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Spin Nematics and Quantum Fluctuation-Controlled Coherent Spin Dynamics of Hyperfine Spin F=2 Cold Atoms[1] JUN LIANG SONG, GORDON SEMENOFF, FEI ZHOU, The Univ. of British Columbia — We show that quantum fluctuations lift the accidental continuous degeneracy that was found in the mean field analysis of spin nematic states of hyperfine spin F=2 ^{87}Rb. Two distinct spin nematic states with higher symmetries are selected out depending on scattering lengths: a uniaxial spin nematic and a biaxial spin nematic. Recently we also study coherent spin dynamics mainly driven by quantum fluctuations. Unlike the usual mean-field driven dynamics, quantum fluctuation-controlled spin dynamics are sensible to the variation of fluctuations and the potential induced by quantum fluctuations can be tuned by four or five orders of magnitude in optical lattices. These dynamics have unique dependence on quadratic Zeeman fields and potential depth in optical lattices. We find that although these dynamics are difficult to observe in traps, it is possible to observe them in optical lattices; particularly they can survive in F=2 ^{87}Rb condensates with a relatively short life time.

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