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Performance study of CBM Muon Chamber detectors at the mCBM setup of SIS18 with Pb+Au collisions at 1.06 AGeV

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The CBM experiment at FAIR aims to explore the QCD phase diagram at high net baryon density and moderate temperature by colliding heavy nuclei in the energy range 4-12 AGeV. The Muon Chamber (MuCh) detector at CBM is dedicatedly designed to detect muon pairs originating at different phases in the evolution of the fireball produced in nuclear collisions. MuCh consists of several absorber pieces and detector chambers (called stations), where chambers are placed in between the absorbers to facilitate momentum dependent track identification in high particle density environment upto an interaction rate ~ 10 MHz. Gas Electron Multiplier detector are used in first two stations of MuCh. Two prototype real size GEM detectors have been tested in mCBM (mini CBM) experiment at SIS18. This mCBM is a part of FAIR phase-0 program where a pre series production of CBM detector systems have been tested with their triggerless streaming readout chain under high particle density environment.

In mCBM campaign 2020 data for mMuCh along with other sub detectors have been collected for Pb+Au collisions at 1.06 AGeV upto beam intensity of $10^8/3s$ spill and with different Au target thicknesses. In this work, we will present the performance of mMuCh in terms of linearity of mMuCh with beam intensity and its time and spatial correlations with other sub detectors. Employing a time based event reconstruction technique we have also studied the mMuCh performance in terms of degree of spatial correlations by constructing residual distributions between reconstructed mMuCh hit and projected mTOF tracks at the mMuCh plane.

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