HK 80: Hadron Structure and Spectroscopy I

Time: Friday 11:00–12:45 Location: H-ZO 20

HK 80.1 Fr 11:00 H-ZO 20

Simulations of Antihyperon-hyperon Physics for PANDA — •Erik Thome for the PANDA-Collaboration — Uppsala University

At high energies the strong force is well described using quarks and gluons as degrees of freedom, while at lower energies hadronic degrees of freedom are more adequate. The PANDA energy regime is in the transition region between these two descriptions. $p\bar{p} \to Y\bar{Y}$ is a good reaction to test models based on these two alternative viewpoints. The weak decay of the hyperons gives direct access to spin degrees of freedom in their production process, which in turn, can be related to the role of spin in the creation of strangeness.

We present results of simulations that show that PANDA is very suitable for doing this kind of studies. If data exist for these reactions, at all, PANDA will exceed the previous measurements by orders of magnitude in statistics. Many hyperons channels for which there are no experimental data will be accessible.

HK 80.2 Fr 11:15 H-ZO 20

Study of the pp→K$^+$nΣ$^+$ reaction near threshold — •Yury Valdau for the ANKE-Collaboration — Forschungszentrum Jülich, Leo-Brandt-Straße, 52428 Jülich

Three different hyperon channels Λ, Σ^0 and Σ^+ are contribute to the K^+ production in pp interactions close-to-threshold. While there are a lot of data exist on the Λ and Σ^0 total production cross sections, there are only few measurements of the third hyperon reaction channel $pp \to K^+n\Sigma^+$.

At ANKE-COSY the energy dependence of the Σ^+ production total cross section was studied at four different proton beam energies between reaction threshold and 2.15 GeV. Our analysis of the Σ^+ reaction channel is based on a simultaneous measurement of three experimental observable: K^+ inclusive spectra, K^+p missing mass spectra and individual particle momentum spectra from the $K^+\pi^+$ correlation events. Below the $pp \to K^+n\Lambda\pi^+$ reaction threshold ($\sim$ 2.02 GeV) the only source of the $K^+\pi^+$ correlations can be Σ^+ production. Thus, identification of $K^+\pi^+$ allows us to identify Σ^+ reaction channel unambiguously below $\sim$ 2.0 GeV, and estimate total cross section. Extracted Σ^+ production total cross sections should allow to describe K^+ inclusive and K^+p correlation spectra using known Λ and Σ^0 total cross sections.

The status of the analysis as well as preliminary experimental results will be presented.

Supported by the COSY–FFE program.

HK 80.3 Fr 11:30 H-ZO 20

Hyperon production in the reactions $pp \to K^+\Lambda p$ and $pn(p) \to K^0\Lambda p(p)$ — •Martin Krapp, Wolfgang Eyrich, Cecilia Pizzolotto, Wolfgang Schroeder, and Andreas Teufel for the COSY-TOF-Collaboration — Universität Erlangen-Nürnberg

The near threashold 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 $pp \to K^+\Lambda p$, $K^0\Sigma^+p$ 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 $pn(p) \to K^0\Lambda p(p)$ will be presented, as well as reconstruction techniques and first results. Moreover the data of the reaction $pp \to K^+\Lambda p$, which are now available with high statistical precision, are discussed. In this context especially the influence of N^*-resonances on Dalitz-plots is investigated.

supported by BMBF and FZ Jülich.

HK 80.4 Fr 11:45 H-ZO 20

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

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, new 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 80.5 Fr 12:00 H-ZO 20

A Regge-plus-resonance approach to radiative kaon capture processes using crossing symmetry — •Tim Van Cauteren and Pieter Vancraeyveld — Ghent University, Dept. Subatomic and Radiation Physics, Proeftuinstraat 86, B-9000 Gent, Belgium

Over the last years, we have developed a Regge-plus-resonance (RPR) model for describing cross sections and polarization observables of kaon photo- and electroproduction from the proton. In our model, the background arises from the exchange of two kaon Regge-trajectories in the t-channel. A limited set of nucleon resonances is added to explain the broad structures seen in kaon production observables. Crossing symmetry can be used to relate the amplitude for $\gamma(p,K)Y$ reactions to the amplitude for radiative kaon capture processes. This amounts to interchanging s- and u-channel, while the t-channel remains unaffected. Therefore, we can apply the background description from our RPR model for kaon production to the radiative kaon capture processes. Hyperon resonances can be added to explain possible structure. We present our results for $K^-p \to \gamma Y$ ($Y = \Lambda, \Sigma$) cross sections for kaon momenta $|\vec{p}_K|$ between 514 and 750 MeV/c, which were measured by the Crystal Ball collaboration at BNL.

HK 80.6 Fr 12:15 H-ZO 20

$p\bar{p} \to \Lambda\bar{\Lambda}$ production cross section in a constituent quark model — •Pablo Garcia, David R. Entem, and Francisco Fernandez — Universidad de Salamanca, E-37008, Salamanca Spain

In recent years the interest in the $N\bar{N}$ system has been renewed due to the observation of a near threshold enhancement in the $J/\psi \to \gamma p\bar{p}$ decay which was interpreted as a possible $N\bar{N}$ bound state or as a FSI effect in the $N\bar{N}$ system. Also the construction of the antiproton facility FAIR and its low energy facility FLAIR will provide new and precise data for reactions involving antiproton beams which motivates the theoretical study of such reactions.

In Ref. [1] a chiral constituent quark model was used to study the $N\bar{N}$ interaction. We now apply this model to study the $\Lambda\bar{\Lambda}$ production reaction. This reaction has been traditionally explained with kaon exchange in meson models and with gluon annihilation in quark models. The chiral constituent quark model used includes both mechanisms. The kaons are generated as pseudogoldstone bosons of the spontaneous chiral symmetry breaking and gluons as perturbative contributions from QCD.

We perform a coupled channel calculation which allows us to study the FSI and ISI approximations. The optical potential is modified to describe the $p\bar{p}$ total cross section data in the $\Lambda\bar{\Lambda}$ production energy range. We find that the kaon contribution dominates and we need to increase g_{ch} in the strange sector to describe the data. We also study polarization observables for the $p\bar{p} \to p\bar{p}$ and $p\bar{p} \to \Lambda\bar{\Lambda}$ reactions.

[1] D.R. Entem, and F. Fernandez, Phys. Rev. C **73**, 045214 (2006).

HK 80.7 Fr 12:30 H-ZO 20

The Qweak experiment - A search for new physics at the TeV scale — •Klaus Grimm — Louisiana Tech University, Ruston, LA 71272, USA

The Q_{weak} experiment is a new precision measurement of the weak charge of the proton, $Q_p^W = 1 - 4\sin^2(\theta_W)$, using parity violation in electron scattering from the proton at very low Q^2 and forward angles and is in the final stages of preparation for execution at Jefferson Laboratory (JLab). The Standard Model makes a firm prediction of Q_p^W, based on the running of the weak mixing angle $\sin^2(\theta_W)$ from

the Z_0 pole down to lower energies. Because the electroweak radiative corrections which give rise to the running depend not only on known particles, but on particles which have not yet been discovered, a difference between the calculated and measured weak charges may signal new physics where Q_{weak} will be sensitive to new physics at the few TeV scale. Any significant deviation of $\sin^2(\theta_W)$ from the Standard Model prediction at low Q^2 would be a signal of new physics, where as agreement would place new and strict constraints on possible Standard Model extensions. In the absence of new physics Q_{weak} will provide a 0.3% determination of $\sin^2(\theta_W)$, making this a very competitive stand-alone measurement of the weak mixing angle indeed.

The experiment plans to measure the predicted parity violating asymmetry of -0.3 ppm with a combined statistical and systematic uncertainty of 2.2%, corresponding to a total uncertainty of 4% in Q_p^W.