Internship offer: ***Design of Optical Metasurfaces***

Background:

Metasurfaces are components made up of patterns (pillars) with geometries and spacing smaller than the wavelength. This nanometer-scale structure allows for local manipulation of light properties [1]. This new type of technology makes it possible to design ultra-thin components with unique properties, sometimes going beyond what is possible with traditional optical components. Many sectors are now interested in this type of technology, which is still relatively unexploited but has very promising potential applications.

The CONCEPT team at the Fresnel Institute has developed expertise in metasurface design, particularly for applications in the space sector [2]. The aim of this internship is to use the tools and methods already developed by the team to design a metasurface component that fulfills a specific function, such as the examples below:

- ✓ Reproducing the behavior of a freeform lens
- ✓ Reproducing the behavior of a polarization combiner

[1] P. Genevet et al, « Les métasurfaces, des composants optiques fonctionnels ultra-minces », Photoniques, 2017
[2] E. Hartmann et al, « All-dielectric metasurface polarization scrambler for imaging applications », Phys. Rev. A, 2025

Missions :

- ⇨ Understanding the physical concepts and design methods used in the field of metasurfaces
- ⇨ Numerical simulations of the behavior of sub-wavelength structures
- ⇨ Implementation of a method for designing a component that performs the required optical function
- ⇨ Duration: 5 to 6 months

Candidate profile :

Level: M2 in Research master Program or Engineering School, with a specialization in physics (ideally related to optics/photonics).
Knowledge of metasurfaces is not required; the candidate will receive support and training to learn about the subject.
A good knowledge of a programming language (Matlab/Python) is preferable.

To Apply :

Send resume to : edith.hartmann@fresnel.fr and myriam.zerrad@fresnel.fr