

Charge densities and the electron scattering form factors of exotic nuclei

S. Karataglidis¹ and K. Amos²

¹ Department of Physics and Electronics, Rhodes University, Grahamstown, 6140, South Africa

² School of Physics, University of Melbourne, Victoria, 3010, Australia.

Most of the knowledge of exotic nuclei has been done with regards to the neutron rich nuclei, and their neutron densities. This has been a rich field of study as the densities of exotic nuclei exhibit unusual properties, the halo being the best example. And most of that information has been concentrated on the long range part of the density where the halo exists.

But very little information is known of the proton density. Experiments involving scattering off heavy ions only probe the neutron skin or halo, and the scattering from hydrogen at intermediate energies probes primarily the neutron density, due to the dominance of the pn part of the NN interaction. Any extension of the neutron density may also influence the extension of the proton density and so a means to study the proton density would complement existing data.

Measurements of the $B(E1)$ values of transitions in exotic systems have been done, but these are measurements at zero momentum transfer and so no direct information of the charge density may be obtained. Electron scattering is the direct means by which to probe the charge densities of nuclei and, with the planned electron-ion collider at GSI and the SCRIT project at RIKEN, such may be possible for exotic nuclei. Form factors for the scattering from light exotic nuclei will be discussed, from a microscopic structure viewpoint, illustrating what may be measured at such facilities. The connections to proton scattering will be outlined. Consequences for the experimental programs will be discussed, especially with regards to possible limitations.