Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Frustrated two-dimensional XY models with cold atoms in optical lattices ANTON BURKOV, EUGENE DEMLER, Harvard University — We consider a system of cold bosonic atoms in a rotating optical lattice at finite temperature. We show that such system exhibits a non-trivial dependence of the condensation temperature and the superfluid order parameter on the vortex density due to commensuration effects of the vortex and optical lattices. We identify several vortex filling/lattice geometry combinations for which the vortex ordering pattern exhibits subtle order-by- disorder effects due to an interplay between multiple degeneracy of frustrated vortex configurations and thermal fluctuations.

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Date submitted: 12 Jan 2006 Electronic form version 1.4