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Dynamics of spin-1 bosons in an optical lattice KHAN W. MAHMUD, EITE TIESINGA, Joint Quantum Institute, University of Maryland and NIST — We study spin-mixing and collapse and revival dynamics of spin-1 atoms in an optical lattice. Starting with the ferromagnetic or anti-ferromagnetic superfluid ground state - a sudden raising of the lattice depth creates a non-equilibrium state. Analysis of the oscillations in atom numbers in different spin states and the collapse and revivals in visibility reveals details about the system parameters and the initial superfluid state. For example, in situ number oscillations reveal the spin-dependent interactions, and visibility oscillations reveal the ratio of on-site and spin-dependent interactions, and thus the various scattering lengths in different channels can be determined. To study the interplay of superlfuidity and magnetism, we also examine the oscillations in various observables in the presence of an external magnetic field in the form of quadratic Zeeman energy. The frequency spectrum of the oscillations reveals the discrete energy levels and relative importance of different Fock states in the initial superfluid and magnetic states.

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