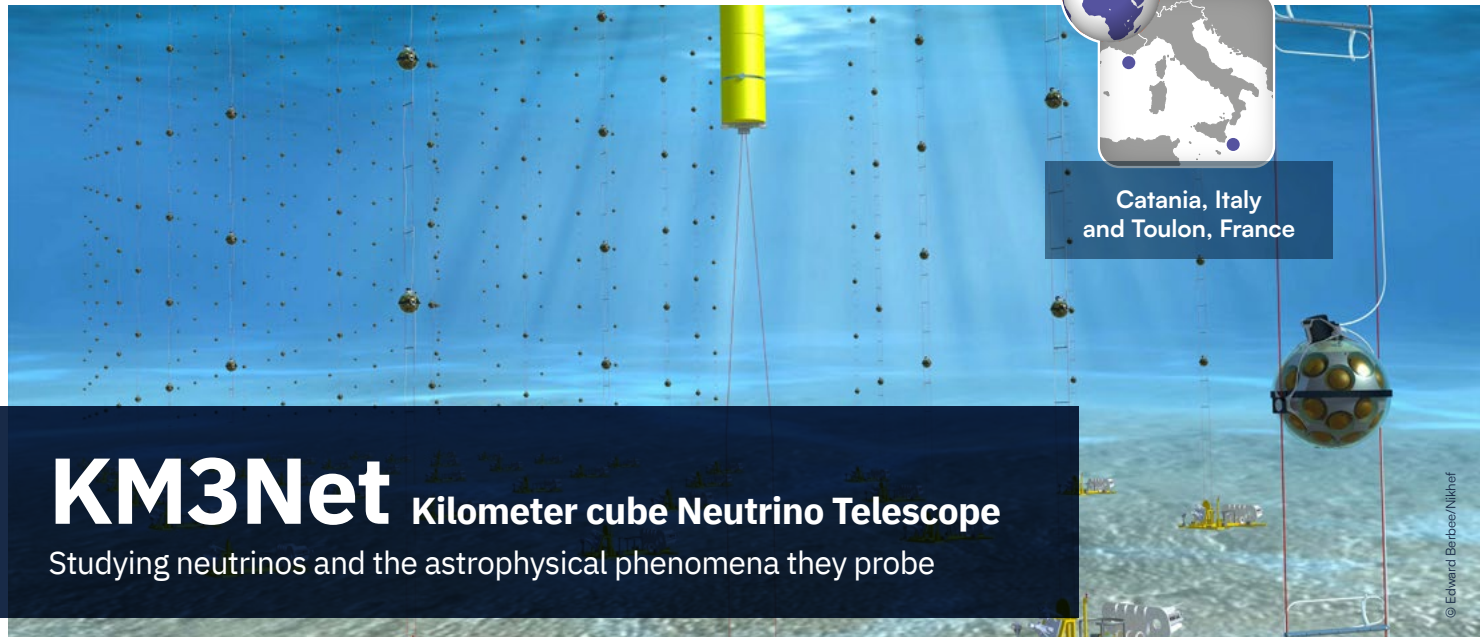


Neutrino physics and astrophysics



Scientific leader: Mathieu Perrin-Terrin (CPPM) *

Laboratories involved: APC (Paris), CPPM (Marseille), IPHC (Strasbourg), LPCC (Caen), LUPM (Montpellier), Subatech (Nantes)

Nature: distributed research infrastructure

Status: international project under construction, supported mainly by France, Italy and the Netherlands

Website: <https://www.km3net.org/>

Scientific objectives

Deep in the Mediterranean, KM3NeT contributes to the study of neutrinos. Using the ORCA detector in France, scientists study the properties of neutrinos by exploiting neutrinos generated in the Earth's atmosphere. The ARCA telescope in Italy is looking for neutrinos from distant astrophysical sources: supernovae, gamma-ray bursts or colliding stars. The KM3NeT infrastructure also houses instruments for earth and marine sciences, such as long-term monitoring of the deep waters and seabed.

Resources deployed

- Deployment of 6 000 optical modules at two deep mediterranean sites (ARCA and ORCA) to detect, in the sea water, the passage of muons produced by the interaction of neutrinos with the atmosphere or the earth. The modules are fixed to vertical lines and are evenly spaced to monitor a large volume of water.
- When completed, ORCA will consist of 115 lines of eighteen optical modules spaced metres apart, giving a total of 2 000 modules.
- ARCA will have 230 lines of eighteen optical modules spaced 35 metres apart, i.e. 4 000 modules in total.
- The submarine infrastructure is controlled via two telecommunication cables and several junction boxes.
- The two French and Italian sites will form a neutrino telescope with a total volume of 1.1 km³.

300Tb of data generated per year	2 500m deep
1,1 km³ of water instrumented	15 years of operation
18 participating countries on 4 continents	€ 190M budget

IN2P3 CONTRIBUTIONS

- Design and development of the underwater infrastructure, including the junction boxes hosting the ORCA telescope and the instrumentation for marine and earth sciences.
- Management and maintenance of the installation and contribution to the construction of ORCA, with the assembly of optical modules, electronic and optical containers, the assembly and calibration of detection lines, and their installation on the sea floor.
- Design and construction of the instrumentation lines for the in situ calibration of the detector.

Other french laboratories involved

LIS (Marseille), GeoAZur (Sophia Antipolis), MIO (Marseille)

2013

Formation of the KM3NeT collaboration

2016

KM3NeT registered on the ESFRI roadmap

2015-2016

Installation of junction boxes on ORCA and ARCA

2015-2017

First line deployed on ORCA and ARCA

2019

Data analysis with five lines

2021

Ten lines are operational for ORCA and eight for ARCA

2028

KM3NeT ARCA detector expected completed

* Since 2021