

Title: Photon statistics of electrical light nanosources

Keywords: scanning tunnelling microscopy; optical microscopy; photon statistics; nanophotonics; plasmonics; optical nanoantennas; nanosciences; nano-optics

Scientific description: The objective of this internship is to develop a unique combination of a scanning tunneling microscope, an optical microscope, and a Hanbury Brown and Twiss (HBT) interferometer for photon correlation measurements. Using this unique instrument, cutting-edge nano-optics experiments on plasmonic nanostructures coupled to quantum emitters will be performed. The tunneling current under the STM tip will be used as a source of local electrical excitation of the surface plasmons. The light produced will be collected using the optical microscope, and the photon bunching and anti-bunching effects will be demonstrated using the HBT interferometer (i.e. measuring the second-order correlation $g^{(2)}$ function of light). The internship includes a significant experimental component and instrumental development.

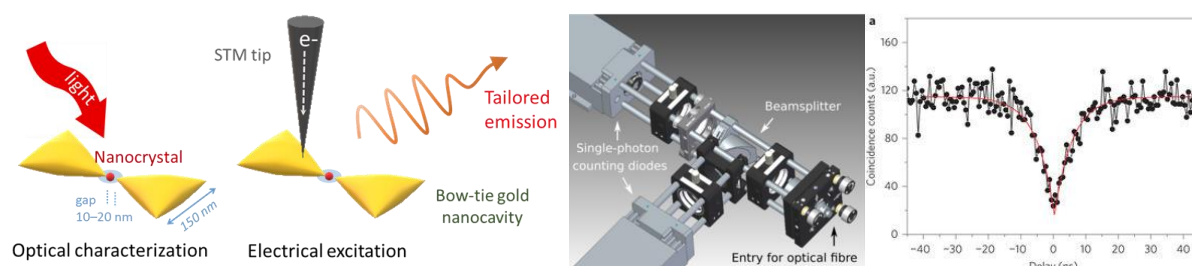


Figure: (left to right) plasmonic structure coupled to a quantum emitter ; schematic of the electrical excitation of the nanostructure using the STM ; schematic of an HBT experiment (ref: <https://www.phy.kit.edu>); example of a photon correlation spectrum, i.e., second-order correlation $g^{(2)}$ curve (ref: DOI: 10.1038/nano.2015.75).

Techniques/methods in use: STM, optical microscopy, photon correlation spectroscopy

Applicant skills: Basics in physical optics and quantum optics, and a taste for experimental physics

Industrial partnership: N

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Internship location: Institut des Sciences Moléculaires d'Orsay (ISMO) Bât. 520, rue André Rivière, Campus universitaire, 91400 Orsay

Possibility for a Doctoral thesis: Y (Not financed yet. The student may apply for a thesis scholarship of the Ecole Doctorale Ondes et Matière)