Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Exploring the Néel phase using a compensated optical lattice[1]
TSUNG-LIN YANG, SETH T. COLEMAN, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston TX, PEDRO M. DUARTE, RUSSELL A. HART, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston TX, RANDALL G. HULET, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston TX
— We have realized the Fermi-Hubbard model with fermionic ^{6}Li atoms in a three-dimensional optical lattice. The red-detuned optical lattice is compensated by three additional blue-detuned laser beams which overlap each of the lattice beams, but are not retro-reflected. Using the compensated optical lattice, we have reached temperatures low enough to produce short-range antiferromagnetic (AF) spin correlations, which we detect via Bragg scattering of light. Previously, we reached temperatures down to 1.4 times that of the AFM phase transition,[2] more than a factor of 2 below temperatures obtained previously in 3D optical lattices with fermions. However, the alignment stability of the lattice beams and the lack of tunability of the relative size of the lattice and compensating beam sizes hindered the optimization of the temperature. We have implemented an improved experimental setup which allows us to adjust the lattice beam waist ratios with better long-term stability. We will report on the status of these efforts and our progress on cooling deep into the Néel phase.

[1]Work supported by ARO, ONR, NSF and the Welch Foundation.
[2]R. A. Hart, P. M. Duarte et al., arXiv:1407.5932, to be published in Nature.

Tsung-Lin Yang
Department of Physics and Astronomy and Rice Quantum Institute,
Rice University, Houston TX

Date submitted: 30 Jan 2015 Electronic form version 1.4