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 : 02/11/2016

Responsable du stage / *internship supervisor*:

Nom / *name*:	**DU BURCK**	Prénom/ *first name* :	**Frédéric**
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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*: **www-lpl.univ-paris13.fr**

Adresse / *address:* **99 avenue J.-B. Clément 93430 Villetaneuse**

Lieu du stage / *internship place*: **Laboratoire de Physique des Lasers**

Titre du stage / *internship title*: **Frequency stabilization of a single frequency semiconductor laser to a molecular transition of Acetylene detected in saturated absorption**

Résumé / *summary*

Context of the study:

The "Molecular Metrology and Fundamental Tests" group of the Laboratoire de Physique des lasers (LPL) is involved in several projects dealing with ultra-stable frequency references based on detection of molecular transitions. In this context, the master student will become part of a team involved in the development of compact ultra-stable optical frequency combs based on semiconductor mode-locked lasers. Such transportable devices could play an important role in generating and distributing low phase noise optical and microwave signals. This is essential for a number of scientific and technical applications such as clocks, gravimeters, sensors, synchronization at large-scale facilities, and radar systems.

One essential step of the project is to transfer stability and accuracy of a molecular transition to the comb. The chosen molecular reference is a transition of Acetylene $^{13}C_2H_2$ in a cell at 1.542µm which will be probed by a single-frequency semiconductor laser.

In order to increase the Signal to Noise ratio of the molecular signal, the gas-cell will be inserted into an optical resonator. In order to realize a compact system, we plan to test the metrological performances of a fiber based ring cavity. For this purpose we use an ultra-stable optical reference transmitted by the "Observatoire de Paris" (SYRTE) on an optical fiber.

Program of the internship:

- Detection and characterization of linear absorption of Acetylene
- Detection and characterization of the absorption in saturation spectroscopy (Doppler-free configuration)
- Signal/Noise improvement by inserting the cell into an optical resonator based on fiber components
- Laser frequency stabilization onto the molecular signal
- Metrological characterization (noise analysis, frequency accuracy and stability)

Duration of the internship:

- 4 months minimum

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***: Bourse ministère**

Lumière, Matière, Interactions	**OUI**	Lasers, Optique, Matière	**OUI**

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