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 : 2 novembre 2015

Responsable du stage / *internship supervisor*:

Nom / *name*:	DEGIRON	Prénom/ *first name* :	Aloyse
Tél :	+33 1 69 15 41 22	Fax : +33 169154090	
Courriel / *mail*:	aloyse.degiron@u-psud.fr		

Nom du Laboratoire / *laboratory name*:

Code d'identification : IEF — Organisme : Institut d'Electronique Fondamentale

Site Internet / *web site*: http://www.ief.u-psud.fr/
Adresse / *address:* Rue André Ampère, Bâtiment 220, 91405 Orsay
Lieu du stage / *internship place*: IEF, see address above (located on Université Paris-Sud campus).

Titre du stage / *internship title*: Superradiance Mediated By Metallic Resonators

Résumé / *summary*

Superradiance, or photonic Dicke effect, is a cooperative emission mechanism whereby an ensemble of atoms, molecules or quantum dots comes to interact through virtual photon exchange, inducing coherent correlations within the system [1]. In this regime, the emitters are oscillating in phase, generating a signal proportional to the square of their number in the direc-tions of space where they interfere constructively.

Recently, it has been predicted that superradiance is much more robust when the emitters are coupled to a metallic nanoparticle. The origin of this improvement is that metallic nanostructures sustain plasmonic oscillations [2], i.e. resonant excitations of the free electron cloud coupled with high electromagnetic fields. In this case, superradiance is not only mediated through photons, but also via plasmons. Since the fields associated with plasmons are very strong across the nanoparticle, the latter acts as a "hub" [3] promoting cooperative behavior among the emitters placed in its vicinity.

The goal of this internship is to investigate this behavior when two emitters are separated by two plasmonic resonators. The successful candidate will use a semiclassical framework to understand how the synchronization between the two emitters are affected by the distance between the plasmonic resonators and will try to maximize the resulting superradiance. This study will elucidate how far the emitters can be physically placed apart while still cooperating together, providing guidelines for future applications of Dicke superradiance.

References

[1] R. H. Dicke, Phys. Rev. 93, 99 (1954).
[2] L. Novotny and B. Hecht, "Principles of Nano-Optics", (Cambridge University Press, 2006).
[3] V.N. Pustovit and T. Shahbazyan, Phys. Rev. Lett. 102, 077401 (2009).

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

Ce stage pourra-t-il se prolonger en thèse ? *Possibility of a PhD* **? : yes, depending funding availability**

Si oui, financement de thèse envisagé/ *financial support for the PhD***: depending funding availability**

Lumière, Matière, Interactions		Lasers, Optique, Matière	

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