## **Advances in Radioactive Isotope Science**



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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 11Be and discuss its strong E1 transitions and photo-dissociation [3]. We will also discuss its mirror 11N, an unbound 10C+p system, and highlight the role of chiral NN and 3N interactions in the description of the 10C(p,p) scattering measured recently at TRIUMF. Further, we will present ongoing applications of the NCSMC to 11C(p,p) scattering and the  $11C(p,\gamma)12N$  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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