

Abstract Submitted
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Investigation of the Fermi-Hubbard model with ${}^6\text{Li}$ in an optical lattice¹ RUSSELL A. HART, PEDRO M. DUARTE, TSUNG-LIN YANG, RANDY G. HULET, Rice University — We present our results on investigation of the physics of the Fermi-Hubbard model using an ultracold gas of ${}^6\text{Li}$ 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 $T \sim 59 \mu\text{K}$.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 facilitates evaporative cooling in the lattice. We investigate the possibility of observing antiferromagnetic ordering of spins in the lattice using Bragg scattering of light.³

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²P. M. Duarte et al., Phys. Rev. A **84**, 061406 (2011).

³T. A. Corcovilos et al., Phys. Rev. A **81**, 013415 (2010).

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