

PROCEEDINGS OF SPIE

Novel In-Plane Semiconductor Lasers XXII

Alexey A. Belyanin

Peter M. Smowton

Editors

31 January – 2 February 2023

San Francisco, California, United States

Sponsored and Published by

SPIE

Volume 12440

Proceedings of SPIE 0277-786X, V. 12440

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 XXII*, edited by Alexey A. Belyanin, Peter M. Smowton, Proc. of SPIE 12440, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510659858

ISBN: 9781510659865 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2023 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*

LASERS FOR PHOTONIC INTEGRATION

- 12440 02 **Improving the reliability of InAs quantum-dot laser diodes for silicon photonics: the role of trapping layers and misfit-dislocation density** [12440-2]
- 12440 03 **800 nm narrow linewidth tunable hybrid laser based on a dual micro-ring external cavity** [12440-4]

DFB AND DBR

- 12440 04 **Modulated DFB ridge laser diodes at 894 nm for compact Cesium CPT atomic clocks** [12440-7]
- 12440 05 **Comparison of dual-wavelength Y-branch DBR single chip diode lasers and diode laser arrays at 785 nm** [12440-8]
- 12440 06 **Comparison of micro-integrated dual-wavelength master oscillator power amplifiers at 785 nm** [12440-9]
- 12440 07 **Novel >57 GHz bandwidth O-band InGaAlAs MQW RW DFB** [12440-11]

EPITAXIAL GROWTH AND MATERIAL PHYSICS

- 12440 08 **Mechanisms limiting the operation time of UVB Al(In)GaN quantum well light emitters** [12440-13]
- 12440 09 **Semi-insulating InP:Fe growth by hydride vapor phase epitaxy for advanced buried heterostructure quantum cascade lasers** [12440-14]

MID-INFRARED LASERS

- 12440 0A **Continuous-wave single-mode slotted interband cascade lasers emitting at 3.5 μm** [12440-19]
- 12440 0B **GaSb-based interband cascade lasers with advanced waveguides operating near 3.3 and 3.4 μm** [12440-17]

12440 0C **Correlation of superlattice cross-plane thermal conductivity with emission wavelength in InAlAs/InGaAs quantum cascade lasers** [12440-21]

VERTICALLY COUPLED IN-PLANE LASERS

12440 0D **Convergence criteria for probabilistic Markov chains modelling of photonic crystal surface emitting lasers** [12440-24]

12440 0E **High-power with single-lobe beam of 1.3- μ m InP-based double-lattice photonic-crystal surface-emitting lasers** [12440-25]

12440 0F **Epitaxially re-grown quantum dot-based photonic crystal surface emitting laser** [12440-26]

QCL APPLICATIONS: QUANTUM TECHNOLOGIES, HIGH-SPEED COMMUNICATIONS, AND MODULATION

12440 0G **Designing and controlling quantum cascade lasers for quantum technologies: towards a new generation of infrared sub-classical sources (Invited Paper)** [12440-35]

12440 0H **Recent advances in high-speed data communications using mid-infrared quantum cascade lasers (Invited Paper)** [12440-37]

HIGH BRIGHTNESS I

12440 0I **Investigation of distributed Bragg reflectors tapered-ridge-waveguide lasers under nanosecond high pulse current excitation** [12440-39]

12440 0J **High optical power pulsed laser structures at 905 nm for automotive LIDAR** [12440-40]

12440 0K **Beam combining and spectral linewidth narrowing of high-power, broad-area blue laser diode, and linear 1D array of diodes (447nm) via external cavity** [12440-41]

12440 0L **Coherent combination of microsecond-pulse tapered amplifiers for a water-vapor differential absorption lidar** [12440-42]

SESSION 10 HIGH BRIGHTNESS II

12440 0M **Red laser diodes explore the future of biomedical and quantum technology** [12440-43]

12440 0N **Reliable operation of 1064 nm DBR tapered lasers and monolithic master oscillator tapered amplifiers at output powers up to 7 W** [12440-44]

12440 0O **Efficiency optimization of ridge waveguide amplifiers at 1122 nm** [12440-45]

MID-IRRED QCLS: HIGH-POWER, ARRAYS, AND INTEGRATION

- 12440 OP **High power RT quasi-CW 4.6 μ m quantum cascade laser (QCL) arrays [12440-54]**
- 12440 OQ **Beam quality analysis of mid infrared tree-array quantum cascade lasers (QCLs) based on multi-mode interference (MMI) couplers and broad-area emitters [12440-57]**

POSTER SESSION

- 12440 OR **Spin-on-glass in the technology of InAs-based quantum cascade lasers [12440-58]**
- 12440 OS **Delayed differential equation-based study of sub-terahertz emission in multi-section quantum dot ring lasers [12440-59]**