Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition : 02/01/2013

Responsable du stage / *internship supervisor*:

Nom / *name*:	LEPERS	Prénom/ *first name* :	Maxence
Tél :	01 69 35 20 50	Fax :	
Courriel / *mail*:	maxence.lepers@u-psud.fr		

Nom du Laboratoire / *laboratory name*: Laboratoire Aimé Cotton

Code d'identification : UPR 3321 Organisme : CNRS

Site Internet / *web site*: http://www.lac.u-psud.fr/

Adresse / *address:* Bâtiment 505, Campus d'Orsay

Lieu du stage / *internship place*: Laboratoire Aimé Cotton

Titre du stage / *internship title*: Improving laser cooling and trapping of diatomic molecules

Résumé / *summary*

Laser-cooling techniques have proven to be very efficient to bring atoms down to temperatures close to the absolute zero, which enabled physicists to explore new and intriguing phenomena. The same techniques are generally not applicable to the cooling of molecules, due to their rich but complex level structure.

However, there are a few exceptions. For instance a novel experiment [1] has recently demonstrated that the SrF (strontium fluoride) molecule can indeed be laser-cooled in the laboratory, thanks to the accurate knowledge of its spectroscopic properties.

External electric and magnetic fields applied to the molecule bring additional possibilities to control the external and internal degrees of freedom by removing level degeneracy, provided that the relevant interactions are well characterized.

In this project, the candidate will model the level structure of a SrF molecule placed both in an electric and a magnetic field with an arbitrary angle between them. Such fields induce a potential energy for the molecule center of mass, which determines the cooling and trapping conditions. The goal of the project will be to find the optimal conditions for the field characteristics (amplitude of the fields, angle,..), allowing for an efficient cooling and trapping process. This theoretical work will be achieved in close relationship with new experiments performed at Laboratoire Aimé Cotton.

[1] E. S. Shuman, J. F. Barry, D. DeMille, *Nature* **467**, 820-823 (2010).

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*: **EDOM**

Lasers et matière	**X**	Lumière, Matière : Mesures Extrêmes	
Optique de la science à la technologie		Plasmas : de l'espace au laboratoire	

*Fiche à transmettre (fichier pdf **obligatoirement**) sur le site http://stages.master-omp.fr*