

Experimental measurement of the level of transmutation and neutron flux density in subcritical nuclear reactors ADS

Project supervisor:

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Goal:

Currently, nuclear reactors of type III and III+ are dominating in the world. Safety considerations, as well as the increasing requirements, are a reason for intensive research of type IV reactors. One of the examples is the subcritical nuclear reactor controlled by a beam from the accelerator "ADS". The key issue in the design of such reactors is the knowledge of the neutron flux density values inside the reactor. The methods for determining the level of transmutation in subcritical reactors by using nuclear threshold reactions to determine the density of fast neutron fluxes will be considered. The goal will be to perform practical measurements using germanium detectors, calibrate and analyze the results.

Project description:

1. Discussion of the differences (advantages and disadvantages) of various types of nuclear reactors compared to subcritical accelerator-controlled reactors.
2. Participation in the experiment (provided it takes place during the practice), and visit to the experimental site and the accelerators site.
3. Measurements of the samples of gamma spectrum on the germanium detector and detector calibration procedure. Samples irradiated during the experiment.
4. Analysis of obtained gamma spectra (Deimos program) and identification of isotopes.
5. Determination of the isotope content in the samples.
6. Normalization of results and their comparison with other results - practical analysis of the results obtained.
7. Determination of neutron flux density with an energy of above 10 MeV.
8. Preparation of student's speech at the end of the practice and for the conference after that, and preparation of a publication together with the practice supervisor based on the obtained results.

Requirements for the students:

- The topic is addressed to students interested in nuclear experimental physics using large research equipment and/or nuclear energy
- Basic knowledge of nuclear physics
- Basic skills in using Excel program

Number of participants: up to 4 students.