HK 31: Instrumentation VII and Applications

Zeit: Dienstag 16:30–18:30 Raum: HS 12

Gruppenbericht HK 31.1 Di 16:30 HS 12

Possibilities of photonuclear studies at the upgraded low-energy photon tagger NEPTUN — •Dmytro Symochko[1], Thomas Aumann[1,2], Martin Baumann[1], Patrick van Beek[1], Alexander Fuchs[1], Yevhen Kozymka[1], Daniel Körper[2], Bastian Löher[1], and Heiko Scheit[1] — [1]TU Darmstadt — [2]GSI Helmholtzzentrum für Schwerionenforschung

The low-energy photon tagging facility NEPTUN at the superconducting Darmstadt linear accelerator (SDALINAC) has been constructed with the aim to study the photoabsorption cross section of the nuclei in low energy region under conditions of quasi-monochromatic gamma beam. Recently it went through the major upgrade which included a complete rework of the focal plane detectors. The setup now allows measurements in the 30 MeV energy bite in single spectrometer settings effectively covering energy range of Pygmy- and Giant Dipole Resonances. This provides us unique chance to study the photoresponse of the nuclei below and far above particle separation threshold (up to 35 MeV) within the same experiment under the same conditions. Upgraded NEPTUN was tested in the commissioning runs and aiming for the first production runs in 2019.

The talk will be focused on the results of NEPTUN commissioning and details of the planned experimental campaign, which will combine experiments at NEPTUN, HiGS and NewSubaru facilities.

Supported by DFG (SFB 1245).

HK 31.2 Di 17:00 HS 12

Status report on NEPTUN upgrade and total photoabsorption setup PROTEUS — •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. From the complete photo nuclear cross section spectrum the dipole polarizability of the nucleus can be calculated, which helps constraining the symmetry energy in the equation of state. NEPTUN was undergoing a major upgrade. The setup was extended by the target positioning system PROTEUS, which ensures a precise and rapid target exchange. Its concept idea in the context of NEPTUN and a characterization will be presented.

Supported by DFG (SFB 1245).

HK 31.3 Di 17:15 HS 12

Linearly polarized photon beams at the BGO-OD experiment — •Christian Tillmanns for the BGO-OD-Collaboration — Physikalisches Institut, Nussallee 12, D-53115 Bonn

The BGO-OD experiment at the ELSA electron accelerator facility in Bonn studies the excitation spectra of nucleons via photoproduction of mesons. The setup combining a central BGO calorimeter and a forward magnetic spectrometer is ideally suited for the investigation of strangeness photoproduction. Linearly polarized photons enable access to polarization observables which are used to disentangle resonances. These photons are produced via koherent Bremstrahlung of electrons in crystal radiators.

The currently used method for the extraction of the degree of polarisation and it's verification will be presented.

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HK 31.4 Di 17:30 HS 12

Development of a HPGe-BGO Pair Spectrometer for ELI-NP — •Ilja Homm, Alexander Ignatov, Stoyanka Ilieva, and Thorsten Kröll — Technische Universität Darmstadt

At the moment, the new european research facility called ELI-NP (The **E**xtreme **L**ight **I**nfrastructure - **N**uclear **P**hysics) is being built in Bucharest-Magurele, Romania. ELI-NP offers unprecedented opportunities for photonuclear reactions with high intensity, brilliant and fully polarized photon beams at energies up to 19.5 MeV.

The 8 HPGe CLOVER detectors of ELIADE are important instruments for the gamma spectroscopic study of photonuclear reactions. We investigate the possibility to operate an advanced version of an anti-Compton shield (AC shield) as escape γ-rays pair spectrometer for one of the ELIADE CLOVERS to extend the high-resolution spectroscopy to photon energies of several MeV where the pair production process dominates. The BGO shield operated as a stand-alone device can also be used as intensity monitor and to investigate the cross section for pair production near the threshold. The main tasks are to develop and test such an AC shield: a pair spectrometer consisting of BGO crystals with SiPM (silicon photomultiplier) readout. The results of prototype testing are reported. First measurements with low energy photons are planned for 2019.

This work is supported by the LOEWE-Forschungsschwerpunkt "Nukleare Photonik".

HK 31.5 Di 17:45 HS 12

Commissioning tests for (e,e'γ) coincidence experiments at the S-DALINAC * — •Gerhart Steinhilber, Tobias Klaus, Ronan Lefol, Norbert Pietralla, and Peter von Neumann-Cosel — Institut für Kernphysik, TU Darmstadt

At the Institut für Kernphysik at the TU Darmstadt high resolution electron scattering experiments at low momentum transfer are performed using the QCLAM electron spectrometer. The electron beam is delivered by the Superconducting Darmstadt Linear Accelerator S-DALINAC. The QCLAM spectrometerfeatures a comparatively large solid-angle coverage of 35 msr and a momentum acceptance of 20%. This makes it suitable for (e,e'x) coincident measurements.

We combine the large acceptance QCLAM spectrometer with fast timing LaBr:Ce detectors to perform (e,e'γ) coincidence experiments. The excitation of the nuclei is studied by measuring inelastically scattered electrons, so that the energy of the excited state is known. The decay back to the ground state is measured by a detector array consisting of high resolution LaBr:Ce detectors with excellent timing properties.

The detectors are shielded from low-energy γ background by a new lead housing. The data acquisition (DAQ) is connected to the QCLAM DAQ and was tested during a QClam beam time in fall 2018. Also, a clear coincidence time signal caused by cosmic radiation showers has been observed off-beam. The concept of the setup, data acquisition, results from the tests will be shown.

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HK 31.6 Di 18:00 HS 12

Advances in a Silicon Photomultiplier Readout of a Compton Camera — •Tim Binder[1,2], Maria Kawula[1], Silvia Liprandi[1], Giovanni Paolo Vinci[1], Florian Schneider[2], Katia Parodi[1], and Peter G. Thirolf[1] — [1]Ludwig-Maximilians-Universität, Munich, Germany — [2]KETEK GmbH, Munich, Germany

Silicon Photomultipliers (SiPM) have moved into the focus of a variety of applications to substitute photomultiplier tubes (PMT) due to their limitations in some areas. SiMPs can be operated in medical applications with the presence of magnetic fields, e.g. PET/MRI, or, because of their compact package size, where PMTs would introduce intolerable amounts of dead material, e.g. in a Compton camera (CC) scatter detector. Our CC prototype was developed for online range verification in hadron therapy. The absorber component of the prototype, a monolithic $LaBr_3$:Ce crystal (read out by a multianode PMT), will alternatively be read out by SiPMs, while the currently used scatterer, consisting of six layers of double-sided silicon strip detectors (DSSSD), can alternatively be substituted by a pixelated GAGG scatterer with SiPM readout to provide common readout and data processing of the whole CC. Furthermore, a $CeBr_3$ crystal is under investigation as a cost-effective and low-background alternative to $LaBr_3$:Ce. In this work results of the characterization of the SiPM readout (including the readout electronics) will be presented. Furthermore, a summary of the characterization of the $CeBr_3$ absorber will be given. This work is supported by the DFG Cluster of Excellence Munich Centre of Advanced Photonics (MAP) and the Bayerische Forschungsstiftung.

HK 31.7 Di 18:15 HS 12

Response of different types of scintillation materials to Am-Be neutron source — •Valera Dormenev[1], Kai-Thomas Brinkmann[1], Georgy Dosovitskiy[2], Mikhail Korjik[2,3], Vitaly Mechinsky[3], Dmitry Kozlov[3], Andrey Fedorov[3], and Hans-Georg Zaunick[1] — [1]2nd Physic Institute, Justus Liebig University, Giessen, Germany — [2]National Research Center "Kurchatov Institute-

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Neutron detectors have a wide range of application as for example non-destructive inspection, security systems and scientific research using different types of physical methods and equipment for detection of different types of ionizing radiation. Gadolinium and Lithium based scintillation materials can be considered as very promising candidates for such kinds of detectors. The materials have high absorption of neutrons with following prompt emission of gamma-quanta or alpha particles and detect these radiations efficiently due to high stopping power. Here we report test results of different types of scintillators, glass, ceramics and single crystals consisting or loaded with Gd and Li, obtained with standard Am-Be neutron source.

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