



Observatoire  
de la CÔTE d'AZUR



### Offered position

Post-doctoral position in optics  
ARTEMIS laboratory, Nice, France

## The mission

The post-doctoral researcher will study and assess the perturbations, due to stray light, in the LISA (Laser Interferometer Space Antenna) instrument. LISA is a space mission under ESA supervision, in collaboration with NASA, with the support of the national agencies (CNES, DLR etc.) of the European member states that contribute to the LISA consortium.

## The context

ARTEMIS laboratory is a joint research unit of the Observatoire de la Côte d'Azur, CNRS and the Université Côte d'Azur. Its main scientific thematic is gravitational wave (GW) research and their detection and it contributes to the Virgo, LISA, Einstein Telescope and MIGA projects. The ARTEMIS team has pioneered the design and implementation of the French-Italian detector Virgo, built near Pisa (Italy). Virgo has contributed to several detection events together with LIGO, the double GW US detector. With the detection of the gravitational wave GW170817, the determination of the direction of the source was so precise that the electromagnetic counterparts could be detected, and the source of the GW could be observed and identified.

In the LISA project, the targeted precision of the heterodyne phase measurement implies a very detailed study of the sources of noise and systematic errors. This makes the Instrument AIVT (assembly, integration, verification and testing) phase, in which France is involved, a delicate task.

The Laboratoire ARTEMIS participates in theoretical aspects of the LISA project, as well as in the instrumental aspects. An interferometer set-up for the detection and study of light scattered at the imperfections or at the contamination of an optical surface, has been developed and used for characterization of the scattered field. This work will continue and will be extended by theoretical and simulations studies devoted to stray light in the LISA instrument.

The hired researcher will join a unit where expertise ranges from the physics of interferometers to the modelling of gravitational wave emission, cosmology, metrology or laser stabilization. Work will be done in the framework of the LISA France collaboration led by CNES, the French space agency, under the coordination of the LISA Instrument group LIG of the international LISA consortium. He/she will study and simulate the perturbations caused by stray light in the LISA heterodyne measurement with the goal of mitigating the noise and improving the performance in GW detection, through appropriate measures to be taken during the AIVT phase.

## Main activities

Work will target the modelling of stray light and of the resulting perturbation of the readout of the various LISA interferometers. The goal is to interpret the data collected with the ARTEMIS set-ups (homodyne,

heterodyne) devoted to scattered light characterization, then to assess the budget for stray-light related noise in the LISA instrument (in coordination with the LISA teams dealing with thermal and mechanical stability, and with the Contamination working group), and define mitigation strategies.

## Other activities

- Writing documents such as technical notes for the LISA consortium, the space agencies, and the industrial partners.
- Writing articles and preparing presentations in scientific conferences
- Attending and presenting results at the meetings of the ARTEMIS LISA team, the LISA France collaboration, and the LISA Consortium
- Supervising the members of the LISA team (doctoral students, internship students, engineers, technical staff)
- Possible contributions (data taking, ...) to experimental activities, provided the required training to laser safety has been done.

## Expected background

The candidate must have an engineer degree or a PhD degree in optics or physics/applied physics with a strong background in optics. Expertise in optical modelling and light propagation will be appreciated.

Particularly relevant is the expertise in:

- Optical simulation software such as FRED, IfoCAD, ZEMAX
- Geometrical optics and beam propagation
- Light scattering in optical systems and in gravitational wave detectors
- Contamination in optical systems (particulate contamination, chemical contamination) in space missions
- thermal modelling

Fluent English is expected (French will be appreciated)

## Location

- Laboratoire ARTEMIS, Observatoire de la Côte d'Azur, Boulevard de l'Observatoire, Nice, France

## Contract duration: 1 year, with possible extension for a 2<sup>nd</sup> year

Net monthly salary: slightly above 2000 euros, before income tax.

## Contact:

Nelson Christensen, [nelson.christensen@oca.eu](mailto:nelson.christensen@oca.eu), director, or Michel Lintz, [michel.lintz@oca.eu](mailto:michel.lintz@oca.eu)