

Parcours EuroPhotonics - Year 2021 - 2022

- Personal Project (Master 1)
- Internship (Master 1)
- Apprenticeship (Master 2)
- Master Thesis (Master 2)

Name of host organization : Institut Fresnel

Mail address : **Faculté des Sciences de St Jérôme 13013 Marseille**

Title: Plasmonic-enhanced single photon source from nano-optically trapped diamond NV center

Name of the supervisor(s): Jérôme Wenger

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Summary of the subject (maximum 1 page) :

Nanophotonics opens a powerful avenue to manipulate nano-objects and overcome the limitations of conventional optical tweezers. Thanks to the plasmonic optical nanoantennas, intense electromagnetic field gradients can be generated at the nanoscale, enabling efficient trapping of nanoscale objects that would otherwise be too small or too transparent to be manipulated using diffraction-limited optical tweezers.

Optical nanoantennas can enhance the emission properties of single quantum emitters, but this approach requires accurate nanoscale positioning of the source at the plasmonic hotspot. Here we will solve this issue by using nano-optical tweezers to trap single nanodiamond containing nitrogen-vacancy (NV) centers. The nano-optical trapping automatically locates the NV center at the nanoantenna hotspot to maximize its emission enhancement.

As main applications we plan to trap single nanodiamond containing NV centers for single photon sources. Commercially available diamond nanoparticles enriched in NV centers will be dispersed on a glass coverslip and investigated individually. A selected NV center will then be trapped to position the nanodiamond at the nanoantenna hotspot and maximize its fluorescence enhancement. The gains in the emission photodynamics brought by the nanoantenna will be characterized, which opens a promising route for quantum technologies and spectroscopy of single nano-objects.

Additional information (optional):

- * Keywords : nanophotonics, plasmonics, optical tweezers, optical nanoantenna
- * Required skills : motivation
- * Salary : for internships according to usual practice
- * Begin/End dates (min 7 weeks for Internship): to be discussed
- * Miscellaneous : webpage www.jeromewenger.com twitter @PhotonicsNano