

# Spécialité de Master « Optique, Matière, Plasmas »

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

## Proposition de stage

Date de la proposition : 06/11/2014

<b>Responsable du stage / internship supervisor:</b>		
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<b>Nom du Laboratoire / laboratory name:</b> LERMA		
Code d'identification :	UMR 8112	Organisme : CNRS-UPMC-Observatoire de Paris
Site Internet / web site:	<a href="http://lerma.obspm.fr/">http://lerma.obspm.fr/</a>	
Adresse / address:	4 place Jussieu, 3, Paris 5eme	
Lieu du stage / internship place:	Campus Jussieu, Tour 32-32, 3 <sup>ème</sup> étage	

<b>Titre du stage</b> Photon Stimulated Desorption in the vacuum ultraviolet
Résumé / summary
<p>In the coldest and dense regions of the interstellar medium, almost all the molecular matter, except H<sub>2</sub>, is expected to be entirely frozen onto dust particles. However, recent observations of cold gas in these regions cannot be explained without taking into account efficient non-thermal processes, such as desorption of particles induced by Photon Stimulated Desorption. However, laboratory data are missing in order to understand basic processes leading to the ejection of atoms and molecules after absorption of energetic UV photons, which prevent any valuable model to be developed.</p> <p>In the laboratory, one can investigate this phenomenon in the Vacuum-Ultra-Violet (VUV) energy range (<math>\lambda &lt; 200</math> nm) thanks to monochromatic sources, such as tunable state-of-the-art synchrotron beam line or LASER pump-probe experiments, which are relevant for simulating interstellar radiation fields. In the present case, these sources can be coupled to our ultra-vacuum chamber to investigate the effect of VUV radiation onto the surface of thin molecular ice films.</p> <p>The subject of this study will be first to perform pulsed LASER experiments with the aim to characterize the quantum states of molecules that are ejected from a cold surface simulating astrophysical ices (T=10 K). The student will develop the Resonance Enhanced Multiphoton Ionisation spectroscopy (REMPI) in order to characterize the relative population of molecular excited states. The technique will be first validated in a separate vacuum chamber, using simple systems such as CO or H<sub>2</sub>O, before being adapted in the SPICES set-up ("Surface Processes and ICES"). This set-up is equipped with a quadrupole mass spectrometer for the monitoring of the atoms and molecules escaping the surface and a Fourier-Transform Reflexion-Absorption InfraRed Spectrometer for probing the ice surface transformation. The student will be also involved in the optimization of a tripling-cell chamber in order to generate pulsed laser VUV radiation from an OPO tunable laser (201– 1750 nm).</p> <p>Depending on the timetable, an important part of the work might be devoted to a measurement campaign on the DESIRS beamline at the French synchrotron facility SOLEIL for recording photon stimulated desorption spectra using a technique that has been developed in recent years with the SPICES set-up. Interaction with researchers from the Netherlands is expected during this period. The training will be supervised by Jean-Hugues Fillion and Mathieu Bertin.</p>

<b>Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : YES</b>			
<b>Si oui, financement de thèse envisagé/ financial support for the PhD:</b>			
Lasers, Optique, Matière	X	Lumière, Matière, Interactions	X
Plasmas : de l'espace au laboratoire	X		