

Abstract Submitted
for the APR17 Meeting of
The American Physical Society

Few Nucleon Systems From Expanding About the Unitarity Limit¹ HARALD W. GRIESSHAMMER, George Washington Univ — Can one understand the structure of nuclei at the physical point by an expansion about the unitarity limit? When the NN S -wave binding energies are zero, the NN system has no scale. Still, the $3N$ system has one dimensionful quantity Λ_* , related to the breaking of scale invariance to a discrete scaling symmetry (Efimov effect). The scale is set by the triton binding energy. While qualitatively this has been known for a long time, one may speculate that Nuclear Physics resides then in a sweet spot: bound weakly enough to be insensitive to the details of the nuclear interaction and thus to be described by “pionless” EFT; but dense enough that the NN scattering lengths are perturbatively close to the unitarity limit. In this case, Λ_* sets the *only* low-energy scale of all observables. Without it, no scale exists, and all nuclei have zero or infinite binding energy in the unitarity limit. For $A \leq 4$ nucleons, the spectrum is indeed described well in this simplified version: a converging, perturbative expansion around the unitarity limit, with controlled corrections in the inverse scattering lengths, the interaction ranges and isospin breaking. [1] S. König, H. W. Griesshammer, H.-W. Hammer, U. van Kolck: arXiv:1607.04623 [nucl-th].

¹Supported in part by US DOE and George Washington University.

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Date submitted: 27 Sep 2016

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