QMC calculations of electron scattering from ^{12}C in the Short-Time Approximation

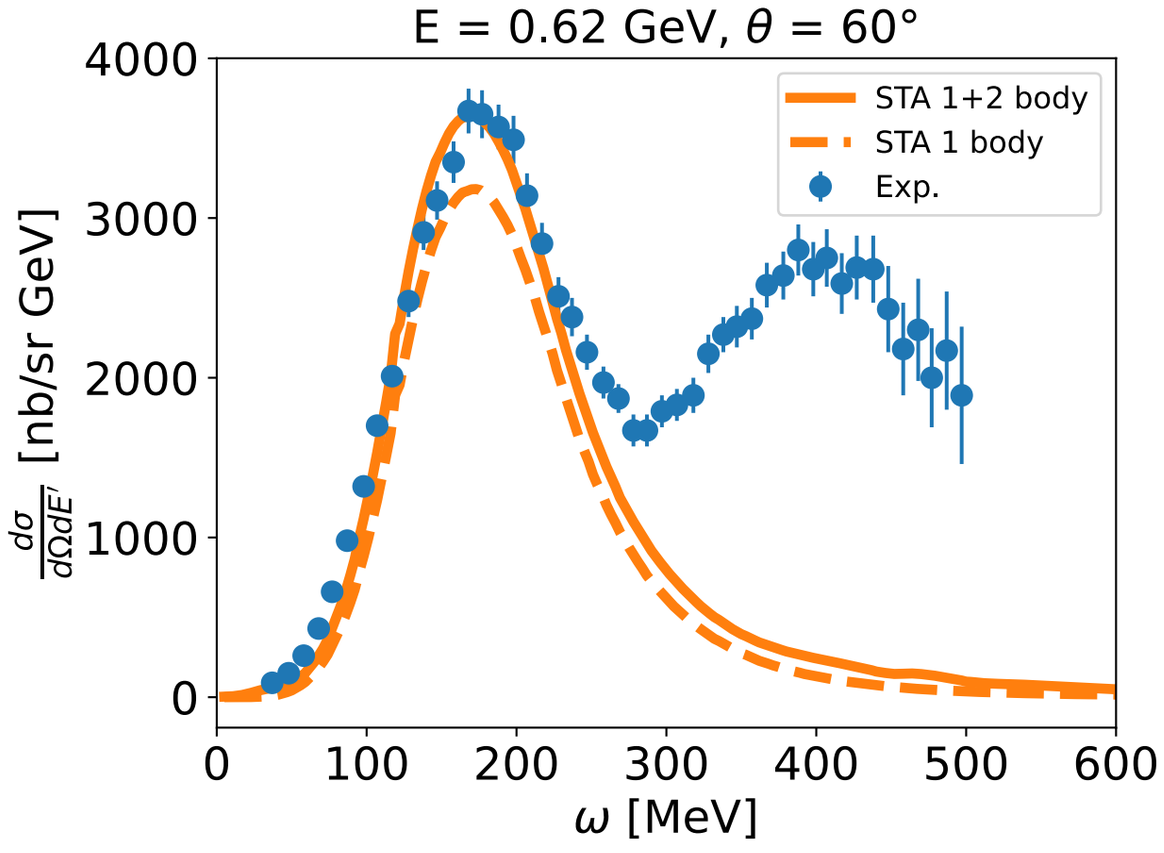
U.S. DEPARTMENT OF ENERGY | Office of Science

NUCLEI Nuclear Computational Low-Energy Initiative

Objectives

The STA aims to extend the reach of accurate QMC calculations of lepton-nucleus scattering to A ≥ 12 nuclei, fully retaining two-body physics in correlations and currents.

We performed Quantum Monte Carlo calculations of nuclear response densities, response functions and cross sections for electron scattering on ^{12}C, in the quasi-elastic regime.



Inclusive double-differential cross section for electron scattering on ^{12}C

Impact

The QMC calculations of nuclear response functions, calculated for values of momentum transfer in the range 300 – 800 MeV/c, are in good agreement with both Green's Function Monte Carlo calculations and experimental data. For values of $|q| \gtrsim 600$ MeV/c, a proper inclusion of relativistic effects is needed.

The STA gives a very good description of the quasi-elastic peak in calculations of inclusive cross sections, for electron energies in the range $E_e \sim [0.3, 2.5]$ GeV.

The STA formalism can also address neutrino-nucleus scattering and could provide accurate ab initio calculations relevant for neutrino event generators.

Accomplishments

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