



IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom



Masters Internship in Photonics/Optics

Modelling and fabrication of nano-structured photonics meta-surfaces

Context and description

Metasurfaces (composed of nano-structures) are capable of manipulating light with unprecedented flexibility acting on phase, polarization, amplitude and dispersion. Based on the technique of high speed parallelised multi-photon polymerisation (« 3D nanoprinter ») developed in the IMT laboratory^{1,2} in the ongoing EU project “FABulous” and the French ANR project “Nanoshape”, the industrial scale manufacturing of sub-wavelength metasurfaces has recently been made possible, opening up many perspectives for applications in optics, photonics, biology/health (bio-scaffolds) and beyond. The aim of the internship is to model such metasurfaces, predicting the light behaviour thanks to simulations, then to fabricate (using the prototype 3D nanoprinters in the IMT Atlantique cleanrooms) and characterise the optical performance of the nano-structures to validate the models. The resulting software will help select the parameters of metasurfaces in order to produce specific novel optical functions unavailable with conventional optical devices.

Internship tasks/objectives

The selected candidate’s roles will include:

- digitally model different kinds of metasurface for applications in optics/photonics
- simulate the optical functions and effects of the metasurface on illuminating lightfields
- fabricate by multi-photon polymerisation, the resulting nanostructures to validate/iterate the models
- contribute to improving the performance of the prototype nanoprinters by providing user feedback
- disseminate the scientific results (patents, conferences, publications, ...).

The candidate should have a strong theoretical and practical background in photonics and will be expected to contribute his/her own innovative ideas to develop new metasurfaces and optimise fabrication processes. The work will be performed in the IMT Atlantique laboratory in a team with optics department researchers (Profs, PhD students ...) but also in close relationship with the industrial and academic partners of Optics Laboratory, particularly those of the ongoing EU FABulous (<https://fabulous3d.eu>) and ANR Nanoshape projects (Thales, Oberthur, Essilor, Fraunhofer ...)

If the internship is successful, the subject is likely to be continued into a 3-year PhD project.

Candidate profile

- Masters or engineering student and with a solid grounding in and practical experience of photonics
- Experience of digital modelling (Matlab, Python, C ...) of photonic/physical processes
- Practical experience of characterisation techniques: optical/electronic microscopy, spectroscopy...
- Cleanroom and photolithography experience would be an advantage
- Taste and aptitude for laboratory experimentation (fabrication) and practical applications.
- Ability to work and write scientific reports and articles in English. French is not required initially.

Practical details

Start date: Feb/March 2026

Duration: 6 months (then possible PhD thesis)

Location: IMT Atlantique, Brest

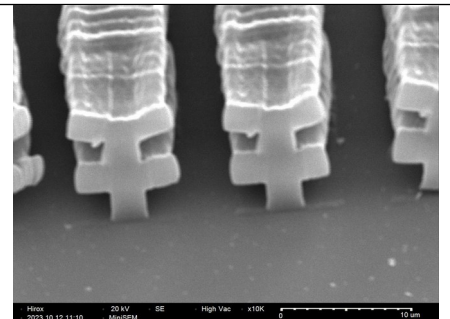
Financial conditions: internship grant of ~600€ net/month

Student accommodation and restaurant available on campus.

Applications considered continuously, closed 15/12/2025

Please send candidatures to:

Prof. Kevin Heggarty kevin.heggarty@imt-atlantique.fr



1. ARNOUX Caroline, PÉREZ-COVARRUBIAS Luis A., KHALDI Alexandre, *et al.* Understanding and overcoming proximity effects in multi-spot two-photon direct laser writing. *Additive Manufacturing*, 2022, vol. 49, p. 102491.
2. HILBERT Fabian, WIEDENMANN Jonas, STENDER Benedikt, *et al.* Impact of massive parallelization on two-photon absorption micro-and nanofabrication. In : *Laser 3D Manufacturing VII*. SPIE, 2020. p. 1127105.