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Polarizability contribution to the hyperfine splitting in muonic deuterium from effective field theory

Muonic atom spectroscopy provides a precision probe of electroweak physics and possible sources of Beyond the Standard Model physics such as dark matter and the violation of lepton flavor universality. However, uncertainties from nuclear theory are the main bottleneck in calculations of the energy levels for muonic atoms. Therefore, it is necessary to reduce these uncertainties in order to correctly interpret possible new physics. In particular, the theoretical prediction of the nuclear polarizability that enters the two-photon exchange contribution to the energy levels must be improved. In recent years, a significant amount of progress has been made in regards to the two-photon exchange contribution to the Lamb shift in light muonic atoms using effective field theory techniques. Here, we use similar tools to investigate the polarizability contribution to the hyperfine splitting of muonic deuterium. We detail the generic formalism used to extract the hyperfine splitting and employ forces and currents derived in chiral effective field theory.

Primary author: RICHARDSON, Thomas

Presenter: RICHARDSON, Thomas