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Effective three-body interactions and decoherence of coherent atom states in optical lattices PHILIP JOHNSON, American University, EITE TIESINGA, TREY PORTO, CARL WILLIAMS, NIST — We show that effective attractive three-body interactions are generated by the virtual excitations of bosons to higher vibrational states in a three dimensional optical lattice. These processes can quickly decohere non-equilibrium coherent states faster than would be expected from the effects of inhomogenieties, which may explain the surprisingly rapid damping of collapse and revival oscillations seen in some experiments. Using Feshbach resonances, it should be possible to tune the effective three-body interaction strength, creating new opportunities for studying the effects of three-body interactions on the coherence and correlations of both equilibrium and non-equilibrium many-body states.

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