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Deflection of a CaF Molecular Beam Using the Bichromatic Force
SCOTT GALICA, University of Connecticut, LELAND ALDRIDGE, Gonzaga University, DANIEL MCCARRON, EDWARD EYLER, PHILLIP GOULD, University of Connecticut — We demonstrate that a bichromatic standing-wave laser field can exert a significantly larger force on a molecule than ordinary radiation pressure. Our experiment[1] measures the deflection of a pulsed supersonic beam of CaF molecules by a two-frequency 531 nm laser field near resonance with the very nearly closed X(v = 0) - B(v = 0) transition. A skewed magnetic field prevents population from accumulating in dark magnetic sublevels. The transverse momentum transfer is measured with a scanning slit. The molecules are excited immediately upstream of the slit, using the X(v = 0) - A(v = 1) transition at 583 nm, and the fluorescence which passes through the slit is monitored. The inferred force as a function of relative phase of the two frequencies is in reasonable agreement with numerical simulations[2] of the bichromatic force in this multilevel system. The large magnitude of the force, coupled with the reduced rate of spontaneous emission, indicates its potential utility in the slowing and manipulation of molecular beams. This work was supported by NSF and BSF.

[1]S.E. Galica, L. Aldridge, D.J. McCarron, E.E. Eyler, and P.L. Gould, Phys. Rev. A **98**, 023408 (2018).
[2]L. Aldridge, S.E. Galica, and E.E. Eyler, Phys. Rev. A **93**, 013419 (2016).

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