Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Cavity QED determination of atomic number statistics in optical lattices.[1] WENZHOU CHEN, DOMINIC MEISER, PIERRE MEYSTRE, University of Arizona — We study the reflection of two counter-propagating modes of the light field in a ring resonator by ultracold atoms either in the Mott insulator state or in the superfluid state of an optical lattice. We obtain exact numerical results for a simple two-well model and carry out statistical calculations appropriate for the full lattice case. We find that the dynamics of the reflected light strongly depends on both the lattice spacing and the state of the matter-wave field. Depending on the lattice spacing, the light field is sensitive to various density-density correlation functions of the atoms. The light field and the atoms become strongly entangled if the latter are in a superfluid state, in which case the photon statistics typically exhibit complicated multimodal structures.

[1]This work is supported in part by ARO, NASA, NSF, and ONR.

Pierre Meystre
The University of Arizona

Date submitted: 16 Nov 2006 Electronic form version 1.4