

The CBM RICH project

The Compressed Baryonic Matter (CBM) experiment at the future Facility for Antiproton and Ion research (FAIR) in Darmstadt will investigate the QCD phase diagram in the region of highest net-baryon density in fixed target heavy ion collisions up to ~ 10 AGeV beam energy, starting in 2022. In its electron configuration the CBM detector concept includes a large Ring Imaging Cherenkov detector (RICH) which will provide access to rare di-electron probes.

This RICH is based on a CO₂ gas radiator (pion threshold 4.65 GeV/c) in combination with a 13m² segmented spherical focussing mirror. Hamamatsu H12700 Multianode Photomultipliers were recently selected as sensor type for the Cherenkov photon detection, following an extensive sensor R&D program. This program also covered detailed radiation hardness tests using neutrons (nuclear reactor) and high energetic gammas (Co60) at different irradiation facilities.

A highly integrated FPGA-TDC based readout chain for the PMTs is currently under development.

The detector concept was approved by building a laterally scaled prototype detector, reflecting the final design in all major dimensions and characteristics. Several test beams at CERN PS helped to provide valuable information on the photon statistics, the ring resolution, and the general performance and operation of the full system.

We report on the design and status of the RICH development, show results of the prototype beam tests, and present results of the photon sensor R&D.

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Track Classification: Gaseous Detectors