Abstract Submitted
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1D-3D Crossover In A Spin–Balanced 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. Spin-imbalanced trapped Fermi gases have been observed to phase separate in both 1D and 3D, but with qualitatively different features[2]. The difference between the phase separation in these regimes allows for the dimensionality of the system to be determined using phase diagrams. We observed the transition for a 1D-like to 3D-like Fermi gas by varying the atomic interactions and the tunneling rate between the 1D tubes. Using the inversion of the phase separation between 1D and 3D, we determined crossover point. By scaling the tunneling rate t with respect to the pair binding energy ϵ_B, we observe a collapse of the data and have identified a universal crossover point of $t/\epsilon_B = 0.025(7)$[3].

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[2]Y.A. Liao et al., Nature 467, 567 (2010);G. B. Partridge et al., Science 311, 503 (2006); Y. Shin et al., Phys. Rev. Lett. 97, 030401 (2006).
[3]M.C. Revelle et al., arXiv:1605.06986v2 [physics.atom-ph] (2016)

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