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

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Charge-current (CC) and neutral-current (NC) quasielastic (anti)neutrino scattering cross sections on ^{12}C target are analyzed using a realistic spectral function $S(p, \mathcal{E})$ that gives a scaling function in accordance with the (e, e') scattering data. The spectral function accounts for the nucleon-nucleon correlations and has a realistic energy dependence. The standard value of the axial mass $M_A = 1.03$ GeV is used in the calculations. 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 an improved version of the SuperScaling Approach (SuSA), called SuSAv2, as well as with those of the relativistic mean field and the relativistic Green's function in the NC case. Theoretical predictions including both the QE and the 2p-2h meson exchange currents (MEC) contributions are in good accord with the data in most of the kinematical situations explored in the MiniBooNE and Minerνa experiments. The NC results are compared with the empirical data of the MiniBooNE and BNL experiments. The possible missing ingredients in the considered theoretical methods are discussed.