HK 15: Heavy Ion Collisions and QCD Phases 2

Time: Monday 17:00–19:00 Location: T/HS1

Group Report HK 15.1 Mon 17:00 T/HS1

Rare hadronic probes from Au+Au collisions at 1.23 AGeV — •Timo Scheib for the HADES-Collaboration — Goethe-Universität Frankfurt

Over the years an extensive amount of data in the 1-2 AGeV energy regime has been collected leading to enormous improvements of our understanding of particle production mechanisms and HIC dynamics. At these beam energies, however, the production of hadrons is observed below or slightly above their free elementary production threshold. Due to this fact a comparison to reference data from elementary collisions is not straightforward and phenomenological models are mandatory.

Through rapidly advancing detector technologies and analysis techniques more and more precise data sets can be recorded and analyzed. In April 2012 HADES took data from Au+Au collisions at 1.23 AGeV with a – for this system size and energy – so far unreached precision and statistics (about 7 billion events). By determining the yields and spectra of a comprehensive set of hadrons produced in this system ($\pi^{+/-}$, $K^{+/-}$, K^0_S, Λ, ϕ) a detailed comparison with phenomenological models can be drawn, allowing to further deepen our understanding of hadron production in HIC.

This work has been supported by BMBF (05P12RFGHJ), GSI, HIC for FAIR, HGS-HIRe and H-QM.

HK 15.2 Mon 17:30 T/HS1

Production of strange particles in charged jets in Pb–Pb collisions measured with ALICE at the LHC — •Alice Zimmermann for the ALICE-Collaboration — Physikalisches Institut Universität Heidelberg

Studies of jet production can provide information about the properties of the hot and dense strongly interacting matter created in ultra-relativistic heavy-ion collisions. Specifically, measurement of strange particles in jets may clarify the role of fragmentation processes in the anomalous baryon to meson ratio at intermediate particle p_{T} that has been observed in Pb–Pb collisions.

In this contribution, measurements of the p_{T} spectra of Λ baryons and $\mathrm{K}^0_{\mathrm{S}}$ mesons produced in association with charged jets in Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 2.76$ TeV are presented. The analysis is based on data which was recorded by ALICE at the LHC, exploiting its excellent particle identification capabilities. The baryon/meson ratios of the spectra of strange particles associated with jets are measured in central events in Pb-Pb. A comparison to the ratios obtained for inclusive particles and for particles stemming from the underlying event is shown.

HK 15.3 Mon 17:45 T/HS1

Dynamical K/π, p/π, and K/p fluctuations in Pb-Pb collisions with ALICE — •Mesut Arslandok for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

The study of event-by-event fluctuations of identified hadrons may reveal the degrees of freedom of the strongly interacting matter created in heavy-ion collisions and reflect the underlying dynamics of the system. The observable ν_{dyn}, which is given in terms of the moments of identified-particle multiplicity distributions, is used to quantify the magnitude of the dynamical fluctuations in event-by-event measurements of given particle ratios. The ALICE detector at the LHC is well suited for the study of ν_{dyn}, due to its excellent particle identification (PID) capabilities.

Particle identification that is based on the measurement of the specific ionisation energy loss dE/dx works well on a statistical basis, however, suffers from ambiguities when applied on the event-by-event level. A novel experimental technique called the "Identity Method" was recently proposed to overcome such limitations. The method follows a probabilistic approach using the inclusive dE/dx distributions measured in the ALICE TPC, and determines the moments of the multiplicity distributions by an unfolding procedure. In this contribution, dynamical K/π, p/π, and K/p fluctuation analysis that applies the Identity Method to Pb-Pb data from ALICE will be presented.

HK 15.4 Mon 18:00 T/HS1

Charged kaon and ϕ reconstruction in Au+Au-collisions at 1.23 AGeV — •Heidi Schuldes for the HADES-Collaboration — Goethe-Universität Frankfurt

In Au+Au-collisions at 1.23 AGeV incident energy, strangeness is produced below the free nucleon-nucleon threshold. In baryon dominated matter K^+ and K^- mesons exhibit different properties, because K^- can be resonantly absorbed by nucleons.

Although strangeness exchange reactions have been proposed to be the dominant channel for K^- production in this energy regime, the production yield could also be explained in Ar+KCl-reactions at 1.76 AGeV based on a statistical hadronization model fit to the measured particle yields. To guarantee strangeness conservation, strangeness is calculated canonically within R_c in these models, and therefore the ratio of ϕ/K^- is predicted to rise with decreasing beam energies and as a consequence the feed-down of ϕ-mesons to kaons becomes important.

In 2012, 7.3 billion Au(1.23 GeV per nucleon)+Au collisions have been recorded by the HADES detector. In this contribution, we present results on charged kaons and ϕ mesons.

Supported by BMBF (05P12RFGHJ), GSI, HIC for FAIR, HGS-HIRe and H-QM.

HK 15.5 Mon 18:15 T/HS1

Dynamics of K* mesons in heavy-ion collisions — •Andrej Ilner[1,2], Daniel Cabrera[1,2], and Elena Bratkovskaya[1,2] — [1]Institut für theoretische Physik, Johann Wolfgang-Goethe Universität, Frankfurt am Main, Deutschland — [2]Frankfurt Institute for Advanced Studies, Frankfurt am Main, Deutschland

We investigate the dynamics of strange vector resonances (the K* and the anti-K*) in the Parton-Hardon-String Dynamics (PHSD) transport approach. The time evolution of the production of the (anti-)K* resonances in the QGP phase by quark fusion as well as from hadronic sources is presented. We also investigate the effect of final state hadronic interaction (absorption and rescattering) on experimental observables.

HK 15.6 Mon 18:30 T/HS1

Dynamics of strangeness in hot and dense nuclear matter: from hadronic theory to transport — •Daniel Cabrera[1,2], Laura Tolos[2,3], Jörg Aichelin[4], and Elena Bratkovskaya[1,2] — [1]Institut für Theoretische Physik, Goethe-Universität Frankfurt, 60438 Frankfurt am Main, Germany — [2]Frankfurt Institute for Advanced Studies (FIAS), 60438 Frankfurt am Main, Germany — [3]Institut de Ciències de l'Espai (IEEC/CSIC), Campus Universitat Autònoma de Barcelona, Facultat de Ciències, Torre C5, E-08193 Bellaterra, Spain — [4]Subatech, UMR 6457, IN2P3/CNRS, Université de Nantes, École des Mines de Nantes, 4 rue Alfred Kastler, 44307 Nantes cedex 3, France

We present a study of medium effects on the most relevant binary reactions involving strange pseudoscalar mesons close to threshold in heavy-ion collisions at FAIR energies. Our results rely on a self-consistent chiral unitary approach in coupled channels which incorporates the s- and p-waves of the kaon-nucleon interaction including finite temperature and baryonic density effects. Our model provides transition rates and cross sections for reactions such as $\bar{K}N \to \pi\Sigma$, fully off-shell kaon and anti-kaon spectral functions as well as nuclear optical potentials for several hyperon excitations. The latter are essential ingredients to account for within transport simulations of strange hadron dynamics. Additionally, we explore "unconventional" mechanisms for strangeness generation within meson meson and meson baryon interactions and try to give an explanation to puzzling observations in the production of strange hadrons such as ϕ and Ξ.

HK 15.7 Mon 18:45 T/HS1

Measurement of charged jet fragmentation in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV with ALICE — •Dennis Weiser for the ALICE-Collaboration — Physikalisches Institut, Heidelberg, Deutschland

A Large Ion Collider Experiment (ALICE) is a dedicated heavy-ion experiment at the LHC that is focused on the study of the hot and dense strongly interacting medium created in Pb-Pb collisions, the so-called Quark-Gluon-Plasma (QGP). Prior to the QGP formation hard partons can be created in initial hard scattering processes and form jets by fragmentation into hadrons. Jets can probe the QGP and access its properties via energy loss or, for instance, the modification of

jet structure observables.
The measurement of jet structure observables in p-Pb collisions provides an important reference to the measurement in Pb-Pb collisions. To assign possible modifications in Pb-Pb collisions to in-medium effects a measurement in a reference system is needed in that the medium is not created, but where possible initial-state- or cold-nuclear-matter effects are present.

We present the measurement of the longitudinal momentum distribution of tracks in charged jets in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV using minimum bias and Transition Radiation Detector (TRD) triggered data. By demanding 3 tracks above 3 GeV/c in any TRD stack an efficient trigger on high p_T jets is realised. Thus the TRD triggered data can be used to extend the range of the measurement towards high p_T.