The HERA–B Ring Imaging Čerenkov Detector — design, expected performance, and status

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Abstract

The RICH system of the fixed target experiment HERA-B, which recently was completed at the DESY 820 GeV proton storage ring HERA, is one of the most advanced Čerenkov ring imaging detectors. It consists of a 100 m^3 gaseous C_4F_{10} radiator, two tilted spherical mirrors with an area of 24 m^2 and planar mirrors to move the two focal plane halves out of the particle flux. A total of 2.9 m^2 of photon detection area is mapped by 2240 two-lens telescopes onto an array of 2240 Hamamatsu R5900 multi-anode photomultipliers. The system contains about 27,000 pixels, 9$\times$9 mm^2 (89%) and 18$\times$18 mm^2 (11%) in size. We expect for a 2.75 m long radiator and $\beta = 1$ particles 34 $\pm$2 detected photons per ring. This will allow pion/kaon separation in the momentum range $5 < p < 80$ GeV/c and will be vital for B tagging via the charge of high momentum kaons.

The design challenges and their innovative solutions, the expected performance derived from prototype measurements and the current status of the assembly will be presented.