DNP19-2019-000574

Abstract for an Invited Paper
for the DNP19 Meeting of
the American Physical Society

Beta-Delayed Neutron Measurements for R-Process Isotopes with BRIKEN[1]

ALFREDO ESTRADE[2], Central Michigan University

Most of the unstable isotopes produced during the rapid neutron capture process (r-process) are expected to be β-delayed neutron emitters; a decay mode that populates neutron-unbound states in the daughter nuclei. The probability for β-delayed neutron emission is a key input for models of r-process nucleosynthesis in neutron star mergers and other astrophysical sites. β-delayed neutrons contribute to the density of free neutrons in the astrophysical environment, in particular during the late stages of the neutron capture phase of the r-process, and this decay mode also affects the final abundance of the elements produced once unstable isotopes have decayed to β-stability. A significant number of nuclei along the path of the r-process are finally within reach of decay experiments, thanks to a new generation of laboratories designed to produce intense beam of neutron-rich isotopes coupled with sensitive experimental setups. Beta-delayed neutrons at RIKEN (BRIKEN) is a setup for β-decay measurements at the Radioactive Isotope Beam Factory (RIBF) in RIKEN, Japan, which achieves a high detection efficiency with a state-of-the-art neutron detector based on ^{3}He proportional counters. Since the first BRIKEN experiment, in 2017, our collaboration has studied β-delayed neutron emission in regions of the nuclear chart extending from cobalt (Z=27) to gadolinium (Z=64). The experiments covered regions that affect salient features of the r-process: the A=130 and the rare-earth elements abundance peaks. I will present the program of experiments of the BRIKEN collaboration, and discuss some of the first results and their impact in r-process models.

[1]This work was supported in part by the National Science Foundation grant PHY-1714153 and PHY-1430152, and by the Office of Nuclear Physics, U. S. Department of Energy under contract DE-AC05-00OR22725

[2]For the BRIKEN collaboration