

OGMA TEAM : Contributions to Multimessenger & High Energy Neutrino Astronomy

The **OGMA** Team (*Observations with Gravitational waves & Multimessenger Astronomy*) is involved in High Energy Neutrino (HEN) Astronomy, with technical and physics contributions to the **ANTARES** and **KM3NET** GeV-PeV neutrino telescopes, and in Gravitational Wave (GW) Astronomy, with technical and physics contributions to the **VIRGO** interferometer. OGMA also contributes to MultiMessenger studies, i.e. combining data from GW, HEN and ElectroMagnetic (EM) instruments.

High Energy Neutrino astronomy was born after the discovery by **ICECUBE** of a [diffuse flux of cosmic neutrinos](#) with energies TeV-PeV in 2013. Since then, only a handful of HEN sources have been discovered - recently [NGC1068](#), an active galactic nucleus, but also the [Tidal disruption event AT2019dsg](#) observed in EM and associated with the HEN candidate IC191001A, and [the blazar TXS0506+056](#) observed in high energy gamma-rays, associated with the HEN IC170922A. These observations were the first MultiMessenger observations involving High Energy Neutrinos. Other potential HEN sources range from short-duration transients, such as gamma-ray bursts (GRBs) with EM light curves fading after a few hours, to medium-duration transients, such as core-collapse supernovae or long-duration transients, for instance, jetted TDE. Some of these sources may be associated with GW emissions occurring shortly before or during the production of HEN - see for instance the [search for HEN in coincidence with GW170817](#) to which IPHC participated.

The main multimessenger astronomy contribution of the OGMA team consists in combining GW and HEN data, both in realtime and offline, to show a possible connection between the production of the astrophysical jets producing HEN, detectable with **KM3NET** or **ICECUBE**, and the origin of their engines through GW emissions. These [GWHEN analyses](#) have to be consolidated for the incoming concomittant operations of **VIRGO/LIGO** and **KM3NET** instruments. In particular, the realtime correlation between observed [GW candidates](#) since the beginning of the O4 run, and **ICECUBE** neutrino alerts, could be studied during this internship. OGMA finally takes part in the definition of the Neutrino followup campaigns that will be performed by the **GRANDMA** Telescope Network in the near future - to discover and characterize possible EM counterparts of HEN candidates. After the detection of an interesting HEN candidate by **KM3NET** or **ICECUBE**, telescopes scan the sky in the direction of the incoming neutrino in order to discover a possible EM counterpart. Another possible internship is the implementation of the [HEN followup strategy](#) within the GRANDMA telescope network.

These works could be naturally extended during a PhD Thesis.

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