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Tau Neutrino Physics with IceCube

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Kilometer-scale neutrino detectors, like the IceCube Neutrino Observatory deployed in the ice cap at the South Pole, are uniquely capable of detecting energetic tau neutrinos and tau leptons. IceCube has sensitivity to tau neutrinos with energies at and above the threshold for tau lepton production, and has sufficiently large volume to contain tau leptons that travel hundreds of meters. The experiment has world-leading acceptance for atmospheric tau neutrinos at energies above roughly 10 GeV, and to astrophysical tau neutrinos at energies above roughly 100 TeV. Atmospheric tau neutrinos are primarily created by the oscillation of muon neutrinos as they pass through the earth after production in the northern hemisphere, and IceCube detects them and their tau lepton daughters inclusively, as an excess of shower-like events in its DeepCore sub-array. Astrophysical tau neutrinos are likely produced by neutrino oscillations over cosmic baselines, and can be detected exclusively, through the distinctive signatures created by the tau neutrino interaction vertex and the subsequent tau lepton decay vertex. We present results of IceCube's atmospheric and astrophysical tau neutrino measurements, and provide projections for future improvements and possible new channels for tau neutrino and tau lepton detection.

What is your topic?

Neutrino Physics

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