

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 : 14/12/2012

Responsable du stage / internship supervisor:	
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Nom du Laboratoire / laboratory name: INSP/GSI & Université of Jena dans le cadre du labex Plas@par	
Code d'identification : UMR75 88	Organisme : UPMC - CNRS
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Lieu du stage / internship place: mainly at GSI and University of Jena – Germany (<i>supervisor: T. Stöhlker</i>)	

Titre du stage / internship title: Ab initio calculation of charge state distributions for heavy ions in matter
Résumé / summary
<p>We have developed a model allowing <i>ab initio</i> predictions of the evolution of charge state distributions of fast heavy ions in matter. This model includes the quantum calculation of the cross sections of stochastic collision processes leading to charge changing and excitation of ions, as well as an integration routine of the set of differential equations governing the temporal evolution of charge states. The corresponding FORTRAN code has been called “ETACHA” and has been distributed to interested users.</p> <p>There is at present a growing interest for extending the validity of the code to lower velocities and/or heavier ions with many electrons. This is a real challenge, which is put forward by the advent of new accelerators such as FAIR at GSI, or SPIRAL2 in France (first beams are expected here in 2013). Other motivations are related to new phenomena discovered in the field of materials under irradiation, or the production of fast heavy ions following intense laser – matter interaction, with the characterization of accelerated particles in femtosecond laser or free electron laser (X-FEL) created plasmas.</p> <p>Therefore, besides testing fundamental collision processes, the ETACHA model is also a general interest tool for physicist working on charge changing related phenomena of ions penetrating through matter. This includes fields such as nuclear physics, plasma physics and material modification under irradiation. For instance, ETACHA is used on many accelerators to optimize their working mode.</p> <p>We already have at hand a large data base for the systems needing to be addressed by ETACHA, but many aspects of the work require to have collaborations with experimentalists at GSI and theorists as well, among which the groups at Rosario and Bariloche in Argentina who already helped us to improve some cross section calculations. During the internship several tasks could be addressed:</p> <ul style="list-style-type: none">- Use of collisional cross sections well suited for the strong perturbation regime (low velocity and/or high atomic number target)- Test of the subroutines used for the calculation of cross sections and solving the set of differential equations- Comparison with published experimental data or with the results of devoted experiments (to be performed) <p>This internship will start in our group at the INSP for a period between 15 days to 1 month and then will mainly take place either at GSI in Darmstadt or at the Helmholtz Institute in Jena (Germany); it could be continued during a PhD thesis in our group in France but in strong collaboration with experimentalists and theorists mentioned above.</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: will be submitted to PLAS@PAR			
Lasers et matière	X	Lumière, Matière : Mesures Extrêmes	X
Optique de la science à la technologie		Plasmas : de l'espace au laboratoire	X

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