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Investigation of the Fermi-Hubbard model with ^{6}Li in an optical lattice[1] R.A. HART, P.M. DUARTE, T.-L. YANG, R.G. HULET, Rice University, Department of Physics and Astronomy — We present our results on investigation of the physics of the Fermi-Hubbard model using an ultracold gas of ^{6}Li loaded into an optical lattice. We use all-optical methods to efficiently cool and load the lattice beginning with laser cooling on the $2S_{1/2} \rightarrow 2P_{3/2}$ transition and then further cooling using the narrow $2S_{1/2} \rightarrow 3P_{3/2}$ transition to T $\sim$ 59 μK^2. The second stage of laser cooling greatly enhances loading to an optical dipole trap where a two spin state mixture of atoms is evaporatively cooled to degeneracy. We then adiabatically load $\sim 10^6$ degenerate fermions into a 3D optical lattice formed by three orthogonal standing waves of 1064 nm light. Overlapped with each of the three lattice beams is a non-retroreflected beam at 532 nm. This light cancels the harmonic trapping caused by the lattice beams, which extends the number of lattice sites over which a Néel phase can exist and may allow evaporative cooling in the lattice. By using Bragg scattering of light[3], we investigate the possibility of observing long-range antiferromagnetic ordering of spins in the lattice.

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[2]P. M. Duarte et al., Phys. Rev. A **84**, 061406 (2011).
[3]T. A. Corcovilos et al., Phys. Rev. A **81**, 013415 (2010).

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