

Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition : 20 janvier 2015

Responsable du stage / internship supervisor:			
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Nom du Laboratoire / laboratory name:			
Code d'identification :	Organisme : SYNCHROTRON SOLEIL		
Site Internet / web site:	http://www.synchrotron-soleil.fr/		
Adresse / address:	L'Orme des Merisiers BP48 Saint-Aubin 91192 GIF-SUR-YVETTE CEDEX		
Lieu du stage / internship place:	SYNCHROTRON SOLEIL		

Titre du stage / internship title: Preparation of the transport line for a Free Electron Laser application with a laser plasma accelerated electron beam
Résumé / summary <p>X-ray Free Electron Lasers (FEL) provide nowadays intense coherent fs pulses for multidisciplinary investigations of matter. In the context of the LUNEX5 advanced and compact demonstrator project, it is considered to drive the FEL with a Laser Wakefield Accelerator (LWFA). Indeed, LWFAs can now provide high quality electron beams of very short duration with high peak currents. Spontaneous emission has already been observed, but the presently still rather large energy spread and divergence prevent from the FEL amplification. In the framework of the ERC Grant COXINEL at SOLEIL, an experiment is planned to demonstrate the first FEL amplification based on a LWFA, thanks to a longitudinal and transverse electron beam manipulation during the transport from the LWFA to the undulator. The electron will be generated with a 2x60 TW laser at LOA, whereas the components of transport line and the undulator are presently being developed at SOLEIL. Electron beam fine characterization all along the experiment is crucial and mastering the beam transfer of such electron source is a new challenge never achieved up to now. Reliable and accurate electron beam diagnostics are therefore mandatory. Standard beam position, transverse sizes, energy and energy spread measurements will be implemented all along the transfer line, from the source down to the undulator exit. Smart and dedicated schemes to recover much more detailed information as global and slice emittances as well as bunch length and even the optics of the electrons of interest fraction for the FEL are open and welcome.</p> <p>The Master work will be both experimental and theoretical. He/she will model under MATLAB the diagnostic. They essentially rely on an imaging system with various types of screens in the object plane, a set of movable spherical lenses to adjust the required magnification and a CCD in the image plane. The modelling will have as input the 6D distribution of the expected electron beam travelling along the experiment (output of other simulations from SOLEIL fellows) and deliver as an output the simulated measurement of each diagnostic. Such modelling will enable to optimize the final resolution and robustness of each diagnostics and eventually adjust their initial design. This theoretical work will also introduce the student to the electron beam dynamics concepts involved in the experiment, and to the FEL physics. In parallel, the Master student will also mount those diagnostics under supervision of the diagnostics group of SOLEIL and test them. The student can also participate to measurements of the magnetic elements of the transport line strongly linked to the diagnostic manipulations as well as to the success of this challenging experiment.</p> <p>The Master internship can be continued by a PhD work.</p>
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: Yes ERC Advanced Grant COXINEL			
Lasers, Optique, Matière	X	Lumière, Matière, Interactions	
Plasmas : de l'espace au laboratoire			

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