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# Nuclear structure and dynamics from ab initio theory

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A realistic description of atomic nuclei, in particular light nuclei characterized by clustering and low-lying breakup thresholds, requires a proper treatment of continuum effects. We have developed a new approach, the No-Core Shell Model with Continuum (NCSMC) [1,2], capable of describing both bound and unbound states in light nuclei in a unified way. With chiral two- and three-nucleon interactions as the only input, we are able to predict structure and dynamics of light nuclei and, by comparing to available experimental data, test the quality of chiral nuclear forces.
We will discuss our NCSMC calculations of polarization effects in the 3H(d,n)4He fusion and its mirror reaction 3He(d,p)4He [3]. These transfer reactions are relevant for primordial nucleosynthesis and 3H(d,n)4He in particular is being explored in large-scale experiments such as NIF and ITER as a possible future energy source. Next, we will present latest NCSMC calculations of weakly bound states and resonances of exotic halo nuclei 11Be and 15C and discuss the photo-dissociation of 11Be and 14C(n,γ)15C capture. We will also present our results for their unbound mirror nuclei 11N and 15F, respectively. We will point out the effects of continuum on the structure of mirror resonances and highlight the role of chiral NN and 3N interactions and make connections to TRIUMF experimental results.
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