Spécialité de Master « Optique, Matière, Paris »

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

Proposition de stage

Date de la proposition : 08/10/2016

Responsable du stage / *internship supervisor*:

Nom / *name*: MANGENEY Prénom/ *first name* : Juliette

Tél : 01 44 32 35 07 Fax : 01 44 32 38 40

Courriel / *mail*: Juliette.mangeney@lpa.ens.fr

Nom du Laboratoire / *laboratory name*:

Code d'identification : UMR 8551 Organisme : CNRS

Site Internet / *web site*:

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*: Coherent THz Emission from Graphene-based Materials

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.

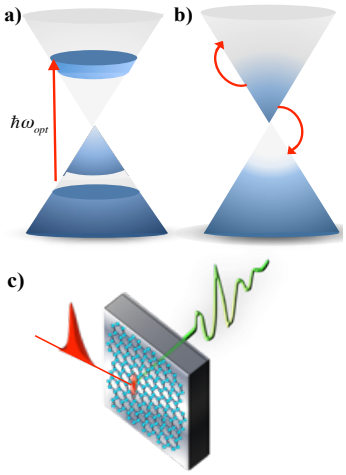

Figure 1 a) Optical excitation induces direct interband transition in 2D graphene, b) Intraband scattering leads to population inversion regime within the 100 fs after the excitation c) Optical excitation at oblique incidence of graphene leading to THz gerantion relying on photon drag effect.

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 and inter-Landau level transitions that, according to theoretical studies, could lead to efficient coherent THz emission.

The aim of the intership is to study the photonic properties of graphene in the THz frequency range and also to investigate coherent THz emission from graphene. The candidate will participate to the development of an optical pump-THz probe experiments, and to the investigation of carrier relaxation dynamics in graphene materials. The candidate will also develop an experimental set-up to probe the absorption saturation properties of graphene-based materials. 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. 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**

Lumière, Matière, Interactions	**X**	Lasers, Optique, Matière	**X**