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The LHCb RICH Detectors

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The LHCb experiment has been optimized for high precision studies of CP violation and other rare decay phenomena in B-meson decays at the CERN LHC. Particle Identification (PID) in the momentum range from a few to ~ 100 GeV/c is essential. Hadrons in this momentum range are identified by means of two Ring Imaging Cherenkov (RICH) detectors using Silica Aerogel, C₄F₁₀ and CF₄ gas radiators. The RICH detectors will use Hybrid Photon Detectors (HPDs) to measure the position of Cherenkov photons over the wavelength range 200-600 nm. The HPDs have an 83 mm diameter quartz entrance window. Electrostatic focusing images the photocathode onto a pixelated anode sensor, bump-bonded to a read-out chip that is encapsulated in the tube vacuum. The anode has 1024 pixels providing 2.5 mm \times 2.5 mm granularity at the photocathode and the addresses of hit pixels are read out at the LHC bunch crossing rate of 40 MHz. A total of 484 HPDs cover an area of ~ 2.6 m² with $\sim 70\%$ active area coverage. In this talk we describe the RICH detectors, the performance of the HPDs in laboratory measurements and tests using charged particle beams, and the calibration that the HPDs will require when operating in the LHCb detector. The status of the LHCb RICH detector construction and commissioning will be presented.

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