— 第895回九大原子核セミナー —

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演題：Gamow-Teller transitions from ^{56}Ni

日時：2月16日 (木) 16:00〜

場所：理学部 物理第三講義室 (理学部2号館2階2249室)

概 要

The Gamow-Teller (GT) transition is the simplest excitation mode of atomic nuclei reflecting the interplay between spin and isospin degrees of freedom and, therefore, the transition strength is a key quantity for understanding the nuclear structures and interactions. Furthermore, electron-capture (EC) and beta-decay, which play important roles in type-II and typeIa supernovae, occur through the GT transitions. Thus, their strengths are also extensively studied to reliably estimate the weak-interactions rates. Experimentally, a powerful probe to study GT transitions has been provided by the charge-exchange reactions at intermediate energies such as the (p,n), (^{3}He,t) rections. They can selectively excite the GT transitions in a wide excitation energy region. Until recently, however, such studies have been restricted to stable nuclei, or to a few low-lying states in a limited number of light unstable nuclei, because of difficulties in inverse-kinematics measurements with rare isotope (RI) beams. In this talk, we present a new experimental technique to measure the (p,n) reaction on any unstable nuclei and up to any excitation energy region, and its first application to study the GT transitions from ^{56}Ni via the (p,n) reaction at 110 MeV/u in inverse kinematics. ^{56}Ni is produced in large abundances during the pre-explosion phase of core-collapse supernovae and considered to be as one of the most important contributors to the change in the electron-to-baryon ratio in core-collapse supernovae. In addition, to study the GT transition in ^{56}Ni serves as a stringent test of the effects of the $N = Z = 28$ core not being inert on GT transitions for a large number of nearby nuclei in the Fe region. In this first study, a newly developed Low-Energy Neutron Detector Array (LENDA) was used in combination with the S800 spectrometer. To employ thus developed experimental method in conjunction with a high-intensity RI beam provided by RIKEN RI beam facility will provide a unique opportunity to study exotic properties of unstable nuclei near the proton/neutron drip lines through their GT transitions.

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