

PROCEEDINGS OF SPIE

Quantum Sensing and Nano Electronics and Photonics XVIII

**Manijeh Razeghi
Giti A. Khodaparast
Miriam S. Vitiello**
Editors

**22–27 January 2022
San Francisco, California, United States**

**20–24 February 2022
ONLINE**

*Sponsored and Published by
SPIE*

**Volume
12009**

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 XVIII*, edited by Manijeh Razeghi, Giti A. Khodaparast, Miriam S. Vitiello, Proc. of SPIE 12009, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510648890

ISBN: 9781510648906 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2022 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

v *Conference Committee*

ADVANCES IN DETECTORS

- 12009 02 **Graphene photogated infrared photodetectors for high-performance infrared imaging (Invited Paper)** [12009-7]
- 12009 03 **Spectroscopic sensing with resonant cavity-enhanced photodetector arrays** [12009-10]
- 12009 04 **A numerical design for SWIR/eSWIR dual-band operation with InGaAs nBn structures** [12009-16]

THZ DEVICES AND QUANTUM CASCADE LASERS II

- 12009 05 **Optimizing the light penetration depth in APDs and SPADs for high gain-bandwidth and ultra-wide spectral response** [12009-25]
- 12009 06 **High-resolution spectroscopy with quantum cascade laser frequency combs** [12009-26]

SPIN-BASED PHOTONICS

- 12009 07 **Polarization dynamics of grating-based spin-lasers (Invited Paper)** [12009-33]

ADVANCES IN SENSING

- 12009 08 **High efficiency electrically-driven single photon sources: advanced design concepts (Invited Paper)** [12009-35]
- 12009 09 **GaN laser diodes for quantum sensing, optical atomic clocks, and precision metrology** [12009-36]
- 12009 0A **Effects of Gadolinium precursors on the magnetic properties of Gadolinium-doped Gallium Nitride for spintronic applications (Invited Paper)** [12009-37]
- 12009 0B **Novel nitride quantum structures for infrared sensing (Invited Paper)** [12009-39]

QUANTUM OPTICS

12009 OC **Precision timing of radio-frequency pulses using Rydberg atom electrometry (Invited Paper)**
[12009-41]

NANOSCALE SPECTROSCOPY

12009 OD **Near-field nanoscopy of excitons and ultrafast interlayer dynamics in van der Waals crystals (Invited Paper)** [12009-48]

OPTICAL SENSING I

12009 OE **Quantum plasmonics and hyperbolic material for biosensing (Invited Paper)** [12009-59]

12009 OF **Automated, deep reactive ion etching free fiber coupling to nanophotonic devices** [12009-54]

12009 OG **Simultaneous measurement of N₂O, CH₄, and NH₃ with a compact quartz-enhanced photoacoustic sensor for monitoring agricultural activities** [12009-55]

12009 OH **Measurement of the methane isotopologues relaxation rate exploiting quartz-enhanced photoacoustic spectroscopy** [12009-56]

12009 OI **On the effective medium theory to study the dielectric response of the cancerous biological tissue (Invited Paper)** [12009-61]

OPTICAL SENSING II

12009 OJ **Compact sensor for wide concentration range methane and ethane detection employing quartz tuning fork as photodetector in tunable diode laser spectroscopy** [12009-64]

12009 OK **Multi-channel waveguide-integrated superconducting nanowire single-photon detector system for ultrafast quantum key distribution** [12009-66]

12009 OL **An integrated entangled photons source for mid-infrared ghost spectroscopy** [12009-69]

POSTERS-WEDNESDAY

12009 OM **Radiation monitoring of lasers with variable output** [12009-71]

12009 ON **Nonlinear plasmon-exciton infrared photodetector operating in the two-photon absorption mode** [12009-72]