Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition :

Responsable du stage / *internship supervisor*:

Nom / *name*:	MANGENEY	Prénom/ *first name* :	Juliette
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Nom du Laboratoire / *laboratory name*: Laboratoire Pierre Aigrain de l'Ecole Normale Supérieure

Code d'identification : UMR 8551 Organisme : CNRS

Site Internet / *web site*: http://www.lpa.ens.fr/spip/spip.php?rubrique66&lang=en

Adresse / *address:* 24 rue Lhomond, 75005 Paris cedex

Lieu du stage / *internship place*: Laboratoire Pierre Aigrain de l'Ecole Normale Supérieure

Titre du stage / *internship title*: **THz generation from graphene-based photoswitch**

Résumé / *summary*

The terahertz (THz) frequency domain (typically 0.1 to 10 THz) is a very specific region within the electromagnetic spectrum, which lies between the microwave and mid-infrared ranges. THz radiation has many promising applications in various areas of science and technology such as astronomy, chemistry, bio-security and high bandwidth communications. However, even if THz rays are being widely studied, their consumer applications are almost inexistent. This is due to the lack of practical sources and detectors. The development of a coherent, miniature and powerful source of THz radiation that can operate at room temperature is one of the main challenges of modern THz technology.

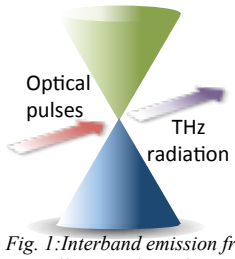

Fig. 1:Interband emission from optically excited graphene.

Our group is currently exploring the potential of graphene to generate coherent THz radiation [1]. Indeed, owing to its unique properties such as a band structure with a zero energy gap and linear energy dispersion, many mechanisms may be responsible for efficient THz emission in graphene. We are particularly interested in radiative interband transitions, photon drag effects that, according to theoretical studies, could lead to efficient coherent THz emission.

The aim of the intership is to investigate the THz generation from ultrafast photoswitch made of graphene excited by femtosecond optical pulses. The candidate will participate to the fabrication of the photoswitch and will use guided-wave time domain spectroscopy technique to characterize the temporal optoelectronic dynamics in graphene. The properties of the transient photocurrent signal delivered by graphene photoswitch will provide new insigth in the ligth-matter interaction and in ultrafast charge-carrier dynamics in graphene. This experimental work will be supported by close exchange with the theory group at LPA. This work will provide a strong support for the realization of graphene-based THz sources and ultrafast photodetectors. This intership may be pursued by a thesis.

[1] J. Maysonnave, S. Huppert, F. Wang, S. Maero, C. Berger, W. de Heer, W; T.B. Norris, L. A. De Vaulchier, S. Dhillon, J. Tignon, R. Ferreira, J. Mangeney, NanoLett. 14, 5797 (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***: Ministerial Funding**

Lasers, Optique, Matière	**X**	Lumière, Matière, Interactions	
Plasmas : de l'espace au laboratoire			