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Meson-exchange currents in quasielastic electron and neutrino scattering in a generalized superscaling approach

A method that enables the consistent inclusion of meson-exchange currents (MEC) within the framework of the superscaling analisys with relativistic effective mass will be presented. We use a novel definition of the single nucleon tensor, defined as the mean value of the single-nucleon responses by averaging with an energy distribution n() [1]. This single nucleon prefactor is obtained from the 1p-1h matrix element of the OB current combined with the two body current. The averaging definition is extended beyond the scaling region of the ψ variable characteristic of the Fermi gas modifying the momentum distribution through a smeared Fermi distribution [2].

In the generalized scaling analysis, the selected QE data generate a band with scatter of 20% at the maximum (highlighting the extent of scaling violation) that will be parametrized using a simple function f $(\psi*)*$.

Through the inclusion of MEC, we conducted a comparative analisys of the 1p-1h response functions within the context of the RFG, RMF and SuSAM $*$ models. These responses can be expressed in a factorized way as the product of the averaged single nucleon multiplied by the scaling function. A reduction in the transverse response is observed, which is in accordance with previous calculations [3][4].

In this manner, the 1p-1h cross section including MEC is calculated and compared with the calculation without MEC and the experimental data [5][6]. Our examination shows that in the low momentum limit, the predictions of the relativistic model align with those of the non-relativistic model in Fermi gas. The formalism can be extended to calculate the 1p-1h neutrino nuclear responses by including the meson exchange currents using the models already proposed in electron scattering.

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