Abstract Submitted
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A Hyperspherical Treatment of the N-Fermion problem.[1] SETH T. RITENHOUSE, JAVIER VON STECHER, CHRIS H. GREENE, Department of Physics and JILA, University of Colorado at Boulder, M. CAVAGNERO, Department of Physics and Astronomy, University of Kentucky — Hyperspherical methods provide for an interesting approach to studying the N body problem. We develop this unconventional description for the ground state and collective oscillations of the two-component normal Fermi gas with two-body s and p-wave contact interactions in an isotropic trap. The many-body problem can be accurately reduced to a linear, one-dimensional Schrödinger equation in a single collective coordinate, the hyperradius (the root mean square radius) R of the N-atom system. The calculated properties of the Fermi gas ground state are shown to be in close agreement with results from the Hartree-Fock (HF) approximation over a wide range of interspecies scattering lengths while the collective breathing mode excitation energy deviates qualitatively from HF predictions. The hyperspherical method also suggests that the Fermi gas may collapse for sufficiently large and negative scattering lengths.

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