Abstract Submitted
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Measuring h/m_{Cs} and the Fine Structure Constant with Bragg Diffraction and Bloch Oscillations RICHARD PARKER, Univ of California - Berkeley — We have demonstrated a new scheme for atom interferometry based on large-momentum-transfer Bragg beam splitters and Bloch oscillations [1]. In this new scheme, we have achieved a resolution of $\delta\alpha/\alpha$=0.25ppb in the fine structure constant measurement, which gives up to 4.4 million radians of phase difference between freely evolving matter waves. We suppress many systematic effects, e.g., Zeeman shifts and effects from Earths gravity and vibrations, use Bloch oscillations to increase the signal and reduce the diffraction phase, simulate multi-atom Bragg diffraction to understand sub-ppb systematic effects, and implement spatial filtering to further suppress systematic effects. We present our recent progress toward a measurement of the fine structure constant, which will provide a stringent test of the standard model of particle physics. [1] Estey et al., PRL 115, 083002 (2015).

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