

Cavity optimization of 1.3um InAs/InGaAs quantum dot passively mode-locked lasers

*Original*

Cavity optimization of 1.3um InAs/InGaAs quantum dot passively mode-locked lasers / Xu, Tianhong; Bardella, Paolo; Montrosset, Ivo. - STAMPA. - 8552:(2012). (Intervento presentato al convegno Semiconductor Lasers and Applications V tenutosi a Pechino nel 5-6 novembre 2012) [10.1117/12.981762].

*Availability:*

This version is available at: 11583/2505637 since:

*Publisher:*

SPIE-INT SOC OPTICAL ENGINEERING

*Published*

DOI:10.1117/12.981762

*Terms of use:*

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

*Publisher copyright*

(Article begins on next page)

# PROCEEDINGS OF SPIE

## **Semiconductor Lasers and Applications V**

**Ning Hua Zhu**  
**Jinmin Li**  
**Frank H. Peters**  
**Changyuan Yu**  
*Editors*

**5–6 November 2012**  
**Beijing, China**

*Sponsored by*  
SPIE  
COS—Chinese Optical Society

*Cooperating Organizations*

Tsinghua University (China) • Peking University (China) • Zhejiang University (China) • Beijing Institute of Technology (China) • Beijing University of Posts and Telecommunications (China) • University of Science and Technology of China (China) • Tianjin University (China) • Nankai University (China) • Changchun University of Science and Technology (China) • University of Shanghai for Science and Technology (China) • Capital Normal University (China) • Huazhong University of Science and Technology (China) • Beijing Jiaotong University (China) • Shanghai Institute of Optics and Fine Mechanics (China) • Changchun Institute of Optics and Fine Mechanics (China) • Institute of Semiconductors (China) • Institute of Optics and Electronics (China) • Institute of Physics (China) • Shanghai Institute of Technical Physics (China) • China Instrument and Control Society (China) • Optoelectronics Technology Committee, COS (China) • SPIE National Committee in China (China) • Japan Optical Society (Japan) • Korea Optical Society (Korea, Republic of) • Australia Optical Society (Australia) • Singapore Optical Society (Singapore)

*Supporting Organizations*

CAST—China Association for Science and Technology (China)  
NSFC—National Nature Science Foundation (China)

*Published by*  
SPIE

**Volume 8552**

Proceedings of SPIE 0277-786-786X, V.8552

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

Semiconductor Lasers and Applications V, edited by Ning Hua Zhu, Jinmin Li, Frank H. Peters, Changyuan Yu,  
Proc. of SPIE Vol. 8552, 855201 · © 2012 SPIE · CCC code: 0277-786/12/\$18 · doi: 10.1117/12.1518468

Proc. of SPIE Vol. 8552 855201-1

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 Applications V*, edited by Ning Hua Zhu, Jinmin Li, Frank H. Peters, Changyuan Yu, Proceedings of SPIE Vol. 8552 (SPIE, Bellingham, WA, 2012) Article CID Number.

ISSN: 0277-786X

ISBN: 9780819493071

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 © 2012, 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](http://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/12/\$18.00.

Printed in the United States of America.

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



[SPIDigitalLibrary.org](http://SPIDigitalLibrary.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

- vii *Symposium Committees*  
ix *Conference Committee*

---

## OPENING CEREMONY AND PLENARY SESSION

---

- 8552 02 **Quantum dot lasers and relevant nanoheterostructures (Plenary Paper)** [8552-1]  
A. E. Zhukov, N. V. Kryzhanovskaya, A. V. Savelyev, A. M. Nadtochiy, E. M. Arakcheeva, F. I. Zubov, V. V. Korenev, Saint Petersburg Academic Univ. (Russian Federation); M. V. Maximov, Y. M. Shernyakov, M. M. Kulagina, I. A. Slovinskiy, Ioffe Physical-Technical Institute (Russian Federation); D. A. Livshits, Innolume GmbH (Germany); A. Kapsalis, C. Mesaritis, D. Syvridis, Univ. of Athens (Greece); A. Mintairov, Univ. of Notre Dame (United States)

---

## SESSION 1 CHARACTERIZATION TECHNOLOGIES FOR LASER DIODES I

---

- 8552 03 **Ultrafast nonlinear dynamics in semiconductor optical amplifiers for optical signal processing (Invited Paper)** [8552-2]  
Y. Liu, L. Chen, X. Zheng, S. Zhang, R. Lu, Univ. of Electronic Science and Technology of China (China)

---

## SESSION 2 CHARACTERIZATION TECHNOLOGIES FOR LASER DIODES II

---

- 8552 05 **VCSEs for exascale computing, computer farms, and green photonics (Invited Paper)** [8552-5]  
W. Hofmann, P. Moser, P. Wolf, G. Larisch, H. Li, W. Li, Technische Univ. Berlin (Germany); J. Lott, VI Systems GmbH (Germany); D. Bimberg, Technische Univ. Berlin (Germany) and King Abdulaziz Univ. (Saudi Arabia)
- 8552 06 **Retrieving alpha factor of semiconductor lasers from a self-mixing interference waveform (Invited Paper)** [8552-6]  
Y. Gao, Y. Yu, J. Xi, Univ. of Wollongong (Australia)
- 8552 08 **Cavity optimization of 1.3 $\mu$ m InAs/InGaAs quantum dot passively mode-locked lasers** [8552-8]  
T. Xu, P. Bardella, I. Montrosset, Politecnico di Torino (Italy)
- 8552 09 **The characteristics of spectral in vertical-cavity surfacing-emitting lasers based on defect layer structure** [8552-9]  
B. L. Guan, G. Z. Shi, Q. Wang, X. Guo, G. D. Shen, Beijing Univ. of Technology (China)

---

**SESSION 3 MEASUREMENT, TESTING, AND PACKAGING FOR SEMICONDUCTOR LASER DIODES**

---

- 8552 0B **Holding beam injection for improving self-induced polarization rotation in a semiconductor optical amplifier (Invited Paper)** [8552-11]  
S. J. Zhang, Y. L. Zhang, S. Liu, Y. Liu, Univ. of Electronic Science and Technology of China (China)
- 8552 0C **Single facet slotted Fabry-Perot laser and its application in photonic integrated circuits (Invited Paper)** [8552-12]  
H. Yang, P. Morrissey, Tyndall National Institute (Ireland); Q. Y. Lu, Trinity College Dublin (Ireland); W. Cotter, Tyndall National Institute (Ireland); C. L. L. M. Daunt, Tyndall National Institute (Ireland) and Univ. College Cork (Ireland); J. O'Callaghan, Tyndall National Institute (Ireland); W. H. Guo, Trinity College Dublin (Ireland); W. Han, Tyndall National Institute (Ireland); J. F. Donegan, Trinity College Dublin (Ireland); B. Corbett, Tyndall National Institute (Ireland); F. H. Peters, Tyndall National Institute (Ireland) and Univ. College Cork (Ireland)
- 8552 0E **High power narrow far-field broad-stripe semiconductor lasers with second-order metal grating feedback** [8552-14]  
Y. Y. Chen, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Univ. of Chinese Academy of Sciences (China); L. Qin, Changchun Institute of Optics, Fine Mechanics and Physics (China); P. Jia, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Univ. of Chinese Academy of Sciences (China); Y. Q. Ning, Y. Liu, L. J. Wang, J. L. Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China)
- 8552 0F **InGaAsP/InP DFB laser array monolithically integrated with MMI combiner and SOA** [8552-15]  
L. Ma, Institute of Semiconductors (China) and Tsinghua Univ. (China); H. Zhu, Institute of Semiconductors (China); M. Chen, Tsinghua Univ. (China); C. Zhang, B. Wang, Institute of Semiconductors (China)

---

**SESSION 4 APPLICATIONS OF SEMICONDUCTOR LASERS I**

---

- 8552 0G **Time delay signatures of chaotic output in 1550nm VCSELs with double variable-polarization optical feedback (Invited Paper)** [8552-16]  
P. Xiao, Southwest Univ. (China); Z.-M. Wu, Southwest Univ. (China) and Southeast Univ. (China); J.-G. Wu, L. Jiang, G.-Q. Xia, Southwest Univ. (China)
- 8552 0H **Photonics-assistant spectra shaping of ultra-wideband signals for dynamic spectrum access in cognitive network (Invited Paper)** [8552-17]  
J. Zheng, N. Zhu, L. Wang, H. Wang, Y. Du, J. Liu, Institute of Semiconductors (China)
- 8552 0I **Design of laser echo data acquisition system based on USB2.0** [8552-18]  
F. Shang, Y. Song, Q. Hao, K. Zhang, M. Li, W. Zhang, Beijing Institute of Technology (China)

---

**SESSION 5 APPLICATIONS OF SEMICONDUCTOR LASERS II**

---

- 8552 0K **40-Gbps random bit generation by oversampling chaos from an injected semiconductor laser (Invited Paper)** [8552-20]  
X.-Z. Li, S.-C. Chan, City Univ. of Hong Kong (Hong Kong, China)
- 8552 0L **Raman spectroscopy system with hollow fiber probes** [8552-21]  
B. Liu, Y. Shi, Fudan Univ. (China)
- 8552 0M **All-optical sampling based on semiconductor optical amplifiers towards high-speed optical analog-to-digital conversion** [8552-22]  
S. J. Zhang, Y. L. Zhang, S. Liu, H. P. Li, Y. Liu, Univ. of Electronic Science and Technology of China (China)
- 8552 0N **0.5Gbits/s message bidirectional encryption and decryption based on two synchronized chaotic semiconductor lasers** [8552-23]  
J.-G. Wu, Southwest Univ. (China); Z.-M. Wu, Southwest Univ. (China) and Southeast Univ. (China); T. Deng, X. Tang, L. Fan, Y.-Y. Xie, G.-Q. Xia, Southwest Univ. (China)

---

**POSTER SESSION**

---

- 8552 0O **The influence of sampling duty cycle fabrication error in an SBG semiconductor laser on its lasing wavelength** [8552-24]  
Y. Zhou, Changzhou Institute of Technology (China); W. Li, R. Liu, L. Lu, Y. Shi, X. Chen, Nanjing Univ. (China)
- 8552 0P **Thermal effects of pulsed pumping in semiconductor disk lasers** [8552-25]  
P. Zhang, T. Dai, Y. Liang, S. Fan, Y. Zhang, Chongqing Normal Univ. (China)
- 8552 0R **Low threshold 980-nm tunable vertical-cavity surface-emitting lasers** [8552-28]  
G.-Z. Shi, B.-L. Guan, X. Guo, S. Li, Q. Wang, G.-D. Shen, Beijing Univ. of Technology (China)
- 8552 0S **Wavelength tunable VCSEs based on voltage-dependent birefringence of liquid crystal** [8552-29]  
Q. Wang, B. Guan, G. Shi, X. Liu, X. Guo, G. Shen, Beijing Univ. of Technology (China)
- 8552 0T **A novel four-section DBR tunable laser with dual-wavelength lasing** [8552-31]  
L. Yu, L. Zhao, D. Lu, Institute of Semiconductors (China); Y. Li, Beijing Univ. of Posts and Telecommunications (China); J. Pan, H. Zhu, W. Wang, Institute of Semiconductors (China)
- 8552 0U **Numerical simulation on output performance of continuous-wave Raman silicon lasers** [8552-33]  
H. Su, L. Xu, Z. Dai, X. Li, X. Li, Hebei Univ. (China)
- 8552 0V **The amplified spontaneous emission in EDF with small pulse pump** [8552-34]  
F. Wang, C. Wu, L. Liu, Z. Wang, Z. Sun, Y. Mao, Beijing Jiaotong Univ. (China) and Key Lab. of Education Ministry on Luminescence and Optical Information Technology (China)

- 8552 OW **A high-power laser diode driver and collimating optical system design for laser 3D imaging**  
[8552-35]  
W. Zhang, Q. Hao, Y. Song, F. Shang, H. Sun, T. Li, Beijing Institute of Technology (China)
- 8552 OX **A balanced optical heterodyne detection for local-oscillator excess-noise suppression**  
[8552-36]  
J. Yang, Z. Hu, Y. Zhang, Beihang Univ. (China)
- 8552 OY **Speckle characteristics of a broad-area laser diode** [8552-37]  
S. Zhang, W. Gao, Y. Shi, P. Zhao, North Univ. of China (China); X. Chen, North Univ. of  
China (China) and Vestfold Univ. College (Norway)

*Author Index*

# Symposium Committees

## *General Chairs*

**Eustace L. Dereniak**, College of Optical Sciences, The University of Arizona (United States)

**Bingkun Zhou**, Tsinghua University (China)

## *General Cochairs*

**Arthur Chiou**, National Yang-Ming University (Taiwan, China)

**Zhizhan Xu**, Shanghai Institute of Optics and Fine Mechanics (China)

**Jianlin Cao**, China Ministry of Science and Technology (China)

**Junhao Chu**, Shanghai Institute of Technical Physics (China)

## *Technical Program Chairs*

**Songlin Zhuang**, Shanghai University of Science and Technology (China)

**Xingde Li**, Johns Hopkins University (United States)

## *Technical Program Cochairs*

**Qiming Wang**, Institute of Semiconductors (China)

**Xu Liu**, Zhejiang University (China)

**Daoyin Yu**, Tianjin University (China)

**Qihuang Gong**, Peking University (China)

**Tianchu Li**, National Institute of Metrology (China)

**Wei Huang**, Nanjing University of Posts and Telecommunications (China)

## *Local Organizing Committee Chair*

**Guangcan Guo**, University of Science and Technology of China (China)



*Local Organizing Committee Cochairs*

**Guoqiang Ni**, Beijing Institute of Technology (China)  
**Shusen Xie**, Fujian Normal University (China)  
**Xiaomin Ren**, Beijing University of Posts and Telecommunications  
(China)  
**Ying Gu**, PLA General Hospital (China)  
**Huilin Jiang**, Changchun University of Science and Technology  
(China)

*General Secretary*

**Qihuang Gong**, Peking University (China)

*Local Organizing Committee*

**Yan Li**, Chinese Optical Society/Peking University (China)  
**Zhiping Zhou**, Peking University (China)  
**Changhe Zhou**, Shanghai Institute of Optics and Fine Mechanics  
(China)  
**Qingming Luo**, Huazhong University of Science and Technology  
(China)  
**Chongxiu Yu**, Beijing University of Posts and Telecommunications  
(China)  
**Hongda Chen**, Institute of Semiconductors (China)  
**Yongtian Wang**, Beijing Institute of Technology (China)  
**Yiping Cui**, Southeast University (China)  
**Xuping Zhang**, Nanjing University (China)  
**Feijun Song**, Daheng Corporation (China)  
**Cunlin Zhang**, Capital Normal University (China)  
**Yanting Lu**, Nanjing University (China)  
**Yuejin Zhao**, Beijing Institute of Technology (China)  
**Chunqing Gao**, Beijing Institute of Technology (China)  
**Tiegen Liu**, Tianjin University (China)  
**Xiaocong Yuan**, Nankai University (China)  
**Weimin Chen**, Chongqing University (China)  
**Zhongwei Fan**, Academy of Optoelectronics (China)  
**Hanyi Zhang**, Tsinghua University (China)  
**Lan Wu**, Zhejiang University (China)  
**Yongsheng Zhang**, University of Science and Technology of China  
(China)  
**Hong Yang**, Peking University (China)  
**Xiaoying Li**, Tianjin University (China)  
**Lin Zhai**, Chinese Optical Society (China)

# Conference Committee

## *Conference Chairs*

**Ning Hua Zhu**, Institute of Semiconductors (China)  
**Jinmin Li**, Institute of Semiconductors (China)  
**Frank H. Peters**, Tyndall National Institute (Ireland)  
**Changyuan Yu**, National University of Singapore (Singapore)

## *Conference Program Committee*

**Minghua Chen**, Tsinghua University (China)  
**Xiangfei Chen**, Nanjing University (China)  
**Nan Chi**, Fudan University (China)  
**Brian Corbett**, Tyndall National Institute (Ireland)  
**Jianjun Gao**, East China Normal University (China)  
**Xia Guo**, Beijing University of Technology (China)  
**Jian-Jun He**, Zhejiang University (China)  
**Sailing He**, Joint Research Center of Photonics (China)  
**Werner H. Hofmann**, Technische Universität Berlin (Germany)  
**Weisheng Hu**, Shanghai Jiao Tong University (China)  
**Yongqing Huang**, Beijing University of Posts and Telecommunications (China)  
**Yongzhen Huang**, Beijing University of Posts and Telecommunications (China)  
**Shan Jiang**, Accelink Technologies Company, Ltd. (China)  
**Ming Li**, University of Ottawa (Canada)  
**Xianjie Li**, China Electronics Technology Group Corporation (China)  
**Jianguo Liu**, Institute of Semiconductors (China)  
**Ning Liu**, Huawei Technologies Company, Ltd. (China)  
**Park Liu**, Shagrow Telecom Company, Ltd. (China)  
**Wen Liu**, Huazhong University of Science and Technology (China)  
**Yong Liu**, University of Electronic Science and Technology of China (China)  
**Yi Luo**, Tsinghua University (China)  
**Xiaoyu Ma**, Institute of Optics and Electronics (China)  
**Shilong Pan**, Nanjing University of Aeronautics and Astronautics (China)  
**Edwin Yue-Bun Pun**, City University of Hong Kong (Hong Kong, China)  
**Hongbo Sun**, Jilin University (China)  
**Lijun Wang**, Changchun Institute of Optics, Fine Mechanics and Physics (China)  
**Shawn S. Wang**, Integrated Automation Systems (United States)  
**Guang-Qiong Xia**, Southwest University (China)

**Kun Xu**, Beijing University of Posts and Telecommunications (China)  
**Zhaowen Xu**, Institute for Infocomm Research (Singapore)  
**Lian Shan Yan**, Southwest Jiaotong University (China)  
**Jinlong Yu**, Tianjin University (China)  
**Siyuan Yu**, University of Bristol (United Kingdom)  
**Li Zeng**, Huawei Technologies Company, Ltd. (China)  
**Guo-Yi Zhang**, Peking University (China)  
**Xinliang Zhang**, Huazhong University of Science and Technology  
(China)  
**Zhiping Zhou**, Peking University (China)  
**Hongliang Zhu**, Institute of Semiconductors (China)

*Session Chairs*

- 1 Characterization Technologies for Laser Diodes I  
**Werner H. Hofmann**, Technische Universität Berlin (Germany)
- 2 Characterization Technologies for Laser Diodes II  
**Yong Liu**, University of Electronic Science and Technology of China  
(China)
- 3 Measurement, Testing, and Packaging for Semiconductor Laser  
Diodes  
**Ninghua Zhu**, Institute of Semiconductors (China)
- 4 Applications of Semiconductor Lasers I  
**Jianguo Liu**, Institute of Semiconductors (China)
- 5 Applications of Semiconductor Lasers II  
**Hua Yang**, Tyndall National Institute (Ireland)