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Control the spin coherence of a spin-1 Bose-Einstein Condensate with dynamical decoupling approach BOYUAN NING, JUN ZHUANG, WENXIAN ZHANG, Department of Optical Science and Engineering, Fudan University, Shanghai 200433, China, J.Q. YOU, Department of Physics, Fudan University, Shanghai 200433, China — The coherence of spinor Bose-Einstein condensates (BECs) is determined by the dynamically unstable collective modes. Recently, Uhrig Dynamical Decoupling (UDD), a sequence containing n π-pulses, has been applied to eliminate the decoherence of a qubit in the spin-boson (SB) model up to the order of $\mathcal{O}(t^{n+1})$ and proved to be a universal method. Stimulated by its promising power, we conjecture whether the UDD sequence could also preserve the coherence of a spinor BEC by modulating the spin exchange interaction through optical Feshbach resonance. In this work, we theoretically analyze the effect of UDD, periodic DD (PDD) and concatenated DD (CDD) to maintain the coherence of a ^{87}Rb spin-1 BEC and a scalar BEC. Our numerical results show that the CDD, as n increases, suppresses the decoherence more than the other two DD sequences in both the spinor and the scalar BECs. However, it is interesting that all three sequences only remove the decoherence up to the same order $\mathcal{O}(t)$. We further carry out analytical works for the scalar BEC, which confirms our numerical results that UDD, compared to the case of SB model, is not as superior as expected at coherence control in BECs.

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