

Determining the photon yield for the LHCb RICH Upgrade photodetection system

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For the upgrade of the LHCb RICH detectors in 2020 the existing photon detection system will be replaced. This study investigates the photon yield of the Multi Anode PMTs (MaPMT), which have been proposed as the new photon detectors, together with the associated readout electronics. Data collected during the LHCb RICH Upgrade testbeam experiment in autumn of 2016 is used.

Four MaPMTs were exposed simultaneously to Cherenkov light generated in a solid radiator by a charged Pion beam of 180 GeV. The collected data was combined and matched with tracking information from the LHCb VeLo track telescope, which was also present in the same particle beam. The tracking information allows for track selection by the number of concurrently arriving charged particles and track direction.

A simulation of the testbeam set up was created using the Geant4 toolkit. Results obtained from reconstruction of the Monte-Carlo events are compared with those from the data taken during the testbeam. Comparing the number of detected photoelectrons for each incident charged particle in real data and simulation allows to determine the detection efficiency of the MaPMTs.

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