THE BICHROMATIC FORCE ON SMALL MOLECULES

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The bichromatic force is a coherent optical force that has been demonstrated to exceed the saturated radiative force from a monochromatic cw laser by orders of magnitude in atomic systems. By stimulating photon emission between two states, the bichromatic force allows us to increase the photon scattering rate beyond the spontaneous emission rate while also suppressing decays into dark states. We present studies of the efficacy of the bichromatic force on molecular systems using the test cases of B-X (0,0), $P_{11}(1.5)/^{P}Q_{12}(0.5)$ in CaF and $\tilde{A}(000)-\tilde{X}(000)$, $P_{11}(1.5)/^{P}Q_{12}(0.5)$ in the linear triatomic molecule SrOH. Computational results from detailed multilevel models indicate that both of these molecular systems are suitable for the use of the bichromatic force, with neither repumping nor magnetic destabilization of dark states interrupting the coherent cycling at the heart of the force. We comment on the applicability of the bichromatic force to arbitrary polyatomic molecules, and present our experimental progress in demonstrating the bichromatic force on CaF and possibly on SrOH.[a]

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