UNSTABLE STATES IN DISSOCIATION OF RELATIVISTIC NUCLEI IN NUCLEAR TRACK EMULSION

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: **no**
Price: **375 000 RUB**

Programme webpage at the university website:
https://eng.mipt.ru/programs/unstable-states-in-dissociation-of-relativistic-nuclei-in-nuclear-track-emulsion/

Programme curator: **Denis Ustyuzhaninov**
Tel.: **+7 (498) 713 91 70**
E-mail: interadmission@phystech.edu

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:
Pavel Zarubin
PhD, DSc

Supervisor's research interests:
Nuclear track emulsion (NTE) is used at the JINR Nuclotron in the BECQUEREL experiment http:// becquerel.jinr.ru/ to study the clustering in light stable and radioactive nuclei in the relativistic approach. The identification of the relativistic decays of 8Be and 9B pointed out the possibility to search for triples of α particles in the Hoyle state (HS) in the relativistic dissociation. 8Be and HS are considered as the simplest states of the α-particle Bose – Einstein condensate. The 6th excited state 0+ 6 of the 16O nucleus is considered as a 4α-condensate. These observations indicate the possibility of their manifestation of dissociation of medium and heavy nuclei. In addition, the 9B and HS nuclei can serve as bases in the nuclear molecules. It is hoped that the rapid progress in image analysis will give a whole new dimension to the use of the NTE method in the study of nuclear structure in the relativistic approach. The solution of the tasks set requires investment in modern automated microscopes and the reconstruction of NTE technology at a modern level. At the same time, such a development will be based on the classical NTE method.

Research highlights:
NTE allows one to study production of such ensembles in full with record angular resolution and identification He and H isotopes. Electronic experiments in this direction run into fundamental difficulties. Therefore, the NTE method retains its uniqueness as the composition analysis tool in the relativistic fragmentation cone. The experiment is based on own capabilities of developing NTE layers and measurements of nuclear interactions on microscopes keeping the "world monopoly" on information about multi-particle relativistic nuclear ensembles.

Supervisor's specific requirements:

- Motivation for MS or PhD degree in nuclear physics.
- Readiness for concentrated work using microscopes.

Main publications:

A status of research and relevant references are submitted to publication in the Topical issue of EPJ A on nuclear clustering https://arxiv.org/abs/2004.10277.

Specializations within this programme