ASSP

Eighteenth Topical Meeting and Tabletop Exhibit

February 2 - 5, 2003

Hyatt Regency
San Antonio, Texas, USA

Made possible with generous support from:
AFOSR
Army Research Laboratory
CVI Laser Corporation
ELS Elektronie Laser System GmbH
Positive Light, Inc.
Lawrence Livermore National Laboratory
NASA
Northrop Grumman Space Technology

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

Technical Program Committee

Committee Chairs

- Martin E. Fermann, IMRA America, USA, General Chair
- John J. Zayhowski, MIT, USA, Program Chair

Committee Members

- James Barnes, NASA Langley Res. Ctr., USA
- Raymond Beach, Lawrence Livermore Natl. Lab., USA
- Craig Denman, Air Force Research Lab., USA
- Ernst Heumann, Univ. of Hamburg, Germany
- Franz Kaertner, MIT, USA
- Hiroshi Komine, TRW, USA
- Fredrik Laurell, Royal Inst. of Tech., Sweden
- Dennis Lowenthal, Aculight Corp., USA
- Larry R. Marshall, Lightbit, USA
- Peter F. Moulton, Q-Peak, Inc., USA
- Johan Nilsson, Univ. of Southampton, UK
- James Piper, Macquarie Univ., Australia
- Gregory J. Quarles, VLOC - A Subdivision of II-VI, USA
- Francois Salin, Univ. of Bordeaux, France
- Frank Tittel, Rice Univ., USA
- Andreas Tunnermann, Friedrich-Schiller Univ., Germany
- Kenichi Ueda, Univ. of Electro-Communications, Japan
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 Southampton, 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**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00pm - 5:00pm</td>
<td>Registration Los Rios Foyer</td>
</tr>
</tbody>
</table>

**Monday, February 3, 2003**

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

**Tuesday, February 4, 2003**

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

**Wednesday, February 5, 2003**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00am - 5:00pm</td>
<td>Registration Los Rios Foyer</td>
</tr>
<tr>
<td>8:00am - 9:45am</td>
<td>WA: Ultra-High Power Lasers Regency East Ballroom</td>
</tr>
<tr>
<td>9:45am - 10:45am</td>
<td>WB: Poster Session: III Rio Grande Ballroom</td>
</tr>
<tr>
<td>10:45am - 12:30pm</td>
<td>WC: UV and Blue Sources Regency East Ballroom</td>
</tr>
<tr>
<td>12:30pm - 2:00pm</td>
<td>Lunch Break (On Your Own)</td>
</tr>
<tr>
<td>2:00pm - 3:15pm</td>
<td>WD: Novel Sources Regency East Ballroom</td>
</tr>
<tr>
<td>3:15pm - 3:45pm</td>
<td>Coffee Break Rio Grande Ballroom</td>
</tr>
<tr>
<td>3:45pm - 6:15pm</td>
<td>WE: 1mm Lasers Regency East Ballroom</td>
</tr>
</tbody>
</table>
2003 Advanced Solid-State Photonics
Advanced Program Agenda and Abstracts

February 2 – 5, 2003
Hyatt Regency
San Antonio, Texas, USA
<table>
<thead>
<tr>
<th>Sunday, February 2, 2003</th>
</tr>
</thead>
</table>
| 3:00pm - 5:00pm | Registration  
Los Rios Foyer |

<table>
<thead>
<tr>
<th>Monday, February 3, 2003</th>
</tr>
</thead>
</table>
| 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) |

<table>
<thead>
<tr>
<th>Tuesday, February 4, 2003</th>
</tr>
</thead>
</table>
| 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 |

<table>
<thead>
<tr>
<th>Wednesday, February 5, 2003</th>
</tr>
</thead>
</table>
| 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) |
Los Rios Foyer
3:00pm – 5:00pm
Registration

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
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 LiNbO₃ 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 LiNbO₃ 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 ZnGeP₂ optical parametric 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 TEM₀₀ 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:YAlO₃ laser. We have also obtained the first Q-switched pulses from a Cr:ZnSe laser.
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 filter. Energie up to 50 mJ have been obtained in 540 fs pulse at 1Hz repetition rate.

MB4
**Self-stimulating, transversely diode-pumped Nd\textsuperscript{3+}: PbWO\textsubscript{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\textsuperscript{3+}: PbWO\textsubscript{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\textsubscript{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\textsubscript{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**


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 Li₂B₄O₇ 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 Li₂B₄O₇. 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 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(NO₃)₂ (1197nm), KGd(WO₄)₂ (1158nm and/or 1177nm), LiIO₃ (1156nm) and PbWO₄ (1170nm).

MB12
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:YVO₄ medium.

MB13
Interferometric study of refractive index changes in Nd:YAG laser crystals under intensive pumping due to Nd³⁺-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
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
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 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


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.
INVITED


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.

Femtosecond fiber-feedback OPO with 18 W average power based on periodically poled stoichiometric LiTaO₃, 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.

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 Nd³⁺ 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.

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.

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


We report on the watt-level average power, flat supercontinuum generation (<500 nm to >1800 nm) in different air-silica microstructured 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.
Sub-50-fs pulses with 24-W average power from a passively mode-locked thin disk


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.

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%.

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:YVO4 laser.


We report directly diode-pumped self-starting mode-locked Cr4+:YAG laser with the InGaAs-InP semiconductor saturable absorber mirror (SESAM), generating 62 fs transform-limited pulses.

All-optical active mode-locking of a ps-Nd:YVO4-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:YVO4-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.

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.

Mode-locking of the Yb:Sc$_2$O$_3$ 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.

Diode-pumped 100-fs lasers based on a new apatite-structure crystal:

We demonstrated sub-100-fs lasers based on an Yb-doped apatite crystal called Yb:SYS (Yb$^{3+}$:SrY$_4$(SiO$_4$)$_3$O). 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.

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.


We report on a polycrystalline Yb:Y$_2$O$_3$ 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


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(WO4)2 laser**, N. Kuleshov, V. Kisel, V. Shcherbitsky, International Laser Center, Minsk, Belarus.

Self-frequency Raman conversion in Yb:KGd(WO4)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


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:Y2O3, Yb:Sc2O3 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-stoichiometric 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 Cr²⁺: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 Cr²⁺: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


New absorption band in Y₃Al₅O₁₂ crystal doped with divalent metal ions Ca²⁺ or Mg²⁺ 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 Cr²⁺:ZnSe laser**, E. Sorokin, I. Sorokina, TU Vienna, Vienna, Austria; A. Di Lieto, M. Tonelli, P. Minguzzi, Università di Pisa, Pisa, Italy.

We present the results of mode-locking of the ceramic Cr²⁺:ZnSe laser at 2.5 µm pumped by a diode-pumped Nd:YVO₄ - Co²⁺:MgF₂ laser and provide a comparison between the mode-locked ceramic and single crystalline Cr:ZnSe lasers.

TuB18


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

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:LiNbO₃ 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 LiNbO₃ 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 LiNbO₃.

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
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 [Yb3+:Sr5(PO4)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.
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.

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.

Laser emission in Pr$^{3+}$, Yb$^{3+}$:BaY$_2$F$_8$ 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$_2$F$_8$ 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%.

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.


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%.
Pulsed operation of a diode-side-pumped Tm,Ho:GdVO₄ 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:GdVO₄ laser was experimentally achieved for the first time.

Sensitization of MIR Tb³⁺ luminescence by Tm³⁺ 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 Tm³⁺ ions to Tb³⁺ ions was firstly investigated in the CsCdBr₃:Tb,Tm and KPb₂Cl₅: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.

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.

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: LuLiF₄ (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.

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 Corporation, 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**  
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 SrMoO₄ and Ca₃(VO₄)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 utilizing diode-pumped 100 Hz actively Q-switched Nd:YAG laser and Ba(NO₃)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 2.7 μm and their use in CO₂ 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 2.7 μm 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:YVO₄ 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 CsB₃O₅ 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 CsB₃O₅ crystal. The conversion efficiency from the fundamental light to the third harmonic reached 30%.

**WC5 11:45am**  
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
We have discovered a new nonlinear optical BaAlBO$_3$F$_2$ crystal. It has a structure similar to that of KBe$_2$BO$_3$F$_2$ 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

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

WD1 2:00pm INVITED
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
Wide 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.
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.

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

Fiber-embedded disk lasers generated 1014W output 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.


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.

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.

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.

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.

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.

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.

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:Y₂O₃, Nd:Lu₂O₃ and Nd:YGdO₃ 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
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
A new ceramic laser material Nd:Y₃ScₓAl(5-x)O₁₂ 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)

--- A ---
<table>
<thead>
<tr>
<th>Author</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdolvand, A.</td>
<td>MA7</td>
</tr>
<tr>
<td>Agate, B.</td>
<td>TuA2</td>
</tr>
<tr>
<td>Alford, W. J.</td>
<td>MA8, MC3</td>
</tr>
<tr>
<td>Andes, K.</td>
<td>MC2</td>
</tr>
<tr>
<td>Antipov, O. L.</td>
<td>MB13</td>
</tr>
<tr>
<td>Antonopoulos, G.</td>
<td>MD1</td>
</tr>
<tr>
<td>Apanasevich, P. A.</td>
<td>MB14</td>
</tr>
<tr>
<td>Armstrong, D. J.</td>
<td>WB10</td>
</tr>
<tr>
<td>Asai, K.</td>
<td>WB4</td>
</tr>
<tr>
<td>Aschwanden, A.</td>
<td>WE2</td>
</tr>
<tr>
<td>Asrar, G.</td>
<td>MC1</td>
</tr>
<tr>
<td>Avdokhin, A. M.</td>
<td>TuC3</td>
</tr>
<tr>
<td>Avdokhin, A. V.</td>
<td>MD5</td>
</tr>
<tr>
<td>Axenson, T. J.</td>
<td>MB10</td>
</tr>
</tbody>
</table>

--- B ---
<table>
<thead>
<tr>
<th>Author</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bach, W. D.</td>
<td>MC3</td>
</tr>
<tr>
<td>Baggett, J. C.</td>
<td>TuA1</td>
</tr>
<tr>
<td>Bagnoud, V.</td>
<td>WA5</td>
</tr>
<tr>
<td>Bai, Y.</td>
<td>WB6</td>
</tr>
<tr>
<td>Baker, H. J.</td>
<td>MB17, MB20</td>
</tr>
<tr>
<td>Baldwin, K. G.</td>
<td>WB13</td>
</tr>
<tr>
<td>Balembois, F.</td>
<td>MB6, TuA8, TuB3, WB19, WC2, WE9</td>
</tr>
<tr>
<td>Barnes, J.</td>
<td>MC</td>
</tr>
<tr>
<td>Barnes, N. P.</td>
<td>MB10, MB7, WB2, WB7</td>
</tr>
<tr>
<td>Basiev, T. T.</td>
<td>WB15</td>
</tr>
<tr>
<td>Batay, L. E.</td>
<td>MB14</td>
</tr>
<tr>
<td>Bayramian, A. J.</td>
<td>WA3, WA4</td>
</tr>
<tr>
<td>Beach, R. J.</td>
<td>MD3, WA, WA3</td>
</tr>
<tr>
<td>Beckwitt, K.</td>
<td>WB9</td>
</tr>
<tr>
<td>Begishev, I. A.</td>
<td>WA5</td>
</tr>
<tr>
<td>Behrendt, W.</td>
<td>WA3</td>
</tr>
<tr>
<td>Benabid, F.</td>
<td>MD1</td>
</tr>
<tr>
<td>Beyert, A.</td>
<td>WE1</td>
</tr>
<tr>
<td>Bibeau, C.</td>
<td>WA3, WA4</td>
</tr>
<tr>
<td>Bohn, M. J.</td>
<td>MA4</td>
</tr>
<tr>
<td>Bonaccini, D.</td>
<td>MD3</td>
</tr>
<tr>
<td>Borschowa, L. A.</td>
<td>WB17</td>
</tr>
<tr>
<td>Bouwmans, G.</td>
<td>MD1</td>
</tr>
<tr>
<td>Bredikhin, D. V.</td>
<td>MB13</td>
</tr>
<tr>
<td>Brown, A.</td>
<td>WB17</td>
</tr>
<tr>
<td>Brown, T.</td>
<td>TuA2</td>
</tr>
<tr>
<td>Brunner, F.</td>
<td>MD2, TuA1, WE2</td>
</tr>
<tr>
<td>Burns, P. A.</td>
<td>MA3</td>
</tr>
<tr>
<td>Butvina, L. N.</td>
<td>WB5</td>
</tr>
<tr>
<td>Byer, R. L.</td>
<td>WE5</td>
</tr>
</tbody>
</table>

--- C ---
<table>
<thead>
<tr>
<th>Author</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell, R.</td>
<td>WA3</td>
</tr>
<tr>
<td>Canioni, L.</td>
<td>WB8</td>
</tr>
<tr>
<td>Carrig, T. J.</td>
<td>MA8, MC3</td>
</tr>
<tr>
<td>Cerullo, G.</td>
<td>WD3</td>
</tr>
<tr>
<td>Champert, P. A.</td>
<td>TuC3</td>
</tr>
<tr>
<td>Chen, C.</td>
<td>WC4</td>
</tr>
<tr>
<td>Chen, D.</td>
<td>WB11</td>
</tr>
<tr>
<td>Chen, S.</td>
<td>WB6, WB7</td>
</tr>
<tr>
<td>Chénais, S.</td>
<td>TuA8, TuB3</td>
</tr>
<tr>
<td>Christensen, S. E.</td>
<td>MC3</td>
</tr>
<tr>
<td>Chunaev, D. S.</td>
<td>WB15</td>
</tr>
<tr>
<td>Clarkson, W. A.</td>
<td>MA7, WA1</td>
</tr>
<tr>
<td>Clausnitzer, T.</td>
<td>WE3</td>
</tr>
<tr>
<td>Coic, H.</td>
<td>MB1, MB2</td>
</tr>
<tr>
<td>Cooper, L.</td>
<td>WA1</td>
</tr>
<tr>
<td>Cooper, L. J.</td>
<td>MA7</td>
</tr>
<tr>
<td>Cormack, I.</td>
<td>TuA2</td>
</tr>
</tbody>
</table>

--- D ---
<table>
<thead>
<tr>
<th>Author</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danailov, M. B.</td>
<td>MB14</td>
</tr>
<tr>
<td>Dascalu, T.</td>
<td>TuB19</td>
</tr>
<tr>
<td>Davis, R. E.</td>
<td>MB7</td>
</tr>
<tr>
<td>Dawes, J. M.</td>
<td>MA3, TuB13</td>
</tr>
<tr>
<td>Dawson, J. W.</td>
<td>MD3, WA4</td>
</tr>
<tr>
<td>De Silvestri, S.</td>
<td>WD3</td>
</tr>
<tr>
<td>Dekker, P.</td>
<td>MA3, TuB13</td>
</tr>
<tr>
<td>Demidovich, A. A.</td>
<td>MB13</td>
</tr>
<tr>
<td>Denker, B.</td>
<td>TuB14</td>
</tr>
<tr>
<td>Denman, C.</td>
<td>TuC</td>
</tr>
<tr>
<td>Dergachev, A.</td>
<td>MA2</td>
</tr>
<tr>
<td>Deschaseaux, G.</td>
<td>MB1, MB2</td>
</tr>
</tbody>
</table>
DeWald, A. ■ WA3, WA4
Dhellemmes, S. ■ TuA8
Di Lieto, A. ■ TuB17
Dianov, E. M. ■ WB5
Ding, Y. J. ■ MA5, MC5
Dixit, S. N. ■ WA3
Drobshoff, A. ■ MD3
Druon, F. P. ■ MD7, TuA8, TuB3, WC2
Dudley, J. ■ MD7

— E —
Ebbers, C. A. ■ WA3
Edwards, W. C. ■ WC3
Ehlers, B. ■ MB18
Ell, R. ■ TuA5
Endo, A. ■ TuB18
Eremeykin, O. N. ■ MB13
Erhard, S. ■ WA6

— F —
Fagundes de Sousa, D. ■ WE8
Fakhoury, E. ■ MC2
Ferrand, B. ■ TuB3
Forget, S. ■ WB18, WC2
Foti, P. J. ■ WD2
Fournier, D. ■ MB19
Fragemann, A. ■ TuC2
Freitas, B. L. ■ WA3
Fromm, M. ■ MC2
Fromzel, V. A. ■ TuB10
Fuchs, H. J. ■ WE3
Fukuda, M. ■ TuB6
Fukuda, T. ■ TuB11
Furusawa, K. ■ TuA1

— G —
Galagan, B. ■ TuB14
Gaumé, R. ■ MB19, TuA8, TuB3
Georges, P. ■ MB6, MD7, TuA8, TuB3, WB18, WB19, WC2, WE9
Giesen, A. ■ WA6, WE1
Glebov, L. ■ WB8
Glebova, L. ■ WB8
Gleyze, J. F. ■ MB2
Goyal, A. K. ■ WD2
Grabchikov, A. S. ■ MB14
Griebner, U. ■ TuA7
Guardalben, M. J. ■ WA5

— H —
Hackenberg, W. ■ MD3
Hall, D. R. ■ MB17, MB20
Hamano, A. ■ MB4
Hamlin, S. ■ MA1
Hanna, D. C. ■ MD2
Hansen, K. P. ■ MD6
Häring, R. ■ WE2
Hays, A. ■ MA1
He, Y. ■ WB13
Heinemann, S. ■ MB18
Henderson, A. J. ■ WB17
Hérault, E. ■ WB18
Heumann, E. ■ WB1, WE8
Higuchi, M. ■ MB5
Hill, M. R. ■ WA3, WA4
Himbert, M. E. ■ MB6
Holdsworth, A. R. ■ MB17
Holmgren, S. J. ■ TuC5
Hönninger, C. ■ WE2
Hovis, F. E. ■ MC2
Hu, Z. ■ WC6
Huang, K. ■ TuB12
Huang, S. ■ TuB12
Huber, G. ■ WB1
Huignard, J. ■ WB19
Hutchinson, A. ■ MA1

— I —
Ikesue, A. ■ WE10
Ilday, F. Ö. ■ TuA6, WB9
Imaeda, M. ■ WC7
Imai, S. ■ WC5
Innerhofer, E. ■ MD2, TuA1, WE2
Inoue, H. ■ WC5
Ishikawa, H. ■ TuB18
Ishizuki, H. ■ TuC4
Isyanova, Y. ■ TuB7
Ito, H. ■ MD2
Ito, S. ■ TuB18
Ivleva, L. I. ■ WB15
Iwai, M. ■ WC7

—J—
Jacquemet, M. ■ TuB3
Jander, D. ■ WA2
Jiang, H. ■ MA3
Jolly, A. J. ■ MB1, MB2
Juncar, P. ■ MB6

—K—
Kachynski, A. V. ■ WB16
Kalashnikov, V. L. ■ TuB1
Kaminskii, A. A. ■ TuB2, TuB8, WE7
Kan, H. ■ WD4
Kanz, V. K. ■ WA3
Karasik, A. Y. ■ WB15
Karlsson, G. ■ TuB14
Kärtner, F. X. ■ TuA1, TuA5
Kawato, S. ■ TuB6
Keene, J. A. ■ MA8
Keller, U. ■ MD2, TuA1, TuA3, WE2
Kemp, A. J. ■ TuA2
Kennedy, C. J. ■ TuB20
Khazanov, E. A. ■ MB16
Khurgin, J. B. ■ MA5
Kiefer, W. ■ MB14
King, V. ■ MA1
Kisel, V. E. ■ TuB4
Kitamura, K. ■ MD2
Kitano, H. ■ WC4
Kley, E. B. ■ WE3
Klopp, P. ■ TuA7
Klose, M. ■ TuB21
Knight, J. C. ■ MD1
Kobayashi, T. ■ TuB6
Kodaira, K. ■ MB5
Kong, J. ■ TuB2
Kono, M. ■ WB13

Koroshetz, J. E. ■ WE4
Kozeki, T. ■ TuB11
Krainer, L. ■ TuA3
Kück, S. ■ WB1
Kuehnemann, F. ■ MC4
Kulev, N. V. ■ TuA4
Kumkar, M. ■ WE2
Kurimura, S. ■ TuC4
Kuzmin, A. N. ■ MB14, WB16
Kuzmin, O. V. ■ MB14
Kuznetsov, M. S. ■ MB13

—L—
Laporta, P. ■ WD3
Larat, C. ■ TuA8
Laurell, F. ■ TuC2, TuC5
Le, K. ■ MC2
Lecomte, S. ■ TuA3
Lederer, F. ■ TuC1
Lederer, M. J. ■ TuA5
Lee, J. R. ■ MB20
Liao, Z. ■ MD3
Lichkova, N. V. ■ WB5
Liem, A. ■ WE3
Lim, H. ■ TuA6, WB9
Limpert, J. ■ MD6, WE3
Lippert, E. ■ WB14, WB3
Lis, D. A. ■ TuB9
Lisinetkii, V. A. ■ MB14
Liu, H. ■ TuB13
Lo, C. ■ TuB12
Louyer, Y. ■ MB6
Lowenthal, D. D. ■ MA, WA2
Lu, C. ■ WB12
Lu, J. ■ TuB2, TuB8, WE7
Lucas-Leclin, G. ■ MD7, WB18
Luce, J. ■ MB1, MB2, MB3
Lünstedt, K. ■ WE8
Lupei, V. ■ MB12
— M —
Machida, H. MB5
Man, W. WB12
Manfra, M. J. WD2
Marangoni, M. WD3
Marquardt, J. M. MC3
Martinez Rosas, M. WB8
Martinyuk, N. WE8
Masada, G. MB9
Matsui, T. WC4
McCord, J. WB17
McKay, J. B. TuB15
McKinnie, I. T. MC3, WE4
Mendelyev, D. TuB9
Mercier, R. MB3
Miller, H. WE4
Minguzzi, P. TuB17
Monjardin, J. F. MB17
Monro, T. M. TuA1
Morgner, U. TuA5
Mori, Y. WC4, WC6
Morris, R. WA4
Moulton, P. F. MA2, TuB7, WE6
Mu, X. MA5
Mueller, F. MC4
Müller, D. WA6, WE1
Mullot, M. MB3
Murakami, H. TuB11
Muramatsu, K. WC6

— N —
Nakamura, M. MD2
Naumov, S. TuA4, TuB1
Nickel, D. WE1
Nicolas, S. WB14
Nilsson, J. MD
Nomura, T. WC5
Nowak, K. M. MB17

— O —
O’Brien, P. WD2
Ogawa, T. MB5
Ogilvy, H. MB11

Okhrimchuk, A. G. TuB16, WB5
Omatsu, T. MB11, MB4
Ono, S. MB9, TuB11
Orlovich, V. A. MB14, WB16
Orr, B. J. WB13
Ortiz, V. TuA8
Osellame, R. WD3
Osiac, E. WB1
Osiko, V. V. TuB14, WB15
Ostroumov, V. WD1

— P —
Paschotta, R. MD2, TuA1, TuA3, WE2
Pasiskevicius, V. TuC2, TuC5
Pask, H. M. MB11
Pati, B. TuB7, WE6
Pavel, N. MB12, TuB19, WC7
Payne, S. A. MD3, WA3, WA4
Pennington, D. M. MD3
Pertsch, T. TuC1
Peschel, U. TuC1
Petermann, K. TuA7, WE8
Peters, V. TuA7, WE8
Petros, M. WB6, WB7
Petrov, V. TuA7
Petway, L. B. WC3
Piper, J. A. MA3, MB11, TuB13
Plimmer, M. D. MB6
Pollak, T. M. MA6
Polli, D. WD3
Popov, S. V. MD5, TuC3
Popp, A. MC4
Prasad, C. R. TuB10
Prasad, P. N. WB16
Puth, J. WA5

— R —
Ramponi, R. WD3
Randles, M. H. MB8, WA4
Rankin, J. WA3, WA4
Raybaut, P. TuA8
Reeves, W. H. MD1
Reichle, D. J. ■ MB10
Renz, G. ■ MA4, TuB21
Ribeyre, X. ■ MB3
Richardson, D. J. ■ TuA1
Riede, W. ■ MA4
Roger, J. ■ MB19
Roh, W. B. ■ TuB15
Roman, S. ■ WA2
Ronsin, O. ■ WA6
Rouyer, C. ■ MB3
Rubin, L. F. ■ WB20
Rushford, M. C. ■ WA3
Russell, P. ■ MD1
Rustad, G. ■ WB14, WB3

—S—
Sahu, J. K. ■ WA1
Sakai, F. ■ TuB18
Sanchez, A. ■ WD2
Sanner, N. ■ MD7
Saraf, S. ■ WE5
Sarger, L. ■ WB8
Sarukura, N. ■ MB9, TuB11
Sasaki, T. ■ WC4, WC6
Sato, A. ■ WB4
Sato, H. ■ TuB11
Sato, K. ■ WC4
Sato, Y. ■ MB12, WE10
Savikin, A. P. ■ MB13
Schaffers, K. I. ■ WA3, WA4, WE9
Schepler, K. L. ■ TuB15
Schibli, T. R. ■ TuA5
Schiller, S. ■ MC4
Schlup, P. ■ MC3, WE4
Schmidt, J. ■ WA3
Schreiber, T. ■ MD6, WE3
Schunemann, P. G. ■ MA6
Seelert, W. ■ WD1
Seitz, W. ■ TuA5
Sekiguchi, H. ■ WD4
Sekiguchi, T. ■ MD4
Sekine, I. ■ MB9
Setzler, S. D. ■ MA6
Shcherbitsky, V. G. ■ TuB4
Shen, D. ■ TuB2
Shen, D. Y. ■ MA7
Shestakov, A. V. ■ TuB16
Shi, W. ■ MC5
Shiraishi, H. ■ MB9
Shirakawa, A. ■ MD4
Shoji, I. ■ TuC4, WC7, WE10
Shonai, T. ■ MB5
Shukshin, V. E. ■ TuB9
Shum, P. ■ WB12
Sibbett, W. ■ TuA2
Singh, U. N. ■ WB6, WB7
Sinha, S. ■ WE5
Skulina, K. M. ■ WA3
Smith, A. V. ■ WB10
Smith, D. ■ WE4
Sobol, A. A. ■ TuB9, WB15
Solodyankin, M. A. ■ MD5
Sorokin, E. ■ TuA4, TuB1, TuB17
Sorokina, I. T. ■ TuA4, TuB1, TuB17
Spühler, G. J. ■ TuA3
Sridharan, A. K. ■ WE5
Stenersen, K. ■ WB14, WB3
Stormont, B. ■ TuA2
Subbotin, K. A. ■ TuB9
Südmeyer, T. ■ MD2, TuA1, WE2
Suliga, B. ■ MC2
Sullivan, E. ■ MC2
Suzuki, Y. ■ MB9, TuB11
Sverchkov, S. ■ TuB14
Szipoecs, R. ■ TuA2

—T—
Taccheo, S. ■ WD3
Taira, T. ■ MB12, TuB19, TuC4, WC7, WE10
Takaichi, K. ■ TuB2, TuB8, WE7
Takasaki, S. ■ TuB6
Tam, H. ■ WB12
Tang, D. ■ TuB2, WB12
Tassano, J. B. ■ WA3, WA4
Taylor, L. ■ MD3
Taylor, R. ■ MD5, TuC3
Telford, S. ■ WA3
Tidwell, S. ■ WA2
Tiemann, B. ■ WE4
Tirpak, A. ■ WB8
Tojo, T. ■ WC5
Toncelli, A. ■ WB1
Tonelli, M. ■ TuB17, WB1
Torizuka, K. ■ TuB18
Traverso, F. ■ WB1
Trussell, W. ■ MA1
Tu, S. ■ TuB12
Tünnemann, A. ■ MD6, WE, WE3
Turner, G. W. ■ WD2

— U —
Ueda, K. ■ MD4, TuB2, TuB8, WC, WD4, WE7
Uematsu, T. ■ TuB2, TuB8, WE7
Unternahrer, J. ■ WE4
Usami, T. ■ MD2
Ushakov, S. N. ■ TuB9
Usuki, Y. ■ MB4

— V —
Viana, B. ■ MB19, TuA8, TuB3
Videau, L. ■ MB1, MB3
Vivien, D. ■ MB19, TuA8, TuB3
von Elm, R. ■ WD1
Voron’ko, Y. K. ■ TuB9

— W —
Wada, S. ■ MB5
Wadsworth, W. J. ■ MD1
Wagner, G. J. ■ MA8
Wall, K. F. ■ WE6
Walsh, B. M. ■ MB7, WB2, WB7
Wang, J. ■ MA3
Wang, P. ■ WA1
Wang, S. ■ TuC5
Waxer, L. J. ■ WA5
Weingarten, K. J. ■ TuA3

White, R. T. ■ WB13
Williams, R. ■ WA1
Williams, R. B. ■ MA7
Williams-Byrd, J. A. ■ WC3
Wilson, A. L. ■ WC1
Wise, F. W. ■ TuA6, WB9
Witt, G. ■ MC2
Wu, Y. ■ WC4

— X —
Xu, G. X. ■ WB16
Xu, J. ■ MB20

— Y —
Yagi, H. ■ TuB2, TuB8, WE7
Yanagida, T. ■ TuB18
Yanagitani, T. ■ TuB2, TuB8, WE7
Yeh, P. S. ■ TuB12
Yiou, S. ■ WB19, WE9
Yoshimura, M. ■ WC4, WC6
Yoshino, T. ■ WC7
Yu, J. ■ WB6, WB7

— Z —
Zavgorodnev, V. N. ■ WB5
Zayhowski, J. J. ■ WC1
Zellmer, H. ■ MD6, WE3
Zhao, B. ■ WB12
Zharikov, E. V. ■ TuB9
Zotova, I. B. ■ MA5
Zuegel, J. D. ■ WA5
Zverev, P. G. ■ WB15