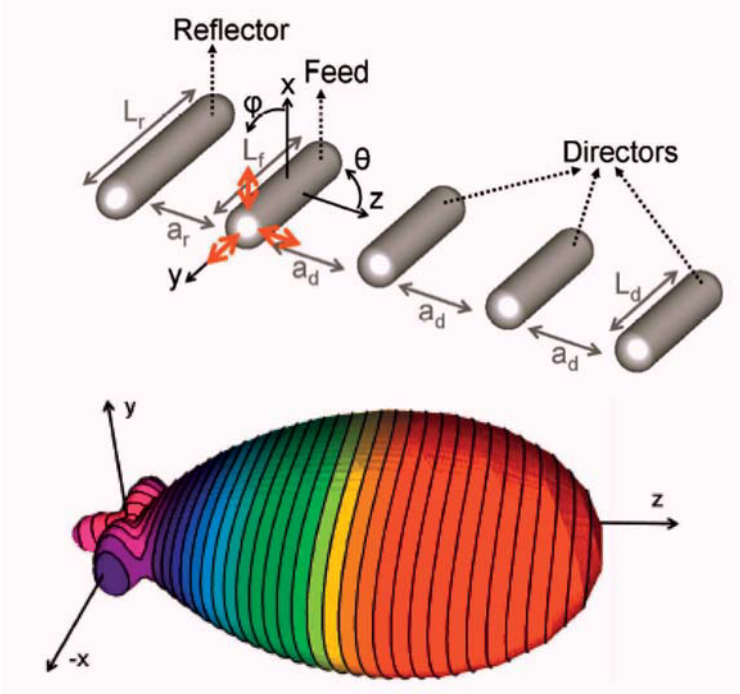
The Institute of OPTICS **Research Seminar** UNIVERSITY of ROCHESTER

Optical antennas for single emitters



Tim Taminiau
Institut de Ciències Fotòniques
Barcelona, Spain

MSc U. Twente, Netherlands
PhD student, ICFO Barcelona

We will describe experiments on single emitters coupled to metal nano-rod antennas of two types: scanning-probe-based monopole, and directional optical Yagi-Uda.

Special Time and Place
11:00 am, Monday, May 17, 2010
Goergen 109
Refreshments provided.

Optical antennas for single emitters

Tim Taminiau
The Institute of Photonic Sciences
Castelldefels (Barcelona), Spain

Abstract:
Nanoscale quantum emitters interact weakly with freely-propagating light. This interaction can be improved by metal nanoparticles, acting as optical antennas, the optical analogue of conventional antennas.

In this talk, I will present our experiments on single emitters coupled to metal nano-rod antennas [1,2], and show that the interaction of the emitter with light is improved by the near-field coupling to the antenna. I will focus on two types of antennas: scanning-probe-based monopole antennas [1,2], and directional optical Yagi-Uda antennas [3].

The monopole antenna is placed on a probe so that it can be scanned near single quantum emitters. The coupling to the antenna mode enhances the emission, and is highly spatially localized. The emitter mainly interacts with light through the antenna mode; the antenna design thus determines the emission. The optical Yagi-Uda design, exploits this fact. By coupling the emitter to a Yagi-Uda antenna, highly directed emission is obtained. Optical antennas combining strong local fields with high directivity can both enhance and direct the emission and excitation of otherwise weak and onmidirectional emitters.

[1] T. H. Taminiau et al., Nature Photon. 2, 234 (2008)
[2] T. H. Taminiau et al., Nano Lett. 7, 28 (2007)
[3] T. H. Taminiau et al., Opt. Express 16, 10858 (2008)

Biography:
Tim Taminiau obtained a M.Sc. in applied physics from the University of Twente, the Netherlands, in 2005. He is now working towards his Ph.D. under the supervision of Prof. Niek van Hulst at the Institut de Ciències Fotòniques (ICFO) in Barcelona, Spain. Currently, Tim is a visiting researcher at Brown University working with Prof. Rashid Zia.

Tim’s research aims to understand the interaction of light and matter at the nano-scale. His interests include: the interaction of electric and magnetic dipoles with localized optical fields; enhanced single molecule spectroscopy; and near-field scanning optical microscopy.