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Determination of GT + Strength and its Astrophysical Implications

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Charge-exchange isovector collective modes have been studied extensively in the last four decades. The Gamow-Teller (GT) resonance is the most studied because GT transitions, aside from their interest from the nuclear structure point of view, play very important roles in various phenomena in nature [1]. In nucleosynthesis, the beta-decay of nuclei along the s- and r-processes determine the paths that these processes follow and the abundances of the elements synthesized.
In supernova collisions, GT transitions are of paramount importance in the pre-supernova phase where electron capture occurs on neutron-rich fp-shell nuclei at the high temperatures of giant stars. Electron capture is mediated by GT transitions. Electron capture removes the electron pressure that keeps the star from collapsing precipitating a cataclysmic implosion followed by a huge explosion throwing much of the star material into space and leaving a neutron star or black hole behind [2,3]. Also, the charge-exchange isovector spin giant monopole resonance(IVSGMR) and isovector spin giant dipole resonance (IVSGDR) have been discovered and have been studied in a few nuclei. Their macroscopic as well as microscopic properties have been determined [4,5]. In this talk, I will concentrate on measurements of GT + strength via the (d, 2 He) reaction.

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Experimental study on nuclear physics

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