

HK 28 Elektromagnetische und Hadronische Sonden

Zeit: Mittwoch 14:00–16:00

Raum: F

HK 28.1 Mi 14:00 F

Untersuchung der Summenregel für die Sivers-Funktion — ●STEPHAN MEISSNER, KLAUS GOEKE, ANDREAS METZ und MARC SCHLEGEL — Institut für Theoretische Physik II, Ruhr-Universität Bochum, 44780 Bochum

Messungen von HERMES [1] zeigen in tiefinelastischer Streuung von Positronen an einem transversal polarisierten Wasserstofftarget transversale Single-Spin Asymmetrien (SSAs). Eine mögliche Erklärung dieser SSAs besteht im Sivers-Mechanismus [2], welcher die Partonen eines transversal polarisierten Nukleons mit einer intrinsischen Impuls-Asymmetrie versieht, die durch die Sivers-Funktion $f_{1T}^{\perp}(x, k_T)$ beschrieben wird.

Für die Sivers-Funktion hat M. Burkardt eine Summenregel aufgestellt [3], welche wir anhand von Modellrechnungen untersucht haben [4]. Diese Summenregel besagt, dass für den mittleren Transversalimpuls $\langle k_T^i \rangle$ der Partonen $\sum_i \langle k_T^i \rangle = 0$ gilt, er also verschwindet, wenn über alle Partonen des Nukleons summiert wird. Dabei lässt sich $\langle k_T^i \rangle$ aus $f_{1T}^{\perp}(x, k_T)$ im Wesentlichen durch Integration über den Impulsbruchteil x sowie den Transversalimpuls k_T des Partons bestimmen.

[1] A. Airapetian *et al.* [HERMES Collaboration], Phys. Rev. Lett. **94** (2005) 012002 [hep-ex/0408013].

[2] D.W. Sivers, Phys. Rev. D **43** (1991) 261.

[3] M. Burkardt, Phys. Rev. D **69** (2004) 091501 [hep-ph/0402014].

[4] K. Goeke, S. Meissner, A. Metz, M. Schlegel, *in Vorbereitung*.

HK 28.2 Mi 14:15 F

Phenomenology of the Sivers function — ●SIMONE MENZEL¹, J.C. COLLINS², A.V. EFREMOV³, K. GOEKE¹, M. GROSSE-PERDEKAMP⁴, B. MEREDITH⁴, A. METZ¹, and P. SCHWEITZER¹ — ¹University Bochum, Germany — ²Penn State University, USA. — ³Joint Institute for Nuclear Research, Russia — ⁴BNL, USA

Recently, the Sivers asymmetry (SA) has been measured in semi-inclusive DIS by the HERMES and the COMPASS Collaborations. These data allow one for the first time to reliably extract the Sivers parton density $f_{1T}^{\perp}(x, k_{\perp})$ [1], which describes the distribution of unpolarized partons in a transversely polarized target. Assuming a Gaussian distribution for the transverse momentum dependence of the Sivers function we have fitted the HERMES data [2,3]. On the basis of our fit we made predictions for the SA in the Drell-Yan process (DY) for different experiments (COMPASS, PAX, RHIC) [2,3] and explain their advantages. It turns out that the SA in DY is measurable. It seems possible to check the predicted sign-reversal of the Sivers function when comparing DIS and DY [4] and so to test our understanding of single spin asymmetries in terms of QCD.

[1] D.W.Sivers, *Phys.Rev.D*, 41:83, 1990

[2] J.C.Collins et al., hep-ph/0511272

[3] J.C.Collins et al., hep-ph/0509076

[4] J.C.Collins, *Phys.Lett.B*, 536:43, 2002

HK 28.3 Mi 14:30 F

Measurement of Asymmetries in high- p_T Single Hadron Production at COMPASS[†] — ●R. KUHN, A.-M. DINKELBACH, J. M. FRIEDRICH, S. GERASSIMOV, B. GRUBE, B. KETZER, I. KONOROV, T. NAGEL, S. PAUL, L. SCHMITT, P. TUNKA, and Q. WEITZEL for the COMPASS collaboration — Technische Universität München, Physik-Department E18

During the three beamtimes 2002–2004 COMPASS has measured hard scattering processes of polarized muons off a polarized ⁶LiD target. The spin asymmetry of the hadron production cross section at high transverse momenta is related to the polarized gluon density ΔG of the nucleon. An update on the analysis of this asymmetry for single hadrons at low Q^2 and small x_{Bj} will be presented.

[†]This work is supported by the BMBF and the Maier-Leibnitz-Labor, Garching.

HK 28.4 Mi 14:45 F

Measurement of the Transverse Hyperon Polarization at COMPASS — ●B. GRUBE, J.M. FRIEDRICH, A.-M. DINKELBACH, S. GERASSIMOV, B. KETZER, I. KONOROV, R. KUHN, S. PAUL, L. SCHMITT, Q. WEITZEL, and M. WIESMANN for the COMPASS collaboration — TU München, Physik Department E18

COMPASS has measured the transverse polarization of Λ , $\bar{\Lambda}$, Ξ^- , and

Ξ^+ hyperons in quasi-real photo-production using a 160 GeV/c muon beam from the CERN SPS.

Utilizing the self-analyzing weak decay of the hyperons, their polarization was determined from the up-down asymmetry of the angular distribution of the respective decay baryons with respect to the production plane. Acceptance effects were reduced by applying bias-canceling methods that exploit the mid-plane symmetry of the apparatus. We have evaluated the polarization in different kinematical regions of the longitudinal momentum fraction x_F of the hyperons and their transverse momentum p_T .

This work is supported by the BMBF and the Maier-Leibnitz-Labor, Garching.

HK 28.5 Mi 15:00 F

Longitudinal Λ and $\bar{\Lambda}$ polarization in the COMPASS experiment — ●DONGHEE KANG, H. FISCHER, J. FRANZ, S. HEDICKE, F.H. HEINSIUS, F. HERMANN, M. VON HODENBERG, K. KÖNIGSMANN, F. NERLING, C. SCHILL, D. SETTER, A. VOSSEN, E. WEISE, and H. WOLLNY for the COMPASS collaboration — Physikalisches Institut, Universität Freiburg

At the COMPASS experiment at CERN Λ and $\bar{\Lambda}$ particles are produced in deep inelastic scattering processes with high statistics. Preliminary results from data collected in the current fragmentation region during 2002-2003 are presented. The main focus of the research is the understanding of the longitudinal Λ and $\bar{\Lambda}$ polarization and the spin transfer mechanism from quarks to hadrons through the fragmentation process. The Λ and $\bar{\Lambda}$ polarization can be studied by measuring the acceptance corrected angular distribution of its decay products. The results of the Λ and $\bar{\Lambda}$ longitudinal polarization and spin transfer provides useful information to test different model predictions which describe spin effects in hyperon production and the quark-antiquark asymmetry of the nucleon spin structure. We will compare our results with other measurements and discuss the dependence of the polarization on various kinematical variables. The project is supported by BMBF.

HK 28.6 Mi 15:15 F

Hadronenmultiplizitäten und Fragmentationsfunktionen bei HERMES — ●ACHIM HILLENBRAND für die HERMES-Kollaboration — Universität Erlangen-Nürnberg, Physikalisches Institut II, Erwin-Rommel-Str. 1, 91058 Erlangen

Aus den Protonendaten des Jahres 2000 wurden Hadronenmultiplizitäten gewonnen. Gezeigt werden ladungsseparierte Multiplizitäten in Abhängigkeit von z , x_{Bj} und Q^2 , letztere für verschiedene z -Bereiche. Der RICH-Detektor des HERMES-Experimentes ermöglicht die Separation der Hadronen in Pionen, Kaonen und Protonen. Mittels eines Monte Carlo-Modells wurden die Beiträge exklusiv erzeugter Vektormesonen zu den Hadronenspektren ermittelt. In weiteren Analyseschritten wurden die Daten um Akzeptanzeffekte und Einflüsse durch radiative Prozesse korrigiert. Die dabei verwendete Methode ist die gleiche, die bei der Δq -Analyse verwendet wurde[1]. Sie berücksichtigt die Teilchenmigration zwischen verschiedenen Bins mittels aus Monte Carlo-Simulationen gewonnenen Matrizen. Unter Berücksichtigung der unterschiedlichen Energien werden die Ergebnisse mit Fragmentationsfunktionen von EMC verglichen.

[1] Phys.Rev. D71 (2005) 012003

HK 28.7 Mi 15:30 F

Exclusive ρ^0 Production at HERMES — ●ARMINE ROSTOMYAN — HERMES / DESY, Notkestrasse 85, 22607,Hamburg

The measurement of hard exclusive processes opens access to the unknown Generalized Parton Distributions (GPDs) of the nucleon which provide a unified description of hadronic structure. Moreover, it was shown that the first moment of the GPDs H and E can be related to the total angular momentum of the quarks inside the nucleon.

This talk will report on measurements of hard exclusive ρ^0 production on a hydrogen target at HERMES using the 27.6 GeV HERA positron beam. First preliminary result for the single target-spin asymmetry measured with a transversely polarised hydrogen target will be presented.

Using the measured spin density matrix elements, representing the helicity transfer from the virtual photon to the ρ^0 mesons, the ratio of

the longitudinal to transverse components of the production cross section is determined. The extracted longitudinal part of the total cross section will be compared to GPD calculations.

It has been predicted that the transverse spin asymmetry depends linearly on the GPD E and, therefore, provides a unique observable for obtaining constraints on E.

HK 28.8 Mi 15:45 F

Double Polarization Virtual Compton Scattering — •LUCA DORIA — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Johann-Joachim-Becher-Weg 45, D-55099 Mainz, Germany

Virtual Compton Scattering (VCS) is, like Compton Scattering, a fundamental reaction in order to understand the physics of the nucleon, especially in the nonperturbative regime of QCD. VCS off the proton consists in the reaction $\gamma^* p \rightarrow p \gamma$, where γ^* and γ are the incoming virtual photon and the outgoing real photon respectively. With this reaction up to six new observables can be extracted: the Generalized Polarizabilities (GPs). Two of them represent the evolution of the ordinary nucleon polarizabilities as a function of the transferred momentum. VCS can be accessed experimentally measuring the reaction $ep \rightarrow ep \gamma$. In an unpolarized in-plane measurement two combinations of GPs can be extracted. Using a polarized beam and measuring the recoil proton polarization one gains access to five GPs. In order to disentangle all the six GPs an out-of-plane measurement is also required. Currently the A1 Collaboration is carrying out the double polarization experiment with the final aim to extract all the six GPs at $Q^2=0.33 \text{ (GeV/c)}^2$ using the polarized beam of the 100% duty-cycle Mainz Microtron (MAMI).