

PhD proposition: Study of exotic nuclei interesting for applied and fundamental nuclear physics with Total Absorption Gamma Spectroscopy (TAGS)

The proposed PhD thesis will be developed in the frame of total absorption gamma spectroscopy research on exotic nuclei performed by the IFIC Valencia (Spain) and Subatech (France) collaboration team.

Total Absorption Gamma Spectrometry (TAGS) technique is based on the detection of deexcitation gammas produced subsequently to beta decay. The technique is the best available one to determine the beta strength, and it is thus a privileged tool to bring constraints to theoretical nuclear models. It allows in addition to avoid the Pandemonium effect, which arises from the difficulty to build decay schemes out of measurements performed with Germanium detectors in large Q-values beta decays.

The collaboration has two proposals accepted at the the JYFL facility (Jyväskylä-Finland) for the measurements of nuclei interesting for applied and fundamental physics. The selected nuclei are affected by pandemonium effect so the beta decay properties and nuclear structure of these nuclei are not well known. Depending on the nucleus, this can affect the calculation of decay heat in nuclear reactor, the reconstruction of reactor neutrino flux and spectra in neutrino physics experiment and the element production in nuclear astrophysics. One of these experiments should be done in 2022.

The selected candidate will participate to the preparation of the detector, the experiment and to the following data analysis. This analysis will allow to compute the beta feeding distribution and to deduce the subsequent beta strength toward the daughter nucleus, for each studied nucleus.

Candidates should have a Master of Science (MSc) in Physics or equivalent university studies with 300 ECTS finished by the time of the application and they should have good skills in analysis methods largely used in experimental physics such as C++ programming, the CERN/ROOT package, detector simulation with Monte-Carlo codes (mainly GEANT4).

The fellowship is funded by the SANDA (Supplying Accurate Nuclear Data for energy and non-energy Applications) European Project and the student will work in both IFIC and Subatech laboratories.

The candidate should send a CV, motivation letter, 2 recommendation letters (one from M2 internship tutor) and marks of last 3 university years to:

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before 13th of March 2022. The PhD will start around June 2022.

Key words: beta decay, gamma-ray spectroscopy, reactor physics, nuclear safety, Gamow-Teller strength, neutrino physics