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Nucleon-Nucleus Global Optical Potential from Chiral Effective Field Theory[1] TAYLOR WHITEHEAD, JEREMY HOLT, Texas AM University, YEUNHWAN LIM, Max Planck Institute for Physics — We formulate a global microscopic nucleon-nucleus optical potential from many-body perturbation theory based on chiral two- and three-body forces. The nucleon self-energy is calculated in homogeneous matter to second order in perturbation theory, which gives the central real and imaginary terms of the optical potential. The full nucleon-nucleus optical potential is derived within the improved local density approximation utilizing mean field models consistent with the chiral nuclear force employed. A selection of chiral forces is used and theoretical uncertainties are accounted for. Each term of the optical potential is then fit to the standard Woods-Saxon form. Functional forms of the depth and shape parameters that depend on projectile energy, mass number, and isospin asymmetry are derived. This microscopic global optical potential is calculated from the local optical potentials of all stable nuclei within 16A208 and 0E200 MeV. In future works we plan to include nuclei off of stability. Assumptions and potential shortcomings of conventional global optical potentials are examined. Lastly we compare the results of the microscopic calculations to phenomenological models and experimental data.

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