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Understanding The Proton Radius Puzzle: "Nuclear Polarizability Corrections in Muonic Deuterium" OSCAR HERNANDEZ, Univ of Manitoba, CHEN JI, TRIUMF, SONIA BACCA, TRIUMF, Univ of Manitoba, NIR NEVO DINUR, NIR BARNEA, Racah Institute of Physics, The Hebrew University
— In 2010 the accuracy of the rms proton radius was improved ten-fold by new spectroscopic measurements of the Lamb shift in muonic hydrogen. However, this new value differed by 7σ from what was previously determined in ordinary hydrogen. This large discrepancy was coined the "proton radius puzzle" and challenges our understanding of physics based on the standard model. New high-precision measurements on various muonic atoms are planned at PSI to study whether this discrepancy persists or varies with mass and charge numbers. The accuracy of the nuclear charge radii determination from their data is limited by the uncertainty in the nuclear polarizability corrections. For μD, these nuclear corrections have been most recently calculated by Pachucki with the AV18 nuclear potential. In this contribution I would like to show how we complement Pachucki's pioneering work by performing ab-initio calculations in μD with state-of-the-art nuclear potentials from chiral effective field theory. We take into account multipole corrections, Coulomb, relativistic and finite-nucleon-size corrections. Furthermore, performing a systematic study in chiral effective field theory will allow us to better assess the theoretical error associated to the polarizability.

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