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Ab initio optical potentials for Magnesium Isotopes: Case Study for extrapolation to the neutron dripline

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Abstract. Constructing effective interactions ('optical potentials') between a proton or neutron and a nucleus for computing elastic scattering observables has a long tradition. A renewed interest in considering this challenging task stems from the possibility to combine today's *ab initio* structure work with elastic scattering from light to medium nuclei using the framework of the spector expansion of multiple scattering and compute the first order term in this expansion consistently. The calculation of the effective interaction in first order relies on two basic input quantities, which are the fully-off-shell nucleon-nucleon (NN) t-matrix and the translationally invariant nonlocal one-body density matrix of the target together with spin-projected density. The latter can been obtained within the framework of the No-Core Shell Model (NCSM) or the Symmetry-Adapted NCSM so that structure and reaction inputs are treated on equal footing with no adjustable parameters.

In this talk the *ab initio* frame work for optical potentials will be illustrated with examples for proton and and neutron scattering from ^{24}Mg and compared to experimental information for energies between 65 and 250 MeV laboratory kinetic energy. *Ab initio* predictions are then given for $26, 28, 32$Mg and compared to uncertainty quantified Koning-Delaroche (KDUQ) global optical potential and ENDEF nuclear data extrapolations. These comparisons highlight some of the limitations of global phenomenological models, while also validating their use in reaction modeling near the N=20 island of inversion.

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