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GZK neutrinos through Earth

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IceCube has measured an astrophysical flux of neutrinos extending to 10 PeV. However, a guaranteed yet undetected flux of cosmogenic neutrinos caused by interactions of ultra-high energy cosmic rays with the cosmic microwave background remains elusive. Using the regeneration effect, we show that EeV tau neutrinos traversing the Earth cascade down in energy and emerge at O(PeV), a region where current cubic-kilometer detectors such as IceCube are sensitive. We show that the rate of upgoing cosmogenic neutrinos is twice that of earth-skimming neutrinos, with a unique zenith and spectral distribution. We discuss possible searches with the currently available ten years of IceCube data.

Summary

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