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Overview of LHCb-RICH upgrade

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The two RICH detectors in LHCb have successfully collected data corresponding to 3.3 /fb of integrated luminosity since 2010 and have been essential for most of the physics programme of LHCb. From 2021 onwards LHCb plans to collect data corresponding to 5 /fb of integrated luminosity per year in order to improve the statistical precision of the physics measurements and to search for very rare B-decays and D-decays. This will be achieved by removing the Level 0 hardware trigger running at 1 MHz and reading out the detectors at the full collision rate of 40 MHz.

In order to cope with the corresponding increase in the readout rate for the RICH detectors, the HPDs will be replaced by MaPMTs. The optics of the upstream RICH is modified so that the occupancy is reduced and the particle identification performance is improved. This requires rebuilding most parts of the upstream RICH where the arrays of MaPMTs and their readout would be installed in a tight space inside a magnetic shielding. New structures to hold MaPMTs and their readout boards will have to be designed. Following a technical design review in 2013, substantial advances in the mechanics have taken place and prototypes of MaPMTs and their readout electronics were tested. This includes testing these components in three test beams at CERN. A magnetic shielding system for the MaPMTs was designed and tested. Various readout components were tested for radiation hardness. New spherical mirrors made of carbon fibre composite are being developed and tested. An overview of these developments for RICH upgrade will be presented and the expected performance of the RICH system using LHCb simulations will be reported.

Registered

Yes

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