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Measurement of Gamow-Teller transitions from ^{56}Ni[1]

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Electron-capture (EC) and β-decay play important roles in type-II and type-Ia supernovae. They occur through the Gamow-Teller (GT) and Fermi transitions in nuclei, which are 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, such studies have been restricted to stable nuclei because of difficulties in inverse-kinematics measurements with rare isotope beams. In this talk, we present the first study with a rare isotope using the ^{56}Ni(p,n)^{56}Cu reaction at 110 MeV/u in inverse kinematics with a newly developed Low-Energy Neutron Detector Array (LENDA) in combination with the S800 spectrometer. ^{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.

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