

PROCEEDINGS OF SPIE

Integrated Optics: Design, Devices, Systems, and Applications V

Pavel Cheben
Jiří Čtyroký
Iñigo Molina-Fernández
Editors

1–3 April 2019
Prague, Czech Republic

Sponsored by
SPIE

Cooperating Organisations
ELI Beamlines (Czech Republic)
Laserlab Europe
European Optical Society
HiLASE (Czech Republic)

Published by
SPIE

Volume 11031

Proceedings of SPIE 0277-786X, V. 11031

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

Integrated Optics: Design, Devices, Systems, and Applications V, edited by Pavel Cheben,
Jiří Čtyroký, Iñigo Molina-Fernández, Proc. of SPIE Vol. 11031, 1103101 · © 2019
SPIE · CCC code: 0277-786X/19/\$18 · doi: 10.1117/12.2535596

Proc. of SPIE Vol. 11031 1103101-1

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 *Integrated Optics: Design, Devices, Systems, and Applications V*, edited by Pavel Cheben, Jiří Čtyroký, Iñigo Molina-Fernández, Proceedings of SPIE Vol. 11031 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510627284
ISBN: 9781510627291 (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 © 2019, 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/19/\$18.00.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE

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>
ix	<i>Conference Committee</i>

INTEGRATED OPTICS I

11031 04	Enhanced performance of integrated silicon nanophotonic devices engineered by sub-wavelength grating structures (Invited Paper) [11031-2]
11031 05	Analysis of surface-emitting thin-film superluminescent diodes with high efficiency [11031-3]
11031 06	High coupling efficiency surface illuminated 2D metasurface waveguide coupler for mid-IR wavelengths [11031-4]

INTEGRATED OPTICS II

11031 07	Surface plasmon optoelectronics and exceptional point waveguides on silicon (Keynote Paper) [11031-5]
11031 09	Black-silicon-structured back-illuminated Ge-on-Si photodiode arrays [11031-7]

INTEGRATED OPTICS IV

11031 0G	Optimization of the threshold pump power of a photonic crystal nanolaser: experiment and theory [11031-15]
11031 0H	Refractive index engineered Bragg grating filters in wide SOI waveguides [11031-16]
11031 0I	Thermomechanical local stress in assembled GaN LEDs investigated by Raman optical spectroscopy [11031-17]

INTEGRATED OPTICS V

11031 0M	Designing polarization management devices by tilting subwavelength grating [11031-21]
----------	--

INTEGRATED OPTICS VI

- 11031 0Q **Optical gain evaluation on rare-earth doped Yttria-stabilized zirconia for hybrid integration on silicon photonics platforms (Best Student Paper Award)** [11031-25]
- 11031 0R **Diffractive sidewall grating coupler: towards 2D free-space optics on chip** [11031-26]

INTEGRATED OPTICS VII

- 11031 0V **Spectral behavior of integrated distributed-feedback resonators utilizing a distributed phase shift** [11031-30]

POSTER SESSION

- 11031 0Y **The fast quasiadiabatic approach to optical waveguide design** [11031-33]
- 11031 10 **Crosstalk analysis in high speed two-dimensional photodetector array directly coupled to multi-core fibers** [11031-35]
- 11031 11 **Self-assemble organic molecular micron-sized tubular structures for active and passive wave-guiding regimes** [11031-36]
- 11031 13 **Antimonide-based visible to short wavelength infrared bispectral photodetector** [11031-38]
- 11031 14 **Selective polarization generation in an amplifying photonic crystal with 2D array of metal nanoparticles** [11031-39]
- 11031 15 **High-Q mid-infrared 1D photonic crystal waveguide resonator in SOI** [11031-40]
- 11031 16 **Analysis of ring resonator structure with quality factor enhancement** [11031-41]
- 11031 18 **Photonics enabled generation of multiband millimeter-wave radio over fiber signals for frequency band 200 GHz-300 GHz** [11031-43]
- 11031 1A **A performance comparison between lumped, distributed and optical phase locked local oscillator used in the photonic generation of millimeter-wave signals for radio over fiber systems** [11031-46]
- 11031 1B **Integrated silicon-on-insulator broadband spectrometer with a high resolution** [11031-47]
- 11031 1D **Analysis of the effect of long-time thermal load on the total losses of the selected fiber-optic couplers** [11031-50]
- 11031 1E **Design and modeling of long-range hybrid plasmonic waveguides** [11031-51]
- 11031 1F **Design of electro-optic modulators and switches based on graphene and phase change materials** [11031-52]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five 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.

Agnus, Guillaume, 0Q
Al-attar, Nebras, 11
Alonso-Ramos, Carlos Alberto, 04, 0Q
Al-Shammari, Rusul M., 11
Baudot, Charles, 04, 0Q
Benedikovic, Daniel, 04
Bentivegna, Florian F. L., 14
Berciano, Mathias, 04
Berini, Pierre, 07
Bernhardi, E. H., 0V
Bhardwaj, Priyanka, 1F
Bhogaraju, Sri Krishna, 0I
Bilal, Asif, 06
Boeuf, Frédéric, 04, 0Q
Brugnolotto, Enrico, 0I
Cassan, Eric, 04, 0Q
Cheben, Pavel, 04, 0M, 0R
Chung, Hung-Ching, 0Y
Conti, Fosca, 0I
Dado, Milan, 0H
Dadoenkova, Yuliya S., 14
Das, Abhijit, 1E
Dhawan, Anuj, 1E, 1F
Dietrich, Kay, 09
Ding, Ying, 13
Dolnák, Ivan, 0H
Duran-Valdeiglesias, Elena, 0Q
Elger, Gordon, 0I
Fotiadi, Andrei A., 14
Frnda, Jaroslav, 1D
Ghosh, Rajib R., 1E, 1F
Glukhov, Igor A., 14
Gomez-Iglesias, Alvaro, 05
Gowen, Aoife, 11
Guerber, Sylvain, 04, 0Q
Guo, Chunyan, 13
Hadj-ElHouati, A., 0R
Halir, Robert, 0M, 0R
Herrero-Bermello, Alaine, 0M
Hraghi, Abir, 18, 1A
Hu, Xiaoyan, 1B
Ismail, N., 0V
Jaiswal, Mangesh, 1E, 1F
Jalowiczor, Jakub, 1D
Jaros, Rene, 1D
Jentzsch, Bruno, 05
Jia, Qingxuan, 13
K., Narayan, 16
Käsebier, Thomas, 09
Khan, Abdullah Nafis, 15
Kores, C. C., 0V
Largeau, Ludovic, 0Q
Laurell, F., 0V
Le Roux, Xavier, 04
Lecoeur, Philippe, 0Q
Lee, Kun-Sheng, 0Y
Li, Zhong-Ying, 0Y
Liang, Fu-Chieh, 0Y
Litvik, Jan, 0H
Liu, E., 0I
Luque-González, José Manuel, 0M
M., Shwetha, 16
Marcaud, Guillaume, 04, 0Q
Maroutian, Thomas, 0Q
Marris-Morini, Delphine, 04, 0Q
Mathiesen, K. S., 0G
Matzen, Sylvia, 0Q
Menif, Mourad, 18, 1A
Moiseev, Sergey G., 14
Molina-Fernández, Íñigo, 0M, 0R
Mørk, J., 0G
Minshid, Mohammed A., 11
Niu, Zhichuan, 13
Novak, Martin, 1D
Ortega-Moñux, Alejandro, 0M, 0R
Pedron, Danilo, 0I
Pérez-Galacho, Diego, 04
Pollnau, M., 0V
Ramírez, Joan Manel, 0Q
Rasmussen, T. S., 0G
Rice, James H., 11
Rodríguez, Brian J., 11
Ruiz-Caridad, Alicia, 0Q
Sakanas, A., 0G
Samoud, Zaineb, 18, 1A
Schmelz, David, 09
Schmid, Jens H., 0M, 0R
Semenova, E., 0G
Sheridan, John T., 11
Signorini, Raffaella, 0I
Steglich, Martin, 09
Stolarik, Martin, 1D
Subramanian, Senthil, 1F
Thomas, Arun, 1E
Tian, Jinshou, 13
Tonkikh, Alexander, 05
Tseng, Shuo-Yen, 0Y
Umezawa, Toshimasa, 10

V., Raksha, 16
Vakarin, Vladyslav, 04, 0Q
Vartanyan, Tigran A., 14
Velasco, Aitor V., 0M
Vivien, Laurent, 04, 0Q
Wang, Guowei, 13
Wang, Shurui, 0M
Wang, Tao, 13
Wang, Weiping, 1B
Wangüemert-Pérez, J. G., 0R
Wasige, Edward, 13
Witas, Karel, 1D
Witzigmann, Bernd, 05
Wu, Zhaoxin, 13
Xu, Yingqiang, 13
Yamamoto, Naokatsu, 10
Younis, Usman, 06, 15
Yu, Y., 0G
Yvind, K., 0G
Zabka, Stanislav, 1D
Zeitner, Uwe D., 09
Zhao, Shaoyu, 1B

Conference Committee

Symposium Chairs

Bedřich Rus, ELI Beamlines, Institute of Physics of the CAS, v.v.i.
(Czech Republic)

Chris Edwards, STFC Rutherford Appleton Laboratory
(United Kingdom)

Saša Bajt, Deutsches Elektronen-Synchrotron (Germany)

Ivo Rendina, Istituto per la Microelettronica e Microsistemi (Italy)

Mike Dunne, SLAC National Accelerator Laboratory (United States)

Honorary Symposium Chair

Erich Spitz, French Academy of Sciences, National Academy of
Technologies (France) Advisor to Thales (France)

Conference Chairs

Pavel Cheben, National Research Council Canada (Canada)

Jiří Čtyroký, Institute of Photonics and Electronics of the CAS, v.v.i.
(Czech Republic)

Iñigo Molina-Fernández, Universidad de Málaga (Spain)

Conference Programme Committee

Roel G. Baets, Universiteit Gent (Belgium)

Trevor Mark Benson, The University of Nottingham (United Kingdom)

Hung-Chun Chang, National Taiwan University (Taiwan)

Christopher R. Doerr, Acacia Communications Inc. (United States)

Romuald Houdré, Ecole Polytechnique Fédérale de Lausanne
(Switzerland)

Raman Kashyap, Ecole Polytechnique de Montréal (Canada)

Christophe Kazmierski, III-V Laboratoire (France)

Philippe Lalanne, Institut d'Optique Graduate School (France)

Xaveer J. M. Leijfens, Technische Universiteit Eindhoven (Netherlands)

Goran Z. Mashanovich, University of Southampton (United Kingdom)

Andrea I. Melloni, Politecnico di Milano (Italy)

Jarmila Müllerová, University of Žilina (Slovakia)

Martin Schell, Fraunhofer-Institut für Nachrichtentechnik Heinrich-
Hertz-Institut (Germany)

Laurent Vivien, Institut d'Électronique Fondamentale (France)

Lech Wosinski, KTH Royal Institute of Technology (Sweden)

Session Chairs

- 1 Integrated Optics I
Jiří Čtyroký, Institute of Photonics and Electronics of the CAS, v.v.i.
(Czech Republic)
- 2 Integrated Optics II
Roel G. Baets, Photonics Research Group (Belgium)
- 3 Integrated Optics III
Pierre Berini, University of Ottawa (Canada)
- 4 Integrated Optics IV
Dan-Xia Xu, National Research Council Canada (Canada)
- 5 Integrated Optics V
Raman Kashyap, Ecole Polytechnique de Montréal (Canada)
- 6 Integrated Optics VI
Isabelle Staude, Friedrich-Schiller-Universität Jena (Germany)
- 7 Integrated Optics VII
Iñigo Molina-Fernández, Universidad de Málaga (Spain)