HK 38: Instrumentation X

Time: Wednesday 14:00–15:30 Location: HK-H4

Group Report HK 38.1 Wed 14:00 HK-H4

Status of the CBM Time-of-Flight project — •Ingo Deppner and Norbert Herrmann — 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 93000 channels) equipped with 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 preproduction series of MRPCs is being used for physics research at two scientific pillars of the FAIR Phase-0 program. At STAR, the fixed-target program of the Beam Energy Scan II (BES-II) relies on 108 CBM MRPC detectors for forward PID at interaction rates of up to 2.5 kHz with 3 to 31.2 AGeV Au beams. 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 38.2 Wed 14:30 HK-H4

Inner-TOF, a Trigger Scintillator for HADES — •Dieter Grzonka[1], Pawel Kulessa[2], James Ritman[2,3,1], Thomas Sefzick[1], and Marcin Zielinski[4] — [1]Institut für Kernphysik, Forschungszentrum Jülich, 52428 Jülich, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, 64291 Darmstadt, Germany — [3]Ruhr-Universität Bochum, Institut für Experimentalphysik I, 44801 Bochum, Germany — [4]Jagiellonian University, 30-348 Krakow, Poland

In order to reduce the trigger rate originating from background in proton induced reaction studies at the HADES experiment an additional trigger scintillator was built. It consists of large trapezoidal shaped modules (height∼730mm, long side∼700mm, short side∼90mm) containing three separate plastic scintillator plates with a thickness of about 6 mm, which are read out by 6x6 mm^2 SiPMs. Each scintillator is equipped with 12 SiPMs attached to the scintillator edge. A trigger signal is generated by exceeding a certain SiPM signal multiplicity resulting in a close to 100% efficiency for the detection of a minimum ionizing particle which was investigated with cosmic particles and proton beams at COSY. The detector system and its performance will be presented.

HK 38.3 Wed 14:45 HK-H4

Development of a coincidence time resolution (CTR) setup for measuring timing characteristics of scintillation materials utilizing SiPMs — •Marvin Peter, Kai-Thomas Brinkmann, Valera Dormenev, and Hans-Georg Zaunick — II. Physikalisches Institut, Justus-Liebig-Universität Giessen, Germany

Coincidence time resolution (CTR) measurements have been conducted with different SiPM-based scintillation detectors. The results of measurements with a Raspberry Pi time-to-digital converter (TDC) board based on the TDC-GPX2 chip from Sciosense are compared to those obtained by using a high sampling rate oscilloscope. The goal was to find an optimum setup for fast timing measurements which will be used in the evaluation of new scintillation materials regarding their timing characteristics. Measurement setup, methods and results are discussed in this contribution. This work was carried out in the framework of BMBF Project 05K2019 - UFaCal.

HK 38.4 Wed 15:00 HK-H4

Deployment of digital fast-timing method for picosecond precision lifetime measurements using the NuDAQ system at IKP Cologne — •Andreas Harter, Jean-Marc Régis, Michael Weinert, Lukas Knafla, and Jan Jolie — University of Cologne, Institute for Nuclear Physics, 50937 Cologne, Germany

The comissioning of the NuDAQ digital data acquisition system built at the Institute for Nuclear Physics in Cologne is presented. Special regard is set on the ability of high-precision timing of the incoming detector pulses using a digital timing algorithm. Usually, analogue constant-fraction-discriminators (CFDs) and time-to-amplitude converters (TACs) are used to provide a timing signal with precision of around 1 ps or even better (dependent on the DAQ). However, the complexity of an analogue fast-timing electronics setup increases rapidly with the number of detectors. The digital CFD integrated in the V1730 digitizer modules with a sampling rate of 500 MHz uses a digital algorithm to determine a time stamp of an incoming signal with a precision of 2 ps [1]. Our results using the γ-γ timing technique impressively show that this easy-to-use digitizer using the sophisticated timing algorithm is competitive to the conventional analogue timing technique. [1] CAEN SpA, https://www.caen.it/products/v1730/

HK 38.5 Wed 15:15 HK-H4

Performance status for the endcap-time-of-flight upgrade of STAR — •Philipp Weidenkaff — Ruprecht-Karls-Universität Heidelberg

As part of the FAIR phase 0 program, CBM-ToF MRPC modules have been installed as endcap-time-of-flight detectors in STAR for the beam-energy-scan II (BES II) program from 2019 to 2021. These detectors provide a major improvement to the particle identification capability of the experiment in the forward region ($1.0 < \eta < 1.5$), which is especially necessary for the fixed target program. In this talk, an evaluation of PID capabilities and physics performance improvements is shown. The results are based on the 2020 fixed target run.

The project is partially founded by BMBF 05P15VHFC1.