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Scaling in lepton-nucleus scattering

The accuracy of theoretical predictions for neutrino-nucleus scattering is a critical factor limiting the precise extraction of neutrino oscillation parameters in long-baseline experiments. To address this, we analyze electron-nucleus scattering in the quasi-elastic regime using the scaling method, where we abstract the scattering process from specific kinematics. We investigate the impact of two-body currents and final state interactions and compare different theoretical descriptions. Our study highlights the crucial role of these effects in accurately describing the scattering process. We demonstrate that ab initio nuclear theory, which systematically includes final state interactions, shows very good agreement with experimental data and is much superior compared to the less refined Fermi gas model and plane wave impulse approximation.

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