TUNNELING AND ANDREEV SPECTROSCOPY OF HIGH-TEMPERATURE SUPERCONDUCTORS

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: **full-time**
Duration: **4 years**
Availability of free education: **yes**
Price: **375 000 RUB**

Programme webpage at the university website:
https://eng.mipt.ru/programs/tunneling-and-andreev-spectroscopy-of-high-temperature-superconductors/

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:
Tatiana Kuzmicheva
PhD

Supervisor's research interests:
Experimental study of the superconducting order parameter and its temperature dependence in novel multiple-band superconductors using tunneling techniques. Estimation of the gap symmetry, coupling constants, partial band parameters from the experiment.

Research highlights:
We use a unique break-junction technique in order to create Josephson SIS and Andreev SNS nanojunctions (S – superconductor, N – normal metal, I – insulator). The spectroscopy of such junctions provides direct and high-resolution probe of the superconducting order parameter, its symmetry and temperature dependence, those crucial for understanding the mechanisms of unconventional superconductivity. Our studies are partially made in collaboration with Russian (MSU, IP SB RAS) and foreign (IFW Dresden, Bern University) institutions, and supported by Russian Science Foundation, Ministry of Higher Education and Science, Russian Foundation for Basic Research, and Russian Academy of Sciences.

Supervisor's specific requirements:

- Taken lecture courses: condensed matter physics, low-dimensional systems, superconductivity, tunneling effects in superconductors.
- Software: Office, OriginLab, LaTex; desirably Wolfram Mathematica, LabView.
- Desirable skills: radioelectronics, cryogen experiment.

Main publications:

- T.E. Kuzmicheva, et al., Phys. Rev. B 100, 144504 (2019).
- T.E. Kuzmicheva, et al., Phys. Rev. B 97, 235106 (2018).

- T.E. Kuzmicheva, et al., Phys. Rev. B 95, 094507 (2017).

Specializations within this programme