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The RICH detector of the LHCb experiment

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The LHCb experiment was fully operational during the Run 1 of the Large Hadron Collider in the period 2009-2013, collected more than 3 fb^{-1} of data and has produced many world first and world best measurements. The RICH system is an integral part of LHCb proving hadron identification in the momentum range of 2-100 GeV/c. The ability to separate pions and kaons in this wide momentum range is essential for the physics measurements of LHCb.

The LHCb RICH system consists of two RICH detectors with three different radiators. The optical systems are made from a total of 116 mirrors (four constructed out of low mass carbon fibre) and single photon detection is achieved by 484 Hybrid Photon Detectors (HPD). The RICH detectors have been aligned and calibrated using the LHCb data and their performance evaluated using pure particle samples collected without RICH information. The performance of the RICH detectors in a high multiplicity hadron environment is excellent.

The LHCb experiment is preparing for a significant upgrade during the Long Shutdown 2 of the LHC. There are advanced plans to modify the existing layout in order to conserve the current particle identification performance despite the increase in luminosity by a factor five.

The alignment, calibration and performance of the LHCb RICH system will be presented, together with a few example analyses showing the contribution of the RICH. The plans for the LHCb RICH upgrade will also be presented.

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