Spécialité de Master « Optique, Matière, Paris »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition :

Responsable du stage / *internship supervisor*:

Nom / *name*:	Wilkowski	Prénom/ *first name* :	David
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Nom du Laboratoire / *laboratory name*: UMI Majulab

Code d'identification :3654 Organisme :CNRS

Site Internet / *web site*: http://majulab.cnrs.fr/

Adresse / *address:* CNRS-UCA-SU-NUS-NTU International Joint Research Unit, Singapore

Lieu du stage / *internship place*: Nanyang Technological University, Singapore

Titre du stage / *internship title*: **QND measurement on an optical clock transition**

Résumé / *summary*

Quantum technology has opened up frontiers in precision science and technology. In an atom interferometer, matter-waves are split and recombined using momentum exchange between photons and atoms, generating interference fringes which depend sensitively on forces encountered by atoms, allowing for high precision measurement of inertial effects and studies in fundamental physics. Most of the current state-of-the-art atom interferometric sensors use a pair of the hyperfine ground states or momentum states of Alkaline-metal atoms for atomic interference through a two-photon process in free space. Despite of their success, they are currently reaching new challenges, limiting their capability for higher sensitivity and broader applications. Our research proposal is aiming to harvest these cutting-edge technologies, proposing an optical lattice guided atom interferometer based on a single photon process on an optical clock transition and to detect the interferometer states with quantum non-demolition measurement.

We will use the optical $^1S_0$-$^3P_0$ transition in 88-strontium atoms as the interferometer state. Atoms in the coherent superposition of the clock states will be guided by two distinct optical lattices to realize a large spatial separation of the wavepackets and, thus, accumulate a large phase shift of the interference fringe. In addition to the interferometer we plant to demonstrate spin-squeezing using quantum non-demolition (QND) measurement. We propose to implement a new method for the QND measurement using a three-photon resonance. In contrast to other proposed methods, here, we can directly measure the difference of clock states population which simplifies the protocol.

The intern will join the team in charge of the project and will help on setting up the experiment and participate to some measurement campaigns.

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

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***: Singapore PhD Grant**

Lumière, Matière, Interactions	**X**	Lasers, Optique, Matière	**X**

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