HK 67: Instrumentation XVII

Time: Thursday 16:00–17:30 Location: HK-H3

Group Report HK 67.1 Thu 16:00 HK-H3

New detectors for high precision measurements of thermal neutrons — •Jochen Kaminski[1], Markus Gruber[1], Saime Gürbüz[1], Markus Köhli[2], Michael Lupberger[1], Divya Pal[1], Laura Rodríguez Gómez[1], and Klaus Desch[1] — [1]Physikalisches Institut, Universität Bonn, Bonn, Deutschland — [2]Physikalisches Institut, Universität Heidelberg, Heidelberg, Deutschland

In the light of neutron sources in the construction or the commissioning phase, such as the ESS or the CSNS, the demand for neutron detectors is increasing. Because of the shortage and the subsequent rise in cost of helium-3 the availability of conventional neutron detectors is limited. Therefore, new types of detectors based on layers of solid state converters made of boron or gadolinium are being developed. Our group is developing three different types of detectors for high spatial and time resolution for which very different technologies are employed. One of them uses a boron and gadolinium loaded MCP as a converter and amplification stage with a readout by four Timepix3 ASICs, which is ideal for time resolved imaging applications. The two gaseous detectors are aimed for event-by-event high precision measurements of space and time of the conversion point. The detectors use boron-rich conversion layers and are based on the one hand on the TPC principle with a GridPix readout for high precision or on the other hand on a multi-layer GEM-based detector for high rates. In this presentation the principles and the current development statuses of the three detectors are discussed.

HK 67.2 Thu 16:30 HK-H3

Status of the neutron lifetime experiment τSPECT — •Kim Ulrike Ross for the tauSPECT-Collaboration — Department of Chemistry, Johannes Gutenberg University, Mainz

The τSPECT experiment aims to measure the neutron lifetime τ_n using a 3D magnetic storage technique. Due to the neutron's magnetic moment, very low-energetic neutrons (ultracold neutrons, UCN) with a maximum energy of $\sim$50 neV can be stored in our magnetic trap after double spin flip loading. UCN which are produced in pulses at the TRIGA research reactor Mainz are trapped for varying storage times and afterwards remaining neutrons are counted. The neutron lifetime can then be extracted from an exponential fit. In contrast to previous lifetime experiments employing material walls, systematic effects are reduced significantly by the magnetic confinement of UCN. The target uncertainty in the measured neutron lifetime is $\Delta\tau_n = 1.0$ s in phase I of the experiment.

This talk will give an overview of the status of the τSPECT experiment including the magnetic field configuration, as well as the filling and measurement procedure.

HK 67.3 Thu 16:45 HK-H3

A normalization detector for the neutron lifetime experiment τSPECT — •Martin Engler for the tauSPECT-Collaboration — Department of Chemistry, Johannes Gutenberg University, Mainz

The τSPECT experiment aims to measure the free neutron lifetime, using fully magnetic storage. Neutrons with energies of $\approx$50 neV are stored in the magnetic field gradient and then counted after varying storage times. The individual measurements have to be normalized, in order to account for statistical and systematical changes in the yield of the neutron source. To monitor the neutron flux during the filling process, an in-situ neutron detector, detecting light from a ^{10}B coated ZnS:Ag scintillator coupled to an array of silicon photomultipliers, has been designed and built.

This talk will cover the detectors design, as well as the results of the first test run.

HK 67.4 Thu 17:00 HK-H3

Development of the compact, high resolution particle detection system HI-TREX for ISOLDE — Christian Berner, Roman Gernhäuser, •Sergei Golenev, and Robert Neagu for the MINIBALL-Collaboration — Technical University of Munich

Transfer reactions are a unique tool to populate and probe the structure of nuclei. Due to its unprecedented capabilities in producing and accelerating exotic nuclei, the HIE-ISOLDE facility at CERN provides an excellent opportunity for transfer experiments using radioactive ion beams. HI-TREX is a particle detection setup, optimized for this nuclei. HI-TREX is based on three technological pillars: very thin, AC-coupled, double-sided silicon strip detector (DSSSD); extremely low-powered, high resolution front-end electronics, based on the SKIROC ASICs; and a newly developed, custom made, FPGA based GEneric Asic Readout board GEAR for the TRB data acquisition system. We will present the concept, layout and a whole series of prototype tests towards this demanding technology.

Supported by BMBF 05P21WOCI1

HK 67.5 Thu 17:15 HK-H3

Determination of a high neutron flux using a DT generator — Marie Pichotta, •Hans Hoffmann, and Kai Zuber — TU Dresden IKTP, Dresden, Deutschland

Reproducing r-process reactions on earth is challenging because a very high neutron flux is needed. A promising way is DT implosion at the NIF (National Ignition Facility). There the cross section of reaction ^{40}Ar(2n,γ)^{42}Ar is going to be measured. The reaction ^{40}Ar(n,2n)^{39}Ar will monitor the neutron field. A measurement of the total cross section is needed because theoretical models for this cross section differ.

An argon gas sample enriched in ^{40}Ar was fed into a 20 mm diameter Al sphere at 20 bar. The argon-filled sphere was irradiated with a high neutron flux using the TU Dresden DT neutron generator. It is located at HZDR (Helmholtz-Zentrum Dresden - Rossendorf) and produces a 14 MeV neutron field with densities up to 10^{12} n/(s cm^2). The Ar-filled sphere was positioned in close geometry in order to gain a high neutron flux. 2 metal foils consisting of Al, Zr and Nb respectively, served as neutron monitors. After the irradiation, the monitors' activity was measured using a germanium detector surrounded by a lead shielding. It was calibrated using point sources of known activity and Monte-Carlo simulations. The irradiation procedure and neutron flux analysis will be presented.