	IVANOV, Andrei V. Candidate of Science
Research interests	✓ Investigation of the mechanisms of optical cooling of semiconductor nanostructures of various dimensions, as well as bulk crystals doped with rare-earth ions ✓ Investigation of the mechanisms of translational and internal optical cooling of mesoscopic objects levitating in ion and optical traps ✓ Investigation of optimizing the optical pumping of solid-state laser systems to reduce the thermal load of the active element using optical cooling mechanisms ✓ Investigation of optical nonlinear processes for the implementation of the Ising machine for solving combinatorial problems
Features of the PhD program	The proposed program provides for the participation a postgraduate student in research projects, interaction with foreign scientists and research centers, and financial support.
List of the supervisor's research projects (participation/supervision)	✓ Study of the effect of optical pumping on the operation of an erbium-ytterbium laser to obtain a thermally stabilized regime (principal investigator) ✓ Development of a functional scheme of the optoelectronic subsystem of a coherent Ising machine (investigator) ✓ Optical and electrical properties of hybrid nanomaterials based on carbon, semiconductor, and metal nanostructures (investigator) ✓ Laser cooling of ions and nanocrystals in non-linear radio frequency traps (investigator) ✓ New types of nonlinear optical and photoinduced kinetic processes in condense matter (investigator) ✓ Photoinduced phenomena in transparent materials: prebreak down excitation, optical switching, processes with participation of surface and impurity states (investigator)
List of potential thesis topics	✓ Translational and internal optical cooling of nanocrystals doped with ytterbium ions ✓ Optical cooling of semiconductor nanostructures of various dimensions using dynamic Stark shift ✓ Laser systems with optical cooling: diamond Raman laser, crystal lasers with rare earth ions ✓ Optical methods for solving combinatorial optimization problems in terms of the Ising model
Publications in the last five years	15 (Scopus / Web of Science / RSCI)
Key publications	1. Rybin V., Shcherbinin D., Semynin M., Gavenchuk A., Zakharov V., Ivanov A., Rozhdestvensky Y., Rudyi S. Novel nonlinear damping identification method: Simultaneous size,

	mass, charge and density measurements of a microparticle in quadrupole trap // Powder Technology - 2023, Vol. 427, pp. 118717
	2. Shcherbinin D., Rybin V., Rydyi S., Dubavik A., Cherevkov S., Rozhdestvensky Y., Ivanov A. Charged Hybrid Microstructures in Transparent Thin-Film ITO Traps: Localization and Optical Control // Surfaces - 2023, Vol. 6, No. 2, pp. 133-144
	3. Ivanov A.V., Perlin E.Y. Vibronic coupling induced by fast Rabi oscillations for kinetic energy control in free atom // Journal of Physics B: Atomic, Molecular and Optical Physics, 2020, Vol. 53, No. 20, pp. 205005. DOI: 10.1088/1361-6455/abb012
	4. Kosinskii I.V., Rozhdestvensky Y.V., Ivanov A.V. Thermally stabilized operating mode of erbium-ytterbium laser // Applied Optics, 2020, Vol. 59, No. 28, pp. 8997-9002. DOI: 10.1364/AO.403389
	5. Vovk T.A., Rudyi S.S., Ivanov A.V., Perlin E.Y., Rozhdestvensky Y.V., Translational cooling of doped nanocrystals by Raman pulses: Towards macroscopic quantum state // Physics Letters A. 2019. V. 383. P. 923-928. DOI: 10.1016/j.physleta.2018.12.016
Key IPs	✓ Certificate, # 2015612108 (Rospatent), February 12, 2015. Ivanov A.V., Rozhdestvensky Yu.V., Perlin E.Yu. PC program for calculating time dependence of temperature for Raman scheme of laser cooling of crystals doped by RE ions ✓ Certificate, # 2018664807 (Rospatent), November 22, 2018. Ivanov A.V., Perlin E.Yu., Rozhdestvensky Yu.V., Popov A.A. PC program for calculating temperature dependence of the pump radiation intensity for increasing the depth of optical cooling of a crystal doped with ytterbium ions ✓ Certificate, # 2018664976 (Rospatent), November 27, 2018. Kosinskii I.V., Ivanov A.V., Rozhdestvensky Yu.V. Software package for analytical and numerical calculation of the dynamics of a charged particle in a multipole radio frequency trap
Supervisor's specific requirements	For theoretical work ✓ good mathematical background and knowledge of classical and quantum mechanics ✓ ability to work in symbolic computing systems (preferably Wolfram Mathematica) For experimental work ✓ experience with spectroscopic instruments and laser systems ✓ ability to work with application programs for processing experimental results
Code of the subject area of the PhD program	1.3.6 Optics