



Interferometric Survey
of Stellar Parameters



Postdoc position

Fringe tracking for multi chromatic imaging – advanced performance for the Interferometric Survey of Stellar Parameters

Job offer: FT-ISSP for H2020_AdG 2020: Project 101019953 ISSP

Level: PostDoc, PhD required + experience

Salary: Depending on experience

Type of position: postdoc position with research activities in stellar physics, fundamental parameters of stars, interferometric observations, fringe tracking and signal analysis – Required experience in optical interferometry

Situation : Université Côte d'Azur – Observatoire de la Côte d'Azur - Laboratoire LAGRANGE – Bâtiment Fizeau du Campus Valrose (Nice, Calern - France) – CHARA Array, Mount Wilson, CA (USA)

Description of Observatoire de la Côte d'Azur :

Observatoire de la Côte d'Azur is a French public Center for research in earth sciences and astronomy. With more than 450 persons working at four different locations (Nice Observatory, Université de Nice, Sophia Antipolis, Plateau de Calern), its role is to explore, understand and transfer knowledge about Earth sciences and astronomy, whether in astrophysics, geosciences, or related sciences such as mechanics, signal processing, or optics. OCA is composed of 3 research units (ARTEMIS, GEOAZUR, and LAGRANGE) and 1 support structure (GALILEE). This program will be developed in the Lagrange Laboratory.

The Interferometric Survey of Stellar Parameters (ISSP) ERC-Adv grant, started on 1 Sep 2021 for 5 years, aims at realizing and exploiting an ambitious and homogenous survey of the angular diameters of a thousand stars as faint as magnitude 8 in the visible and as small as 0.2 milliseconds of arc. It benefits from the recently commissioned CHARA/SPICA instrument installed on the CHARA Array, Mount Wilson Observatory (USA, CA). The survey is built to address key questions about the relation between planets and stars and to offer to the broader community a unique and primary source of direct information on a representative and large sample of stars all over the HR diagram. The ISSP team is opening this postdoc position to support the scientific programs of the survey through a dedicated effort on the fringe tracking facility and image reconstruction.

Description of the CHARA Array

The flagship project of Georgia State University's Center for High Angular Resolution Astronomy (CHARA) is its optical interferometric array of six telescopes located on Mount Wilson, California. Each telescope of the

CHARA Array (Director: Gail Schaefer) has a light-collecting mirror 1-meter in diameter. The telescopes are dispersed over the mountain to provide a two-dimensional layout that provides the resolving capability of a single telescope with a diameter of 330 meters! Light from the individual telescopes is transported through vacuum tubes to a central Beam Synthesis Facility in which the six beams are combined together. When the paths of the individual beams are matched to an accuracy of less than one micron, after the light traverses distances of hundreds of meters, the Array then acts like a single coherent telescope for the purposes of achieving exceptionally high angular resolution. The Array can resolve details as small as 200 micro-arcseconds. In terms of the number and size of its individual telescopes, its ability to operate at visible and near infrared wavelengths, and its longest baselines of 330 meters, the CHARA Array is arguably the most powerful instrument of its kind in the world.

Description of the position:

This position is focused on the imaging part of the survey, mainly related to the subprograms S05 (limb darkening), S06 (binary), S07 (fast rotators) and S08 (disks and winds). The goal is to open the possibility of image reconstruction combining R-band data (SPICA-VIS), H-band data (MIRCx) and K-band data (MYSTIC), using the three instruments simultaneously with the 15 baselines of CHARA. To achieve the required performance for the different programs, we need to have a fully operational fringe tracker, called SPICA-FT, and that can be operated routinely every night.

Part of the activity will be dedicated to the optimization of the fringe tracking capabilities and to its consolidation as a routine service tool for interferometric observations. This supposes some works to correctly parametrize the system for the different kinds of objects (bright/faint, unresolved/resolved) and to characterize the stability of the fringe phase over the large domain of wavelengths, from $0.7\mu\text{m}$ to $2.4\mu\text{m}$. This also includes a potential amelioration of the operation of the longitudinal dispersion compensators.

The characterization of the progresses will be guided by the imaging program of the survey, mainly for complex objects for which the measurement of the angular diameter is not enough for the science objectives. As already said, the preferred targets will be binaries, fast rotators, and stars with environments.

We welcome applicants with diverse backgrounds and experiences. We regard gender equality and diversity as a strength and an asset.

Main activities

- Observations with the CHARA/SPICA instrument and the CHARA Array. Data reduction. Exploitation of the interferometric data for the optimal extraction of stellar fundamental parameters through multichromatic imaging.
- Multichromatic characterization of the fringe tracking performance. Optimization of its behavior for the different cases of science objects.
- Reporting, publications
- Collaboration on tools with other people in the team

Skills

A background in interferometric instrumentation is necessary as well as an experience in interferometric observations. The position supposes also some skills in data analysis. Some knowledge in image reconstruction would be ideal but collaborations within the existing group are also considered for this objective.

Conditions

This position assumes that the candidate will undertake observations, and it will be required to travel to (1) the United States at Mount Wilson in California for some onsite observations, and (2) the remote observatory at the Plateau de Calern site at Observatoire de la Côte d'Azur for most of the observations.

The deadline for application is fixed to January 31, 2025. Interviews will be organized. The starting date for the contract will be discussed during the interview, but the sooner the better. The end of the contract is on 31 Aug 2026 at the latest.

Application must be sent by email to denis.mourard@oca.eu. The application should contain a detailed CV, a letter of motivation describing the interest in the position and the skills for the activities that are described. Please provide also the name of two external referees that we can contact for discussion.

Contact :

Denis Mourard, (+33) 625 665 130

<https://lagrange.oca.eu/fr/welcome-erc-issp>