HK 22 Postersitzung

Zeit: Montag 16:30–18:00 Raum: TU MA141

HK 22.1 Mo 16:30 TU MA141

Der mittlere quadratische Radius des Protons. * — •I. Pysmenetska, P. von Neumann-Cosel, A. Richter, S. Rathi und G. Schrieder — Institut für Kernphysik, TechnischeUniversität Darmstadt

Die genaue Messung des mittleren quadratischen Radius des Protons ist ein altes, aber immer noch ein unbefriedigend gelöstes Problem. Die Analyse neuer Experimente mit der Lamb-Shift Methode in Rahmen der QED werden durch die ungenaue Kentnis des Protonradius begrenzt. Die Systematik aller Weltdaten für den Radius des Protons ist in [1] zusammengefasst. Eine etablierte Methode ist elastische Elektronenstreuung, die experimentellen Werte unterscheiden sich aber stark. Am S-DALINAC wird zur Zeit ein neuartiges Experiment vorbereitet, bei den statt der Elektronen die rückgestreute Protonen nachgewiesen werden sollen.

Die neue Methode bringt eine ganze Reihe von Vorteilen, so dass eine die relative Ungenauigkeit besser als 1 % erreicht werden kann. So kann die ganze Winkelverteilung und damit die Impulsübertragsabhängigkeit gleichzeitig gemessen werden, was das Problem Absolutnormierung einzelner Messungen vermeidet. Zuzätzlich kann das Verhältnis des elektrischen zum magnetischen Formfaktor bestimmt werden.

[1] S.G.Karshenboim, arXiv:hep-ph/9712347

*Gefördert durch die DFG unter SFB 634.

HK 22.2 Mo 16:30 TU MA141

Polarisierbarkeit des Nukleons* — •O. Yevetska[1], J. Ahrens[2], V. Chizhov[3], V. Iatsioura[3], A. Richter[1], G. Schrieder[1], L. Sergeev[3], Yu. Smirenin[3] und S. Watzlawik[1] — [1]Institut für Kernphysik, TU Darmstadt, Deutschland — [2]Institut für Kernphysik, Johannes Gutenberg-Universität, Mainz, Deutschland — [3]Petersburg Nuclear Physics Institute, Petersburg, Russland

Am supraleitenden Darmstädter Elektronenlinearbeschleuniger S-DALINAC wurde ein Experiment zur Bestimmung der elektrischen und magnetischen Polarisierbarkeit des Nukleons aufgebaut. Ziel ist es, mit einer neuen experimentellen Methode den differenziellen Wirkungsquerschnitt von elastischer γp-, bzw. γd-Streuung im Gammaenergiebereich von 20-100 MeV modellunabhängig mit einer Genauigkeit von $\leq$ 1% absolut zu bestimmen. Ein kollimierter Gammastrahl wird in zwei Hochdruckionisationskammern an Wasserstoff (Deuterium) gestreut. Die gestreuten Photonen werden unter 90° und 130° in 10"x14" NaJ-Detektoren nachgewiesen, koinzident werden Energie und Winkel der Rückstoßprotonen bzw. -deuteronen in der Ionisationskammer bestimmt.

Es werden der fertige Experimentaufbau, sowie Ergebnisse von Simulationen und ersten Messungen präsentiert.

*Gefördert durch die DFG, SFB 634.

HK 22.3 Mo 16:30 TU MA141

Study of the parity violation in the Δ(1232) region — •Luigi Capozza — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, 55099 Mainz

A measurement of the parity violation asymmetry in electron-proton scattering using a polarised electron beam is performed at MAMI. So far the asymmetry has been fully extracted and interpreted for the elastic part of the observed spectrum. With the same apparatus, inelastic processes are recorded in parallel to the elastic scattering events. Contributions to the inelastic spectrum arise from processes such as resonance excitation, non-resonant pion production, radiative tail from the elastic scattering and other processes. In order to study parity violation in the excitation if the $\Delta(1232)$ resonance, it is important to recognise which phenomena are responsible for the experimental spectrum and with which magnitude. The aim of this work is a simulation including all relevant processes in order to extract an estimate of the parity violation asymmetry in the $\Delta(1232)$ region.

HK 22.4 Mo 16:30 TU MA141

Single-Spin-Asymmetrien im A4-Experiment an MAMI — •Sebastian Baunack für die A4-Kollaboration — Institut für Kernphysik, Universität Mainz, J.J. Becherweg 45, 55099 Mainz

Die A4-Kollaboration führt Untersuchungen zur Struktur des Protons durch. Dazu werden am Elektronenbeschleuniger MAMI polarisierte Elektronen an unpolarisierten Protonen gestreut. Im Falle longitudinal polarisierter Elektronen wird die Paritätsverletzung in der elastischen ep-Streuung gemessen. Aus den gemessenen Asymmetrien im Wirkungsquerschnitt können Rückschlüsse auf den Beitrag von Strange-Seequarks zu den Vektorformfaktoren des Protons gezogen werden. Im Falle transversal polarisierter Elektronen werden Azimutalasymmetrien gemessen, welche den Zugriff auf den Imaginärteil der Zweiphoton-Austauschamplitude ermöglichen.

Die gemessenen Asymmetrien liegen in der Größenordnung 10^{-6}. Es wird die Analyse der Meßprogramme bei Impulsüberträgen von $Q^2 = 0.23(GeV/c)^2$ und $Q^2 = 0.11(GeV/c)^2$ sowohl bei Longitudinal- als auch bei Transversalpolarisation vorgestellt.

HK 22.5 Mo 16:30 TU MA141

Longitudinal single-spin asymmetries in semi-inclusive DIS — •Marc Schlegel and Andreas Metz — Institut fuer Theoretische Physik II, Ruhr-Universitaet Bochum, D-44780 Bochum, Germany

Non-zero single-spin asymmetries (SSA) in semi-inclusive lepton nucleon scattering have been observed recently by the HERMES collaboration. In general, SSA can be generated by time-reversal odd (T-odd) parton distributions and fragmentation functions, where the former are of particular interest, because they are non-zero only if the gauge-link in their operator definition is included [1,2]. The gauge link encodes the re-interaction of the struck quark with the target system. By means of a calculation in a perturbative spectator model for the nucleon we show explicitly that not only the leading twist SSA for a transversely polarized target is affected by the rescattering of the struck quark but also the twist-3 longitudinal SSAs (beam or target polarization) [3]. Our result indicates that previous analyses of these observables are incomplete. We also discuss if, for the twist-3 observables, the rescattering effect can be described by T-odd parton distributions in a factorized picture.

[1] Brodsky, Hwang, Schmidt [2] Collins [3] Metz, Schlegel

HK 22.6 Mo 16:30 TU MA141

Two-proton correlation function for the $pp \to pp\eta$ reaction. — •Pawel Klaja for the COSY-11 collaboration — Institute of Physics, Jagellonian University, Cracow, PL-30-059 Poland

A large enhancement in the excitation function of the $pp \to pp\eta$ reaction observed close to the kinematical threshold indicates a strong attractive interaction within the $pp\eta$ system [1, 2]. The effect can be described assuming, that the proton-proton pair is produced from a large object of a 4 fm radius [3]. It is however still not established whether the low energy $pp\eta$ system can form a Borromean or resonant state. Recently published high statistics data for the $pp \to pp\eta$ reaction measured by the COSY-11 collaboration will be used to elucidate this question. This data are presently evaluated using the well known intensity interferometry method, commonly referred to as the HBT effect [4]. This technique permits the size of the source from which protons are emitted to be determined. It is based on the correlation function of two protons relative momenta. A comparison of the experimental results with theoretical predictions will be presented and the achieved accuracy of the determination of the source size will be discussed. In particular it will be shown how the shape of two-proton correlation function calculated including Coulomb interaction and Pauli exclusion principle depends on the spatial size of the source.

Supported by FZ-Jülich and DAAD. [1] P. Moskal, Physical Rev. C **69** (2004) 025203.

[2] M. Abdel-Bary et al., Eur. Phys. J. A **16** (2003) 127.

[3] S. Wycech, Acta Phys. Polon. **B 27** (1996) 2981.

[4] D. H. Boal, C.-K. Gelbke, B. K. Jennings,
Rev. Mod. Phys. **62** (1990) 553.

HK 22.7 Mo 16:30 TU MA141

Analysing power measurements for the $\vec{p}p \to pp\eta$ reaction at COSY-11 — •Rafał Czyżykiewicz for the COSY-11 collaboration — IKP, FZ-Jülich, Germany — Jagellonian University, Kraków, Poland

Supported by FZ-Jülich and DAAD.

It is generally expected that in NN collisions the η meson is predominantly created via the mesonic excitation of the $S_{11}(1535)$ resonance, and its subsequent decay into a proton-η system. At present it is still not established what the relative production amplitudes for the $S_{11}(1535)$ resonance are. Among the available models Nakayama et al. [1] postulated a dominance of π and η as exchange mesons, while Fäldt and Wilkin [2] found a main contribution originating from the vector meson exchange. Both models are in good agreement with unpolarised observables, however they differ significantly when predicting polarisation observables – such as the analysing power A_y.

In this contribution we report on the COSY-11 measurements of A_y for the $\vec{p}p \to pp\eta$ reaction [3] determined at different close-to-threshold energies. The techniques of the polarisation determination at COSY-11 and their comparison with the results [4,5] obtained by means of the other polarimeters operating at COSY will be presented.

[1] K. Nakayama et al., Phys. Rev. **C 65** (2002) 045210.
[2] G. Fäldt and C. Wilkin, Phys. Scripta **64** (2001) 427.
[3] COSY-11: P. Winter et al., Phys. Lett. **B 544** (2002) 251; erratum-ibid. **B 553** (2003) 339.
[4] B. Lorentz, FZ-Jülich, private communication (2003).
[5] K. Ulbrich, Bonn University, private communication (2003).

HK 22.8 Mo 16:30 TU MA141

Single-Pion Production Measured at COSY-TOF* — •E. Doroshkevich, K. Haug, H. Clement, K. Ehrhardt, A. Erhardt, R. Meier, and G. J. Wagner for the COSY-TOF collaboration — Physikalisches Institut, Universität Tübingen

The single-pion production channels $pp \to d\pi^+, pp \to pn\pi^+$ and $pp \to pp\pi^0$ have been measured at COSY at incident proton energies of 400 and 800 MeV, the latter with polaried beam. In order to have minimum contributions from pion decay in flight and simultaneously an optimum phase space coverage by the central calorimeter the TOF spectrometer has been used in its short version. Track reconstruction is achieved by pixel informations from start, fiber, quirl and ring hodoscopes. Particle identification and kinetic energies have been obtained for particles detected in the central calorimeter. For particles detected at larger angles in the ring hodoscope the time-of-flight information has been utilized for the determination of their kinetic energy. This way the full event information is obtained with four overconstraints in case of the $d\pi^+$ channel and one overconstraint in case of $pp\pi^0$ and $pn\pi^+$ channels. For $pp \to d\pi^+$ the resulting angular distributions agree well with SAID. Our data for $pp \to pp\pi^0$ at $T_p = 400MeV$ agree with a previous experiment [1] in the overall features, however, deviate significantly in the angular distributions.
Graduiertenkolleg)

[1] R. Bilger et al., Nucl. Phys. **A693** (2001) 633

* supported by BMBF (06 TU 201), DFG (Europ. Graduiertenkolleg), FZ Jülich (FFE) and Landesforschungsschwerpunkt (Quasiteilchen)

HK 22.9 Mo 16:30 TU MA141

Determination of Effective Target Thickness and Luminosity from Beam Energy Losses at the ANKE Cluster Target* — •Irakli Keshelashvili, Michael Hartmann, Hans Joachim Stein, Yoshikazu Maeda, and Dieter Prasuhn for the ANKE collaboration — Forschungszentrum Jülich, Jülich, Germany

The thickness of a hydrogen cluster jet target and the corresponding luminosity in an experiment at the ANKE spectrometer at the internal beam of the COSY-Jülich accelerator were determined by measuring the energy loss of the circulating proton beam[1]. Possible error sources of the measurement, especially residual gas influences, were carefully studied resulting in a relative accuracy better than 10%. In parallel, the luminosity was determined by the standard technique of elastic scattering based on known cross sections. The results do compare reasonably well. Practicability and limitations of the energy loss method are discussed. * This work is supported by the FZJ.

[1] H.J.Stein, D.Prasuhn, IKP annual report 2001, 64

HK 22.10 Mo 16:30 TU MA141

Nuclear Polarization of Hydrogen and Deuterium Molecules after Recombination of Polarized Atoms in a Storage Cell — •M. Poltavtsev[1], N. Chernov[1], L. Kochenda[1], A. Kovalev[1], P. Kravtsov[1], M. Mikirtychyants[1], S. Sherman[1], V. Trofimov[1], A. Vasilyev[1], R. Engels[2], K. Grigoriev[2], F. Rathmann[2], H. Seyfarth[2], and H. Paetz gen. Schieck[3] — [1]PNPI, St. Petersburg, Russia — [2]IKP, FZ Jülich — [3]IKP, Uni. Köln

The experiment will investigate the nuclear polarization of hydrogen and deuterium molecules recombined from nuclear polarized atoms under different conditions (surface material, temperature, external magnetic field, and spin states of atoms). The experimental setup consists of three components*:
1.) An atomic beam source [1] to deliver a beam of nuclear polarized hydrogen and deuterium atoms.
2.) A Lamb-shift polarimeter [2] to analyse the polarization of the stored particles.
3.) A recombiner including a superconducting solenoid with the ionization and electrostatic extraction system.
The present status and first results will be presented.

* Supported by the ISTC, project 1861.

[1] M. Mikirtychiants et al., Proc 9th Int. Workshop PST01, USA, World Scientific, 47 (2002).
[2] R. Engels et al., Rev. Sci. Instr. **74**, 4607 (2003).

HK 22.11 Mo 16:30 TU MA141

Spektroskopie exotischer Kerne durch Transferreaktionen mit MINIBALL an REX-ISOLDE — •Monica Pantea — Institut für Kernphysik der TechnischenUniversität Darmstadt

Transferreaktionen mit leichten und schweren Ionen sind eine wichtige Quelle spektroskopischer Informationen. Mit niederenergetischen radioaktiven Strahlen, deren Intensitäten nur einige 10^4 Teilchen pro Sekunde betragen können, ist es möglich, Spektroskopie an neutronenreichen, instabilen Kernen zu betreiben [2]. Mit dem hocheffizienten und hochauflösenden γ-Spektrometer MINIBALL [3] war es in ersten Experimenten bei REX-ISOLDE [4] am CERN möglich, direkte Anregungen und Zerfall der Single-Particle-States zu studieren. Hierbei mußten wegen der geringen Strahlintensitäten Reaktionen mit hohem Wirkungsquerschnitt und angemessenen Targets wie ^{2}H oder gewählt, sowie in inverser Kinematik und bei Energien nahe der Coulombbarriere gemessen werden. Neben Experimenten zur Coulombanregung der Kerne ^{30}Mg und ^{32}Mg ist es auch gelungen, die Neutronentransferreaktion ^{2}H(^{30}Mg,^{31}Mg*)^{1}H und damit die angeregten Zustände des Kerns ^{31}Mg zu untersuchen. Erste Ergebnisse werden hier vorgestellt.

*Diese Arbeit wird gefördert durch BMBF 06 DA 115.

[2] H. Lenske and G. Schrieder, Eur. Phys. J. **A2** (1998) 41.
[3] J. Eberth et al., Prog. Part. Nucl. Phys. **46** (2001) 389.
[4] D. Habs et al., Nucl. Phys. **A616** (1997) 29.

HK 22.12 Mo 16:30 TU MA141

Untersuchung der Zustände $D^*_{sJ}(2317)^+$ und $D_{sJ}(2460)^+$ — •Marc Pelizäus für die Babar-Kollaboration — Institut für Experimentalphysik I, Ruhr-Universität Bochum, 44780 Bochum

Das Babar-Experiment am asymmetrischen e^+e^--Speicherring PEP-II des SLAC hat seit 1999 eine einer integrierten Luminosität von über 240 fb^{-1} entsprechende Datenmenge aufgezeichnet.

Durch das Babar-Experiment wurden in $e^+e^- \to c\bar{c}$ Fragmentationsereignissen erstmals die Zustände $D^*_{sJ}(2317)^+$ und $D_{sJ}(2460)^+$ beobachtet, deren Natur bisher unzureichend geklärt ist. Gegenstand der aktuellen Diskussion ist u.a. die Interpretation des $D^*_{sJ}(2317)^+$ als exotisches DK-Molekül, zu dem ebenfalls doppelt geladene und neutrale Komponenten existieren sollten. Weiterhin spielt die Messung relativer Verzweigungsverhältnisse radiativer Zerfälle der beiden Zustände eine wichtige Rolle beim Test theoretischer Vorhersagen.

Vorläufige Ergebnisse der Messung relativer Verzweigungsverhältnisse und die Suche nach doppelt geladenen und neutralen Partnern des $D^*_{sJ}(2317)^+$ im $D^+_s\pi^+$ bzw. $D^+_s\pi^-$ System werden vorgestellt.

Gefördert durch das bmb+f (Förderkennzeichen 06BO9041).

HK 22.13 Mo 16:30 TU MA141

An Experiment for the Measurement of the Bound β-Decay of the Free Neutron — •Wolfgang Schott, G. Dollinger, Th. Faestermann, J. M. Friedrich, J. Hartmann, R. Hertenberger, S. Paul, and A. Ulrich — Physik-Department TU-München und Sektion Physik der LMU-München, D-85748 Garching

The H hyperfine state population after the neutron bound β decay yields directly the neutrino left-handedness or a possible right-handed admixture, and small scalar (g_S) and tensor (g_T) contributions to the weak force. We present a possible setup to detect the two-body decay and to determine the hyperfine state of the resulting H atom. We will show that an improvement of the experimental limits of g_S and g_T by at least a factor of 10 seems possible.

HK 22.14 Mo 16:30 TU MA141

Bestimmung der Gamow-Teller-Stärke in der Reaktion ^{90}Zr(^{3}He,t)^{90}Nb* — •Y. Kalmykov[1], T. Adachi[2], G.P.A. Berg[3], H. Fujita[3], Y. Fujita[2], P. von Neumann-Cosel[1], V.Yu. Ponomarev[1], A. Richter[1], A. Shevchenko[1], Y. Shimbara[2], F.D. Smit[4] und J. Wambach[1] — [1]Institut für Kernphysik, Technische Universität Darmstadt — [2]Department of Physics, Osaka University, Japan — [3]Research Center for Nuclear Physics, Osaka University, Japan — [4]iThemba LABS, Somerser West, South Africa

Der Kern ^{90}Zr wurde am RCNP, Osaka, mit Hilfe der (^{3}He,t)-Reaktion unter 0° untersucht. Das Hauptziel des Experiments war, die Feinstruktur der Gamow-Teller-Resonanz zu untersuchen und ihre charakteristische Energieskalen zu bestimmen. Außerdem wurde die Gamow-Teller-Stärke in ^{90}Nb im Bereich $E_x < 9.7$ MeV aus dem $L = 0$ Wirkungsquerschnitt bestimmt, wobei die diskrete Waveletanalyse eine neuartige modellunabhängige Methode zur Festlegung des Untergrundverlaufs liefert. Die Ergebnisse wurden mit den Resultaten von ^{90}Zr$(p,n)^{90}$Nb–Messungen [1] verglichen. Die kumulative $B(GT_-)\uparrow$ Stärke von 6.0 ± 0.6 bis $E_x = 9.7$ MeV ist deutlich geringer als der Wert 10 ± 1.5, der aus den (p,n)–Daten extrahiert wurde. Vermutlich resultiert diese Diskrepanz zum großen Teil aus den unterschiedlichen Normierungsmethoden. In dieser Arbeit wurde die Systematik des Verhältnisses zwischen dem auf β–Zerfallsdaten normierten GT-Übergang zum Grundzustand und zum isobaren Analogzustand verwendet.

* Gefördert durch die DFG unter SFB 634 und 446 JAP 113/2670-1.

[1] T. Wakasa et al., Phys. Rev. C55 (1997) 2909.

HK 22.15 Mo 16:30 TU MA141

Kernresonanzfluoreszenz-Experimente zur Untersuchung der Pygmy-Resonanz* — •S. Volz, M. Babilon, M. Elvers, J. Hasper, K. Lindenberg, S. Müller, D. Savran und A. Zilges — Institut für Kernphysik, TU Darmstadt, D-64289 Darmstadt

In den letzten Jahren wurden zahlreiche Experimente an mittelschweren und schweren Kernen durchgeführt, um die Verteilung elektrischer Dipolstärke zwischen 4 und 12 MeV zu untersuchen.

Eine ideale Methode für solche Untersuchungen ist die Kernresonanzfluoreszenz [1]. Im Rahmen der Experimente wurden Z=20 [2] und N=82 [3] Kerne am supraleitenden Darmstädter Elektronenbeschleuniger S-DALINAC systematisch untersucht. Als generelles Phänomen wurde dabei das Auftreten einer Häufung von E1 Stärke zwischen 5 und 9 MeV - der Pygmy-Resonanz - beobachtet. Die Ergebnisse werden mit Modellrechnungen im Quasi Particle Phonon Modell (QPM) [4] und in der Extended Theory of Finite Fermion Systems (ETFFS) [5] verglichen.

* Gefördert durch die DFG (SFB 634)

[1] U. Kneissl *et al.*, Prog. Part. Nucl. Phys. **37** (1996) 349
[2] T. Hartmann *et al.*, Phys. Rev. **C65** (2002) 034301
[3] A. Zilges *et al.*, Phys. Lett. **B542** (2002) 43
[4] N. Tsoneva *et al.*, Nucl. Phys. **A731** (2004) 273
[5] T. Hartmann *et al.*, Phys. Rev. Lett., im Druck

HK 22.16 Mo 16:30 TU MA141

Paritätsmessungen in ^{172,174}Yb mit Hilfe polarisierter Photonen und die K-Quantenzahl in den Kernen der Seltenen Erden* — •D. Savran[1], M.W. Ahmed[2], M. Babilon[1,3], J.H. Kelley[4], J. Li[5], S. Müller[1], N. Pietralla[6], I. Pinaev[5], A. Tonchev[2], W. Tornow[2], H.R. Weller[2], Y. Wu[5], A. Zapp[1] und A. Zilges[1] — [1]Institut für Kernphysik, TU Darmstadt, D-64289 Darmstadt — [2]Duke University, Durham, NC, USA — [3]Wright Nuclear Structure Laboratory, Yale University, New Haven, CT, USA — [4]North Carolina State University, Raleigh, NC, USA — [5]Free Electron Laser Laboratory, Department of Physics, Duke University, Durham, NC, USA — [6]Nuclear Structure Laboratory, Department of Physics & Astronomy, SUNY, Stony Brook, NY, USA

Mit Hilfe des zu 100 % polarisierte Photonenstrahls der High Intensity γ-ray Source (HIγS) an der Duke University wurden die Paritäten von sechs Dipolanregungen in den deformierten Kernen ^{172,174}Yb in Photonen-Streuexperimenten gemessen. Die Ergebnisse werden mit Zuweisungen basierend auf der K-Quantenzahl verglichen, die in Kernresonanzfluoreszenz-Experimenten (KRF) über die Alaga-Regeln zugewiesen wurden. Darüber hinaus wird eine systematische Untersuchung der Beziehung zwischen Verzweigungsverhältnissen und Paritäten von Dipolanregungen in den Kernen der Seltenen Erden präsentiert.

* gefördert durch die DFG (SFB 634), DAAD und U.S. DOE Grant No. DE-FG02-97ER41033.

HK 22.17 Mo 16:30 TU MA141

ANGULAR CORRELATIONS OF THE DECAY CHANNELS OF ^{56}Ni* FORMED IN THE ^{24}Mg + ^{32}S REACTION — •G. Efimov[1,2,3], W. von Oertzen[1,2], G. Gebauer[2], S. Thummerer[2], Tz. Kokalova[1,2], C. Wheldon[1], Ch. Schulz[2], H.G. Bohlen[2], D.R. Napoli[4], S.M. Lenzi[5], C. Beck[6], M. Rousseau[6], P. Papka[6], and D. Kamanin[3] — [1]Freie Universität, Berlin, Germany — [2]SF7, Hahn-Meitner-Institut Berlin, Germany — [3]Joint Institute for Nuclear Research, JINR, Dubna, Russia — [4]INFN-Laboratori Nazionali di Legnaro, Legnaro, Italy — [5]Dipartimento di Fisica and INFN, Padova, Italy — [6]Institut de Recherches Subatomiques, Strasbourg, France

Using the Binary Reaction Spectrometer (BRS) together with the EUROBALL array of Ge detectors the coplanarity of events with two heavy fragments in the decay channels of the reaction ^{32}S + ^{24}Mg $\rightarrow$ ^{56}Ni at an energy of $E_L = 163.5$ MeV has been reconstructed. For the correlated detection of two heavy ejectiles, the BRS combines 2 large-area gas detector telescopes in a kinematic coincidence set-up.

Extremely narrow out-of-plane angular correlations are observed not only in the case of binary decays with no charge loss, but also for the events with missing charges of 4 and 6. This observation can be interpreted as due to ternary fission processes, proceeding through elongated shapes of the hyper deformed compound nucleus.

HK 22.18 Mo 16:30 TU MA141

TERNARY FISSION OF THE COMPOUND NUCLEUS ^{60}Zn FORMED IN THE ^{24}Mg + ^{36}Ar REACTION — •V. Zherebchevsky[1,2,3], W. von Oertzen[1,2], G. Gebauer[2], S. Thummerer[2], Ch. Schulz[2], H.G. Bohlen[2], Th. Wilpert[2], and D. Kamanin[3] — [1]Freie Universität Berlin, Germany — [2]Hahn-Meitner-Institut Berlin, Germany — [3]Joint Institute for Nuclear Research, JINR, Dubna, Russia

This experiment has been performed in Berlin using the Binary Reaction Spectrometer (BRS) combined with the Gamma-Spectrometer OSIRIS.

“Binary” coincidences with missing charges of $\Delta Z = 4$ and 6 are observed as ternary fission events. The systematics of the ternary fission process (energy spectra, yields, etc.) have been studied and are interpreted using the Extended Hauser Feshbach formalism.

HK 22.19 Mo 16:30 TU MA141

Search for Short-Lived Fission Isomers in light Actinides* — •P.G. Thirolf, D. Habs, R. Hertenberger, H.J. Maier, T. Morgan, O. Schaile, W. Schwerdtfeger, and J. Szerypo — Ludwig-Maximilians-Universität München

Spectroscopic studies of super- and hyperdeformed actinide nuclei offer the possibility to gain insight into the multiple-humped fission barrier landscape of these heavy nuclei. With the identification of deep third minima in ^{234,236}U the systematics of fission isomers in light actinides was revisited, especially searching for short-lived isomers in light uranium isotopes. Using a geometrical projection method and solid state nuclear track detectors, we started an experimental search for their observation. This rather old detection technique [1] nowadays benefits from an efficient analysis technology based on a PC-controlled auto-focus microscope and a CCD camera together with pattern recognition software. Using the ^{232}Th(α,2n) reaction, evidence was found for a new fission isomer in ^{234}U with a halflife of 110±10 ps. The reaction ^{238}U(α,2n) was used for calibration and normalization. Excitation functions and absolute prompt and isomeric fission cross sections were measured. Also the (^{3}He,3n) reactions on ^{232}Th and ^{235}U target were studied in a similar way, searching for an isomer in ^{232}U and measuring the known isomer in ^{238}Pu for calibration purposes, respectively. First results will be presented. [1] V. Metag et al., Nucl. Instr. Meth 114 (1974) 445.

* Supported by the DFG under contract HA 1101/12-1

HK 22.20 Mo 16:30 TU MA141

Bestimmung der Kernladungsradien von ^{8,9}Li und ^{11}Li — •Guido Ewald[1], Daniel Albers[2], John Behr[2], Pierre Bricault[2], Bruce Bushaw[3], Andreas Dax[4], Jens Dilling[2], Marik Dombsky[2], Gordon Drake[5], Stefan Götte[1], Reinhard Kirchner[1], Thomas Kühl[1], Jens Lassen[2], Phil Levi[2], Wilfried Nörtershäuser[1,6], Matthew Pearson[2], Erika Prime[2], Vladimir Ryjkov[2], Rodolfo Sanchez[1], Agnieszka Wojtaszeck[1], H.-Jürgen Kluge[1], Zong-Chao Yan[7] und Claus Zimmermann[6] — [1]GSI Darmstadt — [2]TRIUMF, Vancouver, Kanada — [3]PNNL, Richland, USA — [4]PSI, Villingen, Schweiz — [5]Univ. Windsor, Kanada — [6]Univ. Tübingen — [7]Univ. New Brunswick, Kanada

Am TRIUMF in Vancouver wurden die Ladungsradien der gesamten Lithium-Isotopenkette, einschließlich des Halokerns ^{11}Li vermessen. Damit wurde bei ^{11}Li ein letzendlicher direkter Beweis über das Maß der Trennung von Halo und innerem Kern erbracht. Der Ladungsradius wurde über die Isotopieverschiebung im $2S \rightarrow 3S$-Zweiphotonen-Übergang bestimmt. Dieser Ansatz ist bei leichten Elementen mit mehr als 2 Elektronen das erste Mal durch eine Kombination von hochgenauer Atomtheorie [1] und Experiment möglich. Am ISAC-Online-Massenseparator (TRIUMF) wird das kurzlebige ^{11}Li-Isotop mit einer Rate von etwa $50\,000\,\mathrm{s}^{-1}$ hergestellt, woraufhin die Ionen gestoppt, neutralisiert, spektroskopiert, ionisiert und nachgewiesen werden. Die Ergebnisse liefern den Verlauf der Ladungsradien der Lithium-Isotopenkette in Vergleich zum verwendeten Referenzisotop ^{6}Li.

[1] Yan and Drake, PRA 61 022504 (2000), PRA 66 042504 (2002)

HK 22.21 Mo 16:30 TU MA141

Towards 2n Transfer Reactions around the Island of Inversion

— •W. Schwerdtfeger[1], B. Bruyneel[2], T. Faestermann[3], R. Gernhäuser[3], D. Habs[1], T. Kröll[3], R. Krücken[3], M. Lauer[4], R. Lutter[1], H.J. Maier[1], T. Morgan[1], M. Münch[3], O. Niedermaier[4], P. Reiter[2], O. Schaile[1], H. Scheit[4], P. Thirolf[1], W. von Oertzen[5], N. Warr[2], and H. Wolter[1] for the MINIBALL collaboration — [1]Sektion Physik, Ludwig Maximilians Universität München — [2]Institut für Kernphysik, Köln — [3]E12, Technische Universität München — [4]Max Planck Institut, Heidelberg — [5]Hahn Meitner Institut, Berlin

Transfer reactions enable to investigate the shape coexistence of e.g. super deformed and spherical 0^+ states in Mg isotopes around the island of inversion at $N \approx 20$, because the transfer to first order is shape conserving. Two neutron transfer reactions from a radioactive ^{10}Be target provide a distinct trigger via the two α particles ejected from the intermediate ^{8}Be reaction product. In order to estimate the cross section of the two neutron transfer ^{10}Be(^{30}Mg,^{32}Mg)^{8}Be, which is intended to be performed at REX-ISOLDE CERN, the preparatory reaction ^{9}Be(^{26}Mg,^{27}Mg*)^{8}Be (E_{lab} = 57 MeV) has been studied at the MINIBALL γ-spectrometer in Cologne. First results of this measurement will be presented together with coupled channel DWBA calculations using the code FRESCO[1] for the one neutron as well as for the two neutron transfer reaction.

[1] I.J. Thompson, Comp. Phys. Rep. **7** (1987) pp 167-212

HK 22.22 Mo 16:30 TU MA141

Kinematically complete experiment with light neutron rich nuclei using knock-out reactions on protons

— •H.T. Johansson and H. Simon for the S245 collaboration — Gesellschaft für Schwerionenforschung (GSI), D–64291 Darmstadt

The S245 experiment at GSI, Darmstadt, aims at investigating the cluster structure of the exotic, multi-neutron halo nuclei ^{8}He, ^{11}Li, ^{14}Be. Secondary beams (250-300 MeV/u) of these nuclei were produced at the FRS and knockout reactions induced in a liquid hydrogen target were studied. The momenta of the recoiling proton and of charged projectile fragments are obtained by measuring scattering angles, time-of-flight, energy loss, and, in part, magnetic rigidity. Emitted neutrons are detected with the Large Area Neutron Detector [1].

Halo-neutron removal in heavy-ion induced knockout reactions were observed earlier [2]. In the present experiment, a multitude of charge-changing reactions are observed in addition; first results are presented.

This work is supported by BMBF (06 DA 115) and GSI.

[1] Th. Blaich et al., Nucl. Instr. and Meth. A **314**, 136-154 (1992)
[2] H. Simon et al., Nucl. Phys. A **734**, 323-326 (2004)

HK 22.23 Mo 16:30 TU MA141

Low-energy transfer reactions with a ^{9}Li beam*

— •Thomas Nilsson for the ISOLDE-IS371 collaboration and the REX-ISOLDE collaboration — Institut für Kernphysik, Technische Universität Darmstadt

The recently commissioned post-accelerator for radioactive beams REX-ISOLDE enables the majority of the ~700 nuclides available at CERN-ISOLDE to be post-accelerated to 0.3-3.1 MeV/u[1]. This permits an unprecedented range of exotic nuclei to be experimentally investigated through low-energy reactions.

The first experimental results of transfer reactions following ^{9}Li incident on a deuterated polypropylene target at 2.36 MeV/u are presented. ^{9}Li constitutes the core of the emblematic two-neutron halo nucleus ^{11}Li and its unbound two-body subsystem $^{9}Li + n$ can be studied through $^{2}H(^{9}Li,p)$ reactions. In addition, several further reaction products were observed, d, t, ^{4}He and ^{6}He[2]. The $^{2}H(^{9}Li,t)^{8}Li^{*}$ channel is of special interest in conjunction with new ab-initio[3] and shell-model[4] calculations, both predicting hitherto unobserved excited states in ^{8}Li. The experimental data are generally well described by population of the ground state and the three first excited states, however, a small discrepancy at ~4 MeV could offer a first glimpse of additional states.

*This work was supported by the BMBF under the contract 06DA115.

[1] D. Habs *et al.*, Hyp. Int. **129** (2000) 43
[2] H.B. Jeppesen *et al.*, submitted to Nucl. Phys. A
[3] S.C. Pieper and R.B. Wiringa, Annu. Rev. Nucl. Part. Sci. **51** (2001) 53
[4] D. Kurath, Private communication to A. Richter

HK 22.24 Mo 16:30 TU MA141

New Mass Measurements with FRS-ESR at GSI

— •L. Chen[1], K. Beckert[2], P. Beller[2], F. Bosch[2], D. Boutin[1,2], L. Caceres[2], J.J. Carroll[3], R. S. Chakrawarthy[4], D. Cullen[5], B. Franzke[2], H. Geissel[1,2], J. Gerl[2], E. Greda[2], G. Jones[6], A. Kishada[5], O. Klepper[2], H.-J. Kluge[2], R. Knöbel[1], C. Kozhuharov[2], E. Kulich[2], N. Kuzminchuk[2], S.A. Litvinov[1,2], Yu.A. Litvinov[1,2], Z. Liu[6], S. Mandal[2], M. Matos[2], F. Montes[7], G. Münzenberg[2], F. Nolden[2], Yu.N. Novikov[8], W. Plass[1], Z. Podolyak[6], R. Propri[3], S. Rigby[5], N. Saito[2], T. Saito[2], C. Scheidenberger[1,2], M. Shindo[9], M. Steck[2], P. Ugorowski[3], G. Vorobjev[2], P.M. Walker[6], H. Weick[2], S. Williams[6], M. Winkler[2], and H.-J. Wollersheim[2] — [1]JLU Giessen — [2]GSI Darmstadt — [3]SU Youngstown — [4]TRIUMF Vancouver — [5]Uni. Manchester — [6]Uni. Surrey — [7]MSU East Lansing — [8]PNPI Gatchina — [9]Uni. Tokyo

First results are reported from a recent experiments with neutron-rich uranium fragments at the FRS-ESR facilities. 670 MeV/u ^{238}U projectiles with an intensity of 1-2*10^{9}particles/spill were fragmented in 4 g/cm^{2} ^{9}Be target placed in front of the fragment separator FRS. The FRS was used to separate the fragments in flight and to inject them into the storage-cooler ring ESR. Time resolved Schottky Mass Spectrometry was applied to measure the revolution frequencies of stored and electron-cooled ions. Preliminary results on masses and half-lives of neutron-rich nuclides in the lead area will be presented.

HK 22.25 Mo 16:30 TU MA141

Mass and Lifetime Measurements of Exotic Nuclei

— •Helmut Weick for the ILIMA collaboration — GSI Darmstadt, Germany

Precision measurements of nuclear masses and lifetimes of stored exotic nuclei at relativistic energies and studies with isomeric beams are planned [1]. The new international facility FAIR [2] with production and separation of exotic nuclear beams in the new fragment separator Super-FRS [3] will yield access to interesting nuclei near and at the driplines which cannot be accessed with present facilities.

The measurements can be done after fast stochastic cooling in the collector ring (CR) and electron cooling of the exotic ions in the new experimental storage ring (NESR) using Schottky pickups and particle detectors for lifetime measurements. Very shortlived nuclei can be investigated directly in the CR using an isochronous mode of the ring together with a ToF detector or fast resonant pickups. The planned experiments are triggered by the successful experimental program at the present FRS-ESR facilities [4].

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[1] `http://www.gsi.de/documents/DOC-2004-Apr-89-1.pdf`
[2] `http://www.gsi.de/GSI-Future/cdr/`
[3] H. Geissel et al., Nucl. Instr. Meth in Phys Res. **B204** (2003) 71.
[4] see group report 'Mass and Half-Live Measurements at FRS-ESR facilities at GSI' by Yu. Litvinov

HK 22.26 Mo 16:30 TU MA141

Laser spectroscopy and β-NMR measurements on ^{11}Li and on Mg isotopes around $N = 20$

— •M. Kowalska[1], K. Blaum[1,2], D. Borremans[3], P. Himpe[3], P. Lievens[3], S. Mallion[3], R. Neugart[1], G. Neyens[3], N. Vermeulen[3], and D. Yordanov[3] — [1]Universität Mainz, Germany — [2]CERN, Switzerland — [3]K.U.Leuven, Belgium

Measurements of nuclear moments are crucial for a better understanding of nuclear structure, in particular in connection with halo and shell effects. This is demonstrated for recent results on ^{11}Li and ^{31}Mg. Beams from ISOLDE are optically polarised with laser light and implanted into a host crystal. Scans of the optical excitation frequency show the hyperfine structure in the β-decay asymmetry. NMR measurements are performed for the laser frequency at resonance. Radio-frequency is applied and the nuclear g-factor and quadrupole moment are measured.

High-resolution NMR measurements were performed recently on the halo nucleus ^{11}Li. They reveal a quadrupole moment significantly larger than that of the ^{9}Li core, showing the influence of the halo neutrons on the proton core. Similar experiments took place on neutron-rich Mg isotopes, to further explore the "island of inversion". A combined measurement of the hyperfine structure and g-factor of ^{31}Mg reveals an unexpected $1/2^+$ ground state, dominated by 2p-2h intruder configurations, proving a weakening of the $N = 20$ shell closure. These investigations are being extended to ^{29}Mg and ^{33}Mg.

(Supported by BMBF and FWO Vlaanderen)

HK 22.27 Mo 16:30 TU MA141

Anomalous expansion in heavy-ion reactions around Fermi energy — •K. Morawetz[1,2], M. Płoszajczak[3] und V.D. Toneev[4] — [1]Institute of Physics, Chemnitz University of Technology, 09107 Chemnitz, Germany — [2]Max-Planck-Institute for the Physics of Complex Systems, Nöthnitzer Str. 38, 01187 Dresden, Germany — [3]Grand Accélérateur National d'Ions Lourds (GANIL), CEA/DSM – CNRS/IN2P3, BP 5027, F-14076 Caen Cedex 05, France — [4]Bogoliubov Laboratory of Theoretical Physics, Joint Institute for Nuclear Research, 141980 Dubna, Russia

Central heavy-ion reactions are simulated within the nonlocal kinetic theory. In the Fermi energy domain the expansion velocity profile is found to be non-Hubblean in the surface region scaling proportional to a higher exponent of the radius. This anomalous expansion velocity profile is accompanied by a specific power law nucleon density profile in the surface region. Both these features disappear at higher energies, and the system follows a uniform Hubble expansion. The interpretation is given in terms of Tsallis statistics revealing a critical behavior pointing towards a phase transition.

[1] P. Lipavský, K. Morawetz, and V. Špička; Annales de Physique, Paris, 2001, No. 26, 1, ISBN 2-86883-541-4
[2] K. Morawetz, P. Lipavsk'y, V. Spicka; Ann. Phys. 294 (2001) 135
[3] K. Morawetz, M. Płoszajczak, V.D. Toneev; Phys. Rev. C 62(2001) 64602
[4] K. Morawetz; Physica A 305 (2002) 234-237

HK 22.28 Mo 16:30 TU MA141

Flow due to nonlocal correlations in heavy-ion reactions — •K. Morawetz — Institute of Physics, Chemnitz University of Technology, 09107 Chemnitz, Germany — Max-Planck-Institute for the Physics of Complex Systems, Nöthnitzer Str. 38, 01187 Dresden, Germany

The flow parameters like squeezing and flow angle are systematically calculated for ALADIN-INDRA data on Au+Au. The nonlocal extension of BUU [1,2] is compared with standard simulations. A visible effect of nonlocal correlations is seen and it is found a better agreement with the data. This underlines the improvement by nonlocal extensions as found earlier when comparing with data of charge density distribution [3] or particle spectra [4].

[1] P. Lipavský, K. Morawetz, and V. Špička; Annales de Physique, Paris, 2001, No. 26, 1, ISBN 2-86883-541-4
[2] K. Morawetz, P. Lipavsk'y, V. Spicka; Ann. Phys. 294 (2001) 135
[3] K. Morawetz, P. Lipavský, J. Normand, D. Cussol, J. Colin, B. Tamain, Phys. Rev. C 63 (2001) 034619
[4] K. Morawetz, V. Špička, P. Lipavský, G. Kortemeyer, Ch. Kuhrts, R. Nebauer, Phys. Rev. Lett. 82, (1999), 3767

HK 22.29 Mo 16:30 TU MA141

Production and decay of charmonium in dense nuclear matter — •Goran Kruzic[1], Elena Bratkovskaya[2], Roman Caplar[3], and Peter Senger[1] — [1]GSI,Darmstadt,Germany — [2]Univ. Frankfurt, Germany — [3]IRB Zagreb, Croatia

Production and absorption mechanisms of charmonium in dense nuclear matter have been studied using the Hadron String Dynamics (HSD) model. The HSD code provides a microscopic way of calculating Pt, rapidity, and invariant mass spectra (taking into account in-medium effects) for particles of interest: J/psi, rho, omega and phi. Additionally, the perturbative treatment of charmed mesons in the HSD model ensures predictions of their multiplicities and differential spectra. In order to optimize the layout of the Compressed Baryonic Matter (CBM) detector facility for future experiments at the Facility for Antiproton and Ion Research(FAIR), we have simulated the electron-positron decay channel of J/psi and various sources of background (Pi0-¿2gamma,Pi0-¿Dalitz,eta-¿2gamma,eta-¿Dalitz,phi¿e+e-,rho-¿e+e-,omega-¿e+e-) in the range of energies from 10 to 45 GeV/ nucleon.

HK 22.30 Mo 16:30 TU MA141

Vorbereitende Untersuchungen zur Laserspektroskopie an Nobelium — •A. Dretzke[1], D. Ackermann[2], H. Backe[1], M. Block[2], H.P. Hessberger[2], S. Hofmann[2], R. Horn[1], H.-J. Kluge[2], T. Kolb[1], P. Kunz[1], W. Lauth[1] und M. Sewtz[1] — [1]Institut für Kernphysik der Universität, D-55099 Mainz — [2]Gesellschaft für Schwerionenforschung, D-64291 Darmstadt

Zur Laserspektroskopie an Trans-Einsteinium-Elementen wurde eine hochempfindliche Methode entwickelt, die auf der Resonanzionisationsspektroskopie in einer Puffergaszelle basiert. Erste Experimente sollen an Nobelium (Z = 102) durchgeführt werden, für das keinerlei atomspektroskopische Daten bekannt sind. Das Nuklid ^{254}No ($T_{1/2}$ = 55 s) soll über die Kernreaktion ^{208}Pb (^{48}Ca,2n)^{254}No am Geschwindigkeitsfilter SHIP der GSI in Darmstadt erzeugt werden. Die erzeugten Ionen werden im Puffergas abgestoppt und neutralisieren teilweise. Die verbleibenden geladenen Reaktionsprodukte werden mit elektrischen Feldern aus der Zelle entfernt, so dass die neutralen Fusionsprodukte in der Zelle gespeichert bleiben und für laserspektroskopische Untersuchungen zur Verfügung stehen. Nach der Resonanzionisation, die über eine zweistufige Anregung geschieht, werden die Ionen mit einem elektrischen Feld auf einen Halbleiterdetektor gesaugt und durch ihren α-Zerfall nachgewiesen. Erste Voruntersuchungen wurden an den Nukliden ^{152,153}Er ($T_{1/2}$ = 10.3 bzw. 37.1 s) und ^{154,155}Yb ($T_{1/2}$ = 0.4 bzw. 1.6 s), für die die atomaren Niveaus bekannt sind, durchgeführt.

Gefördert durch Bundesministerium für Bildung und Forschung (BMBF) (06MZ169I).

HK 22.31 Mo 16:30 TU MA141

Laser cooling of relativistic C^{3+} ion beams at the ESR†. — •U. Schramm[1], M. Bussmann[1], D. Habs[1], M. Steck[2], T. Kühl[2], K. Beckert[2], P. Beller[2], B. Franzke[2], F. Nolden[2], G. Saathoff[3], S. Reinhard[3], and S. Karpuk[4] — [1]LMU München, Department für Physik — [2]GSI, Darmstadt — [3]MPI für Kernphysik, Heidelberg — [4]Universität Mainz, Institut für Kernphysik

We present results of the first laser cooling experiment with relativistic C^{3+} beams at 1.47 GeV energy at the Experimental Storage Ring (ESR) at GSI. A bunched beam of several 10 μA was laser-cooled by a counterpropagating laser beam kept at a fixed wavelength of $\lambda = 257$ nm. With pure laser cooling[1] the regime of a longitudinally space-charge dominated beam with a momentum spread of $\Delta p/p \approx 10^{-7}$ was reached – a value unprecedented at the ESR.
These experiments represent an important intermediate step for the development of laser cooling techniques proposed for beams of highly-charged heavy ions at the future SIS300 synchrotron (GSI-FAIR) in a regime where no other cooling scheme seems feasible.

[†] funded by BMBF (06ML183)
[1] **Poster** M. Bussmann et al. *Probing the structure of crystalline ion beams*

HK 22.32 Mo 16:30 TU MA141

Identification of heavy spallation residues in the Spaladin experiment — •Michael Böhmer for the Spaladin collaboration — Physik Department E12, TU München

To improve our understanding of the spallation mechanism a complete experiment, called SPALADIN, has been performed in 2004 at GSI using the spallation reactions $^{56}\mathrm{Fe} + \mathrm{p}$ in reverse kinematics at 1 GeV/A.

The detection in coincidence of all the characteristics (type and energy) of the evaporation particles (including neutrons) and of the heavy residue should permit the reconstruction of the remnant prior to evaporation in mass, charge and excitation energy.

The reconstruction of the heavy residue mass was done using a ring imaging Čerenkov detector for heavy ions with a velocity reolution of $\Delta\beta/\beta < 10^{-3}$ and the GSI ALADIN magnet. We will discuss the method and show first results from the experiment with about 50 different heavy residues identified.

HK 22.33 Mo 16:30 TU MA141

Investigation of the SHIPTRAP gas cell — •Sergey Eliseev for the SHIPTRAP collaboration — GSI,Planckstr.1,64291 Darmstadt

The SHIPTRAP double penning trap mass-spectrometer installed behind SHIP is designed for precision mass measurements of very heavy nuclei. The key component determining the overall efficiency of the spectrometer is the gas stopping cell. The stopping and extraction efficiency as well as the extraction time of the gas cell were examined with a ^{223}Raion source for several pressures of the He stopping gas. The stopping efficiency at the working pressure of 40 mbar amounts to 40% and increases with the pressure. The extraction efficiency was measured to be about 25%. The extraction time was of the order of 15 ms and consistent with the calculations. The influence of the ion diffusion in the stopping gas and of the contamination of the stopping gas on the performance of the gas cell are considered. A further improvement of the gas cell, based on the results of this investigation, is planned.

HK 22.34 Mo 16:30 TU MA141

Stopping and cooling of fusion reaction products with buffer gas cells* — •J.B. Neumayr[1], L. Beck[1], D. Habs[1], S. Heinz[1], J. Szerypo[1], P.G. Thirolf[1], V. Varentsov[1], F. Voit[1], M. Block[2], S. Eliseev[2], H.-J. Kluge[2], M. Mukherjee[2], W. Quint[2], S. Rahaman[2], C. Rauth[2], D. Rodriguez[2], G. Sikler[2], C. Weber[2], W. Plass[3], and Z. Wang[3] for the SHIPTRAP and the MLLTRAP collaboration — [1]Ludwig-Maximilians-Universität München — [2]GSI, Darmstadt — [3]Justus-Liebig-Universität Giessen

High precision measurements of reaction products in trap systems like SHIPTRAP at GSI require an efficient way of stopping and cooling the energetic ions prior to their injection into the trap. This can be achieved with buffer gas cells. The combination of buffer gas cell and extraction RFQ for the SHIPTRAP facility at GSI was designed and characterized at the MLL (Maier-Leibnitz-Labor) in Garching with a stopping and extraction efficiency (4-8%) that enabled first successful high precision mass measurements at SHIPTRAP. An improved buffer gas cell is presently set up at the MLL, representing the base for further optimizations of the cell performance also at SHIPTRAP as well as for experiments at the MLLTRAP facility in Garching [1]. [1] J. Szerypo et al., Nucl. Instr. Meth. B204, 512 (2003)

* Supported by the BMBF and GSI

HK 22.35 Mo 16:30 TU MA141

Physics with exotic nuclei at the Low-Energy-Branch of the Super-FRS — •C. Scheidenberger for the NUSTAR collaboration — GSI Darmstadt

The Low-Energy-Branch of the Super-FRS will provide high-intensity exotic nuclear beams of all elements for experiments with energies in the range (5...200)MeV/u, with stopped beams, and with accelerated beams (10...100)keV. Versatile and advanced instrumentation will provide ideal conditions for a broad experimental physics programme. The high-intensity beams will allow for new astrophysical studies relevant for a deeper understanding of the s-process. High-resolution gamma-ray spectroscopy will explore Coulomb excitations close to the barrier and nucleon transfer, deep-inelastic and compound reactions. Decay spectroscopy with stopped beams (alpha-, beta- and isomer-spectroscopy) of nuclei implanted in thin, active stoppers will benefit from small range straggling and thus allow for new opportunities in x-ray and electron spectroscopy. Accelerated beams will be available due to the use of a new hybrid system (in-flight separation, energy focusing, and stopping in a helium-filled stopping cell). The full experimental spectrum of modern low-energy radioactive-beam facilities, such as Penning traps, charge breeders (EBIS), electron-beam ion traps (EBIT), LASER spectroscopy will be used to study neutron rich nuclei. The opportunity to produce exotic nuclei and antiprotons at the same facility will allow for new experiments using this particular hadronic probe, for instance for the study of formation and properties of antiprotonic exotic nuclei.

HK 22.36 Mo 16:30 TU MA141

A set-up for high-resolution in-flight spectroscopy with rare isotope beams at FAIR — •Jürgen Gerl for the HISPEC collaboration — GSI Darmstadt

The HISPEC project being part of the NUSTAR facility [1] at FAIR/GSI aims to study the structure of exotic nuclei by high-resolution in-flight spectroscopy, taking advantage of the isotopes produced at the Super-FRS facility at FAIR. Mono-energetic beams in the range 3 MeV/u to 100 MeV/u available at the Low Energy Branch of the Super-FRS will be used for gamma spectroscopy employing multiple Coulomb excitation, direct reactions and compound reaction at barrier energies as well as single step Coulomb excitation and fragmentation at inter-mediate beam energies. The set-up will comprise beam particle identification and tracking detectors before an active reaction target surrounded by the 4pi Ge gamma tracking array AGATA. At intermediate energies beam -like particle tracking and identification by a magnetic spectrometer (e.g. ALADIN) is foreseen. For low energies the HYDE heavy particle array for reaction studies and a complete suite of ancillary detectors including a velocity filter added to the magnet separator is planned.

[1] Letters of Intent for the NUSTAR Facility, http://www.gsi.de/nustar

HK 22.37 Mo 16:30 TU MA141

Measurements with an advanced trapping system at the GSI future facility FAIR — •Klaus Blaum[1,2] and Frank Herfurth[2] for the MATS collaboration — [1]GSI Darmstadt, Planckstraße 1, 64291 Darmstadt, Germany — [2]Institute of Physics, Johannes Gutenberg-University Mainz, 55099 Mainz, Germany

Ion traps play an important role not only in high-precision experiments on stable particles but also on exotic nuclei. Besides accurate mass measurements they have recently been introduced to nuclear decay studies and laser spectroscopy as well as to tailoring the properties of radioactive ion beams. This broad usage of trapping devices at accelerator facilities is based on the manifold advantages of a three-dimensional ion confinement in well controlled fields: First, the extended observation time is only limited by the half-life of the radionuclide of interest, yielding very high precisions for instance for mass measurements. Second, stored ions can be cooled and manipulated in various ways, even polarization and charge breeding of the ions are possible, giving a unique tool in order to prepare otherwise impossible experiments. Third, it is possible to create a backing free source of radioactive nuclei and to collect light particles (e^- and e^+) very efficiently, reducing a number of uncertainty in classical spectroscopic experiments. The MATS Collaboration proposes an advanced trapping system at the future GSI facility FAIR for high-precision mass measurements and decay studies on short-lived radionuclides. The proposed setup and the planned experimental program will be presented.

HK 22.38 Mo 16:30 TU MA141

A universal setup for kinematical complete measurements of Reactions with Relativistic Radioactive Beams at FAIR — •Thomas Aumann for the R3B collaboration — GSI, Darmstadt

A versatile reaction setup with excellent efficiency, acceptance, and resolution for kinematically complete measurements of reactions with high-energy radioactive beams is proposed. The setup will be located at the focal plane of the high-energy branch of the SUPER-FRS, an integral part of the new accelerator facility FAIR planned at GSI [1]. The setup will be adapted to the highest beam energies (corresponding to 20 Tm magnetic rigidity) provided by the SUPER-FRS. The combination of a superconducting large-acceptance dipole with high-resolution tracking and time-of-flight detectors will provide significant improvements in momentum resolutions for heavy fragments, light-charge particles, and neutrons retaining full-acceptance measurement. An additional magnetic spectrometer allows highest resolution in momentum analysis of heavy fragments. The technical design of the detectors and magnetic spectrometers is presently performed by an international collaboration [2]. The experimental setup is suitable for kinematically complete measurements for a wide variety of scattering experiments, such as heavy-ion induced electromagnetic excitation, knockout and fragmentation, or light-ion (in)elastic and quasi-free scattering in inverse kinematics.

[1] An International Accelerator Facility for Beams of Ions and Antiprotons, Conceptual Design Report, Publisher GSI (2001), http://www.gsi.de/GSI-Future/cdr/
[2] Letter of Intent of the R3B collaboration, http://www-land.gsi.de/r3b/.

HK 22.39 Mo 16:30 TU MA141

Nuclear Structure Studies on Exotic Nuclei by Light-Ion Induced Direct Reactions with Stored Radioactive Beams — •Peter Egelhof for the EXL collaboration — Gesellschaft für Schwerionenforschung mbH (GSI), D-64291 Darmstadt

The experimental conditions at the future facility FAIR will provide unique opportunities for nuclear structure studies on nuclei far off stability, and will allow reaching new regions in the chart of nuclides of high interest for nuclear structure and astrophysics. In particular, the predicted luminosities will allow for the investigation of direct reactions with stored and cooled radioactive beams at internal H, He, etc. targets of the storage ring NESR. This technique enables high resolution measurements down to very low momentum transfer and provides a gain in luminosity from accumulation and recirculation of the radioactive beams. A brief overview on the research objectives will be given.

The design of a complex detector setup, including a detector for recoiling target-like reaction products and gammas, surrounding the internal target, as well as a forward detector for fast ejectiles and beam-like reaction products, is presently investigated by the EXL collaboration with the aim to provide a highly efficient, high resolution universal detection system, applicable to a wide class of reactions. Results of a design study and the present status of the project are presented.

HK 22.40 Mo 16:30 TU MA141

Electron Scattering off Rare Isotopes — •Haik Simon for the ELISe collaboration — GSI Darmstadt, Germany

The planned international accelerator facility FAIR at Darmstadt [1,2] will provide intense high-quality ion beams. A new double synchrotron ring system will accelerate 10^{12} ions/s up to uranium to an energy of 1.5 GeV/u. A system of storage-cooler rings will be used to reduce the emittance and energy spread of secondary beams created via fragmentation or fission reactions [3] in the Super-FRS.

Two intersecting electron and ion rings (eA collider [4]) will allow [5] to scatter electrons with an energy of 125-500 MeV off exotic nuclei. The eA collider will enable for the first time to perform elastic, inelastic and quasielastic electron scattering off shortlived radioactive isotopes. The collider kinematics has the advantage that it will be possible to detect electrons and target like ejectiles in coincidence. One of the most challenging aspects in this context is the design of a high-resolution electron spectrometer with large acceptance adapted to the specific demands of an in-ring experiment. Charge distributions, transition form factors in giant resonance or electrofission experiments and spectral functions can be measured with a clean electromagnetic probe. The future prospects and feasability of these sophisticated experiments will be shown.

[1] `http://www.gsi.de/zukunftsprojekt/`
[2] `http://www.gsi.de/GSI-Future/cdr/`
[3] H. Geissel et al., Nucl. Inst. Meth. **B204**(2003)71
[4] I.A Koop et al., BINP-GSI Report 2001
[5] L.V. Chulkov et al., Physica Scripta **T104**(2003)144

HK 22.41 Mo 16:30 TU MA141

Decay spectroscopy with implanted beams at FAIR (DESPEC) — •M. Górska for the DESPEC collaboration — GSI Darmstadt, Germany

The access to the first structure information of the most exotic nuclei will be possible with the implanted beams into the active stopper detector. The subsequent α, proton, β, γ and neutron decays of those species will be measured with a compact multi task array consisting of double sided silicon strip detectors, germanium γ-ray detectors and neutron detectors. The main objective of the DESPEC collaboration are the doubly magic nuclei placed at the extremes of the chart of nuclides, as ^{100}Sn, the new magic numbers and shell evolution for the very neutron rich isotopes e.g. ^{120}Zr, and exploration of astrophysical r and rp- process paths. The necessary development of the new detector and electronic and data acquisition techniques will be undertaken within this project.

HK 22.42 Mo 16:30 TU MA141

Development of High Density Cluster-Jet-Targets for Storage Ring Experiments — •Alexander Täschner, Alfons Khoukaz, Hans-Werner Ortjohann, and Tobias Rausmann — Institut für Kernphysik, Universität Münster, D-48149 Münster

Cluster-jet-targets are sucessfully in operation for many years as internal targets for storage ring experiments. Main advantages of this windowless type of target are a density distribution which is homogeneous and constant in space and time, an extreme high purity of the target beams and an easy possibility to adjust the density and therefore the luminosity of the experiment by orders of magnitude.

However, in order to utilize these advantages for new types of detector systems in 4π-geometry like the PANDA detector at the upcoming FAIR at GSI, cluster-jet sources have to be improved with respect to the maximum target density to allow for highest luminosities in combination with larger distances between the cluster source and the interaction region.

For this purpose a cluster-jet target station has been build up at the University of Münster which covers the required spatial requirements of a future 4π-detection system. This target station allows for systematic studies on the production of high-density cluster-jet beams. First results of our studies as well as an outlook on further promising modifications will be presented.

* Work supported by EU

HK 22.43 Mo 16:30 TU MA141

Antiproton-Ion Collider — •L. Fabbietti[1], M. Cargnelli[2], B. Franzke[3], J. Homolka[1], P. Kienle[2], R. Krücken[1], H. Lenske[4], A. Skrinsky[5], K. Suzuki[1], and S. Wycech[6] — [1]Technische Universität, Munich, Germany — [2]S. Meyer Institute for Subatomic Physics, Vienna, Austria — [3]GSI, Darmstadt, Germany — [4]Institute for Theoretical Physics, Giessen, Germany — [5]INP, Novosibirsk, Russia — [6]Soltan Institute for Nuclear Studies, Warsaw, Poland

An antiproton-ion collider is proposed for FAIR at GSI to study antiproton absorption at medium energies in stable and radioactive nuclei, for the determination of both neutron and proton rms radii. To realize this novel method, it is planned to cool and collide antiprotons of 30 MeV energy with 740A MeV ions in the NESR and identify and momentum analyze the recoil nuclei, that circulate in the ring acceptance after the antiproton absorption, via Schottky noise frequency spectroscopy. From the measurement of the exclusive absorption cross-sections on neutrons and protons the rms radii will be derived independently. The expected luminosities of the antiproton-ion collider has been calculated together with the estimation of the annihilation cross-section and the detection technique.

HK 22.44 Mo 16:30 TU MA141

A high-rate GEM based TPC for PANDA — •Quirin Weitzel, Bernhard Ketzer, Igor Konorov, Sebastian Neubert, Stephan Paul, and Lars Schmitt for the PANDA collaboration — Physik Department, TU München, D-85748 Garching

PANDA is a universal detector system to study fundamental questions of hadron physics in $\bar{p}p$ interactions. It is designed as an internal target detector at the antiproton storage ring HESR, which is planned in the context of the future research center FAIR at Darmstadt. In order to fulfill the proposed rich physics program, an excellent 4π charged particle tracking system is required. Minimal material budget, momentum resolution on the $\sim$ % level and good particle identification for a wide momentum range are mandatory. A possible solution for the central tracker of PANDA fulfilling all these requirements is a Time Projection Chamber (TPC). The continuous beam structure at the HESR in combination with interaction rates of the order of 10^7/s, however, poses a big challenge for such a detector. The feedback of ions into the drift region is intrinsically suppressed in a Gas Electron Multiplier (GEM), thus opening the possibility to operate the TPC in an ungated mode without accumulating excessive space charge. The technical design of such a device implemented in PANDA as well as concepts and ideas to cope with the high event rate will be introduced. First simulation results are presented as well as prototype developments.

† supported by Maier-Leibniz-Labor der TU und LMU Muenchen, BMBF and EU

HK 22.45 Mo 16:30 TU MA141

Simulation of a GEM based TPC for PANDA — •Sebastian Neubert, Bernhard Ketzer, Igor Konorov, Stephan Paul, Lars Schmitt, and Quirin Weitzel for the PANDA collaboration — Physik Department, TU München, D-85748 Garching

PANDA is an universal detector system, which is proposed in the scope of the FAIR project at Darmstadt, Germany and is dedicated to high statistics measurements in QCD physics. At the HESR antiproton storage ring the formation of the full charmonium spectrum will be possible, allowing the determination of the observables of these states (e.g. η_c) with an unprecedented precision. Among other topics, valuable information on the quark-confining potential will be extracted from this data.

One key component of modern spectrometer systems is the central tracking device. An interesting option for the PANDA-tracker is to use a TPC, which in combination with the GEM technology makes a 3D-tracking detector with ideal properties: very low radiation length, very good spatial resolution and the ability to provide particle identification (PID) at low momenta.

This talk presents results from monte carlo simulations of such an apparatus. The advantage of PID-capability is demonstrated for the reconstruction of the $\eta_c \to 4K$ decay channel. The basic performances of the TPC-tracker are shown and the problem of space charge accumulation in the high rate environment is tackled.

† supported by Maier-Leibniz-Labor der TU und LMU München, BMBF and EU

HK 22.46 Mo 16:30 TU MA141

Der Micro-Vertex-Detektor des PANDA-Experiments — •Tobias Stockmanns, James Ritman und Andrei Sokolov für die Panda-Kollaboration — IKP I, Forschungszentrum Jülich, D-52425 Jülich

Der PANDA Detektor wird am zukünftigen HESR-Speicherring der GSI in Darmstadt errichtet und soll die Wechselwirkung beschleunigter Antiprotonen an Kernen unterschiedlicher Target-Materialien untersuchen.

Als zentrales Spursystem des Detektors dient ein Silizium-Pixeldetektor, der es erlauben soll, D-Mesonen zu identifizieren und diese Daten zur Triggerung zu verwenden. Daher ist eine gute Vertexauflösung sowie eine schnelle, triggerlose Auslese notwendig bei gleichzeitig geringer Strahlungslänge. Zusätzlich unterliegt die innerste Lage des Detektors einer Strahlenbelastung, die den Einsatz strahlentoleranter Technologien erfordert.

Zur Realisierung des PANDA Micro Vertex Detektors gibt es mehrere unterschiedliche Detektorkonzepte von denen das Pixelmodul des ATLAS Experimentes am ehesten die hohen Anforderungen erfüllt. In diesem Vortrag werden das ATLAS Pixelmodul sowie dessen Alternativen für das PANDA Experiment vorgestellt und die notwendigen Modifikationen erläutert, die notwendig sind, um diese Systeme für PANDA einsetzen zu können. Im zweiten Teil des Vortrages wird ein Design des Micro Vertex Detektors vorgestellt, welches auf dem Einsatz von ATLAS-Pixelmodulen beruht.

HK 22.47 Mo 16:30 TU MA141

Micro-Vertex-Detektordesign für PANDA* — •R. Jäkel, K.T. Brinkmann, H. Freiesleben und R. Kliemt — Technische Universität Dresden

Der PANDA-Detektor soll eine Vielzahl unterschiedlicher Experimente mit einem kontinuierlichen Antiprotonen-Strahl hoher Intensität ermöglichen. Konzipiert als internes Experiment im Antiprotonen-Speicherring HESR (Strahlimpulse zwischen $p = (1,5 \ldots 15)$ GeV/c) und mit einem stationären Target ausgestattet, stellt dies insbesondere große Herausforderungen an den Micro-Vertex-Detektor bezüglich primärer und sekundärer Vertexrekonstruktion.

Eine kurze Ansprechzeit sowie Strahlungsresistenz der Detektorkomponenten sollen den inneren Spurdetektor ebenso auszeichnen wie eine möglichst geringe Materialbelegung der aktiven und passiven Detektorkomponenten. Dies soll durch den Aufbau des Detektors aus einer mehrlagigen Fassstruktur und den Einsatz einer Endkappe im Vorwärtsbereich aus Silizium-Pixel- oder Streifendetektoren erreicht werden.

Verschiedene Optionen für die Realisierung des Vertexdetektors bei PANDA sollen diskutiert und an Hand von Simulationen untermauert werden. Dabei steht die Verwendung von Standardtechnologien (HAPS, Streifendetektoren) im Vordergrund, aber auch ambitioniertere Detektorkonzepte (MAPS) können für den Panda-Vertexdetektor aufgrund ihrer geringen Dicke und hohen Auflösung durchaus attraktiv werden.

[1] GSI-Zukunftsprojekt - Conceptual Design Report 2001, Kapitel 2

* gefördert durch BMBF

HK 22.48 Mo 16:30 TU MA141

Development of the Straw Tube Tracker for the proposed PANDA detector at GSI — •Andrei Sokolov[1,2], James Ritman[1], Peter Wintz[1], and Ucar Aziz[1] for the PANDA collaboration — [1]Institute für Kernphysik I, Forschungzentrum Jülich, 52428 Jülich — [2]II. Physikalisches Institut, Justus-Liebig Universität, Heinrich-Buff-Ring 14, 35392 Giessen

One of the components of the approved extension to the accelerator facility at GSI/Darmstadt is a storage ring for high luminosity phase space cooled antiprotons with momenta between 1.0 and 15 GeV/c. Antiproton annihilation reactions on protons and nuclei will be investigated with a detector system called PANDA. One of the crucial items of the central tracking system is the Straw Tube Tracker (STT). The STT will consist of the 11 double layers, 5 of them are skewed. The straws will have a diameter 8 and 10 mm. The STT needs high position resolution ($\sim 150\mu m$) and high rate capabilities, to handle the high events rate (10^7 events/s). This poster will present an overview of the simulations and prototyping performed to investigate performance of the STT for PANDA.

HK 22.49 Mo 16:30 TU MA141

Detection of $\eta_c \to K^{\pm}\pi^{\mp}K_s^0$ with $\overline{\text{P}}$ANDA — •F. Ottone[1], M.G. Destefanis[1], I. Fröhlich[1], D.G. Kirschner[1], L. Lavezzi[2], J. Ritman[3], A. Sokolov[3], and W. Kühn[1] for the Panda collaboration — [1]Justus Liebig-Universität Gießen — [2]Università degli Studi di Pavia — [3]Institut für Kernphysik, Forschungszentrum Jülich

Fundamental questions of hadron and nuclear physics will be studied in interactions of antiprotons and protons, using the $\overline{\text{P}}$ANDA detector at GSI. A benchmark channel that will be taken into account is the $\eta_c \to K^{\pm}\pi^{\mp}K_s^0$, where the η_c is the ground state of charmonium, at 2.979 GeV/c^2. In the past two years there have been five published measurements of the η_c properties which disagree strongly among themselves. By detecting hadronic final states, such as $K\overline{K}\pi$, with branching fractions two orders of magnitude higher than the decay modes studied so far, high statistics samples can be easily collected, thus allowing a study of the mass, width and branching ratios with high precision. In this poster the latest results of the simulation will be presented.

Work supported by BMBF, DFG, EU and GSI.

HK 22.50 Mo 16:30 TU MA141

$\bar{p}\ p \to \Lambda\ \bar{\Lambda}$ simulation with the PANDA detector — •M. G. Destefanis[1], I. Fröhlich[1], D. Kirschner[1], J. Lehnert[2], F. Ottone[1], T. Perez[1], J. Ritman[3], A. Sokolov[3], A. Toia[2], and W. Kühn[1] for the Panda collaboration — [1]Justus Liebig Universität-Gießen, II. Physikalisches Institut — [2]Now at SUNY, Stony Brook, New York — [3]Institut für Kernphysik, Forschungszentrum Jülich

The PANDA experiment which is part of the future FAIR facility at Darmstadt will investigate reactions of antiprotons with hydrogen and nuclear targets. One of the benchmark channels for the simulation and the design of the detector is the $\Lambda\ \bar{\Lambda}$ channel, which has been extensively investigated by the PS185 collaboration. This poster will report on first results of GEANT4 simulations including the full PANDA detector geometry which have been performed to study the detector acceptance, resolution and background suppression as well as the reconstruction of polarization observables. This work was supported in part by BMBF, DFG and GSI.

HK 22.51 Mo 16:30 TU MA141

Response Function of Improved $PbWO_4$ Crystals — •Karoly Makonyi for the PANDA collaboration — 2nd Physics Institute, University Giessen

The development of $PbWO_4$ (PWO) for LHC detectors enabled the mass production of high quality radiation hard crystals. The EM calorimeter of PANDA requires sufficient resolution over a wide range of photon energies down to 10-20 MeV. To select PWO as the appropriate fast and compact material, research started to increase the luminescence yield by quality improvement, reduction of defects, doping and operation below room temperature. Response functions of energy, time and position information to monoenergetic photons up to 800 MeV were measured at MAMI. Arrays of up to 20 cm long crystals with significantly improved light yield, manufactured in Russia and China, are investigated and operated at temperatures down to 25 degree C read-out with photomultipliers. The improvement with respect to CMS-quality crystals as well as the comparison to GEANT4 simulations will be discussed. The work is supported by BMBF, GSI and EU within the I3 Hadron Physics project.

HK 22.52 Mo 16:30 TU MA141

APD-Readout of PbWO4 Scintillator Arrays — •Michaela Thiel for the PANDA collaboration — 2nd Physics Institute, University Giessen

The EM calorimeter of the future PANDA detector, located inside a superconducting solenoid, considers $PbWO_4$ as scintillator material due to its short radiation length, fast response and moderate costs. The readout of the calorimeter modules within the magnetic field (¡2T) can be performed using large area avalanche photo diodes (APD). In spite of the significant improvement of the performance of PWO, the photosensor readout has to cope with a small number of scintillation photons per MeV deposited energy. Therefore, large area APDs have been developed, tested and operated at temperatures well below room temperature. To optimize low energy photon detection, a number of low noise charge sensitive preamplifiers has been developed using discrete components. First experiments have been performed with several arrays of large crystals to measure the energy and time response to monoenergetic photons up to 800 MeV at MAMI. The operation at low temperatures imposes strong requirements on temperature and bias voltage stability. The applicability of alternative photosensors will be discussed in comparison. The work is supported by BMBF, GSI and EU within the I3 Hadron Physics project.

HK 22.53 Mo 16:30 TU MA141

Performance of germanium detectors in high magnetic fields — •Alicia Sanchez[1], P. Achenbach[1], M. Agnello[2], A. Banu[3], E. Botta[4], T. Bressani[4], D. Calvo[4], G. D'Erasmo[5], A. Feliciello[4], F. Ferro[2], A. Filippi[2], E. Fiore[5], J. Gerl[3], F. Iazzi[2], I. Kojouharov[3], S. Marcello[4], A. Pantaleo[5], V. Paticchio[5], J. Pochodzalla[1], G. Raciti[6], T. Saito[3], N. Saito[3], H. Schaffner[3], and C. Sfienti[6] for the PANDA and the FINUDA collaboration — [1]Institut für Kernphysik, Mainz, Germany — [2]Politecnico de Torino, Italy — [3]GSI, Darmstadt, Germany — [4]INFN Torino, Italy — [5]INFN Bari, Italy — [6]INFN Catania, Italy

Future experiments on hypernuclei γ-spectroscopy at FINUDA@DAFNE and PANDA@FAIR require the operation of germanium detectors in high magnetic fields ≈1T. To explore the feasibility of these experiments we studied the performance of high resolution germanium detectors of the VEGA and EUROBALL collaboration in a magnetic dipole field. We will present results on the energy resolution and the pulse shape as a function of the magnitude and the orientation of the magnetic field.

HK 22.54 Mo 16:30 TU MA141

A 2.5 TBit/s Readout Scheme for the ALICE TRD — •Rolf Schneider and Volker Lindenstruth for the ALICE TRD collaboration — Kirchhoff-Institut für Physik, Universität Heidelberg

The Transition Radiation Detector (TRD) of the ALICE experiment at CERN serves as trigger, tracking and electron identification detector. All of these functions make particular demands on the readout scheme.

About 65 000 multi chip modules (MCM), each equipped with an amplifier, an ADC and a four-fold processor, preprocess and store the event data. To perform the Level-1 trigger, the preprocessed data has to be shipped off the detector to the next processing stage, the Global Tracking Unit (GTU), within 600 ns. As a result of accurate detector simulations and analyses to qualify the amount of preprocessed data, only a latency of a few clock cycles and a data bandwidth of ∼2.5 TBit/s fulfill these requirements. In contrast the readout of the full event data of ∼30 MByte is less time-critical and a handshaking protocol is used.

Taking into account the specifications like the number of pads, routing area, fault tolerance and power consumption, a readout scheme and corresponding Network Interface (NI) has been developed and tested. The resulting 4-to-1 readout trees which collect the data of 64 MCMs each, end in 1 080 optical links which are connected to the GTU. The NI consists of four 10 Bit wide input ports, one output port, FIFOs, interfaces to the processor, and control logic. The data transfer is performed with 120 MHz DDR. In order to save power the NI is capable of operating stand-alone and dynamically switching off unused LVDS ports. This project is supported by the BMBF (06HD9551).

HK 22.55 Mo 16:30 TU MA141

Hardware-Based Low-Latency Track Reconstruction for the ALICE TRD — •Jan de Cuveland and Volker Lindenstruth for the ALICE TRD collaboration — Kirchhoff-Institut für Physik, Universität Heidelberg

The Transition Radiation Detector (TRD) is one of the main detector components of the ALICE experiment at the LHC. One of its primary objectives is to trigger on high momentum electrons.

The trigger complexity is considerable and requires fast event reconstruction. Based on data from 1.2 million analog channels, the reconstruction must be performed within 6 μs to contribute to the Level-1 trigger decision. After preprocessing the analog data and applying pattern-matching algorithms in application-specific chips directly on the detector chambers, the resulting track segments of different chambers must be reassembled three-dimensionally. From the curvature of the reconstructed tracks, the momentum of the originating particle is calculated to finally make the trigger decision. This part of the online processing must be completed in less than 2 μs.

A hardware architecture has been developed which is able to perform the processing of up to 20 000 track segments in the required time by means of massive parallelism. This presentation focuses on an efficient implementation of the low-latency track reconstruction in hardware using FPGA technology.

This work is supported by the BMBF (06HD9551).

HK 22.56 Mo 16:30 TU MA141

Developments in the simulation of the ALICE Transition Radiation Detector from the analysis of beam test data — •Bogdan Vulpescu for the ALICE TRD collaboration — Physikalisches Institut der Universität, Heidelberg, Germany

The ALICE detector is described and simulated with a modular software at the level of its sub-detectors, with specific geometry design, signal formation, read-out data structure and tracking algorithm. Each module is plugged to an event reconstructor, collecting the summary information necessary for track recognition and particle identification.

The Transition Radiation Detector (TRD) plays an essential role in the high-level trigger of ALICE. By fast tracking of the high momentum particles and by performing a separation of the rare electrons from the more numerous pions in nucleus-nucleus collisions, the TRD will enhance the signals allowing in-depth studies of quarkonia and jets.

We will present the important feedback of the beam test data analysis on the detector simulations, obtained during runs at the CERN PS secondary beam with small chamber prototypes, as well as first conclusions from a practically final configuration of real size, real electronics stack of 6 TRD chambers. The on-line tracking was trained on data at momenta from 2 to 10 GeV/c, in various orientations of the beam relative to the chamber stack, covering to a large extent the incidence of the 540 single chambers of the TRD.

This work is supported by BMBF.

HK 22.57 Mo 16:30 TU MA141

The ALICE TRD detector control system and readout electronics performance under test beam conditions — •Jorge Mercado for the ALICE TRD collaboration — Physikalisches Institut der Universität Heidelberg, Germany

The ALICE experiment incorporates a transition radiation detector (TRD) designed to provide electron identification in the central barrel at momenta in excess of 2 GeV/c as well as fast (6 μs) triggering capability for high transverse momentum ($p_t \geq 3$ GeV/c) processes. With a total of 540 individual detectors (drift chambers) arranged in 6 radial layers, the TRD implements about 1.2 million analog channels which are digitised during the 2 μs drift time by the front-end electronics (FEE) mounted directly on the back of the detectors.

During late autumn 2004, a 6-layer stack equipped with final chamber prototypes as well as final FEE, was set up at the CERN PS secondary beam and tested up to 10 GeV/c in various orientations (relative to the beam) and momenta. For the first time, the whole FEE was configured and *monitored* via its devoted detector control system (DCS) under such conditions. Besides this, some features of the final upper communication layers were used successfully; namely, PVSS (Prozessvisualisierungs- und Steuerungs-System) running as DIM (Distributed Information Management) client and being able to provide dedicated commands. An overview of both, the TRD DCS and FEE performance during this beam time is given.

HK 22.58 Mo 16:30 TU MA141

Experimental Evaluation of the ALICE TPC Front-End Electronics Cooling Strategy — •U. Frankenfeld, P. Braun-Munzinger, H.R. Schmidt, and J. Wiechula — Gesellschaft für Schwerionenforschung, Darmstadt

The Time Projection Chamber (TPC) is the main tracking detector of the ALICE Experiment at the CERN Large Hadron Collider (LHC). A gas-filled, cylindrical volumen of 88 m^3 composes the sensitive region of the TPC. The maximal drift length is 2.5 m. The readout chambers are arranged in 18 trapezoidal sectors at both ends of the cylinder. The electron drift velocity changes by $\sim 0.3\%$/K for the nominal gas mixture of Ne (90%) and CO_2 (10%) and a drift field of 400 V/cm. This leads to the requirement for the temperature stability and homogeneity within the TPC drift volume of ΔT< 0.1°C. The main heat source is the Front-End Electronics (FEE) of the detector itself, with a total heat dissipation of $\sim$ 30kW. The FEE is connected with kapton cables to the readout chambers. A cooling strategy has been worked out to fulfill the thermal requirement. To verify the cooling strategy tests with a readout chamber module in a thermal controlled environment have been carried out. Results of actual measurements of the heat transfer and cooling efficiencies will be presented.

HK 22.59 Mo 16:30 TU MA141

SAPIS - Stored Atoms Polarized Ion Source — •R. Emmerich, R. Schulze, G. Tenckhoff, C. Weske, and H. Paetz gen. Schieck — Institut für Kernphysik der Universität zu Köln, Zülpicher Strasse 77, 50937 Köln

In 1995, improved varieties of the colliding-beams type polarized ion sources, some of which are used successfully in different laboratories such as COSY, have been proposed independently by three participants of the Cologne Polarized Beams and Targets Workshop [1]. An intensity gain factor has been predicted of at least ten without considerable loss of polarization. The main design feature is the use of a T-shaped storage cell for the charge-exchange region. A source of this type has been built. Its setup and first operational results will be presented.

Supported by BMBF

[1] International Workshop on Polarized Beams and Polarized Gas Targets (1995), World Scientific, pp. 155, 208, and 231

HK 22.60 Mo 16:30 TU MA141

The Frankfurt Funneling Experiment — •Jan Thibus, Ulrich Bartz, Dariusz Ficek, Norbert Müller, Holger Zimmermann, and Alwin Schempp — Institut für Angewandte Physik, J.W. Goethe-Universität, Robert-Mayer-Str. 2-4, D-60325 Frankfurt am Main

At low energies funneling is a technique to multiply beam currents of rf-accelerators. In ideal case the beam current can be multiplied in several stages without emittance growth. The Frankfurt Funneling Experiment consists of two ion sources, a Two-Beam RFQ accelerator, two different funneling deflectors and a beam diagnostic equipment system. To facilitate beam operation and beam diagnostics the whole set-up is scaled for He^+ instead of Bi^+ for the first funneling stage of a HIIF driver. The progress of our experiment and the results of the simulations will be presented.

HK 22.61 Mo 16:30 TU MA141

Simulations for the Frankfurt Funneling Experiment — •Jan Thibus and Alwin Schempp — Institut für Angewandte Physik, J.W. Goethe-Universität, Robert-Mayer-Str. 2-4, D-60325 Frankfurt am Main

Beam simulations for the Frankfurt Funneling Experiment are done with *RFQSim* and *FUSIONS*. *RFQSim* calculates macro particle bunches in the 6D phase space through a RFQ accelerator. To optimise beam transport of existing and new funneling deflector structures the simulation software *FUSIONS* is presently being developed (formerly *DEFTRA*). Neighbour bunch and channel interaction is planned to be integrated in the software. The progress of the development and the results will be presented.

HK 22.62 Mo 16:30 TU MA141

Status des elektrostatischen Speicherringes in Frankfurt — •Christian Glässner, Kai-Uwe Kühnel, Simone Maul und Alwin Schempp — Institut für Angewandte Physik, J.W. Goethe-Universität, Robert-Mayer-Str. 2-4, D-60325 Frankfurt am Main

Am Stern-Gerlach-Zentrum in Frankfurt-Niederursel wird vom IAP-Frankfurt in Zusammenarbeit mit dem IKF-Frankfurt ein elektrostatischer Speicherring für Teilchen mit einer Gesamtenergie von bis zu 50 keV aufgebaut. Die benötigten strahlführenden Elemente wurden optimiert, um eine größtmögliche Flexibilität in Bezug auf durchführbare Experimente zu erreichen. Die daraus resultierenden Ergebnisse werden vorgestellt. Darüber hinaus wurde das gesamte Layout des Ringes mehrfach geändert, um allen Anforderungen gerecht zu werden. Das aktuelle Layout, sowie der momentane Status des Aufbaues werden dargestellt.

HK 22.63 Mo 16:30 TU MA141

Design eines 352 MHz-Protonen-RFQ fuer die GSI — •Lutz Brendel, Benjamin Hofmann, Alwin Schempp und Markus Vossberg — Institut fuer Angewandte Physik, JWG-Universitaet Frankfurt, Robert-Mayer-Strasse 2-4, 60325 Frankfurt am Main

Ein Teil des zukuenftigen Projekts der GSI, ist ein neuer Protonen-LINAC, um Antiprotonen zu erzeugen. Der 4-Rod-RFQ, welcher mit 352 MHz betrieben wird, beschleunigt den Protonenstrahl einer ECR-Quelle (bis zu 100mA) auf eine Energie von 3MeV. Es wurden Modellmessungen und Simulationsrechnungen mit RFQsim und Microwave Studio durchgeführt, um die Strahldynamik und Feldverteilungen zu optimieren.

HK 22.64 Mo 16:30 TU MA141

Ein CW - RFQ Beschleuniger für Deuteronen — •P. Fischer[1], J. Häuser[2], A. Schempp[1], N. Mueller[1] und H. Vormann[1] — [1]J.-W.-Goethe - Universitaet, Institut f. Angewandte Physik, Robert-Mayer-Str. 2-4, 60325 Frankfurt am Main — [2]NTG Neue Technologien GmbH & Co KG, Im Steinigen Graben 12, 63571 Gelnhausen

Es wird der Aufbau eines four-rod-$\lambda/2$-RFQ Beschleunigers mit 176 MHz beschrieben. Ziel ist die Beschleunigung eines CW-Deuteronenstrahls von 20 keV auf 3 MeV. Kritisch ist die hohe Leistungsaufnahme des Resonators von 250 kW bei einer Gesamtlaenge von 3.8 m. Experimente zur Frequenzabstimmung und die Einstellung der Feldverteilung werden beschrieben.

HK 22.65 Mo 16:30 TU MA141

Nachweissystem zur Elektronenstreuung unter extremen Vorwärtswinkeln am S–DALINAC* — •K. Zimmer, Y. Kalmykov, P. von Neumann-Cosel, A. Richter und G. Schrieder — Institut für Kernphysik, Technische Universität Darmstadt

Am S–DALINAC soll ein Aufbau zur Elektronenstreuung bei extremen Vorwärtswinkeln realisiert werden, um Messungen bei sehr kleinen Impulsüberträgen durchführen zu können. Ähnlich wie bei der Streuung unter 180° dominiert auch nahe 0° der transversale kinematische Faktor. Der Aufbau stellt daher ein Instrument zur selektiven spektroskopischen Messung von transversalen Anregungen mit kleinem Drehimpuls dar. Die Trennung von Primärstrahl und gestreuten Elektronen durch einen Separationsmagneten ähnelt dem bereits realisierten Aufbau zur Messung unter 180° [1]. Interesse an diesem Projekt besteht außerdem von seiten der GSI, bei der sich ein neuer Elektronen-Ionen-Kollider in Planung befindet. Hier wird ein vergleichbares System zur Messung der Strahlluminosität benötigt.

* Gefördert durch die DFG im Rahmen des SFB 634.

[1] C. Lüttge et al., Nucl. Instr. and Meth. **A 366** (1995) 325.

HK 22.66 Mo 16:30 TU MA141

Röntgen- und Feldemission in supraleitenden Beschleunigungskavitäten des S-DALINAC* — •W. Bayer, M. Brunken, M. Gopych, H.D. Gräf, J. Hasper, U. Laier, A. Richter und A. Zilges — Institut für Kernphysik, TU Darmstadt, D-64289 Darmstadt

Die Feldemission in den supraleitenden Beschleunigungsstrukturen des Darmstädter Elektronenbeschleunigers S-DALINAC und damit verbundene Leuchterscheinungen im optischen Bereich sind seit längerem bekannt [1]. Eine neue, zusätzliche Methode, die Feldemission zu untersuchen, besteht in der Analyse der gleichzeitig emittierten Röntgenstrahlung.

Die Ergebnisse dieses neuen Messverfahrens und Vergleiche mit herkömmlichen Untersuchungsmethoden [2] werden vorgestellt.

* Gefördert durch die DFG (SFB 634 und Graduiertenkolleg 410)

[1] M. Gopych *et al.*, to be published in Nucl. Instr. and Meth. **A**
[2] Ph. Bernard *et al.*, Nucl. Instr. and Meth. **190**, 257 (1981)

HK 22.67 Mo 16:30 TU MA141

Design eines Niederenergie-Photonen-Tagger am S-DALINAC* — •J. Hasper, K. Lindenberg und A. Zilges — Institut für Kernphysik, TU Darmstadt, D-64289

An der TU Darmstadt wird am supraleitenden Elektronenbeschleuniger S-DALINAC ein Niederenergie-Photonen-Tagger aufgebaut, der Photonen im Energiebereich zwischen $E_\gamma = 10$ bis 20 MeV mit einer Energieauflösung von $\Delta E = 25$ keV und einer Zeitauflösung von $\Delta t = 5$ ns taggen soll. In diesem Energiebereich wird ein Photonenstrom von bis zu $5 \cdot 10^4$ keV^{-1}s^{-1} angestrebt.

Der Beitrag erläutert das Design des Taggers mit der Geometrie des Clam-Shell-Magneten, den Detektoren für die Fokalebene und einem geeigneten Bremstarget. Dies umfasst auch Magnetfeldsimulationen mit dem Toolkit CST EM Studio [1], so wie Bremsstrahlungssimulationen und das Tracking der Elektronen mit Geant4 [2].

* Gefördert durch die DFG (SFB 634)

[1] CST EM Studio, CST GmbH, Darmstadt
[2] Geant4 - A Simulation Toolkit, S. Agostinelli et al., NIM A 506 (2003) 250-303

HK 22.68 Mo 16:30 TU MA141

Status of the S–DALINAC Polarized Injector * — •C. Hessler[1], W. Ackermann[2], V. B. Asgekar[1,3], K. Aulenbacher[4], M. Brunken[1], J. Enders[1], H.-D. Gräf[1], G. Iancu[1], S. Khodyachykh[1], W. F. O. Müller[2], Y. Poltoratska[1], M. Roth[1], B. Steiner[2], T. Weiland[2], and J. Zwarych[1] — [1]Inst. für Kernphysik, TU Darmstadt, Germany — [2]Inst. Theorie elektromagnetischer Felder, TU Darmstadt, Germany — [3]Dept. of Physics, University of Pune, India — [4]Inst. für Kernphysik, Universität Mainz, Germany

Recent developments for a source of polarized electrons at the superconducting electron linear accelerator S-DALINAC at the Technische Universität Darmstadt will be presented. The polarized electron beam will be produced by photoemission from a 'strained-layer' GaAs/GaAsP cathode. The results of detailed simulations of the cathode geometry and of the beam dynamics will be shown. A 'load-lock' chamber for the preparation of GaAs photocathodes has been adapted from the source of polarized electrons at the MAMI accelerator at Mainz [1] and has been assembled. A semiconductor laser system is presently under development; pulsed operation of the seed laser with a repetition rate of 3 GHz has been achieved. A compact Mott polarimeter based on the design of a device developed for MAMI is presently under construction.
[1] K. Aulenbacher *et al.*, Nucl. Instrum. Meth. A 391, 498 (1997)
*Supported by DFG through SFB 634 and GRK 410.

HK 22.69 Mo 16:30 TU MA141

Hochauflösende γ-Spektroskopie am Big-Bite-Spektrometer* — •K. Ramspeck[1], M. Harakeh[2], J. Hasper[1], S. Rakers[3], D. Savran[1], A. van den Berg[2], H. Wörtche[2] und A. Zilges[1] — [1]Institut für Kernphysik, TU Darmstadt, D 64289 Darmstadt — [2]KVI, NL 9747 Groningen — [3]Institut für Kernphysik, Universität Münster

Ein selektives Instrument zur Untersuchung des Isospincharakters elektrischer Dipolanregungen unterhalb der Teilchenschwelle sind (α,α'γ)-Koinzidenzexperimente. Das Big-Bite-Spektrometer[1] am AGOR-Zyklotron des KVI wurde dazu um einen Array von sechs hochauflösenden HPGe-Detektoren mit BGO-Shields ergänzt. Die gute Auflösung der Ge-Detektoren ermöglicht es, energetisch dicht beieinander liegende Zustände zu trennen. Der Aufbau und erste Testexperimente werden vorgestellt. *gefördert durch die DFG (SFB 634) [1] A.M. van den Berg, Nucl. Instr. Meth. Phys. Res. B 99 (1995) 637

HK 22.70 Mo 16:30 TU MA141

A set up for High-Resolution γ - spectroscopy of Odd-N Fission Isomers* — •T. Morgan[1], B. Bruyneel[2], D. Habs[1], R. Hertenberger[1], H. Hübel[3], O. Koschorreck[4], H.-J. Maier[1], P. Reiter[2], W. Schwerdtfeger[1], T. Striepling[2] und P. G. Thirolf[1] für die MINIBALL-Kollaboration — [1]Ludwig Maximilians Universität München — [2]Universität zu Köln — [3]Rheinische Friedrich-Wilhelms Universität Bonn — [4]Max-Planck-Institut für Kernphysik, Heidelberg

While so far spectroscopic studies of fission isomers concentrated on even - even nuclei, high - resolution γ - spectroscopy of odd - N fission isomers will allow to identify Nilsson orbitals in heavy actinide nuclei. In order to prepare for the investigation of ^{237}Pu, following the ^{235}U(α,2n) reaction, the small population cross section (ca. 2 μb), requires a large solid angle coverage both for the γ - rays as well as for the fission fragments. A very compact 4π parallel plate detector array will be used for the fission fragment detection. Design and characteristics of the array will be presented. The excellent time resolution of the PPAC's will allow to distinguish between the dominant prompt fission products and the rare isomeric fission events ($t_{1/2} = 110$ ns ; 1.1 μs). The extremely rare γ - rays from the second potential energy minimum are planned to be investigated with eight EUROBALL Ge CLUSTER - detectors (56 Ge crystals) arranged in a highly efficient set up. A self supporting thick metallic ^{235}U target will be used, where the ^{237}Pu reaction products will be stopped and fission products will be emitted in opposite directions into the PPAC array.

*Supported the DFG under Contract number HA1101/12-1

HK 22.71 Mo 16:30 TU MA141

Simulation of RICH with achromatic and short-focused optics. — •Peter Vlasov[1,2], Anatoly Povtoreyko[2], James Ritman[1], Boris Morozov[2], and Anrei Nikitin[2] for the PANDA collaboration — [1]Institute für Kernphysik, Forschungzentrum Jülich, 52428 Jülich — [2]Joint Institute for Nuclear Research, Joliot-Curie 6, 141980 Dubna, Russia

A concept for a RICH detector for the PANDA experiment at the future GSI facility (Darmstadt, Germany) was proposed by the LHE JINR experimental group. This detector consists of a disk shaped fused silica radiator that is 12 mm thick, has a 2160 mm diameter, and is arranged perpendicular to the beam axis. This choice of radiator material has a long absorption length for Cherenkov photons with 250 to 700 nm wavelength. An optical scheme constisting of three different media lithium fluoride, fused silica and methanol compensates dispersion effects in this wavelength range. A torus shaped mirror focusses the photons to a surface containing the photosensors. This report will present simulation results of the optical scheme using the Geant4 package, that demonstrates the high velocity resolution for charged kaons with polar angle $1^o < \theta_{lab} < 22^o$ and momentum $> 0.6 GeV/c$.

HK 22.72 Mo 16:30 TU MA141

Single Crystal CVD Diamond Particle Detectors for Hadron Physics Experiments — •Michal Pomorski, Eleni Berdermann, Mircea Ciobanu, Alexander Martemyianov, Peter Moritz, and Bernd Voss — Gesellschaft für Schwerionenforschung, Darmstadt, Germany

Due to its remarkable physical properties Single-Crystal CVD diamond is one of the most promising wide band-gap materials for particle detection in present and future hadron physics experiments, where radiation hardness and speed is the crucial requirement. First results from a Single-Crystal CVD diamond detector are reported, which is under development for heavy-ion particle identification and minimum-ionizing particles timing as well. The charge-collection efficiency is about 100% , never obtained from poly-crystalline CVD-diamond detectors. An energy resolution of 20 keV ($\Delta E/E \approx 0.0035$) is achieved using mixed nuclide α -sources, which is comparable to the energy resolution of silicon detectors. Using low impedance broadband electronics and a ToF technique, where holes or electrons drift separately inside the diamond bulk, the saturation velocity, mobility and lifetime of both charge carriers are estimated. The influence of the electric field on both, the material parameters and the signal shape is discussed regarding the timing properties of the detectors.

Supported by the 6th European Frame Program (FP6, I3 Hadron Physics, JRA NoRHDia)

HK 22.73 Mo 16:30 TU MA141

The Magnetic Field Configuration of the Neutron Decay Spectrometer *a*SPECT — •Raquel Muñoz Horta[1], Fidel Ayala Guardia[1], Stefan Baessler[1], Michael Borg[1], Jim Byrne[2], Ferenc Glück[1], Werner Heil[1], Igor Konorov[3], Marius Orlowski[1], Gerd Petzoldt[1], Yuri Sobolev[1], Maurits van der Grinten[2], Hans-Friedrich Wirth[3], and Oliver Zimmer[3] — [1]Institut für Physik, U. Mainz — [2]University of Sussex, Falmer, Brighton, UK — [3]Physik Department E18, TU München

In this poster the spectrometer *a*SPECT is presented. Its working principle – *a*SPECT is a retardation spectrometer and will measure the proton spectrum in the decay of the free neutron – is explained. Better knowledge of the proton spectrum provides information about the unitarity of the Cabbibo-Kobayashi-Maskawa-Matrix. More specifically, a detailed description of the superconducting coil system and its magnetic field configuration is given.

HK 22.74 Mo 16:30 TU MA141

Development of a novel high-resolution TOF spectrometer with tracking capabilities for photo-fission fragments and beams of exotic nuclei* — •K.M. Kossev[1], N. Nankov[1,2], A. Wagner[1], E. Grosse[1], A. Hartmann[1], A.R. Junghans[1], K.D. Schilling[1], and M. Sobiella[1] — [1]FZ-Rossendorf e.V., Dresden, Germany — [2]INRNE, Sofia, Bulgaria

An advanced double-arm TOF spectrometer is under development. The spectrometer is designed to have high time resolution ($\sigma < 100$ ps) and tracking capabilities[1]. It is proposed to be used for high-precision identification of exotic nuclei for the planned photo-fission experiments at the ELBE radiation source in Rossendorf and for experiments with beams of exotic nuclei at GSI. Recently, the position sensitivity of the TOF detector has been optimized and a spatial resolution better than 1 mm in both x-and y-directions has been achieved. We present the results for the optimized imaging properties of the TOF detector.
[1] H. Sharma, K. Kosev, A. Wagner, K. D. Schilling, M. Sobiella, FZR Anual Report 2002.

*Supported by GSI, Darmstadt under contract DR-DÖN

HK 22.75 Mo 16:30 TU MA141

A photoneutron source for time-of-flight experiments at the radiation source ELBE — •A.R. Junghans[1], E. Altstadt[1], R. Beyer[1], H. Freiesleben[2], V. Galindo[1], M. Greschner[2], E. Grosse[1,2], K. Noack[1], A. Rogov[1], A. Wagner[1], and F.P. Weiss[1] — [1]Forschungszentrum Rossendorf, Dresden, Germany — [2]Technische Universität Dresden, Dresden, Germany

The radiation source ELBE at Research Center Rossendorf can deliver electron beam energies between 12 MeV and 40 MeV with a wide variability of the beam intensity and pulse structure (1 mA at 13 MHz repetition rate [and at 1 MHz after completion of the photo-gun injector under developement at FZR], pulse width <10 ps). This electron beam is ideally suited to produce intense sub-ns neutron pulses from (γ,n)-reactions with bremsstrahlung photons in a small-volume liquid-Pb radiator circuit. Because of the excellent time structure of the electron beam, a comparably short flight path (<4 m) can be used to make high-resolution time-of-flight measurements with fast neutrons. An energy resolution of $\Delta E/E \approx 1\%$ can be reached up to $E_{kin} \approx 3$ MeV with a differential neutron flux of $\approx 10^6 (\mathrm{cm}^2\ \mathrm{s\ MeV})^{-1}$. The physics objectives are to measure reactions induced by fast neutrons important for construction materials of advanced reactor systems and transmutation of nuclear waste. For studies of (n,γ) reactions of relevance to the cosmic nucleosynthesis a differential neutron flux of $\approx 10^4 (\mathrm{cm}^2\ \mathrm{s}\ 10\ \mathrm{keV})^{-1}$ in the energy range of $\approx$100 keV is expected.

HK 22.76 Mo 16:30 TU MA141

A Versatile Program for the Analysis of COSY-TOF Measurements* — •K. Ehrhardt, K. Haug, H. Clement, E. Doroshkevich, A. Erhardt, and G. J. Wagner for the COSY-TOF collaboration — Physikalisches Institut, Universität Tübingen

A frequent problem in collaborations is the situation that analysis programs start to develop differently at different places due to individual improvements. In order to facilitate the comparability of different versions of analysis packages, we have started to develop a program, which is versatile enough to implement, test and compare different options/modules for specific purposes in a well-defined environment. The analysis is based on the ROOT package. It uses a graphical user interface based on the Qt package (by Trolltech) for an online definition of the analysis. First applications will be demonstrated.

* supported by BMBF (06 TU 201), DFG (Europ. Graduiertenkolleg), FZ Jülich (FFE) and Landesforschungsschwerpunkt (Quasiteilchen)

HK 22.77 Mo 16:30 TU MA141

RESULTS OF THE COSMIC-RAY TRACKING WITH STRAW DETECTOR PROTOTYPE — •Aziz Ucar, K. Kilian, R. Nellen, J. Ritman, T. Sefzick, and P. Wintz for the COSY-TOF, Forschungszentrum Juelich collaboration — Forschungszentrum Juelich, 52425 Juelich

A new straw tube tracking detector for the COSY time of flight (TOF) detector system is under construction. The detector will consist of more than 3000 straws with 1 cm diameter and 30 micron Mylar wall thickness. The active area of the tracker is 1 m^2 with a depth of 30 cm. Using gas overpressure to provide mechanical stability eliminates the necessity of a massive surrounding frame, the final tracker will have a total weight less than 15 kg. A prototype of the straw tracker, consisting of four double planes, is constructed for 3 dimensional tracking and testing some detector elements. The electronic part of the prototype is studied to get rid of oscillations caused by the ASD-8 chip. By modifying some passive elements (capacitors, resistors) on the input board to the ASD-8 chip, a stable and oscillation free state in electronic part is obtained. First spatial resolution and efficiency values of the tracker from cosmic-rays will be presented.

HK 22.78 Mo 16:30 TU MA141

Ein 10 GHz Elektronen-Spin-Resonanz-Spektrometer — •J. Dahmen, J. Heckmann, C. Hess, W. Meyer, E. Radtke und G. Reicherz — Ruhr-Universität Bochum, Institut für Experimentalphysik, D-44780 Bochum

Elektronen-Spin-Resonanz-Messungen (ESR) sind nützlich, um das Verständnis der Polarisationsmechanismen zu erweitern. In der Forschung des Polarisierten Targets (PT) werden ESR-Messungen durchgeführt, um polarisierte Targetmaterialien zu untersuchen. Dabei spielen die paramagnetischen Zentren der Radikale eine wichtige Rolle - auch in Bezug auf die Dynamische-Nukleonen-Polarisation (DNP). Umgebende Kerne wechselwirken mit den Elektronen und beeinflussen dadurch die Linienform. Ein ESR-Spektrometer zur Untersuchung von Radikalen in polarisierten Festkörpertargets wird dokumentiert, der Aufbau der Apparatur wird beschrieben und verschiedene Messergebnisse werden vorgestellt (Ammoniakisotope, in Butanol und Propandiol gelöste Radikale, sowie neue Trityl-Radikale). Abschließend wird noch ein kurzer Ausblick auf zukünftige Entwicklungen und Perspektiven der ESR-Messungen für die PT-Forschung gegeben. Außerdem kann man mit der Apparatur auch noch die Größe der Spindichte einer Probe bestimmen.

HK 22.79 Mo 16:30 TU MA141

Ein hardwarebasiertes Computer Cluster Kontrollsystem — •Ralf Panse und Volker Lindenstruth — Kirchhoff-Institut für Physik der Universität Heidelberg

Zukünftige LHC Experimente benötigen enorme Rechenleistung um die anfallenden Daten zu analysieren und Triggerentscheidungen zu treffen. Diese Rechenleistung wird in Zukunft von PC Farmen zur Verfügung gestellt werden. Diese Farmen bestehen aus mehreren hundert handelsüblichen PCs. Jeder PC ist fehleranfällig, was besondere Anforderungen für den zuverlässigen Betrieb einer PC Farm stellt. Die Konfiguration, Überwachnung und Kontrolle eines Clusters ist sehr zeitintensiv und erfordert einen hohen Verwaltungsaufwand. Um diesen Aufwand zu minimieren, wurde ein kostengünstiges und einfache Hardware Lösung für dieses Problem entwickelt. Das Kernstück unseres Clusterkontrollsystem ist eine PCI Erweiterungskarte, der sogenannte Cluster Interface Agent (CIA). Die Karte verfügt über einen Prozessor und eigene Netzwerkanbindung und arbeitet dadurch unabhängig vom zu überwachenden Rechner. Der PC kann mittels dieser Karte überwacht und kontrolliert werden, selbst dann, wenn das Betriebssystem des PCs eine solche Fernkontrolle nicht unterstützt. Desweiteren kann man mit ihr Betriebssysteme installieren, den Host-Rechner ausschalten und die PC Hardware testen.

HK 22.80 Mo 16:30 TU MA141

Development of new Crystal-Barrel forward detectors: I. The forward plug crystal readout and the Mini-TAPS detector. — •Volker Hannen[1], Philipp Hoffmeister[2], Vahe Sokhoyan[1], and Ulrike Thoma[1,2] — [1]II. Phys. Inst. der Universität Giessen, Heinrich-Buff-Ring 16, 35392 Giessen — [2]HISKP, Universität Bonn, Nussallee 14-16, 53115 Bonn

The structure of hadrons is investigated by the Crystal-Barrel experiment at ELSA using electromagnetic probes. Due to its setup as a fixed target experiment the coverage of forward angles is of special importance. Here two new forward detectors will be installed for the planned double polarisation measurements. The so-called Forward Plug, consisting of 90 CsI crystals, which covers forward angles from 30° to 11° and the Mini-TAPS detector, consisting of 60 TAPS BaF_2 crystals, which completes the angular coverage down to 2°. The readout of the Forward Plug crystals is done by photomultipliers, unlike the rest of the barrel, where photodiodes are used. In addition, plastic scintillators will be mounted in front of each crystal for both detector systems. Their signals can be used together with the ones from the crystals to provide an efficient trigger for charged and neutral particles. In addition to the setup, we will present test results of the new photomultiplier readout of the Forward Plug crystals, discuss its newly designed backend electronics and provide an overview of the readout electronics to be used with the Mini-TAPS detectors.

Supported within the Emmy-Noether-program and the SFB/TR16 by the DFG.

HK 22.81 Mo 16:30 TU MA141

Development of new Crystal-Barrel forward detectors: II. A charged particle detector, fast clustering triggerlogic and Flash-ADC readout — •Christian Funke, Torge Szczepanek, and Christoph Wendel — Helmholtz-Institut für Strahlen- und Kernphysik der Universität Bonn, Nussallee 14-16, 53115 Bonn

The Crystal-Barrel experiment at ELSA is used to investigate the structure of hadrons with electromagnetic probes. The 4π-geometry of this electromagnetic calorimeter is particularly suited to study multi-photon final states. Due to it's setup as a "fixed target" experiment an efficient trigger for particles and their energy determination under forward angles is important. For the upcoming data-taking period a new set of forward detectors is being developed. The focus of this poster is the new charged particle detector, the new clustering (pre-)trigger for the Crystal-Barrel calorimeter and the fast Flash-ADC CsI-Crystal-Readout using FPGAs. These systems will cover the angle of $12-30°$ in the forward direction. Charged particle detection is achieved by two layers of

szintillating material with a combined angular resolution of 6°. Each of the 180 plastic szintillator plates is, due to spatial constraints, read out by wavelength-shifting fibres. The trigger system for the 90 CsI crystals of the given forward segment has to be able to deliver a multiplicity count of incident hadronic showers in a timeframe of 250ns. To achieve this a fast SRAM-based solution is build. The Flash-ADC will provide additional data for particle identification and event selection.
Supported within the SFB/TR16 by the DFG.

HK 22.82 Mo 16:30 TU MA141

2nd Level Trigger Performance in HADES — •Camilla Gilardi, Ingo Fröhlich, and Tiago Pérez for the HADES collaboration — II. Physikalisches Institut, University of Gießen, Heinrich-Buff-Ring 16, 35392 Gießen

The main purpose of the HADES spectrometer at GSI Darmstadt is the measurements of dilepton decays of light vector mesons. Since the amount of unbiased data would be relatively high, it could not be stored without the employ of an online selective mechanism which allows an enhancement of the signal-to-background ratio. The first level trigger system (LVL1) selects the most central collisions, while the second level trigger (LVL2) searches signatures of dilepton decays first as leptons candidates in the RICH, TOF and Pre-shower detector. In order to select events with lepton pairs, the LVL2 trigger performs pattern recognition to find lepton signatures (through the Image Processing Units - IPUs), and combines the position and angle information for each of these signatures into tracks (through the Matching Unit - MU). In the last year, a lot of progress has been achieved to increase the performance of the LVL2 trigger. In particular the distribution system of the LVL1 and LVL2 signals has been reimplemented. Furthermore, the time-of-flight IPU was improved to gain in speed and flexibility, allowing to read out generic modules like scaler and latches. This work has been supported by BMBF, GSI and the DFG.

HK 22.83 Mo 16:30 TU MA141

Alignment of the HADES Spectrometer — •Alexander Schmah[1], Geydar Agakichiev[2], Yvonne Pachmayer[3], Vladimir Pechenov[2], and Anar Rustamov[1] for the HADES collaboration — [1]Gesellschaft für Schwerionenforschung, Planckstrasse 1, 64291 Darmstadt, Germany — [2]II. Physikalisches Institut, University of Gießen, Heinrich-Buff-Ring 16, 35392 Gießen — [3]Institut für Kernphysik, Johann Wolfgang Goethe-Universität Frankfurt 60486 Frankfurt, Germany

Varios alignment methods for the HADES detector system have been investigated. Data from measuring straight tracks (without magnetic field), cosmic rays as well as proton - proton elastic scattering are used. A new approach has been developped using the hit information of the multi wire drift chambers (MDC). For each iteration of the MDC geometry the full tracking procedure is performed. This allows to modify and correct not only the position of chambers in space but also the internal geometry of the chambers. A simultaneous fit of tracks in all chambers is employed which has the potential to significantly enhance the accuracy of alignment. This method allows to align the chambers not only with respect to each other but also with respect to the target point. This work has been supported by BMBF and GSI.

HK 22.84 Mo 16:30 TU MA141

Teilchenidentifikation im HADES Experiment* — •T. Christ[1], T. Eberl[1], L. Fabbietti[1], J. Friese[1], R. Gernhäuser[1], M. Jurkovic[1], K. Kanaki[2], R. Krücken[1], J. Mousa[3], V. Pospisil[4], B. Sailer[1], M. Sudol[5], P. Tlusty[4] und T. Wojcik[6] für die HADES-Kollaboration — [1]Physik-Department E12 der Technischen Universität München — [2]Forschungszentrum Rossendorf, Dresden — [3]University of Cyprus, Nicosia, Zypern — [4]Czech Academy of Sciences, Rez, Tschechische Republik — [5]Gesellschaft für Schwerionenforschung, Darmstadt — [6]Jagiellonian University, Krakau, Polen

Mit dem HADES-Spektrometer wird bei der GSI, Darmstadt, in protonen- und schwerioneninduzierten Kernreaktionen Produktion und e^+e^- Zerfall von leichten Mesonen und baryonischen Resonanzen untersucht. Für die zuverlässige Identifikation der gemessenen Reaktionsprodukte (p, $\pi^{\pm}$, $e^{\pm}$, usw.) sowie eine ausreichende Unterdrückung des Untergrunds haben wir verschiedene Analysemethoden entwickelt. Ein einfaches, aber robustes Verfahren verwendet Datenschnitte auf Detektorsignale (ΔE, TOF, RICH-Ring, etc.) und Spureigenschaften (P, $\Delta\Theta$, $\Delta\Phi$). Ein komplementäres Verfahren benutzt statistische Methoden in der Detektorsignalanalyse zur Gewinnung von Wahrscheinlichkeitsaussagen über die zu einer gemessenen Spur gehörende Teilchensorte. Wir berichten die Ergebnisse eines Vergleichs der beiden Methoden für die Reaktion C + C (E_{kin} = 2 AGeV) im Hinblick auf Effizienz, Reinheit und Untergrundunterdrückung. * gefördert durch BMBF (06MT190) und GSI (TM-KR2).

HK 22.85 Mo 16:30 TU MA141

Status von MAFF — •Martin Gross[1], Dieter Habs[1], Reiner Krücken[2], Walter Assmann[1], Ludwig Beck[3], Thomas Faestermann[2], Sophie Heinz[1], Philipp Jüttner[4], Oliver Kester[1], Hans-Jörg Maier[1], Peter Maier-Komor[2], Florian Nebel[2], Matteo Pasini[1], Michael Schumann[1], Jerzy Szerypo[1], Peter Thirolf[1], Franz Tralmer[4] und Ernst Zech[2] — [1]Department f. Physik, Ludwig-Maximilians-Universität München — [2]Physik-Department E12, Technische Universität München — [3]Maier-Leibnitz-Labor f. Kern- u. Teilchenphysik, Garching — [4]ZWE FRM-II, Garching

Das Projekt des Münchner Spaltfragmentbeschleunigers MAFF (**M**unich **A**ccelerator for **F**ission **F**ragments) am nunmehr in Betrieb befindlichen Forschungsreaktor FRM-II hat als Ziel die Erzeugung hochintensiver Ionenstrahlen neutronenreicher Isotope.
Im letzten Jahr waren Fortschritte insbesondere auf dem Gebiet der Berechnung der zu erwartenden Aktivitätsverteilung im System, des Aktivitätshandlings, der Ionenquelle und der Strahlführung zu verzeichnen.
Es wird ein Überblick über den aktuellen Stand der Planung des Gesamtsystems gegeben.

HK 22.86 Mo 16:30 TU MA141

Radioactivity distribution in the MAFF beamline — •Jerzy Szerypo — Department für Physik, Universität München (LMU), D-85748 Garching, Germany

The MAFF facility (Munich Accelerator for Fission Fragments [1]) planned at the research reactor FRM-II in Munich is dedicated to produce, cool and accelerate high-intensity neutron-rich radioactive beams. The primary radioactive beam consists of fission fragments, which result from bombarding a uranium target by the thermal neutrons emerging from the reactor. The fragments are produced in the target/ion source unit. Part of the nuclides are ionized (1+) and accelerated to 30 keV energy. A considerable portion of fission fragments will leave the target without being ionized. In order to retain the noble radioactive gases in a well-shielded place and also to provide good vacuum conditions in the reactor beam tube, helium-cooled cryopanels (T=15 K) will be installed close to the ion source. This contribution is concerned with simulating the properties of the MAFF beamline cryopumping system. The calculations are performed with the help of the computer program MOVAK3D [2]. This program simulates, in 3 dimensions, the trajectories of single particles (atoms, molecules) in an arbitrary vacuum system, in a Monte Carlo approach. Preliminary results show that the fraction of non-ionized radioactivity at the experimental area amounts to about 10-7 only.

[1] D. Habs et al., Nucl. Instr. Meth. B204 (2003) 739 [2] G. Class, Report 4292, Institut IRS, Kernforschungszentrum Karlsruhe GmbH (1987)

HK 22.87 Mo 16:30 TU MA141

Der 101.28 MHz IH-RFQ für MAFF* — •O. Kester[1], M. Pasini[1], T. Sieber[1], D. Habs[1] und A. Schempp[2] — [1]Department für Physik der LMU München, Am Coulombwall 1, D-85748 Garching — [2]Institut für Angewandte Physik, Uni Frankfurt, Robert-Mayer-Str. 2-4, D-60325 Frankfurt

Für die Nachbeschleunigung radioaktiver isotope ist ein 101.28 MHz IH-RFQ entwickelt worden in Hinblick auf optimierte Shuntimpedanz und Strahldynamik. Dieser ist neben dem Einsatz am Münchner Spaltfragmentbeschleuniger eine zukünftige Option für EURISOL in Verbindung mit einem Ladungsbrüter. Die Resonanzfgrequenz des IH-RFQs stellt das obere Limit solcher Strukturen dar und ist daher eine Herausforderung für das Tuning der Struktur. Die mit den REX-ISOLDE Strukturen identische Resonanzfrequenz bietet jedoch die einmalige Möglichkeit eines Vergleichs mit einem 4-Rod-RFQ. Der aktuelle Status des Aufbaus und das Design sollen vorgestellt werden.

*Unterstützt durch DFG (HBFG 132-825)

HK 22.88 Mo 16:30 TU MA141

The active stabilization of the laser system of the A4-Compton-Backscattering-Polarimeter — •Jürgen Diefenbach for the A4 collaboration — Institut für Kernphysik, Universität Mainz

The A4 collaboration measures single-spin asymmetries (e.g. parity violation) in the elastic scattering of polarized electrons off the nucleon at the MAMI accelerator facility in Mainz. To perform an online monitoring of the electron beam polarization a new type of laser backscattering compton polarimeter are used. Due to the intracavity design of the backscattering polarimeter an active stabilization of the 7.8m long laser resonator is unavoidable to achieve stable overlap of laser and electron beam and to optimize the polarimeter's luminosity. The design ideas and first results from the operation of the stabilization will be presented.

HK 22.89 Mo 16:30 TU MA141

Umbau des A4 Kalorimeters für die Messung unter Rückwärtswinkeln — •Boris Gläser für die A4-Kollaboration — Institut für Kernphysik Johannes Gutenberg Universität Mainz, J.J. Becherweg 45, 55099 Mainz

Es ist geplant, die Paritätsverletzung in der elastischen Elektron-Nukleon-Streuung unter Rückwärtswinkeln an Wasserstoff und Deuterium mit dem A4-Kalorimeter zu messen. Zu diesem Zweck wird der Detektor auf eine rotierbare Plattform gestellt, so daß Messungen sowohl unter Vorwärts- als auch unter Rückwärtswinkeln möglich sein werden. Der neue experimentelle Aufbau und die besonderen Anforderungen werden erläutert.

HK 22.90 Mo 16:30 TU MA141

The internal cavity Compton polarimeter of the A4 experiment — •Yoshio Imai for the A4 collaboration — Institut für Kernphysik, Universität Mainz, D-55128 Mainz, Germany

The A4 experiment at the MAMI facility in Mainz is investigating single-spin asymmetries in the electron-nucleon-scattering with polarized beams. In order to control the beam polarization, a Compton backscattering polarimeter has been installed into the beamline. This polarimeter implements for the first time the internal cavity-concept. In July 2004, first Compton asymmetries have been measured. This contribution will present the principle of operation and the results achieved so far, and discuss the next steps towards quantitative results on the beam polarization.

HK 22.91 Mo 16:30 TU MA141

Wire Scanner Analysis and Emittance Measurement in the A4 Compton Polarimeter — •Jeong Han Lee — Institut fuer Kernphysik,Universitaet Mainz, D-55099 Mainz, Germany

The A4 collaboration investigate the structure of the proton by measuring parity-violating asymmetry for elastic electron scattering off an unpolarized proton. To extract the physics asymmetry, it is crucial to determine the polarization of the electron beam to high accuracy. The Compton Polarimeter has been installed in the new beamline and has been operational. There are three wire scanners in the polarimeter. The purpose of these are to determine transverse positions of the electron and photon beam and measure an emittance and beam size in the Compton Polarimeter.

This poster will present the result of the wire scanner analysis and progress of the emittance measurement.

HK 22.92 Mo 16:30 TU MA141

A new polarised He3 gas target for the Crystal Ball at MAMI — •Patricia Aguar Bartolome for the A2 collaboration — Institut für Kernphysik, Becherweg 45, 55099 Mainz

This poster will show the status of the development of the new polarised ^{3}He gas target for the Crystal Ball on the Mainz A2 tagged photon facility.

The simulation results for the solenoid necessary to provide the homogeneous magnetic field for this new target will be presented.

The preparation of the setup and the results of an ^{4}He feasibility test carried out in October 2004 will be illustrated.

HK 22.93 Mo 16:30 TU MA141

A new bremsstrahlung tagging system for the CBELSA experiment* — •Kathrin Fornet-Ponse, Susanne Kammer, and Andre Süle for the CBELSA/TAPS collaboration — Physikalisches Institut Universität Bonn

For future double polarisation experiments at CBELSA with real photon beams and polarised proton and neutron targets, a new photon tagging system has been designed. It enables accurate flux determination and the control and measurement of both linear and circular beam polarisation. The tagger consists of a dipol magnet for momentum selection of the decelerated electrons. Using standard focal plane hodoscopes a photon energy resolution of 0.2-2.2% over the tagging range of 4-82% of the electron beam energy is achieved. The photon flux is determined from geometrically overlapping scintillator channels. Control of the linear polarisation of the photon beam is provided by adequate orientation of a diamond radiator using a commercial goniometer. The measurement of the circular photon beam polarisation requires Møller polarimetry of the longitudinally polarised electron beam. This shall be realised by using polarised ferromagnetic radiator foils and the coincident measurement of the symmetric Møller pairs in a dedicated focal plane detection system.

* supported by DFG (SFB/TR 16).

HK 22.94 Mo 16:30 TU MA141

Method for (n,γ)-cross section measurements of unstable isotopes — •Stephan Walter[1], Michael Heil[1], Franz Käppeler[1], Ralf Plag[1], and René Reifarth[2] — [1]Forschungszentrum Karlsruhe, Postfach 3640, D-76021 Karlsruhe — [2]LANL, Los Alamos, New Mexiko, 87545, USA

Quantitative studies of s-process nucleosynthesis in Red Giant stars require reliable cross sections for the unstable branching point isotopes. Such data are important with respect to explosive nucleosynthesis in the r- as well as in the p-process. Currently, time of flight (TOF) measurements are limited by the available neutron fluxes, which require target masses in the milligram region, implying severe backgrounds caused by the self activity of the target. We propose to increase the sensitivity of the TOF technique such that target masses of a few micrograms can be used. This is achieved by shortening the flight path to a few centimetres, along with the use of a 4π calorimeter for the detection of neutron capture events.

HK 22.95 Mo 16:30 TU MA141

The ^{14}N(p,γ)^{15}O reaction at energies of astrophysical interest — •Daniel Bemmerer — Istituto Nazionale di Fisica Nucleare, Sezione di Padova, Italy, and Institut für Atomare Physik und Fachdidaktik, Technische Universität Berlin, Germany

The ^{14}N(p,γ)^{15}O reaction is the bottleneck of the hydrogen-burning CNO cycle. At the LUNA 400 kV accelerator deep underground in the Gran Sasso laboratory, its cross section has been measured in the $E_{\rm CM}$ = 130 – 370 keV energy range using a TiN solid target and germanium detectors [1]. The resulting astrophysical S-factor extrapolated to zero energy is only half the previously accepted value, with interesting consequences for the age determination of globular clusters [2].

The present talk reports on the subsequent measurement [3] of the total cross section of this reaction in the $E_{\rm CM}$ = 70 – 230 keV energy range using a windowless gas target and a 4π BGO detector at the LUNA accelerator. The results are consistent with [1] and extend the data to energies that lie within the Gamow peak for some stars.

[1] A. Formicola *et al.*, Phys. Lett. **B 591** (2004), 61 - 68.
[2] G. Imbriani *et al.*, Astronomy & Astrophysics **420** (2004), 625 - 629.
[3] http://edocs.tu-berlin.de/diss/2004/bemmerer_daniel.htm

HK 22.96 Mo 16:30 TU MA141

Measurement of the ^{3}He(α,γ)^{7}Be cross section with ERNA — •Antonino Di Leva for the ERNA collaboration — Institut für Experimentalphysik III, Ruhr-Universität Bochum

The ^{3}He(α,γ)^{7}Be reaction plays an important role in the interpretation of the results of the solar neutrino experiments, since the estimate of the oscillation parameters relies on the solar neutrino spectrum, calculated by solar models. The high energy component in this spectrum is mainly produced by the decay of ^{7}Be and ^{8}B.

However uncertainty in the ^{3}He(α,γ)^{7}Be cross section is also one of the largest contributions to the uncertainty on primordial ^{7}Li abundance in Big Bang Nucleosynthesis calculations. The latter can constrain the universe initial baryon density and the number of light neutrino flavors.

Measurements of the ^{3}He(α,γ)^{7}Be cross section have been performed detecting the capture gamma rays or measuring the activity of the synthesized ^{7}Be. While the results of the two different approaches agree on the energy dependence of the astrophysical S factor, they disagree in the extrapolated $S_{34}(0)$ value at a 3σ level, that suggests the presence of systematic errors in one or both techniques, or a non radiative component in the cross section.

A novel approach uses the European Recoil separator for Nuclear Astrophysics (ERNA), that can provide the simultaneous detection of both the capture gamma rays and the ^{7}Be ions produced in the reaction. In this talk the experiment and results of preliminary measurements are

discussed.
Supported by DFG(Ro 429/35-3), BMBF(05CL1PC1/1) and INFN

HK 22.97 Mo 16:30 TU MA141

Eine kondensierte ^{83m}Kr-Konversionselektronenquelle für das KATRIN-Experiment — Matthias Prall, Beatrix Ostrick, •Matthias Prall und Beatrix Ostrick für die KATRIN-Kollaboration und die KATRIN-Kollaboration — Institut für Kernphysik Münster

Das KATRIN-Experiment wird $m^2_{\bar{\nu}_e}$ aus dem β-Zerfall von Tritium mit einer Signifikanz von 5 σ für eine Masse von 0,35 eV/c^2, bzw. 3 σ für eine Masse von 0.3 eV/c^2 messen. Für kleinere Neutrinomassen wird es möglich sein, eine Obergrenze von 0,2 eV/c^2 bei 90% CL anzugeben. Hierfür wird der sogenannte MAC-E (magnetic adiabatic collimation followed by electrostatic filter) Filter eingesetzt.

Für die Messung wird der MAC-E Filter mit einer Retardierungsspannung im Bereich von 18,6 kV versorgt. Man muss in der Lage sein, Fluktuationen σ dieser Spannung im Bereich unter 60 meV zu erkennen, da eine unerkannte Fluktuation über die Relation $\Delta m^2_{\bar{\nu}_e} = -2\sigma^2$ die Neutrinomasse verfälschen würde. Uns dienen K-Konversionselektronen von ^{83m}Kr bei 17,8 keV mit einer Breite von 2,9 eV als nuklearer/atomarer Standard zur Langzeitüberwachung der Retardierungsspannung, die parallel an einem Monitor-Spektrometer angelegt wird. Das ^{83m}Kr ist hierbei auf einem Graphitsubstrat aufgefroren. Da die Halbwertszeit von ^{83m}Kr nur 1,8 Stunden beträgt, muss der ^{83m}Kr-Film auf dem Substrat immer wieder erneuert werden. Dies muss so geschehen, dass die Energie der Konversionselektronen reproduzierbar ist.

Wir stellen das zugehörige Gaseinlasssytem und die verschiedenen Filmpräparationsmethoden vor, welche dazu dienen, Reproduzierbarkeit zu erreichen.

HK 22.98 Mo 16:30 TU MA141

Untersuchungen zum p-Prozess radioaktiver Kerne: Mo Isotope als Testfall — •S. Müller[1], M. Babilon[1], K. Sonnabend[1], M. Zarza[1], A. Zilges[1], M. Erhard[2], E. Grosse[2], A. Junghans[2], N. Nankov[2], A. Wagner[2], M. Heil[3], F. Käppeler[3], R. Plag[3], T. Aumann[4], H. Emling[4], H. Simon[4], K. Sümmerer[4] und U. Datta Pramanik[4] — [1]Institut für Kernphysik, TU Darmstadt, D-64289 Darmstadt — [2]Institut für Kern- und Hadronenphysik, FZ Rossendorf — [3]Institut für Kernphysik FZ Karlsruhe — [4]GSI Darmstadt

Es gibt 35 neutronenarme, stabile Kerne welche nur im *p*-Prozess [1] durch eine Reihe von (γ,n), (γ,p) und (γ,α) Reaktionen erzeugt werden können. Am LAND Aufbau der GSI können die (γ,n) Wirkungsquerschnitte von stabilen und instabilen Kernen durch Coloumbaufbruch in inverser Kinematik untersucht werden [2,3]. In einem ersten Experiment sollen die (γ,n) Wirkungsquerschnitte der Kerne ^{100}Mo, ^{93}Mo und ^{92}Mo gemessen werden. Die Ergebnisse der neuen Methode werden verglichen, indem die Kerne ^{100}Mo und ^{92}Mo zusätzlich mit reellen Photonen [4] an den Strahlungsquellen S-DALINAC und ELBE untersucht werden.
Gefördert durch das BMBF (06 DA 115)
[1] M. Arnould, S. Goriely, Phys. Rep. 384 (2003) 1
[2] G. Baur *et al.*, Prog. Part. Nucl. Phys. 51 (2003) 487
[3] R. Palit *et al.*, Phys. Rev. C 68 (2003) 034318
[4] K. Sonnabend *et al.*, Phys. Rev. C 70 (2004) 035802

HK 22.99 Mo 16:30 TU MA141

Theoretical Description of a Quenching of the Neutron Channel observed in d+d Reactions within some Host Metals — •Tatiana Dorsch, Konrad Czerski, Peter Heide, and Armin Huke — Institut für Atomare Physik und Fachdidaktik, Technische Universität Berlin, Berlin, Germany

Angular distributions and the neutron-proton branching ratio of the mirror reactions ^{2}H(d,p)^{3}H and ^{2}H(d,n)^{3}He have been investigated using different deuterized metallic targets the projectile energies ranging from 5 to 60 keV. Whereas the experimental results obtained for Al, Zr, Pd and Ta targets do not differ from those known from gas-target experiments, an enhancement of the angular anisotropy in the neutron channel and a quenching of the neutron-proton branching ratio have been observed for Li and Sr targets at deuteron energies below 20 keV. A theoretical analysis of the experimental results has been performed using a parameterization of all possible channel-spin matrix-elements. Assuming an induced polarization of reacting deuterons, the observed asymmetry effects between the neutron and proton channels could be explained within an adiabatic approximation.