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Marrying *ab initio* calculations and Halo-EFT: ^{7}Li and ^{7}Be radiative nucleon captures[1] XILIN ZHANG, KENNETH NOLLETT, DANIEL PHILLIPS, Ohio University — We combine *ab initio* quantum-Monte-Carlo (QMC) calculations with the Halo-Effective-Field-Theory (Halo-EFT) framework, in order to study low-energy radiative nucleon capture to a weakly bound (halo) nucleus. Here we focus on the reactions ^{7}Li(n,γ)^{8}Li and ^{7}Be(p,γ)^{8}B, which are subjects of long-standing interest for astrophysics. In the low-energy region we can approximate ^{8}Li (^{8}B) as composed of a ^{7}Li (^{7}Be) core (and also its excitation), and a neutron (proton) with an anomalously extended wave function. The scattering and bound states can be studied in Halo-EFT, in which both core and the nucleon are treated as fundamental degrees of freedom. In our leading order calculation, we use asymptotic normalization coefficients from QMC calculations to fix the parameters in the Lagrangian, which we then apply to study radiative captures. This obviates computing the captures by directly using numerically intensive QMC methods, while still incorporating the nuclear dynamics that these methods provide. In addition, the model-independent EFT framework provides novel insights into the manner in which these two nucleon-capture processes are related to one another.

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