

Postdoctoral position at SYRTE
“Atom Interferometry and Inertial Sensors” Team

Ultrasensitive Bragg Atom Gradiometer

The candidate will work on the development of a laboratory based atom gradiometer that measures the gradient of the Earth gravity acceleration. This instrument will use cutting-edge techniques (ultracold atoms on atom chips, large momentum beam splitting techniques, hybridization with other sensors) to reach an unprecedented level of sensitivity, better than 1 Eötvös ($=10^{-9} \text{ s}^{-2}$) at 1s measurement time on the ground. This level of performance opens new perspectives for applications in the fields of geosciences (monitoring and exploration of natural resources, geophysics ...) and space science (tests of fundamental physics, Earth gravity field mapping ...).

The experiment is presently operational, and allows for driving simultaneous atom interferometers based on Bragg beamsplitters on two clouds of laser-cooled atoms. We recently demonstrated novel methods for differential phase extraction, simultaneous measurements of both the gravity acceleration and its gradient, and novel detection methods. Preliminary gravity gradient **sensitivities of order of 200 E at 1 s** have been demonstrated, which will be soon improved thanks to the increase of the interrogation time and vibration noise reduction. The work of the postdoctoral fellow will consist in **pushing the performances** of the sensor to its extreme, using sequences of large momentum transfer beamsplitters, based on high order Bragg diffraction. For that, he or she will **optimize the Bragg pulse sequences**, in particular using **optimal control methods**, and perform measurements of the gravity gradient. He or she will perform the metrological characterization of the sensor, and study its **limits in terms of stability and accuracy**.

The post-doctoral researcher will join the “Atomic interferometry and inertial sensors” team at SYRTE, a leading laboratory in the development of high sensitivity inertial sensors based on atomic interferometry, such as gravimeters and gyrometers, using cold atoms trapped or in free fall. He or she will work under the supervision of Franck Pereira dos Santos and Leonid Sidorenkov, staff CNRS researchers SYRTE.

Start date: as soon as possible, starting from 1st of December 2023

Contract duration: 18 months, possibility of extension by 12 months and application for postdoctoral grants at Paris Observatory – PSL, DIM Quantip, MSCA

Profile: The candidate should hold a PhD in physics and have strong experimental skills in laser physics, atomic physics, electronics and instrument control. Research experience in the field of cold atoms is mandatory. Any experience in the field of atomic interferometry will be highly appreciated.

Nationality: No restrictions.

Contact: Send CV, publication list, and references to Franck Pereira dos Santos (franck.pereira@obspm.fr) and Leonid Sidorenkov (leonid.sidorenkov@obspm.fr)