HK 42: Instrumentation 14

Time: Wednesday 14:30–16:30 Location: M/HS2

HK 42.1 Wed 14:30 M/HS2

Simulationen der HEBT-Sektion für FRANZ — •O. Hinrichs, C. Arda, C. Claessens, O. Meusel, D. Noll, M. Reich, R. Reifarth, M. Schwarz, K. Sonnabend und B. Thomas — Goethe-Universität Frankfurt

Die Frankfurter Neutronenquelle am Stern-Gerlach-Zentrum (FRANZ), die sich gegenwärtig im Aufbau befindet, wird von einem Protonenstrahl mit einer Stromstärke von 20 mA Dauerstrom und Energien zwischen 1,8 und 2,2 MeV betrieben. Diese Anlage hat das Ziel, protonen- und neutroneninduzierte Reaktionen von astrophysikalischem Interesse zu untersuchen, bei denen nur geringe Reaktionsausbeuten zu erwarten sind, z.B. aufgrund instabiler Targetkerne.
In dieser Präsentation wird der derzeitige Status der Strahlführung in Richtung des Experimentierplatzes mit einem 4π BaF_2-Kalorimeters, der HEBT-Sektion (High-Energy Beam-Transport), vorgestellt. Diese besteht aus einem Dipolmagneten und einem Quadrupoldublett als finalem Fokussierelement.
Hierbei liegt der Schwerpunkt auf Simulationen, die den Strahltransport und die Phasenraumverteilung im Hinblick auf einen variablen Strahlfleck optimieren, um bestmögliche experimentelle Bedingungen zu erreichen. Dieses Projekt wird gefördert durch die DFG (SO907/2-1).

HK 42.2 Wed 14:45 M/HS2

CST CALCULATIONS FOR THE LAYOUT OF A BUTTON BPM SYSTEM FOR THE FAIR PROTON LINAC — •Mohammed Almalki — Planckstrasse 1, 64291 Darmstadt,

M. Almalki, P. Forck, W. Kaufmann and T. Sieber, C. Krüger, P. Kowina, O. Kester GSI, Darmstadt, Germany C. Simon, CEA-Saclay/DSM/Irfu, Gif sur Yvette, France,

At the planned Proton LINAC at the FAIR facility, four-fold button Beam Position Monitor (BPM) will be installed at 14 locations along the 30 m long FAIR pLINAC. These monitors will be used to determine the beam position, the relative beam current and the mean beam energy by time of flight (TOF). Depending on the location, the BPM design has to be optimized, taking into account an energy range from 3 MeV to 70 MeV, limited space for installation at the 30 mm or 50 mm beam pipe aperture. Detailed simulations of the button parameters with the finite element code CST were executed including signal shape analysis, impedance matching characteristic and capacitance calculations. Moreover, time and frequency-domain response of the BPM output signals reflecting the BPMs interaction with the beam, nonlinearity, sensitivity and position map for different geometries and beam parameters were performed. The results of these simulations and the related measurements are presented.

HK 42.3 Wed 15:00 M/HS2

Construction of a scalable neutron source — •Eduard Friske — Universität Tübingen, Tübingen, Germany

The silicon strip detectors used in the Silicon Tracking System of the CBM project are expected to be subject to high doses of particles, including neutrons. To anticipate the effects of neutron irradiation of the detectors, a high rate neutron source is being constructed at the Rosenau accelerator facility. Using deuterium fusion and cooling via liquid nitrogen, this design will allow scaling of the neutron flux over a wide range of values. It also allows the online instrumentation of the sample during the irradiation process, as well as defined variations of the irradiation rate, e.g. to study annealing effects.

HK 42.4 Wed 15:15 M/HS2

A new cryogenic gas target for electron scattering coincidence experiments — •Simela Aslanidou, Sergej Bassauer, Andreas Krugmann, Peter von Neumann-Cosel, Norbert Pietralla, Maxim Singer, and Gerhart Steinhilber — Institut für Kernphysik, Technische Universität Darmstadt

Exclusive electron scattering experiments off ^{3,4}He are planed at the superconductive Darmstadt electron accelerator S-DALINAC. The results promise important tests of theoretical predictions in the framework of potential models [1] and EFT [2]. The experiments will be performed at low momentum transfer where data are scarce. A new cryogenic system for coincidence experiments on gaseous targets was constructed and tested. The experimental setup and the performance of the apparatus under realistic beam conditions will be presented.
This work is supported by the DFG under contract SFB 634

[1] J. Golak et al., Phys. Rep. **415** (2005) 89
[2] E. Epelbaum, et al., Rev. Mod. Phys. **81** (2009) 1773

HK 42.5 Wed 15:30 M/HS2

Development of an thin, internal superconducting polarisation magnet for the Polarised Target — Timo Altfelde, •Marcel Bornstein, Hartmut Dutz, Stefan Goertz, Roland Miebach, Scott Reeve, Stefan Runkel, Marco Sommer, and Benjamin Streit — 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 polarisation 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.

HK 42.6 Wed 15:45 M/HS2

Entwickling eines pseudo internen Gastargets (PIT) für MAGIX — •Stephan Aulenbacher — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

Der neue energierückgewinnende Beschleuniger MESA eröffnet neue Möglichkeiten für Elektronenstreuexperimente hoher Präzision, bei niedrigen Energien (˜100 MeV). Unser Ziel ist der Aufbau eines Doppelarmspektrometers für Messungen an einem pseudo internen Gastarget. In diesem Vortrag wird die Entwicklung des Targets dargelegt. Dies beinhaltet die Wahl der Materialien und Fertigung des Targets, Design des differentiellen Pumpsystems, sowie Simulationen der Fluid-Dynamik im inneren des Targets und dem physikalischen Einfluss des Targets selbst.

HK 42.7 Wed 16:00 M/HS2

CFD-Simulations of a 4π-contiuous-mode dilution refrigerator for the CB-ELSA experiment — Timo Altfelde, Marcel Bornstein, Hartmut Dutz, Stefan Goertz, Roland Miebach, Scott Reeve, •Stefan Runkel, Marco Sommer, and Benjamin Streit — 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 CFD-simulations are done. First the different streams are simulated independently for different parts of the refrigerator to get a better estimation of the flow parameters. Then the simulation is extended to include the heat exchange between the different streams at the heat exchangers for different operational parameters of the refrigerator. Afterwards the precooling stages of the refrigerator will be tested to compare the predicted and the measured operational parameters.

HK 42.8 Wed 16:15 M/HS2

Polarisation and relaxation characteristics of 15 MeV proton irradiated polmeric materials at 1 K and at 2.5 T. — Timo Altfelde, Marcel Bornstein, Hartmut Dutz, Stefan Goertz, Roland Miebach, •Scott Reeve, Stefan Runkel, and Benjamin Streit — Physikalisches Institut, Bonn, Germany

The dynamic polarisation of nuclear spins requires the introduction of paramagnetic centres into potential target materials. A method of choice is the irradiation of such materials. A solid target material that can be handled at room temperature and in which the paramag-

netic centre remains stable under theses conditions would have many advantages for nuclear and particle physics experiments. Initial indications are that the polymeric materials may fulfil these criteria. Foils of polyethylene and polypropylene of 0.18 mm thickness were irradiated with a 15 MeV proton beam at various doses and subsequently analysed under standard polarised target conditions of 2.5 T and 1 K. The influence of annealing on the radical structure and the resulting change in polarisation characteristics are presented.