HK 55: Hadron Structure and Spectroscopy IX

Time: Friday 11:00–12:30 Location: J-HS A

Group Report HK 55.1 Fri 11:00 J-HS A

Results of polarization observables in η- and $\pi^0\pi^0$-photoproduction off the proton from the CBELSA/TAPS experiment — •Farah Afzal for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik, Universität Bonn, Deutschland

The study of the nucleon excitation spectra allows to better understand the dynamics of the constituents inside the nucleons. Large discrepancies exist between experimentally observed states and predicted states from lattice QCD calculations or from phenomenological quark models. Experimentally, the nucleon excitation spectra can be investigated by studying different meson photoproduction reactions. Partial wave analyses are performed in order to extract the contributing resonances from experimental data. For an unambiguous solution it is not enough to only measure the unpolarized cross section, but several single and double polarization observables are needed in addition.

The CBELSA/TAPS experiment is located at the electron stretcher accelerator ELSA in Bonn. It offers the possibility to measure polarization observables with a linearly or circularly polarized photon beam and a longitudinally or transversely polarized target. The detection system consists mainly of two calorimeters: the Crystal Barrel and the MiniTAPS detector. Together, both cover almost the full 4π solid angle.

This talk will present recent results of several polarization observables from the CBELSA/TAPS collaboration and focus mainly on the $p\eta$ and $p\pi^0\pi^0$ final states.

HK 55.2 Fri 11:30 J-HS A

Search for polarization in the antiproton production process — •Dominika Alfs, Dieter Grzonka, and James Ritman — Institut für Kernphysik, Forschungszentrum Jülich, Germany

The goal of the P-349 experiment is to investigate a possible polarization of antiprotons produced in pA collisions in view of preparation of a polarized antiproton beam. Experimentally this is done by the measurement of the left-right asymmetry of elastic antiproton scattering on a liquid hydrogen target in the Coulomb-nuclear interference region.

Measurements were performed at the Proton Synchrotron test beam East Area (T11) at CERN. The analysis in ongoing, however, the expected statistics of reconstructed scattering events based on preliminary results is too low for a significant polarization analysis.

Therefore additional measurements are planned at CERN combined with precursor experiments with polarized proton scattering at Cooler Synchrotron (COSY) at Forschungszentrum Jülich.

In this talk the achieved results and details of the additional measurements will be presented.

HK 55.3 Fri 11:45 J-HS A

Determination of the target asymmetry T in the reaction $\gamma p \to p\pi^0$ — •Sebastian Ciupka for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik, Universität Bonn

Photoproduction experiments provide a tool to further our understanding of the experimentally observed nucleon excitation spectra, which show discrepancies to predictions based on e.g. lattice QCD. Since the resonances are strongly overlapping, a partial wave analysis is needed to disentangle the states. To unambiguously determine the complex amplitudes of the analysis, it is not enough to conduct unpolarised measurements, therefore measurements with a polarised beam, a polarised target or with a recoil nucleon polarimeter have to be realised.

At the CBELSA/TAPS experiment in Bonn a linearly or circularly polarised photon beam and a longitudinally or transversely polarised target are provided, giving access to single and double polarization observables. The two main detectors of the experiment are the Crystal Barrel (CB) calorimeter and the MiniTAPS calorimeter in forward direction, which in combination provide nearly 4π coverage.
This talk presents preliminary results for the target asymmetry T in π^0 photoproduction, determined from data collected after the upgrade of the CB readout system at the end of 2017. The data are compared with previously collected data and theoretical predictions.

HK 55.4 Fri 12:00 J-HS A

Photoproduction of $\pi^0\eta$ pairs on nuclei — •Vahe Sokhoyan for the A2-Collaboration — Universität Mainz, Institut für Kernphysik

In order to study the production mechanisms and possible modifications of baryon resonances in the nuclear medium, the beam helicity asymmetry $I^{\odot}$ was measured with the A2 setup at MAMI for the photoproduction of $\pi^0\eta$ pairs on carbon, aluminum, and lead targets. The new data for the nuclear targets are compared to the existing free proton data and to the corresponding model calculations performed within the Mainz model. The obtained results are interpreted in terms of contributions of the D_{33} partial wave with the $\eta\Delta(1232)$ intermediate state.

HK 55.5 Fri 12:15 J-HS A

Density Matrix and Dilepton Production in πN collision — •Deniz Nitt[1], Miklós Zétényi[2], and Michael Buballa[1] — [1]TU Darmstadt, Germany — [2]WCRP Budapest, Hungary

The study of hadronic interactions with a dilepton in the final state reveals crucial information about the underlying reaction mechanisms, since the electromagnetic probes can escape the collision volume easily. We use an effective lagrangian model [1, 2] to study the elementary reaction $\pi N \to Ne^+e^-$ in the first and second nucleon resonance region at $\sqrt{s} = 1.49GeV$ and $\sqrt{s} = 1.7GeV$ respectively, which coincides with HADES experiments at GSI [3]. Even though the initial particles are unpolarised, the virtual photon shows a tensor polarisation which results in angular anisotropy for the dilepton. We calculate differential cross sections, angular anisotropy and give predictions for the spin density matrix of the hadronic channel. This work is supported by GSI - TU Darmstadt F&E, HGS-HIRe and COST THOR action CA15213.

[1] Enrico Speranza et al. Phys. Lett. B764 (2017) [2] Tom Vrancx et al. Phys. Rev. C84 (2011) [3] J. Adamczewski-Musch et al. Eur. Phys. J. A53.9 (2017)