

Dear members of the Admissions Committee,

For the last year I was fortunate enough to get acquainted with Skoltech, and in this respect I have an interest in the work and education in your university. I read on your website the information about the PhD Program in physics with great interest. In this motivational letter I would like to nominate my candidacy for the PhD Program in physics.

I completed of master's degree in Physics (Moscow State University), where the curriculum devoted to the intensive study of both theoretical and experimental disciplines. I believe that this specialty, which ensures the application of theoretical and experimental approaches to research of a higher level, is a great continuation for my training. The received educational training is a good basis for the PhD program. My master's degree includes courses of general and theoretical level in the areas of Quantum Mechanics, Optics, Thermodynamics, Statistical Physics, Solid-State Physics. From other hand, my education background includes Applied physics, the basics of Engineering Physics, and Experimental Methods of Physical Research.

Two research directions I am especially interested in are (1) application of numerical and computer algebra methods to problems in condensed matter physics and (2) quantum information theory.

I started working under the guidance of Oleg Lychkovskiy who is Senior Research Scientist from Center in Photonics and Quantum Materials of Skolkovo Institute for Science and Technology. I analyzed the geometry of the spaces of symmetric states of a number of few-spin systems and calculated ground state energies of spin lattices. As a result of the work done by our group, we wrote article “N. Il'in, E. Shpagina, F. Uskov, O. Lychkovskiy, A parameterization of constrained and unconstrained sets of quantum states, J. Phys. A: Math. Theor. 51, 085301 (2018)”.

Under the guidance of Oleg Lychkovskiy I wrote my graduate work “Spin systems $\frac{1}{2}$ with isotropic Heisenberg interaction: density matrix parameterization, variational principle, exact diagonalization.”. In connection with this work I wrote computer library for working with scalar and mixed products of Pauli matrices, and share it on github. My work took one of the 3rd places in competition of theses on faculty of physics of MSU.

In addition, I got the experience of participation in conferences. The conclusions of the article were presented by me on ICQOQ'2017 and 60th all-Russian scientific conference of MIPT as poster presentations. Thanks to the trust of Oleg Lychkovskiy I participate in his project “Quantum adiabaticity in many-body systems”. And also I was accepted to Skoltech in the position of research intern, which contributed to my educational background through a variety of public lectures and seminars held in Skoltech.

In believe that I fulfill the criteria for your program and I will be glad to take part in this and I hope I will join your academy in this session to achieve my educational and future career goals. Sincerely thank you for consideration.

Respectfully yours,

Filipp Uskov.