Abstract Submitted
for the OSF10 Meeting of
The American Physical Society

Electromagnetic properties of Beryllium-11 in Halo EFT[1] DANIEL PHILLIPS, Ohio University, HANS-WERNER HAMMER, University of Bonn —
We compute properties of ^{11}Be using an effective field theory (EFT) that exploits the separation of scales in this halo system. This nucleus has both a shallow $1/2^+$ *and* a shallow $1/2^-$ state. At leading order (LO) in the EFT the theory contains three parameters: the binding energies of these two states, as well as the effective "range" for p-wave ^{10}Be-neutron scattering. We use data on the $1/2^+$ and $1/2^-$ levels and the B(E1) strength of the $1/2^+$ to $1/2^-$ transition in the ^{11}Be nucleus to fix these three parameters. We then compute the dissociation spectrum obtained from Coulomb excitation of the ^{11}Be nucleus into ^{10}Be plus a neutron, and compare to experimental data. At LO this spectrum is a prediction of the EFT. At next-to-leading order (NLO) one additional parameter associated with the $1/2^+$ state arises. This can be adjusted to obtain a good description of the low-energy part of the $d\mathrm{B(E1)}/dE$ spectrum. We also predict the charge radius of the $1/2^+$ state, which agrees with experiment at the level expected for an NLO calculation. The convergence pattern of the halo EFT is consistent with the nominal expansion parameter in this system. This allows us to extract the s-wave scattering length and effective range and the p-wave scattering volume in the effective-range expansions that parametrize scattering of a neutron from a ^{10}Be nucleus.

[1]Research supported by the DFG and by the US DOE.

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Date submitted: 10 Sep 2010 Electronic form version 1.4