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## Towards the nano g with a cold atoms absolute gravimeter

The acceleration of gravity is of great interest in different subjects, from geology to the redefinition of the kilogram. The atomic interferometry is a mature technology used to build inertial sensors able to measure that value in an absolute and accurate way. An atomic cloud of cold rubidium atoms is prepared into a vacuum chamber. One can then use contra propagating Raman light pulses to separate them during their free fall. A Mach-Zehnder interferometer can be made with a sequence of three pulses: a first one to split the atomic clouds in two, a second one to redirect them, and a last one to recombine them. The gravity value can finally be extracted from the phase difference between the two clouds of atoms.

In LNE-SYRTE, an absolute gravimeter using this technique has been developed since 2005, achieving an accuracy of  $2 \cdot 10^{-9}$  g and a stability at 1 s of  $6 \cdot 10^{-8}$  g. The limits of those results are linked to the temperature of the atoms, in the order of the  $\mu$ K, and more specifically to their ballistic expansion in the inhomogeneous intensity and phase of the light pulses. In order to reduce this expansion effect, a dipolar trap will be implemented to cool the atoms below the  $\mu$ K. New collimator and optics will also be used in order to increase the optical quality of the beam. We hope with those implementations to reach an accuracy below  $10^{-9}$  g.

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