Abstract Submitted
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A few interacting fermions near the unitarity limit[1] MICHAEL D HIGGINS, CHRIS H GREENE, Purdue University — Interacting few-fermion systems have been extensively studied in atomic physics, and their behavior at very large scattering lengths continues to pose stringent theoretical challenges. One naturally occurring class of systems that are close to unitarity arises in the nuclear few-body problem: key examples are the few-neutron systems that interact through the strong force. The n-n two body s-wave scattering length is large ($\simeq -18.9$ fm) compared to the range of the interaction ($\simeq$ 1-2 fm), which provides good criteria for studying near-unitarity physics. Low-energy scattering of the three neutron ($3n$) and four neutron ($4n$) systems are studied in the framework of the adiabatic hyperspherical method using an Explicitly-Correlated Gaussian basis. The $4n$ problem is treated in the symmetry $J^\pi = 0^+$ and $J^\pi = \frac{3}{2}^-$ for the $3n$ system. These symmetries lead to the strongest attraction between the neutrons due to the large, negative two-body singlet s-wave scattering length. The nuclear interaction considered is a version of the Argonne nuclear potentials, the AV8′ potential, fitted to gaussians. The lowest few potentials are obtained and the energy-depenent phaseshift and time delay are computed for the lowest potential in each case.

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