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(t,^{3}He) and (^{3}He,t): complementary probes of spin strength for astrophysics and double beta decay.[1]

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Nuclear charge-exchange (CE) experiments at intermediate energies (E$\sim$100-400 MeV/nucleon) have long been recognized as tools to study the isovector (spin) response of nuclei. The importance of increasing our understanding of collective isovector giant resonances is manifold. Fundamental topics, such as the isovector part of the nucleon-nucleon force and the symmetry part of the nuclear equation of state can be addressed. At the same time, results from CE experiments (in particular the excitation of Gamow-Teller and dipole resonances) are vital for validating theoretical weak transition rates that are input for stellar evolution codes. Furthermore, the accurate knowledge of charge-exchange matrix elements plays an important role in understanding neutrinoless double-beta decay ($0\nu\beta\beta$) and with the current efforts devoted to the experimental search of signals of $0\nu\beta\beta$ there is a strong need to pursue the measurements and reduce the uncertainties in the extraction of these matrix elements. At the NSCL, the (t,^{3}He) charge-exchange reaction at 115 MeV/nucleon has been developed to address these physics issues. It provides an important addition to existing probes in the (n,p)-direction [mainly (n,p) and (d,^{2}He)] since its mirror [(^{3}He,t), i.e. (p,n)-type] can be studied at similar beam energies at RCNP, Japan and in both directions good energy resolutions can be achieved. Since the reaction mechanisms of (t,^{3}He) and (^{3}He,t) are similar, it is possible to understand and reduce uncertainties in the extraction of the structure information. In the presentation, the status of the (t,^{3}He) program and its connection to the (^{3}He,t) experiments will be given.

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