

Abstract Submitted
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Occupation numbers of the harmonically trapped few-boson system¹ XIANGYU YIN, KEVIN DAILY, DOERTE BLUME, Washington State University — We consider a harmonically trapped dilute N -boson system with pairwise interactions, which are characterized by the two-body s -wave scattering length a_s and the effective range r_e . We construct the one-body density matrix of the weakly-interacting N -boson system and calculate the condensate fraction, defined as the largest occupation number, by employing a perturbative treatment within the framework of second quantization. The condensate fraction for the harmonically trapped N -boson system, calculated within first order perturbation theory, is $1 - (N - 1)0.420004a_s^2$. Corrections of order a_s^3 and $a_s^3 r_e$ are also considered. The condensate depletion induced by effective three-body interactions is identified to occur at order a_s^3 . Our expression for $N = 2$ is confirmed by comparing with the expansion of the exact solution [1]. Our results for $N = 3$ and 4 are compared with high precision *ab initio* calculations for Bose gases that interact through finite-range two-body model potentials.

[1] T. Busch, B.-G. Englert, K. Rzazewski, and M. Wilkens, Foundations of Phys. **28**, 549 (1998).

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