Organic Photonics and Electronics

Topical Meeting collocated with FiO/LS 2006

October 9-11 2006

Hyatt Regency Rochester
Rochester, New York

Hotel Reservation Deadline: September 6, 2006
Pre-Registration Deadline: September 15, 2006

Collocated with:

Frontiers in Optics/Laser Science XXII
Optical Fabrication and Testing Topical Meeting
OSA Vision Meeting

General Chairs

Ghassan Jabbour, *Arizona State Univ., USA*
Steve Van Slyke*, Eastman Kodak Company, USA*

Plan To Attend OPE 2006

Technical Program Committee

General Chairs

Ghassan Jabbour, *Univ. of Arizona, USA*
Steve Van Slyke*, Eastman Kodak Company, USA*

Committee Members

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Bilal Kaafarani, *American Univ. of Beirut, Lebanon*
Jian Li, *Arizona State Univ., USA*
Sheng Li, *Nitto Denko Technical Corp., Japan*
Alan Sellinger, *Inst. of Materials Res. and Engineering, Singapore*
Woon-Seop Choi, *Hoseo Univ., Korea*
Ana Claudia Arias, *Electronic Materials and Devices Lab, Palo Alto Res. Ctr. Inc., USA*
Ulrich Schubert, *Eindhoven Univ. of Technology, Netherlands*
Klaus Meerholz, *Univ. of Cologne, Germany*

About OPE

The rapid progress in electronic and optical molecular and polymeric materials has made them key enablers for novel photonic, electronic, and optoelectronic device applications. These applications are broad and include: smart cards, flat panel displays, light-emitting diodes, transistors, photovoltaics, photorefractive materials, and optical coatings. Our aim is to bring together researchers from academia, industry and government laboratories from national and international settings in order to share their latest developments in this exciting area.

Meeting Topics

The conference will accommodate both the applied as well as the fundamental areas of materials and device fabrication. Papers regarding electronic/optical/optoelectronic molecular and polymeric materials are solicited in, but not limited to, the following areas:

- Organic light-emitting devices (polymers, macromolecules and small molecules)
- Organic transistors (polymeric and molecular based)
- Organic photovoltaics
- Nonlinear materials and related device applications
- Materials development and characterisation.
- Self assembly and nanostructures
- Organic memory storage applications
- Hybrid devices
- Molecular electronics
- Device physics and engineering.
- New phenomena
- Processing and printing techniques
- Organic materials for sensing applications

Invited Speakers

OPE Plenary Speakers

OPMA1, **OLEDs/Organic Solar Cells,** *Ching Tang; Kodak, USA*

OPTuB1, **Injection and Transport of Extremely High Current Densities in Organic Thin-Film Devices,** *Chihaya Adachi, Toshinori Matsushima; Ctr. for Future Chemistry, Kyushu Univ., Japan*

OPTuC1, **Design and Integration Challenges of Active Matrix Organic Light Emitting Diode Displays,** *Arokia Nathan; London Ctr. for Nanotechnology, UK*

OPE Invited Speakers

OPMA4, **OLEDs,** *Hany Aziz; Xerox Labs, USA*

OPMB1, **Energy Level Alignment and Engineering of Organic/Organic Heterojunctons,** *J. X. Tang, C. S. Lee, S. T. Lee; City Univ. of Hong Kong, Hong Kong*

OPTuA1, **Encapsulation of OLEDs,** *Robert Jan Visser; Vitex Systems, USA*

OPWA1, **OLEDs for Lighting: New Approaches,** *Joseph J. Shiang, Anil R. Duggal, James A. Cella, Jie Liu, Larry N. Lewis, Donald F. Foust; General Electric Co., USA*

OPWA2, **Advances in White OLED Technology,** *T. K. Hatwar; Eastman Kodak Co., USA*

OPWA3, **Charge Transport in White Light-Emitting Polymer Devices,** *Paul Blom, Andre J. Hof, H. T. Nicolai; Univ. of Groningen, Netherlands*

OPWB1, **Engineering Properties of Organic Materials for Near Infra-Red Applications,** *Jian Li, Evan L. Williams, Kirsi Haavisto, Ghassan E. Jabbour; Arizona State Univ., USA*

OPWB2, **Taking a Visible Step Forward into the Non-Visible (Infrared) Region,** *Kenneth Hanson[1], Carsten Borek[1], Peter Djurovich[1], Mark E. Thompson[1], Yiru Sun[2], Stephen R. Forrest[2], Anna Chwang[3], Jason Brooks[3], Julie Brown[3]; [1]Univ. of Southern California, USA, [2]Princeton Univ., USA, [3]Universal Display Corp., USA*

OPWB3, **Devices,** *Vladmir Bulovic; MIT, USA*

OPWC1, **Vapor and Solution Deposited Organic Thin Film Transistors,** *Tom Jackson; Pennsylvania State Univ., USA*

OPWC2, **Interfacial Effects in Organic Thin-Film Transistors,** *Thokchom B. Singh[1], Pinar Senkarabacack[1], Philip Stadler[1], Helmut Neugebauer[1], Niyazi Serdar Sariciftci[1], James Grote[2]; [1]Linz Inst. of Organic Solar Cells (LIOS), Austria, [2]AFRL, USA*

OPWC3, **Investigation of Charge-Injection Barriers in Finished PLEDs by Means of Non-Invasive Optical Probing,** *Franco Cacialli*[1]*, T. M. Brown*[2]*, Vladimir Bodrozic*[1]*;* [1]*Univ. College London, UK,* [2]*Univ. of Rome, Italy*

OPWD1, **Printed Organic Electronics,** *Ana Claudia Arias; Xerox Corp. Palo Alto Res. Ctr. Inc., USA*

OPWD2, **Morphological Basis for High Mobility of Poly(bithiophene thienothiophene),** *R. Joseph Kline*[1]*, Dean M. DeLongchamp*[1]*, Eric K. Lin*[1]*, Lee Richter*[1]*, Daniel A. Fischer*[1]*, Martin Heeney*[2]*, Iain McCulloch*[2]*;* [1]*NIST, USA,* [2]*Merck Chemical Ltd., UK*

OPE Short Courses

Short Courses

With a strong commitment to continuing technical education, OPE short courses are designed to increase your knowledge of a specific subject, while offering you the experience of expert teachers. Top-quality instructors stay current with the subject matter required to advance your research and career goals. An added benefit of attending a short course is the availability of continuing education units (CEUs).

Continuing Education Units (CEUs)

Short Course attendees who successfully complete a course are eligible to receive continuing education units (CEUs). The CEU is a nationally recognized unit of measure for continuing education and training programs that meet established criteria. CEUs will be calculated and certificates will be mailed to participants after the conference.

Registration

Tuition for the short course is a separate fee. Advance registration is recommended, as the number of seats in each course is limited. Short courses sell out quickly! There will not be a waiting list for short courses. Short course materials are not available for purchase.

Click here for registration information.

Short Course Schedule

Sunday, January 29, 2006

8:00 a.m. –12:00 p.m.

- **SC256: Lasers for Ultrashort Pulse Generation**
  Rüdiger Paschotta, RP Photonics Consulting GmbH, Switzerland

1:00 p.m.–5:00 p.m.

- **SC257: Designing Crystal Nonlinear Optical Devices Using SNLO Models**
  Arlee Smith, Sandia Natl. Labs, USA

- **SC258: Optical Crystals for Advanced Solid-State Photonic Applications**
  David Sumida, HRL Laboratories, LLC, USA

SC256 Lasers for Ultrashort Pulse Generation

Rüdiger Paschotta, RP Photonics Consulting GmbH, Germany

Course Description

This course gives an introduction to the field of ultrashort pulse generation with various kinds of mode-locked lasers. It begins with essential information on laser gain media, techniques for dispersion compensation, and relevant optical nonlinearities, and continues with an overview on the physics of mode locking in various situations. The latter topic includes the starting of the mode-locking process, an overview of different types of saturable absorbers, soliton mode locking, harmonic mode locking, Q-switching instabilities and other destabilizing effects. Finally, different types of mode-locked lasers will be discussed, including various kinds of picosecond and femto¬second diode-pumped solid-state lasers, Ti:sapphire lasers, fiber lasers, diode lasers (very briefly), and optically pumped surface-emitting semiconductor lasers. Some emphasis will be put on mode-locked lasers for operation in extreme parameter ranges, such as Ti:sapphire lasers generating sub-10-fs pulses, thin disk lasers for sub-picosecond pulses with extremely high average power, and miniature lasers for pulse repetition rates of tens of GHz and more. It will become apparent that the kinds of lasers discussed differ greatly, not only concerning the magnitude of various parameters, but also in terms of the important physical mechanisms.

Benefits and Learning Objectives

This course should enable participants to:

- Compare different laser gain media in terms of suitability for mode locking in different parameter ranges;
- List different techniques for dispersion compensation;
- Explain the role of nonlinearities in different kinds of mode-locked lasers;
- Explain the essentials of active and passive mode locking;
- Identify limiting parameters for pulse durations, output powers, and pulse repetition rates; and
- Compare the potential of different kinds of mode-locked lasers in different operation regimes.

Intended Audience

This course should be useful for researchers at universities as well as R&D staff in the industry who want to get an introduction to the field of ultrashort pulse generation with lasers and an overview of different types of mode-locked lasers, in order to either develop mode-locked lasers themselves or select suitable lasers for particular applications. A general background in lasers and optics (principle of lasers, etc.) is required to understand the course, but no specific knowledge of pulse generation is necessary.

Instructor Biography

Rüdiger Paschotta received the PhD degree in Konstanz, Germany, for achievements in the fields of quantum optics and nonlinear optics. From 1994 to 1997, he worked on fiber lasers and amplifiers at the Optoelectronics Research Centre in Southampton, United Kingdom. After a short stay in Paderborn, Germany, he supervised a research team at ETH Zurich, Switzerland, from 1997 to 2005, who worked on nonlinear integrated optics, within the group of Ursula Keller, developing diode-pumped mode-locked lasers. His work concentrated on the physics of mode locking, mode-locked lasers for high powers or high repetition rates, mode-locked surface-emitting semiconductor lasers, and high-power nonlinear frequency conversion. He is now offering technical consultancy to the industry via his company RP Photonics Consulting GmbH.

SC257 Designing Crystal Nonlinear Optical Devices Using SNLO Models

Arlee Smith, Sandia Natl. Labs, USA

Course Description

SNLO is a free, Windows-based software package comprising 17 functions relating to crystal nonlinear optics. It is intended as a convenient aid in the selecting of the best crystal for a particular application and in quantitatively modeling the crystal's performance. For example, the crystal selection functions compute phase-matching properties for angle-tuned crystals or quasi-phase matching properties for periodically-poled crystals. The device performance models cover the time range from fs to cw, and they can be applied to crystals inside or outside of optical cavities. They are physically realistic because they rigorously account for nonlinear interactions, as well as linear propagation of beams with realistic spatial and temporal profiles. Linear propagation includes diffraction and dispersion to account for spatial and temporal walk off, focusing, etc.

The course will cover all of the SNLO modules but it will emphasize the use of the numerical models of nonlinear crystal performance. Each modeling function will be described in detail and numerous examples will be presented in live demonstrations. The mathematics will be minimal. Instead, the emphasis will be on developing intuition regarding the physical principles that determine crystal performance. Attendees will receive notes that explain each of the models and that present a wide variety of illustrative examples with descriptions of each modeled device and the physical principles highlighted by each example. These examples are preloaded in SNLO so running them yourself is quick and easy. There will be ample time allotted to modeling devices suggested by the course participants.

Benefits and Learning Objectives

This course should enable participants to:

- Speed the design of nonlinear optical devices by the use of well-benchmarked quantitative models;
- Save dollars spent on optical components and nonlinear crystals by bypassing the trial and error steps in device design;
- Quickly and quantitatively test the feasibility of novel device concepts; and
- Develop a better intuition of crystal nonlinear optics.

Intended Audience

Anyone who uses nonlinear optical crystals or designs devices based on nonlinear optical crystals, including spectroscopists who use crystals to generate tunable laser light across the optical spectrum, optical engineers who design devices such as optical parametric oscillators or laser frequency multipliers, and students who would like to learn the principles of crystal nonlinear optics. No previous experience in numerical modeling or in the use of SNLO is needed.

Instructor Biography

Arlee Smith (PhD, physics, University of Michigan) is a staff scientist in the Lasers, Optics and Remote Sensing Department at Sandia National Labs in Albuquerque, New Mexico. He is an OSA fellow with 30 years experience in the laboratory use of lasers and nonlinear optical devices as well as in numerical modeling of nonlinear optical processes. He is the author of SNLO.

SC258 Optical Crystals for Advanced Solid-State Photonic Applications

David Sumida, HRL Labs, LLC, USA

Course Description

The selection of an optical crystal for a particular photonics application involves the consideration of numerous properties of the host crystalline material. In this short course, I focus extensively on the physical, optical, and thermo-mechanical properties of such crystals for laser and other optical elements, leaving a detailed discussion of spectroscopy and laser properties of dopant ions aside for now. The various intrinsic material properties (e.g., crystal structure, refractive index, dn/dT, thermal expansion, thermal conductivity, fracture toughness, etc.) of a wide range of crystalline materials are discussed, including their measurement and relevance to device operation. Existing data on oxide and fluoride crystals is presented in order to provide a comparison of the properties of available crystals. Important optical design issues (e.g., thermally-induced distortions and thermal stress resistance) are evaluated in light of these properties. Finally, we discuss the impact of these properties on solid-state laser and other optical applications.

Benefits and Learning Objectives

This course will enable participants to:

- Understand the physical basis of optical and thermo-mechanical crystalline properties;
- Develop familiarity with conventional nomenclature and units of doped and undoped crystalline media;
- Compare the properties of approximately 100 laser host crystals;
- Assess the relative strengths and weaknesses of various solid-state laser crystals; and
- Evaluate the impact of crystalline properties on solid-state laser and photonic devices.

Intended Audience

This course is tailored to help scientists, engineers, students, and managers become more comfortable with making a design decision given the usual ”real-world” conflict between what the intended photonics application calls for, and what the material can actually do given its crystalline-material properties. This course is intended to provide attendees the tools with which to evaluate the relative merits of particular crystals for specific laser and photonic applications.

Instructor Biography

David S. Sumida, PhD (Senior Research Project Engineer, HRL Laboratories LLC, Malibu, California) has over 20 years of professional experience in advanced solid-state lasers. He received his PhD in physics at the University of Southern California in 1984. He currently manages several advanced solid-state laser

research projects involving diode-pumped solid-state laser media, architectures, and applications. He has authored/coauthored over 100 technical papers and presentations, co-authored a book chapter on laser host crystals, and he holds 14 U.S. patents. He is a member of the Optical Society of America and, for nearly ten years, he has co-taught a CLEO short course similar in scope to this one.

FiO Exhibit Guide Updates & FiO/LS/OF&T/OPE Program Addendum

FiO/LS/OF&T/OPE Progamming Updates

PRESENTER CHANGES

Timo Pfau, *Univ. Paderborn, Germany*, will present **FMD3.**
Yoshihiro Emori, *OFS Labs, USA,* will present **FWG4.**
Joel Hale, *Georgia Tech, USA,* will present **FWK5.**
Kenny Kubala, *CDM Optics, USA,* will present **FWT2.**
Bing He, *CUNY Hunter College, USA,* will present **LWF3.**
Zengxiu Zhao, *Univ. of Ottawa, Canada,* will present **JWE3.**
Jurgen Daniel, *Xerox Corp. Palo Alto Res. Ctr. Inc., USA*, will present **OPWD1.**

PRESIDER UPDATES

Vadim Backman, *Northwestern Univ., USA,* will preside over **FTuK.**
Dai Fukumura, *Massachusetts General Hospital, USA,* will preside over **FWD.**
John Schotland, *Univ. of Pennsylvania, USA,* will preside over **FWP.**

PRESENTATION TIME CHANGES

The following two papers' presentation times have been swapped.

OLEDs, *Hany Aziz and Roy Luo, Xerox Labs, USA*, will be presented as paper **OPWC3.** Roy Luo will present the paper.

Investigation of Charge-Injection Barriers in Finished PLEDs by Means of Non-Invasive Optical Probing, *Franco Cacialli[1], T. M. Brown[2], Vladimir Bodrozic[1], [1]Univ. College London, UK, [2]Univ. of Rome, Italy*, will be presented as paper **OPMA4.**

The following two papers' presentation times have been swapped.

Plasmonic "Diode" for Optical Field Rectification, *Nader Engheta; Univ. of Pennsylvania, USA,* will be presented as paper FTuB2.

Giant Transmission and Dissipation in Perforated Films Mediated by Surface Phonon Polaritons, *Gennady Shvets, Dmitriy Korobkin, Yaroslav Urzhumov, Burton Neuner III; Univ. of Texas at Austin, USA,* will be presented as paper FThF4.

ABSTRACT FOR INVITED PAPER LTuH2:

Making Ultracold Molecules from Ultracold Atoms with Chirped Laser Pulses

Eliane Luc-Koenig[1], Christiane Koch[1,2,3], Ronnie Kosloff[2], Françoise Masnou-Seeuws[1]; [1]Laboratoire Aimé Cotton (CNRS), Univ. Paris-Sud XI, France, [2]Department of Physical Chemistry, The Hebrew Univ., Israel, [3]Freie Universität Berlin, Germany.

The possibility to use chirped laser pulses to optimize the formation of ultracold molecules by photoassociation and radiative stabilization is discussed. Calculations of the absolute number of molecules per pulse has been performed for Rb$_2$ and Cs$_2$.

WITHDRAWN ORAL PRESENTATIONS

FMO4
FTuA3
JTuC4
LTuD5
LTuK3
FWO3
FWX5
JWE3
LTA6
JThC3
FThQ7

WITHDRAWN POSTER PRESENTATIONS

JSuA18
JSuA26
JSuA28
JSuA46
JWD101
JWD102

SHORT COURSE CANCELLATIONS

SC155
SC273

CORRECTIONS TO SESSION LMF

In the conference program, the titles of the talks in session **LMF** are listed incorrectly. Here is the correct information.

3:45 p.m.-6:15 p.m.
LMF • Lasers, Amplifiers and Waveguides
Daniel Gauthier; Duke Univ., USA, Presider

LMF1 • 3:45 p.m.
Q-Switched Yb: Lu2SiO5 Laser with a SESAM
Yanrong Song[1], Jianghai Hu[1], Chengfeng Yan[2], Guangjun Zhao[2], Liangbi Su[2], Jun Xu[2], Kai Guo[1], Yonggang Wang[3], Zhigang Zhang[1,4]; [1]College of Applied Science, Beijing Univ. of Technology, China, [2]Shanghai Inst. of Optics and Fine Mechanics, Chinese Acad. of Sciences, China, [3]Inst. of Semiconductors, Chinese Acad. of Sciences, China, [4]Inst. of Quantum Electronics, Peking Univ., China.
A new Yb-doped crystal Yb^{3+}: Lu$_2$SiO$_5$ laser was demonstrated. The laser was Q-switched at 1058nm by an InGaAs saturable absorber above 25KHz. The slope efficiency were 4.6% and 3.0% for CW and Q-switched respectively.

FiO Exhibit Guide Updates & FiO/LS/OF&T/OPE Program Addendum

LMF2 • 4:00 p.m.

Carrier-Envelope-Phase Stabilization of a kHz Ti:S Laser Based on a Direct Locking Method

Yong Soo Lee, Tayyab Imran, Chang Hee Nam; Korea Advanced Inst. of Science and Technology (KAIST), Republic of Korea.

Carrier-envelope phase (CEP) of a femtosecond Ti:S oscillator was stabilized using a direct locking method based on time-domain feedback. CEP variation during amplification in a kHz Ti:S laser was measured using a spectral interferometry method.

LMF3 • 4:15 p.m.

Highly-Stable, Long-Pulse, Diode-Pumped Nd:YLF Regenerative Amplifier

Andrey V. Okishev[1], Lance D. Lund[1], Jonathan D. Zuegel[1], Frank DeWitt[2]; [1]Univ. of Rochester, Lab for Laser Energetics, USA, [2]LBP Inc., USA.

A new diode-pumped, highly-stable compact Nd:YLF regenerative amplifier of shaped 10-ns pulses, which is insensitive to room temperature variations, has been developed for the front-end laser system of the OMEGA EP facility.

LMF4 • 4:30 p.m.

Optimizing Broadband SBS Slow Light in an Optical Fiber

Daniel J. Gauthier[1], Zhaoming Zhu[1], Andrew M. C. Dawes[1], Lin Zhang[2], Alan E. Willner[2]; [1]Duke Univ., USA, [2]Univ. of Southern California, USA.

We describe how to optimize slow-light via stimulated Brillouin scattering in a room temperature optical fiber that is pumped with a spectrally broadened laser. Our recent experimental results on broadband SBS slow-light will be discussed.

LMF5 • 4:45 p.m.

Antisymmetric Soliton in a Dispersion-Managed Fiber Laser

Andy Chong, Joel R. Buckley, Frank W. Wise; Cornell Univ., USA.

A dispersion-managed soliton fiber laser generates doubly-peaked temporal and spectral profiles at large anomalous net dispersion. The emitted pulse is consistent with an antisymmetric soliton, which was not observed previously in a laser.

LMF6 • 5:00 p.m.

Group Period-Doubling of Solitons in a Fiber Ring Laser

Luming Zhao[1], Dingyuan Tang[1], Tee Hiang Cheng[1], Chao Lu[2]; [1]School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore, [2]Dept. of Electronic and Information Engineering, Hong Kong Polytechnic Univ., Hong Kong.

Period-doubling of multiple solitons in a passively mode-locked Erbium-doped fiber laser is observed numerically and experimentally. Each soliton in a multiple-soliton train can experience period-doubling bifurcations under existence of laser gain competition.

LMF7 • 5:15 p.m.

Fiber-Based Optical Parametric Oscillator with 50-mW Average Output Power and 200 nm of Wavelength Tunability

Jay E. Sharping[1], Mark A. Foster[1], Alexander L. Gaeta[1], Jacob Lasri[2], Ove Lyngnes[2], Kurt Vogel[2]; [1]Cornell Univ., USA, [2]Precision Photonics Corp., USA.

We demonstrate an optical parametric oscillator based on a short piece of microstructure fiber that generates sub-picosecond pulses with record average output power (50 mW) and >200 nm of wavelength tunability (yellow to near-IR).

LMF8 • 5:30 p.m.

Improved Narrow Wavelength Band Blocking Filters

Ronald R. Willey; Willey Optical, Consultants, USA.

A new design approach is described to achieve spectral blocking filters for narrow blocking bands of any spectral width or optical density. This approach can be useful for laser line blocking, night vision filters, etc.

LMF9 • 5:45 p.m.

Enhanced Parametric Amplification in AlGaAs Microring Resonators

Zhenshan Yang[1], Philip Chak[1], Rajiv Iyer[2], J. Stewart Aitchison[2], John E. Sipe[1]; [1]Dept. of Physics, Univ. of Toronto, Canada, [2]Dept. of Electrical and Computer Engineering, Univ. of Toronto, Canada.

We show that parametric amplification can be greatly enhanced in microring resonator structures even in the presence of material and modal dispersion, without the need for artificially structuring the nonlinear properties of the waveguides.

LMF10 • 6:00 p.m.

Mode Selection in a Vertical-Cavity Surface-Emitting Laser Using Preferential Alignment of Optical Feedback

Hong Lin, Htay M. Hlaing; Bates College, USA.

Transverse modes are selected in a multi-transverse-mode vertical-cavity surface-emitting laser (VCSEL) by adjusting alignment of the feedback mirror. When the feedback is strong, single transverse mode is obtained in a wide current range.

Agenda of Sessions — SUNDAY, OCTOBER 8, 2006

	Riverside Court and Galleria	Highland F	Highland G	Highland H	Hyatt Regency Ballroom
8:00 a.m.–2:00 p.m.	OSA Student Chapter Leadership Meeting, **Douglass Room, Clarion Rochester Hotel**				
9:00 a.m.–12:30 p.m.	**SC235: Nanophotonics: Design, Fabrication and Characterization** **SC252: Phase-Space Representations in Optics: Fundamentals and Applications** **SC253: Medical Imaging and Beyond** **SC273: Superresolution Theory and Applications**				
12:30 p.m.–1:30 p.m.	Lunch Break (On Your Own)				
1:30 p.m.–5:00 p.m.	**SC155: The Measurement of Ultrashort Laser Pulses** **SC254: Optimal Marriage of Wave and Ray Optics in Paraxial Imaging System Analysis** **SC274: Polarization Engineering**				
2:30 p.m.–5:30 p.m.					Hands-On Optics Training
4:00 p.m.–6:00 p.m.		Optics Overviews: What's Hot in Optics Today?			
6:00 p.m.–7:30 p.m.	Welcome Reception and Joint FiO/LS Poster Session I				
7:30 p.m.–8:30 p.m.		Optical Design and Instrumentation Division Meeting (ends at 9:30 p.m.)	Optics in Information Science Division Meeting	Quantum Electronics Division Meeting	

KEY TO SHADING:

□ Frontiers in Optics ░ Laser Science ▒ Joint FiO/LS ░ OF&T ▨ OPE

Agenda of Sessions — MONDAY, OCTOBER 9, 2006

	Highland A	Highland B	Highland C	Highland D	Highland E
8:00 a.m.–10:00 a.m.	**JMA:** Joint FiO/LS Plenary Session and Awards Ceremony, Part I: OSA/APS Awards, **Lilac Ballroom**				
8:00 a.m.–9:45 a.m.					
9:50 a.m.-10:20 a.m.	Coffee Break, **Lilac Ballroom Foyer** Coffee Break, **Hyatt Grand Ballroom G** (starts at 9:45 a.m., ends at 10:30 a.m.)				
10:20 a.m.–11:10 a.m.	**JMB:** Joint FiO/LS Plenary Session and Awards Ceremony, Part II: The Energy Problem and What We Can Do about It, Steven Chu, **Lilac Ballroom**				
10:30 a.m.–12:15 p.m.					
11:10 a.m.–12:00 p.m.	**JMC:** Joint FiO/LS Plenary Session and Awards Ceremony, Part III: Optics Meets Alzheimer's Disease: Seeing the Way to a Cure, Lee E. Goldstein, **Lilac Ballroom**				
12:00 p.m.–1:30 p.m.	Lunch Break (On Your Own)				
12:00 p.m.–2:00 p.m.	**LMA:** Symposium on Undergraduate Research Posters, **Riverside Court**				
12:30 p.m.–2:00 p.m.	**OFMC:** OF&T Main Poster Session (Including Postdeadline Papers), **Hyatt Grand Ballroom G**				
1:30 p.m.–3:15 p.m.	**FMA:** Photonic Metamaterials I	**LMB:** Symposium on Undergraduate Research I (starts at 2:00 p.m., ends at 3:30 p.m.)	**FMB:** Computational Imaging I	**FMC:** Diffractive Micro- and Nanostructures for Sensing and Information Processing I	**FMD:** Advanced Transmission and Impairments
3:15 p.m.–3:45 p.m.	Coffee Break, **Highland Room Foyer** Coffee Break, **Hyatt Grand Ballroom G**				

Continued on Pages 52–53.

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom E/F	Hyatt Regency Ballroom A/B
JMA: Joint FiO/LS Plenary Session and Awards Ceremony, Part I: OSA/APS Awards, **Lilac Ballroom**						
					OFMA: Space Optics: Fabrication Solutions for an Extreme Environment	
Coffee Break, **Lilac Ballroom Foyer** Coffee Break, **Hyatt Grand Ballroom G** (starts at 9:45 a.m., ends at 10:30 a.m.)						
JMB: Joint FiO/LS Plenary Session and Awards Ceremony, Part II: The Energy Problem and What We Can Do about It, Steven Chu, **Lilac Ballroom**						
					OFMB: Advances in Optics Fabrication	
JMC: Joint FiO/LS Plenary Session and Awards Ceremony, Part III: Optics Meets Alzheimer's Disease: Seeing the Way to a Cure, Lee E. Goldstein, **Lilac Ballroom**						
Lunch Break (On Your Own)						
LMA: Symposium on Undergraduate Research Posters, **Riverside Court**						
OFMC: OF&T Main Poster Session (Including Postdeadline Papers), **Hyatt Grand Ballroom G**						
FME: Coherent and Quantum Optics in Fibers I (ends at 3:00 p.m.)	**FMF:** Image-Based Wavefront Sensing I	**FMG:** Advances in Instrumentation for High-Resolution Retinal Imaging I (starts at 1:00 p.m., ends at 3:30 p.m.)	**LMC:** Quantum Degenerate Gases I (ends at 3:30 p.m.)	**LMD:** Optics in Soft Condensed Matter Physics I	**OFMD:** Micro-Optics and Integrated Optics	**OPMA:** Light Emission I
Coffee Break, **Highland Room Foyer** Coffee Break, **Hyatt Grand Ballroom G**						

Continued on Pages 52–53.

Agenda of Sessions — MONDAY, OCTOBER 9, 2006, *continued*

	Highland A	**Highland B**	**Highland C**	**Highland D**	**Highland E**
3:45 p.m.–5:30 p.m.	**FMH:** Metamaterials and Negative Refraction I	**LME:** Symposium on Undergraduate Research II (starts at 3:30 p.m., ends at 6:30 p.m.)	**LMF:** Lasers, Amplifiers and Waveguides (ends at 6:15 p.m.)	**FMI:** Computational Imaging II	**FMJ:** Advanced Transmission and Quantum Communications (ends at 5:15 p.m.)
4:45 p.m.–6:30 p.m.					
5:30 p.m.–6:30 p.m.	OSA's Annual Business Meeting, **Highland E**				
5:45 p.m.–6:00 p.m.	**OFMF:** OF&T Poster Session Wrap-up, **Hyatt Grand Ballroom G**				
6:00 p.m.–8:30 p.m.	OSA Student Member Welcome Reception, **Saddle Ridge Entertainment Resort**				

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom E/F	Hyatt Regency Ballroom A/B
FMK: Ceramic Lasers I	**FML:** Image-Based Wavefront Sensing II (ends at 5:45 p.m.)	**FMM:** Advances in Instrumentation for High-Resolution Retinal Imaging II (ends at 4:30 p.m.)	**LMG:** Quantum Degenerate Gases II (ends at 5:45 p.m.)	**LMH:** Optics in Soft Condensed Matter Physics II	**OFME:** Advances in Surface Finishing (ends at 5:45 p.m.)	**OPMB:** Light Emission II (ends at 5:45 p.m.)
		FMN: Advances in Understanding Accommodation and Presbyopia Correction				
OSA's Annual Business Meeting, **Highland E**						
OFMF: OF&T Poster Session Wrap-up, **Hyatt Grand Ballroom G**						
OSA Student Member Welcome Reception, **Saddle Ridge Entertainment Resort**						

Agenda of Sessions — TUESDAY, OCTOBER 10, 2006

	Highland A	Highland B	Highland C	Highland D	Highland E
8:00 a.m.–9:45 a.m.	**FTuA:** A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art I: A Tribute to Emmett Leith	**FTuB:** Photonic Metamaterials II	**FTuC:** Metamaterials and Negative Refraction II	**FTuD:** Photofluidics I	**FTuE:** Scattering and Tissue Properties
9:45 a.m.	Ribbon-Cutting to Open Exhibit, **Empire Hall** Exhibit Open 9:45 a.m.–5:00 p.m.				
9:45 a.m.–10:15 a.m.	Coffee Break, **Empire Hall** Coffee Break, **Hyatt Grand Ballroom G**				
10:15 a.m.–12:15 p.m.	**FTuH:** A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art II: A Tribute to Emmett Leith	**JTuA:** Molecules and Clusters in Strong Fields (ends at 12:00 p.m.)	**FTuI:** Metamaterial Structures: Photonic Band Engineering I (ends at 12:00 p.m.)	**FTuJ:** Photofluidics II (ends at 12:00 p.m.)	**FTuK:** Leveraging Spectroscopic Signatures I
12:15 p.m.–2:00 p.m.	Exhibit-Only Time/Lunch Refreshments				
2:00 p.m.–3:45 p.m.	**FTuN:** A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art III: A Tribute to Emmett Leith	**JTuB:** XUV Sources and Science	**FTuO:** Metamaterial Structures: Photonic Band Engineering II	**FTuP:** All-Optical Networks and Systems	**FTuQ:** Leveraging Spectroscopic Signatures II
2:30 p.m.–3:30 p.m.	Building Your Future in Optics, **Douglass Room, Clarion Rochester Hotel**				
3:45 p.m.–4:15 p.m. **4:15 p.m.–5:45 p.m.**	Coffee Break, **Empire Hall** Coffee Break, **Hyatt Grand Ballroom G**				
	OPTuD: OPE Poster Session, **Hyatt Grand Ballroom G**				

Continued on Pages 56–57.

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom E/F	Hyatt Regency Ballroom A/B
FTuF: Ultrafast Control of Laser/Matter Interactions I	**FTuG:** High-Power Optics: State-of-the-Art I	**LTuA:** Cold Rydberg Gases (ends at 10:00 a.m.)	**LTuB:** Ultracold Molecules I: Magneto-Association via Feshbach Resonances (ends at 9:30 a.m.)	**LTuC:** Spintronix and Quantum Information I	**OFTuA:** Fabrication and Testing of Aspheres	**OPTuA:** Light Emission III (ends at 9:30 a.m.)
Ribbon-Cutting to Open Exhibit, **Empire Hall** Exhibit Open 9:45 a.m.–5:00 p.m.						
Coffee Break, **Empire Hall** Coffee Break, **Hyatt Grand Ballroom G**						
FTuL: Ultrafast Control of Laser/Matter Interactions II (ends at 12:00 p.m.)	**FTuM:** Consumer Optics	**LTuD:** Quantum Optics I (ends at 12:00 p.m.)	**LTuE:** Ultracold Molecules II: Photoassociative Spectroscopy and Ultracold Molecule Formation	**LTuF:** Carbon Nanotube Spectroscopy I (ends at 12:30 p.m.)	**OFTuB:** Absolute Testing of Aspheres	**OPTuB:** Organic Lasers and Charge Injection
Exhibit-Only Time/Lunch Refreshments						
FTuR: Coherent and Quantum Optics in Fibers II	**FTuS:** High-Power Optics: State-of-the-Art II	**LTuG:** Quantum Optics II	**LTuH:** Ultracold Molecules III: New Approaches to Cold Molecules (ends at 4:00 p.m.)	**LTuI:** Spintronix and Quantum Information II (ends at 4:00 p.m.)	**OFTuC:** Materials and Material Properties	**OPTuC:** OLED Circuits, Solar Cells and Organic Memory
Building Your Future in Optics, **Douglass Room, Clarion Rochester Hotel**						
Coffee Break, **Empire Hall** Coffee Break, **Hyatt Grand Ballroom G**						
OPTuD: OPE Poster Session, **Hyatt Grand Ballroom G**						

Continued on Pages 56–57.

Agenda of Sessions — TUESDAY, OCTOBER 10, 2006, *continued*

	Highland A	Highland B	Highland C	Highland D	Highland E
4:15 p.m.–6:00 p.m.	**FTuT:** Diffractive Micro- and Nanostructures for Sensing and Information Processing II	**JTuC:** Atoms and Molecules in Laser Fields	**FTuU:** Disordered Structures: Coherence, Localization and Lasing I	**FTuV:** All-Optical Signal Processing Techniques	**FTuW:** Microscopy and Optical Trapping
5:45 p.m.–6:30 p.m.	**OPTuE:** OPE Postdeadline Papers, **Hyatt Regency Ballroom A/B**				
6:00 p.m.–7:00 p.m.	Division of Laser Science Annual Business Meeting, **Highland B**				
7:00 p.m.–9:00 p.m.	LS Banquet, **Hyatt Grand Ballroom D**				

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom E/F	Hyatt Regency Ballroom A/B
FTuX: Quantum Optics in Micro- and Nanostructures I	**FTuY:** General Optical Design and Instrumentation I	**LTuJ:** Light Propagation in Atomic Ensembles (ends at 6:15 p.m.)	**LTuK:** Novel Cooling and Trapping Techniques (ends at 6:15 p.m.)	**LTuL:** Carbon Nanotube Spectroscopy II (ends at 6:30 p.m.)	**OFTuD:** Grinding and Polishing	
OPTuE: OPE Postdeadline Papers, **Hyatt Regency Ballroom A/B**						
Division of Laser Science Annual Business Meeting, **Highland B**						
LS Banquet, **Hyatt Grand Ballroom D**						

Agenda of Sessions — WEDNESDAY, OCTOBER 11, 2006

	Highland A	**Highland B**	**Highland C**	**Highland D**	**Highland E**
8:00 a.m.–9:45 a.m.	**JWA:** Attosecond Laser Science I	**FWA:** High-Power and Fiber Amplifiers	**FWB:** Optical Computing (ends at 10:00 a.m.)	**FWC:** Diffractive Micro- and Nanostructures for Sensing and Information Processing III	**FWD:** Ultrafast Lasers in Medicine and Biology I
9:45 a.m.–4:00 p.m.	Exhibit Open 9:45 a.m.–4:00 p.m., **Empire Hall**				
9:45 a.m.–10:15 a.m.	Coffee Break, **Empire Hall** Coffee Break, **Hyatt Grand Ballroom G**				
10:15 a.m.–12:00 p.m.	**JWB:** Attosecond Laser Science II	**FWG:** Semiconductor and Raman Amplifiers	**FWH:** Computational Imaging III	**FWI:** Diffractive Micro- and Nanostructures for Sensing and Information Processing IV	**FWJ:** Ultrafast Lasers in Medicine and Biology II
12:00 p.m.– 1:30 p.m.	**JWD:** Joint FiO/LS Poster Session II, **Empire Hall**				
12:00 p.m.–1:30 p.m.	WOSA Luncheon, **Hyatt Grand Ballroom C**				
1:30 p.m.–3:15 p.m.	**JWE:** Atoms in Strong and Ultrastrong Fields I	**FWM:** Microstructures and Waveguides	**FWN:** Computational Imaging IV	**FWO:** Silicon and III-V Based Optoelectronics for Optical Interconnects I	**FWP:** Advances in Macroscopic Optical Imaging I
3:15 p.m.–3:45 p.m.	Coffee Break, **Empire Hall** Coffee Break, **Hyatt Grand Ballroom G**				
3:45 p.m.–5:30 p.m.	**JWG:** Atoms in Strong and Ultrastrong Fields II	**FWS:** Slow Light and Photonic Structures	**FWT:** Computational Imaging V (ends at 5:45 p.m.)	**FWU:** Silicon and III-V Based Optoelectronics for Optical Interconnects II	**FWV:** Advances in Macroscopic Optical Imaging II
5:30 p.m.–7:00 p.m.	OSA Member Reception, **Hyatt Grand Ballroom**				
7:00 p.m.–8:30 p.m.	FiO Postdeadline Papers, **Highland Rooms**				

Highland F	Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom E/F	Hyatt Regency Ballroom A/B
FWE: Nano- and Micro-Enhancement of NLO Effects I	**FWF:** Laser Guide Star Technology for Adaptive Optics I	**LWA:** Quantum Information I	**LWB:** Nonlinear Optics of Micro- and Nanoparticles (ends at 10:00 a.m.)	**LWC:** Quantum Optics in Photonic Materials I (ends at 10:00 a.m.)	**OFWA:** Uncommon Ideas and Often Missed Details: In Memory of Frank Cooke (ends at 10:00 a.m.)	**OPWA:** White OLEDs (ends at 10:00 a.m.)
Exhibit Open 9:45 a.m.–4:00 p.m., **Empire Hall**						
Coffee Break, **Empire Hall** Coffee Break, **Hyatt Grand Ballroom G**						
FWK: Nano- and Micro-Enhancement of NLO Effects II (ends at 12:30 p.m.)	**FWL:** Laser Guide Star Technology for Adaptive Optics II (ends at 11:30 a.m.)	**LWD:** Quantum Information II	**JWC:** Spectroscopic Imaging for Disease Diagnostics (ends at 12:15 p.m.)	**LWE:** Quantum Dots (ends at 12:30 p.m.)	**OFWB:** Optics for Telescopes (starts at 10:30 a.m.)	**OPWB:** Infrared OLEDs and Quantum Dots (starts at 10:30 a.m., ends at 12:15 p.m.)
JWD: Joint FiO/LS Poster Session II, **Empire Hall**						
WOSA Luncheon, **Hyatt Grand Ballroom C**						
FWQ: Quantum Optics in Micro- and Nanostructures II	**FWR:** General Optical Design and Instrumentation II	**LWF:** Quantum Measurement and Control	**JWF:** Novel Microscopies for Medicine and Biology I (ends at 3:00 p.m.)	**LWG:** Quantum Optics in Photonic Materials II	**OFWC:** Testing I	**OPWC:** Current Injection and Organic Thin Film Transistors (starts at 2:00 p.m., ends at 3:45 p.m)
Coffee Break, **Empire Hall** Coffee Break, **Hyatt Grand Ballroom G**						
FWW: Ceramic Lasers II	**FWX:** General Optical Design and Instrumentation III (ends at 5:45 p.m.)	**LWH:** Quantum Imaging	**JWH:** Novel Microscopies for Medicine and Biology II	**FWY:** Photonic Metamaterials III	**OFWD:** Testing II (ends at 5:15 p.m.)	**OPWD:** Organic Thin Film Transistors (starts at 4:15 p.m., ends at 5:15 p.m.)
OSA Member Reception, **Hyatt Grand Ballroom**						
FiO Postdeadline Papers, **Highland Rooms**						

Agenda of Sessions — THURSDAY, OCTOBER 12, 2006

	Highland A	**Highland B**	**Highland C**	**Highland D**	**Highland E**
8:00 a.m.–9:45 a.m.	Commercialization of University and Orphan Technologies	Best of Topicals	**FThA:** Photonic Crystals and Solitons	**FThB:** Disordered Structures: Coherence, Localization and Lasing II	**FThC:** Photonic Crystals
9:45 a.m.–10:15 a.m.	Coffee Break, **Highland Rooms Foyer**				
10:15 a.m.–12:00 p.m.	Commercialization of University and Orphan Technologies	Best of Topicals	**FThF:** Photonic Metamaterials IV	**FThG:** General Optics I (ends at 12:15 p.m.)	**FThH:** Nanostructured Materials and Devices
12:00 p.m.–1:30 p.m.	Lunch Break (On Your Own)				
1:30 p.m.–3:15 p.m.	20 Years of CPA (starts at 1:00 p.m.)	**FThK:** Microstructured Waveguides and Devices	**FThL:** Optical Chip and Nonlinear Metamaterials	**FThM:** Single Cycle Pulses and Pulse Measurement (ends at 3:00 p.m.)	**FThN:** Novel Fibers and Fiber Lasers
3:15 p.m.–5:00 p.m.	20 Years of CPA (ends at 7:00 p.m.)				

Highland F	Highland G	Highland H	Highland J	Highland K	Lilac Ballroom
FThD: Nonlinear Propagation Effects (ends at 9:30 a.m.)	**FThE:** Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations I	**LThA:** Precision and Quantum Enabled Measurements (ends at 10:00 a.m.)	**JThA:** Optical Imaging of Response to Therapy I	**JThB:** Laser Plasmas and Filaments	
Coffee Break, **Highland Rooms Foyer**					
FThI: Coherent and Quantum Optics in Fibers III	**FThJ:** Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations II	**LThB:** Precision and Quantum Enabled Measurements II (ends at 12:15 p.m.)	**JThC:** Optical Imaging of Response to Therapy II	**JThD:** Attosecond and High Harmonic Generation (ends at 12:15 p.m.)	
Lunch Break (On Your Own)					
FThO: Nano- and Micro-Enhancement of NLO Effects III	**FThP:** Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations III			**FThQ:** General Optics II	
		Quantum Optics and Quantum Information Teaching Experiments			Science Educators' Day (ends at 9:00 p.m.)

SESSIONS, SYMPOSIA AND INVITED SPEAKERS BY TOPIC

FRONTIERS IN OPTICS

Division 1—Optical Design and Instrumentation

▶ Theme 1: Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations

Technical Sessions

FThE, **Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations I,** 10/12/2006 8:00 a.m.–9:45 a.m.

FThJ, **Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations II,** 10/12/2006 10:15 a.m.–12:00 p.m.

FThP, **Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations III,** 10/12/2006 1:30 p.m.–3:15 p.m.

Invited Speakers

FThE2, **The Role of Jones Matrices in Critical Dimension Computation for Immersion Lithography,** Ronald L. Gordon, James P. McGuire, Matthew P. Rimmer; Optical Res. Associates, USA. 10/12/2006 8:45 a.m.–9:15 a.m.

FThJ1, **Classification of Depolarizing Mueller Matrices,** Russell Chipman; Univ. of Arizona, USA. 10/12/2006 10:15 a.m.–10:45 a.m.

FThJ2, **Space-Variant Birefringent Components,** Scott McEldowney, Jerry Zeiba, Kim Tan, Paul McKenzie; JDSU, USA. 10/12/2006 10:45 a.m.–11:15 a.m.

FThP1, **Nanometrology Using Spatially-Variant Optical Polarization,** Qiwen Zhan; Univ. of Dayton, USA. 10/12/2006 1:30 p.m.–2:00 p.m.

FThP2, **Polarization Vortices and Partial Coherence,** Thomas G. Brown; Inst. of Optics, Univ. of Rochester, USA. 10/12/2006 2:00 p.m.–2:30 p.m.

Tutorial Speaker

FThE1, **Polarization Ray Tracing of Wave Fields,** *Miguel Alonso; Univ. of Rochester, USA.* 10/12/2006 8:00 a.m.–8:45 a.m.

Short Course

SC274, **Polarization Engineering,** Russell Chipman; Univ. of Arizona, USA. 10/8/2006 1:30 p.m.–5:00 p.m.

▶ Theme 2: Consumer Optics

Technical Session

FTuM, **Consumer Optics,** 10/10/2006 10:15 a.m.–12:15 p.m.

Invited Speaker

FTuM1, **Design of an Aspheric Refractive Tip for Wide-Angle Immersed Applications,** John Tamkin[1], Amar Kendale[2]; [1]Optical Res. Associates, USA, [2]Guidant Systems, USA. 10/10/2006 10:15 a.m.–10:45 a.m.

▶ Theme 3: Laser Guide Star Technology for Adaptive Optics

Technical Session

FWL, **Laser Guide Star Technology for Adaptive Optics II,** 10/11/2006 10:15 a.m.–11:30 a.m.

Invited Speakers

FWF2, **Single Frequency Sodium Guidestar Excitation at the Starfire Optical Range,** Craig A. Denman, Paul D. Hillman, Gerald T. Moore, John M. Telle, Jack D. Drummond, Steven J. Novotny, Mark L. Eickhoff, Robert Q. Fugate; AFRL, USA. 10/11/2006 8:45 a.m.–9:15 a.m.

FWL1, **The Challenge of Laser Guide Stars Technology for Astronomy,** Edward Kibblewhite; Univ. of Chicago, USA. 10/11/2006 10:15 a.m.–10:45 a.m.

FWL2, **Advanced Sodium Guide Star Technology Development,** Deanna M. Pennington, Jay W. Dawson, Alex Drobshoff, Scott Mitchell, Aaron Brown; Lawrence Livermore Natl. Lab, USA. 10/11/2006 10:45 a.m.–11:15 a.m.

Tutorial Speaker

FWF1, **A Quarter Century of Adaptive Optics at the Starfire Optical Range,** *Robert Q. Fugate; NM Inst. of Mining and Technology, USA.* 10/11/2006 8:00 a.m.–8:45 a.m.

▶ Theme 4:
Image-Based Wavefront Sensing and Control

Technical Sessions

FMF, **Image-Based Wavefront Sensing I,** 10/9/2006 1:30 p.m.–2:45 p.m.

FML, **Image-Based Wavefront Sensing II,** 10/9/2006 3:45 p.m.–5:45 p.m.

FTuY, **General Optical Design and Instrumentation I,** 10/10/2006 4:15 p.m.–6:00 p.m.

Invited Speakers

FMF1, **Robust Wavefront Sensing and Control for Space-Borne Imaging Interferometry and Coronagraphy,** Richard Lyon; NASA Goddard Space Flight Ctr., USA. 10/9/2006 1:30 p.m.–2:00 p.m.

FML2, **Wave Front Sensing by Nonlinear Optimization,** James R. Fienup; Univ. of Rochester, USA. 10/9/2006 4:30 p.m.–5:00 p.m.

FML3, **Phase-Diverse Wavefront Sensing,** Richard Paxman; General Dynamics, USA. 10/9/2006 5:00 p.m.–5:30 p.m.

Tutorial Speaker

FML1, **Introduction to Focus-Diverse Phase Retrieval,** *Bruce H. Dean; NASA, Goddard Space Flight Ctr., USA.* 10/9/2006 3:45 p.m.–4:30 p.m.

▶ Theme 5:
High-Power Optics: State-of-the-Art

Technical Sessions

FTuG, **High-Power Optics: State-of-the-Art I,** 10/10/2006 8:00 a.m.–9:45 a.m.

FTuS, **High-Power Optics: State-of-the-Art II,** 10/10/2006 2:00 p.m.–3:45 p.m.

Invited Speakers

FTuG1, **The National Ignition Facility: Overview and Optical Engineering Challenges,** J. Nan Wong; Lawrence Livermore Natl. Lab, USA. 10/10/2006 8:00 a.m.–8:30 a.m.

FTuG2, **High Average Power Optical Systems for the Jefferson Lab FEL,** Michelle D. Shinn; Thomas Jefferson Natl. Accelerator Facility, USA. 10/10/2006 8:30 a.m.–9:00 a.m.

FTuG3, **Optics for X-Ray FEL,** John Arthur; SLAC-LCLS, USA. 10/10/2006 9:00 a.m.–9:30 a.m.

FTuS1, **Ion Beam Sputtered Optical Coating for High Fluence Applications,** Gary DeBell; MLD Technologies, LLC, USA. 10/10/2006 2:00 p.m.–2:30 p.m.

FTuS2, **New and Improved Technologies for the OMEGA EP High-Energy Petawatt Laser,** Jonathan Zuegel, V. Bagnoud, S. W. Bahk, I. A. Begishev, J. Bromage, J. Bunkenburg, S. Dalton, C. Dorrer, L. Folnsbee, M. J. Guardalben, P. A. Jaanimagi, R. Jungquist, T. J. Kessler, J. H. Kelly, B. E. Kruschwitz, S. J. Loucks, D. N. Maywar, D. D. Meyerhofer, S. F. B. Morse, J. B. Oliver, J. Qiao, J. Puth, A. L. Rigatti, A. W. Schmid, M. J. Shoup; Lab for Laser Energetics, Univ. of Rochester, USA. 10/10/2006 2:30 p.m.–3:00 p.m.

▶ Theme 6:
General Optical Design and Instrumentation

Technical Sessions

FWF, **Laser Guide Star Technology for Adaptive Optics I,** 10/11/2006 8:00 a.m.–9:45 a.m.

FWR, **General Optical Design and Instrumentation II,** 10/11/2006 1:30 p.m.–3:15 p.m.

FWX, **General Optical Design and Instrumentation III,** 10/11/2006 3:45 p.m.–5:45 p.m.

Invited Speakers

FWF3, **The ESO Program and Activities on Laser Guide Stars for Adaptive Optics,** Domenico Bonaccini; ESO, Germany. 10/11/2006 9:15 a.m.–9:45 a.m.

FWR1, **High Luminance Optical Film with Improved Cosmetic Appearance,** Junwon Lee, Stephen Meissner, Ronald Sudol; Eastman Kodak Co., USA. 10/11/2006 1:30 p.m.–2:00 p.m.

Short Course

SC254, **Optimal Marriage of Wave and Ray Optics in Paraxial Imaging System Analysis,** William T. Rhodes; Georgia Tech, USA. 10/8/2006 1:30 p.m.–5:00 p.m.

DIVISION 2—OPTICAL SCIENCES

▶ Theme 1:
Metamaterials and Negative Refraction

Technical Sessions

FMA, **Photonic Metamaterials I,** 10/9/2006 1:30 p.m.–3:15 p.m.

FMH, **Metamaterials and Negative Refraction I,** 10/9/2006 3:45 p.m.–5:30 p.m.

FTuB, **Photonic Metamaterials II,** 10/10/2006 8:00 a.m.–9:45 a.m.

FTuC, **Metamaterials and Negative Refraction II,** 10/10/2006 8:00 a.m.–9:45 a.m.

Invited Speakers

FMH1, **Negative Refraction in Si-Based 2-D Photonic Crystal Structures,** Won Park[1], E. Schonbrun[1], Q. Wu[1], Y. Yamashita[2], C. J. Summers[2], M. Tinker[3], Y. Cui[3], J. B. Lee[3]; [1]Colorado Univ., USA, [2]Georgia Tech, USA, [3]Univ. of Texas at Dallas, USA. 10/9/2006 3:45 p.m.–4:15 p.m.

FTuB1, **Multi-Wave Interaction in Nanostructured Materials,** Ildar R. Gabitov; Univ. of Arizona, USA. 10/10/2006 8:00 a.m.–8:30 a.m.

Tutorial Speaker

FMA1, **Photonic Metamaterials: Optics Starts Walking on Two Feet,** *Martin Wegener; DFG-Ctr. for Functional Nanostructures, Univ. Karlsruhe (TH), Germany.* 10/9/2006 1:30 p.m.–2:15 p.m.

▶ Theme 2:
Periodic Structures: Photonic Band Engineering, Nonlinearity and QED Effects

Technical Sessions

FTuI, **Metamaterial Structures: Photonic Band Engineering I,** 10/10/2006 10:15 a.m.–12:00 p.m.

FTuO, **Metamaterial Structures: Photonic Band Engineering II,** 10/10/2006 2:00 p.m.–3:45 p.m.

FThA, **Photonic Crystals and Solitons,** 10/12/2006 8:00 a.m.–9:45 a.m.

FThL, **Optical Chip and Nonlinear Metamaterials,** 10/12/2006 1:30 p.m.–3:15 p.m.

Invited Speakers

FTuI1, **Slow Light Engineering in Photonic Crystals,** Toshihiko Baba, D. Mori, S. Kubo, T. Kawasaki; Yokohama Nation. Univ., Japan. 10/10/2006 10:15 a.m.–10:45 a.m.

FTuI2, **Photonic Bands, Non-Reciprocity and Plasmons,** Shanhui Fan; Stanford Univ., USA. 10/10/2006 10:45 a.m.–11:15 a.m.

FTuO1, **Manipulation of Photons by Photonic Crystals,** Susumu Noda; Kyoto Univ., Japan. 10/10/2006 2:00 p.m.–2:30 p.m.

FThL1, **Chip-Scale All-Optical Group Delay,** Yurii Vlasov, Fengnian Xia, Lidija Sekaric, Erik Dulkeith, Solomon Assefa, William Green, Martin O'Boyle, Hendrik Hamann, Sharee McNab; IBM Thomas J. Watson Res. Ctr., USA. 10/12/2006 1:30 p.m.–2:00 p.m.

Short Course

SC235, **Nanophotonics: Design, Fabrication and Characterization,** Joseph W. Haus, Andrew Sarangan, Qiwen Zhan; Univ. of Dayton, USA. 10/8/2006 9:00 a.m.–12:30 p.m.

▶ Theme 3:
Disordered Structures: Coherence, Localization, Lasing and Optical Chaos

Technical Sessions

FTuU, **Disordered Structures: Coherence, Localization and Lasing I,** 10/10/2006 4:15 p.m.–6:00 p.m.

FWY, **Photonic Metamaterials III,** 10/11/2006 3:45 p.m.–5:30 p.m.

FThB, **Disordered Structures: Coherence, Localization and Lasing II,** 10/12/2006 8:00 a.m.–9:45 a.m.

Invited Speakers

FTuU1, **Random Lasing,** Gregor Hackenbroich[1], Carlos Viviescas[2], Fritz Haake[3]; [1]SAP Res., SAP AG, Germany, [2]MPIPKS, Germany, [3]Univ. of Duisburg-Essen, Germany. 10/10/2006 4:15 p.m.–4:45 p.m.

FWY1, **Statistics of Resonances and Delay Times in High Dimensional Random Media,** Tsampikos Kottos; Wesleyan Univ., USA. 10/11/2006 3:45 p.m.–4:15 p.m.

FThB1, **Dynamic Link between Mesoscopic Fluctuations and Photon Localization,** Azriel Genack[1], Andrey A. Chabanov[2], Bing Hu[1], Sheng Zhang[1]; [1]Queens College of CUNY, USA, [2]Univ. of Texas at San Antonio, USA. 10/12/2006 8:00 a.m.–8:30 a.m.

FThB3, **Conquering Surface Plasmon Resonance Loss in Metallic Nanoparticles,** Mikhail A. Noginov; Norfolk State Univ., USA. 10/12/2006 8:45 a.m.–9:15 a.m.

▶ Theme 4:
X-ray, XUV Generation and Relativistic Electrons from Laser Interactions with Matter

Technical Sessions

JTuB, **XUV Sources and Science,** 10/10/2006 2:00 p.m.–3:45 p.m.

JWG, **Atoms in Strong and Ultrastrong Fields II,** 10/11/2006 3:45 p.m.–5:30 p.m.

Invited Speakers

JWG1, **Relativistic Optics: A New Approach to Attosecond Physics,** Gerard Mourou; Univ. of Michigan, USA. 10/11/2006 3:45 p.m.–4:15 p.m.

JThB1, **GeV Laser-Plasma Electron Acceleration in a cm-Scale Capillary Waveguide,** Kei Nakamura[1], Csaba Toth[1], Bob Nagler[1], Cameron G. R. Geddes[1], Carl B. Schroeder[1], Eric H. Esarey[1], Wim P. Leemans[1], Anthony J. Gonsalves[2], Simon M. Hooker[2]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Univ. of Oxford, UK. 10/12/2006 8:00 a.m.–8:30 a.m.

JThB4, **High Repetition Rate Soft X-Ray Lasers: A Doorway to Coherent Soft X-Ray Science on a Tabletop,** Jorge Rocca[1], Yong Wang[1], Miguel Larotonda[1], Bradley Luther[1], David Alessi[1], Mark Berrill[1], Scott Heinbuch[1], Mario C. Marconi[1], Vyacheslav Shlyaptsev[2], Carmen S. Menoni[1]; [1]Colorado State Univ. at Fort Collins, USA, [2]Univ. of California at Davis, USA. 10/12/2006 9:00 a.m.–9:30 a.m.

▶ Theme 5: Atoms, Molecules and Dynamics in Strong Fields

Technical Sessions

JTuA, **Molecules and Clusters in Strong Fields,** 10/10/2006 10:15 a.m.–12:00 p.m.

JWE, **Atoms in Strong and Ultrastrong Fields I,** 10/11/2006 1:30 p.m.–3:15 p.m.

Invited Speakers

JTuC1, **Observation of Intra-Molecular Vibrational Dynamics Using High-Harmonic Generation as a Probe,** Margaret Murnane, Henry C. Kapteyn, Nicholas L. Wagner, Andrea Wuest, Ivan P. Christov; Univ. of Colorado at Boulder, USA. 10/10/2006 4:15 p.m.–4:45 p.m.

JWE1, **Strong-Field In-Plane Triple Ionization: Model Atom Time-Dependence,** Joseph Eberly, Phay J. Ho; Univ. of Rochester, USA. 10/11/2006 1:30 p.m.–2:00 p.m.

JWE3, **Correlated Electron Dynamics in Intense Fields,** Zengxiu Zhao, Thomas Brabec; Univ. of Ottawa, Canada. 10/11/2006 2:30 p.m.–3:00 p.m.

JTuA3, **Spinning Tops in External Fields: Nonadiabatic Alignment in Complex Systems,** Sesha Ramakrishna, Edward Hamilton, Adam Pelzer, Tamar Seideman; Northwestern Univ., USA. 10/10/2006 11:00 a.m.–11:30 a.m.

▶ Theme 6: Attosecond Sciences and Coherent Control

Technical Sessions

JWA, **Attosecond Laser Science I,** 10/11/2006 8:00 a.m.–9:45 a.m.

JWB, **Attosecond Laser Science II,** 10/11/2006 10:15 a.m.–12:00 p.m.

Invited Speakers

JWA4, **Attosecond Pulses for Probing the Time-Resolved Two-Electron Dynamics in Helium Atoms,** Chii Dong Lin[1], Toru Morishita[2], Shin Watanabe[2]; [1]Kansas State Univ., USA, [2]Univ. of Electrocommnications, Japan. 10/11/2006 9:15 a.m.–9:45 a.m.

JWB2, **Ultrafast Science with Attosecond Optical Pulses,** Markus Drescher; Univ. Hamburg, Inst. für Experimentalphysik, Germany. 10/11/2006 10:45 a.m.–11:15 a.m.

JWB4, **Monitoring Electron Motion in Molecules on "Attosecond" Time Scales,** Andre Bandrauk, Stefan Chelkowski, Gennady Yudin; Univ. de Sherbrooke, Canada. 10/11/2006 11:30 a.m.–12:00 p.m.

Tutorial Speaker

JWA1, **The Physics of Attosecond Pulses: Generation, Characterization and Attosecond Science,** *Lou DiMauro; Ohio State Univ., USA.* 10/11/2006 8:00 a.m.–8:45 a.m.

▶ Theme 7: Ultrafast Laser Science

Technical Sessions

JTuC, **Atoms and Molecules in Laser Fields,** 10/10/2006 4:15 p.m.–6:00 p.m.

FThM, **Single Cycle Pulses and Pulse Measurement,** 10/12/2006 1:30 p.m.–3:00 p.m.

JThB, **Laser Plasmas and Filaments,** 10/12/2006 8:00 a.m.–9:45 a.m.

JThD, **Attosecond and High Harmonic Generation,** 10/12/2006 10:15 a.m.–12:15 p.m.

Invited Speaker

JTuC2, **New Applications of Intense Femtosecond Laser Filamentation: Efficient Generation of Tunable Few Cycle Pulses and Remote Sensing of Chem-Bio Agents,** See Leang Chin[1], Francis Théberge[1], Huailiang Xu[1], Qi Luo[1], Weiwei Liu[1], S. Abbas Hosseini[1], Mehdi Sharifi[1], Jean-François Daigle[1], Neset Akozbek[2], Andreas Becker[3], Gilles Roy[4], Pierre Mathieu[4]; [1]Univ. Laval, Canada, [2]Time Domain Corp, USA, [3]Max Planck Inst. for the Physics of Complex Systems, Germany, [4]Defence Res. and Development Canada-Valcartier, Canada. 10/10/2006 4:45 p.m.–5:15 p.m.

Short Course

SC155, **The Measurement of Ultrashort Laser Pulses,** Rick Trebino; Georgia Tech, USA. 10/8/2006 1:30 p.m.–5:00 p.m.

▶ Theme 8: General Optical Sciences

Technical Sessions

FThF, **Photonic Metamaterials IV,** 10/12/2006 10:15 a.m.–12:00 p.m.

FThG, **General Optics I,** 10/12/2006 10:15 a.m.–12:15 p.m.

FThQ, **General Optics II,** 10/12/2006 1:30 p.m.–3:15 p.m.

Invited Speaker

FMA3, **Advanced Optical Negative Index Materials,** Richard Osgood, Nicolae Panoiu, Rohit Chatterjee, Kai Liu, Chee-Wei Wong; Columbia Univ., USA. 10/9/2006 2:30 p.m.–3:00 p.m.

DIVISION 3—OPTICS IN BIOLOGY AND MEDICINE

▶ Theme 1: Ultrafast Lasers in Medicine and Biology

Technical Sessions

FWD, **Ultrafast Lasers in Medicine and Biology I,** 10/11/2006 8:00 a.m.–9:45 a.m.

FWJ, **Ultrafast Lasers in Medicine and Biology II,** 10/11/2006 10:15 a.m.–12:00 p.m.

Invited Speakers

FWD2, **Cells, Tissues and CARS,** Vishnu V. Krishnamachari[1], Esben R. Andresen[2], Eric Olaf Potma[1]; [1]Univ. of California at Irvine, USA, [2]Univ. of Aarhus, Denmark. 10/11/2006 8:45 a.m.–9:15 a.m.

FWJ4, **Stroking the Synapse: Insight into Ischemic Damage and Recovery from in vivo 2-Photon Imaging of Individual Synapses,** Timothy H. Murphy; Univ. of British Columbia, Canada. 10/11/2006 11:15 a.m.–11:45 a.m.

Tutorial Speaker

FWD1, **On the Versatility of Nonlinear Microscopy,** *Warren Zipfel; Cornell Univ., USA*. 10/11/2006 8:00 a.m.–8:45 a.m.

▶ Theme 2: Advances in Macroscopic Optical Imaging

Technical Sessions

FWP, **Advances in Macroscopic Optical Imaging I,** 10/11/2006 1:30 p.m.–3:00 p.m.

FWV, **Advances in Macroscopic Optical Imaging II,** 10/11/2006 3:45 p.m.–5:30 p.m.

Invited Speakers

FWP2, **Diffuse Optical Imaging in Scattering Media with Highly Contrasted Absorption Coefficients: Application to Small Animal Imaging,** Philippe Rizo[1], Jean-Marc Dinten[1], Philippe Peltié[1], Jean-Luc Coll[2], Anabela Da Silva[1], Lionel Hervé[1], Jerome Boutet[1], Michel Berger[1], Anne Koenig[1], Véronique Josserand[3]; [1]CEA-DRT-Léti , France, [2]Inserm U578, France, [3]ANIMAGE, France. 10/11/2006 1:45 p.m.–2:15 p.m.

FWP4, ***In vivo* Applications of Diffuse Optical Imaging and Spectroscopy,** Sergio Fantini[1], Angelo Sassaroli[1], Yunjie Tong[1], Ning Liu[1], Debbie Chen[1], Yang Yu[1], Jeffrey M. Martin[1], Peter R. Bergethon[2], Perry F. Renshaw[3], Blaise deB. Frederick[3]; [1]Tufts Univ., USA, [2]Boston Univ. School of Medicine, USA, [3]McLean Hospital, USA. 10/11/2006 2:30 p.m.–3:00 p.m.

FWV1, **The Inverse Source Problem of the Equation of Radiative Transfer in Fluorescence and Bioluminescence Tomography,** Alexander Klose; Columbia Univ., USA. 10/11/2006 3:45 p.m.–4:15 p.m.

FWV2, **Optical Tomography with Large Data Sets,** John C. Schotland; Univ. of Pennsylvania, USA. 10/11/2006 4:15 p.m.–4:45 p.m.

▶ Theme 3: Leveraging Spectroscopic Biosignatures

Technical Sessions

FTuK, **Leveraging Spectroscopic Signatures I,** 10/10/2006 10:15 a.m.–12:15 p.m.

FTuQ, **Leveraging Spectroscopic Signatures II,** 10/10/2006 2:00 p.m.–3:45 p.m.

Invited Speakers

FTuK2, **Interpreting Light Scattering from Cells Subjected to Oxidative Stress,** Jeremy D. Wilson, Thomas H. Foster; Univ. of Rochester, USA. 10/10/2006 10:30 a.m.–11:00 a.m.

FTuK4, **New Twists and Turns for Confocal Raman Microscopy,** Andrew J. Berger, Zachary J. Smith; Univ. of Rochester, USA. 10/10/2006 11:15 a.m.–11:45 a.m.

FTuQ2, **Single Cell Partial Wave Spectroscopy: Understanding Alterations of Intracellular Nanoarchitecture in Cancer,** Vadim Backman, Yang Liu, Prabhakar Pradhan, Young Kim, Xu Li, Allen Taflove, Hemant Roy, Randall Brand; Northwestern Univ., USA. 10/10/2006 2:15 p.m.–2:45 p.m.

FTuQ3, **Cost Effective Evaluation of Cervical Cancer Using Reflectance and Fluorescence Spectroscopy,** Shabbir Bambot, Mark L. Faupel, David Mongin, Brenda Schultz, Roger Milliken, Rick Fowler; Guided Therapeutics Inc., USA. 10/10/2006 2:45 p.m.–3:15 p.m.

▶ Theme 4:
General Optics in Biology and Medicine

Technical Sessions

FTuE, **Scattering and Tissue Properties,** 10/10/2006 8:00 a.m.–9:45 a.m.

FTuW, **Microscopy and Optical Trapping,** 10/10/2006 4:15 p.m.–6:00 p.m.

JWC, **Spectroscopic Imaging for Disease Diagnostics,** 10/11/2006 10:15 a.m.–12:15 p.m.

JWF, **Novel Microscopies for Medicine and Biology I,** 10/11/2006 1:30 p.m.–3:00 p.m.

JWH, **Novel Microscopies for Medicine and Biology II,** 10/11/2006 3:45 p.m.–5:30 p.m.

JThA, **Optical Imaging of Response to Therapy I,** 10/12/2006 8:00 a.m.–9:45 a.m.

JThC, **Optical Imaging of Response to Therapy II,** 10/12/2006 10:15 a.m.–12:00 p.m.

Invited Speaker

FWJ1, **Dissecting Tumor and Vascular Biology Using Multi-Photon Laser Scanning Microscopy,** Dai Fukumura; Massachusetts General Hospital, USA. 10/11/2006 10:15 a.m.–10:45 a.m.

Short Course

SC253, **Medical Imaging and Beyond,** Arthur Gmitro; Univ. of Arizona, USA. 10/8/2006 9:00 a.m.–12:30 p.m.

DIVISION 4—OPTICS IN INFORMATION SCIENCE

▶ Theme 1:
A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art: A Tribute to Emmett Leith

Technical Sessions

FTuA, **A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art I: A Tribute to Emmett Leith,** 10/10/2006 8:00 a.m.–9:45 a.m.

FTuH, **A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art II: A Tribute to Emmett Leith,** 10/10/2006 10:15 a.m.–12:15 p.m.

FTuN, **A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art III: A Tribute to Emmett Leith,** 10/10/2006 2:00 p.m.–3:45 p.m.

Invited Speakers

FTuA1, **Emmett Leith and the Solidification of a Communications Viewpoint in Optics,** Joseph W. Goodman; Stanford Univ., USA. 10/10/2006 8:00 a.m.–8:30 a.m.

FTuA2, **Emmett's Question,** Adolf Lohmann; Univ. Erlangen-Nuremberg, Germany. 10/10/2006 8:30 a.m.–9:00 a.m.

FTuA3, **Profiting from Leith's Inventions,** Ken Haines; Consultant, USA. 10/10/2006 9:00 a.m.–9:30 a.m.

FTuH1, **A History of the Optics Group at the Univ. of Michigan's Willow Run Lab,** Kim A. Winick; EECS Dept., Univ. of Michigan, USA. 10/10/2006 10:15 a.m.–10:45 a.m.

FTuH2, **A Brief History of Holographic Interferometry,** Karl A. Stetson; HoloMetrology, LLC, USA. 10/10/2006 10:45 a.m.–11:15 a.m.

FTuH3, **Planar Holographic Elements for Compact Displays,** A. A. Friesem; Weizmann Inst. of Science, Israel. 10/10/2006 11:15 a.m.–11:45 a.m.

FTuN1, **Diffractive Optics Meets Electro-Optics: A Review of Holography's Impact on Electro-Optic Devices,** James R. Leger; Univ. of Minnesota, USA. 10/10/2006 2:00 p.m.–2:30 p.m.

FTuN2, **Holography and Education,** Tung Jeong; Integraf LLC, USA. 10/10/2006 2:30 p.m.–3:00 p.m.

▶ Theme 2:
Diffractive Micro- and Nanostructures for Sensing and Information Processing

Technical Sessions

FMC, **Diffractive Micro- and Nanostructures for Sensing and Information Processing I,** 10/9/2006 1:30 p.m.–3:15 p.m.

FTuT, **Diffractive Micro- and Nanostructures for Sensing and Information Processing II,** 10/10/2006 4:15 p.m.–6:00 **p.m.**

FWC, **Diffractive Micro- and Nanostructures for Sensing and Information Processing III,** 10/11/2006 8:00 a.m.–9:45 a.m.

FWI, **Diffractive Micro- and Nanostructures for Sensing and Information Processing IV,** 10/11/2006 10:15 a.m.–12:00 p.m.

Invited Speakers

FMC1, **Modulated Optical Crystals as Computer-Generated Volume Holograms,** Rafael Piestun; Univ. of Colorado at Boulder, USA. 10/9/2006 1:30 p.m.–2:00 p.m.

FTuT1, **From Diffractive Optics to Nano-Optics,** Hans Peter Herzig, Iwan Marki, Toralf Scharf; Univ. Neuchatel, Switzerland. 10/10/2006 4:15 p.m.–4:45 p.m.

FWC1, **Fourier Modal Method for the Analysis of Optical Nano-Devices,** Philippe Lalanne, Jean-Paul Hugonin; IOTA, France. 10/11/2006 8:00 a.m.–8:30 a.m.

FWI1, **Subwavelength Optics: From Expanding Scalar Optics Limits to On-Chip Integration,** Uriel Levy, Maxim Abashin, Kazuhiro Ikeda, Hyo-Chang Kim, Chia-Ho Tsai, Yeshaiahu Fainman; Univ. of California at San Diego, USA. 10/11/2006 10:15 a.m.–10:45 a.m.

▶ Theme 3:
Computational Imaging

Technical Sessions

FMB, **Computational Imaging I,** 10/9/2006 1:30 p.m.–3:15 p.m.

FMI, **Computational Imaging II,** 10/9/2006 3:45 p.m.–5:30 p.m.

FWH, **Computational Imaging III,** 10/11/2006 10:15 a.m.–12:00 p.m.

FWN, **Computational Imaging IV,** 10/11/2006 1:30 p.m.–3:15 p.m.

FWT, **Computational Imaging V,** 10/11/2006 3:45 p.m.–5:45 p.m.

Invited Speakers

FMB1, **Compressive Sampling in Spectral Imaging Systems,** David Brady; Duke Univ., USA. 10/9/2006 1:30 p.m.–2:00 p.m.

FMI1, **3-D Information Retrieval Aided by Diffraction,** Rafael Piestun, Adam Greengard; Univ. of Colorado at Boulder, USA. 10/9/2006 3:45 p.m.–4:15 p.m.

FWH1, **Integration of Sensing and Processing in Computational Imaging,** Dennis Healy; Univ. of Maryland, USA. 10/11/2006 10:15 a.m.–10:45 a.m.

FWH2, **Computation Imaging: Old Wine in New Bottles?,** Ravindra Anant Athale[1], Joseph N. Mait[2], Gary W. Euliss[1]; [1]MITRE Corp., USA, [2]US ARLs, USA. 10/11/2006 10:45 a.m.–11:15 a.m.

FWN1, **Recent Results of Integrated Sensing and Processing Using a Programmable Imaging Sensor,** Abhijit Mahalanobis, Robert Muise; Lockheed-Martin, USA. 10/11/2006 1:30 p.m.–2:00 p.m.

FWT1, **3-D Nanophotonics for Computational Imaging,** George Barbastathis; MIT, USA. 10/11/2006 3:45 p.m.–4:15 p.m.

FWT2, **Improved Performance in Miniature Cameras through Wavefront CodingTM,** Chris Linnen, Ed Dowski; CDM Optics Inc., USA. 10/11/2006 4:15 p.m.–4:45 p.m.

Short Course

SC273, **Superresolution Theory and Applications,** Charles L. Matson; AFRL, USA. 10/8/2006 9:00 a.m.–12:30 p.m.

▶ Theme 4:
Silicon and III-V Based Optoelectronics for Optical Interconnects: Challenges and Solutions

Technical Sessions

FWO, **Silicon and III-V Based Optoelectronics for Optical Interconnects I,** 10/11/2006 1:30 p.m.–3:15 p.m.

FWU, **Silicon and III-V Based Optoelectronics for Optical Interconnects II,** 10/11/2006 3:45 p.m.–5:30 p.m.

Invited Speakers

FWO1, **Photonics in Computing: Interconnects and Beyond,** Sadik Esener, Pengyue Wen; Univ. of California at San Diego, USA. 10/11/2006 1:30 p.m.–2:00 p.m.

FWO4, **CMOS Photonics™ Technology: Enabling Optical Interconnect,** Cary Gunn; Luxtera, USA. 10/11/2006 2:30 p.m.–3:00 p.m.

FWU1, **Silicon Microphotonics: Technology Elements and the Roadmap to Implementation,** Lionel Kimerling; MIT, USA. 10/11/2006 3:45 p.m.–4:15 p.m.

▶ Theme 5:
Optics for Multimedia and Immersive Environments

Invited Speaker

FWB5, **To Be Announced,** Mohan Trivedi; Univ. of California at San Diego, USA. 10/11/2006 9:30 a.m.–10:00 a.m.

▶ Theme 6:
Optical Computing

Technical Session

FWB, **Optical Computing,** 10/11/2006 8:00 a.m.–10:00 a.m.

Invited Speakers

FWB3, **Programmable Photonic Integrated Circuitry for Optical Signal Processing,** Duncan MacFarlane[1], Jiang Tong[1], L. Roberts Hunt[1], Issa Panahi[1], Kent Wade[1], Manasi Peshave[1], Gary A. Evans[2], Marc P. Christensen[2]; [1]Univ. of Texas at Dallas, USA, [2]Southern Methodist Univ., USA. 10/11/2006 8:30 a.m.–9:00 a.m.

FWB4, **Nonlinear Optics for Solving Problems in Fluid Dynamics,** Demetri Psaltis; Caltech, USA. 10/11/2006 9:00 a.m.–9:30 a.m.

▶ Theme 7:
General Optics in Information Science

Short Course

SC252, **Phase-Space Representations in Optics: Fundamentals and Applications,** Markus Testorf[1], Jorge Ojeda-Castañeda[2]; [1]Dartmouth College, USA, [2]Univ. de las Americas, Mexico. 10/8/2006 9:00 a.m.–12:30 p.m.

DIVISION 5—PHOTONICS

▶ Theme 1:
Advanced Optical Amplifiers

Technical Sessions

FWA, **High-Power and Fiber Amplifiers,** 10/11/2006 8:00 a.m.–9:45 a.m.

FWG, **Semiconductor and Raman Amplifiers,** 10/11/2006 10:15 a.m.–12:00 p.m.

Invited Speakers

FWA5, **Overcoming Nonlinearities in High-Power Fiber Amplifiers and Lasers,** Almantas Galvanauskas; Univ. of Michigan, USA. 10/11/2006 9:00 a.m.–9:30 a.m.

FWG4, **Challenges of Raman Amplification,** Yoshihiro Emori[1], Shu Namiki[2]; [1]Furukawa Electric Co., Ltd., Japan, [2]Natl. Inst. of Advanced Industrial Science and Technology, Japan. 10/11/2006 11:15 a.m.–11:45 a.m.

▶ Theme 2:
Novel Photonic Structures

Technical Sessions

FWS, **Slow Light and Photonic Structures,** 10/11/2006 3:45 p.m.–5:30 p.m.

FThC, **Photonic Crystals,** 10/12/2006 8:00 a.m.–9:45 a.m.

FThH, **Nanostructured Materials and Devices,** 10/12/2006 10:15 a.m.–12:00 p.m.

FThK, **Microstructured Waveguides and Devices,** 10/12/2006 1:30 p.m.–3:15 p.m.

Invited Speakers

FWS3, **Wide Band Slow Light Systems Based on Nonlinear Fibers,** Gadi Eisenstein, Evgeny Shumakher, David Dahan, Amnon Willinger, Roy Blit, Nadav Orbach, Amir Nevet; Technion, Israel. 10/11/2006 4:15 p.m.–4:45 p.m.

FThC3, **Modified Spontaneous Emission and Disorder-Induced Optical Scattering in Photonic Crystal Slabs,** Stephen Hughes; Queen's Univ., Canada. 10/12/2006 8:30 a.m.–9:00 a.m.

FThH3, **Modeling and Optimization of Mode-Locked Vertical-External-Cavity Surface-Emitting Diode Lasers,** Josep Mulet, Salvador Balle; Univ. de Illes Balears, Spain. 10/12/2006 11:15 a.m.–11:45 a.m.

FThK5, **Micro-Ring Lasers in Digital Optical Signal Processing,** Martin T. Hill; Technische Univ. Eindhoven, The Netherlands. 10/12/2006 2:30 p.m.–3:00 p.m.

Tutorial Speaker

FThH1, **Optoelectronic Devices Based on Nanostructured Materials,** *Johann Peter Reithmaier; Univ. Kassel, Germany.* 10/12/2006 10:15 a.m.–11:00 a.m.

▶ Theme 3:
Advanced Optical Transmission: High Capacity and Coherent Systems and Techniques

Technical Sessions

FMD, **Advanced Transmission and Impairments,** 10/9/2006 1:30 p.m.–3:15 p.m.

FMJ, **Advanced Transmission and Quantum Communications,** 10/9/2006 3:45 p.m.–5:15 p.m.

Invited Speakers

FMD2, **Electronic Compensation of Linear and Nonlinear Impairments in Phase-Modulated Systems,** Keang-Po Ho[1], Joseph M. Kahn[2]; [1]SiBEAM, USA, [2]Stanford Univ., USA. 10/9/2006 1:45 p.m.–2:15 p.m.

FMD3, **Synchronous Demodulation of Optical Phase Shift Keying in Coherent Systems with DFB Lasers,** Reinhold Noe, Timo Pfau; Univ. Paderborn, Germany. 10/9/2006 2:15 p.m.–2:45 p.m.

FMJ1, **Coherent Technologies for Analog Transmission with Enhanced Linearity,** Willie Ng; HRL Labs, USA. 10/9/2006 3:45 p.m.–4:15 p.m.

Tutorial Speaker

FThI1, **Coherent Optical Communications: Fundamentals and Future Prospects,** *Joseph Kahn, Leonid Kazovsky; Stanford Univ., USA.* 10/12/2006 10:15 a.m.–11:00 a.m.

▶ Theme 4:
All-Optical Networks: Technologies and Systems

Technical Session

FTuV, **All-Optical Signal Processing Techniques,** 10/10/2006 4:15 p.m.–6:00 p.m.

Invited Speakers

FTuP1, **Architecture and Integration Technologies for LASOR: A Label Switched Optical Router,** Daniel Blumenthal; Univ. of California at Santa Barbara, USA. 10/10/2006 2:00 p.m.–2:30 p.m.

FTuV4, **Hybrid Integrated SOA-Based Devices for Optical Signal Processing,** Alistair Poustie; Ctr. for Integrated Photonics, UK. 10/10/2006 5:30 p.m.–6:00 p.m.

Tutorial Speaker

FTuV1, **All-Optical Processing of Novel Modulation Formats Using Semiconductor Optical Amplifiers,** *Wolfgang Freude, Juerg Leuthold, Philipp Vorreau, Andrej Marculescu, Jin Wang, Gunnar Böttger; Univ. of Karlsruhe, Germany.* 10/10/2006 4:15 p.m.–5:00 p.m.

▶ Theme 5:
All-Optical Networks: Technologies and Systems

Technical Sessions

FTuD, **Photofluidics I,** 10/10/2006 8:00 a.m.–9:45 a.m.

FTuJ, **Photofluidics II,** 10/10/2006 10:15 a.m.–12:00 p.m.

Invited Speakers

FTuD1, **Applications of Optical Resonance to Biological Sensing and Imaging,** Selim Unlu, Bennett Goldberg; Boston Univ., USA. 10/10/2006 8:00 a.m.–8:30 a.m.

FTuD4, **Optofluidics for Adaptive Optics and Sensing,** Yeshaiahu Fainman, Uriel Levy, Alex Groisman, Kyle Kampbell, Shayan Mookherjea, Lin Pang, Kevin Tetz; Univ. of California at San Diego, USA. 10/10/2006 9:00 a.m.–9:30 a.m.

FTuJ1, **Micro- and Nanofluid Dynamics in Optofluidic and Nanophotonic Devices,** Sudeep Mandal, Allen Yang, David Erickson; Cornell Univ., USA. 10/10/2006 10:15 a.m.–10:45 a.m.

FTuJ2, **Where Optics and Fluidics Meet,** Axel Scherer, Zhaoyu Zhang, Jiajing Xu, Xiaoliang Zhu; Caltech, USA. 10/10/2006 10:45 a.m.–11:15 a.m.

▶ Theme 6:
General Photonics

Technical Sessions

FTuP, **All-Optical Networks and Systems,** 10/10/2006 2:00 p.m.–3:45 p.m.

FWM, **Microstructures and Waveguides,** 10/11/2006 1:30 p.m.–3:15 p.m.

FThN, **Novel Fibers and Fiber Lasers,** 10/12/2006 1:30 p.m.–3:15 p.m.

Invited Speakers

FTuP5, **Single Channel Transmission beyond 1 Tbit/s,** Reinhold Ludwig; Heinrich-Hertz-Inst., Germany. 10/10/2006 3:15 p.m.–3:45 p.m.

FWG1, **High-Performance Quantum Dot Optoelectronic Devices,** Pallab Bhattacharya, Zetian Mi, Xiaohua Su; EECS Dept., Univ. of Michigan, USA. 10/11/2006 10:15 a.m.–10:45 a.m.

DIVISION 6—QUANTUM ELECTRONICS

▶ Theme 1:
Quantum Optics in Micro- and Nanostructures

Technical Sessions

FTuX, **Quantum Optics in Micro- and Nanostructures I,** 10/10/2006 4:15 p.m.–6:00 p.m.

FWQ, **Quantum Optics in Micro- and Nanostructures II,** 10/11/2006 1:30 p.m.–3:15 p.m.

Invited Speakers

FTuX1, **Microphotonic Technologies for Chip-Scale Cavity QED,** Oskar Painter; Caltech, USA. 10/10/2006 4:15 p.m.–4:45 p.m.

FTuX4, **Cavity QED with Nanocrystals and Silica Microresonators,** Hailin Wang, Young-Shin Park, Andrew K. Cook; Univ. of Oregon, USA. 10/10/2006 5:15 p.m.–5:45 p.m.

FWQ1, **Light Scattering with Entangled Photons,** J. P. Woerdman, A. Aiello, G. Puentes, D. Voigt; Univ. Leiden, Netherlands. 10/11/2006 1:30 p.m.–2:00 p.m.

FWQ2, **Cavity QED with N-V Centers in Diamond,** Charles Santori[1], David Fattal[1], Sean M. Spillane[1], Marco Fiorentino[1], Raymond G. Beausoleil[1], James R. Rabeau[2], Paolo Olivero[2], Andrew D. Greentree[2], Martin Draganski[3], Patrick Reichart[2], Brant C. Gibson[2], Sergey Rubanov[2], David N. Jamieson[2], Steven Prawer[2]; [1]Hewlett-Packard Labs, USA, [2]Univ. of Melbourne, Australia, [3]RMIT Univ., Australia. 10/11/2006 2:00 p.m.–2:30 p.m.

▶ Theme 2: Ultrafast Control of Laser/Matter Interactions

Technical Sessions

FTuF, **Ultrafast Control of Laser/Matter Interactions I,** 10/10/2006 8:00 a.m.–9:45 a.m.

FTuL, **Ultrafast Control of Laser/Matter Interactions II,** 10/10/2006 10:15 a.m.–12:00 p.m.

Invited Speakers

FTuF1, **Control of Quantum Phenomena with Cooperating Photonic and Material Reagents,** Herschel Rabitz; Princeton Univ., USA. 10/10/2006 8:00 a.m.–8:30 a.m.

FTuF2, **Understanding Strong Field Learning Control of Atomic and Molecular Dynamics,** Thomas Weinacht; SUNY Stony Brook, USA. 10/10/2006 8:30 a.m.–9:00 a.m.

FTuL1, **Quantum Control by Ultrafast Dressed State Tailoring,** Matthias Wollenhaupt, Tim Bayer, Andreas Präkelt, C. Sarpe-Tudoran, Thomas Baumert; Univ. Kassel, Germany. 10/10/2006 10:15 a.m.–10:45 a.m.

▶ Theme 3: Coherent and Quantum Optics in Fibers

Technical Sessions

FME, **Coherent and Quantum Optics in Fibers I,** 10/9/2006 1:30 p.m.–3:00 p.m.

FTuR, **Coherent and Quantum Optics in Fibers II,** 10/10/2006 2:00 p.m.–3:45 p.m.

FThI, **Coherent and Quantum Optics in Fibers III,** 10/12/2006 10:15 a.m.–12:00 p.m.

Invited Speakers

FME3, **Coherent Optical Signal Processing in High-Confinement Fibers,** Stojan Radic; Univ. of California at San Diego, USA. 10/9/2006 2:30 p.m.–3:00 p.m.

FTuR1, **Generation of Entangled Photons in Fiber and Their System Applications,** Kyo Inoue[1],[2],[3], Hiroki Takesue[2,3]; [1]Osaka Univ., Japan, [2]NTT Basic Res. Labs, Japan, [3]JST-CREST, Japan. 10/10/2006 2:00 p.m.–2:30 p.m.

FTuR5, **Polarization Squeezing in Fibers,** Ulrik Andersen[1], Joel Heersink[1], Vincent Josse[1], Gerd Leuchs[1], Joel Corney[2], Peter Drummond[2]; [1]Univ. Erlangen, Germany, [2]Univ. of Queensland, Australia. 10/10/2006 3:15 p.m.–3:45 p.m.

FThI2, **Raman Scattering Noise in Phase-Insensitive and Phase-Sensitive Parametric Processes in Fibers,** Paul L. Voss[1],[2], Prem Kumar[3]; [1]Georgia Tech Lorraine, France, [2]Georgia Tech, USA, [3]Northwestern Univ., USA. 10/12/2006 11:00 a.m.–11:30 a.m.

Tutorial Speaker

FME1, **Introduction to Quantum Optics in Crystals and Fibers,** *Peter D. Drummond, J. Corney; ARC Ctr. for Quantum-Atom Optics, Univ. of Queensland, Australia.* 10/9/2006 1:30 p.m.–2:15 p.m.

▶ Theme 4: Nano- and Micro- Enhancement of NLO Effects

Technical Sessions

FWE, **Nano- and Micro-Enhancement of NLO Effects I,** 10/11/2006 8:00 a.m.–9:45 a.m.

FWK, **Nano- and Micro-Enhancement of NLO Effects II,** 10/11/2006 10:15 a.m.–12:30 p.m.

FThO, **Nano- and Micro-Enhancement of NLO Effects III,** 10/12/2006 1:30 p.m.–3:15 p.m.

Invited Speakers

FWE1, **Enhanced Nonlinear Optical Response of Nano- and Micro-Scale Composite Materials,** Robert Boyd; Univ. of Rochester, USA. 10/11/2006 8:00 a.m.–8:30 a.m.

FWE4, **Enhancement of Nonlinear Effects in Slow Light Photonic Structures: Figures of Merit,** Jacob Khurgin; Johns Hopkins Univ., USA. 10/11/2006 9:00 a.m.–9:30 a.m.

FWK4, **Nonlinear Optics in 1D Polymer Structures,** James S. Shirk[1], R. S. Lepkowicz[1], Guy Beadie[1], A. Ranade[2], E. Baer[2], A. Hiltner[2]; [1]NRL, USA, [2]Case Western Reserve Univ., USA. 10/11/2006 11:30 a.m.–12:00 p.m.

FWK5, **Structure-Property Relationships for Organic Nonlinear Optical Materials,** Seth Marder; Georgia Tech, USA. 10/11/2006 12:00 p.m.–12:30 p.m.

FThO1, **Photonic Metamaterials: From Linear to Nonlinear Optics,** Vladimir M. Shalaev[1], Alexander V. Kildishev[1], Thomas A. Klar[2], Vladimir P. Drachev[1], Alexander K. Popov[3]; [1]Purdue Univ., USA, [2]Maximilians-Univ., Germany, [3]Univ. of Wisconsin, USA. 10/12/2006 1:30 p.m.–2:00 p.m.

Tutorial Speaker

FWK1, **Enhancement of NLO Effects in Photonic Crystals,** *Marin Soljacic; MIT, USA*. 10/11/2006 10:15 a.m.–11:00 a.m.

▶ Theme 5:
Ceramic Lasers

Technical Sessions

FMK, **Ceramic Lasers I,** 10/9/2006 3:45 p.m.–5:30 p.m.

FWW, **Ceramic Lasers II,** 10/11/2006 3:45 p.m.–5:30 p.m.

Invited Speakers

FMK1, **Temperature-Tuned Ceramic Lasers for IFE Drivers,** Ken-ichi Ueda; Univ. of Electro-Communications, Japan. 10/9/2006 3:45 p.m.–4:15 p.m.

FMK4, **Comparison of Optical, Mechanical and Thermo-Optical Properties of Oxide Polycrystalline Laser Gain Materials with Single Crystals,** Gregory J. Quarles[1], Vida K. Castillo[1], John Q. Dumm[2], Gary L. Messing[3], Sang-Ho Lee[3]; [1]VLOC Inc., USA, [2]II-VI Inc., USA, [3]Pennsylvania State Univ., USA. 10/9/2006 4:45 p.m.–5:15 p.m.

FWW2, **Ceramic Laser Materials for the Solid-State Heat Capacity Laser,** Thomas Soules; Lawrence Livermore Natl. Lab, USA. 10/11/2006 4:30 p.m.–5:00 p.m.

FWW3, **Fabrication and Properties of Ceramic Laser Materials,** Jasbinder Sanghera[1], Guillermo Villalobos[1], Woohong Kim[2], Brian Sadowski[2], Shyam Bayya[1], Robert Miklos[2], Ishwar Aggarwal[1]; [1]US NRL, USA, [2]SF Associates, USA. 10/11/2006 5:00 p.m.–5:30 p.m.

Tutorial Speaker

FWW1, **Transparent Polycrystalline Materials for Advanced Solid-State Lasers,** *Robert L. Byer; Stanford Univ., USA*. 10/11/2006 3:45 p.m.–4:30 p.m.

▶ Theme 6:
General Quantum Electronics

Technical Session

FThD, **Nonlinear Propagation Effects,** 10/12/2006 8:00 a.m.–9:30 a.m.

DIVISION 7—VISION AND COLOR

▶ Theme 1:
Advances in Understanding Accommodation and Presbyopia Correction

Technical Session

FMN, **Advances in Understanding Accommodation and Presbyopia Correction,** 10/9/2006 4:45 p.m.–6:30 p.m.

Invited Speakers

FMN1, **Dynamics of Accommodation and the Mechanism of Presbyopia in the Primate Eye,** Adrian Glasser; College of Optometry, Univ. of Houston, USA. 10/9/2006 4:45 p.m.–5:15 p.m.

FMN2, **Understanding Human Accommodation and Presbyopia by In Vivo Imaging of the Anterior Segment,** Jane Koretz; Biochemistry and Biophysics Program, Rensselaer Polytechnic Inst., USA. 10/9/2006 5:15 p.m.–5:45 p.m.

FMN3, **Advances in the Design of Intra-Ocular Lenses for Presbyopia Correction,** Alan Lang; ReVision Optics, USA. 10/9/2006 5:45 p.m.–6:15 p.m.

▶ Theme 2:
Advances in Instrumentation for High-Resolution Retinal Imaging

Technical Sessions

FMG, **Advances in Instrumentation for High-Resolution Retinal Imaging I,** 10/9/2006 1:00 p.m.–3:30 p.m.

FMM, **Advances in Instrumentation for High-Resolution Retinal Imaging II,** 10/9/2006 3:45 p.m.–4:30 p.m.

Invited Speakers

FMG1, **MEMS-Based Adaptive-Optics Scanning Laser Ophthalmoscope,** Yuhua Zhang[1], Jacque L. Duncan[2], Brandon Lujan[2], Austin Roorda[1]; [1]School of Optometry, Univ. of California, Berkeley, USA, [2]Ophthalmology Dept., Univ. of California,San Francisco, USA. 10/9/2006 1:00 p.m.–1:30 p.m.

FMG2, **Adaptive Optics High-Resolution Retinal Imaging,** Donald T. Miller; School of Optometry, Indiana Univ., USA. 10/9/2006 1:30 p.m.–2:00 p.m.

FMG3, **Ultrahigh Resolution, Functional Optical Coherence Tomography,** Wolfgang Drexler; Cardiff Univ., UK. 10/9/2006 2:00 p.m.–2:30 p.m.

LASER SCIENCE

Technical Sessions

For joint FiO/LS sessions, see FiO Division 1 (Themes 4–7) and Division 3 (Theme 4).

LMA, **Symposium on Undergraduate Research Posters,** 10/9/2006 12:00 p.m.–2:00 p.m.

LMB, **Symposium on Undergraduate Research I,** 10/9/2006 1:30 p.m.–3:15 p.m.

LMC, **Quantum Degenerate Gases I,** 10/9/2006 1:30 p.m.–3:30 p.m.

LMD, **Optics in Soft Condensed Matter Physics I,** 10/9/2006 1:30 p.m.–3:15 p.m.

LME, **Symposium on Undergraduate Research II,** 10/9/2006 3:45 p.m.–5:30 p.m.

LMF, **Lasers, Amplifiers and Waveguides,** 10/9/2006 3:45 p.m.–6:15 p.m.

LMG, **Quantum Degenerate Gases II,** 10/9/2006 3:45 p.m.–5:45 p.m.

LMH, **Optics in Soft Condensed Matter Physics II,** 10/9/2006 3:45 p.m.–5:30 p.m.

LTuA, **Cold Rydberg Gases,** 10/10/2006 8:00 a.m.–10:00 a.m.

LTuB, **Ultracold Molecules I: Magneto-Association via Feshbach Resonances,** 10/10/2006 8:00 a.m.–9:30 a.m.

LTuC, **Spintronix and Quantum Information I,** 10/10/2006 8:00 a.m.–9:45 a.m.

LTuD, **Quantum Optics I,** 10/10/2006 10:15 a.m.–12:00 p.m.

LTuE, **Ultracold Molecules II: Photoassociative Spectroscopy and Ultracold Molecule Formation,** 10/10/2006 10:15 a.m.–12:15 p.m.

LTuF, **Carbon Nanotube Spectroscopy I,** 10/10/2006 10:15 a.m.–12:30 p.m.

LTuG, **Quantum Optics II,** 10/10/2006 2:00 p.m.–3:45 p.m.

LTuH, **Ultracold Molecules III: New Approaches to Cold Molecules,** 10/10/2006 2:00 p.m.–4:00 p.m.

LTuI, **Spintronix and Quantum Information II,** 10/10/2006 2:00 p.m.–4:00 p.m.

LTuJ, **Light Propagation in Atomic Ensembles,** 10/10/2006 4:15 p.m.–6:15 p.m.

LTuK, **Novel Cooling and Trapping Techniques,** 10/10/2006 4:15 p.m.–6:15 p.m.

LTuL, **Carbon Nanotube Spectroscopy II,** 10/10/2006 4:15 p.m.–6:30 p.m.

LWA, **Quantum Information I,** 10/11/2006 8:00 a.m.–9:45 a.m.

LWB, **Nonlinear Optics of Micro- and Nanoparticles,** 10/11/2006 8:00 a.m.–10:00 a.m.

LWC, **Quantum Optics in Photonic Materials I,** 10/11/2006 8:00 a.m.–10:00 a.m.

LWD, **Quantum Information II,** 10/11/2006 10:15 a.m.–12:00 p.m.

LWE, **Quantum Dots,** 10/11/2006 10:15 a.m.–12:30 p.m.

LWF, **Quantum Measurement and Control,** 10/11/2006 1:30 p.m.–3:15 p.m.

LWG, **Quantum Optics in Photonic Materials II,** 10/11/2006 1:30 p.m.–3:15 p.m.

LWH, **Quantum Imaging,** 10/11/2006 3:45 p.m.–5:30 p.m.

LThA, **Precision and Quantum Enabled Measurements,** 10/12/2006 8:00 a.m.–10:00 a.m.

LThB, **Precision and Quantum Enabled Measurements II,** 10/12/2006 10:15 a.m.–12:15 p.m.

Invited Speakers

LMC1, **Fermionic Superfluidity with Imbalanced Spin Populations,** Christian H. Schunck, Martin W. Zwierlein, André Schirotzek, Yong-il Shin, Wolfgang Ketterle; MIT, USA. 10/9/2006 1:30 p.m.–2:00 p.m.

LMC2, **New States of Matter in Polarized Cold Fermi Atoms,** Joseph Carlson, Sanjay Reddy; Los Alamos Natl. Lab, USA. 10/9/2006 2:00 p.m.–2:30 p.m.

LMC3, **Spatial Deformation in a Phase Separated Fermi Gas,** Guthrie B. Partridge, Wenhui Li, Yean-an Liao, Duong Nguyen, Ramsey I. Kamar, Randall G. Hulet; Rice Univ., USA. 10/9/2006 2:30 p.m.–3:00 p.m.

LMD1, **Surmounting Barriers: The Benefit of Hydrodynamic Interactions,** Clemens Bechinger; Univ. Stuttgart, Germany. 10/9/2006 1:30 p.m.–2:00 p.m.

LMD3, **Colloidal Interactions, Kinetics and Crystallization Due to DNA Hybridization,** John Crocker; Univ. of Pennsylvania, USA. 10/9/2006 2:15 p.m.–2:45 p.m.

LMD4, **Using Confocal Microscopy to Explore Complex Fluids and Biological Materials,** Itai Cohen, Peter Schall, Thomas G. Mason, Frans Spaepen, David A. Weitz, Mark Buckley, Lawrence Bonassar; Cornell Univ., USA. 10/9/2006 2:45 p.m.–3:15 p.m.

LMG1, **Cavity QED with Ultracold Atoms,** Subhadeep Gupta, Kevin L. Moore, Kater W. Murch, Dan M. Stamper-Kurn; Univ. of California at Berkeley, USA. 10/9/2006 3:45 p.m.–4:15 p.m.

LMG2, **Atomtronics: An Ultracold Analogue of Semiconductor Devices,** Murray Holland, B. T. Seaman, M. Kraemer, D. Z. Anderson; JILA/Univ. of Colorado, USA. 10/9/2006 4:15 p.m.–4:45 p.m.

LMG3, **Rotating a Bose-Einstein Condensate Using Photons with Orbital Angular Momentum,** Kristian Helmerson[1], Mikkel Andersen[1], Changhyun Ryu[1], Pierre Cladé[1], Vasant Natarajan[1], Alipasha Vaziri[2], William Phillips[1]; [1]NIST, USA, [2]Inst. für Experimentalphysik, Austria. 10/9/2006 4:45 p.m.–5:15 p.m.

LMH1, **Light Propagation in Colloidal Crystals and Glass: The Role of the Packing Geometry,** Anthony D. Dinsmore, Xiaotao Peng; Univ. of Massachusetts, USA. 10/9/2006 3:45 p.m.–4:15 p.m.

LMH5, **Using Confocal Microscopy to Study the Colloidal Glass Transition,** Eric Weeks; Emory Univ., USA. 10/9/2006 5:00 p.m.–5:30 p.m.

LTuA1, **Using Laser Cooling to Study Plasma Physics,** Steven Rolston, Robert Fletcher, Xianli Zhang; Univ. of Maryland, USA. 10/10/2006 8:00 a.m.–8:30 a.m.

LTuA2, **Interactions and Trapping of Cold Rydberg Atoms,** Georg Raithel; Univ. of Michigan, USA. 10/10/2006 8:30 a.m.–9:00 a.m.

LTuA3, **Interaction between Cold Rydberg Atoms,** Daniel Comparat, Amodsen Chotia, Matthieu Viteau, Thibault Vogt, Jianming Zhao, Pierre Pillet; Lab Aimé Cotton, France. 10/10/2006 9:00 a.m.–9:30 a.m.

LTuB1, **Production of Cold Molecules via Magnetically Tunable Feshbach Resonances,** Thorsten Köhler; Univ. of Oxford, UK. 10/10/2006 8:00 a.m.–8:30 a.m.

LTuB2, **Raman-Induced Oscillation between an Atomic and a Molecular Quantum Gas,** Daniel Heinzen; Univ. of Texas, USA. 10/10/2006 8:30 a.m.–9:00 a.m.

LTuB3, **Tuning the Interactions in an Atomic Fermi-Bose Mixture,** Giovanni Mondugno, Giacomo Roati, Chiara D'Errico, Francesca Ferlaino, Matteo Zaccanti, Massimo Inguscio; LENS/Univ. of Florence, Italy. 10/10/2006 9:00 a.m.–9:30 a.m.

LTuC1, **Imaging and Manipulating Single Spins in Diamond,** David Awschalom, Ronald Hanson, Felix Mendoza, Ryan Epstein; Univ. of California at Santa Barbara, USA. 10/10/2006 8:00 a.m.–8:30 a.m.

LTuC2, **Spin-Based Quantum Information Processing in Diamond,** Fedor Jelezko; Univ. of Stuttgart, Germany. 10/10/2006 8:30 a.m.–9:00 a.m.

LTuC4, **Optical and Electrical Detection of Spin-Polarized Transport,** S. A. Crooker[1], X. Lou[2], M. Furis[1], C. Adelmann[2], D. L. Smith[1], C. J. Palmstrom[2], Paul Crowell[2]; [1]Los Alamos Natl. Lab, USA, [2]Univ. of Minnesota, USA. 10/10/2006 9:15 a.m.–9:45 a.m.

LTuD1, **Generation and Tomographic Analysis of Temporally-Delocalized Single Photons,** Alessandro Zavatta, Valentina Parigi, Milena D'Angelo, Marco Bellini; LENS/Univ. of Florence, Italy. 10/10/2006 10:15 a.m.–10:45 a.m.

LTuD2, **Schrödinger Kittens and Higher-Order Fock States: Generation and Detection of Propagating Light Fields with Negative Wigner Functions,** Alexei Ourjoumtsev, Aurélien Dantan, Rosa Tualle-Brouri, Philippe Grangier; Lab Charles Fabry de l'Inst. d'Optique, France. 10/10/2006 10:45 a.m.–11:15 a.m.

LTuE1, **Photoassociation Spectroscopy of Ultracold Atoms and the Study of "Physicist's Molecules," a Review,** Kevin Jones[1], Eite Tiesinga[2], Paul D. Lett[2], Paul S. Julienne[2]; [1]Williams College, USA, [2]Atomic Physics Div., Natl. Inst. of Standards and Technology, USA. 10/10/2006 10:15 a.m.–10:45 a.m.

LTuE2, **Production, Detection, Spectroscopy and Collisions of Ultracold KRb Molecules,** D. Wang, C. Ashbaugh, Y. Huang, H. K. Pechkis, J. T. Kim, E. E. Eyler, P. L. Gould, William C. Stwalley; Univ. of Connecticut, USA. 10/10/2006 10:45 a.m.–11:15 a.m.

LTuE3, **Photoassociative Spectroscopy of Ultracold NaCs,** Christopher Haimberger, Jan Kleinert, Nicholas P. Bigelow; Univ. of Rochester, USA. 10/10/2006 11:15 a.m.–11:45 a.m.

LTuF2, **Recent Advances in the Photophysics of Carbon Nanotubes and Related Materials,** Mildred S. Dresselhaus; MIT, USA. 10/10/2006 10:30 a.m.–11:00 a.m.

LTuF3, **Optical and Magnetic Anisotropy in Carbon Nanotubes,** Jay Kikkawa; Univ. of Pennsylvania, USA. 10/10/2006 11:00 a.m.–11:30 a.m.

LTuF4, **Nanotube Defects Studied with Near-Field Raman Scattering,** Lukas Novotny[1], Neil Anderson[1], Achim Hartschuh[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Ludwig-Maximilians-Univ., Germany. 10/10/2006 11:30 a.m.–12:00 p.m.

LTuF5, **Measurements of Electron-Phonon Coupling Strengths in Carbon Nanotubes,** Y. Yin[1], A. Vamivakas[1], A. Walsh[1], S. Cronin[2], M. S. Unlu[1], B. B. Goldberg[1], Anna Swan[1]; [1]Boston Univ., USA, [2]Univ. of Southern California, USA. 10/10/2006 12:00 p.m.–12:30 p.m.

LTuH1, **Cold Free-Radical NH Molecules,** Heather Lewandowski, L. Paul Parazzoli, Daniel Lobser; JILA, USA. 10/10/2006 2:00 p.m.–2:30 p.m.

LTuH2, **Making Ultracold Molecules from Ultracold Atoms with Chirped Laser Pulses,** Francoise Masnou-Seeuws; Orsay, France. 10/10/2006 2:30 p.m.–3:00 p.m.

LTuH3, **The Effect of Chirped Femtosecond Laser Pulses on the Formation of Ultracold Molecules in a Magneto-Optical Trap,** Ian Walmsley[1], Alex Dicks[1], Dave McCabe[1], Antoine Monmayrant[1], Ben Brown[2]; [1]Univ. of Oxford, UK, [2]NIST, USA. 10/10/2006 3:00 p.m.–3:30 p.m.

LTuI1, **Restoring Coherence Lost in a Mesoscopic Bath,** L. J. Sham[1], Wang Yao[1], Ren-Bao Liu[2]; [1]Univ. of California San Diego, USA, [2]Chinese Univ. of Hong Kong, China. 10/10/2006 2:00 p.m.–2:30 p.m.

LTuI3, **Spin Based Test-Beds for Quantum Information Processing,** David Cory; MIT, USA. 10/10/2006 2:45 p.m.–3:15 p.m.

LTuI4, **Quantum Measurement and Feedback with Atomic Hyperfine Spins,** Hideo Mabuchi, John J. Stockton, Ramon van Handel, Anthony E. Miller; Caltech, USA. 10/10/2006 3:15 p.m.–3:45 p.m.

LTuJ1, **Large Group Delays and Long Storage Times for Optical Pulses in Atomic Vapor Cells,** Irina Novikova, David F. Phillips, Ronald L. Walsworth; Harvard Smithsonian Ctr. for Astrophysics, USA. 10/10/2006 4:15 p.m.–4:45 p.m.

LTuJ2, **Quantum Control of Single Photons,** Mikhail Lukin; Harvard Univ., USA. 10/10/2006 4:45 p.m.–5:15 p.m.

LTuK1, **Coherent Atoms in a Storage Ring,** Dan Stamper-Kurn; Univ. of California at Berkeley, USA. 10/10/2006 4:15 p.m.–4:45 p.m.

LTuK2, **Precision Measurement Based on Ultracold Atoms and Cold Molecules,** Jun Ye, S. Blatt, M. M. Boyd, S. M. Foreman, E. R. Hudson, T. Ido, B. Lev, A. D. Ludlow, B. C. Sawyer, T. Zelevinsky; JILA/Univ. of Colorado, USA. 10/10/2006 4:45 p.m.–5:15 p.m.

LTuL1, **Excited States and Electroluminescence of Carbon Nanotubes,** Phaedon Avouris; IBM, USA. 10/10/2006 4:15 p.m.–4:45 p.m.

LTuL4, **Exciton Dynamics in Bundled and Unbundled (6,5) Carbon Nanotubes,** Tobias Hertel; Vanderbilt Univ., USA. 10/10/2006 5:15 p.m.– 5:45 p.m.

LTuL5, **Single Carbon Nanotube Photonics and the Role of Excitons,** Todd Krauss, Libai Huang, Zhenjia Wang, Lewis Rothberg; Univ. of Rochester, USA. 10/10/2006 5:45 p.m.– 6:15 p.m.

LWA1, **Scalable Generation of Graph-State Entanglement through Realistic Linear Optics,** Luming Duan, T. P. Bodiya; Univ. of Michigan, USA. 10/11/2006 8:00 a.m.–8:30 a.m.

LWA2, **Light-Matter Interface for Quantum Information,** Brian Kennedy, Stewart Jenkins, O. A. Collins, D. N. Matsukevich, T. Chaneliere, S.-Yu. Lan, A. Kuzmich; Georgia Tech, USA. 10/11/2006 8:30 a.m.– 9:00 a.m.

LWB1, **Equilibrium and Dynamics at Microparticle/Liquid Interfaces,** Kenneth B. Eisenthal; Dept. of Chemistry, Columbia Univ., USA. 10/11/2006 8:00 a.m.–8:30 a.m.

LWB3, **Origin of the Second Harmonic Generation Process in Small Gold and Silver Metallic Particles,** Pierre-François Brevet; Lab de Spectrométrie Ionique et Moléculaire, France. 10/11/2006 8:45 a.m.–9:15 a.m.

LWB4, **Optical Second-Harmonic Spectroscopy of Silicon Nano-Interfaces,** Michael Downer, P. Figliozzi, L. Sun, Jinhee Kwon; Physics Dept., Univ. of Texas, USA. 10/11/2006 9:15 a.m.–9:45 a.m.

LWC1, **Photonic Band Gap Materials: Engineering the Fundamental Properties of Light,** Sajeev John; Dept. of Physics, Univ. of Toronto, Canada. 10/11/2006 8:00 a.m.–8:30 a.m.

LWC3, **Tunable Microcavities in 3-D Photonic Crystals for Single-Photon Emission,** Minghao Qi; Purdue Univ., USA. 10/11/2006 8:45 a.m.–9:15 a.m.

LWD1, **Quantum Simulations in Ion Traps,** Dana Berkeland[1], Malcolm Boshier[1], John Chiaverini[1], D. Lizon[1], Warren Lybarger[1], Robert Scarlett[1], Rolando Somma[1], Kendra Vant[1], Matt Blain[2], B. Jokiel[2], Chris Tigges[2]; [1]Los Alamos Natl. Lab, USA, [2]Sandia Natl. Labs, USA. 10/11/2006 10:15 a.m.–10:45 a.m.

LWD2, **Single Photonics and Quantum Information,** Gerard Milburn; Univ. of Queensland, Australia. 10/11/2006 10:45 a.m.–11:15 a.m.

LWE1, **Photophysical Pathology of Quantum Dots and Slinky Cornell Dots,** Watt Webb; Cornell Univ., USA. 10/11/2006 10:15 a.m.–10:45 a.m.

LWE2, **Cavity QED with Semiconductor Nanocrystals,** Ulrike Woggon[1], N. Le Thomas[1], O. Schops[1], M. V. Artemyev[2], M. Kazes[3], U. Banin[3]; [1]Fachbereich Physik der Univ. Dortmund, Germany, [2]Belarussian State Univ., Belarus, [3]Hebrew Univ. of Jerusalem, Israel. 10/11/2006 10:45 a.m.–11:15 a.m.

LWF1, **Efficient Quantum State Estimation by Continuous Weak Measurement and Dynamic Control,** Andrew Silberfarb[1], Greg A. Smith[2], Ivan H. Deutsch[1], Poul S. Jessen[2]; [1]Univ. of New Mexico, USA, [2]Univ. of Arizona, USA. 10/11/2006 1:30 p.m.–2:00 p.m.

LWF2, **Discrimination between Optical Coherent States via a Closed-Loop Quantum Measurement,** J. M. Geremia; Univ. of New Mexico, USA. 10/11/2006 2:00 p.m.–2:30 p.m.

LWG1, **Quantum and Nonlinear Optics with Few Photons: New Perspectives in Solids and Gases,** Gershon Kurizki; Dept. of Chemical Physics, Weizmann Inst. of Science, Israel. 10/11/2006 1:30 p.m.–2:00 p.m.

LWG2, **Quantum Optics and Quantum Information Processing with Photonic Crystal Devices,** Jelena Vuckovic, Dirk Englund, Hatice Altug, Ilya Fushman, Andrei Faraon, Edo Waks; Edward L. Ginzton Lab, Stanford Univ., USA. 10/11/2006 2:00 p.m.–2:30 p.m.

LWG3, **Controlled Photon Generation in Structured Nonlinear Optical Materials,** M. G. Raymer; Univ. of Oregon, USA. 10/11/2006 2:30 p.m.–3:00 p.m.

LWH1, **Quantum Imaging and Precision Measurements with N00N States,** Jonathan Dowling; Louisiana State Univ., USA. 10/11/2006 3:45 p.m.–4:15 p.m.

LWH2, **Multi-Photon Path-Entangled (e.g. "Noon") States: Issues in Preparation and Measurement,** Aephraim Steinberg; Univ. of Toronto, Canada. 10/11/2006 4:15 p.m.–4:45 p.m.

LThA1, **Quantum Measurement in Gravitational-Wave Detectors,** Yanbei Chen; Max-Planck-Inst. für Gravitationsphysik, Germany. 10/12/2006 8:00 a.m.–8:30 a.m.

LThA2, **To Be Announced,** Mark Kasevich; Stanford Univ., USA. 10/12/2006 8:30 a.m.–9:00 a.m.

LThB1, **Octave Spanning Ti:Sapphire Lasers and Carrier-Envelope Phase Control,** Oliver D. Muecke, Lia Matos, Richard Ell, Franz X. Kaertner; MIT, USA. 10/12/2006 10:15 a.m.–10:45 a.m.

LThB2, **Optical Frequency Metrology and Beyond: New Directions with Femtosecond Frequency Combs,** Scott Diddams; NIST, USA. 10/12/2006 10:45 a.m.–11:15 a.m.

JTuA1, **Imaging Molecular Structure and Dynamics Using Laser Driven Recollisions,** Jon Marangos[1], S. Baker[1], R. Torres[1], N. Kajumba[1], C. Haworth[1], J. Robinson[1], J. W. G. Tisch[1], C. Vozzi[2], F. Calegari[2], E. Benedetti[2], G. Sansone[2], S. Stagira[2], M. Nisoli[2], C. Altucci[3], C. Altucci[4], R. Velotta[4]; [1]Imperial College, UK, [2]Politenico, Italy, [3]Univ. di Napoli, UK, [4]Univ. di Napoli, Italy. 10/10/2006 10:15 a.m.–10:45 a.m.

JTuB3, **Pathways to Photo-Double-Ionization of Xe in Combined XUV and Infrared Laser Pulses,** Horst Rottke[1], Martin Böttcher[1], Nickolai Zhavoronkov[1], Wolfgang Sandner[1], Pierre Agostini[2], Mathieu Gisselbrecht[3], Alain Huetz[3]; [1]Max Born Inst., Germany, [2]Dept. of Physics, Ohio State Univ., USA, [3]LIXAM, Univ. Paris-Sud, France. 10/10/2006 3:00 p.m.–3:30 p.m.

JTuC4, **Attosecond Double-Slit Experiment,** Garhard Paulus; Texas A M Univ., USA. 10/10/2006 5:30 p.m.–6:00 p.m.

JWB1, **Progress in Attosecond Technology-Application to Momentum Shearing Interferometry of Electron WavePackets,** Thierry Ruchon[1], Thomas Remetter[1], Per Johnsson[1], Katalin Varju[1], Erik Gustafsson[1], Johan Mauritsson[1,2], Rodrigo López-Martens[3], Matthias Kling[4], Yongfeng Ni[4], Franck Lépine[4], Jafar Kahn[4], Markus J. J. Vrakking[4], Ken J. Schafer[2], Anne L'Huillier[1]; [1]Lund Univ., Sweden, [2]Dept. of Physics and Astronomy, Louisiana State Univ., USA, [3]LOA, ENSTA, UMR CNRS 7639, France, [4]FOM-Inst. AMOLF, Netherlands. 10/11/2006 10:15 a.m.–10:45 a.m.

JWC1, **Physiologic, Metabolic and Structural Alterations in Breast Cancer: Assessment via Optical Technologies,** Nimmi Ramanujam, J. Quincy Brown; Biomedical Engineering Dept., Duke Univ., USA. 10/11/2006 10:15 a.m.–10:45 a.m.

JWC2, **Plasmonics and Surface-Enhanced Raman Scattering (SERS) Nanoprobes for Biomedical Diagnostics,** Tuan Vo Dinh; Ctr. for Advanced Biomedical Photonics, Oak Ridge Natl. Lab, USA. 10/11/2006 10:45 a.m.–11:15 a.m.

JWC5, **Spectral Encoding: A Novel Platform for Endoscopy and Microscopy,** Caroline Boudoux[1], Dvir Yelin[2], Jason T. Motz[2], Brett E. Bouma[2], Guillermo J. Tearney[2]; [1]Harvard-MIT Div. of HST and Wellman Ctr. for Photomedicine, USA, [2]Wellman Ctr. for Photomedicine, Harvard Medical School, USA. 10/11/2006 11:45 a.m.–12:15 p.m.

JWE2, **Rescattering across Shells and into Ultra-Strong Fields,** S. Palaniyappan, I. Ghebregziabher, A. DiChiara, J. MacDonald, Barry Walker; Univ. of Delaware, USA. 10/11/2006 2:00 p.m.–2:30 p.m.

JWF1, **Far-Field Fluorescence Microscopy at the Macromolecular Scale,** Stefan W. Hell, Katrin Willig, Michael Hofmann, Christian Eggeling, Volker Westphal; Max Planck Inst. for Biophysical Chemistry, Germany. 10/11/2006 1:30 p.m.–2:00 p.m.

JWF2, **Pushing the Sensitivity Limit of CARS Microscopy,** Conor L. Evans, X. Sunney Xie; Harvard Univ., USA. 10/11/2006 2:00 p.m.–2:30 p.m.

JWH1, **Multimodality Microscopy for Structural and Functional Imaging of Three-Dimensional Cell Dynamics,** Stephen A. Boppart; Beckman Inst., Univ. of Illinois at Urbana-Champaign, USA. 10/11/2006 3:45 p.m.–4:15 p.m.

JWH2, **Spectral Domain OCT and Optical Coherence Phase Microscopy,** Johannes F. de Boer; Massachusetts General Hospital, USA. 10/11/2006 4:15 p.m.–4:30 p.m.

JWH3, **New Techniques in Confocal Microscopy,** Jerome Mertz; Boston Univ., USA. 10/11/2006 4:30 p.m.– 4:45 p.m.

JThA1, **Imaging of Intrinsic Optical Stem Cell Changes in Engineered Tissues,** Irene Georgakoudi, William Rice, Shamaraz Firdous, Joshua Mauney, Vladimir Volloch, David Kaplan; Tufts Univ., USA. 10/12/2006 8:00 a.m.–8:30 a.m.

JThA2, **Functional Imaging of Blood Flow in Brain and in Tumors during Therapy,** Turgut Durduran, C. Zhou, G. Yu, U. Sunar, R. Choe, M. G. Burnett, J. Pluta, A. M. Hoang, E. Mahoney-Wilensky, S. A. Bloom, C. Pellegrini, S. Kasner, B. Cucchiara, S. Messe, Q. Shah, J. J. Wang, T. M. Busch, J. H. Greenberg, J. H. Greenberg, J. A. Detre, A. G. Yodh; Univ. of Pennsylvania, USA. 10/12/2006 8:30 a.m.–9:00 a.m.

JThC1, **Photodynamic Tumor Vascular Targeting Enhances Cancer Chemotherapy,** Bin Chen[1], Brian Pogue[2], Jack Hoopes[2], Tayyaba Hasan[3]; [1]Univ. of the Sciences in Philadelphia, USA, [2]Dartmouth College, USA, [3]Harvard Medical School, USA. 10/12/2006 10:15 a.m.–10:45 a.m.

JThC2, **Interstitial Monitoring of Treatment-Induced Functional Tissue Changes,** Alex Vitkin, Beau Standish, Youxin Mao, Nigel Munce, Adrain Mariampillai, George Y. Liu, Heng Li, Daina Burnes, Stephanie E. Chiu, Victor X. D. Yang; Univ. of Toronto / Ontario Cancer Inst., Canada. 10/12/2006 10:45 a.m.–11:15 a.m.

JThD1, **Generation of Attosecond Pulses in Molecules,** Pascal Salieres; Saclay, France. 10/12/2006 10:15 a.m.–10:45 a.m.

JThD3, **High Harmonics Attochirp at Long Wavelength,** Pierre Agostini; Ohio State Univ., USA. 10/12/2006 11:00 a.m.–11:30 a.m.

JThD4, **Broadband Isolated Attosecond XUV Pulses,** Eric Mevel[1], Inigo J. Sola[1], Luc Elouga[1], Eric Constant[1], Vasily Strelkov[2], Luigi Poletto[3], Paolo Villoresi[3], Giuseppe Sansone[4], Enrico Benedetti[4], Jean - Pascal Caumes[4], Salvatore Stagira[4], Catarina Vozzi[4], Mauro Nisoli[4]; [1]CELIA Bordeaux, France, [2]Russian Acad. of Science, Russian Federation, [3]INFM-D.E.I. Univ. di Padova, Italy, [4]INFM, Politecnico, Italy. 10/12/2006 11:30 a.m.–12:00 p.m.

Tutorial Speakers

JTuB1, **Ultrafast X-Ray Sources and Science,** Linda Young; Argonne Natl. Lab, USA. 10/10/2006 2:00 p.m.–2:45 p.m.

LTuG1, **Continuous Variable Teleportation of Gaussian and Non-Gaussian Light,** Howard Carmichael, Changsuk Noh; Univ. of Auckland, New Zealand. 10/10/2006 2:00 p.m.–2:45 p.m.

JOINT FiO/LS POSTER SESSIONS

JSuA, **Welcome Reception and Joint FiO/LS Poster Session I,** 10/8/2006 6:00 p.m.–7:30 p.m.

JWD, **Joint FiO/LS Poster Session II,** 10/11/2006 12:00 p.m.–1:30 p.m.

FiO/LS PLENARY SESSIONS AND FiO SPECIAL SYMPOSIA

JMA, **Joint FiO/LS Plenary Session and Awards Ceremony, Part I: OSA/APS Awards,** 10/9/2006 8:00 a.m.–10:00 a.m. See Page 22 for details and speakers.

JMB, **Joint FiO/LS Plenary Session and Awards Ceremony, Part II: The Energy Problem and What We Can Do about It,** *Steven Chu, Lawrence Berkeley Natl. Lab, USA.* 10/9/2006 10:30 a.m.–11:15 a.m.

JMC, **Joint FiO/LS Plenary Session and Awards Ceremony, Part III: Optics Meets Alzheimer's Disease: Seeing the Way to a Cure,** *Lee E. Goldstein, Harvard Medical School, USA.* 10/9/2006 11:15 a.m.–12:00 p.m.

A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art: A Tribute to Emmett Leith, 10/10/2006, 8:00 a.m.–3:45 p.m.

Best of Topicals, 10/12/2006, 8:00 a.m.–12:00 p.m. See Page 12 for details and speakers.

Commercialization of University and Orphan Technologies, 10/12/2006, 8:00 a.m.–12:00 p.m. See Page 13 for details and speakers.

20 Years of CPA, 10/12/2006, 1:00 p.m.–7:00 p.m. See Page 14 for details and speakers.

Quantum Optics and Quantum Information Teaching Experiments, 10/12/2006, 3:15 p.m.–5:00 p.m. See Page 15 for details and speakers.

OPTICAL FABRICATION AND TESTING

Technical Sessions

OFMA, **Space Optics: Fabrication Solutions for an Extreme Environment,** 10/9/2006 8:00 a.m.–9:45 a.m.

OFMB, **Advances in Optics Fabrication,** 10/9/2006 10:30 a.m.–12:15 p.m.

OFMC, **OF T Main Poster Session,** 10/9/2006 12:30 p.m.–2:00 p.m.

OFMD, **Micro-Optics and Integrated Optics,** 10/9/2006 1:30 p.m.–3:15 p.m.

OFME, **Advances in Surface Finishing,** 10/9/2006 3:45 p.m.–5:45 p.m.

OFMF, **OF T Poster Session Wrap-up,** 10/9/2006 5:45 p.m.–6:00 p.m.

OFTuA, **Fabrication and Testing of Aspheres,** 10/10/2006 8:00 a.m.–9:45 a.m.

OFTuB, **Absolute Testing of Aspheres,** 10/10/2006 10:15 a.m.–12:15 p.m.

OFTuC, **Materials and Material Properties,** 10/10/2006 2:00 p.m.–3:45 p.m.

OFTuD, **Grinding and Polishing,** 10/10/2006 4:15 p.m.–6:00 p.m.

OFWA, **Uncommon Ideas and Often Missed Details: In Memory of Frank Cooke,** 10/11/2006 8:00 a.m.–10:00 a.m.

OFWB, **Optics for Telescopes,** 10/11/2006 10:30 a.m.–12:00 p.m.

OFWC, **Testing I,** 10/11/2006 1:30 p.m.–3:15 p.m.

OFWD, **Testing II,** 10/11/2006 3:45 p.m.–5:15 p.m.

Invited Speakers

OFMA1, **Fabrication of Extremely Lightweight Mirrors,** William Zhang; NASA Goddard Space Flight Ctr., USA. 10/9/2006 8:00 a.m.–8:30 a.m.

OFMA2, **Optical Fabrication of the James Webb Space Telescope Primary Mirror,** Glen Cole[1], Robert Garfield[1], Tracy Peters[1], Wendell Wolff[1], Robert Bernier[1], Craig Kiikka[1], Taha Nassar[1], John Kincade[1], Tony Hull[1], Ben Gallagher[2], Robert J. Brown[2], Andrew McKay[3], Lester M. Cohen[4]; [1]Tinsley Labs Inc., USA, [2]Ball Aerospace Technologies, USA, [3]Northrop Grumman Space Technology, USA, [4]Smithsonian Astrophysical Observatory, USA. 10/9/2006 8:30 a.m.–9:00 a.m.

OFMA3, **Large Aspheric Mirror Fabrication and Testing at CIOMP,** Xue-Jun Zhang; CIOMP, China. 10/9/2006 9:00 a.m.–9:30 a.m.

OFMB1, **Reactive Atom Plasma Processing for Lightweight SiC Mirrors,** Peter Fiske, Yogesh Verma, Andrew Chang, Nick Lyford, Jude Kelley, Phil Sommer, Ning Li, Kurt Pang, George Gardopee, Tom Kyler, John Berrett; RAPT Industries, Inc., USA. 10/9/2006 10:30 a.m.–11:00 a.m.

OFMB2, **Elastic Emission Machining for the Fabrication of X-Ray and EUV Mirrors,** Kazuto Yamauchi; Osaka Univ., Japan. 10/9/2006 11:00 a.m.–11:30 a.m.

OFMB3, **New Lightweight, Low Cost, Replicated Glass Mirrors for Astronomical Telescopes,** David Strafford; ITT, USA. 10/9/2006 11:30 a.m.–12:00 p.m.

OFMD1, **The European Network of Excellence in Micro-Optics (NEMO),** Hugo Thienpont[1], Jürgen Van Erps[1], Malgorzata Kujawinska[2], Jürgen Mohr[3]; [1]Vrije Univ. Brussel, Belgium, [2]Inst. of Micromechanics and Photonics, Warsaw Univ. of Technology, Poland, [3]Inst. fur Mikrostrukturtechnik, Forschungszentrum Karlsruhe, Germany. 10/9/2006 1:30 p.m.–2:00 p.m.

OFMD5, **Recent Advances in Fabrication of Micro-Optics Components and Assemblies,** Jim Morris; Digital Optics Corp., USA. 10/9/2006 2:45 p.m.–3:15 p.m.

OFME1, **Material Response to Micro/Nano Abrasive Processes for Optical Mirrors,** Ling Yin[1], Han Huang[2]; [1]School of Mechanical Engineering, Tianjin Univ., China, [2]School of Engineering, Univ. of Queensland, Australia. 10/9/2006 3:45 p.m.–4:15 p.m.

OFME6, **Advanced Surface Finishing through the Application of Novel CMP Enabling Technology,** Kevin J. Moeggenborg, John Clark, Jeffrey Gilliland, Stanley Lesiak, Roman Salij, Tamara Vincer, Alicia Walters; Cabot Microelectronics Corp., USA. 10/9/2006 5:15 p.m.–5:45 p.m.

OFTuA1, **Medium Precision Geometrical Test for Very Fast Aspheres,** Rufino Diaz-Uribe, Manuel Campos-Garcia; UNAM, Mexico. 10/10/2006 8:00 a.m.–8:30 a.m.

OFTuB1, **Absolute Testing of Aspheric Surfaces,** Christof Pruss; Univ. of Stuttgart, Germany. 10/10/2006 10:15 a.m.–10:45 a.m.

OFTuB2, **Fabrication and Certification of High-Quality and Larger-Aperture CGHs for Optical Testing,** Victor Korolkov, A. G. Poleshchuk; Inst. of Automation and Electrometry, Russian Federation. 10/10/2006 10:45 a.m.–11:15 a.m.

OFTuB5, **Absolute Measurement of Rotationally Symmetric Aspheric Surfaces,** Michael Kuechel; Zygo, Germany. 10/10/2006 11:45 a.m.–12:15 p.m.

OFTuC1, **High-Index Materials for UV Lithography Optics,** John Burnett; NIST, USA. 10/10/2006 2:00 p.m.–2:30 p.m.

OFTuC5, **Birefringence Dispersion Measurement for Advanced Display Materials,** Yukitosho Otani, Toshitaka Wakayama; Tokyo Univ., Japan. 10/10/2006 3:15 p.m.–3:45 p.m.

OFTuD1, **Effect of Rogue Particles on the Sub-Surface Damage of Fused Silica during Grinding/Polishing,** Tayyab Suratwala, R. Steele, M. D. Feit, L. Wong, P. Miller, J. Menapace, P. Davis; Lawrence Livermore Natl. Lab, USA. 10/10/2006 4:15 p.m.–4:45 p.m.

OFTuD2, **Mechanics of Full Aperture Polishing Tools for Aspheres,** John Lambropoulos; Univ. of Rochester, USA. 10/10/2006 4:45 p.m.–5:15 p.m.

OFTuD4, **Recent Nano-Precision Ductile Machining Technology for Advanced Optical Applications,** Jiwang Yan, Tsunemoto Kuriyagawa; Tohoku Univ., Japan. 10/10/2006 5:30 p.m.–6:00 p.m.

OFWA1, **The Ronchi Test and the Use of Structured Gratings for Sharpening the Fringes,** Alejandro Cornejo-Rodriguez, Fermin Granados-Agustin, Yaoltzin Luna-Zayaz; Inst. Natl. de Astrofisica, Mexico. 10/11/2006 8:00 a.m.–8:30 a.m.

OFWA6, **Rapid Prototyping of Polymer Micro-Opto-Mechanical Components with Deep Proton Writing,** Jürgen Van Erps, Christof Debaes, Michael Vervaeke, Bart Volckaerts, Heidi Ottevaere, Pedro Vynck, Virginia Gomez, Lieven Desmet, Sara Van Overmeire, Alex Hermanne, Hugo Thienpont; Vrije Univ. Brussel, Belgium. 10/11/2006 9:30 a.m.–10:00 a.m.

OFWB1, **Manufacturing Technology for a 1.1m Primary Mirror,** Yu Jing-Chi, Pei-ji Guo, Yao-ming Zhang; Soochow Univ., China. 10/11/2006 10:30 a.m.–11:00 a.m.

OFWB4, **Optical Metrology for the 8.4m Diameter Mirror Segments for the 25m Giant Magellan Telescope,** Jim Burge, L. B. Kot, H. M. Martin, R. Zehnder, C. Zhao; Univ. of Arizona, USA. 10/11/2006 11:30 a.m.–12:00 p.m.

OFWC1, **Advanced Metrology Tools Applied for Lithography Optics Fabrication and Testing,** Masaru Ohtsuka; Canon, Inc., Japan. 10/11/2006 1:30 p.m.–2:00 p.m.

OFWD1, **Recent Advances in White-Light Interferometry: Speed Improvement and Transparent Film Profiling,** Katsuichi Kitagawa; Toray Engineering Co., Japan. 10/11/2006 3:45 p.m.–4:15 p.m.

ORGANIC PHOTONICS AND ELECTRONICS

Technical Sessions

OPMA, **Light Emission I,** 10/9/2006 1:30 p.m.–3:15 p.m.

OPMB, **Light Emission II,** 10/9/2006 3:45 p.m.–5:45 p.m.

OPTuA, **Light Emission III,** 10/10/2006 8:00 a.m.–9:30 a.m.

OPTuB, **Organic Lasers and Charge Injection,** 10/10/2006 10:15 a.m.–12:15 p.m.

OPTuC, **OLED Circuits, Solar Cells and Organic Memory,** 10/10/2006 2:00 p.m.–3:45 p.m.

OPTuD, **OPE Poster Session,** 10/10/2006 4:15 p.m.–5:45 p.m.

OPTuE, **OPE Postdeadline Papers,** 10/10/2006 5:45 p.m.–6:30 p.m.

OPWA, **White OLEDs,** 10/11/2006 8:30 a.m.–10:00 a.m.

OPWB, **Infrared OLEDs and Quantum Dots,** 10/11/2006 10:30 a.m.–12:15 p.m.

OPWC, **Current Injection and Organic Thin Film Transistors,** 10/11/2006 2:00 p.m.–3:45 p.m.

OPWD, **Organic Thin Film Transistors,** 10/11/2006 4:15 p.m.–5:15 p.m.

Plenary Speakers

OPMA1, **OLEDs/Organic Solar Cells,** Ching Tang; Kodak, USA. 10/9/2006 1:30 p.m.–2:15 p.m.

OPTuB1, **Injection and Transport of Extremely High Current Densities in Organic Thin-Film Devices,** Chihaya Adachi, Toshinori Matsushima; Ctr. for Future Chemistry, Kyushu Univ., Japan. 10/10/2006 10:15 a.m.–11:00 a.m.

OPTuC1, **Design and Integration Challenges of Active Matrix Organic Light Emitting Diode Displays,** Arokia Nathan; London Ctr. for Nanotechnology, UK. 10/10/2006 2:00 p.m.–2:45 p.m.

Plenary Speakers

OPMA1, **OLEDs/Organic Solar Cells,** *Ching Tang; Kodak, USA.* 10/9/2006 1:30 p.m.–2:15 p.m.

OPTuB1, **Injection and Transport of Extremely High Current Densities in Organic Thin-Film Devices,** *Chihaya Adachi, Toshinori Matsushima; Ctr. for Future Chemistry, Kyushu Univ., Japan.* 10/10/2006 10:15 a.m.–11:00 a.m.

OPTuC1, **Design and Integration Challenges of Active Matrix Organic Light Emitting Diode Displays,** *Arokia Nathan; London Ctr. for Nanotechnology, UK.* 10/10/2006 2:00 p.m.–2:45 p.m.

Invited Speakers

OPMA4, **OLEDs,** Hany Aziz; Xerox Labs, USA. 10/9/2006 2:45 p.m.–3:15 p.m.

OPMB1, **Energy Level Alignment and Engineering of Organic/Organic Heterojunctons,** J. X. Tang, C. S. Lee, S. T. Lee; City Univ. of Hong Kong, Hong Kong. 10/9/2006 3:45 p.m.–4:30 p.m.

OPTuA1, **Encapsulation of OLEDs,** Robert Jan Visser; Vitex Systems, USA. 10/10/2006 8:00 a.m.–8:30 a.m.

OPWA1, **OLEDs for Lighting: New Approaches,** Joseph J. Shiang, Anil R. Duggal, James A. Cella, Jie Liu, Larry N. Lewis, Donald F. Foust; General Electric Co., USA. 10/11/2006 8:30 a.m.–9:00 a.m.

OPWA2, **Advances in White OLED Technology,** T. K. Hatwar; Eastman Kodak Co., USA. 10/11/2006 9:00 a.m.–9:30 a.m.

OPWA3, **Charge Transport in White Light-Emitting Polymer Devices,** Paul Blom, Andre J. Hof, H. T. Nicolai; Univ. of Groningen, Netherlands. 10/11/2006 9:30 a.m.–10:00 a.m.

OPWB1, **Engineering Properties of Organic Materials for Near Infra-Red Applications,** Jian Li, Evan L. Williams, Kirsi Haavisto, Ghassan E. Jabbour; Arizona State Univ., USA. 10/11/2006 10:30 a.m.–11:00 a.m.

OPWB2, **Taking a Visible Step Forward into the Non-Visible (Infrared) Region,** Kenneth Hanson[1], Carsten Borek[1], Peter Djurovich[1], Mark E. Thompson[1], Yiru Sun[2], Stephen R. Forrest[2], Anna Chwang[3], Jason Brooks[3], Julie Brown[3]; [1]Univ. of Southern California, USA, [2]Princeton Univ., USA, [3]Universal Display Corp., USA. 10/11/2006 11:00 a.m.–11:30 a.m.

OPWB3, **Devices,** Vladmir Bulovic; MIT, USA. 10/11/2006 11:30 a.m.–12:00 p.m.

OPWC1, **Vapor and Solution Deposited Organic Thin Film Transistors,** Tom Jackson; Pennsylvania State Univ., USA. 10/11/2006 2:00 p.m.–2:30 p.m.

OPWC2, **Interfacial Effects in Organic Thin-Film Transistors,** Thokchom B. Singh[1], Pinar Senkarabacack[1], Philip Stadler[1], Helmut Neugebauer[1], Niyazi Serdar Sariciftci[1], James Grote[2]; [1]Linz Inst. of Organic Solar Cells (LIOS), Austria, [2]AFRL, USA. 10/11/2006 2:30 p.m.–3:00 p.m.

OPWC3, **Investigation of Charge-Injection Barriers in Finished PLEDs by Means of Non-Invasive Optical Probing,** Franco Cacialli[1], T. M. Brown[2], Vladimir Bodrozic[1]; [1]Univ. College London, UK, [2]Univ. of Rome, Italy. 10/11/2006 3:00 p.m.–3:30 p.m.

OPWD1, **Printed Organic Electronics,** Ana Claudia Arias; Xerox Corp. Palo Alto Res. Ctr. Inc., USA. 10/11/2006 4:15 p.m.–4:45 p.m.

OPWD2, **Morphological Basis for High Mobility of Poly(bithiophene thienothiophene),** R. Joseph Kline[1], Dean M. DeLongchamp[1], Eric K. Lin[1], Lee Richter[1], Daniel A. Fischer[1], Martin Heeney[2], Iain McCulloch[2]; [1]NIST, USA, [2]Merck Chemical Ltd., UK. 10/11/2006 4:45 p.m.–5:15 p.m.

8:00 a.m.–2:00 p.m.
Student Chapter Leadership Meeting, Douglass Room, Clarion Rochester Hotel

2:30 p.m.–5:30 p.m.
Hands-On Optics Training, Hyatt Regency Ballroom

4:00 p.m.–6:00 p.m.
Optics Overviews: What's Hot in Optics Today? Highland F

Galleria Lobby

Joint

6:00 p.m.–7:30 p.m.
JSuA • Welcome Reception and Joint FiO/LS Poster Session I

OPTICAL DESIGN AND INSTRUMENTATION POSTERS

JSuA1
Polarization-Controlled Switching in Cycloidal Nematic Liquid Crystals, *Svetlana V. Serak[1], Hakob Sarkissian[1], Nelson Tabiryan[1], Leon B. Glebov[2], Vasile Rotar[2], Boris Ya Zeldovich[2]; [1]BEAM Engineering for Advanced Measurements Co., USA, [2]College of Optics and Photonics/CREOL, Univ. of Central Florida, USA.* Cycloidal nematic liquid crystal cells are capable of high diffraction efficiency in thin layers of materials comparable to the radiation wavelength. We demonstrate switching between diffraction orders of such grating using phase retarder.

JSuA2
Demonstration and Analysis of a Second Harmonic Generated Laser Used in Absolute Displacement Metrology, *Ihab H. Naeim[1], M. Bahrawi[1], M. Nicklawy[2], Yves Salvadé[3], M. Amer[1]; [1]Natl. Inst. of Standards, Egypt, [2]Faculty of Science, Helwan Univ., Egypt, [3]Inst. de Michrotechnique, Switzerland.* Spectroscopic analysis of SHG laser used in superheterodyne interferometer are reported. The induced polarizations are mathematically described. The axial modes inter SHG laser cavity are illustrated. The refractive indices for the generated frequencies are computed.

JSuA3
General Formalism for the Treatment of Polarized Light Scattering, *Camilo Reyes Sierra; Univ. del Valle, Colombia.* An optical model of a material system for polarized light scattering is built; the formalism is related to time-space and spin procedures. Solutions require a new reference plane definition and geometrical approximations.

JSuA4
A-law/µ-law Dynamic Range Compression Deconvolution, *Jed Khoury[1], Charles L. Woods[1], Bahareh Haji-saeed[2], S. K. Sengupta[2], William D. Goodhue[3], John Kierstead[4]; [1]AFRL / SNHC, Hanscom Air Force Base, USA, [2]Electrical and Computer Engineering Dept., Univ. of Massachusetts Lowell, USA, [3]Physics Dept., Univ. of Massachusetts at Lowell, USA, [4]Solid State Scientific Corp., USA.* In this paper the A-law/µ-law Dynamic Range Compression algorithm used in telecommunication systems is proposed for the first time for nonlinear Dynamic Range Compression image deconvolution.

JSuA5
Semi-Spherical Irradiance Profiles Detector, *Margarita Tecpoyotl-Torres[1], Jesus Escobedo-Alatorre[1], I. A. González-Román[1], Javier Sánchez-Mondragón[1,2], E. E. Orozco-Guillén[2]; [1]Ctr. for Res. on Engineering and Applied Sciences UAEM, Mexico, [2]Photonics and Optical Physics Lab, Optics Dept. INAOE, Mexico.* To bypass the non orthogonality of the corresponding spherical harmonics on a semisphere we map the detection data on a circle, were a good data fitting is provided by the Zernike Polynomilas.

JSuA6
Sharpness Metric Nonstationarity in Undersampled Systems, *Donald R. McGaughey[1], Larry P. Murray[2], Chris Dainty[2]; [1]Royal Military College of Canada, Canada, [2]NUI Galway, Ireland.* A sharpness metric based on the sum of the intensities squared will be non-stationary with respect to sub-pixel shifts, for under-sampled images. Sensorless AO systems must be sampled at the Nyquist frequency or higher.

JSuA7
Spectrum Modification of Diffractive Optical Lenses Generated by a Spatial Light Modulator, *Zhao Liping, Bai Nan, Li Xiang, Fang Zhong Ping; Singapore Inst. of Manufacturing Technology, Singapore.* For enhancing the resolving power of diffractive optical lenses generated by a Spatial Light Modulator, an apodization technique, frequency spectrum modification was proposed and investigated, and the experimental results were presented to demonstrate its effectiveness.

JSuA8
Dispersion Compensation in Metropolitan Networks Using Chirped Light Sources, *Mohamed S. E. Hefeida, Moustafa H. Aly; Arab Acad. for Science and Technology, Egypt.* Fiber dispersion is compensated in Metroplitan networks using chirped sources. Different sources are considered. Eye-closure penalty of the proposed system is calculated showing a negative penalty over different distances, bit rates and other affecting parameters.

JSuA9
Orthonormal Polynomials in Wavefront Analysis: Error Analysis, *Guang-ming Dai[1], Virendra N. Mahajan[2,3]; [1]VISX, Inc., A Subsidiary of Advanced Medical Optics, Inc., USA, [2]Aerospace Corp., USA, [3]College of Optical Sciences, Univ. of Arizona, USA.* This paper formulates the error arising when Zernike polynomials are used in wavefront analysis of non-circular pupils. Numerical examples illustrate how the error varies as the number of terms and shapes of the apertures vary.

JSuA10
Longwave Infrared (LWIR) Coded Aperture Dispersive Spectrometer, *Christy A. Fernandez[1], Bobby D. Guenther[1], Mike E. Gehm[1], David J. Brady[1], Michael E. Sullivan[2]; [1]Duke Univ., USA, [2]Centice Corp., USA.* We describe a static aperture-coded, dispersive longwave infrared (LWIR) spectrometer that uses a microbolometer array as the detector plane. We present experimental results of absorption spectroscopy for a variety of sources.

JSuA • Welcome Reception and Joint FiO/LS Poster Session I—Continued

JSuA11

Gas Sensor Design Using a Fabry-Perot Interferometer with Long Cavity Length as a Modulator, *Everardo Vargas-Rodríguez, Harvey N. Rutt; Optoelectronics Res. Ctr., Univ. of Southampton, UK.* A gas sensor based on correlation spectroscopy using a FPI with long cavity length (>500 µm) as a modulator is presented. Eventually the FPI and the optical detector will be integrated within a MEMS structure.

OPTICAL SCIENCES POSTERS

JSuA12

Non-Linear Optical Behavior in Metallic Nano-Spheres, *Miguel Torres-Cisneros[1], Javier Sánchez-Mondragón[2,3], Celso Velásquez-Ordóñez[2], Marco Meneses-Nava[4], Igor Sukhoivanov[1], Alejandro Espinoza-Calderón[1]; [1]Univ. of Guanajuato, Mexico, [2]Photonics and Optical Physics Lab, Optics Dept. INAOE, Mexico, [3]Ctr. for Res. on Engineering and Applied Sciences UAEM, Mexico, [4]CIO, Mexico.* In this work we study the linear and nonlinear characteristic of the metallic nano-spheres fixed on different substrates matrixes. The preliminary results of a z-scan analysis demonstrate a nonlinear dependence of these structures.

JSuA13

Characterization of Metal Dielectric Photonic Crystals, *Alvaro Zamudio-Lara[1], Javier Sánchez-Mondragón[2,1], Miguel Torres-Cisneros[3], Jesus Escobedo-Alatorre[1], Celso Vásquez-Ordóñez[2], Miguel Basurto-Pensado[1], Oscar G. Ibarra-Manzano[3,2]; [1]Ctr. for Res. on Engineering and Applied Sciences UAEM, Mexico, [2]Photonics and Optical Physics Lab, Optics Dept. INAOE, Mexico, [3]Univ. of Guanajuato, Mexico.* This work shows a microsphere analyses the dependence of the dielectric width σ_D and the metallic width σ_M respectively, as functions of the refraction index difference and the metal thickness *d*.

JSuA14

Refraction and Diffraction by a Metal and Dielectric Multilayered Prism, *Hisao Kikuta[1], Yasutomo Ohta[2], Shinji Kameda[1]; [1]College of Engineering, Osaka Prefecture Univ., Japan, [2]School of Engineering, The Univ. of Tokyo, Japan.* A multilayered structure of metal and dielectric thin-films has a cylindrical dispersion surface for TM polarized light. Refraction and diffraction of the light wave in a metal/dielectric multilayered prism has been investigated.

JSuA15

Numerical Studies of 2D Photonic Crystal Based Structures, *Ivan Richter, Milan Šiňor, Adam Haiduk; Czech Technical Univ. in Prague, Faculty of Nuclear Sciences and Physical Engineering, Dept. of Physical Electronics, Czech Republic.* We have implemented several numerical methods for PhC structure simulations. On several examples, the methods are compared. Consecutively, several interesting cases of PhC-structure simulations are shown and analyzed, including 2D PhC waveguides and filters.

JSuA16

Effects of Asymmetry on GaN Photonic Crystal Slabs, *Michael W. Carter, A. Rosenberg, Mijin Kim, Ronald T. Holm, Richard L. Henry, Charles R. Eddy, M. A. Mastro, K. Bussman; NRL, USA.* We demonstrate that the spectrum of an asymmetrical photonic crystal slab has regions of vanishing transmission. Measurements are performed on GaN photonic crystal slabs consisting of two-dimensional triangular lattices of holes on sapphire substrates.

JSuA17

Overall Permutation Symmetry Breakdown in Nonlinear Optical Susceptibilities of One-Dimensional Periodic Systems, *Minzhong Xu[1], Shidong Jiang[2]; [1]New York Univ., USA, [2]New Jersey Inst. of Technology, USA.* The overall permutation symmetry of the nonlinear susceptibilities is broken under the infinite one-dimensional single-electron dimerized Huckel model. Physical conditions to experimentally test such a symmetry break are discussed.

JSuA18

Coherence Controlled Soliton Interaction in Waveguide Array, *Shao-Chuan Wang, Chih-Shiang Chou, Ming-Feng Shih; Natl. Taiwan Univ., Taiwan.* We found that the interactions between two solitons in a waveguide array can be controlled by the total coherence of the soliton pair as well as their relative phase.

JSuA19

Efficient Picosecond Pulse Shaping by Programmable Bragg Grating, *Chunbai Wu, Michael G. Raymer; Dept. of Physics, Univ. of Oregon, USA.* We propose a method for picosecond pulse shaping in a programmable manner. A genetic algorithm is used for searching of control parameters, and more than 40% of theoretic maximum energy is achieved in shaped pulse.

JSuA20

Transport Mean-Free-Path in $K_5Bi_{1-x}Nd_x(MoO_4)_4$ Laser Crystal Powders, *M. Asuncion Illarramendi, Mohammad Al-Saleh, Ibon Aramburu, Rolindes Balda, Joaquin Fernandez; Univ. del Pais Vasco, Spain.* The transport mean-free-paths in $K_5Bi_{1-x}Nd_x(MoO_4)_4$ laser crystal powders were determined by using the diffuse reflectance and transmittance of the powders and the absorption coefficient of the crystal materials. Similar results were obtained from both methods.

JSuA21

Ablation of Nanometer-Scale Features Using a Table-Top Soft X-ray Laser, *Fernando Brizuela[1], Herman Bravo[1], Georgiy Vaschenko[1], Carmen S. Menoni[1], Jorge J. Rocca[1], Oscar Hemberg[2], Bradley Frazer[2], Scott Bloom[2], Weilun Chao[3], Erik H. Anderson[3], David T. Attwood[3]; [1]Colorado State Univ., USA, [2]JMAR Technologies, USA, [3]Lawrence Berkeley Natl. Lab, USA.* Ablation holes 82 nm in diameter were obtained in polymethylmethacrylate. This was realized by using a free-standing zone plate to focus a Ne-like Ar 46.9 nm compact capillary-discharge laser beam onto PMMA-coated samples.

JSuA22

Programmable Fabrication of Spatial Structures in a Gas Jet by Laser Machining with Spatial Light Modulator, *Yen-Mu Chen[1,2], Ming-Wei Lin[1], Chih-Hao Pai[1,2], Cheng-Cheng Kuo[1,3], Kan-Hwa Lee[1], Jyhpyng Wang[1,2,4], Szu-yuan Chen[1,4], Jiunn-Yuan Lin[5]; [1]Inst. of Atomic and Molecular Sciences, Academia Sinica, Taiwan, [2]Dept. of Physics, Natl. Taiwan Univ., Taiwan, [3]Inst. of Electro-Optical Engineering, Natl. Taiwan Univ., Taiwan, [4]Dept. of Physics, Natl. Central Univ., Taiwan, [5]Dept. of Physics, Natl. Chung Cheng Univ., Taiwan.* Programmable fabrication of longitudinal spatial structures in gas jets was achieved using laser machining with a liquid-crystal spatial light modulator as pattern mask, taking high-field plasma photonic devices to a new level.

JSuA23

Atomic and Molecular Single Ionization in the Multiphoton Ionization Regime, *Jian Wu, Heping Zeng, Chunlei Guo; Inst. of Optics, Univ. of Rochester, USA.* We report, for the first time in the multiphoton ionization regime, a comparison study of single-electron ionization of diatomic molecules versus rare gas atoms with virtually the same ionization potentials.

JSuA24

Modeling of Interaction between Polarized Femtosecond Laser Pulses and a Plant Light Harvesting Complex II, *Margarita Kamenova[1,2], Kolyo Dankov[3]; [1]Inst. of Solid State Physics, Bulgaria, [2]Physics Dept. of Sofia Univ., Bulgaria, [3]Inst. of Biophysics, Bulgaria.* We investigate ultrafast spectral properties and energy transfer rates of light harvesting complex II (LHCII) by modeling the exciton migration and depopulation of excited states after interaction of LHCII with femtosecond light pulses.

JSuA25

Exploiting Directional Fields in the Few-Cycle Regime, *Samuel B. P. Radnor, P. Kinsler, G. H. C. New; QOLS Group, Blackett Lab, Imperial College, UK.* Directional field variables are used to investigate few-cycle pulse problems in nonlinear optics. Combined with Pseudo Spectral Spatial Domain techniques, they provide a powerful tool for studying carrier wave shocking and carrier-envelope phase offset effects.

JSuA26

Dependence of Optical Absorption of Metals on Ambient Pressure following Femtosecond Pulse Excitation, *Dean P. Brown, Zhixun Ma, Chunlei Guo; Inst. of Optics, Univ. of Rochester, USA.* This paper examines a change in the optical absorption in metals following femtosecond laser pulse excitation that is greatly dependent on ambient pressure.

JSuA27

THz-Field Induced Cross-Phase Modulation in ZnTe, *Yuzhen Shen, Dario Arena, G. L. Carr, James Murphy, Thomas Y. Tsang, Takahiro Watanabe, Xijie Wang; Brookhaven Natl. Lab, USA.* We demonstrate spectral shift and broadening of 120fs, 800nm pulses in ZnTe with the presence of ~1ps, ~40uJ coherent terahertz pulses. This spectral modulation is attributed to cross-phase modulation induced by the strong THz field.

JSuA28

Propagation of Femtosecond Optical Pulses through a Photonic Crystal Fiber, *Md. Aminul I. Talukder[1], Kouki Totsuka[2], Makoto Tomita[2]; [1]Dhaka Univ., Bangladesh, [2]Shizuoka Univ., Japan.* We investigate the arbitrary optical pulse propagation through a photonic crystal fiber. Arrival times of centroid of energy both for coherent and incoherent pulses are measured and explained by the concept of net group delay.

JSuA29

Increasing the Mode-Locking Range of HSPS, *Nuran Dogru; Univ. of Gaziantep, Turkey.* Mode-locking range of hybrid soliton pulse source is extremely increased with the use of linearly chirp tanh apodized fiber Bragg grating giving a range of 1.6 GHz.

JSuA30

Helmholtz-Gauss Beams in Homogeneous Media with Complex Index of Refraction, *Manuel Guizar-Sicairos[1], Julio C. Gutiérrez-Vega[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Photonics and Mathematical Optics Group, Tecnológico de Monterrey, Mexico.* Propagation characteristics of Helmholtz-Gauss beams through homogeneous gain and loss media are studied. General expressions for the propagated field, average power, nondiffracting distance, and beam centroid and spreading are obtained and discussed.

JSuA31

Making Sense of Optical Turbulence Measurements in the Spectral Domain, *Mark P. J. L. Chang; Univ. of Puerto Rico, Mayagüez, USA.* The refractive index structure constant has defied accurate spectral characterization due to its nonlinear, non-stationary behavior. I introduce the marginal Hilbert spectrum as an improvement upon traditional methods and apply it to weak scintillation measurements.

Galleria Lobby

Joint

JSuA • Welcome Reception and Joint FiO/LS Poster Session I—Continued

JSuA32

Scattering of Three Dimensional Optical Radiation, *Thomas Owens, Jeremy Ellis, Aristide Dogariu; CREOL, Univ. of Central Florida, USA.* Scattered light contains information about the obstruction that scattered it. Using three dimensional polarimetry, we determine the shape anisotropy of scattering particles.

JSuA33

Random Phase Diffusers for Extending the Depth of Focus, *Enrique E. García-Guerrero[1], Eugenio R. Méndez[1], Hector M. Escamilla[1,2], Tamara A. Leskova[2], Alexei A. Maradudin[2]; [1]CICESE, Div. de Fisica Aplicada, Mexico, [2]Univ. of California at Irvine, USA.* We present a method for designing diffusers that, when illuminated by a converging beam, produce a specified intensity along the optical axis. Using this method we fabricate a diffuser for extending the depth of focus.

JSuA34

Characterization of Spherical Lenses Using X-Scan, *Abdullatif Y. Hamad; Southern Illinois Univ. Edwardsville, USA.* We developed a theoretical Model to determine the radius of curvature for spherical lenses using the x-scan technique. In addition, the size and type of the lens can be found directly from the results.

JSuA35

Reducing IFOV Errors in Microgrid Imaging Polarimeters, *Rakesh Kumar[1], J. S. Tyo[1], Bradley M. Ratliff[2], James K. Boger[2]; [1]Dept. of Electrical and Computer Engineering, Univ. of New Mexico, USA, [2]Applied Technology Associates, USA.* Microgrid polarimeters suffer from IFOV error, as two different pixels are used to obtain the Stokes parameter at a given point in the scene. We study interpolation techniques and hardware solutions to minimize this error.

JSuA36

Near Field Diffraction of Hankel Beams, *Marcelino Anguiano-Morales, M. Maribel Méndez-Otero, M. David Iturbe-Castillo, Sabino Chávez-Cerda; Inst. Nacional de Astrofisica, Òptica y Electrònica, Mexico.* We investigate the diffraction of the two distinct Hankel beams by an obstruction placed at different positions of their symmetry axis. Due to their convex and concave conical phases the respective diffracted patterns differ substantially.

JSuA37

A Novel Approach to Generating Extended Depth of Focus Beams Using a Phase Mask, *Farnaz Massoumian, Davood Shamsi, Hamid Bazargan; Sharif Univ. of Technology, Iran.* We present a novel method in which a phase mask is used to modulate a laser beam in order to produce a large extension in the focal depth at the focus of a lens.

JSuA38

Characterization of Subwavelength-Scale Marginal Roughness from Far-Field Irradiance, *Jyh-Long Chern, Shu-Chun Chu; Dept. of Photonics, IEO, Taiwan.* A constructed-aperture approach is proposed to measure marginal roughness by far-field irradiance. It is numerically shown that spatial profile could be retrieved with an error less than 3%, even its variation is in subwavelength scale.

JSuA39

Speckle in a 4F Optical System, *Nienan Chang, Nicholas George; Inst. of Optics, Univ. of Rochester, USA.* We find that the space-invariant form of 4F processors makes it a convenient configuration to study various aspect of speckle. We show space, wavelength, and aperture-shape dependence of speckle generated by thin and thick diffusers.

JSuA40

Angular Spectrum Representation for Partially Coherent Beams in Turbulence, *Greg Gbur[1], Olga Korotkova[2]; [1]Univ. of North Carolina at Charlotte, USA, [2]Univ. of Rochester, USA.* An angular spectrum representation is applied for a description of beamlike fields of arbitrary intensity profile and coherence properties propagating through atmospheric turbulence. The new method is illustrated by examples.

OPTICS IN BIOLOGY AND MEDICINE POSTERS

JSuA41

Schlieren Imaging of Salt Concentration Gradients around a KDP Crystal Growing from its Aqueous Solution, *Krishnamurthy Muralidhar, Atul Srivastava, Pradipta K. Panigrahi; Indian Inst. of Technology Kanpur, India.* Concentration gradients around a KDP crystal growing from its aqueous solution are measured using laser-schlieren technique. The 3D field is determined using an algebraic reconstruction algorithm. Gradients on crystal faces correlate with their growth rates.

JSuA42

Satellital Type Remote Sensing Detector, *Javier Sánchez-Mondragón[1,2], Kurt B. Wolf[3], Miguel Torres-Cisneros[4], Margarita Tecpoyotl-Torres[2], Jesus Escobedo-Alatorre[2], Darío Gómez-García[5], Aurelio A. Heredia-Jiménez[6]; [1]INAOE, Mexico, [2]UAEM, Mexico, [3]Ctr. de Ciencias Físicas, UNAM, Mexico, [4]Univ. of Guanajuato, Mexico, [5]Univ. valle Mexico, Mexico, [6]Univ. Popular Autònoma del Estado de Puebla, Mexico.* The equidistant detector distribution on a circular path is quite convenient for detection, but should be related with an spherical description and this is the object of this work.

OPTICS IN INFORMATION SCIENCE POSTERS

JSuA43

Generation of Hyperbolic Beam, *Rijuparna Chakraborty[1], Sendhil S. Raja[2], Ajay Ghosh[1]; [1]Univ. of Calcutta, India, [2]Raja Ramanna Ctr. for Advanced Technology, India.* Propagation invariant hyperbolic beam, with and without optical vortex, is produced using Fourier-transform holography, which keeps its shape unchanged up to 45cm. Bessel function with arguments having hyperbolic locus are used to generate the mask.

JSuA44

Precise Phase-Contrast Image Using In-Line Phase-Shifting Digital Holographic Microscopy, *Jeon Woong Kang, Chung Ki Hong; Pohang Univ. of Science and Technology, Republic of Korea.* An in-line phase-shifting digital holographic microscopy was used to measure the three dimensional shapes of living fibroblast cell and micro Fresnel lens. The lateral and axial resolutions of the system were superior to off-axis systems.

JSuA45

Generation of Incomplete Annular Beam, *Rijuparna Chakraborty, Ajay Ghosh; Univ. of Calcutta, India.* Diffraction-free incomplete annular beam is produced using destructive interference between two modified and unmodified annular beams, where modification is done on its pitch using modulo operation. The holographically generated beam remains unchanged up to 1.5cm.

JSuA46

Dependent Secret Key Sharing Scheme for Optical Image Verification, *Hsuan Ting Chang[1], Chao-Ching Chen[1], Chia-Hung Yeh[2]; [1]Dept. of Electrical Engineering, Natl. Yunlin Univ. of Science and Technology, Taiwan, [2]Dept. of Computer Science and Information Engineering, Natl. Don Hwa Univ., Taiwan.* A novel scheme that three images can be independently reconstructed by any two of three determined two-dimensional signals is proposed. It can be referred to as a special case of the visual secret sharing method.

JSuA47

Real-Time Characterization of the Recording Processes in Self-Developing Photopolymer Materials, *Milan Kveton[1], Jan Mihalik[1], Pavel Fiala[1], Antonin Havranek[2]; [1]Czech Technical Univ. in Prague, Czech Republic, [2]Charles Univ., Czech Republic.* Self-developing ability of the photopolymer holographic recording materials allows real-time characterization of the recording processes running during exposition. Mechanisms of diffraction grating formation and photopolymerization are studied and optimum response is investigated.

JSuA48

Design of Rotationally Symmetric Diffractive Beam Shapers Using IFTA, *Ondrej Komenda, Marek Skeren; Czech Technical Univ., Czech Republic.* Design of rotationally symmetric synthetic diffractive elements is observed on the base of the iterative Fourier transform algorithm and discrete Hankel transform. New approaches to the iterative loop are presented with considerable improvement of quality.

JSuA49

Fiber Optic Temperature Sensor Based On Surface Plasmon Resonance, *Banshi D. Gupta, Anuj K. Sharma; Dept. of Physics, Indian Inst. of Technology Delhi, India.* A fiber optic temperature sensor based on surface plasmon resonance with gold as metallic layer and TiO_2 as sensing layer is proposed and analyzed theoretically. The effect of fiber parameters on its performance is studied.

JSuA50

Three-Dimensional Error Diffusion for Color Halftoning, *Eugene K. Ressler, Wenli Huang, Barry L. Shoop; United States Military Acad., USA.* The paper presents a three-dimensional interconnect scheme for color halftoning that performs four tasks simultaneously: the first three are to compute good halftones for each primaries and the fourth is to minimize frequency-weighted luminosity error.

JSuA51

Fast Algorithm for Computational Imaging with Partially Coherent Illumination, *Andrey S. Ostrovsky; Univ. Autonoma de Puebla, Mexico.* The fast algorithm for calculating the image in optical system with partially coherent illumination is proposed. The algorithm is based on the coherent-mode representation of cross-spectral density of illumination. An example of computing is given.

JSuA52

Image Processing Using Nonlinear Transmission, *Chandra S. Yelleswarapu, Devulapalli Vgln Rao; Univ. of Massachusetts at Boston, USA.* We demonstrated novel all-optical self-adaptive continuous band-pass spatial filtering system which exploits any nonlinear transmission mechanism. As intensity is increased above threshold, low spatial frequencies are blocked resulting in edge-enhanced images containing high spatial frequencies.

JSuA • Welcome Reception and Joint FiO/LS Poster Session I—Continued

JSuA53

Polarization-Sensitive Media for Holographic Data Storage, *Barbara N. Kilosanidze, George A. Kakauridze; Inst. of Cybernetics, Georgia.* The stable and dynamic polarization-sensitive media for holographic data storage that gives the possibility of obtaining big capacity (up to 1 Terabytes) of recorded and readed information, re-writable, with ultimately low noise are described.

JSuA54

Aberration Free Imaging via Speckle Pattern Encoding, *Eyal Ben-Eliezer, Emanuel Marom, Naim Konforti; Tel Aviv Univ., Israel.* Time varying speckle patterns are used to modulate input objects. Proper processing provides not only improved resolution, but also aberration correction, such as misfocus. Computer simulations as well as experimental results will be presented.

PHOTONICS POSTERS

JSuA55

Raman Amplification Applied to CWDM Systems, *Meire Fugihara, Armando Nolasco Pinto; Inst. of Telecommunications, Univ. of Aveiro, Portugal.* We model a Raman amplifier suitable for Coarse Wavelength Division Multiplexing (CWDM). Comparisons with laboratorial results show good agreement. Our model achieves an amplification window greater than 80nm, suitable for a four channel CWDM system.

JSuA56

Pattern-Dependence Suppression at 0.1 THz Repetition Rate Using the Two-Photon Absorption in Semiconductor Optical Amplifiers, *Claudio Crognale[1], Stefano Caputo[2]; [1]TechnoLabs S.p.A., Italy, [2]SMD Elettronica, Italy.* We numerically demonstrate that a proper management of the Two-Photon Absorption and the nonlinear optical gain saturation in a SOA-based pump-probe scheme can produce an inverted output probe pattern without any relevant pattern-dependence.

JSuA57

A Single-Frequency, 2-cm, Yb-doped Silica Fiber Laser, *Weihua Guan, John R. Marciante; Lab for Laser Energetics and the Inst. of Optics, Univ. of Rochester, USA.* A single-frequency, 2-cm, ytterbium-doped silica fiber laser has been demonstrated with an output power of 35 mW and side-mode suppression ratio greater than 25 dB. The optical signal-to-noise ratio is greater than 65 dB.

JSuA58

Ferroelectric Photonic Crystals Based on the Porous-Silicon Templates, *Fedor Sychev, Irina Kolmychek, Tatyana Murzina, Oleg Aktsipetrov; Moscow State Univ., Russian Federation.* One-dimensional photonic microcavities containing sodium nitrite are designed and studied by reflectance spectroscopy and second-harmonic generation spectroscopy. SHG enhancement and ferroelectric phase transition by the SHG method are observed.

JSuA59

Nonlinearity Cancellation: Experimental Demonstration of Two New Techniques Based on Optical Phase Conjugation, *Paolo Minzioni[1], Ilaria Cristiani[1], Vittorio Degiorgio[1], Lucia Marazzi[2], Mario Martinelli[2,3], Carsten Langrock[4], Martin M. Fejer[4]; [1]CNISM and Univ. of Pavia, Italy, [2]CoreCom, Italy, [3]Politecnico di Milano, Italy, [4]Edward Ginzton Lab, Stanford Univ., USA.* We experimentally demonstrate two simple techniques, based on a modified phase conjugation setup, that allow obtaining nonlinearity compensation even in an embedded link with asymmetrical power profiles. These techniques are particularly well-suited for system upgrade.

JSuA60

Particle Self-Organizing in Non-Diffracting Laser Beams, *Vítězslav Karásek[1], Veneranda Garcés-Chávez[2], Tomáš Čižmár[1], Kishan Dholakia[2], Pavel Zemánek[1]; [1]Inst. of Scientific Instruments, Czech Republic, [2]School of Physics and Astronomy, Univ. of St. Andrews, UK.* We present results of numerical and experimental studies of the particles self-organizing in non-diffracting laser beams. We focus on two and more spheres placed even off-axis.

JSuA61

Flame Hydrolysis Deposition of Glass on Silicon with Porous Silicon Sacrificial Membranes, *Jian Li, Hejun Yao, Zhixin Zhang; Natl. Inst. of Metrology (NIM), China.* This paper shows how the partly-oxidized porous silicon sacrificial layer can be used to compensate the coefficient of thermal expansion difference between the SiO_2 layer and the Si substrate layer fabricated by the FHD method.

JSuA62

Compact, Simple Tuneable Mechanism for Fibre Lasers, *Alejandro Martinez-Rios[1], R. Selvas-Aguilar[2], I. Torres-Gomez[1], D. A. May-Arrioja[3], G. Anzueto-Sanchez[1], J. J. Sánchez-Mondragron[3]; [1]Ctr. de Investigaciones en Optica, Mexico, [2]Facultad de Ciencias Físico Matemáticas, Mexico, [3]INAOE, Mexico.* A simple tuning-mechanism for an ytterbium-doped fibre laser is implemented. Based on the wavelength-dependence of the re-imaging distance that occurs in multimode-fibre, a fibre-gripper is fabricated to provide automatic-alignment of the multimode-fibre and a fibre-mirror.

QUANTUM ELECTRONICS POSTERS

JSuA63

Generating Entanglement via Interaction of Coupled Quantum Dots with a Quantized Field, *Arnab Mitra[1], Daniel Erenso[1,2], Reeta Vyas[1]; [1]Univ. of Arkansas, USA, [2]Middle Tennessee State Univ., USA.* We discuss the possibility of generating entanglement in coupled quantum dots interacting with a quantized field by studying the evolution of entanglement of formation when the dots are initially in a state with zero entanglement.

JSuA64

Controlling Two-Photon Excited Fluorescence in Perylene Derivatives via Femtosecond Pulses, *Daniel L. da Silva, Lino Misoguti, Cleber R. Mendonça; Univ. de São Paulo, Brazil.* We present results on the control of two-photon excited fluorescence with femtosecond pulses in perylene derivatives. The pulses were chirped and optimized via spectral shaping in a closed-loop evolutionary algorithm.

JSuA65

Study of Two-Photon Excited Fluorescence in MEH-PPV, *Paulo H. D. Ferreira, Daniel L. Silva, Lino Misoguti, Cleber R. Mendonça; Inst. de Física de São Carlos, Brazil.* The two-photon excited fluorescence of MEH-PPV was measured using femtosecond laser pulses. We carried out intensity and fluorescence spectrum measurements as a function of the ultrashort pulse shape.

JSuA66

Four-Wave Mixing in Colloidal Media, *Carlos Lopez-Mariscal[1], Julio C. Gutiérrez-Vega[1], David McGloin[2], Kishan Dholakia[2]; [1]Photonics and Mathematical Optics Group, Mexico, [2]Univ. of St Andrews, UK.* Degenerate four wave mixing and phase conjugation in a colloidal crystal are demonstrated using an artificial structure formed by the ordered arrangement of dielectric particles in a colloidal suspension as the nonlinear medium

JSuA67

Second- and Third-Harmonic Generation Enhancement in Three-Dimensional Photonic Crystals, *Irina V. Soboleva, Sergey A. Seregin, Andrey A. Fedyanin, Oleg A. Aktsipetrov; Quantum Electronic Div., Physics Dept., M.V. Lomonosov Moscow State Univ., Russian Federation.* The second- and third-harmonics enhancement and nonlinear diffraction are detected in three-dimensional photonic crystals of artificial opals at the photonic band gap edge due to fulfillment of phase matching condition.

JSuA68

Single Ion and Cooperative Optical Processes in Yb-Doped Sc_2O_3 Transparent Ceramics, *Voicu Lupei[1], Aurelia Lupei[1], Cristina Gheorghe[1], Georges Boulon[2], Anis Jouini[3]; [1]Inst. of Atomic Physics, Romania, [2]Universite Claude Bernard, France, [3]Univ Claude Bernard, France.* High-resolution spectroscopic investigation and the cooperative absorption and emission at high concentrations of Yb doped Sc_2O_3 transparent ceramics indicates that Yb^{3+} ions occupy at random the sites of C_2 and C_{3i} symmetry without obvious clustering.

JSuA69

Coherent Generation of Short Terahertz Pulses in Doped Optical Crystals, *Elena A. Kuznetsova, Yuri V. Rostovtsev, Nikolai G. Kalugin, Roman L. Kolesov, Olga Kocharovskaya, Marlan O. Scully; Dept. of Physics, Texas A&M Univ., USA.* We show that a coherently driven solid state medium can produce short pulses of THz radiation. Ruby can generate THz pulses with energy hundreds pJ - nJ at room temperature with ps pulse durations.

JSuA70

Evolution of Broadband Spectrum Generation and Stimulated Raman Scattering from Nanosecond Pump Pulses in Single-Mode Optical Fiber, *Roberto Rojas-Laguna[1], Julian Moises Estudillo-Ayala[1], Jaime Gutiérrez-Gutiérrez[2], Evgeny A. Kuzin[2], Baldemar Ibarra-Escamilla[2], Joseph W. Haus[3]; [1]Univ. de Guanajuato, Mexico, [2]Inst. Nacional de Astrofisica Optica y Electronica, Mexico, [3]Univ. of Dayton, USA.* At pumping of a standard fiber by an amplified directly modulated DFB laser the leading part of the pulse generates a broadband spectrum while the plateau causes the Raman amplification resulting in flat spectrum.

JSuA • Welcome Reception and Joint FiO/LS Poster Session I—Continued

JSuA71

Coherence Transfer for the Polarization Dependent Four Wave Mixing Quantum Beats in Semiconductors, *Wenfeng Wang*[1,2], *Klaas Allaart*[1,2], *Daan Lenstra*[1,2]; [1]*Vrije Univ. Amsterdam, Netherlands,* [2]*COBRA, Eindhoven Univ. of Technology, The Netherlands.* We report an alternative explanation for the pump-probe polarization related quantum beats in a bulk semiconductor, which reproduces experimental observations well but without the requirement of bi-exciton states.

VISION AND COLOR POSTERS

JSuA72

A Mathematical and Experimental Simulation of Haidinger's Brushes, *Mark D. Rothmayer*[1], *Wolfgang Dultz*[2], *Dennis A. Tierney*[1], *Heidrun Schmitzer*[1]; [1]*Xavier Univ., USA,* [2]*Goethe Univ., Germany.* Haidinger's brushes are the perception of polarized light with the unaided eye. We experimentally confirmed a computer model of Haidinger's brushes, extended the empirical findings, and modeled the percept using the Poincare sphere.

JSuA73

Human Visual Sensitivity Curve Using a Diffraction Model, *V. Vijayakumar, C. Eswaran; Multimedia Univ., Malaysia.* In this paper we propose a diffraction-based model to explain the visual sensitivity curve in human vision. The model can also be extended to include color discrimination in the eye.

JSuA74

Equivalent Sine-Wave Response of Periodic Targets in Incoherent Light for Human Eye in the Presence of Stiles-Crawford Effect of the First Kind, *Pronab Mondal, Sumit Ghosh; Indian Student Chapter of Optical Society of America (ISCOSA), India.* The equivalent incoherent sine-wave response for other types of periodic targets for all transmitted spatial frequencies for human eye in the presence of Stiles-Crawford effect of the first kind have been determined analytically.

7:30 p.m.–8:30 p.m. OSA Division and Technical Group Meetings

NOTES

Lilac Ballroom

Joint

8:00 a.m.–9:50 a.m.
JMA • Joint FiO/LS Plenary Session and Awards Ceremony, Part I: OSA/APS Awards

Schawlow Prize Lecture:
Mapping Attosecond Science onto Electron Interferometry
Paul Corkum, Natl. Res. Council, Canada

Ives Medal Address:
Femtosecond Optics: More Than Just Really Fast
Erich. P. Ippen, MIT, USA

9:50 a.m.–10:20 a.m. Coffee Break, Lilac Ballroom Foyer

10:20 a.m.–11:10 a.m.
JMB • Joint FiO/LS Plenary Session and Awards Ceremony, Part II: The Energy Problem and What We Can Do about It
Steven Chu, Lawrence Berkeley Natl. Lab, USA

11:10 a.m.–12:00 p.m.
JMC • Joint FiO/LS Plenary Session and Awards Ceremony, Part III: Optics Meets Alzheimer's Disease: Seeing the Way to a Cure
Lee E. Goldstein, Harvard Medical School, USA

Hyatt Grand Ballroom E/F

OF&T

8:00 a.m.–9:45 a.m.
OFMA • Space Optics: Fabrication Solutions for an Extreme Environment
Howard J. Wood, III; NASA Goddard Space Flight Ctr., USA, Presider

OFMA1 • 8:00 a.m. Invited
Fabrication of Extremely Lightweight Mirrors, *William Zhang; NASA Goddard Space Flight Ctr., USA.* I will report on the development of using a thermal glass forming technique to make extremely lightweight and extremely aspherical mirrors. I will speak on its applications for both space and ground based telescopes.

OFMA2 • 8:30 a.m. Invited
Optical Fabrication of the James Webb Space Telescope Primary Mirror, *Glen Cole[1], Robert Garfield[1], Tracy Peters[1], Wendell Wolff[1], Robert Bernier[1], Craig Kiikka[1], Taha Nassar[1], John Kincade[1], Tony Hull[1], Ben Gallagher[2], Robert J. Brown[2], Andrew McKay[3], Lester M. Cohen[4]; [1]Tinsley Labs Inc., USA, [2]Ball Aerospace & Technologies, USA, [3]Northrop Grumman Space Technology, USA, [4]Smithsonian Astrophysical Observatory, USA.* An overview of the JWST mirror segment fabrication at Tinsley will be presented. The 18 JWST primary mirror segments are lightweighted 1.3m flat-to-flat Beryllium hexagonal substrates.

OFMA3 • 9:00 a.m. Invited
Large Aspheric Mirror Fabrication and Testing at CIOMP, *Xue-Jun Zhang; CIOMP, China.* The Intent of this paper is to review the technology developments regarding to large aspheric mirrors fabrication and testing at Changchun Institute of Optics and Fine Mechanics and Physics (CIOMP).

OFMA4 • 9:30 a.m.
Mirror Technology Roadmap, *H. Philip Stahl; NASA, USA.* NASA's Mirror Technology Roadmap identifies specific capabilities requiring significant advances in optical fabrication and testing to enable the next generation of large-aperture space telescopes for astronomy and Earth science missions ranging from x-ray to infrared.

9:45 a.m.–10:30 a.m. Coffee Break, Hyatt Grand Ballroom G

10:30 a.m.–12:15 p.m.
OFMB • Advances in Optics Fabrication
Oliver Fähnle; Fisba Optik AG, Switzerland, Presider

OFMB1 • 10:30 a.m. Invited
Reactive Atom Plasma Processing for Lightweight SiC Mirrors, *Peter Fiske, Yogesh Verma, Andrew Chang, Nick Lyford, Jude Kelley, Phil Sommer, Ning Li, Kurt Pang, George Gardopee, Tom Kyler, John Berrett; RAPT Industries, Inc., USA.* Reactive Atom Plasma (RAP) is a plasma-based tool for rapid damage-free shaping of optical surfaces. We discuss our success rapidly shaping and finishing advanced lightweight SiC mirrors using an integrated manufacturing process that includes RAP.

OFMB2 • 11:00 a.m. Invited
Elastic Emission Machining for the Fabrication of X-Ray and EUV Mirrors, *Kazuto Yamauchi; Osaka Univ., Japan.* No abstract available.

OFMB3 • 11:30 a.m. Invited
New Lightweight, Low Cost, Replicated Glass Mirrors for Astronomical Telescopes, *David Strafford; ITT, USA.* Corrugated mirrors are a new technology for rapid fabrication large volumes of lightweight mirror segments at low cost. These mirrors have high performance, low mass and can produced with a replicated optical surface.

OFMB4 • 12:00 p.m.
Jet Finishing of Novel Optic Designs, *Aric Shorey, William Kordonski, Justin Tracy, Marc Tricard; QED Technologies Inc, USA.* Manufacturing challenges become great as optic designs trend towards increasing aspheric departure and freeform shapes. Magnetorheological Jet (MR Jet™) finishing provides a versatile polishing processes capable of achieving high precision on next generation optic designs.

Riverside Court

Laser Science

12:00 p.m.–2:00 p.m.
LMA • Symposium on Undergraduate Research Posters

Grand Ballroom G

OF&T

12:30 p.m.–2:00 p.m.
OFMC • OF&T Main Poster Session

OFMC1

Interferometric Measurement of Glass-Gel Boundary Reflectance, *Shiguang Wang, Maria Robinson, Michael Kuechel; Zygo Corp., USA.* Details are described for measuring reflectance of Fused-Silica-Sub-Lux-Gel boundary reflectance. Based on two beam interference, the method is sensitive yet easy to use. Average reflectance is 2.3E-05.

OFMC2

Vibe: A New Process For High Speed Polishing Of Optical Elements, *Juan J. Sánchez Escobar[1], Javier Salinas Luna[2]; [1]Ceti, Mexico, [2]CCMC, Mexico.* A method based on a hybrid genetic algorithm is proposed to obtain the wavefront aberrations of a real interferogram.

OFMC3

A General Tool for the Design and Analysis of Stressed Optic Polishing, *Ulf Griesmann, Quandou Wang, Johannes Soons; NIST, USA.* Three-flat tests are measurement procedures to separate errors in the interferometer reference wavefront from errors due to the test part surface. We present a comparison of several three-flat test algorithms.

OFMC4

A Practical Implementation of the Random Ball Test, *Takuma Doi[1], Tomizo Kurosawa[2], Takeshi Hatsuzawa[3]; [1]Natl. Metrology Inst. of Japan(NMIJ), Natl. Inst. of Advanced Industrial Science and Technology (AIST), Japan, [2]Japan Quality Assurance Organization, Japan, [3]Precision and Intelligence Lab, Tokyo Inst. of Technology, Japan.* Effect of numerical aperture is theoretically estimated on the basis of the measured pupil function of Mirau-type objective. The discrepancies of numerical aperture factor between theoretical calculations and measured values are less than 0.6%.

OFMC5

Tuneable Planar Integrated Optical Systems, *Adriana Nava-Vega[1], Luis Salas[2], Esteban Luna[2], Alejandro Cornejo-Rodriguez[3]; [1]Univ. Autonoma de Baja California, Facultad de Ciencias Quimicas e Ingenieria, Mexico, [2]Observatorio Astronomico Nacional de San Pedro Martir, Insituto de Astronomia, Univ. Nacional Autonoma de Mexico, Mexico, [3]INAOE, Mexico.* It is testing a paraboloid off axis surface with numerical simulations of interferograms, we proposed to apply a correlacion algorithm to recover the phase and evaluate the whole surface with sections by subaperture stitching test.

OFMC6

Obtaining the Phase of a Real Interferogram by Use of a Hybrid Genetic Algorithm, *Dale E. Ewbank; Rochester Inst. of Technology, USA.* A system to measure phase for reflective electro-optical micro-devices at visible wavelengths was developed. Relative phase versus voltage is required for control design of devices utilizing electro-optic materials such as polymer dispersed liquid crystals.

OFMC7

A Comparison of Three-Flat Tests, *Bruce M. Pixton, John E. Greivenkamp; Univ. of Arizona, USA.* A method for automating refractive index measurements of liquids has been implemented on a Hilger-Chance refractometer. A beam angle sensor using a position-sensitive detector enables automated determination of angles usually obtained by visual reading.

OFMC8

Estimation of Numerical Aperture Effect on the Basis of Measured Pupil Function of Mirau-type Objective, *Georgina Beltran, Juan Pablo Padilla-Martinez, Rodolfo Palomino-Merino, Juan Castillo Mixcóatl, Severino Muñoz Aguirre; FCFM-BUAP, Mexico.* In the present work there is introduced the fabrication and characterization of a pH sensor based on a multimodal optical fiber that uses a sensing film deposited by the Sol-Gel technique.

OFMC9

Interferometer Testing Using Subaperture Stitching Test for a 1.8 Meters Paraboloid Segmented Mirror, *Maximino Avendaño-Alejo, Manuel Campos-Garcia, Rufino Díaz-Uribe; Univ. Nacional Autónoma de México, Mexico.* We explore different tilted null screens for a better alignment and centroid evaluation in the test of an off-axis surface. Drop shaped spots are used, on both radial and rectangular arrays.

OFMC10

Optical Test System for Reflective Electro-Optical Adaptive Micro-Device Phase Measurement, *Charles Klinger; Optimax Systems Inc., USA.* The concept for polishing optical elements with a process called **VIBE** is presented. Application to non uniformly sloped optics such as aspheric shapes is detailed. A few technical challenges to be overcome are outlined.

OFMC11

Automated Hilger-Chance Refractometer for Index Measurement of Liquids, *Victor Genberg, Gregory Michels, Keith Doyle, Gary Bisson; Sigmadyne, Inc., USA.* SigFit, a general tool for the design and analysis of stressed optic polishing is presented. SigFit will determine the number, location, and stroke magnitude for actuators for minimum surface error.

OFMC12

Optical Fiber pH Sensor Using Sol-Gel Deposited TiO_2 Film Doped with Organic Dyes, *Robert E. Parks; Optical Perspectives Group, LLC, USA.* The random ball test for calibrating interferometer transmission spheres1 was reported about 8 years ago but there did not appear to be an ideal ball. Now, nearly ideal balls are available.

OFMC13

Tilted Null Screens with Drop Shaped Spots: Radial and Square Arrays, *Martin Amberg[1], A. Oeder[1], P. J. W. Hands[2], G. Love[2], S. Sinzinger[1]; [1]TU Ilmenau, Germany, [2]Univ. of Durham, United Kingdom.* Planar optical systems are well suited for various applications, such as optical interconnects and security devices. We demonstrate dynamic or adaptive functionality of such microoptical systems through the integration of modal liquid crystal-devices.

Highland A

Frontiers in Optics

1:30 p.m.–3:15 p.m.
FMA • Photonic Metamaterials I
Vladimir M. Shalaev; Purdue Univ., USA, Presider

FMA1 • 1:30 p.m. Tutorial
Photonic Metamaterials: Optics Starts Walking on Two Feet, *Martin Wegener; DFG-Ctr. for Functional Nanostructures, Univ. Karlsruhe (TH), Germany.* Photonic metamaterials consist of nanostructured building blocks ("photonic atoms") that are packed into an effective material. This allows for magnetism at optical frequencies, the basis for negative-index materials. We review this emerging field.

Martin Wegener obtained his Ph.D. from the Johann Wolfgang Goethe Universität

Highland B

Laser Science

2:00 p.m.–3:30 p.m.
LMB • Symposium on Undergraduate Research I

Highland C

Frontiers in Optics

1:30 p.m.–3:15 p.m.
FMB • Computational Imaging I
Joseph N. Mait; ARL, USA, Presider

FMB1 • 1:30 p.m. Invited
Compressive Sampling in Spectral Imaging Systems, *David Brady; Duke Univ., USA.* Optical prefilters shape the analog-digital interface in imaging systems to implement generalized spatio-spectral sampling. The Duke Imaging and Spectroscopy Program explores generalized sampling systems, this talk focuses specifically on spectral encoding for compressive spatial imaging.

Highland D

1:30 p.m.–3:15 p.m.
FMC • Diffractive Micro- and Nanostructures for Sensing and Information Processing I
Thomas J. Suleski; Univ. of North Carolina at Charlotte, USA, Presider

FMC1 • 1:30 p.m. Invited
Modulated Optical Crystals as Computer-Generated Volume Holograms, *Rafael Piestun; Univ. of Colorado at Boulder, USA.* The optical properties of modulated three-dimensional periodic structures are studied and different encoding techniques are proposed. The structures are fabricated using femtosecond laser pulses to modify the refractive index in the volume of dielectric materials.

Highland E

1:30 p.m.–3:15 p.m.
FMD • Advanced Transmission and Impairments
Reinhold Ludwig; Heinrich-Hertz-Inst., Germany, Presider

FMD1 • 1:30 p.m.
Broadband Polarization Mode Dispersion Measurement via Spectral Polarimetry, *Li Xu, Shawn X. Wang, Andrew M. Weiner; School of Electrical and Computer Engineering, Purdue Univ., USA.* We demonstrate a technique for broadband Polarization Mode Dispersion (PMD) measurement via spectral polarimetry, which allows PMD monitoring on millisecond scale.

FMD2 • 1:45 p.m. Invited
Electronic Compensation of Linear and Nonlinear Impairments in Phase-Modulated Systems, *Keang-Po Ho[1], Joseph M. Kahn[2]; [1]SiBEAM, USA, [2]Stanford Univ., USA.* Chromatic dispersion and PMD can be compensated using linear feedforward equalizer with or without DFE. Correlated to the received intensity, nonlinear phase noise can be compensated by combining the received phase with the received intensity.

Highland F

1:30 p.m.–3:00 p.m.
FME • Coherent and Quantum Optics in Fibers I
Colin J. McKinstrie; Lucent Technologies, USA, Presider

FME1 • 1:30 p.m. Tutorial
Introduction to Quantum Optics in Crystals and Fibers, *Peter D. Drummond, J. Corney; ARC Ctr. for Quantum-Atom Optics, Univ. of Queensland, Australia.* Experiments with lasers can explore quantum effects in radically new environments. This tutorial explains simple quantum theories and phase-space methods used to describe such nonlinear dispersive media, including optical waveguides, fibres and crystals.

Peter Dummond was educated at the Universities of Auckland and Waikato in

Frontiers in Optics

Highland G

1:30 p.m.–2:45 p.m.
FMF • Image-Based Wavefront Sensing I
Bruce Dean; NASA, Goddard Space Flight Ctr., USA, Presider

FMF1 • 1:30 p.m. Invited
Robust Wavefront Sensing and Control for Space-Borne Imaging Interferometry and Coronagraphy, *Richard Lyon; NASA Goddart Space Flight Ctr., USA.* An overview of image-based wavefront sensing and control, relevant to NASA, from Hubble Space Telescope to the James Webb Space Telescope and future proposed imaging interferometry and coronagraphic missions is given.

Highland H

1:00 p.m.–3:30 p.m.
FMG • Advances in Instrumentation for High-Resolution Retinal Imaging I
David Williams; Univ. of Rochester, USA, Presider

FMG1 • 1:00 p.m. Invited
MEMS-Based Adaptive-Optics Scanning Laser Ophthalmoscope, *Yuhua Zhang[1], Jacque L. Duncan[2], Brandon Lujan[2], Austin Roorda[1]; [1]School of Optometry, Univ. of California, Berkeley, USA, [2]Ophthalmology Dept., Univ. of California,San Francisco, USA.* We developed a clinically deployable adaptive optics (AO) scanning laser ophthalmoscope (AOSLO) using a micro-electro-mechanical (MEMS) deformable mirror and low coherent light sources. We investigated retina microstructure in retinal degeneration patients with high resolution.

FMG2 • 1:30 p.m. Invited
Adaptive Optics High-Resolution Retinal Imaging, *Donald T. Miller; School of Optometry, Indiana Univ., USA.* Adaptive optics cameras based on flood illumination and optical coherence tomography have been developed and applied to imaging the cellular retina. The cameras have led to new insights into the optical properties of photoreceptor cells.

Laser Science

Highland J

1:30 p.m.–3:15 p.m.
LMC • Quantum Degenerate Gases I
Kristian Helmerson; NIST, USA, Presider

LMC1 • 1:30 p.m. Invited
Fermionic Superfluidity with Imbalanced Spin Populations, *Christian H. Schunck, Martin W. Zwierlein, André Schirotzek, Yong-il Shin, Wolfgang Ketterle; MIT, USA.* Superfluidity in a two-state mixture of ultracold fermionic atoms with imbalanced state populations is established. This relates to the long-standing debate about the nature of the superfluid state in Fermi systems.

Highland K

1:30 p.m.–3:15 p.m.
LMD • Optics in Soft Condensed Matter Physics I
Arjun Yodh; Univ. of Pennsylvania, USA, Presider

LMD1 • 1:30 p.m. Invited
Surmounting Barriers: The Benefit of Hydrodynamic Interactions, *Clemens Bechinger; Univ. Stuttgart, Germany.* We investigate the properties of colloidal particles driven along a toroidal trap. Due to hydrodynamic interactions amongst the particles, this leads to a rather surprising collective behavior which is experimentally and theoretically investigated.

OF&T

Hyatt Grand Ballroom E/F

1:30 p.m.–3:15 p.m.
OFMD • Micro-Optics and Integrated Optics
Angela Davies; Univ. of North Carolina at Charlotte, USA, Presider

OFMD1 • 1:30 p.m. Invited
The European Network of Excellence in Micro-Optics (NEMO), *Hugo Thienpont[1], Jürgen Van Erps[1], Malgorzata Kujawinska[2], Jürgen Mohr[3]; [1]Vrije Univ. Brussel, Belgium, [2]Inst. of Micromechanics and Photonics, Warsaw Univ. of Technology, Poland, [3]Inst. fur Mikrostrukturtechnik, Forschungszentrum Karlsruhe, Germany.* We highlight the joint strategy of 30 partners, who teamed up in a European Network of Excellence to structure and integrate their efforts in the multidisciplinary domain of micro-optics, the key-link between photonics and nano-electronics.

OPE

Hyatt Regency Ballroom A/B

1:30 p.m.–3:15 p.m.
OPMA • Light Emission I
Presider to Be Announced

OPMA1 • 1:30 p.m. Plenary
OLEDs/Organic Solar Cells, *Ching Tang; Kodak, USA.* No abstract available.

Highland A

Frontiers in Optics

FMA • Photonic Metamaterials I—Continued

zu Frankfurt am Main in 1987. From 1988 to 1990 he was a postdoc at AT&T Bell Laboratories in New Jersey (USA) and from 1990 to 1995 C3 professor at the Universität Dortmund. Since 1995 he has been C4 professor at the Institut für Angewandte Physik of the Universität Karlsruhe (TH), and since 2001 he has also been a group leader at the Forschungszentrum Karlsruhe and the coordinator of the DFG-Center for Functional Nanostructures, one of six centers of excellence funded by the Deutsche Forschungsgemeinschaft (DFG) in Germany. His current research interests include three-dimensional photonic crystals, optical near-field spectroscopy and microscopy, nano-photonics, biophotonics, and photonic metamaterials. He has obtained various awards and honors. For example, regarding photonic metamaterials, he was awarded the European Union René Descartes Award 2005 for cooperative research (together with Ekmel Ozbay, John Pendry, David Smith, and Costas Soukoulis), the Research Award of the State of Baden-Württemberg 2005, and the international Carl Zeiss Research Award 2006 (together with Kurt Busch).

FMA2 • 2:15 p.m.
Optical "Hyperlens": Imaging in the Far Field Beyond the Diffraction Limit, *Zubin Jacob, Leonid V. Alekseyev, Evgenii Narimanov; Princeton Univ., USA.* We propose a system for far-field optical imaging below the diffraction limit. As opposed to the "superlens" based on negative index materials, our approach allows image magnification and is robust with respect to material losses.

Highland B

Laser Science

LMB • Symposium on Undergraduate Research I—Continued

Highland C

Frontiers in Optics

FMB • Computational Imaging I—Continued

FMB2 • 2:00 p.m.
Pushbroom Hyperspectral Imaging with a Coded Aperture, *Andrew D. Portnoy, Michael E. Gehm, David J. Brady; Duke Univ., USA.* We describe a hyperspectral camera which operates by translating a scene across the entrance of a coded aperture spectrometer. This applies a sequence of unique codes to the image, allowing full reconstruction of the datacube.

FMB3 • 2:15 p.m.
Dual-Disperser Design for Single-Shot Computational Spectral Imaging, *Michael E. Gehm, Andrew D. Portnoy, David J. Brady; Duke Univ., USA.* We describe a dual-disperser approach to computational spectral imaging. This approach enables flexible code design and avoids problems present in single-disperser systems. We will report on a prototype single-shot spectral imager based on these ideas.

Highland D

FMC • Diffractive Micro- and Nanostructures for Sensing and Information Processing I—Continued

FMC2 • 2:00 p.m.
Distributed Bragg Reflector Design for GaN Based High Brightness LEDs, *Dongxue M. Wang, Ian Ferguson, John Buck; Georgia Tech, USA.* A model for distributed Bragg Reflector (DBR) is developed. A detailed refractive index calculations for GaN, AlN, AlGaN and InGaN in embedded in this model. It can model and predict DBR performances.

FMC3 • 2:15 p.m.
Integration of Eight Different-Period DBRs by Interference Exposure for Intra-Board WDM Optical Interconnection, *Shogo Ura[1], Takuo Asada[1], Satoshi Yamaguchi[1], Kenzo Nishio[1], Atsushi Horii[1], Kenji Kintaka[2]; [1]Kyoto Inst. of Technology, Japan, [2]Natl. Inst. of Advanced Industrial Science and Technology, Japan.* Partial exposure of chirped grating by two-beam interference using cylindrical mirror and multi-slit mask was discussed to integrate different-period DBRs of 0.6 mm length and 80 % efficiency suitable for intraboard WDM optical interconnection.

Highland E

FMD • Advanced Transmission and Impairments—Continued

FMD3 • 2:15 p.m. Invited
Synchronous Demodulation of Optical Phase Shift Keying in Coherent Systems with DFB Lasers, *Reinhold Noe, Timo Pfau; Univ. Paderborn, Germany.* An I&Q digital coherent receiver with feedforward carrier recovery and clock recovery has been realized. QPSK data, currently 1.6 Gb/s over 63 km, is transmitted in realtime with FEC-compatible BER using standard commercial DFB lasers.

Highland F

FME • Coherent and Quantum Optics in Fibers I—Continued

New Zealand, and at Harvard University (Boston). He has worked at the University of Rochester, Auckland University, IBM Laboratories (San Jose), NTT Basic Research Labs (Tokyo), and currently is Professor of Theoretical Physics at the University of Queensland (Australia), as well as Node Director of the Australian Centre of Excellence for Quantum-Atom Optics. Drummond developed the first exact stochastic methods for dealing with the quantum time-evolution of many-body systems in quantum optics and BEC, including: fundamental theorems, exact solutions, practical implementations, useful approximations, numerical algorithms, and comparisons with experiment. His research in quantum optics pioneered the theory of squeezing and EPR effects in parametric amplifiers and in optical fibers. Current work is in the fields of many-body theory as applied to ultra-cold bosons and fermions, as well as to novel features of solitons and quantum information in atom and optical lasers. This is closely related to tests of quantum theory, and is carried out in association with experimental groups. Potential applications include advanced communications, nano-technology, and precision measurements.

FME2 • 2:15 p.m.
Demonstrations of Distant and Low-Noise Wavelength Conversion by Bragg Scattering in a Fiber, *Alan H. Gnauck[1], John D. Harvey[2], Robert M. Jopson[1], Colin J. McKinstrie[1], David Méchin[2], Stojan Radic[3]; [1]Lucent Technologies, USA, [2]Univ. of Auckland, New Zealand, [3]Univ. of California at San Diego, USA.* Four-wave-mixing (Bragg scattering) in a fiber has the potential to wavelength-convert (WC) signals without adding excess noise. We report efficient WC, with less noise than the corresponding phase-conjugation process, and record WC by 180 nm.

Highland G

Highland H

Frontiers in Optics

FMF • Image-Based Wavefront Sensing I—Continued

FMF2 • 2:00 p.m.

Comparison of Estimation Methods for Field-Dependent Phase Aberrations, *Matthew R. Bolcar, James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* Two techniques of multi-field phase retrieval are compared using digital simulations and Fisher Information theoretical methods. Results show solving for phase coefficients with explicit field-dependence yields a lower estimation error in the phase retrieval process.

FMF3 • 2:15 p.m.

Wavefront Sensor-Less Adaptive Optics—Image Correction through Sharpness Maximisation, *Larry P. Murray[1], Chris Dainty[1,2], Donald McGaughey[2]; [1]Applied Optics Group, Ireland, [2]Royal Military College of Canada, Canada.* Wavefront-sensorless image correction through sharpness maximisation is presented. An image sharpness metric is shown to relate to low wavefront-error as the sharpness is maximised. Various search algorithms are used to determine the conjugate DM shape.

FMG • Advances in Instrumentation for High-Resolution Retinal Imaging I—Continued

FMG3 • 2:00 p.m. Invited

Ultrahigh Resolution, Functional Optical Coherence Tomography, *Wolfgang Drexler; Cardiff Univ., UK.* Recent developments of optical coherence tomography enable volumetric cellular level resolution, depth resolved functional imaging of the living retina as well as enhanced penetration into the choroid by employing novel wavelength regions.

Highland J

Highland K

Laser Science

LMC • Quantum Degenerate Gases I—Continued

LMC2 • 2:00 p.m. Invited

New States of Matter in Polarized Cold Fermi Atoms, *Joseph Carlson, Sanjay Reddy; Los Alamos Natl. Lab, USA.* Cold Fermi atoms enable the study of strongly-interacting Fermions where the superfluid gap is comparable to the Fermi energy. New phases of matter can appear when such systems are polarized; we compare calculations with experiments.

LMD • Optics in Soft Condensed Matter Physics I—Continued

LMD2 • 2:00 p.m.

Premelting at Defects within Bulk Colloidal Crystals, *Ahmed M. Alsayed, Mohammad F. Islam, Yilong Han, Peter J. Collings, Arjun G. Yodh; Univ. of Pennsylvania, USA.* We observe premelting at grain boundaries and dislocations within bulk colloidal crystals using video microscopy. The crystals are 3-D thermally responsive microgel colloidal structures. Particle tracking reveals increased disorder in crystalline regions bordering defects.

LMD3 • 2:15 p.m. Invited

Colloidal Interactions, Kinetics and Crystallization Due to DNA Hybridization, *John Crocker; Univ. of Pennsylvania, USA.* No abstract available.

Hyatt Grand Ballroom E/F

OF&T

OFMD • Micro-Optics and Integrated Optics—Continued

OFMD2 • 2:00 p.m.

Measuring the Wavefront Distortion of a Microlens Array Using an Index Matching Liquid, *Daryl Purcell, Amit Suratkar, Angela Davies, Faramarz Farahi; Univ. of North Carolina at Charlotte, USA.* This paper describes a method in which the overall geometry and form errors of each lens in a microlens array are measured simultaneously by the use of a planar wave.

OFMD3 • 2:15 p.m.

Planarized Multilayer Composite Microstructures for Optical Function Integration, *Xuegong Deng, Jian Wang, Xiaoming Liu, Qihong Wu, Feng Liu; NanoOpto Co., USA.* We realize microstructures of composite materials (MCMs) for polarization control. Transmission only polarizers and dielectrics diffractive optics are demonstrated with features spanning 50 nm to a few micrometers. We elucidate a paradigm for functional integration.

Hyatt Regency Ballroom A/B

OPE

OPMA • Light Emission I—Continued

OPMA2 • 2:15 p.m.

Exciton Diffusion in Highly Doped Organic Films, *Stefan Lochbrunner, Martin Schlosser; Lehrstuhl für BioMolekulare Optik, Germany.* Energy transfer pathways are characterized by ultrafast absorption spectroscopy in thin PMMA films highly doped with perylene bisimide dyes. We find a high exciton mobility and a multistep mechanism for the transfer to acceptor units.

Highland A

Frontiers in Optics

FMA • Photonic Metamaterials I—Continued

FMA3 • 2:30 p.m. Invited

Advanced Optical Negative Index Materials, *Richard Osgood, Nicolae Panoiu, Rohit Chatterjee, Kai Liu, Chee-Wei Wong; Columbia Univ., USA.* Optical negative refractive-index materials are changing our approaches to manipulating light for filtering, signal processing, and imaging. We describe new approaches to dealing with their initial limitations including loss, limited acceptance angle, and design complexity.

FMA4 • 3:00 p.m.

Reflectionless Evanescent Wave Amplification by Two Dielectric Slabs, *Mankei Tsang, Demetri Psaltis; Caltech, USA.* It is shown that evanescent waves can be amplified without any reflection simply by two dielectric slabs. This enables non-scanning near-field imaging without direct contact with the object, suitable for biological imaging applications.

Highland B

Laser Science

LMB • Symposium on Undergraduate Research I—Continued

Highland C

Frontiers in Optics

FMB • Computational Imaging I—Continued

FMB4 • 2:30 p.m.

Multiple Order Coded Aperture (MOCA) Spectrometer, *Steven D. Feller[1], Michael E. Gehm[1], David J. Brady[1], Chaoray Hsieh[2], Omid Momtahan[2], Ali Adibi[2]; [1]Duke Univ., USA, [2]Georgia Tech, USA.* We introduce a Multiple Order Coded Aperture (MOCA) spectrometer that uses a cross-dispersive hologram and a coded aperture to achieve improved spectral range over traditional dispersive spectrometers at comparable resolution.

FMB5 • 2:45 p.m.

Evaluation of Aperture Codes for High Throughput Spectroscopy, *Ashwin A. Wagadarikar, Michael E. Gehm, David J. Brady; Duke Univ., USA.* A coded aperture spectrometer maintains the spectral resolution of a traditional slit spectrometer while dramatically increasing the throughput. Here we evaluate the performance of different aperture codes for spectroscopy of weak, incoherent sources.

FMB6 • 3:00 p.m.

Throughput Improvement for Volume Holographic Spectrometer Using Shift-Multiplexing Techniques, *Chaoray Hsieh, Omid Momtahan, Ali Adibi; Georgia Tech, USA.* We show the throughput of the volume holographic spectrometer is considerably improved using shift-multiplexed holograms as the dispersion medium. We also show the resolution-throughput trade-off is solved by recording shift-multiplexed holograms in a thicker material.

Highland D

FMC • Diffractive Micro- and Nanostructures for Sensing and Information Processing I—Continued

FMC4 • 2:30 p.m.

A Far-Field Implementation of Near-Field Phase-Shift Lithography Using Diffractive Optical Elements, *Wei-Feng Hsu, Yuan-Hong Su; Dept. of Electro-Optical Engineering, Natl. Taipei Univ. of Technology, Taiwan.* We present a lithographic technique where a diffractive optical element of a Fourier system generated a diffractive pattern. It resembled the near-field pattern of a phase-shift mask that has been used to create subwavelength features.

FMC5 • 2:45 p.m.

New Overlay Technique for Fabrication of 15nm Zone Plates, *Weilun Chao[1,2], Bruce Harteneck[2], J. Alexander Liddle[2], Erik Anderson[2], David Attwood[1,2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA.* Soft x-ray zone-plate microscopy is a unique and powerful nano-imaging technique. Using our internally developed nanofabrication processes, Fresnel zone plates with 15-nm zonewidth have been successfully fabricated, enabling the microscopy to achieve sub-15 nm resolution.

FMC6 • 3:00 p.m.

True-Color Imaging Using Synthetic Diffractive Structures, *David Najdek, Pavel Fiala; Czech Technical Univ. in Prague, Czech Republic.* Presented work provides a tool for true-color imaging, using additive color mixing of arbitrary sets of diffraction gratings. Equations for primaries proportions determination were derived and experimentaly verified for a set of available gratings.

Highland E

FMD • Advanced Transmission and Impairments—Continued

FMD4 • 2:45 p.m.

Integrated Components for Optical QPSK Transmission, *Reinhold Noé[1], Timo Pfau[1], Yaakov Achiam[2], Franz-Josef Tegude[3], Henri Porte[4]; [1]Univ. Paderborn, Germany, [2]CeLight Israel Ltd., Israel, [3]Univ. Duisburg-Essen, Germany, [4]Photline Technologies, France.* $LiNbO_3$ Z-cut QPSK modulators, $LiNbO_3$ 90° hybrids co-packaged with balanced photoreceiver OEICs and SiGe/CMOS circuits for digital signal processing are being developed as key components for a 40-Gb/s synchronous QPSK polarization division multiplex transmission testbed.

FMD5 • 3:00 p.m.

Timing Jitter in Optical Communication Systems, *Armando N. Pinto; Inst. of Telecommunications, Univ. of Aveiro, Portugal.* Timing jitter cubic growth limits the reach of high-speed optical communication systems. In this work we consider both linear and non-linear optical transmission systems and analyze the accumulation and mitigation of this unwanted effect.

Highland F

FME • Coherent and Quantum Optics in Fibers I—Continued

FME3 • 2:30 p.m. Invited

Coherent Optical Signal Processing in High-Confinement Fibers, *Stojan Radic; Univ. of California at San Diego, USA.* Multiple-pump parametric processing in silica and non-silica fibers represents the basis of coherent, band mapping technology. Recent results demonstrating distant channel and band mapping from visible to infrared optical range are outlined.

Frontiers in Optics

Highland G

FMF • Image-Based Wavefront Sensing I—Continued

FMF4 • 2:30 p.m.
Extending Wavefront Sensing Capture Range for Segmented Systems through Tip and Tilt Estimation, *Thomas Zielinski, James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* Once wavefront aberrations exceed a threshold value, phase retrieval algorithm convergence suffers greatly. We can overcome this problem by estimating segment tip and tilt values from differences between a computed PSF and the measured PSF.

Highland H

FMG • Advances in Instrumentation for High-Resolution Retinal Imaging I—Continued

FMG4 • 2:30 p.m.
MEMS Based, Compact, Tracking Adaptive Optics SLO: Initial Subject Results, *Stephen A. Burns[1], Ann E. Elsner[1], Xiaofeng Qi[1], Hongxin Song[1], Zhangyi Zhong[1], Daniel Ferguson[2], Daniel X. Hammer[2]; [1]Indiana Univ., USA, [2]Physical Sciences, Inc, USA.* The Indiana AOSLO is a compact MEMS system, with a retinal tracker/stabilizer, and simultaneous low and high resolution imaging. The detection channel allows control of sampling and polarization properties of the detected light.

FMG5 • 2:45 p.m.
Laser Scanning Digital Camera for Retinal Imaging with a 40 Degree Field of View, *Yanming Zhao, Ann E. Elsner, Bryan P. Haggerty, Dean A. VanNasdale, Benno L. Petrig; School of Optometry, Indiana Univ., USA.* A laser scanning digital camera designed for retinal imaging is described. This device features illumination with a scanned slit and imaging with a 40 degree field, and it could provide eye diagnostics to underserved populations.

FMG6 • 3:00 p.m.
Retinal Birefringence Changes Associated with Exudative Eye Disease, *Ann E. Elsner[1], Dean A. VanNasdale[1], Bryan P. Haggerty[1], Brian D. Hansel[1], Yanming Zhao[1], Masahiro Miura[2], Anke Weber[3]; [1]Indiana Univ., USA, [2]Tokyo Medical Univ., Japan, [3]Univ. Eye Hospital, Germany.* The phase and amplitude of retinal birefringence was imaged to investigate retinal diseases with fluid leakage. Besides mechanical changes, such as fringes around fluid and traction-related striae, focal phase or amplitude changes were common.

Laser Science

Highland J

LMC • Quantum Degenerate Gases I—Continued

LMC3 • 2:30 p.m. Invited
Spatial Deformation in a Phase Separated Fermi Gas, *Guthrie B. Partridge, Wenhui Li, Yean-an Liao, Duong Nguyen, Ramsey I. Kamar, Randall G. Hulet; Rice Univ., USA.* Phase separation between a uniformly paired core and excess unpaired atoms is observed in a two component strongly interacting ultra-cold gas of fermionic 6Li. Spatial deformations in the density distributions violate the local density approximation.

LMC4 • 3:00 p.m.
Effect of Spatial Dynamics on Spin Squeezing in Two-Component Bose-Einstein Condensates, *Sulakshana N. Thanvanthri[1], Zachary Dutton[2]; [1]Univ. of Maryland, Baltimore County, USA, [2]NRL, USA.* We discuss the effect of spatial dynamics in two-component Bose-Einstein condensates on spin squeezing and transfer to squeezed light. We also present a general treatment of squeezing transfer from atomic spins to light fields.

Highland K

LMD • Optics in Soft Condensed Matter Physics I—Continued

LMD4 • 2:45 p.m. Invited
Using Confocal Microscopy to Explore Complex Fluids and Biological Materials, *Itai Cohen, Peter Schall, Thomas G. Mason, Frans Spaepen, David A. Weitz, Mark Buckley, Lawrence Bonassar; Cornell Univ., USA.* Fast confocal microscopy allows exploration of dynamic processes in sheared complex materials. I will show this technology can be used to study defect nucleation in colloidal crystals and the inhomogeneous response of sheared cartilage tissue.

Hyatt Grand Ballroom E/F

OF&T

OFMD • Micro-Optics and Integrated Optics—Continued

OFMD4 • 2:30 p.m.
Ray-Trace Simulation of the Random Ball Test to Improve Interferometric Microlens Metrology, *Neil W. Gardner, Angela Davies; Univ. of North Carolina at Charlotte, USA.* A comprehensive ray-trace simulation of the random ball test was created to allow for further investigation into the relationship between test part curvature, misalignment and interferometer bias during the self-calibration of micro-refractive lens measurements.

OFMD5 • 2:45 p.m. Invited
Recent Advances in Fabrication of Micro-Optics Components and Assemblies, *Jim Morris; Digital Optics Corp., USA.* No abstract available.

Hyatt Regency Ballroom A/B

OPE

OPMA • Light Emission I—Continued

OPMA3 • 2:30 p.m.
Novel Organic Light-Emitting Materials Capable of Variable Charge Injection and Transport, *Andrew C. A. Chen, Jason U. Wallace, Simon K. H. Wei, Lichang Zeng, Shaw H. Chen; Univ. of Rochester, USA.* Novel organic materials were designed and synthesized by attaching monodisperse oligofluorenes to a hole- and an electron-conducting core through a flexible spacer. These material class holds promise for the realization of efficient and stable OLEDs.

OPMA4 • 2:45 p.m. Invited
OLEDs, *Hany Aziz; Xerox Labs, USA.* No abstract available.

Highland A	Highland B	Highland C	Highland D	Highland E	Highland F
Frontiers in Optics	**Laser Science**	**Frontiers in Optics**			

3:15 p.m.–3:45 p.m. Coffee Break, Highland Room Foyer

NOTES

FMG • Advances in Instrumentation for High-Resolution Retinal Imaging I—Continued

FMG7 • 3:15 p.m.

Application of One-Dimensional Wavelet Transformation in Retina Imaging of Optical Coherence Tomography, *Yun Dai, Yu-dong Zhang, Guo-hua Shi; Inst. of Optics and Electronics, The Chinese Acad. of Sciences, China.* One-dimensional Wavelet transformation is used to demodulate the modulated interferometric signal and de-noising at the same time for optical coherence tomography in the time-domain. This method is more compact and efficient than traditional STFT.

LMC • Quantum Degenerate Gases I—Continued

LMC5 • 3:15 p.m.

Matter Wave EIT in Raman Photoassociation, *Lincoln D. Turner, Adam T. Black, Eduardo Gomez, Eite Tiesinga, Paul D. Lett; NIST, USA.* Electromagnetically-induced transparency (EIT) underpins the phenomenon of slow light. We extend EIT to a Raman photoassociation system with controllable collision velocities, and investigate transparency windows and reduced group velocities for colliding ultracold atom clouds.

3:15 p.m.–3:45 p.m.
Coffee Break, Hyatt Grand Ballroom G

NOTES

Highland A

Frontiers in Optics

3:45 p.m.–5:30 p.m.
FMH • Metamaterials and Negative Refraction I
Martin Wegener; Karlsruhe Univ., Germany, Presider

FMH1 • 3:45 p.m. Invited
Negative Refraction in Si-Based 2-D Photonic Crystal Structures, *Won Park[1], E. Schonbrun[1], Q. Wu[1], Y. Yamashita[2], C. J. Summers[2], M. Tinker[3], Y. Cui[3], J. B. Lee[3]; [1]Colorado Univ., USA, [2]Georgia Tech, USA, [3]Univ. of Texas at Dallas, USA.* Si-based 2-dimensional slab photonic crystal structures were designed and fabricated for operation in the near-infrared region. Negative refraction was experimentally observed in the integrated device structures including in- and out-coupling waveguides.

Highland B

Laser Science

3:30 p.m.–6:30 p.m.
LME • Symposium on Undergraduate Research II

Highland C

3:45 p.m.–6:15 p.m.
LMF • Lasers, Amplifiers and Waveguides
Daniel Gauthier; Duke Univ., USA, Presider

LMF1 • 3:45 p.m.
Q-Switched Yb: Lu$_2$SiO$_5$ Laser with a SESAM, *Yanrong Song[1], Jianghai Hu[1], Chengfeng Yan[2], Guangjun Zhao[2], Liangbi Su[2], Jun Xu[2], Kai Guo[1], Yonggang Wang[3], Zhigang Zhang[1,4]; [1]College of Applied Science, Beijing Univ. of Technology, China, [2]Shanghai Inst. of Optics and Fine Mechanics, Chinese Acad. of Sciences, China, [3]Inst. of Semiconductors, Chinese Acad. of Sciences, China, [4]Inst. of Quantum Electronics, Peking Univ., China.* A new Yb-doped crystal Yb^{3+}: Lu$_2$SiO$_5$ laser was demonstrated. The laser was Q-switched at 1058nm by an InGaAs saturable absorber above 25KHz. The slope efficiency were 4.6% and 3.0% for CW and Q-switched respectively.

LMF2 • 4:00 p.m.
Mode Selection in a Vertical-Cavity Surface-Emitting Laser Using Preferential Alignment of Optical Feedback, *Yong Soo Lee, Tayyab Imran, Chang Hee Nam; Korea Advanced Inst. of Science and Technology (KAIST), Republic of Korea.* Carrier-envelope phase (CEP) of a femtosecond Ti:S oscillator was stabilized using a direct locking method based on time-domain feedback. CEP variation during amplification in a kHz Ti:S laser was measured using a spectral interferometry method.

Highland D

Frontiers in Optics

3:45 p.m.–5:30 p.m.
FMI • Computational Imaging II
David Brady; Duke Univ., USA, Presider

FMI1 • 3:45 p.m. Invited
3-D Information Retrieval Aided by Diffraction, *Rafael Piestun, Adam Greengard; Univ. of Colorado at Boulder, USA.* We discuss approaches for retrieving three-dimensional information using diffraction in passive coherent and incoherent computational sensing systems. We demonstrate the localization of objects with accuracy exceeding the limitations of classical diffraction limits.

Highland E

3:45 p.m.–5:15 p.m.
FMJ • Advanced Transmission and Quantum Communications
Guifang Li; Univ. of Central Florida, USA, Presider

FMJ1 • 3:45 p.m. Invited
Coherent Technologies for Analog Transmission with Enhanced Linearity, *Willie Ng; HRL Labs, USA.* We describe the advantages of adopting coherent technololgies for the high-fidelity transmission of microwave signals via photonic links. The resulting enhancement of the link's figures-of-merit such as its spur free dynamic range will be presented.

Highland F

3:45 p.m.–5:30 p.m.
FMK • Ceramic Lasers I
Jason Eichenholz; Newport Corp., USA, Presider

FMK1 • 3:45 p.m. Invited
Temperature-Tuned Ceramic Lasers for IFE Drivers, *Ken-ichi Ueda; Univ. of Electro-Communications, Japan.* Ceramic laser technique broke a scaling limit of solid state lasers. For the future IFE driver, a temperature tuning of Yb:YAG is proposed to adjust the emission cross section to the suitable parameter window for IFE driver. Low temperature operation of ceramic lasers gives us advantages in thermal conductivity and others.

Highland G

Frontiers in Optics

3:45 p.m.–5:45 p.m.
FML • Image-Based Wavefront Sensing II
Richard Lyon; NASA Goddart Space Flight Ctr., USA, Presider

FML1 • 3:45 p.m. Tutorial
Introduction to Focus-Diverse Phase Retrieval, *Bruce H. Dean; NASA, Goddard Space Flight Ctr., USA.* The fundamental physics of the image-based approach is discussed in addition to various applications of the image-based algorithms. Specification of the optimal amount of defocus diversity is solved by identification as a Talbot effect.

Bruce Dean is a senior optical physicist at the NASA Goddard Space Flight Center (GSFC) and is a wavefront sensing algorithm developer for the James Webb Space Telescope (JWST). He has worked as lead optical designer for COVIR and RIVMOS and is currently Group Leader for the NASA GSFC Wavefront Sensing and Control Group. Bruce has B.A. and Ph.D. degrees in theoretical physics as well as an M.S. in mathematics from West Virginia University.

Highland H

3:45 p.m.–4:30 p.m.
FMM • Advances in Instrumentation for High-Resolution Retinal Imaging II
Stephen A. Burns; Indiana Univ., USA, Presider

FMM1 • 3:45 p.m.
Dual-Wavelength Focusing and Simultaneous Image Registration for *In Vivo* High-Resolution Retinal Imaging, *Jessica I. Wolfing[1,2], Alfredo Dubra[2], Daniel C. Gray[1,2], David R. Williams[2]; [1]Ctr. for Visual Science, Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* We describe dual-wavelength, simultaneous retinal imaging with compensation for eye movements and monochromatic and chromatic aberrations. Using lipofuscin autofluorescence, we can resolve human retinal pigment epithelial cells *in vivo*.

FMM2 • 4:00 p.m.
***In Vivo* High-Resolution Fluorescence Retinal Imaging with Adaptive Optics,** *Daniel C. Gray[1,2], William Merigan[1], Bernard P. Gee[1], Jessica I. Wolfing[1,2], Jason Porter[1], Alfredo Dubra[1], Ted H. Twietmeyer[1], Kamran Ahmad[1], David R. Williams[1]; [1]Ctr. for Visual Science, Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* We describe a new instrument combining adaptive optics ophthalmoscopy and fluorescence imaging. The instrument is capable of imaging retrograde labeled ganglion cells, intrinsic fluorescence from retinal pigment epithelial cells, and intravenous fluorescein injections *in vivo*.

Highland J

Laser Science

3:45 p.m.–5:45 p.m.
LMG • Quantum Degenerate Gases II
Dan Stamper-Kurn; Univ. of California at Berkeley, USA, Presider

LMG1 • 3:45 p.m. Invited
Cavity QED with Ultracold Atoms, *Subhadeep Gupta, Kevin L. Moore, Kater W. Murch, Dan M. Stamper-Kurn; Univ. of California at Berkeley, USA.* We have realized an apparatus for in-situ, strong-coupling optical cavity QED studies with ultracold atoms and Bose-Einstein Condensates. We will present the first results from this novel system.

Highland K

3:45 p.m.–5:30 p.m.
LMH • Optics in Soft Condensed Matter Physics II
Arjun Yodh; Univ. of Pennsylvania, USA, Presider

LMH1 • 3:45 p.m. Invited
Light Propagation in Colloidal Crystals and Glass: The Role of the Packing Geometry, *Anthony D. Dinsmore, Xiaotao Peng; Univ. of Massachusetts, USA.* We study light propagation in films composed of random mixtures of strongly- and weakly-scattering spheres. The transport mean free path of photons, l^*, is enhanced when the coordination number of strong scatterers is ~ 4.

Hyatt Grand Ballroom E/F

OF&T

3:45 p.m.–5:45 p.m.
OFME • Advances in Surface Finishing
Peter Blake; NASA/GSFC, USA, Presider

OFME1 • 3:45 p.m. Invited
Material Response to Micro/Nano Abrasive Processes for Optical Mirrors, *Ling Yin[1], Han Huang[2]; [1]School of Mechanical Engineering, Tianjin Univ., China, [2]School of Engineering, Univ. of Queensland, Australia.* This paper reports on the response of the ceramic materials with single crystal, polycrystalline, and amorphous microstructures to micro/nano indentation, grinding and polishing processes for fabrication of optical mirrors using diamond tools.

Hyatt Regency Ballroom A/B

OPE

3:45 p.m.–5:45 p.m.
OPMB • Light Emission II
Denis Kondakov; Eastman Kodak Co., USA, Presider

OPMB1 • 3:45 p.m. Plenary
Energy Level Alignment and Engineering of Organic/Organic Heterojunctons, *J. X. Tang, C. S. Lee, S. T. Lee; City Univ. of Hong Kong, Hong Kong.* The present work shows the breakdown of the traditional concept of vacuum level alignment at organic/organic heterojunctions due to the formation of interface dipole and band bending. Engineering the heterojunction through doping is performed.

Highland A

Frontiers in Optics

FMH • Metamaterials and Negative Refraction I—Continued

FMH2 • 4:15 p.m.
From Plasmonic Nanocircuit Elements to Volumetric Photonic Negative-Refraction Metamaterials, *Nader Engheta, Andrea Alù, Alessandro Salandrino, Jingjing Li, Mário G. Silveirinha, Brian E. Edwards; Univ. of Pennsylvania, USA.* We give an overview of our theoretical works that connect the concept of lumped nanocircuit elements using plasmonic particles with ideas for 3-D photonic metamaterials with negative refraction. Analytical results and numerical simulations are presented.

FMH3 • 4:30 p.m.
Negative Refraction and Super-resolution Using Transparent Metallo-Dielectric Stacks, *Michael Scalora[1], Giuseppe D'Aguanno[1], Neset Akozbek[2], Marco Centini[3], Domenico De Ceglia[1,4], Mirko Cappeddu[1,5], Nadia Mattiucci[2], Joseph W. Haus[6], Mark J. Bloemer[1]; [1]Charles M. Bowden Res. Ctr., USA, [2]Time Domain Corp., USA, [3]Univ. of Rome, Italy, [4]Politecnico di Bari, Italy, [5]Univ. of Catania, Italy, [6]Univ. of Dayton, USA.* Negative refraction occurs in materials that simultaneously possess a negative electric permittivity and magnetic permeability. We propose a new way of achieving negative refraction with currently available technology, based on transparent, metallo-dielectric multilayer structures.

Highland B

Laser Science

LME • Symposium on Undergraduate Research II—Continued

Highland C

LMF • Lasers, Amplifiers and Waveguides—Continued

LMF3 • 4:15 p.m.
Carrier-Envelope-Phase Stabilization of a kHz Ti:S Laser Based on a Direct Locking Method, *Andrey V. Okishev[1], Lance D. Lund[1], Jonathan D. Zuegel[1], Frank DeWitt[2]; [1]Univ. of Rochester, Lab for Laser Energetics, USA, [2]LBP Inc., USA.* A new diode-pumped, highly-stable compact Nd:YLF regenerative amplifier of shaped 10-ns pulses, which is insensitive to room temperature variations, has been developed for the front-end laser system of the OMEGA EP facility.

LMF4 • 4:30 p.m.
Highly-Stable, Long-Pulse, Diode-Pumped Nd:YLF Regenerative Amplifier, *Daniel J. Gauthier[1], Zhaoming Zhu[1], Andrew M. C. Dawes[1], Lin Zhang[2], Alan E. Willner[2]; [1]Duke Univ., USA, [2]Univ. of Southern California, USA.* We describe how to optimize slow-light via stimulated Brillouin scattering in a room temperature optical fiber that is pumped with a spectrally broadened laser. Our recent experimental results on broadband SBS slow-light will be discussed.

Highland D

Frontiers in Optics

FMI • Computational Imaging II—Continued

FMI2 • 4:15 p.m.
A Product-of-Convolutions Model for Three-Dimensional Microscopy, Comparison to Born and Rytov Models, *Heidy Sierra, Charles A. DiMarzio, Dana Brooks; Northeastern Univ., USA.* Three-dimensional imaging by a microscope is important in the study of three-dimensional structures such as embryos. In this work we present a three-dimensional forward model and a comparison to Born and Rytov models is presented.

FMI3 • 4:30 p.m.
Non-Paraxial Solution to Inverse Scattering in Optical Coherence Tomography, *Tyler S. Ralston, Daniel L. Marks, Stephen A. Boppart, Paul Scott Carney; Univ. of Illinois at Urbana-Champaign, USA.* The analytic solution for inverse scattering in optical coherence tomography is formulated for fields that are non-paraxial. Such a solution is important in high numerical-aperture experiments where the paraxial approximation may not be valid.

Highland E

FMJ • Advanced Transmission and Quantum Communications—Continued

FMJ2 • 4:15 p.m.
Spectral Shaping of High Power Supercontinuum, *Charu Kakkar[1,2], K. Thyagarajan[1]; [1]Indian Inst. of Technology Delhi, India, [2]Dept. of Physics, Kirori Mal College, Univ. of Delhi, India.* We propose an optimised design for obtaining a flat-top, high power supercontinuum source covering C+L band of optical communication window and emphasise the role played by various physical mechanisms affecting spectral flatness of supercontinuum.

FMJ3 • 4:30 p.m.
Single-Photon Source by Means of Four-Wave Mixing Inside a Dispersion-Shifted Optical Fiber, *Paulo F. C. Antunes[1,2], Armando N. Pinto[1,3], Paulo S. B. André[1,2]; [1]Inst. of Telecommunications, Portugal, [2]Dept. of Physics, Univ. of Aveiro, Portugal, [3]Dept. of Electronics, Telecommunications and Informatics, Univ. of Aveiro, Portugal.* We show how an inexpensive and versatile single photon source can be built using four-wave mixing inside a dispersion-shifted optical fiber. The average number of generated photons per pulse agrees well with theoretical predictions.

Highland F

FMK • Ceramic Lasers I—Continued

FMK2 • 4:15 p.m.
Comparison of Thermal Conductivity in YAG between Polycrystalline Ceramics and Single Crystals, *Yoichi Sato, Takunori Taira; Laser Res. Ctr. for Molecular Science, Inst. for Molecular Science, Japan.* We have evaluated the thermal conductivity (κ) in polycrystalline YAG ceramics and crystalline YAG single crystals. The influence of Nd-doping on κ was discussed, and found a dependence of κ on fabrication methods.

FMK3 • 4:30 p.m.
Diode-Pumped Mode-Locked Yb-Doped Sesquioxide Nanocrystalline Ceramic Lasers, *Masaki Tokurakawa[1], Kazunori Takaichi[1], Akira Shirakawa[1], Ken-ichi Ueda[1], Hideki Yagi[2], Shunsuke Hosokawa[2], Takagimi Yanagitani[2], Alexander A. Kaminskii[3]; [1]Inst. for Laser Science, Univ. of Electro-Communications, Japan, [2]Takuma Works, Konoshima Chemical Co. Ltd., Japan, [3]Inst. of Crystallography, Russian Acad. of Sciences, Russian Federation.* Broad-stripe-laser-diode-pumped, passively mode-locked $Yb^{3+}:Y_2O_3$ and $Yb^{3+}:Lu_2O_3$ ceramic lasers have successfully generated >188fs pulses with <352mW average power. To our knowledge this is the shortest pulse generation from Yb-doped sesquioxide lasers and ceramic lasers ever reported.

Highland G

Frontiers in Optics

FML • Image-Based Wavefront Sensing II—Continued

FML2 • 4:30 p.m. Invited

Wave Front Sensing by Nonlinear Optimization, *James R. Fienup; Univ. of Rochester, USA.* Both iterative transform algorithms (ITAs) and nonlinear optimization algorithms (NLOAs) have been widely used for image-based wavefront sensing by phase retrieval. ITAs are simpler to program, but the NLOAs offer greater flexibility and accuracy.

Highland H

FMM • Advances in Instrumentation for High-Resolution Retinal Imaging II—Continued

FMM3 • 4:15 p.m.

Inter-Photoreceptor Distance Calibrated by Axial Length in Adaptive Optics Fundus Camera, *Tatsuo Yamaguchi[1], Naoki Nakazawa[1], Toshifumi Mihashi[1], Kenichiro Bassho[2], Yoshiyuki Kitaguchi[2], Naoyuki Maeda[3], Takashi Fujikado[2]; [1]Res. Inst. Topcon Corp., Japan, [2]Applied Visual Science, Osaka Univ., Japan, [3]Ophthalmology, Osaka Univ., Japan.* We measured the inter-photoreceptor distance (IPD) using an adaptive optics fundus camera.The IPD was correlated with the axial length and the IPD in the myopia group was significantly larger than that in the normal group.

Highland J

Laser Science

LMG • Quantum Degenerate Gases II—Continued

LMG2 • 4:15 p.m. Invited

Atomtronics: An Ultracold Analogue of Semiconductor Devices, *Murray Holland, B. T. Seaman, M. Kraemer, D. Z. Anderson; JILA/Univ. of Colorado, USA.* We report on progress in developing "atomtronics"; the atom analog of electronics, for a strongly interacting ultracold Bose gas in an optical lattice.

Highland K

LMH • Optics in Soft Condensed Matter Physics II—Continued

LMH2 • 4:15 p.m.

Brownian Motion of an Ellipsoid, *Yilong Han, Ahmed Alsayed, Maurizio Nobili, J. Zhang, Tom C. Lubensky, Arjun G. Yodh; Univ. of Pennsylvania, USA.* We measured the Brownian motion of isolated ellipsoidal particles with video microscopy. Non-Gaussian statistics, anisotropic to isotropic diffusion and translation-rotation coupling were observed for the first time and understood in theory and simulations.

LMH3 • 4:30 p.m.

Fluctuations and Rheology of Active Bacterial Suspensions, *Daniel T. N. Chen, Andy W. C. Lau, Larry Hough, Mohammad F. Islam, Mark Goulian, Tom Lubensky, Arjun Yodh; Univ. of Pennsylvania, USA.* We present measurements of fluctuations and mechanical response in an active bacterial suspension using optical microscopy. Taken together, these measurements enable us to observe uniquely non-equilibrium effects such as Fluctuation-Dissipation theorem violation.

Hyatt Grand Ballroom E/F

OF&T

OFME • Advances in Surface Finishing—Continued

OFME2 • 4:15 p.m.

Development of Numerically Controlled Local Wet Etching, *Kazuya Yamamura; Osaka Univ., Japan.* Numerically controlled local wet etching (NC-LWE) is a novel deterministic sub-aperture figuring method. We applied NC-LWE for finishing the photomask substrate made of quartz glass, and achieved 69 nm flatness with 0.15 nm rms roughness.

OFME3 • 4:30 p.m.

Using Mechanics and Polishing Particle Properties to Model Material Removal for Magnetorheological Finishing (MRF) of Optical Glasses, *Jessica E. DeGroote[1,2], Anne E. Marino[1], Amy L. Bishop[1,2], Stephen D. Jacobs[1,2]; [1]Univ. of Rochester, Lab for Laser Energetics, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* A material removal rate model for Magnetorheological Finishing is introduced. Results show a strong linear dependence between material removal rates and drag force specific to glass type as removal rates increase with nanodiamond concentration.

Hyatt Regency Ballroom A/B

OPE

OPMB • Light Emission II—Continued

OPMB2 • 4:30 p.m.

High Performance Host Materials of Electrophosphorescence Blue Dopants, *Min-Fei Wu[1], Shi-Jay Yeh[1], Chin-Ti Chen[1], Hideyuki Murayama[2], Taiju Tsuboi[2], Wan-Sheung Li[1], Ito Chao[1], Shun-Wei Liu[1], Juen-Kai Wang[3,4]; [1]Inst. of Chemistry, Academia Sinica, Taiwan, [2]Kyoto Sangyo Univ., Japan, [3]Ctr. for Condensed Matter Sciences, Natl. Taiwan Univ., Taiwan, [4]Inst. of Atomic and Molecular Science, Academia Sinica, Taiwan.* SimCP is a superior host material to mCP for phosphorescent blue dopant of OLEDs. Triphenylsilyl substituent plays a critical role in preventing molecules from aggregation and hence maintaining high triplet-state energy in condense phase.

Highland A

Frontiers in Optics

FMH • Metamaterials and Negative Refraction I—Continued

FMH4 • 4:45 p.m.
Lattice Resonance Inside Photonic Crystal Slab with Negative Refraction, *Guilin Sun, Andrew G. Kirk; McGill Univ., Canada.* We report that the standing wave pattern inside the photonic crystal slab with negative effective index of refraction is not a Fabri-Perot effect, instead it is due to the resonance of the lattice periodicity.

FMH5 • 5:00 p.m.
Slow Light Modes in Non-Magnetic Negative Refractive Index Waveguides, *Leonid V. Alekseyev, Evgenii E. Narimanov; Princeton Univ., USA.* We demonstrate the possibility of slow light in strongly anisotropic dielectric waveguides with negative transverse permittivity.

Highland B

Laser Science

LME • Symposium on Undergraduate Research II—Continued

Highland C

LMF • Lasers, Amplifiers and Waveguides—Continued

LMF5 • 4:45 p.m.
Optimizing Broadband SBS Slow Light in an Optical Fiber, *Andy Chong, Joel R. Buckley, Frank W. Wise; Cornell Univ., USA.* A dispersion-managed soliton fiber laser generates doubly-peaked temporal and spectral profiles at large anomalous net dispersion. The emitted pulse is consistent with an antisymmetric soliton, which was not observed previously in a laser.

LMF6 • 5:00 p.m.
Antisymmetric Soliton in a Dispersion-Managed Fiber Laser, *Luming Zhao[1], Dingyuan Tang[1], Tee Hiang Cheng[1], Chao Lu[2]; [1]School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore, [2]Dept. of Electronic and Information Engineering, Hong Kong Polytechnic Univ., Hong Kong.* Period-doubling of multiple solitons in a passively mode-locked Erbium-doped fiber laser is observed numerically and experimentally. Each soliton in a multiple-soliton train can experience period-doubling bifurcations under existence of laser gain competition.

Highland D

Frontiers in Optics

FMI • Computational Imaging II—Continued

FMI4 • 4:45 p.m.
Strong Probe Scattering in NSOM, *Jin Sun[1], Paul S. Carney[1], John C. Schotland[2]; [1]Univ. of Illinois at Urbana-Champaign, USA, [2]Univ. of Pennsylvania, USA.* A strongly scattering probe tip is considered in near-field scanning optical microscopy assuming a weakly scattering sample. An effective tip strength is defined to characterize the tip scattering effect. Numerical and experimental results are shown.

FMI5 • 5:00 p.m.
Multi-Spectral Intensity Diffraction Tomography, *Mark A. Anastasio[1], Daxin Shi[1], Greg Gbur[2]; [1]Illinois Inst. of Tech., USA, [2]Univ. of North Carolina at Charlotte, USA.* A theory of multi-spectral intensity diffraction tomography (I-DT) is described. Unlike conventional I-DT that requires intensity measurements on a pair of detector planes, this method uses measurements on a single detector plane at two frequencies.

Highland E

FMJ • Advanced Transmission and Quantum Communications—Continued

FMJ4 • 4:45 p.m.
Theoretical and Practical Limits of Large Alphabet Energy-Time Quantum Key Distribution, *Curtis Broadbent[1], Irfan Ali Khan[1], Alexis Toulouse[1,2], Paul A. Lopata[3], Thomas B. Bahder[3,4], John C. Howell[1]; [1]Univ. of Rochester, USA, [2]Lehigh Univ., USA, [3]U. S. ARL, USA, [4]Weapons Sciences Directorate, USA.* We show that with current technology, large alphabet energy-time quantum key distribution will easily allow for the transmission of quantum key qubytes, photonic quantum states which transmit 8 random key bits per sifted photon.

FMJ5 • 5:00 p.m.
Achieving Secure Stealth Transmission via a Public Fiber-Optical Network, *Bernard Wu, Evgenii Narimanov; Princeton Univ., USA.* A spread spectrum based method is developed for performing secure stealth transmission over a public fiber-optical network. Secure channel is encrypted and hidden under the noise floor, hence providing enhanced cryptographic and steganographic security.

Highland F

FMK • Ceramic Lasers I—Continued

FMK4 • 4:45 p.m. Invited
Comparison of Optical, Mechanical and Thermo-Optical Properties of Oxide Polycrystalline Laser Gain Materials with Single Crystals, *Gregory J. Quarles[1], Vida K. Castillo[1], John Q. Dumm[2], Gary L. Messing[3], Sang-Ho Lee[3]; [1]VLOC Inc., USA, [2]II-VI Inc., USA, [3]Pennsylvania State Univ., USA.* Comparisons of the spectroscopic, mechanical, thermo-optic, and laser performance properties between single crystal and ceramic oxide gain materials will be presented. Inaccuracies and myths regarding these ceramics will be dispelled by presentation of statistically-significant data.

Highland G

Frontiers in Optics

FML • Image-Based Wavefront Sensing II—Continued

FML3 • 5:00 p.m. Invited
Phase-Diverse Wavefront Sensing, *Richard Paxman; General Dynamics, USA.* No abstract available.

Highland H

4:45 p.m.–6:15 p.m.
FMN • Advances in Understanding Accommodation and Presbyopia Correction
Ian Cox; Bausch & Lomb, USA, Presider

FMN1 • 4:45 p.m. Invited
Dynamics of Accommodation and the Mechanism of Presbyopia in the Primate Eye, *Adrian Glasser; College of Optometry, Univ. of Houston, USA.* Accommodation is the process whereby the eye changes focus for objects at near. Dynamic analysis of accommodation provides insight into the accommodative mechanism and age changes that lead to the loss of accommodation with presbyopia.

Highland J

Laser Science

LMG • Quantum Degenerate Gases II—Continued

LMG3 • 4:45 p.m. Invited
Rotating a Bose-Einstein Condensate Using Photons with Orbital Angular Momentum, *Kristian Helmerson[1], Mikkel Andersen[1], Changhyun Ryu[1], Pierre Cladé[1], Vasant Natarajan[1], Alipasha Vaziri[2], William Phillips[1]; [1]NIST, USA, [2]Inst. für Experimentalphysik, Austria.* We demonstrate the coherent transfer of the orbital angular momentum of photons to atoms using a stimulated 2-photon Raman process with Laguerre-Gaussian beams. The process is used to create superpositions of rotational (vortex) atomic states.

Highland K

LMH • Optics in Soft Condensed Matter Physics II—Continued

LMH4 • 4:45 p.m.
Optical Artifacts in Digital Video Microscopy, *Kevin B. Aptowicz[1], Ahmed M. Alsayed[2], Yilong L. Han[2], Arjun G. Yodh[2]; [1]West Chester Univ., USA, [2]Univ. of Pennsylvania, USA.* The limits of digital video microscopy due to optical artifacts are explored. In particular, the contribution of out-of-focus layers in a bulk crystal to the optical image of an in-focus monolayer was investigated.

LMH5 • 5:00 p.m. Invited
Using Confocal Microscopy to Study the Colloidal Glass Transition, *Eric Weeks; Emory Univ., USA.* We study concentrated colloidal suspensions, a model system which has a glass transition. We view the motion of the colloidal particles using a confocal microscope, and quantify this motion as a function of the concentration.

Hyatt Grand Ballroom E/F

OF&T

OFME • Advances in Surface Finishing—Continued

OFME4 • 4:45 p.m.
Contact Mechanics Models and Algorithms for UltraForm Finishing (UFF), *Christophe Bouvier, Sheryl M. Gracewski, Stephen J. Burns; Univ. of Rochester, USA.* Algorithms are developed for UltraForm Finishing to predict tool velocity for form correction, create the tool path, and handle metrology data. Contact mechanics and Preston's equation are used to predict the tool removal function.

OFME5 • 5:00 p.m.
Adding Chemistry and Glass Composition Data into a Mechanical Material Removal Model for Magnetorheological Finishing (MRF), *Jessica E. DeGroote[1,2], John P. Wilson[1,2], Theresa M. Pfuntner[1], Stephen D. Jacobs[1,2]; [1]Univ. of Rochester, Lab for Laser Energetics, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* Chemical durability and glass composition terms were developed for the MRF material removal process. Results indicate that chemistry plays a significant role in the MRF process with nanodiamond fluid.

Hyatt Regency Ballroom A/B

OPE

OPMB • Light Emission II—Continued

OPMB3 • 4:45 p.m.
Synthesis and Photophysical Characterization of Boron-Modified Thiophene Polymers, *Frieder Jaekle, Kshitij Parab, Anand Sundararaman; Rutgers Univ., USA.* The functionalization of oligo- and polythiophene derivatives with Lewis acidic boron moieties is reported. These new materials are of interest for device and sensor applications due to their unusual photophysical properties.

OPMB4 • 5:00 p.m.
Emitting Color Controllable Novel PPV Polymers, *Minyoung Choi[1], Sangyup Song[2], Zhiqiang Liu[1], Bing Chen[1], Michael R. Wang[1]; [1]Univ. of Miami, USA, [2]New Span Opto-Technology Inc., USA.* Novel PPV emitters having conjugation limited atoms in their polymer backbone have been synthesized to control their emitting color through the control of conjugation length. White light emitters have been realized.

Highland A

Frontiers in Optics

FMH • Metamaterials and Negative Refraction I—Continued

FMH6 • 5:15 p.m.
Second Harmonic Generation at Angular Incidence in a Negative/Positive Index Photonic Band Gap Structure, *Giuseppe D'Aguanno[1], Nadia Mattiucci[2], Michael Scalora[1], Mark J. Bloemer[1]; [1]Charles M. Bowden Res. Facility, USA, [2]Time Domain Corp., USA.* We exploit the unique properties of the band-edge resonances in a NIM/PIM photonic band gap structure for applications to nonlinear frequency conversion, second harmonic generation in particular.

Highland B

Laser Science

LME • Symposium on Undergraduate Research II—Continued

Highland C

LMF • Lasers, Amplifiers and Waveguides—Continued

LMF7 • 5:15 p.m.
Group Period-Doubling of Solitons in a Fiber Ring Laser, *Jay E. Sharping[1], Mark A. Foster[1], Alexander L. Gaeta[1], Jacob Lasri[2], Ove Lyngnes[2], Kurt Vogel[2]; [1]Cornell Univ., USA, [2]Precision Photonics Corp., USA.* We demonstrate an optical parametric oscillator based on a short piece of microstructure fiber that generates sub-picosecond pulses with record average output power (50 mW) and >200 nm of wavelength tunability (yellow to near-IR).

LMF8 • 5:30 p.m.
Fiber-Based Optical Parametric Oscillator with 50-mW Average Output Power and 200 nm of Wavelength Tunability, *Ronald R. Willey; Willey Optical, Consultants, USA.* A new design approach is described to achieve spectral blocking filters for narrow blocking bands of any spectral width or optical density. This approach can be useful for laser line blocking, night vision filters, etc.

Highland D

Frontiers in Optics

FMI • Computational Imaging II—Continued

FMI6 • 5:15 p.m.
Complex Valued Object Reconstruction from Extrapolated Intensity Measurements, *Manuel Guizar-Sicairos, James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* Image reconstruction of an object by detecting the non-imaged speckle intensity pattern is addressed. The problem arising from incomplete intensity measurement is solved by an algorithm that allows analytic continuation in the Fourier transform domain.

Highland E

Highland F

FMK • Ceramic Lasers I—Continued

FMK5 • 5:15 p.m.
Comparative Spectroscopic, Structural and Distribution Characteristics of Laser Transparent Ceramics and Crystals, *Voicu Lupei[1], Aurelia Lupei[1], Akio Ikesue[2]; [1]Inst. of Atomic Physics, Romania, [2]Poly-Techno Co. Ltd., Japan.* Comparative high-resolution spectroscopic and emission decay investigation indicates the similarity of the spectroscopic, dynamic, structural and statistic distribution characteristics of doping centers in rare earth activated garnet and sesquioxide laser crystals and transparent ceramics.

5:30 p.m.–6:30 p.m. OSA's Annual Business Meeting, Highland E

NOTES

Highland G

Frontiers in Optics

FML • Image-Based Wavefront Sensing II—Continued

FML4 • 5:30 p.m.
Amplitude Metrics for Field Retrieval, *Samuel T. Thurman, Ryan T. DeRosa, James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* We present metrics for field (both amplitude and phase) retrieval for hard-edged or uniformly illuminated pupil functions. Results are presented for experimental data.

Highland H

Frontiers in Optics

FMN • Advances in Understanding Accommodation and Presbyopia Correction—Continued

FMN2 • 5:15 p.m. Invited
Understanding Human Accommodation and Presbyopia by *in vivo* Imaging of the Anterior Segment, *Jane Koretz; Biochemistry and Biophysics Program, Rensselaer Polytechnic Inst., USA.* Scheimpflug photography, high-resolution MRI, and other non-invasive methods have been used to characterize accommodation and presbyopia development in normal adult human eyes. The resultant model provides a framework for accommodating IOL design and testing.

Highland J

Laser Science

LMG • Quantum Degenerate Gases II—Continued

LMG4 • 5:15 p.m.
Dynamics of a BEC Colliding with a Time-Dependent Dipole Barrier, *Mirco Siercke, Chris W. Ellenor, Rockson Chang, Matthew J. Partlow, Aephraim M. Steinberg; Univ. of Toronto, Canada.* We report on the progress of experiments to study the interaction of a BEC with a dipole barrier. Goals include observation of transitory enhancement of high momentum components and realization of a SPIDER-like tomographical technique.

LMG5 • 5:30 p.m.
Center of Mass Motion in Atom Lasers, *Peter D. Drummond, Timothy Vaughan, Joel Corney; Univ. of Queensland, Australia.* Center-of-mass motion fundamentally limits atom laser coherence properties. We analyse the quantum properties of center of mass motion, calculate COM temperatures in evaporative cooling, and relate this to the condensate fraction and quantum superpositions.

Highland K

Hyatt Grand Ballroom E/F

OF&T

OFME • Advances in Surface Finishing—Continued

OFME6 • 5:15 p.m. Invited
Advanced Surface Finishing through the Application of Novel CMP Enabling Technology, *Kevin J. Moeggenborg, John Clark, Jeffrey Gilliland, Stanley Lesiak, Roman Salij, Tamara Vincer, Alicia Walters; Cabot Microelectronics Corp., USA.* Chemical-Mechanical Polishing (CMP) was developed for semiconductor manufacturing to allow rapid, reproducible polishing of varied materials. This paper discusses benefits and challenges of CMP for optics manufacturing using aluminum mirror polishing as a case study.

Hyatt Regency Ballroom A/B

OPE

OPMB • Light Emission II—Continued

OPMB5 • 5:15 p.m.
Temporal Stability of Blue OLEDs: Effect of Hole Mobility through the Emissive Layer, *Sean W. Culligan[1], Andrew C. A. Chen[1], Jason U. Wallace[1], Shaw H. Chen[1], Kevin P. Klubek[2], Ching W. Tang[2]; [1]Univ. of Rochester, USA, [2]Eastman Kodak Company, USA.* Anthracene-containing model compounds were synthesized to investigate causes of instability in blue OLEDs. Transient OLED measurements revealed that an emissive layer with higher hole mobility resulted in a longer lifetime at the expense of efficiency.

OPMB6 • 5:30 p.m.
Light-Emitting Electrochemical Cells: Direct Probing of Doping Progression and Emission, *Ludvig Edman[1], Joon-Ho Shin[1], Nathaniel D. Robinson[2], Magnus Berggren[2], Steven Xiao[3]; [1]Dept. of Physics, Umeå Univ., Sweden, [2]Dept. of Science and Technology, Linköpings Universitet, Sweden, [3]Organic Vision Inc., Canada.* By directly probing the doping progression and the emission zone in a large number of different wide-gap light-emitting electrochemical cells, we are able to establish key criteria for the optimized operation of such devices.

5:30 p.m.–6:30 p.m. OSA's Annual Business Meeting, Highland E

NOTES

LME • Symposium on Undergraduate Research II—Continued

LMF • Lasers, Amplifiers and Waveguides—Continued

LMF9 • 5:45 p.m.
Improved Narrow Wavelength Band Blocking Filters, *Zhenshan Yang*[1], *Philip Chak*[1], *Rajiv Iyer*[2], *J. Stewart Aitchison*[2], *John E. Sipe*[1]; [1]*Dept. of Physics, Univ. of Toronto, Canada,* [2]*Dept. of Electrical and Computer Engineering, Univ. of Toronto, Canada.* We show that parametric amplification can be greatly enhanced in microring resonator structures even in the presence of material and modal dispersion, without the need for artificially structuring the nonlinear properties of the waveguides.

LMF10 • 6:00 p.m.
Enhanced Parametric Amplification in AlGaAs Microring Resonators, *Hong Lin, Htay M. Hlaing; Bates College, USA.* Transverse modes are selected in a multi-transverse-mode vertical-cavity surface-emitting laser (VCSEL) by adjusting alignment of the feedback mirror. When the feedback is strong, single transverse mode is obtained in a wide current range.

5:45 p.m.–6:00 p.m. OFMF • OF&T Poster Session Wrap-up, Hyatt Grand Ballroom G

6:00 p.m.–8:30 p.m. OSA Student Member Welcome Reception, Saddle Ridge Entertainment Resort

NOTES

FMN • Advances in Understanding Accommodation and Presbyopia Correction—Continued

FMN3 • 5:45 p.m. Invited

Advances in the Design of Intra-Ocular Lenses for Presbyopia Correction, *Alan Lang; ReVision Optics, USA.* FDA approved intraocular lens optical designs demonstrate improved intermediate or near visual function. Full restoration of accommodation has yet to be achieved. Current designs under development are described and the degree of presbyopic correction summarized.

5:45 p.m.–6:00 p.m. OFMF • OF&T Poster Session Wrap-up, Hyatt Grand Ballroom G

6:00 p.m.–8:30 p.m. OSA Student Member Welcome Reception, Saddle Ridge Entertainment Resort

NOTES

Frontiers in Optics

Highland A

8:00 a.m.–9:45 a.m.
FTuA • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art I: A Tribute to Emmett Leith

James R. Fienup; Inst. of Optics, Univ. of Rochester, USA, Presider

FTuA1 • 8:00 a.m. Invited
Emmett Leith and the Solidification of a Communications Viewpoint in Optics, *Joseph W. Goodman; Stanford Univ., USA.* The invention of the carrier frequency hologram by Emmett Leith and his colleagues energized a remarkable influx of communications ideas into optics, and helped solidify the role of optics in electrical engineering.

Highland B

8:00 a.m.–9:45 a.m.
FTuB • Photonic Metamaterials II

Martin Wegener; Karlsruhe Univ., Germany, Presider

FTuB1 • 8:00 a.m. Invited
Multi-Wave Interaction in Nanostructured Materials, *Ildar R. Gabitov; Univ. of Arizona, USA.* We investigated parametric amplification and second-harmonic generation arising from three-wave interaction in nanocomposite materials with negative refractive index. The sign of the refractive index is assumed to change with the frequencies of the interacting waves.

Highland C

8:00 a.m.–9:45 a.m.
FTuC • Metamaterials and Negative Refraction II

Presider to Be Announced

FTuC1 • 8:00 a.m.
Counter-Propagating Pulses in a NIM Cavity, *Domenico de Ceglia[1], Antonella D'Orazio[1], Michael Scalora[2]; [1]Politecnico di Bari, Italy, [2]Charles M. Bowden Res. Ctr., USA.* We study second harmonic generation in a metamaterial cavity. We show that both SHG and linear material losses may be controlled by exciting the cavity using counter-propagation pulses.

FTuC2 • 8:15 a.m.
Coupled Resonances to Increase Bandwidths of Metamaterial Antennas, *Andrea Alù, Nader Engheta; Univ. of Pennsylvania, USA.* Metamaterial or plasmonic nanoparticles employed as scatterers may represent new elements for nanoantenna devices. We explore how coupling closely packed plasmonic nanoparticles may provide an increase in the bandwidth of such radiators.

Highland D

8:00 a.m.–9:45 a.m.
FTuD • Photofluidics I

Presider to Be Announced

FTuD1 • 8:00 a.m. Invited
Applications of Optical Resonance to Biological Sensing and Imaging, *Selim Unlu, Bennett Goldberg; Boston Univ., USA.* Optical resonators designed for biological sensing and imaging are demonstrated to yield sub-nanometer position accuracy in DNA conformation, high-sensitivity in ring-resonators for biosensing, and massively parallel, non-labeled detection in a Resonant Cavity Imaging Biosensor.

Highland E

8:00 a.m.–9:45 a.m.
FTuE • Scattering and Tissue Properties

Gregory Faris; SRI Intl., USA, Presider

FTuE1 • 8:00 a.m.
Red Blood Cell Fluctuations During Osmolarity Changes, *Gabriel Popescu[1], YongKeun Park[1], Catherine A. Best-Popescu[2], Kamran Badizadegan[2], Ramachandra R. Dasari[1], Michael S. Feld[1]; [1]MIT, USA, [2]Harvard Medical School and Massachusetts General Hospital, USA.* Using optical interferometry, we quantified the volumetry and nanoscale thermal fluctuations of red blood cells. We found that the mean squared displacement of the cell membranes correlate with both cell morphology and osmolarity-induced volume changes.

FTuE2 • 8:15 a.m.
Modeling of the Internal Optical Structure of the Nuclei of B-Cells, *R. Scott Brock[1], Huafeng Ding[1], Douglas A. Weidner[1], Thomas J. McConnell[1], Xin-Hua Hu[1], Judith R. Mourant[2], Jun Q. Lu[1]; [1]East Carolina Univ., USA, [2]Los Alamos Natl. Lab, USA.* Inhomogeneity within B-cell nuclei is modeled according to the feature of intensity distribution in images of B-cells stained with a DNA-binding dye for light scattering simulations. Results from FDTD simulations are compared with experiment results.

Highland F

8:00 a.m.–9:45 a.m.
FTuF • Ultrafast Control of Laser/Matter Interactions I

David H. Reitze; Univ. of Florida, USA, Presider

FTuF1 • 8:00 a.m. Invited
Control of Quantum Phenomena with Cooperating Photonic and Material Reagents, *Herschel Rabitz; Princeton Univ., USA.* A high degree of control over broad classes of quantum dynamics phenomena can be achieved by suitably tailored photonic reagent laser pulses working cooperatively with tailored material reagents.

Highland G

Frontiers in Optics

8:00 a.m.–9:45 a.m.
FTuG • High-Power Optics: State-of-the-Art I
Lahsen Assoufid; Argonne Natl. Lab, USA, Presider

FTuG1 • 8:00 a.m. Invited
The National Ignition Facility: Overview and Optical Engineering Challenges, *J. Nan Wong; Lawrence Livermore Natl. Lab, USA.* The National Ignition Facility at LLNL when complete will be the world's largest and most energetic laser system. This talk will overview the NIF Laser system's architecture, from the regenerative amplifier to the target chamber.

Laser Science

Highland H

8:00 a.m.–10:00 a.m.
LTuA • Cold Rydberg Gases
Steven L. Rolston; Univ. of Maryland, USA, Presider

LTuA1 • 8:00 a.m. Invited
Using Laser Cooling to Study Plasma Physics, *Steven Rolston, Robert Fletcher, Xianli Zhang; Univ. of Maryland, USA.* Ultracold neutral plasmas are formed by photoionizing laser-cooled atoms. The resulting plasmas are the coldest neutral plasmas ever formed, exhibiting a rich variety of behavior, including Rydberg atom formation, driven expansion, and plasma instabilities.

Highland J

8:00 a.m.–9:30 a.m.
LTuB • Ultracold Molecules I: Magneto-Association via Feshbach Resonances
William Stwalley; Univ. of Connecticut, USA, Presider

LTuB1 • 8:00 a.m. Invited
Production of Cold Molecules via Magnetically Tunable Feshbach Resonances, *Thorsten Köhler; Univ. of Oxford, UK.* Diatomic molecules have been produced in cold gases using magnetically tunable Feshbach resonances. Based on an introduction to the technique of linear magnetic field sweeps, we discuss the association of clusters consisting of three atoms.

Highland K

8:00 a.m.–9:45 a.m.
LTuC • Spintronix and Quantum Information I
Jeremy Levy; Univ. of Pittsburgh, USA, Presider

LTuC1 • 8:00 a.m. Invited
Imaging and Manipulating Single Spins in Diamond, *David Awschalom, Ronald Hanson, Felix Mendoza, Ryan Epstein; Univ. of California at Santa Barbara, USA.* We describe an angle-resolved magneto-photoluminescence microscope used to investigate electron spin interactions of single nitrogen-vacancy centers in diamond. Spatially-resolved spectroscopy and electron spin resonance measurements reveal single and coupled coherent spin dynamics at room temperature.

Hyatt Grand Ballroom E/F

OF&T

8:00 a.m.–9:45 a.m.
OFTuA • Fabrication and Testing of Aspheres
Christof Pruss; Univ. of Stuttgart, Germany, Presider

OFTuA1 • 8:00 a.m. Invited
Medium Precision Geometrical Test for Very Fast Aspheres, *Rufino Diaz-Uribe, Manuel Campos-Garcia; UNAM, Mexico.* Null screens producing a perfect square array of points after reflection on a test surface are proposed. They are useful for concave, convex and off axis surfaces with F/#<1 and do not require null lenses.

Hyatt Regency Ballroom A/B

OPE

8:00 a.m.–9:30 a.m.
OPTuA • Light Emission III
Presider to Be Announced

OPTuA1 • 8:00 a.m. Invited
Encapsulation of OLEDs, *Robert Jan Visser; Vitex Systems, USA.* No abstract available.

NOTES

Frontiers in Optics

Highland A

FTuA • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art I: A Tribute to Emmett Leith—Continued

FTuA2 • 8:30 a.m. Invited

Emmett's Question, *Adolf Lohmann; Univ. Erlangen-Nuremberg, Germany.* The contribution reflects on a conversation with Emmett Leith on the Wigner function.

FTuA3 • 9:00 a.m. Invited

Profiting from Leith's Inventions, *Ken Haines; Consultant, USA.* Holography's evolution from Leith's inventions to commercial success is examined. Twenty years elapsed before holograms were applied to credit cards, the first major profitable venture. Their presence on the euro represents holography's greatest commercial success.

Highland B

FTuB • Photonic Metamaterials II—Continued

FTuB2 • 8:30 a.m.

Giant Transmission and Dissipation in Perforated Films Mediated by Surface Phonon Polaritons, *Gennady Shvets, Dmitriy Korobkin, Yaroslav Urzhumov, Burton Neuner III; Univ. of Texas at Austin, USA.* Measurements of mid-IR light transmission through optically thin SiC membranes perforated by an array of subwavelength holes reveal giant transmission/absorption, explained in terms of the effective permittivity $\varepsilon_{eff}(\omega)$ of the perforated film.

FTuB3 • 8:45 a.m.

SHG in Lithium Niobate Based Bragg Reflection Waveguides, *Ritwick Das, Krishna Thyagarajan; Indian Inst. of Technology, Delhi, India.* A novel design for second harmonic generation using quasi phase-matching in Bragg reflection waveguides is proposed. The structure exhibits very large bandwidth for the second harmonic generation with high efficiency as compared to conventional waveguides.

FTuB4 • 9:00 a.m.

Confirmation of the Validity of the Rayleigh Hypothesis in a Concave Metal Grating, *Alexander V. Tishchenko; Univ. Jean Monnet, France.* The Rayleigh hypothesis is unexpectedly confirmed in a metal grating having concave anvil shape grooves. The reference method is the exact modal method.

Highland C

FTuC • Metamaterials and Negative Refraction II—Continued

FTuC3 • 8:30 a.m.

Optical Magnetic Dipole Interactions for Dielectric Metamaterials, *Samuel L. Oliveira, Stephen C. Rand; Univ. of Michigan, USA.* An intense magneto-optic effect, magnetic dipole radiation, is predicted and observed in a dielectric liquid. The results suggest magnetic resonant response at optical frequencies can be obtained leading to the development of unstructured metamaterials.

FTuC4 • 8:45 a.m.

Imaging of Photonic Crystal with Absolute Value of Effective Refractive Index Less than Unity, *Guilin Sun, Andrew G. Kirk; McGill Univ., Canada.* We investigate the imaging properties of photonic crystal slab with an effective refractive index n_{eff} of -0.8. the resulting larger image distances are advantageous for some applications such as bio-medical imaging and bio-sensing.

FTuC5 • 9:00 a.m.

Singularity Statistics in Quasi-1D Random Systems, *Sheng Zhang[1], Bing Hu[1], Patrick Sebbah[2], Azriel Genack[1]; [1]Queens College of City Univ. of New York, USA, [2]CNRS and Univ. de Nice-Sophia Antipolis, France.* Phase Singularities and their topological charges and screening are measured at the output surface of quasi-1D random systems. Statistics of singularities' displacement with frequency shift for diffusive and strongly correlated waves are compared.

Highland D

FTuD • Photofluidics I—Continued

FTuD2 • 8:30 a.m.

Fluorescence Correlation Spectroscopy of Single Molecules on a Chip, *Dongliang Yin[1], John P. Barber[2], Aaron R. Hawkins[2], Holger Schmidt[1]; [1]Univ. of California at Santa Cruz, USA, [2]Brigham Young Univ., USA.* We demonstrate fluorescence correlation spectroscopy with single molecule sensitivity using planar integrated optofluidics. An analytic model to describe the diffusion characteristics inside liquid-core waveguides is developed and used to determine molecule concentration and mobility.

FTuD3 • 8:45 a.m.

Evanescent Coupling of Fluorescence Emission into Waveguide Modes for Integrated Biochemical Sensors, *Lirong Wang[1], Nasser Peyghambarian[1], Sergio B. Mendes[1,2]; [1]College of Optical Sciences, Univ. of Arizona, USA, [2]Dept. of Chemistry, Univ. of Arizona, USA.* Fluorescence emission of radiating-molecules in close proximity to bound waveguide modes is investigated. Electromagnetic power coupled into guided, radiation, and substrate modes are calculated; waveguide geometries that maximize power coupling into guided modes are analyzed.

FTuD4 • 9:00 a.m. Invited

Optofluidics for Adaptive Optics and Sensing, *Yeshaiahu Fainman, Uriel Levy, Alex Groisman, Kyle Kampbell, Shayan Mookherjea, Lin Pang, Kevin Tetz; Univ. of California at San Diego, USA.* We present a 2X2 optofluidic switch (1 dB insertion loss, 20 dB extinction ratio operating at 20 msec); an optofluidic adaptive lens; a tunable cladding microring resonator (extinction ratio 37 dB); and plasmonic optofluidic sensor.

Highland E

FTuE • Scattering and Tissue Properties—Continued

FTuE3 • 8:30 a.m.

Live Cell Refractometry Using Microfluidic Devices, *Gabriel Popescu, Niyom Lue, Kamran Badizadegan, Ramachandra R. Dasari, Michael S. Feld; MIT, USA.* Using quantitative phase imaging, we measured the average refractive index associated with live cells. We used microchannels to decouple the contributions to the phase signal of the cell refractive index and thickness.

FTuE4 • 8:45 a.m.

Improved Simulations for Measuring Microbicidal Gel Thickness Using Low-Coherence Interferometry, *Kelly E. Braun, Adam Wax; Duke Univ., USA.* Spectral-domain low coherence interferometry is used to measure the thickness of microbicidal gels as applied to realistic tissue phantoms. Reflections originating between the gel and phantom are analyzed to give thickness measurements.

FTuE5 • 9:00 a.m.

Diffraction Phase and Fluorescence Microscopy, *Gabriel Popescu[1], YongKeun Park[1], Kamran Badizadegan[2], Ramachandra R. Dasari[1], Michael S. Feld[1]; [1]MIT, USA, [2]Dept. of Pathology, Harvard Medical School and Massachusetts General Hospital, USA.* We developed simultaneous quantitative phase and epi-fluorescence microscopy of live cells. The sub-nanometer path-length stability is demonstrated by studying cell membrane fluctuations, while the composite phase-fluorescence imaging mode is exemplified with mitotic kidney cells.

Highland F

FTuF • Ultrafast Control of Laser/Matter Interactions I—Continued

FTuF2 • 8:30 a.m. Invited

Understanding Strong Field Learning Control of Atomic and Molecular Dynamics, *Thomas Weinacht; SUNY Stony Brook, USA.* This talk will focus on uncovering mechanism in closed loop coherent control experiments. The experiments, which use shaped ultrafast laser pulses, range from strong field population transfer in atoms to fragmentation of polyatomic molecules.

FTuF3 • 9:00 a.m.

Control and Selective Addressing of Molecular Rotational Wave Packets by Femtosecond Pulses, *Sharly Fleischer, Ilya Sh. Averbukh, Yehiam Prior; Weizmann Inst. of Science, Israel.* Selective alignment by femtosecond pulses of molecules in multi-component mixtures is shown to be a powerful tool for the detection, identification, and separation of chemically close species.

Highland G

Frontiers in Optics

FTuG • High-Power Optics: State-of-the-Art I—Continued

FTuG2 • 8:30 a.m. Invited

High Average Power Optical Systems for the Jefferson Lab FEL, *Michelle D. Shinn; Thomas Jefferson Natl. Accelerator Facility, USA.* High average power free-electron lasers based on energy-recovering accelerators challenges the laser designer to deliver stable output over a long period of time. This talk discusses our experiences at the FEL User Facility.

FTuG3 • 9:00 a.m. Invited

Optics for X-Ray FEL, *John Arthur; SLAC-LCLS, USA.* The novel properties of X-ray free-electron lasers will present unique challenges to the optical systems which will condition their radiation. Careful design, new materials, and precision construction will be needed.

Laser Science

Highland H

LTuA • Cold Rydberg Gases—Continued

LTuA2 • 8:30 a.m. Invited

Interactions and Trapping of Cold Rydberg Atoms, *Georg Raithel; Univ. of Michigan, USA.* Collision-induced interactions of cold Rydberg atoms and the magnetic trapping of diamagnetic Rydberg atoms will be described. The effect of an excitation blockade on the statistics of the Rydberg-atom excitation number will also be discussed.

LTuA3 • 9:00 a.m. Invited

Interaction between Cold Rydberg Atoms, *Daniel Comparat, Amodsen Chotia, Matthieu Viteau, Thibault Vogt, Jianming Zhao, Pierre Pillet; Lab Aimé Cotton, France.* Van der Waals or dipole-dipole long range interactions lead to exciting phenomenon in cold Rydberg sample: formation and recombination of ultracold plasmas and observation of the dipole blockade effect with possible use for quantum information.

Highland J

LTuB • Ultracold Molecules I: Magneto-Association via Feshbach Resonances—Continued

LTuB2 • 8:30 a.m. Invited

Raman-Induced Oscillation between an Atomic and a Molecular Quantum Gas, *Daniel Heinzen; Univ. of Texas, USA.* We drive stimulated Raman photoassociation transitions of pairs of Rb atoms in a Mott insulator state of an optical lattice. Reversible oscillations between an atomic and molecular gas are observed.

LTuB3 • 9:00 a.m. Invited

Tuning the Interactions in an Atomic Fermi-Bose Mixture, *Giovanni Mondugno, Giacomo Roati, Chiara D'Errico, Francesca Ferlaino, Matteo Zaccanti, Massimo Inguscio; LENS/Univ. of Florence, Italy.* We investigate an ultracold ^{40}K-^{87}Rb Fermi-Bose quantum gas with tunable interaction via Feshbach resonances. This realizes a system where to study phenomena such as formation of polar molecules and exotic quantum phases.

Highland K

LTuC • Spintronix and Quantum Information I—Continued

LTuC2 • 8:30 a.m. Invited

Spin-Based Quantum Information Processing in Diamond, *Fedor Jelezko; Univ. of Stuttgart, Germany.* Defects in diamond may have a large impact on solid state quantum physics in general and quantum information processing and communication in particular. This contribution will highlight recent results on the nitrogen vacancy center.

LTuC3 • 9:00 a.m.

Hidden Geometric Phases and Holonomies of Four Level System, *Dmitry Uskov, Ravi Rau; Louisiana State Univ., USA.* We derive a set of new geometric phases in a four-level system exploiting accidental isomorphism between SU(4) and Spin(6) groups. Higher dimensional generalization of the Bloch sphere, visualizing quantum geometry of 4-level system, is described.

Hyatt Grand Ballroom E/F

OF&T

OFTuA • Fabrication and Testing of Aspheres—Continued

OFTuA2 • 8:30 a.m.

ASPHERO5: Using Advanced Tactile Surface Analysis for Economic Fabrication of Precision Optics, *Helge Thiess[1], V. Giggel[2], R. Börret[3], U. Birnbaum[4], M. Haag-Pichl[5]; [1]Carl Zeiss AG, Germany, [2]Carl Zeiss Jena GmbH, Germany, [3]FH Aalen, Germany, [4]Jenoptik AG, Germany, [5]Schneider OM, Germany. Asphero5* is a funded research project aiming for advances in the economic fabrication of high precision aspheres. Presentation focuses on the PSD analysis for mid spatial frequency errors of the classical process chain.

OFTuA3 • 8:45 a.m.

Measurement the Profile of a Non -Symmetric Lens, by One-Dimensional Integration of the Irradiance Transport Equation, *Luis Rodríguez-Castillo[1], Fermin S. Granados-Agustín[1], Eva Acosta-Plaza[2], Alejandro Cornejo-Rodríguez[1]; [1]INAOE, Mexico, [2]Area de Optica, Departemento de Optica Aplicada, Spain.* The hyperbolic shape of a lens was found, using the irradiance measurement made along a slit. This measurement was considered one-dimensional irradiance distribution, and the Irradiance Transport Equation (ITE) was used by direct integration.

OFTuA4 • 9:00 a.m.

Off-Axis Mirror Manufacturing, *Christian du Jeu[1], Hélène Ducollet[1], Maryline Davi[1], Philippe Cheroutre[2], Trevor B. Winstone[3]; [1]Société Européenne de Systèmes Optiques, France, [2]Alcatel Alenia Space, France, [3]CCLRC Rutherford Appleton Lab, UK.* Discussion on large off-axis mirror manufacturing is presented with examples, including lightweighted mirror, direct off-axis polishing or parent mirror and very large departure. Also comparison between processes was made.

Hyatt Regency Ballroom A/B

OPE

OPTuA • Light Emission III—Continued

OPTuA2 • 8:30 a.m.

Triplet-Polaron Quenching in Conjugated Polymers, *Dirk Hertel, Klaus Meerholz; Inst. of Physical Chemistry, Univ. of Cologne, Germany.* The influence of polaron quenching on phosphorescence of PtOEP doped poly-spirobifluorene is investigated. We are able to derived a triplet polaron quenching constant of 10^{-13} cm x s^{-1}, showing the importance of this decay mechanism.

OPTuA3 • 8:45 a.m.

Effects of External Physical Parameters on Light Emission from Alq$_3$ Films, *Giuseppe Baldacchini[1], Piero Chiacchiaretta[1], Qian-Ming Wang[1], Tommaso Baldacchini[2], Ramchandra Balaji Pode[3]; [1]ENEA, Italy, [2]Harvard Univ., USA, [3]Nagpur Univ., India.* Photoluminescence from Alq$_3$ films is described by four components with different spectral and time features, which depend markedly on environmental conditions. In particular, spectra evolve through activation-like processes towards more stable shapes with increasing temperature.

OPTuA4 • 9:00 a.m.

Charge Carriers and Triplets in OLED Devices Studied by Electrically Detected Magnetic Resonance, *Thomas D. Pawlik, Denis Kondakov, Ralph Young, Marina Kondakova; Eastman Kodak Company, USA.* Organic light-emitting diodes were investigated with electron paramagnetic resonance using the device conductivity as the detection channel. This type of spectroscopy provides information about triplet energy transfer and the location of the recombination zone.

Frontiers in Optics

Highland A

FTuA • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art I: A Tribute to Emmett Leith—Continued

FTuA4 • 9:30 a.m.

Long-Wave Infrared Holography Using a Microbolometer Array, *Nicholas George, Kedar Khare, Wanli Chi; Inst. of Optics, Univ. of Rochester, USA.* Infrared holographic diffraction gratings and other simple objects have been recorded on sensitive microbolometer arrays. We describe useful recording setups and playback for these infrared electronic holograms. Research dedicated to Professor Leith, beloved colleague.

Highland B

FTuB • Photonic Metamaterials II—Continued

FTuB5 • 9:15 a.m.

Coherence Length for Second Harmonic Generation in Generic, One-Dimensional Structures, *Nadia Mattiucci[1], Giuseppe D'Aguanno[2], Michael Scalora[2], Mark J. Bloemer[2]; [1]Time Domain Corp., USA, [2]Charles M. Bowden Res. Facility, USA.* We find an analytic expression for second harmonic conversion efficiency in generic, one-dimensional structures, and define a coherence length for the process in an unambiguous way. We provide numerical examples that confirm the analytical results.

FTuB6 • 9:30 a.m.

Observation of Light Propagation via Whispering Gallery Modes in 3D Networks of Coupled Spherical Cavities, *Vasily N. Astratov, Shashanka P. Ashili, Andrey M. Kapitonov; Univ. of North Carolina at Charlotte, USA.* We present spectroscopic evidence for efficient optical transport via coupled whispering gallery modes in 3D networks of slightly disordered spherical cavities with attenuation length in excess of 50 μm.

Highland C

FTuC • Metamaterials and Negative Refraction II—Continued

FTuC6 • 9:15 a.m.

Quasi-Modes in Disordered Waveguide with Gain, *Alexey G. Yamilov; Univ. of Missouri-Rolla, USA.* Disorder realizations that contribute to bulk of conductance distribution in passive system are shown to strongly contribute to large-g tail of the distribution in system with gain. Explanation in terms of waveguide quasi-modes is given.

FTuC7 • 9:30 a.m.

Nonlinear Photonic Quasicrystals for General $\chi^{(2)}$ Processes, *Alon Bahabad, Noa Voloch, Ady Arie, Ron Lifshitz; Tel-Aviv Univ., Israel.* A nonlinear photonic quasicrystal accommodating any set of arbitrary $\chi^{(2)}$ processes can be designed using a known quasi-crystallographic algorithm. We demonstrate the design of multiple second harmonic generation and of cascaded polarization rotation.

Highland D

FTuD • Photofluidics I—Continued

FTuD5 • 9:30 a.m.

Heavy Water Detection Using Ultra-High-Q Microcavities, *Andrea M. Armani, Kerry J. Vahala; Caltech, USA.* Ultra-high Q resonators immersed in H_2O have a lower Q than those in D_2O due to the higher optical absorption. By monitoring the cavity-Q, concentrations of .0001% (1ppmv) of D_2O in H_2O have been detected.

Highland E

FTuE • Scattering and Tissue Properties—Continued

FTuE6 • 9:15 a.m.

Biomechanical Studies of Living Cells Using the Optical Stretcher, *Carolyn L. Posey, Meg M. Marquardt, Russell P. Wolfe, Michael G. Nichols; Creighton Univ., USA.* The optical stretcher is a novel biophotonic device capable of trapping and stretching individual biological cells. A geometrical optics model of force generation is used to determine cellular elasticity. Laser induced heating is carefully considered.

FTuE7 • 9:30 a.m.

Simulation of a Theta Line-Scanning Confocal Microscope, *Blair K. Simon, Charles A. DiMarzio; Northeastern Univ., USA.* A 2D FDTD computational model of optical propagation in human skin was used to evaluate a confocal reflectance theta microscope. The model improved our understanding of the performance of this microscope.

Highland F

FTuF • Ultrafast Control of Laser/Matter Interactions I—Continued

FTuF4 • 9:15 a.m.

Femtosecond Coherent Control of Two-Photon Absorption in Cesium, *Charlie Barnes[1], Matt E. Anderson[2]; [1]Del Mar Photonics, USA, [2]San Diego State Univ., USA.* Shaped, amplified pulses from a Ti:sapphire laser were used to excite two-photon transitions in atomic cesium. Both amplitude and phase shaping were used to coherently manipulate the two-photon absorption.

FTuF5 • 9:30 a.m.

Dark State Resonances in a Ca Hollow Cathode Lamp, *Luis de Araujo[1], Silvânia A. de Carvalho[1], Luciano S. Cruz[1], Armando Mirage[2], Daniel Pereira[1], Flávio Cruz[1]; [1]Univ. Estadual de Campinas, Brazil, [2]Inst. de Pesquisas Energéticas e Nucleares, Brazil.* We observed dark state resonances in Ca vapor from a hollow cathode lamp. Detection via the optogalvanic signal from the lamp was found to be much more sensitive than via a standard optical detection.

9:45 a.m. Ribbon-Cutting to Open Exhibit, Empire Hall

9:45 a.m.–10:15 a.m. Coffee Break, Empire Hall
9:45 a.m.–10:15 a.m. Coffee Break, Hyatt Grand Ballroom G

Highland G

Frontiers in Optics

FTuG • High-Power Optics: State-of-the-Art I—Continued

FTuG4 • 9:30 a.m.
Arbitrary Optical Pulse Generation by Chirped Pulse Stacking, *Lin Honghuan, Sui Zhan, Wang Jianjun, Zhang Rui, Li Mingzhong; Res. Ctr. of Laser Fusion, China.* A novel way to produce synchronized shaped ns pulse and compressible 100-psec pulse is demonstrated, this pulse shaping method has the potential use in Fast Ignition.

Highland H

Laser Science

LTuA • Cold Rydberg Gases—Continued

LTuA4 • 9:30 a.m.
Inelastic Collisions in an Ultracold Cs Rydberg Gas, *Kim R. Overstreet, Arne Schwettmann, Jonathan Tallant, James P. Shaffer; Univ. of Oklahoma, USA.* We present measurements of inelastic collisions between ultracold Cs Rydberg atoms using time-of-flight velocity distributions. The collision mechanism is identified by comparison to Rydberg atom pair potentials calculated using matrix diagonalization.

LTuA5 • 9:45 a.m.
Electric Quadrupole Transitions to Rydberg States and Anomalous Fine Structure Ratios in Ultracold ^{85}Rb, *David Tong[1], S. M. Farooqi[1], E. G. M. van Kempen[1,2], E. E. Eyler[1], P. L. Gould[1]; [1]Univ. of Connecticut, USA, [2]Eindhoven Univ. of Technology, Netherlands.* Unexpectedly strong 5*s*—>*nd* electric quadrupole transitions have been observed in a ^{85}Rb MOT. We also report on the nonstatistical ratio of the fine-structure components of the dipole-allowed 5*s*—>*np* transitions.

Highland J

Highland K

LTuC • Spintronix and Quantum Information I—Continued

LTuC4 • 9:15 a.m. Invited
Optical and Electrical Detection of Spin-Polarized Transport, *S. A. Crooker[1], X. Lou[2], M. Furis[1], C. Adelmann[2], D. L. Smith[1], C. J. Palmstrom[2], Paul Crowell[2]; [1]Los Alamos Natl. Lab, USA, [2]Univ. of Minnesota, USA.* Spin transport in lateral ferromagnet-semiconductor-ferromagnet devices is studied using magneto-optical Kerr microscopy and electrical transport. Spin polarization images are obtained near the source and drain. Spin accumulation at the drain is detected electrically.

Hyatt Grand Ballroom E/F

OF&T

OFTuA • Fabrication and Testing of Aspheres—Continued

OFTuA5 • 9:15 a.m.
High-Precision Measurements of the LMJ's Reflectors, *Sébastien Petitrenaud, Philippe Voarino, Hervé Piombini, Frédéric Sabary, Daniel Marteau; CEA, France.* The reflectors specifications of amplifying section of LMJ need to have spectral reflectance measurements more accurate. The innovative solution proposes to increase the precision of reflectance measurements and to detect heterogeneities in reflectance.

OFTuA6 • 9:30 a.m.
Measuring a Nanometer-Precision Asphere with Subaperture Stitching Interferometry, *Jon F. Fleig, Paul E. Murphy; QED Technologies, USA.* An aspheric mirror with rms figure error of ~5 nm rms was measured using the SSI-A™ system. The measurements agreed well with null measurements of the same surface, and have improved lateral resolution as well.

Hyatt Regency Ballroom A/B

OPE

OPTuA • Light Emission III—Continued

OPTuA5 • 9:15 a.m.
Tuning of the Emission of Organoboron Quinolate Polymers, *Frieder Jaekle, Yang Qin; Rutgers Univ., USA.* A new class of organoboron quinolate polymers have been prepared and their luminescence properties have been studied.

9:45 a.m. Ribbon-Cutting to Open Exhibit, Empire Hall

9:45 a.m.–10:15 a.m. Coffee Break, Empire Hall
9:45 a.m.–10:15 a.m. Coffee Break, Hyatt Grand Ballroom G

Highland A

Frontiers in Optics

10:15 a.m.–12:15 p.m.
FTuH • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art II: A Tribute to Emmett Leith

Rod Alferness; Bell Labs, Lucent Technologies, USA, Presider

FTuH1 • 10:15 a.m. Invited

A History of the Optics Group at the Univ. of Michigan's Willow Run Lab, *Kim A. Winick; EECS Dept., Univ. of Michigan, USA.* The early history of the Optics Group at the University of Michigan's Willow Run Laboratory is presented and the seminal contributions of Emmett Leith to the fields of synthetic aperture radar and holography are highlighted.

Highland B

Joint

10:15 a.m.–12:00 p.m.
JTuA • Molecules and Clusters in Strong Fields

Presider to Be Announced

JTuA1 • 10:15 a.m. Invited

Imaging Molecular Structure and Dynamics Using Laser Driven Recollisions, *Jon Marangos[1], S. Baker[1], R. Torres[1], N. Kajumba[1], C. Haworth[1], J. Robinson[1], J. W. G. Tisch[1], C. Vozzi[2], F. Calegari[2], E. Benedetti[2], G. Sansone[2], S. Stagira[2], M. Nisoli[2], C. Altucci[3], C. Altucci[4], R. Velotta[4]; [1]Imperial College, UK, [2]Politenico, Italy, [3]Univ. di Napoli, UK, [4]Univ. di Napoli, Italy.* Laser driven electron recollision provides a unique tool for measuring the structure and dynamics of matter. We illustrate this with experiments that use HHG to measure molecular structure with sub-Angstrom spatial and sub-femtosecond temporal resolution.

Frontiers in Optics

Highland C

10:15 a.m.–12:00 p.m.
FTuI • Metamaterial Structures: Photonic Band Engineering I

Presider to Be Announced

FTuI1 • 10:15 a.m. Invited

Slow Light Engineering in Photonic Crystals, *Toshihiko Baba, D. Mori, S. Kubo, T. Kawasaki; Yokohama Natl. Univ., Japan.* Narrow bandwidth and strong dispersion are crucial issues for slowlight. We discuss wideband dispersion-compensated slowlight in photonic crystal waveguides. An average group velocity of *c*/40 is experimentally demonstrated in a 6 THz bandwidth.

Highland D

10:15 a.m.–12:00 p.m.
FTuJ • Photofluidics II

Presider to Be Announced

FTuJ1 • 10:15 a.m. Invited

Micro- and Nanofluid Dynamics in Optofluidic and Nanophotonic Devices, *Sudeep Mandal, Allen Yang, David Erickson; Cornell Univ., USA.* Optofluidics represents the fusion of nanophotonics and microfluidics. Here we will discuss the coupling of nanoscale fluid dynamics with electromagnetics and how it can be exploited to create unique optical and biomedical analysis devices.

Highland E

10:15 a.m.–12:15 p.m.
FTuK • Leveraging Spectroscopic Signatures I

Presider to Be Announced

FTuK1 • 10:15 a.m.

Sensitivity Analysis of Detecting Plasmon Resonance Spectral Shifts for Nanoparticle Based Biosensors, *Adam C. Curry, Adam Wax; Dept. of Biomedical Eng., Duke Univ., USA.* Shifts in the plasmon resonance of single nanoparticles are being investigated for biosensing applications. A systematic analysis of the factors which influence uncertainties in the spectral data and a method for optimizing acquisition are presented.

FTuK2 • 10:30 a.m. Invited

Interpreting Light Scattering from Cells Subjected to Oxidative Stress, *Jeremy D. Wilson, Thomas H. Foster; Univ. of Rochester, USA.* Scattering from cells subjected to oxidative stress reveals subtle changes in organelle morphology, including mitochondrial swelling induced by direct and indirect perturbation. Scattering from cells loaded with organelle-specific absorbers imposes constraints on organelle refractive index.

Highland F

10:15 a.m.–12:00 p.m.
FTuL • Ultrafast Control of Laser/Matter Interactions II

Presider to Be Announced

FTuL1 • 10:15 a.m. Invited

Quantum Control by Ultrafast Dressed State Tailoring, *Matthias Wollenhaupt, Tim Bayer, Andreas Präkelt, C. Sarpe-Tudoran, Thomas Baumert; Univ. Kassel, Germany.* Strong field quantum control using shaped intense femtosecond laser pulses is investigated. The physical mechanism relies on Selective Population Of Dressed States (SPODS). Ultrafast switching, high selectivity and tunability is demonstrated experimentally on atoms.

Highland G

Frontiers in Optics

10:15 a.m.–12:15 p.m.
FTuM • Consumer Optics
Scott A. Lerner; Hewlett Packard, USA, Presider

FTuM1 • 10:15 a.m. Invited
Design of an Aspheric Refractive Tip for Wide-Angle Immersed Applications, *John Tamkin[1], Amar Kendale[2]; [1]Optical Res. Associates, USA, [2]Guidant Systems, USA.* This paper explores conformal optics solutions for applications such as disposable endoscope windows. While mechanical and optical performance is important, surface reflections from typical ring-illumination sources must also be considered in the optimization process.

Highland H

Laser Science

10:15 a.m.–12:00 p.m.
LTuD • Quantum Optics I
Olivier Pfister; Univ. of Virginia, USA, Presider

LTuD1 • 10:15 a.m. Invited
Generation and Tomographic Analysis of Temporally-Delocalized Single Photons, *Alessandro Zavatta, Valentina Parigi, Milena D'Angelo, Marco Bellini; LENS/Univ. of Florence, Italy.* We report the experimental coherent delocalization of a single photon between two distinct temporal modes. Dual-mode quantum homodyne tomography is used to analyze the state and test for the violation of a Bell's-type inequality.

Highland J

10:15 a.m.–12:15 p.m.
LTuE • Ultracold Molecules II: Photoassociative Spectroscopy and Ultracold Molecule Formation
Nicholas Bigelow; Univ. of Rochester, USA, Presider

LTuE1 • 10:15 a.m. Invited
Photoassociation Spectroscopy of Ultracold Atoms and the Study of "Physicist's Molecules," a Review, *Kevin Jones[1], Eite Tiesinga[2], Paul D. Lett[2], Paul S. Julienne[2]; [1]Williams College, USA, [2]Atomic Physics Div., Natl. Inst. of Standards and Technology, USA.* Photoassociation is the process where two colliding atoms absorb a photon to form molecule. When the initial gas sample is <1mK the technique achieves "atomic" spectral resolution permitting one to extract atomic and molecular properties.

Highland K

10:15 a.m.–12:30 p.m.
LTuF • Carbon Nanotube Spectroscopy I
Tony Heinz; Columbia Univ., USA, Presider

LTuF1 • 10:15 a.m.
Spectroscopy of the Electronic Transitions of Individual Carbon Nanotubes of Defined Crystal Structure, *Matthew Y. Sfeir[1,2], Tobias Beetz[2], Feng Wang[1], Limin Huang[1], Henry X. M. Huang[1], Mingyuan Huang[1], James Hone[1], Stephen O'Brien[1], James A. Misewich[2], Tony F. Heinz[1], Lijun Wu[2], Yimei Zhu[2], Louis E. Brus[1]; [1]Columbia Univ., USA, [2]Brookhaven Natl. Lab, USA.* By combining electron diffraction with Rayleigh scattering spectroscopy, we simultaneously determine the crystal structure and the optical transition energies of individual single-walled carbon nanotubes.

LTuF2 • 10:30 a.m. Invited
Recent Advances in the Photophysics of Carbon Nanotubes and Related Materials, *Mildred S. Dresselhaus; MIT, USA.* Some recent advances in single nanotube photophysics based on both resonance Raman spectroscopy and photoluminescence will be discussed and intercompared. Finally, some of the current research challenges and opportunities facing the field will be mentioned.

Hyatt Grand Ballroom E/F

OF&T

10:15 a.m.–12:15 p.m.
OFTuB • Absolute Testing of Aspheres
John Greivenkamp; Univ. of Arizona, USA, Presider

OFTuB1 • 10:15 a.m. Invited
Absolute Testing of Aspheric Surfaces, *Christof Pruss; Univ. of Stuttgart, Germany.* Absolute interferometric testing methods for aspheric surfaces based on computer-generated holograms (CGHs) are reviewed. Limiting factors and critical issues such as parasitic diffraction orders and the setup alignment are discussed and measurement results are given.

Hyatt Regency Ballroom A/B

OPE

10:15 a.m.–12:15 p.m.
OPTuB • Organic Lasers and Charge Injection
Presider to Be Announced

OPTuB1 • 10:15 a.m. Plenary
Injection and Transport of Extremely High Current Densities in Organic Thin-Film Devices, *Chihaya Adachi, Toshinori Matsushima; Ctr. for Future Chemistry, Kyushu Univ., Japan.* We demonstrate an extremely high breakdown current density of J_{MAX}=6.35MA/cm^2 using the smallest organic active device area of S=0.04µm^2. We discuss on the detailed mechanism and the prospect of organic laser diodes.

Highland A

Frontiers in Optics

FTuH • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art II: A Tribute to Emmett Leith—Continued

FTuH2 • 10:45 a.m. Invited

A Brief History of Holographic Interferometry, *Karl A. Stetson; HoloMetrology, LLC, USA.* This paper presents the history of holographic interferometry from its first observation at the Willow Run Laboratories of the Institute of Science and Technology at the University of Michigan to the present day.

Highland B

Joint

JTuA • Molecules and Clusters in Strong Fields—Continued

JTuA2 • 10:45 a.m.

Single Shot Measurement of Field-Free Rotational Revivals with Spectral Interferometry, *Klaus K. Hartinger, Randy A. Bartels; Colorado State Univ., USA.* We demonstrate single-shot measurement of rotational revivals in CO_2 with spectral interferometry. In contrast to other single-shot techniques available, it allows measurement and reconstruction of rotational wave packets without the requirement of birefringence.

JTuA3 • 11:00 a.m. Invited

Spinning Tops in External Fields: Nonadiabatic Alignment in Complex Systems, *Sesha Ramakrishna, Edward Hamilton, Adam Pelzer, Tamar Seideman; Northwestern Univ., USA.* Short, intense laser pulses can be used to excite rotationally-broad, aligned wavepackets with fascinating properties. We extend the alignment concept to dissipative media and propose applications in quantum information, molecular switches, and guided molecular assembly.

Highland C

Frontiers in Optics

FTuI • Metamaterial Structures: Photonic Band Engineering I—Continued

FTuI2 • 10:45 a.m. Invited

Photonic Bands, Non-Reciprocity and Plasmons, *Shanhui Fan; Stanford Univ., USA.* We report our recent works on engineering photonic band structures to enable new optical effects. Examples include dynamic photonic crystals, non-reciprocal effects, as well as band structures in plasmonic systems.

Highland D

FTuJ • Photofluidics II—Continued

FTuJ2 • 10:45 a.m. Invited

Where Optics and Fluidics Meet, *Axel Scherer, Zhaoyu Zhang, Jiajing Xu, Xiaoliang Zhu; Caltech, USA.* Optic and fluidic devices have traditionally met in the field of spectroscopy. Both have been radically miniaturized within the past two decades. Here we show some microfabricated lasers and microfluidics with applications in medical analysis.

Highland E

FTuK • Leveraging Spectroscopic Signatures I—Continued

FTuK3 • 11:00 a.m.

Protein Crystal Detection and Characterization Using Polarization Interferometry, *Joshua D. Borneman*[1], *Vladimir P. Drachev*[1], *Alexander V. Kildishev*[1], *Petr G. Leiman*[2], *Vladimir M. Shalaev*[1]; [1]*School of Electrical and Computer Engineering; Purdue Univ., USA,* [2]*Dept. of Biological Sciences, Purdue Univ., USA.* Protein crystals down to 30um in size have been detected using a scanning polarization interferometer with a 568nm laser source. The size and anisotropy of the crystals have been retrieved from the phase anisotropy measurements.

Highland F

FTuL • Ultrafast Control of Laser/Matter Interactions II—Continued

FTuL2 • 10:45 a.m.

Quantum Control of Rhodamine 6G in Solution, *Daniel G. Kuroda, Valeria D. Kleiman; Dept. of Chemistry, Univ. of Florida, USA.* We present coherent control of dye photoluminescence in solution obtained with a novel, compact, and high-resolution phase modulator in reflective mode. Analysis of the populations used in the optimization process is also presented.

FTuL3 • 11:00 a.m.

Discrete Optical Solitons in Frequency Space and Trains of Short Pulses in a Raman Medium, *Dmitry Skryabin, Andrey Gorbach, Chris Benton; Univ. of Bath, UK.* We report new type of optical solitons - discrete optical solitons in frequency space. These solutions are found in equations describing interaction of multiple Raman sidebands and physically correspond to trains of ultrashort pulses.

NOTES

Highland G

Frontiers in Optics

FTuM • Consumer Optics—Continued

FTuM2 • 10:45 a.m.
Diffraction of Partially-Coherent Light Beams by Micro-Lens Arrays, *Nikolai I. Petrov*[1], *Jin-Jong Kim*[2], *Ho-Seop Jeong*[2], *Dong Ho Shin*[2]; [1]*Samsung Electronics Co., Ltd., Russian Federation,* [2]*Samsung Electromechanics Company, Republic of Korea.* The synthesis method including wave-optics and ray-tracing is developed for the acceleration of simulation of micro-optical systems. Effects of partially coherence and polarization of light source, randomization of micro-lens array parameters and non-paraxiality are considered.

FTuM3 • 11:00 a.m.
Local Cell Gap Variations and Visible Defects in LCD Panels, *Arash Mafi, Michal Mlejnek, Min Shen, William Wood, Yihong Mauro, Kevin Sparks; Corning Inc., USA.* We relate local cell gap variations to visible defects in TN LCD devices using psychophysical methods of human eye perception of intensity variation.

Highland H

Laser Science

LTuD • Quantum Optics I—Continued

LTuD2 • 10:45 a.m. Invited
Schrödinger Kittens and Higher-Order Fock States: Generation and Detection of Propagating Light Fields with Negative Wigner Functions, *Alexei Ourjoumtsev, Aurélien Dantan, Rosa Tualle-Brouri, Philippe Grangier; Lab Charles Fabry de l'Inst. d'Optique, France.* We describe the experimental realization of propagating light fields with negative Wigner functions, measured by pulsed homodyne quantum tomography. This includes Schroedinger cat states with small amplitudes ("Schroedinger kittens"), and n=2 Fock states.

Highland J

LTuE • Ultracold Molecules II: Photoassociative Spectroscopy and Ultracold Molecule Formation—Continued

LTuE2 • 10:45 a.m. Invited
Production, Detection, Spectroscopy and Collisions of Ultracold KRb Molecules, *D. Wang, C. Ashbaugh, Y. Huang, H. K. Pechkis, J. T. Kim, E. E. Eyler, P. L. Gould, William C. Stwalley; Univ. of Connecticut, USA.* The production, detection, spectroscopy, Raman transfer and reactive and nonreactive collisions of ultracold KRb molecules will be surveyed and discussed.

Highland K

LTuF • Carbon Nanotube Spectroscopy I—Continued

LTuF3 • 11:00 a.m. Invited
Optical and Magnetic Anisotropy in Carbon Nanotubes, *Jay Kikkawa; Univ. of Pennsylvania, USA.* We use optical anisotropy to study the magnetism of single walled carbon nanotubes (SWNTs) in suspension. Alignment of nanotubes in a magnetic field is used to infer their intrinsic and extrinsic magnetic properties.

Hyatt Grand Ballroom E/F

OF&T

OFTuB • Absolute Testing of Aspheres—Continued

OFTuB2 • 10:45 a.m. Invited
Fabrication and Certification of High-Quality and Larger-Aperture CGHs for Optical Testing, *Victor Korolkov, A. G. Poleshchuk; Inst of Automation and Electrometry, Russian Federation.* Laser-writing systems operated in polar coordinates and direct writing technologies for fabrication of large size (up to 300mm) and high precision (50nm) CGHs are described. Methods for certifying fabrication process are developed and experimentally validated.

Hyatt Regency Ballroom A/B

OPE

OPTuB • Organic Lasers and Charge Injection—Continued

OPTuB2 • 11:00 a.m.
Optical Losses in Injection- and Contact Layers for Organic Laser Devices, *Torsten Rabe, Patrick Görrn, Jens Meyer, Sami Hamwi, Thomas Riedl, Wolfgang Kowalsky; Inst. für Hochfrequenztechnik, Germany.* The VSL method is used to investigate the optical losses of injection and contact layers suitable for electrically driven organic lasers. For aluminium doped zinc oxide optical losses of 150 cm^{-1} could be observed.

NOTES

Highland A

Frontiers in Optics

FTuH • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art II: A Tribute to Emmett Leith—Continued

FTuH3 • 11:15 a.m. Invited

Planar Holographic Elements for Compact Displays, *A. A. Friesem; Weizmann Inst. of Science, Israel.* The principles, design and recording of holographic optical elements in planar optics configurations , and their successful incorporation into head-mounted and head-up displays will be presented.

Highland B

Joint

JTuA • Molecules and Clusters in Strong Fields—Continued

JTuA4 • 11:30 a.m.

Two-Dimensional Infrared Spectrometer, *Matthew F. DeCamp[1,2], Kevin C. Jones[1], Andrei Tokmakoff[1]; [1]MIT, USA, [2]Univ. of Delaware, USA.* An apparatus for acquiring two-dimensional infrared correlation spectra is presented. The spectrometer has the potential of acquiring a full 2DIR spectra using a single laser pulse.

Highland C

Frontiers in Optics

FTuI • Metamaterial Structures: Photonic Band Engineering I—Continued

FTuI3 • 11:15 a.m.

UV Lasing near the First ΓL-Pseudogap of ZnO Inverse Opals, *Michael Scharrer[1], Xiaohua Wu[1], Alexey Yamilov[1,2], Hui Cao[1], Robert P. H. Chang[1]; [1]Northwestern Univ., USA, [2]Dept. of Physics, Univ. of Missouri-Rolla, USA.* We demonstrate room temperature UV lasing of ZnO photonic crystals. Tuning the first Γ-L pseudogap to the gain spectrum leads to a five-fold reduction in lasing threshold due to the enhanced confinement of light.

FTuI4 • 11:30 a.m.

Conical Diffraction and Gap Solitons in Honeycomb Photonic Lattices, *Or Peleg[1], Guy Bartal[1], Barak Freedman[1], Ofer Manela[1], Mordechai Segev[1], Demetrios Christodoulides[2]; [1]Technion, Israel, [2]Univ. of Central Florida, USA.* We present the first experimental study of nonlinear wave dynamics in honeycomb photonic lattices, and demonstrate unique phenomena such as "honeycomb gap solitons" and "zero mass" conical diffraction arising from the special honeycomb symmetry.

Highland D

Frontiers in Optics

FTuJ • Photofluidics II—Continued

FTuJ3 • 11:15 a.m.

Two-Beam Interference Light-Fields as a Tool for Confinement, Delivery and Sorting of Micro-Objects, *Tomas Cizmar[1], Martin Siler[1], Mojmir Sery[1], Veneranda Garcés-Chávez[2], Vera Kollárová[3], Kishan Dholakia[2], Zdenek Bouchal[3], Pavel Zemánek[1]; [1]Inst. of Scientific Instruments, Czech Republic, [2]School of Physics and Astronomy, Univ. of St. Andrews, UK, [3]Dept. of Optics, Palacky Univ., Czech Republic.* We present how stationary and motional two-beam interference light structures can be efficiently used for confinement, precise delivery or sorting of micro-objects and nano-objects in a "washboard potential landscape"- a periodical system of optical traps.

FTuJ4 • 11:30 a.m.

Brownian Surfer and Swimmer in Standing Wave Optical Traps, *Martin Siler, Tomáš Cizmár, Pavel Zemánek; Inst. of Scientific Instruments, Acad. of Sciences of the Czech Republic, Czech Republic.* We analyze theoretically and experimentally influence of the velocity of the motional array of optical traps on Brownian dynamics of confined beads. We consider influence of weak traps on the rectification of the random motion.

Highland E

Frontiers in Optics

FTuK • Leveraging Spectroscopic Signatures I—Continued

FTuK4 • 11:15 a.m. Invited

New Twists and Turns for Confocal Raman Microscopy, *Andrew J. Berger, Zachary J. Smith; Univ. of Rochester, USA.* Confocal Raman microscopes usually reject elastically scattered light. This light, however, carries information about the target's angular scattering properties. Imaging this rejected beam creates a multimodal microscope with chemical (Raman) and structural (elastic scatter) capabilities.

Highland F

Frontiers in Optics

FTuL • Ultrafast Control of Laser/Matter Interactions II—Continued

FTuL4 • 11:15 a.m.

Current-Induced Second-Harmonic Generation in Silicon, *Vladimir O. Bessonov, Andrey A. Fedyanin, Oleg A. Aktsipetrov; M.V. Lomonosov Moscow State Univ., Dept. of Physics, Russian Federation.* The contribution to the optical second-harmonic generation resulting from the dynamic influence of the direct electric current flowing along the silicon (100) surface on the electron distribution anisotropy in the surface region is observed.

FTuL5 • 11:30 a.m.

A New High-Resolution Pulsed Laser Technique: CHAPS - Coherent Heterodyne-Assisted Pulsed Spectroscopy, *Kenneth G. Baldwin[1], Mitsuhiko Kono[1], Yabai He[2], Richard T. White[2], Brian J. Orr[2]; [1]Australian Natl. Univ., Australia, [2]Macquarie Univ., Australia.* A new precision pulsed laser technique, Coherent Heterodyne-Assisted Pulsed Spectroscopy (CHAPS), employs optical heterodyne detection for high-resolution measurement using a ns-pulsed optical parametric oscillator/amplifier whose ~18MHz bandwidth is very close to the Fourier transform limit.

Highland G

Frontiers in Optics

FTuM • Consumer Optics—Continued

FTuM4 • 11:15 a.m.
An Accurate *in vitro* SPF Evaluation Method for Sunscreens, *Yoshimasa Miura[1], Yoshihiro Takiguchi[2], Masayuki Shirao[1], Sadaki Takata[1], Takeshi Yanagida[1], Hiroshi Fukui[1]; [1]Shiseido Co.,Ltd., Japan, [2]Hamamatsu Photonics K.K., Japan.* A sensitive UV spectroscopy system has been developed to evaluate sun protection factor (SPF) values of sunscreen materials. With the system, excellent correlations between the *in vitro* SPF measured values and skin tests were realized.

FTuM5 • 11:30 a.m.
Optical System for Ultra-Thin Projection Display, *Sergey M. Shamaev; Moscow State Technical Univ. n.a. N.E. Bauman (MSTU), Russian Federation.* A rear projection optical system that performs enlarged projection from the primary image plane on the reduction side to the second image plane on the enlargement side without forming an intermediate real image.

Highland H

Laser Science

LTuD • Quantum Optics I—Continued

LTuD3 • 11:15 a.m.
Multipartite Entanglement in Cavity QED, *James P. Clemens, Perry Rice; Miami Univ., USA.* For an atom in a driven cavity with an external potential, we examine nonclassical correlations and entanglement. We consider entanglement by examining various bipartite splits.

LTuD4 • 11:30 a.m.
Entanglement in a Cavity QED System with a Multi-Level Atom in a Weakly Driven Two-Mode Cavity, *James P. Clemens[1], Perry Rice[1], Rebecca Olson[2], Matthew P. Terraciano[2], Luis A. Orozco[2]; [1]Miami Univ., USA, [2]Univ. of Maryland, USA.* For a 4-level atom in a weakly driven 2-mode cavity, we explore the entanglement between the atom, and the field modes. We explore the relation between various cross-correlation functions and the usual measures of entanglement.

Highland J

LTuE • Ultracold Molecules II: Photoassociative Spectroscopy and Ultracold Molecule Formation—Continued

LTuE3 • 11:15 a.m. Invited
Photoassociative Spectroscopy of Ultracold NaCs, *Christopher Haimberger, Jan Kleinert, Nicholas P. Bigelow; Univ. of Rochester, USA.* We present photoassociation spectroscopy of ultracold NaCs below the cesium D-line. Vibrational progressions are assigned to long range Hund case (c) states based on diabatic potentials with spin-orbit interaction included in a perturbative approach.

Highland K

LTuF • Carbon Nanotube Spectroscopy I—Continued

LTuF4 • 11:30 a.m. Invited
Nanotube Defects Studied with Near-Field Raman Scattering, *Lukas Novotny[1], Neil Anderson[1], Achim Hartschuh[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Ludwig-Maximilians-Univ., Germany.* We use an optical antenna to localize laser radiation to a spot of 10nm. The localized field is used as a excitation source and is guided point-by-point over the surface of a carbon nanotube sample.

Hyatt Grand Ballroom E/F

OF&T

OFTuB • Absolute Testing of Aspheres—Continued

OFTuB3 • 11:15 a.m.
Combined Diffractive Optical Elements for Quasi-Absolute Testing of Aspherics, *Gufran Sayeed Khan, Klaus Mantel, Norbert Lindlein, Johannes Schwider; Inst. of Optics, Information and Photonics, Univ. of Erlangen-Nuremberg, Germany.* Three position quasi-absolute test for aspherics by using combined-diffractive optical elements is presented. We discuss the effects of substrate quality of DOE on the proposed calibration procedure and present an optimised design of the DOE.

OFTuB4 • 11:30 a.m.
Absolute High-Accuracy Testing of Large Aspheres Using Twin Computer-Generated Holograms (CGHs), *Proteep C. V. Mallik, Rene Zehnder, James H. Burge; College of Optical Sciences, Univ. of Arizona, USA.* We present a method for a cascading null test using twin computer-generated holograms to calibrate errors in null correctors. This will allow us to test large aspheres an order of magnitude better than current limits.

Hyatt Regency Ballroom A/B

OPE

OPTuB • Organic Lasers and Charge Injection—Continued

OPTuB3 • 11:15 a.m.
Emission Characteristics of a DCJTB/PVK Composite Thin-Film Distributed Feedback Laser, *Sidney S. Yang, Yun-Ching Chang; Inst. of Photonics Technologies, Natl. Tsing Hua Univ., Taiwan.* We demonstrate the emission behaviors of a composite thin-film organic laser. The active layer consisted of PVK and DCJTB was spin-casted on a distributed feedback structure. Experimental results show good agreement with the simulated data.

OPTuB4 • 11:30 a.m.
Organic DFB Laser with Threshold in the Nanojoule Range in a Guest-Host Polymeric Waveguide, *Naoto Tsutsumi, Arata Fujihara, Makoto Takeuchi; Kyoto Inst. of Technology, Japan.* Organic guest-host polymeric DFB laser waveguide was performed using holographic dynamic gratings. Both emissions of TE_0 and TM_0 modes were measured. Effective energy transfer from PVCz to DCM through Alq reduced the threshold of lasing.

Highland A

Frontiers in Optics

FTuH • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art II: A Tribute to Emmett Leith—Continued

FTuH4 • 11:45 a.m.
Motion-Compensation and Noise Tolerance in Phase-Shifting Digital In-Line Holography, *Michael D. Stenner, Mark A. Neifeld; Univ. of Arizona, USA.* We present a technique to compensate for object motion in phase-shifting digital in-line holography. We also present a general inversion technique for arbitrary reference phases and amplitudes, including analysis of noise and error.

FTuH5 • 12:00 p.m.
Image Design for Image-Plane Disk-Type Multiplex Holography, *Yih-Shyang Cheng, Chuan-Jeh Lin, Chih-Hung Chen; Inst. of Optical Sciences, Natl. Central Univ., Taiwan.* By shifting the reference source points off the axis of holographic disk and swapping or rotating the original 2D objects, real and virtual images can be generated from opposite half circle of the hologram.

Highland B

Joint

JTuA • Molecules and Clusters in Strong Fields—Continued

JTuA5 • 11:45 a.m.
Single-Shot Femtosecond CARS Spectroscopy, *Yuri Paskover, Ilya Sh. Averbukh, Yehiam Prior; Weizmann Inst. of Science, Israel.* We demonstrate single shot retrieval of coherent molecular field-free evolution by geometric space-time mapping combined with non-linear signal imaging.

Highland C

Frontiers in Optics

FTuI • Metamaterial Structures: Photonic Band Engineering I—Continued

FTuI5 • 11:45 a.m.
Visible Planar Photonic Crystal Laser, *Zhaoyu Zhang[1], Tomoyuki Yoshie[2], Xiaoliang Zhu[1], Jiajing Xu[1], Axel Scherer[1]; [1]Caltech, USA, [2]Duke Univ., USA.* Visible planar photonic crystal lasers were fabricated within membranes of InGaP / InGaAlP quantum well material. These red photonic crystal lasers with ultra-small mode volumes (~ 0.01μm^3) are ideally useful for spectroscopic sources.

Highland D

FTuJ • Photofluidics II—Continued

FTuJ5 • 11:45 a.m.
Dynamic Control of Optically-Driven Rotation of Micro-Particles via Transferring of Angular Momentum of Light, *Gang Wang; Indiana Univ., Purdue Univ., USA.* We report an experimental approach to transfer, and to linearly superimpose the angular momentum in various laser modes into optically-bound microscopic colloidal particles, thereby allowing a dynamic-configurable rotation of the particle assemblies via optically-manipulation.

Highland E

FTuK • Leveraging Spectroscopic Signatures I—Continued

FTuK5 • 11:45 a.m.
Coded-Excitation Raman Spectroscopy for Ethanol Chemometrics of Tissue, *Scott T. McCain, Rebecca Willett, David J. Brady; Duke Univ., USA.* Raman spectroscopy of bulk tissue is challenging due to sample auto-fluorescence and weak Raman cross-sections of most molecules. We investigate the use of coded-excitation Raman spectroscopy coupled with an iterative algorithm for Raman signal estimation.

FTuK6 • 12:00 p.m.
Raman Spectroscopy of Single PDT Treated Cells, *Zachary J. Smith[1], Soumya Mitra[2], Thomas H. Foster[2], Andrew J. Berger[1]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Radiology, Univ. of Rochester, USA.* Raman spectra were obtained from single mouse tumor cells before and after treatment with photodynamic therapy. We are presently investigating pure chemicals to illuminate differences observed in the spectra of treated and untreated cells.

Highland F

FTuL • Ultrafast Control of Laser/Matter Interactions II—Continued

FTuL6 • 11:45 a.m.
Dynamics of EIT-Enhanced Refractive-Kerr Nonlinearities: Prospects for Quantum Nonlinear Optics, *Michael V. Pack, Praveen K. V. Setu, Ryan M. Camacho, John C. Howell; Univ. of Rochester, USA.* For CW-EIT and pulsed signal fields, we observe that the rise-times of the EIT-Kerr optical nonlinearity are proportional to the product of optical-pumping rate and medium optical-thickness. A slow-light signal field overcomes some rise-time limitations.

12:15 p.m.–2:00 p.m. Exhibit-Only Time/Lunch Refreshments

NOTES

Highland G

Frontiers in Optics

FTuM • Consumer Optics—Continued

FTuM6 • 11:45 a.m.
LED Illumination with a Condensing Sphere, *Wanli Chi, Nicholas George; Inst. of Optics, Univ. of Rochester, USA.* Novel compact and efficient illumination systems are described which comprise dielectric spheres with planar cuts at the edges and imbedded light emitting diodes. The rays are refracted to the forward direction or totally internally reflected.

FTuM7 • 12:00 p.m.
Fast Detection of Single Sided Diffracted Defects in Display Glass, *Vitor M. Schneider, Michal Meljnek, Kevin T. Gahagan; Corning, Inc, USA.* A fast non-interferometric system for measurement of diffraction patterns based on the incidence of partially coherent light in display glass is assembled. The system provides an acceptable qualitative measurement for the detection of asymmetric defects.

Highland H

Laser Science

LTuD • Quantum Optics I—Continued

LTuD5 • 11:45 a.m.
Quantum Noise Properties of Cavity Solitons, *Isabel Pérez-Arjona[1], Germán J. de Valcárcel[2], Eugenio Roldán[2]; [1]Univ. Politecnica de Valencia - ESPG, Spain, [2]Univ. de Valencia, Spain.* General method for studying quantum fluctuations of dissipative structures formed in nonlinear optical cavities is presented. Application to cavity soliton supported by degenerate optical parametric oscillator is presented. Squeezing and intensity fluctuations spectra are discussed.

Highland J

LTuE • Ultracold Molecules II: Photoassociative Spectroscopy and Ultracold Molecule Formation—Continued

LTuE4 • 11:45 a.m.
Light Forces in Ultracold Photoassociation, *Eduardo Gomez, Adam T. Black, Lincoln D. Turner, Eite Tiesinga, Paul D. Lett; NIST, USA.* We study the light forces present during high intensity photoassociation. The signal reveals the motion of the atoms induced by the photoassociation laser and the presence of a *d*-wave shape resonance in sodium.

LTuE5 • 12:00 p.m.
State-Selective Detection of Ultracold Rb$_2$ and Optical Trapping Using a CO$_2$ Laser, *H. K. Pechkis, Y. Huang, D. Wang, C. Ashbaugh, E. E. Eyler, P. L. Gould, W. C. Stwalley; Physics Dept., Univ. of Connecticut, USA.* We report formation and state-selective detection of ultracold Rb$_2$ by photoassociation. Resonance-enhanced ionization was used for the detection. We also present recent progress towards forming ultracold Rb$_2$ in an optical trap using a CO$_2$ laser.

Highland K

LTuF • Carbon Nanotube Spectroscopy I—Continued

LTuF5 • 12:00 p.m. Invited
Measurements of Electron-Phonon Coupling Strengths in Carbon Nanotubes, *Y. Yin[1], A. Vamivakas[1], A. Walsh[1], S. Cronin[2], M. S. Unlu[1], B. B. Goldberg[1], Anna Swan[1]; [1]Boston Univ., USA, [2]Univ. of Southern California, USA.* We measure the electron-phonon coupling in carbon nanotubes by correlating the first and second harmonic of the resonant Raman excitation profile. The results are in good agreement with the chirality and diameter dependence calculations.

Hyatt Grand Ballroom E/F

OF&T

OFTuB • Absolute Testing of Aspheres—Continued

OFTuB5 • 11:45 a.m. Invited
Absolute Measurement of Rotationally Symmetric Aspheric Surfaces, *Michael Kuechel; Zygo, Germany.* The surface is scanned along its symmetry axis in a Fizeau cavity with spherical reference surface. The coordinates x,y,z at the (moving) zone of normal incidence are derived from simultaneous phase-measurements at apex and zone.

Hyatt Regency Ballroom A/B

OPE

OPTuB • Organic Lasers and Charge Injection—Continued

OPTuB5 • 11:45 a.m.
Organic Vertical-Cavity Distributed-Feedback Lasers Using Dye-Doped Bragg Reflectors, *Hajime Sakata, Hideki Takeuchi, Kazutoshi Natsume, Shunpei Suzuki; Shizuoka Univ., Japan.* Optically pumped surface-emitting lasers were fabricated by stacking thin-film polymers. We observed a single-mode laser operation by doping dye into the whole layer. The lasing threshold was lower than that for lasers with nondoped reflectors.

OPTuB6 • 12:00 p.m.
High Performance Dye-Doped Cholesteric Liquid Crystal Lasers, *Ying Zhou, Yuhua Huang, Shin-Tson Wu; College of Optics and Photonics/CREOL, USA.* A high performance dye-doped cholesteric liquid crystal (CLC) laser pumped by second harmonic Nd-YAG laser is demonstrated. By incorporating external passive CLC reflectors, the light efficiency is enhanced while the beam divergence is reduced significantly.

12:15 p.m.–2:00 p.m. Exhibit-Only Time/Lunch Refreshments

NOTES

Highland A

Frontiers in Optics

2:00 p.m.–3:45 p.m.
FTuN • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art III: A Tribute to Emmett Leith

Joseph N. Mait; ARL, USA, Presider

FTuN1 • 2:00 p.m. Invited

Diffractive Optics Meets Electro-Optics: A Review of Holography's Impact on Electro-Optic Devices, *James R. Leger; Univ. of Minnesota, USA.* This talk reviews several applications of holography in laser system design. Among these are Bragg reflectors in fiber lasers, intra-cavity mode selecting and mode shaping elements, integrated lenses, and beam samplers and homogenizers.

Highland B

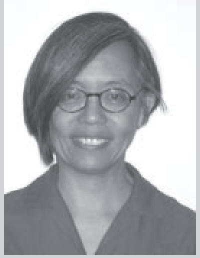
Joint

2:00 p.m.–3:45 p.m.
JTuB • XUV Sources and Science

Presider to Be Announced

JTuB1 • 2:00 p.m. Tutorial

Ultrafast X-Ray Sources and Science, *Linda Young; Argonne Natl. Lab, USA.* X-ray science is entering the ultrafast and ultraintense era - spurred by developments in coherent, short-wavelength sources that range from tabletop to accelerator-based. These revolutionary X-ray sources and their scientific applications will be reviewed.



Linda Young is currently group leader for Atomic, Molecular and Optical Physics at Argonne National Laboratory. The AMO group studies dynamical processes with X-ray radiation. Her current research centers on ultrafast X-ray probes of strong-field processes in atoms and molecules. She received an S.B. from the Massachusetts Institute of Technology, Ph.D. from the University of California at Berkeley and held a postdoctoral appointment at the University of Chicago, before employment at Argonne National Laboratory.

Highland C

Frontiers in Optics

2:00 p.m.–3:45 p.m.
FTuO • Metamaterial Structures: Photonic Band Engineering II

Tsampikos Kottos; Wesleyan Univ., USA, Presider

FTuO1 • 2:00 p.m. Invited

Manipulation of Photons by Photonic Crystals, *Susumu Noda; Kyoto Univ., Japan.* Photonic crystals provide an exciting new tool for the manipulation of photons. In this presentation, I will describe the recent progresses of manipulation of photons based on various types of engineering in photonic crystals.

Highland D

2:00 p.m.–3:45 p.m.
FTuP • All-Optical Networks and Systems

Alistair J. Poustie; Ctr. for Integrated Photonics, UK, Presider

FTuP1 • 2:00 p.m. Invited

Architecture and Integration Technologies for LASOR: A Label Switched Optical Router, *Daniel Blumenthal; Univ. of California at Santa Barbara, USA.* No abstract available.

Highland E

2:00 p.m.–3:45 p.m.
FTuQ • Leveraging Spectroscopic Signatures II

Andrew J. Berger; Inst. of Optics, Univ. of Rochester, USA, Presider

FTuQ1 • 2:00 p.m.

Determination of Intracellular Distributions of Refractive Index of B-Cells and HL60 cells at 442, 633 and 850nm, *Huafeng Ding, Jun Q. Lu, R. Scott Brock, Lillian Burke, Douglas A. Weidner, Thomas J. McConnell, Xin-Hua Hu; East Carolina Univ., USA.* Mueller matrix elements of B-cell and HL60 cell suspensions were measured and compared to FDTD calculated results with 3D reconstructed structures. The intracellular distributions of refractive index were determined for the two types of cells.

FTuQ2 • 2:15 p.m. Invited

Single Cell Partial Wave Spectroscopy: Understanding Alterations of Intracellular Nanoarchitecture in Cancer, *Vadim Backman, Yang Liu, Prabhakar Pradhan, Young Kim, Xu Li, Allen Taflove, Hemant Roy, Randall Brand; Northwestern Univ., USA.* We developed a novel microscopic technique, single-cell partial-wave spectroscopic (PWS) microscopy, which provides insights into the nanoarchitecture of living cells. We demonstrated that PWS enables diagnosis of colon carcinogenesis by analysis of histologically normal-appearing cells.

Highland F

2:00 p.m.–3:45 p.m.
FTuR • Coherent and Quantum Optics in Fibers II

Govind Agrawal; Univ. of Rochester, USA, Presider

FTuR1 • 2:00 p.m. Invited

Generation of Entangled Photons in Fiber and Their System Applications, *Kyo Inoue[1,2,3], Hiroki Takesue[2,3]; [1]Osaka Univ., Japan, [2]NTT Basic Res. Labs, Japan, [3]JST-CREST, Japan.* Quantum entangled photons, which are usually created via optical nonlinearity, have a unique correlation between them. This paper describes entangled-photon generation using spontaneous four-wave mixing in fiber and its application to quantum cryptography.

Highland G

Frontiers in Optics

2:00 p.m.–3:45 p.m.
FTuS • High-Power Optics: State-of-the-Art II
Michelle Shinn; Jefferson Lab, USA, Presider

FTuS1 • 2:00 p.m. Invited
Ion Beam Sputtered Optical Coating for High Fluence Applications, *Gary DeBell; MLD Technologies, LLC, USA.* Ion beam sputtered optical coatings are a crucial part of many high fluence optical systems. The high packing density and very low absorption and scatter of these films is reviewed, application examples are given.

Highland H

Laser Science

2:00 p.m.–3:45 p.m.
LTuG • Quantum Optics II
Olivier Pfister; Univ. of Virginia, USA, Presider

LTuG1 • 2:00 p.m. Tutorial
Continuous Variable Teleportation of Gaussian and Non-Gaussian Light, *Howard Carmichael, Changsuk Noh; Univ. of Auckland, New Zealand.* The continuous variable quantum teleportation of an optical field is reviewed, contrasting three different points of view: those of stochastic electrodynamics, quantum trajectory theory, and an operator-based treatment of the classical channel.

Howard Carmichael earned an M.Sc. from the University of Auckland in 1973 and a Ph.D. from the University of Waikato in 1977. He was a member of the physics faculty of the University of Arkansas from 1983 to 1989. In 1989 he moved to the University of Oregon, where he was Professor of Physics from 1991 to 2001. He currently holds the Dan Walls Chair in Theoretical Physics at the University of Auckland. Howard Carmichael is a Fellow of the American Physical Society and the Optical Society of America, and recipient of the Optical Society's Max Born Award in 2003.

Highland J

2:00 p.m.–4:00 p.m.
LTuH • Ultracold Molecules III: New Approaches to Cold Molecules
Kevin M. Jones; Williams College, USA, Presider

LTuH1 • 2:00 p.m. Invited
Cold Free-Radical NH Molecules, *Heather Lewandowski, L. Paul Parazzoli, Daniel Lobser; JILA, USA.* The advent of laser cooling and trapping has transformed atomic physics. Cold molecules, with their richer internal structure, offer many new exciting research opportunities. We create cold molecules by supersonic expansion coupled with Stark deceleration.

Highland K

2:00 p.m.–4:00 p.m.
LTuI • Spintronix and Quantum Information II
Jeremy Levy; Univ. of Pittsburgh, USA, Presider

LTuI1 • 2:00 p.m. Invited
Restoring Coherence Lost in a Mesoscopic Bath, *L. J. Sham[1], Wang Yao[1], Ren-Bao Liu[2]; [1]Univ. of California at San Diego, USA, [2]Chinese Univ. of Hong Kong, China.* Dynamics of entanglement of a two state system with a bath of a large but finite number of interacting particles is used to show how the two state coherence is lost and can be recovered.

Hyatt Grand Ballroom E/F

OF&T

2:00 p.m.–3:45 p.m.
OFTuC • Materials and Material Properties
Don Golini; QED Technologies Inc., USA, Presider

OFTuC1 • 2:00 p.m. Invited
High-Index Materials for UV Lithography Optics, *John Burnett; NIST, USA.* A survey of candidate high-index lens materials for UV lithography optics is presented. These materials may enable extension of 193 nm immersion lithography to smaller features sizes, while reducing lens system sizes.

Hyatt Regency Ballroom A/B

OPE

2:00 p.m.–3:45 p.m.
OPTuC • OLED Circuits, Solar Cells and Organic Memory
Presider to Be Announced

OPTuC1 • 2:00 p.m. Plenary
Design and Integration Challenges of Active Matrix Organic Light Emitting Diode Displays, *Arokia Nathan; London Ctr. for Nanotechnology, UK.* Design of active matrix organic light emitting diode (AMOLED) displays comes with significant challenges associated with material degradation. This talk will review pertinent design considerations and compensation schemes to manage backplane instability and OLED degradation.

Highland A

Frontiers in Optics

FTuN • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art III: A Tribute to Emmett Leith—Continued

FTuN2 • 2:30 p.m. Invited

Holography and Education, *Tung Jeong; Integraf LLC, USA.* Holography can be taught to anyone in context as art, craft, or science using safe and low cost equipment. Leith gave me a hologram in 1965 that started my career in holography to this day.

Highland B

Joint

JTuB • XUV Sources and Science—Continued

Highland C

Frontiers in Optics

FTuO • Metamaterial Structures: Photonic Band Engineering II—Continued

FTuO2 • 2:30 p.m.

Spin-Dependent Ultrafast Optical Nonlinearities in Bragg-Spaced Quantum Wells, *Wesley J. Johnston[1], John P. Prineas[1], Arthur L. Smirl[1], Hyatt M. Gibbs[2], Galina Khitrova[2]; [1]Univ. of Iowa, USA, [2]Univ. of Arizona, USA.* We observe spin-dependent ultrafast blue shifts, transient gain, and the opening of spectral transmission windows in the forbidden gap of the photonic band structure of Bragg-spaced InGaAs/GaAs quantum wells.

Highland D

FTuP • All-Optical Networks and Systems—Continued

FTuP2 • 2:30 p.m.

Polarization-Independent Cross-Phase Modulation Using Nonlinear Birefringent Fiber, *Anthony S. Lenihan[1,2], Reza Salem[3], Gary M. Carter[1], Thomas E. Murphy[3]; [1]Univ. of Maryland Baltimore County, USA, [2]Lab for Physical Sciences, Univ. of Maryland at College Park, USA, [3]Univ. of Maryland at College Park, USA.* We report a new method for polarization-independent cross-phase modulation in nonlinear fiber. The technique utilizes fiber birefringence to eliminate polarization dependence. We successfully applied the technique for polarization independent demultiplexing at 80 Gb/s.

Highland E

FTuQ • Leveraging Spectroscopic Signatures II—Continued

Highland F

FTuR • Coherent and Quantum Optics in Fibers II—Continued

FTuR2 • 2:30 p.m.

Quantum Entangled States Generation in Three Coupled Kerr Nonlinear Waveguides, *Bakhram Umarov[1,2], Ridza Wahiddin[1,2]; [1]Cyberspace Security Lab, Malaysia, [2]Faculty of Science, Intl. Islamic Univ. Malaysia, Malaysia.* The paper is devoted to the investigation of nonclassical states of the continuous light beams in three coupled Kerr nonlinear waveguides. It is shown that spatially separated entangled beams can be generated in this system.

2:30 p.m.–3:30 p.m. Building Your Future in Optics, Douglass Room, Clarion Rochester Hotel

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JTuB2 • 2:45 p.m.

The Application of High-Order Harmonics to Extreme Ultraviolet Polarimetry, *Nicole Brimhall, John C. Painter, Matt Turner, R. Steven Turley, Michael Ware, Justin Peatross; Brigham Young Univ., USA.* We report on the construction of an extreme-ultraviolet polarimeter based on laser-generated high-order harmonics.

FTuO3 • 2:45 p.m.

Real-Time Spectral Phase Measurement in Nanoscale Optical Waveguides Using Spectral Interferometry, *Aliakbar Jafarpour, Jiandong Huang, Murtaza Askari, Ali Adibi; Georgia Tech, USA.* High-speed, high-resolution, and wideband spectral phase measurement of photonic crystal waveguides at optical communications wavelengths has been demonstrated. The technique is especially important in the study of fast dynamics and in sensing applications.

FTuP3 • 2:45 p.m.

Optically Addressed MEMS Deformable Mirrors Driven via an Array of Photodetectors, *Bahareh Haji-saeed[1], Sandip K. Sengupta[1], Craig Armiento[1], William D. Goodhue[2], Jed Khoury[3], Kenneth Vaccaro[3], Charles L. Woods[3], John Kierstead[4], Andrew Davis[4], William Clark[5]; [1]Electrical and Computer Engineering Dept., Univ. of Massachusetts at Lowell, USA, [2]Physics Dept., Univ. of Massachusetts at Lowell, USA, [3]AFRL / SNHC, Hanscom Air Force Base, USA, [4]Solid State Scientific Corp., USA, [5]Auteon Corp., USA.* This paper presents fabrication of all-optically-addressed-deformable-mirror-MEMS driven via an array of photodetectors. Each deformable mirror is suspended over a PIN photodetector structure. It was possible to drive the MEMS optically and this was demonstrated experimentally.

FTuQ3 • 2:45 p.m. Invited

Cost Effective Evaluation of Cervical Cancer Using Reflectance and Fluorescence Spectroscopy, *Shabbir Bambot, Mark L. Faupel, David Mongin, Brenda Schultz, Roger Milliken, Rick Fowler; Guided Therapeutics Inc., USA.* Quantitative spectroscopy is a powerful and economically viable method for real time tissue diagnosis with the potential to reduce healthcare costs and improve patient care. We demonstrate this in a device for cervical cancer diagnosis.

FTuR3 • 2:45 p.m.

Secure Communication by Low-Photon-Number Pathlength Modulation, *William T. Rhodes; Florida Atlantic Univ., USA.* Pathlength modulation interferometers operating at the single-photon level allow the transmission of conventionally encrypted messages with greatly increased security. By modulating pathlength differences, Alice and Bob can prevent Eve from having access to the ciphertext.

Highland G

Frontiers in Optics

FTuS • High-Power Optics: State-of-the-Art II—Continued

FTuS2 • 2:30 p.m. Invited

New and Improved Technologies for the OMEGA EP High-Energy Petawatt Laser, *Jonathan Zuegel, V. Bagnoud, S. W. Bahk, I. A. Begishev, J. Bromage, J. Bunkenburg, S. Dalton, C. Dorrer, L. Folnsbee, M. J. Guardalben, P. A. Jaanimagi, R. Jungquist, T. J. Kessler, J. H. Kelly, B. E. Kruschwitz, S. J. Loucks, D. N. Maywar, D. D. Meyerhofer, S. F. B. Morse, J. B. Oliver, J. Qiao, J. Puth, A. L. Rigatti, A. W. Schmid, M. J. Shoup; Lab for Laser Energetics, Univ. of Rochester, USA.* OMEGA EP (extended performance) is a petawatt-class laser under construction at the University of Rochester. This paper reviews both the OMEGA EP performance objectives and the enabling technologies required to meet these goals.

Highland H

Laser Science

LTuG • Quantum Optics II—Continued

Highland J

LTuH • Ultracold Molecules III: New Approaches to Cold Molecules—Continued

LTuH2 • 2:30 p.m. Invited

Making Ultracold Molecules from Ultracold Atoms with Chirped Laser Pulses, *Francoise Masnou-Seeuws; Orsay, France.* No abstract available.

Highland K

LTuI • Spintronix and Quantum Information II—Continued

LTuI2 • 2:30 p.m.

Decoherence in Quantum Information Systems: Kraus Operator Approach, *Ting Yu, J. H. Eberly; Univ. of Rochester, USA.* We extend previous work by showing that disentanglement of two-qubit open systems can be described in a unified way by Kraus operators. Our discussion includes many examples such as vacuum noise and thermal noise.

Hyatt Grand Ballroom E/F

OF&T

OFTuC • Materials and Material Properties—Continued

OFTuC2 • 2:30 p.m.

Dual Interferometer System for Measuring Index of Refraction, *Eric P. Goodwin, John J. Sullivan, Daniel G. Smith, John E. Greivenkamp; Univ. of Arizona, USA.* Geometrical limitations can sometimes preclude the accurate measurement of the bulk index of refraction. A novel dual interferometer system for measuring the bulk index of thin transparent optical materials is presented.

Hyatt Regency Ballroom A/B

OPE

OPTuC • OLED Circuits, Solar Cells and Organic Memory—Continued

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2:30 p.m.–3:30 p.m. Building Your Future in Optics, Douglass Room, Clarion Rochester Hotel

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LTuG2 • 2:45 p.m.

Generating Scalable Multipartite Entanglement and Non-Gaussian States of Light Using Nonlinear Concurrences and Cascades, *Raphael C. Pooser, Olivier Pfister; Univ. of Virginia, USA.* Scalable multipartite entanglement and non-Gaussian states are essential for quantum computing. Second order concurrent nonlinearities can aid with scalability, while cascaded nonlinearities can be used to produce an effective third-order Hamiltonian resulting in non-Gaussian states.

LTuI3 • 2:45 p.m. Invited

Spin Based Test-Beds for Quantum Information Processing, *David Cory; MIT, USA.* We will discuss three spin-based test-beds for quantum information processing: Liquid state NMR - universal control, 10+ qubits Solid state NMR - coherent multi-spin dynamics, 40+ spins. Coherent control of the electron/nuclear hyperfine interaction.

OFTuC3 • 2:45 p.m.

Subsurface Damage Depth Determination for Precision Microground Tungsten Carbides, *Shai N. Shafrir[1,2], John C. Lambropoulos[1,2], Stephen D. Jacobs[2]; [1]Mechanical Engineering, Materials Science Program, Univ. of Rochester, USA, [2]Lab for Laser Energetics, Univ. of Rochester, USA.* We demonstrate the use of a magnetorheological finishing based approach to study subsurface damage depth of microground tungsten carbides. This work expands previous results on glasses, and single crystals.

OPTuC2 • 2:45 p.m.

Chemically Amplified Refractive Index Recording in Solid Polymers, *Douglas R. Robello[1], Samir Y. Farid[1], Joseph P. Dinnocenzo[2], Thomas G. Brown[3]; [1]Eastman Kodak Company, USA, [2]Dept. of Chemistry, Univ. of Rochester, USA, [3]Inst. of Optics, Univ. of Rochester, USA.* We describe a new, highly sensitive photochemical imaging medium that exhibits a refractive index contrast of >0.02, and very low dimensional changes on recording. Holograms and other photonic structures can be written in the polymer.

Highland A

Frontiers in Optics

FTuN • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art III: A Tribute to Emmett Leith—Continued

FTuN3 • 3:00 p.m.
Diffractive and Micro-Optics for Spatial, Spectral, and Polarization Modification, *Eric Johnson, A. Mehta, R. Rumpf, Z. Roth, K. Buhl; Univ. of Central Florida, USA.* This paper summarizes applications of micro-optics and nano-optics for spatial and spectral beam control. Methods of fabrication will be summarized with specific examples in beam conditioning, imaging, and filtering.

FTuN4 • 3:15 p.m.
Beamshaping Generation of Hermite, Laguerre, and Ince Gaussian Beams with a Liquid Crystal Display, *Jeffrey A. Davis[1], Joel B. Bentley[1], Miguel A. Bandres[2], Julio C. Gutiérrez-Vega[2]; [1]San Diego State Univ., USA, [2]Technologico de Monterrey, Mexico.* We show how to generate the three types of Gaussian beams by encoding amplitude and phase patterns onto a single phase-only liquid crystal display.

Highland B

Joint

JTuB • XUV Sources and Science—Continued

JTuB3 • 3:00 p.m. Invited
Pathways to Photo-Double-Ionization of Xe in Combined XUV and Infrared Laser Pulses, *Horst Rottke[1], Martin Böttcher[1], Nickolai Zhavoronkov[1], Wolfgang Sandner[1], Pierre Agostini[2], Mathieu Gisselbrecht[3], Alain Huetz[3]; [1]Max Born Inst., Germany, [2]Dept. of Physics, Ohio State Univ., USA, [3]LIXAM, Universite Paris-Sud, France.* 2-color Xe photo-double-ionization is investigated after absorption of one XUV high order harmonic photon and few infrared Ti:Sapphire laser photons. Double ionization is found to happen predominantly step wise via intermediate excited Xe^+ states.

Highland C

Frontiers in Optics

FTuO • Metamaterial Structures: Photonic Band Engineering II—Continued

FTuO4 • 3:00 p.m.
3D Photonic Crystals Fabrication in Lithium Niobate: Towards Nonlinearity and Functionality, *Guangyong Zhou, Min Gu; Ctr. for Micro-Photonics, Australia.* We report the fabrication of three-dimensional photonic crystals in a high refractive index lithium niobate by using a femtosecond laser-induced micro-explosion method. Photonic bandgaps with ~30% suppression rate for an FCC structure have been observed.

FTuO5 • 3:15 p.m.
Theory of Luminescence of One-Dimensional Resonant Photonic Crystals, *Lev I. Deych[1], Mikhail Erementchouk[2], Alexander Lisyansky[1]; [1]Dept. of Physics, Queens College, USA, [2]Dept. of Physics, Northwestern Univ., USA.* We develop a general transfer-matrix based theoretical approach to describing the role of photonic environment on the luminescent properties of one-dimensional resonant photonic crystals. The approach is applied to Bragg multiple quantum well structures.

Highland D

FTuP • All-Optical Networks and Systems—Continued

FTuP4 • 3:00 p.m.
High-Speed Transparent Switch via Frequency Up-Conversion, *Aaron P. VanDevender, Paul G. Kwiat; Univ. of Illinois at Urbana-Champaign, USA.* We present a novel mechanism to realize high-speed, transparent, low-loss phase-, intensity-, and polarization-modulators using frequency up-conversion in a nonlinear crystal.

FTuP5 • 3:15 p.m. Invited
Single Channel Transmission beyond 1 Tbit/s, *Reinhold Ludwig; Heinrich-Hertz-Inst., Germany.* We report on components and techniques for transmission beyond 1 Tbit/s. In particular, signal generation using advanced modulation formats, transmission over appropriate fiber spans and ultrafast demultiplexing are discussed.

Highland E

FTuQ • Leveraging Spectroscopic Signatures II—Continued

FTuQ4 • 3:15 p.m.
Scattering Spectroscopy with Novel Darkfield Microscope Instrumentation, *William J. Cottrell[1], Jeremy D. Wilson[2], Thomas H. Foster[1,2,3]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Physics, Univ. of Rochester, USA, [3]Dept. of Imaging Science, Univ. of Rochester, USA.* A retrofitted scattering spectroscopy system expands capabilities of a commercial inverted darkfield microscope. It measures wavelength- and angularly-resolved scattering using a spectrometer and the Fourier plane, respectively, and allows direct imaging of the target region.

Highland F

FTuR • Coherent and Quantum Optics in Fibers II—Continued

FTuR4 • 3:00 p.m.
Generation of Cross-Polarized Degenerate Photon Pairs in Dispersion-Shifted Fiber, *Jun Chen, Kim Fook Lee, Chuang Liang, Prem Kumar; Northwestern Univ., USA.* We generate degenerate-frequency, cross-polarized photon pairs for the first time in dispersion-shifted fiber using dual-frequency, orthogonally-polarized pump pulses. A ratio of coincidence to accidental-coincidence counts near 20 is obtained.

FTuR5 • 3:15 p.m. Invited
Polarization Squeezing in Fibers, *Ulrik Andersen[1], Joel Heersink[1], Vincent Josse[1], Gerd Leuchs[1], Joel Corney[2], Peter Drummond[2]; [1]Univ. Erlangen, Germany, [2]Univ. of Queensland, Australia.* We report on a source of polarization squeezing (5.1±0.3dB) based on a single pass through an optical fiber. Using a rigorous model for pulse propagation in fibers quantitative agreement between experiment and theory is found.

Highland G

Frontiers in Optics

FTuS • High-Power Optics: State-of-the-Art II—Continued

FTuS3 • 3:00 p.m.
Coherent Combination of Two Semiconductor Lasers Using Optical Phase Locked Loops (OPLLs), *Wei Liang[1], Amnon Yariv[1], Anthony Kewitsch[2], George Rakuljic[2]; [1]Caltech, USA, [2]Telaris Inc., USA.* We experimentally demonstrate 95% efficient coherent power combination of two semiconductor DFB lasers by using electronic feedback and Optical Phase-Locked Loops (OPLLs). The rms phase error between the locked lasers is about 30 degrees.

FTuS4 • 3:15 p.m.
Analysis of Thermal Aberrations in a High Average Power Single-Stage Ti:Sapphire Regenerative Chirped Pulse Amplifier, *Vidya Ramanathan, Jinho Lee, Shengbo Xu, Xiaoming Wang, D. H Reitze; Univ. of Florida, USA.* We present a comprehensive investigation of thermal effects in single-stage high average power regenerative Ti:Sapphire amplifiers. Using finite element analysis coupled with experimental diagnostics of optical path deformations, we determine the parameters for optimum performance.

Highland H

Laser Science

LTuG • Quantum Optics II—Continued

LTuG3 • 3:00 p.m.
Measurement of Conditional Squeezing for Non-Gaussian Fields, *Justin Vines, Reeta Vyas, Surendra Singh; Univ. of Arkansas, USA.* A scheme based on homodyne detection for measuring conditional quadrature fluctuations for non-Gaussian fields is proposed. Results for light from parametric oscillators and fluorescence from an atom in a high-Q cavity are discussed.

LTuG4 • 3:15 p.m.
Entanglement Propagation in Photon Pairs Created by Spontaneous Parametric Down-Conversion, *Malcolm N. O'Sullivan-Hale, Kam Wai Chan, Robert W. Boyd; Inst. of Optics, USA.* We experimentally observe the apparent loss and recovery of spatial entanglement during the propagation of photon pairs created in SPDC and understand it as a migration of the entanglement from the intensity to the phase.

Highland J

LTuH • Ultracold Molecules III: New Approaches to Cold Molecules—Continued

LTuH3 • 3:00 p.m. Invited
The Effect of Chirped Femtosecond Laser Pulses on the Formation of Ultracold Molecules in a Magneto-Optical Trap, *Ian Walmsley[1], Alex Dicks[1], Dave McCabe[1], Antoine Monmayrant[1], Ben Brown[2]; [1]Univ. of Oxford, UK, [2]NIST, USA.* We discuss recent experiments on the use of shaped broadband optical pulses to effect photoassociation of ultracold atoms into ultracold molecules in bound states of the ground electronic potential.

Highland K

LTuI • Spintronix and Quantum Information II—Continued

LTuI4 • 3:15 p.m. Invited
Quantum Measurement and Feedback with Atomic Hyperfine Spins, *Hideo Mabuchi, John J. Stockton, Ramon van Handel, Anthony E. Miller; Caltech, USA.* I will review our ongoing research on continuous non-demolition measurement of collective hyperfine spin in a dilute cloud of laser-cooled Cesium atoms. Connections with quantum filtering, parameter estimation and quantum information theory will be highlighted.

Hyatt Grand Ballroom E/F

OF&T

OFTuC • Materials and Material Properties—Continued

OFTuC4 • 3:00 p.m.
Computer-Aided Design and *in vitro* Intra-Oral Finishing of Bioceramics in Dentistry, *Ling Yin[1], Jia Li[1], Yali Song[1], Xiaofei Song[1], Yigang Han[1], Ping Gao[2]; [1]School of Mechanical Engineering, Tianjin Univ., China, [2]Dental Hospital, Tianjin Medical Univ., China.* This paper describes the research challenges in dental CAD/CAM and *in vitro* oral finishing of dental bioceramics for restorations. Some progress made on computer-aided crown design and *in vitro* dental finishing testing methodology are described.

OFTuC5 • 3:15 p.m. Invited
Birefringence Dispersion Measurement for Advanced Display Materials, *Yukitosho Otani, Toshitaka Wakayama; Tokyo Univ., Japan.* A fast two-dimensional measurement system of birefringence dispersion is developed for inspection of LCD retardation films using a Xenon flash lamp and a line type of imaging spectrometer.

Hyatt Regency Ballroom A/B

OPE

OPTuC • OLED Circuits, Solar Cells and Organic Memory—Continued

OPTuC3 • 3:00 p.m.
Charge Transport and Recombination in Bulk-Heterojunction Solar Cells, *Almantas Pivrikas[1,2], Gytis Juška[3], Markus Scharber[4], Niyazi Serdar Sariciftci[5], Ronald Österbacka[1]; [1]Dept. of Physics and Ctr. for Functional Materials, Åbo Akademi Univ., Finland, [2]Graduate School of Materials Res., Turku Univ., Finland, [3]Vilnius Univ., Dept. of Solid State Electronics, Lithuania, [4]Konarka Austria, Austria, [5]Linzer Inst. für organische Solarzellen (LIOS), Physikalische Chemie, Johannes Kepler Univ. Linz, Austria.* Charge carrier transport and recombination are measured in polymer/fullerene bulk-heterojunction solar cells using novel opto-electrical techniques. The impact of nanomorphology on carrier transport and recombination as well as on solar cell performance is discussed.

OPTuC4 • 3:15 p.m.
Resonant Tunneling and Room Temperature Negative Differential Resistance in TiO$_2$/MEH-PPV Junctions for Quantum Functional Circuits, *Woo-Jun Yoon[1], Andrew P. Bonifas[2], Richard L. McCreery[2], Paul R. Berger[1,3]; [1]Dept. of Electrical and Computer Engineering, Ohio State Univ., USA, [2]Dept. of Chemistry, Ohio State Univ., USA, [3]Dept. of Physics, Ohio State Univ., USA.* We demonstrate robust room temperature negative differential resistance and logic circuit operations using polymer tunnel diodes (ITO/TiO$_2$/MEH-PPV/Al). Resonant tunneling is believed to occur through localized defect levels in the TiO$_2$ characterized by ultraviolet/visible absorption spectrometry.

Highland A

Frontiers in Optics

FTuN • A Half Century of Holography, Optical Signal Processing, Diffractive Optics and Art III: A Tribute to Emmett Leith—Continued

FTuN5 • 3:30 p.m.
Bow-Tie Effect: Differential Operator, *Jorge Ojeda-Castañeda[1], Albertina Castro[2], Adolf W. Lohmann[3]; [1]Univ. of the Americas, Mexico, [2]INAOE, Mexico, [3]Lehrsthul für Multimediakommunikation und Signalverarbeitung, Univ. Erlangen-Nürnberg, Germany.* We propose a differential operator for representing the influence of phase-only filters on the defocused MTF. We apply this result for presenting a phase-only filter that optically implements Taylor's theorem in phase-space.

Highland B

Joint

JTuB • XUV Sources and Science—Continued

JTuB4 • 3:30 p.m.
Towards Photoelectron Spectroscopy with Shaped High Harmonic Radiation, *Alexander Paulus, Carsten Winterfeldt, Thomas Pfeifer, Dominik Walter, Sebastian Jung, Nico Franke, Christian Spielmann; Physikalisches Inst., Germany.* Single high-harmonic orders selected by adaptive control of the driving laser pulses are suitable for time-resolved electron spectroscopy. An optimized time-of-flight electron spectrometer for efficient detection of photoelectrons in this energy regime is used.

JTuB5 • 3:45 p.m.
Imaging with Sub-38nm Spatial Resolution Using a Tabletop 13nm Wavelength Laser, *Fernando Brizuela[1], Courtney Brewer[1], Georgiy Vaschenko[1], Yong Wang[1], Miguel Larotonda[1], Bradley Luther[1], Mario C. Marconi[1], Jorge J. Rocca[1], Carmen S. Menoni[1], Weilun Chao[2], J. Alexander Liddle[2], Yanwei Liu[2], Erik H. Anderson[2], David T. Attwood[2]; [1]Colorado State Univ., USA, [2]Lawrence Berkeley Natl. Lab, USA.* Images with sub-38nm spatial resolution were obtained with a tabletop microscope based on a high repetition rate tabletop 13nm wavelength laser and zone-plate optics.

Highland C

Highland D

Highland E

Highland F

Frontiers in Optics

FTuO • Metamaterial Structures: Photonic Band Engineering II—Continued

FTuO6 • 3:30 p.m.
Surface Gap Solitons in $LiNbO_3$ Waveguide Arrays, *Christian R. Rosberg[1], Dragomir N. Neshev[1], Wieslaw Z. Krolikowski[1], Arnan Mitchell[2], Rodrigo A. Vicencio[3], Mario I. Molina[4], Yuri S. Kivshar[1]; [1]Australian Natl. Univ., Australia, [2]RMIT Univ., Australia, [3]Max-Planck-Inst. für Physik komplexer Systeme, Germany, [4]Univ. de Chile, Chile.* We experimentally demonstrate the existence of surface gap solitons in a semi-infinite array of $LiNbO_3$ waveguides with defocusing nonlinearity. Power threshold dynamics and the staggered phase structure of the self-localized beam are studied in detail.

FTuQ • Leveraging Spectroscopic Signatures II—Continued

FTuQ5 • 3:30 p.m.
Studies of Absorption and Scattering of Light on a Model Coral, *Eugenio R. Méndez[1], Emiliano Terán-Bobadilla[1], Susana Enríquez[2], Roberto Iglesias-Prieto[2]; [1]CICESE, Div. de Fisica Aplicada, Mexico, [2]Unidad Academica Puerto Morelos, ICMyL - UNAM, Mexico.* Based on a simplified optical model of a coral and Monte Carlo simulations that employ the estimated optical properties of the media involded, we study the light environment in which the symbiotic algae are immersed.

3:45 p.m.–4:15 p.m. Coffee Break, Empire Hall
3:45 p.m.–4:15 p.m. Coffee Break, Hyatt Grand Ballroom G

Highland G

Frontiers in Optics

FTuS • High-Power Optics: State-of-the-Art II—Continued

FTuS5 • 3:30 p.m.
Three Techniques to Improve High Power Optics, *George Dubé[1], Arthur J. Braundmeier[2], Steve Chelli[3], J. Daniel Kelley[1], Anthony Webb[1], Roland Juhala[1]; [1]MetaStable Instruments, Inc., USA, [2]Southern Illinois Univ.-Edwardsville, USA, [3]Deposition Res. Lab, Inc., USA.* This paper describes recently developed techhiques for; (1) measuring very low absorption in certain thin film coatings, (2) reducing both thermal distortion and depolarization from a window and (3) laser cleaning polished window surfaces.

Highland H

Laser Science

LTuG • Quantum Optics II—Continued

LTuG5 • 3:30 p.m.
Experimental Demonstration of Continuous-Variable Entanglement of Phase-Locked Bright Beams, *Jietai Jing[1], Sheng Feng[2], Russell Bloomer[1], Olivier Pfister[1]; [1]Dept. of Physics, Univ. of Virginia, USA, [2]Ctr. for Photonic Communication and Computing, Northwestern Univ., USA.* We observed continuous-variable entanglement between two bright beams emitted above threshold by a phase-difference-locked ultrastable optical parametric oscillator. The squeezing about HWHM is -3 dB for amplitude-difference and -1.35 dB for phase-sum.

Highland J

LTuH • Ultracold Molecules III: New Approaches to Cold Molecules—Continued

LTuH4 • 3:30 p.m.
Rotationally-Resolved Depletion Spectroscopy of Ultracold KRb Molecules, *Dajun Wang[1], Court Ashbaugh[1], Jin-Tae Kim[1,2], Edward E. Eyler[1], Phillip L. Gould[1], William C. Stwalley[1]; [1]Univ. of Connecticut, USA, [2]Dept. of Photonic Engineering, Chosun Univ., Republic of Korea.* We report on the use of depletion spectroscopy to detect ultracold ground-state KRb molecules with rotational resolution. Binding energies of these molecules and possible intermediate rovibrational levels for Raman transfer are also explored.

LTuH5 • 3:45 p.m.
Ionization Potentials of KRb, Rb_2, and K_2 and Triplet Rydberg States of the Ultracold KRb Molecule, *Jin-Tae Kim[1,2], Dajun Wang[1], William C. Stwalley[1]; [1]Dept. of Physics, Univ. of Connecticut, USA, [2]Dept.of Photonic Engineering, Chosun Univ., Republic of Korea.* Ionization potentials of the alkali diatomic molecules KRb, Rb_2, and K_2 have been investigated and experimental methods for exploring triplet Rydberg states from the metastable $a^3\Sigma^+$ state of ultracold KRb molecules are proposed.

Highland K

LTuI • Spintronix and Quantum Information II—Continued

LTuI5 • 3:45 p.m.
Generation of Entangled Photon-States in a Quantum Dot, *Christoph F. Wildfeuer, Jonathan P. Dowling; Louisiana State Univ., USA.* A quantum dot in a microcavity is a promising device to generate entangled photon pairs. We show an efficient scheme to obtain entangled two-mode N-photon states based on a two-mode Jaynes-Cummings model.

Hyatt Grand Ballroom E/F

OF&T

Hyatt Regency Ballroom A/B

OPE

OPTuC • OLED Circuits, Solar Cells and Organic Memory—Continued

OPTuC5 • 3:30 p.m.
Generalized Model of Photopolymer Behavior for Use in Optimized Holographic Data Storage Scheduling Algorithms, *John V. Kelly, Michael R. Gleeson, Ciara E. Close, Feidhlim T. O'Neill, John T. Sheridan; Univ. College Dublin, Ireland.* A generalized model of photo-polymerization in free radical chainforming polymers has been developed. Applying this model to data storage, optimized scheduling algorithms are developed for the multiplexing of multiple data pages of uniform diffraction efficiency.

3:45 p.m.–4:15 p.m. Coffee Break, Empire Hall
3:45 p.m.–4:15 p.m. Coffee Break, Hyatt Grand Ballroom G

NOTES

4:15 p.m.–5:45 p.m.
OPTuD • OPE Poster Session

OPTuD1

Characterization of Long-Range Surface Plasmon-Polariton in Polymer-Metal Stripe Waveguides by Scanning Near-Field Optical Microscopy, *Ildar Salakhutdinov[1], Kristjan Leosson[2], Thomas Nikolajsen[3], Sergey I. Bozhevolnyi[4]; [1]Wayne State Univ., USA, [2]Science Inst., Univ. of Reykjavik, Iceland, [3]Crystal Fibre A/S, Denmark, [4]Dept. of Physics and Nanotechnology, Univ. Ålborg, Denmark.* The propagation of long-range surface plasmon polariton (LRSPP) guiding along thin gold stripes embedded in polymer cover layer up to 10µm by scanning near-field optical microscopy (SNOM) has been investigated.

OPTuD2

Nanomorphology Evolution of Poly[3-alkylthiophene] Based Polymer/Fullerene Bulk Heterojunction Solar Cells, *Harald Hoppe[1], Le Huong Nguyen[2], Tobias Erb[1], Serap Günes[2], Gerhard Gobsch[1], N. Serdar Sariciftci[2]; [1]Inst. of Physics; Dept. of Experimental Physics I; Technical Univ. Ilmenau, Germany, [2]Linz Inst. for Organic Solar Cells (LIOS), Physical Chemistry, Johannes Kepler Univ. Linz, Austria.* We report on nanomorphology evolution within different poly[3-alkylthiophene]/phenyl C61-butyric acid methyl ester (P3AT/PCBM) blends upon film formation and subsequent thermal annealing. A correlation between achievable solar cell performance and corresponding nanomorphology is drawn in conclusion.

OPTuD3

Deposition of PEDOT:PSS Films by IR Laser Vaporization, *Stephen L. Johnson[1], Richard F. Haglund[1], Hee Park[2]; [1]Vanderbilt Univ., USA, [2]AppliFlex LLC, USA.* Thin films of poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) have been grown by infrared laser vaporization (IR-LVD) at room temperature. The deposited films are continuous and exhibit structural and electrical properties comparable to spin cast films.

OPTuD4

3,4-Diphenylmaleimide Copolymers for Red Polymer Light-Emitting Diodes, *Li-Hsin Chan[1,2], Yu-Der Lee[2], Chin-Ti Chen[1]; [1]Inst. of Chemistry, Taiwan, [2]Dept. of Chemical Engineering, Natl. Tsing Hua Univ., Taiwan.* A series of newly designed 3,4-diphenylmaleimide-based π-conjugated copolymers that exhibit red fluorescence were synthesized and characterized. Bright and efficient red fluorescence was achieved by varying the structural combination of thiophene and/or fluorene with 3,4-diphenylmaleimide fluorophore.

OPTuD5

Photoalignment of Glassy-Nematic Oligofluorenes on Coumarin-Containing Polymer Films, *Anita Trajkovska, Chunki Kim, Kenneth Marshall, Shaw H. Chen; Univ. of Rochester, USA.* Orientation of a series of nematic oligofluorenes was investigated on coumarin-containing photoalignment films. Cross-over behavior in liquid crystal alignment was observed and interpreted with a kinetic model. The spectroscopic analyses revealed no evidence of photodegradation.

OPTuD6

Synthesis and Nonlinear Optical Properties of Fulleropyrrolidine Derivatives, *He-Ping Zeng; Inst. of Functional Molecular Faculty of Chemistry, South China Univ. of Technology, China.* We have synthesized a series of fulleropyrrolidines and investigated their third-order NLO. The measured value for **3** is the largest in these compounds (**1-11**).

OPTuD7

Progress Toward a Solution-Imidized, UV-Curable NLO-Pendent Model Compound, *Marvin L. Illingsworth, Joseph J. Peterson, Bradford P. Loesch, Robert M. Pasquarelli; Rochester Inst. of Technology, USA.* The goal of this research is to prepare a nonlinear optical polymer with extended useful life. Progress toward the preparation of a soluble, solution-imidized, UV-curable, NLO pendent model compound with be presented.

OPTuD8

Effects of Mechanical Polishing on Dot-Nickel Embedded Indium Tin Oxide Anodes of an Organic Light-Emitting Diode, *Ching-Ming Hsu, Yu-Sheng Chen, Wen-Tuan Wu; Southern Taiwan Univ. of Technology, Taiwan.* A lift-off method and mechanical polishing are employed to form a dot-nickel-embedded indium tin oxide anode for an organic light-emitting diode. A 10 sec polishing can improve nickel surface morphology and enhance the device characteristics.

OPTuD9

Development of an Interferometric Gas Sensor to Detect Organic Volatile Compounds, *Severino Muñoz-Aguirre, Carlos Martínez-Hipatl, Gilberto Camacho-Basilio, Juan Castillo-Mixcóatl, Georgina Beltrán-Pérez; Benemerita Univ. Autonoma de Puebla, Mexico.* The swelling of polysiloxane films provoked by their interaction with organic vapors causes an interference fringes shift. Such shift was used to detect ethanol (among other vapors) in a concentration range of 0-24,000 ppm.

OPTuD10

Blue Electroluminescent Copolymers Containing Fluorene and Flexible Segments, *Songting Tan, Zhuliang Yuan; College of Chemistry, Xiangtan Univ., China.* Syntheses and luminescent properites of two novel alternating copolymers containing fluorene and flexible segments was reported. PLED devices with the configuration as ITO/PEDOT/copolymer/Ca/Al emitted blue light with the EL maximum brightness of 1190 cd/m^2.

OPTuD11

Ellipsometric Analysis and Functionalization of a Photoinduced Chiral Material, *Hiroshi Sumimura[1], Takashi Fukuda[2,3], Jun Y. Kim[2], Daisuke Barada[1,2], Masahide Itoh[1], Toyohiko Yatagai[1,3]; [1]Inst. of Applied Physics, Univ. of Tsukuba, Japan, [2]Photonics Res. Inst., Natl. Inst. of Advanced Industrial Science and Technology, Japan, [3]Special Res. Project on Nanoscience, Univ. of Tsukuba, Japan.* Applying Invariant ellipticity states and Invariant azimuth states, we achieved an optimization of the condition for an incident probe light, which can optically functionalize photoinduced chiral materials. The theory and some experimental results are described.

OPTuD12

Comparison of Methods of Forming Dot-Nickel Embedded Indium Tin Oxide Anodes of an Organic Light-Emitting Diode, *Ching-Ming Hsu, Yu-Sheng Chen, Chung-Lin Tsai, Wen-Tuan Wu; Southern Taiwan Univ. of Technology, Taiwan.* Formation of a dot-nickel-embedded indium tin oxide anode using lift-off and planar polishing are compared. Results show planar polishing produces bump surface profiles of Ni/ITO anodes, leading to superior OLED device performances over lift-off method.

OPTuD13

Photo-Induced Refractive Index Change in Organic Single Crystal due to Excited State Intramolecular Proton Transfer, *Hwan Hong Lim[1], Myoungsik Cha[1], Sanghyuk Park[2], Soo Young Park[2]; [1]Pusan Natl. Univ., Republic of Korea, [2]Seoul Natl. Univ., Republic of Korea.* Photo-induced refractive index change was investigated in organic single crystals with excited-state intramolecular protontransfer molecules. The relaxation dynamics associated with the keto-enol transition could be monitored by pump-probe method.

OPTuD14

Factors Governing Crossover in Liquid Crystal Orientation on Photoalignment Films, *Chunki Kim, Anita Trajkovska, Jason U. Wallace, Shaw H. Chen; Univ. of Rochester, USA.* A new interpretation of liquid crystal orientation on photoalignment films was presented in terms of monomer conversion in the context of a kinetic model, thereby permitting an assessment of key factors governing the crossover behavior.

OPTuD15

The Approximate Model for Holographic Grating Formation in Photopolymers, *Ciara E. Close, Michael Gleeson, John Kelly, John Sheridan; Univ. College Dublin, Ireland.* Nonlocal Polymerisation Driven Diffusion model describes grating formation in photopolymer materials and gives valuable insight into the processes taking place during formation. For weak exposures, NPDD reduces to a simple approximate model describing polymer concentration.

OPTuD16

Cholesteric Liquid Crystal Laser Using an Oligofluorene for High Performance and Spectral Purity, *Ku-Hsien Wei[1], Ksenia Dolgaleva[2], Anita Trajkovska[1], Svetlana Lukishova[2], Robert W. Boyd[2], Shaw H. Chen[1]; [1]Chemical Engineering Dept., Univ. of Rochester, USA, [2]Inst. of Optics, Univ. of Rochester, USA.* We have compared laser behaviors of a cholesteric liquid crystal doped with DCM and a rod-like oligofluorene. The results indicate that the highly oriented oligofluorene dopant yields better lasing efficiency and lasing spectral purity.

OPTuD17

A Study of Variable Fiber-Polymer Optical Attenuator for Simple Frame, *Xiao-Kang Zhang, Xiao-Jing Ye; South China Univ. of Technology, China.* A fiber-polymer VOA design for simple frame was proposed. The theory and experiment demonstrated that the range of attenuations can reach about 30 dB if the temperature of device has a change of 5°C.

Highland A

Frontiers in Optics

4:15 p.m.–6:00 p.m.
FTuT • Diffractive Micro- and Nanostructures for Sensing and Information Processing II

Rafael Piestun; Univ. of Colorado, USA, Presider

FTuT1 • 4:15 p.m. Invited

From Diffractive Optics to Nano-Optics, *Hans Peter Herzig, Iwan Marki, Toralf Scharf; Univ. Neuchatel, Switzerland.* The progress in diffractive optics is driven by microfabrication. Recent research investigates structures with subwavelength and nanoscale dimensions. Photonic crystals are natural descendants of diffractive elements. Smaller are nanoparticles enabling the realization of new materials.

Highland B

Joint

4:15 p.m.–6:00 p.m.
JTuC • Atoms and Molecules in Laser Fields

Chunlei Guo; Inst. of Optics, Univ. of Rochester, USA, Presider

JTuC1 • 4:15 p.m. Invited

Observation of Intra-Molecular Vibrational Dynamics Using High-Harmonic Generation as a Probe, *Margaret Murnane, Henry C. Kapteyn, Nicholas L. Wagner, Andrea Wuest, Ivan P. Christov; Univ. of Colorado at Boulder, USA.* Intramolecular vibrational dynamics in SF_6 are observed, using electrons rescattered during the process of high-order harmonic generation. All of the Raman-active modes of SF_6 are observed, as well as vibrational relaxation.

Highland C

Frontiers in Optics

4:15 p.m.–6:00 p.m.
FTuU • Disordered Structures: Coherence, Localization and Lasing I

Mikhail Noginov; Norfolk State Univ., USA, Presider

FTuU1 • 4:15 p.m. Invited

Random Lasing, *Gregor Hackenbroich[1], Carlos Viviescas[2], Fritz Haake[3]; [1]SAP Res., SAP AG, Germany, [2]MPIPKS, Germany, [3]Univ. of Duisburg-Essen, Germany.* Random lasers with disordered active media have wave chaotic field modes with spectral overlaps. Their output displays fluctuations in excess of those of standard lasers. In particular, the number of lasing modes becomes random.

Highland D

4:15 p.m.–6:00 p.m.
FTuV • All-Optical Signal Processing Techniques

Jay Wiesenfeld; Bell Labs, Lucent Technologies, USA, Presider

FTuV1 • 4:15 p.m. Tutorial

All-Optical Processing of Novel Modulation Formats Using Semiconductor Optical Amplifiers, *Wolfgang Freude, Juerg Leuthold, Philipp Vorreau, Andrej Marculescu, Jin Wang, Gunnar Böttger; Univ. of Karlsruhe, Germany.* Transmission formats for next generation systems encode data in the phase and in the amplitude of an optical carrier using a binary or M-ary scheme. Highly nonlinear fast semiconductor optical amplifiers process these signals all-optically.

Wolfgang Freude received the diploma and Ph.D. degrees in electrical engineering from the University of Karlsruhe for works related to microwave oscillator noise. Currently, he is Professor at the Institute of High-Frequency and Quantum Electronics, University of Karlsruhe. His present research activities are in optical communication systems, in the design and fabrication of high-density integrated-optics devices, and in photonic crystals. He has published more than 90 papers in refereed journals and international conferences, co-authored a book on *Optical Communications*, and authored and co-authored two book chapters on

Highland E

4:15 p.m.–6:00 p.m.
FTuW • Microscopy and Optical Trapping

Chris Schaffer; Univ. of California at San Diego, USA, Presider

FTuW1 • 4:15 p.m.

Color Video Imaging with a Scanning Fiber Endoscope, *Richard S. Johnston, Eric J. Seibel; Univ. of Washington, USA.* Scanning fiber endoscope (SFE) devices have been reported that produce high resolution images within a thin, flexible package required for minimally invasive medical procedures. Current SFE prototypes are capable of *in-vivo* color video imaging.

FTuW2 • 4:30 p.m.

4Pi Spectral Self-Interference Fluorescence Microscopy, *Mehmet Dogan, Bennett B. Goldberg, Anna K. Swan, M. Selim Unlu; Boston Univ., USA.* Spectral Self-interference Fluorescence Microscopy using two opposing high numerical aperture objectives is proposed to precisely measure the axial position of fluorescent emitters. 5 nm change in the position of monolayer of fluorescent emitters was measured.

Highland F

4:15 p.m.–6:00 p.m.
FTuX • Quantum Optics in Micro- and Nanostructures I

Prem Kumar; Northwestern Univ., USA, Presider

FTuX1 • 4:15 p.m. Invited

Microphotonic Technologies for Chip-Scale Cavity QED, *Oskar Painter; Caltech, USA.* No abstract available.

Highland G

Frontiers in Optics

4:15 p.m.–6:00 p.m.
FTuY • General Optical Design and Instrumentation I
Virendra Mahajan; Aerospace Corp, USA, Presider

FTuY1 • 4:15 p.m.
Polarization-Holographic Element for Complete Analysis of Light, *Barbara N. Kilosanidze, George A. Kakauridze; Inst. of Cybernetics, Georgia.* Polarization-Holographic Element on the basis of diffraction gratings with different profile of anisotropy for complete analysis of light, namely definition of all parameters of polarization ellipse is described.

FTuY2 • 4:30 p.m.
Polarimetric Imaging of Retinal Arteries and Veins in Diabetic Retinopathy, *Benno L. Petrig[1], Ann E. Elsner[1], Dean A. VanNasdale[1], Bryan P. Haggerty[1], Brian Hansel[1], Masahiro Miura[2], Anke Weber[3]; [1]Indiana Univ. School of Optometry, USA, [2]Tokyo Medical Univ., Japan, [3]Univ. Hospital, Germany.* The arteries and veins in retinas of patients with diabetic retinopathy were readily imaged using near infrared light. For larger vessels, Michaelson contrasts were significantly higher for depolarized light images than reflectance images.

Laser Science

Highland H

4:15 p.m.–6:15 p.m.
LTuJ • Light Propagation in Atomic Ensembles
George Welch; Texas A & M Univ., USA, Presider

LTuJ1 • 4:15 p.m. Invited
Large Group Delays and Long Storage Times for Optical Pulses in Atomic Vapor Cells, *Irina Novikova, David F. Phillips, Ronald L. Walsworth; Harvard Smithsonian Ctr. for Astrophysics, USA.* We achieved large fractional delays in slow and stored light in atomic vapors using temporally shaped control fields. Combined with amplification, temporal control allows for pulse transmission with pulse bandwidth preservation and minimal distortion.

Highland J

4:15 p.m.–6:15 p.m.
LTuK • Novel Cooling and Trapping Techniques
Georg Raithel; Univ. of Michigan, USA, Presider

LTuK1 • 4:15 p.m. Invited
Coherent Atoms in a Storage Ring, *Dan Stamper-Kurn; Univ. of California at Berkeley, USA.* Bose condensates were loaded into and guided within a millimeter-scale magnetic storage ring. I will discuss observations of betatron resonances and dispersion management, measurements of the quantum state of propagating atomic beams, and future prospects.

Highland K

4:15 p.m.–6:30 p.m.
LTuL • Carbon Nanotube Spectroscopy II
Tony Heinz; Columbia Univ., USA, Presider

LTuL1 • 4:15 p.m. Invited
Excited States and Electroluminescence of Carbon Nanotubes, *Phaedon Avouris; IBM, USA.* I will discuss the electronic structure, nature of the excited states and optical properties of carbon nanotubes. Single nanotube electrically-excited light emitters and photodetectors and the mechanism of their operation will be presented.

Hyatt Grand Ballroom E/F

OF&T

4:15 p.m.–6:00 p.m.
OFTuD • Grinding and Polishing
Stephen D. Jacobs; Univ. of Rochester, USA, Presider

OFTuD1 • 4:15 p.m. Invited
Effect of Rogue Particles on the Sub-Surface Damage of Fused Silica during Grinding/Polishing, *Tayyab Suratwala, R. Steele, M. D. Feit, L. Wong, P. Miller, J. Menapace, P. Davis; Lawrence Livermore Natl. Lab, USA.* The sub-surface damage formed during the grinding/polishing of silica glass with rogue particle additions to the slurry has been characterized. The damage depth was found to increase with even small amounts of rogue particle additions.

NOTES

NOTES

Tuesday, October 10

Highland A

Frontiers in Optics

FTuT • Diffractive Micro- and Nanostructures for Sensing and Information Processing II—Continued

FTuT2 • 4:45 p.m.
Beam Propagation Design of Diffractive Element for Linearizing Sinusoidal Scanning: Experimental Verification, *Bahareh Haji-saeed[1], Sandip K. Sengupta[1], Jed Khoury[2], Charles L. Woods[2], William Bailey[3], John Kierstead[3]; [1]Electrical and Computer Engineering Dept., Univ. of Massachusetts at Lowell, USA, [2]AFRL / SNHC, Hanscom Air Force Base, USA, [3]Solid State Scientific Corp., USA.* This paper demonstrates the design, fabrication and testing of a diffractive element that converts the sinusoidal into linear scanning. The design approach is based on the beam propagation in inhomogeneous media.

FTuT3 • 5:00 p.m.
Nanophotonics Based Matched Spectroscopy, *Markus E. Testorf; Dartmouth College, USA.* Enhanced spectroscopy based on resonant nanophotonic structures is investigated. The concept of matched spectroscopy is exploited to improve the performance of passive spectroscopic devices for identifying optical signals with a characteristic discrete line spectrum.

Highland B

Joint

JTuC • Atoms and Molecules in Laser Fields—Continued

JTuC2 • 4:45 p.m. Invited
New Applications of Intense Femtosecond Laser Filamentation: Efficient Generation of Tunable Few Cycle Pulses and Remote Sensing of Chem-Bio Agents, *See Leang Chin[1], Francis Théberge[1], Huailiang Xu[1], Qi Luo[1], Weiwei Liu[1], S. Abbas Hosseini[1], Mehdi Sharifi[1], Jean-François Daigle[1], Neset Akozbek[2], Andreas Becker[3], Gilles Roy[4], Pierre Mathieu[4]; [1]Univ. Laval, Canada, [2]Time Domain Corp., USA, [3]Max Planck Inst. for the Physics of Complex Systems, Germany, [4]Defence Res. and Development Canada-Valcartier, Canada.* Inside a 800nm fs laser filament in air: 1) tunable few cycle visible pulses ($M^2<1.01$) are generated; 2) fingerprint fluorescence of chem.-bio agents are remotely detected using a LIDAR.

Highland C

Frontiers in Optics

FTuU • Disordered Structures: Coherence, Localization and Lasing I—Continued

FTuU2 • 4:45 p.m.
A Simple Criterion for Improving the Impedance Matching in Photonic Crystal Waveguides, *Javad Zarbakhsh[1], Abbas Mohtashami[1], Lasha Tkeshelashvili[2], Kurt Hingerl[1], Kurt Busch[2]; [1]Inst. für Halbleiter und Festkörperphysik, Austria, [2]Inst. für theoretische Festkörperphysik, Germany.* By employing certain degrees of geometrical freedom, we demonstrate how to keep the group-velocity constant along the non-uniform photonic crystal structures. Moreover, we show how this may improve impedance matching between different photonic devices.

FTuU3 • 5:00 p.m.
Infrared Filters Based on Photomodification of Semicontinuous Metal Films, *Piotr Nyga, Mark D. Thoreson, Vashista de Silva, Hsiao-Kuan Yuan, Vladimir P. Drachev, Vladimir M. Shalaev; Purdue Univ., USA.* Broadband infrared long-pass filters were fabricated using semicontinuous silver films and subsequent photomodification with a pulsed CO_2 laser operating at 10.6μm. This technique allows the creation of filters for wavelengths in the visible to mid-IR.

Highland D

FTuV • All-Optical Signal Processing Techniques—Continued

Multimode Fibres and *Microwave Modelling of Photonic Crystals.* He is an honorary doctor of the Kharkov National University of Radioelectronics, Kharkov, Ukraine. Presently, he is serving as a Vice Chair of the IEEE German LEOS Chapter.

FTuV2 • 5:00 p.m.
Single-Photon All-Optical Switching by Use of Coupled Microring Resonators, *Wenge Yang[1], Holger Schmidt[1], Amitabh Joshi[2], Min Xiao[2]; [1]Univ. of California at Santa Cruz, USA, [2]Univ. of Arkansas, USA.* We demonstrate exponential reduction of optical switching threshold in a Mach-Zehnder interferometer by using coupled microring resonators. With only few microring resonators, the switching power can reach attowatt level - ideal for single-photon all-optical devices.

Highland E

FTuW • Microscopy and Optical Trapping—Continued

FTuW3 • 4:45 p.m.
Off Axis Fresnel Zone Plates for White Light 3D Microscopy, *Ruby Raheem[1], K. C. A. Raheem[2], Alistair Elfick[1]; [1]Univ. of Edinburgh, UK, [2]Retired Fellow, Indian Inst. of Astrophysics, India.* Paraxial thin lens ray model of white light imaging using Fresnel zone plates indicates that axial chromatic aberrations can be reduced and off-axis zone plates can be designed for high-speed 3D microscopy applications.

FTuW4 • 5:00 p.m.
2-Dimensional Optical Trap and Lattices Generated by DMD—ALP, *Seungrag Lee, Youngjae Won, Junki Kim, K. Oh; Gwangju Inst. of Science and Technology, Republic of Korea.* We propose a new optical trap lattices, and optical trapping using digital-micromirror-device (DMD) along with accessory-light-modulator-package (ALP). The proposed device provides flexible digital control of trap intensity profile, array dimension, and steering within optical lattices.

Highland F

FTuX • Quantum Optics in Micro- and Nanostructures I—Continued

FTuX2 • 4:45 p.m.
Spontaneous Emission in Multiple Coupled Resonators, *David P. Fussell, Marc M. Dignam; Queen's Univ., Canada.* We demonstrate that spontaneous emission in an arbitrary system of multiple coupled resonators can be accurately modeled by calculating the Green tensor using a tight-binding approach, greatly simplifying the treatment of large, complicated structures.

FTuX3 • 5:00 p.m.
Probing the Mesoscopic Environment of a Single Electron Spin: Long Coherence Times Enabled by Quantum Backaction, *M V Gurudev Dutt[1], Lilian Childress[1], Jacob M. Taylor[1], Mikhail D. Lukin[1], Philip R. Hemmer[2], Fedor Jelezko[3]; [1]Harvard Univ., USA, [2]Dept. of Electrical and Computer Engineering, Texas A&M Univ., USA, [3]3. Physikalisches Inst., Germany.* We demonstrate how spin-echo spectroscopy on a single electron solid-state quantum bit can be used to experimentally characterize its local environment.

Highland G

Frontiers in Optics

FTuY • General Optical Design and Instrumentation I—Continued

FTuY3 • 4:45 p.m.
A Sensorless Adaptive Optics Scanning Laser Ophthalmoscope for Mice, *David P. Biss[1], Robert H. Webb[1], Yaopeng Zhou[2], Thomas G. Bifano[3], Charles Lin[4]; [1]Schepens Eye Res. Inst., USA, [2]Dept. of Aerospace and Mechanical Engineering, Boston Univ., USA, [3]Dept. of Manufacturing Engineering, Boston Univ., USA, [4]Wellman Ctr. for Photomedicine, Massachusetts General Hospital, USA.* Wavefront correction in ophthalmology is achieved with the use of wavefront sensor. We explore the use of image data to correct for aberrations introduced by the mouse eye in an adaptive optics scanning laser ophthalmoscope.

FTuY4 • 5:00 p.m.
Systematic Phase Retrieval Error due to Signal Bias, *Samuel T. Thurman, James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* Signal bias in measured PSFs can cause systematic errors in the retrieved phase for the generalized pupil function of an optical system. We discuss the nature of these errors and compensation methods.

Laser Science

Highland H

LTuJ • Light Propagation in Atomic Ensembles—Continued

LTuJ2 • 4:45 p.m. Invited
Quantum Control of Single Photons, *Mikhail Lukin; Harvard Univ., USA.* No abstract available.

Highland J

LTuK • Novel Cooling and Trapping Techniques—Continued

LTuK2 • 4:45 p.m. Invited
Precision Measurement Based on Ultracold Atoms and Cold Molecules, *Jun Ye, S. Blatt, M. M. Boyd, S. M. Foreman, E. R. Hudson, T. Ido, B. Lev, A. D. Ludlow, B. C. Sawyer, T. Zelevinsky; JILA/Univ. of Colorado, USA.* We report our group's recent research efforts on precision test of fundamental physics using ultracold atoms and cold molecules.

Highland K

LTuL • Carbon Nanotube Spectroscopy II—Continued

LTuL2 • 4:45 p.m.
Probing the Mechanical Properties of Individual Single-Walled Carbon Nanotubes, *Yang Wu, Feng Wang, Mingyuan Huang, Henry X. M. Huang, Limin Huang, Hugen Yan, Stephen O'Brien, James Hone, Tony F. Heinz; Columbia Univ., USA.* The physical displacement of individual single-walled carbon nanotubes is measured by Rayleigh light scattering. Each nanotube's Young's modulus is determined by an applied Lorentz force.

LTuL3 • 5:00 p.m.
Single Wall Carbon Nanotube Aerogels, *Mateusz B. Bryning[1], Dan M. Milkie[1], Mohammad F. Islam[2], Lawrence A. Hough[3], James M. Kikkawa[1], Arjun G. Yodh[1]; [1]Univ. of Pennsylvania, USA, [2]Carnegie Mellon Univ., USA, [3]Rhodia, USA.* Novel aerogels made from single wall carbon nanotubes were created by freeze drying and critical point drying of aqueous SWNT suspensions. The electrical and physical properties of the aerogels are explored.

Hyatt Grand Ballroom E/F

OF&T

OFTuD • Grinding and Polishing—Continued

OFTuD2 • 4:45 p.m. Invited
Mechanics of Full Aperture Polishing Tools for Aspheres, *John Lambropoulos; Univ. of Rochester, USA.* We discuss issues related to mechanical optimization of full aperture polishing tools. We propose an approximate optimization of the tool/work contact pressure for given work surface profile (or error to be removed).

NOTES

Highland A

Frontiers in Optics

FTuT • Diffractive Micro- and Nanostructures for Sensing and Information Processing II—Continued

FTuT4 • 5:15 p.m.
Control of Emitted Fields from Apertureless NSOM Probes through Structuring of Metal Coating Layer, *Wataru Nakagawa*[1], *Luciana Vaccaro*[1], *Hans Peter Herzig*[1], *Christian Hafner*[2]; [1]*Inst. of Microtechnology, Switzerland,* [2]*Swiss Federal Inst. of Technology Zürich (ETHZ), Switzerland.* We investigate polarization mode conversion due to metal-layer structuring in apertureless microfabricated near-field scanning optical microscopy (NSOM) probes using rigorous modeling techniques in order to enhance the emitted optical near-field characteristics.

FTuT5 • 5:30 p.m.
Characterization of Silicon Micro-Optic Structures with a Near-Infrared Near-Field Scanning Optical Microscope, *Webin Chen, Lirong Sun, Andrew Sarangan, Qiwen Zhan; Electro-Optics Graduate Program, Univ. of Dayton, USA.* We report the instrumentation of a near-infrared near-field scanning optical microscope (NSOM). This NSOM is applied for the characterization of a simple yet novel silicon micro-optic device.

Highland B

Joint

JTuC • Atoms and Molecules in Laser Fields—Continued

JTuC3 • 5:15 p.m.
Self-Guiding of the Laser in High Harmonic Generation, *John C. Painter, Nichole Brimhall, Gavin Giraud, Nathan Powers, Matthew Turner, Michael Ware, Justin B. Peatross; Dept. of Physics and Astronomy, Brigham Young Univ., USA.* We measure the spatial evolution of a laser pulse used to generate high harmonics in a helium-filled cell. Best phase matching occurs in the region between double foci, associated with laser filamentation.

JTuC4 • 5:30 p.m. Invited
Attosecond Double-Slit Experiment, *Garhard Paulus; Texas A&M Univ., USA.* Taking advantage of the unique properties of phase-controlled few-cycle pulses, a close analogue of the double-slit scheme has been realized in the time domain. The briefness of the temporal slits suggest applications in attosecond physics.

Highland C

Frontiers in Optics

FTuU • Disordered Structures: Coherence, Localization and Lasing I—Continued

FTuU4 • 5:15 p.m.
Experimental Evidence of X-Shaped Spatiotemporal Coherence of Superfluorescence Radiation, *Ottavia Jedrkiewicz*[1], *Matteo Clerici*[1], *Daniele Faccio*[1], *Antonio Picozzi*[2], *Paolo Di Trapani*[3]; [1]*Dept. of Physics and Mathematics, Univ. of Insubria, Italy,* [2]*Lab de Physique de l'Univ. de Bourgogne, France,* [3]*Dept. of Quantum Electronics, Vilnius Univ., Lithuania.* Considering the parametric generation process in a quadratic nonlinear crystal, we report the experimental observation of optical waves characterized by a X-shaped spatiotemporal coherence, i.e. a coherence skewed along spatiotemporal trajectories.

FTuU5 • 5:30 p.m.
Invariance and Non-Invariance of the Spectra of Stochastic Electromagnetic Beams on Propagation, *Olga Korotkova*[1], *Jixiong Pu*[2], *Emil Wolf*[1,3,4]; [1]*Dept. of Physics and Astronomy, Univ. of Rochester, USA,* [2]*Dept. of Physics, Huaqiao Univ., China,* [3]*College of Optics, CREOL and FPCE, Univ. of Central Florida, USA,* [4]*Inst. of Optics, Univ. of Rochester, USA.* A generalization from random scalar fields to random electromagnetic fields is obtained, of the phenomenon of correlation-induced spectral changes generating, for example, spectral shifts. An electromagnetic version of the scaling law is also obtained.

Highland D

Frontiers in Optics

FTuV • All-Optical Signal Processing Techniques—Continued

FTuV3 • 5:15 p.m.
High Speed 2x2 GaAs-GaAlAs Electro-Optic Switches Based on Multi-Mode Interference Couplers, *Shaochun Cao, Julian Noad, Liping Sun, Robert James, David Coulas, Glendon Lovell, Erle Higgins; Communications Res. Ctr. Canada, Canada.* We have designed and fabricated 2x2 GaAs-GaAlAs electro-optic switches using multi-mode interference couplers. Prototype switches have demonstrated almost the same insertion-loss as straight waveguides, typically 0.3dB/cm, and small channel-to-channel cross-talk better than - 22dB.

FTuV4 • 5:30 p.m. Invited
Hybrid Integrated SOA-Based Devices for Optical Signal Processing, *Alistair Poustie; Ctr. for Integrated Photonics, UK.* Recent advances in photonic hybrid integration technology have realised high-performance optical signal processing modules based on SOAs. I describe the hybrid technology platform and exciting applications of these modules in high-speed optical regeneration and logic.

Highland E

Frontiers in Optics

FTuW • Microscopy and Optical Trapping—Continued

FTuW5 • 5:15 p.m.
3D Drag-and-Drop Multi-Beam Particle Manipulation, *Jesper Glückstad, Peter J. Rodrigo, Ivan P. Nielsen; Risø Natl. Lab, Denmark.* A fully user-interactive 3D drag-and-drop optical manipulation system is presented. Materials-scientist or biologists can directly interact and observe a 3D microscopic world consisting of a plurality of dividing cells, particles or micro-fabricated structures with nano-features.

FTuW6 • 5:30 p.m.
Characterization of Sub-10-fs Pulses for Nonlinear Optical Microscopy, *Adam M. Larson, Alvin T. Yeh; Texas A&M Univ., USA.* Dispersion-compensation within a custom nonlinear optical microscope is achieved using chirped mirrors. Characterization of sub-10-fs pulses is achieved by interferometric autocorrelation in mouse tail tendon and simultaneous two-photon excited fluorescence of common fluorescent dyes.

Highland F

Frontiers in Optics

FTuX • Quantum Optics in Micro- and Nanostructures I—Continued

FTuX4 • 5:15 p.m. Invited
Cavity QED with Nanocrystals and Silica Microresonators, *Hailin Wang, Young-Shin Park, Andrew K. Cook; Univ. of Oregon, USA.* We report recent progress on achieving strong-coupling in a cavity QED system, in which nitrogen vacancy centers in diamond nanocrystals are coupled to whispering gallery modes in a silica microsphere.

Highland G

Frontiers in Optics

FTuY • General Optical Design and Instrumentation I—Continued

FTuY5 • 5:15 p.m.
Vortex Structure Induced by m-Fold Symmetric Stress Birefringence, *Alexis K. Spilman, Thomas G. Brown; Inst. of Optics, Univ. of Rochester, USA.* Symmetric stress gradients produce intriguing space-variant birefringence patterns in circular windows. When illuminated with circularly polarized light, vortices appear in equally spaced rings. We describe the implementation of these vortices and their use in imaging.

FTuY6 • 5:30 p.m.
Sub-Wavelength Grating Induced Wavefront Aberrations: A Case Study, *Karlton Crabtree, Russell A. Chipman; College of Optical Sciences, USA.* The on-axis polarization aberration function of a one-dimensional sub-wavelength grating anti-reflection coating on a f/1.7 lens surface is analyzed. 0.02 waves of astigmatism are induced and the retardance aberration (astigmatism+defocus) is less than 0.02 waves.

Highland H

Laser Science

LTuJ • Light Propagation in Atomic Ensembles—Continued

LTuJ3 • 5:15 p.m.
Why Do Coherent Population Oscillations (CPOs) Lead to Slow Light When the Laser Linewidth Exceeds the Width of the CPO Transparency Window? *Giovanni Piredda, Robert W. Boyd; Inst. of Optics, USA.* We derive coherent population oscillations (CPO) from the rate equations, showing that it is possible to slow down light using CPO even if the laser linewidth exceeds the width of the CPO transparency window.

LTuJ4 • 5:30 p.m.
Slow-Light Based Control of Interferometer Sensitivity, *Selim M. Shahriar, Gour Pati, Mary Messall, Kenneth Salit; Northwestern Univ., USA.* A slow-light medium placed inside any interferometer can be used to reduce drastically its sensitivity. This can enhance the dynamic range of the interferometer, as well as increase the robustness of a servo system.

Highland J

LTuK • Novel Cooling and Trapping Techniques—Continued

LTuK3 • 5:15 p.m.
Evanescent Field Atom Optics Using Micro-Tapered Fibres, *Sile Nic Chormaic[1,2], Michael Morrissey[1,2], Kieran Deasy[1,2], Thejesh Bandi Nagabhushan[1,2], Jonathan Ward[1,2], Brian Shortt[1,2]; [1]Cork Inst. of Technology, Ireland, [2]Tyndall Natl. Inst., Ireland.* We present initial results obtained using an evanescent field of a tapered optical fibre for trapping and guiding cold, neutral atoms. Losses through the fibre are monitored in order to detect atom-light coupling.

LTuK4 • 5:30 p.m.
Monolithically Integrated Atomic Vapor Cell for Quantum Optics on a Chip, *Wenge Yang[1], Dongliang Yin[1], Bin Wu[1], Holger Schmidt[1], Donald B. Conkey[2], Evan J. Lunt[2], Aaron R. Hawkins[2]; [1]Univ. of California at Santa Cruz, USA, [2]Brigham Young Univ., USA.* We report the first monolithically integrated rubidium vapor cell on a chip. Hollow-core ARROW waveguides are used to create cell volumes of 500 picoliters and mode areas of 30µm^2 - ideal for low-level nonlinear optics.

Highland K

LTuL • Carbon Nanotube Spectroscopy II—Continued

LTuL4 • 5:15 p.m. Invited
Exciton Dynamics in Bundled and Unbundled (6,5) Carbon Nanotubes, *Tobias Hertel; Vanderbilt Univ., USA.* We present a pump-probe study of exciton dynamics in semiconducting (6,5) single-wall carbon nanotubes (SWNTs). Optical transients from individual tubes and small bundles (n<8) shed new light onto the dynamics of singlet and triplet excitons.

Hyatt Grand Ballroom E/F

OF&T

OFTuD • Grinding and Polishing—Continued

OFTuD3 • 5:15 p.m.
Finishing of Optical Materials with Bound and Loose Abrasives Utilizing the Ultraform 5-Axis Computer Controlled System, *David E. Mohring[1], Michael Bechtold[1], Ed Fess[2]; [1]OptiPro Systems, USA, [2]Univ. of Rochester, USA.* Finishing using bound and loose abrasives, requires consistent static environmental conditions and deterministic control over the dynamic variables. Experimental analysis of these variables is used to determine their influence on resultant surface form and finish.

OFTuD4 • 5:30 p.m. Invited
Recent Nano-Precision Ductile Machining Technology for Advanced Optical Applications, *Jiwang Yan, Tsunemoto Kuriyagawa; Tohoku Univ., Japan.* Recent research and development work in the ductile machining technology for semiconductors and crystalline materials is reviewed. The latest applications of ductile machining to the fabrication of infrared optical elements and semiconductor substrates are introduced.

NOTES

Highland A

Frontiers in Optics

FTuT • Diffractive Micro- and Nanostructures for Sensing and Information Processing II—Continued

FTuT6 • 5:45 p.m.
Range Measurements through Turbulent Atmosphere Based on Laguerre Gaussian Modes, *Markus E. Testorf*[1], *Canh Ly*[2], *Joseph N. Mait*[2]; [1]*Dartmouth College, USA,* [2]*ARL, USA.* Coherent superpositions of Laguerre-Gaussian beams are used for range measurements. The impact of atmospheric turbulence is investigated. A scheme is introduced to synthesize beams which are robust against a specified class of perturbations.

Highland B

Joint

Highland C

Frontiers in Optics

FTuU • Disordered Structures: Coherence, Localization and Lasing I—Continued

FTuU6 • 5:45 p.m.
Near-Field Characterization of Effective Optical Interfaces, *Adela Apostol, David Haefner, Aristide Dogariu; College of Optics and Photonics, USA.* The properties of heterogeneous media depend on both surface roughness and local variations of the permeability. Using approaches of near-field optics, the two influences are decoupled and a quantitative assessment of their contributions is obtained.

Highland D

Highland E

FTuW • Microscopy and Optical Trapping—Continued

FTuW7 • 5:45 p.m.
Optical Tweezers: Test of Absolute Calibration, *Nathan B. Viana*[1], *Alexander Mazolli*[1], *Paulo Américo M. Neto*[1], *Herch M. Nussenzveig*[1], *Marcio S. Rocha*[2], *Oscar N. Mesquita*[2]; [1]*UFRJ, Brazil,* [2]*UFMG, Brazil.* A first-principles theory of trapping forces of optical tweezers with no adjustable parameters is experimentally tested. We find generally very good agreement for transverse stiffness, trapping threshold, peak position, sample depth variation and other effects

Highland F

FTuX • Quantum Optics in Micro- and Nanostructures I—Continued

FTuX5 • 5:45 p.m.
Probing Fermi Degeneracy in Neutral Atomic ^{40}K on an Atom Chip, *Marcius H. T. Extavour, Seth Aubin, Lindsay J. LeBlanc, Stefan Myrskog, Thorsten Schumm, David McKay, Barbara Cieslak, A. Stummer, Joseph H. Thywissen; Dept. of Physics, Univ. of Toronto, Canada.* We present recent results on achieving a degenerate Fermi gas (DFG) of neutral ^{40}K via rapid ^{87}Rb sympathetic cooling on an atom chip. We outline current work on interference and density-density correlation measurements in DFGs.

5:45 p.m.–6:30 p.m. OPTuE • OPE Postdeadline Papers, Hyatt Regency Ballroom A/B

6:00 p.m.–7:00 p.m. Division of Laser Science Annual Business Meeting, Highland B

7:00 p.m.–9:00 p.m. LS Banquet, Hyatt Grand Ballroom D

Highland G

Frontiers in Optics

FTuY • General Optical Design and Instrumentation I—Continued

FTuY7 • 5:45 p.m.
New Developments at NASA's Instrument Synthesis and Analysis Laboratory, *Howard J. Wood, Ellen L. Herring, Tammy L. Brown; NASA Goddard Space Flight Ctr., USA.* NASA's Instrument Synthesis & Analysis Laboratory (ISAL) has developed methods to provide an instrument study in one week's engineering time. The final product is recorded oral presentations, models and analyses which underlie the models.

Highland H

Laser Science

LTuJ • Light Propagation in Atomic Ensembles—Continued

LTuJ5 • 5:45 p.m.
Competition between Electromagnetically Induced Transparency and Raman Processes, *Tarak N. Dey[1], G. S. Agarwal[1], D. J. Gauthier[2]; [1]Oklahoma State Univ., USA, [2]Dept. of Physics, Duke Univ., USA.* We discuss the competition between electromagnetically induced transparency and Raman processes in a Λ system due to the cross talk among optical transitions. We compare theory with recent experimental work of Harada et al.

LTuJ6 • 6:00 p.m.
Phase-Dependent Nonlinear Optics in Resonant Atomic Systems, *Sarah Kajari-Schroeder[1], Giovanna Morigi[2], Sonja Franke-Arnold[3], Gian-Luca Oppo[4]; [1]Abteilung Quantenphysik, Univ. of Ulm, Germany, [2]Grup d'Optica, Dept. de Fisica, Univ. Autonoma de Barcelona, Spain, [3]Dept. of Physics and Astronomy, UK, [4]Dept. of Physics, Univ. of Strathclyde, UK.* Light fields propagating in atomic media with diamond level configuration exhibit two metastable behaviors of their relative phase. These behaviours are associated with separate types of atomic coherence and minimize dissipation.

Highland J

LTuK • Novel Cooling and Trapping Techniques—Continued

LTuK5 • 5:45 p.m.
Generation of a Spatial Superposition of a Single Atom Using a Multi-Trap System, *Sile Nic Chormaic[1,2], Thomas Busch[3], Kieran Deasy[1,2], Yueping Niu[4], Shangqing Gong[4], Shiqi Jin[4]; [1]Cork Inst. of Technology, Ireland, [2]Tyndall Natl. Inst., Ireland, [3]Univ. College Cork, Ireland, [4]Shanghai Inst. of Optics and Fine Mechanics, China.* We present an atom optics analogue to the generation of a superposition of atomic states using a STIRAP type process with a twofold final state. We show that two orthogonal superposition states can be created.

LTuK6 • 6:00 p.m.
Time Dependent Light Dynamics in Ultracold Atomic ^{87}Rb, *Salim Balik[1], Oguz Er[1], C. I. Sukenik[1], M. D. Havey[1,2], V. Datsyuk[2], I. M. Sokolov[2], D. V. Kupriyanov[2]; [1]Old Dominion Univ., USA, [2]State Polytechnic Univ., Russian Federation.* Proximity of the light localization threshold can be detected through time evolution of forward or diffusely scattered light. We report experimental and theoretical results of time-dependent light scattering (F=1 - F'=0) in dense, ultracold ^{87}Rb.

Highland K

LTuL • Carbon Nanotube Spectroscopy II—Continued

LTuL5 • 5:45 p.m. Invited
Single Carbon Nanotube Photonics and the Role of Excitons, *Todd Krauss, Libai Huang, Zhenjia Wang, Lewis Rothberg; Univ. of Rochester, USA.* Ultrafast optical measurements determined that Auger recombination in isolated single-walled carbon nanotubes (SWNTs) involves excitons and not free electrons, while Raman spectra of SWNTs under electrochemical bias allows for a determination of exciton binding energies.

LTuL6 • 6:15 p.m.
Probing Interactions between Individual Carbon Nanotubes by Rayleigh Scattering Spectroscopy, *Feng Wang, Matthew Y. Sfeir, Limin Huang, Henry X. M. Huang, Yang Wu, Jaehee Kim, James Hone, Stephen O'Brien, Louis E. Brus, Tony F. Heinz; Columbia Univ., USA.* Optical transitions of individual single-walled carbon nanotubes are measured in their isolated and bundled forms. The observed inter-tube coupling effects attributed to dielectric screening.

Hyatt Grand Ballroom E/F

OF&T

NOTES

5:45 p.m.–6:30 p.m. OPTuE • OPE Postdeadline Papers, Hyatt Regency Ballroom A/B

6:00 p.m.–7:00 p.m. Division of Laser Science Annual Business Meeting, Highland B

7:00 p.m.–9:00 p.m. LS Banquet, Hyatt Grand Ballroom D

Highland A

Joint

8:00 a.m.–9:45 a.m.
JWA • Attosecond Laser Science I

Barry C. Walker; Univ. of Delaware, USA, Presider

JWA1 • 8:00 a.m. Tutorial

The Physics of Attosecond Pulses: Generation, Characterization and Attosecond Science, *Lou DiMauro; Ohio State Univ., USA.* The genesis of attosecond pulses signifies a new frontier in time-domain science providing light bursts equivalent to the electronic timescale. This tutorial will examine the fundamental principles, recent advances and challenges from these sources.

Louis DiMauro is Professor of Physics and holds the Edward and Sylvia Hagenlocker Chair at The Ohio State University. He received his Ph.D. from the University of Connecticut in 1980. He is a fellow of the OSA, APS and AAAS and recipient of the 2004 Brookhaven Science and Technology award. His general interests are in experimental atomic, chemical, and ultrafast optical physics.

Highland B

Frontiers in Optics

8:00 a.m.–9:45 a.m.
FWA • High-Power and Fiber Amplifiers

Shu Namiki; Furukawa Elect. Co. Ltd., Japan., Presider

FWA1 • 8:00 a.m.

EDFA Gain Clamping with a Self-Tuning All-Optical Feedback Loop, *Hao Li, Ying Zhang, Shaw Wei Kok, Yeng Chai Soh; Singapore Inst. of Manufacturing Technology, Singapore.* Using automatic control theory, this paper presents a scheme of using a self-tuning all-optical feedback loop to clamp the gain of erbium-doped fiber amplifiers while the relaxation oscillation in gain clamping is reduced as specified.

FWA2 • 8:15 a.m.

Gain Controlled EDFA with Extended Dynamic Gain Range, *Júlio C. R.f. de Oliveira[1], João B. Rosolem[1], Ronaldo F. da Silva[1], Aldário C. Bordonalli[2]; [1]Telecom Network Div., CPqD - Telecom and IT Solutions, Brazil, [2]Univ. of Campinas—Unicamp, Brazil.* A new approach for a hybrid gain-controlled EDFA with a maximum dynamic gain range of 33 dB is presented, where gain variations are kept below 0.5 dB after add/drop of 31 out of 32 channels.

FWA3 • 8:30 a.m.

Loss Measurements for Optimization of Large-Mode-Area Helical-Core Fibers, *Zhuo Jiang, John R. Marciante; Univ. of Rochester, USA.* Helical-core fibers with various values of pitch have been fabricated. Modal loss measurements are presented and compared to our improved bend-loss model for validation in designing large-mode-area helical-core fibers for high-power lasers and amplifiers.

Highland C

8:00 a.m.–10:00 a.m.
FWB • Optical Computing

Ravindra A. Athale; MITRE Corp., USA, Presider

FWB1 • 8:00 a.m.

Relativistic Quantum Cryptography, *Evan Jeffrey, Joseph Altepeter, Paul Kwiat; Univ. of Illinois at Urbana-Champaign, USA.* Using entangled photons and a low-loss optical delay, we implement a novel quantum cryptography protocol in which every photon contributes to the key, yielding enhanced efficiency, and an advantage for six- versus four-basis state protocols.

FWB2 • 8:15 a.m.

Quantum Random Walk of Two Entangled Qubits, *Pradyumna K. Pathak, Girish S. Agarwal; Oklahoma State Univ., USA.* We discuss random walk of two entangled qubits using linear optical elements. The joint probability of detecting two photons at a given site shows remarkable dependence on the quantum nature of the initial states.

FWB3 • 8:30 a.m. Invited

Programmable Photonic Integrated Circuitry for Optical Signal Processing, *Duncan MacFarlane[1], Jiang Tong[1], L. Roberts Hunt[1], Issa Panahi[1], Kent Wade[1], Manasi Peshave[1], Gary A. Evans[2], Marc P. Christensen[2]; [1]Univ. of Texas at Dallas, USA, [2]Southern Methodist Univ., USA.* An integrated optical architecture based on nanoscale photonic couplers is introduced and used to realize optical filters with a high density of integration. Experimental and theoretical results will be presented.

Highland D

8:00 a.m.–9:45 a.m.
FWC • Diffractive Micro- and Nanostructures for Sensing and Information Processing III

Markus Testorf; Dartmouth College, USA, Presider

FWC1 • 8:00 a.m. Invited

Fourier Modal Method for the Analysis of Optical Nano-Devices, *Philippe Lalanne, Jean-Paul Hugonin; IOTA, France.* The Fourier modal method, also known as the RCWA, has been used for grating analysis for many years. We describe its generalization for analysing non-periodic systems. Examples include photonic-crystal microcavities and SPP-metallic devices.

FWC2 • 8:30 a.m.

All Dielectric Unidirectional Grating Output Coupler, *Andrew Greenwell, Sakoolkan Boonruang, M. G. Moharam; College of Optics and Photonics, CREOL, USA.* A novel design for an all-dielectric unidirectional output double-grating coupler is proposed and rigorously analyzed. It is shown that virtually all the energy is output coupled into the substrate region.

Highland E

8:00 a.m.–9:45 a.m.
FWD • Ultrafast Lasers in Medicine and Biology I

Presider to Be Announced

FWD1 • 8:00 a.m. Tutorial

On the Versatility of Nonlinear Microscopy, *Warren Zipfel; Cornell Univ., USA.* Nonlinear laser-scanning microscopy has become a valuable tool for biological and biomedical research. This tutorial reviews its strengths and areas of development needed to further advance the technology for future biomedical applications.

Warren R. Zipfel is an associate professor in the Department of Biomedical Engineering at Cornell University in Ithaca, NY. Zipfel also serves as the associate director of the Developmental Resource for Biophysical Imaging and Optoelectronics (DRBIO), an NIH/NIBIB P41 Research Resource which focuses the development and enhancement of new forms of optical microscopy, spectroscopy and fluorescence detection. His primary research interest is on the development of optical techniques for biological and biomedical imaging with a strong focus on nonlinear or multiphoton microscopy. Within the framework of the DRBIO center, Zipfel has long been involved in all aspects of the development of multiphoton microscopy, a form of laser scanning microscopy that has since become an indispensable imaging tool for investigations requiring high resolution optical imaging in highly scattering specimens.

Highland F

8:00 a.m.–9:45 a.m.
FWE • Nano- and Micro-Enhancement of NLO Effects I

David Hagan; USA, Presider

FWE1 • 8:00 a.m. Invited

Enhanced Nonlinear Optical Response of Nano- and Micro-Scale Composite Materials, *Robert Boyd; Univ. of Rochester, USA.* We review research aimed at developing new photonic materials based on the use of composite architectures.

FWE2 • 8:30 a.m.

Polarization-Dependent Nonlinear Refraction in GaAs/AlAs Superlattice Waveguides, *Sean J. Wagner[1], Joachim Meier[1], Amr S. Helmy[1], J. Stewart Aitchison[1], Daniele Modotto[2], Marc Sorel[3], David C. Hutchings[3]; [1]Univ. of Toronto, Canada, [2]Univ. di Brescia, Italy, [3]Univ. of Glasgow, UK.* Third-order nonlinear coefficients are studied in GaAs/AlAs superlattice waveguides between 1505nm and 1625nm. Nonlinear refractive index coefficients (n_2) measured for the TE mode are about two-times greater than for the TM mode at shorter wavelengths.

Highland G

Frontiers in Optics

8:00 a.m.–9:45 a.m.
FWF • Laser Guide Star Technology for Adaptive Optics I
Presider to Be Announced

FWF1 • 8:00 a.m. Tutorial
A Quarter Century of Adaptive Optics at the Starfire Optical Range, *Robert Q. Fugate; NM Inst. of Mining and Technology, USA.* This paper summarizes developments in adaptive optics at the Starfire Optical Range from the first Rayleigh laser guidestar concepts in 1981 through current efforts on the 3.5-m telescope using mesospheric sodium guidestars.

Robert Q. Fugate has spent over 35 years in Air Force R&D until his recent retirement in February 2006. He received his B.S. in physics from Case Institute of Technology and Ph.D. in physics from Iowa State University. He started his career at the Foreign Technology Division and AF Avionics Lab at Wright-Patterson AFB, Ohio, but transferred to Kirtland AFB, NM in 1979. His main contributions are in the areas of tactical and strategic laser detection, and compensating in real time for the distorting effects of atmospheric turbulence using adaptive optics. He is recognized for the first experiment demonstrating the feasibility of using laser beacons for sensing atmospheric turbulence and for developing practical implementations of laser guide star adaptive optics for scientific and military uses. He is now a member of the staff at New Mexico Institute of Mining and Technology, Socorro, NM. He has published over 100 papers and book chapters, is a member of the National Academy of Engineering, a Fellow of the Optical Society of America, and has received numerous awards and honors.

Laser Science

Highland H

8:00 a.m.–9:45 a.m.
LWA • Quantum Information I
Alexander Kuzmich; Georgia Tech, USA, Presider

LWA1 • 8:00 a.m. Invited
Scalable Generation of Graph-State Entanglement through Realistic Linear Optics, *Luming Duan, T. P. Bodiya; Univ. of Michigan, USA.* We propose a scheme for efficient construction of graph states using realistic linear optics, imperfect photon source and single-photon detectors.

LWA2 • 8:30 a.m. Invited
Light-Matter Interface for Quantum Information, *Brian Kennedy, Stewart Jenkins, O. A. Collins, D. N. Matsukevich, T. Chaneliere, S.-Yu. Lan, A. Kuzmich; Georgia Tech, USA.* We describe some recent investigations of the use of cold atomic ensembles as an interface for quantum information processing.

Highland J

8:00 a.m.–10:00 a.m.
LWB • Nonlinear Optics of Micro- and Nanoparticles
Hai-Lung Dai; Univ. of Pennsylvania, USA, Presider

LWB1 • 8:00 a.m. Invited
Equilibrium and Dynamics at Microparticle/Liquid Interfaces, *Kenneth B. Eisenthal; Dept. of Chemistry, Columbia Univ., USA.* Second harmonic studies of:time dependent imaging of live neuron membrane potential, molecular ion transport across a liposome bilayer in real time, and ultrafast interfacial electron transfer, will be discussed.

LWB2 • 8:30 a.m.
Nonlinear Optical Properties of a Colloid Containing Silver Sub-Nanoparticles, *Edilson L. Falcao-Filho, Whualkuer Lozano B., Cid B. de Araujo, L. H. Acioli; Univ. Federal de Pernambuco, Brazil.* Time response and third-order susceptibility of a colloid containing silver sub-nanoparticles were studied. A giant optical nonlinearity and an oscillating response function were observed. The analysis of sub-nanoparticle response was based on a molecular approach.

Highland K

8:00 a.m.–10:00 a.m.
LWC • Quantum Optics in Photonic Materials I
Gershon Kurizki; Weizmann Inst. of Science, Israel, Presider

LWC1 • 8:00 a.m. Invited
Photonic Band Gap Materials: Engineering the Fundamental Properties of Light, *Sajeev John; Dept. of Physics, Univ. of Toronto, Canada.* No abstract available.

LWC2 • 8:30 a.m.
Coherent Backscattering via Ultra Slow Light, *Yuri Rostovtsev[1], Zoe-Elizabeth Sariyanni[1], Marlan O. Scully[1,2,3]; [1]Inst. for Quantum Studies, Texas A&M Univ., USA, [2]Princeton Univ., USA, [3]Max-Planck-Inst. fuer Quantenoptik, Germany.* A strong coherent backward wave oscillation using forward propagating fields only is achieved. This leads to controling phase-matching and having phase-matching simultaneously in forward and backward directions. It has applications to entangled photon state generation.

Hyatt Grand Ballroom E/F

OF&T

8:00 a.m.–10:00 a.m.
OFWA • Uncommon Ideas and Often Missed Details: In Memory of Frank Cooke
Robert E. Parks; Optical Perspectives Group, LLC, USA, Presider

OFWA1 • 8:00 a.m. Invited
The Ronchi Test and the Use of Structured Gratings for Sharpening the Fringes, *Alejandro Cornejo-Rodriguez, Fermin Granados-Agustin, Yaoltzin Luna-Zayaz; Inst. Natl de Astrofisica, Mexico.* Sharpening the fringes is an important aspect in interferometry; from this point of view, structured Ronchi gratings, using LCD, sharpening of the fringes in the Ronchigrams were reached.Theoretical and experimental results will be presented.

OFWA2 • 8:30 a.m.
PSD Determination Using a Simultaneous-Phase Acquisition Interferometer for the Constellation-X Spectroscopy X-ray Telescope (SXT) Mirror Program, *J. P. Lehan[1,2], T. T. Saha[1], W. W. Zhang[1]; [1]NASA Goddard Space Flight Ctr., USA, [2]Univ. Space Res. Association, USA.* We investigated the use of a simultaneous-phase acquisition interferometer for determining PSD. We found that the results obtained are strongly influenced by the methodology employed while collecting the data.

Hyatt Regency Ballroom A/B

OPE

8:30 a.m.–10:00 a.m.
OPWA • White OLEDs
Presider to Be Announced

OPWA1 • 8:30 a.m. Invited
OLEDs for Lighting: New Approaches, *Joseph J. Shiang, Anil R. Duggal, James A. Cella, Jie Liu, Larry N. Lewis, Donald F. Foust; General Electric Co., USA.* In this presentation, we will first review the requirements necessary to create a lighting source using OLED technology, and discuss some of our previous efforts in building demonstration white light sources.

Highland A

Joint

JWA • Attosecond Laser Science I—Continued

JWA2 • 8:45 a.m.
Measurement of Isolated Attosecond Pulses in the Few-Cycle Regime, *Giuseppe Sansone, Enrico Benedetti, Francesca Calegari, Salvatore Stagira, Caterina Vozzi, Sandro De Silvestri, Mauro Nisoli; Politecnico di Milano, Italy.* We report on compression and temporal characterization of isolated attosecond pulses consisting of few cycles, generated by polarization-gating technique with phase-stabilized pulses. Thin aluminum foils are used to compensate for chirp of the attosecond pulses.

JWA3 • 9:00 a.m.
Direct Imaging of Attosecond Electron Recollision: An Attosecond Microscope, *Olga Smirnova[1,2], Michael Spanner[2], Serguei Patchkovskii[1], Misha Ivanov[1]; [1]Steacie Inst. for Molecular Sciences, NRC of Canada, Canada, [2]Physics Theory Group, Dept. of Chemistry, and Ctr. for Quantum Information and Quantum Control, Univ. of Toronto, Canada.* We show how full temporal and spatial characterization of the recollision wavepacket can be achieved by measuring the photoelectron spectra for different time delays between the driving IR laser and the attosecond XUV probe.

JWA4 • 9:15 a.m. Invited
Attosecond Pulses for Probing the Time-Resolved Two-Electron Dynamics in Helium Atoms, *Chii Dong Lin[1], Toru Morishita[2], Shin Watanabe[2]; [1]Kansas State Univ., USA, [2]Univ. of Electrocommunications, Japan.* Using attosecond light pulses to doubly ionize a coherent doubly excited state, we show that the time-resolved correlated motion can be probed directly from the measured electron angular distributions.

Highland B

Frontiers in Optics

FWA • High-Power and Fiber Amplifiers—Continued

FWA4 • 8:45 a.m.
Real-Time Determination of Recoverable Energy in Optical Pulse Propagation, *Michael J. Ware, Justin Peatross, Scott Glasgow; Brigham Young Univ., USA.* We present a general method for calculating the fraction of energy stored in a medium that is transferable to an optical pulse. We also calculate the minimum energy required to create a pulse/medium excitation.

FWA5 • 9:00 a.m. Invited
Overcoming Nonlinearities in High-Power Fiber Amplifiers and Lasers, *Almantas Galvanauskas; Univ. of Michigan, USA.* No abstract available.

Highland C

FWB • Optical Computing—Continued

FWB4 • 9:00 a.m. Invited
Nonlinear Optics for Solving Problems in Fluid Dynamics, *Demetri Psaltis; Caltech, USA.* No abstract available.

Highland D

FWC • Diffractive Micro- and Nanostructures for Sensing and Information Processing III—Continued

FWC3 • 8:45 a.m.
Strategies for Employing Surface Plasmons in Near-Field Optical Readout Systems, *Choon How Gan, Greg Gbur; Univ. of North Carolina at Charlotte, USA.* We study strategies for employing surface plasmons in a near-field optical readout system using an exact Green's tensor formulation. Several viable strategies were found, each with its merits and limitations.

FWC4 • 9:00 a.m.
Optical Yagi-Uda and Reflector Nanoantennas and Their Potential Applications as Nano-Scale Spectrum Analyzers in Molecular Spectroscopy, *Jingjing Li, Alessandro Salandrino, Nader Engheta; Univ. of Pennsylvania, USA.* Optical Yagi-Uda and reflector nanoantennas using resonant core-shell plasmonic particles are studied analytically and numerically and their potential applications as spectrum analyzers in molecular spectroscopy are theoretically explored.

FWC5 • 9:15 a.m.
Interference of Surface Wave at a Metallic Subwavelength Slit, *Bora Ung, Yunlong Sheng; Univ. Laval, Canada.* Coupling of surface wave into nanoslit and its interference with incident beam are investigated in FDTD computation. Summation of their induced complex charge distributions inside real metal determines maximum and minimum transmission of the slit.

Highland E

FWD • Ultrafast Lasers in Medicine and Biology I—Continued

FWD2 • 8:45 a.m. Invited
Cells, Tissues and CARS, *Vishnu V. Krishnamachari[1], Esben R. Andresen[2], Eric Olaf Potma[1]; [1]Univ. of California at Irvine, USA, [2]Univ. of Aarhus, Denmark.* We present molecular selective imaging of live cells and tissues with heterodyne CARS microscopy. Employing phase sensitive detection, we obtain quantitative vibrational images with contrast based on hitherto indiscernible vibrational bands of key biomolecules.

FWD3 • 9:15 a.m.
Retrieval of a Coherent Anti-Stokes Raman Spectrum Using a Broadband Chirped Pump Pulse, *Daniel L. Marks, Gareth W. Jones, Stephen A. Boppart; Univ. of Illinois at Urbana-Champaign, USA.* Using spectral interferometry, we time-resolve the anti-Stokes signal stimulated from isopropanol using a chirped pump pulse and short Stokes pulse. From this signal, we calculate the complex Raman spectrum.

Highland F

FWE • Nano- and Micro-Enhancement of NLO Effects I—Continued

FWE3 • 8:45 a.m.
Reflection Second-Harmonic Microscopy of Porous Silicon Structures, *Anton Maidykovski, Jung Yongseok, Sergey Magnitskiy, Nikolay Nagorsky, Alexandr Ejov, Fedor Sychev, Oleg Aktsipetrov; Moscow State Univ., Russian Federation.* Scanning optical microscopy in reflection is used to quantity estimate effectiveness of second harmonic generation in porous silicon performed at various etching current density. We observe linear dependence of second harmonic signal on silicon porosity.

FWE4 • 9:00 a.m. Invited
Enhancement of Nonlinear Effects in Slow Light Photonic Structures: Figures of Merit, *Jacob Khurgin; Johns Hopkins Univ., USA.* Enhancement of nonlinear effects in slow light photonic structures is analyzed and its limitations due to dispersion of group velocity and gain/loss are determined.

Highland G

Frontiers in Optics

FWF • Laser Guide Star Technology for Adaptive Optics I—Continued

FWF2 • 8:45 a.m. Invited

Single Frequency Sodium Guidestar Excitation at the Starfire Optical Range, *Craig A. Denman, Paul D. Hillman, Gerald T. Moore, John M. Telle, Jack D. Drummond, Steven J. Novotny, Mark L. Eickhoff, Robert Q. Fugate; AFRL, USA.* A fully-automated, facility-class, 50W diffraction-limited, single-frequency, cw 589-nm guidestar excitation source has produced radiance returns as high as 7000 photons/cm^2/s. Laser design, sodium guidestar characteristics, and progress of AO implementation and performance will be presented.

FWF3 • 9:15 a.m. Invited

The ESO Program and Activities on Laser Guide Stars for Adaptive Optics, *Domenico Bonaccini; ESO, Germany.* The ESO LGS for AO program involves the LGS facility on the VLT in Cerro Paranal (Chile), and the development of Fiber lasers at 589nm. Details on the activities and their status will be reported.

Highland H

Laser Science

LWA • Quantum Information I—Continued

LWA3 • 9:00 a.m.

Multi-Spectral Raman Gain in Atomic Rubidium Vapor, *Joseph E. Vornehm[1], Gour S. Pati[2], Kenneth R. Salit[2], M. Selim Shahriar[2]; [1]Univ. of Rochester, USA, [2]Northwestern Univ., USA.* Optically off-resonant stimulated Raman scattering of 85-Rb is studied experimentally to implement a scheme that eliminates the key sources of fidelity loss in macroscopic entanglement and quantum information storage using atomic vapor or trapped atoms.

LWA4 • 9:15 a.m.

Quantum Cryptography with Optical Entanglement at 1.5 µm, *Alexander V. Sergienko, Martin A. Jaspan, Bahaa E. A. Saleh, Malvin C. Teich; Boston Univ., USA.* We report on the engineering, preparation, and utilization of polarization entangled-photon states in the telecommunications window of 1.5 µm for secure quantum key distribution.

Highland J

LWB • Nonlinear Optics of Micro- and Nanoparticles—Continued

LWB3 • 8:45 a.m. Invited

Origin of the Second Harmonic Generation Process in Small Gold and Silver Metallic Particles, *Pierre-François Brevet; Lab de Spectrométrie Ionique et Moléculaire, France.* The optical second harmonic response from small gold and silver metallic particles the diameter of which ranges from ten to more than a hundred nanometers is investigated with the technique of Hyper Rayleigh Scattering.

LWB4 • 9:15 a.m. Invited

Optical Second-Harmonic Spectroscopy of Silicon Nano-Interfaces, *Michael Downer, P. Figliozzi, L. Sun, Jinhee Kwon; Physics Dept., Univ. of Texas, USA.* Second-harmonic generation (SHG), traditionally a spectroscopic probe of planar interfaces, is adapted to probe spherical interfaces of Si nanocrystals and linear step-edges of vicinal Si. Two-beam SHG and coordination with reflectance-anisotropy spectroscopy (RAS) are critical.

Highland K

LWC • Quantum Optics in Photonic Materials I—Continued

LWC3 • 8:45 a.m. Invited

Tunable Microcavities in 3-D Photonic Crystals for Single-Photon Emission, *Minghao Qi; Purdue Univ., USA.* Microcavities in high-index-contrast 3-D photonic crystals could achieve ultra-high quality factors and be robust against fabrication distortions. A scheme for single-photon emission will be presented and new fabrication approaches will be discussed.

LWC4 • 9:15 a.m.

Low-Light-Level Optical Interactions with Rubidium Vapor in a Photonic Band-Gap Fiber, *Saikat Ghosh, Amar R. Bhagwat, Christopher Kyle Renshaw, Shireen Goh, Alexander L. Gaeta, Brian J. Kirby; Cornell Univ., USA.* We create a significant population of Rubidium atoms inside a hollow-core photonic band-gap fiber, which we use for performing nonlinear optical interactions at very low light levels.

Hyatt Grand Ballroom E/F

OF&T

OFWA • Uncommon Ideas and Often Missed Details: In Memory of Frank Cooke—Continued

OFWA3 • 8:45 a.m.

Surface Profilometry Using Liquid Crystal Grating Projection, *Toru Yoshizawa[1], Masayuki Yamamoto[2], Hiroo Fujita[3]; [1]Saitama Medical Univ., Japan, [2]Softron Corp., Japan, [3]Citizen Active Co., Ltd., Japan.* A specified liquid crystal (LC) device is shown for three dimensional profile measurement systems based on triangulation principle using phase shifting technique. Dual projection is available to improve problems in conventional pattern projection method.

OFWA4 • 9:00 a.m.

Grating-Slit: An Unusual Optical Surface Test, *Chao-Wen Liang, Jose Sasian; College of Optical Sciences, Univ. of Arizona, USA.* This method uses a DMD chip to generate a sinusoidal grating as the light source and uses a slit modulating light at the image location. The transverse ray aberration function is obtained through phase shifting.

OFWA5 • 9:15 a.m.

Measurement of an Optical Surface Using Phase Retrieval, *Gregory R. Brady, James R. Fienup; Inst. of Optics, Univ. of Rochester, USA.* We describe the experimental measurement of a concave spherical mirror using a phase retrieval algorithm. Estimates of the resulting phases using different data sets agree to within about three thousandths of a wave RMS.

Hyatt Regency Ballroom A/B

OPE

OPWA • White OLEDs—Continued

OPWA2 • 9:00 a.m. Invited

Advances in White OLED Technology, *T. K. Hatwar; Eastman Kodak Co., USA.* Significant progress is made in the white OLED technology that propelled the demonstration of 40” full-color display and 2’x2’ lighting panel. We will review developments in the white technology for AMOLEDs displays and solid-state lighting.

Highland A

Joint

Frontiers in Optics

Highland B

FWA • High-Power and Fiber Amplifiers—Continued

FWA6 • 9:30 a.m.
Management of Nonlinearity, Gain and Third Order Dispersion in High Energy Yb-Doped Fiber Amplifiers, *Lyuba Kuznetsova, Andy Chong, Frank W. Wise; Dept. of Applied and Engineering Physics, Cornell Univ., USA.* Amplification in the presence of strong self-phase-modulation $(\Phi^{NL}\sim 12\pi)$, finite gain bandwidth $(\Delta\lambda_{FWHM}\sim 15nm)$ and third-order dispersion is studied numerically and experimentally. Pulses amplified to 30 µJ energy in Yb-doped fiber are dechirped to 240 fs duration.

Highland C

FWB • Optical Computing—Continued

FWB5 • 9:30 a.m. Invited
To Be Announced, *Mohan Trivedi; Univ. of California at San Diego, USA.* No abstract available.

Highland D

FWC • Diffractive Micro- and Nanostructures for Sensing and Information Processing III—Continued

FWC6 • 9:30 a.m.
Modulation of Transmission through Isolated Subwavelength Apertures by Dielectric Filling and Its Implications for Use in Biophysical Research, *Huizhong Xu, Kevan T. Samiee, Harold G. Craighead, Watt W. Webb; Cornell Univ., USA.* Use of finite element method to study transmission through dielectric-filled subwavelength apertures shows that a small change in the filling refractive index can induce a large change in light transmission for certain subwavelength aperture radii.

Highland E

FWD • Ultrafast Lasers in Medicine and Biology I—Continued

FWD4 • 9:30 a.m.
Tissue Scattering and the Effect on SHG Imaging, *Francois Legare[1], Christian Pfeffer[2], Bjorn R. Olsen[2]; [1]INRS-EMT, Canada, [2]Oral and Developmental Biology, HSDM, USA.* We investigate the formation of *in-vivo* SHG images for two matrices consisting primarily of similar collagen type-I arrays, fascia and tendon. The image quality depends strongly on the scattering properties of the immediate tissue environment.

Highland F

FWE • Nano- and Micro-Enhancement of NLO Effects I—Continued

FWE5 • 9:30 a.m.
Linear Effective Index Contribution to the Enhancement of Nonlinear Coefficient in Silica Nanowires, *Yannick Keith Lizé[1,2], Bryan Burgoyne[1], Xavier Daxhelet[1], Alan E. Willner[2], Raman Kashyap[1]; [1]École Polytechnique de Montréal, Canada, [2]Univ. of Southern California, USA.* We derive a modified nonlinear coefficient for silica nanowires and show numerically the contribution of the linear effective index. Nonlinearities increase by 41% at lambda=800nm while the optimal diameter is shifted by 50nm.

9:45 a.m.–10:15 a.m. Coffee Break, Empire Hall
9:45 a.m.–10:15 a.m. Coffee Break, Hyatt Grand Ballroom G

NOTES

Highland G

Frontiers in Optics

Highland H

Laser Science

LWA • Quantum Information I—Continued

LWA5 • 9:30 a.m.
Generation of Narrow-Bandwidth Paired Photons with a Standing Wave Pump, *Pavel Kolchin, Shengwang Du, Chinmay Belthangady, G. Y. Yin, Steve E. Harris; Stanford Univ., USA.* A single retro-reflected Ti:Sapphire laser is used to cool, pump, and to render transparent a cloud of ^{87}Rb atoms. Paired photons are generated into opposing single-mode fibers at a rate of 600 counts/sec.

Highland J

LWB • Nonlinear Optics of Micro- and Nanoparticles—Continued

LWB5 • 9:45 a.m.
Microspherical-Fiber Laser System, *Hossin A. Abdeldayem; NASA, USA.* Microspheres (5-50µm diameters) doped with lasing materials have been demonstrated to lase fine laser lines with broad tunability. A novel coupling technique to couple their lasing emission to an optical fiber is presented.

Highland K

LWC • Quantum Optics in Photonic Materials I—Continued

LWC5 • 9:30 a.m.
Saturated Absorption Spectroscopy in Acetylene Filled Photonic Bandgap Fibers, *Kevin Knabe, Rajesh Thapa, Oliver L. Weaver, Brian R. Washburn, Kristan L. Corwin; Kansas State Univ., USA.* Saturated absorption spectroscopy in acetylene filled photonic bandgap (PBG) fibers is investigated. Pressure and optical power are optimized to narrow the line width to allow this signal to be used as an optical reference.

LWC6 • 9:45 a.m.
Correlation with Polarization of Localized Waves, *Andrey A. Chabanov[1], Azriel Z. Genack[2]; [1]Univ. of Texas at San Antonio, USA, [2]Queens College CUNY, USA.* In measurements of intensity correlation with polarization for localized waves, the correlation function is a product of the correlator of conductance and two reciprocal correlators associated with coupling into and out of the sample.

Hyatt Grand Ballroom E/F

OF&T

OFWA • Uncommon Ideas and Often Missed Details: In Memory of Frank Cooke—Continued

OFWA6 • 9:30 a.m. **Invited**
Rapid Prototyping of Polymer Micro-Opto-Mechanical Components with Deep Proton Writing, *Jürgen Van Erps, Christof Debaes, Michael Vervaeke, Bart Volckaerts, Heidi Ottevaere, Pedro Vynck, Virginia Gomez, Lieven Desmet, Sara Van Overmeire, Alex Hermanne, Hugo Thienpont; Vrije Univ. Brussel, Belgium.* We present Deep Proton Writing as a flexible rapid prototyping technology for the fabrication of a wide variety of three dimensional refractive micro-optical components and high-aspect-ratio micromechanical structures with applications in telecom, datacom and biophotonics.

Hyatt Regency Ballroom A/B

OPE

OPWA • White OLEDs—Continued

OPWA3 • 9:30 a.m. **Invited**
Charge Transport in White Light-Emitting Polymer Devices, *Paul Blom, Andre J. Hof, H. T. Nicolai; Univ. of Groningen, Netherlands.* Copolymers are able to generate white light. The difference in energy levels for the different components complicates the charge transport in light-emitting devices as our measurements indicate.

9:45 a.m.–10:15 a.m. Coffee Break, Empire Hall
9:45 a.m.–10:15 a.m. Coffee Break, Hyatt Grand Ballroom G

NOTES

Highland A

Joint

10:15 a.m.–12:00 p.m.
JWB • Attosecond Laser Science II

Margaret Murnane; JILA, USA, Presider

JWB1 • 10:15 a.m. Invited
Progress in Attosecond Technology-Application to Momentum Shearing Interferometry of Electron WavePackets, *Thierry Ruchon[1], Thomas Remetter[1], Per Johnsson[1], Katalin Varju[1], Erik Gustafsson[1], Johan Mauritsson[1,2], Rodrigo López-Martens[3], Matthias Kling[4], Yongfeng Ni[4], Franck Lépine[4], Jafar Kahn[4], Markus J. J. Vrakking[4], Ken J. Schafer[2], Anne L'Huillier[1]; [1]Lund Univ., Sweden, [2]Dept. of Physics and Astronomy, Louisiana State Univ., USA, [3]LOA, ENSTA, UMR CNRS 7639, France, [4]FOM-Inst. AMOLF, Netherlands.* The recently demonstrated momentum shearing interferometry technique, aimed at recovering phase information about electronic wave packets will be presented. Possibilities to improve this technique will be discussed.

JWB2 • 10:45 a.m. Invited
Ultrafast Science with Attosecond Optical Pulses, *Markus Drescher; Univ. Hamburg, Inst. für Experimentalphysik, Germany.* Isolated attosecond XUV bursts are generated as high harmonics of few-cycle laser pulses. Electron and ion detection techniques unveil the evolution of electronic processes in the interior of the atomic shell with unprecedented temporal resolution.

Highland B

Frontiers in Optics

10:15 a.m.–12:00 p.m.
FWG • Semiconductor and Raman Amplifiers

Gadi Eisenstein; Technion, Israel, Presider

FWG1 • 10:15 a.m. Invited
High-Performance Quantum Dot Optoelectronic Devices, *Pallab Bhattacharya, Zetian Mi, Xiaohua Su; Elect. Eng. and Comp. Sci. Dept., Univ. of Michigan, USA.* Self-organized quantum dots are fascinating nanostructures with unique electronic, optical and structural properties. The properties of lasers, intersubband detectors, amplifiers and microcavity light sources, with In(Ga)As/GaAs quantum dot active regions will be described.

FWG2 • 10:45 a.m.
Observation of Wavelength Bistability in 850nm Vertical-Cavity Semiconductor Optical Amplifiers (VCSOAs), *Haijiang Zhang, Veronica Gauss, Pengyue Wen, Sadik Esener; Univ. of California at San Diego, USA.* The experimental observation of wavelength bistability in an 850nm VCSOA is reported. Clockwise hystereses are obtained with input wavelength sweeping when the input power is kept constant. Results are in good agreement with theoretical predictions.

Highland C

10:15 a.m.–12:00 p.m.
FWH • Computational Imaging III

Mark Allen Neifeld; Univ. of Arizona, USA, Presider

FWH1 • 10:15 a.m. Invited
Integration of Sensing and Processing in Computational Imaging, *Dennis Healy; Univ. of Maryland, USA.* No abstract available.

FWH2 • 10:45 a.m. Invited
Computation Imaging: Old Wine in New Bottles? *Ravindra Anant Athale[1], Joseph N. Mait[2], Gary W. Euliss[1]; [1]MITRE Corp., USA, [2]ARL, USA.* Computational imaging is described in context of previous concepts in image formation such as holographic and tomographic imaging. New concepts emerging in this research area will be highlighted.

Highland D

10:15 a.m.–12:00 p.m.
FWI • Diffractive Micro- and Nanostructures for Sensing and Information Processing IV

Eric Johnson; Univ. of Central Florida, USA, Presider

FWI1 • 10:15 a.m. Invited
Subwavelength Optics: From Expanding Scalar Optics Limits to On-Chip Integration, *Uriel Levy, Maxim Abashin, Kazuhiro Ikeda, Hyo-Chang Kim, Chia-Ho Tsai, Yeshaiahu Fainman; Univ. of California at San Diego, USA.* We demonstrate novel optical devices for controlling vector optical fields in free space, as well as new concept for "free space on a chip" using subwavelength structures etched into a slab waveguide.

FWI2 • 10:45 a.m.
Submicron Multiplexed Holograms for High Density Disk-Compatible Data Storage, *Pengfei Wu[1], Jame J. Yang[1], Michael R. Wang[2]; [1]New Span Opto-Technology Inc., USA, [2]Univ. of Miami, USA.* Multiplexed holograms of 0.5 µm in diameter and 15 µm in depth are demonstrated using our designed refractive/diffractive hybrid lens and wavelength combiner. This CD/DVD-compatible holographic technique has potential to reach capacity of hundreds GB.

Highland E

10:15 a.m.–12:00 p.m.
FWJ • Ultrafast Lasers in Medicine and Biology II

Warren R. Zipfel; Cornell Univ., USA, Presider

FWJ1 • 10:15 a.m. Invited
Dissecting Tumor and Vascular Biology Using Multi-Photon Laser Scanning Microscopy, *Dai Fukumura; Massachusetts General Hospital, USA.* Intravital multi-photon laser scanning microscopy and sophisticated animal models have provided unprecedented molecular, anatomic and functional insight into tumors as well as blood and lymph vessels, their responses to therapy, and suggested novel treatment approaches.

FWJ2 • 10:45 a.m.
Femtosecond Laser Near-Field Ablation by Gold Nanoparticles, *Daniel S. Eversole[1], Xun Guo[1], Boris Luk'yanchuk[2], Adela Ben-Yakar[1]; [1]Univ. of Texas at Austin, USA, [2]Data Storage Inst., Singapore.* We describe a novel, non-thermal ablation process for selective removal of biological material. The technique takes advantage of enhanced-plasmonic scattering of near-infrared, ultrashort laser pulses in the near-field of gold nanoparticles to vaporize attoliter volumes.

Highland F

10:15 a.m.–12:30 p.m.
FWK • Nano- and Micro-Enhancement of NLO Effects II

Michael Scalora; US ARMY, USA, Presider

FWK1 • 10:15 a.m. Tutorial
Enhancement of NLO Effects in Photonic Crystals, *Marin Soljacic; MIT, USA.* It has recently been shown that unique opportunities of photonic crystals to control light enable implementation of nanostructures with dramatically enhanced optical nonlinear response. Theoretical and experimental advances in this exciting field will be discussed.

Marin Soljacic did his undergraduate studies at MIT, both in physics, and also in electrical engineering. He received his Ph.D. from physics department of Princeton University in 2000, on a topic in nonlinear optics. In 2000, he became a Pappalardo fellow in the physics department of MIT, after which he was a Principal Research Scientist in RLE at MIT. Since September 2005, he has been an assistant professor of physics at MIT. His main research interests are in theoretical photonic crystals, and nonlinear optics. He is a co-author of 55 scientific articles (published or submitted), is a co-author of 14 patents pending (or issued) with the US patent office, and has given more than 40 invited talks at conferences and universities around the world. He is the recipient of the Adolph Lomb medal from the Optical Society of America (2005).

Highland G

Frontiers in Optics

10:15 a.m.–11:30 a.m.
FWL • Laser Guide Star Technology for Adaptive Optics II

Craig Denman; AFRL, USA, Presider

FWL1 • 10:15 a.m. Invited

The Challenge of Laser Guide Stars Technology for Astronomy, *Edward Kibblewhite; Univ. of Chicago, USA.* This paper will review the principals of laser beacon adaptive optics for astronomy, the current state of the art and the requirements of laser systems for the next generation of optical telescopes.

FWL2 • 10:45 a.m. Invited

Advanced Sodium Guide Star Technology Development, *Deanna M. Pennington, Jay W. Dawson, Alex Drobshoff, Scott Mitchell, Aaron Brown; Lawrence Livermore Natl. Lab, USA.* Laser guided adaptive optics significantly improve ground-based telescope resolution. We are developing a pulsed, 589nm laser system for this application by sum-frequency mixing 1583nm Er/Yb:doped and 938nm Nd:silica fiber lasers in a periodically poled crystal.

Highland H

Laser Science

10:15 a.m.–12:00 p.m.
LWD • Quantum Information II

Dana J. Berkeland; Los Alamos Natl. Lab, USA, Presider

LWD1 • 10:15 a.m. Invited

Quantum Simulations in Ion Traps, *Dana Berkeland[1], Malcolm Boshier[1], John Chiaverini[1], D. Lizon[1], Warren Lybarger[1], Robert Scarlett[1], Rolando Somma[1], Kendra Vant[1], Matt Blain[2], B. Jokiel[2], Chris Tigges[2]; [1]Los Alamos Natl. Lab, USA, [2]Sandia Natl. Labs, USA.* We are using an array of laser-controlled strontium ions confined in a linear rf trap to build a multi-body quantum simulator to solve otherwise intractable many-body quantum problems.

LWD2 • 10:45 a.m. Invited

Single Photonics and Quantum Information, *Gerard Milburn; Univ. of Queensland, Australia.* I introduce the concept of an optical single photon state and review proposed quantum information processing schemes that use them. I also describe a scheme for coherent optical communication with single photon states.

Highland J

Joint

10:15 a.m.–12:15 p.m.
JWC • Spectroscopic Imaging for Disease Diagnostics

Irene Georgakoudi; Tufts Univ., USA, Presider

JWC1 • 10:15 a.m. Invited

Physiologic, Metabolic and Structural Alterations in Breast Cancer: Assessment via Optical Technologies, *Nimmi Ramanujam, J. Quincy Brown; Biomedical Engineering Dept., Duke Univ., USA.* Optical spectroscopy was used to assess structural and functional changes which occur in breast tissue for the optical diagnosis of cancer in humans *in vivo*, and characterization of mammary tumor biology in animal models.

JWC2 • 10:45 a.m. Invited

Plasmonics and Surface-Enhanced Raman Scattering (SERS) Nanoprobes for Biomedical Diagnostics, *Tuan Vo Dinh; Ctr. for Advanced Biomedical Photonics, Oak Ridge Natl. Lab, USA.* No abstract available.

Highland K

Laser Science

10:15 a.m.–12:30 p.m.
LWE • Quantum Dots

Todd Krauss; Univ. of Rochester, USA, Presider

LWE1 • 10:15 a.m. Invited

Photophysical Pathology of Quantum Dots and Slinky Cornell Dots, *Watt Webb; Cornell Univ., USA.* Semiconducting nanocrystal quantum dots coated for biological application all blink or are totally dark. Blink time distributions and dark fractions in solution are reported. Nonblinking Cornell Dots, silica nanoparticles embedding rhodamine molecules show comparable brilliance.

LWE2 • 10:45 a.m. Invited

Cavity QED with Semiconductor Nanocrystals, *Ulrike Woggon[1], N. Le Thomas[1], O. Schops[1], M. V. Artemyev[2], M. Kazes[3], U. Banin[3]; [1]Fachbereich Physik der Univ. Dortmund, Germany, [2]Belarussian State Univ., Belarus, [3]Hebrew Univ. of Jerusalem, Israel.* We demonstrate the strong coupling between a CdSe nanocrystal and a single photon mode of a polymer microsphere. The strong exciton-photon coupling is manifested by the observation of a cavity mode splitting of $h\Omega_{exp} \approx 37 \mu eV$.

Hyatt Grand Ballroom E/F

OF&T

10:30 a.m.–12:00 p.m.
OFWB • Optics for Telescopes

Scott A. Lerner; Hewlett Packard, USA, Presider

OFWB1 • 10:30 a.m. Invited

Manufacturing Technology for a 1.1m Primary Mirror, *Yu Jing-Chi, Pei-ji Guo, Yao-ming Zhang; Soochow Univ., China.* Manufacturing technology of large aperture primary mirror is discussed in this paper. A 3-D measuring machine is used to control contour and parameters of the mirror. Supporting system avoiding deformation of the mirror is described.

Hyatt Regency Ballroom A/B

OPE

10:30 a.m.–12:15 p.m.
OPWB • Infrared OLEDs and Quantum Dots

T. K. Hatwar; Eastman Kodak Co., USA, Presider

OPWB1 • 10:30 a.m. Invited

Engineering Properties of Organic Materials for Near Infra-Red Applications, *Jian Li, Evan L. Williams, Kirsi Haavisto, Ghassan E. Jabbour; Arizona State Univ., USA.* This presentation will highlight the development of novel cyclometalated Ir complexes as phosphorescent emitters and the utilization of novel electron transporting materials and host materials for efficient near infra-red OLED.

Highland A

Joint

JWB • Attosecond Laser Science II—Continued

JWB3 • 11:15 a.m.
A Complete Analytical Description of Few Cycle Focused Laser Pulses, *Scott M. Sepke, Donald P. Umstadter; Univ. of Nebraska, USA.* An exact, analytical laser field model is developed for focused laser pulses, allowing for all pulse durations and spot sizes from infinite, paraxial beams to single cycle, wavelength size spots.

Frontiers in Optics

Highland B

FWG • Semiconductor and Raman Amplifiers—Continued

FWG3 • 11:00 a.m.
Single Wavelength Square Semiconductor Laser with Quad Grating-Coupled Surface-Emitting Outputs, *Jason K. O'Daniel, Oleg V. Smolski, K. Shavitranuruk, Eric G. Johnson; Univ. of Central Florida, USA.* We present a square broad area semiconductor surface emitting laser lasing in orthogonal directions with feedback provided by four dual grating reflectors. The outputs of the device, having two orthogonal polarizations, overlap above the laser.

FWG4 • 11:15 a.m. Invited
Challenges of Raman Amplification, *Yoshihiro Emori[1], Shu Namiki[2]; [1]Furukawa Electric Co., Ltd., Japan, [2]Natl. Inst. of Advanced Industrial Science and Technology, Japan.* After reviewing the state-of-the-arts technologies of fiber Raman amplification, this talk will address ongoing practical issues on handling high power. It will also discuss the advantages of Raman amplification in the future dynamic WDM networks.

Highland C

FWH • Computational Imaging III—Continued

FWH3 • 11:15 a.m.
End-to-End Optimization of Multiframe Imaging Systems, *Dirk Robinson, David G. Stork; Ricoh Innovations, USA.* We introduce a novel framework for designing digital imaging systems which considers multiframe image reconstruction. We describe how we adapt commercial lens design software to predict and optimize the end-to-end performance of multiframe optical-digital systems.

Highland D

FWI • Diffractive Micro- and Nanostructures for Sensing and Information Processing IV—Continued

FWI3 • 11:00 a.m.
High Resolution Optical Data Storage in Composite Polymeric Materials, *Luigino Criante, Francesco Vita, Riccardo Castagna, Daniele E. Lucchetta, Francesco Simoni; Univ. Politecnica delle Marche, Italy.* High resolution reflection gratings have been recorded at 457 nm in polymer composites. They exhibited high diffraction efficiency and sensitivity, low losses, and index modulation over 0.01. Finally recording of micro-gratings has been carried out.

FWI4 • 11:15 a.m.
Demonstration of a Spectrally Multiplexed Holographic Stokesmeter, *Jong-Kwon Lee, John Shen, Shih Tseng, Gour Pati, Selim M. Shahriar; Northwestern Univ., USA.* A holographic Stokesmeter utilizes polarization sensitivity of volume gratings to determine the Stokes parameters of an input beam. We demonstrate a spectrally multiplexed holographic stokesmeter for two different wavelengths of 532nm and 780nm simultaneously.

Highland E

FWJ • Ultrafast Lasers in Medicine and Biology II—Continued

FWJ3 • 11:00 a.m.
Effects of Heat Absorption and Transfer in Pulsetrain-Burst Ablation of Biological Tissues, *Paul Forrester[1], Kieran Bol[1], Catherine Greenhalgh[1], Robin Marjoribanks[1], Lothar Lilge[2]; [1]Dept. of Physics, Univ. of Toronto, Canada, [2]Dept of Medical Biophysics, Univ. of Toronto, and Princess Margaret Hospital, Canada.* Bursts of picosecond and femtosecond pulses at >100MHz repetition rates allow unique control of fluence delivery and heat transfer. From trials with hard and soft biological tissues, we report tailored impact relevant for laser surgery.

FWJ4 • 11:15 a.m. Invited
Stroking the Synapse: Insight into Ischemic Damage and Recovery from *in vivo* 2-Photon Imaging of Individual Synapses, *Timothy H. Murphy; Univ. of British Columbia, Canada.* 2-photon imaging of blood flow, brain structure, and function has been applied in transgenic mice *in vivo* to assess the events which occur during first few hrs after an interruption of blood supply termed stroke.

Highland F

FWK • Nano- and Micro-Enhancement of NLO Effects II—Continued

FWK2 • 11:00 a.m.
Experimental and Theoretical Analysis of Two-Photon Absorption in Semiconductor Quantum-Dots, *Lazaro A. Padilha[1,2], Jie Fu[1], Gero Nootz[1], David J. Hagan[1], Eric W. Van Stryland[1], Carlos L. Cesar[2], Luiz C. Barbosa[2], Carlos H. B. Cruz[2], Dario Buso[3], Alex Martucci[3]; [1]Univ. of Central Florida, CREOL and FPCE, USA, [2]Univ. Estadual de Campinas, Brazil, [3]Univ. di Padova, Italy.* We report theoretical and experimental studies of two-photon absorption spectra of CdSe and CdTe quantum-dots. The influence of the quantum-dot size is verified. Theories using the band-mixing and parabolic bands models are compared.

FWK3 • 11:15 a.m.
Two-Photon Absorption Studies of Polymethine, Squaraine and Tetraon Dyes, *Jie Fu[1], Olga V. Przhonska[1,2], Lazaro A. Padilha[1], Scott Webster[1], David J. Hagan[1,3], Eric W. Van Stryland[1,3], Mikhail V. Bondar[2], Yuriy L. Slominsky[4], Alexei D. Kachkovski[4]; [1]College of Optics and Photonics, CREOL and FPCE, Univ. of Central Florida, USA, [2]Inst. of Physics, Natl. Acad. of Sciences, Ukraine, [3]Dept. of Physics, Univ. of Central Florida, USA, [4]Inst. of Organic Chemistry, Natl. Acad. of Sciences, Ukraine.* We compare two-photon absorption spectra of polymethine, squaraine and tetraon dyes experimentally. Both squaraine and tetraon dyes display peak two-photon cross-sections considerably larger (>8x10^{3}GM) than polymethine.

Highland G

Frontiers in Optics

FWL • Laser Guide Star Technology for Adaptive Optics II—Continued

FWL3 • 11:15 a.m.

Laser Guide Star with Collimated Laser Beam for Large Aperture Telescope, *Domenico Bonaccini[1], Vladimir Lukin[2]; [1]European Southern Observatory, Germany, [2]Inst. of Atmospheric Optics SB RAS, Russian Federation.* We did calculations structure function of phase fluctuations in signal from real star and set of spherical waves, formed in plane of LGS. We developed the approach on formation laser guide star free from focal anisoplanarity.

Highland H

Laser Science

LWD • Quantum Information II—Continued

LWD3 • 11:15 a.m.

Generating Multimode Entangled States of Light by Linear Optics and Photocounting, *Pavel Lougovski, Dmitry Uskov, Jonathan Dowling; Louisiana State Univ., USA.* We develop analytic and numerical schemes for generating multimode photon entangled states using linear optics and projective measurement with applications to linear optical quantum computing and quantum lithography.

Highland J

Joint

JWC • Spectroscopic Imaging for Disease Diagnostics—Continued

JWC3 • 11:15 a.m.

Arrayed Imaging Reflectometry for Rapid Label-Free Clinical Diagnostics, *Christopher C. Striemer[1,2], Charles R. Mace[2], Benjamin L. Miller[2]; [1]Pathologics, LLC, USA, [2]Univ. of Rochester, USA.* We have developed a rapid label-free protein biosensor based on null laser reflectance principles. Our imaging technique is capable of identifying and quantifying protein targets in <100pg/mL concentration while measuring >500 arrayed detection spots simultaneously.

Highland K

Laser Science

LWE • Quantum Dots—Continued

LWE3 • 11:15 a.m.

Stabilization of Quasi-Penning Resonances by Destabilizing, Anty-Harmonic Potentials of Quantum Dots to Frozen Trojan States, *Matt K. Kalinski; Utah State Univ., USA.* We show that the addition of the anty-harmonic quantum dot potential stabilizes the resonances originally discovered by Clark in crossed electric and magnetic field. Those states are frozen Trojan wavepackets in the laboratory.

Hyatt Grand Ballroom E/F

OF&T

OFWB • Optics for Telescopes—Continued

OFWB2 • 11:00 a.m.

Certification of Null Corrector for 4 -m f/1 Primary Mirror for VISTA Telescope, *M. A. Abdulkadyrov[1], V. E. Patrikeev[1], A. P. Semenov[1], Y. A. Sharov[1], Alexander G. Poleshchuk[2], Ruslan Nasyrov[2], Alexey Matochkin[2]; [1]Lytkarino Optical Glass Factory, Russian Federation, [2]Inst. of Automation and Electrometry SB RAS, Russian Federation.* An optical test for measuring null correctors for 4-m f/1 primary mirror for VISTA telescope has been developed. Test uses a CGH to synthesize the wavefront that would be reflected by a perfect primary mirror.

OFWB3 • 11:15 a.m.

Manufacture of a 1.7 m Prototype of the GMT Primary Mirror Segments, *Buddy Martin, Jim Burge, Steve Miller, Bryan Smith, Rene Zehnder, Chunyu Zhao; Univ. of Arizona, USA.* We have manufactured a 1.7 m off-axis mirror as part of the technology development for the Giant Magellan Telescope. The mirror was polished with a stressed lap and measured using a hybrid reflective-diffractive null corrector.

Hyatt Regency Ballroom A/B

OPE

OPWB • Infrared OLEDs and Quantum Dots—Continued

OPWB2 • 11:00 a.m. Invited

Taking a Visible Step Forward into the Non-Visible (Infrared) Region, *Kenneth Hanson[1], Carsten Borek[1], Peter Djurovich[1], Mark E. Thompson[1], Yiru Sun[2], Stephen R. Forrest[2], Anna Chwang[3], Jason Brooks[3], Julie Brown[3]; [1]Univ. of Southern California, USA, [2]Princeton Univ., USA, [3]Universal Display Corp., USA.* This presentation focuses on our most recent work in the area of red to near-IR emitting OLEDs. The discussion will include descriptions of emitter design, device structures, external efficiencies and lifetimes of these devices.

Highland A

Joint

JWB • Attosecond Laser Science II—Continued

JWB4 • 11:30 a.m. Invited

Monitoring Electron Motion in Molecules on “Attosecond” Time Scales, *Andre Bandrauk, Stefan Chelkowski, Gennady Yudin; Univ. de Sherbrooke, Canada.* Attosecond electron motion in molecules is studied theoretically in levels prepared coherently by a first ultrashort pump pulse and subsequently ionized with transform-limited or chirped attosecond pulses.Asymmetric photoelectron spectra provide measurement of attosecond electron dynamics.

Frontiers in Optics

Highland B

FWG • Semiconductor and Raman Amplifiers—Continued

FWG5 • 11:45 a.m.

Raman Gain Efficiency Enhancement in the O-Band, *Lucia A. M. Saito[1], Palmerston D. Taveira[1], Eunezio A. De Souza[1], Peter B. Gaarde[2], Keith De Souza[3]; [1]Mackenzie Univ., Brazil, [2]OFS Fitel Denmark ApS, Denmark, [3]Univ. of the West Indies, Trinidad and Tobago.* Optical fiber networks currently operate in the C and L-bands with no usage of the O-band. We demonstrate theoretically that discrete Raman amplifiers operate more efficiently in the O-band than in the other wavelength bands.

Highland C

FWH • Computational Imaging III—Continued

FWH4 • 11:30 a.m.

Task-Specific Information, *Amit Ashok[1], Pawan Baheti[1], Mark A. Neifeld[1,2]; [1]Dept. of Electrical and Computer Engineering, Univ. of Arizona, USA, [2]College of Optical Sciences, Univ. of Arizona, USA.* We present task-specific information as a metric to evaluate imaging system performance for a given task. Target detection in presence of clutter is used as a task to demonstrate the effectiveness of the proposed metric.

FWH5 • 11:45 a.m.

Multi-Domain Optimization for Ultra-Thin Cameras, *Michael D. Stenner, Amit Ashok, Mark A. Neifeld; Univ. of Arizona, USA.* Computational imaging architectures enable joint optimization of all imaging stages. We present a multi-domain optimization (MDO) framework and examples including a system with optical point-spread function and inversion tailored to minimize error from detector undersampling.

Highland D

FWI • Diffractive Micro- and Nanostructures for Sensing and Information Processing IV—Continued

FWI5 • 11:30 a.m.

Diffraction Gratings for a Compact Integrated Optical Micro-Spectrometer, *Ildar Salakhutdinov[1], Kalyani Chaganti[1], Ivan Avrutsky[1], Gregory W. Auner[1], Ed Basgall[2]; [1]Wayne State Univ., USA, [2]Nanofabrication Facility, Pennsylvania State Univ., USA.* The integrated optical micro-spectrometer based on of focusing diffraction grating fabricated by e-beam lithography with the size of optical part less than 0.1 cm and spectral resolution at least 5 nm has been developed.

FWI6 • 11:45 a.m.

Securing Holographic Three-Dimensional Information by Digital Fresnel Field Encryption, *Anith Nelleri, Joby Joseph, Kehar Singh; Indian Inst. of Technology, Delhi, India.* Complex Fresnel field retrieved from a digital off-axis Fresnel hologram is encrypted. Object information is directly decrypted in a single step. The noisy nature of the Fresnel field is helpful for single random phase encoding.

Highland E

FWJ • Ultrafast Lasers in Medicine and Biology II—Continued

FWJ5 • 11:45 a.m.

Laser-Induced Nanopores in Living Cells, *Cheng Peng, Robert E. Palazzo, Ingrid Wilke; Rensselaer Polytechnic Inst., USA.* We report the creation of nanometer-sized artificial pores in membranes of living cells by femtosecond near-infrared laser pulses. This is a novel approach to deliver molecules into which are resistant to conventional microinjection techniques.

Highland F

FWK • Nano- and Micro-Enhancement of NLO Effects II—Continued

FWK4 • 11:30 a.m. Invited

Nonlinear Optics in 1-D Polymer Structures, *James S. Shirk[1], R. S. Lepkowicz[1], Guy Beadie[1], A. Ranade[2], E. Baer[2], A. Hiltner[2]; [1]NRL, USA, [2]Case Western Reserve Univ., USA.* Nonlinear dielectric optical polymer structures that behave as 1D photonic crystals with some disorder are readily fabricated. These materials can perform useful optical functions: an intensity dependent nonlinear band gap is demonstrated.

Highland G

Frontiers in Optics

Highland H

Laser Science

LWD • Quantum Information II—Continued

LWD4 • 11:30 a.m.
Entangled Collective Dark States, *Hideomi Nihira, Carlos R. Stroud; Univ. of Rochester, USA.* We present an entangled collective dark state of a multilevel multipartite system, and show a systematic procedure to obtain these states relatively easily by exploiting the symmetries of the system.

LWD5 • 11:45 a.m.
Maximally Entangled Mixed States Made Easy, *Andrea Aiello, Graciana Puentes, Han Woerdman; Leiden Univ., Netherlands.* We show how to generate maximally entangled mixed states of two photons from the singlet state by using local linear-optical channels and postselection. Both theoretical predictions and experimental findings are presented.

Highland J

Joint

JWC • Spectroscopic Imaging for Disease Diagnostics—Continued

JWC4 • 11:30 a.m.
Femtosecond Nonlinear Spectroscopy on Biomolecules, *Zoe-Elizabeth Sariyanni[1], Yuri Rostovtsev[1], Torsten Siebert[2], Wolfgang Kiefer[2], Guy Beadie[3], John F. Reintjes[3], Marlan O. Scully[1,4]; [1]Dept. of Physics and Inst. for Quantum Studies, Texas A&M Univ., USA, [2]Inst. für Physikalische Chemie, Univ. Würzburg, Germany, [3]NRL, USA, [4]Princeton Inst. for the Science and Tech. of Materials and Dept. of Mechanical and Aerospace Engineering, USA.* We apply Coherent Anti-Stokes Raman Spectroscopy with femtosecond pulses on fast dephasing biomolecular media. We simulate the interaction, compare with the experiments and demonstrate its application as a real time detector for biochemical hazards.

JWC5 • 11:45 a.m. **Invited**
Spectral Encoding: A Novel Platform for Endoscopy and Microscopy, *Caroline Boudoux[1], Dvir Yelin[2], Jason T. Motz[2], Brett E. Bouma[2], Guillermo J. Tearney[2]; [1]Harvard-MIT Div. of HST and Wellman Ctr. for Photomedicine, USA, [2]Wellman Ctr. for Photomedicine, Harvard Medical School, USA.* Spectral encoding is a single optical fiber imaging approach that projects different wavelengths to distinct locations on a sample, enabling a wide variety of reflectance and fluorescence medical imaging devices for macroscopic imaging and microscopy.

Highland K

Laser Science

LWE • Quantum Dots—Continued

LWE4 • 11:30 a.m.
Suppression of Blinking in Solid-State Quantum Dot/Conjugated Organic Polymer Composite Nanostructures, *Nathan I. Hammer, Kevin T. Early, Michael Y. Odoi, Kevin Sill, Todd Emrick, Michael D. Barnes; Univ. of Massachusetts at Amherst, USA.* Single-molecule spectroscopy combined with AFM measurements reveal that CdSe quantum dots functionalized with oligo-phenylenevinylene ligands exhibit enhanced optical properties such as reduced blinking. The degree of polymer coverage is found to control this effect.

LWE5 • 11:45 a.m.
Optical Properties of a Molecule on the Surface of a Metallic Nanosphere in Strong Coupling Limit, *Railing Chang; Inst. of Optoelectronic Sciences, Natl. Taiwan Ocean Univ., Taiwan.* In strong coupling limit, a molecule on the surface of a metallic nanosphere is studied and the fluorescence and Raman spectra are evaluated using density matrix method.

Hyatt Grand Ballroom E/F

OF&T

OFWB • Optics for Telescopes—Continued

OFWB4 • 11:30 a.m. **Invited**
Optical Metrology for the 8.4m Diameter Mirror Segments for the 25m Giant Magellan Telescope, *Jim Burge, L. B. Kot, H. M. Martin, R. Zehnder, C. Zhao; Univ. of Arizona, USA.* The 25-m f/0.7 primary mirror for the Giant Magellan Telescope is made of seven 8.4 m segments, which will be measured interferometrically using a 3.75-m concave mirror, a smaller spherical mirror, and computer generated hologram.

Hyatt Regency Ballroom A/B

OPE

OPWB • Infrared OLEDs and Quantum Dots—Continued

OPWB3 • 11:30 a.m. **Invited**
Devices, *Vladmir Bulovic; MIT, USA.* No abstract available.

NOTES

FWK • Nano- and Micro-Enhancement of NLO Effects II—Continued

FWK5 • 12:00 p.m. Invited
Structure-Property Relationships for Organic Nonlinear Optical Materials, *Seth Marder; Georgia Tech, USA.* The real and imaginary third-order nonlinear optical properties of organic and metallo-organic materials will be discussed, highlighting promising materials for two-photon absorption and all optical switching.

12:00 p.m.–1:30 p.m. WOSA Luncheon, Hyatt Grand Ballroom C

Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom E/F	Hyatt Regency Ballroom A/B
Frontiers in Optics	**Laser Science**	**Joint**	**Laser Science**	**OF&T**	**OPE**

NOTES

LWE • Quantum Dots—Continued

LWE6 • 12:00 p.m.
Investigating Nonradiative Relaxation in Optically Pumped Er^{3+}-Doped BaTiO$_3$ Nanocrystals, *Glauco S. Maciel*[1], *Marcio Andre R. C. Alencar*[1], *Cid B. de Araujo*[1], *Amitava Patra*[2]; [1]*Dept. de Fisica - UFPE, Brazil,* [2]*Sol-Gel Div., Central Glass & Ceramic Res. Inst., India.* Luminescent Er^{3+}-doped BaTiO$_3$ nanocrystals were investigated in different media (air, water and glycerol) and temperatures (27 to 47 °C). The results showed that the nonradiative relaxation rate experienced by Er^{3+} changes with the particle size.

LWE7 • 12:15 p.m.
Initial State Selective Femtosecond Dynamics of Semiconductor Quantum Dots, *Patanjali Kambhampati, Samuel Sewall, Ryan Cooney, Kevin Anderson, Eva Dias; McGill Univ., Canada.* Femtosecond relaxation dynamics of colloidal CdSe quantum dots are measured for different initial excitonic states. These experiments show dramatic, previously unobserved dynamics at all probe wavelengths based upon preparation of the initial state.

OPWB • Infrared OLEDs and Quantum Dots—Continued

OPWB4 • 12:00 p.m.
Thiophenol-Modified CdS Nanoparticles Enhance the Luminescence of Benzoxyl Dendron-Substituted Polyfluorene Copolymers, *Kung-Hwa Wei, Hsu-Shen Wang, Mao-Yuan Chiu, So-Lin Hsu; Natl. Chiao Tung Univ., Taiwan.* We have prepared highly luminescent dendron-substituted copolyfluorenes that incorporate surface-modified cadmium sulfide nanoparticles. Both the photoluminescence and electroluminescence efficiencies of the polymer nanocomposites are dramatically enhanced relative to the values of the pure polymer.

12:00 p.m.–1:30 p.m. WOSA Luncheon, Hyatt Grand Ballroom C

12:00 p.m.–1:30 p.m.
JWD • Joint FiO/LS Poster Session II

OPTICAL DESIGN AND INSTRUMENTATION POSTERS

JWD1
Polarization Properties of Forked Holographic Grating for Producing Optical Vortices, *Ravindra P. Singh, Virendra K. Jaiswal; Physical Res. Lab, India.* It is important to know what happens to initial polarization during formation of optical vortices. We use Mueller matrix to quantify changes in polarization introduced by the forked holographic grating that produces an optical vortex.

JWD2
Propagation of Focused Vector Helmholtz-Gauss Beams, *Raul I. Hernández-Aranda[1], Miguel A. Bandres[2], Julio C. Gutiérrez-Vega[1]; [1]Tecnologico de Monterrey, Mexico, [2]Caltech, USA.* We examine the free-space propagation characteristics of focused vector Helmholtz-Gauss (vHzG) beams. A closed-form expression for the vector field distribution at the focal plane is derived and exemplified for several types of vHzG beams.

JWD3
Composite Optical Vortices by Superpositions of Collinear Laguerre-Gauss Beams, *Enrique J. Galvez, Nikhil Fernandes, Nathan Smiley; Colgate Univ., USA.* We study the optical beam that results when two collinear beams in Laguerre-Gauss modes are superimposed. We observe the creation of vortices whose positions depend on the relative amplitude and phase of the component beams.

JWD4
Color Appearance and Imaging Quality in Videophone with Free-Form Optics, *Jyh-Long Chern, Chih-Yu Liu, Pi-Ying Chuang; Dept. of Photonics, IEO, Natl. Chiao Tung Univ., Taiwan.* Imaging performance and color rendering property of a free-form optical prism that plays camera lens and projection display are investigated. Complementary designs in photoptic and scotopic environments are developed for superior color adaptation and optimization.

JWD5
Development of Lighting System for Hologram Using High Power LEDs, *Takehisa Shibuya[1], Junko Baba[1], Hisashi Asakawa[2], Moriaki Wakaki[1]; [1]Tokai Univ., Japan, [2]Marumo Electric Co., Ltd., Japan.* LED became popular rapidly by the appearance of blue LED. In this study, we aim to fabricate the illumination system using high brightness LED for the hologram illumination instead of the conventional halogen lamp.

JWD6
Uniformity Analysis of Low f/# Two-Lens Illumination System with Extended Light Sources, *Zhiling Xu; X-Rite, Inc., USA.* The uniformity of two-lens illumination system with extended light sources was analyzed. It was found that the using of different focal-length front lens follows the same uniformity-efficiency trend curve.

JWD7
Slanted Hole Array Beam Profiler (SHArP)—A High-Resolution Portable Beam Profiler Based on a Slanted Linear Aperture Array, *Xiquan Cui, Xin Heng, Jigang Wu, Zahid Yaqoob, Demetri Psaltis, Changhuei Yang; Caltech, USA.* A high-resolution portable beam profiler based on a linear aperture array fabricated on a metal coated CMOS imaging sensor is introduced. With single linear scan, it establishes a dense virtual sensing grid for beam profiling.

JWD8
Dynamic Range Compression Deconvolution Based on MEMS Deformable Mirror Optical Limiter, *Bahareh Haji-saeed[1], Sandip K. Sengupta[1], William D. Goodhue[2], Jed Khoury[3], Charles L. Woods[3], John Kierstead[4]; [1]Electrical and Computer Engineering Dept., Univ. of Massachusetts at Lowell, USA, [2]Physics Dept., Univ. of Massachusetts at Lowell, USA, [3]AFRL / SNHC, Hanscom Air Force Base, USA, [4]Solid State Scientific Corp., USA.* In this paper an optical limiter MEMS based Dynamic Range Compression deconvolver is proposed. The deconvolution orders of this device using nonlinear transform methods has been analyzed.

JWD9
***CW* Achromatic Thermal Lens Spectroscopy Experiment,** *Aristides Marcano, Noureddine Melikechi; Delaware State Univ., USA.* We describe a mode-mismatched *cw* achromatic thermal lens experiment with focused pump beam and collimated probe beam. We compare this scheme to the usual mode-matched experiment showing its superior performance when performing spectroscopy.

JWD10
Wobble Correcting Beam-Folding Interferometer and Its Application on the UV-Visible FTS, *Xuzhu Wang, Robert K. Y. Chan; Dept. of Physics, Hong Kong Baptist Univ., Hong Kong.* A wobble correcting beam-folding technique is reported. The UV-visible Fourier Transform Spectrometer (FTS), with a ball-bearing translation stage, based on this technique can achieve a resolution of 0.28 cm^{-1} at the He-Ne laser (632nm) wavelength.

JWD11
Photoelastic Modulated Imaging Ellipsometry in Surface Plasmon Resonance Detection, *Yu-Faye Chao, Hsiu-Ming Tsai, Chien-Yuan Han; Dept. of Photonics, Inst. of Electro-Optical Engineering Natl. Chiao Tung Univ., Taiwan.* The photoelastic modulated (PEM) imaging ellipsometry is used to measure the immobilization of Protein A on biochip through the micro-channel. Its lateral and temporal resolution of ellipsometric parameters are 4µm and 13sec, respectively.

JWD12
Performance Tolerance of Single Zone Flat-Top Beam Shapers, *Zhiqiang Liu[1], Jame J. Yang[2], Michael R. Wang[1]; [1]Univ. of Miami, USA, [2]New Span Opto-Technology Inc., USA.* A binary-phase element for shaping a Gaussian beam to a flat-top beam is presented. The analysis shows increased beam shaper fabrication tolerance which can be beneficial for low-cost prototyping and production of flat-top beam shapers.

JWD13
Fiber Optic Sensor System for Estimation of Atmospheric Corrosion of Metals, *A. Balaji Ganesh, T. K. Radhakrishnan, G. Gobi, D. Sastikumar; Natl. Inst. of Techology, India.* A fiber optic sensor system is developed to probe the changes in surface texture of corroded metals. The calculated surface roughness factor is used to estimate the corrosion of metals.

JWD14
Coherence-Polarization Measurements by Reversed-Wavefront Interferometers, *Alexis K. Spilman Lanning[1], Riccardo Borghi[2], Massimo Santarsiero[2], Thomas G. Brown[1], Franco Gori[2], Miguel A. Alonso[1]; [1]Univ. of Rochester, USA, [2]Univ. Roma Tre, Italy.* A novel experimental technique, based on a Michelson-Young interferometer combination, for measuring spatial correlations of partially coherent, partially polarized quasi-monochromatic light fields is proposed.

JWD15
Non-Paraxial Ray Packet-Based Simulation of Laser Beam Propagation, *Konstantin Karapetyan; SRC, Russian Federation.* Presented is the mathematical apparatus allowing application of a ray packet model to simulation of propagation of laser beams through aberrated and non-rotationally symmetric optical systems.

JWD16
A Compact Fabry-Perot Grating Cascaded Spectrometer, *Majid Badieirostami[1], Omid Momtahan[1], Ali Adibi[1], David J. Brady[2]; [1]Georgia Tech, USA, [2]Duke Univ., USA.* We designed a compact spectrometer by cascading a Fabry-Perot etalon and a grating. The grating expands the spectral range of the Fabry-Perot and the combination of both results in two-dimensional diversity in the output plane.

OPTICAL SCIENCES POSTERS

JWD17
Optical Thin Films with Extremely Low Refractive Index, *J.-Q. Xi, Jong Kyu Kim, Dexian Ye, Jasbir S. Juneja, T.-M. Lu, Shawn-Yu Lin, E. F. Schubert; Rensselaer Polytechnic Inst., USA.* An optical thin film consisting of SiO_2 nano-rods is demonstrated to have an extremely low refractive index of $n = 1.08$. This is the lowest refractive index ever reported for viable optical thin film.

JWD18
Source Interaction with Epsilon-Near-Zero (ENZ) Materials, *Andrea Alù, Mario Silveirinha, Alessandro Salandrino, Nader Engheta; Univ. of Pennsylvania, USA.* We analyze the electromagnetic behavior of plasmonic materials with permittivity near zero when realistic sources excite them. We show how such materials may be used to manipulate the phase fronts for imaging and optical applications.

JWD19
Isotropic Negative Permeability at Optical Frequencies, *Andrea Alù, Nader Engheta; Univ. of Pennsylvania, USA.* Inducing a negative permeability in optical metamaterials is currently under investigation by several research groups. Here we propose a setup providing a 3-D isotropic magnetic response at optical frequencies exploiting resonant plasmonic nanoparticles.

JWD20
Plane Waves in 3D Periodic Distributions of Particles with High-Order Multipole Polarizabilities, *Jingjing Li, Nader Engheta; Univ. of Pennsylvania, USA.* Plane wave propagation in 3D periodic arrays of particles with high-order multipole polarizabilities is studied by generalizing the method for dipole scatterer arrays, based on the relationship between the local field and the induced multipoles.

JWD21
Spontaneous Emission Spectrum of a Three-Level Lambda-Type Atom in Modified Isotropic Photonic Crystals, *Xiudong Sun, Xiangqian Jiang; Harbin Inst. of Technology, China.* Considering a three-level lambda-type atom coupled to the modified isotropic photonic crystals (PCs), we investigate the spontaneous emission spectrum by using resolvent operator. Due to introducing the smooth factor epsilon, the singularity in spectra disappears.

JWD • Joint FiO/LS Poster Session II — Continued

JWD22

Optical Intensity Sensing and Limiting Using Nonlinear Photonic Crystals, *Igor A. Sukhoivanov[1], Igor V. Guryev[2], Edgar Alvardo-Mendez[1], Jose A. Andrade-Lucio[1]; [1]FIMEE, Univ. de Guanajuato, Mexico, [2]Lab "Photonics", Natl. Univ. of Radio Electronics, Ukraine.* We demonstrate the using of 1D nonlinear photonic crystals to intensity sensing of high-power optical signals and for optical power limiting. The analytical expression for dependence of the reflectivity on the radiation intensity is presented.

JWD23

Near-Field from Surface Plasmon in Metallic Bigrating, *Raúl García-Llamas[1], Jorge Gaspar-Armenta[1], Manuel Leyva-Lucero[2]; [1]Univ. de Sonora, Mexico, [2]Univ. Autónoma de Sinaloa, Mexico.* The diffraction of p- polarized electromagnetic plane waves from square lattice metallic bigratings is studied theoretically. Numerical results of the diffraction orders and Near-Field are obtained using both, two-dimensional sinusoidal and semicircular profiles.

JWD24

Band Structure and Coupled Surface Plasmons in One Dimensional Photonic Crystals, *Michael Bergmair, Kurt Hingerl; CD-Lab, Austria.* A one dimensional photonic crystal made of metallic sheets provides a huge band gap which is omnidirectional for all angles of incidence. Parallel propagation of light yields the physics of surface plasmons in such systems.

JWD25

Light Propagation through Dual-Periodic 1D Photonic Crystal, *Alexey G. Yamilov, Mark Herrera, Massimo F. Bertino; Univ. of Missouri-Rolla, USA.* We consider 1D photonic lattice with short- and long-range refractive index modulations. We demonstrate that these structures allow easy control of light propagation within photonic bands. Slow-light applications and their experimental realization will be discussed.

JWD26

Bragg Fiber with a Photonic Crystal Like Core, *Javier Sánchez-Mondragón[1,2], Celso Vásquez-Ordoñez[1], Miguel Basurto-Pensado[2], Ismael Torres[3], A. Alejo-Molina[3], Abundio Dávila[3]; [1]Photonics Lab, INAOE, Mexico, [2]Univ. Autónoma del Estado de Morelos(UAEM), Ctr. de Investigaciones en Ingeniería y Ciencias Aplicadas, Mexico, [3]Ctr. de Investigaciones en Óptica, Mexico.* Bragg Fibers whose core has been filed up by a structure of nanospheres whose assembly resembles a finite Opal Like Photonic crystal. The numerical solutions are discussed, as well as the experimental feasibility.

JWD27

Coherence and Polarization Properties of Electromagnetic Laser Modes, *Emil Wolf[1,2]; [1]Univ. of Rochester, USA, [2]College of Optics, CREOL and FPCE, Univ. of Central Florida, USA.* It is shown that each transverse electromagnetic mode in a rotationally symmetric laser resonator cavity is completely spatially coherent; and that its degree of polarization is the same at every point of the cavity mirrors.

JWD28

Systematic Investigation of High-Order Harmonics from Silver, Indium and Tin Ablation, *Tsuneyuki Ozaki[1], Luc Elouga Bom[1], Masayuki Suzuki[2], Hiroto Kuroda[2]; [1]INRS-EMT, Canada, [2]ISSP, Univ. of Tokyo, Japan.* Systematic investigation of ablation harmonics are performed for various targets, using the 40 mJ, 25 fs output from the Advanced Laser Light Source. Optimum pre-pulse and main pulse conditions for ablation harmonics are studied.

JWD29

Slow Light Using the Three-Photon Effect in a Dressed Two-Level Atomic System, *Yuping Chen, Petros Zerom, Zhimin Shi, Robert W. Boyd; Inst. of Optics, Univ. of Rochester, USA.* Slow light induced by the three-photon effect is studied theoretically. We have found that an appreciably large group index (on the order of 10^2—10^3) can be obtained under accessible experimental conditions.

JWD30

Observation of Superfluorescent Emissions from Laser Cooled Rb Atoms, *E. Paradis[1], B. Barrett[1], A. Kumarakrishnan[1], G. Raithel[2]; [1]York Univ., Canada, [2]Univ. of Michigan, USA.* We present studies of superfluorescent pulses observed at 420.3 nm from a sample of laser cooled rubidium atoms that are excited to the $5D_{5/2}$ excited state by a two-photon transition from the $5S_{1/2}$ ground state.

JWD31

Ring-Opening Reaction of 1,3-Cyclohexadiene: Ultrafast Laser Spectroscopy of $^1B_2$ Excited State, *Narayanan Kuthirummal[1], Peter Weber[2]; [1]College of Charleston, USA, [2]Brown Univ., USA.* Photoelectron spectra of 1,3-cyclohexadiene in the ultrashort-lived 1^1B_2 state have been investigated. The C=C stretching vibration at 1350 cm^{-1} is prominent, which likely is responsible for the entire ring opening event in CHD.

JWD32

XUV Multilayer Coating Design for Attosecond Pulse Compression, *Michele Suman, Fabio Frassetto, Piergiorgio Nicolosi, Maria Pelizzo; Dept. of Information Engineering, Univ. of Padova, Italy.* Multilayer techniques are used to obtain high reflectivity in the XUV spectral region. This work presents an optimization algorithm based on "evolutive strategy" for designing optimal "wide" band aperiodic multilayer mirrors for attosecond pulse compression.

JWD33

Measuring Spatio-Temporal Distortions in Ultrafast Optics Using Normalized Coefficients, *Pablo Gabolde, Dongjoo Lee, Selcuk Akturk, Rick Trebino; Georgia Tech, USA.* We present a general method to characterize the magnitude of spatio-temporal distortions present in ultrashort pulses of arbitrary profiles using normalized parameters that are restricted to the range [-1, 1].

JWD34

Numerical Simulations of GRENOUILLE, *Xuan Liu[1], Rick Trebino[1], Arlee V. Smith[2]; [1]Georgia Tech, USA, [2]Sandia Natl. Labs, USA.* We simulate the performance of GRENOUILLE for measuring ultrashort laser pulses. We computed the tightly focused signal field and considered all on- and off-axis sum-frequency-generation processes. We show that accurate measurements can be easily obtained.

JWD35

Spatial-Profile Effects and their Removal in Ultrashort-Laser-Pulse Measurement Using GRENOUILLE, *Lina Xu, Ziyang Wang, Selcuk Akturk, Rick Trebino; Georgia Tech, USA.* We show that the effect of a non-uniform beam spatial profile can be removed from GRENOUILLE measurements of ultrashort-laser-pulses. Consequently, single-shot measurements can be performed even when a beam has poor spatial quality.

JWD36

Femtosecond Laser Nanostructuring of Metals, *Anatoliy Y. Vorobyev, Chunlei Guo; Inst. of Optics, Univ. of Rochester, USA.* We report on various nanostructures produced through direct surface modification of metals using femtosecond laser pulses. We show that nanostructures are a natural consequence of femtosecond laser ablation. Optimal conditions for nanostructuring are determined.

JWD37

Ultrafast Laser Pulsetrain-Burst (>100 MHz) Processing of Glasses and Resultant Hole Morphologies, with Application to Damage Mitigation, *Luke McKinney[1], Jesse Dean[1], Paul Forrester[1], Marc Nantel[2], Robin Marjoribanks[1,3]; [1]Univ. of Toronto, Canada, [2]Photonics Res. Ontario, OCE Inc., Canada, [3]Inst. for Optical Sciences, Canada.* Ultrafast-laser pulsetrain-burst processing (microsecond bursts at 100 MHz) as a method of fluence delivery affords special control of residual heat; we present the evolution of machined features, background science, and investigate mitigation of laser-induced damage.

JWD38

Improvement of Chirped Mirror Design for Femtosecond Pulse Compression, *S. O. Yakushev[1], O. V. Shulika[1], V. V. Lysak[2], S. I. Petrov[1], I. A. Sukhoivanov[3]; [1]Kharkov Natl. Univ. of Radio Electronics, Ukraine, [2]Gwangju Inst. of Science and Technology, Republic of Korea, [3]FIMEE, Univ. de Guanajuato, Mexico.* We developed model for interaction of fs-pulse with chirped mirrors. Model possesses predictive capabilities. We found there are domains of stable and unstable compression under variation of layer number, which is unpredictable with present counterparts.

JWD39

Comparison of Three Methods to Measure the Coherence Length of a Low Coherence Source, *Maximino L. Arroyo Carrasco, Marcela M. Méndez Otero, René O. Hernández Sánchez, Alma Arroyo Vélez, Erwin Martí Panameño; FCFM BUAP, Mexico.* We measure the coherence length of a Super Luminescent Diode with three different methods; its spectral profile, the visibility of an interference pattern and the photo-EMF effect. These permit us to compare the three techniques.

JWD40

Wigner Functions for Non-Paraxial Fields: Interfaces, *Jonathan C. Petruccelli, Miguel A. Alonso; Inst. of Optics, Univ. of Rochester, USA.* The transformation of the angle-impact Wigner function of nonparaxial fields upon refraction/reflection at interfaces between media is expressed as a series of operators. The resulting terms are examined for Gaussian Schell-model fields.

JWD41

Experimental Realization of the Adjustable Partially Coherent Bottle Beams, *Jixiong Pu, Meimei Dong; Huaqiao Univ., China.* We report, to our knowledge, the first experimental realization of partially coherent bottle beams. It is shown that by controlling the coherence of the incident light we can generate the adjustable partially coherent bottle beams.

JWD42

A Sufficient Condition for Non-Negative Definiteness of Cross-Spectral Densities, *Franco Gori, Massimo Santarsiero, Riccardo Borghi; Univ. Roma Tre, Italy.* The choice of functions used as cross-spectral densities is restricted by the constraint of non-negative definiteness. A sufficient condition for ensuring satisfaction of the definiteness constraint is discussed and several examples of application are given.

JWD • Joint FiO/LS Poster Session II — Continued

JWD43

Coherence Momentum in Second-Order Vectorial Coherence Theory of Stationary Electromagnetic Fields, *Wei Wang, Mitsuo Takeda; Univ. of Electro-Communications, Japan.* In analog to the electromagnetic momentum, we introduce vector and tensor densities to the general coherence theory of vector electromagnetic fields, and present new conservation laws for the second-order correlation functions.

JWD44

Reflection and Transmission of Light Beams at a Curved Surfaces: Coherent States Approach, *Nikolai I. Petrov; Samsung Electronics Co., Ltd., Russian Federation.* Phase-space procedure based on coherent state representation is proposed for investigation of reflection and transmission of light at a curved dielectric boundary. Numerical simulations of beams reflection and transmission at various boundaries are carried out.

JWD45

Applying the Hilbert Phase Analysis to the Study of Atmospheric Turbulence Data, *Carlos O. Font[1,2], Mark Chang[2], Charmaine Gilbreath[1], Eun Oh[3]; [1]Freespace Photonics Communications Office, NRL, USA, [2]Univ. of Puerto Rico, USA, [3]Remote Sensing Div., NRL, USA.* Hilbert Phase Analysis is a new technique that combined with the Hilbert-Huang Decomposition method allows analysis of a non-stationary data. We apply this method for the study of the C_n^2 parameter and weather data.

JWD46

Efficient Mid-IR Generation in Reverse-Proton Exchanged Lithium Niobate Waveguides, *Rostislav V. Roussev, Supriyo Sinha, Robert L. Byer, Martin M. Fejer; Stanford Univ., USA.* We report on the design and fabrication of reverse-proton-exchanged lithium niobate waveguides for difference-frequency generation of 3-4 micron radiation. 14 mW of single-frequency CW power was generated at 3.3 microns.

JWD47

Light Reflection Scattering Enhancement by Surface Waves at the Surface of a One Dimensional Photonic Crystal, *Aldo S. Ramírez-Duverger, Raúl García-Llamas, Jorge Gaspar-Armenta; Dept. de Investigaciones en Fisica, Univ. de Sonora, Mexico.* One-dimensional photonic crystal supporting a surface electromagnetic wave inside the first band gap, was developed to demonstrate experimentally that light scattering is enhanced when the incident light is in resonance with the surface wave.

JWD48

Sagnac Effect in Goedel's Universe, *Endre Kajari[1], Reinhold Walser[1], Wolfgang P. Schleich[1], Aldo Delgado[2]; [1]Dept. of Quantum Physics, Univ. of Ulm, Germany, [2]Dept. de Fisica, Univ. de Concepcion, Chile.* We consider the Sagnac effect of counter-propagating light beams in the curved spacetime of Goedel's universe. Furthermore, we discuss how far it can be distinguished from a rotating frame in flat spacetime using Sagnac interferometry.

JWD49

Modeling Second Harmonic Generation and Parametric Excitation by a Bi-Frequency Pendulum, *Boris Y. Zeldovich, Chris Atkins, Amanda Hughes; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* Second Harmonic Generation and Parametric Excitation require phase-matching, central symmetry violation, angular or other tuning of uniaxial crystal, seed for subharmonics etc. These difficult subjects are illustrated by a bi-frequency pendulum of special design.

JWD50

Plastic Optical Fiber with Inner Imperfections for Displacement Application, *Jonathan Maryles, Zvi Weinberger, Aharon Kreysler, Anatoly Babchenko; Jerusalem College of Technology, Israel.* The paper presents the latest experimental results for the displacement sensor based on inner-side imperfected bent plastic optical fiber. The location of the imperfection area with maximum increase and decrease in sensor sensitivity is defined.

JWD51

Generalized Spatial Correlation and Speckle Analysis of Laser Speckle, *Kaiqin Chu, Nicholas George; Inst. of Optics, Univ. of Rochester, USA.* We calculate the correlation of a laser speckle field using the Rayleigh-Sommerfeld-Smythe integral formula. The nonparaxial formulas for speckle sizes are new and the other results are consistent with the well-known solutions in the literature[1,2].

OPTICS IN BIOLOGY AND MEDICINE POSTERS

JWD52

Selective Excitation of Fluorescent Proteins on the Basis of the Two-Photon Absorption Spectrum Measurement, *Masahiro Tanaka[1], Junji Tada[1], Fumihiko Kannari[1], Hiroyuki Kawano[2], Hideaki Mizuno[2], Atsushi Miyawaki[2], Akira Suda[3], Katsumi Midorikawa[3]; [1]Keio Univ., Japan, [2]Lab for Cell Function Dynamics, Brain Science Inst., RIKEN, Japan, [3]Laser Technology Lab, RIKEN, Japan.* Combining an ultra-broadband laser pulse and a fringe resolved autocorrelation scheme followed by Fourier transform analysis, we demonstrate measurement of the two-photon absorption spectra of fluorescent proteins to design optimal laser pulses for selective excitation.

JWD53

Measurement of Near-Field Femtosecond Light Pulses Enhanced by a Metal Probe by Autocorrelation, *Yuri Terada, Koichi Tamura, Fumihiko Kannari; Keio Univ., Japan.* We measured a fringe-resolved autocorrelation waveform of near-field femtosecond light generated at a metal probe used in a reflection-type aperture-less scanning near-field optical microscopy for the first time.

JWD54

Holoprojection of Transmission Objects Using a Diffractive Grating, *Jose J. Lunazzi, Noemí I. R. Rivera; Campinas State Univ.-UNICAMP, Brazil.* A transmission object is projected on a diffractive grating. An extended filament of a white light lamp is the only additional element necessary to form images with normal depth.

JWD55

Fluorescence Spectroscopy for Detection of Citrus Canker in Orange Plantation, *Emery Lins[1], José Belasque[2], Maria C. Gasparoto[2], Vanderlei S. Bagnato[1], Luis G. Marcassa[1]; [1]Inst. de Fisica de São Carlos, Brazil, [2]Fundecitrus, Brazil.* In this work, we investigate the use of induced fluorescence for the detection of Citrus Canker in orange plantations in Brazil. The spectrum allows us to detect the disease in a very early stage.

JWD56

Spatial-Spectral Holographic Interpretation of High Field NMR Imaging, *Andrew J. Kiruluta; Harvard Univ., USA.* The MR imaging equation can be derived from a 3D spatial-spectral holographic interpretation similar to that in quantum optics. It is shown that an NMR absorber can accomplish holographic characteristics such as storage and time-reversal.

JWD57

Determination of Local Optical Parameters of Turbid Media with Optical Fibers, *Huafeng Ding, Jun Q. Lu, Cheng Chen, Gorden E. Downie, Xin-Hua Hu; East Carolina Univ., USA.* A fiber based method has been developed to determine local optical parameters of μ_a, μ_s and g of turbid samples and human tissues by comparing the probed light signals to the Monte Carlo simulation results.

OPTICS IN INFORMATION SCIENCE POSTERS

JWD58

Spectral Transmission of Volume Bragg Gratings: Influence of Uncompensated Fresnel Reflections, *Leon Glebov, Julien Limeau, Sergiy Mokhov, Boris Y. Zeldovich; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* Spectral profile of reflective Volume Bragg Gratings is studied with account of interference effects of Fresnel boundaries, partially or completely uncoated. Small boundary contributions diminish considerably transmissivity in the region designated for 100% transmission.

JWD59

Extended Depth of Field: Axially Merging Foci, *Jorge Ojeda-Castañeda[1], A. Sauceda-Carvajal[2], J.e.a. Landgrave[3]; [1]Univ. of the Americas, Mexico, [2]Ctr. de Investigación en Micro y Nanotecnología, Univ. Veracruzana, Mexico, [3]Ctr. de Investigaciones en Optica, Mexico.* We present a family of phase-only zone plates with substructure rings. For extending the depth of field, the foci are merged axially. And the substructure rings follows sequences used in spread spectrum techniques.

JWD60

Crossed-Gratings Volume Hologram: Backward Reflection with High Angular and Spectral Selectivity, *Chang Ching Tsai, Boris Y. Zeldovich, Leon Glebov, Steven Frederick; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* Reflection hologram is suggested with two volume gratings at 90° to each other and at 45° to the incident beam. Diffraction properties are calculated. High efficiency and unusually high angular selectivity are predicted.

JWD • Joint FiO/LS Poster Session II — Continued

JWD61

Angular Size Measurement: Noncoherent Talbot Images, *P. Rodríguez-Montero[1], Cristina M. Gómez-Sarabia[2], Jorge Ojeda-Castañeda[2]; [1]INAOE, Mexico, [2]Univ. of the Americas, Mexico.* We present a robust optical technique for evaluating the angular size of a source, by using a photoinduced electromotive force detector that measures the average visibility of the irradiance patterns at Talbot images.

JWD62

Performance of Computer Generated Volume Holograms Directly Written with a Femtosecond Laser, *Tim D. Gerke, Rafael Piestun; Dept. of Electrical Engineering, Univ. of Colorado at Boulder, USA.* We study the performance of computer generated volume holograms in terms of efficiency and angular and frequency selectivity. We demonstrate that the performance is on par with interferometrically written volume holograms.

JWD63

Binary Encoding and Nanotagging Using Plasmonic Core-Shell Nanoparticles, *Divya Krishnan, Alessandro Salandrino, Nader Engheta; Univ. of Pennsylvania, USA.* We present a frequency-domain binary encoding/tagging using a set of core-shell nanoparticles. The frequency content of signals from this set contains peaks corresponding to plasmonic resonances of particles and can be interpreted as binary digits.

JWD64

Pseudo-Fourier Modal Analysis on Dielectric Structures with Arbitrary Permittivity and Permeability Tensors, *Hwi Kim, Seyoon Kim, Junghyun Park, Il-Min Lee, Byoungho Lee; Seoul Natl. Univ., Republic of Korea.* Three-dimensional version of the recently proposed pseudo-Fourier modal analysis method for solving the Maxwell equations of dielectric structures with three-dimensional arbitrary permittivity and permeability tensors is described. Its parallel implementation is described for practical calculation.

JWD65

Electromagnetic Field for a Symmetric Biconvex Microlens with Arbitrary Illumination, *John P. Barton; Univ. of Nebraska-Lincoln, USA.* A spheroidal coordinate separation-of-variables solution is applied to theoretically investigate the focusing and imaging properties of a symmetric biconvex microlens. Calculations are performed for five, ten, and twenty wavelength diameter microlenses.

JWD66

Joint Spectral-Spatial Pattern Recognition and Target Segregation, *Jian Fu[1], John H. Caulfield[2], Kaveh Heidary[3]; [1]Computer Science Dept., Alabama A & M Univ., USA, [2]Alabama A & M Univ. Res. Inst., USA, [3]Electrical and Computer Engineering Dept., Alabama A & M Univ., USA.* Near metamers of patterns were sensed by a CCD camera and Artificially Colored to favor one over the others. This Artificially Colored scene was searched for targets of the desired color by Fourier correlation.

JWD67

Alternative Coherent-Mode Representation of a Planar Source in Computational Imaging, *Andrey S. Ostrovsky, Alexandre M. Zemliak, Mario V. Rodríguez Solís, Paulo C. Romero Soria; Univ. Autonoma de Puebla, Mexico.* The alternative coherent-mode representation of a planar source with unknown cross-spectral density is defined from the results of radiometric measurements. The example of such a representation of the Lambertian source is given.

JWD68

Surface-Strain-Induced Second-Harmonic Generation in Silicon, *Tatyana V. Dolgova, Vladimir O. Bessonov, Anton I. Maidykovsky, Oleg A. Aktsipetrov; Moscow State Univ., Russian Federation.* The contribution of the buried Si-SiO_2 interface strain to second-harmonic generation (SHG) is observed and isolated clearly from internal electric-field-induced SHG by applying external deformation of specific geometry to (100) crystalline silicon plate.

JWD69

Optical Realization of Bio-Inspired Spiking Neurons in SrS:Eu^{2+},Sm^{3+} Thin Film, *Ramin Pashaie, Nabil Farhat; Univ. of Pennsylvania, USA.* An infrared stimulable electron trapping material combined with suitable optical bi-stability is considered as a medium for optical realization of the stylized Hodgkin-Huxley model of the biological neuron. Parallelism between these two dynamics is discussed.

JWD70

Optical Quantum Computing on Base of Photon Echo Effect, *Elena V. Melnitchenko, Edward A. Manykin; MEPhI (State Univ.), Russian Federation.* Application of photon-echo (PE) effect for optical quantum computation is considered. We show that architecture of a PE-based laser device is appropriate for quantum computation. One-way quantum computational scheme is chosen as quantum computer architecture.

JWD71

Implementation of Boolean Logic by an Optics-Inspired Architecture, *Joseph Shamir[1], James Hardy[2]; [1]Technion, Israel, [2]Idaho State Univ., USA.* We present a general architecture for accomplishing Boolean logic in optics. The architecture represents a new approach to doing logic designed from the ground up to be implemented in optics.

JWD72

Non-Diffracting Random Intensity Patterns, *Jeffrey A. Davis, Don M. Cottrell, Julia M. Craven; San Diego State Univ., USA.* We report a new type of non-diffracting random intensity pattern that does not change with propagation. Theory and experimental results are shown where we encode the generating pattern onto a phase-only liquid crystal display.

JWD73

Improved 405-nm Diode-Pumped Downconversion Entanglement Source, *Michael E. Goggin[1,2], Nicholas A. Peters[2], Julio T. Barreiro[2], Joseph Yasi[2], Radhika Rangarajan[2], Paul G. Kwiat[2]; [1]Truman State Univ., USA, [2]Univ. of Illinois at Urbana-Champaign, USA.* We show that a temporal precompensatiton scheme similar to the one used for pulsed pumps improves the tangle of cw diode sources utilizing two-crystal type-I spontaneous parametric downconversion.

JWD74

Large Alphabet Quantum Key Distribution, *John Howell, Irfan Ali Khan, Curtis Broadbent; Univ. of Rochester, USA.* A large alphabet quantum cryptosystem will be presented. Instead of using qubits having two states we have generated secure keys having well over 100 states. This significantly increases information throughput without changing the transmission rate.

JWD75

Shadow Vision Enhancement Using Polarization Imaging, *Shih-Schön Lin[1], Konstantin M. Yemelyanov[1], Edward N. Pugh Jr.[2], Nader Engheta[1]; [1]Electrical and Systems Engineering Dept., Univ. of Pennsylvania, USA, [2]F. M. Kirby Ctr. for Molecular Ophthalmology and Inst. of Neurological Sciences, Univ. of Pennsylvania, USA.* Shadow is omnipresent in natural scenes. Conventional imaging methodologies are less effective in detecting features in shadow regions. Polarization imaging exploits another dimension of light that increases detection sensitivity in shadow and reveals hidden features.

PHOTONICS POSTERS

JWD76

S-Band Distributed Raman Amplification over 100 km Fiber Span, *Fausto H. Mizutani, Jair Fiúza, Samuel Iglesias, Maria A. G. Martinez; Univ. Presbiteriana Mackenzie, Brazil.* The feasibility of 70nm Raman distributed amplification in the S-band, with 25 dB on-off gain and ripple smaller than 3dB, over 100km fiber span is numerically demonstrated using fiber measured and properly estimated physical parameters.

JWD77

Modeling Parallel Anti-Symmetric Waveguide Bragg Gratings Using Modified Rouard's Method, *Jose M. Castro, David F. Geraghty; Univ. of Arizona, USA.* Optical devices based on the anti-symmetric grating were already demonstrated for WDM and OCDMA. We present a simple modeling tool for the design of these gratings. Novel gratings structures and applications are proposed.

JWD78

MEMS Based Optical Limiter, *Jed Khoury[1], Charles L. Woods[1], Bahareh Hajisaeed[2], Sandip K. Sengupta[2], William D. Goodhue[3], John Kierstead[4]; [1]AFRL / SNHC, Hanscom Air Force Base, USA, [2]Electrical and Computer Engineering Dept., Univ. of Massachusetts at Lowell, USA, [3]Physics Dept., Univ. of Massachusetts at Lowell, USA, [4]Solid State Scientific Corp., USA.* In this paper we demonstrate the design of a MEMS-deformable-mirror based optical limiter which deflects parabolicaly. Conversion of membrane deflection into intensity is described. The operating theory of this optical limiter device has been developed.

JWD79

Nanoapertures Near Field Properties and Conditions for the Nanoparticles Optical Trapping, *Juan M. Merlo, Erwin A. Martí Panameño, Maximino L. Arroyo Carrasco; Benemerita Univ. Autonoma de Puebla, Mexico.* Based on Bethe's complete Green function, we found an analytic expression for the diffracted field produced by a circular nanoaperture. The normalized intensity and the optical forces properties in the near field regime are discussed.

JWD • Joint FiO/LS Poster Session II — Continued

JWD80

Perturbation Theory of Dispersion-Managed Solitons, *Mário F. Ferreira, Mayra Sousa; Dept. of Physics, Univ. of Aveiro, Portugal.* The adiabatic evolution equations of the dispersion-managed pulse parameters under perturbations are obtained, considering an arbitrary pulse profile. The effects of several perturbations, such as the amplifier noise, higher-order dispersion, and nonlinear interaction, are analyzed.

JWD81

Slow Light Near Two Absorbing Rb Resonances, *Ryan Camacho, Michael Pack, John Howell; Univ. of Rochester, USA.* We consider group delay and broadening using two strongly absorbing resonances. Large pulse bandwidths and large group delays with small broadening are achieved. We report up to 50 pulse delays with 40% broadening.

JWD82

A Simple Method to Fabricate 45° Polymer Micro-Mirrors For Three-Dimensional Board-Level Optical Interconnects, *Fengtao Wang, Fuhan Liu, Ali Adibi; School of Electrical and Computer Engineering, Georgian Tech, USA.* We introduce a simple method to fabricate polymer optical waveguides with integrated 45° micro-mirrors by improved photolithography on printed circuit boards (PCBs). Critical mirror properties of angle, surface quality, and coupling efficiency are characterized experimentally.

JWD83

Free-Space Optical Interconnects Using a Single Volume Holographic Element, *Fengtao Wang, Chaoray Hsieh, Omid Momtahan, Arash Karbaschi, Fuhan Liu, Ali Adibi; School of Electrical and Computer Engineering, Georgia Tech, USA.* We demonstrate an 8-channel free-space optical interconnect system using a single volume holographic element recorded in photopolymer. Important system performances, such as cross-talk, misalignment tolerances, and link efficiency, are characterized both theoretically and experimentally.

JWD84

Variation of the Magnitude and Phase of the Recorded Complex Refraction Index along Waves Propagation in Sillenites, *Isabel Casar[1], Fernando Magana[1], Jose Murillo[2], Rurik Farias[2], Arturo Zuñiga[3]; [1]Inst. de Física, Univ. Nacional Autónoma de Mexico, Mexico, [2]Ctr. de Investigación en Materiales Avanzados, Mexico, [3]Escuela Superiou de Física y Matemáticas, Inst. Politécnico Nacional, Mexico.* We calculated the complex recorded refraction index taking into account optical activity, absorption, birefringence, polarization angles, external d. c. field and the non-uniformity of the grating along sample thickness. A strong variation was found.

JWD85

A New 3D Time Domain Full-Band Method Using Orthogonal Edge Basis Functions for Photonics Applications, *Marcos S. Gonçalves, Hugo E. Hernandez-Figueroa, Aldário C. Bordonalli; Univ. of Campinas - Unicamp, Brazil.* A new time-domain numerical approach for 3D-vectorial wave equation solutions is presented. The algorithm uses finite element discretization and a new set of orthogonal edge basis functions to describe pulse propagation in optical waveguides.

JWD86

High Power Tunable CW Raman Fiber Laser, *Erik Bélanger, Martin Bernier, Dominic Faucher, Réal Vallée; Univ. Laval, Canada.* This paper presents a tunable Raman fiber laser over 15nm (1135-1150nm) delivering over 8W of Stokes power.

JWD87

Effect of Higher Order Dispersion on Optical Bistability in Presence of Cubic-Quintic Nonlinearity, *Samudra Roy, Shyamal Bhadra; Central Glass and Ceramic Res. Inst., India.* Adopting variational approach the effect of defocusing quintic nonlinearity on pulse width is examined with numerical verification. Novel parametric effect of dispersion on minimum critical width of solitons and its bistable regime is predicted analytically.

JWD88

Single-Mode Low-Loss Chalcogenide Glass Photonic Components for Mid-Infrared Operations, *Nicolas Ho, Mark C. Phillips, Hong Qiao, Paul J. Allen, Kannan Krishnaswami, Brian J. Riley, Tanya L. Myers, Norman C. Anheier; Pacific Northwest Natl. Lab, USA.* We report the fabrication of photonics components designed for mid-infrared quantum cascade lasers based on photodarkening of thin-film chalcogenide glasses. We measure propagation losses of 0.5 dB/cm for single-mode waveguides and demonstrate evanescent wave couplers.

JWD89

Multi-Stage Parametric Amplification, *Anup Pandey, Joseph Haus, Peter Powers; Electro-Optics Program, Univ. of Dayton, USA.* A numerical simulation using split step method is done on optical parametric down conversion cascaded crystal system to compare the efficiencies from both stages. The M^2 values for output idler are found to be 1.01.

JWD90

Diode Pumped 500mJ 500Hz 10ns All-Solid-State Green MOPA System, *Chun Tang, Qingsong Gao, Lixin Tong, Zhen Cai, Xiaolin Chen, Deyong Wu, Bin Wei, Bo Tu, Kai Zhang; Inst. of Applied Electronics, China.* A diode pumped Nd:YAG MOPA system with 1.27J pulse energy, 2.3 times-diffraction limits at 500Hz was presented. With a type II phase-matched KTP crystal 500mJ green light is obtained with beam quality of 4.8.

QUANTUM ELECTRONICS POSTERS

JWD91

Optical Cluster State Generation without Number Resolving Photon Detectors, *Mark M. Wilde[1], Federico Spedalieri[2], Jonathan P. Dowling[3,4], Hwang Lee[3]; [1]Univ. of Southern California, USA, [2]Univ. of California at Los Angeles, USA, [3]Louisiana State Univ., USA, [4]Inst. for Quantum Studies, Dept. of Physics, Texas A&M Univ., USA.* We propose a controlled phase gate for linear optical quantum computing without using photon detectors that are photon number resolving. If the dark count probability is low, we can reliably generate optical cluster states.

JWD92

Distance Dependence of Entanglement of Two Quantum Dots, *A. Pérez-Leija[1], Javier Sánchez-Mondragón[1], Adalberto Alejo-Molina[1], Celso Vásquez-Ordoñez[1], M. Lopez-Medina[1], Daniel May-Arrioja[2]; [1]Photonics and Optical Physics Lab, Optics Dept. . INAOE, Mexico, [2]College of Optics and Photonics, Univ. of Central Florida, USA.* The distance dependence of entanglement of two Quantum Dots as a possible source of entangled photons. We model by a harmonic oscillator and therefore the coupling of the Two QDs as a double harmonic oscillator.

JWD93

Occupied and Unoccupied States of Clean Stepped Cu(775) Surfaces, *Mehmet B. Yilmaz[1], Kevin Knox[1], Nader Zaki[1], Shancai Wang[1], Jerry I. Dadap[1], Richard M. Osgood[1], Tonica Valla[2], Peter D. Johnson[2]; [1]Columbia Univ., USA, [2]Brookhaven Natl. Lab, USA.* We report angle-resolved photoemission and two-photon photoemission measurements of occupied and unoccupied states of clean stepped Cu(775) surfaces using tunable synchrotron and ultrafast femtosecond laser sources.

JWD94

Nonlinear Effective Susceptibility for a Kerr-Quadratic Composite, *Ángel Vergara Betancourt[1], Erwin A. Marti Panameño[2], Maximino Arroyo Carrasco[2]; [1]Inst. Tecnológico de Zacapoaxtlas, Mexico, [2]Benemerita Univ. Autonoma de Puebla, Mexico.* Here we present a closed expression for the effective nonlinear susceptibility of a layered composite, conformed by two materials of different nonlinear properties: quadratic and cubic. The main optical properties of the composite are discussed.

JWD95

Broadband Optical Parametric Amplification in a Periodically Poled $LiNbO_3$ Crystal by ps-Pulse Pump, *Oc-Yeub Jeon, Min-Ji Jin, Hwan-Hong Lim, Byoung-Joo Kim, Myoungsik Cha; Pusan Natl. Univ., Republic of Korea.* We report broadband optical parametric amplification in a single periodically poled $LiNbO_3$ crystal pumped by a 35 ps pulse at a fixed wavelength of 870 nm.

JWD96

Spectroscopic and Energy Transfer Properties of Rare Earth Doped Sc_2O_3 Transparent Ceramics, *Voicu Lupei[1], Aurelia Lupei[1], Cristina Gheorghe[1], Akio Ikesue[2]; [1]Inst. of Atomic Physics, Romania, [2]Poly-Techno Co. Ltd., Japan.* Spectroscopic investigation of rare earth (Tm, Pr, Er, Ho) doped Sc_2O_3 ceramics shows that the spectroscopic properties are similar to single crystals and the short ion-ion distances enable efficient energy transfer and various sensitisation schemes.

JWD97

Optical Pumping and EIT in the $5S_{1/2}\rightarrow5P_{1/2}\rightarrow6S_{1/2}$ transitions in Rb, *Yanting Zhao, Adrian Perez Galvan, Luis A. Orozco; Univ. of Maryland, College Park, USA.* The D_1 line absorption increases and shows EIT in rubidium with resonant two step excitation ($5S_{1/2}\rightarrow5P_{1/2}\rightarrow6S_{1/2}$). A model including optical pumping/depumping reproduces the observations.

JWD98

Testing Complementarity with Quantum Entangled Photons, *Sean J. Bentley; Adelphi Univ., USA.* Entangled photons are used to explore complementarity, with one sent through a double-slit without direct observation and the second used to indirectly determine the which-slit information of the first photon.

JWD99

Spectrum of Two-Photon Absorption in InSb, *Peter Olszak, Claudiu M. Cirloganu, Scott Webster, David J. Hagan, Eric W. Van Stryland; College of Optics and Photonics, CREOL and FPCE, Univ. of Central Florida, USA.* The spectrum of two-photon absorption in undoped InSb is measured by temperature dependent transmittance studies using a nanosecond CO_2 laser and by pump-probe and Z-scan methods using tunable infrared picosecond and femtosecond sources.

JWD • Joint FiO/LS Poster Session II — Continued

LASER SCIENCE POSTERS

JWD100

Spectroscopic Method for Determining the Strain Configuration in Semiconductor Optoelectronic Devices and Structures, *Mark L. Biermann; Eastern Kentucky Univ., USA.* The ratio of heavy-hole to light-hole interband transition energy shifts as a function of strain can be used to determine the strain configuration of semiconductor devices or structures for a wide range of strains.

JWD101

Terahertz Time-Domain Spectroscopy Technique for Characterizing GaN Thin Film, *Tsong-Ru Tsai[1], Shi-Jie Chen[1], Chih-Fu Chang[1], Tai-Yuan Lin[1], Cheng-Chung Chi[2]; [1]Inst. of Optoelectronic Sciences, Natl. Taiwan Ocean Univ., Taiwan, [2]Dept. of Physics and Materials Science Ctr., Natl. Tsing Hua Univ., Taiwan.* The optical constants and complex conductivities of the GaN film for frequencies ranging from 0.2 to 2.5 THz are obtained using THz time-domain spectroscopy. The results correspond well with the Kohlrausch stretched exponential model.

JWD102

Terahertz Time-Domain Spectroscopy Technique for Characterizing Ytterbium-Doped Yttrium Aluminum Garnet Crystals, *Tsong-Ru Tsai[1], Chih-Fu Chang[1], Shi-Jie Chen[1], Hai-Pang Chiang[1], Masahiko Tani[2], Mariko Yamaguchi[2], Hisashi Sumikura[2], Yuan-Fan Chen[3], Wan-Sun Tse[3]; [1]Inst. of Optoelectronic Sciences, Natl. Taiwan Ocean Univ., Taiwan, [2]Inst. of Laser Engineering, Osaka Univ., Japan, [3]Inst. of Physics, Academia Sinica, Taiwan.* Terahertz time-domain spectroscopy has been employed to measure the optical constants of ytterbium-doped yttrium aluminum garnet crystals for frequencies ranging from 0.2 to 1.8 THz.

JWD103

Elastic Light Scattering and Nanostructures in Barium Sodium Niobate Crystals, *Svetlana V. Ivanova; P.N. Lebedev Physical Inst. RAS, Russian Federation.* It was studied correlation between the temperature behavior of elastic light scattering by BSN crystals under illumination by laser beam and results of structural investigations by means X-ray and electron microscope in works [1, 2].

JWD104

Ultrafast Electronic Gruneisen Parameter at Non-Equilibrium Distributions, *Jincheng Wang, Jian Wu, Chunlei Guo; Inst. of Optics, Univ. of Rochester, USA.* A temperature dependent expression for electronic Gruneisen parameter γ_e is proposed to accurately account for the hot electron contribution in driving acoustic phonons in electron-lattice non-equilibrium distribution in Ag film excited by femtosecond laser pulses.

JWD105

Electrical Measurement of Quantum Interference Population Control in a Semiconductor, *Jared K. Wahlstrand, Ryan P. Smith, Jessica A. Pipis, Peter A. Roos, Steven T. Cundiff; JILA, USA.* We present the results of an electrical measurement of carrier population control via quantum interference between one- and two-photon absorption in (111) oriented bulk GaAs. Our results match with the theory and previous all-optical experiments.

JWD106

A Single Photon Source Based on SiV Centers in Diamond, *Chunlang Wang[1], Asli Ugur[1], Vladimir Chernyshev[2], Jan Meijer[2], Harald Weinfurter[1,3]; [1]Dept. für Physik, LMU Munich, Germany, [2]Experimental Physik III, Ruhr Univ. Bochum, Germany, [3]Max-Planck-Inst. für Quantenoptik, Germany.* Single SiV color centers are fabricated in diamond by ion implantation and detected means confocal microscopy. Antibunching of the fluorescence is demonstrated. Through nitrogen doping the quantum efficiency of single photon generation can be enhanced.

JWD107

Microscopic Model of Reflection and Refraction, *Matthew J. Berg, Christopher M. Sorensen, Amit Chakrabarti; Kansas State Univ., USA.* Reflection and refraction of light from a planar interface is a canonical problem in optics. This work examines reflection and refraction from a microscopic perspective by modeling the optical medium as an array of dipoles.

JWD108

Fast Light in the High Gain Limit of a Brillouin Laser, *Radha K. Pattnaik, Jean Toulouse; Lehigh Univ., USA.* We observe an increase in the cavity mode separation of a Brillouin laser with increasing pump power. This is shown to be a manifestation of fast light in the high gain limit (depleted pump).

JWD109

Remarks on the Wave-Particle Duality, *Jerzy Ciosek; Inst. of Electron Technology, Poland.* Problem of the wave-particle duality for photon has been analysed. Electron-waves of the screen in slit experiments were considered. The point spots were interpreted as pure wave effect of photon- and electron-waves reactions.

JWD110

Exact Quantum Simulations of Ionization and Coulomb Explosion of Small Rare-Gas Clusters with Time Dependent Diffusion Monte Carlo Method, *Matt K. Kalinski; Utah State Univ., USA.* We show the exact quantum simulations of the ionization and Coulomb explosion of small rare-gas clusters using the Time Dependent Quantum Diffusion Monte Carlo method. We calculate the ion charge distribution and the cluster size.

JWD111

Third-Order Susceptibility of Colloid Containing Tetrafenil-Ciclopentadinona and Silver Nanoparticles, *Luis A. Gómez, Márcia M. D. Gomes de Brito, Cid B. de Araújo, Glauco S. Maciel, Antonio M. de Brito Silva, Wagner E. da Silva, André Galembeck, Severino Alves Junior; Univ. Federal de Pernambuco, Brazil.* The nonlinear behavior of tetrafenil-ciclopentadinona in a solution containing silver nanoparticles was investigated at 532nm. The z-scan technique was applied and the results were analized using the Maxwell-Garnett approach.

JWD112

Polarization-Based Characterization of Laser Thermal Treatment on Biological Tissue, *Félix Fanjul-Vélez[1], David Pereda-Cubián[1], Jose L. Arce-Diego[1], Omar Ormachea[2], Oleg G. Romanov[2], Alexei L. Tolstik[2]; [1]Univ. of Cantabria, Spain, [2]Belarusian State Univ., Belarus.* The field of biomedical optics is promising in medical praxis. The study of laser thermal treatment and polarization-based characterization of tissue under it can be utilized in the correction of certain disorders with good results.

JWD113

Nonclassical Interferometry with a Single-Photon Interferometer, *Enrique J. Galvez, Mehul Malik, Bradford Melius; Colgate Univ., USA.* We present experiments that use quantum-state correlations between polarization-entangled photon pairs to specify the phase and amplitude of an interference pattern by actions on the photon that does not go through the interferometer.

JWD114

A Double Well Lattice for Dynamically Manipulating Pairs of Cold Atoms, *Jennifer Sebby-Strabley, Marco Anderlini, Ben Brown, Patricia Lee, William D. Phillips, James V. Porto; NIST, USA.* We describe the design and implementation of a double-well optical lattice suitable for isolating and manipulating individual pairs of atoms. This lattice will be used to test controlled atom motion and controlled two-qubit gates.

JWD115

Entanglement in a Linear Array of Atoms Coupled to a Multimode Field, *Andrew R. Jacobs, James P. Clemens; Miami Univ., USA.* We consider entanglement between atoms in a linear array undergoing emission into a multimode electromagnetic field. The entanglement is characterized by means of the von Neumann entropy for different bipartite splits among the atoms.

JWD116

Toward Direct Frequency Comb Spectroscopy in Helium: Proposed Measurements and Experimental Progress, *D. E. Procyk[1], M. Bellos[1], E. E. Eyler[1], M. C. Stowe[2], R. J. Jones[2], K. D. Moll[2], M. J. Thorpe[2], J. Ye[2]; [1]Univ. of Connecticut, USA, [2]JILA, NIST, and Univ. of Colorado, USA.* We describe progress toward precision measurements in helium by direct use of a phase-stabilized frequency comb, including numerical calculations of estimated signal sizes and lineshapes, and experimental work on a bichromatic-force slower for metastable helium.

JWD117

Two-Photon Optics: Imaging below the Diffraction Limit, *Daniel Schlenk[1], Harald Weinfurter[1,2]; [1]Dept. für Physik, Germany, [2]Max-Planck-Inst. für Quantenoptik, Germany.* Imaging properties of an optical system are limited by the wave nature of light. Entangled photons allow an improvement in resolution. We show an experimental realisation using entangled photons from a Spontaneous Parametric Downconversion source.

JWD118

Measuring the Electronic Transport Properties of Si Wafers with Laser-Induced Free-Carrier Dynamics, *Xiren Zhang, Bincheng Li, Yudong Zhang; Inst. of Optics and Electronics, China.* The carrier lifetime, carrier diffusivity and front surface recombination velocity of a Si wafer are simultaneously and unambiguously determined by laterally resolved modulated free-carrier absorption technique and multi-parameter fitting.

JWD119

CW All-Optical Quadruple Resonance Spectroscopy and Transition Dipole Measurements of Sodium Dimer, *Ergin H. Ahmed, Peng Qi, Marjatta Lyyra; Temple Univ., USA.* We report CW all-optical quadruple resonance excitation experiment with all excitations steps driven coherently by a combination of four tunable lasers. This excitation technique is very general allowing access to transitions at large internuclear distance.

JWD120

Observation of Large Optical Forces in Modulated Light, *X. Miao[1], T. Lu[2], E. Wertz[3], M. G. Cohen[1], Harold Metcalf[1]; [1]SUNY Stony Brook, USA, [2]Computational Science Ctr., Brookhaven Natl. Lab, USA, [3]Univ. of Paris VII, France.* We have observed huge optical forces caused by multiple repetitions of adiabatic rapid passage sweeps with counterpropagating light beams that coherently exchange of momentum between atoms and the light field. It exceeds 10X radiative force.

JWD • Joint FiO/LS Poster Session II — Continued

JWD121

Control of Ultracold Collisions with Frequency-Chirped Light, *M. J. Wright[1], J. A. Pechkis[2], J. L. Carini[2], C. E. Rogers III[2], P. L. Gould[2]; [1]Inst. für Experimentalphysik, Univ. Innsbruck, Austria, [2]Physics Dept., Univ. of Connecticut, USA.* We report on ultracold collision experiments utilizing frequency-chirped laser light. The collision rate is measured through trap loss. We also present our recent progress towards producing the frequency-chirp through phase modulation of the laser light.

JWD122

Efficient Rydberg Excitation of He with STIRAP, *S-H. Lee[1], A. Vernaleken[2], K. Choi[1], J. Kaufman[1], O. Kritsun[3], Harold Metcalf[1]; [1]Stony Brook Univ., USA, [2]Univ. of Wuerzburg, Germany, [3]AMD Corp., USA.* The ~100% efficiency of STIRAP is used to produce Rydberg He atoms in a slightly supersonic beam. We focus the atoms with a hexapole electrostatic lens and calibrate the Rabi frequency with the Autler-Townes effect.

JWD123

Design and Analysis of Ultrashort Femtosecond Laser Preamplifier and Main Amplifier, *Ersin Dogan, Sinan Bilikmen, Sevi Ince, Elif Yurdanur, Pinar Yilmaz, Pinar Demir; METU, Turkey.* The backbones of ultrashort laser amplifiers are discussed in the concept of design for efficiency and free abberation. Pulse propagation and best mirror-crystal position are simulated to optimize the amplifiers.

JWD124

Multi-Pass Preamplifier with Regenerative Pulse Shaping, *Lan-Sheng Yang[1], Ping-Hsun Lin[1], Yen-Cheng Ho[1], Jyhpyng Wang[1], Szu-yuan Chen[1], Jiunn-Yuan Lin[2]; [1]Inst. of Atomic and Molecular Sciences, Academia Sinica, Taiwan, [2]Dept. of Physics, Natl. Chung Cheng Univ., Taiwan.* A multi-pass preamplifier with regenerative pulse shaping using pellicles was demonstrated. By tuning the angles of the pellicles the strong red shifting in the spectra of this and subsequent amplifiers can be compensated.

JWD125

Pulse Width Effect on Rb_2 Predissociation by Negatively Chirped Femtosecond Laser Pulses, *Yan Xiao, Ju Gao, J. Gary Eden; Lab for Optical Physics and Engineering, Dept. of Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA.* The effect of laser pulse width on Rb_2 predissociation is probed. The relative yields of Rb excited state fragments with different pulse widths are compared experimentally. Reproducible dissociation channels are observed.

JWD126

Blue-Light Induced Red Absorption in $LiTaO_3$ Waveguides Using Ultrashort Laser Pulses, *Andrew J. Carson[1], Charles C. Barnes[1], Matthew E. Anderson[2]; [1]Del Mar Photonics, Inc., USA, [2]Dept. of Physics, San Diego State Univ., USA.* Blue light induced red absorption (BLIRA) was investigated using ultrashort pump-probe experiments in $LiTaO_3$ waveguides. BLIRA time and intensity dependence measurements were compared to a stretched-exponential model that is the basis for current BLIRA theory.

JWD127

Non-Classicality of Resonance Fluorescence by Conditional Homodyne Detection, *Hector M. Castro-Beltran, Eric R. Marquina-Cruz; Univ. Autonoma del Estado de Morelos, Mexico.* We study amplitude-intensity correlations of the fluorescence of the weak and strong transitions of a V-type three-level atom. The weak transition has asymmetric fluctuations and violates classical inequalities by orders of magnitude.

JWD128

Controlling of the Group Velocity Using Third-Order Nonlinearity, *Qiguang Yang[1,2], Jae Tae Seo[1], Na Xu[2], Bagher Tabibi[1], SeongMin Ma[1], Huitian Wang[2], S. S. Jung[3], M. Namkung[4]; [1]Hampton Univ., USA, [2]Natl. Lab of Solid State Microstructures and Dept. of Physics, Nanjing Univ., China, [3]Korea Res. Inst. of Standards and Science, Republic of Korea, [4]Astrochemistry Branch, NASA Goddard Space Flight Ctr., USA.* Third-order nonlinearity of optical material has been found to be very useful for group velocity controlling. The velocity of a pulse may be changed by tuning its intensity or using an extra CW pump.

JWD129

Generation of Bessel-Gauss Beams by Means of Computed-Generated Holograms for Bessel Beams, *Marcela M. Méndez Otero[1], Gregorio C. Martínez Jiménez[1], Maximino L. Arroyo Carrasco[1], Marcelo D. Iturbe Castillo[2], Erwin A. Martí Panameño[1]; [1]FCFM BUAP, Mexico, [2]INAOE, Coordinación de Óptica, Mexico.* We show the generation of a Bessel-Gauss beam with a Bessel computer-generated hologram illuminated with a Gaussian intensity distribution. The parameters of the generated beam depend of the wave front of the illumination.

JWD130

Digital Coherent Lightwave Communication System Using Fiber Optic and Adaptive Photodetectors, *José A. Palma-Vargas, Juan Castillo-Mixcóatl, Georgina Beltrán-Pérez, Severino Muñoz-Aguirre; Benemérita Univ. Autónoma de Puebla, Mexico.* In this work a digital coherent lightwave communication system is used to transmit information using RS232 protocol. The system was made with fiber optic and adaptive photodetectors to compensate the fluctuations in polarization and phase.

JWD131

Synchronization Dynamics in Chaotic Diode Lasers with Rotated Optical Feedback and Injection, *David W. Sukow[1], Guinevere Burner[1], Taylor McLachlan[1], John Miller[1], Jake Amonette[1], Athanasios Gavrielides[2]; [1]Washington and Lee Univ., USA, [2]AFRL, USA.* Experimental and theoretical investigations into a chaotic system of diode lasers with polarization-rotated optical feedback and injection demonstrate multiple synchronization solutions. The role of parameter mismatch is also considered.

JWD132

The Excess Supermode Noise in a Detuned Phase Modulated Harmonic Mode-Locking Laser, *Shiquan Yang, Xiaoyi Bao; Dept. of Physics, Univ. of Ottawa, Canada.* The excess supermode noise was found in the transition from FM laser oscillation to phase mode-locking in a phase modulated harmonic mode-locking laser. The results are explained by Floquet analysis of the laser equations.

JWD133

Concentration Effects and Highly Efficient Laser Emission in Diode Laser Pumped Nd:YAG Crystals, *Voicu Lupei, Nicolaie Pavel; Inst. of Atomic Physics, Romania.* Continuous-wave laser slope efficiency in range of 0.8 is reported with diode laser pumping at 885 nm in the emitting level of 1.1 and 2.5at.%Nd:YAG crystals, the most concentrated crystal showing also good pump absorption.

JWD134

Multiwavelength Erbium-Doped Fiber Ring Laser Thermally-Tunable, *Georgina Beltrán-Pérez, Isaac Huixtlaca-Cuatecatl, Juan Castillo Mixcoatl; FCFM-BUAP, Mexico.* We propose the wavelength change of a laser of ring cavity, using a filter tunable based on the interferometer of Sagnac with a section of birefringence fiber which response to variations of temperature.

JWD135

A Water Flow-Meter Using a Fiber Laser and Bragg Gratings, *Manuel Durán-Sánchez, Georgina Beltrán-Pérez, Juan Castillo Mixcóatl, Severino Muñoz Aguirre; FCFM-BUAP, Mexico.* In this work we present a monitoring system to measure the water flux into tubing. The experimental setup uses an optical fiber laser sensor which is constituted by two Bragg grating used like a mirrors.

NOTES

Highland A

Joint

1:30 p.m.–3:15 p.m.
JWE • Atoms in Strong and Ultrastrong Fields I
Presider to Be Announced

JWE1 • 1:30 p.m. Invited
Strong-Field In-Plane Triple Ionization: Model Atom Time-Dependence, *Joseph Eberly, Phay J. Ho; Univ. of Rochester, USA.* Non-sequential triple ionization (NSTI) of atoms is calculated classically and shown in video format as an ultrashort multi-dimensional rescattering sequence in a linearly polarized 8-cycle 780nm laser pulse. Momentum data are compared with experiment.

Highland B

Frontiers in Optics

1:30 p.m.–3:15 p.m.
FWM • Microstructures and Waveguides
Martin T. Hill; Eindhoven Univ. of Technology, Netherlands., Presider

FWM1 • 1:30 p.m.
Fabrication and Characterization of Air-Trench Waveguide Beam Splitters in Perfluorocyclobutyl Polymers, *Nazli Rahmanian[1], Seunghyun Kim[2], Gregory P. Nordin[2]; [1]Univ. of Alabama in Huntsville, USA, [2]Electrical and Computer Engineering, Brigham Young Univ., USA.* We report fabrication and characterization of small-area air-trench waveguide splitters in perfluorocyclobutyl polymers. An ICP/RIE anisotropic, high aspect ratio etch is developed using CO/O2 chemistry to fabricate air-trenches, preventing excessive widening with stress relief method.

FWM2 • 1:45 p.m.
Laser Writable Azobenzene Functionalized Polymer for Waveguide Fabrication, *Zhiqiang Liu[1], Namkhun Srisanit[1], Pengfei Wu[2], Michael R. Wang[1]; [1]Univ. of Miami, USA, [2]New Span Opto-Technology Inc., USA.* We report on laser-writing waveguides fabrication on an azobenzene polymer film. Intensity dependent material response and waveguide formation mechanism are discussed. Visible laser writing resulted in low-loss polarization independent optical waveguides at 1550 nm wavelength.

Highland C

1:30 p.m.–3:15 p.m.
FWN • Computational Imaging IV
Presider to Be Announced

FWN1 • 1:30 p.m. Invited
Recent Results of Integrated Sensing and Processing Using a Programmable Imaging Sensor, *Abhijit Mahalanobis, Robert Muise; Lockheed-Martin, USA.* We present a study of ISP using a hyper-spectralspectral camera which allows spatial resolution of the data to be varied in addition to selecting spectral bands that enable the detection of targets in background clutter.

Highland D

1:30 p.m.–3:15 p.m.
FWO • Silicon and III-V Based Optoelectronics for Optical Interconnects I
David Plant; McGill Univ., Canada., Presider

FWO1 • 1:30 p.m. Invited
Photonics in Computing: Interconnects and Beyond, *Sadik Esener, Pengyue Wen; Univ. of California at San Diego, USA.* With the advent of VCSELs, optical interconnects became pratical for machine-to-machine communication and are penetrating inside the machine. This presentation will review the progress made so far to assess future directions for photonics in computing.

Highland E

1:30 p.m.–3:00 p.m.
FWP • Advances in Macroscopic Optical Imaging I
Presider to Be Announced

FWP1 • 1:30 p.m.
Cancer Detection Using a Novel Contrast Mechanism via Infrared Transillumination, *Sanhita Dixit, Kenneth T. Kotz, Theresamai Le, Khalid Amin, Gregory W. Faris; SRI Intl., USA.* We present a novel differential near infrared transillumination imaging modality using inspiratory contrast agents as a possible route to specific imaging of tumors. The advantages and possible pitfalls in whole animal imaging are presented.

FWP2 • 1:45 p.m. Invited
Diffuse Optical Imaging in Scattering Media with Highly Contrasted Absorption Coefficients: Application to Small Animal Imaging, *Philippe Rizo[1], Jean-Marc Dinten[1], Philippe Peltié[1], Jean-Luc Coll[2], Anabela Da Silva[1], Lionel Hervé[1], Jerome Boutet[1], Michel Berger[1], Anne Koenig[1], Véronique Josserand[3]; [1]CEA-DRT-Léti , France, [2]Inserm U578, France, [3]ANIMAGE, France.* Fluorescence tomography of highly contrasted media requires to built and to take into account a precise description of the attenuation coefficients map. Using this attenuation map provides new opportunities to handle complex acquisition geometries.

Highland F

1:30 p.m.–3:15 p.m.
FWQ • Quantum Optics in Micro- and Nanostructures II
Michael Vasilyev; Univ. of Texas at Arlington, USA, Presider

FWQ1 • 1:30 p.m. Invited
Light Scattering with Entangled Photons, *J. P. Woerdman, A. Aiello, G. Puentes, D. Voigt; Univ. Leiden, Netherlands.* We study experimentally the scattering of polarization-entangled twin photons by a large variety of inhomogeneous media. The scattered twin photons are generally in a mixed state which shows a surprisingly universal behavior.

Highland G

Frontiers in Optics

1:30 p.m.–3:15 p.m.
FWR • General Optical Design and Instrumentation II
Nicholas George; Univ. of Rochester, USA, Presider

FWR1 • 1:30 p.m. Invited
High Luminance Optical Film with Improved Cosmetic Appearance, *Junwon Lee, Stephen Meissner, Ronald Sudol; Eastman Kodak Co., USA.* This paper presents an optical film for enhancing head-on luminance through light-redirecting structures with a variable pitch. The optical film has an improved light-collimating microstructure that redirects light more effectively, resulting in higher head-on luminance.

Highland H

Laser Science

1:30 p.m.–3:15 p.m.
LWF • Quantum Measurement and Control
J. M. Geremia; Univ. of New Mexico, USA, Presider

LWF1 • 1:30 p.m. Invited
Efficient Quantum State Estimation by Continuous Weak Measurement and Dynamic Control, *Andrew Silberfarb[1], Greg A. Smith[2], Ivan H. Deutsch[1], Poul S. Jessen[2]; [1]Univ. of New Mexico, USA, [2]Univ. of Arizona, USA.* We present a procedure for reconstructing the full quantum state of an individual spin based upon an ensemble continuous measurement. We present a demonstration of this procedure using a laser probe of ultracold cesium atoms.

Highland J

Joint

1:30 p.m.–3:00 p.m.
JWF • Novel Microscopies for Medicine and Biology I
Xingde Li; Univ. of Washington, USA, Presider

JWF1 • 1:30 p.m. Invited
Far-Field Fluorescence Microscopy at the Macromolecular Scale, *Stefan W. Hell, Katrin Willig, Michael Hofmann, Christian Eggeling, Volker Westphal; Max Planck Inst. for Biophysical Chemistry, Germany.* Since its discovery by Abbe in 1873, the microscopy diffraction barrier has received a lot of attention. We discuss the principle of fundamentally breaking the diffraction barrier through reversible saturable optical (fluorescence) transitions (RESOLFT).

Highland K

Laser Science

1:30 p.m.–3:15 p.m.
LWG • Quantum Optics in Photonic Materials II
Azriel Z. Genack; Dept. of Physics, Queens College of the City Univ. of New York, USA, Presider

LWG1 • 1:30 p.m. Invited
Quantum and Nonlinear Optics with Few Photons: New Perspectives in Solids and Gases, *Gershon Kurizki; Dept. of Chemical Physics, Weizmann Inst. of Science, Israel.* Periodic structures with resonant dopants allow giantly enhanced cross-coupling between ultraweak pulses within photonic band gaps, subject to self-induced or electromagnetically-induced ansparency. These features may lead to novel quantum optical applications.

Hyatt Grand Ballroom E/F

OF&T

1:30 p.m.–3:15 p.m.
OFWC • Testing I
Toru Yoshizawa; Tokyo Univ of Agriculture and Technology, Japan., Presider

OFWC1 • 1:30 p.m. Invited
Advanced Metrology Tools Applied for Lithography Optics Fabrication and Testing, *Masaru Ohtsuka; Canon, Inc., Japan.* Low to mid spatial frequency roughness of lens surfaces is one of key quality issues for projection optics of lithography tools. Advanced metrology instruments for this spatial frequency roughness measurement are applied to optics fabrication.

Hyatt Regency Ballroom A/B

OPE

NOTES

Highland A

Joint

JWE • Atoms in Strong and Ultrastrong Fields I—Continued

JWE2 • 2:00 p.m. Invited
Rescattering across Shells and into Ultra-Strong Fields, *S. Palaniyappan, I. Ghebregziabher, A. DiChiara, J. MacDonald, Barry Walker; Univ. of Delaware, USA.* Multielectron, nonsequential ionization has been measured up to Xe^{11+}. The data shows rescattering collisions at $10^{16}W/cm^2$ to $10^{17}W/cm^2$ and across electron shells. A rescattering deflection parameter predicts the change from the strong to ultrastrong field.

JWE3 • 2:30 p.m. Invited
Correlated Electron Dynamics in Intense Fields, *Zengxiu Zhao, Thomas Brabec; Univ. of Ottawa, Canada.* Multielectron phenomena in intense laser fields combine two of the most difficult problems of theoretical physics, which are many-body effects and non-perturbative dynamics. I will review experimental work and theoretical avenues to tackle this problem.

Highland B

Frontiers in Optics

FWM • Microstructures and Waveguides—Continued

FWM3 • 2:00 p.m.
Group Index in Highly Compact Silicon Bends and Rings, *Shijun Xiao, Minghao Qi; Purdue Univ., USA.* We discuss a simple method to analyze group index with regard to various cross-sectional dimensions in highly compact (radius ~ 2 microns) silicon-on-insulator bends and rings.

FWM4 • 2:15 p.m.
Super-High N.A. Microscopic GRIN Lens for Coupling into Nanophotonics Waveguides, *Yingyan Huang[1], Seng-Tiong Ho[1], Jing Ma[2]; [1]EECS Dept., USA, [2]OptoNet, USA.* A miniature integrated graded-refractive index lens with ultra-high numerical aperture of NA>1.5 can be realized using two alternating nano layers of materials with high index contrast. Efficient coupling into nano-waveguide can be achieved.

FWM5 • 2:30 p.m.
Soliton Fission and Continuum Generation in Silicon Waveguides, *Lianghong Yin, Qiang Lin, Govind P. Agrawal; Univ. of Rochester, USA.* We study the propagation of ultrashort pulses in dispersion-tailored silicon waveguides and demonstrate the possibility of soliton fission and continuum generation in such devices.

Highland C

FWN • Computational Imaging IV—Continued

FWN2 • 2:00 p.m.
Optical Architectures for Compressive Imaging, *Mark A. Neifeld, Jun Ke; Univ. of Arizona, USA.* We compare three optical architectures for compressive imaging. We quantify each in terms of photon efficiency and image quality. We find that the pipeline architecture offers the highest performance in the presence of measurement noise.

FWN3 • 2:15 p.m.
A Single Pixel Camera Based on White-Noise Compressed Sensing, *Dharmpal Takhar, Jason Laska, Dror Baron, Michael Wakin, Marco F. Duarte, Shriram Sarvotham, Richard Baraniuk, Kevin Kelly; Rice Univ., USA.* We design a camera by combining a micromirror-array with a single optical sensor and exploiting compressed sensing based on projections with white-noise basis. A practical image/video camera is developed based on this concept and realized.

FWN4 • 2:30 p.m.
The Effects of Analog Micro-Mirror Arrays in an Adaptive Flat Computational Imaging Sensor Architecture, *Vikrant R. Bhakta, Marc P. Christensen; Southern Methodist Univ., USA.* An adaptive computational imaging system utilizing analog micro-mirror arrays at the pupil of an imaging sensor is discussed. The effects of the analog micro-mirror arrays are investigated. Analysis, simulation and experimental results are presented.

Highland D

FWO • Silicon and III-V Based Optoelectronics for Optical Interconnects I—Continued

FWO2 • 2:00 p.m.
A Semi-Analytical Simulation Model for Capacitor Based E-O Modulators, *Jidong Zhang[1], Mikhail Haurylau[1], Hui Chen[1], Guoqing Chen[1], Nicholas A. Nelson[1], David H. Albonesi[2], Eby G. Friedman[1], Philippe M. Fauchet[1]; [1]Univ. of Rochester, USA, [2]Cornell Univ., USA.* We introduce a semi-analytical model of capacitor-based electro-optical modulators. By applying this model, the performance dependence on the primary device parameters can be analyzed and a set of design rules has been developed.

FWO3 • 2:15 p.m.
Electro-Static Damange Mechanisms in Surface Emitting Laser Arrays, *Casimer M. DeCusatis, Robert Atkins; IBM, USA.* We describe a latent failure mechanism for vertical cavity laser arrays. Electrostatic damage creates a nucleation point for dark line defects, which migrate under applied voltage. Random array elements fail after 30-40 days of operation.

FWO4 • 2:30 p.m. Invited
CMOS Photonics™ Technology: Enabling Optical Interconnect, *Cary Gunn; Luxtera, USA.* No abstract available.

Highland E

FWP • Advances in Macroscopic Optical Imaging I—Continued

FWP3 • 2:15 p.m.
Refractive Index of Rat Mammary Tumor Tissue, *Adam M. Zysk, Eric J. Chaney, Stephen A. Boppart; Univ. of Illinois at Urbana-Champaign, USA.* Breast optical property studies have been conducted, yielding data for macroscopic and microscopic optical imaging. Absent, however, are investigations of breast tissue refractive indices. We present measurements of rat mammary tumor, adipose, and stromal tissues.

FWP4 • 2:30 p.m. Invited
***In vivo* Applications of Diffuse Optical Imaging and Spectroscopy,** *Sergio Fantini[1], Angelo Sassaroli[1], Yunjie Tong[1], Ning Liu[1], Debbie Chen[1], Yang Yu[1], Jeffrey M. Martin[1], Peter R. Bergethon[2], Perry F. Renshaw[3], Blaise deB. Frederick[3]; [1]Tufts Univ., USA, [2]Boston Univ. School of Medicine, USA, [3]McLean Hospital, USA.* This contribution reviews some of the concepts of diffuse optical imaging and spectroscopy of tissue, and presents some *in vivo* applications to the human breast (optical mammography) and brain (functional near-infrared imaging).

Highland F

FWQ • Quantum Optics in Micro- and Nanostructures II—Continued

FWQ2 • 2:00 p.m. Invited
Cavity QED with N-V Centers in Diamond, *Charles Santori[1], David Fattal[1], Sean M. Spillane[1], Marco Fiorentino[1], Raymond G. Beausoleil[1], James R. Rabeau[2], Paolo Olivero[2], Andrew D. Greentree[2], Martin Draganski[3], Patrick Reichart[2], Brant C. Gibson[2], Sergey Rubanov[2], David N. Jamieson[2], Steven Prawer[2]; [1]Hewlett-Packard Labs, USA, [2]Univ. of Melbourne, Australia, [3]RMIT Univ., Australia.* Nitrogen-vacancy centers in diamond can provide a Lambda-type energy level structure with long-lived ground-state spin coherence. This talk reports progress toward demonstration of EIT in a single center coupled to an optical cavity.

FWQ3 • 2:30 p.m.
Effects of Local Plasmon Resonance Inhomogeneity on Surface Enhanced Molecular Fluorescence, *Zhenjia Wang, Lewis J. Rothberg; Univ. of Rochester, USA.* Surface plasmons in silver nanostructured surfaces dramatically enhance the photoluminescence of adsorbed terbium-containing organic complexes. Wide variations in emission spectra show that the surface plasmons have a wide spectral distribution varying significantly with location.

Highland G

Frontiers in Optics

FWR • General Optical Design and Instrumentation II—Continued

FWR2 • 2:00 p.m.
Automated Zoom Lens Design, *Sergey G. Menabde; Bauman Moscow State Technical Univ., Russian Federation.* Method of automated zoom lens' design with zero third order aberrations is described. This method allows to get lots of system variations with compensated aberrations using eccentricities and to pick out variants for further optimization.

FWR3 • 2:15 p.m.
Description of Light Focusing by a Lens Using Vector Diffraction Theory, *Shekhar Guha[1], Glen D. Gillen[2]; [1]AFRL, USA, [2]Anteon Corp., USA.* For a plane wave incident on a spherical lens at normal incidence, the field distributions in the focal region are calculated using vector diffraction theory showing the effects of aberration.

FWR4 • 2:30 p.m.
Improvement of Photon Propagation in Long Scintillating Optical Fibers for Astroparticle Physics, *David H. Kaplan[1], W. R. Binns[2], P. Hink[3], A. J. Davis[4]; [1]Southern Illinois Univ. Edwardsville, USA, [2]Washington Univ. in St. Louis, USA, [3]Burle Industries, USA, [4]Caltech, USA.* Scintillating optical fibers produce photons upon traversal by charged particles. A model for understanding improvements we have observed in photon propagation in long scintillating fiber detector elements for astroparticle physics and experimental results are presented.

Highland H

Laser Science

LWF • Quantum Measurement and Control—Continued

LWF2 • 2:00 p.m. Invited
Discrimination between Optical Coherent States via a Closed-Loop Quantum Measurement, *J. M. Geremia; Univ. of New Mexico, USA.* I will describe progress toward implementing optical quantum state discrimination at the minimum quantum error probability via a closed-loop quantum measurement. The procedure highlights the enabling role of continuous feedback in quantum information theoretic procedures.

LWF3 • 2:30 p.m.
Programmable Discrimination of Quantum States and Operators via Optimized Measurements and Their Optical Implementation, *Janos A. Bergou; Dept. of Physics and Astronomy, CUNY Hunter College, USA.* The problem of operator/gate testing in quantum information is closely related to that of discriminating between unknown quantum states. We present generalized measurements and their linear optical implementations that accomplish this task optimally.

Highland J

Joint

JWF • Novel Microscopies for Medicine and Biology I—Continued

JWF2 • 2:00 p.m. Invited
Pushing the Sensitivity Limit of CARS Microscopy, *Conor L. Evans, X. Sunney Xie; Harvard Univ., USA.* CARS Microscopy is a powerful technique capable of rapid chemically-selective imaging in vivo. In this report, we will show recent work on Frequency Modulated CARS (FM-CARS) to push the sensitivity limit of CARS imaging.

JWF3 • 2:30 p.m.
Hyper-Raman Spectroscopy of Organic Chromophores, *Anne M. Kelley, Lian C. T. Shoute; Univ. of California at Merced, USA.* Conjugated organic chromophores with large first hyperpolarizabilities exhibit strong two-photon-resonant hyper-Raman scattering. The resonance Raman and hyper-Raman spectra and excitation profiles together provide structural and energetic information about overlapping electronic transitions in these molecules.

Highland K

Laser Science

LWG • Quantum Optics in Photonic Materials II—Continued

LWG2 • 2:00 p.m. Invited
Quantum Optics and Quantum Information Processing with Photonic Crystal Devices, *Jelena Vuckovic, Dirk Englund, Hatice Altug, Ilya Fushman, Andrei Faraon, Edo Waks; Edward L. Ginzton Lab, Stanford Univ., USA.* We have demonstrated classical and quantum information processing devices enabled by strong light-matter interaction in photonic crystals, including quantum dot-photonic crystal single photon source, ultrafast photonic crystal nanocavity laser, and small quantum network on chip.

LWG3 • 2:30 p.m. Invited
Controlled Photon Generation in Structured Nonlinear Optical Materials, *M. G. Raymer; Univ. of Oregon, USA.* When single- or pair-photon packets are created by spontaneous wave mixing, their properties are determined by the dispersive properties of the devices used. By spatially modulating the refractive index, desirable properties can be achieved.

Hyatt Grand Ballroom E/F

OF&T

OFWC • Testing I—Continued

OFWC2 • 2:00 p.m.
Recent Advances in Subaperture Stitching Interferometry, *Paul E. Murphy, Greg W. Forbes, Jon F. Fleig, Dragisha Miladinovic, Gary DeVries, Stephen O'Donohue; QED Technology, USA.* It is well known that stitching can boost the aperture capability. Stitching can also improve the accuracy, lateral resolution, and testable aspheric departure. We demonstrate these improvements on our subaperture stitching interferometer (SSI®).

OFWC3 • 2:15 p.m.
Optimization of Basis Functions for Aperture Shifting Interferometric Testing, *Peng Su, Jim H. Burge; Univ. of Arizona, USA.* Aperture shifting interferometric testing uses multiple measurements with the interferometer aperture shifted to different positions and orientations. This paper discusses the optimal selection of basis functions to provide a robust solution using minimal computational resources.

OFWC4 • 2:30 p.m.
Improving Radius Measurements on a Commercial Interferometer, *Angela D. Davies[1,2], Tony L. Schmitz[2], Neil Gardner[1], Kate M. Medicus[1], Matthew L. Vaughn[1]; [1]Univ. of North Carolina at Charlotte, USA, [2]Univ. of Florida, USA.* We have applied a mathematical error motion compensation technique to improve radius measurements on a commercial instrument and removed a 0.14% bias from the measured radius value. The method uses a homogeneous transformation matrix formalism.

Hyatt Regency Ballroom A/B

OPE

2:00 p.m.–3:45 p.m.
OPWC • Current Injection and Organic Thin Film Transistors

Presider to Be Announced

OPWC1 • 2:00 p.m. Invited
Vapor and Solution Deposited Organic Thin Film Transistors, *Tom Jackson; Pennsylvania State Univ., USA.* Organic thin film transistor (OTFT) device performance rivals or exceeds that of a-Si:H devices. For device and system use, OTFTs must demonstrate the uniformity, reproducibility, reliability, and integration with other devices needed for practical applications.

OPWC2 • 2:30 p.m. Invited
Interfacial Effects in Organic Thin-Film Transistors, *Thokchom B. Singh[1], Pinar Senkarabacack[1], Philip Stadler[1], Helmut Neugebauer[1], Niyazi Serdar Sariciftci[1], James Grote[2]; [1]Linz Inst. of Organic Solar Cells (LIOS), Austria, [2]AFRL, USA.* We employed attenuated total reflection Fourier transform infrared spectroscopy (ATR FTIR) and dielectric spectroscopy to investigate this the interface properties of OFETs. The chemical structure of materials determine the properties like hystheresis and ambipolar transport.

Highland A

Joint

JWE • Atoms in Strong and Ultrastrong Fields I—Continued

JWE4 • 3:00 p.m.
Strong-Field Pair Production: A Structure of Wave Packets and the Electron-Positron Entanglement (Correlations), *Mikhail Fedorov; General Physics Inst., Russian Federation.* We investigate a structure of the bipartite electron-positron wave function arising in the process of multiphoton pair production. To evaluate the degree of electron-positron correlations (entanglement) we calculate and analyze the Schmidt number *K*.

Highland B

Frontiers in Optics

FWM • Microstructures and Waveguides—Continued

FWM6 • 2:45 p.m.
8x8 Wavelength Reconfigurable Photonic Switch Using Thermally Tuned Micro-Ring Resonators Fabricated on Silicon Substrate, *Han-Yong Ng[1], Michael R. Wang[1], Xuan Wang[2], Jose Martinez[2], Roberto R. Panepucci[2], Daqun Li[3]; [1]Univ. of Miami, USA, [2]Florida Intl. Univ., USA, [3]New Span Opto-Technology Inc., USA.* An 8x8 wavelength reconfigurable photonic switch is described using micro-ring resonators fabricated on silicon substrate. Switch channels are routed by independent thermo-optic tuning of resonators with local heaters. Device fabrication and characterization are presented.

FWM7 • 3:00 p.m.
Porous Silicon Waveguides for Biosensing Applications, *Guoguang Rong[1], Ali Najmaie[2], John E. Sipe[2], Sharon M. Weiss[1]; [1]Vanderbilt Univ., USA, [2]Univ. of Toronto, Canada.* Porous silicon waveguides are designed and fabricated to achieve well-defined resonances suitable for high sensitivity biosensing. Two coupling schemes are investigated based on fabrication, measurement complexity, coupling losses, resonance quality, and DNA detection sensitivity.

Highland C

FWN • Computational Imaging IV—Continued

FWN5 • 2:45 p.m.
A Cramér-Rao Lower Bound Analysis of Noise Reduction Limits in Blind Deconvolution for Zernike-Based Point-Spread-Function Estimation with the Use of a Support Constraint, *Charles L. Matson, Alim Haji; AFRL, USA.* We show in an algorithm-independent way that Zernike-based blind deconvolution of atmospherically-blurred images produces higher quality estimates of an object and the blurring PSFs than does pixel-based PSF estimation.

FWN6 • 3:00 p.m.
Ultra-Thin Multi-Aperture LWIR Imagers, *Mohan Shankar[1], Rebecca Willett[1], Nikos Pitsianis[1], David Brady[1], Timothy Schulz[2], Bob Gibbons[3], Bob Te Kolste[4], James Carriere[4], Caihua Chen[5]; [1]Duke Univ., USA, [2]Michigan Technological Univ., USA, [3]Raytheon Company, USA, [4]Digital Optics Corp., USA, [5]Univ. of Delaware, USA.* We design and implement an ultra-thin LWIR camera by replacing the conventional lens system with a micro-lens array. The resulting low resolution images can be used to reconstruct a high resolution image by post processing.

Highland D

FWO • Silicon and III-V Based Optoelectronics for Optical Interconnects I—Continued

FWO5 • 3:00 p.m.
Tolerance Analysis of PCB-Integrated Optical Interconnects, *Nina Hendrickx[1], Jürgen Van Erps[2], Hugo Thienpont[2], Peter Van Daele[1]; [1]Ghent Univ., Belgium, [2]Vrije Univ. Brussel, Belgium.* The alignment tolerances between the different building blocks of an optical interconnection are studied both numerically and experimentally. Laser ablation is used for the structuring of polymer optical layers integrated on a printed circuit board.

Highland E

Highland F

FWQ • Quantum Optics in Micro- and Nanostructures II—Continued

FWQ4 • 2:45 p.m.
Tapered Coupling of a Photonic Molecule Comprising Two Microsphere Lasers, *Sile Nic Chormaic[1,2], Danny O'Shea[1,2], Jonathan Ward[1,2], Brian Shortt[1,2]; [1]Cork Inst. of Technology, Ireland, [2]Tyndall Natl. Inst., Ireland.* We present initial results obtained when two erbium/ytterbium co-doped phosphate spherical micro-resonators are coupled using a tapered optical fiber. Evanescent field coupling between the spheres has been achieved and the spectral characterisation is presented.

FWQ5 • 3:00 p.m.
Integrated Optics Technology for Ion Trap Based Large-Scale Quantum Information Processors, *Jungsang Kim, Changsoon Kim, Caleb W. Knoernschild, Bin Liu, Kyle S. McKay; Duke Univ., USA.* Realizing ion trap based large-scale quantum information processor requires integrated optics technologies. We design and characterize basic optical beam steering system using micromirrors as a first step towards constructing high-quality functional integrated optics.

3:15 p.m.–3:45 p.m. Coffee Break, Empire Hall
3:15 p.m.–3:45 p.m. Coffee Break, Hyatt Grand Ballroom G

Highland G

Frontiers in Optics

FWR • General Optical Design and Instrumentation II—Continued

FWR5 • 2:45 p.m.
High Resolution—Extended Depth of Field Imaging, *Eyal Ben-Eliezer, Emanuel Marom, Naim Konforti, Leah Bar, Nahum Kiryati; Tel Aviv Univ., Israel.* A pupil phase mask, designed for incoherently illuminated scenes, allows imaging with significantly increased depth of field, while maintaining acceptable resolution and color preservation. Color and contrast of the resulting images may be enhanced digitally.

FWR6 • 3:00 p.m.
Experimental Study of the Magneto-optical Faraday Rotation Spectra in Some Aromatic Liquids, *Shukhrat Egamov; Sanarkand State Univ., Uzbekistan.* The magnetooptical properties of benzene, nitrobenzene, o-toluidine, o-anisidine, m-chloraniline and o-chloraniline were studied using Faraday effect measurements. Experimental results of Faraday rotation as a function of wavelength between 1.8 - 3.65 eV were obtained.

Highland H

Laser Science

LWF • Quantum Measurement and Control—Continued

LWF4 • 2:45 p.m.
Photon Burst Detection of Multi-Level Atoms in Cavity QED, *Rebecca Olson, Mathew L. Terraciano, Luis A. Orozco; Univ. of Maryland at College Park, USA.* We present a new, fast method for observing individual atoms inside cavity QED system in the intermediately coupled regime, using light fluoresced into a cavity mode that is orthogonal to the driving mode.

LWF5 • 3:00 p.m.
Generation of Narrowband Twin Beams for Atomic Manipulation, *Vincent Boyer[1], Colin McCormick[1], Ennio Arimondo[1], Kevin Jones[1,2], Paul Lett[1]; [1]NIST, USA, [2]Williams College, USA.* We have demonstrated 3dB relative intensity squeezing from a non-degenerate four-wave mixing scheme in hot atomic rubidium vapor. The generated twin beams are narrowband and are suitable for atomic manipulation.

Highland J

Joint

JWF • Novel Microscopies for Medicine and Biology I—Continued

JWF4 • 2:45 p.m.
Making Use of Rejected Light - Improved Imaging with Multi-Channel Detection in Confocal and 4Pi Microscopy, *Brynmor J. Davis, William C. Karl, Anna K. Swan, M. Selim Unlu, Bennett B. Goldberg; Boston Univ., USA.* Light usually discarded in a microscope can be collected in additional channels and used to reduce noise sensitivity. Optimal Fourier-domain processing is used to construct a single superior image from the multi-channel image set.

Highland K

Laser Science

LWG • Quantum Optics in Photonic Materials II—Continued

LWG4 • 3:00 p.m.
Photon-Number Distribution of Photonic Crystal Nanolasers, *Hyun-Ju Chang, Se-Heon Kim, Soon-Hong Kwon, Yong-Hee Lee; Korea Advanced Inst. of Science and Technology, Republic of Korea.* We have performed the photocount measurement using a photonic crystal nanolaser having a high spontaneous emission factor at communication wavelengths. For comparison purpose, the photon-number distribution of the single-mode DFB laser diode is also measured.

Hyatt Grand Ballroom E/F

OF&T

OFWC • Testing I—Continued

OFWC5 • 2:45 p.m.
Mini-Fizeau Interferometer for Curvature Sensing in the NIST Geometry Measuring Machine, *Quandou Wang, Ulf Griesmann; NIST, USA.* We describe the design of a miniature Fizeau interferometer, which is intended to be an accurate curvature sensor for the NIST Geometry Measuring Machine (GEMM), which is used to measure aspheric and free form surfaces.

OFWC6 • 3:00 p.m.
Uncertainty Analysis on the Absolute Thickness of a Cavity Using Wavelength Shifting Interferometry, *Amit R. Suratkar, Angela A. Davies; Univ. of North Carolina at Charlotte, USA.* Wavelength shifting interferometry is implemented to determine the absolute thickness of a cavity. We propose to perform a general uncertainty analysis on the thickness of a Zerodur block and determine the major contributors towards uncertainty.

Hyatt Regency Ballroom A/B

OPE

OPWC • Current Injection and Organic Thin Film Transistors—Continued

OPWC3 • 3:00 p.m. Invited
Investigation of Charge-Injection Barriers in Finished PLEDs by Means of Non-Invasive Optical Probing, *Franco Cacialli[1], T. M. Brown[2], Vladimir Bodrozic[1]; [1]Univ. College London, UK, [2]Univ. of Rome, Italy.* We have used electroabsorption measurements as non-invasive probes of the built-in potential of polymer light-emitting diodes (PLEDs). Such measurements provides precious experimental information on the alteration of the polymer/electrode interfacial energy level line-up.

OPWC4 • 3:30 p.m.
Electronic Structure and Dynamics in Thin, Ordered Pentacene Films, *Stefan Lochbrunner[1], Henning Marciniak[1], Tobias Bittkau[1], Martin Huth[2], Stefan Schiefer[2], Bert Nickel[2]; [1]Lehrstuhl für BioMolekulare Optik, Germany, [2]Dept. für Physik und CeNS, Ludwig-Maximilians-Univ., Germany.* Femtosecond absorption measurements show that electronic excitations in pentacene films can be described with a band model considering two Davidov components while migration between the microcrystalline grains is quite slow.

3:15 p.m.–3:45 p.m. Coffee Break, Empire Hall
3:15 p.m.–3:45 p.m. Coffee Break, Hyatt Grand Ballroom G

Highland A

Joint

3:45 p.m.–5:30 p.m.
JWG • Atoms in Strong and Ultrastrong Fields II
Enam Chowdhury; Ohio State Univ., USA, Presider

JWG1 • 3:45 p.m. Invited
Relativistic Optics: A New Approach to Attosecond Physics, *Gerard Mourou; Univ. of Michigan, USA.* No abstract available.

JWG2 • 4:15 p.m.
High Energy Photoelectron Angular Distributions by an Ultra-Intense Laser Field-Atom Interaction, *Anthony DiChiara, Isaac Ghebregziabher, Barry C. Walker; Univ. of Delaware, USA.* High energy, > 3 KeV, electron azimuthal distributions are measured from an ultrastrong, $>10^{17}$ W/cm^2, laser focus and compared to theoretical predictions. The theory predicts increased isotropy in the distribution as the focal intensity is increased.

Frontiers in Optics

Highland B

3:45 p.m.–5:30 p.m.
FWS • Slow Light and Photonic Structures
Presider to Be Announced

FWS1 • 3:45 p.m.
Slowing Down of Solitons by Intrapulse Raman Scattering in Fibers with Frequency Cut-Off, *Alex Yulin, Dmitry Skryabin; Univ. of Bath, UK.* A method for transforming fast solitons into slow ones in band-gap fibers with modal cut-off is proposed. The approach is based on deceleration of solitons by intrapulse Raman scattering and allows working with femtosecond pulses.

FWS2 • 4:00 p.m.
Slow Light in Resonant Raman Systems for High-Speed Applications, *Dong Sun, P.C. Ku; Univ. of Michigan, USA.* We propose a novel slow light scheme using resonant Raman system. Slow down factor of 19 with a bandwidth exceeding 2 THz can be achieved in semiconductor quantum wells with signal gain at room temperature.

FWS3 • 4:15 p.m. Invited
Wide Band Slow Light Systems Based on Nonlinear Fibers, *Gadi Eisenstein, Evgeny Shumakher, David Dahan, Amnon Willinger, Roy Blit, Nadav Orbach, Amir Nevet; Technion, Israel.* We describe wideband slow light propagation in optical fibers based on two nonlinear effects, parametric amplification and pump modulated Brillouin scattering. Both systems enable large delays with low distortion of high rate digital data sequences.

Highland C

3:45 p.m.–5:45 p.m.
FWT • Computational Imaging V
Ravindra A. Athale; MITRE Corp., USA, Presider

FWT1 • 3:45 p.m. Invited
3-D Nanophotonics for Computational Imaging, *George Barbastathis; MIT, USA.* We present recent developments in the theoretical understanding and manufacturing/assembly processes for three-dimensional nanophotonics. Applications include computational imagers with ultra-thin form factors, optical interconnects, and materials characterization.

FWT2 • 4:15 p.m. Invited
Improved Performance in Miniature Cameras through Wavefront Coding™, *Chris Linnen, Ed Dowski; CDM Optics Inc., USA.* Challenges involved in miniature camera module design and implementation will be presented. A particular camera module example will be used to show how Wavefront Coding™ technology can meet these challenges and improve overall system performance.

Highland D

3:45 p.m.–5:30 p.m.
FWU • Silicon and III-V Based Optoelectronics for Optical Interconnects II
Michal Lipson; Cornell Univ., USA, Presider

FWU1 • 3:45 p.m. Invited
Silicon Microphotonics: Technology Elements and the Roadmap to Implementation, *Lionel Kimerling; MIT, USA.* No abstract available.

FWU2 • 4:15 p.m.
XPM-Induced Modulation Instability in SOI Photonic Nanowires, *Nicolae C. Panoiu, Xiaogang Chen, Richard M. Osgood; Columbia Univ., USA.* We demonstrate that modulation instability of copropagating optical waves can be observed in millimeter-long silicon photonic nanowires. The calculated gain of the modulation instability is more than 100x larger than that achieved in optical fibers.

Highland E

3:45 p.m.–5:30 p.m.
FWV • Advances in Macroscopic Optical Imaging II
Sergio Fantini; Tufts Univ., USA, Presider

FWV1 • 3:45 p.m. Invited
The Inverse Source Problem of the Equation of Radiative Transfer in Fluorescence and Bioluminescence Tomography, *Alexander Klose; Columbia Univ., USA.* The equation of radiative transfer is employed for solving the inverse source problem of optical reporter probes in highly scattering tissue. Gradient-based and stochastic optimization methods minimize an error function and recover the probe distributions.

FWV2 • 4:15 p.m. Invited
Optical Tomography with Large Data Sets, *John C. Schotland; Univ. of Pennsylvania, USA.* We report recent work on reconstruction algorithm for optical tomography with large data sets.

Highland F

3:45 p.m.–5:30 p.m.
FWW • Ceramic Lasers II
Gregory Quarles; VLOC, USA, Presider

FWW1 • 3:45 p.m. Tutorial
Transparent Polycrystalline Materials for Advanced Solid-State Lasers, *Robert L. Byer; Stanford Univ., USA.* No abstract available.

Robert L. Byer has conducted research and taught classes in lasers and nonlinear optics at Stanford University since 1969. He has made numerous contributions to laser science and technology including the demonstration of the first tunable visible parametric oscillator, the development of the Q-switched unstable resonator Nd:YAG laser, remote sensing using tunable infrared sources and precision spectroscopy using Coherent Anti Stokes Raman Scattering (CARS). Current research includes the development of nonlinear optical materials and laser diode pumped solid state laser sources for applications to gravitational wave detection and to laser particle acceleration. Byer has published more than 400 scientific papers and holds over 50 patents in the fields of lasers and nonlinear optics.

Highland G

Frontiers in Optics

3:45 p.m.–5:45 p.m.
FWX • General Optical Design and Instrumentation III

Anurag Gupta; Optical Res. Associates, USA, Presider

FWX1 • 3:45 p.m.
Orthonormal Polynomials in Wavefront Analysis: Analytical Solution, *Virendra N. Mahajan[1], Guang-ming Dai[2]; [1]Aerospace Corp, USA, [2]AMO Laser Vision Correction Group, USA*. This paper derives closed-form orthonormal polynomials over noncircular apertures using the Gram-Schmidt orthogonalization process. Isometric plots, interferograms, and point-spread functions are illustrated. Their use in wavefront analysis is discussed.

FWX2 • 4:00 p.m.
Sub-Diffraction Optical Lenses for Use in Far-Field Sub-Wavelength Optical Microscopy (FSOM), *Alessandro Salandrino, Brian E. Edwards, Nader Engheta; Univ. of Pennsylvania, USA*. We theoretically study a new imaging technique that allows for far-field sub-diffraction imaging. This technique is based on a near-field pre-magnification operated through a properly designed metamaterial crystal acting as a near-field subdiffraction lens.

FWX3 • 4:15 p.m.
Fourier Transform Approach for the Design of Arbitrary Axial Intensity Distribution Functions, *Jeffrey A. Davis[1], Juan Campos[2], Maria J. Yzuel[2], Claudio Iemmi[3]; [1]San Diego State Univ., USA, [2]Univ. Autonoma de Barcelona, Spain, [3]Univ. de Buenos Aires, Argentina*. We show how to obtain an arbitrary axial imaging distribution for an optical system using pupil functions obtained from a Fourier transform approach. We generate these complex pupil functions using a single liquid crystal display.

Highland H

Laser Science

3:45 p.m.–5:30 p.m.
LWH • Quantum Imaging

Robert W. Boyd; Univ. of Rochester, USA, Presider

LWH1 • 3:45 p.m. Invited
Quantum Imaging and Precision Measurements with N00N States, *Jonathan Dowling; Louisiana State Univ., USA*. I discuss quantum lithography and Heisenberg-limited metrology with optical N00N states. I show how the enhanced accuracy in measurements and the increased resolution in lithography follow from the use of entanglement, and review recent experiments.

LWH2 • 4:15 p.m. Invited
Multi-Photon Path-Entangled (e.g. "Noon") States: Issues in Preparation and Measurement, *Aephraim Steinberg; Univ. of Toronto, Canada*. Recent advances make it possible to entangle multiple photons, despite the absence of strong photon-photon interactions. We present experiments generating "noon" states applicable to quantum interferometry, and complete quantum tomography of such states.

Highland J

Joint

3:45 p.m.–5:30 p.m.
JWH • Novel Microscopies for Medicine and Biology II

Xingde Li; Univ. of Washington, USA, Presider

JWH1 • 3:45 p.m. Invited
Multimodality Microscopy for Structural and Functional Imaging of Three-Dimensional Cell Dynamics, *Stephen A. Boppart; Beckman Inst. - Univ. of Illinois at Urbana-Champaign, USA*. A multimodality microscope has been constructed to enable simultaneous optical coherence and nonlinear multi-photon microscopy. Spectroscopic detection permits three-dimensional scatterer sizing in tissue and in single cells.

JWH2 • 4:15 p.m. Invited
Spectral Domain OCT and Optical Coherence Phase Microscopy, *Johannes F. de Boer; Massachusetts General Hospital, USA. In vivo* structural and functional imaging of the human retina with Spectral domain OCT and OFDI will be presented, as well as Optical Coherence Phase Microscopy for imaging cell structure and nerve bundle function

Highland K

Frontiers in Optics

3:45 p.m.–5:30 p.m.
FWY • Photonic Metamaterials III

Presider to Be Announced

FWY1 • 3:45 p.m. Invited
Statistics of Resonances and Delay Times in High Dimensional Random Media, *Tsampikos Kottos; Wesleyan Univ., USA*. We review recent developments on properties of resonances and delay times of complex systems. Emphasis is given to non-universal characteristics like diffusion, localization or critical behavior which cannot be captured by Random Matrix Theory.

FWY2 • 4:15 p.m.
Variable Coherence Enhanced Backscattering, *Erwan Baleine, Aristide Dogariu; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA*. Using an incident beam with shaped spatial coherence properties and measuring the coherent backscattered intensity, we demonstrate that the probability of radial intensity distribution of a diffusing medium can be directly obtained.

Hyatt Grand Ballroom E/F

OF&T

3:45 p.m.–5:15 p.m.
OFWD • Testing II

Rufino Diaz-Uribe, Sr.; UNAM, Mexico., Presider

OFWD1 • 3:45 p.m. Invited
Recent Advances in White-Light Interferometry: Speed Improvement and Transparent Film Profiling, *Katsuichi Kitagawa; Toray Engineering Co., Japan*. Two major shortcomings in white-light interferometric surface measurement are 1) slow measurement speed, and 2) error caused by a transparent film on the surface. This paper introduces new developments to solve these problems.

OFWD2 • 4:15 p.m.
Fast-Light For Enhanced-Sensitivity White-Light Resonant Interferometry, *Selim M. Shahriar, Gour Pati, Mary Messall, Kenneth Salit; Northwestern Univ., USA*. A fast-light medium placed inside a resonant interferometer can be used to enhance its sensitivity significantly. At the same time, the linewidth of the cavity resonance can be highly augmented without sacrificing the cavity build-up.

Hyatt Regency Ballroom A/B

OPE

4:15 p.m.–5:15 p.m.
OPWD • Organic Thin Film Transistors

Presider to Be Announced

OPWD1 • 4:15 p.m. Invited
Printed Organic Electronics, *Ana Claudia Arias; Xerox Corp. Palo Alto Res. Ctr. Inc., USA*. No abstract available.

Highland A

Joint

JWG • Atoms in Strong and Ultrastrong Fields II—Continued

JWG3 • 4:30 p.m.
Time Resolved Asymmetrically Enhanced Third Harmonic Generation from Noble-Gas Cluster Explosions, *Bonggu Shim, Greg Hays, Rafal Zgadzaj, Todd Ditmire, Michael Downer; Univ. of Texas at Austin, USA.* We studied asymmetrically enhanced third harmonic generation from a noble-gas clustered jet heated with high intensity lasers using pump-probe techniques. When enhanced due to resonance and increased coherence length, third harmonic generation becomes temporarily anisotropic.

JWG4 • 4:45 p.m.
Electromagnetic Modeling of Ultra Short Pulses in Focal Regions, *Frank Wyrowski[1], Hagen Schimmel[2]; [1]Friedrich Schiller Univ. Jena, Germany, [2]LightTrans GmbH, Germany.* We base electromagnetic modeling and propagation of ultra short pulses through optical systems on a harmonic field decomposition in combination with wave-optical propagation techniques. Its potential is discussed in focal regions of high NA lenses.

JWG5 • 5:00 p.m.
Isolated, CEP-Insensitive, EUV Pulses via Gated Phase-Matching Mechanism in a Waveguide, *Arvinder S. Sandhu[1], Etienne Gagnon[1], Ariel Paul[1], Isabell Thomann[1], Amy Lytle[1], Margaret Murnane[1], Henry Kapteyn[1], Ivan Christov[2]; [1]JILA, Univ. of Colorado at Boulder, USA, [2]Sofia Univ., Bulgaria.* We discuss a regime of harmonic generation, where isolated femtosecond EUV pulses are generated via a mechanism relatively insensitive to carrier-envelope phase. This approach also allows for selective control of the EUV energy and bandwidth.

Highland B

Frontiers in Optics

FWS • Slow Light and Photonic Structures—Continued

FWS4 • 4:45 p.m.
Tunable Optical Delay with On-Chip Analogue to EIT, *Qianfan Xu, Jagat Shakya, Michal Lipson; Cornell Univ., USA.* We measure group delay in a silicon based coupled-resonator device with transmission properties analogous to those of electromagnetically-induced-transparency system. We demonstrate thermal tuning of the group delay in this device.

FWS5 • 5:00 p.m.
Tunable Slow Light in Cesium Vapor, *Aaron Schweinsberg, Ryan M. Camacho, Michael V. Pack, Robert W. Boyd, John C. Howell; Univ. of Rochester, USA.* We obtain large fractional pulse delays in a Cesium vapor for a probe centered between two absorption resonances in the hyperfine structure. This delay can be tuned by applying pump fields to the absorption lines.

Highland C

FWT • Computational Imaging V—Continued

FWT3 • 4:45 p.m.
Wavefront Coding for Millimeter Wave Imaging, *Gregory P. Behrmann[1], Mark Mirotznik[1], Joseph N. Mait[2], David Wikner[2], Joseph van der Gracht[3]; [1]Catholic Univ. of America, USA, [2]ARL, USA, [3]Holospex, Inc., USA.* The large numerical apertures employed in millimeter wave imaging are necessary for light gathering and resolution, but result in limited depth-of-field. We explore wavefront coding to extend the depth-of-field and examine effects on system performance.

FWT4 • 5:00 p.m.
Optical Transfer Function of the Odd-Symmetric Quadratic Phase Mask Imager, *Manjunath Somayaji, Marc P. Christensen; Dept. of Electrical Engineering, Southern Methodist Univ., USA.* The optical transfer function of a wavefront coding odd-symmetric quadratic phase mask imager is mathematically derived. The available spatial frequency bandwidth is quantified and a special imaging condition yielding an increased dynamic range is identified.

Highland D

FWU • Silicon and III-V Based Optoelectronics for Optical Interconnects II—Continued

FWU3 • 4:30 p.m.
Semiconductor Arrayed Waveguide Gratings with 200 nm Operating Range for Photonic Integrated Circuits, *Alan R. Kost, Kameron Rausch; Univ. of Arizona, USA.* This paper describes the design and implementation of InP-based, arrayed waveguide grating multiplexers for coarse wavelength division that operate over a 200 nm range.

FWU4 • 4:45 p.m.
Multi-Resonant Photonic Crystal Waveguide for Integrated Active Devices in Silicon, *Ashutosh R. Shroff[1], Philippe M. Fauchet[1,2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Electrical and Computer Engineering, Univ. of Rochester, USA.* High-bandwidth and slow-light are essential for integration of active Silicon devices. Hence, we propose a novel device, interlaced coupled-cavity photonic crystal waveguide with usable bandwidth above 400 Gbits/s and average group velocity below 0.004c.

FWU5 • 5:00 p.m.
10 Gb/s Optical Link via Array Waveguide Evanescent Coupling, *Angel Flores[1], Jame J. Yang[2], Michael R. Wang[1]; [1]Univ. of Miami, USA, [2]New Span Opto-Technology Inc., USA.* A high-speed 10Gb/s optical link has been experimentally demonstrated. Low-loss exposed core waveguide array ribbons were devised. Through evanescent coupling between ribbons, modulated light is transferred from a backplane waveguide bus to an output bus.

Highland E

FWV • Advances in Macroscopic Optical Imaging II—Continued

FWV3 • 4:45 p.m.
Measuring the Diffusion Coefficient Independent of the Boundary Conditions, *Matthew R. Montgomery, Chaim Schwartz, Aristide Dogariu; College of Optics and Photonics: CREOL and FPCE, USA.* We present an experimental method of non-invasively measuring the optical pathlength distribution in diffusive media using dual-fiber interferometry, which allows for the evaluation of the diffusion coefficient independent of the boundary conditions.

FWV4 • 5:00 p.m.
Application of a Dual-Detector Scheme for Biological Noise Removal in NIRS Cerebral Hemodynamics Monitoring, *Rolf B. Saager, Andrew J. Berger; Inst. of Optics, Univ. of Rochester, USA.* We proposed a method to isolate cerebral NIRS signatures using measurements at two source-detector separations. To examine this method's applicability on human subjects, a series of different activation protocols are monitored via specialized NIRS probes.

Highland F

FWW • Ceramic Lasers II—Continued

FWW2 • 4:30 p.m. Invited
Ceramic Laser Materials for the Solid-State Heat Capacity Laser, *Thomas Soules; Lawrence Livermore Natl. Lab, USA.* LLNL's SSHCL experience with 10x10x2 cm Nd:YAG amplifier slabs from Konoshima Ltd. is described. Slabs framed with ceramic Sm:YAG for ASE suppression by co-sintering and other ceramic materials being investigated are also discussed.

FWW3 • 5:00 p.m. Invited
Fabrication and Properties of Ceramic Laser Materials, *Jasbinder Sanghera[1], Guillermo Villalobos[1], Woohong Kim[2], Brian Sadowski[2], Shyam Bayya[1], Robert Miklos[2], Ishwar Aggarwal[1]; [1]US NRL, USA, [2]SF Associates, USA.* We have developed a novel sintering process using in-house prepared powders to make transparent ceramics such as Yb:Y_2O_3. The properties of this material indicate that it is suitable for making a high power laser.

Highland G

Frontiers in Optics

FWX • General Optical Design and Instrumentation III—Continued

FWX4 • 4:30 p.m.
Spectroscopic Interferometry Using Slow Light Media, *Zhimin Shi[1], Robert W. Boyd[1], Daniel J. Gauthier[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Physics, and Fitzpatrick Ctr. for Photonics and Communications Systems, Duke Univ., USA.* We consider a Mach-Zehnder interferometer with a slow-light medium in one of its arms. We show that the frequency/wavelength sensitivity is enhanced enormously because of the large difference in group indices between the two arms.

FWX5 • 4:45 p.m.
Optical Design Methods for Spectrographic Systems, *Blair L. Unger[1], Joseph M. Howard[2], Duncan T. Moore[1]; [1]Univ. of Rochester, USA, [2]Goddard Space Flight Ctr., USA.* Hamiltonian methods are applied to spectrometer design using linearly spaced gratings. The aberration function is expanded in terms of system construction parameters, constraints are then derived on certain parameters which ensure some low-order image properties.

FWX6 • 5:00 p.m.
Non-Planar Photolithography Using Digital Holograms, *Richard McWilliam[1], Simon Johnson[1], Andrew M. Maiden[1], Alan Purvis[1], Luke N. Seed[2], Gavin L. Williams[2], Peter A. Ivey[3]; [1]Univ. of Durham, UK, [2]Sheffield Univ., UK, [3]Innotec Ltd., UK.* A photolithographic process using digital holograms enables the fine-pitch patterning of grossly non-planar substrates, with many potential applications in microelectronics packaging. Considerations of hologram design, fabrication and verification particular to the lithographic process are presented.

Highland H

Laser Science

LWH • Quantum Imaging—Continued

LWH3 • 4:45 p.m.
Quantum Lithography Has a Reduced Multiphoton Absorption Rate, *Mankei Tsang, Demetri Psaltis; Caltech, USA.* It is shown that, contrary to popular belief, the multiphoton absorption rate is reduced if entangled photons are used to reduce the feature size of multiphoton lithography.

LWH4 • 5:00 p.m.
Demonstration of Sub-Rayleigh Lithography Using a Multi-Photon Absorber, *Heedeuk Shin, Hye Jeong Chang, Malcolm N. O'Sullivan-Hale, Robert W. Boyd; Inst. of Optics, USA.* We demonstrate resolution enhancement beyond the standard Rayleigh limit using an interferometric, nonlinear optical method. Using PMMA as multi-photon absorbing lithographic material, we record fringes with a period of a quarter of the wavelength.

Highland J

Joint

JWH • Novel Microscopies for Medicine and Biology II—Continued

JWH3 • 4:30 p.m. Invited
New Techniques in Confocal Microscopy, *Jerome Mertz; Boston Univ., USA.* Two new optical techniques are presented that lead to out-of-focus background rejection. The first is autoconfocal microscopy, which reveals phase-gradients. The second is dynamic speckle illumination microscopy, which reveals fluorescence.

JWH4 • 4:45 p.m.
Super-Resolution Mapping of Flow Velocity Distribution in Nanofluidic Channels, *Junpeng Guo[1], Guiren Wang[2], David J. Brady[3]; [1]Univ. of Alabama in Huntsville, USA, [2]CFD Res. Corp., USA, [3]Duke Univ., USA.* We will show a super-resolution mapping technique for measuring the flow velocity distribution in nanofluidic channels. The mapping resolution can be much smaller than the diffraction limit of the optical imaging system.

Highland K

Frontiers in Optics

FWY • Photonic Metamaterials III—Continued

FWY3 • 4:30 p.m.
Chaotic Stimulated Brillouin Scattering in a Fiber near the Threshold, *Chil-Min Kim[1], Sang Hun Lee[2]; [1]Natl. Creative Init. Ctr. for Controlling Optical Chaos, Pai-Chai Univ., Republic of Korea, [2]Dept. of Physics, Seonam Univ., Republic of Korea.* We investigate the stimulated Brillouin scattering (SBS) in the absence of feedback near the threshold in an optical fiber. From the experimental results, we verify that the irregular SBS signal is chaos.

FWY4 • 4:45 p.m.
Light Transport in Volume Disordered Optical Fibers, *Elena I. Chaikina[1], Noemí Lizárraga[1], Eugenio Méndez[1], Patricia Puente[2]; [1]CICESE, Mexico, [2]Univ. Autónoma de Baja California, Mexico.* We study the spatial and spectral dependence of the optical intensity inside a monomode optical fiber with random variations of refractive index. The random structures were fabricated in UV-sensitive Ge-doped optical fibers.

FWY5 • 5:00 p.m.
Competition of Gain Channels in Neodymium Random Laser, *G. Zhu, C. E. Small, M. A. Noginov; Norfolk State Univ., USA.* We have studied the competition between two gain channels $^4F_{3/2}$—>$^4I_{11/2}$ and $^4F_{3/2}$—>$^4I_{13/2}$ in $Nd:Ba_5(PO_4)_3F$ random laser with added $Cr^{4+}:Y_3Al_5O_{12}$ powder (absorbing light at 1.06µm) and mirrors reflecting light at 1.32µm or 1.06µm.

Hyatt Grand Ballroom E/F

OF&T

OFWD • Testing II—Continued

OFWD3 • 4:30 p.m.
Disturbance Free Phase-Shifting Laser Diode Interferometer, *Takamasa Suzuki, Tsutomu Takahashi, Osami Sasaki; Niigata Univ., Japan.* A feedback control-equipped phase-shifting laser diode interferometer that eliminates external disturbance is proposed. Also the sequence of the interference fringe is automatically determined by means of synchronization between the image-capture and the phase-shift.

OFWD4 • 4:45 p.m.
Physical Optics Modeling of the Interferometric Radius Measurement, *Kate M. Medicus, Angela Davies; Univ. of North Carolina at Charlotte, USA.* We model the radius measurement to approximate the physical optics model. This identifies the bias in the measurement due to using a simple geometric ray model instead of the more complex physical optics model.

OFWD5 • 5:00 p.m.
Challenges with Interferometric Non-null Measurements, *Gary M. DeVries, Jon F. Fleig, Paul E. Murphy; QED Technologies, USA.* Typically interferometers are used in a null configuration where the reference and test wavefronts are nearly identical. Non-null testing, however, can enable aspheric measurements without dedicated correctors. We demonstrate challenges encountered with interferometric nonnull measurements.

Hyatt Regency Ballroom A/B

OPE

OPWD • Organic Thin Film Transistors—Continued

OPWD2 • 4:45 p.m. Invited
Morphological Basis for High Mobility of Poly(bithiophene thienothiophene), *R. Joseph Kline[1], Dean M. DeLongchamp[1], Eric K. Lin[1], Lee Richter[1], Daniel A. Fischer[1], Martin Heeney[2], Iain McCulloch[2]; [1]NIST, USA, [2]Merck Chemical Ltd., UK.* We have solved the packing arrangement for the recently reported high mobility polymer poly(2,5-bis(3-alkylthiophen-2-yl)thieno[3,2-*b*]thiophenes) and will highlight the key aspects that result in improved performance.

Highland A

Joint

JWG • Atoms in Strong and Ultrastrong Fields II—Continued

JWG6 • 5:15 p.m.
Control of Relativistic and Non-Relativistic High-Harmonic Generation from Overdense Laser Plasmas, *Robin Marjoribanks[1], Patrick Audebert[2], Jean-Paul Geindre[2], Fabien Quéré[3], Cédric Thaury[3], Pascal Monot[3], Philippe Martin[3]; [1]Univ. of Toronto, Canada, [2]LULI, Ecole Polytechnique, France, [3]SPAM, CEA-Saclay, France.* High harmonic generation from ultra-intense laser-matter interaction can be generated by both linear and relativistic means. In experiments with intensity up to a few 10^{19} Wcm^{-2}, we show the distinctions and means to control each.

Highland B

Frontiers in Optics

FWS • Slow Light and Photonic Structures—Continued

FWS6 • 5:15 p.m.
A Data-Fidelity Metric for Designing Slow-Light Media, *Michael D. Stenner, Ravi Pant, Mark A. Neifeld; Univ. of Arizona, USA.* In slow light systems, increasing the delay-bandwidth product also increases distortion. We present a distortion metric that is directly related to data fidelity and can be used to design slow-light media under a bit-error-rate constraint.

Highland C

FWT • Computational Imaging V—Continued

FWT5 • 5:15 p.m.
Imaging and Design Based on Nonlinear Filtering of K-Space Data, *Michael A. Fiddy[1], Markus E. Testorf[2]; [1]Univ. of North Carolina at Charlotte, USA, [2]Dartmouth College, USA.* The problem of multiple scattering in the context of imaging and the design of diffracting structures is addressed with a nonlinear filter technique. Rigorous diffraction models are used to analyze the filtering technique in detail.

FWT6 • 5:30 p.m.
Object-Based Stereo Panorama Disparity Adjusting, *Chiao Wang, Alexander A. Sawchuk; Univ. of Southern California, USA.* We describe a stereo panorama horizontal disparity adjusting algorithm in which the viewer can enhance/reduce the perceived stereo effect of selected objects. We present object selection methods based on the mean-shift image segmentation algorithm.

Highland D

FWU • Silicon and III-V Based Optoelectronics for Optical Interconnects II—Continued

FWU6 • 5:15 p.m.
Current-Induced Surface Second-Harmonic Generation in Silicon, *Oleg Aktsipetrov, Vladimir Bessonov, Andrei Fedyanin; Moscow State Univ., Russian Federation.* Surface contribution to the optical second-harmonic generation resulting from the dynamic influence of cw-electric current flowing along Si(100) surface on the electron distribution anisotropy in the surface region is observed.

Highland E

FWV • Advances in Macroscopic Optical Imaging II—Continued

FWV5 • 5:15 p.m.
High Speed Frequency Domain Camera, *Abneesh Srivastava, David Watt, Gregory W. Faris; SRI Intl., USA.* We are developing a system for high bandwidth frequency domain imaging using a high-speed camera together with field programmable gate array processing. Data processing rates are up to 2 gigapixels per second.

Highland F

5:30 p.m.–7:00 p.m. OSA Member Reception, Hyatt Grand Ballroom

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7:00 p.m.–8:30 p.m. FiO Postdeadline Papers, Highland Rooms

NOTES

Highland G	Highland H	Highland J	Highland K	Hyatt Grand Ballroom E/F	Hyatt Regency Ballroom A/B
Frontiers in Optics	**Laser Science**	**Joint**	**Frontiers in Optics**	**OF&T**	**OPE**

FWX • General Optical Design and Instrumentation III—Continued

FWX7 • 5:15 p.m.
Development of a Spectrum Generator, *Michael E. Zugger; Penn State Applied Res. Lab, USA.* Penn State Applied Research Lab has developed a Spectrum Generator which can produce a color spot of arbitrary spectral content, with 3nm resolution across the visible band, or 1nm resolution across a smaller band.

FWX8 • 5:30 p.m.
Study of a GRIN Array Imaging System: Resolution Analysis and Extended Depth-of-Field, *Xi Chen, Nicholas George; Inst. of Optics, Univ. of Rochester, USA.* A comprehensive physical optics analysis of a gradient-index (GRIN) rod and a GRIN lens array imaging system including aberrations is presented. Also we study the application of extended depth-of-field techniques to the GRIN array imager.

LWH • Quantum Imaging—Continued

LWH5 • 5:15 p.m.
Generation of Entangled Photon Holes Using Quantum Interference, *Todd B. Pittman, James D. Franson; Johns Hopkins Univ., USA.* Entangled photon holes represent a new form of entanglement in quantum optics. Here we report on an experimental observation of entangled photon holes generated using quantum interference techniques.

FWY • Photonic Metamaterials III—Continued

FWY6 • 5:15 p.m.
Coupled Dipole Description of Random Near Fields, *David P. Haefner, Adela Apostol, Aristide Dogariu; College of Optics and Photonics, USA.* We report coupled dipole calculations of near field responses from optically inhomogeneous media. The results are validated by measurements preformed in different statistical regimes.

5:30 p.m.–7:00 p.m. OSA Member Reception, Hyatt Grand Ballroom

7:00 p.m.–8:30 p.m. FiO Postdeadline Papers, Highland Rooms

NOTES

Frontiers in Optics

Highland A

8:00 a.m.–9:45 a.m.
Commercialization of University and Orphan Technologies
See Page 13.

Highland B

8:00 a.m.–9:45 a.m.
Best of Topicals
See Page 12.

Highland C

8:00 a.m.–9:45 a.m.
FThA • Photonic Crystals and Solitons
Presider to Be Announced

FThA1 • 8:00 a.m.

Bistability, Chirping and Switching in a Cuasilineal Photonic Crystal, *Jesus Escobedo-Alatorre[1], Javier Sánchez-Mondragón[1,2], Miguel Torres-Cisneros[3], Elder DelaRosa-Cruz[4], Margarita Tepocyotl-Torres[1], Ismael Torres-Gomez[4], Miguel Basurto-Pensado[1], Daniel May-Arrioja[5]; [1]Ctr. for Res. on Engineering and Applied Sciences UAEM, Mexico, [2]INAOE, Mexico, [3]Univ. of Guanajuato, Mexico, [4]Ctr. de Investigaciones en Optica (CIO), Mexico, [5]College of Optics and Photonics, Univ. of Central Florida, USA.* We present a study of the bistability, switching and chirping in a one dimensional stack (1-D photonic crystal) for a linear-nonlinear and both nonlinear media.

FThA2 • 8:15 a.m.

Effective Refractive Index of 3-D Photonic Crystals at Photonic Bandgap, *Masanobu Iwanaga, Masashi Ishikawa, Teruya Ishihara; Tohoku Univ., Japan.* We numerically evaluate effective refractive index of a 3-D photonic crystal at full photonic bandgap. The typical value is 0.001. The 3-D photonic crystal at bandgap is characterized as a material of small refractive index.

Highland D

8:00 a.m.–9:45 a.m.
FThB • Disordered Structures: Coherence, Localization and Lasing II
Hui Cao; Northwestern Univ., USA, Presider

FThB1 • 8:00 a.m. Invited

Dynamic Link between Mesoscopic Fluctuations and Photon Localization, *Azriel Genack[1], Andrey A. Chabanov[2], Bing Hu[1], Sheng Zhang[1]; [1]Queens College CUNY, USA, [2]Univ. of Texas at San Antonio, USA.* We observe the increasing impact of weak localization and the growth of intensity correlation with delay time from an exciting pulse and find a link between localization and mesoscopic fluctuations of total transmission.

Highland E

8:00 a.m.–9:45 a.m.
FThC • Photonic Crystals
Johann Peter Reithmaier; Univ. Kassel, Germany, Presider

FThC1 • 8:00 a.m.

Accessing Quadratic Nonlinearities of Metals through Metallo-Dielectric Photonic Band Gap Structures, *Giuseppe D'Aguanno[1], Nadia Mattiucci[2], Michael Scalora[1], Mark J. Bloemer[1]; [1]Charles M. Bowden Res. Facility, USA, [2]Time Domain Corp., USA.* Second harmonic generation in a metallo-dielectric photonic band gap structure can be, under suitable conditions, two orders of magnitude greater than the maximum conversion efficiency achievable in a single layer of silver.

FThC2 • 8:15 a.m.

Near-Field Characterization of Three-Dimensional Woodpile Photonic Crystals Fabricated with Two-Photon Polymerization, *Baohua Jia, Jiafang Li, Min Gu; Ctr. for Micro-Photonics, Faculty of Engineering and Industrial Sciences, Swinburne Univ. of Technology, Australia.* A scanning near-field optical microscope (SNOM) is used to observe high-resolution optical intensity distributions of three-dimensional woodpile photonic crystals fabricated with two-photon-polymerization technique. Near-field signals reveal different mode distributions inside and outside the partial bandgap.

Highland F

8:00 a.m.–9:30 a.m.
FThD • Nonlinear Propagation Effects
Qiwen Zhan; Electro-Optics Program, USA, Presider

FThD1 • 8:00 a.m.

Optical Collapse of Coupled Beams in Kerr Media, *Amiel A. Ishaaya, Taylor D. Grow, Saikat Ghosh, Luat T. Vuong, Alexander L. Gaeta; Cornell Univ., USA.* We investigate the mutual collapse dynamics of two spatially separated beams. Depending on the relative phase, we observe repulsion or attraction, which in the latter case reveals a sharp transition to a single collapsing beam.

FThD2 • 8:15 a.m.

Topological Charge Effects on Azimuthal Modulation Instabilities for Cylindrical Polarization in Nonlinear Media, *Zasim Mozumder, Nkorni Katte, Joseph W. Haus, Qiwen Zhan; Univ. of Dayton, USA.* Inhomogeneously polarized optical waves form a novel class of nonlinear vector wave propagation effects. In this talk we report the effects of topological charge on the azimuthal modulation instability.

Highland G

Frontiers in Optics

8:00 a.m.–9:45 a.m.
FThE • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations I
Russell Chipman; Univ. of Arizona, USA, Presider

FThE1 • 8:00 a.m. Tutorial
Polarization Ray Tracing of Wave Fields, *Miguel Alonso; Univ. of Rochester, USA.* This tutorial gives an overview of methods used for modeling the propagation of the polarization properties of electromagnetic fields, and presents a new ray-based method. The validity and numerical efficiency of these methods are discussed.

Miguel A. Alonso graduated as an Engineer in Physics from the Universidad Autonoma Metropolitana in Mexico City, and obtained his PhD in Optics from the University of Rochester. After a three-year postdoctoral appointment at Macquarie University in Sydney, he took on a position at the Universidad Nacional Autonoma de Mexico in Cuernavaca from 2000 until 2003, when he returned to the University of Rochester to join the faculty of the Institute of Optics. He has been an Associate Editor for *Optics Express* since 2002. His main research interest is the development of new mathematical tools for modeling the propagation of wave fields, with particular emphasis on methods based on the ray model.

Highland H

Laser Science

8:00 a.m.–10:00 a.m.
LThA • Precision and Quantum Enabled Measurements
Poul S. Jessen; Univ. of Arizona, USA, Presider

LThA1 • 8:00 a.m. Invited
Quantum Measurement in Gravitational-Wave Detectors, *Yanbei Chen; Max-Planck-Inst. fur Gravitationsphysik, Germany.* Laser interferometric gravitational-wave detectors measure tiny motions of macroscopic test masses. Complex interferometer configurations and quantum optical techniques will enable future detectors to reach and surpass the Standard Quantum Limit.

Highland J

Joint

8:00 a.m.–9:45 a.m.
JThA • Optical Imaging of Response to Therapy I
Brian Pogue; Dartmouth College, USA, Presider

JThA1 • 8:00 a.m. Invited
Imaging of Intrinsic Optical Stem Cell Changes in Engineered Tissues, *Irene Georgakoudi, William Rice, Shamaraz Firdous, Joshua Mauney, Vladimir Volloch, David Kaplan; Tufts Univ., USA.* Interactions between stem cells and their surrounding matrix are essential in the development of engineered tissues. Spectroscopic imaging of endogenous sources of optical contrast provides a non-invasive means for monitoring such interactions.

Highland K

8:00 a.m.–9:45 a.m.
JThB • Laser Plasmas and Filaments
Presider to Be Announced

JThB1 • 8:00 a.m. Invited
GeV Laser-Plasma Electron Acceleration in a cm-Scale Capillary Waveguide, *Kei Nakamura[1], Csaba Toth[1], Bob Nagler[1], Cameron G. R. Geddes[1], Carl B. Schroeder[1], Eric H. Esarey[1], Wim P. Leemans[1], Anthony J. Gonsalves[2], Simon M. Hooker[2]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Univ. of Oxford, UK.* 33 mm plasma channels produced in a gas-filled capillary discharge and 40 TW, 40 fs laser pulses were used to produce GeV electron beams in a multi-table-top setup.

NOTES

Frontiers in Optics

Highland A

Commercialization of University and Orphan Technologies—Continued

NOTES

Highland B

Best of Topicals—Continued

Highland C

FThA • Photonic Crystals and Solitons—Continued

FThA3 • 8:30 a.m.
Radiative Transport in Disordered Photonic Crystals, *Mikhail V. Erementchouk[1], Heeso Noh[1], Hui Cao[1], Lev Deych[2], Alexander Lisyansky[2]; [1]Northwestern Univ., USA, [2]Queens College, CUNY, USA.* The theory of the radiative transfer is developed for disordered photonic crystals. The radiative transfer equation is derived for the specific intensity of the photonic modes. Basic transport properties are studied near the equilibrium regime.

FThA4 • 8:45 a.m.
Solitons and Slow-Light in Materials with Resonantly Enhanced Quadratic and Cubic Nonlinearities, *Dmitry Skryabin[1], Alex Yulin[1], Andrey Maimistov[2]; [1]Univ. of Bath, UK, [2]Moscow Engineering Physics Inst., Russian Federation.* We consider propagation of short optical pulses in medium of classical oscillators with various nonlinearities and find analytical solutions in form of localized polaritons. We study transparency and slow light effects associated with these solutions.

Highland D

FThB • Disordered Structures: Coherence, Localization and Lasing II—Continued

FThB2 • 8:30 a.m.
Observation of Millimeter Wave Localization in Randomly Stratified Media, *John A. Scales[1], Valentin D. Freilikher[2], Yury P. Bliokh[3]; [1]Colorado School of Mines, USA, [2]Bar Ilan Univ., Israel, [3]Technion, Israel.* Multiple scattering in 1-D random media creates resonances at frequencies associated with localized modes. We have developed a configurable 1-D photonic structure that has allowed us to observe this localization at millimeter wave frequencies.

FThB3 • 8:45 a.m. Invited
Conquering Surface Plasmon Resonance Loss in Metallic Nanoparticles, *Mikhail A. Noginov; Norfolk State Univ., USA.* We have observed the compensation of loss in metal by gain in interfacing dielectric in the mixture of aggregated silver nanoparticles and rhodamine 6G dye, which is evidenced by six-fold enhancement of the Rayleigh scattering.

Highland E

FThC • Photonic Crystals—Continued

FThC3 • 8:30 a.m. Invited
Modified Spontaneous Emission and Disorder-Induced Optical Scattering in Photonic Crystal Slabs, *Stephen Hughes; Queen's Univ., Canada.* We present a selection of photon-Green-function techniques to study the spontaneous emission dynamics in photonic-crystal-slabs. Applications towards single photon emission and low-loss waveguides are discussed and the important role of sample disorder is highlighted.

Highland F

FThD • Nonlinear Propagation Effects—Continued

FThD3 • 8:30 a.m.
Harmonic Generation with Vector Gaussian Beams, *Bahaa E. A. Saleh[1], Malvin C. Teich[1], Silvia Carrasco[2], John T. Fourkas[3]; [1]Boston Univ., USA, [2]Harvard Univ., USA, [3]Univ. of Maryland, USA.* A Gaussian beam has an axial field component with (1,0) Hermite-Gauss distribution and a doubled Gouy phase. Its contribution to harmonic generation exhibits different dependence on the location of the beam relative to the crystal.

FThD4 • 8:45 a.m.
Oligofluorene as a New High-Performance Dye for Cholesteric Liquid Crystal Lasers, *Ksenia Dolgaleva[1], Simon K.-h. Wei[2], Anita Trajkovska[2], Svetlana Lukishova[1], Robert W. Boyd[1], Shaw Horng Chen[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Chemical Engineering, Univ. of Rochester, USA.* We conducted comparative studies of laser characteristics of CLC doped with DCM dye and a new oligofluorene dye possessing the highest order parameter among all laser dyes. The latter demonstrated better absolute laser performance.

Highland G

Frontiers in Optics

FThE • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations I—Continued

FThE2 • 8:45 a.m. **Invited**
The Role of Jones Matrices in Critical Dimension Computation for Immersion Lithography, *Ronald L. Gordon, James P. McGuire, Matthew P. Rimmer; Optical Res. Associates, USA.* The effect of polarization changes through an immersion lithographic projection lens on image critical dimension is examined. Ignoring these polarization changes in imaging models produces errors in prediction of across-field behavior and lens tolerance analysis.

Highland H

Laser Science

LThA • Precision and Quantum Enabled Measurements—Continued

LThA2 • 8:30 a.m. **Invited**
To Be Announced, *Mark Kasevich; Stanford Univ., USA.* No abstract available.

Highland J

Joint

JThA • Optical Imaging of Response to Therapy I—Continued

JThA2 • 8:30 a.m. **Invited**
Functional Imaging of Blood Flow in Brain and in Tumors during Therapy, *Turgut Durduran, C. Zhou, G. Yu, U. Sunar, R. Choe, M. G. Burnett, J. Pluta, A. M. Hoang, E. Mahoney-Wilensky, S. A. Bloom, C. Pellegrini, S. Kasner, B. Cucchiara, S. Messe, Q. Shah, J. J. Wang, T. M. Busch, J. H. Greenberg, J. H. Greenberg, J. A. Detre, A. G. Yodh; Univ. of Pennsylvania, USA.* The development of diffuse correlation spectroscopy for noninvasive measurement of blood flow in healthy and diseased brains and during tumor therapy is described. By combining with "traditional" diffuse optics, estimates of oxygen metabolism are obtained.

Highland K

JThB • Laser Plasmas and Filaments—Continued

JThB2 • 8:30 a.m.
Frequency Domain Holography of Laser Wakefields, *Nicholas H. Matlis[1], Stephen Reed[2], Stepan S. Bulanov[2], Vladimir Chvykov[2], Galina Kalintchenko[2], Takeshi Matsuoka[2], Pascal Rousseau[2], Victor Yanovsky[2], Anatoly Maksimchuk[2], Serguei Kalmykov[1], Genady Shvets[1], Michael C. Downer[1]; [1]Univ. of Texas at Austin, USA, [2]Univ. of Michigan, USA.* We report the first single-shot measurements of transverse and longitudinal structure of laser-generated wakefields. Real-time, non-averaged measurements of resonant wakes reveal detailed temporal and spatial features that depend on pulse energy and electron density.

JThB3 • 8:45 a.m.
Shocked-X-Wave Dynamics in Fs Laser Pulse Filamentation, *Francesca Bragheri[1], Vittorio Degiorgio[1], Daniele Faccio[2], Alessandro Averchi[2], Arnaud Couairon[3], Miguel A. Porras[4], Aidas Matijosius[5], Gintaras Tamošauskas[5], Arunas Varanavičius[5], Audrius Dubietis[5], Rimtautas Piskarskas[5], Algis Piskarskas[5], Paolo Di Trapani[5]; [1]Electronics Dept., Univ. of Pavia, Via Ferrata 1, Italy, [2]CNISM and Dept. of Physics and Mathematics, Univ. of Insubria, Italy, [3]Ctr. de Physique Théorique, CNRS, École Polytechnique, France, [4]Dept. de Fisíca Aplicada, ETSIM, Univ. Politécnica de Madrid, Spain, [5]Dept. of Quantum Electronics, Vilnius Univ., Lithuania.* We show that axial white-light continuum and off-axis coloured conical emission, which are peculiar features of the Angular Spectrum of filaments in water, derive from the same temporal event: the generation of nonlinear "Shocked-X-waves".

NOTES

Frontiers in Optics

Highland A

Commercialization of University and Orphan Technologies—Continued

NOTES

Highland B

Best of Topicals—Continued

Highland C

FThA • Photonic Crystals and Solitons—Continued

FThA5 • 9:00 a.m.
Dispersion Surfaces for Photonic Crystals Composed of Anisotropic Materials, *Mohammad M. Siraj[1], J. W. Haus[1], Paras Prasad[2], Paul Markowicz[2]; [1]Univ. of Dayton, USA, [2]Univ. at Buffalo, SUNY, USA.* We demonstrate numerically the dispersion surfaces of anisotropic, optically biaxial dielectric composites by using plane wave expansion method . We find that by varying the anisotropy it changes the shape of the dispersion surfaces.

FThA6 • 9:15 a.m.
Solitons Propagation in a Tandem Arrangement of Nonlinear Materials, *Javier Sánchez-Mondragón[1,2], Miguel Torres-Cisneros[3], Adalberto Alejo-Molina[1], Jose A. Andrade-Lucio[3], Jesús Escobedo-Alatorre[2], Miguel Basurto-Pensado[2], Luz A. Aguilera-Cortés[3]; [1]Photonics and Optical Physics Lab, Optics Dept. INAOE, Mexico, [2]Ctr. for Res. on Engineering and Applied Sciences UAEM, Mexico, [3]Univ. of Guanajuato, Mexico.* The ensuing Optical solitons reshaping results into a nonlinear modulation of a tandem, that can be locally linearized as a perturbation near a soliton. We discuss two typical media, Two Level Atom and Kerr media.

Highland D

FThB • Disordered Structures: Coherence, Localization and Lasing II—Continued

FThB4 • 9:15 a.m.
Opto-Excited Chaotic Vibration of a Micron-Scaled Cavity, *Tal Carmon, Michael C. Cross, Kerry J. Vahala; Caltech, USA.* Opto-mechanical vibration of an on-chip oscillator is experimentally excited by radiation-pressure nonlinearity to a regime where oscillation is chaotic. Period-doubling and broad power spectra are measured in spheroidal- and toroidal-resonators.

Highland E

FThC • Photonic Crystals—Continued

FThC4 • 9:00 a.m.
A Modified Single Defect Cavity Study for Coherent Coupling in Photonic Crystal VCSELs, *James J. Raftery, Jr., Gregory R. Kilby; US Military Acad., USA.* A modified single defect cavity study was conducted to determine if a calibrated simplified model could be use to predict and subsequently design for coherent coupling in PhC VCSELs. Modeled and fabricated devices are compared.

FThC5 • 9:15 a.m.
Photo-Mask for Wafer-Scale Fabrication of Two- and Three-Dimensional Photonic Crystal Structures, *Justin L. Stay, Thomas K. Gaylord; Georgia Tech, USA.* A methodology is presented for the batch fabrication of photonic crystal device structures based on a Multi-Beam Interference Lithography photo-mask. The mask produces a pre-designed set of beams to expose and record three-dimensional interference patterns.

Highland F

FThD • Nonlinear Propagation Effects—Continued

FThD5 • 9:00 a.m.
Figure-Eight Fiber Laser with a Symmetrical NOLM and a Fiber Bragg Grating, *Baldemar Ibarra-Escamilla[1], Ruben Grajales-Coutiño[1], Placido Zaca-Moran[1], Eugene A. Kuzin[1], Joseph W. Haus[2], Olivier Pottiez[3], Roberto Rojas-Laguna[4]; [1]INAOE, Mexico, [2]Univ. of Dayton, USA, [3]CIO, Mexico, [4]Univ. de Guanajuato, Mexico.* We experimentally demonstrate the operation of a figure-eight fiber laser based on a symmetrical NOLM with twisted low-birefringence fiber and a fiber Bragg grating. We investigate how the NOLM transmission affects the laser mode-locked operation.

FThD6 • 9:15 a.m.
Pulse Compression Limit in the Normal Dispersion Regime, *Uwe Bandelow, Ayhan Demircan; Weierstrass Inst., Germany.* We detected a fundamental pulse-compression limit for high-nonlinear dispersion-flattened fibers in the normal dispersion regime, when the desired generation of a broadband continuum is perturbed by third-order dispersion. Above a critical power the pulse splits.

Highland G

Frontiers in Optics

FThE • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations I—Continued

FThE3 • 9:15 a.m.
Electromagnetic Young's Interference Experiment: Stokes Parameters, Polarization Constants and Degree of Coherence, *Tero Setälä[1], Jani Tervo[2], Ari T. Friberg[3]; [1]Helsinki Univ. of Technology, Finland, [2]Univ. of Joensuu, Finland, [3]Royal Inst. of Technology, Sweden.* An interference law for the Stokes parameters in electromagnetic Young's two-pinhole experiment is derived. The modulation contrasts of the Stokes parameters, their measurement, and relation to the field's degree of coherence are also discussed.

Highland H

Laser Science

LThA • Precision and Quantum Enabled Measurements—Continued

LThA3 • 9:00 a.m.
Frequency Measurements via NOON States, *Pavel Lougovski, Jonathan P. Dowling; Louisiana State Univ., USA.* GHZ states are known to be useful for sub-shot-noise frequency measurements. NOON states are of a paramount for imaging and super phase resolution. We investigate applicability of the NOON states in all optical frequency standards.

LThA4 • 9:15 a.m.
Quantum Metrology with Maximally Entangled States and Parity Measurements, *Christopher C. Gerry, Adil Benmoussa, Richard A. Campos; Lehman College, USA.* We discuss our recent work on Heisenberg-limited interferometric measurements of phase shifts using maximally entangled states of N photons and with twin Fock states injected into a Mach-Zehnder interferometer, coupled with photonic parity measurements.

Highland J

Joint

JThA • Optical Imaging of Response to Therapy I—Continued

JThA3 • 9:00 a.m.
Breast Cancer Characterization and Neoadjuvant Chemotherapy Monitoring Using Diffuse Optical Methods, *Regine Choe, Soren D. Konecky, Alper Corlu, Kijoon Lee, Turgut Durduran, Chao Zhou, Britton Chance, Arjun G. Yodh; Univ. of Pennsylvania, USA.* We have quantified optical contrast of various tumor type (N=34) with a clinical diffuse optical tomography system. Also, we have monitored neoadjuvant chemotherapy response which agreed well with MRI.

JThA4 • 9:15 a.m.
A Strategy for Labeling Tumor Boundaries, *Jeanne P. Haushalter, Xudong Xiao, Khalid Amin, Zishan Haroon, Wan-Ru Chao, Gregory W. Faris; SRI Intl., USA.* We describe a method for labeling tumor boundaries using an enzyme active in the tumor boundary to crosslink a fluorescent-labeled substrate into the boundary. Preliminary in vitro assays are described.

Highland K

JThB • Laser Plasmas and Filaments—Continued

JThB4 • 9:00 a.m. Invited
High Repetition Rate Soft X-Ray Lasers: A Doorway to Coherent Soft X-Ray Science on a Tabletop, *Jorge Rocca[1], Yong Wang[1], Miguel Larotonda[1], Bradley Luther[1], David Alessi[1], Mark Berrill[1], Scott Heinbuch[1], Mario C. Marconi[1], Vyacheslav Shlyaptsev[2], Carmen S. Menoni[1]; [1]Colorado State Univ. at Fort Collins, USA, [2]Univ. of California at Davis, USA.* New high repetition rate table-top soft X-ray lasers allow the generation of intense coherent soft X-ray beams. The high peak spectral brightness of these lasers in the 25-100 eV photon energy region enable new applications.

NOTES

Highland A | Highland B | Highland C | Highland D | Highland E | Highland F

Frontiers in Optics

Commercialization of University and Orphan Technologies—Continued

Best of Topicals—Continued

FThA • Photonic Crystals and Solitons—Continued

FThA7 • 9:30 a.m.
Discrete and Gap Solitons in Triangular Photonic Lattices, *Christian R. Rosberg, Dragomir N. Neshev, Andrey A. Sukhorukov, Wieslaw Z. Krolikowski, Yuri S. Kivshar; Australian Natl. Univ., Australia.* We study the formation of solitons in triangular photonic lattices and demonstrate experimentally the self-localisation of beams associated with the first and second bands of the linear transmission spectrum.

FThB • Disordered Structures: Coherence, Localization and Lasing II—Continued

FThB5 • 9:30 a.m.
An Ultrasonic Analogue for a Random Laser, *Alexey G. Yamilov[1], Richard W. Weaver[2], Oleg Lobkis[2]; [1]Univ. of Missouri-Rolla, USA, [2]Univ. of Illinois at Urbana-Champaign, USA.* We describe electromechanical auto-oscillator which, when placed in contact with irregular acoustic cavity, can exhibit stimulated emission of ultrasound. Analytic model is constructed describing the device, which we propose as classical analogue of random laser.

FThC • Photonic Crystals—Continued

FThC6 • 9:30 a.m.
Single Molecule Detection Using Silicon Photonic Crystal Slab, *Mindy Lee[1], Philippe Fauchet[2]; [1]Inst. of Optics, USA, [2]Dept. of Electrical and Computer Engineering, Univ. of Rochester, USA.* We report a novel design for single molecule detection using photonic bandgap structures on SOI wafer. The device works at communication band and can be potentially used for single molecule detection.

9:45 a.m.–10:15 a.m. Coffee Break, Highland Rooms Foyer

Highland G

Frontiers in Optics

FThE • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations I—Continued

FThE4 • 9:30 a.m.
Intensity Fluctuations in Random Electromagnetic Beams Propagating through Turbulent Atmosphere, *Olga Korotkova; Dept. of Physics and Astronomy, Univ. of Rochester, USA.* Behavior of intensity fluctuations of random electromagnetic beams propagating in vacuum and atmosphere are discussed. Possibility of control of intensity fluctuations of such beams on propagation by changing degree of polarization of source is demonstrated.

Highland H

Laser Science

LThA • Precision and Quantum Enabled Measurements—Continued

LThA5 • 9:30 a.m.
Towards Heisenberg Limit in Magnetometry with Parametric Down Converted Photons, *Aziz Kolkiran, G. S. Agarwal; Oklahoma State Univ., USA.* We show how the photons in non-collinear down conversion process can be used for improving the sensitivity of magneto-optical rotation by a factor of four which takes us towards the Heisenberg limit.

LThA6 • 9:45 a.m.
Self-Oscillating EIT-Based Clocks and Magnetometers, *Dmitry Strekalov, Andrey Matsko, Nan Yu, Anatoliy Savchenkov, Lute Maleki; JPL, USA.* EIT resonance in atomic vapor cell provides a natural frequency reference. We report an atomic clock implementation where EIT media is included in an opto-electronic gain loop. Different polarization coupling turns it into a magnetometer.

Highland J

Highland K

Joint

JThA • Optical Imaging of Response to Therapy I—Continued

JThA5 • 9:30 a.m.
Optical Head-Tracking for fMRI Using Structured Light, *Andrei Zaremba, Duncan MacFarlane, Richard Briggs, Wei-Che Tseng; Univ. of Texas at Dallas, USA.* A novel, non-intrusive approach to patient motion correction in fMRI is discussed. A pattern of structured light is used to measure spatial transformations with 0.1 mm translational and 1 degree rotational precisions.

JThB • Laser Plasmas and Filaments—Continued

JThB5 • 9:30 a.m.
Laguerre-Gaussian Supercontinuum, *Henry I. Sztul, Vladimir Kartazayev, Robert R. Alfano; Inst. for Ultrafast Spectroscopy and Lasers, City College and Graduate Ctr. of CUNY, USA.* We show the first white-light optical vortices generated from supercontinuum that have the azimuthally varying phase consistent with monochromatic Laguerre-Gaussian beams. We use a computer-generated hologram to convert Gaussian supercontinuum source into Laguerre-Gaussian supercontinuum.

9:45 a.m.–10:15 a.m. Coffee Break, Highland Rooms Foyer

NOTES

Frontiers in Optics

Highland A

10:15 a.m.–12:00 p.m.
Commercialization of University and Orphan Technologies
See Page 13.

Highland B

10:15 a.m.–12:00 p.m.
Best of Topicals
See Page 12.

Highland C

10:15 a.m.–12:00 p.m.
FThF • Photonic Metamaterials IV
Won Park; Univ. of Colorado, USA, Presider

FThF1 • 10:15 a.m.
Terahertz Transmission Properties of Split Ring Resonator Arrays, *Amit K. Agrawal, Wenqi Zhu, Xiang Shou, Ajay Nahata; Dept. of Electrical and Computer Eng., Univ. of Utah, USA.* We measure the phase sensitive terahertz transmission properties through an array of split ring resonators using time-domain spectroscopy. We also present 3-D FDTD simulation results to support the experimentally observed transmission behavior.

FThF2 • 10:30 a.m.
Interaction between Optical Nano-Objects at Metallo-Dielectric Interfaces, *Philippe Lalanne, Jean Paul Hugonin; Inst. d'Optique Théorique et Appliquée, France.* We elucidate several important aspects of the interaction between nano-objects at metallo-dielectric interfaces. We show that the interaction is mediated by two-different fields, the surface plasmon and a wave creeping at the interface.

FThF3 • 10:45 a.m.
A Volume-Grating Stokesmeter Based on Photonic Band Gap Structures, *Jong-Kwon Lee, John Shen, Shih Tseng, Gour Pati, Selim M. Shahriar; Northwestern Univ., USA.* We show polarization-dependent band-gap in a photonic-crystal composed of six rows of 4mm diameter Pyrex rods on a 9mm square lattice using FDTD, and describe how such a structure can be used as a Stokesmeter.

Highland D

10:15 a.m.–12:15 p.m.
FThG • General Optics I
Emil Wolf; Univ. of Rochester, USA, Presider

FThG1 • 10:15 a.m.
Pulse Propagation with a Negative Group Velocity in Erbium Doped Fiber, *George M. Gehring, Aaron Schweinsberg, Heedeuk Shin, Robert W. Boyd; Inst. of Optics, Univ. of Rochester, USA.* We report on the first experimental demonstration that the peak of a pulse in a medium with negative group velocity does propagate backwards, even though no energy propagates in that direction.

FThG2 • 10:30 a.m.
Propagation of Helmholtz-Gauss Beams through ABCD Optical Systems, *Manuel Guizar-Sicairos[1], Julio C. Gutiérrez-Vega[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Photonics and Mathematical Optics Group, Tecnológico de Monterrey, Mexico.* We derive an elegant and closed-form expression for the propagation of a Helmholtz-Gauss beam through an optical ABCD system. The formulation is exemplified with a cosine-Gauss beam propagating in a GRIN medium.

FThG3 • 10:45 a.m.
Characterization of Radiometric Particle Levitation in a Laser Beam, *Matthew D. Turner, Jacob J. Campbell, Krystle Farnsworth, Mindi Martin, Robert Petersen, Nathan D. Powers, Justin B. Peatross; Brigham Young Univ., USA.* We investigate the effects of gravity, ambient gas pressure, and beam structure on the capture and trapping of microscopic opaque particles in a laser beam.

Highland E

10:15 a.m.–12:00 p.m.
FThH • Nanostructured Materials and Devices
Daniel Blumenthal; Univ. of California at Santa Barbara, USA, Presider

FThH1 • 10:15 a.m. **Tutorial**
Optoelectronic Devices Based on Nanostructured Materials, *Johann Peter Reithmaier; Univ. Kassel, Germany.* The tutorial will introduce to semiconductor nanostructure fabrication technologies and their applications in new types of optoelectronic devices, like quantum-dots lasers and amplifiers as well as new approaches for the realisation of single-photon sources.

Johann Peter Reithmaier was born in 1960 in Bavaria, Germany. He studied technological physics at the TU Munich where he finished his studies with a diploma thesis on "Physical effects of active waveguiding in InGaAsP double-stripe lasers" in 1987. The experimental work was performed in the central research institution of Siemens, Munich. At the same institution he completed his Ph.D. work on "Pseudomorphic InGaAs/Ga(Al)As Heterostructures: Growth and Characterization." Afterwards, he entered IBM in Rüschlikon, Switzerland, working as postdoc on III/V-epitaxy of new materials for optoelectronic and fundamental material research. In 1992, he started work at the

Highland F

10:15 a.m.–12:00 p.m.
FThI • Coherent and Quantum Optics in Fibers III
Joseph W. Haus; Univ. of Dayton, USA, Presider

FThI1 • 10:15 a.m. **Tutorial**
Coherent Optical Communications: Fundamentals and Future Prospects, *Joseph Kahn, Leonid Kazovsky; Stanford Univ., USA.* Nonbinary modulation with coherent detection maximizes spectral efficiency and tolerance to transmission impairments, while enabling effective electrical compensation of impairments. Advances in laser and digital signal processing technologies make coherent detection an increasingly practical alternative.

Joseph M. Kahn received the A.B., M.A. and Ph.D. degrees in physics from University of California at Berkeley in 1981, 1983 and 1986, respectively. From 1987 to 1990, he was at AT&T Bell Laboratories, Crawford Hill Laboratory, in Holmdel, N.J. He demonstrated multi-Gb/s coherent optical fiber transmission systems, setting world records for receiver sensitivity. From 1990 to 2003, he was on the faculty of the Department of Electrical Engineering and Computer Sciences at University of California at Berkeley, performing research on optical and wireless communications. Since 2003, he has been a professor of electrical engineering

Highland G

Frontiers in Optics

10:15 a.m.–12:00 p.m.
FThJ • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations II
Tom Brown; Univ. of Rochester, USA, Presider

FThJ1 • 10:15 a.m. Invited
Classification of Depolarizing Mueller Matrices, *Russell Chipman; Univ. of Arizona, USA.* Within the sixteen-dimensional space of Mueller matrices, nine degrees of freedom are associated with depolarization which can be visualized using Degree of Polarization Surfaces, and Maps.

FThJ2 • 10:45 a.m. Invited
Space-Variant Birefringent Components, *Scott McEldowney, Jerry Zeiba, Kim Tan, Paul McKenzie; JDSU, USA.* This presentation will review space-variant birefringent components. We present recent advancements in creating these components using Liquid Crystal Polymers (LCP) and sub-wavelength structures. We also discuss how these advancements are enabling design of space-variant components.

Highland H

Laser Science

10:15 a.m.–12:15 p.m.
LThB • Precision and Quantum Enabled Measurements II
Leo Hollberg; NIST, USA, Presider

LThB1 • 10:15 a.m. Invited
Octave Spanning Ti:Sapphire Lasers and Carrier-Envelope Phase Control, *Oliver D. Muecke, Lia Matos, Richard Ell, Franz X. Kaertner; MIT, USA.* We demonstrate f-to-2f self-referenced 200 MHz octave-spanning Ti:sapphire lasers with 50 attosecond residual carrier-envelope phase jitter. The intracavity intensity-related carrier-envelope phase dynamics is discussed and a noise analysis of the carrier-envelope phase-lock loop is presented.

LThB2 • 10:45 a.m. Invited
Optical Frequency Metrology and Beyond: New Directions with Femtosecond Frequency Combs, *Scott Diddams; NIST, USA.* While optical frequency metrology experiments employing femtosecond frequency combs are now pushing 17-digit resolution, new comb tools and applications are emerging for direct precision spectroscopy and sensing with spatially and spectrally-resolved comb elements.

Highland J

Joint

10:15 a.m.–12:00 p.m.
JThC • Optical Imaging of Response to Therapy II
Brian Pogue; Dartmouth College, USA, Presider

JThC1 • 10:15 a.m. Invited
Photodynamic Tumor Vascular Targeting Enhances Cancer Chemotherapy, *Bin Chen[1], Brian Pogue[2], Jack Hoopes[2], Tayyaba Hasan[3]; [1]Univ. of the Sciences in Philadelphia, USA, [2]Dartmouth College, USA, [3]Harvard Medical School, USA.* Cancer drug therapy is limited by inadequate and heterogeneous tumor drug delivery due to the existence of vascular barrier. Photodynamic tumor vascular targeting is shown to disrupt tumor vascular barrier and enhance cancer chemotherapy.

JThC2 • 10:45 a.m. Invited
Interstitial Monitoring of Treatment-Induced Functional Tissue Changes, *Alex Vitkin, Beau Standish, Youxin Mao, Nigel Munce, Adrain Mariampillai, George Y. Liu, Heng Li, Daina Burnes, Stephanie E. Chiu, Victor X. D. Yang; Univ. of Toronto/Ontario Cancer Inst., Canada.* Minimally invasive structural and functional imaging is possible deep within tissues via a sub-mm needle. Performing Doppler Optical Coherence Tomography (DOCT) at the tip of 22-gauge probe yields high-resolution maps of tissue microstructure and microvasculature.

Highland K

10:15 a.m.–12:15 p.m.
JThD • Attosecond and High Harmonic Generation
Presider to Be Announced

JThD1 • 10:15 a.m. Invited
Generation of Attosecond Pulses in Molecules, *Pascal Salieres; Saclay, France.* No abstract available.

JThD2 • 10:45 a.m.
Is High Harmonic Generation a Single-Electron Process? *Ariel Gordon[1], Robin Santra[2], Franz X. Kaertner[1]; [1]MIT, USA, [2]Argonne Natl. Lab, USA.* We argue that the bound electrons, set to motion by the recolliding electron, emit much of the radiation during high harmonic generation. This may explain the significantly higher conversion efficiencies found with heavier noble gases.

NOTES

Highland A

Highland B

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Highland D

Highland E

Highland F

Frontiers in Optics

Commercialization of University and Orphan Technologies—Continued

NOTES

Best of Topicals—Continued

FThF • Photonic Metamaterials IV—Continued

FThF4 • 11:00 a.m.

Plasmonic "Diode" for Optical Field Rectification, *Nader Engheta; Univ. of Pennsylvania, USA.* We propose an idea for a lumped nanocircuit element that can effectively act as a "diode", rectifying optical field displacement currents. This element can be formed by juxtaposing an epsilon-negative nanostructure with a nonlinear element.

FThG • General Optics I—Continued

FThG4 • 11:00 a.m.

Electromagnetic Field Oscillations in Nucleic Acid Strand, *Dhiraj Sinha; Univ. of Cambridge, UK.* Analysis of Pi electrons present in nucleic acids using Langevin equation and Nyquist Theorem points towards existence of electromagnetic modes. The energy density of the modes can be augmented under resonance with external electromagnetic waves.

FThH • Nanostructured Materials and Devices—Continued

"Microstructure Laboratory" of the University of Würzburg in the group of Alfred Forchel, where he built-up a research group focusing on nanostructure technologies and their optoelectronic applications. He finished habilitation in 1997 on "Electronic and photonic quantization effects in III/V compound semiconductors: Optical spectroscopy and applications" and became a member of the faculty. Since May 2005, he has been a full professor at the University of Kassel and is Director of the Institute of Nanostructure Technologies & Analytics. He has contributed to and coordinated several European research projects on optoelectronic devices based on nanostructured semiconductors and is author/co-author of more than 300 publications and conference contributions.

FThH2 • 11:00 a.m.

Coherence Properties of CdSe/ZnCdMgSe Self-Assembled Quantum Dots Photoluminescence under Femtosecond Pulse Excitation, *Iosif Zeylikovich[1], Taposh K. Gayen[1], Xuecong Zhou[1], Jorge I. Franco[1], R. R. Alfano[1], M. Noemi Perez-Paz[2], Maria C. Tamargo[2]; [1]Inst. for Ultrafast Spectroscopy and Lasers, City College and Graduate School of CUNY, Dept. of Physics, USA, [2]Inst. for Ultrafast Spectroscopy and Lasers, City College and Graduate School of CUNY, Dept. of Chemistry, USA.* The photoluminescence from quantum dots ensemble excited by femtosecond pulse excitation is shown to be mutually coherent by the observation of the high contrast of the interference fringes.

FThI • Coherent and Quantum Optics in Fibers III—Continued

at Stanford University. His current research interests include single- and multimode optical fiber communications, free-space optical communications, and MEMS for optical communications. Kahn received the National Science Foundation Presidential Young Investigator Award in 1991. He is a fellow of the IEEE. From 1993 to 2000, he served as a technical editor of *IEEE Personal Communications Magazine*. In 2000, he helped found StrataLight Communications, where he served as Chief Scientist from 2000 to 2003. StrataLight is developing transceiver technology for robust, spectrally efficient optical fiber transmission at 40 Gb/s.

FThI2 • 11:00 a.m. Invited

Raman Scattering Noise in Phase-Insensitive and Phase-Sensitive Parametric Processes in Fibers, *Paul L. Voss[1,2], Prem Kumar[3]; [1]Georgia Tech Lorraine, France, [2]Georgia Tech, USA, [3]Northwestern Univ., USA.* The non-instantaneous response of the Kerr nonlinearity couples noise to parametric processes in fibers through Raman scattering. We describe theoretical and experimental progress in understanding this noise and its effect on phase-insensitive and phase-sensitive applications.

Highland G

Frontiers in Optics

FThJ • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations II—Continued

Highland H

Laser Science

LThB • Precision and Quantum Enabled Measurements II—Continued

Highland J

Highland K

Joint

JThC • Optical Imaging of Response to Therapy II—Continued

JThD • Attosecond and High Harmonic Generation—Continued

JThD3 • 11:00 a.m. Invited
High Harmonics Attochirp at Long Wavelength, *Pierre Agostini; Ohio State Univ., USA.* The dispersion of emission times, or "attochirp," limits attosecond pulses from high harmonics. Time-dependent Schrödinger equation numerical solutions in argon are discussed to testing the prediction of a decrease of the attochirp with wavelength.

NOTES

Frontiers in Optics

Highland A

Commercialization of University and Orphan Technologies—Continued

NOTES

Highland B

Best of Topicals—Continued

Highland C

FThF • Photonic Metamaterials IV—Continued

FThF5 • 11:15 a.m.

Systematic Design of High Transmission and Low Dispersion Wide-Bandwidth Photonic Crystal Waveguide Bends, *Murtaza Askari, Mohammad Soltani, Babak Momeni, Ali Adibi; Georgia Tech, USA.* We present a method for systematic design of photonic crystal waveguide (PCW) bends to achieve high transmission and low dispersion over large bandwidths. We also identify the factors affecting transmission and dispersive properties of bends.

FThF6 • 11:30 a.m.

Disorder-Tolerant Waveguides in Magneto-Optical Photonic Crystals, *Zheng Wang, Shanhui Fan; Stanford Univ., USA.* We explore back-scattering suppression in 2-D magneto-optical photonic-crystal waveguides. A nonreciprocal waveguide is side-coupled to a coupled-resonator optical waveguide, where at certain frequency range the forward- and the backward-traveling waves are spatially separated.

Highland D

FThG • General Optics I—Continued

FThG5 • 11:15 a.m.

Screening of Excitons in Single, Suspended Carbon Nanotubes, *Andrew G. Walsh[1], Nickolas Vamivakas[1], Yan Yin[1], Stephen B. Cronin[2], Bennett B. Goldberg[1], Selim Unlu[1], Anna K. Swan[1]; [1]Boston Univ., USA, [2]Univ. of Southern California, USA.* We study suspended carbon nanotubes using resonant Raman spectroscopy before and after immersion in water and observe red shifts up to 30 meV in the optical transition energies. We thus quantify the effect of screening.

FThG6 • 11:30 a.m.

Polarization Change due to Pseudo-Parallel Transport: Intermediate Rytov-Berry-Chiao Phase and Rotation Sensors, *Nadia Baranova[1], Nelson V. Tabirian[2], Chang Ching Tsai[3], Boris Y. Zeldovich[3]; [1]Northrop Grumman Laser Systems, USA, [2]BEAM Corp., USA, [3]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* Light propagation in inhomogeneous medium or in bent and twisted polarizationally neutral fiber is considered theoretically and studied experimentally. Explicit formula is derived for the polarization change, which generalizes Berry's phase for arbitrary ray trajectory.

Highland E

FThH • Nanostructured Materials and Devices—Continued

FThH3 • 11:15 a.m. Invited

Modeling and Optimization of Mode-Locked Vertical-External-Cavity Surface-Emitting Diode Lasers, *Josep Mulet, Salvador Balle; Univ. de Illes Balears, Spain.* We develop a comprehensive description of passive mode-locking of electrically-driven VECSELs. We demonstrate stable pulses of ~10 ps at 15 GHz, in agreement with experimental results. The optimization of pulsewidth and mode-locking onset are presented.

Highland F

FThI • Coherent and Quantum Optics in Fibers III—Continued

FThI3 • 11:30 a.m.

Ultra Stable All-Fiber Telecom-Band Entangled Photon-Pair Source for Turnkey Quantum Communication Applications, *Chuang Liang, Kim Fook Lee, Todd Levin, Jun Chen, Prem Kumar; Northwestern Univ., USA.* We demonstrate a novel alignment-free all-fiber source for generating telecom-band polarization-entangled photon pairs. Up to 91.7% two-photon-interference visibility is observed without subtracting accidental coincidences arising from background photons while operating the source at room temperature.

Highland G

Frontiers in Optics

FThJ • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations II—Continued

FThJ3 • 11:15 a.m.
Interferometry in a Random Medium with Two Coincident Input Beams, *Zhenyu Wang, Andrew M. Weiner, Kevin J. Webb; Purdue Univ., USA.* A two-beam random interferometer is demonstrated to have a second order speckle intensity frequency correlation with a ripple due to the path-length difference between the input beams and an envelope governed by the scattering medium.

FThJ4 • 11:30 a.m.
Angular Momentum Exchange in Scattering, *Chaim Schwartz, Aristide Dogariu; College of Optics and Photonics: CREOL and FPCE, USA.* Scattering, which involves highly non-paraxial trajectories, couples spin and orbital angular momentum of light. Some polarization effects can be attributed to cases in which the total angular momentum flux density is conserved.

Highland H

Laser Science

LThB • Precision and Quantum Enabled Measurements II—Continued

LThB3 • 11:15 a.m.
High Resolution Spectroscopy of Optical Lattice-Confined ^{174}Yb, *Chad W. Hoyt[1], Zeb W. Barber[1,2], Chris W. Oates[1], Leo W. Hollberg[1]; [1]NIST, USA, [2]Univ. of Colorado, USA.* We report high resolution spectroscopy of optical lattice-confined ^{174}Yb atoms. We demonstrate spectroscopic linewidths as narrow as 4 Hz (full-width at half-maximum) using the highly forbidden clock transition ($^1S_0$-$^3P_0$) in a one-dimensional optical lattice.

LThB4 • 11:30 a.m.
Ultra-Stable Compact Optical Atomic Clock, *Yann Le Coq, Chris Oates, Leo Hollberg; NIST, USA.* We present results on a compact and ultra-stable optical clock using Calcium atoms with very short cycle times. A stability better than $3x10^{-15}$ at 1 second, averaging down to mid-10^{-16} at 200 seconds is achieved.

Highland J

Highland K

Joint

JThC • Optical Imaging of Response to Therapy II—Continued

JThC3 • 11:15 a.m.
Coherent and Stimulated Raman Spectroscopy with Shaped Femtosecond Pulses in Scattering Media, *Yuri Rostovtsev[1,2], Zoe-Elizabeth Sariyanni[1,2], Warren S. Warren[3], Marlan O. Scully[1,2]; [1]Inst. for Quantum Studies, Texas A&M Univ., USA, [2]Princeton Univ., USA, [3]Duke Univ., USA.* Femtosecond shaped pulses is used to detect coherent and stimulated Raman scattering in multiscattering media to determine vibrational frequencies and relaxation rates. The technique can be applied to spore detection and tissue microscopy.

JThC4 • 11:30 a.m.
Two-Photon, Two-Channel, Metabolic Imaging of the Organ of Corti, *LeAnn M. Tiede, Michael G. Nichols, Richard Hallworth, Kirk Beisel; Creighton Univ., USA.* Quantitative two-photon microscopy of intrinsic NADH and flavoprotein fluorescence was used to characterize the metabolic status of the inner and outer hair cells of the mouse organ of Corti.

JThD • Attosecond and High Harmonic Generation—Continued

JThD4 • 11:30 a.m. **Invited**
Broadband Isolated Attosecond XUV Pulses, *Eric Mevel[1], Inigo J. Sola[1], Luc Elouga[1], Eric Constant[1], Vasily Strelkov[2], Luigi Poletto[3], Paolo Villoresi[3], Giuseppe Sansone[4], Enrico Benedetti[4], Jean-Pascal Caumes[4], Salvatore Stagira[4], Catarina Vozzi[4], Mauro Nisoli[4]; [1]CELIA Bordeaux, France, [2]Russian Acad. of Science, Russian Federation, [3]INFM-D.E.I. Univ. di Padova, Italy, [4]INFM, Politecnico, Italy.* For the first time, we observe unambiguous signature of broadband (50 eV) XUV harmonic radiation temporally confined down to an isolated attosecond pulse by applying polarization gating to phase-stabilized-few-cycle laser pulses.

NOTES

Frontiers in Optics

Highland A

Commercialization of University and Orphan Technologies—Continued

NOTES

Highland B

Best of Topicals—Continued

Highland C

FThF • Photonic Metamaterials IV—Continued

FThF7 • 11:45 a.m.
Observation of Whispering Gallery Resonances in Circular and Elliptical Semiconductor Pillar Microcavities, *Vasily N. Astratov[1,2], Sang Lam[2], Daniele Sanvitto[2], Jane A. Timpson[2], Abbes Tahraoui[2], David M. Whittaker[2], Maurice S. Skolnick[2]; [1]Univ. of North Carolina at Charlotte, USA, [2]Univ. of Sheffield, UK.* We present spectroscopic evidence for excitation of whispering gallery resonances in circular and elliptical semiconductor pillar microcavites. Due to high *Q*-factors and small modal volumes these modes can be used in quantum cavity electrodynamics experiments.

Highland D

FThG • General Optics I—Continued

FThG7 • 11:45 a.m.
Fractional Talbot Effect in High Order Dispersive Media, *David Duchesne, Jose Azana, Roberto Morandotti; INRS-EMT, Canada.* We show through simulations that repetition rate multiplication of temporal periodic pulse trains via the fractional Talbot effect is still possible in higher order dispersive media, providing flexibility under different geometries and initial input conditions.

FThG8 • 12:00 p.m.
Efficient Computation of Rotationally-Symmetric Nonparaxial Fields in Terms of Spherical Waves with Complex Foci, *Miguel A. Alonso[1], Riccardo Borghi[2], Massimo Santarsiero[2]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Univ. Roma Tre, Italy.* A scheme for computing rotationally-symmetric nonparaxial fields is proposed, based on a complete orthonormal basis given by combinations of spherical waves focused at imaginary points, whose location is chosen to optimize convergence.

Highland E

FThH • Nanostructured Materials and Devices—Continued

FThH4 • 11:45 a.m.
Novel Approach for Design of Low-Loss DBRs for VCSELs, *I. M. Safonov[1], I. A. Sukhoivanov[1,2], J. Kratz[3], S. I. Petrov[1], M. V. Klimenko[1], O. V. Shulika[1]; [1]Lab "Photonics", Natl. Univ. of Radio Electronics, Ukraine, [2]FIMEE, Univ. de Guanajuato, Mexico, [3]Natl. Training Ctr. for Microelectronics, USA.* We show theoretically fundamental existence of heterostructures without discontinuity in one of bands. Such structures can provide extremely low-loss DBRs with superior electrical and optical properties similar or better than those of present counterparts.

Highland F

FThI • Coherent and Quantum Optics in Fibers III—Continued

FThI4 • 11:45 a.m.
Correlated Photon Pairs Using Silicon Waveguides, *Qiang Lin, Govind P. Agrawal; Inst. of Optics, Univ. of Rochester, USA.* We propose to use four-wave mixing inside silicon waveguides for generating correlated photon pairs. We present a theory that includes all noise sources and provides an analytic expression for the pair correlation.

12:00 p.m.–1:30 p.m. Lunch Break (On Your Own)

Highland G

Frontiers in Optics

FThJ • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations II—Continued

FThJ5 • 11:45 a.m.
Polarization Singularities of Focused, Radially Polarized Fields, *Robert W. Schoonover*[1,2]*, Taco D. Visser*[2]*;* [1]*Univ. of Illinois at Urbana Champaign, USA,* [2]*Free Univ., Netherlands.* The state of polarization of focused, radially polarized electromagnetic fields is examined. Several types of polarization singularities exist and their relationship is investigated. We demonstrate that polarization singularities can annihilate in a variety of ways.

Highland H

Laser Science

LThB • Precision and Quantum Enabled Measurements II—Continued

LThB5 • 11:45 a.m.
A Microfabricated High Performance Magnetometer, *Brad Lindseth*[1,2]*, Peter D. D. Schwindt*[1]*, Svenja Knappe*[1]*, Vishal Shah*[1,2]*, Li-Anne Liew*[1]*, John Moreland*[1]*, John Kitching*[1]*;* [1]*NIST, USA,* [2]*Univ. of Colorado, USA.* We report the operation of a microfabricated atomic magnetometer using the M_x configuration. A device size of a few millimeters achieves a magnetic field noise limited sensitivity of 5.9 pT/Hz$^{1/2}$ over a 1-100 Hz bandwidth.

LThB6 • 12:00 p.m.
Magnetic Resonance in an Atomic Vapor Excited by a Mechanical Resonator, *Matthew D. Eardley, Ying-Ju Wang, Svenja Knappe, John Moreland, Leo Hollberg, John Kitching; NIST-Boulder, USA.* We demonstrate direct resonant interaction between a magnetic cantilever and Rubidium atomic spin. The coupled system may enable development of low-power, high performance sensors as well as cold atom manipulation and quantum control.

Highland J

Joint

JThC • Optical Imaging of Response to Therapy II—Continued

JThC5 • 11:45 a.m.
Influence of *in vitro* Experimental Conditions on Drug Diffusion in Cornea and Sclera, *Kirill V. Larin, Mohamad G. Ghosn; Univ. of Houston, USA.* Diffusion of several chemical agents in rabbit cornea and sclera (dissected and in whole eyeballs) was studied using OCT technique. Demonstrated, that permeability coefficients for the same agents are significantly different in different experimental conditions.

Highland K

JThD • Attosecond and High Harmonic Generation—Continued

JThD5 • 12:00 p.m.
Femtosecond Enhancement Cavities for High-Harmonic Generation, *R. Jason Jones, Kevin D. Moll, Michael J. Thorpe, Jun Ye; JILA, NIST and Univ. of Colorado at Boulder, USA.* We demonstrate high-harmonic generation at high repetition rates using a passive enhancement cavity and propose improved cavity geometries. This source provides a frequency comb in the VUV for high-resolution spectroscopy.

12:00 p.m.–1:30 p.m. Lunch Break (On Your Own)

NOTES

Frontiers in Optics

Highland A

1:00 p.m.–3:10 p.m.
20 Years of CPA
See Page 14.

Highland B

1:30 p.m.–3:15 p.m.
FThK • Microstructured Waveguides and Devices
Stephen Hughes; Queen's Univ., Canada., Presider

FThK1 • 1:30 p.m.
Large Group Index Birefringence in Silicon-on-Insulator Photonics Nano-Waveguides, *David Duchesne[1], Roberto Morandotti[1], Pavel Cheben[2], Boris Lamontagne[2], Danxia Xu[2], Siegfried Janz[2]; [1]INRS-EMT, Canada, [2]Natl. Res. Council of Canada, Canada.* Through polarisation beating and Fabry-Perot measurements, we determine a large group index birefringence of up to 0.6 in SOI nanowaveguides of various dimensions. We confirm our results numerically and find various regimes of anomalous dispersion.

FThK2 • 1:45 p.m.
Silicon Slot-Waveguide as NOEMS Photonic Platform, *Vilson R. Almeida[1], Roberto R. Panepucci[2]; [1]Inst. de Estudos Avancados (IEAv-CTA), Brazil, [2]Florida Intl. Univ. (FIU), USA.* We present useful functionalities for Nano-Opto-Electro-Mechanical System (NOEMS) devices based on the evanescent-wave bonding acting on silicon slot-waveguides.

Highland C

1:30 p.m.–3:15 p.m.
FThL • Optical Chip and Nonlinear Metamaterials
Toshihiko Baba; Yokohama Natl. Univ., Japan., Presider

FThL1 • 1:30 p.m. Invited
Chip-Scale All-Optical Group Delay, *Yurii Vlasov, Fengnian Xia, Lidija Sekaric, Erik Dulkeith, Solomon Assefa, William Green, Martin O'Boyle, Hendrik Hamann, Sharee McNab; IBM Thomas J. Watson Res. Ctr., USA.* Recent results on ultra-compact optical delay lines based on SOI photonic wires and photonic crystals are reviewed. On-chip group delays exceeding 4 bits have been successfully demonstrated for bandwidth of 10Gbps within footprint of 0.1mm^2.

Highland D

1:30 p.m.–3:00 p.m.
FThM • Single Cycle Pulses and Pulse Measurement
David N. Fittinghoff; LLNL, USA, Presider

FThM1 • 1:30 p.m.
Spatially Resolved Spectral Interferometry, *Pamela R. Bowlan, Pablo Gabolde, Aparna Shreenath, Selcuk Akturk, Rick Trebino; School of Physics, Georgia Tech, USA.* We present an alignment-free, high-spectral-resolution version of spectral interferometry using optical fibers and spatial fringes. We demonstrate this technique by measuring temporal chirp, a 14-ps double-pulse, and a double train of pulses.

FThM2 • 1:45 p.m.
Complete Pulse Characterization from MOSAIC Envelopes and Pulse Spectrum, *Balakishore Yellampalle, Richard D. Averitt, Antoinette J. Taylor; Los Alamos Natl. Lab, USA.* Although MOSAIC offers a sensitive approach for chirp characterization, the chirp from this method is not necessarily unique. We demonstrate complete and unambiguous ultrashort pulse characterization using an additional spectral measurement and a new algorithm.

Highland E

1:30 p.m.–3:15 p.m.
FThN • Novel Fibers and Fiber Lasers
Presider to Be Announced

FThN1 • 1:30 p.m.
Coherent Proximity Sensor with High Density Fiber Array, *Yuan Luo, Lina Arauz, Jose Castillo, Jennifer Barton, Raymond Kostuk; ECE Dept. and Optical Sciences Ctr., Univ. of Arizona, USA.* A linear, high density single mode fiber (SMF) array with 15µm center spacing was fabricated and used to make coherent distance measurements. Objects were detected up to 250µm from the fiber without a lens.

FThN2 • 1:45 p.m.
Comprehensive Characterization of Nano-Scale Optical Microfiber Nonuniformities, *Misha Sumetsky, Yury Dulashko, John M. Fini, Arturo Hale, Jeffrey W. Nicholson; OFS Labs, USA.* We demonstrate a novel, simple, and comprehensive method for probing optical microfiber surface and bulk distortions with subnanometer accuracy. These results explain observed transmission losses in silica microfibers and open broad opportunities for microfiber investigation.

Highland F

1:30 p.m.–3:15 p.m.
FThO • Nano- and Micro-Enhancement of NLO Effects III
Baldemar Ibarra-Escamilla; INAOE, Mexico., Presider

FThO1 • 1:30 p.m. Invited
Photonic Metamaterials: From Linear to Nonlinear Optics, *Vladimir M. Shalaev[1], Alexander V. Kildishev[1], Thomas A. Klar[2], Vladimir P. Drachev[1], Alexander K. Popov[3]; [1]Purdue Univ., USA, [2]Maximilians-Univ., Germany, [3]Univ. of Wisconsin, USA.* Recent progress in optical negative-index materials is reviewed. Matched impedance and compensated losses due to optimized design and gain material can lead to 100% transmission. The extraordinary nonlinear optical properties of NIMs are also discussed.

Highland G

Frontiers in Optics

1:30 p.m.–3:15 p.m.

FThP • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations III

Scott McEldowney; JDS Uniphase, USA, Presider

FThP1 • 1:30 p.m. Invited

Nanometrology Using Spatially-Variant Optical Polarization, *Qiwen Zhan; Univ. of Dayton, USA.* We report the designs and implementations of microellipsometer as well as near-field scanning optical microscope using spatial polarization symmetry. Their applications in semiconductor metrology will be discussed.

Highland K

1:30 p.m.–3:15 p.m.

FThQ • General Optics II

Miguel A. Alonso; Inst. of Optics, Univ. of Rochester, USA, Presider

FThQ1 • 1:30 p.m.

Dependence of the Degree of Polarization on the Degree of Coherence in Stochastic Electromagnetic Beams, *Mohamed F. Salem[1], Olga Korotkova[2], Emil Wolf[1,2]; [1]College of Optics and Photonics, CREOL and FPCE, Univ. of Central Florida, USA, [2]Dept. of Physics and Astronomy and the Inst. of Optics, Univ. of Rochester, USA.* We will show that two light beams may have different degrees of polarization, even though they have the same sets of Stokes parameters in the source plane. Reasons for this will also be discussed.

FThQ2 • 1:45 p.m.

Scattering of Light from Quasi-Homogeneous Sources by Quasi-Homogeneous Media, *Taco D. Visser[1,2], David G. Fischer[3], Emil Wolf[2,4,5]; [1]Free Univ., Netherlands, [2]Inst. of Optics, Univ. of Rochester, USA, [3]NASA Glenn Res. Ctr., USA, [4]Dept. of Physics and Astronomy, Univ. of Rochester, USA, [5]College of Optics, CREOL, Univ. of Central Florida, USA.* The field generated by scattering of light from a quasi-homogeneous source on a quasi-homogeneous, random medium is investigated. Two new reciprocity relations (sometimes called 'uncertainty relations') for the far field are derived.

NOTES

Highland A

Highland B

Highland C

Highland D

Highland E

Highland F

Frontiers in Optics

20 Years of CPA—Continued

FThK • Microstructured Waveguides and Devices—Continued

FThK3 • 2:00 p.m.
Optical Isolator Based on a Rectangular Waveguide with Helical Grooves, *Gennady Shvets, Simeon Trendafilov; Univ. of Texas at Austin, USA.* Rectangular waveguide with slanted grooves in its sidewalls can be used as an optical isolator due to the chirality effect. Even the crudest implementations of chirality are shown to exhibit significant directional asymmetry.

FThK4 • 2:15 p.m.
Parallel Anti-Symmetric Waveguide Bragg Gratings, *Jose E. Castillo, Jose M. Castro, Raymond K. Kostuk, David F. Geraghty; Electrical and Computer Engineering, Univ. of Arizona, USA.* We theoretically demonstrate parallel anti-symmetric waveguide Bragg gratings within a two-mode waveguide with mode conversions. This is the functional equivalent of superimposed Bragg gratings in silica-on-silicon without requiring multi-level etches.

FThK5 • 2:30 p.m. Invited
Micro-Ring Lasers in Digital Optical Signal Processing, *Martin T. Hill; Technische Univ. Eindhoven, Netherlands.* Here the use of micro-ring lasers as digital processing elements is outlined. Ring lasers combined with a passive ring resonator can make Boolean complete logic functions, satisfying all requirements necessary for interconnection and cascading.

FThL • Optical Chip and Nonlinear Metamaterials—Continued

FThL2 • 2:00 p.m.
Design, Fabrication and Characterization of Photonic Crystal Directional Couplers, *Mohammad Soltani, Siva Yegnanarayanan, Ali Adibi; Georgia Tech, USA.* Systematic design of directional couplers in photonic crystals with controlled coupling length are proposed and experimentally demonstrated. Coupler and waveguide bends are simultaneously optimized for frequency overlap and efficient waveguide coupling and bending.

FThL3 • 2:15 p.m.
Radiation Loss of Coupled-Resonator Waveguides Can Be Much Lower than for Single Resonators, *Michelle L. Povinelli, Shanhui Fan; Stanford Univ., USA.* We calculate the radiation loss rate of coupled-resonator optical waveguides in photonic-crystal slabs. In certain cases, the loss can be an order of magnitude lower than for a single resonator alone.

FThL4 • 2:30 p.m.
Compact On-Chip Photonic Crystal Spectrometers for Integrated Sensing Applications, *Babak Momeni, Ali A. Eftekhar, Majid Badieirostami, Jiandong Huang, Murtaza Askari, Saeed Mohammadi, Ehsan Shah Hosseini, Mohammad Soltani, Ali Adibi; Georgia Tech, USA.* We use three unique dispersive properties of photonic crystals (superprism effect, negative diffraction, and negative refraction) to implement a compact integrated spectrometer that isolates signal from stray light to be used in sensing applications.

FThM • Single Cycle Pulses and Pulse Measurement—Continued

FThM3 • 2:00 p.m.
Single-Cycle Pulse Generation in Photonic Nanowires, *Mark A. Foster[1], Alexander L. Gaeta[1], Qiang Cao[2], Rick Trebino[2]; [1]Cornell Univ., USA, [2]Georgia Tech, USA.* Photonic nanowires exhibit broad regions of anomalous group-velocity dispersion and large effective nonlinearities allowing for efficient pulse self-compression. Experimentally, we demonstrate self-compression of 30-fs pulses to 2.93 fs, which corresponds to 1.1 optical cycles.

FThM4 • 2:15 p.m.
Ultrashort Pulse Characterization Using a Compact Spectral Shearing Interferometer, *Simon-Pierre E. Gorza[1], Aleksandr S. Radunsky[1], Ian A. Walmsley[1,2], Piotr Wasylczyk[2]; [1]Oxford Univ., UK, [2]Inst. of Experimental Physics, Warsaw Univ., Poland.* We present a simple and compact implementation of SPIDER using a single long nonlinear crystal that allows us to accurately characterize pulses down to 30 fs, over the 740-900 nm tuning range.

FThM5 • 2:30 p.m.
Repetition-Rate Multiplication Using Phase-Only Line-by-Line Pulse Shaping, *José Caraquitena, Zhi Jiang, Daniel E. Leaird, Andrew M. Weiner; Purdue Univ., USA.* We demonstrate a technique for all-optical, tunable pulse repetition-rate multiplication based on spectral line-by-line control. In particular, two to five times multiplication of a 9-GHz source is achieved.

FThN • Novel Fibers and Fiber Lasers—Continued

FThN3 • 2:00 p.m.
Impact of Structural Parameter Deviations in Hollow-Core Photonic Crystal Fibers, *Ronald Holzlohner[1], Peter J. Roberts[2]; [1]European Southern Observatory (ESO), Germany, [2]Technical Univ. of Denmark, Denmark.* We numerically study the sensitivity of fiber attenuation in hollow-core photonic crystal fibers (HC-PCFs) to deviations in structural parameters using a finite-element mode solver. We find the highest sensitivity to wavelength and core wall thickness.

FThN4 • 2:15 p.m.
Gain Apodization in Highly-Doped Fiber DFB Lasers, *Weihua Guan, John R. Marciante; Lab for the Laser Energetics and the Inst. of Optics, Univ. of Rochester, USA.* Axial gain apodization can lead to lower thresholds for fiber DFB lasers. Modeling shows the lasing threshold is reduced over 21% for a phase-shifted DFB laser without penalty on spectral-mode discrimination.

FThN5 • 2:30 p.m.
Filamentation Analysis in Large-Mode-Area Fiber Lasers, *Lei Sun, John R. Marciante; Lab for Laser Energetics and Inst. of Optics, Univ. of Rochester, USA.* We drive an analytic expression for filament gain in fiber lasers due to self focusing. The filamentation process has two thresholds that must be met, with beam-quality degradation occurring for peak powers above a megawatt.

FThO • Nano- and Micro-Enhancement of NLO Effects III—Continued

FThO2 • 2:00 p.m.
Opto-Excited Vibration of a Micron-Scale On-Chip Sphere, *Tal Carmon, Kerry J. Vahala; Caltech, USA.* >1GHz optically-induced vibrations are demonstrated in an on-chip micron-scaled device in which radiation pressure of a (CW) optical input pushes the structure to mechanically oscillate. Many mechanical eigen-modes are investigated.

FThO3 • 2:15 p.m.
Using Shape-Controlled Gold Nanorods for Surface Enhanced Raman Spectroscopy (SERS), *Kvar C. L. Black, Christophe Juncker, Tim Troutman, Joseph Simmons, Marek Romanowski; Univ. of Arizona, USA.* Raman spectroscopy is plagued by low signal. Shape-controlled gold nanorods with infrared plasmon resonances were used for enhancement of the Raman signal of aminothiophenol (p-MA), resulting in nonlinear characteristics and a maximum enhancement ~10^5/molecule.

FThO4 • 2:30 p.m.
Capture-Induced Quantum Dot Coherences Controlled by Traveling Wave Packets of Different Spatial Extension, *Doris Reiter, Vollrath Martin Axt, Tilmann Kuhn; Westfälische Wilhelms-Univ. Münster, Germany.* The injection of two wave packets with different spatial extensions is used to control the coherences, which build up when traveling wave packets are captured into a quantum dot.

Frontiers in Optics

Highland G

FThP • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations III—Continued

FThP2 • 2:00 p.m. Invited

Polarization Vortices and Partial Coherence, *Thomas G. Brown; Inst. of Optics, Univ. of Rochester, USA.* An illumination system which has a polarization vortex in its point spread function produces interesting effects in imaging. We discuss experiment and theory directed to the incoherent superposition of polarization vortices.

FThP3 • 2:30 p.m.

Orbital Angular Momentum Switching of Optical Vortices, *Luat T. Vuong[1], Amiel A. Ishaaya[1], Taylor D. Grow[1], Alexander L. Gaeta[1], Eric R. Eliel[2]; [1]Dept. of Applied and Engineering Physics, Cornell Univ., USA, [2]Huygens Lab, Leiden Univ., Netherlands.* We show that co-propagating non-radially-symmetric phase vortices experience a nonlinear transfer of orbital angular momentum between circularly-polarized components in Kerr media. We investigate how this exchange depends on power and vortex topological charge.

Highland K

FThQ • General Optics II—Continued

FThQ3 • 2:00 p.m.

Scalar Approximation to Describe Depolarized Light: Equation for Refraction when Impedance is Constant, *Chang Ching Tsai, Boris Y. Zeldovich; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* Scalar wave equation is derived, which describes refraction due to propagation speed inhomogeneities in assumption of constant impedance Z. This Z-Helmholtz equation yields surprisingly good description of situations with depolarized light sources and unpolarized detectors.

FThQ4 • 2:15 p.m.

Rotational Doppler Shifts for Electromagnetic Fields of Arbitrary State of Coherence and Polarization, *Greg Gbur[1], Girish S. Agarwal[2]; [1]Univ. of North Carolina at Charlotte, USA, [2]Oklahoma State Univ., USA.* The rotational Doppler shift is studied for partially coherent and partially polarized fields. It is shown that both the degree of polarization and the state of coherence affect the spectrum in the rotated frame.

FThQ5 • 2:30 p.m.

Pulse Polarization Splitting in a Transient Wave Plate, *Klaus K. Hartinger, Randy A. Bartels; Colorado State Univ., USA.* We demonstrate propagation of ultrafast laser pulses through transiently aligned, linear molecules, acting as a transient wave plate, under conditions of strong phase modulation. The resulting decomposition into two distinct, orthogonally polarized pulses is shown.

NOTES

Frontiers in Optics

Highland A

20 Years of CPA—Continued

Highland B

FThK • Microstructured Waveguides and Devices—Continued

FThK6 • 3:00 p.m.

High-Q Silicon Microcavities for Chip Scale Integrated Optics, *Mohammad Soltani, Siva Yegnanarayanan, Ali Adibi; Georgia Tech, USA.* Fabrication and experimental characterization of high Q silicon microdisk resonators with planar-integrated input-output coupling waveguides is reported. Resonator-on-substrate devices are compared with undercut resonators. A record high Q of $0.5x10^6$ for resonator-on-substrate is experimentally measured.

Highland C

FThL • Optical Chip and Nonlinear Metamaterials—Continued

FThL5 • 2:45 p.m.

Magnetic Opals: Observation of Magnetization-Induced Second-Harmonic Generation in 3-D Magnetophotonic Crystals, *Oleg Aktsipetrov[1], Tatyana Murzina[1], Ruslan Kapra[1], Jane Kim[1,2], Dmitrii Kurdyukov[3], Savelii Kaplan[3], Valerii Golubev[3]; [1]Moscow State Univ., Russian Federation, [2]Physics Dept., Univ. of California at Berkeley, USA, [3]Ioffe Physico-Technical Inst., Russian Federation.* 3-D magnetophotonic crystals based on opals impregnated by Bi-substituted iron-yttrium garnet are fabricated. Magnetization-induced effect (nonlinear magneto-optical Kerr effect) in second-harmonic generation is observed.

FThL6 • 3:00 p.m.

Enhanced Second-Harmonic Generation in 3-D Gallium Nitride and Silicon Photonic Crystals, *Oleg Aktsipetrov[1], Andrei Fedyanin[1], Dmitrii Kurdyukov[2], Valerii Golubev[2]; [1]Moscow State Univ., Russian Federation, [2]Ioffe Physico-Technical Inst., Russian Federation.* Enhancement of optical second-harmonic generation due to nonlinear diffraction is demonstrated in 3-D photonic crystals based on silica opals impregnated by GaN and Si.

Highland D

FThM • Single Cycle Pulses and Pulse Measurement—Continued

FThM6 • 2:45 p.m.

Single-Shot Holographic Technique for Measuring the Complete Electric Field of an Ultrashort Pulse, *Pablo Gabolde, Rick Trebino; Georgia Tech, USA.* We present a new technique, Full Information from a Single Hologram (FISH), to measure the complete spatiotemporal profile of femtosecond pulses on a single shot, using multiple digital holograms simultaneously recorded at different frequencies.

Highland E

FThN • Novel Fibers and Fiber Lasers—Continued

FThN6 • 2:45 p.m.

Stimulated Brillouin Scattering (SBS) in Photonic Crystal Fibers (PCF) , *Jean Toulouse, Radha Pattnaik, John McElhenny; Lehigh Univ., USA.* We have investigated Stimulated Brillouin Scattering (SBS) in several different Photonic Crystal Fibers (PCF). We present results on a new Brillouin peak in these fibers and propose an explanation for its origin in those fibers.

FThN7 • 3:00 p.m.

Investigation of Novel Materials for Microspherical Lasers, *Sile Nic Chormaic[1,2], Jonathan Ward[1,2], Danny O'Shea[1,2], Brian Shortt[1,2]; [1]Cork Inst. of Technology, Ireland, [2]Tyndall Natl. Inst., Ireland.* We report on using a variety of erbium-doped glasses for the fabrication of microspherical lasers, based on whispering gallery mode resonators. Green fluorescence and lasing in the C-band have been observed.

Highland F

FThO • Nano- and Micro-Enhancement of NLO Effects III—Continued

FThO5 • 2:45 p.m.

Subwavelength Atom Localization via Coherent Population Trapping, *Kishor T. Kapale[1,2], Girish S. Agarwal[3]; [1]JPL, USA, [2]Dept. of Physics and Astronomy, Louisiana State Univ., USA, [3]Dept of Physics, Oklahoma State Univ., USA.* We present an atom-localization scheme based on CPT driven by a standing-wave field. The population in one of the ground states experiences a fringe pattern similar to that of a Fabry-Perot interferometer causing atom localization.

FThO6 • 3:00 p.m.

Study of the Dispersion of Nonlinear Refraction in InSb, *Claudiu M. Cirloganu, David J. Hagan, Eric W. Van Stryland; CREOL, USA.* We studied the nonlinear refraction due to bound electrons in InSb using femtosecond pulses in the range of 8-13 µm and show that the nonlinear refraction coefficient changes sign at a wavelength around 10 µm.

3:15 p.m.–5:00 p.m. Quantum Optics and Quantum Information Teaching Experiments, Highland H

3:15 p.m.–9:00 p.m. Science Educators' Day, Lilac Ballroom

3:30 p.m.–7:00 p.m. 20 Years of CPA, Highland A

Highland G

Highland K

Frontiers in Optics

FThP • Spatially Variant Polarization Fields, Polarized Speckle Patterns, Polarized Vortices and Polarization Aberrations III—Continued

FThP4 • 2:45 p.m.
Optical Modeling with Spatially Variant Polarization Fields, *Frank Wyrowski*[1], *Hagen Schimmel*[2]; [1]*Friedrich Schiller Univ. Jena, Germany,* [2]*LightTrans GmbH, Germany.* Harmonic electromagnetic fields may be globally or locally polarized. In the latter case the state of polarization varies spatially. An electromagnetic representation and propagation of spatially variant polarization fields through optical systems is presented.

FThP5 • 3:00 p.m.
Polarization Singularities Maps of Biological Tissues Images, *Yuriy A. Ushenko, Oleg V. Angelsky, Aleksandr G. Ushenko; Chernivtsi Natl. Univ., Ukraine.* It has been shown that the 3rd and the 4th statistical moments of the linear density of the singular points of polarization are the most sensitive towards the optical-geometric structure of the biological tissue.

FThQ • General Optics II—Continued

FThQ6 • 2:45 p.m.
Slow Light Using Biological Bacteriorhodopsin Film, *Pengfei Wu; New Span Opto-Technology Inc., USA.* Group velocity of light is reduced to 0.091μm/s in a biological film. Exploiting flexible photodynamics for coherent photoisomerization oscillation, the velocity is all-optically controlled. Ultraslow light is observed at microwatt level, indicating high energy efficiency.

FThQ7 • 3:00 p.m.
Laser Spectroscopy of Ultracold Metastable Helium Atoms, *Lesa J. Byron, Oscar Turazza, Robert G. Dall, Andrew G. Truscott, Kenneth G. Baldwin; Australian Natl. Univ., Australia.* A Bose-Einstein condensation experiment is used to create ultracold metastable helium (2^3S_1) atoms which are probed by a 389nm laser connecting with the 3^3P state to study photoassociation in the short-lived molecular states thus created.

NOTES

FiO/LS/OF&T/OPE Key to Authors and Presiders

Presentation numbers are listed alphabetically, not chronologically.