HK 36: Instrumentation XII

Zeit: Mittwoch 14:00–16:00 Raum: HZO 90

HK 36.1 Mi 14:00 HZO 90

Teststand für Submodule des elektromagnetischen Kalorimeters für das $\overline{\text{P}}$ANDA-Experiment — •Florens Grimm für die PANDA-Kollaboration — Ruhr-Universität Bochum, Institut Experimentalphysik I, 44780 Bochum

Im $\overline{\text{P}}$ANDA-Experiment wird ein kompaktes, homogenes Elektromagnetisches Kalorimeter zum Einsatz kommen, welches aus Bleiwolframat-Szintillatoren besteht. Submodule bestehen aus 16, abhängig von der Lage im Detektor, mit Avalanche-Photodioden (APD) bzw. Vakuum-Photo-Tetroden (VPTT) und entsprechenden Vorverstärkern bestückten Kristallen. Durch die Temperaturabhängigkeit des Szintillationslichtes sind zusätzlich Temperatursensoren notwendig, die im Submodul verbaut werden.
Nach Zusammenbau eines Submoduls wird dieses in einem Teststand auf seine Funktionstüchtigkeit hin überprüft. Dazu wird von einem Lichtpulser ein Lichtpuls erzeugt, dessen Form so optimiert wurde, dass es dem Szintillationslicht entspricht. Dieser Puls wird von hinten in den Kristall eingekoppelt. Die resultierenden Vorverstärkersignale werden über eine Adapterplatine, die auch die Spannungsversorgung der einzelnen Submodule-Kanäle ermöglicht, auf ein 16-Kanal SADC mit analogem Shaper-Eingang, wie später im Experiment verwendet, gegeben. Somit steht zum Test der einzelnen Submodul-Kanäle die gesamte $\overline{\text{P}}$ANDA-Kalorimeter-Auslesekette zur Verfügung.

Gefördert durch das BMBF.

HK 36.2 Mi 14:15 HZO 90

Improved two-gamma decay measurement setup and NEPTUN status report — •Patrick van Beek[1], Thomas Aumann[1,2], Martin Baumann[1], Michael Beckstein[1], Daniel Körper[1,2], Bastian Löher[1,2], 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. From the complete photo nuclear cross section spectrum one can calculate the diagonal dipole polarizability of the nucleus, which helps constraining the symmetry energy in the equation of state. A major upgrade of NEPTUN is underway, which will be presented.

One approach to investigate the off-diagonal dipole polarizability of nuclei is to study the two-gamma decay of excited nuclear states. A new experimental setup is being developed which will use state of the art $LaBr_3$ scintillators with excellent time and energy resolution in combination with Heidelberg-Darmstadt-Crystal-Ball NaI spectrometer. To suppress unwanted Compton events a collimating lead ball (BACCHUS) will be used. This promises significantly reduced background conditions and higher count rates compared to our previous setup.

Supported by DFG (SFB 1245).

HK 36.3 Mi 14:30 HZO 90

Vorbereitungen ür das Screening von Avalanche-Photodioden für das PANDA-Experiment — •Leon Knarr — RuhrUniversitätBochum, Institut für Experimentalphysik I

Das PANDA-Experiment ist eines der Schlüsselexperimente an der Beschleunigeranlage FAIR in Darmstadt. Die primären Forschungsziele des Experiments sind der Aufbau von Hadronen, die starke und schwache Wechselwirkung sowie exotische Materiezustände.
Hierbei kommt im Targetspektrometer ein homogenes elektromagnetisches Kalorimeter zum Einsatz, welches aus einem Fass-Teil und je einer Endkappe in Vorwärts- und Rückwärtsstrahlrichtung besteht, und in dem insgesamt 15644 Szintillatorkristalle aus Bleiwolframat eingesetzt werden. Für die Auslese der 768 Kristalle im inneren Bereich der Vorwärtsendkappe, wo eine höhere Strahlendosis zu erwarten ist, werden Vakuum-Phototetroden (VPPTs) genutzt. Die restlichen Szintillatoren werden von je zwei Avalanche-Photodioden (APDs) pro Kristall ausgelesen. Um Platz und Kosten zu sparen, werden Gruppierungen mehrerer APDs mit der selben Spannungsversorgung betrieben. Diese Gruppierungen müssen so gewählt werden, dass die APDs einer Gruppierung möglichst ähnliche Charakteristiken aufweisen. Wichtige Kriterien dafür sind die Spannungs- und Temperaturabhängigkeit des Verstärkungsfaktors der APDs. Dazu wird ein Verfahren entwickelt, welches es ermöglicht, über 30.000 APDs effizient bei +20 °C und -25 °C zu vermessen.

Gefördert durch das BMBF

HK 36.4 Mi 14:45 HZO 90

CALIFA at R^{3}B: The Q.A test stand and the gain monitoring system — •Han-Bum Rhee, Anna-Lena Hartig, Alexander Ignatov, and Thorsten Kröll for the R3B-Collaboration — Institut für Kernphysik, TU Darmstadt, Germany

CALIFA is a calorimeter and spectrometer that aims to detect gamma-rays and light charged particles. It is a part of the R3B experiment at GSI and the future FAIR facility. The functional units for the CALIFA demonstrator are called petals containing 64 CsI(Tl) crystals with APD readout each. Before assembling the detection units, a precise study of individual parts has to be done. This project aims to develop a quality assurance test stand for the APDs and crystals characterisation. Particularly, the inhomogeneity of the crystal light output is investigated with a collimated source.
The gain monitoring system (GMS) using the light signal from a pulsed LED is being developed by our group. The GMS distributes the signal to the detector elements via optical fibers and monitors the gain variance. In addition, our group developed a dedicated connetor PCB for the APD. PCB is used not only for the connection with the preamplifier, but also for the gain monitoring optical fiber and temperature sensor.
This work is supported by the German BMBF (05P15RDFN1), HIC for FAIR and GSI-TU Darmstadt cooperation contract.

HK 36.5 Mi 15:00 HZO 90

Investigation of $CeBr_3$ for its use in neutron capture experiments — •Benjamin Brückner[1], Uwe Zscherpel[2], and René Reifarth[1] — [1]Goethe Universität Frankfurt am Main, 60438 Frankfurt am Main — [2]Bundesanstalt für Materialforschung und Prüfung, 12205 Berlin

Measurements of neutron capture cross sections at energies up to a few hundred keV are important for constraining astrophysical processes relevant for the creation of heavy elements. The efficient detection of the prompt γ-rays emitted after the neutron capture is necessary to determine these cross sections. Scintillation detectors are commonly used for these measurements. Recently detectors made of the scintillator material $CeBr_3$ became available in larger volumes. Its advantage compared to lanthanum halide scintillators are the lower prices and the absence of intrinsic background while the light output is similar. An overview of the characteristics of a $CeBr_3$ scintillator and its possible use as a substitute for different scintillators such as $LaBr_3$(Ce), NaI(Tl) and BaF_2 will be presented.

HK 36.6 Mi 15:15 HZO 90

Development of LYSO detector modules for an EDM polarimeter at COSY — •Dito Shergelashvili for the JEDI-Collaboration — Ivane Javakhishvili Tbilisi State University, Chavchavadze ave. 1, Tbilisi 0128, Georgia

The JEDI collaboration (Jülich Electric Dipole moment Investigations) aims to measure the permanent electric dipole moments (EDMs) of charged hadrons (proton, deuteron) in storage rings, which offers the possibility to measure EDMs of charged particles by ob- serving the influence of the EDM on the spin motion. The Cooler Synchrotron COSY at the Forschungszentrum Juelich provides polarized protons and deuterons up to a momentum of 3.7 GeV/c and is thus an ideal machine for development and commissioning of the nec- essary technology. The essential point would observe a tiny change of beam polarization over an extended period of time.

For the EDM measurements, a dedicated high precision polarimeter is required. To fulfill specifications, a fast, dense, high resolution (energy and time), and the radioactive hard novel crystal scintillating material is required. For that purpose, several detector modules, built from different types of LYSO crystals and light sensors (PMTs and SiPM arrays), have been tested at COSY with a polarized deuteron (proton) beam with different energies from 100 MeV up to 270 MeV.

In this talk, the preliminary results of these measurements and accumulated experience of the module development will be presented.

HK 36.7 Mi 15:30 HZO 90

The EDM Polarimeter Development at COSY-Jülich — •Fabian Müller for the JEDI-Collaboration — Forschungszentrum Jülich, Institute for Nuclear Physics, Wilhelm-Johnen-Straße, 52428 Jülich

The JEDI (Jülich Electric Dipole moment Investigations) collaboration performs a set of experiments at the COSY storage ring in Jülich, within the R&D phase to search for the Electric Dipole Moments (EDMs) of charged particles. A measurement of proton and deuteron EDMs is a sensitive probe of yet unknown CP violation. The method of charged particle EDM search will exploit stored polarized beams in order to observe a miniscule rotation of the polarization axis as a function of time due to the interaction of a finite EDM with large electric fields. Key challenge is the provision of a sensitive and efficient method to determine the tiny change of the beam polarization. Elastic scattering of the beam particles on carbon nuclei will provide the polarimetry reaction. To perform these measurement, an EDM polarimeter needs to be developed. The polarimetry concept developed within the JEDI collaboration is based on a heavy crystal (LYSO) hadron calorimeter. LYSO as a fast, dense and radiation hard, novel scintillating material was chosen to fulfill these specifications. The polarimeter is designed in a compact and modular fashion consisting of modules made from LYSO crystals coupled to silicon photomultipliers (SiPM). This setup has been tested at COSY in a deuteron beam with five different energies from 100 MeV up to 270 MeV. The preliminary results of this measurements will be presented.

HK 36.8 Mi 15:45 HZO 90

Prototype Test Beam Results of the Crystal Zero Degree Detector for BES III — Achim Denig[1], Peter Drexler[1], Brice Garillon[1], •Leonard Koch[2], Wolfgang Kühn[2], Sören Lange[2], Werner Lauth[1], Yutie Liang[2], and Christoph Redmer[1] for the BESIII-Collaboration — [1]Johannes Gutenberg Universität Mainz — [2]Justus-Liebig-Universität Gießen

The BES III experiment at the BEPCII electron positron collider in Beijing is collecting data in the charm-τ mass region. Being strongly peaked towards small polar angles, photons from initial state radiation (ISR) are detected with limited efficiency.

In order to increase the detection efficiency of these photons, we develop a small detector comprised of two arrays of scintillating crystals separated by a small gap to be placed in the very forward and backward regions. The scintillation light will be collected by silicon photomultipliers (SiPMs) and the signals will be digitized by feature extracting flash ADCs. This data stream is correlated with the BES III trigger in realtime on FPGA based hardware.

In November '17, a prototype detector consisting of a single LYSO crystal, four SiPMs and the full readout chain was tested succesfully at the MAMI facility in Mainz.

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