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Atmospheric Neutrinos and Neutrino Oscillations

CHIA-HUI LIN^{1,2}, Stony Brook University — Atmospheric neutrinos are produced from the collisions between cosmic rays and upper atmospheric nuclei. Pions and kaons are the collision products in the first place. Then, the pion decays to one muon neutrino and one muon which subsequently decays to a one electron, one electron neutrino and another muon neutrino. We expect a 2:1 ratio of atmospheric pion neutrinos to electron neutrinos based on this kinematical argument. Because of neutrino oscillation which is mixing the neutrino flavors, the experimental observation is no longer 2:1. I will discuss three experimental evidences to support the existence of neutrino oscillation. The first is the deviation from kinematical ratio.[1] The second is the significant up-down asymmetry of neutrino events in high energy regime.[2] The last one is the so-called upward-going muon study.[3] All of them support the prediction of neutrino oscillation. [1]Y. Fukuda *et al.*, Phys. Rev. Lett. **81**, 1562 (1998) [2] W. Doki *et al.*, Phys. Lett. **B436**, 33 (1998) [3] Y. Fukuda *et al.*, Phys. Rev. Lett. **82**, 2644 (1999)

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