OSA
Optical Society of America

ASSP

Eighteenth Topical Meeting and Tabletop Exhibit

February 2 - 5, 2003

Hyatt Regency
San Antonio, Texas, USA

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- Frank Tittel, *Rice Univ., USA*
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About ASSP

February 2 - 5, 2003

Advances in solid-state lasers and coherent nonlinear optical sources provide powerful tools for an increasingly broad range of applications including spectroscopy, remote sensing, communications, material processing, medicine, and entertainment. In recent years, the Advanced Solid-State Lasers topical meeting has extended its scope to include nonlinear frequency conversion and has been the meeting of choice for new developments in laser and nonlinear materials and devices.

Under the new name, Advanced Solid-State Photonics, the topical meeting is continuing its expansion to include anything that could impact the development of coherent solid-state sources from concepts and basic materials research, to new emerging devices, to the advanced applications that drive the development of the technology. Take this opportunity to be part of the year's most significant meeting on advanced solid-state sources; plan to attend Advanced Solid-State Photonics 2003.

Meeting Topics

Topics to be considered:

- Tunable and new wavelength solid-state lasers
- Diode-pumped lasers
- Fiber lasers
- Optically-pumped semiconductor lasers
- Photonic-crystal lasers
- Short-pulse lasers
- High-power lasers
- Frequency-stable lasers
- Microlasers
- Optical sources based on nonlinear frequency conversion
- Frequency conversion techniques, including OPO, OPA, OPG, SHG, and SFG
- Quasi-phasematching
- Nonlinear waveguides
- Developments in laser media
- Developments in nonlinear optical materials
- Applications enabled by advanced laser technology
- Applications driving the development of new laser technology
    - Developments in nonlinear optical materials
    - Applications enabled by advanced laser technology
    - Applications driving the development of new laser technology

Invited Speakers

Speakers

The invited speakers for the main program include:

- Past, present, and future role of solid-state lasers at NASA, MC1
  Ghassem Asrar, *NASA Headquarters, USA*
- Power scaling concepts for fiber lasers, WA1
  Andrew Clarkson, *Univ. of Southhampton, UK*
- Linear and nonlinear optics in discrete systems, TuC1
  Falk Lederer, *Univ. of Jena, Germany*
- Recent progress in frequency-doubled CW OPS lasers, MD1
  Vasily Ostroumov, *Coherent Luebeck GmbH, Germany*
- Generation and wavelength conversion of laser light in photonic-crystal fibers, WD1
  Philip Russell*, Univ. of Bath, UK*

Banquet Speaker

The conference banquet will feature a presentation entitled "Night thoughts on fiber lasers" from David Hanna, *Univ. of Southampton, UK.*

In general, a study of History can help in predicting the Future. That will be the guiding principle of this talk, starting with a review of early fibre lasers, to provide a perspective for considering possible future developments.

Publications

Advance Program

The Advance Program will be available only via the website, in early December 2002. A broadcast email will be sent to all previous registrants and authors notifying them of the availability of the online program.

Technical Digest

The ASSP Technical Digest will be comprised of the camera-ready summaries of papers being presented during the meeting. At the meeting, each registrant will receive a copy of the Technical Digest. Extra copies may be purchased at the meeting for a special price of $60 USD.

TOPS Proceedings Volume

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

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

Each registrant will receive a copy of the TOPS Advanced Solid-State Photonics proceedings volume, upon publication in June 2003, as part of the registration fee. Extra copies of the volume can be purchased in advance at the meeting for a special price of $60.00 US (shipping & handling included).

2003 ASSP Exhibitor List

A brief listing of this year's exhibitors:

- Coherent
- Crystal Fibre A/S
- Cutting Edge Optronics
- Deltronic Crystal Industries, Inc.
- ELS Elektronic Laser System GmbH
- EKSMA Co.
- Inrad
- Laser Focus World
- LAS-CAD GmbH
- LINOS
- Lisa Laser Products OHG
- MegaWatt Lasers, Inc.
- Northrop Grumman Poly-Scientific
- Onyx Optics
- OXIDE Corporation
- Photonics Industries International, Inc.
- Photonics Spectra
- Positive Light
- Scientific Materials Corp.
- Spiricon, Inc.
- Super Optronics
- VLOC, subsidiary of II-VI, Inc.

Agenda of Sessions

Sunday, February 2, 2003

Time	Event
3:00pm - 5:00pm	Registration *Los Rios Foyer*

Monday, February 3, 2003

Time	Event
7:00am - 5:00pm	Registration *Los Rios Foyer*
7:00am - 7:50am	Continental Breakfast
7:50am - 8:00am	Opening Remarks *Regency East Ballroom*
8:00am - 10:00am	MA: MID-IR-Sources *Regency East Ballroom*
10:00am - 11:00am	MB: Poster Session: I and Coffee Break *Rio Grande Ballroom*
11:00am - 12:30pm	MC: Sources for Remote Sensing *Regency East Ballroom*
12:30pm - 2:00pm	Lunch Break *(On Your Own)*
2:00pm - 4:00pm	MD: Fiber Systems *Regency East Ballroom*
4:00pm - 4:30pm	Coffee Break *Rio Grande Ballroom*
4:30pm - 6:00pm	ME: Postdeadline Session *Regency East Ballroom*

Tuesday, February 4, 2003

Time	Event
7:00am - 12:30pm	Registration *Los Rios Foyer*
8:00am - 10:00am	TuA: Femtosecond Oscillators *Regency East Ballroom*
10:00am - 11:00am	TuB: Poster Session: II *Rio Grande Ballroom*
11:00am - 12:30p	TuC: Materials (Pg. 17) *Regency East Ballroom*
12:30pm - 7:00pm	Lunch (On Your Own) *FREE AFTERNOON*
7:00pm - 10:00pm	Conference Banquet *Regency East Ballroom*

Wednesday, February 5, 2003

Time	Event
7:00am - 5:00pm	Registration *Los Rios Foyer*
8:00am - 9:45am	WA: Ultra-High Power Lasers *Regency East Ballroom*
9:45am - 10:45am	WB: Poster Session: III *Rio Grande Ballroom*
10:45am - 12:30pm	WC: UV and Blue Sources *Regency East Ballroom*
12:30pm - 2:00pm	Lunch Break *(On Your Own)*
2:00pm - 3:15pm	WD: Novel Sources *Regency East Ballroom*
3:15pm - 3:45pm	Coffee Break *Rio Grande Ballroom*
3:45pm - 6:15pm	WE: 1mm Lasers *Regency East Ballroom*

2003 Advanced Solid-State Photonics
Advanced Program Agenda and Abstracts

February 2 – 5, 2003
Hyatt Regency
San Antonio, Texas, USA

Sunday, February 2, 2003		
3:00pm - 5:00pm	Registration *Los Rios Foyer*	
Monday, February 3, 2003		
7:00am - 5:00pm	Registration *Los Rios Foyer*	
7:00am - 7:50am	Continental Breakfast	
7:50am - 8:00am	Opening Remarks *Regency East Ballroom*	
8:00am - 10:00am	**MA:** MID-IR-Sources *Regency East Ballroom*	(Pg. 3)
10:00am - 11:00am	**MB:** Poster Session: I and Coffee Break *Rio Grande Ballroom*	(Pg. 5)
11:00am - 12:30pm	**MC:** Sources for Remote Sensing *Regency East Ballroom*	(Pg. 8)
12:30pm - 2:00pm	Lunch Break *(On Your Own)*	
2:00pm - 4:00pm	**MD:** Fiber Systems *Regency East Ballroom*	(Pg. 9)
4:00pm - 4:30pm	Coffee Break *Rio Grande Ballroom*	
4:30pm - 6:00pm	**ME:** Postdeadline Session *Regency East Ballroom*	(Pg. 11)
Tuesday, February 4, 2003		
7:30am - 12:30pm	Registration *Los Rios Foyer*	
7:00am - 8:00am	Continental Breakfast	
8:00am - 10:00am	**TuA:** Femtosecond Oscillators *Regency East Ballroom*	(Pg. 11)
10:00am - 11:00am	**TuB:** Poster Session: II *Rio Grande Ballroom*	(Pg. 13)
11:00am - 12:30pm	**TuC:** Materials *Regency East Ballroom*	(Pg. 17)
12:30pm - 7:00pm	Lunch *(On Your Own)* FREE AFTERNOON	
7:00pm - 10:00pm	Conference Banquet *Regency East Ballroom*	
Wednesday, February 5, 2003		
7:30pm - 5:00pm	Registration *Los Rios Foyer*	
7:00am - 8:00am	Continental Breakfast	
8:00am - 9:45am	**WA:** Ultra-High Power Lasers *Regency East Ballroom*	(Pg. 19)
9:45am - 10:45am	**WB:** Poster Session: III *Rio Grande Ballroom*	(Pg. 20)
10:45am - 12:30pm	**WC:** UV and Blue Sources *Regency East Ballroom*	(Pg. 24)
12:30pm - 2:00pm	Lunch Break *(On Your Own)*	
2:00pm - 3:15pm	**WD: Novel Sources** *Regency East Ballroom*	(Pg. 25)
3:15pm - 3:45pm	Coffee Break *Rio Grande Ballroom*	
3:45pm - 6:15pm	**WE: 1mm Lasers** *Regency East Ballroom*	(Pg. 26)

■ **Sunday**
■ **February 2, 2003**

Los Rios Foyer
3:00pm – 5:00pm
Registration

■ **Monday**
■ **February 3, 2003**

Los Rios Foyer
7:00am – 5:00pm
Registration

7:00am – 7:50am
Continental Breakfast

Regency East Ballroom
7:50am – 8:00am
General Chair's Opening Remarks
Martin E. Fermann, ***IMRA America, USA***

Regency East Ballroom
8:00am – 10:00am
MA ■ MID-IR-Sources
Dennis Lowenthal, Aculight Corp., Edmonds, WA, USA, Presider

MA1 8:00am
Eyesafe erbium glass micro-laser, *W. Trussell, V. King, A. Hays, A. Hutchinson, U.S. Army CECOM, RDEC, Fort Belvoir, VA, USA; S. Hamlin, MegaWatt Lasers, Hilton Head Island, SC, USA.*
We have developed an eyesafe micro-laser producing pulses with 50 kilowatts of peak power at up to 20 Hertz. This device has a volume of less than two cubic centimeters and operates from a single battery.

MA2 8:15am
Tunable CW Er:YLF diode-pumped laser, *A. Dergachev, P. Moulton, Q-Peak, Inc., Bedford, MA, USA.*
We report a 4-W, 2810-nm, diode-pumped, cw Er:YLF laser, to the best of our knowledge the highest power achieved for a cw 3-um Er-laser. The laser was tuned on 11 different lines in the 2720-2840-nm region.

MA3 8:30am

250 mW continuous-wave output from Er,Yb:YCOB laser at 1.5 µm, *P. Burns, J. Dawes, P. Dekker, J. Piper, Macquarie University, Sydney, Australia; H. Jiang, J. Wang, Shandong University, Jinan, China.*

250mW continuous-wave laser output is demonstrated in the Er,Yb:YCOB host in an hemispherical cavity with 22% slope efficiency. Laser output has also been observed in a flat-flat and microchip cavity configurations.

MA4 8:45am

Improving the beam quality of Mid-IR OPOs using an unstable resonator, *M. Bohn, W. Riede, G. Renz, DLR, Vaihingen, Germany.*

We report a 400% improvement in the beam quality of a Nd:YAG (0.5 Joule) pumped $LiNbO_3$ mid-IR OPO using an unstable resonator. The beam quality, M^2, was improved from 12.5 to 3.

MA5 9:00am

Amplifier-enhanced optical parametric oscillator as stable and tunable mid-IR source, *I. Zotova, University of Arkansas, Fayetteville, AR, USA; X. Mu, Y. Ding, Lehigh University, Bethlehem, PA, USA; J. Khurgin, Johns Hopkins University, Baltimore, MD, USA.*

We have demonstrated that the threshold for an optical parametric oscillator based in periodically-poled $LiNbO_3$ as a stable and tunable mid-IR source is significantly reduced by using an optical amplifier in the same cavity.

MA6 9:15am

A high power, line-narrowed doubly resonant ZGP OPO, *S. Setzler, P. Schunemann, T. Pollak, BAE SYSTEMS, Nashua, NH, USA.*

We report a high power $ZnGeP_2$ optical parametic oscillator seeded by a 3.39mm HeNe laser. The OPO is configured as a ring for easy seeding. Optimal line-narrowing is obtained when the OPO is noncollinearly phasematched.

MA7 9:30am

Ultra-efficient Ho:YAG laser end-pumped by a cladding-pumped Tm-doped silica fibre laser, *A. Abdolvand, D. Shen, L. Cooper, R. Williams, W. Clarkson, Optoelectronics Research Centre, Southampton, United Kingdom.*

We report a Ho:YAG laser with 5.2W of TEM_{oo} output at 2097nm at room-temperature and with a slope efficiency with respect to incident pump power of 80%, pumped by a Tm-doped silica fibre laser.

MA8 9:45am

High-power and Q-switched Cr:ZnSe lasers, *W. Alford, G. Wagner, J. Keene, T. Carrig, Coherent Technologies, Inc., Lafayette, CO, USA.*

We have demonstrated output power in excess of 7 W at a wavelength of ~2.5 µm from a Cr:ZnSe laser pumped by a diode-pumped $Tm:YAlO_3$ laser. We have also obtained the first Q-switched pulses from a Cr:ZnSe laser.

Rio Grande Ballroom
10:00am – 11:00am
Coffee Break
MB ■ Poster Session: I

MB1
FM to AM conversion issue within a regenerative amplifier, *J. Luce, G. Deschaseaux, H. Coic, A. Jolly, L. Videau, CEA, Le Barp, France.*
The FM to AM conversion issues inside diode pumped Nd:glass regenerative amplifiers are reported. We describe the main issues in the reduction of output modulations with injection by a phase modulated-single mode source.

MB2
State of the art of a highly multiplexed new source for parallel LIL - LMJ fusion lasers, *A. Jolly, J. Gleyze, J. Luce, H. Coic, G. Deschaseaux, CEA, Le Barp, France.*
A new laser system is currently designed for the LIL-LMJ fusion lasers. This system makes use of bulk optics and can provide improved performance and higher reliability. It is compared with the first "fully fibered" design on LIL.

MB3
Generation of 50 mJ, 1Hz sub-picosecond pulses based on diode-pumped Nd:Glass regenerative amplifier, *X. Ribeyre, J. Luce, L. Videau, C. Rouyer, CEA CESTA, Le Barp, France; M. Mullot, R. Mercier, IOTA, Orsay, France.*
We have built a diode-pumped Nd:Glass regenerative amplifier based on the use of a phase mirror and adding an intracavity birefringent filtrer. Energie up to 50 mJ have been obtained in 540 fs pulse at 1Hz repetition rate.

MB4
Self-stimulating, transversely diode-pumped Nd^{3+}: $PbWO_4$ yellow laser, *A. Hamano, Y. Usuki, FURUKAWA CO.,LTD., Tsukuba, Japan; T. Omatsu, Chiba University, Chiba, Japan.*
We present a compact diode-pumped, self-generating, actively Q-switched Nd^{3+}: $PbWO_4$ yellow laser. The yellow laser output energy of 6μJ was obtained at the diode energy of 34mJ. Pulse width of the yellow output was 15ns.

MB5
Efficient laser performance of Nd:$GdVO_4$ crystals grown by the floating zone method, *T. Ogawa, S. Wada, RIKEN, Saitama, Japan; H. Machida, NEC Tokin Corporation, Tsukuba, Japan; T. Shonai, M. Higuchi, K. Kodaira, Hokkaido University, Sapporo, Japan.*
Using a 2at.% Nd-doped $GdVO_4$ crystal grown by the floating zone method, the slope efficiency of 75% was achieved with pumping at 879nm. We also demonstrated two types of crystal growth, which conveniently provides c- and a-cut crystals for practical use.

MB6

CW Nd:YLF lasers for cold atom optical clocks, *Y. Louyer, P. Juncar, M. Himbert, BNM-INM, CNAM, Paris, France; M. Plimmer, BNM-INM,CNAM, Paris, France; F. Balembois, P. Georges, Institut d'Optique Théorique et Appliquée, Orsay, France.*

We describe single-frequency operation of diode-pumped Nd :YLF lasers around 1.3 µm. Their harmonics are destined for laser cooling of atomic silver, and interrogation of clock transitions in silver and calcium.

MB7

Dispersive tuning and performance of a pulsed Nd:YAG laser, *N. Barnes, Langley Research Center, Hampton, VA, USA; B. Walsh, R. Davis, NASA Langley Research Center, Hampton, VA, USA.*

A flashlamp pumped Nd:YAG laser was tuned to 12 laser transitions from 1.052 – 1.356 µm using a dispersive resonator. Experimental results for threshold and slope efficiency agree quite well with a model that utilizes spectroscopically measured parameters.

MB8

The solid-state heat capacity laser: crystals, *M. Randles, Northrop Grumman Poly-Scientific, Charlotte, NC, USA.*

Progress is reported on the growth of high-quality Nd-doped Gadolinium Gallium Garnet (GGG) laser crystals with a diameter of 6.3 inches (16cm) for the SSHCL. In addition Cobalt-doped GGG was grown as an improved parasitic absorber for edge cladding.

MB9

Thermal-induced two-photon absorption reduction of $Li_2B_4O_7$ for the high-pulse-energy scaling of the fourth harmonic generation of Nd:YAG laser, *G. Masada, H. Shiraishi, I. Sekine, Mitsubishi Materials Corporation (MMC), Naka, Ibaraki, Japan; Y. Suzuki, S. Ono, N. Sarukura, Institute of Molecular Science (IMS), Okazaki, Aichi, Japan.*

Thermal-induced two-photon-absorption reduction is found for the $Li_2B_4O_7$. By raising the temperature upto 100 degrees, 33 % increase of the fourth harmonic of Nd:YAG laser upto 0.43-J are achieved at 10-Hz repetition rate.

MB10

Quadruple pass amplifier for a Q-switched 0.946 µm laser, *T. Axenson, Science & Technology;Technology Corporation, Hampton, VA, USA; N. Barnes, D. Reichle, NASA Langley Research Center, Hampton, VA, USA.*

An innovative approach – quadruple passing an end-pumped amplifier – has produced an unprecedented small signal gain of 3.3 at 0.946 µm in Nd:GYAG.

MB11

Efficient frequency extension of a diode-side-pumped Nd:YAG laser by intracavity SRS in crystalline materials, *H. Ogilvy, H. Pask, J. Piper, Macquarie University, Sydney, Australia; T. Omatsu, Chiba University, Chiba, Japan.*

Efficient frequency extension of a diode-side-pumped, Q-switched 1064nm Nd:YAG laser generating ~5W at 5kHz has been demonstrated by way of intracavity SRS in crystalline $Ba(NO_3)_2$ (1197nm), $KGd(WO_4)_2$ (1158nm and/or 1177nm), $LiIO_3$ (1156nm) and $PbWO_4$ (1170nm).

MB12

Near quantum-defect slope efficiency laser operation in Nd:YVO$_4$ under direct pumping into the emitting level, *Y. Sato, N. Pavel, T. Taira, Institute for Molecular Science, Okazaki, Japan; V. Lupei, Solid-State Quantum Electronics Lab., Bucharest, Romania.*

One-micron continuous-wave laser emission with 80% slope efficiency (0.79 input-to-output efficiency) under Ti:Sapphire and 75% slope efficiency under diode laser pumping at 880 nm into the emitting level is demonstrated in a 1.0-at.% Nd:YVO$_4$ medium.

MB13

Interferometric study of refractive index changes in Nd:YAG laser crystals under intensive pumping due to Nd^{3+}-ion excitation, *O. Antipov, O. Eremeykin, Russian Academy of Science, Nizhny Novgorod, Russian Federation; A. Savikin, D. Bredikhin, M. Kuznetsov, Nizhny Novgorod State University, Nizhny Novgorod, Russian Federation.*

Refractive index changes in an Nd:YAG crystal under intensive pumping were studied using a polarization interferometer. An electronic index change was measured to be high in the crystal under diode-stack pumping. The electronic component increased dramatically under additional fourth-harmonic pumping.

MB14

100-picosecond Raman microchip laser, *A. Demidovich, P. Apanasevich, L. Batay, A. Grabchikov, V. Lisinetskii, V. Orlovich, National Academy of Sciences of Belarus, Minsk, Belarus; A. Kuzmin, SUNY, University at Buffalo, Buffalo, NY, USA; O. Kuzmin, STC FIRN, Krasnodar, Russian Federation; M. Danailov, Laser Lab Sincrotrone-Trieste, Trieste, Italy; W. Kiefer, Universität Würzburg, Würzburg, Germany.*

Laser characteristics of subnanosecond pulsed operation of Raman microchip lasers have been investigated. The pulse duration obtained at the Stokes wavelength 1196 nm was as short as 98 ps. Optical conversion efficiency of 8% to the Stokes power has reached.

MB15 **Paper withdrawn.**

MB16

Use of slabs in Faraday isolators and Faraday mirrors for radiation with average power up to 10 kW, *E. Khazanov, Institute of Applied Physics, N. Novgorod, Russian Federation.*

Analytically we have obtained dependences of thermally induced depolarization in Faraday devices on radiation power and on slab aspect ratio. The use of slabs instead of rods enables the creation of various Faraday devices operating at multikilowatt power.

MB17

Characterisation and correction of radiation from micro-lensed stacked laser diode bars, *J. Monjardin, K. Nowak, A. Holdsworth, H. Baker, D. Hall, Heriot Watt University, Edinburgh, United Kingdom.*

Wavefront sensing has been used to characterise fast axis pointing errors and micro-lens aberrations in laser diode stacks. Phaseplate correction has been implemented to increase the beam brightness by factors of 5-10.

MB18

Fiber-coupled high brightness, high power diode laser for solid-state laser pumping and material processing, *B. Ehlers, S. Heinemann, Fraunhofer USA, Center for Laser Technology, Plymouth, MI, USA.*

A fiber-coupled diode laser system delivers 250W out of a 600 mirometer fiber. It incorporates an optic that changes the oblong laser mode distribution into a symmetric beam. Polarization-multiplexing and beam interleaving are exploited. Initial fiber-laser pumping results are included.

MB19

Prediction and measurements of thermo-mechanical and thermo-optical parameters for high power solid state lasers, *B. Viana, R. Gaumé, D. Vivien, LCAES-ENSCP, Paris, France; D. Fournier, J. Roger, Laboratoire d'Optique Physique, Paris, France.*

Thermo-mechanical parameters such as thermal conductivity, thermal expansion coefficient and dn/dT have been calculated and experimentally determined for various laser materials. Variation of the thermal conductivity with Yb dopant is investigated .

MB20

Studies of energy storage and pulse amplification in a large core Nd:YAG diode pumped planar waveguide laser, *J. Xu, J. Lee, H. Baker, D. Hall, Heriot Watt University, Edinburgh, United Kingdom.*

We report the use of an Nd:YAG planar waveguide structure as the gain medium in a Q-switched oscillator, and separately as a power amplifier in a MOPA system producing high brightness output beams at power levels of ~200W.

Regency East Ballroom
11:00am – 12:30pm
MC ■ Sources for Remote Sensing
James Barnes, Langley Research Center, Hampton, VA, USA, Presider

MC1 11:00am ***INVITED***

Space-based earth observations in 21st century, *G. Asrar, NASA, Washington, DC, USA.*

NASA's Earth Science Enterprise has the lead role in fulfilling the first element of the Agency's three part mission statement; "To Understand and Protect Our Home Planet" We endeavor to accomplish this by developing a scientific understanding of the "Earth System" and its response to natural and human-induced changes to enable improved prediction of climate, weather, and natural hazards.

MC2 11:30am
Space-based laser design, *F. Hovis, G. Witt, E. Sullivan, K. Andes, B. Suliga, K. Le, E. Fakhoury, M. Fromm, Fibertek, Inc., Herndon, VA, USA.*
Space-based missions impose a unique set of requirements on laser designs. We will discuss a set of guidelines we developed during the design of the laser transmitter for the CALIPSO aerosol lidar mission.

MC3 11:45am
Multi-line Doppler/ DIAL laser radar transmitter based on an OPO with high idler absorption, *S. Christensen, J. Alford, J. Marquardt, I. McKinnie, T. Carrig, Coherent Technologies Inc., Lafayette, CO, USA; P. Schlup, University of Otago, Dunedin, New Zealand; W. Bach, U.S. Army Research Office, Research Triangle Park, NC, USA.*
We have developed a novel multiline infrared laser for dual-mode coherent/direct-detection Doppler/DIAL measurements of wind velocity and 3-D aerosol and chemical concentration. 2.02µm and 3.4-3.6µm tunable output are generated by a highly efficient Tm:LuAG-pumped PPLN OPO despite high idler absorption.

MC4 12:00pm
A continuous-wave optical parametric oscillator for mid infrared trace gas detection, *F. Mueller, A. Popp, F. Kuehnemann, Institute of Applied Physics, Bonn, Germany; S. Schiller, Institute of Experimental Physics, Duesseldorf, Germany.*
We present a continuous-wave, pump-resonant, singly-resonant optical parametric oscillator in a linear dual-cavity design which is applied for photoacoustic trace gas detection between 2.35 and 3.75 µm. An ethane detection limit of 110 ppt is achieved.

MC5 12:15pm
Coherent mid-IR wave tunable in the range of 15-28 mm in CdSe, *W. Shi, Y. Ding, Lehigh University, Bethlehem, PA, USA.*
We have achieved coherent radiation continuously tunable in the range of 15-28 mm based on type-II phase-matched and non-phase-matched difference-frequency generation in CdSe.

12:30pm – 2:00pm
Lunch Break (on your own)

Regency East Ballroom
2:00pm – 4:00pm
MD ■ Fiber Systems
Johan Nilsson, Univ. of Southampton, Southampton, United Kingdom, Presider.

MD1 2:00pm ***INVITED***

Generation and wavelength conversion of laser light in photonic crystal fibres, *P. Russell, J. Knight, F. Benabid, G. Bouwmans, G. Antonopoulos, W. Reeves, W. Wadsworth, University of Bath, Bath, Avon, United Kingdom.*

By offering greatly enhanced control of light compared to conventional step-index structures, photonic crystal fibres are radically improving the performance of nonlinear fibre devices, including gas-Raman cells, super-continuum generators, soliton systems and cladding-pumped lasers.

MD2 2:30pm

Femtosecond fiber-feedback OPO with 18 W average power based on periodically poled stoichiometric $\mathbf{LiTaO_3}$, *T. Südmeyer, E. Innerhofer, F. Brunner, R. Paschotta, U. Keller, Institute of Quantum Electronics, Swiss Federal Institute of Technology (ETH), Zürich, Switzerland; T. Usami, H. Ito, RIEC, Tohoku University, Sendai, Japan; M. Nakamura, K. Kitamura, National Institute for Materials Science, Tsukuba, Japan; D. Hanna, Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom.*

We demonstrate a synchronously pumped high-gain OPO with feedback through a fiber, using an Yb:YAG thin disk laser as pump source. We obtained 18 W average signal power at a wavelength of 1.45 μm in 900-fs pulses.

MD3 2:45pm

938nm Nd-doped high power cladding pumped fiber amplifier, *J. Dawson, R. Beach, A. Drobshoff, Z. Liao, D. Pennington, S. Payne, Lawrence Livermore National Laboratory, Livermore, CA; L. Taylor, W. Hackenberg, D. Bonaccini, European Southern Observatory, Garching-bei-Muenchen, Germany.*

2.1W of 938nm light has been produced in an Nd^{3+} doped fiber amplifier. Wavelength dependent losses can be employed to minimize 1088nm amplified spontaneous emission giving the optical fiber a distinct advantage over bulk media.

MD4 3:00pm

Scalable coherent beam combining of fiber lasers, *A. Shirakawa, T. Sekiguchi, K. Ueda, University of Electro-Communications, Chofu, Tokyo, Japan.*

Coherent addition of N fiber lasers using fiber couplers has been investigated for N=2, 4, and 8. As N increases, higher addition efficiency can be obtained due to suppression of sidebands by lineshape narrowing.

MD5 3:15pm

Fully fiber integrated, 4W continuum source based on holey fiber and seeded Yb pump, *A. Avdokhin, S. Popov, M. Solodyankin, R. Taylor, Imperial College, London, United Kingdom; A. Avdokhin, M. Solodyankin, NTO IRE-Polus, Fryazino, Russian Federation.*

We report on fully fibre integrated, white light source with 4.1W average power and 200-280nm width. Single pass Raman continuum generation in the holey fibre spliced to single mode fibre is employed. The splices handle up to 10.5W average power.

MD6 3:30pm

High power supercontinuum generation based on femtosecond fiber amplifier, *T. Schreiber, J. Limpert, H. Zellmer, A. Tünnermann, Institute of Applied Physics, Jena, Germany; K. P. Hansen, Crystal Fibre A/S, Birkerod, Denmark.*

We report on the watt-level average power, flat supercontinuum generation (<500 nm to >1800 nm) in different air-silica microstructered fibers using a compact single-mode ytterbium-doped femtosecond fiber amplifier at 1060 nm wavelength. The experimental results are confirmed by numerical simulations.

MD7 3:45pm

Self-compression effects and Raman soliton generation in a photonic crystal fiber seeded by a 100-fs-pulsed diode–pumped Yb-doped oscillator, *F. Druon, N. Sanner, G. Lucas-Leclin, P. Georges, Laboratoire Charles Fabry de l'Institut d'Optique, Orsay, France; J. Dudley, Université de Franche-Comté, Besançon, France.*

We demonstrate the use of a photonic crystal fiber for nonlinear pulse compression of pulses from a diode-pumped ytterbium laser. A broad tunability from 1 to 1.3-µm for sub-75-fs pulses is also reported.

Rio Grande Ballroom
4:00pm – 4:30pm
Coffee Break

Regency East Ballroom
4:30pm – 6:00pm
ME ■ Postdeadline Session

■ Tuesday
■ February 4, 2003

Los Rios Foyer
7:30am – 12:30pm
Registration

7:00am – 8:00am
Continental Breakfast

Regency East Ballroom
8:00am – 10:00am
TuA ■ Femtosecond Oscillators
Franz Kärtner, Massachusetts Institute of Technology, Cambridge, MA, USA, Presider.

TuA1 8:00am

Sub-50-fs pulses with 24-W average power from a passively mode-locked thin disk Yb:YAG laser with nonlinear fiber compression, *F. Brunner, T. Südmeyer, E. Innerhofer, R. Paschotta, U. Keller, Institute of Quantum Electronics, Swiss Federal Institute of Technology (ETH), Zurich, Switzerland; K. Furusawa, J. Baggett, T. Monro, D. Richardson, Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom.*

By combining a passively mode-locked high-power laser with a large mode area holey fiber for nonlinear compression, we generated sub-50-fs pulses with 24-W average power. The output beam is diffraction-limited and linearly polarized.

TuA2 8:15am

Tuning of compact femtosecond Cr: LiSAF lasers a using novel birefringent filter design, *B. Stormont, I. Cormack, A. Kemp, B. Agate, T. Brown, W. Sibbett, University of St. Andrews, St. Andrews, United Kingdom; R. Szipocs, R&D Lézer-Optika Bt, Budapest, Hungary.*

Smooth tuning over 30nm is demonstrated by a compact prismless femtosecond Cr:LiSAF laser using broadband negatively dispersive mirrors and a specially designed birefringent filter. 150fs pulses are generated with an electrical-to-optical efficiency exceeding 1%.

TuA3 8:30am

Tunable pulse-generating sources at 1.5 µm with 10-160 GHz repetition rate, *S. Lecomte, R. Paschotta, U. Keller, ETH, Zürich, Switzerland; L. Krainer, G. Spühler, K. Weingarten, GigaTera Inc., Dietikon, Switzerland.*

We describe two approaches to generate high repetition rate pulse trains at 1.5 µm: the direct approach with a passively mode-locked Er:Yb:glass laser and the indirect approach with an optical parametric oscillator, pumped with a 1-µm passively mode-locked Nd:YVO_4 laser.

TuA4 8:45am

Directly diode-pumped femtosecond Cr^{4+}:YAG laser, *S. Naumov, E. Sorokin, I. Sorokina, TU Vienna, Photonics Inst., Vienna, Austria.*

We report directly diode-pumped self-starting mode-locked Cr^{4+}:YAG laser with the InGaAs-InP semiconductor saturable absorber mirror (SESAM), generating 62 fs transform-limited pulses.

TuA5 9:00am

All-optical active mode-locking of a ps-Nd:YVO_4-laser, *W. Seitz, R. Ell, U. Morgner, University of Karlsruhe (TH), Karlsruhe, Germany; T. Schibli, F. Kärtner, MIT, Cambridge, MA, USA; M. Lederer, Australian National University, Canberra, Australia.*

We present an all-optical active mode-locking scheme applied to a Nd:YVO_4-laser. Optically modulating the reflectivity of an intracavity semiconductor mirror leads to pulse widths between 6 and 20 ps depending on the carrier recombination time.

TuA6 9:15am

Generation of 2-nJ pulses from a femtosecond Yb fiber laser, *H. Lim, F. Ilday, F. Wise, Cornell University, Ithaca, NY, USA.*

We report a Yb fiber laser that generates 100-fs pulses with 2.2 nJ energy. The laser also produces pulses as short as 52 fs. These are the highest-energy and shortest pulses produced by a Yb fiber laser.

TuA7 9:30am

Highly-efficient mode-locking of the Yb:Sc_2O_3 laser, *P. Klopp, U. Griebner, V. Petrov, Max-Born-Institute, Berlin, Germany; K. Petermann, V. Peters, University of Hamburg, Hamburg, Germany.*

Mode-locking of the Yb:Sc_2O_3 laser with a saturable absorber mirror is demonstrated. The pump efficiency reached 47% in the picosecond regime and with dispersion compensation pulses as short as 230 fs were obtained at 1044.5 nm.

TuA8 9:45am

Diode-pumped 100-fs lasers based on a new apatite-structure crystal: Yb^{3+}:$SrY_4(SiO_4)_3O$, *P. Raybaut, F. Druon, S. Chénais, F. Balembois, P. Georges, Laboratoire Charles Fabry de l'Institut d'Optique, Orsay, France; R. Gaumé, B. Viana, D. Vivien, Laboratoire de Chimie Appliquée de l'Etat Solide, Paris, France; S. Dhellemmes, V. Ortiz, C. Larat, THALES Research and Technology, Orsay, France.*

We demonstrated sub-100-fs lasers based on an Yb-doped apatite crystal called Yb:SYS (Yb^{3+}:$SrY_4(SiO_4)_3O$). 94-fs pulses have been obtained at 1070 nm with an average power of 110 mW. We also discussed the first results obtained with an Yb:SYS regenerative amplifier.

Rio Grande Ballroom

10:00am – 11:00am

Coffee Break

TuB ■ Poster Session: II

TuB1

Spectral broadening and shift of the few optical cycle pulses in Cr^{4+}:YAG laser, *V. Kalashnikov, S. Naumov, E. Sorokin, I. Sorokina, Institut fuer Photonik, Vienna, Austria.*

Spectral characteristics of the few optical cycle pulses in Cr^{4+}:YAG laser were investigated both experimentally and theoretically. Spectral extra-broadening (up to 400 nm) and red-shift (up to 100 nm) were observed and explained.

TuB2

Study on a diode-pumped Yb:Y_2O_3 ceramic laser, *J. Kong, D. Tang, D. Shen, Nanyang Technological University, Singapore, Singapore; J. Lu, K. Takaichi, T. Uematsu, K. Ueda, Institute for Laser Science, University of Electro-Communications, Chofu, Japan; H. Yagi, T. Yanagitani, Takuma Works, Konoshima Chemical Co., Ltd, Kagawa, Japan; A. Kaminskii, Institute of Crystallography, Russian Academy of Sciences, Moscow, Russian Federation.*

We report on a polycrystalline Yb:Y_2O_3 ceramic laser and its random wavelength emission characteristic. Passive Q-switching by using a GaAs saturable absorber the Q-Switched pulse has also been achieved in the laser.

TuB3

CW Yb:YSO diode pumped laser emitting at 1003.4 nm for the realization of a stable frequency standard, *M. Jacquemet, F. Balembois, S. Chénais, F. Druon, P. Georges, Laboratoire Charles Fabry de l'Institut d'Optique, Orsay, France; R. Gaumé, B. Viana, D. Vivien, Laboratoire de Chimie Appliquée de l'Etat Solide, Paris, France; B. Ferrand, LETI/DOPT/CEA-G, Grenoble, France.*

Laser emission at 1003.4 nm with an ytterbium doped crystal (Yb:YSO) is reported for the first time by using a new diode pumping scheme. A power of 16 mW at 1003.4 nm was obtained.

TuB4

Efficient self-frequency Raman conversion in a passively Q-switched diode-pumped Yb:KGd(WO$_4$)$_2$ laser, *N. Kuleshov, V. Kisel, V. Shcherbitsky, International Laser Center, Minsk, Belarus.*

Self-frequency Raman conversion in Yb:KGd(WO$_4$)$_2$ laser was demonstrated with conversion efficiency as high as 40%. The output pulses with energy of 8.2 μJ as short as 0.7 ns with repetition rate of 13.3 kHz have been obtained at 1145 nm.

TuB5 **Paper withdrawn.**

TuB6

CW and Q-switched operation of end-pumped thin-rod Yb:YAG lasers, *S. Kawato, S. Takasaki, M. Fukuda, T. Kobayashi, Fukui University, Fukui, Japan.*

A diode-end-pumped thin-rod Yb:YAG laser has been developed for CW and Q-switched oscillation. An output power of 55 W was obtained at 207 W pump power without compensation of thermal focusing at room temperature.

TuB7

Yb:SFAP multipass side-pumped amplifier, *B. Pati, Y. Isyanova, P. Moulton, Q Peak, Inc., Bedford, MA, USA.*

We report a diode side-pumped, single-stage, multi-pass Yb:S-FAP amplifier designed to achieve high pump brightness, uniform absorption, and high amplification. We demonstrate highly efficient operation of the amplifier with an input signal from a Nd:YLF oscillator.

TuB8

New ytterbium doped ceramic laser materials, *J. Lu, K. Takaichi, T. Uematsu, K. Ueda, University of Electro-Communications, Tokyo, Japan; H. Yagi, T. Yanagitani, Konoshima Chemical Co., Ltd, Kagawa, Japan; A. Kaminskii, Russian Academy of Sciences, Moscow, Russian Federation.*

Optical and laser properties of Yb:Y$_2$O$_3$, Yb:Sc$_2$O$_3$ ceramic laser materials were investigated. High thermal conductivities, broadband laser emissions and low laser thresholds show their bright future in laser industry.

TuB9

Growth and spectroscopic study of Yb^{3+}:$NaGd(WO_4)_2$ as potential laser material, *D. Lis, E. Zharikov, D. Mendeleyev, University of Chemical Technology of Russia, Moscow, Russian Federation; K. Subbotin, Y. Voron'ko, A. Sobol, S. Ushakov, V. Shukshin, General Physics Institute of Russian Academy of Sciences, Moscow, Russian Federation.*

Spectroscopic investigations of promising laser crystal Yb^{3+} $NaGd(WO_4)_2$ are performed. The absorption and fluorescence spectra were obtained at 300K. The fluorescence lifetime was measured.

TuB10

A tunable, narrow linewidth, 1kHz Ce:LiCAF laser with 46% efficiency, *V. Fromzel, C. Prasad, SESI, Burtonsville, MD, USA.*

A narrow linewidth (0.2-0.3nm), 600 μJ/pulse, 1 kHz, tunable (281-315nm) all-solid-state Ce:LiCAF laser with the highest known conversion efficiency of 46%, developed for use with an ozone differential absorption lidar is described.

TuB11

Vacuum-ultraviolet, compact video camera system utilizing $LiCaAlF_6$ crystal optics transparent down to 112-nm, *H. Murakami, T. Kozeki, Y. Suzuki, S. Ono, N. Sarukura, Institute for Molecular Science, Okazaki, Japan; H. Sato, T. Fukuda, Tohoku University, Sendai, Japan.*

$LiCaAlF_6$ crystal is shown to be used as optics component down to 112nm. Moreover, the compact camera system utilizing $LiCaAlF_6$ crystal lens is developed and the real-time imaging in visible and vacuum-ultraviolet region is demonstrated.

TuB12

Diode array directly pumped Cr:YAG crystal fiber broadband light source, *K. Huang, C. Lo, S. Tu, S. Huang, National Sun Yat-Sen University, Kaohsiung, Taiwan Republic of China; P. Yeh, Optospace, San Jose, CA, USA.*

Amplified spontaneous emission with a 3-dB width of 270 nm(1.25~1.52 μm), a 6-dB width of 400 nm(1.20~1.60 μm) was generated by a Cr:YAG crystal fiber. Preliminary result of a total power of 0.5 mW was obtained at room temperature.

TuB13

Measurement of polarization-dependent loss mechanisms in Cr^{4+}: YAG, *H. Liu, J. Dawes, P. Dekker, J. Piper, Macquarie University, Sydney, Australia.*

Using a polarized pump-probe technique, we studied the cw absorption and emission anisotropy of Cr^{4+}: YAG crystals and modeled the excited state absorption. We propose a twisted mode laser cavity to compensate for the birefringence loss.

TuB14

Comparison of cobalt-activated spinel crystals grown by various methods as saturable absorbers for 1.3-1.6 µm lasers, *B. Denker, B. Galagan, V. Osiko, S. Sverchkov, Laser Materials and Technologies Research Center of GPI, Moscow, Russian Federation; G. Karlsson, Royal Institute of Technology, Stockholm, Sweden.*
Q-switch properties of cobalt-activated magnesium-aluminum spinel crystals grown by various methods were compared. It was shown that non-stoichimetric Verneuil grown crystals Q-switch Er:glass lasers with the same efficiency as Czochralski and flux grown crystals and have a wider absorption band.

TuB15

Thermal lensing in Cr^{2+}:ZnSe face-cooled disks, *J. McKay, W. Roh, AFIT, Wright-Patterson AFB, OH, USA; K. Schepler, Air Force Research Lab, Wright-Patterson AFB, OH, USA.*
We report the experimental characterization and modeling of thermal lensing in Cr^{2+}:ZnSe face-cooled laser disks using the phase shift interferometry technique. The thermal lens powers were strong and nonradiative relaxation became significant at 5-W pumping levels.

TuB16

The local vibration absorption band in YAG:Cr^{4+} crystals, *A. Okhrimchuk, A. Shestakov, E.L.S.Co., Moscow, Russian Federation.*
New absorption band in $Y_3Al_5O_{12}$ crystal doped with divalent metal ions Ca^{2+} or Mg^{2+} was found in MIR. We tend to assign it to local vibration modes, dealing with an oxygen vacancy-divalent ion complex.

TuB17

Mode-locked ceramic Cr^{2+}:ZnSe laser, *E. Sorokin, I. Sorokina, TU Vienna, Vienna, Austria; A. Di Lieto, M. Tonelli, P. Minguzzi, Universitá di Pisa, Pisa, Italy.*
We present the results of mode-locking of the ceramic Cr^{2+}:ZnSe laser at 2.5 µm pumped by a diode-pumped Nd:YVO_4 - Co^{2+}:MgF_2 laser and provide a comparison between the mode-locked ceramic and single crystalline Cr:ZnSe lasers.

TuB18

Characterization of a diode-pumped high-energy Yb:S-FAP regenerative amplifier, *S. Ito, T. Yanagida, F. Sakai, A. Endo, The Femtosecond Technology Research Association, Tsukuba, Japan; H. Ishikawa, Waseda University, Tokyo, Japan; K. Torizuka, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan.*
We present on a characterization of a diode-pumped high-energy Yb:S-FAP regenerative amplifier that was developed as a preamplifier in an all-solid-state laser system for laser-Compton X-ray generations. The amplifier delivers the pulse energy more than 12 mJ at 50 Hz.

TuB19

Diode radially-pumped microchip composite Yb:YAG laser: high power operation, *T. Dascalu, T. Taira, N. Pavel, Institute for Molecular Science, Okazaki, Japan; T. Dascalu, CREATE-JST Fukui Association for Industry & Technology, Fukui, Japan; T. Dascalu, N. Pavel, Institute for Atomic Physics, Solid-State Quantum Electronics Laboratory, Bucharest, Romania.*
A diode radially-pumped composite microchip Yb:YAG laser is presented. Quasi-continuous wave pumping of 15-at.% Yb:YAG core square shape with pulses of 5-Hz repetition rate delivers 112-W peak power with 0.63 slope efficiency and 0.38 optical-to-optical efficiency.

TuB20

High power and brightness CW MOPA with spherical aberration, *C. Kennedy, Cutting Edge Optronics, Inc., St. Charles, MO, USA.*
A practical implementation of techniques for achieving high brightness despite spherical aberration in a diode-pumped rod laser is described. 750 W was achieved with an M2 of 14 in a MOPA configuration.

TuB21

Three-dimensional numerical modeling of Mid-IR OPOs with an implicit finite difference method, *G. Renz and M. Klose, German Aerospace Research Establishment (DLR), Stuttgart, Germany.*
Optical Parametric Oscillator simulation lags behind experimental advances. Simultaneous implementation of complex beam propagation and three wave interaction with an implicit finite difference method allows full three dimensional insight in nonlinear interaction.

Regency East Ballroom
11:00am – 12:30pm
TuC ■ Nonlinear Optics in Periodic Materials
Craig Denman, Air Force Research Lab, Kirtland AFB, NM, USA, Presider.

TuC1 11:00am ***INVITED***

Linear and nonlinear optics in discrete systems, *F. Lederer, T. Pertsch, U. Peschel, University of Jena, Jena, Germany.*
Recent experimental and theoretical work on light propagation in discrete optical systems as coupled waveguide arrays or coupled optical resonator waveguides in photonic crystals will be reviewed. Potential applications will be discussed.

TuC2 11:30am

Simultaneous Raman and optical parametric oscillation in periodically poled KTP, *V. Pasiskevicius, A. Fragemann, F. Laurell, Royal Institute of Technology, Stockholm, Sweden.*
Concurrent Raman oscillation has been observed in PPKTP nanosecond optical parametric oscillators in the near-infrared spectral region. The increased Raman activity is associated with direct excitation of the phonon overtone band by the idler wave.

TuC3 11:45am

3.5W, sum frequency, 630nm generation of synchronously seeded Yb and Yb-Er fiber amplifiers in PPKTP, *P. Champert, S. Popov, A. Avdokhin, R. Taylor, Imperial College, London, United Kingdom; A. Avdokhin, NTO IRE-Polus, Moscow region, Russian Federation.*
Synchronous temporal seeding of high average and peak power Yb/Er and Yb fibre amplifiers is demonstrated, for efficient single pass SFG in periodically poled KTP. 3.5W average power is obtained at 630nm wavelength.

TuC4 12:00pm

Fabrication of periodically-poled structures in 3mm-thick MgO:$LiNbO_3$ crystals for high-power wavelength conversion, *H. Ishizuki, I. Shoji, T. Taira, Institute for Molecular Science, Okazaki, Japan; H. Ishizuki, CREATE Fukui of Japan Science and Technology Corporation, Fukui, Japan; S. Kurimura, National Institute for Materials Science, Tsukuba, Japan.*
Temperature dependence of poling field was investigated in 5mol% MgO-doped $LiNbO_3$ and the field was found to be reduced to 1.3kV/mm at 200°C. Periodically poled structures of 30µm period was fabricated in 3mm-thick MgO-doped $LiNbO_3$.

TuC5 12:15pm

3D-mapping of effective second-order nonlinearity in periodically poled crystals,
V. Pasiskevicius, S. Holmgren, S. Wang, F. Laurell, Royal Institute of Technology, Stockholm, Sweden.
A technique for 3D mapping of effective nonlinearity in periodically poled crystals is proposed and demonstrated in PPKTP. It utilizes group-velocity walk-off between the femtosecond pulses at fundamental wavelength in type-II QPM SHG.

12:30pm – 7:00pm
Free Afternoon

7:00pm – 10:00pm
Regency East Ballroom
Conference Banquet

The conference banquet will feature a presentation entitled "**Night Thoughts on Fiber Lasers**" from David Hanna, *Univ. of Southampton, Southampton, United Kingdom.*

- **Wednesday**
- **February 5, 2003**

Los Rios Foyer
7:30am – 5:00pm
Registration

7:00am – 8:00am
Continental Breakfast

Regency East Ballroom
8:00am – 9:45am
WA ■ Ultra-High Power Lasers
Raymond Beach, Lawrence Livermore Natl. Lab., Livermore, CA, USA, Presider.

WA1 8:00am ***INVITED***
Power scaling concepts for fiber lasers, *W. Clarkson, L. Cooper, P. Wang, R. Williams, J. Sahu, Univ. of Southampton, Highfield, South, United Kingdom.*
Recent progress in the development of high power fiber lasers will be reviewed, and the prospects for scaling output powers to well beyond the hundred watt level, whilst maintaining diffraction-limited beam quality will be discussed.

WA2 8:30am
Spectrally beam combined diode laser bars: Efficient and near diffraction limited output power, *S. Tidwell, S. Roman, D. Jander, D. Lowenthal, Aculight Corporation, Bothell, WA, USA.*
400 individual diode lasers have been combined using spectral beam combination. The process is greater than 75% efficient and resulted in a 1 cm diode laser bar with a BQ in the slow direction of < 1.5 xDL.

WA3 8:45am
Activation of the Mercury laser, a diode-pumped, gas-cooled, solid-state slab laser, *A. Bayramian, R. Beach, W. Behrendt, C. Bibeau, R. Campbell, S. Dixit, C. Ebbers, B. Freitas, V. Kanz, M. Rushford, S. Payne, J. Schmidt, K. Schaffers, K. Skulina, S. Telford, J. Tassano, Lawrence Livermore National Laboratory, Livermore, CA, USA; A. DeWald, J. Rankin, M. Hill, University of California, Davis, Davis, CA, USA.*
Operation of the Mercury laser with one of two amplifiers activated has yielded 20.7 Joules at 0.1 Hz and 12 Joules at 3.3 Hz. Correction of static distortions in the amplifier accomplished using a conjugate phase optic.

WA4 9:00am
High-quality, 4 x 6 cm, Yb:S-FAP [$Yb^{3+}:Sr_5(PO_4)_3F$] crystal slabs for the Mercury Laser, *K. Schaffers, J. Tassano, A. Bayramian, J. Dawson, C. Bibeau, S. Payne, Lawrence Livermore National Laboratory, Livermore, CA, USA; R. Morris, Consultant, Flanders, NJ; M. Randles, Northrop Grumman Poly-Scientific, Charlotte, NC, USA; A. DeWald, J. Rankin, M. Hill, University of California, Davis, CA, USA.*
We report on the progress in developing Yb:S-FAP crystals for use in the Mercury Laser system. Currently high quality crystals are routinely produced that yield half slabs that are bonded to make full size slabs.

WA5 9:15am

Optimization of an optical parametric chirped pulse amplification system for the OMEGA EP laser system, *I. Begishev, V. Bagnoud, M. Guardalben, L. Waxer, J. Puth, J. Zuegel, University of Rochester, Rochester, NY, USA.*
We report on the experimental achievements of the optical parametric chirped pulse amplification (OPCPA) system, including 29% pump-to-signal conversion efficiency and 10^7 gain using two LBO crystals configured as a single amplification stage.

WA6 9:30am

Thin disk multipass amplifier, *D. Müller, S. Erhard, O. Ronsin, A. Giesen, IFSW, Stuttgart, Germany.*
A new geometrical multi-pass design for thin disk lasers allows the amplification of high energy pulses in a nearly arbitrary number of amplification passes with only 13 optical elements.

Rio Grande Ballroom
9:45am – 10:45am
Coffee Break
WB ■ Poster Session: III

WB1

Laser emission in Pr^{3+}, Yb^{3+}:BaY_2F_8 pumped by an avalanche upconversion mechanism, *E. Osiac, E. Heumann, G. Huber, Institut für Laser Physik, Hamburg, Germany; S. Kück, Physikalisch-Technische Bundesanstalt, Braunschweig, Germany; A. Toncelli, F. Traverso, M. Tonelli, Universita' di Pisa, Pisa, Italy.*
We report on the laser oscillation at 607.5nm in Pr^{3+},Yb^{3+}:BaY_2F_8 pumped by an avalanche upconversion mechanism. The maximum output power was 25mW, the slope efficiency with respect to the absorbed pump power was 13.5%.

WB2

Comparison of Tm-doped ZBLAN and silicate fiber lasers operating near 2.0 micrometers, *B. Walsh, N. Barnes, NASA Langley Research Center, Hampton, VA, USA.*
Tm-doped ZBLAN and Tm-doped Silicate glass are compared spectroscopically and fiber lasing of the Tm 3F4 manifold around 1.9 micrometers in ZBLAN and silicate glass is compared. Diode-pumped fiber lasing experiments show that Tm:ZBLAN is a superior laser to Tm:Silicate.

WB3

Fiber laser pumped Mid-IR source, *E. Lippert, G. Rustad, K. Stenersen, Norwegian Defence Research Establishment (FFI), Kjeller, Norway.*
We report on a compact and efficient 3-5µm laser source where a fiber-laser pumps a Ho:YAG-laser, which in turn pumps a ZGP OPO. The system emits 3W and has a wall-plug efficiency of 1%.

WB4

Pulsed operation of a diode-side-pumped Tm,Ho:GdVO$_4$ laser at room temperature, *A. Sato, K. Asai, Tohoku Institute of Technology, Sendai, Japan.*
A new approach to 2-µm lasers using vanadate crystals is discussed here. The pulsed operation of a diode-side-pumped Tm,Ho:GdVO$_4$ laser was experimentally achieved for the first time.

WB5

Sensitization of MIR Tb^{3+} luminescence by Tm^{3+} ions in CsCdBr3 and KPb2Cl5 crystals, *A. Okhrimchuk, L. Butvina, E. Dianov, Fiber Optics Research Center at GPI, RAS, Moscow, Russian Federation; N. Lichkova, V. Zavgorodnev, Institute of Microelectronics Technology, RAS, Chernogolovka, Russian Federation.*
Energy transfer process from Tm^{3+} ions to Tb^{3+} ions was firstly investigated in the CsCdBr$_3$:Tb,Tm and KPb$_2$Cl$_5$:Tb,Tm crystals. It is shown that they are promising candidates as laser crystals for MIR, suitable for diode laser pumping at 0.8 µm.

WB6

A double-pass diode-pumped Tm: Ho: YLF laser amplifier at 2.05 µm, *S. Chen, Y. Bai, Science Applications International Corp., Hampton, VA, USA; J. Yu, U. Singh, NASA Langley Research Center, Hampton, VA, USA; M. Petros, Science and Technology Corporation, Hampton, VA, USA.*
Double-pass Tm:Ho:YLF laser amplifiers were developed and compared with single-pass amplifiers. The output pulse energy was improved by 75% and the energy extraction efficiency was increased from 1.4% to 3.1% at 54-mJ input pulse energy

WB7

Diode pumped 105 mJ Ho:Tm:LuLF oscillator, *M. Petros, Science and Technology Corp., Hampton, VA, USA; J. Yu, U. Singh, B. Walsh, N. Barnes, NASA Langley Research Center, Hampton, VA; S. Chen, SAIC, Hampton, VA, USA.*
The design and performance of a diode pumped Tm:Ho: LuLiF$_4$ (LuLF) laser is described. The laser produced 105-mJ of Q-Switched output, which represents a slope efficiency of 0.08. To our knowledge this is the highest Q-Switched output for this material.

WB8

Third order optical non linearity of PTR glasses, *L. Sarger, L. Canioni, M. Martinez Rosas, CPMOH, Talence, France; L. Glebov, L. Glebova, A. Tirpak, UCF/CREOL, Orlando, FL, USA; M. Martinez Rosas, Universidad Baja California, Ensenada, Mexico.*
We present precise and absolute measurements of third order optical susceptibility in Photo-Thermo-Refractive Glass and gratings using a Collinear Orthogonal Pump Probe method. Small nonlinear index and negligible two photon absorption coefficient demonstrate their potentiality in high power laser application.

WB9

Red and blue shift of femtosecond pulse using cascaded quadratic processes, *F. Ilday, K. Beckwitt, H. Lim, F. Wise, Cornell University, Ithaca, NY, USA.*

We theoretically and experimentally demonstrate frequency-shift of femtosecond pulses in quadratic media in the presence of group velocity mismatch. Sign and magnitude of the shift is controllable via phase-mismatch. Applications include Raman-shift compensation and high-energy femtosecond pulse compression.

WB10

Self seeding a nanosecond ring-cavity optical parametric oscillator for better efficiency and beam quality, *D. Armstrong, A. Smith, Sandia National Laboratories, Albuquerque, NM, USA.*

We perform numerical modeling and laboratory studies of self injection seeded nanosecond optical parametric oscillators, demonstrating improved conversion efficiency and beam quality.

WB11

CW tunable mid-wave infrared generation near 4.5 µm, *D. Chen, The Aerospace Corperation, El Segundo, CA, USA.*

Tunable output from 4.25 to 4.65-µm was demonstrated by using difference frequency generation in a PPLN OPO cavity. Up to 90-mW of cw power at 4.5-µm was achieved using a 1-µm Nd:YAG pump laser.

WB12

A passively mode-locked bound-soliton fiber laser, *B. Zhao, D. Tang, P. Shum, C. Lu, Nanyang Technical University, Singapore, Singapore; W. Man, H. Tam, Hong Kong Polytechnic University, Hong Kong, Hong Kong Special Administrative Region of China.*

States of bound-soliton operation in a passively mode-locked fiber ring laser have been revealed. We demonstrate both experimentally and numerically that, like the single-pulse soliton operation, the bound-soliton emission is another intrinsic feature of the laser.

WB13

Frequency chirp in a ns-pulsed, single-longitudinal-mode, injection-seeded PPKTP optical parametric oscillator, *R. White, Y. He, B. Orr, Macquarie University, Sydney, Australia; M. Kono, K. Baldwin, Australian National University, Canberra, Australia.*

Optical heterodyne experiments on ns-pulsed, single-longitudinal-mode signal output from an injection-seeded PPKTP optical parametric oscillator measure frequency chirp ranging between ±130 MHz and controllable down to ±5 MHz. Factors influencing frequency chirp are identified.

WB14

Tuning and dual wavelength operation of a 2 micron pumped ZGP OPO in the 8-11micron range, *S. Nicolas, E. Lippert, K. Stenersen, G. Rustad, FFI (Norwegian Defence Research Establishment), Kjeller, Norway.*

Tunable and dual wavelength operation of a 2-micron pumped ZGP OPO in the 8-11 µm range is demonstrated. Length-matching effects between the OPO and the pump source is observed. Numerical simulations show good agreement with the experimental results.

WB15

Picosecond stimulated Raman scattering in oxide crystals, *T. Basiev, D. Chunaev, A. Karasik, P. Zverev, A. Sobol, L. Ivleva, V. Osiko, Laser Materials and Technology Research Center GPI, Moscow, Russian Federation.*

Stimulated Raman scattering in 9 oxide crystals under excitation with long trains of 15 ps pulses was investigated. For the first time SRS was observed in $SrMoO_4$ and $Ca_3(VO_4)_2$ crystals.

WB16

All solid-state 100 Hz pulsed Raman laser, *A. Kachynski, A. Kuzmin, G. Xu, P. Prasad, SUNY, University at Buffalo, Buffalo, NY, USA; V. Orlovich, National Academy of Sciences of Belarus, Minsk, Belarus.*

All-solid-state Raman laser has been developed utilasing diode-pumped 100 Hz actively Q-switched Nd:YAG laser and $Ba(NO_3)_2$ multi-pass Raman shifter. The main characteristics of 2nd and 3rd Stokes for fundamental and 1st, 2nd, and 3rd Stokes for second harmonics are presented.

WB17

Characteristics of diode-pumped CW OPOs at 2.7µm and their use in CO_2 spectroscopy, *A. Henderson, L. Borschowa, A. Brown, Aculight Corporation, Bothell, WA, USA; J. McCord, Air Force Research Laboratories, Albuquerque, NM, USA.*

We have demonstrated spectral scans of carbon dioxide absorption features at 2.7µm using a diode-pumped optical parametric oscillator (OPO), and characterized the effects of water vapor absorption at this wavelength upon OPO performance.

WB18

Continuously tunable visible compact laser source using optical parametric generation in a microlaser-pumped periodically poled lithium niobate, *E. Hérault, S. Forget, G. Lucas-Leclin, P. Georges, Laboratoire Charles Fabry de l'Institut d'Optique, Orsay, France.*

We demonstrated a very compact laser system providing continuous tunability at high-repetition rate in the visible range based on an OPG of PPLN pumped by a frequency-doubled microchip laser operating at 532 nm.

WB19

Improvement of spatial beam quality of laser sources with an intracavity Bragg grating, *S. Yiou, F. Balembois, P. Georges, Laboratoire Charles Fabry de l'Institut d'Optique, Orsay, France; J. Huignard, Thalès Research and Technology France, Orsay, France.*

We demonstrate a novel compact technique having significantly improved beam quality of two laser sources, a degraded $Nd:YVO_4$ laser and a laser diode in external cavity. The efficient mode filtering is obtained with an intracavity Bragg grating.

WB20

Interferometric measurements on a High power Yb^+:YAG laser, *L. Rubin, Boeing/Lasers Electro-optics, Canoga Park, CA, USA.*

Phase distortions induced during lasing in a high powered Yb^+:YAG laser are measured interferometrically. Under certain conditions, spherical aberration can improve beam quality.

Regency East Ballroom

WC ■ UV and Blue Sources

10:45am – 12:30pm

Kenichi Ueda, Univ. of Electro-Communications, Tokyo, Japan, Presider.

WC1 10:45am

Miniature, high-power 355-nm laser system, *J. Zayhowski, A. Wilson, MIT Lincoln Laboratory, Lexington, MA, USA.*

A robust, miniature laser system produces >100-µJ, 355-nm pulses of 700-ps duration at pulse rates up to 500 Hz. The system is pumped by two fiber-coupled 808-nm diode-laser arrays and occupies a volume of <0.5 liters.

WC2 11:00am

Diode-pumped sub-ns ultraviolet laser system operating at 1 MHz, *S. Forget, F. Balembois, F. Druon, P. Georges, Laboratoire Charles Fabry de l'Institut d'Optique, Orsay, France.*

We demonstrated a compact diode pumped ultraviolet source providing sub-nanosecond pulses at 355 nm and operating with a repetition rate of 1 MHz. The system consists in a MOPA followed by a THG stage.

WC3 11:15am

High conversion sum frequency generation using internal and external SFG configurations, *J. Williams-Byrd, L. Petway, W. Edwards, NASA Langley Research Center, Hampton, VA, USA.*

We will report on high conversion efficiency sum frequency generation using intra and external cavity techniques. Sum frequency generation external to the OPO resonator produced 73mJ at 320nm, while SFG internal to the OPO produced 103mJ at 320nm.

WC4 11:30am

Efficient 355-nm laser using high-quality CsB_3O_5 crystal, *H. Kitano, T. Matsui, K. Sato, M. Yoshimura, Y. Mori, T. Sasaki, Osaka University, Suita, Japan; Y. Wu, C. Chen, Chinese Academy of Sciences, Beijing, China.*

We obtained a 3.0W of 355-nm output by using a type-II CsB_3O_5 crystal. The conversion efficiency from the fundamental light to the third harmonic reached 30%.

WC5 11:45am

CW 198.5-nm light generation in CLBO, *S. Imai, H. Inoue, T. Nomura, T. Tojo, MIRAI Project, Tsukuba, Japan.*

A continuous-wave 198.5-nm light is produced by sum-frequency generation in CLBO. Two fundamental lights are frequency-stabilized and mixed in an external cavity. The output power of 45mW was demonstrated with a single-resonance cavity.

WC6 12:00pm

A new nonlinear borate crystal, $BaAlBO_3F_2$ for UV light generation, *Z. Hu, M. Yoshimura, K. Muramatsu, Y. Mori, T. Sasaki, Osaka University, Osaka, Japan; K. Muramatsu, Nikon Corporation, Kangawa, Japan.*

We have discovered a new nonlinear optical $BaAlBO_3F_2$ crystal. It has a structure similar to that of $KBe_2BO_3F_2$ but can easily be grown as large crystal and does not contain toxic elements in its composition.

WC7 12:15pm

High-power blue generation in a periodically poled $MgO:LiNbO_3$ ridge-type waveguide by frequency doubling of a diode end-pumped Nd:YAG laser, *N. Pavel, I. Shoji, T. Taira, Institute for Molecular Science, Okazaki, Japan; M. Iwai, T. Yoshino, M. Imaeda, NGK Insulators Ltd., Mizuho, Nagoya, Japan.*

First blue-light generation from a periodically polled $MgO:LiNbO_3$ ridge-type waveguide by frequency doubling of a diode end-pumped Nd:YAG laser is reported. Continuous-wave power in excess of 140 mW at 473 nm was obtained.

12:30pm – 2:00pm
Lunch Break (on your own)

Regency East Ballroom
2:00pm – 3:15pm
WD ■ Novel Sources
Peter Moulton, Q-Peak, Inc., Bedford, MA, USA, Presider.

WD1 2:00pm ***INVITED***

Recent progress in OPS frequency doubled cw lasers, *V. Ostroumov, R. von Elm, W. Seelert, Coherent Luebeck GmbH, Luebeck, Germany.*

Diode pumped frequency doubled OPS lasers can deliver up to 500 mW at 488 nm and 200 mW at 460 nm under 5 W of pump power. The scalability and reliability of OPS lasers has been demonstrated.

WD2 2:30pm

Widely tunable, aluminum-free, GaSb-based, mid-infrared semiconductor lasers, *A. Goyal, G. Turner, A. Sanchez, M. Manfra, P. Foti, P. O'Brien, MIT Lincoln Laboratory, Lexington, MA, USA.*

An external-cavity tuning range of 0.3 microns, at a center wavelength of 3.8 microns, is demonstrated from an optically pumped, aluminum-free semiconductor laser grown on a GaSb substrate, with peak single-facet power of 0.65 Watts.

WD3 2:45pm

Amplification at 1.5 µm in Erbium-Ytterbium doped single-mode active waveguide made by femtosecond micromaching, *S. Taccheo, R. Osellame, G. Cerullo, M. Marangoni, D. Polli, R. Ramponi, S. De Silvestri, P. Laporta, INFM - Politecnico di Milano and IFN-CNR, Milano, Italy.*

We demonstrated low-loss (<0.25 dB/cm), gaussian-profile single-transverse mode active waveguides at 1.5 µm in Er:Yb-doped glass substrate made by femtosecond micromachining. Net gain has been achieved when used as active element in a standard waveguide-amplifier set-up.

WD4 3:00pm

KW fiber lasers for industrial applications, *K. Ueda, H. Sekiguchi, H. Kan, Univ. of Electro-Communications, Tokyo, Japan.*

Fiber-embedded disk lasers generated 1014W ourput in CW-mode. The thin disk with 200-micron thickness composed of multi-mode fiber lasers was developed successfully.
The possibility of such type of new fiber lasers will be discussed.

Rio Grande Ballroom
3:15pm – 3:45pm
Coffee Break

Regency East Ballroom
3:45pm – 6:15pm
WE ■ 1mm Lasers
Andreas Tünnermann, Friedrich-Schiller Univ, Jena, Germany, Presider

WE1 3:45pm

Femtosecond thin disk Yb:KYW regenerative amplifier without CPA, *A. Beyertt, D. Müller, D. Nickel, A. Giesen, Institut für Strahlwerkzeuge, Universität Stuttgart, Stuttgart, Germany.*

We demonstrate the potential of an Yb:KYW thin disk amplifier system to provide ultra short pulses with high energies. Without using chirped pulse amplification, 100 µJ, subpicosecond pulses were generated at a repetition rate of 5 kHz.

WE2 4:00pm

Thin disk Yb:YAG lasers generating 60 W average power in picosecond or femtosecond pulses, *E. Innerhofer, T. Südmeyer, F. Brunner, R. Häring, A. Aschwanden, R. Paschotta, U. Keller, Institute of Quantum Electronics, Swiss Federal Institute of Technology (ETH), Zürich, Switzerland; C. Hönninger, M. Kumkar, Haas-Laser GmbH + Co. KG, Schramberg, Germany.*

We demonstrate two versions of a passively mode-locked Yb:YAG thin-disk laser, generating as much as 60 W average output power (without using an amplifier) in picosecond or femtosecond pulses.

WE3 4:15pm

60 W average power femtosecond fiber CPA system, *J. Limpert, T. Clausnitzer, T. Schreiber, A. Liem, H. Zellmer, H. J. Fuchs, E. B. Kley, A. Tünnermann, Institute of Applied Physics, Jena, Germany.*

We report on a diode-pumped ytterbium-doped double-clad fiber based CPA system delivering 350-fs pulses, at 1060 nm, 75 MHz and 60 W average power. Key element is a highly efficient transmission grating compressor allowing the recompression at this high power.

WE4 4:30pm

20W single-frequency, near diffraction-limited, linearly polarized laser based on a Yb fiber pre-amplifier and self-imaging Nd:YAG waveguide power amplifier, *J. Koroshetz, B. Tiemann, D. Smith, I. McKinnie, J. Unternahrer, Coherent Technologies Inc., Lafayette, CO, USA; P. Schlup, University of Otago, Dunedin, New Zealand; H. Miller, AFRL, Kirtland AFB, NM, USA.*

We report a novel architecture for power scaling of near-diffraction-limited, single-frequency lasers. In a first demonstration, we have generated 20W single-frequency output from a MOPA based on a large-core double-clad Yb fiber pre-amplifier and self-imaging Nd:YAG waveguide power amplifier.

WE5 4:45pm

Power scaling of diffraction limited, single frequency lasers for LIGO, *S. Saraf, S. Sinha, A. Sridharan, R. Byer, Stanford University, Stanford, CA, USA.*

Master Oscillator Power Amplifier (MOPA) approach allows scaling lasers to high powers while preserving spatial and temporal coherence. We are demonstrating scaling of a 20 W Nd:YAG MOPA to the 100 W level using two edge-pumped slabs.

WE6 5:00pm

A diode-pumped, Q-switched, Nd:YLF laser using a prismatic pump cavity, *B. Pati, K. Wall, P. Moulton, Q Peak, Inc., Bedford, MA, USA.*

We report an energy of 110 mJ per pulse from a diode-pumped, Q-switched, conduction-cooled, 1053-nm, Nd:YLF laser designed for space-based applications. We obtained a slope efficiency of 23% and used heat pipes for laser-head cooling.

WE7 5:15pm

New progress in neodymium doped ceramic lasers, *J. Lu, K. Takaichi, T. Uematsu, K. Ueda, University of Electro-communications, Tokyo, Japan; H. Yagi, T. Yanagitani, Konoshima Chemical Co., Ltd, Kagawa, Japan; A. Kaminskii, Russian Academy of Sciences, Moscow, Russian Federation.*

New development in Nd:YAG, Nd:Y_2O_3, Nd:Lu_2O_3 and Nd:$YGdO_3$ ceramic laser materials was introduced. Excellent quality and high laser performance show the great potential in laser applications for such new series of ceramic laser materials.

WE8 5:30pm

Spectroscopy and laser action of highly doped Yb:YAG, *N. Martinyuk, V. Peters, D. Fagundes de Sousa, K. Lünstedt, E. Heumann, K. Petermann, Universitaet Hamburg, Hamburg, Germany.*
Highly doped Yb:YAG is a highly promising material for high power thin-disk-lasers. Highly Yb-doped crystals with nearly 100% quantum efficiency have been grown. Cw-laser operation of Yb:YAG with 20% to 60% dopant concentration is demonstrated.

WE9 5:45pm

Efficient three-level continuous-wave laser operation of an Yb:S-VAP crystal at 985 nm, *S. Yiou, F. Balembois, P. Georges, Laboratoire Charles Fabry de l'Institut d'Optique, Orsay, France; K. Schaffers, Lawrence Livermore National Laboratory, Livermore, CA.*
We report the first demonstration of a cw three-level laser at 985 nm with an Yb:S-VAP crystal. The slope efficiency (40%) and the output power (105 mW) are the highest ever obtained with an Yb-doped crystal at this wavelength.

WE10 6:00pm

The spectroscopic properties and laser characteristics of a novel ceramic laser with $Y_3Sc_xAl_{(5-x)}O_{12}$, *Y. Sato, I. Shoji, T. Taira, Institute for Molecular Science, Okazaki, Japan; A. Ikesue, Japan Fine Ceramics Center, Atsuta-ku, Nagoya, Japan.*
A new ceramic laser material $Nd{:}Y_3Sc_xAl_{(5-x)}O_{12}$ has been developed by sintering method. Laser emission with 30% slope efficiency under Ti:Sapphire pumping was demonstrated using an uncoated sample.

KEY TO AUTHORS

(INVITED SPEAKER PRESENTATIONS IN BOLD)