

HK 50: Elektromagnetische und Hadronische Sonden

Zeit: Donnerstag 17:00–18:45

Raum: A

HK 50.1 Do 17:00 A

quark spin content of proton and the decay width of the Θ^+ baryon — ●GHIL-SEOK YANG¹, HYUN-CHUL KIM², MAXIM POLYAKOV¹, and KLAUS GOEKE¹ — ¹Institut für Theoretische Physik II, Ruhr-Universität Bochum, Germany — ²NuRI, Department of Physics, Pusan National University, Busan, Republic of Korea

Using the existing experimental data for hyperon semileptonic decays and the flavor-singlet axial-vector charge $g_A^{(0)}$ from polarized deep inelastic scattering of the proton, we derive the decay width of the pentaquark baryon. We take into account the effects of flavor SU(3) symmetry breaking within the framework of the chiral quark-soliton model. All dynamical parameters of the model are fixed by using the five experimental hyperon semileptonic decay constants and flavor singlet axial-vector charge. We obtain the numerical results of the decay width of the Θ^+ pentaquark baryon as a function of the sigma πN term and investigate the dependence of the decay width of the Θ^+ on the $g_A^{(0)}$, varying $g_A^{(0)}$ within the range of the experimental uncertainty. It turns out that the decay width of the Θ^+ is very sensitive to the singlet axial-vector charge. We discuss the constraint on the decay width of the Θ^+ due to the flavor-singlet axial-vector charge and vice versa.

HK 50.2 Do 17:15 A

Analysis of the reactions $pp \rightarrow pK^+\Lambda$ and $pp \rightarrow pK^+\Sigma^0$ at excess energies of 150 MeV* — ●J. DIETRICH, K.-T. BRINKMANN, S. DSHEMUCHADSE, H. FREIESLEBEN, L. KARSCH, E. KUHLMANN, M. SCHULTE-WISSERMANN, W. ULLRICH, and R. WENZEL for the COSY-TOF-Collaboration — Institut für Kern- und Teilchenphysik, 01069 Dresden, Deutschland

One of the main issues of the COSY-TOF collaboration is the measurement of hyperon production in proton-proton interactions. The reactions $pp \rightarrow pK^+\Lambda$ and $pp \rightarrow pK^+\Sigma^0$ were studied at beam momenta of $p_{beam} = 2950 \text{ MeV}/c$ and $3065 \text{ MeV}/c$. The analysis is based on the reconstruction of the velocity vectors of all charged particles which allows the kinematically complete reconstruction of the missing neutral particle. Using a new and improved track reconstruction algorithm both reaction channels can be separated clearly via their missing mass. For both channels total and differential cross sections are determined, where the differential data for the Σ^0 -channel are new to the world data set. In view of these data, different models for associated strangeness production will be discussed and the influence of the N^* -resonances will be pointed out.

* supported by BMBF and FZ-Jülich

HK 50.3 Do 17:30 A

Λ Analysis in p - p Reactions with the HADES Spectrometer — ●MARCO DESTEFANIS for the HADES-Collaboration — II. Physikalisches Institut, Gießen, Germany

In the year 2004 the HADES experiment, which is part of the GSI facility in Darmstadt, recorded 300 million events of proton-proton collisions at 2.2 GeV beam energy.

Although the design of HADES is optimized for dilepton spectroscopy, also hadron final states can be reconstructed, using the advantages of the large geometrical acceptance and the excellent momentum resolution of HADES. We report preliminary results on Λ production in the $\Lambda \rightarrow p\pi^-$ final state. The reaction $pp \rightarrow pK^+\Lambda$ is currently under investigation. Remarks on reaction polarization observables using the self-analysing Λ decay will be given. As an outlook, a possible measurement of the timelike form factor in rare decays such as $\Sigma^0 \rightarrow \Lambda e^+e^-$ will be commented upon.

This work was supported in part by BMBF (06 GI 179), DFG, EGS and GSI.

HK 50.4 Do 17:45 A

Determination of the $p\Lambda$ scattering length via $\bar{p}p \rightarrow pK^+\Lambda$ — ●DIETER GRZONKA for the COSY-11-Collaboration — IKP, Forschungszentrum Jülich, 52425 Jülich, Germany

The close-to-threshold Λ hyperon production via the $\bar{p}p \rightarrow pK^+\Lambda$ reaction with a polarized proton beam was measured at the COSY-11 installation, an internal experimental facility at the cooler synchrotron COSY.

A 3-body final state is an appropriate tool to study the interac-

tions of the two particle subsystems especially for unstable particles where a direct scattering analysis is difficult like the ΛN system or sometimes even impossible. The ΛN -interaction has already been investigated with unpolarized beams, but experimentally spin singlet and spin triplet interactions were not disentangled.

The determination of the spin singlet and spin triplet components requires the polarization of both, beam and target. However, using a polarized beam alone allows at least to extract the spin triplet scattering length when selecting a certain kinematical region.

The data are presently under analysis and the status of the investigations will be given.

HK 50.5 Do 18:00 A

Energy dependence of the $pp \rightarrow K^+n\Sigma^+$ reaction near threshold — ●YURY VALDAU for the ANKE-Collaboration — Forschungszentrum Jülich, 52425 Jülich — Petersburg Nuclear Physics Institute, Orlova Rosha, Gatchina, Russian Federation, 188300

Hyperon production in proton-proton collisions in the close-to-threshold region has been extensively studied at different experimental facilities. The energy dependence of the total cross sections for $pp \rightarrow K^+p\Lambda$ and $pp \rightarrow K^+p\Sigma^0$ shows a phase-space behavior, though modified in the former case by the Λp final-state interaction (FSI). However, new data on the $pp \rightarrow K^+n\Sigma^+$ channel, published recently by the COSY-11 collaboration at excess energies of $\varepsilon = 13 \text{ MeV}$ and 60 MeV , show surprisingly high production rates [1].

Using experimental data collected at the magnetic spectrometer ANKE (COoler-Synchrotron Jülich), new estimates for the total cross section for Σ^+ production at 129 MeV excess energy have been done. Our new results, taken in conjunction with other experimental data, would indicate a close-to-threshold anomaly in the energy dependence of the total cross section for the $pp \rightarrow K^+n\Sigma^+$ reaction channel.

The status of analysis as well as plans for the future measurements will be presented.

Supported by FZ-Jülich, DFG, WTZ, COSY-FFE.

[1] T. Rožek et al., Phys. Lett. B 643 (2006), 251.

HK 50.6 Do 18:15 A

Messung von Polarisationsobservablen in der Λ -Produktion an COSY-TOF — ●CECILIA PIZZOLOTTO, WOLFGANG EYRICH, MARTIN KRAPP, ALBERT LEHMANN, PETER SCHÖNMEIER, WOLFGANG SCHROEDER und ANDREAS TEUFEL für die COSY-TOF-Kollaboration — Physikalisches Institut IV der Universität Erlangen-Nürnberg

Die exklusive Untersuchung von Strangeness-Produktion im Schwellenbereich ist ein Schwerpunkt des COSY-TOF Messprogramms. Ein speziell optimiertes Startdetektorsystem dient zur Identifikation und vollständigen Rekonstruktion der Ereignisse einschließlich der verzögerten schwachen Zerfälle und erlaubt die Extraktion nahezu untergrundfreier Eventsamples, unter Abdeckung des vollen Phasenraums. Die Reaktion $\bar{p}p \rightarrow pK^+\Lambda$ wurde erstmals bei zwei Strahlimpulsen am polarisierten Protonenstrahl gemessen. Ziel der Messung ist es, die Polarisationsobservablen zu extrahieren. Im Vortrag werden Ergebnisse für die Lambda Polarisation, die Analysierstärke und die Depolarisation gezeigt. Die untersuchten Observablen werden diskutiert und mit früheren Experimenten sowie Modellrechnungen verglichen.

HK 50.7 Do 18:30 A

Hyperon production in hadronic collisions at ANKE-COSY — ●IZABELLA ZYCHOR for the ANKE-Collaboration — Institute for Nuclear Studies, Swierk

Hyperons are produced at COSY in pp collisions. The maximal beam momentum of $3.65 \text{ GeV}/c$ allows to measure hyperons Y with masses $<1540 \text{ MeV}/c^2$ in reactions induced by protons. It is essential that the ANKE spectrometer permits the simultaneous observation of different decay modes: $Y \rightarrow \pi^0\Sigma^0, \pi^\mp\Sigma^\pm, \pi^0\Lambda, K^-p$.

Indications for a neutral excited hyperon resonance $Y^{0*}(1480)$ have been found in the reaction $pp \rightarrow pK^+Y^{0*} \rightarrow pK^+\pi^\pm X^\mp$. Its parameters are $M(Y^{0*}) = (1480 \pm 15) \text{ MeV}/c^2$ and $\Gamma(Y^{0*}) = (60 \pm 15) \text{ MeV}/c^2$ though, since it is neutral, it can be either a Λ or Σ hyperon. On the basis of existing data we cannot decide whether it is a three-quark baryon or an exotic state.

The $\Lambda(1405)$ is a particularly interesting baryonic state because its structure is not yet understood and it is difficult to obtain in quark

models. Recent theoretical investigations based on chiral dynamics predict two poles for the $\Lambda(1405)$. The missing and invariant mass techniques are used to identify the $\Lambda(1405)$ resonance decaying via $\Sigma^0\pi^0$.

An overview about new results from recent hyperon experiments performed at ANKE/COSY will be presented.

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