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Progress Towards a Cavity Based Atom Interferometer Inertial Sensor JUSTIN BROWN, BRIAN ESTEY, PAUL HAMILTON, HOLGER MÜLLER, University of California at Berkeley — Inertial sensing relies on absolute measurements of acceleration and rotation to determine one's location independent of external references (e.g. GPS). While atom interferometers have been able to achieve unparalleled sensitivity to inertial effects, they are typically bulky and require long interrogation times, making them unsuitable for real world applications. High order Bragg diffraction allows for increased atom interferometer sensitivity, which would allow for more compact setups, but the momentum transfer is limited by laser power and beam quality. Utilizing an optical cavity to circumvent these problems and enhance the momentum transfer of Bragg beamsplitters, we expect to achieve the sensitivity required for practical inertial sensing (acceleration noise of 10 ng/Hz$^{1/2}$ and rotation noise of 100 nrad/s/Hz$^{1/2}$) in an interaction region of a few cm. We report on our progress in developing this new interferometer using cold Cs atoms and discuss its prospects for exploring large momentum transfer up to 100 $\hbar k$ in a single Bragg diffraction process. In addition we discuss how we can utilize the cavity to create accelerometers and gyroscopes with very accurate scale factors.

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