HK 44: Heavy-Ion Collisions and QCD Phases XI

Time: Thursday 14:00–15:45 Location: J-HS G

Group Report HK 44.1 Thu 14:00 J-HS G

Λ Polarization in Au+Au collisions at $\sqrt{s_{NN}}$ = 2.4 GeV measured with HADES — •Frederic Kornas for the HADES-Collaboration — TU Darmstadt, Darmstadt, Germany

In peripheral heavy-ion collisions there are very strong initial velocity profiles due to the different stopping power perpendicular to the beam axis. This might lead to vortical effects and manifest itself in a polarization of the particle spins. Such a polarization has been measured through the weak decay of the Λ hyperon by the ALICE and STAR collaboration showing an increase towards lower beam energies to $\sqrt{s_{NN}}$ = 7.7 GeV up to $P_\Lambda \approx 2\,\%$. In this contribution the Λ polarization measurement with HADES at $\sqrt{s_{NN}}$ = 2.4 GeV will be presented. In addition results for the flow components v_1 and v_2 of the Λ will be shown too.

This work has been supported by Stiftung GIERSCH.

HK 44.2 Thu 14:30 J-HS G

Predictions for particle production in Ag+Ag collisions at E_{kin}=1.58A GeV from a hadronic transport approach — •Natey Kübler[1,2], Jan Staudenmaier[1,2], and Hannah Elfner[3,2,1] — [1]Frankfurt Institute for Advanced Studies, Ruth-Moufang-Straße 1, 60438 Frankfurt am Main — [2]Goethe University, Max-von-Laue-Strasse 1, 60438 Frankfurt am Main — [3]GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt

The production of particles in heavy ion collisions is of great importance to inspect the properties and dynamics of hadronic matter. As part of the HADES experiment at GSI Ag+Ag collisions at beam energies of 1.58A GeV have been performed in spring 2019. In the light of these experimental studies this work provides a theoretical prediction of the expected results. The hadronic transport approach SMASH (Simulating Many Accelerated Strongly-interacting Hadrons) is applied in order to predict the production of particles (protons, pions, kaons) and their respective distributions in phase space. A special focus is given to the production rates of ϕ mesons and Ξ^- baryons and their agreement with recent HADES data. In addition to the analysis of multiplicities and rapidity spectra, the mean transverse masses for different centrality classes are explored. In this context the hadronic spectra are confronted with earlier HADES results for Au+Au and C+C collisions in order to study the system size dependence. Furthermore, predictions for the invariant mass spectra of dielectron emission are provided.

HK 44.3 Thu 14:45 J-HS G

Charged Kaon and ϕ Reconstruction in Ag+Ag Collisions at $\sqrt{s_{NN}}$ = 2.5 GeV with HADES — •Marvin Kohls for the HADES-Collaboration — Institut für Kernphysik, Goethe Universität Frankfurt am Main, Deutschland

Heavy ion collisions in the few GeV energy regime probe similar temperatures and densities as created in neutron stars, which gives us a tool to probe the matter created in those macroscopic collisions in earthly laboratories [1].

In March 2019, the HADES collaboration recorded $13 \cdot 10^9$ Ag(1.58A GeV)+Ag events as part of the FAIR Phase-0 program. Within this talk we present the status of the reconstruction of K^+, K^- and ϕ and further discuss preliminary results.

Due to the fact, that these strange hadrons are produced under the free nucleon-nucleon production threshold, they are a good probe for in-medium effects with respect to their steep excitation function. Furthermore, comparing the production yields in peripheral collisions to those in central collisions will provide a good test for strangeness enhancement effects.

The work has been supported by BMBF (05P19RFFCA), GSI and HIC for FAIR.

[1] Adamczewski-Musch, J., Arnold, O., Behnke, C. et al. *Probing dense baryon-rich matter with virtual photons.* Nat. Phys. 15, 1040*1045 (2019) doi:10.1038/s41567-019-0583-8

HK 44.4 Thu 15:00 J-HS G

Reconstruction of weakly decaying strange hadrons in Ag+Ag Collisions at $\sqrt{s_{NN}}$ = 2.55 GeV with HADES — •Simon Spies for the HADES-Collaboration — Goethe-Universität Frankfurt

In the scope of the FAIR Phase 0 program we recorded 13.7×10^9 Ag(1.58A GeV)+Ag events in March 2019 with the HADES detector located at the *GSI Helmholtzzentrum für Schwerionenforschung* in Darmstadt, Germany. In this contribution we discuss the status of the reconstruction of Λ hyperons and K^0_S mesons and present first preliminary multi-differential phase space distributions. Both hadrons are produced near their free nucleon nucleon threshold of $\sqrt{s}$ = 2.55 GeV where the excitation functions are steep and a high sensitivity to medium effects is expected. They are reconstructed via the invariant mass of their decay products while the sensitivity is enhanced by exploiting the weak-decay topology with the help of an artificial neural network (ANN).

This work has been supported by BMBF under ErUM-FSP (05P19RFFCA), GSI and HIC for FAIR.

HK 44.5 Thu 15:15 J-HS G

Multi-strange Hyperons reconstruction at the CBM experiment — •Evgeny Lavrik for the CBM-Collaboration — Facility for Antiproton and Ion Research, Darmstadt, Germany

The main goal of the CBM experiment at FAIR is to study the behavior of nuclear matter at very high baryonic density. This includes the exploration of the high density equation of state, search for the transition to a deconfined and chirally restored phase, critical endpoint. The promising diagnostic probes for this new states are the enhanced production of multi-strange (anti-)particles. The CBM detector is designed to measure such rare diagnostic probes multi-differentially with unprecedented precision and statistics.

Results of feasibility studies of these key observables in the CBM experiment are discussed.

HK 44.6 Thu 15:30 J-HS G

Longitudinal dynamics of multiple conserved charges — •Jan Fotakis[1], Harri Niemi[2], Gabriel Denicol[3] und Carsten Greiner[1] — [1]Institut für Theoretische Physik, Goethe Universität, Frankfurt/Main — [2]Department of Physics, University of Jyväskylä — [3]Instituto de Física, Universidade Federal Fluminense

The constituents of nuclear matter produced at collider facilities carry a multitude of conserved charges, namely the baryon number, strangeness and electric charge, so that the diffusion currents of conserved charge couple with each other. Therefore, baryon density gradients in the high-density collision experiments at RHIC, FAIR or NICA will generate equalizing currents in all conserved charges. We provide for the first time a fluid dynamical approach including the complete diffusion coefficient matrix describing the evolution of a dense system with multiple conserved charges. A novel phenomenon arising from the coupled diffusion currents is the generation of positive and negative net-strangeness domains from originally net-strangeness neutral matter. We show how these domains are generated dynamically, and argue that observing the rapidity dependence of net-strangeness can give an experimental access to diffusion.