HK 52: Instrumentation XII

Time: Thursday 15:45–17:00 Location: SR Exp1B Chemie

HK 52.1 Thu 15:45 SR Exp1B Chemie

Current Iteration of Prototype Tests of the Front-End and Readout Electronics Systems for the PANDA Barrel EMC* — •Aniko Tim Falk[1], Kai-Thomas Brinkmann[1], Simon Glennemeier-Marke[1], Simon Habermehl[1], Phil Ionkov[1], Marvin Peter[1], Hans-Georg Zaunick[1], Oliver Noll[2,3], and Luigi Capozza[2,3] for the PANDA-Collaboration — [1]II. Physics Institute, Justus Liebig University, Gießen — [2]Institute of Nuclear Physics, Johannes Gutenberg University, Mainz — [3]Helmholtz Institute, Mainz

The barrel section of the electromagnetic calorimeter (EMC) in the PANDA experiment, which is one of the largest installations at the upcoming FAIR accelerator facility, aims to deliver superior photon energy resolution across a broad dynamic range. To achieve this high level of precision, the operation and calibration of the calorimeter's various subsystems, particularly the readout and front-end electronics, must be meticulously fine-tuned. This demands a thorough series of functional tests and calibration procedures, especially concerning the front-end electronics, to ensure that the system operates optimally. This contribution will present the current prototype setup, along with results from beam tests and laboratory measurements conducted over the past year. *supported by the BMBF, GSI and HFHF.

HK 52.2 Thu 16:00 SR Exp1B Chemie

Stability analyses of a cryogenic hydrogen filament target — •Eva-Maria Hausch, Jost Froning, Christian Mannweiler, Simon Obszerninks, and Alfons Khoukaz — Institut für Kernphysik, Universität Münster, 48149 Münster, Germany

Internal targets such as hydrogen cluster-jet and pellet/droplet targets are widely applied in accelerator experiments in nuclear and particle physics. For example, the future $\overline{\mathrm{P}}$ANDA experiment at FAIR will make use of both target types. Another option for internal target experiments is to use filament targets.
The MDT-H is a droplet target which is currently operated in Münster as a filament target. The hydrogen is cooled down to liquid conditions, leaves the target through an aperture nozzle with a diameter of 10 microns into the interaction chamber and freezes out due to the low vacuum pressure, resulting in a solid hydrogen beam. For operation in accelerator experiments, it is important that the target beam exhibits minimal fluctuations, for vertex reconstruction. Stability analyses provide information about these fluctuations and form a basis for optimising the target.
In this talk, the setup of the MDT-H will be presented and the results of various stability measurements will be shown.
The research project was supported by EU Horizon 2020 programme (824093), BMBF (05P21PMFP1) and NRW Netzwerke (NW21-024-E).

HK 52.3 Thu 16:15 SR Exp1B Chemie

Cryobending: Deflection of frozen hydrogen filaments — •Jost Froning, Eva-Maria Hausch, Christian Mannweiler, Simon Obszerninks, and Alfons Khoukaz — Institut für Kernphysik, Universität Münster, 48149 Münster, Germany

For the use of cryogenic fibre or droplet/pellet targets at accelerator experiments in nuclear and particle physics, a way to adjust the position of the target beam at the interaction point without mechanical movement of the target components is desirable. For this purpose, a novel strategy, named cryobending, is developed and presented in this talk for a frozen hydrogen filament in vacuum. The produced hydrogen target beam is deflected by helium gas emerging from correction nozzles. A comparison between measured and expected deflection angles is shown in this talk.
Funding was received from GSI F&E (MSKHOU2023), EU Horizon 2020 programme (824093), BMBF (05P21PMFP1) and NRW Netzwerke (NW21-024-E).

HK 52.4 Thu 16:30 SR Exp1B Chemie

Construction of the crystal Zero Degree Detector for BESIII — •Frederic Stieler, Achim Denig, Peter Drexler, Werner Lauth, Jan Muskalla, Saskia Plura, Christoph Florian Redmer, and Yasemin Schelhaas for the BESIII Germany-Collaboration — Institute for Nuclear Physics, Johannes Gutenberg University, Germany

The crystal Zero Degree Detector (cZDD) is a proposed addition to the BESIII experiment in China. In order to measure hadronic cross sections with the Initial State Radiation (ISR) method, for a more precise calculation of the hadronic vacuum polarization contribution to the anomalous magnetic moment of the muon, ISR photons have to be detected. Since these photons are mostly emitted at small angles relative to the colliding particles, the cZDD will measure these photons at angles of about 1.5 mrad to 10.4 mrad, that are not covered yet by the already existing detectors at BESIII. Additionally, the cZDD will replace the Luminsoity monitors of BEPCII. Balancing both tasks of the cZDD is a challenge for the design of the readout.

This presentation discusses the design of the first prototype of the cZDD and the development of an online feature extraction based on FPGAs.

HK 52.5 Thu 16:45 SR Exp1B Chemie

Results from the Digital Calorimeter Prototype EPICAL-2 — •Johannes Keul — Institut für Kernphysik Frankfurt

A prototype of a novel digital electromagnetic calorimeter, EPICAL-2, has been developed. The R&D is performed in the context of the ALICE-FoCal and is strongly related to studies of imaging in proton CT. Digital calorimetry also proves promising for future collider projects like EIC, ILC, CLIC, or FCC.

Based on proof of principle with a first prototype, EPICAL-2 has been constructed as an advanced second prototype. EPICAL-2 consists of 24 layers with alternating tungsten absorbers and ALPIDE MAPS. The design features an active area of approximately $30 \times 30\,\mathrm{mm}^2$ and a depth of 20 radiation lengths, totaling over 25 million pixels.

EPICAL-2 test-beam measurements were performed at DESY in February 2020 and CERN-SPS in September 2021. The DESY test-beam campaign results have been published in [1], showing good energy resolution and linearity.

This contribution will report on energy resolution and linearity measurements for different definitions of the detector response in the EPICAL-2 and compare it to a detailed MC simulation. Furthermore, shower shape studies will be presented and studies of the Molière radius in the EPICAL-2 will be shown.

[1] J.Alme et al 2023 JINST 18 P01038

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