Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition : 09 Octobre 2014

Responsable du stage / *internship supervisor*:

Nom / *name*:	BIDAULT	Prénom/ *first name* :	Sébastien
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Nom du Laboratoire / *laboratory name*: Institut Langevin

Code d'identification : UMR 7587 Organisme : ESPCI et CNRS

Site Internet / *web site*: http://www.institut-langevin.espci.fr/optical_antennas

Adresse / *address:* 1 rue Jussieu 75005 Paris

Lieu du stage / *internship place*: 1 rue Jussieu 75005 Paris

Titre du stage / *internship title*: **Multiple excitons in a broadband DNA-templated optical resonator**

Gold nanostructures are broadband resonators that act as the optical equivalent of radiowave antennas by coupling a propagating field to a nanoscale element of matter. To position excitons with nanometer accuracy in optical antennas, we develop, at Institut Langevin, bottom-up fabrication strategies in which two gold particles are linked by a short DNA double-strand (M.P. Buson et al, Nano Lett. 11, 5060 (2011)) on which fluorescent emitters can be introduced (Fig. 1-a and b). This approach has allowed us to study precisely the interaction between a single quantum emitter and a broadband plasmon-based resonator at room temperature (M.P. Buson et al Nature Commun. 3, 962 (2012), Angew. Chem. Int. Ed. 51, 11083 (2012) & Nano Lett. 14, 284 (2014), Fig. 1-c).

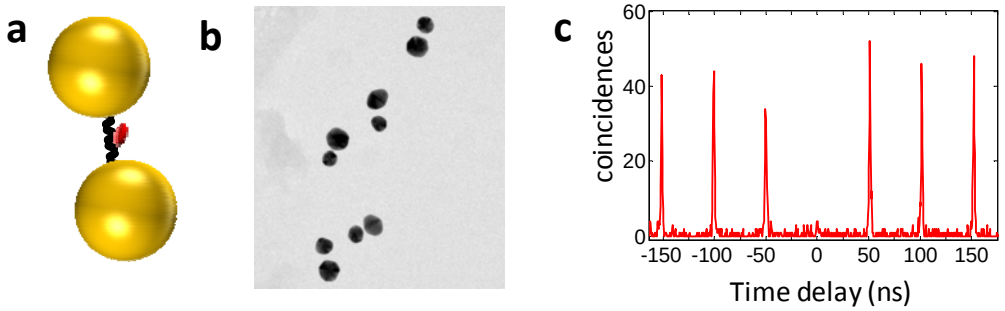

Figure 1: (a) Representation of a DNA-templated dimer with one fluorescent molecule. (b) TEM images of 30nm – 40nm gold particle dimers linked by a 30bp DNA strand. (c) Photon emission statisitics of a dimer with one quantum emitter demonstrating photon antibunching and short fluorescence lifetimes.

During this internship and a consecutive PhD thesis, we will study how the DNA double-strand can also template several identical molecules producing excitons coupled through the antenna. We will analyze how fluorescent dyes that either intercalate between or replace nucleotides provide controlled positioning and relative orientations at the nanoscale. The optical response of these nanostructures will be studied by temporal and spectral measurements of the fluorescence signal from single nanoantennas and ensembles in suspension.

The assembly of fluorescent emitters in a broadband resonator at the nanoscale should allow unprecedented control over temporal coherence from coupled excitons at room temperature.

Ce stage pourra-t-il se prolonger en thèse ? *Possibility of a PhD* **? : oui**

Si oui, financement de thèse envisagé/ *financial support for the PhD***: bourse doctorale**

Lasers, Optique, Matière	**OUI**	Lumière, Matière : Mesures Extrêmes	**OUI**
Plasmas : de l'espace au laboratoire	**OUI**		