Spécialité de Master « Optique, Matière, Paris »

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

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition : 27 Oct 2017

Responsable du stage / *internship supervisor*:

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Nom du Laboratoire / *laboratory name*:

Code d'identification : UMR 8551 — Organisme : Laboratoire Pierre Aigrain

Site Internet / *web site*: www.lpa.ens.fr

Adresse / *address:* Ecole Normale Supérieure, 24 rue Lhomond, 75005 Paris

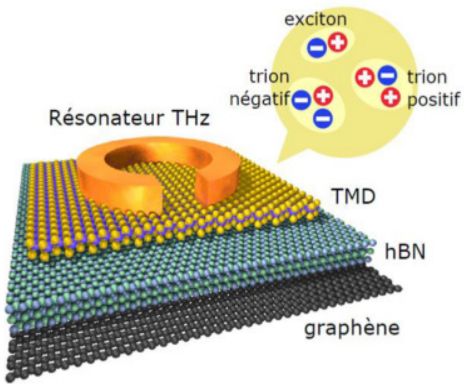
Lieu du stage / *internship place*: Ecole Normale Supérieure, 24 rue Lhomond, 75005 Paris

Titre du stage / *internship title*: Terahertz nonlinear properties of 2D semiconductors

Résumé / *summary*

Context: Terahertz (THz) nonlinear optics is an emerging and active research field that takes advantage of recent breakthroughs in THz technologies. A growing number of studies using THz excitations to induce giant nonlinearities are being investigated, allowing insights into fundamental science as well as potential applications. This includes, for example, exotic transport regimes in semiconductors, spin excitations in magnetic materials as well as new sources and functionalities in underdeveloped spectral regions.

Internship Subject: Recently high order sideband generation (HSG) has been demonstrated in condensed matter systems, akin to high harmonic generation (HHG) observed in gas mediums which forms the basis of attosecond research. Here the internship will investigate practical generation of HSG through compact semiconductor THz pump lasers (quantum cascade lasers) and highlight two different regimes of HSG; the classical regime through physical electron-hole collisions in large binding energy excitons (e.g. excitons in monolayer WSe2, a new class of two dimensional semiconductors) and the quantum regime through the overlap of the electron and hole wavefunctions in monolayer materials such as graphene. This studies will be combined with meta-material resonators to enhance the nonlinear interactions (see figure). This will permit insights into the dynamics of these new 'collisions' and go beyond the use of entire facilities or high power femtosecond laser technology for their applications in wavelength shifting and spectroscopy



Meta-material. Planar resonator integrated on top of the 2D transition metal dichalcogenides (TMDs) to enhance the nonlinear interaction around an exciton

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*: ANR application

Lumière, Matière, Interactions	x	Lasers, Optique, Matière	x

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