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Lorentz Violation in Neutrino Oscillations using IceCube Atmospheric Neutrino Interferometry BARBARA SKRZYPEK, CARLOS ARGUELLES DELGADO, Harvard University, ICECUBE NEUTRINO OBSERVATORY COLLABORATION, HARVARD UNIVERSITY TEAM — Lorentz invariance is a fundamental symmetry of spacetime underpinning general relativity and the Standard Model of particle physics. However, its violation at high energies could indicate new physics such as string theory or non-commutative field theory. Moreover, as another indication of new physics, neutrino oscillations are a phenomenon that cannot be accommodated within the the Standard Model. Whereas this is usually accounted for by a mass term, Lorentz violating effects could play a subleading role in neutrino oscillations and explain anomalous measurements. Lorentz violation (LV), as formalized in the Standard Model Extension (SME) framework, introduces terms whose characteristic oscillation lengths become significant at atmospheric neutrino energies accessible by the IceCube Neutrino Observatory, providing the most stringent bounds on LV operators. We carry out our LV analysis by using ten years of through-going muon data to study muon-neutrino disappearance in the atmospheric neutrino spectrum at IceCube. We also consider an astrophysical component, which provides a unique and very sensitive test of Lorentz symmetry. In this talk, I will present the current limits on LV by IceCube and sensitivities for our new ten-year analysis.

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