Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Recoil-sensitive lithium interferometer without a subrecoil sample[1] KAYLEIGH CASSELLA, ERIC COPENHAVER, BRIAN ESTEY, University of California - Berkeley, YANYING FENG, Tsinghua University, CHEN LAI, University of California - San Diego, HOLGER MÜLLER, University of California - Berkeley — We report recoil-sensitive Ramsey-Bordé atom interferometry with a sample of lithium-7 atoms at 300 μK, well above the atomic recoil temperature of 6 μK. We overcome the need for additional cooling and velocity selection steps, which decrease phase sensitivity, by spectrally resolving the output ports with 160-ns Raman beam splitters. The large bandwidth pulses drive both conjugate interferometers simultaneously with nearly equal contrast, allowing for state selective detection of the summed interferometer signal. Optical pumping to a magnetically-insensitive state suppresses magnetic dephasing and extends coherence time. Sensitivity comparable to interferometers using large momentum transfer pulses can be attained at interrogation times on the order of 10-ms due to lithiums high recoil frequency and the increased available atom number. At this time scale, vibration noise is converted to amplitude noise and does not perturb the determination of the recoil frequency from the summed interference signal. In addition to simplifying cooling, increasing atom number and reducing cycle time for faster integration, these techniques broaden the applicability of recoil-sensitive interferometry to particles that remain difficult to trap and cool, like electrons.

[1]This work was supported by the National Science Foundation, the David and Lucile Packard Foundation, and National Aeronautics and Space Administration.

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Date submitted: 27 Jan 2017 Electronic form version 1.4