# HK 52: Poster

Zeit: Donnerstag 16:30–18:45 Raum: Audimax Foyer

HK 52.1 Do 16:30 Audimax Foyer

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

Simulations studies have shown that the PANDA detector at FAIR will be capable of measuring the timelike electromagnetic form factors of the proton via the reaction $\bar{p} \rightarrow e^+e^-$ with a precision of a few percent at low $q^2$, thus demanding to take into account radiative corrections. First order radiative corrections to $\bar{p}p \rightarrow e^+e^-$ have been calculated in the point-like approximation, including both virtual and real corrections, and interference effects. Soft and hard photon emission regimes are covered in the calculation. Suitable event generators to be used in the framework of the PANDA experiment have been developed on the basis of the calculated cross section.

HK 52.2 Do 16:30 Audimax Foyer

**Study of the transverse beam spin asymmetries at forward angles in $\vec{e}$-p scattering at A4** — D. Balaguer Ríos[1], S. Baunack[1,3], L. Capozza[1], J. Diefenbach[1,2], B. Gläser[1,2], •B. Gou[2], Y. Imai[1,2], E.-M. Kabuss[1], J.H. Lee[1], F. Maas[1,2,3], M. C. Mora Espí[1,2], E. Schilling[1], D. von Harrach[1], and C. Weinrich[1] — [1]Institut für Kernphysik, Johannes Gutenberg-Universität Mainz — [2]Helmholtz-Institut Mainz — [3]PRISMA Cluster of Excellence, Johannes Gutenberg-Universität Mainz

The one-photon exchange approximation in the electron-nucleon scattering had been regarded as sufficient in probing the nucleon structure, until the discrepancy between the Rosenbluth separation and the polarization transfer methods in measuring the proton form factor ratio arose. The two-photon exchange process has been proposed to account for this discrepancy. It is imperative to study the two-photon exchange amplitudes quantitatively, in order to understand how the two-photon exchange process may affect various observables. The imaginary parts of the two-photon exchange amplitudes are accessible via the single normal spin asymmetries in the polarized electron-nucleon scattering. The A4 collaboration has embarked on a systematic study of the transverse beam spin asymmetries in the intermediate energy regime using polarized electron beams scattering on hydrogen/deuterium targets. Measurements have been performed at both forward and backward angles at energies between 210 MeV and 1.5 GeV. In this poster we present the investigation of the forward measurements.

HK 52.3 Do 16:30 Audimax Foyer

**Lambda-Proton Correlation in Pion-Induced Reactions at 1.7 GeV/*c*** — •Steffen Maurus for the HADES-Collaboration — Technisches Universität München, München

Worldwide data on $\Lambda p$ scattering in pion-induced reactions are quite scarce.
The HADES Collaboration performed in 2014 an experimental campaign with pion-nucleon reactions $\pi^- + A$ $(A = C, W)$ at 1.7 GeV/$c$. With the aid of the exclusive channel $\pi^- + p \rightarrow K^0 + \Lambda$ $(\Lambda + p \rightarrow \Lambda + p)$ we may provide information on the $\Lambda p$ scattering and further shed light on the short range interaction with simulations as a reference.
Presented in this poster are the analysis strategy, the event and observable selection along with the preliminary comparison to transport simulations.
∗ supported by the DFG cluster of excellence "Origin and Structure of the Universe"

HK 52.4 Do 16:30 Audimax Foyer

**Measurements of Neutron Cross Section and Form Factors using 2015 Scan Data at BESIII** — •Samer Ahmed[1], Alaa Dbeyssi[1], Paul Larin[1], Dexu Lin[1], Frank Maas[1,2,3], Cristina Morales[1], Cristoph 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

The neutron structure and dynamics can be understood via the study of its electro- magnetic form factors. In the time-like region few experiments had been performed so far, none of them had the possibility to determinate the ratio of the electric and magnetic form factors. Therefore, a large data sample in a wide range of center of mass energies [ 2.0 - 3.08 GeV] has been collected in Beijing Spectrometer III (BESIII) at the Beijing Electron Positron Collider II (BEPCII). With the collected data, it is expected to determine the electric and the magnetic FFs of neutron separately, determine Born cross section with higher precision and therefore enhance the knowledge of neutron structure. In this contribution, we will present our strategy of selecting $e^+e^- \rightarrow n\bar{n}$ signal and the expected precision in the determination of Born cross section and electro-magnetic form factors.

HK 52.5 Do 16:30 Audimax Foyer

**$\Sigma^0$ Baryon Production in pp Collisions at $\sqrt{s} = 13$ TeV measured with the ALICE experiment** — •Andreas Mathis for the ALICE-Collaboration — TU München, Physik Department E62, Excellence Cluster 'Universe', Garching

Even though it has been recently demonstrated that gravitational wave observations of binary neutron star mergers are a powerful tool to determine the neutron star equation of state (EOS), the latter still remains a puzzle. In particular, for the description of such a system in the presence of Hyperons a thorough understanding of the Hyperon-Nucleon interaction is mandatory. Recently much progress has been made for the case of the Λ-N interaction, by employing femtoscopy as a complementary method compared to scattering data. For other Hyperons, however, the knowledge of the interaction is rather poor. In particular, since Σ hypernuclei have not been observed so far and since also scattering data for Σ hyperon beams are scarce, the Σ -Nucleon interaction remains to be probed.

As a first step, we measure the production of the $\Sigma^0$ baryon at an unprecedented energy of $\sqrt{s} = 13$ TeV in pp collisions. The $\Sigma^0$ baryon is reconstructed via the decay $\Sigma^0 \rightarrow \Lambda\gamma$ with subsequent decays $\Lambda \rightarrow p\pi$ in coincidence with a dielectron pair stemming from photon conversions employing the unique capability of the ALICE detector to measure low energy photons. The yield of the $\Sigma^0$ is compared to that of Λ baryons, which have the same quark content but different isospin.

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

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**The P2-Experiment - A high precision determination of the proton's weak charge** — •Dominik Becker[1], Kathrin Imai[1], David Rodriguez Pineiro[2], Sebastian Baunack[1], Krishna S. Kumar[4], and Frank E. Maas[1,2,3] — [1]Institut für Kernphysik, Mainz, Ger — [2]Helmholtz-Institut, Mainz, Ger — [3]GSI, Darmstadt, Ger — [4]Stony Brook, NY, USA

The goal of the P2 collaboration is to perform a high precision determination of the electroweak mixing angle $\hat{s}_Z^2$ at low momentum transfer to a relative precision of 0, 15 %. This can be achieved by measuring the proton's weak charge to a relative precision of 1, 9 %. The parity violating asymmetry in elastic electron-proton-scattering grands experimental access to the weak charge of the proton.

The P2-Experiment will be carried out at the new electron accelerator facility MESA to be constructed in Mainz. The poster we present features the experimental concept, calculations regarding the achievable precision in the determination of the proton weak charge as well as results of Geant4-simulations carried out to validate the experimental setup.

HK 52.7 Do 16:30 Audimax Foyer

**Can Experimental Data From HADES Be Described With Thermal Models?** — •Julia Stumm and Roman Hensch for the HADES-Collaboration — Goethe-Universität, Frankfurt am Main

The study of particle production in heavy ion collisions is of great interest for our understanding of medium properties in dense baryonic matter. Using the HADES detector at the "Helmholtzzentrum für Schwerionenforschung" in Darmstadt, Au+Au Collisions at 1.23A GeV have been studied and particle multiplicities for different centrality classes have been measured. Special attention has been paid

to strange hadron production, which occurs at sub threshold energies. An important finding was that about 30% of the $K^-$ Mesons do not actually originate directly from the fireball, but instead stem from $\phi$-Decays. Therefore, to interpret the spectra one has to disentangle the various particle sources. We used the statistical model THERMUS to estimate the fireball parameters, in particular temperature, volume and the baryochemical potential, and to compare hadron multiplicities. We further explore how well transverse hadron spectra can be described by a superposition of various thermal sources, in addition to a radial expansion of the fireball.
This work has been supported by BMBF (05P15RFFCA), GSI and HIC for FAIR.

HK 52.8 Do 16:30 Audimax Foyer

**Measurement of $\eta$ and $\omega$ mesons via their three pion decay with ALICE in pp collisions at $\sqrt{s} = 7$ TeV** — •Florian Jonas for the ALICE-Collaboration — Institut für Kernphysik, Westfälische-Wilhelms Universität, Münster, Deutschland

ALICE is designed as a heavy ion experiment and its research mainly focuses on the properties of the quark gluon plasma (QGP) – a phase in which quarks and gluons exist as unconfined particles. Due to the high energy densities reached in PbPb collisions, the creation of the QGP is expected and supported by measurements up to this point.

One way to probe the medium are photons radiated by the hot QGP. Due to their lack of strong interaction, they can transverse unaffected through the later stages of the plasma and then be detected by ALICE detectors. But the direct photons are only a small contribution to the total amount of photons that are detected in each collision. This motivates the reconstruction of mesons like the $\pi^0$, $\eta$, $\omega$ and others, given the fact that a good knowledge of their spectra is directly linked to the amount of decay photons.

In this contribution, the current status on the reconstruction of the $\omega$ and the $\eta$ meson, using their $\pi^+\pi^-\pi^0$ decay channel in pp collisions at $\sqrt{s} = 7$ TeV will be presented. ALICE's two calorimeters PHOS and EMCal, the so called Photon Conversion Method (PCM) and two hybrid methods will be used to detect the photons needed to reconstruct the neutral pions, profiting from the different resolutions and reconstruction efficiencies of each detection method.

HK 52.9 Do 16:30 Audimax Foyer

**Application of the Hydrodynamic Event Generator THESEUS to CBM** — •Elena Volkova for the CBM-Collaboration — The University of Tübingen, Tübingen, Germany

The Compressed Baryonic Matter experiment (CBM) at FAIR will measure nucleus-nucleus collisions at beam energies up to 14AGeV. The key objective of CBM is to investigate the QCD phase diagram in the region of the highest net-baryon-densities. The experiment is well suited to explore the Equation-of-State of nuclear matter at densities as they might occur in the interior of neutron stars or during neutron star mergers.

Recently, a new event generator (P. Batyuk et al. "Three-fluid Hydrodynamics-based Event Simulator Extended by UrQMD final State interactions (THESEUS) for FAIR-NICA-SPS-BES/RHIC energies") based on the three-fluid hydrodynamics approach for the early stage of the collision, followed by a particlization at the hydrodynamic decoupling surface to join to a microscopic transport model, UrQMD, to account for hadronic final state interactions has been developed. The generator allows, e.g., to employ different Equations-of-State for the description of nuclear matter.

In this poster, we present first results obtained with this new Event Generator apply it to the description of heavy-ion collisions in the CBM experiment.

HK 52.10 Do 16:30 Audimax Foyer

**Separation of Heavy-Flavour Production Mechanisms via Two-Particle Angular Correlations in Proton-Proton Collisions at $\sqrt{s} = 2.76$ TeV** — •Katharina Garner for the ALICE-Collaboration — WWU Münster, Germany

In high-energy particle collisions, heavy quarks are – due to their large mass – mainly generated in interactions with large momentum transfers. Because of this, their production can be described perturbatively and heavy-flavour production rates offer the possibility to validate predictions of perturbative QCD. In addition, heavy flavours experience the whole evolution of the collision system and can therefore serve to investigate the properties of the Quark-Gluon Plasma generated in heavy-ion collisions. As a reference for heavy-ion collisions, smaller collision systems like proton-proton collisions are examined.

Heavy-flavour production processes can be classified in three categories: pair creation, flavour excitation and gluon splitting, each of them leading to a characteristic angular distribution of the outgoing particles. Measurements on angular correlations of heavy-flavour particles might thus provide information on the contribution of individual production processes.

Based on Monte Carlo simulations with the event generator PYTHIA 8, the feasibility of investigating production processes of charm and bottom quarks in 2.76 TeV proton-proton collisions via azimuthal correlations between heavy-flavour decay electrons (HFEs) and between HFEs and hadrons is discussed.

HK 52.11 Do 16:30 Audimax Foyer

**Results of mini-CBM mRICH simulations*** — •Gregor Pitsch for the CBM-Collaboration — Justus Liebig Universität Gießen

The Compressed Baryonic Matter Experiment (CBM) will be built at the future Facility for Antiproton and Ion Research (FAIR) in Darmstadt and aims the exploration of the QCD phase diagram using high-energy nucleus-nucleus collisions. For testing the interplay of the subsystems of CBM, the data acquisition and the fast online event reconstruction, a full test setup comprising all prototypes or pre-series components is proposed, named *mini-CBM*. Mini-CBM will analyze the particle production of 1.24GeV Au + Au collisions provided by the SIS18 accelerator. One of the CBM subsystems is the Ring Imaging Cherenkov Detector (RICH), will be used for high quality electron identification for p<8GeV/c. In this contribution we present simulation results of an mRICH detector in the mCBM setup which will work as proximity focusing RICH detector using aerogel as radiator serving for pion-proton separation. This radiator type has been chosen due to space constraints, but also to improve particle identification in mCBM.
* supported by BMBF(05P15RGFCA)

HK 52.12 Do 16:30 Audimax Foyer

**Performance Studies on Light Nuclei and Hypernuclei Measurements with the TRD in the CBM-Experiment** — •Susanne Glässel for the CBM-Collaboration — Goethe-Universität 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 net-baryon densities. A high statistics measurement of double-$\Lambda$ hypernuclei as a part of the CBM-measurement programm will represent a breakthrough in this field of physics, since up to now only very few double-$\Lambda$ hypernuclei events have been identified.

The Transition Radiation Detector (TRD) will significantly extend the number of hypernuclei states accessible within the CBM physics program. For the identification of ${}^{6}_{\Lambda\Lambda}$He, which decays as ${}^{6}_{\Lambda\Lambda}\mathrm{He} \rightarrow {}^{5}_{\Lambda}\mathrm{He}$ + p + $\pi^-$ and subsequently as ${}^{5}_{\Lambda}\mathrm{He} \rightarrow {}^{4}\mathrm{He}$ + p + $\pi^-$, the separation of d und ${}^{4}$He is particularly important. The m/Z measurement of hadrons alone, as provided by the Time of Flight Detector (TOF), is not able to distinguish between the two different charge states. The TRD contributes to the separation of charged hadrons with a measurement of the specific energy loss in its four layers of Multi-Wire Proportional Chambers.

Simulations demonstrate how a unique identification of d and ${}^{4}$He can be performed by combining TOF and TRD information, allowing to identify double-$\Lambda$ hypernuclei with high efficiency.

Supported by the German BMBF-grant 05P15RFFC1.

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**Protons and light nuclei in Au+Au Collisions at 1.23A GeV with HADES** — •Melanie Szala for the HADES-Collaboration — Goethe Universität Frankfurt

As light hadrons have successfully been analysed, ongoing studies try to extend the set of identified particles towards light nuclei.

Light nuclei are expected to form at a later stage of the evolution and can probe the final freeze-out. The production of nuclei in heavy ion collisions is commonly discussed within two different scenarios: the thermal-statistical model and the coalescence model.

Furthermore higher order moments of conserved quantities (e.g. baryon number, charge, strangeness) are predicted to be sensitive to a first order phase transition and especially to the critical point of the QCD phase diagram. The HADES experiment started analysing the higher moments of proton number distributions but as the fully conserved quantity is the baryon number, further investigations will focus on including the light nuclei to the analysis.

In 2012 the HADES experiment at GSI Helmholtzzentrum für Schwerionenforschung in Darmstadt measured Au+Au collisions at $\sqrt{s_{NN}}$ = 2.41 GeV. In this contribution, we present results on protons and light nuclei.

This work has been supported by BMBF (05P15RFFCA), GSI and HIC for FAIR.

HK 52.14 Do 16:30 Audimax Foyer

**Commissioning and First Experiments with TITAN's Multiple-Reflection Time-of-Flight Isobar Separator and Mass Spectrometer** — •C. Hornung[1], S. Ayet[1,4], M.P. Reiter[1,2], S. Beck[1,4], J. Bergmann[1], T. Dickel[1,4], J. Dilling[2,3], A. Finlay[2,3], H. Geissel[1,4], F. Greiner[1], C. Jesch[1], A.A. Kwiatkowski[2], E. Leistenschneider[2,3], W.R. Plass[1,4], C. Scheidenberger[1,4], D. Short[2], C. Will[1], M. Yavor[5], and the TITAN collaboration[2] — [1]Justus-Liebig-Universität, Gießen — [2]TRIUMF, Vancouver — [3]University of British Columbia, Vancouver — [4]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt — [5]Russian Academy of Sciences, St. Petersburg

Exotic nuclei can be produced with very high rates at the ISOL facility ISAC at TRIUMF (Vancouver, Canada). TRIUMF's Ion Trap for Atomic and Nuclear Science (TITAN) is a multiple ion-trap system for high-precision mass measurements and in-trap decay spectroscopy. Recently a Multi-Reflection Time-of-Flight Mass Separator and Spectrometer (MR-TOF-MS) has been installed and commissioned at TITAN. It is based on an established concept applied at the FRS Ion-Catcher at GSI. The ion of interest can be spatially separated from isobaric contaminations with mass-selective dynamic re-trapping. Furthermore, the device is well suited to perform high precision mass measurements, particularly for short-lived isotopes produced at low rate. High-precision mass measurements of neutron-rich titanium isotopes were performed by the MR-TOF-MS to probe the existence of the N=32 sub-shell closure above calcium.

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**Lifetime determination of nuclear levels using a new Doppler-shift attenuation approach** — •Anna Bohn[1], Michelle Färber[1], Miriam Müscher[1], Simon G. Pickstone[1], Sarah Prill[1], Philipp Scholz[1], Mark Spieker[1,2], Vera Vielmetter[1], Michael Weinert[1], Julius Wilhelmy[1], and Andreas Zilges[1] — [1]Institute for Nuclear Physics, University of Cologne — [2]NSCL, Michigan State University, MI 48824, USA

The measurement of nuclear level lifetimes via the Doppler-shift attenuation method (DSAM) using proton-$\gamma$ coincidences is well established at the 10 MV FN-Tandem accelerator in Cologne [1]. The SONIC@HORUS setup allows to determine excitation energy, recoil velocity and direction of the target nuclei [2]. In the standard analysis, the attenuation factor F($\tau$) has been determined by comparing the Doppler-shift at different photon emission angles $\theta$ and using that F($\tau$) represents the slope of $E_\gamma(cos(\theta))$. In this contribution a new approach will be introduced, in which the data are first Doppler-corrected and summed up, assuming different F($\tau$) values. Then, for each line, the optimum F($\tau$) yielding the best peak shape is determined. Due to the highly improved peak-to-background ratio, lifetimes of weaker transitions might also be extracted. Furthermore, first results from DSAM experiments on $^{130}$Te and $^{128}$Te using this method will be presented.

Supported by DFG (ZI 510/7-1). JW is supported by the Bonn-Cologne Graduate School of Physics and Astronomy.

[1] A. Hennig *et al.*, NIM A 794 (2015) 171
[2] S. G. Pickstone *et al.*, NIM A 875 (2017) 104

HK 52.16 Do 16:30 Audimax Foyer

**Dipole strength in $^{164}$Dy below the neutron separation threshold *** — •O. Papst[1], T. Beck[1], J. Beller[1], C. Bernards[2], M. Bhike[3], N. Cooper[2], B. P. Crider[4,5,6], U. Gayer[1], J. Isaak[1,7], J. Kleemann[1], FNU Krishichayan[3], B. Löher[1], F. Naqvi[2], E. E. Peters[4], N. Pietralla[1], F. M. Prados-Estevez[4], P. C. Ries[1], R. S. Ilieva[8], T. J. Ross[4], D. Savran[9], M. Scheck[1,10], M. Schilling[1], W. Tornow[3], J. R. Vanhoy[4,11], V. Werner[1,2], S. W. Yates[4], and M. Zweidinger[1] — [1]IKP, TU Darmstadt — [2]WNSL, Yale University, New Haven, CT, USA — [3]TUNL, Duke University, Durham, NC, USA — [4]UKY, Lexington, KY, USA — [5]MSU, East Lansing, MI, USA — [6]MSU, Starkville, MS, USA — [7]RCNP, Osaka, Japan — [8]UNIS, Guildford, UK — [9]GSI, Darmstadt — [10]UWS, Paisley, UK — [11]USNA, Annapolis, MD, USA

In several nuclei, on the low-energy tail of the giant dipole resonance, concentrated electric dipole strength has been observed that is commonly referred to as the pygmy dipole resonance. In the proposed picture of neutron skin oscillations, this resonance should be sensitive to the nucleus' symmetry axes, separating into two parts for axially deformed nuclei. However, little data is available for such nuclei. In nuclear resonance fluorescence experiments conducted at the $\gamma^3$ setup at the High Intensity $\gamma$-ray Source (HI$\gamma$S) in Durham, NC, USA, the dipole strength above 4 MeV of the strongly deformed nucleus $^{164}$Dy has been studied using a completely polarized, quasi-monochromatic $\gamma$-ray beam. Contributions to $E1$ and $M1$ strength are discussed.

* Supported by the DFG, Collaborative Research Center 1245.

HK 52.17 Do 16:30 Audimax Foyer

**Coulomb excitation of $^{142}$Xe** — •Corinna Henrich for the IS548-MINIBALL-Collaboration — TU Darmstadt, Darmstadt, Germany

The nucleus $^{142}$Xe lies in the proximity of the doubly magic nucleus $^{132}$Sn, a region through which the r-process is expected to pass. $^{142}$Xe was studied in a "safe" Coulomb excitation experiment at HIE-ISOLDE (CERN) in 2016 in order to follow quadrupole and octupole collectivity in this area. Also, $^{144}$Ba, which exhibits the largest octupole collectivity in the region, is located just two protons above $^{142}$Xe. Both beam and target nuclei were measured using an array of segmented Si detectors (C-REX), covering forward as well as backward angles. The MINIBALL spectrometer was used to detect the emitted gamma rays in coincidence. The status of the analysis will be presented.

This work is supported by BMBF under contract 05P15RDCIA, by the EU under contract ENSAR 262010 and by ISOLDE.

HK 52.18 Do 16:30 Audimax Foyer

**Lifetime Measurements at SONIC@HORUS: The Doppler-shift attenuation method using p$\gamma$ coincidences** — •Vera Vielmetter[1], Anna Bohn[1], Michelle Färber[1], Pavel Petkov[1,2,3], Simon G. Pickstone[1], Sarah Prill[1], Mark Spieker[1,4], Michael Weinert[1], and Andreas Zilges[1] — [1]Institute for Nuclear Physics, University of Cologne — [2]INRNE, Bulgarian Academy of Sciences, Sofia — [3]National Institute for Physics and Nuclear Engineering, Bucharest-Magurele — [4]NSCL, Michigan State University, MI 48824, USA

Recently, the Doppler-shift attenuation method (DSAM) using p$\gamma$ coincidences has been established in Cologne as a new technique for measuring lifetimes of excited states in the range of femtoseconds [1]. The SONIC@HORUS setup [2] with 14 HPGe detectors and several silicon detectors is used to extract the centroid energy shifts from proton-gated $\gamma$-ray spectra, yielding lifetime values that are independent of feeding contributions. In this poster the (p,p'$\gamma$) DSAM technique will be introduced and results of several experiments, such as $^{96}$Ru [1], $^{98}$Ru, $^{112,114}$Sn, $^{94}$Zr and $^{128,130}$Te, will be shown.

Supported by the DFG (ZI-510/7-1). JW is supported by the Bonn-Cologne Graduate School for Physics and Astronomy.

[1] A. Hennig *et al.*, Nucl. Instr. and Meth. A 794 (2015) 717
[2] S.G. Pickstone *et al.*, Nucl. Instr. and Meth. A 875 (2017) 104-110

HK 52.19 Do 16:30 Audimax Foyer

**A direct nuclear laser excitation scheme for $^{229m}$Th** — •Lars von der Wense[1], Benedict Seiferle[1], Simon Stellmer[2], Johannes Weitenberg[3], Georgy Kazakov[2], Adriana Pálffy[4], and Peter G. Thirolf[1] — [1]Ludwig-Maximilians-Universität München, 85748 Garching, Germany — [2]Technische Universität Wien, 1040 Vienna, Austria — [3]Max-Planck-Institut für Quantenoptik, 85748 Garching, Germany — [4]Max-Planck-Institzt für Kernphysik, 69117 Heidelberg, Germany

Direct nuclear laser excitation has been a long-standing goal. By today there is only one nuclear excitation known which would allow for direct laser excitation due to its exceptionally low energy of only a few eV above the ground state. This is the metastable first excited state in $^{229}$Th. While direct nuclear laser excitation of $^{229}$Th ions in a Paul trap is still hindered by insufficient knowledge of the exact isomeric energy value, here a new laser excitation scheme for neutral $^{229}$Th atoms on a surface will be presented [1]. This excitation scheme circumvents the requirement of an improved knowlede of the isomeric energy, thereby paving the way for nuclear laser spectroscopy of $^{229m}$Th. It is making use of the recently detected internal conversion decay channel of the isomeric state [2] in combination with a short isomeric lifetime [3].

[1] L. v.d.Wense et al., PRL 119, 132503 (2017).
[2] L. v.d.Wense et al., Nature 533, 47-51 (2016).
[3] B. Seiferle et al., PRL 118, 042501 (2017).

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HK 52.20 Do 16:30 Audimax Foyer

**Study of high angular momentum states in $^{105,106}$Pd** — Angel Angelov[1], •Liliya Atanasova[2], Dimiter Balabanski[3], Andrey Blazhev[4], Jan Jolie[4], Mattias Rudigier[4,5], and Ralitsa Stanoeva[1] — [1]South-West University, Blagoevgrad, Bulgaria — [2]Medical University of Sofia, 1431 Sofia, Bulgaria — [3]ELI-NP, Horia Hulubei National Institute of Physics and Nuclear Engineering, 077125 Magurele, Romania — [4]IKP, Universität zu Köln, D-50937, Köln, Germany — [5]Department of Physics, University of Surrey, Guildford, GU2 7XH, United Kingdom

The high spin states of the $^{105,106}$Pd have been studied via the fusion-evaporation reactions $^{96}$Zr($^{13}$C, 3n$\gamma$)$^{106}$Pd and $^{96}$Zr($^{13}$C, 4n$\gamma$)$^{105}$Pd. The Zr beam with energies 40 MeV and 50 MeV respectively, was provided from the Tandem accelerator at IKP, University of Cologne. The gamma rays were detected with HORUS spectrometer. The preliminary results from the data analysis will be presented. Previous experiments on Pd and the present results have shown that the majority of states populated by (HI, xn) reactions in Pd nuclei are members of decoupled collective bands built on quasineutron states. These nuclei provide an unusually simple and complete illustration of the relation between particle and collective motion in slightly deformed nuclei. These experiments provide ample evidence that the yrast states populated in (HI, xn) reactions are in good agreement with a slightly deformed-rotor description of these nuclei.

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**Measurement of the $^{96}$Ru(p,$\gamma$)$^{97}$Rh reaction cross section in an activation experiment** — •Markus Reich[1], Jan Glorius[2], Joachim Goerres[3], Yuri Litvinov[2], Rene Reifarth[1], Edward Stech[3], Meiko Volknandt[1], and Michael Wiescher[3] — [1]Goethe Universität Frankfurt, 60438 Frankfurt am Main — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, 64291 Darmstadt — [3]University of Notre Dame, Notre Dame, Indiana 46556, USA

The use of storage rings offers new opportunities to measure reaction cross sections on unstable nuclei. In 2015, a proof-of-principle experiment was performed at the experimental storage ring ESR at GSI, Darmstadt, where the reaction cross section of the reaction $^{96}$Ru(p,$\gamma$)$^{97}$Rh has been measured in inverse kinematics at energies between 9 and 11 MeV. The luminosity was determined with two methods. Both methods are based on theoretical predictions for electron capture events, which occur in the $H_2$ gas. An independent activation experiment was performed at Notre Dame, USA to test the results of the experiment at the ESR.
The $^{96}$Ru(p,$\gamma$)$^{97}$Rh cross section has been measured at 3.2 MeV to compare with a previous activation experiment as well as between 9 and 11 MeV. The preliminary results of this experiment are presented.

This project is supported by BMBF-CRYRING, HGS-HIRe and HIC for FAIR.

HK 52.22 Do 16:30 Audimax Foyer

**Detector for a Measurement of Shape Factors in Beta Decay** — •Karina Bernert[1], Thierry Lasserre[2], Bastian Märkisch[1], Christoph Roick[1], Heiko Saul[1], and Stefan Schönert[1] — [1]Physik Department, Technische Universität München, 85748 Garching b. München, Germany — [2]Institute of Research into the Fundamental Laws of the Universe, French Alternative Energies and Atomic Commission, 25 rue Leblanc, 75015 Paris, France

The search for a sterile neutrino, a viable candidate for dark matter, requires an improved understanding of the shape factors of non-unique forbidden beta decays. We present the design of a scintillation detector read out by mesh type photomultiplier tubes. It will be used in the PERKEO III spectrometer, which was initially developed for neutron beta decay, to measure electron spectra of various beta decays with high precision. We show the progress in designing the light guide form that yields the optimal performance with simulations using Geant4, and present a way of calibrating the detector with sufficient precision.

HK 52.23 Do 16:30 Audimax Foyer

**Implementation and test of a setting generator for the GSI fragment separator FRS in the LHC Software Architecture LSA** — •Jan-Paul Hucka[1], Joachim Enders[1], Stephane Pietri[2], Helmut Weick[2], David Ondreka[2], Jutta Fitzek[2], and Bernd Schlei[2] — [1]Institut für Kernphysik TU Darmstadt — [2]GSI Helmholtzzentrum

At the GSI facility, the LSA [1] framework is used to implement a new control system for accelerators and beam transfers.

This was already completed and tested for the SIS18 accelerator. The implementation at CRYRING and ESR is currently being finalized. In addition, controls of the fragment separator FRS [2] and later also the superconducting fragment separator Super-FRS at FAIR will be provided by this framework. For the implementation at the FRS the interaction of the beam with matter in the beamline and the beam's associated energy loss must be taken into account. This energy loss is determined using input from ATIMA [3] and has been included into the code of the LSA framework. The implemented setting generator was simulated and benchmarked by comparison to results of earlier measurements. Furthermore recent developments included the modeling of slits and of the propagation of charge states through matter.

[1] M. Lamont et al., LHC Project Note 368
[2] H. Geissel et al., NIM B 70, 286 (1992)
[3] H. Weick et al., NIM B 164/165 168(2000)
Supported in part by BMBF through grant 05P15RDFN1

HK 52.24 Do 16:30 Audimax Foyer

**The Cylindrical Gas Electron Multiplier Inner Tracker for the BESIII Spectrometer** — •Cristina Morales Morales for the BESIII-Collaboration — Helmholtz-Institut Mainz, Staudingerweg 18, 55129 Mainz, Germany

The BESIII experiment is a multi-purpose detector operating at the electron-positron collider BEPCII in Beijing. The experiment has been in operation since 2008 and has collected the world's largest data samples at the main charmonium resonances and XYZ exotic states. The innner drift chamber used as inner tracker will be replaced. In 2014 an upgrade was proposed based on the Cylindrical Gas Electron Multipliers (CGEM) technology with several innovations. The new mechanical support for the GEM foils will reduce the total radiation length of the detector and improve its tracking performance. An innovative design of the CGEM anode will allow for smaller capacitance and hence for bigger signals. The relatively strong BESIII magnetic field requires a new analogue charge and time readout. Full custom front-end electronics, including a dedicated ASIC, will be designed and produced for optimal data collection. Specific software will be developed to first simulate, and then reconstruct the CGEM hits to detect the reaction products. Proper benchmark channels will be identified and investigated to maximise the outcome of the project. In this contribution, an overview of the project will be presented.

HK 52.25 Do 16:30 Audimax Foyer

**Assignment of Avalanche Photodiodes with respect to their operational parameters** — •Benjamin Wohlfahrt[1], Kai-Thomas Brinkmann[1], Gerrit Eichner[2], Christopher Hahn[1], Markus Moritz[1], Andrea Wilms[3], and Hans-Georg Zaunick[2] for the PANDA-Collaboration — [1]II. Physikalisches Institut, Justus-Liebig-Universität Gießen — [2]Mathematisches Institut, Justus-Liebig-Universität Gießen — [3]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt

The PANDA experiment will investigate physics in the strong interaction regime utilizing antiproton-proton annihilations. The PANDA detector will comprise a Target Spectrometer as well as a Forward Spectrometer. In the target region, a barrel-shaped electromagnetic calorimeter with end-caps on both sides will be used. It will play a major role in detecting photons utilizing about 15500 PbWO4 crystals. Each of these crystals is read out by two independent Avalanche Photo Diodes. To ensure a close-as-possible similar behaviour, an optimization algorithm groups APDs into pairs based on a distance function applied to a number of selection-criteria. A threshold scan of the distance function gathers the best matching criterion. Hence, a model selection has been performed to obtain most precise operating parameters out of the APD measurements. *The Project is supported by BMBF and HIC for FAIR

HK 52.26 Do 16:30 Audimax Foyer

**Picosec Gaseous Detectors for Fast-timing Applications** — •Lukas Sohl — Ruhr-Universität Bochum, Institut für Experimentalphysik I, 44780 Bochum

The future strategy of experimental particle physics plans to build colliders with increasing luminosity and energy to todays machines. Especially at increasing luminosities the correct separation of vertices becomes more difficult. This is only possible with detector systems that provide time resolution in the range of some 10 ps. The RD51 collaboration "Development of Micro-Pattern Gas Detectors Technologies" have presented a detector concept with an expected time resolution in the demanded range. The Picosec gaseous detector prototypes are based on the working principles of Micromegas detectors. A time jitter of some nanoseconds is inevitable due to different positions of the primary ionization cluster in the drift zone of a Micromegas. Instead the Picosec detector have a Cherenkov radiator in front of the gaseous volume. The photons of this radiator are converted in a photocathode. The drift gap can be reduced to some 100 micrometres as all primary ionized electrons are located in the photocathode. Several prototypes of this detector were tested in 2017 at the SPS beam at CERN. A time resolution of up to 24 ps was reached during this measurements. The poster introduces the concept of the Picosec detector as well as the beam setup and first results from the 2017 beam measurements.

HK 52.27 Do 16:30 Audimax Foyer

**Aufbau und Test eines Flüssig-Heliumtargets für Elektronenstreuexperimente** — •Michaela Hilcker, Jens Conrad, Norbert Pietralla, Gerhart Steinhilber und Peter von Neumann-Cosel — Institut für Kernphysik, TU Darmstadt, Deutschland

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 des Instituts, 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 flüssigem Helium als Targetmaterial notwendig. Ein geeigneter Aufbau inklusive Heliumkryostat und einer dazu passenden neuen Streukammer, werden vorgestellt und erste Funktionstests 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 52.28 Do 16:30 Audimax Foyer

**The Cologne Clover Counting Setup in a face-to-face configuration** — •Marvin Körschgen, Felix Heim, Elena Hoemann, Philipp Scholz, and Andreas Zilges — Institute for Nuclear Physics, University of Cologne

The Institute for Nuclear Physics of the University of Cologne has a detector setup dedicated for activation measurements for Nuclear Astrophysics - the Cologne Clover Counting Setup. Since the activity of reaction products in Nuclear Astrophysics are usually very low, knowledge and optimizations of laboratory background and efficiency of the setup are very important. Here we present the construction of this setup and its advantages. Further more we describe a summing correction for a close detector geometry via Geant4 simulations.

Supported by the DFG under the contracts DFG (ZI 510/8-1) and INST (216/544-1). Additional support was received within the ULDETIS project of the UoC Excellence Initiative institutional strategy.

HK 52.29 Do 16:30 Audimax Foyer

**Status of the Development of a HPGe-BGO Pair Spectrometer for ELI-NP** — •Ilja Homm, Alexander Ignatov, Stoyanka Ilieva, and Thorsten Kröll — Technische Universität Darmstadt, Germany

At the moment, the new european research facility called ELI-NP (The **E**xtreme **L**ight **I**nfrastructure - **N**uclear **P**hysics) is being built in Bucharest-Magurele, Romania. ELI-NP offers unprecedented opportunities for photonuclear reactions with high intensity, brilliant and fully polarized photon beams at energies up to 19.5 MeV.

The 8 HPGe CLOVER detectors of ELIADE are important instruments for the gamma spectroscopic study of photonuclear reactions. We investigate the possibility to operate an advanced version of an anti-Compton shield (AC shield) as escape $\gamma$-rays pair spectrometers for two of the ELIADE CLOVERS to extend the high-resolution spectroscopy to photon energies of several MeV where the pair production process dominates. The BGO shield operated as a stand-alone device can be used as intensity monitor too. The main tasks are to develop and test such an AC shield: a pair spectrometer consisting of BGO and CsI(Tl) crystals with APD (avalanche photodiode) or SiPM (silicon photomultiplier) readout. The results of prototype testing are reported.

This work is supported by the German BMBF (05P15RDENA).

HK 52.30 Do 16:30 Audimax Foyer

**Precision high voltage divider for the electron cooler at CRYRING** — T. Dirkes[1], V. Hannen[1], W. Nörtershäuser[2,3], H.-W. Ortjohann[1], O. Rest[1], •D. Roth[1], Ch. Weinheimer[1], and D. Winzen[1] — [1]Institut für Kernphysik, Uni Münster — [2]Institut für Kernchemie, Uni Mainz — [3]GSI, Darmstadt

The heavy ion storage ring CRYRING at GSI provides a unique possibility to test atomic structure calculations with slow exotic ion beams at energies in the range of 0.3 MeV/u up to 15 MeV/u. In order to cool the ions and thus achieve a low momentum spread of the stored beam, CRYRING features an electron cooler, where the ion beam is superimposed with a monoenergetic electron beam. In earlier measurements of hyperfine transitions in hydrogen- and lithiumlike ions at Experimental Storage Ring (ESR), the limiting uncertainty was the voltage measurement of the electron cooler. That uncertainty could be removed by an in-situ precision measurement of the cooler voltage using a precision high voltage divider provided by PTB on a temporary basis. Therefore the construction of a high-precision divider for voltages up to 35 kV for the CRYRING electron cooler is ongoing in our group. The concept is similar to the ultrahigh-precision voltage dividers which have been constructed for use at the KATRIN experiment. The precision of the divider is designed to be in the low ppm range and will allow for measurement uncertainties in the $< 10^{-5}$ region. We will present characterization measurements of the precision parts and first calibration measurements of the finished divider. This work is supported by BMBF under contract number 05P15PMFAA.

HK 52.31 Do 16:30 Audimax Foyer

**Preparatory tests for (e,e',$\gamma$) coincidence experiments at the S-DALINAC *** — •Gerhart Steinhilber, Tobias Klaus, Norbert Pietralla, Dmytro Symochko, and Peter von Neumann-Cosel — Institut für Kernphysik, TU Darmstadt

At the Institut für Kernphysik, TU Darmstadt high resolution electron scattering experiments are performed at low momentum transfer using the Superconducting Darmstadt Linear Accelerator and electron spectrometers Lintott and QClam.

Experiments of inelastically scattered electrons in coincidence with real photons have the big advantage that the probe is purely electromagnetic and hence allows for nuclear structure studies of highest precision. In the framework of the CRC 1245 two coincidence experiments investigating the gamma-decay branching ratio of the giant dipole resonance of $^{112,124}$Sn and the vorticity in $^{92}$Zr are planned using the QClam spectrometer and a detector array consisting of 17 LaBr:Ce detectors is under construction.

During a beam time in fall 2017 three LaBr:Ce detectors have been placed around the scattering chamber of the Lintott spectrometer to test the coincidence data acquisition (DAQ). The concept of the DAQ and first results from the test will be presented.

* Supported by the DFG within the CRC 1245.

HK 52.32 Do 16:30 Audimax Foyer

**A Spark-Detection-System for GEM foils** — •Philip Hauer, Steffen Urban, Viktor Ratza, Markus Ball, and Bernhard Ketzer for the ALICE-Collaboration — Universität Bonn, Helmholtz-Institut für Strahlen- und Kernphysik, Bonn, Germany

Gas Electron Multipliers (GEM) are widely used as an amplification stage in gaseous detectors exposed to high rates. The GEM consists of a polyimide foil which is coated by two thin copper layers. GEM have a high density of holes, where charges are multiplied if suitable voltages are applied. One example where GEM foils will be used is the Time Projection Chamber (TPC) of ALICE (A Large Ion Collider Experiment) after its upgrade which will take place during the long shutdown 2 of the Large Hadron Collider (LHC). Over 700 GEM foils will be manufactured for the read-out chambers, each with a size of several hundred square centimeters. In order to assure the quality of each individual GEM foil, a strict quality-control protocol is followed. One important step in this protocol is the leakage-current measurement. For this measurement, a voltage of 500 V is applied on a GEM foil for 15 minutes and the current is measured with a pA-meter. While the high voltage is applied, it is possible that discharges occur in one or more holes of the GEM. Until now, these sparks can only be measured by eye which is cumbersome and not precise. With the help of the Spark-Detection-System (SDS), the detection is automized and accuracate to approximately 1 mm. A camera observes the GEM during the measurement and the video stream is analyzed by a LabView software. Supported by BMBF.

HK 52.33 Do 16:30 Audimax Foyer

**Untersuchung systematischer Effekte für das P2-Experiment** — •Sebastian Baunack[1], Dominik Becker[1], Kathrin Imai[1], Frank Maas[1,2,3] und David Rodriguez Pineiro[2] — [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, z.B. den helizitätskorrelierten Differenzen in den Parametern Lage, Intensität und Energie des Elektronenstrahls. Eine frühzeitige Untersuchung dieser Effekte ermöglicht es, die noch in Entwicklung befindlichen aktiven Strahlstabilisierungssysteme auf die Bedürfnisse des Experiments anzupassen.

HK 52.34 Do 16:30 Audimax Foyer

**Compact signal processing of a Compton camera system for medical imaging** — •Peter G. Thirolf[1], Silvia Liprandi[1], Vasiliki Anagnostatou[1], Tim Binder[1], George Dedes[1], Maria Kawula[1], Florian Lüke[2], Robert Schneider[2], Ingrid Valencia Lozano[1], and Katia Parodi[1] — [1]LMU München, Germany — [2]Mesytec GmbH, Putzbrunn, Germany

At LMU in Garching we are developing a Compton camera for ion beam range verification in particle therapy. The system is designed to detect prompt $\gamma$-rays induced by nuclear reactions during the irradiation of tissues. Our prototype consists of a stack of 6 double-sided silicon strip detectors (2x128 ch. each) as scatterers and an absorber formed by a $LaBr_3$(Ce) scintillator coupled to a multi-anode (8x8 or 16x16) photomultiplier (PMT). A $CeBr_3$ scintillator is also under comparative investigation. The system requires the signal processing of up to 2000 channels: the previous (ASIC-based) readout electronics provided several shortcomings (input polarities acceptance, trigger capability, noise level and rate limitations) that were now removed by an upgrade. We are presently testing a compact frontend-board and VME-based signal processing and DAQ electronics built from discrete components. The system is capable of handling data rates up to 30 MB/s. First tests offline and online using the new readout and data acquisition system will be presented. This work was supported by the DFG Cluster of Excellence MAP (Munich Centre for Advanced Photonics) and CALA (Centre for Advanced Laser Applications).

HK 52.35 Do 16:30 Audimax Foyer

**Teilautomatisierte Produktion von Ultra-Thin-Pt-Temperatursensoren für PANDA** — •Niels Boelger — Ruhr-Universität Bochum, Institut für Experimentalphysik I, 44780 Bochum

Das PANDA-Experiment ist eines der Schlüsselexperimente an der zukünftigen Beschleunigeranlage FAIR in Darmstadt. Es dient der Untersuchung des Aufbaus von Hadronen und von Aspekten sowohl der starken und schwachen Wechselwirkung als auch exotischer Materiezustände. Der PANDA-Detektor wird über ein homogenes, mit Bleiwolframat-Szintillatoren bestücktes elektromagnetisches Kalorimeter im Bereich des Targetspektrometers verfügen. Die Intensität des erzeugten Szintillationslichtes innerhalb der Bleiwolframat-Kristalle ist temperaturabhängig, weshalb ein System zur Temperaturmessung direkt an den Szintillatoren notwendig ist. Aufgrund der kompakten Bauweise und der Tatsache, dass Sensoren passender Bauform nicht kommerziell verfügbar sind, ist es notwendig, die Sensoren selbst zu produzieren. Die Produktion solch kleiner Bauteile, also das Winden eines Platindrahts mit 0,025 mm Durchmesser auf eine Kaptonfolie ist Präzisionsarbeit. Bei benötigter Stückzahl von 1634 verwendbaren Sensoren, wobei nur circa 40% der bisher produzierten Sensoren verwendbar sind, ist die Produktion von Hand zu aufwendig. Deshalb soll ein modifizierter 3D-Drucker diese Aufgabe übernehmen. Dem vom 3D-Drucker geführten Platindraht wird ein elektrischer Strom aufgeprägt, sodass ein Mini-Magnet-Array genutzt werden kann, um den Draht präzise in die gewünschte Position zu bringen.

This project is supported by the BMBF Gefördert durch das BMBF

HK 52.36 Do 16:30 Audimax Foyer

**Performance of the silicon vertex tracker used in the $^8$He(p, pα)$^4$n experiment at SAMURAI** — Thomas Aumann[1], Michael Böhmer[2], Florian Dufter[2], Laura Fabbietti[2], Roman Gernhäuser[2], Sebastian Reichert[2], Dominic Rossi[1], Masaki Sasano[3], and •Vadim Wagner[1] for the NeuLAND-SAMURAI-Collaboration — [1]Technische Universität Darmstadt — [2]Technische Universität München — [3]RIKEN Nishina Center, Wako, Japan

An experiment at the SAMURAI setup at RIKEN was performed to study the existence of a resonant state of four neutrons in a quasi-free $\alpha$-knockout reaction in inverse kinematics from $^8$He. For this the missing-mass method will be used, which requires to know precisely the reaction vertex inside the 5 cm thick liquid hydrogen target. The channel of interest is selected by the detection of a fast proton and a slow $\alpha$, i.e., low and high deposited energies, respectively, with a very small angle. Therefore a silicon strip detector system, consisting of 6 planes (3 horizontal and 3 vertical) with 100 $\mu$m pitch size, was built. Additionaly this detector allows, amongst others, background-subtraction and transverse momentum reconstruction. The design and performance of this detector during the experiment will be presented. This work is supported by the DFG through grant no. SFB 1245, the BMBF under contract number 05P15RDFN1 and 05P15WOFNA and the GSI-TU Darmstadt cooperation agreement.

HK 52.37 Do 16:30 Audimax Foyer

**Lifetime measurements with the DSA method** — •Maximilian Droste, Andreas Vogt, Konrad Arnswald, Peter Reiter, Claus Müller-Gatermann, and Alfred Dewald — Institute for Nuclear Physics, University of Cologne

The Doppler shift attenuation method (DSAM) is the method of choice for the measurement of lifetimes of nuclear excited states in the sub-picosecond region. DSAM experiments employ thin production targets mounted on a thick stopper foil (backing) in which the recoiling nuclei of interest slow down and stop in a well-defined manner. The emission of $\gamma$ rays during this time leads to the observation of a Doppler-broadened lineshape whose details are sensitive to the lifetime and the time evolution of the population of the level of interest. The APCAD analysis code (Analysis Programm for Continuous-Angle DSAM) [1] is a versatile tool for the analysis of $\gamma$-ray lineshapes. The code simulates the slowing-down history of the recoiling ions and fits the distinct lineshapes to the observed spectra. Excited states in $^{20}$Ne and $^{47}$V were populated in fusion-evaporation reactions with the tandem accelerator of the IKP, University of Cologne to test and benchmark the analysis procedures with APCAD. Different stopping approximations (SRIM and GEANT4) are investigated and the impact of nuclear and electronic stopping powers on the fitted lineshapes is studied in detail. Results of these variations as well as a first results for the lifetime of the $4^+$ state of $^{48}$Cr will be presented. A.V. supported by BCGS.

[1] C. Stahl *et al.*, Comput. Phys. Commun. 214 (2017) 174-198.

HK 52.38 Do 16:30 Audimax Foyer

**Monitoring the CBM-TRD Performance with a $^{55}$Fe-Source** — •Dennis Spicker for the CBM-Collaboration — Institut für Kernphysik, Goethe Uni Frankfurt

The Compressed Baryonic Matter (CBM) experiment at FAIR is designed to investigate the properties of strongly interacting matter at highest net-baryon densities. The Transition Radiation Detectors (TRD) main purpose is the identification of dielectrons in the low and intermediate mass region (up to m($J/\Psi$) ). Another important contribution of the CBM-TRD is the measurement of the specific energy loss, in order to differentiate between nuclear fragments with the same $m/Z$ -ratio but different $Z$.

In September 2017, test measurements were performed at DESY with four TRD chambers, equipped with full-size foam radiators, in an electron beam with 1 to 4 GeV momentum. The main goals of the test campaign were a performance test of the radiators, to measure spatial resolution, a test of the readout electronics and a calibration of the gas-gain for the new $Xe/CO_2$ mixture. For the latter, a $^{55}$Fe source was placed in front of one detector.

For this contribution, analyses of $^{55}$Fe spectra were performed, in order to determine the performance and energy resolution of the latest TRD chamber design.

Supported by the German BMBF-grant 05P15RFFC1

HK 52.39 Do 16:30 Audimax Foyer

**Simulating the Radiation Exposure of Medical Staff Caused by Radiologic Interventions** — •Elena Hoemann[1,2],

H. Eberhardt[2], J. Endres[2], A. Günther[2], J. Kopp[3], G. Östreicher[3], F.-N. Sentuc[2], and A. Zilges[1] — [1]Institute for Nuclear Physics, University of Cologne — [2]Gesellschaft für Anlagen- und Reaktorsicherheit, Köln — [3]Klinikum Augsburg

Interventional radiology provides the possibility for a surgeon to execute image-based minimally invasive operations. Due to the need of X-ray-live-images during the procedure, the medical experts are daily exposed to varying amounts of radiation doses. The total amount of this exposure depends, among others, on type, duration and frequency of interventions, the usage of protective equipment and the position of the executing person. The determination of the radiation exposure, especially of equivalent doses in certain organs or tissues, is a major challenge, because an adequate measurement of these quantities during an operation is difficult.

Motivated by that, Geant4-simulations of a medical setup are performed to determine dose distributions, as well as equivalent doses for the surgery team. These simulations provide a powerful tool for investigating influences of protective equipment and other parameters with the objective of optimizing radiation protection for the medical staff.

To evaluate the results of the simulations, experimental measurements are performed at the Klinikum Augsburg. First preliminary results show the consistency of simulated and experimental data.

Funded by the BMUB (3616S42335).

HK 52.40 Do 16:30 Audimax Foyer

**A Data Acquisition System for the Prototypes of the PANDA Micro Vertex Detector Front-End Electronics** — Alessandra Lai[1], •Kai-Thomas Brinkmann[2], Daniela Calvo[3], Valentino Di Pietro[2], Tommaso Quagli[2], Alberto Riccardi[2], James Ritman[1], Angelo Rivetti[3], Manuel Rolo[3], Robert Schnell[2], Tobias Stockmanns[1], Richard Wheadon[3], André Zambanini[1], and Hans-Georg Zaunick[2] — [1]Forschungszentrum Jülich GmbH — [2]II. Physikalisches Institut, Justus-Liebig-Universität Gießen — [3]INFN, Sezione di Torino

The readout of the PANDA Micro Vertex Detector will require novel ASICs for the readout of the strip and pixel sensors. The assessment of the front-end chips performance is a mandatory task, in order to verify the requirements imposed by the experiment. In order to characterize the prototype front-end chips, the Jülich Digital Readout System (JDRS) has been designed to enable both laboratory and in-beam tests. The main features of the JDRS are flexibility and modularity. The functionality of the data acquisition system will be shown together with test results on measurements with the strip front-end ASIC PASTA.

HK 52.41 Do 16:30 Audimax Foyer

**A GEM PCB simulator** — •Piotr Gasik and Laura Fabbietti — TU München, James-Franck-Str. 1, 85748 Garching, Germany

The key parameter for a long-term operation of GEM-based detectors in the harsh environment of high-rate experiments is their stability against electrical discharges. To mitigate the results of violent discharge events, an optimised HV system is mandatory. Behaviour of the system in case of a spark occurrence, propagated discharges or an emergency shutdown of a power supply is of a great importance. The possibility of an over-voltage across any GEM foil must be avoided as it may lead to the development of a destructive discharge. In order to test the reaction of the powering scheme on the events listed above, we have designed and built a multi-GEM detector simulator based on the conventional electronic elements. It can serve as a testing tool for the assessment of the HV scheme without a need to use a real detector.

The device allows for the simulation of a short in one of the GEM segments using HV relays or a spark occurrence by employing a Gas Discharge Tube. Voltages on electrodes in question can be monitored on a scope using standard test probes via decoupling HV capacitors, included in the design. The GEM PCB simulator has been successfully used to test several powering schemes commonly used with GEM detectors, such as: passive voltage divider, multi-channel and a so-called "cascaded" power supply. The results of these tests will be presented in the contribution.

This research was supported by the DFG cluster of excellence "Origin and Structure of the Universe".

HK 52.42 Do 16:30 Audimax Foyer

**Design of an optimized Cluster-Jet Target for CryoFlash** — •L. Lessmann, D. Bonaventura, S. Grieser, and A. Khoukaz — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, 48149 Münster, Germany

The CryoFlash experiment investigates the interaction of the high intensity, short-pulse Ti:Sa laser of the Arcturus Facility Düsseldorf with a cryogenic cluster-jet target constructed at the University of Münster. The main fields of research are the generation of femtosecond X-ray pulses for pump-probe experiments and furthermore the acceleration of electrons and ions up to the MeV scale within a tabletop setup. The cluster-jet target provides a continuous flow of micro- to nanometer sized particles which are of approximately solid density by pressing pre-cooled gas through a Laval nozzle. This combines the advantages of gas-jet targets (continuous flow) and solid targets (high density).

A first cluster-jet target, constructed at the University of Münster, has already been installed at the Arcturus Facility Düsseldorf. First measurements of the interaction of the high intensity, short-pulse laser with the cluster-jet have been taken. The results and experience of the first measurements have been used to design a new and optimized cluster-jet target. The concept and design of this new target will be presented and discussed.

HK 52.43 Do 16:30 Audimax Foyer

**ELIADE@ELI-NP: A multi-detector array for NRF studies** — •Simon G. Pickstone[1], Calin A. Ur[2], Andreas Zilges[1], Norbert Pietralla[3], Jacob Beller[3], Bertrand De Boisdeffre[2], Mihail O. Cernaianu[2], Bastian Löher[3], Catalin Matei[2], George Pascovici[2], Cristian Petcu[2], Deniz Savran[4], Gabriel Suliman[2], Emil Udup[2], Volker Werner[3], and Julius Wilhelmy[1] — [1]Institute for Nuclear Physics, University of Cologne — [2]ELI-NP, IFIN-HH, Bucharest, Romania — [3]Institute for Nuclear Physics, University of Darmstadt — [4]GSI, Darmstadt

Laser-Compton Backscattering facilities provide unique possibilities to study the interaction of $\gamma$-rays with atomic nuclei. Using the Nuclear Resonance Fluorescence (NRF) technique, many experimental quantities can be deduced in a model independent way, such as level energies and widths, $\gamma$-decay branching ratios, and spin and parity quantum number. The new $\gamma$-beam system at the ELI-NP (Extreme Light Infrastructure – Nuclear Physics) facility will provide unprecedented intensities at very narrow bandwidths.

This contribution will present an overview and the current status of ELIADE, a multi-detector array comprised of HPGe detectors and large-volume $LaBr_3$ detectors currently under construction at ELI-NP.

Supported by the Project Extreme Light Infrastructure – Nuclear Physics (ELI-NP) – co-financed by the Romanian Government, the European Union through the European Regional Development Fund and the BMBF (05P2015/ELI-NP).

HK 52.44 Do 16:30 Audimax Foyer

**Modification of the GEM response due to etching effects from high irradiation** — •Michael Jung for the ALICE-Collaboration — Institut für Kernphysik Frankfurt

For the Upgrade of the ALICE Time Projection Chamber (TPC) with Gas Electron Multipliers (GEMs) an aging test setup was built to evaluate the long-term performance of GEMs in high-luminosity experiments. These tests revealed that the insulating kapton layer between the copper electrodes is worn out after long-term operation of the GEM stack with high gain. This phenomenon, which is changing the hole geometry of the irradiated area, leads to a modification of the GEM response, which is now investigated with simulations of a single GEM. The simulations of the electric fields were performed with ANSYS 16.1 and the operation process of the detector is simulated with the Garfield$^{++}$ toolkit.

The simulations focus on the details of the amplification process to understand the change in gain and multiplication of etched GEMs as well as the decrease of the energy resolution.

HK 52.45 Do 16:30 Audimax Foyer

**Development of an Optical System for the Backward End-Cap of PANDA** — •Samer Ahmed[1], Luigi Capozza[1], Alaa Dbeyssi[1], Phillip Grasemann[1], Frank Maas[1,2,3], Oliver Noll[1], David Rodriguez Pineiro[1], Sara Wolff[1], Manuel Zambrana[1], and Iriz Zimmermann[1] for the PANDA-Collaboration — [1]Helmholtz-Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA Cluster of Excellence, Mainz, Germany

The PANDA experiment at the upcoming FAIR accelerator facility will study antiproton annihilation reactions at antiproton beam momenta from 1.5 GeV/c up to 15 GeV/c. The PANDA homogeneous electromagnetic calorimeter has been designed to meet the physics goals of the PANDA experiment. The calorimeter consists of lead tungstate (PbWO4 ) crystals and ensures an efficient photon/electron detection in a wide range of energy with a high resolution. In order to achieve the required energy resolution of the electromagnetic calorimeter, the individual crystal channels have to be calibrated and their radiation damage must be monitored and recovered. An optical fiber distribution system has been developed for the backward end-cap of the PANDA electromagnetic calorimeter. The optical prototype system provides light uniformity better than 95% which enable us to precisely calibrate the crystals. In this contribution, a description of the technical design and the performance of this prototype is presented.

HK 52.46 Do 16:30 Audimax Foyer

**Ladder Assembly for the Silicon Tracking System of the CBM Experiment at FAIR** — •Shaifali Mehta for the CBM-Collaboration — Universität Tübingen, Tübingen, Deutschland — GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Deutschland

In the CBM Experiment, the track reconstruction of the charged particles followed by the momentum measurements are carried out using the Silicon Tracking System (STS). The detector comprises of 896 detector modules, based on double- sided silicon microstrip sensors distributed on 8 tracking stations. The Stations are made from mechanical half units onto which carbon fibre detector ladders are mounted holding the modules. A concept tool has been designed to study the feasibility of the ladder assembly. The size of the tool has been chosen to mount two $6.2 \times 6.2\,\mathrm{cm}^2$ sensors on the ladder, one of the four sensor variants in the STS.
This work focuses on assembly and testing of the ladders with sensors. This way one can ensure that handling and gluing of sensors does not effect the performance of the detector system. The ladder structure, its components (sensors, micro-cables, read-out chips, front end boards) will be presented along with the assembly techniques in order to mount the modules with mechanical precision better than 100 $\mu$m.

HK 52.47 Do 16:30 Audimax Foyer

**Entwicklung eines neuen Triggerdetektors für das Lintott-Spektrometer am S-DALINAC*** — •Isabelle Brandherm, Maxim Singer und Peter von Neumann-Cosel — Institut für Kernphysik, TU Darmstadt

Das Lintott-Spektrometer ist ein hochauflösendes Elektronenspektrometer für $(e, e')$-Experimente am S-DALINAC in Darmstadt. Das Detektorsystem besteht aus einem ortsaufgelösten Siliziumstreifenzähler, sowie einem Triggerdetektor [1]. Dabei liefert der Triggerdetektor das Startsignal für die Auslese der Siliziumstreifen. Um das Signal-Untergrund-Verhältnis zu verbessern, wurde dieser neu entwickelt. Er besteht jetzt aus zwei hintereinander angeordneten Szintillatoren, sowie einem Tscherenkow-Detektor. Das Triggersignal wird durch eine Dreifachkoinzidenzschaltung zwischen den einzelnen Detektoren erzeugt. Ein mögliches Tracking der Elektronenbahnen durch eine ortsauflösende Messung mit den beiden Szintillatoren wird diskutiert.
[1] A. Lenhardt et al., NIM A 562,320 (2006).
Gefördert durch die DPG im Rahmen des SFB 1245.

HK 52.48 Do 16:30 Audimax Foyer

**Entwicklung eines neuen Datenaufnahmesystems für das Lintott-Spektrometer am S-DALINAC *** — •Maxim Singer, Adrian Brauch, Michaela Hilcker, Peter von Neumann-Cosel und Maximilian Spall — Institut für Kernphysik, TU Darmstadt

Am supraleitenden Elektronenbeschleuniger S-DALINAC wurde für das hochauflösende Lintott-Magnetspektrometer ein neues Datenaufnahmesystem für Elektronenstreuexperimente entwickelt. Das Detektorsystem des Spektrometers besteht aus einem ortsauflösenden Siliziumstreifendetektor und einem Triggerdetektor[1]. In dem neu entwickelten Datenaufnahmesystem werden die analogen Spannungssignale der einzelnen Siliziumstreifenmodule mit Hilfe eines Flash ADCs digitalisiert und erlauben nun eine flexible Online-Analyse von (e,e')-Events. Gezeigt wird das Konzept der Datenaufnahme, sowie das speziell darauf zugeschnittene Online-Monitoring-Programm Lintomon. Die Funktionsfähigkeit und mögliche Erweiterungen des Systems werden anhand von Messergebnissen aus einer aktuellen Strahlzeit diskutiert.
[1] A. Lenhardt et al., NIM A 562, 320 (2006).
* Gefördert durch die DFG im Rahmen des SFB 1245.

HK 52.49 Do 16:30 Audimax Foyer

**Design and Performance of the Jet Target for MAGIX at MESA** — •S. Grieser, P. Brand, D. Bonaventura, C. Hargens, and A. Khoukaz — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, 48149 Münster, Germany

The future electron accelerator MESA (Mainz Energy-recovering Superconducting Accelerator) at the University of Mainz will focus on low energy measurements with high precision to verify the Standard Model of particle physics. For the MAGIX experiment (MESA Gas Internal target eXperiment) MESA will provide a beam with energies up to 105 MeV with a beam current of 1 mA in the energy-recovering sector, allowing high luminosities of $10^{35}$ 1/cm$^2$s. Essential for the experiment is the jet target with highest thicknesses of $10^{19}$ atoms/cm$^2$ directly behind the nozzle which was designed, built up and set successfully into operation at the University of Münster. To realise this high thickness in combination with good vacuum conditions, the target will be operated at low temperatures in the cluster mode where a well defined beam leaves the nozzle. Therefore, investigations and measurements with a Mach-Zehnder interferometer and with different nozzle geometries and stagnation conditions were made to improve the performance of the target. The nozzles originate from an improved production process developed at the University of Münster. Additionally, first successful beam times at MAMI (MAinz MIcrotron) were performed. The production line of nozzles, the target design and the studies on the cluster beam will be presented and discussed.

HK 52.50 Do 16:30 Audimax Foyer

**GEM Tracking Detectors for the NA64 Experiment at CERN** — •Michael Hösgen, Markus Ball, and Bernhard Ketzer — Universität Bonn, Helmholtz-Institut für Strahlen- und Kernphysik, Bonn, Germany

The NA64 experiment conducts rare–event searches at the SPS of CERN. The poster will present the triple GEM tracking detectors with 2D strip readout that are part of the beam spectrometer of the NA64 experiment.

In 2016 and 2017 separate dedicated searches for two mediators between standard model and dark sector, a new light vector boson A' and a new short-lived neutral boson X, were performed. The event selection process of both searches includes the clean identification of the incident 100 GeV beam electrons, which is achieved with a magnetic spectrometer. As tracking detectors $8 \times 8\,\mathrm{cm}^2$ Micromegas and $10 \times 10\,\mathrm{cm}^2$ triple Gas Electron Multiplier (GEM) detectors are used.

I document the manufacturing of two GEM detectors starting from the design, to the production and quality assurance of the components and the calibration of the full detectors. I will present the performance at the SPS at CERN and discuss possible improvements.

HK 52.51 Do 16:30 Audimax Foyer

**Characterization of ultra-nanocrystalline diamond films as reflector for ultra-cold neutrons** — Hadwig Sternschulte[1,2], Stephan Wlokka[2], •Andreas Frei[2], Peter Geltenbort[3], and Stefan Wenisch[2] — [1]Fakultät für Geistes- und Naturwissenschaften, Hochschule Augsburg, Germany — [2]Heinz Maier-Leibnitz Zentrum, Technische Universität München, Germany — [3]Institut Laue-Langevin, Grenoble, France

Diamond is an excellent reflector for ultra-cold neutrons (UCN) due to the high atom density in combination with a large bound coherent scattering length and low loss cross sections. As a material with high radiation hardness it is especially suitable for UCN reflectors close to a reactor core or a spallation target. Ultra-nanocrystalline diamond (UNCD) films have a very low surface roughness independent of the film thickness. They can be grown on various substrates with 3D geometries by chemical vapour deposition and are therefore promising candidates for UCN reflecting layers in superthermal sources for UCN, which are currently build up. UNCD films have so far not been used as UCN reflectors.

In this work we present the first measurements of the UCN storage properties of UNCD films. In a storage chamber made from stainless steel four side walls were covered with several $\mu$m thick UNCD films grown on 6" Si substrates. The experiments show a significant increase of the effective UCN storage time compared to the pure stainless steel chamber. The influence of the surface termination of the UNCD films on the effective UCN storage time will be discussed.

HK 52.52 Do 16:30 Audimax Foyer

**Construction and Assembly of the First Barrel Slice for the Electromagnetic Calorimeter of the PANDA Experiment** — •Markus Moritz, Hans-Georg Zaunick, and Kai-Thomas Brinkmann for the PANDA-Collaboration — II. Pysikalisches Institut, Justus Liebig Universität, Gießen

The first major assembly stage of the barrel part of the electromagnetic calorimeter (EMC) of the PANDA experiment at the future FAIR facility will be presented. This consists in the construction of the first of 16 slices of the EMC barrel. The full EMC will be composed of two end-caps and a barrel, consisting of more than 11.300 tapered PbWO4 crystals. Each scintillator module is read out via two large area avalanche photo diodes connected to custom made ASIC-preamplifiers. The construction of the first segment comprises a full length slice beam holding in total 18 module blocks. Each block consists of a matrix of 4x10 crystals. The assembly procedure of single detector modules, module blocks and the overall slice segment, respectively, will be highlighted. Test results of single components and fully assembled detector modules will be discussed and compared with earlier prototype in-beam and lab tests.

Supported by BMBF, GSI and HIC for FAIR.

HK 52.53 Do 16:30 Audimax Foyer

**Research and Development for the PANDA Backward End-Cap of the Electromagnetic Calorimeter** — Samer Ahmed[1,2], Luigi Capozza[1], Alaa Dbeyssi[1], Phillip Grasemann[1,2], Frank Maas[1,2,3], Javier Mateo Cardena[1], Oliver Noll[1,2], •David Rodriguez Pineiro[1], Sahra Wolff[1,2], Manuel Zambrana[1,2], and Iris Zimmermann[1,2] for the PANDA-Collaboration — [1]Helmholtz-Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA Cluster of Excellence, Mainz, Germany

The PANDA experiment will be one of the key projects of the new accelerator facility FAIR in Darmstadt. With its mature detector system, it will be able to observe a variety of physical channels. Thus it will make a huge contribution to the understanding of the strong interaction. The electromagnetic process group (EMP) in Mainz is developing the backward end-cap (BWEC) of the electromagnetic calorimeter. For its construction various tests regarding mechanics have been carried out and are foreseen within the R&D framework. A full prototype of the moving support system was built and tested, comprising insertion rails and a movable trolley base. The rails were divided into two sections (fixed and removable in PANDA). A big change in the crystal support is being implemented making the detector more modular. FR4 holders in different configurations (fiber orientation and positioning) were tested. In addition, thermal studies using our current proto16 are being performed.

HK 52.54 Do 16:30 Audimax Foyer

**Study of pedestals and noise of an IROC prototype for the upgrade of the ALICE TPC** — •Hendrik Schulte for the ALICE-Collaboration — Institut für Kernphysik, Goethe Universität Frankfurt

In the LHC Run 3 period (2021 and beyond) the collision rate in Pb–Pb will be increased to 50 kHz. To cope with this data rate, the Time Projection Chamber (TPC) of ALICE will be upgraded with a GEM-based readout system for continous readout. In the course of that, also the front-end electronics will be replaced.

The requirements to this new readout system are stable pedestal values and a noise level of around 1 ADC value. In May 2017, a test beam campaign at the CERN Proton Synchroton was performed, employing a pre-production Inner Readoutchamber (IROC) module of the final design.The detector is equipped with advanced prototypes of the new Front-End Cards (FECs), employing the newly developed SAMPA readout chip. The aim of this test is to demonstrate that the readout requirements are fulfilled in a realistic setup, and finally to verify the PID performance of the system using pion and electron beams.

This poster shows investigations on pedestal and noise values in data from the beam test in May 2017.

HK 52.55 Do 16:30 Audimax Foyer

**Nachweis hochenergetischer Strahlung im CALIFA-Detektor** — Roman Gernhäuser, Benjamin Heiss, •Philipp Klenze, Patrick Remmels und Felix Stark — Physik Department, Technische Universität München

Das CALIFA Kalorimeter mit seinen etwa 2600 Szintillationskristallen ist eine der wesentlichen Komponenten des $R^3B$-Experiments. Neben geladenen Teilchen wie Protonen wird es vor allem auch Gammastrahlen nachweisen.

Am Tandembeschleuniger des *Campus Tecnológico e Nuclear* (CTN) der Universität Lissabon wurde ein Experiment zur Charakterisierung der Barrelsegmente von CALIFA durchgeführt. In einer $^{27}\mathrm{Al}(p,\gamma)^{28}\mathrm{Si}$ Reaktion bei Strahlenergien von 2.2 – 3.1 MeV wurden selektiv hochangeregte Zustände in $^{28}$Si bevölkert. Dank des hohen Q-Wertes der Reaktion von 11.6 MeV konnten Gammas mit einer Energie von über 10 MeV nachgewiesen werden.

Der vorliegende Beitrag wird sich primär mit Methoden der Clusterbildung und zur Rekonstruktion der Gamma-Energien beschäftigen.

Gefördert durch BMBF (05P15WOFNA).

HK 52.56 Do 16:30 Audimax Foyer

**Energy Calibration of the Münster Dual-Phase Xenon Time Projection Chamber** — •Kevin Gauda and Henning Schulze Eissing — Institut für Kernphysik, WWU Münster

The Münster dual-phase xenon time projection chamber (TPC), an experiment of the Institut für Kernphysik in Münster, is designed according to the XENON100 TPC, which aimed for direct detection of dark matter. Due to its high atomic number, the self-shielding against gamma-rays and the high purity, liquid xenon is a very capable material for detectors in particle and astroparticle physics and specifically for dark matter direct detection experiments.

The Münster TPC contains a maximum of 2.6 kg pure liquid xenon in a highly reflecting polytetrafluoroethylene (PTFE) vessel and is equipped with 14 photomultipliers (PMTs). Its signals are analyzed by the processor for analyzing XENON (PAX), which was developed for XENON1T.

A deep understanding of the detector is necessary for any future scientific work. Therefore, the characterization of the TPC will be shown, i.e. the energy calibration with the radioactive sources Kr-83m and Cs-137. This includes the determination of the electron drift lifetime, light collection efficiency and light yield.

HK 52.57 Do 16:30 Audimax Foyer

**A small-sized multi-purpose data-logging device** — •Mario Engel, Philip Hauer, Philipp Bielefeldt, Markus Ball, and Bernhard Ketzer — Universität Bonn, Helmholtz-Institut für Strahlen- und Kernphysik, Bonn, Germany

For the operation of gaseous detectors it is crucial to monitor environmental parameters such as pressure and temperature. For the quality assurance of GEM-foils (HV-measurements) and in the process of gluing the relative humidity plays an important role. If GEM foils or detector parts are transported it is important to record possible external shocks which might damage the components. We have developed a compact multi-functional data-logging device that has the flexibility to fulfill all these numerous requirements. The micro-controller-based device consists of modules for each parameter (temperature, pressure, humidity, acceleration). The data can be stored on a compact microSD card if there is no access to the device (e.g. during transport). It is possible to send the data automatically via WiFi. The poster will present a first characterization of the device in terms of parameter measurements and power consumption.

HK 52.58 Do 16:30 Audimax Foyer

**The A1 - Jet-Target-Project** — •Stephan Aulenbacher — Institut für Kernphysik, Mainz, Deutschland

In the year 2017 a new target has been installed @A1 in Mainz. This target is a Cluster-Jet-Target, which means that a hydrogen jet streams through the vacuum chamber, perpendicular to Mamis electron beam. By cooling down to gas temperatures of 40 K, the gas jet gets high densities in the core, due to the formation of clusters. The Jet-Target enables high precision measurements due to its windowless design. This poster shows the details of the entire construction and the first performed measurements regarding the density profile of the jet and the cooling behavior of the system.

HK 52.59 Do 16:30 Audimax Foyer

**A cosmics telescope for the compact GEM-TPC.** — •wael alkakhi, markus ball, philipp bielefeldt, jonathan ottnad, dimitri schaab, and bernhard ketzer — Universtät Bonn, 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-TPC. Such a TPC is currently being developed for a future upgrade of the CBELSA/TAPS experiment at the ELSA facility at 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 $10 \times 10\,\mathrm{cm}^2$ GEM (Gas Electron Multiplier) detectors with 2D strip readout on a movable platform. Applying a programmable trigger matrix to the hodoscopes, 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 a precise external track reference for TPC resolution studies.

The poster will describe the setup, the characterization of the trigger hodoscope, and the status of the GEM detectors.

HK 52.60 Do 16:30 Audimax Foyer

**Ray Optics Simulation of the KATRIN Rear Wall Illumination** — •Benedikt Bieringer — Institut für Kernphysik, Münster, Deutschland

The KArlsruhe TRItium Neutrino (KATRIN) experiment is designed to measure the mass of the electron antineutrino from the shape of the tritium $\beta$-decay spectrum with a sensitivity of $0.2\,eV/c^2$ (90 % CL). An electrostatic spectrometer of MAC-E filter type is used for the analysis of the decay electrons generated in the Windowless Gaseous Tritium Source (WGTS). The decaying tritium produces a plasma inside the WGTS with a high conductivity along the magnetic flux lines inside the source. Electrons that are emitted in the backward direction (away from the spectrometer) or reflected from the spectrometer because of not passing the high energy filter are magnetically guided and absorbed in the so-called rear wall (a gold-plated stainless steel disc). To prevent a net positive charge of the plasma, the rear wall can be illuminated homogeneously with UV light to produce photoelectrons which neutralize the plasma. For this purpose, a broad light spectrum is generated from a xenon short-arc lamp and then filtered using two dichroic beam splitters. The remaining beam with wavelengths between approx. 200 and 260 nm is enlarged using a refracting telescope. This illumination setup was optimized using 3D ray-tracing simulations performed with COMSOL to investigate the homogeneity of the illumination, the total intensity of the illumination and the size of the setup. The optimization process of the rear wall illumination setup is presented. This work is supported under BMBF contract number 05A17PM3.

HK 52.61 Do 16:30 Audimax Foyer

**Radiation Hardness of pcCVD Detectors and precise IC Calibration** — •Steffen Schlemme[1,2], Mladen Kis[1], Chiara Nociforo[1], Fabio Schirru[1], Joachim Enders[2], P. Figuera[3], J. Frühauf[1], A. Kratz[1], N. Kurz[1], S. Löchner[1], A. Musumarra[3,4], S. Salamone[3], B. Szczepanczyk[1], M. Träger[1], and R. Visinka[1] — [1]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [2]Schlossgartenstr. 9 — [3]LNS-INFN Catania, Italy — [4]University of Catania, Italy

A new in-flight separator Super-FRS is under construction at FAIR/Darmstadt. Ion rates up to $3{\times}10^{11}$ $^{238}U$/spill demand an adaptation of detectors to a high radiation environment. Test experiments to investigate the radiation hardness and absolute efficiency of single- (SC) and polycrystalline (PC) diamond detectors have been performed at the LNS-INFN in Catania using a $^{12}C$ beam at 62MeV/u and intensities of up to 1.5pnA. Counting efficiencies of 100% and 95% were found for the SC and PC respectively. While the SC showed a decrease in signal quality after 25KGy the signal quality of the PC did not show a significant decrease after 3.5MGy. Further the prototypes of an ionisation chamber (IC) and secondary electron monitor (SEM) designed for the use at the Super-FRS have been tested. Both detectors were operationable and a calibration of the IC and SEM using each the SC as reference achieved precisions of 1% and 5% respecively concluding that C is the far lower limit for a direct calibration of the SEM using the SC directly.

HK 52.62 Do 16:30 Audimax Foyer

**Practical Approaches for Usage of Raspberry Pis in Slow Control Systems** — •Maik Biroth, Patrick Achenbach, Werner Lauth, and Andreas Thomas for the A2-Collaboration — Institute for Nuclear Physics, Mainz

In nuclear physics single-board computers like Raspberry Pis are enjoying growing popularity for an usage in slow control applications based on a decentralized network infrastructure like EPICS. This work gives an overview of known everyday issues and approaches of detailed electronic solutions. Main topics are: How to convert NIM signals to the LVTTL level that they can be processed by the Raspberry Pi; how to build an uninterruptible power supply to avoid a corrupted file system after breakdown of the voltage; how to use an microcontroller as a front processor to reboot the computer if a software error leads to a crash of the network connection.

HK 52.63 Do 16:30 Audimax Foyer

**The second step of the fission reaction.** — Genevieve Mouze[1], Christian Ythier[1], Hong-Yin Han[2], and •Jean-Francois Comanducci[3] — [1]Universite de Nice, 06108 Nice cedex 2, France — [2]CIAE, Beijing , 102413, China — [3]LE-AIEA, 4, Quai Antoine Premier, 98000 Monaco

This rearrangement step begins by a collision between the bare 82-proton phase of the 208Pb core and the charged cluster. A proof is furnished by the symmetric fission of 258Fm. There, the 132Sn product can be formed only by the fusion of the 50Ar cluster with the whole 82 proton phase, whereas the complementary product 126Sn comes from the 126 neutron phase. This rearrangement can occur only thanks to the intervention of a new boson field allowing not only a modification of the quark-constitution of core and cluster but also the sharing- out of the charge between the two products; and all that occurs within an extremely short time interval. The value, 0.17 yoctosecond, of this lifetime results from the uncertainty in the mass, neutron number and charge number, 4, about 2.4 and about 1.6 respectively, observed in transfer reactions and in fission. In the lighter nucleus 235U, due to confinement, the nucleons of the cluster are shared-out between p- and n- phases; its fission is asymmetric.

HK 52.64 Do 16:30 Audimax Foyer

**The third step of the fission reaction** — Genevieve Mouze[1], Christian Ythier[1], Hong-Yin Han[2], and •Jean-Francois Comanducci[3] — [1]Universite de Nice, 06108 Nice cedex 2, France — [2]CIAE, Beijing 102413, China — [3]LE-AIEA, 4, Quai Antoine Premier, 98000 Monaco

As in the emission of an alpha particle by a nucleus, the separation of the two nuclei from a fission- product pair involves a Coulomb barrier. The barrier- free fission of 258Fm was discovered in 2005 [1]; there, only two pairs, 126Sn- 132Sn and 128Sn- 130Sn, are emitted, the others are confined; and all nuclei lighter than 258Fm fission asymmetrically, due to the confinement. Even 252Cf, in which a single pair, 126In- 126In, could have been formed in the collision of its 44S cluster with the 82 p-phase, and which should have led to two products of A >126 and so could be the lighter nucleus fissioning symmetrically, still fissions asymmetrically because 126In- 126In is confined. Thanks to the concept of confinement, a new fission barrier Bf can be taken into consideration, and defined as the difference between the Coulomb barrier Bc and the fission energy Q, where Bc has to be corrected for the sphericity of the involved fission products. [1] G. Mouze, Intern. Winter Meeting on Nuclear Physics, Bormio, Universita di Milano, 2005,p.250 .

HK 52.65 Do 16:30 Audimax Foyer

**Where is inertia coming from ?** — Christian Ythier[1] and •Jean-Francois Comanducci[2] — [1]Universite de Nice, 06108 Nice cedex 2, France — [2]LE- AIEA 4 Quai Antoine Premier, 98000 Monaco

Newtons experiment with a vessel shows how much he wished to find an explanation of the centrifugal force. The body in rotation was water; each part, even the smallest, of the water has the property of withstanding the centripetal force; so, the cause of inertia lies in the elementary particles. Electrons and quarks have a rest mass, but can it be represented by Einsteins equation, that contains a frequency? Indeed, how can an electron at rest vibrate or rotate? According to Zisman, or Feynman, electrons can move along the time axis. In the time, why do they not rotate perpendicularly to the 3D-space? It could be the cause of inertia! The same could hold for each of the three quarks of a proton or neutron, as it has an angular frequency. So we propose that matter, because it is made of electrons and quarks, is submitted to centripetal forces and for this reason has inertia and mass. We mention some consequences of this new idea.