

OGMA TEAM : Toward an accurate measurement of the Gravitational Wave sources density

The **OGMA** Team (*Observations with Gravitational waves & Multimessenger Astronomy*) is involved in Gravitational Wave (GW) Astronomy, with technical contributions to the **VIRGO** interferometer plus the analysis of the LIGO/VIRGO data, and in High Energy Neutrino (HEN) Astronomy, with technical and physics contributions to the **ANTARES** and **KM3NeT** GeV-PeV neutrino telescopes. OGMA also contributes to MultiMessenger studies, i.e. combining data from GW, HEN and ElectroMagnetic (EM) instruments.

OGMA efforts for GW science is focused on the search for events from the merger of compact objects (black holes BH or neutron stars NS). This search is performed with two different time scales. First, a set of realtime analyses leading to public alerts with a latency of the order of a minute or less. Second, the production of source catalogues. Both activities relies on the development and use of the data analysis pipeline **MBTA**.

In parallel to the data analysis effort, the OGMA team is developing a new calibration technique, the **Newtonian Calibrator (NCal)**, based on the production of a variable gravitational field thanks to a massive rotor. Several NCal have been installed on the **VIRGO** site and regular calibration shifts are scheduled prior and during detector operations. This system is going to provide the most accurate absolute calibration of a GW detector and therefore the most accurate calibration of the GW source distance.

The proposed PhD work is on both topics : the development and operation of the NCal system to get the best absolute calibration, and the use of this absolute scale for the analysis of the data collected by the LIGO and VIRGO detectors to extract accurate information like the rate of GW sources and their evolution up to cosmological distances. The next LIGO/VIRGO observing run is scheduled to start on May 24, 2023, for a duration of one and half year. It will provide great opportunities to be involved in the operation of these instruments, from the detector side up to the analysis and publication of the scientific results.

The PhD student will become a member of the **VIRGO** collaboration, in charge of the **VIRGO** gravitational wave detector located close to Pisa in Italy. Since LIGO and **VIRGO** fully share their data, data analysis teams and publications, the PhD student will be fully integrated in this join effort and will work on LIGO and **VIRGO** data.

PhD Supervisor(s) : **MOURS Benoit** and/or **PRADIER Thierry**

Phone : +33 (0)3 88 10 6609 - Email : benoit.mours@iphc.cnrs.fr

Phone : +33 (0)3 88 10 6620 - Email : thierry.pradier@iphc.cnrs.fr

Composition of the Team - Scientific Contact T. Pradier (University Staff); A. Albert (University Staff), D. Drouhin (University Staff), B. Mours (CNRS Staff), P. Van Hove (CNRS Staff), D. Estevez (CNRS Post-doc), V. Juste (PhD), A. Syx (PhD), T. Sainrat (PhD)