

PROCEEDINGS OF SPIE

Novel In-Plane Semiconductor Lasers XXIII

Alexey A. Belyanin
Peter M. Smowton
Editors

30 January – 1 February 2024
San Francisco, California, United States

Sponsored and Published by
SPIE

Volume 12905

Proceedings of SPIE 0277-786X, V. 12905

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

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 *Novel In-Plane Semiconductor Lasers XXIII*, edited by Alexey A. Belyanin, Peter M. Smowton, Proc. of SPIE 12905, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510670709

ISBN: 9781510670716 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2024 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center 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.

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: A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE 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 *Conference Committee*

MATERIALS DEVELOPMENT

- 12905 02 **Red laser diode development for automotive applications** [12905-5]
12905 03 **Recombination kinetics in polar InGaN/GaN structures with wide quantum wells** [12905-6]

BEAM QUALITY

- 12905 04 **A study into lateral and longitudinal spatial hole burning as a limit to CW output power in GaAs-based high-power diode lasers (Invited Paper)** [12905-8]
12905 06 **CW room temperature operation of the GaSb-based photonic crystal surface emitting diode lasers (Invited Paper)** [12905-11]

QCL DYNAMICS AND FREQUENCY COMBS

- 12905 07 **Comparative analysis of frequency combs in ring and Fabry-Perot quantum cascade lasers: an order-parameter equation approach** [12905-13]
12905 08 **Modeling optical solitons in ring quantum cascade lasers in the presence of backscattering** [12905-15]

QCL FREQUENCY COMBS AND INTEGRATION

- 12905 09 **Harmonic comb generation in mid-infrared quantum cascade laser frequency combs by external cavity optical feedback** [12905-18]
12905 0A **Fully stabilized quantum cascade laser frequency comb by RF injection and frequency locking to a crystalline microresonator** [12905-19]

DFB AND DBR

- 12905 0B **Narrow linewidth DBR and MOPA laser systems for quantum applications in the 7xx nm regime** [12905-20]

- 12905 0C **Ultra-low frequency noise diode laser systems for optical atomic clocks** [12905-21]
- 12905 0D **Comparison of Y-branch and multimode interference coupler-based dual-wavelength light sources around 785 nm** [12905-22]
- 12905 0E **Narrow linewidth 935 nm DBR laser diode for quantum applications** [12905-23]
- 12905 0F **Narrow-linewidth semiconductor laser with highly-linear frequency modulation response for coherent sensing** [12905-24]
- 12905 0G **2.3- μ m InAs/InGaAs distributed Bragg reflector laser grown on InP substrate with continuous tuning range of over 4 nm** [12905-25]

INTEGRATION

- 12905 0H **Micro-transfer-printed membrane lasers on Si platform (Invited Paper)** [12905-26]
- 12905 0I **Frequency combs in III-V/SiN integrated hybrid lasers with narrowband mirror** [12905-28]
- 12905 0J **16-channel integrated multi-wavelength DFB lasers with 200 GHz channel spacing** [12905-57]

QCL INTEGRATION, ARRAYS

- 12905 0K **Mid-infrared InP photonic integrated circuits (Invited Paper)** [12905-31]
- 12905 0L **Monolithic beam combined quantum cascade laser arrays with integrated arrayed waveguide gratings** [12905-32]

ICL AND QCL SPECTROSCOPY, PERFORMANCE LIMITS

- 12905 0M **Laser-based gas sensing using mid-infrared semiconductor lasers combined with hollow-core fibers (Invited Paper)** [12905-35]
- 12905 0N **Intensity noise of mid-infrared semiconductor cascade lasers: exploring shot-noise-limited operation** [12905-36]
- 12905 0O **Excess frequency noise in interband cascade lasers: towards narrower-linewidth operation** [12905-37]

NANOWIRES AND QUANTUM DOTS

- 12905 OP **Effect of a single asymmetric barrier layer on the steady-state characteristics of quantum dot lasers** [12905-38]
- 12905 OQ **InAs quantum dash lasers for 2- μ m photonics** [12905-42]
- 12905 OR **Investigation of passive mode-locking and self-mode-locking in two-section monolithic QD and QW lasers** [12905-43]

NOVEL QCL DESIGNS

- 12905 OS **Improving transverse mode quality of broad area quantum cascade lasers** [12905-54]