

Saratov Fall Meeting 2021

Computational Biophysics and Nanobiophotonics

Dmitry E. Postnov
Boris N. Khlebtsov
Editors

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Introduction

The Ninth International Symposium on Optics and Biophotonics (Saratov Fall Meeting, aka SFM21) was held in Saratov, Russia, 27 September – 1 October 2021 with over 500 participants from Russia, North and South America, Europe, Asia, and Africa. It covered a wide range of modern problems of fundamental and applied optics, laser physics, photonics, and biomedical optics, as well as related fields of material science.

The Proceedings of the Symposium are published in three SPIE volumes. The present volume includes selected papers of the following Conferences and Workshops organized in the framework of the Symposium:

Laser Physics and Photonics XXIII

Vladimir L. Derbov, *Chair*

Spectroscopy and Molecular Modeling XXII

Lev M. Babkov, Kirill V. Berezin, *Chairs*

Low-Dimensional Structures XI

Olga E. Glukhova, *Chair*

Electromagnetics of Microwaves, Submillimeter and Optical Waves XXI

Michael V. Davidovich, *Chair*

Due to the interdisciplinary character of many papers, there is no one-to-one correspondence between the Symposium sessions and the sections of the volume. The volume begins with the section devoted to problems of beam and pulse propagation, optical waveguides, and nonlinear optics. Most of papers presented deal with modeling numerical simulations, including matrix calculation of vector beams in anisotropic inhomogeneous structures, adiabatic propagation through a smooth transition between planar waveguides, dispersion interaction of 1D filaments, and frequency-modulated normal modes of electromagnetically induced transparency. Decay of photoinduced susceptibility under red light as well as optical and electronic properties of chalcogenide glasses are considered with regard to their use in tapered fibers as sensing elements for mid-IR spectroscopy.

The next section collects the papers of photonics and technology of low dimensional structures, bandgap structures, and metamaterials. Excitation of the broadband surface plasmon polaritons in planar metal-dielectric structures. Graphene and nonlinear graphene arrays are studied as sources of THz lasing, including cavities with graphene hyperbolic media. Unusual optical effects in dielectric mesoscale particles and propagation of supersonic excitations through

a forest of carbon nanotubes are investigated, as well as electronic and optical properties of layered Van der Waals heterostructures.

Studies of laser and photonic technologies in materials science and biology are a subject of the next section. The scope of presented papers is wide and includes both the diagnostic applications of lasers, e.g., interferometry of microdisplacement, and the material-processing applications, such as laser micromachining and microfabrication of photonic band gap structures, as well as related issues of the materials science.

The section on quantum optics and entangled states reports new theoretical results relevant to the state of art in the field and important for the development of quantum computers.

The section on molecular modelling and spectroscopy presents recent theoretical and experimental studies of spectra of molecules, molecular complexes and aggregates. New advances in the application of neural networks and machine learning methods to solving inverse spectroscopic problems are reported. Alongside with molecules, condensed-matter and nuclear systems are considered within the molecular modeling approach.

This is the second volume of *Saratov Fall Meeting 2021*. The preface to the first volume *Optical and Nano-Technologies for Biology and Medicine*, edited by Elina A. Genina and Valery V. Tuchin, provides the reader with thorough and impressive information about the entire event of Saratov Fall Meeting 2021.

The papers by the participants located at the meeting website: <https://sfmconference.org/sfm/sfm21/workshops/>, were available during the meeting and will be available for a whole year until the next meeting.

On behalf of SFM21 organizers, the editor of this volume thanks all authors for their contributions to the Symposium. We are also grateful to all the sponsoring organizations and programs that efficiently supported the meeting.

Vladimir L. Derbov