HK 66: Heavy-Ion Collisions and QCD Phases XIII

Time: Thursday 15:45–17:15 Location: SCH/A315

HK 66.1 Thu 15:45 SCH/A315

Measurement of light neutral meson production inside jets in pp collisions at $\sqrt{s}$ = 13 TeV with ALICE — •Joshua König for the ALICE Germany-Collaboration — IKF, Goethe-Universität Frankfurt

Particle production in ultra-relativistic pp collisions can be factorized into the parton density function (PDF), the partonic cross-section and the fragmentation function (FF). While PDFs, accessible via deep inelastic scattering experiments, and the partonic cross section, calculable using perturbative QCD, are independent of the final state particle species, FFs need to be constrained by experimental data for each particle species. Measurements of the momentum fraction $z = p_{\mathrm{part}}/p_{\mathrm{jet}}$ of a particle species contained in a high energetic jet gives direct access to the FF of the species.
In this talk, the measurement of the p_{T} spectra of π^0 and η mesons inside jets as well as the measurement of the meson momentum fraction z in pp collisions at $\sqrt{s}$ = 13 TeV with ALICE will be presented. The measurement combines results from several partial independent meson reconstruction techniques available in ALICE, including calorimeter based photon detection as well as utilizing photon conversions in the central tracking detectors. Particle jets are reconstructed using charged tracks from the central tracking detectors as well as neutral clusters from the electromagnetic calorimeter. The results will be compared to theoretical model predictions.
Supported by BMBF and the Helmholtz Association

HK 66.2 Thu 16:00 SCH/A315

Jet-hadron correlations in PbPb collisions at $\sqrt{s_{\mathrm{NN}}}$=5.02 TeV with ALICE — •Luisa Bergmann for the ALICE Germany-Collaboration — Physikalisches Institut, Im Neuenheimer Feld 226, 69120 Heidelberg

In relativistic heavy-ion collisions, a deconfined medium with high energy density is created, the quark-gluon plasma. Amongst other observables, jets – originating from primordial hard scatterings – act as useful probes for the properties of this medium. As the initial partons traverse the quark-gluon plasma, they lose energy by interacting with the constituents of the medium. The study of this so called "jet quenching" yields insight into the properties of the medium.

By analyzing the angular correlations of jets with charged hadrons, one obtains 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 jet. In this talk, first studies of event plane dependent jet-hadron correlations for data collected by the ALICE experiment in PbPb collisions at $\sqrt{s_{\mathrm{NN}}}$=5.02 TeV are presented.

HK 66.3 Thu 16:15 SCH/A315

Studies of jets in heavy-ion collisions at ALICE with a novel mixed-event approach — •Nadine Grünwald for the ALICE Germany-Collaboration — Physikalisches Institut Heidelberg, Im Neuenheimer Feld 226, 69120 Heidelberg

With heavy-ion collisions QCD matter is studied at very high temperatures and densities. 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 in various ways. A major difficulty in heavy-ion jet measurements is the huge amount of uncorrelated particles which distorted the jet measurements, especially at lower p_{T}. 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 for the first time inclusive charged jet measurements down to low p_{T} at collision energies of $\sqrt{s_{\mathrm{NN}}}$ = 5.02 TeV. In particular no cuts on the reconstructed jet energies are necessary.

HK 66.4 Thu 16:30 SCH/A315

Direct photon and χ_c performance studies for the ALICE 3 experiment — •Abhishek Nath for the ALICE Germany-Collaboration — Ruprecht Karl University of Heidelberg, Germany

Direct photons are one of the critical tools for studying hot QCD medium as their mean free path is much larger than the size of the system and they leave the medium without further interaction. As the ALICE 3 LOI received the LHCC recommendation to proceed with R&D, we try to perform more critical studies regarding photons. With much larger rapidity coverage and usage of bent Monolithic Active Pixel Sensors (MAPS), the ALICE 3 experiment aims to go much lower in p_{T} to explore the direct photons originating majorly from thermal contribution. Along with that, with the measurement of χ_c, χ_b, and other $L = 1$ states in the extended rapidity range in ALICE 3, a more accurate description of the dynamics of quarkonium interactions with the medium will be possible.

In this talk, we present performance studies and uncertainty projections in key direct photon measurements like R_γ, direct photon spectrum and corresponding inverse slope parameter, direct photon v_2 and possibly also HBT anticipated for Run 5 and 6. Along with this, the performance of χ_c measured through the radiative decay channel $\chi_c \to J/\psi + \gamma$ in Pb–Pb collisions is also presented.

HK 66.5 Thu 16:45 SCH/A315

Low p_{T} ω measurements in pp collisions at $\sqrt{s}$ = 5.02 TeV with ALICE — •Merle Luisa Wälde for the ALICE Germany-Collaboration — Goethe University, Frankfurt, Germany

Measurements of hadron production cross sections in proton-proton (pp) collisions at high energies are important to test our understanding of QCD and as reference for heavy-ion studies. While the hard production of particles can be calculated in a perturbative approach, the production via soft scattering processes relies on phenomenological model approaches that require experimental input and suffer from sizeable uncertainties in their predictions. Therefore, the spectra of the ω meson needs to be measured down to the lowest transverse momentum (p_{T}) where the reach to low momenta is scarce at LHC energies and midrapidity.

In this talk, the first measurement of the ω meson down to $p_{\mathrm{T}} = 0$ in pp collisions at $\sqrt{s} = 5.02$ TeV at midrapidity will be presented. The ω meson is reconstructed in the decay into $\mathrm{e}^+\mathrm{e}^-$ pairs with ALICE. We will discuss the estimation of the combinatorial background as well as uncertainties related to the extraction of the signals. The final results will be compared to model calculations.

HK 66.6 Thu 17:00 SCH/A315

Charged Kaon and ϕ Production in Ag+Ag Collisions at 1.58A GeV with HADES — •Marvin Kohls for the HADES-Collaboration — Goethe-Universität Frankfurt

The investigation of strangeness production and propagation in heavy-ion collisions in the few GeV energy regime is a sensitive tool to study the microscopic structure of nuclear matter at high baryo-chemical potential [1]. For respective studies presented in this talk, a total of 6×10^9 central Ag(1.58 A GeV)+Ag events recorded with HADES in 2019 have been used. We focus on results concerning K^+, K^- and $\phi(1020)$.
The multiplicities of strange particles are compared with results obtained from statistical hadronization models. Special attention will be put on the non-strange $\phi(1020)$ meson and the double-strange Ξ^- hyperon. Furthermore, the centrality ($\langle A_{\mathrm{part}} \rangle$) dependence of strange-hadron multiplicities will be discussed, which was found to follow a universal scaling for the collision system Au(1.23 A GeV)+Au.

This work has been supported by BMBF (05P21RFFC2), GSI, HFHF, the State of Hesse within the Research Cluster ELEMENTS (Project ID 500/10.006) and HGS-HIRe.

[1] Che Ming Ko et al.; Ann.Rev.Nucl.Part.Sci. 47 (1997) 505-539