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Atomic pair statistics and adiabatic realization of the Mott state in an optical lattice GUIDO PUPILLO, CARL J. WILLIAMS, NIST, Gaithersburg, Atomic Physics Division, NIKOLAY V. PROKOF'EV, Dept. of Physics, UMASS, Amherst; "Kurchatov Institute", Moscow — In a series of recent experiments, several groups demonstrated the experimental realization of a Mott insulator state, created by loading a trapped atomic Bose-Einstein condensate into an optical lattice. A superfluid-insulator transition is then induced by varying the intensity of lattice laser beams. When the average filling of lattice sites at the trap center is of order one, double occupancy of lattice sites in the Mott state is both consequence of zero-temperature mixing of high energy basis states into the ground state and of finite temperature population of high energy states. Finite temperature may be due to imperfect adiabaticity while increasing the intensity of the lattice laser beams. In this talk we discuss the distribution of atomic pairs in the trapped Mott insulator relevant to current experiments and suggest that statistics of detection of atomic pairs may be used to bound the temperature of the trapped atoms for energies well below the lattice level spacing. We discuss time scales for adiabatic realization of the Mott state in the trap.

Guido Pupillo
NIST, Gaithersburg, Atomic Physics Division

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