Abstract Submitted
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Sensitivity and accuracy studies of an atomic gravimeter JULIEN LE GOUËT, CNRS, Observatoire de Paris — Atom interferometry is used to perform an absolute measurement of the gravitational acceleration g with ^{87}Rb free falling cold atoms. A sequence of three stimulated Raman transitions separates and recombines the atomic wave function, using vertical counter-propagating lasers. During each light pulse, the phase difference of the lasers is imprinted onto the atomic phase. The phase shift between the two paths depends on g, and scales with the square of the time interval between two consecutive pulses. As our experiment was developed to be transportable, the maximum interaction time is limited to 120 ms, but has a high repetition rate of up to 5 Hz. By combining passive isolation and post-treatment of the vibrations measurement, we reach a sensitivity better than $2 \times 10^{-8} g/Hz^{1/2}$. The contribution of the lasers to the phase noise of the interferometer is negligible, as it limits the sensitivity to $3 \times 10^{-9} g/Hz^{1/2}$. We pointed out a generally neglected effect due to the retro-reflection delay, which could represent a limitation to the sensitivity of atomic gradiometers. I will also detail our investigations of the various systematic effects that shift the measured value of g. Alternating measurements with opposite directions of the Raman lasers allows to reject shifts due to one photon light shift, RF phase shifts, as well as magnetic field gradients (rejection at the 10^{-3} level). The influence of two photon light shift, wavefront distortions and Coriolis acceleration will be discussed too.

Julien Le Gouët
CNRS, Observatoire de Paris

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