HK 52: Instrumentation XIII

Zeit: Donnerstag 14:00–16:00 Raum: S1/01 A3

HK 52.1 Do 14:00 S1/01 A3

Development of a thin, internal superconducting polarisation magnet for the Polarised Target — •Marcel Bornstein, Hartmut Dutz, Stefan Goertz, Scott Reeve, and Stefan Runkel — Physikalisches Institut, Bonn, Germany

In order to improve the figure of merit of double-polarisation experiments at CB-ELSA in Bonn, the Polarised Target is working on a new dilution refrigerator. For maximum polarisation of nucleons low temperatures and a high homogeneous magnetic field within the target area is needed. A thin, superconducting magnet is in development, which will create a continuous longitudinal magnetic field of 2.5 T and which will be used within the new refrigerator. The solenoidal geometry of this magnet uses two additional correction coils, placed at a well defined calculated position, for reaching the homogeneity criteria of 10^{-4} needed for the dynamic nuclear process. Practically, the superconducting wires as well as the correction coils have to be placed with maximum precision: Small fluctuations of the distance between the current loops can diminish the requested homogeneity. A second build prototype passes first tests and looks promising to fulfil the particular requirements.

HK 52.2 Do 14:15 S1/01 A3

CFD-Simulations of a 4π-continuous-mode dilution refrigerator for the CB-ELSA experiment — Marcel Bornstein, Hartmut Dutz, Stefan Goertz, Scott Reeve, and •Stefan Runkel for the CBELSA/TAPS-Collaboration — Physikalisches Institut, Bonn, Germany

The polarized target group at Bonn operates a dilution refrigerator for double polarization experiments at the Crystal Barrel in Bonn. To get high target polarizations and long relaxation times low temperatures are indispensable. To reach temperatures below 30 mK and to allow for the use of an internal polarization magnet, the polarized target group is building a new continuous mode dilution refrigerator. As a optimizing tool for the construction of dilution refrigerators and for a better understanding of the different incoming and outgoing fluid streams several **C**omputational **F**luid **D**ynamic simulations are done. The heat exchange between the different streams of the refrigerator were simulated for the precooling stages within one simulation including a submesh for each fluid and solid. This leads to a better estimation of the flow characteristics and the operational parameter of the refrigerator. The last steps of construction and the preparation of the refrigerator for first test measurements are ongoing.

HK 52.3 Do 14:30 S1/01 A3

Design and performance of an ionisation chamber for the measurement of low alpha-activities — •Heinrich Wilsenach and Kai Zuber — Institut für Kern- und Teilchenphysik, Technische Universität Dresden

The study of alpha decay has been important for the understanding of nuclei and their properties for more than a century. Currently these studies still have impact in various areas of nuclear physics, providing information which is valuable and often not accessible otherwise. The measurement of half-lifes from alpha decays of the order of 1×10^{15} yr is of particular interest. A measurement of such a long lived decay imposes, however, a series of challenges, where the correct discrimination between background and true signal is critical.

This work discusses an ionisation chamber used for low rate alpha-spectroscopy. The measurement makes use of pulse shape analysis to discriminate between signal and background events. The design and performance of the chamber is described in this work. A background rate of (10.9 ± 0.6) counts per day in the energy region of 1 MeV to 9 MeV was achieved with a run period of 30.8 days, this will also be presented. The remeasurement of the half-life of ^{147}Sm will also be presented here, as well as a discussion on the current half-life values.

HK 52.4 Do 14:45 S1/01 A3

Magnetic shielding for a transversely polarized target in the longitudinal field of the PANDA solenoid — •Bertold Fröhlich[1], Samer Ahmed[1], Alaa Dbeyssi[1], María Carmen Mora Espí[1], Kathrin Gerz[1], Dexu Lin[1], Frank Maas[1], Ana Peñuelas Martinez[1], Cristina Morales[1], Yadi Wang[1], and Patricia Aguar Bartolome[2] — [1]Helmholtz Institut Mainz — [2]Institut für Kernphysik Johannes Gutenberg-Universität Mainz

A transversely polarized target in PANDA would allow for the first time access to the imaginary part of the time like electromagnetic proton form factors, namely the phase angle in the imaginary plane between electric and magnetic form factors. Moreover it would allow for a number of other target single spin asymmetries revealing nucleon structure observables connected with the transverse spin structure of the proton.

As a first step for achieving a transverse target polarization, the target region has to be shielded against the 2 T longitudinal magnetic flux from the solenoid of the PANDA spectrometer. We present experimental results on intense magnetic flux shielding using a BSCCO-2212 high temperature superconducting hollow cylinder at liquid helium temperature.

HK 52.5 Do 15:00 S1/01 A3

Entwicklung und Test einer Probenhalterung für intensive Protonenstrahlen — •Markus Reich[1], Ulrich Giesen[2], Ole Hinrichs[1], Rene Reifarth[1], Kerstin Sonnabend[1] und Benedikt Thomas[1] — [1]Goethe Universität Frankfurt am Main — [2]Physikalisch-Technische Bundesanstalt, Braunschweig

Zur Messung der Wirkungsquerschnitte von (p,γ)-Reaktionen mit intensiven Protonenstrahlen wurde eine wassergekühlte Probenhalterung entwickelt. Die Spezifikationen sind an die sich im Aufbau befindende Neutronenquelle am Stern-Gerlach Zentrum in Frankfurt am Main (FRANZ) angepasst. Bei einer Protonenenergie von 2 MeV und einem Strahlstrom von 2 mA wird eine Leistungsdeposition von 4 kW in den Proben erwartet. Das Design der Halterung wurde durch Simulationen optimiert.

Bei einem Langzeitbelastungstest an der Physikalisch-Technischen Bundesanstalt in Braunschweig (PTB) wurde die Halterung bei einer mittleren Leistungsdeposition von etwa 200 W erfolgreich getestet.

Dieser Beitrag wurde gefördert durch DFG (SO907/2-1)/Emmy Noether.

HK 52.6 Do 15:15 S1/01 A3

Development of the Jet-Target System of the MAGIX experiment. — •Aulenbacher Stephan for the Magix/MESA-Collaboration — Institut für Kernphysik - JGU, Mainz, Deutschland

Since the new accelerator MESA which will be built up in Mainz in the next years operates at low Energies (˜100 MeV), but at high beam currents (˜1 mA), a thin windowless target is required. Therefore the MAGIX collaboration is developing a Jet-Target. This target blasts a Gas-Jet perpendicular to the beam through the scattering chamber of MAGIX. This talk is about the development of this Target System.

HK 52.7 Do 15:30 S1/01 A3

Improvement of the photon flux measurement at the BGO-OD experiment* — •Katrin Kohl for the BGO-OD-Collaboration — Physikalisches Institut, Universität Bonn

The BGO-OD experiment at the ELSA accelerator facility at Bonn investigates the internal reaction mechanisms of the nucleon, using an energy tagged bremsstrahlung photon beam. Absolute normalisation of the beam flux is required for cross section determination. In this talk the measurement principle is presented and an improved method of the photon flux monitoring of the experiment is introduced.

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HK 52.8 Do 15:45 S1/01 A3

Effects of Irradiation Temperature on Polarisation and Relaxation Characteristics of Polymeric Materials. — Marcel Bornstein, Harmut Dutz, Stefan Goertz, •Scott Reeve, and Stefan Runkel — Physikalisches Institut, Bonn, Germany

To achieve significant enhancement of polarisation of solid target materials one must use the principles of dynamic nuclear polarisation and utilise the coupling of the nuclear and electron spins. The unpaired electrons needed can be created as paramagnetic structural defects by irradiation of the material. Polyethylene and polypropylene materials were irradiated at various temperatures and subsequently polarised with microwaves of approximately 70 GHz at temperatures around 1 K. Additionally the samples were investigated with respect to the nature of the created paramagnetic defects using a X-band EPR spectrom-

eter. It was found that the irradiation temperature has a significant effect on the polarisation values achieved and also on the relaxation times of the materials in the 2.5 T magnetic field. The EPR line shape is clearly dominated by the well known alkyl radical structure.