HK 42: Hadronenstruktur und -spektroskopie

Zeit: Dienstag 16:45–18:45 Raum: HSZ-304

Gruppenbericht HK 42.1 Di 16:45 HSZ-304

Hadronische Wirkungsquerschnittsmessungen via ISR bei BaBar — •Achim Denig, Miriam Fritsch, Konrad Griessinger und Andreas Hafner für die BaBar-Kollaboration — Johannes Gutenberg Universität Mainz, Institut für Kernphysik

Die Messung des hadronischen Wirkunsquerschnittes in der e^+e^- Annihilation ist von entscheidender Bedeutung für eine verbesserte Standardmodellvorhersage des anomalen magnetischen Momentes des Myons a_μ. Mit Hilfe einer Dispersionsrelation ist es möglich, den hadronischen Anteil a_μ^{had} aus den gemessenen exklusiven Wirkungsquerschnitten der hadronischen Reaktionen zu bestimmen.

Der BaBar-Detektor hat von 1999-2008 eine integrierte Luminosität von ca. 500 fb^{-1} am e^+e^--Beschleuniger PEP-II aufgenommen. Die Schwerpunktsenergie beträgt 10.58 GeV. In Initial State Radiation (ISR) Ereignissen wird von einem einkommendem Lepton ein Photon abgestrahlt und dadurch die effektive Schwerpunktsenergie abgesenkt. Mit Hilfe dieser ISR-Methode können bei BaBar hadronische Wirkungsquerschnitte im Energiebereich von der Schwelle bis 5 GeV vermessen werden. Der Reaktionskanal $e^+e^- \to \pi^+\pi^-$ hat zwar mit ca. 75% des Gesamtbeitrages zum Dispersionsintegral den größten Einfluss auf die Berechnung von a_μ, wurde jedoch mit sehr hoher Präzision vermessen. Dadurch ist der Fehler auf den hadronischen Anteil der Myon-Anomalie momentan dominiert durch Kanäle mit höherer Multiplizität. Diese Messungen werden vorgestellt.

HK 42.2 Di 17:15 HSZ-304

Single-Hadron transverse target spin asymmetries at COMPASS — •Christoph Adolph — for the COMPASS collaboration — Physikalisches Institut IV der Universität Erlangen-Nürnberg

The quark content of the nucleon at twist-two level in the collinear case can be fully described by three independent distribution functions for each quark flavour: the unpolarized distribution function $f_1(x)$, the helicity distribution function $g_1(x)$ and the transverse spin distribution function $h_1(x)$, also called transversity. The measurement of single spin asymmetries in semi-inclusive deep inelastic scattering (SIDIS) on a transversely polarized target are an important part of the COMPASS physics program. By extracting azimuthal asymmetries in hadron production one can access both the Collins fragmentation function and the Sivers distribution function. The COMPASS collaboration has measured these asymmetries in the scattering of a 160 GeV/c polarized μ^+ beam off a transversely polarized ^{6}LiD (deuteron) target in the years 2002–2004 and off a transversely polarized NH_3 (proton) target in 2007 and 2010. In this contribution we especially present results from the 2010 data for the Collins and Sivers asymmetries for identified pions and kaons.

HK 42.3 Di 17:30 HSZ-304

Exclusive ρ^0 muoproduction on transversely polarised protons and deuterons — •Katharina Schmidt, Steffen Bauer, Horst Fischer, Florian Herrmann, Kay Königsmann, Michael Kunz, Tobias Kunz, Pasquale Malm, Christopher Regali, Robert Schäfer, Stefan Sirtl, Tobias Szameitat, and Johannes ter Wolbeek — for the COMPASS collaboration, Physikalisches Institut, Albert- Ludwigs-Universität Freiburg

The theoretical framework of Generalized Parton Distributions (GPDs) provides a dynamical and geometrical picture of the nucleon. Additional to the longitudinal momentum information of partons they contain information on the transverse localisation of the constituents. The exclusive production of ρ^0 mesons off a transversely polarised target allow for instance to constrain the GPD E which is connected, according to Ji's sum rule, with the total angular momentum of quarks and gluons. At the COMPASS experiment at CERN measurements were performed scattering a 160 GeV/c longitudinal poalized muon beam off a transversely polarised ^{6}LiD (2003-2004) and NH_3 (2007, 2010) target. The final state particles are detected with the two-stage spectrometer with high resolution tracking and calorimetry.
This talk gives an introduction to the analysis of exclusively produced ρ^0 mesons. Results for the azimuthal asymmetry are presented. Supported by BMBF, DFG and EU FP7 (Grant Agreement 283286)

HK 42.4 Di 17:45 HSZ-304

Measurement of the Proton Scalar Polarizabilities at MAMI — •Vahe Sokhoyan for the A2-Collaboration — George Washington University, Washington, USA — Institut für Kernphysik, Universität Mainz, Germany

The scalar polarizabilities, α_{E1} and β_{M1}, are fundamental properties of the nucleon. They play a crucial role not only in our understanding of the nucleon, but also in other areas such as atomic physics, where they provide e.g. corrections to the Lamb Shift. Recent analyses suggest significant model dependence in the extraction of α_{E1} and β_{M1}. To date, these observables were extracted in parallel from unpolarized cross-sections of Compton scattering on the proton. At the MAMI accelerator facility in Mainz, the nucleon polarizabilities will be measured using a linearly polarized photon beam for the first time in a photon energy range from 110 to 150 MeV. The beam will impinge on a liquid Hydrogen target and the reaction products will be detected in the Crystal Ball and TAPS 4π spectrometer setup. This measurement will allow for the first independent extraction of the observables α_{E1} and β_{M1} using real Compton scattering on the proton below pion threshold. In the talk the current status of the α_{E1} and β_{M1} measurement will be presented. In addition the current status of the investigation of dilepton photoproduction off the proton, which will be measured in parallel due to the necessarily open trigger conditions, will be discussed.

HK 42.5 Di 18:00 HSZ-304

Symmetric Møller/Bhabha luminosity monitor for the OLYMPUS experiment — •Roberto Perez Benito for the OLYMPUS-Collaboration — Johannes Gutenberg Universität Mainz

Recent determinations of the proton electric to magnetic form factor ratio indicate an unexpected discrepancy between the ratio obtained using polarisation transfer measurements and the ratio from the Rosenbluth separation technique in unpolarised cross section measurements. This discrepancy has been explained theoretically as the effect of two-photon exchange.

The *OLYMPUS* experiment at DESY proposed to measure the ratio of positron-proton and electron-proton elastic scattering cross sections. The experiment utilised beams of electrons and positrons in the DORIS ring at 2.0 GeV incident on an unpolarized internal hydrogen gas target and the BLAST detector from the MIT-Bates Linear Accelerator Center with modest upgrades.

In order to reduce the systematic error from the determination of luminosity, redundant measurements of the relative luminosity were necessary. The symmetric Møller/Bhabha luminosity monitor built at the University of Mainz consisted of two symmetric arrays of lead fluoride (PbF_2) crystals. Results on the performance of the symmetric Møller/Bhabha luminosity monitor will be presented in this contribution.

HK 42.6 Di 18:15 HSZ-304

OLYMPUS Luminosity Monitoring — •Ozgur Ates for the OLYMPUS-Collaboration — Hampton University, Hampton, Virginia, USA

The OLYMPUS experiment at DESY has been measuring the ratio of positron-proton and electron-proton elastic scattering cross sections to quantify the effect of two-photon exchange, which is widely considered to be responsible for the discrepancy between measurements of the proton electric to magnetic form factor ratio with the Rosenbluth and polarization transfer methods. In order to control the systematic uncertainties to the percent level, the luminosities are monitored redundantly with high precision by measuring the rates for symmetric Moller and Bhabha scattering, and by measuring the ep-elastic count rates at forward angles and low momentum transfer with tracking telescopes based on GEM (Gas Electron Multiplier) and MWPC (Multi Wire Proportional Chamber) technology. During two data taking periods, performances of GEM and MWPC luminosity monitors will be presented.

HK 42.7 Di 18:30 HSZ-304

Energy Calibration for the Forward Detector at WASA-at-COSY* — •Kay Demmich, Florian Bergmann, Paul Goslawski, Nils Hüsken, Florian Schepers, Alexander Täschner, and Al-

FONS KHOUKAZ — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster

One focus of the WASA-at-COSY physics program is the investigation of meson productions and rare meson decays. The experimental setup itself allows for meson production in scattering reactions with any combination of protons and deuterons. The forward scattered ejectiles can be detected in the forward detector and the four-momenta can be reconstructed e.g. for missing mass studies. Generally the energy calibration of the forward detector is performed by comparing measured with simulated or calculated energy loss distributions in different detector layers as function of the ejectile energy. For investigations on the η' production in the p+d $\rightarrow$ ^{3}He+η' reaction the accuracy of this calibration is crucial since the reaction cross section is very small compared to background reactions. A new powerful tool to calibrate the forward detector is presented. It enables the variation of the calibration parameters within a graphical user interface and a following optimization by an adjusted method based on least square fitting. Although primarily developed for the η' production, this program has been applied successfully to an η production data set, as well, and can be adapted for ^{3}He and ^{4}He production reactions. In this talk the calibration method and first results of the implementation will be presented.

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