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Continuous all-optical deceleration of molecular beams ANDREW JAYICH, GARY CHEN, XUEPING LONG, ANNA WANG, WESLEY CAMPBELL, University of California - Los Angeles — A significant impediment to generating ultracold molecules is slowing a molecular beam to velocities where the molecules can be cooled and trapped. We report on progress toward addressing this issue with a general optical deceleration technique for molecular and atomic beams. We propose addressing the molecular beam with a pump and dump pulse sequence from a mode-locked laser. The pump pulse counter-propagates with respect to the beam and drives the molecules to the excited state. The dump pulse co-propagates and stimulates emission, driving the molecules back to the ground state. This cycle transfers $2\hbar k$ of momentum and can generate very large optical forces, not limited by the spontaneous emission lifetime of the molecule or atom. Importantly, avoiding spontaneous emission limits the branching to dark states. This technique can later be augmented with cooling and trapping. We are working towards demonstrating this optical force by accelerating a cold atomic sample.

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