ICHEP 2022 BOLOGNA

ICHEP 2022 6
XLI 13 07 2022
International Conference
on High Energy Physics
Bologna (Italy)

Contribution ID: **944** Type: **Parallel Talk**

TORCH, a novel time of flight detector for LHCb upgrade II

Saturday, 9 July 2022 11:15 (15 minutes)

The plans for LHCb upgrade II in the HL LHC era include complementing the experiment's particle ID capabilities in the low momentum region up to 10-15 GeV with the novel TORCH time of flight detector. TORCH is designed to provide 15 ps timing resolution for charged particles, resulting in K/pi (p/K) particle identification up to 10 (15) GeV/c momentum over a 10 m flight path. Cherenkov photons, produced in a quartz plate of 10 mm thickness, are focused onto an array of micro-channel plate photomultipliers (MCP-PMTs) which measure the photon arrival times and spatial positions. We present the latest TORCH design for the LHCb upgrade II Framework Design Report, including a novel, computationally efficient TORCH pattern recognition algorithm, and the simulated particle ID performance in LHCb upgrade II high luminosity running conditions. As a proof of concept, a half-scale (660 x 1250 x 10 mm^3) TORCH demonstrator module, instrumented with customised MCP_PMTs, has been tested in a mixed proton-pion beam at the CERN PS. The MCP-PMTs with an active area of 53 x 53 mm^2 and a granularity of 64 x 8 pixels have been developed in collaboration with an industrial partner (Photek). We present a comprehensive analysis of the testbeam data, complemented by lab-based performance measurements of individual TORCH components. A fully instrumented TORCH prototype module is under construction.

In-person participation

No

Primary authors: Dr FREI, Christoph (CERN); Dr FLAVIA, Cicala (University of Warwick); Dr KREPS, Michal (University of Warwick); Dr CUSSANS, David (University of Bristol); PIEDIGROSSI, Didier (CERN); Dr GABRIEL, Emmy Pauline Maria (University of Edinburgh); MILNES, James (Photek Ltd); SMALLWOOD, Jennifer Clare (University of Oxford); RADEMACKER, Jonas; Dr VAN DIJK, Maarten (CERN); TAT, Martin (University of Oxford); Prof. HARNEW, Neville (University of Oxford); Prof. BROOK, Nicholas (University of Bath); Dr FORTY, Roger (CERN); Dr GAO, Rui (University of Oxford); TRILOV, Stoyan (University of Bristol); Dr GYS, Thierry (CERN); BAKE, Thomas (University of Warwick); CONNEELY, Thomas (Photek Ltd); Dr HANCOCK, Thomas Henry (University of Oxford); JONES, Thomas (University of Warwick); Prof. GERSHON, Timothy (University of Warwick)

Presenter: RADEMACKER, Jonas

Session Classification: Detectors for Future Facilities, R&D, novel techniques

Track Classification: Detectors for Future Facilities, R&D, novel techniques