

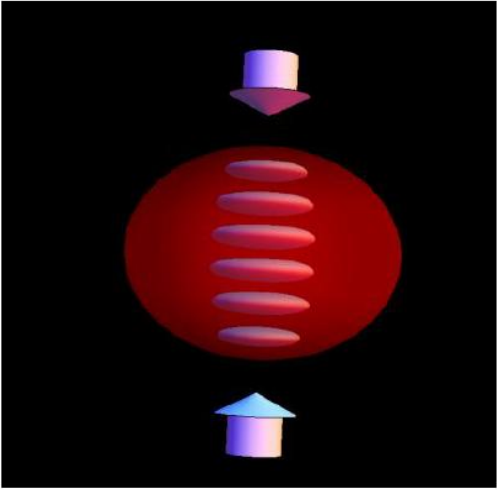
Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition : 20/11/13

Responsable du stage / internship supervisor:	
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Nom du Laboratoire / laboratory name: Laboratoire Kastler Brossel	
Code d'identification : UMR 8552	Organisme : CNRS/ENS/UPMC
Site Internet / web site: http://www.lkb.ens.fr/-Ultracold-Fermi-gases-	
Adresse / address: 24, rue Lhomond 75005 Paris	
Lieu du stage / internship place: Département de Physique de l'Ecole Normale Supérieure	

Titre du stage / internship title: Mixtures of Ultracold Fermions in Mixed dimensions
<p>During the past few years, we have been developing a new experimental setup devoted to the cooling and trapping of a fermionic mixture of Lithium and Potassium atoms. In this experiment, we take advantage of the different resonant optical frequencies of the two atomic species to impart different trapping potentials to Lithium and Potassium: this way we can engineer a <i>mixed dimensional system</i>, where Lithium atoms are free to move in 3D, while the motion of Potassium atoms is frozen along one, two or even three spatial dimensions.</p>  <p>This scheme paves the way to the exploration of a wide range of novel experimental situations. Using an optical standing wave created by two counter-propagating beams, it is possible to create an array of almost two-dimensional potassium pancakes immersed in a three dimensional Fermi Sea of Lithium (see Figure). In the absence of the 3D Fermi Sea, the different pancakes are uncoupled and each in each plane, the behavior of the potassium atoms is driven by the celebrated Bererzinski-Kosterlitz-Thouless mechanism where superfluidity is driven by the formation of bound pairs of vortices of opposite topological charges. Adding the three-dimensional Lithium atoms enriches the phase diagram, since it is now possible to couple two different planes by the exchange of excitations of the surrounding Fermi Sea. Another intriguing possibility arises when the Potassium are confined in all three spatial dimensions. In this case one can simulate the physics of Anderson's impurities, one of the main paradigms in solid state physics which can be mapped onto the Kondo Problem. The goal of the intership and of the subsequent PhD will be the exploration of theses mixed dimensional systems.</p>
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: ERC

Lasers, Optique, Matière	X	Lumière, Matière : Mesures Extrêmes	X
Plasmas : de l'espace au laboratoire			

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