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LINKING NUCLEAR REACTIONS AND NUCLEAR STRUCTURE ON THE WAY TO THE DRIP LINES

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The dispersive optical model (DOM), originally conceived by Claude
Mahaux [1], provides a unified description of both elastic nucleon scattering and structure information related to single-particle properties below the Fermi energy [2]. Extensions of this framework have introduced a fully non-local implementation for 40-Ca [3,4]. For the first time properties below the Fermi energy like the charge density and the presence of high-momentum nucleons can be included in the DOM description while elastic cross section data can be represented as accurately as in the local DOM implementation. Application of the non-local DOM to 48-Ca incorporates the effect of the 8 additional neutrons and allows for an excellent description of elastic scattering data of both protons and neutrons [5]. The corresponding neutron distribution constrained by all available data generates a prediction for the neutron skin of 0.249 +/- 0.023 fm for this nucleus [5] which is larger than most mean-field and available ab initio results.

We report on the most recent developments including a non-local DOM analysis for 208-Pb, an extension to heavier Ca isotopes, an analysis of the energy density in comparison with ab initio nuclear matter calculations, applications to (d,p) and (p,d) transfer reactions with DOM ingredients, and a reanalysis of (e,e'p) data to determine if experimental data can constrain the magnitude of absolute spectroscopic factors.

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