HK 60: Hadronenstruktur und -spektroskopie

Zeit: Freitag 14:00–15:45 Raum: HZ 3

Gruppenbericht HK 60.1 Fr 14:00 HZ 3

Behaviour of kaons in cold nuclear matter — •Kirill Lapidus for the HADES-Collaboration — Excellence Cluster 'Universe', Boltzmannstr. 2, 85748, Garching, Germany

A number of experimental and theoretical efforts were made to understand the behaviour of hadrons immersed in a strongly interacting environment. This contribution addresses the case of K^0-mesons produced in proton-niobium collisions. The high-statistics ($\sim 10^4$ kaons) data were delivered by the HADES experiment (GSI Helmholtzzentrum), employing a proton beam with a kinetic energy of 3.5 GeV. The GiBUU transport model was used for the interpretation of the data. The model allows to simulate the production and propagation of kaons inside the nucleus, including their interaction with the collective of nucleons in terms of a mean field potential. The data favour the presence of the repulsive kaon potential that follows from the Chiral Perturbation Theory.

Supported by BMBF and the Excellence Cluster "Universe".

HK 60.2 Fr 14:30 HZ 3

Investigation of isospin effects in $dp \rightarrow {}^3\mathrm{He}\,\pi^+\pi^-$ at ANKE* — •Malte Mielke[1], Christopher Fritzsch[1], Paul Goslawski[1], Alfons Khoukaz[1], Michael Papenbrock[1], Daniel Schröer[1], Alexander Täschner[1], and Colin Wilkin[2] for the ANKE-Collaboration — [1]Westfälische Wilhelms-Universität, Münster,Germany — [2]University College London, U.K.

Two-pion production in nuclear collisions has been the subject of intensive research for more than 50 years, ever since the discovery of the so-called ABC-effect in proton-deuteron collisions. The effect appears as an enhancement at low two-pion invariant masses and is found to be dominantly in the $\pi\pi$ isospin $I_{\pi\pi} = 0$ channel. In the $dp \rightarrow {}^3\mathrm{He}\,\pi^+\pi^-$ reaction, interferences of $I_{\pi\pi} = 0$ and $I_{\pi\pi} = 1$ are allowed, which permits studies on possible contributions of the Roper resonance, especially in the isovector part. These cause the ${}^3\mathrm{He}\,\pi^+$ and ${}^3\mathrm{He}\,\pi^-$ invariant-mass distributions to differ in shape and are therefore experimentally accessible.

The high momentum resolution that is needed to quantify these differences can be achieved with the ANKE spectrometer at the COoler SYnchrotron (COSY), where data of the reaction $dp \rightarrow {}^3\mathrm{He}\,\pi^+\pi^-$ were recorded in an excess energy range of 265 to 285 MeV. The use of kinematically complete events allows a detailed analysis of the invariant mass distributions to be made and reveals that there must be some isospin-one $\pi\pi$ production even for relatively low values of $M_{\pi\pi}$. Final results will be presented and discussed.

*Supported by the COSY-FFE programme.

HK 60.3 Fr 14:45 HZ 3

Antiproton Annihilation and Meson Production on Nuclei — •Stefanie Lourenço[1], Horst Lenske[1] und Slawomir Wycech[1,2] — [1]Institut für Theoretische Physik, Universität Gießen — [2]National Centre for Nuclear Studies, Hoza 69, 00-681, Warsaw, Poland

With the study of hadron and meson production in antinucleon-nucleus reactions a broad spectrum of final particle configurations and physics phenomena become accessible. Our approach is directed towards investigations of non-strangeness meson production and strangeness channels, ranging from elementary processes in antiproton-proton interactions and antiproton-nucleus collisions to the production of hypernuclei. We are investigating coherent meson production in antiproton-nucleus reactions, intended as exploratory studies for the PANDA experiment and, if realized at a later stage of FAIR, also for the nuclear structure-oriented AIC proposal. The underlying fundamental antinucleon-nucleon and meson-nucleon interactions enter into the optical potentials, which are folded with Hartree-Fock-Bogoliubov nuclear densities. Existing approaches to pion nucleus interactions have been extended to higher energies beyond the Δ-resonance. A phenomenological ansatz for the antinucleon-nucleon interaction, describing the whole energy range up to $p_{\mathrm{lab}} = 15$ GeV/c is presented. Cross sections are shown for the elementary processes and future experiments at FAIR.

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HK 60.4 Fr 15:00 HZ 3

Correlation studies in the low energetic p(T=3.5 GeV) + Nb system — •Oliver Arnold for the HADES-Collaboration — Technische Universität München, Garching, Germany

In astrophysics, a technique was developed to determine the source size of stellar objects with a measurement of the correlation between photons which were emitted from this object. This HBT formalism named after their inventors Hanbury-Brown and Twiss was independently discovered in nuclear physics by Goldhaber et al. who measured an angular correlation for like-sign pion pairs. This discovery was the starting point to use the HBT technique in nuclear physics e.g. in the field of heavy ion physics to gain information about the excited matter state of large temperature and density created during the collision of the ions by measuring final state interactions of the produced particles.

We use the HBT technique to measure the correlation between protons which were produced in proton-niobium collisions and detected with HADES at a proton beam kinetic energy of 3.5 GeV. We compare the experimental correlation function with theoretical predictions from the Koonin model to extract the region of homogeneity. It also allows us to confront transport model simulations (UrQMD) with the HADES data to learn more about the emission dynamics of protons.

This work was supported by the Helmholtz fonds VH-NG-330 and the Excellence Cluster "Universe".

HK 60.5 Fr 15:15 HZ 3

Search for the kaonic bound state ppK^- in pp$\rightarrow pK^+\Lambda$* — •Robert Muenzer — Excellence Cluster Universe, TU-München, Boltzmannstrasse 2, D-85748 Garching

The investigation of the kaon-nucleon interaction has been intensified in the last year due to new results on $\Lambda(1405)$ (1) and indications on the existence of the ppK^- bound state (2). Such results are heavily discussed among the community since the description of the background needs a good knowledge of the underling production reaction in the reaction pp$\rightarrow pK^+\Lambda$.

We have measured the proton-proton reaction with a beam energy of 3.1 GeV at the FOPI Spectrometer at GSI-Darmstadt. At this experiment a set of around 1000 events of these exclusive reaction $pp \rightarrow pK^+\Lambda$ could be extracted.

This exclusive events were analysis with the Bonn Gatchina Partial Wave Analysis framework (3), which provides a solution including several resonant and non-resonant production mechanism and their interference. This description delivers a sufficient description of experimental data and a determination of possible contribution of ppK^-.

In this talk method of the background description via the PWA and the determination of an upper limit for the ppK^- will be presented.

(1) L. Fabbietti, J. Siebenson / arXiv:1208.0205
(2) T. Yamazaki, M. Maggiora, P. Kienle / PRL 104 / 132502 (2010)
(3) Sarantsev, A., Chin.Phys.,C33,1085-1092

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HK 60.6 Fr 15:30 HZ 3

Exclusive Measurement of Resonance Productions associated with Strangeness in pp@3.5 GeV* — •Jia-Chii Berger-Chen for the HADES-Collaboration — TU München, Boltzmannstr. 2, 85748 Garching, Germany

A detailed understanding of p+p reactions has a great importance for the study of p+A and also heavy ion collisions, where with increased nuclear density in-medium modifications of hadrons are expected. For that reason exclusive cross sections and studies of exclusive kinematics in p+p reactions are necessary. Especially, the ability to distinguish resonant from non-resonant productions will help in the understanding of underlying kinematics. A dedicated analysis has been performed on the p+p data measured at 3.5 GeV with the HADES experiment (GSI, Darmstadt, Germany). We concentrate on the study of the reactions $p + p \rightarrow Y + p + \pi^+ + K^0$ (Y = Λ or Σ^0), in which an intermediate Δ^{++} resonance decaying into proton and π^+ might be produced. The strength of this analysis is the capability to decompose not only resonant and non-resonant reactions, but also reactions with a Λ from a Σ^0 in the final state. Especially because the reaction $p + p \rightarrow \Sigma^0 + \Delta^{++} + K^0$ has never been measured before. In this contribution the analysis procedure will be presented as well as the resulting cross sections and obtained kinematic distribtions.

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