Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars 2012)

Proposition de stage pour l'année 2011-2012 (ne pas dépasser 1 page)

Date de la proposition :

Responsable du stage / *internship supervisor*:			
Nom / *name*:	Leo	Prénom/ *first name* :	Giuseppe
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Nom du Laboratoire / *laboratory name*: MPQ Laboratory (Quantum Materials and Phenomena)			
Code d'identification : UMR 7162		Organisme : Université Paris Diderot and CNRS	
Site Internet / *web site*: www.mpq.univ-paris-diderot.fr			
Adresse / *address:* Bâtiment Condorcet, CC 7021, 10 rue Domon et Duquet, 75205 PARIS CEDEX 13			
Lieu du stage / *internship place*: MPQ Laboratory			

Titre du stage / *internship title*: Semiconductor integrated optical parametric oscillator

Résumé / *summary*

This experimental internship is included in a forefront project that aims at demonstrating the first semiconductor integrated optical parametric oscillator, operating at room temperature in the continuous-wave regime. As a specific demonstrator, we have opted for an emission wavelength of 2 µm at degeneracy, with a tunability of about 1 µm for the idler. Compared to existing lithium niobate guided-wave optical parametric oscillators, such source would bring the crucial perspective of a monolithic electrically-pumped device, with a tremendous impact on out-of-the-lab practical use for mid-IR applications in the security and the gas detection.

Among the possible competing approaches, like quasi-phase matching [1] or modal phase matching [2], we adopt the technique of form-birefringent phase matching in selectively oxidized AlGaAs/AlAs multilayer waveguides, which combine strong material nonlinearity and artificial form birefringence and have provided the highest values of parametric gain to date [3]. Our approach relies on the quality of AlAs oxidation process, which presently constitutes the bottleneck for efficient nonlinear interactions in semiconductor waveguides, due to propagation losses and poor-quality integrated mirrors. Today, therefore, the central goal of the project is twofold: 1) to make a clear link between the material optical properties of the AlOx/AlGaAs waveguides and different parameters controllable in the technological process; and 2) to fabricate and characterize high-quality integrated mirrors, based on either the deposition of multi-dielectric mirrors on the waveguide end facets, or the realization of photonic-crystal mirrors.

This project will benefit from the advanced characterization techniques available in the DON (Nonlinear Optical Devices) team, from the new clean room of the MPQ Laboratory, and from the high-level collaborations with the Photonics and Nanostructures Laboratory (LPN, Marcoussis) and the Laboratory of Systems analysis and architectures (LAAS , Toulouse).

Requested skills: Solid bases in semiconductor physics and in optics, a taste for experimental research and technological development, team-work capability.

[1] X. Yu et al., Opt. Express 13, 10742 (2005).
[2] P. Abolghasem et al. IEEE Photon. Technol. Lett. 21, 1462 (2009).
[3] M. Savanier et al., Opt. Lett. 36, p. 2955 (2011).

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

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*: **MESRT or LABEX SEAM**

Lasers et matière	**X**	Lumière, Matière : Mesures Extrêmes	
Optique de la science à la technologie	**X**	Plasmas : de l'espace au laboratoire	

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