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Dipole polarizability from small-angle proton scattering and implications for symmetry energy properties and the formation of neutron skins

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The dipole polarizability of nuclei carries information on the density dependence of the symmetry energy governing the properties of the Equation of State of neutron-rich matter relevant to neutron stars and core-collapse supernovae. In recent years, zero-degree polarized proton scattering has been developed at RCNP as an experimental tool to measure the dipole polarizability [1]. Such data also provide constraints on the neutron skin thickness of heavy nuclei [2]. A recent study of ^{40}Ca together with results from a previous experiment on ^{48}Ca [3] serve as a test of state-of-the-art ab initio [4,5] and energy densitiy functional [6] calculations. From the good agreement obtained for both methods one can set limits on the density dependence of the symmetry energy. These are clearly at variance with those derived [7] from the recently published result of the PREX-II experiment [8].

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