Abstract Submitted
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FFLO superfluidity in a spin imbalanced Fermi gas[1] ANNA L. MARCHANT, JACOB A. FRY, YI JIN, MELISSA C. REVELLE, RANDALL G. HULET, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston, TX 77005 — Ultracold atomic gases confined in optical lattices have proven to be highly versatile, tunable systems, capable of emulating condensed matter systems. Using the lowest two hyperfine states of ^{6}Li to create a pseudo-spin-1/2 system we can engineer a spin imbalance in the gas, analogous to applying a magnetic field to a superconductor. Using a 2D optical lattice to create an array of 1D tubes the tunneling between tubes can be precisely controlled whilst a Feshbach resonance is used to tune the atomic interactions. Previously we 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 lattice tunneling. This crossover region is expected to be a promising regime in which to observe the elusive polarized superfluid FFLO where magnetism is accommodated by the formation of pairs with finite momentum. Here we present our 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 gas and thus search for experimental signatures of the FFLO phase.

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[2]M. C. Revelle et al., Phys. Rev. Lett. 117, 235301 (2016)

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