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Results on Neutrino Non-Standard Interactions with KM3NeT/ORCA6 and ANTARES

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Neutrino Non-Standard Interactions (NSIs) are proposed as extensions of the Standard Model (SM) to accommodate mechanisms for the origin of neutrino masses. The NSIs are incorporated through effective four-fermion interactions which lead to both charged-current (CC) and neutral-current (NC) interactions. The NC NSIs affect the coherent forward scattering of neutrinos on fermions in matter, ultimately leading to modifications of the oscillation probabilities of neutrinos experiencing matter potentials. Therefore, strong matter effects influencing the core-crossing trajectories of atmospheric neutrinos traversing the Earth would enhance such modifications, making neutrino telescopes ideal candidates for NSIs studies.

This work presents the results of the NSIs search with the KM3NeT/ORCA6 and ANTARES neutrino telescopes. The ORCA detector is currently under construction in the Mediterranean Sea, and its NSIs results benefit from an increased exposure (510 days), improved reconstruction and calibration methods compared to previous works and higher selection efficiencies driven by Machine Learning techniques. On the other hand, ANTARES was the predecessor neutrino telescope of ORCA and operated uninterruptedly for 14 years with 12 detection units. This work will also present the results of the NSIs search with ANTARES data collected from 2007 to 2016, providing a constraint on the NSIs parameter $\varepsilon_{\mu\tau}$ which is among the most stringent to date.

Submitted on behalf of a Collaboration?

Yes

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