# SEMINAIRE ISMO

**Maxim Sukharev**
*Arizona State University*

## *Electrodynamics of quantum many-body systems optically coupled to plasmonic nanomaterials*

With a fast surge of the nanophotonics in recent years, researchers now are able to go far beyond diffraction limit investigating optical properties of nanomaterials. Despite the progress on experimental side there are still several fundamental questions to be addressed. One of the cornerstones of nanophotonics is a set of impressive experiments on hybrid systems - materials comprised of noble metal nanostructures and ensembles of quantum emitters (quantum dots, j-aggregates, atoms, etc.). The latter are chosen in such a way that their internal electronic transitions is in a close proximity of plasmon-polariton resonances of the metal. Such systems exhibit a wide variety of interesting optical properties.

From the theoretical point of view hybrid materials, present a unique opportunity to blend classical electrodynamics together with quantum physics at the nanoscale. I will present a self-consistent model based on direct numerical integration of the Maxwell-Liouville equations in the time domain in two and three dimensions. I will show the direct comparison of this model with recent experiments on hybrid systems demonstrating that the present model of strong coupling widely used in the literature is incomplete. I will show that at high densities of quantum emitters the hybrid system exhibits excitonic resonances. Optical properties of molecular clusters will be discussed. I will show that collective effects play an important role. I will also discuss several future research directions including nonlinear nanophotonics and Bose-Einstein condensates driven by plasmonic materials.

* * * * *

**ATTENTION JOUR INHABITUEL**

## Vendredi 10 juin 2011 à 11 h 00

**Bât. 351 (Bibliothèque, 2ème étage)**
***Université Paris-Sud, 91405 ORSAY Cedex***