Abstract Submitted
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FFLO Superfluidity in the 1D-3D Crossover of a Spin-imbalanced Fermi Gas[1] JACOB A. FRY, YI JIN, EDUARDO IBARRA G.P., RANDALL G. HULET, Department of Physics and Astronomy, Rice University, Houston, TX, 77005 — Ultracold atomic gases provide an ideal platform to realize novel quantum many-body states due to their tunability and versatility. In particular, spin-polarized Fermi gases provide a promising environment for the search of exotic superfluids such as the Fulde–Ferrell–Larkin–Ovchinnikov (FFLO) phase. We create a pseudo-spin-1/2 system using the lowest two hyperfine states of fermionic lithium that are polarized with a high degree of control. The atoms are confined in an array of 1D tubes with variable tunneling generated with a 2D optical lattice, while interactions are tuned via an s-wave Feshbach resonance. Previous work identified the crossover from 1D to 3D as the most likely region to stabilize the FFLO superfluid[2,3], therefore we bring the system to the dimensional crossover by tuning the inter-tube tunneling rate and interaction strength. We present our progress towards direct observation of the domain walls containing the excess unpaired fermions. The periodicity of these domain walls, which depends on the magnitude of the polarization, is a definitive signature of the FFLO phase.

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