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Study of Gamow-Teller states in neutron-rich ^{11}Li

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The (p, n) reaction at intermediate energies (about 200MeV) is a very effective tool to investigate spin-isospin excitations in nuclei. Gamow-Teller (GT) states is one of the most basic spin-isospin excitations. GT states are changed spin and isospin of the nuclei by one unit without being changed the orbital angular momentum from the initial quantum state. Fermi states are also one of the most basic spin-isospin excitations. Fermi states occurs only between Isobaric Analog states (IAS), that only change isospin by one unit from the initial quantum state. These excited states appear such as Gamow-Teller Resonance (GTR) or IAS peaks and are the basic process involving spin and isospins. The energy difference between the peak of GTR and the peak of IAS is very sensitive for the neutron-proton asymmetry. While the research on the behavior of the neutron-proton asymmetry has been studied in stable nuclei, the research on unstable nuclei with the large asymmetry such as neutron-rich nuclei has not been well studied.

^{11}Li is a neutron-rich nucleus having very large asymmetry such as $N - Z/A = 0.45$. We investigated the spin-isospin excitation of ^{11}Li using the (p, n) reaction of ^{11}Li at Radioactive Isotope Beam factory (RIBF) in RIKEN. Because high Q value of ^{11}Li opens various decay channels after the (p, n) reaction, it is difficult to comprehensively study all decay channels in beta decay. At RIBF, it is possible to measure multiple particles simultaneously using Superconducting Analyser for MUti-particle from Radio Isotope beam (SAMURAI). we selected decay channels and comprehensively studied various decay channels for ^{11}Li. As a result, we got the excitation energy spectrum of ^{11}Be which seems to contain GTR around 18 MeV. It is the first time that GTR was observed by comprehensively measuring the (p, n) reaction of the neutron-rich ^{11}Li with high Q values.

In this presentation, I will talk about preliminary results in the ^{11}Li(p, n) reaction.

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