Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

FFLO superfluidity in a spin imbalanced Fermi gas[1] ANNA L. MARCHANT, JACOB A. FRY, YI JIN, MELISSA C. REVELLE, RANDALL G. HULET, Rice University — Ultracold atomic gases confined in optical lattices have proven to be highly versatile, tunable systems, capable of emulating condensed matter systems and realizing novel quantum states of matter. We use a pair of atomic states to create a pseudo-spin-1/2 system and engineer a spin imbalance in the gas, analogous to applying a magnetic field to a superconductor. The atomic gas is confined in a 2D optical lattice, which produces an array of 1D tubes. Both the tunneling between tubes and interactions between atoms can be precisely controlled. We previously identified a universal crossover regime[2] from 1D to 3D-like behavior in the phase separation of this spin-imbalanced Fermi gas when varying the tunneling in the lattice. This crossover region is expected to be a promising regime in which to observe the elusive polarized superfluid known as FFLO where magnetism is accommodated by the formation of pairs with finite momentum. Here we present our current progress towards the observation of this exotic superfluid state. By compensating the optical potential along the weak axial direction of the lattice we can carry out 1D time-of-flight expansion to study the momentum distribution of the spin imbalanced gas and thus search for experimental signatures of the FFLO phase.
[1] Supported by the ONR, ARO MURI program, the Welch Foundation, and the NSF [2] M. C. Revelle et al., to be published in Phys. Rev. Lett., arXiv:1605.06986 (2016)

Anna L. Marchant
Rice University

Date submitted: 11 Nov 2016 Electronic form version 1.4