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

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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 ^{6}He and ^{11}Li. 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 ^{6}He. 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.

Presenter: GOEBEL, Matthias

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