PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 11067

, "Front Matter: Volume 11067," Proc. SPIE 11067, Saratov Fall Meeting 2018: Computations and Data Analysis: from Nanoscale Tools to Brain Functions, 1106701 (3 June 2019); doi: 10.1117/12.2532615

SPIE.

Event: International Symposium on Optics and Biophotonics VI: Saratov Fall Meeting 2018, 2018, Saratov, Russian Federation

Saratov Fall Meeting 2018

Computations and Data Analysis: from Nanoscale Tools to Brain Functions

Dmitry E. Postnov

Editor

24–28 September 2018

Saratov, Russian Federation

Sponsored by

Russian Foundation for Basic Research (Russian Federation) • Russian Academy of Sciences (Russian Federation) • SPIE • OSA—The Optical Society • IEEE – The Photonics Society • Russian Technology Platform “The Medicine of the Future” (Russian Federation) • Russian Technology Platform “Photonics” (Russian Federation) • European Technology Platform “Photonics21” • EPIC – European Photonics Industry Consortium • LLC SPE “Nanostructured Glass Technology” (Russian Federation) • RME “INJECT” LLC (Russian Federation) • LLC SPE Nanostructured Glass Technology (Russian Federation) • TechnoInfo, Ltd. (Russian Federation) • BioVitrum, Ltd. (Russian Federation) • LLC SPE OESSP (Russian Federation)

Published by

SPIE

Volume 11067

Proceedings of SPIE, 1605-7422, V. 11067

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

Saratov Fall Meeting 2018: Computations and Data Analysis: from Nanoscale Tools to Brain Functions,
edited by Dmitry E. Postnov, Proc. of SPIE Vol. 11067, 1106701 · © 2019 SPIE
CCC code: 0277-786X/19/\$18 · doi: 10.1117/12.2532615

Proc. of SPIE Vol. 11067 1106701-1

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 SPIEDigitalLibrary.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 *Saratov Fall Meeting 2018: Computations and Data Analysis: from Nanoscale Tools to Brain Functions*, edited by Dmitry E. Postnov, Proceedings of SPIE Vol. 11067 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 1605-7422

ISSN: 2410-9045 (electronic)

ISBN: 9781510628243

ISBN: 9781510628250 (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 © 2019, 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/19/\$18.00.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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. 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

vii	<i>Authors</i>
ix	<i>Conference Committee</i>
xi	<i>Introduction</i>
xiii	<i>Organizers</i>

BRAIN DYNAMICS: ANALYSIS, MODELING, COMPUTATIONS

11067 02	Study of EEG characteristics during the observation of an educational material [11067-35]
11067 03	Detection of EEG oscillatory patterns corresponding to human concentration of attention with help of perceptron type artificial neural network [11067-37]
11067 04	Use of artificial intelligence for study of the visual perception [11067-38]
11067 05	Methods of assessing the degree of synchronization of multichannel EEG recordings [11067-39]
11067 06	Detection of proepileptic activity patterns in EEG of WAG/Rij rats [11067-40]
11067 07	Structural properties of brain functional network during Schulte table solving [11067-41]
11067 08	Mathematical simulation of coherent resonance phenomenon in a network of Hodgkin-Huxley biological neurons [11067-42]
11067 09	Artificial intelligence systems for classifying EEG responses to imaginary and real movements of operators [11067-43]
11067 0A	The investigation of synchronization between different areas of the brain in locomotor activity [11067-44]
11067 0B	The study of the correlation between EEG-EMG signals for the simple test "fist-rib"/"palm-fist" [11067-46]
11067 0C	Assessment method for tumorous objects volume from brain MR images [11067-182]
11067 0D	The personalised diagnosis program of functional maladjustment of the human organism [11067-1]
11067 0E	Adjustment of the cerebral and peripheral blood flow dynamics at the pre-stroke stage [11067-3]

- 11067 OF **Separation between real and imaginary movements from multichannel EEG signals** [11067-4]
- 11067 OG **Lymphatic or glymphatic systems: opposite conceptions in fundamental understanding of the brain clearing** [11067-32]
- 11067 OH **Dynamics of spectral indices of the heart rate variability and the photoplethysmogram and synchronization of the low-frequency oscillations in healthy subjects during the tilt test** [11067-8]

ADVANCED METHODS IN BIOCOMPUTING

- 11067 OI **Phase synchronization of human cardiovascular oscillations using photoplethysmography and laser Doppler flowmetry data** [11067-7]
- 11067 OJ **When Na modulates Ca: nonlinear interplay between Na/Ca-exchanger and IP₃-mediated Ca oscillations in astrocytes** [11067-19]
- 11067 OK **Diagnostic of gastric pre-cancer with complexity analysis** [11067-5]
- 11067 OL **Spectrophotometric vs. colorimetric analysis of mycobacterium tuberculosis population growth curves in resazurin assay** [11067-15]
- 11067 OM **Docking as a way to analyze biomedical data** [11067-9]
- 11067 ON **Estimating of the inertial manifold dimension for a chaotic attractor of complex Ginzburg-Landau equation using a neural network** [11067-11]
- 11067 OO **Using a neural network for prediction the effect of chemical compounds on plant growth** [11067-12]
- 11067 OP **Bistability promotes solitary states in ensembles of nonlocally coupled maps** [11067-13]
- 11067 OQ **Variational-statistical and spectral analysis of photoplethysmograms** [11067-20]
- 11067 OR **Emergence of macroscopic chimera states in multilayer multiplex network** [11067-34]
- 11067 OS **Molecular docking data preparation tool** [11067-6]
- 11067 OT **The study of the spatial distribution of non-invasive electromyographic signals on the front surface of a human hand arm during movement in the elbow joint** [11067-45]
- 11067 OU **Pattern formation in spatially distributed networks via spatially correlated preferential attachment** [11067-47]
- 11067 OV **The influence of low-intensity electromagnetic field on the process of self-organization of linker histone H1** [11067-250]

- 11067 0W **The use of theoretical and experimental methods of Raman spectroscopy in the determination of unsaturated fatty acids in vegetable oils** [11067-166]

COMPUTER-ASSISTED MICROCIRCULATION STUDIES

- 11067 0X **Computational study of occlusion-triggered responses in small vascular network** [11067-16]
- 11067 0Y **Recovery of endothelial function in microvessels in patients with peripheral artery disease (PAD) after conservative and surgery treatment** [11067-10]
- 11067 0Z **The role of the meningeal lymphatic in the brain clearing** [11067-28]
- 11067 10 **Modeling cellular parqu岸: endothelially mediated vascular signaling** [11067-14]
- 11067 11 **Light sheet microscopy of blood vessels in mouse brain in vivo** [11067-24]
- 11067 12 **Vascular mesh and diffusive bells: 2D modeling of blood-brain barrier leakage** [11067-25]
- 11067 13 **Optical monitoring of the meningeal lymphatic clearance after opening of blood-brain barrier** [11067-27]
- 11067 14 **Computational study of endothelial-mediated vascular responses at Y-bifurcation: when occlusion does not reduce the total flow** [11067-17]
- 11067 16 **Theoretical study of the blood stream in a tube in the presence of a steady-state magnetic field** [11067-30]

NANOSCALE TOOLS FOR BIOMEDICINE

- 11067 17 **Citrate-reduced Au nanoparticles vs. monodisperse spheres: extinction and dynamic light scattering measurements** [11067-125]
- 11067 18 **An influence of surface modification on the carbon nanoparticles photoluminescence** [11067-130]
- 11067 19 **Synthesis and SERS properties of Au@Au and Au@Ag nanomatryoshkas with embedded reporters** [11067-132]
- 11067 1A **SERS-platforms based on electrospun nanofibers with embedded silver nanoparticles** [11067-134]
- 11067 1B **Strategies to enhance the sensitivity of NaGdF₄:Yb-Tm based nanothermometers** [11067-149]
- 11067 1C **Comparison between ligand exchange methods for the quantum dots hydrophilization** [11067-150]

- 11067 1D **Optical properties of polydopamine-coated Au nanorods** [11067-190]
- 11067 1E **Luminescence properties of lanthanide upconversion nanoparticles for biomedicine**
[11067-168]
- 11067 1F **Synthesis and silanization of CdSeZnS/ZnS quantum dots with blue and green emission**
[11067-163]
- 11067 1G **Nanodiamond based complexes for prolonged dexamethasone release** [11067-174]
- 11067 1H **Optical properties of citric acid and ethylenediamine based carbon nanoparticles** [11067-164]
- 11067 1I **A novel centrifuge-based approach for tunable 2D layering of plasmonic nanoparticles (Best Poster Award)** [11067-180]
- 11067 1J **Fluorescence quenching of bioactive molecules by nanodiamonds** [11067-171]
- 11067 1K **High luminescent fluorophore synthesized at atmospheric pressure from citric acid and ethylenediamine** [11067-120]

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.

Abdurashitov, Arkady S., 0E, 0Z, 13
Agranovich, Ilana, 0K
Andreev, Andrey V., 08
Anishchenko, Vadim S., 0P
Antonova, E. M., 0W
Askarova, Adel Kh., 0C
Avdeeva, Elena, 1I
Avtomonov, Yuri N., 14
Bakal, Artem A., 1H, 1K
Berezin, K. V., 0W
Boccaletti, Stefano, 0U
Bockeria, Olga L., 0H
Borisova, Ekaterina, 0K
Brazhe, Alexey R., 0J
Brill, G. E., 0V
Bugueva, I. O., 0V
Burikov, Sergey A., 1E, 1G
Burov, Andrey M., 17, 1D
Chemeris, Nikolay K., 0I
Chernavina, M. L., 0W
Chukalina, T., 0G
Dogonadze, Marine Z., 0L
Dolenko, Tatiana A., 1E, 1G, 1J
Drozd, Daniil D., 1C, 1F
Duarte Torres, E. N., 0G, 0Z, 13
Dubrovsky, A., 0Z
Dvoretzky, K. N., 0W
Egorova, A. V., 0V
Fedorov, Pavel P., 1B
Fedosov, Ivan V., 1I
Frick, Peter, 0Y
Frolov, Nikita S., 02, 03, 09
Galushka, Victor V., 1A
Goryacheva, Irina Yu., 18, 1C, 1F, 1H, 1K
Grachev, Pavel V., 1B
Grechukhina, O. N., 0W
Gridnev, Vladimir I., 0H
Grinevich, Andrey A., 0I
Grishina, Daria S., 0F
Grubov, Vadim V., 02, 03, 06
Hramov, Alexander E., 05, 0F
Ishbulatov, Yurii M., 0H
Iskra, T., 0G, 0Z
Isupov, Igor B., 0Q
Karavaev, Anatoly S., 0H
Kartashov, M. V., 0W
Kettiger, Helene, 1G
Khalin, Andrey A., 0L
Khanadeev, Vitaly, 19
Khlebtsov, Boris N., 17, 19, 1D, 1I
Khlebtsov, Nikolay G., 17, 19, 1D, 1I
Khorovodov, Alexander, 0K, 0Z, 13
Kirsanov, Daniil V., 0R
Kiselev, Anton R., 0H
Klimova, Maria, 0G, 0K, 0Z
Kokorina, Alina A., 18, 1H, 1K
Komova, Nadezhda S., 1A
Kovalenko, Alexander V., 0M, 0O, 0S
Kryuchkov, Yu., 0A, 0B, 0T
Kulanin, Roman A., 02
Kuptsov, Pavel V., 0N
Kuptsova, Anna V., 0N
Kurkin, Semen, 09
Kurths, Ju., 0G
Kushneruk, Snezhana, 19
Kuznetsov, Sergey V., 1B
Lapinskiy, Kirill A., 1G
Lavrova, Anastasia I., 0L
Lichter, A. M., 0W
Litovka, Yuri V., 0C
L'vov, Alexey A., 0C
Makarov, Vladimir V., 07, 0U
Maksimenko, Vladimir, 04
Mamedova, Aysel, 0K
Manicheva, Olga A., 0L
Mironov, Sergey A., 0H
Mizeva, Irina, 0Y
Mohammad, Yasir Kh., 0E, 0F
Mordovina, E. A., 1H
Mulik, Alexander B., 0D
Namykin, Anton A., 12, 13
Nechaev, V. V., 0W
Nedajvozov, Vladimir O., 02
Novoselova, A. V., 0W
Parshakov, Aleksey, 0Y
Patsaeva, Svetlana, 1J
Pavlov, Alexey N., 0E, 0F, 0K
Pavlov, Anton M., 1A
Pavlova, Olga N., 0E, 0F, 0K
Pisarchik, Alexander N., 08
Pitsik, Elena, 09, 0U
Podtaev, Sergey, 0Y
Pominova, Daria V., 1B
Postnikov, Eugene B., 0L
Postnov, Dmitry E., 0J, 0V, 0X, 10, 12, 14
Postnova, Margarita V., 0D, 0M, 0O, 0S
Protasov, P., 07
Proydakova, Vera Yu., 1B

Pylaev, Timofey, 11
 Ratto, Fulvio, 17, 1D
 Rogatina, Kristina V., 10, 12
 Romanishkin, Igor D., 1B
 Rosenholm, Jessica M., 1G
 Runnova, Anastasiya E., 02, 04, 05, 07, 0A, 0B, 0F,
 0T
 Rusanova, Tatiana Yu., 1A
 Ryabova, Anastasiya V., 1B
 Rybalova, Elena V., 0P
 Safonov, Sergey V., 0O
 Salem, S. F., 16
 Samarskaya, Viktoriya O., 0D, 0S
 Sapelkin, Andrei V., 1K
 Saranceva, E., 0G
 Sarantseva, E. I., 0Z, 13
 Sarmanova, Olga E., 1E
 Semyachkina-Glushkovskaya, Oxana V., 0E, 0G,
 0K, 0Z, 11, 13
 Serdobintsev, Alexey A., 1A
 Serov, A. G., 0S
 Shatyr, Yulia A., 0D
 Shenderova, Olga A., 1G
 Shirokov, A. A., 0Z, 13
 Shiroky, A. A., 0S
 Shushunova, N. A., 13
 Shvartz, Vladimir A., 0H
 Sitnikova, Evgenia Yu., 06
 Skazkina, Victoria V., 0H
 Smirnov, V. V., 0W
 Sobolev, Aleksandr M., 1F
 Sroslova, Galina A., 0M, 0O, 0S
 Stiukhina, Elena S., 0X, 14
 Strelkova, Galina I., 0P
 Sukhorukov, Gleb B., 18, 1K
 Tankanag, Arina V., 0I
 Terskov, Andrey, 0K, 0Z
 Tikhonova, Irina V., 0I
 Toropova, Olga A., 0C
 Tsyupka, Daria V., 1F
 Tuchin, Valery V., 11, 16
 Ulesikova, Irina V., 0D
 Ushakova, O. V., 0V
 Vadivasova, Tatyana E., 0P
 Vavilina, S. A., 1H
 Verisokin, Andrey Yu., 0J, 10
 Vervald, Alexey, 1J
 Vervald, Ekaterina, 1J
 Verveiko, Darya V., 0J, 10
 Voronov, Valerii V., 1B
 Zakharevich, Andrey, 11
 Zatrudina, Rimma Sh., 0Q
 Zhuravlev, Maksim O., 04, 05, 07, 0A, 0B, 0T
 Zimina, Yulia A., 0M, 0O
 Zubareva, Nadezhda, 0Y

Conference Committee

Symposium Chair

Valery V. Tuchin, Saratov State University (Russian Federation) and
National Research Tomsk State University, (Russian Federation) and
Institute of Precision Mechanics and Control, RAS (Russian Federation)

Conference Chairs

Vadim S. Anishchenko Saratov State University (Russian Federation)
Nikolai G. Khlebtsov, Institute of Biochemistry and Physiology of Plants
and Microorganisms, RAS (Russian Federation), Saratov State University
(Russian Federation)
Dmitry E. Postnov, Saratov State University (Russian Federation)

Conference Program Committee

Boris P. Bezruchko, Saratov State University (Russian Federation)
Vladimir Bogatyrev, Institute of Biochemistry and Physiology of Plants and
Microorganisms, RAS (Russian Federation)
Lev Dykman, Institute of Biochemistry and Physiology of Plants and
Microorganisms, RAS (Russian Federation)
Dmitry Gorin, Skoltech (Russian Federation), Saratov State University
(Russian Federation)
Boris N. Khlebtsov, Institute of Biochemistry and Physiology of Plants and
Microorganisms, RAS (Russian Federation)
Alexander B. Neiman, The Ohio University (United States)
Dmitry E. Postnov, Saratov State University (Russian Federation)
Oxana V. Semyachkina-Glushkovskaya, Saratov State University
(Russian Federation)
Anatoly V. Skripal, Saratov State University (Russian Federation)
Olga V. Sosnovtseva, University of Copenhagen (Denmark)
Valery V. Tuchin, Saratov State University (Russian Federation) and
National Research Tomsk State University, (Russian Federation) and
Institute of Precision Mechanics and Control, RAS (Russian Federation)

Session Chairs

- 1 Conference on Computation Biophysics and Analysis of Biomedical
Data V
Dmitry E. Postnov, Saratov State University (Russian Federation)
Eugene B. Postnikov, Kursk State University (Russian Federation)
- 2 Workshop on Nonlinear Dynamics IX
Vadim S. Anishchenko, Saratov State University (Russian Federation)
Andrei V. Slepnev, Saratov State University (Russian Federation)

- 3 Conference on Nanobiophotonics XIV
Nikolai G. Khlebtsov, Institute of Biochemistry and Physiology of Plants and
Microorganisms, RAS (Russian Federation), Saratov State University
(Russian Federation)
Timofey E. Pylaev, Institute of Biochemistry and Physiology of Plants and
Microorganisms, RAS (Russian Federation)

Introduction

The Sixth International Symposium on Optics and Biophotonics (Saratov Fall Meeting; SFM18) was held in Saratov, Russian Federation, 24–28 September 2018 with over 500 participants from the Russian Federation, the United States, Canada, Europe, Asia, and Pacific Ocean countries. It covered a wide range of modern problems of fundamental and applied optics, laser physics, photonics, and biomedical optics.

This volume includes selected papers of the following Conferences and Workshops organized in the framework of the Symposium:

Conference on Computation Biophysics and Analysis of Biomedical Data V

Dmitry E. Postnov (*Chair*)

Workshop on Nonlinear Dynamics IX

Vadim S. Anishchenko (*Chair*)

Conference on Nanobiophotonics XIV

Nikolai G. Khlebtsov (*Chair*)

The volume began with a series of reports of non-invasive studies of brain activity, mainly through advanced methods for analyzing electroencephalograms. While the experimental method itself was de facto standard in modern experimental physiology, computer-based methods for processing data and recognizing patterns of electrical response of the brain in various situations continue to evolve. An additional impetus to such work gives practical focus on the development of computer-human interfaces. A whole range of specifically addressed problems presented in this section, including the analysis of brain activity when performing specific tasks (reading the training texts) or assessing the degree of synchronization as a marker of involvement in the process of various brain regions.

The next section was devoted to a topic that invariably accompanies the development of optical methods for analyzing blood flow. Namely, mathematical methods for studying the dynamics of blood flow and lymph flow, as well as vascular reactions of microcirculatory networks in response to various stimuli. In this group of works, those that devoted to the experimental study of lymph flow in the brain should be noted. This research topic attracts more and more attention since the lymphatic vessels in the brain were discovered very recently, in 2015.

The features of various research tasks stimulate the search for new, often unexpected methods of data analysis, such as analyzing phase synchronization or evaluating the measure of signal complexity. Such reports, heterogeneous in

the field of study, but similar in approaches used were combined into a section "Advanced Methods in Biocomputing". The contribution by E. Rybalova et al. "Bistability promotes solitary states in ensembles of nonlocally coupled maps" [11067-13], took the second prize in the competition of poster presentation among all SFM conferences.

In this volume, we devoted a special section "Nanoscale Tools for Biomedicine" to this rapidly growing field, which was well presented during Saratov Fall Meeting 2018. The studies reported in the section combine original experimental techniques with theoretical approaches that allow wide application both in biomedical diagnostics and in nano-material science. The contribution by Elena Avdeeva et al. "A novel centrifuge-based approach for tunable 2D layering of plasmonic nanoparticles" [11067-180], won the Best Poster Award of the Saratov Fall Meeting 2018.

This is the third (of three) volume of Saratov Fall Meeting 2018. The comprehensive information about the entire event can be found in the preface to the first volume entitled "Optical and Nano-Technologies for Biology and Medicine", edited by Elina A. Genina and Valery V. Tuchin.

On behalf of SFM18 organizers, the editor of this volume thanks all authors for their contributions to the Symposium, especially the plenary, invited and Internet lecturers for their exciting presentations. We are also grateful to all the sponsoring organizations and programs that efficiently supported the meeting: SPIE; OSA; IEEE - Institute of Electrical and Electronics Engineers; Russian Foundation for Basic Research; Russian Academy of Sciences; Government of the Russian Federation; European Technology Platform "Photonics21"; EPIC – European Photonics Industry Consortium; LLC SPE "Nanostructured Glass Technology" (Russian Federation); and RME "INJECT" LLC (Russian Federation); TechnoInfo Ltd. (Germany); BioVitrum Ltd. (Russian Federation); and LLC SPE OESSP (Russian Federation).

Dmitry E. Postnov

Organizers

Saratov State University (Russian Federation)
Research-Educational Institute of Optics and Biophotonics at Saratov State University (Russian Federation)
International Research-Educational Center of Optical Technologies for Industry and Medicine "Photonics" at Saratov State University (Russian Federation)
Institute of Biochemistry and Physiology of Plants and Microorganisms of the RAS (Russian Federation)
Institute of Precision Mechanics and Control of the RAS (Russian Federation)
Saratov State Medical University named after V.I. Razumovsky (Russian Federation)
Volga Region Center of New Information Technologies of Saratov State University (Russian Federation)
National Research Tomsk State University (Russian Federation)
ITMO University (Russian Federation)
Bauman Moscow State Technical University (Russian Federation)
Institute of Solid State Physics of the RAS (Russian Federation)
A.M. Prokhorov Institute of General Physics of the RAS (Russian Federation)
Research Center of Biotechnology of the RAS (Russian Federation)
Biochemical Photonics Committee of Chinese Optical Society (China)
SPIE Student Chapters of Saratov State University (Russian Federation), Bauman Moscow State Technical University (Russian Federation), Institute of Solid State Physics of the RAS, and Samara University (Russian Federation)
OSA Student Chapters Saratov State University (Russian Federation) and Bauman Moscow State Technical University (Russian Federation)