NUSTAR Seminar

Oscar Hall

University of Edinburgh

Wednesday, November 03 2021 at 04.00 pm

Zoom Link

https://gsi-fair.zoom.us/j/99001211778

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Beta-delayed neutron emission with BRIKEN

The rapid-neutron capture process is responsible for the production of around half the elements heavier than iron. Characterised by rapid neutron captures on seed nuclei takes place in explosive astrophysical scenarios. The accurate modelling of the nucleosynthesis processes taking place in such scenarios requires precise nuclear input data, including nuclear masses, beta-decay half-lives, and beta-delayed neutron emission probabilities. A challenge here is that for the exotic neutron-rich nuclei that are of importance to the r-process, relatively few properties are known experimentally. There is, therefore, high demand for experimental measurements along the r-process path which can be used as inputs in r-process calculations. In addition to being used as inputs in nucleosynthesis calculations, experimentally measured values act as reference points for the development of theoretical models in regions far from stability.

The BRIKEN project aims to measure the beta-delayed neutron emission probabilities (P_n values) of nuclei near and along the r-process path. To do this the BRIKEN neutron counter, the world's largest system of its kind for the detection of beta-delayed neutrons, is utilised alongside the Advanced Implantation Detector Array (AIDA), a state-of-the-art charged-particle spectroscopy array developed at the University of Edinburgh. Using these systems together the Pn values of many neutron-rich nuclei can be measured simultaneously with high precision.

This talk will introduce the BRIKEN neutron counter array and the Advanced Implantation Detector Array (AIDA), and the methods used to measure P_n values. In particular, it will focus on measurements performed on nuclei at the N=82 shell closure, a region that has been highlighted as being important for the production of the A=130 peak. These measurements have so far resulted in the measurement of 33 P_n values for nuclei southwest of ^{132}Sn, 16 of which have been measured for the first time. These P_n values will be compared to state of the art nuclear theories and their implications for the r-process discussed.

Convener: T. Dickel
Secretary: R. Krause / D. Press
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