HK 19: Heavy-Ion Collisions and QCD Phases III

Zeit: Dienstag 14:00–15:45 Raum: HS 15

Gruppenbericht HK 19.1 Di 14:00 HS 15

Central production in ALICE in proton-proton collisions at the LHC — •Rainer Schicker for the ALICE-Collaboration — Phys. Inst., Heidelberg

Central production in proton-proton collisions has been analysed from the low energy range $\sqrt{s}$ = 12.7-63 GeV of the ISR at CERN up to the presently highest energy available of $\sqrt{s}$ = 13 TeV achieved in Run II at the LHC. Central production is characterized by the hadronic state produced at or close to midrapidity, and by the two forward scattered protons, or remnants thereof. No particles are produced between the midrapidity system and the beam particles or remnants on either side of the central system, thereby resulting in a double gap topology of the event. I will give an overview of the ongoing efforts in the ALICE collaboration to analyse double gap events taken in Run II at the LHC, and present the prospects of such data taking in Run III.

HK 19.2 Di 14:30 HS 15

Production of (anti-)t and (anti-)^{4}He in Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}}$ = 5.02 TeV with ALICE at the LHC — •Esther Bartsch for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

The high collision energies reached at the LHC lead to significant production yields of light (anti-)nuclei in proton-proton and, in particular, Pb–Pb collisions. The excellent particle identification capabilities of the Time Projection Chamber, using the specific energy loss (dE/dx), and the time-of-flight measurement, allow for the detection of these rarely produced particles. Furthermore, the Inner Tracking System gives the possibility to separate primary nuclei from those coming from the decay of heavier systems.

New results on (anti-)triton and (anti-)^{4}He production in Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}}$ = 5.02 TeV will be presented. The goal is to study production mechanisms such as coalescence and thermal models, and to compare the results to those in heavy-ion collisions at lower energies.

Supported by BMBF and the Helmholtz Association.

HK 19.3 Di 14:45 HS 15

Light Nuclei Production in Au+Au Collisions at 1.23A GeV with HADES — •Melanie Szala for the HADES-Collaboration — Goethe Universität Frankfurt

In 2012 the HADES experiment at GSI Helmholtzzentrum für Schwerionenforschung in Darmstadt measured Au+Au collisions at $\sqrt{s_{NN}}$ = 2.4 GeV. As light hadrons have successfully been analysed, we present recent results of light nuclei in order to extend the set of identified particles towards heavier hadrons.

After particle identification, the transverse mass spectra of the particle candidates are extracted. Subsequently, they are corrected for acceptance and efficiency losses, and the obtained spectra are then compared to blast-wave-fits, in order to extract the radial expansion velocity β of the system and its kinetic freeze-out temperature T_{kin}.

The production of nuclei in heavy ion collisions is commonly discussed within two different scenarios: the thermal-statistical model and the coalescence model.

The yields and extracted kinetic freeze out temperature are confronted to the chemical freeze-out temperature T_{chem} as extracted from statistical model fits to light hadron yields.

This work has been supported by BMBF (05P15RFFCA), GSI and HIC for FAIR.

HK 19.4 Di 15:00 HS 15

Anti-helium production in pp collisions mesured with ALICE — •Michael Habib for the ALICE-Collaboration — GSI, Planckstraße 1, 64291 Darmstadt

Cosmic-ray anti-helium ($\overline{\mathrm{He}}$) have been long suggested as dark matter probe, since their production from collisions of high-energetic cosmic-rays with the interstellar medium seems to be extremely rare. However, due to the lack of $\overline{\mathrm{He}}$ measurements at comparable energies and system sizes, the astrophysical background is still poorly known.

ALICE has collected ∼1.5 billion pp events at a center-of-mass energy of $\sqrt{s}$ = 13 TeV. This constitutes a sufficient sample to measure the rare processes of anti-^{3}He production and contribute to a more precise estimate of the astrophysical background.

In this talk, we present the transverse-momentum (p_{T}) spectra of (anti-)^{3}He in pp collisions and the corresponding coalescence parameter (B_3) for different event multiplicities.

HK 19.5 Di 15:15 HS 15

Alice measurement of the elliptic flow relative to the spectator plane — •Damir Devetak for the ALICE Collaboration — PI, Heidelberg

The Quark-Gluon Plasma (QGP) is a system of strongly interacting partons, created in heavy-ion collisions, that behaves almost like a perfect liquid. Its energy density and geometry profile can be described by relativistic hydrodynamics. The initial conditions to this calculations are defined by the phase-space distribution of the participating nucleons and thus fluctuate even at a fixed beam energy and collision centrality. This results in fluctuations of the anisotropic flow coefficients of the final particles that can be seen in the experiment and in calculations.

In this talk, measurements of the reaction plane elliptic flow are presented, using the Zero Degree Calorimeter at ALICE, and compared to the elliptic flow values calculated with the cumulants of the fourth order. According to calculations, in which elliptic flow fluctuations emerge from Gaussian fluctuations of initial spatial eccentricity components, the results should exhibit the same behaviour for central and semi-central collisions and differ for peripheral. Deviation from this trend can provide new insight into the nature of flow fluctuations in heavy-ion collisions.

HK 19.6 Di 15:30 HS 15

Performance study of the TRD nuclei trigger — •Ömür Erkiner for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

At the Large Hadron Collider at CERN significant production rates of light (anti-)(hyper-)nuclei have been measured in Pb–Pb collisions. The production of such loosely bound objects has recently become a topic of high interest. For instance the measured lifetime of the lightest hypernucleus, the hypertriton (a bound state of a proton, a neutron and a Λ hyperon), is significantly below the expectation of theory calculations which expect the lifetime to be very close to the Λ lifetime. Therefore, it is important to also measure these rare nuclei in pp collisions. Due to their weak decay, only its daughter products can be measured, e.g. the charged two body decay channel ${}^3_{\Lambda}\mathrm{H} \rightarrow {}^3\mathrm{He} + \pi^-$. Furthermore, anti-alpha have not been measured in pp and p–Pb collisions because of rare statistics and low production yield. In order to be able to measure these rare (anti-)nuclei also in pp collisions, it is essential to increase the statistics by employing a trigger on nuclei. The transition radiation detector (TRD) was constructed for electron identification and offers trigger capabilities. Using the data on pp collisions at $\sqrt{s}$ = 13 TeV it turned out that particles with $Z > 1$ the TRD shows a good behaviour as a nuclei trigger. In this talk the properties of the nuclei trigger will be elaborated as well as the extracted efficiencies and purities for the different light nuclei, i.e. (anti-)d, (anti-)t, (anti-)^{3}He and (anti-)^{4}He.

Supported by BMBF and the Helmholtz Association.