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Measuring the neutrino mass hierarchy with KM3NeT/ORCA

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ORCA is the low-energy branch of KM3NeT, the next-generation underwater Cherenkov neutrino detector currently being built in the Mediterranean Sea. The detector will be used to determine the neutrino mass hierarchy, i.e. whether the third mass eigenstate is heavier or lighter than the other two states.

Atmospheric neutrinos traversing the Earth are affected by matter effects, which lead to modifications in the oscillation probabilities that are sensitive to the mass hierarchy. The technical design of the ORCA detector foresees a dense configuration of optical modules, optimised for the study of interactions of neutrinos with energies down to a few GeV. With ORCA, both cascades events involving mostly electron neutrinos and track events of mostly muon neutrinos can be accurately reconstructed thanks to the excellent optical properties of deep-sea water. With the total instrumented volume of ORCA of several megatons of sea water, it will be possible to probe with high event statistics a wide range of baselines through the Earth allowing for a 3-sigma determination of the neutrino mass hierarchy after 3-4 years of operation.

In this contribution we review the methods and technology of ORCA and present its sensitivity to the neutrino mass hierarchy and other oscillation parameters such as theta_23. Additionally, the detector construction status and further science opportunities with ORCA are presented.

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