

## HK 33: Hadron Structure and Spectroscopy VI

Zeit: Mittwoch 14:00–16:00

Raum: S1/01 A5

**Gruppenbericht** HK 33.1 Mi 14:00 S1/01 A5  
**Complete Experiments in pseudoscalar meson photoproduction** — ●YANNICK WUNDERLICH for the CBELSA/TAPS-Collaboration — HISKP, Universität Bonn

The understanding of the nucleon excitation spectrum poses a long lasting challenge on the way towards a precise picture on how QCD forms bound states. Many excited states that were predicted by phenomenological models have not shown up in the results of analyses for  $\pi N$  scattering data. Therefore, experiments on photoproduction of mesons have been planned and executed, in order to find resonances with a comparatively large photocoupling, which have escaped observation before. The reaction  $\gamma N \rightarrow \pi N$  in particular allows for the extraction of 16 polarization observables.

An interesting mathematical problem associated with polarization measurements is the so called 'Complete Experiment'. Here, one investigates the content and size of a minimal subset of the 16 observables which still allows for an unambiguous determination of the underlying amplitudes. It can be shown that, at least in case numerically precise pseudo-data are investigated, 8 carefully selected observables can constitute a Complete Experiment. If a truncated partial wave analysis is done, fewer observables can be already sufficient.

The presentation will treat the Complete Experiment problem for truncated partial wave analyses and show preliminary results for an analysis of  $\gamma p \rightarrow \pi^0 p$ , which utilizes 7 polarization observables measured in the second resonance region. Supported by the Deutsche Forschungsgemeinschaft (SFB/TR16).

**Gruppenbericht** HK 33.2 Mi 14:30 S1/01 A5  
**Strangeness photoproduction at the BGO-OD experiment** — ●THOMAS JUDE for the BGO-OD-Collaboration — Physikalisches Institut, Bonn University, Bonn, Germany

The BGO-OD experiment at the ELSA accelerator facility uses an energy tagged bremsstrahlung photon beam to investigate the internal structure of the nucleon. The setup consists of a highly segmented BGO calorimeter surrounding the target, with a particle tracking magnetic spectrometer at forward angles.

Compared to constituent quark models (CQMs), models including pseudoscalar meson-baryon interactions have had improved success in describing baryon excitation spectra. For example, the  $\Lambda(1405)$  appears to be dynamically generated from meson-baryon interactions at least to some extent. Vector-meson baryon interactions have also been predicted to dynamically generate states, which may have been observed in photoproduction reactions.

BGO-OD is ideal for investigating low momentum transfer processes due to the acceptance and high momentum resolution at forward angles. This enables the investigation of degrees of freedom not derived from CQMs, and in particular, strangeness photoproduction where  $t$ -channel exchange mechanisms play a dominant role.

With the first major data taking periods for BGO-OD complete, an extensive programme for the investigation of associated strangeness photoproduction has begun. Supported by DFG (SFB/TR-16).

HK 33.3 Mi 15:00 S1/01 A5  
**Measurement of double polarization observables in  $2\pi^0$ -photoproduction off the proton with the CBELSA/TAPS-experiment** — ●PHILIPP MAHLBERG for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik, Nussallee 14-16, 53115 Bonn

In contrast to the atomic spectrum with its sharp and well defined excitation levels, the nucleon excitation spectrum is dominated by broad, overlapping resonances. Partial wave analyses are needed to extract the contributing resonances from the experimental data. In order to find an unambiguous solution, the measurement of polarization observables is indispensable.

The Crystal Barrel/TAPS experiment at the electron accelerator ELSA is, due to its high photon detection efficiency and its almost complete solid angle coverage, ideally suited to measure neutral mesons

decaying into photons. The measurement with double polarization, i.e. a circularly polarized photon beam and a longitudinally polarized target provides access to single and double polarization observables. At higher energies, the cross sections show that multi-meson decay channels gain in importance compared e.g. to single pseudoscalar meson photoproduction.

In this talk, preliminary results for the helicity asymmetry  $E$  in  $2\pi^0$ -photoproduction measured with the CBELSA/TAPS experiment will be presented.

Supported by the Deutsche Forschungsgemeinschaft (SFB/TR16).

HK 33.4 Mi 15:15 S1/01 A5  
**Helicity asymmetry of the single  $\pi^0$  photoproduction on neutron** — ●FEDERICO CIVIDINI for the A2-Collaboration — Institut für Kernphysik - Universität Mainz

During the pion production reaction, the nucleon is excited to an intermediate resonant state, and a systematic analysis of the experimental data allows a determination of the main properties of the baryon resonances. A detailed knowledge of the spectrum of nucleon excited states gives essential constraints on models of nucleon structure. The data for the observables accessible using a polarised photon beam and/or polarised nucleon targets are scarce in many channels, especially in those induced on the neutron. A measurement is performed at the Mainz Microtron, using a circularly polarised photon beam and longitudinally polarised proton and deuteron targets. The detector is the large acceptance Crystal Ball/TAPS setup.

The talk gives an overview of the status of the experiment and the preliminary results of the helicity asymmetry of the single  $\pi^0$  photoproduction reaction from the deuteron target.

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HK 33.5 Mi 15:30 S1/01 A5  
**Linearly polarised photons at the BGO-OD experiment\*** — ●ANDREAS BELLA — Physikalisches Institut, Universität Bonn

The BGO-OD experiment, located at the ELSA accelerator of the University of Bonn studies photoproduction reactions off the nucleon. A real, energy-tagged photon beam is produced via bremsstrahlung by exposing a thin radiator to the electron beam provided by ELSA.

Linear polarisation is obtained by coherent bremsstrahlung. To do this we use a  $570 \mu\text{m}$  thick diamond radiator.

The degree of polarisation is obtained from the bremsstrahlung spectrum. A consistency check is performed by extracting the already well measured beam asymmetry  $\Sigma$  in  $\pi^0$  photoproduction off the proton.

\*Supported by DFG (SFB/TR-16)

HK 33.6 Mi 15:45 S1/01 A5  
**Commissioning of the new SciRi detector and reaction channel reconstruction at the BGO-OD experiment\*** — ●GEORG SCHELUCHIN for the BGO-OD-Collaboration — Physikalisches Institut, D-53115 Bonn

The aim of the BGO-OD experiment is the investigation of non-strange and strange meson photoproduction. The setup combines a large aperture forward magnetic spectrometer covering the polar angles up to  $12^\circ$  and a central BGO crystal calorimeter with a  $25^\circ$  to  $155^\circ$  polar angle acceptance. The acceptance gap between these two apparatus is a region which requires covering, as many final states under investigation have charged particles in this region.

The Scintillating Ring detector (SciRi) is a segmented plastic scintillator detector with Avalanche Photodiode readout designed to cover the polar angles between 10 and 25 degrees. The detector is segmented into 96 pieces, each covering  $\Delta\phi = 11.25^\circ$  and  $\Delta\theta = 5^\circ$ .

The increase in acceptance leads to a significantly increased detection efficiency of many photoproduction channels. The enhancement of meson identification such as  $\omega$ ,  $\eta$  and  $\eta'$  using this new detector complementing the BGO-OD setup will be presented.

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