

PROCEEDINGS OF SPIE

[SPIDigitalLibrary.org/conference-proceedings-of-spie](https://spiedigitallibrary.org/conference-proceedings-of-spie)

Front Matter: Volume 9504

, "Front Matter: Volume 9504," Proc. SPIE 9504, Photon Counting Applications 2015, 950401 (20 May 2015); doi: 10.1117/12.2197744

SPIE.

Event: SPIE Optics + Optoelectronics, 2015, Prague, Czech Republic

PROCEEDINGS OF SPIE

Photon Counting Applications 2015

Ivan Prochazka
Roman Sobolewski
Ralph B. James
Editors

13–15 April 2015
Prague, Czech Republic

Sponsored by
SPIE

Cooperating Organisations
HiPER Project (United Kingdom)
ELI Beamlines (Czech Republic)
Laserlab Europe

Published by
SPIE

Volume 9504

Proceedings of SPIE 0277-786X, V. 9504

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

Photon Counting Applications 2015, edited by Ivan Prochazka, Roman Sobolewski, Ralph B. James,
Proc. of SPIE Vol. 9504, 950401 · © 2015 SPIE · CCC code: 0277-786X/15/\$18 · doi: 10.1117/12.2197744

Proc. of SPIE Vol. 9504 950401-1

The papers included 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. The papers published in these proceedings 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 this book:

Author(s), "Title of Paper," in *Photon Counting Applications 2015*, edited by Ivan Prochazka, Roman Sobolewski, Ralph B. James, Proceedings of SPIE Vol. 9504 (SPIE, Bellingham, WA, 2015) Article CID Number.

ISSN: 0277-786X

ISBN: 9781628416251

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 © 2015, 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/15/\$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, with papers published first online and then in print. Papers are published as they are submitted and meet publication criteria. A unique citation identifier (CID) number is assigned to each article at the time of the first 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, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four 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. The complete citation is used on the first page, and an abbreviated version on subsequent pages.

Contents

- v *Authors*
- vii *Conference Committee*
- ix *Introduction*

SUPERCONDUCTING PHOTON COUNTING I

- 9504 02 **A near-infrared 64-pixel superconducting nanowire single photon detector array with integrated multiplexed readout (Invited Paper) [9504-1]**
- 9504 03 **Near-field single photon detection in a scattering SNOM [9504-2]**
- 9504 04 **Dark counts in superconducting single-photon NbN/NiCu detectors [9504-3]**
- 9504 05 **Superconducting and ferromagnetic properties of NbN/NiCu and NbTiN/NiCu bilayer nanostructures for photon detection [9504-4]**
- 9504 06 **Y-Ba-Cu-O nanostripes for optical photon detection (Invited Paper) [9504-5]**

SUPERCONDUCTING PHOTON COUNTING II

- 9504 08 **Ultrafast superconducting single-photon detector with reduced-size active area coupled to a tapered lensed single-mode fiber [9504-7]**

SOLID STATE PHOTON COUNTING

- 9504 09 **Active quenching and gating circuit of the photon counting detector for laser time transfer with improved timing resolution and stability (Invited Paper) [9504-8]**
- 9504 0A **High-performance timing electronics for single photon avalanche diode arrays [9504-9]**
- 9504 0B **Single photon time transfer link model for GNSS satellites [9504-10]**
- 9504 0C **Aqueye+: a new ultrafast single photon counter for optical high time resolution astrophysics [9504-11]**

PHOTON COUNTING APPLICATIONS

- 9504 0J **Enhancing the fill-factor of CMOS SPAD arrays using microlens integration (Invited Paper, Best Student Paper Award) [9504-18]**
- 9504 0K **Occurrence and characteristics of mutual interference between LIDAR scanners [9504-19]**

9504 0L **Superiorities of time-correlated single-photon counting against standard fluorimetry in exploiting the potential of fluorochromized oligonucleotide probes for biomedical investigation** [9504-20]

POSTER SESSION

- 9504 0M **Research and primary results of SLR experiment with 1064nm wavelength using Si detector** [9504-22]
- 9504 0N **Thin scintillators for ultrafast hard X-ray imaging** [9504-23]
- 9504 0O **Modeling of kinetic processes in thermoelectric single photon detectors** [9504-24]
- 9504 0P **Simultaneous detection of tissue autofluorescence decay distribution and time-gated photo-bleaching rates** [9504-25]
- 9504 0Q **Evaluating the effectiveness of the extrafocal images method when observing low-orbiting space objects** [9504-26]

Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four 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.

Acconcia, G., 0A
Aichner, B., 05
Allman, M. S., 02
Arpaia, R., 06
Barbieri, C., 0C
Barbieri, M., 0C
Barnes, Cris W., 0N
Bauch, T., 06
Beyer, A. D., 02
Blazej, Josef, 09, 0B
Bondani, Maria, 0L
Borysiewicz, M. A., 05
Buller, G. S., 0J
Ceribella, G., 0C
Cristiano, R., 04, 06
Crotti, M., 0A
Czerwinski, A., 05
D'Alessandro, M., 0C
de Dood, Michiel J. A., 03
Deng, Huarong, 0M
Di Paola, A., 0C
Divochiy, Alexander, 08
Ejrnaes, M., 04, 06
Eom, Jeongsook, 0K
Farisato, G., 0C
Ferulova, Inesa, 0P
Gerrits, T., 02
Ghioni, M., 0A
Golubev, D., 06
Grishin, E. A., 0Q
Guziewicz, M., 05
Horansky, R. D., 02
Intermite, G., 0J
Joon, E., 05
Juchniewicz, M., 05
Kapustinsky, Jon S., 0N
Kim, Gunzung, 0K
Klimov, A., 05
Kodet, Jan, 09
Kruszka, R., 05
Kumor, D., 02
Kuzanyan, Armen, 0O
Kuzanyan, Astghik, 0O
Lamperti, Marco, 0L
Lang, W., 05
Łaszcz, A., 05
Li, Pu, 0M
Lihachev, Alexey, 0P
Lita, A. E., 02
Lombardi, F., 06
Marsili, F., 02
McCarthy, A., 0J
Meng, Wendong, 0M
Michalek, Vojtech, 09, 0B
Mirin, R., 02
Morris, Chris L., 0N
Myoren, H., 04
Naletto, G., 0C
Nam, S. W., 02
Nardo, Luca, 0L
Nasti, U., 04
Nelson, Ron O., 0N
Nikoghosyan, Vahan, 0O
Park, Seonghyeon, 0K
Park, Yongwan, 0K
Parlato, L., 04, 06
Peca, Marek, 0B
Pepe, G. P., 04, 06
Prochazka, Ivan, 09, 0B, 0M
Puźniak, R., 05
Rech, I., 0A
Ren, X., 0J
Shargorodskii, V. D., 0Q
Shaw, M. D., 02
Shumilov, Yu. P., 0Q
Sidorova, Maria V., 08
Słysz, W., 05
Smirnov, Konstantin V., 08
Sobolewski, Roman, 04, 05, 06
Spigulis, Janis, 0P
Stern, R., 05
Stevens, M., 02
Tafari, F., 06
Taghizadeh, M. R., 0J
Tamosiunas, Mindaugas, 0P
Tang, Kai, 0M
Tosi, A., 0J
Vacek, Michael, 0B
Vachtomin, Yury B., 08
Verma, V. B., 02
Verroi, E., 0C
Villa, F., 0J
Vygon, V. G., 0Q
Waddie, A. J., 0J
Wang, Qiang, 03
Wang, Zhehui, 0N
Warburton, R. E., 0J
Węgrzecki, M., 05

Yang, Fan, 0N
Zampieri, L., 0C
Zappa, F., 0J
Zhang, Haifeng, 0M
Zhang, Liyuan, 0N
Zhang, Zhongping, 0M
Zhu, Nenghong, 0M
Zhu, Ren-Yuan, 0N
Zoccarato, P., 0C
Zou, Y., 0J

Conference Committee

Symposium Chairs

- Jiri Homola**, Institute of Photonics and Electronics of the ASCR, v.v.i.
(Czech Republic)
- Chris Edwards**, Central Laser Facility, Science and Technology
Facilities Council (United Kingdom)
- Mike Dunne**, SLAC National Accelerator Laboratory (United States)
and Linac Coherent Light Source (United States)
- Ivo Rendina**, Istituto per la Microelettronica e Microsistemi, CNR (Italy)

Honorary Symposium Chair

- Miroslav Miller**, Institute of Photonics and Electronics of the ASCR,
v.v.i. (Czech Republic)

Conference Chairs

- Ivan Prochazka**, Czech Technical University in Prague
(Czech Republic)
- Roman Sobolewski**, University of Rochester (United States)
- Ralph B. James**, Brookhaven National Laboratory (United States)

Conference Programme Committee

- Josef Blazej**, Czech Technical University in Prague (Czech Republic)
- Ulrich Schreiber**, Technische Universität München (Germany)
- Valery Zwiller**, Technische Universiteit Delft (Netherlands)

Session Chairs

- 1 Superconducting Photon Counting I
Roman Sobolewski, University of Rochester (United States)
- 2 Superconducting Photon Counting II
Roman Sobolewski, University of Rochester (United States)
- 3 Solid State Photon Counting
Ivan Prochazka, Czech Technical University in Prague
(Czech Republic)
- 4 X-ray Photon Detection
Nathan R. Gemmell, University of Glasgow (United Kingdom)
- 5 Photon Counting Applications
Ralph B. James, Brookhaven National Laboratory (United States)

Introduction

This book contains the proceedings of the SPIE Conference on Photon Counting Applications. The conference was held 13–15 April, in Prague, Czech Republic as part of the 2015 SPIE Conference on Optics and Optoelectronics. The meeting was organized into technical sessions on superconducting photon counting, solid state photon counting, x-ray photon detection, and applications. A poster session was also provided.

The purpose of the conference was to provide a forum for scientists and engineers from the detector development and user communities to present and evaluate the most recent results on photon-counting detectors and to discuss the requirements for a variety of detection and imaging applications. A total of 26 presentations, including 6 posters, were provided at the conference. This book provides detailed documentation describing a portion of the presentations. The editors hope that it will serve as an important record of the meeting, providing an update on the status of photon-counting detectors and applications, and serving as a useful resource for those working in the field.

The Conference Chairs would like to thank the Session Chairs and members of the Conference Program Committee, who offered their time to enlist the involvement of researchers working in the field.

Ivan Prochazka
Roman Sobolewski
Ralph B. James

