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*: Guillon Prénom/ *first name* : Marc

Tél : 0142864254 Fax :

Courriel / *mail*: marc.guillon@parisdescartes.fr

Nom du Laboratoire / *laboratory name*:

Code d'identification : CNRS UMR8250 Organisme : Neurophotonics Laboratory

Site Internet / *web site*: http://neurophotonics.parisdescartes.cnrs.fr//?lang=en

Adresse / *address:* 47 rue des Saints Pères, 75006 Paris

Lieu du stage / *internship place*: Paris Descartes University

Titre du stage / *internship title*: Common path digital holography

Résumé / *summary*

The internship will take place in the interdisciplinary neurophotonics laboratory, in the wavefront engineering group. This group aims at developing novel imaging modalities and optical techniques for biological matter.

In this context, we have been developing microscopy techniques based on the use of optical vortex beams. Optical vortices are called after the circulation of the optical current around a nodal line of intensity. The circulation of the optical current is due to a helical phase profile. At the center of the helix, the phase is "singular" (undefined) and the intensity is zero. The nodal lines of optical vortices are remarkably stable structures, which allows performing super-resolution STED microscopy [1,2], or imaging very thin phase objects [3,4].

In this project, we propose to develop a novel kind of digital holographic microscope, a microscope measuring both the phase and the amplitude of the beam. Digital holography usually makes use of an external reference beam to measure the phase of the signal wave. Here we suggest another solution based on optical vortices to have a common path interferometer configuration and thus improve the stability of the system.

The intern will set up the experiment, take and analyze the data. He will also participate in the development of the post-processing algorithm.
The candidate should be interested in experimental optics and have at least a theoretical background in wave optics.

[1] Hell, S. W. and J. Wichmann (1994). "Breaking the diffraction resolution limit by stimulated-emission – Stimulated-Emission-Depletion fluorescence microscopy," Opt. Lett. **19**(11): 780-782.

[2] M. A. Lauterbach, M. Guillon, A. Soltani, and V. Emiliani, *STED microscope with spiral phase contrast*, **Sci. Rep. 3** , 2050 (2013)

[3] S. Fürhapter, A. Jesacher, S. Bernet and M. Ritsch-Marte, "Spiral phase contrast imaging in microscopy", Opt. Express 13(3), 689 (2005)

[4] M. Guillon, M. A. Lauterbach, *quantitative confocal spiral phase contrast*, **J. Opt. Soc. Am. A 31**(6), 1215-1225 (2014)

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***: funding application applied or doctoral school**

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

*Fiche à transmettre (fichier pdf **obligatoirement**) sur le site http://stages.master-omp.fr*