

# Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars 2012)

**Proposition de stage pour l'année 2011-2012 (ne pas dépasser 1 page)**

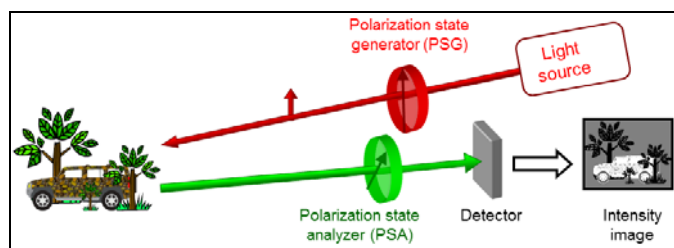
Date de la proposition :

<b>Responsable du stage / internship supervisor:</b>	
Nom / name: GOUDAIL	Prénom/ first name : François
Tél : 0164533195	Fax :
Courriel / mail: Francois.goudail@institutoptique.fr	
<b>Nom du Laboratoire / laboratory name:</b>	
Code d'identification : UMR 8501	Organisme : CNRS
Site Internet / web site: <a href="http://www.institutoptique.fr/lcf-en">http://www.institutoptique.fr/lcf-en</a>	
Adresse / address: 2 rue Augustin Fresnel 91127 PALAISEAU	
Lieu du stage / internship place: Palaiseau	

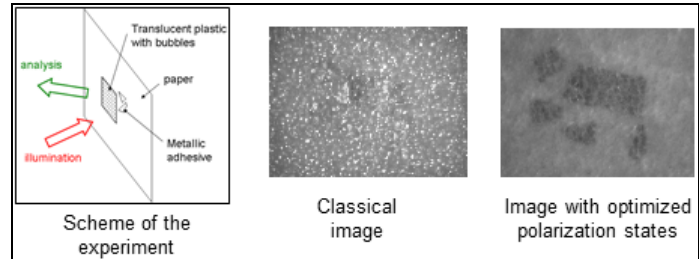
**Titre du stage / internship title:** Automation and optimization of a polarimetric imager

Polarimetric imaging consists in measuring one or several parameters of the polarization state of the light coming from a scene. It can reveal contrasts that are not visible in classical images and finds many applications in remote sensing, medical imaging, or industrial control. Technologies for realizing such imagers are mature, and it is now possible to optimize their performance.

Our team has designed and built a active polarimetric imager based on electrically controllable liquid-crystal (LCD) polarization modulators (see Figure 1). The state of polarization of illumination (PSG) and analysis (PSA) can be controlled in order to optimize the quality of the final image. This system can for example significantly improve vision through diffusive media (Figure 2).



**Figure 1**



**Figure 2**

In the present system, the optimization of the PSG and PSA state are supervised since they rely on a priori knowledge about the polarimetric properties of the scene. The aim of the internship is to fully automatize the image optimization process. This presents a double challenge: in terms of signal and image processing, to find the algorithms that make automation possible, and in terms of instrumentation, to couple the device with the optimization algorithms. Some imaging experiments will be led to demonstrate the capacity of the system. The work will thus have the following components.

- Design of image processing algorithms to automate polarimetric contrast optimization.
- Implementation on the imaging systems by integrating the algorithms and the acquisition (LCD and camera driving) with Labview and Matlab.
- Validation and performance assessment of the automated system on real-world imaging scenarios : imaging through diffusive media, multispectral imaging, coherent imaging ...

During the internship, the student will thus develop skills in polarization measurements, optoelectronic system design and optimization, data and image processing algorithms.

**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: DGA / MESR**

Lasers et matière		Lumière, Matière : Mesures Extrêmes	
Optique de la science à la technologie	x	Plasmas : de l'espace au laboratoire	