Realistic Spectral Function Model for Charged-Current Quasielastic-Like Neutrino and Antineutrino Scattering Cross Sections on ^{12}C

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A detailed study of charged current quasielastic neutrino and antineutrino scattering cross sections on a ^{12}C target with no pions in the final state is presented. The initial nucleus is described by means of a realistic spectral function $S(p, \mathcal{E})$ in which nucleon-nucleon correlations are implemented by using natural orbitals through the Jastrow method. The roles played by these correlations and by final-state interactions are analyzed and discussed [1–4]. The model also includes the contribution of weak two-body currents in the two-particle two-hole sector, evaluated within a fully relativistic Fermi gas. The theoretical predictions are compared with a large set of experimental data for double-differential, single-differential and total integrated cross sections measured by the MiniBooNE, MINERνA and T2K experiments. Good agreement with experimental data is found over the whole range of neutrino energies. The results are also in global good agreement with the predictions of the SuperScaling Approach (SuSA), which is based on the analysis of electron-nucleus scattering data, with only a few differences seen at specific kinematics.

References

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