

PROCEEDINGS OF SPIE

Quantum Communications and Quantum Imaging XIX

Keith S. Deacon
Ronald E. Meyers
Editors

1–5 August 2021
San Diego, California, United States

Sponsored and Published by
SPIE

Volume 11835

Proceedings of SPIE 0277-786X, V. 11835

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 Communications and Quantum Imaging XIX*, edited by Keith S. Deacon, Ronald E. Meyers, Proc. of SPIE 11835, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510645080

ISBN: 9781510645097 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2021 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

SESSION 1 QUANTUM TECHNOLOGY

- 11835 05 Performance assessment of SPAD arrays for coincidence detection in quantum-enhanced imaging [11835-17]
- 11835 08 A practical compact source of heralded single photons for a simple detection LIDAR [11835-21]
- 11835 09 Quantum convolutional neural networks on NISQ processors [11835-22]

SESSION 2 QUANTUM IMAGING / QUANTUM SENSING

- 11835 0C Quantum sensing using thermal photon bunching (Invited Paper) [11835-1]
- 11835 0D Measurement of the second-order $g^{(2)}$ correlation function of visible light from Vega in photon counting mode (Invited Paper) [11835-2]
- 11835 0E Investigation of light wave propagation in atmospheric disturbance toward quantum illumination (Invited Paper) [11835-3]
- 11835 0G Theoretical comparison of quantum and classical illumination for simple detection-based LIDAR [11835-5]
- 11835 0H Time-efficient non-degenerate ghost imaging powered by deep learning (Invited Paper) [11835-6]
- 11835 0I Plenoptic microscopy and photography from intensity correlations (Invited Paper) [11835-7]

SESSION 3 QUANTUM COMMUNICATIONS

- 11835 0J Goals and feasibility of the deep space quantum link (Invited Paper) [11835-8]
- 11835 0L Network routing protocols for multi-photon quantum cryptography [11835-10]
- 11835 0M Non-local network coding in interference channels (Invited Paper) [11835-11]
- 11835 0O Results of the NATO project: "analysis, design, and implementation of an end-to-end QKD link" (Invited Paper) [11835-14]

SESSION 4 ENTANGLEMENT

11835 0P Phase matching between energy-time entanglement and two photon absorption processes
(Invited Paper) [11835-25]