Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Superfluidity in 1D and 3D Spin-Imbalanced Fermi Gases[1] BEN A. OLSEN, MELISSA REVELLE, JACOB A. FRY, RANDALL G. HULET, Department of Physics & Astronomy and Rice Quantum Institute, Rice University, Houston, TX 77005 — The phase separation between superfluid and normal phases (both polarized and unpolarized) in trapped Fermi gases in the BEC-BCS crossover reveals the interplay between superfluid pairing, interactions, and dimensionality. We measure density profiles of both spins of a two-component, spin-polarized gas of ^{6}Li atomic fermions cooled to ~ 100 nK. In a 3D gas, an unpolarized superfluid core is surrounded by a polarized shell. We observe gradual suppression of this core as interactions are weakened from unitarity. For a 1D gas in an optical lattice, the phase separation matches exactly-solved 1D models, where the central phase is partially polarized, and is predicted to exhibit FFLO correlations[2]. By increasing the inter-tube tunneling rate, we investigate the dimensional crossover between 1D and 3D Fermi gases. In this regime, the FFLO order parameter is predicted to be correlated between tubes[3], and its modulation length constant over larger regions of the trap[4]. These features are predicted to enhance the observable signatures of FFLO correlations; we report progress towards such measurements.

[1]Supported by DARPA, NSF, ARO, and ONR
[2]Y.A. Liao et al., Nature **467**, 567 (2010).
[3]K. Sun, and C. J. Bolech, PRA **87**, 053622 (2013)
[4]M. M. Parish, et al., PRL **99**, 250403 (2007)

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Date submitted: 14 Nov 2014 Electronic form version 1.4