Abstract Submitted
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A well-controlled environment for Very Long Baseline Atom Interferometry[1] D. TELL, E. WODEY, C. MEINERS, R.J. RENGELINK, C. SCHUBERT, D. SCHLIPPERT, W. ERTMER, E.M. RASEL, Institute of Quantum Optics, Leibniz University Hannover — Very Long Baseline Atom Interferometry (VLBAI) introduces a new scale of ground-based interferometers employing ultracold atoms on a vertical baseline of several meters. This enables absolute measurements of gravity and its gradients with unprecedented sensitivity through superposition states with large separation, as well as probing the frontiers of physics in terms of quantum macroscopicity limits and tests of the Einstein equivalence principle.

Driven by these goals, the Hannover VLBAI facility offers a well-controlled environment for high-sensitivity atom interferometry on a 10 m baseline. Shot-noise limited short-term instabilities below 10^{-9} m/s^2 in 1 s are anticipated. However, this requires meticulous control and analysis of error sources, such as vibrations of the inertial reference mirror and gradients of the magnetic and gravitational field.

We present progress on the unique parts essential for the envisaged performance: a 10.5 m long dual-layer magnetic shield, a seismic attenuation system featuring active and passive damping as well as monitoring of residual motion, and two high-flux sources of ultracold rubidium and ytterbium. Additionally, concepts for understanding the gravitational environment as a systematic bias are shown.

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