

Title: Search for Quantum Gravity with IceCube and High Energy Atmospheric Neutrinos

Abstract: The IceCube Neutrino Observatory has collected an unprecedented sample of atmospheric muon neutrino events, with energies up to about 400 TeV. The energy and direction dependence of these events will be used to search for signatures of quantum gravity in the neutrino sector. A likelihood method will be used to search for deviations in the energy and zenith angle dependence of the atmospheric neutrino flux at the detector, due to Lorentz invariance violating oscillations or quantum decoherence. A discrete Fourier transform method will be used to search for a periodic variation as a function of right ascension, a possible consequence of a Lorentz-violating directional asymmetry. The current status of these analyses will be discussed, including potential sensitivity and challenges provided by systematic uncertainties. Additionally, preliminary results from the unfolding of the atmospheric neutrino spectrum up to 400 TeV will be discussed.