

On possibility of the tau neutrino astronomy in GeV energies

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We discuss the possibility of searching the galactic-plane tau neutrinos in GeV energies.

The comparison of the galactic-plane and the atmospheric ν_τ fluxes is shown in Figs. 1 and 2 in two neutrino flavor approximation. These figures indicate opportunities for the tau neutrino astronomy in GeV energies for incident zenith angles $\xi = 0^\circ$ and $\xi = 60^\circ$ respectively. The galactic-plane tau neutrino flux dominates over the atmospheric tau neutrino background beginning from a few GeV's. We note that, for $E \leq 20$ GeV, the former flux has a different slope from that of the latter. This is an important criterion for distinguishing the two fluxes, as the normalization of the galactic-plane tau neutrino flux is still uncertain. The crossing energy of galactic-plane and atmospheric ν_τ fluxes for $\xi = 60^\circ$ is higher than for $\xi = 0^\circ$. This is because for $\xi = 60^\circ$, the atmosphere depth is larger and the atmospheric ν_μ are produced more far away from the ground detector.

We point out that the dominance of galactic-plane tau neutrino flux over its atmospheric background in GeV energies is unique among all neutrino flavors. Due to neutrino oscillations, the total galactic ν_τ flux is identical to that of galactic ν_μ . However, the atmospheric ν_μ flux is much greater than the flux of atmospheric ν_τ . As a result, in the presence of neutrino oscillations, the crossing energy for galactic-plane and atmospheric ν_μ fluxes is pushed up to $5 \cdot 10^5$ GeV, which is significantly different from the tau neutrino case [1].

REFERENCES

1. H. Athar, F.-F. Lee, and G.-L. Lin, arXiv:hep-ph/0407183.

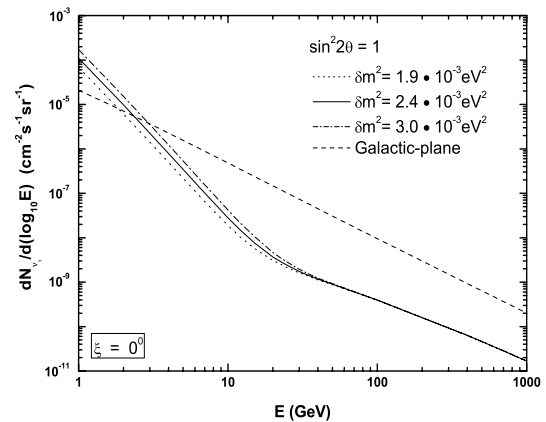


Figure 1. The galactic-plane and the downward going atmospheric ν_τ fluxes cross at $E = 2.3$ GeV.

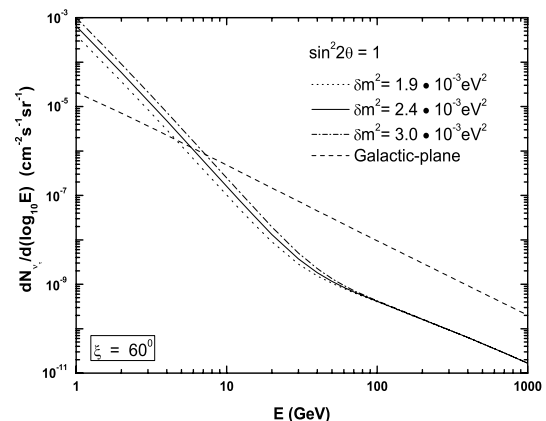


Figure 2. The galactic-plane and the atmospheric ν_τ fluxes cross at $E = 6.0$ GeV.