Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars 2010)

Proposition de stage pour l'année 2009-2010 (ne pas dépasser 1 page)

Date de la proposition : 07 oct. 2009

Responsable du stage /*internship supervisor*

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Lieu du stage/ *Internship place*:	Palaiseau, France

Titre du stage /*internship title* : **All-Optical on-chip devices based on nonlinear microcavities**

Résumé/*summary*

Research Context :

The future need for on-chip optical interconnects drives the research towards new class of ultra-compact and low-power photonic devices. One of the research topics of the LCFIO's group MANOLIA concerns characterizations and modeling of nonlinear optical devices and their applications for optical information processing. These devices are photonic crystal waveguides (PCWs) or optical microcavities realized on semiconductor platform. They are known to exhibit peculiar propagation characteristics, such as strong transverse confinement and slow-light propagation. As a result, nonlinearities in such structures can be considerably enhanced. Therefore, PCWs are really interesting for developing ultra-compact, low-power and very fast optical devices.

In order to investigate the nonlinear properties of the PCWs, we are developing both experimental and modeling tools. For instance, we have developed a very specific tunable Optical Parametric Oscillator (OPO) providing 10 ps pulses around 1550 nm. By injecting light from the OPO into a GaAs PCW, we have been able to conduct the first quantitative experimental study of the nonlinearities enhancement due to light propagation in a slow mode waveguide. This work has been conducted in collaboration with our colleagues of the Thales Research & Technologies (Palaiseau).

Research project :

The research project targets the next generation of all-optical on-chip devices, like optical buffer memories. The achievement of extremely small mode volume microcavities and of slow mode waveguides enables a very strong enhancement of the nonlinearities that benefits to the development of ultra compact with low command power devices.

The candidate will conduct a project towards the development of a new revolutionary concept. More precisely, fundamental aspects about the dynamics of transient microcavities will be explored. One of the specific functionality that will be addressed concerns the study of an optical buffer memory operating with an optical control of the time delay minimizing the distortion of the stored information. This theoretical approach will drive the design of samples that will be fabricated in the join clean-room facilities of Thales RT-Institut d'Optique. These samples will be then characterized with advanced linear and nonlinear characterization facilities available in our laboratory.

The whole work will rely on our expertise in nonlinear photonic crystals and on the competences of our collaborators from Thales R&T (Palaiseau) who have a strong expertise in the design, fabrication and characterizations of microcavities and PCWs in III-V semiconductors.

[1] A. Ryasnyanskiy et al. J. Europ. Opt. Soc. Rap. Public. 3, 08037 (2008)
[2] A. Baron et al, Opt. Express, 17, 552 – 557 (2009)
[3] S. Combrié, et al., Opt. Lett. 33, 1908-1910 (2008).
[4] P. Delaye et al., J. Opt. Soc. Am. B 22, 2494-2504 (2005). L. Razzari et al. Appl. Phys. Lett. 86, 231106 (2005). M. Astic et al., J. Phys. D: Appl. Phys. 41, 224005 (2008).
[5] S. Combrié et al. Opt. Lett., 33, 1908 (2008). Husko et al. Appl. Phys. Lett. 94, 021111 (2009). M. Patterson et al. Phys. Rev. Lett. 102, 253903 (2009)

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* **: EDOM, DGA**

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

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