HK 53: Instrumentation XIV

Zeit: Donnerstag 14:00–16:00 Raum: S1/01 A4

Gruppenbericht HK 53.1 Do 14:00 S1/01 A4

Das P2-Experiment: Hochpräzise Messung des schwachen Mischungswinkels an MESA — •Sebastian Baunack für die P2-Kollaboration — PRISMA Cluster of Excellence und Institut für Kernphysik, Johannes Gutenberg-Universität Mainz

Die P2-Kollaboration bereitet derzeit eine Messung des schwachen Mischungswinkels $\sin^2\theta_w$ mittels elastischer Elektron-Proton-Streuung vor. Die angestrebte relative Genauigkeit beträgt 0.15% und ist damit vergleichbar mit den derzeit genauesten Messungen am Z-Pol. Das Experiment soll am neu zu errichtenden Elektronenbeschleuniger MESA in Mainz durchgeführt werden.

Im Vortrag wird zum einen auf die Motivation für eine solche Messung eingegangen. Zum anderen werden die vielfältigen experimentellen und theoretischen Herausforderungen vorgestellt, um das Experiment durchzuführen und die Resultate zu interpretieren. Der aktuelle Stand der Arbeiten wird präsentiert.

Gruppenbericht HK 53.2 Do 14:30 S1/01 A4

Developement of Closed Orbit Diagnostics towards EDM Measurements at COSY in Jülich — •Fabian Hinder for the JEDI-Collaboration — Forschungszentrum Jülich, Institut für Kernphysik IV — RWTH Aachen University, III. Physikalisches Institut B

Electric Dipole Moments (EDMs) violate parity and time reversal symmetries. Assuming the CPT-theorem, this leads to CP violation, which is needed to explain the matter over antimatter dominance in the Universe. Thus, a non-zero EDM is a hint to new physics beyond the Standard Model. The JEDI collaboration (Jülich Electric Dipole moment Investigations) has started investigations of a direct EDM measurement of protons and deuterons at a storage ring. To measure a tiny EDM signal with high precision, systematic effects have to be controlled to the same level. One major source of systematic uncertainties is a distortion of the closed orbit. To control and measure this effect, the orbit measurement system, including the readout electronics, the orbit correction system and the beam position monitor pick-ups are improved. All the mentioned developments are ongoing at the Cooler Synchrotron (COSY) at Jülich. The achievements in the mentioned fields will be presented at the conference.

HK 53.3 Do 15:00 S1/01 A4

Search for a permanent Xe-elecric dipole moment — •Stefan Zimmer for the MIXed-Collaboration — Institut für Physik, Universität Mainz

A permanent electric dipole moment (EDM) of the isotope ^{129}Xe would imply a breakdown of both parity P and time-reversal symmetry T and, through the CPT theorem, a breakdown in CP, the combined symmetries of charge conjugation C and parity P. Our goal is to improve the present experimental limit ($d_{Xe} < 3 \cdot 10^{-27}$ ecm) by about three orders of magnitude. The most precise EDM limit on diamagnetic atoms was measured on ^{199}Hg ($d_{Hg} < 3.1 \cdot 10^{-29}$ ecm). To get more stringent limits, we perform a ^{3}He/^{129}Xe clock comparison experiment with the detection of free spin precession of gaseous, nuclear polarized ^{3}He or ^{129}Xe samples with a SQUID as magnetic flux detector. The precession of co-located ^{3}He/^{129}Xe nuclear spins are used as an ultra-sensitive probe for non-magnetic spin interactions of type $\delta\nu \sim d_{Xe} \cdot E$. With our experimental setup at the research center Jülich we are able to observe spin coherence times T_2^* of several hours for both species. We report on first experimental results achieved within the MIXed-collaboration.

HK 53.4 Do 15:15 S1/01 A4

Status and First Measurement Results for a High Gradient CH- Cavity — •Ali Almomani and Ulrich Ratzinger — Institut für Angewandte Physik - Frankfurt Universität, Frankfurt am Main, Germany

This pulsed linac activity aims on compact designs and on a considerable increase of the voltage gain per meter. A high gradient CH * cavity operated at 325 MHz was developed at IAP * Frankfurt. The mean effective accelerating field for this cavity is expected well above 10 MV/m at $\beta = 0.164$. This cavity is developed within a funded project. The results might influence the rebuilt of the UNILAC * Alvarez section, aiming to achieve the beam intensities specified for the GSI * FAIR project (15 mA U28+). Another motivation is the development of an efficient pulsed ion accelerator for significantly higher energies like 60 AMeV. The new GSI 3 MW Thales klystron test stand will be used for the cavity RF power tests. Detailed studies on two different types of copper plating will be performed with this cavity.

HK 53.5 Do 15:30 S1/01 A4

Teststand zur HEBT-Sektion für FRANZ — •Ole Hinrichs, Christine Claessens, Oliver Meusel, Daniel Noll, Markus Reich, René Reifarth, Malte Schwarz, Kerstin Sonnabend, Benedikt Thomas, Christopher Wagner und Christoph Wiesner — Goethe-Universität Frankfurt

Die Frankfurter Neutronenquelle am Stern-Gerlach-Zentrum (FRANZ), die sich gegenwärtig im Aufbau befindet, wird von einem Protonenstrahl mit einer anfänglichen Stromstärke von 2 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 vorbereitenden Testmessungen, die mithilfe eines Teststandes durchgeführt werden. Der Teststand umfasst einen RFQ-Beschleuniger mit angeschlossener He^+-Ionenquelle und Stahldiagnostik. Die Messungen werden mit den entsprechenden Strahldynamiksimulationen verglichen.
Dieses Projekt wird gefördert durch die DFG (SO907/2-1), HGS-HIRe und HIC for FAIR.

HK 53.6 Do 15:45 S1/01 A4

Development of a Compton camera prototype for prompt gamma medical imaging — •S. Liprandi[1], S. Aldawood[1,2], A. Miani[1,3], T. Marinšek[1], I. Valencia[1], C. Lang[1], J. Bortfeldt[1], L. Maier[4], R. Lutter[1], R. Gernhäuser[4], D.R. Schaart[5], G. Pausch[6,7], F. Fiedler[7], W. Enghardt[6,7], G. Dedes[1], K. Parodi[1], and P.G. Thirolf[1] — [1]LMU München, Germany — [2]King Saud University, Riyadh, Saudi Arabia — [3]Universitá degli Studi di Milano, Italia — [4]TU München, Germany — [5]Delft University of Technology, The Netherlands — [6]OncoRay and TU Dresden, Germany — [7]Helmholtz-Zentrum Dresden-Rossendorf, Germany

At LMU in Garching we are developing a Compton camera, designed to detect prompt γ-rays induced by nuclear reactions, during the irradiation of tissue in particle therapy. Our prototype consists of a stack of double-sided silicon strip detectors (50 x 50 mm^2, 0.5 mm thick, 128 strips/side, Gassiplex ASIC readout) acting as scatterers and an absorber formed by a $LaBr_3$(Ce) scintillator (50 x 50 x 30 mm^3, 256-fold multianode PMT readout). The detectors have been characterized in the laboratory and recently also online with a therapeutic proton beam at the University Proton Therapy Dresden (UPTD): we used 100, 160 and 225 MeV proton beams, irradiating water and PMMA targets. The offline and online characterization of the camera and its components will be presented.

This work was supported by the DFG Cluster of Excellence Munich Centre for Advanced Photonics (MAP) and KSU, Saudi Arabia.