

Abstract Submitted  
for the DAMOP09 Meeting of  
The American Physical Society

**Progress Towards Single-site Imaging of Fermions in an Optical Lattice** DYLAN JERVIS, University of Toronto, DAVID MCKAY, MICHAEL YEE, JULIE SUTTON, JASON MCKEEVER, ALAN STUMMER, JOSEPH THY-WISSEN — We discuss progress towards *in-situ* imaging of a single plane of fermionic  $^{40}\text{K}$  atoms in an optical lattice. Spin-sensitive *in-situ* imaging will allow for local measurements of occupation, spin ordering, and domain structure of interesting many-body phases, including band insulators, Mott insulators, Néel antiferromagnets, superfluid states, and striped or other structured ordering. We are currently testing a design that collects light from the 405 nm  $4S \rightarrow 5P$  transition of  $^{40}\text{K}$  through a thin (200 micron) vacuum window in order to achieve a resolution of better than 700 nm. We have measured the optical transfer function of this system in air by imaging a test target with features as small as 50 nm and determined our resolution to be better than 500nm. We also present our work on locking to the  $4S \rightarrow 5P$  transition using saturation spectroscopy.

Dylan Jervis  
University of Toronto

Date submitted: 23 Jan 2009

Electronic form version 1.4