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Halo-EFT description of one-neutron halo nuclei with core excitation

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Halo nuclei are fascinating short-lived nuclear systems found near the driplines.
In standard reaction models, halo nuclei are usually described as an inert core with one or two weakly bound nucleons. However, some breakup data suggest that the dynamics of the reaction is influenced by the excitation of the core to its excited states in a significant way [1].

Halo-EFT has been shown to give a good description of halo nuclei within reaction models [2]. Accordingly, we extend it to include core excitation considering a rigid-rotor model of the core [3]. As a study case, we take ^{11}Be which is a typical one-neutron halo nucleus.
Its core deformation is then treated at the first order of perturbations to include effectively the 2^+ excited state of ^{10}Be in the description of ^{11}Be.

We perform a coupled-channels study of the bound states of ^{11}Be where the low energy constants are fitted to reproduce an *ab initio* calculation [4]. For the ground state, the inclusion of core excitation allows us to better reproduce the *ab initio* predictions (wavefunction and phaseshift). In contrast, for the first excited state, core excitation does not have much influence on the calculations, confirming that this is a shell model state. This simple few-body model will enable us to study the influence of core excitation in nuclear reactions. It will also provide a better understanding of the complicated No Core Shell Model (NCSM) results [4].

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Attendance Type

In-person

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