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Prospects of detecting prompt atmospheric neutrinos and muons with TRIDENT

Atmospheric neutrinos and muons, produced from cosmic-ray-induced air showers, are one of the dominant backgrounds for astrophysical neutrino detections. The flux with energy below 100 TeV is dominated by muons and conventional atmospheric neutrinos produced by pion and kaon decays. In contrast, their prompt counterparts, from decays of short-lived charm hadrons, are predicted to contribute at higher energies and exhibit a harder spectral index. A precise understanding of the prompt components is essential not only for constraining the background in astrophysical neutrino detection, but also for advancing the development of hadronic interaction models. Despite their significance, the prompt components have yet to be measured experimentally. This poster presents prospects for the detection of prompt atmospheric neutrinos and muons using TRIDENT, a proposed next-generation neutrino telescope. We explore the potential to refine modeling of forward charm production in hadronic interactions as well as enhancing sensitivity to astrophysical neutrino searches.

Collaboration(s)

TRIDENT

Author: HUANG, Weilun (Tsung-Dao Lee Institute, Shanghai Jiao Tong University)

Presenter: HUANG, Weilun (Tsung-Dao Lee Institute, Shanghai Jiao Tong University)

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