Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Thermometry and Dynamics of Two-Component Ultracold Gases in Optical Lattices[1] HIROKAZU MIYAKE, PATRICK MEDLEY, DAVID WELD, DAVID PRITCHARD, WOLFGANG KETTERLE, MIT — Two-component mixtures of ultracold atoms in optical lattices are expected to exhibit novel many-body quantum phases at very low temperatures. We have used such a system to realize a new type of lattice-based thermometry with ^{87}Rb atoms, which we call spin gradient thermometry. We present results of this thermometry technique, which include measurement of temperatures as low as 1 nK in the Mott insulating state. We also present results of a study of non-equilibrium spin dynamics in this system. Understanding the time scale of relaxation towards equilibrium is crucial to the realization of quantum magnetism. Furthermore, controlling spin relaxation processes may enable realization of a new cooling scheme analogous to adiabatic demagnetization cooling.

[1]We acknowledge support from the DARPA OLE Program, NSF, and the Department of Defense.

Hirokazu Miyake
MIT

Date submitted: 21 Jan 2010 Electronic form version 1.4