38th INTERNATIONAL CONFERENCE ON HIGH ENERGY PHYSICS
AUGUST 3 - 10, 2016
CHICAGO

Contribution ID: **1308** Type: **Oral Presentation**

Developing a water Cherenkov optical time-projection chamber (12' + 3')

Saturday, 6 August 2016 17:30 (15 minutes)

The prospect of large-area, scalable, and high-granularity photodetectors opens the possibility of building a water-based 'optical time-projection chamber' (OTPC), in which high-energy charged-particle tracks are reconstructed by measuring the relative times and positions of the 'drifted' Cherenkov photons.
A first experimental test the OTPC concept was performed at the MCenter Fermilab Test-Beam Facility using a 40 kg cylindrical water volume, which was instrumented with an array of small, commercial micro-channel plate photo-multipliers (MCP-PMTs) in combination with optical mirrors. The MCP-PMT signals were collected on 50Ω transmission lines and digitized using a 180-channel data acquisition system based on a front-end custom 10 GSPS waveform sampling circuit. An initial test-beam run examined the detector response to multi-GeV muons. Approximately 80 Cherenkov photons are detected for a through-going muon track in a total event duration of about 2 ns. By measuring the time-of-arrival and the position of these photons at the surface of the detector to better than 100 ps and a few mm, we measure a 3D spatial resolution of 15 mm on the particle track.

Primary author: OBERLA, eric (uchicago)

Co-author: FRISCH, henry (university of chicago)

Presenter: OBERLA, eric (uchicago)

Session Classification: Detector: R&D and Performance

Track Classification: Detector: R&D and Performance