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Laser Physics and Photonics XVII; and Computational Biophysics and Analysis of Biomedical Data III

Vladimir L. Derbov
Dmitry E. Postnov
Editors

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2 Computational Biophysics and Analysis of Biomedical Data III
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Introduction

The 4th International Symposium on Optics and Biophotonics (Saratov Fall Meeting SFM16) was held in Saratov, Russian Federation, 27–30 September 2016 with over 500 participants from the Russian Federation, United States, Canada, Europe, Asia, and South Pacific countries. It covered a wide range of modern problems of fundamental and applied optics, laser physics, photonics, and biomedical optics.

This volume is the second part of the symposium proceedings and includes selected papers of the following conferences and workshops within the symposium:

Laser Physics and Photonics XVII
Vladimir L. Derbov (Chair)

Computational Biophysics and Analysis of Biomedical Data III
Dmitry E. Postnov (Chair)

The first part of the volume, devoted to laser physics and photonics, began with papers related to nonlinear optical media and the mechanisms of light-matter interactions. The innovative feature of the presented papers included a variety of novel materials and artificial media interacting with laser light, such as graphene, arrays of carbon nanotubes, nanoscale DLC film structures with field localization, and planar structures with surface plasmons, hyperbolic metamaterials, etc.

SFM16 traditionally gave the floor to discussions on the urgent problems of quantum optics. In this volume, papers related to quantum optics and nonclassical light mainly focused on generalizing the known quantum optical models, and the theoretical interpretation of fundamental quantum optical experiments. Particularly those related to the formation and application of entangled quantum states, which are expected to play a crucial role in the implementation of quantum computers.

Quite naturally, a variety of new objects for laser exposure and the implementation of light-matter interactions beyond the limits of classical optics (belonging to a more general field of photonics) require novel theoretical approaches, software development, and various computer simulations. The papers on computational approaches and numerical simulations in photonics demonstrated both the numerical studies of material objects interacting with laser light; and the conceptual approaches to electrodynamics used in photonics, showing promising progress in further computer experiments. Finally, a considerable part of the papers were devoted to beam and pulse propagation as well as image formation using laser sources of light.

The second part of the volume is devoted to computational biophysics and analysis of biomedical data. Computational issues naturally accompany any research involving data processing; in particular, the measurements of physiological parameters of living systems. The mastering of relevant algorithms and numerical methods is typically as important as the development of research hardware. Another important computer-based field was the mathematical modeling of processes not yet assessable by direct measurements.

In the framework of the conference, both issues were a matter of discussions and are presented in the papers of this volume. Some are contributed methods of general interest (see 103370X), but the typical trend was to develop highly specialized, problem-optimized methods for specific tasks of physiology and dynamics of living systems, particularly the analysis of human electroencephalography (EEG) data. Here, the problem of detection of rhythms in noisy and incomplete data was in the focus of discussions. Another important topic was the mathematical modeling of physiological processes in microcirculation that underlie the formation of signals obtained from the skin surface.

This is the second part of the Saratov Fall Meeting 2016 proceedings collection. *Saratov Fall Meeting 2016: Optical Technologies in Biophysics and Medicine XVIII*, edited by Elina A. Genina and Valery V. Tuchin, SPIE volume 10336, contains part one. The introduction in 10336 provides the reader with detailed and impressive information about the entire Saratov Fall Meeting 2016.

The editors of this volume thank all of the 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 this meeting, with special thanks to:

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