Spécialité de Master « Optique, Matière, Paris »

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

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition :

Responsable du stage / *internship supervisor*:

Nom / *name*:	DELAYE	Prénom/ *first name* :	Philippe
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Nom du Laboratoire / *laboratory name*: Laboratoire Charles Fabry

Code d'identification : UMR 8501 Organisme : CNRS

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

Adresse / *address:* Institut d'Optique Graduate School, 2 Avenue Augustin Fresnel, 91127 Palaiseau

Lieu du stage / *internship place*: Palaiseau

Internship title:

Single photon conversion in fluid filled hollow core photonic crystal fibers

Summary:

The nonlinear mechanisms in optical fibers are very rich and efficient thanks to the light confinement in a small dimension core and the large propagation length allowed by the small propagation losses. The interest of the fibered geometry has still increased by the apparition 20 years ago of the photonic crystal fibers. Among the different geometries proposed for these micro-structured fibers, the hollow core fibers are particularly interesting as they allow to replace the usual nonlinear media of fibers (silica) by a large variety of new media in the liquid and the gas phase. Among the numerous nonlinear mechanisms implemented in these fluid-filled hollow core fibers, four wave mixing has been used to generate pairs of correlated [1] that are one of the basic devices for quantum communications systems.

In the proposed internship, we will study another nonlinear mechanism used for frequency conversion of single photons based on "Bragg scattering" four wave mixing. In this configuration, a single photon interacts with two pump beams in a nonlinear media and is up- or down-converted, as another single photon. The conversion operates at the single photon level and is noiseless, as it isn't subject to spontaneous emission and it can be operated far from the potential Raman lines of the nonlinear fluid used. With this device, we will be able to transfer single photons between different frequency bands for example to couple photons at telecom wavelength to quantum memories operating in the near infrared range, or in close wavelength range, to transfer photons between different WDM channels for multi-user quantum telecommunications systems.

The work will be made in the frame of a collaboration between LCF for nonlinear experiments, Telecom Paristech for quantum characterization and XLIM for the conception and realization of fibers.

- [1] M Barbier, I Zaquine, P Delaye "Spontaneous four-wave mixing in liquid-core fibres: Towards fibered Raman-free correlated photon sources", *New J. Phys.***17** 053031 (2015).

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***: EDOM, DGA, …**

Lumière, Matière, Interactions	**X**	Lasers, Optique, Matière	**X**

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