DEVELOPMENT OF THE INTENSE SOURCE OF LOW-ENERGY NEUTRONS

Moscow Institute of Physics and Technology (National Research University)

Degree or qualification is awarded: **PhD (Candidate of Science)**

Language of study: **English**
Mode of study:
Duration: **4 years**
Availability of free education: **yes**
Price: **375 000 RUB**

Programme webpage at the university website:
https://eng.mipt.ru/programs/development-of-the-intense-source-of-low-energy-neutrons/

Programme curator: **Denis Ustyuzhaninov**
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Entry requirements:

- Master's degree / equivalent in a related field
- B2 level of English
- Good track record of publications related to the topic of the intended research
- Strong research proposal 1,500 - 3,500 words

Research supervisor:
Alexander Nezvanov
PhD

Supervisor's research interests:
More than ten years ago, we discovered the intense reflection of low-energy neutrons from nanodispersed media. Since then, The FLNP JINR has been studying the interaction of neutrons with diamond nanoparticle powders. At the moment, there are no worldwide analogues of the nanostructured reflectors of very cold neutrons created by us. The accumulated knowledge and collaborations with industrial partners allow us to move on to creating intensive sources of such neutrons. Their appearance will give a new pulse to both neutron studies of condensed matter and the study of fundamental interactions.

Research highlights:
The planned research allows us to welcome candidates from different spheres: physicists, mathematicians, chemists, engineers, programmers, and so on. The estimated tasks include working together with ionizing radiation sources at mega-science installations with our colleagues from Institut Laue- Langevin (France), Heinz Maier-Leibnitz Zentrum (Germany), North Carolina State University (USA), etc. The research is supported by national and international scientific grants, including the CREMLINplus grant of the European Commission under Horizon 2020.

Supervisor's specific requirements:

- FOR PHYSICISTS: General knowledge in quantum mechanics;
- FOR MATHEMATICIANS: Experience in Monte Carlo methods for particle trajectories simulation or a specialized software;
- FOR CHEMISTS: A qualification in inorganic chemistry;
- FOR ENGINEERS: Experience in cryogenics, particle detection;
- FOR PROGRAMMERS: Common skills of software development.

All the requirements only reflect the directions of the
part of planned tasks in the frame of the research.

They are welcome, but not strictly mandatory.

Main publications:

- Bosak A., Dideikin A., Dubois M., Ivankov O., Lychagin E., Muzychka A., Nekhaev G., Nesvizhevsky V., Nezvanov A., Schweins R., Strelkov A., Vul' A. and Zhernenkov K., Materials 13, 3337 (2020).
- V. V. Nesvizhevsky, M. Dubois, Ph. Gutfreund, E. V. Lychagin, A. Yu. Nezvanov, and K. N. Zhernenkov, Phys. Rev. A 97, 023629 (2018).
- A. Yu. Nezvanov, Doctoral dissertation. Communauté Université Grenoble Alpes (2018).
- V. A. Artem'ev, A. Yu. Nezvanov, and V. V. Nesvizhevsky, Crystallogr. Rep. 61, 84 (2016).

Specializations within this programme