



## JOINT EUROPEAN MASTER IN NUCLEAR PHYSICS

Academic Year 2025/2026

### MASTER THESIS PROPOSAL

**TITLE: Neutrino detection with KM3NeT/ORCA: exploring a novel event-containment method**

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#### ABSTRACT

(just few lines 5-10 explaining briefly the idea of the proposed work and the place where it will be developed).

The KM3NeT research infrastructure comprises two neutrino telescopes at the bottom of the Mediterranean Sea. The KM3NeT/ORCA telescope is located off-shore Toulon in France at about 2.5 km depth and has been optimized to perform neutrino oscillation measurement. Since the deployment and operation of the 6 lines configuration, the collaboration is providing regular measurement of neutrinos, already contributing to neutrino oscillation and atmospheric neutrinos flux landscapes. In October of this year, the detector is expected to reach 34 detection lines, out of the 115 it will have when fully completed.

While many aspect of a neutrino oscillation measurement have been explored with the early configuration, the detector is now reaching a size that allow for selecting a new type of topology: events that are totally contained in the detector. This so-called contained events are of paramount importance for precise neutrino oscillation measurement, as for these we expect to reach the best energy resolution. However, defining what is contained is not as evident as it may seems for a borderless detector, which deform under the influence of sea-currents.

The internship aimed at exploring a novel method to defined a containment volume, based on a convex-hull describing the external surface formed by the detector, which adapt dynamically to follow the detector movement. The project aimed at introducing the derived quantities into a neutrino selection and evaluate its performances. This study will take place in the LPC Caen KM3NeT group, and will mainly involve data-analysis and visualization skills, while discovering the complex reconstruction and simulation landscape of an experiment like KM3NeT.