

M2-internship: Ultrafast Quantum Acousto-Magneto-Plasmonics

Proposition de stage / Internship proposal

Date de la proposition : 16.10.2026

Responsable du stage / internship supervisor:

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Etablissement / institution : LSI @ Polytechnique

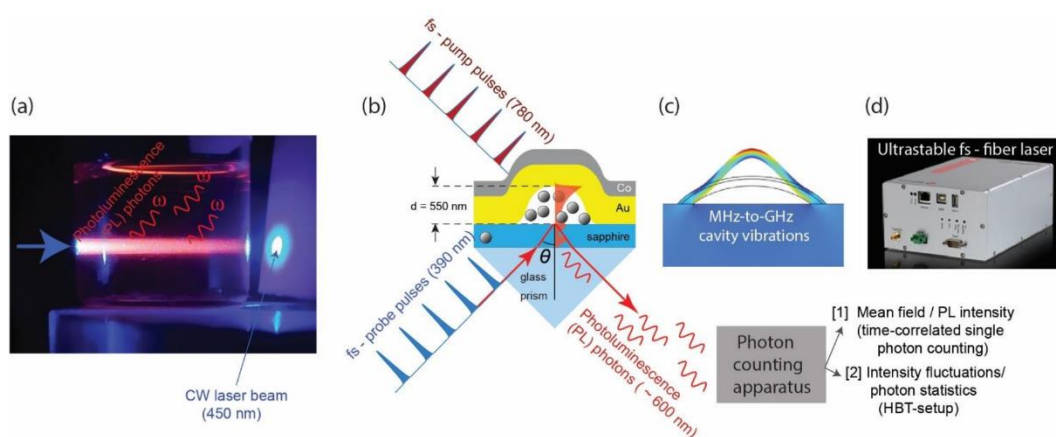
Code d'identification : CNRS UMR 7642

Site Internet / web site: <https://lsi.ip-paris.fr/equipes/physique-chimie-des-nano-objets>

Adresse / address: Ecole Polytechnique, Palaiseau

Lieu du stage / internship place: Equipe PCnano

Titre du stage / internship title: Ultrafast quantum photoacoustics on active nanostructures and metasurfaces



Résumé / summary

The project will focus on active control of time-resolved photoluminescence (PL) in functional quantum nanostructures excited with ultrashort laser pulses. Through a series of theoretical/ computational tasks and the combined photoacoustic/PL experiments the student will be asked to

design a prototype of a quantum acousto-magneto-plasmonic modulator (exploiting plasmonic [1], magneto-plasmonic [2] or acoustic/magneto-acoustic [3] interactions), where various fs-laser-assisted excitations in hybrid multilayer structures would modulate the dynamics of nanoscale light emitters. Recent collaborative efforts in fs-laser nanofabrication [4] and unconventional solitonic superfluorescence in perovskites [5] will be combined to produce and characterize innovative hybrid nanostructures for quantum-optical applications. This research stay will be part of existing national and international collaborations providing access to fluorescent nanoparticles (PCnano), high-quality colloidal CdSe quantum dots and J-aggregates (France), hybrid perovskites (USA), hybrid metallic multilayers (Spain & Germany) and metasurfaces (Sweden) and advanced magneto-acoustic spectroscopy (South Korea).

[1] D. Pacifici et al., **Nature Phot.** **1**, 402 (2007); Y. Fedutik et al. **Phys. Rev. Lett.** **99**, 136802 (2008)

[2] V.V. Temnov, **Nature Phot.** **6**, 728 (2012); **J. Opt.** **18**, 093002 (2016)

[3] A. Alekhin et al., **Nano letters** **23**, 9295 (2023)

[4] P. Varlamov et al., **Phys. Rev. Lett.** **135**, 126904 (2025)

[5] M. Biliroglu et al., **Nature** **642**, 71 (2025)



The Physics and Chemistry of NanoObjects (PCnano) team, Laboratory of Irradiated Solids @ Ecole Polytechnique is an interdisciplinary research team investigating physics and chemistry of functional (nano-)materials using a vast majority of nanofabrication and characterization techniques including colloidal chemistry (Dr. Florian AUBRIT), femtosecond laser lithography, magneto-optical and femtosecond time-resolved pump-probe microscopies and ultrafast time-resolved photoluminescence (a few techniques relevant for this internship).

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : yes

Si oui, financement de thèse envisagé ou acquis / financial support for the PhD ?

Financement acquis / Secured funding

Nature du financement /Type of funding

Financement demandé / Requested funding

x

Nature du financement /Type of funding

Bourse de l'X