Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Optimizing Bichromatic Force Decelerators for Atoms and Molecules[1] SCOTT GALICA, LELAND ALDRIDGE, KURT NESTERUK, MICHAEL CHIEDA[2], EDWARD EYLER, University of Connecticut — Optical bichromatic forces (BCFs) have shown success in slowing atomic beams,[3] and they have considerable promise for laser slowing of molecules. Our first-generation BCF decelerator for metastable helium has achieved slowing by >500 m/s in less than 5 cm using ordinary diode lasers, with He* brightness similar to a Zeeman slower. We discuss explorations of atomic and molecular evolution under multicolor illumination with a view towards optimizing decelerators for MOT loading. These explorations include numerical studies of the excited-state fraction for two-level atoms in bichromatic and polychromatic light, progress towards a multi-level simulation for testing molecular behavior, and continuing investigations of the large-detuning limit of the BCF magnitude. We also discuss progress in developing a practical BCF decelerator for molecules, which could substantially improve on recent results using Doppler and Sisyphus forces.[4] Our initial experimental configuration is a BCF-based beam deflector for CaF molecules.

[1]Supported by the National Science Foundation.
[2]Present address: ASML, Wilton CT
[3]M. A. Chieda and E. E. Eyler, PRA **86**, 053415 (2012), and references therein.
[4]J. F. Barry, *et al.*, PRL **108**, 103002 (2012); M. Zeppenfeld, *et.al.*, Nature **491**, 570 (2012).

Edward Eyler
University of Connecticut

Date submitted: 28 Jan 2013 Electronic form version 1.4