ID de Contribution: **91** Type: **Poster**

A hybrid cold atom accelerometer for space geodesy missions

Space gravimetry missions such as GRACE or GOCE determine the Earth gravity field with great accuracy [1]. The data gathered are very useful in the sciences of climatology, hydrology or geophysics and to understand global climate change. These missions board state-of-the-art space electrostatic accelerometers displaying a very good sensitivity but also a long-term drift. By combining an electrostatic accelerometer with a very stable cold atom accelerometer, it is possible to correct this drift. To this day, no acceleration measurements with a cold atom accelerometer has been performed in space, mostly because of the harmful effect of the satellite's rotation on the interferometer output [2].
In this paper, we present our ongoing experimental work concerning the development of a hybridised electrostatic/atomic accelerometer. In particular, we addressed the problematic of satellite's rotation and its detrimental effect on the cold atom interferometer. The hybrid lab prototype is made of an electrostatic accelerometer and a cold atom interferometer. The test mass of the electrostatic accelerometer, very well controlled in angle and position, is employed as the retro-reflection mirror of the interferometer. By rotating the test mass, we studied the impact of inertial acceleration on the atomic interferometer contrast and phaseshift. Moreover, we are working on the rotation compensation technique: the test mass is rotated in order to limit the impact of the whole instrument's rotation [3].

[1] S. Cesare and al. The European way to gravimetry: From GOCE to NGGM, Advances in Space Research 57, 1047 (2016).
[2] S. Lan and al. Influence of the Coriolis Force in Atom Interferometry, Physical Review Letters 108, 090402 (2012).
[3] N. Zahzam and al. Hybrid electrostatic-atomic accelerometer for future space gravity missions, Remote Sensing, 14(14),3273 (2022).

Affiliation de l'auteur principal

DPHY, ONERA-The French Aerospace Lab, Palaiseau, France

Auteur principal: MARQUET, Noémie (DPHY, ONERA-The French Aerospace Lab)

Co-auteurs: ZAHZAM, Nassim (DPHY, ONERA-The French Aerospace Lab); BIDEL, Yannick (DPHY, ONERA-The French Aerospace Lab); BONNIN, Alexis (DPHY, ONERA-The French Aerospace Lab); GODARD, Antoine (DSG, ONERA-The French Aerospace Lab); CADORET, Malo (LCM-CNAM); BRESSON, Alexandre (DPHY, ONERA-The French Aerospace Lab)

Orateur: MARQUET, Noémie (DPHY, ONERA-The French Aerospace Lab)

Classification de Session: Session Poster 2: MC1, MC4, MC8, MC10, MC12, MC14, MC20, MC21, MC23, MC24, MC25, REDP

Classification de thématique: MC8 Dernières avancées dans le domaine des technologies quantiques