OSA
Optical Society of America

NLO

Nonlinear Optics: Materials, Fundamentals and Applications

Topical Meeting and Tabletop Exhibits

August 2-6, 2004

Waikoloa Beach Marriott, An Outrigger Resort
Waikoloa, Hawaii

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About NLO

The purpose of this meeting is to provide an international forum for discussion of all aspects of nonlinear optics, including new phenomena, novel devices, advanced materials and applications.

Meeting Topics

Topics to be considered:

The topics to be considered in the main program will include (but not be limited to):

Fundamental studies and new concepts

- Quantum optics, computation and communication
- Solitons and nonlinear propagation
- Ultrafast phenomena and techniques
- Surface, interface and nanostructure nonlinearities
- Microcavity and microstructure phenomena
- High intensity & relativistic nonlinear optics
- Slow light
- Coherent control
- Novel lasers and frequency converters

Nonlinear materials

- Atoms, molecules and condensates
- Semiconductors
- Nanostructures
- Organics
- Photonic bandgap structures
- Fibers and waveguides
- Photorefractives

Applications

- Lasers and amplifiers
- Frequency converters
- Optical communications
- Photonic switching
- Ultrafast measurement

- Frequency combs and optical clocks
- THz generation, spectroscopy and imaging
- Materials processing
- Optical storage

Invited Speakers

The preliminary list of invited speakers includes:

- MB1, **Discrete optical solitons in waveguide arrays and photonic lattices**, Demetrios Christodoulides[1], Mordechai Segev[2], *[1]School of Optics/CREOL, Univ. of Central Florida, USA, [2]Technion-Israel Inst. of Technology, Israel.*
- MB5, **Discrete solitons**, Yaron Silberberg, *Weizmann Inst. of Science, Israel, Univ. of Rochester, USA.*
- MC3, **THz spectroscopy of nanostructures**, Tony Heinz, *Columbia Univ., USA.*
- MD1, **Quantum information processing with realistic linear and nonlinear optics**, Nobuyuki Imoto, *SOKENDAI, Japan.*
- MD2, **Generation of a single-cycle optical pulse**, Miroslav Shverdin, D. R. Walker, D. C. Yavuz, G.Y. Yin, S. E. Harris, *Stanford Univ., USA.*
- MD3, **Tests for non-randomness in quantum jumps**, Dana J. Berkeland, *Los Alamos Natl. Lab., USA*
- TuA1, **A chip-based micro-cavity optical parametric oscillator (μOPO)**, Tobias J. Kippenberg, S. M. Spillane, K. J. Vahala, *Caltech, USA.*
- TuA4, **Optical parametric oscillation in orientation-patterned GaAs**, Konstantin L. Vodopyanov[1], O. Levi[1], P. S. Kuo[1], T. J. Pinguet[1], J. H. Harris[1], M. M. Fejer[1], B. Gerard[2], L. Becouarn[2], E. Lallier[2], *[1]Stanford Univ., USA, [2]THALES Res. & Technology, France.*
- TuC1, **Carrier-envelope phase controlled quantum interference in a semiconductor**, Steven Cundiff[1], P. A. Roos[1], T. M. Fortier[1], D. J. Jones[1], R.D. R. Bhat[2], J. E. Sipe[2], *[1]JILA/NIST, Univ. of Colorado, USA, [2]Dept. of Physics, Univ. of Toronto, Canada.*
- TuD1, **Two-photon absorption imaging and self-phase modulation imaging with shaped laser pulses**, Warren S. Warren[1,2], A. Miller[2], W. Wagner[3], T. Ye[1], M. Fischer[1], G. Yurtsever[1], *[1]Univ. of Pennsylvania, USA, [2]Princeton Univ., USA, [3]Rutgers Univ., USA.*
- TuD2, **Transforming mesoscopic matter with holographic optical traps**, David Grier, *New York Univ., USA.*
- TuD3, **Stationary pulses of light in an atomic medium**, Axel Andre[1], M. Bajcsy[1], D. E. Chang[1], A. S. Zibrov[1,2,3], M. F. Lukin[1]; *[1]Harvard*

Univ., USA, [2]Harvard-Smithsonian Ctr. for Astrophysics, USA, [3]Lebedev Inst. of Physics, Russian Federation.

- TuD4, **QPM NLO in microstructured ferroelectrics and semiconductors**, Martin M. Fejer, *Stanford Univ., USA.*
- WA3, **Multiwavelength harmonic generation from two-dimensional χ 2 nonlinear photonic crystals**, Lung-Han Peng[1], S.- M. Tsan[1], Y.- C. Shih[1], C.- C. Hsu[1], A. H. Kung[2], *[1]Natl. Taiwan Univ., Taiwan Republic of China, [2]Academia Sinica, Taiwan Republic of China.*
- WA6, **Ultra-small photonic crystal lasers**, Yong-Hee Lee, H. Y. Ryu, H. K. Park, S. H. Kim, I. K. Hwang, *KAIST, Republic of Korea.*
- WB1, **Nonlinear interactions in gas-filled photonic band-gap fibers**, Alexander Gaeta[1], Dimitre G. Ouzounov[1], Faisal R. Faisal[1], Natesan Venkataraman[2], Michael T. Gallagher[2], Karl W. Koch[2]; *[1]Cornell Univ., USA, [2]Corning Inc., USA.*
- ThA1, **Nanophotonics of structural transformations**, Nikolay I. Zheludev, *Southampton Univ., UK.*
- FA1, **Telecom-band entanglement generation, storage, and long-distance distribution**, Prem Kumar, Xiaoying Li, Jun Chen, Paul L. Voss, Jay E. Sharping, *Northwestern Univ., USA.*
- FA4, **Superluminal light pulses, subluminal information transmission**, Daniel Gauthier, *Duke Univ., USA.*
- FA5, **Ultraslow and superluminal light propagation in room temperature solids**, Robert W. Boyd, Matthew S. Bigelow, Nick Lepeshkin, Aaron Schweinsberg, Petros Zerom, *Univ. of Rochester, USA.*
- FC1, **Non locality and nonlinearity for light localization in liquid crystals**, Gaetano Assanto, *Italian Inst. for the Physics of Matter, Italy.*
- FC3, **Filamentary propagation of intense ultrashort laser pulses in air**, Andre Mysyrowicz, *Ecole Polytechnique, France.*
- FC4, **Self-organized coherence in fiber laser arrays**, Metin S. Mangir, *HRL Labs, USA.*

New! Special Symposium on "The Pioneers of Nonlinear Optics"

This symposium describes the evolution of and breakthroughs in the field of nonlinear optics, organized by Boris Stoicheff, Univ. of Toronto, Canada.

- MA1, **Nonlinear Optics: Recollections About the Early Years**, Nicolaas Bloembergen, *Univ. of Arizona, USA.*

- MA2, **Nonlinear Optics at MIT in the Early 60s**, Ray Chiao, *Univ. of California at Berkeley, USA.*
- MA3, **From Fluidics to Photonics: 200 Years of Parametric Conversion**, Joseph Giordmaine, *Princeton Univ., USA.*
- MA4, **Noise, Information, and Nonlinear Optics**, Amnon Yariv, *Caltech, USA.*

Publications

Conference Program

The *Conference Program* will be available on the web in May 2004. Authors submitting papers, past meeting participants and current committee members will automatically be notified by email when the *Conference Program* is available.

Technical Digest

The NLO *Technical Digest* on CD-ROM will contain PDFs of paper summaries presented during the meeting as they were submitted by the authors; the *Technical Digest* will be produced only on CD. At the meeting, each registrant will receive a copy of the *Technical Digest* on CD-ROM. Extra copies can be purchased at the meeting for a special price of US$ 45.

Agenda

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Sunday, August 01, 2004

Time	Event/Location
12:00 PM - 5:00 PM	Registration *Ali-i Foyer*

Monday, August 02, 2004

Time	Event/Location
7:00 AM - 1:00 PM 7:00 PM - 9:00 PM	Registration *Ali-i Foyer*
8:00 AM - 8:15 AM	Opening Remarks *Ali-i I*
8:15 AM - 10:30 AM	**MA**, Special Symposium: The Pioneers of Nonlinear Optics *Ali-i I*
10:30 AM - 11:00 AM	Coffee Break *Ali-i III*
11:00 AM - 1:00 PM	**MC**, Terahertz Nonlinear Optics *Ali-i II*
11:00 AM - 1:00 PM	**MB**, Discrete Solitons *Ali-i I*
1:00 PM - 7:30 PM	Free Afternoon *On Your Own*

7:30 PM - 9:00 PM	**MD**, Novel Nonlinear Optics I *Ali-i I*

Tuesday, August 03, 2004

Time	Event/Location
7:00 AM - 12:30 PM 7:00 PM - 9:30 PM	Registration *Ali-i Foyer*
8:00 AM - 10:00 AM	**TuA**, Parametric Processes *Ali-i I*
10:00 AM - 10:30 AM	Coffee Break *Ali-i III*
10:30 AM - 12:30 PM	**TuB**, Nonlinear Optical Techniques *Ali-i I*
10:30 AM - 12:30 PM	**TuC**, Nonlinear Optics in Semiconductors *Ali-i II*
12:30 PM - 7:30 PM	Free Afternoon *On Your Own*
7:30 PM - 9:30 PM	**TuD**, Novel Nonlinear Optics II *Ali-i I*

Wednesday, August 04, 2004

Time	Event/Location
7:00 AM - 5:00 PM	Registration *Ali-i Foyer*
8:00 AM - 10:00 AM	**WA**, Photonic Crystals *Ali-i I*
10:00 AM - 10:30 AM	Coffee Break *Ali-i III*
10:30 AM - 12:30 PM	**WB**, Photonic Crystal Fibers *Ali-i I*
12:30 PM - 2:00 PM	Lunch Break *On Your Own*
2:00 PM - 3:30 PM	**WC**, Nonlinear Progagation Effects *Ali-i I*
3:30 PM - 5:00 PM	**WD**, Poster Session *Paniolo Ball Room*
5:30 PM - 7:30 PM	**Conference Banquet** Royal Luau on the Luau Lawn

Thursday, August 05, 2004

Time	Event/Location
7:00 AM - 12:30 PM 7:00 PM - 9:30 PM	Registration *Ali-i Foyer*
8:00 AM - 10:00 AM	**ThA**, Nano Media Nonlinear Optics *Ali-i I*
10:00 AM - 10:30 AM	Coffee Break *Ali-i III*
10:30 AM - 12:30 PM	**ThB**, Lasers and Processing *Ali-i II*
10:30 AM - 12:30 PM	**ThC**, Nonlinear Optics in Fibers *Ali-i I*
12:30 PM - 7:30 PM	Free Afternoon *On Your Own*
7:30 PM - 9:30 PM	**ThD**, Postdeadline Session *Ali-i I*

Friday, August 06, 2004

Time	Event/Location
7:30 AM - 12:30 PM	Registration *Ali-i Foyer*
8:00 AM - 10:00 AM	**FA**, Nonlinear Information Processing *Ali-i I*
10:00 AM - 10:30 AM	Coffee Break *Ali-i III*
10:30 AM - 12:30 PM	**FB**, Nonlinear Optics in Organics *Ali-i II*
10:30 AM - 12:30 PM	**FC**, Spatial Solitons *Ali-i I*

Monday, August 2, 2004

► Room: Ali-i I
8:15 a.m. – 10:30 a.m.
MA • Special Symposium: The Pioneers of Nonlinear Optics
Boris Stoicheff, *Univ. of Toronto, Canada,* Presider.

► Room: Ali-i I
11:00 a.m. – 1:00 p.m.
MB • Discrete Solitons
Gaetano Assanto, *Italian Inst. for the Physics of Matter, Italy*, Presider.

MB1 • 11:00 a.m. Invited
Discrete optical solitons, Demetrios Christodoulides[1], Mordechai Segev[2]; *[1]School of Optics/CREOL, Univ. of Central Florida, USA, [2]Technion-Israel Inst. of Technology, Israel.* In this talk we provide an overview of recent developments in the emerging area of optical discrete solitons. The physics of discrete solitons along with their potential applications will be discussed.

MB2 • 11:30 a.m.
Random-phase solitons in nonlinear periodic lattices, *Moti Segev[1], Oren Cohen[1], Hrvoje Buljan[1], Jason W. Fleischer[1], Tal Schwartz[1], Ziad Musslimani[2], Nikolaos K. Efremidis[2], Demetrios Christodoulides[2]; [1]Technion–Israel Inst. of Technology, Israel, [2]School of Optics/CREOL, Univ. of Central Florida, USA.* We present a theoretical study and experimental demonstration of random-phase solitons (RPS) in nonlinear periodic lattices. We find that for RPS to exist, their intensity profile and statistical (coherence) properties must conform to the lattice periodicity.

MB3 • 11:45 a.m.
Staggered and unstaggered solitons in quadratically nonlinear lithium niobate waveguide arrays, *Roland Schiek[1], Robert Iwanow[2], George I. Stegeman[2], Thomas Pertsch[3], Falk Lederer[3], Yoohong Min[4], Wolfgang Sohler[4]; [1]FH Regensburg, Germany, [2]CREOL, Univ. of Central Florida, USA, [3]FSU Jena, Germany, [4]Univ. of Paderborn, Germany.* We report the first observation of staggered and unstaggered quadratic discrete solitons in arrays of coupled waveguides. Intensity profiles, powers and stability of the solitons were measured in good agreement with theoretical predictions.

MB4 • 12:00 p.m.
Single channel excitation, discrete solitons and bistable response in PPLN waveguide arrays, *Robert Iwanow[1], George I. Stegeman[1], Roland Schiek[2], Thomas Pertsch[3], Falk Lederer[3], Yoohong Min[4], Wolfgang Sohler[4]; [1]School of Optics/CREOL, Univ. of Central Florida, USA, [2]Univ. of Applied Sciences Regensburg, Germany, [3]Friedrich-Schiller-Univ. Jena, Germany, [4]Univ. of Paderborn, Germany.* We report nonlinear optical behavior unique to weakly coupled PPLN arrays of phase-matched channel waveguides with single channel excitation. With second harmonic seeding, the response becomes bistable, locking into different power ratios at the ouput.

MB5 • 12:15 p.m. Invited
Discrete solitons, *Yaron Silberberg; Weizmann Inst. of Science, Israel*. Nonlinear propagation of light in periodic structures leads to a reach spectrum of phenomena, ranging from simple discrete behavior to complex multiband structures. I shall review my group's experimental effort in this area.

MB6 • 12:45 p.m.
Blocking beam intractions in 1D waveguide arrays, *Joachim Meier[1], George I. Stegeman[1], Demetrios N. Christodoulides[1], Yaron Silberberg[2], Roberto Morandotti[3], H. Yang[4], G. Salamo[4], M. Sorel[5], J. S. Aitchison[6], J. S. Aitchison[6]; [1]School of Optics/CREOL, Univ. of Central Florida, USA, [2]Dept. of Physics of Complex Systems, Weizmann Inst. of Science, Israel, [3]Inst. Natl. de la Recherche Scientifique, Univ. du Québec, Canada, [4]Physics Dept., Univ. of Arkansas, USA, [5]Dept. of Electrical and Electronic Engineering, Univ. of Glasgow, UK, [6]Dept. of Electrical and Computer Engineering, Univ. of Toronto, Canada.* We investigate experimentally the collision interactions of a highly localized discrete soliton ("blocker") with a wide, tilted beam in a 1D AlGaAs array.

► Room: Ali-i II
11:00 a.m. – 1:00 p.m.
MC • Terahertz Nonlinear Optics
Victor I. Klimov, *Los Alamos Natl. Lab, USA,* Presider.

MC1 • 11:00 a.m.
Terahertz radiation spectrum emitted from InAs under the existence of magnetic field up to 27 T, *Hiroshi Takahashi[1], Alex V. Quema[2], Masahiro Goto[2], Shingo Ono[2], Nobuhiko Sarukura[2], Gen Nishijima[3], Kazuo Watanabe[3]; [1]Graduate Univ. for Advanced Studies, Japan, [2]Inst. for Molecular Science, Japan, [3]Tohoku Univ., Japan.* THz-radiation from femtosecond-laser-irradiated InAs (100) surface is investigated. It is found that THz-radiation spectrum exhibits two inter-related phenomena in a strong magnetic field under the Voigt configuration.

MC2 • 11:15 a.m.
Terahertz emission via ultrashort pulse excitation of magnetic metal films, *David J. Hilton, Chad A. Meserole, Richard D. Averitt, Greg L. Fisher, David J. Funk, II, Joe D. Thompson, Antoinette J. Taylor; Los Alamos Natl. Lab, USA*. We observe terahertz emission via optical rectification of a 1.5 eV, 50 fs pulse in single crystal iron thin films. The azimuthal dependence of the emission indicates the presence of a magnetic and surface nonlinearity.

MC3 • 11:30 a.m. Invited
THz spectroscopy of nanostructures, *Tony Heinz[1], Feng Wang[1], Mischa Bonn[2], Jie Shan[1], E. Hendry[2], Ernst Knoesel[1], Mohammad Islam[1], Irving P. Herman[1]; [1]Columbia Univ., USA, [2]Leiden Inst. of Chemistry, Netherlands.* Terahertz (THz) time-domain spectroscopy provides a powerful tool to determine the frequency-dependent conductivity of materials using propagating electromagnetic waves. The approach permits probing nanostructures and bulk materials that are difficult to contact. We describe recent measurements on photoexcited semiconductor nanoparticles and insulators.

MC4 • 12:00 p.m.
Strong enhancement of higher frequency terahertz radiation from n-type InAs by the reduction of excitation pulse duration, *Hiroshi Takahashi[1], Michael P. Hasselbeck[2], Alex V. Quema[3], Masahiro Goto[3], Shingo Ono[3], Nobuhiko Sarukura[3]; [1]Graduate Univ. for Advanced Studies, Japan, [2]Univ. of New Mexico, USA, [3]Inst. for Molecular Science, Japan.* THz-radiation from femtosecond-laser-irradiated n-type InAs is investigated under the existence of the magnetic field. THz-radiation at around 9 THz is found to be enhanced by using the laser pulses with much shorter duration.

MC5 • 12:15 p.m.
Generation of programmable terahertz waveforms via optical rectification, *Jaewook Ahn, Anatoly V. Efimov, Richard D. Averitt, Antoinette J. Taylor; Los Alamos Natl. Lab, USA.* We present the use of optical rectification process in a Nonlinear optoelectronic crystal in conjunction with optical pulse-shaping technique for the generation of programmable electromagnetic waveforms at terahertz frequency.

MC6 • 12:30 p.m.
Efficient, wideband THz emission from thin electro-optic polymer films, *Michael Hayden[1], Alexander Sinyukov[1], Megan Leahy[1], Jingdong Luo[2], Alexander Jen[2], Larry Dalton[2], Kai Liu[3], Xi-Cheng Zhang[3]; [1]Univ. of Maryland, Baltimore County, USA, [2]Univ. of Washington, USA, [3]Rensselaer Polytechnic Inst.,*

USA. A 3 micron thick polymer film (r33 > 350 pm/V) is used to generate THz radiation greater than a 1000 micron thick crystal of ZnTe. THz emission up to 20 THz is observed.

MC7 • 12:45 p.m.
GaSe crystals for broadband terahertz wave detection, *Kai Liu, Jingzhou Xu, X.-C. Zhang; Ctr. for THz Res., Rensselaer Polytechnic Inst., USA.* GaSe crystal is reported in broadband detection of terahertz (THz). The central frequency is tunable and the amplitude measured with a GaSe crystal exceeds that detected by a ZnTe crystal with comparable detection bandwidth.

► Room: Ali-i I
7:30 p.m. – 9:00 p.m.
MD • Novel Nonlinear Optics I
Wayne H. Knox, *The Inst. of Optics, Univ. of Rochester,USA*, Presider.

MD1 • 7:30 p.m. Invited
Quantum information processing with realistic linear and nonlinear optics, *Nobuyuki Imoto; SOKENDAI, Japan*. We describe about useful linear and nonlinear optical devices that can be used for photon-based quantum information processing. Some principles and classifications are given together with our recent work of experimental demonstration.

MD2 • 8:00 p.m. Invited
Generation of a single-cycle optical pulse, *Miroslav Shverdin, D. R. Walker, D. C. Yavuz, G. Y. Yin, S. E. Harris; Stanford Univ., USA.* By electronically adjusting the phases of seven Raman sidebands which span 1.56 μm to 410 nm we generate a train rain of well-formed single-cycle optical pulses with a pulse width of 1.5 fs.

MD3 • 8:30 p.m. Invited
Tests for non-randomness in quantum jumps, *Dana J. Berkeland; Los Alamos Natl. Lab, USA.* We statistically analyze 230,000 intervals between internal transitions of single, laser-driven strontium ions, and over 240,000 intervals in simultaneously trapped ions. Our results are consistent with no short- or long-term correlations in the transition times.

Tuesday, August 3, 2004

► Room: Ali-i I
8:00 a.m. – 10:00 a.m.
TuA • Parametric Processes
TBA, Presider.

TuA1 • 8:00 a.m. Invited
A chip-based micro-cavity optical parametric oscillator (µOPO), *Tobias J. Kippenberg, S. M. Spillane, K. J. Vahala; Caltech, USA.* We report a micro-scale optical parametric oscillator (µOPO). Oscillations are observed at low threshold values (170 micro-Watts) with highly ideal (97%) signal-to-idler photon emission. High conversion efficiencies (36%) are achieved.

TuA2 • 8:30 a.m.
Continuous-wave ultraviolet generation at 354 nm in a periodically poled MgO:$LiNbO_3$, *Nicolaie Pavel[1,2], Takunori Taira[1], Kiminori Mizuuchi[3], Akihiro Morikawa[3], Tomoya Sugita[3], Kazuhisa Yamamoto[3]; [1]Inst. for Molecular Science, Japan, [2]Natl. Inst. for Laser, Plasma and Radiation Physics, Romania, [3]Storage Media Systems Development Ctr., Matsushita Electric Co., Japan.* Ultraviolet radiation, the third-harmonic of a Nd:$GdVO_4$ laser operating at 1.06-microns wavelength, is reported from a single-pass cascaded first-order periodically poled MgO:$LiNbO_3$ crystals. Continuous-wave 47 mW at 354 nm with 3.8%/Wcm normalized conversion efficiency resulted.

TuA3 • 8:45 a.m.
Measurements of pattern formation in a confocal optical parametrical oscillator with applications in quantum optics, *Mikael Lassen, Preben Buchhave; Technical Univ. of Denmark, Denmark.* We describe simultaneous measurements of signal/idler near field and far field patterns of 2nd order nonlinear multi-mode parametric downconverters. We also describe the use of auto- and cross correlation techniques to obtain statistical data.

TuA4 • 9:00 a.m. Invited
Optical parametric oscillation in orientation-patterned GaAs, *Konstantin L. Vodopyanov[1], O. Levi[1], P. S. Kuo[1], T. J. Pinguet[1], J. H. Harris[1], M. M. Fejer[1], B. Gerard[2], L. Becouarn[2], E. Lallier[2]; [1]Stanford Univ., USA, [2]THALES Res. & Technology, France.* We demonstrate a GaAs OPO. It utilizes all-epitaxially-grown quasi-phasematched GaAs pumped by near-IR pulses, has 2-10μm tunability, 16μJ threshold and 54% slope quantum efficiency. We also show that it can be pumped by unpolarized light.

TuA5 • 9:30 a.m.
Quantum signatures from singly-resonant and doubly-resonant parametric amplifiers, *Jeffrey H. Shapiro, Christopher E. Kuklewicz, Franco N.C. Wong; MIT, USA.* The quantum signatures of singly-resonant and doubly-resonant optical parametric amplifiers are derived. Preliminary experiments with two novel single-cavity, double-resonant systems are presented.

TuA6 • 9:45 a.m.
Scaling limits for single-photon Kerr phase shifts in integrated EIT, *Holger Schmidt; Univ. of California at Santa Cruz, USA.* We analyze integration of electromagnetically induced transparency in alkali atoms on a semiconductor chip. We derive the scaling laws for single-photon Kerr phase shifts and reduction in group velocity as a function of device dimensions.

► Room: Ali-i I
10:30 a.m. – 12:30 p.m.
TuB • Nonlinear Optical Techniques
Stephen Harris, *Stanford Univ.,USA,* Presider.

TuB1 • 10:30 a.m.
Ultrasimple FROG device for measuring ultrashort pulses at ~ 1.5-micron wavelengths, *Rick Trebino, Selcuk Akturk, Mark Kimmel; Georgia Tech., USA.* We have developed an experimentally ultrasimple, few-element FROG device for measuring ~1-ps pulses at ~1.5-micron wavelengths. The key to this device is a highly dispersive nonlinear crystal, specifically, the all-but-forgotten crystal Proustite.

TuB2 • 10:45 a.m.
Real-time tracking of the peaks in transient difference transmittance spectra during vibrational periods in PDA, *Takayoshi Kobayashi[1], Yoshiharu Yuasa[1], Mituhiro Ikuta[1], Tatsumi Kimura[2], Hiroo Matsuda[2]; [1]Dept. of Physics, Univ. of Tokyo, Japan, [2]Natl. Inst. of Advanced Industrial Science and Technology, Japan.* Sub-5-fs NOPA was used to track the instantaneous peak energy of the vibronic transition in polydiacetylene Stokes shift associated with geometrical relaxation and electronic spectral change caused by lattice vibration are directly real time observed.

TuB3 • 11:00 a.m.
Nonlinear interferometric vibrational imaging with differentiation of resonant CARS from nonresonant four-wave-mixing processes, *Stephen A. Boppart, Daniel L. Marks, Jeremy S. Bredfeldt, Claudio Vinegoni; Univ. of Illinois at Urbana-Champaign, USA.* We report new interferometric techniques for measuring coherent anti-Stokes raman scattering signals and differentiating between resonant and nonresonant contributions. The exploitation of these optical nonlinearities for molecular contrast enhancement in Optical Coherence Tomography is presented.

TuB4 • 11:15 a.m.
Three-dimensional mapping of single event effects using nonlinear absorption, *Dale McMorrow[1], William T. Lotshaw[1], Joseph S. Melinger[1], Stephen Buchner[2], Younes Boulghassoul[3], Lloyd Massengill[3], Ronald L. Pease[4]; [1]NRL, USA, [2]QSS Group, Inc, USA, [3]Vanderbilt Univ., USA, [4]RLP Res., USA*. Carrier generation based on sub-bandgap two-photon absorption is used to perform three-dimensional mapping of the single event transient response of the LM124 operational amplifier.

TuB5 • 11:30 a.m.
Onset detection of solid-state phase transition in a quasi-mimic natural hormone chemical using transmission spectroscopy in the terahertz frequency region, *Alex V. Quema[1], Masahiro Goto[1], Masahiro Sakai[1], Riadh El Ouenzerfi[1], Hiroshi Takahashi[1], Shingo Ono[1], Nobuhiko Sarukura[1], Gerardo C. Janairo[2]; [1]Inst. for Molecular Science, Japan, [2]Chemistry Dept., De La Salle Univ., Philippines.* Solid-state phase transition onset in a chemical suspected to mimic natural hormone is detected using transmission spectroscopy in the terahertz frequency region. Such phenomenon is verified by differential scanning microscopy and temperature-dependent X-ray diffraction analysis.

TuB6 • 11:45 a.m.
A compact, narrow-line-width, fast-data-acquiring, ais-TPG spectrometer, *Ruixiang Guo[1], Youichi Ishikawa[1], Hiroaki Minamide[1], Tomofumi Ikari[1], Hiromasa Ito[2],[1], Kazuhiro Imai[3], Atsushi Hashimoto[4], Takaharu Kameoka[4]; [1]Photodynamics Res. Ctr., RIKEN, Japan, [2]Res. Inst. of Electrical Communication (RIEC), Tohoku Univ., Japan, [3]Optical Comb Inst., Inc., Japan, [4]Dept. of Sustainable Resource Science, Faculty of Bioresources, Mie Univ. 1515, Japan.* An achromatically injection-seeded terahertz-wave parametric generator (ais-TPG) and a tera-photonics spectra system were closely integrated in an air-free aluminum box with a volume of about 44×66×17 cm^3 and successfully used to measure terahertz-wave absorption spectra.

TuB7 • 12:00 p.m.
Broadband optical clock recovery system based on two-photon absorption, *Reza Salem, Thomas E. Murphy; Univ. of Maryland, Electrical and Computer Engineering Dept., USA.* We describe a new optical clock recovery system that uses two-photon absorption in a silicon photodiode. Unlike many earlier approaches, the system is compact, sensitive, broadband, polarization-insensitive, and scalable to higher bit-rates.

TuB8 • 12:15 p.m.
A frequency domain cross-correlation technique for measuring the linewidth of difference frequency generated radiation, *Ajay Nahata; Univ. of Utah, USA.* We demonstrate a novel approach for measuring the linewidth of difference frequency generated radiation based on a frequency domain cross-correlation approach. The technique is particularly well suited for narrow linewidth applications.

► Room: Ali-i II
10:30 a.m. – 12:30 p.m.
TuC • Nonlinear Optics in Semiconductors
Chung Tang, *Cornell Univ., USA*, Presider.

TuC1 • 10:30 a.m. Invited
Carrier-envelope phase controlled quantum interference in a semiconductor, *Steven Cundiff[1], P. A. Roos[1], T. M. Fortier[1], D. J. Jones[1], R.d. R. Bhat[2], J. E. Sipe[2]; [1]JILA/NIST, Univ. of Colorado, USA, [2]Dept. of Physics, Univ. of Toronto, Canada.* We demonstrate quantum interference of injected photocurrents in a semiconductor using a phase stabilized modelocked Ti:sapphire laser. Using this technique we detect the carrierenvelope evolution with a 40 dB signal to noise ratio.

TuC2 • 11:00 a.m.
Nonlinear susceptibility due to intersubband absorption saturation in GaN/AlN multiple quantum wells, *Junichi Hamazaki[1], Hideyuki Kunugita[1], Kazuhiro Ema[1], Satoshi Matsui[2], Youhei Ishii[2], Takayuki Morita[2], Akihiko Kikuchi[2], Katsumi Kishino[2]; [1]Dept. of Physics, Sophia Univ., Japan, [2]Dept. of Electric and Electronics Engineering, Sophia Univ., Japan.* We have estimated degenerated and non-degenerated nonlinear susceptibilities in GaN/AlN MQW by one- and two-color pump-probe technique. We have discussed the origin of the nonlinear susceptibility in the framework of intersubband absorption saturation.

TuC3 • 11:15 a.m.
Degenerate four-wave-mixing of spiral-type excitons, *Hajime Ishihara[1,2], Hiroshi Mifune[1]; [1]Dept. of Materials Engineering Science, Osaka Univ., Japan, [2]CREST, Japan Science and Technology Corp., Japan*. We theoretically study the degenerate four-wave-mixing of thin films confining the spiral-type excitons, which reveals an interesting role of the nanoscale orientation structure of polarizations in the linear and nonlinear optical responses.

TuC4 • 11:30 a.m.
Novel mid-IR optical limiter based on type-II quantum wells, *Jacob B. Khurgin[1], Igor Vurgaftman[2], Jerry R. Meyer[2]; [1]Johns Hopkins Univ., USA, [2]NRL, USA.* We show that strong optically-induced intervalence band transitions in type-II QWs lead to reverse saturable absorption, and propose to use it for optical limiting over a large dynamic range.

TuC5 • 11:45 a.m.
Ultrafast mid-infrared dynamics in the colossal magnetoresistance pyrochlore $Tl_2Mn_2O_7$, *Richard D. Averitt[1], Rohit P. Prasankumar[1], Antoinette J. Taylor[1], Hide Okamura[2], H. Imai[3], Y. Shimikawa[3], Y. Kubo[3]; [1]Los Alamos Natl. Lab, USA, [2]Graduate School of Science and Technology, Kobe Univ., Japan, [3]Fundamental Res. Labs, NEC Corp., Japan.* An optical pump, mid-infrared (IR) probe system is used to investigate ultrafast temperature-dependent dynamics of the colossal magnetoresistance pyrochlore $Tl_2Mn_2O_7$. The dynamics change appreciably near the Curie temperature (T_c), indicating a dependence on ferromagnetic ordering.

TuC6 • 12:00 p.m.
Nanocrystal lasing in the single-exciton regime using engineered nonlinear exciton-exciton interactions, *Victor I. Klimov, Sergei Ivanov, Jagjit Nanda, Ilya Bezel, Marc Achermann, Laurent Balet; Los Alamos Natl. Lab, USA.* We study the effect of type-I vs. type-II carrier localization on lasing performance of semiconductor nanocrystals (NCs). We show that in type-II NCs lasing is possible in the single-exciton regime at dramatically reduced pump thresholds.

TuC7 • 12:15 p.m.
Nonlinear processes in laser cooling of semiconductors, *Mansoor Sheik-Bahae[1], Babak Imangholi[1], Michael P. Hasselbeck[1], Richard I. Epstein[2], Sarah Kurtz[3]; [1]Univ. of New Mexico, USA, [2]Los Alamos Natl. Lab, USA, [3]Natl. Renewable Energy Lab, USA.* The conditions for attaining net laser cooling in semiconductors are theoretically and experimentally investigated. The nonlinear processes of band-filling and many body recombination are essential in determining the lowest attainable temperatures.

► Room: Ali-i I
7:30 p.m. – 9:30 p.m.
TuD • Novel Nonlinear Optics II
TBA, Presider.

TuD1 • 7:30 p.m. Invited
Two-photon absorption imaging and self-phase modulation imaging with shaped laser pulses, *Warren S. Warren[1],[2], A. Miller[2], W. Wagner[3], T. Ye[1], M. Fischer[1], G. Yurtsever[1]; [1]Univ. of Pennsylvania, USA, [2]Princeton Univ., USA, [3]Rutgers Univ., USA.* We present a new method for deep tissue imaging using nonlinear optics. Specific tailored laser pulses permit measurement of two-photon absorption or self-phase modulation with modest near-IR powers (1-10mW), giving good penetration and molecular specificity.

TuD2 • 8:00 p.m. Invited
Transforming mesoscopic matter with holographic optical traps, *David Grier; New York Univ., USA.* Holographic optical tweezers use forces exerted by computer-generated holograms to trap, move and photochemically transform mesoscopic objects. Hundreds of independent traps can be projected in arbitrary three-dimensional configurations, and transformed into novel optical tools.

TuD3 • 8:30 p.m. Invited
Stationary pulses of light in an atomic medium, *Axel Andre[1], M. Bajcsy[1], D. E. Chang[1], A. S. Zibrov[1,2,3], M. F. Lukin[1]; [1]Harvard Univ., USA, [2]Harvard-Smithsonian Ctr. for Astrophysics, USA, [3]Lebedev Inst. of Physics, Russian Federation.* We describe and experimentally demonstrate the conversion of light propagating in a medium of Rb atoms into an excitation with localized, stationary electromagnetic energy, which can be held and released after a controllable interval.

TuD4 • 9:00 p.m. Invited
QPM NLO in microstructured ferroelectrics and semiconductors, *Martin M. Fejer; Standford Univ., USA.* Quasi-phasematching has been investigated for more than a decade as a means for implementing efficient nonlinear interactions. Recent progress in eliminating the photorefractive and photochromic aging effects that have limited practical application of ferroelectric materials, and use of orientation-patterned GaAs for mid-infrared devices will be described.

Wednesday, August 4, 2004

► Room: Ali-i I
8:00 a.m. – 10:00 a.m.
WA • Photonic Crystals
Alexander Gaeta, *Cornell Univ., USA,* Presider.

WA1 • 8:00 a.m.
Enhancement of multi-harmonic generation in one-dimensional semiconductor photonic crystal, *Hui Yang, Ping Xie, Zhao-Qing Zhang, George K. L. Wong, Kam Sing Wong; Dept. of Physics, Hong Kong Univ. of Science and Technology, China.* Strong enhancement of second harmonic and third harmonic radiation were observed in a one-dimensional ZnSe/ZnMgS semiconductor photonic crystal. This comes from phase matching and a high density of states near the photonic band edge.

WA2 • 8:15 a.m.
Comparative analysis of linear and nonlinear devices based on slow waves in periodic photonic structures and in EIT media, *Jacob B. Khurgin; Johns Hopkins Univ., USA.* Performance of the optical delay lines and nonlinear devices based on slow wave propagation in periodic photonic structures in the presence of higher order dispersion is analyzed and compared with the schemes based on EIT.

WA3 • 8:30 a.m. Invited
Multiwavelength harmonic generation from two-dimensional $\chi 2$ nonlinear photonic crystals, *Lung-Han Peng[1], S.- M. Tsan[1], Y.- C. Shih[1], C.- C. Hsu[1], A. H. Kung[2]; [1]Natl. Taiwan Univ., Taiwan Republic of China, [2]Acad. Sinica, Taiwan Republic of China.* Wide-tuning of SHG phase-matching temperature and wavelength acceptance bandwidth over 150C and 200nm are observed on 2D-NPC made of $LiNbO_3$. These observations are ascribed to the reciprocal lattice vectors $G_{mn}(l_c,\phi)$ assisted QPM-SHG process.

WA4 • 9:00 a.m.
Enhancement of quasi-phase-matched second harmonic generation with use of photonic band structure by optimizing densities of light mode, *Masaru Minamiguchi, Masaaki Ashida, Tadashi Itoh; Osaka Univ., Japan.* Backward quasi-phase-matched second harmonic generation (BQPM-SHG) has been investigated in semiconductor/dielectric periodic multilayer structures. Large enhancement of second harmonic generation is realized by optimizing the density of mode for fundamental and second harmonic light frequencies.

WA5 • 9:15 a.m.
Nonlinear transmission of 1D photonic crystal polymers, *Steven R. Flom, Sr.[1], James S. Shirk[1], Richard G. Pong[1], Michael J. Wiggins[1], Richard S. Lepkowicz[1], Aditya Renade[2], Huiwen Tai[2], Eric Baer[2], Anne Hiltner[2]; [1]NRL, USA, [2]Case Western Reserve Univ., USA.* Transmission from a strongly nonlinear material incorporated into monolithic and nanolayered polymer thin films are compared. When the laser wavelength approaches the bandgap, the nanolayered films transmit less than monoliths as excitation fluence is increased.

WA6 • 9:30 a.m. Invited
Ultra-small photonic crystal lasers, *Yong-Hee Lee, H. Y. Ryu, H. K. Park, S. H. Kim, I. K. Hwang; KAIST, Republic of Korea.* Wavelength-scale high-Q photonic crystal lasers is summarized. We chose the nondegenerate resonant mode having a central node through which current could be supplied. Lasing characteristics from triangular lattice single-cell photonic crystal slab resonators are reported.

► Room: Ali-i I
10:30 a.m. – 12:30 p.m.
WB • Photonic Crystal Fibers
Kerry Vahala, *Caltech, USA*, Presider.

WB1 • 10:30 a.m. Invited
Nonlinear interactions in gas-filled photonic band-gap fibers, *Alexander Gaeta[1], Dimitre G. Ouzounov[1], Faisal R. Faisal[1], Natesan Venkataraman[2], Michael T. Gallagher[2], Karl W. Koch[2]; [1]Cornell Univ., USA, [2]Corning Inc., USA.* We discuss recent studies of nonlinear optical processes in gas-filled photonic band-gap fibers. Such fibers can support pulses with intensities of 10^{13} W/cm^2 over distances exceeding 100 meters and thus allow for unexplored regimes of nonlinear optics with gases.

WB2 • 11:00 a.m.
Femtosecond pulse propagation dynamics near second zero-dispersion point in photonic crystal fibers, *Anatoly Efimov[1], Antoinette J. Taylor[1], Fiorenzo G. Omenetto[1], Nicolas Joly[2], Jonathan C. Knight[2], William J. Wadsworth[2], Philip St. J. Russell[2]; [1]Los Alamos Natl. Lab, USA, [2]Univ. of Bath, UK.* Cross-correlation frequency-resolved optical gating is used to probe the dynamics of a femtosecond pulse in a double-zero dispersion point photonic crystal fiber. Soliton attraction to the second zero-dispersion point and multiple-soliton interaction are observed.

WB3 • 11:15 a.m.
Parametric generation and amplification in micro-structured fibers, *Arthur Dogariu, Jingyun Fan, Lijun Wang; NEC Labs America, USA.* We observe significant amplification and beam correlation in micro-structured fibers via cascaded four-wave mixing and parametric amplification.

WB4 • 11:30 a.m.
Simultaneous phase- and group-velocity matching in photonic crystal fibres, *Hanne Nielsen, Jesper Lægsgaard, Ole Bang, Anders Bjarklev; Res. Ctr. COM, Denmark.* We investigate the possibility of designing a triangular index-guiding photonic crystal fiber having simultaneous phase- and group-velocity matching for second-harmonic generation. A lower limit on the phase-velocity mismatch for perfect group-velocity matching is estimated.

WB5 • 11:45 a.m.
Photonic crystal fiber waveguide for terahertz radiation, *Masahiro Goto, Alex Quema, Hiroshi Takahashi, Shingo Sarukura, Nobuhiko Sarukura; Inst. for Molecular Science, Japan.* Photonic crystal fiber for terahertz radiation was constructed through highly flexible plastic materials. This fiber is reasonably long, non-polarization changing, and low-loss, consequently we can accomplish preparing long waveguide for terahertz radiation.

WB6 • 12:00 p.m.
Nonlinear optical lithography for the fabrication of 3D photonic crystals and optical devices, *Jesper Serbin, Boris N. Chichkov; Laser Zentrum Hannover e.V., Germany.* Nonlinear optical lithography for the fabrication of 3D nanostructures will be presented. Characterization of photonic crystals fabricated by this technique in different photosensitive polymers as well as their infiltrated replicas will be reported.

WB7 • 12:15 p.m.
Parametric generation of tunable mid-infrared radiation, *Jirong Yu[1], Hyune R. Lee[2], Yingxin Bai[3], Norman P. Barnes[1]; [1]NASA Langley Res. Ctr., USA, [2]Hampton Univ., USA, [3]SAIC, USA.* We report a singly resonant, 2.05 μm pumped Zinc Germanium Phosphide optical parametric oscillator with high pulse energy at an energy conversion efficiency of 27.5%. It generates up to 17.3mJ with the tunability over 4.3-10.1μm.

► Room: Ali-i I
2:00 p.m. – 3:30 p.m.
WC • Nonlinear Propagation Effects
TBA, Presider.

WC1 • 2:00 p.m.
Crystal whispering gallery mode resonators and their nonlinear behavior, *Anatoliy Savchenkov, Andrey Matsko, Vladimir Iltchenko, Lute Maleki; JPL/NASA, USA.* We demonstrate strong nonlinear behavior of high-Q whispering gallery mode microresonators (wgmr) made out of various crystals and devices based on them. The maximum optical Q-factor achieved at room temperature is $2*10^{10}$.

WC2 • 2:15 p.m.
Nonlinear effects in a periodic structure with alternating positive and negative index materials, *Ravi S. Hegde, Herbert G. Winful; Univ. of Michigan, USA.* We present a general framework for analyzing transmission properties of 1D periodic structures with alternating positive and negative media when either could exhibit nonlinearity. Numerical results demonstrate intensity dependant shift in the transmission spectrum.

WC3 • 2:30 p.m.
Nonlinear effects on the carrier-envelope phase calculated with Maxwell's equations, *Peter M. Goorjian[1], Steven T. Cundiff[2]; [1]NASA Ames Res. Ctr., USA, [2]JILA, NIST and Univ. of Colorado, USA.* Calculations of nonlinear effects on the carrier-envelope phase of unchirped ultrashort pulses propagating in sapphire show the slope with respect to intensity changes signs whereas for pulses with initial chirp the phase increases monotonically.

WC4 • 2:45 p.m.
Are large local fields necessary for the observation of Surface Enhanced Raman Scattering? *Haim Grebel; NJIT, USA.* Local fields may not be responsible for SERS. Rather, the molecule needs to adsorb on metal particles whose real value of their refractive index is close to zero.

WC5 • 3:00 p.m.
Investigation of nonlinear effects leading to laser-induced damage initiation in KDP and DKDP crystals, *Paul DeMange, Raluca A. Negres, Christopher W. Carr, Harry B. Radousky, Stavros G. Demos; Lawrence Livermore Natl. Lab, USA.* Laser-induced damage initiation in KDP and DKDP crystal plates using single and multi-wavelength irradiation as a function of laser parameters is investigated. Pre-exposure of the material increases its damage threshold by two different pathways.

WC6 • 3: 15 p.m.
White-light continuum Z-scan technique for nonlinear materials characterization, *Mihaela Balu, Joel Hales, David Hagan, Eric Van Stryland;Univ. of Central Florida, School of Optics/CREOL, USA.* We present a rapid characterization technique for nonlinear absorption and refraction using white-light continuum to perform Z-scans. The broadband nature of this source permits us to measure degenerate two-photon absorption spectra of, for example, ZnSe.

► Room: Paniolo Ball Room
3:30 p.m. – 5:00 p.m.
WD • Poster Session

WD1 • 3:30 p.m. – 5:00 p.m.
Gap solitons and mutual focusing in nonlinear periodic structures, *Dragomir N. Neshev[1], Brendan Hanna[2], Andrey A. Sukhorukov[1], Wieslaw Z. Krolikowski[2], Yuri S. Kivshar[1]; [1]Nonlinear Physics Group, RSPhysSE, Australian Natl. Univ., Australia, [2]Laser Physics Ctr., RSPhysSE, Australian Natl. Univ., Australia.* We realized experimentally fully-controlled generation of gap and lattice soliton in nonlinear periodic structures. We demonstrated their unique features including incoherent interaction of solitons from different band gaps and the formation of stationary multi-gap solitons.

WD2 • 3:30 p.m. – 5:00 p.m.
Quantum correlation among spectral modes of ultra-broadband pulses generated by nonlinear optics in microstructure fibers, *Fumihiko Kannari[1], Kenichi Hirosawa[1], Hirohito Furumochi[1], Montian Tianprateep[1], Junji Tada[1], Atsushi Tada[1], Masahiro Takeoka[2], Masataka Nakazawa[3]; [1]Keio Univ., Japan, [2]Communications Res. Lab, Japan, [3]Res. Inst. of Electrical Communication, Tohoku Univ., Japan.* Quantum correlation in broadband spectra generated with a microstructure fiber is experimentally and theoretically studied. Synthesis of quantum correlation among the spectral modes in ultra-broad pulses by manipulating nonlinear optics in fibers is discussed.

WD3 • 3:30 p.m. – 5:00 p.m.
Studies of nondegenerate, quasi-phase-matched optical parametric amplification, *Igor Jovanovic[1], Christopher Anderson[1], Christopher A. Ebbers[1], Shaun D. Clarke[2], Tatjana Jevremovic[2]; [1]Lawrence Livermore Natl. Lab, USA, [2]Purdue Univ., USA.* We have performed extensive numerical studies of quasi-phase-matched optical parametric amplification with the aim to improve its nondegenerate spectral bandwidth. Our multi-section fan-out design calculations indicate a 35-fold increase in spectral bandwidth.

WD4 • 3:30 p.m. – 5:00 p.m.
Observation of coherent phonon-polariton modes in a bulk ZnSe using a noncollinear OPA, *Takashi Okada, Yuji Ohkubo, Kanji Yabumoto, Hideyuki Kunugita, Kazuhiro Ema; Sophia Univ., Japan.* We observed coherent phonon-polariton modes in a bulk ZnSe by means of a transient grating method using a noncollinear optical parametric amplifier. We confirmed the generation mechanism of phonon-polariton and measured the dispersion relationship.

WD5 • 3:30 p.m. – 5:00 p.m.
Second harmonic and difference frequency generations in polymeric waveguides, *Jung Jin Ju, Jung Yun Do, Seung Koo Park, Min-Su Kim, Jongbae Kim, Suntak Park, Myung-Hyun Lee; Electronics and Telecommunications Res. Inst., Republic of Korea.* Quasi-phase-matched second harmonic/difference frequency generation in nonlinear optical polymer waveguides have been demonstrated with a normalized SHG efficiency of 2.4 $\%W^{-1}cm^{-2}$ and a DFG efficiency of -47 dB, operating at the optical communication band.

WD6 • 3:30 p.m. – 5:00 p.m.
Continuous-wave high-power intracavity frequency-doubled Nd:$GdVO_4$-LBO green laser, *Nicolaie Pavel[1,2], Takunori Taira[1], Y. Tamaoki[3], Hirofumi Kan[3]; [1]Inst. for Molecular Science, Japan, [2]Natl. Inst. for Lasers, Plasma and Radiation Physics, Romania, [3]Hamamatsu Photonics K. K., Ctrl. Res. Lab, Japan.* A continuous-wave diode end-pumped Nd:$GdVO_4$ laser intracavity frequency-doubled by LBO nonlinear crystal with 5.3 W green output power, 66% conversion of the available infrared power and 31% overall optical-to-optical conversion efficiency is reported.

WD7 • 3:30 p.m. – 5:00 p.m.
All-optical half adder using sole mechanism of XGM in semiconductor optical amplifiers, *Sang H. Kim, Jae H. Kim, Jae W. Choi, Young T. Byun, Young M. Jhon, Seok Lee, Deok H. Woo, Sun H. Kim; Photonics Res. Ctr., KIST, Republic of Korea.* By using gain nonlinearity characteristics of semiconductor optical amplifier, an all-optical binary half adder at 10 Gbps is demonstrated. The half adder operates in single mechanism, which is XGM.

WD8 • 3:30 p.m. – 5:00 p.m.
Evanescent-wave-coupled waveguide mode lasing in a thin microcavity, *Hee-Jong Moon[1], Sang-Pil Sun[1], Sang-Bum Lee[2], Kyungwon An[2], Jai-Hyung Lee[2]; [1]Dept. of Optical Engineering, Sejong Univ., Republic of Korea, [2]School of Physics, Seoul Natl. Univ., Republic of Korea.* We investigated the lasing characteristics of waveguide modes from a thin ring microcavity, in which the laser gain was obtained by evanescent-wave coupling.

WD9 • 3:30 p.m. – 5:00 p.m.
Characteristics of all-optical ultra-fast gate switches using the cascaded second-order nonlinear effect in quasi-phase matched lithium niobate devices, *Yutaka Fukuchi, Masami Akaike, Joji Maeda; Tokyo Univ. of Science, Japan.* We numerically analyze switching characteristics of all-optical gate switches using the cascade of second harmonic generation and difference frequency mixing in quasi-phase matched Lithium Niobate devices, and show possibility of efficient ultra-fast operation beyond 1Tbps.

WD10 • 3:30 p.m. – 5:00 p.m.
Efficient chirp diagnosis algorithms for femtosecond laser pulses, *Daniel Bender, Michael P. Hasselbeck, Mansoor Sheik-Bahae; Univ. of New Mexico, USA.* We present new algorithms for implementing MOdified Spectrum Auto-Interferometric Correlation (MOSAIC). Ultrashort laser pulse chirp can be quantified quickly and with high sensitivity in real time.

WD11 • 3:30 p.m. – 5:00 p.m.
Phase-matching in $ZnGeP_2$ for the generation of terahertz radiation by difference-frequency mixing, *Takayoshi Kobayashi[1], Pathik Kumbhakar[1], Gopal C. Bhar[2]; [1]Dept. of Physics, Univ. of Tokyo, Japan, [2]Dept. of Physics, Burdwan Univ., India.* A new Sellmeier dispersion equation and the phase-matching data for the generation of terahertz radiation by difference-frequency mixing in zinc germanium diphosphide crystal are presented. The computed data explain excellently the available experimental results.

WD12 • 3:30 p.m. – 5:00 p.m.
Effects of dephasing on the nonlinear phase shift obtained from a one-dimensional atom, *Hisaki Oka[1], Holger F. Hofmann[2,1], Shigeki Takeuchi[1,2], Keiji Sasaki[1]; [1]Res. Inst. for Electronic Science, Hokkaido Univ., Japan, [2]PRESTO, Japan Science and Technology Agency (JST), Japan.* We investigate the effects of dephasing on the nonlinear phase shift obtained from a one-dimensional atom. A maximal 180° phase shift is obtained for atomic dephasing rate smaller than the coherent atom-field coupling rate.

WD13 • 3:30 p.m. – 5:00 p.m.
Two-photon absorption in conjugated phenylacetylene dendrimers with unsymmetrical branching, *Joseph S. Melinger[1], Dale McMorrow[1], William T. Lotshaw[1], Yongchun Pan[2], Zhonghua Peng[2]; [1]NRL, USA, [2]Univ. of Missouri at Kansas City, USA.* Two-photon excitation spectra and cross sections are compared for phenylacetylene dendrimers of different generation. The effect on the two-photon cross section of incorporating donor/acceptor pairs in the dendrimer structure is also studied.

WD14 • 3:30 p.m. – 5:00 p.m.
Anisotropy of alkyl chains by isomerization of azobenzene: A sum-frequency vibrational spectroscopic study, *Masahito Oh-e, Yuka Tabe, Hirashi Yokoyama; Yokoyama Nano-Structured LC Project, ERATO, Japan Science & Technology Agency, Japan.* Surface-specific sum-frequency vibrational spectroscopy has been used to find the existence of the anisotropy of the alkyl chains connected to azobenzene cores in the solid phase of an azobenzene monolayer under linearly polarized UV irradiation.

WD15 • 3:30 p.m. – 5:00 p.m.
Images of hydrogen deficiency on H-Si(111) surfaces observed by second harmonic microscopy, *Yoshihiro Miyauchi, Haruyuki Sano, Goro Mizutani; Japan Advanced Inst. of Science and Technology, Japan.* SH intensity images of hydrogen terminated Si(111) surface partially irradiated with UV light were observed. We have demonstrated that spatial distribution of hydrogen desorption can be observed by SH microscopy.

WD16 • 3:30 p.m. – 5:00 p.m.
Optical switching and amplification without population inversion through state-dependent alignment of anisotropic molecules, *Alexander K. Popov[1], Vitaly V. Slabko[3,2]; [1]Univ. of Wisconsin at Stevens Point, USA, [2]Krasnoyarsk State Technical Univ., Russian Federation, [3]Inst. of Physics of the Russian Acad. of Sciences, Russian Federation.* Effective switching of anisotropic molecules from strongly absorbing to transparent and amplifying states is shown to be possible without population inversion by dc or ac control electric fields. Suitable class of molecules is outlined.

WD17 • 3:30 p.m. – 5:00 p.m.
Thermally induced dephasing in periodically poled $KTiOPO_4$ nonlinear crystals, *Zhi M. Liao[1], Stephen A. Payne[1], Jay W. Dawson[1], Alexander D. Drobshoff[1], Christopher A. Ebbers[1], Deanna M. Pennington[1], Igor Jovanovic[1], Luke R. Taylor[2]; [1]Lawrence Livermore Natl. Lab, USA, [2]European Southern Observatory, Germany.* Experimental data that exhibits a continuous-wave, second-harmonic intensity threshold (15 kW/cm^2) that causes two-photon nonlinear absorption which leads to time-dependent photochromic damage in periodically poled $KTiOPO_4$ is presented and verified through a thermal dephasing model.

WD18 • 3:30 p.m. – 5:00 p.m.
Femtosecond nonlinear optical spectroscopy of CdSe colloidal semiconductor nanocrystals, *JaeTae Seo[1], S. Ma[1], K. Lee[1], P. Muhoro[1], B. Tabibi[1], W. Yu[2], S. S. Jung[3], R. Hyun[3]; [1]Hampton Univ., USA, [2]Rice Univ., USA, [3]Korea Res. Inst. of Standards and Science, Republic of Korea.* The nonlinear absorption and refraction coefficients CdSe nanocrystals (D~4 nm) in toluene were estimated to be ~4.6 x 10^{-15} W/cm and ~2 x 10^{-15} cm^2/W using a femto-second single beam Z-scan nonlinear spectroscopy.

WD19 • 3:30 p.m. – 5:00 p.m.
Characterization of a microspherical cavity with a stem by observing resonantly scattered far-field incident light, *Hideaki Takashima, Akito Chiba, Hideki Fujiwara, Jun-ichi Hotta, Shigeki Takeuchi, Keiji Sasaki; Res. Inst. for Electronic Science, Hokkaido Univ., Japan.* A simple method to evaluate silica microspheres with stem without evanescent couplers is proposed. Comparing the observed resonant peaks to calculations, the radius of the sphere is determined with the precision of 10 nm.

WD20 • 3:30 p.m. – 5:00 p.m.
A new type of gain nonlinearity leading to anti-competition of laser mode, *Chi-Chia Huang[1], Yi-Shin Su[1], Ching-Fuh Lin[1,2,3]; [1]Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan Republic of China, [2]Inst. of Electronics Engineering, Natl. Taiwan Univ., Taiwan Republic of China, [3]Dept. of Electrical Engineering, Natl. Taiwan Univ., Taiwan Republic of China.* Anti-competition of laser modes has been observed in dual-wavelength semiconductor laser with a broadband gain medium. This phenomenon is due to a new-type of gain nonlinearity in addition to the conventional gain saturation.

WD21 • 3:30 p.m. – 5:00 p.m.
Theoretical study on two-photon nonlinearity in atom-cavity systems, *Kazuki Koshino[1,2], Hajime Ishihara[1,2]; [1]Dept. of Physical Science, Graduate School of Engineering Science, Osaka Univ., Japan, [2]Japan Science and Technology Agency, Japan.* The nonlinear interaction between two photons in general atom-cavity systems is investigated. Using the analytic two-photon propagator, the optimum pulse shape for inducing large nonlinearity is clarified for both weak and strong coupling regimes.

WD22 • 3:30 p.m. – 5:00 p.m.
Optical second harmonic generation from the Au(100) surface state, *Tetsuya Iwai, Goro Mizutani; Japan Advanced Inst. of Science and Technology, Japan.* We have performed SH spectroscopy on the Au(100)5x20 reconstructed surface. We have found an anisotropic surface electronic states in the *s*-in/*p*-out polarization configuration. Observed broadened SH intensity structure may be attributed to the surface reconstruction.

WD23 • 3:30 p.m. – 5:00 p.m.
Investigation of bandwidth in frequency conversion of high power optical fiber lasers, *Yalin Lu, Jr-Rung Chang, Iyad A. Dajani, Randy J. Knize; US Air Force Acad., USA.* The dependence of wavelength acceptance and conversion efficiency on period fluctuations in a PPKTP crystal was simulated. Bandwidth matching through fluctuating domain periods was experimentally demonstrated.

WD24 • 3:30 p.m. – 5:00 p.m.
A scheme for the generation of intense short optical pulses via frequency modulation and nonlinear pulse compression, *Gino Biondini, Yuji Kodama; Ohio State Univ., USA.* We propose a new scheme for the generation of intense short optical pulses. The method takes advantage of nonlinear compression via appropriate frequency modulation, and allows tuning of both the pulse amplitude and its width.

WD25 • 3:30 p.m. – 5:00 p.m.
Comparison of polarization-independent fiber-optical parametric amplifiers pumped by circularly and orthogonally polarized waves, *Takuro Kanou, Takeshi Ozeki; Sophia Univ., Japan.* We demonstrated polarization independent fiber optical parametric amplifiers employing circular or orthogonal polarization pump waves and confirmed excellent polarization-independent gain characteristics for orthogonal pump case.

WD26 • 3:30 p.m. – 5:00 p.m.
Suppressing the frequency chirp in optical solitons by coherent propagation effects, *Dilson P. Caetano[1], Jandir M. Hickmann[2]; [1]Univ. Fed. do Rio de Janeiro, Brazil, [2]Univ. Fed. de Alagoas, Brazil.* We report on the coherent propagation of optical solitons through a three level atomic system embedded in a nonlinear dispersive waveguide showing that the soliton frequency chirp can be suppressed during the frequency conversion process.

WD27 • 3:30 p.m. – 5:00 p.m.
Third harmonic generation in air: The time-dependent phase-matching conditions, *R. A. Ganeev[1], M. Suzuki[1], M. Baba[1], H. Kuroda[1], I. A. Kulagin[2]; [1]Inst. for Solid State Physics, Univ. of Tokyo, Japan, [2]NPO Akadempribor, Uzbekistan.* The spectral and spatial variations of phase-matched third harmonic radiation (265 nm) generated in air are discussed. The THG conversion efficiency of 795 nm, 300 fs radiation was measured be $1x10^{-3}$.

WD28 • 3:30 p.m. – 5:00 p.m.
Coherence-controlled optical switching and amplification without inversion in a strongly-absorbing inhomogeneously-broadened medium, *Alexander K. Popov[1], Sergey A. Myslivets[2], Thomas F. George[3]; [1]Univ. of Wisconsin at Stevens Point, USA, [2]Inst. of Physics of the Russian Acad. of Sciences, Russian Federation, [3]Dept. of Chemistry & Biochemisty and Dept. of Physics & Astronomy, Univ. of Missouri at St. Louis, USA.* A sample, opaque at an inhomogeneously-broadened transition, can be made transparent or even strongly amplifying without inversion by two control lower-frequency lasers. Applications for frequency-tunable filtering, photon switching and amplification in Raman schemes are discussed.

WD29 • 3:30 p.m. – 5:00 p.m.
Evaluation of phase-matching for four-wave mixing in strongly-guiding silica optical fiber, *Robert D. Osborne; Siemens AG, Germany.* Phase-matching for four-wave mixing is evaluated numerically for several core radii and for the HE_{11} and HE_{12} modes of a strongly-guiding, air-silica fiber such as a microstructure fiber.

WD30 • 3:30 p.m. – 5:00 p.m.
Threshold behavior of an idler-optimized mid-IR OPO with nanosecond pump pulses, *Brian K. Brickeen, Donald R. Paddick; Northrop Grumman Space Technology, USA.* A mid-IR OPO is developed by optimizing the cavity to extract the idler radiation. Threshold and slope efficiency with respect to the input pulse duration are characterized for both critical and non-critical phase matching.

WD31 • 3:30 p.m. – 5:00 p.m.
Nanosecond pulsed, temperature tunable optical parametric oscillator based on periodically poled MgO:$LiNbO_3$, *He-Ping Li, D. Y. Tang, S. P. Ng; Photonics Res. Ctr., School of EEE, Nanyang Technological Univ., Singapore.* We report a compact quasi-phase-matched optical parametric oscillator (OPO) using periodically poled MgO-doped $LiNbO_3$ with different grating periods, which is pumped by a diode-pumped passively Q-switched Nd:YAG laser. Temperature tuning of the OPO is demonstrated.

WD32 • 3:30 p.m. – 5:00 p.m.
Spontaneous optical modulation instability in a noninstantaneous self-defocusing medium within a cavity, *Ming-Feng Shih, Po-Er Sung, Meng-Chieh Tsai, Chien-Chung Jeng; Natl. Taiwan Univ., Taiwan Republic of China.* We observe spontaneous and induced spatial optical modulation instability in a self-defocusing medium within a cavity. This modulation instability happens only when the feedback intensity of the cavity is above a threshold.

WD33 • 3:30 p.m. – 5:00 p.m.
Novel all-optical phase and amplitude regeneration of DPSK signals, *Kevin Croussore, Cheolhwan Kim, Guifang Li; Univ. of Central Florida, School of Optics/CREOL, USA.* All optical regeneration of differential phase-shift keying signals based on phase-sensitive amplification is described. Nearly ideal phase regeneration can be achieved in the undepleted-pump regime while simultaneous amplitude and phase regeneration can be realized in the depleted-pump regime.

WD34 • 3:30 p.m. – 5:00 p.m.
Wigner analysis of nonlinear pulse propagation in optical fibers, *José Azaña; Inst. Natl. de la Recherche Scientifique, Canada.* Wigner analysis is demonstrated to be a powerful tool for investigating nonlinear optical systems (e.g. nonlinear optical fibers), providing a clear and deeper insight into the physical phenomena that determine the behavior of these systems.

Thursday, August 5, 2004

► ThA • Nano Media Nonlinear Optics
Room: Ali-i I
8:00 a.m. – 10:00 a.m.
Richard Averitt, *Los Alamos Natl. Lab., USA,* Presider.

ThA1 • 8:00 a.m. Invited
Nanophotonics of structural transformations, *Nikolay I. Zheludev; Southampton Univ., UK.* Light and electron-beam induced structural transformation in nanoparticles and films of polymorphic metals provide a paradigm of achieving substantial reversible and fast changes in their dielectric properties that are suitable for photonic applications.

ThA2 • 8:30 a.m.
Depolarization field in Au nanowires investigated by optical second harmonic spectroscopy, *Goro Mizutani, Takeshi Kitahara, Akira Sugawara, Haruyuki Sano; School of Materials Science, Japan.* Anisotropy in second harmonic response of Au nanowire arrays on faceted NaCl(110) templates was discovered for a wide photon energy region and has been attributed to the anisotropic depolarization field in the Au nanowires.

ThA3 • 8:45 a.m.
Ultrafast electron dynamics in silver nanoparticle arrays, *Richard D. Averitt[1], Jure Demsar[1], E. K. Woode[1], Antoinette J. Taylor[1], K. C. Beverly[2], J. R. Heath[2]; [1]Los Alamos Natl. Lab, USA, [2]Caltech Chemistry, USA.* We present the results of ultrafast optical experiments on silver quantum dot superlattices. Dramatic changes in the electron dynamics occur as a function of interparticle spacing due to enhanced dipolar coupling and,importantly, electron delocalization.

ThA4 • 9:00 a.m.
High-order nonlinearities and light induced dichroism in silver nanocolloids, *Cid B. de Araújo, Lucio H. Acioli, Edilson L. Falcão-Filho, Marcio Heraclyto G. Miranda, José J. Rodrigues, Jr.; Univ. Fed. de Pernambuco, Brazil.* Nonlinear refraction, nonlinear absorption and light induced dichroism (LID) were investigated in silver colloids. The third-, fifth-, and seventh-order susceptibility were determined. The ultrafast dynamics of LID and the contribution of surface plasmons were characterized.

ThA5 • 9:15 a.m.
Si-wire waveguide nonlinear-optic devices with strong optical field confinement, *Hirohito Yamada[1],[2], Masayuki Shirane[1], Tao Chu[2], Satomi Ishida[3], Yasuhiko Arakawa[3], Hiroyuki Yokoyama[4]; [1]Fundamental and Environmental Res. Labs, NEC Corp., Japan, [2]Optoelectronic Industry and Technology Development Association (OITDA), Japan, [3]NCRC, RCAST & IIS, Univ. of Tokyo, Japan, [4]New Industry Creation Hatchery Ctr. (NICHe), Tohoku Univ., Japan.* Spectral broadening of optical pulses based on the nonlinear effect in Si-wire waveguides was demonstrated for the first time. Spectra of 2-ps optical pulses from a mode-locked laser-diode were obviously broadened in a 4-mm-long device.

ThA6 • 9:30 a.m.
Measurement of saturable nonlinear refraction in atomic rubidium vapor, *Colin F. McCormick[1], Daniel R. Solli[1], Raymond Y. Chiao[1], Jandir M. Hickmann[2]; [1]Univ. of California at Berkeley, USA, [2]Univ. Fed. de Alagoas, Brazil*. We measured the Kerr coefficient near the D2 line in hot atomic rubidium vapor using z-scan. Saturation effects complicate the method. We test different saturation models to model our large detuning obtaining good theoretical agreement.

ThA7 • 9:45 a.m.
Laser cooling by optical shaking with feedback, *Yehiam Prior, Ilya Sh. Averbukh; Weizmann Inst. of Science, Israel.* Optical shaking with feedback is proposed as a new method for laser cooling of atoms and molecules to high phase-space density and without the loss of particles typical of evaporative cooling.

► ThB • Lasers and Processing
Room: Ali-i I
10:30 a.m. – 12:30 p.m.
TBA, Presider.

ThB1 • 10:30 a.m.
Ultralow-threshold toroidal microcavity Raman laser, *Sean M. Spillane, Tobias J. Kippenberg, Deniz K. Armani, Kerry J. Vahala; Caltech, USA.* We investigate Raman lasing in fiber-coupled ultra-high-Q chip-based toroidal microcavities. Low threshold, single mode emission with high conversion efficiency is obtained. Additionally, the effect on threshold of varying the toroid geometry is discussed.

ThB2 • 10:45 a.m.
Nonlinear spectral quenching in random lasers, *Bin Li, Stephen C. Rand; Univ. of Michigan at Ann Arbor, USA,* Calculations of stimulated emission dynamics are shown to be in good qualitative agreement with experimental observations of nonlinear quenching on rare earth transitions competing for gain in continuous-wave random laser media.

ThB3 • 11:00 a.m.
Supercontinuum generation in 800-nm wavelength region with semiconductor laser pulses, *Hiroyuki Yokoyama[1], Masayuki Shirane[2], Yuzo Sasaki[3], Hiromasa Ito[3], Hirokazu Taniguchi[4]; [1]New Industry Creation Hatchery Ctr. (NICHe), Tohoku Univ., Japan, [2]Fundamental and Environmental Res. Labs, NEC Corp., Japan, [3]Res. Inst. of Electrical Communication, Tohoku Univ., Japan, [4]Photonics Labs, Mitsubishi Cable Industry Ltd., Japan.* A second-harmonic output from amplified InGaAsP diode-laser pulses has successfully induced a supercontinuum generation in holey optical fibers. Spectral broadening of over 100-nm has been demonstrated with a low-averaged optical power of less than 100-microwatts.

ThB4 • 11:15 a.m.
Broadband parametric chirped pulse amplification at 1.5 µm, *Bodo Schmidt, S. P. Jensen, D. Du, P. S. Banks, M. D. Perry; General Atomics, USA.* We present the design and performance of an OPCPA system operating at 1550 nm. The pump laser and the broadband phase matching in RTP and KTA are discussed in detail.

ThB5 • 11:30 a.m.
Electro-optic birefringence induced polarization anisotropy in vertical-cavity semiconductor optical amplifiers (VCSOAs), *Michael Sánchez, Pengyue Wen, Matthias Gross, Sadik Esener; ECE, Univ. of California at San Diego, USA.* The polarization anisotropy including polarization dependent gain (PDG) and frequency splitting in VCSOAs are measured. Measurements of the output polarization state show that the cause of this polarization anisotropy in VCSOAs is electro-optic birefringence.

ThB6 • 11:45 a.m.
Few centimeter single mode fiber lasers generating several Watts output power at 1535 nm, *Nasser Peyghambarian[1], T. Qui[1], L. Li[1], V. L. Temyanko[1], L. Li[1], A. Schülzgen[1], A. Mafi[2], J. V. Moloney[2]; [1]Optical Sciences Ctr., Univ. of Arizona, USA, [2]Arizona Ctr. for Mathematical Sciences, Univ. of Arizona, USA.* Using high concentration Er/Yb co-doped phosphate fiber, we generated 6.6 W output from a 7.0-cm long fiber laser with M2 of 3.5. 4W emission was obtained from a 7.1-cm single-mode fiber laser with diffraction-limited output.

ThB7 • 12:00 p.m.
Femtosecond laser material processing–How short is short? *Yehiam Prior[1], Kaiyin Zhang[1], Vladimir Batenkov[1], Yuri Paskover[1], Ilya Sh. Averbukh[1], Frank Korte[2], Carsten Fallnich[2]; [1]Weizmann Inst. of Science, Israel, [2]Laser Zentrum Hannover, Germany.* Temporal shaping of femtosecond laser pulses is used for the optimization of laser material processing. We find that the shortest pulse is not always the best in terms of ablation efficiency and quality.

ThB8 • 12:15 p.m.
Nonlinear optics as novel probes of molecular chirality, *Mikhail A. Belkin, Song-Hee Han, Na Ji, Y. Ron Shen; Physics Dept., Univ. of California, USA.* Second harmonic generation is allowed and phase-matchable in an anisotropic fluid medium if it is chiral. Doubly resonant sum-frequency generation has sufficient sensitivity for in situ detection of vibrational chirality of a molecular monolayer.

► ThC • Nonlinear Optics in Fibers
Room: Ali-i II
10:30 a.m. – 12:30 p.m.
Prem Kumar, *Northwestern Univ.,USA,* Presider.

ThC1 • 10:30 a.m.
Coherent supercontinuum generation with an Erbium-fiber oscillator-amplifier system in an extruded SF6-PCF, *Holger Hundertmark[1], Dieter Wandt[1], Carsten Fallnich[1], Nils Haverkamp[2], Harald R. Telle[2]; [1]Laser Zentrum Hannover e.V., Germany, [2]Physikalisch-Technische Bundesanstalt, Germany.* We report on the coherent supercontinuum generation with a 60 fs passively mode-locked Erbium oscillator-amplifier system in an extruded SF6 photonic crystal fiber by measurement of the carrier-envelope-offset frequency in a novel f-2f-interferometer.

ThC2 • 10:45 a.m.
Optimal waveguide dimensions for nonlinear interactions, *Mark A. Foster, Kevin D. Moll, Alexander L. Gaeta; Cornell Univ., USA.* We determine that the transverse dimensions of cylindrical and rectangular dielectric waveguides with the highest effective nonlinearity are sub-wavelength in size. For a rectangular waveguide, we find an asymmetric cross-section is optimal.

ThC3 • 11:00 a.m.
Temporal self-compression of intense femtosecond pulses propagating in argon-filled hollow waveguides, *Nick Wagner[1], Emily Gibson[1], Sterling Backus[1], Margaret M. Murnane[1], Henry C. Kapteyn[1], Ivan P. Christov[2]; [1]JILA, USA, [2]Sofia Univ., Bulgaria.* We demonstrate temporal compression of intense femtosecond 800nm pulses in a hollow-core fiber filled with low-pressure argon gas, without any subsequent dispersion compensation. We achieve self-compression from 30 fs to 13 fs.

ThC4 • 11:15 a.m.
Spectral Talbot phenomena of periodic frequency combs induced by cross-phase-modulation in optical fibers, *José Azaña; Inst. Natl. de la Recherche Scientifique, Canada.* The problem of cross-phase-modulation of a finite-duration optical pulse sequence (frequency comb) by a long Gaussian pump pulse is theoretically investigated and new effects, namely spectral-domain integer and fractional self-imaging (Talbot) phenomena, are reported.

ThC5 • 11:30 a.m.
Polarization-mode dispersion monitoring by the use of self-phase modulation in a fiber, *Masayuki Matsumoto, Hiroyuki Maru, Hiroyuki Toda; Osaka Univ., Japan.* A PMD monitoring method using a nonlinear fiber and an optical filter is proposed. Strong correlation between the monitor signal and the PMD-induced pulse distortion is experimentally and numerically demonstrated.

ThC6 • 11:45 a.m.
Quasi-phase matching of high harmonic generation in the water window at 100% ionization levels, *Ariel Paul[1], Emily Gibson[1], Sterling Backus[1], Ra'anan Tobey[1], Margaret M. Murnane[1], Henry C. Kapteyn[1], Ivan Christov[2]; [1]JILA, USA, [2]Sofia Univ., Bulgaria.* We demonstrate that high-order harmonic generation can be phase-matched in the water window region of the spectrum around 300eV using hollow fibers with a periodically modulated diameter.

ThC7 • 12:00 p.m.
Periodically poled lithium niobate single-crystal fibers for frequency conversion applications, *Yalin Lu, Iyad A. Dajani, Randy J. Knize; US Air Force Acad., USA.* Lithium niobate ($LiNbO_3$) single-crystal fibers were periodically poled for the first time by applying an electric field. Efficient CW second harmonic generation was demonstrated.

ThC8 • 12:15 p.m.
Reduction of collision-induced timing jitter via periodic-group-delay dispersion-compensating modules in quasi-linear return-to-zero systems, *Mark J. Ablowitz[1], Cory Ahrens[1], Gino Biondini[2], Sarbarish Chakravarty[1], Andrew Docherty[1]; [1]Univ. of Colorado, USA, [2]Ohio State Univ., USA.* We quantify collision-induced timing jitter (CITJ) in quasi-linear dispersion-managed systems with periodic-group-delay (PGD) dispersion-compensating modules. Significant reductions of CITJ are achieved when even moderate fractions of the total dispersion are compensated by PGDs.

Friday, August 6, 2004

► FA • Nonlinear Information Processing
Room: Ali-i I
8:00 a.m. – 10:00 a.m.
Jeffrey H. Shapiro, *MIT, USA*, Presider.

FA1 • 8:00 a.m. Invited
Telecom-band entanglement generation, storage, and long-distance distribution, *Prem Kumar, Xiaoying Li, Jun Chen, Paul L. Voss, Jay E. Sharping; Northwestern Univ., USA.* We present a source of correlated photon-pairs based on four-photon scattering in silica fiber. With this source we have demonstrated the generation, storage, and long-distance distribution of polarization entanglement in standard optical fiber.

FA2 • 8:30 a.m.
Design of integrated optical source of polarization-entangled photon pairs, *Ivan Avrutsky[1], Alexander V. Sergienko[2]; [1]Wayne State Univ., USA, [2]Boston Univ., USA.* The phase-matching for frequency-degenerated parametric fluorescence in tunneling-coupled channel waveguides is analyzed. Type-II downconversion with individual photons appearing in different output channels allows for generation of polarization-entangled states well suited for quantum information processing applications.

FA3 • 8:45 a.m.
Interaction induced photon-number entangled temporal soliton pairs, *Ray-Kuang Lee, Yinchieh Lai; Inst of Electro-Optical Eng, Natl. Chiao Tung Univ., Taiwan Republic of China.* The quantum fluctuations of two out-of-phase time-separated temporal solitons are calculated. Almost perfect positive correlation between their photon-number fluctuations can be achieved after propgating a certain distance and with suitable initial separation.

FA4 • 9:00 a.m. Invited
Superluminal light pulses, subluminal information transmission, *Daniel Gauthier; Duke Univ., USA.* We describe optical pulse propagation through a medium where the group velocity exceeds the speed of light in vacuum. The information velocity is observed to be subluminal, consistent with the special theory of relativity.

FA5 • 9:30 a.m. Invited
Ultraslow and superluminal light propagation in room temperature solids, *Robert W. Boyd, Matthew S. Bigelow, Nick Lepeshkin, Aaron Schweinsberg, Petros Zerom; Univ. of Rochester, USA.* We have observed ultraslow propagation in ruby and superluminal propagation in alexandrite enabled by the process of coherent population oscillations. Novel applications are allowed by the ability to control the velocity of light.

► FB • Nonlinear Optics in Organics
Room: Ali-i I
10:30 a.m. – 12:30 p.m.
James Glownia, *Los Alamos Natl. Lab, USA*, Presider.

FB1 • 10:30 a.m.
Nonlinear absorption sensitization of a photorefractive polymer composite for operation at 1.55 microns, *Nasser Peyghambarian[1], S. Tay[1], J. Thomas[1], M. Earlp[1], G. Li[1], G. Meredith[1], A. Schülzgen[1], S. R. Marder[2]; [1]Optical Sciences Ctr., Univ. of Arizona, USA, [2]Georgia Tech, USA.* Photorefractivity at 1.55 μm in a polymer composite is demonstrated using twophoton absorption. We show large diffraction efficiency and perform holographic reconstruction of distorted images utilizing thin-film devices made of this polymer.

FB2 • 10:45 a.m.
Nonlinear optics of chiral liquids: Odd-wave mixing and a new chiral electro-optic effect, *Peer Fischer[1], Frank W. Wise[1], Diederik S. Wiersma[2], A. D. Buckingham[3]; [1]Cornell Univ., USA, [2]European Lab for Nonlinear Spectroscopy, Italy, [3]Univ. of Cambridge, UK.* Odd-wave mixing is a probe of molecular chirality in isotropic media. We demonstrate an electro-optic effect where a sum-frequency signal from a liquid changes sign with the handedness of the chiral solute.

FB3 • 11:00 a.m.
Time resolved Hyper-Rayleigh Scattering, *Tiago Buckup[1], Julio R. Schoffen[1], Ricardo R. Correia[1], Silvio L. Cunha[1], Marcus Motzkus[2]; [1]Univ. Fed. do Rio Grande do Sul, Brazil, [2]Philipps Univ. Marburg, Germany.* We extend the Hyper-Rayleigh Scattering (HRS) technique in time domain using two delayed polarized beams. We present the results in two model liquids, acetonitrile and carbon tetrachloride, analyzing the transient regime (CNPq, DAAD).

FB4 • 11:15 a.m.
Novel nonlinear three-dimensional distributed nano-structures with single-wall carbon nanotubes, *Hui Han[1], Jing Chen[1], Y. Diamant[1], Haim Grebel[1], M. Etienne[2], R. Dorsinville[2]; [1]New Jersey Inst. Of Technology, USA, [2]The City College of New York, USA.* The nonlinear optical properties of three-dimensional, distributed, nanostructures made of p-n junctions and composed of doped carbon nanotubes, in addition to carbon nanotubes/conductive polymers structures, were studied.

FB5 • 11:30 a.m.
Highly nonlinear optical isotropic materials, *Nelson Tabiryan, Uladzimir Hrozhyk, Svetlana Serak; BEAM Co., USA.* Giant optical nonlinearity is observed in an isotropic liquid combined with high transmission for red wavelengths. These materials allow effective light modulation at microwatt level of radiation power throughout the visible spectrum.

FB6 • 11:45 a.m.
Impact of molecular weight on film morphology and optical properties of the conjugated polymer MEH-PPV, *Christoph Bubeck, Kaloian Koynov, Ayi Bahtiar, Taek Ahn; Max-Planck-Inst. for Polymer Res., Germany.* We show that the molecular weight of the typical model polymer MEH-PPV has major impact on every optical property of thin films, e.g. on birefringence, cubic optical nonlinearities, and propagation loss of slab waveguides.

FB7 • 12:00 p.m.
Effects of extending conjugation length on the two-photon absorption spectra of fluorene molecules, *J. M. Hales[1], A. M. Morales[1], S. Yao[1], K. J. Schafer[1], K. D. Belfield[1], D. J. Hagan[1], E. W. Van Stryland[1], P. Pacher[2], O. Kwon[2], E. Zojer[2], J. L. Bredas[2]; [1]Univ. of Central Florida, School of Optics/CREOL, USA, [2]School of Chemistry and Biochemistry, Georgia Tech, USA.* By systematically altering the structural properties of various fluorene-based molecules, we determine how these changes affect their two-photon absorbing capabilities. Here we emphasize the effects of conjugation extension, however other structural motifs were also investigated.

FB8 • 12:15 p.m.
Femtosecond to nanosecond characterization of the excited-state properties of polymethine molecules, *Richard S. Lepkowicz[1], Jie Fu[1], Claudiu M. Cirloganu[1], Olga V. Przhonska[1,2], David J. Hagan[1], Eric W. Van Stryland[1], Mike V. Bondar[2], Yuriy L. Slominsky[3]; [1]Univ. of Central Florida, School of Optics: CREOL&FPCE, USA, [2]Inst. of Physics, Natl. Acad. of Sciences of Ukraine, Ukraine, [3]Inst. of Organic Chemistry, Natl. Acad. of Sciences of Ukraine, Ukraine.* Saturation limits excited-state absorption (ESA) in many organic molecules. We studied polymethines using continuum spectroscopy to determine ESA spectra, two-color pump-probe anisotropy for transition dipole moment orientations, picosecond and nanosecond z-scans and nonlinear transmission measurements.

► FC • Spatial Solitons
Room: Ali-i II
10:30 a.m. – 12:30 p.m.
Robert W. Boyd, *Univ. of Rochester, USA,* Presider.

FC1 • 10:30 a.m. Invited
Non locality and nonlinearity for light localization in liquid crystals, *Gaetano Assanto; Italian Inst. for the Physics of Matter, Italy.* The nature of liquid crystals is such that a reorientational nonlinearity inherently couples to a non-local response. Spatial solitons and transverse modulational instability intrinsically depend on this interplay. Recent advances on the subject are reviewed.

FC2 • 11:00 a.m.
Nonlocal incoherent solitons in materials with a logarithmic nonlinearity, *Ole Bang[1], Wieslaw Królikowski[2], John Wyller[3], Darran Edmundson[4]; [1]Res. Ctr. COM, Technical Univ. of Denmark, Denmark, [2]Laser Physics Ctr., Res. School of Physical Sciences and Engineering, Australian Natl. Univ., Australia, [3]Nonlinear Physics Group and Laser Physics Ctr., Res. School of Physical Sciences and Engineering, Australian Natl. Univ., Australia, [4]ANU Supercomputing Facility, Australian Natl. Univ., Australia.* We study the propagation of partially coherent beams in spatially nonlocal nonlinear materials with a logarithmic nonlinearity. We describe analytically the beam evolution and find conditions for the formation of nonlocal incoherent solitons.

FC3 • 11:15 a.m. Invited
Filamentary propagation of intense ultrashort laser pulses in air, *Andre Mysyrowicz; Ecole Polytechnique, France.* We have studied long distance filamentation in air at high pulse power. Multi-filamentary patterns can be controlled by phase or amplitude masks. Results are in good agreement with numerical simulations from a 3-d propagation code.

FC4 • 11:45 a.m.
Self-organized coherence in fiber lasers, *Metin S. Mangir; HRL Labs.,LLC, USA*. We have combined multiple 100 W fiber lasers in a self-organized manner so that they produce a coherent, high brightness output beam. We use lasers designed to avoid SBS, SRS and FWM limitations and use proper coupling between fibers to ensure in-phase output.

FC5 • 12:15 p.m. Invited
Coherence-controlled soliton interaction, *Tyng-Sen Ku[1], Ming-Feng Shih[2], Andrey Sukhorukov[3], Yuri Kivshar[3]; [1]Natil. Taiwan Univ., Taiwan Republic of China, [2]Natl. Taiwan Univ., Taiwan Republic of China, [3]Australian Natl. Univ., Australia.* We show that interaction of two spatial optical solitons can be controlled by their total partial incoherence, and it may change from attractive to repulsive about a certain threshold in the coherence parameter.