

PROCEEDINGS OF SPIE

***Nonlinear Frequency Generation
and Conversion: Materials,
Devices, and Applications XI***

Konstantin L. Vodopyanov
Editor

24–26 January 2012
San Francisco, United States

Sponsored and Published by
SPIE

Volume 8240

Proceedings of SPIE, 0277-786X, v. 8240

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

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 XI*, edited by Konstantin L. Vodopyanov, Proceedings of SPIE Vol. 8240 (SPIE, Bellingham, WA, 2012) Article CID Number.

ISSN 0277-786X
ISBN 9780819488831

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 © 2012, 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/12/\$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 and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent 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. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

- ix *Conference Committee*
- xi *Introduction*

VISIBLE AND UV LASERS I

- 8240 03 **Picosecond pulse generation at 596 nm via sum-frequency mixing with a gain-switched, fiber-amplified laser diode** [8240-02]
K. Lauritsen, T. Schönau, T. Siebert, R. Erdmann, PicoQuant GmbH (Germany)
- 8240 05 **Power-scalable tunable UV, visible, and NIR generation from an ultrafast fiber OPA based on four wave mixing in PCF** [8240-04]
M. J. Yarrow, Fianium Ltd. (United Kingdom); W. J. Wadsworth, L. Lavoute, Univ. of Bath (United Kingdom); J. R. Clowes, A. B. Grudinin, Fianium Ltd. (United Kingdom)

TERAHERTZ GENERATION

- 8240 07 **Intracavity generation of continuous wave terahertz radiation (Invited Paper)** [8240-06]
M. Scheller, Desert Beam Technologies LLC (United States) and College of Optical Sciences, The Univ. of Arizona (United States); A. Young, The Univ. of Arizona (United States) and Philipps-Univ. Marburg (Germany); J. M. Yarborough, J. V. Moloney, Desert Beam Technologies LLC (United States) and College of Optical Sciences, The Univ. of Arizona (United States); S. W. Koch, Desert Beam Technologies LLC (United States) and Philipps-Univ. Marburg (Germany); C. Y. Drouet d'Aubigny, C. Walker, The Univ. of Arizona (United States) and TeraVision Inc. (United States)
- 8240 08 **Terahertz-induced optical modulations in quantum-well microcavity** [8240-07]
Y.-S. Lee, J. L. Tomaino, A. D. Jameson, Oregon State Univ. (United States); G. Khitrova, H. M. Gibbs, College of Optical Sciences, The Univ. of Arizona (United States); A. C. Klettke, M. Kira, S. W. Koch, Philipps-Univ. Marburg (Germany)
- 8240 0A **Coherent electro-optical detection of THz-wave generated from synchronously pumped picosecond THz parametric oscillator** [8240-09]
Y. Takida, T. Ohira, Y. Tadokoro, H. Kumagai, S. Nashima, Osaka City Univ. (Japan)
- 8240 0B **Single-cycle terahertz pulses with amplitudes exceeding 1 MV/cm generated by optical rectification in LiNbO₃ and applications to nonlinear optics (Invited Paper)** [8240-10]
H. Hirori, K. Tanaka, Kyoto Univ. (Japan) and Japan Science and Technology Agency (Japan)

OPTICAL PARAMETRIC DEVICES

- 8240 0C **Optical parametric oscillation in orientation patterned GaAs waveguides (Invited Paper)** [8240-11]
M. B. Oron, P. Blau, S. Pearl, M. Katz, Soreq Nuclear Research Ctr. (Israel)

- 8240 0D **Sub-nanosecond, 1-kHz, low-threshold, non-critical OPO based on periodically-poled KTP crystal pumped at 1064 nm** [8240-12]
G. Marchev, V. Petrov, A. Tyazhev, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany); V. Pasiskevicius, N. Thilmann, F. Laurell, Royal Institute of Technology (Sweden); I. Buchvarov, Sofia Univ. St. Kliment Ohridski (Bulgaria)
- 8240 0E **Comparison of linear and RISTRA cavities for a 1064-nm pumped CdSiP₂ OPO** [8240-13]
G. Marchev, A. Tyazhev, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany); G. Stöppler, M. Eichhorn, Institut Franco-Allemand de Recherches de Saint-Louis (France); P. Schunemann, BAE Systems, Inc. (United States); V. Petrov, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany)
- 8240 0F **Improved space bandwidth product in image upconversion** [8240-14]
J. S. Dam, C. Pedersen, P. Tidemand-Lichtenberg, Technical Univ. of Denmark (Denmark)

VISIBLE AND UV LASERS II: JOINT SESSION WITH CONFERENCE 8235

- 8240 0H **Coherent quasi-CW 153-nm light source at high repetition rate (Invited Paper)** [8240-16]
Y. Nomura, The Univ. of Tokyo (Japan) and Japan Science and Technology Agency (Japan); Y. Ito, The Univ. of Tokyo (Japan); A. Ozawa, The Univ. of Tokyo (Japan) and Japan Science and Technology Agency (Japan); X. Wang, C. Chen, Technical Institute of Physics and Chemistry (China); S. Shin, The Univ. of Tokyo (Japan) and Japan Science and Technology Agency (Japan); S. Watanabe, Japan Science and Technology Agency (Japan) and Tokyo Univ. of Science (Japan); Y. Kobayashi, The Univ. of Tokyo (Japan) and Japan Science and Technology Agency (Japan)
- 8240 0I **Microchip green laser sources: broad range of possibilities** [8240-64]
S. Essaian, J. Khaydarov, S. Slavov, V. Ter-Mikirtychev, Spectralus Corp. (United States); G. Gabrielyan, M. Keroopyan, S. Soghomonyan, Spectralus CJSC (Armenia)

NONLINEAR FIBER DEVICES AND APPLICATIONS

- 8240 0L **Photonic crystal fibers for supercontinuum generation pumped by a gain-switched CW fiber laser** [8240-19]
C. Larsen, Technical Univ. of Denmark (Denmark); D. Noordegraaf, Technical Univ. of Denmark (Denmark) and NKT Photonics A/S (Denmark); K. P. Hansen, NKT Photonics A/S (Denmark); K. E. Mattsson, Technical Univ. of Denmark (Denmark); O. Bang, Technical Univ. of Denmark (Denmark) and NKT Photonics A/S (Denmark)
- 8240 0M **Single-frequency acoustically tailored Raman fiber amplifier** [8240-20]
C. Vergien, I. Dajani, C. Robin, C. Zeringue, Air Force Research Lab. (United States); K. Wyman, U.S. Air Force Academy (United States)
- 8240 0O **Demonstration of minute continuous-wave triggered supercontinuum generation at 1 μ m for high-speed biophotonic applications** [8240-22]
Y. Qiu, C. Zhang, K. K. Y. Wong, K. K. Tsia, The Univ. of Hong Kong (Hong Kong, China)

ULTRAFAST NONLINEAR DEVICES AND APPLICATIONS

- 8240 OP **Three-dimensional light bullets (Invited Paper)** [8240-23]
S. Minardi, F. Eilenberger, Friedrich-Schiller-Univ. Jena (Germany); Y. V. Kartashov, ICFO - Institut de Ciències Fotòniques (Spain); A. Szameit, Friedrich-Schiller-Univ. Jena (Germany); U. Röpke, J. Kobelke, K. Schuster, H. Bartelt, Institut für Photonische Technologien e.V. (Germany); S. Nolte, Friedrich-Schiller-Univ. Jena (Germany); L. Torner, ICFO - Institut de Ciències Fotòniques (Spain); F. Lederer, A. Tünnermann, T. Pertsch, Friedrich-Schiller-Univ. Jena (Germany)
- 8240 OQ **High-energy 450-MHz CdSiP₂ picosecond optical parametric oscillator near 6.3 μm for biomedical applications** [8240-24]
S. Chaitanya Kumar, ICFO - Institut de Ciències Fotòniques (Spain); A. Agnesi, P. Dallocchio, F. Pirzio, G. Reali, Univ. degli Studi di Pavia (Italy); K. T. Zawilski, P. G. Schunemann, BAE Systems, Inc. (United States); M. Ebrahim-Zadeh, ICFO - Institut de Ciències Fotòniques (Spain) and Institució Catalana de Recerca i Estudis Avançats (Spain)
- 8240 OS **Few-cycle high-energy pulse compression at MHz repetition rate** [8240-26]
T. Ganz, W. Köhler, FEMTOLASERS Produktions GmbH (Germany); V. Pervak, P. Baum, Ludwig-Maximilians-Univ. München (Germany) and Max-Planck-Institut für Quantenoptik (Germany)
- 8240 OT **A highly efficient broadband picosecond pump high-gain OPCPA system for Ti-sapphire seed pulses; an ideal seed for high-contrast, large-energy/aperture CPA laser system: Vulcan** [8240-27]
W. Shaikh, I. O. Musgrave, M. Galimberti, A. Boyle, Science and Technology Facilities Council (United Kingdom)
- 8240 OU **Broadband OPCPA pumped by ultra-narrowband gaseous iodine laser** [8240-28]
O. Novák, Institute of Physics of the ASCR, v.v.i. (Czech Republic) and Czech Technical Univ. in Prague (Czech Republic); H. Turčičová, Institute of Physics of the ASCR, v.v.i. (Czech Republic); M. Divoký, M. Smrž, J. Huynh, Institute of Physics of the ASCR, v.v.i. (Czech Republic) and Czech Technical Univ. in Prague (Czech Republic); P. Straka, Institute of Physics of the ASCR, v.v.i. (Czech Republic)

MID-IR FREQUENCY COMB AND SUPERCONTINUUM GENERATION

- 8240 OX **Broadband mid-IR subharmonic OPOs for molecular spectroscopy** [8240-31]
N. Leindecker, A. Marandi, K. L. Vodopyanov, R. L. Byer, Stanford Univ. (United States)
- 8240 OZ **High-quality 3.6-fs pulses by compression of an octave-spanning supercontinuum** [8240-33]
J. Rothhardt, Friedrich-Schiller-Univ. Jena (Germany) and Helmholtz Institute Jena (Germany); S. Demmler, Friedrich-Schiller-Univ. Jena (Germany); A. M. Heidt, Stellenbosch Univ. (South Africa) and Institut für Photonische Technologien e.V. (Germany); A. Hartung, H. Bartelt, Institut für Photonische Technologien e.V. (Germany); E. G. Rohwer, Stellenbosch Univ. (South Africa); J. Limpert, Helmholtz Institute Jena (Germany) and Friedrich-Schiller-Univ. Jena (Germany); A. Tünnermann, Friedrich-Schiller-Univ. Jena (Germany), Helmholtz Institute Jena (Germany), and Fraunhofer Institute for Applied Optics and Precision Engineering (Germany)

NONLINEAR MATERIALS AND CHARACTERIZATION II

- 8240 16 **Investigation of birefringence uniformity of mid-IR nonlinear optical crystals** [8240-40]
B. R. Johnson, K. T. Zawilski, P. G. Schunemann, P. R. Staver, T. M. Pollak, E. P. Chickilis, BAE Systems, Inc. (United States)

POSTER SESSION

- 8240 19 **Multilayer core asymmetric Bragg reflection waveguides for monolithic three-wave mixing** [8240-43]
P. Abolghasem, A. S. Helmy, Univ. of Toronto (Canada)
- 8240 1B **Nonlinear wideband optical filters for laser protection applications** [8240-45]
A. Donval, K. Golding, D. Nevo, T. Fisher, O. Lipman, M. Oron, KiloLambda Technologies, Ltd. (Israel)
- 8240 1C **Generation of white-light through frequency upconversion in praseodymium-ytterbium codoped nano-structured fluorogermanate glass** [8240-46]
A. S. Gouveia-Neto, N. P. S. M. Rios, L. A. Bueno, Univ. Federal Rural de Pernambuco (Brazil)
- 8240 1F **Brillouin enhanced four-wave mixing with the liquid fluorocarbon** [8240-49]
F. F. Wu, MetroLaser, Inc. (United States)
- 8240 1G **Supercontinuum generation in standard telecom fiber using picoseconds pulses** [8240-51]
J. M. Estudillo-Ayala, R. Rojas-Laguna, Univ. de Guanajuato (Mexico);
J. C. Hernandez-Garcia, O. Pottiez, Ctr. de Investigaciones en Óptica, A.C. (Mexico);
R. I. Mata-Chavez, M. Trejo-Duran, D. Jauregui-Vazquez, J. M. Sierra-Hernandez,
J. A. Andrade-Lucio, Univ. de Guanajuato (Mexico)
- 8240 1H **Parametric down conversion process in one-dimensional photonic band gap structure** [8240-52]
S. Wicharn, P. Buranasiri, King Mongkut's Institute of Technology Ladkrabang (Thailand)
- 8240 1I **Analyses of optical packet switching techniques based on nonlinear materials with respect to various label formats** [8240-53]
M. Komanec, S. Zvanovec, Czech Technical Univ. in Prague (Czech Republic)
- 8240 1J **Sum-frequency generation of continuous-wave tunable ultraviolet coherent light in BBO-installed external cavity** [8240-54]
K. Mukoyama, K. Tokuyama, H. Kumagai, Osaka City Univ. (Japan); N. Inoue, N. Fukuda,
T. Takiya, Hitachi Zosen Corp. (Japan)
- 8240 1K **Tunable terahertz parametric oscillator synchronously-pumped by mode-locked picosecond Ti:Sapphire laser with MgO-doped LiNbO₃** [8240-55]
Y. Tadokoro, Y. Takida, T. Ohira, H. Kumagai, S. Nashima, Osaka City Univ. (Japan)
- 8240 1L **Nonlinear optical properties of Er³⁺ ions doped TeO₂-Li₂O-WO₃ glass by 800nm femtosecond laser excitation** [8240-56]
G. F. Ansari, All Saints' College of Technology (India); S. K. Mahajan, J. Parashar, Samrat Ashok Technological Institute (India)

- 8240 1M **Influence of losses induced by macrobends in the supercontinuum generation using standard fiber** [8240-57]
R. Rojas-Laguna, J. M. Estudillo-Ayala, R. I. Mata-Chávez, E. Vargas-Rodríguez, J. M. Sierra-Hernández, J. A. Andrade-Lucio, Univ. de Guanajuato (Mexico); C. O. Rodríguez-Ramírez, Univ Politécnica de San Luis Potosí (Mexico)
- 8240 1N **Experimental and numerical investigation of highly absorbing nonlinear organic chromophores** [8240-58]
E. Parilov, Simphotek Inc. (United States); M. J. Potasek, Simphotek Inc. (United States) and New York Univ. (United States)
- 8240 1O **Arrangement of an advanced acousto-optical processor for modeling the triple correlations of low-power optical pulse trains** [8240-59]
A. S. Shcherbakov, A. V. Hanessian de la Garza, V. Chavushyan, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); J. Campos Acosta, Consejo Superior de Investigaciones Científicas (Spain)
- 8240 1P **Quasi phase matching through periodic step structure: modeling of frequency conversion in consideration of heat influence** [8240-60]
T. Ohfuchi, Hitachi Zosen Corp. (Japan); N. Hirano, H. Matsukawa, Osaka City Univ. (Japan); K. Nakayama, Hitachi Zosen Corp. (Japan); H. Kumagai, Osaka City Univ. (Japan); N. Inoue, N. Fukuda, T. Takiya, Hitachi Zosen Corp. (Japan)
- 8240 1R **Fabrication and characteristic of long photonic crystal fiber taper** [8240-62]
P. Yan, Shenzhen Univ. (China); H. Wei, Yangtze Optical Fibre and Cable Co., Ltd. (China); S. Ruan, Shenzhen Univ. (China); S. Chen, Yangtze Optical Fibre and Cable Co., Ltd. (China); C. Guo, Shenzhen Univ. (China); J. Guo, Yangtze Optical Fibre and Cable Co., Ltd. (China); J. Shu, G. Cao, Shenzhen Univ. (China)
- 8240 1S **A multi-phonon light-scattering and resolution of acousto-optic devices** [8240-63]
A. S. Shcherbakov, A. V. Hanessian de la Garza, V. Chavushyan, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); S. A. Nemov, St. Petersburg State Polytechnical Univ. (Russian Federation)

Author Index

Conference Committee

Symposium Chairs

Friedhelm Dorsch, TRUMPF Werkzeugmaschinen GmbH + Co. KG
(Germany)

Alberto Piqué, Naval Research Laboratory (United States)

Symposium Cochairs

Bo Gu, IPG Photonics Corporation (China)

Andreas Tünnermann, Friedrich-Schiller-Universität Jena (Germany)

Conference Chair

Konstantin L. Vodopyanov, Stanford University (United States)

Conference Cochair

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

Program Committee

Darrell J. Armstrong, Sandia National Laboratories (United States)

Pinhas Blau, Soreq Nuclear Research Center (Israel)

Majid Ebrahim-Zadeh, ICFO - Instituto de Ciencias Fotónicas (Spain)

Peter P. Günter, ETH Zurich (Switzerland)

Angus J. Henderson, Lockheed Martin Aculight (United States)

Baldemar Ibarra-Escamilla, Instituto Nacional de Astrofísica, Óptica y
Electrónica (Mexico)

Yun-Shik Lee, Oregon State University (United States)

Rita D. Peterson, Air Force Research Laboratory (United States)

Peter E. Powers, University of Dayton (United States)

Kenneth L. Schepler, Air Force Research Laboratory (United States)

Peter G. Schunemann, BAE Systems (United States)

Andrei V. Shchegrov, KLA-Tencor Corporation (United States)

Wei Shi, NP Photonics, Inc. (United States)

Ramesh K. Shori, Naval Air Warfare Center Weapons Division
(United States)

Session Chairs

- 1 Visible and UV Lasers I
Yehoshua Y. Kalisky, Nuclear Research Center Negev (Israel)
Peter E. Powers, University of Dayton (United States)
- 2 Terahertz Generation
Peter Günter, ETH Zurich (Switzerland)
- 3 Optical Parametric Devices
Darrell J. Armstrong, Sandia National Laboratories (United States)
Peter G. Schunemann, BAE Systems (United States)
- 4 Visible and UV Lasers II: Joint Session with Conference 8235
W. Andrew Clarkson, University of Southampton (United Kingdom)
Andrei V. Shchegrov, KLA-Tencor Corp. (United States)
- 5 Nonlinear Fiber Devices and Applications
Wei Shi, NP Photonics, Inc. (United States)
Yun-Shik Lee, Oregon State University (United States)
- 6 Ultrafast Nonlinear Devices and Applications
Peter E. Powers, University of Dayton (United States)
Darrell J. Armstrong, Sandia National Laboratories (United States)
- 7 Mid-IR Frequency Comb and Supercontinuum Generation
Konstantin L. Vodopyanov, Stanford University (United States)
- 8 Nonlinear Materials and Characterization I
Angus J. Henderson, Lockheed Martin Aculight (United States)
- 9 Nonlinear Materials and Characterization II
Baldemar Ibarra-Escamilla, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico)

Introduction

The span of electromagnetic frequencies achieved by means of nonlinear optics covers more than 4 orders of magnitude: from vacuum UV to THz. And this is reflected by a remarkable variety of current achievements in nonlinear optics presented in this volume.

For example, in the realm of visible and UV generation, the invited paper [82400H] by Nomura et al. describes high-repetition rates for coherent quasi-CW 153nm vacuum UV light source. The narrowband pulses generated from an ytterbium-fiber laser system at a 33MHz repetition rate at the central wavelength of 1074 nm are frequency-converted by successive stages of LBO and KBBF crystals. The generated radiation at 153 nm has the shortest wavelength achieved through phase-matched frequency conversion processes in nonlinear optical crystals.

On the other end of the spectrum, in the invited paper [824007], Sheller et al. present their results on intracavity generation of continuous wave terahertz radiation. The terahertz source is based on difference frequency generation within a laser cavity. Combining the high-intracavity intensities of a dual-color vertical external cavity surface emitting laser (VECSEL) with the high-nonlinear coefficient of a periodically poled lithium niobate crystal enables the generation of milliwatt-level continuous wave broadly tunable terahertz radiation. As the frequency spacing between the two simultaneously oscillating laser lines can be adjusted freely, the entire range of the terahertz gap can be covered.

The invited paper [82400B] by Hirori et al. describes single-cycle terahertz pulses with amplitudes exceeding 1 MV/cm generated by optical rectification in LiNbO₃ with tilted-pump-pulse-front scheme, and application of these pulses to nonlinear optics. In particular, results of the study of nonlinear interactions of GaAs quantum wells with the intense THz pulses are presented.

The first results on optical parametric oscillation in orientation patterned GaAs (OP-GaAs) waveguides are presented in the invited paper [82400C] by Oron et al. The waveguides for parametric conversion have been fabricated by MOCVD growth on OP-GaAs templates. A monolithic OPO cavity was formed by dielectric facet coating. With the pump in the range 1.98-2.05 μm , the OPO tunability of 3 -5.2 μm was achieved with the OPO threshold around 6 Watts.

In the field of ultrafast nonlinear devices, the invited paper [82400P] by Minardia et al. describes latest achievements in light bullets. Three-dimensional light bullets (3D-LBs) are the most symmetric solitary waves, being nonlinear optical wavepackets propagating without diffraction and dispersion. Since their theoretical prediction, 3D-LBs have constituted a challenge in nonlinear science, due to the impossibility to avoid catastrophic collapse in conventional

homogeneous nonlinear media. The authors have recently observed stable 3D-LBs in media with periodically modulated transverse refractive index profile.

A new approach for generating ultra-broadband mid-infrared frequency combs in the difficult-to-access mid-infrared spectral region was implemented in the paper by Leindecker et al. [82400X]. This technique is based on degenerate optical parametric oscillation, and efficiently transfers the desirable coherence properties of shorter wavelength mode-locked sources to the mid-infrared. With an ultrafast 2-micron Tm fiber laser as a pump and an OP-GaAs-based OPO system, the authors achieved octave-spanning output from 3 to 6 microns, with output powers over 30 mW.

In brief, the future of nonlinear optics looks bright. The volume describes great variety of new laser-based nonlinear optical sources as well as many applications.

Konstantin L. Vodopyanov