ASSL

OSA Advanced Solid-State Lasers

Seventeenth Topical Meeting and Tabletop Exhibit

February 3–6, 2002

Hôtel Loews Le Concorde, Québec City, Canada

Sponsored by: Optical Society of America

Technical Cosponsor:
IEEE/Lasers and Electro-Optics Society

The organizers of the Advanced Solid-State Lasers Topical Meeting gratefully acknowledge the support of the following Corporations and U.S. Government Agencies:

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*Denotes OSA Technical Council Representative

About ASSL

Meeting Scope

Advances in solid-state lasers, laser materials, nonlinear optical materials, and high power diode lasers are creating new capabilities and applications opportunities in medicine, spectroscopy, remote sensing, material processing, and communications.

In recent years, the Advanced Solid State Lasers Topical Meeting has extended its traditional scope to include rapidly developing areas such as telecommunications technologies, nonlinear frequency conversion, all solid-state ultrafast lasers, fiber lasers, and laser applications. Take this opportunity to attend the conference of choice for significant developments in laser and nonlinear materials and devices.

Topics To Be Considered:

- Novel devices for telecommunications
- Tunable and new wavelength solid-state lasers
- New laser and nonlinear optical materials
- Diode-pumped lasers
- Microlasers and frequency stable lasers
- Short pulse and high peak power lasers
- Frequency upconversion schemes and devices
- OPO, OPA, SHG, SFG and other nonlinear conversion processes
- Nonlinear waveguides and quasi-phasematching
- Frequency conversion of diode lasers
- Laser applications including medicine, telecommunications, data storage and remote sensing
- Fiber and waveguide lasers and applications

Invited Speakers

The invited speakers for the main program includes:

Invited

- Novel fiber lasers for telecommunications,
  John D. Minelly, Corning Inc., USA
- High average power femtosecond and picosecond lasers
  Rüdiger Paschotta, Inst. of Quantum Electronics, Switzerland
- Concepts and technologies of advanced RGB sources
  Richard Wallenstein, Univ. of Kaiserslautern, Germany
- 1.46 kW cw Nd:YAG ceramic laser
  Jianren Lu, Univ. of Electro-Comm., Japan

Publications

Advance Program

Authors submitting papers, past meeting participants, and current committee members will automatically receive the Advance Program. Other individuals who wish to receive a mailed copy of the Advance Program should contact OSA Customer Service.

Technical Digest

The Advanced Solid-State Lasers Technical Digest is comprised of the camera-ready summaries of papers being presented during the meeting. At the meeting, each registrant receives a copy of the technical digest. Extra copies can be purchased at the meeting for a special price of $60 US.

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 Lasers Topical Meeting in Québec City. TOPS Proceedings Volumes offer a place where specialists, students and practitioners can quickly learn about rapidly developing fields in the world of solid-state lasers. All authors are invited to contribute to the volume by submitting camera-ready articles on-site at the meeting or online. Instructions will be mailed to all corresponding authors.

Each registrant will receive a copy of the TOPS Proceedings Volume, upon publication in May 2002, 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).

ASSL Exhibitor List

As of February 1, 2002

- Alpine Research Optics
- Cleveland Crystals, Inc.
- Coherent - Crystal Associates
- Coherent Semiconductor Division
- Cristal Laser, SA
- Cutting Edge Optronics, Inc.
- Davis Marketing, Inc.
- Doric Lenses, Inc.
- EKSMA Co.
- Essential Research, Inc.
- Gamble Technologies Limited
- Gentec Electro-Optics, Inc.
- INRAD, Inc.
- Kigre, Inc.
- LAS-CAD GmbH
- LINOS Photonics, Inc.
- MegaWatt Lasers
- Onyx Optics, Inc.
- Photonics Spectra
- Positive Light
- QPhotonics, LLC
- Scientific Materials Corporation

Agenda of Sessions

Sunday, February 3, 2002	
Time	**Event**
3:00pm - 5:00pm	Registration Opens Borduas Foyer

Monday, February 4, 2002	
Time	**Event**
7:00am - 5:00pm	Registration Borduas Foyer
7:00am - 8:00am	Continental Breakfast Borduas Foyer
7:50am - 8:00am	Opening Remarks Borduas/Krieghoff Room
8:00am - 10:00am	MA Waveguide Lasers & Amplifiers Borduas/Krieghoff Room
10:00am - 4:30pm	Exhibits Open Suzor- Coté Room
10:00am - 11:00am	MB Coffee Break & Poster Session: 1 Suzor- Coté Room
11:00am - 12:30pm	MC Ultrafast Lasers Borduas/Krieghoff Room
12:30pm - 2:00pm	Lunch Break (on your own)
2:00pm - 4:00pm	MD Ytterbium Lasers Borduas/Krieghoff Room
4:00pm - 4:30pm	Refreshment Break Suzor- Coté Room
4:30pm - 6:00pm	ME Postdeadline Paper Session Borduas/Krieghoff Room

Tuesday, February 5, 2002	
Time	**Event**
7:30am - 12:30pm	Registration Borduas Foyer
8:00am - 10:00am	TuA Nonlinear Optical Sources Borduas/Krieghoff Room
10:00am - 12:30pm	Exhibits Open Suzor- Coté Room
10:00am - 11:00am	TuB Coffee Break & Poster Session: 2 Suzor- Coté Room
11:00am - 12:30pm	TuC Nd Lasers Borduas/Krieghoff Room
12:30pm - 6:00pm	Lunch Break (on your own)

Free Afternoon	
6:00pm - 7:00pm	Coherent Reception
7:00pm - 10:00pm	Conference Banquet Borduas/Krieghoff Room

Wednesday, February 6, 2002

Time	Event
7:30am - 5:00pm	Registration Borduas Foyer
8:00am - 10:00am	WA Mid IR Lasers Borduas/Krieghoff Room
10:00am - 11:00am	WB Coffee Break & Poster Session: 3 Suzor- Coté Room
10:00am - 4:00pm	Exhibits Open Suzor- Coté Room
11:00am - 12:30pm	WC Ultraviolet Lasers Borduas/Krieghoff Room
12:30pm - 2:00pm	Lunch Break (on your own)
2:00pm - 3:30pm	WD Advanced Lasers Borduas/Krieghoff Room
3:30pm - 4:00pm	Refreshment Break Borduas Foyer
4:00pm - 6:15pm	WE High Power Lasers Borduas/Krieghoff Room
6:15pm - 6:30pm	Closing Remarks Borduas/Krieghoff Room

Abstracts
Advanced Solid-State Lasers

■ Sunday
■ February 3, 2002

Room: Borduas Foyer
3:00pm–5:00pm
Registration

■ Monday
■ February 4, 2002

Room: Borduas Foyer
7:00am–5:00pm
Registration

Room: Borduas Foyer
7:00am–8:00am
Continental Breakfast

Room: Borduas/Krieghoff
7:50am–8:00am
General Chair's Opening Remarks
Larry Marshall, Lightbit, USA, General Chair

Room: Borduas/Krieghoff
8:00am–10:00am
MA ■ Waveguide Lasers and Amplifiers
Martin E. Fermann, Boston Laser Inc., USA, Presider

Presider

MA1 8:00am Invited

Novel fiber lasers for telecommunications, *John D. Minelly, L.A. Zentano, A.J.E. Ellison, M.J. Dejneka, Corning Inc., USA.*
Fiber lasers have the potential for cost reduction in amplifiers for DWDM applications. This is achieved through efficient use of broad-area lasers. Yb fiber lasers operating at or near the gain peak of 978nm are of particular interest. Lasing on this transition can be realized through either a tapered multimode oscillator or a strictly designed double-clad fiber. This work will be reviewed and compared to alternative power scaling techniques.

MA2 8:30am

Self-imaging in waveguide lasers and amplifiers, *Wayne S. Pelouch, Duane D. Smith, John E. Koroshetz, Iain T. McKinnie, Josef R. Unternahrer, Sammy W. Henderson, Coherent Tech., Inc.; William R. Scharpf, Naval Res. Lab., USA.*

A novel approach to near-diffraction-limited and highly-efficient power-scaling of solid state lasers is reported. This technique is capable of high power TEM_{00} output from a highly multimode waveguide. First demonstrations include a 16W CW Nd:YAG laser.

MA3 8:45am

Constant refractive index multi-core fiber laser, *Raymond J. Beach, Michael D. Feit, LeAnn D. Brasure, Stephen A. Payne, Lawrence Livermore Natl. Lab., USA; Joseph S. Hayden, David Krashkevich, David A. Alunni, Schott Glass Tech., Inc., USA.*

A scalable fiber laser approach is described based on phase-locking multiple gain cores in an antiguided structure. The waveguide is comprised of periodic sequences of gain-and no-gain-loaded segments having uniform index, within the cladding region.

MA4 9:00am

Stretched-pulse fiber laser with a nonlinear optical loop mirror, *Fatih O. Ilday, Frank W. Wise, Cornell Univ., USA.*

A stretched-pulse fiber laser with a nonlinear optical loop mirror (NOLM) produces 135-fs pulses with 1-nJ energy. These are the best results obtained with a laser utilizing a NOLM, which can be the basis for environmentally-stable designs.

MA5 9:15am

Raman amplification in As-Se fiber, *L.B. Shaw, P.C. Pureza, V.Q. Nguyen, J.S. Sanghera, I.D. Aggarwal, Naval Res. Lab., USA; P.A. Thielen, SFA, USA.*

Raman amplification has been demonstrated at 1.56 μm in As-Se fiber. The Raman gain coefficient was measured to be ~340 times that of silica.

MA6 9:30am

A novel pump source for multi-watt continua generation around the zero dispersion of holey fibers, *P.A. Champert, S.V. Popov, J.R. Taylor, Imperial College, UK.*

A 6W source at 770nm based on 64% efficient harmonic generation of a seeded 10W erbium fiber amplifier in PPKTP is demonstrated and used as an alternative to the Ti:Sapphire laser for 2.3W continuum generation in holey fibers.

MA7 9:45am

2W average power, all-fiber format, continuum source based on holey fiber pumped at 1 micron wavelength, *P.A. Champert, S.V. Popov, J.R. Taylor, Imperial Col., UK.*

We propose and demonstrate a 2.1W average power, 600nm wide broadband fiber source based on highly nonlinear 1.6μm core size holey fiber pumped by the 10W average, 1KW peak power seeded Ytterbium fiber amplifier.

Room: Suzor-Coté
10:00am–4:30pm
Exhibits Open

Room: Suzor-Coté
10:00am–11:00am
Coffee Break
MB ■ Poster Session: Nonlinear Conversion and Fiber Optics

Harmonic Generation

MB1

Compact UV source for laser-induced fluorescence applications, *C. Salb, A.J. Alcock, Natl. Res. Council of Canada, Canada; G. Marowsky, S. Soria, Laser Lab. Göttingen, Germany.*

We report a compact, Q-switched, diode-pumped Nd:YVO_4 laser for use in a portable laser-induced fluorescence system. A side-pumped grazing incidence slab configuration is used and harmonic generation yields ~2 ns duration pulses with energies of 300 μJ at 355 nm and 140 μJ at 266 nm.

MB2

Frequency conversion for blue laser emission with $Gd_{1-x}Y_xCOB$, *E. Reino, E. Verdier, G. Aka, J.M. Bénitez, D. Vivien, ENSCP, France.*

Type-I noncritically phase-matched second harmonic generation was studied in $Gd_{1-x}Y_xCOB$. The crystal $Gd_{0.86}Y_{0.13}COB$ was found to be type-I NCPM. The first intracavity frequency doubling of 946 nm Nd: YAG produced 31μW of blue light.

MB3

Diode-pumped cw Nd:YAG laser operating at 938.5 nm and efficient extra-cavity frequency doubling, *Stefan Bjurshagen, David Evekull, Ralf Koch, Acreo, Sweden.*

Efficient operation of a diode-pumped Nd:YAG laser at 938.5 nm is reported. We obtained a continuous wave output power of 3.9 W. Single-pass frequency doubling in periodically poled KTP delivered a power of 88 mW at 469 nm.

MB4

Widely tunable green lasers based on the self-frequency doubling material Yb:YAB, *Peter Dekker, Judith Dawes, Phil Burns, James Piper, Macquarie Univ., Australia.*

We report widely tunable infrared (70nm) and self-frequency-doubled operation, (with 25-450mW output power) in Yb:YAB, covering the wavelengths of the copper vapor laser (510nm, Argon ion (514nm) doubled Nd:YAG (532nm) and green HeNe (543nm).

MB5

Enhanced self-doubling efficiency in directly pumped Nd-activated nonlinear crystals: Case of GdCOB, *V. Lupei, Inst. of Atomic Physics, Romania; G. Aka, D. Vivien, ENSCP, France.*

The possibility to enhance the self-doubling emission characteristics in Nd-activated nonlinear crystals by direct pump in the emitting level is discussed. A marked improvement is reported with respect to the traditional $^4F_{5/2}$ pump for Nd:GdCOB.

MB6

Coupled-cavity, single-frequency Yb:YAB yellow laser, *Phillip A. Burns, Judith M. Dawes, Peter Dekker, James A. Piper, Macquarie Univ., Australia.*

CW single-longitudinal-mode output in the 1120-1140 nm range and self-frequency-doubling into the yellow spectral region has been observed in Yb:YAB. Excellent agreement between experiment and modelling of yellow output in a single-crystal solid-state-laser-system is observed.

MB7
Continuous-wave broadly tunable orange-red generation with an intracavity frequency-doubled Cr^{4+}:forsterite laser, *Alphan Sennaroglu, Koc Univ., Turkey.*
By using a periodically poled lithium niobate crystal, intracavity frequency doubling of a room-temperature, continuous-wave Cr^{4+}:forsterite laser yielded as high as 45 mW of broadly tunable orange-red output between 613 and 655 nm.

Frequency Conversion

MB8
Nanocluster molecular crystals of lacunary polyoxometalates as structure-design-flexible, new inorganic nonlinear materials, *Hidetoshi Murakami, Toshimasa Kozeki, Yuji Suzuki, Shingo Ono, Hideyuki Ohtake, Nobuhiko Sarukura, IMS, Japan; Eri Ishikawa, Toshihiro Yamase, Tokyo Inst. of Tech., Japan.*
Lacunary polyoxometalates, large inorganic, structure-design-flexible, nanocluster crystals are found to have higher optical nonlinearity than KDP by the powder SHG method. Moreover, the capability of generating ultraviolet radiation down to 300 nm is found.

MB9
Spectral narrowing of a pulsed optical parametric oscillator using an intracavity photorefractive crystal pulsed optical parametric oscillator using an intracavity photorefractive crystal, *Stéphane Victori, Thierry Lépine, Patrick Georges, Alain Brun, Lab. Charles Fabry de l'Institut d'Optique, France.*
We report on the first use of a photorefractive crystal inside a pulsed OPO cavity, which acts as a longitudinal mode selector, providing an efficient spectral narrowing.

MB10
Raman laser on strontium tungstate crystal, *P.G. Zverev, T.T. Basiev, L.I. Ivleva, V.V. Osiko, N.M. Polozkov, I.S. Voronina, GPI, Russia.*
Comparable SRS measurements were done in tungstate Raman crystals. Strontium tungstate crystal exhibits one of the highest Raman gain among Nd doped Raman host materials. Efficient intracavity Raman self-conversion in Nd^{3+}:$SrWO_4$ laser was obtained.

MB11

Picosecond stimulated Raman scattering in $BaWO_4$ crystal with close to quantum limit efficiency, *Pavel Černý, Helena Jelínková, Czech Tech. Univ., Czech Republic.*

Stimulated Raman scattering of 35-ps pulses in $BaWO_4$ crystal was studied. First Stokes conversion efficiency reached 38% in single-pass and 85% in double-pass setup. A numerical model developed was in good agreement with measured data.

MB12

High conversion efficiency of an eye-safe KTP monolithic OPO, *N. Angert, E. Gold, Raicol Crystals Ltd.; M. Tseitlin, Col. of Judea and Samaria, Israel; M. Roth, Hebrew Univ. of Jerusalem, Israel.*

We have compared the performance of pulsed eye-safe (1.576 μ) OPO resonators based on KTP crystals with monolithic and conventional external mirrors design. The former yields higher frequency conversion efficiency of 40% and lower conversion threshold.

MB13

Efficient conversion into the mid-IR using periodically poled stoichiometric $LiTaO_3$, *Ariel Bruner, Pinhas Blau, Moti Katz, Soreq NRC, Israel.*

An OPO based on Periodically Poled Stoichiometric $LiTaO_3$ was operated. More than 15% conversion efficiency from 1.064 μm to the 4 μm region, and 0.5 Watt of average output power in a signal resonating SRO were achieved.

MB14

Efficient $ZnGeP_2$ optical parametric oscillator in a doubly resonant ring resonator, *S.D. Setzler, G.A. Rines, P.A. Budni, D.M. Rines, BAE Systems, USA.*

We report the first, to our knowledge, demonstration of a doubly resonant $ZnGeP_2$ optical parametric oscillator in a ring-resonator configuration, providing passive pump-laser isolation potentially eliminating the complexity and losses associated with active Faraday isolation.

MB15
Experimental study of SHG by a laser pulse with nonlinear rotation of polarization azimuth in a type-II synchronism doubling crystal, *A.V. Kir'yanov, J.J. Soto-Bernal, V.J.Pinto-Robledo, Ctr. de Investigaciones en Optica, Mexico.*
An experimental study is performed of the type-II optical second harmonic generation by a laser pulse whose direction of polarization experiences time variations. These ones are shown to result in considerable transformations of the harmonic pulse. Under some conditions, the harmonic pulse shortening is observed comparing the case of a pump fundamental pulse with fixed polarization.

MB16
Optical parametric oscillator for narrow-band conversion to a single polarization, *G. Arisholm, FFI, Norway.*
We present simulations of an optical parametric oscillator concept that combines degenerate type 1 and 2 interactions. The former couples most of the converted pump light to a single signal polarization, while the latter limits the bandwidth.

Fiber Lasers

MB17
Blue thulium-doped double-clad fiber amplifier by an up-conversion process: Numerical model, *Phillippe Lagueux, Martin Chamberland, Telops, Canada; Réal Vallée, COPL, Canada.*
A numerical model of a thulium-doped ZBLAN fiber amplifier, which provides gain for blue light at about 482nm when co-directionally pumped at around 1120nm by an up-conversion mechanism is presented.

MB18
Cr^{4+}-doped silica-based optical fibers fluorescence from 0.8 μm to 1.7 μm, *Bernard Dussardier, Valérie Felice, Gérard Monnom, Univ. de Nice Sophia Antipolis, France; Yannick Guyot, Georges Boulon, Univ. Claude Bernard, France.*
The luminescence broad band from Cr^{4+}-doped silica-based optical fibers is highly sensitive to preparation and experimental parameters. We present spectroscopic measurements and discuss the optical properties of this new kind of active optical fiber.

MB19
Gradient-index Nd:YAG crystal fiber laser, *Chia-Yao Lo, Tsai-Shuan Chou, Li-Ming Lee, Pi-Ling Huang, Sheng-Lung Huang, Nat. Sun Yat-Sen Univ., Taiwan; Yujing Huo, Tsinghua Univ., China.*
Efficient Nd:YAG lasers were demonstrated using gradient-index crystal fibers. 75 mW of laser output power was achieved with a slope efficiency of 17.1%. Index difference of 0.0284 between the center and edge of the crystal fiber was observed.

MB20
Suppression of higher order modes in a multimode fiber amplifier using efficient gain-loss-management (GLM), *J. Limpert, H. Zellmer, A. Tünnermann, T. Pertsch, F. Lederer, Friedrich-Schiller-Univ. Jena, Germany.*
The suppression of higher order transverse modes in rare-earth-doped multimode fiber amplifiers is analyzed. Applying an efficient gain-loss-management single transverse mode operation can be enforced in fibers with core diameters up to several 10 μm to 100 μm.

Room: Borduas/Krieghoff
11:00am–12:30pm

MC ■ Ultrafast Lasers

Andreas Tunnermann, Friedrich-Schiller Univ., Germany, Presider

Presider

MC1 11:00am Invited
High average power femtosecond and picosecond lasers, *R. Paschotta, F. Brunner, E. Innerhofer, T. Südmeyer, U. Keller, Swiss Fed. Inst. of Tech., Switzerland.*
We discuss recent developments in passively mode-locked lasers with high average output power, based on thin disk laser heads and semiconductor saturable absorber mirrors (SESAMs). New power records of 23 W in 420-fs pulses and 60 W in 5-ps pulses are presented.

MC2 11:30am
Diode pumped multikilohertz femtosecond amplifier, *Antoine Courjaud, CELIA and THALES Laser, France; Rysvan Maleck-Rassoul, Nelly Deguil, Clemens Hönninger, François Salin, CELIA, France.*
We report on a high-energy diode pumped Yb:KGW femtosecond system delivering 0.2 mJ,420 fs pulses at repetition rates up to 3 kHz. A single 15 W fiber-coupled diode pumps the amplifier leading to a compact reliable system for industrial applications.

MC3 11:45am

Broadband high-gain pre-amplifier based on OPCPA for PW laser system, *Y. Izawa, H. Yoshida, E. Ishii, K. Sawai, R. Kodama, H. Fujita, Y. Kitagawa, S. Sakabe, N. Miyanaga, T. Yamanaka, Osaka Univ., Japan; M. Fujita, Inst. for Laser Tech., Japan.*

A broadband high-gain pre-amplifier using optical parametric chirped pulse amplification in the PW glass laser system has been developed. The output energy of 20 mJ without gain narrowing was obtained in a single pass through two BBO–OPCPA systems with good output stability.

MC4 12:00pm

High average power femtosecond fiber CPA system, *A. Liem, J. Limpert, S. Höfer, S. Nolte, H. Zellmer, A. Tünnermann, Friedrich-Schiller-Univ. Jena, Germany; V. Reichel, S. Unger, S. Jetschke, H.R. Müller, Inst. for Physical High Tech., Germany.*

We report on a diode-pumped ytterbium-doped low-NA large mode area fiber based chirped pulse amplification system delivering 28.5 W average power at a repetition rate of 75 MHz and diffraction limited beam quality. Femtosecond laser pulses at 1060 nm center wavelength are stretched in a single mode fiber and recompressed after amplification to 600 fs pulse duration.

MC5 12:15pm

Sub-40 fs pulses from a 500 fs green-pumped single-pass noncollinear parametric amplifier, *R. Maleck-Rassoul, F. Salin, CELIA, France; A. Courjaud, CELIA and THALES Laser, France.*

500 fs pulses at 3kHz repetition rate from a diode pumped Yb:KGW system were used to produce 30 fs pulses tunable from 750 to 850 nm.

12:30pm–2:00pm

Lunch Break (on your own)

Room: Borduas/Krieghoff
2:00pm–4:00pm

MD ■ Ytterbium Lasers

Christopher D. Marshall, Lawrence Livermore Natl. Lab., USA, Presider

Presider

MD1 2:00pm
Initial experiments on Mercury, a 100 J / 10 ns / 10 Hz diode-pumped solid-state laser, *A.J. Bayramian, R.J. Beach, W. Behrendt, C. Bibeau, C.A. Ebbers, B.L. Freitas, V.K. Kanz, S.A. Payne, K.I. Schaffers, K.M. Skulina, L.K. Smith, J.B. Tassano, Lawrence Livermore Natl. Lab., USA.*
We report the activation of four 80 kW diode arrays, fabrication of four full aperture (4 x 6 x 0.75 cm) S-FAP slabs, an average power Pockels cell, transmitted wavefront, and gain measurements on the Mercury laser system.

MD2 2:15pm
Laser performance of Yb:S-FAP in a prismatic side-pumping configuration, *Bhabana Pati, Kevin F. Wall, Q-Peak, Inc., USA; K.I. Schaffers, Lawrence Livermore Natl. Lab., USA.*
We have demonstrated the first, to our knowledge, side-pumped, 1047-nm, Yb:S-FAP laser. Using a prismatic pump cavity and quasi-CW diode pump lasers, we obtained an energy-per-pulse of 8 mJ with an optical-to-optical slope efficiency of 8%.

MD3 2:30pm
Growth of sesquioxides for high power thin-disk-laser applications, *V. Peters, K. Petermann, G. Huber, Univ. Hamburg, Germany; M. Larionov, J. Speiser, A. Giesen, Univ. Stuttgart, Germany.*
Yb-doped sesquioxides (Sc_2O_3, Lu_2O_3) grown by the Bridgman-method produced an output power of 124W cw in the thin-disk-laser-setup. Crystals of improved optical quality can be grown by the heat-exchanger-method (HEM).

MD4 2:45pm
Growth, characterization, and laser operation of $Yb_3Al_5O_{12}$ with nearly intrinsic Yb^{3+}-fluorescence lifetime, *V . Müller, V. Peters, E. Heumann, M. Henke, K. Petermann, G. Huber, Univ. Hamburg, Germany.*
Highly doped Yb:$Y_3Al_5O_{12}$ crystals exhibit a strong fluorescence quenching when grown using traditional growth methods. Experiments with fully concentrated $Yb_3Al_5O_{12}$ were performed to identify the reasons for this fluorescence quenching and circumvent them.

MD5 3:00pm

Q-switched, injection-seeded, single-frequency Yb:YAG disk laser, *Allen K. Hankla, Timothy J. Carrig, Coherent Tech., Inc., USA.*

A Q-switched, injection-seeded, single-frequency Yb:YAG disk laser that outputs up to 22 W is described. The laser has been Q-switched at pulse repetition frequencies of 300-10,000 Hz and outputs up to 12 mJ/pulse.

MD6 3:15pm

1.5 W femtosecond diode-pumped Yb:KGW laser, *Antoine Courjaud, CELIA and THALES Laser, France; Nelly Deguil, François Salin, CELIA, France.*

We present a high average power passively mode-locked diode-pumped Yb:KGW laser using a simple fiber-coupled laserdiode pump source.The laser produces 25 nJ pulses with 150 fs pulse duration and 1.5 W average power at 1032 nm.

MD7 3:30pm

CW and femtosecond regime of a new very broadband Yb-doped BOYS crystal, *F. Druon, S. Chénais, P. Raybaut, F. Balembois, P. Georges, Centre Univ. d'Orsay, France; R. Gaumé, G. Aka, B. Viana, D. Vivien, ENSCP, France; S. Mohr, D. Kopf, High Q Laser Production, Austria.*

We studied a new promising broadband crystal : Yb:BOYS. A femtosecond laser producing largely tunable and sub-100-fs (down to 69fs) pulses was built.

MD8 3:45pm

Spectral compression of picosecond pulses in a single-mode Yb-doped fiber amplifier, *J. Limpert, T. Gabler, A. Liem, H. Zellmer, A. Tünnermann, Friedrich-Schiller-Univ. Jena, Germany.*

In a fiber amplifier spectral compression due to self-phase modulation (SPM) is demonstrated for ultrashort pulses for the first time. We report on the generation of near-transform-limited picosecond pulses with peak powers up to 7 kW at a repetition rate of 74 MHz and diffraction-limited beam quality in an Yb-doped fiber amplifier when seeding with a negative chirped pulse.

Room: Suzor-Coté
4:00pm–4:30pm
Refreshment Break

Room: Borduas/Krieghoff
4:30pm–6:00pm
ME ■ Postdeadline Paper Session

Larry Marshall, Lightbit, USA, Presider

■ Tuesday
■ February 5, 2002

Room: Borduas Foyer
7:30am–12:30pm
Registration

Room: Borduas/Krieghoff
8:00am–10:00pm
TuA ■ Nonlinear Optical Sources
Peter F. Moulton, Q-Peak Inc., USA, Presider

Presider

TuA1 8:00am Invited

Concepts and technologies of advanced RGB Sources, *B. Henrich, T. Herrmann, J. Kleinbauer, R. Knappe, A. Nebel, R. Wallenstein, Univ. of Kaiserslautern, Germany.*
This paper reports on concepts and technologies of advanced all solid state RGB sources which are based on mode-locked diode pumped infrared solid state lasers with nonlinear frequency conversion.

TuA2 8:30am
PPLN optical parametric oscillator pump-tuned by a grazing incidence coupled cavity Ti:sapphire laser, *Chris J. Lee, Donald M. Warrington, Univ. of Otago, New Zealand; Iain T. McKinnie, Coherent Tech. Inc., USA; Peter G.R. Smith, Graeme W. Ross, David C. Hanna, Univ. of Southhampton, UK.*
We report a PPLN OPO, capable of delivering 360 μJ, pumped by a tunable Ti:sapphire laser. 25 nm of pump tuning produced OPO tuning from 0.94 - 1.21 μm (signal) and 2.2 - 4.3 μm (idler).

TuA3 8:45am
Active frequency converter for continuous-wave tunable lasers, *J. Capmany, J.A. Pereda, A. Coves, Univ. Miguel Hernández, Spain; V. Bermúdez, D. Callejo, E. Diéguez, Univ. Autónoma de Madrid, Spain.*
We present an active frequency converter for continuous wave Ti:Sapphire tunable laser that produces tunable radiation between 440-475 nm and 485-505 nm. The device is based on self-sum-frequency mixing of the tunable emission of a Ti:Sapphire laser injected in the cavity of a diode-pumped aperiodically poled Nd^{3+}:$LiNbO_3$ laser oscillating in continuous-wave.

TuA4 9:00am
Multi-watt ZGP OPO based on diffusion bonded walkoff compensated KTP OPO and Nd: YALO laser, *R.F. Wu, K.S. Lai, Ernest Lau, H.F. Wong, W.J. Xie, Y.L. Lim, K.W. Lim, Lindy Chia, DSO Natl. Labs., Republic of Singapore.*
We have obtained maximum average power of 2.5W of mid-IR radiation from an ZGP OPO, which is pumped by an intracavity diffusion bonded walkoff compensated (DBWOC) KTP OPO placed inside the Nd: YALO laser cavity.

TuA5 9:15am
High-efficiency mid-IR nanosecond cascaded optical parametric oscillators based on diffusion-bonded walk-off-compensated KTP and ZGP crystals, *Renaud Lebrun, Gabriel Mennerat, CILAS, France; Patrick Georges, Ctr. Univ. d'Orsay, France.*
We demonstrate a high efficiency cascaded OPO setup based on DBWOC KTP and ZGP crystals for emission in the mid-IR from a 1064 nm pump. The overall energy conversion efficiency from 1 μm to 3.8-5 μm was 10.3%.

TuA6 9:30am
Laboratory study of beam quality in an image-rotating optical parametric oscillators, *Darrell J. Armstrong, Arlee V. Smith, Sandia Natl. Labs., USA.*
We performed laboratory and numerical studies of optical parametric oscillators with 90° intracavity image rotation. We found the signal beam was more symmetric than that from comparable cavities without image rotation, and it had low values of M^2.

TuA7 9:45am
Coherence enhancement in optical parametric devices pumped by multi-transversal-mode beams, *V. Pasiskevicius, F. Laurell, Royal Inst. of Tech., Sweden; H. Karlsson, Cobolt AB, Sweden; V. Smilgevicius, A. Piskarskas, Vilnius Univ., Lithuania.*
Coherence properties were investigated in multi-transversal-mode-pumped PPKTP OPG and OPO. Generation of totally spatially coherent signal is demonstrated in devices pumped by Bessel-Gauss beam. The degree of coherence of OPO signal exceeds that of pump.

Room: Suzor-Coté
10:00am–12:30pm
Exhibits Open

Room: Suzor-Cote
10:00am–11:00am
Coffee Break
TuB ■ Poster Session: Mid-Infrared and Laser Spectroscopy

Mid-IR

TuB1
1.3-μm neodymium laser passively mode-locked with PbS-doped phosphate glass, *V.G. Savitski, A.M. Malyarevich, P.V. Prokoshin, N.N. Posnov, K.V. Yumashev, Intl. Laser Ctr., Belarus; A.A. Lipovskii, St. Petersburg State Tech. Univ., Russia.*
Mode-locking of Nd:YAP laser at 1.34 μm with PbS phosphate glass as saturable absorber is demonstrated. Kinetics of bleaching for glasses doped with PbS quantum dots of different radii at 1.3 μm is discussed.

TuB2
Pecurarities of operatioin of Cr^{4+}-doped garnets with different thickness in adaptive loop resonator, *V.B. Tsvetkov, D.A. Nikolaev, G.A. Bufetova, I.A. Shcherbakov, General Physics Inst., Russia.*
Results of experimental investigation and computer simulation of the self-adaptive loop resonator operation with different thickness of Cr-doped garnets as nonlinear medium are presented.

TuB3
New saturable absorber passive Q-switches for erbium laser, *V.G. Shcherbitsky, V.E. Kisel, N.V. Kuleshov, Intl. Laser Ctr., Belarus; V.I. Levchenko, V.N. Yakimovich, Natl. Academy of Science, Belarus.*
Passive Q-switching of flash-lamp pumped Er:YSGG laser operating at 2790 μm was demonstrated with Co:ZnS and Fe:ZnSe saturable absorbers. The output pulses with energy of 10 mJ and 3.2 mJ and pulse width of 350 ns and 140 ns were obtained with Co:ZnS and Fe:ZnSe, respectively.

TuB4
High energy diode-pumped Er:Yb:Glass 1.54μm laser, *E. Georgiou, G. Stivaktakis, A. Souliotis, Tech. Educational Inst. of Crete, Greece; O. Musset, J.P. Boquillon, Univ. de Bourgogne, France.*
The use of a burst-series of diode-pump pulses in a compact Er:Yb:Glass laser yields 1.2J output energy in free-running operation and 25% optical slope efficiency.

TuB5

Yb-Er laser glass for high average power diode-pumped 1.54 mkm lasers, *B. Denker, V. Osiko, B. Galagan, S. Sverchkov, Russian Acad. of Science, Russia; G. Karlsson, F. Laurell, J. Tellefsen, Royal Inst. of Tech., Sweden.*

A new Yb-Er glass for high average power 1.54 μm diode-pumped lasers is developed and investigated. Its thermal damage threshold significantly exceeds the power of existing single laser diodes.

TuB6

600 mJ, double-pulsed Ho amplifier, *Jirong Yu, Upendra N. Singh, NASA Langley Research Center, USA; Alain Braud, SAIC, USA; Mulugeta Petros, Science and Tech. Corp., USA.*

An efficient double-pulsed Ho:Tm:YLF 2-μm laser amplifier has been demonstrated. 600 mJ per pulse pair under Q-switch operation is achieved with the gain of 4.4, which represents the highest reported optical-to-optical efficiency at this energy level.

TuB7

Direct measurement of upper laser level population dynamics in a laser-diode side-pumped Ho:Tm:$YLiF_4$ 2 micron laser, *A. Braud, SAIC, USA; J. Yu, N.P. Barnes, NASA, USA; M. Petros, Science and Tech. Corp., USA.*

A pump-probe setup capable of directly measuring the upper laser level population dynamics of the $^5I_7$ to $^5I_8$ laser transition is developed. The results are investigated both theoretically and experimentally under non-lasing and lasing conditions.

TuB8

A comparison of Tm:Ho:YLF and Tm:Ho:LuLF for 2.0 micrometer lasers; experiment and modeling, *Brian M. Walsh, Boston Col., USA; Norman P. Barnes, Jirong Yu, NASA Langley Res. Ctr., USA; Mulugeta Petros, Science and Tech. Corp., USA.*

Tm:Ho co-doped crystals of $YLiF_4$ (YLF) and $LuLiF_4$ (LuLF) are studied for 2.0 μm laser applications. Energy levels and cross sections are determined for the manifolds involved in 2.0 μm lasing. Diode side-pumped laser performance shows Tm:Ho:LuLF to have a lower threshold and higher slope efficiency than Tm:Ho:YLF. An explanation for the improved performance of Tm:Ho:LuLF over Tm:Ho:YLF through modeling of the laser is presented.

TuB9

Photodynamic processes in Ce-activated solid-state active media: anti-solarant co-doping and new tunable UV-blue laser materials, *V.V. Semashko, R.Yu Abdulsabirov, S.L. Korableva, A.K. Naumov, Kazan State Univ., Russia; M.A. Dubinskii, Magnon, Inc., USA.*
The results of a comprehensive analysis of dynamic processes in Ce^{3+}-activated media with and without anti-solarant co-doping are reported along with the first UV lasing results on Yb^{3+} co-doped Ce^{3+}: KY_3F_{10} (Ce:KYF) material.

TuB10

Study of optical bistability in stimulated emission from Cr:LiSrGaF6 laser, *M.A. Noginov, B.D. Lucas, M. Vondrova, Norfolk State Univ., USA.*
We have theoretically predicted and experimentally demonstrated an optical bistability in Cr:$LiSrGaF_6$ laser. The effect of various experimental parameters on optical bistability was studied. The experimental results are in a good agreement with theoretical predictions.

TuB11

Spectroscopic and luminescent study of new potential laser medium based on the Cr:$(Ce,Gd)Sc_3(BO_3)_4$ single crystals, *E.V. Kluchko, V.A. Lebedev, Kuban State Univ., Russia; A. DeBacker, I.M. Razdobreev, Univ. des Sciences et Tech., France; M.G. Brik, Univ. of Asmara, Eritrea.*
Heterodesmic crystals of Cr:$(Ce,Gd)Sc_3(BO_3)_4$ (CSB) exhibit a broad-band luminescence with high quantum output. Due to low thermal quenching and high emission cross sections Cr^{3+}:CSB crystals can be attractive as active media for tunable lasers with diode pumping.

TuB12

Spectroscopic characterization of chromium in single crystals of Li_2MgSiO_4, *C. Jousseaume, A. Kahn-Harari, J. Derouet, D. Vivien, CNRS-UMR, France.*
Single crystals of Cr^{IV}:Li_2MgSiO_4 reveal a very long fluorescence lifetime: more than 100µs at room temperature. Chromium spectroscopic characterization and semi-empirical crystal field calculations are presented in order to elucidate this exceptional property.

TuB13

Linear electron-phonon interaction and non-radiative transitions in $LiCaAlF_6:Cr^{3+}$ laser crystals, *M.G. Brick, Univ. of Asmara, Eritrea; C.N. Avram, N.M. Avram, Univ. of the West Timisoara, Romania.*

Low-lying energy levels structure, the constants of the electron-phonon interaction and the probabilities of the non-radiative transitions in the oscillating field model of $LiCaAlF_6:Cr^{3+}$ were calculated. Comparation with the experiment is discussed.

TuB14

Compositional wavelength tuning predictions for garnets; Comparison with experimental results, *Norman P. Barnes, NASA Langley Res. Ctr., USA; Brian M. Walsh, Boston Col., USA; Elizabeth D. Filer, SAIC; Ralph L. Hutcheson, Randy Equall, Scientific Materials, USA.*

Laser tuning rates achievable by varying the composition of the laser material are predicted using a quantum mechanical model and compare favorably with experimental results for garnets. The method is extended to other Nd laser materials.

TuB15

Quantum efficiency measurements of Nd:YAG, Yb:YAG, and Tm:YAG, *Norman P. Barnes, NASA Langley Res. Ctr., USA; Brian M. Walsh, Boston Col., USA.*

Quantum efficiencies of Nd:YAG, Yb:YAG, and Tm:YAG were measured using several different approaches. Good agreement is obtained for Nd:YAG and Yb:YAG utilizing 2 different methods. Tm:YAG measurements required a different method because of the anomalous behavior.

TuB16

Spectroscopic analysis and diode pumped laser results of $Nd:BaY_2F_8$, *A. Agnesi, A. Guandalini, G. Reali, Univ. of Pavia, Italy; F. Cornacchia, E. Sani, A. Toncelli, M. Tonelli, Univ. of Pisa, Italy.*

Here we present our room temperature polarized IR spectroscopic investigation and diode-pumped cw laser results in the 1 and 1.3 μm regions together with some preliminary Q-switching results in the 1 μm region on some $Nd^{3+}:BaY_2F_8$ samples.

TuB17

Investigation of the spectroscopic properties of Nd:YVO_4, *R.D. Peterson, H.P. Jenssen, Univ. of Central Florida, USA; A. Cassanho, AC Materials, USA.*
Absorption and stimulated emission cross section were measured for Nd:YVO_4 using a self-consistent method that also provides verification of the active ion concentration in the crystal. Peak emission cross section of 11.4 x 10^{-19} cm^2 was obtained.

TuB18

Optical properties of highly Nd-doped $GdVO_4$ crystals grown by the floating zone method, *Takayo Ogawa, Masataka Morita, Yoshiharu Urata, Megaopto Co., Ltd; Hiroshi Machida, Tokin Corp., Japan; Tomohiro Shonai, Michio Higuchi, Kohei Kodaira, Hokkaido Univ., Japan; Satoshi Wada, RIKEN, Japan.*
Highly neodymium-doped $GdVO_4$ crystals were successfully grown by the floating zone (FZ) method. Nd-doped crystals with a Nd concentration as high as 10 at. % showed favorable optical properties and laser performance.

TuB19

Cr^{4+}:$LiGaSiO_4$ crystal - new promising active medium for tunable solid-state lasers, *K.A. Soubbotin, V.A. Smirnov, E.V. Zharikov, I.A. Shcherbakov, Russian Acad. of Sciences, Russia.*
New crystal Cr^{4+}:$LiGaSiO_4$ was grown from melt for the first time. The preliminary investigation of its spectroscopic properties shows the prospects of this crystal as new active laser medium.

TuB20

A study of the energy transfer self-absorption of an Er^{3+} doped silicate glass, *R. Naccache, F. Vetrone, J.A. Capobianco, Concordia Univ., Canada; A. Speghini, M. Bettinelli, Univ. di Verona, Italy.*
The energy transfer properties of erbium-doped multicomponent silicate glass designed for waveguide fabrication are investigated using fluorescence spectroscopy. Self-absorption is observed to occur for all transitions except the intraconfigurational transition.

Room: Borduas/Krieghoff
11:00am–12:30pm

TuC ■ Nd Lasers

Hiroshi Komine, TRW, USA, Presider

TuC1 11:00am
A 49.5 W Nd:YVO_4 laser using the disc-anvil configuration, *Renzhong Hua, Kresimir Franjic, Barry Bruner, R.J.D. Miller, Univ. of Toronto, Canada; Yan Liao, GSI Lumonics, Canada.*
By using a thin disc in clamped boundary conditions, output powers of 49.5 W (M^2 =6.6) or 31 W of TEM_{00} have been attained using Nd:YVO_4 with 110 W of incident pump power. This concept should enable scaling output powers to the 100 W TEM_{00} level in a simple design.

TuC2 11:15am
Highly efficient CW Nd:Y_2O_3 ceramic laser, *Jianren Lu, Junhua Lu, T. Murai, K. Takaichi, T. Uematsu, Ken-ichi Ueda, Univ. of Electro-Comm., Japan; Hideki Yagi, Takakimi Yanagitani, Konoshima Chemical Co., Japan; Alexander A. Kaminskii, Russian Acad. of Sciences, Russia.*
High-transparency large-size Nd:Y_2O_3 ceramics were fabricated successfully. Optical properties were investigated. CW lasing was demonstrated with an 1.5% Nd:Y_2O_3 ceramic plate. 160 mW output power was obtained with an slope efficiency of 32%.

TuC3 11:30am
New 3 D multipass Nd:YAG or Nd:YVO_4 diode-pumped amplification scheme, *Sébastien Forget, François Balembois, Patrick Georges, Univ. Paris-Sud., France.*
We report on a new tri-dimensional multipass longitudinally diode-pumped amplification scheme that provides both high gain (up to 30 dB) and efficient energy extraction (3W of output power) from Nd doped crystals.

TuC4 11:45am
Efficient, diode temperature insensitive Nd:YAG hybrid longitudinal transversal pumped zigzag slab laser: Delta concept, *B. Crépy, M. Le Nevé, J. Montagne, CILAS, France; L. Cabaret, Lab. Aime Cotton, France.*
A diode-pumped Nd:YAG laser has been developed with a novel hybrid longitudinal/transversal-pumped zig-zag slab architecture. This novel architecture enables to pump with multipass through the active medium. The laser provides output pulse energy of 140 mJ.

TuC5 12:00pm

Laser emission of Nd:ASL at 900 nm, *G. Aka, E. Reino, D. Vivien, ENSCP, France; François Balembois, Patrick Georges, Lab. Charles Fabry de l'Inst. d'Optique; B. Ferrand, CEA-LETI, France.*

An output power of 250 mW has been obtained from a Nd-doped strontium-lanthanum aluminate crystal (Nd:ASL) pumped by a titanium sapphire laser. The slope efficiency reached 65%. This value is relatively high for a quasi-three level Nd-doped laser.

TuC6 12:15pm

Passive Q-switching of 1.35 μm diode-pumped Nd:KGW laser with PbS- doped silicate glasses, *V.G. Savitski, A.M. Malyarevich, P.V. Prokoshin, N.N. Posnov, M.S. Gaponenko, K.V. Yumashev, Intl. Laser Ctr., Belarus; E. Raaben, A.A. Zhilin, S.I. Vavilov, State Optical Inst., Russia.*

Q-switching of Nd:KGW at 1.35 μm diode-pumped solid state laser with PbS quantum dots doped silicate glasses as saturable absorber is demonstrated. Intensity dependent transmission and kinetics of bleaching for PbS doped glasses with QD's of different radii at 1.3 μm are discussed.

12:30pm–6:00pm

LUNCH BREAK (on your own)

FREE AFTERNOON

6:00pm–7:00pm

Coherent Reception

Room: Borduas/Krieghoff

7:00pm–10:00pm

Conference Banquet

■ Wednesday
■ February 6, 2002

Room: Borduas Foyer
7:30am–5:00pm
Registration

Room: Borduas/Krieghoff
8:00am–10:00am
WA ■ Mid IR Lasers
Patrick Georges, Univ. Paris Sud, France, Presider

Presider

WA1 8:00am
A CW side-pumped Tm:YLF laser, *Alex Dergachev, Kevin Wall, Peter F. Moulton,Q-Peak, Inc., USA.*
We report on a broadly tunable (1905 - 2067 nm) diode-pumped Tm:YLF laser producing cw output powers of >10 W (37% slope efficiency) in multimode operation and 6.5 W in the TEM_{oo} mode.

WA2 8:15am
Tunable efficient continuous-wave room-temperature Tm^{3+}:$GdVO_4$ laser, *Evgeni Sorokin, Irina T. Sorokina, Inst. fur Photonik, Austria; Andrei N. Alpatiev, Alexander I. Zagumennyi, Ivan A. Shcherbakov, Russian Acad. of Sciences, Russia.*
We report room-temperature continuous-wave laser operation, tunable over 1.86 to 1.99 μm range with up to 55 % slope efficiency at the $^3F_4$ ->$^3H_6$ transition in Tm^{3+}:$GdVO_4$ laser. Threshold pump power as low as 86 mW was measured.

WA3 8:30am
Tunable telecom diode laser based mid-IR source at 2.64 microns, *Dirk Richter, Alan Fried, Geoffrey S. Tyndall, Natl. Ctr. for Atmospheric Res., USA; Eduardo Oteiza, Coherent Inc., USA; Miklos Erdelyi, Frank K. Tittel, Rice Univ., USA.*
We report a new difference frequency mixing optical architecture for the generation of coherent mid-infrared radiation at ~2.64 microns. A fiber pigtailed optically pumped semiconductor laser operating at 981 nm is mixed with an Er/Yb fiber amplified DFB diode laser at 1562 nm in a 19 mm long periodically poled lithium niobate crystal (PPLN). With respective powers of ~450mW by each of these pump lasers, spectrally stable, narrow linewidth mid-IR radiation of 0.25 mW is generated with a near Gaussian beam profile. Wavelength tuning characteristics and the sensitive spectroscopic detection of HF and HDO are reported.

WA4 8:45am

Cr^{2+}:ZnSe laser pumped by a 1.57 μm erbium fibre amplifier, *D. Albrecht, H.M. Kretschmann, M. Mond, E. Heumann, G. Huber, S. Kueck, Univ. Hamburg, Germany; V.I. Levchenko, V.N. Yakimovich, Natl. Acad. of Science, Belarus; V.G. Shcherbitsky, V.E. Kisel, N.V. Kuleshov, Intl. Laser Ctr., Belarus.*

A Cr^{2+}:ZnSe laser pumped by a 1.57 μm erbium fibre amplifier is presented. In this compact setup an output power of 230 mW was obtained.

WA5 9:00am

Tunable continuous-wave room-temperature Cr^{2+}:ZnS laser, *Irina T. Sorokina, Evgeni Sorokin, Inst. fur Photonik, Austria; Vladimir Fedorov, Sergey Mirov,Univ. Alabama- Birmingham, USA; Alberto Di Lieto, Mauro Tonelli, Univ. of Pisa, Italy; Andranik Avanesov, Kuban State Univ., Russia.*

We report the first continuous-wave tunable over ~280 nm around 2.3 μm Cr^{2+}:ZnS laser, pumped by the Co:MgF_2 laser at 1.67 μm and generating over 100 mW of output power.

WA6 9:15am

Mid-IR CW Cr^{2+}:ZnS and ZnSe microchip lasers, *S.B. Mirov, V.V. Fedorov, K. Graham, I.S. Moskalev, Univ. of Alabama–Birmingham, USA; V.V. Badikov, V. Panutin, Kuban State Univ., Russia.*

The first successful demonstrations of Er fiber laser pumped CW ZnS:Cr^{2+} and ZnSe:Cr^{2+} microchip lasers are reported with the maximum output powers of 63 and 100 mW and the slope efficiencies of 53 and 20%, respectively.

WA7 9:30am

Extended mid-IR tuning of a Cr^{2+}:CdSe laser, *Jason B. McKay, Won B. Roh, Air Force Inst. of Tech., USA; Kenneth L. Schepler, Air Force Res. Lab., USA.*

We report 2450-3400 nm laser operation from a Cr^{2+}:CdSe laser, pumped by a Q-switched Tm,Ho:YLF laser. Laser tuning was achieved over a large part of the 2100-3400 nm emission cross section bandwidth using a simple grating-tuned resonator.

WA8 9:45am

Multipulse operation and limits of the Kerr-lens mode locking stability for Cr^{2+}:ZnSe laser, *V.L. Kalashnikov, E. Sorokin, I.T. Sorokina, Inst. für Photonik, Austria.*

The numerical simulations supported by experimental data demonstrate stable multipulse lasing and define the limits of femtosecond pulse generation for Kerr-lens mode-locked Cr^{2+}:ZnSe laser

Room: Suzor-Coté

10:00am–4:00pm

Exhibits Open

Room: Suzor-Cote

10:00am–11:00am

Coffee Break

WB ■ Poster Session: Yb Lasers, Nd:DPSSL, Nd:YAG Laser Technology

Yb Lasers

WB1

New evaluation of ytterbium-doped laser crystals, *Alain Brenier, Georges Boulon, Univ. Claude Bernard Lyon, France.*

Considering both the optical parameters of the diode pump and the spectroscopic characterizations of the ytterbium-doped laser crystals, we show a new evaluation of the most promizing compounds for either amplifier or oscillator regimes.

WB2

Crystal host requirements for Yb-based high power lasers and laser properties of Yb:YCOB composites, *R. Gaumé, B. Viana, D. Vivien, G.P. Aka, LCAES-ENSCP, France.*

Laser, structural, and crystal growth parameters lead us to a quantification of the thermal behavior of the Yb-based laser material. First results on Yb:YCOB composite obtained by diffusion bonding are also presented.

WB3

Thermal lensing measurements in diode-pumped Yb-doped materials, *S. Chénais, F. Balembois, P. Georges, Centre Univ. d'Orsay, France; R. Gaumé, B. Viana, G.P. Aka, D. Vivien, ENSCP, France.*

A Shack-Hartmann wavefront sensor was used to measure thermal lensing in diode-pumped Yb-doped YCOB and YSO, under lasing or non-lasing conditions. Reduction of thermal effects in composite crystals is observed, as well as a dependance of thermal lensing with the emission wavelength.

WB4

Gain and thermal characteristics of end-pumped thin-rod Yb:YAG amplifier, *S. Kawato, Y. Sugiura, Y. Tsujioka, T. Kobayashi, Fukui Univ., Japan.*

An end-pumped thin-rod Yb:YAG amplifier has been developed for efficient amplification of high repetition pulses. The unsaturated single-path gain was 1.4 with the pump power of 70 W, which agree well with theoretical analysis.

WB5

Enhancement of Yb:BOYS mechanical properties for tunable and ultrafast lasers, *R. Gaumé, B. Viana, G. Wallez, D. Vivien LCAES-ENSCP, France.*

Yb^{3+}:BOYS, a new tunable and ultrafast laser material, could have its mechanical properties enhanced by the use of a cationic substitution. In $Yb^{3+}:(Sr_{1-x}Ca_x)_3Y(BO_3)_3$, $0<x<0.5$, the thermal expansion and material hardness properties are improved. Laser oscillation has been obtained.

WB6

Yb:KYW microchip laser performance: fundamental frequency generation and Raman self-frequency conversion, *A.S. Grabtchikov, A.N. Kuzmin, V.A. Lisinetskii, V.A. Orlovich, Natl. Acad. of Sciences, Belarus; A.A. Demidovich, ICS-UNIDO; M.B. Danailov, Lab. for Lasers and Optical Fibres, Italy; H.J. Eichler, TU Berlin-Optisches Inst., Germany; A. Bednarkiewicz, W. Strek, Polish Acad. of Sciences, Poland; A.N. Titov, Vavilov State Optical Inst., Russia.*

Diode pumped Yb:KYW microchip laser in passively Q-switched and CW regimes is demonstrated. A slope efficiency of 23% has been achieved for CW operation. Raman self-frequency conversion for the microchip configuration has been obtained.

WB7

Diode-pumped Q-switched Yb:$LiYF_4$ laser at low temperature for chirped pulse regenerative amplification, *Junji Kawanaka, Koichi Yamakawa, APR/JAERI, Japan; Hajime Nishioka, Ken-ichi Ueda, ILS/UEC, Japan.*

A diode-pumped regenerative amplifier with a cooled Yb:$LiYF_4$ crystal has been constructed for chirped pulse amplification. The intracavity energy of 125 mJ in a Q-switching operation mode was experimentally estimated in saturation.

WB8
Single-frequency operation of a diode-pumped Yb:SVAP laser tunable from 1104nm to 1128nm, *Allen K. Hankla, Gregory J. Wagner, Timothy J. Carrig, Coherent Tech., Inc., USA; Nathan A. Brilliant, Craig A. Denman, Air Force Res. Lab., USA.*
We report tunable, single longitudinal mode operation of a diode-pumped Yb:SVAP laser. Single-frequency tuning was achieved from 1104nm to 1128nm with a peak output power of 130mW at 1115nm.

Nd:DPSSL

WB9
Diode end pumped slab laser with variable reflectivity mirror, *C. Schnitzler, G. Schmidt, M. Höfer, D. Hoffmann, R. Poprawe, Fraunhofer Inst. fur Lasertechnik, Aachen.*
This paper contains a comprehensive study of using variable reflectivity mirrors in order to increase the beam quality of a hybrid resonator. 60W output power are generated at a beam quality M^2=1.2.

WB10
High quality output from a CW Nd:YVO_4 laser with phase conjugate resonator, *Takashige Omatsu, Chiba Univ., Japan; A. Minassian, M.J. Damzen, Imperial Col., UK.*
Laser oscillation of a continuous-wave diode-pumped Nd:YVO_4 phase conjugate resonator has been demonstrated. A 7.5 W output with high beam quality was obtained. Slope efficiency of 46 % and optical extraction efficiency of 33 % were achieved.

WB11
A novel multi-rod configuration to generate automatically collimated output beams independent of pump powers, *Susumu Konno, Tetsuo Kojima, Shuichi Fujikawa, Koji Yasui, Mitsubishi Electric Corp., Japan.*
A novel configuration for a multi-rod solid-state laser system is proposed.The output beam diameter is stabilized by extracting laser beam from a collimating point of a periodical beam propagation.

WB12
Highly stable, diode-pumped, cavity-dumped Nd:YLF regenerative amplifier for the OMEGA laser fusion facility, *Andrey V. Okishev, Devon Battaglia, Ildar Begishev, Jonathan Zuegel, Univ. of Rochester, USA.*
A new highly stable, diode-pumped, cavity-dumped, compact Nd:YLF regenerative amplifier of continuously shaped nanosecond pulses with gain of ~10^9 has been developed for the front-end laser system of the OMEGA laser fusion facility.

Nd:YAG Laser Technology

WB13
Improved brightness laser oscillator with spherical aberration, *Chadler Kennedy, Cutting Edge Optronics, Inc., USA.*
The effect of rod spherical aberration on oscillator beam quality is analysed using helicoid modes as approximate eigenmodes. Beam quality can be degraded or improved, depending on resonator g-factor. Efficient power extraction is problematic, however.

WB14
41 W continuous-wave diode-side-pumped Nd:YAG laser by use of a dual-telescopic optics configuration, *Hongru Yang, Fukui Univ., Japan.*
41 W cw TEM_{00} (M2=1.2), peak power of 218-kW, and pulse duration of 63-ns in Q-switched mode were obtained by use of a dual-telescopic optics configuration in diode-side-pumped Nd:YAG two-rod laser.

WB15
Thermally induced birefringence in Nd:YAG ceramics, *Efim A Khazanov, Inst. of Applied Physics, Russia.*
It is shown, that the depolarization of radiation in polycrystalline ceramics results the beam modulation with a characteristic size less than ceramic grain size. Birefringence compensation in laser rod made of ceramics is discussed.

WB16
Quasi-three-level laser emission at 946 nm in Nd:YAG under direct pump in the emitting level, *V. Lupei, Inst. of Atomic Physics, Romania; G. Aka, D. Vivien, ENSCP, France.*
The reduction of quantum defect between the pump and laser radiation by pumping directly in the emitting level improves the quasi-three-level 946-nm emission of Nd:YAG as compared to the 808-nm pump.

WB17
Heat reduction by direct pumping of Nd:YAG at 885nm, *R. Lavi, A. Tal, S. Jackel, E. Lebiush, S. Goldring, Y. Tzuk, Soreq NRC, Israel.*
Measurements of heat generated in Nd:YAG pumped with 885 or at the 808nm pump-band with high-power diodes is reported. Heat generated with 885nm pumping was less than 82% of the heat generated with 803nm.

WB18
Influence of saturation anisotropy on output polarization of Nd:YAG laser with Cr^{4+}-doped Q-switch, *V.B. Tsvetkov, I.V. Klimov, I.A. Shcherbakov, General Physics Inst., Russia.*
Results of the experimental investigation of the factors effecting on the polarization condition of Q-switched Nd:YAG laser without intracavity polarizers are presented. Q-switching is produced by Cr^{4+}-doped garnets.

Other

WB19
Sub-microJoule kHz/MHz femtosecond laser oscillators for use in surface micromachining, *L. Shah, A. Zoubir, M. Al-Ani, M. Richardson Univ. of Central Florida, USA*
Until recently, most femtosecond laser systems have required chirped pulse amplification (CPA) schemes to generate sufficient energy for micromachining. Here we present experimental results in precise surface structuring of materials using modified femtosecond laser oscillators which are generally less expensive and less complicated than traditional CPA systems.

WB20
Phase-conjugate emission of a two-mirror solid state laser, *M. Ouhayoun, M. Boucher, O. Musset, J.P. Boquillon, Univ. de Bourgogne, France.*
We show that phase conjugation strongly contributes to the emission of a solid state laser in a two-mirror Fabry-Pérot resonator.

11:00am–12:30pm
Exhibits Open

Room: Borduas/Krieghoff
11:00am–12:30pm

WC ■ Ultraviolet Lasers

Gregory J. Quarles, VLOC, Subsidiary of II-VI Inc., USA, Presider

Presider

WC1 11:00am
A 200 mW, 205 nm quasi CW, deep ultraviolet laser source, *K.F. Wall, J.S. Smucz, Y. Isyanova, B. Pati, P.F. Moulton, Q-Peak, Inc., USA; J. Manni, JGM Associates, Inc., USA.*
A quasi-cw, deep ultraviolet source has been developed, producing >200 mW of 205-nm radiation. The source consists of a mode-locked 16-W 1047-nm master-oscillator/power-amplifier, a sychronously-pumped optical parametric oscillator, and three non-linear conversion stages.

WC2 11:15am
100-hour operation of an all-solid-state 20-W 266-nm UV laser by using high-quality CLBO crystal, *Tetsuo Kojima, Susumu Konno, Shuichi Fujikawa, Koji Yasui, Mitsubishi Electric Corp., Japan; Tomosumi Kamimura, Masasi Yoshimura, Yusuke Mori, Takatomo Sasaki, Osaka Univ.; Mitsuhiro Tanaka, Yukikatsu Okada, KogakuGiken Co., Ltd., Japan.*
By using high-quality CLBO crystal, we obtained the UV power of 23 W that is, to our knowledge, the highest 266-nm UV power in solid-state lasers. The UV laser was operated up to 100 hours.

WC3 11:30am
High conversion efficiency solid-state 263-nm laser for triggering high-voltage switches at Sandia's Z-accelerator, *C. Ebbers, A. Erlandson, J. Bartolick, W. Massey, W. Behrendt, A. Drobshoff, J. Narduzzi, J. Caird, S. Payne, Lawrence Livermore Nat. Lab., USA.*
Several advanced technologies, including phase conjugation with non-hazardous fluorinert and harmonic conversion with 2-cm aperture BBO crystals, were used to generate near diffraction-limited, 2.4-J, 20-ns-long pulses at 263-nm.

WC4 11:45am

0.336-J, 10-Hz fourth harmonic generation of Nd:YAG laser using large $Li_2B_4O_7$ crystals, *Yuji Suzuki, Shingo Ono, Hidetoshi Murakami, Toshimasa Kozeki, Hideyuki Ohtake, Nobuhiko Sarukura, IMS, Japan; Genta Masada, Hiroyuki Shiraishi, Ichiro Sekine, Mitsubishi Materials Corp., Japan.*

Using large-sized $Li_2B_4O_7$ crystals, 0.336-J, 266-nm pulses are obtained from a 10-Hz Nd:YAG laser with a total conversion efficiency of 23%. Moreover, long-term stable, 3-W operation over 5 hour is demonstrated.

WC5 12:00pm

Large-aperture Ce^{3+}:$LiCaAlF_6$ power-amplifier module development for the TW ultraviolet femtosecond CPA laser system, *Hidetoshi Murakami, Shingo Ono, Yuji Suzuki, Toshimasa Kozeki, Hideyuki Ohtake, Nobuhiko Sarukura, IMS, Japan; Hiroki Sato, Susumu Machida, Tokin Corp.; Kiyoshi Shimamura, Tsuguo Fukuda, Tohoku Univ., Japan.*

Coaxially-pumped large-aperture Ce^{3+}:$LiCaAlF_6$ power-amplifier module for the TW ultraviolet CPA laser system is demonstrated to have 98-mJ output with 25% extraction efficiency. Additionally newly-invented homogenized-gain, side-pump, power-amplifier scheme for further energy scaling is successfully operated.

WC6 12:15pm

Electron-beam excited Ce:LiCAF spectroscopy by a table-top-sized, low-jitter, 3-MeV picosecond electron-beam source with a photo cathode, *Yuji Suzuki, Toshimasa Kozeki, Hideyuki Ohtake, Nobuhiko Sarukura, IMS, Japan; Terunobu Nakajyo, Fumio Sakai, Yasushi Aoki, Sumitomo Heavy Industries, Ltd., Japan.*

The electron-beam-pumped Ce^{3+}:$LiCaAlF_6$ ultraviolet laser medium is found to have longer fluorescence lifetime than those of the optically pumped medium. using a newly-developed, table-top-sized, low-jitter, 3-MeV picosecond electron-beam source with a photo cathode.

12:30pm–2:00pm

Lunch Break (on your own)

Room: Borduas/Krieghoff
2:00pm–3:30pm

WD ■ Advanced Lasers

Nobuhiko Sarukura, Inst. for Molecular Science, Japan, Presider

Presider

WD1 2:00pm
Design and operation of an efficient 1.4W diode-pumped Raman laser at 578nm, *H.M. Pask, J.A. Piper, Macquarie Univ., Australia.*
Using a 20W diode laser pump source, we have achieved 1.4W output power at 578nm from a frequency-doubled Raman laser.

WD2 2:15pm
Green upcoversion lasing of Er^{3+}:$LiLuF_4$ using cavity external pump feedback, *E. Heumann, S. Bär, H. Scheife, G. Huber, Univ. Hamburg, Germany.*
Powerful green upconversion lasing of Er^{3+}:$LiLuF_4$ at room temperature could be achieved by use of a resonator external mirror for back reflection of the nonabsorbed pump power into the laser crystal. The maximum cw output was 152mW.

WD3 2:30pm
Ultra-stable Nd:YAG ring laser for a space-born LIDAR system, *M. Hunnekuhl, P. Burdack, M. Tröbs, U. Hinze, C. Fallnich, Laser Zentrum Hannover, Germany; M. Bode, O. Dölle, I. Freitag, Innolight GmbH, Germany; K. Danzmann Albert-Einstein-Inst., Germany.*
The development of a space qualifiable laser system based on a monolithic non-planar Nd:YAG ring laser is reported. Such a system can be used in a satellite-based measurement set-up to measure wind velocities.

WD4 2:45pm
Beat measurements of single-frequency lasers independently frequency-locked to thermally shielded high-finesse cavities, *M. Trobs, M. Hunnekuhl, P. Burdack, U. Hinze, C. Fallnich, Laser Zentrum, Germany; S. Skorupka, G. Heinzel, K. Danzmann, Albert Einstein Inst.; M. Bode, I. Freitag, Innolight GmbH, Germany.*
We present beat measurements of two Nd:YAG lasers frequency-locked to thermally shielded room-temperature cavities. By suppressing convection, heat radiation, and heat conduction we reach lower beat-frequency drifts than are currently found in literature.

WD5 3:00pm

All optical passive synchronization of two independent laser oscillators, *W. Seitz, T.R. Schibli, U. Morgner, F.X. Kärtner, Univ. of Karlsruhe, Germany; C.H. Lange, W. Richter, Friedrich-Schiller-Univ. Jena, Germany; B. Braun, Jenoptik Laser, Optik, Systeme GmbH, Germany.* By optically modulating the reflectivity of an intracavity nonlinear Fabry-Perot semiconductor mirror, the pulse train from a passively mode-locked ps-Nd:YVO_4 laser oscillator at 1064 nm is synchronized to an independent fs-mode-locked Ti:sapphire laser around 850 nm.

WD6 3:15pm

Suppression of Q-switching instabilities in passively mode-locked high repetition-rate and high-power lasers, *T.R. Schibli, K.E. Robinson, U. Morgner, F.X. Kaertner, Univ. of Karlsruhe, Germany; S. Mohr, D. Kopf, High Q Laser Production GmbH, Austria.* Suppression of Q-Switching instabilities in a passively mode-locked high repetition-rate high power Nd:YVO_4 laser and in a Yb:YAG laser using an all-electronic stabilization technique is demonstrated and two possible implementations of the feedback-electronics are described.

Room: Borduas Foyer
3:30pm–4:00pm
Refreshment Break

Room: Borduas/Krieghoff
4:00pm-6:15pm
WE ■ High-Power Lasers

Ernst Heumann, Univ. Hamburg, Germany, Presider

WE1 4:00pm

1.46 kW CW Nd:YAG ceramic laser, *Jianren Lu, T. Murai, K. Takaichi, T. Uematsu, Ken-ichi Ueda, Univ. of Electro-Comm., Japan; Y. Akiyama, Toshiba Corp.; Hideki Yagi, Takakimi Yanagitani, Konoshima Chemical Co., Ltd., Japan; Alexander A. Kaminskii, Russian Acad. of Sciences, Russia.*
Continuous-wave 1.46 kW Nd:YAG ceramic laser at 1.064 mm was developed. The optical-to-optical efficiency is 42% which is very close to that of Nd:YAG single crystal laser. Laser oscillation at ≈1.32 μm was also demonstrated.

WE2 4:30pm

A 500W high brightness diode end pumped Nd:YAG slab laser, *C. Schnitzler, G. Schmidt, M. Höfer, D. Hoffmann, R. Poprawe, Fraunhofer Inst. fur Lasertechnik, Germany.*

This report deals with a diode end pumped slablaser with an output power of 500W at a beam quality superior to M^2=6. We discuss different resonator designs for achieving high brightness operation.

WE3 4:45pm

Great reduction of thermally-induced-birefringence depolarization by use of a (110)-cut YAG crystal, *Ichiro Shoji, Takunori Taira, Inst. for Molecular Science, Japan.*

Depolarization caused by thermally induced birefringence in YAG lasers is intrinsically reduced without any compensation by use of a (110)-cut crystal. The depolarization can be made smaller by more than one order than that in a (111)-cut crystal.

WE4 5:00pm

Efficient 10 kW diode-pumped Nd:YAG rod laser, *Y. Akiyama, H. Takada, H. Yuasa, N. Nishida, Toshiba Corp., Japan.*

We demonstrated average powers of 12 kW with CW operation and 7.2 kW with combined mode of CW and QCW operation with the multi-head configuration. The electrical-optical efficiencies are more than 22% in both modes.

WE5 5:15pm

Thermal guiding, birefringence, and brightness scaling of high average power, planar waveguide lasers, *J.R. Lee, H.J. Baker, D.R. Hall, Heriot-Watt Univ., UK.*

Nd: YAG planar waveguide now produce 90W with M^2 = 1.7 x 1.4 and 150W multimode. Scaling this performance towards 1kW is studied by modelling the thermo-optic properties.

WE6 5:30pm

A 150W 2-micron diode-pumped Tm:YAG laser, *K.S. Lai, W.J. Xie, R.F. Wu, Y.L. Lim, Ernest Lau, Lindy Chia, P.B. Phua, DSO Natl. Labs., Republic of Singapore.*

We present a 150W CW diode-side-pumped 2-micron Tm:YAG laser. Temperature dependence on performance of this quasi-3-level laser is investigated, together with characterization of the thermal lensing and cavity designing for such high average power lasers.