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

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The Time Of internally Reflected CHerenkov detector (TORCH) is a proposed large-area time-of-flight detector, designed to enhance the particle identification performance of the Upgrade-II LHCb experiment in the 2–15 GeV/c momentum range. A TORCH module consists of a 10 mm thick quartz plate of dimensions 2.5 x 0.66 m^2 from which the positions and arrival times of Cherenkov photons from a charged track are detected by highly segmented MCP-PMTs. Each MCP-PMT has an active area of 53 x 53 mm^2 and a granularity of 64 x 8 pixels, and developed in collaboration with an industrial partner (Photek). A general overview of TORCH and its operating principles will be reviewed along with recent results from a half-length 1.25 m TORCH prototype module tested at the CERN proton synchrotron. In the most recent beam test in November 2022, the prototype module was instrumented with 6 MCP-PMTs compared to 2 MCP-PMTs in previous tests. The current status of the analysis of the latest data will be presented.

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