Abstract Submitted
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Achieving long interaction times with a free-oscillation atom interferometer[1] A.J. FALLON, R.H. LEONARD, R.A. HORNE, T. ARPORNTHIP, C.A. SACKETT, University of Virginia — In a free oscillation interferometer, a trapped Bose-Einstein condensate is split into two packets using Bragg scattering from an off-resonant standing wave. The moving packets complete a full oscillation in the harmonic trap potential and are then recombined using another Bragg pulse. The resulting motional state is determined the interferometric phase between the packets. Free oscillation interferometers have been used to obtain measurement times as long as one second, and offer the potential to improve precision measurements of inertial and atomic phenomena. However, at long interaction times the interferometer is subject to a variety of technical effects, including vibrational noise, trap anharmonicity, phase curvature, phase diffusion, and fluctuations in the initial BEC state. We have developed a variety of techniques to understand and control these effects, including anharmonicity compensation, a reciprocating dual interferometer, passive and active vibration stabilization, and numerical and analytical analysis of the three-dimensional Gross-Pitaevskii equation. Results of these investigations will be described and current performance of the interferometer will be discussed.

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