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KM3NeT contribution to the European Strategy for Particle Physics

The two KM3NeT neutrino detectors, currently under construction in the Mediterranean Sea, have been optimised to cover a broad neutrino energy range, spanning from a few GeV to tens of PeV. This document aims to highlight the expected key physics results. In particular the ORCA detector, designed to study neutrino oscillations in the atmospheric neutrino flux, will be able to determine the neutrino mass ordering (achieving more than 4σ significance after three years of operation) and precisely measure the values of the oscillation parameters Δm^2_{31} and $\sin^2\theta_{23}$. Furthermore, it is expected to yield valuable constraints on the limits on sterile neutrinos and non-standard interactions. The ARCA detector, thanks to its geographic position in the Northern Hemisphere, will enable rapid investigations on the diffuse flux and on neutrinos originating from the Galactic Centre and the Galactic plane (achieving 5σ significance after three years of operation). Discoveries or stringent upper limits are also expected for neutrino searches in the Southern Sky. The innovative design of the KM3NeT optical module also allows for the search and for the characterization of a galactic Core-Collapse supernova O(10 MeV) neutrino signal. The importance of the KM3NeT multi-site infrastructure to the European Research Area is recognized by the European Strategy Forum for Research Infrastructures (ESFRI) with KM3NeT featuring on the ESFRI roadmap since 2006. KM3NeT is currently the only facility located in Europe capable of studying fundamental neutrino oscillation physics and to detect high energy cosmic neutrinos. In particular, KM3NeT ORCA offers the opportunity for a first measurement of the neutrino mass ordering in advance of competing experiments.

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