Spécialité de Master « Optique, Matière, Paris »

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

Proposition de stage

Date de la proposition : 5/1/2017

Responsable du stage	*internship supervisor*:		
Nom / *name*:	**Glorieux**	Prénom/ *first name* :	**Quentin**
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Nom du Laboratoire / *laboratory name*:	Laboratoire Kastler Brossel	LKB	
Code d'identification :	Organisme : CNRS, UPMC, ENS		
Site Internet / *web site*: www.quantumoptics.fr			
Adresse / *address:* 4 place Jussieu, Paris			
Lieu du stage / *internship place*: Jussieu			

Titre du stage / *internship title*: Superfluidity at room temperature and above

Quantum fluids Physics is the study of hydrodynamic systems which demonstrate a quantum behavior. A large range of many-particle systems are currently under intense investigation, from liquid Helium, to electrons in solids, to quark-gluon plasma and trapped gases of ultra-cold atoms. Surprisingly, these very different systems show similar behavior when the thermal de Broglie wavelength becomes comparable or larger than the average inter-particle spacing. In this regime, the Bose versus Fermi statistics of the particules starts playing a critical role in determining the properties of the fluid. For exemple, in a non-interacting Bose gas a macroscopic fraction of the particules will accumulates in the lowest-energy state leading to a Bose-Einstein condensate. When interactions between particules are not negligible, the Physics become even more fascinating with the appearance of purely quantum effects such as supra-conductivity and superfluidity.

Quantum fluids of light

Historically, most work in many body-physics (theoretical and experimental) are dealing with massive material particules (atoms, electrons…). However, we know since the early days of quantum mechanics, that photons in a box can be interpreted as a massless Bose gas of non-interacting particules and this interpretation leads to a correct calculation of the black-body radiation. Recently, it has been realized that under suitable circumstances photons can acquire an effective mass and will behave as a quantum fluid of light with photon-photon interactions. Striking experimental demonstrations of superfluidity and other quantum hydrodynamics effects such as quantized vortices and solitons have been performed using semi-conductor planar micro-cavities. Building on these experiments done by the LKB group, we propose to use a different geometry (propagating light instead of confined) to study quantum fluids of light.

For more details, please check our website: www.quantumoptics.fr/2745-2/
Experimental internship. Duration: 3 to 6 months. Possible PhD.

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***: ANR ou Allocation Ministère**

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