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Test and development of the front-end electronics for the Silicon Tracking System of the CBM experiment

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The Compressed Baryonic Matter (CBM) Experiment at the FAIR facility will explore the QCD phase diagram at very high baryon densities, where a first order phase transition from hadronic to partonic matter as well as a chiral phase transition is expected to occur. The design goal of CBM is to cope with very high interaction rates up to 10 MHz. This will allow performing high precision measurements of extremely rare probes. To achieve the high rate capability, CBM will be equipped with fast and radiation hard detectors employing free-streaming readout electronics. The Silicon Tracking System (STS), is the essential component for tracking up to 1000 particles per event in A+A collision. Having 2.1 million readout channels, it poses the most demanding requirements in terms of bandwidth and density of all CBM detectors. The custom developed front-end device for reading out the double-sided silicon sensors is the STS-XYTER ASIC. This is a low power, self-triggering ASIC with 128 channels, which provides timing and energy information for each sensor signal. In addition, the ASIC implements a new readout protocol, developed for operation with the GBTx data aggregation ASIC. To ensure its satisfactory operation, it demands low noise levels as the system is self-triggering; it needs to be fully integrated into a very confined space and it must have a reliable performance in a highly irradiated environment and strong magnetic field. Various tests are carried out to check the ASIC functionalities, its performance in different data taking scenarios, system integration as well as radiation hardness. An overview of the experimental setup, device testing procedures and results will be presented.

Content type

Experiment

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