

Boson Correlation Energies from Reduced Hamiltonian Interpolation

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Abstract

The ground state energies of interacting bosons are computed beyond the mean-field approximation through a new method which we call reduced Hamiltonian interpolation (RHI). Within RHI the N -particle Hamiltonian is represented through a sequence of p -particle expanded and reduced Hamiltonians which give upper and lower bounds on the true energy. Combining ideas from N -representability and dimensional interpolation, the RHI technique interpolates over the number p of quasi-particles (equivalent to spatial dimension) through sequential quadratic programming to calculate the N -particle energy as the mean of close upper and lower bounds. Application of the method to systems of spinless bosons with harmonic interactions yields more than ninety-nine percent of the correlation energy.