Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Optical Lattice Realization of 1D Antiferromagnetic Ising Chain
RUICHAO MA, WASEEM BAKR, M. ERIC TAI, PHILIPP PREISS, JONATHAN SIMON, MARKUS GREINER — Ultracold gases in optical lattices provide a novel avenue for quantum simulation of condensed matter Hamiltonians due to the exquisite control over the interaction parameters, and the availability of local and temporal probes of the dynamics. We present a recent realization of an antiferromagnetic Ising model with transverse and longitudinal fields using Rubidium 87 in a tilted 1D optical lattice, where the dipolar excitations of the Mott Insulator are mapped to spin degrees of freedom. By sweeping the tilt of the lattice, the spins transition between the paramagnetic and the antiferromagnetic phase. We observe the quantum phase transition both in situ by single-site resolved imaging using our quantum gas microscope and by density-correlation measurements. Using a spatial light modulator, we can modify the lattice topography with high resolution. This enables us to study the impact of superlattice or random disorder on the dynamics of the phase transition, as well as the dynamics of local excitations.

Ruichao Ma
Harvard Physics

Date submitted: 04 Feb 2011 Electronic form version 1.4