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Ab Initio Study of Low-Energy Antiproton-Nucleus Systems

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Despite a century since E. Rutherford's discovery of neutrons, many aspects of this particle remain uncertain. Notably, neutron halos, exemplifying the quantum realm, were revealed through indirect measurements a few decades ago. In a pioneering effort, the PUMA experiment at CERN [1] exploits the unique property of antiprotons –the sensitivity of the annihilation process to the nuclear density's tail –to investigate the asymmetry in neutron/proton distribution at the nuclei's surface. Our focus is on providing theoretical guidance to support this ambitious experiment. To that end, we study the scattering of antinucleons from various targets by introducing an $N\bar{N}$ optical potential into the No-Core Shell Model combined with the Resonating Group Method (NCSM/RGM) [2]. I will present our preliminary findings on the scattering of antinucleon from ^2H , ^3H , and ^3He targets, including our results for low-energy observables (phaseshift, scattering length) as well as scattering cross-section.

References

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