HK 68: Hadron Structure and Spectroscopy IX

Time: Thursday 15:45–17:00 Location: SCH/A419

Group Report HK 68.1 Thu 15:45 SCH/A419

Exclusive Hyperon Reconstruction in pp Data at HADES — •Jenny Regina — GSI, Helmholtzzentrum für Schwerionenforschung GmbH, Planckstraße 1, 64291 Darmstadt, Germany

Hyperons are expected to play an important role in describing the dynamics of high-dense baryonic matter such as present in the interior of neutron stars. HADES (High Acceptance Di-Electron Spectrometer) offers excellent opportunities for studying hyperon production in pp and heavy ion collisions. In February 2022 HADES collected high statistics data of the reaction p(4.5 GeV)p. With this data set, the production and decay of single and double strange hyperons in inclusive and exclusive channels will be possible. In particular rare dielectron Dalitz decays of Σ^0 and Λ hyperons will investigated for the first time.

For this purpose, HADES was upgraded with straw tube trackers, which are a FAIR-Phase0 contribution from PANDA, and a timing detector, both of which cover polar angles below 7 degrees; a region where many hyperon decay products are emitted. As a result, they increase the efficiency of the hyperon reconstruction. A kinematic fitting library has been developed to improve the overall resolution. It is based on Lagrange multipliers and utilizes kinematic and geometric constraints.

This talk will address the exclusive hyperon reconstruction, for example of $pp \to pK^+\Lambda$, in the recent data, focusing on the new hyperon reconstruction tools; the straw tube tracker, the kinematic fitting, and how these are used in the analyses.

HK 68.2 Thu 16:15 SCH/A419

Hyperon-production studies in proton-proton collisions at 4.5 GeV with HADES — •Snehankit Pattnaik, Johan Messchendorp, and James Ritman for the HADES-Collaboration — GSI, Darmstadt, Germany

This work presents a preliminary analysis of the $\Lambda + K^0_S + \mathrm{p} + \pi^+$ final state in recently collected proton-proton scattering data taken at 4.5 GeV using HADES at GSI Helmholtzzentrum für Schwerionenforschung in Darmstadt, Germany. The production of hyperons is of particular interest since it provides information about the role of N* resonances in strangeness production in NN interactions. Furthermore, this study could be relevant in describing the dynamics of high-dense matter such as that located at the core of neutron stars.

This talk will present some of the data-driven analysis procedures that have been used to select the final-state of interest. In particular, a particle identification method exploiting the relative time-of-flights and utilizing several vertex and kinematical observables have been used to obtain a strong signal for this exclusive state.

HK 68.3 Thu 16:30 SCH/A419

Photoproduction of $\Lambda(1520)$ at forward angles with BGOOD — •Emil Rosanowski for the BGOOD-Collaboration — Physikalisches Institut der Universität Bonn

The BGOOD experiment at the ELSA facility is used for photoproduction in the *uds* sector. It is uniquely designed to explore reactions where a meson is detected at forward angles, leaving a recoiling hadronic system at low momentum transfer, which could enable the observation of molecular structure.

Studies of the reaction $\gamma p \to K^+\Lambda(1520)$ at forward angles will be presented. The analysis required K^+ identification and the $\Lambda(1520)$ via the decay $\Lambda(1520) \to \pi^0\Sigma^0$. Progress in measuring preliminary differential cross sections at forward K^+ angles will be presented.

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HK 68.4 Thu 16:45 SCH/A419

Hyperon Reconstruction with Realistic Track Finding for PANDA — •Anna Alicke[1], Tobias Stockmanns[3], and James Ritman[2,1,3] — [1]Ruhr-Universität Bochum, Experimentalphysik, Lehrstuhl I — [2]GSI Helmholtzzentrum für Schwerionenforschung — [3]Forschungszentrum Jülich, Institut für Kernphysik

One main research topic of the PANDA experiment is the spectroscopy of excited hyperon states. Hyperons, such as Ξ, have a large decay length of several cm and further decay into Λ particles, which have a similarly long lifetime. Consequently, hyperons have a distinctive decay pattern consisting of final state particles that have a displaced secondary vertex. These tracks, which do not originate from the primary interaction point (IP), make track reconstruction and the subsequent event reconstruction challenging. In contrast to primary track finders, which use the IP, secondary track finders have to deal with a much higher combination of hits and are lacking this additional constraint to the IP. Consequently, the track finding efficiency and the momentum resolution for secondary tracks is worse than for primary tracks and usually require more computational power. Up to now, the PANDA experiment was lacking a dedicated track finder for secondary particles. Therefore, hyperon reactions have only been investigated using ideal track finding in PANDA. This work presents the new secondary track finder and its application on the reaction $p\bar{p} \to \Xi(1820)^-\Xi^+$. The expected reconstruction rate to observe the $\Xi(1820)^-$ resonance will be shown.