

Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Phase Diagram of a One-Dimensional Spin-Imbalanced Fermi Gas¹ ANN SOPHIE RITTNER, YEAN-AN LIAO, TOBIAS PAPROTTA, WEN-HUI LI, GUTHRIE PARTRIDGE, RANDY HULET, Rice University — We report experimental measurements of spin and density profiles of a two spin mixture of ultracold ⁶Li atoms trapped in an array of one dimensional (1D) tubes², a system analogous to electrons in 1D wires. Compared to the three-dimensional case³, at finite spin imbalance the 1D system shows an inverted phase separation: a partially polarized core surrounded by wings composed of either a completely paired BCS superfluid or a fully polarized Fermi gas, depending on the degree of polarization. The observations are in quantitative agreement with the Bethe ansatz and numerous other theoretical calculations⁴, in which the partially polarized phase is found to be a 1D analogue of the FFLO state, a superfluid state with spatially modulated magnetic order.

¹Supported by DARPA, NSF, ONR, the Keck and Welch Foundations

²Y. Liao *et al.*, Submitted; in collaboration with S. K. Baur and E. J. Mueller.

³G. B. Partridge *et al.*, *Science* 311, 503-505 (2006); G. B. Partridge *et al.*, *Phys. Rev. Lett.* **97**, 190407 (2006).

⁴G. Orso, *Phys. Rev. Lett.* 98, 070402 (2007); H. Hu *et. al*, *Phys. Rev. Lett.* 98, 070403 (2007).

Ann Sophie Rittner
Rice University

Date submitted: 21 Jan 2010

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