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Creation of massive entanglement with optimized multiple spin squeezing[1] CHAO SHEN, LUMING DUAN, University of Michigan-Ann Arbor — Quantum entanglement is an important resource in many areas such as precision measurement, quantum information processing and quantum computation. Controlled creation of quantum entanglement between a large number of particles is a goal to which significant theoretical and experimental efforts have been devoted. For a large collection of spins, spin squeezing is an experimentally relevant approach to entanglement creation. Two-axis spin squeezing was shown to achieve the Heisenberg limit for phase sensitivity, which scales as 1/N and N is the particle number. However the required Hamiltonian H=(Sy^2-Sx^2) is usually not readily available in experimental systems. Here we propose an optimized control scheme to approach the Heisenberg limit with only a single-axis spin squeezing Hamiltonian combined with an external magnetic field. Essentially the scheme consists of multiple spin squeezing with optimized parameters. And squeezing parameter achieved seems even better than two-axis squeezing. Moreover this scheme can be employed to prepare the —S, Sz= 0 > Dicke state.

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