HK 16 Elektromagnetische und Hadronische Proben

Zeit: Montag 14:00–16:00 Raum: TU MA001

HK 16.1 Mo 14:00 TU MA001

First measurement of helicity dependent photoabsorption cross sections on the neutron from 815 to 1825 MeV — •Jochen Krimmer für die GDH-Kollaboration — Physikalisches Institut der Universität Tübingen, Germany

Helicity dependent total photoabsorption cross sections on the deuteron have been measured for the first time at ELSA (Bonn) in the photon energy range from 815 to 1825 MeV. Circularly polarized tagged photons impinging on a longitudinally polarized LiD target have been used together with a highly efficient 4π detector system. The data around 1 GeV are not compatible with predictions from existing multipole analyses. From the measured energy range an experimental contribution to the GDH integral on the neutron of $(33.9 \pm 5.5(\text{stat}) \pm 4.5(\text{syst}))$ μb is extracted.

HK 16.2 Mo 14:15 TU MA001

Status of the GDH Experiment on the Deuteron at MAMI — •Oliver Jahn for the A2 collaboration and the GDH collaboration — Institut für Kernphysik, Becherweg 45, 55099 Mainz

The GDH sum rule connects ground state properties of the nucleon with helicity dependent cross sections. To investigate these cross sections on the deuteron, experiments have been carried out in the A2-Collaboration at the Mainz Microtron, Germany, in 1998 and in 2003, using circularly polarized photons on a polarized d-butanol target. A status report of the data analysis and latest results from the pilot experiment of 1998 are given.

HK 16.3 Mo 14:30 TU MA001

Das Crystal Ball/TAPS Experiment am Mainzer Mikrotron — •Martin Kotulla — Universität Basel, Basel, Schweiz

Ein 4π Kalorimeter wurde am Mainzer Mikrotron (MAMI) für Experimente mit reellen Photonen aufgebaut. Die Energie der Photonen wird dabei mit dem Glasgow-Mainz Tagger markiert. Der Crystal Ball Detektor, bestehend aus 672 NaJ Kristallen, deckt dabei den überwiegenden Raumwinkelanteil in diesem Aufbau ab und ist im Vorwärtswinkelbereich ergänzt durch das BaF_2-Kalorimeter TAPS (510 Detektoren). Beide Detektorsysteme sind unabhängig voneinander mit einer neuen modernen Elektronik und Datenerfassung ausgestattet worden. Zusätzlich sind ein zylindrischer Plastikdetektor umgeben von zwei Drahtkammern zur Teilchenidentifikation und Spurrekonstruktion installiert.

Das Experimentierprogramm begann im Juni 2004 und wird im Überblick mit ersten vorläufigen Ergebnissen vorgestellt. Dazu gehört die Untersuchung der Struktur des Nukleons und seiner Resonanzanregungen durch die Messung sensitiver Observablen mithilfe linear und zirkular polarisierter Photonen sowie der Bestimmung des magnetischen Dipolmoments der $\Delta^+(1232)$ Resonanz. Mit Präzisionsmessungen kann die chiralen Störungstheorie durch die π^0- und $2\pi^0$-Produktion an der Schwelle getestet werden und die Mediummodifikation der $\pi\pi$-Wechselwirkung in nuklearer Materie untersucht werden. Tests der C und CP Invarianz werden mit der Untersuchung seltener Zerfälle des η-Mesons durchgeführt.

HK 16.4 Mo 14:45 TU MA001

η and η' photoproduction off the deuteron and off the proton — •Igal Jaeglé — Universität Basel, CH-4056 Basel, Klingelbergst. 82

The photoproduction of η and η' mesons off the deuteron and off the proton has been measured up to 2.8GeV at the tagged photon beam of the Bonn ELSA accelerator with a combined setup of the Crystal Barrel and TAPS detectors, which formed a 4π electromagnetic calorimeter. For the deuteron, the mesons were detected in coincidence with the (participant) recoil nucleons. Models predict a strong rise of the ratio at higher energies due to the contribution from other resonances such as $D_{15}(1675)$. An alternative explanation is the possible photoexcitation of the non-strange pentaquark state, which is associated with the second member of an antidecuplet of exotic baryons. Angular distributions and photon beam asymetries will be analysed in view of these effects.
Furthermore the invariant mass region around 2 GeV where many resonances are predicted is still not very well explored. The finding and investigation of selective channels which couple only to a very small number of resonances is very desirable. In that sense, the photoproduction of η' mesons off the proton is a promising tool, since at threshold only a few partial waves contribute. So far, the current data status is very poor and insensitive. The measurement of η' production off the deuteron is the first attempt to study this reaction on the neutron. It aims furthermore at an investigation of the threshold behaviour (η' nucleon - interaction) on the deuteron. We will discuss preliminary results.

HK 16.5 Mo 15:00 TU MA001

Messung der Photoproduktion von $\pi^0\omega$ am Proton und der Reaktion $\gamma p \to \Delta\omega$ — •Jörg Junkersfeld für die CBELSA-Kollaboration — Hemholtz-Institut für Strahlen- und Kernphysik, Universität Bonn

Das CBELSA-Experiment verfügt über einen hervorragend zur Untersuchung von Multiphoton-Endzuständen geeigneten Detektor, mit dem bereits die totalen und differentiellen Wirkungsquerschnitte der Reaktionen $\gamma p \to p\pi^0$ und $\gamma p \to p\eta$ erfolgreich gemessen und zu neuen Energie- und Winkelbereichen erweitert wurden.

In diesem Vortrag werden Ergebnisse zur Photoproduktion von $\pi^0\omega$ am Proton vorgestellt, wobei insbesondere auf Δ-Resonanzen, die über $\Delta\omega$ in $p\pi^0\omega$ zerfallen, eingegangen wird. Von einigen *Fehlenden Resonanzen* wird erwartet, dass sie eine hohe Photokopplung und eine starke Kopplung an $\Delta\omega$ besitzen [1] und somit in diesem Kanal auftauchen. In diesem Vortrag werden totale und differentielle Wirkungsquerschnitte für die Reaktionen vorgestellt.

Gefördert durch den SFB Transregio 16.

[1] S. Capstick and W. Roberts. *Phys. Rev.*, D57:4301–4309, 1998.

HK 16.6 Mo 15:15 TU MA001

Omega production on the nucleon with linearly polarised photons at ELSA* — •Frank Klein for the CBELSA/TAPS collaboration — Physikalisches Institut, Universität Bonn

The reaction $\vec{\gamma} + N \to \omega + N$ was measured at the electron accelerator ELSA with the Crystal Barrel and TAPS calorimeter.

A 3.2 GeV electron beam from ELSA was used to obtain a tagged photon beam (0.6 - 2.6 GeV) by bremsstrahlung from a crystal radiator. Utilising the coherent bremsstrahlung at the aligned crystal radiator, we have produced linear polarised photons up to 2 GeV with a maximum degree of polarization of about 50%. The photon beam impinged on a 5 cm long liquid hydrogen or deuterium target in the center of the Crystal Barrel detector. The 1290 CsI(Tl) crystals of the Crystal Barrel were complemented in this setup by 528 BaF_2 crystals of the TAPS detector. The TAPS modules were arranged as a forward wall to cover the polar angles up to 30°. The combination of these two detectors yields an azimuthally symmetric electromagnetic calorimeter, which covers 90% of 4π and is ideally suited for multi-photon final states and polarisation measurements. The measurement of polarisation observables in addition to the angular distribution of the omega production will help to disentangle the involved baryon resonances. This improves the identification of specific resonances. The neutral decay cascade of the omega: $\omega \to \pi^0\gamma \to 3\gamma$ is used to reconstruct the produced ω. The status of the analysis of the photon beam asymmetry Σ and the unpolarized cross section will be reported.

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HK 16.7 Mo 15:30 TU MA001

η photoproduction on nuclei — •Thierry Mertens — Universität Basel, CH-4056 Basel, Klingelbergst. 82

Total photo-absorption cross sections on nuclei show a clear disappearance of the second resonance region. Theoritical models predict such a depletion caused by a large increase of the $D_{13}(1520)$ width. The η photoproduction on nuclei is a very powerful tool to investigate properties and possible in-medium modification of the $S_{11}(1535)$ resonance. It allows us to select one particular resonance since η photoproduction in this energy range is completely dominated by the excitation of the $S_{11}(1535)$. The Experiments have been carried out using the combined Crystall Barrel and Taps detectors at the ELSA accelerator facility in Bonn with an incident photon beam up to 2.2 GeV. The inclusive η cross section covering the entire lineshape of the $S_{11}(1535)$ has been measured on four nuclear targets: carbon, calcium, nyobium and lead. Furthermore the final state interaction of η mesons in nuclear matter was analysed in view of the η -mean free path. Previous experiments extracted an average value of $\approx$ 2 fm using incident photons up to 800 MeV. This is the region where the η - nucleon interaction is dominated by the excitation of the $S_{11}(1535)$.

The present experiment extends to much larger momenta of the η meson.

HK 16.8 Mo 15:45 TU MA001

Σ^+ production in photonuclear reactions — •Mariana Nanova for the CBELSA/TAPS collaboration — II. Physikalisches Institut, Heinrich-Buff-Ring 16, 35392 Giessen

The exclusive study of the reaction $\gamma p \to \Sigma^+(1189)K^{*0}$ leading to the $p4\pi^0$ final state is presented. The experiment has been performed at the tagged photon facility of the ELSA accelerator (Bonn), using photons in the energy range up to 3.3 GeV. Data have been taken using lineary polarised photons with the polarisation peak at 1950 MeV. The 8 photon final state is detected in the Crystal Barrel and TAPS detector system which provides an almost 4π coverage for photon detection. The analysis has been checked by studying known reactions leading to the same final state, i.e. $\gamma p \to p\pi^0\eta \to p4\pi^0$. The total cross section for the reaction $p(\gamma, \Sigma^+K^{*0})$ has been measured from threshold to 2600 MeV and will be compared to theoretical calculations [1].

[1] Q. Zhao et al. , Phys. Rev. C 64, (2001) 052201