HK 41: Instrumentation XI

Time: Wednesday 15:45–17:15 Location: HBR 19: C 5a

Group Report HK 41.1 Wed 15:45 HBR 19: C 5a

With mCBM towards the CBM experiment at FAIR — •Christian Sturm for the CBM-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH

The Compressed Baryonic Matter experiment (CBM) at FAIR is designed to measure nucleus-nucleus collisions at unprecedented interaction rates of up to 10 MHz which will allow study of extremely rare probes with high precision. To achieve this high rate capability, CBM will be equipped with fast and radiation-tolerant detector systems, readout by a free-streaming data acquisition system, transporting data with a bandwidth of up to 1 TB/s to a large scale computer farm for event reconstruction and first level event selection. The mCBM experiment, a CBM demonstrator and full-system test-setup was constructed 2017/18 at the SIS18 facility of GSI/FAIR, taking data within the FAIR Phase-0 program since 2019, to commission and optimize the complete CBM data chain under realistic experiment conditions. mCBM comprises prototypes and pre-series productions of all CBM detector systems with their read-out electronics, transporting synchronized data streams into the Green IT Cube of GSI/FAIR. To further validate CBM's read-out and data processing concept, the production yield of rare Λ baryons is studied in nucleus-nucleus collisions serving as a benchmark observable, which will allow comparison with published data. Hence, latest results on Λ reconstruction as well as performance studies of the detector systems will be presented. Furthermore, detector upgrades and a first online system prototype for the upcoming 2024 beam campaign will be introduced.

Group Report HK 41.2 Wed 16:15 HBR 19: C 5a

Status of the CBM Time-of-Flight system — •Ingo Deppner and Norbert Herrmann for the CBM-Collaboration — Physikalisches Institut, Uni. Heidelberg

In order to provide an excellent particle identification (PID) of charged hadrons at the future high-rate Compressed Baryonic Matter (CBM) experiment the CBM-TOF group has developed a concept of a 120 m^2 large Time-of-Flight (ToF) wall with a system time resolution below 80 ps based on Multi-gap Resistive Plate Chambers (MRPC). The MRPC detectors were extensively tested in several beam campaigns at particle Fluxes of up to a 30 kHz/cm^2 and reached by now the close to final design. Prior to its destined operation at the Facility for Antiproton and Ion Research (FAIR), a pre-production series of MRPCs is being used for physics research at two scientific pillars of the FAIR Phase0 program. At STAR, the Fixed-target program of the Beam Energy Scan II (BES-II) relies on 108 CBM MRPC detectors enabling forward PID for center of mass energies in the range of 3 to 7.7 AGeV Au+Au collisions. At mCBM, high-performance benchmark runs of Λ production at top SIS18 energies (1.5/1.9 AGeV for Au/Ni beams) and CBM design interaction rates of 10 MHz became feasible. Apart from the physics perspectives, these FAIR Phase-0 involvements allowed for high rate detector tests and long term stability tests. Observations and conclusions for the upcoming mass production will be discussed. The project is partially funded by BMBF contract 05P21VHFC1.

HK 41.3 Wed 16:45 HBR 19: C 5a

PANDA — •Thorsten Erlen, Kai-Thomas Brinkmann, and Hans-Georg Zaunick for the PANDA-Collaboration — II.Physikalisches Institut Justus Liebig Universität, Giessen, Deutschland

The Electromagnetic Calorimeter (EMC) of the future PANDA-Experiment at the FAIR complex in Darmstadt will use 2nd generation lead tungstate scintillator crystals (PWO II) to convert energy into a proportional amount of light in the visible spectrum. Two Large Area Avalanche Photo Diodes (LAAPD) per crystal are used to measure the amount of light created. Main characteristics of both the scintillator and the photosensors are temperature dependent. With decreasing temperature the light yield (photons per MeV) of the scintillators increases and the noise of the photosensors is reduced, while their gain-factor at a fixed voltage also increases. The nominal operating temperature for the EMC is -25 degree celsius to meet the desired properties and allow the EMC to perform according to the needs of the experiment. Energy resolution and threshold depend on a system that is capable of achieving and maintaining stable crystal and photosensor temperatures. Topic of this talk will be the results of test measurements with the first-in-its-kind slice (one of sixteen) for the barrel part of the calorimeter, using the latest (pre)production versions of the cooling, monitoring and front end electronic systems. Cooling and monitoring system design solutions will be presented in more detail.

Supported by BMBF

HK 41.4 Wed 17:00 HBR 19: C 5a

Intermediate results from the series calibration of the Front-end Electronics of the barrel part of the PANDA EMC* — •Christopher Hahn[1,2], Kai-Thomas Brinkmann[1,2], and Hans-Georg Zaunick[1,2] for the PANDA-Collaboration — [1]Justus Liebig Universität, Giessen, Deutschland — [2]II. Physikalisches Institut, Giessen, Deutschland

The Electromagnetic Calorimeter (EMC) inside a 2T solenoid will be the main component of the upcoming PANDA experiment at the future FAIR complex in Darmstadt. Due to the targeted energy resolution, timing and spatial constraints, individual high-voltage adjustments for the Large Area Avalanche Photodiodes (LAAPDs) and specifically tailored settings and architectures have to be chosen. In order to achieve optimal performance, a thorough understanding of the customized electronics as well as its behavior is crucial. Among others, the individual bias voltage adjustment of the photodiodes needs to be known with high accuracy. Simultaneously, space constraints limit the cable routing and connections, such as for the LAAPD bias voltage and control signals. The setup for the calibration of the high-voltage distribution and the test algorithm for the front-end electronics will be described. Furthermore, the intermediate results of the functionality tests and pre-calibration of the first 198 high-voltage distribution PCBs will be presented. *supported by BMBF, GSI und HFHF.