Beta delayed neutron emission studies of exotic nuclei

Research Project / Research Group Description:
The gamma and neutron spectroscopy group at IFIC (CSIC-Univ. Valencia) has three main research lines: study of the beta decay of exotic nuclei using total absorption spectroscopy, study of the beta decay of exotic nuclei using 3He counters and the participation in the nTOF experiment.

The present research project is related to the study of very exotic nuclei using beta delayed neutron emission detection. The group has a leading role in the installation and use of the largest beta delayed neutron detector ever built for the study of exotic nuclei using He3 counters, the BRIKEN detector. This detector has been installed in a World leading installation RIKEN (Japan). Presently this installation provides the largest yield of the most exotic neutron rich nuclei in the World.

Beta delayed neutron emission is a form of decay that gradually becomes dominant when we move away from stability on the neutron rich side of the nuclide chart. As such, it provides first hand information of great relevance for nuclear structure and astrophysics, in particular for a better understanding of the astrophysical r-process, which is responsible for the creation (nucleosynthesis) of approximately half of the nuclei heavier than iron.

Job position description:
The applicant will participate in the preparation, realization and analysis of experiments related to the detection of beta delayed neutrons at RIKEN using the detector BRIKEN. Presently the IFIC group is leading several of the already accepted experimental proposals aiming for the study of the beta delayed emission of the most exotic nuclei accessible today in medium light and intermediate heavy nuclei (regions A~50, A~70, A~110 and A~150).

The analysis of these experiments will provide for the first time half-lives and beta delayed neutron emission probabilities for the studied most exotic nuclei.

The research work will provide the candidate with a solid preparation in nuclear instrumentation techniques: neutron detection, gamma-ray detection, implantation and decay detectors, in-flight ion separators, as well as in state-of-the-art data analysis techniques using tools such as ROOT. The candidate will learn also the use of advanced simulation Monte Carlo techniques, all of this in an international competitive environment. The candidate should have a medium/high level in English, computer skills, travel disposition and the interest to work in a dynamic experimental group.

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"la Caixa" Foundation
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 713673.