

PROCEEDINGS OF SPIE

[SPIDigitalLibrary.org/conference-proceedings-of-spie](https://spiedigitallibrary.org/conference-proceedings-of-spie)

Front Matter: Volume 10098

, "Front Matter: Volume 10098," Proc. SPIE 10098, Physics and Simulation of Optoelectronic Devices XXV, 1009801 (11 April 2017); doi: 10.1117/12.2276385

SPIE.

Event: SPIE OPTO, 2017, San Francisco, California, United States

PROCEEDINGS OF SPIE

Physics and Simulation of Optoelectronic Devices XXV

**Bernd Witzigmann
Marek Osiński
Yasuhiko Arakawa**
Editors

**30 January–2 February 2017
San Francisco, California, United States**

Sponsored and Published by
SPIE

Volume 10098

Proceedings of SPIE 0277-786X, V. 10098

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

Physics and Simulation of Optoelectronic Devices XXV, edited by Bernd Witzigmann, Marek Osiński,
Yasuhiko Arakawa, Proc. of SPIE Vol. 10098, 1009801 · © 2017 SPIE
CCC code: 0277-786X/17/\$18 · doi: 10.1117/12.2276385

Proc. of SPIE Vol. 10098 1009801-1

The papers 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. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIDigitalLibrary.org.

The papers 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 these proceedings:

Author(s), "Title of Paper," in *Physics and Simulation of Optoelectronic Devices XXV*, edited by Bernd Witzigmann, Marek Osiński, Yasuhiko Arakawa, Proceedings of SPIE Vol. 10098 (SPIE, Bellingham, WA, 2017) Seven-digit Article CID Number.

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510606371
ISBN: 9781510606388 (electronic)

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 © 2017, 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/17/\$18.00.

Printed in the United States of America.

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

SPIE. DIGITAL LIBRARY

SPIDigitalLibrary.org

Paper Numbering: *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article at the time of 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 and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five 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.

Contents

vii	<i>Authors</i>
xi	<i>Conference Committee</i>

PLASMONICS AND NANOPHOTONICS

10098 07	Nanophotonic modulators and photodetectors using silicon photonic and plasmonic device concepts (Invited Paper) [10098-6]
10098 08	Voltage control of surface plasmon and phonon interactions in doped semiconductor-dielectric interfaces [10098-84]

NONLINEAR OPTICS AND MODE-LOCKING

10098 0D	Optical bistability, self-pulsing and XY optimization in silicon micro-rings with active carrier removal [10098-11]
10098 0E	Characteristics of ultrafast passively mode-locking soliton fiber laser utilizing higher-order mode fibers [10098-12]
10098 0F	Coherent pulse progression in nonlinear quantum-cascade laser medium under group-velocity dispersion [10098-13]

OPTICAL INJECTION AND FEEDBACK IN LASERS

10098 0H	Injection-locking criteria for simultaneously locking single-mode lasers to optical frequency combs from gain-switched lasers [10098-15]
10098 0I	Wideband chaos in hybrid III-V/silicon distributed feedback semiconductor lasers under optical feedback [10098-16]
10098 0J	Increasing stability by two-state lasing in quantum-dot lasers with optical injection [10098-17]
10098 0K	Self-consistent rate-equation theory of coupling in mutually injected semiconductor lasers [10098-18]
10098 0L	Large-signal analysis of directly modulated strongly injection-locked whistle-geometry ring lasers [10098-19]

NON-CLASSICAL LIGHT

- 10098 0N **Feedback control of photon statistics** [10098-21]
- 10098 0O **Spin transport in a Lindblad-driven isotropic quantum Heisenberg spin-chain** [10098-22]
- 10098 0P **Momentum and rest mass of the covariant state of light in a medium** [10098-23]

SEMICONDUCTOR LASERS I

- 10098 0Q **What limits the power conversion efficiency of GaN-based lasers? (Invited Paper)**
[10098-24]
- 10098 0S **Seed laser diodes in pulsed operation: limitations and reliability** [10098-26]
- 10098 0T **Analysis of carrier dynamic effects on frequency response of tin incorporated group-IV alloy-based transistor laser** [10098-27]

ELECTROMAGNETICS I

- 10098 0U **Investigation of light extraction efficiency comparison of AlGaIn-based deep- and mid-ultraviolet flip-chip light-emitting diodes with patterned sapphire substrate** [10098-28]
- 10098 0V **Quadrant detector sensitivity and linearity index measurement with Laguerre-Gaussian beams** [10098-29]
- 10098 0W **Modeling and design of DBR fiber lasers for sensor applications** [10098-30]
- 10098 0X **Characterization and modelling of multimode optical fiber for MOEMS applications using the elementary source method** [10098-31]

SEMICONDUCTOR LASERS II

- 10098 0Z **Stabilization of broad area semiconductor lasers** [10098-34]
- 10098 10 **High-speed directly modulated lasers based on high-order slotted surface gratings**
[10098-35]
- 10098 11 **Lasing of metamorphic hybrid 1300nm spectral band VCSEL under optical pumping up to 120 °C** [10098-36]

OPTOELECTRONICS MODELING TECHNIQUES

- 10098 12 **Simulation and analysis of quantum cascade lasers (Invited Paper)** [10098-37]

10098 13 **NEMO5: realistic and efficient NEGF simulations of GaN light-emitting diodes (Invited Paper)** [10098-38]

10098 14 **Novel BPM technique using leap frog method** [10098-39]

QUANTUM DOTS

10098 16 **Submonolayer quantum-dot lasers** [10098-41]

10098 18 **Excited state spectral blowup induced by carrier dynamics in the ground state of a quantum dot laser** [10098-43]

10098 19 **Modeling and simulation of the multi-population quantum-dot lasers based on equivalent circuit** [10098-44]

PHOTONIC INTEGRATION AND SENSING

10098 1A **Photonic integrated devices and functions on hybrid polymer platform (Invited Paper)** [10098-45]

10098 1B **Important parameters of printed polymer optical waveguides (POWs) in simulation and fabrication** [10098-46]

10098 1C **Fiber based flexure sensor utilizing the sensitivity of evanescent coupling** [10098-47]

10098 1D **High sensitive pressure sensor based on plasmonic Mach-Zehnder interferometer** [10098-48]

METAMATERIALS

10098 1F **Optical propagation in anisotropic metamaterials** [10098-50]

10098 1G **Numerical modeling of photoluminescence in anisotropic nano-layered aluminum-doped zinc-oxide metamaterial with hyperbolic dispersion** [10098-51]

ELECTROMAGNETICS II

10098 1I **Stopped microwave rainbow in 3D chirped photonic crystals** [10098-53]

10098 1K **Modeling and analysis of scattering from silicon nanoparticles with high excess carriers for MIR spectroscopy** [10098-55]

10098 1L **Device design for global shutter operation in a 1.1- μm pixel image sensor and its application to near infrared sensing** [10098-56]

SENSORS MODELING

- 10098 1M **Analysis of SiN_x TIR mirror for polygonal ring resonator sensor structure** [10098-58]
- 10098 1N **Strain sensor based on sectional crosstalk change in dual-core fibers** [10098-59]
- 10098 1O **Autofocus changes the paradigm for camera technology** [10098-60]
- 10098 1P **Modeling of frequency response in strain balanced SiGeSn/GeSn quantum well infrared photodetector** [10098-68]

POSTER SESSION

- 10098 1Q **Multi-parameter fiber optic sensing setup based on spectral overlap using Fabry-Perot interferometers** [10098-61]
- 10098 1R **Measurement of refractive index distribution using micro-lens array based on total internal reflection** [10098-62]
- 10098 1S **Optical J-K flip-flop using switching property of Mach-Zehnder interferometers** [10098-63]
- 10098 1V **Tunable plasmon-induced transparency and slow-light based on graphene metamaterials** [10098-66]
- 10098 1X **Solving the nonlinear diffusion model of the ion exchange process using finite element method** [10098-69]
- 10098 1Y **Stabilization of regular pulses utilizing double-delay loops** [10098-70]
- 10098 1Z **Generation of broadband chaos and stabilized regular pulses by quasi-periodic states in dual-feedback system** [10098-71]
- 10098 21 **Computer modeling and approximation of laser beam reshaper based on aspherical optics** [10098-73]
- 10098 25 **Two-dimensional modeling of AlInAs avalanche photodiodes for high gain-bandwidth product** [10098-77]
- 10098 27 **Highly accurate scanning attachment for SRS-lidar system** [10098-80]
- 10098 29 **Optimization of micro channel heat sinks for high-power 9xx-nm laser diodes** [10098-82]

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.

Aguilar, Ritz Ann P., 0V
Ahmed, W. W., 0Z
Anandarajah, Prince M., 0H
Ayoub, Ahmad B., 14
Babichev, A. V., 11
Bach, Heinz-Gunter, 1A
Badr, Mohamed M., 1X
Bai, Jing, 0F
Bailli, G., 0I
Banerjee, Partha P., 1F
Barry, Liam P., 0H
Baselt, T., 1C
Bechou, Laurent, 0S
Bedi, Amna, 1S
Beiley, Zach M., 1L
Best, Natalie, 1G
Bienkowska, B., 1N
Blokhin, S. A., 11
Bobrov, M. A., 11
Botey, M., 0Z
Brinker, Walter, 1A
Browne, Ben, 13
Budnicki, D., 1N
Cai, Wanshao, 29
Carmelet, Alexander, 0N, 0O
Chauhan, Chanderkanta, 1S
Chen, Junyao, 1R
Cheung, Robin, 1L
Choi, Jung Han, 1A
Choi, Young-Wan, 1M
Chowdhury, Rahnuma Rifat, 0U
Dalton, L. R., 07
Das, Mukul K., 0T, 1P
de Felipe, David, 1A
Droenner, Leon, 0O
Duan, G.-H., 0I
Dubinkin, Ilya, 18
Egorov, A. Yu., 11
Elder, D., 07
Elizarov, Valentin, 27
Erneux, Thomas, 18
Estudillo-Ayala, J. M., 1Q
Evans, Dean R., 1F
Farina, Jim, 0W
Fathy, Alaa, 0X
Federov, Nikita, 18
Filoteo Razo, J. D., 1Q
Franke, Joerg, 1B
Freude, W., 07
Gallet, A., 0I
Gao, Jun, 1V
Geng, Junzhe, 13
Gladyshev, A. G., 11
Glavin, Lisanne, 1O
Gnawali, Rudra, 1F
Gomez, S., 0I
Goulding, David, 18
Gray, Dodd, 0D
Grillot, F., 0I
Grishkanich, Aleksandr, 27
Guan, Lei, 19
Guo, Wei-Hua, 10
Guo, Wenping, 1R
Hamerly, Ryan, 0D
Hanelt, Erin F., 1L
Happach, Magnus, 1A
Harter, T., 07
Hartmann, P., 1C
Haus, Joseph W., 1F
Hayran, Zeki, 11
Hegarty, Stephen P., 18
Hein, Sven M., 0N
Hermosa, Nathaniel P., 0V
Hernandez-Garcia, J. C., 1Q
Herrera-Piad, L. A., 1Q
Herrero, R., 0Z
Heyl, Markus, 0O
Iakovlev, Alexey, 27
Ismail, Yehea, 1K
Jamshidi, Kambiz, 0D
Janipour, Mohsen, 08
Jauregui-Vazquez, D., 1Q
Jeon, Su-Jin, 1M
Ji, Myung-Gi, 1M
Jirauschek, Christian, 12
Joly, Simon, 0S
Juan, Yu-Shan, 1Y, 1Z
Karachinsky, L. Ya., 11
Kascheev, Sergey, 27
Keil, Norbert, 1A
Kelleher, Bryan, 18
Kelly, Priscilla, 1G
Khalil, Diaa, 0X
Kieninger, C., 07
Kim, Ji-Hoon, 1M
Kleinert, Moritz, 1A
Klimeck, Gerhard, 13
Knorr, Andreas, 0N

Kotakowska, A., 1N
 Koltchanov, Igor, 0W
 Koos, C., 07
 Kraft, Manuel, 0N
 Kryzhanovskaya, N. V., 11
 Kubis, Tillmann, 13
 Kumar, Manish, 1D
 Kumar, S., 0Z
 Kumar, Santosh, 1S
 Kurt, Hamza, 1I
 Kutuvantavida, Y., 07
 Kuznetsova, Lyuba, 1G
 Laruelle, François, 0S
 Lauerermann, M., 07
 Le Galès, Germain, 0S
 Lenstra, Daan, 0K
 Lestrade, Michel, 25
 Leuthold, J., 07
 Li, Bin, 1V
 Li, Zhanming S., 25
 Li, Zhiqiang, 25
 Liang, Xuejie, 29
 Liao, Ting-De, 1Z
 Lin, Zhiyuan, 19
 Lindlein, Norbert, 1B
 Lingnau, Benjamin, 0J, 16
 Liu, Xingsheng, 29
 Loosen, Florian, 1B
 Lopez-Dieguez, Y., 1Q
 Lu, Qiaoyin, 10
 Lüdge, Kathy, 0J, 16
 Luo, Shiwen, 1V
 MacKinnon, Joel, 1O
 Mak, Andrey, 27
 Mandelli, Emanuele, 1L
 Marcello, Giulia, 0S
 Meinecke, Stefan, 0J
 Meitzner, Jet, 1L
 Mekawey, Hosam I., 1K
 Melikyan, A., 07
 Mergo, P., 1N
 Mirzoyan, Levon, 0D
 Misirlioglu, Ibrahim Burc., 08
 Möhrle, Martin, 1A
 Moiseev, E. I., 11
 Morisset, Adèle, 0S
 Muehlbrandt, S., 07
 Murawski, M., 1N
 Nageeb, Ahmed, 1K
 Namdari, Meysam, 0D
 Napierala, M., 1N
 Nasilowski, T., 1N
 Naumann, Nicolas L., 0N, 0O
 Nellen, Simon, 1A
 Nelsen, B., 1C
 Nelson, Erik, 13
 Novikov, I. I., 11
 Ó Duill, Seán P., 0H
 Ooi, Yu Kee, 0U
 Orekhova, Maria, 21
 Osiński, Marek, 0L
 Osman, Abdelrahman, 1K
 Ostrowski, Łukasz, 1N
 Owschimikow, Nina, 16
 Pan, Zhongqi, 0E
 Pareek, Prakash, 0T, 1D, 1P
 Park, Jae, 1L
 Park, Jun-Hee, 1M
 Partanen, Mikko, 0P
 Pattantyus-Abraham, Andras, 1L
 Pedroza, Guillaume, 0S
 Piprek, Joachim, 0Q
 Raghuwanshi, Sanjeev Kumar, 1D
 Ranjan, Ravi, 0T, 1P
 Reinke, Philipp, 1A
 Reitberger, Thomas, 1B
 Richter, André, 0W
 Rogers, Christopher, 0D
 Rojas Laguna, R., 1Q
 Rudek, F., 1C
 Sabry, Yasser, 0X
 Sarangapani, Prasad, 13
 Sargent, Edward H., 1L
 Schell, Martin, 1A
 Schires, K., 0I
 Schrauf, Alexander, 1B
 Sendur, Kursat, 08
 Shoer, Ibrahim, 1K
 Sierra-Hernandez, J. M., 1Q
 Smolyakov, Gennady A., 0L
 Smyth, Frank, 0H
 Staliunas, Kestutis, 0Z, 1I
 Sun, Wei, 10
 Swillam, Mohamed A., 14, 1K, 1X
 Szostkiewicz, L., 1N
 Taudt, Ch., 1C
 Troshkov, S. I., 11
 Tulkki, Jukka, 0P
 Turduev, Mirbek, 1I
 Tykalewicz, Boguslaw, 18
 Varghese, Shilpa, 1O
 Viktorov, Evgeny A., 18
 Voznesenskaya, Anna, 21
 Wang, Hanquan, 0F
 Wang, Xinbing, 1V
 Wang, Zhuoran, 19
 Weng, Yi, 0E
 Wolf, S., 07
 Wordelman, Carl, 13
 Wu, Ming-Ju, 1Y
 Xiao, Yegao, 25
 Xiong, Dongsheng, 1V
 Yang, Kecheng, 1R
 Yang, Meng, 19
 Yin, Xiaojun, 1R
 Yu, Anlan, 1V
 Yu, Long, 1R
 Yuan, Guohui, 19
 Zadiranov, Yu. M., 11
 Zah, Chungen, 29

Zarate, Evan, 1G
Zawadzki, Crispin, 1A
Zhang, Hongyou, 29
Zhang, Jing, 0U
Zhao, Gongyuan, 10
Zhevlakov, Aleksandr, 27
Zhou, Debao, 0F
Ziolowicz, A., 1N
Zuo, Duluo, 1V
Zwickel, H., 07

Conference Committee

Symposium Chairs

Jean-Emmanuel Broquin, IMEP-LAHC (France)
Shibin Jiang, AdValue Photonics, Inc. (United States)

Symposium Co-chairs

Connie J. Chang-Hasnain, University of California, Berkeley
(United States)
Graham T. Reed, Optoelectronics Research Centre, University of
Southampton (United Kingdom)

Program Track Chair

James G. Grote, Air Force Research Laboratory (United States)

Conference Chairs

Bernd Witzigmann, Universität Kassel (Germany)
Marek Osiński, The University of New Mexico (United States)
Yasuhiko Arakawa, The University of Tokyo (Japan)

Conference Program Committee

Hiroshi Amano, Nagoya University (Japan)
Toshihiko Baba, Yokohama National University (Japan)
Enrico Bellotti, Boston University (United States)
Guillermo Carpintero del Barrio, Universidad Carlos III de Madrid
(Spain)
Weng W. Chow, Sandia National Laboratories (United States)
Alexandre Freundlich, University of Houston (United States)
Frédéric Grillot, Télécom ParisTech (France)
Ortwin Hess, Imperial College London (United Kingdom)
Thomas A. Klar, Johannes Kepler Universität Linz (Austria)
Stephan W. Koch, Philipps-Universität Marburg (Germany)
Cun-Zheng Ning, Arizona State University (United States)
Joachim Piprek, NUSOD Institute LLC (United States)
Marc Sciamanna, Supélec (France)
Ikuo Suemune, Hokkaido University (Japan)

Session Chairs

- 1 Active Materials
Ramon Herrero, Universidad Politècnica de Catalunya (Spain)
- 2 Plasmonics and Nanophotonics
Moritz Kleinert, Fraunhofer-Institut für Nachrichtentechnik
Heinrich-Hertz-Institut (Germany)
- 3 Nonlinear Optics and Mode-Locking
Sangam Chatterjee, Justus-Liebig-Universität Gießen (Germany)
- 4 Optical Injection and Feedback in Lasers
Sokratis Kalliakos, Toshiba Research Europe Ltd. (United Kingdom)
- 5 Non-classical Light
Daan Lenstra, Technische Universiteit Eindhoven (Netherlands)
- 6 Semiconductor Lasers I
Marek Osiński, The University of New Mexico (United States)
- 7 Electromagnetics I
Joachim Piprek, NUSOD Institute LLC (United States)
- 8 Semiconductor Lasers II
Bryan Kelleher, University College Cork (Ireland)
- 9 Optoelectronics Modeling Techniques
Bernd Witzigmann, Universität Kassel (Germany)
- 10 Quantum Dots
Tillmann Kubis, Purdue University (United States)
- 11 Photonic Integration and Sensing
Christian Koos, Karlsruher Institut für Technologie (Germany)
- 12 Metamaterials
Friedhard Roemer, Universität Kassel (Germany)
- 13 Electromagnetics II
Bernd Witzigmann, Universität Kassel (Germany)
- 14 Sensors Modeling
Christian Jirauschek, Technische Universität München (Germany)