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Separable Expansions of V_{low} for 2- and 3-Nucleon Systems JAMES SHEPARD, University of Colorado, Boulder, JAMES MCNEIL, Colorado School of Mines — We present an alternative organizational scheme for developing effective theories of 2- and 3-body systems that is systematic, accurate, and efficient with controlled errors. To illustrate our approach we consider the bound state and scattering properties of the ${}^3S_1$ and ${}^4S_{3/2}$ 2- and 3-nucleon systems. Our approach combines the computational benefits of using separable potentials with the improved convergence properties of potentials evolved with a renormalization group procedure. Long ago Harms showed that any potential can be expanded in a series of separable terms, but this fact is only useful if the expansion can be truncated at low order. The separable expansion provides an attractive organizational scheme that incorporates finite range effects at the outset in contrast to the familiar effective range theory starting with contact interactions. We show that when applied to a renormalization group-evolved potential, the separable expansion converges rapidly, with accurate results for both 2- and 3-body scattering processes using only two separable terms.

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