PROCEEDINGS OF SPIE

Quantum Information Science, Sensing, and Computation XIV

Eric Donkor Michael Hayduk Michael R. Frey Samuel J. Lomonaco Jr. John M. Myers Editors

3–7 April 2022 Orlando, Florida, United States

6-12 June 2022 ONLINE

Sponsored and Published by SPIE

Volume 12093

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 *Quantum Information Science, Sensing, and Computation XIV*, edited by Eric Donkor, Michael Hayduk, Michael R. Frey, Samuel J. Lomonaco Jr., John M. Myers, Proc. of SPIE 12093, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510650626

ISBN: 9781510650640 (electronic)

Published by

SPIF

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.



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

SESSION 1	QUANTUM COMPUTING
12093 02	Quantum system-on-chip: classic and quantum collaborative computation in NISQ era [12093-1]
12093 03	Quantum computing with induced dipole-dipole forbidden transitions [12093-2]
SESSION 2	QUANTUM SENSING AND MEASUREMENT
12093 04	Towards operationally relevant quantum signal detection [12093-4]
12093 05	Embedded cold atom accelerometer for atmospheric drag measurement [12093-5]
12093 06	Comparison of quantum Fisher information of a qutrit in three configurations [12093-7]
SESSION 3	QUANTUM KEY DISTRIBUTION AND CRYPTOGRAPHY
12093 07	Quantum random number generation with practical device imperfections [12093-8]
12093 08	A continuous-variable quantum key distribution using correlated photons [12093-9]
12093 09	Evaluating different topologies for multi-photon quantum key distribution [12093-10]
SESSION 4	QUANTUM INFORMATION SCIENCE
12093 0A	ER = EPR, entanglement topology and tensor networks [12093-11]
12093 OB	Quantum computing for radar and sonar information processing [12093-12]
12093 OC	Large bandwidth RF detector based on Rydberg atoms, quantum interferometry, and entanglement [12093-13]
12093 0D	Problem solving dynamics for gate-model quantum computers [12093-16]

SESSION 5	QUANTUM INFORMATION SCIENCE, SENSING, AND COMPUTATION
12093 0E	Qubit complexity and the complexity of operators acting on the space of quantum states [12093-17]
12093 OF	Effective QUBO modeling for solving linear systems on D-wave quantum annealing device [12093-18]