

IceCube Search for Earth-traversing ultra-high energy Neutrinos

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The search for ultra-high energy neutrinos is more than half a century old. While the hunt for these neutrinos has led to major leaps in neutrino physics, including the detection of astrophysical neutrinos, neutrinos at the EeV energy scale remain undetected. Proposed strategies for the future have mostly been focused on direct detection of the first neutrino interaction, or the decay shower of the resulting charged particle. Here we present an analysis that uses, for the first time, an indirect detection strategy for EeV neutrinos. We focus on tau neutrinos that have traversed Earth, and show that they reach the IceCube detector, unabsorbed, at energies greater than 100 TeV for most trajectories. This opens up the search for ultra-high energy neutrinos to the entire sky. We use ten years of IceCube data to perform an analysis that looks for secondary neutrinos in the northern sky, and highlight the promise such a strategy can have in the next generation of experiments when combined with direct detection techniques.

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Collaboration

IceCube

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Subcategory

Experimental Results

Primary authors: SAFA, Ibrahim (University of Wisconsin-Madison); ARGUELLES, Carlos (Harvard University); FOR THE ICECUBE COLLABORATION

Presenter: SAFA, Ibrahim (University of Wisconsin-Madison)

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