HK 47: Heavy-Ion Collisions and QCD Phases X

Time: Wednesday 17:30–18:45 Location: SCH/A315

HK 47.1 Wed 17:30 SCH/A315

Light Nuclei Emission in Ag+Ag Collisions — •Marvin Nabroth for the HADES-Collaboration — Institut fuer Kernphysik, Frankfurt, Deutschland

This contribution gives an overview of data on protons, deuterons and He3, emitted in Ag+Ag collisions at $\sqrt{s_{NN}} = 2.55$ GeV measured at HADES. Covered is the procedure of particle identification based on a Bayesian ansatz as well as the process of acceptance and efficiency correction and extrapolation into uncovered phase space regions. The reconstructed transverse mass spectra and resulting rapidity density distributions as a function of the collision centrality are presented and a comparison of the 4π yield to the world data in the low energy regime, as a function of collision energy, is discussed.
Detailed knowledge of the production yields and phase space spectra is of special interest when it comes to test to what extent thermal models can describe the nature of a heavy-ion collision in the low-energy regime and to understand the mechanisms under which light nuclei are formed during a heavy-ion collision.
This work has been supported by BMBF (05P21RFFC2), GSI F&E and HGS-HIRe.

HK 47.2 Wed 17:45 SCH/A315

Testing coalescence by studying (anti)nuclei production in and out of jets in ALICE — •Chiara Pinto for the ALICE Germany-Collaboration — Technische Universität München, München, Deutschland

The production mechanism of (anti)nuclei in ultrarelativistic hadronic collisions is under intense debate in the scientific community. The description of the experimental measurements is currently based on two competing phenomenological models: the statistical hadronisation model and the coalescence approach. For the first time, the deuteron production in pp collisions at \sqrt{s}= 13 TeV is measured both in jets and in the underlying event. Due to the collimated emission of nucleons in a jet, the nuclear production by coalescence is expected to be enhanced. In this contribution, the results for the coalescence parameter B2 in and out of the jet are presented in comparison with predictions from the coalescence model and a recently developed reaction-based production mechanism implemented in PYTHIA 8.3.

This work is funded by DFG SFB1258 and by BMBF Verbundforschung (05P21WOCA1 ALICE).

HK 47.3 Wed 18:00 SCH/A315

Measurement of proton-deuteron correlations in Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV — •Michael Jung for the ALICE Germany-Collaboration — Institut für Kernphysik Frankfurt

The first measurement of p–d two-particle correlations measured with ALICE in central and semi-central Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV will be presented. This measurement enables the possibility to study three particle interactions as well as the formation mechanism of light nuclei in heavy-ion collisions. The particle identification, the procedure to obtain the correlation functions and a study of the source size will be shown. The measured correlations are then compared with theoretical predictions using the Lednický-Lyuboshitz approach. For these calculations measured scattering lengths of proton-deuteron pairs from scattering experiments are taken.

HK 47.4 Wed 18:15 SCH/A315

Sexaquark Search in ALICE — •Andrés Bórquez for the ALICE Germany-Collaboration — Universität Heidelberg, Germany

For many years, WIMPs have been the leading candidate for the phenomenon of dark matter in astronomy. However, despite extensive experimental research, no WIMP signal has been detected, leading to the exploration of other dark matter candidates. In 2017, G. Farrar proposed the sexaquark as a new candidate for dark matter, which is a neutral, compact, six-quark state with the quark content $uuddss$. This particle is consistent with our current understanding of Quantum Chromodynamics (QCD) and the dark matter relic abundance. In the ALICE experiment at the Large Hadron Collider (LHC), we plan to search for this exotic particle via its interaction with detector material after being produced in heavy-ion collisions.

In this presentation, we will discuss an overview of the sexaquark, some preliminary studies with specialized simulations, and the challenges and prospects of this search analysis.

HK 47.5 Wed 18:30 SCH/A315

Net-Proton Fluctuations in Pb-Pb Collisions with the ALICE Experiment — •Ilya Fokin for the ALICE Germany-Collaboration — Physikalisches Institut, Heidelberg

Fluctuations of conserved charges – such as the electric charge, baryon number or strangeness – in ultrarelativistic heavy-ion collisions provide insight into the QCD phase diagram. They are quantified using moments or cumulants of the distribution of the respective charge in a collision, which can be related to susceptibilities from lattice QCD calculations. These numerical calculations predict a second order phase transition from the quark-gluon plasma to the hadron gas close to the chemical freeze-out temperature for vanishing quark masses and baryon chemical potential, which is expected to turn into a continuous crossover for physical masses. Since the LHC provides heavy-ion collisions with almost vanishing baryon chemical potential, using the proton number as a proxy for the baryon number makes the lattice QCD results accessible in the experiment.

In this contribution, recent measurements of higher-order cumulants of the net-proton number in Pb-Pb collisions recorded with the ALICE detector are presented. Their dependence on the pseudorapidity acceptance and centrality and comparisons to models are discussed. Moments of the proton number distributions are measured probabilistically using the Identity Method, treating contamination of the proton sample in a natural way.