

PHYSICS OF ULTRACOLD ATOMS AND THEIR APPLICATION https://doi.org/10.1070/QEL17588

Physics of ultracold atoms in Russia: current research

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Quantum technologies are one of the highest priority areas of research in the 2020s. The Russian government has supported a wide range of works in the areas of such roadmaps as 'Quantum Computing', 'Quantum Communications', and 'Quantum Sensors', aimed both at reducing the gap with world leaders and at achieving new frontiers in the field of basic and applied physics. At the same time, quantum technologies have already penetrated deeply into everyday life. The State-supported GLONASS programme for 2021–2030 provides for the development of advanced systems for forming a time scale with an uncertainty better than 10^{-17}, as well as of time and frequency transmission systems and wave-matter gravimeters and gradiometers. For the successful implementation of all these tasks, it is necessary to undertake deep research in the field of physics of ultracold atoms, which are widely used as a working body in quantum computers, high-precision atomic clocks, gravimeters and quantum sensors of other types. The development of this direction requires well-coordinated joint efforts of Russian researchers from various institutes and universities, as well as broad international cooperation.

Russian scientists are demonstrating significant progress in the research of ultracold atoms and their applications. In continuation of the previous special issues of Quantum Electronics [1–4], this issue contains papers selected by the organising committee and the editorial board of the journal, as well as the corresponding parts of the reports presented at the annual conference 'Physics of Ultracold Atoms – 2020', which was held online on 21–23 December 2020. In general, the conference programme included 44 reports of scientists from 39 Russian and foreign institutions (see the conference web page at https://www.isp.nsc.ru/quantum20/). The reports were divided into several thematic sections: optical frequency standards, laser cooling, quantum Fermi and Bose gases, and quantum information. Papers devoted to these topics are presented in this special issue.

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