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Cooling of individual neutral atoms in an optical lattice MICHAEL GIBBONS, PEYMAN AHMADI, KEVIN FORTIER, SOO KIM, MICHAEL CHAPMAN, Georgia Institute of Technology — We study the lifetime of individual neutral rubidium atoms trapped in a one-dimensional optical lattice. By using optical molasses to continuously cool the trapped atoms, we achieve vacuum-limited lifetimes greater than 200 s. Without cooling, we observe negligible atom loss within the first 5 s; thereafter, they are observed to decay with a 15 s lifetime. We use a Fokker-Planck [1] equation to simulate the evolution of the cloud in the optical lattice. By fitting the observed population remaining in the lattice to the theoretical predictions, we infer the initial temperature and heating rate of the cloud. Motivated by these results, we have developed a pulsed cooling scheme that maintains very long lifetimes with a low duty cycle (<1%) of applied cooling.
[1] M.G. Gehm, K.M O'Hara, T.A. Savard, and J.E. Thomas, Phys. Rev. A **58**, 3914 (1998).

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