Contribution ID: **48** Type: **Invited talk**

Beta-delayed neutron emission probability measurements for r process studies at RIKEN RIBF

Tuesday, 20 June 2017 17:40 (30 minutes)

About 50% of the isotopes heavier than iron are synthesized in the so-called astrophysical r-process [1]. During the explosion of a type II supernovae or a Neutron star merger exotic isotopes, closed to the drip line are formed via rapid neutron capture reactions [2]. These, very neutron-rich nuclei emit neutrons after the beta-decay when the decay Q-value is larger than the neutron separation energy of the daughter nucleus. These beta-delayed neutrons play an important role during freeze-out in redistributing the initial isotopic distribution of matter and thus smoothing the final abundance pattern as observed in the solar system [3]. Recent studies have also highlighted that freeze-out is not instantaneous and neutron capture during this phase is responsible for some of the main features of the r-process abundance pattern such as the rare earth peak (REP) at A~160 [4] (and references therein).

Last year the BRIKEN neutron detector has been built at the BigRIPS separator at RIKEN Nishina Center (Wako-shi, Japan) to study the decay properties of the most neutron-rich nuclei produced through the fragmentation of high intensity 238U primary beam. The BRIKEN detector consists of the world largest array of 3He counters [5], the most advanced implantation array, AIDA [6] and clover-type HPGe detectors and, therefore, it's suitable to measure the half-life and the beta-delayed neutron emission probability of the isotopes located on the r-process path.

The aim of this presentation is to introduce the scientific program of the collaboration and show the results of the first measurement carried out in the Al-Mg region in 2016. Furthermore, the experimental details of the first campaign performed in Spring 2017 will be presented, too.

[1] F.-K. Thielemann et al., Prog. Part. Nucl. Phys. 66 346 (2011);
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[5] A. Tarifeno-Saldivia et al., https://arxiv.org/abs/1606.05544, IOP Jour.of Instr. (2016);
[6] C. Griffin et al., Proceedings of Science (NIC XIII) 097 (2014);

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Session Classification: r-process 3

Track Classification: Explosive scenarios in astrophysics: observations, theory, and experiments