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Nuclear structure made clear by Gamow-Teller transitions

Gamow-Teller (GT) transitions are caused by the sigma; tau; operator. Therefore, they reflect the uniqueness of nuclei that consist of two types of Fermions "protons and neutrons" with "spin-degree" of freedom. In addition, GT transitions are the most common nuclear weak transitions that are active all over the Universe. Most direct information on GT transition strength B(GT) can be derived from beta-decay measurements, but they cannot access highly excited states. In the 1980s, it was found that p,n) charge-exchange (CE) reactions at intermediate energies (E_p > 100 MeV) and 0-degrees are sensitive to the sigma; tau; response of nuclei. Thus, they became the break through against the Q-value limitation in the beta-decay study. In the late 1990s, (³He, t), CE reaction at 0-degrees was introduced, in which a magnetic spectrometer was used for the analysis of tritons. By the realization of beam matching conditions for the high-dispersive beam line WS course and the Grand Raiden spectrometer, high energy-resolutions of 30 keV or even better were achieved at the incoming ³He energy of 140 MeV/nucleon. The overview of the study of GT transitions at RCNP, Osaka [1] are presented for p-shell, sd-shell, pf-shell, and also for heavier mass A nuclei.We see that they are the transitions with full of personality.

[1] Y. Fujita, B. Rubio and W. Gelletly, Prog. in Part. and Nucl. Phys. 66, 549 (2011).

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