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The powering concept of the CBM Silicon Tracking System

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The presentation summarizes the powering concept of the Silicon Tracking System for the future CBM experiment at FAIR/Germany. Efficient powering is an important task with the goal to minimize power dissipation and heat development. Also the limited space for power cable routing has to be taken into account. Chosen solutions determine the necessary cooling and cabling effort and therefore have high impact to system integration. Some aspects are already completely solved while other issues have to be further investigated. The current status concerning powering the STS electronics and the subsequent consequences for system integration will be shown.

Summary

The Silicon Tracking System (STS) detector, which is the main part of the CBM experiment at FAIR/GSI Germany, comprises 9 units that make up 8 detector planes of 900 double sided 300um thick silicon detectors.
The units of the STS will be installed in a thermal enclosure inside a strong magnetic field of 1 T together with the front-end part of the readout electronics and a part of the powering system. Each STS-unit consists of two halves which will be moved independently of each other and supplied with low voltage, sensor biasing high voltage, optical fiber for the readout, cooling medium tubing, controls etc. The base structure of one half-unit is a C-shaped aluminium cooling plate which serves as mechanical support for components like cooling shelves and detector holding ladders. The low-voltage conditioning system as well as the readout electronics will consume many kilowatt of electric energy in a volume of very few cubic meters. This circumstances force the team of developers to optimise energy consumption of electronics on one hand and cooling efficiency on the other. The requirement of the construction foresee separate low voltage powering for readout of each side of every detector, thus the space restrictions inside the thermal enclosure as well as surface available only on the front wall of the box for mounting are critical. According to the simulations the components will absorb a dose of 10 kGy in their life time what poses certain requirements on all system components. Last but not least: assumed mechanical accuracy for the Silicon Tracking System imposes construction solutions which assure mechanical precision and will stand thermal cycling for years of usage.
The overall concept as well as electrical and mechanical details of the system will be discussed.

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