Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Optical Microscope for Quantum Gases in a 2D Trap[1] WASEEM BAKR, JONATHON GILLEN, AMY PENG, SIMON FÖLLING, MARKUS GREINER, Harvard-MIT Center for Ultracold Atoms and Dept. of Physics, Harvard University — Ultracold quantum gases are used to experimentally realize and quantitatively study fundamental models of condensed matter physics. When combined with optical lattice potentials, ultracold quantum gases allow for a large scale implementation of quantum materials with ultra cold atoms playing the role of electrons or cooper pairs in real materials. We create a new type of quantum simulator by combining a quantum gas in a deeply 2D surface trap with a high numerical aperture microscope. We describe the current status of the experiment which enables optical imaging with an exceptionally large numerical aperture of up to $NA = 0.8$. This microscope access allows us to efficiently collect fluorescence photons for low-background imaging and very high optical resolution on the 500 nm scale. Optical lattice potentials are generated by direct projection of the lattice potentials using a novel trapping approach with a hologram generation of the lattice geometry.

[1]Work supported by NSF, AFOSR, DARPA and Sloan.

Simon Foelling
Harvard-MIT Center for Ultracold Atoms and
Dept. of Physics, Harvard University

Date submitted: 27 Jan 2009 Electronic form version 1.4