Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition : 03/11/2014

Responsable du stage / *internship supervisor*:

Nom / *name*:	Belabas	Prénom/ *first name* :	Nadia
Tél :	0169636179	Fax :	0169636000
Courriel / *mail*:	Nadia.belabas@lpn.cnrs.fr		

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

Code d'identification : UPR 20 Organisme : CNRS

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

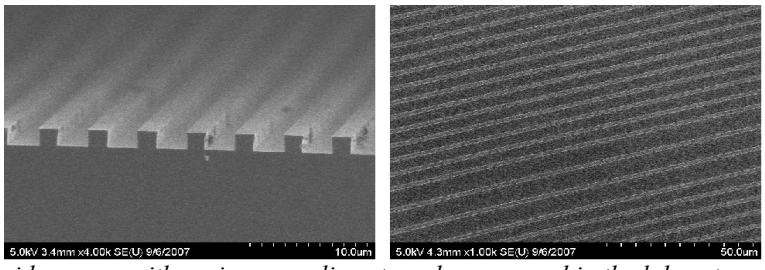
Adresse / *address:* Route de Nozay – 91460 Marcoussis

Lieu du stage / *internship place*: LPN

Titre du stage / *internship title*: ***Optique classique et quantique discrète intégrée : exploiter la versatilité des réseaux de guides fonctionnalisés sur puce***

Résumé / *summary*

Light manipulation on-chip promises novel prospects in classical and quantum photonics, due the scalability, stability and flexibility of the photonic platform. One recent direction line in this field is based on bidimensionnal metamaterials formed by coupled waveguide arrays. In such novel platform, the scalability and stability benefit from the integration of the optical functions on a single planar setting, while the flexibility exploits a clever engineering of the waveguide geometry. Analogues of junctions, lenses, wells or waveguides, superlattices or Bragg stacks, etc. can be implemented, opening a new route for all optical signal processing on-chip. In the quantum regime, advanced patterning of the coupling strength between waveguides, enable high-dimensional quantum manipulation, implementing quantum walks, emulating quantum operators or even generating entanglement



Examples of such 2D waveguide arrays with various coupling strengh, processed in the laboratory clean room.

LPN has launched a research activity in this direction line, by revisiting the field of waveguide arrays. It pioneered a novel design approach, benefiting from a conceptual parallel between optical waveguide arrays and gap-engineered semiconductor quantum wells and superlattices. This novel approach takes advantage of the propagation of extended waves (guidonic beams) exhibiting unique propagation features while remaining in the guided regime. It is supported by experimental work on InP-based waveguide arrays processed in the LPN nanofabrication facility. Following analogies with optics and electronics, the intern project will aim at demonstrating a photonic transistor by implementing and controlling via optical nonlinear effects a photonic resonant-tunneling double barrier.

This work can be pursued within a PhD work via the implementation of quantum light manipulation on chip (on-chip quantum coalescence effects and quantum simulators). The PhD work will involve design, simulation and advanced optical characterization.

Ce stage pourra-t-il se prolonger en thèse ? *Possibility of a PhD* **? : Yes**

Si oui, financement de thèse envisagé/ *financial support for the PhD***: Bourse Ecole Doctorale**

Lasers, Optique, Matière	**x**	Lumière, Matière, Interactions	***x***
Plasmas : de l'espace au laboratoire			