Short-Range Correlations and Meson-Exchage Currents in Electron and Neutrino Scattering

P.R. Casale [1,2], **J.E. Amaro**[1,2]

[1]Departamento de Fisica Atomica, Molecular y Nuclear, Universidad de Granada, 18071 Granada, Spain

[2]Instituto Carlos I de Fisica Teorica y Computacional, Universidad de Granada, 18071 Granada, Spain

We compute the contribution of meson-exchange currents (MEC) to the one-particle emission transverse response of nuclear matter, including short-range correlations (SRC) within the independent pair approximation. Our results show a significant enhancement of the transverse response in electron scattering, in contrast to independent-particle models that neglect SRC [1]. SRC are incorporated by solving the Bethe-Goldstone (BG) equation in the nuclear medium [2] using the Granada-2013 NN potential. This realistic interaction, fitted to the world database of NN scattering [3], allows the BG equation to be reduced to a system of linear equations, which can be solved exactly. The nucleon-pair wave function acquires high-momentum components, as Pauli blocking prevents low-momentum scattering in the nuclear medium. In one-particle emission reactions, the MEC 1p1h matrix element interferes with the one-body current contribution, modifying the response function. When the MEC operator acts on the high-momentum components of the correlated wave function, it generates an additional contribution that enhances the response beyond the uncorrelated Fermi gas. This enhancement is consistent with Fabrocinis results [4], within correlated basis function perturbation theory and provides a step toward explaining experimental data on the transverse response. We also present preliminary results extending this formalism to neutrino scattering, which is relevant for neutrino oscillation experiments.

References

[1] P.R. Casale, J.E. Amaro, V. Belocchi, M.B. Barbaro, A. De Pace,d M. Martini, [arXiv:2503.08391 [nucl-th]].

[2] P.R. Casale, J.E. Amaro, E. Ruiz Arriola, I. Ruiz Simo, *Phys. Rev. C* **108** (2023) 054001.

[3] R. Navarro Pérez, J.E. Amaro, E. Ruiz Arriola, *Phys. Rev. C* **88** (2013) 064002 [erratum: *Phys. Rev. C* **91** (2015) 029901].

[4] Adelchi Fabrocini, *Phys. Rev. C* **55** (1997) 338.