Stage de master M2 de physique / Physics Master M2 Internship

Proposition de stage/ Internship proposal

Responsable du stage / *internship supervisor*: Carlos L. Garrido Alzar

Nom / *name*: Garrido Alzar **Prénom/ *first name* : Carlos**

Tél : 0140512051 **Fax :**

Courriel / *mail*:

carlos.garrido@obspm.fr

Nom du Laboratoire / *laboratory name*: SYRTE

Code d'identification : UMR8630 **Organisme :Observatoire de Paris/Sorbonne Université/PSL**

Site Internet / *web site*:

Adresse / *address:* 61 av de l'observatoire 75014 PARIS

Lieu du stage / *internship place*: Observatoire de Paris

Titre du stage / *internship title*: Etude de la compression du bruit de spin dans une cavité optique intégrée sur une puce à atomes/Study of spin squeezing generated with an optical cavity integrated on an atom chip

Résumé / *summary*

This internship proposal concerns a second generation of experiments evaluating the contribution of non-classical, entangled states to improve the stability of atomic clocks. Spin squeezed states redistribute the fundamental quantum noise of the atomic phase to a conjugate variable of secondary interest. This overcomes the fundamental signal-to-noise limit of today's best clocks. The principle of improvement has been demonstrated by several teams around the world, but no device has yet reached the performance level of a real clock. Our aim is to improve, for the first time, a state-of-the-art atomic clock.

In our experiment, performed in collaboration with Laboratoire Kastler Brossel, a fiber-optic microcavity is installed on an atom chip to prepare and detect the spin-squeezed states. State tomography of the spin distribution will be used to quantify the noise reduction. Comparison of the clock with and without squeezing will assess the performance gain. The expected results have the potential to place TACC ahead of the best compact clocks currently known. In addition, tools for manipulating entangled states are likely to find application in other fields such as quantum computing.

In your internship, you will take part in the assembly of modules (optical, mechanical, electronic, etc.) required for the experiments described above. If possible, you will also take part in data acquisition and analysis. You will be part of a team comprising a PhD student and a postdoctoral researcher, and interact with members of the Atomic Interferometry and Inertial Sensors team at SYRTE, as well as with members of the Atom Chips team at LKB.

Ce stage pourra-t-il se prolonger en thèse ? *Possibility of a PhD* ? : Oui

Si oui, financement de thèse envisagé/ *financial support for the PhD*: Oui