

The Silicon Tracking System of the CBM experiment at FAIR

Summary

The Silicon Tracking System (STS) is the central component of the Compressed Baryonic Matter (CBM) experiment at FAIR. The CBM physics program aims at exploring the properties of matter under extreme conditions, in particular at highest nuclear matter densities with possible signs for a phase transition from normal matter to quark-gluon plasma.

The purpose of STS is the measurement of the trajectories and momenta of the charged particles produced from the interaction of heavy-ion beams with nuclear targets. The STS is located in the superconducting dipole magnet and extends from 30 to 100 cm downstream of the target

The STS system must be able to operate at interaction rates up to 10 MHz, achieving 95% efficiency of track reconstruction and momentum resolution with a precision of about $\Delta p/p=1\%$. These requirements can be satisfied with a tracking system of 8 layers of 300 μm thick silicon microstrip sensors. The sensors are designed to be double-sided with a stereo angle of 7.5° and a strip pitch of 58 μm . The self-triggering read-out electronics will be located at the periphery of the tracking stations to achieve a low material budget in the physics aperture. The building block of the STS is therefore a detector module composed of a fine-pitch microstrip sensor, ultra-thin signal transmission cables up to half a meter long, and front-end electronics boards. About 1200 sensors are to be mounted onto 106 low-mass mechanical support structures.

The tracker system is operated in a thermal enclosure that allows operating the sensors at about -5°C , thus reducing dark currents due to radiation damage.

The status of the prototype development and tests is addressed in this poster, also system integration issues are considered. The STS detector is developed in cooperation of institutes from Germany, Poland, Russia and Ukraine. It is planned to be constructed and ready for installation into the CBM experiment by the year 2020.

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