

# 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 : Novembre 2020

<b>Responsable du stage / internship supervisor:</b>			
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Lieu du stage / internship place:	19 place Marguerite Perey, 91120 Palaiseau		

<b>Titre du stage / internship title:</b> Photon triplet generation in hollow-core photonic crystal fibers
<b>Résumé / summary</b> Photon triplets have been the focus of a large number of studies as they can lead to the generation of the so-called Greenberger–Horne–Zeilinger (GHZ) tripartite maximally entangled state of the form $ \psi\rangle = \frac{1}{\sqrt{2}}( 000\rangle +  111\rangle)$ , or non gaussian states, which are important resource for quantum information, both from a fundamental and a practical viewpoint. Third order spontaneous parametric down conversion has never been observed directly in the optical wavelength range. Triplets have been obtained from two entangled pairs (second order spontaneous parametric down conversion : SPDC) through post-selection or by cascading two SPDC processes. In spite of extensive theoretical investigation, experimental demonstration is still limited to preliminary results of the reverse process of third harmonic generation (THG) via optimization of the phase matching condition. Apart from the third order non linearity, the main parameters to optimize are the pump regime, the effective area and the interaction length. Optical fibers have been considered an optimal platform for third-order parametric down-conversion since they can potentially overcome the weak third-order nonlinearity by their long interaction length. Our group has demonstrated recently that hollow core photonic crystal fibers provide a very promising platform for quantum technologies. We want to evaluate theoretically the photon triplet generation rate and to optimize it through the various available parameters as fiber design and pump regime. This work requires knowledge in nonlinear and quantum optics.
<b>Toutes les rubriques ci-dessous doivent obligatoirement être remplies</b>

<b>Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : oui</b>			
<b>Si oui, financement de thèse envisagé/ financial support for the PhD: Région Ile de France, ANR, école doctorale IP paris</b>			
Lumière, Matière, Interactions		Lasers, Optique, Matière	

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