HK 44: Instrumentation XII

Time: Wednesday 17:30–19:00 Location: SCH/A251

Group Report HK 44.1 Wed 17:30 SCH/A251

Status of the CBM Silicon Tracking System — •Marcel Bajdel for the CBM-Collaboration — Goethe-Universität Frankfurt am Main — GSI Helmholtz Centre for Heavy Ion Research

The Compressed Baryonic Matter (CBM) is one of the core experiments at the future Facility for Anti-proton and Ion Research (FAIR), Darmstadt, Germany. The Silicon Tracking System (STS) is a central detector system of CBM, placed inside a 1 Tm magnet and with an operation temperature of about -10 $^{\circ}C$ to keep low radiation-induced bulk current in the 300 μm double sided microstrip silicon sensors.

The STS comprises eight tracking stations with 876 modules. Each module is calibrated and tested in order to access its performance. Next steps involve mounting the module on a carbon ladder, and subsequently these objects are arranged horizontally on so-called C-frames.

The purpose of this contribution is to give an overview of the recent progress towards the STS detector. The first major milestone is the operation of the readout chain and detector control system of the miniaturized version of STS, which features 11 detector modules. The second accomplishment features the commissioning efforts of the thermal demonstrator which serves to validate the concept for crucial services of the STS (cooling, air drying, ambient conditions measurements). Lastly, the preproduction of the detector modules has started, and the first results collected.

HK 44.2 Wed 18:00 SCH/A251

Quantifying the Dual-Sided Silicon Strip Detectors at R3B — •Andrea Jedele[1,2], Dominic Rossi[1,2], and Thomas Aumann[1,2] for the R3B-Collaboration — [1]TU-Darmstadt, Darmstadt, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany

Dual-sided silicon strip detectors allow for accurate position and charge determination of in-beam fragments for heavy-ion collisions with minimal spatial restraints. The X5 Micron silicon detectors have been used in the R3B set-up at GSI. Improvements have been implemented to the hardware of the detector and a new calibration method has been developed and tested for beams of primary and secondary Sn isotope experiments.

Supported in part by BMBF (05P21RDFN2), Helmholtz Forschungsakademie Hessen für FAIR and GSI-TU Darmstadt cooperation agreement

HK 44.3 Wed 18:15 SCH/A251

HI-TREX: Compact, high resolution particle detection system for ISOLDE — Roman Gernhäuser, •Sergei Golenev, and Robert Neagu for the MINIBALL-Collaboration — Technische Universität München, Germany

HI-TREX is a particle detection setup, developed for the HIE-ISOLDE facility at CERN, optimized for transfer reactions using radioactive ion beams. HI-TREX is based on a very thin double-sided silicon strip detector (DSSSD), high-resolution front-end electronics based on SKIROC ASICs, and a newly developed, custom made, FPGA based GEneric Asic Readout board GEAR for the TRB data acquisition system.

A full system test with an array of four detectors in a two arm geometry was performed at the Bronowice Cyclotron Center in Krakow using proton beams with energies ranging from 80 to 200 MeV.

With ancillary CsI(Tl) scintillation detectors behind the setup and a plastic fiber target a full 4-momentum reconstruction of the 12C(p,2p) reactions is performed. We will present first results on calibrations, the energy resolution and the event correlations to determine absolute efficiencies of the new detector elements.

(supported by BMBF 05P21WOCI1)

HK 44.4 Wed 18:30 SCH/A251

A new concept for the geometry of the Silicon Tracking System in the CBM Experiment — •Mehulkumar Shiroya — GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

The Compressed Baryonic Matter experiment is a fixed target experiment planned to be built at the Future Facility of Anti-Proton and Ion Research at the GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany. The Silicon Tracking System is the main detector for tracking and momentum determination of the CBM experiment. It is designed to measure up to 700 charged particles produced in nucleus-nucleus collisions up to an interaction rate of 10 MHz, and achieve a momentum resolution in 1 Tm dipole magnetic field better than 2%. It uses double-sided micro-strips silicon sensors with a thickness of 320 $\pm$ 15 μm arranged in 8 tracking stations. Since the CBM magnet cannot be realized as previously planned, the originally intended monolithic design which minimizes the detector dimensions can be replaced by a modular structure independently assembled, called STS-3 & STS-5, and a full separation of services (low/high voltage, front-end, cooling, etc). A ROOT based geometrical model for the new conceptual design of the STS, including a detailed description of the passive material, has been implemented. The performance for track reconstruction and momentum determination has been studied in comparison with the old design with Au+Au simulations at different colliding energies. Further detailed information will be presented during the conference.

HK 44.5 Wed 18:45 SCH/A251

Light-weight but dense: mechanics and integration of Silicon Tracking System of the CBM experiment — •Maksym Teklishyn[1,2] and Oleg Vasylyev[1] for the CBM-Collaboration — [1]GSI Helmholtzzentrum für Schwerionenforschung — [2]Kyiv Institute for Nuclear Research

Silicon Tracking System (STS) is a core tracking detector of the future heavy-ion CBM experiment at FAIR. Requirements to cope with unprecedentedly high beam-target interaction rate (up to 10 MHz), multiple low-momentum reaction products (up to 700 charge particles per central collision) challenge the detector technologies.

STS features fast light-weight detector modules of various form factors. They are made of the 300 μm thick 2×1024 channel double-sided double-metal silicon sensors connected to the dedicated read-out electronics by 32 thin aluminium-polyimide micro-cables of up to 500 mm length. The STS assembly features highly integrated unique components. The basic blocks of STS are 876 detector modules in 199 unique configurations. They are arranged on the light-weight carbon-fibre mechanical support structures forming ladders of 8 or 10 modules each. There are 106 ladders in 38 ladder types; they form 8 tracking layers on 18 aluminium supports. They also accommodate powering and back-end read-out electronics, and liquid cooling.

Recently, STS team altered the detector mechanical design: STS may be split in upstream and downstream parts with 3 and 5 tracking layers, respectively. This introduces flexibility for running scenarios ($2 - 11\,A$GeV for Au ions) and facilitates upgrade.