ID de la contribución : **865** Tipo : **Poster**

KM3NeT: R&D and technical solutions for the next generation underwater neutrino telescope

The KM3NeT Collaboration aims at constructing a multi-km3 neutrino telescope in the Mediterranean Sea, exploiting the Cherenkov emission of relativistic charged particles in water. The detector will consist of a three-dimensional array of large-diameter pressure-resistant digital optical modules (DOMs), each equipped with 31 photomultipliers with 3" photocatode diameter. The DOMs are attached to vertical structures called detection units. Although the standard DOM density is optimized for the measurement of astrophysical neutrinos, the same technology can also be used to construct more densely instrumented detectors, as investigated in the ORCA sub-project targeting a measurement of the neutrino mass hierarchy with atmospheric neutrinos. The KM3NeT project will be implemented in three subsequent phases, increasing the telescope size from about 0.1 km3 (phase 1) to 1 km3 (phase 1.5) and finally to several km3 (phase 2).
Construction in phase 1 will start at two installation sites (40 km offshore Toulon, France at a depth of 2500 m; 80 km offshore Capo Passero in Sicily, at a depth of 3500 m); a third site offshore Pylos, Greece is expected to join in the next phase. The deployment of the first prototype detection unit, composed of only 3 DOMs is planned by May 2014, in the Capo Passero site. In this contribution we present all the key features of the detector, reviewing the DOM performance, the organization of the sea-floor network infrastructure, the strategies for deploying, connecting and calibrating the detection units, the trigger and data acquisition system and the computing model adapted.

Summary

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Clasificación de temáticas : Astroparticle Physics and Cosmology