

## **ASSP**

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### **Advanced Solid-State Photonics**

### **Topical Meeting and Tabletop Exhibit**

**January 28-31, 2007**

[Fairmont Hotel Vancouver](#)  
Vancouver, Canada

[PDP Submission Deadline](#): January 4, 2007,  
12:00 p.m. noon EST (17.00 [GMT](#))

[Hotel Reservation Deadline](#): December 28, 2006

[Pre-Registration Deadline](#): January 4, 2007



## **Program Committee**

### **General Chair**

Timothy J. Carrig, *Lockheed Martin Coherent Technologies, USA*

### **Program Chair**

Jonathan D. Zuegel, *Univ. of Rochester, USA*

### **Committee Members**

Gerard Aka, *Ecole Natl. Supérieure de Chimie de Paris, France*

Tasoltan Basiev, *General Physics Inst., Russia*

Craig Denman, *AFRL, USA*

Christopher Ebbers, *LLNL, USA*

Jason Eichenholz, *Newport, Inc., USA, SEC Representative\**

Ingmar Hartl, *IMRA America, Inc., USA*

Guenter Huber, *Univ. Hamburg, Germany*

Jens Limpert, *Friedrich-Schiller Univ., Germany*

Rüdiger Paschotta, *RP Photonics Consulting GmbH, Switzerland*

Robert R. Rice, *Northrop Grumman, USA*

Irina Sorokina, *Vienna Univ. of Technology, Austria*

David Sumida, *HRL, USA*

Stefano Taccheo, *Politecnico di Milano, Italy*

Takunori Taira, *Inst. for Molecular Science, Japan*

Anne Christine Tropper, *Univ. of Southampton, UK*

Kurt Weingarten, *Time-Bandwidth Products, Switzerland*

Jirong Yu, *NASA Langley Res. Ctr., USA*

Jianqiang Zhu, *Shanghai Inst. of Optics and Fine Mechanics, China*

\*Representative to OSA's Science and Engineering Council

## About ASSP

Advances in solid-state lasers, parametric devices and nonlinear frequency conversion provide powerful tools for an increasingly broad range of applications including spectroscopy, metrology, remote sensing, communications, material processing, medicine and entertainment.

Now in its 22nd year, the Advanced Solid-State Photonics Topical Meeting remains the world's premier forum for discussing new developments in laser and nonlinear optical materials and devices. The upcoming meeting, in Vancouver, British Columbia, will provide a spectacular setting for learning about these advances. Take this opportunity to be part of the year's most significant meeting on advanced solid-state laser sources. Plan to attend Advanced Solid-State Photonics 2007!

## Meeting Topics to Be Considered

- Tunable and New Wavelength Solid-State Lasers
- Diode-Pumped Lasers
- Fiber Lasers
- Photonic-Crystal Lasers
- High-Power Lasers
- Short-Pulse Lasers
- Frequency-Stable Lasers
- Microlasers
- Optically-Pumped Semiconductor Lasers
- High Brightness Diodes
- Optical Sources Based on Nonlinear Frequency Conversion
- Frequency Conversion Techniques, Including OPO, OPA, OPG, SHG, SFG, DFG and Raman
- Developments in Laser Media
- Developments in Nonlinear Optical Materials
- Developments in Engineered Optical Materials
- Laser Sources and Their Applications in Science, Medicine, Remote Sensing, Industry or Entertainment

## Invited Speakers

### Banquet Speaker

**Forensic Lasers Use in CSI: Crime Scene Investigation**, *Richard Catalani; CSI Productions, USA*

### ASSP Invited Speakers:

**MA1, High-Power Thin-Disk Lasers**, *Adolf Giesen; Univ. of Stuttgart, Germany.*

**MC1, High-Power Cryogenically Cooled Yb:YAG Lasers**, *Daniel J. Ripin; MIT Lincoln Lab, USA.*

**TuA1, Precision Timing, Measurements and Optical Clocks Using Solid State Lasers**, *Leo Hollberg; NIST, USA.*

**TuA3, Single Frequency DFB Fiber Lasers: A Versatile Source for Spectroscopy and Sensing**, *Jens Engholm Pedersen; Koheras A/S, Denmark.*

**TuC1, Periodically Poled Nonlinear Materials - Engineered for Applications and away from Damage**, *Fredrik Laurell, Carlota Canalias, Junji Hirohshi, Shunhua Wang, Valdas Pasiskevicius; Royal Inst. of Technology, Sweden.*

**WA1, Octave Spanning Ti:Sapphire Lasers**, *Franz X. Kaertner, A. Benedick, R. Ell, O. D. Mücke, J. Birge, M. Sander; MIT, USA.*

**WD1, Recent Progress and the Future of Ceramic Lasers**, *Ken-ichi Ueda; Univ. of Electro-Communications, Japan.*

## Special Events

### Short Courses

Short courses are a wonderful way to enhance your knowledge of the optical field. ASSP selects experts in their fields to provide you with an in-depth look at intriguing topics. The courses are designed to increase your knowledge of a specific subject while offering you the experience of knowledgeable teachers. An added benefit of the courses is the availability of continuing education units (CEUs).

CEUs are awarded to each participant who successfully completes the short course. The CEU is a nationally recognized unit of measure for continuing education and training programs that meet established criteria. To earn CEUs, a participant must complete the CEU credit form and course evaluation and return it to the course instructor at the end of the course. CEUs will be calculated and certificates will be mailed to participants.

- Tuition for the short course is a separate fee, and advance registration is recommended: the number of seats in the course is limited.
- The short course will sell out quickly! There will be no waiting list for the short course.
- Short course materials are not available for purchase.

### Schedule

**Sunday, January 28, 2007**

[SC276, \*\*Ultrafast Fiber Amplifiers\*\*, Martin Fermann; IMRA America, Inc, USA.](#)  
[SC277, \*\*Raman Laser Materials and Applications\*\*, Tasoltan T. Basiev, Sr.; General Physics Inst. RAS, Russian Federation.](#)  
[SC275, \*\*Solid-State Slab Lasers\*\*, Hagop Injeyan, Richard Moyer; Northrop Grumman Corp, USA.](#)

**Tuesday, January 30, 2007**

[\*\*Conference Banquet\*\*, "CSI Productions on Forensic Lasers Use in CSI: Crime Scene Investigation", Richard Catalani.](#)

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**Sunday, January 28, 2007**

**1:00 p.m. –5:00p.m.**

SC276, **Ultrafast Fiber Amplifiers**, Martin Fermann; IMRA America, Inc, USA.

**Course Level:**

Advanced Beginner (basic understanding of topic is necessary to follow course material)

**Intended Audience:**

This course is intended for researchers, engineers and graduate students who are interested in a comprehensive review of current high power pulsed fiber laser

technology. It will not only be a 'how to' instruction but will also address the 'why' for those who want to build their own fiber laser systems.

### **Course Objectives:**

- Design optical systems for fiber amplifier pumping
- Build pico- and femtosecond fiber oscillator systems
- Build high peak and high average power fiber amplifier systems
- Design and model pulsed fiber oscillators and amplifiers
- Test the performance characteristics of fiber pulse sources
- Build fiber supercontinuum sources and fiber frequency combs

### **Course Description:**

The attendee will be introduced to the unique capabilities of fiber amplifiers in the construction of high average power and high peak power laser systems. Short pulse fiber systems operating with wall plug efficiencies of 30% at average powers in the kW range can be constructed in conjunction with high brightness diode pump sources, whereas peak powers in excess of several MW can be reached in large mode fibers. In conjunction with chirped pulsed or parametric amplification schemes peak powers in excess of 1 GW are reachable.

This course gives an overview of short pulse generation techniques in fiber amplifiers; all relevant aspects of high power fiber laser technology will be addressed, comprising diode pump sources, diode to fiber coupling techniques, seed sources and pulse generation in fiber oscillators, fiber amplifier material and spectroscopic properties, linear and nonlinear fiber amplification processes as well as thermal limitations and damage mechanisms. The emphasis will be on industrially relevant laser systems as used in instrumentation and optical processing. Numerous design examples will be given, illustrating the recurring physical phenomena governing these systems.

The attendee will be introduced to the latest developments in ultra-large mode fiber and doped fiber technology. The properties of solid core, higher-order mode, micro-structure, photonic crystal fibers and fiber rods will be compared. The attendee will be introduced to the physical limits of such ultra large mode fibers in the construction of high peak power and high average power fiber amplifiers and how to optimally approach these limits in actual system design.

The attendee will further learn how to construct all-fiber pico-second and femto-second pulse sources and how to generate canonical pulse forms, such as, solitons, gaussians, similaritons and cubicons. The relevance of these canonical pulse forms in high peak power amplification systems based on chirped pulse amplification in fiber amplifiers and nonlinear crystals will be elucidated and preferred options for pulse stretching and re-compression will also be addressed.

The course will conclude with a brief review of hot topics in fiber technology, comprising supercontinuum generation, THz generation, frequency combs and absolute phase control.

### **Biography:**

Martin E. Fermann is Director of Laser Research with IMRA America Inc. He has been involved in fiber and ultrafast laser research for more than 20 years. He has pioneered ultrafast fiber laser technology and has been a major force in the commercialization of ultrafast fiber laser systems. He has contributed to 250 peer-reviewed publications, has

edited a book on ultrafast lasers and is the holder of 31 US patents. Currently he is serving as guest editor for a JOSA B special edition on 'fiber lasers' to be published by the Optical Society of America.

SC277, **Raman Laser Materials and Applications**, *Tasoltan T. Basiev, Sr.; General Physics Inst. RAS, Russian Federation.*

**Course Level:**

I do not want to select a level for my course.

**Intended Audience:**

Scientists, engineers, and students of Universities and RD staff in the industry, who use and develop laser and nonlinear crystals for laser frequency shifting, wavelength multiplication, pulse shortening, fast-switched optical amplification, and coherent light sources at new wavelengths (Raman shifters, Raman lasers, self-Raman lasers). General background in optics and lasers is required.

**Course Objectives:**

- Compare different Raman laser crystals in terms of the threshold and gain values, Raman frequency shifts, and line broadening
- Determine the best regime of operation for specific Raman crystals
- Specify materials and constructions for Raman lasing and frequency shifting at specific wavelengths and duration of pumping
- Design low-threshold highly efficient Raman lasers and frequency shifters for picosecond to CW modes of operation
- Develop diode-pumped self-Raman lasers with strong pulse shortening and peak power increasing

**Course Description:**

This course is focused on the search and development of new nonlinear crystals for Raman shifters and lasers. It will be shown how the Raman Gain Spectroscopy, Coherent Anti-Stokes Raman Scattering, and spontaneous Raman Scattering techniques can be used to evaluate the effect of line broadening, vibrational relaxation, temperature, and crystal structure on the Raman gain and scattering cross section in various crystals. The comparative analysis of many tens of different Raman-active crystals with different quasi-molecular anion groups ( $\text{NO}_3$ ,  $\text{NbO}_3$ ,  $\text{WO}_4$ ,  $\text{MoO}_4$ , and  $\text{VO}_4$ ) will be presented. Selection of the most promising crystals with the maximum Raman gain and scattering cross sections and their testing under nano- and picosecond pumping at different wavelengths will be outlined. The newly developed  $\text{BaWO}_4$ ,  $\text{SrWO}_4$ ,  $\text{PbWO}_4$ ,  $\text{BaMoO}_4$ ,  $\text{SrMoO}_4$ ,  $\text{PbMoO}_4$ ,  $\text{YVO}_4$ ,  $\text{GdVO}_4$  crystals with unique (both for steady-state and transient regimes) Raman characteristics used to design low-threshold highly efficient Raman frequency shifters and lasers will be described in detail (in particular, the high-gain  $\text{BaWO}_4$  crystal provides efficient multistage Raman shifting to new wavelengths in the mid IR, up to  $3.69 \mu\text{m}$ ). Self-Raman-laser operation in LD-pumped  $\text{Nd}:\text{GdVO}_4$ ,  $\text{Nd}:\text{PbMoO}_4$  and  $\text{Nd}:\text{SrMoO}_4$  laser-Raman crystals with the high energy conversion efficiency ( $>60\%$ ) and strong Raman laser pulse shortening (below 400 ps) will be reported.

It will be shown that solid state Raman lasers ensure a low divergence of the output laser radiation (one transverse mode), many watts of average power, high conversion efficiency (up to 50% at the external pumping and 90% at the intracavity pumping), effective shortening of nano- and picosecond pulses, and radiation tuning in an

extremely wide frequency range. Eye-Safe and Sodium-Star laser projects will be touched as an example of application.

**Biography:**

Tasoltan T. Basiev is a Scientific Deputy Director and a Division Head at Laser Materials and Technology Research Center of GPI, Moscow, Russia. Received master degree in electrical engineering at the Moscow Power Engineering Institute in 1972, Ph.D. and doctoral degree in physics in 1977 and 1983 at Lebedev Physical Institute RAS. He has an over 30-year experience in photonic materials and solid state lasers (research and developments). He is the author of 3 books, 27 patents, 33 book chapters and review articles, and more than 300 scientific publications. T. Basiev is an OSA Fellow, elected member of Russian Academy of Engineering Sciences. He supervised 16 Ph.D recipients.

SC275, **Solid-State Slab Lasers**, *Hagop Injeyan, Richard Moyer; Northrop Grumman Corp, USA.*

**Course Level:**

**Beginner (no background or minimal training is necessary to understand course material)**

**Intended Audience:**

Students, engineers, scientists and non-degreed professionals who have a basic knowledge of lasers and would like to learn about the unique aspects of slab lasers and how they are used to scale the power of solid state lasers.

**Course Objectives:**

- Describe the top level characteristics of solid state lasers, issues that are unique to solid state lasers and common geometries of gain media including rods and slabs
- Identify the advantages of slabs over rods including advantages in optical path differences (OPD) and stress induced birefringence. You will also learn about the power scaling laws for each geometry
- Discuss the characteristics of various pumping geometries of slabs including side-pumping, edge-pumping and end-pumping, and how to determine optimal doping level for each geometry
- Describe various thermal management approaches and methods for controlling the OPD under steady state and heat capacity modes of operation
- Estimate power extraction from slab amplifiers using the modified Frantz-Nodvik equation for zig-zag propagation through slabs and how to use different eigenangles to multipass a slab
- Compare how different groups across the industry are trying to scale power to 100 kW and beyond

**Course Description:**

This course will provide the student with an overview of solid state lasers, the issues associated with power scaling solid state lasers, and the characteristics of slab lasers that overcome or moderate these issues. Discussions will include scaling laws for slab geometry lasers and a comparison with rods. The course will present a historical perspective of how slab lasers have evolved over the last 20 years focusing on the design features of various embodiments of slab lasers and the different techniques for



pumping, cooling and extracting from slabs. The course will conclude with a comparison of how different groups across the industry are racing to scale power to 100 kW and beyond.

**Biography:**

Dr. Injeyan and Dr. Moyer, graduates of UCLA and Caltech respectively, have a combined experience of over 60 yrs in laser development and related technologies. During the last 15 years, their work at Northrop Grumman Space Technology (formerly TRW) has focused on architectures using slab lasers, where they have contributed to scaling solid state laser powers to record levels. They have also collaborated in developing two laser courses that have been used to provide solid state laser training to over 200 staff members at Northrop Grumman during the last two years.

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**Tuesday, January 30, 2007**

**7:00 p.m. – 10:00 p.m.**

*Pacific Ballroom*

**Conference Banquet**



Join your colleagues for the conference banquet, featuring a presentation by Richard Catalani, “CSI Productions on Forensic Lasers Use in CSI: Crime Scene Investigation.” All technical registrants receive a ticket with registration. Guest tickets may be purchased for US\$ 75 and must be purchased by 12:00 p.m. on Monday, January 29.

**Biography:**

Richard Catalani graduated from California State University at Northridge with a Major in Biology and Minor in Chemistry. Catalani received a certificate from the State of California as a Medical Toxicologist Technologist and in 1985, started working with the Los Angeles County Sheriff’s Crime Lab in the Toxicology, Narcotics and Firearms Identification Sections. In 1998, Catalani became the Supervising Criminalist in the Firearms Identification Section in 1998.

Retiring from the Los Angeles County Sheriff’s Department Crime Lab in 2001 after sixteen years of service, Catalani began working as an Independent Firearms Examiner. In 2002, Catalani became the technical advisor to the television show, *CSI- Crime Scene Investigation*. For two seasons, Catalani worked with the cast and crew advising them how to perform all of the forensic tasks written for the show. The next season, Catalani became a writer, contributing his experiences in forensics and police procedures to the stories. Richard Catalani currently serves as the Executive Story Editor for *CSI – Crime Scene Investigation*.

## ASSP 2007 Postdeadline Papers

MF1 • 7:30 p.m.

**First Modelocked Integrated External-Cavity Surface Emitting Laser (MIXSEL),** Benjamin Rudin, Deran J. H. C. Maas, Aude-Reine Bellancourt, Matthias Golling, Heiko J. Unold, Thomas Südmeyer, Ursula Keller; *ETH Zurich, Switzerland*. We demonstrate the first vertical-external-cavity surface-emitting semiconductor laser with an integrated saturable absorber for passive modelocking. The novel MIXSEL concept appears suitable for cost-effective high-volume wafer-scale fabrication of high-repetition-rate lasers for telecommunications or optical clocking.

MF2 • 7:42 p.m.

**Efficient, High-Power, Tm-Doped Silica Fiber Laser,** Evgueni Slobodtchikov<sup>1</sup>, Peter F. Moulton<sup>1</sup>, Gavin Frith<sup>2</sup>; <sup>1</sup>Q-Peak Inc., USA, <sup>2</sup>Nufern, Inc., USA. We report on a Tm-doped silica fiber laser that generates 263 W of cw power with a launched pump conversion efficiency of 52% and a slope efficiency of 59%.

MF3 • 7:54 p.m.

**104 W Highly Efficient Thulium Doped Germanate Glass Fiber Laser,** Shibin Jiang<sup>1</sup>, Jianfeng Wu<sup>1</sup>, Zhidong Yao<sup>1</sup>, Jie Zong<sup>1</sup>, Norm P. Barnes<sup>2</sup>; <sup>1</sup>NP Photonics, USA, <sup>2</sup>NASA Langley Res. Ctr., USA. 104 W 1.9 $\mu$ m laser was demonstrated from a 40-cm-long dual-end pumped Tm-doped germanate glass fiber. The Slope efficiency of 68% was achieved from 20-cm-long one-end pumped fiber with an output power of 64 W.

MF4 • 8:06 p.m.

**Quasi-Phase-Matching Structures Induced by Ferroelastic Domains in RbTiOAsO<sub>4</sub> Crystals,** Sooseok Lee<sup>1</sup>, Min Ho Rim<sup>1</sup>, Yusin Yang<sup>1</sup>, Ae Ran Lim<sup>2</sup>, Se-Young Jeong<sup>3</sup>, Choon Sup Yoon<sup>1</sup>; <sup>1</sup>KAIST, Republic of Korea, <sup>2</sup>Jeonju Univ., Republic of Korea, <sup>3</sup>Busan Natl. Univ., Republic of Korea. We report for the first time quasi-phase-matching (QPM) structures induced by ferroelastic domains in RbTiOAsO<sub>4</sub> crystals, which overcome the current limit of  $\sim 3$   $\mu$ m period and  $\sim 3$  mm thickness in electrically poled QPM structures.

MF5 • 8:18 p.m.

**Resonantly Diode-Pumped Er:YAG Cryo-Laser at 1618 nm,** Mark Dubinskii, Nikolay Ter-Gabrielyan, George A. Newburgh, Larry D. Merkle; *US ARL, USA*. Efficient resonantly diode-pumped Er:YAG cryo-laser is demonstrated for the first time. Slope efficiency of 71.5% per absorbed power was achieved at 78°K in these initial experiments. Maximum quasi-CW power of over 63W is reported.

MF6 • 8:30 p.m.

**Validation of Rotary Disk Laser Concept in Producing Efficient, High-Power, Diffraction-Limited Laser Sources in the Visible and the Infrared,** Santanu Basu; *Sparkle Optics Corp., USA*. The premise that a rotary disk laser can efficiently generate high power across the spectrum was validated by a 256-W cw laser and a 214-W Q-switched laser at 1030-nm and an 87-W laser at 515-nm.

MF7 • 8:42 p.m.

**Real-Time Terahertz Imaging System for the Detection of Concealed Objects,** Daniel Creeden, John C. McCarthy, Peter A. Ketteridge, Timothy Southward, James J. Komiak, Evan P. Chicklis; *BAE Systems, USA*. We have demonstrated for the first time

a novel, real-time terahertz imaging system using a single fiber laser to generate THz radiation by DFM and an uncooled microbolometer array to image the THz signal.

## **Current Exhibitor List**

*(as of January 23, 2007)*

[Cleveland Crystals](#)

[Coherent Inc.](#)

[Crystal Fibre A/S](#)

[Del Mar Photonics](#)

[DILAS Diodenlaser GmbH](#)

[EKSPLA](#)

[ELS Electronic Laser System](#)

[Koheras A/S](#)

[Laser Focus World](#)

[Leading Edge Optical](#)

[LINOS Photonics](#)

[Multiwave Photonics](#)

[Newport Corporation](#)

[Northrop Grumman Cutting Edge Optronics](#)

[Northrop Grumman Corp. – SYNOPTICS](#)

[NUFERN](#)

[Nuvonyx Inc.](#)

[Onyx Optics, Inc.](#)

[OptiGrate](#)

[Oxide Corporation](#)

[Photonics Spectra](#)

[Quintessence Photonics Corporation](#)

[RPMC Lasers, Inc.](#)

[Scientific Materials Corp.](#)

[Sparkle Optics Corporation](#)

[VLOC](#)

## Agenda of Sessions

Sunday, January 28, 2007		
Time	Event	Location
12:00p.m. – 6:00p.m.	Registration	<i>British Columbia Ballroom Foyer</i>
1:00p.m. – 5:00p.m.	SC275: Solid-State Slab Lasers	
1:00p.m. – 5:00p.m.	SC276: Ultrafast Fiber Amplifiers	
1:00p.m. – 5:00p.m.	SC277: Raman Laser Materials and Applications	
Monday, January 29, 2007		
Time	Event	Location
7:00a.m. – 5:00p.m.	Registration	<i>British Columbia Ballroom Foyer</i>
8:00a.m. – 8:15a.m.	Opening Remarks	<i>British Ballroom</i>
8:15a.m. – 10:00a.m.	<b>MA:</b> High Power Solid-State Lasers I	<i>British Ballroom</i>
10:00a.m. – 4:00p.m.	Exhibits	<i>Columbia Ballroom</i>
10:00a.m. – 11:00a.m.	<b>MB:</b> Poster Session I, Coffee Break & Exhibits	<i>Columbia Ballroom</i>
11:00a.m. – 12:30p.m.	<b>MC:</b> High Efficiency Yb Lasers	<i>British Ballroom</i>
12:30p.m. – 2:00p.m.	Lunch (on your own)	
2:00p.m. – 3:30p.m.	<b>MD:</b> VIS/UV Sources	<i>British Ballroom</i>
3:30p.m. – 4:00p.m.	Coffee Break & Exhibits	<i>Columbia Ballroom</i>
4:00p.m. – 5:30p.m.	<b>ME:</b> Fiber Lasers	<i>British Ballroom</i>
5:30p.m. – 7:30p.m.	Dinner (on your own)	
7:30p.m. – 9:00p.m.	<b>MF:</b> Postdeadline Paper Session	<i>British Ballroom</i>
Tuesday, January 30, 2007		
Time	Event	Location
7:30a.m. – 12:30p.m.	Registration	<i>British Columbia Ballroom Foyer</i>
8:00a.m. – 10:00a.m.	<b>TuA:</b> Applications	<i>British Ballroom</i>
10:00a.m. – 1:00p.m.	Exhibits	<i>Columbia Ballroom</i>
10:00a.m. – 11:00a.m.	<b>TuB:</b> Poster Session II – Student Posters; Coffee Break & Exhibits	<i>Columbia Ballroom</i>
11:00a.m. – 1:00p.m.	<b>TuC:</b> Nonlinear Optics	<i>British Ballroom</i>
Wednesday, January 31, 2007		
Time	Event	Location
7:30a.m. – 5:00p.m.	Registration	<i>British Columbia Ballroom Foyer</i>
8:00a.m. – 10:00a.m.	<b>WA:</b> Ultrafast Lasers	<i>British Ballroom</i>
10:00a.m. – 4:00p.m.	Exhibits	<i>Columbia Ballroom</i>
10:00a.m. – 11:00a.m.	<b>WB:</b> Poster Session III, Coffee Break & Exhibits	<i>Columbia Ballroom</i>
11:00a.m. – 12:30p.m.	<b>WC:</b> Novel Technologies	<i>British Ballroom</i>
12:30p.m. – 2:00p.m.	Lunch (on your own)	
2:00p.m. – 3:30p.m.	<b>WD:</b> High Power Solid-State Lasers II	<i>British Ballroom</i>
3:30p.m. – 4:00p.m.	Coffee Break & Exhibits	<i>Columbia Ballroom</i>

4:00p.m. – 6:00p.m.

6:00p.m. – 6:30p.m.

**WE:** Mid-IR Sources  
Closing Remarks and Presentation of Best  
Student Paper Prizes

*British Ballroom*

*British Ballroom*

**Advanced Solid-State Photonics**  
**Fairmont Hotel Vancouver, Vancouver, British Columbia**

*Welcome* to Vancouver and to the **Advanced Solid-State Photonics** Topical Meeting and Tabletop Exhibit! We consider this meeting to be the world's premier forum for discussion of new research in lasers and nonlinear optical materials and devices. These advances continue to enable an increasingly broad range of applications in fields as diverse as spectroscopy, metrology, remote sensing, communications, material processing, inertial confinement fusion, atomic physics, forensics, medicine and entertainment. We thank you for joining us!

As you can see from this year's program, this event brings together a diverse, multinational group sharing a common interest in the development and use of solid-state photonics. This year you will be exposed to over 130 presentations of the highest caliber. We have scheduled seven invited and 55 contributed oral presentations, and over 70 poster presentations for you to attend over the next three days. Invited speakers will review the latest research in novel gain and parametric media, such as ceramics and periodically-poled materials, discuss developments in unconventional coherent sources, such as single-frequency fiber lasers and octave-spanning lasers, and highlight applications such as the use of solid-state lasers in optical clocks. In addition, our banquet speaker will provide insight into how lasers are used in forensics and how Hollywood, in particular, views lasers. This year's meeting also provides three new short courses and the opportunity to learn first-hand from leaders in ultrafast fiber amplifiers, Raman laser materials, and solid-state slab lasers. The program is exceptional!

This year we have added a special poster session for students to be held Tuesday morning. For the first time, the best paper in that session will be awarded a Best Student Poster Award. This will complement the Best Student Paper Award that we have traditionally given out to our best oral presentation.

Lastly, a highlight of all ASSP meetings is the chance to network with colleagues from across the globe. We have tried to structure this year's conference to provide ample opportunities for such activities. Please be sure to introduce yourself to us and tell us about your research.

We hope that you enjoy your time with us this week and this unique opportunity to explore Vancouver, considered by some to be the "Best City in the Americas!"

Sincerely,

**Timothy J. Carrig**, *Lockheed Martin Coherent Technologies, USA*  
General Chair

**Jonathan D. Zuegel**, *Univ. of Rochester, Lab for Laser Energetics, USA*  
Program Chair

# Program Committee

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*\*Representative to OSA's Science and Engineering Council*



# Agenda of Sessions

## Sunday, January 28, 2007

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10:00 a.m. – 11:00 a.m.	<b>MB:</b> Poster Session I, Coffee Break & Exhibits	<i>Columbia Ballroom</i>
11:00 a.m. – 12:30 p.m.	<b>MC:</b> High Efficiency Yb Lasers	<i>British Ballroom</i>
12:30 p.m. – 2:00 p.m.	Lunch (on your own)	
2:00 p.m. – 3:30 p.m.	<b>MD:</b> VIS/UV Sources	<i>British Ballroom</i>
3:30 p.m. – 4:00 p.m.	Coffee Break & Exhibits	<i>Columbia Ballroom</i>
4:00 p.m. – 5:30 p.m.	<b>ME:</b> Fiber Lasers	<i>British Ballroom</i>
5:30 p.m. – 7:30 p.m.	Dinner (on your own)	
7:30 p.m. – 9:00 p.m.	<b>MF:</b> Postdeadline Paper Session	<i>British Ballroom</i>

## Tuesday, January 30, 2007

Time	Event	Location
7:30 a.m. – 12:30 p.m.	Registration	<i>British Columbia Ballroom Foyer</i>
8:00 a.m. – 10:00 a.m.	<b>TuA:</b> Applications	<i>British Ballroom</i>
10:00 a.m. – 1:00 p.m.	Exhibits	<i>Columbia Ballroom</i>
10:00 a.m. – 11:00 a.m.	<b>TuB:</b> Poster Session II – Student Posters; Coffee Break & Exhibits	<i>Columbia Ballroom</i>
11:00 a.m. – 1:00 p.m.	<b>TuC:</b> Nonlinear Optics	<i>British Ballroom</i>
7:00 p.m. – 10:00 p.m.	<b>Conference Banquet</b>	<i>Pacific Ballroom</i>

## Wednesday, January 31, 2007

Time	Event	Location
7:30 a.m. – 5:00 p.m.	Registration	<i>British Columbia Ballroom Foyer</i>
8:00 a.m. – 10:00 a.m.	<b>WA:</b> Ultrafast Lasers	<i>British Ballroom</i>
10:00 a.m. – 4:00 p.m.	Exhibits	<i>Columbia Ballroom</i>
10:00 a.m. – 11:00 a.m.	<b>WB:</b> Poster Session III, Coffee Break & Exhibits	<i>Columbia Ballroom</i>
11:00 a.m. – 12:30 p.m.	<b>WC:</b> Novel Technologies	<i>British Ballroom</i>
12:30 p.m. – 2:00 p.m.	Lunch (on your own)	
2:00 p.m. – 3:30 p.m.	<b>WD:</b> High Power Solid-State Lasers II	<i>British Ballroom</i>
3:30 p.m. – 4:00 p.m.	Coffee Break & Exhibits	<i>Columbia Ballroom</i>
4:00 p.m. – 6:00 p.m.	<b>WE:</b> Mid-IR Sources	<i>British Ballroom</i>
6:00 p.m. – 6:30 p.m.	Closing Remarks and Presentation of Best Student Paper Prizes	<i>British Ballroom</i>

## Conference Highlights

**Tuesday, January 30, 2007**

*Pacific Ballroom*

► **7:00 p.m. – 10:00 p.m.**

### **Conference Banquet**

Join your colleagues for the conference banquet, featuring a presentation by Richard Catalani, "CSI Productions on Forensic Lasers Use in CSI: Crime Scene Investigation." All technical registrants receive a ticket with registration. Guest tickets may be purchased for US\$ 75 and must be purchased by 12:00 p.m. on Monday, January 29.

### ► **Banquet Speaker**

**Forensic Lasers Use in CSI: Crime Scene Investigation**, *Richard Catalani; CSI Productions, USA*

*The organizers of the Advanced Solid-State Photonics Topical Meeting gratefully acknowledge the generous support of the following government agencies:*

**Air Force Office of Scientific Research**

**Lawrence Livermore National Laboratory**

**National Aeronautics and Space Administration**

## ASSP 2007 Short Courses

Sunday, January 28, 2007 – 1:00 p.m. – 5:00 p.m.

### ► SC276 Ultrafast Fiber Amplifiers

Martin Fermann, *IMRA America Inc, USA*

#### Course Description

Attendees will be introduced to the unique capabilities of fiber amplifiers in the construction of high average power and high peak power laser systems. This course gives an overview of short pulse generation techniques in fiber amplifiers. All relevant aspects of high power fiber laser technology will be addressed, comprising diode pump sources, diode to fiber coupling techniques, seed sources and pulse generation in fiber oscillators, fiber amplifier material and spectroscopic properties, linear and nonlinear fiber amplification processes as well as thermal limitations and damage mechanisms. The emphasis will be on industrially relevant laser systems as used in instrumentation and optical processing. Numerous design examples will illustrate the recurring physical phenomena governing these systems.

Attendees will be introduced to the latest developments in ultra-large mode fiber and doped fiber technology. The properties of solid core, higher-order mode, micro-structure, photonic crystal fibers and fiber rods will be compared. The attendee will be introduced to the physical limits of such ultra large mode fibers in the construction of high peak power and high average power fiber amplifiers and how to optimally approach these limits in actual system design. Attendees will further learn how to construct all-fiber picosecond and femtosecond pulse sources and how to generate canonical pulse forms, such as solitons, gaussians, similaritons and cubicons. The relevance of these canonical pulse forms in high peak power amplification systems based on chirped pulse amplification in fiber amplifiers and nonlinear crystals will be elucidated and preferred options for pulse stretching and re-compression will be addressed. The course will conclude with a brief review of hot topics in fiber technology, comprising supercontinuum generation, THz generation, frequency combs and absolute phase control.

#### Benefits and Learning Objectives

This course should enable you to:

- Design optical systems for fiber amplifier pumping
- Build pico-and femtosecond fiber oscillator systems
- Build high peak and high average power fiber amplifier systems
- Design and model pulsed fiber oscillators and amplifiers
- Test the performance characteristics of fiber pulse sources
- Build fiber supercontinuum sources and fiber frequency combs

#### Course Level

Advanced Beginner (basic understanding of topic is necessary to follow course material)

#### Intended Audience

This course is intended for researchers, engineers and graduate students who are interested in a comprehensive review of current high power pulsed fiber laser technology. It will not only be a “how to” instruction but will also address the “why” for those who want to build their own fiber laser systems.

#### Instructor Biography

Martin E. Fermann is Director of Laser Research with IMRA America Inc. He has been involved in fiber and ultrafast laser research for more than 20 years. He has pioneered ultrafast fiber laser technology and has been a major force in the commercialization of ultrafast fiber laser systems. He has contributed to 250 peer-reviewed publications, has edited a book on ultrafast lasers and is the holder of 31 U.S. patents. Currently he is serving as guest editor for a JOSA B special edition on “fiber lasers” to be published by the Optical Society of America.

**Sunday, January 28, 2007 – 1:00 p.m. – 5:00 p.m.**

► **SC277 Raman Laser Materials and Applications**

Tasoltan T. Basiev, *General Physics Inst. RAS, Russian Federation*

**Course Description**

This course focuses on the search and development of new nonlinear crystals for Raman shifters and lasers. It will be shown how the Raman Gain Spectroscopy, Coherent Anti-Stokes Raman Scattering and spontaneous Raman Scattering techniques can be used to evaluate the effect of line broadening, vibrational relaxation, temperature and crystal structure on the Raman gain and scattering cross section in various crystals. The comparative analysis of many different Raman-active crystals with different quasi-molecular anion groups (NO<sub>3</sub>, NbO<sub>3</sub>, WO<sub>4</sub>, MoO<sub>4</sub> and VO<sub>4</sub>) will be presented. Selection of the most promising crystals with the maximum Raman gain and scattering cross sections and their testing under nano- and picosecond pumping at different wavelengths will be outlined. The newly developed BaWO<sub>4</sub>, SrWO<sub>4</sub>, PbWO<sub>4</sub>, BaMoO<sub>4</sub>, SrMoO<sub>4</sub>, PbMoO<sub>4</sub>, YVO<sub>4</sub>, GdVO<sub>4</sub> crystals with unique (both for steady-state and transient regimes) Raman characteristics used to design low-threshold highly efficient Raman frequency shifters and lasers will be described in detail. (In particular, the high-gain BaWO<sub>4</sub> crystal provides efficient multistage Raman shifting to new wavelengths in the mid IR, up to 3.69 μm.) Self-Raman-laser operation in LD-pumped Nd:GdVO<sub>4</sub>, Nd:PbMoO<sub>4</sub> and Nd:SrMoO<sub>4</sub> laser-Raman crystals with the high energy conversion efficiency (>60%) and strong Raman laser pulse shortening (below 400 ps) will be reported.

It will be shown that solid state Raman lasers ensure a low divergence of the output laser radiation (one transverse mode), many watts of average power, high conversion efficiency (up to 50% at the external pumping and 90% at the intracavity pumping), effective shortening of nano- and picosecond pulses, and radiation tuning in an extremely wide frequency range. Eye-Safe and Sodium-Star laser projects will be touched as an example of application.

**Benefits and Learning Objectives**

This course should enable you to:

- Compare different Raman laser crystals in terms of the threshold and gain values, Raman frequency shifts and line broadening
- Determine the best regime of operation for specific Raman crystals
- Specify materials and constructions for Raman lasing and frequency shifting at specific wavelengths and duration of pumping
- Design low-threshold highly efficient Raman lasers and frequency shifters for picosecond to CW modes of operation
- Develop diode-pumped self-Raman lasers with strong pulse shortening and peak power increasing

**Intended Audience**

Scientists, engineers, students and research and development staff in the industry who use and develop laser and nonlinear crystals for laser frequency shifting, wavelength multiplication, pulse shortening, fast-switched optical amplification, and coherent light sources at new wavelengths (Raman shifters, Raman lasers, self-Raman lasers). General background in optics and lasers is required.

**Instructor Biography**

Tasoltan T. Basiev is a scientific deputy director and a division head at Laser Materials and Technology Research Center of GPI, Moscow, Russia. He received a master's degree in electrical engineering at the Moscow Power Engineering Institute in 1972, a Ph.D. and doctoral degree in physics in 1977 and 1983 at Lebedev Physical Institute RAS. He has more than 30 years of experience in photonic materials and solid state lasers (research and development). He is the author of three books, 27 patents, 33 book chapters and review articles, and more than 300 scientific publications. Basiev is an OSA Fellow and an elected member of the Russian Academy of Engineering Sciences. He supervised 16 Ph.D. recipients.

**Sunday, January 28, 2007 – 1:00 p.m. – 5:00 p.m.**

► **SC275 Solid-State Slab Lasers**

Hagop Injeyan, Richard Moyer; *Northrop Grumman Corp., USA*

**Course Description**

This course will provide students with an overview of solid state lasers, the issues associated with power scaling solid state lasers, and the characteristics of slab lasers that overcome or moderate these issues. Discussions will include scaling laws for slab geometry lasers and a comparison with rods. The course will present a historical perspective of how slab lasers have evolved over the last 20 years, focusing on the design features of various embodiments of slab lasers and the different techniques for pumping, cooling and extracting from slabs. The course will conclude with a comparison of how different groups across the industry are racing to scale power to 100 kW and beyond.

**Benefits and Learning Objectives**

This course should enable you to:

- Describe the top level characteristics of solid state lasers, issues that are unique to solid state lasers and common geometries of gain media including rods and slabs
- Identify the advantages of slabs over rods, including advantages in optical path differences (OPD) and stress induced birefringence, and learn about the power scaling laws for each geometry
- Discuss the characteristics of various pumping geometries of slabs, including side-pumping, edge-pumping and end-pumping, and how to determine optimal doping level for each geometry
- Describe various thermal management approaches and methods for controlling the OPD under steady state and heat capacity modes of operation
- Estimate power extraction from slab amplifiers using the modified Frantz-Nodvik equation for zig-zag propagation through slabs and how to use different eigenangles to multipass a slab
- Compare how different groups across the industry are trying to scale power to 100 kW and beyond

**Course Level**

Beginner (no background or minimal training is necessary to understand course material)

**Intended Audience**

Students, engineers, scientists and non-degreed professionals who have a basic knowledge of lasers and would like to learn about the unique aspects of slab lasers and how they are used to scale the power of solid state lasers.

**Instructor Biography**

Hagop Injeyan and Richard Moyer, graduates of the University of California at Los Angeles and Caltech respectively, have a combined experience of more than 60 years in laser development and related technologies. During the last 15 years, their work at Northrop Grumman Space Technology (formerly TRW) has focused on architectures using slab lasers, where they have contributed to scaling solid-state laser powers to record levels. They have also collaborated in developing two laser courses that have been used to provide solid-state laser training to more than 200 staff members at Northrop Grumman during the last two years.

# 2007 Program Abstracts

## Sunday, January 28, 2007

British Columbia Ballroom Foyer

► 12:00 p.m. – 6:00 p.m.

Registration

► 1:00 p.m. – 5:00 p.m.

Short Courses

SC275: Solid-State Slab Lasers

SC276: Ultrafast Fiber Amplifiers

SC277: Raman Laser Materials and Applications

## Monday, January 29, 2007

British Columbia Ballroom Foyer

► 7:00 a.m. – 5:00 p.m.

Registration

British Ballroom

► 8:00 a.m. – 8:15 a.m.

Opening Remarks

### MA • High Power Solid-State Lasers I

British Ballroom

► 8:15 a.m. – 10:00 a.m.

MA • High Power Solid-State Lasers I

Christopher A. Ebbers; LLNL, USA, *President*

MA1 • 8:15 a.m.

Invited

**High-Power Thin-Disk Lasers**, *Adolf Giesen; Univ. of Stuttgart, Germany.* The current status of the thin disk laser technology will be given for cw-operation and for pulsed-mode operation. Also the scaling laws and the scaling limits will be discussed in detail.

MA2 • 8:45 a.m.

**>400 W CW Operation of Diode Edge-Pumped, Composite All-Ceramic Yb:YAG Microchip Laser**, *Masaki Tsunekane, Takunori Taira; Inst. for Molecular Science, Japan.* 414W CW operation of a diode edge-pumped, composite all-ceramic Yb:YAG microchip (a 3mm-diameter core with a 200 $\mu$ m thickness) laser was successfully demonstrated. The emission power density of 0.29MW/cm<sup>3</sup> from the core is highest ever reported.

MA3 • 9:00 a.m.

**High Power Operation of Yb:LuVO<sub>4</sub> and Yb:YVO<sub>4</sub> Crystals in the Thin-Disk Laser Setup**, *Christian Kränkel, Rigo Peters, Klaus Petermann, Günter Huber; Inst. of Laser-Physics, Germany.* A thin-disk Yb:LuVO<sub>4</sub> laser with 13 W output power at 33% optical-to-optical efficiency and slope efficiency of 50% is demonstrated for the first time. Power scaling of Yb:YVO<sub>4</sub> delivers 10 W with 43% slope efficiency.

MA4 • 9:15 a.m.

**Thin-Disk Laser Operation of Yb<sup>3+</sup>-Doped NaGd(WO<sub>4</sub>)<sub>2</sub>**, *Rigo Peters, Christian Kränkel, Klaus Petermann, Günter Huber; Inst. of Laser-Physics, Germany.* We report on high-power Yb:NaGd(WO<sub>4</sub>)<sub>2</sub> laser using the thin-disk geometry. 16.5W of output power at 1.026 $\mu$ m with a slope efficiency of 59% was obtained from a 10.7at%-doped 0.1mm-thin disk under diode-pumping with 42W at 975nm.

MA5 • 9:30 a.m.

**Characterization and Stabilization of High-Power Solid-State Lasers**, *Benno Willke<sup>1</sup>, Patrick Kwee<sup>2</sup>, Frank Seifert<sup>2</sup>, Maik Frede<sup>3</sup>; <sup>1</sup>Leibniz Univ. Hanover, Germany, <sup>2</sup>Max-Planck-Inst. für Gravitationsphysik Germany, <sup>3</sup>Laserzentrum Hannover, Germany.* Modern laser applications require high-power laser with very high stability. We discuss stabilization concepts, the highest power stability ever achieved (RIN=3.5E-9/sqrt(Hz)) and a tool to measure fractional power below 2E-4 in higher order spatial modes.

MA6 • 9:45 a.m.

**Picosecond Regenerative Yb:YAG Thin Disk Amplifier at 200 kHz Repetition Rate and 62 W Output Power**, *Christian Stolzenburg, Adolf Giesen; Inst. für Strahlwerkzeuge, Germany.* We report on a picosecond regenerative Yb:YAG thin disk amplifier capable of delivering 62 W of average output power with repetition rates up to 200 kHz and nearly diffraction-limited beam quality.

Columbia Ballroom

► 10:00 a.m. – 4:00 p.m.

Exhibits

### MB • Poster Session I

Columbia Ballroom

► 10:00 a.m. – 11:00 a.m.

MB • Poster Session I

MB1

**Activation of a Spatial, Temporal, and Spectrally Sculpted Front End for the Mercury Laser**, *J. P. Armstrong, A. Bayramian, R. Beach, R. Campbell, J. Dawson, Christopher A. Ebbers, B. Frietas, R. Kent, R. Lanning, S. Telford, E. Utterback; LLNL, USA.* We have produced over 500 mJ using a hybrid fiber-based master-oscillator system coupled with a Yb:S-FAP power amplifier. This system is designed with spatial, temporal, and spectral sculpting enabling broadband amplification correctable for gain narrowing.

MB2

**42-mJ Q-Switched Active-Mirror Laser Oscillator with a Cryogenic Yb:YAG Ceramics**, *Junji Kawanaka<sup>1</sup>, Shigeki Tokita<sup>1</sup>, Hajime Nishioka<sup>2</sup>, Ken-ichi Ueda<sup>2</sup>, Masayuki Fujita<sup>3</sup>, Toshiyuki Kawashima<sup>4</sup>, Hideki Yagi<sup>5</sup>, Takagimi Yanagitani<sup>5</sup>; <sup>1</sup>Inst. of Laser Engineering, Japan, <sup>2</sup>Inst. for Laser Science, Japan, <sup>3</sup>Inst. for Laser Technology, Japan, <sup>4</sup>Hamamatsu Photonics K. K., Japan, <sup>5</sup>Konoshima Chemical Co. Ltd., Japan.* A 42-mJ Q-switched laser oscillator has been demonstrated by using an active-mirror Yb:YAG ceramics at low temperature. The extraction density of the pulse energy from the unit ceramics volume is up to 17J/cm<sup>3</sup>.

**MB3**

**High Average Power Ho:YAG Laser**, Ian Elder; SELEX Sensors and Airborne Systems Ltd., UK. 27.4 W of average power in a beam with  $M^2 < 1.5$  is demonstrated from a repetitively Q-switched Ho:YAG laser pumped by a thulium fibre laser.

**MB4**

**Optical Parametric Chirped Pulse Amplification for the PETAL Front-End: Design and First Results**, Emmanuel Hugonnot, Gérard Deschaseaux, Olivier Hartmann, Nicolas Beck, Hervé Coïc; CEA/CESTA, France. We present the design and the first results of the front-end for the French LIL multi-Petawatt Laser Facility (PETAL) based on OPCPA architecture.

**MB5**

**Yb-Doped Sesquioxide Ceramics: Temperature Dependent Laser Performance and Spectroscopy**, Nikolay Ter-Gabrielyan, Mark Dubinskii, Larry D. Merkle, G. Alex Newburgh; ARL, USA. We observe that laser performance improves far more upon cooling to liquid nitrogen temperature in ceramic Yb:Y<sub>2</sub>O<sub>3</sub> than in Yb:Sc<sub>2</sub>O<sub>3</sub>. Differences in the temperature dependence of their spectra suggest a possible reason for this difference.

**MB6**

**The Onset of Optical Parametric Generation in Long Periodically-Poled Crystals**, Shy Acco<sup>1</sup>, Pinhas Blau<sup>1</sup>, Shaul Pearl<sup>1</sup>, Ady Arie<sup>2</sup>; <sup>1</sup>SOREQ NRC, Israel, <sup>2</sup>School of Electrical Engineering, Tel-Aviv Univ., Israel. OPG emission in long periodically-poled MgO:LiNbO<sub>3</sub> crystals pumped by a Q-switched Nd:YVO<sub>4</sub> laser was characterized. The experimental results obtained for small gain-length product ( $g_0L < 10$ ) are in excellent agreement with quantum mechanical model calculations.

**MB7**

**Comparative Study on the Coercive Field in Undoped and MgO-Doped Congruent LiNbO<sub>3</sub>**, Hideki Ishizuki, Takunori Taira; Laser Res. Ctr., Inst. for Molecular Science, Japan. The coercive fields of undoped and MgO-doped congruent LiNbO<sub>3</sub> were compared using ramping electric-field application. The MgO-doped LiNbO<sub>3</sub> was poled inversely at ~2kV/mm electric field by ramping field of 10V/mm/s at room temperature.

**MB8**

**Difference Frequency Generation in a ZnGeP<sub>2</sub> Crystal Pumped by a Large Aperture Periodically Poled MgO:LiNbO<sub>3</sub> Optical Parametric System**, Jiro Saikawa<sup>1</sup>, Mitsuhiro Miyazaki<sup>1</sup>, Masaaki Fujii<sup>1</sup>, Hideki Ishizuki<sup>2</sup>, Takunori Taira<sup>2</sup>; <sup>1</sup>Tokyo Inst. of Technology, Japan, <sup>2</sup>Inst. for Molecular Science, Japan. We have developed a high-energy (>30mJ), narrow-bandwidth (<2nm) optical parametric system with large-aperture PPMgLN devices. The optical parametric system was employed in a ZnGeP<sub>2</sub> difference frequency generation system and tunable mid-infrared generation was observed.

**MB9**

**High-Energy, Sub-Nanosecond Pulse Duration Intracavity Pumped KTP OPO at 1572 nm**, Paul D. Mason, Brian J. Perrett; QinetiQ, UK. Sub-nanosecond duration eyesafe pulses at 1572 nm with energies of up to 10 mJ are produced for high precision ranging applications by cavity-dumped operation of an intracavity-pumped KTP OPO.

**MB10**

**Parametric THz Generation Pumped by Q-Switched Fiber Lasers in GaSe Crystal**, Wei Shi, Matt Leigh, Jie Zong, Shibin Jiang; NP Photonics, Inc., USA. Two fiber lasers were simultaneously Q-switched by using one piezo to modulate the intracavity polarization-dependent loss, which were amplified as pump sources. Coherent and single-frequency THz radiation has been firstly achieved by using all-fiber lasers.

**MB11**

**Efficient Nonlinear Frequency Conversion to 193-nm Using Cooled BBO**, Andrew J. Merriam<sup>1</sup>, James J. Jacob<sup>1</sup>, Donald S. Bethune<sup>2</sup>, John A. Hoffnagle<sup>2</sup>; <sup>1</sup>Actinix, USA, <sup>2</sup>IBM Almaden Res. Ctr., USA. We have developed a 5-kHz 193-nm laser source that generates a near-diffraction-limited TEM<sub>00</sub> beam with 35 mW average power. The conversion efficiency and stability are both significantly enhanced by cooling the BBO sum-frequency mixing crystal.

**MB12**

**Backswitching and Fixing of Periodically Poled Structure in Low Coercive Field Stoichiometric LiTaO<sub>3</sub>**, Xiaoyan Liu, Kenji Kitamura, Kazuya Terabe, Shunji Takekawa; Natl. Inst. for Materials Science, Japan. Temperature-induced backswitching in near-stoichiometric LiTaO<sub>3</sub> QPM devices was investigated. Backswitching consistently occurred due to heat treatment. We found two effective methods for fixing of fine periodically poled structures. They are cutting-edge methods and ion implantations.

**MB13**

**Modeling and Characterization of High-Efficiency, High Power Cascaded Intracavity Optical Parametric Oscillators in the Mid-Infrared**, Gabriel Mennerat<sup>1</sup>, Arnaud Grisard<sup>2</sup>, Éric Lallier<sup>2</sup>, Jean-Eucher Montagne<sup>3</sup>, Olivier Squaglia<sup>3</sup>; <sup>1</sup>CEA - Commissariat à l'Énergie Atomique, France, <sup>2</sup>Thales Res. & Technology, France, <sup>3</sup>Compagnie Industrielle des Lasers, France. Modeling and demonstration of efficient intracavity cascaded PPLN OPO which converts 20% energy from 1.064μm to three bands in the 2-5μm range. Spatio-temporal simulation of cascaded processes correctly estimates self-induced thermal lensing and efficiency saturation.

**MB14**

**300K-7.8K Temperature Dependence of the Verdet Constant of Terbium Gallium Garnet Ceramic**, Ryo Yasuhara<sup>1</sup>, Shigeki Tokita<sup>2</sup>, Junji Kawanaka<sup>2</sup>, Hideki Yag<sup>3</sup>, Hoshiteru Nozawa<sup>3</sup>, Takagimi Yanagitani<sup>3</sup>, Toshiyuki Kawashima<sup>1</sup>, Hirofumi Kan<sup>1</sup>; <sup>1</sup>Hamamatsu Photonics K. K., Japan, <sup>2</sup>Inst. of Laser Engineering, Osaka Univ., Japan, <sup>3</sup>Konoshima Chemical Co. Ltd., Japan. As the first demonstration of Faraday effect in a TGG ceramics, its Verdet constant at 1053nm was evaluated to be 1453 rad/Tm at 7.8 K which is 40 times greater than that at 300 K.

**MB15**

**Polarization-Maintaining 1064 nm Fiber MOPA System with Narrow Bandwidth for Wavelength Conversion,** Yoshio Wada<sup>1</sup>, Tatsuya Shinozaki<sup>1</sup>, Yoshiharu Urata<sup>1</sup>, Yushi Kaneda<sup>1</sup>, Satoshi Wada<sup>1</sup>, Shinichi Imai<sup>2</sup>; <sup>1</sup>Megaopto Co., Ltd., Japan, <sup>2</sup>Advanced Mask Inspection Technology Inc., Japan. A seeded pulsed diode oscillator and fiber amplifiers are used to obtain a polarized single-mode output with 750 MHz linewidth and over 1 kW peak power with low-nonlinearity for wavelength conversion applications.

**MB16**

**Broadband Optical Parametric Amplification at the Communication Band with Periodically Poled Lithium Niobate Pumped by Ps-Laser Pulse,** 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 periodically poled LiNbO<sub>3</sub> crystal. A 20 dB-gain was obtained for a broadband signal at 1580 nm with a 35 ps-pump at a fixed wavelength of 870 nm.

**MB17**

**Yb-Bi Pulsed Fiber Lasers,** Vladislav V. Dvoyrin, Valery M. Mashinsky, Oleg I. Medvedkov, Evgueni M. Dianov; Fiber Optics Res. Ctr., RAS, Russian Federation. Bi-doped fiber laser inside Yb fiber laser cavity causes a pulsed lasing of the both lasers. 975 nm diode pumping of Yb-Bi laser resulted in 1050-1200 nm lasing with pulse energy up to 100 µJ.

**MB18**

**470 mW of Blue Laser Emission by Frequency Doubling of CW Oscillation Nd:ASL with LBO Crystal Using a V-Type Cavity,** Cyrille Varona<sup>1</sup>, Pascal Loiseau<sup>1</sup>, Gérard Aka<sup>1</sup>, Bernard Ferrand<sup>2</sup>, Philippe Villeval<sup>3</sup>, Dominique Lupinski<sup>3</sup>; <sup>1</sup>CNRS UMR, France, <sup>2</sup>CEA - LETI, France, <sup>3</sup>Cristal Laser, France. 470mW of blue output laser emission at 450nm was generated by frequency doubling of Nd:ASL crystal Sr<sub>1-x</sub>La<sub>x-y</sub>Nd<sub>y</sub>Mg<sub>x</sub>Al<sub>12-x</sub>O<sub>19</sub> (x=0.3,y=0.05) with a 7mm-long LBO nonlinear crystal. The cavity was V-type associated with a CW Ti:sapphire pumping source.

**MB19**

**Power Scaling of End-Pumped Nd:YAG Rod Lasers into the Kilowatt Region,** Ralf Wilhelm, Maik Frede, Dietmar Kracht; Laserzentrum Hannover, Germany. A method for scaling end-pumped rod lasers to high output powers by employing multi-segmented crystals in a pump light double pass is presented and a design example for 2 kW of pump power is given.

**MB20**

**High-Power, Direct Upper Laser Level Compared to Traditionally Nd:YAG Pumping,** Maik Frede, Denis Freiburg, Ralf Wilhelm, Dietmar Kracht; Laser Zentrum Hannover, Germany. A high-power, highly-efficient, multi-segmented, end-pumped Nd:YAG laser by pumping into the upper laser level is demonstrated. In comparison with traditional Nd:YAG pumping at 807 nm the advantages of upper laser level pumping are demonstrated experimentally.

**MB21**

**Phase-Conjugated 2-µm Laser System,** Yingxin Bai<sup>1</sup>, Jirong Yu<sup>2</sup>, M. Petros<sup>3</sup>, Paul Petzar<sup>1</sup>, Bo Trieu<sup>2</sup>, Hyung Lee<sup>4</sup>, U. Singh<sup>2</sup>, V. Leyva<sup>5</sup>, V. Shkunov<sup>5</sup>, D. Rockwell<sup>5</sup>, A. Betin<sup>5</sup>, J. Wang<sup>5</sup>; <sup>1</sup>Science Applications Intl. Corp., USA, <sup>2</sup>NASA Langley Res. Ctr., USA, <sup>3</sup>Science and Technology Corp., USA, <sup>4</sup>Dept. of Physics, Hampton Univ., USA, <sup>5</sup>Raytheon Space & Airborne Systems, USA. For the first time, beam quality improvement of 2 µm laser using fiber based phase conjugation mirror has been demonstrated. Single frequency operation is necessary to lower threshold. The reflectivity of the PCM is ~50%.

**MB22**

**Tunable Green Yb-Doped Fiber Laser,** Vladimir A. Akulov<sup>1</sup>, Denis M. Afanasiev<sup>1</sup>, Sergey A. Babin<sup>1</sup>, Dmitriy V. Churkin<sup>1</sup>, Sergei I. Kablukov<sup>1</sup>, Michail A. Rybakov<sup>2</sup>, Alexander A. Vlasov<sup>1</sup>; <sup>1</sup>Inst. of Automation and Electrometry, Russian Federation, <sup>2</sup>Inversion Fiber Co., Russian Federation. A tunable Yb-doped fiber laser with intracavity frequency doubling in KTP nonlinear crystal has been realized, 0.4 W green output power with 540-548 nm tuning has been achieved.

**MB23**

**Polarization-Maintaining Fiber Pulse Compressor by Birefringent Hollow-Core Photonic Bandgap Fiber,** Akira Shirakawa, Motoyuki Tanisho, Ken-ichi Ueda; Inst. for Laser Science, Univ. of Electro-Communications, Japan. Structural birefringent properties of a hollow-core photonic-bandgap fiber were carefully investigated and applied to all-fiber chirped-pulse amplification. Preferable polarization-maintaining fiber-pigtail output of clean 440-fs pulses was obtained without any pulse degradation by polarization-mode dispersion.

**MB24**

**First Laser Operation at 899 nm and below in a Diode End-Pumped Nd:YAG,** Marc Castaing, Emilie Hérault, François Balembois, Patrick Georges; Inst. d'Optique, France. We present the first demonstration of a 899-nm-laser-emission in a Nd:YAG-crystal, on the <sup>4</sup>F<sub>3/2</sub>-<sup>4</sup>I<sub>3/2</sub> transition. 630mW of average power is obtained at 899nm and 100mW at 450nm after an intracavity frequency doubling.

**MC • High Efficiency Yb Lasers**

*British Ballroom*

► 11:00 a.m. – 12:30 p.m.

**MC • High Efficiency Yb Lasers**

*Robert Rice; Northrop Grumman, USA, President*

**MC1 • 11:00 a.m.**

**Invited**

**High-Power Cryogenically Cooled Yb:YAG Lasers,** Daniel J. Ripin; MIT Lincoln Lab, USA. Abstract unavailable.

**MC2 • 11:30 a.m.**

**Q-Switched Cryo-Cooled Yb:YAG Laser,** Bhabana Pati, Kevin F. Wall; Q Peak, Inc., USA. Using a side-pumping geometry, we obtained 400 W of cw power with 56% optical-to-optical efficiency from a cryogenically-cooled, Yb:YAG laser. In the Q-switched operation, we obtained 200 W with a near diffraction limited beam.



**MC3 • 11:45 a.m.**

**Picosecond Cryogenic Yb:YAG Multipass Amplifier with 23.7 W Average Output Power**, Shigeki Tokita<sup>1</sup>, Junji Kawanaka<sup>1</sup>, Masayuki Fujita<sup>2</sup>, Toshiyuki Kawashima<sup>3</sup>, Yasukazu Izawa<sup>1</sup>; <sup>1</sup>Osaka Univ., Japan, <sup>2</sup>Inst. for Laser Technology, Japan, <sup>3</sup>Hamamatsu Photonics K. K., Japan. We have demonstrated an 8-pass picosecond laser amplifier using a liquid-nitrogen-cooled Yb:YAG crystal. Over 20-W average-power was obtained with sub-millijoule pulse energies and  $M^2$  factor of less than 1.2.

**MC4 • 12:00 p.m.**

**Tunable Yb:KYW Laser with a Volume Bragg Grating**, Jonas E. Hellström, Björn Jacobsson, Valdas Pasiskevicius, Fredrik Laurell; *Laser Physics, KTH, Sweden*. We demonstrate a tunable Yb:KYW laser, locked by a volume Bragg grating in a retroreflector geometry. The power was ~1 W within the tuning range from 1032 nm to 1048 nm.

**MC5 • 12:15 p.m.**

**Intense Few-Cycle Optical Parametric Chirped-Pulse Amplifier Pumped by a Cryogenically-Cooled Yb-Doped Solid-State Chirped-Pulse Amplification Laser**, Kanade Ogawa<sup>1</sup>, Makoto Aoyama<sup>1</sup>, Yutaka Akahane<sup>1</sup>, Koichi Tsuji<sup>1</sup>, Junji Kawanaka<sup>2</sup>, Hajime Nishioka<sup>3</sup>, Tetsuo Harimoto<sup>4</sup>, Masayuki Fujita<sup>5</sup>, Koichi Yamakawa<sup>1</sup>; <sup>1</sup>Japan Atomic Energy Agency, Japan, <sup>2</sup>Inst. of Laser Engineering, Osaka Univ., Japan, <sup>3</sup>Inst. for Laser Science, Univ. of Electro-Communications, Japan, <sup>4</sup>Faculty of Engineering, Univ. of Yamanashi, Japan, <sup>5</sup>Inst. for Laser Technology, Japan. We report a terawatt-class few-cycle OPCPA system with an ultra-broad bandwidth of over 400 nm pumped by double broadband pump pulses delivered from an Yb-doped solid-state CPA laser cooled to liquid nitrogen temperatures.

► 12:30 p.m. – 2:00 p.m.

**Lunch (on your own)**

**MD • VIS/UV Sources**

*British Ballroom*

► 2:00 p.m. – 3:30 p.m.

**MD • VIS/UV Sources**

*Jirong Yu; NASA Langley Res. Ctr., USA, President*

**MD1 • 2:00 p.m.**

**Linearly-Polarized Yb-Doped Fiber Laser Directly Operating at 1178 nm for 589-nm Generation**, Akira Shirakawa, Jun Ota, Hiroki Maruyama, Ken-ichi Ueda; *Inst. for Laser Science, Univ. of Electro-Communications, Japan*. Successful operation of 1178nm Yb-doped fiber laser is reported. Polarization selection by an all-fiber configuration enables a high-Q operation required to suppress parasitic lasing, and 1.9W linearly-polarized output with narrow bandwidth (<50pm) was obtained.

**MD2 • 2:15 p.m.**

**Design and Operation of All-Solid-State, 320 mW Continuous-Wave Yellow Laser**, Peter Dekker, Helen M. Pask, James A. Piper; *Macquarie Univ., Australia*. Continuous-wave powers up to 320mW at 588 nm and quasi-cw powers up to 700mW are reported from diode-pumped Nd:GdVO<sub>4</sub> laser with intracavity Raman-shifting (KGW) and intracavity frequency-doubling (LBO) are reported, with efficiency up to 3.2%.

**MD3 • 2:30 p.m.**

**Linearly-Polarized, Narrow-Linewidth, High-Power, 1150-nm Yb-Doped Silica Fiber MOPA for Frequency Doubling to the Yellow**, Supriyo Sinha, Karel E. Urbanek, Michel J. F. Digonnet, Robert L. Byer; *Stanford Univ., USA*. We report a Yb-doped silica fiber MOPA producing a record output power of 2.34 W at 1150 nm, linearly-polarized, for 5.5 W of launched 1064-nm pump power.

**MD4 • 2:45 p.m.**

**34 W CW Intracavity-Doubled TEM<sub>00</sub> Nd:YVO<sub>4</sub> Green Laser Pumped at 888 nm**, Louis Mc Donagh, Richard Wallenstein; *Technische Univ. Kaiserslautern, Germany*. We present a cw intracavity frequency-doubled TEM<sub>00</sub> Nd:YVO<sub>4</sub> laser oscillator pumped at 888 nm, producing 34 W of green light at 532 nm with  $M^2 = 1.05$  and RMS noise of 0.25%.

**MD5 • 3:00 p.m.**

**Tunable High-Power Blue-Green Laser Based on Intracavity Frequency Doubling of a Diode-Pumped Vertical-External-Cavity Surface-Emitting Laser**, Li Fan<sup>1</sup>, Mahmoud Fallahi<sup>1</sup>, Jorg Hader<sup>1</sup>, Aramais R. Zakharian<sup>1</sup>, Jerome V. Moloney<sup>1</sup>, James T. Murray<sup>2</sup>, Robert Bedford<sup>3</sup>, Stephan W. Koch<sup>4</sup>, Wolfgang Stolz<sup>4</sup>; <sup>1</sup>College of Optical Sciences, USA, <sup>2</sup>Arete Associates, USA, <sup>3</sup>AFRL, USA, <sup>4</sup>Philipps Univ. Marburg, Germany. We present the development and demonstration of tunable high-power blue-green (around 488 nm) laser by using intracavity frequency doubling of a tunable high-power high-brightness linearly polarization vertical-external-cavity surface-emitting laser.

**MD6 • 3:15 p.m.**

**UV Picosecond Microchip Cerium Lasers**, Hua Liu<sup>1</sup>, David J. Spence<sup>1</sup>, K. Johnson<sup>1</sup>, David W. Coutts<sup>1</sup>, H. Sato<sup>2</sup>, T. Fukuda<sup>2</sup>; <sup>1</sup>Macquarie Univ., Australia, <sup>2</sup>Tohoku Univ., Japan. We present all solid-state, microchip-type Ce:LiCAF and Ce:LiLuF lasers, that generate picosecond laser pulses at 289nm and 309nm using a relatively inexpensive Nd:YVO<sub>4</sub> microchip pump laser.

*Columbia Ballroom*

► 3:30 p.m. – 4:00 p.m.

**Coffee Break & Exhibits**

**ME • Fiber Lasers**

*British Ballroom*

► 4:00 p.m. – 5:30 p.m.

**ME • Fiber Lasers**

*Jens Limpert; Inst. of Applied Physics, Germany, President*

**ME1 • 4:00 p.m.**

**Experimental Demonstration of Gain Guided Lasing in an Index Anti-Guiding Large Mode Area Fiber**, *Ying Chen<sup>1</sup>, Vikas Sudesh<sup>1</sup>, Martin C. Richardson<sup>1</sup>, Michael Bass<sup>1</sup>, John Ballato<sup>2</sup>, Anthony E. Siegman<sup>3</sup>*; <sup>1</sup>CREOL, Univ. of Central Florida, USA, <sup>2</sup>Clemson Univ., USA, <sup>3</sup>Stanford Univ., USA. Recent observations of apparently single mode gain-guided lasing in Nd<sup>3+</sup> fibers with 100 μm diameter index anti-guided cores demonstrate the potential of gain guiding for single mode fiber lasers with very large mode areas.

**ME2 • 4:15 p.m.**

**Effectively Single-Mode Chirally-Coupled Core Fiber**, *Chi-Hung Liu<sup>1</sup>, Guoqing Chang<sup>1</sup>, Natasha Litchinitser<sup>1</sup>, Almantas Galvanauskas<sup>1</sup>, Doug Guertin<sup>2</sup>, Nick Jakobson<sup>2</sup>, Kanishka Tankala<sup>2</sup>*; <sup>1</sup>EECS Dept., Univ. of Michigan, USA, <sup>2</sup>NUFERN, USA. We demonstrate Chirally-Coupled-Core (CCC) fiber with 35-μm diameter and 0.07 NA core which is effectively single-mode. This is a new type of fibers whose modal properties are defined both by their longitudinal and transverse structure.

**ME3 • 4:30 p.m.**

**Robust Fundamental Mode Operation in a Ytterbium-Doped Leakage Channel Fiber with an Effective Area of ~3000μm<sup>2</sup>**, *Jun Li, Xiang Peng, Liang Dong*; IMRA America Inc., USA. We report the fundamental mode operation in an ytterbium-doped fiber with effective areas of ~3000μm<sup>2</sup>, which can be coiled down to 15cm radius. Lasers with slope efficiency ~60% and M<sup>2</sup> ~1.3 have been demonstrated.

**ME4 • 4:45 p.m.**

**Very High Efficiency, High Peak Power, Nanosecond Fiber Lasers**, *Ramatou Bello Doua, Julien Saby, Francois Salin*; FEMLIGHT, France. We demonstrated over 50% absolute efficiency in a diffraction limited Q-switched fiber laser producing pulses as short as 6.7ns. 130kW peak and 50W average powers were obtained at repetition rates from 10 to 100kHz.

**ME5 • 5:00 p.m.**

**All-Normal-Dispersion Femtosecond Fiber Laser with Pulse-Shaping Due to Spectral Filtering**, *Andy Chong, Joel R. Buckley, Will H. Renninger, Frank W. Wise*; Cornell Univ., USA. A modelocked Yb-doped fiber laser without an anomalous segment is successfully demonstrated. Pulse-shaping is based on spectral filtering of a highly-chirped pulse in the cavity. The laser generated 170-fs pulses with 3-nJ pulse energy.

**ME6 • 5:15 p.m.**

**Tunable Single-Frequency External-Cavity Diode Laser Ytterbium-Doped Fiber Amplifier System**, *Matthias Hildebrandt, Maik Frede, Dietmar Kracht*; Laser Zentrum Hannover e.V., Germany. A master-oscillator fiber amplifier system, delivering up to 133 W of continuous-wave output power using a tunable single-frequency external-cavity diode seed laser is presented. Stable high-power operation between 1040 nm and 1085 nm was obtained.

► 5:30 p.m. – 7:30 p.m.

**Dinner (on your own)**

**MF • Postdeadline Paper Session**

*British Ballroom*

► 7:30 p.m. – 9:00 p.m.

**MF • Postdeadline Paper Session**

*Jonathan D. Zuegel, Univ. of Rochester, USA*

**Tuesday, January 30, 2007**

*British Columbia Ballroom Foyer*

► 7:30 a.m. – 12:30 p.m.

**Registration****TuA • Applications**

*British Ballroom*

► 8:00 a.m. – 10:00 a.m.

**TuA • Applications**

*Ingmar Hartl; IMRA America, Inc., USA, Presider*

**TuA1 • 8:00 a.m.**

**Invited**

**Precision Timing, Measurements and Optical Clocks Using Solid State Lasers**, *Leo Hollberg*; NIST, USA. Revolutionary advances in the performance of atomic clocks results from some new ideas, precision spectroscopy of ultra-cold atoms, and maturing technologies of stable lasers. Frequency stabilized solid-state lasers are playing increasingly important roles.

**TuA2 • 8:30 a.m.**

**Radian-Level Coherent Optical Links over 100's of Meters and 100's of Terahertz**, *Ian R. Coddington, Qudsia Quraishi, Luca Lorini, William Swann, Jim Bergquist, Chris Oates, Scott Diddams, Nate Newbury*; NIST, USA. We demonstrate coherent transfer of optical signals with radian level noise in a 25 MHz bandwidth through a series of laser systems spanning from 657 nm to 1550 nm and over several hundred meter distances.

**TuA3 • 8:45 a.m.**

**Invited**

**Single Frequency DFB Fiber Lasers: A Versatile Source for Spectroscopy and Sensing**, *Jens Engholm Pedersen*; Koheras A/S, Denmark. Fiber lasers for sensing and spectroscopy require a combination of low noise, high power and access to a variety of wavelengths. These issues are discussed with emphasis on methods to reduce frequency noise.

**TuA4 • 9:15 a.m.**

**Generation of a Squeezed Vacuum Field with PPKTP at 1064nm for Gravitational Wave Interferometers**, *Shailendhar Saraf<sup>1</sup>, Keisuke Goda<sup>2</sup>, Nergis Mavalvala<sup>2</sup>, Eugeny Mikhailov<sup>2</sup>, Osamu Miyakawa<sup>3</sup>*; <sup>1</sup>Rochester Inst. of Technology, USA, <sup>2</sup>MIT, USA, <sup>3</sup>Caltech, USA. Squeezed vacuum generation at 1064 nm in a PPKTP-based optical parametric oscillator is demonstrated for sensitivity improvements in gravitational wave detectors. Broadband squeezing of >2.5dB is reported in the 1-100 KHz frequency range.

**TuA5 • 9:30 a.m.**

**Miniature Eye-Safe Laser System for High-Resolution Three-Dimensional Lidar**, John J. Zayhowski, Alexander L. Wilson; MIT Lincoln Lab, USA. A microchip-laser-pumped OPA produces 25- $\mu$ J, 1.537- $\mu$ m pulses of 114-ps duration at 8 kHz, in a near-diffraction-limited beam. The flight-ready system is pumped by fiber-coupled diodes, has a volume <0.14 liters and mass <0.34 kg.

**TuA6 • 9:45 a.m.**

**Solid-State Laser-Driven Free-Electron Based Coherent Attosecond Radiation Sources**, Tomas Plettner, Robert L. Byer; E.L. Ginzton Labs, USA. We propose a free-electron based attosecond coherent X-ray source powered by a laser-driven particle accelerator capable of producing sub-optical cycle electron pulses. The design parameters for the device are established by the one-dimensional FEL model.

Columbia Ballroom

► 10:00 a.m. – 1:00 p.m.

Exhibits

**TuB • Poster Session II – Student Posters**

Columbia Ballroom

► 10:00 a.m. – 11:00 a.m.

**TuB • Poster Session II – Student Posters**

**TuB1**

**Similariton Fiber Laser around 1  $\mu$ m with a Photonic Bandgap Fiber for Dispersion Control**, Axel Ruehl, Oliver Prochnow, Dieter Wandt, Dietmar Kracht; Laser Zentrum Hannover e.V., Germany. We demonstrate a hybrid mode-locked similariton fiber laser with a photonic bandgap fiber for dispersion control. The laser generates highly-stretched parabolic pulses with pulse energies of 290 pJ at a repetition rate of 21.9 MHz.

**TuB2**

**Parabolic Pulse Regime of an Ultrafast Fiber Laser**, Axel Ruehl<sup>1</sup>, Oliver Prochnow<sup>1</sup>, Dieter Wandt<sup>1</sup>, Dietmar Kracht<sup>1</sup>, Bryan Burgoyne<sup>2</sup>, Nicolas Godbout<sup>2</sup>, Suzanne Lacroix<sup>2</sup>; <sup>1</sup>Laser Zentrum Hannover e.V., Germany, <sup>2</sup>Ecole Polytechnique Montreal, Canada. We report on experimental and numerical results about the parabolic pulse regime in a passively mode-locked fiber oscillator. Beside a detailed description of the pulse dynamics, fundamental design guidelines and possible optimizations are discussed.

**TuB3**

**Chirped-Pulse Amplification of Femtosecond Pulses in a Yb-Doped Fiber Amplifier near the Gain Narrowing Limit Using a Reflection Grism Compressor**, Lyuba Kuznetsova<sup>1</sup>, Frank Wise<sup>1</sup>, Steve Kane<sup>2</sup>, Jeff Squier<sup>3</sup>; <sup>1</sup>Dept. of Applied and Engineering Physics, Cornell Univ., USA, <sup>2</sup>Horiba Jobin Yvon, Inc., USA, <sup>3</sup>Dept. of Physics, Colorado School of Mines, USA. Compensation of third-order dispersion using a high-efficiency reflection grism pair is demonstrated for the first time in an all-fiber chirped-pulse amplification system. Transform-limited 120 fs pulses are produced near the Yb gain-narrowing limit.

**TuB4**

**Extremely Low Quantum Defect Oscillation of Ytterbium Fiber Laser by Laser Diode Pumping at Room Temperature**, Shinichi Matsubara<sup>1</sup>, Kyousuke Uno<sup>1</sup>, Yoshiaki Nakajima<sup>1</sup>, Sakae Kawato<sup>1</sup>, Takao Kobayashi<sup>1</sup>, Akira Shirakawa<sup>2</sup>; <sup>1</sup>Fiber Amenity Engineering, Graduate School of Engineering, Univ. of Fukui, Japan, <sup>2</sup>Inst. for Laser Science, Univ. of Electro-Communications, Japan. Ytterbium laser emissions at 980.6 nm and 983.0 nm are observed by laser diode pumping at 978.1 nm while room temperature. Their quantum defects are 0.26% and 0.50%, respectively.

**TuB5**

**Impact of Spatial-Hole Burning on Beam Quality in Large Mode-Area Yb-Doped Fibers**, Zhuo Jiang, John R. Marcianti; Univ. of Rochester, USA. The effects of spatial-hole burning are explored in multimode active fibers. A propagation model using the fiber modes is used to explain experimentally observed behavior. Local gain saturation is required for accurate explanation of physics.

**TuB6**

**A Self-Imaging Silicon Waveguide Raman Amplifier**, Varun Raghunathan<sup>1</sup>, Robert R. Rice<sup>2</sup>, Bahram Jalali<sup>1</sup>; <sup>1</sup>Univ. of California at Los Angeles, USA, <sup>2</sup>Northrop Grumman Space Technology, USA. We propose a novel self-imaging Raman amplifier consisting of collinearly propagating pump and Stokes signal beams in a multimode silicon waveguide. Potential application as an image preamplifier for MWIR remote sensing is discussed.

**TuB7**

**Molecular Beam Epitaxy Growth of Nd:Y<sub>2</sub>O<sub>3</sub> for Planar Waveguide Lasers**, I. C. Robin<sup>1</sup>, R. Kumar<sup>1</sup>, S. Penson<sup>1</sup>, S. E. Webster<sup>1</sup>, T. Tiedje<sup>1</sup>, A. Oleinik<sup>2</sup>; <sup>1</sup>Univ. of British Columbia, Canada, <sup>2</sup>Zecotek Medical Systems Singapore Pte Ltd, Singapore. Thin films of Nd:Y<sub>2</sub>O<sub>3</sub> have been grown by molecular beam epitaxy. The deposition process has been optimized to generate materials with excellent crystalline and optical properties that are suitable for planar waveguide lasers.

**TuB8**

**Transversal Mode Transformation in Reflective Volume Bragg Gratings, Theory and Experiments**, Björn Jacobsson, Jonas E. Hellström, Valdas Pasiskevicius, Fredrik Laurell; Laser Physics, KTH, Sweden. We present a theoretical model describing finite beams incident at volume Bragg gratings and confirm it experimentally. Reflectivity decreases with increasing incidence angle and decreasing beam size, and the transmitted transversal mode profile is transformed.

**TuB9**

**New Nonlinear Optical Crystal for UV Light Source: Calcium Fluoroborate**, Ke Xu, P. Loiseau, G. Aka; ENSCP, France. Single crystals of calcium fluoroborate, Ca<sub>5</sub>(BO<sub>3</sub>)<sub>2</sub>F have been grown by flux method. The refractive indices were measured by the minimum deviation technique and fitted to the Sellmeier equations. SHG and THG phase matching are discussed.

#### TuB10

**Second Order Mode Selective Phase-Matching**, Mikael Lassen<sup>1,2</sup>, Vincent Delaubert<sup>3,2</sup>, Hans-A. Bachor<sup>2</sup>, Ping Koy Lam<sup>2</sup>, Nicolas Treps<sup>3</sup>, Preben Buchhave<sup>1</sup>, Charles Harb<sup>4</sup>; <sup>1</sup>Dept. of Physics, Technical Univ. of Denmark, Denmark, <sup>2</sup>Australian Natl. Univ., Australia, <sup>3</sup>Lab Kastler Brossel, France, <sup>4</sup>Univ. of New South Wales, Australia. We exploit second order nonlinear optical phase matching for the selection of individual high order transverse modes. The ratio between the generated components can be adjusted continuously via changes in the phase-matching condition.

#### TuB11

**Frequency Quadrupled Picosecond Fiber Laser for UV Generation**, Onur Kuzucu<sup>1</sup>, Franco N. C. Wong<sup>1</sup>, David E. Zelmon<sup>2</sup>, Shrikishna M. Hegde<sup>2</sup>, Tony D. Roberts<sup>3</sup>, Philip Battle<sup>3</sup>; <sup>1</sup>MIT, USA, <sup>2</sup>AFRL, USA, <sup>3</sup>AdvR, Inc., USA. We demonstrate efficient picosecond UV generation by means of frequency quadrupling of an amplified picosecond fiber laser. The narrowband 390-nm source with 250 mW is suitable for a number of quantum information processing tasks.

#### TuB12

**Accurate Sizing of an Extremely Small Amount of Brownian Particles in Water with a Laser-Diode-Pumped Self-Mixing Thin-Slice Nd:GdVO<sub>4</sub> Laser**, Kana Nemoto<sup>1</sup>, Yoshihiko Miyasaka<sup>2</sup>, Koji Kamikariya<sup>2</sup>, Seiichi Sudo<sup>1</sup>, Kenju Otsuka<sup>2</sup>; <sup>1</sup>Dept. of Physics, Tokai Univ., Japan, <sup>2</sup>Dept. of Human and Information Science, Tokai Univ., Japan. Doppler particle sizing by self-mixing laser was demonstrated by using a laser-diode-pumped thin-slice Nd:GdVO<sub>4</sub> laser. Quick and accurate sizing of 262-nm polystyrene spheres with concentration as low as 0.05 ppm in water has been achieved.

#### TuB13

**Experimental Study of Kilowatt-Average-Power Faraday Isolators**, Ivan B. Mukhin, Efim A. Khazanov, Oleg V. Palashov, Alexander V. Voytovich; *Inst. of Applied Physics, Russian Federation*. We designed two 20mm-aperture Faraday isolators with thermal effects compensation. The isolation ratio (limited by the quality of TGG crystals) was 24dB at 750W average power for one isolator and 42dB at 200W for another.

#### TuB14

**Magnesium-Oxide Doped PPLN for Intracavity Frequency Doubling of Semiconductor Disk Lasers**, René Hartke, Ernst Heumann, Günter Huber; *Inst. of Laser-Physics, Univ. of Hamburg, Germany*. We report on the use of magnesium-oxide doped periodically poled lithium niobate for intracavity frequency doubling of a vertical external cavity surface emitting laser. 76mW of amplitude fluctuation free green output could be demonstrated.

#### TuB15

**High-Gain, End-Pumped, Yb:YAG Zig-Zag Slab Amplifier for Remote Sensing Applications**, Arun Kumar Sridharan<sup>1</sup>, Robert L. Byer<sup>1</sup>, Shailendhar Saraf<sup>2</sup>; <sup>1</sup>Stanford Univ., USA, <sup>2</sup>Rochester Inst. of Technology, USA. We describe a laser-diode end-pumped Yb:YAG zig-zag slab amplifier with high-gain and with novel parasitic oscillation suppression. This could enable efficient energy scaling to meet the laser requirements for remote win d sensing.

#### TuB17

**Self-Heterodyne Performances of Ceramic Nd:YAG Lasers**, Aaron McKay<sup>1</sup>, Peter Dekker<sup>1</sup>, David W. Coutts<sup>1</sup>, Judith M. Dawes<sup>1</sup>, Jong-Dae Park<sup>2</sup>; <sup>1</sup>Ctr. for Lasers & Applications, Macquarie Univ., Australia, <sup>2</sup>Dept. of Physics, Pai-Chai Univ., Republic of Korea. Ceramic Nd:YAG dual-frequency lasers offers superior performances as a photonic-based radiofrequency source over crystalline Nd:YAG-based dual-frequency lasers. The power of the self-heterodyne signal is on average 6 dB stronger for ceramic compared to crystalline lasers.

#### TuB18

**Nd:GSAG Laser Amplifier at 942 nm Wavelength**, Frank Kallmeyer<sup>1</sup>, Markus Dziedzina<sup>1</sup>, Daniel Schmidt<sup>1</sup>, Hans J. Eichler<sup>1</sup>, Rainer Treichel<sup>2</sup>, Susanne Nikolov<sup>2</sup>; <sup>1</sup>Technical Univ. Berlin, Germany, <sup>2</sup>EADS Astrium GmbH, Germany. The measurement of the stimulated emission cross-section in Nd:GSAG in the 941-944nm wavelength-region is presented. A peak-cross-section of  $4.0 \cdot 10^{-20} \text{cm}^2$  and FWHM-linewidth of 1.5nm was obtained. Also first results with diode pumped Nd:GSAG amplifiers are shown.

#### TuB19

**Laser Generation of Nd:GGG at 938 nm**, Chunyu Zhang<sup>1,2</sup>, Chunqing Gao<sup>2</sup>, Ling Zhang<sup>1</sup>, Zhiyi Wei<sup>1</sup>, Zhiguo Zhang<sup>1</sup>; <sup>1</sup>Inst. of Physics, Chinese Acad. of Sciences, China, <sup>2</sup>Dept. of Opto-Electronics, Beijing Inst. of Technology, China. Continuous-wave (CW) laser from Nd:GGG operating at 938nm on quasi-three-level was reported. The maximum output power of 500 mW was obtained at the incident pump power of 5.3 W with a slope efficiency of 15%.

#### TuB20

**Diode-Pumped Nd:GSAG Laser with 2.93 W Output Power at 942 nm**, Ling Zhang, Chunyu Zhang, Zhiyi Wei, Zhiguo Zhang; *Inst. of Physics, China*. We demonstrated a diode-pumped Nd:GSAG laser at 942 nm. As much as 2.93 W output power of 942 nm was obtained with a slope efficiency of 16.6% at the incident pump power of 19.7 W.

#### TuB22

**ZGP Mid-Infrared Laser Source Pumped by Nearly-Degenerate PPKTP Parametric Oscillator**, Markus Henriksson<sup>1</sup>, Mikael Tiihonen<sup>2</sup>, Valdas Pasiskevicius<sup>2</sup>, Fredrik Laurell<sup>2</sup>; <sup>1</sup>FOI, Sweden, <sup>2</sup>KTH, Sweden. A tandem OPO is reported where a Nd:YAG laser pumps a near-degenerate quasi phase-matched KTiOPO<sub>4</sub> OPO with a volume Bragg grating output coupler. Both signal and idler are used to pump a single ZnGeP<sub>2</sub> OPO.

#### TuB23

**Efficient Diode-Pumped Er,Yb:YAl<sub>3</sub>(BO<sub>3</sub>)<sub>4</sub> Laser**, Nikolai A. Tolstik<sup>1</sup>, Siarhei Kurilchik<sup>1</sup>, Victor Kisel<sup>1</sup>, Nikolai Kuleshov<sup>1</sup>, V. Maltsev<sup>2</sup>, O. Pilipenko<sup>2</sup>, E. Koporulina<sup>2</sup>, Nikolai Leonyuk<sup>2</sup>; <sup>1</sup>Inst. for Optical Materials and Technologies BNTU, Belarus, <sup>2</sup>Moscow State Univ., Russian Federation. We report on the spectroscopic properties, CW and Q-switched laser operation of a diode-pumped Er,Yb:YAl<sub>3</sub>(BO<sub>3</sub>)<sub>4</sub> laser. CW output power of 250 mW with slope efficiency of 18.5% with respect to absorbed pump power was demonstrated.

#### TuB24

**Fe:ZnSe and ZnS Polycrystalline Passive Q-Switching of 2.8  $\mu\text{m}$  Er:Cr:YSGG Laser**, Alán Martínez<sup>1</sup>, Andrew R. Gallian<sup>1</sup>, Patrick Marine<sup>1</sup>, Vladimir Fedorov<sup>1</sup>, Sergey Mirov<sup>1</sup>, Valeri Badikov<sup>2</sup>; <sup>1</sup>Univ. of Alabama at Birmingham, USA, <sup>2</sup>Kuban State Univ., Russian Federation. Fe:ZnSe and ZnS polycrystals as passive Q-switches for Er:Cr:YSGG lasers operating at 2.8 $\mu\text{m}$  are introduced. Samples with 1-7 $\text{cm}^{-1}$  absorption coefficients were prepared using thermal diffusion of iron in CVD grown polycrystalline ZnSe and ZnS.

### TuC • Nonlinear Optics

British Ballroom

► 11:00 a.m. – 1:00 p.m.

#### TuC • Nonlinear Optics

Craig Denman; AFRL, USA, Presider

#### TuC1 • 11:00 a.m.

Invited

**Periodically Poled Nonlinear Materials – Engineered for Applications and away from Damage**, Fredrik Laurell, Carlota Canalias, Junji Hirohshi, Shunhua Wang, Valdas Pasiskevicius; Royal Inst. of Technology, Sweden. Periodic poling issues and damage measurements for important ferroelectrics like KTP, KNbO<sub>3</sub> and undoped and MgO-doped stoichiometric LiNbO<sub>3</sub> and LiTaO<sub>3</sub> will be presented together with suggestions on how optimize choose and use these materials.

#### TuC2 • 11:30 a.m.

**Control of Nonlinearity in Fiber CPA System by Pulse Shaping**, Damian Schimpff, Doreen Müller<sup>1</sup>, Steffen Hädrich<sup>1</sup>, Thomas Schreiber<sup>1</sup>, Jens Limpert<sup>1</sup>, Andreas Tünnermann<sup>1,2</sup>; <sup>1</sup>Inst. of Applied Physics, Germany, <sup>2</sup>Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany. We report on a fiber CPA-system operating beyond the B-integral limit. Pulse shaping using a spatial-light-modulator allows for the amplification of stretched parabolic pulses. Very clean recompressed pulses are obtained at a B-integral of 16.

#### TuC3 • 11:45 a.m.

**Diode-Pumped Nd:GdVO<sub>4</sub> Microchip Laser with a Single-Pass Green Generation in PPMgLN**, Tsuyoshi Suzudo<sup>1</sup>, Yasuhiro Satoh<sup>1</sup>, Masaki Hiroi<sup>1</sup>, Hironobu Mifune<sup>1</sup>, Yoichi Sato<sup>2</sup>, Hideki Ishizuki<sup>2</sup>, Takunori Taira<sup>2</sup>, Osamu Nakamura<sup>3</sup>, Shinya Watanabe<sup>3</sup>, Yasunori Furukawa<sup>3</sup>; <sup>1</sup>RICOH CO., Ltd., Japan, <sup>2</sup>Inst. for Molecular Science, Japan, <sup>3</sup>Oxide Corp., Japan. High-power Nd:GdVO<sub>4</sub> microchip laser with a single-pass green generation in PPMgLN has been developed. Quasi-cw 27.3-W fundamental output generated 8.8-W green power with conversion efficiency of 34% from the PPMgLN device of 1-mm thickness.

#### TuC4 • 12:00 p.m.

**Cavity-Dumped Intracavity Frequency Doubled Yb:YAG Thin Disk Laser at 100 kHz Repetition Rate**, Christian Stolzenburg<sup>1</sup>, Adolf Giesen<sup>1</sup>, Frank Butze<sup>2</sup>, Peter Heist<sup>3</sup>, Günter Hollemann<sup>3</sup>; <sup>1</sup>Inst. für Strahlwerkzeuge, Germany, <sup>2</sup>Technologiesgesellschaft für Strahlwerkzeuge mbH, Germany, <sup>3</sup>JENOPTIK Laser, Optik, Systeme GmbH, Germany. We report on cavity-dumped Yb:YAG thin disk lasers with repetition rates up to 100 kHz. 208 W was obtained at a wavelength of 1030 nm. Using intracavity SHG 102 W was achieved at 515 nm.

#### TuC5 • 12:15 p.m.

**3.4- $\mu\text{m}$  ZGP RISTRA Nanosecond Optical Parametric Oscillator Pumped by a 2.05- $\mu\text{m}$  Ho:YLF MOPA System**, Alex Dergachev<sup>1</sup>, Darrell Armstrong<sup>2</sup>, Arlee Smith<sup>2</sup>, Thomas E. Drake<sup>3</sup>, Marc Dubois<sup>3</sup>; <sup>1</sup>Q-Peak, Inc., USA, <sup>2</sup>Sandia Natl. Labs, USA, <sup>3</sup>Lockheed Martin Aeronautics Co., USA. We report on the first demonstration of ZGP OPO based on Rotated Image Singly-Resonant Twisted RectAngle (RISTRA) cavity. We achieved a near diffraction-limited beam at 3.4  $\mu\text{m}$  with pulse energy of 10 mJ.

#### TuC6 • 12:30 p.m.

**Intracavity-Pumped Raman Laser Action in a Mid-IR, Continuous-Wave (cw) MgO:PPLN Optical Parametric Oscillator**, Andrey V. Okishev, Jonathan D. Zuegel; Univ. of Rochester, USA. Intracavity-pumped Raman laser action in a fiber-laser-pumped, single-resonant, continuous-wave (cw) Mg:PPLN optical parametric oscillator with a high-Q linear resonator has been observed for the first time to our knowledge. Experimental investigation results will be presented.

#### TuC7 • 12:45 p.m.

**Terahertz-Wave Parametric Generation Pumped by Microchip Nd:YAG Laser**, S. Hayashi<sup>1,2</sup>, T. Shibuya<sup>1,3</sup>, H. Sakai<sup>4</sup>, H. Kan<sup>4</sup>, Takunori Taira<sup>5</sup>, Y. Ogawa<sup>2</sup>, C. Otani<sup>1</sup>, K. Kawase<sup>1,2,3</sup>; <sup>1</sup>RIKEN SENDAI, Japan, <sup>2</sup>Tohoku Univ., Japan, <sup>3</sup>Nagoya Univ., Japan, <sup>4</sup>Hamamatsu Photonics K. K., Japan, <sup>5</sup>Laser Res. Ctr. for Molecular Science, Japan. We developed THz-wave parametric-generator pumped by microchip Nd:YAG laser. This generated narrow-linewidth or broadband THz-wave w/or w/out injection seeding by ECDL for idler-wave. We observed THz-wave linewidth of less than 10-GHz or more than 1-THz.

## Wednesday, January 31, 2007

British Columbia Ballroom Foyer

► 7:30 a.m. – 5:00 p.m.

Registration

### WA • Ultrafast Lasers

British Ballroom

► 8:00 a.m. – 10:00 a.m.

#### WA • Ultrafast Lasers

Jason Eichenholz; Newport Corp., USA, Presider

#### WA1 • 8:00 a.m.

Invited

**Octave Spanning Ti:Sapphire Lasers**, Franz X. Kaertner, A. Benedick, R. Ell, O. D. Mücke, J. Birge, M. Sander; MIT, USA. Ti:sapphire lasers with ultra-broadband double-chirped mirror pairs generate 5fs-pulses with output spectra covering a full octave for direct carrier-envelope phase-locking. Current status of lasers and applications in phase-sensitive nonlinear optics and frequency metrology discussed.

**WA2 • 8:30 a.m.**

**Generation of 66-fs 440 mW Average Power Pulses from a Diode Pumped Yb<sup>3+</sup>:CaGdAlO<sub>4</sub> Laser**, Justine Boudeile<sup>1</sup>, Y. Zaouter<sup>1</sup>, Frederic Druon<sup>1</sup>, Marc Hanna<sup>1</sup>, Patrick Georges<sup>1</sup>, Johan Petit<sup>2</sup>, Philippe Goldner<sup>2</sup>, Bruno Viana<sup>2</sup>; <sup>1</sup>Lab Charles Fabry de l'Inst. d'Optique, France, <sup>2</sup>Lab de Chimie Appliquée Etat Solide de l'Ecole Natl. Supérieure de Chimie de Paris, France. We demonstrate the generation of 66-fs pulses with an average power of 440mW from a diode-pumped Yb<sup>3+</sup>:CaGdAlO<sub>4</sub> modelocked laser. This represents the highest average power ever obtained for a sub-100 fs diode-pumped Yb-bulk laser.

**WA3 • 8:45 a.m.**

**58 fs Pulses from a Mode-Locked Yb:LuVO<sub>4</sub> Laser**, Simon Rivier<sup>1</sup>, Xavier Mateos<sup>1</sup>, Junhai Liu<sup>1</sup>, Valentin Petrov<sup>1</sup>, Uwe Griebner<sup>1</sup>, Martin Zorn<sup>2</sup>, Markus Weyers<sup>2</sup>, Huaijin Zhang<sup>3</sup>, Jiyang Wang<sup>3</sup>, Minhua Jiang<sup>3</sup>; <sup>1</sup>Max-Born-Inst., Germany, <sup>2</sup>Ferdinand-Braun-Inst., Germany, <sup>3</sup>Shandong Univ., China. We report passive mode-locking of the ytterbium doped orthovanadate crystal Yb:LuVO<sub>4</sub> with a semiconductor saturable absorber, achieving pulses as short as 58 fs at 1036 nm for an average power of 85 mW.

**WA4 • 9:00 a.m.**

**Passive Cavity Enhancement of a Femtosecond Fiber Chirped Pulse Amplification System to 204W Average Power**, Ingmar Hartl<sup>1</sup>, M. E. Fermann<sup>1</sup>, Thomas R. Schibli<sup>2</sup>, D. D. Hudson<sup>2</sup>, M. J. Thorpe<sup>2</sup>, R. J. Jones<sup>2</sup>, J. Ye<sup>2</sup>; <sup>1</sup>IMRA America, Inc., USA, <sup>2</sup>JILA, Natl. Inst. of Standards and Technology and Univ. of Colorado, USA. An external passive cavity has been used to demonstrate more than 200-times enhancement of a 1-W-average-power Yb chirped mode-locked fiber-laser-system emitting ~120-fs pulses at 90-MHz repetition-rate. Peak intra-cavity intensities of >1012 W/cm<sup>2</sup> were achieved.

**WA5 • 9:15 a.m.**

**54 W, 150 MHz, Passively Mode-Locked TEM<sub>00</sub> Nd:YVO<sub>4</sub> Oscillator Pumped at 888 nm**, Louis Mc Donagh<sup>1</sup>, Christian Theobald<sup>1</sup>, Markus Serr<sup>1</sup>, Richard Wallenstein<sup>1</sup>, Ralf Knappe<sup>2</sup>, Achim Nebel<sup>2</sup>; <sup>1</sup>Technische Univ. Kaiserslautern, Germany, <sup>2</sup>Lumera Laser GmbH, Germany. We report on a passively mode-locked TEM<sub>00</sub> Nd:YVO<sub>4</sub> oscillator providing 54 W of power at a repetition rate of 150 MHz, thanks to the high gain of Nd:YVO<sub>4</sub> and its optimized pumping at 888 nm.

**WA6 • 9:30 a.m.**

**Self-Starting Femtosecond Cr<sup>4+</sup>:YAG Laser Mode Locked with a GaInNAs Saturable Bragg Reflector**, Christopher G. Leburn<sup>1</sup>, Andrews D. McRobbie<sup>1</sup>, Alexander A. Lagatsky<sup>1</sup>, Christian T. A. Brown<sup>1</sup>, Wilson Sibbett<sup>1</sup>, Stephane Calvez<sup>2</sup>, David Burns<sup>2</sup>, Handong D. Sun<sup>2</sup>, Martin D. Dawson<sup>2</sup>, James A. Gupta<sup>3</sup>, Geof C. Aers<sup>3</sup>; <sup>1</sup>Univ. of St Andrews, UK, <sup>2</sup>Inst. of Photonics, Univ. of Strathclyde, UK, <sup>3</sup>Inst. for Microstructural Sciences, Natl. Res. Council of Canada, Canada. We report the first demonstration of a passively mode-locked femtosecond Cr<sup>4+</sup>:YAG laser incorporating a GaInNAs saturable Bragg reflector to mode lock around 1500nm. 132fs pulses were generated with an output power of 140mW.

**WA7 • 9:45 a.m.**

**Chirped-Mirror Dispersion Controlled Femtosecond Cr:ZnSe Laser**, Irina T. Sorokina, Evgeni Sorokin; Photonics Inst., Austria. We report the first chirped-mirror dispersion controlled KLM Cr:ZnSe laser, using a SESAM for starting and generating nearly transform-limited 80 fs pulses at 80 mW output power at 180 MHz rep-rate at 2.4 μm.

**WB • Poster Session III**

Columbia Ballroom

▶ 10:00 a.m. – 11:00 a.m.

**WB • Poster Session III****WB1**

**Generation of Supercontinuum Bottle Beam Using an Axicon**, JaHon Lin<sup>1</sup>, Hui-Hung Liang<sup>1</sup>, Wen-Feng Hsieh<sup>1</sup>, Ming-Dar Wei<sup>2</sup>, Kuei-Huei Lin<sup>3</sup>; <sup>1</sup>Dept. of Photonics and Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan, <sup>2</sup>Inst. of Optical Physics, Feng Chia Univ., Taiwan, <sup>3</sup>Dept. of Science Education, Taipei Municipal Univ. of Education, Taiwan. Supercontinuum bottle beam produced by the axicon and focal lens can enhance the trapping ability. The position and diameters of the optical bottle are different for the selecting wavelength that consists with the theoretical prediction.

**WB2**

**Laser Operation of Tm near 2-μm in the Disordered Double Tungstate Host NaGd(WO<sub>4</sub>)<sub>2</sub>**, Mauricio Rico<sup>1</sup>, Xavier Mateos<sup>1</sup>, Junhai Liu<sup>1</sup>, Uwe Griebner<sup>1</sup>, Valentin Petrov<sup>1</sup>, Jose Maria Cano-Torres<sup>2</sup>, Maria Dolores Serrano<sup>2</sup>, Carlos Zaldo<sup>2</sup>, Francisco Jose Valle<sup>2</sup>, Miguel Galan<sup>3</sup>, Gregorio Viera<sup>3</sup>; <sup>1</sup>Max-Born-Inst., Germany, <sup>2</sup>ICMM, Spain, <sup>3</sup>Monocrom, Spain. Lasing with an output power up to 300 mW is reported for Tm:NaGd(WO<sub>4</sub>)<sub>2</sub>, both with Ti-sapphire and diode laser pumping. This disordered crystal grown by the Czochralski method allowed tuning from 1813 to 2025 nm.

**WB3**

**Up-Conversion Processes Accompanying the 2.5 μm Oscillation in the RbPb<sub>2</sub>Cl<sub>5</sub>:Pr<sup>3+</sup> Crystal**, Andrey G. Okhrimchuk<sup>1</sup>, Leonid N. Butvina<sup>1</sup>, Evgeniy M. Dianov<sup>1</sup>, Ninel V. Lichkova<sup>2</sup>, Vladimir Zavgorodnev<sup>2</sup>, Alexander V. Shestakov<sup>3</sup>; <sup>1</sup>Fiber Optics Res. Ctr., RAS, Russian Federation, <sup>2</sup>Inst. of Microelectronics Technology, RAS, Russian Federation, <sup>3</sup>Elements of Laser Systems Co., Russian Federation. Up-conversion processes detrimental to oscillation on the <sup>3</sup>F<sub>3</sub> - <sup>3</sup>H<sub>5</sub> transition in RbPb<sub>2</sub>Cl<sub>5</sub>:Pr<sup>3+</sup> crystal is investigated in order to optimize the dopant ions concentration and the pump wavelength.

**WB4**

**Single Frequency Ytterbium-Doped Fiber Laser with 26 nm Tuning Range**, Martin Engelbrecht, Dieter Wandt, Dietmar Kracht; Laser Zentrum Hannover e.V., Germany. A core-pumped fiber-laser is presented, tunable from 1017 to 1043 nm, filtered by a grating pair. The free spectral range of 260 MHz ensures stable single frequency operation with a maximum output of 31 mW.

**WB5**

**Miniature Lasers on the Basis of Yb:Sc<sub>2</sub>O<sub>3</sub>**, Karsten Scholle<sup>1</sup>, Peter Fuhrberg<sup>1</sup>, Teoman Gün<sup>2</sup>, Yury Kuzminykh<sup>2</sup>, Klaus Petermann<sup>2</sup>, Günter Huber<sup>2</sup>; <sup>1</sup>LISA Laser Products OHG, Germany, <sup>2</sup>Inst. of Laser-Physics, Germany. Yb:Sc<sub>2</sub>O<sub>3</sub> was investigated in a miniature plane-plane resonator and compared with Yb:YAG. A record slope efficiency around 80 % was measured with a 0.1 % Yb-doped 2.5 mm-rod.

**WB6**

**CW Laser Emission around 900 nm along the  $^4F_{3/2} \rightarrow ^4I_{9/2}$  Channel with New Nd-Doped Crystals**, Cyrille Varona, Pascal Loiseau, Gérard Aka; CNRS UMR, France. CW laser emission around 900nm was demonstrated for Nd:CaWO<sub>4</sub> and Nd:SrLaGasO<sub>7</sub>. For Nd:CaWO<sub>4</sub>, more than 400mW output power at 914nm were measured for 2.2W of absorbed pump power, with an output coupling of 10%.

**WB7**

**Actively Stabilised Single-Frequency Red VECSEL**, Lynne G. Morton<sup>1</sup>, Hannah D. Foreman<sup>1</sup>, Jennifer E. Hastie<sup>1</sup>, Martin D. Dawson<sup>1</sup>, Erling Riis<sup>2</sup>; <sup>1</sup>Inst. of Photonics, UK, <sup>2</sup>Univ. of Strathclyde, UK. We report an actively stabilised single-frequency vertical external cavity surface emitting laser operating at 678nm with a 200kHz laser linewidth. More than 10mW of output power was achieved in single-frequency operation.

**WB8**

**Tuning and Q-Switching Tm:Germanate Fiber Laser**, Norman P. Barnes<sup>1</sup>, Brian M. Walsh<sup>1</sup>, Donald J. Reichle<sup>1</sup>, Shubin Jiang<sup>2</sup>; <sup>1</sup>NASA Langley Res. Ctr., USA, <sup>2</sup>NP Photonics, USA. Tm:germanate fiber lasers can tune between 1.88 and 2.04  $\mu$ m, depending on the length. Optimized pulsed operation yielded thresholds of 62 mJ and slope efficiencies of 0.25, even with a low launch efficiency. Q-switching achieved.

**WB9**

**Numerical Modeling of High Power Continuous-Wave Yb:YAG Thin Disk Lasers, Scaling to 14 kW**, Jochen Speiser, Adolf Giesen; Inst. für Strahlwerkzeuge, Germany. A numerical model of the thin disk laser, including inversion, absorption, intracavity power density, temperature and ASE is presented. It is combined with FEM analysis to compute deformation, stress and thermal lensing.

**WB10**

**Diode-Pumped Yb:YAG Ring Laser with High Beam Quality**, Sadao Uemura, Kenji Torizuka; Natl. Inst. of Advanced Industrial Science and Technology, Japan. We developed a diode-pumped Yb:YAG ring laser with high beam quality only applying a highly doped Yb:YAG pumped directly into the upper lasing level. The laser produces a TEM<sub>00</sub> beam. M<sup>2</sup> factor is 1.26.

**WB11**

**Femtosecond Thin Disk Yb:KYW Regenerative Amplifier with Astigmatism Compensation**, Mikhail Larionov<sup>1</sup>, Frank Butze<sup>1</sup>, Detlef Nickel<sup>2</sup>, Adolf Giesen<sup>2</sup>; <sup>1</sup>Technologiegesellschaft für Strahlwerkzeuge mbH, Germany, <sup>2</sup>Inst. für Strahlwerkzeuge, Germany. Pulses with an energy of 116  $\mu$ J and 250 fs pulse duration at a repetition rate of 40 kHz are demonstrated. Special technique is applied to compensate the astigmatism of the laser crystal.

**WB12**

**Diode-Pumped Yb: Lu<sub>2</sub>SiO<sub>5</sub> Lasers**, Yanrong Song<sup>1</sup>, Jianghai Hu<sup>1</sup>, Chengfeng Yan<sup>2</sup>, Guangjun Zhao<sup>2</sup>, Liangbi Su<sup>2</sup>, Jun Xu<sup>2</sup>, Kai Guo<sup>1</sup>, Zhigang Zhang<sup>3,1</sup>; <sup>1</sup>College of Applied Sciences, Beijing Univ. of Technology, China, <sup>2</sup>Shanghai Inst. of Optics and Fine Mechanics, China, <sup>3</sup>Inst. of Quantum Electronics, China. Yb:LSO CW and Q-switched lasers pumped by diode lasers were demonstrated. Q-switched laser operated at 1058nm with InGaAs absorber. Pulse repetition was around 39KHz, slope efficiency of CW and Q-switched lasers were 22.2% and 3.0%.

**WB13**

**Influence of Impurity and Energy Migrations on the Radiative and Non-Radiative Decay of Ytterbium-Doped Sesquioxide Ceramics**, Jean-Francois Bisson, Dmitrii Kouznetsov, Ken-Ichi Ueda; Inst. for Laser Science, Japan. Data about fluorescence decay in ytterbium-doped sesquioxide ceramic materials are presented. The influence of impurities on quenching probability and the enhancement of the latter by the energy migrations are studied.

**WB14**

**Effectiveness of Radial-Gain Tailoring in Large-Mode-Area Fiber Lasers and Amplifiers**, John R. Marcante; Univ. of Rochester, USA. Analytic expressions are derived for modal discrimination in large-mode-area gain-tailored fibers. While Gaussian-like profiles result in increased modal discrimination, step-gain profiles smaller than the waveguide core offer the highest discrimination.

**WB15**

**Characterization of Ytterbium-Doped Calcium Fluoride for Broadband Regenerative Pulse Amplification**, Mathias Siebold, Axel Jochmann, Marco Hornung, Stefan Bock, Joachim Hein, Malte C. Kaluza, Sebastian Podleska, Ragnar Boedefeld; Inst. for Optics and Quantum Electronics, Germany. DPSSL-systems combined with CPA technique are promising devices for generation of highest peak intensities. We report on investigations of Yb:CaF<sub>2</sub> as broadband amplifying medium in a diode pumped regenerative amplifier for millijoule output.

**WB16**

**Thermal Conductivities of Polycrystalline Nd<sup>3+</sup>- and Yb<sup>3+</sup>-Doped Y<sub>3</sub>Al<sub>5</sub>O<sub>12</sub> Ceramics**, Yoichi Sato, Takunori Taira; Laser Res. Ctr. for Molecular Science, Inst. for Molecular Science, Japan. We have evaluated thermal conductivities ( $\kappa$ ) in polycrystalline Nd<sup>3+</sup>- and Yb<sup>3+</sup>-doped YAG ceramics. The differences of  $\kappa$  of YAG between two types of ceramics and single crystals that have various RE<sup>3+</sup>-concentrations were also discussed.

**WB17**

**Ambient-Temperature 4-W Yb:YAG Ceramic Microchip Lasers at Both 1030 nm and 1049 nm**, Jun Dong<sup>1</sup>, Akira Shirakawa<sup>1</sup>, Ken-ichi Ueda<sup>1</sup>, Hideki Yagi<sup>2</sup>, Takagimi Yanagitan<sup>2</sup>, Alexander A. Kaminski<sup>3</sup>; <sup>1</sup>Inst. for Laser Science, Univ. of Electro-Communications, Japan, <sup>2</sup>Konoshima Chemical Co. Ltd., Japan, <sup>3</sup>Inst. of Crystallography, Russian Acad. of Sciences, Russian Federation. Laser-diode end-pumped Yb:YAG ceramic microchip lasers with 4 W output power at 1.03  $\mu$ m and 1.049  $\mu$ m were obtained at ambient temperature. Slope efficiencies of 64%, 69% at 1049 nm and 1030 nm were achieved.



## WB18

**Potential of Fiber Raman Laser in Visible Wavelength Region**, Yan Feng, Wolfgang Hackenberg, Domenico Bonaccini Calia; European Southern Observatory, Germany. We investigate the potential of fiber Raman lasers in the visible wavelength region, which have hardly been explored yet, motivated by developing a fiber based 589nm source for laser guide star adaptive optics.

## WB19

**Compact Continuous-Wave Yellow Laser Based on a Self-Stimulating Raman Nd:YVO<sub>4</sub> Laser**, Takashi Omatsu<sup>1</sup>, Andrew Lee<sup>2</sup>, Peter Dekker<sup>2</sup>, Helen M. Pask<sup>2</sup>, James A. Piper<sup>2</sup>; <sup>1</sup>Chiba Univ., Japan, <sup>2</sup>Macquarie Univ., Australia. We report 92mW CW yellow output from a small-scale, diode-pumped intracavity-doubled self-stimulating Raman Nd:YVO<sub>4</sub> laser with optical efficiency of 2.2%. We believe this to be the first report of a CW self-stimulating Raman yellow laser.

## WB20

**900 nm Emission of a Nd:ASL Laser Pumped by an Extended-Cavity Tapered Laser Diode**, David Paboeuf, Gaëlle Lucas-Leclin<sup>1</sup>, Patrick Georges<sup>1</sup>, Bernd Sumpff, Götz Erbert<sup>2</sup>, Cyrille Varona<sup>3</sup>, Pascal Loiseau<sup>3</sup>, Gérard Aka<sup>3</sup>, Bernard Ferrand<sup>4</sup>; <sup>1</sup>Inst. d'Optique, France, <sup>2</sup>Ferdinand Braun Inst. für Höchstfrequenztechnik, Germany, <sup>3</sup>ENSCP, France, <sup>4</sup>CEA-LETI, France. We describe here the use of a 798-nm-stabilized high-brightness tapered laser diode to pump a Nd:ASL crystal for 900 nm laser operation. An output power of 150 mW is obtained.

## WB21

**Continuous-Wave and Mode-Locked Laser Operation of Yb:NaLu(WO<sub>4</sub>)<sub>2</sub>**, Xavier Mateos<sup>1</sup>, Simon Rivier<sup>1</sup>, Uwe Griebner<sup>1</sup>, Valentin Petrov<sup>1</sup>, Xiumei Han<sup>2</sup>, Jose Maria Cano-Torres<sup>2</sup>, Alberto Garcia-Cortes<sup>2</sup>, Concepcion Cascales<sup>2</sup>, Carlos Zaldo<sup>2</sup>; <sup>1</sup>Max-Born-Inst., Germany, <sup>2</sup>ICMM-CSIC, Spain. Highly Yb-doped tetragonal crystals of NaLu(WO<sub>4</sub>)<sub>2</sub> with disordered structure were synthesized with Na<sub>2</sub>W<sub>2</sub>O<sub>7</sub> flux. Continuous-wave laser operation yielded an output power of 650 mW and 90-fs pulses were generated by passive mode-locking.

## WB22

**New Regularity of Multiphonon Relaxation in Rare Earth Doped Laser Crystals**, Yurii V. Orlovskii, Tasoltan T. Basiev, Konstantin K. Pukhov; General Physics Inst. RAS, Russian Federation. Dependence of multiphonon relaxation rate of mid-IR transitions of rare-earth ions on the distance between a rare-earth ion and a nearest ligand in low phonon laser hosts with similar phonon spectra is considered.

## WB23

**Lasing of Yb<sup>3+</sup> in the Non-Centrosymmetric Host KGd(PO<sub>3</sub>)<sub>4</sub>**, Isabel Parreau<sup>1</sup>, Maria Cinta Pujol<sup>1</sup>, Magdalena Aguilo<sup>1</sup>, Francisc Diaz<sup>1</sup>, Xavier Mateos<sup>2</sup>, Valentin Petrov<sup>2</sup>; <sup>1</sup>Univ. Rovira i Virgili, Spain, <sup>2</sup>Max-Born-Inst., Germany. Crystals of the self-doubling KGd(PO<sub>3</sub>)<sub>4</sub> were grown with Yb-doping as high as 3.2×10<sup>20</sup> at/cm<sup>3</sup>. They were spectroscopically characterized and laser generation in the 1 μm range was achieved with a slope efficiency exceeding 55%.

## WC • Novel Technologies

British Ballroom

► 11:00 a.m. – 12:30 p.m.

### WC • Novel Technologies

Rüdiger Paschotta; RP Photonics Consulting GmbH, Switzerland, Presider

### WC1 • 11:00 a.m.

**2-Dimensional Waveguide Coherent Beam Combiner**, Scott E. Christensen, Olivia Koski; Lockheed Martin Coherent Technologies, USA. We report on a novel 2-D coherent beam combiner with the potential to completely eliminate side-lobe power in the combined beam, without using vulnerable refractive or diffractive elements in the beam train, allowing high-power scaling.

### WC2 • 11:15 a.m.

**High Brightness Semiconductor Lasers with Internal Gratings**, Mark Osowski, Rob Lammert, Se Oh, C. Panja, Paul Rudy, Tom Stakelon, Jeffrey Ungar; QPC Lasers, Inc., USA. We present recent advances in high power semiconductor lasers including increased spectral brightness using on-chip internal gratings, increased spatial brightness, and reduced cost architectures at wavelengths from the near infrared to the eye-safe regime.

### WC3 • 11:30 a.m.

**Core-Clad-Type Composites of Nd:GdVO<sub>4</sub> Single Crystal Grown by the Double Die EFG Method**, Makoto Matsukura<sup>1</sup>, Osamu Nakamura<sup>1</sup>, Shinya Watanabe<sup>1</sup>, Akio Miyamoto<sup>1</sup>, Yasunori Furukawa<sup>1</sup>, Yoichi Sato<sup>2</sup>, Takunori Taira<sup>2</sup>, Tsuyoshi Suzudo<sup>3</sup>, Hironobu Mifune<sup>3</sup>; <sup>1</sup>Oxide Corp., Japan, <sup>2</sup>Laser Res. Ctr. for Molecular Science, Japan, <sup>3</sup>Tohoku R&D Ctr., Ricoh Co., Ltd., Japan. Core-clad-type composite structures in GdVO<sub>4</sub> single crystals were directly fabricated by single-crystal-growth techniques. The double die EFG method enables 3-mm core of Nd:GdVO<sub>4</sub> inside 5-mm clad. Laser oscillation in our samples was successfully demonstrated.

### WC4 • 11:45 a.m.

**Continuous-Wave and Q-Switched Operation in Nd:YAG Single-Crystal Fiber Grown by Micro-Pulling-Down**, Julien Didierjean<sup>1</sup>, Didier Perrodin<sup>2</sup>, Marc Castaing<sup>1</sup>, François Balembois<sup>1</sup>, Kherreidine Lebbou<sup>3</sup>, Alain Brenier<sup>3</sup>, Patrick Georges<sup>1</sup>, Jean-Marie Fourmigué<sup>2</sup>, Olivier Tillement<sup>3</sup>; <sup>1</sup>Inst. d'Optique, France, <sup>2</sup>Fibercryst SAS, France, <sup>3</sup>LPCML, Univ. Lyon, France. We present the first high power laser using single-crystal Nd:YAG fibers grown by micro-pulling-down technique, producing 10-W CW power and 370-kW peak power in Q-switched regime for 60-W of pump power.

### WC5 • 12:00 p.m.

**11W Broadband Amplified Spontaneous Emission Fiber Source at 2 μm**, DeYuan Shen, Lee Pearson, Jayanta Sahu, W. Andy Clarkson; Univ. of Southampton, UK. High-power operation of Tm-doped superfluorescent fiber source is described. Over 11W of single-ended output spanning the wavelength-range from 1940nm to 1976nm was obtained with a slope efficiency of 38% with respect to launched pump power.



**WC6 • 12:15 p.m.**

**First Demonstration of Neodymium True Three Level Laser Emitting at 879 nm**, *Emilie Herault, François Balembos, Patrick Georges; Lab Charles Fabry de l'Inst. d'Optique, France.* We present the first true three-level-laser based on an Nd-doped crystal. Emission at 879-nm in NdGdVO<sub>4</sub> was studied in cw and pulsed regime. SHG was realized to reach blue range at 439.5-nm.

► **12:30 p.m. – 2:00 p.m.**

**Lunch (on your own)**

**WD • High Power Solid-State Lasers II**

*British Ballroom*

► **2:00 p.m. – 3:30 p.m.**

**WD • High Power Solid-State Lasers II**

*Takunori Taira; Laser Res. Ctr. for Molecular Science, Japan, Presider*

**WD1 • 2:00 p.m.**

**Invited**

**Recent Progress and the Future of Ceramic Lasers**, *Ken-ichi Ueda; Univ. of Electro-Communications, Japan.* Abstract unavailable.

**WD2 • 2:30 p.m.**

**The Texas Petawatt Laser**, *Erhard W. Gaul<sup>1</sup>, Mikael Martinez<sup>1</sup>, Todd Ditmire<sup>1</sup>, Skyler Douglas<sup>1</sup>, Watson Henderson<sup>1</sup>, Joel Blakeney<sup>1</sup>, John Caird<sup>2</sup>, Al Erlandson<sup>2</sup>, Igor Iovanovic<sup>2</sup>, Chris Ebberts<sup>2</sup>, Bill Molander<sup>2</sup>; <sup>1</sup>Univ. of Texas at Austin, USA, <sup>2</sup>Lawrence Livermore Natl. Lab, USA.* We report on the 200 J, 150 fs Texas Petawatt Laser. A hybrid amplification with OPCPA in BBO and YCOB crystals and mixed glasses is used for broadband gain. Scalability to Exawatt lasers is discussed.

**WD3 • 2:45 p.m.**

**Suppression of Optical Parametric Generation in the High-Efficient OPCPA System**, *Ildar A. Begishev, Vincent Bagnoud, Christophe Dorrer, Jonathan D. Zuegel; Lab for Laser Energetics, Univ. of Rochester, USA.* An orbital tip of crystals and a higher level of a seed signal have significantly suppressed super-luminescent optical-parametric generation as the main limitation factor in high-efficient optical-parametric chirped-pulse amplifiers.

**WD4 • 3:00 p.m.**

**The Mercury Project: A kW Scale Yb:S-FAP Laser for Inertial Fusion Energy and Target Experiments**, *Andy Bayramian<sup>1</sup>, Paul Armstrong<sup>1</sup>, Camille Bibeau<sup>1</sup>, John Caird<sup>1</sup>, Rob Campbell<sup>1</sup>, Rick Cross<sup>1</sup>, Jay Dawson<sup>1</sup>, Chris Ebberts<sup>1</sup>, Al Erlandson<sup>1</sup>, Barry Freitas<sup>1</sup>, Robert Kent<sup>1</sup>, Zhi Liao<sup>1</sup>, Joe Menapace<sup>1</sup>, Bill Molander<sup>1</sup>, Noel Peterson<sup>1</sup>, Kathleen Schaffers<sup>1</sup>, Nick Schenkel<sup>1</sup>, Steve Sutton<sup>1</sup>, John Tassano<sup>1</sup>, Steve Telford<sup>1</sup>, Everett Utterback<sup>1</sup>, Mark Randles<sup>2</sup>, Bruce Chai<sup>3</sup>, Yting Fei<sup>3</sup>; <sup>1</sup>Lawrence Livermore Natl. Lab, USA, <sup>2</sup>Northrop Grumman Space Technologies, Synoptics, USA, <sup>3</sup>Crystal Photonics, Inc., USA.* The laser is nearing completion with demonstration of 73% frequency-conversion efficiency, deformable mirror operation that generated a 4-times diffraction limited spot, and commissioning of an advanced front end to be installed on the main laser.

**WD5 • 3:15 p.m.**

**Tabletop 300J 1ns Nd:Glass Laser for Pumping of a Chirped Pulse Optical Parametric Amplifier**, *Anatoly K. Poteomkin, Eugeny V. Katin, Efim A. Khazanov, Alexey V. Kirsanov, Grigory A. Luchinin, Anatoly N. Mal'shakov, Michail A. Martyanov, Oleg V. Palashov, Andrey A. Shaykin; Inst. of Applied Physics, Russian Federation.* 300J-energy 1ns duration pulse has been achieved at the laser output with fill factor of 0.8. The laser has been accommodated on a single optical table. The energy efficiency of second harmonic generation is 55%.

*Columbia Ballroom*

► **3:30 p.m. – 4:00 p.m.**

**Coffee Break & Exhibits**

**WE • Mid-IR Sources**

*British Ballroom*

► **4:00 p.m. – 6:00 p.m.**

**WE • Mid-IR Sources**

*Gerard Aka; Ecole Natl. Supérieure de Chimie de Paris, France, Presider*

**WE1 • 4:00 p.m.**

**Core Pumped Erbium Fiber Nanosecond Pulse Amplifier Generating 360 kW Peak Lower with M<sup>2</sup><1.1 at 1545 nm Wavelength**, *Jayesh C. Jasapara, Matt Andrejco, David DiGiovanni, Cliff Headley, Andrew D. Yablon; OFS Labs, USA.* Nanosecond pulses are amplified in a single clad 875 μm<sup>2</sup> effective area Erbium doped fiber, core pumped at 1480 nm, to generate record 360 kW peak power with M<sup>2</sup><1.1 at 1545 nm wavelength.

**WE2 • 4:15 p.m.**

**Efficient Diffraction-Limited SLM Eyesafe 1617 nm Er:YAG MOPA with 1.1 ns Pulsewidth**, *Robert C. Stoneman, Ross Hartman, Eric A. Schneider, Charles G. Garvin, Sammy W. Henderson; Lockheed Martin Coherent Technologies, USA.* We report an eyesafe diffraction-limited SLM Er:YAG MOPA with 1.1ns pulsewidth. The injection-seeded oscillator produces 2.1W output with 1.1 M<sup>2</sup> at 10kHz PRF. The amplifier produces 10W CW and 4.7W pulsed outputs.

**WE3 • 4:30 p.m.**

**Tunable Laser Operation of Tm-Doped Epitaxial Layers of Monoclinic KLu(WO<sub>4</sub>)<sub>2</sub> near 2-μm**, *Xavier Mateos<sup>1</sup>, Valentin Petrov<sup>1</sup>, Uwe Griebner<sup>1</sup>, Oscar Silvestre<sup>2</sup>, Maria Cinta Pujol<sup>2</sup>, Magdalena Aguilo<sup>2</sup>, Francesc Diaz<sup>2</sup>; <sup>1</sup>Max-Born-Inst., Germany, <sup>2</sup>Univ. Rovira i Virgili, Spain.* Epitaxial layers of Tm-doped KLu(WO<sub>4</sub>)<sub>2</sub> grown on undoped KLu(WO<sub>4</sub>)<sub>2</sub> substrates are longitudinally pumped by a Ti:sapphire laser at 802 nm and tunable (1894-2039 nm) laser operation is achieved with slope efficiencies as high as 64%.

**WE4 • 4:45 p.m.**

**Efficient Single-Frequency Thulium Doped Fiber Laser near 2-μm**, *Jihong Geng<sup>1</sup>, Jianfeng Wu<sup>1</sup>, Shibin Jiang<sup>1</sup>, Jirong Yu<sup>2</sup>; <sup>1</sup>NP Photonics, USA, <sup>2</sup>NASA Langley Res. Ctr., USA.* We demonstrate highly efficient diode-pumped single-frequency fiber laser with 35% slope efficiency and 50mW output power operating near 2μm, which generated from a 2-cm long piece of highly Tm<sup>3+</sup>-doped germanate glass fiber pumped at 800nm.

**WE5 • 5:00 p.m.**

**Power-Scalable Thulium and Holmium Fibre Lasers Pumped by 793 nm Diode-Lasers**, David G. Lancaster<sup>1</sup>, Alex Sabella<sup>1</sup>, Alex Hemming<sup>1</sup>, Shayne Bennetts<sup>1</sup>, Stuart D. Jackson<sup>2</sup>; <sup>1</sup>Defence Science and Technology Organization, Australia, <sup>2</sup>Optical Fibre and Technology Ctr., Australia. High-Power 793nm diode-laser pumped thulium and holmium double-clad fibre lasers are reported. The 112 W Tm<sup>3+</sup> and 83 W Tm<sup>3+</sup>:Ho<sup>3+</sup> lasers have slope-efficiencies of 53% and 42%, respectively, both with M<sup>2</sup> < 1.5.

**WE6 • 5:15 p.m.**

**Ultrabroad Tuning of an Intracavity-Pumped Cr<sup>2+</sup>:ZnSe Laser between 1880 and 3100 nm**, Umit Demirbas, Alphan Semnaroglu, Koç Univ., Turkey. By using a Cr<sup>2+</sup>:ZnSe sample with reduced reabsorption losses and by employing intracavity pumping inside a 1570-nm KTP optical parametric oscillator, we demonstrated ultrabroad tuning of a gain-switched Cr<sup>2+</sup>:ZnSe laser between 1880 and 3100 nm.

**WE7 • 5:30 p.m.**

**Energy Scaling of Mid-Infrared Femtosecond Oscillators**, Vladimir L. Kalashnikov, Evgeni Sorokin, Irina T. Sorokina;

*Photonics Inst., Austria.* An analytical theory of chirped-pulse-oscillators mode-locked by SESAM is developed and applied to femtosecond Cr-chalcogenide lasers. The positive dispersion regime is shown to be significantly more promising for  $\mu$ J-level pulse energies than the negative-dispersion regime.

**WE8 • 5:45 p.m.**

**Generation of Watt-Level Mid-Infrared Radiation by Wavelength-Conversion of an Eye-Safe Fiber Source**, Fabio Di Teodoro, Sebastien Desmoulins; Aculight Corp., USA. We obtained pulse average power in excess of 1W (at pulse repetition rate ~100 kHz) in the 3.8-4micron wavelength range by pumping a periodically-poled lithium niobate optical parametric oscillator with a 1545nm-wavelength pulsed fiber source.

*British Ballroom*

► **6:00 p.m. – 6:30 p.m.**

**Closing Remarks and Presentation of Best Student Paper Prizes**

## Key to Authors and Presiders

Acco, Shy – MB6	Bonaccini Calia, Domenico – WB18	Deschaseaux, Gérard – MB4	Fujita, Masayuki – MB2, MC3, MC5
Aers, Geof C. – WA6	Boudeile, Justine – WA2	Desmoulines, Sebastien – WE8	Fukuda, T. – MD6
Afanasiev, Denis M. – MB22	Brenier, Alain – WC4	Di Teodoro, Fabio – WE8	Furukawa, Yasunori – TuC3, WC3
Aguilo, Magdalena – WB23, WE3	Brown, Christian T.A. – WA6	Dianov, Evgeniy M. – MB17, WB3	
Aka, Gérard – MB18, TuB9, WB20, WB6, WE	Buchhave, Preben – TuB10	Diaz, Francesc – WB23, WE3	
Akahane, Yutaka – MC5	Buckley, Joel R. – ME5	Diddams, Scott – TuA2	Galan, Miguel – WB2
Akulov, Vladimir A. – MB22	Burgoyne, Bryan – TuB2	DiGiovanni, David – WE1	Gallian, Andrew R. – TuB24
Andrejco, Matt – WE1	Burns, David – WA6	Digonnet, Michel J.F. – MD3	Galvanauskas, Almantas – ME2
Aoyama, Makoto – MC5	Butvina, Leonid N. – WB3	Ditmire, Todd – WD2	Gao, Chunqing – TuB19
Arie, Ady – MB6	Butze, Frank – TuC4, WB11	Dong, Jun – WB17	Garcia-Cortes, Alberto – WB21
Armstrong, Darrell – TuC5	Byer, Robert L. – MD3, TuA6, TuB15	Dong, Liang – ME3	Garvin, Charles G. – WE2
Armstrong, J. P. – MB1, WD4		Dorrer, Christophe – WD3	Gaul, Erhard W. – WD2
	Caird, John – WD2, WD4	Douglas, Skyler – WD2	Geng, Jihong – WE4
Babin, Sergey A. – MB22	Calvez, Stephane – WA6	Drake, Thomas E. – TuC5	Georges, Patrick – MB24, WA2, WB20, WC4, WC6
Bachor, Hans - A. – TuB10	Camargo, Fabiola A. – TuB16	Druon, Frederic – WA2	Giesen, Adolf – MA1, MA6, TuC4, WB11, WB9
Badikov, Valeri – TuB24	Campbell, Rob – MB1, WD4	Dubinskii, Mark – MB5	Goda, Keisuke – TuA4
Bagnoud, Vincent – WD3	Canalias, Carlota – TuC1	Dubois, Marc – TuC5	Godbout, Nicolas – TuB2
Bai, Yingxin – MB21	Cano-Torres, Jose M. – WB2, WB21	Dvoyrin, Vladislav V. – MB17	Goldner, Philippe – WA2
Balembois, François – MB24, WC4, WC6	Cascales, Concepcion – WB21	Dziedzina, Markus – TuB18	Griebner, Uwe – WA3, WB2, WB21, WE3
Ballato, John – ME1	Castaing, Marc – MB24, WC4	Ebbers, Christopher A. – MA, MB1, WD2, WD4	Grisard, Arnaud – MB13
Barnes, Norman P. – WB8	Cha, Myoungsik – MB16	Eichenholz, Jason – WA	Guertin, Doug – ME2
Basiev, Tasoltan T. – SC277, WB22	Chai, Bruce – WD4	Eichler, Hans J. – TuB18	Gün, Teoman – WB5
Bass, Michael – ME1	Chang, Guoqing – ME2	Elder, Ian – MB3	Guo, Kai – WB12
Battle, Philip – TuB11	Chen, Ying – ME1	Ell, R. – WA1	Gupta, James A. – WA6
Bayramian, Andy – MB1, WD4	Chong, Andy – ME5	Engelbrecht, Martin – WB4	
Beach, R. – MB1	Christensen, Scott E. – WC1	Erbert, Götz – WB20	Hackenberg, Wolfgang – WB18
Beck, Nicolas – MB4	Churkin, Dmitriy V. – MB22	Erlandson, Al – WD2, WD4	Hader, Jorg – MD5
Bedford, Robert – MD5	Clarkson, W.A. – WC5	Fallahi, Mahmoud – MD5	Hädrich, Steffen – TuC2
Begishev, Ildar A. – WD3	Coddington, Ian R. – TuA2	Fan, Li – MD5	Han, Xiumei – WB21
Bello Doua, Ramatou – ME4	Coïc, Hervé – MB4	Fedorov, Vladimir – TuB24	Hanna, Marc – WA2
Benedick, A. – WA1	Coutts, David W. – MD6, TuB17	Fei, Yting – WD4	Harb, Charles – TuB10
Bennetts, Shayne – WE5	Cross, Rick – WD4	Feng, Yan – WB18	Harimoto, Tetsuo – MC5
Bergquist, Jim – TuA2	Dawes, Judith M. – TuB17	Fermann, Martin – SC276, WA4	Hartke, René – TuB14
Bethune, Donald S. – MB11	Dawson, Jay – MB1, WD4	Ferrand, Bernard – MB18, WB20	Hartl, Ingmar – TuA, WA4
Betin, A. – MB21	Dawson, Martin D. – WA6, WB7	Foreman, Hannah D. – WB7	Hartman, Ross – WE2
Bibeau, Camille – WD4	Deana, Alessandro – TuB21	Fourmigué, Jean-Marie – WC4	Hartmann, Olivier – MB4
Birge, J. – WA1	Dekker, Peter – MD2, TuB17, WB19	Frede, Maik – MA5, MB19, MB20, ME6	Hastie, Jennifer E. – WB7
Bisson, Jean-Francois – WB13	Delaubert, Vincent – TuB10	Freiburg, Denis – MB20	Hayashi, S. – TuC7
Blakeney, Joel – WD2	Demirbas, Umit – WE6	Freitas, Barry – MB1, WD4	Headley, Cliff – WE1
Blau, Pinhas – MB6	Denman, Craig – TuC	Fuhrberg, Peter – WB5	Hegde, Shrikishna M. – TuB11
Bock, Stefan – WB15	Dergachev, Alex – TuC5	Fujii, Masaaki – MB8	Hein, Joachim – WB15
Boedefeld, Ragnar – WB15			Heist, Peter – TuC4

Hellström, Jonas E. – MC4, TuB8	Kalashnikov, Vladimir L. – WE7	Laurell, Fredrik – MC4, TuB22, TuB8, TuC1	Menapace, Joe – WD4
Hemming, Alex – WE5	Kallmeyer, Frank – TuB18	Lebbou, Kherreidine – WC4	Mennerat, Gabriel – MB13
Henderson, Sammy W. – WE2	Kaluza, Malte C. – WB15	Leburn, Christopher G. – WA6	Merkle, Larry D. – MB5
Henderson, Watson – WD2	Kamikariya, Koji – TuB12	Lee, Andrew – WB19	Merriam, Andrew J. – MB11
Henriksson, Markus – TuB22	Kaminskii, Alexander A. – WB17	Lee, Hyung – MB21	Mifune, Hironobu – TuC3, WC3
Héroult, Emilie – MB24, WC6	Kan, Hirofumi – MB14	Leigh, Matt – MB10	Mikhailov, Eugeny – TuA4
Heumann, Ernst – TuB14	Kan, H. – TuC7	Leonyuk, Nikolai – TuB23	Mirov, Sergey – TuB24
Hildebrandt, Matthias – ME6	Kane, Steve – TuB3	Leyva, V. – MB21	Miyakawa, Osamu – TuA4
Hirohshi, Junji – TuC1	Kaneda, Yushi – MB15	Li, Jun – ME3	Miyamoto, Akio – WC3
Hiroi, Masaki – TuC3	Katin, Eugeny V. – WD5	Liang, Hui-Hung – WB1	Miyasaka, Yoshihiko – TuB12
Hoffnagle, John A. – MB11	Kawanaka, Junji – MB14, MB2, MC3, MC5	Liao, Zhi – WD4	Miyazaki, Mitsuhiko – MB8
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Hollemann, Günter – TuC4	Kawashima, Toshiyuki – MB14, MB2, MC3	Lim, Hwan-Hong – MB16	Moloney, Jerome V. – MD5
Hornung, Marco – WB15	Kawato, Sakae – TuB4	Limpert, Jens – ME, TuC2	Montagne, Jean-Eucher – MB13
Hsieh, Wen-Feng – WB1	Kent, Robert – MB1, WD4	Lin, JaHon – WB1	Morton, Lynn G. – WB7
Hu, Jianghai – WB12	Khazanov, Efim A. – TuB13, WD5	Lin, Kuei-Huei – WB1	Moyer, Richard – SC275
Huber, Günter – MA3, MA4, TuB14, WB5	Kim, Byoung-Joo – MB16	Litchinitser, Natasha – ME2	Mücke, O.D. – WA1
Hudson, D.D. – WA4	Kirsanov, Alexey V. – WD5	Liu, Chi-Hung – ME2	Mukhin, Ivan B. – TuB13
Hugonnot, Emmanuel – MB4	Kisel, Victor – TuB23	Liu, Hua – MD6	Müller, Doreen – TuC2
	Kitamura, Kenji – MB12	Liu, Junhai – WA3, WB2	Murray, James T. – MD5
	Knappe, Ralf – WA5	Liu, Xiaoyan – MB12	
Imai, Shinichi – MB15	Kobayashi, Takao – TuB4	Loiseau, Pascal – MB18, TuB9, WB20, WB6	Nakajima, Yoshiaki – TuB4
Injeyan, Hagop – SC275	Koch, Stephan W. – MD5	Lorini, Luca – TuA2	Nakamura, Osamu – TuC3, WC3
Iovanovic, Igor – WD2	Koporulina, E. – TuB23	Lucas-Leclin, Gaëlle – WB20	Nebel, Achim – WA5
Ishizuki, Hideki – MB7, MB8, TuC3	Koski, Olivia – WC1	Luchinin, Grigory A. – WD5	Nemoto, Kana – TuB12
Izawa, Yasukazu – MC3	Kouznetsov, Dmitrii – WB13	Lupinski, Dominique – MB18	Newburgh, G.A. – MB5
	Kracht, Dietmar – MB19, MB20, ME6, TuB1, TuB2, WB4	Mal'shakov, Anatoly N. – WD5	Newbury, Nate – TuA2
Jabobson, Nick – ME2	Kräinkel, Christian – MA3, MA4	Maltsev, V. – TuB23	Nickel, Detlef – WB11
Jackson, Stuart D. – WE5	Kuleshov, Nikolai – TuB23	Marciante, John R. – TuB5, WB14	Nikolov, Susanne – TuB18
Jacob, James J. – MB11	Kumaran, R. – TuB7	Marine, Patrick – TuB24	Nishioka, Hajime – MB2, MC5
Jacobsson, Björn – MC4, TuB8	Kurilchik, Siarhei – TuB23	Martinez, Alán – TuB24	Nozawa, Hoshiteru – MB14
Jalali, Bahram – TuB6	Kuzminykh, Yury – WB5	Martinez, Mikael – WD2	Oates, Chris – TuA2
Jasapara, Jayesh C. – WE1	Kuznetsova, Lyuba – TuB3	Martyanov, Michail A. – WD5	Ogawa, Kanade – MC5
Jeon, Oc-Yeub – MB16	Kuzucu, Onur – TuB11	Maruyama, Hiroki – MD1	Ogawa, Y. – TuC7
Jiang, Minhua – WA3	Kwee, Patrick – MA5	Mashinsky, Valery M. – MB17	Oh, Se – WC2
Jiang, Shibin – MB10, WB8, WE4		Mason, Paul D. – MB9	Okhrimchuk, Andrey G. – WB3
Jiang, Zhuo – TuB5	Lacroix, Suzanne – TuB2	Mateos, Xavier – WA3, WB2, WB21, WB23, WE3	Okishev, Andrey V. – TuC6
Jin, Min-Ji – MB16	Lagatsky, Alexander A. – WA6	Matsubara, Shinichi – TuB4	Oleinik, A. – TuB7
Jochmann, Axel – WB15	Lallier, Éric – MB13	Matsukura, Makoto – WC3	Omatsu, Takashige – WB19
Johnson, K. – MD6	Lam, Ping Koy – TuB10	Mavalvala, Nergis – TuA4	Orlovskii, Yurii V. – WB22
Jones, R.J. – WA4	Lammert, Rob – WC2	McDonagh, Louis – MD4, WA5	Osowski, Mark – WC2
	Lancaster, David G. – WE5	McKay, Aaron – TuB17	Ota, Jun – MD1
Kablukov, Sergei I. – MB22	Lanning, R. – MB1	McRobbie, Andrews D. – WA6	Otani, C. – TuC7
Kaertner, Franz X. – WA1	Larionov, Mikhail – WB11	Medvedkov, Oleg I. – MB17	Otsuka, Kenju – TuB12
	Lassen, Mikael – TuB10		

Paboeuf, David – WB20	Rivier, Simon – WA3, WB21	Sorokin, Evgeni – WA7, WE7	Uemura, Sadao – WB10
Palashov, Oleg V. – TuB13, WD5	Roberts, Tony D. – TuB11	Sorokina, Irina T. – WA7, WE7	Ungar, Jeffrey – WC2
Panja, C. – WC2	Robin, I.C. – TuB7	Speiser, Jochen – WB9	Uno, Kyousuke – TuB4
Park, Jong-Dae – TuB17	Rockwell, D. – MB21	Spence, David J. – MD6	Urata, Yoshiharu – MB15
Parreu, Isabel – WB23	Rudy, Paul – WC2	Squaglia, Olivier – MB13	Urbanek, Karel E. – MD3
Paschotta, Rüdiger – WC	Ruehl, Axel – TuB1, TuB2	Squier, Jeff – TuB3	Utterback, Everett – MB1, WD4
Pasiskevicius, Valdas – MC4, TuB22, TuB8, TuC1	Rybakov, Michail A. – MB22	Sridharan, Arun Kumar – TuB15	
Pask, Helen M. – MD2, WB19	Sabella, Alex – WE5	Stakelon, Tom – WC2	Valle, Francisco J. – WB2
Pati, Bhabana – MC2	Saby, Julien – ME4	Stolz, Wolfgang – MD5	Varona, Cyrille – MB18, WB20, WB6
Pearl, Shaul – MB6	Sahu, Jayanta – WC5	Stolzenburg, Christian – MA6, TuC4	Viana, Bruno – WA2
Pearson, Lee – WC5	Saikawa, Jiro – MB8	Stoneman, Robert C. – WE2	Viera, Gregorio – WB2
Pedersen, Jens Engholm – TuA3	Sakai, H. – TuC7	Su, Liangbi – WB12	Villeval, Philippe – MB18
Peng, Xiang – ME3	Salin, Francois – ME4	Sudesh, Vikas – ME1	Vlasov, Alexander A. – MB22
Penson, S. – TuB7	Sander, M. – WA1	Sudo, Seiichi – TuB12	Voytovich, Alexander V. – TuB13
Perrett, Brian J. – MB9	Saraf, Shailendhar – TuA4, TuB15	Sumpf, Bernd – WB20	
Perrodin, Didier – WC4	Sato, H. – MD6	Sun, Handong D. – WA6	Wada, Satoshi – MB15
Petermann, Klaus – MA3, MA4, WB5	Sato, Yoichi – TuC3, WB16, WC3	Sutton, Steve – WD4	Wada, Yoshio – MB15
Peters, Rigo – MA3, MA4	Satoh, Yasuhiro – TuC3	Swann, William – TuA2	Wall, Kevin F. – MC2
Peterson, Noel – WD4	Schaffers, Kathleen – WD4	Taira, Takunori – MA2, MB7, MB8, TuC3, TuC7, WB16, WC3, WD	Wallenstein, Richard – MD4, WA5
Petit, Johan – WA2	Schenkel, Nick – WD4	Takekawa, Shunji – MB12	Walsh, Brian M. – WB8
Petros, M. – MB21	Schibli, Thomas R. – WA4	Tanisho, Motoyuki – MB23	Wandt, Dieter – TuB1, TuB2, WB4
Petrov, Valentin – WA3, WB2, WB21, WB23, WE3	Schimpf, Damian – TuC2	Tankala, Kanishka – ME2	Wang, J. – MB21
Petzar, Paul – MB21	Schmidt, Daniel – TuB18	Tassano, John – WD4	Wang, Jiyang – WA3
Pilipenko, O. – TuB23	Schneider, Eric A. – WE2	Telford, Steve – MB1, WD4	Wang, Shunhua – TuC1
Piper, James A. – MD2, WB19	Scholle, Karsten – WB5	Ter-Gabrielyan, Nikolay – MB5	Watanabe, Shinya – TuC3, WC3
Plettner, Tomas – TuA6	Schreiber, Thomas – TuC2	Terabe, Kazuya – MB12	Webster, S.E. – TuB7
Podleska, Sebastian – WB15	Seifert, Frank – MA5	Theobald, Christian – WA5	Wei, Ming-Dar – WB1
Poteomkin, Anatoly K. – WD5	Sennaroglu, Alphan – WE6	Thorpe, M.J. – WA4	Wei, Zhiyi – TuB19, TuB20
Prochnow, Oliver – TuB1, TuB2	Serr, Markus – WA5	Tiedje, T. – TuB7	Wetter, Niklaus U. – TuB16, TuB21
Pujol, Maria C. – WB23, WE3	Serrano, Maria D. – WB2	Tiihonen, Mikael – TuB22	Weyers, Markus – WA3
Pukhov, Konstantin K. – WB22	Shaykin, Andrey A. – WD5	Tillement, Olivier – WC4	Wilhelm, Ralf – MB19, MB20
	Shen, DeYuan – WC5	Tokita, Shigeki – MB14, MB2, MC3	Willke, Benno – MA5
Quraishi, Qudsia – TuA2	Shestakov, Alexander V. – WB3	Tolstik, Nikolai A. – TuB23	Wilson, Alexander L. – TuA5
	Shi, Wei – MB10	Torizuka, Kenji – WB10	Wise, Frank W. – ME5, TuB3
Raghunathan, Varun – TuB6	Shibuya, T. – TuC7	Treichel, Rainer – TuB18	Wong, Franco N. C. – TuB11
Randles, Mark – WD4	Shinozaki, Tatsuya – MB15	Treps, Nicolas – TuB10	Wu, Jianfeng – WE4
Reichle, Donald J. – WB8	Shirakawa, Akira – MB23, MD1, TuB4, WB17	Trieu, Bo – MB21	
Renninger, Will H. – ME5	Shkunov, V. – MB21	Tsuji, Koichi – MC5	Xu, Jun – WB12
Rice, Robert R. – MC, TuB6	Sibbett, Wilson – WA6	Tsunekane, Masaki – MA2	Xu, Ke – TuB9
Richardson, Martin C. – ME1	Siebold, Mathias – WB15	Tünnermann, Andreas – TuC2	
Rico, Mauricio – WB2	Siegman, Anthony E. – ME1	Ueda, Ken-ichi – MB2, MB23, MD1, WB13, WB17, WD1	Yablon, Andrew D. – WE1
Riis, Erling – WB7	Silvestre, Oscar – WE3		Yagi, Hideki – MB14, MB2, WB17
Ripin, Daniel J. – MC1	Singh, U. – MB21		
	Sinha, Supriyo – MD3		
	Smith, Arlee – TuC5		
	Song, Yanrong – WB12		

Yamakawa, Koichi – MC5  
Yan, Chengfeng – WB12  
Yanagitani, Takagimi – MB14,  
MB2, WB17  
Yasuhara, Ryo – MB14  
Ye, J. – WA4  
Yu, Jirong – MB21, MD, WE4

Zakharian, Aramais R. – MD5  
Zaldo, Carlos – WB2, WB21  
Zaouter, Y. – WA2  
Zavgorodnev, Vladimir – WB3  
Zayhowski, John J. – TuA5  
Zelmon, David E. – TuB11  
Zhang, Chunyu – TuB19,  
TuB20  
Zhang, Huaijin – WA3  
Zhang, Ling – TuB19, TuB20  
Zhang, Zhiguo – TuB19, TuB20  
Zhang, Zhigang – WB12  
Zhao, Guangjun – WB12  
Zong, Jie – MB10  
Zorn, Martin – WA3  
Zuegel, Jonathan D. – TuC6,  
WD3