Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Detection of antiferromagnetic order and characterizing spin-charge separation with ultracold ^{6}Li in a compensated optical lattice[1] YA-TING CHANG, ZHENGHAO ZHAO, TSUNG-LIN YANG, Rice Univ, CHUNG-YOU SHIH, None, RANDALL HULET, Rice Univ — We explore the physics of fermions in both 1D and 3D using ultracold ^{6}Li atoms in an optical lattice. We have realized the 3D Fermi-Hubbard model and detected short-range antiferromagnetic (AFM) spin correlations via Bragg scattering[2]. We must cool to 40% lower temperatures to realize the long-range ordered Néel phase. We are setting up a low noise laser and servo to reduce the rate of heating by lattice intensity fluctuation. In addition, we are studying the 1D system by turning off one of the lattice beams. Luttinger liquid theory predicts that fermions have different speeds of sound for spin and charge excitations, an effect known as spin-charge separation. Evidence of spin-charge separation has been obtained in quantum wire tunneling experiments[3,4]. However, spin and charge dispersion have not been measured independently. Ultracold atoms provide a highly tunable system for which we may directly observe this phenomenon using Bragg spectroscopy[5].

[1]Work supported by an ARO MURI grant, our NSF, and the Welch Foundation.
[2]R. A. Hart, P. M. Duarte et al., Nature 519, 211-214 (2015).
[3]O. M. Auslaender et al., Science 308, 88 (2005).
[4]Y. Jompol et al., Science 325, 597 (2009).
[5]S. Hoinka et al., Phys. Rev. Lett. 109 , 050403 (2012).

Ya-Ting Chang
Rice Univ

Date submitted: 27 Jan 2017 Electronic form version 1.4