INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: Institut des Sciences Moléculaires d'Orsay (ISMO)
CNRS identification code: UMR 8214
Internship director'surname: Eric Le Moal
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Web page: https://www.ismo.universite-paris-saclay.fr/en/scanning-probe-plasmonics/
Internship location: Institut des Sciences Moléculaires d'Orsay (ISMO) Bât. 520, rue André Rivière, Campus universitaire, 91400 Orsay

Thesis possibility after internship: YES
Funding: Not financed yet. The student may apply for a thesis scholarship of the Ecole Doctorale Ondes et Matière.

Shaping the polarization of light for tip-enhanced photoluminescence

The goal of the internship is to develop an optical spectroscopy technique that is spatially resolved at the nanoscale, which is known as tip-enhanced photoluminescence (TEPL). This technique employs a laser beam focused onto the apex of a plasmonic metal tip (gold or silver) within an atomic force microscope (AFM) or scanning tunneling microscope (STM). To maximize the field enhancement effect at the tip apex, the focused beam must be radially polarized. To achieve this specific polarization, the intern will use a liquid-crystal polarization converter. The intern will then couple this beam to the plasmonic tip of an AFM or STM microscope, contribute to developing the software interface for controlling the optical detectors, and conduct TEPL experiments on semiconductor nanomaterial samples.

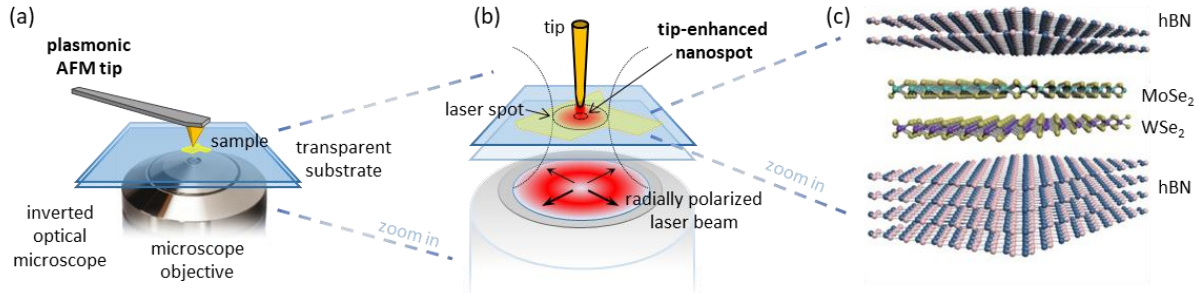

Figure: (a) Schematic of the experimental setup and principle of the experiment, (b) coupling of the radially polarized laser beam to the Plasmonic tip of an AFM, (c) example of studied semiconductor nanomaterial samples, i.e., a van der Waals heterostructure of transition metal dichalcogenide monolayers.

Techniques/methods in use: liquid-crystal radial polarization converter, AFM/STM, optical microscopy, Python programming language
Applicant skills: Basics in physical optics and quantum optics, and a taste for experimental physics and instrumental development. Knowledge of PYTHON is an asset.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics:	YES	Soft Matter and Biological Physics:	NO
Quantum Physics:	YES	Theoretical Physics:	NO