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 : 17/09/2019

Responsable du stage / *internship supervisor*:

Nom / *name*:	**Perrin**	**Prénom/ *first name* :**	**Aurélien**
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Nom du Laboratoire / *laboratory name*: Laboratoire de physique des lasers

Code d'identification : UMR 7538 **Organisme : CNRS / Université Paris 13**

Site Internet / *web site*: http://www-lpl.univ-paris13.fr/bec/

Adresse / *address:* 99 av. JB Clément 93430 Villetaneuse

Lieu du stage / *internship place*: Villetaneuse

Titre du stage / *internship title*: Absorption imaging of unidimensional gases

In the cold atom domain, absorption imaging allows the measurement of the density distribution of diluted quantum gases. Atoms initially trapped in a magnetic potential are released and undergo a time of flight before being illuminated by a laser beam at resonance with an atomic transition. Finally, an optical objective allows the beam to be imaged on a CCD camera. Comparison of the intensity distribution of the laser beam in the presence of the atoms and that obtained in the absence of the atoms makes it possible to deduce the atomic density. The optical objective is based on the use of two converging lenses leading to a fixed magnification and a resolution limited by the wavelength of the laser. In principle, the addition of additional lenses reduces the size of the lens.

On our experimental device, ultracold sodium atoms are magnetically trapped on the surface of an atomchip. The magnetic potential being very anisotropic, the gas reaches the one-dimensional regime for temperatures on the order of hundred nanokelvin. Once released, the properties of the gas can be deduced using an absoption imaging system.

The purpose of the internship will be to design and implement such a system on the experimental device. It will start with a simulation of the properties of the optical objective using the Zeemax software and then build it using commercial lenses. The objective will then be experimentally characterized before being installed on the experimental setup. Finally, it will be tested directly on the one-dimensional cold gases produced at the surface of the atomchip.

Environment: The intern will be supervised by Aurélien Perrin, within the BEC group, and will benefit from stimulating interactions with the larger Quantum gases group of about fifteen people, including three other ultra cold atom experiments and a theory group. Our group is a member of SIRTEQ, a world-leading joint Institute gathering all the groups in Paris area in the field Quantum technologies. **The internship is expected to lead to a PhD position (secured funding).**

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

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

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