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Spin Squeezing in Spinor Condensates SABRINA LESLIE, JAY SAU, MARVIN COHEN, DAN STAMPER-KURN, Physics Dept, UC Berkeley —
Spin squeezing in spinor condensates enables the control of quantum spin fluctuations in a fascinating multi-mode system. Further, it provides a coherent spin system characterized by sub-shot-noise spin fluctuations, with applications towards sensitive spatially-resolved magnetometry. With the application of appropriate unitary transformations, we show that one may manipulate the spin fluctuation modes atop an arbitrary F=1 coherent state, and in so doing prepare an arbitrary F=1 spin squeezed state. Taking into account experimental limitations to spin squeezing such as atom loss and nonlinear interactions in the condensate, we find that one may achieve roughly 17 dB of spin squeezing in the single mode regime and 10 dB of spin squeezing in the multi mode regime, for reasonable experimental parameters.

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