Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition :

Responsable du stage / *internship supervisor*:

Nom / *name*: Bloch — Prénom/ *first name* : Jacqueline

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Courriel / *mail*: Jacqueline.bloch@lpn.cnrs.fr

Nom du Laboratoire / *laboratory name*: Laboratoire de Photonique et de Nanostructures

Code d'identification : UPR20 — Organisme : CNRS

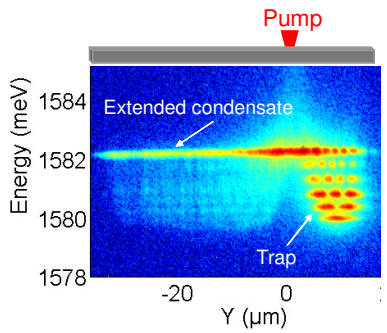
Site Internet / *web site*: http:///www.lpn.cnrs.fr

Adresse / *address:* Route de Nozay, 91460 Marcoussis

Lieu du stage / *internship place*: Laboratoire de Photonique et de Nanostructures

Titre du stage: **Manipulation of Bose condensates in photonic circuits**

Semiconductor microcavities are a model system for the investigation of the physics of Bose condensates. Indeed cavity polaritons, light-matter mixed particles resulting from the strong coupling regime between quantum well excitons and the optical mode of a cavity, obey to bosonic statistics and can massively occupy a single quantum. Because of the very small effective mass of cavity polaritons as compared for instance to atoms, their condensation can take place at much higher temperatures (several tens of K as compared to 0.1 µK). Moreover it is possible to use semiconductor technology to fully control and engineer the potential landscape in which polariton condensates are generated.



Spectrally and spatially resolved of a single wire cavity : an extended polariton condensate can be directly visualized, as well as a trap between the laser spot and the end of the wire

Our group at Laboratory of Photonic and Nanostructures (LPN-CNRS) has recently reported the generation of polariton condensates, formed by a macroscopic number of coherent polaritons, and showed that they can propagate over macroscopic distances (superior to 1 mm) while preserving their spontaneous spatial coherence. These results put our group at the forefront of research at an international level for further investigation of polariton condensates and for the development of new devices based on the propagation and manipulation of theses quantum states.

The main goal of this PhD thesis is to make use of the technological facilities available at LPN (electron beam lithography and etching) to design and study integrated optical circuits in which polariton condensates are generated and manipulated by optical means to realize optical functionnalities. We will design and fabricate a polariton interferometer, realize a polariton transistor and implement other theoretical proposals for innovant polaritonic devices.

[1] "Spontaneous formation and optical manipulation of extended polariton condensates", E. Wertz et al., Nature Physics 6, 860 (2010)

[2] "Interactions in Confined Polariton Condensates" L. Ferrier et al., Phys. Rev. Lett. 106, 126401 (2011)

[3] "Backscattering suppression in supersonic 1D polariton condensates", Phys. Rev. Lett. 108, 36405 (2012)

[4] "Polariton condensation in photonic molecules" M. Galbiati et al., Phys. Rev. Lett. 108, 126403 (2012)

[5] "Propagation and amplifcation dynamics of 1D polariton condensates", E. Wertz et al., Phys. Rev. Lett to appear(2012)

Ce stage pourra-t-il se prolonger en thèse ?: *oui*

Si oui, financement de thèse envisagé: Ministère ou Contrat de Recherche

Lasers et matière	**x**	Lumière, Matière : Mesures Extrêmes	
Optique de la science à la technologie	**x**	Physique des plasmas	