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Effective Spectral Function for Quasielastic Scattering on Nuclei

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Spectral functions that are used in modeling of quasi elastic scattering in neutrino event generators such as GENIE, NEUT, NUANCE and NUWRO, and GiBUU include Fermi gas, local Fermi gas, Bodek-Ritche Fermi gas with high momentum tail, and the Benhar Fantoni two dimensional spectral function. We find that the $\frac{d\sigma}{d\nu}$ predictions for these models are in disagreement with the prediction of ψ' superscaling function which is good extracted from fits to quasielastic electron scattering data on nuclear targets. It is known that spectral functions do not fully describe quasielastic scattering because they only model the initial state. Final state interactions distort the shape of the quasi elastic peak, reduce the cross section at the peak and increase the cross section at the tail of the distribution for large energy transfer to final state nucleons. We show that the kinematic distributions predicted by the ψ' superscaling formalism can be well described by the predictions using a modified “effective spectral function”. }

Summary

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