SS1: Summer School Lecture 1 - Ultrashort pulse and high power lasers - Prof. Morgner

Time: Sunday 14:00–16:00 Location: Oscar Klein - Lecture Hall

Summer School Lecture 1 - Ultrashort pulse and high power lasers - Prof. Morgner

Break

Summer School Lecture 1 - Ultrashort pulse and high power lasers - Prof. Morgner

Discussion

2: Coffee Break

Time: Sunday 16:00–16:30 Location: Main Hall Area

Coffee Break

SS2: Summer school lecture 2 - High harmonics, Attosecond generation - Prof. L'Huillier

Time: Sunday 16:30–18:30 Location: Oscar Klein - Lecture Hall

Summer school lecture 2 - High harmonics, Attosecond generation - Prof. L'Huillier

Break

Summer school lecture 2 - High harmonics, Attosecond generation - Prof. L'Huillier

Discussion

4: Welcome by chairs

Time: Monday 8:00–8:15 Location: Oscar Klein - Lecture Hall

welcome

MoA: Novel trends in photonics

Time: Monday 8:15–10:00 Location: Oscar Klein - Lecture Hall

Invited talk MoA.1 *(233)* Mon 8:15

Nonlinear optical phononics: harnessing sound and light in nonlinear nanoscale circuits — •Benjamin Eggleton — University of Sydney, CUDOS, Australia

The convergence of optics and phononics, enabled by new nonlinear materials in which acoustic phenomena can be excited on small scales and nanoscale structures that enhance the interaction between sound and light, is unlocking innovations for chip-based information processing. This paper will review recent breakthroughs that harness this optical*phononic interaction for a new paradigm in information processing, including tunable slow light, frequency comb sources and microwave photonic signal processing.

MoA.2 *(107)* Mon 8:45

1 mJ, 15 kHz Q-switched laser at 946 nm in Nd:YAG single-crystal fiber — •Loïc Deyra[1], François Balembois[1], Xavier Delen[1], Igor Martial[2], Nicolas Aubry[2], and Patrick Georges[1] — [1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Univ Paris-Sud, 91127 Palaiseau, France — [2]Fibercryst SAS, La DouaBatiment l'Atrium, Boulevard Latarjet, F 69616 Villeurbanne Cedex, France

We demonstrate the potential of crystalline fiber for high power solid-state 946nm lasers.1mJ energy at 946nm have been reached in actively Q-switched operation at 15kHz, improving by 3.5 times the state-of the art level of output average power and by 2.4 times the output energy at 946nm.

MoA.3 *(144)* Mon 9:00

Dual frequency emission in a compact semiconductor laser for coherent population trapping cesium atomic clocks — •Fabiola de Almeida Camargo[1], Gaëlle Lucas-Leclin[1], Patrick Georges[1], Ghaya Baili[2], Loic Morvan[2], Daniel Dolfi[2], David Holleville[3], Stéphane Guérandel[3], and Isabelle Sagnes[4] — [1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Univ Paris-Sud XI , 2 Av. A. Fresnel, 91127, Palaiseau, France — [2]Thales Research & Technology, 1 Av. A. Fresnel, 91767, Palaiseau, France — [3]LNE-SYRTE, Systèmes de Référence Temps-Espace, Observatoire de Paris, CNRS, UPMC , 61 Av. de l'Observatoire, 75014, Paris, France — [4]Laboratoire de Photonique et de Nanostructures, CNRS, Route de Nozay, 91460, Marcoussis, France

We present the dual-frequency emission of a diode-pumped vertical external-cavity semiconductor laser at 852 nm dedicated to coherent population trapping experiments. With

a compact cavity more than 10mW is demonstrated in each polarization, with a frequency difference in the GHz range.

MoA.4 *(99)* Mon 9:15

Selective excitation of Laguerre-Gaussian (LG0n) doughnut modes in a diode-laser end-pumped solid-state laser — •Ji Won Kim[1] and William Andrew Clarkson[2] — [1]Department of Applied Physics, Hanyang University, Ansan, Gyeonggi-do 426-791, Republic of Korea — [2]Optoelectronics Research Centre, University of Southampton, Southampton, SO17 1BJ, UK

A simple method for direct excitation of Laguerre-Gaussian (LG0n) doughnut modes in a diode-laser end-pumped solid-state laser is described. Using this scheme, lasing on the LG01, LG02 and LG03 modes has been realised in a diode-pumped Nd:YAG laser. Experimental results for laser performance are presented and compared with theoretical predictions.

MoA.5 *(130)* Mon 9:30

Graphene Saturable Absorber Mode-Locked Yb:KLuW Laser at 1047 nm — •Elena Ugolotti[1,2], Andreas Schmidt[1], Valentin Petrov[1], Jun Wan Kim[3], Fabian Rotermund[3], Sukang Bae[4], Byung Hee Hong[4], Antonio Agnesi[2], Christian Fiebig[5], Götz Erbert[5], Xavier Mateos[6], Magdalena Aguilo[6], Francesc Diaz[6], and Uwe Griebner[1] — [1]Max Born Institute, Berlin, Germany — [2]University of Pavia, Pavia, Italy — [3]Ajou University, Suwon, Korea — [4]Seoul National University, Seoul, Korea — [5]Ferdinand-Braun-Institut, Berlin, Germany — [6]Universitat Rovira i Virgili, Tarragona, Spain

Mode-locking of a Yb:KLuW laser using a saturable absorber based on a monolayer graphene fabricated by chemical vapor deposition is demonstrated. Nearly bandwidth-limited pulses as short as 160 fs are generated around 1 micrometer.

MoA.6 *(24)* Mon 9:45

24ps pulses from a spectrally filtered passively Q-switched microchip laser — •Reinhold Lehneis[1], Alexander Steinmetz[1], Cesar Jauregui[1], Jens Limpert[1], and Andreas Tünnermann[1,2] — [1]Friedrich-Schiller-Universität Jena, Abbe Center of Photonics, Institute of Applied Physics, Albert-Einstein-Str. 15, 07745 Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany

We present a simple approach for the pulse duration reduction of passively Q-switched microchip lasers. With this technique a reduction from 138ps to 24ps has been realized and amplified to pulse energies of 20uJ, subsequently.

6: Coffee Break

Time: Monday 10:00–10:30 Location: Main Hall Area

Coffee Break

MoB: Nonlinear optics

Time: Monday 10:30–12:15 Location: Oscar Klein - Lecture Hall

Invited talk MoB.1 *(234)* Mon 10:30

Saturation of the all-Optical Kerr Effect in Solids and Gases — •Günter Steinmeyer — Max-Born-Institut, 12489 Berlin, Germany

The saturation of nonlinear optical index changes in dielectric materials is theoretically modeled by a Kramers-Kronig transform and compared to recent experimental results in solids and gases. This investigation indicates a previously underestimated role of the Kerr saturation for various experimentally relevant scenarios, including supercontinuum generation in fibers and filamentation.

MoB.2 *(137)* Mon 11:00

Mid-infrared pulses with 115 MW peak power from an OPCPA based on apodized APPLN — •Benedikt Walfried Mayer[1], Clemens Heese[1], Christopher Richard Phillips[2], Lukas Gallmann[1], Martin Marty Fejer[2], and Ursula Keller[1] — [1]Department of Physics, Institute of Quantum Electronics, ETH Zurich, 8093 Zurich, Switzerland — [2]Edward L. Ginzton Laboratory, Stanford University, Stanford, California 94305, USA

We present an ultra-broadband optical parametric chirped-pulse amplifier producing femtosecond pulses in the mid-infrared with 115-MW peak power. A record-high average power of 700 mW is achieved. The use of apodized aperiodically poled $LiNbO_3$ amplifiers yields clean 75-fs pulses at 100 kHz and 110-fs pulses at 50 kHz repetition rate.

MoB.3 *(206)* Mon 11:15

Multi-millijoule few-cycle pulses in mid-IR: generation and applications — •Audrius Pugzlys[1], Skirmantas Alisauskas[1], Giedrius Andriukaitis[1], Tadas Balciunas[1], Daniil Kartashov[1], Ming-Chang Chen[2], Tenio Popmintchev[2], Audrius Zaukevicius[3], Gintaras Valiulis[3], and Andrius Baltuska[1] — [1]Photonics Institute, Vienna University of Technology, Gusshausstrasse 27/387, 1040 Vienna, Austria — [2]JILA, University of Colorado at Boulder, Boulder, CO 80309-0440 USA — [3]Dep. of Quantum Electronics, Vilnius University, Sauletekio ave. 9, Vilnius, Lithuania

We present and characterize a compact 20-Hz-repetition-rate mid-IR OPCPA system delivering 12 mJ, 83 fs pulses at 3.9 um. With the system we demonstrate generation of bright coherent X-ray supercontinua extending to 1.6 keV, studies on generation of lower-order harmonics and filamentation as well as efficient lasing from a filament.

MoB.4 *(187)* Mon 11:30

Two-color pumped OPCPA emitting 450 THz broadband spectra with 1 μJ of pulse energy at 200 kHz repetition rate — •Anne Harth[1,2], Marcel Schultze[1], Tino Lang[1,2], Thomas Binhammer[3], Stefan Rausch[1,2], and Uwe Morgner[1,2] — [1]Leibniz Universität Hannover, Hannover, Germany — [2]Centre for Quantum Engineering and Space-Time Research (Quest), Hannover, Germany — [3]VENTEON Laser Technologies GmbH, Garbsen, Germany

We present a double-stage non-collinear parametric amplifier pumped with two different wavelengths. The system operates at 200 kHz and delivers μJ pulse energies with a 1.5-octaves spanning spectrum, supporting a Fourier limited pulse duration of 2.5 fs. Compression of the inner part leads to sub-5 fs pulse duration.

MoB.5 *(166)* Mon 11:45

Measurement and control of OPA-induced phase in ultra-broadband parametric amplifiers - Towards energetic single-cycle optical pulses — •Jan Rothhardt[1,2], Stefan Demmler[1], Steffen Hädrich[1,2], Jake Bromage[3], Jens Limpert[1,2], and Andreas Tünnermann[1,2] — [1]Friedrich Schiller University Jena, Abbe Center of Photonics, Institute of Applied Physics, Albert-Einstein-Straße 15, 07745 Jena, Germany — [2]Helmholtz-Institute Jena, Fröbelstieg 3, 07743 Jena, Germany — [3]University of Rochester, Laboratory for Laser Energetics, 250 East River Road, Rochester, NY 14623 USA

We present measurements of the spectral phase which is induced by the amplification process in an ultra-broadband OPCPA system. The measurements agree well with theory. Compensation of this phase leads to Fourier-limited pulses with less than two-optical cycles duration and potentially allows reaching single-cycle pulse durations in the future.

MoB.6 *(196)* Mon 12:00

Second harmonic generation in a CW diamond Raman laser for tunable visible emission — Daniele Parrotta, Alan Kemp, Martin Dawson, and •Jennifer Hastie — Institute of Photonics, University of Strathclyde, 106 Rottenrow, Glasgow G4 0NW, UK

Tunable, visible emission from a frequency-doubled CW diamond Raman laser intracavity pumped by an InGaAs-based semiconductor disk laser is reported. Maximum output power of 1.5W at 614nm was achieved, with good beam quality (M2˜1.3) and emission linewidth of ˜0.1nm. The visible emission was tuned from 604.5-619.5nm.

8: Lunch Break

Time: Monday 12:15–13:30 Location: Lunch

Lunch Break

SS3: Summer school lecture 3 - Understanding fiber amplifiers - Dr Paschotta

Time: Monday 13:30–15:30 Location: Oscar Klein - Lecture Hall

Summer school lecture 3 - Understanding fiber amplifiers - Dr Paschotta

Break

Summer school lecture 3 - Understanding fiber amplifiers - Dr Paschotta

Discussion

10: Coffee Break

Time: Monday 16:00–16:45 Location: Main Hall Area

Coffee Break

SS4: Summer school lecture - Ultrashort-pulse lasers for bioimaging applications - Prof. French

Time: Monday 16:45–18:30 Location: Oscar Klein - Lecture Hall

Summer school lecture - Ultrashort-pulse lasers for bioimaging applications - Prof. French

Break

Summer school lecture - Ultrashort-pulse lasers for bioimaging applications - Prof. French

Discussion

SS5: Summer school lecture 5 - Mid-infrared fiber lasers - Prof. Jackson

Time: Tuesday 8:00–10:00 Location: Oscar Klein - Lecture Hall

Summer school lecture 5 - Mid-infrared fiber lasers - Prof. Jackson

Break

Summer school lecture 5 - Mid-infrared fiber lasers - Prof. Jackson

Discussion

13: Coffee Break

Time: Tuesday 10:00–10:30 Location: Main Hall Area

Coffee Break

SS6: Summer school lecture 6 - On chip nonlinear optics, Si photonics - Prof. Lipson

Time: Tuesday 10:30–12:30 Location: Oscar Klein - Lecture Hall

Summer school lecture 6 - On chip nonlinear optics, Si photonics - Prof. Lipson

Break

Summer school lecture 6 - On chip nonlinear optics, Si photonics - Prof. Lipson

Discussion

15: Lunch Break

Time: Tuesday 12:30–13:30 Location: Lunch

Lunch Break

TuP: Poster Session I

Time: Tuesday 13:30–14:30 Location: Main Hall Area

TuP.1 *(25)* Tue 13:30

CW VECSEL Raman laser with tunable lime-yellow-orange output — Jipeng Lin[1], •Helen M. Pask[1], David J. Spence[1], Craig J. Hamilton[2], and Graeme P. A. Malcolm[2] — [1]Department of Physics and Astronomy, Macquarie University, Sydney, New South Wales 2109, Australia — [2]M-Squared Lasers Ltd, 1 Technology Terrace, Todd Campus, Maryhill Road, Glasgow, G20 0XA

A compact CW VECSEL-pumped KGW Raman laser with intracavity sum-frequency-mixing was demonstrated. Two separate tunable emissions bands (548.5-566nm and 577.5-596nm) were obtained. The maximum output powers for SFG and SHG were 0.8W at 560 nm and 0.52W at 592.5 nm.

TuP.2 *(225)* Tue 13:30

4 - 5 um wavelength radiation generated by mid-IR lasers — •Helena Jelinkova[1], Maxim Doroshenko[2], Jan Sulc[1], Michal Jelinek[1], Michal Nemec[1], Tasoltan Basiev[2], Vitaly Komar[3], Alexander Gerasimenko[3], Vyacheslav Puzikov[4], Valerii Badikov[4], and Dmitri Badikov[4] — [1]Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering — [2]A. M. Prokhorov General Physics Institute, Russian Academy of Sciences, Laser Materials and Technology Research Center, — [3]Institute for Single Crystals, NAS of Ukraine, 60 Lenin Ave., Kharkiv, 61001 Ukraine — [4]Kuban State University, May 9th Street 46a, 350040 Krasnodar, Russian Federation

Dy:PbGa2S4 and Fe:ZnSe lasers generated in 4-5 um region at room temperature were investigated. The generated energy, pulse-length, and the slope efficiency with respect to the absorbed energy were 7 mJ, 120 us, 8%, respectively for Dy:PbGa2S4 laser, and 1.3 mJ, 120 ns, 30 %, respectively for Fe:ZnSe system.

TuP.3 *(27)* Tue 13:30

1064 nm pumped CdSiP2 optical parametric oscillator generating ˜400 ps pulses near 6150 nm at 1-10 kHz repetition rates — Georgi Marchev[1], Paolo Dallocchio[2], Federico Pirzio[2], Antonio Agnesi[2], Giancarlo Reali[2], •Valentin Petrov[1], Aleksey Tyazhev[1], Peter Schunemann[3], and Kevin Zawilski[3] — [1]Max-Born-Institute for Nonlinear Optics and Ultrafast Spectroscopy, 2A Max-Born-Str., D-12489 Berlin, Germany — [2]INFN and Dipartimento di Elettronica dell Università di Pavia, Via Ferrata 1 - 27100 Pavia, Italy — [3]BAE Systems, Inc., MER15-1813, P.O. Box 868, Nashua, NH 03061-0868, USA

A short cavity optical parametric oscillator based on CdSiP2 generates ˜400ps idler pulses near 6150nm under 1064nm pumping at a variable repetition rate of 1-10kHz. Quantum conversion efficiency of 9.5% is achieved although the sig-

nal pulse experiences <3 cavity round rips within the pump FWHM.

TuP.4 *(173)* Tue 13:30

Applicability of Graphene Flakes as Saturable Absorber for Bulk Solid-State Lasers — •Jun Wan Kim, Sun Young Choi, Bo Hee Jung, Dong-Il Yeom, Kihong Kim, and Fabian Rotermund — Department of Physics and Division of Energy Systems Research, Ajou University, Suwon 443-749, Korea

We report for the first time the applicability of graphene flakes as saturable absorber for bulk solid-state laser mode-locking. The graphene flakes-based saturable absorber mode-locked Cr;forsrerite laser delivers 131 fs long pulses at 75 MHz with an output power of 78 mW.

TuP.5 *(10)* Tue 13:30

Experiments and modeling of energetic and spectral properties of triple photons third-order down-conversion in KTiOPO4 — •Adrien Borne[1], Audrey Dot[1], Benoit Boulanger[1], Patricia Segonds[1], Corinne Felix[1], Kamel Bencheikh[2], and Juan Ariel Levenson[2] — [1]Institut Néel, grenoble, France — [2]Laboratoire de Photonique et Nanostructures, Marcoussis, France

We performed the study of the spectral and energetic properties of triple photons generated by a down-conversion parametric process in KTP. Our model takes into account the beams spectral linewidths and a parasitic Kerr effect.

TuP.6 *(28)* Tue 13:30

Passively Q-switched Tm:LiLuF4 laser with 1.26 mJ output energy — Haohai Yu[1,2], •Valentin Petrov[1], Uwe Griebner[1], Daniela Parisi[3], Stefano Veronesi[3], and Mauro Tonelli[3] — [1]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, 2A Max-Born-Str., D-12489 Berlin, Germany — [2]State Key Laboratory of Crystal Materials and Institute of Crystal Materials, Shandong University, 250100 Jinan, China — [3]NEST Istituto Nanoscienze-CNR and Dipartimento di Fisica dell Universita di Pisa, Largo B. Pontecorvo 3, 56127 Pisa, Italy

We demonstrate passively Q-switched diode-pumped Tm3+:LiLuF4 laser operation near 1900 nm. Stable passive Q-switching with Cr2+:ZnS saturable absorbers resulted in minimum pulse duration of 7.6 ns and maximum pulse energy and peak power of 1.26 mJ and 166 kW, respectively, at a repetition rate of 161 Hz.

TuP.7 *(49)* Tue 13:30

Generation of ultrashort optical-vortex pulses in few-cycle regime — •Keisaku Yamane, Yasunori Toda, and Ryuji Morita — Department of Applied Physics, Hokkaido University, and JST, CREST, Kita-13, Nishi-8, Kita-ku, Sapporo, 060-8628 Japan

We succeeded in generating 2.3-cycle, 5.9-fs, 56-μJ ultrashort optical-vortex pulses by optical parametric amplification. A fork-like interferogram showed that the topological charge was conserved during the amplification process. To the best of our knowledge, it is the first generation of optical vortex pulses in the few-cycle regime.

TuP.8 *(39)* Tue 13:30

14 W High-Efficient cw Yb:KGd(WO4)2 Laser with Low Thermo-Optic Aberrations — •Pavel Loiko[1], Viktor Kisel[1], Konstantin Yumashev[1], Nikolai Kuleshov[1], and Anatoly Pavlyuk[2] — [1]Center for Optical Materials and Technologies, Belarusian National Technical University, Minsk, Belarus — [2]Nikolaev Institute for Inorganic Chemistry, Siberian Branch of Russian Academy of Sciences, Novosibirsk, Russia

Thermal lensing was characterized in Ng-cut monoclinic Yb:KGdW laser crystal under diode pumping. Thermal lens was found to be positive for rays lying in all meridional planes and slightly astigmatic. This athermal crystal was utilized to produce 14W cw Yb:KGdW laser with slope efficiency of 76% and low thermo-optic aberrations.

TuP.9 *(87)* Tue 13:30

Ultrafast Composite-Thin-Disk Cryogenic Yb:YAG Laser Driver — •Luis E. Zapata[1], Eduardo Granados[1], Kyung-Han Hong[1], and Franz X. Kaertner[1,2] — [1]MIT-RLE, Cambridge, MA, USA — [2]DESY and University of Hamburg, Hamburg, Germany

We propose and analyze a composite-thin-disk technology based on cryogenic Yb:YAG for constructing high energy picosecond lasers for pumping of optical parametric chirped pulse amplifiers. The storage amplifiers thermo-mechanics/thermo-optics coupled with an image relayed multi-pass architecture predicts high beam-quality at high average power

TuP.10 *(101)* Tue 13:30

Mode-locked Yb^{3+}-doped $Lu_3Al_5O_{12}$ ceramic laser — •Hiroaki Nakao[1], Akira Shirakawa[1], Ken-ichi Ueda[1], Hideki Yagi[2], and Takagimi Yanagitani[2] — [1]Institute for Laser Science, University of Electro-Communications, 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan — [2]Takuma Works, Konoshima Chemical Co., Ltd., 80 Kouda, Takuma, Mitoyo-gun, Kagawa 769-1103, Japan

Yb^{3+}:$Lu_3Al_5O_{12}$ ceramic is promising material for thin-disk laser due to its higher emission cross section and thermal conductivity than that of Yb^{3+}:$Y_3Al_5O_{12}$ at $C_{Yb} > 2$-3%. The optical property and first mode-locked laser operation of Yb^{3+}:$Lu_3Al_5O_{12}$ ceramic with 200 mW average output power and 699 fs pulse duration is reported.

TuP.11 *(5)* Tue 13:30

Efficient, simultaneous dual-wavelength emission at 1.06 and 1.34 μm in Nd:$GdVO_4$ laser crystal — •Nicolaie Pavel, Gabriela Salamu, Oana Sandu, Alina Ionescu, Catalina Brandus, Flavius Voicu, and Traian Dascalu — National Institute for Lasers, Plasma and Radiation Physics, Laboratory of Solid-State Quantum Electronics, Bucharest R-077125, Romania

A diode-pumped Nd:$GdVO_4$ laser that generates up to 6.8 W powers simultaneously at 1.06 and 1.34 μm, having the 1.06-μm transition power ratio adjustable, is demonstrated. Furthermore, a Nd:$GdVO_4$ laser that yields simultaneous emission at the two fundamental wavelengths and that generates concomitant green light at 0.53 μm is realized.

TuP.12 *(35)* Tue 13:30

Spectral and Temperature Dependencies of Refractive Indices for Uniaxial $M^+T^{3+}(W/MoO_4)_2$ Laser Host Crystals — Pavel A. Loiko[1], Xiumei Han[2], Konstantin V. Yumashev[1], María Dolores Serrano[2], Nikolay V. Kuleshov[1], Concepción Cascales[2], and •Carlos Zaldo[2] — [1]Center for Optical Materials and Technologies, Belarusian National Technical University, 220013 Belarus, Minsk, 65/17 Nezavisimosti Ave. — [2]Instituto de Ciencia de Materiales de Madrid, Consejo Superior de Investigaciones Científicas, c/ Sor Juana Inés de la Cruz 3, 28049 Madrid, Spain

The anisotropy and dispersion of refractive indices and thermo-optic coefficients are investigated for uniaxial $M^+T^{3+}(W/MoO_4)_2$ laser host crystals. They are characterized by low birefringence $\Delta n \approx 10^{-3}$ and negative dn/dT due to large volumetric thermal expansion. The dependence of the refractive indices and group velocity dispersion on the crystal composition is investigated.

TuP.13 *(67)* Tue 13:30

Dependence of the Raman gain coefficient in diamond on pump wavelength — •Vasili Savitski, Sean Reilly, and Alan Kemp — Institute of Photonics, University of Strathclyde, SUPA, 106 Rottenrow, Glasgow, G4 0NW, UK

Pump-probe and stimulated Raman scattering threshold experiments are used to give absolute and relative measurements of the SRS gain coefficient in CVD-grown single-crystal diamond. Both approaches indicate that the SRS gain coefficient is inversely proportional to the pump wavelength between 450 and 1450 nm.

TuP.14 *(17)* Tue 13:30

Thermal Lensing in CW Intracavity Raman Lasers — •Gerald M Bonner[1,2], Takashige Omatsu[3], Andrew J Lee[1], Alan J Kemp[2], Jiyang Wang[4], Huaijin Zhang[4], and Helen M Pask[1] — [1]MQ Photonics, Macquarie University, Sydney, Australia — [2]Institute of Photonics, University of Strathclyde, Glasgow, UK — [3]Graduate School of Advanced Integration Science, Chiba University, Chiba, Japan — [4]State Key Laboratory of Crystal Materials, Shandong University, Jinan, China

Thermal problems often limit the performance of crystalline Raman lasers. Interferometric measurements of the thermal lenses in CW intracavity Raman lasers will be presented. The effect of these lenses on the behaviour of Raman laser cavities will be analysed and the implications for future Raman laser design will be discussed.

TuP.15 *(50)* Tue 13:30

Spectral Broadening in CW Intracavity Raman Lasers — •Gerald M Bonner[1,2], Andrew J Lee[1], Jiyang Wang[3], Huaijin Zhang[3], Helen M Pask[1], and David J Spence[1] — [1]MQ Photonics, Macquarie University, Sydney, Australia — [2]Institute of Photonics, University of Strathclyde, Glasgow, UK — [3]State Key Laboratory of Crystal Materials, Shandong University, Jinan, China

Significant spectral broadening of the fundamental field occurs in intracavity Raman lasers as the Raman process presents a loss to the centre of the fundamental line. Theoretical and experimental investigations of this phenomenon will be presented and possible approaches to controlling it will be discussed.

TuP.16 *(84)* Tue 13:30

Spectral analysis of multi-beam pumped Non-Collinear Optical Parametric Amplifiers — •Benoît Trophème[1], Gabriel Mennerat[2], and Benoît Boulanger[3] — [1]CEA DAM CESTA Le Barp France — [2]CEA SACLAY DSM Gif-sur-Yvette France — [3]Institut Néel CNRS Grenoble France

From spectral analysis of multi-beam pumped OPA experiments, we demonstrated the need of single-mode pumps to avoid cascading effects and that these pumps can be mutually incoherent without any degradation of the signal spectral quality.

TuP.17 *(89)* Tue 13:30

Enhancement of Cavity-Length Detuning Tolerance in Diffraction-Grating Narrowed Synchronously Pumped Optical Parametric Oscillators — •Cédric Laporte, Antoine Godard, Jean-Baptiste Dherbecourt, Jean-Michel Melkonian, and Myriam Raybaut — ONERA - the French Aerospace Lab, F-91123 Palaiseau cedex, France

Line-narrowing of a synchronously-pumped OPO using an intracavity diffraction grating leads to an increase of the resonator-length detuning tolerance. We show that this effect, studied at 1.5 μm and 2.0 μm signal wavelengths, is due to resonant beam geometric adaptation within the cavity.

TuP.18 *(69)* Tue 13:30

Diode pumped Tm:BaYLuF8 2 micron cw laser: first evidence with a novel host — •Stefano Veronesi, Daniela Parisi, Azzurra Volpi, and Mauro Tonelli — NEST Istituto Nanoscienze-CNR and Dipartimento di Fisica dell*Universita‘ di Pisa, I-56127 Pisa, Italy

We demonstrate, for the first time, diode-pumped Tm3+:BaYLuF8 laser operation near 1.9 micron in cw. The slope efficiency with respect to the absorbed power was about 28% and the emitted power 110 mW with a threshold of 87 mW. Power scaling experiments are in progress.

TuP.19 *(188)* Tue 13:30

Experiment and simulation of optical parametric amplified pulses inherently including parasitic, cascaded, and spatial effects — •Tino Lang[1,2], Anne Harth[1,2], Marcel Schultze[1], and Uwe Morgner[1,2] — [1]Institute of Quantum Optics, Leibniz Universität Hannover, Welfengarten 1, 30167 Hannover, Germany — [2]Centre for Quantum Engineering and Space-Time Research (QUEST),Welfengarten 1, 30167 Hannover, Germany

We compare measured spectra of different stages and geometries of home-build OPCPA-systems to novel simulation results. The prominent characteristic features are reproduced and understood by the dispersive compression of the negatively chirped idler, the wavelength dependent spatial or temporal separation or cascaded effects.

TuP.20 *(211)* Tue 13:30

Yb:CaF2 diode-pumped millijoule nanosecond laser tunable from 1030 to 1065nm — •Antoine Courjaud[1], Vincent Clet[1], Jean-Louis Doualan[2],

Patrice Camy[2], Richard Moncorgé[2], and Eric Mottay[1] — [1]Amplitude Systemes, 6 allée des Lumières, Batiment MEROPA, Cité de la Photonique, 11 avenue de Canteranne 33600 PESSAC, France — [2]CIMAP, UMR6252 CNRS-CEA-ENSICAEN, Université de Caen, 6 Blvd Maréchal Juin, 14050 CAEN, France

We report a broadly tunable nanosecond diode-pumped laser source based on Yb:CaF2. The Q-switched cavity delivers pulses ranging from 1030 up to 1065 nm in the millijoule range at 300Hz repetition rate.

TuP.21 *(221)* Tue 13:30

Thermal management for high power VECSEL emission in the near- and the mid-IR — •Mathieu Devautour[1], Adrien Michon[2], Gregoire Beaudoin[2], Isabelle Sagnes[2], Laurent Cerutti[1], and Arnaud Garnache[1] — [1]Institut d'Electronique du Sud, CNRS UMR5214, Université Montpellier 2, France — [2]Laboratoire de Photonique et Nanostructures, CNRS UPR20, 91460 Marcoussis, France

Technological process for thermal management of VECSEL is reported. Substrate is removed through wet selective etching and an electrolytic gold layer is added on the chip. 1.2 W and 11.6 mW maximum power and 7 K/W and 90 K/W thermal resistance are measured for GaAs- and GaSb-based chips.

TuP.22 *(123)* Tue 13:30

Towards complete monolithic integration of microjoule-level femtosecond ytterbium fiber lasers; — •Alma Fernandez[1], Thomas Andersen[2], Tobias Flöry[1], Lingxiao Zhu[1], Almantas Galvanauskas[3], Andrius Baltuska[1], and Aart Verhoef[1] — [1]Institut für Photonik, Technische Universität Wien, Gusshausstrasse 27/387, Vienna, Austria — [2]NKT Photonics A/S, Blokken 84, 3460 Birkerød, Denmark — [3]Center for Ultrafast Optical Science, University of Michigan, Ann Arbor, MI 48109-2099, USA

We present first pulse compression results from an all Ytterbium-fiber chirped pulse amplifier. The use of a dispersion engineered fiber stretcher and a 25 meter long hollow-core photonics bandgap fiber allowed to obtain 250 nJ, 220 fs pulses, opening the door to direct fiber delivery of microjoule-energy femtosecond laser pulses.

TuP.23 *(53)* Tue 13:30

Simulations and Experiments of a Lateral Pumped Fiber Combiner for Monolithic Fiber Laser and Amplifier Systems — •Thomas Theeg[1], Hakan Sayinc[1,2], Jörg Neumann[1,2], and Dietmar Kracht[1,2] — [1]Laser Zentrum Hannover e.V. — [2]Centre for Quantum Engineering and Space-Time Research (QUEST)

We present an all-fiber component capable to combine up to 6 multi-mode pump sources up to several hundreds of watt of pump power in conjunction with a signal feedthrough offering the possibility to pass a high power signal in forward and in reverse direction.

TuP.24 *(154)* Tue 13:30

Broadband Cascaded Four-Wave Mixing Generation in a Photonic Crystal Fibre at 1 um — •Mateusz Wysmolek[1,2], Hakan Sayinc[1,2], Jose M. Chavez Boggio[4], Roger Haynes[4], Martin M. Roth[4], Uwe Morgner[1,2,3], Jörg Neumann[1,2], and Dietmar Kracht[1,2] — [1]Laser Zentrum Hannover e. V., Hollerithallee 8, D-30419 Hannover, Germany — [2]Centre for Quantum Engineering and Space-Time Research QUEST, Welfengarten 1, D-30167 Hannover, Germany — [3]Institut für Quantenoptik, Leibniz Universität Hannover, Welfengarten 1, D-30167 Hannover, Germany — [4]innoFSPEC-VKS, Leibniz-Institut für Astrophysik Potsdam, An der Sternwarte 16, D-14482 Potsdam, Germany

Broadband cascaded four-wave mixing optical frequency comb (CFWM) around 1um is presented. The cascade is generated from two-tone low power pulsed seed lasers. The comb spans between 806nm and 1400nm. To the best of our knowledge it is the first demonstration of a fibre based CFWM frequency comb at 1um.

TuP.25 *(151)* Tue 13:30

Er:LiLuF4 upconversion waveguide laser fabricated by femtosecond-laser writing — •Francesca Moglia, Sebastian Müller, Thomas Calmano, and Günter Huber — Institut für Laser-Physik, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany

The first crystalline erbium-doped fluoride upconversion waveguide laser is presented. Waveguides were written in an Er:LiLuF4 crystal via direct femtosecond-laser writing technique. By Ti:Sapphire pumping at 974 nm, laser oscillation at 540.6, 551.5 and 850 nm was achieved.

TuP.26 *(19)* Tue 13:30

Optically Controllable All-fiber based Phase Shifter — •P. C. Peng[1], V. K. S. Hsiao[2], T. L. Chang[1], and H. Y. Chen[1] — [1]Department of Electro-Optical Engineering, National Taipei University of Technology, Taipei, Taiwan, R.O.C. — [2]Department of Applied Materials and Optoelectronic Engineering, National Chi Nan University, Nantou, Taiwan, R.O.C.

This investigation demonstrates an optically controllable side-polished fiber phase shifter operating in the telecommunication wavelength of 1.55 μm. Experimental results indicate that the proposed phase shifter can be used in microwave photonic systems.

TuP.27 *(138)* Tue 13:30

TEM00 mode content measurements on a large core passive CCC fiber — •Malte Karow[1,2], Jörg Neumann[1,2], Dietmar Kracht[1,2], and Peter Wessels[1,2] — [1]Laser Zentrum Hannover e.V., Hollerithallee 8, 30419 Hannover, Germany — [2]Centre for Quantum Engineering and Space-Time Research - QUEST, Welfengarten 1, 30167 Hannover, Germany

The overlap of a single-frequency signal, transmitted through a passive chirally coupled core fiber (42 micrometer mode field diameter) with the TEM00 mode of a non-confocal ring cavity is measured. For different fiber bending diameters and power levels, the obtained fractional fundamental mode content was always >96%.

TuP.28 *(217)* Tue 13:30

Gain-switched laser-diode seeded Ytterbium fiber

amplifier delivering 11ps laser pulses at >1MW peak power — •Manuel Ryser[1], Soenke Pilz[1], Andreas Burn[1], and Valerio Romano[1,2] — [1]Institute of Applied Physics, University of Bern, Sidlerstrasse 5, CH-3012 Bern, Switzerland — [2]Bern University of Applied Sciences, ALPS, Pestalozzistrasse 20, CH-3400 Burgdorf, Switzerland

A gain-switched laser-diode was used as seed for a multi-stage fiber-amplifier. The final amplification was done with a cladding pumped Yb-doped large-mode-area fiber with a subsequent rod-type fiber and yielded pulse energies of $>10\mu$J at pulse peak-powers of >1MW. The pulse duration was 11ps at a repetition rate of 1MHz.

TuP.29 *(212)* Tue 13:30

Experimental investigation of light propagation in tapered fiber with very large core size — Juho Kerttula[1], •Valery Filippov[1], Yuri Chamorovskii[2], Vasilij Ustimchik[2], Konstantin Golant[2], and Oleg Okhotnikov[1] — [1]Optoelectronics Research Centre, Tampere University of Technology, P.O. Box 692, 33101 Tampere, Finland — [2]Institute of Radio and Electronics of the Russian Academy of Sciences, Mokhovaya 11, bld.7, 125009 Moscow, Russia

In this paper we have experimentally studied the evolution of the parameters of radiation propagating in a long (up to 20m) adiabatic taper with an 117um core diameter at the wide part (NA 0.11). The longitudinal distribution of the divergence, M2, mode content and polarization properties have been investigated in details.

TuP.30 *(68)* Tue 13:30

All-fiber erbium laser system for producing tunable optical pulses in the range of 1.7-2.5 μm with GeO2-doped fibers — •Elena Anashkina, Alexey Andrianov, Sergey Muraviev, Maxim Koptev, and Arkady Kim — Institute of Applied Physics, Russian Academy of Sciences,46 Ulyanov st., 603950 Nizhny Novgorod, Russia

We present an all-fiber system consisting of an Er:fiber laser source, GeO2-doped fibers for producing 50-150 fs optical pulses in the range of 1.7-2.5 μm, which can be used as a seed for Tm:fiber as well as for Cr:ZnSe amplifiers.

TuP.31 *(143)* Tue 13:30

Measurement of effective refractive-index differences in a few-mode fiber by axial fiber stretching — •Juha-Matti Savolainen and Peter Balling — Department of Physics and Astronomy, University of Aarhus, Ny Munkegade 120, 8000 Aarhus C, Denmark

A method for measuring effective refractive-index differences in a few-mode fiber by applying axial fiber stretching is described. Interference between LP01 and LP11 and in some cases also between LP11 and LP21 are observed. The results agree well with theoretical predictions.

TuP.32 *(181)* Tue 13:30

Similariton-Induced Temporal Lens for Ultrafast Photonics — •Levon Mouradian[1], Aram Zeytunyan[1], Garegin Yesayan[1], Frédéric Louradour[2], and Alain Barthélémy[2] — [1]Ultrafast Optics Laboratory, Faculty of Physics, Yerevan State University, 1, Alex Manoogian Street, Yerevan 0025, Armenia — [2]XLIM-UMR 6172 Université de Limoges/CNRS, 123 Avenue Albert Thomas, 87060 Limoges Cedex, France

The concept of similariton-induced parabolic temporal lens in view of its applications to ultrafast photonics based on our femtosecond scale experiments is presented. The temporal and spectral focusing, time-to-frequency conversion, and specificity of "spectral domain Newton rings" in a fiber aberration-free spectrotemporal lens are the subjects of our report.

TuP.33 *(114)* Tue 13:30

Dispersion Measurement of Photonic Crystal Fibers up to Fifth Order Using Spectral Interferometry — •Tímea Grósz, Miklós Kiss, and Attila P. Kovács — Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary

Spectral interferograms of a photonic crystal fiber were evaluated by various methods. We found that the Fourier-transform method provides the higher order dispersion coefficients with the best precision. We present a simplified Fourier-transform method which gives the spatial-temporal shape of the pulse after the fiber quickly and with high precision.

TuP.34 *(209)* Tue 13:30

Investigation of nonlinear spectral broadening in a ring resonator — •Jose Chavez Boggio[1], Andres Rieznik[2], Mateusz Wysmolek[3,4], Hakan Sayinc[3,4], Jorg Neumann[3,4], Dietmar Kracht[3,4], Roger Haynes[1], and Martin Roth[1] — [1]innoFSPEC-VKS, Leibniz-Institut für Astrophysik Potsdam, An der Sternwarte 16, D-14482 Potsdam, Germany — [2]Instituto Tecnologico de Buenos Aires and CONICET, Buenos Aires, Argentina — [3]Laser Zentrum Hannover e.V., Hollerithallee 8, D-30419 Hannover, Germany — [4]Centre for Quantum Engineering and Space-Time Research- QUEST, Welfengarten 1, D-30167 Hannover, Germany

We numerically investigated the generation of a broadband optical frequency comb with 80GHz spacing by placing the nonlinear medium in a ring configuration. It is shown that the comb bandwidth can be improved by one order of magnitude by appropiate adjustment of the dispersive and nonlinear parameters.

TuA: QPM nonlinear optical materials

Time: Tuesday 14:30–18:00 Location: Oscar Klein - Lecture Hall

Keynote TuA.1 *(230)* Tue 14:30

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TuA.2 *(30)* Tue 15:15

Half-joule class, efficient optical-parametric oscillation by 10-mm-thick periodically poled Mg-doped congruent LiNbO3 — •Hideki Ishizuki and Takunori Taira — Institute for Molecular Science, Okazaki, Japan

We present a next generation of large-aperture periodically poled Mg-doped LiNbO3 (PPMgLN) device with 10-mm thickness. Half-joule class, efficient optical parametric oscillation using the 10-mm-thick PPMgLN device in nanoseconds region could be realized with total conversion efficiency $> 75\%$.

TuA.3 *(127)* Tue 15:30

Progress in Fabrication of sub-μm QPM Devices in Bulk Rb-doped KTP — •Andrius Zukauskas, Charlotte Liljestrand, Valdas Pasiskevicius, Fredrik Laurell, and Carlota Canalias — Department of Applied Physics, Royal Institute of Technology, Roslagstullsbacken 21, 10691 Stockholm, Sweden

We report on the progress in fabrication of sub-micrometer ferroelectric domain gratings in bulk Rb-doped $KTiOPO_4$. Periodicities as short as 530 nm have been achieved in a 1 mm thick crystal. The different techniques used for sub-μm periodic poling are presented and discussed.

TuA.4 *(124)* Tue 15:45

$ZnGeP_2$ RISTRA OPO in the mid-IR Region Pumped by a Periodically Poled $KTiOPO_4$ Master-Oscillator Power Amplifier — •Nicky Thilmann[1], Georg Stoeppler[2], Marc Eichhorn[2], Valdas Pasiskevicius[1], Andrius Zukauskas[1], and Carlota Canalias[1] — [1]Department of Applied Physics, Royal Institute of Technology, Roslagstullsbacken 21, 10691 Stockholm, Sweden — [2]French-German Research Institute of Saint Louis ISL, 5 rue du Général Cassagnou, 68301 Saint-Louis, France

A ZGP RISTRA OPO is pumped by a PPKTP OPO and OPA system. Collinear and noncollinear phase matching is achieved and angle tuning is demonstrated. The maximum output energy at 6.45 μm was 0.9 mJ at 100 Hz repetition rate.

TuA.5 *(194)* Tue 16:00

Tunable, High-Power, All-Periodically-Poled, Continuous-Wave, Intracavity-Frequency-Doubled Optical Parametric Oscillator — •Kavita Devi[1], Suddapalli Chaitanya Kumar[1], and Majid Ebrahim-Zadeh[1,2] — [1]ICFO-Institut de Ciencies Fotoniques, Mediterranean Technology Park, 08860 Castelldefels, Barcelona, Spain — [2]Institucio Catalana de Recerca i Estudis Avancats (ICREA), Passeig Lluis Companys 23, Barcelona 08010, Spain

We report a high-power, single-frequency, near-infrared source tunable across 775-807nm based on an all-periodically-poled, intracavity-frequency-doubled, continuous-wave OPO, generating up to 3.2W of SHG power together with 4.1W of mid-IR idler. The SHG output exhibits passive power-stability better than 3.5% rms (72sec.) and a linewidth of 8.5MHz in high beam-quality (M2<1.4).

TuA.6 *(175)* Tue 16:15

Widely and continuously tunable Optical Parametric Oscillator up to 4.8 microns based on 5%MgO:PPLN crystal cut as a cylinder — •Vincent Kemlin[1], David Jegouso[1], Jérôme Debray[1], Bertrand Menaert[1], Patricia Segonds[1], Benoit Boulanger[1], Hideki Ishizuki[2], and Takunori Taira[2] — [1]Institut Néel Centre National de la Recherche Scientifique Université Joseph Fourier 25 rue des Martyrs, BP 166, F38402 Grenoble Cedex 9 France — [2]Laser Research Center for Molecular Science, Institute for Molecular Science, 38 Nishigonaka, Myodaiji, Okazaki 444-8585, Japan

An Optical Parametric Oscillator based on a 38 mm long 5%MgO:PPLN crystal engineered as a cylinder is reported. Continuous tuning is achieved from 1.37 microns up to 4.8 microns. First energetical characterizations are presented.

TuA.7 *(136)* Tue 16:30

1 W, 2 mJ-Kilohertz, Sub-nanosecond, 3 - 3.5 um Tunable, PPSLT OPO Pumped at 1064 nm — •Danail Chuchumishev, Alexander Gaydardzhiev, and Ivan Buchvarov — Department of Physics, Sofia University, 5 James Bourchier Blvd., BG-1164 Sofia, Bulgaria

We report 2.1 mJ at 0.5 kHz, temperature tunable (3-3.5micons) radiation from a sub-nanosecond, singly resonant PPSLT OPO, pumped at 1064 nm. Idler conversion efficiency is 18.3%, while the overall quantum conversion efficiency (both idler and resonating signal) is nearly 52% and output pulse duration is 700 ps.

TuA.8 *(134)* Tue 16:45

Enhanced Backward Stimulated Raman Scattering in Periodically Poled KTiOPO4 — •Hoon Jang, Gustav Strömqvist, Andrius Zukauskas, Carlota Canalias, and Valdas Pasiskevicius — KTH, Stockholm, Sweden

We report the experimental demonstration of significantly enhanced backward Stimulated Raman Scattering (SRS) by suppressing forward SRS in periodically-poled KTP (PPKTP) crystals. We investigated thresholds of backward SRS in PPKTP crystals with different poling periods to explain the physical mechanism of the enhancement. This can be employed in BSRS-based devices.

Welcome reception at Stockholm City Hall

WeA: Special Symposium " From Femto-Science to Atto Science: Sources and Applications"

Chaired by Jens Limpert, University of Jena, Germany

Time: Wednesday 8:00–9:45 Location: Oscar Klein - Lecture Hall

Invited talk WeA.1 *(231)* Wed 8:00

Ultra-fast dynamics in atoms and molecules - Pump-probe experiments — •Markus Drescher — University of Hamburg, Department of Physics, Luruper Chaussee 149, 22761 Hamburg, Germany

Ultrashort synchronized XUV, laser- and terahertz pulses open up new opportunities for dynamics studies on the time-scale of electronic an nuclear motion. Coherent laser- and accelerator-based light sources, corresponding specialized pump-probe techniques and their application in time-

resolving experiments on atoms and molecules will be discussed.

WeA.2 *(20)* Wed 8:30

Visible-OPA-driven tunable coherent EUV source for free electron laser seeding — •Giovanni Cirmi[1,2], Chien-Jen Lai[1], Eduardo Granados[1,3], Shu-Wei Huang[1], Alexander Sell[1], Kyung-Han Hong[1], Jeffrey Moses[1], Phillip Keathley[1], and Franz Kärtner[1,2] — [1]Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Massachusetts Institute of Technology,77 Massachusetts Ave, Cambridge, MA 02139, USA — [2]Center for Free-Electron Laser Science, DESY and University of Hamburg, Notkestraße 85, D-22607 Hamburg, Germany — [3]IKERBASQUE, Basque Foundation for Science, 48011, Bilbao, Spain

We developed a prototype seed source for free electron lasers, based on high harmonic generation from a visible optical parametric amplifier, fully tunable in the 25-100 eV range. We studied efficiency and cutoff scaling laws.

Keynote WeA.3 *(239)* Wed 8:45

Time-delays in ionization: real, imaginary, and imagined — •Misha Ivanov — Max Born Institute and Humboldt University, Berlin, Germany — Imperial College London, London UK

I will present our recent work on trying to understand how much time it takes to liberate an electron from an atom or a molecule, via either one-photon ionization or via optical tunnelling.

WeA.4 *(29)* Wed 9:30

Isolated Attosecond Pulse Generation in Transition Metal Ablation Plumes — •Tobias Witting[1], Rashid Ganeev[1,2], Felix Frank[1], Maria Tudorovskaya[3], Amelle Zair[1], William Okell[1], Christopher Hutchingson[1], Manfred Lein[3], Jon Marangos[1], and John Tisch[1] — [1]Blackett Laboratory, Imperial College London, Prince Consort Road, London SW7 2AZ, UK — [2]Institute of Electronics, 33, Dormon Yoli Street, Tashkent 100125, Uzbekistan — [3]Institut für Theoretische Physik and Centre for Quantum Engineering and Space-Time Research (QUEST), Leibniz Universität Hannover, Appelstraße 2, 30167 Hannover, Germany

We report experimental and theoretical studies of carrier-envelope phase (CEP) stabilised few-cycle pulses driven isolated attosecond pulse generation in Mn ablation plumes. First experimental results using 3.5fs high intensity laser pulses confirm the numerical simulations.

19: Coffee Break

Time: Wednesday 9:45–10:00 Location: Main Hall Area

Coffee Break

WeB: Special Symposium " From Femto-Science to Atto Science: Sources and Applications"

Chaired by Jens Limpert, University of Jena, Germany

Time: Wednesday 10:00–12:15 Location: Oscar Klein - Lecture Hall

Invited talk WeB.1 *(242)* Wed 10:00

Attosecond Lighthouses: A new tool for ultrafast science and metrology — •Fabien Quéré[1], Sylvain Monchocé[1], Henri Vincenti[1], Jonathan Wheeler[2], Antonin Borot[2], Arnaud Malvache[2], and Rodrigo Lopez-Martens[2] — [1]CEA, IRAMIS, Service des Photons Atomes et Molécules, F-91191 Gif-sur-Yvette, France — [2]Laboratoire d'Optique Appliquée - ENSTA, Chemin de la Hunière, F-91761 Palaiseau, France

We show how to use spatio-temporally coupled light fields to generate isolated attosecond pulses. This general *attosecond lighthouse* effect provides a very convenient scheme for attosecond pump-probe experiments, and constitutes a powerful new tool for ultrafast metrology. We present the first experimental evidence of this effect.

WeB.2 *(170)* Wed 10:30

Isolated Attosecond Pulse Generation at High Repetition Rate — •Manuel Krebs[1], Steffen Hädrich[1,2], Stefan Demmler[1], Jan Rothhardt[1,2], Jens Limpert[1,2], and Andreas Tünnermann[1,2,3] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Albert-Einstein-Str. 15, 07745 Jena, Germany — [2]Helmholtz Institute Jena, Fröbelstieg 3, 07743 Jena, Germany — [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany

We present first measurements of supercontinua supporting isolated attosecond pulses at substantially increased repetition rate of 150 kHz, which is easily scalable to 1 MHz. This will enable significant improvements of experiments studying the dynamics of electronic processes by reducing measurement times and increasing signal to noise ratio.

WeB.3 *(171)* Wed 10:45

Efficient and Power Scalable Collinear XUV Output Coupling of Intracavity Generated High-Order Harmonics — Simon Holzberger[1,2], Ioachim Pupeza[1], •Tino Eidam[3], Dominik Esser[4], Johannes Weitenberg[5], Henning Carstens[1,2], Peter Russbüldt[4], Jens Limpert[3], Thomas Udem[1], Andreas Tünnermann[3], Theodor W. Hänsch[1,2], Ferenc Krausz[1,2], and Ernst Fill[1] — [1]Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Str. 1, 85748 Garching, Germany — [2]Ludwig-Maximilians-Universität München, Fakultät für Physik, Am Coulombwall 1, 85748 Garching, Germany — [3]Friedrich-Schiller-Universität Jena, Institut für Angewandte Physik, Albert-Einstein-Str. 15,

07745 Jena, Germany — [4]Fraunhofer-Institut für Lasertechnik ILT, Steinbachstr. 15, 52074 Aachen, Germany — [5]Lehrstuhl für Lasertechnik LLT, RWTH Aachen University, Steinbachstr. 15, 52074 Aachen, Germany

We generate harmonic radiation down to 23 nm in a 78-MHz femtosecond enhancement cavity and couple it out through an on-axis opening in a mirror. This concept offers an unparalleled flexibility for the driving pulse regarding power, bandwidth and polarization, together with a boost of XUV photon energy and flux.

WeB.4 *(223)* Wed 11:00

High Brightness XUV Frequency Combs via Intracavity High Order Harmonic Generation — T.K. Allison[1], A. Cingöz[1], C. Benko[1], D.C. Yost[1], A. Ruehl[2], M.E. Fermann[2], •I. Hartl[2], and J Ye[1] — [1]JILA, NIST and the University of Colorado, Boulder, CO 80309-0440, USA — [2]IMRA America Inc., 1044 Woodbridge Ave., Ann Arbor, MI 48105, USA

We present a high brightness XUV frequency comb, capable of delivering >200 μW of average power per harmonic in the 50-100 nm wavelength range. We present the first direct frequency comb spectroscopy in the extreme ultraviolet (XUV) palso discuss ongoing XUV comb coherence studies via heterodyne beat of two such combs.

WeB.5 *(94)* Wed 11:15

High-intensity enhancement cavities based on revolution-symmetric bow-tie cavities — •Damian N. Schimpf[1,2], William P. Putnam[1], and Franz X. Kärtner[1,2] — [1]Research Laboratory of Electronics, Massachusetts Institute of Technology, 77 Mass Ave Cambridge MA 02139, USA — [2]Center for Free-Electron Laser Science, DESY and University of Hamburg, Notkestraße 85, D-22607 Hamburg, Germany

We report on a new Bessel-Gauss enhancement cavity that can overcome the restrictions of conventional bow-tie cavities. Our novel resonator renders additional out coupling elements redundant, and allows for higher intensity ratios between the focus and the mirror surface. This increases damage threshold and permits higher circulating powers.

WeB.6 *(190)* Wed 11:30

Sculpted Light Waveforms from a Phase-Locked Three-color OPA for attosecond control of strong-field dynamics — •Stefan Haessler[1], Tadas Balciunas[1], Guangyu Fan[1], Giedrius Andriukaitis[1], Audrius Pugzlys[1], Andrius Baltuska[1], Amelle Zair[2], Richard Squibb[2], Luke Chipperfield[2], Leszek Frasinski[2], John Tisch[2], and Jon Marangos[2] — [1]Photonics Institute, Vienne University of Technology, Gusshausstrasse 27/387, 1040 Vienna, Austria — [2]Imperial College London, London SW7 2BW, UK

We synthesize millijoule femtosecond pulses with sculpted optical cycles based on the combination of three phase-locked pulses of different color, together spanning two octaves, and demonstrate control of efficient HHG via shaping the waveform. The system is based on a collinear white-light-seeded OPA driven by a high-energy CEP-locked Yb CPA.

Invited talk WeB.7 *(241)* Wed 11:45

Towards Zeptosecond X-ray Pulses — •Tenio Popmintchev — JILA and University of Colorado at Boulder

We demonstrate bright coherent X-ray supercontinua generated through fully phase-matched upconversion of mid-IR laser light into the keV spectral region. The ultrabroad bandwidths can support pulse durations of few attoseconds, scalable to zeptosecond time scales.

21: Lunch Break

Time: Wednesday 12:15–13:30 Location: Lunch

Lunch Break

WeP: Poster Session II

Time: Wednesday 13:30–14:30 Location: Main Hall Area

WeP.1 *(148)* Wed 13:30

Ho:LLF grown by micro-PD: spectroscopy and efficient laser emission — •Stefano Veronesi[1], Yongzhuan Zhang[1], Mauro Tonelli[1], and Martin Schellhorn[2] — [1]NEST Istituto Nanoscienze-CNR and Dipartimento di Fisica dell'Universita' di Pisa, I-56127 Pisa, Italy — [2]French -German Research Institute, ISL, 5, rue du General Cassagnou, 68301 Saint-Louis, France

We report a spectroscopic investigation and the first laser emission of a fluoride crystal grown by micro-PD technique. The Ho:LLF laser, in-band pumped at 1938 nm, yielded a maximum output power of 7.1W with a slope efficiency of 41%, at lasing wavelength of 2054.2 nm.

WeP.2 *(163)* Wed 13:30

A frequency-comb-referenced OPO for high-resolution spectroscopy around 3 micron — •Iolanda Ricciardi[1], Edoardo De Tommasi[1], Pasquale Maddaloni[1], Simona Mosca[1], Alessandra Rocco[1], Jean-Jacques Zondy[2], Maurizio De Rosa[1], and Paolo De Natale[1] — [1]INO-CNR, Istituto Nazionale di Ottica, Sezione di Napoli, and LENS, European Laboratory for Nonlinear Spectroscopy, Via Campi Flegrei 34, I-80078 Pozzuoli (NA), Italy — [2]Laboratoire Commun de Mètrologie LNE-CNAM, 61 rue du Landy, 93210 La Plaine Saint-Denis, France

We report on a cw singly-resonant optical parametric oscillator, emitting more than 1 W between 2.7 and 4.2 micron, which has been phase-locked to a self-referenced frequency comb. As a test, we performed saturation spectroscopy of CH3I rovibrational transitions around 3.4 micron, resolving

their electronic hyperfine structure.

WeP.3 *(169)* Wed 13:30

Soft aperture Kerr-lens mode-locked laser with Yb:CaF2 — •Guillaume Machinet[1], Florent Guichard[1], Pierre Sevillano[1], Romain Dubrasquet[1,2], Patrice Camy[3], Jean-Louis Doualan[3], Richard Moncorgé[3], Sandrine Ricaud[4,5], Patrick Georges[4], Frédéric Druon[4], Dominique Descamps[1], and Eric Cormier[1] — [1]Université Bordeaux-CNRS-CEA-UMR 5107, Centre Lasers Intenses et Applications, 351 Cours de la Libération, F-33405 Talence, France — [2]Azur light System, Cité de la Photonique-Meropa, 33600 Pessac, France — [3]Centre de recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA CNRS-ENSICAEN, Université de Caen, 14050 Caen, France — [4]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris Sud, 91127 Palaiseau, France — [5]Amplitude Systèmes, 11 avenue de Canteranne, Cité de la Photonique, 33600 Pessac, France

We demonstrate a soft-aperture Kerr-lens modelocking (KLM) operation in a long Yb:CaF2 crystal optically pumped by a high brightness fiber laser operating at 976 nm. Stable 117 fs pulses at around 1048 nm are produced with an average power of 560 mW and a repetition rate of 82 MHz.

WeP.4 *(186)* Wed 13:30

Holmium-doped KLu(WO4)2 Laser with 67% Slope Efficiency — Venkatesan Jambunathan[1], •Xavier Mateos[1], Maria Cinta Pujol[1], Joan Josep Carvajal[1], Francesc Díaz[1], Magdalena Aguiló[1], Uwe Griebner[2], and Valentin Petrov[2] — [1]FiCMA-FiCNA group, Universitat Rovira i Virgili (URV), Tarragona, Spain — [2]Max-Born Institute, Berlin, Germany

Resonantly pumped Ho:KLu(WO4)2 lasers of different Ho concentrations are studied. The optimized laser configuration operating at a wavelength of 2080 nm provides a slope efficiency approaching 70% with a maximum output power of 0.5 W.

WeP.5 *(205)* Wed 13:30

Diode-side-pumped channel waveguide laser — •Dimitri Geskus[1], Christos Grivas[2], Sanmugam Aravazhi[1], Uwe Griebner[3], Sonia García Blanco[1], and Markus Pollnau[1] — [1]Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands — [2]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [3]Max-Born-Institut, Forschungsverbund Berlin e.V., Berlin, Germany

Here we demonstrate laser emission from a highly Yb3+-doped, Microstructured, tapered channel waveguide in KGdxLu1-x(WO4)2 by diode side pumping with a high-power, multi-mode diode bar via a passive planar waveguide, offering the potential for significantly increased output powers.

WeP.6 *(14)* Wed 13:30

"Fiber laser pumped, microsecond, single frequency, nested cavity OPO for spectroscopy applications in the 3.0 - 3.5 micrometer range" — •Jessica Barrientos Barria, Jean-Baptiste Dherbecourt, Myriam Raybaut, Antoine Godard, Jean-Michel Melkonian, and Michel Lefebvre — ONERA, The French Aerospace Lab, BP 80100, 91123 Palaiseau Cedex, France

We report on a mid-infrared optical source based on a microsecond, fiber laser pumped, nested cavities, optical parametric oscillator. Power, frequency tuning and frequency purity are studied and compared to the specifications for spectroscopy.

WeP.7 *(75)* Wed 13:30

OPSL-Pumped Laser Operation of Pr^{3+}:$SrAl_{12}O_{19}$ — •Fabian Reichert, Daniel-Timo Marzahl, Philip Metz, Matthias Fechner, Nils-Owe Hansen, and Günter Huber — Institute of Laser-Physics, Hamburg, Germany

In this contribution we present OPSL-pumped laser operation of Pr^{3+}:$SrAl_{12}O_{19}$. Direct green laser emission from an oxide crystal was realized for the first time to the best of our knowledge. Output powers in the red spectral region exceeded 1 W.

WeP.8 *(177)* Wed 13:30

Cherenkov terahertz radiation from fs laser pulses in Si-LiNbO3-air-metal sandwich structure as a potential mW average power pulsed THz source — •Sergey Bodrov[1,2], Maxim Tsarev[2,1], Igor Ilyakov[1], Boris Shishkin[1], Eugene Mashkovich[2], Sergey Gorelov[2], and Andrey Stepanov[1] — [1]Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod, 603950 Russia — [2]University of Nizhny Novgorod, Nizhny Novgorod, 603950 Russia

Cherenkov terahertz radiation by optical rectification of femtosecond laser pulses in a sandwich structure with thin LiNbO3 layer, Si prism and metal substrate with variable air gap is experimentally investigated for different pump parameters. High energy efficiency of 0.3% and possibility of realization of mW-level THz source are demonstrated.

WeP.9 *(182)* Wed 13:30

Non-collinear optical parametric oscillator (NOPO) with femtosecond pulses rapidly tunable from the VIS to the NIR — •Tino Lang[1,2], Claudia Hoffmann[1], Thomas Binhammer[3], Stefan Rausch[1,2], Moritz Emons[1], Marcel Schultze[1], Anne Harth[1,2], and Uwe Morgner[1,2] — [1]Institute of Quantum Optics, Leibniz Universität Hannover, Welfengarten 1, 30167 Hannover, Germany — [2]Centre for Quantum Engineering and Space-Time Research (QUEST),Welfengarten 1, 30167 Hannover, Germany — [3]VENTEON Laser Technologies GmbH, Hertzstr. 1b, 30827 Garbsen, Germany

We present a non-collinear optical parametric oscillator based on ultra-broadband chirped mirrors delivering fs-pulses widely tunable form 650 to 1200 nm. 3 W of output power could be achieved with 12 W of green pump power from a home-build frequency-doubled thin disk laser. Spectral ramping up to 1kHz is demonstrated.

WeP.10 *(200)* Wed 13:30

New compact and stable SPIDER-setup for complete pulse characterization for pulse dura-

tions up to several 10 ps — •Jan Matyschok[1], Oliver Prochnow[2], Daniel Steingrube[1,3], Thomas Binhammer[2], Stefan Rausch[1,3], and Uwe Morgner[1,3,4] — [1]Institute of Quantum Optics, Leibniz Universität Hannover, Welfengarten 1, D-30167 Hannover, Germany — [2]VENTEON Laser Technologies GmbH, Hertzstr. 1b, D-30827 Garbsen, Germany — [3]Centre for Quantum Engineering and Space-Time Research (QUEST), Welfengarten 1, D-30167 Hannover, Germany — [4]Laser Zentrum Hannover e.V., Hollerithalle 8, D-30419 Hannover, Germany

We demonstrate a novel SPIDER setup to measure ultrashort laser pulses with spectral bandwidths of only a few nanometers and pulse durations up to the picosecond range. The setup is free of drifts due to a monolithic glass stretcher and an etalon.

WeP.11 *(168)* Wed 13:30

Pulsed polarization sequences from a twisted-mode Nd:YAG laser passively mode-locked by a SESAM — •Jérémie Thévenin, Marc Vallet, and Marc Brunel — Institut de Physique de Rennes, Université de Rennes I - CNRS UMR 6251, Campus de Beaulieu, F-35042 Rennes Cedex, France

A mode-locked Nd:YAG laser containing two quarter-wave plates is shown to emit synchronously two frequency combs associated to the polarization eigenstates of the cavity. Experiments are in perfect agreement with a modal analysis predicting the polarization sequences of the pulse train. We demonstrate locking between the two combs.

WeP.12 *(228)* Wed 13:30

Tunable diode pumped 2.7 μm laserbased on Er:CaF_2 hot-pressed ceramics — •Jan Sulc[1], Michal Nemec[1], Maxim E. Doroshenko[2], Helena Jelinkova[1], TasoltanT. Basiev[2], Vasilii A. Konyuskhin[2], and Vyacheslav V. Osiko[2] — [1]FNSPE,Czech Technical University in Prague, Prague, Czech Republic — [2]GPI, Russian Academy of Sciences, Moscow,Russian Federation

Erbium doped hot-pressed fluoride ceramics CaF_2 was investigated as an active medium in diode pumped laser, tunable using birefringent filter. The laser tuning range extended from 2692 nm up to 2761 nm. The output energy of 0.2 mJ at 2705 nm was obtained for the absorbed energy 20 mJ.

WeP.13 *(111)* Wed 13:30

Frequency Noise and Linewidth Properties of a Mid-IR Quantum Cascade Laser from Cryogenic to Room Temperature — •Lionel Tombez, Stéphane Schilt, Joab Di Francesco, Pierre Thomann, and Daniel Hofstetter — Laboratore Temps-Fréquence, Institut de Physique, Université de Neuchâtel, Neuchâtel, Switzerland

We present the temperature dependence of the frequency noise and linewidth of a mid-IR quantum cascade laser measured with the same device from 128K to 303K. While a sub-MHz linewidth is achieved at room-temperature, it rises exponentially below 200 K and broadens up to 10 MHz at low temperature.

WeP.14 *(183)* Wed 13:30

Analysis of Gold Nanoantennas for Harmonic Generation Utilising Plasmonic Field Enhancement — •Nils Pfullmann[1,2], Christian Waltermann[1,2], Milutin Kovacev[1,2], Vanessa Knittel[3], Rudolf Bratschitsch[3], Dieter Akemeier[4], Andreas Hütten[4], Alfred Leitenstorfer[3], and Uwe Morgner[1,2] — [1]QUEST Centre for Quantum Engineering and Space-Time Research — [2]Institut für Quantenoptik, Leibniz Universität Hannover — [3]Department of Physics and Center for Applied Photonics, University of Konstanz — [4]Department of Physics, Thin Films and Physics of Nanostructures, Bielefeld University

We present an analysis of the plasmonic field enhancement in gold nanoantennas based on FDTD calculations. In experiments we detect radiation at wavelengths of laser harmonics as well as plasma lines. Experimental issues are discussed and explained by a theoretical model.

WeP.15 *(216)* Wed 13:30

CW and quasi-CW operation of a Nd:YLF/KGW Raman Laser at 1163 nm, 552 nm and 581 nm — •Jonas Jakutis Neto[1,2], Jipeng Lin[1], Niklaus Ursus Wetter[2], and Helen Pask[1] — [1]MQ Photonics Research Centre, Department of Physics, Macquarie University, Sydney, NSW 2109, Australia. — [2]Instituto de Pesquisas Energéticas e Nucleares, CNEN/SP, Universidade de São Paulo, CEP 05508-000, São Paulo/SP, Brazil.

We demonstrate in this work a Nd:YLF/KGW Raman Laser operating at 1163 nm, 552 nm and 581 nm, with good beam qualities, M2 below 2, and Watt-level output powers in continuous wave regime. It is the first time the Nd:YLF 1053 nm fundamental transition is used in a Raman laser.

WeP.16 *(33)* Wed 13:30

Passively Q-switched microchip Er,Yb:YAB diode pumped laser — Victor Kisel[1], Konstantin Gorbachenya[1], Anatol Yasukevich[1], Alexey Ivashko[1], •Nikolay Kuleshov[1], Victor Maltsev[2], and Nikolay Leonyuk[2] — [1]Center for Optical Materials and Technologies, Belarusian National Technical University, 65 Nezavisimosti Avenue,Building 17, Minsk 220013, Belarus, e-mail: nkuleshov@bntu.by — [2]Geological Faculty, Moscow State University, Moscow 119992/GSP-2, Russia

Diode-pumped CW and Q-switched microchip Er,Yb:YAB laser operation is demonstrated. An output power of 800 mW at 1602 nm in CW regime was obtained. By using a Co2+:MALO saturable absorber Q-switched laser pulses with 5.25 microjoules energy, 5 ns duration, and 60 kHz repetition rate were demonstrated at 1522 nm.

WeP.17 *(3)* Wed 13:30

GaN mirrorless optical parametric oscillator — •Carlos Montes, Pierre Aschieri, and Marc de Micheli — LPMC-CNRS, Université de Nice-Sophia Antipolis, Parc Valrose, F-06108 Nice, France

Quasi-phase-matching of counterpropagating three-wave parametric interaction requires sub-micrometric structuration of cm long waveguides which can hardly be realized without stitching errors. We numerically study a periodically poled GaN mirrorless OPO and show that it is very tolerant to these fabrication errors.

WeP.18 *(56)* Wed 13:30

Diode-pumped Nd:YAG slab laser with self-adaptive, closed-loop resonator — •Jan Jabczynski, Waldemar Zendziam, Mateusz Kaskow, Lukasz Gorajek, Jacek Kwiatkowski, and Krzysztof Kopczynski — Military University of Technology , Institute of Optoelectronics, ul gen S. Kaliskiego 2, 00-908 Warsaw, Poland

Four wave mixing process inside Nd:YAG slab side pumped by 4kW diode pump radiation was exploited to achieve near diffraction limited output beam with 1 mrad divergence The output energy of 250 mJ with slope efficiency of 30% was demonstrated.

WeP.19 *(65)* Wed 13:30

Microchip Tm:KY(WO4)2 Laser — •Maxim Gaponenko[1], Pavel Loiko[1], Nataliya Gusakova[1], Viktor Kisel[1], Konstantin Yumashev[1], Anotoliy Pavlyuk[2], and Nikolai Kuleshov[1] — [1]Center for Optical Materials and Technologies, Belarusian National Technical University, Bldg. 17, Nezavisimosti Ave 65, Minsk, 220013 — [2]Institute of Inorganic Chemistry, Siberian Branch of Russian Academy of Sciences, 3 Lavrentyev Ave., Novosibirsk, 630090, Russia

Thermal lensing effect is characterized in the diode-pumped monoclinic Ng-cut Tm:KYW crystal under laser operation conditions at the wavelength of 1.94 μm. Passively-cooled cw microchip Tm:KYW laser with 0.65 W output power and 44% slope efficiency is presented.

WeP.20 *(229)* Wed 13:30

Diode pumped tunable Tm:BaF_2-SrF_2laser — Jan Sulc[1], •Michal Nemec[1], Maxim E. Doroshenko[2], Helena Jelinkova[1], TasoltanT. Basiev[2], Vasilii A. Konyuskhin[2], and Vyacheslav V. Osiko[2] — [1]FNSPE,Czech Technical University in Prague, Prague, Czech Republic — [2]GPI, Russian Academy of Sciences, Moscow,Russian Federation

Tunability of diode pumped laser based on Tm:BaF_2-SrF_2 crystal was investigated. Smooth and broad tuning in range from 1840 up to 1990 nm was reached using birefringent filter as a tuning element. The energy of 2.6 mJ @ 1943 nm was obtained for the absorbed pumping energy 61 mJ.

WeP.21 *(153)* Wed 13:30

Slowly Polarization Evolving Vector Solitons in Erbium Doped Fibre Laser Mode Locked with Carbon Nanotubes — •Sergey Sergeyev, Chengbo Mou, Aleksey Rozhin, and Sergei Turitsyn — Aston Institute of Photonic Technologies, Aston University, Aston Triangle, Birmingham, B4 7ET, UK

We demonstrate experimentally and study theoretically new type of stable pulse structures in erbium-doped fibre lasers - slowly polarization evolving vector solitons. Demonstrated vector solitons precess with characteristic times of 100-1000 round trips and their trajectories form a double semi-circle on the Poincaré sphere.

WeP.22 *(86)* Wed 13:30

High-Power, Fiber-Based, Picosecond Green Source Based on BiB3O6 — •Chaitanya Kumar Suddapalli[1] and Majid Ebrahim-Zadeh[1,2] — [1]ICFO-The Institute of Photonic Sciences, Mediterranean Technology Park, 08860 Castelldefels, Barcelona, Spain — [2]Institucio Catalana de Recerca i Estudis Avancats (ICREA), Passeig Lluis Companys 23, Barcelona 08010, Spain

We present a stable, high-power, picosecond, green source at 532 nm based on single-pass second-harmonic-generation of Yb-fiber laser in 10-mm-long BiB3O6 crystal, generating >5 W of green power at a single-pass conversion-effciency of 38%. The green beam exhibits excellent power-stability of 0.2% rms(15 hours) and has TEM00 spatial-profle(M2<1.93).

WeP.23 *(23)* Wed 13:30

All-optical manipulation of light with an optical event horizon — •Ayhan Demircan[1], Shalva Amiranashvili[2], Carsten Bree[2], Jens Bethge[3], and Günter Steinmeyer[3] — [1]Invalidenstr. 114, 10115 Berlin, Germany — [2]Weierstrass Institute for Applied Analysis and Stochastics (WIAS), Mohrenstr. 39, 10117 Berlin, Germany — [3]Max-Born-Institut (MBI), Max-Born-Str. 2a, 12489 Berlin, Germany

We demonstrate numerically and experimentally that temporal locking of pulses in an optical event horizon enables effective modification of the central wavelength, energy, and duration of both pulses. The interaction scheme fulfills all necessary criteria for a practical all-optical transistor.

WeP.24 *(54)* Wed 13:30

Efficient Coherent Addition of High Power Photonic Crystal Fiber Lasers — •Boris Shulga and Amiel Ishaaya — Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel

We experimentally demonstrate efficient intracavity coherent combining of two high power rod-type photonic crystal fiber lasers. We further investigate coherent combining configurations for high peak and average power Q-switched pulsed operation.

WeP.25 *(58)* Wed 13:30

Supercontinuum Generation in a Tapered Tellurite Air-clad Fiber — Meisong Liao, Weiqing Gao, Tonglei Cheng, Zhongchao Duan, Takenobu Suzuki, and •Yasutake Ohishi — Research Center for Advanced Photon Technology, Toyota Technological Institute, 2-12-1, Hisakata, Tempaku, Nagoya 468-8511, Japan.

We adopt a tapered tellurite air-clad microstructured fiber with an extremely high nonlinearity as well as tailored dispersion to generate supercontinuum(SC) in the picosecond regime. The SC covers 350-2000 nm. The pump power is much lower than those of the conventional picosecond-pulse-pumped SC sources with a similar bandwidth.

WeP.26 *(34)* Wed 13:30

Wavelength conversion of nanosecond pulses to the mid-IR using four wave mixing in photonic crystal fibers — Herzog Amir[1,2], Avishay Shamir[1,2], and •Amiel Ishaaya[1] — [1]Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer Sheva, Israel — [2]Electrooptics Unit, Ben-Gurion University of the Negev, Beer Sheva, Israel

We investigate degenerate four wave mixing with Nd:YAG nanosecond pulses in fused silica photonic crystal fibers. Experiments show more than an octave spanning conversion to idler and signal wavelengths at 3.105 and 0.642 μm, respectively, representing a new stretch towards the limit of the silica transmission window in the mid-infrared.

WeP.27 *(113)* Wed 13:30

Fabrication of High-aspect Ratio Microchannels in Fused Silica Hollow Fibers Using a Tesla coil — •Zhangwei Yu, Mårten Stjernström, Andrius Zukauskas, and Fredrik Laurell — Department of Applied Physics, Royal Institute of Technology (KTH), Roslagstullbacken 21, 10691 Stockholm, Sweden

Microchannels are fabricated into fused silica capillaries and hollow fibers by high-voltage high-frequency corona discharge induced by Tesla coil. Channels as narrow as 2.2 um are successfully made in 2-um-capillaries. This simple, low-cost and HF-free technique can be employed in developing fiber-based optofludic systems for fiber dye lasers.

WeP.28 *(83)* Wed 13:30

Self-induced laser line sweeping in tunable erbium-doped fiber laser — Pavel Honzátko[1], Petr Vojtíšek[1,2], Petr Navrátil[1,2], and •Pavel Peterka[1] — [1]Institute of Photonics and Electronics Academy of Science of the Czech Republic, v.v.i., 18251 Prague, Czech Republic — [2]Czech Technical University, Faculty of Nuclear Sciences and Physical Engineering, 115 19 Prague, Czech Republic

Periodic drift of laser wavelength is reported in core pumped erbium doped fiber laser tunable from 1557 to 1567 nm. The sweeping rate depended on the settings of the tunable filter, polarization controller and pump power and it was found in the range 0.8-12.5 nm/s.

WeP.29 *(90)* Wed 13:30

Erbium doped fibre laser passively harmonically mode locked using carbon nanotubes — •Chengbo Mou, Raz Arif, Aleksey Rozhin, and Sergei Turitsyn — Aston Institute of Photonic Technologies, Aston University, Birmingham, UK, B4 7ET

We have investigated passively harmonic mode locked erbium doped fibre laser using carbon nanotubes polymer films. Two types of carbon nanotubes have been studied including filtrated and centrifugated carbon nanotubes. The proposed laser can support up to 10 harmonic orders with 1 ps pulse duration and 12 mW output power.

WeP.30 *(91)* Wed 13:30

Yb3+ and Er3+ fiber lasers based on Pure Silica Sol-Gel core Photonic Crystal Fibers — •Ihsan fsaifes, Assaad Baz, Guillaume Le Cocq, Bruno Capoen, Géraud Bouwmans, Laurent Bigot, and Mohamed Bouazaoui — PhLAM/IRCICA - UMR8523/USR3380, CNRS - Université Lille1, Parc de la Haute Borne, 50 avenue Halley, 59658 Villeneuve d'Ascq cedex, France

In this paper, we present for the first time to our knowledge, the realization of Yb3+ and Er3+ fiber lasers based on Pure Silica Sol-Gel core Photonic Crystal Fibers

WeP.31 *(161)* Wed 13:30

Doping Management in High Power Fiber Amplifiers: Optimization of Heat Generation and Nonlinear Phase Shift — •Parviz Elahi[1], Sinem Yilmaz[1], Önder Akçaalan[1], Hamit Kalaycioglu[1], Bülent Öktem[2], Cagri Senel[1,3], Fatih Ömer Ilday[1], and Koray Eken[4] — [1]Department of Physics, Bilkent University, 06800 Ankara, Turkey — [2]Institute of Materials Science and Nanotechnology, Bilkent University, 06800 Ankara, Turkey — [3]TÜBITAK Ulusal Metroloji Enstitüsü (UME), Gebze, 41470 Kocaeli, Turkey — [4]FiberLAST Inc., 06531 Ankara, Turkey

We propose the use of varying doping levels along the gain fiber to optimize the trade-off between heat generation and nonlinear phase shift in high-power fiber amplifiers. We demonstrate a hybrid low- and high-doped Yb fiber laser-amplifier system, which generates 100-W at 100-MHz with pulse duration of 4.5 ps.

WeP.32 *(192)* Wed 13:30

Modal content study of an active multifilament-core fiber amplifier for long range coherent LIDAR — •Julien Le Gouët, Laurent Lombard, and Guillaume Canat — Office National des Etudes et Recherches Aerospatiales, F-91761 Palaiseau, France

The guiding properties of an Er:Yb doped multi-filament core fiber are extensively studied using spatially resolved spectral S2 imaging. Quantifying the effect of bending and pumping the fiber, and measuring its birefringence properties, we conclude on the interest of this fiber for sources in long range coherent LIDAR systems.

WeP.33 *(63)* Wed 13:30

Tellurite glass hollow-core photonic bandgap fiber — •Tonglei Cheng, Meisong Liao, Weiqing Gao, Zhongchao Duan, Takenobu Suzuki, and Yasutake Ohishi — Research Center for Advanced Photon Technology, Toyota Technological Institute, 2-12-1 Hisakata, Tempaku, Nagoya 468-8511, Japan

This paper presents the design of a tellurite (TZLB) HC-PBGF with wide bandgap which can guide light in the mid-infrared region. The bandgaps are simulated by the plan-wave method, and because the tellurite galss has low fiber drawing temperature, it is easier to draw than the silica bandgap fiber.

WeP.34 *(198)* Wed 13:30

Picosecond fiber laser system for synchronization of the pump and seed pulses of the OPCPA system — •Nerijus Rusteika[1,2], Vytautas Vosylius[1,2], Maratas Safinas[2], and Andrejus Michailovas[1,2] — [1]Center for Physical Sciences and Technology, Vilnius, Lithuania — [2]Ltd. Ekspla, Vilnius, Lithuania

We developed fiber laser system for the synchronization of Yb/Nd:YAG OPCPA system. Picosecond pulses generated from a fiber oscillator were amplified and spectrally expanded in standard optical fiber to generate radiation in 1030-1064nm range. The pulses were spectrally filtered to match the amplification spectrum of the power laser system.

WeC: Ultrafast Fiber and Waveguide Oscillators

Time: Wednesday 14:30–16:15 Location: Oscar Klein - Lecture Hall

Keynote WeC.1 *(235)* Wed 14:30

History and Prospects of Mode-locked Fiber and Waveguide Lasers — •Erich P. Ippen — Massachusetts Institute of Technology, Cambridge, MA 02139 USA

The technology of ultrashort pulse generation with fiber lasers has advanced dramatically toward higher pulse energies, higher repetition rates, varied wavelengths and more compact formats. This talk will review the principles and techniques that have enabled these advances, describe recent progress in our laboratory and discuss possible future directions.

WeC.2 *(156)* Wed 15:15

500 MHz, 58fs highly coherent Tm fiber soliton laser — J Jiang[1], C-C Lee[2], J Bethge[1], A Mills[1], W Mefford[1], S Suzuki[2,3], T.R. Schibli[2], •I Hartl[1], and M.E. Fermann[1] — [1]IMRA America, Inc., 1044 Woodridge Ave., Ann Arbor, MI 4810, USA — [2]Department of Physics, University of Colorado at Boulder, 2000 Colorado Avenue, Boulder, CO 80309, USA — [3]Graduate School of Engineering, Toyota Technological Institute, 2-12-1 Hisakata, Tempaku, Nagoya 468-8511, Japan

We demonstrate a 500 MHz ultra-low noise 58fs Tm fiber soliton laser based on carrier phase noise reduction with an electro-optic graphene modulator. We achieved record carrier phase stability of 400 mrad integrated f_ceo phase noise (0.3Hz to 3.5MHz)

WeC.3 *(46)* Wed 15:30

2.46-GHz, fundamentally mode-locked, femtosecond Yb-fiber oscillator — Guoqing Chang[1], Hung-Wen Chen[1], Shanhui Xu[2], Zhongmin Yang[2], and •Franz Kärtner[1,3] — [1]Research Laboratory of Electronics, Massachusetts Institute of Technology, 77 Mass Ave Cambridge MA 02139 — [2]State Key Laboratory of Luminescent Materials and Devices and Institute of Optical Communication Materials, South China University of Technology, Guangzhou 510640, China — [3]Center for Free-Electron Laser Science, DESY and University of Hamburg, Notkestraße 85, D-22607 Hamburg, Germany

We demonstrate a 2.46-GHz repetition-rate, fundamentally mode-locked, femtosecond Yb-fiber oscillator that incorporates two enabling technologies: a 1-cm heavily Yb-doped phosphate glass fiber as the gain medium and a high-dispersion (-1300 fs2) output coupler to manage cavity dispersion. The oscillator self-starts and generates 35-mW utrashort pulses of ˜250-fs duration.

WeC.4 *(178)* Wed 15:45

Repetition-Rate Locked, Wavelength Tunable 1 GHz Erbium-doped Fiber Laser — •Michelle Y. Sander[1], David Chao[1], Gale S. Petrich[1], Leslie A. Kolodziejski[1], Franz X. Kaertner[1,2], and Erich P. Ippen[1] — [1]Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, MA, 02139-4307, USA — [2]Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron and Universität Hamburg, Notkestraße 85, D-22607 Hamburg, Germany

A repetition-rate locked 1GHz femtosecond Er-doped fiber laser with a butt-coupled saturable Bragg reflector is demonstrated. Depending on the butt-coupling, the center wavelength was tuned between 1550nm and 1573nm. With the absorber mounted on a piezo-transducer, the laser repetition rate was stably locked to a RF reference source.

WeC.5 *(189)* Wed 16:00

High Fidelity 62-fs, 7-nJ Pulses at 1035 nm from an Integrated Yb-Fiber Oscillator — •Aart Verhoef, Lingxiao Zhu, Dusan Lorenc, Andrius Baltuska, and Alma Fernández — Institut für Photonik, Technische Universität Wien, Gusshausstrasse 27/387, Vienna, Austria

We present a mode-locked Ytterbium-doped fiber oscillator operating in the net normal-dispersion regime, delivering 7.2 nJ pulses that can be dechirped down to 62 fs. A higher-order mode fiber is used for intracavity dispersion compensation.

24: Coffee Break

Time: Wednesday 16:15–16:30 Location: Main Hall Area

Coffee Break

WeD: Ultrafast Optics

Time: Wednesday 16:30–18:30 Location: Oscar Klein - Lecture Hall

Invited talk WeD.1 *(243)* Wed 16:30

High-power femtosecond Kerr-lens oscillators — •Alexander Apolonskiy — Max-Planck Institut für Quantenoptik, Garching, Germany — Ludwig-Maximillians-Universität München, Am Coulombwall 1, 85748 Garching, Germany

High-energy femtosecond oscillators have chances to become key elements in nonlinear experiments with low yield where high photon flux is needed. I will present our recent experimental results showing progress in development of high-power Ti:Sa and Yb:YAG disk Kerr-lens oscillators together with numerical simulations showing the perspectives and limitations.

WeD.2 *(128)* Wed 17:00

25 W, 185 fs pulses from an Yb:Lu2O3 mode-locked thin disk laser — •Clara Saraceno[1], Cinia

Schriber[1], Oliver Heckl[1], Cyrill Baer[1], Matthias Golling[1], Kolja Beil[2], Christian Kraenkel[2], Thomas Suedmeyer[1,3], Guenter Huber[2], and Ursula Keller[1] — [1]Department of Physics, Institute for Quantum Electronics, ETH Zürich, 8093 Zürich, Switzerland — [2]Institute of Laser-Physics, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — [3]Department of Physics, University of Neuchâtel, Neuchâtel, Switzerland

We demonstrate power scaling of a sub-200 fs Yb:Lu2O3 thin disk laser. We achieved 25 W of average power and 185 fs at a repetition rate of 66.5 MHz. The key element to achieve this result was the use of a high damage threshold SESAM with optimized parameters.

WeD.3 *(61)* Wed 17:15

CW and femtosecond Yb:CALGO thin disk oscillator — •sandrine ricaud[1,5], anael jaffres[2], akiko suganuma[2], Bruno Viana[2], pascal loiseau[2], birgit weichelt[3], katrin wentsch[3], marwan abdou-ahmed[3], andreas voss[3], thomas graf[3], daniel ritz[4], clemens honninger[5], eric mottay[5], patrick georges[1], and frédéric druon[1] — [1]Laboratoire Charles Fabry, Institut d'Optique, Palaiseau, France — [2]Laboratoire de Chimie de la Matière Condensée de Paris, Chimie-Paristech, Paris, France — [3]Institut für Strahlwerkzeuge (IFSW), Stuttgart, Germany — [4]FEE GmbH, Idar-Oberstein, Germany — [5]Amplitude Systèmes, Pessac, France

In this contribution, we present the first femtosecond thin-disk oscillator using an Yb3+:CaGdAlO4 crystal. Pulses as short as 135 fs are obtained with an average power of 1.3 W and at higher average power operation 10.5 W and 390 fs pulse width are generated.

WeD.4 *(115)* Wed 17:30

250 MHz Modelocked VECSEL: Towards Low Repetition Rates Using an Extendable Multi-Pass Approach — •Christian A. Zaugg[1], Martin Hoffmann[1], Wolfgang P. Pallmann[1], Valentin J. Wittwer[1], Matthias Golling[1], Kurt J. Weingarten[2], Thomas Südmeyer[1], and Ursula Keller[1] — [1]ETH Zurich, Department of Physics, Institute for Quantum Electronics, Zurich, Switzerland — [2]Time-Bandwidth-Products, Zurich, Switzerland

With a multi-pass cavity we avoid modelocking instabilities of low-repetition rate modelocked VECSELs due to short gain lifetime. We achieve record-low 250-MHz repetition rates with 400 mW average output power in 11.2 ps pulses. Using modular Herriott-type cells will result in extremely compact high peak power ultrafast pulse sources.

WeD.5 *(41)* Wed 17:45

Femtosecond pulse generation from a Tm:Lu_2O_3 ceramic laser at 2070 nm — •Alexander A. Lagatsky[1], Oleg L. Antipov[2], and Wilson Sibbett[1] — [1]SUPA, School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, KY16 9SS, UK — [2]Institute of Applied Physics of the Russian Academy of Sciences, 46 Ul'yanov Street,603950, Nizhny Novgorod, Russia

Passive mode-locking of a Tm:Lu_2O_3 ceramic laser at around 2070 nm is reported. Nearly transform-limited 180 fs pulses are generated with an average power of 400 mW and a pulse repetition frequency of 121 MHz. A maximum output power of 750 mW is reached during ultrashort pulse generation.

WeD.6 *(52)* Wed 18:00

Broadband Nonlinear Optical Characteristics of Graphene Saturable Absorber Applicable for Bulk Lasers — •In Hyung Baek[1], Hwang Woon Lee[1], Jun Wan Kim[1], Sukang Bae[2], Byung Hee Hong[2], Dong-Il Yeom[1], and Fabian Rotermund[1] — [1]Department of Physics & Division of Energy Systems Research, Ajou University, Suwon 443-749, Korea — [2]Department of Chemistry, Seoul National University, Seoul 151-747, Korea

Nonlinear optical characteristics of graphene saturable absorbers, such as nonlinear transmission and nonlinear responses, are investigated in a broad spectral range between 800 and 1500 nm. The results show excellent properties applicable for bulk solid-state laser mode-locking.

WeD.7 *(62)* Wed 18:15

148-fs passively mode-locked Tm:$LuScO_3$ laser at 2100 nm — •Alexander A. Lagatsky[1], Philipp Koopmann[2,3], Peter Fuhrberg[3], Günter Huber[2], Christian Tom A. Brown[1], and Wilson Sibbett[1] — [1]SUPA, School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, KY16 9SS, UK — [2]Institute of Laser-Physics, University of Hamburg, Luruper Chaussee 149, D-22761 Hamburg, Germany — [3]LISA laser products, Max-Planck-Str. 1, D-27191 Katlenburg-Lindau, Germany

Femtosecond pulse generation from a SESAM mode-locked Tm:$LuScO_3$ laser is reported. Near transform-limited pulses as short as 148 fs with a corresponding spectral bandwidth of 31.8 nm at a center wavelength of 2100 nm are generated at a maximum output power of 110 mW.

26: Conference Dinner

Time: Wednesday 20:00–23:00 Location: Moderna Museet

Conference Dinner

ThA: Coherent combining and high power fiber lasers

Time: Thursday 8:00–10:00 Location: Oscar Klein - Lecture Hall

Invited talk ThA.1 *(238)* Thu 8:00

High Power Fiber Lasers by Structured Fibers — •Akira Shirakawa — Institute for Laser Science, University of Electro-Communications 1-5-1 Chofugaoka, Chofushi, Tokyo 182-8585, Japan

Fiber laser is now widely recognized as the most reliable high average power source with a diffraction-limit beam quality. However, the huge gain and nonlinearities due to the rather small mode area and long interaction length make generations of specific wavelength radiation and high peak-power/high energy radiation so difficult that applications have been limited. Our research focuses on new fiber lasers to overcome these problems.

ThA.2 *(135)* Thu 8:30

Large-pitch fibers: Pushing very large mode areas to highest powers — •Fabian Stutzki[1], Florian Jansen[1], Cesar Jauregui[1], Jens Limpert[1,2,3], and Andreas Tünnermann[1,2,3] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Max-Wien-Platz 1, 07743 Jena, Germany — [2]Helmholtz Institute Jena, Fröbelstieg 3, 07743 Jena, Germany — [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany

Large-pitch fibers demonstrated effective single-mode high power operation in fiber lasers with mode-field diameters exceeding 100mu. This superior performance is enabled by the fundamental concept of higher-order mode delocalization. We will propose novel fiber designs with improved delocalization to further increase the stable performance level of fiber based laser systems.

ThA.3 *(139)* Thu 8:45

Physical origin of the dynamic behavior of mode instabilities in active fibers — •Cesar Jauregui[1], Hans-Jürgen Otto[1], Fabian Stutzki[1], Florian Jansen[1], Tino Eidam[1,2], Jens Limpert[1,2], and Andreas Tünnermann[1,2,3] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, 07745 Jena, Germany — [2]Helmholtz-Institute Jena, Helmholtzweg 4, 07743 Jena, Germany — [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany

The physical origin of mode instabilities is explained in detail. Our simulations reveal the presence of two competing effect as the output power of a fiber laser system is increased. We believe that the interplay between these effects determines the complex temporal dynamics of mode instabilities.

ThA.4 *(179)* Thu 9:00

Influencing mode instabilities by dynamic excitation of fiber modes using an acousto optical deflector — •Hans-Jürgen Otto[1], Fabian Stutzki[1], Florian Jansen[1], Tino Eidam[1,2], Cesar Jauregui[1], Jens Limpert[1,2], and Andreas Tünnermann[1,2,3] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Albert-Einstein-Str. 15, 07745 Jena, Germany — [2]Helmholtz-Institute Jena, Helmholtzweg 4, 07743 Jena, Germany — [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany

We investigate how the dynamic excitation of fiber modes influences mode instabilities (MI). Hereby, the seed coupling to the main amplifier under study was varied on the characteristic time scale for MI. We show a clear increase of beam quality at power levels, where typically chaotic MI occur.

ThA.5 *(44)* Thu 9:15

Passive coherent combining of two high energy fiber chirped pulse amplifiers — •Yoann Zaouter[1], Louis Daniault[2], Marc Hanna[2], Dimitris Papadopoulos[3], Franck Morin[1], Clemens Hönninger[1], Frederic Druon[2], Eric Mottay[1], and Patrick Georges[2] — [1]Amplitude Systemes, 11 avenue de Canteranne, Cité de la Photonique, 33600, Pessac, France — [2]Laboratoire Charles Fabry, Institut d Optique, CNRS, Université Paris-Sud, 2 av. Augustin Fresnel, 91127 Palaiseau Cedex, France — [3]Institut de la Lumiere Extreme, CNRS, Ecole Polytechnique, ENSTA Paristech, Institut d*Optique, Université Paris Sud, Palaiseau Cedex, France

Using passive coherent beam combining of two ultrafast fiber amplifiers, we demonstrate the generation of high temporal quality 300fs 650uJ pulses at 92kHz repetition rate, corresponding to 60 W average power. Furthermore, at 2MHz up to 135W and 105W are generated, respectively, before and after compression.

ThA.6 *(167)* Thu 9:30

Coherent Combination of Femtosecond Fiber Amplifiers at High Average Power — •Arno Klenke[1,3], Stefan Demmler[1], Thomas Gottschall[1], Tino Eidam[1,3], Steffen Hädrich[1,3], Jan Rothhardt[1,3], Jens Limpert[1,2,3], and Andreas Tünnermann[1,2,3] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität, Albert-Einstein-Str. 15, 07745 Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany — [3]Helmholtz-Institute Jena, Fröbelstieg 3, 07743 Jena, Germany

We present the coherent combining technique as a scaling concept for the average power of femtosecond fiber amplifiers. Two fiber amplifiers were combined in a Mach-Zehnder type interferometer in a state-of-the art CPA system. With this setup, we could achieve 560fs pulses at a compressed average power of 215W.

ThA.7 *(73)* Thu 9:45

Passive spatio-temporal coherent combining of stretcher-free femtosecond fiber systems — •Louis Daniault[1], Marc Hanna[1], Dimitris N. Papadopoulos[1,2], Yoann Zaouter[3], Eric Mottay[3], Frédéric Druon[1], and Patrick Georges[1] — [1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Univ Paris-Sud, 91127 Palaiseau, France — [2]Laboratoire d'Utilisation des Lasers Intenses, CNRS, Ecole Polytech-

nique, CEA, Univ Pierre et Marie Curie, Palaiseau, France — [3]Amplitude Systèmes, 11 avenue de Canteranne, Cité de la Photonics, 33600 Pessac, France

We demonstrate the passive coherent combining of 8 femtosecond pulses, generated from a common seed in both the spatial and the temporal domains and amplified by a single stretcher-free fiber amplifier. Sub-100 fs 52 MW peak-power pulses are obtained and the scalability is discussed.

28: Coffee Break

Time: Thursday 10:00–10:15 Location: Main Hall Area

Coffee Break

ThB: Novel fiber lasers and applications

Time: Thursday 10:15–12:15 Location: Oscar Klein - Lecture Hall

Invited talk ThB.1 *(237)* Thu 10:15

Cladding-Pumped Raman Fibre Lasers and Amplifiers: Review and Progress — •Christophe Codemard[1,2], Junhua Ji[2], and Johan Nilsson[2] — [1]SPI Lasers, SO30 2QU, Hedge End, Southampton, United Kingdom — [2]Optoelectronics Research Centre, Southampton University, SO17 1BJ, Southampton, United Kingdom

We review the state-of-the-art of cladding-pumped Raman fibre technology and its limits and present advances in output power and energy. We discuss the potential to scale to higher power than that of conventional rare-earth doped-fibre which suffers from deleterious effects and technical challenges at extreme power.

ThB.2 *(132)* Thu 10:45

20 W average power picosecond Tm-doped all-fiber MOPA system — •Jiang Liu, Qian Wang, and Pu Wang — Beijing University of Technology, Beijing 100124, P. R. China

We report high average-power picosecond Tm-doped all-fiber MOPA system. The oscillator was mode-locked by a SESAM to generate average power 10 mW at repetition rate of 103 MHz. Two-stage Tm-doped all-fiber amplifiers were used directly to boost average power to 20.7 W, which corresponds to pulse width was 18 ps.

ThB.3 *(203)* Thu 11:00

Power-scalable wavelength-agile fibre laser source at two-microns — •Jae Daniel, Masaki Tokurakawa, and Andy Clarkson — Optoelectronics Research Centre, University of Southampton, Highfield, SO17 1BJ, UK.

A simple wavelength-agile Tm-doped fibre laser source employing an acousto-optic tunable-filter to achieve narrow-band operation (˜0.12 nm) with wide and rapid wavelength tunability in the two-micron spectral region at watt-level power is described. The prospects for extended wavelength coverage using spectral beam-combination and scaling to much higher powers are considered.

ThB.4 *(219)* Thu 11:15

Frequency doubling in Rb:PPKTP of a high-power, continuous-wave, VBG-locked fiber laser — •Peter Zeil, Andrius Zukauskas, Carlotta Canalias, Valdas Pasiskevicius, and Fredrik Laurell — Laser physics, KTH Royal Institute of Technology, 106 91 Stockholm, Sweden

In this work, we demonstrate efficient single-pass second harmonic generation at 533 nm by frequency doubling of a high-power VBG-locked Yb-fiber laser. The narrow-band (<16 GHz) infrared power of 30 W generated 4.7 W green light in a periodically poled Rb:KTP crystal.

ThB.5 *(152)* Thu 11:30

Simple scheme for active mode selection in a multimode fibre oscillator — •Jae Daniel and Andy Clarkson — Optoelectronics Research Centre, University of Southampton, Highfield, SO17 1BJ,UK

A novel technique for electronically-controllable selection of different transverse modes in a multi-mode fiber laser oscillator is presented. Preliminary results demonstrate individual transverse mode lasing and fast switching between modes with watt-level output powers.

ThB.6 *(119)* Thu 11:45

High Power Ytterbium LMA Rod-Type Fiber Laser Oscillator With Pulse Duration Flexibility — •Pierre Deslandes[1,2], Damien Sangla[1], Julien Saby[1], Mathias Perrin[2], François Salin[1], and Eric Freysz[2] — [1]Eolite Systems, 11 Avenue Canteranne, 33600 Pessac, France — [2]Université de Bordeaux, CNRS, LOMA, UMR 5798, 351, Cours de la libération, 33405 Talence, France

We present a pulsewidth flexible, selfstarting and powerfull ytterbium doped ring LMA fiber laser. It makes it possible to generate subpicosecond or few tens of picosecond pulses almost Fourier Transform limited with an average power up to 10 W at 104 MHZ.

ThB.7 *(70)* Thu 12:00

All-fiber laser source for CARS-Microscopy — •Thomas Gottschall[1], Javier Abreu-Afonso[2], Martin Baumgartl[1], Tobias Meyer[3], Benjamin Dietzek[3], Jürgen Popp[3], Jens Limpert[1], and Andreas Tünnermann[1,4] — [1]Friedrich-Schiller-Universität Jena, Institute of Applied Physics, Abbe Center of Photonics, Albert-Einstein-Str. 15, 07745 Jena, Germany — [2]Universidad de Valencia, Instituto de Ciencias de los Materiales, La Coma S/N, 46100 Valencia, Spain — [3]Institut für Photonische Technologien e.V., Albert-Einstein-Str. 9, 07745 Jena, Germany — [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany

We present a parametric all-fiber laser source for CARS microscopy. The pump and Stokes wavelengths are generated by four-wave-mixing and are delivered from a single fiber end with intrinsic synchronization. The generated wavelength pair was used to obtain high quality pictures of blood cells probing vibrational resonances around 2850cm-1.

30: Lunch Break

Time: Thursday 12:15–13:30 Location: Lunch

Lunch Break

ThP: Poster Session III

Time: Thursday 13:30–14:30 Location: Main Hall Area

ThP.1 *(47)* Thu 13:30

Experimental Validation of a Simple Relation between Laser Frequency Noise and Linewidth — •Nikola Bucalovic, Vladimir Dolgovskiy, Christian Schori, Pierre Thomann, Gianni Di Domenico, and Stéphane Schilt — Laboratoire Temps-Fréquence, Université de Neuchâtel, Avenue de Bellevaux 51, 2000 Neuchâtel, Switzerland

We present an experimental validation of a simple formula that we recently proposed to calculate the linewidth of a laser from its frequency noise spectrum. Using state-of-the-art lasers, agreement within the experimental uncertainty is obtained between the linewidth approximated from the frequency noise spectrum and the actual value separately measured.

ThP.2 *(4)* Thu 13:30

Measurement of transverse pseudo-nonlinear effects in solid-state laser materials using a highly sensitive technique — •Thomas Godin[1], Michael Fromager[1], Emmanuel Cagniot[1], Tomàz Catunda[2], Richard Moncorgé[1], and Kamel Aït-Ameur[1] — [1]CIMAP, Caen, France — [2]IFSC, São Carlos, Brasil

We present a detailed study of the Baryscan technique, a new efficient alternative to the widespread Z-scan technique for measuring pump-induced refractive index changes. This method, based upon the use of a Position Sensitive Detector, reaches among the highest sensitivity levels to date.

ThP.3 *(66)* Thu 13:30

Laser Operation and Spectroscopy of Pr^{3+}:$LaMgAl_{11}O_{19}$ — •Daniel-Timo Marzahl, Fabian Reichert, Matthias Fechner, Nils-Owe Hansen, Klaus Petermann, and Günter Huber — Institut für Laser-Physik, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany

In this contribution we present spectroscopic investigations and demonstrate laser action of Pr^{3+}:LaMgAl11O19. For central emission wavelengths of 729.1 nm, 648.1 nm, and 620.4 nm we obtained maximum output powers of 63.7 mW, 10.1 mW, and 2.9 mW with slope efficiencies of 12

ThP.4 *(176)* Thu 13:30

Generation of 1.6 ps by χ(2)-lens Mode Locking of an In-band Pumped Nd:LuVO4 Laser — •Hristo Iliev[1], Veselin Alexandrov[1], Ivan Buchvarov[1], Huaijin Zhang[2], Jiyang Wang[2], and Valentin Petrov[3] — [1]Physics Department, Sofia University, 5 James Bourchier Blvd., BG-1164 Sofia, Bulgaria — [2]National Laboratory of Crystal Materials, Shandong University, Jinan 250100, China — [3]Max-Born-Institute for Nonlinear Optics and Ultrafast Spectroscopy, 2A Max-Born-Street, D-12489 Berlin, Germany

Mode-locking of an In-band pumped Nd:LuVO4 laser by $\chi(2)$-lens formation in periodically-poled KTP nonlinear crystal has been studied. The shortest pulse duration of 1.6 ps is obtained at 0.7 W, while the maximum output power reaches is 4.6 W at 7.5 ps.

ThP.5 *(204)* Thu 13:30

Spatiotemporal Pulse Dynamics of Passively Mode-locked Few-cycle Ti:sapphire Lasers — •Shih-Hsuan Chia[1], Li-Jin Chen[2], and Franz Kärtner[1,2] — [1]Center for Free-Electron Laser Science, DESY and Department of Physics, University of Hamburg, Notkestraße 85, D-22607 Hamburg, Germany — [2]Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139, USA

In this paper, the full dynamics of few-cycle Ti:sapphire lasers are studied. The highly wavelength-dependent beam profile, which has been observed experimentally, and can now be clearly traced back to the limited high reflectivity range of the cavity.

ThP.6 *(15)* Thu 13:30

High energy optical parametric source for multi-wavelength CO2 DIAL — •Jessica Barrientos Barria, Jean-Baptiste Dherbecourt, Myriam Raybaut, Antoine Godard, Jean-Michel Melkonian, and Michel Lefebvre — ONERA, The French Aerospace Lab, BP 80100, 91123 Palaiseau Cedex, France

We report on a high energy 2.05 micrometer nanosecond master oscillator power amplifier optical parametric source for CO2 DIAL, based on a versatile architecture allowing multi-wavelengths generation in the vicinity of CO2 absorption line.

ThP.7 *(51)* Thu 13:30

Power scaling of laser-diode pumped Pr:YAlO3 laser at 747 nm wavelength — •Martin Fibrich[1], Jan Šulc[1], Helena Jelínková[1], Karel Nejezchleb[2], and Václav Škoda[2] — [1]Czech Technical University in Prague, FNSPE, Czech Republic — [2]Crytur Ltd., Turnov, Czech

Republic

Efficient continuous-wave Pr:YAlO3 laser generation at 747nm in power-scaled resonator configuration is reported. As a pumping source, two GaN-laser-diodes with output power of 1W each were used. The maximum output power of 290mW with the slope efficiency of 28% related to absorbed power was reached.

ThP.8 *(145)* Thu 13:30

Development of a Deformable Mirror for Compensation of Aspherical Components of the OPD in High Power Thin-Disk Lasers — •Elke Schmid, Jochen Speiser, and Adolf Giesen — Institute of Technical Physics, German Aerospace Center, Pfaffenwaldring 38-40, D-70569 Stuttgart

For compensating non-spherical parts of the intra-cavity OPD in high power lasers, the aberrations was measured and a deformable mirror based on locally thermal heating is introduced. According to simulations a deformable mirror was produced. First measurements demonstrate the capability of the concept.

ThP.9 *(85)* Thu 13:30

Pulsed Laser Deposition of Nd:$Lu_3Al_5O_{12}$: Elimination of Particulates Using a Vane Velocity Filter — •Sebastian Heinrich, Jonathan Thielmann, Friedjof Tellkamp, Sven H. Waeselmann, Christian Kränkel, and Günter Huber — Institut für Laser-Physik, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany

A vane velocity filter was used to reduce the number of undesired particulates on the surface of Nd:$Lu_3Al_5O_{12}$ films grown with the pulsed laser deposition method. The elimination of particulates on the surface of the films results in a decrease of the waveguiding losses by a factor of 5.

ThP.10 *(38)* Thu 13:30

The potential of Yb:Sc2SiO5 for high-power continuous-wave and passively mode-locked laser operation — •Katrin Sarah Wentsch[1], Lihe Zheng[2], Su Liangbi[2], Xu Xiaodong[2], Jun Xu[2], Marwan Abdou Ahmed[3], and Thomas Graf[3] — [1]Graduate School of Excellence advanced Manufacturing Engineering, Universität Stuttgart, Nobelstrasse 12, D-70569 Stuttgart — [2]Shanghai Institute of Ceramics, Chinese Academy of Sciences, 215 Chengbei Road, Cn-201800 Shanghai — [3]Instut für Strahlwerkzeuge, Universität Stuttgart, Pfaffenwaldring 43, D-70569 Stuttgart

Ytterbium doped scandium silicon oxide (Yb:Sc2SiO5) is a rather novel laser material which is promising for high-power ultra-short pulse generation due to its excellent thermo-mechanical properties and its broad emission bandwidth. We present first characterizations and investigations on passively mode-locked thin-disk laser oscillators.

ThP.11 *(185)* Thu 13:30

38-mJ, single frequency, sub-nanosecond, kilohertz, Nd based laser system — •Danail Chuchumishev, Bozhidar Oreshkov, Alexander Gaydardzhiev, Dimiter Draganov, and Ivan Buchvarov — Department of Physics, Sofia University,5 James Bourchier Blvd., BG-1164 Sofia, Bulgaria

We report the amplification of pulses from a near diffraction limited, single frequency, passively Q-switched Nd:YAG laser (0.24 mJ, 830 ps at 0.5 kHz) up to 38-mJ in a one Nd:YVO4 preamplifier and two diode pumped boost YAG-amplifiers, whilst preserving pulse duration, beam quality and linear polarization.

ThP.12 *(201)* Thu 13:30

Yb3+:YAl3(BO3)4 thin-disk laser — •Birgit Weichelt[1], Katrin Sarah Wentsch[2], Andreas Voss[1], Andreas Gross[3], Volker Wesemann[3], Daniel Rytz[3], Marwan Abdou Ahmed[1], and Thomas Graf[1] — [1]Institut fuer Strahlwerkzeuge, Stuttgart, Germany — [2]Graduate School of Excellence advanced Manufacturing Engineering, Stuttgart, Germany — [3]Forschungsinstitut für mineralische und metallische Werkstoffe -Edelsteine/Edelmetalle- GmbH, Idar Oberstein, Germany

We present the first operation of Yb:YAl3(BO3)4, being of special interest due to its self-frequency doubling ability and its potential for sub-100 fs pulse generation, in thin-disk laser configuration. In continuous wave operation, an output power of 7.9 W with an optical efficiency of 37% at 1040 nm was obtained.

ThP.13 *(26)* Thu 13:30

Singly-resonant LiGaS2 mid-IR optical parametric oscillator — Aleksey Tyazhev[1], Vitaly Vedenyapin[2], Georgi Marchev[1], Alexander Yelisseyev[2], Ludmila Isaenko[2], Dmitri Kolker[3], Marina Starikova[2,3], Sergei Lobanov[2], •Valentin Petrov[1], and Jean-Jacques Zondy[4] — [1]Max-Born-Institute for Nonlinear Optics and Ultrafast Spectroscopy, 2A Max-Born-Str., D-12489, Berlin, Germany — [2]Institute of Geology and Mineralogy, SB RAS, 43 Russkaya Str., 630058 Novosibirsk, Russia — [3]Novosibirsk State Technical University, 20 K. Marx Ave., 630028 Novosibirsk, Russia — [4]Laboratoire Commun de Métrologie LNE-CNAM, 61 rue du Landy, 93210 La Plaine Saint Denis, France

We demonstrate singly resonant optical parametric oscillator based on the wide band-gap (3.76eV) LiGaS2, pumped by a 100Hz, 8ns Nd:YAG laser. Due to the high optical damage resistivity this is possible notwithstanding the modest nonlinearity. The 5.4ns long idler pulses near 5500nm have a maximum energy of 134μJ.

ThP.14 *(76)* Thu 13:30

Tunable Laser Operation of Pr^{3+}:LaF_3 — •Fabian Reichert, Francesca Moglia, Daniel-Timo Marzahl, Philip Metz, Matthias Fechner, Nils-Owe Hansen, and Günter Huber — Institute of Laser-Physics, Hamburg, Germany

In this contribution we present diode-pumped tunable laser operation of Pr^{3+}:LaF_3. Tuning between 609.2 nm and 622.7 nm with two small gaps was achieved after inserting a birefringent filter into a linear cavity.

ThP.15 *(45)* Thu 13:30

High-power qcw-side-pumped Nd:$YLiF_4$ laser with over 50% efficiency using mode-controlling —

Alessandro M. Deana[1] and •Niklaus U. Wetter[2] — [1]University Nove de Julho, 109 Dr. Adolpho Pinto, São Paulo - SP, Brazil — [2]Institute for Nuclear and Energetic Research, CNEN-IPEN/SP, 2242 Av. Prof. Lineu Prestes, São Paulo - SP, Brazil

A very compact and robust cavity design is demonstrated that allows record optical-to-optical efficiency of over 50% in a side-pumped Nd:$YLiF_4$ laser emitting at 1053 nm. This efficiency is even higher than in longitudinal pumped cavity designs and based on a novel two-beam mode-controlling scheme.

ThP.16 *(48)* Thu 13:30

Over 2 mJ, 2 μm optical vortex pulse generation from an optical vortex pumped optical parametric oscillator — •Yu Tokizane[1,2], Taximaiti Yusufu[1], Masaki Yamada[1], Katsuhiko Miyamoto[1], and Takashige Omatsu[1,2] — [1]Chiba Univertiy, Chiba, Japan — [2]CREST, Tokyo, Japan

We demonstrate 2um optical vortex generation from a semi-concentric KTP optical parametric oscillator pumped by a 1um optical vortex. The maximum energy of the vortex 2um output with a topological charge of 1 was measured to be 2.1 mJ with a slope efficiency of 15%.

ThP.17 *(140)* Thu 13:30

Compact 2 μm Single-frequency, Q-switched Tm:YAG Laser Injection-seeded by Fiber Coupled Monolithic Nonplanar Ring Oscillator Laser — •Lei Wang[1], Chunqing Gao[1], Mingwei Gao[1], Yan Zheng[1], and Zhifeng Lin[2] — [1]School of Opto-Electronics, Beijing institute of technology, 5 South Zhongguancun Street, Beijing 100081, P. R. China — [2]Beijing METSTAR Radar CO., Ltd., Fudao Buiding, 11 Kaituo Road, Haidian District Beijing 100085, P. R. China

A Single-frequency injection-seeded Q-switched Tm:YAG laser was demonstrated. The seed laser was a fiber-coupled Tm:YAG monolithic nonplanar ring oscillator with the maximum output power of 480 mW. The output energy of the single-frequency Q-switched pulse was 2.5 mJ, with pulse width of 250 ns and repetition rate of 100 Hz.

ThP.18 *(208)* Thu 13:30

Sub-150-fs pulses from an Yb:KYW regenerative amplifier — •Martin Delaigue, Clemens Hönninger, and Eric Mottay — Amplitude Systèmes, 11 avenue de Canteranne, Cité de la Photonique, Bâtiment MEROPA, F-33600 Pessac, France

We report an amplification scheme using femtosecond fiber oscillator and Yb:KYW regenerative amplifier, delivering 50microJ-range pulses around 50kHz, in order to produce sub-150fs pulse duration exploiting non linear effects to compensate gain narrowing without degrading beam profile and temporal quality.

ThP.19 *(81)* Thu 13:30

Multi-Wavelength Operation of Pr3+-doped Solid-State Lasers Q-switched by an Acousto-Optic Modulator or Novel Saturable Absorbers — •Ryo Abe, Junichiro Kojou, and Fumihiko Kannari — Department of Electronics and Electrical Engineering, Keio University, 3-14-1, Hiyoshi, Kohoku-ku, Yokohama 223-8522, JAPAN

Q-switching of wavelength tunable Pr3+-doped fluoride-glass fiber laser pumped by high-power GaN diode lasers is demonstrated. We also experimentally prove that a Cr:YAG crystal exhibits saturable absorption in the visible region. We demonstrate passively Q-switched Pr:YLF and Pr:fluoride-glass-fiber lasers and their multi-color operation.

ThP.20 *(195)* Thu 13:30

First complete phase-matching characterization of the Langatate LGT — •Patricia Segonds, Benoit Boulanger, Bertrand Menaert, Jerome Debray, and Rajeev Ranjan — Institut Néel CNRS Université Joseph Fourier, 25 rue des Martyrs, 38042 Grenoble cedex 9, France

We identified the piezoelectric crystal La3Ga5.5Ta0.5O14 (LGT) as a new material for nonlinear optics from 0.5 microns to 6.5 microns. We performed the first characterization of sum- and difference-frequency generations by measuring the phase-matching properties using a LGT crystal cut as a sphere.

ThP.21 *(102)* Thu 13:30

5 GHz passive harmonic mode-locking in a single-clad fiber laser via pulse energy engineering — •Chang Su Jun[1], Sun Young Choi[1], Fabian Rotermund[1], Byoung Yoon Kim[2], and Dong-Il Yeom[1] — [1]Division of Energy Systems Research, Ajou University, Suwon, 443-749, Republic of Korea — [2]Department of Physics, KAIST, Daejeon, 305-701, Republic of Korea

We report the highest pumping efficiency of 13.8 MHz/mW in increasing the repetition rate of passive harmonic mode-locking through pulse energy engineering. Stable pulses with ~5GHz repetition rate and 40dB super-mode suppression is demonstrated with only 395mW pump power in a single-clad fiber laser incorporating the carbon-nanotube saturable absorber.

ThP.22 *(16)* Thu 13:30

Continuum Generation in Mid-IR from Tm-doped Germanate Fiber Using Femtosecond Cr:ZnS Laser — •Nikolai Tolstik[1], Dmitry Klimentov[1], Vladislav Dvoyrin[1], Irina Sorokina[1], Vladimir Kalashnikov[2], and Evgeni Sorokin[2] — [1]Department of Physics, Norwegian University of Science and Technology,Hogskoleringen 5, N-7491 Trondheim, Norway — [2]Photonics Institute, Vienna University of Technology, Gusshausstrasse 27/387, A-1040 Vienna, Austria

We report on continuum generation at 2.4 um using a step-index germanate-doped silica fiber. Femtosecond Cr:ZnS laser was used as a pulse source. The supercontinuum spectral bandwidth reaches 600 nm at -20dB level for 0.65 nJ launched pulse energy.

ThP.23 *(227)* Thu 13:30

Efficient frequency conversion by gain-induced four-wave mixing in optical fibers — Guillaume Tison[1,2] and •Eric Freysz[1] — [1]Université de Bordeaux, CNRS, LOMA, UMR 5798, 351, Cours de la libération, 33405 Talence, France — [2]NEXEYA SYSTEMS, Route des Lasers,

Parc Scientifique et Technologique Laseris I, Avenue du Médoc, 33114 Le Barp, France

We present an ytterbium-doped LMA fiber amplifier that besides amplification of nanosecond pulse at 1064 nm allows generation of powerful nanosecond pulses centered at 824 nm.The observed phenomena can be explained when accounting for four-wave mixing and an application to produce tunable nanosecond MOPA systems is proposed.

ThP.24 *(158)* Thu 13:30

Graphene saturable absorbers on glass substrates for passive mode-locking of fiber lasers — •Grzegorz Sobon[1], Jaroslaw Sotor[1], Iwona Pasternak[2], Kacper Grodecki[2,3], Piotr Paletko[4], Wlodzimierz Strupinski[2], Zdzislaw Jankiewicz[2], and Krzysztof Abramski[1] — [1]Laser & Fiber Electronics Group, Wroclaw University of Technology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland — [2]Institute of Electronic Materials Technology, Wolczynska 133, 01-919 Warsaw, Poland — [3]Faculty of Physics, University of Warsaw, Hoza 69, 00-681 Warsaw, Poland — [4]Faculty of Microsystem Electronics and Photonics, Wroclaw University of Technology, Janiszewskiego 11/17, Wroclaw 50-372, Poland

In this paper we describe the development of free-space coupled graphene saturable absorbers for passive mode-locking of fiber lasers. The graphene layers were grown by chemical vapor deposition on copper foils and transferred onto glass substrates. Fabricated saturable absorbers allowed to achieve 315 fs pulses in an Er-doped fiber laser.

ThP.25 *(57)* Thu 13:30

UV energy levels of bismuth luminescent centers in Bi-doped v-SiO2 and v-GeO2 optical fibers — •Igor Bufetov[1], Elena Firstova[1], Vladimir Khopin[2], Sergey Firstov[1], Vladimir Vel'miskin[1], Konstantin Nischev[3], Alexey Guryanov[2], and Evgeny Dianov[1] — [1]Fiber Optics Research Center, Russian Academy of Sciences, 38. Vavilov Street, 119333, Moscow, Russia — [2]Institute of Chemistry of High-Purity Substances, Russian Academy of Sciences, 49 Tropinin Street, 603600, Nizhny Novgorod, Russia — [3]Ogarev Mordovia State University, Physics and Chemistry Institute, 68 Bolshevistskaja St., Saransk 430005,Rebublic of Mordovia, Russia

Excitation-emission luminescence spectra of Bi-doped v-SiO2 and v-GeO2 optical fibers in the wavelength range 200-500 nm were measured. UV and visible energy-levels positions of bismuth luminescent centers in these fibers were determined.

ThP.26 *(74)* Thu 13:30

Thermally-induced Changes in Distributed Modal Filtering Yb-doped Double Cladding Photonic Crystal Fibers — •Enrico Coscelli[1], Federica Poli[1], Mette M. Jørgensen[2], Marko Laurila[2], Jesper Laegsgaard[2], Thomas T. Alkeskjold[3], Lasse Leick[3], Jes Broeng[3], Annamaria Cucinotta[1], and Stefano Selleri[1] — [1]Information Engineering Department - University of Parma, Parma, Italy — [2]DTU Fotonik - Department of Photonics Engineering - Technical University of Denmark, Lyngby, Denmark — [3]NKT Photonics A/S, Birkerød, Denmark

The effects of thermally-induced refractive index change on the single-mode regime of active distributed modal filtering photonic crystal fibers are numerically investigated. A blue-shift of the single-mode range and a decrease of the fundamental mode effective area, both proportional to the coupled pump power, are reported.

ThP.27 *(100)* Thu 13:30

Radiofrequency Spectroscopy Method of Temperature Measurements in Silica Active Fiber Polymer Jacket — •Renat Shaidullin[1,2] and Oleg Ryabushkin[1,2,3] — [1]NTO "IRE-Polus", Vvedensky Sq. 1, Fryazino, Moscow Region, Russia — [2]Moscow Institute of Physics and Technology, Institutskiy per. 9, Dolgoprudniy, Moscow Region, Russia. — [3]Kotelnikov Institute of Radio-Engineering and Electronics of RAS, Vvedensky Sq. 1, Fryazino, Moscow Region, Russia.

In this paper a new method of temperature measurements in the protective polymer jacket of active fiber lasers is proposed. This method based on impedance spectroscopy allows to determine heating of the polymer jacket by measuring radio-frequency dielectric constant change.

ThP.28 *(95)* Thu 13:30

High-average-power nanosecond pulse generation in polarization-maintained Yb-doped PCF fiber laser systems — •Hidetsugu Yoshida[1], Koji Tsubakimoto[1], Hisanori Fujita[1], Noriaki Miyanaga[1], Yamamura Takeshi[2,3], Ishikawa Masahiro[2,3], Sakagawa Tomokazu[2,3], and Tsukamoto Masahiro[4] — [1]Institute of Laser Engineering, Osaka University, Osaka, Japan — [2]Kataoka Corp., Kyoto, Japan — [3]Advanced Laser and Process Technology Research Association (ALPROT), Tokyo, Japan — [4]Joining and Weiding Research Institute, Osaka University,Osaka, Japan

We have developed a high-peak and high-average power Yb-doped fiber laser system generates the polarization-maintained pulsed in PCF rod fibers. The output power has been achieved to 132-180 W by a 100-μm PCF-rod type fiber.

ThP.29 *(147)* Thu 13:30

Beam quality degradation of a strongly pumped Yb-doped photonic crystal fiber amplifier — •Malte Karow[1,2], Henrik Tünnermann[1,2], Jörg Neumann[1,2], Dietmar Kracht[1,2], and Peter Wessels[1,2] — [1]Laser Zentrum Hannover e.V., Hollerithallee 8, 30419 Hannover, Germany — [2]Centre for Quantum Engineering and Space-Time Research - QUEST, Welfengarten 1, 30167 Hannover, Germany

The beam quality degradation of a strongly pumped Yb-doped photonic crystal fiber amplifier is investigated by measuring the frequency resolved intensity noise spectra. A sudden increase of the relative intensity noise at the onset of beam profile fluctuations and further changes in the dynamics beyond this threshold were observed.

ThP.30 *(199)* Thu 13:30

Towards integrated channel waveguide lasers in monoclinic double tungstates — •Koop van Dalfsen[1], Henk A. G. M. van Wolferen[2], Mein-

dert Dijkstra[1], Shanmugam Aravazhi[1], Edward H. Bernhardi[1], Sonia M. Garcia-Blanco[1], and Markus Pollnau[1] — [1]Integrated Optical MicroSystems Group, Mesa+ Institute for Nanotechnology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands — [2]Transducers Science and Technology Group, Mesa+ Institute for Nanotechnology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands

Co-doped planar waveguide layers with various dopant levels of thulium between 1.5 and 8.0 at.% and maximum dopant levels of gadolinium and lutetium have been grown onto pure KYW substrates. Striploaded, corrugated channel waveguides in silicon-nitride have been deposited onto these planar waveguides for channel waveguide lasers with on-chip mirrors.

ThP.31 *(55)* Thu 13:30

Spectral Narrowing in a System of Coherently Combined Fiber Lasers — Oleg Shneider[1,2], •Boris Shulga[1], and Amiel Ishaaya[1] — [1]Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel — [2]Electro-Optics Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel

We investigate intracavity coherent beam combining in a system of two fiber lasers, when spectrally selective elements are inserted only in one of the lasers. We find that the narrow spectral content can be imposed on the other laser resulting narrowband operation of the system with high beam combining efficiency.

ThP.32 *(131)* Thu 13:30

Is It Possible to Create Pure Single-Mode PCF with 100μm Core Diameter? — •Victor Shevandin, Konstantin Dukelskii, and Vladimir Demidov — S.I. Vavilov Federal Optical Institute, St. Petersburg, Russia

Several photonic crystal fibers with core dimensions of 25-57 μm were fabricated and investigated. The structure was formed by 4, 3, 2 and 1 hole rings around the silica core. It is shown that, in contrary to the literature data, pure single-mode regime is not available in the 1-ring structure.

ThP.33 *(92)* Thu 13:30

Mode-locked fibre laser and amplifier at 1.12 micron using aluminosilicate ytterbium-doped fibre — •Laure Lago[1], François Narbonneau[1], Laurent Lablonde[2], Yves Hernandez[1], Benoit Cadier[2], and Domenico Giannone[1] — [1]Applied Photonic Department, Multitel, 2 av. Pierre et Marie Curie, Parc Initialis, 7000 Mons, Belgium — [2]IXFIBER, rue Paul Sabatier, 22300 Lannion, France

We present a mode-lock laser and amplifier at 1118 nm based on aluminosillicate Yb doped fibres. The laser delivers, after amplification more than 170 W peak power for 19 ps pulses duration and a spectral linewidth of about 0.2 nm. This laser is a good candidate for future frequency doubling.

ThP.34 *(11)* Thu 13:30

Nanohole Arrays in Borates by Femtosecond Laser Ablation toward Realizing Two-Dimensional Photonic Crystals — Nobuhiro Kodama[1], Tomoko Takahashi[1], Kunihiko Yamamoto[1], Hedeyuki Kabaki[1], Naoki Ikeda[2], and •Yoshimasa Sugimoto[2] — [1]Akita University, Akita 010-8502, Japan — [2]National Institute for Materials Science, Ibaraki, 305-0047, Japan

We report here the fabrication of nanohole arrays in a LKB borate glass and a LBO borate crystal by femtosecond laser ablation toward realizing 2D photonic crystals. In addition, we calculate the photonic band structures of the fabricated air nanohole arrays and examine electromagnetic wave propagation in arrays containing a line defect.

ThC: Applications of Engineered Fibers

Time: Thursday 14:30–16:30 Location: Oscar Klein - Lecture Hall

Keynote ThC.1 *(236)* Thu 14:30

Ultrafast Nonlinear Optics in Hollow-Core Photonic Crystal Fibres — •Philip Russell, Wonkeun Chang, Nicolas Joly, and John Travers — Max Planck Institute for the Science of Light, GuentherScharowsky Str. 1, 91058 Erlangen, Germany

Kagome-style hollow core PCF provides an ideal environment for studying ultrafast nonlinear optical effects in noble gases, where very low group velocity dispersion and the absence of Raman scattering enhances the efficiency of pulse compression and the generation of tunable ultra-violet dispersive-waves.

ThC.2 *(142)* Thu 15:15

Pulse compression of a modelocked thin disk laser to 10 MW, sub-50 fs in a gas filled Kagome-type hollow-core PCF — •Florian Emaury[1], Coralie Fourcade Dutin[2], Clara Saraceno[1], Oliver Heckl[1], Yingying Wang[2,3], Cinia Schriber[1], Thomas Südmeyer[1], Fetah Benabid[2,3], and Ursula Keller[1] — [1]Department of Physics, Institue for Quantum Electronics, ETH Zürich, 8093 Zürich, Switzerland — [2]Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, Claverton Down, Bath BA2 7AY, UK — [3]XLIM Institut de Recherche, CNRS UMR 6172, Université de Limoges, 87060 Limoges, France

We spectrally broaden 860 fs pulses from a 7.3-W, 3.91-MHz thin disk laser in a 2.1 m long Xe-filled HC-PCF. After compression, we achieve 4.2-W in sub 50-fs pulses at a peak power of 10MW.

ThC.3 *(97)* Thu 15:30

THz Pulse Propagation Through Zero Defect Kagome Photonic Crystal Fibers — •Jessienta Anthony[1], Rainer Leonhardt[1], Sergio Leon-Saval[2], and Alexander Argyros[2] — [1]Physics Department, University of Auckland, Private Bag 92019, Auckland, New Zealand — [2]IPOS, School of Physics, University of Sydney, Sydney, Australia

We present THz characteristics of a zero defect kagome fiber. We identify the loss mechanism of the fiber is due to the high leakage of the strut modes into the background air. The ob-

served loss peaks are in good agreement with the predicted numerical simulations.

ThC.4 *(202)* Thu 15:45

Single frequency amplification by ytterbium doped photonic bandgap fiber at 1178 nm — •Mingchen Chen[1], Akira Shirakawa[1], Ken-ichi Ueda[1], Christina Olausson[2], Jens Lyngsø[2], and Jes Broeng[2] — [1]Institute for Laser Science, University of Electro-Communications, 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan — [2]NKT Photonics A/S, Blokken 84, DK-3460 Birkerød, Denmark

1178 nm single-frequency amplification by Yb-doped photonic bandgap fiber has been demonstrated. 24.6 W output was obtained without stimulated Brillouin scattering. 1.8 dB suppression of Brillouin gain by an acoustic antiguiding effect has been found in the low-index core antiresonant reflecting optical waveguide.

ThC.5 *(37)* Thu 16:00

High normal Group Velocity Dispersion Photonic Crystal Fiber for wavelength tunable pulse stretching around 2 μm — •Pureur Vincent[1], Guillemet Sébastien[1], Bouwmans Géraud[2], Bigot Laurent[2], Hernandez Yves[1], and Giannone Domenico[1] — [1]Applied Photonics Department, Multitel, 2 av Pierre et Marie Curie, Parc Initialis, 7000, Mons, Belgium — [2]Laboratoire de Physique des Lasers, Atomes et Molécules UMR 8523, IRCICA USR 3380, 50 av Halley, 59658, Villeneuve d'Ascq, France

We present a polarization-maintaining solid-core photonic crystal fiber with very high normal group velocity dispersion around 2 μm for optical pulse stretching. With relatively low propagation losses, the total dispersion of the fiber is measured to be -530 and -400 ps/nm/km at 1979 nm depending on the polarization axis.

ThC.6 *(59)* Thu 16:15

Nanosecond electrical switch using monolithic fiber interferometer — •Patrik Rugeland[1,2], Walter Margulis[2], and Oleksandr Tarasenko[2] — [1]Applied Physics, Royal Institute of Technology, Roslagstullsbacken 21, 10691 Stockholm, Sweden — [2]Fiber Photonics, Acreo, Electrum 236, 16440 Kista, Sweden

We demonstrate a monolithic fiber Mach-Zehnder interferometer that can be electrically switched with ˜10 ns response time. The device is broadband and temperature stable, and could be used for low-loss all-spliced Q-switching of fiber lasers at tens of kilohertz.

33: Coffee Break

Time: Thursday 16:30–16:45 Location: Main Hall Area

Coffee Break

ThD: Ultrafast optics and frequency combs

Time: Thursday 16:45–18:30 Location: Oscar Klein - Lecture Hall

Invited talk ThD.1 *(232)* Thu 16:45

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ThD.2 *(164)* Thu 17:15

Mid-IR frequency ruler based on a doubly resonant non-degenerate OPO — •I. Hartl[1], J. Jiang[1], C. Mohr[1], J. Bethge[1], M. E. Fermann[1], N. Leindecker[2], K. L. Vodopyanov[2], and P. G. Schunemann[3] — [1]IMRA America, Inc., 1044 Woodridge Ave., Ann Arbor, MI 4810, USA — [2]E.L. Ginzton Laboratory, Stanford University, Stanford CA, 94305, USA — [3]BAE Systems, PO Box 868 Nashua NH, 03063, USA

We demonstrate a Tm-femtosecond fiber frequency comb pumped non-degenerate doubly resonant OP-GaAs-based broadband OPO, emitting idler and signal waves centered at 5283nm and 3350nm respectively. We demonstrate that the OPO produces a ruler of well defined signal and idler frequencies by cavity length stabilization with a comb-tooth linewidth of <300kHz, limited by the reference laser.

ThD.3 *(93)* Thu 17:30

3D Precision Imaging with a Terahertz-bandwidth, Comb-calibrated Swept Laser — •Esther Baumann, Fabrizio R. Giorgetta, Ian Coddington, Kevin Knabe, Laura Sinclair, William C. Swann, and Nathan R. Newbury — Quantum Electronics and Photonics Division, National Institute of Standards and Technology, 325 Broadway, Boulder, CO, 80305, USA

A frequency-comb and a MEMS-based external-cavity laser are integrated into a Terahertz-bandwidth LIDAR system capable of sub-ms update times and 150 μm range resolution. For a specular target, a precision/accuracy of 92 nm was obtained; 3D images of diffuse targets (a shoe and a face) are presented.

ThD.4 *(184)* Thu 17:45

Comparison of low-noise microwave generation from ultrafast fiber and DPSSL frequency combs — •Vladimir Dolgovskiy[1], Nikola Bucalovic[1], Stéphane Schilt[1], Gianni Di Domenico[1], Pierre Thomann[1], Serge Grop[2], Benoit Dubois[2], Vincent Giordano[2], Max Stumpf[1,3], Selina Pekarek[3], Ursula Keller[3], and Thomas Südmeyer[1] — [1]Laboratoire Temps Fréquence, Université de Neuchâtel, 51 Avenue de Bellevaux, CH-2000 Neuchâtel, Switzerland — [2]FEMTO-ST Institute, Time and Frequency Dpt., 26 Chemin de l'Epitaphe, 25030 Besançon Cedex, France — [3]Department of Physics, Institute of Quantum Electronics, ETH Zurich, 8093 Zürich, Switzerland

We report the first comparison of microwaves generated from an ultra-stable laser using a SESAM-mode-locked Er:Yb:glass laser oscillator (ERGO) and an Er:fiber fre-

quency comb with the transportable ultra-low instability signal source ULISS based on a cryocooled sapphire oscillator. Relative instabilities of 5E-15 are measured at 1s.

ThD.5 *(193)* Thu 18:00

Generation of Mid-Infrared Optical Frequency Combs from Crystalline Microresonators — •Christine Wang[1,2,3], Tobias Herr[2], Pascal Del'Haye[1,3], Albert Schliesser[1,2], Ronald Holzwarth[1,3], Theodor Hänsch[1,4], Nathalie Picqué[1,4,5], and Tobias Kippenberg[1,2] — [1]Max-Planck-Instiut für Quantenoptik, Garching, Germany — [2]École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland — [3]Menlo Systems GmbH, Martinsried, Germany — [4]Ludwig-Maximilians-Universität München, Fakultät für Physik, München, Germany — [5]Institut des Sciences Moléculaires d'Orsay, CNRS, Université Paris-Sud, Orsay, France

We present mid-infrared frequency comb generation from micro-resonators. Combs spanning over 10 THz with mode spacing of 50-110 GHz around the 2.5 micron wavelength CW-pump are generated in crystalline MgF2 whispering-gallery mode resonators via four-wave-mixing. Low phase-noise is verified by beating the comb modes with a narrow linewidth CW laser.

ThD.6 *(141)* Thu 18:15

Experimentally verified pulse formation model for high-power femtosecond vertical emitting semiconductor lasers — •Oliver Dominik Sieber, Mario Mangold, Valentin Johannes Wittwer, Martin Hoffmann, Matthias Golling, Thomas Südmeyer, and Ursula Keller — Department of Physics, Institute for Quantum Electronics, ETH Zurich, 8093 Zurich, Switzerland

A quantitative understanding of the pulse formation mechanism is necessary to overcome the challenges to achieve a few 100-fs pulses with high average output power. With the presented numerical model, we obtain excellent agreement with our experiments and correctly predict the observed output power for the first time.

35: Coffee Break/snacks

Time: Thursday 18:30–19:00 Location: Main Hall Area

Coffee Break/snacks

POSD: Postdeadline Session

Time: Thursday 19:00–20:00 Location: Oscar Klein - Lecture Hall

Postdeadline

FrA: Solid-State lasers

Time: Friday 8:00–10:15 Location: Oscar Klein - Lecture Hall

FrA.1 *(43)* Fri 8:00

Efficient Er:Lu2O3 laser with 5.9 W of output power at 2.85 μm — •Tao Li, Kolja Beil, Christian Kränkel, and Günter Huber — Institute of Laser-Physics, University of Hamburg, Luruper Chaussee 149, D-22761 Hamburg, Germany

We report on 2.85 micron laser performance of Er:Lu2O3. Pumping with an optically pumped semiconductor laser,1.4 W output power with a slope efficiency of ˜36% was obtained. Under diode pumping, 5.9 W of output power with 27% of slope efficiency was achieved with an M2 of 1.2 to 1.4.

FrA.2 *(157)* Fri 8:15

High Power Diode-Pumped Alexandrite Slab Laser — •Michael Damzen and Ara Minassian — Midaz Lasers Ltd, London, UK

Record powers are demonstrated from a diode-pumped Alexandrite slab laser producing pulse energy 23.4 mJ at 100 Hz (in quasi-CW mode) with ˜ 42% slope efficiency, and 6.4 W in CW mode, showing exciting prospects as a high efficiency tunable wavelength source for remote sensing and ultrafast applications.

FrA.3 *(22)* Fri 8:30

High average-power, high-quality pico-second laser system based on a thin Nd:YVO4 slab bounce amplifier — Hiroki Seki[1], Takaharu Yoshino[1], Katsuhiko Miyamoto[1], and •Takashige Omatsu[1,2] — [1]Graduate School of Advanced Integration Science, Chiba University, 1-33 Yayoi-cho, Inage-ku, Chiba, 263-8522, JAPAN — [2]CREST Japan Science and Technology Agency, 5,Sanbancho,Chiyoda-ku,Tokyo,102-0075, Japan

We present a high average-power, near-diffraction-limited pico-second laser system formed by a thin Nd:YVO4 slab bounce amplifier with a multi-pass geometry. A maximum output power of 65 W with an optical efficiency of 47 % has been achieved.

FrA.4 *(146)* Fri 8:45

Highly efficient Pr:LiYF$_4$-lasers — •Philip Metz, Fabian Reichert, Sebastian Müller, Daniel-Timo Marzahl, Nils-Owe Hansen, Matthias Fechner, Christian Kränkel, and Günter Huber — Institut für Laser-Physik, Universität Hamburg, Luruper Chaussee 149, D-22761 Hamburg, Germany

We report on highly efficient Pr:LiYF$_4$-lasers pumped with a frequency doubled OPS laser at 480 nm. Slope efficiencies

of 73% and 61% and optical-to-optical efficiencies of 70% and 49% are demonstrated at wavelengths of 523 nm and 607 nm, respectively, at up to 2 W of output power.

FrA.5 *(116)* Fri 9:00

High Peak Power, Yb:YAG/Cr:YAG Passively Q-switched MicroLaser — •Masaki Tsunekane and Takunori Taira — Institute for Molecular Science, Okazaki Aichi, Japan

A QCW diode end-pumped, high peak power Yb:YAG/Cr:YAG passively Q-switched micro-laser was demonstrated. Output pulse energy of 3.5mJ was obtained with a pulse duration of 1.3ns at a Cr:YAG initial transmission of 89%. The peak power is estimated to be 2.7MW.

FrA.6 *(60)* Fri 9:15

High energy and broadband Yb:CaF2 multipass amplifier — Dimitrios Papadopoulos[1,2], •Sandrine Ricaud[1,3], Louis Daniault[1], Florence Friebel[1], Alain Pelegrina[2], Marc Hanna[1], Patrice Camy[4], Jean Louis Doualan[4], Richard Moncorgé[4], Patrick Georges[1], and Frederic Druon[1] — [1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Univ Paris-Sud, 2 Av. A. Fresnel, 91127 Palaiseau, France — [2]Laboratoire d'Utilisation des Lasers Intenses, CNRS, Ecole Polytechnique, CEA, Univ. Pierre et Marie Curie, Palaiseau, France — [3]Amplitude Systèmes, 11 avenue de Canteranne, Cité de la Photonics, 33600 Pessac, France — [4]Centre de recherché sur les Ions, les Matériaux et la Photonique, CEA, CNRS, ENSICaen, Université de Caen, 14050, Caen, France

A novel multipass amplifier design based on Yb:CaF2 that permits high gain and high energy operation is presented. Up to 105 mJ pulses at 30 Hz are obtained for 1.3 mJ at the input. The passive coherent combination technique is also examined to increase the output energy to >200 mJ.

FrA.7 *(133)* Fri 9:30

High energy diode pumped Er:YSGG bounce geometry laser at ~3μm — •Emma Arbabzadah, Chris Phillips, and Michael Damzen — Imperial College London, London SW7 2BW, UK

A diode-pumped Er:YSGG laser operating at the 3-micron transition is presented. We report pulse energies ~55mJ and average powers ~2W under quasi-continuous wave pumping. Electro-optic Q-switching yields 0.5mJ pulses with duration ~100ns. This work demonstrates the promise for efficient, compact Er:YSGG lasers as potentially useful tools for mid-IR generation.

FrA.8 *(126)* Fri 9:45

Resonantly-pumped single-frequency Er:YLuAG-laser with pulsed emission at 1645.2 nm (air) — •Ansgar Meissner, Philipp Kucirek, and Hans-Dieter Hoffmann — Fraunhofer Institute for Laser Technology, Steinbachstr. 15, 52074 Aachen, Germany

A resonantly-pumped single-frequency Q-switched laser oscillator based on an Er:YLuAG crystal is reported. The wavelength is controlled with Ramp-and-Fire technique and is definable between 1644.5 nm and 1645.6 nm, which is suitable for CH4-Lidar-Systems. The laser emits single-frequency pulses at 100 Hz with 2.3 mJ and 90 ns.

FrA.9 *(120)* Fri 10:00

Broadly tunable OPS pumped Yb:CALGO laser — •Bastian Deppe, Alexander Heuer, Kolja Beil, Christian Kränkel, and Günter Huber — Institut für Laser-Physik, Universität Hamburg, Germany

We present laser experiments with Czochralski-grown Yb:CALGO crystals under pumping with an optically pumped semiconductor laser (OPS). A maximum output power of 2.4 W, slope efficiencies exceeding 60% and a spectral tuning range of over 70 nm were realized with >1.5 W output power between 1027 nm and 1072 nm.

38: Coffee Break

Time: Friday 10:15–10:30 Location: Main Hall Area

Coffee Break

FrB: Waveguide photonics

Time: Friday 10:45–12:30 Location: Oscar Klein - Lecture Hall

FrB.1 *(78)* Fri 10:45

Femtosecond-laser Written Diode-pumped Visible Pr:LiYF$_4$ Waveguide Laser — •Sebastian Müller, Thomas Calmano, Philip Metz, Christian Kränkel, and Günter Huber — Institut für Laser-Physik, Hamburg, Deutschland

In this contribution we present a femtosecond-laser inscribed Pr:YLF waveguide laser. Emission in the orange and red spectral region with output powers of 26 mW (604 nm) and 12 mW (720 nm) have been achieved under InGaN diode laser pumping.

FrB.2 *(77)* Fri 11:00

Dual Wavelength and Switchable Laser Operation of Visible Pr:SrAl$_{12}$O$_{19}$ Waveguide Lasers — •Thomas Calmano, Sebastian Müller, Fabian Reichert, Matthias Fechner, Nils-Owe Hansen, and Günter Huber — Institut für Laser-Physik, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany

Channel waveguides were fabricated in Pr:SrAl$_{12}$O$_{19}$ by femtosecond-laser writing. Dual wavelength and switchable laser operation in the visible spectral range could be demonstrated by using an output coupling mirror with variable transmission. Furthermore, output powers of 91 mW at 643.8 nm and 62 mW at 622.8 nm were obtained.

FrB.3 *(125)* Fri 11:15

Ti:Sapphire Channel Waveguide Lasers Produced by Femtosecond and Picosecond Laser Writing — •Christos Grivas[1], Costantino Corbari[2], Gilberto Brambilla[2], and Pavlos Lagoudakis[1] — [1]School of Physics and Astronomy, University of Southampton, Southampton SO17 1BJ, United Kingdom — [2]Optoelectronics Research Centre (ORC), University of Southampton, Southampton SO17 1BJ, United Kingdom

Fabrication and continuous-wave lasing near 798 nm is reported for femtosecond and picosecond laser-written channel waveguides in Ti:sapphire crystals. Channels inscribed by femtosecond (picosecond) pulses lase above a threshold of 84 mW (189 mW) with maximum output power and slope efficiency of 143 mW (45 mW) and 23.5% (7.1%), respectively.

FrB.4 *(118)* Fri 11:30

Single-mode, Tuneable Laser Operation of Hybrid Microcavities based on CdSe/CdS Core/Shell Colloidal Nanorods on Silica Microspheres — •Christos Grivas[1], Peri Andreakou[1], Pengfei Wang[2], Ming Ding[2], Gilberto Brambilla[2], Liberato Manna[3], and Pavlos Lagoudakis[1] — [1]School of Physics and Astronomy, University of Southampton, Southampton SO17 1BJ, United Kingdom — [2]Optoelectronics Research Centre (ORC), University of Southampton, Southampton SO17 1BJ, United Kingdom — [3]Istituto Italiano di Technologia (IIT), I-16163 Genoa, Italy

Fiber-coupled hybrid lasers based on colloidal CdSe/CdS core/shell semiconducting nanorods on silica microspheres produced single-mode emission near 628 nm above a 67.5-microwatts threshold. The lasing wavelength was tuned over a 2.1-nm range by laser-heating at 3.5 micrometers while the emission modality was dependent on the coupling conditions and microsphere size.

FrB.5 *(174)* Fri 11:45

Ytterbium-doped fiber laser mode-locked with electrooptical fiber — •Mikael Malmström[1], Oleksandr Tarasenko[2], Walter Margulis[2], and Fredrik Laurell[1] — [1]Laser Physics, Applied Physics, Royal Institute of Technology, Roslagstullsbacken 21, 10691 Stockholm, Sweden — [2]Fiber Photonics, Acreo, Electrum 236, 16440 Kista, Sweden

An actively mode-locked Yb-doped fiber laser is demonstrated, incorporating an electrooptical fiber phase modulator, driven with 40 Vpp. The all-spliced linear cavity generates subnanosecond pulses at 1065 nm wavelength with a fundamental repetition rate of 15.6 MHz. It produces comparable output pulses up to the 7th harmonic at 109 MHz.

FrB.6 *(9)* Fri 12:00

Temperature Induced Dynamic Refractive Changes in Fiber Amplifiers — •Henrik Tünnermann[1,2], Jörg Neumann[1,2], Dietmar Kracht[1,2], and Peter Wessels[1,2] — [1]Laser Zentrum Hannover e.V., Hollerithallee 8, D-30419 Hannover — [2]Centre for Quantum Engineering and Space-Time Research - QUEST, Welfengarten 1, 30167 Hannover, Germany

Thermally induced refractive index changes are important in high power fiber amplifiers. We present measurements of the time dependent optical phase shift and show it can be explained by radial heat diffusion through the fiber.

FrB.7 *(36)* Fri 12:15

Asymmetric single-mode fused fiber coupler for core pumping thulium-doped fiber at 795 nm — •Gabriel Pelegrina-Bonilla[1], Katharina Hausmann[1,2], Kai Liu[1], Hakan Sayinc[1,2], Uwe Morgner[1,2,3], Jörg Neumann[1,2], and Dietmar Kracht[1,2] — [1]Laser Zentrum Hannover e.V., Hollerithallee 8, D-30419 Hannover, Germany — [2]Centre for Quantum Engineering and Space-Time Research - QUEST, Welfengarten 1, D-30167 Hannover, Germany — [3]Institut für Quantenoptik, Leibniz Universität Hannover, Welfengarten 1, D-30167 Hannover, Germany

We present a fused fiber coupler capable of multiplexing wavelengths in the range of 795nm and 1980nm. Different single-mode fibers with single-mode guidance for the respective wavelength were employed. We achieved a transmission of 90% in the signal fiber for both wavelengths and demonstrated the application in a fiber amplifier.

40: Prizes, Closing Session

Time: Friday 12:30–12:45 Location: Oscar Klein - Lecture Hall

Prizes, Closing