

The TORCH time-of-flight detector

Saturday 7 July 2018 17:42 (12 minutes)

The TORCH detector is a time-of-flight based system that is being developed for use in particle physics experiments with the aim of providing particle identification in the momentum range 2–10 GeV/c over a wide area. The detector exploits prompt Cherenkov light produced by charge particles traversing a 10 mm thick quartz plate. Photons propagate via total-internal reflection and are focussed onto a detector plane comprising position-sensitive micro-channel plate (MCP) detectors. The goal is to achieve a resolution of 15 ps per particle by combining information from around 30 detected photons, given a single-photon resolution of 70 ps. The MCP-PMT detectors have been developed with a commercial partner (Photek), leading to the delivery of a 53 by 53 mm square tube, with 8 by 128 pixels. A small-scale demonstrator of the TORCH has been tested in beam tests and preliminary results indicate a single photon-resolution better than 100 ps. Progress towards a larger-scale system with a 10 MCP-PMTs, and the possible impact on the physics programme of a future LHCb upgrade, will be presented.

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Session Classification: Detector: R&D for Present and Future Facilities

Track Classification: Detector: R&D for Present and Future Facilities