

# **INTERNSHIP PROPOSAL**

*(One page maximum)*

Laboratory name: Laboratoire des 2 infinis - Toulouse

CNRS identification code: UMR5033

Internship director's surname: Tamanini

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Internship location: Toulouse

Thesis possibility after internship: NO

Funding: YES

If YES, which type of funding: Gratification de stage

## **BRIDGING THE GAP: USING SPECTROSCOPY TO ENHANCE GRAVITATIONAL WAVE COSMOLOGY**

One of the most significant challenges in cosmology is the difference in Hubble constant values resulting from different measurement methods. Gravitational waves (GWs) offer a third, independent approach to determine the Hubble constant and resolve this discrepancy. The key to employing GWs for cosmological purposes lies in the direct measurement of the source's distance through GW signals, which can then be combined with the redshift of the galaxy from which the GW originated. Even when the exact host galaxy cannot be identified, considering all possible host candidates allows for a reliable estimate. By aggregating numerous such estimates from various GW events, we can progressively approach a resolution of the Hubble tension. During the ongoing observation period of the GW detector network, we are already detecting sources at distances where our knowledge of galaxies may not be detailed enough to provide an accurate Hubble constant estimate. In this project, you will investigate the potential benefits of collaborating with astronomical telescopes to conduct spectroscopic observations, obtaining more precise redshift values for galaxies. You will learn how gravitational-wave cosmology works, what are the capabilities of the state-of-the-art telescopes, how to combine gravitational wave data with electromagnetic observations, and how to work in a large international collaboration. Based on this study, a partnership between the global gravitational-wave detector network and some of the world's largest telescopes can start to be established. The internship will be undertaken in the GW group at the L2IT in Toulouse, which is composed by internationally well-known researchers, and currently counts 3 postdocs, 4 PhD students and 3 software engineers. Weekly interactions with group members and other L2IT members will expose the student to a highly dynamical environment where the she/he will be able to affine her/his research skills.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO      Soft Matter and Biological Physics: NO

Quantum Physics: NO                      Theoretical Physics: YES