HK 44: Instrumentierung

Zeit: Donnerstag 14:00–15:45 Raum: HZ 9

HK 44.1 Do 14:00 HZ 9

A high resolution germanium detector array for hypernuclear studies at $\overline{\text{P}}$ANDA — Sebastian Bleser[1], Jürgen Gerl[2], Felicce Iazzi[3], Jasmina Kojouharova[2], Ivan Kojouharov[2], Josef Pochodzalla[4], Kai Rittgen[4], Cihan Sahin[4], Alicia Sanchez Lorente[1], and •Marcell Steinen[1] — [1]Helmholtz-Institut Mainz — [2]GSI Darmstadt — [3]Politecnico and INFN, Torino — [4]Institute for nuclear physics, JGU Mainz

The $\overline{\text{P}}$ANDA experiment, planned at the FAIR facility in Darmstadt, aims at the high resolution γ-spectroscopy of double Λ hypernuclei. For this purpose a devoted detector setup is required, consisting of a primary nuclear target, an active secondary target and a germanium detector array for the γ-spectroscopy. Due to the limited space within the $\overline{\text{P}}$ANDA detector a compact design is required. In particular the conventional LN_2 cooling system must be replaced by an electro mechanical device and a new arrangement of the crystals is needed.

This presentation shows the progress in the development of the germanium detectors. First results of in-beam measurements at COSY with a new electro mechanically cooled single crystal prototype are presented. Digital pulse shape analysis is used to disentangle pile up events due to the high event rate. This analysis technique also allows to recover the high original energy resolution in case of neutron damage. Finally the status of the new triple crystal detector prototype is given.

HK 44.2 Do 14:15 HZ 9

Pulse Shape Analysis Optimization with segmented HPGe-Detectors — •Lars Lewandowski[1], Benedikt Birkenbach[1], Bart Bruyneel[2], and Peter Reiter[1] for the AGATA-Collaboration — [1]Institute for Nuclear Physics, University of Cologne — [2]CEA, Saclay

Measurements with the position sensitive, highly segmented AGATA HPGe detectors rely on the gamma-ray-tracking GRT technique which allows to determine the interaction point of the individual gamma-rays hitting the detector. GRT is based on a pulse shape analysis PSA of the preamplifier signals from the 36 segments and the central electrode of the detector. The achieved performance and position resolution of the AGATA detector is well within the specifications. However, an unexpected inhomogeneous distribution of interaction points inside the detector volume is observed as a result of the PSA even when the measurement is performed with an isotropically radiating gamma ray source. The clustering of interaction points motivated a study in order to optimize the PSA algorithm or its ingredients. Position resolution results were investigated by including contributions from differential crosstalk of the detector electronics, an improved preamplifier response function and a new time alignment. Moreover the spatial distribution is quantified by employing different χ^2-minimization procedures. Supported by the German BMBF (05P12PKFNE TP4)

HK 44.3 Do 14:30 HZ 9

Characterisation of pixel sensor prototypes for the ALICE ITS Upgrade — •Felix Reidt for the ALICE-Collaboration — CERN — Physikalisches Institut, Universität Heidelberg

ALICE is preparing a major upgrade of its experimental apparatus to be installed in the second long LHC shutdown (LS2) in the years 2018-2019. A key element of the upgrade is the replacement of the Inner Tracking System (ITS) deploying Monolithic Active Pixel Sensors (MAPS). The upgraded ITS will have a reduced material budget while increasing the pixel density and readout rate capabilities. The novel design leads to higher pointing and momentum resolution as well as a p_T acceptance extended to lower values. The corresponding sensor prototypes were qualified in laboratory measurements and beam tests with respect to their radiation tolerance and detection efficiency. This talk will summarise recent results on the characterisation of prototypes belonging to the ALPIDE family.

HK 44.4 Do 14:45 HZ 9

Ortssensitiver Nachweis von kosmischer Höhenstrahlung in einem segmentierten HPGe-Detektor — •David Schneiders, Benedikt Birkenbach, Jürgen Eberth, Herbert Hess, Gheorghe Pascovici, Peter Reiter und Andreas Vogt — IKP, Universität zu Köln

Der neu entwickelte Dual-Gain-Vorverstärker der AGATA-HPGe-Detektoren ermöglicht mit Hilfe eines Time-over-Threshold-Verfahrens den Nachweis von hochenergetischen γ-Quanten und geladenen Teilchen bis zu einer Energie von 160 MeV. Die Messmethode reduziert zusätzlich die Totzeit des Detektors signifikant. Durch die Segmentierung des Detektors ist es möglich, partielle Energiedepositionen ortssensitiv aufzulösen. In einer Langzeitmessung wurden Energien bis 200 MeV von hochenergetischen Teilchen aus der kosmischen Höhenstrahlung nachgewiesen. Energieverlustrechnungen sind konsistent mit dem Myonenanteil der einfallenden Höhenstrahlung. Die gemessenen Ergebnisse wurden ebenfalls mit den Ergebnissen einer Monte-Carlo-Simulation des Detektorsystems verglichen. Wichtige zukünftige Anwendung ist die Unterdrückung von unerwünschten hochenergetischen Sekundärteilchen bei der in-beam γ-Spektroskopie bei NUSTAR/FAIR.
Gefördert durch das BMBF (05P12PKFNE TP4).

HK 44.5 Do 15:00 HZ 9

Radiation damage in single crystal CVD diamond material investigated with a high current Au beam. — •Jerzy Pietraszko and Wolfgang Koenig for the HADES-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH, Planckstraße 1, 64291 Darmstadt, Germany

Single-crystal Chemical Vapor Deposition (ScCVD) diamond based prototype detectors have been constructed for the high current heavy ion experiments HADES and CBM at the future FAIR facility at GSI Darmstadt. Their properties have been studied with a high current density beam (about 2-3$\times 10^6$/s/mm^2) of 1.25 A GeV Au ions. Details of the design, the intrinsic properties of the detectors and their performance after irradiation with such beam will be reported.

HK 44.6 Do 15:15 HZ 9

Compton-Kamera basierend auf einem hochsegmentierten HPGe-Detektor und einem DSSSD — •Tim Steinbach[1], Rouven Hirsch[1], Benedikt Birkenbach[1], Jürgen Eberth[1], Roman Gernhäuser[2], Herbert Hess[1], Lars Lewandowski[1], Ludwig Maier[2], Peter Reiter[1], Michael Schlarb[2], Benedikt Weiler[2] und Max Winkel[2] — [1]IKP Universität zu Köln, Köln, Deutschland — [2]E12 Technische Universität München, München, Deutschland

Eine Compton-Kamera für hochenergetische γ-Quanten, bestehend aus einem 36-fach segmentierten ortsempfindlichen HPGe-Detektor und einem Double-Sided-Silicon-Strip-Detector (DSSSD), wurde im Rahmen des TRAKULA-Projekts in Betrieb genommen. Das Nachweisverfahren beruht auf Comptonstreuung im DSSSD und der Detektion des gestreuten γ-Quants im HPGe-Detektor. Koinzidenzmessungen mit den beiden Detektoren ermöglichen die Bestimmung des Emissionsorts der γ-Strahlung. Die Wechselwirkungsorte im HPGe-Detektor und ihre zeitliche Sequenz werden mittels Impulsformanalyse der 37 HPGe-Detektorsignale und der γ-ray tracking Methode bestimmt. Die Emissionsorte von punktförmigen γ-Quellen wurden bei verschiedenen Energien und für unterschiedliche Versuchsaufbauten, bei denen auch mehrere Strahlungsquellen gleichzeitig verwendet wurden, bestimmt. Mit der neuen Compton-Kamera wurde eine Winkelauflösung von unter 5° erzielt, die nahe an der berechneten Ortsauflösung liegt. Gefördert durch BMBF Projekt 02MUK013D und 02NUK013F.

HK 44.7 Do 15:30 HZ 9

Proton detection in the neutron lifetime experiment PENeLOPE — •Christian Tietze for the PENeLOPE-Collaboration — Technische Universität München, Physik Department E18

Although neutron lifetime plays an important role in the Standard Model of particle physics, τ_n is not very precisely know and often discussed. The official PDG mean value has been lowered during the last three years by more than 6σ to the new value of 880.0 ± 0.9s. The new precision experiment PENeLOPE, which is currently developed at TU München, will help to clear this up. Ultra-cold neutrons are lossless stored in a magneto-gravitational trap, formed by superconducting coils. The combined determination of τ_n by counting the surviving neutrons after each storage cycles on one side and in-situ detection of the decay protons on the other side together with a very good handle on systematic errors leads to an unprecedented precision of the neutron lifetime value of 0.1s. This contribution will give an overview of the challenges concerning proton detection under the exceptional requirements of this experiment. The developed concept of using avalanche photodiodes for direct proton detection will be presented as well as results from first measurements with a prototype detector read out by particular developed electronics. This project is supported by the cluster of excellence “Origin and structure of the universe”, the Deutsche Forschungsgemeinschaft and the Maier-Leibnitz Laboratorium, Garching.