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Experimental Studies of Decoherence using a Single State Atom Interferometer[1] SCOTT BEATTIE, MATTHEW WEEL, IAIN CHAN, S. CHUDASAMA, A. KUMARAKRISHNAN, Department of Physics and Astronomy, York University — We have measured the decay time of a ground state grating echo produced by off resonant standing wave pulses tuned to the vicinity of the $F = 3 \rightarrow F' = 4$ transition in trapped ^{85}Rb atoms. The time scale of the decay ($\sim$ 20ms) is determined primarily by the transit time of the cold atoms through the region of interaction and is sufficiently long to investigate effects of decoherence due to light and velocity changing collisions. We find that the decay rate exhibits an exponential dependance on light intensity and scales inversely as the square of the detuning with respect to the excited state. We have also observed the effect of diffractive collisions on the decay time by varying the pressure of the background rubidium atoms. The data can be used to infer the total cross section for collisions between hot and cold rubidium atoms. These studies allow the time scale of the echo signal to be extended making it feasible to improve the precision of our measurement of $\hbar/M_{Rb}$.

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