

PROCEEDINGS OF SPIE

Solid State Lasers XXIV: Technology and Devices

W. Andrew Clarkson

Ramesh K. Shori

Editors

8–10 February 2015

San Francisco, California, United States

Sponsored and Published by
SPIE

Volume 9342

Proceedings of SPIE 0277-786X, V. 9342

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Solid State Lasers XXIV: Technology and Devices, edited by W. Andrew Clarkson, Ramesh K. Shori,
Proc. of SPIE Vol. 9342, 934201 · © 2015 SPIE · CCC code: 0277-786X/15/\$18 · doi: 10.1117/12.2183961

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Solid State Lasers XXIV: Technology and Devices*, edited by W. Andrew Clarkson, Ramesh K. Shori, Proceedings of SPIE Vol. 9342 (SPIE, Bellingham, WA, 2015)
Article CID Number.

ISSN: 0277-786X

ISBN: 9781628414325

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

Copyright © 2015, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/15/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.



SPIEDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print. Papers are published as they are submitted and meet publication criteria. A unique citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages.

Contents

vii	Authors
xi	Conference Committee

SESSION 1 CRYSTAL FIBER LASERS I

- 9342 02 Single crystal fiber for laser sources (Invited Paper) [9342-1]
- 9342 03 High-power Yb:YAG single-crystal fiber amplifiers for femtosecond lasers [9342-2]
- 9342 04 Erbium distribution in single crystal YAG fibers grown by laser-heated pedestal growth technique [9342-3]
- 9342 05 Investigation of the amplification properties of Ho:YAG single crystal fiber [9342-4]

SESSION 2 CRYSTAL FIBER LASERS II

- 9342 07 Beam quality investigation in Nd:YAG crystal fiber amplifier pumped at >110w [9342-6]
- 9342 09 Laser diode pumped high efficiency Yb:YAG crystalline fiber waveguide lasers [9342-8]
- 9342 0A Templatized growth of II-VI semiconductor optical fiber devices and steps towards infrared fiber lasers (Invited Paper) [9342-9]

SESSION 3 EYE-SAFE AND MID-IR LASERS

- 9342 0B 4.5 W mid-infrared supercontinuum generation in a ZBLAN fiber pumped by a Q-switched mode-locked Tm³⁺- doped fiber laser [9342-10]
- 9342 0C Multi-wavelength resonant pumping of Er:YAG lasers for energy efficient trace gas detection systems [9342-11]
- 9342 0D Ho:YLF non-planar ring laser with fractional image rotation [9342-12]
- 9342 0E Gain-switched operation of ultrafast laser inscribed waveguides in Cr:ZnSe [9342-13]
- 9342 0F A continuous wave Fe:ZnSe laser pumped by efficient Er:Y₂O₃ laser [9342-14]
- 9342 0G Radiation-enhanced thermal diffusion of transition metal and rare earth ions into II-VI semiconductors [9342-15]

SESSION 4	AIRBORNE AND SPACE QUALIFIED LASERS
9342 0H	Radiation tests on erbium-doped garnet crystals for spaceborne CH4-Lidar applications [9342-16]
9342 0I	Multi-pulse detection technique to improve the timing/range resolution in a scanning LADAR system [9342-17]
9342 0J	Single frequency and wavelength stabilized near infrared laser transmitter for water vapor DIAL remote sensing application [9342-18]
9342 0K	Monolithic solid-state lasers for spaceflight [9342-19]
9342 0L	ICESat-2 laser technology readiness level evolution [9342-20]
9342 0M	Laser amplifier development for IPDA Lidar measurements of CO₂ from space [9342-21]
SESSION 5	UV AND VISIBLE LASERS
9342 0N	1W frequency-doubled VCSEL-pumped blue laser with high pulse energy [9342-22]
9342 0P	Development of high coherence, 200mW, 193nm solid-state laser at 6 kHz [9342-24]
9342 0Q	Annealing temperature dependence of random lasing properties in a diamond nanoparticle film [9342-25]
9342 0R	Demonstration of miniaturized 20mW CW 280nm and 266nm solid-state UV laser sources [9342-26]
SESSION 6	DISK LASERS
9342 0T	Front end for high-repetition rate thin disk-pumped OPCPA beamline at ELI-beamlines [9342-28]
9342 0U	Thin-disk laser multi-pass amplifier [9342-29]
9342 0V	Ultrafast thin-disk multipass amplifier with 1.4 kW average power and 4.7 mJ pulse energy at 1030 nm converted to 820 W and 2.7 mJ at 515 nm [9342-30]
9342 0W	First demonstration of passively mode-locked Yb:CaF₂ thin-disk laser [9342-31]
9342 0Y	Latest advances in high brightness disk lasers [9342-33]
SESSION 7	NOVEL CONCEPTS I
9342 0Z	Double-beam, mode-controlling diode side-pumped Nd:YLF laser with near 60% efficiency [9342-34]

9342 10 **LED side-pumped Nd³⁺:YVO₄ laser at room temperature** [9342-35]

SESSION 8 NOVEL CONCEPTS II

9342 14 **Fully vectorial laser resonator modeling by vector extrapolation methods** [9342-39]

9342 16 **High power tube solid-state laser with zigzag propagation of pump and laser beam** [9342-41]

9342 17 **In-phase synchronization of array laser using intra-Talbot-cavity second harmonic generation** [9342-42]

SESSION 9 LASER MATERIALS AND CHARACTERIZATION

9342 1D **Energy transfer upconversion measurements for popular neodymium-doped crystals** [9342-49]

SESSION 10 ULTRAFAST LASERS

9342 1E **First experimental results towards a 100 W wavelength tunable femtosecond OPCPA** [9342-50]

9342 1F **High-energy multiwatt femtosecond diode-pumped Yb:CaAlGdO₄ and Yb:CaF₂ regenerative amplifiers** [9342-51]

9342 1G **Single grating mirror intracavity stretcher design for chirped pulse regenerative amplification** [9342-52]

9342 1J **High average power picosecond laser for selective material processing at 1342 nm wavelength** [9342-55]

SESSION 11 PULSED LASERS I

9342 1K **1 mJ single-rod fiber Er:glass laser for rangefinding** [9342-56]

9342 1L **A cryo-cooled high-energy DPSSL system delivering ns-pulses at 10 J and 10 Hz** [9342-57]

SESSION 12 PULSED LASERS II

9342 1M **Mode-locking in intracavity frequency doubled Nd:YVO₄ laser** [9342-59]

9342 1N **Current status of Kumgang laser system** [9342-60]

9342 1O **50W CW output power and 12mJ pulses from a quasi-2-level Yb:YAG ceramic rod laser end-pumped at the 969nm zero-phonon line** [9342-61]

9342 1P **Investigation of mechanically Q-switched lasers** [9342-62]

POSTER SESSION

- 9342 1Q **Numerical simulations of the optical gain of crystalline fiber doped by rare earth and transition ion** [9342-63]
- 9342 1S **Temperature influence on diode pumped Er:CaF₂ laser** [9342-67]
- 9342 1T **Wavelength tunability of laser based on Yb-doped YGAG ceramics** [9342-68]
- 9342 1U **On the efficiency of Tm-doped 2μm lasers** [9342-69]
- 9342 1V **Fe:ZnSe and Fe:ZnMgSe lasers pumped by Er:YSGG radiation** [9342-70]
- 9342 1W **Moderate high power 1 to 20μs and kHz Ho:YAG thin disk laser pulses for laser lithotripsy** [9342-71]
- 9342 1X **Influence of temperature on spectroscopic and lasing properties of Pr:YLF crystal** [9342-72]
- 9342 1Y **60W Ho:YLF oscillator-amplifier system** [9342-73]
- 9342 1Z **Development of a closed-loop cryogenically cooled sub-picosecond regenerative amplifier** [9342-74]
- 9342 20 **Continuous-wave hybrid index-antiguided and thermal-guided planar waveguide laser with large mode area** [9342-75]
- 9342 21 **Underwater laser detection system** [9342-76]
- 9342 22 **Transmitted beam profile for determining bulk scattering in transparent ceramics** [9342-77]
- 9342 23 **Angle resolved scatter measurement of bulk scattering in transparent ceramics** [9342-78]
- 9342 25 **Spectroscopic characterization of Cr²⁺ ions in ZnSe/ZnS crystals under visible excitation** [9342-81]
- 9342 26 **Direct measurement of up-conversion processes in diode pumped erbium-doped YAG** [9342-82]

Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

- | | |
|---|----------------------------------|
| Abdou Ahmed, Marwan, 03, 0U, 0V, 0W, 1G | Deana, Alessandro M., 0Z |
| Abshire, James B., 0M | Délen, Xavier, 02, 0W |
| Adouane, A., 1Q | Demagh, N., 1Q |
| Agnesi, A., 1F, 1G | Dementjev, Aleksandr S., 07 |
| Ahn, HeeKyung, 1N | Deyra, Loïc, 02 |
| Aleknavicius, Aidas, 07 | Didierjean, Julien, 02, 03 |
| Alekseeva, Irina P., 1K | Doneian, B., 0B |
| Alexeev, Sergey G., 1M | Doroshenko, Maxim E., 1S, 1V |
| Antipenkov, Roman, 0T | Dreyer, Elizabeth F. C., 04 |
| Antognini, A., 0U | Druon, Frédéric, 10 |
| Aravazhi, S., 1U | Dymshits, Olga S., 1K |
| Asoubar, Daniel, 14 | Edwards, Ryan E., 0L |
| Aubourg, Adrien, 02 | Eichhorn, Marc, 0B, 0D |
| Aus-der-Au, J., 1F, 1G | Eichler, Hans J., 0C |
| Badding, John V., 0A | El-Sharkawy, Yasser H., 21 |
| Bakule, Pavel, 0T | El-Sherif, Ashraf F., 21 |
| Balembois, François, 02, 03, 10 | Endo, Akira, 1T, 1Z |
| Banerjee, Saumyabrata, 1L | Ertel, Klaus, 1L |
| Barbet, Adrien, 10 | Esser, Dominik, 0H |
| Baril, Neil F., 0A | Evans, Jonathan W., 0F |
| Bartschke, Jürgen, 1O | Fedorov, Pavel P., 1S |
| Batysta, František, 0T | Fedorov, Vladimir V., 0G, 25 |
| Bauer, Dominik, 0V | Fibrich, Martin, 1X |
| Beaurepaire, Julien, 0R | Fitzgibbons, Thomas C., 0A |
| Beecher, Stephen J., 0E, 1D | Fries, Christian, 1O |
| Bera, Subhabrata, 04 | Fritzsche, Haro, 0C |
| Berrou, A., 0B | Fujiwara, Hideki, 0Q |
| Berry, Patrick A., 0E, 0F | Gaertner, Martin, 0C |
| Betin, Alexander, 0M | Gafarov, Ozarfar, 0G |
| Blanchot, Jean-Philippe, 10 | García-Blanco, S. M., 1U |
| Boubir, B., 1Q | Georges, Patrick, 02, 03, 10 |
| Buchenkov, Vyacheslav A., 1K | Georges, Thierry, 0R |
| Buckley, Ian, 05 | Gerasimenko, A. S., 1V |
| Burnham, Ralph, 0J | Ghosh, Chuni, 0N |
| Burns, Patrick M., 0L | Ghoumazi, M., 1Q |
| Butcher, Thomas J., 1L | Glebov, Leonid, 0K |
| Cadier, B., 0B | Glebova, Larissa, 0K |
| Caracciolo, E., 1F, 1G | Goldberg, Lew, 1P |
| Casperon, Lee, 20 | Gomaa, Walid, 21 |
| Chaudhuri, Subhasis, 0A | Gomes, Jean Thomas, 03 |
| Chazevskis, Gediminas, 1J | Goorsky, Mark S., 22, 23 |
| Chen, Tong, 0N | Gopalan, Venkatraman, 0A |
| Chuang, Ti, 0J | Gottwald, Tina, 0Y |
| Cole, Brian, 1P | Graf, Thomas, 03, 0U, 0V, 0W, 1G |
| Collier, John L., 1L | Grardel, Hugo, 10 |
| Cubera, Miroslaw, 0H | Green, Jonathan T., 0T |
| Dannecker, Benjamin, 0W | Greenhalgh, R. Justin S., 1L |
| Daoui, A. K., 1Q | Gries, Wolfgang, 0C |
| De Vido, Mariastefania, 1L | Grishin, Mikhail, 1J |

- Grivas, C., 1U
 Grohe, Andreas, 0C
 Gronloh, Bastian, 0H
 Guandalini, A., 1F, 1G
 Hage, A., 1E
 Hänsch, T. W., 0U
 Harrington, James A., 04, 05
 He, Rongrui, 0A
 Healy, Noel, 0A
 Her, Tsing-Hua, 20
 Hernandez-Gomez, Cristina, 1L
 Hiroswa, Kenichi, 17
 Hoef, Christopher D., 04
 Höfer, Marco, 0H
 Hoffmann, Hans-Dieter, 0H
 Hönninger, Clemens, 0W
 Höppner, H., 1E
 Horáček, Martin, 0T
 Hough, Nathaniel, 1P
 Hovis, Floyd E., 0L
 Ito, S., 0P
 Jacobs, Cobus, 1Y
 Jambunathan, Venkatesan, 1T, 1Z
 Jelínek, M., 1V
 Jelínková, Helena, 1S, 1T, 1V, 1X, 1Z
 Johnson, Eric G., 05
 Joulain, F., 0B
 Juhre, Ronny, 0C
 Kakizaki, K., 0P
 Kannari, Fumihiko, 17
 Kar, Ajoy K., 0E
 Kemnitzer, M., 1F, 1G
 Kharitonov, Artem A., 1K
 Kieleck, C., 0B
 Kienle, F., 1G
 Killi, Alexander, 0V, 0Y
 Kim, Jom Sool, 1N
 Kirch, K., 0U
 Kneis, C., 0B
 Koen, Wayne, 1Y
 Komar, V. K., 1V
 Kong, Hong Jin, 1N
 Kottmann, K., 0U
 Kovalenko, N. O., 1V
 Kovalev, Anton V., 1M
 Krainak, Michael A., 0K
 Kreitler, Martin, 0H
 Krishnamurthi, Mahesh, 0A
 Kubeček, V., 1V
 Kucirek, Philipp, 0H
 Kuhn, Michael, 14
 Kuhn, Vincent, 0Y
 Landru, Nicolas, 0R
 Le Bail, Guy, 0R
 Le Guen, Bruno, 0R
 Lee, Hwihiyeong, 1N
 Lesparre, Fabien, 02, 03
 L'huillier, Johannes A., 1O
 Li, Yuan, 05
 Linnemann, J., 1Z
 Litvinovitch, Viatcheslav, 0L
 Liu, Brad Chun-Ting, 26
 Liu, Yuanye, 20
 Loescher, André, 03, 0V
 Losee, Andrew, 0J
 Lucianetti, Antonio, 1T
 Lux, Oliver, 0C
 Macdonald, John R., 0E
 Mackenzie, Jacob I., 1D
 Mak, Andrey A., 1K, 1M
 Manek-Hönninger, I., 0B
 Markushin, Yury Y., 0I
 Martial, Igor, 02, 03
 Martinez, Alán, 0G
 Martyshkin, Dmitry, 0G
 Mason, Paul D., 1L
 Mazanec, Tomáš, 0T
 McDaniel, Sean A., 0E
 Meissner, Ansgar, 0H
 Meissner, Helmuth, 09, 0K
 Meissner, Stephanie, 09, 0K
 Melzer, Jeffrey E., 04
 Merritt, Scott, 0K
 Michailovas, Andrejus, 07, 1J
 Miller, Jerome Keith, 05, 22, 23
 Mirov, Sergey B., 0G, 25
 Miura, Taisuke, 1T, 1Z
 Mocek, Tomáš, 1T, 1Z
 Mu, Xiaodong, 09, 0K
 Nakazato, T., 0P
 Naylon, Jack A., 0T
 Negel, Jan-Phillipp, 03, 0V
 Němec, Michal, 1S, 1V
 Nettleton, John, 1P
 Nie, Craig D., 04, 05
 Niyuki, Ryo, 0Q
 Novák, Jakub, 0T
 Oh, Jungsuk, 1N
 Onose, T., 0P
 Orlov, Oleg A., 1M
 Osiko, Vyacheslav V., 1S
 Pallmann, Wolfgang, 03
 Park, Sangwoo, 1N
 Pati, Gour S., 0I
 Paul, Amandine, 10
 Peacock, Anna C., 0A
 Peppers, Jeremy M., 25
 Phillips, P. Jonathan, 1L
 Pirzio, F., 1F, 1G
 Pohl, R., 0U
 Pollnau, M., 1U
 Polyakov, Vadim M., 1K, 1M
 Poulain, M., 0B
 Prandolini, M. J., 1E
 Puffenberger, Kent, 0J
 Puzikov, V. M., 1V
 Rand, Stephen C., 04
 Renz, Günther, 1W
 Resan, Bojan, 03
 Richards, David, 1L

- Riedel, R., 1E
 Robin, T., 0B
 Rodin, Aleksej M., 07, 1J
 Rodionov, Andrey Yu., 1K
 Rumpel, M., 1G
 Rus, Bedřich, 0T
 Ryasnyanskiy, Aleksandr, 0K
 Ryba, Tracey, 0Y
 Sanamyan, Tigran, 0F
 Sarukura, N., 0P
 Sasaki, Keiji, 0Q
 Savich, Michael, 16
 Sawruk, Nicholas W., 0L
 Sazio, Pier J. A., 0A
 Schad, Sven-Silvius, 0Y
 Schellhorn, Martin, 0D
 Schepler, Kenneth L., 0E
 Schuett, Casey, 0C
 Schuhmann, K., 0U
 Schulz, M., 1E
 Schum, Tom, 0J
 Seurin, Jean-Francois, 0N
 Shaikh, Waseem, 1L
 Sharma, Saurabh, 22, 23
 Shohda, Fumio, 17
 Shori, Ramesh K., 05, 22, 23, 26
 Shuman, Tim, 0J
 Sikocinski, P., 1Z
 Smirnov, Vadim, 0K
 Smith, Jodie M., 1L
 Sparks, Justin R., 0A
 Stafsuud, Oscar M., 26
 Stephen, Mark A., 0K
 Stolzenburg, Christian, 0Y
 Storm, Mark, 0M
 Strauss, Hencharl J., 1Y
 Šulc, Jan, 1S, 1T, 1V, 1X
 Sullivan, Edward, 0L
 Sutter, Dirk H., 0V
 Švejkar, Richard, 1S
 Takashima, Hideaki, 0Q
 Tanaka, Y., 0P
 Taqqu, D., 0U
 Tavella, F., 1E
 Theobald, Christian, 1O
 Trembath-Reichert, Stephen, 04
 Tripathi, Renu, 0I
 Tsuboi, M., 0P
 Ulevichius, Nortautas, 1J
 v. Löwis of Menar, Patric, 1O
 van Dalzen, K., 1U
 Van Leeuwen, Robert, 0N
 VanTuijl, Andre, 0L
 Vitkin, Vladimir V., 1K, 1M
 Voss, Andreas, 0U, 0V, 0W
 Walters, Brooke, 0J
 Wang, Qing, 0N
 Watanabe, S., 0P
 Watkins, Laurence, 0N
 Weichelt, Birgit, 0U, 0W
 Weitz, Marco, 1O
 Wentsch, Katrin S., 0W
 Wetter, Niklaus U., 0Z
 Williams, Lamario, 0G
 Wu, Lorinda, 1Y
 Wyrowski, Frank, 14
 Wysocki, Theodore, 0L
 Xu, Guoyang, 0N
 Yan, RenPeng, 1D
 Yanagisawa, Takayuki, 17
 Yoon, SungJin, 1D
 Yu, Anthony W., 0K, 0M
 Zagoruiko, Y. A., 1V
 Zervos, Charalampos, 0T
 Zhang, Zeyu, 05
 Zhilin, Alexander A., 1K
 Zhou, Delai, 0N

Conference Committee

Symposium Chairs

Guido Hennig, Daetwyler Graphics AG (Switzerland)
Yongfeng Lu, University of Nebraska-Lincoln (United States)

Symposium Co-chairs

Bo Gu, Bos Photonics (United States)
Andreas Tünnermann, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) and Friedrich-Schiller-Universität Jena (Germany)

Program Track Chair

Gregory J. Quarles, Optoelectronics Management Network (United States)

Conference Chairs

W. Andrew Clarkson, University of Southampton (United Kingdom)
Ramesh K. Shori, SPAWAR Systems Center (United States)

Conference Program Committee

Patrick A. Berry, Air Force Research Laboratory (United States)
Marc Eichhorn, Institut Franco-Allemand de Recherches de Saint-Louis (France)
Dennis G. Harris, MIT Lincoln Laboratory (United States)
Norman Hodgson, Coherent, Inc. (United States)
Helena Jelínková, Czech Technical University in Prague (Czech Republic)
Christian Kräkel, Universität Hamburg (Germany)
Jacob I. Mackenzie, University of Southampton (United Kingdom)
Markus Pollnau, Universiteit Twente (Netherlands)
Narasimha S. Prasad, NASA Langley Research Center (United States)
David H. Titterton, Defence Science and Technology Laboratory (United Kingdom)
Masaki Tokurakawa, The University of Electro-Communications (Japan)
Matteo Vannini, Istituto Nazionale di Ottica, CNR (Italy)

Session Chairs

- 1 Crystal Fiber Lasers I
Ramesh K. Shori, SPAWAR Systems Center (United States)
- 2 Crystal Fiber Lasers II
Ramesh K. Shori, SPAWAR Systems Center (United States)
- 3 Eye-Safe and Mid-IR Lasers
Patrick A. Berry, Air Force Research Laboratory (United States)
- 4 Airborne and Space Qualified Lasers
Narasimha S. Prasad, NASA Langley Research Center (United States)
- 5 UV and Visible Lasers
Dennis G. Harris, MIT Lincoln Laboratory (United States)
- 6 Disk Lasers
Jacob I. Mackenzie, University of Southampton (United Kingdom)
- 7 Novel Concepts I
Ramesh K. Shori, SPAWAR Systems Center (United States)
- 8 Novel Concepts II
Jacob I. Mackenzie, University of Southampton (United Kingdom)
- 9 Laser Materials and Characterization
Ramesh K. Shori, SPAWAR Systems Center (United States)
- 10 Ultrafast Lasers
Jacob I. Mackenzie, University of Southampton (United Kingdom)
- 11 Pulsed Lasers I
W. Andrew Clarkson, University of Southampton (United Kingdom)
- 12 Pulsed Lasers II
W. Andrew Clarkson, University of Southampton (United Kingdom)