Nuclear Theory

Uncertainties in modeling low-energy neutrino induced reactions on iron group nuclei

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Charged-current neutrino-nucleus cross sections for 54,56Fe and 58,60Ni are calculated and compared using frameworks based on relativistic and Skyrme energy density functionals, and the shell model. The current theoretical uncertainties in modeling neutrino-nucleus cross sections are assessed in relation to the predicted Gamow-Teller transition strength and available data, multipole decomposition of the cross sections, and cross sections averaged over the Michel flux and Fermi-Dirac distribution. Employing different microscopic approaches and models, the DAR neutrino-56Fe cross section and its theoretical uncertainty are estimated: <sigma>_th=(258+-57) 10^{-42} cm^2, in very good agreement with the experimental value: <sigma>_exp=(256+-108+-43) 10^{-42} cm^2.

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