Abstract Submitted
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Probing Gravity with Trapped Atoms: the Optical Lattice Atom Interferometer[1] CRISTIAN PANDA, VICTORIA XU, MATT JAFFE, SOFUS KRISTENSEN, LOGAN CLARK, JAMES EGELHOFF, HOLGER MULLER, University of California Berkeley — Atom interferometers are powerful tools for fundamental physics and inertial sensing in the field. However, their performance is currently limited by the interrogation time available to freely falling atoms in Earths gravitational field, as well as noise due to vibrations. Our experiment probes gravitational potentials by holding, rather than dropping, atoms. We realize an interrogation time of 20 seconds by suspending the spatially separated atomic wave packets in an optical lattice. This record coherence is enabled by the smooth lattice wave fronts, which are mode-filtered by an optical cavity. This trapped geometry suppresses phase variance due to vibrations by three to four orders of magnitude, overcoming a dominant noise source in atom-interferometric gravimeters. We describe recent progress in characterizing and reducing dephasing of the interferometer, with the goal of increased spatial separation between the interferometer wave packets, as well as prospects for improved detection using the coupling of the atoms to the optical cavity.

[1]NSF

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