Contribution ID: **187** Type: **Poster**

A Novel Reconstruction Method for Atmospheric Neutrinos in Large Liquid Scintillator Detectors with Machine Learning Technique

Thursday, 11 August 2022 14:40 (2 minutes)

Large liquid scintillator detectors such as JUNO play an important role in particle physics. They typically provide low-threshold, high-precision energy measurements, but their ability in getting other event informations, especially the particle direction, is limited with traditional reconstruction methods. These informations are critical to atmospheric neutrino oscillation analysis, which offers independent sensitivity to neutrino mass ordering for JUNO. In this talk we present a novel method for the reconstruction of atmospheric neutrino events in JUNO and other large liquid scintillator detectors, by extracting features from PMT waveforms and use them as inputs to machine learning models. This method is able to reconstruct multiple objects, including direction, energy, interaction vertex, event type, etc., and has the potential to achieve better resolution than traditional methods. The performance of this method using JUNO simulation will be presented.

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Session Classification: Parallel Session IX (5)：Particle Detector Technology

Track Classification: 粒子物理实验技术