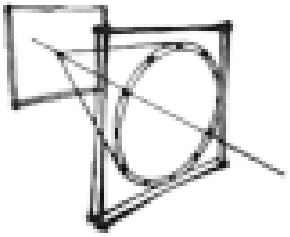

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The RICH detector of the CBM experiment

Monday 5 September 2016 16:20 (25 minutes)

CBM is a future heavy-ion experiment at the FAIR facility. It will explore the intermediate region of the QCD phase diagram with beam energies of up to 11 AGeV for the heaviest nucleus at SIS100. In CBM electrons with momenta of up to 8 GeV/c will be mainly identified with a RICH detector. It consists of a CO2 gaseous radiator, a spherical mirror system, and Multianode Photomultiplier Tubes (PMT) as photon detectors. The RICH concept and results of extensive R&D studies on its components were summarized in a TDR that was accepted by FAIR in Feb. 2014. Major open issues were defined in the TDR concerning the radiation hardness of the PMTs, shielding of a magnetic stray field in the PMT region, and the mirror holding structure. One major milestone achieved since then was the ordering of 1100 PMTs of type H12700 from Hamamatsu.

The sensor will be operated in a radiation high environment, thus its radiation hardness was tested in detail with thermal neutrons from a TRIGA reactor and gammas from a 60Co source. All components survive more than 20 years of CBM operation without major loss of performance. The PMTs are located close to the yokes of the CBM dipole magnet, where a stray field of up to 100 mT exists. To escape the field influence, the PMTs have been displaced outwards and a shielding box has been designed. This change of the RICH layout called for re-optimization of the primarily adapted detector geometry to assure minimal impact on the ring quality. With this change the close-to-final RICH geometry has been achieved. A mechanical design has been worked out which improves considerably the material budget of the mirror wall compared to earlier solutions while still keeping sufficient mechanical stability. A concept for correction for mirror misalignment is under development.
In this contribution an overview on the CBM RICH design with focus on the new developments described above will be given.

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