

Spin diffusion in spinor Bose-Einstein condensate

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We discuss the quantum phases and its diffusion dynamics in a spinor-1 atomic Bose-Einstein condensate. For ferromagnetic interactions, we obtain the exact ground state distribution of the phases associated with the total atom number (N), the total magnetization (M), and the total hypercharge (Y) of the system. We find that the mean field ground state is stable against fluctuations of atom numbers in each of the spin components, and the phases associated with each spin component dynamically recovers the $U(1)$ symmetries when N and M are conserved as in current experiments.