

Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars 2011)

Proposition de stage pour l'année 2010-2011 (**ne pas dépasser 1 page**)

Date de la proposition :

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|---|---|----------------------|--------------------------|
| Responsable du stage / internship supervisor: Julien Fuchs | | | |
| Nom / name: | Fuchs | Prénom/ first name : | Julien |
| Tél : | 01 69 33 54 07 | Fax : | 01 69 33 54 82 |
| Courriel / mail: | Julien.fuchs@polytechnique.fr | | |
| Nom du Laboratoire / laboratory name: Laboratoire pour l'Utilisation des Lasers Intenses | | | |
| Code d'identification : | UMR 7605 | Organisme : | CNRS/Ecole Polytechnique |
| Site Internet / web site: | http://www.luli.polytechnique.fr | | |
| Adresse / address: | Ecole Polytechnique, 91128 Palaiseau | | |
| Lieu du stage / internship place: | Ecole Polytechnique, 91128 Palaiseau | | |

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| Titre du stage / internship title: Generation of ps- neutron sources for ultrafast material probing applications |
| Résumé / summary |
| <p>Neutrons provide unique and valuable insights into many aspects of physics of matter beyond the capability of charged particles or ionizing radiation probes. Whereas X-rays, electrons and ions interact strongly with the electrons in the material, neutron diffraction and small angle scattering methods are widely popular because of their unique ability to reach nuclei, and therefore provide crucial information on complex processes of molecular motion and atomic vibrations. However, various aspects of these areas are studied at the very limits of existing neutron sources - the key limitation being the temporal resolution in the msec-μsec range.</p> <p>Ultrafast (sub-nsec) studies using neutrons, either as a pump or a probe, are not currently possible since no high flux (say, $> 10^9$ neutrons/cm²/s) sources with suitably short neutron pulses exist. An opportunity for development in this area is offered by neutron sources driven by intense laser pulses, which, under suitable conditions, can be controlled to emit a short burst of neutrons within a narrow energy band.</p> <p>Exciting opportunities for applying ultrashort neutron pulses lie in the life sciences, solid-state physics and for many technological applications, including testing of semiconductor devices and shielding material for space and aircrafts, development of robust materials for fusion/fission reactors and particle accelerator vessels, or containers for storing radioactive nuclear wastes.</p> <p>Developing this capability is the main aim of the proposed thesis project. The candidate will work toward doing the first demonstration of a narrow spectrum neutron source, so that the short duration of the source can be maintained over the distances required by the applications. As a next step, the candidate will undertake coupling this source to astrophysical relevant matter in order to access uniquely to the properties of correlated and degenerate matter, possibly studying out-of-equilibrium such states of matter. The project will be realized in the frame of a European collaboration between different laboratories. The ELFIE laser facility at LULI will provide a unique environment for the pursuit of such project.</p> |
| Toutes les rubriques ci-dessous doivent obligatoirement être remplies |

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| 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: Ecole Polytechnique | | | |
| Lasers et matière | x | Lumière, Matière : Mesures Extrêmes | x |
| Optique de la science à la technologie | | Physique des plasmas | x |

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