

**THE RTRA SCIENCES AND TECHNOLOGIES  
FOR AERONAUTICS AND SPACE  
RECRUITS**

**POST-DOC POSITION**

PROJECT FDAI-UV  
VALIDATION OF THE FRESNEL IMAGER CONCEPT IN THE ULTRA-VIOLET DOMAIN

➤ Profile	Doctorate in optics or astrophysics, Knowledge in UV domain optics, diffractive optics, signal processing
➤ Missions	Build the validation prototype of an innovative optical concept for a future space mission in high angular resolution astrophysics
➤ Duration	2 years
➤ Scientific Officer	Laurent Koechlin
➤ Host laboratory	Laboratoire d'Astrophysique de Toulouse Tarbes, 14 avenue Edouard Belin 31400 Toulouse France

Description of the project :

The main mirror of a space telescope is one of the major challenges for large aperture instruments, due to weight and manufacturing constraints. We propose to replace the mirror by a network of void apertures in a thin opaque membrane, which will focus light by diffraction. This should open the way to very large and lightweight apertures in space, while providing diffraction limited images.

We propose this optical concept for large aperture space telescopes, tens of metres in size. This lightweight will be used for direct imaging of exoplanets, stellar photospheres, circumstellar disks, interstellar clouds and their complex chemistry, and other astrophysical targets spanning from small objects in the solar system, to galaxies and AGN (Active galactic nuclei).

We have validated the concept in the visible domain (500 to 800 nm) with a first prototype. A second generation prototype will point at sky sources and test its high contrast, with a small 20 cm aperture from the ground. It will be operated during observing runs at Nice observatory.

The topic proposed here for this post-doc position concerns a third validation phase: the UV spectral domain. A recent "phase zero" study carried out at CNES has revealed several astrophysical topics where the Fresnel array is particularly competitive, even with a modest 3 to 4 m aperture, affordable for a preliminary space mission. These topics are mostly in the UV domain. Hence, a laboratory prototype and an optical bench suitable for UV tests need to be built. For practical reasons of safety and propagation in air, we will remain in the near UV, and the UV sources used will be of very low intensity. Further tests will



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aim to validate the optics for shorter wavelengths. Another important aspect of the postdoctoral work will be the study of the astrophysical targets that will be observable, and the preparation of the space mission.

### Partners :

Laboratoire d'Astrophysique de Toulouse-Tarbes

Centre National d'Etudes Spatiales

Universidad Complutense Madrid

Harvard Smithsonian Center for Astrophysics

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