HK 69: Heavy-Ion Collisions and QCD Phases XVI

Time: Thursday 15:45–17:15 Location: HBR 62: EG 05

HK 69.1 Thu 15:45 HBR 62: EG 05

Measurement of p-d and Λ-d correlations in Pb–Pb and pp collisions — •Michael Jung for the ALICE Germany-Collaboration — Goethe-Universität Frankfurt

The correlation functions of p–d and Λ–d measured with ALICE in three different source sizes will be presented. The measurements were performed in pp collisions at $\sqrt{s} = 13\,\text{TeV}$ as well as in semi-central and central Pb–Pb collisions at $\sqrt{s_{\text{NN}}} = 5.02\,\text{TeV}$. The particle identification and the procedure to obtain the correlation function will be shown. The results are then compared to theoretical predictions calculated using the Lednický-Lyuboshitz approach. For these calculations measured scattering lengths are taken. This measurement enables the possibility to study three particle interactions as well as the formation mechanism of light (hyper-)nuclei in particle collisions at LHC energies.

HK 69.2 Thu 16:00 HBR 62: EG 05

Ξ-baryon reconstruction with ALICE in LHC Run 3 data — •Tim Weinreich for the ALICE Germany-Collaboration — Physikalisches Institut, Universität Heidelberg

The precise reconstruction of strange baryons like the Ξ is crucial to study charm baryons via their decay to strange baryons.
In order to extract a signal even in high charged particle multiplicity environments and low transverse momentum regions with high combinatorial background a precise reconstruction of the decay topology is invaluable for obtaining high invariant mass resolutions and reducing background for longer decay chains.
The Kalman Filter Particle (KFParticle) package is a complete reconstruction algorithm for complex decay topologies, fully taking into account the uncertainties of the daughter tracks.
In this work, the KFParticle package is used to reconstruct the cascade-like decay structure of the Ξ-baryon in simulated Run 3 proton-proton data at a centre of mass energy of $\sqrt{s} = 13.6$ TeV.
The reconstruction performance is compared to a reconstruction algorithm used for ALICE Run 3 data analysis, which is based on the minimisation of the distance of closest approach between daughter tracks. A comparison of the two reconstruction methods regarding secondary vertex, transverse momentum and invariant mass resolutions is presented.

HK 69.3 Thu 16:15 HBR 62: EG 05

Sexaquark Search with ALICE — •Andres Borquez — Physikalisches Institut, Germany

For many years, WIMPs have been the most popular dark matter candidate. However, despite extensive experimental research, no WIMP signal has yet been detected, leading to the search for more exotic candidates. In 2017, G. Farrar proposed the sexaquark as a new baryonic 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 relic abundance of dark matter. 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 talk, we will discuss the challenges and prospects of this search, as well as an analysis of the simulations needed to carry it out.

HK 69.4 Thu 16:30 HBR 62: EG 05

Dynamic light Nuclei Production in SMASH — •Martha Ege[2,3], Justin Mohs[2,3], and Hannah Elfner[1,2,3] — [1]Gesellschaft für Schwerionenforschung — [2]Frankfurt Institute for Advanced Studies — [3]Goethe Universität Frankfurt am Main

The study of the QCD phase diagram and in particular the search for the critical endpoint and the first-order phase transition between the QGP and the hadronic phase at high μ_{B} is one of the main goals of heavy-ion physics. Since for the first order phase transition large fluctuations of the net baryon density are expected, we can assume that the production of light nuclei is sensitive to the critical endpoint and the phase transition. Therefore it is of major interest to get a better understanding about how light nuclei are formed in heavy-ion collisions.

In this work we investigate the production of light nuclei such as deuteron, triton, helium, and hypertriton in Au-Au collisions at different energies from the RHIC beam energy scan. We study the afterburner calculations for the light nuclei production in the framework of the hadronic transport approach SMASH (Simulating Many Accelerated Strongly-interacting Hadrons). The nuclei are produced via pion and nucleon catalysis reactions. In this approach a stochastic collision criterion is implemented to realize both $2 \leftrightarrow 3$ and $2 \leftrightarrow 4$ reactions. In this work spectra and multiplicities of light nuclei will be presented. We will investigate the production time and the origin of the light nuclei in detail. The results are compared to recent experimental data from the STAR collaboration.

HK 69.5 Thu 16:45 HBR 62: EG 05

Measurement of inclusive jet suppression in Pb–Pb collisions at $\sqrt{s_{\text{NN}}} = 5.02$ TeV with a novel mixed-event approach — •Nadine Alice Grünwald — Physikalisches Institut Universität Heidelberg

QCD matter is studied at very high temperatures and densities utilizing heavy-ion collisions. The ALICE experiment is dedicated to measure heavy-ion collisions at the LHC. The Quark-Gluon Plasma (QGP) is produced in those collisions where quarks and gluons are deconfined and new physics phenomena emerge. The QGP can be studied using jets, which are produced in the early stage of the collisions. Depending on the structure of the QGP, the jets lose energy mainly due to collisional and radiative energy loss. A major difficulty in heavy-ion jet measurements is the huge amount of uncorrelated particles from the underlying event. Those bulk particles smear out the jet measurement itself and are responsible for fake jets. In order to perform low p_{T} jet measurements, a novel mixed-event technique is exploited. In this talk the mixed events as a new approach to describe the uncorrelated background in heavy-ion jet measurements at ALICE are presented. The description of the uncorrelated background by mixed events enables the inclusive charged-particle jet measurement down to $p_{\text{T}} = 13.5$ GeV/c at collision energies of $\sqrt{s_{\text{NN}}} = 5.02$ TeV. We can compare for the first time the jet yield suppression due to quenching at RHIC and the LHC in the same kinematic range. In addition, the results are compared to various model predictions.

HK 69.6 Thu 17:00 HBR 62: EG 05

Role of initial transverse momentum in a hybrid approach — •Niklas Götz[1,2], Lucas Constantin[1], and Hannah Elfner[3,1,2,4] — [1]Goethe University Frankfurt, Department of Physics, Institute for Theoretical Physics, Frankfurt, Germany — [2]Frankfurt Institute for Advanced Studies, Ruth-Moufang-Strasse 1, 60438 Frankfurt am Main, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany — [4]Helmholtz Research Academy Hesse for FAIR (HFHF), GSI Helmholtz Center, Campus Frankfurt, Max-von-Laue-Straße 12, 60438 Frankfurt am Main, Germany

This work studies the effect of exchanging initial condition models in the modular hybrid approach SMASH-vHLLE, composed of the hadronic transport approach SMASH and the (3+1)d viscous hydrodynamic code vHLLE. The initial condition models investigated are SMASH IC, Trento and IP-Glasma. Correlations are calculated on an event-by-event basis between the eccentricities and momentum anisotropies of the initial state as well as the momentum anisotropies in the final state. This work demonstrates that substantial differences exist both in the distributions of eccentricities, the correlations amongst the initial state properties as well as in the correlations between initial state and final state properties. Inclusion of radial flow in the linear fit improves the prediction of final state flow from initial state properties. The presence of momentum in the initial state has an effect on the emergence of flow and is therefore a relevant part of initial state models, challenging the common understanding of a linear response.