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Hyperspherical-LOCV Approximation to Resonant BEC[1] MICHELLE WYNNE SZE, JILA and Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA, ANDREW SYKES, LPTMS, CNRS, University Paris Sud, Universit Paris-Saclay, 91405 Orsay, France, DOERTE BLUME, Homer L. Dodge Department of Physics and Astronomy, The University of Oklahoma, 440 W. Brooks Street, Norman, Oklahoma 73019, USA, JOHN BOHN, JILA, NIST, and Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA — We study the ground state properties of a system of harmonically trapped bosons interacting with two-body contact interactions, from small to large scattering lengths. This is accomplished in a hyperspherical coordinate system that is flexible enough to describe both the overall scale of the gas and two-body correlations. By adapting the lowest-order constrained variational (LOCV) method, we are able to semi-quantitatively attain Bose-Einstein condensate ground state energies even for gases with infinite scattering length. In the large particle number limit, our method provides analytical estimates for the energy per particle $E_0/N \approx 2.5N^{1/3}\hbar\omega$ and two-body contact $C_2/N \approx 16N^{1/6}\sqrt{m\omega/\hbar}$ for a Bose gas on resonance.

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