Advanced Solid-State Photonics

2009 OSA Optics & Photonics Congress

Technical Conference: February 1-4, 2009
Exhibition: February 2-4, 2009
Grand Hyatt Denver
Denver, Colorado, USA

Postdeadline Submissions Deadline: January 13, 2009 12:00 p.m. noon EST (17.00 GMT)
Hotel Reservations Deadline: December 30, 2008
Pre-Registration Deadline: January 12, 2009

The Optical Society would like to congratulate the winners of the Lockheed Martin Coherent Technologies Presentation Awards.

View the Meeting Archives for ASSP 2008 highlights

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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, astronomy, medicine, biology and entertainment.

Now in its 24th 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 Denver, Colorado 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 2009!

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
- Microphotonics, including microchip and compact lasers
- Optically Pumped Semiconductor Lasers
- High-Brightness Diodes
- Optical Sources Based on Nonlinear Frequency Conversion, including OPO, OPA, OPG, SHG, SFG, DFG and Raman
- Laser Media
- Nonlinear Optical Materials
- Engineered Optical Materials
- Applications of Laser Sources in:
  − Science
  − Astronomy, including gravity wave detection and laser guide star
  − Medicine and Biology
  − Remote Sensing
  − Industry
  − Entertainment, including laser display technology

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The purpose of the ASSP Advisory Committee is to assist the ASSP general and program chairs with meeting planning efforts and to advise them on how the meeting can better serve the solid-state photonics community. Previous ASSP chairs and other leaders in our field are invited by the current chairs to augment the technical program committee.

Exhibitors to ASSP

Exhibit:
February 2-4, 2009

Tabletop exhibit space will be $1,090 for Corporate Members and $1,250 for non-members

10’x10’ booth space will be $1,350 for Corporate Members and $1,550 for non-members

All exhibitors receive:

- An attendee list
- One technical digest
- One technical badge
- One ticket to the conference reception
- Two exhibit personnel registrations

If you have questions about exhibiting at ASSP, please contact our exhibit sales staff at 202.416.1428 or exhibitsales@osa.org.

Sponsorship Opportunities at ASSP 2009

Increase your company's visibility among qualified attendees with a sponsorship at the event.

Current ASSP Sponsorship Opportunities include:

- Coffee Break Sponsorships
- Reception Sponsorships
- Attendee Tote Bag Sponsorship
- Registration Material Inserts
- Advertising Signage Placements

Plus other customizable promotional opportunities

To find out more about one of the sponsorship opportunities listed above or to discuss a customized ASSP promotional package or sponsorship, please contact Anne Jones at 202.416.1942 or email ajones@osa.org.

Exhibitor Listings

ADVANCED SOLID-STATE PHOTONICS (ASSP)
2009 OSA OPTICS AND PHOTONICS CONGRESS

February 2-4, 2009
Grand Hyatt
Denver

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ALIO, (*which is Latin for "A better way."*) is an innovator in nano technology motion systems. ALIO's designs exceed current standards of precision product designs for automation technology. Holding two patents for the Parallel 6 Axis Hexapod and the Parallel 3 Axis Tripod as well as several patents pending for nano Z stages and planar air bearing systems, ALIO has set the pace for nano precision design and systems.

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Colorado Photonics Industry Association
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cpia@coloradophotonics.org
www.coloradophotonics.org
The Colorado Photonics Industry Association (CPIA) is an active non-profit supporting the hundreds of companies, researchers, and educators using photonics technology in the state. Information on member companies is available at the exhibit, including precision optical components, lasers, detectors, instrumentation, and other photonics systems and components. Pick up your free copy of the newly released Colorado Photonics Directory.

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LAS-CAD GmbH presents new version 3.5 of the program LASCAD, which provides a unique combination of simulation tools for LASer Cavity Analysis and Design. Thermal and Structural Finite Element Analysis, Gaussian ABCD Algorithm, and Wave Optics BPM Code are integrated for the first time in one software package to analyze thermal lensing, stability, and efficiency of solid state lasers. Contact: Konrad Altmann, President, dr.altmann@las-cad.com; Harry Skolnik, US sales, hskolnik@comcast.net.

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TUESDAY LUNCH

Lunch is available for purchase Tuesday afternoon in the Grand Ballroom Foyer. This is a great option for those attending Industry Tours!

Items are priced a la carte and available to-go.

Sandwiches	Sides
Desserts	Beverages

WIRELESS INTERNET

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Complimentary Wireless Internet is available for all ASSP Attendees. Internet is accessible on the 2nd Floor Monday through Wednesday. Thank you for your participation!

Join us for ASSP 2010

Collocated with Laser Applications to Chemical, Security & Environment Analysis (LACSEA); Coherent Optical Technologies & Their Applications (COTA); and Applications of Lasers for Sensing & Free Space Communications (NEW!)

January 31- February 3, 2010

Westin San Diego
San Diego, California, USA

Special Events

Welcome Reception

Sunday, February 1, 2009 – 7:00 p.m. – 8:30 p.m.
Grand Ballroom

Join your colleagues as we welcome you to Denver for ASSP 2009. The opening evening reception is an excellent opportunity to enjoy a beverage with those who you have met during previous conferences. Beer, wine and light hors d'oeuvres will be served.

Summit and Roundtable: Optical Frequency Combs—10 Years of History and a Bright Future

Please join us for a special event to review the exciting progress in the field of optical frequency combs, a technology which has revolutionized optical frequency metrology and triggered many novel and emerging applications. Featuring leaders in the field, the summit starts with each of them giving their views on recent developments in frequency comb technology and its applications. This is followed by a roundtable discussion and interaction with the audience in which the future of the field will be discussed.

Albrecht O. Bartels[1,2]
[1]*Univ. of Konstanz, Germany,* [2]*Gigaoptics GmbH, Germany*
Ultrastable Optical and Microwave Frequency Synthesis with GHz Femtosecond Lasers

Nathan R. Newbury
NIST, USA
Coherent Measurements with Fiber-Laser Frequency Combs

Ronald Holzwarth[1,2]
Menlo Systems GmbH, Germany, [2]*Max Planck Inst. of Quantum Optics, Germany*
Novel Frequency Combs for Applications Beyond the Optics Lab

Andrew Weiner
Purdue Univ., USA
Line by Line Pulse Shaping and Arbitrary Optical Waveform Generation

ASSP Tours

New Tour: Precision Photonics Corp.

Several Boulder, Colorado based laboratories are offering tours to ASSP 2008 attendees on Tuesday, February 3, 2009 after the ASSP Technical Sessions. Attendees may sign-up for a tour when registering on or before January 12, 2009. Limit: One tour per person.

Certain labs are requesting specific information or requirements from each attendee. An e-mail requesting this information will be sent to registered participants after tour registration closes.

Round trip transportation is included. Busses will depart promptly from the Grand Hyatt Denver at the listed times. Please meet in the hotel reception area at least 15 minutes prior to the departure time.

Joint Institute for Laboratory Astrophysics (JILA) – FULL
Time: 3:30 p.m.—5:30 p.m.
Departure: 2:30 p.m.
Capacity: 50 people
Description:
The JILA tour will be an open-house format with several optics-related labs open to you. In each lab you will be given a brief explanation of the current research being conducted there, and have the opportunity to ask questions about the research. Labs included in the open house will include those of Dr. Dana Anderson, Dr. Steve Cundiff, Drs. Kapteyn and Murnane, and Dr. David Nesbitt. Learn more about JILA, its research faculty and programs.

National Center for Atmospheric Research (NCAR)
Time: 3:00 p.m.—5:00 p.m.
Departure: 2:00 p.m.
Capacity: 50 people
Description:
The tour will take place at NCAR's Mesa Lab, located at the west end of Table Mesa Drive in Boulder, Colorado. It is a working research laboratory that welcomes the public seven days a week. NCAR's laboratory offers a wealth of hands-on educational exhibits that visitors are welcome to explore. Features of the tour may include the Climate Gallery, the Weather Gallery and NCAR's Supercomputers.

If time allows you are welcome to explore the nearby Walter Orr Roberts Weather Trail. The Weather Trail is a unique, self-guided tour that will introduce you to the weather and climate of NCAR's mesa location in Boulder as well as its plant and animal life. Visit NCAR's website for more information about the facilities and tours.

National Oceanic and Atmospheric Administration (NOAA)
Time: 3:00 p.m .—5:00 p.m.
Departure: 2:00 p.m.
Capacity: 50 people
Description:
The Earth System Research Laboratory's mission is to observe and understand the Earth system. The laboratory, largest of the National Oceanic and Atmospheric Administration (NOAA), conducts research to understand the roles of gases and particles that contribute to climate change, provide climate information related to water management decisions, improve weather prediction, and monitor recovery of the stratospheric ozone layer. This tour may include visits to the Earth System Research Lab and to divisions of NOAA National Weather Service in Boulder—the Space Weather Prediction Center and Weather Forecast Office—as well as a demonstration of NOAA's unique visualization tool, Science on a Sphere. For more information on tours, visit NOAA's website.
*Participants are required to show a government issued US Photo ID or foreign passport for entrance.

Precision Photonics Corp.
Time: 3:30 p.m.—5:30 p.m.
Departure: 2:30 p.m.
Capacity: 20 people
Description:
The PPC tour will include a brief presentation on recent advancements in optical polishing, epoxy-free bonding and coating technologies for high energy laser applications. There will be guided tours of our engineering and manufacturing areas with ample time to discuss technical questions and receive coating and fabrication manufacturability feedback from our senior technical team. Highlights of the tours will include our newly expanded metrology lab and a first-hand look at our ion beam sputtering chambers. Refreshments will be provided.

Students

The Optical Society would like to congratulate the following winners of the Lockheed Martin Coherent Technologies Presentation Awards. These awards were presented during the Advanced Solid-State Photonics Topical Meeting, held February 2-4, 2009 in Denver, Colorado.

ASSP Best Student Oral Paper Award

Development of a Novel Multibeam Yb:KGd(WO4)2 Oscillator for Multifocal Nonlinear Microscopy, *Kraig E. Sheetz, Colorado School of Mines, USA.*

ASSP Best Student Poster Paper Award

High Average Power Spectral Beam Combining of Yb-Doped Fiber Amplifiers, *Christian Wirth, Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.*

Pictured L-R, Tim Carrig, Representative of Lockheed Martin Coherent Technologies and 2007 ASSP General Chair, Kraig E. Sheetz, Colorado School of Mines, USA and Christian Wirth, Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.

Student Members

Student members are an important and active part of the OSA community. Student benefits are built around the unique needs of those preparing to enter the professional world of optics. As an OSA Student Member, you join a worldwide community of optics and photonics scientists, engineers and businees leaders. Join us today.

Student Members attend OSA conferences, exhbits and educational sessions at reduced rates. Frontiers in Optics (OSA's Annual Meeting), the Optical Fiber Communication Conference & Exposition and National Fiber Optic Engineers Conference (OFC/NFOEC), the Conference on Lasers and Electro-Optics (CLEO) and more than 20 topical meetings are among the many annual events hosted by OSA.

Awards and Grants

Announcing Newport/Spectra-Physics Student Travel Awards

We are pleased to announce the winners of the Newport/Spectra-Physics Student Travel Award. The winners will be presented with a certificate and a $1000 US award check during the ASSP 2009 Conference Banquet on February 3rd in Denver, Colorado.

2009 Award Winners

Pierre Brand, *Institut Néel, France*
Huseyin Cankaya, *Koc Univ., Turkey*
Andreas Oehler, *ETH Zurich, Switzerland*
Jan Rothhardt, *Friedrich Schiller Univ., Germany*
Chun Zhou, *Peking Univ., China*

Best Student Paper Award

The ASSP Best Student Oral Paper Award was established in 2001 to encourage excellence in research and scientific presentation skills in the student optics community. The award is sponsored by Lockheed Martin Coherent Technologies and includes a $1000 cash prize and a glass engraved award plaque.

There will also be a competition for the ASSP Best Student Poster Paper Award. The recipient of this award will be presented with a $500 cash prize and a glass engraved award plaque.

Students submitting contributed papers who desire to compete for these awards must indicate this intention when submitting the paper. Papers actually presented by advisors or other non-students will not be scored. Student papers accepted for oral presentation will be scored by the ASSP Technical Program Committee with the scores weighted according to the following formula: technical content (50%), oral presentation quality and general poise (25% with no penalty for non-native English speakers) and graphical presentation quality (25%). Student papers accepted for poster presentation will be scheduled in a “Young Scientist Poster Session” and scored according to the same formula as the oral papers. ASSP attendees are highly encouraged to participate in this session to provide feedback to the students and encourage their work.

In order to be considered for this award, you **must** indicate in your submission record whether or not you are a Student Member or a Student Nonmember. You must also indicate whether or not you wish to be considered for this award. If you do not complete these two steps, your paper will **not** be considered for these awards.

LOCKHEED MARTIN

OSA Foundation Student Travel Grants

The OSA Foundation is pleased to offer travel grants to students working or studying in a qualifying developing nation who plan to attend Advanced Solid-State Photonics (ASSP) 2009. Travel grants will average $1,000 US per award.

Application Deadline: November 20, 2008

All grant program applicants must:

1. Work or study in a qualifying developing nation
2. Be enrolled in an accredited undergraduate or graduate program
3. Demonstrate need for travel support and state the value of attending the conference
4. Agree that if they are selected as a grant recipient the OSA Foundation (OSAF) may use their name, photo and the information provided in their trip report to promote OSAF programs and solicit donations. This information may be used online, in print and email and in other OSAF communication vehicles.

OSA Foundation Travel Grant Application

It is not required that the applicant is a conference presenter, but we encourage interested students to submit a paper for oral or poster presentation. You are not required to be an OSA Student Member to apply for a grant, but preference is given to members. View more information on OSA Membership.

Please note: Applicants must apply for a visa, if required. OSA can send a letter of invitation for US meetings, but has no influence on the process.

If you have any questions please contact us at foundationgrants@osa.org.

The meeting chairs will review all qualified applications and applicants will be notified of the results via email.

Application Deadline: November 20, 2008.

OSA FOUNDATION

Invited Speakers

The preliminary list of invited speakers includes:

Banquet Speaker

John L. Hall[1,2], *[1]NIST, USA, [2]Univ. of Colorado, USA.*

John L. Hall of NIST and the University of Colorado, will present during the 2009 ASSP Conference Banquet. Hall and Theodor W. Hänsch were awarded half the Nobel Prize for their contributions to the development of laser-based precision spectroscopy, including the optical frequency comb technique. An optical frequency comb is generated by a laser specially designed to produce a series of extremely short—a few billionths of a second—equally spaced pulses of light.

Invited Speakers

MA1, **Fourier Domain Mode Locking (FDML): A New Laser Operating Regime and Applications for Biomedical Imaging, Profilometry, Ranging and Sensing**, *Robert Huber; Ludwig Maximilians Univ. of Munich, Germany.*

MC1, **Pulse Energies Exceeding 20 µJ Directly from a Subpicosecond Yb:YAG Oscillator by Use of Active Angular Multiplexing**, *Jörg Neuhaus1,2, Dominik Bauer1,2, Jochen Kleinbauer2, Alexander Killi2, Sascha Weiler2, Dirk H. Sutter2, Thomas Dekorsy1; 1Univ. of Konstanz, Germany, 2TRUMPF-Laser GmbH + Co. KG, Germany.*

MD1, **Spatially Structured Light in Optical Fibers: Applications to High-Power Lasers,** *Siddharth Ramachandran; OFS Labs, USA.*

ME1, **Semiconductor Disk Lasers: Recent Developments in Bulk and Micro-Lasers**, *Martin Dawson, Jennifer E. Hastie, Stephane Calvez, Nicolas Laurand, David Burns, Alan J. Kemp; Inst. of Photonics, Univ. of Strathclyde, UK.*

TuA1, **Diode Lasers for Pumping Solid State Laser: Overview of Current Technology and Means for Scaling of Power and Brightness**, *Stefan Heinemann; Ctr. for Laser Technology, Fraunhofer USA,USA.*

TuC1, **Optical Parametric Oscillators for the Visible and Ultraviolet**, *Majid Ebrahim-Zadeh1,2; 1ICFO, The Inst. of Photonic Sciences, Spain, 2Inst. Catalana de Recerca I Estudis Avancats (ICREA), Spain.*

WE1, **High Performance Micro Green Laser for Laser TV**, *Yoshihito Hirano; Mitsubishi Electric Corp., Japan.*

Roundtable Summit Speakers

WC1, **Ultrastable Optical and Microwave Frequency Synthesis with GHz Femtosecond Lasers**, *Albrecht O. Bartels1,2; 1Univ. of Konstanz, Germany, 2Gigaoptics GmbH, Germany.*

WC2, **Coherent Measurements with Fiber-Laser Frequency Combs**, *Nathan R. Newbury, I. Coddington, T. Dennis, W. C. Swann, P. Williams; NIST, USA.*

WC3, **Novel Frequency Combs for Applications beyond the Optics Lab**, *Ronald Holzwarth1,2; 1Menlo Systems GmbH, Germany, 2Max Planck Inst. of Quantum Optics, Germany.*

WC4, **Line by Line Pulse Shaping and Arbitrary Optical Waveform Generation**, *Andrew Weiner; Purdue Univ., USA.*

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 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 Courses will sell out quickly! There will be no waiting list for the Short Courses.
- Short Course Notes are not available for purchase.

Schedule

Sunday, February 1, 2009
2:00 p.m. - 6:00 p.m.

SC329 Thin Disk Lasers, *Adolf Giesen; Deutsches Zentrum für Luft- und Raumfahrt, Inst. für Technische Physik, Germany.*

SC330 Optical Frequency Combs: Introduction, Sources and Applications, *Scott Diddams; NIST, USA.* – **CANCELLED**

SC331 Modeling of Fiber Amplifiers and Fiber Lasers, *Rüdiger Paschotta; RP Photonics Consulting GmbH, Switzerland.*

SC332 How to Use LASCAD Software for LASer Cavity Analysis and Design, *Konrad Altmann; LAS-CAD GmbH, Germany.*

Course Descriptions

SC329 Thin Disk Lasers
Sunday, February 1, 2009, 2:00 p.m. - 6:00 p.m.
Adolf Giesen; Inst. für Technische Physik, Deutsches Zentrum für Luft- und Raumfahrt, Germany

Course Description
This course provides a detailed overview of thin disk laser design, the properties, the results achieved and the limitations of thin disk lasers. Firstly, the principle of the thin disk laser design will be explained in detail, including the operation of quasi three level materials like Yb:YAG. For this case the rate equations will be derived and discussed. A numerical model for calculating the laser parameters as well as the opto-mechanical properties of the thin disk laser will be discussed, including the stress behaviour and the optical phase distortions inside the disk.

The results for thin disk lasers in cw-operation are then presented for multi-mode and fundamental mode operation. The properties of pulsed thin disk lasers are discussed in detail, including q-switched and cavity-dumped lasers as well as regenerative amplifiers for the amplification of ns- ps- and fs-pulses. The use of other laser materials in thin disk laser design also will be covered. At the end of the course, the scaling laws and the scaling limits will be discussed for cw-operation and for pulsed operation. Some examples of industrial realizations will be given.

Benefits and Learning Objectives
This course should enable you to:

- Compare different laser designs including thin disk lasers.
- Design a thin disk laser for a specific application.
- Identify laser materials that are able to be operated as thin disk laser.

Intended Audience
This course is helpful for all who would like to learn the details of the thin disk laser design, the properties and results of thin disk lasers and the limitations.

Biography
Adolf Giesen received his doctorate in 1982 at the University of Bonn, Germany, and then joined the Institute of Technical Physics at DLR (the German Aerospace Center) in Stuttgart. He worked on rf-excited CO2-lasers before moving to the Institut für Strahlwerkzeuge, University of Stuttgart. He then worked on thin disk lasers (in collaboration between the University of Stuttgart and DLR). In 2002 he received the Berthold Leibinger Preis, and in 2004 he received the Rank Prize for the invention and his work on thin disk lasers. Since 2007 he has been the director of the Institute of Technical Physics, DLR.

SC330 Optical Frequency Combs: Introduction, Sources and Applications – CANCELLED
Sunday, February 1, 2009, 2:00 p.m. - 6:00 p.m.
Scott Diddams; NIST, USA
Level: Beginner (no background or minimal training is necessary to understand course material)

Course Description
This course will review the topic of optical frequency combs, with an emphasis placed on practical details related to the construction and operation of optical frequency combs for various applications. The course will begin with a brief historical perspective, including discussion of key developments in the late 1990s that ushered in the era of femtosecond laser frequency combs. From there, we will review the construction, major components, and operation principles of several of the most common types of optical frequency combs. Finally, we will highlight important applications of these frequency combs to research areas such as frequency metrology, optical clocks, precision spectroscopy, optical/microwave synthesis, timing synchronization/distribution, and attosecond science.

Benefits and Learning Objectives
This course should enable you to:

- Summarize the main historical developments in optical frequency combs.
- Identify and describe the main components of a femtosecond laser frequency comb.
- Build a nonlinear interferometer for carrier-envelope phase control.
- Construct a basic phase-lock between two oscillators (optical or RF).
- Describe time and frequency domain applications that are enabled by optical frequency combs.
- Describe at least two different techniques for stabilization of a frequency comb.
- Characterize the stability of a frequency comb.
- Discuss advantages and disadvantages of techniques used to expand the spectral extent of a frequency comb.

Intended Audience
This course is intended for physicists, chemists and engineers who have some basic knowledge of laser physics. Instruction will be at a level appropriate for beginning graduate students.

Biography
Scott Diddams began working with optical frequency combs as a Ph.D. student at the University of New Mexico in the early 1990s. He continued this theme through his postdoctoral work at JILA, where he was part of the team that first developed octave-spanning frequency combs for optical frequency measurements and carrier-

envelope phase-controlled pulses. He is presently a physicist in the Time and Frequency Division of the National Institute of Standards and Technology (NIST), and he and his coworkers continue to pioneer optical frequency comb technology for optical clocks, precision spectroscopy, frequency synthesis, waveform generation and many other applications.

SC331 Modeling of Fiber Amplifiers and Fiber Lasers
Sunday, February 1, 2009, 2:00 p.m. - 6:00 p.m.
Rüdiger Paschotta; RP Photonics Consulting GmbH, Switzerland
Level: Advanced Beginner (basic understanding of topic is necessary to follow course material)

Course Description
This course begins with a short introduction into fiber amplifiers and lasers and then discusses methods for physical modeling of such devices. A central topic is the use of rate equations within steady-state propagation models for amplifiers and lasers, which can also include amplified spontaneous emission. Different mathematical methods such as the shooting method and the relaxation method are compared. The course also addresses methods for acquiring spectroscopic data, as there is often a lack of such data.

Physical models can give useful insight into the operation and limitations of devices. Some typical phenomena in active fiber devices such as saturation effects, ASE and noise, nonlinear limitations and dynamic aspects are explored. The instructor will demonstrate some concrete simulations, using the RP Fiber Power and RP Q-switch software. As time permits, he will address cases brought up by participants. Further, a methodology for successful modeling is suggested. Finally, an overview on different types of modeling software concerning addressed phenomena, techniques and user interfaces is given.

Attendees will receive fully functional trial versions of the software (functional for three weeks, starting from the course date), and may start the trial during the course if they bring a laptop running under Microsoft Windows. They will have the opportunity to purchase the software at a 25 percent discount.

Benefits and Learning Objectives
This course should enable you to:

- Understand basic physical effects in fiber amplifiers and lasers.
- Understand important mathematical methods for calculating amplifier and laser performance.
- Know methods for obtaining spectroscopic data for active fibers.
- Distinguish different types of modeling software and understand typical tradeoffs.
- Know a methodology for successful use of laser and amplifier models.

Intended Audience
This course is designed for researchers and engineers who are interested in the understanding and optimization of fiber amplifiers and/or lasers. Attendees will receive fully functional trial versions of the software and may start the trial during the course if they bring a laptop running under Microsoft Windows.

Biography
Rüdiger Paschotta started his career in scientific research. In 2002 while at ETH Zürich he received the Fresnel Prize of the European Physical Society (EPS). In 2004 he started RP Photonics Consulting GmbH in Zürich, Switzerland. His full-time occupation is now to serve companies in the photonics industry worldwide. Typical tasks are to work out feasibility studies and designs for lasers and other photonic devices, to identify and solve technical problems, to find suitable laser sources for specific applications, and to do tailored staff training courses on specialized subjects. RP Fiber Power and RP Q-switch software are products offered by RP Photonics Consulting GmbH.

SC332 How to Use LASCAD Software for LASer Cavity Analysis and Design
Sunday, February 1, 2009, 2:00 p.m. - 6:00 p.m.
Konrad Altmann; LAS-CAD GmbH, Germany
Level: Advanced Beginner (basic understanding of topic is necessary to follow course material)

Course Description

Modern solid state laser (SSL) performance is affected by a diverse group of materials, pump and cavity configurations causing complicated 3-D interaction of strong fields in tiny crystal volumes. This course explains how to model SSL using LASCAD software. Four interactive software tools enable users to do: 1) geometrical ABCD matrix mode analysis, 2) finite element analysis (FEA) of thermal and mechanical effects, 3) dynamic analysis of Gaussian multimode and Q-switch operation, 4) physical optics analysis (BPM). It is shown how temperature distribution, thermal deformation and stress in the crystal can be computed using FEA. By the use of this tool it is demonstrated how different configurations, materials, and doping, affect temperature and crystal deformation. FEA results can be combined with a Gaussian mode approximation. For this purpose the thermally induced modification of the refractive index is fitted parabolically transverse to the crystal axis. The obtained parabolic parameters are used in an ABCD matrix code, which immediately delivers the shape of the transverse Gaussian modes. In a next step, the obtained Gaussian modes are used to carry through a dynamic analysis of multimode and Q-switch operation, by solving the time dependent rate equations for a set of transverse modes, again using an FEA solver on a space-time domain. This delivers the contribution of the individual modes to power output, beam quality factor, and pulse shape. Alternatively, the results of FEA can be used with a physical optics code propagating a wavefront through the obtained 3-D data set using a split-step beam propagation method.

Attendees should bring a laptop computer. Preceding the instruction, attendees can install a fully functional demonstration version of LASCAD software. The full version of the software will also be available for examination, and course attendees will have the opportunity to purchase the software at a 10 percent discount.

Benefits and Learning Objectives

This course should enable you to:

- Model resonator mode structure using ABCD matrix Gaussian mode approximation.
- Carry through finite element analysis of heat conduction and thermal deformation.
- Model common laser configurations like end and side pumped systems.
- Demonstrate the effect of different pumping and doping on mode structure, laser efficiency, and beam quality.
- Compute the power output for 4-level and quasi 3-level laser systems.
- Model the effect of pump light and temperature distribution on quasi 3-level and 4-level laser systems.
- Carry through dynamic modeling of multimode and Q-switch operation.
- Use a split-step BPM code to analyze a laser resonator applying the Fox and Li type roundtrip algorithm.

Intended Audience

This course is intended for individuals with at least a basic knowledge of lasers. Students, laser engineers and scientists interested in using modeling software for laser design and educational purposes are welcome. To follow along with the course content, all attendees should bring a laptop computer on which to install a demonstration version of LASCAD software.

Biography

Konrad Altmann is president of LAS-CAD GmbH, Munich, Germany, which develops and sells LASCAD software. He received his bachelor's and doctorate degree from the University of Munich. Working in the defense industry, he developed modeling software for high energy lasers, and laser beam propagation in the atmosphere. In 1993 he founded LAS-CAD GmbH with the vision of providing laser engineers all the simulation tools necessary for a quantitative understanding of the complicated multiphysics interaction in solid state lasers. In 2000 LAS-CAD received the Laser Focus World Commercial Technology Achievement Award.

Advanced Solid-State Photonics
Denver, CO

Welcome to the 2009 **Advanced Solid-State Photonics** Topical Meeting and Tabletop Exhibit!

We consider ASSP to be the world's premier forum for discussion of new research in lasers and nonlinear optical materials and devices. Advances in lasers and photonics continue to enable an increasingly broad range of applications in fields as diverse as spectroscopy, metrology, remote sensing, material processing, inertial confinement fusion, atomic physics, forensics, medicine, and entertainment. Thank you for joining us in the mile-high city of Denver, Colorado!

As you can see from this year's program, this event brings together a diverse, multinational group sharing common interests in the development and use of solid-state photonics. A total of 147 high caliber papers will be presented. We have scheduled 11 invited and 47 contributed oral presentations, and 89 poster presentations for you to attend. Invited speakers will review the latest research in semiconductor disk lasers, optical parametrical oscillators, high brightness diode pump lasers, solid state lasers for laser TV, novel Fourier domain mode-locking concepts, high power ultrafast thin-disk oscillators and novel fiber designs for high power fiber lasers. This year's meeting also provides four short courses. Starting on Sunday afternoon, two of them bring the opportunity to learn firsthand from pioneers in thin disk lasers and optical frequency combs. Further short-courses will focus on modeling concepts as well as commercial modeling software for both fiber and solid state lasers.

Please join us on Sunday evening for a welcome reception in the Grand Ballroom where we will kick off this year's exciting program. As highlighted speaker for our traditional banquet on Tuesday evening, we are honored to welcome Nobel laureate John L. Hall. Dr. Hall is scientist emeritus of the National Institute of Standards and Technology Quantum Physics Division and a fellow of JILA, a joint institute of NIST and the University of Colorado, Boulder and will share his experiences from over 40 years of cutting-edge laser research. Learning about Dr. Hall's pioneering work on laser-based precision spectroscopy and optical frequency combs will set the tone for our summit and roundtable on optical frequency combs which will be held on Wednesday morning. Featuring four leaders in the field we will have talks on major developments during the last ten years since this technology was born and conclude with a round-table discussion.

A poster session for students will be held Tuesday morning. Again, the best paper in this session will be awarded a Best Student Poster Award. This will complement the Best Student Paper Award that we have traditionally given out to the best oral presentation. On Tuesday afternoon you will have the opportunity to tour several laboratories in Boulder, Colorado.

Finally, the 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 and tell us about your research. We hope that you enjoy your time with us this week and this unique opportunity to explore Denver, the Mile High City with its spectacular scenery.

Again, we would personally like to thank you for attending. Welcome and enjoy the presentations!

Christopher Ebbers, Lawrence Livermore Natl. Lab, USA
Takunori Taira, Inst. of Molecular Science, Japan
General Co-Chairs

Ingmar Hartl, IMRA America, USA
James D. Kafka, Newport/Spectra-Physics, USA
Program Co-Chairs

Agenda of Sessions

Sunday, February 1, 2009		
12:00 p.m.–6:00 p.m.	**Registration Open**	*Grand Ballroom Foyer*
2:00 p.m.–6:00 p.m.	**SC329 Thin Disk Lasers, Adolf Giesen, SC330 Optical Frequency Combs: Introduction, Sources and Applications, Scott Diddams; SC331 Modeling of Fiber Amplifiers and Fiber Lasers, Rüdiger Paschotta; SC332 How to Use LASCAD Software for LASer Cavity Analysis and Design, Konrad Altmann**	
7:00 p.m.–8:30 p.m.	**Welcome Reception**	*Grand Ballroom*
Monday, February 2, 2009		
7:00 a.m.–5:00 p.m.	**Registration Open**	*Grand Ballroom Foyer*
8:00 a.m.–8:15 a.m.	**Opening Remarks**	*Grand Ballroom*
8:15 a.m.–10:00 a.m.	**MA • Metrology and Novel Pulsed Sources**	*Grand Ballroom*
10:00 a.m.–11:30 a.m.	**MB • Ultrafast and Nonlinear Optics: Poster Session I**	*Imperial Ballroom*
10:00 a.m.–11:30 a.m.	**Exhibit Open, Coffee Break**	*Imperial Ballroom*
11:30 a.m.–1:00 p.m.	**MC • Novel Oscillators I**	*Grand Ballroom*
1:00 p.m.–2:30 p.m.	**Lunch Break**	
2:30 p.m.–4:00 p.m.	**MD • Fiber and Waveguide Lasers and Amplifiers**	*Grand Ballroom*
4:00 p.m.–4:30 p.m.	**Coffee Break**	*Imperial Ballroom*
4:30 p.m.–6:00 p.m.	**ME • Optically-Pumped Semiconductor Lasers**	*Grand Ballroom*
6:00 p.m.–8:00 p.m.	**Dinner Break**	
8:00 p.m.–10:00 p.m.	**MF • Postdeadline Paper Session**	*Grand Ballroom*
Tuesday, February 3, 2009		
7:30 a.m.–1:00 p.m.	**Registration Open**	*Grand Ballroom Foyer*
8:00 a.m.–10:00 a.m.	**TuA • Brightness Scaling and Beam Combining**	*Grand Ballroom*
10:00 a.m.–11:30 a.m.	**TuB • Student Poster Session: Poster Session II**	*Imperial Ballroom*
10:00 a.m.–11:30 a.m.	**Exhibit Open, Coffee Break**	*Imperial Ballroom*
11:30 a.m.–1:30 p.m.	**TuC • Nonlinear**	*Grand Ballroom*
1:30 p.m.–6:00 p.m. (individual times vary)	**Lunch Break and Industry Tours (early RSVP required; see website for details)**	
7:30 p.m.–10:00 p.m.	**Conference Banquet**	*Grand Ballroom*
Wednesday, February 4, 2009		
7:30 a.m.–5:00 p.m.	**Registration Open**	*Grand Ballroom Foyer*
8:00 a.m.–9:30 a.m.	**WA • High-Field Sources I**	*Grand Ballroom*
9:30 a.m.–11:00 a.m.	**WB • Fiber Lasers and Bulk Solid-State Lasers: Poster Session III**	*Imperial Ballroom*
9:30 a.m.–11:00 a.m.	**Exhibit Open, Coffee Break**	*Imperial Ballroom*
11:00 a.m.–1:00 p.m.	**WC • Summit and Roundtable: Optical Frequency Combs—10 Years of History and a Bright Future**	*Grand Ballroom*
1:00 p.m.–2:30 p.m.	**Lunch Break**	
2:30 p.m.–4:00 p.m.	**WD • High-Field Sources II**	*Grand Ballroom*
4:00 p.m.–4:30 p.m.	**Coffee Break**	*Imperial Ballroom*
4:30 p.m.–6:30 p.m.	**WE • Novel Oscillators II**	*Grand Ballroom*
6:30 p.m.–6:45 p.m.	**Closing Remarks**	*Grand Ballroom*

Conference Highlights

Welcome Reception

Sunday, February 1, 7:00 p.m. – 8:30 p.m.
Grand Ballroom
Join your colleagues as we welcome you to Denver for ASSP 2009. The opening evening reception is an excellent opportunity to enjoy a beverage with those who you have met during previous conferences. Beer, wine and light hors d'oeuvres will be served.

Conference Banquet

Tuesday, February 3, 7:30 p.m.–10:00 p.m.
Grand Ballroom

Banquet Speaker

From Hard-Hat to Tux, in 40 Years of Laser Fun, *John L. Hall, Ph.D., JILA, Univ. of Colorado and NIST, USA*

Nobel laureate John L. Hall is senior fellow emeritus at the National Institute of Standards and Technology (NIST), adjoint professor at the University of Colorado, and adjoint fellow of JILA (formerly the Joint Institute for Laboratory Astrophysics), a cooperative physical science research institute of NIST and the University of Colorado-Boulder.

The Colorado native holds B.S., M.S., and Ph.D. degrees from the Carnegie Institute of Technology (now Carnegie-Mellon University). He joined the National Bureau of Standards (now NIST) as a physicist in 1962 and served as NIST senior scientist from 1971 until his retirement in 2004.

Internationally renowned for his experimentation with lasers, Dr. Hall has contributed significantly to the evolution of the laser from a laboratory curiosity into one of the fundamental tools of modern science. His research has resulted in a number of major innovations and developments in laser frequency stabilization, high-resolution and ultrasensitive laser spectroscopy, laser length and frequency standards, laser/atom cooling, quantum optics, and high-precision laser-based measurements.

He was awarded the 2005 Nobel Prize in Physics, jointly with Theodor Hänsch of the Max Planck Institute and Roy Glauber of Harvard, for his pioneering work on "Optical Comb" techniques, which allow simple and direct measurement of optical frequencies and have broad applications in science, meteorology and diagnostic medicine.

Dr. Hall has received numerous other peer-generated awards, has more than 235 refereed publications and holds 11 U.S. patents, the most recent on "Airport Sniffing." He is a member of the National Academy of Sciences and the French Légion d'honneur, and is a fellow of The Optical Society and the American Physical Society.

•Sunday, February 1, 2009•

Grand Ballroom Foyer
12:00 p.m.–6:00 p.m.
Registration Open

2:00 p.m.–6:00 p.m.
SC329 Thin Disk Lasers, Adolf Giesen
SC330 Optical Frequency Combs: Introduction, Sources and Applications, Scott Diddams
SC331 Modeling of Fiber Amplifiers and Fiber Lasers, Rüdiger Paschotta
SC332 How to Use LASCAD Software for LASer Cavity Analysis and Design, Konrad Altmann

Grand Ballroom
7:00 p.m. – 8:30 p.m.
Welcome Reception

•Monday, February 2, 2009•

Grand Ballroom
8:00 a.m.–8:15 a.m.
Opening Remarks

MA • Metrology and Novel Pulsed Sources

Grand Ballroom
8:15 a.m.–10:00 a.m.
MA • Metrology and Novel Pulsed Sources
Kaoru Minoshima; AIST, Japan, Presider

MA1 • 8:15 a.m. **Invited**
Fourier Domain Mode Locking (FDML): A New Laser Operating Regime and Applications for Biomedical Imaging, Profilometry, Ranging and Sensing, *Robert Huber; Ludwig-Maximilians-Univ. München, Germany.* Fourier Domain Mode Locking (FDML) is a new stationary operating regime of lasers, generating narrowband, rapidly wavelength swept output waveforms. The FDML mechanism and applications for biomedical imaging, coherent sensing and spectroscopy are discussed.

MA2 • 8:45 a.m.
Low Noise Frequency Comb Based on an All-Fiber Polarization-Maintaining Figure-8 Laser, *Esther Baumann[1], Fabrizio R. Giorgetta[1], Jeffrey W. Nicholson[2], William C. Swann[1], Ian Coddington[1], Nathan R. Newbury[1]; [1]NIST, USA, [2]OFS Labs, USA.* We present a frequency comb based on an all-fiber polarization-maintaining figure-8 laser. It is locked to an optical reference through an intracavity high-bandwidth electro-optical modulator and has a flat phase noise of -78 dBc/Hz.

MA3 • 9:00 a.m.
Testing the Broadband Phase Coherence of a Mode Locked Laser at Microhertz Relative Linewidth, *Michael J. Martin[1], Seth M. Foreman[1,2], Thomas R. Schibli[1], Jun Ye[1]; [1]JILA, NIST and Univ. of Colorado at Boulder, USA, [2]Stanford Univ., USA.* We report new limits on the phase coherence of the mode-locking process in an octave-spanning Ti:Sapphire comb. We find the mode-locking mechanism correlates optical phase across an octave with less than 2.5 microHz relative linewidth.

MA4 • 9:15 a.m.
100 GHz Passively Mode-Locked Er:Yb:Glass Laser at 1.5 μm and Experimental Identification of Transverse Cavity-Mode Degeneracies, *Andreas E. H. Oehler[1], Thomas Südmeyer[1], Ursula Keller[1], Kurt J. Weingarten[2]; [1]ETH Zurich, Switzerland, [2]Time-Bandwidth Products, Switzerland.* A fundamentally mode-locked Er:Yb:glass laser with a record high repetition rate of 100 GHz generates 8.6 mW average power in 1.64-ps pulses in the 1.5-μm telecom window. Frequency degeneracies of transverse cavity-modes are investigated.

MA5 • 9:30 a.m.
Generation of sub-40 fs Pulses at 20 GHz via Repetition Rate Multiplication, *Matthew S. Kirchner[1,2], Tara M. Fortier[1], Danielle Braje[1], Andrew M. Weiner[3], Leo Hollberg[1], Scott A. Diddams[1]; [1]NIST, USA, [2]Univ. of Colorado at Boulder, USA, [3]Purdue Univ., USA.* Optical filtering of a stabilized 1 GHz optical frequency comb produces a 20 GHz comb with ~40 nm bandwidth (FWHM) at 960 nm. Pulse durations <40 fs with low residual amplitude modulation are achieved.

MA6 • 9:45 a.m.
20 GHz Pulse Generation with a Stabilized Optical Frequency Comb Generator, *Shijun Xiao, Leo Hollberg, Scott Diddams; NIST, USA.* 20 GHz pulses were generated by a Fabry-Pérot modulator based optical frequency comb generator. We demonstrate high-fidelity 20 GHz sub-picosecond pulses with low residual microwave AM and PM noises.

Imperial Ballroom
10:00 a.m.–11:30 a.m.
Exhibit Open, Coffee Break

MB • Ultrafast and Nonlinear Optics: Poster Session I

Imperial Ballroom

10:00 a.m.–11:30 a.m.

MB • Ultrafast and Nonlinear Optics: Poster Session I

MB1

A Large-Bandwidth, Cylindrical Offner Pulse Stretcher for a High-Average-Power, 15 Femtosecond Laser, *W. A. Molander, A. J. Bayramian, R. Campbell, R. R. Cross, G. Huete, N. Schenkel, C. A. Ebbers, J. Caird, C. W. Siders, C. P. J. Barty; Lawrence Livermore Natl. Lab, USA.* We have designed a new cylindrical mirror pulse stretcher based on an Offner telescope. With a bandwidth of 200 nm this stretcher is part of a high average power 10 Hz femto-petawatt laser system.

MB2

Spectral Phase Diagnostic for PETAL Laser: SPIRITED, *Jacques Luce, Claude Rouyer; CEA, CESTA, France.* The "SPIRITED" stands for Spectral Phase Interferometer Resolved In Time Extra Dimensional. This diagnostic displays with no processing software and no calibration, the derivative spectral phase of a pulse duration up to 2 ps.

MB3

Ultra High Gain Monolithic Multipass Nd:Glass Amplifier, *Yitshak Tzuk, Chana Goren, Alon Tal; Soreq Nuclear Res. Ctr., Israel.* A novel scheme for an ultra high gain laser amplifier is presented based on flashlamp pumped monolithic slab design, achieving a gain of 10^5. The measured ratio between pulse and prepulse output power was 5×10^7.

MB4

Development of a Novel Large Bandwidth Front-End System for High Peak Power OPCPA Systems, *Oleg Chekhlov, John Collier, Cristina Hernandez-Gomez, Andrey Lyachev, Pavel Matousek, Ian O. Musgrave, Ian Ross, Yunxin Tang; Central Laser Facility, Science and Technology Facilities Council, UK.* We present the development of a novel large bandwidth front-end that is capable of supporting sub 30fs pulses, with 1J of energy at a 2Hz repetition rate that is centred at 910nm.

MB5

OPA Development on the Petawatt Field Synthesizer, *Zsuzsanna Major[1,2], Tie-Jun Wang[1], Izhar Ahmad[1], Sergei Trushin[1], József A. Fülöp[3], Andreas Henig[1,2], Sebastian Kruber[1], Raphael Weingartner[1,2], Mathias Siebold[1], Joachim Hein[4], Christoph Wandt[1], Sandro Klingebiel[1], Antonia Popp[1], Jens Osterhoff[1], Rainer Hörlein[1,2], Vladimir Pervak[1,2], Alexander Apolonskiy[1,2], Ferenc Krausz[1,2], Stefan Karsch[1,2]; [1]Max-Planck-Inst. für Quantenoptik, Germany, [2]Dept. für Physik, Ludwig-Maximilians-Univ. München, Germany, [3]Dept. of Experimental Physics, Univ. of Pécs, Hungary, [4]Inst. of Optics and Quantum Electronics, Friedrich Schiller Univ. Jena, Germany.* We report on recent OPCPA progress at the PFS system. We present a scheme for generating a broadband (700 nm-1400 nm) seed pulse for OPA, and a new preamplifier setup for the CPA pump laser chain.

MB6

Chirped Pulse Amplification System Using Nd-Doped Zig-Zag Glass Slab Pumped by Laser Diodes, *Keiichi Sueda[1,2], Takashi Kurita[2,3], Takashi Sekine[2,3], Z. Baozhen[1,4], Osamu Matsumoto[2,3], Toshiyuki Kawashima[2,3], Koichi Yamakawa[2,5], Masayuki Fujita[2,6], Junji Kawanaka[1,2], Takayoshi Kobayashi[7], Noriaki Miyanaga[1,2]; [1]Inst. of Laser Engineering, Osaka Univ., Japan, [2]JST CREST, Japan, [3]Hamamatsu Photonics K. K., Japan, [4]JST Intl. Cooperative Res. Project, Japan, [5]JAEA, Japan, [6]Inst. for Laser Technology, Osaka Univ., Japan, [7]Univ. of Electro-Communications, Japan.* We have developed a chirped pulse amplification system using Nd-doped zig-zag glass slab pumped by laser diodes as a pump source for the OPA. The output energy of 1 J with 4.1nm bandwidth was obtained.

MB7

Intracavity Phase Measurement towards Sub Nanometer Resolution, *Ladan Arissian[1,2], Alex Bragga[3], Xuan Luo[3], Jean Claude M. Diels[3]; [1]Natl. Res. Council of Canada, Canada, [2]Texas A&M Univ., USA, [3]Univ. of New Mexico, USA.* Using intracavity phase measurement technique, we designed a linear laser cavity with two pulses per cavity operation, that provides a sample/reference arm. We demonstrate the conversion of nanometer positioning of a mirror into kHz bandwidth.

MB8

Yb:CaF_2 Based 100-fs Diode-Pumped Oscillator, *Frederic Druon[1], Florence Friebel[1], Justine Boudeile[1], Dimitris N. Papadopoulos[1], Marc Hanna[1], Patrick Georges[1], P. Camy[2], V. Petit[2], J. L. Doualan[2], R. Moncorgé[2], C. Cassagne[3], G. Boudebs[3]; [1]Inst. d'Optique, Univ. Paris-Sud, France, [2]Ctr. de Recherche sur les Ions les Matériaux et la Photonique, Univ. de Caen, France, [3]Lab Propriétés Optiques des Matériaux et Applications, Univ. d'Angers, France.* We demonstrate 100-fs Yb:CaF_2 with an average power of 380 mW for a 13-nm-bandwidth spectrum centered at 1053 nm. The impact of the Kerr and thermal lenses on the short pulse stabilization has been investigated.

MB9

Femtosecond Mode-Locking of the Yb^{3+}:$YCa_4O(BO_3)_3$ Laser, *Xavier Mateos[1], Andreas Schmidt[1], Valentin Petrov[1], Uwe Griebner[1], Huaijin Zhang[2], Jiyang Wang[2], Junhai Liu[3]; [1]Max-Born-Inst., Germany, [2]Shandong Univ., China, [3]Qingdao Univ., China.* Femtosecond mode-locking is investigated for single crystals of the biaxial Yb:$YCa_4O(BO_3)_3$ and all possible polarization orientations including the self-frequency doubling configuration. Stable mode-locking and bandwidth-limited pulses are achieved with durations down to 76 fs.

MB10

Pulsing Dynamics in Ytterbium Based Chirped-Pulse Oscillators, *Martin Siegel[1], Guido Palmer[1], Moritz Emons[1], Marcel Schultze[1], Axel Ruehl[2], Uwe Morgner[1,2]; [1]Leibniz Univ. Hannover, Germany, [2]Laser Zentrum Hannover e.V., Germany.* The properties of passively mode-locked chirped-pulse oscillators based on Ytterbium doped gain media are studied theoretically along with experimental data. Predictions about potential future pulse energies up to 20μJ and possible experimental challenges are discussed.

MB11

Ultrashort Pulse Generation from a Diode-Pumped Kerr-Lens Mode-Locked Yb:YAG Laser, *Sadao Uemura, Kenji Torizuka; AIST, Japan.* We have generated ultrashort pulses with a pulse duration as short as 75 fs from a diode-pumped Kerr-lens mode-locked Yb:YAG laser, where the center wavelength and spectral width are 1057 nm and 18.0 nm, respectively.

MB12

Passively Mode-Locked Yb:LuScO$_3$ Oscillator, *Andreas Schmidt[1], Xavier Mateos[1], Valentin Petrov[1], Uwe Griebner[1], Rigo Peters[2], Klaus Petermann[2], Günter Huber[2], Andreas Klehr[3], Götz Erbert[3]; [1]Max-Born-Inst., Germany, [2]Hamburg Univ., Germany, [3]Ferdinand-Braun-Inst., Germany.* Mode locking of the novel mixed sesquioxide crystal Yb:LuScO$_3$ employing a SESAM is demonstrated. Pulse durations as short as 111 fs were obtained using a diode-laser pump source.

MB13

Efficient and Simple High-Power Femtosecond Yb:KGW Slab-Laser Pumped by a Single Broad-Area Emitter Diode, *Felix Hoos[1], Todd P. Meyrath[1], Sai Li[1], Bernd Braun[2], Harald Giessen[1]; [1]4th Physics Inst., Univ. of Stuttgart, Germany, [2]Georg-Simon-Ohm-Hochschule Nürnberg, Germany.* We demonstrate a simple and efficient femtosecond Yb:KGW slab laser with output powers of nearly 5 W and pulse widths as short as 161 fs. It is pumped with a single broad-area emitter diode.

MB14

High Fidelity Femtosecond Pulses from an Ultrafast Fiber Laser System via Adaptive Amplitude and Phase Pre-Shaping, *Jerry Prawiharjo, Nikita K. Daga, Rui Geng, David C. Hanna, David J. Richardson, David P. Shepherd; Optoelectronics Res. Ctr., Univ. of Southampton, UK.* We report the generation of a 12.6W average power, 50MHz repetition rate pulse train, compressible to high fidelity 170fs pulses, from an ultrafast ytterbium-doped fiber laser system via adaptive amplitude and phase pre-shaping.

MB15

µJ-Level Femtosecond and Picosecond Fiber Oscillators, *Bülend Ortaç[1], Martin Baumgartl[1], Oliver Schmidt[1], Jens Limpert[1], Ammar Hideur[2], Isabelle Sagnes[3], Arnaud Garnache[4], Andreas Tünnermann[1,5]; [1]Inst. of Applied Physics, Friedrich-Schiller-Univ. Jena, Germany, [2]Groupe d'Optique et d'Optronique, Univ. de Rouen, France, [3]Lab de Photonique et Nanotechnologie, CNRS, France, [4]Inst. d'Electronique du Sud, CNRS, Univ. Montpellier, France, [5]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* The generation of 1.1 µJ, 310 ps and 0.74 µJ, 711 fs pulses from an all-normal self-starting mode-locked Ytterbium-doped large-mode-area microstructure fiber laser is reported.

MB16

Timing Jitter of Mode-Locked Fiber Lasers, *Rüdiger Paschotta[1], Oliver Prochnow[2], Dieter Wandt[2], Uwe Morgner[2], Dietmar Kracht[2]; [1]RP Photonics Consulting GmbH, Switzerland, [2]Laser Zentrum Hannover, Germany.* We have investigated the timing jitter of fiber lasers with strong spectral broadening and filtering and present both theoretical and experimental results. In various aspects, such lasers differ from soliton fiber lasers and bulk lasers.

MB17

Generation of High Energy and High Quality Ultrashort Pulses in Moderately Nonlinear FCPA, *Yoann Zaouter[1,2], Johan Boullet[1], Eric Mottay[2], Eric Cormier[1]; [1]Ctr. Lasers Intenses et Applications, Univ. de Bordeaux 1, France, [2]Amplitude Systemes, France.* We report on the generation of high temporal quality 100 microJoule and 270 fs pulses from a compact moderately non-linear fiber chirped pulse amplifier with mistmatched grating stretcher and compressor units.

MB18

Femtosecond Pulse Generation Using Ground-State and Excited-State Transitions in Quantum-Dot SESAMs, *Christopher G. Leburn[1], Nikolaus K. Metzger[1], Alexander A. Lagatsky[1], Christian T. A. Brown[1], Wilson Sibbett[1], Matthew Lumb[2], Edmund Clarke[2], Raymond Murray[2]; [1]Univ. of St Andrews, UK, [2]Imperial College London, UK.* Stable mode locking is demonstrated in a Cr^{4+}:forsterite laser incorporating quantum-dot SESAMs operating either through ground-state or excited-state transitions to initiate and maintain the generation of pulses as short as 100fs and 122fs respectively.

MB19

870-fs Passively Mode-Locked Quantum Dot SESAM Semiconductor Disk Laser, *Keith G. Wilcox[1], Mantas Butkus[1], Anne Tropper[2], Ian Farrer[3], David A. Ritchie[3], Edik U. Rafailov[1]; [1]School of Engineering, Physics and Mathematics, Univ. of Dundee, UK, [2]School of Physics and Astronomy, Univ. of Southampton, UK, [3]Cavendish Lab, Univ. of Cambridge, UK.* We report a sub-picosecond pulse train generated by a passively mode-locked QD-SESAM Semiconductor Disk Laser. We obtained 870-fs pulses at a repetition rate of 895MHz with average output power of 45mW at 1027.5nm.

MB20

Influence of Preliminary Electron Feeding on Breakdown of Air by Laser, *Hirohide Furutani[1], Keita Kawana[2], Naoya Shimomura[2], Makihito Nishioka[2], Eiichi Takahashi[1]; [1]AIST, Japan, [2]Univ. of Tsukuba, Japan.* We examined the influence of preliminary feeding of electrons from the small breakdown produced by the femtosecond laser pulse into the breakdown produced by nanosecond laser pulse. We also observed the patterns of plasma emissions.

MB21

Double-Pass Single Mode ECOPO with Achromatic Phase-Adaptation, *Sylvain Guilbaud, Antoine Berrou, Myriam Raybaut, Antoine Godard, Michel Lefebvre; ONERA, France.* We report on a new ECOPO architecture for nanosecond OPO with low oscillation threshold and narrow linewidth. We demonstrate open loop single longitudinal mode operation over several hours with short term stability of 5 MHz.

MB22

Intracavity Frequency Mixing in a Semiconductor Disk Laser Generating >100mW in the Yellow-Orange, *Jennifer E. Hastie[1], Martin Thalbitzer Andersen[2], Martin D. Dawson[1], Peter Tidemand-Lichtenberg[2]; [1]Inst. of Photonics, Univ. of Strathclyde, UK, [2]Technical Univ. of Denmark, Denmark.* More than 100mW of ~593nm continuous wave output was generated by mixing the 980mW beam from a 1342nm Nd:YVO_4 laser with the intracavity beam of an InGaAs semiconductor disk laser with centre wavelength ~1064nm.

MB23

High-Efficiency Diode-Pumped Intracavity Frequency-Doubled Nd:YAG/$SrWO_4$/KTP Raman Laser, *Xingyu Zhang, Qingpu Wang, Shutao Li, Xiaohan Chen, Zhenhua Cong, Shuzhen Fan, Zhaojun Liu; School of Information Science and Engineering, Shandong Univ., China.* The characteristics of a high-efficiency diode-pumped actively Q-switched intracavity KTP frequency-doubled Nd:YAG/$SrWO_4$ Raman laser is presented. The obtained maximum optical conversion efficiency from laser diode to yellow laser is 11.1%.

MB24

Tunable Phase-Stabilized Infrared Parametric Laser Source, *Chunmei Zhang[1], Jianliang Wang[1], Pengfei Wei[1], Liwei Song[1], Chuang Li[1], Cheol-Jung Kim[2], Yuxin Leng[1]; [1]Shanghai Inst. of Optics and Fine Mechanics, CAS, China, [2]Korea Atomic Energy Res. Inst., Democratic People's Republic of Korea.* Tunable self-phase-stabilized infrared laser pulses have been generated from a two-stage OPA. The output pulses are tunable 1.3μm-2.3μm and the max-energy is higher than 1mJ. The cep is ~0.15 rad for longer than one hour.

MB25

Electro-Optic PPLN Bragg Q-switch Integrated with Wavelength Converter in a Bulk PPLN Crystal, *Yen-Yin Lin, Shou-Tai Lin, Yen-Chieh Huang; Inst. of Photonics Technologies, Natl. Tsinghua Univ., Taiwan.* We demonstrate a PPLN crystal as an electro-optic Bragg modulator. Using the PPLN crystal, we report an integrated temperature-insensitive laser Q-switch and temperature-tuned wavelength converter with 35% parametric conversion efficiency in a Nd:YVO_4 laser system.

MB26

Second Harmonic Generation of Strongly Aberrated Beams in DKDP and LBO, *Gabriel Mennerat[1], Jacques Rault[1], Moana Pittman[2], Gilles Chériaux[3], Jean-Paul Chambaret[3], Philippe Villeval[4], Bruno Rainaud[4], Hervé Albrecht[4], Dominique Lupinski[4]; [1]Commissariat a l'Energie Atomique (CEA), France, [2]Lab d'Interaction du Rayonnement X avec la Matière, Univ. Paris-Sud, France, [3]ENSTA, Ecole Polytechnique, France, [4]Cristal Laser, France.* Substituting LBO for DKDP, we demonstrate and analyze a ×1.6 enhancement in frequency doubling effciency of high-energy strongly aberrated beams.

MB27

High Brightness 2 μm Source Based on A Type II Doubly Resonant ECOPO, *Myriam Raybaut[1], Antoine Berrou[1], Antoine Godard[1], Ajmal Mohamed[1], Michel Lefebvre[1], Fabien Marnas[2], Dimitri Edouart[2], Pierre Flamant[2], Axel Bohman[3], Peter Geiser[3], Peter Kaspersen[3]; [1]ONERA, France, [2]Lab de Météorologie Dynamique (LMD), Ecole Polytechnique, France, [3]Norsk Elektro Optikk A/S (NEO), Norway.* For CO2 DIAL, the single mode output of a type II PPLN, entangled-cavity nanosecond OPO is amplified to 11 mJ at 2.05 μm, with 3MHz frequency stability and a M^2 quality factor better than 1.9.

MB28

A Continuous-Wave, Yellow, Intracavity Doubled, Self-Raman Laser with 2.25-W Output Power, *Andrew J. Lee, Helen M. Pask, Peter Dekker, James A. Piper; Macquarie Univ., Australia.* We report the generation of high power, continuous-wave yellow emission from a frequency-doubled, self-Raman laser. Output power of 2.25 W at 586.5 nm is achieved with a diode to yellow conversion efficiency of 13.2%.

MB29

Fabrication of a Stress-Induced Nd:YAG Channel Waveguide Laser Using fs-Laser Pulses, *Jörg Siebenmorgen, Thomas Calmano, Klaus Petermann, Günter Huber; Inst. of Laser-Physics, Univ. of Hamburg, Germany.* Using a fs-laser tracks were written in Nd:YAG. Due to stress induced birefringence waveguiding is possible in channels surrounding the tracks. Laser oscillation was achieved with an output-power of 132mW at 284mW of pump-power.

MC • Novel Oscillators I

Grand Ballroom
11:30 a.m.–1:00 p.m.
MC • Novel Oscillators I
Alphan Sennaroglu; Koç Univ., Turkey, Presider

MC1 • 11:30 a.m. **Invited**
Pulse Energies Exceeding 20 μJ Directly from a Subpicosecond Yb:YAG Oscillator by Use of Active Angular Multiplexing, *Joerg Neuhaus[1,2], Dominik Bauer[1,2], Jochen Kleinbauer[2], Alexander Killi[2], Sascha Weiler[2], Dirk H. Sutter[2], Thomas Dekorsy[1]; [1]Univ. of Konstanz, Germany, [2]TRUMPF-Laser GmbH + Co. KG, Germany.* We demonstrate the generation of pulses with twenty-five microjoules of energy generated from a thin-disk oscillator at a repetition rate of 2.94MHz, corresponding to an average output power of seventy-six watts.

MC2 • 12:00 p.m.
Chirped-Pulse and Solitary Mode-Locked Yb:KLuW Thin-Disk Laser Oscillator, *Guido Palmer[1], Marcel Schultze[1], Martin Siegel[1], Moritz Emons[1], Andy Steinmann[1], Uwe Morgner[1,2]; [1]Inst. of Quantum Optics, Leibniz Univ. Hannover, Germany, [2]Laser Zentrum Hannover e.V., Germany.* We present a mode-locked $Yb:KLu(WO_4)_2$ thin-disk laser oscillator delivering 25 W of average output power. The laser performance of chirped-pulse operation in the positive dispersion regime is compared with solitary operation.

MC3 • 12:15 p.m.
Ultra-Short Pulses from Diode-Pumped Yb^{3+}-Doped Crystal and Ceramic Lasers with High Average Power, *Masaki Tokurakawa[1], Akira Shirakawa[1], Ken-ichi Ueda[1], Rigo Peters[2], Susanne Fredrich-Thornton[2], Klaus Petermann[2], Günter Huber[2], Hideki Yagi[3], Takagimi Yanagitani[3], Alexsander A. Kaminskii[4]; [1]Univ. of Electro-Communications, Japan, [2]Inst. für Laser Physik, Univ. Hamburg, Germany, [3]Takuma Works, Konoshima Chemical Co. Ltd., Japan, [4]Inst. of Crystallography, RAS, Crystal Laser Physics, Russian Federation.* From $Yb^{3+}:Sc_2O_3$, $Yb^{3+}:Lu_2O_3$ crystals and an $Yb^{3+}:Y_2O_3$ ceramic, sub-70 fs pulses with above 500 mW average power were obtained, respectively. Additionally, 128 fs pulses with 1.35 W average power were achieved with an Yb:YAG ceramic.

MC4 • 12:30 p.m.
A New Mixed Sesquioxide $Yb:LuScO_3$: Spectroscopic Properties and Highly Efficient Thin-Disk Laser Operation, *Rigo Peters, Klaus Petermann, Günter Huber; Inst. of Laser-Physics, Univ. of Hamburg, Germany.* Spectroscopic properties and laser-operation of $Yb:LuScO_3$ are reported for the first time. Using the thin disk geometry 32.9W of output-power at 1039nm with a slope-efficiency of 81% was obtained from a 0.2mm-thick, 3.15at% Yb-doped disk.

MC5 • 12:45 p.m.
Resonant Dispersive Effects in Optically Pumped Yb:KYW, *Stephanie A. Meyer[1,2], Scott A. Diddams[2]; [1]Dept. of Physics, Univ. of Colorado, USA, [2]NIST, USA.* We measured Yb:KYW's pump-power dependent group-velocity dispersion (GVD) using white-light interferometry around 1030 nm. Resonant contributions from the laser transitions changed the GVD by 100's of fs^2.

1:00 p.m.–2:30 p.m.
Lunch Break

MD • Fiber and Waveguide Lasers and Amplifiers

Grand Ballroom
2:30 p.m.–4:00 p.m.
MD • Fiber and Waveguide Lasers and Amplifiers
John Minelly; Coherent, Inc., USA, Presider

MD1 • 2:30 p.m. **Invited**
Spatially Structured Light in Optical Fibers: Applications to High-Power Lasers, *Siddharth Ramachandran; OFS Labs, USA.* We review advances in the state-of-the-art of high-power fiber-amplifiers where signal propagation is forced to occur in higher-order spatial modes–a regime in which recent demonstrations have pointed towards significant advantages in mode-area scalability.

MD2 • 3:00 p.m.
High Energy and High Power Pulsed Chirally-Coupled Core Fiber Laser System, *Chi-Hung Liu[1,2], Shenghong Huang[1], Cheng Zhu[1], Almantas Galvanauskas[1]; [1]Ctr. for Ultrafast Optical Science, Univ. of Michigan, USA, [2]Arbor Photonics Inc., USA.* Pulsed amplifier using chirally-coupled-core Yb-doped double-clad fiber is demonstrated at average powers above 100W and 10-ns pulse energies exceeding 1mJ, with pure single-mode output at all powers and energies independently from coiling and excitation conditions.

MD3 • 3:15 p.m.
325 W Average Power of Femtosecond Pulses from a Fiber Laser System, *Tino Eidam[1], Fabian Röser[1], Jan Rothhardt[1], Steffen Hädrich[1], Enrico Seise[1], Thomas Gottschall[1], Thomas Schreiber[2], Jens Limpert[1], Andreas Tünnermann[1,2]; [1]Inst. of Applied Physics, Friedrich Schiller Univ. Jena, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* An average power of 325-W is extracted from a high repetition rate (40MHz) fiber-CPA-system. The compressed pulse duration of 375-fs leads to a peak-power of 22-MW. Further scaling potential towards kW-level will be discussed.

MD4 • 3:30 p.m.

Sub-100-fs Pulses at Watt-Level Powers from a Fiber Laser, *Khanh Kieu, Will Renninger, Andy Chong, Frank Wise; Cornell Univ., USA.* We report a mode-locked fiber laser that generates 31-nJ chirped pulses at 70-MHz repetition rate, for an average power of 2.2 W. After dechirping outside the cavity, 80-fs pulses, with 200-kW peak power, are obtained.

MD5 • 3:45 p.m.

Ultrafast Laser Written 102 mW Monolithic Waveguide Laser in Yb-Doped Phosphate Glass, *Martin Ams, Peter Dekker, Graham D. Marshall, Michael J. Withford; Macquarie Univ., Australia.* A femtosecond laser-written waveguide laser based on a DFB architecture and fabricated in ytterbium doped phosphate glass is reported. The device lased at 1033nm with an output power of 102mW and a bandwidth < 2pm.

Imperial Ballroom
4:00 p.m.–4:30 p.m.
Coffee Break

ME • Optically-Pumped Semiconductor Lasers

Grand Ballroom
4:30 p.m.–6:00 p.m.
ME • Optically-Pumped Semiconductor Lasers
Kurt J. Weingarten; Time-Bandwidth Products Inc., Switzerland, Presider

ME1 • 4:30 p.m. Invited

Semiconductor Disk Lasers: Recent Developments in Bulk and Micro-Lasers, *Martin Dawson, Jennifer E. Hastie, Stephane Calvez, Nicolas Laurand, David Burns, Alan J. Kemp; Inst. of Photonics, Univ. of Strathclyde, UK.* We review the status of semiconductor disk lasers, an attractive emerging laser technology combining the wavelength versatility of III-V semiconductors with the cavity design and control flexibility of diode-pumped solid-state lasers.

ME2 • 5:00 p.m.

Efficient High-Power VECSEL Generates 20 W Continuous-Wave Radiation in a Fundamental Transverse Mode, *Benjamin Rudin, Andreas Rutz, Deran J. H. C. Maas, Aude-Reine Bellancourt, Emilio Gini, Thomas Südmeyer, Ursula Keller; ETH Zurich, Switzerland.* We demonstrate a 960-nm VECSEL generating 20 W continuous-wave output power in TEM_{00} transverse mode. The highly efficient laser has a slope efficiency of 49% and an overall optical-to-optical efficiency of 43%.

ME3 • 5:15 p.m.

InGaAs-AlGaAs Disk Laser Generating sub-220-fs Pulses and Tapered Diode Amplifier with Ultrafast Pulse Picking, *Peter Klopp[1], Uwe Griebner[1], Martin Zorn[2], Andreas Klehr[2], Armin Liero[2], Götz Erbert[2], Markus Weyers[2]; [1]Max-Born-Inst., Germany, [2]Ferdinand-Braun-Inst., Germany.* The femtosecond regime of mode-locked InGaAs/AlGaAs disk lasers was investigated, resulting in almost chirpfree sub-220-fs pulses. Pulse picking using a tapered diode amplifier is demonstrated, reducing the pulse rate from 3 GHz to 47 MHz.

ME4 • 5:30 p.m.

70-fs Transform-Limited Pulses Emitted by InGaAs/GaAs Quantum Well Laser, *Keith G. Wilcox[1], Zakaria Mihoubi[2], Stephen Elsmere[2], Adrian Quarterman[2], Ian Farrer[3], David A. Ritchie[3], Anne Tropper[2]; [1]Univ. of Dundee, UK, [2]Univ. of Southampton, UK, [3]Univ. of Cambridge, UK.* We observe near-transform-limited 70-fs pulses, stable over ~10^{10} round trips, and stable 260-fs transform-limited pulse trains from an optical Stark mode-locked vertical-external-cavity surface-emitting InGaAs/GaAs quantum well laser operating at 1040 nm.

ME5 • 5:45 p.m.

First Modelocked Quantum Dot Vertical External Cavity Surface Emitting Laser, *Martin Hoffmann[1], Yohan Barbarin[1], Deran J. H. C. Maas[1], Matthias Golling[1], Thomas Südmeyer[1], Ursula Keller[1], Igor L. Krestnikov[2], Sergey S. Mikhrin[2], Alexey R. Kovsh[2]; [1]ETH Zurich, Switzerland, [2]Innolume GmbH, Germany.* We report the first successful modelocking of a VECSEL with a quantum dot gain region. We obtain 27.4 mW average output power at 1059 nm wavelength in 18 ps pulses with 2.57 GHz repetition rate.

6:00 p.m.–8:00 p.m.
Dinner Break

MF • Postdeadline Paper Session

Grand Ballroom
8:00 p.m.–10:00 p.m.
MF • Postdeadline Paper Session
James Kafka; Newport Corp., USA, Presider

•Tuesday, February 3, 2009•

Grand Ballroom Foyer
7:30 a.m.–1:00 p.m.
Registration Open

TuA • Brightness Scaling and Beam Combining

Grand Ballroom
8:00 a.m.–10:00 a.m.
TuA • Brightness Scaling and Beam Combining
Gregory D. Goodno; Northrop Grumman Corp., USA, Presider

TuA1 • 8:00 a.m. **Invited**
Diode Lasers for Pumping Solid-State Laser: Overview of Current Technology and Means for Scaling of Power and Brightness, *Stefan Heinemann; Fraunhofer USA, Ctr. for Laser Technology, USA.* The requirements for diode pumping of disk, slab and fiber lasers is discussed. The state-of-the art and means for scaling of power and brightness to fit the specific laser designs will be reviewed.

TuA2 • 8:30 a.m.
Power Scaling of High Brightness 980 nm Yb-Doped Fiber Laser: Detailed Study and Experiment, *Fabian Röser[1], Cesar Jauregui[1], Jens Limpert[1], Andreas Tünnermann[2]; [1]Inst. of Applied Physics, Friedrich-Schiller-Univ. Jena, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* We report on a detailed study on 980nm emission in Yb-fiberlasers highlighting the appropriateness of a short-length LMA PCF as gain medium. An experimental realization resulted in 94W output power in a close-to-diffraction-limited beam.

TuA3 • 8:45 a.m.
Single Mode Fiber Laser Emitting 94 W at 977 nm, *Johan Boullet[1], Yoann Zaouter[1,2], Rudy Desmarchelier[1], Matthieu Cazaux[1], François Salin[3], Eric Cormier[1]; [1]CELIA, Univ. de Bordeaux, France, [2]Amplitude Systemes, France, [3]EOLITE Systems, France.* We have demonstrated a photonic crystal fiber laser emitting up to 94 W of average power at 977 nm with a diffraction limited beam quality.

TuA4 • 9:00 a.m.
High Power Spectral Beam Combining of Four 2ns-Pulsed Fiber-Amplifiers, *Oliver Schmidt[1], Thomas V. Andersen[2], Jens Limpert[1], Andreas Tünnermann[1,3]; [1]Inst. of Applied Physics, Friedrich Schiller Univ Jena., Germany, [2]KOHERAS, Denmark, [3]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* Four 2ns-pulsed fiber amplifier systems are spectrally combined on a dielectric reflection grating to a total output power of 187W at 50kHz repetition rate resulting in >3.7mJ of pulse energy and 1.7MW pulse peak power.

TuA5 • 9:15 a.m.
400-W, High Efficiency Coherent Combination of Fiber Lasers, *Peter A. Thielen[1], James G. Ho[1], Michael Hemmat[1], Gregory D. Goodno[1], Robert R. Rice[1], Josh Rothenberg[1], Michael Wickham[1], David J. Gallant[2], Jeffrey T. Baker[2], Arthur R. Lucero[2], Anthony D. Sanchez[3], Thomas M. Shay[3], Craig A. Robin[3], Christopher L. Vergien[3], Clint M. Zeringue[3]; [1]Northrop Grumman Space Technology, USA, [2]Boeing LTS Inc., USA, [3]AFRL, USA.* Five high-power fiber laser amplifiers were actively phase-locked using a single-element, reference-free phase sensor. The phase-locked lasers were combined with 87% efficiency using a diffractive optical element to generate 396-W beam with M^2=1.1.

TuA6 • 9:30 a.m.
Coherent Beam Combination Using Multi-Core Leakage-Channel Fibers, *I. Hartl, A. Marcinkevičius, H. A. McKay, L. Dong, M. E. Fermann; IMRA America, Inc., USA.* A hexagonally stacked all-glass multi-core leakage-channel fiber consisting of seven 51µm diameter fused silica cores was fabricated. Negligible mode-coupling between the localized core modes and their independent phase-control using a segmented MEMS mirror is demonstrated.

TuA7 • 9:45 a.m.
Numerical and Experimental Study of a High-Power Narrow-Line Phase-Locked Tapered Lasers Array in External Cavity, *David Paboeuf[1], Gaëlle Lucas-Leclin[1], Patrick Georges[1], Nicolas Michel[2], Michel Krakowski[2], Jun J. Lim[3], Slawomir Sujecki[3], Eric C. Larkins[3]; [1]Lab Charles Fabry de l'Inst. d'Optique, Univ. Paris-Sud, France, [2]Alcatel-Thales III-V Lab, France, [3]School of Electronic and Electrical Engineering, Univ. of Nottingham, UK.* We describe both coherent combining and wavelength stabilization of 10 tapered lasers in an external Talbot cavity with a volume Bragg grating. 1.7W at 976 nm in a narrow bandwidth, high coherent beam are obtained.

Imperial Ballroom
10:00 a.m.–11:30 a.m.
Exhibit Open, Coffee Break

TuB • Student Poster Session: Poster Session II

Imperial Ballroom
10:00 a.m.–11:30 a.m.
TuB • Student Poster Session: Poster Session II

TuB1
Simultaneous Repetition Rate Multiplication and Amplification of a Femtosecond Laser by Injection Locking, *Stephanie A. Meyer[1,2], Matthew S. Kirchner[1,2], R. Jason Jones[3], Scott A. Diddams[1]; [1]NIST, USA, [2]Univ. of Colorado at Boulder, USA, [3]College of Optical Sciences, Univ. of Arizona, USA.* An 870 MHz laser cavity is injection-locked by a 174 MHz femtosecond laser. We study effects of pump power and output coupling on the output power, optical spectrum and microwave spectrum of the slave laser.

TuB2

Generation of Mid-Infrared Ultrashort Pulses in DAST, *Yoshihiro Toya[1], Shunsuke Yamamoto[1], Takuya Satoh[1], Tsutomu Shimura[1], Kazuo Kuroda[1], Satoshi Ashihara[2,3], Yoshinori Takahashi[4], Masashi Yoshimura[4], Yusuke Mori[4], Takatomo Sasaki[4]; [1]Univ. of Tokyo, Japan, [2]Tokyo Univ. of Agriculture and Technology, Japan, [3]PRESTO, JST, Japan, [4]Graduate School of Engineering, Osaka Univ., Japan.* Tunable mid-infrared ultrashort pulses are generated by difference frequency mixing in DAST. The spectrum extends over the wavelength of 10-30 μm. The pulse duration is determined to be 370 fs by the cross-correlation measurement.

TuB3

Passively Mode-Locked Chirped-Pulse Fiber Oscillators: Study on Dispersion, *Martin Baumgartl[1], Bülend Ortaç[1], Jens Limpert[1], Andreas Tünnermann[1,2]; [1]Inst. of Applied Physics, Friedrich Schiller Univ. Jena, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* The dispersion issue in a passively mode-locked Yb-doped chirped-pulse fiber oscillator is studied. Stable mode-locked operation is demonstrated from highly negative up to extremely positive total cavity dispersion values.

TuB4

Passive Synchronization of Femtosecond Er:Fiber Laser and Yb:Fiber Laser by Injection Mode Locking, *Chun Zhou, Yue Cai, Peng Li, Shiying Cao, Zhigang Zhang; Inst. of Quantum Electronics, Univ. of Beijing, China.* We demonstrate a self-starting passively synchronized Er and Yb fiber laser system. Synchronization was implemented by the master-slave configuration and the RMS timing jitter between two lasers was measured as 11 fs in one second.

TuB5

Energy Scaling in a Chirped Volume Bragg Grating Based Yb-Fiber CPA System, *Matthew Rever[1], Vadim I. Smirnov[2], Leonid Glebov[3], Almantas Galvanauskas[1]; [1]Univ. of Michigan, USA, [2]OptiGrate, USA, [3]College of Optics and Photonics, CREOL, Univ. of Central Florida, USA.* The viability of using chirped volume Bragg gratings for mJ-scale CPA systems is demonstrated. A CVBG-based fiber-CPA system with 0.4mJ amplified and 290μJ recompressed energy from a CVBG compressor is reported.

TuB6

Ultra-Compact CPA-System with Intrinsic Phase-Compensation, *Damian N. Schimpf[1], Enrico Seise[1], Jens Limpert[1], Andreas Tünnermann[1,2]; [1]Inst. of Applied Physics, Friedrich Schiller Univ. Jena, Germany, [2]Fraunhofer Inst., Applied Optics and Precision Engineering, Germany.* Phase-compensation in ultra-compact nonlinear CPA systems employing chirped volume Bragg gratings as stretcher and compressor is demonstrated. It is based on compensation of nonlinear phase with phases due to the dispersion of the amplifiers.

TuB7

Analysis of Nonlinear CPA-Systems with Real Input Pulses, *Damian N. Schimpf[1], Enrico Seise[1], Jens Limpert[1], Andreas Tünnermann[2,1]; [1]Inst. of Applied Physics, Friedrich Schiller Univ. Jena, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* We analyze the impact of small amplitude and phase modulations of the input pulse on the pulse contrast at the output of nonlinear CPA-systems. The Kerr-effect precludes nonlinear amplification if the initial pulse-quality is low.

TuB8

Optically Synchronized Frontend for High-Power Short-Pulse OPCPA System, *Izhar Ahmad[1], Sergei Trushin[1], Zsuzsanna Major[1,2], Christoph Wandt[1], Sandro Klingebiel[1], Vladimir Pervak[1,2], Antonia Popp[1], Tie-Jun Wang[1], Mathias Siebold[1,3], Alexander Apolonskiy[1,2], Ferenc Krausz[1,2], Stefan Karsch[1]; [1]Max-Planck Inst. for Quantum Optics, Germany, [2]Ludwig-Maximilians-Univ. München, Germany, [3]Inst. für Optik und Quantenelektronik, Friedrich Schiller Univ. Jena, Germany.* We present the development of a light source for synchronous seeding of both the pump laser and optical parametric chirped pulse amplification (OPCPA) chain of a high power Petawatt Field Synthesizer (PFS).

TuB9

Counteracting Gain Narrowing Using Spectral Amplitude Shaping in a High-Energy Diode-Pumped CPA System Based on Yb-Doped Materials, *Sandro Klingebiel[1], Christoph Wandt[1], Mathias Siebold[1,2], Zsuzsanna Major[1,3], Izhar Ahmad[1], Sergei Trushin[1], Rainer Hörlein[1], Tie-Jun Wang[1], Ferenc Krausz[1,3], Stefan Karsch[1,3]; [1]Max-Planck-Inst. für Quantenoptik, Germany, [2]Inst. für Optik und Quantenelektronik, Friedrich Schiller Univ. Jena, Germany, [3]Dept. für Physik, Ludwig-Maximilians-Univ. München, Germany.* Amplification of 3.5nm bandwidth in Yb:YAG to pulse energies of 300mJ at 10Hz repetition rate is shown. A spatial light modulator (SLM) introduces spectral amplitude shaping for preserving bandwidth, extending the limit of gain narrowing.

TuB10

Passively Mode-Locked Self-Starting Cr:Forsterite Laser Using a Carbon Nanotube Saturable Absorber, *Won Bae Cho[1], Jong Hyuk Yim[1], Sun Young Choi[1], Soonil Lee[1], Uwe Griebner[2], Valentin Petrov[2], Fabian Rotermund[1]; [1]Ajou Univ., Republic of Korea, [2]Max-Born-Inst., Germany.* A Cr:forsterite laser passively mode-locked with a transmission-type single-walled carbon nanotube saturable absorber delivers pulses as short as 120 fs near 1.25 μm with a maximum average power of 202 mW at 79.1 MHz.

TuB11

Growth Parameter Optimization for Fast Quantum Dot Semiconductor Saturable Absorber Mirrors (QD-SESAMs), *Deran J. H. C. Maas, Martin Hoffmann, Aude-Reine Bellancourt, Benjamin Rudin, Yohan Barbarin, Matthias Golling, Thomas Südmeyer, Ursula Keller; ETH Zurich, Switzerland.* We present the first systematic study on QD-SESAM growth parameters and post-growth annealing. We achieve low saturation fluence and fast recovery, which is important for increasing repetition rate and reducing pulse duration in ultrafast lasers.

TuB12

Realization of Hetero Composite Laser Materials, *Pierre-Olivier Petit[1], Cédric Boissière[1], Philippe Goldner[1], Bruno Viana[1], Julien Didierjean[2], Francois Balembois[2], Frédéric Druon[2], Patrick Georges[2]; [1]Lab de Chimie de la Matière Condensée de Paris, Univ. Pierre et Marie Curie, France, [2]Lab Charles Fabry de Inst. d'Optique, Univ. Paris-Sud, France.* A low-cost method based on sol-gel technique has been developed to realize hetero-composite laser materials. Laser actions have been demonstrated in Er/Yb glass||sapphire and Nd:YVO_4||sapphire composites with significant improvements on thermal issues.

TuB13

Absolute Frequency Measurement of an Ultrastable Laser at 729nm with a Monolithic Frequency Comb, *Wei Zhang[1], Yan Ying Zhao[1], Hai Nian Han[1], Qiang Du[1], Hao Teng[1], Zhi Yi Wei[1], Hua Guan[2], Xue Ren Huang[2], Ke Lin Gao[2]; [1]Inst. of Physics, CAS, China, [2]Wuhan Inst. of Physics and Mathematics, CAS, China.* By use of a novel design monolithic frequency comb based on mode-locked Ti:sapphire laser, the absolute optical frequency of an ultrastable laser at 729nm is measured with relative uncertainty of 10^{-14} and repeatability of 10^{-11}.

TuB14

High Average Power Spectral Beam Combining of Yb-Doped Fiber Amplifiers, *Chr. Wirth[1], O. Schmidt[1], I. Tsybin[1], Thomas Schreiber[1], S. Böhme[1], T. Peschel[1], T. Clausnitzer[2], F. Röser[2], J. Limpert[2], R. Eberhardt[1], A. Tünnermann[1]; [1]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany, [2]Inst. of Applied Physics, Friedrich Schiller Univ. Jena, Germany.* We report on our experimental results of spectral beam combination. Four fiber amplifiers have been combined to an average power of 1.2 kW with good beam quality. Limitations and further scaling strategies will be discussed.

TuB15

Tunable Yb:KYW Laser Using a Transversely Chirped Volume Bragg Grating, *Kai Seger, Björn Jacobsson, Valdas Pasiskevicius, Fredrik Laurell; Laser Physics KTH, Royal Inst. of Technology, Sweden.* An Yb:KYW laser was locked using a transversely chirped volume-Bragg-grating. Translating the grating, the laser tuned from 997 nm to 1015 nm, with spectral bandwidth of 13 GHz and power up to 3.0 W.

TuB16

High Power Laser with Yb:YAG Single Crystal Fibers Directly Grown by the Micro-Pulling Down Technique, *Damien Sangla[1,2], Nicolas Aubry[2,3], Julien Didierjean[3], Didier Perrodin[3], François Balembois[1], Kherreddine Lebbou[2], Alain Brenier[2], Patrick Georges[1], Jean-Marie Fourmigué[3]; [1]Lab Charles Fabry de Inst. d'Optique, Univ. Paris-Sud, France, [2]Lab de Physico-Chimie des Matériaux Luminescents, Univ. de Lyon, France, [3]Fibercryst, France.* Using Yb:YAG single-crystal fibers grown by the micro-pulling-down technique, we achieved 50-W of cw power for 200-W of pump power with a M^2 of 2.2. The millijoule-level of energy was reached in the Q-switched regime.

TuB17

275-fs Pulses from First Mode-Locked Yb:$LuScO_3$ Thin Disk Laser, *Cyrill R. Baer[1], Christian Kränkel[1], Oliver H. Heckl[1], Anna G. Engqvist[1], Matthias Golling[1], Thomas Südmeyer[1], Ursula Keller[1], Rigo Peters[2], Klaus Petermann[2], Günter Huber[2]; [1]Dept. of Physics, ETH Zurich, Switzerland, [2]Univ. of Hamburg, Germany.* The recently developed Yb:$LuScO_3$ gain material combines large emission bandwidth with good thermal conductivity. We demonstrate the first mode-locked Yb:$LuScO_3$ thin disk laser, obtaining 275-fs pulses at 67 MHz and 7.7 W average output power.

TuB18

Degradation of Laser Performance in Yb-Doped Oxide Thin-Disk Lasers at High Inversion Densities, *Susanne T. Fredrich-Thornton, Rigo Peters, Klaus Petermann, Günter Huber; Inst. of Laser-Physics, Univ. of Hamburg, Germany.* Inversion dependent losses have been observed in Yb:Lu_2O_3 and Yb:YAG thin-disk lasers leading to significant heating. A degradation of laser performance over time is found for Yb:Lu_2O_3. The different behaviour of the materials is discussed.

TuB19

12.0-W Diode-End-Pumped CW Operation at 912 nm in Nd:$GdVO_4$ Laser at Room Temperature, *Fei Chen, Xin Yu, Jing Gao, Xudong Li, Renpeng Yan, Junhua Yu, Zhonghua Zhang; Harbin Inst. of Technology, China.* 12.0-W CW 912 nm laser is obtained in LD-pumped Nd:$GdVO_4$ at room temperature, with optical-to-optical efficiency of 22.5% and slope efficiency of 27.8%. Using 808 nm π-polarized pump source, the efficiency is increased evidently.

TuB20

New Approaches for the Dynamic 3-D Simulation of Solid-State Lasers, *Matthias Wohlmuth, Konrad Altmann, Christoph Pflaum; Univ. Erlangen-Nuremberg, Germany.* New simulation methods for solid-state lasers are presented: We describe a dynamic multimode analysis to model mode competition and Q-switching. Furthermore, we propose a 3-D finite element analysis of the electric field without mode decomposition.

TuB21

Efficient Broadband Raman Generation in Diamond Driven by Multi-Frequency Femtosecond Pulses, *Xi Wang, Miaochan Zhi, Alexei V. Sokolov; Dept. of Physics and Inst. for Quantum Studies, Texas A&M Univ., USA.* We demonstrate efficient generation of multiple spatially-separated and frequency-shifted anti-Stokes and Stokes sidebands due to strong near-resonant excitation of Raman transition by crossing two- or three-color femtosecond laser pulses into diamond.

TuB22

High Peak Power Flattop Picosecond Pulses for Parametric Amplification, *Jan Rothhardt[1], Steffen Hädrich[1], Jens Limpert[1], Andreas Tünnermann[1,2]; [1]Friedrich Schiller Univ. Jena, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* We report on an Yb doped fiber amplifier system temporarily synchronized to a broad bandwidth Ti:Sa oscillator delivering 380 μJ infrared pulses which are frequency-doubled to 175 μJ flattop shaped pulses suitable for OPCPA pumping.

TuB23

Observation of Thermal-Induced Optical Guiding and Bistability in Mid-Infrared Continuous-Wave, Singly Resonant Optical Parametric Oscillator, *Shoutai Lin, Yenyin Lin, Yenchieh Huang, JowTsong Shy; Natl. Tsinghua Univ., Taiwan.* We report the thermal-induced optical guiding and bistability in a mid-infrared continuous-wave, SRO at ~3.2 μm. When the pump power reaches the guiding threshold at 16.5 W, the parametric efficiency shows an increase of 2.5.

TuB24

Fabrication of Quasi-Phase-Matched Devices by Use of the Room-Temperature-Bonding Technique, *Munenori Kawaji, Ken Imura, Tomohiko Yaguchi, Ichiro Shoji; Chuo Univ., Japan.* We propose a new versatile method for fabricating quasi-phase-matched devices: surface activated direct plate bonding at room temperature. We have succeeded in bonding six GaAs plates and obtained good optical quality at the bonded interfaces.

TuB25

Femtosecond Nonlinear Microscopy and Photomanipulation Based on a Broadband Tunable Er/Yb:Fiber System, *Daniel Träutlein[1], Alfred Leitenstorfer[1], Martin Deibler[2], Elisa Ferrando-May[2], Ulrike Camenisch[3], Hans-Peter Nägeli[3]; [1]Dept. of Physics and Ctr. for Applied Photonics, Univ. Konstanz, Germany, [2]Dept. of Biology and Ctr. for Applied Photonics, Univ. Konstanz, Germany, [3]Inst. of Pharmacology and Toxicology, Univ. of Zurich, Switzerland.* We present a versatile laser system for microscopy consisting of an Er:fiber oscillator and an Yb:amplifier. This system provides free wavelength choice over the entire visible spectrum as well as femtosecond pulses in the infrared.

TuB26

Narrow Linewidth Dual Volume-Bragg-Grating Locked Ytterbium-Doped Fiber-Laser, *Pär Jelger, Valdas Pasiskevicius, Fredrik Laurell; Applied Physics, Royal Inst. of Technology (KTH), Sweden.* Two identical highly reflective volume Bragg gratings are used in tandem to lock an ytterbium doped fiber laser. A narrow linewidth (<2GHz) and high efficiency (>70%) is achieved with output powers above 7W.

TuB27

Raman Threshold for CW Double-Clad Fiber Amplifiers, *Cesar Jauregui, Tino Eidam, Damian N. Schimpf, Jens Limpert, Andreas Tünnermann; Inst. of Applied Physics, Friedrich Schiller Univ. Jena, Germany.* We show that the classic Raman threshold formula is unsuitable to accurately predict the onset of Raman scattering in high-power CW fiber amplifiers. We propose a new analytical formula which accuracy is tested with simulations.

TuB28

Efficient Low-Threshold Multipass-Cavity Femtosecond Cr^{4+}:Forsterite Laser, *Huseyin Cankaya[1], James G. Fujimoto[2], Alphan Sennaroglu[1]; [1]Koç Univ., Turkey, [2]MIT, USA.* By using absorbed pump powers less than 2 W, we obtained pulses as short as 41 fs and pulse energies up to 5.1 nJ from a multipass-cavity Cr^{4+}:forsterite laser operated at 11.7 MHz repetition rate.

TuB29

Femtosecond Pulses Generation by Yb:GYSO Laser, *Binbin Zhou[1], Zhiyi Wei[1], Yongdong Zhang[1], Xin Zhong[1], Hao Teng[1], Lihe Zheng[2], Liangbi Su[2], Jun Xu[3]; [1]Inst. of Physics, CAS, China, [2]Shanghai Inst. of Optics and Fine Mechanics, CAS, China, [3]Shanghai Inst. of Ceramics, CAS, China.* We report the first demonstration of a femtosecnod Yb:GYSO laser. Pulses as short as 210 fs at the center wavelength of 1093 nm were obtained with the average power of 300 mW.

TuB30

Regenerative Spectral and Pulse Shaping of High Average Power Chirped Pulse Thin-Rod Yb:YAG Laser Amplifier, *Shinichi Matsubara[1,2], Shinya Okuda[3], Motoharu Tanaka[3], Masaki Takama[3], Takao Kobayashi[2], Sakae Kawato[1,2], Makoto Aoyama[4], Koichi Yamakawa[4]; [1]RIKEN/SPring-8 Ctr., Japan, [2]Graduate School of Engineering, Univ. of Fukui, Japan, [3]Fiber Amenity Engineering, Graduate School of Engineering, Univ. of Fukui, Japan, [4]Quantum Beam Science Directorate, JAEA, Japan.* Regenerative-spectral-and-pulse shaping of chirped-pulse thin-rod Yb:YAG amplifier has yielded an average-output-power of 18 W at 100-kHz PRF with an output-pulse-width of below 1.2 ps. An amplifiied bandwidth of 2.5 nm was also observed.

TuC • Nonlinear

Grand Ballroom
11:30 a.m.–1:30 p.m.
TuC • Nonlinear
Takunori Taira; Laser Res. Ctr. for Molecular Science, Inst. of Molecular Science, Japan, Presider

TuC1 • 11:30 a.m. Invited
Optical Parametric Oscillators for the Visible and Ultraviolet, *Majid Ebrahim-Zadeh[1,2]; [1]ICFO, The Inst. of Photonic Sciences, Spain, [2]ICREA, Spain.* New strategies for the generation of tunable coherent radiation in the visible and ultraviolet using optical parametric oscillators are outlined. Spectral regions from 250 to 740 nm are accessed in the cw and femtosecond time-scales.

TuC2 • 12:00 p.m.
Generation of Squeezed States of Light at 860 nm with Periodically Poled MgO:LiNbO$_3$ Crystal, *Genta Masada[1,2], Koyo Nagashima[1], Hidehiro Yonezawa[1], Tsuyoshi Suzudo[3], Yasuhiro Satoh[3], Hideki Ishizuki[4], Takunori Taira[4], Akira Furusawa[1]; [1]Dept. of Applied Physics, School of Engineering, Univ. of Tokyo, Japan, [2]Tamagawa Univ. Res. Inst., Japan, [3]Ricoh Co., Ltd, Japan, [4]Inst. of Molecular Science, Japan.* We report generation of squeezed light at 860nm by using a periodically poled MgO:LiNbO$_3$ crystal in a subthreshold optical parametric oscillator. At the pump power of 140mW we observed the squeezing level of -5.72 ±0.14dB.

TuC3 • 12:15 p.m.
Angular Quasi-Phase-Matched SHG and DFG in a 7%MgO:PPLN Crystal Sphere, *Pierre Brand[1], Benoît Boulanger[1], Patricia Segonds[1], Yannick Petit[1,2], Corinne Félix[1], Bertrand Ménaert[1], Hideki Ishizuki[3], Takunori Taira[3]; [1]Joseph Fourier Univ., France, [2]Univ. de Genève, Switzerland, [3]Inst. for Molecular Science, Japan.* We report the first measurements of angular quasi-phase-matched second harmonic generation and difference frequency generation over the entire transparency range of a 7%MgO:PPLN crystal cut as a sphere with a diameter of 3.9 mm.

TuC4 • 12:30 p.m.
Suppression of Forward Stimulated Raman Scattering in Periodically Poled Nonlinear Crystals, *Gustav Strömqvist, Valdas Pasiskevicius, Carlota Canalias, Fredrik Laurell; Laser Physics, KTH, Royal Inst. of Technology, Sweden.* Periodic ferroelectric domain inversion leads to modification of polariton dispersion and to efficient suppression of stimulated Raman scattering by phonon-polaritons. This physical mechanism can be employed for controlling stimulated Raman scattering.

TuC5 • 12:45 p.m.
Forward and Backward Terahertz-Wave Difference-Frequency Generations from Periodically Poled Lithium Niobate, *Tsong-Dong Wang, S. T. Lin, Y. Y. Lin, F. Y. Lin, Y. C. Huang; Natl. Tsing-Hua Univ., Taiwan.* We report terahertz-wave generation in the wavelength range of 190~210 and 457~507 μm from forward and backward difference frequency generations, respectively, in a 3.2-cm long multi-grating periodically poled lithium niobate (PPLN) crystal.

TuC6 • 1:00 p.m.
CdSiP$_2$: A New Nonlinear Optical Crystal for 1- and 1.5-Micron-Pumped Mid-IR Generation, *Peter G. Schunemann[1], Kevin T. Zawilski[1], Thomas M. Pollak[1], Valentin Petrov[2], David E. Zelmon[3]; [1]BAE Systems, USA, [2]Max-Born-Inst. for Nonlinear Optics and Ultrafast Spectroscopy, Germany, [3]US AFRL, AFRL/RXPS, USA.* CdSiP$_2$ is an exciting NLO crystal for mid-IR OPOs. Here we report reduced absorption losses, refined sellmeier coefficients, and a measured nonlinear coefficient - 84.5pm/V - far higher than other crystals pumped at 1μm.

TuC7 • 1:15 p.m.
Development of a Novel Multibeam Yb:KGd(WO$_4$)$_2$ Oscillator for Multifocal Nonlinear Microscopy, *Kraig E. Sheetz, Erich E. Hoover, Ramón Carriles, Jeff A. Squier; Colorado School of Mines, USA.* We present a novel Yb:KGd(WO$_4$)$_2$ oscillator design that generates six beams of temporally delayed, 253 fs, 11 nJ pulses. We demonstrate twelve simultaneously acquired two-photon, second-harmonic and/or third-harmonic images generated from six laterally separated foci.

1:30 p.m.–6:00 p.m. (individual times vary)
Lunch Break and Industry Tours (early RSVP required; see website for details)

Grand Ballroom
7:30 p.m.–10:00 p.m.
Conference Banquet

•Wednesday, February 4, 2009•

Grand Ballroom Foyer
7:30 a.m.–5:00 p.m.
Registration Open

WA • High-Field Sources I

Grand Ballroom
8:00 a.m.–9:30 a.m.
WA • High-Field Sources I
Christopher A. Ebbers; Lawrence Livermore Natl. Lab, USA, Presider

WA1 • 8:00 a.m.
Microwatt-Level XUV Frequency Comb via Intracavity High Harmonic Generation, *Dylan C. Yost, Thomas R. Schibli, Jun Ye; JILA, NIST and Univ. of Colorado at Boulder, USA.* We demonstrate microwatt-level XUV frequency combs produced by a cavity enhanced, ultra-coherent IR frequency comb. Cavity enhancement and efficient XUV output-coupling enable power-scaling >200MW. We present a study of the intensity dependence of the high-harmonics.

WA2 • 8:15 a.m.
High Repetition Rate–sub 30 fs–Gigawatt Peak Power Optical Parametric Amplifier Pumped by a Chirped Pulse Fiber Amplifier, *Jan Rothhardt[1], Steffen Hädrich[1], Fabian Röser[1], Jens Limpert[1], Andreas Tünnermann[1,2]; [1]Friedrich Schiller Univ. Jena, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* We present a parametric amplifier pumped by a high power fiber CPA system. Ultrashort pulses with 29 fs pulse duration and 2 GW peak power have been obtained by amplification of a spectrally broadened signal.

WA3 • 8:30 a.m.
Generation of 8 fs, 125 mJ Pulses through Optical Parametric Chirped Pulse Amplification, *Daniel Herrmann[1], Laszlo Veisz[1], Franz Tavella[2], Karl Schmid[1,3], Raphael Tautz[1], Alexander Buck[1], Vladimir Pervak[3], Ferenc Krausz[1,3]; [1]Max-Planck Inst. für Quantenoptik, Germany, [2]HASYLAB/DESY, Germany, [3]Ludwig-Maximilian-Univ. München, Germany.* We report generation of three-cycle, 8 fs, 125 mJ optical pulses in a noncollinear optical parametric chirped-pulse amplifier (NOPCPA). These 16 TW laser pulses are compressed to within 6% of their Fourier limit.

WA4 • 8:45 a.m.
High-Energy, Diode-Pumped CPA to the Joule-Level Based on Yb-Doped Materials, *Christoph Wandt[1], Sandro Klingebiel[1], Rainer Hörlein[1], Izhar Ahmad[1], Tie-Jun Wang[1], Sergei Trushin[1], Zsuzsanna Major[1,2], Mathias Siebold[1,3], Joachim Hein[3], Ferenc Krausz[1,2], Stefan Karsch[1,2]; [1]Max-Planck-Inst. für Quantenoptik, Germany, [2]Dept. für Physik, Ludwig-Maximilians-Univ. München, Germany, [3]Inst. für Optik und Quantenelektronik, Friedrich Schiller Univ. Jena, Germany.* We present the latest progress in developing a diode-pumped, Yb:YAG CPA pump laser. A pulse energy of 300mJ at a 10Hz repetition rate and close to 1J at 1Hz could be demonstrated.

WA5 • 9:00 a.m.
Femtosecond Field Synthesizer, *Stefan Rausch[1], Thomas Binhammer[2], Anne Harth[1], Franz X. Kärtner[3,4], Uwe Morgner[1,5]; [1]Inst. of Quantum Optics, Leibniz Univ. Hannover, Germany, [2]VENTEON Femtosecond Laser Technologies, Germany, [3]Dept. of Electrical Engineering and Computer Science, MIT, USA, [4]Res. Lab of Electronics, MIT, USA, [5]Laser Zentrum Hannover, Germany.* We present a few-cycle field synthesizer, consisting of an octave-spanning Ti:sapphire oscillator, a double-LCD pulse shaper and SPIDER pulse-characterization, a versatile tool for coherent control experiments of field sensitive processes and precision spectroscopy.

WA6 • 9:15 a.m.
Hollow-Core Fiber Compression of High Repetition Rate Fiber CPA Systems, *Steffen Hädrich[1], Jan Rothhardt[1], Tino Eidam[1], Jens Limpert[1], Andreas Tünnermann[1,2]; [1]Friedrich Schiller Univ. Jena, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* Nonlinear pulse compression by more than a factor of 10 in an 200 µm xenon-filled hollow fiber with subsequent chirped mirror compressor is presented yielding sub-60 fs pulses at repetition rates up to 100 kHz.

Imperial Ballroom
9:30 a.m.–11:00 a.m.
Exhibit Open, Coffee Break

WB • Fiber Lasers and Bulk Solid-State Lasers: Poster Session III

Imperial Ballroom
9:30 a.m.–11:00 a.m.
WB • Fiber Lasers and Bulk Solid-State Lasers: Poster Session III

WB1
High Power, Tunable, CW, Narrow Line Thulium Fiber Laser for Ranging Applications, *Vikas Sudesh, Timothy McComb, Robert Sims, Larry Shah, Martin Richardson; College of Optics and Photonics, Univ. of Central Florida, USA.* We have developed a narrow linewidth (0.3 nm), tunable (1981-2095 nm) Tm fiber-laser for ranging applications with a master oscillator power amplifier with ~100 W configuration. Power scaling to 200 W is underway.

WB2
High Efficiency 20W Single Frequency PM Fiber Amplifier at 2037nm, *Thomas Ehrenreich[1], V. Khitrov[1], G. Frith[1], J. Farroni[1], K. Farley[1], K. Tankala[1], A. Carter[1], S. Christensen[1], Bryce Samson[1], D. Machewirth[1], G. Goodno[2], L. Book[2], J. Rothenberg[2]; [1]Nufern, USA, [2]Northrop Grumman Space Technology, USA.* We demonstrate a high efficiency PM fiber amplifier delivering 20W output power and operating in conjunction with an external single frequency, seed source at 2037nm (linewidth ~100kHz). The system is not limited by SBS.

WB3

Diode-Pumped Very Large Core, Gain Guided, Index Antiguided Single Mode Fiber Laser, *Robert Sims[1], Vikas Sudesh[1], Timothy McComb[1], Ying Chen[1], Michael Bass[1], Martin Richardson[1], Andrew G. James[2], John Ballato[2], Anthony Siegman[3]; [1]College of Optics and Photonics, Univ. of Central Florida, USA, [2]Ctr. for Optical Materials Science and Engineering Technologies, Clemson Univ., USA, [3]Ginzton Lab, Stanford Univ., USA.* Single-mode laser action, up to 4-times the threshold power, in a diode-pumped Nd-doped phosphate glass fiber having a 300-μm core is demonstrated. Subtle differences associated with the effectiveness of diode-pumping gain-guided, index-antiguided fibers are discussed.

WB4

Efficient, Resonantly Cladding-Pumped, Yb-Free, Er-Doped FBG Laser, *Mark Dubinskii[1], Jun Zhang[1], Valerii Ter-Mikirtychev[2]; [1]US ARL, USA, [2]NovaWave Technologies, Inc, USA.* Ultra-low quantum defect (~3.75%) operation of the resonantly cladding-pumped Er-doped fiber laser with 47.6 W of 1590-nm output was obtained with ~56.6% efficiency. This is the highest power reported for Yb-free, Er-doped LMA fiber laser.

WB5

Frequency Doubling of Tm-Doped Fiber Lasers for Efficient 950nm Generation, *Gavin Frith[1], T. McComb[1,2], Bryce Samson[1], W. Torruellas[3], M. Dennis[3], A. Carter[1], V. Khitrov[1], K. Tankala[1]; [1]Nufern, USA, [2]CREOL, Univ. of Central Florida, USA, [3]Applied Physics Lab, Johns Hopkins Univ., USA.* We demonstrate a robust, highly efficient pulsed Tm-doped fiber laser systems operating at 1908nm and producing 6W average power. Using PPLN crystal we demonstrate 60% conversion efficiency to 954nm.

WB6

Impact of Variable Doped Gain Medium on HiPER Multiple kJ / ~10Hz Diode Pumped Beam Lines Design, *Jean-Christophe F. Chanteloup[1], Daniel Albach[2], Gilbert Bourdet[3], Philippe Hollander[3], Bernard Vincent[3]; [1]CNRS, France, [2]Inst. Saint Louis, France, [3]Ecole Polytechnique, France.* We discuss advantages of variable doping on gain medium volume requirement, Amplified Spontaneous Emission and thermal management when designing high energy (several kJ) high average power (several tens of kW) Diode Pumped Solid State Laser.

WB7

Efficient Continuous-Wave, 2-μm Tm,Ho:KY(WO_4)$_2$ Laser, *Alexander A. Lagatsky[1], Flavio Fusari[1], Christian T. A. Brown[1], Wilson Sibbett[1], S. V. Kurilchik[2], V. E. Kisel[2], A. S. Yasukevich[2], N. V. Kuleshov[2], A. A. Pavlyuk[3]; [1]Univ. of St Andrews, UK, [2]Inst. for Optical Materials and Technologies, Belarusian Natl. Technical Univ., Belarus, [3]Inst. of Inorganic Chemistry, Siberian Branch of RAS, Russian Federation.* The growth, spectroscopy and lasing performance of a Tm,Ho:KY(WO_4)$_2$ crystal are reported. An average power up to 390mW is generated at 2058nm with a corresponding slope efficiency of 42% during continuous-wave operation at room temperature.

WB8

Single-Frequency Diode-Pumped Vertical-External Cavity Laser at the Caesium D_2 line, *Benjamin Cocquelin[1], Gaëlle Lucas-Leclin[1], David Holleville[2], Isabelle G. Sagnes[3], Arnaud Garnache[4], Patrick Georges[1]; [1]Lab Charles Fabry de l'Inst. d'Optique, CNRS, Univ Paris-Sud, France, [2]LNE-SYRTE, Systèmes de Référence Temps-Espace, CNRS, Observatoire de Paris, France, [3]Lab de Photonique et de Nanostructures, CNRS, France, [4]Inst. d'Electronique du Sud, CNRS, Univ. Montpellier II, France.* We report on the design and characterization of a single-frequency diode-pumped vertical external-cavity surface-emitting laser emitting at 852 nm for Caesium atomic clock experiments. Up to 120 mW under 1.1 W pumping is achieved.

WB9

Efficient Broadly Tunable Yb:YAG Ceramic Laser at Room Temperature, *Shinki Nakamura[1], Hiroaki Yoshioka[1], Takayo Ogawa[2], Satoshi Wada[2]; [1]Ibaraki Univ., Japan, [2]RIKEN, Japan.* The diode-end-pumped Yb:YAG ceramic tunable laser with the maximum output power of 6.8 W and with the slope efficiency of 72% was demonstrated. The tunable range of 118.3 nm from 992.5 to 1110.8 was obtained.

WB10

Direct-Pumped Nd:YLF Laser, *Bhabana Pati, Glen A. Rines; Q-Peak, Inc., USA.* We report 10% improvement in the slope-efficiency by directly pumping the upper-laser-level of Nd:YLF at 863 nm. We obtained a slope-efficiency of 60%, which is 10% improvement over the conventionally 806-nm pumped Nd:YLF laser.

WB11

Single-Frequency Operation of 2μm Monolithic Sandwich Tm:YAG Non-Planar Ring Laser at Room Temperature, *Zhifeng Lin, Mingwei Gao, Yunshan Zhang, Chunqing Gao; Beijing Inst. of Technology, China.* A diode-pumped, monolithic Tm:YAG non-planar ring laser was demonstrated by using a diffusion-bonded sandwich crystal as the resonator. At room temperature 404mW single-frequency output power was obtained at 2012.983nm, with a slope efficiency of 48.2%.

WB12

1W of 902 nm Laser Emission of Neodymium Doped Strontium and Lanthanum Aluminate (Nd:ASL), under Fiber Coupled Diode Laser Pumping Source, *Pascal Loiseau[1], Gerard Aka[1], Lucian Gheorghe[2], Takunori Taira[3]; [1]Ecole Natl. Superieure de Chimie de Paris, France, [2]Natl. Inst. for Laser, Plasma and Radiation, Romania, [3]Laser Res. Ctr. for Molecular Science, Inst. for Molecular Science, Japan.* We present a 792 nm fiber coupled laser diode pump Nd:ASL crystals $Sr_{1-x}La_{x-y}Nd_yMg_xAl_{12-x}O_{19}$ (x = 0.3; y = 0.05). The best results lead to 1W of 902 nm output laser with two Nd:ASL crystals concentration.

WB13

Bi-Doped Mg-Al-Silicate Glass–A Potential Medium for Bulk NIR Lasers, *Boris I. Denker[1], Evgenii M. Dianov[2], Boris I. Galagan[1], Sergey E. Sverchkov[1]; [1]A.M.Prokhorov General Physics Inst.,RAS, Russian Federation, [2]Fiber Optics Res. Ctr., RAS, Russian Federation.* A Bi-doped Mg-Al-silicate glass interesting for bulk NIR lasers is developed. The quadratic concentration dependence of Bi-caused absorption is an argument in favor of the hypothesis that the emitting centers are Bi-Bi dimers.

WB14

200-W 15-kHz MOPA System Based on Side-Pumped Rod-Type Nd:YAG Modules, *Yong-Ho Cha, Kwang-Hoon Ko, Gwon Lim, Jae-Min Han, Hyun-Min Park, Taek-Soo Kim, Do-Young Jeong; Korea Atomic Energy Res. Inst., Republic of Korea.* We have developed a 200-W 15-kHz MOPA system with a 30-ns pulse duration and a 5-M^2 value based on rod-type Nd:YAG gain modules. Thermal lensing and thermal depolarization were carefully compensated by image relay.

WB15

Nd:YLF Laser Pumped at 880 nm, *Bastian Schulz, Maik Frede, Dietmar Kracht; Laser Zentrum Hannover e. V., Germany.* We present a Nd:YLF Laser pumped directly into the emitting level at 880nm. Using a short pump-fiber maintained linear polarization of the pump-diode. The laser emitted 9.5W at fundamental mode with 63% optical-to-optical efficiency.

WB16

Tunability of Lasers Based on Yb^{3+}-Doped Fluorides SrF_2, SrF_2-CaF_2, SrF_2-BaF_2, and YLF, *Jan Šulc[1], Helena Jelínková[1], Maxim E. Doroshenko[2], Tasoltan T. Basiev[2], Vasily A. Konyushkin[2], Pavel P. Fedorov[2]; [1]Faculty of Nuclear Sciences and Physical Engineering, Czech Technical Univ., Czech Republic, [2]General Physics Inst, RAS, Russian Federation.* Ytterbium doped fluorides were investigated as gain medium in diode pumped laser, tunable using birefringent filter. Smooth, broad tunability was reached using new fluoride solid solutions Yb:SrF_2-CaF_2 (1005-1082 nm) and Yb:SrF_2-BaF_2 (1004-1083 nm).

WB17

23-dB Ho:YLF Amplifier, *Alex Dergachev; Q-Peak, Inc., USA.* Single-stage, 2050-nm Ho:YLF amplifier providing up to 23 dB gain and up to 41% extraction efficiency with high-repetition rate, nanosecond-pulsed, broadband or single-frequency seed is reported.

WB18

A Study on Influences of Nd^{3+}-Doping Concentration upon Spectroscopic Properties of Nd:$Y_3Al_5O_{12}$ Ceramics, *Yoichi Sato[1], Takunori Taira[1], Akio Ikesue[2]; [1]Laser Res. Ctr. for Molecular Science, Inst. for Molecular Science, Japan, [2]World-Labo Co., Ltd., Japan.* We have confirmed that there is severe dependence of fluorescent profiles in Nd:$Y_3Al_5O_{12}$ ceramics on Nd^{3+}-doping concentration. Especially at 1319-nm stimulated emission cross section becomes -46% by 8.9at.% Nd^{3+}-doping compared to 1.0at.% samples.

WB19

Thin-Disk Lasers with Dynamically Stable Resonators, *Jens Mende, Gerhard Spindler, Elke Schmid, Jochen Speiser, Adolf Giesen; Deutsches Zentrum für Luft- und Raumfahrt, Germany.* A significant reduction of the influence of the thermal lens for high power laser operation could be achieved in a thin-disk laser by characterization of the medium and the utilization of a dynamically stable resonator.

WB20

Thermal Lens Astigmatism in Birefringence Crystals, *Victor V. Zelenogorsky, Khazanov A. Efim; Inst. of Applied Physics, RAS, Russian Federation.* We showed that well-known strong astigmatism of thermal lens in YLF crystal may be explained only by photoelastic effect. Only few photoelastic coefficients really contribute in thermal lens both for ordinary and extraordinary polarizations.

WB21

High Power, Diode-Pumped, 100 Hz, Yb:S-FAP Amplifier, *Deborah Alterman, Megan Garske, Tracy Vatter, Mark S. Bowers; Lockheed Martin Aculight, USA.* We demonstrate a novel 4-pass, single-crystal Yb:S-FAP thin-slab amplifier generating 105 mJ, 20 ns pulses with excellent beam quality at 100 Hz, a higher repetition rate than typically demonstrated in Yb:S-FAP amplifiers.

WB22

High Repetition Rate and Frequency Stabilized Ho:YLF Laser for CO_2 Differential Absorption Lidar, *Yingxin Bai[1], Jirong Yu[2], Mulugeta Petros[3], Paul Petzar[4], Bo Trieu[2], Hyung Lee[4], Upendra Singh[2]; [1]Science Systems and Applications Inc., USA, [2]NASA Langley Res. Ctr., USA, [3]Science and Technology Corp., USA, [4]Natl. Inst. of Aerospace, USA.* High repetition rate operation of an injection seeded Ho:YLF laser has been demonstrated. For 1 kHz operation, the output pulse energy reaches 5.8mJ and the optical-to-optical efficiency is 39% when the pump power is 14.5W.

WB23

Dysprosium Doped Lead Thiogallate Laser, *Helena Jelínková [1], Petr Koranda[1], Jan Šulc[1], M. E. Doroshenko[2], T. T. Basiev[2], V. V. Osiko[2], V. V. Badikov[3], D. V. Badikov[3]; [1]Czech Technical Univ., Czech Republic, [2]General Physics Inst., Laser Materials and Technology Res. Ctr., Russian Federation, [3]Kuban State Univ., Russian Federation.* By Er:YAP 1.66 μm laser resonant pumping of Dy^{3+}:$PbGa_2S_4$ laser was investigated and compared with non-resonant Nd:YAG 1.32 μm one. The maximum energy obtained was 57 μJ with only negligible influence of the atmosphere.

WB24

0.2 J, 100 Hz Cryogenic Laser by Using Yb:YAG Crystal, *Junji Kawanaka[1], Stuart John Pearce[1], Akira Yoshida[1], Ryo Yasuhara[2], Ryuji Katai[2], Toshiyuki Kawashima[2], Hirofumi Kan[2]; [1]Univ. of Osaka, Japan, [2]Hamamatsu Photonics K. K., Japan.* A diode-pumped MOPA laser system with 0.2-J pulse energy and 100-Hz repetition rate has been demonstrated with liquid-nitrogen-cooled Yb:YAG crystals. The slope efficiency was as high as 30% in the four-pass main amplifier.

WB25

Spectroscopic and Oscillation Properties of Yb^{3+} Ions in BaF_2-SrF_2-CaF_2 Crystals and Ceramics, *Olimkhon K. Alimov[1], Tasoltan T. Basiev[1], Maxim E. Doroshenko[1], Pavel P. Fedorov[1], Vasilii A. Konyushkin[1], Sergey V. Kouznetsov[1], Andrey N. Nakladov[1], Vyacheslav V. Osiko[1], Helena Jelinkova[2], Jan Šulc[2]; [1]General Physics Inst., RAS, Russian Federation, [2]Czech Technical Univ., Czech Republic.* Absorption and emission cross sections of Yb^{3+} ions in SrF_2 crystal and CaF_2-SrF_2 and BaF_2-SrF_2 solid solutions were determined. Tuning in 1000-1080 nm region was observed. Physicochemical and oscillation properties of CaF_2 ceramic were investigated.

WB26

Reduction of Self-Focusing in Solid State Lasers, *Anatoly Potemkin, Michail Martyanov, Marianna Kochetkova, Efim A. Khazanov; Inst. of Applied Physics, RAS, Russian Federation.* We report pioneer observation of small scale self-focusing at B-integral less than unity. An analytical dependence has been found for distance between two laser rods, for which maximum allowable B-integral increases from 2.7 to 4.3.

WB27

Tunable, Continuous-Wave near 2-μm Laser Operation of Tm^{3+} in $NaY(WO_4)_2$ Single Crystal, *Mauricio Rico[1], José-María Cano-Torres[1], María Dolores Serrano[1], Concepción Cascales[1], Carlos Zaldo[1], Uwe Griebner[2], Valentin Petrov[2]; [1]Inst. de Ciencia de Materiales de Madrid, Spanish Natl. Res. Council, Spain, [2]Max-Born Inst. for Nonlinear Optics and Spectroscopy, Germany.* Broadly tunable (1847-2069 nm) continuous-wave laser operation of 4.68 at % Tm-doped $NaY(WO_4)_2$ disordered crystals is demonstrated. The maximum output power obtained without cooling the sample was 406 mW at a slope efficiency of 39%.

WB28

Yb-Doped Thin-Disk Laser Materials: A Comparison between Yb:LuAG and Yb:YAG, *Kolja Beil, Susanne T. Fredrich-Thornton, Rigo Peters, Klaus Petermann, Günter Huber; Inst. of Laser-Physics, Univ. of Hamburg, Germany.* The impact of Yb-doping concentration on thermal conductivity is much lower in Yb:LuAG compared to Yb:YAG. As the materials have very similar spectroscopic properties, Yb:LuAG is supposed to outperform Yb:YAG in high power laser applications.

WB29

High-Energy, Diode-Pumped Laser Amplification in Yb:CaF_2 and Yb:SrF_2, *Mathias Siebold[1,2], Marco Hornung[1], Ragnar Bödefeld[1], Markus Wolf[1], Joerg Koerner[1], Sebastian Podleska[1], Sandro Klingebiel[2], Christoph Wandt[2], Ferenc Krausz[2], Stefan Karsch[2], Reinhard Uecker[3], Joachim Hein[1], Malte C. Kaluza[1]; [1]Inst. of Optics and Quantum Electronics, Germany, [2]Max Planck Inst. of Quantum Optics, Germany, [3]Inst. for Crystal Growth, Germany.* We present nanosecond pulse amplification to the Joule-level based on diode-pumped Yb:CaF_2 and Yb:SrF_2. When seeding with microsecond pulses a maximum pulse energy of 1.54 J at a repetition rate of 1 Hz was achieved.

WB30

12-Watt CW Polycrystalline Cr^{2+}:ZnSe Laser Pumped by Tm-Fiber Laser, *Igor S. Moskalev[1], Vladimir V. Fedorov[1], Sergey B. Mirov[1], Patrick A. Berry[2], Kenneth L. Schepler[2]; [1]Univ. of Alabama at Birmingham, USA, [2]AFRL, AFRL/RYJW, USA.* We demonstrate high-power (12 W, 43% efficient) polycrystalline Cr^{2+}:ZnSe CW laser, operating at 2425 nm, pumped by Tm-fiber laser at 1908 nm. The output power shows no roll-off indicating that much higher output-powers are achievable.

WC • Summit and Roundtable: Optical Frequency Combs—10 Years of History and a Bright Future

Grand Ballroom

11:00 a.m.–1:00 p.m.

WC • Summit and Roundtable: Optical Frequency Combs—10 Years of History and a Bright Future

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

WC1 • 11:00 a.m. **Invited**

Ultraprecise and Ultrastable Optical and Microwave Frequency Synthesis with GHz Femtosecond Lasers, *Albrecht O. Bartels[1,2]; [1]Univ. of Konstanz, Germany, [2]Gigaoptics GmbH, Germany.* Very low relative instability (~2×10^{-17} at 1s) and uncertainty (~10^{-19}) combined with uniquely high power-per-mode make frequency combs built with GHz femtosecond lasers invaluable tools for precision metrology, spectroscopy and generation of ultralow-noise microwaves.

WC2 • 11:20 a.m. **Invited**

Coherent Measurements with Fiber-Laser Frequency Combs, *Nathan R. Newbury, I. Coddington, T. Dennis, W. C. Swann, P. Williams; NIST, USA.* The coherent and broad spectral output of fiber-laser frequency combs can be exploited for a variety of high-resolution measurements outside of conventional frequency metrology. We will discuss recent measurements in spectroscopy, ranging, and telecommunication components.

WC3 • 11:40 a.m. **Invited**

Novel Frequency Combs for Applications beyond the Optics Lab, *Ronald Holzwarth[1,2]; [1]Menlo Systems GmbH, Germany, [2]Max Planck Inst. of Quantum Optics, Germany.* Frequency Combs are prepared for applications like synchronisation of clocks over large distances or calibration of astronomical spectrometers. Combs with large mode spacing are provided by mode filtering or the Kerr effect in micro toroids.

WC4 • 12:00 p.m. **Invited**

Line by Line Pulse Shaping and Arbitrary Optical Waveform Generation, *Andrew Weiner; Purdue Univ., USA.* Line-by-line pulse shaping combines the ability to manipulate time domain profiles of ultrashort pulses with the possibility to exploit high spectral resolution attributes of frequency combs. Recent work in this field at Purdue University are discussed.

12:20 p.m.–1:00 p.m.
Open Discussion and Q&A

1:00 p.m.–2:30 p.m.
Lunch Break

WD • High-Field Sources II

Grand Ballroom
2:30 p.m.–4:00 p.m.
WD • High-Field Sources II
Iain T. McKinnie; Kapteyn Murnane Labs, USA, Presider

WD1 • 2:30 p.m.
Demonstration of a 1.1 Petawatt Hybrid OPCPA-Nd:glass Laser, *Erhard W. Gaul, Mikael Martinez, Joel Blakeney, Axel Jochmann, Martin Ringuette, Doug Hammond, Srdjan Marijanovic, Ramiro Escamilla, Todd Ditmire; Univ. of Texas at Austin, USA.* A 1.1 Petawatt Laser (186 J, 167 fs) based on optical parametric chirped pulse amplification and mixed Nd:glass amplification is demonstrated and its operations are characterized.

WD2 • 2:45 p.m.
Highly Nonlinear Femtosecond Chirped-Pulse Fiber Amplifier to Overcome Gain Narrowing, *Dimitris N. Papadopoulos, Marc Hanna, Frederic Druon, Patrick Georges; Inst. d'Optique, Univ. Paris-Sud, France.* We propose a method to compensate gain narrowing by use of the self-phase modulation effect in femtosecond fiber chirped-pulse amplifier (CPA). An experimental proof of principle demonstrates the generation of 112 fs, 10 μJ pulses.

WD3 • 3:00 p.m.
1-kHz-Repetition-Rate Millijoule Femtosecond Cryocooled DPSS Yb,Na:CaF_2 Regenerative Amplifier, *Audrius Pugžlys[1], Giedrius Andriukaitis[1], Andrius Baltuška[1], Liangbi Su[2], Jun Xu[2], Ruxin Li[2], Wennjing Lai[3], Poh-Boon Phua[3], Andrius Marcinkevičius[4], Martin E. Fermann[4], Linas Giniūnas[5], Romualdas Danielius[5]; [1]Photonics Inst., Vienna Univ. of Technology, Austria, [2]Shanghai Inst. of Optics and Fine Mechanics, CAS, China, [3]Nanyang Technological Univ., Singapore, [4]IMRA America Inc., USA, [5]Light Conversion Ltd., Lithuania.* 1-mJ pulses at 1 kHz compressable to 115 fs are extracted from cw-diode-pumped $Yb^{3+}Na^{+}CaF_2$ regenerative amplifier cooled at -130°C. Further output energy scaling is currently prevented by AR coating burn of the laser crystal.

WD4 • 3:15 p.m.
Generation of 287-W, 5.5-ps Pulses at 78-MHz Repetition Rate from a Cryogenically-Cooled Yb:YAG Amplifier for OPCPA Applications, *Kyung-Han Hong[1], Aleem M. Siddiqui[1], Jeffrey A. Moses[1], Juliet Gopinath[2], John D. Hybl[2], F. Omer Ilday[1], Tso Yee Fan[2], Franz X. Kärtner[1]; [1]MIT, USA, [2]MIT Lincoln Lab, USA.* We generate linearly polarized, 287-W average-power, 5.5-ps pulses with 0.3-nm bandwidth at 1029 nm using a cryogenically-cooled Yb:YAG amplifier at 78 MHz for OPCPA applications.

WD5 • 3:30 p.m.
10-mJ Infrared Phase-Stable Parametric Amplification Based on a Femtosecond Yb-MOPA, *Oliver D. Mücke[1], Aart Verhoef[1], Audrius Pugžlys[1], Andrius Baltuška[1], Skirmantas Ališauskas[2], Valerijus Smilgevičius[2], Jonas Pocius[3], Linas Giniūnas[3], Romualdas Danielius[3], Nicolas Forget[4]; [1]Vienna Univ. of Technology, Austria, [2]Vilnius Univ., Lithuania, [3]Light Conversion Ltd., Lithuania, [4]Fastlite, France.* We demonstrate 10-mJ infrared carrier-envelope phase-stable parametric amplification based on a DPSS femtosecond Yb-MOPA and observe spectral broadening of its recompressed output in a preliminary filamentation experiment in xenon.

WD6 • 3:45 p.m.
High Order Harmonic Generation at 1 MHz Repetition Rate from an Yb-Doped Fiber Chirped Pulse Amplification System, *Johan Boullet[1], Yoann Zaouter[1,2], Jens Limpert[3], Stéphane Petit[1], Eric Mével[1], Eric Constant[1], Eric Cormier[1]; [1] CNRS-CEA, CELIA , Univ. de Bordeaux, France, [2]Amplitude Systemes, France, [3]Inst. of Applied Physics, Friedrich Schiller Univ. Jena, Germany.* We use a 100 μJ-class ytterbium-doped fiber, CPA system to generate high order harmonic in gases and we achieve XUV emission in several gases at controllable ultrahigh (100 kHz to 1 MHz) repetition rate.

Imperial Ballroom
4:00 p.m.–4:30 p.m.
Coffee Break

WE • Novel Oscillators II

Grand Ballroom
4:30 p.m.–6:30 p.m.
WE • Novel Oscillators II
James Kafka; Newport Corp., USA, Presider

WE1 • 4:30 p.m. **Invited**
High Performance Micro Green Laser for Laser TV, *Yoshihito Hirano; Mitsubishi Electric Corp., Japan.* Ultra-compact, highly efficient and high-power micro green laser is newly developed for light source of laser TV. Usage of planar-waveguide devices improves efficiency, power, size, and cost of the intra-cavity SHG green laser dramatically.

WE2 • 5:00 p.m.
Direct Diode Laser Pumping of a Ti:Sapphire Laser, *Alexander J. Maclean, Peter Roth, Gareth J. Valentine, Alan J. Kemp, David Burns; Inst. of Photonics, Univ. of Strathclyde, UK.* The design and initial demonstration of a directly diode-laser pumped Ti:Sapphire laser is reported. System design considerations and plans for future optimisation are presented.

WE3 • 5:15 p.m.
Microjoule Pulse Energy from a Chirped-Pulse Ti:Sapphire Oscillator with Cavity-Dumping, *Martin Siegel[1], Nils Pfullmann[1], Guido Palmer[1], Stefan Rausch[1], Thomas Binhammer[1], Uwe Morgner[1,2]; [1]Leibniz Univ. Hannover, Germany, [2]Laser Zentrum Hannover e.V., Germany.* We report on the generation of 1.1 μJ pulses at 1 MHz pulse repetition rate directly from a chirped-pulse Ti:sapphire oscillator with acousto-optical cavity-dumping. The spectrum of the pulses supports a Fourier-limit of 74 fs.

WE4 • 5:30 p.m.
10-nJ Multipass-Cavity Femtosecond Cr^{3+}:LiCAF Laser Pumped by Low-Power Single-Mode Diodes, *Alphan Sennaroglu[1,2], Umit Demirbas[1], Franz X. Kärtner[1], James G. Fujimoto[1]; [1]MIT, USA, [2]Koç Univ., Turkey.* We report on the generation of 9.9-nJ, 95-fs pulses at a repetition rate of 9.58 MHz from a multipass-cavity Cr^{3+}:LiCAF laser pumped by single-mode diodes with a total absorbed pump power of only 540 mW.

WE5 • 5:45 p.m.
High-Power and Ultra-Efficient Operation of a 946nm Nd:YAG Planar Waveguide Laser, *Jacob I. Mackenzie[1], Helmuth E. Meissner[2]; [1]Optoelectronics Res. Ctr., Univ. of Southampton, UK, [2]Onyx Optics Inc., USA.* A high-power and ultra-efficient 946nm Nd:YAG double-clad planar waveguide laser is reported. The laser produced 35W of output for 68W of incident pump power with a corresponding slope efficiency of 57%.

WE6 • 6:00 p.m.
Total-Reflection Active-Mirror Laser with Cryogenic Yb:YAG, *Hiroaki Furuse[1], Junji Kawanaka[2], Taku Saiki[1], Kazuo Imasaki[1], Masayuki Fujita[1], Shinya Ishii[3], Kenji Takeshita[3], Noriaki Miyanaga[2]; [1]Inst. for Laser Technology, Osaka Univ., Japan, [2]Inst. of Laser Engineering, Osaka Univ., Japan, [3]Mitsubishi Heavy Industries, Ltd., Japan.* We report on the efficient high-power laser operation by using a cryogenic Yb:YAG composite ceramics with a total-reflection active-mirror arrangement. A 273W CW output power was demonstrated at 65% optical efficiency and 72% slope efficiency.

WE7 • 6:15 p.m.
Diamond in Solid-State Disk Lasers: Thermal Management and CW Raman Generation, *Alan J. Kemp, Patricia Millar, Walter Lubeigt, Jennifer E. Hastie, Martin D. Dawson, David Burns; Inst. of Photonics, Univ. of Strathclyde, UK.* The use of diamond for thermal management in a $Nd:YVO_4$ disk laser is explored experimentally and theoretically. Its first use as a CW Raman laser medium is also reported.

Grand Ballroom
6:30 p.m.–6:45 p.m.
Closing Remarks

NOTES

Key to Authors and Presiders
(**Bold** denotes Presider or Presenting Author)

Advanced Solid-State Photonics (ASSP) Topical Meeting and Tabletop Exhibit 2009

UPDATE SHEET

Withdrawals:
MB24
WB11

Substituted Paper:
The paper **TuA5** that is in your program will not be presented. During this time slot, the following paper will be presented in its place:
TuA5, Advances and Limitations in Fiber Beam Combination, *Josh Rothenberg; Northrop Grumman Aerospace Systems, USA.* A number of methods have been proposed to combine high power fiber beams with near diffraction limited beam quality, including active and passive coherent phasing, and spectral combination. These methods and their limitations are discussed.

Presider Updates:
Christopher A. Ebbers; Lawrence Livermore Natl. Lab, USA, will preside over session **MF • Postdeadline Papers**, on Monday, February 2, 2009, 8:00 p.m.–10:00 p.m. in the Grand Ballroom.

Presenter Changes:
MB3, Ultra High Gain Monolithic Multipass Nd:Glass Amplifier will now be presented by *Chana Goren, Soreq Nuclear Res. Ctr., Israel*.

WE1, High Performance Micro Green Laser for Laser TV will be presented by *Takayuki Yanagisawa; Mitsubishi Electric Corp., Japan.*

Author Block Updates:
The author block for **WE1, High Performance Micro Green Laser for Laser TV** should read *Yoshihito Hirano, Syuhei Yamamoto, Yousuke Akino, Akira Nakamura, Tetsuya Yagi, Hiroaki Sugiura, Takayuki Yanagisawa; Mitsubishi Electric Corp., Japan.*

CANCELLED: **SC330 Optical Frequency Combs: Introduction, Sources and Applications**. A similar course will be taught at CLEO/IQEC 2009 in Baltimore. For more information about SC339 A Guide to Building an Optical Clock, visit http://www.cleoconference.org/short_courses/. As with all Short Courses, register early since on-site registration is not guaranteed.

NOTE: Please note the new features on the Technical Digest CD-Rom included in your Conference Program including a comprehensive author index search.

The Organizers of the Advanced Solid-State Photonics Topical Meeting and Tabletop Exhibit wish to acknowledge the following support for grants and student awards:

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The OSA Foundation
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• Monday, February 2, 2009 •

MF • Postdeadline Paper Session

Grand Ballroom
8:00 p.m.–10:00 p.m.
MF • Postdeadline Paper Session
Christopher A. Ebbers; Lawrence Livermore Natl. Lab, USA, Presider

MF1 • 8:00 p.m.
New Generation of Laser Ceramics with Anisotropic Materials, *Jun Akiyama, Yoichi Sato, Takunori Taira; Inst. for Molecular Science, Japan.* Transparent anisotropic ceramics with oriented grain structure have been developed by means of advanced electromagnetic processing. We report the first demonstration of RE: FAP (RE: Nd, Yb) ceramics, which have laser-grade transparency.

MF2 • 8:12 p.m.
Single-Frequency, Single-Mode Emission at 2040 nm from a 600-W Thulium-Doped Fiber Amplifier Chain, *Gregory D. Goodno, Lewis D. Book, Joshua E. Rothenberg; Northrop Grumman Space Technology, USA.* A single-frequency, 2040-nm DFB diode laser is amplified by 53 dB through a chain of four Tm fiber amplifiers to 608 W with M^2=1.05 and sufficiently low phase noise to allow coherent beam combining.

MF3 • 8:24 p.m.
All-Glass PM Leakage Channel Fibers with up to 80μm Core Diameters for High Gain and High Peak Power Fiber Amplifiers, *Libin Fu, Hugh A. McKay, Shigeru Suzuki, Michiharu Ohta, Liang Dong; IMRA America Inc., USA.* All-glass-double-clad-ytterbium-doped PM LCFs with 80μm core-diameter are demonstrated to provide >30dB gain and single-mode polarized output with nearly transform-limited 14.2ps pulses with energy of ~2.7μJ, peak-power of ~190kW and average power of 27.4W at 10MHz.

MF4 • 8:36 p.m.
Hybrid 400W Fiber-Innoslab fs-Amplifier, *Peter H. Rußbüldt[1], Torsten Mans[1], G. Rotarius[1], Dieter Hoffmann[1], Reinhart Poprawe[1], Tino Eidam[2], Jens Limpert[2], Andreas Tünnermann[2]; [1]Fraunhofer Inst. for Laser Technology, Germany, [2]Inst. of Applied Physics, Friedrich-Schiller-Univ., Germany.* Combining fiber- and Innoslab technology enables up to 420W average output power at almost diffraction limited beam quality. Pulses compressible to τ=720 fs at 1MHz and 100kHz repetition rate have been achieved so far.

MF5 • 8:48 p.m.
Power-Scalable, 200 fs Chirped-Volume-Bragg-Grating Based Fiber-CPA System, *Matthew Rever[1], Shenghong Huang[1], Caglar Yavuz[1], Vadim Smirnov[2], Eugene Rotari[2], Ion Cohanoshi[2], Sergiy Mokhov[3], Leonid Glebov[3], Almantas Galvanauskas[1]; [1]Univ. of Michigan, USA, [2]OptiGrate, USA, [3]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* New broadband and spatial-chirp free chirped-volume-Bragg-gratings have been demonstrated to produce 200fs from a 50W Yb-doped fiber based CPA laser system.

MF6 • 9:00 p.m.
First High Harmonic Generation (HHG) in a Photonic Crystal Fiber (PCF), *C. R. E. Baer[1], Oliver H. Heckl[1], Christian Kränkel[1], Sergio V. Marchese[1], Florian Schapper[1], Mirko Holler[1], Thomas Südmeyer[1], Ursula Keller[1], Joe S. Robinson[2], John W. G. Tisch[2], François Couny[3], Philip Light[3], Fetah Benabid[3], Philip St. J. Russell[4]; [1]Inst. of Quantum Electronics, ETH Zurich, Switzerland, [2]Quantum Optics and Laser Science, Blackett Lab, Imperial College London, UK, [3]Univ. of Bath, UK, [4]Inst. of Optics, Information and Photonics, Univ. of Erlangen-Nuremberg, Germany.* We generate the 7th-13th harmonic of ≈800 nm by propagating 30-fs pulses at $>10^{14}$ W/cm^2 through a xenon-filled hollow-core PCF. The extremely low HHG threshold of 0.4 μJ would be achievable by multimegahertz solid-state lasers.

MF7 • 9:12 p.m.
Practical Compact Spatially-Coherent, Phase-Matched Extreme UV Source at 50 kHz, *Ming-Chang Chen[1], Michael Gerrity[1], Tenio Popmintchev[1], Sterling Backus[1,2], X. Zhang[2], Margaret Murnane[1,2], Henry Kapteyn[1,2]; [1]JILA, Univ. of Colorado at Boulder and NIST, USA, [2]Kapteyn-Murnane Labs, USA.* We report the first efficient source of spatially-coherent extreme-UV light at the high repetition rates (>50kHz) needed for metrology and imaging applications. This practical compact tabletop EUV source uses IR pulse energy of only 25μJ.

MF8 • 9:24 p.m.
15-fs, 1-μJ, 100-kHz by Direct Seeding of a CEP Stabilized 7-fs Oscillator into a Fiber-Pumped NOPA, *Julien Nillon, Sebastien Montant, Johann Boullet, Rudy Desmarchelier, Yoann Zaouter, Eric Cormier, Stephane Petit; Univ. Bordeaux, CNRS-CEA, CELIA, France.* We report on the direct seeding of a 7-fs Ti:sapphire oscillator into a fiber amplifier at 100-kHz repetition rate used for pumping a NOPA. 1-μJ pulses have been then recompressed down to 15-fs.

MF9 • 9:36 p.m.
Fully Stabilized GHz Yb-Fiber Laser Frequency Comb, *Ingmar Hartl, H. A. McKay, R. Thapa, B. K. Thomas, A. Ruehl, L. Dong, M. E. Fermann; IMRA America, Inc., USA.* We demonstrate a fully stabilized GHz-spaced Yb-fiber laser frequency comb using a Yb-fiber femtosecond oscillator with 1.04 GHz fundamental repetition rate.

MF10 • 9:48 p.m.
Ultrashort Mid-IR OPCPA with Micro-Joule Energy at 100 kHz, *Olivier Chalus[1], Philip K. Bates[1], Mathias Smolarski[1], Jens Biegert[1,2]; [1]ICFO, Spain, [2]ICREA, Spain.* A novel mid-IR OPCPA source generates 9.0 cycle pulses (96 fs at 3.2μm) with 1.2 μJ energy at 100kHz; expected intrinsically CEP stable. The minimum fourier limited pulse duration is 45 fs, or 4.2 cycles

NOTES

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