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Status of the CBM RICH detector towards first beam in 2028

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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.

Dileptons are an important part of the CBM physics program, giving access to the early, high density phase of the evolution of the fireball created by heavy ion collisions.

The CBM RICH detector is a key CBM subdetector for providing efficient electron identification and suppression of pion background up to 6-8 GeV/c momentum range.
The RICH will be using a CO_2 gas radiator (pion threshold 4.65~GeV/c) and a 13m^2 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.

With first beam for CBM being expected for 2028, and CBM RICH being part of the CBM day-1 detector setup, the RICH project has now fully shifted from the design- towards construction phase.
Major components, like the two photon cameras, or large parts (60\%) of the frontend readout electronic modules have been already built.

Cooling of the readout electronics inside the camera volumes, enclosed by magnetic shielding boxes, will be achieved using a unique closed-loop air-cooling approach. In this concept, the cooling air and heat flow is channeled away from the sensitive photon sensors, using CNC-milled aluminum parts for air distribution.
A prototype of the cooling system (including a large air/water heat exchanger and blower system) has been put into operation, and temperature measurements operating a fully equipped camera module are currently being carried out.

The free streaming readout concept of CBM - and CBM RICH in particular - has been successfully demonstrated in the mRICH detector, a small-scale aerogel proximity-focusing RICH detector using the same PMT and electronic DIRICH readout as the CBM RICH, routinely operated during several mCBM beam campaigns over the last years.

In the presentation we intend to present the latest status of constructing the CBM RICH detector, and report on results of the ongoing prototype tests, in particular of the RICH cooling system.\\

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