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Nuclear structure effects in the Lamb shift of muonic deuterium in pionless effective field theory

Thursday, 3 August 2023 14:55 (15 minutes)

In this presentation, I will discuss the results for the $O(\alpha^5)$ effects of the nuclear structure, the two-photon-exchange (TPE) corrections, in the energies of S-levels in muonic (μD) and ordinary (D) deuterium. They were recently obtained at next-to-next-to-next-to-leading order (N³LO) in the pionless effective field theory (EFT). At this order, there is a single low-energy constant that is fitted to the hydrogen-deuterium isotope shift. This constant generates a correlation between the deuteron charge and Friar radii. This correlation can be used to judge how well a deuteron charge form factor parametrization describes the low-virtuality properties of the deuteron. The pionless EFT evaluation of the TPE corrections in μD and D allows one to extract the deuteron charge radius r_d from the μD Lamb shift, the $2S - 1S$ transition in D, and the $2S - 1S$ hydrogen-deuterium isotope shift in a unified approach, giving values of r_d that are in agreement [1,2]. I will also discuss the role of the TPE corrections generated by the structure of the individual nucleons.

[1] V. Lensky, F. Hagelstein and V. Pascalutsa, *Eur. Phys. J. A* **58** (2022), 224 [arXiv:2206.14756 [nucl-th]].

[2] V. Lensky, F. Hagelstein and V. Pascalutsa, *Phys. Lett. B* **835** (2022), 137500 [arXiv:2206.14066 [nucl-th]].

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