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Superscaling analysis of inclusive electron and (anti)neutrino scattering within the coherent density fluctuation model

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The experimental data from quasielastic electron and (anti)neutrino scattering on ^{12}C are reanalyzed in terms of a new scaling variable ψ^* suggested by the interacting relativistic Fermi gas with scalar and vector interactions, which is known to generate a relativistic effective mass for the interacting nucleons. We construct a new scaling function $f^{\mathrm{QE}}(\psi^*)$ for the inclusive lepton scattering from nuclei within the coherent density fluctuation model (CDFM). The latter is a natural extension of the relativistic Fermi gas model to finite nuclei. In this work, on the basis of the scaling function obtained within CDFM with a relativistic effective mass $m_N^* = 0.8m_N$, we calculate and compare the theoretical predictions with a large set of experimental data for inclusive (e, e') and (anti)neutrino cross sections. 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. Good agreement with experimental data is found over the whole range of electron and (anti)neutrino energies.

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