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Measurement of the atmospheric muon neutrino flux with KM3NeT/ORCA6

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The KM3NeT/ORCA detector (Oscillation Research with Cosmics in the Abyss) is an underwater array of Digital Optical Modules. These are spheres that host 31 photomultiplier tubes each, and they are tied together in vertical structures (the Detection Units-DUs) anchored on the seabed. This configuration allows the detection of neutrino events using the Cherenkov radiation emitted by secondary particles originating from neutrino interactions in the abyssal depths of the Mediterranean Sea. The KM3NeT/ORCA detector is being deployed at a depth of 2450m, approximately 40 km South of Toulon, France with the determination of the Neutrino Mass Ordering being the main physics goal of the detector.

in this work, we present a measurement of the atmospheric muon neutrino flux between 1 GeV and 100 GeV, using data collected with the 6-DU configuration of KM3NeT/ORCA (KM3NeT/ORCA6). The data analyzed corresponds to a time period of one and a half years. A high-purity atmospheric neutrino sample is selected using a Machine Learning classifier (Boosted Decision Tree). Subsequently, an unfolding scheme is used to obtain an estimation of the atmospheric muon neutrino flux in bins of energy in the region of interest. Finally, a detailed study of the impact of the systematic uncertainty sources in the measurement is also presented. This measurement illustrates the ability of the KM3NeT/ORCA detector to provide experimental information, even with an early-stage detector configuration, at an energy region in which only few measurements exist by other experiments.

Author: Dr STAVROPOULOS, Dimitris (NCSR Demokritos)

Co-authors: Dr MARKOU, Christos (NCSR Demokritos); Dr TZAMARIUDAKI, Ekaterini (NCSR Demokritos); Dr DRAKOPOULOU, Evangelia (NCSR Demokritos)

Presenter: Dr STAVROPOULOS, Dimitris (NCSR Demokritos)

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