OPTICAL POTENTIALS AND NUCLEON SCATTERING ON MEDIUM-MASS NUCLEI FROM AB-INITIO GREEN FUNCTION

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This presentation will show results of nucleon scattering on medium-mass nuclei making use of optical potentials derived consistently from ab-initio Self Consistent Green Function (SCGF) with saturating Chiral Effective Field Theory (χEFT) interaction.

Structure and reactions are two crucial facets of nuclear physics. However, due to the lack of an essentially complete description of the nuclear many-body system, nuclear reactions have often relied on phenomenological models, namely fitting optical potentials on elastic scattering data.

This work aims to bridge the gap between the two branches of the discipline by building a common framework for structure and reactions. It proceeds by solving the nuclear many-body problem using the Dyson equation, returning a consistent self-energy which is microscopically equivalent to the generalized optical potential in the Feshbach theory. The properties of this self-energy will be discussed in the context of the very first results of elastic scattering on Ca and O isotopes, and comparing the low-energy scattering experimental cross sections and angular distributions will be shown that it is possible to reproduce key low energy scattering observables in medium mass nuclei from “first principles” consistently.