HK 43: Instrumentation XIV

Zeit: Mittwoch 16:30–17:15 Raum: HZO 90

HK 43.1 Mi 16:30 HZO 90

A new plunger device for MINIBALL at HIE-ISOLDE — •Christoph Fransen[1], Thomas Braunroth[1], Alfred Dewald[1], Liam Gaffney[2], Alina Goldkuhle[1], Jan Jolie[1], Julia Litzinger[1], Claus Müller-Gatermann[1], Peter Reiter[1], Stefan Thiel[1], and Nigel Warr[1] — [1]Institut für Kernphysik, Universität zu Köln — [2]CERN, Geneva, Switzerland

The recoil distance Doppler-shift method (RDDS) is a very valuable technique for measuring lifetimes of excited nuclear states in the picosecond range from which absolute transition strengths between nuclear excitations can be deduced in an independent manner. Especially during the last years this method was intensively used in combination with radioactive beams for investigating exotic nuclei. A new dedicated plunger device was thus built by our group to implement this method at HIE-ISOLDE where a detection of the Doppler-shifted gamma-rays is realized with the MINIBALL spectrometer for reactions with radioactive beams in inverse kinematics. Besides multiple step Coulomb excitation excited states can be also populated with incomplete and complete fusion reactions. The availability of the new plunger device will open excellent prospects for detailed investigations of exotic nuclei at HIE-ISOLDE. Here we will present the concept of the new device including the special requirements for the use with radioactive beams with energies of several MeV/u. We will also show the performance of the plunger in a first experiment on ^{28}Mg. Supported by the BMBF, Grant No. 05P15PKFNA.

HK 43.2 Mi 16:45 HZO 90

Numerical correction methods of neutron damage in position-sensitive HPGe detectors — •Robert Hetzenegger, Benedikt Birkenbach, Bart Bruyneel, Peter Reiter, Jürgen Eberth, Herbert Hess, Rouven Hirsch, Lars Lewandowski, and Andreas Vogt — IKP, Universität zu Köln

The Advanced GAmma Tracking Array (AGATA) is based on the novel technique of γ-ray tracking in electrically segmented high-purity germanium (HPGe) crystals. The array is currently employed at the Grand Accélérateur National d'Ions Lourds (GANIL, France) in stable-beam experiments with high count rates. Fast neutrons are emitted after various types of nuclear reactions with projectile energies above the Coulomb barrier. These neutrons generate defects by dislocating Ge atoms within the HPGe crystal lattice. Dislocations act as hole traps within the HPGe detector material, causing a reduced charge collection efficiency of the detectors, observed as a left tailing in the energy-peak shapes. In order to avoid time consuming annealing procedures a software-based numerical method was developed employing pulse-shape analysis (PSA) to correct for and to minimize the trapping effects. The method will be described in detail as well as results of the correction applied to latest AGATA measurements comprising 35 HPGe crystals. The energy resolution (FWHM) is considerably improved. For detectors with severe neutron damage the final resolution value is better by a factor of two. The tailing of the peaks reflected by large FWTM values is reduced by a factor of three. Supported by the German BMBF 05P12PKFNE TP4 and 05P15PKFN9.

HK 43.3 Mi 17:00 HZO 90

Impact of Hole Mobility on Simulated Pulse Shapes in Highly Segmented HPGe Detectors — •Lars Lewandowski, Peter Reiter, Herbert Hess, Jürgen Eberth, Bart Bruyneel, and Benedikt Birkenbach for the AGATA-Collaboration — Institut für Kernphysik, Köln

The AGATA spectrometer is a γ-ray tracking array consisting of 36 fold segmented high purity germanium detectors. In contrast to conventional γ-ray spectrometers, AGATA relies on the γ-ray tracking method which reconstructs the path of a γ ray through the array. The tracking needs the interaction positions of the individual γ rays within the segments. These are obtained via pulse-shape analysis (PSA) of the 37 preamplifier signals. The measured signals are compared with simulations to obtain the interaction position. The drift velocity of the holes is crucial for these simulations. An essential ingredient for the velocity calculation is the hole mobility in germanium. The hole mobility that yields the best results was obtained empirically by maximizing the accuracy of the found interaction positions. As a complementary approach the difference in the time evolution of the of measured and simulated pulses was investigated, which is a crucial observable to determine correct drift velocities.