon-Based Sources from the Visible to Mid-Infrared, Alex Gaeta[1]; [1]*Cornell University, USA.* We describe our recent work in which we use harmonic generation and parametric four-wave mixing in silicon-based nanostructures to generate light from the visible to mid-infrared regimes.

NThD2 • 20:00 Invited
Novel nonlinear nanophotonic phenomena, Marin Soljacic[1]; [1]*MIT, USA.* We present our theoretical and experimental work on one-way waveguides, analogous to quantum-Hall edge states. We also discuss some possible applications, as well as the possibility of breaking time-reversal symmetry using active meta-materials.

NThD3 • 20:30 Invited
Ultrafast and Strong Fields in Nanooptics, Mark Stockman[1]; [1]*Georgia State Univ., USA.* Abstract Not Available

NThD4 • 21:00
Optical Nonlinear Properties of Light-tunneling Heterostructures, Hong Chen[1]; [1]*Pohl Institute of Solid State Physics, Tongji University, China.* We report our experimental demonstrations on enhanced nonlinear optical response of light-tunneling heterostructures, and review recent theoretical investigations on exploiting their nonlinear optical properties and applications including resonance-enhanced excitation of surface plasmon polaritons, nonlinear nonreciprocal transmission and all-optical diode action.

NThD5 • 21:15
Highly Efficient Optical Gain Media Based on Thick-Shell CdSe/CdS Nanocrystals with Suppressed Auger Recombination, Victor I. Klimov[1]; [1]*Chemistry, Los Alamos National Laboratory, USA.* Significant suppression of Auger recombination in thick-shell CdSe/CdS nanocrystal quantum dots derives primarily from "smoothing" of the confinement potential. These nanocrystals show strong optical gain due to involvement of multiexcitons of very high orders.

• Friday, 22 July, 2011 •

Kauai Court, **07:30 – 12:00, Morning Registration Open**

NFA • Frequency Combs and Waveform Synthesis

Kauai Ballroom, Kona
08:00-10:00
Steven Cundiff; JILA, USA, Presider

NFA1 • 08:00 Invited
Quantum frequency combs, Claude Fabre[1], Nicolas Treps[1], Beniot Chalopin[1], German J. de Valcarcel[1], Jinxia Feng[1], Renne Medeiros[1], G. Patera[1], O. Pinel[1], Pu Jian[1]; [1]*Laboratoire Kastler Brossel, University P.M. Curie, France.* Frequency combs generated by Synchronously Pumped Parametric Oscillators exhibit nonclassical features such as multimode squeezing and multipartite entanglement that we have investigated experimentally and which can be used to improve time measurements beyond the shot noise limit.

NFA2 • 08:30 Invited
High Repetition Rate Optical Frequency Combs - Generation and Applications, Andrew Weiner[1]; [1]*Electrical and Computer Engineering, Purdue University, USA.* High repetition rate optical frequency combs are generated by electro-optic modulation and nonlinear optical wave mixing and applied to radio-frequency photonic filtering. In addition, line-by-line shaping of Kerr combs generated in microresonators is demonstrated.

NFA3 • 09:00 Invited
Coherent frequency combs and spectroscopy - from IR to XUV, Jun Ye[1]; [1]*JILA, JILA/Univ. of Colorado, USA.* I will present our effort in producing coherent frequency combs in the infrared and extreme ultraviolet and use them for novel spectroscopy with powerful applications.

NFA4 • 09:30
Synthesis and Characterization of Optical Field Waveform, Andy Kung[1,2], Han-Sung Chan[1,2], Zhi-Ming Hsieh[2], Wei-Hong Liang[2], Chien-Jen Lai[5], Chao-Kuei Lee[6], Ru-Pin Pan[3], Lung-Han Peng[4]; [1]*Institute of Photonics Technologies, National Tsing Hua University, Taiwan;* [2]*Institute of Atomic and Molecuar Sciences, Academia Sinica, Taiwan;* [3]*Electro-Physics, National Chiao Tung University, Taiwan;* [4]*Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taiwan;* [5]*EECS, MIT, USA;* [6]*Photonics, National Sun Yat Sen University, Taiwan.* Periodic optical fields in the shapes of sawtooth, square, single-cycle sine and cosine are synthesized from laser harmonics generated by molecular modulation and measured using shaper-assisted cross-correlation.

NFA5 • 09:45
Pulse-shaper-assisted phase optimization of an ultrabroadband spectral comb, Miaochan Zhi[1], Kai Wang[1], Xia Hua[1], Alexei Sokolov[1]; [1]*Physics, Texas A&M University, USA.* We investigate pulse-shaper-assisted phase optimization of an ultrabroadband spectrum aiming to synthesize non-sinusoidal waveforms. A linear phase across 5 frequency-separated sidebands is achieved, which implies generation of 2 to 3 optical-cycle pulses.

Kauai Court, **10:00 – 10:30, Coffee Break & Exhibit Time**

NFB • Nonlinear Spectroscopy II

Kauai Ballroom, Kona
10:30--12:30
Keith Nelson; MIT, USA, Presider

NFB1 • 10:30 Invited
Atmospheric Nonlinear Optics, Pierre Béjot[1]; [1]*Univ. Of Geneva, Switzerland.* Abstract not available.

NFB2 • 11:00 Invited
Observation of the Relativistic Response of an Electron-Hole Plasma in Graphene on Femtosecond Timescales, Dani M. Keshav[1], Jinho Lee[1], Sharma Rishi[2], Aditya D. Mohite[1], Charudatta C. Galande[3], Pulickel M. Ajayan[3], Andrew M. Dattelbaum[1], Han Htoon[1], Antoinette J. Taylor[1], Rohit P. Prasankumar[1]; [1]*Center for Integrated Nanotechnologies, , USA;* [2]*Theoretical Division, Los Alamos National Laboratory, USA;* [3]*Department of Mechanical Engineering and Materials Science, Rice University, USA.* Visible pump-probe spectroscopy is used to isolate the femtosecond Drude response of a photogenerated electron-hole plasma in a graphene monolayer. The observed sub-linear dependence on carrier density reveals the relativistic nature of the electron-hole plasma.

NFB3 • 11:30
The Off-resonance and Non-resonant Dispersion of the Nonlinear Index of Linear Symmetric Molecules, George Stegeman[1,2], Dimitris Papazoglou[3], Stelios Tzortakis[3], Mark Kuzyk[4]; [1]*College of Engineering, King Fad University of Petroleum and Minerals, Saudi Arabia;* [2]*College of Optics and Photonics, University of Central Florida, USA;* [3]*Institute of Electronic Structure and Laser, Greece;* [4]*Dept. Physics, Washington State University, USA.* Using the sum-over-states model for linear symmetric molecules we derive expressions for the frequency dispersion of n_2 of air molecules. The measured sign of non-resonant n_2 shows the recently published extended Miller formula is incorrect.

NFB4 • 11:45
Resonance tuning of coherent population trapping with intracavity pulse shaping, Koji Masuda[2], Ladan Arissian[1]; [1]*Electrical and Computer Engineering Department, University of New Mexico, USA;* [2]*Physics & Astronomy, University of New Mexico, USA.* Atomic resonances had long been used as a frequency reference. We present resonant tuning of coherent population trapping in 87Rb with an intracavity Fabry-Perot etalon in a mode-locked laser.

NFB5 • 12:00
Coherent Control in 2D Fourier Transform Optical Spectroscopy, Jaewook Ahn[1], Jongseok Lim[1], Jae-uk Kim[1], Han-gyeol Lee[1]; [1]*Physics, KAIST, Republic of Korea.* Using individually shaped three pulses in 2D Fourier transform optical spectroscopy, we coherently control the amplitude and phase of the two-photon transition between 5P1/2 and 5P3/2 levels in atomic Rb V-type energy system.

NFB6 • 12:15
Second-harmonic generation spectroscopic study of silicon nanocrystals embedded in SiO2, Junwei Wei[1]; [1]*Physics, the University of Texas at Austin, USA.* Cross-polarized 2-beam second-harmonic generation, with enhanced signal from both the nano-interface and nanocrystal bulk, supplemented with spectroscopic ellipsometry and Raman spectroscopy, has been applied spectroscopically to study the embedded Si NCs of different sizes.