

INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: ONERA/DPHY
CNRS identification code:
Internship director's surname: Yannick Bidet / Malo Cadoret
e-mail: yannick.bidet@onera.fr / malo.cadoret@lecnam.net Phone number: 0180386174
Web page: <https://w3.onera.fr/qtech/en>
Internship location: Palaiseau

Thesis possibility after internship: YES
Funding: YES If YES, which type of funding:
international collaboration

Title : Study of a dual source of cold atoms for a matter wave gyroscope

Summary (half a page maximum)

Atom-laser interaction makes it possible to create matter wave interferometers that are highly sensitive to acceleration and rotation. It is then possible to build extremely precise sensors that can be used to determine the Earth's gravity field or to perform fundamental physics tests. ONERA has already played a major role in the development of this technology, notably with the first marine and airborne gravity measurements using an on-board cold atom accelerometer. ONERA is currently developing an inertial measurement unit that can simultaneously measure accelerations and rotations, enabling the user to determine its position and orientation without using GPS. Laboratory experiments have shown that quantum technology holds great promise for this type of instrument. However, a number of scientific and technological barriers currently prevent the construction of a compact sensor that can be used in the field.

The internship we are proposing will focus on overcoming one of these obstacles, namely the need to build in a compact device the dual source of cold atoms required for accurate rotation measurement. In particular, the intern will study a technique for splitting a cloud of cold atoms from a magneto-optical trap into two using mobile optical lattices. The intern will first carry out a numerical simulation of the interaction of a cloud of cold atoms with lasers, and then take part in its implementation on our experimental set-up. The internship may be followed by a thesis on the development of an on-board cold atom gyroscope.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO Soft Matter and Biological Physics: NO
Quantum Physics: YES Theoretical Physics: NO