Abstract Submitted
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Large molasses-like cooling forces for molecules using polychromatic optical fields: A theoretical description[1] IVAN KOZYRYEV, KONRAD WENZ, Columbia University, LELAND ALDRIDGE, Gonzaga University, REES MCNALLY, TANYA ZELEVINSKY, Columbia University — Recent theoretical investigations have indicated that rapid optical cycling should be feasible in complex polyatomic molecules with diverse constituents [1], geometries and symmetries [2]. However, as a composite molecular mass grows, so does the required number of photon scattering events necessary to decelerate and confine molecular beams using laser light. Utilizing coherent momentum exchange between light fields and molecules can suppress spontaneous emission and significantly reduce experimental complexity for molecular slowing and trapping. Working with BaH as a test species, we have identified a robust, experimentally viable configuration to achieve large molasses-like cooling forces for molecules using polychromatic optical fields addressing both X-A and X-B electronic transitions simultaneously. Using direct numerical solutions of the time-dependent density matrix, we demonstrate that creation of optical molasses-like forces with large capture velocities is generically feasible for polyatomic molecules of increasing complexity that have an optical cycling center. Both numerical results and progress towards experimental proof-of-principle implementation with BaH will be described. [1] Klos and Kotochigova, arXiv:1912.09364 [2] Augenbraun et al., arXiv:2001.11020

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