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Search for decoherence due to quantum gravity with the IceCube Neutrino Observatory

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In order to develop a consistent quantum theory of gravity, we must understand whether spacetime exhibits fluctuations at the Planck scale. If these Planck-scale fluctuations exist, they may cause propagating particles to evolve in an apparently non-unitary manner. Neutrinos, which interact only via the weak force and gravity, maintain quantum coherence while propagating over large distances. Thus, neutrino oscillations serve as a precise interferometer to search for Planck-scale fluctuations of spacetime. The IceCube Neutrino Observatory is the world's largest neutrino telescope, located in the Antarctic glacier. We search the data on atmospheric neutrinos detected by IceCube in the energy range 0.5-100 TeV to test for neutrino decoherence. In this contribution, we present the sensitivity of the analysis, which shows significant improvement compared to previous IceCube results as a result of improved reconstruction and a larger sample of events.

Collaboration(s)

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