Internships offered in M2
2018-2019

Responsible for internship

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Internship title: Plasmonic antennas in the high confinement regime

An optical antenna make it possible to convert non propagation near field into a radiative and directive one. In the team, we couple nanoemitters to plasmonic patch antennas in order to improve their fluorescence characteristics such as emission rate or directivity.
We achieve inside the plasmonic antennas a high interaction between the emitters and the confined field excited inside the antenna. The objective is to study how thanks to a very high confinement, the emitters gain specific original quantum properties.
Nanometric semi-conductor colloidal nanocrystals, like CdSe/CdS ones, stable and bright, are excellent single photon sources. We couple these nanoemitters in patch nanoantenna, consisted of a thin dielectric medium (30-40nm) sandwiched between a thick gold layer and gold patch whose diameter is typically of the order of de 100nm-1µm. We can collect their emission in far field and get efficient single photon sources. Moreover because of plasmonic modes and high confinement, emission can be accelerated by a large factor.
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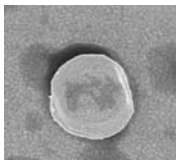
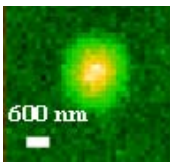


a)Patch antenna



b) emission diagram

In the preceeding years, we have developed lithographic methods making it possible to locate the emitter exactly in the center of the antenna to maximise interaction. We have evidenced for a single emitter an acceleration of spontaneous emission by a factor 200 and directive emission
During the internship, following our protocol, the student will fisrst fabricate antennas for which the interaction between field and nanoemitters is maximised. We will then investigate the quantum properties of this nanosources. .

Techniques involved: microscopy, single photon counting, lithography

Paid internship: Yes
Can this internship be continued for a PhD? Yes
If yes, type of PhD funding envisaged is: Doctoral School