

PROCEEDINGS OF SPIE

# ***Nonlinear Optics and Applications X***

**Mario Bertolotti**  
**Joseph W. Haus**  
**Alexei M. Zheltikov**  
*Editors*

**24–25 April 2017**  
**Prague, Czech Republic**

*Sponsored by*  
SPIE

*Cooperating Organisations*  
Science and Technology Facilities Council (United Kingdom)  
ELI Beamlines (Czech Republic)  
Laserlab Europe  
AILU—Association of Laser Users (United Kingdom)  
European Optical Society  
HiLASE (Czech Republic)  
AWE—Atomic Weapons Establishment (United Kingdom)

*Published by*  
SPIE

**Volume 10228**

Proceedings of SPIE 0277-786X, V. 10228

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

Nonlinear Optics and Applications X, edited by Mario Bertolotti, Joseph W. Haus, Alexei M. Zheltikov, Proc. of SPIE Vol. 10228, 1022801 · © 2017 SPIE · CCC code: 0277-786X/17/\$18 · doi: 10.1117/12.2281973

Proc. of SPIE Vol. 10228 1022801-1

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](http://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 *Nonlinear Optics and Applications X*, edited by Mario Bertolotti, Joseph W. Haus, Alexei M. Zheltikov, Proceedings of SPIE Vol. 10228 (SPIE, Bellingham, WA, 2017) Seven-digit Article CID Number.

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

ISBN: 9781510609570  
ISBN: 9781510609587 (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](http://SPIE.org)

Copyright © 2017, 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](http://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/17/\$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](http://SPIDigitalLibrary.org)

---

**Pa 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 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

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

---

## **SESSION 1    NONLINEAR MATERIALS**

---

- 10228 03    **Co-sputtered amorphous Ge-Sb-Se thin films: optical properties and structure** [10228-2]
- 10228 04    **Determination of Kerr and two-photon absorption coefficients of indandione derivatives** [10228-3]
- 10228 05    **Investigating nonlinear distortion in the photopolymer materials** [10228-4]

---

## **SESSION 2    NONLINEARITIES AT FEMTOSECOND I**

---

- 10228 09    **Forming of supercontinuum in the visible upon filamentation of a femtosecond pulse in the air** [10228-8]
- 10228 0A    **Self-trapping of intensities changing under SHG and SWG for high intensive femtosecond laser pulse** [10228-9]

---

## **SESSION 3    NONLINEARITIES AT FEMTOSECOND II**

---

- 10228 0B    **Analysis of THG modes for femtosecond laser pulse** [10228-10]
- 10228 0C    **Non-linear effects during interaction of femtosecond doughnut-shaped laser pulses with glasses: overcoming intensity clamping** [10228-11]
- 10228 0D    **Asymmetry of light absorption upon propagation of focused femtosecond laser pulses with spatiotemporal coupling through glass materials** [10228-12]
- 10228 0E    **Modeling of silicon in femtosecond laser-induced modification regimes: accounting for ambipolar diffusion** [10228-13]
- 10228 0F    **Spectral narrowing in gases using femtosecond laser pulses** [10228-14]

---

## **SESSION 4    NANOOPTICS AND PLASMONICS**

---

- 10228 0J    **Nonlinear optical effects in organic microstructures** [10228-18]

10228 OK **All-optically tunable EIT-like dielectric metasurfaces hybridized with thin-phase change material layers (Best Student Paper)** [10228-19]

10228 OL **Second harmonic generation on self-assembled GaAs/Au nanowires with thickness gradient** [10228-20]

---

**SESSION 5 FIBRES**

10228 ON **Thermal optical nonlinearity in photonic crystal fibers filled with nematic liquid crystals doped with gold nanoparticles** [10228-22]

10228 OO **Route to high energy dissipative soliton resonance pulse in a dual amplifier figure-of-eight fiber laser** [10228-23]

10228 OQ **Rogue waves driven by polarization instabilities in a long ring fiber oscillator** [10228-25]

---

**SESSION 6 APPLICATIONS**

10228 OR **Photoinduced  $\chi^{(2)}$  for second harmonic generation in stoichiometric silicon nitride waveguides** [10228-26]

10228 OS **Implementation of stimulated Raman scattering microscopy for single cell analysis** [10228-27]

10228 OT **Laser-induced periodic surface structures formation: investigation of the effect of nonlinear absorption of laser energy in different materials** [10228-28]

10228 OU **Parametric Raman anti-Stokes laser at 503nm with phase-matched collinear beam interaction of orthogonally polarized Raman components in calcite under 532nm 20ps laser pumping** [10228-30]

10228 OV **Numerical simulation and comparison of nonlinear self-focusing based on iteration and ray tracing** [10228-31]

---

**POSTER SESSION**

10228 OX **All-optical variable-length packet router with contention resolution based on wavelength conversion** [10228-33]

10228 OY **Significant improvement in the thermal annealing process of optical resonators** [10228-34]

10228 OZ **Optimization of coupled device based on optical fiber with crystalline and integrated resonators** [10228-35]

10228 11 **Tunneling current emission spectrum of biased impurity in the presence of electron-phonon interaction** [10228-37]

- 10228 12 **Dynamic photonic crystals dimensionality tuning by laser beams polarization changing** [10228-38]
- 10228 13 **Interplay between convection and bistability in a pattern forming system** [10228-39]
- 10228 15 **Photo-induced nonlinear absorption in carbon nanostructures** [10228-41]
- 10228 16 **Poling dynamics of an EO active material using parallel-plate electrodes** [10228-42]
- 10228 18 **Generation of intensive surface plasmon polariton pulses due to the induced modulation instability effect** [10228-44]
- 10228 19 **Generation of wide spectrum and pedestal-free pulse compression in highly nonlinear dispersion increasing fiber** [10228-45]
- 10228 1A **Modulation instability of wave packets propagating in inhomogeneous nonlinear fiber** [10228-46]
- 10228 1B **The impact of dispersion of the ultrashort light pulses on the THz radiation formation from asymmetric air plasmas** [10228-47]
- 10228 1C **Creation technique and nonlinear optics of dynamic one-dimensional photonic crystals in colloidal solution of quantum dots** [10228-48]
- 10228 1D **Automatic method for features extraction for images achieved by stimulated Raman scattering microscopy** [10228-49]



# 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.

Arsevey, Petr I., 11  
Bahloul, F., 0O  
Bassir, David, 0Z  
Baudet, Emeline, 03  
Bednarska, Karolina, 0N  
Belardini, A., 0L  
Ben Braham, F., 0O  
Boller, Klaus-J., 0R  
Börzsönyi, A., 1B  
Brancati, Nadia, 1D  
Buatier de Mongeot, F., 0L  
Budaszewski, Daniel, 0N  
Bulgakova, Nadezhda M., 0C, 0D, 0E, 0T  
Bundulis, Arturs, 04, 16  
Busenbergs, Janis, 04  
Cassidy, Derek, 05  
Cen, Zhaofeng, 0V  
Centini, M., 0L  
Chandrasekar, R., 0J  
Chen, Hao, 0V  
Chikan, V., 1B  
Chychłowski, Miłosz, 0N  
D'Arco, Annalisa, 0S, 1D  
Derrien, Thibault J.-Y., 0E  
Dharmadhikari, A. K., 0F  
Dharmadhikari, J. A., 0F  
Epping, Jörn P., 0R  
Ezhova, K., 1C  
Farhat, A., 0X  
Farhat, R., 0X  
Fazio, E., 0L  
Fedoruk, Mikhail P., 0C  
Fedotov, Mikhail V., 0A  
Ferrara, Maria Antonietta, 0S, 1D  
Flender, R., 1B  
Fotiadi, Andrew A., 18, 19, 1A  
Fourmont, J., 0O  
Frucci, Maria, 1D  
Golinskaya, A. D., 1C  
Golinskaya, Anastasia D., 12, 1C  
Gribkov, Vladislav Yu., 15  
Gueguen, Yann, 03  
Gutwirth, Jan, 03  
Halenkovič, Tomáš, 03  
Indolfi, Maurizio, 0S, 1D  
Ivanov, N. G., 09  
Jelínek, Michal, 0U  
Karpate, Tanvi, 0F  
Kbashi, Hani, 0Q  
Kharitonov, Dmitry M., 0A  
Kolpakov, S. A., 0Q  
Kopylov, Denis A., 0J  
Korobko, Dmitry A., 18, 19  
Kozlova, Maria, 1C  
Kubeček, Václav, 0U  
Lapin, V. A., 1A  
Leahu, G., 0L  
Lesiak, Piotr, 0N  
Levy, Yoann, 0T  
Li Voti, R., 0L  
Li, Xiaotong, 0V  
Linina, Elza, 16  
Losev, V. F., 09  
Lubenko, D. M., 09  
Mak, Jesse, 0R  
Malallah, Ra'ed, 05  
Mamonov, Evgeniy A., 0J  
Mantsevich, Vladimir N., 11, 12  
Marsal, N., 13  
Maslova, Natalya S., 11  
Mathur, D., 0F  
Menif, M., 0X  
Mihailovs, Igors, 04  
Mitetelo, Nikolai V., 0J  
Mocek, Tomáš, 0T  
Moiseev, Sergey, 18  
Muniraj, Inbarasan, 05  
Murzina, Tatiana V., 0J  
Narayana, YSLV, 0J  
Nazabal, Virginie, 03  
Němec, Petr, 03  
Nitiss, Edgars, 04, 16  
Novikov, Vladimir B., 0J  
Petronijevic, Emilija, 0K  
Porcel, Marco A. G., 0R  
Prokop'ev, V. E., 09  
Repetto, D., 0L  
Ruan, Wangchao, 0V  
Rubenchik, Alexander M., 0C  
Rutkis, Martins, 04, 16  
Ryle, James P., 05  
Salhi, M., 0O  
Salzenstein, Patrice, 0Y, 0Z  
Sanchez, F., 0O  
Sangleboeuf, J.-C., 03  
Sárosi, K., 1B  
Schermerhorn, Victoria K., 0R  
Sciamanna, M., 13

Semaan, G., 00  
Sergeyev, Sergey, 0Q  
Sheridan, John T., 05  
Sibilia, Concita, 0K, 0L  
Sidorov, Pavel S., 0B  
Sirleto, Luigi, 0S, 1D  
Sitnik, K. A., 09  
Smetanin, Sergei, 0U  
Smirnov, Alexandr M., 12, 1C  
Sobotka, Piotr, 0N  
Specht, Marion, 03  
Stebakova, Yulia V., 12, 1C  
Stoliarov, Dmitrii A., 19  
Sysoliatin, Alexey A., 19  
Taballione, Caterina, 0R  
Trofimov, Vyacheslav A., 0A, 0B  
Tufano, Vitaliano, 0S, 1D  
Valchuk, Yana V., 12, 1C  
van der Slot, Peter J. M., 0R  
Venkatakrishnarao, D., 0J  
Wang, Weiwei, 0V  
Weicker, L., 13  
Wójcik, Michał, 0N  
Wolfersberger, D., 13  
Woliński, Tomasz R., 0N  
Zarubin, Mikhail, 0Y  
Zatrudina, Rimma Sh., 15  
Zhang, Luwei, 0V  
Zhang, Mingjun, 0Z  
Zhao, Liang, 05  
Zhukov, Vladimir P., 0C, 0D  
Zolotovskii, Igor O., 18, 19

# Conference Committee

## *Symposium Chairs*

- Jiri Homola**, Institute of Photonics and Electronics of the ASCR, v.v.i. (Czech Republic)  
**Bedrich Rus**, Institute of Physics 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)

## *Conference Chairs*

- Mario Bertolotti**, Università degli Studi di Roma La Sapienza (Italy)  
**Joseph W. Haus**, University of Dayton (United States)  
**Alexei M. Zheltikov**, Lomonosov Moscow State University (Russian Federation)

## *Conference Programme Committee*

- Javier Aizpurua**, Centro de Fisica de Materiales (Spain)  
**Kiyoshi Asakawa**, University of Tsukuba (Japan)  
**Bruno Crosignani**, Università dell'Aquila (Italy)  
**Reinhard Kienberger**, Max Planck Institut für Quantenoptik (Germany)  
**Yuri S. Kivshar**, The Australian National University (Australia)  
**Jan Perina**, Palacky University (Czech Republic)  
**Mark I. Stockman**, Georgia State University (United States)  
**Anatoly V. Zayats**, King's College London (United Kingdom)

## *Session Chairs*

- 1 Nonlinear Materials  
**Mario Bertolotti**, Sapienza Università di Roma (Italy)
- 2 Nonlinearities at Femtosecond I  
**Eric Plum**, University of Southampton (United Kingdom)
- 3 Nonlinearities at Femtosecond II  
**Mario Bertolotti**, Sapienza Università di Roma (Italy)
- 5 Fibres  
**Yuri S. Kivshar**, Australian National University (Australia)
- 6 Applications  
**Mario Bertolotti**, Sapienza Università di Roma (Italy)



## Introduction

This volume contains papers presented at the seventh Nonlinear Optics and Applications Conference held in Prague from 24-25 April 2017 at Clarion Congress Hotel. The session topics included Nonlinear Materials, Nonlinearities at Femtosecond, Nano-optics and Plasmonics, Fibers, and Applications. A few invited papers that introduced the sessions are not included as they simply reviewed already existing material found in open literature. As a whole, the presented papers cover a good part of the field and contain interesting ideas or results. Also, the geographic distribution of the authors was able to cover a broad ensemble of countries. The trend to move towards femtosecond applications and nanoscale is evident together with the effort to study new nonlinear materials.

**Mario Bertolotti**

