HK 54: Poster

Zeit: Donnerstag 16:30–19:00 Raum: Foyer Nordbau

HK 54.1 Do 16:30 Foyer Nordbau

Search for exotic states in $e^+e^- \to \gamma\eta'\pi^+\pi^-$ above 4 GeV with the BESIII experiment — •Frederik Weidner, Johannes Bloms, Nils Hüsken, Johannes Kellers, Alfons Khoukaz, and Marcel Rump — Westfälische Wilhelms-Universität Münster, Münster, Germany

In the search for states in the charmonium energy region many particles have been found which could not be described by conventional $c\bar{c}$ states. Examples for these charmonium-like states are the X(3872) with quantum numbers $J^{PC} = 1^{++}$ or the Y(4260) with $J^{PC} = 1^{--}$. To obtain information on the nature of theses states, it is essential to determine their decay patterns which might give hints on their internal structure.
With the BESIII detector charmonium and charmonium-like states with $J^{PC} = 1^{--}$ can be investigated directly via the annihilation of an electron and a positron provided by BEPCII. Based on a previous BESIII analysis on $J/\psi \to \gamma\eta'\pi^+\pi^-$, the process $e^+e^- \to \gamma\eta'\pi^+\pi^-$ is studied. For this purpose 15 datasets in the energy region of $4.0\,\mathrm{GeV} \leq \sqrt{s} \leq 4.6\,\mathrm{GeV}$, each with an integrated luminosity of $L_{\mathrm{int}} > 480\,\mathrm{pb}^{-1}$, are used. In addition to the search for charmonium(-like) contributions, the subsystem $\eta'\pi^+\pi^-$ gives access to resonances in the light hadron sector. Here, different resonances like the X(1835) have been reported, whose quantum mechanical nature has not yet been determined.
The current status of the analysis will be presented.

HK 54.2 Do 16:30 Foyer Nordbau

Analysis of $e^+e^- \to (\gamma/\pi^+\pi^-)J/\psi\pi^+\pi^-$ at BESIII — •Johannes Bloms, Nils Hüsken, Johannes Kellers, Alfons Khoukaz, Marcel Rump, and Frederik Weidner — Westfälische Wilhelms-Universität Münster, Münster, Germany

The region of the charmonium and charmonium-like spectrum around $3.9\,\mathrm{GeV}/c^2$ is a highly interesting one due to the observation of several unexpected states that do not fit the quark anti-quark assignment.
In 2006, the Belle Collaboration found a peak in the mass spectrum of $D\bar{D}$ mesons with $M = 3929 \pm 6\,\mathrm{MeV}/c^2$ and $\Gamma = 29 \pm 10\,\mathrm{MeV}$ called the $X(3930)$ with $J^{PC} = 2^{++}$. Hence, this state was assigned to the $\chi_{c2}(2P)$ charmonium state.
In 2008, the BaBar Collaboration observed a resonance in the $B \to J/\psi\omega K$ decay, which was later reported by Belle in the $\gamma\gamma \to \omega J/\psi$ process at $M = 3915^{\pm 3}_{\pm 2}\,\mathrm{MeV}/c^2$ and $\Gamma = 17^{\pm 10}_{\pm 3}\,\mathrm{MeV}$ and finally confirmed by BaBar with $J^{PC} = 0^{++}$.
However, recent studies have altered the previous situation. The scalar $X(3915)$ just might be the helicity-0 realisation of the tensor $X(3930)$. The latter one also might be the $s = 2$ partner of the $X(3872)$ which is assumed to be a $D\bar{D}^*$ bound state.
Since the $X(3915)$ was only observed in the $\omega J/\psi$ decay channel so far, other channels have to be searched for. The current status of the analysis will be discussed. This work has been supported by the Deutsche Forschungsgemeinschaft (DFG) through the Research Training Group "GRK 2149: Strong and Weak Interactions - from Hadrons to Dark Matter".

HK 54.3 Do 16:30 Foyer Nordbau

Extraction of $A^{LU}_{sin(\phi)}$ moments from the hard exclusive $\pi+$ channel off the unpolarized hydrogen target in a wide range of kinematics with CLAS at 5.5 GeV — •Stefan Diehl for the CLAS-Collaboration — University of Connecticut, Storrs, USA — Justus Liebig University Giessen, Giessen, Germany

For the first time, we have measured single beam spin asymmetries to extract $A^{LU}_{sin(\phi)}$ moments from the hard exclusive π^+ channel off the unpolarized hydrogen target in a wide range of kinematics from forward angles to backward angles in the center of mass frame. The measured moment in forward angles is known to be sensitive to generalized parton distributions (GPDs), while in backward angles, it is known to be sensitive to transition distribution amplitudes (TDAs). Our results clearly show that the sign of forward beam spin asymmetry measurements is positive whereas that of backward BSA measurements is negative, with the sign transition taking place around 90 degrees. By performing accurate measurements over a wide range of Q^2 and t, we can explore the transition from hadronic to partonic reaction mechanisms.

*The work is supported by DOE grant no: DE-FG02-04ER41309.

HK 54.4 Do 16:30 Foyer Nordbau

Proton-Xi interaction studied via the femtoscopy method in p-Pb collisions measured by ALICE — •Bernhard Hohlweger for the ALICE-Collaboration — TU Munich, Physics Department E62, ExcellenceCluster Universe Garching

Femtoscopic studies of Baryon-Baryon pairs opens a new era of studying two particle interactions at colliders. In particular, small collision systems prove to be particularly well suited to probe the short-ranged strong potentials. Experimental data are compared to local potentials with the newly developed Correlation Analysis Tool using the Schrödinger Equation (CATS). This analysis is based on the data measured by the ALICE Collaboration from p-Pb collisions at 5.02 TeV and the correlation function is obtained for pairs of protons and Ξs. For the first time, an attractive strong interaction is observed between the two particles is observed with a significance of more than 3σ. Lattice calculations by the HAL QCD to model the latter are validated and are used to explore the implications of including the newly found attractive p-Ξ interaction in the description of neutron stars.

HK 54.5 Do 16:30 Foyer Nordbau

Σ^0 Baryon Production in pp Collisions at $\sqrt{s} = 13$ TeV measured with the ALICE experiment — •Maximilian Korwieser, Andreas Mathis, and Laura Fabbietti for the ALICE-Collaboration — Technische Universität München, Physik Department E62, Excellence Cluster 'Universe', Garching

In the quest of understanding heavy neutron stars the equation of state for dense fermionic systems is investigated under the hypothesis of hyperons as additional degrees of freedom. A necessary condition to allow for a systematic exploration of this ansatz is an in depth understanding of the Hyperon-Nucleon interaction. In reality, however, for the majority of hyperons experimental constraints of the interaction are scarce. Complementing the canonical methods of studying these interactions via means of hypernuclei decays and scattering data, femtoscopy could allow to probe some interactions for the very first time.

As a first step, the production of the Σ^0 baryon at an unprecedented energy of $\sqrt{s} = 13\,\mathrm{TeV}$ in minimum bias and high multiplicity triggered pp collisions is measured. The Σ^0 baryon is reconstructed via the decay $\Sigma^0 \to \Lambda\gamma$ with subsequent decays $\Lambda \to p\pi$ in coincidence with a di-electron pair stemming from photon conversions employing the unique capability of the ALICE detector to measure low energy photons. The yield of the Σ^0 is compared to that of Λ baryons, which albeit sharing the quark content differ in isospin.

This research was supported by the DFG cluster of excellence 'Origin and Structure of the Universe' and the SFB 1258.

HK 54.6 Do 16:30 Foyer Nordbau

Measurements of Baryons Electro-magnetic From Factors at BESIII — •Samer Ahmed[1], Alaa Dbeyssi[1], Paul Larin[1], Frank Maas[1,2,3], Christoph Rosner[1], and Yadi Wang[1] — [1]Helmholtz-Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA Cluster of Excellence, Mainz, Germany

Electro-magnetic form factors are unique experimental tools not only in describing the internal structure of hadrons and testing QCD-inspired models but also in many areas of hadron and nuclear physics including charge-radii determination, parity-violating experiments, etc. They can be measured in space- and time-like regions via scattering and annihilation experiments, respectively. Form Factors in the time-like region are not as precisely measured as those measured in the space-like region, therefore different data samples being collected at Beijing Spectrometer III (BESIII) in the Beijing Electron Positron Collider II (BEPCII) are used for measuring time-like form factors which in turn leads to enhance the knowledge of hadrons structure. In this contribution, we report the recent results of measuring electromagnetic form factors of baryons at the BESIII experiment.

HK 54.7 Do 16:30 Foyer Nordbau

Investigating the decays $J/\psi \to \phi K^+K^-$ and $J/\psi \to \phi K^0_S K^0_S$ with the BESIII experiment — •Nils Hüsken, Johannes Bloms, Johannes Kellers, Alfons Khoukaz, Marcel Rump, and Frederik Weidner — Westfälische Wilhelms-Universität Münster, Münster, Deutschland

The decays of the lightest charmonium vector state, the J/ψ, into a

vector and two pseudoscalar particles present an ideal opportunity to study scalar and tensor resonances through their decays into a pair of pseudoscalar mesons. While gluon-rich radiative decays are exploited in the search for light glueballs, decays involving massive vector mesons like the ω or the ϕ offer some insight into the quark content of the scalar and tensor resonances. Specifically, decays of the type $J/\psi \to \phi K\bar{K}$ strongly couple to those resonances containing large $s\bar{s}$ components. In a previous analysis based on 58×10^6 J/ψ decays gathered with BESII, the $f_0(980)$, $f_0(1710)$ and the $f_2'(1525)$, among other intermediate resonances, were found to strongly contribute to the $J/\psi \to \phi K^+K^-$ decay. Assuming isospin symmetry, it is expected that decays involving either K^+K^- or $K_S^0K_S^0$ pairs only differ by a scaling factor. Using the world's largest dataset of roughly 5.9×10^9 J/ψ decays this assumption is explored by investigation of the decays $J/\psi \to \phi K^+K^-$ and $J/\psi \to \phi K_S^0K_S^0$ in a partial wave analysis. Resonant contributions to the $J/\psi \to \phi K\bar{K}$ decay amplitude can be investigated with increased statistical precision, while the simultaneous consideration of the two different decay channels allows sensitivity to isospin violating contributions. The current status of the analysis will be discussed.

HK 54.8 Do 16:30 Foyer Nordbau

Radiation hard environmental monitoring sensors inside the PANDA calorimeter — •Yannik Bettner, Kai-Thomas Brinkmann, Christopher Hahn, Markus Moritz, and Hans-Georg Zaunick for the PANDA-Collaboration — Justus-Liebig Universität Gießen, 2.Physikalisches Institut

The future PANDA experiment at FAIR will investigate quantum chromodynamics with unprecedented precision. Its target calorimeter is composed of lead tungstate crystals operating at -25°C. Therefore, an important aspect is the monitoring of temperature, relative humidity and pressure by suitable sensors, in particular close to the front-end electronic to avoid water or even ice formation. The BME280 and the SHT21 sensors were investigated through measurements assessing their performance in the planned setup. Accuracies with respect to the above observables and radiation resistance will be presented. This work was supported by BMBF and HIC for FAIR.

HK 54.9 Do 16:30 Foyer Nordbau

Extracting the Chiral Anomaly from Primakoff Reactions in COMPASS Data — •Dominik Steffen for the COMPASS-Collaboration — Physik-Department E18, Technische Universität München

The COMPASS collaboration at CERN has measured pion-photon scattering reactions via the Primakoff effect. In these reactions, high-energetic pions scatter off quasi-real photons stemming from the Coulomb field of nuclei with high atomic number. The single-π^0 production $\pi^-\gamma^{(*)} \to \pi^-\pi^0$ shows a strong contribution of the $\rho(770)$ resonance in the invariant-mass spectrum of the $\pi^-\pi^0$ system. On the low-mass side of the $\rho(770)$ contribution, close to the kinematic threshold, a tail is present in the spectrum which is not driven by a resonance but by the chiral anomaly: the non-resonant production of a π^0 is only possible by the point-like coupling of the photon to three pions defined by the respective coupling constant $F_{3\pi}$ called chiral anomaly. Previous extractions of the chiral anomaly date back to the Serpukhov experiment in 1987, are restricted to the kinematic threshold region, and extracted the chiral anomaly to a 10%-level. COMPASS measured the invariant mass spectrum including the $\rho(770)$-resonance which allows for more precise extraction of $F_{3\pi}$. The contribution will present the status of the analysis.

This work was supported by the BMBF, the DFG Cluster of Excellence "Origin and Structure of the Universe" (Exc 153), the Maier-Leibnitz-Laboratorium der Universität und der Technischen Universität München.

HK 54.10 Do 16:30 Foyer Nordbau

Antideuteron annihilation with the ALICE detector material — •Anisa Dashi and Lucas Cordova Nyffenegger for the ALICE-Collaboration — Technical University Munich, Germany

Low energy antideuterons could be a unique probe for indirect search of dark matter. This measurement is limited by our understanding of the interaction of antideuteron with matter. There is no scattering data available with any material and therefore we propose to study the interaction of antideuterons with the detector material of the ALICE detector at the Large Hadron Collider.

In this poster, the first steps of the analysis are presented, starting from the identification of primary (anti-)protons and (anti-)deuterons produced in pp collisions at 13 TeV (both Minimum Bias and High Multiplicity) and pPb collisions at 5 TeV. The indications for antiparticle absorption in the ALICE detector material are discussed on the basis of antiparticle/particle ratios and simulations using the GEANT4 toolkit.

HK 54.11 Do 16:30 Foyer Nordbau

Study of the effect of strong resonance decays on the emitting source in baryon-baryon femtoscopy with EPOS — •Gerhard Huber for the ALICE-Collaboration — TUM Munich

The femtoscopy technique has been used, in heavy-ions and pp collisions, to investigate both the emission source and the interaction potential between particle pairs by measuring their correlation function. For such studies, the emitting source has been generally assumed to have a Gaussian profile With the achievement of high precision femtoscopic data in pp collisions RUN 2 with ALICE and the improved knowledge of the underlying interaction it is possible to study the effect of strong resonances and collective effects on the profile source. Transport models as EPOS are tuned to describe the full dynamics of pp collisions at ALICE energies and are able to provide the space-time emitting source of the produced particles including resonances decay and rescattering which lead to non-gaussian contributions. This source can hence be used in femtoscopic analysis tools, as CATS, to evaluate the theoretical correlation function and compare it to experimental data.

In this poster we will present a detailed analysis on the effects of strong resonance decays on the emitting source, obtained with EPOS model simulations for pp collisions in ALICE. We will show the comparison of the resulting correlation function for different particle pairs, proton-proton and proton-Λ, with recent ALICE data in pp collisions at $\sqrt{s} = 13$ TeV.

HK 54.12 Do 16:30 Foyer Nordbau

Radiative corrections on $\bar{p}p \to e^+e^-$ with the PANDA experiment at FAIR — •Manuel Zambrana[1,2], Alaa Dbeyssi[1], Frank Maas[1,2,3], Egle Tomasi-Gustafsson[4], Yury M. Bystritskiy[5], Vladimir A. Zykunov[5], Samer Ahmed[1,2], Luigi Capozza[1], Phillip Grasemann[1,2], Oliver Noll[1,2], David Rodríguez Piñeiro[1], Sahra Wolff[1,2], and Iris Zimmermann[1,2] — [1]Helmholtz-Institut Mainz, Germany — [2]Institut für Kernphysik, Johannes Gutenberg-Universität, Mainz, Germany — [3]Prisma Cluster of Excellence, Mainz, Germany — [4]CEA, IRFU, SPhN, Saclay, France — [5]Joint Institute for Nuclear Research, Dubna, Russia

First order radiative corrections to $\bar{p}p \to e^+e^-$ have been calculated in the proton point-like approximation, including both virtual and real corrections, and interference effects. Soft and hard photon emission regimes are covered in the calculation. In the soft photon regime, divergences from singular virtual diagrams are cancelled in pairs with the corresponding ones from real diagrams. On the other hand, the regularisation of infrared divergences of the bremsstrahlung cross section is achieved by the use of a small photon mass as a parameter, which makes the calculation suitable in both the soft and hard photon regime. The calculated cross section is the basis of an event generator to be used in the framework of the future PANDA experiment, where the expected precision in the measurement of the timelike electromagnetic form factors of the proton will demand a next-to-leading order differential cross section.

HK 54.13 Do 16:30 Foyer Nordbau

Measurement of the $e^+e^- \to p\bar{p}$ cross section via initial state radiation at BESIII — •Alaa Dbeyssi[1], Samer Ahmed[1], Paul Larin[1], Dexu Lin[1], Frank Maas[1,2,3], Cristina Morales[1], Christoph Rosner[1], and Yadi Wang[1] for the BESIII-Collaboration — [1]Helmholtz- Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA Cluster of Excellence, Mainz, Germany

This contribution reports on the measurements of the $e^+e^- \to \bar{p}p$ cross section using the initial state radiation technique at the BESIII experiment in Beijing. Two independant analyses with detected and undetected initial state radiation photons have been perfomered. The two analyses are based on data sets, corresponding to an integrated luminosity of 7.4 fb^{-1}, collected at center of mass energies between 3.773 and 4.600 GeV. The results on the measured $e^+e^- \to \bar{p}p$ cross section and the proton form factors in the time-like region are presented.

HK 54.14 Do 16:30 Foyer Nordbau

Production of $\pi^0\eta$ pairs on nucleons and nuclei — •Vahe Sokhoyan for the A2-Collaboration — Universität Mainz, Institut für

Kernphysik

The A2 Collaboration performs a manifold research program using real photons in the Crystal Ball/TAPS experiment at the MAMI accelerator facility in Mainz. The experiments are carried out with high-intensity unpolarized, linearly or circularly polarized photon beams, and unpolarized or polarized targets. The Crystal Ball/TAPS setup provides almost complete coverage in solid angle and is well suited for the detection of multi-particle final states. In order to probe the internal structure of the nucleon, the spectrum of baryon resonances is studied via measurements of unpolarized cross-sections and various polarization observables in single and double meson photoproduction.

The new data presented in this poster provide the world's best statistical accuracy in the energy range from threshold to $E_\gamma = 1.45\,\mathrm{GeV}$ for the $\gamma p \to p\pi^0\eta$ reaction. The results obtained for the unpolarized cross section and beam helicity asymmetry are compared with exisiting models. Moreover, the possible modifications of the $D_{33}(1700)$ resonance in the nuclear medium were studied using the production of $\pi^0\eta$ pairs on heavier targets (carbon, aluminum, lead) and the beam helicity asymmetry has been extracted for these targets for the first time.

HK 54.15 Do 16:30 Foyer Nordbau

In-medium properties of Λ in π^--induced reactions at 1.7 GeV/c — •Steffen Maurus for the HADES-Collaboration — Physik Department, TUM, Garching, Germany — Excellence Cluster "Universe", Garching, Germany

The existence of a two solar mass neutron star, gives strong boundaries to the equation of state (EOS) and models describing such dense objects. While more experiments offer data which reduce the allowed phase space, the appearance of hyperons in the nucleus of the neutron star is still a discussed topic. For all these EOS, the hyperon-nucleon interaction plays a crucial role. Of particular interest is the Λ hyperon, which should appear first because it is the lightest hyperon. In 2014, the HADES collaboration measured $\pi^- + A$ (A = C, W) reactions at an incident secondary pion beam momentum of 1.7 GeV/c. Since the pion-nucleon cross section is rather sizeable, hyperon production takes place at the surface of the nucleus. This is an ideal system, since the path length of the produced hyperons through the nuclear matter is quite large. In our experimental approach we choose the exclusive channel of $\pi^- + p \to \Lambda + K^0$, in both nuclear environment. Using the GiBUU-transport code, we can test different scenarios involving different couplings of Λ with the normal nuclear environment in combination with K^0. One of these scenarios also includes for the first time a repulsive Σ^0 potential, predicted by the χ effective theory. We will report on the ongoing analysis and demonstrate our sensitivity to the different scenarios of the in-medium propagation.

Supported by the Excellence Cluster "Universe" and SFB 1258

HK 54.16 Do 16:30 Foyer Nordbau

Monte Carlo Templates in the Measurement of Neutral Pions with the ALICE EMCal — •Marvin Hemmer for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

A hot and dense medium, the so-called quark-gluon plasma (QGP), is believed to be created in ultra-relativistic heavy-ion collisions. The dedicated heavy-ion experiment ALICE at the LHC is designed to study the properties of the QGP. Measurements in pp collisions function as a baseline for the measurements in Pb-Pb collisions and further provide insights into the particle production processes. In the ALICE experiment, neutral pions (π^0) can be measured via their two-photon decay channel, using one of the calorimeters EMCal, DCal and PHOS.

In this poster, a study of the background subtraction in the π^0 measurement in pp collisions at $\sqrt{s} = 13$ TeV with the EMCal using Monte Carlo templates will be presented.

Supported by BMBF and the Helmholtz Association.

HK 54.17 Do 16:30 Foyer Nordbau

Transverse momentum spectra of charged particles in pp collisions at $\sqrt{s} = 5.02$ TeV — •Youssef El Mard Bouziani for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

The ALICE experiment at the LHC is designed to study the properties of the Quark-Gluon Plasma which is believed to be created in heavy-ion collisions. To distinguish medium effects from QCD vacuum effects a reference measurement of charge particle production in pp collisions is compared to the one in Pb-Pb collisions by means of the nuclear modification factor.

In previous measurements, charge particle production in pp collisions at $\sqrt{s} = 5.02$ TeV, recorded in 2015, was limited to a transverse momentum $p_T < 50$ GeV/c. With the much higher statistics of the 2017 data sets, a more precise analysis with higher p_T reach and finer p_T binning is possible.

In this poster, we present an analysis of the cross section of charge particle production in pp collisions at $\sqrt{s} = 5.02$ TeV based on these data sets.

Supported by BMBF and the Helmholtz Association.

HK 54.18 Do 16:30 Foyer Nordbau

Investigations on light (ant-)hypernuclei with ALICE at the LHC — •Janik Ditzel for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität, Frankfurt, Germany

At the Large Hadron Collider at CERN copious production of light (anti-)(hyper-)nuclei has been measured in Pb–Pb collisions by the ALICE Collaboration. The excellent performance of the Inner Tracking System, the Time Projection Chamber and the Time-Of-Flight detector of the ALICE apparatus provide a clear identification and separation of primary produced light (anti-)nuclei from secondaries. ALICE is currently starting its upgrade of the detector setup to cope with the interaction rate of 50 kHz in Pb–Pb collisions. This will lead to an even larger sample of light (anti-)(hyper-)nuclei. One object to study is the hypertriton - a bound state of a proton, a neutron and a Λ hyperon. It is reconstructed by reconstructing its decay products, e.g. in the charged two-body decay channel ${}^3_\Lambda\mathrm{H} \to {}^3\mathrm{He} + \pi^-$. In order to predict the yields of the (anti-)hypertriton and also (double-)(anti-)(hyper-)hypernuclei of mass number A=4 and A=5, it is essential to study the acceptance x efficiency in Monte Carlo simulations. The investiagted decay channel channels are: ${}^5_\Lambda\mathrm{He} \to {}^4\mathrm{He} + \mathrm{p} + \pi^-$, ${}^5_\Lambda\mathrm{He} \to {}^3\mathrm{He} + \mathrm{d} + \pi^-$, ${}^4_\Lambda\mathrm{He} \to {}^3\mathrm{He} + \mathrm{p} + \pi^-$, ${}^4_\Lambda\mathrm{H} \to {}^4\mathrm{He} + \pi^-$, ${}^4_\Lambda\mathrm{H} \to \mathrm{t} + \mathrm{p} + \pi^-$ and ${}^4_{\Lambda\Lambda}\mathrm{H} \to {}^4_\Lambda\mathrm{He} + \pi^-$. We will present the status of the investigations of these (double-)(anti-)(hyper-)hypernuclei.

HK 54.19 Do 16:30 Foyer Nordbau

Predictions for particle production in Ag+Ag collisions at $E_{kin} = 1.67A$ GeV from a hadronic transport approach — •Natey Kübler — Institute for Theoretical Physics, Goethe University, Frankfurt am Main, Germany

The production of particles in heavy ion collisions is of great importance to inspect the properties and dynamics of hadronic matter. As part of the HADES experiment at GSI Ag+Ag collisions at beam energies of 1.67A GeV are going to be performed in spring 2019. In the light of these experimental studies this work provides a theoretical prediction of the expected results. The hadronic transport approach SMASH (Simulating Many Accelerated Strongly-interacting Hadrons) is applied in order to predict the production of particles (protons, pions, kaons) and their respective distributions in phase space. In addition to the analysis of multiplicities and rapidity spectra, the mean transverse masses for different centrality classes are explored. In this context the hadronic spectra are confronted with earlier HADES results for Au+Au and C+C collisions in order to study the system size dependence. Furthermore, predictions for the invariant mass spectra of dielectron emission are provided.

HK 54.20 Do 16:30 Foyer Nordbau

Symmetry-plane correlations in flow analyses — •Marcel Lesch — Technical University of Munich, James-Franck-Str. 1, 85748 Garching, Germany

Multiparticle correlations build from azimuthal angles whose distributions were parameterized with the Fourier series expansion, depend generically on two distinct degrees of freedom: flow harmonics v_n and symmetry-planes Ψ_n. While analyses techniques for flow harmonics v_n have advanced over the past years, robust and unbiased techniques for analyzing symmetry-planes Ψ_n still need to be developed. In this poster we summarize the recent improvements in this direction.

HK 54.21 Do 16:30 Foyer Nordbau

A surface coalescence model for proton-nucleus collisions — •Ailec de la Caridad Bell Hechavarria — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster

A theoretical surface coalescence approach was developed to describe the production of light clusters (nuclei) in nucleon-nucleus reactions at moderate energies. A semi-classical Wigner distribution is used to describe the coalescence phase space. Calculated differential production

cross sections for $A \leq 4$ are compared to experimental data in p-Au collisions at a proton beam kinetic energy of 1.2 GeV. The model describes the data well for small emission angles and shows some differences to data for larger angles.

HK 54.22 Do 16:30 Foyer Nordbau

Monte Carlo studies of charged particle production in proton-proton collisions with ALICE — •Kristina Schmitt for the ALICE-Collaboration — Institut für Kernphysik, Goethe Universität, Frankfurt

The ALICE experiment at CERN-LHC is dedicated to study the properties of the so-called Quark-Gluon Plasma by investigating high-energy pp, p-Pb and Pb-Pb collisions. To obtain detector independent results, corrections facilitating Monte Carlo generators such as PYTHIA are indispensable. For the corrections it is crucial that the generators accurately describe the particle collisions. Apart from theoretical concepts, phenomenological models and input parameters are used in the simulations. These input parameters cannot be determined theoretically and need to be tuned to experimental measurements.

In this poster, we present a systematic analysis of transverse momentum (p_T) distributions of charged particles for different center of mass energies generated with different tunes of the PYTHIA8 Monte Carlo generator. A comparison of PYTHIA8-tunes employing moments of the p_T distributions per charged multiplicity interval will be discussed with particular focus on mapping physical aspects of the collisions to certain Monte Carlo tune parameters.

Supported by BMBF and the Helmholtz Association

HK 54.23 Do 16:30 Foyer Nordbau

Search for the hypertriton via its three-body-decay — •Holger Huck for the HADES-Collaboration — Institut für Kernphysik, Goethe-Uni, Frankfurt, Deutschland

We use Au+Au heavy ion collisions at 1.23A GeV to search for ${}^{3}_{\Lambda}H$-hypernuclei via it's three-body-decay in d, p and π^-. After particle identification, we apply topological restrictions based on the weak decay to find a signal in the invariant mass spectrum. The uncorrelated combinatorical background is estimated with the mixed-event-method. Because of the similar Λ-decay in p and π^-, there is a source of correlated background which has to be taken into account. With the help of simulation we introduce an invariant mass cut on combined p and π^- to seperate the correlated background from free Λ-hyperon from the ${}^{3}_{\Lambda}H$-sample.

HK 54.24 Do 16:30 Foyer Nordbau

Inelastic $(e, e'\gamma)$ scattering from ^{12}C and ^{92}Zr nuclei — •Doris Jakubassa-Amundsen[1] and Vladimir Ponomarev[2] — [1]Mathematisches Institut, LMU Muenchen — [2]Institut fuer Kernphysik, TU Darmstadt

At the S-DALINAC there are electron scattering experiments in preparation which will concentrate on low-lying nuclear excitations and their subsequent radiative decay for beam energies around 70-100 MeV. By allowing for a clear separation from the background of high-spin states, such coincidence experiments are aimed at investigating nuclear structure properties of low-lying 2^+ states of spin-zero nuclei. Within the QPM and the DWBA theory, we provide theoretical predictions for the excitation of the 2^+_1 and 2^+_2 states of ^{92}Zr, but we also discuss the 2^+_1 excitation of ^{12}C which was pioneered in an early experiment in 1984. Particular emphasis will be laid on the 2^+-subshell excitations, on the photon angular distributions and on the role of bremsstrahlung as a competing process to nuclear excitation and decay.

HK 54.25 Do 16:30 Foyer Nordbau

Fast-Timing lifetime measurement of ^{150}Gd — •J. Wiederhold[1], N. Pietralla[1], V. Werner[1], W. Witt[1,2], E. Aciksöz[1], N. Marginean[3], D. G. Ghita[3], R. Marginean[3], C. R. Nita[3], R. Lica[3], N. Florea[3], S. Pascu[3], D. Bucurescu[3], D. M. Filipescu[3], C. Mihai[3], and R. Mihai[3] — [1]Institut für Kernphysik, TU-Darmstadt, Deutschland — [2]GSI, Darmstadt, Deutschland — [3]IFIN-HH, Bucharest, Rumänien

The region of the nuclear chart around the neutron number $N = 90$ is an example for a rapid change of structure as a function of nucleon number, i.e. shape-phase transition from spherical to quadrupole-deformed nuclei. Several observables, e.g. $\rho^2(E0; 0^+_{gs} \rightarrow 0^+_2)$ are promising signatures for a quantum phase transition. The aim of the experiment was to determine the mean lifetime of the first-excited 0^+ state of ^{150}Gd and other lifetimes in the ps - ns range.

Excited states of ^{150}Gd were populated using the ^{147}Sm(α,n)^{150}Gd fusion-evaporation reaction. The ions were produced at the IFIN-HH in Bucharest, Magurele, and accelerated with the 9 MV FN-Tandem accelerator to a beam energy of 17.5 MeV. De-excitation γ rays were detected with the RoSphere detector array in a configuration with 14 HPGe detectors and 11 $LaBr_3$:Ce detectors for fast-timing applications. This work was supported by the DFG under the grants SFB 634 and SFB 1245 and the BMBF under the grant 05P15RDFN1 within the collaboration 05P15 NuSTAR R&D and 05P15(18)RDFN9.

HK 54.26 Do 16:30 Foyer Nordbau

Analysis of excited low-spin states in ^{164}Dy via (p,p'γ) — •F. Kluwig, A. Bohn, V. Everwyn, M. Färber, S. G. Pickstone, S. Prill, M. Weinert, J. Wilhelmy, and A. Zilges — University of Cologne, Institute for Nuclear Physics

Many nuclear-level lifetimes of low-spin states in the rare-earth nucleus ^{164}Dy are still unknown. Therefore a (p,p'γ) experiment was performed at the combined detector setup SONIC@HORUS in Cologne. SONIC@HORUS consists of the γ-ray detector array HORUS equipped with 14 HPGe detectors and the particle detection array SONIC with up to 12 Si (PIPS) detectors (as singles or ΔE-E telescopes) [1]. At SONIC@HORUS the Doppler-shift attenuation method (DSAM) using the p-γ-coincidence technique is an established method to determine lifetimes of excited nuclear levels in the sub-picosecond range [2,3]. Using DSAM three lifetimes of nuclear-levels in ^{164}Dy were determined, two of them for the first time. Additionally, several branching ratios were extracted. In this contribution, the results of the lifetime measurement as well as the extracted branching ratios will be presented.
Supported by DFG (ZI 510/9-1). AB is supported by the Bonn-Cologne Graduate School of Physics and Astronomy.
[1] S. G. Pickstone *et al.*, NIM A **875** (2017) 104.
[2] M. Spieker *et al.*, Phys. Rev. C **97** (2018) 054319.
[3] A. Hennig *et al.*, NIM A **794** (2015) 171.

HK 54.27 Do 16:30 Foyer Nordbau

Study of γ-spectroscopy of neutron-rich cerium isotopes after fission — •U. Ahmed[1], P. Koseoglou[1,2], V. Werner[1], N. Pietralla[1], J. Wiederhold[1], M. Thürauf[1], M. Jentschel[3], A. Blanc[3], G. de France[4], U. Köster[3], S. Leoni[5], P. Mutti[3], G. Simpson[6], T. Soldner[3], C. Ur[7,8], W. Urban[3,9], S. Ilieva[1], R. B. Cakirili[10], J. Jolie[11], T. Kröll[1], J.-M. Régis[11], and N. Saed-Samii[11] — [1]IKP - TU Darmstadt, Germany — [2]GSI, Germany — [3]ILL, France — [4]GANIL, France — [5]Universita di Milano, Italy — [6]LPSC, Université Grenoble Alpes, France — [7]Universita di Padova, Italy — [8]ELI-NP, Romania — [9]University of Warsaw, Poland — [10]MPIK Heidelberg, Germany — [11]IKP Universität zu Köln, Germany

^{148}Ce and ^{150}Ce isotopes are located in an area of the nuclear chart known for a quantum shape phase transition from spherical to deformed nuclei [1]. The energies of the band-heads of the β- and γ-vibrations are valuable indicators for the shape of a nucleus.
At the Institute Laue-Langevin, neutron-rich cerium isotopes were produced by cold-neutron induced fission of ^{235}U. The prompt γ-rays were measured with the EXILL spectrometer [2], comprised of 8 HPGe clover detectors. The data were analysed using γ-spectroscopy coincidence techniques, e.g. including coincidence conditions with fission partners. These techniques were explored and applied to the search for the 0^+_2-states of ^{148}Ce and ^{150}Ce. Supported by BMBF under Grant No. 05P15RDFN1.
[1] R. F. Casten, Nature Physics 2, 811 (2006).
[2] M. Jentschel *et al.*, JINST 12, P11003 (2017).

HK 54.28 Do 16:30 Foyer Nordbau

Nucleon-Nucleon correlations in SMASH — •Damjan Mitrovic[1,2], Alba Soto Ontoso[2,3,4], and Jan Hammelmann[1,2] — [1]Frankfurt Institue for Advanced Studies, Frankfurt, Germany — [2]Goethe-Universität, Frankfurt, Germany — [3]Brookhaven National Laboratory, Upton, NY, USA — [4]Universidad de Granada, Granada, Spain

In this work, the effect of short range correlations at the nucleonic level are investigated within a hadronic transport approach, SMASH (Simulating Many Accelerated Strongly-interacting Hadrons). Most transport approaches in the literature model the initial nuclei by sampling random positions for the nucleons according to Woods-Saxon distribution, that is, neglecting short-range correlations. Our goal is to improve the traditional approach by implementing in SMASH the nuclear configurations computed my M. Alvioli et al. that include realistic nucleon-nucleon correlations. The impact of NN correlations is studied in the

context of the initial state of a heavy ion collision. Further, the eccentricity and its fluctuations are investigated, which are highly relevant for the study of collective phenomena in heavy ion collisions.

HK 54.29 Do 16:30 Foyer Nordbau

Field Emission Electron Source and Diagnostics for the PUMA Ion Trap — •Jonas Fischer, Noritsugu Nakatsuka, and Alexandre Obertelli — TU Darmstadt, Darmstadt, Germany

The goal of the PUMA (antiProton Unstable Matter Annihilation) experiment is to investigate the density distribution of short-lived nuclei. This is to be achieved by the annihilation of antiprotons, after capture, with the outermost part of the nucleus' density distribution. To make this measurement possible one has to transport antiprotons to a radioactive ion beam facility. PUMA will be placed at the ELENA and ISOLDE facilities at CERN. For the storage of the $\bar{p}$ and the collision with the nuclei a cryogenic Penning trap is being built. Approximately one billion antiprotons will be stored in the trap and cooled by sympathetic electron cooling. In this work the design of a cryogenic field emission electron gun is detailed. Also the development of destructive and non-destructive diagnostics for antiproton cloud shape, charge and position is described.

HK 54.30 Do 16:30 Foyer Nordbau

Stability Simulations of the $\bar{p}$ Cloud in the PUMA Trap — •Alexander Schmidt, Alexandre Obertelli, Oliver Boine-Frankenheim, and Noritsugu Nakastuka — TU Darmstadt, Darmstadt, Germany

The PUMA (antiProton Unstable Matter Annihilation) project aims at the investigation of the nucleon density tails of short-lived nuclei by the means of nucleon-antiproton annihilations. These antiprotons will be trapped in a Penning trap at the ELENA facility of CERN and afterwards transported to ISOLDE for measurements. Due to the small amount of exotic nuclei with large neutron or proton excess that can be produced at ISOLDE, as many $\bar{p}$ as possible need to trapped to get sufficient statistics. Such large numbers of antiprotons in the trap volume imply repulsive internal space charge fields which need to be compensated. The present work aims at the simulation of the $\bar{p}$ cloud in the trap and the behaviour of the plasma during sympathetic cooling by electrons.

HK 54.31 Do 16:30 Foyer Nordbau

One-nucleon removal from ^{14}O at 100 MeV/nucleon with a thin hydrogen target — •Thomas Pohl, Yelei Sun, and Alexandre Obertelli — TU Darmstadt, Darmstadt, Germany

One-nucleon removal reactions at intermediate energies are an important tool for nuclear structure studies, but the reaction mechanism is still not fully understood. One unexplained phenomenon is the asymmetric parallel momentum distribution (PMD) of the residual nucleus observed in some occasions [1-3]. Recently, theoretical calculations with the distorted-wave impulse approximation (DWIA) have predicted a large asymmetric PMD for *(p,pN)* reactions of ^{14}O [4]. The asymmetric shape of the PMD is found to be due to the phase volume effect and the attractive potential of the residues and the outgoing nucleons. Quantitative comparison with experimental data is essential to verify the predicted effects and establish a basis for further spectroscopic factor studies at medium energy facilities. Therefore we performed an experiment with ^{14}O beam at 100 MeV/nucleon impinging on a 2-mm thick solid hydrogen target at RIBF at RIKEN. The momentum of the knockout residues were measured by the SAMURAI spectrometer. On the proposed poster, details of the experiment and the current status of the analysis will be presented.

[1] A. Gade *et al.*, Phys. Rev. C 71, 051301(R)(2005).
[2] K.L. Yurkewicz *et al.*, Phys. Rev. C 74, 024304 (2006).
[3] F. Flavigny *et al.*, Phys. Rev. Lett. 108, 252501 (2012).
[4] K. Ogata *et al.*, J. Phys. Rev. C 92, 034616 (2015).

HK 54.32 Do 16:30 Foyer Nordbau

Plasma screening effects in laser-generated plasmas — •David Elsing, Adriana Pálffy, and Yuanbin Wu — Max-Planck-Institut für Kernphysik, Heidelberg

In hot and dense astrophysical plasmas, the reaction rate of nuclear reactions is modified by the plasma screening. Direct measurements of this effect in the laboratory, which would be vital for our understanding of nuclear processes occuring in stellar nucleosynthesis, remain until today very challenging. Upcoming petawatt laser facilities, such as the Extreme Light Infrastructure, could render such measurements possible, allowing the comparison of several theoretical models to experimental data [1].

Here we investigate theoretically four plasma screening models with focus on the quantum mechanical model [2] which we extend to low temperatures and laboratory conditions. The reactions considered are ^{13}C$(\alpha,\mathrm{n})^{16}$O, which is important in advanced stellar phases and in the s-process, as well as ^{7}Li$(\mathrm{d},\alpha)\alpha$, which is relevant in the big bang nucleosynthesis. Our results show a rather large discrepancy between the investigated models at low temperatures and high densities.

[1] Y. Wu and A. Pálffy, Astrophys. J. 838, 55 (2017).
[2] A. V. Gruzinov and J. N. Bahcall, Astrophys. J. 504, 996 (1998).

HK 54.33 Do 16:30 Foyer Nordbau

Simple Geant4 atmosphere model for cosmic shower simulations and comparison to other simulation frameworks. — •Sven Peter, Hans-Georg Zaunick, and Kai-Thomas Brinkmann — II. Physikalisches Institut, JLU Gießen, Deutschland

Earth is hit by high energy cosmic rays emitted by various sources. This radiation includes protons and light nuclei with energies up to 10^{20} eV. Reactions of these particles with nuclei in the atmosphere lead to the formation of a particle shower consisting of hadrons and electromagnetic particles. Being known as one of the components of these showers, muons are used for testing scintillation detectors. In order to investigate some properties of cosmic showers, a simple atmosphere model was implemented in Geant4. The distribution of particle species, energy spectrum and shower geometry were examined varying primary particle energies and entry angles. A comparison of the results to results of other frameworks and measured data is presented.

HK 54.34 Do 16:30 Foyer Nordbau

Observations of charge sign dependent modulation of galactic cosmic rays during four successive solar cycles — •Bernd Heber, Marlon Koeberle, Patrick Kuehl, and Johannes Marquardt — Christian-Albrechts-Universität, 24118 Kiel, Germany

The intensity of galactic cosmic rays (GCRs) is modulated as they traverse the turbulent magnetic field embedded in the solar wind. These particles are scattered by irregularities in the interplanetary magnetic field and undergo convection and adiabatic deceleration in the expanding solar wind. The large-scale heliospheric magnetic field leads to gradient and curvature drifts leading to charge sign dependent variations. In this contribution we investigate the time period from 1980 to 2017, including two and one solar minima during the A < 0 and A > 0 solar magnetic epoch as well as four solar magnetic field polarity reversals. Observations are taken from instruments aboard IMP-8, ISEE-3, Ulysses as well as from PAMELA and AMS-02. While the latter two separate between particle and its corresponding anti-particle the instruments utilized in this study prioir to PAMELA cannot. In order to compare these measurements with each other we utilize here the electron plus positron flux. Since the proton to antiproton ratio is smaller than 10^{-3} the contribution of antiprotons is neglected. The measurements by the Kiel Electron Telescope aboard Ulysses are altered by the variation along the orbit of the spacecraft that needs to be taken into account.

HK 54.35 Do 16:30 Foyer Nordbau

Neutron monitor measurements on the German research vessel Polarstern — •Bernd Heber[1], Dennis Galsdorf[1], Konstantin Herbst[1], Michael Walter[2], Du Toit Strauss[3], and Carolin Schwerdt[3] — [1]Christian-Albrechts-Universität, 24118 Kiel, Germany — [2]Deutsches Elektronen-Synchrotron DESY, D-15738 Zeuthen — [3]Center for Space Research, North-West University, Potchefstroom 2520, South Africa

Neutron Monitors (NM) and Muon Telescopes (MT) are ground-based devices to measure the variation of galactic cosmic ray intensities. Since their measurements are influenced by the variable Earth magnetic field and the atmospheric conditions close to its position a detailed knowledge of the instrument sensitivity with geomagnetic latitude (rigidity) and atmospheric pressure is essential. The rigidity dependence is determined experimentally by utilizing several so called latitude scans. The Polarstern is currently one of the most sophisticated polar research vessels in the world that spends almost 310 days a year at sea. Between November and March it usually sails to and around the waters of the Antarctic, while the northern summer months are spent in Arctic waters. In other words the vessel scans twice a year the rigidity range below the atmospheric threshold and above 10 GV. One Mini NM, constructed by the North West University campus Potchefstroom, and

one MT, constructed by DESY Zeuthen, are measuring the variation of galactic cosmic rays with respect to the position of the vessel. In this presentation the measurements of the NM over the last years are presented.

HK 54.36 Do 16:30 Foyer Nordbau

Strahldiagnose mit bewegten Minikameras in der Vakuumkammer eines Magneten — •Adem Ates, Heiko Niebuhr und Ulrich Ratzinger — Institut für Angewandte Physik, Goethe Universität, Frankfurt am Main

Am Teststand des Figure-8 Projektes am IAP an der Goethe Universität Frankfurt wird die Injektion von Protonenstrahlen zwischen zwei Toroidmagneten sowie der gleichzeitige Transport von Protonen entlang der beiden Toroidsegmente untersucht. Hauptaugenmerk bei diesem Beitrag liegt in der Entwicklung eines optischen Detektionssystems für das Figure-8 Projekt. Dazu wird ein eingebettetes optisches System entwickelt, welches das ionenstrahlinduzierte Restgasleuchten aufnimmt. Dieses besteht aus einer CMOS Einplatinenkamera und einem Einplatinencomputer. Die Kameras werden in den Vakuumrezipienten des Magneten auf einer Schiene integriert. Der Beitrag zeigt erste Aufnahmen von einem Ionenstrahl entlang der Strahlbahn, der durch ein 30° Toroidsegment mit einem Kreisbogen von 680mm transportiert wird. Die Kalibrierung der Kameras ermöglicht es, den Strahlschwerpunkt und die Halbachsen des transversalen Strahlprofils in realen Koordinaten zu rekonstruieren.

HK 54.37 Do 16:30 Foyer Nordbau

Upgrade des Darmstadt High Intensity Photon Setup am S-DALINAC — •M. Schilling, V. Werner, O. Papst und N. Pietralla — IKP, TU Darmstadt

Für hochpräzise Kernresonanzfluoreszenzexperimente (KRF) am Darmstadt High Intensity Photon Setup (DHIPS) ist der Untergrund momentan ein limitierender Faktor. Eine der Quellen des nichtresonanten Untergrundes ist Streuung von γ-Strahlung an Luft. Erfahrungen vom γ^3-Aufbau an der High Intensity γ-ray Source (HIγS) haben gezeigt, dass ein evakuiertes Strahlrohr den nicht-resonanten Untergrund um mindestens eine Größenordnung reduzieren kann [1].

Des Weiteren ist die genaue Kenntnis der Endpunktsenergie bei KRF-Experimenten mit Bremstrahlung, wichtig um eine exakte Kalibrierung des Photonenflusses zu ermöglichen. Aus diesem Grund wird eine Online-Messung für den Endpunkt des Bremsstrahlungsspektrums aufgebaut, damit dieser während des gesamten Experiments überwacht werden kann. Das Strahlprofil wird durch den photoneninduzierte Aufbruch des Deuterons vermessen und schließlich für die genaue Analyse des Photonenflusses benutzt.

Durch diese Maßnahmen ist das Potenzial vorhanden, die Qualität und die Präzision der Experimente an DHIPS zu steigern. Der Status und die ersten Ergebnisse des Upgrades von DHIPS werden vorgestellt.

[1] B. Löher et al., Nucl. Instr. Meth. Phys. Res. A 723, 136 (2013)

* gefördert durch die DFG im Rahmen des SFB 1245

HK 54.38 Do 16:30 Foyer Nordbau

Verbesserung der Energie- und Zeitauflösung des QCLAM-Spektrometers am S-DALINAC — •A. D'Alessio, J. Birkhan, P. von Neumann-Cosel, N. Pietralla, M. Singer und V. Werner — Institut für Kernphysik, TU Darmstadt

Im erfolgten Upgrade des Superconducting-DArmstadt-LINear-ACcelerator (S-DALINAC) wurde dieser mit einer dritten Rezirkulationsstrahlführung ausgestattet. Im Zuge dieser Umbauarbeiten wurde ebenfalls ein Strahlscraper in der Strahlführung installiert. Hierdurch hat sich die Energieauflösung verbessert. Es wurden Energieauflösungen von $< 5 \cdot 10^{-4}$ gemessen. In dieser Konfiguration ist das QCLAM-Magnet-Spektrometer das limitierende Element in der Energieauflösung bei zukünftigen Koinzidenzexperimenten mit großer Akzeptanz. Aus diesem Grund wird das Detektorsystem des Spektrometers überarbeitet.

Durch Umstellung des Gasgemisches, welches für die Vieldraht-Driftkammern des Detektorsystem genutzt wird, erreicht man eine geringere Diffusion der Elektronenlawine innerhalb des Gases und somit eine bessere Zeitauflösung der Driftzeiten. Nach ausführlichen Tests der momentan genutzten Vieldrahtdriftkammern hat sich gezeigt, dass Nachbesserungsbedarf in mehreren Punkten besteht. Dies kann nicht ohne weiteres durch Reparaturen oder einfache Änderungen des Aufbaus geschehen. Ein neues Design der Driftkammern wird in diesem Beitrag vorgestellt.

Gefördert wird diese Arbeit durch das Graduiertenlolleg GRK 2128 „AccelencE “und den Sonderfoschungsbereich SFB 1245.

HK 54.39 Do 16:30 Foyer Nordbau

Test eines Flüssig-Heliumtargets für Elektronenstreuexperimente — •M. Hilcker, T. Klaus, N. Pietralla, M. Singer, G. Steinhilber und P. von Neumann-Cosel — Institut für Kernphysik, TU Darmstadt

Am Institut für Kernphysik der TU Darmstadt werden mittels hochauflösender, inelastischer Elektronenstreuung Untersuchungen der Kernstruktur bei niedrigen Impulsüberträgen durchgeführt. Das QClam-Spektrometer, eines der beiden großen Magnetspektrometer am S-DALINAC Elektronenbeschleuniger, dient der Bestimmung des Impulses der gestreuten Elektronen.

Im Rahmen des Sonderforschungsbereich 1245 „Nuclei: From Fundamental Interaction to Structure and Stars“ ist ein Elektronenstreuexperiment bei niedrigem Impulsübertrag zur Untersuchung des ersten angeregten 0^+ Zustandes in ^{4}He geplant, da bisherige Experimente [1] stark von aktuellen „ab initio“ Rechnungen im Rahmen der chiralen EFT [2] abweichen. Um eine ausreichend gute Statistik der Messdaten in annehmbarer Messzeit erhalten zu können, ist die Verwendung von suprafluidem Helium als Targetmaterial notwendig. Ein geeigneter Aufbau inklusive Heliumkryostat und einer dazu passenden Streukammer, werden vorgestellt und erste Ergebnisse des bereits durchgeführten Testexperiments gezeigt.

[1] T. Walcher, Phys. Lett. B **31**, 442 (1970).
[2] S. Bacca, N. Barnea, W. Leidemann, and G. Orlandini, Phys. Rev. Lett. **110**, 042503 (2013).

Gefördert durch die DFG im Rahmen des SFB 1245.

HK 54.40 Do 16:30 Foyer Nordbau

Towards a nuclear clock: Neutralization of $^{229(m)}$Th ions in carbon foils — •Ines Amersdorffer, Benedict Seiferle, Lars von der Wense, and Peter G. Thirolf — LMU Munich, Garching, Germany.

It has been proposed that a nuclear clock could potentially outperform today's most precise atomic clocks, using a nuclear transition instead of an atomic shell transition. ^{229}Th possesses an isomeric state (^{229m}Th) with an extraordinary low energy which makes it the only candidate for a nuclear clock. However, precise knowledge of the nuclear transition energy is required. For a measurement of this energy via the internal conversion decay which only occurs in neutral ^{229m}Th, thorium ions are neutralized by charge exchange in a carbon foil. In the presented measurements, the particles exiting the carbon foil are analyzed. The results can be used to perform a background-free measurement of the nuclear transition energy.

This work was supported by DFG Grant No. Th956/3-2, by the EU's Horizon 2020 research and innovation program under grant agreement 664732 "nuClock".

HK 54.41 Do 16:30 Foyer Nordbau

Spatial Resolution-Induced Restraints for $\gamma\gamma/\gamma$ Experiments with AGATA — •P. Napiralla[1,2], D. Brugnara[4], H. Egger[3], A. Goasduff[4], P. R. John[1], N. Pietralla[1], and J. J. Valiente-Dobón[4] — [1]Institut für Kernphysik, TU Darmstadt, Darmstadt, Germany — [2]GSI, Darmstadt, Germany — [3]AG Numerik und Wissenschaftliches Rechnen, TU Darmstadt, Darmstadt, Germany — [4]INFN LNL, Legnaro, Italy

The competitive double γ-decay ($\gamma\gamma/\gamma$) is a strongly suppressed second order decay process in nuclear physics. Its first observation in the nucleus ^{137}Ba [1] was performed using five $LaBr_3$:Ce scintillation detectors in a star-shaped configuration which severely limits the measurement of angular correlations between emitted γ rays. Using the Advanced GAmma Tracking Array AGATA, a detailed resolution of angular correlations could be possible. However, due the limited time resolution of AGATA's high-purity germanium detectors, the experimental analysis has to fully rely on γ-ray tracking methods.

Based on a *Geant4* simulation, a technical feasibility study of $\gamma\gamma/\gamma$ experiments with AGATA using ^{137}Ba as an example case is presented. The impact of AGATA's metrological restraints is emphasized.

This work was supported by the German BMBF under grant Nos. 05P15RDFN1 and 05P15(18)RDFN9, HGS-HIRe and HIC for FAIR.

[1] C.Walz *et al.*, Nature 526 (2015) 406-409.

HK 54.42 Do 16:30 Foyer Nordbau

A photoelectric-effect-based field calibration system for the Time Projection Chamber at the CBELSA/TAPS experiment — •Dimitri Schaab, Fabian Metzger, Markus Ball, Reinhard Beck, and Bernhard Ketzer for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik,

Bonn

The performance of a Time Projection Chamber (TPC) relies on a very good knowledge of the electric field inside the sensitive volume. This is crucial since deviations from a perfectly homogeneous drift field deteriorate the spatial resolution of the detector if they remain uncorrected. Reasons for these deviations are, on the one hand, static imperfections of the detector structure and, on the other hand, dynamic changes of the space charge inside the sensitive volume which mainly originate from fluctuations of the event rate.
For the CBELSA-TPC, a calibration system based on the one of the T2K experiment is being set up. With the help of a UV-laser, electrons are released via the photoelectric effect at well-known positions on the cathode. By the electric field, these electrons are guided towards the readout plane and show the integrated spatial distortions.
The UV laser light is introduced into the TPC from the anode side through fibre bundles. Care was taken to achieve a uniform illumination of the cathode surface.
The poster will present the optical setup and a small TPC, which has been designed and built in order to test the calibration system.

HK 54.43 Do 16:30 Foyer Nordbau

Entwicklung eines neuen (e,e'x)-Datenaufnahmesystems für das QCLAM-Spektrometer am S-DALINAC * — •M. Singer, A. D'Alessio, P. von Neumann-Cosel und M. Spall — Institut für Kernphysik, TU Darmstadt

Am supraleitenden Elektronenbeschleuniger S-DALINAC wurde für das hochauflösende QCLAM-Magnetspektrometer ein neues Datenaufnahmesystem für (e,e'x)-Elektronenstreuexperimente entwickelt. Das Detektorsystem des Spektrometers besteht aus drei Driftkammern zur Elektronbahnbestimmung und einem Triggerdetektor. Die Driftkammersignale werden durch ein VME-basiertes System ausgelesen und mit in einem dazu in Koinzidenz geschalteten Datenaufnahmesystem für LaBr- und Neutronendetektoren verbunden. Gezeigt wird das Konzept der Datenaufnahme, sowie das speziell darauf zugeschnittene Online-Monitoring-Programm QCLAMon. Die Funktionsfähigkeit und mögliche Erweiterungen des Systems werden anhand von (e,e')- und (e,e'γ)-Messergebnissen aus einer aktuellen Strahlzeit diskutiert.

* Gefördert durch die DFG im Rahmen des SFB 1245.

HK 54.44 Do 16:30 Foyer Nordbau

Monte-Carlo-Studien zum Prototypen des Endcap Disc DIRC für PANDA — Simon Bodenschatz, Lisa Brück, Michael Düren, Erik Etzelmüller, Klaus Föhl, Avetik Hayrapetyan, •Jan Hofmann, Sophie Kegel, Ilknur Köseoğlu, Jhonathan Pereira de Lira, Mustafa Schmidt und Marc Strickert für die PANDA-Kollaboration — Justus Liebig-Universität Gießen, II.Physikalisches Institut, Gießen

Im Rahmen der Entwicklung des Endcap Disc DIRC Detektors für das PANDA Experiment wurde ein DIRC-Prototyp bei einer Teststrahlzeit im Sommer 2018 getestet. Zur Verbesserung der Winkelauflösung soll die chromatische Dispersion der detektierten Photonen durch verschiedene optische Filter eingeschränkt werden. Das Leistungsvermögen des Prototyps wurde mit Monte-Carlo-Simulationen getestet und untersucht, wie verschiedene Konfigurationen aus optischen Filtern und MCP-PMTs dieses beeinflusst. Dabei wurden Impuls, Auftreffwinkel und Position des Teilchenstrahls zum Radiator variiert und der Einfluss auf die performance-kritischen Größen - Photonenausbeute, Winkelauflösung und Separation Power - untersucht.

HK 54.45 Do 16:30 Foyer Nordbau

Reflectivity and storage properties of ultra-nanocrystalline diamond films for ultracold neutrons — •Andreas Frei[1], Peter Geltenbort[2], Christopher Geppert[3], Christian Gorges[3], Petra Müschenborn[1], Hadwig Sternschulte[4], Stefan Wenisch[1], Stephan Wlokka[1], and Nicolas Wöhrl[5] — [1]Heinz Maier-Leibnitz-Zentrum, Technische Universität München — [2]Institut Laue-Langevin, Grenoble — [3]Institut für Kernchemie, Universität Mainz — [4]Fakultät für Geistes- und Naturwissenschaften, Hochschule Augsburg — [5]Fakultät für Physik, Universität Duisburg-Essen

Ultra-cold neutrons (UCN) have kinetic energies of < 300 neV and are used for high precision experiments. UCN have to be transported in guides under specular reflection on the walls to such experiments over long distances with low losses.

Diamond is an excellent reflector for UCN due to the high atom density in combination with a large bound coherent scattering length and low loss cross sections. Ultra-nanocrystalline diamond (UNCD) films with a very low surface roughness independent of the film thickness can be grown on various 3D shaped substrates by chemical vapour deposition. Therefore they are promising candidates for UCN reflecting layers.

In this work we present studies of the UCN reflection and storage properties of UNCD thin films grown on planar 6" Si substrates. The influence of the UNCD film morphology and composition on the reflectity and storage properties will be discussed.

HK 54.46 Do 16:30 Foyer Nordbau

CALIFA detector test using the ^{208}Pb(p,2p) reaction in direct kinematics — •Anna-Lena Hartig, Thorsten Kröll, Alexander Ignatov, Han-Bum Rhee, and Christian Sürder for the R3B-Collaboration — Institut für Kernphysik, TU Darmstadt, Germany

The 4π-calorimeter CALIFA is one of the major detectors of the R3B-experiment at the upcoming Facility for Antiproton and Ion Research (FAIR) in Darmstadt. CALIFA consists of 2464 CsI(Tl) crystals and 96 Phoswich detectors providing high efficiency, good energy resolution of 5 % for γ-rays at 662 keV and a large dynamic range, enabling a simultaneous measurement of γ-rays of E $>$ 100 keV and light charged particles of up to E $<$ 700 MeV. Besides the assembling of a CALIFA detector unit, this contribution will show first results of a test experiment with 192 CALIFA detectors at the Bronowice Cyclotron Center in November 2017 in Kraków where the ^{280}Pb(p,2p) reaction was studied in direct kinematics with a proton beam of 200 MeV.

Supported by BMBF Project (05P15RDFN1,05P19RDFN1) and HIC for FAIR.

HK 54.47 Do 16:30 Foyer Nordbau

Investigation of the response of the CALIFA demonstrator — •Han-Bum Rhee, Anna-Lena Hartig, Thorsten Kröll, and Christian Sürder for the R3B-Collaboration — Institut für Kern-Physik, Darmstadt, Germany

CALIFA is a calorimeter and spectrometer that aims to detect γ-rays and light charged particles. It is a part of the R3B experiment at GSI and the future FAIR facility. CALIFA is divided into a cylindrical barrel and a forward end-cap. The CALIFA barrel consist of CsI(Tl) scintillating crystals, which are individually read out with Avalanche Photodiodes(APDs). The functional units for the CALIFA demonstrator are called PETALs containing 64 crystals each. The PETALs are built using the same construction procedures, materials and elements as for CALIFA.
In this work, I have tested a PETAL in the laboratory of the institute of nuclear physics(IKP), TU Darmstadt. The basic properties of the detection unit, the event reconstruction and particle identification have been checked. In addition the measurement programs have been simulated to be compared to the data. R3BRoot, which is an analysis and simulation toolkit of the R3B experiment, was used. Several measurements were done, for which different sources were used: an AmBe source(γ-rays, fast neutrons), thermalized neutrons (high-energy γ rays via capture process) and muons from cosmic rays.

This work is supported by German BMBF(05P15DFN1,05P19RDFN1), HIC for FAIR and GSI-TU Darmstadt cooperation contract.

HK 54.48 Do 16:30 Foyer Nordbau

The first Barrel Slice for the Electromagnetic Calorimeter of the $\overline{\text{P}}$ANDA experiment — •Markus Moritz, Hans-Georg Zaunick, and Kai-Thomas Brinkmann for the PANDA-Collaboration — II. Physikalisches Institut, Justus-Liebig-Universität, Gießen

The electromagnetic target calorimeter (EMC) of the future $\overline{\text{P}}$ANDA detector has the challenging aim to detect high energy photons with excellent energy resolution from 15 GeV down to a few tens of MeV. To reach this goal, improved $PbW0_4$ scintillator crystals, cooled down to $-25°$C have been chosen. They provide a fast decay time for highest count rates, short radiation length for compactness, improved light yield for lowest thresholds and excellent radiation hardness. The target calorimeter itself is divided into a barrel and two endcaps. The individual crystal will be read out with two precisely matched large area avalanche photo sensors (APD). In the very inner part of the forward endcap, vacuum phototetrodes will be used instead. In this poster the construction and assembly status of the first slice of the barrel will be presented. This includes for example the assembly of detector subunits, mechanical support structure, the cooling system, optical monitoring system and front end electronics. This project is supported by the BMBF, GSI and HIC for FAIR.

HK 54.49 Do 16:30 Foyer Nordbau

$^{12}C^{3+}$ fine structure transitions measured with a detection system for forward emitted XUV photons at the ESR — •Daniel Winzen[1], Michael Bussmann[2], Axel Buss[1], Christian Egelkamp[1], Lewin Eidam[3], Volker Hannen[1], Zhongkui Huang[4], Daniel Kiefer[3], Sebastian Klammes[3], Thomas Kühl[5,6,7], Markus Loeser[2], Xinwen Ma[4], Wilfried Nörtershäuser[3], Hans-Werner Ortjohann[1], Rodolfo Sánchez[3,5], Mathias Siebold[2], Thomas Stöhlker[5,6,8], Johannes Ullmann[3,6,8], Jonas Vollbrecht[1], Thomas Walther[3], Hanbing Wang[4], Christian Weinheimer[1], and Danyal Winters[5] — [1]WWU Münster — [2]HZDR Dresden — [3]TU Darmstadt — [4]IMP Lanzhou — [5]GSI Darmstadt — [6]HI Jena — [7]JGU Mainz — [8]FSU Jena

The Institut für Kernphysik in Münster developed an XUV-photon detection system for laser spectroscopy measurements at the ESR (GSI/FAIR). In a test beam time for laser cooling with $^{12}C^{3+}$-ions at $\beta \approx 0.47$, the $^2S_{1/2} - {}^2P_{1/2}$ and the $^2S_{1/2} - {}^2P_{3/2}$ transitions were investigated to commission the system. The detector features a movable cathode plate which is brought into the vicinity of the beam to collect forward emitted Doppler shifted photons ($\lambda_{lab} \approx 93$ nm). These photons produce mostly low energetic (<3 eV) secondary electrons which are electromagnetically guided onto an MCP detector. The working principle of the detector as well as the results of the beam time will be presented. This work is supported by BMBF under contract number 05P15PMFAA. D. Winzen thanks HGS-Hire for FAIR for funding his scholarship.

HK 54.50 Do 16:30 Foyer Nordbau

Untersuchung systematischer Effekte für das P2-Experiment — •Sebastian Baunack[1], Dominik Becker[1], Kathrin Imai[1], Frank Maas[1,2,3], David Rodriguez Pineiro[2], Rahima Krini[1], Malte Wilfert[1] und Boxing Gou[2] für die P2-Kollaboration — [1]Johannes Gutenberg-Universität Mainz — [2]Helmholtz-Institut Mainz — [3]PRISMA Cluster of Excellence, Mainz

Die P2-Kollaboration bereitet derzeit eine Messung des schwachen Mischungswinkels $\sin^2\theta_w$ mittels elastischer Elektron-Proton-Streuung vor. Die angestrebte relative Genauigkeit beträgt 0.15% und ist damit vergleichbar mit den derzeit genauesten Messungen am Z-Pol. Diese Messung bei niedrigem Impulsübertrag ist sensitiv für Physik jenseits des Standardmodells. Das Experiment soll am neu zu errichtenden Elektronenbeschleuniger MESA in Mainz durchgeführt werden.

Die erreichbare Präzision hängt sowohl von der zu erreichenden statistischen Unsicherheit in der Messung der paritätsverletzenden Asymmetrie als auch von zahlreichen systematischen Effekten ab. Im Beitrag werden verschiedene Quellen systematischer Unsicherheiten untersucht und eine Abschätzung ihrer Beiträge zur Gesamtunsicherheit vorgestellt.

HK 54.51 Do 16:30 Foyer Nordbau

Implementation of an automated position and tension determination of wires in MWPCs — •Murat Esen for the CBM-Collaboration — Institut für Kernphysik, Uni Frankfurt

The Compressed Baryonic Matter (CBM) experiment at the Facility for Antiproton and Ion Research (FAIR) will be dedicated to the exploration of the QCD phase-diagram in the region of high netbaryon densities. As part of the experimental setup a Transition Radiation Detector (TRD) will deliver tracking and particle identification information. Each layer of the TRD is composed of several Multi-Wire Proportional Chambers (MWPC). In order to guarantee the desired performance a constant gas gain and thus a constant electromagnetic field is required. Therefore it must be ensured that the values for tension and position of all wires fulfill a certain accuracy. Otherwise, an inhomogeneous electric field would develop in the chambers and the gas gain and thus the measured data would deteriorate. Since more than 200 chambers have to be built and each is equipped with up to 400 wires, a manual check of the tension and position of each wire could hardly be carried out. For this reason the so-called Wire-Test-Device (WTD), which was originally developed for the construction of the ALICE-TRD, was adapted and further improved. The purpose of this device is to carry out the tension and position measurement automatically. Its working principle, especially the newly written program code of its software, will be presented in this poster.

HK 54.52 Do 16:30 Foyer Nordbau

An electroluminescence tracking TPC for high rates — •Markus Ball, Kevin Dojan, Bernhard Ketzer, and Konstantin Muenning — Helmholtz Institut für Strahlen und Kernphysik, Universität Bonn

Time Projection Chambers (TPC) are used both for tracking of charged particles and the search for rare events. The requirements for these two fields of applications are rather different. A high drift velocity, low diffusion and small distortions of the drifting electrons are mandatory for tracking, especially at high rates. Distortions are primarily induced by ions drifting back from the avalanche multiplication region into the drift region. This ion backflow could be completely eliminated by exploiting a different concept for signal amplification based on excitation instead of ionization, i.e. electroluminescence. The excited noble gas atoms form dimers, which emit photons with a gas-specific wavelength, which is typically in the deep UV region. This concept is widely used in rare-event TPCs. We plan to adapt it to develop a zero-ion-backflow tracking TPC for future applications in high-rate experiments. This requires the addition of a quench gas in order to achieve higher drift velocities and limit the diffusion. The quencher, however, also reduces the light yield. The goal is to find a gas mixture, which is suitable for tracking and amplification by electroluminescence. GARFIELD++ simulations provide some guidance, but the final validation has to come from experiment. The poster will present simulation results and a demonstrator setup, which are currently being assembled. This work was supported by BMBF.

HK 54.53 Do 16:30 Foyer Nordbau

Investigation of ion backflow and energy resolution in four GEM systems with Ar-CO2 for the Upgrade of the ALICE TPC — •Christoph Weidlich for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

The Time Projection Chamber (TPC) of the ALICE experiment will be upgraded during the LHC long shutdown 2 (2019-2021). The upgrade includes a replacement of the MWPC-based readout chambers by stacks of Gas Electron Multipliers (GEMs). Two key parameters of the GEMs are ion backflow (IBF) and energy resolution. These parameters are anti-correlated and an ideal working point where both parameters are as low as possible has to be achieved. The phase-space of these parameters has already been measured in detail in the baseline gas mixture Ne-CO2-N2 (90-10-5).

During run1 and run2 operation the MWPCs showed instabilities with the Ne-based gas mixture which were not present in an Ar-based mixture. Such instabilities are not expected with a GEM-based readout. However, for completeness IBF and energy resolution were investigated in Ar-CO2 (90-10). Here we present the results of these measurements.

Supported by BMBF and the Helmholtz Association.

HK 54.54 Do 16:30 Foyer Nordbau

Entwicklung, Aufbau und Optimierung eines Droplet-Targets für kryogene Gase — •Christina Westphälinger, Daniel Bonaventura, Laura Habers, Catharina Hargens und Alfons Khoukaz — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, 48149 Münster, Germany

Droplet-Targets bieten für eine Vielzahl von Beschleunigerexperimenten in der Hadronen-, Leptonen- und Laserphysik wie beispielsweise PANDA, MAGIX@MESA oder CryoFlash eine interessante Alternative zu den bisher bestehenden Gas- und Cluster-Jet Targets. Hierbei sind die Interaktionspunkte wegen der festen Droplet-Frequenz und kleinen lokalen Ausdehnung der Streuzentren individuell rekonstruierbar. Gleichzeitig ist eine hohe Dichte und damit verbunden eine hohe Ereigniswahrscheinlichkeit vorhanden. Dazu wird mittels mikrometerfeiner Düsen und i.d.R. kryogen verflüssigten Gasen ein laminarer Flüssigkeitsstrahl aus z.B. Argon oder Wasserstoff erzeugt, der aufgrund des Rayleigh-Kriteriums bei einer festen Oszillationsfrequenz und entsprechenden Temperatur- und Druckparametern im Vakuum zu Tröpfchen aufbricht und einen kontinuierlichen, periodischen Tröfpchenstrahl liefert. Die Einstellung der exakten Parameter zur Erzeugung eines über Wochen langzeitstabilen Droplet-Strahls, sowie die Erstellung einer geeigneten Düse bieten dabei die größten Herausforderungen, weshalb hierzu an der Universität Münster systematische Studien begonnen wurden. Der aktuelle Stand des Targetaufbaus sowie der Dropleterzeugung werden im Folgenden aufgezeigt und diskutiert.

HK 54.55 Do 16:30 Foyer Nordbau

Front-end signal path of the P2 experiment at MESA — •Rahima Krini[1], Sebastian Baunack[1], Dominik Becker[1], Michael Gericke[2], Frank Maas[1,3,4], and David Rodriguez Pineiro[3] for the P2-Collaboration — [1]Institute for Nuclear Physics, Mainz, Germany — [2]University of Manitoba, Canada — [3]Helmholtz

Institute Mainz, Germany — [4]PRISMA Cluster of Excellence, Mainz

The MESA accelerator is planned to be built in the next years in the Institute for Nuclear Physics in Mainz. In this research area, the parity-violating asymmetry in the elastic electron-proton scattering was never measured with the precision that the P2 experiment is aiming for. Therefore, many technical challenges have to be solved.

For measuring asymmetries in the order of $\mathcal{O}(10^{-9})$ the front-end signal path at the P2 experiment has to be well thought out. The helicity of the polarized electron beam will be flipped with a reversal rate of f=2 kHz. The bandwidth of the signal path and the sampling rate of the ADC need to be adjusted accordingly. A joint read-out electronics for the P2 experiment in Mainz and for the Moeller experiment at the Jefferson Laboratory is under development by collaborators of the University of Manitoba. The I-U preamplifier prototype with a bandwidth of 1 MHz is already designed and first tests can be performed.

HK 54.56 Do 16:30 Foyer Nordbau

A Detection System for Laser Spectroscopy Experiments at CRYRING@ESR — •A. Buss[1], Z. Andelkovic[2], V. Hannen[1], C. Huhmann[1], K. Mohr[3], W. Nörtershäuser[3], H. Ortjohann[1], R. Sánchez[2], T. Tüshaus[1], and C. Weinheimer[1] — [1]Institut für Kernphysik, WWU Münster — [2]GSI, Darmstadt — [3]Institut für Kernphysik, TU Darmstadt

In order to enable laser spectroscopy experiments at CRYRING, a new general purpose fluorescence detector has been developed at the University of Münster. The design allows detection from ultraviolet to the near infrared regime. Among others, the transition $3^2S_{1/2} \rightarrow 3^2P_{1/2}$ at 280 nm of Mg^+ is of special interest as it enables tests for polarization conservation of the stored ion beams at CRYRING. The detector consists of an elliptical mirror chamber and a set of three interchangable PMTs. The geometry has been optimized in Geant4 simulation for enhanced detection of fluorescence photons, originating in one focus point of the ellipse. After installation in spring 2018, a test beamtime with D^+ ions was conducted to check the detector's performance. Though these ions were completely ionized, and thus no observable transition existed, excitations of residual gas produced a detactable signal. Experimental background rates from laser stray light and residual gas excitation were measured and allowed to extract the bunch structure of the stored ion beam. Results from the PMT calibration and from the test beam time will be presented.

This project is funded by BMBF, contract number: 05P15PMFAA.

HK 54.57 Do 16:30 Foyer Nordbau

Weiterentwicklung eines automatisierten Messverfahrens zur Qualifikation der Fokussierelemente für den PANDA Endcap Disc DIRC — •Sophie Kegel, Simon Bodenschatz, Lisa Brück, Michael Düren, Erik Etzelmüller, Klaus Föhl, Avetik Hayrapetyan, Jan Niclas Hofmann, Ilknur Köseoğlu, Jhonathan Pereira de Lira, Mustafa Schmidt und Marc Strickert für die PANDA-Kollaboration — Justus Liebig-Universität Gießen, II.Physikalisches Institut, Gießen

Mit Hilfe des Endcap Disc DIRCs sollen im PANDA Experiment Pionen und Kaonen anhand ihres Cherenkov-Winkels identifiziert werden. Zweck der FELs (Focusing ELements) ist es dabei, die Winkelinformation der Cherenkov-Photonen in eine Ortsinformation umzuwandeln, um diese auswerten zu können. Da die Qualität der Fokussierung durch die FELs die Auflösung beeinflusst, wurde ein Messstand entwickelt, mit dem die Vermessung und Qualitätssicherung der FELs weitgehend automatisiert erfolgen kann.

HK 54.58 Do 16:30 Foyer Nordbau

The new Neutron Depth Profiling Instrument N4DP at the MLZ — •Lukas Werner[1], Markus Trunk[1], Roman Gernhäuser[1], Ralph Gilles[2], Bastian Märkisch[1], and Zsolt Revay[2] — [1]Technische Universität München, Physikdepartment — [2]Technische Universität München, Heinz-Maier-Leibnitz Zentrum

In neutron depth profiling (NDP), an applied nuclear physics technique, neutrons are captured by nuclei such as ^{6}Li or ^{10}B. The resulting compound nucleus then decays into two charged particles (an alpha and triton particle in the case of Lithium). Due to conservation of four-momentum, these particles are emitted back to back, at fixed energies. If the two charged particles are produced within a sample they will lose energy while propagating out of it. In NDP, this energy loss is correlated to the depth where this reaction takes place. At the Heinz-Maier-Leibnitz Zentrum in Garching a new instrument with a high neutron flux of up to 5^{10} n/sec cm^2 and a depth resolution down to 5 nm is currently being set up for a long series of measurements in very different fields of physics.

HK 54.59 Do 16:30 Foyer Nordbau

Construction of a new Cluster-Jet Target for the CryoFlash Experiment — •Christian Mannweiler, Lukas Lessmann, Daniel Bonaventura, Silke Grieser, and Alfons Khoukaz — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster 48149 Münster, Germany

The Cryoflash-Experiment employs the ARCTURUS high power laser system of the University of Düsseldorf and a cluster-jet target designed and constructed by the University of Münster to study laser-plasma interactions. These experiments investigate the acceleration of particles, especially protons, for use in compact tabletop accelerators as well as the generation of ultrashort intense X-ray pulses for pump-probe experiments. The clusters are created by pressing cooled gas through a Laval nozzle, resulting in a continuous jet of small particles with approximately solid density, each the size of tens of nanometres, thus combining the strengths of both gas- as well as foil-targets. Previous experiments with a first cluster-jet target have already demonstrated a remarkable stability concerning the spectra of obtained accelerated protons. The newly developed target, its design optimised using the experience gained from the previous target, will enable greater Proton fluxes and energies. Furthermore, it will become possible to characterise clusters created with liquid hydrogen with the help of Mie-scattering techniques. The design as well as first test- and experimental results will be presented and discussed.

HK 54.60 Do 16:30 Foyer Nordbau

Das $\overline{\text{P}}$ANDA Cluster-Jet Target an COSY mit einem optischen Monitorsystem für Clusterstrahldichten — •Daniel Klostermann, Benjamin Hetz, Daniel Bonaventura, Silke Grieser und Alfons Khoukaz — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, 48161 Münster

Das interne Cluster-Jet Target für das zukünftige $\overline{\text{P}}$ANDA Experiment wurde im Sommer 2018 am COSY Beschleuniger in Jülich installiert, nachdem es bereits Jahre zuverlässig in Münster betrieben wurde. In annähernd $\overline{\text{P}}$ANDA-Geometrie, sowie mit den finalen Vakuum- und Strahlüberwachungssystemen wurden die ersten Messungen erfolgreich durchgeführt und bereits die anvisierten HESR-Targetdichten von mehr als $10^{15} \frac{\text{Atome}}{\text{cm}^2}$ erzielt. Eine wichtige Rolle bei der Überwachung der Targetstrahldichte spielt ein optisches Monitorsystem des finalen Cluster-Jet Targets, welches an der WWU Münster entwickelt und getestet worden ist. Hierbei wird der Clusterstrahl von einem Laser beleuchtet und die Intensität des Streulichts kann in direkten Zusammenhang zur Targetdichte gebracht werden, was eine zerstörungsfreie Überwachung der Clusterstrahldichte ohne Beeinflussung des Experiments ermöglicht. Zudem können durch das optische Monitorsystem die Targeteigenschaften mit hoher Zeitauflösung überwacht werden. Hiermit lassen sich Aussagen über die Stabilität des Cluster-Jet Targets treffen. Vorgestellt werden der $\overline{\text{P}}$ANDA-Aufbau an COSY und Kennzahlen der letzten COSY-Strahlzeit des $\overline{\text{P}}$ANDA-Targets, sowie die zerstörungsfreie Dichtebestimmung der Targetdichte mithilfe des optischen Monitorsystems.

HK 54.61 Do 16:30 Foyer Nordbau

Sensor Quality Assurance for the CBM Silicon Tracking System — •Iaroslav Panasenko — Physikalisches Institut, Universität Tübingen, Germany — Institute for Nuclear Research, Kiev, Ukraine

The CBM experiment at FAIR will investigate the properties of nucler matter at extreme conditions created in ultrarelativistic heavy-ion collisions. Its core detector — the Silicon Tracking System (STS) — will determine the momentum of charged particles from beam-target interactions. The high track multiplicity (up to 700 within the detector aperture) as well as stringent requirements to the momentum resolution ($\sim$2% at $p \geq 1 GeV/c$) require a system with high channel granularity and low material budget.

The STS will be constructed of about 900 double-sided silicon microstrip sensors with a total area of $\sim$4 m^2. CBM microstrip sensors have 1024 readout strips per side with 58 μm pitch, thus, resulting in about 1.8 million channels. The fraction of the defective strips per sensor has to be less than 1.5 % to guarantee the expected STS performance. The mission of quality assurance (QA) is to ensure that the manufactured sensors correspond to the CBM specifications. For this purpose, dedicated equipment including a custom-built probe station has been set up in the clean room at the Tübingen University. Advanced QA methods were developed and successfully applied for the

CBM microstrip sensors. Results of the characterization of the prototype microstrip sensors CBM06 will be presented.

Work supported by BMBF under grant 05P12VTFCE.

HK 54.62 Do 16:30 Foyer Nordbau

Radiation damage and recovery studies with lead tungstate scintillators of the $\overline{\text{P}}$ANDA Target Calorimeter — •Pavel Orsich[1], Kai-Thomas Brinkmann[1], Valera Dormenev[1], Rainer-Willi Novotny[1], Hans-Georg Zaunick[1], Till Kuske[1], Vitaly Mechinski[2], and Mikhail Korzhik[2] for the PANDA-Collaboration — [1]2nd Physics Institute JLU, Giessen, Germany — [2]Institute for Nucleans Problems BSU, Minsk, Belarus

The $\overline{\text{P}}$ANDA detector is a new detector system which will be installed at the international FAIR accelerator facility (Darmstadt, Germany) with a wide research program. One of the major detector components will be the Electromagnetic Target Calorimeter (EMC) based on second generation lead tungstate scintillation crystals (PWO-II). The operating temperature of the PANDA EMC was chosen as -25^o C.

The consequence of radiation damage in PWO is the degradation of optical transmittance. This leads to light collection losses and results in the degradation of energy resolution of the EMC in general. In particular, the impact is critical at low temperatures, whose spontaneous recovery processes are suppressed or frozen. To minimize radiation induced damages during operation, a LED based stimulated recovery is foreseen.

A experimental setup to study stimulated recovery was developed. Test results of radiation damage annealing via stimulated recovery will be shown.

This project is supported by BMBF and HIC for FAIR.

HK 54.63 Do 16:30 Foyer Nordbau

Performance of a monolithic scintillator studied under realistic conditions in a Compton Camera system — •Giovanni Paolo Vinci, Tim Binder, Silvia Liprandi, Maria Kawula, Katia Parodi, and Peter G. Thirolf — Ludwig-Maximilans-Universität München

The Compton Camera (CC) prototype under commissioning in Garching aims at providing an online beam range verification tool using the prompt γ rays emitted by excited nuclei during the irradiation of tissue with a particle beam. Currently, we are working with 50x50x30 mm^3 monolithic $LaBr_3$:Ce or $CeBr_3$ scintillators as CC absorber component, read out by multianode photomultipliers. These configurations show excellent energy, spatial and timing resolutions.

In realistic conditions, however, the Compton electrons, generated in the scatterer, consisting of 6 layers of 0.5 mm thick double-sided Silicon strip detectors (DSSSD), may reach the scintillator, since the thickness of the DSSSD array is not enough to stop them. So far, the determination of the photon interaction position in the absorber crystal was studied only with individual collimated γ sources. Yet, it remains to be explored how the resolution is affected by either an electron and the Compton scattered photon or two photons impinging simultaneously onto the crystal. This work will present a study of these two scenarios using simultaneous irradiation by a collimated ^{204}Tl electron source and collimated ^{137}Cs or ^{60}Co photon sources.

This work is supported by the DFG Cluster of Excellence Munich Centre for Advanced Photonics (MAP).

HK 54.64 Do 16:30 Foyer Nordbau

A Monitoring System for the CALIFA Calorimeter — Roman Gernhäuser, Benjamin Heiss, •Philipp Klenze, and Lukas Ponnath for the R3B-Collaboration — Physik Department, Technische Universität München

Using more than 2600 scintillator crystals, the CALIFA calorimeter is a key component of the R^{3}B experiment.

Time stamped events of independent detector units are a state of the art way to collect large event rates from high granularity detection systems. In CALIFA we combine a local time stamping with a widely used *White Rabbit* protocol implemented in the precision time distribution system at the upcoming Facility for Antiproton and Ion Research (FAIR) in Darmstadt.

Large buffers of event data are collected asynchronously from different subsystems and especially for online monitoring have to be sorted and combined to physics events in real time.

We will present an event builder concept which allows to monitor and compensate regular drifts between different clock domains. This is being used during FAIR the phase-0 campaign for the first time to provide online QA for the full system. We will especially discuss the interplay of rate capability and error recovery essential for scalable system operations.

HK 54.65 Do 16:30 Foyer Nordbau

A test stand for the characterization of a GEM-TPC with cosmic muons — •Wael alkakhi, dimitri schaab, jonathan ottnad, markus ball, philipp bielefeldt, and bernhard ketzer for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen und Kernphysik, Bonn, Germany

We are setting up a cosmic-ray triggering and tracking telescope for the characterization of a compact GEM(Gas Electron Multiplier)-TPC (Time Projection Chamber).Such a GEM-TPC is currently being developed for a future upgrade of the CBELSA/TAPS experiment at the ELSA facility in Bonn.The setup consists of a trigger hodoscope made up of two planes of four scintillator panels, each read out on both sides by photomultiplier tubes, and four $10\times10\,\text{cm}^2$ GEM detectors with 2D strip readout on a movable platform.Applying a programmable trigger matrix to the hodoscopes signals,we make a coarse selection of cosmic tracks through the TPC. The GEM detectors deliver two space points on each side of the TPC and thus provide an precise external track reference for TPC resolution studies. The poster will describe the setup, the characterization of the trigger hodoscope, and the characterization of the GEM detectors, and the readout of the GEM detectors.

HK 54.66 Do 16:30 Foyer Nordbau

Performance of the BGO-OD experiment at ELSA* — •Björn-Eric Reitz for the BGO-OD-Collaboration — Physikalisches Institut, Universität Bonn

Since many years meson photoproduction has been used to explore the excitation structure of the nucleon and the degrees of freedom involved. With the pentaquark baryon candidates and the XYZ mesons recently discovered in the charmed quark sector, the question arises whether similar structures are present in the lighter strange quark sector as well. To investigate this issue experimentally, it is crucial to have access to a region of low momentum exchange with the baryonic final states.

The BGO-OD experiment at the ELSA accelerator facility of the University of Bonn is ideally suited for such experiments. It allows photoproduction of forward going kaons with ground or excited state hyperons remaining with little momentum transfer. Non-strange reaction channels can be explored detecting forward going protons, e.g. in η' photoproduction. The experiment is comprised of a forward magnetic spectrometer combined with a central crystal calorimeter.

This poster will present an overview of the general detector performance together with preliminary results of various analyses.

*Supported by DFG (PN 50165297).

HK 54.67 Do 16:30 Foyer Nordbau

Status of the LED based gain monitoring system for CALIFA CALorimeter for In flight detection of γ rays and high energy charged pArticles — •Christian Sürder, Anna-Lena Hartig, Alexander Ignatov, Thorsten Kröll, Noël Merkel, and Han-Bum Rhee for the R3B-Collaboration — Institut für Kernphysik, TU Darmstadt, Germany

CALIFA is part of the R^{3}B setup of the future FAIR facility. The quality of the scintillator crystal is important for the setup perfomance. To check for the crystal's light output uniformity a scanner was developed, using a collimated ^{137}Cs source. The scanners features and future improvements will be presented. To be able to monitor changes of the crystal quality during experiments, a LED based gain monitoring system was developed. It produces a reliable signal to monitor the crystal quality over time. The peak position can be chosen via the light pulse intensity, produced by the LED. The LED system was attached to 64 CsI+APD detector units and was tested within the CALIFA demonstrator. The current development status and the further improvements will be presented. This work is supported by the German BMBF (05P15RDFN1 and 05P19RDFN1), GSI-TU Darmstadt cooperation contract and HIC for FAIR.

HK 54.68 Do 16:30 Foyer Nordbau

Testing prototype Micron X5 silicon-strip detectors for the R3B setup — •Sonja Storck[1], Ina Syndikus[1,2], Dominic Rossi[1], and Thomas Aumann[1,2] for the R3B-Collaboration — [1]Institut für Kernphysik, TU Darmstadt, Darmstadt, Deutschland — [2]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Deutschland

With the R3B (Reactions with Relativistic Radioactive Beams) setup

at GSI in Darmstadt, it is possible to perform kinematically complete measurements with relativistic radioactive beams. In order to identify the incoming and outgoing particles, various detector systems are necessary. Among other systems, silicon-strip detectors employing the resistive charge division are used to measure the positions and the energy loss of charged particles before and after the target.

A new prototype of a double-sided silicon-strip detector, Micron X5, was tested in beam during a beam time at GSI in 2018 with ^{40}Ar and ^{107}Ag beams. The detectors have 32 strips on each side which are arranged perpendicularly to each other to give an x and y position in the same detector. The strips have a resistive surface and are read out at the ends of each strip. The detectors were tested regarding the energy and position resolution.

This work is supported in part by BMBF contract 05P15RDFN1 and GSI-TU Darmstadt cooperation agreement.

HK 54.69 Do 16:30 Foyer Nordbau

Studying discharge propagations with an optically read-out GEM — •Berkin Ulukutlu and Piotr Gasik — TU München, Physik Department E62, Excellence Cluster 'Universe', Garching

Gas Electron Multiplier (GEM) has become a commonly employed technology for modern high-rate particle and nuclear physics experiments (e.g. upgraded ALICE TPC). A key parameter for their long-term sustainability is stability against electrical discharges. Typically, these electrical breakdown events occur within the holes on the GEM foil, but they may also propagate into the gap between subsequent GEM foils resulting in secondary discharges. It is crucial to mitigate secondary discharges since they can result in irreparable damage to the detector. Accordingly, many successful methods have been developed to increase their stability against discharges. However, the propagation of discharges is still not fully understood.

In this study, an optically readout GEM detector incorporating a sCMOS camera was built as a new tool to investigate the formation of secondary discharges. We used optical imaging to capture the time evolution of the light from discharges. Studying the glow in instances leading and not leading to a secondary discharge, we pursue to determine the underlying mechanisms for discharge propagation.

HK 54.70 Do 16:30 Foyer Nordbau

Charge density as a driving factor for discharges in THGEM-based detectors — •Lukas Lautner, Berkin Ulukutlu, and Piotr Gasik — TU München, Physik Department E62, Excellence Cluster 'Universe', Garching

Thick Gas Electron Multipliers (THGEMs) are robust, high gain gaseous detectors with a structure resembling a GEM with expanded dimensions. Electrical discharges during operation of THGEM-based detectors may result in detection dead time, efficiency loss and damage to hardware and electronics. Although there are measures to minimize the discharge probability, discharges cannot be completely avoided. These discharges are triggered by charge densities close to the Raether limit (10^6-10^7 electrons) in single THGEM holes. Discharge probability curves for THGEMs in different Ar- & Ne-based gas mixtures have been measured. A comparison with GEANT4 simulations allowed to extract the critical charge density leading to the formation of a spark in a THGEM hole. It occurs that this number depends on the gas mixture and is a driving factor for discharge formation in THGEM-based detectors.

This research was supported by BMBF, HGF and the DFG cluster of excellence 'Origin and Structure of the Universe'.

HK 54.71 Do 16:30 Foyer Nordbau

"MCA Recorder", a platform independent, open graphical MCA controller software — •Benedikt Bieringer — Institut für Kernphysik, WWU Münster, Germany

Multichannel Analyzers are broadly used in diverse scientific and educational contexts. Most times, proprietary libraries and software are needed to interact with commercial MCA devices. In this work, a new controller software with low-level device interaction is introduced that is free of calls to proprietary libraries and written in platform independent Python code. It features a clean GUI, allows live fits on Gaussian distributions and ships with open source code. Currently supported devices are the "Ortec EasyMCA 8k" (requires license from manufacturer), "CAEN N957" and "Ortec 926 MCB".

HK 54.72 Do 16:30 Foyer Nordbau

URANOS - a voxel engine Neutron Transport Monte Carlo Simulation — •Markus Köhli[1,2], Martin Schrön[3], Klaus Desch[2], and Ulrich Schmidt[1] — [1]Physikalisches Institut, Universität Heidelberg, Heidelberg, Deutschland — [2]Physikalisches Institut, Universität Bonn, Bonn, Deutschland — [3]Dep. Monitoring and Exploration Technologies, Helmholtz Centre for Environmental Research GmbH - UFZ, Leipzig, Deutschland

URANOS (Ultra RApid Neutron-Only Simulation) is a newly developed 3D neutron transport Monte Carlo for the thermal to fast regime. Emerging from a problem solver for detector development in collaboration with environmental physics the project aims towards providing a fast computational workflow and an intuitive graphical user interface (GUI) for small to medium sized projects. It features a ray-casting algorithm based on a voxel engine. The simulation domain is defined layerwise, whereas the geometry is extruded from a pixel matrix of materials, identified by specific numbers. Therefore, input files are solely a stack of pictures, all other settings, including the configuration of predefined sources, can be adjusted by the GUI. The scattering kernel features the treatment of elastic and inelastic collisions, absorption and absorption-like processes like evaporation. In order to simulate multilayer boron detectors it also models the charged particle transport following the conversion by computing the energy loss in the boron and its consecutive layer. The electron track is then projected onto a readout unit by longitudinal and transversal diffusion.

HK 54.73 Do 16:30 Foyer Nordbau

Low-cost Readout Electronics based on Arduino Microcontrollers — •Markus Köhli[1,2], Jannis Weimar[1], Fabian Schmidt[2], Jochen Kaminski[2], Klaus Desch[2], and Ulrich Schmidt[1] — [1]Physikalisches Institut, Universität Heidelberg, Heidelberg, Deutschland — [2]Physikalisches Institut, Universität Bonn, Bonn, Deutschland

With the Arduino open source electronics platform microcontrollers have become a comparably easy-to-use tool for rapid prototyping and implementing creative solutions. Yet, running at 16 MHz, the capabilities can be extended to data taking and signal analysis at decent rates. Such devices in combination with dedicated frontend electronics can offer low cost alternatives for student projects and independently operating small scale instrumentation. We present two projects, which cover as well the readout of helium-3 and boron-10 proportional counters as of scintillators or wavelength shifting fibers with Silicon Photomultipliers. The nCatcher board transforms an Aruino nano to a proportional counter readout with pulse shape analysis - time over threshold measurement and a 10-bit analog to digital converter for pulse heights. This makes the device suitable for low to medium rate environments, where a good signal to noise ratio is a crucial. With the SiPMTrigger we have realized a small-scale design for triggering or vetoing in combination with a photon counter. It consists of a custom mixed signal frontend board featuring signal amplification, discrimination and a coincidence unit for rates up to 200 kHz.

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Ausrichtung und Bestimmung der Auflösung der Spurrekonstruktionsdetektoren des NA64-Experiments — •Nabeel Ahmed, Michael Hösgen und Bernhard Ketzer für die NA64-Kollaboration — Helmholtz-Institut für Strahlen- und Kernphysik der Universität Bonn

Das NA64-Experiment ist ein Experiment am CERN, das nach möglichen Teilchen der Dunklen Materie sucht, indem hochenergetische Elektronen in einem hermetischen Kalorimeter gestoppt werden und nach Ereignissen mit fehlender Energie gesucht wird. Die notwendige möglichst genaue Messung wird durch eine präzise Rekonstruktion der Teilchenspur vor und nach einem Dipolmagnet erreicht. Es werden zehn Spurrekonstruktionsdetektoren verwendet, sechs Micromegas und vier GEM-Detektoren mit jeweils zwei Projektionen. Zunächst wird die Position der Detektoren im Raum durch eine optische Messung mit einem Laser bestimmt und die Feinausrichtung erfolgt mit Hilfe von rekonstruierten Teilchenspuren. In einem iterativen Verfahren werden die Residuen aller Detektorebenen bestimmt und die Positionen entsprechend justiert. Das Verfahren wird beendet, falls sich die Güte der angepassten Spur nicht mehr ändert. Dabei werden die Auflösungen der Detektoren zunächst genähert. Die tatsächlichen Detektorauflösungen werden nach erfolgter Ausrichtung mit verschiedenen erwartungstreuen Methoden bestimmt, bei denen die zu untersuchende Ebene nicht zur Rekonstruktion herangezogen wird. Das Poster illustriert das iterative Verfahren zur Ausrichtung und die Ergebnisse zu den Auflösungen der GEM- und Micromegas-Detektoren von NA64.

HK 54.75 Do 16:30 Foyer Nordbau

Determination of the photon interaction position in a monolithic scintillator applied in a Compton Camera — •Maria Kawula[1], Silvia Liprandi[1], Tim Binder[1,2], Rita Viegas Rego[1,3], Ben Hoyle[1], Katia Parodi[1], and Peter G. Thirolf[1] — [1]Ludwig-Maximilians-Universität, Munich, Germany — [2]KETEK GmbH, Munich, Germany — [3]University of Coimbra, Portugal

The LMU Compton Camera is being developed to detect prompt gamma rays. The camera consists of a scatterer (6 layers of double-sided Si-strip detectors) and a monolithic $LaBr_3$(Ce) scintillator as an absorber, read out by a multianode photomultiplier. To determine the photon interaction position in the scintillator the "Categorical Average Pattern" (CAP) algorithm [1] is used. This algorithm is based on the comparison of every recorded photon event with a reference library of 2D light amplitude distributions obtained by scanning the scintillator front surface with tightly collimated ^{60}Co and ^{137}Cs sources respectively in 10404 positions (400 photopeak events per position are acquired). A second method based on Convolutional Neural Networks (CNN) is under development. The reference library acquired for the CAP algorithm is used as training data. The architecture of the network as well as a quantitative comparison of CAP and CNN in terms of computational time, memory consumption and obtained spatial resolution will be presented. This work is supported by the DFG Cluster of Excellence Munich Centre of Advanced Photonics (MAP).

HK 54.76 Do 16:30 Foyer Nordbau

Development of a MiniTAPS Trigger Board for the CBELSA/TAPS Experiment — •Janis Hoff, Christian Honisch, and Annika Thiel for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik der Universität Bonn

The structure of hadrons is investigated by the CBELSA/TAPS experiment using electromagnetic probes. The MiniTAPS calorimeter is one of the central parts of the detector system. The detector covers the forward angle between 1° and 12° and is ideally suited to detect photons with energies between 10 MeV and 2.0 GeV. The detector consists of 216 BaF_2 crystals which are read out via photomultiplier tubes. Due to its fast timing the detector can contribute to the first level trigger. For this purpose, the crystals are grouped into four sectors and the number of sectors hit in one event is provided for the trigger decision. The current trigger electronics will be replaced, which will in future allow for a more sophisticated trigger decision algorithm. The discriminator signals of all crystals will be connected to one FPGA. A commercially available VME module will be utilized and extended with high-density level-translation input cards.
This poster shows how the high input density of 10.8 differential pairs per cm is implemented in the prototype and presents the results of the analysis researching the benefits of a full cluster encoder compared to the currently used algorithm.