HK 64: Hadronenstruktur und -spektroskopie X

Zeit: Freitag 14:00–16:00 Raum: HG III

Gruppenbericht HK 64.1 Fr 14:00 HG III

Latest results on hard exclusive processes at HERMES — •Sergey Yaschenko for the HERMES-Collaboration — DESY, Platanenallee 6, D-15738 Zeuthen, Germany

Hard exclusive leptoproduction of real photons (Deeply Virtual Compton Scattering, DVCS) or mesons on nucleons can be expressed in terms of Generalized Parton Distributions (GPDs). The theoretical framework of GPDs includes Parton Distribution Functions and Form Factors as limiting cases and moments of GPDs, respectively, and can provide a three-dimensional representation of the structure of hadrons at the partonic level. The HERMES experiment at DESY, Hamburg, collected a wealth of data on hard exclusive processes utilizing the HERA polarized electron or positron beams with energies of 27.6 GeV, and longitudinally and transversely polarized or unpolarized gas targets (H, D or heavier nuclei). The azimuthal asymmetries measured in DVCS and exclusive meson production allow access to information related to GPDs. An overview of the latest HERMES results on exclusive processes is presented.

HK 64.2 Fr 14:30 HG III

Die Bestimmung von Fragmentationsfunktionen aus der Produktion geladener Kaonen am Deuterontarget — •Regine Panknin für die COMPASS-Kollaboration — Physikalisches Institut, Nussallee 12, Bonn

Fragmentationsfunktionen ($D_q^h(z)$) sind ein Maß für die Wahrscheinlichkeit, dass ein Quark des Flavors q in ein Hadron des Typs h fragmentiert. Sie sind im Wesentlichen eine Funktion des Impulsanteils z des ausgehenden Quarks, der auf das Hadron übertragen wird. Die Kenntnis von Fragmentationsfunktionen ist für die Extraktion polarisierter Quarkverteilungen aus Spin-Asymmetrien von großer Bedeutung. Im Vortrag wird gezeigt, wie vor allem die bisher weitgehend unbekannten Fragmentationsfunktionen von Strange Quarks nach Kaonen aus am COMPASS Experiment gemessenen Hadron-Multiplizitäten bestimmt werden können.

HK 64.3 Fr 14:45 HG III

Deeply virtual electroproduction of π and color transparency — •M. Kaskulov and U. Mosel — Institut für Theoretische Physik, Universität Giessen

A description of exclusive pion electroproduction $(e, e'\pi^{\pm})$ off nucleons at high energies is proposed. The model combines a Regge pole approach and residual effects of nucleon resonances. The contribution of nucleon resonances is described using a dual connection between the exclusive hadronic and deep inelastic inclusive form factors. The model describes the measured longitudinal, transverse and interference cross sections at Jefferson Laboratory (JLAB) and Deutsches Elektronen Synchrotron (DESY) in a same framework. The scaling behavior of the cross sections is in agreement with JLAB and deep exclusive HERMES data. We present the results for the ratio of π^-/π^+ cross sections and the beam single-spin asymmetry in $(\vec{e}, e'\pi^{\pm})$ which are of present interest in the dedicated experiments at JLAB and HERMES/DESY.

An implication of the present results for the deep exclusive electroproduction of pions off nuclei and color transparency will be presented.
Supported by SFB/TR16 "Elektromagnetische Anregung subnuklearer Systeme"

HK 64.4 Fr 15:00 HG III

Partonic offshell effects in next-to-leading order Drell-Yan processes at $\overline{\text{P}}$ANDA energies — •Fabian Eichstädt[1], Stefan Leupold[1,2], and Ulrich Mosel[1] — [1]Institut für Theoretische Physik, Universität Giessen — [2]Department of Physics and Astronomy, Uppsala University, Sweden

We investigate the effects of quark distributions of intrinsic transverse momentum and mass on the unpolarised production of Drell-Yan (DY) pairs. The standard leading-order parton model description has shortcomings: a K-factor is necessary to describe invariant mass spectra and no transverse momentum p_T is generated in this scheme [1]. In addition, e.g., $\overline{\text{P}}$ANDA at FAIR will measure at comparatively low hadron centre-of-mass energies of $\sqrt{s} \approx 5.5$ GeV [2]. Therefore nonpertubative effects are expected to play an important role. To address these issues we study a QCD-inspired phenomenological parton model which includes leading-order [3] and next-to-leading-order (NLO) production processes. We introduce mass distributions for the quarks to handle the divergencies of the NLO processes at $p_T \to 0$. Finally, fixing our phenomenological distributions at available data, our aim is to predict DY pair production at $\overline{\text{P}}$ANDA.
Supported by HIC for FAIR and GSI.

[1] S. Gavin et al., Int. J. Mod. Phys. **A10**, 2961 (1995).
[2] M. F. M. Lutz et al. (PANDA), **arXiv: 0809.2262** [hep-ex].
[3] F. Eichstädt et al., Phys. Rev. D in press, **arXiv:0909.4159** [hep-ph].

HK 64.5 Fr 15:15 HG III

Transverse Λ and $\overline{\Lambda}$ polarization with a transversely polarized proton target at COMPASS* — •DONGHEE KANG for the COMPASS-Collaboration — Institut für Kernphysik, Johannes Gutenberg Universität Mainz, D-55099 Mainz

The measurement of the transverse quark distribution functions $\Delta_T q(x)$ is an important part of the physics program of the COMPASS experiment at CERN. The transversity distributions, being chiral-odd objects, are not directly accessible in inclusive deep-inelastic scattering (DIS), but require the presence of another chiral-odd object. They can be measured in semi-inclusive deep-inelastic scattering (SIDIS), where this additional object is provided by the transversely polarized fragmentation functions $\Delta_T D_q^h(z)$. The most promising channels for the measurement of the transversity distributions in SIDIS are the Collins effect, the azimuthal asymmetries in two hadrons production and the transverse Λ polarization. The transverse Λ and $\overline{\Lambda}$ polarization can be studied by measuring the acceptance corrected angular distribution of its decay products. At COMPASS, the data on the Λ and $\overline{\Lambda}$ hyperons produced in SIDIS processes have been collected in 2007, using a beam of 160 GeV/c polarized μ^+ scattering off a NH_3 target. The preliminary results on the transverse Λ and $\overline{\Lambda}$ polarization as a function of x_{Bj} and z will be presented.
* This work is supported by the BMBF.

HK 64.6 Fr 15:30 HG III

Charge symmetry breaking in $pn \to d\pi^0$ — •Arseniy Filin[2,3], Vadim Baru[1,2], Evgeny Epelbaum[1,3,4], Johann Haidenbauer[1,5], Christoph Hanhart[1,5], Alexander Kudryavtsev[2], and Ulf-G. Meissner[1,3,4,5] — [1]Institut für Kernphysik (Theorie) and Jülich Center for Hadron Physics, Forschungszentrum Jülich, D-52425 Jülich, Germany — [2]Institute for Theoretical and Experimental Physics, 117218, B. Cheremushkinskaya 25, Moscow, Russia — [3]Helmholtz-Institut für Strahlen- und Kernphysik (Theorie), Universität Bonn, D-53115 Bonn, Germany — [4]Bethe Center for Theoretical Physics, Universität Bonn, D-53115 Bonn, Germany — [5]Institute for Advanced Simulation, Forschungszentrum Jülich, D-52425 Jülich, Germany

We study charge symmetry breaking (CSB) in the reaction $pn \to d\pi^0$. CSB manifests itself in a forward-backward asymmetry of the differential cross section measured recently at TRIUMF. A complete calculation of CSB effects at leading order in chiral perturbation theory is performed. A new leading-order operator is included. This allowed us to extract the strong contribution to the neutron-proton mass difference. The value obtained is consistent with the result of Gasser and Leutwyler based on Cottingham sum rule and an extraction from lattice QCD.

HK 64.7 Fr 15:45 HG III

Der elektrische Dipolformfaktor des Neutrons in chiraler Störungstheorie — •Konstantin Ottnad[1], Bastian Kubis[1], Ulf-G. Meissner[1,2] und Feng-Kun Guo[2] — [1]Helmholtz-Institut für Strahlen- und Kernphysik (Theorie) und Bethe Center for Theoretical Physics, Universität Bonn, D-53115 Bonn, Germany — [2]Institut für Kernphysik, Jülich Center for Hadron Physics and Institute for Advanced Simulation, Forschungszentrum Jülich, D-52425 Jülich, Germany

Das elektrische Dipolmoment des Neutrons erlaubt einen sensitiven Test CP-verletzender Effekte, insbesondere starker CP-Verletzung, welche durch den Vakuumwinkel θ_0 parametrisiert wird. Die Analyse des elektrischen Dipolformfaktors des Neutrons zu dritter Ordnung in kovarianter baryonischer chiraler Störungstheorie ermöglicht es, eine obere Schranke an $|\theta_0|$ anzugeben. Weiterhin wird die Quarkmassenabhängigkeit des elektrischen Dipolmoments und deren Vergleich mit Lattice QCD Daten diskutiert.