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Two-neutron halos in EFT: neutron and E1 strength distributions

Halo nuclei are interesting nuclear systems at the edge of stability. In an EFT treatment (halo EFT) they can be described as a more tightly bound core plus the more loosely bound halo nucleons. The so-called two-neutron (2n) halo nuclei consisting of the core and two halo neutrons are a special class within the halo nuclei. Prominent examples are ⁶He and ¹¹Li. In the EFT description they form an effective three-body system. Interesting observables related to these nuclei are inter alia neutron-neutron (nn) distributions measured following the knockout of the halo's core as well as the E1 strength distribution parameterizing the Coulomb dissociation cross section.

In the first part of the talk, I will focus on the nn distributions following the knockout. They can be well described in the EFT. The basis is a three-body description of the ground state using the Faddeev equations. The knockout does not need to be treated explicitly, but the subsequent final-state interactions (FSIs) are taken into account by using Moller operators. I focus on kinematic conditions where all non-nn FSIs are suppressed. The results are discussed in the context of studying the nn interaction [Göbel et al., Phys. Rev. C 104 (2021)] as well as of investigating the universality of (2n) halo nuclei [Göbel et al., Phys. Rev. C 110 (2024)].

In the second part, I will talk about the E1 strength distribution of ⁶He. I will present a finite-range approach to the EFT as an alternative to the commonly used zero-range approach. This avoids the treatment of some peculiarities of zero-range EFTs related to energy-dependent potentials in the case of interactions parameterized by more than one effective-range expansion parameter. The zero-range and the finite-range results will be compared and some preliminary results for the NLO E1 distribution with FSIs will be shown.

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Track Classification: Few-body aspects of nuclear physics and nuclear astrophysics