Identifying astrophysical tau neutrinos with hDOM waveforms in TRIDENT

Tuesday, 18 June 2024 17:30 (2 hours)

Following the exciting discovery of astrophysical neutrinos and subsequent studies of their origins by IceCube, future improved all-flavor neutrino detection would allow for a strong probe into the abundant physics lying within these astrophysical sources. The main challenge in flavor identification is to break the degeneracy among cascade events and separate out the interactions due to tau neutrinos. In 2020, two tau neutrino candidates observed by IceCube demonstrated the great potential using waveforms to do particle identification in neutrinio telescopes. TRIDENT is a next-generation water-based neutrino telescope, incorporating Hybrid Digital Optical Modules (hDOM) with multi-channel PMTs and SiPMs. This system expects to enhance the sensitivity to tau neutrinos by providing larger photon coverage and independent waveform readout, fully leveraging the low optical scattering in seawater. Here, we present the latest progress of tau classification in TRIDENT using waveform techniques.

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