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Electron scattering as a probe of surface properties and proton shell structure of unstable nuclei

Dr. Xavier Roca-Maza (Dipartimento di Fisica, Universit`a degli Studi di Milano)

Dirac partial-wave calculations for elastic electron scattering by stable and exotic nuclei, calculated with charge densities predicted by modern Energy Density Functionals are presented [1,2]. The Z = 50 and 82 isotopic chains as well as the N = 14, 20, 50 and 82 isotopic chains are investigated in detail from the neutron deficient to the neutron rich side. The change of the electric charge form factor along an isotopic chain shows a clear correlation with the surface properties of the electromagnetic charge distribution. Along an isotopic chain, the variation of the electric charge form factor is found to be strongly correlated with the underlying proton shell structure of the isotopes. Therefore, elastic electron scattering experiments can provide valuable information about the surface properties, filling order and occupation of the single-particle levels of protons.

References

[1] Theoretical study of elastic electron scattering off stable and exotic nuclei X. Roca-Maza, M. Centelles, F. Salvat, and X. Vi nas, Phys. Rev. C 78, 044332 (2008).
[2] Electron scattering in isotonic chains as a probe of the proton shell structure of unstable nuclei X. Roca-Maza, M. Centelles, F. Salvat, and X. Vi nas, Phys. Rev. C 87, 014304 (2013).

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