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10th EPS-QEOD Europhoton Conference

EUROPHOTON

SOLID-STATE, FIBRE, AND WAVEGUIDE COHERENT LIGHT SOURCES

CONFERENCE DIGEST

CONFERENCE DIGEST

28 August - 2 September 2022

Schloss Herrenhausen, Herrenhäuser Str. 5,
30419 Hannover, Germany

https://www.europhoton.org/

EUROPHOTON 2022 CONFERENCE DIGEST

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Digest and Copyright Information

The papers included in this digest comprise the short summaries of the **10th EPS-QEOD Europhoton Conference** to be held from 28 August to 2 September 2022, Hannover, Germany. The extended version of the papers (1-page summary in pdf format) will be made available on line within 2 months after the conference. A link with login and password is provided separately.

All web browsers (Firefox, Internet Explorer, Safari or similar) will allow you to download the digest.
A .pdf viewer (tested with Adobe Acrobat) will be necessary to view the papers. This software can be downloaded from **http://www.adobe.com**

The papers reflect the authors' opinion and are published as presented and without any change in the interest of timely dissemination. Their inclusion in these publications does not necessarily constitute endorsement by the editors, the European Physical Society.

Europhoton 2022 is organised and sponsored by

European Physical Society
Quantum Electronics and Optics Division

http://qeod.epsdivisions.org/

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Introduction

***W**elcome to Hannover and to the **10th EPS-QEOD Europhoton Conference**!* Established since 2004, this unique conference features the latest breakthroughs in the fields of **solid-state**, **fibre and waveguide light sources**.

The 2022 edition will take place at **Schloss Herrenhausen**, Herrenhäuser Str. 5, 30419 Hannover, Germany, https://www.schloss-herrenhausen.de/de/home/ .
To arrive there, please download https://www.schloss-herrenhausen.de/de/kontakt-aufnehmen/anfahrt/ .
With public transportation, please use tram line 4 or 5 or Bus line 136 to the Herrenhäuser Garden stop.
In Germany masks are mandatory in public transportation.

World-renowned researchers will discuss the latest developments in the scientific community accompanied by **Summer School Sessions** at the PhD student and postdoctoral level, and by informal breakout sessions for discussion. The conference will also feature a **Special Symposium** where prominent **Keynote and Invited Speakers** will discuss state of the art and future visions for this fascinating field. The conference also includes the award "**EPS-QEOD Prize for Research in Laser Science and Applications"** and the talk of the winner, **Sergey I. Bozhevolnyi**, *University of Southern Denmark, Odense, Denmark,* elected the winner of the 2020 EPS-QEOD Prize for Research in Laser Science and Applications for his "seminal contributions to surface-plasmon polaritons and the developments of plasmonic metasurfaces".

The Europhoton 2022 Conference will include:
– A one-day and a half Summer School from Sunday afternoon 28 August to Monday 29 August (whole day) 2022.
– The main Conference on "Solid-State Lasers" and "Fibre and Waveguide Devices" from Tuesday 30 August to Friday 2 September 2022 (3 pm).
– A tabletop exhibit running from Tuesday 30 August to Thursday 1 September 2022.
– Two poster sessions to take place on Tuesday 30 August and on Thursday 1 September 2022.

Short abstracts of the papers to be presented at the Europhoton 2022 appear in this programme. 142 presentations (6 Summer School lectures, 2 keynotes, 11 invited speakers, 69 orals and 54 poster presentations from Europe and overseas) have been selected for presentation at the conference.

A conference app "Europhoton" is also available and can be downloaded from the App Store or the Play Store. Link to download the app from the play store/ the app store:
https://conference4me.psnc.pl/get/?config=europhoton2022

The tenth in a row, the Europhoton conference series has shown to be very popular among the scientists and engineers who have continued to place it on their calendars.

The conference is organised by the **European Physical Society** in cooperation with the **Quantum Electronics and Optics Division (QEOD)** of the European Physical Society (EPS), and the **Cluster of Excellence PhoenixD** at the **Leibniz University Hannover**.

Conference Topics

Solid State Lasers (SSL)
Novel laser material concepts. Growth, characterisation, and spectroscopic investigations of solid-state laser materials. Rare-earth-ion and transition-metal-ion lasers. Upconversion, tunable, and ultrafast solid-state lasers. Second and higher harmonic generation and optical parametric conversion of solid-state lasers. Modelling of solid-state lasers and resonators. Demonstration of novel pump sources and resonator geometries. Thermal and thermo-optical effects in solid-state lasers. High-power, diode-pumped, and ultra-stable systems. Non-linear materials. Non-linear optical sources. Metrology applications. Optically-pumped semiconductor lasers. Mid-infrared sources and materials

Fibre and Waveguide Devices (FWD)
Novel fibre and waveguide concepts. Fibre materials, fabrication, and characterisation. CW and pulsed fibre lasers. Bragg-grating fibre lasers. Amplification in doped fibres. Waveguide fabrication and characterisation. Waveguide lasers and amplifiers. Rare-earth doped amplifiers. Raman amplifiers. High-power fibre and waveguide lasers. Power-scaling concepts for fibre and waveguide lasers. Ultrafast fibre and waveguide sources. Photonic crystal and fibre light sources. Waveguided broadband and super-continuum light sources. Non-linear materials. Non-linear optical sources. Microcavity lasers.

Summer Schools

Six summer school lectures will be held **from Sunday 28 August (afternoon) to Monday 29 August (all day), 2022**. PhD Students and Postdocs are especially invited to attend these schools. The summer schools will give students a chance to get introduced into various laser related subjects, covering the basics up to the latest research results.
Lecturers who are internationally renowned in their research subjects will present the lecture programme. See programme on the respective pages of this programme

Exhibition

A tabletop exhibit located in the basement next to the auditorium is scheduled as follows:
Tuesday 30 August 2022: 09:30 – 18:00.
Wednesday 31 August 2022: 09:30 – 16:00 (Lunch time extended to allow visits).
Thursday 1 September 2022: 09:30 – 18:00.
See list of exhibitors at https://www.europhoton.org/exhibition/

Poster Sessions and Instructions for Poster Presenters

Poster sessions for contributed papers have been a major attraction at recent conferences. Poster presentations provide a direct interaction between the presenter and the viewer.

Two poster sessions with 27 posters each are scheduled as follows:
TU-P-1: Tuesday 30 August 2022 from 12:00 to 14:00.
THU-P-2: Thursday 1 September 2022 from 12:00 to 14:00.
Poster sessions will take place in the seminar rooms on the ground floor.

These sessions will allow participants to speak with the poster authors. In order to present their work and answer questions, authors are requested to be present at their poster board on their assigned poster session day and time. The list of all posters is presented on the respective pages of this programme.

Speakers' Information

Speakers are asked to check-in with the session presider in the conference room 15 minutes before the session begins.

Speakers will be able to transfer their presentation file by USB memory stick (16:9 PowerPoint is recommended, 4:3 or pdf is possible). It will also be possible to give your presentation from your own notebook with HDMI connection. Individual notebooks will need to be connected to the box during the breaks. The conference room is equipped with microphone, beamer, and computer. No photography or recording of presentations will be allowed at the conference.

All lectures will take place in the auditorium on the first basement floor. The room is equipped with microphone, beamer, and computer. No photography or recording of presentations will be allowed at the conference.

Duration of the presentations:
Keynote: 38 minutes presentation + 7 minutes lfor discussion.
Invited: 25 minutes presentation + 5 minutes for discussion.
Oral: 12 minutes presentation + 3 minutes for discussion
Summer school: 45 minutes lecture, 15 minutes break, 45 minutes lecture, 15 minutes for discussion.

Conference Language

English will be the official conference language.

Technical Digest

The online technical digest including the one-page summaries will be available within 2 months after the conference. The link to upload the material was given via email to the registered participants.

Registration Information

Online registration to Europhoton 2022 is mandatory. Each participant (speaker, poster presenter or conference attendant) is requested to register online. The managing society will keep the right to accept/refuse participants in case online registration was not done. Registration is open to all members of the scientific and technical community.

Registration fees:
Summer school and keynote speakers have their registration fees waived. The other contributors/participants will have to pay a fee as detailed on the conference website.

The registration fees for the meeting include:
– Admission to all technical sessions of the main conference on "Solid-State, Fibre and Waveguide Coherent Light Sources", poster sessions, as well as to the half-day special symposium and summer schools.
– Lunch from Monday 29 August to Friday 2 September is included.
– Coffee breaks as mentioned in the programme.
– Online programme and conference app "Europhoton" to downloadfrom the App Store or the Play Store**.**
– Access to the tabletop exhibits.
– Online technical digest gathering the 1-page summaries. A login and password was given to the participants.
– Public transportation ticket from 28.08 to 02.09.2022. The ticket is valid for zones A, B and C (pdf to download). GVH_Region-1. The transportation ticket will be given at the conference venue. Each participant will still need to buy a ticket for the first transfer from the hotel to the conference.
– Welcome reception on Monday, 29.08.2022, at the New Town Hall, Trammplatz 2, 30159 Hannover. After the welcome by the Lord Mayor of Hannover, Mr Belit Onay, a snack will be offered in the restaurant Gartensaal. The costs for the reception are included in the conference fee. (Registration as conference participant is required).
– The presentation of the badge will allow free admission to the Herrenhausen Gardens.

Conference Dinner
The conference dinner on Wednesday, 31.08.2022, will take place on Wilhelmstein Island in the Steinhuder Meer. The participants will be taken by bus to Steinhude and back to the conference venue. In Steinhude boats will take them to the island of Wilhelmstein and back. Participants wishing to attend had to register and pay an additional cost in advance. As a reservation had to be done, no further onsite reservation can be received.

Registration will take place at the entrance to the conference venue on the ground floor. The conference office will be on floor down in front of the auditorium. Your badge will be ready there.

Conference office - Opening days and times:
Sunday 28 August 2022: From 13:00 to 17:00
Monday 29 August, Tuesday 30 August, Wednesday 31 August, Thursday 1 September and Friday 2 September 2022: From 08:00 to 12:00.

Conference Hours

	Morning	Lunch time	Afternoon
Sunday 28 August 2022			13:45 – 18:15 (a)
Sunday 28 August 2022			18:45 – 20:15 (b)
Monday 29 August 2022	08:00 – 12:30 (a)		14:00 – 18:30 (a)
Tuesday 30 August 2022	08:15 – 12:00	12:00 – 14:00 (c)	14:00 – 19:00
Wednesday 31 August 2022	08:15 – 12:00		14:45 – 16:15
Thursday 1 September 2022	08:15 – 12:00	12:00 – 14:00 (c)	14:00 – 18:30
Friday 2 September 2022	08:15 – 12:00		13:30 – 15:00

(a) Summer School (b) EPS Young Minds Session (c) Poster sessions

Programme overview

The programme overview can be downloaded at https://www.europhoton.org/wp-content/uploads/2022/08/2022_Europhoton_Program_Overview_FINAL-26.08.22.pdf

Coffee breaks will take place in front of the auditorium.
Lunches will take place on the first floor.

Europhoton 2022 Committees

General Chair
Uwe Morgner, *Cluster of Excellence PhoenixD, Leibniz University Hannover, Germany*

Programme Chair
Markus Pollnau, *Advanced Technology Institute, University of Surrey, United Kingdom*

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Thomas Südmeyer, *University of Neuchâtel, Switzerland*

Conference Management

The conference management is provided by the **European Physical Society**, *Mulhouse, France*.
The local arrangements and on-site conference office are provided by **Cluster of Excellence PhoenixD, Leibniz University Hannover**, *Hannover, Germany.*

SS-1: Summer School 1

Time: Sunday, 13:45–15:45 Location: Auditorium

Summer School SS-1.1 13:45

Integrated photonic quantum systems — •Michael Kues — Institute of Photonics, Leibniz University Hannover, Hannover, Germany

In this lecture, I will give an introduction into the topic of integrated photonic quantum systems, revising the on-chip realization of quantum states and their integrated/fiber-based processing with dedicated application scenarios.

15:45–16:15: Coffee break

SS-2: Summer School 2

Time: Sunday, 16:15–18:15 Location: Auditorium

Summer School SS-2.1 16:15

Optical frequency combs from modelocked lasers — •Ursula Keller — ETH Zurich, Zürich, Switzerland

The revolution in optical frequency comb generation started in 1999. This lecture will give an introduction of modelocked frequency comb generation, noise characterization and single-cavity dual-comb generation. I will refer to my new textbook "Ultrafast Lasers" (Springer Verlag 2022) which provides a more comprehensive introduction to fundamental principles and applications.

18:15–18:45: Coffee Break

SUN: EPS Young Minds Session

Time: Sunday, 18:45–20:15 Location: Auditorium

Invited SUN.1 18:45

From Academia to Industry – Advice for Mastering the Transition — •Richard Zeltner — Menlo Systems GmbH, Munich, Germany — European Physical Society Young Minds Programme, Mulhouse, France

A large fraction of STEM-graduates does not pursue an academic career, but takes up a position in the industrial sector. This talk will shed light on the points that should be considered for a successful transition into the industrial realm.

SS-3: Summer School 3

Time: Monday, 8:00–10:00 Location: Auditorium

Summer School SS-3.1 8:00
Femtosecond optical parametric oscillators and frequency combs — •Derryck Reid — Heriot-Watt University, Edinburgh, United Kingdom
Since Burneika's first demonstration in 1972 of a synchronously pumped optical parametric oscillator (OPO), this technology has evolved and matured considerably. I will introduce concepts underpinning femtosecond OPOs, typical architectures, modelling approaches, principles of phase control and several key applications in areas of sensing and metrology.

10:00–10:30: Coffee Break

SS-4: Summer School 4

Time: Monday, 10:30–12:30 Location: Auditorium

Summer School SS-4.1 10:30
Power Scaling of Solid State Lasers — •Andreas Tuennermann — Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — Friedrich Schiller University Jena, Institute of Applied Physics, Jena, Germany
Solid-state lasers are attractive sources of coherent radiation. In the past 60 years different laser geometries have been developed to overcome challenges in power scaling conserving the beam quality. This contribution presents the physical and technical basics of solid-state lasers and their power scalability.

12:30–14:00: Lunch Break

SS-5: Summer School 5

Time: Monday, 14:00–16:00 Location: Auditorium

Summer School SS-5.1 14:00
Fundamentals of attosecond science — •Anne L'Huillier — Lund University, Lund, Sweden
After a brief historical perspective on the field of harmonic generation in gases, an introduction to the physics of the process will be given covering the single atom response and phase matching. The presentation will also discuss laser-assisted photoionization, used both for measurement and application of attosecond pulses.

16:00–16:30: Coffee Break

SS-6: Summer School 6

Time: Monday, 16:30–18:30 Location: Auditorium

Summer School SS-6.1 16:30
Temporal compression of ultrashort pulses: principles and technology — •Marc Hanna — Laboratoire Charles Fabry, Palaiseau, France
We introduce the fundamental principles and review experimental implementations of temporal compression setups based on self-phase modulation. For each platform, such as fibers, capillaries, multiplate setups or multipass cells, we try to outline the design principles, the advantages, and the limitations in terms of pulse parameters.

19:00–21:00: Welcome Reception

TUE-SSL-1: SSL Session 1 Extreme-light Lasers

Chaired by Ingmar Hartl, DESY, Hamburg, Germany

Time: Tuesday, 8:15–9:00 Location: Auditorium

Invited TUE-SSL-1.1 8:15

Relativistic Single-Cycle Optics — Marie Ouillé, Jaismeen Kaur, Zhao Cheng, Stefan Haessler, Julius Huijts, Lucas Rovige, Aline Vernier, Igor Anriyash, Jérôme Faure, and •Rodrigo Lopez-Martens — Laboratoire d'Optique Appliquée, Institut Polytechnique de Paris, ENSTA-Paris, Ecole Polytechnique, CNRS, Palaiseau, France

We present the first experimental demonstration of direct light waveform control over collective relativistic electron motion during ultra-high intensity laser-matter interactions driven by near-single-cycle laser transients.

Oral TUE-SSL-1.2 8:45

Efficient XUV out-coupling mechanisms for intra-oscillator HHG — •Jakub Drs, Julian Fischer, Michael Müller, Norbert Modsching, Valentin Wittwer, and Thomas Südmeyer — Laboratoire Temps-Fréquence, Institut de Physique, Université de Neuchâtel, Neuchâtel, Switzerland

We report on two efficient XUV out-coupling methods highly suitable for intra-oscillator HHG. We demonstrate for the first time XUV cavity out-coupling using a coated grazing-incidence plate. We further show a preliminary operation with a pierced mirror reaching 1-GW of intracavity peak power highly suitable for HHG.

9:00–9:30: 2020 EPS-QEOD Prize for Research in Laser Science and Applications; EPS-QEOD Travel Grant Student Awards

9:30–10:00: Coffee Break

TUE-FWD-1: FWD Session 1 Planar Waveguide Devices

Chaired by Jacob Mackenzie,Optoelectronics Research Centre,Southampton, United Kingdom

Time: Tuesday, 10:00–12:00 Location: Auditorium

Invited TUE-FWD-1.1 10:00

Hybrid Integrated Nonlinear Photonics: From Chipscale frequency combs to cryogenic interconnects — •Tobias J. Kippenberg — Swiss Federal Institute of Technology Lausanne, EPFL, Lausanne, Switzerland

The development of optical frequency combs, and notably self-referencing, has revolutionized precision measurements over the past decade, and enabled counting of the cycles of light. Frequency combs, have enabled dramatic advances in timekeeping, metrology and spectroscopy.

Oral TUE-FWD-1.2 10:30

Optical Parametric Oscillator Based on Silicon Nitride Waveguides — •Ming Gao[1], Niklas M. Lüpken[1], Klaus-J. Boller[2], and Carsten Fallnich[1] — [1]University of Münster, Institute of Applied Physics, Münster, Germany — [2]University of Twente, MESA+ Institute for Nanotechnology, Enschede, Netherlands

We demonstrate a silicon nitride waveguide-based optical parametric oscillator exploiting four-wave mixing (FWM), synchronously fiber-laser pumped at 40 MHz repetition rate and showing an idler tunability across 95 nm near 1150 nm with a output pulse energy up to 63 pJ and a bandwidth of about 10 nm.

Oral TUE-FWD-1.3 10:45

Synchronously Pumped Tantalum Pentoxide Waveguide-based Optical Parametric Oscillator — •Maximilian Timmerkamp[1], Niklas M. Lüpken[1], Shiqiprim Adrian Abazi[2], Julian Rasmus Bankwitz[2], Carsten Schuck[2], and Carsten Fallnich[1] — [1]University of Münster, Institute of Applied Physics, Münster, Germany — [2]University of Münster, Institute of Physics, Münster, Germany

A waveguide-based OPO (WOPO) exploiting four-wave mixing in the emerging tantalum pentoxide platform is investigated. The WOPO, pumped with 500 fs long pulses centered at 1.55 μm wavelength with 2 nJ energy, provided up to 6 pJ pulse energy at 1.46 μm wavelength. It shows potential to be fully integrated on a chip.

Oral TUE-FWD-1.4 11:00

Efficient and Broadband Generation of Mid-Infrared Pulses by Optical Parametric Amplification in Dispersion-Engineered Thin Film Lithium Niobate — •Marin Hamrouni[1], Alex Hwang[2], Marc Jankowski[2,3], Jatadhari Mishra[2], Hubert Sylwester Stokowski[2], Timothy Patrick McKenna[2], Nayara Jornod[2], Carsten Langrock[2], Thomas Südmeyer[1], Amir H. Safavi-Naeini[2], and Martin M. Fejer[2] — [1]Laboratoire Temps-Fréquence, Université de Neuchâtel, Neuchâtel, Switzerland — [2]E. L. Ginzton Laboratory, Stanford University, Stanford, Palo Alto, USA — [3]NTT Research, Inc. Physics & Informatics Laboratories, Sunnyvale, USA

We demonstrate simple and efficient broadband mid-infrared generation via optical parametric amplification driven inside a dispersion-engineered nanophotonic waveguide. Using a commercially-available pulsed pump laser centered at 1045 nm and a CW telecom seed, we achieve up to 60% of conversion efficiency and 140 nm of mid-infrared spectral bandwidth.

Oral TUE-FWD-1.5 11:15

Recent progress on rare earth amplifiers and lasers directly on silicon — •Jonathan D. B. Bradley, Khadijeh Miarabbas Kiani, Henry C. Frankis, Cameron M. Naraine, Dawson B. Bonneville, Hamidu M.Mbonde, and Andrew P. Knights — McMaster University, Hamilton, Canada

We report on our recent developments on rare-earth-based gain and lasing directly on silicon photonic chips. We demonstrate laser emission around 1.8—1.9 μm in thulium-doped tellurium oxide coated silicon hybrid microdisks, with on-chip output powers of > 1 mW and sub-milliwatt threshold pump powers at 1.6 μm.

Invited TUE-FWD-1.6 11:30

Plasmon-Empowered Nanophotonics: from Circuitry to Metasurfaces — •Sergey Bozhevolnyi — Centre for Nano Optics, University of Southern Denmark, Odense M, Denmark

Latest developments in nanophotonics associated with advantageous use of surface plasmon polaritons, hybrid excitations involving free electron oscillations in metals and electromagnetic fields in dielectrics, are overviewed. Special attention is given to the progress in ultra-compact photonic circuitry, including modulators and detectors, and plasmonic metasurfaces dynamically controlling propagation of light.

TUE-P-1: Lunch and Poster Session 1

Time: Tuesday, 12:00–14:00 Location: Foyer

Poster TUE-P-1.1 12:00

Multi-point, pulse-train laser ignition of methane-air mixtures by a high-peak power passively Q-switched Nd:YAG/Cr4+:YAG compact laser — Nicolae-Tiberius Vasile, Gabriela Croitoru, Ciprian Dumitrache, and •Nicolaie Pavel — National Institute for Laser, Plasma and Radiation Physics, Magurele, România

Methane-air mixtures were ignited in a constant-volume combustion chamber by a diode-pumped, passively Q-switched Nd:YAG/Cr4+:YAG laser with four beams, yielding single pulses or operating in burst mode with two pulses. A discussion of peak pressure, combustion time and of the ignition limits is made for each type of ignition.

Poster TUE-P-1.2 12:00

Passively Q-switched Er:YAP laser generating 21 ns pulses at 2.9 μm — •Richard Švejkar, Dominika Popelová, Jan Šulc, and Helena Jelínková — Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, Prague, Czech Republic

A passively Q-switch Er:YAP laser, emitting 21.8 ns long (FWHM) pulses with energy 0.54 μJ and repetition rate 41.6 kHz at 2.9 μm is presented. In a free-running regime, the Er:YAP laser reached maximal output mean power of 200 mW with 25.5 % slope efficiency.

Poster TUE-P-1.3 12:00

0.5 - 1.3 GHz tunable pulse repetition rate solid state laser generating 230 fs pulses with 200 mW average power — •Roger Wüst[1], Daniel Hug[1], Benjamin Rudin[2], Florian Emaury[2], and Bojan Resan[1,3] — [1]Institute of Product and Production Engineering, University of Applied Sciences and Arts Northwestern Switzerland FHNW, 5210 Windisch, Switzerland — [2]Menhir Photonics, 8152 Glattbrugg, Switzerland — [3]Faculty of Medicine, Josip Juraj Strossmayer University, 31000 Osjek, Croatia

We report a compact ultrafast solid-state laser source with a tunable pulse repetition rate from 0.5 - 1.3GHz. The novel cavity design allows to vary the repetition rate by moving two mirrors, without realignment. The Yb:KYW crystal-based SESAM-modelocked laser emits 230fs pulses with 200mW average power around 1040nm.

Poster TUE-P-1.4 12:00

Investigation of dual-crystal subnanosecond LBO optical parametric amplifier operating in the visible spectrum range — •Julius Vengelis, Gabrielė Stanionytė, Simona Armalytė, and Viktorija Tamulienė — Laser Research Center, Vilnius University, Vilnius, Lithuania

Many applications require tunable-wavelength laser radiation, which is provided by optical parametric amplifiers (OPAs) and optical parametric generators (OPGs). We report, to the best of our knowledge, the first dual-crystal LBO subnanosecond OPA system generating widely-tunable radiation in the visible spectrum range from roughly 460 nm to 680 nm.

Poster TUE-P-1.5 12:00

Pr:YAlO3 microchip lasers operating at crystal temperatures close to liquid helium temperature — •Martin Fibrich[1,2], Jan Šulc[1], and Helena Jelínková[1] — [1]Czech Technical University in Prague, FNSPE, Prague, Czech Republic — [2]Institute of Physics ASCR, ELI-Beamlines, Prague, Czech Republic

Cooling of Pr:YAP crystals close to liquid helium temperature allowed to significantly improve the Pr:YAP laser performances with respect to room temperature, which yielded in Watt-level laser outputs at all studied wavelengths (747 nm, 622 nm, 547 nm, and 493 nm) under 4W InGaN laser diode pumping.

Poster TUE-P-1.6 12:00

Colloidal LiYF4:Pr Nanocrystals Downsized to 10 nm –Part 1: Synthesis and Micro-Structural Characteristics — •Rajesh Komban[1], Simon Spelthan[2], Michael Steinke[2], Detlev Ristau[2,3,4,5], Axel Ruehl[4,5], Christoph Gimmler[1], and Horst Weller[1,6] — [1]Fraunhofer-IAP-CAN, Grindelallee 117, D-20146 Hamburg, Germany — [2]Leibniz University Hannover, Institute of Quantum Optics, Welfengarten 1, D-30167 Hannover, Germany — [3]Cluster of Excellence PhoenixD, Welfengarten 1A, D-30167 Hannover, Germany — [4]Leibniz University Hannover, QUEST-Leibniz-Research School, D-30167 Hannover, Germany — [5]Academic Alliance Braunschweig-Hannover QUANOMET, D-30167 Hannover, Germany — [6]University Hamburg, Department of Chemistry, Martin-Luther-King-Platz 6, D-20146 Hamburg, Germany

Nanocrystalline LiYF4:Pr promises exciting design opportunities for composite photonic devices in the visible. Here, we present the spectroscopic properties of monodisperse colloidal LiYF4:Pr nanocrystals. We observed an unexpected yet intense emission with lifetimes comparable to bulk crystals. These results pave the way for applications in quantum optics and biomedicine.

Poster TUE-P-1.7 12:00

Terahertz radiation in tailored two-color laser fields with a stabilized doubly resonant optical parametric oscillator — •Han Rao[1,2], Christian M. Dietrich[1,2], Jose. R. C. Andrade[3], Ayhan Demircan[1,2], Ihar Babushkin[1,2,3], and Uwe Morgner[1,2] — [1] Leibniz University Hannover, Institute of Quantum Optics, Hannover, Germany — [2]Cluster of Excellence PhoenixD, Hannover, Germany — [3]Max Born Institute, Berlin, Germany

The degenerate DROPO was stabilized by using a locking scheme which utilizes monitoring of a "parasitic" sum-frequency generation (SFG) of the signal and pump and together with the phase locked pump laser which can provide high intensities tailored two-color fields and benefit for THz generation.

Poster TUE-P-1.8 12:00

Growth and optical properties of the newly developed Pr:LGSB bifunctional crystal — •Alin Broasca[1,2], Madalin Greculeasa[1,2], Flavius Voicu[1], George Stanciu[1], Stefania Hau[1], Cristina Gheorghe[1], and Lucian Gheorghe[1] — [1]National Institute for Laser, Plasma and Radiation Physics, Lab-

oratory of Solid-State Quantum Electronics, Magurele, Romania — [2]Doctoral School of Physics, University of Bucharest, Faculty of Physics, Magurele, Romania

Incongruent melting Pr-doped La0.678Gd0.572Sc2.75(BO3)4 (Pr:LGSB) crystals were grown by the Czochralski method, for the first time to our knowledge. The spectroscopic and nonlinear optical properties of the 2.5 at.% Pr:LGSB crystal shown that it can be a promising self-frequency doubling crystal in the UV range at ~301.5 nm.

Poster TUE-P-1.9 12:00

Development of Czochralski-grown $La_{0.733}Nd_{0.035}Gd_{0.452}Sc_{2.75}(BO_3)_4$ as a new bifunctional laser and nonlinear crystal — •Madalin Greculeasa[1,2], Alin Broasca[1,2], Flavius Voicu[1], George Stanciu[1], Stefania Hau[1], Cristina Gheorghe[1], Catalina-Alice Brandus[1], Nicolaie Pavel[1], and Lucian Gheorghe[1] — [1]National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania — [2]Doctoral School of Physics, University of Bucharest, Faculty of Physics, Magurele, Romania

High optical quality 3.5-at.% Nd:LGSB crystal with non-congruent melting was grown by the Czochralski method. The structural, the linear and nonlinear properties, as well as the laser emission characteristics in the near-infrared spectrum by direct emission and in the green visible range through self-frequency doubling were investigated.

Poster TUE-P-1.10 12:00

Fan-out grating design MgO:PPLN based subnanosecond optical parametric generator with wide and continuous tunability in the near-infrared — •Jonas Banys, Viktorija Tamulienė, Ona Balachninaitė, Vygandas Jarutis, and Julius Vengelis — Vilnius University, Laser Research Center, Vilnius, Lithuania

The first subnanosecond pulse duration optical parametric generator (OPG) based on fan-out grating design MgO:PPLN crystal is demonstrated. Fan-out grating OPG enables quickly, widely, and continuously tunable, compact, and effective subnanosecond coherent light source covering near-infrared spectral region (1400 - 4400 nm) with OPG conversion efficiency up to 47 %.

Poster TUE-P-1.11 12:00

Influence of Disk Aberrations on High-Power Thin-Disk Laser Cavities — Moritz Seidel, Lukas Lang, •Christopher R. Phillips, and Ursula Keller — Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland

We demonstrate a spatially-resolved approach to simulating thin-disk lasers. The model supports exact phase profiles for cavity elements, allowing the impact of experimentally measured non-radially-symmetric aberrations of the thin-disk to be studied. Predicted stability zones, distorted fundamental mode and higher-order mode excitation are in good qualitative agreement with high-power experiments.

Poster TUE-P-1.12 12:00

Cryogenically cooled compact Yb:Lu2O3 laser — •Venkatesan Jambunathan[1], Bruno J Le Garrec[2], Martin Smrz[1], and Tomas Mocek[1] — [1]HiLASE Center, Institute of Physics of the Czech Academy of Sciences, Za Radnicí 828, 25241 , Dolní Břežany, Czech Republic — [2]Laboratoire pour l'Utilisation des Lasers Intenses (LULI), Unité Mixte n° 7605 CNRS - CEA - Ecole Polytechnique - UPMC, Route de Saclay, 91128, Palaiseau Cedex, France

We studied the continuous-wave laser performance of Yb:Lu2O3 at cryogenic temperatures using a modular laser setup. A maximum output power of 15.23 W was achieved for 120 K corresponding to a slope efficiency of 63%.

Poster TUE-P-1.13 12:00

Thermo-optical wavefront distortions in Nd:YVO_4 laser amplifiers — •Merle Schneewind[1,3], Phillip Booker[1,3], Sergii Iakushev[1,3], Peter Wessels[1,3], Benno Willke[2,3], Jörg Neumann[1,3], and Dietmar Kracht[1,3] — [1]Laser Zentrum Hannover e.V. (LZH), Hanover, Germany — [2]Max-Planck-Institut für Gravitationsphysik (Albert-Einstein-Institut), Hanover, Germany — [3]Cluster of Excellence QuantumFrontiers, Hanover, Germany

The power dependence of a Nd:YVO_4 laser amplifier beam wavefront was analyzed by Zernike polynomial decomposition. This analysis was performed experimentally and by simulations based on split-step Fourier propagation showing a good agreement. The simulations yield a base for the design of an aberration compensation system.

Poster TUE-P-1.14 12:00

Comparison of crossed-Porro prism resonator design with conventional mirror resonator design in a Ho^{3+}:YAG laser — Katharina Goth[1,2], Michael Griesbeck[1], Madeleine Eitner[1], •Marc Eichhorn[1,2], and Christelle Kieleck[1] — [1]Fraunhofer IOSB (Institute of Optronics, System Technologies and Image Exploitation), Ettlingen, Germany — [2]Institute of Control Systems, Karlsruhe Institute of Technology, Karlsruhe, Germany

We compare a Ho^{3+}:YAG laser cavity that includes two crossed Porro prisms instead of cavity end mirrors with a conventional mirror resonator. While the Porro resonator shows a slightly lower slope efficiency of 67.4 % than the mirror resonator, it is superior in terms of beam quality and stability.

Poster TUE-P-1.15 12:00

Compact cryogenic Tm:LiYF4 laser — •Adrian Alles[1,2], Venkatesan Jambunathan[3], Sami Slimi[2], Josep M. Serres[1,2], Magdalena Aguiló[2], Francesc Díaz[2], Xavier Mateos[2], Martin Smrz[3], and Tomas Mocek[3] — [1]Eurecat, Centre Tecnològic de Catalunya, Advanced Manufacturing Systems Unit (AMS), Tarragona, Spain — [2]Física i Cristal·lografia de Materials (FiCMA), Universitat Rovira i Virgili (URV)), Tarragona, Spain — [3]HiLASE Center, Institute of Physics of the Czech Academy of Sciences, Dolní Břežany, Czech Republic

We studied cryogenic laser operation of Tm: YLF using a modular setup pumped by a VBG stabilized diode. At 80K, a maximum output power of 6.50 W corresponding to a slope efficiency of 38% was achieved with excellent beam quality.

Poster TUE-P-1.16 12:00

Sub-30 fs Kerr-lens mode-locked Ytterbium-activated orthoaluminate laser — •Weidong Chen[1,2], Zhang-Lang Lin[1], Huang-Jun Zeng[1], Wen-Ze Xue[1], Ge Zhang[1], Xiaodong Xu[3], Yongguang Zhao[3], Pavel Loiko[4], Xavier Mateos[5], Haifeng Lin[6], Li Wang[2], and Valentin Petrov[2] — [1]Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, China — [2]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany — [3]Jiangsu Key Laboratory of Advanced Laser Materials and Devices, Jiangsu Normal University, Xuzhou, China — [4]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen, Caen Cedex, France — [5]Universitat Rovira i Virgili, Tarragona, Spain — [6]College of Physics and Optoelectronic Engineering, Shenzhen University, Shenzhen, China

Here, we report on a sub-30 fs Yb:YAP laser delivering soliton pulses as short as 24 fs at 1085 nm with an average output power of 186 mW and a pulse repetition rate of 87.8 MHz via soft-aperture Kerr-lens mode-locking (KLM).

Poster TUE-P-1.17 12:00

Improvement of noise properties in SESAM mode-locked Er:fiber femtosecond lasers by intra-cavity filtering — •Jakub Bogusławski, Łukasz Sterczewski, Dorota Stachowiak, and Grzegorz Soboń — Laser & Fiber Electronics Group, Faculty of Electronics, Photonics and Microsystems, Wrocław University of Science and Technology, Wrocław, Poland

The slow response time of semiconductor saturable absorbers significantly increases the noise of generated pulse train. We report a substantial improvement of amplitude and phase noise properties in a SESAM mode-locked Er:fiber oscillator via intracavity spectral filtering. We observed a 2.6-fold reduction of integrated timing jitter to 1.71 ps.

Poster TUE-P-1.18 12:00

Mamyshev oscillator based on split-amplifier configuration — •Gustas Liaugminas, Kęstutis Regelskis, and Julijanas Želudevičius — Center for Physical Sciences and Technology, Vilnius, Lithuania

We present a Mamyshev oscillator setup in which a fiber amplifier is split into two equal parts and placed before the filters. At low repetition rates this setup allows to produce pulses which are less affected by nonlinear distortions.

Poster TUE-P-1.19 12:00

Pulse energy enhancement by means of fiber Bragg gratings in actively Q-switched Tm^{3+}-doped fiber lasers operating at 2050 nm and 2090 nm — •Julian Schneider[1,2], Patrick Forster[1,2], Dieter Panitzek[1], Dominik Lorenz[1,2], Clément Romano[1], Marc Eichhorn[1,2], and Christelle Kieleck[1] — [1]Fraunhofer IOSB (Instiute of Optronics, System Technologies and Image Exploitation), Ettlingen, Germany — [2]Institute of Control Systems, Karlsruhe Institute of Technology, Karlsruhe, Germany

We present a Tm^{3+}-doped actively Q-switched fiber laser providing pulse energies of 960 μJ with 20.5 kW peak power at a wavelength of 2050 nm and pulse energies of 720 μJ with 6.5 kW peak power at a wavelength of 2090 nm. The laser is ideally suited as a pump source for nonlinear frequency conversion.

Poster TUE-P-1.20 12:00

Highly efficient side-fused signal pump combiners based on CO_2-laser restructured optical fibers — •Eike Brockmüller[1,2], Lukas Kleihaus[1], Felix Wellmann[1,2], Roland Lachmayer[3], Jörg Neumann[1], and Dietmar Kracht[1,2] — [1]Laser Zentrum Hannover e.V., Hannover, Germany — [2]Cluster of Excellence QuantumFrontiers, Hannover, Germany — [3]Institut für Produktentwicklung und Gerätebau, Garbsen, Germany

We present the manufacturing of side-fused signal-pump combiners with 25/400-μm signal feed-through fibers and >90% pump coupling efficiency. On the basis of CO_2-laser restructuring of the used optical fibers, the necessity of splice connection is avoided, which improves the pump coupling efficiency and thus overall laser efficiency.

Poster TUE-P-1.21 12:00

Synchronized all-PM-fiber Yb-doped amplifiers for high power fs- and ps-pulse generation — •Philipp König[1], Jean-Paul Yehouessi[2], Alexandre Gognau[2], Simon Boivinet[2], Antonio Baylon[3], Jean-Bernard Lecourt[2], Yves Hernandez[2], Andreas Wienke[1,4], Uwe Morgner[1,4,5], Jörg Neumann[1,4], and Dietmar Kracht[1,4] — [1]Laser Zentrum Hannover, Hannover, Germany — [2]Multitel Innovation center, Mons, Belgium — [3]Euro-Multitel, Mons, Belgium — [4]Cluster of Excellence PhoenixD, Hannover, Germany — [5]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany

We present two parallel all-PM-fiber Ytterbium amplifiers seeded by a single oscillator at 78.9 MHz repetition rate. An output power of 5 W is available at 7.5 or 50 ps pulse duration. The femtosecond part delivers 13.5 W output power at a compressed pulse duration below 60 fs.

Poster TUE-P-1.22 12:00

S^2-Method-Based Monitoring of Modal Composition in Optical Fibers during Fiber Component Manufacturing — •Nils Haverland[1], Felix Wellmann[1,2], Jörg Neumann[1,2], and Dietmar Kracht[1,2] — [1]Laser Zentrum Hannover e.V., Hannover, Germany — [2]Cluster of Excellence Quantum Frontiers, Hannover, Germany

We developed a high-speed S^2-method-based device to monitor the modal content of a beam out of an optical fiber. The device is used to evaluate and optimize a CO_2-laser-based fiber end cap manufacturing process.

Poster TUE-P-1.23 12:00

Temperature-dependent thulium cross sections — •Bára Jiříčková[1,2], Martin Grábner[1], Jan Aubrecht[1], Ondřej Schreiber[1,2], César Jauregui[3], Pavel Honzátko[1], and Pavel Peterka[1] — [1]Institute of Photonics and Electronics of the Czech Academy of Sciences, Prague, Czech Republic — [2]Department of Physical Electronics, Czech Technical University, Prague, Czech Republic — [3]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University, Jena, Germany

Measurement of absorption and emission cross sections of the ~790 nm and ~1600-1900 nm thulium peaks relevant for high-power operation of cladding-pumped fiber lasers at 2-micrometers is reported. Up to 40% change of the respective peak values were observed while heating the fiber from -15 to 300 ˚C.

Poster TUE-P-1.24 12:00

1875-nm high-energy mode-locked thulium fiber laser — •Panuwat Srisamran, Duanyang Xu, Ibrahim Abughazaleh, Matthew Gerard, Sijing Liang, David Richardson, and Lin Xu — Optoelectronics Research Centre, University of Southampton, Southampton SO17 1BJ, United Kingdom

An all-fiberized dissipative-soliton mode-locked thulium fiber laser operating at 1875 nm was demonstrated. Using an in-house fabricated thulium fiber as the gain medium, the laser provided ultrashort pulses with 12-ps pulse duration and 10.3-nJ pulse energy. The pulses could be compressed to 547 fs using a grating pair compressor.

Poster TUE-P-1.25 12:00

Rapid characterisation of Photonic Crystal Fibre dispersive properties by a stochastic and tunable picosecond pump source — •Guillaume Walter[1], Sidi-Ely Ahmedou[2], Thelma De Thoury[1], Nicolas Dos Santos[1], Jules Herbuvaux[1], Melvin Redon[1], Jean-Christophe Delagnes[1], Romain Dauliat[2], Sébastien Février[2], Constance Valentin[1], Stéphane Petit[1], Nicolas Valéro[1], Denis Marion[1], Jérôme Lhermite[1], Sébastien Tanzilli[4], Frédéric Gérôme[2], Benoît Debord[2], Fetah Benabid[2], Guy Millot[3], Philippe Roy[2], and Raphael Jamier[2] — [1]Centre Lasers Intenses et Applications, Bordeaux, France — [2]XLIM, Limoges, France — [3]Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France — [4]Institut de Physique de Nice, Nice, France

We present a picosecond source use to characterise a PCF dispersive properties through Four Wave Mixing. We demonstate that the use of a stochastic pulse train obtain through an Amplified Spontaneous Emission seeder reduce the FWM threshold by several orders of magnitude as compared to a CW seeder.

Poster TUE-P-1.26 12:00

Pulse broadening and compression at 515 nm in a multi-pass cell — •Victor Hariton[1,2], Kilian Fritsch[1], and Oleg Pronin[1] — [1]Helmut Schmidt University, Hamburg, Germany — [2]Instituto Superior Técnico, Universidade de Lisboa, Lisboa, Portugal

Frequency-doubled 220 fs laser pulses at 515 nm are spectrally broadened and compressed in a multipass cell down to 38 fs using solid and gas as nonlinear media. The efficiency of this process is 90 %. This is the first demonstration of multipass spectral broadening and compression in green.

Poster TUE-P-1.27 12:00

Optical emission characterization of liquid core fibers filled with colloidal nanoplatelets — •Simon Spelthann[1], Lars F. Klepzig[2,3], Dan Huy Chau[1], Mario Chemnitz[4,5], Saher Junaid[4], Ronja Stephan[1], Katharina Hausmann[1], Markus A. Schmidt[4,6], Jannika Lauth[2,3,7], Michael Steinke[1,8], and Detlev Ristau[1,3,8] — [1]Leibniz University Hannover, Institute of Quantum Optics, Hannover, Germany — [2]Leibniz University Hannover, Institute of Physical Chemistry and Electrochemistry, Hannover, Germany — [3]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering – Innovation Across Disciplines), Hannover, Germany — [4]Leibniz Institute of Photonic Technology, Jena, Germany — [5]INRS-EMT, Quebec, Canada — [6]Otto Schott Institute of Material Research, Jena, Germany — [7]Universität Tübingen, Institute of Physical and Theretical Chemistry, Tübingen, Germany — [8]Leibniz University Hannover, QUEST-Leibniz-Research School, Hannover, Germany

Solution-processed nanoplatelets exhibit exciting optical properties which can be exploited for lasing in novel spectral ranges. Here, we incorporate these nanoplatelets in capillary fused silica fibers and investigate their optical properties. These results are the basis for a novel class of solution-processed nanomaterial fiber lasers.

TUE-SSL-2: SSL Session 2 Nonlinear Methods

Chaired by Chris Philips , ETH, Zurich, Switzerland

Time: Tuesday, 14:00–15:45 Location: Auditorium

Invited TUE-SSL-2.1 14:00

Generation and control of single-cycle mid-infrared waveforms — •Maciej Kowalczyk[1,2,3], Philipp Steinleitner[1], Nathalie Nagl[1,2], Jinwei Zhang[1,4], Vladimir Pervak[2], Christina Hofer[1,2,3], Aleksander Głuszek[5], Jarosław Sotor[5], Ferenc Krausz[1,2,3], Alexander Weigel[1,3], and Ka Fai Mak[1] — [1]Max-Planck-Institut für Quantenoptik, Garching, Germany — [2]Fakultät für Physik, Ludwig-Maximilians-Universität München, Garching, Germany — [3]Center for Molecular Fingerprinting, Budapest, Hungary — [4]School of Optical and Electronic Information & Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan, China — [5]Laser & Fiber Electronics Group, Faculty of Electronics, Photonics and Microsystems, Wrocław University of Science and Technology, Wrocław, Poland

We demonstrate sub-7-fs pulses derived from a carrier-envelope-phase-stabilized Cr:ZnS mode-locked laser. These pulses drive cascaded intra-pulse difference-frequency mixing in a ZGP crystal, leading to multi-octave (0.9 – 12 μm) coherent pulse synthesis. The resultant single-cycle mid-infrared waveforms can be shaped by varying the CEP of the driving pulses.

Oral TUE-SSL-2.2 14:30

Sub 15 ps Self Mode-Locked Nd:YVO4 Laser through Intra-Cavity Sum-Frequency Mixing — •Martin Brunzell, Max Widarsson, Fredrik Laurell, and Valdas Pasiskevicius — Department of Applied Physics, Royal Institute of Technology, Stockholm, Sweden

A mode-locked source operating at 1064 nm producing 13 ps pulses with a repetition rate of 276 MHz and output power of 102 mW is demonstrated. It is achieved by two Nd:YVO4 cavities operating at different wavelengths that interact in shared section through a PPRKTP crystal phase-matching for sum-frequency mixing.

Oral TUE-SSL-2.3 14:45

Rapid THz-TDS Enabled by Single-Cavity Dual-Comb Gigahertz Laser — •Benjamin Willenberg[1], Christopher Phillips[1], Justinas Pupeikis[1], Lars Liebermeister[2], Robert Kohlhaas[2], Björn Globisch[2], and Ursula Keller[1] — [1]Department of Physics, Institute for Quantumelectronics, ETH Zurich, Zurich, Switzerland — [2]Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute, Berlin, Germany

We present a single-mode pumped SESAM-modelocked single-cavity GHz dual-comb laser with widely tunable repetition rate difference. This low noise free-running solid-state laser is applied for THz-TDS using photoconductive antennas. We show nanosecond scans with 36 kHz update rate, yielding a 40-dB dynamic range for an integration time of 2 seconds.

Oral TUE-SSL-2.4 15:00

Direct broadband infrared generation from 12 to 35 THz with a Kerr-lens modelocked Cr:ZnS oscillator — •Johann Gabriel Meyer and Oleg Pronin — Helmut-Schmidt-Universität, Hamburg, Germany

We generate mid-infrared ranging from 12 to 35 THz (9 – 25 μm) via IDFG. The radiation is directly generated in GaSe by the pulses of an in-house developed KLM Cr:ZnS oscillator. The spectral coverage towards 30 μm is in reach, which is of interest for ultrafast spectroscopy of solids.

Oral TUE-SSL-2.5 15:15

Third Harmonic Generation and $\chi^{(5)}$ Effects in Thin Gradient HfO_2 Layers — •David Zuber[1,2], Sven Kleinert[1,2], Ayhan Tajalli[1,2,3], Morten Steinecke[4], Marco Jupé[2,4], Ihar Babushkin[1,2,5], Detlev Ristau[1,2,4], and Uwe Morgner[1,2,4] — [1]Leibniz Universität Hannover, Welfengarten 1, 30167 Hannover, Germany — [2]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering-Innovation Across Disciplines), 30167, Hannover, Germany — [3]Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, 22607 Hamburg, Germany — [4]Laser Zentrum Hannover e.V., Hollerithallee 8, 30419 Hannover, Germany — [5]Max Born Institute, Max-Born-Strasse 2a, 10117 Berlin, Germany

We investigate third harmonic generation (THG) in thin dielectric HfO_2 gradient layers experimentally and theoretically. This method allows for the first time to quantify the third and fifth order susceptibility in dielectric layer materials.

Oral TUE-SSL-2.6 15:30

High Average Power Nonlinear Pulse Compression in a Gas-filled Multi-pass Cell at 2 μm Wavelength — •Philipp Gierschke[1,3], Christian Grebing[1,2], Mahmoud Abdelaal[3],

Mathias Lensko[3], Joachim Buldt[3], Ziyao Wang[3], Tobias Heuermann[3,4,5], Michael Müller[3,6], Martin Gebhardt[3,4,5], Jan Rothhardt[1,3,4,5], and Jens Limpert[1,3,4,5] — [1]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [2]Active Fiber Systems GmbH, Jena, Germany — [3]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany — [4]Helmholtz-Institute Jena, Jena, Germany — [5]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [6]Institute de Physique Université de Neuchâtel, Neuchâtel, Switzerland

We present the post compression of a thulium-doped fiber laser output in a gas-filled multi-pass cell, delivering 51W average power, 35fs pulse duration at 300kHz repetition rate centered at 1940nm wavelength. To the best of our knowledge, this is the highest average-power multi-pass cell post compression in the short-wave-infrared reported.

15:45–16:15: Coffee Break

TUE-FWD-2: FWD Session 2 Thulium Lasers and Amplifiers

Chaired by Jonathan Bradley, McMaster University, Hamilton, Canada

Time: Tuesday, 16:15–18:00 Location: Auditorium

Oral TUE-FWD-2.1 16:15

100W, 1 mJ, few-cycle pulses at 2 μm wavelength — •Ziyao Wang[1], Tobias Heuermann[1,2,3], Martin Gebhardt[1,2,3], Mathias Lenski[1], Philipp Gierschke[1,4], Robert Klas[1,2,3], Cesar Jauregui[1], and Jen Limpert[1,2,3,4] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-University Jena, Jena, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We present a post compression of a thulium-doped fiber laser output in a hollow-core fiber, delivering 100W average power, 1mJ pulse energy and 17.6fs pulse duration at 100kHz repetition rate. It is, to the best of our knowledge, the highest average-power mJ-class few-cycle source in the SWIR reported.

Oral TUE-FWD-2.2 16:30

High-peak-power Ho^{3+} and Tm^{3+}-doped fiber MOPA for mid-IR conversion — •Dominik Lorenz[1,2], Clément Romano[1], Dieter Panitzek[1], Patrick Forster[1,2], Julian Schneider[1,2], Marc Eichhorn[1,2], and Christelle Kieleck[1] — [1]Fraunhofer IOSB (Institute of Optronics, System Technologies and Image Exploitation), Gutleuthausstraße 1, 76275 Ettlingen, Germany — [2]Institute of Control Systems, Karlsruhe Institute of Technology, Fritz-Haber-Weg 1, 76131 Karlsruhe, Germany

We present a pulsed polarization-maintaining all-in-fiber MOPA setup based on Ho^{3+} and Tm^{3+}-doped silica fibers. By pumping a ZGP OPO an mid-IR output power of 8.1 W and a conversion efficiency of 44 % (slope 61 %) is obtained. M^2 factors of 2.2 (signal) and 2.0 (idler) are determined at maximum power.

Oral TUE-FWD-2.3 16:45

High-power and highly-efficient laser operation of Tm^{3+}:Ho^{3+}-codoped silica fiber lasers emitting at 2.1 μm and 2.2 μm — •Patrick Forster[1,2], Clément Romano[1], Julian Schneider[1,2], Marc Eichhorn[1,2], and Christelle Kieleck[1] — [1]Fraunhofer IOSB (Institute of Optronics, System Technologies and Image Exploitation), Gutleuthausstraße 1, 76275 Ettlingen, Germany — [2]Institute of Control Systems (IRS), Karlsruhe Institute of Technology, Fritz-Haber-Weg 1, 76131 Karlsruhe, Germany

We present our recent results in high-power laser emission from 2.1 to 2.2 μm, introducing the 79X nm pumped Tm^{3+}:Ho^{3+}-codoped silica fiber laser as serious alternative when it comes to power scaling within this wavelength region. In particular, a record power of 145 W has been achieved at 2.2 μm.

Oral TUE-FWD-2.4 17:00

Generation of 12 nJ Pulse Energy by a Thulium-doped Fiber Mamyshev Oscillator — •Benedikt Schuhbauer[1], Veronika Adolfs[1], Frithjof Haxsen[1], Andreas Wienke[1,2], Uwe Morgner[1,2,3], Jörg Neumann[1,2], and Dietmar Kracht[1,2] — [1]Laser Zentrum Hannover e.V., Laser Development Department, Ultrafast Photonics Group, Hannover, Germany — [2]Cluster of Excellence PhoenixD (Photonics, Optics, and Engeneering Innovation Across Disciplines), Hannover, Germany — [3]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany

We report on the generation of up to 12 nJ pulse energy with a compressed pulse duration of 156 fs by an ultrafast thulium-doped fiber Mamyshev oscillator. The oscillator incorporated double-clad fibers to provide a sufficient amplification with a high suppression of amplified spontaneous emission of 22 dB.

Oral TUE-FWD-2.5 17:15

Highly efficient, high-power thulium-doped fibre amplifier via in-band pumping at 1.7 μm — •Mathias Lenski[1], Tobias Heuermann[1,2,3], Martin Gebhardt[1,2,3], Ziyao Wang[1], Christian Gaida[1,5], César Jauregui[1], and Jens Limpert[1,2,3,4] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-University, Jena, Germany — [2]Helmholtz-Institute, Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [5]Active Fiber Systems GmbH, Jena, Germany

We present a high-power, highly efficient thulium-doped fiber amplifier which is cladding-pumped at 1692 nm. For the first time, a Tm-doped fiber suitable for ultrafast operation with considerable pulse energies provides slope efficiencies around 80% with 58 W output power. Using commercially available pump sources, this approach is highly scalable.

Oral TUE-FWD-2.6 17:30

Simple method for determining quantum efficiency and background propagation loss in thulium-doped fibres — •Martin P Buckthorpe and William A Clarkson — Optoelectronics Research Centre, University of Southampton, Southampton, UK

A simple method is presented for determining the quantum efficiency and background core propagation loss in Thulium (Tm)-doped fibre lasers. Since the overall laser efficiency is typically limited by one of these two parameters, quantitatively determining their individual contributions is vital to informing the development of future Tm-doped fibres.

Oral TUE-FWD-2.7 17:45

937 W Thulium:silica fiber MOPA operating at 2036 nm — •Clément Romano[1], Dieter Panitzek[1], Dominik Lorenz[1,2], Patrick Forster[1,2], Marc Eichhorn[1,2], and Christelle Kieleck[1] — [1]Fraunhofer IOSB (Institute of Optronics, System Technologies and Image Exploitation), Ettlingen, Germany — [2]Institute of Control Systems (IRS), Karlsruhe Institute of Technology, Karlsruhe, Germany

We present our latest results in power scaling in the 2 μm region. The all-fiber laser system is a simple MOPA configuration composed of a seed laser and a high power amplifier. More than 900 W of output power at 2036 nm are demonstrated with a diffraction limited beam quality.

TUE-PD: Postdeadline Session

Time: Tuesday, 18:00–19:00 Location: Auditorium

Oral TUE-PD.1 18:00

Spectral Two-Photon Quantum Interference via Electro-optic Modulation Between Light States Of Different Photon Statistics — •Anahita Khodadad Kashi[1,2] and Michael Kues[1,2] — [1]Institute of Photonics, Leibniz University, Hannover, Germany — [2]Cluster of Excellence, Leibniz University, Hannover, Germany

Frequency-domain two-photon quantum interference between a thermal field and a heralded-state is studied theoretically and experimentally, revealing the dependency of visibility on the multi-photon components within the heralded-state.

Oral TUE-PD.2 18:10

Environmentally Stable Harmonic Modelocked All-Fibre Oscillator — Mesut Laçin, •Paul Repgen, and F. Ömer Ilday — Department of Physics, Bilkent University, Ankara, Turkey

We present an environmentally stable laser oscillator, mode-locked through nonlinear-polarisation evolution, that is entirely based on polarisation-maintaining fibres, except for the Yb-doped gain fibre. The laser is reliably operated at the fourth harmonic repetition rate, at 250 MHz, with output pulse energies of 1 nJ.

Oral TUE-PD.3 18:20

Broadband continuum generation by double-stage hybrid multi-pass multi-plate spectral broadening — Marcus Seidel[1], •Anne-Lise Viotti[1,2], Chen Li[1], Lutz Winkelmann[1], Ingmar Hartl[1], and Christoph M. Heyl[1,3,4] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Department of Physics, Lund University, Lund, Sweden — [3]GSI Helmhotzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany — [4]Helmholtz-Institute Jena, Jena, Germany

We report the compression of 1 ps duration, 112 μJ energy pulses from an Yb:YAG amplifier to 11 fs and the generation of an octave-spanning spectrum by two hybrid multi-pass multi-plate spectral broadening stages. Both, the compression factor and the output pulse duration set new records for bulk multi-pass cells.

Oral TUE-PD.4 18:30

Spectral broadening of 2-mJ ultrashort pulses in a convex-concave multipass cell in ambient air — •Alan Omar, Tim Vogel, Martin Hoffmann, and Clara J. Saraceno — Ruhr-Universität Bochum, Bochum, Germany

We demonstrate nonlinear spectral broadening of 2.1-mJ, 670-fs pulses at 210 W of average power in a focus-free compact (61.5 cm distance), convex-concave MPC in ambient air. We show pulse broadening from 21 nm to 24.5 nm, and we demonstrate compressibility down to 134 fs with excellent spectral homogeneity.

Oral TUE-PD.5 18:40

Broadband Conical Third Harmonic Generation in Fused Silica with Femtosecond Laser Pulses — •Robertas Grigutis[1], Vytautas Jukna[1], Marius Navickas[1], Gintaras Tamošauskas[1], Kęstutis Staliūnas[1,2], and Audrius Dubietis[1] — [1]Laser Research Center, Vilnius University, Vilnius, Lithuania — [2]Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain

We report on conical third harmonic generation that accompanies supercontinuum generation in fused silica using broadly tunable femtosecond pulses. Third harmonic radiation carries a broadband, octave-spanning spectrum, with propagation angles of individual spectral components precisely following the entire phase matching curve, as attested by the measurements of angle-resolved spectra.

Oral TUE-PD.6 18:50

Self-Starting Kerr-Lens-Modelocked 1-GHz Ti:sapphire Oscillator Pumped by a Single Laser Diode — Hanna Ostapenko, Toby Mitchell, Pablo Castro-Marin, and •Derryck Reid — School of Engineering and Physical Sciences, Heriot–Watt University, Edinburgh, United Kingdom

We present a 108-fs Kerr-lens-modelocked, diode-pumped 1-GHz Ti:sapphire laser. Self-starting operation producing 103 mW was obtained for 1-Watt pumping with a single 520-nm laser diode. From 1 Hz–1 MHz the relative intensity noise was 0.01% and the repetition rate was externally referenced with a phase error of 1.7 mrad.

WED-SSL-3: Keynote Session and SSL 3

Chaired by Andrejus Michailovas, FTMC/Ekspla, Vilnius, Lithuania

Time: Wednesday, 8:15–9:15 Location: Auditorium

Keynote WED-SSL-3.1 8:15

Recent advances in SWIR and MWIR solid-state and fiber sources — •Marc Eichhorn — Fraunhofer IOSB, Ettlingen, Germany — Karlsruhe Institute of Technology, Karlsruhe, Germany

Recent developments in two-micron thulium and thulium-holmium doped solid-state and fiber lasers allow for significant average-power and pulse-energy scaling, important for mid-IR OPO pumping, materials processing and communication. A focus is put on all-fiber designs and robust, if possible self-aligning, laser resonators, which allow for stable and ruggedized designs.

Oral WED-SSL-3.2 9:00

Sputtered dielectric coatings for high average power petawatt laser technology — •Thomas Willemsen, Melanie Gauch, Tobias Gross, Henrik Ehlers, and Wolfgang Ebert — LASEROPTIK GmbH, Garbsen, Germany

Highest peak powers pave new insights for fundamental research. The performance of laser beam lines is mainly determined by the quality of the optical components. This paper presents novel approaches to manufacture laser mirrors with optimized laser induced damage threshold applying ion beam sputtering up to substrate sizes of 550mm.

9:15–10:00: Coffee Break

WED-SSL-4: SSL Session 4

Chaired by Nicolae Pavel, National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania

Time: Wednesday, 10:00–12:00 Location: Auditorium

Oral WED-SSL-4.1 10:00

Dual-comb modelocked laser oscillators with high power and low noise — •Christopher Phillips[1], Justinas Pupeikis[1], Benjamin Willenberg[1], Alexander Nussbaum-Lapping[1], Sandro Camenzind[1], Fabio Callegari[2,3], Abdelmjid Benayad[4], Patrice Camy[4], and Ursula Keller[1] — [1]ETH Zurich, Institute for Quantum Electronics, Zurich, Switzerland — [2]Nanoscopy and NIC, Istituto Italiano di Tecnologia (IIT), Genova, Italy — [3]Department of Physics, University of Genova, Genova, Italy — [4]Universite de Caen Normandie, CIMAP, Caen, France

We present a platform for high-power dual comb sources from a single spatially-multiplexed oscillator cavity. We demonstrate femtosecond pulses and Watt-level average output powers with low-noise operation over short and long timescales. Our 80 MHz version is ideal for pump-probe measurements, while our 1 GHz version supports coherent dual-comb spectroscopy.

Oral WED-SSL-4.2 10:15

Intra and extra-cavity beam shaping for post-compression of Yb:YAG picosecond high-energy pulses — •Vincent Fortin, Marie-Christine Nadeau, and Stéphane Petit — CELIA Centre Lasers Intenses et Applications UMR5107, CNRS-Université de Bordeaux-CEA, 33400 Talence, France

We designed and tested phase mirrors for intra and extra-cavity flat-top beam shaping of high energy Ytterbium systems. The concept can be applied as a new approach to perform spectrally homogeneous thin-plate post-compression of picosecond pulses from J-level Yb:YAG systems.

Oral WED-SSL-4.3 10:30

10 mJ-level Picosecond OPCPA Pump Laser Based on Room Temperature Hybrid Yb:YAG Amplifier System — •Aivaras Kazakevičius[1,2], Raimundas Burokas[1,2], Rokas Danilevičius[2], and Andrejus Michailovas[1,2] — [1]National Center for Physical Sciences and Technology, Vilnius, Lithuania — [2]Ekspla ltd., Vilnius, Lithuania

On the way to developing 100W and 10 mJ class laser we demonstrate a hybrid laser system based on fiber laser seed source and chirped pulse amplification in free-space Yb:YAG cascade. The system is capable of delivering 13 mJ energy 1 ps duration pulses at 20 Hz repetition rate.

Oral WED-SSL-4.4 10:45

110 MW Thin-Disk Oscillator — •Semyon Goncharov, Kilian Fritsch, and Oleg Pronin — Helmut-Schmidt University, Hamburg, Germany

A compact Kerr-lens mode-locked thin-disk oscillator delivering 110 MW output peak power, the highest among all oscillators, is reported. A pulse train with a repetition rate of 14 MHz carries 115 fs long, 14.5 uJ pulses resulting in 203 W of average power.

Oral WED-SSL-4.5 11:00

Towards ultra fast pulse generation by gain-switching of diode pumped surface emitting semiconductor lasers — •André Marianovich[1], Stefan Spiekermann[1], Moritz Brendel[2], Peter Wessels[1], Jörg Neumann[1], Markus Weyers[2], and Dietmar Kracht[1] — [1]Laser Zentrum Hannover e.V., Laser Development Department, Hollerithallee 8, Hannover, Germany — [2]Ferdinand-Braun-Institut gGmbH, Gustav-Kirchhoff-Str. 4, Berlin, Germany

We present first results of our research towards ultra-short pulse generation in the sub-100 ps range based on cascaded gain-switched diode-pumped vertical-cavity surface-emitting semiconductor lasers. In particular, we focus on the surface emitters themselves and on the dependence of the output parameters on the pump wavelength and the pump fluence.

Oral WED-SSL-4.6 11:15

8.7-W average power femtosecond Ho:CALGO bulk laser at 2.1 μm — •Weichao Yao[1], Yicheng Wang[1], Sergei Tomilov[1], Shahwar Ahmed[1], Christoph Liebald[2], Daniel Rytz[2], Mark Peltz[2], Volker Wesemann[2], and Clara J. Saraceno[1] — [1]Ruhr Universität Bochum, Bochum, Germany — [2]Electro-Optics Technology GmbH, Idar-Oberstein, Germany

We report the first mode-locked operation of a bulk laser based on Ho:CALGO. The laser generates up to 8.7 W of average power and

369-fs pulses duration at 2118 nm, representing the highest avergae power achieved from a mode-locked bulk lasers in the 2-3 μm wavelength region.

Oral WED-SSL-4.7 11:30

Conversion of Mode-Locked States within an Optical Cavity — •Michael Zwilich, Florian Schepers, and Carsten Fallnich — University of Münster, Institute of Applied Physics, Münster, Germany

The conversion of longitudinal mode-locked beam to a transversal mode-locked beam is equivalent to the conversion of temporal pulses to a spatiotemporal oscillation. This is achieved by matching the frequency spacing of incident phase-locked longitudinal modes and the transverse mode spacing of an optical cavity.

Oral WED-SSL-4.8 11:45

1 kHz Yb:YAG thin-disk high-energy picosecond regenerative amplifier — Marie-Christine Nadeau, Philippe Balcou, Dominique Descamps, Christophe Féral, Vincent Fortin, Jérôme Lhermite, Denis Marion, Eric Mével, Antoine Rohm, and •Stéphane Petit — CELIA Centre Lasers Intenses et Applications UMR5107, CNRS-Université de Bordeaux-CEA, Talence, France

We report the developement of a sub-ps Yb:YAG thin disk regenerative amplifier delivering 50 mJ at 1 kHz with an optical-optical efficiency of 18%. We discuss how to address thermal issues in the BBO Pockel's crystal to further increase the output energy up to 100 mJ.

12:00–14:45: Lunch Break and Exhibition

WED-FWD-3: FWD Session 3 CW and Novel Lasers

Chaired by Nadia Boetti, LINKS Foundation, Turin, Italy

Time: Wednesday, 14:45–16:15 Location: Auditorium

Invited WED-FWD-3.1 14:45

Fiber based high power low noise single frequency lasers and applications — •Giorgio Santarelli[1,2], Clément Dixneuf [1], Dia Dia Darwich[1], Roopa Prakash[1], Yves-Vincent Bardin[2], Mathieu Goeppner[2], Germain Guiraud[2], Nicholas Traynor[2], and Adèle Hilico[1] — [1]Laboratoire Photonique Numérique et Nanosciences (LP2N), UMR 5298, CNRS-IOGS-Université Bordeaux, Talence, France — [2]Azur Light Systems, Pessac, France

With the advances in fundamental science such as gravitational wave detection, cold atom physics and quantum computing the need for single frequency high-power fiber lasers has been increasing. We will present several very low noise high power laser sources at different wavelengths and the potential applications.

Oral WED-FWD-3.2 15:15

Fiber-based light source with multi-color output and fast wavelength tuning — •Kristin Wallmeier[1], Thomas Würthwein[1], Maximilian Brinkmann[2], Tim Hellwig[2], and Carsten Fallnich[1,3] — [1]University of Münster, Institute of Applied Physics, Münster, Germany — [2]Refined Laser Systems GmbH, Münster, Germany — [3]University of Münster, Cells in Motion Interfaculty Centre, Münster, Germany

A fiber-based light source with multi-color output and a fast wavelength tuning mechanism is presented. The combination of a frequency modulation scheme for pulse-to-pulse wavelength-switching and low-noise operation with a relative intensity noise of -153.7 dBc/Hz makes this light source well suited for nonlinear microscopy applications.

Oral WED-FWD-3.3 15:30

High-power low-noise single frequency tunable laser at 624 nm — •Dia Darwich[1], Roopa Prakash[1], Clément Dixneuf[2], Yves-Vincent Bardin[2], Mathieu Goeppner[2], Germain Guiraud[2], Nicholas Traynor[2], Giorgio Santarelli[1], and Adèle Hilico[1] — [1]Laboratoire Photonique Numérique et Nanosciences (LP2N), UMR 5298, CNRS-IOGS-Université Bordeaux, Talence, France — [2]Azur Light Systems, Pessac, France

In this work, more than 5 W of output power is obtained between 616.5 nm and 630.8 nm using sum frequency generation of 1 μm and 1.5 μm laser sources in a PPLN crystal with a relative intensity noise lower than -157 dB/Hz at 5 MHz.

Oral WED-FWD-3.4 15:45

Record power transmission of intense 343 nm UV radiation in a single-mode inhibiting coupling hollow-core fiber exceeding 20W of 10-ns pulses — Florian Leroi[1], Arnaud Guillossou[2], Julien Didierjean[2], Julien Saby[2], •Johan Boullet[1], Frederic Gerome[3], and Fetah Benabid[3] — [1]ALPHANOV, Bordeaux, France — [2]BLOOM LASERS, Talence, France — [3]XLIM LABORATORY, GPPM Group, Limoges, France

Thanks to the use of a new-gen UV hollow core fiber, we report here 2 orders of magnitude of gain on the current state of the art, with on a record single-mode delivery of 23.3W (155μJ) with 89.1% transmission from a 343 nm, 10 ns, 150 kHz laser source.

Oral WED-FWD-3.5 16:00

Four wave mixing in multimode hollow core waveguides with a two-color pump for the thorium nuclear clock — •Ihar Babushkin — Leibniz University, Hannover, Germany

We show an approach to effectively generate tunable vacuum and extreme ultraviolet light with both short (femtosecond) and long (nanosecond) pulses using four wave mixing of the fundamental and its second harmonic in hollow gas-filled capillaries. The particularly important application includes nuclear thorium clock with signal at 160 nm.

16:30–20:30: Transfer to the Conference Dinner Location, Conference Dinner

THU-SYM-1: Special Symposium Session 1

Time: Thursday, 8:15–9:30 Location: Auditorium

Keynote THU-SYM-1.1 8:15

Towards Automated Self-Learning Laser-Process Optimization — •Andreas Michalowski[1], Thomas Graf[1], Alexander Kroschel[2], Alexander Ilin[2], Stephanie Karg[2], Peter Stritt[2], Petru Tighineanu[2], Sebastian Becker[2], Adina Dais[2], Gerhard Kunz[2], Steffen Sonntag[2], Martin Lustfeld[3], Fabian Nyenhuis[4], and Heiko Ridderbusch[5] — [1]Institut für Strahlwerkzeuge, Stuttgart, Germany — [2]Bosch Research, Renningen, Germany — [3]Bosch Automotive Products (Suzhou) Co. Ltd., Suzhou , China — [4]Oertli Instruments, Berneck, Switzerland — [5]Scintilla AG, Zuchwil, Switzerland

The flexibility of new laser sources and process-monitoring enables new possibilities in laser-based production technology, especially the combination of different laser processes with many adjustable parameters. The fusion of domain knowledge and probabilistic models in the form of hybrid models allows an efficient optimization of these processes with machine learning.

Invited THU-SYM-1.2 9:00

Deep Learning for Control of Light-Matter Interactions — •Ben Mills — Optoelectronics Research Centre, Southampton, United Kingdom

The team at Southampton are applying the deep learning technology that supports self-driving cars to the real-time control and optimisation of a wide range of light-matter interactions, including femtosecond laser machining. This presentation will provide an overview of recent activity at Southampton at this exciting interface.

9:30–10:00: Coffee Break

THU-SYM-2: Special Symposium Session 2

Time: Thursday, 10:00–11:30 Location: Auditorium

Invited THU-SYM-2.1 10:00

Phase locking of fiber laser array using quasi-reinforcement learning, principle and experiments — •Vincent Kermene [1], Alexandre Boju[1,2], Maksym Shpakovytch[1], Geoffrey Maulion[1], Paul Armand[1], Alain Barthelemy[1], and Agnès Desfarges-Berthelemot[1] — [1]Institut de recherche XLIM, Université de Limoges-CNRS UMR n°7252, Faculté des Sciences et Techniques, Limoges, France — [2]CILAS Ariane Group, Orléans, France

We report a new technique for phase control of tiled array of lasers based on a specific quasi-reinforcement learning approach. Principle and experiments on a seven-fiber amplifier laser array will be presented. We will show the dynamic locking of the laser phase relationship, and on-demand wavefront shaping.

Invited THU-SYM-2.2 10:30

Intelligent control of Lasers for Accelerators — •Henrik Tünnermann — Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

Precise control of lasers is of critical importance for particle accelerators and free electron lasers. We discuss our approach to leverage the power of data science and artificial intelligence to improve the performance (pulse parameters, fast set-point tuning, stability) of our photocathode and pump-probe lasers.

Invited THU-SYM-2.3 11:00

Multi-Core Fibers for Laser, Sensing and Telecommunication Applications — •Thomas Schreiber[1], Stefan Kuhn[1], Johannes Nold[1], Christian Hupel[1], Sigrun Hein[1], Steffen Schulze[1], Benjamin Yildiz[1], Denny Hässner[1], Maximilian Strecker[1], Arno Klenke[2], Christopher Aleshire[2], Albrecht Steinkopf[2], Cesar Jauregui[2], Jens Limpert[1,2], Till Walbaum[1], and Nicoletta Haarlammert[1] — [1]Fraunhofer IOF, Jena, Germany — [2]Institute of Applied Physics / FSU, Jena, Germany

We will present an overview on our research on novel multi-core fibers towards lasers and amplifiers for telecommunication, sensing as well as for scaling of coherently combined high power and high energy laser systems. We will link the required properties for the fibers to the manufacturing and characterization process chain.

THU-P-2: Lunch and Poster Session 2

Time: Thursday, 12:00–14:00 Location: Foyer

Poster THU-P-2.1 12:00

Effect of multilayer substrate interference in planar waveguide scattering loss — •Zhen Liu, Mohamed Ettabib, James Wilkinson, and Michalis Zervas — Zepler Institute for Photonics and Nanoelectronics, University of Southampton, SOUTHAMPTON, United Kingdom

A theoretical model is built for scattering loss from the planar waveguide with multilayer substrate and experimentally validated with good agreement. Our work shows that substrate layer interference can significantly suppress scattering loss.

Poster THU-P-2.2 12:00

Numerical Analysis of Tapered Multicore Fibres for Laser System Scaling — •Christopher Aleshire[1], Albrecht Steinkopff[1], Arno Klenke[1,2], Cesar Jauregui[1], and Jens Limpert[1,2,3] — [1]Institute of Applied Physics, Friederich-Schiller-University Jena, Jena, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

Tapered multicore fibers (MCFs) are numerically analyzed in the context of high power MCF lasers using Beam Propagation Method. These simulations facilitate taper design to avoid mode

mixing and intercore crosstalk. MCF tapers with active fibers enable scalable fundamental-mode operation in large multimode waveguide cores.

Poster THU-P-2.3 12:00

Self-phase modulation in periodically-poled thin-film lithium niobate waveguides — •Gamze Gul[1], Kamal Abdelsalam[2], Sasan Fathpour[2,3], Kim F. Lee[4], Gregory S. Kanter[4], and Prem Kumar[1,4] — [1]Graduate Program in Applied Physics, Northwestern University, Evanston, USA — [2]CREOL, The College of Optics and Photonics, University of Central Florida, Orlando, USA — [3]Department of Electrical and Computer Engineering, University of Central Florida, Orlando, USA — [4]Center for Photonic Communication and Computing, Department of Electrical and Computer Engineering, Northwestern University, Evanston, USA

We study spectral broadening of sub-picosecond telecom wavelength pulses in periodically-poled thin-film lithium niobate waveguides that results from cascaded nonlinear interaction. We experimentally investigate the effect of phase mismatching on spectral broadening and compare the results with simulations based on a split-step Fourier method.

Poster THU-P-2.4 12:00

Fiber-tip nanothermometer based on up-conversion nanocrystals for electrolysis cells — Lea Kötters[1,5], Simon Spelthann[1], Lena Bühre[2], Rajesh Komban[3], Horst Weller[3,4], Richard Hanke-Rauschenbach[2], Detlev Ristau[1,5,6], Christoph Gimmler[3], Boris Bensmann[2], and •Michael Steinke[1,6] — [1]Leibniz University Hannover, Institute of Quantum Optics, Hannover, Germany — [2]Leibniz University Hannover, Institute of Electric Power Systems, Hannover, Germany — [3]Fraunhofer Center for Applied Nanotechnology CAN, Hamburg, Germany — [4]University Hamburg, Department of Chemistry, Hamburg, Germany — [5]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering – Innovation Across Disciplines), Hannover, Germany — [6]Leibniz University Hannover, QUEST-Leibniz-Research School, Hannover, Germany

Temperature measurements inside electrolysis cells pose a challenge for conventional sensors. Since up-conversion-nanocrystals exhibit a temperature dependent emission, we attached such nanocrystals to a fiber facet and applied it as nanothermometer in an electrolysis cell. This approach will yield new insights into the performance of these cells.

Poster THU-P-2.5 12:00

Scalable fabrication of twisted aperiodic multicore fibers for next-generation lens-less endoscopy — •Ronja Stephan[1], Elias Scharf[2], Kinga Zolnacz[3], Katharina Hausmann[1], Matthias Liessmann[1], Lea Kötters[1,4], Jürgen Czarske[2], Detlev Ristau[1,4,5], Robert Kuschmierz[2], and Michael Steinke[1,4] — [1]Leibniz University Hannover, Institute of Quantum Optics, Hannover, Germany — [2]TU Dresden, Chair of Measurement and Sensor System Technique, Dresden, Germany — [3]Wroclaw University of Science and Technology, Department of Optics and Photonics, Wroclaw, Poland — [4]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering – Innovation Across Disciplines), Hannover, Germany — [5]Leibniz University Hannover, QUEST-Leibniz-Research School, Hannover, Germany

A scalable fabrication approach for aperiodic and twisted multicore fibers is presented, which will enable next-generation lens-less endoscopy for 3D imaging deep inside tissue. Particularly, an aperiodic fiber with 1281 cores was developed, which is single-mode throughout the visible spectrum. The design process was supported by in-depth numerical design studies.

Poster THU-P-2.6 12:00

Highly birefringent all-normal dispersion silica fiber with flat dispersion profile in the 1200–2100 nm wavelength range — •Olga Szewczyk[1], Gabriela Statkiewicz-Barabach[2], Jacek Olszewski[2], Kinga Żołnacz[2], Mariusz Makara[3], Krzysztof Poturaj[3], Paweł Mergo[3], Jarosław Sotor[1], Grzegorz Soboń[1], and Wacław Urbańczyk[2] — [1]Laser & Fiber Electronics Group, Wrocław University of Science and Technology, Wrocław, Poland — [2]Department of Optics and Photonics, Wrocław University of Science and Technology, Wrocław, Poland — [3]Laboratory of Optical Fibers Technology, Institute of Chemical Sciences, Maria Curie Sklodowska University, Lublin, Poland

We present a polarization-maintaining all-normal dispersion fiber with flat dispersion profile over the range of 1200-2100 nm. The fiber possesses the solid core of an elliptical shape that enables high birefringence (with polarization extinction ratio of > 22 dB) and also allows for low-loss fusion splicing to conventional Panda fiber.

Poster THU-P-2.7 12:00

Finite-size scaling behaviour in fully-connected equal-coupling multimode photonic networks — •Oliver Melchert — Leibniz Universität Hannover, Hannover, Germany

The phase transition in fully-connected, multimode equal-coupling photonic networks is studied via numerical simulations and by using methods from statistical mechanics. Finite-size scaling is used to estimate critical points and exponents, yielding a phase diagram in a relevant parameter plane, and confirming mean-field behavior as for the planar XY model.

Poster THU-P-2.8 12:00

Experimental and numerical study of a 1.94-μm monolithic single-oscillator thulium-doped fiber laser in continuous-wave regime — •Félix Sanson[1,2], Christophe Louot[1], Inka Manek-Hönninger[2], and Anne Hildenbrand-Dhollande[1] — [1]French-german research Institute of Saint-Louis, Saint-Louis, France — [2]Université de Bordeaux, CNRS CEA, CELIA UMR5107, Bordeaux, France

A continuous-wave all-fibered single-oscillator thulium-doped fiber laser is developed. Taking advantage of a high absorption at 793 nm (8.42 dB/m), the source exhibits 260 W of maximum output power at 1.94 μm and a slope efficiency of 59 %. Rate equations are applied to numerically study the cavity.

Poster THU-P-2.9 12:00

Enhanced Nonlinear Spectral Broadening in Multi-Pass Cells Using Molecular Gases — •Moinuddin Kadiwala, Nazar Kovalenko, Kilian Fritsch, Semyon Goncharov, and Oleg Pronin — Helmut Schmidt University, Hamburg, Germany

We demonstrate enhanced spectral broadening in Nitrogen, Nitrous Oxide filled multipass cells. Contrast to atomic gases, molecular gases have stronger effective nonlinearity leading to red-shifted broadband spectrum. For comparison, the spectral span of Argon, Nitrogen and Nitrous Oxide recorded is 45, 106 and 265 nm at 15 μJ input energy.

Poster THU-P-2.10 12:00

Packaging of an ultra-stable all-fiber-integrated NALM oscillator at 1 μm center wavelength for FEL faciliites — •Yi Hua, Henrik Tünnermann, Caterina Vidoli, Haydar Sarper Salman, Yuxuan Ma, Uwe Grosse-Wortmann, Lutz Winkelmann, and Ingmar Hartl — Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

Previously we have demonstrated an all-fiber-integrated, alignment-free NALM PM Yb: fiber oscillator with sub-fs timing jitter. Here we report on the next steps in engineering this all-fiber compact oscillator. We developed a method to repeat-

ably assemble lasers at a repetition rate required by DESY's FEL facilities.

Poster THU-P-2.11 12:00

Planar Polymer Optical Waveguide Coated with Metal-Organic Framework for CO2 Sensing Application — •Lei Zheng[1,2], Nils Keppler[2,3], Peter Behrens[2,3], and Bernhard Roth[1,2] — [1]Hannover Centre for Optical Technologies, Leibniz University Hannover, Hannover, Germany — [2]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering-Innovation Across Disciplines), Hannover, Germany — [3]Institute of Inorganic Chemistry, Leibniz University Hannover, Hannover, Germany

An easily fabricated planar polymer optical waveguide sensor with metal-organic framework coating for carbon dioxide sensing is demonstrated. The proposed device exhibits good sensitivity, excellent reversibility and rapid response, which are significant towards the further development of gas sensing products for real-world applications such as environmental monitoring and gas detection.

Poster THU-P-2.12 12:00

withdrawn

Poster THU-P-2.13 12:00

VCSELs as Highly Sensitive Stand-Alone Distance Sensors — •Axel Günther[1,2,3], Divyaben Korat[2], Wolfgang Kowalsky[1,3], and Bernhard Roth[2,3] — [1]Institute of High Frequency Technologies, Braunschweig, Germany — [2]Hannover Centre for Optical Technologies, Hannover, Germany — [3]Cluster of Excellence PhoenixD, Hannover, Germany

We investigate the suitability of vertical-cavity surface-emitting lasers (VCSEL) as highly sensitive distance sensors for topography measurement. The concept relies on the light reflected from a moving sample into the VSCEL resonator inducing a measurable change of operating current and emission wavelength to detect motion of a few nm only.

Poster THU-P-2.14 12:00

The impact of heat-load modulation on transverse mode instability in high-power, quasi-continuous wave fibre amplifiers — •Sobhy Kholaif[1], Cesar Jauregui[1], Yiming Tu[1,2], and Jens Limpert[1,2,3] — [1]Instiute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We report that the modulation of the heat-load in fibre laser systems significantly mitigates the transverse mode instability when carefully choosing the modulation parameters. It is possible to suppress the higher-order modes by inducing a permanent energy transfer from the higher-order modes to the fundamental mode.

Poster THU-P-2.15 12:00

577 nm yellow laser source using external pumping — •Great Chayran, Venkatesan Jambunathan, Martin Smrz, and Thomas Mocek — HiLASE Center, Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic

We demonstrated a yellow laser source emitting at 577nm externally pumped by 1029 nm Q-switched laser. With the proper combination of Raman and frequency doubling medium, a maximum output of 9mW is achieved.

Poster THU-P-2.16 12:00

Compact Nd:YAP/V:YAG nanosecond pulse generator at 1342 nm — Kryštof Kadlec[1], •Jan Šulc[1], Michal Němec[1], Helena Jelínková[1], Karel Nejezchleb[2], Lukáš Beran[2], and Radim Kuděłka[2] — [1]Czech Technical University in Prague, Prague, Czech Republic — [2]Crytur, Ltd. Turnov, Turnov, Czech Republic

A compact laser head emitting a linearly polarized radiation at wavelength 1342 nm was designed and constructed. This laser was based on a separate Nd:YAP gain part and V:YAG saturable absorber. Q-switched pulses 12 ns long with energy up to 0.1 mJ were generated with repetition rate 500 Hz.

Poster THU-P-2.17 12:00

Cryogenic Laser Operation of a "Mixed" Yb:YLuAG Garnet Crystal — •Sami Slimi[1], Venkatesan Jambunathan[2], Mingyan Pan[3], Yicheng Wang[4], Weidong Chen[5], Pavel Loiko[6], Rosa Maria Solé[1], Magdalena Aguiló[1], Francesc Díaz[1], Martin Smrz[2], Tomas Mocek[2], and Xavier Mateos[1] — [1]FiCMA-FiCNA-EMaS, Universitat Rovira i Virgili (URV), Campus Sescelades, E-43007 Tarragona, Spain, Tarragona, Spain — [2]HiLASE Centre, Institute of Physics of the Czech Academy of Sciences, Za Radnicí 828, 252 41 Dolní Břežany, Czech Republic, Dolní Břežany, Czech Republic — [3]Key Laboratory of Materials for High Power Laser, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Shanghai 201800, China, Shanghai , China — [4]Photonics and Ultrafast Laser Science, Ruhr Universität Bochum, Universitätsstrasse 150, 44801 Bochum, Germany, Bochum, Germany — [5]Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, 350002 Fujian, China, Fujian, China — [6]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen Normandie, 6 Boulevard Maréchal Juin, 14050 Caen Cedex 4, France, Caen Cedex, France

We report on the cryogenic laser performance of a new "mixed" Yb:LuYAG garnet crystal in the continuous-wave and pulsed regimes. We determined an optimum temperature of 140 K for efficient laser operation. A maximum output of 10.65 W with a slope efficiency of 56% was achieved.

Poster THU-P-2.18 12:00

Colloidal LiYF4:Pr nanocrystals downsized to 10 nm – Part 2: spectroscopic properties — •Simon Spelthann[1], Michael Steinke[1,2], Rajesh Komban[3], Horst Weller[3,4], Christoph Gimmler[3], Axel Ruehl[1,2], and Detlev Ristau[1,2,5] — [1]Leibniz University Hannover, Institute of Quantum Optics, Hannover, Germany — [2]Leibniz University Hannover, QUEST-Leibniz-Research School, Hannover, Germany — [3]Fraunhofer Center for Applied Nanotechnology CAN - (a research division of Fraunhofer Institute for Applied Polymer Research), Hamburg, Germany — [4]University Hamburg, Department of Chemistry, Hamburg, Germany — [5]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering - Innovation Across Disciplines), Hannover, Germany

Nanocrystalline LiYF4:Pr promises exciting design opportunities for composite photonic devices. Here, we present an in-depth spectroscopic investigation on monodispersed colloidal LiYF4:Pr nanocrystals of 10nm size. We observed an unexpected yet intense emission with comparably long lifetimes. These results pave the way for applications in quantum optics or biomedicine.

Poster THU-P-2.19 12:00

Novel coercive field engineering technique for improved periodic poling of KTiOPO4 isomorphs — •Laura Barrett, Andrius Zukauskas, and Fredrik Laurell — Royal Institute of Technology, Stockholm, Sweden

We demonstrate high quality, short period QPM structures in KTP and RKTP, produced through coercive field engineering using a new ion exchange based on Ba2+ ion indiffusion. We show advantages of using this method over the previously established coercive field engineering method using Rb+ ions.

Poster THU-P-2.20 12:00

High-power optical amplifier with enhanced wall-plug efficiency for 10-channel WDM satellite laser communication systems — •Sven Hochheim, Alexander Büttner, Eike Brockmüller, Willy Fittkau, Felix Wellmann, Peter Wessels, Jörg Neumann, and Dietmar Kracht — Laser Zentrum Hannover e.V., Hannover, Germany

An important aspect of optical satellite communication technology is the power consumption of the laser systems. We present a high-efficiency all-fiber amplifier for a WDM communication system. 10 channels combined in a polarization-maintaining fiber can be efficiently amplified up to a total power level of 100W in the 1μm wavelength-range.

Poster THU-P-2.21 12:00

Entirely passive thin-disk dual-comb spectrometer operating in green — •Tobias Hofer, Kilian Fritsch, and Oleg Pronin — Helmut-Schmidt University, Hamburg, Germany

We have frequency doubled an entirely passive dual-comb thin-disk oscillator to perform spectroscopy of iodine at 515nm. Simultaneous measurement of iodine and acetylene (1034nm) helps to evaluate the jitter characteristics at both wavelengths. It indicates that the approach can be extended to higher harmonics in the deep UV spectral range.

Poster THU-P-2.22 12:00

Optimized composition of $LiREF_4$ (RE = Tb_xY_{1-x}) crystals for efficient green and yellow lasers - fluorescence quenching in Tb^{3+} ions — •Moritz Badtke, Sascha Kalusniak, Stefan Püschel, Hiroki Tanaka, and Christian Kränkel — Leibniz-Institut für Kristallzüchtung, Berlin, Germany

We investigated inversion dependent fluorescence quenching of Tb^{3+} via a Z-scan technique. Analysis with an analytical model yielded parameters describing the strength of energy transfer up-conversion and energy migration between Tb^{3+} ions. This allows optimizing the quantum efficiency of the emitting $^5D_4$-level in Tb^{3+}-based lasers by optimized composition.

Poster THU-P-2.23 12:00

Towards Carrier-Envelope Phase Stabilization of a 110 MW Thin-Disk Oscillator — •Yasmin Kopp, Semyon Goncharov, Kilian Fritsch, and Oleg Pronin — Helmut Schmidt University, Hamburg, Germany

Here, the beat signal detection towards carrier-envelope phase stabilization of a 110 MW Kerr-lens mode-locked thin-disk oscillator delivering 140 fs-long pulses is presented. The implementation of an f-2f interferometer is demonstrated using an octave-spanning spectrum from a cascade with a multi-pass cell and photonic-crystal fiber.

Poster THU-P-2.24 12:00

Towards a monolithic, multi-gigahertz mode-locked Ti:Sa laser — •Torben Fiehler and Ulrich Wittrock — Münster University of Applied Sciences, Steinfurt, Germany

We demonstrate a design for a monolithic, multi-gigahertz soft-aperture Kerr-lens mode-locked Ti:Sa laser. First experiments did not show mode-locking but cw laser operation with power fluctuations of less than 0.04% rms. We discuss possible obstacles to mode-locking in monolithic lasers like spatial-hole burning or a standing-wave of the pump beam.

Poster THU-P-2.25 12:00

Energy scaling of multi-pass cells for nonlinear optics — •Victor Hariton[1,2], Kilian Fritsch[1], and Oleg Pronin[1] — [1]Helmut Schmidt University, Hamburg, Germany — [2]Instituto Superior Técnico, Universidade de Lisboa, Lisboa, Portugal

We introduce a novel nonlinear multi-pass cell configuration comprising a concave-convex geometry. In a proof-of-principle experiment, 260 fs, 15 μJ pulses are broadened and compressed to approximately 50 fs with 90 % efficiency with excellent spatio-spectral homogeneity. A compact design for 0.5 J and 1 ps laser is also presented.

Poster THU-P-2.26 12:00

Comparative study on pump wavelength dependent efficiency in Nd:YVO_4 — •Merle Schneewind[1,2], Stefan Spiekermann[1], Peter Wessels[1,2], Jörg Neumann[1,2], and Dietmar Kracht[1,2] — [1]Laser Zentrum Hannover e.V. (LZH), Hanover, Germany — [2]Cluster of Excellence QuantumFrontiers, Hanover, Germany

The influence of the pump wavelength on the heat load and efficiency of Nd:YVO_4 crystals is investigated with a specially designed crystal mount. The measurements indicate that the change in heat load in the crystal can be solely ascribed to the difference of quantum defects and no further non-radiative effects.

Poster THU-P-2.27 12:00

Mamyshev regenerator for ultrashort light pulse shaping — •Gustas Liaugminas, Kęstutis Regelskis, Giedrius Dubosas, and Julijanas Želudevičius — Center for Physical Sciences and Technology, Vilnius, Lithuania

We present a Mamyshev regenerator setup with electrically controlled acousto-optic switch. This setup allows the injection of a long, poor quality pulse through one of the switch inputs. After a few tens of regeneration cycles occur the input pulse is shaped into high quality ultrashort light pulse.

THU-SSL-5: SSL Session 5 Spectral Control and Tuning

Chaired by Pavel Loiko, ENSI, Caen

Time: Thursday, 14:00–16:00 Location: Auditorium

Oral THU-SSL-5.1 14:00

Smart and agile 88 W Yb-fiber frequency comb laser — •Sarper Salman[1,2,3], Mingqi Fan[1], Henrik Tünnermann[1], Prannay Balla[1,2,3], John Darvill[1], Dominic Laumer[1], Vito F. Pecile[4], Jakob Fellinger[4], Valentina Shumakova[4], Christoph Mahnke[1], Yuxuan Ma[1], Christian Mohr[1], Oliver H. Heckl[4], Christoph M. Heyl[1,2,3], and Ingmar Hartl[1] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschnung GmbH, Darmstadt, Germany — [4]University of Vienna, Faculty of Physics, Faculty Center for Nano Structure Research, Christian Doppler Laboratory for Mid-IR Spectroscopy and Semiconductor Optics, Vienna, Austria

We demonstrate an agile high power Yb-fiber frequency comb laser system with long-term stable remote-controlled operation via digital feedbacks and user-friendly interfaces. A programmable, phase and amplitude filter allows optimization of the laser output pulse for driving a subsequent nonlinear process, such as nonlinear frequency shifting and XUV-comb generation.

Oral THU-SSL-5.2 14:15

Line-search FROG algorithm for retrieval of pulses from noisy datasets — •Christoffer Krook[1], Koen Claessen[2], and Valdas Pasiskevicius[1] — [1]Royal Institute of Technology, KTH, Stockholm, Sweden — [2]Chalmers University of Technology, CTH, Gothenburg, Sweden

We present here a new FROG retrieval algorithm which performs well under heavy noise conditions through a structured random search of the available input space. It can retrieve pulses from any FROG geometry, partial datasets, as well as blind FROG retrieval.

Oral THU-SSL-5.3 14:30

High Power Alexandrite Laser for Tunable UV-Blue Generation — •Goronwy Tawy[1], Noelia Palomar Davidson[2], Paolo L. Mennea[2], Glenn M. Topley[2], Peter G. R. Smith[2], James C. Gates[2], Corin B. E. Gawith[2], Ara Minassian[3], and Michael J. Damzen[1] — [1]Photonics Group, The Blackett Laboratory, Dept. of Physics, Imperial College London SW7 2AZ, London, United Kingdom — [2]Optoelectronics Research Centre, University of Southampton, University Road, Hampshire SO17 1BJ, Southampton, United Kingdom — [3]Unilase Ltd, 60 Grays Inn Road, Unit LG04 WC1X 8LU, London, United Kingdom

We report the very first demonstration of wavelength-tunable operation in the UV from a diode-pumped Alexandrite laser. 375-385nm continuous tuning is obtained using a high-power diode-pumped tunable Alexandrite laser and a Type I critically phase-matched BBO crystal. The use of PPLN waveguides for UV generation is also discussed.

Oral THU-SSL-5.4 14:45

Highly efficient cavity-dumped Q-switched Alexandrite laser — •Stefanie Unland, Roland Kalms, Peter Wessels, Dietmar Kracht, and Jörg Neumann — Laser Zentrum Hannover e.V., Hannover, Germany

We present a cavity-dumped Q-switched Alexandrite laser for LIDAR applications under CW double-pass diode pumping. A record pulse energy of >500 μJ was achieved at 755 nm, 2.8 ns and 5 kHz. Furthermore, efficient laser operation at 10 – 20 kHz repetition rates is demonstrated for the first time.

Oral THU-SSL-5.5 15:00

7.5W Alexandrite Ring Laser — •Goronwy Tawy[1], Meizhen Liang[1], Huaifeng Xiao[1], Ara Minassian[2], and Michael J. Damzen[1] — [1]Photonics Group, The Blackett Laboratory, Dept. of Physics, Imperial College London SW7 2AZ, London, United Kingdom — [2]Unilase Ltd, 60 Grays Inn Road, Unit LG04 WC1X 8LU, London, United Kingdom

We report a 7.5W Alexandrite (Cr-doped Chrysoberyl) ring laser operating at 757nm. Pumping is provided by a 200 μm fibre-coupled red laser diode (640nm) with optical and slope efficiencies of 28% and 35%, respectively. This result shows potential for high-power single-longitudinal-mode operation across 720-800nm and 360-400nm by second-harmonic-generation.

Oral THU-SSL-5.6 15:15

Multi-mJ SWIR OPCPA pumped and seeded with 1.2 ps Yb:YAG laser — •Augustinas Petrulėnas, Aistė Butkutė, Paulius Mackonis, and Aleksej Rodin — State research institute Center for Physical Sciences and Technology , Vilnius, Lithuania

We developed a cost-effective broadband SWIR-MIR mJ-level OPCPA pumped and seeded with 1.2 ps Yb:YAG laser. Pulses amplified to 2 mJ in the wavelength range 1900 – 2300 nm with a pump-to-signal record conversion efficiency of ~30% and compressed up to 50 fs in 3-stage OPCPA based on BiBO.

Oral THU-SSL-5.7 15:30

Spectroscopy and continuous wave laser operation of Tm^{3+}-doped $YScO_3$ mixed sesquioxide crystal — •Anna Suzuki[1,2,3], Sascha Kalusniak[3], Hiroki Tanaka[3], Mario Brützam[3], Steffen Ganschow[3], Masaki Tokurakawa[1,2], and Christian Kränkel[3] — [1]Institute for Laser Science, University of Electro-Communication, Tokyo, Japan — [2]Center for Neuroscience and Biomedical Engineering, University of Electro-Communications, Tokyo, Japan — [3]Leibniz-Institut für Kristallzüchtung (IKZ), Berlin, Germany

We present spectroscopic investigations and laser operation of a Czochralski-grown Tm^{3+} : $YScO_3$ mixed sesquioxide crystal. We observed broadband absorption and emission spectra, desirable for ultrafast 2 μm lasers. Continuous wave laser experiments were performed using a 780 nm laser diode, and a maximum slope efficiency of 40% was achieved.

Oral THU-SSL-5.8 15:45

Single-frequency praseodymium doped YLF laser design and operation with extended wavelength coverage in the visible — •Paul White[1], Alan Kemp[2], and Loyd McKnight[1] — [1]Fraunhofer Centre for Applied Phootnics, Glasgow, United Kingdom — [2]University of Strathclyde, Glasgow, United Kingdom

Single-frequency operation of a diode-pumped praseodymium-doped YLF laser has been demonstrated using an elegant cavity design. Over 100 mW of single-frequency operation has been achieved from 687 nm to 705 nm with one cavity arrangement. This laser system targets use in neutral strontium optical clocks.

16:00–16:30: Coffee Break

THU-FWD-4: FWD Session 4 Spectral Control and Tuning

Chaired by Eric Cormier, University of Bordeaux, Bordeaux, France

Time: Thursday, 16:30–18:30 Location: Auditorium

Oral THU-FWD-4.1 16:30

Crystalline Grating-Waveguide Resonant reflectors — •G. Mourkioti[1], G.A. Govindassamy[1], F. Li[2], R.W. Eason[1], M. Abdou Ahmed[3], and J.I. Mackenzie[1] — [1]Optoelectronics Research Centre, University of Southampton, Southampton, SO17 1BJ, United Kingdom — [2]University of Eastern Finland, FI-80100 Joensuu, Finland — [3]Institut für Strahlwerkzeuge, University of Stuttgart, 70569 Stuttgart, Germany

We report the fabrication and first demonstration of crystalline grating waveguide reflectors comprising a Sc2O3 waveguide grown on a sub-wavelength-patterned sapphire substrate. Operating in the 1- and 2-micron regime, distinct TE- and TM-polarisation resonances were obtained, with reflectance approaching 50% at ~7° incident angle from a single waveguide and GWS.

Oral THU-FWD-4.2 16:45

Serrodyne optical frequency shifting using a nonlinear multi-pass cell — •Henrik Tünnermann[1], Prannay Balla[1,2,3], Sarper H. Salman[1,2,3], Mingqi Fan[1,2,3], Skirmantas Alisauskas[1], Ingmar Hartl[1], and Christoph M. Heyl[1,2,3] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]Gesellschaft für Schwerionenforschung, GSI, Darmstadt, Germany

We introduce a novel wavelength shifting concept for ultrafast lasers. We demonstrate this concept by efficiently tuning the wavelength of a 80 W, 200 fs Ytterbium-fiber laser from 1000 nm to 1060 nm. Our method supports high peak and average power operation and excellent temporal pulse quality.

Oral THU-FWD-4.3 17:00

Self-generation scheme for heteronuclear compound states — •Stephanie Willms[1,2], Surajit Bose[1,3], Oliver Melchert[1,2,4], Uwe Morgner[1,2,4], Ihar Babushkin[1,2], and Ayhan Demircan[1,2,4] — [1]Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany — [2]Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany — [3]Institute of Photonics, Leibniz University Hannover, Hannover, Germany — [4]Hannover Centre for Optical Technologies, Hannover, Germany

The generation of two-frequency compound states is challenging, since access to two incommensurable, group-velocity matched frequencies is required. For a possible experimental realization, we propose a self-generation scheme enabled by a spectral tunneling process. With this approach, we demonstrate the generation of a compound state from a single input pulse.

Oral THU-FWD-4.4 17:15

Adaptive liquid-core optical fibers for advanced soliton control — •Mario Chemnitz[1], Ramona Scheibinger[1], Johannes Hofmann[1], Saher Junaid[1], and Markus Schmidt[1,2] — [1]Leibniz Institute of Photonic Technology, Jena, Germany — [2]Otto-Schott Institute for Material Science, Friedrich-Schiller-University, Jena, Germany

We highlight the potential of liquid-core fibers as nonlinear devices for adaptive fiber applications featuring low-coupling losses, full fiber-system connectivity, and picojoule pump energy requirements. We experimentally showcase this potential by controlling the soliton fission point, the soliton self-frequency shift, and the tuneable emission of cascaded dispersive waves.

Oral THU-FWD-4.5 17:30

Stabilization of the unidirectionality phenomenon observed in a fully reciprocal fiber ring laser by retarding the seeding of Raman stokes — •Muhammad Assad Arshad, Alexander Hartung, and Matthias Jäger — Leibniz-Institut für Photonische Technologien e. V, Jena, Germany

We report on the recent developments regarding unidirectional lasing observed in a reciprocal fiber ring laser. In this talk we present how retardation of Stokes assisted broadening results in a considerable reduction of required threshold power accompanied by stabilization enhancement in terms of output power and directionality in unidirectional regime.

Oral THU-FWD-4.6 17:45

Optimization of the temporal quality of ultrafast pulses using dispersion scan based on tunable chirped fiber Bragg gratings — •Meng Liu[1,2], Ayhan Tajalli[1], Mingqi Fan[1], Christoph Mahnke[1], Jiaan Zheng[1], and Ingmar Hartl[1] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]South China Normal University, Guangzhou, Guangdong, China

By using the dispersion scan technique based on tunable chirped fiber Bragg gratings, the 650 ps pulses can be compressed to ~650 fs with optimized pedestals. This method allows reliable pulse-characterization and optimization without movable parts and therefore improve the stability of a laser system used in 24/7 operation.

Oral THU-FWD-4.7 18:00

Spectral Band-Pass Filtering to Reduce the Impact of Higher Order Dispersion in Fibre-Based Laser Amplifiers — •Paul Repgen, Mesut Lacin, Amirhossein Maghsoudi, and Ömer Ilday — Department of Physics, Bilkent University, Ankara, Turkey

High repetition rates in fiber-based laser systems can be achieved through multiplication in asymmetric Mach-Zehnder interferometers. We utilize a spectral band-pass filter to reduce the asymmetric dispersion that is accumulated in the different paths to increase the compressibility of the pulses.

Oral THU-FWD-4.8 18:15

Synchronized and tunable femtosecond laser source from CW laser — William Renard[1], Clément Chan[1], Antoine Dubrouil[2], Jérôme Lhermite[3], •Giorgio Santarelli[4], and Romain Royon[1] — [1]IRISIOME, Pessac, France — [2]FEMTOEASY, Pessac, France — [3]CELIA, Talence, France — [4]LP2N, Talence, France

We present an agile novel laser source delivering clean and stabilized ultrashort pulses < 500 fs at different pulse repetition rates from 10 MHz to 100 MHz and 100 mW of average power. This laser source can be easily synchronized.

FRI-SSL-6: SSL Session 6 Piskarskas Memorial

Chaired by Valdas Pasiskevicius, KTH, Stockholm, Sweden

Time: Friday, 8:15–9:30 Location: Auditorium

Oral FRI-SSL-6.1 8:15

Spatially-multiplexed tunable dual-comb optical parametric oscillator at 250 MHz — •Carolin P. Bauer, Justinas Pupeikis, Benjamin Willenberg, Zofia A. Bejm, Noè Pezzoli, Christopher R. Phillips, and Ursula Keller — Institute of Quantum Electronics, ETH Zurich, Zurich, Switzerland

We demonstrate a spatially-multiplexed dual-comb 250-MHz OPO from a single linear cavity. The adjustable repetition-rate difference is 4.1 kHz. Each idler comb has >200 mW average power at 3.5 μm with 30 nm bandwidth. The OPO is wavelength-tunable from 1.36 μm to 1.7 μm and 2.9 μm to 4.17 μm.

Oral FRI-SSL-6.2 8:30

Inline Amplification of Mid-Infrared Intrapulse Difference Frequency Generation — •Quentin Bournet[1,2], Florent Guichard[2], Michele Natile[2], Yoann Zaouter[2], Antoine Zheng[1], Manuel Joffre[3], Adeline Bonvalet[3], Mindaugas Jonusas[3], Frédéric Druon[1], Marc Hanna[1], and Patrick Georges[1] — [1]Université Paris-Saclay, Institut d'Optique Graduate School, CNRS, Laboratoire Charles Fabry, Palaiseau, France — [2]Amplitude, 11 Avenue de Canteranne, Cité de la Photonique, Pessac, France — [3]Laboratoire d'Optique et Biosciences, Ecole Polytechnique, CNRS, INSERM, Institut Polytechnique de Paris, Palaiseau, France

We present an inline mid-infrared source based on intrapulse-difference-frequency-generation and subsequent optical parametric amplification, with pump recycling. Driven by an Yb-doped-fiber amplifier at 1030 nm, at a repetition rate of 250 kHz, the source delivers 1 μJ 73 fs pulses at 8 μm, corresponding to an unprecedented efficiency of 2%.

Oral FRI-SSL-6.3 8:45

High repetition rate, low noise and wavelength stable OPCPA laser system with highly efficient broadly tunable UV conversion for FEL seeding — •Tino Lang, Mehdi Kazemi, Jiaan Zheng, Samuel Hartwell, Nhat-Phi Hoang, Eugenio Ferrari, Enrico Allaria, Lucas Schaper, and Ingmar Hartl — Deutsches Elektronen Synchrotron DESY, Hamburg, Germany

We present the concept and first results of a novel OPCPA system with highly-efficient, broadly-tunable UV conversion for XUV/VUV FEL seeding. The start-to-end simulation allows to predict the system performance regarding tunability, beam-quality, stability and pointing, depending on the measured input parameters and fluctuations of the high-power CPA pump laser.

Oral FRI-SSL-6.4 9:00

Visible, femtosecond, high power, ultra-broadband noncollinear optical parametric oscillator (VIS-NOPO) — •Robin Mevert[1,2], Yuliya Binhammer[1,2], Christian M. Dietrich[1,2], José R. Cardoso de Andrade[3], Luise Beichert[1,2], Thomas Binhammer[4], Jintao Fan[1,2], and Uwe Morgner[1,2] — [1]Leibniz University Hannover, Institute of Quantum Optics, Hannover, Germany — [2]Cluster of Excellence PhoenixD, Hannover, Germany — [3]Max-Born Institute, Berlin, Germany — [4]neoLASE GmbH, Hannover, Germany

The visible spectral range is difficult to cover by non-parametric laser gain media. Therefore, optical parametric oscillators offer a versatile solutions to this problem but have rather low tuning speeds. We demonstrate a quickly tunable, high power, femtosecond, noncollinear optical parametric oscillator which covers nearly the entire visible spectral range.

Oral FRI-SSL-6.5 9:15

Multi-μJ 12 μm Femtosecond GaSe-based OPCPA at 1 kHz Repetition Rate — •Pia Fuertjes, Martin Bock, Lorenz von Grafenstein, Uwe Griebner, and Thomas Elsaesser — Max Born Institute, Berlin, Germany

We present a LWIR OPCPA containing a fs Cr:ZnS laser as front-end. Sub-200 fs idler pulses at 11.4 μm with 50 μJ energy are generated in the 1 kHz pulse train.

9:30–10:00: Coffee Break

FRI-SSL-7: SSL Session 7 Tm, Ho Lasers

Chaired by Uwe Griebner, MBI , Berlin, Germany

Time: Friday, 10:00–12:00 Location: Auditorium

Invited FRI-SSL-7.1 10:00

Recent Progress in Laser Crystals and Ceramics for Femtosecond Mode-Locked Lasers at ~2 μm — •Pavel Loiko[1], Weidong Chen[2], Xavier Mateos[3], Patrice Camy[1], Uwe Griebner[4], and Valentin Petrov[4] — [1]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CNRS, Université de Caen, Caen, France — [2]Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, China — [3]FiCMA-FiCNA-EMaS, Universitat Rovira i Virgili (URV), Tarragona, Spain — [4]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany

We report on the recent progress in solid-state lasers emitting ultrashort pulses around 2 μm based on broadband-emitting gain media: disordered crystals (garnets and aluminates) and "mixed" transparent ceramics (sesquioxides) doped with Tm3+ and Tm3+/Ho3+ ions. The role of multiphonon-assisted long-wave emissions in reaching sub-50 fs pulse durations is discussed.

Oral FRI-SSL-7.2 10:30

Dual-wavelength pumping of a Tm:LYF laser at 2.3 μm — •Hippolyte Dupont[1], Lauren Guillemot[2], Pavel Loiko[2], Alain Braud[2], Jean-Louis Doualan[2], Patrice Camy[2], Patrick Georges[1], and Frédéric Druon[1] — [1]Université Paris-Saclay, Institut d'Optique Graduate School, CNRS, Laboratoire Charles Fabry, Palaiseau, France — [2]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen, Caen , France

We report on a mid-infrared thulium laser operating on the 3H4 → 3H5 transition with a dual-wavelength pumping at 0.78 and 1.05 μm (direct and upconversion pumping schemes). The reciprocal

interplay between the two pump is studied to evaluate the benefits in terms of the pump absorption and laser efficiency.

Oral FRI-SSL-7.3 10:45

Watt-level femtosecond Tm:(Lu,Sc)2O3 ceramic laser — Ning Zhang[1], Zhanxin Wang[1], Shande Liu[2], Wei Jing[3], Hui Huang[3], Zixuan Huang[1], Kangzhen Tian[1], Zhiyong Yang[1], Yongguang Zhao[1], Uwe Griebner[4], Valentin Petrov[4], and •Weidong Chen[5] — [1]Jiangsu Normal University, Xuzhou, China — [2]Shandong University of Science and Technology, Qingdao, China — [3]China Academy of Engineering Physics, Mianyang, China — [4]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany — [5]Chinese Academy of Sciences, Fujian, China

We report on a SESAM mode-locked Tm:(Lu,Sc)2O3 ceramic laser in-band pumped by a Raman fiber laser at 1627 nm.An average output power up to 1.02 W at 2060 nm is achieved for transform-limited 280-fs pulses at a repetition rate of 86.5 MHz, giving an optical efficiency of 36.4%.

Oral FRI-SSL-7.4 11:00

50-W, >2-μJ SESAM-modelocked Ho:YAG thin-disk oscillator at 2.1 μm — •Sergei Tomilov[1], Yicheng Wang[1], Martin Hoffmann[1], Jonas Heidrich[2], Matthias Golling[2], Ursula Keller[2], and Clara Saraceno[1] — [1]Photonics and Ultrafast Laser Science, Ruhr Universität Bochum, Bochum, Germany — [2]Department of Physics, Institute for Quantum Electronics, ETH Zürich, Zürich, Switzerland

We report our recent progress in power-scaling of short-wave infrared laser systems by demonstrating high-power SESAM-modelocked thin-disk Ho:YAG oscillator, delivering record average power of 50 W and more than 2 μJ of pulse energy at the central wavelength of 2092 nm.

Oral FRI-SSL-7.5 11:15

Sub-40 fs Kerr-lens mode-locked Tm,Ho:CALGO laser — •Weidong Chen[1,2], Li Wang[1], Uwe Griebner[1], Ge Zhang[2], Pavel Loiko[3], Xavier Mateos[4], Ji Eun Bae[5], Fabian Rotermund[5], Xiaodong Xu[6], Arkady Major[7], and Valentin Petrov[1] — [1]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany — [2]Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, China — [3]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen, Caen, France — [4]Universitat Rovira i Virgili, Tarragona, Spain — [5]Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea — [6]Jiangsu Normal University, Xuzhou, China — [7]University of Manitoba, Winnipeg, Canada

In the present work, we explored further reduction of the pulse duration in ML Tm,Ho:CALGO laser via soft-aperture Kerr-lens mode-locking (KLM).Pulses as short as 37 fs were generated from KLM Tm,Ho:CALGO laser at 2061.3 nm with an average output power of 55 mW and a repetition rate of 76 MHz.

Oral FRI-SSL-7.6 11:30

LED-pumped CTH:YAG luminescent concentrator as broadband incoherent source in the SWIR — •Lisa Lopez, Pierre Pichon, Frédéric Druon, Patrick Georges, and François Balembois — Université Paris-Saclay, Institut d'Optique Graduate School, Centre National de la Recherche Scientifique, Laboratoire Charles Fabry, Palaiseau, France

We have demonstrated an incoherent source centred at 2100nm with a bandwidth of 300nm. It is three times brighter spectrally than a blackbody and 10 times brighter than SWIR LEDs. This source consists of a cascade of luminescent concentrators with a Ce:YAG in first and a CTH:YAG in second.

Oral FRI-SSL-7.7 11:45

Iterative 3D modeling of thermal effects in end-pumped continuous-wave Ho^{3+}:YAG lasers — •Marius Rupp[1,2], Katharina Goth[1,2], Marc Eichhorn[1,2], and Christelle Kieleck[1] — [1]Fraunhofer Institute of Optronics, System Technologies and Image Exploitation, Ettlingen, Germany — [2]Institute of Control Systems, Karlsruhe Institute of Technology, Karlsruhe, Germany

In this work we present a highly accurate model for simulating laser resonators based on a beam propagation method algorithm including thermal effects in the laser. An experimental Ho^{3+}:YAG resonator setup is used to validate the model, which shows excellent agreement in output power, resulting M^2 and output field distribution.

12:00–13:30: Lunch Break

FRI-FWD-5: FWD Session 5 GHz Lasers

Time: Friday, 13:30–15:00 Location: Auditorium

Oral FRI-FWD-5.1 13:30

High-power nonlinear amplification of an electro-optic frequency comb at GHz repetition rates — •Hanyu Ye[1], Florian Leroi[2], Lilia Pontagnier[1], Giorgio Santarelli[1], Johan Boullet[2], and Eric Cormier[1,3] — [1]Laboratoire Photonique Numérique et Nanosciences (LP2N), Talence, France — [2]ALPhANOV, Talence, France — [3]Institut Universitaire de France (IUF), Paris, France

We present an electro-optic comb seeded ultrafast nonlinear fiber amplifier at 1.03 μm. By tuning and dividing the driving radiofrequency of the EO comb, the system can deliver up to 200 W picosecond pulses compressible down to hundreds of femtoseconds at flexible GHz repetition rate.

Oral FRI-FWD-5.2 13:45

Photocathode Laser based on a 3 GHz Electro-Optical Comb Generator for the Ultrafast Electron Diffraction Facility REGAE — •Christoph Mahnke[1], Chen Li[1], Henrik Tünnermann[1], Caterina Vidoli[1], Uwe Grosse-Wortmann[1], Christoph M. Heyl[1,2], Lutz Winkelmann[1], and Ingmar Hartl[1] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Helmholtz-Institute Jena, Jena, Germany

We present a photocathode laser generating a train of 1030 nm, picosecond pulses with a repetition rate of 3 GHz, which is converted to 257 nm by two stages of second harmonic generation. The system is able to generate bursts of microsecond duration for the application of ultrafast electron diffraction.

Oral FRI-FWD-5.3 14:00

Multi-GHz repetition rate, femtosecond pulse generation in burst mode based on a phase-only modulated electro-optic frequency comb — •Hanyu Ye[1], Lilia Pontagnier[1], Eric Cormier[1,2], and Giorgio Santarelli[1] — [1]Laboratoire Photonique Numérique et Nanosciences (LP2N), Talence, France — [2]Institut Universitaire de France (IUF), Paris, France

We present a 17.5 GHz repetition rate, femtosecond fiber laser operating in the burst mode, achieved by nonlinearly shaping and amplifying a phase-only modulated electro-optic comb at 1.03 μm. The system delivers 1.2 W output pulses compressible down to <100 fs level.

Oral FRI-FWD-5.4 14:15

Versatile GHz Burst-Mode Operation in High-Power Femtosecond Laser — •Tadas Bartulevičius[1], Mykolas Lipnickas[1], Karolis Madeikis[1], Raimundas Burokas[1,2], and Andrejus Michailovas[1,2] — [1]Ekspla, Vilnius, Lithuania — [2]Center for Physical Sciences and Technology, Vilnius, Lithuania

A new versatile patent-pending method to generate ultra-high (>2 GHz) repetition rate bursts of ultrashort laser pulses containing any number of pulses within a burst with identical pulse separation and adjustable amplitude is introduced in industrial-grade 30 W-level average power ultrashort (sub-1 ps) pulse laser system.

Oral FRI-FWD-5.5 14:30

Controlled multi-pulsing dynamics for superior harmonic mode-locking — •Aladin Şura[1] and Fatih Ömer İlday[1,2] — [1]UNAM, Institute of Materials Science and Nanotechnology, Bilkent University, Ankara, Turkey — [2]Department of Physics and Department of Electrical Engineering, Bilkent University, Ankara, Turkey

Despite the importance of multi-pulsing modelocking as a nonlinear phenomenon and a potential source of high repetition-rate ultrashort pulses, it remains poorly controlled. Guided by the slaving principle in a hierarchy of timescales, we achieved excellent control of a multi-pulsing oscillator, allowing reliable and stable harmonic modelocking with superior characteristics.

Oral FRI-FWD-5.6 14:45

Femtosecond OPO pumped by a high power ytterbium rod-type fiber laser mode locked at harmonic repetition rates — •Valerian FREYSZ[1] and Eric FREYSZ[2] — [1]ALPhANOV, Institut d'optique d'Aquitaine, Rue François Mitterrand, 33400 Talence, France — [2]Laboratoire Ondes et Matière d'Aquitaine (LOMA),UMR 5798, CNRS-Université Bordeaux, 33400 Talence, France

An OPO pumped by femtosecond pulses delivered by a large-mode-area, ytterbium-doped, rod-type fiber laser mode locked at harmonic repetition rates. The repetition rate is changed by adjusting the pulse polarization inside the laser cavity. The OPO delivers femtosecond signal pulses that are tunable from 1450nm to 1700nm.

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