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Weakly Bound and Unbound Light Nuclei From *ab initio* Theory

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In recent years, significant progress has been made in *ab initio* nuclear structure and reaction calculations based on input from QCD employing Hamiltonians constructed within chiral effective field theory. One of the newly developed approaches is the No-Core Shell Model with Continuum (NCSMC) [1,2], capable of describing both bound and scattering states in light nuclei starting from chiral two- (NN) and three-nucleon (3N) interactions. We will present latest NCSMC calculations of weakly bound states and resonances of the exotic halo nucleus ^{11}Be and discuss its strong E1 transitions and photo-dissociation [3]. We will also discuss its mirror ^{11}N , an unbound $^{10}\text{C}+p$ system, and highlight the role of chiral NN and 3N interactions in the description of the $^{10}\text{C}(p,p)$ scattering measured recently at TRIUMF. Further, we will present ongoing applications of the NCSMC to $^{11}\text{C}(p,p)$ scattering and the $^{11}\text{C}(p,\gamma)^{12}\text{N}$ radiative capture of relevance to astrophysics. Finally, we will show our preliminary results for the unbound and controversial ^9He nucleus.

References:

- [1] S. Baroni, P. Navratil, and S. Quaglioni, *Phys. Rev. Lett.* 110, 022505 (2013); *Phys. Rev. C* 87, 034326 (2013).
- [2] P. Navratil, S. Quaglioni, G. Hupin, C. Romero-Redondo, A. Calci, *Physica Scripta* 91, 053002 (2016).
- [3] A. Calci, P. Navratil, R. Roth, J. Dohet-Eraly, S. Quaglioni, G. Hupin, *Phys. Rev. Lett.* 117, 242501 (2016).

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