

Hybrid Photon Detectors for the LHCb RICH Counters

Andrew Pickford* (for the LHCb RICH Collaboration)

*University of Glasgow

The LHCb experiment will use a novel type of photon detector, the Hybrid Photon Detector (HPD), for the Ring Imaging Cherenkov (RICH) counters. Photo-electrons are produced in a semi-transparent multi-alkali photo-cathode and accelerated by a 20 kV potential onto an anode consisting of a silicon pixel sensor. The anode is bump-bonded to a pixel chip, which amplifies and digitizes the photo-electron signals at the LHC speed of 40 MHz. In close collaboration with industry, mass production has recently started of a total of 484 HPDs required for the two LHCb RICH detectors. Measurements of important HPD parameters will be presented: the supply currents at the working point, threshold scans and maps of the pixel chip, the depletion voltage of the silicon anode and the signal rate versus the applied high voltage. The demagnification of the electron optics, the photo-cathode image of the HPDs and the image distortions due to magnetic fields have been measured using dedicated laboratory test facilities. The HPD performance has also been studied in particle beams using Cherenkov light. Finally, stability studies of quantum efficiency, dark count and ion feed-back rates and accelerated ageing tests are reported.