

PROCEEDINGS OF SPIE

Optical Interconnects XXIV

Ray T. Chen
Henning Schröder
Editors

29–31 January 2024
San Francisco, California, United States

Sponsored and Published by
SPIE

Volume 12892

Proceedings of SPIE 0277-786X, V. 12892

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

Optical Interconnects XXIV, edited by Ray T. Chen, Henning Schröder,
Proc. of SPIE Vol. 12892, 1289201 · © 2024 SPIE
0277-786X · doi: 10.1117/12.3029939

Proc. of SPIE Vol. 12892 1289201-1

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 *Optical Interconnects XXIV*, edited by Ray T. Chen, Henning Schröder, Proc. of SPIE 12892, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510670440
ISBN: 9781510670457 (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*

NOVEL OPTICAL INTERCONNECT AND NEURAL NETWORK SYSTEMS

- 12892 02 **Optics-informed neural networks towards accelerating linear operations (Invited Paper)**
[12892-1]
- 12892 03 **Development of dynamic data centre networks and fast-tunable lasers in the DYNAMOS project (Invited Paper)** [12892-2]
- 12892 04 **A hardware-efficient silicon electronic-photonic chip for optical structured neural networks**
[12892-3]
- 12892 05 **Energy efficient passive optical data centre networks** [12892-4]

OPTICAL INTERCONNECT DEVICES AND COMPONENTS

- 12892 06 **Photonic crystal enhanced germanium photodetector on a CMOS compatible SOI platform (Invited Paper)** [12892-6]
- 12892 07 **Design of a 16-channels 2×2 hybrid type wavelength selective crossconnect utilizing a silicon optical switch array** [12892-8]

PIC INTEGRATION AND OPTICAL COUPLING

- 12892 08 **Investigation of adjoint method inverse design applied to photonic integrated circuit fiber-to-chip edge couplers** [12892-10]

FIBER OPTICS, OPTICAL WAVEGUIDES AND MICRO-OPTICS INTEGRATION

- 12892 09 **The application of photonic lanterns in free space optical communications (Invited Paper)**
[12892-15]
- 12892 0A **Experimental multi-bit header recognition with few-mode fibers** [12892-18]
- 12892 0B **Achieving multi-channel fiber V-groove optical coupling for optical interconnects** [12892-19]

NOVEL OPTICAL WAVEGUIDE AND INTEGRATED INTERCONNECT TECHNOLOGIES

- 12892 0C **Photonic glass interposer with integrated optical waveguides for fiber-to-chip coupling (Invited Paper)** [12892-20]
- 12892 0D **Improved integration density with ultra-fast laser written fiber fan-in/fan-out for broadband coupling to silicon photonics** [12892-21]
- 12892 0E **Improved waveguide surface roughness by foundry-processing techniques for enhanced light delivery to integrated ion trap for quantum computing platforms** [12892-22]

PICS FOR OPTICAL INTERCONNECTS

- 12892 0F **Energy-efficient integrated photonics for next-generation computing (Invited Paper)** [12892-24]
- 12892 0G **Optical power splitters achieving Gaussian RF beam profiles** [12892-25]
- 12892 0H **Connect-A-PIC: an open-source automated photonic circuit design and simulation platform for fast iteration and education (Invited Paper)** [12892-26]

NANOPHOTONIC TECHNOLOGY FOR OPTICAL INTERCONNECTS

- 12892 0I **Design, fabrication, and characterization of integrated optical through-silicon waveguides for 3D photonic interconnections** [12892-30]

HYBRID INTEGRATED OPTICAL LINK MODULES

- 12892 0J **High-power 150 mW extended cavity Si₃N₄ tunable narrow-linewidth laser (Invited Paper)** [12892-36]
- 12892 0K **Photonic building blocks for architectural reconfigurability in hyperscale data centres** [12892-37]
- 12892 0L **Co-packaged optics: optical infrastructure from the faceplate to the PIC (Invited Paper)** [12892-38]

MICRO-OPTIC ASSEMBLY AND HYBRID PHOTONIC MICROSYSTEM MANUFACTURING

- 12892 0M **Industrial photonics packaging for high volume applications (Invited Paper)** [12892-39]
- 12892 0N **Photonic-system-in-package (pSiP): miniaturization, panel level assembly, and optical waveguide integration in thin glass substrates** [12892-40]

- 12892 0O **Performance evaluation of a new thermoplastic polymer against glass and thermoset resins for optical transceivers** [12892-41]
- 12892 0P **High-power tests of expanded beam connectors for co-packaged optics applications (Invited Paper)** [12892-42]
- 12892 0Q **Designs of meta-lenses for optical fiber coupling** [12892-43]

POSTER SESSION

- 12892 0R **Design and fabrication of mode-matched fiber-integrated GRIN lenses** [12892-17]
- 12892 0S **Compact multi-functional device for optical communication systems** [12892-49]
- 12892 0T **Inverse design of silicon-based photonic digital circuit components using topology optimization** [12892-50]

Conference Committee

Symposium Chairs

Ulrich T. Schwarz, Technische Universität Chemnitz (Germany)
Karin Hinzer, University of Ottawa (Canada)

Symposium Co-chairs

Sonia M. García-Blanco, Universiteit Twente (Netherlands)
Bernd Witzigmann, Friedrich-Alexander-Universität Erlangen-Nürnberg
(Germany)

Program Track Chairs

Yakov Sidorin, Quarles & Brady LLP (United States)
Jean-Emmanuel Broquin, Université Grenoble Alpes (France)

Conference Chairs

Ray T. Chen, The University of Texas at Austin (United States)
Henning Schröder, Fraunhofer-Institut für Zuverlässigkeit und
Mikrointegration IZM (Germany)

Conference Program Committee

Darrell Childers, US Conec Ltd. (United States)
Douwe H. Geuzebroek, LioniX International BV (Netherlands)
Tingyi Gu, University of Delaware (United States)
Ruth Houbertz, ThinkMade Engineering and Consulting (Germany)
Marika P. Immonen, TTM Technologies, Inc. (Finland)
Takaaki Ishigure, Keio University (Japan)
Wei Jiang, Nanjing University (China)
Mikko Karppinen, VTT Technical Research Centre of Finland Ltd.
(Finland)
Sanjay Krishna, The Ohio State University (United States)
Tobias Lamprecht, OST – Ostschweizer Fachhochschule (Switzerland)
Frank Lerch, EPIGAP Optronic GmbH (Germany)
Matthias Lorenz, AEMtec GmbH (Germany)
Christopher T. Middlebrook, Michigan Technological University
(United States)
Peter O'Brien, Tyndall National Institute (Ireland)
Bert Jan Offrein, IBM Research - Zürich (Switzerland)
Hyo-Hoon Park, KAIST (Korea, Republic of)
Ignazio E. M. Piacentini, IP Consulting (Italy)
Nikos Pleros, Aristotle University of Thessaloniki (Greece)

Richard C. A. Pitwon, Resolute Photonics Ltd. (United Kingdom)
Moritz Seyfried, ficonTEC Service GmbH (Germany)
Harish Subbaraman, Oregon State University (United States)
Michael Thiel, Nanoscribe GmbH and Company KG (Germany)
David J. Thomson, Optoelectronics Research Centre
(United Kingdom)
Andreas Umbach, AUCCEPT Consulting (Germany)
Alan X. Wang, Baylor University (United States)
Ian H. White, University of Cambridge (United Kingdom)
Chris Q. Wu, Corning Incorporated (United States)
Yi Zou, ShanghaiTech University (China)