

HK 12: Hadronenstruktur und -spektroskopie IV

Time: Monday 16:30–19:15

Location: HS3

Group Report

HK 12.1 Mon 16:30 HS3

Zukünftige Messungen zur Struktur des Nukleons am COMPASS-Experiment — ●JOERG PRETZ — Physikalisches Institut, Universität Bonn — für die COMPASS Kollaboration

Nach einem Jahrzehnt Datennahme mit polarisierten Muonen und Hadronstrahlen zur Untersuchung der Spinstruktur des Nukleons und der Hadronspektroskopie tritt das COMPASS-Experiment in eine zweite Phase mit einem erweiterten Messprogramm zur Untersuchung der Struktur von Hadronen.

Neben Messungen zur Polarisierbarkeit liegt der Schwerpunkt auf tiefer gehenden Untersuchungen zur partonischen Beschreibung des Nukleons: Durch die Beobachtung der tief virtuellen Compton-Streuung (DVCS) $\mu + N \rightarrow \mu' + N' + \gamma$ lassen sich generalisierte Partonverteilungen (GPDs) bestimmen. Diese geben Aufschluss über die transversalen Aufenthaltswahrscheinlichkeiten von Partonen im Nukleon. Mithilfe des polarisierten Drell-Yan Prozess ($\pi + \vec{N} \rightarrow \mu^+ + \mu^- + X$) und semi-inklusive Muon-Nukleon Streuung ($\mu + \vec{N} \rightarrow \mu' + h + X$) können Transversalimpuls abhängige Partonverteilungen (TMDs) bestimmt werden. Im Vortrag werden diese Vorhaben vorgestellt.

HK 12.2 Mon 17:00 HS3

Messung des Protonen-Ladungsradius mit elastischer Elektronenstreuung* — ●JONNY BIRKHAN, ANDREAS KRUGMANN, PETER VON NEUMANN-COSEL, NORBERT PIETRALLA, IRYNA POLTORATSKA, INNA PYSMENETSKA, SARLA RATHI, ACHIM RICHTER, GERHARD SCHRIEDER und ARTEM SHEVCHENKO — Institut für Kernphysik, TU Darmstadt, Germany

Der Ladungsradius des Protons stellt eine elementare Größe in der Kernphysik dar, die beispielsweise für die Präzisionstests der QED erforderlich ist. Neueste Experimente mit Hilfe elastischer Elektronenstreuung am MAMI [1] und Messung des Lambshift myonischer Wasserstoffatome am PSI [2] weichen um 5σ voneinander ab. Ein alternatives Experiment wurde am Darmstädter Elektronenbeschleuniger S-DALINAC durchgeführt [3]. Um die Fehlerbeiträge verschiedener experimenteller Parameter zu reduzieren, wurden statt der Elektronen die Rückstoßprotonen über einen großen Winkelbereich mit Silizium-Detektoren simultan nachgewiesen. Die Energie der einfallenden Elektronen betrug etwa 80 MeV mit Impulsüberträgen zwischen 0.18 fm^{-1} und 0.72 fm^{-1} . Die Messmethode wird vorgestellt und im Zusammenhang mit den einzelnen Schritten der Datenanalyse diskutiert.

[1] M.O. Distler et al., arXiv:1011.1861v2.

[2] R. Pohl et al., Nature 466 (2010) 213.

[3] Inna Pysmenetska, Dissertation D17, TU Darmstadt (2009).

*Gefördert von der DFG im Rahmen des SFB 634

HK 12.3 Mon 17:15 HS3

Vector meson production and OZI violation at COMPASS — ●JOHANNES BERNHARD — für the COMPASS collaboration
Institut für Kernphysik Mainz, Johannes-Gutenberg-Universität
Johann-Joachim-Becher-Weg 45, 55099 Mainz

The COMPASS spectroscopy program with 190 GeV/c hadron beams in 2008 and 2009 focused mainly on questions related to mesonic resonances. The rich data set allows for precision studies on known resonances, as well as for a search of spin-exotic states and resonances with gluonic degrees of freedom. As a part of this program, we present a first analysis of vector meson production in $pp \rightarrow pXp$, where $X = \omega, \phi$ is detected within the same experimental setup and trigger configuration. The ratio of the differential cross sections of both channels allows to investigate the degree of a possible violation from the Okubo-Zweig-Iizuka rule, which has not been measured within this energy range before. The event selection, background estimation and angular dependencies will be discussed.

HK 12.4 Mon 17:30 HS3

Hard Exclusive ρ^0 Production to Constrain GPDs — ●KATHARINA SCHMIDT, MAX BÜCHELE, HORST FISCHER, FRITZ-HERBERT HEINSIUS, FLORIAN HERRMANN, TILLMANN GUTHÖRL, KAY KÖNIGSMANN, LOUIS LAUSER, ANDREAS MUTTER, FRANK NERLING, CHRISTIAN SCHILL, SEBASTIAN SCHOPFERER, and JOHANNES TER WOLBEEK — on behalf of the COMPASS Collaboration - Physikalisches Institut, Albert-Ludwigs-Universität Freiburg

Investigation of the spin structure of the nucleon via deep inelastic

scattering is a broad field of research. The recently developed theoretical framework of Generalized Parton Distributions (GPDs) provides a wealth of information concerning the nucleon. Additional to the longitudinal momentum information of partons they contain information on the transverse localization of the constituents. Furthermore they provide, via Ji's sum rule, access to the total angular momentum of quarks and gluons, a very important missing piece in understanding the spin structure of the nucleon. One possible physical channel to constrain GPDs is the exclusive production of ρ^0 mesons off a transversely polarized target. In 2007 first measurements were performed scattering a 160 GeV/c longitudinal polarized muon beam off a transversely polarized NH_3 target at the COMPASS experiment at CERN. The data taking was continued in 2010.

This talk gives an introduction to the analysis of exclusively produced ρ^0 mesons. Results for the transverse target single spin asymmetry $A_{UT}^{\sin(\phi-\phi_s)}$ are presented. Supported by BMBF, DFG and EU FP7.

HK 12.5 Mon 17:45 HS3

Hard exclusive vector-meson leptonproduction — ●MAYYA GOLEMBIOVSKAYA for the HERMES-Collaboration — DESY

The HERMES experiment at DESY, Hamburg collected a set of data on hard exclusive vector meson leptonproduction using the 27.6 GeV longitudinally polarized lepton/positron beam of the HERA accelerator and longitudinally or transversely polarized as well as unpolarized gas targets. Measurements of exclusive vector-meson production give possibility to study nucleon structure since the process can be described in terms of Generalized Parton Distributions (GPDs). Spin-density matrix elements (SDMEs) describe the final vector-meson spin state. Ratios of helicity amplitudes, connected with different SDMEs and various interaction types, are presented for ρ^0 production. A confirmation of contribution from unnatural-parity-exchange amplitudes are obtained from the analysis of these amplitude ratios. A deviation from the hypothesis of s-channel helicity conservation is observed, whereas results for ϕ production are in agreement with this hypothesis. Comparisons of experimental results with GPD model predictions are also presented.

HK 12.6 Mon 18:00 HS3

Analysis of diffractive dissociation of exclusive $K^-\pi^+\pi^-$ events in the high energetic hadron beam of the COMPASS-experiment — ●PROMETEUSZ JASINSKI — Institut für Kernphysik, Universität Mainz, Johann-Joachim-Becherweg 45, 55099 Mainz

In order to study the production of exotic mesons the COMPASS experiment at CERN took data with a 190 GeV/c hadron beam hitting a liquid hydrogen target in the years 2008 and 2009. The negative hadron beam contains mainly pions and a small fraction of about 2.5% of kaons. Kaons are identified using CEDAR PID detectors in the beamline. One of the channels of interest is diffractively produced resonance decaying into the $K^-\pi^+\pi^-$ final state. I will discuss the data selection and quality studies for this channel. The invariant mass spectra show already the well known resonances as the $K_1(1270)$ $K_1(1400)$ and the $K_2(1770)$. To disentangle all contributing resonances techniques of partial wave analysis are applied. A short review on this studies will be presented.

Supported by BMBF under the contract 06MZ224

HK 12.7 Mon 18:15 HS3

Diffractive and Coulomb Dissociation of pions into three charged pions at low momentum transfer at COMPASS — ●STEFANIE GRABMÜLLER — Technische Universität München, Physik-Department E18, James-Frank-Straße, 85748 Garching

COMPASS is a multi-purpose fixed-target experiment at the CERN SPS, that investigates the structure and spectroscopy of hadrons. Dissociation of pions on nuclear or hydrogen targets provides clean access to the light meson spectrum. During a short run with a 190 GeV/c π^- beam on lead in the year 2004, about 4 million exclusive $\pi^-\pi^-\pi^+$ events have been collected. For the 3 million events with low momentum transfer $t' < 0.01 (\text{GeV}/c)^2$, coherent scattering off the nucleus as a whole can be assumed, with contributions from Reggeon, Pomeron and photon exchange. For the lowest $t' < 0.001 (\text{GeV}/c)^2$, the photo-produced part becomes apparent.

The status of the partial-wave analysis of these data will be presented, focussing on new techniques for the extraction of the photo-produced contribution, to be compared to ChPT calculations.

This work is supported by BMBF, Maier-Leibnitz-Labor München and the DFG Cluster of Excellence Exc153.

HK 12.8 Mon 18:30 HS3

Offene Charm-Produktion mit 160 GeV Myonen im COMPASS-Experiment — ●MALTE WILFERT für die COMPASS-Kollaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Johann-Joachim-Becherweg 45, 55099 Mainz

Am COMPASS Experiment, am M2 Strahl des CERN SPS, wurden in den Jahren 2002 bis 2004 und 2006 Myonen mit 160 GeV an einem LiD Target gestreut. Einen Beitrag zur semi-inklusiven Streuung stellen Photon-Gluon-Fusions-Prozesse dar. Hier können auch Charm-Anticharmquarks entstehen, die als D-Mesonen über den Zerfall $D^* \rightarrow D^0 \pi \rightarrow K \pi \pi$ nachgewiesen werden. Die kinematischen Verteilungen der D^0 -Mesonen werden mit denen des Untergrundes verglichen und der semi-inklusive differentielle Wirkungsquerschnitt für die D^* Produktion in Abhängigkeit von ν , E_D , z und p_T^2 bestimmt. Die gemessenen Verteilungen werden mit Vorhersagen für reine Photon-Gluon-Fusion verglichen.

Unterstützt vom BMBF unter dem Vertrag 06MZ224

HK 12.9 Mon 18:45 HS3

Central diffractive meson production in p+p collisions at $\sqrt{s} = 7$ TeV at the ALICE experiment — ●XIANGUO LU for

the ALICE-Collaboration — Physikalisches Institut, Universität Heidelberg

The ALICE experiment is one of the four large experiments at the LHC. ALICE collected proton-proton collision data at $\sqrt{s} = 7$ TeV from 30 March to 4 November 2010. In this contribution, our first analysis results of central diffractive meson production with a signature of pseudo-rapidity gaps in the forward regions will be presented. The measurement reconstructs the invariant mass spectrum from events with two pions in the central barrel, and the pseudo-rapidity gap is identified as null activity in the forward detectors. With current statistics, an enhancement of $f_0(980)$ and $f_2(1270)$ in double-gap events is seen.

HK 12.10 Mon 19:00 HS3

Deeply-virtual Compton scattering measured with the recoil detector at HERMES — ●IRINA BRODSKI for the HERMES-Collaboration — II. Physikalisches Institut JLU Gießen, Deutschland

The HERMES experiment at DESY was originally designed to study the spin structure of the nucleon in semi-inclusive deep inelastic scattering. By adding a recoil detector, Hermes is able to measure recoiling protons and backward pions and thus is able to measure the complete kinematics of certain exclusive reactions. One of the most interesting exclusive reactions is Deeply-virtual Compton scattering, as it gives a direct access to certain Generalized Parton Distributions (GPDs) of the nucleon. This talk will report on recent measurements of spin and charge asymmetries of DVCS processes at HERMES.