Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars 2012)

Proposition de stage pour l'année 2011-2012

Date de la proposition : 28/09/2011

Responsable du stage / *internship supervisor*:

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Nom du Laboratoire / *laboratory name*: **Institut Fresnel**

Code d'identification : UMR 6133 — Organisme : CNRS / Aix Marseille Univ / Ecole Centrale Marseille

Site Internet / *web site*: http://jw-photonics-inside.over-blog.org/ et www.fresnel.fr/mosaic

Adresse / *address:* Domaine universitaire de St Jerome

Lieu du stage / *internship place*: Marseille

Titre du stage / *internship title*: **Optical nanoantennas to enhance single molecule fluorescence detection**

Résumé / *summary*

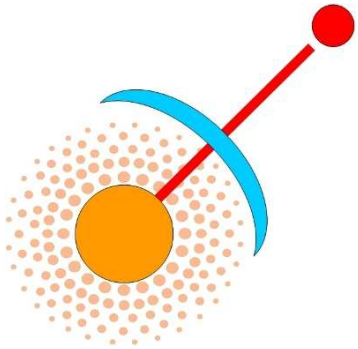
Area : Nanophotonics, plasmonics, biophotonics

Key words : Optical microscopy, gold nanostructures, fluorescence spectroscopy

Scientific context: Enhancing the fluorescence emission of biomolecules is of great interest due to the widespread use of fluorescence-based techniques in chemistry, molecular biology, materials science, and medicine. To meet this goal, metal nanostructures offer unique fascinating prospects to manipulate light down to the nanoscale and take full advantage of the large electromagnetic enhancement close to metal surfaces. The study of light-matter interaction enhanced by metal nanostructures is currently one of the most rapidly growing areas of physics and nanotechnology, and is strongly driven by applications on information processing, sensing, biomedicine, and photovoltaics.

Detailed project: The project will investigate experimentally how a photonic nanostructure such as a gold nanowire or a cluster of gold nanoparticles can enhance the optical detection of fluorescent molecules. The two major aims are (i) to develop new plasmonic nanoantennas to optimize the light-matter interaction at the nanoscale and down to the single molecule level, and (ii) to quantitatively characterize the light-molecule-nanostructure interactions. This will provide more efficient nanosources for biophotonics applications and optical processing.

Recent relevant publications :



1. H. Aouani, O. Mahboub, E. Devaux, H. Rigneault, T.W. Ebbesen, J. Wenger, *Plasmonic antennas for directional sorting of fluorescence emission*, Nano Lett. 11, 2400-2406 (2011).
2. H. Aouani, O. Mahboub, E. Devaux, H. Rigneault, T. W. Ebbesen, J. Wenger, *Large molecular fluorescence enhancement by a nanoaperture with plasmonic corrugations*, Opt. Express 19, 13056-13062 (2011).
3. H. Aouani, O. Mahboub, N. Bonod, E. Devaux, E. Popov, H. Rigneault, T.W. Ebbesen, J. Wenger, *Bright unidirectional fluorescence emission of molecules in a nanoaperture with plasmonic corrugations*, Nano Lett. 11, 637-644 (2011).
4. H. Aouani, S. Itzhakov, D. Gachet, E. Devaux, T. W. Ebbesen, H. Rigneault, D. Oron, J. Wenger, *Colloidal Quantum Dots as Probes of Excitation Field Enhancement in Photonic Antennas*, ACS Nano 4, 4571-4578 (2010).

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***: Financement européen FP7 ou ERC Starting Grant**

Lasers et matière		Lumière, Matière : Mesures Extrêmes	
Optique de la science à la technologie		Plasmas : de l'espace au laboratoire	