Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition : 16/10/2013

Responsable du stage / *internship supervisor*:

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Nom du Laboratoire / *laboratory name*: Laboratoire Charles Fabry (LCF) Groupe MANOLIA

Code d'identification : UMR 8501 Organisme : CNRS/IOGS

Site Internet / *web site*: www.institutoptique.fr

Adresse / *address:* Campus Polytechnique, 2 Avenue Augustin Fresnel, 91127 Palaiseau

Lieu du stage / *internship place*: Palaiseau

Titre du stage / *internship title*:

Study of wavelength conversion of single photons in liquid filled hollow core photonic crystal fibers.

Résumé / *summary*

Four wave mixing nonlinear mechanisms in fibers are technologies for generation and conversion of single photons particularly adapted to the realization of quantum optics systems. The photons are directly converted in the fiber core and can then be directly and efficiently connected to other components of the telecommunication network. Moreover the development of highly nonlinear photonic crystal fibers allows to obtain high conversion efficiencies compatible with the demands of quantum networks. Nevertheless silica glass fibers generally used in these devices present a major drawback at the level of the quantum quality of the conversion. Indeed, it is limited by the ubiquitous generation of non correlated photons emitted through Raman scattering on a wide spectral band related to the spectral bandwidth of the Raman gain of silica or more generally of glasses used for fiber manufacturing.

In contrast with silica, liquids and gases are generally characterized by very narrow Raman lines (smaller than 1nm) often with large Raman shifts. That means that the generation of pairs of correlated photons will be exempt of the pollution of these non correlated Raman photons emitted outside the bands of interest. The basic idea of our research project is to combine those nonlinear properties of liquids and gases, interesting for conversion of single photons, with a guided wave propagation that has already shown its interest in quantum communications. We use an original architecture of hollow core photonic crystal fibers filled with the liquid or the gas. The photonic crystal structure allows wave guidance, and then the long interaction length and high light confinement in a core of small dimensions, that favor nonlinear interactions. That structure also allows the control of the fiber dispersion necessary to realize phase matching that governs the implementation of the four wave mixing mechanism.

The work goal will be to study new non frequency degenerated or "Bragg scattering" four wave mixing architectures allowing for the generation of pairs of entangled photons or noiseless wavelength conversion of single photons, using liquid core photonic crystal fibers which interest has already been demonstrated by the MANOLIA group. That internship/thesis project is based on a collaboration that just began between LCF and LTCI and XLIM on the experimental implementation of the generation and the conversion of pairs of correlated photons in liquid and gas filled photonic crystal fibers.

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

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*: **Bourse EDOM, DGA, …**

Lasers, Optique, Matière	X	Lumière, Matière : Mesures Extrêmes	
Plasmas : de l'espace au laboratoire			

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