Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Detecting FFLO Pairs in a 1D Spin-Polarized Fermi Gas by Time-of-Flight Expansion DAVID W. TAM, MELISSA REVELLE, BEN A. OLSEN, RANDALL G. HULET, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston, TX 77005 — We previously reported the experimental phase diagram of a 1D spin-imbalanced Fermi gas consisting of ultracold ^{6}Li atoms prepared in two unequally-populated hyperfine sublevels [1]. This system exhibits three phases: a uniformly paired phase, a fully-polarized phase consisting of only spin-up atoms, and a partially-polarized phase that is predicted to be the elusive FFLO superfluid. The FFLO state accommodates the mismatched Fermi surfaces by forming atom pairs with nonzero center-of-mass momentum, which we aim to directly characterize via time-of-flight expansion imaging. We confine the atoms in an array of 1D tubes formed from a 2D optical lattice. A blue-detuned anti-trapping laser beam will be applied to exactly cancel the axial harmonic confinement, allowing the atoms to freely expand in 1D. We will report the progress of our experiment.

[1]Y. A. Liao *et al.*, Nature **467**, 567 (2010).

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Date submitted: 31 Jan 2012 Electronic form version 1.4