HK 27: Instrumentation VIII

Time: Tuesday 16:00–17:30 Location: HK-H4

Group Report HK 27.1 Tue 16:00 HK-H4

The TRD in CBM: status and steps towards series production — •Florian Roether — Institut für Kernphysik, Frankfurt, Deutschland

In 2025, the Compressed Baryonic Matter Experiment (CBM) at FAIR is scheduled to start operation. Starting end of 2023, the various detectors will be installed, including the Transition Radiation Detector (TRD). The main task of the TRD is to identify electrons above momenta of 1 GeV/c. In addition, the TRD also contributes to the identification of nuclear fragments. After an intensive and thorough research and development phase, we will start series production of the chambers for the TRD in 2022.

This presentation will summarize the status of the project and the development of the workflows required for series production. We will also present first results and findings from the pre-series production of the detector chambers.

This work is supported by BMBF-grant 05P21RFFC3.

HK 27.2 Tue 16:30 HK-H4

Application of TRD Trigger on the Hypertriton Analysis in p–Pb collisions at ALICE — •Benjamin Brudnyj for the ALICE-Collaboration — Institut für Kernphysik, Goethe Universität, Frankfurt am Main

The production of light (anti-)(hyper-)nuclei has recently become a topic of high interest. One interesting example is the lifetime of the lightest hypernucleus, the hypertriton. Several measurements indicate a significant deviation from the theoretical expectation, in particular in heavy-ion collisions. Therefore, it is important to also measure these rare nuclei in pp and p–Pb collisions.

Due to their short lifetime only their decay products can be measured, e.g. the charged two body decay channel ${}^{3}_{\Lambda}\mathrm{H} \rightarrow {}^{3}\mathrm{He} + \pi^{-}$. In order to be able to measure these rare (anti-)fragments also in pp and p–Pb collisions, a trigger on nuclei was implemented on p–Pb collisions at $\sqrt{s_{NN}} = 8.16$ TeV to increase the statistics by using the ability of the ALICE-TRD to perform fast trigger decisions.

In this talk the performance of a trigger on different light nuclei will be presented, as well as the current status of a hypertriton analysis using data on p–Pb collisions at $\sqrt{s_{NN}} = 8.16$ TeV. In order to measure the hypertriton with a sufficient significance and a good signal-to-background ratio, a study to optimize topological cuts is performed. Supported by BMBF and the Helmholtz Association.

HK 27.3 Tue 16:45 HK-H4

CBM-TRD QA algorithm results for mCBM 2021 — •Axel Puntke — Institut für Kernphysik, Münster, Germany

The Compressed Baryonic Matter (CBM) experiment at the future Facility for Antiproton and Ion Research (FAIR) will explore the QCD phase diagram in the region of very high net baryon densities. The Transition Radiation Detector (TRD) is an important subdetector of the final CBM experiment and is used to identify electrons at high momenta, contributes to tracking of particles and supports the identification of light nuclei via their energy loss.

For commissioning and performance measurements, the TRD takes part in the mCBM high-rate beam campaigns at the SIS18 accelerator, which are part of the FAIR-Phase 0 program. For this purpose, a set of QA algorithms is developed which can automatically produce QA plots, based on the used configuration parameters of the current setup. This also includes correlations with other subsystems (e.g. TOF) which have recorded data simultaneously.

In this poster, the first results, based on the data recorded during the mCBM 2021 beamtime, will be shown . Besides TRD there were also the subsystems TOF, STS, RICH and PSD involved and can be used for temporal and spatial correlations.

This work is supported by BMBF grant 05P21PMFC1.

HK 27.4 Tue 17:00 HK-H4

n2EDM - coating of ultra-cold neutron storage vessel — •Noah Yazdandoost für die nEDM-Kollaboration — Department of Chemistry, Johannes Gutenberg-University, Mainz

The n2EDM experiment at PSI aims to measure the neutron electric dipole moment (nEDM) with ultra-cold neutrons (UCN). UCN are neutrons with energies in the range of nano electron-volts.
A non-zero nEDM would break time and parity reversal symmetry and could explain observations like the matter-antimatter asymmetry of the universe. To measure the nEDM, polarized UCN are filled into a storage vessel where a constant electric and magnetic field is applied. The Ramsey method of separated oscillatory fields is used to measure the Larmor precession frequency of the UCN in the storage vessel. A measured shift in the Larmor precession frequency between parallel and antiparallel field orientation implies a non-zero nEDM. The maximum energy of the stored UCN is limited by the Fermi pseudo-potential of the material the vessel is made of. Besides having a high Fermi pseudo-potential, the material needs to be non-magnetic and electrically insulating.
This talk gives an overview of the n2EDM experiment and the coating process of the insulating rings of the experiment.

HK 27.5 Tue 17:15 HK-H4

Laser cooling of C3+ ions at the Experimental Storage Ring at GSI — •Ken Ueberholz[1], Volker Hannen[1], Danyal Winters[2], Christian Weinheimer[1], Noah Eizenhöfer[4], Michael Bussmann[3], Max Horst[4], Daniel Kiefer[4], Nils Kiefer[5], Sebastian Klammes[2], Thomas Kühl[2,6], Markus Löser[3], Xinwen Ma[7], Wilfried Nörtershäuser[4], Rodolfo Sanchez[2], Ulrich Schramm[3,8], Mathias Siebold[3], Peter Spiller[2], Markus Steck[2], Thomas Stöhlker[2,6,9], Thomas Walther[4], Hanbing Wang[7], Weiqiang Wen[7], Benedikt Langfeld[4], and Lars Bozyk[2] — [1]WWU Münster — [2]GSI Darmstadt — [3]HZDR Dresden — [4]TU Darmstadt — [5]Uni Kassel — [6]HI Jena — [7]IMP Lanzhou — [8]TU Dresden — [9]Uni Jena

In May 2021, an improved XUV fluorescence detection system and a new tuneable pulsed UV laser system were employed in a *beam experiment* for laser cooling of bunched relativistic (47% of c) carbon ions stored at the Experimental Storage Ring at GSI Helmholtzzentrum Darmstadt. Successful laser cooling was demonstrated using the powerful (~200 mW), high repetition rate (~10 MHz) and tuneable (wavelength and pulse duration) UV laser system. One of the main points of interest was to study the effects of ion bunch and laser pulse timing on the cooling process and on the fluorescence detection, which was done by varying the delay of the laser pulses. In the talk preliminary results of these measurements will be presented and discussed. This work has been supported by BMBF under contract number 05P19PMFA1.