

Exchange Grant Application Final Report

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Institute to be visited: Donostia International Physics Centre, San Sebastian, Spain

Collaborator: Dr. Javier Aizpurua, Head of Nanophotonics Group

Duration of stay: August 1st – September 8th 2012

Previous interactions:

I know Dr. Aizpurua for about 6 years, and we have actively started to collaborate on the design and investigation of plasmonic nanocavities, mainly using methods based on electron energy loss spectroscopy, for about 2 years now. This was cemented during an ESF-sponsored exchange visit in summer 2011, and results from this are currently being written up for publication.

Scientific aims of the proposed visit:

The goal of this visit is to investigate ultra-small electromagnetic hot spots in plasmonic nanocavities, with critical dimensions where the boundary between classical and quantum physics is to be expected. In particular, we are aiming to unravel the consequences of quantum mechanical effects on surface enhanced Raman scattering and fluorescence sensing.

Particular goals are:

- Identification of quantum effects in plasmonic nanoantennas, particularly in terms of resonance shifts and limits to field enhancement
- Description of molecule-plasmon interactions in ultra-small plasmonic cavities
- Setup of an exchange schedule of junior researchers for the coming year

Outcome:

- Representation of ESF network and presentation about ESF given (in my capacity as chair) in a public seminar at NanoGune; discussions and advertisement of the network to the director of Nanogune
- Organization and presentation of the ESF day at the NFO-12 conference in San Sebastian, which coincided with the last week of my stay; the ESF symposium (which I chaired) attracted about 150 participants and was judged to be of very high quality (“the best day of the conference” according to a number of colleagues)

- A scientific collaboration with Dr. Aizpurua has commenced on quantum plasmonics, which will be followed up by a visit by Dr. Aizpurua to Imperial College in November
- Two senior researchers in my group and in Dr. Aizpurua's group have now started working together on a daily basis, on theoretical research into quantum plasmonics