

Accuracy of a cold atom gravimeter

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Abstract

Atom interferometry allows for realizing inertial sensors (gyroscopes, accelerometers) whose performances are comparable or better than state of the art instruments [1, 2]. Among such sensors, gravimeters cover a broad range of applications, from fundamental physics, metrology and geophysics to industrial related applications, such as navigation and underground prospection These perspectives stimulate the research towards higher sensitivity, stability and overall performance of atomic sensors and towards more compact and movable systems.

We will present the cold atom gravimeter realized at LNE-SYRTE in the frame of the watt balance project of the Laboratoire National de Métrologie et d'Essais [3], which aims at both high accuracy and discrete portability, with an interferometer interaction length relatively short, of a few centimeters only. A first prototype of the gravimeter reached an excellent sensitivity of $2 \times 10^{-8}g$ at 1 s, despite the noisy environment of Paris inner city [4]. Its accuracy was limited by large parasitic shifts, arising from wavefront distortions and insufficient control of the transverse trajectories. A new vacuum chamber has recently been realized to reduce these systematics. The improvements of this second generation setup will be detailed. The results of a first characterization of it will be presented, as well as a preliminary accuracy budget. Comparisons between this atomic gravimeter and "classical" corner cube gravimeters [5] showed good agreement between the sensors at a level better than $10^{-8}g$.

Keywords: ATOM INTERFEROMETRY, IN-

ERTIAL SENSORS, METROLOGY, GRAVIMETRY

References

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