HK 8: Instrumentation und Anwendungen

Zeit: Montag 18:00–19:15 Raum: B

HK 8.1 Mo 18:00 B

Performance and position sensitivity of the first AGATA detectors. — •Bart Bruyneel, Jürgen Eberth, Herbert Hess, Andreas Linnemann, Gheorghe Pascovici, Peter Reiter, and Andreas Wiens for the AGATA-Collaboration — Institut für Kernphysik, Universität zu Köln

The Advanced GAmma Tracking Array (AGATA) project is aiming to realize the first full 4π γ-ray spectrometer solely build out of Germanium. The 36-fold segmented encapsulated large volume HPGe detectors, equipped with fully digital electronics will provide an optimal energy resolution and a very high efficiency combined with a position sensitivity of a few millimeters employing pulse shape analysis and the new method of γ-ray tracking. The first asymmetric Ge crystals performed excellent with efficiencies exceeding 80 % and crosstalk levels lower than 0.1 %. This crosstalk contribution can be explained as an inherent property of these detectors originating from a capacitive coupling between segments. Some crystals have been characterized for pulse shape analysis by collecting a database of position dependent pulse shapes. First in-beam tests of a prototype triple detector were performed and pulse shape analysis was successfully applied to demonstrate its position sensitivity.

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HK 8.2 Mo 18:15 B

Optimisation of the transfer function and crosstalk in an AGATA test cryostat — •Andreas Linnemann, George Pascovici, Bart Bruyneel, Peter Reiter, Herbert Hess, and Andreas Wiens for the AGATA-Collaboration — Institut für Kernphysik, Universität zu Köln

Position sensitive γ-ray detection including the new γ-ray tracking technique will be feasible with the future AGATA spectrometer due to the 36-fold segmented Ge-crystals and the use of pulse shape analysis. The 180 detectors of the 4π Ge-shell will reach an unprecedented detection efficiency and position sensitivity, which is crucial for γ-ray spectroscopy at relativistic energies. Due to the high density of 111 high resolution spectroscopy channels within one AGATA triple cryostat lowest ringing and crosstalk contributions between segments are challenges for the overall γ tracking performance. The development of the new AGATA test cryostat employs the novel technique to determine electronic transfer functions of all channels simultaneously using a preamplifier including a programmable high precision pulser. The new detectors and cryostats are characterized by almost perfect transfer functions for core and segment signals and a crosstalk level below 10^{-3}. Supported by BMBF (06 K-167).

HK 8.3 Mo 18:30 B

Tracking and background suppression in the planned gamma array of DESPEC — •Stanislav Tashenov and Jürgen Gerl — Gesellschaft für Schwerionenforschung mbH, Planckstr. 1, 64291 Darmstadt, Germany

For decay spectroscopy experiments with implanted radioactive beams within the NUSTAR/DESPEC project a high resolution Ge gamma tracking array is being designed. A new dedicated gamma ray tracking algorithm is being developed, featuring reconstruction of the events with incomplete energy deposition. Exploiting the tracking capability of the array, a background suppression method has been developed based on the separation of events originating from the target and from localized background sources. Monte-Carlo simulations show that a background suppression factor of 10 up to 100 can be achieved. The dependance of the tracking and suppression efficiency on the detector properties will be discussed.

HK 8.4 Mo 18:45 B

AGATA-Pulsformanalyse — •Michael Schlarb[1], Roman Gernhäuser[1], Reiner Krücken[1] und Pierre Désesquelles[2] — [1]Physik-Department E12, TU München — [2]CSNSM Orsay

Das Advanced Gamma Tracking Array (AGATA) das gerade aufgebaut wird, ist ein 4π- Detektor aus hochsegmentierten Germanium-Zählern. Für die genaue Rekonstruktion der Wechselwirkunkgspunkte im Detektor wird die Pulsformanalyse(PSA) eingesetzt. Dabei wird die Methode eines direkten Vergleichs der gemessenen Pulsformen mit simulierten Daten verwendet. Aufgrund der hohen Datenraten muss diese in Echtzeit (∼ms/evt) erfolgen.

Aufgrund der Zeitanforderung wird es jedoch nicht möglich sein alle Mehrfach-Wechselwirkungen aufzulösen. Wir untersuchen daher mit Hilfe einer extensiven Suche die erreichbaren Auflösungen für Zweifach-Wechselwirkungen. Hierbei sind zum einen die Energie- und Ortsauflösungen von Interesse als auch die Auflösung für den Schwerpunkt der Energieverteilung falls nur nach einer Wechselwirkung gesucht wird. Es zeigen sich deutliche Abhängigkeiten von charakteristischen Parametern wie dem Abstand und der Energieverteilung auf die Wechselwirkungen. Abschließend vergleichen wir dies mit den Auflösungen die wir mit dem Particle-Swarm-Algorithmus erreichen.

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HK 8.5 Mo 19:00 B

Photon identification in double beta decay-experiments using segmented germanium detectors — •Kevin Kröninger, Iris Abt, Allen Caldwell, Manuela Jelen, Daniel Lenz, Jing Liu, Xiang Liu, Bela Majorovits, and Jens Schubert — Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), Föhringer Ring 6, D-80805 München

The sensitivity of experiments searching for neutrinoless double beta-decay of ^{76}Ge is limited by background due to γ-radiation. The GERmanium Detector Array, GERDA, is a new experiment for which new background reduction techniques are developed. In the second phase of the experiment segmented detectors will be installed. The segmentation facilitates the identification of events with photons in the final state.

The volume over which energy is deposited inside a detector depends on the incident particle. Photons with an energy around 1 MeV predominantly Compton-scatter and deposit energy on a cm-scale. In contrast, electrons with similar energies deposit energy locally on a mm-scale. For the segmentation scheme under study anti-coincidence requirements between the segments of a detector can be used to identify photons. In addition, the time structure of detector responses gives complementary information on the spread of energy inside the detector and thus allows further identification of photon events.

Data was taken with a GERDA prototype detector and analyzed with respect to the potential of photon identification. The results are presented and the impact for GERDA is discussed.