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Proton elastic scattering from stable and unstable nuclei – extraction of nuclear densities –

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Abstract

Progress in proton elastic scattering at intermediate energies to determine nuclear density distributions is reviewed. After challenges of about 15 years to explain proton elastic scattering and associated polarization phenomena at intermediate energies, we have reached to some conclusions regarding proton elastic scattering as a means of obtaining nuclear densities. During this same period, physics of unstable nuclei has become of interest, and the density distributions of protons and neutrons play more important roles in unstable nuclei, since the differences in proton and neutron numbers and densities are expected to be significant. As such, proton elastic scattering experiments at intermediate energies using the inverse kinematic method have started to determine density distributions of unstable nuclei. In the region of unstable nuclei, we are confronted with a new problem when attempting to find proton and neutron densities separately from elastic proton scattering data, since electron scattering data for unstable nuclei are not presently available. We introduce a new means of determining proton and neutron densities separately by double-energy proton elastic scattering at intermediate energies.

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