

Abstract Submitted
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Number Density Distributions of Ultracold Bosons in 3D Optical Lattices¹ JOE GARRETT, ERIC DUCHON, The Ohio State University, NANDINI TRIVEDI, The Ohio State University — We calculate the probability, $P(n)$, of finding n bosons at a site and the probability of hopping in a uniform optical lattice as a function of the temperature, T , and the repulsive interaction between bosons, U/t , as a function of hopping energy. We examine the characteristic $P(n)$ distribution for the Mott Insulator, quantum critical region and superfluid and determine its behavior across thermal and quantum phase transitions using quantum Monte Carlo. The behavior of the local kinetic energy is estimated using the probability of hopping. These results illuminate number squeezing in the Mott Insulator and the quantum critical region described in [1].

[1] Y. Kato, et al., *Nature Physics* **4**, 617 (2008).

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