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Exploiting KM3NeT/ORCA data to study tau neutrinos and testing the non-unitarity mixing matrix

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The next generation of neutrino experiments aims to provide high-precision measurements of the neutrino oscillation parameters in order to reveal the major unknowns in neutrino physics. Among them, validating the three-neutrino flavor paradigm while testing the non-unitarity of the neutrino mixing matrix remains one of the most exciting, as it allows the exploration of new physics scenarios.

KM3NeT/ORCA is a water Cherenkov detector currently under construction in the Mediterranean Sea. Its primary physics goal is an early measurement of the neutrino mass ordering from the oscillation of atmospheric neutrinos passing through the Earth. Additionally, thanks to its huge fiducial mass, KM3NeT/ORCA will have unprecedented statistics to study tau neutrinos. This talk reports the final results obtained from the data collected with a partially instrumented volume, corresponding to 5% of the total, and 433 kton-years exposure. Studying the oscillation channel of the electron and muon atmospheric neutrino flux into tau neutrinos, a measurement of the normalisation factor, defined as the ratio between the number of observed and expected tau neutrinos, and their charge-current cross-section are discussed. Beyond the standard three-neutrinos flavor paradigm, a first test of the non-unitarity mixing matrix in the atmospheric sector is presented. A dedicated discussion on the event reconstruction and selection, the analysis strategy, and the prospects is described.

Secondary track

Author: LASTORIA, Chiara

Presenter: LASTORIA, Chiara

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