

## HK 37: Hadron Structure and Spectroscopy VI

Zeit: Mittwoch 16:30–18:30

Raum: HZO 50

**Gruppenbericht**

HK 37.1 Mi 16:30 HZO 50

**Production of pseudoscalar mesons in proton-deuteron fusion with WASA-at-COSY** — ●NILS HÜSKEN, KAY DEMMICH, and ALFONS KHOUKAZ for the WASA-at-COSY-Collaboration — Westfälische Wilhelms-Universität Münster

The production of pseudoscalar mesons in the proton-deuteron fusion to  ${}^3\text{He}X$  final states has received considerable interest in the past. In the production of  $\eta$  mesons, a strong final state interaction leads to an unexpected enhancement of the total cross section right at the production threshold. While this effect has been studied extensively already, the main production mechanism remains largely unexplored. A new dataset gathered with the WASA experiment, located inside the COSY accelerator complex, at 15 different excess energies between  $Q_\eta = 13$  MeV and  $Q_\eta = 81$  MeV (corresponding to  $p_p = 1.60$  GeV/c up to  $p_p = 1.74$  GeV/c) provides new insight both in the transition region where the final state interaction loses its importance, as well as into the region where the production mechanism is dominant. In addition, also the production of pions is studied. Within the accessible energy region, thus far only data for collinear single-pion production exists, exhibiting significant structures in both the cross section as well as in the contributing amplitudes and the tensor polarization in the backward direction. With the new dataset, a large part of the backward hemisphere is covered and detailed differential cross sections are extracted. This marks the first time, such data is available in this energy region. Recent results on both the  $\eta$  and the  $\pi^0$  production will be reported and an outlook will be given on future possibilities.

HK 37.2 Mi 17:00 HZO 50

**Helicity dependence of single neutral pion photoproduction on deuteron** — ●FEDERICO CIVIDINI for the A2-Collaboration — Institut für Kernphysik - Universität Mainz

During the pion production reaction, the nucleon is excited to an intermediate resonant state, and a complete analysis of the experimental data gives a determination of the main properties of the baryon resonances. A detailed knowledge of the spectrum of nucleon excited states gives essential constraints on models for nucleon structure. The data for the observables accessible using a polarised photon beam and/or polarised nucleon targets are scarce in many channels, especially in those induced on the neutron. A systematic measurement of all different observables is under way at the Mainz facility by the A2@MAMI collaboration.

This talk will focus on the measurement performed at the Mainz Microtron using a circularly polarised photon beam and longitudinally polarised proton and deuteron target in combination with the large acceptance Crystal Ball/TAPS detection setup. An overview of the status of the experiment will be given together with the preliminary results of the helicity asymmetry of the single  $\pi^0$  photoproduction reaction from the deuteron target.

Supported by DFG under contract SFB1044

HK 37.3 Mi 17:15 HZO 50

**Proton Time-Like Electromagnetic Form Factor Measurement with the Scan Method at BESIII** — ●CHRISTOPH ROSNER<sup>1</sup>, SAMER AHMED<sup>1</sup>, ALAA DBEYSSI<sup>1</sup>, PAUL LARIN<sup>1</sup>, DEXU LIN<sup>1</sup>, FRANK MAAS<sup>1,2,3</sup>, CRISTINA MORALES<sup>1</sup>, and YADI WANG<sup>1</sup> for the BESIII-Collaboration — <sup>1</sup>Helmholtz-Institut Mainz, Mainz, Germany — <sup>2</sup>Institute of Nuclear Physics, Mainz, Germany — <sup>3</sup>PRISMA Cluster of Excellence, Mainz, Germany

Electromagnetic form factors (FF) provide valuable insight to the internal structure and dynamics of the proton. While they are well known in the space-like region through electron scattering experiments, the time-like region, typically accessed by annihilation experiments, is known with much less precision. Specifically the separation of the electric and magnetic FF has only been possible with low accuracy due to the low luminosity of previous data.

This contribution reports on the analysis based on 651 pb<sup>-1</sup> scan data taken at 22 energy points between 2.0 and 3.08 GeV with the Beijing Spectrometer III (BESIII) at the Beijing Electron Positron Collider II (BEPICII). The efforts to extract both the cross section of  $e^+e^- \rightarrow p\bar{p}$  as well as the individual electric and magnetic FF are presented.

HK 37.4 Mi 17:30 HZO 50

**Search for polarization in the antiproton production process** — ●DOMINIKA ALFS — Institut für Kernphysik, Forschungszentrum Jülich, Germany — Institute of Physics, Jagiellonian University, Kraków, Poland

A wide range of fundamental effects in the hadronic sector can be investigated only by means of controlling the spin degrees of freedom. However, for the time being, there is no convenient method for the production of a well-defined polarized antiproton beam with high intensity [1].

An alternative approach towards this problem would be possible if antiprotons had a non zero polarization degree when produced but until now there were no experimental studies in this direction. Such an experiment has been performed at the CERN/PS complex in order to test whether the production process under conditions typical for the antiproton beam preparation can be itself a source of polarization [2].

The polarization is measured by the asymmetry of elastic antiproton scattering on a liquid hydrogen target in the Coulomb-nuclear interference region with the expected analyzing power  $A_y$  equal to about 4.5% [2].

The experimental setup will be presented and the status of the ongoing analysis will be shown. Furthermore, plans for the forthcoming measurement with upgraded detector components will be explained.

[1] E. Steffens, AIP Conf. Proc. 1149, 80-89 (2009)

[2] D. Grzonka, et. al., Acta Phys. Polon. B 46 191 (2015)

HK 37.5 Mi 17:45 HZO 50

**Measurement of the time-like  $\pi^0$  transition form factor at BESIII** — ●THOMAS LENZ, ACHIM DENIG, and CHRISTOPH FLORIAN REDMER for the BESIII-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

Transition form factors of light pseudoscalar mesons play an important role in the calculations of hadronic contributions to the anomalous magnetic moment of the muon. The BESIII experiment at the  $e^+e^-$  collider BEPCII in Beijing has collected more than 10 fb<sup>-1</sup> of data at energies above 3.773 GeV. Based on these data the process  $e^+e^- \rightarrow \pi^0\gamma$  is studied. The analysis aims at the determination of the transition form factor of the  $\pi^0$  in a region of momentum transfer above 14 GeV<sup>2</sup>, which will also help to shed light on the discrepancy between results of the BaBar and Belle measurements in the space-like regime. In this presentation we will give an overview of the current status of the analysis.

Supported by DFG (SFB 1044).

HK 37.6 Mi 18:00 HZO 50

**Analysis of  $e^+e^- \rightarrow p\bar{p}X$ ,  $X = \eta, \omega, \phi$**  — ●MARCEL RUMP, JOHANNES BLOMS, NILS HÜSKEN, ALFONS KHOUKAZ, and FREDERIK WEIDNER for the BESIII-Collaboration — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, 48149 Münster, Germany

Since the discovery of the X(3872) state by the BELLE experiment in 2003, a large number of new states was found in the mass region around 4 GeV/c<sup>2</sup>, which apparently do not fit into the scheme of conventional charmonium states. The possibility that some of these states could be of exotic nature has raised interest on charmonium physics to a new level. Investigations of the type  $e^+e^- \rightarrow p\bar{p}X$  have recently been started using the datasets collected with the Beijing Spectrometer III (BESIII) in positron-electron annihilations at the Beijing Electron-Positron Collider (BEPICII) in the energy region between  $\sqrt{s} = 3.8$  GeV/c<sup>2</sup> and  $\sqrt{s} = 4.6$  GeV/c<sup>2</sup>. Systematic searches can be performed on heavy resonances decaying to  $p\bar{p}X$  as well as decays via different nucleon resonances. In this talk, preliminary results of the analyses of the channels  $e^+e^- \rightarrow p\bar{p}\eta$ ,  $e^+e^- \rightarrow p\bar{p}\omega$  and  $e^+e^- \rightarrow p\bar{p}\phi$  will be presented. Data selection, background analysis and the extraction of cross sections will be discussed.

HK 37.7 Mi 18:15 HZO 50

**Suche nach charmonium-artigen Zuständen im Reaktionskanal  $e^+e^- \rightarrow \pi^+\pi^-\chi_{c,J}$  bei BESIII** — ●PATRIC KIESE<sup>1</sup> und MIRIAM FRITSCH<sup>2</sup> für die BESIII-Kollaboration — <sup>1</sup>Helmholtz-Institut Mainz — <sup>2</sup>Ruhr-Universität Bochum

Seit der Entdeckung der ersten Charmonium-Zustände vor über 10 Jahren wurde eine ganze Reihe von Zuständen (XYZ) entdeckt, wel-

che entweder keinen Platz im Charmonium-Spektrum finden oder unerwartete Eigenschaften haben, wie eine sehr schmale Linienform. Beides könnte damit zusammenhängen, dass diese Zustände komplizierter aufgebaut sind als einfache Mesonen. Nur die geladenen  $Z$ -Zustände müssen auf jeden Fall eine exotische, innere Struktur aufweisen. Da Charmonium-Zustände elektrisch neutral sind, muss die Ladung der  $Z_c(3900)$ -Resonanz durch zwei weitere Quarks erzeugt werden. Die Entdeckung des ersten geladenen  $Z_c$  bei BESIII mit Bestätigung dieses Zustandes durch andere Experimente und dem anschließenden Nachweis des ladungsneutralen Partners beschreibt ein komplettes Isospin

Triplet, dessen Zustände nach  $\pi^{\pm/0}\chi_{cJ}$  ( $J = 0,1, 2$ ) zerfallen. Mit dem BESIII-Experiment am BEPCII-Speicherring in Beijing wurde eine große Menge Daten bei Schwerpunktsenergien oberhalb von 4 GeV aufgezeichnet. Die sechs Datensätze mit der höchsten Luminosität werden in der vorgestellten Analyse verwendet, um nach weiteren charmonium-artigen Zuständen im Reaktionskanal  $e^+e^- \rightarrow \pi^+\pi^-\chi_{cJ}$  zu suchen. Es wird eine Struktur im  $\pi^{\pm}\chi_{cJ}$  Subsystem des Reaktionskanals vermutet. Es werden grundlegende Analyse-Strategien anhand von Monte Carlo Studien vorgestellt und erste Ergebnisse präsentiert.