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Marrying ab initio calculations and Halo-EFT: the case of $^7\mathrm{Li} + n \to {}^8\mathrm{Li} + \gamma$[1] XILIN ZHANG, KENNETH M. NOLLETT, DANIEL R. PHILLIPS, Institute of Nuclear and Particle Physics and Department of Physics and Astronomy, Ohio University, Athens, OH, USA — In this talk, we propose to combine the ab initio quantum-Monte-Carlo (QMC) calculation with the Halo-Effective-Field-Theory (Halo-EFT) framework, in order to study ^{7}Li and ^{7}Be radiative nucleon captures, which are relevant to astrophysics. In the low energy, they are sensitive to the shallow ground states of ^{8}Li and ^{8}B (being shallow as compared to ^{7}Li and ^{7}Be breakup energy). We can approximate ^{8}Li (^{8}B) as composed of ^{7}Li (^{7}Be) core 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 neutron are treated as fundamental degrees of freedom. However, the couplings in EFT are unknown. Meanwhile, the QMC calculation can provide valuable information about the bound and resonant states. So we use asymptotic normalization from QMC calculations to calibrate our EFT Lagrangian and then apply it to study radiative captures. In this talk, I will show our preliminary study of Li system, as the result of this "marriage." The study of ^8B with extra complexity due to Coulomb interaction is under way and will be reported elsewhere in the future.

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Xilin Zhang
Institute of Nuclear and Particle Physics and Department of Physics
and Astronomy, Ohio University, Athens, OH, USA

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