ASSP

20th Anniversary Meeting
Advanced Solid-State Photonics

February 6-9, 2005
Intercontinental Wien
Vienna, Austria

Sponsored by:

Optical Society of America
Technical Cosponsor: IEEE/Lasers and Electro-Optics Society

Made possible by the generous support of:

Bank Austria Creditanstalt
CEA/CESTA
CILAS
Coherent
Cristal Laser
Defense Advanced Research Project Agency
Fastlight
Femtolasers
High Q
Lawrence Livermore National Laboratories
Layertec
NASA Langley Research Center
Q-Peak
Quantel
Roithner Lasertechnik
Time-Bandwidth Products AG
U.S. Air Force Office of Scientific Research
U.S. Army Research Office
Vienna City Administration

Cooperating Society:

Committees

Program Committee

General Chair

Gregory J. Quarles, *VLOC–A Subdivision of II-VI, USA*

Program Chairs

Craig Denman, *AFRL, USA*
Irina Sorokina, *Vienna Univ. of Technology, Austria*

Committee Members

Raymond Beach, *LLNL, USA*
Timothy Carrig, *Coherent Technology, Inc., USA*
Jason Eichenholz, *Newport, Inc., USA, SEC Representative **
Martin Fermann, *IMRA America, Inc., USA*
Franz Kaertner, *MIT, USA*
Fredrik Laurell, *Royal Inst. of Technology, Sweden*
Dennis Lowenthal, *Aculight Corp., USA*
Johan Nilsson, *Univ. of Southampton, UK*
James Piper, *Macquarie Univ., Australia*
Robert R. Rice, *Northrop Grumman, USA*
Francois Salin, *Univ. of Bordeaux, France*
Stefano Taccheo*, Politecnico di Milano, Italy*
Anne Christine Tropper, *Univ. of Southhampton, UK*
Ken-Ichi Ueda, *Univ. of Electro-Communications, Japan*
Jirong Yu, *NASA Langley Res. Ctr., USA*
John J. Zayhowski, *MIT, USA*
Jonathan D. Zuegel, *Univ. of Rochester, USA*

*Representative to OSA's Science and Engineering Council

About ASSP

February 6-9, 2005

Advances in solid-state lasers and coherent nonlinear optical sources provide powerful tools for an increasingly broad range of applications including spectroscopy, remote sensing, communications, material processing, medicine and entertainment. In recent years, the Advanced Solid-State Photonics Topical Meeting has extended its scope to include nonlinear frequency conversion and has been the meeting of choice for new developments in laser and nonlinear materials and devices. Take this opportunity to be part of the year's most significant meeting on advanced solid-state sources.

Meeting Topics

- Tunable and New Wavelength Solid-State Lasers
- Diode-Pumped Lasers
- Fiber Lasers
- High-Power Lasers
- Optically-Pumped Semiconductor Lasers
- High Brightness Diodes
- Photonic-Crystal Lasers
- Short-Pulse Lasers
- Frequency Comb Generators and Optical Clocks
- Frequency-Stable Lasers
- Microlasers
- Optical Sources Based on Nonlinear Frequency Conversion
- Frequency Conversion Techniques, Including OPO, OPA, OPG, SHG, and SFG
- Quasi-Phasematching
- Nonlinear Waveguides
- Developments in Laser Media
- Developments in Nonlinear Optical Materials
- Remote Sensing and Laser Stand-off Detection
- Applications Enabled by Advanced Laser Technology
- Applications Driving the Development of New Laser Technology

Invited Speakers

This is a preliminary list.

- **Microstructured Ferroelectrics and Semiconductors for Nonlinear Optical Devices**, *Marty Fejer, Stanford Univ., USA*
- **Fiber Based Frequency Comb Lasers and Their Applications**, *Ingmar Hartl, IRMA America, USA*
- **Diode-Based Ultrafast Lasers**, *Alexander Lagtsky, Univ. of St. Andrews, UK*
- **Femtosecond High-Brightness Nanometer-Sized Coherent Light Source**, *Orazio Svelto, Politecnico di Milano, Italy*
- **Ultrafast Fiber Lasers and Amplifiers: Novel Light Sources for High Precision Machining,** *Andreas Tünnermann, Friedrich Schiller Univ. of Jena, Germany*
- **Phase Coherent Manipulation of Light: From Precision Measurement to Ultrafast Spectroscopy**, *Jun Ye, JILA/Univ. of Colorado, USA*

Plenary Speakers

- **Advances in Solid-State Lasers**, *Robert Byer, Stanford Univ., USA*
- **Laser Frequency Combs and Ultra-Precise Spectoscopy**, *Theodore Hänsch, Univ of Munich, Germany*

Roundtable Speakers

- **Advanced Solid-State Photonics Round Table Discussion**, *Norman Barnes, NASA Langley Res.Ctr., USA*
- **The OSA Topical Solid-State Laser Meetings in a European Sight**, *Günter Huber, Hamburg Univ., Germany*
- **20 Years of Advanced Solid-State Lasers**, *Peter Moulton, Q-Peak, Inc., USA*
- **Solid-State Lasers–The Evolution of a Successful Topical Meeting**, *Richard Powell, Univ. of Arizona, USA*

After-Dinner Speaker

- **Solid-State: on the Light Side**, *Gerard Mourou, Univ. of Michigan, USA*

ASSP Short Courses

Short Courses

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

Continuing Education Units (CEUs)

Short Course attendees who successfully complete a course are eligible to receive continuing education units (CEUs). The CEU is a nationally recognized unit of measure for continuing education and training programs that meet established criteria. 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.

Publications

Conference Program

The *Conference Program* will be available on the web in January 2005. Authors submitting papers, past meeting participants and current committee members will automatically be notified by email when the *Conference Program* is available.

Technical Digest

The ASSP *Technical Digest* will contain the camera-ready summaries of papers presented during the meeting. At the meeting, each registrant will receive a copy of the *Technical Digest* on CD-ROM. Extra CD-ROM copies can be purchased at the meeting for a special price of US$ 50.

TOPS Proceedings Volume

OSA is pleased to announce another proceedings volume in the series, *Trends in Optics and Photonics (TOPS)*, featuring papers presented at the Advanced Solid-State Photonics Topical Meeting in Vienna, Austria. This *TOPS Proceedings Volume* will offer a snapshot of the most recent developments in quantum electronics and solid-state lasers and promises to be a useful resource for students new to the field and specialists and practitioners who need to be quickly brought up-to-date.

All authors are invited to contribute to the volume by either submitting camera-ready articles on-site at the meeting or online via the OSA electronic submission system. Instructions will be emailed to all corresponding authors.

ASSP Exhibitors

Visit a state-of-the-art exhibit of tabletop displays featuring the latest technological advances of the industry's hottest companies. Connect with the most innovative leaders in the field of Fourier transform spectrometry and hyperspectral imaging and sounding instruments in the atmospheric, land and coastal-ocean disciplinary areas.

For more information contact Cathryn Wanders at +1 202.416.1972 or topicalexhibits@osa.org.

Alphalas
Amplitude Systems
Cilas
Cleveland Crystals
Coherent (Deutschland) GmbH
Cristal Laser
Crystal Fibre A/S
ELS Electronik Laser System GmbH
EKSPLA
FASTLITE
Femtolasers Productions GmbH
Institute of Physics Publishing
High Q Laser
Koheras A/S
Konoshima Baikowski Group
LAS-CAD GmbH
Laser Focus World
LAYERTEC GmbH
Linos Photonics GmbH & Co. YG
Menlo Systems GmbH
Newport GmbH
nLight Photonics Corporation
Northrop Grumman Cutting Edge Optronics
NUFERN
Onyx Optics
OXIDE Corporation
PD-LD Incorporated
Photonics Spectra
Proscan
Quantel
PowerPhotonic Ltd.
Roithner Lasertechnik
Scientific Materials Corp.
Spiricon
STANDA
Time-Bandwidth Products AG
Thorlabs GmbH
TUILaser AG
VLOC

Welcome to Vienna, Austria, and the 20th Anniversary Conference on **Advanced Solid-State Photonics**. As you can see from the program, this year's event brings together a multidisciplinary group sharing a common interest in the experimentation, development and generation of solid-state photonics. Scientists and researchers in the fields of lasers, physics, chemistry, material science, photonics, electronics, biology, engineering and medical applications have joined together to present their latest research, discoveries and applications for solid-state photonics.

This year you will be exposed to over 200 presentations of the highest caliber. We have scheduled 57 oral presentations and approximately 200 poster presentations for you to consider over the next three days. The program is exceptional. There are also opportunities to participate in short courses, plenary and round table sessions, and networking that will allow you to spend time with colleagues from all over the world.

We hope that you enjoy your time with us this week and the unique opportunity to explore our host city of Vienna, Austria.

Sincerely,

Gregory Quarles, *VLOC—A Subsidiary of II-V Inc., USA*
General Chair

Craig Denman, *AFRL, USA*
Irina Sorokina, *Vienna Univ. of Technology, Austria*
Program Chairs

Program Agenda

		Sunday, 6 February 2005
7.30 – 17.00	**Registration**	*Ballroom Foyer*
8.00 – 12.00	**Short Courses 238, 239, Industrial Symposium**	*Schubert, Lehar, Vivaldi 1 & 2*
12.00 – 13.00	**Lunch (On Your Own)**	
13.00 – 17.00	**Short Courses 236, 237, 240**	*Schubert, Lehar, Vivaldi 1 & 2*
18.00 – 19.00	**Welcome Reception**	*Vien Jahreszeiten & Kaunitz*
		Monday, 7 February 2005
6.30 – 7.45	**Continental Breakfast**	*Vien Jahreszeiten & Kaunitz*
7.00 – 17.00	**Registration**	*Ballroom Foyer*
7.45 – 8.00	**Opening Remarks**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
8.00 – 10.00	**MA – Solid-State Lasers**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
10.00 – 11.00	**Coffee Break, MB – Poster Session I**	*Mozart, Fischer von Erlach & Metternich*
10.00 – 16.00	**Exhibits**	*Mozart, Fischer von Erlach & Metternich*
11.00 – 12.30	**MC – Fiber Lasers**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
12.30 – 14.00	**Lunch (On Your Own)**	
14.00 – 15.30	**MD – Mid-IR Solid–State Lasers**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
15.30 – 16.00	**Coffee Break & Exhibits**	*Mozart, Fischer von Erlach & Metternich*
16.00 – 17.30	**ME – High-Energy Femtosecond Laser Systems**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
17.30 – 19.30	**Dinner (On Your Own)**	
19.30 – 20.30	**Postdeadline Papers**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
20.30 – 21.30	**MF – Poster Session II**	*Mozart, Fischer von Erlach & Metternich*
		Tuesday, 8 February 2005
6.30 – 8.00	**Continental Breakfast**	*Vien Jahreszeiten & Kaunitz*
7.00 – 17.30	**Registration**	*Ballroom Foyer*
8.00 – 10.00	**TuA – Solid-State Mode-Locked Lasers**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
10.00 – 11.00	**Coffee Break, TuB – Poster Session III**	*Mozart, Fischer von Erlach & Metternich*
10.00 – 16.00	**Exhibits**	*Mozart, Fischer von Erlach & Metternich*
11.00 – 12.30	**TuC – Waveguide Devices**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
12.30 – 14.00	**Lunch (On Your Own)**	
13.30 – 17.30	**Short Courses 241 & 242**	*Schubert & Lehar*
14.00 – 15.30	**TuD – 20th Anniversary Roundtable**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
15.30 – 16.00	**Coffee Break & Exhibits**	*Mozart, Fischer von Erlach & Metternich*
16.00 – 17.30	**TuD – 20th Anniversary Roundtable Cont.**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
19.00 – 22.00	**Conference Reception**	*Offsite, Wiener Rathauskeller (transportation on own)*
		Wednesday, 9 February 2005
6.30 – 8.00	**Continental Breakfast**	*Vien Jahreszeiten & Kaunitz*
7.30 – 18.00	**Registration**	*Ballroom Foyer*
8.00 – 10.00	**WA – Nonlinear Optical Sources**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
10.00 – 11.00	**Coffee Break, WB –Young Scientist Poster Session**	*Mozart, Fischer von Erlach & Metternich*
10.00 – 16.00	**Exhibits**	*Mozart, Fischer von Erlach & Metternich*
11.00 – 12.30	**WC – Semiconductor Lasers**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
12.30 – 14.00	**Lunch (On Your Own)**	
14.00 – 15.30	**WD – Femtosecond Laser Sources**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
15.30 – 16.00	**Coffee Break & Exhibits**	*Mozart, Fischer von Erlach & Metternich*
16.00 – 18.15	**WE – Femtosecond Fiber Lasers**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*
18.15 – 18.45	**Closing Remarks**	*Van Swieten & Van Swieten & Johann Strauss 1 & 2*

ASSP 2005 Short Courses

Course Descriptions

► **Research Management and Presentation Skills Workshop**, SC239, Sunday, February 6, 8.00 – 12.00 and SC 241, Tuesday, February 8, 13.30 – 17.30, *D. Zuchi, Roland Gareis Consulting, Austria*

Benefits and Learning Objectives

This course is designed to enable you to:

- Present project definitions, types of projects and project management applications;
- Become familiar with the presentation of a case study with applied basic project management methods, such as work break down structure, time schedule, resource and cost plan, project organization and project roles; and
- Enhance your basic presentation skills.

Intended Audience

This course is directed toward young scientists (Ph.D. students and upwards) with little or no experience in research management and presentation skills. More experienced professionals are also welcome.

Instructor Biography

Dr. Dagmar Zuchi graduated from the University of Economics and Business Administration in Vienna , Austria. Her post-graduate program work has been at the International Project Management of the University of Economics and Business Administration and at the Technical University of Vienna. She is an experienced project manager of CRM, with experience in organizational development and event and call center implementation projects. Dr. Zuchi is certified as a Senior Project Manager through Projekt Management Austria and is a trainer and consultant for Roland Gareis Consulting.

► **Scientific Proposal Writing and Intellectual Property Rights Workshop**, SC240, Sunday, February 6, 13.00 – 17.00, and SC 242, Tuesday, February 8, 13.30 – 17.30, *Bodil Holst, Technical Univ. at Graz, Austria*

Course Description

The aim of this workshop is an introduction to the "field" of proposal and paper writing. Whether we like it or not this skill is becoming increasingly important in the scientific community, and like most skills it can be acquired! The workshop is divided into one main section and two smaller sections.

Section one (main section): *General proposal writing strategy* i) How to present your research in an interesting manner. ii) Read the manual!: The importance of tailoring a proposal to a particular funding program. iii) The psychology of the referee: make his/her life easy. iv) Learning by doing: How can I become a referee myself? v) How to write the non-scientific part of a research proposal (management, economic relevance etc.).

Section two: *Possibilities in the EU for Europeans and non-Europeans*. An important part of writing a proposal is to know where to apply for money. This section briefly discusses the various possibilities in the European Union funding program FP6. i) Marie Curie Fellowships and actions. ii) Strategic Research Projects (STREP).

Section three: *Scientific paper writing*. "Publish or perish". i) What journal to publish in (the impact factor). ii) PACS numbers. iii) How to make it to the refereeing stage (the cover letter to the editor). iv) The importance of the abstract and of correct citations. v) Tailor your paper so that you get the referee you want.

Benefits and Learning Objectives

This course is designed to enable you to:

- Determine the "dynamics" of scientific papers and proposals;
- Write better and more successful proposals and papers; and
- Identify research funding possibilities within the European Union Research Program (FP6).

Intended Audience

This course is directed toward young scientists (Ph.D. students and upwards) with little or no experience in scientific proposal and paper writing. More experienced people are also welcome.

Instructor Biography

Dr. Bodil Holst is an Assistant Professor of Experimental Physics at the Technical University of Graz. She was born in 1972 in Denmark and holds a masters degree (Cand. Scient.) in physics and mathematics from the University of Copenhagen. In 1997 she obtained her Ph.D. in Physics at Cambridge University. Since July this year she is a coordinator of the EU STREP project INA (Imaging with Neutral Atoms – www.ina-research.org) - one of the 10 projects funded in the first NEST Call (New and Emerging Science and Technology) out of more than 180 submitted proposals. Dr. Holst has worked as an external expert (evaluator) for the European Commission on several occasions and is a referee for a number of international journals. She is a former Marie Curie Fellow.

► **Industrial Symposium** – Photonics Meets Industry (free of charge), Sunday, February 6, 8.00 – 12.00, *Pierre Tournois, Fastlite, France* (Moderator)

Do not miss the opportunity to get acquainted with the most recent developments in research and technology of the leading European and American Photonics Companies.

► **Solid-State Laser Materials,** SC238, Sunday, February 6, 8.00 – 12.00, *Günter Huber, Hamburg Univ., Germany*

Benefits and Learning Objectives

This course should enable you to:

- Measure fundamental laser parameters of solid-state lasers;
- Describe the preparation and growth of laser crystals;
- Evaluate and specify basic properties of laser crystals;
- Identify risks and critical items in gain materials;
- Define the laser material for a specific application (wavelength, modes of operation);
- Measure and explain laser characteristics;
- Determine efficiency and losses in laser crystals and in laser cavity; and
- Explain the laser processes of various active ions in crystals.

Intended Audience

The course is designed for scientists, engineers in the optics industry, researchers, and students seeking an overview and deeper understanding of crystalline gain materials that are used in a wide field of solid-state laser applications, such as measuring, display, medical techniques and materials processing. Basic knowledge of laser operation and optics is required.

► **Laser Beacon Adaptive Optics for Ground-Based Telescopes– Lessons in Design, Implementation and Operation,** SC236, Sunday, February 6, 13.00 – 17.00**,** *Robert Fugate, AFRL, USA*

Benefits and Learning Objectives

This course is designed to enable you to:

- Quantify the degrading effects of atmospheric turbulence on large aperture ground-based telescopes;
- Develop methodologies and trade spaces for designing a system which optimizes performance to meet a range of requirements;
- Determine the set of key system requirements for a laser guide-star adaptive optical system;
- Evaluate the trade-offs of using Rayleigh vs. mesospheric sodium beacons;
- Select an optimum laser guide-star projection geometry or configuration;
- Determine laser power, temporal formats, wavelengths, polarization and beam quality requirements of suitable laser devices;
- Compute the physics-based performance limits of a laser guide-star adaptive optical system for applications of interest and develop diagnostic sensors to quantitatively measure achieved performance;
- Select and arrange lasers, sensors, filters and aperture sharing elements to minimize stray laser light; and
- Develop operational concepts and procedures for using laser guide star adaptive optics, e.g. obtaining reference wave-fronts from a laser guidestar for calibration of wave-front sensors.

Intended Audience

This course is directed toward observatory systems engineers and scientists who are considering laser guide-star adaptive optics either as a modification to an existing natural guide star AO system or a new installation. Participants also include scientists and engineers developing laser devices that could have application as sources for laser beacons, particularly concepts that efficiently excite mesospheric sodium. This course assumes a general college-level background in optics, mathematics and physics. Prior knowledge of atmospheric turbulence and adaptive optics is useful but not required.

► **Principles and Applications of Optical Coherence Tomography,** SC237, Sunday, February 6, 13.00 – 17.00, *James Fujimoto, MIT, USA*

Benefits and Learning Objectives

This course should enable you to:

- Summarize the principles of optical coherence tomography (OCT);
- Understand OCT systems technology;
- Understand ultrafast laser technology and other low coherence light sources;
- Compare the different OCT imaging devices such as microscopes, hand held probes and catheters;
- Describe functional imaging such as Doppler and spectroscopic OCT;
- Identify examples of clinical imaging applications including clinical ophthalmology, surgical guidance and detection of neoplasia and guiding biopsy; and
- Discuss transitioning technology from the laboratory to the clinic.

Intended Audience

This course is appropriate for scientists, engineers and clinicians who want an introduction to optical coherence tomography technology and applications.

Sunday, 6 February 2005

► **7.30 – 17.00**
Registration
Ballroom Foyer

► **8.00 – 12.00**
Short Courses 238, 239, Industrial Symposium
Schubert, Lehar, Vivaldi 1 & 2

► **12.00 – 13.00**
Lunch (On Your Own)

► **13.00 – 17.00**
Short Courses 236, 237, 240
Schubert, Lehar, Vivaldi 1 &2

► **18.00 – 19.00**
Welcome Reception
Vien Jahreszeiten & Kaunitz

Monday, 7 February 2005

► **6.30 – 7.45**
Continental Breakfast
Vien Jahreszeiten & Kaunitz

► **7.00 – 17.00**
Registration
Ballroom Foyer

► **7.45 – 8.00**
Opening Remarks
Gregory J. Quarles, *VLOC–A Subdivision of II-VI, USA*
Van Swieten & Johann Srauss 1 & 2

MA ● Solid-State Lasers

8.00 – 10.00
Van Swieten & Johann Strauss 1 & 2
MA ● Solid-State Lasers
Jonathan D. Zuegel; Univ. of Rochester, USA, Presider

MA1 ● 8.00 ►**Plenary**◄
Robert Byer is a Professor of Applied Physics at Stanford University and Director of the Hansen Experimental Physics Laboratory. His awards and honors include IEEE Third Millennium Medal from the Laser and Electro-Optics Society in 2000, the A. L. Schawlow Award from the Laser Institute of America in 1998, and the R. W. Wood Prize from the Optical Society of America in 1998. Dr. Byer is on the Advisory Boards for the National Ignition Facility and the LIGO Program. He is the author of many articles and holds over 40 patents.

Advances in Solid-State Lasers, *Robert Byer; Stanford Univ., USA.* Driven by demanding applications that range from fundamental science to precision manufacturing, solid state laser, extended by nonlinear frequency conversion, continue to make rapid progress in coherence, ultrafast performance, power, efficiency and reliability.

MA2 ● 8.45
MOPA with kW Average Power and Multi MW Pulse Power, *Kolja Nicklaus, Dieter Hoffmann, Marco Hoefer, Joerg Luttmann, Reinhart Poprawe; Fraunhofer ILT, Germany.* A Nd:YAG MOPA combining rod and slab geometry with 1.3 kW average, 24 MW peak power and 5.4 ns pulse duration at 10 kHz repetition rate has been developed. Birefringence compensation guarantees good beam quality.

MA3 ● 9.00
Full System Operations of Mercury: A Diode-Pumped Solid-State Laser, *Andy J. Bayramian, James P. Armstrong, Raymond J. Beach, Camille Bibeau, Rob Campbell, Chris A. Ebbers, Barry L. Freitas, Bob Kent, Tony Ladran, Joe Menapace, Stephen A. Payne, Noel Peterson, Kathleen I. Schaffers, Chris Stolz, Steve Telford, John B. Tassano, Everett Utterback; LLNL, USA.* Laser operations with two amplifiers activated produced 35 Joules at 1 Hz, 12 Joules at 10 Hz, and 8x104 total system shots. Static distortions in the Yb:S-FAP amplifiers were corrected by magneto rheological finishing technique.

MA4 ● 9.15
Laser Studies of 8% Nd:YAG Ceramic Gain Material, *Mark Dubinskii[1], Larry D. Merkle[1], John R. Goff[1], Vida K. Castillo[2], Gregory J. Quarles[2]; [1]ARL, USA, [2]VLOC-A Subsidiary of II-VI Inc., USA.* We report what is believed to be the first demonstration of diode-pumped lasing from highly concentrated (8%) ceramic Nd:YAG. Fluorescence kinetics and laser experiments indicate the material's potential for high repetition rate Q-switched laser development.

MA5 ● 9.30
Diode End-Pumped Core-Doped Ceramic Nd:YAG Laser, *Dietmar Kracht, Maik Frede, Denis Freiburg, Ralf Wilhelm, Carsten Fallnich; Laser Zentrum Hannover e.V., Germany.* A composite ceramic Nd:YAG laser with a centrally doped region of 1.5mm in diameter in a 3mm rod is presented. An output power of 60W was achieved with an absorbed pump power of 115W.

MA6 ● 9.45
Quantum Noise Measurements in a Continuous-Wave Laser-Diode-Pumped Nd:YAG Saturated Amplifier, *Shally Saraf[1], Karel Urbanek[1], Robert L. Byer[1], Peter King[2]; [1]Stanford Univ., USA, [2]Caltech, USA.* We present measurements of the power noise due to the optical amplification in a Nd:YAG free-space traveling wave amplifier as the amplifier transitions from the linear regime into the heavily saturated regime.

► **10.00 – 11.00**
Coffee Break
Mozart, Fischer von Erlach & Metternich

► **10.00 – 16.00**
Exhibits
Mozart, Fischer von Erlach & Metternich

MB ● Poster Session I

10.00 – 11.00
Mozart, Fischer von Erlach & Metternich
MB ● Poster Session I

MB1
Timing Jitter Characterisation of a 1.04-micron Passively Mode-Locked VECSEL at an Actively Stabilised Repetition Rate of 897 MHz, *Keith G. Wilcox[1], Hannah D. Foreman[1], Anne C. Tropper[1], John S. Roberts[2]; [1]School of Physics and Astronomy, Univ. of Southampton, UK, [2]Dept. of Electronic Engineering, Univ. of Southampton, UK.* We report a passively mode-locked VECSEL, locked to an external electronic oscillator at a repetition rate of 897 MHz, with timing jitter measured to be 160(30) fs over the bandwidth 1 kHz to 15 MHz.

MB2

Maximization of Ultrashort Pulse Power Stored in a Passive Resonator Synchronously Pumped by a Femtosecond Oscillator, *Vladimir L. Kalashnikov[1], Christoph Gohle[2], Thomas Udem[2]; [1]Inst. für Photonik, TU Wien, Austria, [2]Max-Planck-Inst. für Quantenoptik, Germany.* More than two orders of magnitude enhancement in femtosecond pulse power can be achieved in a synchronously pumped passive cavity with appropriate dispersion and self-phase modulation control.

MB3

Generation of 2.8 ps Pulses by Mode-Locking a Nd:GdVO$_4$ Laser with Defocusing Cascaded Nonlinearity in PPKTP, *Valdas Pasiskevicius, Stefan J. Holmgren, Fredrik Laurell; Royal Inst. of Technology, Sweden.* A Nd:GdVO$_4$ laser mode locked by self-defocussing cascaded nonlinearity in PPKTP is presented. Pulses as short as 2.8 ps were obtained with a bandwidth of 0.6 nm.

MB4

Tailored Pulse Trains from a Mode-Locked SBS-Laser Oscillator for Material Processing Purposes, *Martin Ostermeyer, Philip Kappe, Ralf Menzel; Univ. of Potsdam, Germany.* We present a Nd:YAG-laser simultaneously emitting pulse-structures on microsecond, nanosecond and picosecond timescales. Within a millisecond pump pulse a non-linear SBS-mirror generates several Q-switch pulses. Acusto-optic loss modulation leads to stabilization of the inherent SBS-mode-locking.

MB5

Femtosecond Rapid Prototyping Technique for Patterning of Lithium Niobate Samples, *Martin Engelbrecht, Frank Korte, Jürgen Koch, Dieter Wandt, Carsten Fallnich; Laser Zentrum Hannover e.V., Germany.* A new technique based on two photon absorption in a positive photo resist is presented for rapid prototyping of single lithium niobate samples allowing the fast preparation of samples without any lithographic mask.

MB6

Efficient CW Diode-Pumped Laser Operation of Yb^{3+}:NaLa(MoO$_4$)$_2$, *A. S. Yasukevich[1], A. V. Mandrik[1], V. E. Kisel[1], V. G. Shcherbitsky[1], G. N. Klavsut[1], N. V. Kuleshov[1], A. A. Pavlyuk[2]; [1]Intl. Laser Ctr., BNTU, Belarus, [2]Inst. of Inorganic Chemistry, Siberian Branch of Russian Acad. of Sciences, Russian Federation.* Continuous wave diode-pumped laser operation of Yb^{3+}:NaLa(MoO$_4$)$_2$ single crystal was demonstrated for the first time to our knowledge, with output power of 220 mW and slope efficiency of 46%.

MB7

Optical Properties and Thermal Characteristics of the Floating Zone Grown Nd:LuVO$_4$ Crystals, *Takayo Ogawa[1], Yoshiharu Urata[1], Satoshi Wada[1], Toshiyuki Shimizu[2], Mikio Higuchi[2], Junichi Takahashi[2], Junko Morikawa[3], Toshimasa Hashimoto[3]; [1]RIKEN, Japan, [2]Hokkaido Univ., Japan, [3]Tokyo Inst. of Technology, Japan.* High-quality Nd:LuVO$_4$ crystals were successfully grown by the floating-zone method. Large absorption coefficient of 64cm^{-1} was observed at 808nm with 1at.% Nd-doped crystal. The thermal conductivity of the crystal was measured with temperature wave analysis.

MB8

Spectroscopic Properties of Nd^{3+} and Highly Efficient Nd^{3+} to Yb^{3+} Energy Transfer in Transparent Sc$_2$O$_3$ Ceramics, *Voicu Lupei[1], Aurelia Lupei[1], Akio Ikesue[2]; [1]Inst. of Atomic Physics, Romania, [2]Japan Fine Ceramics Ctr., Japan.* Spectroscopic and emission decay investigation of Nd^{3+} or (Nd^{3+}, Yb^{3+}) doped highly transparent Sc$_2$O$_3$ ceramics evidence highly efficient Nd-to-Yb energy transfer and indicates that these materials have potential for new Nd or Nd-sensitised Yb lasers.

MB9

Laser and Spectroscopic Properties of Yb^{3+}-doped Rare-Earth Sesquioxide Ceramics, *Kazunori Takaichi[1], Hideki Yagi[1,2], Todor S. Petrov[1,3], Masaki Tokurakawa[1], Akira Shirakawa[1], Ken-ichi Ueda[1], Shunsuke Hosokawa[2], Takagimi Yanagitani[2], Junji Kawanaka[4], Alexander A. Kaminskii[5]; [1]Inst. for Laser Science, Univ. of Electro-Communications, Japan, [2]Konoshima Chemical Co., Ltd., Japan, [3]Inst. of Solid State Physics, Bulgarian Acad. of Sciences, Bulgaria, [4]Advanced Photon Res. Ctr., Japan Atomic Energy Res. Inst., Japan, [5]Inst. of Crystallography, Russian Acad. of Sciecnces, Russian Federation.* We fabricated highly transparent Yb-doped rare-earth sesquioxide ceramics for solid-state lasers, and demonstrated the ceramic lasers. The spectroscopic properties were measured for the low temperature laser operation.

MB10

Multiphonon Relaxation Studies of $^4I_{11/2}$ and $^4I_{13/2}$ Energy Levels in Er,RE:YAG Laser Crystals, *Mario K. Furtado[1], Ramesh K. Shori[1], Oscar M. Stafsudd[1], Jennifer L. Stone-Sundberg[2], Milan R. Kokta[2]; [1]Univ. of California at Los Angeles, USA, [2]Saint-Gobain Crystals Inc., USA.* Temperature dependent fluorescent lifetime measurements of the $^4I_{11/2}$ and $^4I_{13/2}$ levels in Er,RE:YAG show nearly two orders of magnitude reduction in the fluorescent lifetime of the $^4I_{13/2}$ level.

MB11

High Energy Totally Conductive Cooled, Diode Pumped, 2μm Laser, *Mulugeta Petros[1], Jirong Yu[2], Tony Melak[3], Bo Trieu[2], Songsheng Chen[4], Upendra N. Singh[2], Yingxin Bai[4]; [1]Science and Technology Corp., USA, [2]NASA Langley Res. Ctr., USA, [3]Swales Aerospace, USA, [4]Science Applications Intl. Corp., USA.* This paper describes the design and performance a totally conductive cooled, space-qualify-able high-energy 2-μm laser. Over 230mJ normal mode energy and 107mJ of Q-switched energy has been achieved.

MB12

Laser Oscillation at 2.4 μm from Cr^{2+} in Znse Optically Pumped over Cr Ionization Transitions, *Andrew Gallian[1], Vladimir V. Fedorov[1], John Kernal[1], Sergey B. Mirov[1], Valery V. Badikov[2]; [1]Univ. of Alabama at Birmingham, USA, [2]Kuban State Univ., Russian Federation.* Spectroscopic properties of Cr^{2+} ions in ZnSe crystal under UV, Visible and MIR pumping are studied. Cr^{2+}:ZnSe lasing using 532nm excitation is reported. Ionization mechanisms of Chromium ions responsible for energy transfer are discussed.

MB13

1.9 μm-Fiber-Pumped Cr:ZnSe Laser, *Rita D. Peterson, Kenneth L. Schepler; AFRL, USA.* We report Cr^{2+}:ZnSe face-cooled disk laser pumped by a 1.9-μm Tm fiber laser operated at repetition rates from true CW to 1 kHz, with slope efficiencies to 28% and thresholds as low as 200mW.

MB14

Widely Tunable 2-μm Tm:BaY$_2$F$_8$ Vibronic Laser, *Gianluca Galzerano[1], Stefano Taccheo[2], Paolo Laporta[1], Francesco Cornacchia[3], Daniela Parisi[3], Alessandra Toncelli[3], Mauro Tonelli[3]; [1]IFN-CNR, Dept. di Fisica, Poitecnico di Milano, Italy, [2]Dept. di Fisica, Poitecnico di Milano, Italy, [3]NEST- INFM, Dept. di Fisica, Univ. di Pisa, Italy.* The development of a room-temperature diode-pumped 2-μm Tm:BaY$_2$F$_8$ laser is reported. The laser showed an efficiency of 32%, a maximum output power of 0.7 W, and a tunability range from 1849 nm to 2059 nm.

MB15

Lead Sulfide Doped Glass Saturable Absorbers for Mode-Locked and Q-Switched Near IR Lasers, *Alexander M. Malyarevich[1], Vasili G. Savitski[1], Maksim S. Gaponenko[1], Konstantin V. Yumashev[1], Andrei A. Lipovskii[2], Helga Raaben[3], Alexander A. Zhilin[3]; [1]Intl. Laser Ctr., Belarus, [2]St. Petersburg State Technical Univ., Russian Federation, [3]S. I. Vavilov State Optical Inst., Russian Federation.* Saturable absorbers on the base of lead sulfide QDs for mode-locking and Q-switching of lasers emitting at 1, 1.3, 1.5, 2 microns are introduced and characterized.

MB16

Tunable cw Lasing of Tm:KGd(WO$_4$)$_2$ near 2 μm, *Valentin Petrov[1], Uwe Griebner[1], Frank Güell[2], Jaume Massons[2], Josefina Gavalda[2], Rosa Maria Sole[2], Magdalena Aguilo[2], Francesc Diaz[2]; [1]Max-Born-Inst., Germany, [2]Dept. Quimica Fisica i Inorganica, FiCMA, Spain.* We describe highly efficient room temperature laser operation of Tm:KGd(WO$_4$)$_2$ on the $^3F_4 \rightarrow {}^3H_6$ transition, tunability from 1790 to 2042nm and pump efficiency of 40%, and consider the effect of doping level, pump wavelength and polarization.

MB17

Development of a Multi-kHz Optical Bench for Nonlinear Optical Diagnostic, *Aude Desormeaux[1], Aurelien Manchon[1], Antoine Godard[1], Michel Lefebvre[1], Patrick Georges[2], Sebastien Forget[2]; [1]Office Natl. d'Etudes et de Recherches Aerospatiales, France, [2]Lab Charles Fabry de l'Inst. d'Optique, France.* We report on a parametric optical source delivering kW peak power pulses at a multi-kHz repetition rate. Largely tunable single-frequency radiation is emitted in the mid-infrared domain for nonlinear spectroscopy.

MB18

1 W 589 nm Coherent Light-Source Achieved by Quasi-Intracavity Sum-Frequency Generation, *Norihito Saito[1], Kazuyuki Akagawa[2], Yutaka Hayano[3], Hideki Takami[3], Yoshihiko Saito[4], Masanori Iye[4], Satoshi Wada[1]; [1]Solid-State Optical Science Res. Unit, RIKEN, Japan, [2]MegaOpto Corp., Japan, [3]Subaru Telescope, NAOJ, USA, [4]Div. of Optical and Infrared Astronomy, NAOJ, Japan.* We proposed a novel quasi-intracavity frequency-conversion-system for efficient sum-frequency generation using two cw Nd:YAG lasers. Output power of sum frequency reached to 1 W and it was ten times higher than that by extracavity conversion.

MB19

KTP Optical Parametric Amplifier Pumped by High Power Passively Q-Switched Microchip Laser, *Alexander S. Podstavkin[1], Alexander V. Shestakov[1], Viktor L. Naumov[2], Alla M. Onischenko[2]; [1]Res. and Development Ctr. E.L.S. Co., Russian Federation, [2]RDI "POLUS" named by M.F.Stelmah, Russian Federation.* We report subnanosecond passively Q-switched 1.57µm laser, based on YAG:Nd/YAG:Cr^{4+} microchip with intracavity KTP OPA. Pumped by 18W fiber coupled laser diode array, this laser produced 200 µJ, 850ps pulses with peak power 235kW.

MB20

Watts-Level Average Power UV Generation around 388nm with Yb/Er Fibre Sources, *A. V. Avdokhin[1], V. P. Gapontsev[1], M. Y. Vyatkin[2], R. I. Yagodkin[2], A. G. Dronov[2], S. V. Popov[3], J. R. Taylor[3]; [1]IPG Photonics, USA, [2]NTO IRE-Polus, Russian Federation, [3]Imperial College, UK.* Average UV powers 3-10W at 388nm can be generated by employing single-pass tandem second-harmonic generation of 30-50W average and 1.5-5kW peak power Yb/Er single-mode fibre sources in a periodically-poled crystal and bulk LBO.

MB21

Development of a Mid-Infrared Tunable Optical- Parametric-Oscillator Employing a QPM Crystal for MALDI in Mass Spectroscopy, *Tetsumi Sumiyoshi[1], Yasutoshi Takada[1], Yoshio Otani[1], Sunao Kurimura[2], Kenji Kitamura[2], Katsutoshi Takahashi[3]; [1]Cyber Laser Inc., Japan, [2]Natl. Inst. of Materials and Chemical Res., Japan, [3]Computational Biology Res. Ctr. AIST, Japan.* A wavelength tunable OPO 2.6-4.0µm was developed for MALDI application. An output idler enegy over 100 uJ with 100 Hz was demonstrated with a slope efficiency of 67.2% employing a 2 mm-thick MgO:PPSLT.

MB22

High Repetition Rate, Rapidly Tunable KTA OPO, *Yelena Isyanova, Evgueni Slobodtchikov, John H. Flint; Q-Peak, Inc., USA.* We report on the design and performance of a KTA OPO pumped and wavelength tuned at a 1 kHz repetition rate. A novel, "quasi" semi-concentric resonator allowed us to achieve high conversion efficiency.

MB23

0.7W Green Frequency Doubled Semiconductor Disk Laser, *Stephan Lutgen[1], Michael Kuehnelt[1], Ulrich Steegmueller[1], Peter Brick[1], Tony Albrecht[1], Wolfgang Reill[1], Johann Luft[1], Werner Späth[1], Bernadette Kunert[2], Stefan Reinhard[2], Kerstin Volz[2], Wolfgang Stolz[2]; [1]Osram OS, Germany, [2]Material Sciences Ctr., Philipps-Univ., Germany.* We demonstrate 0.7W cw output power at 520nm from an intracavity frequency doubled Optically Pumped Semiconductor Disk Laser at room temperature. High beam quality and optical conversion efficiency of 10% has been achieved.

MB24

Design Parameters of Periodically Switched Nonlinear Structures for Efficient Nonlinear Process, *David Artigas[1], Pablo Loza-Alvarez[2], Edik U. Rafailov[3], Wilson Sibbett[3]; [1]Univ. Politècnica de Catalunya, Spain, [2]ICFO Inst. de Ciències Fotòniques, Spain, [3]Univ. of St. Andrews, UK.* In this work we propose the use of averaged coefficients as design parameters for quasi-phase matched structures based on periodically switched nonlinearity (PSN). $Al_xGa_{1-x}As$ and GaAs/a-Si based structures are studied and compared with PPLN.

MB25

Efficient Femtosecond Green Generation in a Periodically Poled $LiTaO_3$ Crystal Using a Diode-Pumped Yb:KYW Laser, *Alexander A. Lagatsky[1], E. U. Rafailov[1], A. R. Sarmani[1], C. T. Brown[1], W. Sibbett[1], L. Ming[2], P. G. Smith[2]; [1]Univ. of St. Andrews, UK, [2]Optoelectronics Res. Ctr., Univ. of Southampton, UK.* An average power of 120mW at 524nm was produced by frequency doubling of a diode-pumped femtosecond Yb:KYW laser in a periodically-poled $LiTaO_3$ crystal. The conversion efficiency was 40% and 225fs green pulses were generated.

MB26

Periodical Poling in 5mm-Thick MgO-Doped Congruent $LiNbO_3$ Crystals for High-Power Wavelength Conversion, *Hideki Ishizuki, Takunori Taira; Laser Res. Ctr., Inst. for Molecular Science, Japan.* 5mm-thick MgO-doped congruent $LiNbO_3$ crystal was poled periodically with 32.1µm period by temperature-elevated field poling technique. The quasi-phase matched structure was evaluated by second-harmonic generation measurement using d_{31}-coefficient.

MB27

Continuous-Wave 456-nm Blue Light Generation in a Periodically Poled MgO:$LiNbO_3$ by Single-Pass Frequency Doubling of a 912-nm Nd:$GdVO_4$ Laser, *Nicolaie Pavel[1,2], Takunori Taira[1], Kiminori Mizuuchi[3], Akihiro Morikawa[3], Tomoya Sugita[3], Kazuhisa Yamsmoto[3]; [1]Inst. for Molecular Science, Japan, [2]Natl. Inst. for Laser, Plasma and Radiation Physics, Romania, [3]Matsushita Electrical Industrial Co. Ltd., Japan.* Continuous-wave 456-nm blue light of 167 mW with 8.3% infrared-to-blue conversion efficiency and 4.2%/W normalized conversion is reported from a 10-mm-long periodically polled MgO:$LiNbO_3$ by single-pass frequency doubling of a 912-nm Nd:$GdVO_4$ laser.

MB28

Thermal Effects vs. Gain in Femtosecond Laser Written Waveguides in Neodymium Doped Fused Silica, *Gabor Matthäus, Jonas Burghoff, Matthias Will, Thomas Schreiber, Steffan Nolte, Andreas Tünnermann; Inst. of Applied Physics, Friedrich Schiller Univ. Jena, Germany.* The influence of thermal effects in gain measurements of fs laser-written waveguides in Nd^{3+}-doped fused silica is reported for the first time. We show that these effects strongly contribute to the signal enhancement.

MB29

Single-Mode Yb-Doped Fiber Laer at 980 nm for Efficient Frequency-Doubling, *Aude Bouchier, Gaëlle Lucas-Leclin, Patrick Georges; Lab Charles Fabry de l'Inst. d'Optique, France.* A single-mode Yb-doped fiber laser producing 1 W at 980 nm is demonstrated with a high conversion efficiency of 66%. A 33 mW power at 498 nm is reported by frequency-doubling in a ppLN waveguide.

MB30

Electrically Controlled Integrated Optical Bragg Gratings for Wavelength Switching and Wavelength Stabilization, *Alexander Shamray, Alexander Kozlov, Igor Ilichev, Mikhail P. Petrov; Ioffe Physico-Technical Inst., Russian Federation.* A novel versatile integrated optical device based on electrically controlled Bragg gratings in the lithium niobate waveguide has been designed and fabricated. This device could be very interesting for laser wavelength tuning and stabilization.

MB31

Rare-Earth-Doped Yttria Waveguides Grown by Pulsed Laser Deposition, *Bert Neubert, Sebastian Bär, Yury Kuzminykh, Hanno Scheife, Günter Huber; Inst. of Laser Physics, Univ. of Hamburg, Germany.* Thin crystalline yttria films were deposited on sapphire and quartz substrates by pulsed laser deposition. Emission and excitation spectra of Eu-doped films are similar to the corresponding bulk spectra. Waveguiding of the films was demonstrated.

MB32

Erbium-Doped Waveguide Amplifier Insensitive to Channel Transient and to Spectral-Hole-Burning Offset, *Karin Ennser[1], Giuseppe Della Valle[2], Dario Mariani[2], Mario Tobia[2], Stefano Taccheo[2]; [1]CNIT-Natl. Lab of Photonic Networks, Italy, [2]INFM-Politecnico di Milano & IFN-CNR, Italy.* We demonstrate an optical-gain clamped Erbium-doped-waveguide-amplifier suitable for application to high-capacity reconfigurable WDM metro-networks. The waveguide amplifier is insensitive to channel add/drop and to spectral-hole-burning offset in large wavelength range suitable for 16ch WDM systems.

MB33

Highly Efficient High-Power Erbium-Ytterbium Co-Doped Large Core Fiber Laser, *Jayanta Kumar Sahu, Yoonchan Jeong, David Richardson, Johan Nillson; Optoelectronics Res. Ctr., UK.* We describe a cladding-pumped erbium-ytterbium co-doped fiber laser with 120 W of output at 1.57μm and with a slope efficiency of 40% with respect to launched pump power. No roll-off in output power was observed.

MB34

Heatspreader-Based Thermal Management in VECSELs: Thermal Lensing in Microchip Devices, *Alan J. Kemp, Jennifer E. Hastie, Scott A. Smith, John-Mark Hopkins, Stephane Calvez, Gareth J. Valentine, Martin D. Dawson, David Burns; Inst. of Photonics, UK.* Finite-element analysis is used to explore the practicalities and scaling potential of heatspreaders in vertical-external-cavity surface-emitting lasers. Thermal lensing and its implications for quasi-monolithic microchip geometries are emphasised.

MB35

Semiconductor Thin-Disk Laser: Comparison of Spacer and Quantum-Well Pumping, *Svent-Simon Beyertt[1], Thomas Kübler[1], Uwe Brauch[1], Adolf Giesen[1], Eckart Gerster[2], Fernando Rinaldi[2], Peter Unger[2]; [1]Univ. Stuttgart, Germany, [2]Univ. of Ulm, Germany.* The laser performance of semiconductor thin-disk lasers is compared for spacer and quantum-well pumping. The quantum efficiency is similar (42 %), the thermal load is reduced by 65 % for quantum-well pumping.

MB36

Diode Laser Stabilization for Coherent Driving of Rare Earth Ions, *Vincent Crozatier, Frederic De Seze, Fabien Bretenaker, Ivan Lorgere, Jean-Louis Le Gouët; Lab Aime Cotton, France.* We investigate the stabilization of a diode laser for the coherent driving of rare earth ions. The stabilization loop uses a single locking point on an intra-cavity electro-optic crystal.

MB37

Laser Ignition in Internal Combustion Engines: A Novel Approach Based on Advanced Lasers, *Martin Weinrotter, Herbert Kopecek, Ernst Wintner; Photonics Inst., Austria.* Advantages of laser ignition compared to spark plugs are illustrated. Experiments involving optimized optics and passively Q-switched remotely diode-pumped mJ-Nd:YAG laser have been performed in a static combustion chamber and on a 1MW gas engine.

MB38

Activation of a Temporal, Spectral, and Spatially-Shaped Front End for the Mercury Laser, *Andy J. Bayramian, James P. Armstrong, Raymond J. Beach, Camille Bibeau, Chris A. Ebbers, Barry L. Freitas, Bob Kent, Tony Ladran, Stephen A. Payne, Kathleen I. Schaffers; LLNL, USA.* Hybrid fiber-based master-oscillator power amplifier system coupled with a Yb:SFAP power amplifier will produce 500mJ at 10Hz with 100:1 temporal contrast over 3-10ns and 300GHz spectrally shaped bandwidth allowing broadband amplification corrected for gain narrowing.

MB39

The Effect of Crystal Orientation on Thermally Induced Depolarization in Active Elements of Solid-State Lasers, *Efim A. Khazanov[1], Ivan B. Mukhin[1], Oleg V. Palashov[1], Igor A. Ivanov[2]; [1]Inst. of Applied Physics, Russian Federation, [2]Res. Inst. of Materials Science and Technology, Russian Federation.* Expressions for depolarization at an arbitrary orientation of a cubic crystal have been experimentally verified. It is shown that crystal orientations [001] or [110] are the best for powerful lasers, whereas [111] is the worst.

MB40

Self-Imaging Solid-State Planar Waveguide Lasers, *Jianqiu Xu; Shanghai Inst. of Optics and Fine Mechanics, China.* We present a design for solid-state lasers with self-imaging planar waveguide structure. The laser can operate with single fundamental mode from a multi-mode doped core. Thermal distortion of laser beam quality can be reduced.

MB41

Continuous Wave Laser Operation of Yb^{3+}:YVO_4, *Christian Kränkel[1], Dione Fagundes-Peters[1], Jens Johannsen[1], Michael Mond[1], Günther Huber[1], Margitta Bernhagen[2], Reinhard Uecker[2]; [1]Inst. of Laser-Physics, Germany, [2]Inst. of Crystal Growth, Germany.* An Yb^{3+}:YVO_4 laser under Ti:Al_2O_3 laser pumping at 985 nm and diode laser pumping at 974 nm is presented. A maximum output power of 433 mW at an emission wavelength of 1037 nm was observed.

MB42

900 nm Infrared Laser Emission and Second Harmonic Generation of Nd Doped ASL, *Cyrille Varona[1,2], Pascal Loiseau[1], Gerard Aka[1], Voicu Lupei[3], Bernard Ferrand[2]; [1]ENSCP-LCAES, France, [2]CEA-LETI, France, [3]Inst. of Atomic Physics, Romania.* Nd: ASL crystals $Sr_{1-x}La_{x-y}Nd_yMg_xAl_{12-x}O_{19}$ ($0.05 \le x \le 0.5$; $y = 0.05$) were grown by Czochralski. 1.4 W of 901 nm IR output laser was obtained under Ti:sapphire pumping. Intracavity SHG experiments were performed.

MB43

Design and Analysis on Face-Cooled Disk Faraday Rotator under High Average Power Lasers, *Ryo Yasuhara[1], Masanobu Yamanaka[1], Takayoshi Norimatsu[1], Yasukazu Izawa[1], Toshiyuki Kawashima[2], Tadashi Ikegawa[2], Osamu Matsumoto[2], Takashi Sekine[2], Takashi Kurita[2], Hirofumi Kan[2], Hiroyuki Furukawa[3]; [1]Inst. of Laser Engineering, Japan, [2]Hamamatsu Photonics K. K., Japan, [3]Inst. for Laser Technology, Japan.* A novel, scalable Faraday rotator has been designed for high-average-power lasers in a gas-cooled multi-disk scheme. The concept with a negligible thermal distortion and birefringence is feasible up to 10 kW/cm^2 enough below fracture limit.

MB44

First Yb:NaGd(WO_4)$_2$ Solid-State Laser Pumped by Ti:Sapphire and Diode Laser, *Jens Johannsen[1], Michael Mond[1], Klaus Petermann[1], Günther Huber[1], Lothar Ackermann[2], Daniel Rytz[2], Claus Dupré[2]; [1]Inst. of Laser Physics, Germany, [2]FEE, Germany.* Room and low temperature spectroscopy of Yb:NaGd(WO_4)$_2$ is presented. Laser operation near 1030 nm is demonstrated under Ti:sapphire and diode laser pumping at 975 nm with maximum slope efficiencies of 36% and 19%, respectively.

MB45

Elimination of Spherical Aberration in Multi-kW, Nd:YAG, Rod Pump-Chambers by Pump-Distribution Control, *Eyal Leibush, Steven M. Jackel, Sharone Goldring, Inon Moshe, Yitshak Tzuk, Avi Meir; Nonlinear Optics Group, Israel*. Multi-kW, homogeneously-pumped rods experience nonparabolic temperature distribution that induce spherical-aberrations. Accurate Monte-Carlo simulations yielded pump-distributions tailored to spherical-aberration elimination. We present simulation results and some measurements using a >2kW output, 54% slope-efficiency (short-cavity) pump-chamber.

MB46

Thermal Design of Segmented Rod Laser Crystals, *Ralf Wilhelm, Maik Frede, Denis Freiburg, Dietmar Kracht, Carsten Fallnich; Laser Zentrum Hannover, Germany.* An efficient fast Fourier transform (FFT) based algorithm for solving the heat conduction equation in solid state laser rods is presented and applied to segmented Nd:YAG crystal geometries

MB47

Multi-Periodic Regimes and Deterministic Chaos in Regenerative Amplifiers, *Jochen Dörring[1], Alexander Killi[1], Uwe Morgner[1], Max J. Lederer[2], Alexander Lang[2], Daniel Kopf[2]; [1]Max Planck Inst. for Nuclear Physics, Germany, [2]High Q Laser Production, Austria.* We present an analysis of multi-periodic and chaotic operation regimes of regenerative amplifiers. Numerical results were confirmed experimentally with a diode-pumped Yb:glass regenerative amplifier generating a maximum pulse energy of 620μJ.

MB48
Efficient 1341-nm Laser Emission and Heat Generation Characteristics in Nd:GdVO$_4$ Laser under Direct 879-nm Pumping, *Jiro Saikawa[1], Yoichi Sato[1], Takunori Taira[1], Osamu Nakamura[2], Yasunori Furukawa[2]; [1]Laser Res. Ctr. for Molecular Science, Japan, [2]Oxide Corp., Japan.* We report on a highly efficient (over 60% slope efficiency) 1.3-μm cw Nd:GdVO$_4$ laser pumped by a 879-nm Ti:Sapphire laser. Non-radiative transition induced heat generation in Nd:GdVO$_4$ crystal under lasing and non-lasing conditions are discussed.

MB49
Efficient Laser Operation with Yb-Doped Silicates Under Diode-Pumping, *Mathieu Jacquemet[1], Frederic Druon[1], Francois Balembois[1], Patrick Georges[1], Johan Petit[2], Bruno Viana[2], Philippe Goldner[2], Bernard Ferrand[3]; [1]Lab Charles Fabry de l'Inst. d'Optique, France, [2]LCAES-ENSCP, France, [3]LETI/DOPT/CEA-G, France.* Very efficient laser action of Yb:Lu$_2$SiO$_5$ under diode-pumping is reported for the first time and compared with Yb:Y$_2$SiO$_5$. Maximum output powers of 7.7 W and 7.3 W had been obtained with Yb:YSO and Yb:LSO respectively.

MB50
Pulsed Laser Pump Wavelength Influence on the Efficiency and Stability of the Alexandrite Laser, *Hamish Ogilvy, Michael J. Withford, James A. Piper; Macquarie Univ., Australia.* Pulsed laser pumping was investigated for a range of monochromatic wavelengths from 532nm to 671nm. Shortening pump wavelength was associated with increased non-radiative energy decay, reduced efficiency and chaotic spectral, temporal and transverse modal characteristics.

MC • Fiber Lasers

11.00 – 12.30
Van Swieten & Johann Strauss 1 & 2
MC • Fiber Lasers
Timothy Carrig; Coherent Technologies, Inc., USA, Presider

MC1 • 11.00
306W All-Fiber Based Linearly Polarized Single-Mode Ytterbium Fiber Laser, *Chi-Hung Liu[1], Almantas Galvanauskas[1], Victor Khitrov[2], Bryce Samson[2], Upendra Manyam[2], Kanishka Tankala[2], David Machewirth[2], Stefan Heinemann[3]; [1]EECS Dept., Univ. of Michigan, USA, [2]Nufern, USA, [3]Fraunhofer USA, Ctr. for Laser Technology, USA.* We demonstrate the first completely monolithic linearly-polarized (extinction 19dB) fiber laser producing high power (306W) diffraction-limited beam (M^2~1.1) with a stabilized, narrow-linewidth (1.1nm) spectrum at 1085.3nm. Laser design does not require any external polarizing components.

MC2 • 11.15
High-Power Fundamental Mode Single-Frequency Laser, *Maik Frede[1], Ralf Wilhelm[1], Dietmar Kracht[1], Carsten Fallnich[1], Frank Seifert[2], Benno Willke[2]; [1]Laser Zentrum Hannover, Germany, [2]Albert-Einstein Inst., Germany.* The first results on an injection-locked high-power Nd:YAG ring laser with 172W single frequency output power in a stable linearly polarized fundamental mode operation for the next generation of gravitational wave detectors will be presented.

MC3 • 11.30
Fiber Laser Coherent Array for Power Scaling, Bandwidth Narrowing and Beam Direction Control, *Akira Shirakawa, Keigo Matsuo, Ken-ichi Ueda; Inst. for Laser Science, Japan.* A 12-MHz-bandwidth fiber laser is reported by coherently arraying eight 10-nm-bandwidth lasers with an 85% addition efficiency. By threshold control of the supermodes, high-speed (>1kHz), high-contrast-ratio (>20dB) beam direction control has been demonstrated.

MC4 • 11.45
Cladding-Pumped Ytterbium-Doped Helical-Core Fiber Laser,
Pu Wang, Laurence J. Cooper, Vladislav Shcheslavskiy, Jayanta Sahu,Andy Clarkson; Optoelectronics Res. Ctr., UK. Efficient single-mode operation of a cladding-pumped ytterbium-doped helical-core fiber laser has been demonstrated. The laser yielded 60.4W of output at 1043nm in a beam with M^2<1.4 for 92.6W of diode pump power at 976nm.

MC5 • 12.00
Nd:Al-Doped Depressed Clad Hollow Fiber Laser at 930nm,
Jaesun Kim, Pascal Dupriez, Daniel Beomsoo Soh, Johan Nilsson, Jayanta Kamu Sahu, David Payne; Optoelectronics Res. Ctr., UK. We propose and demonstrate a depressed-clad hollow fiber structure for an efficient cladding-pumped 930nm Nd-doped fibrefiber laser. that It generated 3.3W of single-mode continuous-wave output, and 133μJ of pulse energy at 5KkHz repetition-rates when Q-switched.

MC6 • 12.15
High-Power and Ultra-Efficient Operation of a Tm^{3+}-Doped Silica Fiber Laser, *D. Y. Shen[1], J. I. Mackenzie[1], J. K. Sahu[1], W. A. Clarkson[1], S. D. Jackson[2]; [1]Optoelectronics Res. Ctr., Univ. of Southampton, UK, [2]Optical Fibre Technology Ctr., Australian Photonics Cooperative Res. Ctr., Univ. of Sydney, Australia.* A high-power and ultra-efficient cladding-pumped Tm-doped silica fiber laser is reported. The laser produced 30.8 W of output at 2025 nm for 58.5 W of launched pump power, and the corresponding slope efficiency was 61%.

► **12.30 – 14.00**
Lunch Break (On Your Own)

MD • Mid-IR Solid-State Lasers

14.00 – 15.30
Van Swieten & Johann Strauss 1 & 2
MD • Mid-IR Solid-State Lasers
Raymond J. Beach; LLNL, USA, Presider

MD1 • 14.00
A New Broadly Tunable Room-Temperature Continuous-Wave Cr^{2+}:ZnS$_x$Se$_{1-x}$ Laser, *Irina T. Sorokina[1], Evgeni Sorokin[1], Alberto Di Lieto[2], Mauro Tonelli[2], Boris N. Mavrin[3], Evgeny A. Vinogradov[3]; [1]Photonics Inst. TU Vienna, Austria, [2]NEST-Dept. di Fisica, Univ. of Pisa, Italy, [3]Inst. of Spectroscopy RAS, Russian Federation.* We report the first room temperature continuous-wave ceramic Cr:ZnS$_{0.42}$Se$_{0.58}$ laser, tunable over 560 nm around 2.48 μm, at 50 mW output power and 24 % slope efficiency, pumped by the Co:MgF$_2$ laser at 1.67 μm.

MD2 • 14.15
High-Brightness, Rapidly-Tunable Cr:ZnSe Lasers, *Andrew Zakel, Gregory J. Wagner, Amy C. Sullivan, John F. Wenzel, William J. Alford, Timothy J. Carrig; Coherent Technologies Inc., USA.* We report a high-brightness, rapidly-tunable Cr:ZnSe master-oscillator power-amplifier producing greater than 5 W of average power with near diffraction limited beam quality and 2 GHz linewidth. An 18.5 W Cr:ZnSe power oscillator was also demonstrated.

MD3 • 14.30
Mid-IR High-Resolution Intracavity Cr^{2+}:ZnSe Laser-Based Spectrometer, *Evgeni Sorokin[1], Irina T. Sorokina[1], Nathalie Picqué[2], Fatou Gueye[2], Guy Guelachvili[2]; [1]TU Vienna, Photonics Inst., Austria, [2]Lab de Photophysique Moléculaire, Unité Propre du C.N.R.S., Univ. de Paris-Sud, Orsay, France.* Cr^{2+}:ZnSe laser for broadband ultrasensitive intracavity laser spectroscopy is reported, with effective absorption path ~30 km in the 2450-2550 nm range. High-resolution combination lines of CO$_2$ were recorded for the first time in laboratory conditions.

MD4 • 14.45
Widely Tunable Cr^{2+}:ZnSe Laser Source for Trace-Gas Sensing, *Evgeni Sorokin[1], Irina T. Sorokina[1], Cornelia Fischer[2], Markus W. Sigrist[2]; [1]TU Wien, Austria, [2]ETH Zurich, Switzerland.*
A continuously tunable Cr^{2+}:ZnSe laser is applied for photoacoustic gas detection in the wavelength range of 2.0-3.1 μm. Trace-gas measurements in the 2.6-3.1 μm range with ppb sensitivity are reported for the first time.

MD5 ● 15.00
High-Power, Rapidly-Tunable Dual-Band CdSe Optical Parametric Oscillator, *Andrew Zakel, Gregory J. Wagner, William J. Alford, Timothy J. Carrig; Coherent Technologies, Inc., USA.* We report on a Cr:ZnSe laser pump-tuned, intracavity CdSe optical parametric oscillator (OPO) with signal and idler tunable from 3.2 to 3.8 μm and 8.2 to 8.5 μm respectively and output power of 2 W.

MD6 ● 15.15
One-Joule Double-Pulsed Ho:Tm:LuLF Master-Oscillator-Power-Amplifier (MOPA), *Songsheng Chen[1], Jirong Yu[2], Mulugeta Petros[3], Yingxin Bai[1], Bo Trieu[2], Michael J. Kavaya[2], Upendra Singh[2]; [1]Science Applications Intl. Corp., USA, [2]NASA Langley Res. Ctr., USA, [3]Science and Technology Corp., USA.* A high output pulse energy Tm:Ho:LuLF laser Master-Oscillator-Power-Amplifier (MOPA) was developed. The 600-mJ single output pulse energy and one-Joule double output pulse energy been achieved with one oscillator and two amplifiers.

► 15.30 – 16.00
Coffee Break
Mozart, Fischer von Erlach & Metternich

ME ● High-Energy Femtosecond Laser Systems

16.00 – 17.30
Van Swieten & Johann Strauss 1 & 2
ME ● High-Energy Femtosecond Laser Systems
Francois Salin; Univ. Bordeaux, France, Presider

ME1 ● 16.00 **►Invited◄**
Phase Coherent Manipulation of Light: From Precision Measurement to Ultrafast Spectroscopy, *Jun Ye; JILA, Univ. of Colorado & NIST, USA.* Phase control of wide-bandwidth optical frequency combs has produced remarkable progress in precision metrology and ultrafast science, including optical frequency measurement and synthesis, optical-atomic clocks, carrier-envelope phase control, coherent pulse synthesis, and united time-frequency spectroscopy.

ME2 ● 16.30
0.5 μJ Diode Pumped Femtosecond Laser Oscillator at 9 MHz, *Clemens Hoenninger[1], Antoine Courjaud[1], Pierre Rigail[1], Eric Mottay[1], Martin Delaigue[2], Nelly Deguil-Robin[2], Jens Limpert[2], Inka Manek-Hoenninger[2], Francois Salin[2]; [1]Amplitude Systemes, France, [2]CELIA, Univ. Bordeaux, France.* We report on a diode pumped high energy femtosecond laser oscillator producing pulses of more than 0.5 μJ pulse energy at a repetition rate of 9 MHz.

ME3 ● 16.45
A Novel Chirped Pulse Amplification System Based on a Monolithic Large Aperture Bulk-Bragg-Grating Stretcher/Compressor, *Kai-Hsiu Liao[1], Chi-Hung Liu[1], Almantas Galvanauskas[1], Emilie Flecher[2], Vadim I. Smirnov[2], Leonid B. Glebov[2]; [1]EECS Dept., Univ. of Michigan, USA, [2]School of Optics/CREOL, Univ. of Central Florida, USA.* This is the first demonstration of a large-aperture linearly chirped bulk Bragg grating stretcher/compressor, which enables compact and robust chirped pulse amplification systems for generating high peak and high average power ultrashort pulses.

ME4 ● 17.00
Diode Pumped Chirped Pulse Amplification to the Joule Level and Beyond, *Joachim Hein[1], Sebastian Podleska[1], Mathias Siebold[1], Marco Hellwing[1], Ragnar Bödefeld[1], Roland Sauerbrey[1], Doris Ehrt[2], Wolfram Wintzer[2]; [1]Inst. for Optics and Quantum Electronics, Germany, [2]Otto Schott Inst., Germany.* The POLARIS project aims the development of an all diode pumped high peak power femtosecond laser system reaching the petawatt level. Recently, pulses with energies up to 1.25 J were generated.

ME5 ● 17.15
Ultrafast Thin Disk Yb:KYW Regenerative Amplifier with 200 kHz Repetition Rate, *Martin Leitner[1], Karin Pachomis[1], Detlef Nickel[2], Christian Stolzenburg[2], Adolf Giesen[2], Frank Butze[3]; [1]Jenoptik L.O.S., Germany, [2]Inst. für Strahlwerkzeuge, Univ. Stuttgart, Germany, [3]Forschungsgesellschaft für Strahlwerkzeuge mbH, Germany.* We report of an Yb:KYW thin disk amplifier system to provide ultra short pulses. Without using a diffraction-grating stretcher, 5 μJ, 280 fs pulses were generated at repetition rates of 200 kHz.

► 17.30 – 19.30
Dinner Break (On Your Own)

► 19.30 – 20.30
Postdeadline Paper Session
Van Swieten & Johann Strauss 1 & 2

MF ● James Barnes Memorial: Poster Session II

20.30 – 21.30
Mozart, Fischer von Erlach & Metternich
MF ● James Barnes Memorial: Poster Session II

MF1
In Memorial James C. Barnes, *Jirong Yu; NASA Langley Res. Ctr., USA.* James Barnes excelled as a NASA Langley technical leader and manager. He led a team that developed a $Ti:Al_2O_3$ laser as an autonomous DIAL transmitter on a high altitude aircraft and performed seminal work on injection seeding.

MF2
High-Average Power Diode-Pumped Amplification of Picosecond-Pulses, *Marco Hornung[1], Mathias Siebold[1], Joachim Hein[1], Roland Sauerbrey[1], Günther Hollemann[2]; [1]Inst. for Optics and Quantum Electronics, Germany, [2]Jenoptik LOS GmbH, Germany.* We present a diode-pumped regenerative $Nd:YVO_4$-laser amplifier with a subsequent amplifier. The behavior of fast Pockels-cell switches for generation of nanosecond and amplification of picosecond pulses with repetition rates up to 100 kHz was investigated.

MF3
High-Energy, Single-Mode, Femtosecond Fiber Lasers, *Fatih O. Ilday[1], Jeff Chen[1], Franz X. Kaertner[1], Frank W. Wise[2], Oleg Shkurikhin[3], Denis Gapontsev[3]; [1]MIT, USA, [2]Cornell Univ., USA, [3]IPG Photonics, USA.* Amplification of femtosecond pulses directly from a fiber oscillator in a truly singlemode fiber amplifier to ~100 nJ is demonstrated. Its simplicity and robustness renders the laser attractive for certain applications, such as micromachining.

MF4
High Brightness, Visible to Infrared Picosecond Generation with All-Fibre Format Yb Laser, *A. B. Rulkov[1], M. Y. Vyatkin[1], S. V. Popov[2], J. R. Taylor[2], V. P. Gapontsev[3]; [1]NTO IRE-Polus, Russian Federation, [2]Imperial College, UK, [3]IPG Photonics, USA.* Pumping highly-nonlinear PCF with zero-dispersion around the wavelength of a 70kW peak, 8W average power, ps Yb-fibre laser allowed realization of a picosecond, all-fibre, source in 525-1800nm region. Possibility of fibre-based femtosecond compression is demonstrated.

MF5
Design Criteria for Cavity-Dumped Mode-Locked Laser Oscillators, *Jochen Dörring[1], Alexander Killi[1], Uwe Morgner[1], Max J. Lederer[2], Jürgen Frei[2], Daniel Kopf[2]; [1]Max Planck Inst. for Nuclear Physics, Germany, [2]High Q Laser Production, Austria.* Design criteria for optimum performance of cavity-dumped passively mode-locked laser oscillators are presented. We discuss the difference between a picosecond laser mode-locked in the positive dispersion regime and a solitary mode-locked femtosecond laser system.

MF6
High Speed Electro-Optical Cavity Dumping of Mode-Locked Laser Oscillators, *Alexander Killi[1], Jochen Dörring[1], Uwe Morgner[1], Max J. Lederer[2],*

Jürgen Frei[2], Daniel Kopf[2]; [1]MPI für Kernphysik, Germany, [2]HighQLaser Production GmbH, Austria. High speed electro-optical cavity dumping is demonstrated for diode-pumped lasers, namely a picosecond $Nd:YVO_4$ and a femtosecond Yb:glass oscillator. Repetition frequencies exceeding 1 MHz are obtained with pulse energies of more than 1.5μJ / 300nJ.

MF7

Site-Selective Spectroscopy and Laser Diode Pumping of $Yb^{3+}:LaSc_3(BO_3)_4$, *Michael Mond, Jens Johannsen, Klaus Petermann, Günter Huber; Univ. of Hamburg, Germany.* Low temperature and site-selective spectroscopy of Yb:LSB are presented. Furthermore, efficient laser operation is demonstrated under diode laser pumping. A slope efficiency of 43 % and a maximum output power of 525 mW were achieved.

MF8

Spectroscopic Properties of $Yb:GdVO_4$ Single Crystal: Stark Levels, Selection Rules, and Polarized Cross Sections, *Yoichi Sato[1], Jiro Saikawa[1], Takunori Taira[1], Osamu Nakamura[2], Yasunori Furukawa[2]; [1]Laser Res. Ctr. for Molecular Science, Inst. for Molecular Science, Japan, [2]New Product Development Group, OXIDE Corp., Japan.* We have investigated spectroscopic properties of $Yb:GdVO_4$, and their Stark sub-levels and selection rules were discussed. The precise spectroscopic parameters were also obtained, 6.1 and 6.7x10-20-cm^2 as absorption and emission cross-sections at 984-nm, respectively.

MF9

Preparation and Spectroscopic Investigation of Diffusion-Doped Fe^{2+}:ZnSe and Cr^{2+}:ZnSe, *Umit Demirbas[1], Alphan Sennaroglu[1], Adnan Kurt[1], Mehmet Somer[2]; [1]Laser Res. Lab, Dept. of Physics, Koc Univ., Turkey, [2]Dept. of Chemistry, Koc Univ., Turkey.* We describe the preparation and spectroscopic characterization of diffusion-doped Fe^{2+}:ZnSe and Cr^{2+}:ZnSe. Diffusion coefficients were determined at 1000˚C. In gain-switched operation, 80-μJ, 1-kHz pulses were produced with Cr^{2+}:ZnSe samples near 2600 nm.

MF10

Emission Peculiarities of TR^{3+}-Doped KPb_2Cl_5 Laser Crystals under Selective Direct, Upconversion and Excitonic/Host Excitation of Impurity Centers, *Alexandra M. Tkachuk[1], Svetlana E. Ivanova[1], Ludmila I. Isaenko[2], Alexander P. Yelisseyev[2], Vladimir A. Pustovarov[3], Marie-France Joubert[4], Yannick Guyot[4], Valentin P. Gapontsev[5]; [1]Vavilov State Optical Inst., Russian Federation, [2]Inst. of Mineralogy & Petrography SB RAS, Russian Federation, [3]Urals State Technical Univ., Russian Federation, [4]Univ. Lyon, France, [5]IPG Laser GmbH, Germany.* We considered the emission properties of TR^{3+}-doped KPb_2Cl_5 crystals under different ways of impurity ion excitation: direct excitation of TR 4fn-configuration levels via ground state absorption, or upconversion processes, and UV excitonic or crystalline-matrix excitation.

MF11

Spectroscopic Investigation and Continuous-Wave Laser Demonstration Utilising Single Crystal Cr^{2+}:CdZnTe, *Pavel Cerny[1], Handong Sun[1], David Burns[1], Utpal N. Roy[2], Arnold Burger[2]; [1]Inst. of Photonics, UK, [2]Fisk Univ., USA.* We report spectroscopic and laser investigations of a novel mid-infrared laser material $Cr^{2+}:Cd_{1-x}Zn_xTe$, x=0.04. The threshold for continuous-wave laser action was 55 mW of absorbed power and up to 3 mW output was obtained.

MF12

High Repetition Rate, High Average Power, Mid-Infrared Laser, *Olivier Pacaud, Jean-Philippe Feve, Laurent Lefort; JDS Uniphase, France.* An optical parametric generator pumped by an amplified passively Q-switched laser at 35kHz generates 1.5W around 1.5μm. Management of thermal lensing due to residual absorption of idler beam is critical for power scalability

MF13

Diode-Pumped Tm,Ho:$GdVO_4$ Laser at Room Temperature, *Yoshiharu Urata[1], Hiroshi Machida[2], Mikio Higuchi[3], Kohei Kodaira[3], Satoshi Wada[4]; [1]Megaopto Co., Ltd, Japan, [2]NEC-Tokin Co., Ltd., Japan, [3]Hokkaido Univ., Japan, [4]RIKEN, Japan.* Diode pumped quasi-continuous-wave oscillation of Floating-Zone-Grown Tm,Ho:$GdVO_4$ was demonstrated at room temperature. Slope efficiency of 7.1 % and threshold of averaged pump power of 65 mW were achieved at a pumping duty ratio of 0.083.

MF14

Passive Q-Switching at 1.54 mm of a Er-Yb:$GdCa_4O(BO_3)_3$ Laser with a Co :$MgAl_2O_4$ Saturable Absorber, *Boris I. Denker[1], Boris I. Galagan[1], Liudmila I. Ivleva[1], Sergei E. Sverchkov[1], Jonas Hellstrom[2], Gunnar Karlsson[2], Fredrik Laurell[2], Valdas Pasiskevichius[2]; [1]Laser Materials & Technologies Res. Ctr. of General Physics Inst., Russian Federation, [2]Dept. of Physics, Royal Inst. of Technology, Sweden.* A train of Q-switched pulses is formed in a diode-pumped microchip laser consisting of an Er-Yb:$GdCa_4O(BO_3)_3$ active and a $Co^{2+}:MgAl_2O_4$ passive elements. The pulses durations were in the range of 1.6-6 ns.

MF15

High Thermal Conductivity and Low Quantum Defect in $Yb:CaGdAlO_4$: A New Infrared Laser Material for High Power Applications, *Johan Petit, Bruno Viana, Philippe Goldner, Daniel Vivien; LCAES-ENSCP, France.* $Yb:CaGdAlO_4$ presents favorable thermo-mechanical properties. A laser oscillation at 1016 nm is demonstrated for the first time. This very small quantum defect (3.5%) results in weak heat released inside the crystal.

MF16

2.94 μm Electro-Optically Q-Switched Er:YAG Laser with High Output Energy, *Jacek Swiderski, Marek Skorczakowski, Andrzej Zajac; Inst. of Optoelectronics, Poland.* A Q-switched Er:YAG laser was developed. At 3Hz repetition rate, pulses of 91.2ns duration and 137mJ energy were obtained. For 10Hz repetition rate 30mJ of output energy in single pulse was achieved.

MF17

1617-nm Er:YAG Laser with Direct Resonant Laser Diode Pumping, *Dmitri Garbuzov[1], Igor Kudryashov[1], Mark Dubinskii[2]; [1]Princeton Lightwave Inc, USA, [2]ARL, USA.* We report what is believed to be the first demonstration of direct resonant diode pumping of 1.6-μm Er^{3+}-doped bulk solid-state laser. Photon conversion efficiency is limited by cavity losses in these initial experiments.

MF18

Two-Photon-Absorption of BBO, CLBO, KDP and LTB Crystals, *Gabor Kurdi[1], Karoly Osvay[2], Jozsef Klebniczki[2], Marta Divall[3], Edwin J. Divall[3], Agnes Peter[4], Katalin Polgar[4], Janos Bohus[5]; [1]HAS Res. Group on Laser Physics, Univ. of Szeged, Hungary, [2]Dept. of Optics and Quantum Electronics, Univ. of Szeged, Hungary, [3]Ctrl. Laser Facility, Rutherford Appleton Lab, UK, [4]Res. Inst. for Solid State Physics and Optics, H.A.S., Hungary, [5]Dept. of Experimental Physics, Univ. of Szeged, Hungary.* The two photon absorption coefficient of long BBO, CLBO, KDP and LBO samples was determined from the intensity dependent transmission in the range of 0.2 - 80 GW/cm^2 using 650 fs laser pulses at 248nm.

MF19

Generation of 5 W Continuous-Wave Green Power at 531 nm Based on a Frequency-Doubled $Nd:GdVO_4$ Micro-Laser Pumped into the Emitting Level at 879 nm, *Nicolaie Pavel[1,2], Yoichi Sato[1], Takunori Taira[1], Yoshinori Tamaoki[3], Hirofumi Kan[3]; [1]Inst. for Molecular Science, Japan, [2]Natl. Inst. for Laser, Plasma and Radiation Physics, Romania, [3]Hamamatsu Photonics K.K., Japan.* A compact green-light source with 5.1 W at 531 nm and 0.31 overall optical-to-optical efficiency, based on an intracavity frequency-doubled $Nd:GdVO_4$ micro-laser that is pumped by diode laser directly into the emitting level, is described.

MF20

High-Energy Mid-IR Source Based on Two-Stage Conversion from 1.06 μm, *Stephane Nicolas, Ørnulf Nordseth, Gunnar Rustad, Gunnar Arisholm; FFI (Norwegian Defence Res. Establishment), Norway.* Using a KTP-based parametric master oscillator and power amplifier for conversion from 1.06 to 2.1 micron followed by a ZGP-based OPO we have generated up to 28 mJ in the 3-5 micron range.

MF21

Highly Efficient, Intracavity-Pumped KTP OPO at 1572 nm, *Waldemar Zendzian, Jan K. Jabczynski, Przemyslaw Wachulak, Jacek Kwiatkowski; Inst. of Optoelectronics, Poland.* We are reporting on highly efficient intracavity optical parametric oscillator inside acousto-optic Q-witched $Nd:YVO_4$ laser pumped by 15-W power fiber coupled diode. Up to 1.5 W of an average power at signal wavelength was demonstrated.

MF22

CW Yellow-Orange Lasers by Frequency Sum-Mixing of a Cascading Raman Fiber Lasers, *Yan Feng, Shenghong Huang, Akira Shirakawa, Ken-ichi Ueda; Inst. for Laser Science, Japan.* We will report our works on 589nm laser and other lasers at yellow-orange spectrum by frequency doubling and sum-mixing of a cascading Raman fiber lasers.

MF23

Regenerative Optical Parametric Chirped Pulse Amplifier, *Emmanuel Hugonnot[1], Eric Freysz[2]; [1]CEA/CESTA, France, [2]CPMOH, France.* The concept of a regenerative cavity, singly resonant for idler pulse, using a nonlinear crystal pumped by a nanosecond laser pulse and injected by a few hundred picoseconds stretched signal pulse is proposed.

MF24

Buildup Time of Pulsed Confocal Unstable Optical Parametric Oscillator, *Shanshan Zou, Mali Gong; Tsinghua Univ., China.* A theoretical model and a simplified analytic expression are developed to describe the buildup time of pulsed confocal unstable optical parametric oscillator. The effects of various cavity parameters on buildup time are investigated.

MF25

Enhanced Efficiency of Second Harmonic Generation in GdCOB of the $Nd:YVO_4$ Laser under Direct $^4F_{3/2}$ Pumping, *Voicu Lupei[1], Gerard Aka[2]; [1]Inst. of Atomic Physics, Romania, [2]ENSCP - Lab de Chimie Appliquée de l'Etat Solide, France.* The improvement of the laser emission parameters at fundamental frequency and reducing the heat generation, the direct pumping into the emitting level of $Nd:YVO_4$ enhances considerably the second harmonic emission of intra-cavity frequency-doubling devices.

MF26

Efficient Generation of Continuous-Wave Yellow-Orange Light Using Sum-Frequency in Periodically Poled KTP, *Jirí Janousek[1], Sandra Johansson[2], Peter Tidemand-Lichtenberg[1], Jesper Mortensen[1], Preben Buchhave[1], Fredrik Laurell[2]; [1]Technical Univ. of Denmark, Denmark, [2]Laser Physics and Quantum Optics, KTH, Sweden.* We present highly efficient sum-frequency generation between two CW 1064 and 1342 nm laser lines of two $Nd:YVO_4$ lasers using periodically poled KTP. This is an all solid-state light source in the yellow-orange spectral range.

MF27

Spectral Broadening by Frequency Mixing Coupling in a PPLN OPG-System, *Gunther Renz, Manfred Klose; DLR, Germany.* We report on spectral broadening of 100% for a domain period of 30.5μm of the idler at 3.2μm in a PPLN OPG-system for broadband applications. The spectral broadening reduces the risk of crystal damage.

MF28

Frequency Noise of an Yb-Doped Fiber Amplifier at the Sub-Hertz Level, *Peter Weßels, Michael Tröbs, Carsten Fallnich; Laser Zentrum Hannover e.V., Germany.* We present the first spectrally resolved frequency noise measurements of an 1W Ytterbium-doped fiber amplifier. Below 1kHz, the excess noise is orders of magnitude below the free-running noise of the intrinsically stable non-planar ring oscillators.

MF29

Environmentally-Stable Femtosecond Ytterbium Fiber Laser with Hollow-Core Photonic Bandgap Fiber, *Hyungsik Lim, Andy Chong, Frank W. Wise; Cornell Univ., USA.* We demonstrate for the first time an environmentally-stable, passively mode-locked ytterbium fiber laser with a hollow-core fiber for dispersion control. The laser generates 1-nJ pulses, which are dechirped to 70 fs.

MF30

Large-Mode-Area Er/Yb-doped Photonic-Crystal Fiber Amplifier yielding a 40-kW Peak Power at 1.5 mm, *Akira Shirakawa[1], Jun Ota[1], Mitsuru Musha[1], Ken-ichi Ueda[1], Jacob Riis Folkenberg[2], Jes Broeng[2]; [1]Inst. for Laser Science, Univ. of Electro-Communications, Japan, [2]Crystal Fibre A/S, Denmark.* A femtosecond fiber amplifier with a 26-mm mode-field-diameter erbium-ytterbium-codoped air-clad photonic-crystal fiber is presented. 700-fs pulses at 1557nm were amplified to 7.2-nJ, 120-fs pulses without chirped-pulse amplification. Double-pass configuration enabled perfect single polarization output.

MF31

Single-Mode Ring Fiber Laser with Longitudinal Mach-Zehnder Mode Filter, *Flavien Liegeois, Yves Hernandez, Guillaume Peigné, Fabien Roy, Dominique Hamoir; Multitel, Belgium.* A novel single-longitudinal-mode erbium doped ring fiber laser with Mach-Zehnder mode filter is proposed. The output power is 15 dBm at 1547 nm with a 50-dB side-mode suppression ratio and a 13-kHz linewidth.

MF32

Spectral Beam Combining of a 980-nm Laser Array for EDFA Pumping, *Paul Salet[1], Gaëlle Lucas-Leclin[1], Gérard Roger[1], Patrick Georges[1], Philippe Bousselet[2], Christian Simonneau[2], Dominique Bayart[2], Nicolas Michel[3], Sophie-Charlotte Auzanneau[3], M. Calligaro[3], O. Parillaud[3], M. Lecomte[3], Michel Krakowski[3]; [1]Lab Charles Fabry de l'Inst. d'Optique, France, [2]Alcatel, Res. and Innovation Dept., France, [3]Thales Res. and Technology France and Alcatel-Thales III-V Lab, France.* Spectral beam combining of an array of ten single-mode ridges is reported at 980 nm. A 1.5 W power is extracted from the external cavity. Its capability for EDFA pumping is experimentally established.

MF33

$Nd:GdVO_4$ in Face-Cooled Geometries: Thin-Disk and High-Power Microchip Lasers, *Alan J. Kemp, Gareth J. Valentine, David Burns; Inst. of Photonics, UK.* The potential of $Nd:GdVO_4$ for face-cooled geometries is discussed. Particular emphasis is given to experimental and finite element studies of thin-disk and high-power, monolithic, microchip geometries. Efficient laser operation is reported.

MF34

Q-Switch Suppression in an Er-Doped Waveguide Laser with an Intracavity Loss Modulator, *Felix J. Grawert[1], Fatih O. Ilday[1], David Kielpinski[1], Juliet T. Gopinath[1], Leslie A. Kolodziejski[1], G. S. Petrich[1], Erich P. Ippen[1], Franz X. Kaertner[1], Frank W. Wise[2]; [1]MIT, USA, [2]Cornell Univ., USA.* Suppression of Q-switch instabilities in an Er-doped waveguide laser, passively mode-locked with a saturable Bragg reflector, is demonstrated using an intracavity loss modulator, despite the strong pulse shaping per roundtrip and millisecond gain relaxation time.

MF35

High Slope Efficiency and Pulse Energy UV Tunable Ce^{3+} Doped Solid-State Laser, *Daniele Alderighi[1], Guido Toci[1], Matteo Vannini[1], Daniela Parisi[2], Mauro Tonelli[2]; [1]IFAC-CNR, Italy, [2]NEST, Physics Dept., Pisa Univ., Italy.* We achieved the highest slope efficiency and pulse energy ever reported with a Ce:LiCAF tunable laser pumped with a single beam. We extended the tuning range by mixing the output with the residual Nd:YAG fundamental.

MF36

Gain Competition in a Dual-Wavelength $Nd:GdVO_4$ Laser at 1063 nm and 912 nm and Intracavity Sum-Frequency, *Emilie Herault, Francois Balembois, Patrick Georges; Lab Charles Fabry de l'Inst. d'Optique, France.* Dual-wavelength $Nd:GdVO_4$ laser at 1063-nm and 912-nm is presented for the first time. Gain competition had been studied theoretically and experimentally and output power of 11-mW from 491-nm radiations had been achieved by intracavity sum-frequency.

MF37

Laser Performance of $Tm:KY(WO_4)_2$ Crystal, *Andrei E. Troshin[1], Victor E. Kisel[1], Victor G. Shcherbitsky[1], N. V. Kuleshov[1], A. A. Pavlyuk[2], E. B. Dunina[3], A. A. Kornienko[3]; [1]Intl. Laser Ctr., Belarus, [2]Inst. of Inorganic Chemistry, Siberian Branch of Russian Acad. of Sciences, Russian Federation, [3]Vitebsk State Technological Univ.,* *Belarus.* CW laser operation on Tm:KYW crystal under laser diode pumping at 802 nm and 1750 nm was demonstrated with slope efficiency of 53% and 28% and output power of 553 mW and 86 mW, respectively.

MF38
Looking for Nd-Doped Crystals Operating at Short Wavelengths on the $^4F_{3/2}\rightarrow{}^4I_{9/2}$ Transition Laser, *Cyrille Varona[1,2], Pascal Loiseau[1], Gérard Aka[1], Bernard Ferrand[2]; [1]ENSCP-LCAES, France, [2]CEA-LETI, France.* The study of neodymium ions emission following the channel $^4F_{3/2}\rightarrow{}^4I_{9/2}$ leads us to find very short potential laser wavelengths. Neodymium doped $BaMoO_4$ show wavelength even lower than 900 nm.

MF39
Dual-Head High-Power Nd:YAG Laser with Thermo-Optically Self-Compensating Amplifiers, *Michelle S. Roth[1], Eduard W. Wyss[1], Valerio Romano[1], Thomas Graf[2]; [1]Univ. of Bern, Switzerland, [2]Univ. of Stuttgart, Germany.* We demonstrate that our recently presented thermo-optically self-compensated amplifiers, consisting of a liquid layer sandwiched between two laser rods, can be operated in a dual-head high-power laser delivering an output power of more than 300W.

MF40
Resonator Designs of Widely Tunable Ti:Sapphire Lasers Covering a Large Pulse Energy Range, *Bernd Jungbluth, Jens Geiger, Sebastian Linke, Dieter Hoffmann, Reinhart Poprawe; Fraunhofer Inst. for Lasertechnology, Germany.* Design and experimental investigation of different Ti:Sapphire lasers pumped with 0.65, 1.5, 7.5 and 10 W are presented. Each provides a tuning range of more than 300 nm with no optic exchange required.

MF41
Evaluation of Pulsed Diode End-Pumped Ytterbium Doped Sesquioxides: Comparison of Sc_2O_3, Y_2O_3 and Lu_2O_3, *Olivier Casagrande[1], Bruno Le Garrec[1], Gilbert L. Bourdet[2]; [1]CEA-CESTA, France, [2]LULI Unité Mixte 7605 CNRS-CEA-Ecole Polytechnique-Univ. Paris VI, France.* This paper deals with the thermal and optical properties of Ytterbium doped sesquioxide crystals. Thermal conductivities and performances are compared for different pumping transitions. We show that the zero-line is unsuitable for pulsed diode pumping.

MF42
Passively Q-Switched Diode-Pumped Cr^{4+}:YAG/Nd^{3+}:$GdVO_4$ High Repetition Rate Monolithic Microchip Laser, *Sébastien Forget[1], Frederic Druon[1], Francois Balembois[1], Patrick Georges[1], Nicolas Landru[2], Jean-Philippe Fève[2]; [1]Lab Charles Fabry de l'Inst. d'Optique, France, [2]JDS Uniphase, France.* We report on the first passively-Q-switched diode-pumped Nd:$GdVO_4$/Cr:YAG microchip laser. The average power is 400 mW and the pulse length is 1.1 ns at a repetition rate as high as 85 kHz.

MF43
Sapphire-Conductive End-Cooling of High Power Cryogenic Yb:YAG Laser, *Shigeki Tokita[1], Masayuki Fujita[2], Junji Kawanaka[1], Toshiyuki Kawashima[3], Yasukazu Izawa[1]; [1]Inst. of Laser Engineering, Osaka Univ., Japan, [2]Inst. for Laser Technology, Japan, [3]Central Res. Lab, Hamamatsu Photonics K. K., Japan.* We have demonstrated a high-power laser oscillator with end-cooling using a sapphire-sandwiched Yb:YAG disk at liquid nitrogen temperature. An output power of 74 W with near-diffraction-limited beam was obtained from a 0.8-mm thick active medium.

MF44
Self-Similar Pulse Evolution in a Ti:sapphire Laser, *Frank W. Wise[1], Fatih O. Ilday[2], Franz X. Kaertner[2]; [1]Cornell Univ., USA, [2]MIT, USA.* Numerical simulations of self-similar pulse evolution in a Ti:sapphire laser are presented. The results show~10-fs pulses with energies as high as 1 microjoule should be possible. Recent experimental results support the conclusions of the simulations.

MF45
High-Power, Actively Q-Switched Planar Waveguide Nd:YAG Laser, *Jesus D. Valera, Howard Baker, J. Xu, Fei Sun, Adam Russell, Denis Hall; Heriot-Watt Univ., UK.* The combination of face-pumped, Nd:YAG planar waveguide gain medium with an AOM in a hybrid waveguide unstable-resonator results in highly effective Q-switching. This is shown to be a direct consequence of using a waveguide structure.

MF46
104W Diode-Pumped TEM_{00} Nd:$GdVO_4$ Master Oscillator Power Amplifier, *Ara Minassian, Benjamin A. Thompson, Gerald R. Smith, Michael J. Damzen; Imperial College London, UK.* A Nd:$GdVO_4$ master oscillator power amplifier in bounce amplifier configuration is demonstrated. 104W of TEM_{00} (M^2 <1.3) CW output with 40% conversion efficiency is obtained. Acousto-optically Q-switched system produces 101W of ~20ns pulses at 400kHz.

MF47
Temperature Dependent Behaviour of Emission Wavelength of the Rare Earths Doped Fiber Lasers, *Mikhail Y. Vyatkin[1], Semen Grabarnik[1], Oleg Ryabushkin[2]; [1]NTO IRE - Polus, Russian Federation, [2]Inst. of Radio Engineering and Electronics, Russian Acad. of Sciences, Russian Federation.* We propose the model of fiber laser which allows analytical expression of the emission wavelength dependence on key parameters of laser and active-medium temperature. Temperature dependent dual-wavelength oscillation was theoretically predicted and experimentally observed.

MF48
Comparison of Lasing Performance for Diode-Pumped Tm:YLF of Various Doping Concentrations, *J. I. Mackenzie, S. So, D. P. Shepherd, W. A. Clarkson; Optoelectronics Res. Ctr., UK.* Single-end-pumped laser performance of 2, 4, and 6at.% Tm-doped YLF rods is reported. Power scaling considerations are discussed with reference to cross-relaxation, upconversion, and thermal loading of the host crystal.

MF49
High-Power End-Pumped Multi-Segmented Nd:YAG Laser, *Denis Freiburg[1], Maik Frede[1], Ralf Wilhelm[1], Dietmar Kracht[1], Carsten Fallnich[1], Klaus Dupré[2], Lothar Ackermann[2]; [1]Laser Zentrum Hannover, Germany, [2]FEE GmbH, Germany.* A diode end-pumped composite Nd:YAG laser consisting of up to 5 segments with different dopant concentrations is presented. An output power of 137W was achieved with 52% optical to optical efficiency.

Tuesday, 8 February 2005

► 6.30 – 8.00
Continental Breakfast
Vien Jahreszeiten & Kaunitz

► 7.00 – 17.30
Registration
Ballroom Foyer

TuA ● Solid-State Mode-Locked Lasers

8.00 – 10.00
Van Swieten & Johann Strauss 1 & 2
TuA ● Solid-State Mode-Locked Lasers
Stefano Taccheo; INFM–Unita di Ricerca di Milano–Politecnico, Italy, Presider

TuA1 ● 8.00 **►Plenary◄**
Theodor W. Hänsch's research interests include the quantum physics of ultra-cold atoms, and laser spectroscopy of atomic hydrogen with extreme precision as a test of fundamental physics laws. He is a member or Fellow the American Acad. of Arts and Sciences (1983-), the Bavarian Acad. of Science (1991-), the U.S. National Acad. of Science (2001-), and the Accademia Nazionale di Lincei, Italy (2002-). His prizes and awards include the Arthur L. Schawlow Prize for Laser Science (American Physical Society, 1996) the Stern-Gerlach Medal

(German Physical Society, 2000), two Philip Morris Research Prizes (1998 and 2000), and the Quantum Electronics and Optics Prize (European Physical Society, 2001).

Laser Frequency Combs and Ultra-Precise Spectoscopy, *Theodor Hänsch; Univ. of Munich, Germany.* Femtosecond laser frequency comb synthesizers have become revolutionary tools for measuring the frequency of light. Applications include optical atomic clocks, ultraprecise laser spectroscopy, and fundamental tests such as searches for time variations of fundamental constants. Frequency comb techniques can also control the carrier-envelope phase of ultrashort laser pulses, revealing novel phenomena in nonlinear light-matter interactions.

TuA2 • 8.45
A 6-Femtosecond Sub-Terawatt All-Solid-State Ti:Sapphire Laser System, *Jozsef Seres[1], Aart-Jan Verhoef[1,2], Eniko Seres[1,3], Gabriel Tempea[1,4], Christian Spielmann[3], Ferenc Krausz[1,2]; [1]Inst. für Photonik, Technische Univ. Wien, Austria, [2]Max-Planck-Inst. für Quantenoptik, Germany, [3]Physikalisches Inst. EP1, Univ. Würzburg, Germany, [4]Femtolasers Produktions GmbH, Austria.* Three-stage, 1-kHz amplifier system has been developed delivering 1-mJ, 6-fs pulses. These pulses were reached by compressing the output pulse of the third amplifier stage with a Neon filled hollow-fiber and broadband chirp-mirror compressor.

TuA3 • 9.00
32 W of Average Power in 24-fs Pulses from a Passively Mode-Locked Thin Disk Laser with Nonlinear Fiber Compression, *Edith Innerhofer[1], Felix Brunner[1], Sergio V. Marchese[1], Rüdiger Paschotta[1], Ursula Keller[1], K. Furusawa[2], J. C. Baggett[2], T. M. Monro[2], D. J. Richardson[2]; [1]Inst. of Quantum Electronics, Switzerland, [2]Optoelectronic Res. Ctr., Univ. of Southampton, UK.* Using a high average power passively mode-locked thin disk laser we generated 24-fs pulses at an average power of 32 W and a pulse repetition rate of 57 MHz through nonlinear fiber compression.

TuA4 • 9.15
220 fs Er-Yb:Glass Laser Mode-Locked by a Broadband Low-Loss Si/Ge Saturable Absorber, *Felix J. Grawert, Juliet T. Gopinath, Fatih O. Ilday, Hanfei Shen, Erich P. Ippen, Franz X. Kaertner, Shoji Akiyama, Jifeng Liu, Kazumi Wada, Lionel C. Kimerling; MIT, USA.* We report a silicon/germanium saturable Bragg reflector, compatible with CMOS processing. Its sub-picosecond recovery time enables a C-band spanning mode-locked Er-Yb:glass laser at 1540 nm, generating 220 fs pulses.

TuA5 • 9.30
Broadly Tunable Optical Parametric Oscillators with up to 82-GHz Pulse Repetition Rate and Very High Output Power, *Steve Lecomte[1], Rüdiger Paschotta[1], Ursula Keller[1], Susanne Pawlik[2], Berthold Schmidt[2], Kentaro Furusawa[3], Andrew Malinowski[3], David J. Richardson[3]; [1]ETH Zurich, Switzerland, [2]Bookham (Switzerland) AG, Switzerland, [3]Optoelectronics Res. Ctr., UK.* We present optical parametric oscillators with 39-GHz and 82-GHz repetition rates, generating 2.1 W and 0.9 W of average output power, respectively. The signal wavelength is broadly tunable in the 1.5-micron spectral region.

TuA6 • 9.45
Mode Locked and Q-Switched Cr:ZnSe Laser Using a Semiconductor Saturable Absorbing Mirror (SESAM), *Clifford Pollock[1,2], Nathan Brilliant[2], Douglas Gwin[2], Timothy J. Carrig[2], William J. Alford[2], J. B. Heroux[3], W. I. Wang[3], I. Vurgaftman[4], J. R. Meyer[4]; [1]Cornell Univ., USA, [2]Coherent Technologies, Inc., USA, [3]Columbia Univ., USA, [4]NRL, USA.* A passively mode-locked cw Cr:ZnSe laser operating near 2.5 μm generated 11 psec pulses using a Semiconductor Saturable Absorbing Mirror (SESAM). Passive Q-switched operation could also be obtained with the same SESAM.

► 10.00 – 11.00
Coffee Break
Mozart, Fischer von Erlach & Metternich

► 10.00 – 16.00
Exhibits
Mozart, Fischer von Erlach & Metternich

TuB • Poster Session III

10.00 – 11.00
Mozart, Fischer von Erlach & Metternich
TuB • Poster Session III

TuB1
Femtosecond Cr:Forsterite Laser Modelocked with a GaInNAs Saturable Bragg Reflector, *Alan McWilliam[1], C. G. Leburn[1], A. A. Lagatsky[1], C. T. Brown[1], W. Sibbet[1], G. J. Valentine[2], A. J. Kemp[2], S. Calvez[2], D. Burns[2], M. D. Dawson[2], J. Kontinnen[3], T. Jouhti[3], M. Pessa[3]; [1]Univ. of St. Andrews, School of Physics and Astronomy, UK, [2]Inst. of Photonics, Univ. of Strathclyde, UK, [3]Optoelectronics Res. Ctr., Tampere Univ. of Technology, Finland.* A low loss GaInNAs saturable Bragg reflector has been used to generate picosecond and femtosecond pulses from a Cr:Forsterite laser operating in the 1300nm sperctral region.

TuB2
200 kHz Electro-Optic Switch for Ultrafast Laser Systems, *Detlef Nickel[1], Christian Stolzenburg[1], Angelika Beyertt[1], Adolf Giesen[1], Jürgen Häußermann[2], Frank Butze[2], Martin Leitner[3]; [1]Inst. für Strahlwerkzeuge, Germany, [2]Forschungsgesellschaft für Strahlwerkzeuge mbH, Germany, [3]JENOPTIK Laser, Optik, Systeme GmbH, Germany.* We report of a method for obtaining very high electro-optic switching rates by multiple-shift usage of a single BBO crystal. This method is employed for regenerative amplification of ultrashort pulses at 200 kHz repetition rate.

TuB3
Novel Technique for Highly Sensitive Timing Jitter Measurements, *Rüdiger Paschotta[1], Benjamin Rudin[1], Adrian Schlatter[1], Simon C. Zeller[1], Gabriel J. Spühler[1], Lukas Krainer[1], Ursula Keller[1], Nils Haverkamp[2], Harald R. Telle[2]; [1]ETH Zürich, Switzerland, [2]Physikalisch-Technische Bundesanstalt, Germany.* A novel technique allows to measure the relative timing jitter of stabilized or free-running mode-locked lasers with extremely high sensitivity, while being quite insensitive to AM-PM conversion.

TuB4
Broadband Regenerative Amplifier Capable of Sub-10-fs Pulse Generation, *Hideyuki Takada, Masayuki Kakehata, Kenji Torizuka; AIST, Japan.* In this study, we report a broadband regenerative amplifier capable of sub-10-fs pulse generation utilizing a gain-narrowing compensator with multiple dielectric layers.

TuB5
Intense Laser Emission at 981 nm in an Ytterbium-Doped $KY(WO_4)_2$ Crystal, *Aude Bouchier, Gaelle Lucas-Leclin, François Balembois, Patrick Georges; Lab Charles Fabry de l'Inst. d'Optique, France.* We present the first efficient laser emission at the three-level transition at 981 nm in an ytterbium-doped $KY(WO_4)_2$ crystal producing 526 mW, pumped at 931 nm with a Ti:sapphire laser in a microchip configuration.

TuB6
Cationic Distribution and Spectral Properties of Nd^{3+} in Hexa-Aluminate Laser Crystals, *Aurelia Lupei[1], Voicu Lupei[1], Cristina Gheorghe[1], Lucian Gheorghe[1], Daniel Vivien[2], Gerard Aka[2]; [1]Inst. of Atomic Physics-INFLPR, Romania, [2]ENSCP-Lab de Chimie Appliquée de l'Etat Solide, France.* The $Sr_{1-x}Nd_yLa_{x-y}Mg_xAl_{12-x}O_{19}$ Hexa-aluminate crystals are investigated for $^4F_{3/2} \rightarrow {}^4I_{9/2}$ 900 nm laser emission. Spectral characteristics and models of three types of non-equivalent Nd^{3+} centers, the cationic distribution types and optimal compositions for laser emission are presented.

TuB7
A Radiative Lifetime Calculation for Quasi Two-Level Impurity Centers in Anisotropic Active Media, *A. S. Yasukevich, A. V. Mandrik, N. V. Kuleshov; Inatl Laser Ctr., BNTU, Belarus.* A phenomenological method for calculation of

radiative lifetime for quasi-two level impurity centers in anisotropic media is reported.

TuB8

Highly Efficient 900 nm Laser Emission of Nd^{3+} in Strontium Lanthanum Aluminate, *Voicu Lupei[1], Gerard Aka[2], Daniel Vivien[2]; [1]Inst. of Atomic Physics, Romania, [2]ENSCP-Lab de Chimie Appliquee de l'Etat Solide, France.* Based on a proper selection of the laser material composition, 900 nm laser emission with slope efficiencies of 0.74 and 0.84 is obtained by $^4F_{5/2}$ and respectively $^4F_{3/2}$ pumping of Nd^{3+} in strontium lanthanum aluminate.

TuB9

Laser Operation of Bulk Crystals and Epitaxially Grown Composites of Yb:KLu$(WO_4)_2$, *Uwe Griebner[1], Simon Rivier[1], Junhai Liu[1], Mauricio Rico[1], Rüdiger Grunwald[1], V. Petrov[1], Xavier Mateos[2], Ana Aznar[2], Jaume Massons[2], Josefina Gavaldà[2], Rosa Solé[2], Magdalena Aguiló[2], Francesc Díaz[2]; [1]Max-Born-Inst., Germany, [2]Univ. of Tarragona, Spain.* Bulk and epitaxial composites of Yb:KLu$(WO_4)_2$ were grown and characterized. CW-lasing at 1µm was demonstrated achieving conversion efficiencies of 50% and output powers of 1W for the bulk and 25.5% and 0.5W for the composite Yb:KLu$(WO_4)_2$.

TuB10

Mid IR Laser Oscillations in New Low Phonon $PbGa_2S_4$:Dy^{3+} Crystal, *Maxim E. Doroshenko[1], Tasoltan T. Basiev[1], Vyacheslav V. Osiko[1], Dmitrii V. Badikov[2]; [1]Laser Materials and Technology Res. Ctr. of GPI, Russian Federation, [2]Kuban State Univ., Russian Federation.* New results on synthesis, spectroscopic properties and laser oscillations (output up to 0.3 mJ at 4.33 µm) in new lead thiogallate ($PbGa_2S_4$) crystal doped with dysprosium are reported.

TuB11

CW and Pulsed Laser Action in New Cr^{3+}, Li:Mg_2SiO_4 Crystal, *Vyacheslav F. Lebedev[1], Sergey Yu Tenyakov[1], Alexander S. Podstavkin[2], Alexander Shestakov[2], Alexander Gaister[3], Evgenii V. Zharikov[3], Ivan A. Scherbakov[3]; [1]Fiber Optics Res. Ctr. at the GPI RAS, Russian Federation, [2]Scientific & Production Ctr. E.L.S. Co., Russian Federation, [3]General Physics Inst. of the Russian Acad. of Sciences, Laser Materials and Technologies Res. Ctr., Russian Federation.* The pulsed and CW laser oscillation of Cr^{3+} in forsterite crystals, codoped by chromium and lithium, are reported for the first time. The tunability within the range 1030-1180 nm has been achieved in pulse mode.

TuB12

Multiwavelength Mid-IR Spatially-Dispersive CW Laser Based on Polycrystalline Cr^{2+}ZnSe, *Igor S. Moskalev, Vladimir V. Fedorov, Sergey B. Mirov; Univ. of Alabama at Birmingham, USA.* For the first time a continuous-wave, multiwavelength, polycrystalline Cr^{2+}ZnSe spatially-dispersive laser is described. A 200 nm wide, multiwavelength (2-40 lines) output spectrum, tunable over 2200-2800 nm spectral range is reported.

TuB13

Tm:YLF Pumped Ho:YAG and Ho:LuAG Lasers, *Norman P. Barnes[1], Brian M. Walsh[1], Donald J. Reichle[1], Theresa J. Axenson[2]; [1]NASA Langley Res. Ctr., USA, [2]Science and Technology Corp., USA.* Room temperature Ho:YAG and Ho:LuAG lasers pumped by Tm:YLF laser demonstrated 3.4 mJ threshold and 0.41 slope efficiency, incident optical to laser energy. Results for numerous rod lengths, Ho concentrations, and output reflectivities are presented.

TuB14

En Route to Electrically Pumpable Cr^{2+} Doped II-VI Semiconductor Lasers, *Andrew Gallian[1], Vladimir V. Fedorov[1], John Kernal[1], Justin Allman[1], Sergey Mirov[1], Evgueni M. Dianov[2], Andrey O. Zabezhaylov[2], Igor P. Kazakov[3]; [1]Univ. of Alabama at Birmingham, USA, [2]General Physics Inst., Russian Acad. of Sciences, Russian Federation, [3]P.N.Lebedev Physical Inst., Russian Acad. of Sciences, Russian Federation.* MBE growth and photoluminescence study of thin films and bulk Cr^{2+}:ZnSe are reported. We show that MBE provides optically active chromium in ZnSe and is viable for fabrication of optically and electrically pumped laser structures.

TuB15

A 20kW Peak Power, Air-Core, Ultrashort Pulse Fibre Source with Extensive Wavelength Conversion, *R. E. Kennedy, C. J. de Matos, S. V. Popov, J. R. Taylor; Imperial College, UK.* Peak power of 20kW is achieved in an all-fibre integrated chirped pulse amplification system by using air-core fiber pulse compression. The high-power femtosecond source is applied to frequency doubling and visible to near-infrared broadband generation

TuB16

Line Tunable Ultraviolet Laser, *Brian M. Walsh, Norman P. Barnes; NASA Langley Res. Ctr., USA.* An ultraviolet laser is demonstrated using a dual wavelength Nd:YAG oscillator, sum frequency and second harmonic process. Synchronous pulses at 1.052 and 1.319 micrometers are amplified, mixed and subsequently doubled, producing pulses at 0.293 micrometers.

TuB17

Theoretical and Experimental Investigation of Cross Resonant Optical Parametric Oscillators, *Myriam Raybaut, Antoine Godard, Olivier Lambert, Jean-Pierre Faleni, Philippe Kupecek, Michel Lefebvre; Office Natl. d'Etudes et de Recherches Aerospatiales, France.* We report on the theoretical analysis and experimental investigation of a two-crystal optical parametric oscillator where the signal and idler are totally and exclusively output coupled after the first and second crystal, respectively.

TuB18

QPM Wavelength Converters Based on Stoichiometric Lithium Tantalate, *Sunao Kurimura[1], Nan Ei Yu[1], Yoshiyuki Nomura[1], Masaru Nakamura[1], Kenji Kitamura[1], Tetsumi Sumiyoshi[2]; [1]Natl. Inst. for Materials Science, Japan, [2]Cyber Laser Inc., Japan.* We report recent developments in periodically-poled stoichiometric lithium tantalate, suitable for high-power operation due to high thermal conductivity. Reduction of optical scattering and extension of effective apertures are reported by choosing appropriate poling parameters.

TuB19

Diode-Laser-Fiber-Amplifier Pumped Optical Parametric Oscillator with 110 GHz Rapid, Continuous Tuning, *Ian D. Lindsay[1], Petra Gross[1], Balaji Adhimoolam[1], Marvin E. Klein[2], Klaus-Jochen Boller[1]; [1]Univ. of Twente, The Netherlands, [2]Art Innovation B.V., The Netherlands.*We describe a singly-resonant continuous-wave optical parametric oscillator pumped by fiber-amplified diode laser. The OPO idler output could be tuned without mode-hops over 110GHz in 30ms allowing mid-infrared absorption spectra to be rapidly acquired.

TuB20

Widely Tunable and Broadband Optical Parametric Amplification in Periodically Poled $KTiOPO_4$, *Anna Fragemann, Valdas Pasiskevicius, Fredrik Laurell; Laser Physics and Quantum Optics, Sweden.* Widely tunable infrared continuum-seeded optical parametric amplification employing periodically poled $KTiOPO_4$ is demonstrated. Collinear and noncollinear amplification is investigated with the aim to substantially broaden the signal's bandwidth.

TuB21

Ti:Sapphire Laser System with a High and Variable Repetition Rate for Generation of EUV and Soft X-Ray Pulses, *Thorben Haarlammert, Jana Hüve, Jörg Kutzner, Torsten Steinbrück, Grigoris Tsilimis, Sebastian Wegner, Helmut Zacharias; Univ. Münster, Germany.* A Ti:sapphire oscillator-amplifier system with a adjustable repetition rate between 1 and 20 kHz is presented. With the output pulses High Harmonic radiation is generated and applied in photoemission spectroscopy experiments.

TuB22

Intracavity Frequency-Doubled Diode-Pumped Continuous Wave Blue Laser Using Nd:YVO_4/ LiB_3O_5, *Ji Won Kim[1], Jong Hoon Jang[1], Choon Sup Yoon[1], Keetae Um[2], Soyeon Park[2]; [1]KAIST, Republic of Korea, [2]LG Electronics Inc., Republic of Korea.* We report intracavity frequency-doubled diode-pumped continuous wave Nd:YVO_4 lasers using LiB_3O_5 as a nonlinear crystal, which exhibit the highest 457 nm blue laser output of 543 mW so far obtained employing Nd:YVO_4.

TuB23

Efficient Generation of Tunable Visible Light by Means of DFG of aTi:Al_2O_3 and a Nd:YAG Laser, *Jochen Wueppen, Bernd Jungbluth, Jens Geiger, Dieter Hoffmann, Reinhart Poprawe; Fraunhofer Inst. for Laser Technology, Germany*. DFG of a frequency doubled Titanium:Sapphire and a Nd:YAG laser provides tunable output in the spectral range between 520 nm and 680 nm. Using BBO crystals, conversion efficiencies of up to 32% have been achieved.

TuB24

Second Harmonic Generation of Nd:YAG Laser Using 9-ppm Cerium-Doped KTP, *Norihito Saito[1], Mayumi Kato[1], Kazuhiro Sakurai[2], Yasuhiko Murayama[2], Masaki Katsumata[3], Satoshi Wada[1]; [1]Solid-State Optical Science Res. Unit, RIKEN, Japan, [2]Earth Chemical Co., LTD, Japan, [3]Kogakugiken Co., LTD, Japan.* We studied second harmonic generation using 9-ppm cerium-doped KTP. High conversion efficiency near 70 % was achieved without optical damage in SHG with heating. The crystal also brought an efficient quasi-continuous-wave 532 nm coherent source.

TuB25

Operation Limits of Flux-Grown PPKTP and Stoichiometric PPLT for High Power SHG around 775nm, *M. Y. Vyatkon[1], A. V. Avdokhin[1], A. G. Dronov[1], R. I. Yagodkin[1], S. V. Popov[2], J. R. Taylor[2], V. P. Gapontsev[3]; [1]NTO IRE-Polus, Russian Federation, [2]Imperial College, UK, [3]IPG Photonics, USA.* Peak-power limits for 775nm SHG in PPKTP and MgO:sPPLT is experimentally assessed. No nonlinear absorption detected in PPKTP up to 16MW/cm^2. SHG efficiency in MgO:sPPLT showed higher susceptibility to the intensity of 775nm SH radiation.

TuB26

Intracavity Second and Third Harmonic Generation at 671 and 447nm from a Q-Switched Nd:GVO_4 Laser, *Hamish Ogilvy, Michael J. Withford, James A. Piper; Macquarie Univ., Australia.* Intracavity frequency doubling and tripling in LBO has demonstrated 2.6W of 671nm output and over 150mW of 447nm using a Q-switched, low-doped Nd:$GdVO_4$ laser operating on the 1342nm transition.

TuB27

Terahertz Pulse Generation via Optical Rectification in Photonic Crystal Microcavities, *Andrea Di Falco, Claudio Conti, Gaetano Assanto; NOOEL-Univ. Roma Tre, Italy.* Using a 3-D time-domain analysis including all the components of the quadratic susceptibility and the material dispersion, we investigate few-cycle terahertz pulse generation by optical rectification in a photonic crystal microcavity.

TuB28

Estimation of the Hollow Core Photonic Crystal Fiber Nonlinearity Factor, *Irina A. Khromova, Leonid A. Melnikov; Saratov State Univ., Russian Federation.* In the present paper photonic crystal fiber properties were studied. Group velocity dispersion and nonlinearity factor of the fiber were obtained. Pulse parameters, needed for fundamental-mode or high-index-mode solitons to form such fibers, were estimated.

TuB29

Single Frequency Fiber Laser Generated in Linear Cavity with Loop Mirror Filter, *Shenghong Huang, Yan Feng, Guanshi Qin, Akira Shirakawa, Ken-ichi Ueda; Inst. for Laser Science, Univ. of Electro-Communications, Japan.* Single frequency 1064nm ytterbium fiber laser was demonstrated by introducing loop mirror filter in linear laser cavity. Output power was 18 mW under pump power of 107 mW, the slope efficiency was about 20%.

TuB30

Super Continuum Generation in Photonic Crystal Fibers Pumped by a Pulsed Fiber Laser, *Anping Liu, Marc A. Norsen, Roy D. Mead; Aculight Corp., USA.* We report up to 6 W average power supercontinuum generation in a PCF pumped by a fiber laser. A 40 m PCF has produced output bandwidth of 800 nm at 12 W of pump power.

TuB31

Modeling of Transverse Beam Dynamics in Photonic Crystal Fibre Laser, *Andrey I. Konyukhov, Leonid A. Melnikov; Saratov State Univ., Russian Federation.* The dynamics of few-mode photonic crystal fibre laser was investigated numerically using the field decomposition in terms of Laguerre-Gaussian functions. The switching of transverse beam structure is observed and dependence on initial conditions is found.

TuB32

Two Methods for Remote Measurements of Thermal Effects in Optical Elements, *Victor V. Zelenogorsky, Eugeny E. Kamenetsky, Efim A. Khazanov, Ilya E. Kozhevatov, Oleg V. Palashov, D. E. Silin, Alexander A. Solovyev; Inst. of Applied Physics, Russian Federation.* We developed a scanning Hartmann sensor and an interferometer detector for precision measurements of thermal effects in samples in vacuum. The simultaneous use of these methods allowed us to distinguish contributions of different thermal effects.

TuB33

Er-Doped Waveguide Laser Fabricated by Femtosecond Pulses from a Cavity-Dumped Yb-Oscillator, *Roberto Osellame[1], Giulio Cerullo[1], Giuseppe Della Valle[1], Stefano Taccheo[1], Nicola Chiodo[1], Paolo Laporta[1], Roberta Ramponi[1], Orazio Svelto[1], Alexander Killi[2], Uwe Morgner[2], Max J. Lederer[3], Daniel Kopf[3]; [1]INFM, Dept. Fisica-Politecnico di Milano and IFN-CNR, Italy, [2]Max-Planck-Inst. fur Kernphysik, Germany, [3]HighQLaser Production, Austria.* Laser action with 2dBm output power was demonstrated in waveguides fabricated on a erbium-ytterbium-doped phosphate glass by direct writing with femtosecond pulses from a cavity-dumped Yb:glass laser (166 KHz repetition rate, 300 fs pulse duration).

TuB34

25-W Diode-Pumped Continuous-Wave Quasi-Three-Level Nd:YAG Thin Disk Laser, *Jiancun Gao, Jochen Speiser, Adolf Giesen; Inst. für Strahlwerkzeuge, Germany.* 25.4-W continuous-wave power of quasi-three-level transitions was achieved with a diode-pumped Nd:YAG thin disk laser. With an etalon in the resonator laser powers of 14-W at 946 nm and 6-W at 938.5 nm are obtained.

TuB35

Precisely-Controlled Frequency Agile Laser for Radio Frequency Spectral Analysis, *Guillaume Gorju, Vincent Crozatier, Vincent Lavielle, Fabien Bretenaker, Ivan Lorgere, Jean-Louis Le Gouët; Lab Aime Cotton, France.* We investigate the requirements in laser sources to develop wide bandwidth and high resolution Radio Frequency spectral analysis. Experimental results of different architectures are presented.

TuB36

Nd:YAG/V:YAG Monolith Microlaser, *Jan Šulc[1], Helena Jelinkova[1], Michal Němec[1], Petr Koranda[1], Karel Nejezchleb[2], Václav Škoda[2]; [1]Czech Technical Univ., Czech Republic, [2]Crytur, Ltd., Czech Republic.* Stable cw Q-switched output at wavelength 1.34 μm with length of pulses 11 ns and peak power 6.1 kW with frequency 6.4 kHz was obtained from a monolith - longitudinally diode pumped Q-switched Nd:YAG/V:YAG laser.

TuB37

Continuous-Wave, Q-Switched and Mode-Locked Laser Operation of Yb^{3+}-Doped YVO_4 Single Crystal, *Victor E. Kisel[1], A. E. Troshin[1], N. A. Tolstik[1], V. G. Shcherbitsky[1], N. V. Kuleshov[1], V. N. Matrosov[2], T. A. Matrosova[2], M. I. Kupchenko[2], F. Brunner[3], R. Paschotta[3], F. Morier-Genoud[3], U. Keller[3]; [1]Intl. Laser Ctr., Belarus, [2]Solix Ltd., Belarus, [3]Inst. of Quantum Electronics, Physics Dept., ETH, Switzerland.* We report on the efficient CW, Q-switched and mode-locked laser operation of a diode-pumped Yb:YVO_4 laser. CW output power of 1W with slope efficiency of 59% with respect to absorbed pump power was demonstrated.

TuB38

Nearly Quantum-Efficiency Limited Oscillation of Yb:YAG Laser at Room Temperature, *Shinichi Matsubara, Tsutomu Ueda, Tetsuji Takamido, Sakae Kawato, Takao Kobayashi; Graduate School of Engineering, Univ. of Fukui, Japan.* Highly efficent 1031-nm cw laser oscillation of Yb:YAG crystal has been realized at room temperature with the slope efficiency of 140% and the optical-to-optical efficiency of 89% for the absorbed pump power.

TuB39
Triggering Passively Q-Switched Microlasers, *Jean-Philippe Feve, Nicolas Landru, Olivier Pacaud; JDS Uniphase, France.* We demonstrate triggered operation of a passively Q-switched microlaser at 266nm. For repetition rates between 10Hz and 1kHz, the output performances (mainly pulse energy and build-up time) exhibit remarkably small variations.

TuB40
Power Scalable Single-Frequency Thin Disk Oscillator, *Christian Stolzenburg[1], Mikhail Larionov[1], Adolf Giesen[1], Frank Butze[2]; [1]Inst. für Strahlwerkzeuge, Univ. Stuttgart, Germany, [2]Forschungsgesellschaft für Strahlwerkzeuge, Germany.* We report on Yb:YAG single-frequency thin disk oscillators. The tuning range with more than 1 W of output power spans over 56 nm. The maximal obtained single-frequency output power is 30 W at 1030 nm.

TuB41
Comparative Investigation of Diode-Pumped Tm^{3+}:$YAlO_3$ Lasers: Influence of Doping Concentration, *Hamit Kalaycioglu, Alphan Sennaroglu, Adnan Kurt; Laser Res. Lab, Dept. of Physics, Koc Univ., Turkey.* Experiments with diode single-end-pumped Tm^{3+}:$YAlO_3$ lasers show that the best power performance near room temperature is obtained with 1.5% Tm^{3+}:$YAlO_3$ crystals. Fluorescence and lifetime measurements were also performed to investigate the influence of doping concentration.

TuB42
A 100 J 1 ns Nd:Glass Laser for Optical Parametric Chirped Pulse Amplifiers Pumping, *Anantoly K. Poteomkin, Eugeny V. Katin, Efim A. Khazanov, Alexey V. Kirsanov, Grigory A. Luchinin, Anantoly N. Mal'shakov, Michail A. Martyanov, Alexander Z. Matveev, Oleg V. Palashov, Andrey A. Shaykin; Inst. of Applied Physics, Russian Federation.* A compact Nd:glass laser amplifier with second harmonic generation is reported, which is used to pump the final stage of a broadband optical parametric chirped pulse amplifier.

TuB43
High-Power Operation of Diode Edge-Pumped, Composite Microchip Yb:YAG Laser with Ceramic Pump Wave-Guide
Masaki Tsunekane, Traian Dascalu, Takunori Taira; Inst. for Molecular Science, Japan. We demonstrated high-power operation of directly diode edge-pumped, composite microchip Yb:YAG laser. The new 300μm-thick microchip consists of cylindrical Yb:YAG single crystal core with 5mm-diameter and surrounding transparent, undoped YAG ceramic pump wave-guide.

TuB44
20-J Diode-Pumped Zig-Zag Slab Laser with 2-GW Peak Power and 200-W Average Power, *Toshiyuki Kawashima[1], Takashi Kurita[1], Osamu Matsumoto[1], Tadashi Ikegawa[1], Takashi Sekine[1], Masahiro Miyamoto[1], Kouich Iyama[1], Hirofumi Kan[1], Yutaka Tsuchiya[1], Ryo Yasuhara[2], Noriaki Miyanaga[2], Masahiro Nakatsuka[2], Yasukazu Izawa[2], Hiroyuki Furukawa[3]; [1]Hamamatsu Photonics K.K., Japan, [2]Inst. of Laser Engineering, Osaka Univ., Japan, [3]Inst. of Laser Technology, Japan.* A high-energy, high-average-power zig-zag slab laser is being demonstrated by 800 kW peak pump power from total 8,000 diode bars. The novel multi-pass laser amplifier generates a 20-J pulse energy in10 ns at 10 Hz.

TuB45
Diode-Side-Pumped Q-switched Nd:YVO_4 / LiF:F_2^-Laser,
Alexander V. Kir'yanov[1], Edgar Villafana R.[1], Ara Minassian[2], Michael J. Damzen[2]; [1]Ctr. de Investigaciones en Optica, Mexico, [2]Imperial College London, UK. Passive Q-switching of diode-side-pumped Nd:YVO_4 laser using LiF:F_2^- crystal as saturable absorber is reported. The giant-pulse (10 ns) high-quality (TEM_{00}) operation with output power of 18.5 W is obtained at pump power of 38 W.

TuB46
Energy Transfer and Population of $^4S_{3/2}$ and $^4F_{9/2}$ Erbium Levels in Er^{3+}:$Na_{0.4}Y_{0.6}F_{2.2}$ Laser Crystals under Direct and Upconversion Selective IR Excitation, *Svetlana E. Ivanova[1], Alexandra M. Tkachuk[1], Marie-France Joubert[2], Yannick Guyot[2], Valentin P. Gapontzev[3]; [1]S.I. Vavilov State Optical Inst., Russian Federation, [2]Univ. Lyon, France, [3]IPG Laser GmbH, Germany.* Energy transfer processes in Er^{3+}:$Na_{0.4}Y_{0.6}F_{2.2}$ crystals under selective laser diode pumping are studied theoretically and experimentally. Concentration and pump power dependences of the intensity of luminescence from different erbium levels are investigated.

TuB47
5.4 W of Single-Frequency Radiation from a Grazing Incidence Composite Thin Slab Multipass Amplifier with Low Thermo-Optical Aberrations, *Hagen Zimer, Klaus Albers, Ulrich Wittrock; Photonics Lab, Germany.* A novel grazing incidence YVO_4-Nd:YVO_4 composite multipass amplifier with low thermo-optical aberrations is presented. We obtained 5.4 W of single-frequency radiation by means of 20 dB amplification of a 50 mW NPRO.

TuB48
Self-Focused Broad Area Distributed Bragg Reflector Laser Diodes, *Grigorii S. Sokolovskii[1], Idris M. Gadjiev[1], Anton G. Deryagin[1], Vladislav V. Dudelev[1], Sergey N. Losev[1], Edik U. Rafailov[2], Wilson Sibbett[2]; [1]Ioffe Inst., Russian Federation, [2]Univ. of St Andrews, UK.* We report theoretical and experimental assessments of prototype broad-area curved-groove distributed Bragg reflector laser diodes (c-DBR) and demonstrate their single-frequency and self-focusing operation. These lasers will be suitable for applications requiring both spectrally/spatially enhanced beams.

TuB49
Nonlinear Decay of the Excited State in Yb:YAG, *Mikhail Larionov[1], Karsten Schuhmann[2], Jochen Speiser[2], Christian Stolzenburg[2], Adolf Giesen[2]; [1]Forschunggesellschaft für Strahlwerkzeuge, Germany, [2]Inst. für Strahlwerkzeuge, Germany.* Decay processes depending on the density of the excited Yb-ions and the temperature with a rate comparable to spontaneous fluorescence rate are observed in Yb:YAG. Their rate and the additional heat generation are estimated.

TuC • Waveguide Devices

11.00 – 12.30
Van Swieten & Johann Strauss 1 & 2
TuC • Waveguide Devices
Johan Nilsson; Univ. of Southampton, UK, Presider

TuC1 • 11.00
Rod-Type Fiber Laser, *Nelly Deguil-Robin[1], Jens Limpert[1], Inka Manek-Hönninger[1], Francois Salin[1], Andreas Liem[2], Thomas Schreiber[2], Fabian Röser[2], Stefan Nolte[2], Holger Zellmer[2], Andreas Tünnermann[2], Jes Broeng[3], Anders Petersson[3], Christian Jakobson[3]; [1]CELIA-PALA, Univ. Bordeaux, France, [2]Friedrich-Schiller-Univ. Jena, Inst. of Applied Physics, Germany, [3]Crystal Fibre A/S, Denmark.* We report on a novel ytterbium-doped fiber design which combines the advantages of rod and fiber gain media. 57 W output power in single-mode beam quality are obtained from a 43 cm long fiber cane.

TuC2 • 11.15
Single-Frequency 133 W CW Self-Imaging Nd:YAG Waveguide Power Amplifier, *Berton E. Callicoatt, Mike Tartaglia, Iain T. McKinnie, Chris Wood, Josef R. Unternahrer; Coherent Technologies, Inc., USA.* We present results on a single-frequency master oscillator power amplifier laser system featuring Nd:YAG self-imaging waveguides. Output power of 133 W was obtained from the system. Gain, beam quality, and system efficiency are assessed.

TuC3 • 11.30
Waveguide Crystal Fibers Doped with Rare-Earth Ions, *Vladimir Tsvetkov, Ivan A. Shcherbakov, Galina Bufetova, Dmitri Nikolaev, Sergey Rusanov, Alexander Yakovlev; General Physics Inst. RAS, Russian Federation.* Realization of graded index single crystal fibers grown by laser heated pedestal growth method are discussed. Development of efficient diode pumped cw 1.06-mm waveguide lasers made of Nd:YAG single-crystal fibers are reported.

TuC4 • 11.45
300-μJ Pulse-Energy, 2-ns Pulse Fiber Amplifier at 1567 nm, *Fabio Di Teodoro, Matthias Savage-Leuchs, Marc Norsen; Aculight Corp., USA.* We report a pulsed

fiber source generating 1567 nm, spectrally narrow, ~2-ns pulses with maximum energy 303 μJ, average power of up to 12 W, and peak power > 130 kW.

TuC5 ● 12.00

IR Supercontinuum Generation in As-Se Photonic Crystal Fiber, *Brandon Shaw[1], Peter Thielen[2], Fred Kung[3], Vinh Nguyen[1], Jas Sanghera[1], Ishwar Aggarwal[1]; [1]NRL, USA, [2]SFA, Inc., USA, [3]Univ. Res. Foundation, USA.* Broadband IR supercontinuum has been generated in As-Se photonic crystal fiber. Supercontinuum extends from 2100 to 3200 nm under 100 fs 2500 nm pumping.

TuC6 ● 12.15

CW-Pumped, High Power, Extended Supercontinuum Generation in Low Water-Loss PCF, *J. C. Travers[1], S. V. Popov[1], J. R. Taylor[1], H. Sabert[2], B. J. Mangan[2]; [1]Imperial College, UK, [2]Blaze Photonics, UK.* Reduction of the inherent water-loss in holey fibres around 1380nm is achieved. Pumping of such fibres with Yb CW fibre laser allowed extension of CW continuum generation required for micron-scale resolution optical coherence tomography.

► 12.30 – 14.00
Lunch (On Your Own)

► 13.30 – 17.30
Short Courses 241 & 242
Schubert & Lehar

TuD ● 20th Anniversary Roundtable

14.00 – 17.30
Van Swieten & Johann Strauss 1 & 2
TuD ● 20th Anniversary Roundtable
Craig Denman, AFRL/DELO, USA; Irina Sorokina; Inst. of Photonics, Austria, Presiders

TuD1 ● 14.00 **►Round Table◄**

Dr. Norman P. Barnes has over 30 years of experience with solid state lasers and nonlinear optics at Texas Instruments, Martin Marietta, Los Alamos National Laboratory, and NASA Langley, and has enjoyed sabbaticals at the Naval Research Laboratory and the University of Southampton. Dr. Barnes developed Nd, Dy, Ho, Er, and Tm lanthanide series lasers, as well as Cr and Ti transition metal lasers. He performed pioneering work on diode pumped lasers beginning in 1970 and seminal modeling and experimental work on injection seeding. He is the author or coauthor for over 150 publications in refereed journals and over 170 presentations at national or international conferences.

Advanced Solid-State Photonics Round Table Discussion, *Norman P. Barnes; NASA Langley Res. Ctr., USA.* Solid-state lasers have remained on the research forefront for over 40 years because of a series of technological innovations. These innovations and the supporting technology that permitted the innovations are reviewed.

TuD2 ● 14.45 **►Round Table◄**

Peter F. Moulton is Vice-President and Chief Technology Officer at Q-Peak, Inc. Moulton received an A.B. in physics from Harvard College and a Ph.D. in electrical engineering from M.I.T in 1975. His recent work has been focused on high-energy nonlinear optical systems, including harmonic generators, parametric oscillators and multicolor, visible-wavelength sources for displays. He has been Principal Investigator for several NIH-funded medical laser programs. Moulton was elected a fellow of the OSA in 1991, and, in 1997, received both the R.W. Wood Prize from the OSA and the William Streifer Award for Scientific Achievement from the IEEE Lasers and Electro-Optics Society (LEOS). In 2000, he was elected a Member of the National Acad. of Engineering.

20 Years of Advanced Solid-State Lasers, *Peter Moulton; Q-Peak Inc., USA.* The Advanced Solid-State Photonics meeting began as an OSA Topical Meeting in 1985 and has undergone a significant change in content and emphasis over the last 20 years. We review those changes and discuss the future.

► 15.30 – 16.00 Coffee Break
Mozart, Fischer von Erlach & Metternich

TuD3 ● 16.00 **►Round Table◄**

Günter Huber has been Dean of the Faculty of Physics at Hamburg University since 2003. His research is focused on solid-state lasers and the growth, development, and fundamental characterisation of new laser materials on the basis of transition metal and rare earth ions. His activities include optical spectroscopy of solids, new diode pumped lasers for various applications, up-conversion lasers based on crystals and fibres, and nonlinear frequency conversion of solid-state lasers. The results of these activities have been documented in about 190 journal papers. Dr. Huber is Fellow of the Optical Society of America; he received the Quantum Electronics and Optics Prize of the European Physical Society in 2003.

The OSA Topical Solid-State Laser Meeting in a European Sight, *Günter Huber; Inst. für Laser-Physik, Univ. Hamburg, Germany.* The history of the topical meeting ASSP reflects the advances of laser research and technology during the past 20 years. The development of the topical solid-state laser meeting series will be disussed from a European point of view.

TuD4 ● 16.45 **►Round Table◄**

Richard C. Powell is Vice President for Research, Graduate Studies and Economic Development and Professor of Optical Science at the University of Arizona. He received his B.S. degree from the United States Naval Acad., and his M.S. and Ph.D. degrees in physics from Arizona State University. He has authored two textbooks and over 260 scientific papers. Powell has been very active in professional societies and is an elected Fellow of both the American Physical Society and the Optical Society of America. He has served on the Board of Directors of OSA and as President of OSA. Powell is also a member of the Southern Arizona Leadership Council and the Arizona Governor's Council on Innovation and Technology.

Solid-State Lasers: The Evolution of a Successful Topical Meeting, *Richard C. Powell; Univ. of Arizona, USA.* Advanced Solid State Photonics is one of the most successful topical meetings of OSA. This talk will review the history of the meeting and elucidate lessons learned relevant to its success.

► 19.00 – 22.00
Conference Reception
Wiener Rathauskeller (transportation on own)

Wednesday, 9 February 2005

► 6.30 – 8.00
Continental Breakfast
Vien Jahreszeiten & Kaunitz

► 7.30 – 18.00
Registration
Ballroom Foyer

WA ● Nonlinear Optical Sources

8.00 – 10.00
Van Swieten & Johann Strauss 1 & 2
WA ● Nonlinear Optical Sources
Dennis Lowenthal; Aculight Corp., USA, Presider

WA1 ● 8.00 **►Invited◄**
Microstructured Ferroelectrics and Semiconductors for Nonlinear Optics, *Martin M. Fejer; Stanford Univ., USA.* Progress in microstructured ferroelectrics, e.g. stoichiometric lithium tantalate, and semiconductors, e.g. orientation-patterned GaAs, enable extension of quasi-phasematching techniques to wavelength ranges and power levels difficult in conventional media.

WA2 ● 8.30
7W Average Power, Green Generation in MgO-Doped Stoichiometric PPLT with Yb Laser Pumping, *S. V. Popov[1], J. R. Taylor[1], M. Y. Vyatkin[2]; [1]Imperial College, UK, [2]NTO IRE-Polus, Russian Federation.* Stoichiometric MgO:PPLT is applied to single-pass, 67% peak-power efficient, 7.05W average-power second harmonic generation of an Yb-doped fiber source. Reduced photorefraction and nonlinear absorption of the material resulted in low M2 value of the green.

WA3 ● 8.45
Improved 3.4 micron Generation from a PPLN OPO with an Intracavity PPLN OPA, *Ian Lee, William J. Alford, Jarett Bartholomew; Coherent Technologies Inc., USA.* Conversion efficiency of a 1047 nm pumped PPLN OPO with an intracavity PPLN OPA was investigated. Idler output of 310 mW at 3.4 microns at 1 kHz with 21.2% conversion efficiency was obtained.

WA4 ● 9.00
Terahertz-Wave Generation in Periodic GaAs Structures, *Konstantin L. Vodopyanov[1], Dmitrii Simanovskii[2], Martin M. Fejer[1]; [1]E.L. Ginzton Lab, Stanford Univ., USA, [2]W.W. Hansen Lab, Stanford Univ., USA.* We demonstrate efficient generation of narrow-band THz-wave pulses near 2.1 THz frequency (wavelength 140 μm) - using periodic GaAs structures and quasi-phase-matched optical rectification mechanism; 110-fs, 1-μJ mid-IR pulses were used as a pump.

WA5 ● 9.15
Wavelength-Versatile, Green -Yellow - Red Laser, *Richard P. Mildren, Helen M. Pask, Hamish Ogilvy, James Piper; Ctr. for Lasers and Applications, Australia.* We report an all-solid-state Raman laser with intracavity frequency mixing, which can be easily configured (without exchanging optics) to switch between various wavelengths in the range 532nm-606nm, with average powers of up to 2W.

WA6 ● 9.30
Continuous-Wave Crystalline Raman Lasers, *Valentin A. Orlovich[1], Alexander S. Grabtchikov[1], Viktor A. Lisinetskii[1], Vladimir N. Burakevich[1], Alexander A. Demidovich[2], Michael Schmitt[3], Wolfgang Kiefer[3]; [1]Inst. of Physics, Belarus, [2]Inst. of Molecular and Atomic Physics, Belarus, [3]Inst. für Physikalishe Chemie, Univ. Würzburg, Germany.* Continuous- wave generation of $Ba(NO_3)_2$ Raman laser pumped by multimode argon laser and diode pumped Nd:KGW and $Nd:YVO_4$ lasers with Raman conversion is investigated. Output Stokes power and generation efficiency reached 160 mW and 5%.

WA7 ● 9.45
High-Power Solid-State Sodium Beacon Laser Guidestar for the Gemini North Observatory, *Allen J. Tracy, Allen K. Hankla, Camilo A. Lopez, David Sadighi, Nathan Rogers, Ken Groff, Iain T. McKinnie; Coherent Technologies, USA.* Coherent Technologies, Inc. is developing the world's first commercial sodium guidestar laser. The 14 W, 589 nm laser is scheduled to be delivered to Gemini North Observatory on Mauna Kea, Hawaii in November of 2004.

► 10.00 – 11.00
Coffee Break
Mozart, Fischer von Erlach & Metternich

► 10.00 – 16.00
Exhibits
Mozart, Fischer von Erlach & Metternich

WB ● Young Scientist Poster Session

10.00 – 11.00
Mozart, Fischer von Erlach & Metternich
WB ● Young Scientist Poster Session

WB1
Withdrawn.

WB2
Generation of Forbidden Frequencies in Nonlinear Photonic Crystal Microcavities and Their Applications, *Andrea Di Falco, Claudio Conti, Gaetano Assanto; NOOEL - Nonlinear Optics and OptoElectronics Lab, Univ. Roma Tre, Italy.* We investigate the transient response of a nonlinear photonic crystal microcavity to a step-like excitation. The generation of in-gap sidebands via four wave mixing lends itself to a novel wavelength-shifting scheme for ultrafast optical communications.

WB3
Thermal Birefringence in Cylindrical Faraday Rotator under High Average Power Lasers, *Ryo Yasuhara[1], Masanobu Yamanaka[1], Takayoshi Norimatsu[1], Yasukazu Izawa[1,2], Toshiyuki Kawashima[2], Hirofumi Kan[2,3], Hiroyuki Furukawa[3]; [1]Inst. of Laser Engineering, Japan, [2]Hamamatsu Photonics K. K., Japan, [3]Inst. for Laser Technology, Japan.* Detailed computation and experimental results of thermal birefringence loss in TGG and glass based Faraday rotator rod was presented. These data will be useful for designing a laser system and a thermally compensated Faraday rotator.

WB4
Temperature and Composition Dependence of the Absorption and Refraction of Mg-Doped Congruent and Stoichiometric $LiNbO_3$ in the THz Range, *László Pálfalvi[1], János Hebling[2,3], Jürgen Kuhl[2], Ágnes Péter[4], Katalin Polgár[4]; [1]Res. Group for Nonlinear and Quantum Optics, Hungarian Acad. of Sciences, Hungary, [2]MPI für Festkörperforschung, Germany, [3]Dept. of Experimental Physics, Univ. of Pécs, Hungary, [4]Res. Inst. for Solid State Physics and Optics, Hungarian Acad. of Sciences, Hungary*. Absorption coefficient and index of refraction of Mg-doped $LiNbO_3$ crystals with different compositions are determined in the 30 - 200 cm^{-1} frequency range. Stochiometric $LiNbO_3$ has smaller absorption and index of refraction than congruent samples.

WB5
Bend-Loss Control of Multi-Mode Fiber Power Amplifiers Producing Single-Mode Operation, *Shay Acco, Yoav Sintov, Yaakov Glick, Ori Katz, Yehudah Nafcha, Raphael Lavi; Soreq NRC, Israel.* A model was developed for evaluating transverse mode evolution in multimode fiber amplifiers, depending on the

induced coiling radius. The model accuracy was verified experimentally. Single mode operation in a multimode fiber amplifier was accomplished.

WB6

Theoretical and Experimental Values of Thermal Effects, Especially Spherical Aberration, in Transversally-Pumped High-Power Lasers, *Aurélie Montmerle Bonnefois; CEA, France.* A comparative study between experimental and theoretical values for spherical aberration in a transversally-pumped high-power lasers is presented. An improved theory was used, which leads to a very good match with the experimental values.

WB7

Electro-Optically Q-Switched Er:YAG Laser, *Petr Koranda, Michal Nemec, Helena Jelinkova, Jan Sulc, Miroslav Cech; FNSPE CTU, Czech Republic.* Q-switch operated Er:YAG laser utilizing $LiNbO_3$ Pockels cell was developed together with special hollow glass waveguide delivery system. 60 ns giant pulses with energ 60 mJ were generated yielding peak power ~1 MW.

WB8

Stable Dual-Passive Mode-Locking of a 7W, Thermal-Lens-Shaped Nd:$GdVO_4$ Laser, *S. L. Schieffer, D. Brajkovic, A. I. Cornea, W. Andreas Schroeder; Univ. of Illinois at Chicago, USA.* The novel combination of a saturable Bragg mirror (amplitude modulation) and a weak second harmonic nonlinear mirror (phase locker) generates extremely stable 10-30ps pulses at 76MHz from a 7W, TEM_{00}-mode, thermal-lens-shaped, diode-pumped, Brewster Nd:$GdVO_4$ laser.

WB9

Ultrafast Soft X-Ray Absorption Spectroscopy, *Enikoe Seres[1, 2], Christian Spielmann[1]; [1]Physikalisches Inst. EP1, Univ. Würzburg, Germany, [2]Inst. für Photonik, Technische Univ. Wien, Austria.* With a solid-state-laser driven soft-X-ray source we investigated the structural dynamic of a-Si, following the variation of the conduction and valence band state density, the inter-atomic distance with a temporal resolution of less than 20fs.

WB10

Beating Instabilities and Dynamic of Inversion in a Yb:KGW Regenerative Amplifier, *Martin Delaigue[1], Antoine Courjaud[2], Clemens Hönninger[2], Inka Manek-Hönninger[1], Eric Mottay[2], François Salin[1]; [1]CELIA - Univ. Bordeaux 1, France, [2]Amplitude Systèmes, France.* We study the physics of high repetition rate Yb:KGW regenerative amplifiers and show both theoretically and experimentally that stable operation can only be obtained for specific ranges of repetition rates.

WB11

Applications of Laser Techniques for the Study of Dynamics of Amorphous Solids with High Spatial Resolution: Single Molecule Spectroscopy, *Andrei V. Naumov[1], Yuri G. Vainer[1], Lothar Kador[2], Markus Bauer[2]; [1]Inst. of Spectroscopy, Russian Federation, [2]Inst. of Physics and BIMF, Univ. of Bayreuth, Germany.* Experimental advances (specifically in the field of lasers) allowed measuring the optical spectra of single molecules in transparent hosts. We demonstrate possibilities of Single Molecule Spectroscopy for the study of low-temperature properties of amorphous solids.

WB12

Novel Approach for Dental Hard Tissue Ablation by Ultra-Short Laser Pulses, *Martin Strassl[1], Ernst Wintner[2]; [1]Photonics Inst. Vienna Univ. of Technology, Austria, [2]Photonics Inst., Vienna Univ. of Technology, Austria.* Ultra-short laser pulses allow collateral damage-free ablation. Scanning involving advanced high-repetition rate lasers yields maximum ablation speed matching Er-lasers together with optimum quality. A novel rotating scanner can act like an optical "drill".

WB13

Near-Field Scanning Optical Microscopy of Femtosecond Laser Written Waveguides, *Michael J. Withford, Graham D. Marshall, Martin Ams, Douglas Little; Ctr. for Ultrahigh-Bandwidth Devices for Optical Systems (CUDOS), Australia.* We designed and built a near-field scanning optical microscope to investigate the properties of femtosecond laser written waveguides in erbium doped phosphate glass. Fine structure in the mode field is identified using this diagnostic technique.

WB14

Crystal Characterization and "Natural Quasi-Phase Matching" in Nd- and Yb:YAB, *Peter Dekker, Judith M. Dawes; Macquarie Univ., Australia.* We characterize nonlinear conversion in Yb:YAB and demonstrate a simple non-destructive technique for measuring crystal quality. Imaging the nonlinear conversion onto a CCD camera we observe phase matching characteristics similar to that of quasi-phase-matched crystals.

WB15

Optimal Pumping of Ce:LiLuF Lasers for Broad Tunability and High Efficeincy, *Hua Liu[1], David Coutts[1], H. Sato[2], K. Shimamura[2], T. Fukuda[2]; [1]Macquarie Univ., Australia, [2]Tohoku Univ., Japan.* Efficient and broadly tunable operation of Ce:LiLuF lasers can only be obtained by careful control of the pump and laser polarisations. Any sigma polarised radiation leads to formation of colour centres which can prevent lasing.

WB16

High Efficiency, High Power, Self-Frequency Doubled Q-Switched Operation in Yb:YAB, *Peter Dekker, Judith M. Dawes, James A. Piper; Macquarie Univ., Australia.* We report 95% conversion from the optimised Q-switched fundamental output to green output in the self-frequency doubling material Yb:YAB. Maximum average green powers of 2.27 W were obtained at 520-522 nm.

WB17

Low Reflection Loss Ion-Beam Sputtered Negative Dispersion Mirrors with MCGTI Structure for Low Pump Threshold Compact Femtosecond Pulses Lasers, *Balázs Császár[1], Ambrus Kőházi-Kis[1], Róbert Szipőcs[2]; [1]R&D Ultrafast Lasers Ltd., Hungary, [2]Res. Inst. for Solid State Physics and Optics, Hungary.* Low reflection loss, ion-beam sputtered, multiple-cavity Gires-Tournois interferometer mirrors are used for dispersion compensation in different configurations of compact, low pump threshold, femtosecond pulse Cr:LiSAF and Ti:sapphire laser oscillators.

WB18

Cubic Phase Distortion of Single Attosecond Pulses Being Reflected on Narrow Band Mo/Si Filtering Mirrors, *András Lukács[1], Zoltán Várallyay[2], Róbert Szipőcs[3]; [1]R&D Ultrafast Lasers Ltd., Hungary, [2]Budapest Univ. of Technology and Economics, Hungary, [3]Res. Inst. for Solid State Physics and Optics, Hungary.* We show that cubic phase distortion caused by narrowband Mo/Si multilayer filtering X-ray mirrors may considerably increase the time duration of single attosecond pulses.

WB19

Nonresonant Feedback Formation in the Random Laser, *Vasil P. Yashchuk[1], Olga A. Prygodjuk[1], Eugene O. Tikhonov[2], Volodymyr I. Bezrodny[2]; [1]Dept. of Physics, Kyiv Natl. T. Shevchenko Univ., Ukraine, [2]Inst. for Physics, Ukrainian Acad. of Science, Ukraine.* The feedback types are analysed: light scattering within active and inactive layers and reflection at the sample surfaces. Its contributions to the total feedback depend on the active media thickness and determine random laser parameters.

WB20

Injection Seeding of a High Energy Ti:Sapphire Laser for Water Vapor Detection around 935nm, *Frank Kallmeyer[1], Andreas Hermerschmidt[1], Hans J. Eichler[1], Hans H. Klingenberg[2]; [1]Technical Univ. Berlin, Germany, [2]DLR, Germany.* A Ti:Sapphire system operating at 935nm wavelength is characterized with a set-up suitable for instantaneous measurements of the linewidth. A 20mJ pulse energy with a spectral purity of 99.6% was achieved using 100mJ pump energy.

WB21

Real Time 3-D Nonlinear Microscopy, *Júlia Fekete[1], Ákos Bányász[1], Róbert Szipöcs[1], Gergely Katona[2], Balázs Császár[2], András Lukács[2], Zoltán Várallyay[3], Attila Sághy[3], Pál Maák[3], Balázs Rózsa[4], Balázs Lendvai[4], Szilveszter E. Vizy[4]; [1]Res. Inst. for Solid State Physics and Optics, Hungary, [2]R & D Ultrafast Lasers Ltd., Hungary,*

[3]Budapest Univ. of Technology and Economics, Hungary, [4]Inst. for Experimental Medicine, Dept. for Pharmacology, Hungary*. We propose a nonlinear microscope scheme being capable of simultaneous, 3-D investigation of the activity patterns of neural networks or signal summation rules of individual neurons in a 600x600x200 μm^3 volume with sub-micrometer spatial resolution.

WB22

Infrared Emitting PbSe Quantum-Dots for Telecommunications-Window Applications, *Christopher E. Finlayson, Adrian Amezcua, Richard J. Curry, Pier Ja Sazio, Paul S. Walker, Martin C. Grossel, David C. Smith, Jeremy J. Baumberg; Univ. of Southampton, UK.* We demonstrate the colloidal synthesis of photoluminescent PbSe nanocrystal quantum-dots. Characterization shows that the wavelength of photoluminescence may be size-tuned, suggesting a wide range of optoelectronic and telecommunications applications within the infrared "telecommunications window".

WB23

Comparative Analysis of the 2 μm Emission in Tm^{3+}:BaY_2F_8 and Tm^{3+}:KYF_4: Spectroscopy and Laser Experiment, *Francesco Cornacchia, Daniela Parisi, Elisa Sani, Alesssandra Toncelli, Mauro Tonelli; NEST - INFM - Univ. di Pisa, Italy.* We report the growth, spectroscopy and laser results of Tm^{3+}:BaY_2F_8 (8% and 12% doping density) and Tm^{3+}:KYF_4 (10% doping density). A comparison of the laser emission in the 2 μm region is presented.

WB24

Novel Method for Generation of Tunable UV/Blue Femtosecond Pulses, *Chao-Kuei Lee[1], J. Y. Huang[2], Ci-Ling Pan[2], Jing-Yung Zhang[3]; [1]Inst. of Electro-Optical Engineering, NSYSU, Taiwan Republic of China, [2]Inst. of Electro-Optical Engineering, NCTU, Taiwan Republic of China, [3]Dept. of Physics, Georgia Southern Univ., USA.* Tunable femtosecond laser pulses from 380nm to 460nm, attributed to a cascaded SFG process, can be directly generated from a 405nm-pumped type-I BBO NOPA. The optical conversion efficiency is more than 5%.

WB25

Erbium-Ytterbium Fiber Laser with Simple Double-Clad Waveguide, *Alena Zavadilova[1], Vaclav Kubecek[1], Ivan Kasik[2], Vlastimil Matejec[2]; [1]Czech Technical Univ. in Prague, Czech Republic, [2]Acad. of Sciences of the Czech Republic, Czech Republic.* Lasing at 1.54 μm of additionally polymer coated Er^{3+}:Yb^{3+} fiber in double clad geometry when pumped by wide strip low cost laser diode is reported. Total efficiency was 14%.

WB26

Double-Pass versus Single-Pass Fiber Amplification: A Numerical and Experimental Comparison, *Nelly Deguil-Robin, Jens Limpert, Stephane Petit, Inka Manek-Hönniger, Francois Salin; CELIA-PALA, France.* A modified Frantz-Nodvick equation is applied to investigate pulsed amplification in ytterbium-doped fibers. Conditions under which single or double pass configuration is preferable are pointed out. The results are compared with experiments.

WB27

Laser Resonator with a Thermo-Optically Driven Adaptive Mirror, *Felix Reinert[1], Michael Gerber[1], Willy Lüthy[1], Thomas Graf[2]; [1]Univ. of Bern, Switzerland, [2]Univ. Stuttgart, Germany.* A thermo-optically driven adaptive mirror has been constructed. The mirror is used as a resonator mirror of a Nd:YAG laser. The influence of different phase patterns on the emission modes of the laser is investigated.

WB28

Ultrafast Dynamics of Multiphoton Photoemission from Gold and Carrier-Envelope Phase Sensitivity, *Peter Dombi[1], Ferenc Krausz[2], Gyözö Farkas[3]; [1]Technische Univ. Wien, Austria, [2]Max-Planck-Inst. für Quantenoptik, Germany, [3]Res. Inst. for Solid State Physics and Optics, Hungary.* Multiphoton-induced photoelectron emission from gold was investigated using ultrashort pulses to assess additional effects influencing its carrier-envelope phase dependence. The third-order interferometric autocorrelation showed short side-wings indicating ultrafast hot electron dynamics reducing the phase contrast.

WB29

High-Speed Micromachining with Ultrashort Laser Pulses Delivered by an Air-Core Photonic Crystal Fiber, *Fabian Röser, Matthias Will, Thomas Schreiber, Jonas Burghoff, Stefan Nolte, Holger Zellmer, Andreas Tünnermann, Jens Limpert; Inst. of Applied Physics, Germany.* We report on microjoule-femtosecond (300fs, 1μJ) pulses delivered by a 25 m long air-core photonic bandgap fiber and its application. High speed (100mm/s) waveguide writing is done by focusing the fiber delivered pulses in glass.

WB30

Ti:Sapphire Lasers for Frequency Metrology Spanning the Visible and Infrared Spectrum without Nonlinear Fiber, *Seth M. Foreman[1], Adela Marian[1], Jun Ye[1], Evgeny A. Petrukhin[2], Mikhail A. Gubin[2], Oliver D. Mucke[3], Franco N. C. Wong[3], Erich P. Ippen[3], Franz X. Kaertner[3]; [1]JILA, NIST and the Univ. of Colorado, USA, [2]P. N. Lebedev Physical Inst., Russian Federation, [3]MIT, USA.* Two different schemes using femtosecond lasers for optical frequency metrology without the use of nonlinear fiber are experimentally demonstrated, allowing phase coherence between the microwave, visible, and infrared portions of the electromagnetic spectrum.

WB31

Measurement of the Excited State Absorption Cross-Section in Cr^{4+}:YAG Using Relaxation Oscillations Study, *Sergey Naumov, Evgeni Sorokin, Irina T. Sorokina; Technische Univ. Wien, Inst. für Photonik, Austria.* We present a measurement technique of ESA at pump wavelength for the four-level lasers. In Cr:YAG, the ESA cross-section is 2.8·10-18 cm^2. Validity of the method is proved by comparison with the ESA-free Cr:ZnSe laser.

WB32

Optical-Phase Stabilization of 1550-nm Mode-Locked Laser to Optical Atomic Clock with Application to Remote Transfer of Ultralow-Jitter Timing Signal, *Kevin W. Holman[1], David J. Jones[2], Jun Ye[1]; [1]JILA, NIST and Univ. of Colorado, USA, [2]Univ. of British Columbia, Canada.* We report optical-phase coherence between a 1550-nm mode-locked laser and an optical atomic clock. Transfer of a timing signal with jitter < 40 fs is achieved with active noise cancellation of the fiber transmission path.

WB33

Batch Fabrication and ASE Suppression Issues in Zig-Zag Slabs for Solid-State Laser Amplifiers, *Arun Kumar Sridharan, Shailendhar Saraf, Robert L. Byer; Stanford Univ., USA.* We show a novel method for the batch fabrication of slabs for zig-zag solid-state laser amplifiers. We also discuss various techniques that we implemented to suppress ASE and dramatically improve the small signal gain.

WB34

Microstructured Optical Fibre Semiconductor Metamaterials, *Adrian Amezcua-Correa[1], Christopher E. Finlayson[1], Pier J. A. Sazio[1], Hui Fang[2], Dong-Jin Wong[2], Thomas J. Scheidemantel[2], Bryan Jackson[2], Neil F. Baril[2], Venkatraman Gopalan[2], John V. Badding[2]; [1]Univ. of Southampton, UK, [2]Pennsylvania State Univ., USA.* We have synthesised arrays of semiconductor wires and tubes inside microstructured optical fibres. These extreme aspect ratio structures have highly functional optoelectronic properties and characterisation studies of waveguiding and electron transport properties are presented here.

WC • Semiconductor Lasers

11.00 – 12.30
Van Swieten & Johann Strauss 1 & 2
WC • Semiconductor Lasers
Jirong Yu; NASA Langley Res. Ctr., USA, Presider

WC1 • 11.00 **►Invited◄**

Diode-Based Ultrafast Lasers, *Wilson Sibbett; Univ. of St. Andrews, UK.* An overview will be presented of femtosecond diode-pumped vibronic lasers. Work in progress on the development of mode-locked quantum-dot diode lasers that operate into a femtosecond regime will also be described.

WC2 ● 11.30

High Power, Continuous Wave Operation of a Vertical External Cavity Surface Emitting Laser at 674nm, *Jennifer E. Hastie[1], Stephane Calvez[1], Handong Sun[1], Martin D. Dawson[1], Tomi Leinonen[2], Markus Pessa[2]; [1]Inst. of Photonics, UK, [2]Optoelectronics Res. Ctr., Finland.* For the first time to our knowledge, high power continuous wave operation has been achieved with a vertical external cavity surface emitting laser based on the GaInP/AlGaInP material system for emission at red wavelengths.

WC3 ● 11.45

72% Wallplug Efficiency and 16W CW Front Facet Output Optical Power from 100-µm Aperture Laser Diode, *Nikita A. Pikhtin, Sergey O. Slipchenko, Dmitry A. Vinokurov, Maxim A. Khomylev, Ilya S. Tarasov; A.F. Ioffe Physico-Technical Inst., Russian Federation.* Record-high 16W CW room temperature output optical power and 72% wallplug efficiency were attained in 100-µm-aperture lasers (λ=1.06 µm) based on quantum well heterostructure with ultra thick asymmetric waveguide possessing 0.34 cm^{-1} internal optical loss.

WC4 ● 12.00

Passively Mode-Locked Surface-Emitting Semiconductor Lasers with High Repetition Rates of up to 30 GHz, *Dirk Lorenser[1], Alex Aschwanden[1], Heiko J. Unold[1], Deran J. Maas[1], Rüdiger Paschotta[1], Ursula Keller[1], Emilio Gini[2], Dirk Ebling[2]; [1]ETH Zurich, Physics Dept., Switzerland, [2]ETH Zurich, FIRST Ctr. for Micro- and Nanoscience, Switzerland.* We present high-repetition-rate passively mode-locked vertical external-cavity surface-emitting semiconductor lasers with average output powers of 1.4 W in 6.1-ps pulses at 10 GHz and 25 mW in 4.7-ps pulses at 30 GHz.

WC5 ● 12.15

A Waveguide Laser Inscribed in the YAG:Nd^{3+} Crystal by Femtosecond Writing, *Andrey Okhrimchuk[1], Alexander Shestakov[1], Igor Khrushchev[2], Ian Bennion[2]; [1]Elements of Laser Systems Co., Russian Federation, [2]Photonics Res. Group, Aston Univ., UK.* Technique of direct writing of depressed cladding waveguides by a femtosecond laser beam in laser crystals has been developed. Laser based on a cladding waveguide in YAG:Nd crystal has been demonstrated for the first time.

► 12.30 – 14.00
Lunch Break (On Your Own)

WD ● Femtosecond Laser Sources

14.00 – 15.30
Van Swieten & Johann Strauss 1 & 2
WD ● Femtosecond Laser Sources
Franz X. Kaertner; MIT, USA, Presider

WD1 ● 14.00 **►Invited◄**

Femtosecond High-Brightness Nanometer-Sized Coherent Light Source, *Orazio Svelto[1], Margherita Zavelani-Rossi[1], Dario Polli[1], Giulio Cerullo[1], Sandro De Silvestri[1], Massimiliano Labardi[2], Maria Allegrini[2]; [1]Politecnico di Milano, Italy, [2]Univ. di Pisa, Italy.* We describe a highly-efficient nanometric light source obtained by second harmonic generation at a sharp metal tip illuminated at grazing-incidence by 25-fs pulses from a Ti:sapphire oscillator. Applications to background-free apertureless near-field microscopy are explored.

WD2 ● 14.30

Sub-Nanojoule Pulse Compression Down to 6 fs in Photonic Crystal Fibers, *Zoltán Várallyay[1], Júlia Fekete[2], Ákos Bányász[2,3], Sándor Lakó[2], Róbert Szipőcs[2]; [1]Budapest Univ. of Technology and Economics, Hungary, [2]Res. Inst. for Solid State Physics and Optics, Hungary, [3]Dept. of Physical Chemistry, Eötvös Univ., Hungary.* A photonic crystal fiber with zero dispersion wavelength of 861 nm is used for pulse compression of sub-nanojoule laser pulses. Theory shows that sub-6 fs pulses can be generated using a 6 mm long fiber.

WD3 ● 14.45

Femtosecond Pulse Compression of a Supercontinuum Generated in a Microstructure Fiber, *Rüdiger Paschotta, Birgit Schenkel, Ursula Keller; ETH Zürich, Switzerland.* We demonstrate the generation of 5.5-fs pulses with 19 MHz repetition rate by dispersive compression of a supercontinuum generated with 15-fs pulses from a Ti:sapphire laser in a 5-mm long microstructure fiber.

WD4 ● 15.00

Yb:CaF_2 Femtosecond Laser, *Andrea Lucca[1], Frederic Druon[1], Francois Balembois[1,2], Patrick Georges[1], Patrice Camy[2], Vincent Petit[2], Jean-Louis Doualan[2], Richard Moncorge[2]; [1]Inst. d'Optique, France, [2]Ctr. Interdisciplinaire de Res. sur les Ions et les Lasers, France.* This is the first demonstration of a high power passively mode-locked diode-pumped femtosecond laser based on an Yb^{3+}:CaF_2 crystal. 0.88 W, 150 fs Pulses and 1.74 W, 230 fs have been produced.

WD5 ● 15.15

135-fs Diode-Pumped Laser with 1-W Average Power Based on a YAG//Yb:SYS Hetero-Bonded Crystal, *Frederic Druon[1], Francois Balembois[1], Patrick Georges[1], Romain Gaumé[2], Bruno Viana[2]; [1]Lab Charles Fabry de l'Inst. d'Optique, France, [2]LCAES-ENSCP, France.* We present the first demonstration in femtosecond regime of a Yb-doped hetero-bonding crystal: YAG//Yb:SYS. Pulses of 135 fs with an average power of 1W have been produced.

►15.30 – 16.00
Coffee Break
Mozart, Fischer von Erlach & Metternich

WE ● Femtosecond Fiber Lasers

16.00 – 18.15
Van Swieten & Johann Strauss 1 & 2
WE ● Femtosecond Fiber Lasers
Anne Tropper; Univ. of Southampton, UK, Presider

WE1 ● 16.00 **►Invited◄**

Ultrafast Fiber Lasers and Amplifiers: Novel Light Sources for High Precision Micro Machining, *Andreas Tünnermann[1,2], Andreas Liem[1], Matthias Reich[1], Fabian Röser[1], Thomas Schreiber[1], Stefan Nolte[1], Holger Zellmer[1], Jens Limpert[3]; [1]Friedrich-Schiller Univ. Jena, Inst. of Applied Physics, Germany, [2]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany, [3]Celia-Pala, Univ. Bordeaux, France.* In this paper we review the achievements, the scaling potential and the advantages in micro machining applications of ultrafast rare-earth-doped high performance fiber laser systems.

WE2 ● 16.30

High Power Picosecond Fiber Amplifier Based on Spectral Compression, *Jens Limpert[1], Nelly Deguil-Robin[1], Inka Manek-Hönniger[1], Francois Salin[1], Thomas Schreiber[2], Andreas Liem[2], Fabian Röser[2], Holger Zellmer[2], Andreas Tünnermann[2], Antoine Courjaud[3], Clemens Hönninger[3], Eric Mottay[3]; [1]CELIA-PALA, Univ. Bordeaux, France, [2]Inst. of Applied Physics, Friedrich Schiller Univ. Jena, Germany, [3]Amplitude Systemes, France.* The fiber based generation of nearly transform-limited 10-ps pulses with 200 kW peak power (97 W average power) based on SPM-induced spectral compression is reported. Efficient second harmonic generation applying this source is also discussed.

WE3 ● 16.45

Power Amplification of Parabolic Pulses, *Thomas Schreiber, Fabian Röser, Andreas Liem, Oliver Schmidt, Sven Höfer, Holger Zellmer, Andreas Tünnermann; Inst. of Applied Physics, Germany.* We report on the high power fiber based amplification of parabolic pulses. The output is compressed using transmission gratings to 300 fs and an average power of 38 W at 75 MHz repetition rate.

WE4 ● 17.00 **►Invited◄**

Fiber Based Frequency Comb Lasers and Their Applications, *Ingmar Hartl[1], L. Dong[1], M. E. Fermann[1], T. R. Schibli[2], A. Onae[2], F. L. Hong[2], H. Inaba[2], K. Minoshima[2], H. Matsumoto[2]; [1]IMRA America, Inc., USA, [2]AIST, Japan.* The carrier envelope phase of a polarization-maintaining fiber frequency comb laser is stabilized for long periods of time. The performance of the system is comparable to a traditional Ti:sapphire-based comb.

WE5 • 17.30
Self-Similar Femtosecond Fiber Lasers with Pulse Energies Above 10 nJ, *Joel R. Buckley[1], Frank W. Wise[1], Fatih O. Ilday[2], Tom Sosnowski[3]; [1]Cornell Univ., USA, [2]MIT, USA, [3]Clark MXR Inc., USA.* By exploiting self-similar pulse propagation in an Yb fiber laser, pulse energies up 14 nJ, the highest produced to date by a short-pulse fiber laser, are achieved. The pulses can be dechirped to <100-fs duration.

WE6 • 17.45
Sub-100 fs Pulses from a 200 MHz Repetition Rate Passively-Modelocked Yb-Fiber Oscillator, *F. Omer Ilday, Jeff Chen, Franz X. Kaertner; MIT, USA*. A passively-modelocked Yb-fiber laser generating sub-100 fs at a fundamental repetition rate of 200 MHz is reported, the highest to date. Practical and fundamental limitations to higher repetition rate fiber lasers are discussed.

WE7 • 18.00
1.3-µm Pulsed Fiber Lasers Mode-Locked by Purified Carbon Nanotubes, *Yong-Won Song[1], Shinji Yamashita[1], Sze Y. Set[2], Chee Seong Goh[2], Tomoharu Kotake[2]; [1]Univ. of Tokyo, Japan, [2]Alnair Labs Corp., Japan.* We demonstrate a novel passively mode-locked fiber laser operating at 1.3µm using purified single-walled carbon nanotubes for the first time. The laser is in a ring configuration with Pr-doped fiber amplifier as the gain medium.

► 18.15 – 18.45
Closing Remarks
Craig Denman, *AFRL, USA*
Irina Sorokina, *Vienna Univ. of Technology, Austria*
Van Swieten & Johann Strauss 1 & 2

Key to Presenters

U

V

W

X

Y

Z

Notes