

## HK 56: Hadron Structure and Spectroscopy 11

Time: Thursday 14:30–16:30

Location: T/SR25

**Group Report**

HK 56.1 Thu 14:30 T/SR25

**Baryon Spectroscopy: Recent Photoproduction Results from the CBELSA/TAPS Experiment** — ●ANDREW WILSON for the CBELSA/TAPS-Collaboration — HISKP, University of Bonn, Nussallee 14-16, 53115 Bonn

The recent results from the CBELSA/TAPS experiment show how there is still much to learn about the baryon resonances. Using photon beams up to 3.2 GeV in energy from the ELSA accelerator in Bonn, our experiment is providing crucial information on the baryons with masses up to 2.5 GeV/c<sup>2</sup>. Since baryon resonances are broad and therefore overlapping, in addition to unpolarized cross sections the measurement of polarization observables are essential for the identification of these states. To measure these observables, this experiment utilizes polarized photon beams, polarized targets, and an excellent reconstruction efficiency for mesons decaying to photons. Our results, which feature several double polarization observables, show how the state-of-the-art partial wave analyses can be updated and more can be learned about the pattern and decays of baryon resonances.

Supported by the Deutsche Forschungsgemeinschaft (SFB/TR16)

HK 56.2 Thu 15:00 T/SR25

**Complete Experiments for pseudoscalar meson photoproduction** — ●YANNICK WUNDERLICH for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik, Universität Bonn

The investigation of the nucleon excitation spectrum has been an important experimental and theoretical task in the recent years. Once this highly complicated bound system of strongly interacting particles is understood, it will yield valuable insights into the workings of QCD. One of the most interesting reactions is the production of mesons by impinging photons off a nucleon target. When only one pseudoscalar meson  $\varphi$  is produced in the reaction  $\gamma N \rightarrow \varphi N$ , 16 polarization observables (not completely independent) can be accessed via the spin degrees of freedom of the incident and final states.

A so called 'Complete Experiment' allows the unambiguous extraction of the underlying amplitudes. It has been shown that at least 8 carefully selected observables have to be measured for this purpose. For a truncated partial wave expansion, considering only the partial waves that contribute significantly in the energy range of interest, fewer observables can be already sufficient. This presentation will discuss such truncated analyses with special focus on the influence of measurement uncertainties. Supported by the Deutsche Forschungsgemeinschaft (SFB/TR16).

HK 56.3 Thu 15:15 T/SR25

**A new PWA method to extract dynamic amplitudes of two-particle subsystems embedded into multi-particle final states** — ●FABIAN KRINNER — Technische Universität München Physik-Department E18

Modern hadron spectroscopy experiments such as COMPASS have collected huge data sets of tens of millions of events. Therefore, analyses in spectroscopy are often dominated by systematic effects. A very common method to analyze these data is Partial-Wave Analysis (PWA). For more than two particles in the final state PWA usually assumes subsequent two-particle decays, i.e. the isobar model. Here, fixed mass shapes for the appearing intermediate states, the so-called isobars, have to be assumed. These shapes, which e.g. may be given by Breit-Wigner amplitudes, have to be put into the analysis beforehand and therefore may introduce a model dependence and thus increase systematic uncertainties. We present a new method, which allows to extract isobar shapes directly from the data in a more model-independent way. As a first application diffractively produced  $\pi^- \pi^+ \pi^-$  events are analyzed and the validity and limitations of this method are shown via various Monte-Carlo studies. Since the method allows free isobar shapes, the effects of non-resonant contributions to the amplitude may also be studied. A common non-resonant contribution is the Deck effect, for which the effective isobar shapes introduced by partial-wave projections decomposing its intensity will be presented.

HK 56.4 Thu 15:30 T/SR25

**Status des Amplitudenanalyse-Frameworks CompPWA** — ●MATHIAS MICHEL<sup>1,2</sup>, FLORIAN FELDBAUER<sup>1,2</sup>, MIRIAM FRITSCH<sup>1,2</sup>,

KLAUS GOETZEN<sup>1,3</sup>, WOLFGANG GRADL<sup>2</sup>, PROMETEUSZ JASINSKI<sup>1,2</sup>, RALF KLIEMT<sup>1,3</sup>, FRANK NERLING<sup>1,3</sup>, KLAUS PETERS<sup>1,3</sup>, STEFAN PFLUEGER<sup>1,2</sup> und PETER WEIDENKAFF<sup>2</sup> — <sup>1</sup>Helmholtz-Institut Mainz — <sup>2</sup>Johannes Gutenberg-Universität Mainz — <sup>3</sup>GSi Helmholtzzentrum Darmstadt

Die Suche nach neuen konventionellen sowie exotischen hadronischen Zuständen, wie z.B. Hybriden oder Glueballs, erfordert die Identifizierung möglicher Kandidaten und die eindeutige Einordnung bereits bekannter Zustände. Dazu wird in einem Großteil der Analysen eine Amplitudenanalyse (PWA) benötigt. Zu diesem Zweck wird das neue, flexible und effiziente PWA-Framework CompPWA entwickelt. Es ist modular gestaltet, was es erlaubt, problemlos weitere Modelle und Formalismen hinzuzufügen, wie auch gleichzeitig mehrere Datensätze (auch verschiedener Experimente) anzupassen. Außerdem werden verschiedene Minimierungs- und Bewertungsstrategien zur Verfügung gestellt. Dabei wird die Software fortwährend mit Daten laufender Experimente wie z.B. BaBar oder BESIII validiert und getestet. In diesem Vortrag werden der Status der Frameworkentwicklung und dessen Werkzeuge sowie Ergebnisse von systematischen Studien einer modellunabhängigen Dalitz-Plot Analyse vorgestellt.

HK 56.5 Thu 15:45 T/SR25

**Analyse des Zerfalls  $D^0 \rightarrow K_S^0 K^+ K^-$**  — ●PETER WEIDENKAFF und WOLFGANG GRADL für die BESIII-Kollaboration — Johannes-Gutenberg-Universität, Mainz

Das BES-III Experiment am BEPCII  $e^+e^-$  Speicherring in Peking hat seit dem Start der Datennahme im Frühjahr 2009 bis zum Mai 2011 bereits ein 2.9 fb<sup>-1</sup> großes Datensample an  $\psi(3770)$  Zerfällen gesammelt. D-Mesonen aus  $\psi(3770)$  Zerfällen werden in einem kohärenten Zustand erzeugt und legen somit wechselseitig den Teilchentyp fest. Durch die Rekonstruktion eines D Zerfalls kann der anti-D Zerfall mit geringem Untergrundbeitrag untersucht werden. BES-III bietet damit ideale Bedingungen, um Zerfälle von D-Mesonen zu studieren.

Wir analysieren den Zerfall ungeladener D Mesonen in den Endzustand der  $K_S^0 K^+ K^-$  indem wir die partielle Zerfallsrate messen sowie den Dalitzplot analysieren.

Dieser Vortrag gibt eine Einführung in das Experiment und stellt danach die Ereignis Selektion und vorläufige Ergebnisse zur Messung der partiellen Zerfallsrate vor. Wir diskutieren das für die Dalitzplot-analyse verwendete Amplitudenmodell sowie die nötigen Korrekturen für Untergrund und Selektionseffizienz. Abschliessend werden vorläufige Resultate der Amplitudenanalyse präsentieren.

HK 56.6 Thu 16:00 T/SR25

**Analysis of the reaction  $p + p \rightarrow p + K^+ + \Lambda$  with Partial Waves\*** — ●R. MÜNZER<sup>1</sup>, S. LU<sup>1</sup>, E. EPPLE<sup>1</sup>, L. FABIETTI<sup>1</sup>, J. RITMAN<sup>2</sup>, E. RODERBURG<sup>2</sup>, and F. HAUENSTEIN<sup>2</sup> — <sup>1</sup>E12, Physik Department, Excellence Cluster Universe - Technische Universität München — <sup>2</sup>Forschungszentrum Jülich

The investigation of the kaon-nucleon interaction currently has been intensified in the last years by some contradicting results on the existence of the  $ppK^-$  bound state. Such results are heavily discussed since they can lead to new knowledge about the  $\bar{K}$ -N interaction. In the last years the reaction  $pp \rightarrow pK^+\Lambda$  has been measured at the GSI with the FOPI and the HADES Spectrometer at beam energies of 3.1 GeV and 3.5 GeV, respectively. The reconstructed exclusive events were analyzed within the Bonn Gatchina PWA framework, which provides a coherent solution including several resonant and non-resonant production channels, which allowed the extraction of an upper limit for the cross-section for the production of the  $ppK^-$ . Based on these results an analysis of further experimental results obtained by the COSY-TOF collaboration will be analysed with these methods with the goal of a further improvement of the common understanding of the production mechanism, including final state interaction and the  $\Sigma$ -N cusp effect. In this talk the analysis method of the PWA, the extracted value for the  $ppK^-$  and the results from the ongoing combined analysis will be shown.

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HK 56.7 Thu 16:15 T/SR25

**Coupled-channel approach for  $\pi N \rightarrow \pi N, 2\pi N$  transitions** —

•VITALY SHKLYAR, HORST LENSKE und ULRICH MOSEL — Institut für Theoretische Physik, Justus-Liebig-Universität Giessen, Heinrich-Buff-Ring 16, D-35392 Giessen

A unitary coupled-channel Giessen model (GiM) is developed for study pion-induced reactions in the nucleon resonance energy region. The two-pion production is treated in the isobar approximation with the  $\sigma N$ ,  $\pi\Delta$  etc. in the intermediate channel. As a first application of the developed approach we perform the partial wave analy-

sis of the  $\pi^-p \rightarrow \pi^0\pi^0p$  experimental data in the first resonance energy region. The  $\pi N$  elastic scattering amplitudes are constrained by the single energy solutions from GWU (SAID) group. We obtain  $R_{\sigma N}(1440) = 27^{+4}_{-9}\%$  and  $R_{\pi\Delta}(1440) = 12^{+5}_{-3}\%$  for the  $\sigma N$  and  $\pi\Delta(1232)$  decay branching ratios of  $N^*(1440)$  respectively. The extracted  $\pi N$  inelasticities and reaction amplitudes are consistent with the results from other groups. The work is supported by Transregio SFB/TR16, project B.7.