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Uniaxial dynamical decoupling for a spinor Bose-Einstein condensate[1] WENXIAN ZHANG, QI YAO, JUN ZHANG, Wuhan University, China, L. YOU, Tsinghua University, China — Dynamical decoupling (DD) is an active and effective method for suppressing decoherence of a quantum system from its environment. In contrast to the nominal biaxial DD, we present a uniaxial decoupling protocol that requires a significantly reduced number of pulses and a much lower bias field satisfying the "magic" condition. We show this uniaxial DD protocol works effectively in a number of model systems of practical interests, e.g., a spinor atomic Bose-Einstein condensate in stray magnetic fields (classical noise), or an electron spin coupled to nuclear spins (quantum noise) in a semiconductor quantum dot. It requires only half the number of control pulses and a 10-100 times lower bias field for decoupling as normally employed in the above mentioned illustrative examples, and the overall efficacy is robust against rotation errors of the control pulses. The uniaxial DD protocol we propose shines new light on coherent controls in quantum computing and quantum information processing, quantum metrology, and low field nuclear magnetic resonance.

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