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Combined search for Lorentz invariance violation with ANTARES, IceCube, and KM3NeT

Lorentz invariance (LI) is a fundamental symmetry in the Standard Model that may be violated in quantum gravity. The "Standard-Model extension" (SME) framework incorporates this hypothetical Lorentz invariance violation (LIV) by introducing a complete set of LI- and CPT-violating operators coupled with corresponding SME coefficients. A non-zero value of one or more of these coefficients would result in a deviation of the predicted neutrino oscillation probability from the case of standard neutrino oscillations, which enables neutrino telescopes to measure or constrain these coefficients.

The four neutrino telescopes ANTARES, IceCube, KM3NeT/ARCA, and KM3NeT/ORCA are sensitive to the atmospheric neutrino flux, which has energies and baselines suitable for constraining LIV coefficients. We report on the progress of a combined analysis using data from all four telescopes, which enables an extended energy range coverage and more statistics compared to previous single-experiment studies. This analysis focuses on isotropic LIV coefficients, of which some are still unconstrained.

Collaboration(s)

ANTARES, IceCube, KM3NeT

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