

HK 39: Hadronenstruktur und -spektroskopie

Zeit: Donnerstag 16:30–19:00

Raum: RW 2

Gruppenbericht

HK 39.1 Do 16:30 RW 2

Kaon pair production in pp, pd, dd and pA collisions at COSY — ●MICHAEL HARTMANN¹, ANDREY POLYANSKIY¹, and QIUJIAN YE^{1,2} for the ANKE-Collaboration — ¹Institut für Kernphysik, Forschungszentrum Jülich, 52425 Jülich, Germany — ²Physics Department, Duke University, Durham, NC 27708, USA

The near-threshold production of ϕ -mesons decaying into K^+K^- , as well as non-resonant ($K\bar{K}$) pairs, has been investigated in proton-proton, proton-deuteron and deuteron-deuteron collisions at the Cooler Synchrotron COSY. These data are sensitive to some of the interactions in the Kp , $K\bar{K}$, and ϕp channels. Studies of ϕ production in proton-nucleus collisions have also been recently undertaken. A review of the results obtained over the last few years will be given, together with a forward look on the ongoing investigations.

Supported by DFG and the COSY-FFE program.

HK 39.2 Do 17:00 RW 2

Strangeness production in antiproton-nucleus reactions — ●ALEXEI LARIONOV^{1,2}, THEODOROS GAITANOS¹, and ULRICH MOSEL¹ — ¹Institut für Theoretische Physik, Universität Giessen, Germany — ²Russian Research Center Kurchatov Institute, Moscow, Russia

The future PANDA experiment at FAIR has a strong potential to study particle production in \bar{p} -nucleus collisions. We perform the Giessen Boltzmann-Uehling-Uhlenbeck model simulations of \bar{p} -nucleus interactions at the beam momenta from zero to about 10 GeV/c [1,2]. The different mechanisms of the hyperon and hypernuclei production are studied, including the $\Lambda\Lambda$ hypernuclei production by Ξ^- interactions with a secondary target. We find a systematic overprediction of experimental data on K_S^0 production in our calculations, in-particular, for light targets. The $\Lambda + \Sigma^0$ hyperon yields are described rather well. Their rapidity spectra at several GeV/c beam momentum are shown to be quite sensitive to the hyperon-nucleon cross sections. Finally, we discuss the Ξ ($S=-2$) hyperon production and argue that the Ξ^- rapidity spectra can serve as a very sensitive test for a hypothetical QGP-fireball scenario of \bar{p} annihilation on a nucleus.

Work supported by BMBF.

[1] A.B. Larionov, T. Gaitanos, U. Mosel, arXiv:1107.2326

[2] T. Gaitanos, A.B. Larionov, H. Lenske, U. Mosel, arXiv:1111.5748

HK 39.3 Do 17:15 RW 2

Reconstruction of the $pp \rightarrow nK^+\Sigma^+$ reaction at COSY-TOF — ●PAWEŁ KLAJA for the COSY-TOF-Collaboration — Erlangen-Nuremberg University

The COSY-TOF detector setup was upgraded with a new tracking system. A high statistics measurement with this setup in August 2010 was dedicated to hyperon production with a polarized proton beam of 2.95 GeV/c momentum. The main goal of this measurement was to measure the spin triplet $p\Lambda$ scattering length, the spin transfer coefficient of the $pp \rightarrow pK^+\Lambda$ reaction and the investigation of N^* resonances.

In addition the $pp \rightarrow nK^+\Sigma^+$ reaction is examined at an excess energy of $Q = 128.7$ MeV.

The current status of the data analysis in view of $pp \rightarrow nK^+\Sigma^+$ reaction identification will be presented. The procedure of data selection as well as the reconstruction method will be discussed.

Supported by FZ-Jülich.

HK 39.4 Do 17:30 RW 2

Endzustandswechselwirkung und Polarisationsobservablen im Prozess $\bar{p}p \rightarrow pK\Lambda$ — ●MATTHIAS RÖDER, PETER WINTZ, and JAMES RITMAN for the COSY-TOF-Collaboration — Forschungszentrum Jülich

Ein Straw Tube Tracker (STT) wurde im COSY-TOF Detektor installiert. Damit wird für die vollständige Rekonstruktion der Reaktion $\bar{p}p \rightarrow pK\Lambda \rightarrow pKp\pi$ eine Nachweiswahrscheinlichkeit von 20% erreicht und somit gegenüber dem alten Experimentaufbau vervierfacht. Die Auflösung der rekonstruierten $p\Lambda$ invarianten Masse beträgt nun $\sigma = 1,1$ MeV/c².

Diese Präzision ermöglicht, zum ersten Mal an COSY-TOF, die Bestimmung der effektiven $p\Lambda$ -Streulänge anhand von Endzustandswechselwirkungen. In Kombination mit dem polarisierten Protonenstrahl kann die Spin-Triplett Streulänge mit Hilfe der Kaon Analysierstärke extrahiert werden. In diesem Vortrag werden die Ergebnisse der er-

sten Strahlzeit mit dem STT vorgestellt. Der Strahlimpuls betrug 2,95 GeV/c und die Strahlpolarisation 60%.

Desweiteren ermöglicht die volle azimutale Akzeptanz und Symmetrie des COSY-TOF Detektors in Verbindung mit dem polarisierten Protonenstrahl und dem selbstanalysierenden Λ -Zerfall die Bestimmung einer Vielzahl von Polarisationsobservablen. Dieser Vortrag konzentriert sich auf die Λ -Depolarisation. Diese trägt zum Verständnis des Produktionsprozesses bei und konnte bisher außer von COSY-TOF nur vom DISTO Experiment nahe an der Schwelle gemessen werden.

HK 39.5 Do 17:45 RW 2

Study of the $pn \rightarrow K^+n\Lambda$ reaction near threshold — ●YURY VALDAU for the ANKE-Collaboration — Forschungszentrum Jülich, Leo-Brandt-Strasse, 52428 Jülich, Germany — Helmholtz-Institut für Strahlen- und Kernphysik, Nussallee 14-16, 53115 Bonn, Germany

A significant data base on kaon production in pp collisions has been accumulated over the last few years. In contrast, there is very little information about close-to-threshold K^+ production in pn interactions.

At ANKE-COSY the energy dependence of $K^+\Lambda$ production in quasi-free pn interactions in a deuterium target has been studied during a dedicated beam-time in March 2011. In this measurement, two Silicon Tracking Telescopes (STTs) were used to identify spectator protons and determine the excess energy. The proton beam momentum (2.6 GeV/c) was optimized to favour in the STT only protons associated with the $pn \rightarrow K^+n\Lambda$ reaction. The identification in coincidence of a single K^+ in the ANKE positive detector system is sufficient for the total cross section determination. The kaon identification at ANKE was done using the so-called delayed-veto technique, which allows measurements of inclusive K^+ production even if the background from π^+ and protons is 10^5 higher. In addition to data on the $pn \rightarrow K^+n\Lambda$ reaction, calibration data on a hydrogen target will allow one to judge the feasibility of studying the $n\Lambda$ final-state interaction using the ANKE magnetic spectrometer.

The status of the analysis and experimental results will be presented.

Supported by the COSY-FFE program.

HK 39.6 Do 18:00 RW 2

Recent Results from the Measurement of Polarization Observables in the $\bar{p}p \rightarrow pK^+\Lambda$ Reaction at COSY-TOF — ●FLORIAN HAUENSTEIN for the COSY-TOF-Collaboration — Universität Erlangen-Nürnberg

The COSY-TOF detector setup was recently upgraded with a new tracking system including a Straw Tube Tracker (STT). This upgrade increases the reconstruction efficiency and the precision of the event reconstruction significantly. Together with the polarized beam it allows to determine the spin triplet $p\Lambda$ scattering length. Also the production mechanism of the $\bar{p}p \rightarrow pK^+\Lambda$ reaction can be studied from polarization observables and the Dalitz plot. The latter can especially be used to determine contributions of N^* resonances.

Data from 2010 at 2.95 GeV/c beam momentum has already been analyzed. In fall 2011 a dedicated measurement with a polarized proton beam of 2.70 GeV/c momentum was performed to investigate the $p\Lambda$ final state interaction in detail.

In this talk the status of the analysis for this recent data will be presented.

Supported by FZ-Jülich.

HK 39.7 Do 18:15 RW 2

Hyperon production in the reactions $pn(p) \rightarrow K^0\Lambda p(p)$ and $pp \rightarrow K^+\Lambda p$ — ●MARTIN KRAPP, WOLFGANG EYRICH, and FLORIAN HAUENSTEIN for the COSY-TOF-Collaboration — Universität Erlangen-Nürnberg

The near threshold production of hyperons by using a liquid hydrogen target is one of the main topics studied at the time-of-flight spectrometer COSY-TOF. Up to now the reactions $pp \rightarrow K^+\Lambda p$, $K^0\Sigma^+p$ and $K^+\Sigma^0p$ have been investigated in detail and led to an essential information gain about the reaction mechanism. In order to achieve more complete information about hyperon production near threshold in nucleon-nucleon reactions, the investigation has been extended to pn reactions by using a liquid deuterium target. The current status of the analysis of the reaction channel $pn(p) \rightarrow K^0\Lambda p(p)$ will be presented. This includes reconstruction techniques, preliminary results from real

data as well as Monte Carlo simulation including Fermi motion. The achieved cross section is compared to theoretical predictions and related reaction channels.

Supported by BMBF and FZ Jülich.

HK 39.8 Do 18:30 RW 2

Results for the $K^0\Sigma^+$ photoproduction off the proton in the energy range from threshold to 2250 MeV — ●O. JAHN for the CBELSA/TAPS-Collaboration — Physikalisches Institut, Nussallee 12, Bonn

The reaction $\gamma + p \rightarrow K^0 + \Sigma^+$ is studied in the photon energy range from threshold to 2250 MeV at the electron accelerator facility ELSA, Bonn. The differential cross section shows increasing forward-peaking with rising photon energy up to K^* threshold exhibiting a sudden flattening and drop by a factor of four above this threshold. This results in a pronounced structure in the total cross section which may hint to a change from t -channel exchange below K^* threshold to an s -channel mechanism above this threshold. In addition, results for the photon beam asymmetry Σ and the recoil polarization P are presented and

discussed. Gefördert durch die / supported by the DFG (SFB/TR-16)

HK 39.9 Do 18:45 RW 2

Study of Σ^+ hyperon production with the upgraded COSY-TOF detector — ●ROMAN DZHYGADLO, ALBRECHT GILLITZER, EDUARD RODEBURG, and JAMES RITMAN for the COSY-TOF-Collaboration — Forschungszentrum Jülich, Germany

Within the COSY-TOF hyperon production studies the reaction $\vec{p}p \rightarrow pK_s^0\Sigma^+$ was measured. The reaction products of the interaction of a 2.95 GeV/c polarized proton beam with a liquid hydrogen target were detected by the COSY-TOF detector. The azimuthal symmetry and large acceptance of the detector as well as an excellent tracking capability introduced by silicon quirl and straw tube trackers allows measuring the complete $pK_s^0\Sigma^+$ final state distribution. A new event reconstruction algorithm was developed to gain maximum reconstruction efficiency. All steps were controlled by Monte Carlo simulations.

The results including the tree-body final state distribution and polarization observables (P, A_N, D_{NN}) will be presented.