# HK 12: Schwerionenkollisionen und QCD Phasen

Zeit: Montag 16:30–19:00 Raum: HZ 6

**Gruppenbericht** HK 12.1 Mo 16:30 HZ 6

**Transverse momentum distributions of identified particles in p–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV measured with ALICE at the LHC** — •Jonas Anielski for the ALICE-Collaboration — Institut für Kernphysik, WWU Münster

Recent measurements of di-hadron correlations in p–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV revealed a double-ridge pattern, reminiscent of the one observed in Pb–Pb collisions. This raises the question of the possible existence of collective effects in high multiplicity p–Pb collisions. Further insight into the observed phenomena can be gained by studying the evolution of spectral shapes with the particle mass and particle ratios as a function of charged-particle density.

Transverse momentum ($p_T$) distributions of particles have been measured at mid-rapidity ($0. < y_{CMS} < 0.5$). Particles are reconstructed with the central barrel detectors over a wide transverse momentum range (0 GeV/$c$ up to 6 GeV/$c$) and different identification techniques are used. Primary charged particles ($\pi^{\pm}, K^{\pm}, p, \bar{p}$, d and $\bar{d}$) are identified by their specific energy loss ($dE/dx$) and time-of-flight. Weakly decaying particles ($K^0_s, \Lambda$ and $\bar{\Lambda}$) are identified by their characteristic decay topology.

Particle-production yields, spectral shapes and particle ratios are measured in several multiplicity classes and are compared with models and results obtained in Pb–Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV and pp collisions at $\sqrt{s_{NN}} = 7$ TeV at the LHC.

HK 12.2 Mo 17:00 HZ 6

**Transverse Momentum Spectra of Unidentified Charged Particles in pp, p–Pb and Pb–Pb Collisions with ALICE** — •Philipp Lüttig for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

To study the properties of matter created in p–Pb and Pb–Pb collisions, a common observable is the nuclear modification factor as function of the transverse momentum ($p_T$) of charged particles. The ALICE detector at the CERN-LHC has accumulated a wealth of data on pp, p–Pb and Pb–Pb collisions in the past years. Using a combined tracking approach based on information in the Inner Tracking System (ITS) and the Time Projection Chamber (TPC) ALICE is capable to measure the transverse momentum in a broad $p_T$ range up to $p_T = 50$ GeV/c in these collision systems.
For the calculation of the nuclear modification factor, pp reference spectra are needed. In this talk, the extraction of the pp baseline spectra for p–Pb and Pb–Pb collisions for charged particles is discussed. The nuclear modification factor measured in Pb–Pb collisions will be presented.
Based on the same tracking approach, ALICE can measure the transverse momentum of charged particles down to $p_T = 150$ MeV/c, which is crucial for the measurement of the average transverse momentum. A systematic study of the system-size and collision energy dependence of the average transverse momentum and its correlation to charged particle multiplicity will be presented.
Supported by BMBF and the Helmholtz Association.

HK 12.3 Mo 17:15 HZ 6

**LHC Predictions for Hadroproduction of Heavy Quarks using POWHEG** — •Michael Topp — Institute for Theoretical Physics, WWU Münster

The POWHEG Box is an event generator that offers a framework for implementing NLO calculations in shower Monte Carlo programs like Pythia. In order to compare with experimental data I have simulated the Hadroproduction of heavy quarks (pp and pA) at $\sqrt{s} = 2.76$ TeV, $\sqrt{s} = 5.023$ TeV and $\sqrt{s} = 7$ TeV. By analysing these data, I have got $p_T$ spectra of electrons, muons and D mesons. In my talk I present the results compared to ALICE data and other theoretical predictions (GM-VFNS and FONLL).

HK 12.4 Mo 17:30 HZ 6

**Measurement of electrons from charm and beauty-hadron decays in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV with ALICE at the LHC** — •Jan Wagner for the ALICE-Collaboration — Research Division and ExtreMe Matter Institute EMMI, Planckstraße 1, 64291 Darmstadt — Institut für Kernphysik, Technische Universität Darmstadt, Schlossgrabenstr. 9, 64289 Darmstadt

Electrons from inclusive semileptonic heavy-flavor hadron decays are used to measure charm and beauty production. Because of their large masses, heavy quarks are mostly produced in initial hard partonic interactions and thus can be used to probe a medium created in heavy-ion collisions.

In heavy-ion collisions the $p_t$-differential heavy-flavor yields are sensitive to initial state effects of the colliding nuclei (e.g. shadowing, saturation) and to the interaction of the heavy quarks with the hot and dense medium. To distinguish these effects from each other a reference measurement using p-Pb collisions is necessary, where only initial state effects play a role.

The status of the analysis of semi-electronic heavy-flavor decays at midrapidity from p–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV using the ALICE apparatus will be presented. $R_{pPb}$ will be shown together with predictions of shadowing effects calculated on the basis of the EPS09 parametrization. The method of separating the charm and beauty contributions from each other will be explained and an outlook to upcoming results will be given.

HK 12.5 Mo 17:45 HZ 6

**Improving thermal models with sequential freeze out** — •Pasi Huovinen — J.W. Goethe Universität, Frankfurt am Main, Germany

Thermal models have been surprisingly successful in describing the particle ratios observed in heavy ion collisions. However, the thermal models predict more protons and less cascades than measured by the ALICE collaboration at LHC. In this contribution I discuss how to improve the fit to data by assuming that not all particle number changing processes cease at the same time, but some of them maintain relative equilibrium even after the full equilibrium has been lost.

HK 12.6 Mo 18:00 HZ 6

**J/$\psi$ Production in Pb–Pb Collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ALICE experiment** — •Julian Book for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

The investigation of the properties of strongly interacting matter under extreme conditions is the aim of the ALICE experiment. Quarkonia, i.e. bound states of heavy (charm or bottom) quarks such as the J/$\psi$, are expected to be produced in initial hard scattering processes in hadronic collisions. Thus they will provide insights into the earliest and hottest stages of nucleus-nucleus collisions where the formation of a Quark-Gluon Plasma (QGP) is expected. A suppression of J/$\psi$ yields due to the hot environement was proposed as a signature of the QGP.
We present the latest results on J/$\psi$ production in Pb–Pb collisions measured by ALICE at the LHC. Clearly less suppression in comparison with SPS and RHIC results is observed. The measurement of the centrality and transverse momentum dependence of J/$\psi$ decaying into $e^+e^-$ at mid-rapidity ($|y| < 0.9$) will help to understand a possible contributing (re)generation mechanism. Its impact together with the results for J/$\psi$ decaying into $\mu^+\mu^-$ measured at forward rapidities ($2.5 < y < 4.0$) will be discussed.
Supported by BMBF and the Helmholtz Association.

HK 12.7 Mo 18:15 HZ 6

**Modifikation von $\Lambda$, $\overline{\Lambda}$ und $K^0_s$ Transversalimpuls-Spektren in Pb–Pb Kollisionen bei ALICE am LHC** — •Simone Schuchmann für die ALICE-Kollaboration — Institut für Kernphysik, Goethe-Universtität Frankfurt

Bei hohen Transversalimpulsen wurde vom ALICE Experiment für die Produktion inklusiver geladener Teilchen eine starke Unterdrückung in Pb–Pb gegenüber pp Kollisionen gemessen. Die entsprechende Größe zur Messung der Unterdrückung als Funktion des Transversalimpulses ist der nukleare Modifikationsfaktor. Zum Verständnis der Modifikation und den entsprechenden Unterdrückungsmechanismen kann die Analyse von Spektren identifizierter Teilchen beitragen. Insbesondere der Unterschied der Modifikation zwischen Baryonen und Mesonen sowie zwischen verschiedenen Flavours könnte Informationen zur unterschiedlichen Kopplung von Quarks und Gluonen an das Medium liefern.
In diesem Vortrag wird die Produktion von $\Lambda$, $\overline{\Lambda}$ und $K^0_s$ in Pb–Pb und pp Kollisionen bei einer Schwerpunktsenergie von $\sqrt{s_{NN}} = 2.76$ TeV,

gemessen mit dem ALICE Detektor, vorgestellt. Die Identifikation von $\Lambda$, $\overline{\Lambda}$ und $K^0_s$ erfolgt über ihren schwachen Zerfallskanal in geladene Hadronen mit Hilfe der Trackingmöglichkeiten des inneren Detektorsystems. Die daraus resultierenden nuklearen Modifikationsfaktoren werden für verschiedene Zentralitätsintervalle diskutiert und mit denen anderer Teilchen mit unterschiedlichen Quarkinhalten verglichen. Unterstützt vom BMBF und der Helmholtz Gemeinschaft.

HK 12.8 Mo 18:30 HZ 6

**Neutral Pion Measurement with the ALICE EMCal** — •Baldo Sahlmüller for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

The quark-gluon plasma produced in heavy-ion collisions at the LHC can be studied via transverse momentum distributions of identified hadrons that are produced through different mechanisms in these collisions. The neutral pion offers a complimentary measurement to the measurement of charged hadrons with the ALICE tracking system, since it can be measured in calorimeters such as the ALICE EMCal via its two-photon-decay. The measurement in p-p collisions is a necessary baseline for interpreting the heavy-ion results. Furthermore, the $\pi^0$ can be regarded as a standard candle in the calibration of calorimeters in heavy-ion collisions. Hence, understanding the $\pi^0$ measurement is an important test for the detector.

We will present the status and first results of ongoing $\pi^0$ analyses in the ALICE p-p data with the EMCal and compare them with complimentary measurements with the ALICE PHOS and the ALICE tracking system. We will focus on technical aspects of the analysis.

Supported by BMBF and the Helmholtz Association.

HK 12.9 Mo 18:45 HZ 6

**Measurement of Neutral Pions with the ALICE PHOS.** — •Malte Hecker for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

For the understanding of the production of identified particles in heavy ion collisions neutral pions are complimentary to other single particle measurements as they decay predominantly into two photons which can be detected by calorimeters. The transverse momentum distributions of $\pi^0$s in p-p collisions are an important baseline to understand the results obtained in heavy-ion collisions.

The ALICE PHOS is a high resolution electromagnetic calorimeter that is used to measure the position and energy of photons, hence allowing the reconstruction of $\pi^0$s via their two photon decay.

We present the status of ongoing $\pi^0$ analyses of ALICE p-p data at $\sqrt{s}$=2.76 TeV. The peak extraction method is discussed in detail. Furthermore the acceptance and reconstruction efficiency correction calculated with both a newly developed fast Monte Carlo approach and the ALICE full Monte Carlo simulations are presented.

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