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Hybrid Photon Detectors for the LHCb RICH: performance and operational experience

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Pion/kaon discrimination in the LHCb experiment will be provided by two Ring Imaging Cherenkov (RICH) counters. These use arrays of 484 Hybrid Photon Detectors (HPDs) to detect the Cherenkov photons emitted by charged particles traversing the RICH. The HPD consists of a vacuum tube with a multi-alkali S20 photocathode deposited on the inside surface of a quartz entrance window, with the photoelectrons accelerated by a 20 kV voltage onto an anode consisting of an 8192 channel pixel silicon sensor. This paper will describe the results from comprehensive quality assurance tests on the 550 HPDs manufactured for LHCb. Furthermore, two extended measurements carried out on a sample of tubes will be described. One measurement determines the efficiency of the HPD pixel chip by measuring the summed analogue response from the backplane of the silicon sensor, and the other determines the quantum efficiency of the photocathode. Finally the operational experience gained during the installation and commissioning of the HPDs in the RICHs, and the current status there of the HPDs, will be detailed.

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