

PROCEEDINGS OF SPIE

Quantum Sensing and Nano Electronics and Photonics XXII

Manijeh Razeghi
Giti A. Khodaparast
Miriam S. Vitiello
Editors

18–22 January 2026
San Francisco, California, United States

Sponsored and Published by
SPIE

Volume 13908

Proceedings of SPIE 0277-786X, V. 13908

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 *Quantum Sensing and Nano Electronics and Photonics XXII*, edited by Manijeh Razeghi, Giti A. Khodaparast, Miriam S. Vitiello, Proc. of SPIE 13908, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510697331

ISBN: 9781510697348 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2026 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*

ADVANCES IN QUANTUM DEVICES

- 13908 02 **Midwave and longwave infrared free-space optical communication systems: status and prospects (Invited Paper)** [13908-1]

NOVEL PHOTONIC STRUCTURES AND DEVICES

- 13908 03 **VCSELs for quantum sensing with Rubidium** [13908-6]

QUANTUM DEVICES

- 13908 04 **Distributed sensing in optical fibers using dual optical frequency combs (Invited Paper)** [13908-12]

NEUROMORPHIC AND QUANTUM SPECTROSCOPY

- 13908 05 **Neuromorphic photodiode with enhanced transient response via electrostatic preconditioning** [13908-16]

NONLINEAR OPTICAL PHENOMENA I

- 13908 06 **Discriminative temperature and strain measurements by Brillouin optical frequency domain analysis in specialty fibers (Invited Paper)** [13908-19]
- 13908 07 **Self-induced generation of absolute negative temperatures in a multimode dense photon gas (Invited Paper)** [13908-20]
- 13908 08 **Gate-tunable synaptic organic–inorganic hybrid phototransistors enabling optoelectronic memory and neuromorphic functionality** [13908-69]

BIO-PHOTONICS I

- 13908 09 **Spatiotemporal assembly of interference fringes unlocks new potential for digital holography in characterizing biological samples, soft matter, and nanostructures (Invited Paper)** [13908-21]

QUANTUM OPTICS AND TECHNOLOGY

13908 0A **Advanced photon-pair sources for chip-based quantum technology (Invited Paper)**
[13908-30]

QUANTUM SENSING AND DETECTION

13908 0B **Leonardo UK development of linear mode mid-infrared wavelength APD array technology for high-speed, high gain 2D imaging applications** [13908-34]

13908 0C **Boosting pixel efficiency through metasurfaces in deadspace regions** [13908-35]

13908 0D **Heterogeneous integration of photonic chips for quantum sensing applications** [13908-36]

ADVANCES IN THZ TECHNOLOGY

13908 0E **Coherent wireless THz transmission and reception with a Kramers-Kronig receiver (Invited Paper)** [13908-39]

13908 0F **Resonant cavity interband cascade light emitting devices with record spectral intensity**
[13908-41]

ADVANCES IN DETECTORS AND QUANTUM SENSING

13908 0G **Mid-wave resonant cavity infrared detectors with tunable resonance wavelength**
[13908-44]

13908 0H **Compact broadband fractal absorber for mid-infrared superconducting photon detectors**
[13908-45]

13908 0I **Investigation of InGaAsSb nBn photodetectors for room temperature e-SWIR applications**
[13908-47]

13908 0J **A unified probabilistic event camera model for noise, step-response curves, and parameter determination** [13908-48]

NANO-PHOTONICS II

- 13908 OK **How resonators couple: coupled mode theory versus quasinormal-mode theory (Invited Paper)** [13908-54]
- 13908 OL **Manipulation of orbital angular momentum via topological photonics (Invited Paper)** [13908-56]
- 13908 OM **Multinary III-V semiconductor nanowires molecular beam epitaxially grown on Si wafer (Invited Paper)** [13908-57]

NANO-PHOTONICS III

- 13908 ON **High-resolution reflectivity profiling over 50km via optical correlation control (Invited Paper)** [13908-59]

NONLINEAR AND ULTRAFAST PHENOMENA

- 13908 OO **Optical sensing with third harmonic generation on Si-based platforms (Invited Paper)** [13908-64]

PHOTONICS DEVICES AND SENSING I

- 13908 OP **Field validation of gas sensors for urban and volcanic emissions monitoring based on quartz-enhanced photoacoustic spectroscopy (Invited Paper)** [13908-66]
- 13908 OQ **Microring resonator assisted photothermal spectroscopy for gas sensing: from external excitation to on-chip pump integration (Invited Paper)** [13908-68]

PHOTONICS DEVICES AND SENSING II

- 13908 OR **CMOS-integrated optical quantum sensing platform based on NV-diamond technology** [13908-71]
- 13908 OS **Characterization of gain, quantum efficiency, and noise-equivalent power in III-V avalanche photodiodes** [13908-73]
- 13908 OT **High resolution wireless imaging with the photonic microwave CMOS technology** [13908-74]

POSTER SESSION

- 13908 0U **Unleashing light: a deep dive into quantum cascade laser dynamics through power, precision, and performance** [13908-17]
- 13908 0V **A study of the structural, optical, and spectral characteristics of MBE-grown InAs quantum dot photodetector heterostructure with quaternary (In(Ga)As(Sb)) capping** [13908-83]
- 13908 0W **Fabrication of uniform, high-field-enhanced plasmonic satellite clusters using multidewetting** [13908-84]