Charge-Current and Neutral-Current Quasielastic Neutrino(Antineutrino) Scattering on ^{12}C with Realistic Spectral and Scaling Functions

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Results of calculations of charge-current (CC) [1] and neutral-current (NC) [2] quasielastic (anti)neutrino scattering cross sections on ^{12}C target are presented. They are obtained using a realistic spectral function $S(p, \mathcal{E})$ [2] that gives a scaling function in accordance with the (e, e') scattering data. The spectral function accounts for the nucleon-nucleon correlations by using natural orbitals from the Jastrow correlation method and has a realistic energy dependence. In the calculations the standard value of the axial mass $M_A = 1.032$ GeV is used.The role of the final-state interaction on the spectral and scaling functions, as well as on the cross sections is accounted for. Our results in the CC case are compared with those from other theoretical approaches, such as the Superscaling Approach (SuSA) and the relativistic Fermi gas (RFG), as well as with those of the relativistic mean field (RMF) and the relativistic Green's function (RGF) in the NC case. Based on the impulse approximation our calculations for the CC scattering underpredict the MiniBooNE data but agree with the data from the NOMAD experiment. The NC results are compared with the empirical data of the MiniBooNE and BNL experiments. The discussion includes the possible missing ingredients in the considered theoretical methods (see also [4]).

References

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