Theoretical Optical Potential Derived from Chiral Potentials

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Elastic scattering is probably the main event in the interactions of nucleons with nuclei. Even if this process has been extensively studied in the last years, a consistent description, i.e. starting from microscopic two- and many-body forces connected by the same symmetries and principles, is still under development. In this work we study the domain of applicability of microscopic two-body chiral potentials in the construction of an optical potential. We basically follow the Kerman, McManus, and Thaler approach to build a microscopic complex optical potential and then we perform some test calculations on ^{16}O at different energies. Our conclusion is that a particular set of potentials with a Lippmann-Schwinger cutoff at relatively high energies (above 500 MeV) has the best performances reproducing the scattering observables. Our work shows that building an optical potential within Chiral Perturbation Theory is a promising approach to the description of elastic proton scattering, in particular, in view of the future inclusion of many-body forces that naturally arise in such framework.