Abstract Submitted
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Harmonically trapped Bose gases: Weakly-interacting regime and beyond[1] K.M. DAILY, D. BLUME, Washington State University — There exist few exactly solvable problems in physics, but they tend to serve as useful benchmarks and starting points for understanding more complex phenomena. We study dilute harmonically trapped few-boson systems with two-body s-wave interactions and present highly accurate results for the energetics and the condensate fraction. Using the exact two-body wave function, we calculate the condensate fraction by diagonalizing the one-body density matrix as a function of the two-body s-wave scattering length a_s. We find that the condensate fraction exhibits an interesting oscillatory behavior. In the weakly-interacting regime, we analytically expand the condensate fraction in terms of a_s. For the weakly-interacting three-body system, our numerical results for the energy agree with the analytical predictions of Ref. [1] and, furthermore, allow for the extraction of higher order corrections. In addition, we determine the condensate fraction of weakly- and strongly-interacting three-boson systems. Extensions to larger systems and an interpretation in terms of effective N-body interactions are presented.

[1] P. R. Johnson, E. Tiesinga, J. V. Porto and C. J. Williams, New J. Phys 11, 093022 (2009).

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