

Contribution ID: 294 Type: Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)

Time-of-flight monitoring techniques for the Water Cherenkov Test Experiment

Tuesday 10 June 2025 17:15 (15 minutes)

The Hyper-Kamiokande (Hyper-K) project aims to measure neutrino oscillations with unprecedented precision which may answer fundamental questions underlying CP violation in the lepton sector. Minimizing systematic uncertainties is now more important than ever, making prototype experiments such as the Water Cherenkov Test Experiment (WCTE) at CERN essential. WCTE is designed to test photosensor technology and calibration methods that will be used in future water Cherenkov detectors such as the Inner Water Cherenkov Detector (IWCD) and Hyper-K. The physics goals of WCTE include evaluating the electron-muon signal separation capabilities of multi-photomultiplier tubes (mPMTs)-new detector technology primarily developed in Canada-enhancing our understanding of pion scattering kinematics to better constrain the neutrino energy spectrum, and improving electron-gamma separation to reduce background signals. Achieving these measurements requires a precise understanding of the timing information from the mPMTs. We are exploring an alternative technique to obtain time-of-flight-corrected signatures of relativistic, charged particles entering WCTE from the T9 beam. We use Geant4 simulations to evaluate the feasibility of reconstructing the entry time of a particle in the detector based on Cherenkov light detected by the mPMTs. This approach could serve as a valuable cross-check against results from the time-of-flight system, which consists of an upstream and a downstream monitor inside the beam pipe. This presentation will cover the time-of-flight measurement technique and provide an overview of WCTE as we begin data collection in March 2025.

Keyword-1

Particle physics

Keyword-2

Neutrino physics

Keyword-3

Author: ZHANG, Jasmine Jinyin (TRIUMF (CA))

Co-authors: Mr HARTZ, Mark (TRIUMF); Ms LI, Xiaoyue (TRIUMF)

Presenter: ZHANG, Jasmine Jinyin (TRIUMF (CA))

Session Classification: (PPD) T3-9 Neutrinoless double beta decay and neutrino experiments | Double désintégration beta sans émission de neutrino et expériences sur les neutrinos (PPD)

Track Classification: Technical Sessions / Sessions techniques: Particle Physics / Physique des particules (PPD)