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Superfluid Density of Weakly Interacting Bosons on a Lattice<sup>1</sup> YARIV YANAY, ERICH MUELLER, Laboratory of Atomic and Solid State Physics, Cornell University, Ithaca NY 14850 — We use a path integral approach to calculate the superfluid density of a Bose lattice gas in the limit where the number of atoms per site is large, for one component and two component gases. The results for a onecomponent gas agree with calculations done by other methods such as a Gutzwilleransatz calculation. In the two component case, we find that the interaction between atom species can increase the superfluid density of both, even if the cross-species superfluid drag remains small. Our approach builds on similar calculations done without a lattice. To attain the correct results we develop tools for calculating discrete time path integrals which are applicable to a range of systems naturally described within an overcomplete basis.

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