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Impact of Decoherence on Internal State Cooling using Optical Frequency Combs STEPHEN L. HORTON, SVETLANA A. MALINOVSKAYA, Stevens Institute of Technology — We discuss femtosecond Raman type techniques to control molecular vibrations, which can be implemented for internal state cooling from Feshbach states with the use of optical frequency combs. We analyzed the use of an optical frequency comb, with and without modulation, as a viable substitute to the STIRAP process. In our theoretical model we take into account decoherence in the form of spontaneous emission and collisional dephasing in order to ascertain an accurate model of the population transfer in a three level system. We analyze the effects of odd and even chirps of the optical frequency comb in the form of sine and cosine functions on the population transfer. We compared the effects of these chirps to the results attained with a standard optical frequency comb to see if they increase the number of molecules that eventually end up in the final deeply bound state in the presence of decoherence. We also analyzed the inherent phase relation of the collisional dephasing between each of the states. This ability to control the rovibrational states of a molecule with an optical frequency comb enables us to create a deeply bound ultracold polar molecule from the Feshbach state.

Stephen L. Horton
Stevens Institute of Technology

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