

The search for double Gamow-Teller giant resonance using double charge exchange reaction at RIBF

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Understanding the nature of two sequential occurrences of the Gamow-Teller transition is important not only for the nuclear structure but also for the particle physics. However, there is little experimental information about the double Gamow-Teller transition at present. Especially, although the existence of a giant resonance state in double Gamow-Teller transition (Double Gamow-Teller Giant Resonance, DGTGR) has been theoretically predicted since 1989, it remains unobserved experimentally. The experimental data of DGTGR is suggested to restrict a value of a nuclear matrix element for the neutrinoless double beta decay, which is essential for the determination of the neutrino mass from the lifetime of the neutrino-less double beta decay.

A possible means to observe DGTGR is a heavy-ion double charge exchange reaction. We performed an experiment at RIBF using the (^{12}C , $^{12}\text{Be}(0_2^+)$) reaction. In this experiment, primary beam of ^{12}C impinged reaction targets placed at F0 of BigRIPS separator. We used BigRIPS as a high precision spectrometer by measuring tracks of ejected particles at dispersive focal plane, F5.

We will see an overview of the experiment in the talk.

Experimental nuclear physics

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Theoretical nuclear physics

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