Abstract Submitted
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Bichromatic Force Slowing of Helium Over Large Velocity Ranges[1] M.A. CHIEDA, E.E. EYLER, University of Connecticut, Department of Physics — The optical bichromatic force holds promise as an efficient, simple, and compact means to slow atoms to MOT capture velocities [1]. Metastable helium beams, with $v \sim 1000$ m/s, are especially worthwhile candidates since they presently require Zeeman slowers with lengths of $2 - 3$ m. Two schemes for bichromatic slowing of helium atoms are considered: static and dynamic (or chirped). In the static slower, very highly detuned bichromatic beams with a fixed (static) Doppler shift are used. While the velocity range of the force is fundamentally capable of slowing the atoms to near rest in a single stage, there are several physical and engineering factors that limit the attainable upper range of the force, requiring a two-stage design. The dynamic slower employs beams with smaller bichromatic detunings in which the Doppler shifts are chirped in order to keep the force centered on the atoms as they are slowed. This is made possible by recent advances in high power diode lasers and electronics, and avoids many of the potential problems of the static slower. Experimental and theoretical results of both schemes will be presented, emphasizing the limitations and relative merits.

[1] M. Cashen and H. Metcalf, "Optical forces on atoms in nonmonochromatic light," J. Opt. Soc. Am. B **20**, 915 (2003).

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