

Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Pionless effective field theory and the 4-nucleon scattering system

JOHANNES KIRSCHER, HARALD GRIESSHAMMER, The George Washington University — The effective field theory without pions at next-to-leading-order is used to analyse universal bound-state and scattering properties of the 4-nucleon system. Results of five phase shift equivalent nucleon-nucleon potentials for the singlet S-wave ^3He neutron scattering length, $a_0(^3\text{He-n})$, the phase shifts of the ^4He system, and bound state properties for ^3H , ^3He , and ^4He , are presented. The calculations are performed within the refined resonating group model and include a full treatment of the coulomb interaction. All results are compared with experimental data and values from AV18/UIX model calculations. A correlation between $a_0(^3\text{He-n})$ and the ^4He binding energy is found. Furthermore, we confirm the linear correlations, already investigated at leading-order, between the ^3H binding energy and the ^3H charge radius, and the Tjon line. Our results demonstrate the usefulness of the pionless theory at next-to-leading-order in the ^4He system, and confirm that no 4-nucleon force is needed to renormalize the theory at this order.

Johannes Kirscher
The George Washington University

Date submitted: 05 Jan 2009

Electronic form version 1.4