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Second-order pion-nucleus potential for scattering and photo production

Coherent pion photoproduction on nuclei is an efficient tool for studying nucleon density and determining neutron skin thickness. However, a reliable description of pion scattering and other medium effects is needed for these purposes. We build a universal model describing both pion scattering and photoproduction on spin-zero nuclei within the same framework. We develop second-order momentum space scattering and photoproduction potentials based on the Delta(1232) effective self-energy modification and nucleon two-body correlation functions. The model's parameters are determined by fitting pion-carbon scattering data and are shown to be universal. We demonstrate the importance of the charge and spin exchange corrections for nuclear pion photoproduction.

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