Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Laser frequency stabilization for narrow linewidth cooling of ^{6}Li atoms[1] ADAM REED, The Ohio State University, Department of Physics, KEVIN JOURDE, ESPCI ParisTech, PEDRO DUARTE, RANDALL HULET, Rice University, Department of Physics and Astronomy — Laser cooling to micro-Kelvin temperatures requires a laser with active frequency stabilization. The linewidth Γ of an atomic transition sets a lower bound on the Doppler cooling temperature $k_B T_D = \hbar\Gamma/2$. The $2s - 2p$ transition in ^{6}Li has a lower bound temperature of $T_D \approx 140\,\mu$K. In contrast, the $2s - 3p$ transition has a narrower linewidth and thus provides a lower temperature limit of $T_D \approx 20\,\mu$K. We present a method for stabilizing a laser to an atomic line in a vapor cell using modulation transfer spectroscopy and a home-built lock-in amplifier. Our results demonstrate successful locking of a 323 nm laser to the $2s - 3p$ transition. The stabilized laser provides a second stage of magneto-optical trapping that results in an order of magnitude increase in the phase space density before evaporating to degeneracy in an optical dipole trap.

[1]This work was supported under ARO Award W911NF-07-1-0464 with funds from the DARPA OLE program, and by the NSF, the ONR, the Welch Foundation (grant C-1133) and the Keck Foundation.

Adam Reed
The Ohio State University, Department of Physics

Date submitted: 16 Nov 2010 Electronic form version 1.4