

Towards the construction of the inner zone for the CBM-TOF wall

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Abstract.

The Compressed Baryonic Matter (CBM) experiment, one of the four major scientific pillars of Facility for Antiproton and Ion Research (FAIR) in Darmstadt, is aiming to investigate the QCD phase diagram at large baryon densities. The Time-of-Flight (TOF) system is one of the core detectors of the CBM experiment dedicated to the identification of all charged hadrons produced in beam-target interaction to a polar angle from 2.5° to 25° . The CBM-TOF system covers about 120 m^2 and comprises about 120000 channels. The targeted system time resolution is 80 ps and an efficiency above 95% at a particle flux up to 30 kHz/cm^2 in the region of low polar angles.

Our R&D activity has been focused on the development of a Multi-Strip Multi-Gap Resistive Plate Counter (MSMGRPC) prototype for the most demanding region of the CBM-TOF wall which is the innermost zone of about 14 m^2 , ranging from 2.5° to 11° . The results obtained with the developed prototypes in heavy ions in-beam tests demonstrated the detector performance in conditions of exposure of the whole active area of the chamber to high flux and high multiplicity reaction products. An optimized design of the MSMGRPC prototype which fulfills simultaneously two main requirements for strip readout multi-gap RPCs, the granularity and the impedance matching to the front-end electronics, was performed. Results obtained with the latest developed prototypes in the cosmic-rays in-house test and in heavy ion in-beam tests performed in a real free streaming mode operation of the readout system (SPS - CERN and SIS18 - GSI Darmstadt, FAIR phase 0 program) will be presented.

A modular structure based on units called modules fit the uniform coverage of the active area of small polar angle region of TOF subsystem, with a total of 450 counters and about 30000 readout channels. Some details on the local infrastructure and expertise committed for the assembling of the counters, modules and their tests for the CBM-TOF inner zone will be discussed.

References

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