Abstract Submitted
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Effects of Light Scattering and Collisions on a Single State Atom Interferometer[1] S. BEATTIE, I. CHAN, A. KUMARAKRISHNAN, York University — We have measured the effects of light scattering and collisions on the signal from a single state atom interferometer that uses laser cooled ^{85}Rb. Two standing wave pulses separated by time T are used to diffract and rephase momentum states (corresponding to the $F = 3$ ground state) in the vicinity of $t = 2T$. Light scattering and collisions reduce the timescale over which matter-wave interference can be observed. The decay rate of the signal is linearly proportional to the intensity of background standing wave light. The decay rate also scales inversely as the square of the detuning of the travelling components of the standing wave with respect to the $F = 3 \rightarrow F = 4$ transition. These observations are consistent with the scattering rate associated with a standing wave potential. By varying the vapour pressure of the background ^{85}Rb vapour, we show that the experiment is sensitive to velocity changes of $\sim 100\mu m/s$ and that the signal decay can be used to measure the cross section for hot-cold Rb collisions. By characterizing decoherence effects it is possible to extend the timescale of the experiment to the transit time limit and carry out a precision measurement of the atomic recoil frequency. We review the current status of this experiment.

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