



Contribution ID: 329

Type: **Oral**

## TheTORCH time-of-flight detector

*Monday, 25 May 2015 18:30 (15 minutes)*

The TORCH time-of-flight detector is being developed to provide particle identification between 2-10 GeV/c momentum over a flight distance of 10m. TORCH is designed for large-area coverage, up to  $30\text{m}^2$ , and has a DIRC-like construction with 10mm thick synthetic quartz radiator plates. Cherenkov photons propagate by total internal reflection to the plate edges and there are focussed onto position-sensitive micro-channel plate (MCP) detectors. The goal is to achieve a 15 ps time-of-flight resolution per incident particle by combining arrival times from multiple photons. A four-year R&D programme is now underway with an industrial partner (Photek, UK) to produce a 53x53 mm square MCP-PMT detector for TORCH application. The MCP-PMT will provide a spatial resolution of 0.4 mm and 6 mm in the two dimensions by incorporating a novel charge-sharing technique. The MCP-PMT will provide a timing accuracy of 40 ps and it will have a lifetime of up to at least  $5\text{ C/cm}^2$  of integrated anode charge by utilizing an Atomic Layer Deposition (ALD) coating. A novel method of coupling the MCP-PMT output pads to a PCB through an Anisotropic Conductive Film (ACF) will be described, together with customised readout electronics incorporating the NINO chipset. The overall requirements of the photon detectors will be presented and laboratory results on prototype MCPs will be compared with simulation. The construction of a prototype TORCH detector and its expected performance will also be described.

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**Session Classification:** Photo Detectors and PID

**Track Classification:** S2 - Photon Detector and PID