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Searching for Traces of Planck-Scale Physics with High Energy Neutrinos FLOYD STECKER, NASA/GSFC, SEAN SCULLY, James Madison University, STEFANO LIBERATI, SISSA, DAVID MATTINGLY, New Hampshire University — Some Planck-scale physics and quantum gravity models predict a slight violation of Lorentz invariance (LIV) at high energies. High-energy cosmic neutrino observations can be used to test for such LIV. Operators in an effective field theory (EFT) can be used to describe the effects of LIV. They can be used to calculate kinematically allowed energy losses of possible superluminal neutrinos. These losses can be caused by both vacuum pair emission (VPE) and neutrino splitting. Assuming a reasonable distribution of extragalactic neutrino sources, we determined the resulting after-loss neutrino spectra using Monte Carlo propagation calculations. We then compared them with the neutrino spectrum observed by IceCube to determine the implications of our results regarding Planck-scale physics. If the drop off in the observed IceCube neutrino flux above 2 PeV is caused by LIV, a potentially significant pileup effect would be produced just below the drop-off energy in the case of CPT-even operator dominance. However, such a clear drop off effect would not be observed if a CPT-odd, CPT-violating term dominates.

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