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Progress towards generating spin-squeezed sodium Bose-Einstein condensates JIE JIANG, LICHAO ZHAO, MICAH WEBB, YINGMEI LIU, Department of Physics, Oklahoma State University, Stillwater, OK 74078 — A coherent spin-state is an unentangled state with all spins aligned in the same direction, while the spin degrees of freedom of atoms become entangled in spin-squeezed states. Spin-squeezing has attracted much attention for its potential to improve the sensitivity of spin-resonance measurements. We present the design and construction of a novel apparatus to generate spin-squeezing with sodium Bose-Einstein condensates (BECs) in optical lattices. Spin-squeezing requires an interaction among atoms to suppress spin noise. Different types of interactions in BECs are exploited in our system: atom-light interaction via a quantum non-demolition measurement, self interactions and elastic collisions controlled by spin-dependent potentials, and spin-exchange collisions. We will also discuss a possibility of using sequences of universal pulses to control loss of entanglement due to decoherence from environmental effects.

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