HK 4: Schwerionenkollisionen und QCD Phasen

Zeit: Montag 14:00–16:00 Raum: HZ 6

Gruppenbericht HK 4.1 Mo 14:00 HZ 6

Jet reconstruction and measurement of identified fragmentation functions in Pb-Pb and pp collisions with the ALICE experiment — •Xianguo Lu and Oliver Busch for the ALICE-Collaboration — Physikalisches Institut, Heidelberg, Germany

Jets are defined in QCD as cascades of consecutive emission of partons from an initial hard scattering. The process of parton showering and subsequent hadronisation is broadly known as fragmentation. High energy nucleus-nucleus collisions allow us to probe parton fragmentation within a QCD medium and the properties of this medium via the modification of the jet spectrum and jet structure. Jet reconstruction in pp collisions provides an elementary baseline and allows to investigate perturbative and non-perturbative aspects of particle production. In addition to inclusive probes, identified particles in the final states provide an enhanced sensitivity to the flavor dependence of fragmentation and nuclear modifications.

ALICE at the CERN LHC is a general-purpose heavy ion experiment designed to study the physics of strongly interacting matter and the Quark-Gluon-Plasma. It has an excellent tracking and particle identification performance over a wide momentum range. In this talk we present results on inclusive jet observable as well as the novel measurements of identified fragmentation functions in pp and Pb-Pb collisions. The results are confronted with theory predictions.

HK 4.2 Mo 14:30 HZ 6

Azimuthal Jet Tomography at RHIC and LHC — •Barbara Betz[1] and Miklos Gyulassy[2] — [1]Johann Wolfgang Goethe-University, Frankfurt am Main, Germany — [2]Columbia University, New York, USA

Recent data on the azimuthal and transverse momentum dependence of high-pT pion nuclear modification factors and high-pT elliptic flow in nuclear collisions at RHIC and LHC are analyzed in terms of a wide class of jet-energy loss models, ranging from running coupling pQCD based prescriptions to AdS/CFT-inspired models, coupled to state of the art (2+1)-dimensional viscous hydrodynamic fields. RHIC data are found to be surprisingly consistent with most models, but with parameters fixed at RHIC, extrapolations to LHC energies favor only running coupling QCD based energy-loss models, while conformal AdS holography models are inconsistent with the measured data. However, recent non-conformal generalizations of AdS holography may provide an alternative description.

HK 4.3 Mo 14:45 HZ 6

Initial state effects in p+Pb collisions at 5.02 TeV from the PHSD transport approach — •V.P. Konchakovski[1], W. Cassing[1], and V.D. Toneev[2] — [1]Institute for Theoretical Physics, University of Giessen, Giessen, Germany — [2]Joint Institute for Nuclear Research, Dubna, Russia

We study initial state effects for different observables in p+Pb collisions at 5.02 TeV using event-by-event simulations within the Parton Hadron String Dynamics (PHSD) transport approach which incorporates both hadronic and partonic degrees of freedom and successfully describes heavy-ion collisions in a wide range of energies. We compare our results with data from the ALICE Collaboration as well as with calculations using Glauber and Color-Glass-Condensate (CGC) initial conditions and find that our results for fluctuations and distributions are close to the CGC assumptions. We additionally investigate the effects of color field fluctuations in the initial phase of the collision that emerge from the non-abelian dynamics of the chromo fields.

HK 4.4 Mo 15:00 HZ 6

Charged Jets in Minimum Bias p-Pb Collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV with the ALICE Detector — •Rüdiger Haake — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, Germany

Highly energetic jets are sensitive probes for the kinematics and the topology of high energy collisions. They are produced in an early stage of the collision from hard scattered partons that hadronize and eventually form jets as a spray of charged and neutral particles.

The measurement in p-Pb provides an important reference to study the effects of cold nuclear matter on jet production and hadronization. This is possible because the formation of a hot and dense medium like in Pb-Pb is not expected. Besides the comparison to Pb-Pb collisions, p-Pb analyses can also be an important constraint for the nuclear parton density functions.

In terms of analysis techniques, the exact evaluation of the background from the underlying event is an important ingredient. It is much smaller than in Pb-Pb so that the methods for background estimation need to be refined.

Our jet analysis of p-Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV is performed on data taken by the ALICE detector at the LHC in the beginning of 2013. The focus of our analysis lies on the minimum bias jet spectra and their comparison to the spectra from pp collisions. For this analysis various estimates for the background and its fluctuations have been tested in p-Pb and PYTHIA MC simulations. Also, different unfolding settings have been evaluated.

HK 4.5 Mo 15:15 HZ 6

Jet reconstruction with background subtraction in a partonic transport model — •Florian Senzel[1], Jan Uphoff[1], Oliver Fochler[1], Zhe Xu[2], and Carsten Greiner[1] — [1]Institut für Theoretische Physik, Johann Wolfgang Goethe-Universität Frankfurt, Germany — [2]Department of Physics, Tsinghua University, Beijing, China

Experimental data measured in $\sqrt{s} = 2.76\,A$TeV Pb+Pb collisions by the LHC experiments showed a significant imbalance in the transverse momenta of the two reconstructed jets with the highest transverse momenta. This momentum imbalance is assumed to be caused by the different in-medium path lengths and thereby different energy and momentum loss of the di-jets within the dense medium. To investigate this momentum loss we extended the transport model BAMPS which solves the full 3+1D Boltzmann equation for partons based on pQCD cross sections. One feature of BAMPS is the stochastic modeling of both 2→2 and 2↔3 scattering processes by employing a new, improved Gunion-Bertsch matrix element. We will show our results for the momentum asymmetry A_J using well-established experimental subtraction methods and have a closer look at the role of further recoil scattering processes of the initial shower partons on the momentum loss of the reconstructed jets. Thereby we will emphasize that for this investigation a careful consideration of the subtraction of the soft underlying background medium becomes crucial.

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HK 4.6 Mo 15:30 HZ 6

Fragmentation of jets into hadrons with strangeness in Pb-Pb collisions in ALICE at the LHC — •Alice Zimmermann for the ALICE-Collaboration — Physikalisches Institut Heidelberg

The research programme of the ALICE experiment at the LHC focuses on the so-called Quark-Gluon Plasma, a state of matter where quarks and gluons are deconfined.

The measurement of particle jets from fragmentation of hard scatterings of partons in the colliding nuclei allows to study parton energy loss in the hot and dense medium and constrains the modelling of such a phenomenon.

By measuring yields of particles like K^0_s, Λ and $\bar{\Lambda}$ of low to intermediate momenta within jet cones, fragmentation into strange hadrons, as well as the baryon-meson ratio in jets can be studied.

In this contribution we present first results on K^0_s, Λ and $\bar{\Lambda}$ production in jets in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV. The analysis is further performed in different centrality classes, representing collisions with different impact parameters. The strangeness identified fragmentation distributions are compared to first results on inclusive fragmentation in Pb-Pb collisions.

HK 4.7 Mo 15:45 HZ 6

Jet-hadron correlations in Pb-Pb collisions with ALICE at the LHC — •Jochen Klein for the ALICE-Collaboration — Physikalisches Institut, University of Heidelberg

A Large Ion Collider Experiment (ALICE) allows for excellent particle identification in Pb-Pb collisions recorded in 2010 and 2011 at the LHC. We discuss how this could help to observe the response of a strongly interacting medium to the traversal of hard partons.

Hard partons from interactions at high scales fragment into jets. In PbPb collisions, the partons interact strongly with the produced medium. This leads to a modification of the jet but also a response of the medium. We discuss the correlation of a trigger jet and hadrons.

We want to exploit the different proton fraction in jet fragmentation and bulk hadronisation to disentagle jet and medium hadronisation.

The response from a quenched jet on the away-side of a trigger jet results from a longer path length and is of particular interest.