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Measuring the flavor ratio of atmospheric neutrinos with IceCube

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IceCube is accumulating an unprecendented number of contained neutrino events with energies from 1 TeV to beyond 100 TeV. The neutrinos at the lower end of the energy range come from the decays of pions and kaons produced in air showers; the energy spectrum is roughly one power steeper than the cosmic ray flux, and muon neutrinos dominate. At higher energies, however, the flavor ratio begins to equalize, and the spectrum hardens. Such changes can be caused by a combination of the onset of a hard component of the atmospheric neutrino flux from the decays of heavy, charmed mesons and a diffuse flux of high-energy astrophysical neutrinos. While it is possible to exclude atmospheric origin of any kind for neutrinos with sufficiently high energies, isolating and measuring the contribution from charmed meson decays requires a direct observation of the flavor ratio and energy spectrum at energies around 10 TeV.

This talk will cover recent progress towards a direct measurement of the flavor composition of the atmospheric neutrino flux with IceCube, prospects for a first observation of a hard component from charmed meson decays, and strategies for distinguishing between the onset of a hard atmospheric component and a diffuse flux of astrophysical neutrinos.

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