HK 29: Instrumentation VIII

Time: Tuesday 17:30–19:00 Location: HBR 19: C 5a

Group Report HK 29.1 Tue 17:30 HBR 19: C 5a

Further development of the planar GEM detectors for AMBER — •Jan Paschek[1], Karl Flöthner[1,3], Dimitri Schaab[1], Michael Lupberger[1,2], Igor Konorov[4], Pascal Henkel[1], Paul Clemens[1], and Bernhard Ketzer[1] — [1]Universität Bonn, Helmholtz-Institut für Strahlen- und Kernphysik, Bonn, Germany — [2]Universität Bonn, Physikalisches Institut, Bonn, Germany — [3]GDD, CERN, Geneva, Switzerland — [4]Technische Universität München, Physik-Department, Garching, Germany

AMBER is a new experiment at CERN's SPS studying fundamental questions of hadron physics using high-energy muon, pion, kaon and proton beams. It successfully concluded its first physics beam time in 2023, yielding valuable input for dark matter searches by measuring the production cross section of antiprotons impinging on helium. This study will be extended in 2024. In 2025, a first measurement of the proton electric form factor is scheduled, using elastic muon-proton scattering. New large-size planar GEM detectors are essential for the tracking of particles with small scattering angles. While for the antiproton production measurements, the new detectors will be operated with triggered readout electronics (APV25), the measurement of the proton form factor requires the application of a self-triggering chip (VMM3a). Extensive tests were performed on the noise performance with both readout variants. A full prototype detector read out by 48 VMM3a chips was tested in a pilot run in 2023. Also other new features of the new detectors are being studied. This presentation aims to provide a comprehensive overview of AMBER's new GEM detectors.

HK 29.2 Tue 18:00 HBR 19: C 5a

Characterization of a prototype GEM detector with VMM3a readout at AMBER — •Pascal Henkel[1], Michael Lupberger[1], Martin Hoffmann[1], Karl Jonathan Flöthner[1,3], Virginia Klapper[1], Jan Glowacz[2], and Bernhard Ketzer[1] — [1]Helmholtz-Institut für Strahlen- und Kernphysik der Universität Bonn, Germany — [2]Physikalisches Institut der Universität Bonn, Germany — [3]CERN, Geneva, Switzerland

The AMBER experiment is a new fixed-target experiment at CERN's M2-beamline which started data taking in 2023 and intends to answer fundamental questions in the field of hadron physics. One important experiment in phase-1 of AMBER is the measurement of the proton charge radius by muon-proton elastic scattering. GEM detectors will be used to reconstruct scattered-muon trajectories and momenta. The experimental setup requires a continuously streaming readout of all detectors. Current plans are to use a readout system based on the VMM3a ASIC as GEM frontend chip, featuring a continuous self-triggered data aquisition.

In September 2023, data were taken under realistic AMBER beam conditions using a prototype large-size triple-GEM detector with continuous VMM3a readout. In this contribution, we will present the ongoing data analysis aiming at finding a stable working point of the detector fulfilling the requirements of the experiment. This involves characterizing the detector in terms of efficiency, signal-to-noise ratio, position and time resolution.

Group Report HK 29.3 Tue 18:15 HBR 19: C 5a

Production status of the CBM Transition Radiation Detector — •Philipp Kähler for the CBM-Collaboration — Institut für Kernphysik, Universität Münster

The Transition Radiation Detector (TRD) in the CBM experiment at FAIR will provide electron identification, enabling the study of the hot and dense medium created in heavy-ion collisions via the measurement of di-electrons at intermediate masses. Furthermore, the TRD will serve as an intermediate tracking station and, moreover, augments the identification of light nuclei for the hypernuclei programme of CBM.

We report on the production process of the high-rate multi-wire proportional chambers for the TRD, which has been started with a first batch of 32 MWPCs with outer dimensions of 960 mm x 960 mm, each equipped with 3 456 read-out channels on the segmented cathode pad-plane. The complete TRD will feature 216 MWPCs with 329 728 channels in total. First-of-series test results will be shown and discussed.

This work is supported by BMBF grants 05P21RFFC1 and 05P21PMFC1.

HK 29.4 Tue 18:45 HBR 19: C 5a

Commissioning of the First Gas System Line for the CBM-TRD — •Fidorra Felix for the CBM-Collaboration — Institut für Kernphysik, Münster

The Compressed Baryonic Matter (CBM) experiment is a fixed target heavy-ion experiment which is currently under construction at FAIR, GSI Darmstadt. It will explore the QCD phase diagram at high net-baryon densities. The Transition Radiation Detector (TRD) of the CBM experiment is based on Multi Wire Proportional Chambers (MWPCs) filled with Xe/CO2 85:15 as detector gas. This talk reports on the commissioning of the first regulated line of the gas system for the CBM-TRD. During operation, the gas flow through the chambers has to be regulated such that the relative pressure in the detector volume stays within -0/+1 mbar. To ensure the gas quality, also continuous monitoring of O_2, CO_2 and H_2O content will be included. A part of the gas system, as, e.g., the main regulation valves, the circulation pump and the PLC layer will be located in a service level above the experiment. The first gas line, including already the final tube lengths has been set up in the laboratories in Münster for characterisation of, e.g., the timing characteristics of the pressure control and for commissioning. This talk will be about the concept, the construction, the operation status of the gas system and a tightness measurement of the first final TRD MWPC. This work is supported by BMBF grant 05P21PMFC1.