HK 57: Heavy-Ion Collisions and QCD Phases IX

Time: Thursday 17:30–19:00 Location: HS 3 Chemie

Group Report HK 57.1 Thu 17:30 HS 3 Chemie

Measurement of radius dependent jet suppression and jet-hadron correlations in Pb–Pb collisions at 5.02 TeV with a novel mixed-event approach — •Nadine Alice Grünwald for the ALICE Germany-Collaboration — Heidelberg University, Heidelberg, Germany

The Quark-Gluon Plasma (QGP) is produced in heavy-ion collisions collisions where quarks and gluons are deconfined and new physics phenomena emerge. The ALICE experiment measures heavy-ion collisions at the LHC where the QGP can be studied using jets from partons, which are produced in the early stage of the collisions.

In this talk mixed events as a new approach to describe the uncorrelated background in jet measurements in heavy-ion collisions in ALICE are presented. The resulting charged-particle jet R_{AA} measurements have high precision over a broad kinematic range, reaching significantly lower jet p_T values as compared to the traditional analyses. Various jet resolution parameters are studied to measure the radius dependence of the jet energy loss and thereby the redistribution of the lost energy to the surrounding QGP medium.

We also present measurements of the event plane dependent jet-hadron correlations. Angular correlations of jets are analyzed to obtain information about the energy loss of jets in the medium. The study of these correlation functions for different orientations of the jet to the event plane allows for a measurement of the energy loss which is sensitive to the in-medium path-length of the parton.

HK 57.2 Thu 18:00 HS 3 Chemie

Semi-inclusive hadron-jet momentum distributions using mixed events with ALICE — •Nicola Wilson for the ALICE Germany-Collaboration — Physikalisches Institut, Ruprecht-Karls-Universitaet Heidelberg, Germany

The ALICE experiment at CERN studies the Quark Gluon Plasma (QGP), a state of matter formed at extreme temperatures/densities with partonic degrees of freedom produced in heavy-ion collisions. Jets, generated in the initial hard scatterings, are valuable for probing QGP properties. As they transverse the QGP, their energy and structure are modified by medium interactions.
This work focuses on jets recoiling from high p_T trigger hadrons (h-jets) in central PbPb collisions at $\sqrt{s} = 5.02$ TeV, with different p_T^{trig} intervals analyzed. Jet measurements are challenging due to the large uncorrelated background, particularly at low p_T. To address this, a novel mixed-event technique is applied, where artificial events with uncorrelated tracks are constructed from real events.
Jet reconstruction is performed using the anti-k_T algorithm with varying jet radii for both real and mixed events. The mixed event jet p_T distribution is used to correct the background yield in real event jet spectra. Finally, unfolding procedures correct detector and background effects.
We present first results of hadron triggered recoil jet transverse momentum spectra using the mixed-event technique.

HK 57.3 Thu 18:15 HS 3 Chemie

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

In 2017, G. Farrar proposed the sexaquark, a hypothetical six-quark state with the quark content $uuddss$. This particle is characterised by being neutral, compactly bound, and cosmologically stable within certain mass limits; unique properties that make it a compelling dark matter candidate.

Despite its elusive nature, several experimental collaborations have been searching for evidence of its existence. In particular, this contribution presents an update on its ongoing search within the ALICE experiment at the LHC. The strategy focuses on identifying displaced strangeness production caused by the annihilation of anti-sexaquarks with detector material, following their potential production in heavy-ion collisions (Pb-Pb) during LHC Run 2.

HK 57.4 Thu 18:30 HS 3 Chemie

Event-by-event multiharmonic correlations in Run 3 heavy-ion collisions with ALICE — •Ante Bilandzic for the ALICE Germany-Collaboration — Technical University of Munich

In ultrarelativistic heavy-ion collisions, several nontrivial physics phenomena can lead to persistent event-by-event azimuthal anisotropies in particle distributions, which are traditionally quantified with Fourier harmonics. Besides the standard measurements of individual vn harmonics, further independent information about different stages in heavy-ion collisions can be extracted from multi-harmonic correlations, using recently developed Symmetric Cumulants (SC) and Asymmetric Cumulants (AC). These novel observables are particularly suitable for Bayesian studies, after it was demonstrated that they exhibit a better sensitivity to model parameters than the previously used observables. This contribution presents the first differential measurements of SC and AC observables in Run 3 Pb-Pb collisions as a function of kinematic variables.

HK 57.5 Thu 18:45 HS 3 Chemie

Angular Correlations in Jets — •Lars Jörgensen for the ALICE Germany-Collaboration — Technische Universität München

Antinuclei in cosmic rays could be an indicator for dark matter decay. In order to correctly interpret any future measurement of the flux of antinuclei in our galaxy, the formation mechanism of antinuclei must be understood. The coalescence model aims to describe the formation process on a microscopic level by assuming that nucleons close in phase space are likely to form a bound state. A powerful tool to test coalescence is the study of nuclear production in jets since their emission is highly collimated, and therefore the coalescence condition is likely to be fulfilled. In this contribution, a first measurement of angular correlations between (anti)nucleons inside jets will be presented. Further, the yields of (anti)nucleons and (anti)nuclei in jets will be shown. With these ingredients it is possible to make a prediction on (anti)nuclei production in jets using a coalescence model such as ToMCCA. This model shows the expected enhancement of the coalescence parameter B_2 in jets previously observed in other analyses. With this extension to the ToMCCA model it is possible to study nuclei production in point-like systems similar to e^+-e^-, which is expected to closely resemble dark matter annihilation. This work was funded by the BMBF 05P24W04 ALICE.