Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Entrainment of lithium atoms into a supersonic beam and magnetic deceleration[1] YU LU, LUKAS GRADL, LICHUNG HA, LOGAN HILLBERRY, KEVIN MELIN, PAVEL NAGORNYKH, JORDAN ZESCH, MARK RAIZEN, UT Austin — We report our progress on the development of an alternative to laser cooling of neutral atoms, using alkali atoms as the benchmark for a direct comparison. The first step is optimization of entrainment of lithium into a supersonic beam followed by magnetic deceleration. We create a supersonic beam of cold helium gas by pulsing on an Even-Lavie valve, which then crosses lithium vapor generated by a directional oven. The resulting entrainment number and temperature of the lithium atoms are measured downstream with a hot-wire detector. In order to further optimize entrainment, we developed a pulsed atomic source that is synchronized with the supersonic valve with an appropriate delay time. Lithium atoms from the directional oven accumulate on a thin metallic ribbon and are quickly evaporated as a short current pulse is applied, creating a dense plume of lithium vapor. The entrained lithium beam will be slowed by a magnetic decelerator as demonstrated in earlier work, combining all the components to deliver lithium atoms near rest in the laboratory frame. Atomic phase space density will be further increased by a new method that we recently proposed, which utilizes optical pumping and magnetic kicks, and does not rely on the momentum of the photon.

[1]W.M. Keck Foundation

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Date submitted: 27 Jan 2017 Electronic form version 1.4