

SciNeGHE 2016 High-energy gamma-ray experiments at the dawn of gravitational wave astronomy



Contribution ID: 124

Type: **Talk**

Astroparticle and neutrino oscillation research with KM3NeT

Wednesday, 19 October 2016 16:10 (20 minutes)

KM3NeT, located in the abysses of the Mediterranean Sea, is a distributed research infrastructure that will host a km³-scale neutrino telescope (ARCA), offshore from Capo Passero in Italy, for high-energy neutrino astronomy, and a megaton scale detector (ORCA), offshore from Toulon in France, for the determination of the neutrino mass hierarchy.

The ORCA array is optimised for the study of atmospheric neutrinos in the energy range 3-30 GeV. Physics studies demonstrate that the neutrino mass ordering can be determined with a significance of 3-7 sigma (depending on the true value of the hierarchy and the value of mixing angle $\sin^2\theta_{23}$) after three years of operation.

The ARCA detector is aimed for the high energy neutrino astronomy. It should provide a measurement of the diffuse neutrino cosmic flux recently discovered by IceCube in a complementary part of the sky and test several possible origins. ARCA's location allows for surveying most of the Galactic Plane, including the Galactic Centre and the most promising source candidates (SNR RJ1713, Vela X) as well as the Fermi Bubbles.

The future KM3NeT participation in multi-messenger programs will exploit the high connection between neutrinos and other cosmic messengers: electromagnetic signals, from X-rays to high energy gamma-rays, charged cosmic rays, gravitational waves. Moreover, both KM3NeT detectors are sensitive to the lower energy neutrinos from the supernova explosions by observing the global light rate increase in the detector. Finally, they both can also look for neutrinos produced by the co-annihilation of Dark Matter particles; in the case of spin-dependent WIMP-nucleon cross section, the expected ORCA sensitivity is one of the best in the WIMP mass range of 10-100 GeV.

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Session Classification: Other messengers: neutrinos

Track Classification: Other cosmic messengers: neutrinos