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Ab initio study of radiative captures and nucleus-nucleus bremsstrahlung

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The recent progresses in the development of ab initio approaches make possible the description of bound and scattering states for light nuclear systems in a unified framework, based on microscopic Hamiltonians built within chiral effective theory. Among these approaches, the No-Core Shell Model with Continuum (NCSMC) [1] has proven particularly successful for studying resonances and elastic scattering of five- and six-nucleon systems [2,3]. The extension of this approach to the description of electromagnetic transitions in nuclear systems is highly desirable. It will be useful to probe the quality of the ab initio wave functions and in particular, to evaluate radiative cross sections including at energy ranges out of reach of experiments. I will present the first attempts to describe radiative captures and nucleus-nucleus bremsstrahlung with the NCSMC. I will discuss the applications of this method to the astrophysically important 3He(α,γ)7Be and 3H(α,γ)7Li reactions and to the αN bremsstrahlung [4], a preliminary step towards the study of the t(d,γn)α bremsstrahlung, considered as a possible plasma diagnostic in fusion experiments [5].

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Primary author: DOHET-ERALY, Jérémy (TRIUMF)

Co-authors: Dr HUPIN, Guillaume (Lawrence Livermore National Laboratory); Dr NAVRÁTIL, Petr (TRIUMF); Dr QUAGLIONI, Sofia (Lawrence Livermore National Laboratory)

Presenter: DOHET-ERALY, Jérémy (TRIUMF)

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