Contribution ID: **99** Type: **Parallel contribution**

Deuteron VVCS and two-photon exchange effects in (muonic) deuterium in pionless EFT

We report on our studies of the forward virtual Compton scattering (VVCS) off a deuteron and the two-photon-exchange corrections to the S-levels in muonic (μD) and ordinary (D) deuterium within the pionless effective field theory (EFT). The spin-independent deuteron VVCS amplitudes are evaluated up to next-to-next-to-next-to-leading order (N3LO) for the longitudinal and next-to-leading order (NLO) for the transverse amplitude. The only unknown low-energy constant enters at N3LO in the former, and describes the coupling of a longitudinal photon to the nucleon-nucleon system. It is extracted using the information about the hydrogen-deuterium isotope shift.

Considering the elastic contribution to the two-photon-exchange in μD, we emphasize the role of the low-virtuality properties of the deuteron, and identify a correlation between the deuteron charge and Friar radii, which can help one to judge how well a form factor parametrisation describes the aforementioned properties. We also quantify the higher-order two-photon-exchange contributions in μD, generated by the single-nucleon structure and expected to be the most important terms beyond N3LO.

With the respective two-photon-exchange effects evaluated in a unified pionless EFT approach, the resulting extractions of the deuteron charge radius from the μD Lamb shift, the $2S-1S$ transition in D, and the $2S-1S$ hydrogen-deuterium isotope shift, are in perfect agreement.

Primary authors: LENSKY, Vadim (JGU Mainz); HILLER BLIN, Astrid; HAGELSTEIN, Franziska (JGU Mainz); Dr PASCALUTSA, Vladimir (University of Mainz)

Presenter: LENSKY, Vadim (JGU Mainz)

Track Classification: Electromagnetic and weak interactions