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Cavity-mediated tunable spin mixing in spinor atomic Bose-Einstein condensates MING XUE[1], JUN-JIE CHEN[2], Tsinghua Univ, ZHI-FANG XU[3], SUSTech, LI YOU[4], Tsinghua Univ — Spin mixing usually refers to the dynamics originating from binary spin exchange collisions in a spinor atomic Bose-Einstein condensate. This work presents a practical scheme for realizing spin mixing with tunable interaction strength and effective quadratic Zeeman shift by placing the condensate in an optical cavity, whereby two atomic Raman transitions are accomplished via a cavity photon and two laser beams, leading to the generation of an effective spin-exchange interaction. The effective Hamiltonian are derived by using Floquet-Magnus expansion. For increased strength, the frequencies of the two σ-polarized lasers are chosen to compensate the spin-exchange energy mismatching. With atoms far off-resonant due to a large bias magnetic field and the cavity photonic mode only virtually excited, our scheme is found to be robust against cavity dissipation and magnetic field noise.

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