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Performance and Design of the Transition Radiation Detector for the CBM Experiment

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The Compressed Baryonic Matter (CBM) experiment will be installed at the SIS100 accelerator at FAIR and is currently in construction. It is devoted to precision measurements of QCD matter at high net-baryon densities. With heavy-ion interaction rates up to 10 MHz, rare probes like, e.g., multi-strange hyperons will be accessible. In-medium mass distributions of vector mesons can be measured via lepton pairs and excitation functions of various observables will serve as sensitive probes for phase transitions. This talk reports on the Transition Radiation Detector (TRD) of CBM. Multi-Wire Proportional Chambers (MWPCs) for this detector are challenged to record the mentioned unprecedented heavy-ion interaction rates, which will result in particle rates at the TRD plane up to 120 kHz cm^{-2}: the MWPCs will therefore be built in a fast design with signal collection times below 300 ns and nevertheless deliver an excellent pion suppression.

The physics case, the detector concept and its PID as well as tracking performance will be presented. The TRD will, for instance, be essential for the identification of hypernuclei and the measurement of intermediate mass dielectrons. The latest evolution of the fully self-triggered and free-streaming read-out chain will be shown. In 2017, testbeam measurements have been performed in DESY II electron beam and in the high-rate environment of the Gamma Irradiation Facility (GIF^{++}) at CERN. Results from these tests will be presented and their implications discussed.

Content type

Experiment

Collaboration

CBM

Centralised submission by Collaboration

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