

PROCEEDINGS OF SPIE

Semiconductor Lasers and Laser Dynamics VI

Krassimir Panajotov
Marc Sciamanna
Angel Valle
Rainer Michalzik
Editors

14–17 April 2014
Brussels, Belgium

Sponsored by
SPIE

Cosponsored by
B-PHOT—Brussels Photonics Team (Belgium)
FWO—Fonds Wetenschappelijk Onderzoek (Belgium)
Brussels-Capital Region (Belgium)
Ville de Bruxelles (Belgium)

Cooperating Organisations
CBO-BCO (Belgium)
European Laser Institute
Photonics 21 (Germany)
EOS—European Optical Society (Germany)

Published by
SPIE

Volume 9134

Proceedings of SPIE 0277-786X, V. 9134

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

Semiconductor Lasers and Laser Dynamics VI, edited by Krassimir Panajotov, Marc Sciamanna,
Angel Valle, Rainer Michalzik, Proc. of SPIE Vol. 9134, 913401 · © 2014 SPIE
CCC code: 0277-786X/14/\$18 · doi: 10.1117/12.2070015

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 *Semiconductor Lasers and Laser Dynamics VI*, edited by Krassimir Panajotov, Marc Sciamanna, Angel Valle, Rainer Michalzik, Proceedings of SPIE Vol. 9134 (SPIE, Bellingham, WA, 2014) Article CID Number.

ISSN: 0277-786X
ISBN: 9781628410822

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 © 2014, 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/14/\$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 and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent 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. Numbers in the index correspond to the last two digits of the six-digit CID Number.

Contents

xiii Conference Committee

SESSION 1 ADVANCED SEMICONDUCTOR LASERS I

- 9134 02 **Green nanophotonics for future datacom and Ethernet networks (Invited Paper) [9134-1]**
D. Bimberg, Technische Univ. Berlin (Germany) and King Abdulaziz Univ. (Saudi Arabia);
D. Arsenijević, G. Larisch, H. Li, J. A. Lott, P. Moser, H. Schmeckebier, P. Wolf, Technische
Univ. Berlin (Germany)
- 9134 04 **Near-threshold relaxation dynamics of a quantum dot laser [9134-3]**
C. Wang, Univ. Européenne de Bretagne, INSA, CNRS FOTON (France) and Telecom
Paristech, Ecole Nationale Supérieure des Télécommunications, CNRS LTCI (France);
J. Even, Univ. Européenne de Bretagne, INSA, CNRS FOTON (France); F. Grillot, Telecom
Paristech, Ecole Nationale Supérieure des Télécommunications, CNRS LTCI (France)
- 9134 05 **The effect of slow passage in the pulse-pumped quantum dot laser [9134-4]**
G. S. Sokolovskii, Ioffe Physical-Technical Institute (Russian Federation); M. Abu Saa, Vrije
Univ. Brussel (Belgium) and Arab American Univ. (Palestinian Territory, Occupied);
J. Danckaert, Vrije Univ. Brussel (Belgium); V. V. Dudelev, A. G. Deryagin, I. I. Novikov,
M. V. Maximov, Ioffe Physical-Technical Institute (Russian Federation); A. E. Zhukov, St.
Petersburg Academic Univ. (Russian Federation); V. M. Ustinov, Ioffe Physical-Technical
Institute (Russian Federation); V. I. Kuchinskii, Ioffe Physical-Technical Institute (Russian
Federation) and St. Petersburg State Electrotechnical Univ. (Russian Federation);
W. Sibbett, Univ. of St. Andrews (United Kingdom); E. U. Rafailov, Aston Univ. (United
Kingdom); E. A. Viktorov, National Research Univ. of Information Technologies, Mechanics
and Optics (Russian Federation) and Univ. Libre de Bruxelles (Belgium); T. Erneux, Univ. Libre
de Bruxelles (Belgium)
- 9134 06 **The analytical approach to the multi-state lasing phenomenon in undoped and p-doped
InAs/InGaAs semiconductor quantum dot lasers [9134-5]**
V. V. Korenev, St. Petersburg Academic Univ. (Russian Federation); A. V. Savelyev, St.
Petersburg Academic Univ. (Russian Federation) and St. Petersburg State Polytechnical
Univ. (Russian Federation); A. E. Zhukov, St. Petersburg Academic Univ. (Russian
Federation), St. Petersburg State Polytechnical Univ. (Russian Federation), and Ioffe
Physical-Technical Institute (Russian Federation); A. V. Omelchenko, St. Petersburg
Academic Univ. (Russian Federation) and St. Petersburg State Polytechnical Univ. (Russian
Federation); M. V. Maximov, St. Petersburg Academic Univ. (Russian Federation),
St. Petersburg State Polytechnical Univ. (Russian Federation), and Ioffe Physical-Technical
Institute (Russian Federation)

SESSION 2 VCSELS I

- 9134 08 **Spin-controlled ultrafast vertical-cavity surface-emitting lasers [9134-7]**
H. Höpfner, M. Lindemann, N. C. Gerhardt, M. R. Hofmann, Ruhr-Univ. Bochum (Germany)
- 9134 09 **Dynamics of long-wavelength VCSELs subject to dual-beam optical injection [9134-8]**
P. Pérez, Univ. de Cantabria (Spain); A. Quirce, Vrije Univ. Brussels (Belgium); A. Consoli, Univ. Politécnica de Madrid (Spain); A. Valle, I. Noriega, L. Pesquera, Univ. de Cantabria (Spain); I. Esquivias, Univ. Politécnica de Madrid (Spain)
- 9134 0A **Experimental and theoretical analysis of limit cycle bistability in a free-running VCSEL [9134-9]**
M. Virte, Vrije Univ. Brussel (Belgium) and Supélec (France); M. Sciamanna, Supélec (France); E. Mercier, Vrije Univ. Brussels (Belgium) and Supélec (France); K. Panajotov, Vrije Univ. Brussel (Belgium) and Institute of Solid State Physics (Bulgaria)
- 9134 0B **Wavelength control in fabrication of wafer fused VCSELs emitting in the 1310 nm waveband [9134-10]**
A. Sirbu, Ecole Polytechnique Fédérale de Lausanne (Switzerland); V. Iakovlev, Ecole Polytechnique Fédérale de Lausanne (Switzerland) and BeamExpress S.A. (Switzerland); A. Mereuta, A. Caliman, G. Suruceanu, BeamExpress S.A. (Switzerland); Z. Mickovic, Ecole Polytechnique Fédérale de Lausanne (Switzerland); E. Kapon, Ecole Polytechnique Fédérale de Lausanne (Switzerland) and BeamExpress S.A. (Switzerland)

SESSION 3 MODE-LOCKING

- 9134 0C **Monolithically integrated InP-based modelocked ring laser systems (Invited Paper) [9134-11]**
E. Bente, V. Moskalenko, S. Latkowski, S. Tahvili, Technische Univ. Eindhoven (Netherlands); L. Augustin, Smart Photonics (Netherlands); M. Smit, Technische Univ. Eindhoven (Netherlands)
- 9134 0D **Revisiting the physics of mode locking in lasers [9134-12]**
A. M. Perego, Univ. de València (Spain) and Univ. Politècnica de Catalunya (Spain); F. Prati, Univ. degli Studi dell'Insubria (Italy); G. J. de Valcárcel, Univ. de València (Spain)
- 9134 0F **Wider-frequency combs generation, noise reduction, and repetition rate tuning in quantum-dot mode-locked lasers [9134-14]**
T. Habruseva, Cork Institute of Technology (Ireland), Tyndall National Institute (Ireland), and Aston Univ. (Ireland); D. Arsenijević, D. Bimberg, Technische Univ. Berlin (Germany); G. Huyet, S. P. Hegarty, Cork Institute of Technology (Ireland) and Tyndall National Institute (Ireland)

SESSION 4 OPTICAL FEEDBACK

- 9134 0H **Laser dynamics providing enhanced-modulation bandwidth (Invited Paper) [9134-16]**
I. Montrosset, P. Bardella, Politecnico di Torino (Italy)

- 9134 0I **Multi-wavelength emission using compact semiconductor ring laser with filtered optical feedback** [9134-17]
M. Khoder, R. M. Nguimdo, J. Danckaert, Vrije Univ. Brussel (Belgium); X. Leijtens, J. Bolk, Technische Univ. Eindhoven (Netherlands); G. Verschaffelt, Vrije Univ. Brussel (Belgium)
- 9134 0J **Bifurcation to chaos and extreme events in a laser diode with phase-conjugate feedback** [9134-18]
E. Mercier, A. Karsaklian Dal Bosco, D. Wolfersberger, M. Sciamanna, Supélec (France)
- 9134 0K **Harmonic fundamental self-pulsations from a laser diode using phase-conjugate optical feedback** [9134-19]
D. Wolfersberger, A. Karsaklian dal Bosco, E. Mercier, M. Sciamanna, Supélec (France)
- 9134 0L **Experimental study of the complex dynamics of semiconductor lasers with feedback via symbolic time-series analysis** [9134-20]
T. Sorrentino, Univ. Politècnica de Catalunya (Spain) and Univ. Federal Rural do Semi-Árido (Brazil); A. Aragoneses, S. Perrone, Univ. Politècnica de Catalunya (Spain); D. J. Gauthier, Duke Univ. (United States); M. C. Torrent, C. Masoller, Univ. Politècnica de Catalunya (Spain)

SESSION 5 ADVANCED SEMICONDUCTOR LASERS II

- 9134 0M **Laser research on an InP-based generic integration platform (Invited Paper)** [9134-21]
D. J. Robbins, Willow Photonics (United Kingdom); K. Lawniczuk, X. Leijtens, J. Zhao, V. Moskalenko, E. Bente, Technische Univ. Eindhoven (Netherlands); A. Wonfor, X. Guo, Univ. of Cambridge (United Kingdom); M. Smit, Technische Univ. Eindhoven (Netherlands); M. Wale, Technische Univ. Eindhoven (Netherlands) and Oclaro Technology Ltd. (United Kingdom)
- 9134 0N **Emission regimes in a distributed feedback tapered master-oscillator power-amplifier at 1.5 μm** [9134-22]
M. Vilera, J. M. G. Tijero, A. Consoli, S. Aguilera, P. Adamiec, I. Esquivias, Univ. Politècnica de Madrid (Spain)
- 9134 0P **Small linewidths 76 \times nm DFB-laser diodes with optimized two-step epitaxial gratings** [9134-24]
O. Brox, F. Bugge, A. Mogilatenko, E. Luvsandamdin, A. Wicht, H. Wenzel, G. Erbert, Ferdinand-Braun-Institut (Germany)
- 9134 0Q **Simulations and analysis of beam quality improvement in spatially modulated broad area edge-emitting devices** [9134-25]
M. Radziunas, Weierstrass-Institut für Angewandte Analysis und Stochastik (Germany); R. Herrero, M. Botez, Univ. Politècnica de Catalunya (Spain); K. Staliunas, Univ. Politècnica de Catalunya (Spain) and Institució Catalana de Recerca i Estudis Avançats (Spain)

SESSION 6 HIGH-PERFORMANCE LASER DIODES

- 9134 0S **Rate equation analysis of longitudinal spatial hole burning in high-power semiconductor lasers** [9134-27]
T. Hao, J. Song, P. O. Leisher, Rose-Hulman Institute of Technology (United States)
- 9134 0T **973 nm wavelength stabilized hybrid ns-MOPA diode laser system with 15.5 W peak power and a spectral line width below 10 pm** [9134-28]
T. N. Vu, Ferdinand-Braun-Institut (Germany) and Vietnam Academy of Science and Technology (Viet Nam); A. Klehr, B. Sumpf, H. Wenzel, G. Erbert, G. Tränkle, Ferdinand-Braun-Institut (Germany)
- 9134 0U **Generating a high brightness multi-kilowatt laser by dense spectral combination of VBG stabilized single emitter laser diodes** [9134-29]
H. Fritsche, R. Koch, B. Krusche, F. Ferrario, A. Grohe, DirectPhotonics Industries GmbH (Germany); S. Pflueger, DirectPhotonics, Inc. (United States); W. Gries, DirectPhotonics Industries GmbH (Germany)
- 9134 0V **Optical characterization of type II quantum wells for long-wavelength mid-infrared interband cascade lasers** [9134-30]
F. Janiak, M. Motyka, G. Sek, K. Ryczko, M. Dyksik, J. Misiewicz, Wroclaw Univ. of Technology (Poland); R. Weih, S. Hofling, M. Kamp, Univ. Würzburg (Germany)

SESSION 7 VCSELS II

- 9134 0X **Comparison of spatial anti-guided mechanism in single emitter VCSELs and VCSEL arrays** [9134-32]
T. Czyszanowski, M. Dems, R. P. Sarzala, Technical Univ. of Lodz (Poland); K. Panajotov, Vrije Univ. Brussel (Belgium) and Institute of Solid State Physics (Bulgaria); E. Kapon, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- 9134 0Y **Volume holographic grating stabilized 780nm VECSEL** [9134-33]
G. N. West, A. C. Sills, P. O. Leisher, Rose-Hulman Institute of Technology (United States)
- 9134 0Z **Pulsed high-power yellow-orange VECSEL (Best Student Paper Award)** [9134-34]
E. Kantola, T. Leinonen, S. Ranta, M. Tavast, M. Guina, Tampere Univ. of Technology (Finland)

SESSION 8 SEMICONDUCTOR LASER DYNAMICS I

- 9134 11 **Absolute and relative refractory periods in a micropillar laser with saturable absorber** [9134-36]
F. Selmi, Lab. de Photonique et de Nanostructures (France); R. Braive, Lab. de Photonique et de Nanostructures (France) and Univ. Paris Diderot (France); G. Beaudoin, I. Sagnes, R. Kuszelewicz, S. Barbay, Lab. de Photonique et de Nanostructures (France)

- 9134 12 **Polarization dynamics of VCSELs in external cavities** [9134-37]
M. Marconi, Institut Non Linéaire de Nice Sophia Antipolis, CNRS, Univ. de Nice Sophia Antipolis (France); J. Javaloyes, Univ. de les Illes Balears (Spain); S. Barland, Institut Non Linéaire de Nice Sophia Antipolis, CNRS, Univ. de Nice Sophia Antipolis (France); S. Balle, Institut Mediterrani d'Estudis Avançats (Spain); M. Giudici, Institut Non Linéaire de Nice Sophia Antipolis, CNRS, Univ. de Nice Sophia Antipolis (France)
- 9134 13 **Beyond the standard approximations: an analysis leading to a correct description of phase instabilities in semiconductor lasers** [9134-38]
L. Gil, G. L. Lippi, Institut Non Linéaire de Nice Sophia Antipolis, CNRS, Univ. de Nice Sophia Antipolis (France)

SESSION 9 OPTICAL PATTERNS AND LOCALIZED STRUCTURES

- 9134 14 **Cavity solitons in vertical-cavity surface-emitting lasers (Invited Paper)** [9134-39]
M. Tlidi, Univ. Libre de Bruxelles (Belgium); A. G. Vladimirov, A. Pimenov, Weierstrass-Institut für Angewandte Analysis und Stochastik (Germany); S. V. Gurevich, Univ. Münster (Germany); E. Averlant, Univ. Libre de Bruxelles (Belgium) and Vrije Univ. Brussel (Belgium); H. Thienpont, Vrije Univ. Brussel (Belgium); K. Panajotov, Vrije Univ. Brussel (Belgium) and Institute of Solid State Physics (Bulgaria)
- 9134 16 **Phase bistable patterns in VCSELs due to spatial rocking** [9134-41]
G. J. de Valcárcel, Univ. de València (Spain); C. Fernández-Oto, M. Tlidi, Univ. Libre de Bruxelles (Belgium); K. Panajotov, Vrije Univ. Brussel (Belgium) and Institute of Solid State Physics (Bulgaria); K. Staliunas, Univ. Politècnica de Catalunya (Spain) and Institució Catalana de Recerca i Estudis Avançats (Spain)
- 9134 17 **Soliton bound states in semiconductor disk laser** [9134-42]
E. A. Viktorov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) and Univ. Libre de Bruxelles (Belgium); M. Butkus, Univ. of Dundee (United Kingdom); T. Erneux, Univ. Libre de Bruxelles (Belgium); C. J. Hamilton, G. P. A. Malcolm, M Squared Lasers Ltd. (United Kingdom); E. U. Rafailov, Univ. of Dundee (United Kingdom)
- 9134 18 **Cavity solitons in a medium-size VCSEL** [9134-43]
E. Averlant, Univ. Libre de Bruxelles (Belgium) and Vrije Univ. Brussel (Belgium); K. Panajotov, Vrije Univ. Brussel (Belgium); T. Ackemann, Univ. of Strathclyde (United Kingdom); M. Tlidi, Univ. Libre de Bruxelles (Belgium)

SESSION 10 SEMICONDUCTOR LASER DYNAMICS II

- 9134 19 **InGaAlAs RW-based electro-absorption-modulated DFB-lasers for high-speed applications (Invited Paper)** [9134-44]
M. Moehrle, Fraunhofer-Institut für Nachrichtentechnik Heinrich-Hertz-Institut (Germany); H. Klein, Packet Photonics Inc. (United States); C. Bornholdt, G. Przyrembel, A. Sigmund, W.-D. Molzow, U. Troppenz, H.-G. Bach, Fraunhofer-Institut für Nachrichtentechnik Heinrich-Hertz-Institut (Germany)

- 9134 1B **All-optical switching with a dual state quantum dot laser** [9134-46]
 B. Tykalewicz, D. Goulding, Cork Institute of Technology (Ireland) and Tyndall National Institute (Ireland); S. P. Hegarty, Tyndall National Institute (Ireland); G. Huyet, Cork Institute of Technology (Ireland), Tyndall National Institute (Ireland), and National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); B. Kelleher, Cork Institute of Technology (Ireland) and Tyndall National Institute (Ireland)
- 9134 1C **Frequency stabilization of an external-cavity diode laser by offset frequency locking to a stabilized He-Ne laser** [9134-47]
 C. Sternkopf, Technische Univ. Ilmenau (Germany); S. Goellner, EPC Technology GmbH (Germany); E. Manske, Technische Univ. Ilmenau (Germany)
- 9134 1D **Time-resolved reconstruction of dynamical pulse trains using multiheterodyne detection** [9134-48]
 T. Butler, B. Tykalewicz, D. Goulding, B. Kelleher, Cork Institute of Technology (Ireland) and Tyndall National Institute (Ireland); G. Huyet, Cork Institute of Technology (Ireland), Tyndall National Institute (Ireland), and National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); S. P. Hegarty, Cork Institute of Technology (Ireland)

SESSION 11 SEMICONDUCTOR LASER DYNAMICS III

- 9134 1F **Feedback-generated periodic pulse trains in quantum dot lasers** [9134-50]
 E. A. Viktorov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) and Univ. Libre de Bruxelles (Belgium); D. Goulding, Cork Institute of Technology (Ireland) and Tyndall National Institute (Ireland); S. P. Hegarty, Tyndall National Institute (Ireland); G. Huyet, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation), Cork Institute of Technology (Ireland), and Tyndall National Institute (Ireland); T. Erneux, Univ. Libre de Bruxelles (Belgium); B. Kelleher, Cork Institute of Technology (Ireland) and Tyndall National Institute (Ireland)
- 9134 1G **Temperature dependent investigation of carrier transport, injection, and densities in 808 nm AlGaAs multi-quantum-well active layers for VCSELs** [9134-51]
 A. P. Engelhardt, Univ. Kassel (Germany); J. S. Kolb, Philips Technologie GmbH (Germany); F. Roemer, Univ. Kassel (Germany); U. Weichmann, H. Moench, Philips Technologie GmbH (Germany); B. Witzigmann, Univ. Kassel (Germany)
- 9134 1H **Photonic heterostructure High Contrast Grating as a novel polarization control and light confinement system in HCG VCSEL** [9134-52]
 M. Gebski, M. Dems, Lodz Univ. of Technology (Poland); J. Chen, W. Qijie, Z. Dao Hua, Nanyang Technological Univ. (Singapore); T. Czyszanowski, Lodz Univ. of Technology (Poland)

SESSION 12 ADVANCED SEMICONDUCTOR LASERS III

- 9134 1J **Distributed-feedback GaSb-based laser diodes in the 2.3 to 3.3 μ m wavelength range** [9134-54]
Q. Gaimard, T. Nguyen-Ba, Institut d'Electronique du Sud, CNRS, Univ. Montpellier 2 (France); A. Larue, LAAS, CNRS (France); L. Cerutti, Y. Rouillard, Institut d'Electronique du Sud, CNRS, Univ. Montpellier 2 (France); O. Gauthier-Lafaye, LAAS, CNRS (France); R. Teissier, A. Vicet, Institut d'Electronique du Sud, CNRS, Univ. Montpellier 2 (France)
- 9134 1K **Performance investigation of 112 Gb/s PDM-QPSK long-haul systems employing discrete mode lasers** [9134-55]
J. O'Carroll, Eblana Photonics Ltd. (Ireland); V. Vujicic, Dublin City Univ. (Ireland); N. Brochier, Orange Labs (France); L. Bramerie, FOTON Lab., CNRS, Univ. Europenne de Bretagne (France); L. P. Barry, Dublin City Univ. (Ireland)
- 9134 1L **Time resolved FTIR study of spectral tuning and thermal dynamics of mid-IR QCLs** [9134-56]
K. Pierściński, D. Pierścińska, Institute of Electron Technology (Poland); D. Szabra, M. Nowakowski, J. Wojtas, J. Mikołajczyk, Z. Bielecki, Military Univ. of Technology (Poland); M. Bugajski, Institute of Electron Technology (Poland)
- 9134 1M **The effect of InP based wide-tunable AMQW laser length on power profile** [9134-82]
H. M. Enshasy, King Faisal Univ. (Saudi Arabia); D. T. Cassidy, McMaster Univ. (Canada)

POSTER SESSION

- 9134 1N **Superfocusing of high- M^2 semiconductor laser beams: experimental demonstration** [9134-57]
G. S. Sokolovskii, Ioffe Physical-Technical Institute (Russian Federation); V. Melissinaki, Foundation for Research and Technology-Hellas (Greece); V. V. Dudelev, S. N. Losev, Ioffe Physical-Technical Institute (Russian Federation); K. K. Soboleva, St. Petersburg State Polytechnical Univ. (Russian Federation); E. D. Kolykhalova, A. G. Deryagin, V. I. Kuchinskii, Ioffe Physical-Technical Institute (Russian Federation); E. A. Viktorov, Univ. Libre de Bruxelles (Belgium) and National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); M. Farsari, Foundation for Research and Technology-Hellas (Greece); W. Sibbett, Univ. of St. Andrews (United Kingdom); E. U. Rafailov, Aston Univ. (United Kingdom)
- 9134 1O **Critical slowing down in polarization switching of vertical-cavity surface-emitting lasers** [9134-58]
Y.-H. Wu, Y.-C. Li, W.-C. Kuo, T.-C. Yen, National Sun Yat-Sen Univ. (Taiwan)
- 9134 1P **Enhancement of the low-frequency response of a reflective semiconductor optical amplifier slow light-based microwave phase shifter by forced coherent population oscillations** [9134-59]
A. Meehan, M. J. Connelly, Univ. of Limerick (Ireland)
- 9134 1Q **Characterization of the working parameters of a long-wavelength VCSEL** [9134-60]
P. Pérez, A. Valle, I. Noriega, L. Pesquera, Univ. de Cantabria (Spain)

- 9134 1R **Wideband model of a reflective tensile-strained bulk semiconductor optical amplifier** [9134-61]
M. J. Connelly, Univ. of Limerick (Ireland)
- 9134 1S **Experimental investigation of elliptically polarized injection-locked VCSELs** [9134-62]
H. Lin, Bates College (United States); P. Pérez, A. Valle, L. Pesquera, Univ. de Cantabria (Spain)
- 9134 1T **An adaptive stepsize controlled solver for the dynamic WDM semiconductor optical amplifier response** [9134-63]
C. Vagionas, Aristotle Univ. of Thessaloniki (Greece); J. Bos, PhoeniX Software (Netherlands)
- 9134 1U **An FDTD algorithm for simulating light propagation in anisotropic dynamic gain media** [9134-64]
A. A. Al-Jabr, D. P. San Roman Alerigi, B. S. Ooi, King Abdullah Univ. of Science and Technology (Saudi Arabia); M. A. Alsunaidi, King Fahd Univ. of Petroleum and Minerals (Saudi Arabia)
- 9134 1V **Two semiconductor ring lasers coupled by a single-waveguide for optical memory operation** [9134-65]
G. Van der Sande, W. Coomans, L. Gelens, Vrije Univ. Brussel (Belgium)
- 9134 1W **Cascadable excitability in optically injected microdisks** [9134-66]
T. Van Vaerenbergh, K. Alexander, M. Fiers, P. Mechet, J. Dambre, P. Bienstman, Univ. Gent (Belgium)
- 9134 1Y **Semiconductor ring lasers with delayed optical feedback: low-frequency fluctuations** [9134-68]
G. Van der Sande, L. Mashal, R. M. Nguimdo, Vrije Univ. Brussel (Belgium); M. C. Soriano, Instituto de Física Interdisciplinar y Sistemas Complejos (Spain); J. Danckaert, G. Verschaffelt, Vrije Univ. Brussel (Belgium)
- 9134 1Z **Analogy between the quantum phase transition and the polarization switching of vertical-cavity surface-emitting lasers** [9134-69]
T.-C. Yen, Y.-H. Wu, Y.-C. Li, W.-C. Kuo, National Sun Yat-Sen Univ. (Taiwan)
- 9134 20 **Ising simulation in polarization switching in vertical-cavity surface-emitting lasers** [9134-70]
Y.-C. Li, Y.-H. Wu, W.-C. Kuo, T.-C. Yen, National Sun Yat-Sen Univ. (Taiwan)
- 9134 22 **1550 nm VCSEL-based 0.48 Tb/s transmission scheme employing PAM-4 and WDM for active optical cables** [9134-72]
S. Markou, Aristotle Univ. of Thessaloniki (Greece); S. Dris, D. Kalavrouziotis, H. Avramopoulos, National Technical Univ. of Athens (Greece); N. Pleros, Aristotle Univ. of Thessaloniki (Greece); D. Tsikos, Aristotle Univ. of Thessaloniki (Greece) and Ctr. for Research and Technology Hellas (Greece)
- 9134 23 **Accurate electro-optical characterization of high power density GaAs-based laser diodes for screening strategies improvement** [9134-73]
P. Del Vecchio, 3S PHOTONICS S.A.S. (France) and Lab. IMS, CNRS, Univ. of Bordeaux (France); Y. Deshayes, S. Joly, Lab. IMS, CNRS, Univ. of Bordeaux (France); M. Bettiai, F. Laruelle, 3S PHOTONICS S.A.S. (France); L. Béchou, Lab. IMS, CNRS, Univ. of Bordeaux (France)

- 9134 24 **Delay signature concealment in chaotic semiconductor ring lasers** [9134-74]
R. M. Nguimdo, G. Verschaffelt, J. Danckaert, G. Van der Sande, Vrije Univ. Brussel (Belgium)
- 9134 25 **Bifurcation diagram of an external-cavity semiconductor laser: experiment and theory** [9134-75]
B. Kim, Georgia Tech-Lorraine, CNRS (France) and Georgia Institute of Technology (United States); N. Li, Southwest Jiaotong Univ. (China); D. Choi, A. Locquet, D. S. Citrin, Georgia Tech-Lorraine, CNRS (France) and Georgia Institute of Technology (United States)
- 9134 26 **Random bit generation using polarization chaos from free-running laser diode** [9134-76]
M. Virte, E. Mercier, Vrije Univ. Brussel (Belgium) and Supélec (France); H. Thienpont, Vrije Univ. Brussel (Belgium); K. Panajotov, Vrije Univ. Brussel (Belgium) and Institute of Solid State Physics (Bulgaria); M. Sciamanna, Supélec (France)
- 9134 27 **Fast random bit generation with a single chaotic laser subjected to optical feedback** [9134-77]
N. Li, Southwest Jiaotong Univ. (China); B. Kim, D. Choi, Georgia Institute of Technology (United States) and Georgia Tech-Lorraine, CNRS (France); V. N. Chizhevsky, B.I. Stepanov Institute of Physics (Belarus); A. Locquet, Georgia Tech-Lorraine, CNRS (France) and Georgia Institute of Technology (United States); M. Bloch, D. S. Citrin, Georgia Institute of Technology (United States) and Georgia Tech-Lorraine, CNRS (France); W. Pan, Southwest Jiaotong Univ. (China)
- 9134 29 **Nonlinear dynamics in semiconductor ring lasers with negative optoelectronic and incoherent optical feedback** [9134-79]
S. T. Kingni, Univ. de Yaoundé 1 (Cameroon) and Vrije Univ. Brussel (Belgium); G. Van der Sande, Vrije Univ. Brussel (Belgium); I. V. Ermakov, Univ. Catholique de Louvain (Belgium); J. Danckaert, Vrije Univ. Brussel (Belgium)
- 9134 2A **Simulation and geometrical design of multi-section tapered semiconductor optical amplifiers at 1.57 μm** [9134-80]
J. M. G. Tijero, L. Borruel, M. Vilera, A. Consoli, I. Esquivias, Univ. Politécnica de Madrid (Spain)
- 9134 2C **Coupled-cavity VCSELs: numerical analysis of physical phenomena** [9134-83]
L. Frasunkiewicz, Technical Univ. of Lodz (Poland) and Vrije Univ. Brussel (Belgium); M. Dems, R. P. Sarzała, Technical Univ. of Lodz (Poland); K. D. Choquette, Univ. of Illinois at Urbana-Champaign (United States); K. Panajotov, Vrije Univ. Brussel (Belgium) and Institute of Solid State Physics (Bulgaria); T. Czyszanowski, Technical Univ. of Lodz (Poland)
- 9134 2E **High precision AlGaAsSb ridge-waveguide etching by *in situ* reflectance monitored ICP-RIE** [9134-85]
N. T. Tran, M. Breivik, S. K. Patra, B. O. Fimland, Norwegian Univ. of Science and Technology (Norway)
- 9134 2H **Electro-thermal characteristics of VCSELs: simulations and experiments** [9134-88]
M. Daubenschuez, Univ. Ulm (Germany); P. Gerlach, Philips Technologie GmbH (Germany); R. Michalzik, Univ. Ulm (Germany)

- 9134 2I **Comparison of two methods of laser stabilization for optoelectronic oscillators** [9134-90]
P. Salzenstein, K. Saleh, M. Zarubin, FEMTO-ST, CNRS (France); A. S. Trushin, Lomonosov
Moscow State Univ. (Russian Federation)
- 9134 2K **Predicting modes of operation in quantum dot mode-locked lasers using a delay
differential equation model** [9134-92]
L. Jaurigue, Technische Univ. Berlin (Germany); F. Grillot, Télécom ParisTech (France);
E. Schöll, K. Lüdge, Technische Univ. Berlin (Germany)

Author Index

Conference Committee

Symposium Chairs

Francis Berghmans, Vrije Universiteit Brussel (Belgium)
Ronan Burgess, European Commission (Belgium)
Jürgen Popp, Institut für Photonische Technologien e.V. (Germany)
Peter Hartmann, SCHOTT AG (Germany)

Honorary Symposium Chair

Hugo Thienpont, Vrije Universiteit Brussel (Belgium)

Conference Chairs

Krassimir Panajotov, Vrije Universiteit Brussel (Belgium)
Marc Sciamanna, Supélec (France)
Angel Valle, Universidad de Cantabria (Spain)
Rainer Michalzik, Universität Ulm (Germany)

Conference Programme Committee

Sylvain Barbay, Laboratoire de Photonique et de Nanostructures, CNRS (France)
Dieter Bimberg, Technische Universität Berlin (Germany)
Weng W. Chow, Sandia National Laboratories (United States)
Kent D. Choquette, University of Illinois at Urbana-Champaign (United States)
Wolfgang E. Elsässer, Technische Universität Darmstadt (Germany)
Nicolas Grandjean, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
Jesper Mørk, Technical University of Denmark (Denmark)
Jerome V. Moloney, College of Optical Sciences, The University of Arizona (United States)
Ivo Montrosset, Politecnico di Torino (Italy)
Jerome V. Moloney, College of Optical Sciences, The University of Arizona (United States)
Włodzimierz Nakwaski, Technical University of Lodz (Poland)
Johann Peter Reithmaier, Universität Kassel (Germany)
K. Alan Shore, Bangor University (United Kingdom)
Marc Sorel, University of Glasgow (United Kingdom)
Anne C. Tropper, University of Southampton (United Kingdom)
Joachim H. Wagner, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany)

Session Chairs

- 1 Advanced Semiconductor Lasers I
Krassimir Panajotov, Vrije Universiteit Brussel (Belgium)
- 2 VCSELs I
Rainer Michalzik, Universität Ulm (Germany)
- 3 Mode-Locking
Ulrich T. Schwarz, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany)
- 4 Optical Feedback
Angel Valle, Universidad de Cantabria (Spain)
- 5 Advanced Semiconductor Lasers II
Andrei G. Vladimirov, Weierstrass-Institut für Angewandte Analysis und Stochastik (Germany)
- 6 High-Performance Laser Diodes
Erwin A. Bente, Technische Universiteit Eindhoven (Netherlands)
- 7 VCSELs II
Alexei Sirbu, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- 8 Semiconductor Laser Dynamics I
Marc Sciamanna, Supélec (France)
- 9 Optical Patterns and Localized Structures
Sylvain Barbay, Laboratoire de Photonique et de Nanostructures, CNRS (France)
- 10 Semiconductor Laser Dynamics II
Bryan Kelleher, Tyndall National Institute (Ireland)
- 11 Semiconductor Laser Dynamics III
Weng W. Chow, Sandia National Laboratories (United States)
- 12 Advanced Semiconductor Lasers III
Martin Moehrle, Fraunhofer-Institut für Nachrichtentechnik Heinrich-Hertz-Institut (Germany)