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Experimental studies of neutron-rich nuclei around N = 126 at KEK isotope separation system

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The lifetimes of the waiting point nuclei at N = 126 of the rapid neutron capture process (r-process) are important parameters to investigate the astrophysical environment of the r-process. However, the difficulty in the production of those extremely neutron-rich nuclei makes their experimental studies unfeasible. Therefore, the theoretical nuclear models play crucial roles in the simulation of the r-process nucleosynthesis. The experimental studies of lifetimes, masses and nuclear structures of the neutron-rich nuclei around N = 126 provide significant inputs to those theoretical models to improve their predictability for the waiting point nuclei.
We are developing KEK Isotope Separation System (KISS) at RIKEN RIBF facility to produce and separate those neutron-rich nuclei for the measurements of the beta-gamma spectroscopy, the lifetime and the mass [1-2]. The multi-nucleon transfer (MNT) reactions between the Xe-136 beam and the Pt-198 target are employed to produce those nuclei. The MNT reactions were studied at GANIL to investigate their feasibility to produce the neutron-rich nuclei around N = 126, demonstrating its promising potential [3-4]. The KISS consists of an argon-gas-cell-based laser ion source and an isotope separation on-line system to extract a single species of the reaction products. The detector system composed from a multi-segmented gas counter [5] and high-purity germanium detectors makes it possible to perform their beta-gamma spectroscopy and laser ionization spectroscopy.
In this presentation, we will report the present status of the KISS including the recent experimental results of nuclear spectroscopy and the future plan.
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