



Contribution ID: 1014

Type: **Oral contribution**

All-flavour high-energy neutrino astronomy with KM3NeT/ARCA

Friday, 31 July 2015 14:18 (18 minutes)

The recent discovery by the IceCube collaboration of a high-energy neutrino flux of extra-terrestrial origin has opened a new observational window on the Universe. However, unambiguous identification of the emitting neutrino sources will require next generation neutrino telescopes with full sky coverage.

The KM3NeT Collaboration aims at building a research infrastructure in the depths of the Mediterranean Sea hosting a several cubic kilometre neutrino telescope. The technology for the detector construction and operation is defined and under final test with prototypes at a depth of 2500m and 3500m. The detector array with optical modules will be subdivided into sizeable building blocks of string-type detection units. This intrinsically modular nature of the detector allows for a staged implementation with increasing size from about 0.1 km³ for high-energy astronomy (phase-1) to be completed by 2016 to a volume of several km³ in the final phase.

Following phase-1, KM3NeT 2.0 will comprise two detectors with different granularity of the arrays of optical modules: KM3NeT/ARCA at the KM3NeT-It site as the extension of the phase-1 detector to two building blocks dedicated to high-energy neutrino astronomy and KM3NeT/ORCA, a single building block located at the KM3NeT-Fr site offshore Toulon (France) dedicated to the study of neutrino mass hierarchy (covered by another presentation).

The latitude of KM3NeT/ARCA will allow for a wide coverage of the observable sky including the region of the galactic centre. Thanks to the favourable characteristics of sea water the direction of neutrinos will be measured with excellent angular resolution also for cascade events. The expected KM3NeT/ARCA sensitivity will allow for the detection of the reported IceCube flux within about one year of observation, providing new data on its origin, energy spectrum and flavour composition; within five years of observation KM3NeT/ARCA could give indications at 3-sigma level on various galactic point-like sources.

Collaboration

KM3NeT

Registration number following "ICRC2015-I/"

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Session Classification: Parallel NU 02

Track Classification: NU-IN