HK 43: Hadronenstruktur und -spektroskopie VIII

Time: Wednesday 16:30–19:00 Location: HS3

HK 43.1 Wed 16:30 HS3

Produktion geladener Pionen in p+Nb Reaktionen bei E_{kin}=3,5 GeV/c^2* — •Michael Weber[1], Pavel Tlusty[2] und Jürgen Friese[1] — [1]Physik Dept. E12, Technische Universität München, 85748 Garching, Deutschland — [2]Nuclear Physics Institute, Academy of Sciences of Czech Republic, 25068 Rez, Czech Republic

Die Dielektronen-Emissivität von Kernmaterie bei Grundzustandsdichte und -temperatur erlaubt den Zugang zu In-Medium Hadroneneigenschaften und wird mit dem HADES Experiment u.a. durch die Messung der inklusiven e^+e^- Produktion in p+p und p+Nb Stößen bei E_{kin} = 3,5 GeV/c^2 untersucht. Im Hinblick auf die Produktion der e^+e^- - Quellen und ihrer möglichen Reabsorption kann ein quantitativer Vergleich der Systeme sowohl untereinander als auch mit Modellrechnungen über die Normierung auf die wesentlich stärkere und besser bekannte Produktion geladener Pionen erfolgen. Wir haben daher die mit HADES gemessene Pionenproduktiom in p+Nb Kollisionen analysiert und mit den Daten der HARP Kollaboration [1] verglichen. Wir präsentieren vorläufige Transversalimpuls- und Polarwinkelverteilungen und die Extraktion des Normierungsfaktors für die Dielektronenspektroskopie.

[1] A. Bolshakova et al., EPJ**C 64**, 181-241 (2009).
* supp. by BMBF(06MT9156), GSI, DFG (Exc.-Clust. 153-Universe)

HK 43.2 Wed 16:45 HS3

K^0_s Production in p+p and p+Nb Reactions at 3.5 GeV with HADES — •Jia-Chii Chen for the HADES-Collaboration — Excellence Cluster "Universe", TU München, Boltzmannstr. 2, 85748 Garching, Germany

Recent results on the kaon-nucleon (KN) interaction have pointed out a repulsive in-medium potential of kaons at normal nuclear density. Nevertheless different values of the KN potential were obtained varying from 20±5 MeV [1] to ∼39 MeV [2]. To contribute to the understanding of the KN potential the K^0_s meson production was investigated for p+p and p+Nb reactions measured at a kinetic beam energy of 3.5 GeV with the HADES set-up (GSI, Darmstadt). An overall statistics of $1.2 \cdot 10^9$ and $4.2 \cdot 10^9$ events has been collected respectively. A comparison of the measured K^0_s transverse momentum spectra from p+p and p+Nb reactions provides information about possible effects caused by the K^0_s potential in cold nuclear matter. In particular, the high statistics collected in the low-momentum region down to 30 MeV/c is fundamental to unravel the effects of the potential.
The main steps of the inclusive analysis will be discussed and transverse momentum as well as transverse mass spectra will be presented for both reactions.
[1]M.L. Benabderrahmane et al. (FOPI), Phys. Rev. Lett. 102, 182501 (2009)
[2]G. Agakishiev et al. (HADES), Phys. Rev. C 82:044907 (2010)

HK 43.3 Wed 17:00 HS3

Search for ppK^--state in p-p@3,1 GeV — •Robert Münzer for the FOPI-Collaboration — Excellence Cluster Universe, TU-München, Boltzmannstrasse 2, D-85748 Garching

The investigation of the kaon-nucleon interaction has been intensified in the last year thanks to new results on Λ(1405) (1,2) and indication on the existance of the ppK^- bound state (3).
At the FOPI Specrometer at GSI we are investigating the possible creation of the ppK^- state in proton-proton-collisions at 3.1 GeV. This reaction should favour the formation of the ppK^-, according to some theoretical predictions (4).
The experiment was carried out with a 3.1 GeV proton beam focused on a 2cm LH_2-Target. Additional to the FOPI Setup, a silicon detector system was used to enhance events containing Λ and improve the tracking in the target region. About $100 \cdot 10^6$ events were collected after the second level trigger selection.
This contribution will show the actual status of the analysis with a particular focus on the techniques used to improve momentum resolution by particle tracking and the reconstruction of Λs in the forward direction.
(1) J. Siebenson, L. Fabbietti / in press.
(2) K. Moriya, R. Schumacher / arXiv:0911.2705v1
(3) T. Yamazaki, M. Maggiora, P. Kienle / PRL 104 / 132502 (2010)
(4) T. Yamazaki, Y. Akaishi / PRC 76 / 045201 (2007)

HK 43.4 Wed 17:15 HS3

Search for ω-mesic nuclei* — •Karoly Makonyi and Stefan Friedrich for the CBELSA/TAPS-Collaboration — II. Physikalisches Institut, Heinrich-Buff-Ring 16, 35392 Giessen

The existence and properties of ω-mesic nuclei are being studied with the tagged photon beam of the ELSA accelerator in Bonn. The combined setup of the Crystal Barrel and MiniTAPS detector systems, which form a 4π electromagnetic calorimeter, was used for detecting the possible ω-mesic states via the $\omega \to \pi^\circ + \gamma$ decay mode and the conversion ($\omega + N \to N^* \to \pi^0 + N$) mode. The recoiling proton of the $\gamma + p \to \omega + p$ reaction was identified with an aerogel Cherenkov detector and the forward angle spectrometer MiniTAPS. A first experiment on a carbon target has been performed as well a reference measurement on LH_2. The status of the analysis will be presented.
* Supported by DFG (SFB/TR16)

HK 43.5 Wed 17:30 HS3

Strange Baryons Below The $\bar{K}N$ Threshold — •Eliane Epple for the HADES-Collaboration — Excellence Cluster "Universe", TU München, Boltzmannstr. 2, 85748 Garching, Germany

A detailed analysis of strange baryon resonances, reconstructed with the **H**igh **A**cceptance **Di**-**E**lectron **S**pectrometer (HADES), in proton-proton collisions will be presented.

The talk focuses on the results of the Λ(1405) and Σ(1385) reconstruction in a p+p reaction with a kinetic beam energy of 3.5 GeV. The investigation of differential cross sections and resonance line shapes can deliver information about the production mechanism and the inner structure of these resonances [1,2]. Especially interesting is an insight into the inner structure of the Λ(1405), which is treated as a dynamically generated resonance with the main contributing channels $\Sigma\pi$ and $\bar{K}N$. Since the pole mass of this resonance is just below the $\bar{K}N$ threshold its behaviour depends sensitively on the relative strength of these two channels and their coupling to the production mechanism. To extract these information from the Λ(1405) a rich database in production and decay channels is needed, as provided by the HADES data.
[1] D. Jido et al., Nucl. Phys. A725 (2003) 181.
[2] T. Hyodo et al., Mod. Phys. Lett. A23 (2008) 2393.

HK 43.6 Wed 17:45 HS3

Determination of the upper limit of the forbidden η decay $\eta \to \pi^0 + e^+ + e^-$ with WASA-at-COSY — •Florian Bergmann, Alexander Winnemöller, Kay Demmich, Paul Goslawski, Christina Husmann, Alfons Khoukaz, Annika Passfeld, Tobias Rausmann, and Alexander Täschner for the WASA-at-COSY collaboration — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster

One main focus of the experimental program of the WASA-at-COSY facility is the investigation of symmetries and symmetry breakings to get a better understanding of the fundamental interaction physics. Since violations of conservation laws are directly connected to symmetry breaking effects, studies of rare meson decays are of high importance. In this connection the η-meson is of paticular interest. Precision measurements of rare η decays can be used to get new limits on the breaking of the fundamental C, P, and T symmetries, or combinations thereof. In this contribution we will present and discuss studies of the C-violating η decay $\eta \to \pi^0 + e^+ + e^-$ using the WASA-at-COSY facility. The dominant C conserving contribution to the decay is via a $\pi^0 + \gamma^* + \gamma^*$ intermediate state with an expected branching ratio of approximately 10^{-8}. An observation of a significantly higher branching ratio would, therefore, be an indication of physics beyond the standard model. The status of the analysis will be presented and discussed.

Supported by COSY-FFE

HK 43.7 Wed 18:00 HS3

Measuring $\eta \to \pi^+\pi^-e^+e^-$ with WASA-at-COSY — •Daniel Coderre[1,2] and James Ritman[1,2] for the WASA-at-COSY-Collaboration — [1]Institut für Kernphysik and Jülich Center for Hadron Physics, Forschungszentrum Jülich, Germany — [2]Institut für Experimentalphysik, Ruhr Universität Bochum, Germany

The analysis of the rare decay $\eta \to \pi^+\pi^-e^+e^-$ has two purposes: measurement of the branching ratio and probing of a possible non standard model CP violation observable in the decay system. Existing experimental results on the branching ratio are not in agreement with modern theories, but the high rates of η production at WASA-at-COSY will allow a statistically significant sample to be identified and a precise determination of the branching ratio to be made. Additionally, it has been postulated that the asymmetry between the electron and π decay planes in the η reference frame may be an observable for CP violation outside the standard model. Currently the upper limit for this asymmetry is about 1%.

We have recorded about 3x10^7 η-mesons produced with the reaction pd $\to{}^3$Heη as well as about 10^8 η-mesons produced with the reaction pp $\to$ ppη just above the kinematic threshold. A clean sample of signal event candidates has been identified in the proton-deuteron data allowing a preliminary determination of the total branching ratio. The decay has also been observed in higher-statistic proton-proton data though the analysis of this data is in its early stages. The presentation will focus on the current results as well as on the analysis techniques.

Supported by COSY-FFE

HK 43.8 Wed 18:15 HS3

Analysis of the $\eta \to e^+e^-e^+e^-$ double Dalitz decay — •Patrick Wurm for the WASA-at-COSY-Collaboration — Institut für Kernphysik and Jülich Center for Hadron Physics, Forschungszentrum Jülich, Germany

The *Wide Angle Shower Apparatus* detector (WASA) – operated at the *Cooler Synchrotron* (COSY-Jülich) – is a large-acceptance detector to study the decay channels of light mesons ranging up into the strange quark sector. A large number of η-mesons is being produced in proton-deuteron and proton-proton collisions. The huge amount of data permits the study of very rare η-decay channels. One of these channels is the double Dalitz decay, where the η-meson decays via two virtual photons into two electron-positron pairs. By introducing the Form Factor, this decay can be related to the QED process, where the η-meson decays into two real photons. The Form Factor depends on the squared invariant mass of the lepton pairs and allows one to study the structure of the decay mechanism.

Currently, there is only an experimental upper limit for the branching ratio. One objective of the WASA-at-COSY experiment is to reduce the upper limit for this decay channel or to determine a finite value of the branching ratio. The status of two independent analyses of this challenging decay based on an amount of in total 30×10^6 η-mesons from pd-interactions and preliminary results will be presented.

HK 43.9 Wed 18:30 HS3

Investigation of the Dalitz decay of the η and the π^0-meson and determination of the η form factor — •Henning Berghäuser and Volker Metag for the A2-Collaboration — II. Physikalisches Institut Universität Giessen, Germany

The Dalitz decays of the pion ($\pi^0 \to e^+e^-\gamma$) and the η-meson ($\eta \to e^+e^-\gamma$) have been investigated in photon-nuclear reactions with the Crystal Ball and TAPS detector setup at MAMI-C in Mainz. The Dalitz events were identified in an exclusive analysis exploiting the full kinematic information. Higher statistics than in previous measurements of this decay channel allowed to determine the electromagnetic transition form factor of the η-meson. Furthermore the branching ratios of the decays $\eta \to e^+e^-\gamma$ and $\eta \to \pi^+\pi^-\pi^0$ were measured relative to the two strongest neutral decay modes $\eta \to \gamma\gamma$ and $\eta \to 3\pi^0$.

Supported by DFG (SFB/TR16)

HK 43.10 Wed 18:45 HS3

Investigation of the ^{3}He$+\eta$ final state at 49 and 60 MeV excess energy* — •Annika Passfeld, Florian Bergmann, Kay Demmich, Paul Goslawski, Christina Husmann, Alfons Khoukaz, Tobias Rausmann, Alexander Täschner, and Alexander Winnemöller — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster

The excitation function of the pd $\to{}^3$He$+\eta$ reaction shows remarkable features close to the production threshold. Within the first 1 MeV of excess energy the total cross section rapidly increases to a maximum which can be attributed to a possible η bound state. Within the next 100 MeV excess energy the total cross section was observed to be almost constant. However, data provided by the COSY-GEM collaboration indicate a possible enhancement at $Q = 49$ MeV. Therefore, new data with high statistics have been taken at the WASA-at-COSY facility at $Q = 49$ MeV as well as at 60 MeV to investigate this situation in detail. Total and differential cross sections have been determined. The obtained results will be presented and compared to existing data.

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