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Quasi-1D Superfluids In A Spin-Imbalanced Fermi Gas[1] MELISSA C. REVELLE, BEN A. OLSEN, JACOB A. FRY, RANDALL G. HULET, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston, TX 77005 — We experimentally study the phases of an ultracold two-spin component gas of atomic fermions (^{6}Li) confined to 1D tubes formed by a 2D optical lattice. The atoms are prepared in the lowest two hyperfine sublevels where their interactions are tuned by a Feshbach resonance. We previously observed phase separation into a partially-polarized superfluid core and either fully-paired or fully-polarized wings (depending on the spin polarization).[2] In 3D, the phase separation is inverted, such that the cloud center is fully paired.[3] We investigate the transition from a 1D to 3D gas by varying the lattice depth and interaction strength which changes the ratio of the tunneling rate between the tubes to the pair binding energy. The region of parameter space we are exploring is believed to be the most promising region for the exotic FFLO superfluid phase.[4]

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[2]Y.A. Liao et al., Nature 467, 567 (2010).
[3]G. B. Partridge et al., Science 311, 503 (2006); Y. Shin et al., Phys. Rev. Lett. 97, 030401 (2006).
[4]M. Parish et al., PRL 99, 250403 (2007).

Melissa Revelle
Department of Physics and Astronomy and Rice Quantum Institute,
Rice University, Houston, TX 77005

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