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# Charged-current quasielastic (anti)neutrino cross sections on $^{12}$C with realistic spectral functions including meson-exchange contributions

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We present a detailed study of charged-current quasielastic (anti)neutrino scattering cross sections on a $^{12}$C target obtained using a spectral function $S(p, calE)$ that gives a scaling function in accordance with the electron scattering data. The spectral function accounts for the nucleon-nucleon (*NN*) correlations, it has a realistic energy dependence and natural orbitals (NO's) from the Jastrow correlation method are used in its construction [1-3]. The results are compared with those when *NN* correlations are not included, namely harmonic-oscillator single-particle wave functions are used instead of NO's. A comparison of the results with recent experiments spanning an energy range from hundreds of MeV up to 100 GeV, as well as to results from the superscaling approach, which is based on the analysis of electron-nucleus scattering data and has been recently improved with the inclusion of relativistic mean field theory effects. The contribution of two-particle two-hole meson-exchange currents on neutrino-nucleus interactions is also considered within a fully relativistic Fermi gas. The results show a good agreement with the experimental data over the whole range of neutrino energies.

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