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Global optical potential from chiral EFT and applications to charge-exchange reactions

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The study of exotic nuclei will offer direct insights into fundamental questions in physics, such as the nucleosynthesis of heavy elements and the structure of neutron stars. As rare isotope beam facilities around the world extend their reach to increasingly exotic regions of the nuclear chart, reaction theory models with robust error estimates will be crucial to drive scientific discovery. In particular, nucleon-nucleus optical potentials play a central role in the analysis of a wide range of nuclear reaction experiments, yet to date the most widely applicable optical model potentials are largely phenomenological and lack uncertainty quantification. The recently constructed Whitehead-Lim-Holt (WLH) global optical potential, on the other hand, offers a microscopic description of nucleon-nucleus scattering over a large range of isotopes and scattering energies with error estimates from chiral effective field theory. In this presentation, I will preview several applications of the WLH optical potential in nuclear reactions and natural extensions to nuclear astrophysics. I will also discuss the Bayesian uncertainty quantification of charge-exchange reactions and how they connect to the nuclear equation of state.

Topic

Theory

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