

Abstract Submitted
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FFLO Superfluidity in the 1D-3D Crossover of a Spin-imbalanced Fermi Gas¹ JACOB A. FRY, ANNA L. MARCHANT, YI JIN, EDUARDO IBARRA G.P., RANDALL G. HULET, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston, TX 77005 — The FFLO polarized superfluid is characterized by finite center of mass pairs. This novel superfluid has yet to be conclusively observed in either condensed matter or ultracold atomic gases. Ultracold atomic gases provide an ideal platform to realize novel quantum many-body states due to their tunability and versatility. We create a pseudo-spin-1/2 system using the lowest two hyperfine states of ⁶Li. By engineering a spin imbalance, we produce an effective magnetic field. The atoms are confined in an array of 1D tubes with variable tunneling, produced using a 2D optical lattice. Interactions are tuned via a Feshbach resonance. Previous work identified the crossover from 3D to 1D as the most likely region to stabilize the FFLO superfluid²³. We present our progress towards direct observation of the domain walls containing the excess unpaired fermions. The periodicity of these domain walls is a definitive signature of the FFLO phase.

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²Meera M. Parish et al., Phys. Rev. Lett. 99, 250403 (2007)

³M. C. Revelle et al., Phys. Rev. Lett. 117, 235301 (2016)

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