PROCEEDINGS OF SPIE

# *Nonlinear Frequency Generation and Conversion: Materials, Devices, and Applications XIV*

**Konstantin L. Vodopyanov**
*Editor*

**9–12 February 2015**
**San Francisco, California, United States**

*Sponsored and Published by*
SPIE

**Volume 9347**

Proceedings of SPIE 0277-786X, V. 9347



Nonlinear Frequency Generation and Conversion: Materials, Devices, and Applications XIV,
edited by Konstantin L. Vodopyanov, Proc. of SPIE Vol. 9347, 934701 · © 2015 SPIE
CCC code: 0277-786X/15/$18 · doi: 10.1117/12.2183978

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 *Nonlinear Frequency Generation and Conversion: Materials, Devices, and Applications XIV*, edited by Konstantin L. Vodopyanov, Proceedings of SPIE Vol. 9347 (SPIE, Bellingham, WA, 2015) Article CID Number.

ISSN: 0277-786X
ISBN: 9781628414370

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



Printed in the United States of America.

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

SPIE Digital Library
SPIEDigitalLibrary.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

# 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.

# Conference Committee

*Symposium Chairs*

**Guido Hennig**, Daetwyler Graphics AG (Switzerland)
**Yongfeng Lu**, University of Nebraska-Lincoln (United States)

*Symposium Co-chairs*

**Bo Gu**, Bos Photonics (United States)
**Andreas Tünnermann**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany), and Friedrich-Schiller Universität Jena (Germany)

*Conference Chair*

**Konstantin L. Vodopyanov**, CREOL, The College of Optics and Photonics, University of Central Florida (United States)

*Conference Co-chair*

**Yehoshua Y. Kalisky**, Nuclear Research Center Negev (Israel)

*Conference Program Committee*

**Darrell J. Armstrong**, Sandia National Laboratories (United States)
**Majid Ebrahim-Zadeh**, ICFO - Institut de Ciències Fotòniques (Spain)
**Peter Günter**, ETH Zurich (Switzerland)
**Baldemar Ibarra-Escamilla**, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico)
**Moti Katz**, Soreq Nuclear Research Center (Israel)
**Yun-Shik Lee**, Oregon State University (United States)
**Rita D. Peterson**, Air Force Research Laboratory (United States)
**Peter G. Schunemann**, BAE Systems (United States)
**Kenneth L. Schepler**, Air Force Research Laboratory (United States)
**Andrei V. Shchegrov**, KLA-Tencor Corporation (United States)
**Wei Shi**, Tianjin University (China)
**Michael Vasilyev**, The University of Texas at Arlington (United States)

*Session Chairs*

1 Microresonator Combs, THz, and RF Photonics I: Joint Session with Conferences 9343 and 9347
**Andrea M. Armani**, The University of Southern California (United States)

2 Microresonator Combs, THz, and RF Photonics II: Joint Session with Conferences 9343 and 9347
**Konstantin L. Vodopyanov**, CREOL, The College of Optics and Photonics, University of Central Florida (United States)
**Gualtiero Nunzi Conti**, Istituto di Fisica Applicata Nello Carrara (Italy)

3 Visible-UV Generation I
**Andrei V. Shchegrov**, KLA-Tencor Corporation (United States)

4 Visible-UV Generation II
**Andrei V. Shchegrov**, KLA-Tencor Corporation (United States)

5 Terahertz Generation
**Konstantin L. Vodopyanov**, CREOL, The College of Optics and Photonics, University of Central Florida (United States)

6 Optical Parametric Processes I
**Majid Ebrahim-Zadeh**, ICFO - Institut de Ciències Fotòniques (Spain)
**Rita D. Peterson**, Air Force Research Laboratory (United States)

7 Optical Parametric Processes II
**Majid Ebrahim-Zadeh**, ICFO - Institut de Ciències Fotòniques (Spain)
**Kenneth L. Schepler**, CREOL, The College of Optics and Photonics, University of Central Florida (United States)

8 Novel Concepts of Nonlinear Optics I
**Michael Vasilyev**, The University of Texas at Arlington (United States)
**Darrell J. Armstrong**, Sandia National Laboratories (United States)

9 Novel Concepts of Nonlinear Optics II
**Michael Vasilyev**, The University of Texas at Arlington (United States)
**Darrell J. Armstrong**, Sandia National Laboratories (United States)

10 Supercontinuum Generation
**Yehoshua Y. Kalisky**, Nuclear Research Center Negev (Israel)

11 Raman and Brillouin Processes
**Darrell J. Armstrong**, Sandia National Laboratories (United States)