PROCEEDINGS OF SPIE

Smart Photonic and Optoelectronic Integrated Circuits XXIII

Sailing He Laurent Vivien Editors

6–11 March 2021 Online Only, United States

Sponsored and Published by SPIE

Volume 11690

Proceedings of SPIE 0277-786X, V. 11690

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

Smart Photonic and Optoelectronic Integrated Circuits XXIII, edited by Sailing He, Laurent Vivien, Proc. of SPIE Vol. 11690, 1169001 · © 2021 SPIE CCC code: 0277-786X/21/\$21 · doi: 10.1117/12.2596597

Proc. of SPIE Vol. 11690 1169001-1

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 SPIEDigitalLibrary.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 *Smart Photonic and Optoelectronic Integrated Circuits XXIII*, edited by Sailing He, Laurent Vivien, Proceedings of SPIE Vol. 11690 (SPIE, Bellingham, WA, 2021) Seven-digit Article CID Number.

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

ISBN: 9781510642157 ISBN: 9781510642164 (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 © 2021, 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 \$21.00 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/21/\$21.00.

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.



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

PHASE ARRAYS AND LIDAR

11690 04	Schematic-driven PIC design process considering manufacturing tolerances [11690-2]
11690 05	Silicon-rich silicon nitride CMOS platform for integrated optical phased arrays [11690-3]
11690 06	Development, calibration and characterization of silicon photonics based optical phased arrays [11690-4]
11690 07	Fast optical phased array on a 300-mm silicon platform [11690-5]
	SMART STRUCTURES FOR SENSING

11690 OB A low-loss SiN photonic integrated circuit foundry platform for waveguide-enhanced Raman spectroscopy (Invited Paper) [11690-9]

PHOTONIC INTEGRATION WITH OPTIMIZATION

- 11690 0J Photonic integrated circulators based on iron garnets without external magnetization (Invited Paper) [11690-18]
- 11690 0M Single perceptron at 12 GigaOPs based on a microcomb for versatile, high-speed scalable, optical neural networks [11690-21]

SMART MODULES FOR COMMUNICATIONS

- 11690 0N Quantum dot semiconductor lasers for 5G and beyond wireless networks (Invited Paper) [11690-22]
- 11690 00 Programmable modular photonic integrated switches for beyond 5G metro optical networks (Invited Paper) [11690-23]

SUBWAVELENGTH DEVICES

11690 0U Selective enhancement of nonlinear processes in linearly uncoupled silicon resonators (Invited Paper) [11690-27]

11690 0W Liquid crystal-tunable optical phased array for LiDAR applications (Invited Paper) [11690-32]