HK 33: Hadron Structure and Spectroscopy V

Zeit: Mittwoch 14:00–16:00 Raum: HS 13

Gruppenbericht HK 33.1 Mi 14:00 HS 13

Perspectives for Ξ Baryon Spectroscopy in $\bar{p}p$ Collisions with the PANDA Detector — •Albrecht Gillitzer, Alessandra Lai, Jennifer Pütz, James Ritman, and Tobias Stockmanns for the PANDA-Collaboration — Forschungszentrum Jülich, Jülich, Deutschland

Due to the lack of experimental data, our knowledge of the excitation spectrum of double strange baryons is very poor. While within SU(3) flavor symmetry the Ξ baryon spectrum should have as many states as the N and Δ spectrum together, only a few Ξ^* states have been established, most of them without spin parity quantum number assignment. An extension of the data base on baryon resonances to the (multi-)strangeness sector is however important to scrutinize the theoretical models based on studies of the N and Δ spectrum. The $\bar{p}p$ entrance channel has a relatively large cross section for the production of double strange (anti-)baryons in the final state. The corresponding high production rates together with the large detector acceptance for both charged and neutral particles make the PANDA experiment the ideal place for Ξ spectroscopy. An important part of the PANDA physics program is therefore devoted to the study of the Ξ spectrum. Results of feasibility studies to identify Ξ^* resonances in the final states $\bar{\Xi}^+\Lambda K^-$ (and its charge conjugate), $\bar{\Xi}^+\Xi^-\pi^0$, and $\bar{\Xi}^+\Xi^-\pi^+\pi^-$ will be reported, and the perspective of studying further decay modes will be discussed.

Gruppenbericht HK 33.2 Mi 14:30 HS 13

Strangeness photoproduction at the BGO-OD experiment — •Thomas Jude for the BGO-OD-Collaboration — Physikalisches Institut, Bonn University

Hadron spectroscopy has for many years been used to explore the relevant internal degrees of freedom of the nucleon. Despite the wealth of data there remain many "missing resonances" which are predicted by quark models but are not observed experimentally. Since the conception these models, there has been discussion of the possibility of baryons and mesons of more than three and two constituent quarks respectively. These could manifest as single colour bound objects, or evolve from meson-baryon and meson-meson interactions, opening a possibility of molecular systems and meson re-scattering effects near production thresholds. Indeed, models including meson-baryon interactions have had improved success in describing both strange and non-strange resonance spectra.

To study such effects experimentally, access to a low momentum exchange region is crucial. The BGO-OD experiment at ELSA, comprised of a forward spectrometer and central calorimeter, is uniquely suited for the study of strangeness photoproduction in this region of forward meson angles. First promising results exhibit unprecedented statistics for the associated photoproduction of charged kaons with both ground state and excited hyperons, and neutral kaons identified via both neutral and charged decay modes.

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HK 33.3 Mi 15:00 HS 13

$K^+\Lambda(1405)$ photoproduction at the BGO-OD experiment — •Georg Scheluchin for the BGO-OD-Collaboration — Physikalisches Institut, Nussallee 12, D-53115 Bonn

Since the discovery of the Λ(1405), it remains poorly described by conventional constituent quark models, and it is a candidate for having an "exotic" meson-baryon or "penta-quark" structure, similar to states recently reported in the hidden charm sector.

The Λ(1405) can be produced in the reaction $\gamma p \to K^+\Lambda(1405)$. The pure I=0 decay mode into $\Sigma^0\pi^0$ is prohibited for the mass-overlapping Σ(1385). Combining a large aperture forward magnetic spectrometer and a central BGO crystal calorimeter, the BGO-OD experiment is ideally suited to measure this decay with the K^+ in the forward direction. Preliminary results using the newest available data will be presented.

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HK 33.4 Mi 15:15 HS 13

Electromagnetic decay of excited hyperons at HADES — •Waleed Esmail, Tobias Stockmanns, and James Ritman for the HADES Kollaboration-Collaboration — Forschungszentrum Jülich GmbH, IKP1, 52428 Jülich, Germany

The electromagnetic (EM) decay of excited hyperons states is a very sensitive probe of the structure of hyperons, since the electromagnetic transitions provide a relatively clean probe of the wave functions of the initial and final baryon states. We propose to measure of EM decay channels of excited hyperons produced in p+p reactions at 4.5GeV using HADES spectrometer. Results from HADES on both photon and dielectron decays such as $\Sigma(1385) \to \Lambda\gamma(e^+e^-)$ will have significant impact on the understanding of the structure of the strange resonances in the region of small q^2. The hyperon reconstruction will significantly benefit from the proposed Forward Detector (FD) that extends HADES acceptance in the forward direction towards lower polar angles $0.5^o - 6.5^o$. This detection system consists of two tracking stations based on straw tubes followed by a time-of-flight wall based on RPC technology. The goal is to perform a semi-inclusive reconstruction of excited hyperon decays tagged by the reconstruction of the $\Lambda \to p\pi^-$ ground state in association with a photon/dielectron pair. Since the FD will be operated in a region without magnetic field, a reconstruction of the momentum vector will be provided by a time-of-flight measurement in the RPC, and measurement of the track direction by means of the straw tube stations. This talk will provide a brief overview of the science case and the simulation results of the expected performance.

HK 33.5 Mi 15:30 HS 13

Kaon-proton femtoscopy in ALICE: going beyond scattering experiments — •Valentina Mantovani Sarti for the ALICE-Collaboration — TUM Munich

Scattering experiments have been one of the main sources of information on hadron-hadron interactions. The large amount of such data in the nucleon-nucleon sector allows the development of a solid and deep knowledge of the nucleon-nucleon interaction.
The situation is completely different when a new degree of freedom such as strangeness is introduced.
In the meson-baryon sector the K^--nucleon interaction relies only on old and rather imprecise scattering data above threshold and on the kaonic atom measurement at threshold. More data are needed to constrain this low-energy QCD regime where chiral symmetry breaking is dominant and where a molecular state as the Λ(1405) is present.
In this talk we present the latest femtoscopy measurements for kaon-proton pairs in pp collisions from ALICE which provide a complementary tool to measure the kaon-proton strong interactions in the low momenta regime with a high precision. We will show results on the K^+-proton and K^--proton correlation function in pp collisions at $\sqrt{s} = 5, 7$ and 13 TeV.
The high-precision femtoscopic data from ALICE provide a unique opportunity to test the predictions of theoretical models. In particular, they are useful at low momenta where they provide experimental evidence for the first time of the opening of the coupled isospin breaking channel $\bar{K}^0$-n.

HK 33.6 Mi 15:45 HS 13

$K^0_S\Sigma^0$ photoproduction at the BGO-OD experiment — •Katrin Kohl — Physikalisches Institut, Nussallee 12, D-53115 Bonn

The BGO-OD experiment at the ELSA accelerator facility uses an energy tagged bremsstrahlung photon beam to investigate the exitation structure of the nucleon in meson photoproduction.

The setup with a BGO calorimeter surrounding the target and an open dipole spectrometer covering the forward region is ideally suited for investigating low momentum transfer processes, in particular in strangeness photoproduction.

The associated photoproduction of K^0_S and hyperons is essential to understand the role of K^* exchange mechanisms. A cusp-like structure observed in the $\gamma p \to K^0_S\Sigma^+$ reaction at the K^* threshold is described by models including dynamically generated resonances from vector meson-baryon interactions. Such interactions are predicted to give a peak like structure in $K^0_S\Sigma^0$ photoproduction off the neutron.

This talk presents a preliminary analysis of the reaction $\gamma n \to K^0_S\Sigma^0$ from a new deuterium target dataset taken in 2018.

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