

## HK 59: Hadronenstruktur und -spektroskopie X

Time: Thursday 16:30–19:00

Location: HS3

## Group Report

HK 59.1 Thu 16:30 HS3

**Towards a combined analysis of pion- and photon-induced hadronic reactions** — ●MICHAEL DÖRING<sup>1</sup>, CHRISTOPH HANHART<sup>2</sup>, FEI HUANG<sup>3</sup>, SIEGFRIED KREWALD<sup>2</sup>, ULF-G. MEISSNER<sup>1,2</sup>, and DEBORAH RÖNCHEN<sup>2</sup> — <sup>1</sup>Helmholtz-Institut für Strahlen- und Kernphysik (Theorie) and Bethe Center for Theoretical Physics, Universität Bonn, Nußallee 14-16, 53115 Bonn — <sup>2</sup>Institut für Kernphysik, Institute for Advanced Simulation and Jülich Center for Hadron Physics, Forschungszentrum Jülich, 52425 Jülich — <sup>3</sup>Department of Physics and Astronomy, University of Georgia, Athens, Georgia 30602, USA

To allow for a controlled extraction of baryon resonance properties from  $\pi N$  induced reactions, a unified description of various reaction channels is compulsory. For this, a coupled channel approach is used, based on hadron exchange in a Lagrangian-based framework, that respects analyticity, unitarity and gauge invariance. Then, together with the determination of the analytic structure of the scattering amplitude, a precise extraction of resonance parameters such as pole positions and residues becomes possible. New results are presented for the reactions  $\pi N \rightarrow KY$  and pion photoproduction.

HK 59.2 Thu 17:00 HS3

**Vereinheitlichte Analyse von Kaon-Hyperon- und Pion-Nukleon-Reaktionen** — ●DEBORAH RÖNCHEN — Helmholtz-Institut für Strahlen- und Kernphysik (Theorie), Universität Bonn, Nussallee 14-16, D-53115 Bonn

Elastische  $\pi N$ -Streuung und Kaon-Produktion werden simultan in einem unitären, volle Analytizität gewährleistenden Ansatz gekoppelter Kanäle beschrieben. Die  $t$ - und  $u$ -Kanal-Austauschdiagramme der Meson-Baryon-Wechselwirkung in den verschiedenen Kanälen werden dabei über SU(3) Flavor-Symmetrie miteinander verbunden. Winkelverteilung, Polarisation und Spinrotations-Parameter werden mit vorhandenen experimentellen Daten verglichen und die analytische Fortsetzung erlaubt die Bestimmung der Pol-Struktur der Streuamplitude.

HK 59.3 Thu 17:15 HS3

**Giessen coupled-channel model pion and photon induced reactions** — ●VITALY SHKLYAR, HORST LENSKE, and ULRICH MOSEL — Institut für Theoretische Physik, Universität Giessen

Pion- and photon-induced reactions are investigated within a unitary coupled-channel effective Lagrangian model in the resonance energy region. The  $\pi N$ ,  $\rho N$ ,  $\pi \Delta$ ,  $\sigma N$ ,  $\eta N$ ,  $\omega N$ ,  $K\Lambda$ ,  $K\Sigma$  final states are treated on the same basis. Two-pion channels are described by an explicit treatment of meson dynamics. The coupling constants are constrained by comparison with the available experimental data. Recent results are presented and discussed.

HK 59.4 Thu 17:30 HS3

**Untersuchung der  $p\Lambda$  Streulänge am COSY-TOF Experiment** — ●MATTHIAS RÖDER, JAMES RITMAN and PETER WINTZ für die COSY-TOF-Kollaboration — Forschungszentrum Jülich

Während die Nukleon-Nukleon Wechselwirkung detailliert untersucht und verstanden ist, reicht die Genauigkeit bisheriger Messungen von Parametern der Hyperon-Nukleon Wechselwirkung nicht aus um verschiedene Modellvorhersagen festzulegen. Die spin aufgelöste  $p\Lambda$  Streulänge, als solcher Parameter, kann an COSY-TOF aus Messungen der Produktionsreaktion  $pp \rightarrow pK\Lambda$  bestimmt werden.

Dabei ermöglicht die  $4\pi$  Akzeptanz des Spektrometers in Verbindung mit dem polarisierten COSY Protonenstrahl, über Spin-Observablen, die Extraktion der elementaren Spin-Triplett Streulänge. Das neue Silicon Quirl Telescope nahe am Target und der neue Straw Tube Tracker ermöglichen eine erhöhte Rekonstruktionswahrscheinlichkeit der Ereignisse und eine verbesserte Ortsauflösung der Spurrekonstruktion. Damit soll ein experimenteller Fehler der Streulänge, vergleichbar mit der theoretischen Unsicherheit, von 0,3 fm erreicht werden.

In diesem Vortrag werden die Methode und das Experiment, sowie erste Ergebnisse einer vierwöchigen Strahlzeit im Juli 2010 vorgestellt.

HK 59.5 Thu 17:45 HS3

**Hyperon production in the reactions  $pn(p) \rightarrow K^0\Lambda p(p)$  and  $pp \rightarrow K^+\Lambda p$**  — ●MARTIN KRAPP, WOLFGANG EYRICH, FLORIAN HAUSTEIN, LUKAS KOBER, CECILIA PIZZOLOTTO, WOLFGANG SCHROEDER, and ANDREAS TEUFEL 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. Moreover a preliminary estimation of the cross section of the reaction will be presented.

supported by BMBF and FZ Jülich.

HK 59.6 Thu 18:00 HS3

**$\Lambda$  and  $\Sigma^+$  hyperon reconstruction with the upgraded COSY-TOF detector.** — ●ROMAN DZHYGADLO<sup>1</sup> and ALBRECHT GILLITZER<sup>2</sup> for the COSY-TOF-Collaboration — <sup>1</sup>Universität Bonn — <sup>2</sup>Forschungszentrum Jülich

New data on hyperon production  $\vec{p}p \rightarrow KNY$  ( $Y = \Lambda, \Sigma$ ) at 2.95 GeV/c beam momentum were collected recently with the COSY-TOF detector. Due to the excellent tracking capability, large acceptance and full azimuthal symmetry of the detector setup the quality of the data allows for full and precise reconstruction of  $\Lambda$  and  $\Sigma^+$ . Analysis results from these data will cast a light on the structure of nuclear resonances and their coupling to strangeness.

In order to effectively use all tracking information from the detector setup, new track finding and fitting algorithms were developed. Current results of the analysis will be presented and compared to Monte Carlo simulations.

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HK 59.7 Thu 18:15 HS3

**Resonanzanregungen in der Reaktion  $pp \rightarrow \Lambda p K^+$  bei  $T_p = 2.26$  GeV** \* — ●KATHARINA EHRHARDT, HEINZ CLEMENT, EVGUENY DOROSHEVICH und GERHARD J. WAGNER für die COSY-TOF-Kollaboration — Physikalisches Institut der Universität Tübingen

Die Reaktion  $pp \rightarrow \Lambda p K^+$  ist bei einer Einschussenergie von  $T_p = 2.26$  GeV (Einschussimpuls  $p_p = 3.06$  GeV/c) am Fluzeitspektrometer TOF an COSY mit hoher Statistik über den vollen Raumwinkel und kinematisch überbestimmt vermessen worden.

In der  $K^+\Lambda$ -invarianten Masse überdecken die Daten die kinematischen Bereiche der  $N^*$ -Resonanzen  $N(1650)S_{11}$ ,  $N(1710)P_{11}$  und  $N(1720)P_{13}$ . In den Daten sticht insbesondere die starke Anregung der schmalen  $N(1710)P_{11}$ -Resonanz hervor.

In der  $p\Lambda$ -invarianten Masse wird der kinematische Bereich von der Schwelle ( $p\Lambda$ -FSI) bis zu 2.3 GeV überdeckt. Die Messung erfasst also noch den Bereich der kürzlich in DISTO-Daten gefundenen Resonanzstruktur bei 2.26 GeV.

Methoden der Datenrekonstruktion und Ergebnisse werden diskutiert.

\* gefördert durch BMBF, COSY-FFE(FZ Jülich) und DFG (Europäisches Graduiertenkolleg)

HK 59.8 Thu 18:30 HS3

**Status of  $pp \rightarrow nK^+\Sigma^+$  studies at COSY-TOF** — ●PAWEŁ KLAJA for the COSY-TOF-Collaboration — Universität Erlangen-Nürnberg — Forschungszentrum Jülich

The COSY-TOF detector setup was recently 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 can be studied at an excess energy of  $Q = 128.7$  MeV.

Detector setup calibrations and an overview of acceptance studies as well as the current status of the data analysis in view of  $pp \rightarrow nK^+\Sigma^+$  reaction identification will be presented.

HK 59.9 Thu 18:45 HS3

$\Sigma^-$  hyperon production in  $pn$  interactions at ANKE/COSY  
— ●EGOR SHIKOV for the ANKE-Collaboration — Petersburg Nuclear  
Physics Institute, Gatchina, Russia — Forschungszentrum Jülich, Ger-  
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The production of light hyperons in  $pp$  and  $pn$  interaction constitutes a large part of the scientific program at the ANKE-spectrometer, which is an internal-beam experiment at the Cooler Synchrotron (COSY).

In this work the  $pd \rightarrow p_{sp}pK^+\Sigma^-$  reaction is investigated using two samples of data with 2915 MeV/c and 3015 MeV/c beam momenta. The deuteron target has been used as an effective neutron target by measurement of the spectator proton's momentum. Thus events of the

$pn \rightarrow pK^+\Sigma^-$  reaction could be reconstructed by using the spectator approximation. The Fermi motion of on-shell neutron allows to cover a wide range of excess energies ( $Q = 30 - 130$  MeV) for this reaction.

Reaction identification has been done using the missing-mass technique. About 1000 events associated with  $\Sigma^-$  hyperon production are observed in a peak of missing mass for events with detected  $K^+$  meson together with high momentum and spectator protons. The normalization procedure has been done using events of proton-deuteron elastic scattering.

Preliminary results for the energy dependence of the  $pn \rightarrow pK^+\Sigma^-$  total cross section will be presented.

This work is supported by COSY-FFE.