Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Spin Squeezing and Entanglement in an Ensemble of Spins Greater than 1/2 LEIGH NORRIS, University of New Mexico, COLLIN TRAIL, IVAN DEUTSCH — Spin squeezed states have generated great interest for their possible applications in metrology and quantum information processing. Substantial research has been directed both at producing spin squeezed states and understanding the properties of the states themselves. This has uncovered a complex relationship between collective spin squeezing and the entanglement between the individual spins. Whereas spin squeezing scales monotonically with the two-body concurrence in an ensemble of spin j=1/2 particles, an analogous relationship for j>1/2 less clear. We explore this problem for an ensemble of alkali atomic spins interacting with a single spatial mode of the electromagnetic field through the Faraday effect, a system that has previously been used for spin squeezing protocols. We investigate how the amplified projection noise of the large spin atoms leads to enhanced entangling interactions due to increased measurement backaction on the atoms and whether this entanglement can be converted into meaningful spin squeezing through local unitary control.

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Date submitted: 22 Jan 2010 Electronic form version 1.4