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Status of the CBM RICH detector project at FAIR *

The Compressed Baryonic Matter experiment (CBM) is a main scientific pillar of FAIR, the Facility for Antiproton and Ion Research, currently being constructed in Darmstadt, Germany. CBM will study the phase diagram of baryonic matter in regions of moderate temperature and large baryonic chemical potential, reaching net baryon densities several times larger than ordinary nuclear matter. Some primary objectives of the experiment are the experimental validation of a 1st order phase transition and the search for signs of possible chiral symmetry restoration.

Dileptons are one key observable for the CBM physics program, giving access to the early, high density phase of the evolution of the fireball created in heavy ion collisions with centre of mass energies $\sqrt{S_{NN}}$ ranging from 2.9 GeV to 4.9 GeV.

A large focusing ring imaging Cherenkov detector (RICH) is part of the CBM day-1 detector setup for efficient identification of electrons and suppression of pion background up to 6-8 GeV/c momentum range. The RICH will be using a CO₂ gas radiator (pion threshold 4.65 GeV/c) and a 13 m² segmented spherical mirror. Hamamatsu H12700 multianode photomultipliers will be used for Cherenkov photon detection in combination with the newly developed FPGA-TDC based DIRICH readout chain, which aims for exceptional timing precision limited only by a transient time spread of 350 ps of the MAPMTs.

The mechanical design of the detector is currently being finalized and construction of several key detector components has already started. The two photon cameras have been assembled and are currently being tested in conjunction with the closed-loop air cooling system. A large prototype of the mirror system has been built, and major parts of the readout electronic components were produced already. The fully free streaming readout has been successfully demonstrated in the miniCBM campaigns at GSI. All 1100 MAPMTs were individually characterized, providing the largest database of series measurements for this type of MAPMT.

In the presentation we give an overview along with the status of the CBM RICH detector project.

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Category

Experiment

Collaboration (if applicable)

CBM RICH collaboration

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