

Large acceptance high rate GEM detectors for muon tracking in heavy ion collisions of CBM experiment at FAIR

The Compressed Baryonic Matter (CBM) experiment at the upcoming FAIR facility will explore the phase diagram of hadronic matter in the region of highest baryon densities with various rare probes including light vector mesons and charmonium decaying into di-muon pairs. Unprecedented interaction rates of 10 MHz Au+Au collisions in an energy range (upto 11 AGeV) is a unique feature in CBM. The Muon Chamber (MUCH) system of CBM will perform the task of dimuon detection. The novel layout of MUCH comprising of alternating absorber and detector stations will be discussed. Harsh radiation environment and high particle rates (upto 400 kHz/cm²) impose severe constraints on the detector design for the first few stations, where large triple GEM modules covering 2 π acceptance will be implemented. Readout plane is segmented into pads of progressively increasing sizes (3-17mm). The readout coupled to self-triggered electronics, is another unique feature in CBM. Such real size prototypes (~2000 sq. cm.) have been built and tested. These prototypes were tested with Pb+Pb collisions at CERN SPS for the first time in a free-streaming mode. The challenging task of event and track-reconstruction based on time-stamps of the detector hits has been performed. All these along with the details of the detector design, data acquisition, intricate mechanical integration issues in CBM, radiation issues, cooling-schematic and production readiness will be presented and discussed.

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