HK 15: Hadron Structure and Spectroscopy I

Time: Tuesday 14:00–15:30 Location: HS 3 Physik

Group Report HK 15.1 Tue 14:00 HS 3 Physik

The CBELSA/TAPS experiment: Recent results and future plans — •Tobias Seifen for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik, Nussallee 14-16, 53115 Bonn

One important step in understanding the baryon spectrum is a precise knowledge of the excited states and their decays. In order to extract the contributing resonances from experimental data a partial wave analysis needs to be performed. To resolve ambiguities, the measurement of polarization observables is indispensable.

The CBELSA/TAPS experiment is ideally suited to measure the photoproduction of neutral mesons decaying into photons due to its good energy resolution, high detection efficiency for photons, and the nearly complete solid angle coverage. In combination with a longitudinally or transversely polarized target and an energy tagged, linearly or circularly polarized photon beam the experiment allows the measurement of a large set of polarization observables.

In addition to recent results from the CBELSA/TAPS experiment, this talk will discuss a new experiment, INSIGHT at ELSA, which will reuse the CB calorimeter, complemented by several new detector systems: a pixel detector surrounding the target and a forward spectrometer consisting of GEMs, a dipole magnet, straw tubes and the PANDA Forward-Endcap calorimeter. This setup will combine high resolution photon measurements with precise charged particle detection over nearly the entire solid angle and extend the measurements of polarization observables e.g. into the strangeness sector.

HK 15.2 Tue 14:30 HS 3 Physik

Determination of polarization observables in the reaction γp $\rightarrow$ pω — •Lisa Richter for the CBELSA/TAPS-Collaboration — Universität Bonn

Nucleons are bound states composed of quarks and gluons. They interact via the strong interaction, which is described by quantum chromodynamics (QCD). The non-pertubative regime of the QCD is not well understood.

One way of deepening the understanding of this regime is the study of baryon excitation spectrum. The spectrum can be obtained in photoproduction experiments, where single and double polarization observables can be measured using a polarized photon beam and target.

The CBELSA/TAPS experiment in Bonn utilizes a linearly or circularly polarized photon beam impinging on a longitudinally or transversally polarized target. As a result, it is possible to get information on single and double polarization observables for different final states.

The main detector system consists of the Crystal Barrel (CB) and the MiniTAPS calorimeter. With this system, it is possible to cover a solid angle of almost 4π with high efficiency for the detection of photons. For the identification of charged particles, an inner detector is located inside of the Crystal Barrel detector.

The reaction γp $\rightarrow$ pω allows the investigation of a non-pionic final state, which could help to get a better understanding of baryon resonances.

This talk gives an insight into possible background reactions and presents my first results of observables for ω photoproduction.

HK 15.3 Tue 14:45 HS 3 Physik

First measurement and investigation of the ρ^0–p final-state interaction with ALICE — •Maximilian Korwieser for the ALICE Germany-Collaboration — Technische Universität Muenchen

Experimental data on the interaction between vector mesons and nucleons are a crucial input for understanding the pattern of in-medium chiral symmetry restoration (CSR) and dynamically generated excited N states. However, accessing these interactions is hampered by the short-lived nature of the vector mesons, making traditional scattering experiments unfeasible. In recent years, the ALICE Collaboration employed femtoscopy to measure similar challenging systems like the p–Ω and ϕ–p. By leveraging the excellent PID capabilities of the ALICE experiment, coupled with the copious production of ρ^0p pairs at the LHC in small colliding systems, ALICE presents the first-ever measurement of the momentum correlation function between ρ^0 and p. The data are interpreted employing calculations within the framework of unitarised chiral perturbation theory in a coupled-channel approach. This measurement represents an unprecedented opportunity to study the nature of the excited N in particular N(1700) and N(1900), possibly unveiling if these states are molecular in nature as well as shedding light on possible signatures of CSR at LHC energies. This work was supported by ORIGINS cluster DFG under Germany's Excellence Strategy-EXC2094 - 390783311 and the DFG through the Grant SFB 1258 *Neutrinos and Dark Matter in Astro and Particle Physics*.

HK 15.4 Tue 15:00 HS 3 Physik

η' beam asymmetry at threshold using the BGOOD experiment — •Leoni Lutter for the BGOOD-Collaboration — Physikalisches Institut, Universität Bonn

The unexpected nodal structure of the beam asymmetry reported by the GRAAL collaboration in η' photoproduction very close to threshold could be explained by a previously unobserved very narrow resonance. BGOOD is one of the few experiments worldwide which is able to verify this result. The experiment is composed of a central calorimeter for neutral meson decays and a forward spectrometer for charged particle identification. Close to threshold the $\gamma p \rightarrow \eta' p$ reaction can be reconstructed over all centre-of-mass angles from proton identification at forward angles. A linearly polarised photon beam produced via coherent bremsstrahlung off a diamond radiator makes it possible to measure the η' beam asymmetry. Preliminary results on reaction identification and progress towards the determination of the $\gamma p \rightarrow \eta' p$ beam asymmetry will be presented.

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HK 15.5 Tue 15:15 HS 3 Physik

Study of neutral-pion pair production in two-photon scattering at BESII — •Max Lellmann, Achim Denig, and Christoph F. Redmer for the BESIII Germany-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz

The anomalous magnetic moment of the muon, a_μ, is one of the most precisely measured observables in the Standard Model; however, a significant discrepancy exists between the Standard Model prediction and experimental measurements. Whether this discrepancy is indicative of new physics or stems from an incomplete understanding of the strong interaction at low energies remains an open question. To gain deeper insight into this discrepancy, it is necessary to reduce the uncertainties in both the Standard Model prediction and the direct measurements. Since the uncertainty in the Standard Model prediction is primarily driven by hadronic contributions, acquiring more detailed information on the relevant hadronic processes is crucial.

The production of pion pairs in two-photon fusion processes is vital for calculating the hadronic light-by-light scattering contribution to a_μ. The BESIII experiment, located at the Institute of High Energy Physics in Beijing, China, provides an ideal platform for investigating two-photon processes at small momentum transfers. The process $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$ is measured at BESIII for a center-of-mass energy of 3.77 GeV, with a total integrated luminosity exceeding 20 fb^{-1}. This presentation will outline the current status of the analysis and the tools utilized.