HK 27: Poster Session

Time: Wednesday 16:15–18:30 Location: Redoutensaal

HK 27.1 Wed 16:15 Redoutensaal

Latest Progress Concerning the Front-End Electronics Prototype for the $\overline{\text{P}}$ANDA Barrel EMC — •Aniko Tim Fenske, Kai-Thomas Brinkmann, Hans-Georg Zaunick, and Karl Simon Habermehl for the PANDA-Collaboration — 2nd Physics Institute, Justus Liebig University, Giessen, Germany

The barrel section of the PANDA electromagnetic calorimeter (EMC) at the future FAIR facility is designed to precisely measure photon and charged particle energies over a wide dynamic range. Achieving the targeted performance requires not only a carefully engineered detector system but also a detailed understanding of its operational behavior under realistic conditions.

Therefore, recent efforts have concentrated on an in-depth analysis of calibration data and functional tests of the readout and front-end electronics. Building on results from the current prototype setup, a comprehensive evaluation of in-beam measurements and laboratory studies has been carried out, with particular attention to the stability, linearity, and noise characteristics of the system. This contribution summarizes the latest findings of these analyses and discusses their implications for the final configuration of the Barrel EMC.

Supported by the BMFTR, GSI and HFHF.

HK 27.2 Wed 16:15 Redoutensaal

Accessing transverse momentum dependent distribution functions with semi-inclusive deep inelastic single pion and kaon production — •Stefan Diehl[1,2] and Aron Kripko[1] for the CLAS-Collaboration — [1]II. Physikalisches Institut, JLU Gießen, Gießen, Germany — [2]University of Connecticut, Storrs, CT, USA

Semi-inclusive deep inelastic scattering is a well-established tool to study TMDs and fragmentation functions. With the CLAS12 detector at Jefferson Laboratory (JLab), precise, multidimensional measurements of cross sections and asymmetry observables become possible in the valence quark regime for the first time. Based on the new high statistics data, the polarized structure-function ratio $F_{LU}^{sin\phi}/F_{UU}$, as well as the un-polarized cross section modulations $F_{UU}^{cos\phi}$ and $F_{UU}^{cos2\phi}$ were studied for single pion and kaon SIDIS. The contribution will present a comprehensive multidimensional study for all three pions as well as positive kaons and discuss the connection of the observable to TMDs and the impact of the new data on our understanding of the involved TMDs and their flavour separation. *The work is supported by Deutsche Forschungsgemeinschaft (Project No. 508107918).

HK 27.3 Wed 16:15 Redoutensaal

Correction of the recoil attenuation in a plunger stopper foil — •Deniz Oyan, Volker Werner, Hannes Mayr, Clemens Nickel, Katharina Ide, and Norbert Pietralla — IKP, TU Darmstadt

Measurements applying the recoil-distance Doppler-shift method [1] at high recoil velocities of around 5 % v/c are prone to suffer from partially overlapping stop and flight components, due to the slowing-down process in the stopper. The Doppler-shifted γ-ray energy of the de-excitation is governed by the ion's velocity distribution. Thus, the flight component cannot be distinguished from the Doppler tail of the (usually denoted "unshifted") component from ions having reached the stopper by simple Gaussian fits. To disentangle both components a simulation using the DSAM analysis software APCAD [2] is performed.

Accurate knowledge on lifetimes of excited states of ^{104,106,108}Pd is necessary to precisely determine E2 transition strengths and g factors in this region of the nuclear chart. Therefore, our simulation is conducted on a dataset of the Pd isotopes from WNSL, Yale University [3]. This contribution presents the applicability of our method to correct for the attenuation in the stopper foil.

[1] A. Dewald *et al.*, Prog. Part. Nucl. Phys. **67**, 786-839 (2012)
[2] C. Stahl *et al.*, Comput. Phys. Commun. **214**, 174-198 (2017)
[3] V. Werner *et al.*, J. Phys.: Conf. Ser. **366**, 012048 (2012)

HK 27.4 Wed 16:15 Redoutensaal

The young High Energy Physicists Association (yHEP) — Farah Afzal[1], Judita Beinortaite[2], Julian Gethmann[3], Simran Gurdasani[4], Meike Küssner[1,5], •Michael Lupberger[5,6], Leonel Morejon[7], Leoniedas Reschke[8], and Srijan Sehgal[7] — [1]Ruhr University Bochum — [2]DESY — [3]Karlsruhe Institute of Technology — [4]University of Berlin — [5]University of Bonn — [6]University of Freiburg — [7]University of Wuppertal — [8]University of Giessen

The young High Energy Physicists Association(yHEP) represents non-permanent scientists within the German and international particle, astroparticle, hadron, nuclear, and accelerator physics communities. Its members range from bachelor and master students to PhD candidates, postdocs, and junior group leaders. The association works to improve working conditions, research support, and career perspectives for early-career researchers. yHEP strengthens the involvement of young scientists in scientific and political decision-making processes, aiming to build broad consensus and to ensure that every voice is heard. This poster introduces the structure and goals of yHEP and provides information on how interested researchers can engage with the community. Meet your yHEP management board representatives at the poster to discuss your topics or to hear what yHEP does for you and how you can get involved.

HK 27.5 Wed 16:15 Redoutensaal

Triple Nuclear Collisions in SMASH — •Luis Miguel Vélez[2], Lucas Constantin[2], and Hannah Elfner[1,2,3,4] — [1]GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany — [2]Institute for Theoretical Physics, Goethe University, Max-von-Laue-Strasse 1, 60438 Frankfurt am Main, Germany — [3]Frankfurt Institute for Advanced Studies, Ruth-Moufang-Strasse 1, 60438 Frankfurt am Main, Germany — [4]Helmholtz Research Academy Hesse for FAIR (HFHF), GSI Helmholtz Center, Campus Frankfurt, Max-von-Laue-Strasse 12, 60438 Frankfurt am Main, Germany

One goal of binary heavy-ion collisions is to study strongly interacting matter under extreme conditions e.g. at a high baryon density. Nevertheless, an even higher density can be accomplished by colliding three nuclei instead of two in a Triple Nuclear Collision (TNC). In this work, the process of simulating a TNC with the use of the hadronic transport approach SMASH (Simulating Many Accelerated Strongly-interacting Hadrons) is presented. Furthermore, the observables for particle production of central Pb+Pb+Pb TNCs at energies between 3 GeV and 20 GeV are examined. Simultaneously, these findings are compared with those of binary Pb+Pb collisions with the same respective energy and centrality. Finally, it is shown that a TNC leads to a higher baryon and energy density than in binary collisions, thus exposing a promising method to better understand QCD matter.

HK 27.6 Wed 16:15 Redoutensaal

Advances in Readout Electronics and Calibration for the PANDA Micro Vertex Detector — •Marvin Peter[1], Kai-Thomas Brinkmann[1], Raphael Ratz[1], Hans-Georg Zaunick[1], Michele Caselle[2], Daniela Calvo[3], and Giovanni Mazza[3] for the PANDA-Collaboration — [1]2nd Physics Institute Justus Liebig university Giessen — [2]Karlsruhe Institute of Technology — [3]Istituto Nazionale di Fisica Nucleare - Sezione di Torino

The Micro Vertex Detector (MVD) forms the innermost tracking layer of the PANDA experiment, positioned closest to the interaction point. Silicon strip sensors are read out by the Torino Amplifier for silicon Strip detectors (ToASt) ASIC, a 64-channel self-triggered chip based on the Time-over-Threshold principle, developed by INFN Turin. In this contribution, we present recent advancements including the implementation of a new test bench and a comprehensive calibration framework for the ToASt ASIC based on the readout system provided by KIT. Results from calibration measurements with radioactive sources are discussed. *Supported by BMFTR.*

HK 27.7 Wed 16:15 Redoutensaal

Simulation study of π^0 flow contribution to direct photon HBT measurement — •Luis Escalante — Institut für Kernphysik, Goethe-Universität Frankfurt

In heavy-ion collisions at the CERN-LHC, a new state of matter, the quark-gluon plasma (QGP), can be created to examine its properties, such as the temperature and spatio-temporal evolution. One approach to probe these properties is the measurement of Bose-Einstein correlations of direct photons using HBT interferometry. The measurement of direct-photon HBT correlations, however, requires a highly accu-

rate determination of background contributions. Previous studies have shown that one of the dominant background sources is contamination from the elliptic flow (v_2) of π^0 mesons. Providing a reliable estimate of this flow contribution is therefore essential for extracting the direct-photon signal.

In this poster, a simulation framework for assessing flow-induced correlations of decay photons originating from π^0 mesons is presented. The study incorporates measured π^0 yields and flow coefficients from ALICE Pb-Pb data and investigates the centrality dependence of flow contributions from decay photons. In addition, the impact of flow using the Bertsch-Pratt parametrization is explored. Based on the findings of these studies, an optimized description of mixed-event is proposed, for which the current status is presented.

Supported by BMFTR and the Helmholtz Association.

HK 27.8 Wed 16:15 Redoutensaal

Conceptual Design of a Fragment Separator for Producing Positron-Emitting Light-Ion Beams in Hadron Therapy — •Suraj Kumar Singh[1,2], Bernhard Franczak[1], Christoph Scheidenberger[1,2,3], Daria Kostyleva[1], Emma Haettner[1], and Sivaji Purushothaman[1] for the Super-FRS Experiment-Collaboration — [1]GSI Helmholtzzentrum for Schwerionenforschung GmbH, Darmstadt — [2]II. Physikalisches Institut, JLU, Gießen — [3]Helmholtz Research Academy Hesse for FAIR (HFHF), Campus Giessen

Recent advances in hadron therapy have stimulated growing interest in the use of light, positron-emitting ion beams as an alternative to conventional heavy ions such as ^{12}C. These radionuclides-produced efficiently through projectile fragmentation and in-flight separation-offer half-lives and production yields well suited for in-beam positron emission tomography (PET), enabling improved real-time verification of beam range during treatment. In this poster, a conceptual design for a fragment separator optimized to deliver such therapeutic positron-emitting light ions will be presented. The system integrates a production target with a sequence of dipole and quadrupole magnets, energy-loss degraders, and time-of-flight diagnostics to perform Bρ-ΔE-ToF particle identification and achieve high beam purity and tunability. This design provides a flexible platform capable of supplying a range of clinically relevant positron-emitting isotopes, supporting enhanced imaging-guided dose delivery and paving the way for more precise and adaptive cancer treatment modalities.

HK 27.9 Wed 16:15 Redoutensaal

New Rutherford Backscattering Spectrometry chamber for experimental nuclear astrophysics in Cologne — •Benedikt Machliner, Martin Müller, Svenja Wilden, and Andreas Zilges — University of Cologne, Institute for Nuclear Physics, Germany

Understanding the formation of the elements in the universe is one of the ultimate objectives of nuclear astrophysics. In order to gain a more profound understanding of the complex processes involved in nucleosynthesis, it is crucial to consider the input from all constituents of this highly interdisciplinary field. Key observables, that experimental nuclear physics can contribute, include cross sections and reaction rates, which are indispensable for constraining model calculations.

In order to experimentally determine absolute reaction cross sections, it is necessary to know the number of target nuclei per unit area with sufficient precision. A method that is frequently utilized to determine the areal density - i.e. the target thickness - is Rutherford Backscattering Spectrometry (RBS). This work presents the new RBS chamber of the Institute for Nuclear Physics at the University of Cologne, which can be attached to both of the institute's accelerators, namely the 10 MV FN Tandem and 6 MV Tandetron accelerator [1]. The recent experimental campaign demonstrates a substantial enhancement in efficiency, attributable to the advanced instrumentation, without any compromise in precision, as suggested by preliminary data.

Supported by the DFG (ZI 510/12-1).

[1] A. Dewald *et al.*, Nucl. Instrum. Methods B **294** (2013) 18-23

HK 27.10 Wed 16:15 Redoutensaal

Improving the ALPACA particle-gamma spectrometer for telescope based particle identification — •Nick Marx, Markus Müllenmeister, Michael Weinert, and Andreas Zilges — University of Cologne, Institute for Nuclear Physics, Germany

Studying nuclear reactions requires precise particle identification (PID) [1], especially when multiple particles are generated in similar energy regions. The current work assesses the capabilities of Passivated Implanted Planar Silicon (PIPS) detectors operating in a telescope configuration, similar to the setup used in the SONIC@HORUS array [2]. The objective is to determine whether it is capable of accurately distinguishing between protons, deuterons, and tritons and whether the resolution is improved by new thin detectors. The detector performance was tested using deuteron beams at 10*MeV and 18*MeV at the FN Tandem accelerator of the University of Cologne. Measurements included both scattering and nuclear reactions on a ^{197}Au target in the ALPACA scattering chamber [3] to evaluate energy resolution and particle identification under realistic experimental conditions. First results demonstrate the achievable energy resolution and PID performance. These findings allow a direct comparison and evaluation of the improved detector setup for upcoming experiments.

[1] G. F. Knoll, *Radiation Detection and Measurement*, 4th ed., Wiley, Hoboken (2010).
[2] S. G. Pickstone et al., Nucl. Instr. and Meth. A **875** (2017) 104.
[3] G. Huppelsberg, Master*s thesis, University of Cologne (2024).

HK 27.11 Wed 16:15 Redoutensaal

Investigation of the decay $\chi_{c2} \to K^+K^-\eta'$ and search for the exotic K_1^* at the BESIII Experiment — •Anna Tsias, Achim Denig, and Nils Huesken — Johannes Gutenberg-Universität Mainz

The BESIII experiment provides an opportunity to investigate χ_{cJ} decays occurring in radiative $\Psi(2S)$ transitions, thanks to its large data sample of $(2259.3 \pm 11.1) \times 10^6$ $\psi(2S)$ events. Motivated by evidence for exotic mesons like the $\pi_1(1600)$, this analysis investigates χ_{c2} decays to search for exotic resonances in the strange sector. In the $K\eta'$ subsystem, there is the possibility to observe the hypothesized K_1^*, a strange member of the exotic hybrid nonet with quantum numbers $J^{PC} = 1^{-+}$. This is motivated by the observation of analogous states such as the $\pi_1(1600)$ and $\eta_1(1855)$ in similar charmonium decays. This decay channel is further of interest because it enables the study of higher-mass f_2 and f_4 mesons in the K^+K^- subsystem, several of which were last reported in the 1990s and have not been revisited with modern datasets. Additionally, the f_2 resonances observed in the K^+ K^- system are possible tensor glueball candidates, making this analysis a potential starting point for their identification.

HK 27.12 Wed 16:15 Redoutensaal

Results from parabolic flight campaigns using a compact scintillation detector — •Roman Bergert, Dzmitry Kazlou, Hans-Georg Zaunick, and Kai-Thomas Brinkmann — 2nd Physics Institute, Justus Liebig University Giessen

A compact, low-power scintillation detector designed for environmental radiation monitoring and dosimetry applications will be presented. The detector utilizes an EJ-276D plastic scintillator, which possesses good pulse-shape discrimination (PSD) characteristics, thereby facilitating effective particle identification. The detector signal readout is performed using a Red Pitaya STEMLab 125-14 platform serving as a high-speed digitizer (125 MS/s, 14 bits resolution), combined with a bespoke high.voltage bias supply and a dual-channel silicon photomultiplier (SiPM) analog front-end readout. The two-channel analog front-end provides a high-gain path that is optimized for high resolution in the low-energy range, as well as a low-gain path that covers the high-energy range, thereby ensuring a higher dynamic range.

The fully integrated system is lightweight (<1 kg), compact (12 cm x 9 cm x 6 cm), and low-power (<8 W), rendering it highly suitable for portable, battery-powered, or autonomous operation. The detector assembly performance was evaluated during multiple parabolic flight campaigns, during which the detector operated autonomously in mixed radiation fields, acquiring complete signal waveforms for subsequent offline PSD analysis. The results are taken to discuss the feasibility of our compact, PSD-capable detector for future radiation monitoring and dosimetry missions.

HK 27.13 Wed 16:15 Redoutensaal

Double-Sided Strip LGAD Detector Performance Study in Beam Operation — •Yevhen Kozymka[1], Thomas Bergauer[2], Tetyana Galatyuk[1,3,4], Albert Hirtl[5], Matthias Kausel[5,6], Mladen Kis[3], Wilhelm Krüger[1], Sergey Linev[3], Jan Michel[3], Jerzy Pietraszko[3], Christian Joachim Schmidt[3], Michael Träger[3], Michael Traxler[3], Felix Ulrich-Pur[5], Matteo Centis Vignali[7], Ashish Bisht[7], Alfons Dehe[8], and Yuanji Tian[8] — [1]Technische Universität Darmstadt — [2]Marietta Blau Institute for Particle Physicsof the Austrian Academy of Sciences — [3]GSI Helmholtzzentrum für Schwerionenforschung GmbH — [4]Helmholtz Forschungsakademie Hessen für FAIR — [5]TU Wien, Atominstitut —

[6]EBG MedAustron — [7]Fondazione Bruno Kessler, Centre of Materials and Microsystems — [8]Hahn-Schickard-Gesellschaft für angewandte Forschung e.V.

Strip low-gain avalanche diode (LGAD) detectors have demonstrated an excellent timing and spatial resolution, making them attractive for high energy physics applications, ion computed tomography and beam diagnostics. Double-sided readout is expected to increase the tracking accuracy in medical applications with no timing precision loss, while further reducing the material budget of the system.

We present our results from performing extensive diagnostics on a double-sided LGAD with parallel strip orientation, both with self-correlation as well as using single-sided LGADs as reference, performed with proton, helium and carbon beams of varying energies.

HK 27.14 Wed 16:15 Redoutensaal

Development of a Scintillating Fiber Tracker as a Beam Monitor for Sub-Therapy Particle Rates at the Marburger Ion Beam Therapy Center — Theresa Heinz[1,2], Kai-Thomas Brinkmann[1], •Lara Dippel[1], and Hans-Georg Zaunick[1] — [1]2nd Physics Institute, Justus Liebig University Giessen, Germany — [2]D-PHYS, Institute for Particle Physics and Astrophysics (IPA)

This work presents the characterization and development of a scintillating fiber detector intended to be used as a beam monitoring system at the Marburg Ion Beam Therapy Center (MIT) for sub-therapy particle rates, where the in-house monitoring systems fail. The central focuses are the investigation of primary particle rate limitation and detector dead times, which were studied through dedicated measurements. These measurements provide performance benchmarks for future integration into various experimental setups which require lower particle rates.

Additionally, the development of the next detector version which contains more fibers and improves spatial resolution will be presented. Preparations for an FPGA-based readout system are carried out, enabling on-board logic for versatile detector operation. Geant4 simulations were carried out to validate the new detector design.

HK 27.15 Wed 16:15 Redoutensaal

Bringing Particle Physics to Metal Festivals: Impressions from the Music Forge Festival — •Aniko Tim Fenske[1], Kai-Thomas Brinkmann[1], Hans-Georg Zaunick[1], Marvin Peter[1], Christian Klein-Boesing[2], and David Borgelt[2] for the Netzwerk Teilchenwelt-Collaboration — [1]2nd Physics Institute, Justus Liebig University, Giessen, Germany — [2]Institut für Kernphysik in Münster

The decreasing trust of modern society in science and scientists (becoming especially prominent during Covid pandemic) pushes scientists to find new ways of rebuilding that trust and making themselves visible and approachable. In our opinion, this task must be tackled via two main approaches. On the one hand, we as scientists should be using understandable language and motivating communication in conversations with non-scientists or those outside of our own field of expertise. On the other hand, we should visit places and events where science is rarely encountered and recognized.

This was the reason for us to start a cooperation with the Netzwerk Teilchenwelt group from Münster and the Music Forge Festival in the village of Lich, near Gießen, in 2024. In 2025, this cooperation was continued and we used the three days of the festival to communicate with a broad audience in and around a booth on the festival ground.

Additionally, some games and activities such as a "particle wall of death" and a soap volcano using dry ice were presented to attract the target group.

This contribution will show a selection of impressions from our outreach activities at the Music Forge Festival 2025.

HK 27.16 Wed 16:15 Redoutensaal

Super-FRS Ion Catcher - Overview and Progress — •Jamie Harkin for the Super-FRS Experiment-Collaboration — Justus-Liebig-Universität Gießen

At the Super-FRS-IC, the exotic nuclei produced at relativistic energies and separated in-flight will be thermalized in the Cryogenic Stopping Cell (CSC). The new CSC for the Super-FRS, currently under construction, features a High Areal Density Orthogonal (HADO) design, achieving an areal density of cryogenic helium (He) exceeding 25 mg cm^(-2) - a four-fold increase over existing systems. The stopping cell chamber (split into stopping and extraction regions), will be nested inside a larger insulating vacuum chamber. The beam will be delivered through air and two thin (100 micron) aluminium beam windows. Investigations into the deformation caused by the pressure differential between the regions; resulting energy deposition difference relative to beam position in the beam windows; optimizing thermal coupling between the cryo-coolers and the cryo-cell; ideal potentials of the DC push electrodes in the stopping region have been conducted. This poster presents these results, and the status of construction.

HK 27.17 Wed 16:15 Redoutensaal

Particle Track classification using Object Condensation at MAGIX — •Nils Hesse for the MAGIX-Collaboration — JGU Mainz

Machine Learning has been a part of modern physics for many years now, aiding with denoising, particle identification and even being used for generating particle events. However, a general limitation lies in the fact that neural networks have a fixed number of inputs and outputs, making classification of an unknown number of particle tracks not just more complex, but also inefficient.

Object Condensation is a loss function developed by Jan Kieseler in 2020, it solves this problem by transforming the input data into a learned condensation space and clustering in said space. This work explores the application of Object Condensation to the Prototype TPC of the MAinz Gas Injection target eXperiment (MAGIX) at the Mainz Energy-Recovering Superconducting Accelerator (MESA). Preliminary results are presented alongside an overview of the underlying principles of the Object Condensation approach.

HK 27.18 Wed 16:15 Redoutensaal

A Comparative Study of Baryon Stopping Models: SMASH and ANGANTYR — •Manou P. Engel[1], Carl B. Rosenkvist[1,3], and Hannah Elfner[2,1,3,4] — [1]Institute for Theoretical Physics, Goethe University, Max-von-Laue-Strasse 1, 60438 Frankfurt am Main, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany — [3]Frankfurt Institute for Advanced Studies, Ruth-Moufang-Strasse 1, 60438 Frankfurt am Main, Germany — [4]Helmholtz Research Academy Hesse for FAIR (HFHF), GSI Helmholtz Center, Campus Frankfurt, Max-von-Laue-Strasse 12, 60438 Frankfurt am Main, Germany

In SMASH, a hadronic transport model, particle formation is modeled through hadronic resonances as well as *string* excitation and fragmentation, handled by PYTHIA8. Leading hadrons can interact earlier than newly produced, not yet fully formed hadrons. This mechanism reproduces baryon stopping in experimental data well at *low collision energies*, while it tends to overestimate stopping at *high energies*.

ANGANTYR, PYTHIA8's default Glauber-based heavy-ion model, models stopping through multiple nucleon interactions and provides a more realistic description of baryon stopping at LHC energies.

In this work, these two approaches will be compared to identify possible avenues to improve the description of baryon stopping in SMASH across collision energies. Specifically, we study their rapidity distributions and transverse-mass spectra as functions of centrality and collision energy. The results are compared to heavy-ion data from the LHC and from the STAR experiment at RHIC.

HK 27.19 Wed 16:15 Redoutensaal

Status of the CBM Micro Vertex Detector Simulations* — •Julio Andary for the CBM-MVD-Collaboration — Goethe-Universität Frankfurt am Main

CBM's Micro Vertex Detector (MVD) will help identify rare particles emitted in violent heavy ion collisions at FAIR and supplements the main tracker (STS) with high-precision pointing capability close to the target. This places, besides outstanding radiation hardness, high demands on the material budget of the detector which in turn has an impact on the performance of the detector. Thus, the detector was optimized w.r.t. multiple scattering and adding unwanted background tracks originating from external conversion of photons.

The focus of this contribution is on the gain in tracking performance enabled by the MVD, also considering alternative detector geometries. Currently, there are two distinct variants of the MVD geometry - a vertexing geometry and a tracking geometry, adjusted to optimize either secondary vertexing of rare particles or particle tracking in a high multiplicity environment, together with the STS detector.

*This work has been supported by BMFTR (05H24RF5), GSI and HFHF.

HK 27.20 Wed 16:15 Redoutensaal

PID using unsupervised clustering methods and pulse shape discimination in a Phoswich detector — •Simon Glennemeier-

Marke[1,2], Kai-Thomas Brinkmann[1,2] und Lara Dippel[1,2] — [1]2nd Physics Institute, Justus-Liebig-University, Gießen — [2]LOEWE Research Cluster for Advanced Medical Phzsics in Imaging and Therapy (ADMIT)

On this poster, we present a workflow for particle identification (PID) in a Phoswich detector, which consists of a fast plastic scintillator optically coupled to a thicker barium fluoride (BaF) scintillator. The dissimilarity in the scintillation characteristics of both materials enables pulse shape discrimination (PSD) between different particle species. We use a dataset obtained at Marburg Ion Beam Therapy Center (MIT) using 300 MeV/u carbon ions impinging on a water target. Feature engineering and unsupervised clustering methods are applied to categorize new observations, unseen during training, even in high rate environments where signal pile-ups occur. Classified detections can then be used to determine the relative abundances. This project is part of the ADMIT consortium under Project Part A, which focuses on estimating spectral neutron fluxes for flash therapy in tumor treatment applications. This project is financed with funds of LOEWE - Landes-Offensive zur Entwicklung Wissenschaftlich-ökonomischer Exzellenz, Förderlinie 2: LOEWE-Schwerpunkte.

HK 27.21 Wed 16:15 Redoutensaal

Thermal triggering of superconducting nanowires for a potential electron tagger at KATRIN — •Christian Gönner[1,2], Juan Navarro Arenas[1], Carsten Schuck[1], and Christian Weinheimer[2] — [1]Department for Quantum Technology, University of Muenster, Germany — [2]Institute for Nuclear Physics, University of Muenster, Germany

The neutrino mass experiment KATRIN has effectively collected 1000 days of tritium beta decay data, allowing to achieve a sensitivity for an upper limit on the electron neutrino mass of m $<$ 300 meV at 90% C.L.. After searching for sterile keV neutrinos with the TRISTAN detector at KATRIN a potential next generation experiment labeled KATRIN++ aims to go beyond this limit and probe the inverted mass ordering range down to neutrino masses m $<$ 50 meV. Besides the necessary development of an atomic tritium source, achieving the required sensitivity requires a new differential method with sub-eV energy resolution. This may be possible through direct time-of-flight spectroscopy of beta-decay electrons. This approach requires detection of electrons when entering the KATRIN spectrometer with minimal change of its energy. The feasibility of a detector based on superconducting nanowires as is already used in single-photon detectors (SNSPDs) is investigated. It could offer the required sensitivity and timing resolution by exploiting the disruption of the superconducting state, while a 2D membrane interaction medium for beta electrons, yielding quasi-discrete excitations to detect via the superconducting nanowires. This work is supported by BMFTR under contract number 05A23PMA.

HK 27.22 Wed 16:15 Redoutensaal

Feasibility studies for the measurement of collective phenomena with multiparticle azimuthal correlations and cumulants in CBM at FAIR — •Ante Bilandzic for the CBM-Collaboration — Technical University of Munich, TUM School of Natural Sciences, Department of Physics, Garching, Germany

In non-central heavy-ion collisions, the initial volume containing the strongly interacting nuclear matter is anisotropic in the coordinate space, due to the leading-order ellipsoidal geometry of non-central collisions. Multiple interactions within this anisotropic volume cause the anisotropy to be transferred from the coordinate space into the momentum space via the thermalized medium, resulting in the anisotropic flow phenomenon. Anisotropic flow is a sensitive probe of the equation of state and transport properties of produced matter, particularly of its shear viscosity.

In this contribution, the status of feasibility studies for measuring collective anisotropic flow with multiparticle azimuthal correlations and cumulants is presented for data-taking conditions in the CBM experiment at FAIR.

HK 27.23 Wed 16:15 Redoutensaal

Lifetime determination of first excited 0+ state of 52Cr — •Steffen Meyer[1], Thorsten Kröll[1], Anna-Lena Hartig[1], Martin von Tresckow[1], Ruxandra Borcea[2], Stefana Calinescu[2], Adina Coman[2], Cristian Costache[2], Irina Dinescu[2], Razvan Lica[2], Nicu Marginean[2], Constantin Mihai[2], Sorin Pascu[2], Sebastian Toma[2], Andrei Turturica[2], Kalin Gladnishki[3], Diana Kocheva[3], Georgi Rainovski[3], Margarita Efstathiou[4], and Pavlos Koseoglou[4] — [1]TU Darmstadt — [2]IFIN-HH, Magurele, Romania — [3]University of Sofia, Bulgaria — [4]University of Athens, Greece

For 52Cr a coexistence of a spherical ground and deformed excited 0+ state can be expected. A recent measurement for the the first excited 0+ state determined the E0/E2 branching ratio to the 0+ ground and the first 2+ state. In order to determine the absolute value of the E0 strength the lifetime of the first excited 0+ state is required.

To determine this lifetime a DSAM experiment was performed in 2024 using the ROSPHERE detector array at the tandem accelerator at IFIN-HH in Magurele, Romania. It was noted that the lifetime is outside the sensitivity range of DSAM. To follow up on this experiment a plunger measurement was performed in 2025 with the IFIN-HH plunger device. Now the lifetime will be determined using the RDDS method, which is suitable to determine lifetimes in the suspected range.

The current state of the analysis with preliminary values is presented.

This work is supported by EURO-LABS grant No. 101057511.

HK 27.24 Wed 16:15 Redoutensaal

Fast detector simulation with machine learning for ALICE 3 — •Nils Meurer — Goethe-Universität Frankfurt am Main

High-energy physics experiments rely on simulations to correct measured collision data for detector effects. Performing these simulations causes high demands in computing resources. Machine learning (ML) models are considered a fast alternative for traditional simulation approaches.

In this poster, a conceptual study of ML-based detector response models using simulation data of the future ALICE 3 experiment is presented. The tracking performance and reconstruction efficiency for inclusive charged particles are compared to the full detector simulation and different ML approaches are explored. The current status of the project will be presented.

Supported by BMFTR and the Helmholtz Association.

HK 27.25 Wed 16:15 Redoutensaal

ϕ Production at subthreshold energies at HADES — •Felix Fritzemeier — Max-von-Laue-Straße 1, 60438 Frankfurt am Main

HADES explores the region of the phase diagram of strongly interacting matter with the highest net-baryon densities accessible in heavy-ion collisions. In this regime, sub-threshold strangeness production is a particularly sensitive probe of the energy sharing inside the fireball. The ϕ-meson is especially interesting at deep subthreshold energies: the ϕ/K^- ratio is observed to increase towards lower $\sqrt{s_{NN}}$, and a successful reconstruction of ϕ mesons in Au+Au at $\sqrt{s_{NN}} = 2.24$ GeV (well below the free production threshold of $\sqrt{s_{NN}} = 2.90$ GeV) would provide the lowest-energy ϕ data point measured so far.

The analysis is highly challenging, but as a first step we achieve good agreement between same-event and mixed-event invariant-mass distributions, demonstrating control over the combinatorial background. This establishes a solid basis for further studies with the next-generation calibrated data set and an improved signal-to-background ratio through enhanced charged-kaon identification.

HK 27.26 Wed 16:15 Redoutensaal

Prospect of hypernuclei flow measurements with HADES in Ag+Ag collisions at $\sqrt{s_{NN}} = 2.55$ GeV — •Christopher Grimm for the HADES-Collaboration — Goethe-Universität, Frankfurt am Main

The hyperon-nucleon (Y-N) interaction plays an important role in the equation of state (EOS) of nuclear matter at high baryon densities, crucial for the understanding of neutron stars. To this end, the measurement of hypernuclei, in particular their collective behavior, offers unique insights. On earth we can produce hypernuclei in heavy-ion collisions and detect them with detectors like the High Acceptance Di-Electron Spectrometer (HADES) located at the GSI Helmholtz Centre for Heavy-Ion Research in Darmstadt, Germany. HADES combines a nearly complete azimuthal coverage with a high mass resolution and is therefore able to reconstruct hypernuclei in a significant number.

The HADES collaboration presented the first observation of ${}^{3}_{\Lambda}H$ and ${}^{4}_{\Lambda}H$ in Ag+Ag collisions at $\sqrt{s_{NN}} = 2.55$ GeV, emitted around mid-rapidity, yielding approximately 1000 ${}^{3}_{\Lambda}H$ and 4000 ${}^{4}_{\Lambda}H$ signal candidates. In this work we estimate if this multiplicity is sufficient to measure, for the first time, the directed (v_1) and elliptic (v_2) flow components of hypernuclei. Additionally, we present predictions for

the elliptic flow of hypernuclei (v_2) using a coalescence model.

HK 27.27 Wed 16:15 Redoutensaal

Hydrodynamic attractors in periodically driven weakly and strongly coupled systems — •Martin Vrdoljak[1], Sören Schlichting[2], Alexas Mazeliauskas[3], Louis Onwuka[4], Simon Schneider[5], and Toshali Mitra[6] — [1]Fakultät für Physik, Universität Bielefeld, D-33615 Bielefeld, Germany — [2]Fakultät für Physik, Universität Bielefeld, D-33615 Bielefeld, Germany — [3]Institut für Theoretische Physik, Universät Heidelberg, D-69120 Heidelberg, Germany — [4]Fakultät für Physik, Universität Bielefeld, D-33615 Bielefeld, Germany — [5]Fakultät für Physik, Universität Bielefeld, D-33615 Bielefeld, Germany — [6]Institut für Theoretische Physik, Universät Heidelberg, D-69120 Heidelberg, Germany

This research investigates equilibration processes and hydrodynamic reactions within systems subjected to periodic one-dimensional expansion. By employing a multi-faceted approach, incorporating strongly coupled holographic models, weakly coupled kinetic theory, and various hydrodynamic frameworks, we analyze the shear response to periodic driving across a range of amplitudes and frequencies. Unlike the standard monotonic Bjorken expansion, these systems do not converge toward thermal equilibrium or traditional Navier-Stokes behavior. In the regime of low drive frequencies and small amplitudes, we observe a universal late-time cyclic attractor that is consistent across different frameworks and accurately characterized by Müller-Israel-Stewart (MIS) theory. Conversely, high-amplitude driving triggers non-linear heating, which causes a continuous drift in both the fundamental system properties and the resulting attractor dynamics.

HK 27.28 Wed 16:15 Redoutensaal

Radon concentration monitoring for future liquid xenon radon removal systems — •Sakuntha Nirodana Prathapage, Lutz Althueser, Robert Braun, David Koke, Volker Hannen, Christian Huhmann, Ying-Ting Lin, Philipp Schulte, Patrick Unkhoff, Daniel Wenz, and Christian Weinheimer — University of Münster, Germany

In next generation dark matter experiments, such as XLZD, it is important to maintain a low radioactive background inside the detector as the dark matter events are extremely rare and mimicked by background signals. The intrinsic radioactive noble isotope Radon-222, which is continuously emanating from detector materials and its decay progenies contribute to an unshieldable background inside liquid xenon detectors. Continuous cryogenic distillation reduces the radon level by exploiting radon's lower volatility relative to xenon, thereby trapping it within the distillation column where it subsequently decays with a 3.8-day half-life. As a part of the LowRAD project an in-column radon detector is designed and constructed, that exploits the inherent enrichment of radon in the distillation column, which enhances the sensitivity for measuring low initial radon concentrations via scintillation light detection. This will allow the online monitoring of the radon concentration inside the distillation column and in turn the radon concentration of the whole experiment. This poster highlights the design of a 16-PMTs detector within the radon column to continuously monitor radon events in enriched xenon. This work is supported by the EU through the ERC AdG 'LowRad' (101055063).

HK 27.29 Wed 16:15 Redoutensaal

Tracking performance studies for the ALICE 3 detector using ACTS — •Maria Gabriela Gomes and Klaus Reygers for the ALICE Germany-Collaboration — Heidelberg University, Heidelberg, Germany

The ALICE 3 experiment is a proposed next-generation detector for heavy-ion collisions at the LHC, with a physics programme based on observables that require charged-particle tracking with high efficiency and a wide pseudorapidity coverage. In this presentation, simulation-based studies of the tracking performance of the ALICE 3 detector using the ACTS (A Common Tracking Software) framework are presented. The tracking geometry is based on silicon pixel sensors arranged in cylindrical layers and forward disks, allowing performance studies up to $^*\eta^*$=4. The results focus on the reconstruction efficiency and transverse momentum resolution, with particular emphasis on the performance of the outer tracking system and its impact on the reconstruction of low-momentum particles. The results are obtained from Monte Carlo simulations of heavy-ion collision events and are compared for different reconstruction configurations. These studies illustrate the capabilities and limitations of ACTS in the ALICE 3 environment and provide essential input for the optimisation of the detector layout and reconstruction strategies.

HK 27.30 Wed 16:15 Redoutensaal

Exploring the particle emission source in proton-proton collisions via collective expansion — •Sebastian Wind — Technical University of Munich

While the formation of Quark-Gluon Plasma (QGP) and associated collective behavior are well-established in heavy-ion collisions, their existence in proton-proton (pp) collisions remains unknown. Recent femtoscopic measurements have observed assumed signatures of collective behavior in pp collisions, challenging our understanding of small system collisions.

In this poster, we investigate the m_T-scaling behavior via collective expansion using the analytically solvable hydrodynamical Gubser solution. By comparing our predictions to ALICE collaboration data and contrasting them with free-streaming model calculations, we try to understand whether the observed m_T-scaling behavior can be related to the collective expansion. This work provides insights into potential QGP formation in small system collisions and the applicability of hydrodynamics in describing pp collisions.

HK 27.31 Wed 16:15 Redoutensaal

Development of Low-Cost and Compact Radiation Monitoring, Long-Range Data Transmission and Tracking Systems for Stratospheric Balloon Missions — •Nico Krug, Hans-Georg Zaunick, and Kai-Thomas Brinkmann — 2^{nd} Physics Institute Justus Liebig University Giessen

A cost-effective readout and monitoring system based on a Raspberry Pi and designed for integration into ongoing stratospheric balloon missions will be presented.

The Strato project consists of a series of stratospheric balloon experiments relying on commercial-off-the-shelf (COTS) components. It features a custom low-power printed circuit board (PCB) built around a Raspberry Pi Zero, incorporating the in-house developed MuonPi detector as well as commercial environmental sensors connected via a generic I^2C interface. The system uses the long-range LoRaWAN communication protocol to maintain contact throughout the entire flight for data transmission and tracking. It can be optionally extended with a telemetry beacon or a cellular communication module to ensure reliable message reception near ground level.

The poster will discuss the performance and robustness of the integrated system under the challenging conditions of near-space environments. Initial environmental and detector measurements as well as data transmission results obtained during past flights are presented and evaluated.

HK 27.32 Wed 16:15 Redoutensaal

Gamma rays in r-process sites — Lucas de Borba Flesch, •Almudena Arcones, Jan Kuske, and Giacomo Ricigliano — Institut für Kernphysik, Technische Universität Darmstadt, Schlossgartenstr. 2, Darmstadt 64289, Germany

The rapid neutron capture process (r-process) synthesizes heavy elements, but its astrophysical sites remain partially unconfirmed. Identifying delayed gamma-ray emission from unstable r-process nuclei is crucial for site verification. This study models time-dependent gamma-ray spectra from r-process nucleosynthesis in varied conditions, including those found in supernovae and neutron star mergers, using the WinNet nuclear reaction network. Focusing on long timescales relevant to galactic remnants, we identify key long-lived isotopes dominating the flux across all three r-process peaks, as well as certain actinide decay chains. We assess the observability of these lines by calculating light curves and Doppler broadened spectra against current and future detector sensitivities (e.g., NuStar and GammaTPC). A prominent high-energy gamma line (661.66 keV) is the most promising signature, potentially visible up to 500 years. Furthermore, we predict that low-energy emission lines should be detectable in existing supernova remnants. These results provide critical guidance for upcoming gamma-ray telescopes seeking to localize the astrophysical origin of heavy elements.