

Abstract Submitted  
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**3D-1D Crossover of a Spin-Imbalanced Fermi Gas**<sup>1</sup> MELISSA REVELLE, YEAN-AN LIAO, ANN SOPHIE C. RITTNER, RANDALL G. HULET, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston, TX 77005 — A 3D trapped spin polarized Fermi gas has been shown to phase separate into a fully paired core and a polarized shell.<sup>2</sup> Motivated by a search for FFLO pairing we have obtained the phase diagram of a 1D spin-imbalanced Fermi gas confined to an array of tubes created by a 2D optical lattice. It exhibits three phases with an inverted structure compared to 3D: a partially polarized superfluid, a fully paired phase and a fully polarized phase, depending on the degree of spin polarization.<sup>3</sup> We investigate the transition from a 3D to 1D gas by smoothly varying the depth of our 2D optical lattice. This changes the tunneling between the 1D tubes allowing us to study how the spin density varies with inter-tube coupling. By varying the lattice depth quickly, we can also measure spin transport in a strongly interacting system.

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<sup>2</sup>G.B. Partridge *et al.*, Science **311**, 503(2006); Y. Shin *et al.* Phys. Rev. Lett. 97, 030401 (2006).

<sup>3</sup>Y.A. Liao *et al.*, Nature **467**, 567(2010).

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