



Contribution ID: 181

Type: Talk

ANTARES & KM3NeT: High Energy Astrophysical Neutrino Telescopes in the Mediterranean Sea

Wednesday 8 September 2021 13:40 (20 minutes)

The first deep-sea neutrino telescope, ANTARES, located in the Mediterranean, close to the coast of Toulon (France), has been continuously taking data since 2007. Its primary aim is to detect astrophysical neutrinos in the TeV–PeV in order to contribute to the effort of identifying astrophysical sources of Cosmic Rays and better understand their nature. The next-generation Neutrino Telescope, the Kilometre Cube Neutrino Telescope (KM3NeT ARCA and ORCA), is currently under construction and deployment in the Mediterranean Sea. ARCA (Astroparticle Research with Cosmics in the Abyss) in its final configuration will instrument 1 Gton of seawater, using more than 100,000 PMTs with a 3" diameter, and it is optimized to detect cosmic neutrinos within an energy range of 1 TeV–10 PeV. The optical properties of the deep-sea water allow for a large effective area and good pointing accuracy in all neutrino flavour channels, leading to an unprecedented sensitivity in the searches for neutrino sources in the Southern Sky. These properties have allowed to ANTARES to constrain the origin of the cosmic neutrino flux discovered by the IceCube detector and to participate, in a multi-messenger context, to the study of astrophysical sources. ANTARES data have been analysed searching for neutrino emission from transient sources, for neutrino correlations with transient events detected at different wavelengths, gravitational wave events, and neutrino events detected by the IceCube observatory. Many other physics topics are also covered by ANTARES: searches of dark matter annihilation or decay in massive objects; the search for relic massive magnetic monopoles and nuclearites; the study of atmospheric neutrinos and neutrino oscillations. An overview of the latest results from all these analyses in ANTARES, as well as the ARCA status and science program will be presented.

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Session Classification: Nuclear and particle astrophysics

Track Classification: Nuclear and particle astrophysics