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The Optical Bichromatic Force in Molecular Systems[1] LELAND ALDRIDGE, SCOTT GALICA, E.E. EYLER, University of Connecticut — The optical bichromatic force has been demonstrated to be useful for slowing atomic beams much more rapidly than radiative forces. Through numerical simulations, we examine several aspects of applying the bichromatic force to molecular beams. One is the unavoidable existence of out-of-system radiative decay, requiring one or more repumping beams. We find that the average deceleration varies strongly with the repumping intensity, but when using optimal parameters, the force approaches the limiting value allowed by population statistics. Another consideration is the effect of fine and hyperfine structure. We examine a simplified multlevel model based on the $B \leftrightarrow X$ transition in calcium monofluoride. To circumvent optical pumping into coherent dark states, we include two possible schemes: (1) a skewed dc magnetic field, and (2) rapid optical polarization switching. Our results indicate that the bichromatic force remains a viable option for creating large forces in molecular beams, with a reduction in the peak force by approximately an order of magnitude compared to a two-level atom, but little effect on the velocity range over which the force is effective. We also describe our progress towards experimental tests of the bichromatic force on a molecular beam of CaF.

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