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Shower reconstruction with the KM3NeT/ORCA detector

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The determination of the neutrino mass hierarchy is a central goal of upcoming neutrino physics experiments. In a detailed investigation we have evaluated the potential of the multi-megaton underwater KM3NeT/ORCA detector (Oscillation Research with Cosmics in the Abyss) to perform this measurement using atmospheric neutrinos in the multi-GeV energy range. The detector will be a dense array of optical modules located in the Mediterranean Sea, using technology developed for KM3NeT.

The reconstruction of electron neutrinos in charged-current events is a key task and substantially effects the mass hierarchy sensitivity. Due to the small light scattering in water, it is possible to distinguish the signatures of electromagnetic and hadronic showers with the ORCA detector. This allows for determining the inelasticity (Bjorken y) of neutrino interactions, and thus a separation of neutrino and anti-neutrino charged-current and of neutral-current events on a statistical basis. In addition, the Bjorken y sensitivity helps to improve the neutrino energy resolution. In this talk the method developed to reconstruct shower events will be presented and the performance in terms of neutrino energy and direction resolution, event classification and Bjorken y sensitivity will be discussed.

Collaboration

KM3NeT

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