

ULTRASHORT PULSES AND ULTRAFAST PROCESSES IN PHYSICS

This issue is based on experimental and theoretical investigations in ultrafast physical processes, optics, condensed matter physics, presented at the annual International Conference on Ultrafast Optical Phenomena (UltrafastLight-2022), held in Moscow on October 03–07, 2022 at the P. N. Lebedev Physical Institute, Russian Academy of Sciences. The number of participants exceeded 170 people, more than half of them were young scientists, graduate students, students, who had a unique opportunity to present their results and discuss scientific problems with representatives of leading Russian and foreign universities, research centers and scientific organizations.

The articles in this collection deal with a wide range of current topics:

- interaction of ultrashort laser radiation with matter;
- ultrafast micro and nanoscale processes and phenomena in condensed media, ionized gases, conductors and dielectrics;
- femtosecond nonlinear optics, filamentation, laser generation of terahertz radiation, stimulated Raman scattering;
- ultra-short pulse spectroscopy and optical frequency metrology;
- physical processes and technology of laser recording with ultrashort pulses;
- exposure of ultrashort laser pulses to bacterial films.

School of young scientists „Quantum Laser Technologies for Broadband Spectral Identification of Optically Active Point Defect Complexes in Natural Diamonds for Industrial Tracing“, supported by the Russian Science Foundation (Grant №. 21-79-30063), highlighted an extensive layer of work devoted to the study of the impurity structure, plastic deformations, color centers in natural and synthetic diamonds, as well as some applications.

This issue covers immersion media for imaging the internal defect structure of diamonds, optimization of mid-IR radiation tracing while passing through crystalline media, spectral and temperature characteristics of color centers in diamonds and diamond particles, 3D visualization of plastic deformations and luminescence of nitrogen complexes in natural and synthetic diamonds, direct laser recording and annealing of birefringent structures in dielectrics, phase transitions, and self-organized structures in semiconductor films (GST225), photocatalytic decomposition of solutions on different surfaces, spectral transformation and nonstationary stimulated Raman scattering in crystals, amplification of short-wave subatomic pulses by means of electrons accelerated in laser plasma, interferometry of the spectral phase of ultrashort terawatt laser pulses, methods of spatial spectral filtration of the light field, modeling of multiphoton processes and helium ionization under the action of high intensity laser fields, resonant tunneling of electromagnetic signals in the presence of a static magnetic field, calculation of target dispersion for optimization of laser ion

acceleration, spectra of optical harmonics during laser sub-relativistic irradiation of a metal target, unipolar and quasi-unipolar electromagnetic pulses, analytical calculation of free electron current density at lower harmonics of laser pulse with elliptical polarization, increasing the efficiency of high-energy multi-particle ion generation in interaction with femtosecond laser pulses.

The editors of this issue offer an insight into interesting modern scientific and applied research from various fields of physics, which will undoubtedly be of interest to a wide range of readers of „Optics and Spectroscopy“.

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