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The BRIKEN experimental campaign: Beta-delayed neutron measurements at RIKEN for nuclear structure, astrophysics, and applications (I)

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The study of the beta-decay properties in the very neutron-rich region is required for a better understanding of the elemental abundances of heavy elements in the Universe. An important decay mechanism in this region includes beta-delayed neutron emissions when the Q-beta value is larger than the neutron separation energy. Thus, by improving the knowledge about these decays we can better understand the freeze-out path to stability of astrophysical nucleosynthesis processes such as the r-process and the particularities of the nuclear structure of the involved species.

Since 2009 several experiments started to enhance this field and provided new neutron branching ratios in different regions. Recently an international cooperation of more than 20 institutions allowed the design and commissioning of the most efficient 3He-based neutron detector within the BRIKEN campaign at RIKEN (Japan). The Radioactive Beam Factory of RIKEN allows to reach unexplored regions of isotopes which were not accessible so far and separate and identify the species of interest by the BigRIPS spectrometer. BigRIPS together with a state-of-the-art implantation detector and two HPGe clover detectors complete the experimental setup. Promising results are being expected from the first measurements performed in 2017, which covered more than 230 beta-delayed neutron emitters between 64Cr up to 151Cs. Many of them were implanted for the first time with enough statistics to determine their half life and neutron branching ratios.

This talk will give an introduction of the type of RIB facilities able to produce neutron rich isotopes of interest for these measurements, as well as a detailed explanation of the BRIKEN setup [1], performed measurements, and the challenges of this experimental campaign, in which almost all of the previously measured beta-delayed neutron emitters will be remeasured, and approximately 150 new isotopes will be added to the current list of 298 known neutron emitters. Also multiple neutron emitters will be measured.

[1] A. Tarifeño-Saldivia et al., Journal of Instrumentation 12 (2017) P04006.

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