PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 10660

, "Front Matter: Volume 10660," Proc. SPIE 10660, Quantum Information Science, Sensing, and Computation X, 1066001 (13 July 2018); doi: 10.1117/12.2502386

SPIE.

Event: SPIE Commercial + Scientific Sensing and Imaging, 2018, Orlando, FL, United States

PROCEEDINGS OF SPIE

Quantum Information Science, Sensing, and Computation X

**Eric Donkor
Michael Hayduk**
Editors

**18–19 April 2018
Orlando, Florida, United States**

Sponsored and Published by
SPIE

Volume 10660

Proceedings of SPIE 0277-786X, V. 10660

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

Quantum Information Science, Sensing, and Computation X, edited by Eric Donkor,
Michael Hayduk, Proc. of SPIE Vol. 10660, 1066001 · © 2018 SPIE
CCC code: 0277-786X/18/\$18 · doi: 10.1117/12.2502386

Proc. of SPIE Vol. 10660 1066001-1

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 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 Information Science, Sensing, and Computation X*, edited by Eric Donkor, Michael Hayduk, Proceedings of SPIE Vol. 10660 (SPIE, Bellingham, WA, 2018) Seven-digit Article CID Number.

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

ISBN: 9781510618312
ISBN: 9781510618329 (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 © 2018, 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 \$18.00 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/18/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE. DIGITAL LIBRARY
SPIDigitalLibrary.org

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

v	<i>Authors</i>
vii	<i>Conference Committee</i>

SESSION 1 QUANTUM COMPUTING, MEASUREMENTS AND ERROR CORRECTION

10660 02	Simulated execution of hybrid quantum computing systems (Keynote Paper) [10660-1]
10660 05	Lasers pumped quantum dynamics in nanostructured arrays for computing [10660-4]
10660 06	Ultra-high spectral resolution spectrometer for single photon source characterization [10660-5]

SESSION 2 QUANTUM CRYPTOGRAPHY AND QUANTUM KEY DISTRIBUTION

10660 08	Mitigating pointing requirements and turbulence effects in free-space quantum key distribution [10660-7]
10660 09	Practical security of semi-quantum key distribution [10660-8]
10660 0A	Method for self-reconstruction of holograms for secure communication [10660-9]
10660 0B	QKD from a microsatellite: the SOTA experience [10660-10]
10660 0C	A Poisson model for entanglement optimization in the quantum internet [10660-11]
10660 0D	Bell state optimizations for reliable quantum applications [10660-12]

SESSION 3 QUANTUM INFORMATION SCIENCE I

10660 0F	Agency and the physics of numbers [10660-14]
10660 0G	Majorana fermions and representations of the artin braid group [10660-16]
10660 0H	Quantum information geometry in the space of measurements [10660-17]

SESSION 4 QUANTUM INFORMATION SCIENCE II

10660 0I **Enhanced communication through quantum hyper-entanglement** [10660-18]

10660 0K **Storage and retrieval of optical information in levitated cavityless optomechanics** [10660-21]

SESSION 5 QUANTUM COMMUNICATION, AND QUANTUM NETWORKS

10660 0L **Towards using trapped ions as memory nodes in a photon-mediated quantum network**
[10660-23]

10660 0M **Higher dimensional quantum communication in a curved spacetime: an efficient simulation of the propagation of the wavefront of a photon** [10660-24]

10660 0N **Optimization and synchronization of programmable quantum communication channels**
[10660-26]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Ahn, Doyeol, 0M	Toyoshima, Morio, 0B
Alsing, Paul M., 0M	Wessing, L., 0L
Babcock, Craig, 0A	Williams, Brian P., 0D
Bashkansky, Mark, 08	
Bell, J., 0L	
Bhattacharya, M., 0K	
Bogorin, D. F., 0L	
Bonenfant, B., 0L	
Brickman-Soderberg, K.-A., 0L	
Britt, Keith A., 02	
Carrasco-Casado, Alberto, 0B	
Cook, P., 0L	
Dasari, Venkat R., 0D, 0N	
Disney, L., 0L	
Dolezal, T., 0L	
Donkor, Eric, 0A	
Donval, A., 05	
Ferraro, Mike S., 08	
Fujiwara, Mikio, 0B	
Geerhart, Billy E., 0D	
Goetz, Peter G., 08	
Gross, N., 05	
Gyongyosi, L., 0C	
Humble, Travis S., 02, 0D	
Im, Mee Seong, 0N	
Imre, S., 0C	
Kauffman, Louis H., 0G	
Kitamura, Mitsuo, 0B	
Krawec, Walter O., 09	
Kumar, Pardeep, 0K	
Ma, Lijun, 06	
Madjid, F. Hadi, 0F	
Mahon, Rita, 08	
Miller, Warner A., 0H, 0M	
Myers, John M., 0F	
O'Reilly, J. P., 0L	
Oron, M., 05	
Phillips, J., 0L	
Poole, K., 0L	
Rabinovich, William S., 08	
Reintjes, J., 08	
Sadlier, Ronald J., 02, 0D	
Sasaki, Masahide, 0B	
Slattery, Oliver, 06	
Smith, James F., 0I	
Snow, Nikolai A., 0D	
Tabakov, B., 0L	
Takenaka, Hideki, 0B	
Tang, Xiao, 06	

Conference Committee

Symposium Chair

Robert Fiete, Harris Corporation (United States)

Symposium Co-chair

Jay Kumler, JENOPTIK Optical Systems, LLC (United States)

Conference Chairs

Eric Donkor, University of Connecticut (United States)

Michael Hayduk, Air Force Research Laboratory (United States)

Conference Co-chairs

Michael R. Frey, Bucknell University (United States)

Samuel J. Lomonaco Jr., University of Maryland, Baltimore County
(United States)

John M. Myers, Harvard University (United States)

Conference Program Committee

Paul M. Alsing, Air Force Research Laboratory (United States)

Radhakrishnan Balu, U.S. Army Research Laboratory (United States)

Mishkatul Bhattacharya, Rochester Institute of Technology
(United States)

Wes Campbell, University of California, Los Angeles (United States)

Jerry Chow, IBM Thomas J. Watson Research Center (United States)

Michael L. Fanto, Air Force Research Laboratory (United States)

Louis H. Kauffman, University of Illinois at Chicago (United States)

Prem Kumar, Northwestern University (United States)

Alexander V. Sergienko, Boston University (United States)

Kathy-Anne Soderberg, Air Force Research Laboratory (United States)

Yaakov S. Weinstein, The MITRE Corporation (United States)

Session Chairs

- 1 Quantum Computing, Measurements and Error Correction

John M. Myers, Harvard University (United States)

Samuel J. Lomonaco Jr., University of Maryland, Baltimore County
(United States)

- 2 Quantum Cryptography and Quantum Key Distribution
John M. Myers, Harvard University (United States)
- 3 Quantum Information Science I
Michael L. Fanto, Air Force Research Laboratory (United States)
- 4 Quantum Information Science II
Neal E. Solmeyer, The MITRE Corporation (United States)
- 5 Quantum Communication, and Quantum Networks
Michael L. Fanto, Air Force Research Laboratory (United States)
Eric Donkor, University of Connecticut (United States)