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A Search for Astrophysical Tau Neutrinos in Three Years of IceCube Data

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The IceCube Neutrino Observatory has reported a diffuse flux of TeV-PeV astrophysical neutrinos in three years of data. The observation of tau neutrinos in the astrophysical neutrino signal is of great interest in determining the nature of astrophysical neutrino oscillations. Tau neutrinos become distinguishable from other flavors in IceCube at energies above a few hundred TeV, when the particle shower from the initial charged current interaction can be separated from the cascade from the tau decay: the two cascades are called a “double bang” signature. An analysis is presented which uses the digitized signal from individual IceCube sensors to resolve the two showers, in order to be sensitive to taus at as low an energy as possible. This is the first IceCube search to be more sensitive to tau neutrinos than to any other flavor. No candidate events were observed in three years of completed IceCube data. The resulting limit and prospects for future high energy tau neutrino searches, including a search for higher energy double bangs, will be discussed.

Collaboration

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