Abstract Submitted
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Symmetry methods for harmonically trapped, interacting particles NATHAN HARSHMAN, Department of Physics, American University — We present a new method for exploiting the symmetries of interacting few-body systems trapped in harmonic potentials to achieve efficient numerical calculations of energy eigenstates. Precision experiments with ultracold atoms trapped in deep optical wells, as well as connections to recombination loss rates in trapped BECs, have driven experimental interest in this topic. Our method has two key elements. First, transformations from the particle observables into the center-of-mass/Jacobi observables can be implemented using the U(Nd) symmetries of N harmonic oscillators in d dimensions. Second, particle exchange symmetries are realized geometrically as orthogonal transformations in Jacobi relative hypercoordinates. Despite this apparent mathematical complexity, the results are easy to implement and interpret, and the method provides simple classifications of particle clustering in configurations and eigenstates. As a side benefit, the entanglement spectroscopy of few-body systems with tunable interactions can be explored.

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