physical r-process.

The three competing decay channels spontaneous fission, $\alpha$-decay and $\beta$-decay are compared.

Lifetimes and reaction rates are calculated on the basis of the self-consistent Skyrme-Hartree-Fock model. Where the tunneling probability for spontaneous fission is estimated by the WKB approximation. To get the necessary ingredients for this approximation namely the collective masses and the corrected potential energy surface self-consistent cranking is used. The halflife for $\alpha$-decay are calculated from the $Q_\alpha$ reaction energies using an estimate based on the Viola systematics.

HK 36.27 Mi 14:00 HG Aula

**Temperature dependence of the pulse properties and the leakage current of germanium detectors** — Allen Caldwell, Daniel Lenz, Jing Liu, Xiang Liu, Bela Majorovitz, and •Oleksandr Volynets for the GERDA-Collaboration — Max-Planck-Institute for Physics, Munich, Germany

High-purity germanium detectors are used in neutrinoless double-beta decay experiments like Gerda as they have very good resolution and act as the detector and the source simultaneously.

Germanium detectors are operated at liquid nitrogen temperatures to reduce the number of electrons in the conduction band. The mobility of the charge carriers is temperature dependent and thus also the rise time of the pulses induced by the drifting charge carriers. Therefore pulse shapes analysis has to take into account possible temperature variations.

Measurements of the temperature dependence of the pulses were made using a high-purity n-type segmented germanium detector. The detector was installed in a vacuum cryostat and cooled through a copper cooling finger submerged in liquid nitrogen. A collimated $^{152}$Eu source located at two different positions along the crystal axes 100 and 110 was used. The temperature was monitored using a PT100 resistor installed at the closest possible point to the detector. The pulse properties in the temperature range from 93 to 99 K and the temperature dependence of the leakage current in the temperature range from 85 to 112 K will be discussed.

HK 36.28 Mi 14:00 HG Aula

**Die DAQ für das Gerda Myonveto** — •Florian Ritter, Dennis Dietrich, Kai Freund, Peter Grabmayr, Alexander Hegai, Josef Jochum, Markus Knapp und Georg Meierhofer für die GERDA-Kollaboration — Kepler Center for Astro and Particle Physics, Eberhard Karls Universität Tübingen, Deutschland

Das Gerda-Experiment [1] möchte den neutrinolosen doppelten Betazerfall des $^{76}$Ge nachweisen. Um die nötige Untergrundreduktion zu erreichen, wird unter anderem ein Myonveto entwickelt. Dies besteht aus ca. 20 Plastikszintillatoren und einem Wasser-Cherenkov-Detektor mit 66 Photomultipliern (8"), die den Kryostaten umgeben.

Die Photomultiplier wurden in Tübingen eingekapselt, getestet und im vergangenen Jahr am LNGS in den Wassertank eingebaut. Aufgrund der in Tübingen gemessenen Dunkelraten erfolgte die Gruppierung der einzelnen Photomultiplier im Auslesesystem. Es wurde ein System zur Überwachung der Stabilität der Photomultiplier-Signale entwickelt. Dieses Überwachungssystem, bestehend aus Glasfasern und Diffusor-Bällen, wird ebenso diskutiert wie ein Vorschlag für ein Triggerschema für die auslesenden FADCs.

[1] The GERmanium Detector Array, Proposal to LNGS, 2004. Gefördert vom BMBF (05A08VT1).

HK 36.29 Mi 14:00 HG Aula

**Upper limit of $^{83}$Rb release into the gas phase from a $^{83m}$Kr calibration source for the XENON project** — Elena Aprile[1], Francesco Arneodo[2], Laura Baudis[3], Marcus Beck[4], Alfredo D. Ferella[3], Karl Giboni[1], Volker Hannen[4], •Karen Hugenberg[4], Raphael F. Lang[1], Ondrej Lebeda[5], Antonin Spalek[5], Drahos Venos[5], and Christian Weinheimer[4] for the XENON-Collaboration — [1]Columbia University, USA — [2]Gran Sasso National Laboratory LNGS, Italy — [3]Zurich University, Switzerland — [4]Institut für Kernphysik, WWU Münster, Germany — [5]Nuclear Physics Institute, ASCR, Rez, Czech Republic

The isomer $^{83m}$Kr with its half-life of 1.83 h is an ideal calibration source for a liquid noble gas dark matter experiment like the XENON project. For such a low counting experiment the possibility that traces of the much longer living mother isotop $^{83}$Rb ($t_{1/2} = 86.2$ d) contaminate the detector must be avoided. In this work the $^{83}$Rb release of a 1.8 MBq strong $^{83}$Rb source embedded in zeolite spheres has been investigated by searching for the characteristic $^{83}$Rb $\gamma$ lines with the ultra-sensitive germanium detector Gator at LNGS after collecting a possible $^{83}$Rb release in a cryogenic trap for about 10 days. No signal has been found. The corresponding upper limit for the $^{83}$Rb release of 200 $\mu$Bq means, that such a $^{83}$Rb source as $^{83m}$Kr generator can be used at the XENON project as well as for the KATRIN experiment. The germanium detector also allowed to set upper limits on the possible release of the isotopes $^{84}$Rb and $^{86}$Rb, which were produced during the $^{83}$Rb production at the Rez cyclotron to some amount.

HK 36.30 Mi 14:00 HG Aula

**Systematische Magnetfeldvermessung der differentiellen Pumpstrecke und des Luftspulensystems von KATRIN** — •Stefan Zepter für die KATRIN-Kollaboration — Karlsruher Institut für Technologie (KIT), Institut für experimentelle Kernphysik (IEKP)

Ziel des KArlsuher TRItium Neutrino Experiments KATRIN ist die modellunabhängige Bestimmung der Masse des Elektronantineutrinos mit einer Sensitivität von 0,2 eV durch die genaue Vermessung des Endpunktsspektrums der $\beta$-Elektronen aus dem Tritiumzerfall. Die adiabatische Führung der Elektronen von der Quelle über eine Transportstrecke zum Spektrometer erfolgt durch starke Magnetfelder die von einer Reihe von supraleitenden Solenoiden erzeugt werden. Die präzise Vermessung der Felder ist wichtig um die Genauigkeit der Feldsimulationen zu überprüfen, auf denen das Design der adiabatischen Führung beruht.

Zur Messung von B-Feldern wurde ein 3D-Messtisch entwickelt, der in der Lage ist große räumliche Bereiche automatisch abzufahren und eine Magnetfeldkarte zu erstellen. Die Messung erfolgt mit Hilfe einer rotierenden Hallsonde.

Damit werden systematische Messungen der Streufelder des Transportstreckenelements DPS2-F und des Luftspulensystems des Hauptspektrometers durchgeführt. Die Messgenauigkeit des 3D-Messtisches wurde bereits durch erste Testmessungen überprüft.

Unterstützt vom BMBF unter der Fördernummer 05A08VK2.

HK 36.31 Mi 14:00 HG Aula

**Plasma effects and ion transport in the KATRIN windowless gaseous tritium source.** — •Nikita Titov for the KATRIN-Collaboration — Karlsruhe Institute for Technology, Institute for Nuclear Physics (on leave from INR, RAS, Moscow)

KATRIN is the international experiment currently being assembled at Karlsruhe to measure the absolute value of the electron antineutrino mass at the 0.2 eV level. It will study the shape of the tritium beta decay spectrum near the endpoint with an electrostatic spectrometer with adiabatic magnetic collimation. In order to reduce the systematic uncertainties, a windowless gaseous tritium source (WGTS) will be used to produce at unprecedented number of decay electrons.

The tritium decay rate inside the WGTS is planned at the $1.2 \times 10^{11} sec^{-1}$ level. Together with processes of secondary ionization, thermalization and charge transport this leads to an ion / electron pair density inside WGTS at the $10^7$ ... $10^8 cm^{-3}$ level. At the operating temperature 30K these charges will behave as a plasma.

There are two main requirements related to the space charge in the WGTS:

- Electric potential inside WGTS level should be controlled below 50 meV
- Ion transport toward spectrometer should be reduced by a factor $10^{+6}$...$10^{+7}$.

Both issues are addressed by numerical analysis and experimental modeling.

HK 36.32 Mi 14:00 HG Aula

**Deconvolution method for determination of the KATRIN energy loss function** — Volker Hannen[1], •Christopher Kranz[1], Anna Sejersen Riis[1,2], and Christian Weinheimer[1] for the KATRIN-Collaboration — [1]Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, Germany — [2]Department of Physics and Astronomy, Aarhus University, Denmark

The KATRIN experimental sensitivity to the neutrino mass depends heavily on the proper reduction of systematic errors, one of which stems from incomplete knowledge of the so-called energy loss function.

As the electrons created by tritium beta decay move through the tritium source they may undergo scattering on T2 molecules and, as a consequence, loose energy and change their direction of motion. This process is described by the energy loss function.

Using singular value decomposition methods the energy loss function can be deconvoluted from measurements of the KATRIN response function at different Tritium densities using a monoenergetic electron gun. From simulated data we determined a systematic error due to the remaining uncertainties in the deconvoluted energy loss function of $\Delta m^2 \approx 0.007$ eV$^2$. This exactly satisfies the KATRIN design report requirements.

A more systematic investigation is currently underway, to optimize the measurement procedure for the experimental determination of the energy loss function.

This work is supported by BMBF under contract number 05A08PM1.

HK 36.33 Mi 14:00 HG Aula

**Studying Radiation from Strongly Accelerating Laser Fields**† — •P.G. Thirolf[1], C. Lang[1], D. Habs[1,2], K. Homma[3], R. Hörlein[2], K. Schmid[2], J. Schreiber[1], R. Schützhold[4], T. Tajima[5], and T. Yamazaki[6] — [1]LMU München, Garching — [2]MPI f. Quantenoptik, Garching — [3]Univ. Hiroshima, Japan — [4]Univ. Duisburg-Essen, Germany — [5]JAEA, Kyoto, Japan — [6]Univ. of Tokyo, Japan

In upcoming experiments with ultra-high fields of high-power short-pulse lasers we will experimentally study the radiation from electrons under extreme fields. Aiming at the detection of radiation from the Unruh effect, first we will encounter the copious classical Larmor radiation. The characterization of (linear) Larmor radiation has never been experimentally carried out, thus this amounts to a first study of physics at extreme acceleration. Moreover, we can study radiation damping effects. Furthermore, the experiment should be able to confirm or disprove whether the radiation components may be enhanced by collective effects, if a tightly clumped cluster of electrons is accelerated. The technique of laser driven dense electron sheet formation by irradiating a thin DLC foil target should provide such a coherent electron cluster with a very high density. If and when such relativistic electron sheets are realized, a counterpropagating second laser can interact with them coherently. Under these conditions enhanced Larmor and Unruh radiation signals may be observed.

†Supported by the DFG Cluster of Excellence MAP.

HK 36.34 Mi 14:00 HG Aula

**Trapping of radioactive $^{21}$Na** — •Wilbert L. Kruithof, Duurt J. van der Hoek, Gouri S. Giri, Ronnie Hoekstra, Steven Hoekstra, Klaus Jungmann, Gerco Onderwater, Bodhaditya Santra, Praveen D. Shildling, Moslem Sohani, Oscar O. Versolato, Lorenz Willmann, and Hans W. Wilschut — Kernfysisch Versneller Instituut, University of Groningen, Netherlands

Radioactive $^{21}$Na atoms in a magneto-optical trap (MOT) provide an excellent opportunity to search for non-Standard Model contributions in the weak interactions. In particular, correlations between the $\beta$-particle and the neutrino are sensitive to time reversal symmetry violating effects. The Na isotope is produced at the TRI$\mu$P facility of the KVI using intense $^{20}$Ne beams from the AGOR cyclotron on a cooled deuterium target. The isotopes are stopped and re-thermalized in a Thermal Ionizer. They are transported as a low energy ion beam to a MOT cell where they are neutralized and subsequently captured by laser light. The trapped Na atoms will be transferred to a second MOT which is placed inside a reaction microscope to measure the momentum distribution of the recoiling daughter nuclei after the $\beta$-decay. The $\beta$-particle will be detected in a scintillation detector. These two devices have been characterized. A pulsed UV laser was used to ionize trapped Na atoms in order to simulate the $\beta$-decay in the reaction microscope. The momentum distribution of the recoil ions is measured. The setup of the whole experiment will be presented.

HK 36.35 Mi 14:00 HG Aula

**Further Development of the Fast Beam Dynamics Simulation Tool V-Code** — •Sylvain Franke, Wolfgang Ackermann, and Thomas Weiland — Institut für Theorie Elektromagnetischer Felder, TU Darmstadt, Germany

The Vlasov equation describes the evolution of a particle density under the effects of electromagnetic fields. It is derived from the fact that the volume occupied by a given number of particles in the six-dimensional phase space remains constant when only long-range interaction as for example Coulomb forces are relevant and other particle collisions can be neglected. Because this is the case for typical charged particle beams in accelerators, the Vlasov equation can be used to describe their evolution within the whole beam line. This equation is a partial differential equation in 6D and thus it is very expensive to solve it via classical numerical methods. A more efficient approach consists in representing the particle distribution function by a discrete set of characteristic moments. For each moment a time evolution equation can be stated. These ordinary differential equations can then be evaluated efficiently by means of time integration methods if all considered forces and a proper initial condition are known. The beam dynamics simulation tool V-Code implemented at TEMF utilizes this approach.

HK 36.36 Mi 14:00 HG Aula

**Das Chopper- und Prebunchersystem am neuentwickelten polarisierten Injektor des S-DALINAC*** — •Thore Bahlo[1], Asim Araz[1], Roman Barday[1], Stefan Bittner[1], Marco Brunken[1], Christian Eckardt[1], Ralf Eichhorn[1], Joachim Enders[1], Martin Konrad[1], Maksim Miski-Oglu[1], Wolfgang F.O. Müller[2], Markus Platz[1], Yuliya Poltoratska[1], Bastian Steiner[1], Markus Wagner[1] und Thomas Weiland[2] — [1]Institut für Kernphysik, Technische Universität Darmstadt, Germany — [2]Theorie Elektromagnetischer Felder, technische Universität Darmstadt, Germany

Am supraleitenden Darmstädter Elektronenlinearbeschleuniger S-DALINAC wird im Frühjahr 2010 die bestehende thermionische Elektronenquelle, die einen kontinuierlichen unpolarisierten Elektronenstrahl liefert, um eine Quelle für polarisierte Elektronen (SPIN - S-DALINAC Polarized Injector) erweitert. Um Elektronen aus beiden Quellen im supraleitenden LINAC beschleunigen zu können, ist es nötig, im Injektorbereich ein Chopper-/Prebunchersystem zu installieren. Dies wird es ermöglichen, die zeitliche Struktur der beiden Quellenstrahlen manipulieren zu können.

In diesem Beitrag werden die Eigenschaften des Chopper-/Prebunchersystems vorgestellt. Hierzu gehören die Hochfrequenzeigenschaften der Bauteile, wie z.B.: Eigenfrequenz und Güte, sowie die Feldverteilung innerhalb der Kavitäten. Außerdem werden erste Tests präsentiert. *Gefördert von der Deutschen Forschungsgemeinschaft im Rahmen des SFB 634.

HK 36.37 Mi 14:00 HG Aula

**Beam Induced Fluorescence Profile Monitor for High Current Heavy Ion Beams** — Christiane Andre, Frank Becker, •Peter Forck, Rainer Haseitl, and Beata Walasek-Höhne — GSI, Darmstadt

For intense heavy ion beams, as delivered by the GSI linear accelerator UNILAC and by the planned Facility for Antiproton and Ion Research (FAIR), a non-intercepting method for transverse beam profile determination is required. A new diagnostic device, the Beam Induced Fluorescence Monitor (BIF), operating at a single-shot basis was developed and installed at several locations along the UNILAC. Fluorescence light (single photons) emitted due to atomic collisions between the heavy ion beam and the residual gas are detected by an image intensified camera system to measure beam profiles. Beam induced fluorescence spectra of nitrogen and various rare gases were investigated with the result that $N_2$ as working gas shows the best overall performance.

HK 36.38 Mi 14:00 HG Aula

**Eine neue Finite-Volumen Methode zur Berechnung von Wake-Feldern** — •Thomas Lau, Erion Gjonaj und Thomas Weiland — Technische Universität Darmstadt

Die Autoren stellen eine neue Methode zur Berechnung von geometrischen Wake-Feldern ultra-kurzer Teilchenpakete in dreidimensionalen Linearbeschleunigern vor. Die Methode basiert auf einer expliziten Finiten-Volumen Methode im Zeitbereich mit räumlich versetzten Freiheitsgraden. Aufgrund dieser Allokation weist die Methode keine numerische Dispersion in Richtung der Koordinatenachsen auf. Der Vorteil im Vergleich zu bisher für diese Problemklasse verwendeten Split-Operator Verfahren liegt zum einem in der Vermeidung eines zusätzlichen Splitting Fehler und zum anderen in dem geringeren Rechenaufwands pro Zeitschritt.

Die neue Methode ist in dem Programm PBCI zur Berechnung von Wake-Feldern implementiert worden. In dem Beitrag wird die Methode, sowie erste Simulationsergebnisse vorgestellt.

HK 36.39 Mi 14:00 HG Aula

**Matching the Laser Generated p- Bunch into a CH-DTL** — •Ali Almomani, Martin Droba, and Ulrich Ratzinger — Institute for Applied Physics, Frankfurt University

The concept of laser acceleration of protons by Target Normal Sheath Acceleration TNSA from thin foils could be used to produce a high intensity proton beam.