Contribution ID: **401** Type: **Oral**

The Silicon Tracking System of the CBM experiment at FAIR: detector development and system integration

Wednesday, 4 June 2014 18:00 (20 minutes)

The CBM experiment at the future Facility for Antiproton and Ion Research (FAIR) will explore the properties of nuclear matter at high net baryon densities and at moderate temperature. The key detector –a Silicon Tracking System (STS) –will reconstruct charged particle tracks created in interactions of heavy-ion beam with nuclear target at projectile energies ranging from 10 to 40 GeV/nucleon. Operation at 10 MHz interaction rate with charged particle multiplicities up to 1000 requires fast and radiation hard silicon sensors. The necessary momentum resolution of 1% imposes stringent requirements to the sensor material budget (0.3% X_0) and detector module structure.

The STS will occupy volume of about 1 m^3 defined by the aperture of a dipole magnet. It will consist of 8 tracking stations based on double-sided silicon microstrip detectors. The sensors with 58 μm pitch, size up to 62×62 mm^2 and 1024 strips per side have AC-coupled strips oriented at $\pm 7.5^{\circ}$ stereo angle. Short corner strips on the opposite edges of the sensors are interconnected via second metallization layer thus avoiding insensitive areas.

Complicated design and the large number of silicon sensors needed for the construction of the STS (about 1300) require a set of quality assurance procedures that involve optical inspection, electric characterization and readout tests. We report about the development of an optical inspection system using NI LabVIEW software and Vision package for pattern recognition.

The STS readout electronics with 2.1 million channels will dissipate about 40 kW of power. To cope with it, bi-phase CO_2 evaporative cooling will be used. Performance of a test system will be presented, in particular the cooling efficiency of a custom-made heat exchanger for the front-end electronics.

Primary author: Dr LYMANETS, Anton (University of Tuebingen)

Co-authors: Mr LAVRIK, Evgeny (University of Tuebingen); Prof. SCHMIDT, Hans Rudolf (University of Tuebingen)

Presenter: Dr LYMANETS, Anton (University of Tuebingen)

Session Classification: IV.abc Cooling & MEMS & 3D

Track Classification: Emerging technologies: 4a) Cooling and cryogenics