

Testing fundamental interactions with the hyperfine splitting in light atomic systems

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While electrons are point-like particles, atomic nuclei have an intricate internal structure. Modern atomic and molecular calculations typically neglect this nuclear structure and represent the nuclei through the static charge and magnetic-moment distributions. There are, however, a number of important fundamental questions for which we do not have fully satisfactory answers yet: Is the description of composite nuclei by the elastic form factors physically adequate? What is the significance of inelastic multi-photon exchange effects? How can we account for the finite-nuclear mass effects of a composite nucleus in atomic systems? Several important discrepancies have been reported in the literature in recent years, that cannot be explained within the existing paradigms of quantum electrodynamics, specifically for the hyperfine splitting of the muonic deuterium, of the HD^+ molecule, and of the lithium atom.

I will present overview of the hyperfine structure theory and possible resolution of reported discrepancies.