DIIPOLE POLARIZABILITY OF ^{48}Ca AND IMPLICATIONS FOR THE NEUTRON SKIN THICKNESS

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Inelastic proton scattering at energies of a few 100 MeV and forward angles including 0° provides a novel method to measure electric dipole response over an excitation energy range of about 5 – 25 MeV. These data allow an extraction of the dipole polarizability (DP) which provides information on the formation of neutron skins in nuclei and symmetry energy parameters of the equation of state of neutron matter governing the properties of neutron stars. Studies of ^{208}Pb and ^{120}Sn have led to important constraints for energy density functional models aiming at a theoretical description of the DP and the neutron skin thickness. Here, we report a result for ^{48}Ca, a case of particular interest for several reasons: (i) recent theoretical progress allows the calculation of the DP in nuclei up to the Ca isotope chain with ab initio methods based on interactions derived in the framework of chiral effective field theory, (ii) there are predictions for ^{48}Ca from energy density functional models selected to reproduce the presently available DP data in nuclei with neutron excess (^{208}Pb, ^{120}Sn, ^{68}Ni), and (iii) a measurement of the neutron matter distribution in ^{48}Ca with parity-violating elastic electron scattering is planned at JLAB (CREX experiment). Although the extraction of a neutron skin from the DP is model-dependent our results favor a rather small neutron skin of the order 0.15 fm.