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Signature of effective three-body interactions on the dynamics of spin-1 atoms in an optical lattice EITE TIESINGA, KHAN W. MAHMUD, Joint Quantum Institute, NIST and University of Maryland — We performed a theoretical study of the non-equilibrium dynamics of spin-1 bosons in an optical lattice after suddenly raising the lattice depth. The hamiltonian that describes the physics of such deep harmonic wells comprises of effective multi-body interactions arising from virtual excitations to higher bands. Spin-1 bosons are known to contain a spin-dependent coupling term which interconverts a pair of spin-0 bosons into a spin+1 and spin-1 bosons, and vice versa; the signature of which shows up in the population oscillations after our quench set up. We show that this expected spin mixing dynamics is influenced by the effective three-body interactions, and a frequency analysis of the oscillations clearly shows its signature. We treat both antiferromagnetic (^{23}Na) and ferromagnetic (^{87}Rb) condensates. The spin-1 bosonic case treated here is unique in the sense that the three-body effect is evident directly in the in-situ number oscillations in addition to the familiar coherence visibility.

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