HK 9: Instrumentation I

Time: Monday 16:30–18:00 Location: J-HS C

HK 9.1 Mon 16:30 J-HS C

Energy Resolution of a Compton Camera Absorber Detector with SiPM Readout for up to 6.13 MeV — •Tim Binder[1,2], Katia Parodi[1], Florian Schneider[2], and Peter G. Thirolf[1] — [1]Ludwig-Maximilians Universität, Munich, Germany — [2]KETEK GmbH, Munich, Germany

The capability of spatially resolved γ detection is required in many applications in modern physics. A Compton camera (CC) allows to spatially resolve the γ-ray origin while still providing an acceptable efficiency compared to other detection setups. In medical physics a CC can be used to detect prompt γrays to verify the range of a hadron beam in the body during a patient's tumor treatment or to detect a higher energetic γ ($\sim$1.5 MeV) which is coincidently emitted by a β^+ emitter (e.g. ^{44}Sr) in a so-called Gamma-PET scanner. The γ origin is obtained, by using the kinematics of Compton scattering, where the energy and interaction position of the primary and the scattered γ is of major interest. Consequently, the energy resolution of the CC, consisting of a scatter and an absorber detector, is a key parameter.In this work, the energy resolution over a wide energy range (100 - 6130 keV) of a monolithic (50 x 50 x 30 mm^3) $LaBr_3$:Ce and a $CeBr_3$ scintillator, respectively, with KETEK SiPM array readout and the PETsys TOFPET2 ASIC data acquisition system will be presented. Furthermore, a comparison study between SiPM with 25 μm and 50 μm microcell sizes will be shown and compared to a PMT readout. This work was supported by the DFG Cluster of Excellence MAP (Munich-Centre for Advanced Photonics) and the Bayerische Forschungsstiftung.

HK 9.2 Mon 16:45 J-HS C

The multi-detector array ELIADE at the Extreme Light Infrastructure ELI-NP — •Julius Wilhelmy[1], Calin Alexandru Ur[2], Andreas Zilges[1], Norbert Pietralla[3], Tobias Beck[3], Anukul Dhal[2], Bastian Löher[4], Miriam Müscher[1], Alfio Pappalardo[2], George Pascovici[2], Cristian Petcu[2], Deniz Savran[4], Gabriel Suliman[2], and Volker Werner[3] — [1]Institute for Nuclear Physics, University of Cologne — [2]ELI-NP, Bucharest — [3]Institute for Nuclear Physics, TU Darmstadt — [4]GSI, Darmstadt

The new γ-beam system at the ELI-NP (Extreme Light Infrastructure - Nuclear Physics) facility will provide highly brilliant and almost monoenergetic γ-ray beams with unprecedented intensities at very narrow bandwidths. Via the Nuclear Resonance Fluorescence (NRF) technique, many experimental quantities can be deduced in a model-independent way, such as level energies and widths, γ-decay branching ratios, and spin and parity quantum numbers.

This contribution will present an overview and the current status of ELIADE, a multi-detector array comprised of HPGe detectors and large-volume $LaBr_3$ detectors.

Supported by the Project Extreme Light Infrastructure - Nuclear Physics (ELI-NP) - co-financed by the Romanian Government, the European Union through the European Regional Development Fund and the BMBF (05P18PKEN9 and 05P18RDEN9).

HK 9.3 Mon 17:00 J-HS C

A new digital data acquisition system for AGATA at IKP Cologne — •Rouven Hirsch[1], Robert Hetzenegger[1], Dino Bazzacco[2], Jürgen Eberth[1], Herbert Hess[1], Lars Lewandowski[1], and Peter Reiter[1] — [1]IKP Universität zu Köln, Cologne, Germany — [2]INFN - LNL, Padua, Italy

An AGATA triple cryostat (ATC) consists of three 36-fold segmented encapsulated large volume High Purity Germanium (HPGe) detectors. As part of any assembly or maintenance cycle the performance of the detector system has to be characterized. In the past multiple measurements with analog and digital electronics were needed to measure the required performance values. The existing setup was replaced with a new digital data aquisition system at the IKP Cologne. It is based on the latest AGATA phase 1 digital electronics and allows the simultaneous readout of all 111 high resolution spectroscopic channels of one ATC system. The main performance values such as the energy resolution, crosstalk, position resolution after pulse shape analysis (PSA) and γ-ray tracking of a complete ATC detector system were measured efficiently. Results obtained with the new data acquisition system demonstrate superior energy resolution and count rate capabilities. PSA and γ-ray tracking were performed in a time efficient way with high accuracy.

HK 9.4 Mon 17:15 J-HS C

SORCERER: A novel particle-detection system for transfer-reaction experiments at ROSPHERE — •Tobias Beck[1], Cristian Costache[2], Razvan Lică[2], Nicolae M. Mărginean[2], Constantin Mihai[2], Radu E. Mihai[2], Oliver Papst[1], Sorin Pascu[2], Norbert Pietralla[1], Christophe Sotty[2], Lucian Stan[2], Andrei E. Turturică[2], Volker Werner[1], Johannes Wiederhold[1], and Waldemar Witt[1] — [1]IKP, TU Darmstadt — [2]IFIN-HH, Bucharest, Romania

Transfer-reactions have proven to be suitable for the population of low-abundant or unstable nuclei close to the valley of stability though they usually suffer from excessive background due to fusion-evaporation (FE) reactions. SORCERER [1] is a customizable and cost-efficient particle-detection system for such transfer experiments to be studied with the ROSPHERE detector array [2] at the Bucharest Tandem accelerator. It allows for an efficient suppression of contributions from FE reactions and an improvement of the peak-to-background ratio by about one order of magnitude. The construction, characteristics, and performance in a ^{94}Zr(^{18}O,^{16}O)^{96}Zr experiment are presented and further developments are outlined.

[1] T. Beck *et al.*, Nucl. Inst. Meth. Phys. A **951** (2020) 163090
[2] D. Bucurescu *et al.*, Nucl. Inst. Meth. Phys. A **837** (2016) 1

HK 9.5 Mon 17:30 J-HS C

Status report on NEPTUN upgrade and first data analysis results — •Patrick van Beek[1], Thomas Aumann[1,2], Martin Baumann[1], Alexander Fuchs[1], Daniel Körper[1,2], Yevhen Kozymka[1], Heiko Scheit[1], and Dmytro Symochko[1] — [1]TU Darmstadt — [2]GSI Helmholtzzentrum

The low-energy photon tagging facility NEPTUN at the superconducting Darmstadt linear accelerator (S-DALINAC) can be used to study the photoabsorption cross section of nuclei in the energy regions of Pygmy Dipole and Giant Dipole Resonances. The electric dipole polarizability can be deduced from the photo nuclear response, which can be used to further constrain the symmetry energy in the equation of state.

After a major upgrade, the setup allows photoabsorption cross section measurements from 5 MeV – 35 MeV within a single spectrometer setting, effectively covering energies well below and far above particle separation threshold. It was furthermore extended by the target positioning system PROTEUS, which ensures a precise and rapid target exchange.

Commissioning data on ^{27}Al has been taken. The current setup and the status of data analysis will be presented.

Supported by DFG (SFB 1245).

HK 9.6 Mon 17:45 J-HS C

New Two-Photon Decay Experiments - Status and First Results — •Martin Baumann[1], Thomas Aumann[1,2], Michael Beckstein[1], Patrick van Beek[1], Daniel Körper[2], Bastian Löher[2], Heiko Scheit[1], and Dmytro Symochko[1] — [1]Institut für Kernphysik, TU Darmstadt, Germany — [2]GSI Helmholtzzentrum, Darmstadt, Germany

The 4π NaI detector array Heidelberg-Darmstadt Crystal Ball has been modified to host up to 18 LaBr3 detectors. In combination with a new compton suppression system called BACCHUS this makes new experimental studies of the competitive two-photon nuclear decay possible, significantly reducing measurement time in comparison to previous experiments. Also the angular distribution between the two emitted photons can be now probed for a larger set of angles. The new setup and first results for the $\frac{11}{2}^-$ state of 137-Ba will be presented.

Supported by DFG (SFB 1245)