# HK 60: Schwerionenkollisionen und QCD Phasen

Zeit: Freitag 11:00–13:00 Raum: P 5

HK 60.1 Fr 11:00 P 5

**Transverse Momentum Spectra of Unidentified Charged Particles in pp Collisions at the ALICE Experiment** — •Philipp Lüttig for the ALICE-Collaboration — Institut für Kernphysik, Goethe University Frankfurt, Germany

The ALICE experiment at the CERN-LHC has accumulated a wealth of data on pp and Pb–Pb collisions in the past two years. Designed for exploring the properties of hot and dense matter formed in heavy-ion-collisions, the ALICE Time Projection Chamber (TPC) has the capability to measure the transverse momentum ($p_T$) of charged particles in a broad $p_T$ range for $p_T > 150$ MeV/c.
In this talk the transverse momentum spectra of unidentified charged particles for pp collisions at $\sqrt{s} = 0.9$, 2.76 and 7 TeV are presented. The extraction of a pp baseline for the calculation of the nuclear modification factor $R_{AA}$ at $\sqrt{s} = 2.76$ TeV is discussed and compared to alternative approaches to construct a baseline. In addition, the dependence of the average transverse momentum of these spectra on center-of-mass energy and multiplicity is reviewed and compared to measurements by other experiments.

HK 60.2 Fr 11:15 P 5

**Charged particle production at large transverse momentum in Pb-Pb collisions at $\sqrt{s}$=2.76 TeV measured with ALICE at the LHC** — •Michael Linus Knichel — Research Division and ExtreMe Matter Institute EMMI, GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany

The suppression of high-$p_T$ particle production in heavy-ion collisions is generally attributed to energy loss of partons as they propagate in the hot and dense QCD medium. Inclusive transverse momentum spectra of primary charged particles in Pb-Pb collisions at $\sqrt{s}$=2.76 TeV have been measured by the ALICE Collaboration at the LHC. The measurements in the central pseudorapidity region $|\eta| < 0.8$ cover a transverse momentum range of $0.15 < p_T < 50$ GeV/c. Charged particle spectra in Pb-Pb collisions are compared to those measured in inelastic pp collisions at the same collision energy, scaled by the number of nucleon-nucleon collisions in Pb-Pb. This comparison is expressed in terms of the nuclear modification factor $R_{\mathrm{AA}}$. The evolution of particle spectra and $R_{\mathrm{AA}}$ as a function of collision centrality will be presented. $R_{\mathrm{AA}}$ as a function of $p_T$ will be compared to calculations from different energy loss models.

HK 60.3 Fr 11:30 P 5

**Elliptic flow of heavy-flavor electrons in Pb-Pb collisions at 2.76 TeV with ALICE** — •Raphaelle Bailhache and Theodor Rascanu for the ALICE-Collaboration — Institut für Kernphysik, Universität Frankfurt, Germany

In ultra-relativistic heavy-ion collisions, heavy quarks, i.e charm and beauty, are produced in the early stage of the reaction. Therefore, they are uniquely suited to probe the Quark-Gluon-Plasma (QGP), which is formed in such reactions. The properties of the QGP can be studied via the azimuthal anisotropy of the heavy-quark emission in the transverse plane, quantified by the elliptic flow $v_2$. Experimentally, this anisotropy can be measured indirectly via the semi-electronic decays of heavy-flavor hadrons.
We present the measured elliptic flow of inclusive electrons in Pb-Pb collisions at 2.76 TeV with the ALICE detector. Electrons are identified using the Time Projection Chamber and the Time-Of-Flight detector. The elliptic flow analysis is performed with methods based on two-particle correlations, i.e. the event plane method and second order cumulant, as well as four-particle correlations, i.e; fourth order cumulant. We show the elliptic flow of inclusive electrons as function of transverse momentum and the centrality of the collision for the different methods. At high $p_t$ the contribution of electrons from heavy-flavour decays is expected to be dominant, whereas at low $p_t$ most electrons come from Dalitz decay of $\pi^0$ and gamma conversion in the detector material. We compare the inclusive electron $v_2$ with the elliptic flow of electrons from the Dalitz decay of $\pi^0$.

HK 60.4 Fr 11:45 P 5

**Open charm elliptic flow from hadronic decays of D-mesons** — •Robert Grajcarek for the ALICE-Collaboration — University of Heidelberg, Physikalisches Institut,Philosophenweg 12, Heidelberg, Germany

A Large Ion Collider Experiment (ALICE) at the Large Hadron Collider (LHC) has been built in order to identify and characterize the quark gluon plasma (QGP) created in high-energy nuclear collisions. As charm quarks are produced at the early stage of the collision, they serve as ideal probes for a QGP. It is still an open question whether charm quarks take part in the collective motion of the expanding fireball in ultrarelativistic heavy ion collisions. The ALICE detector with its powerful capabilities such as particle identification, secondary vertexing at sub-millimeter precision and tracking in a high multiplicity environment addresses the charm sector in nuclear collisions.
We report latest news on the measurment of open charm elliptic flow.

HK 60.5 Fr 12:00 P 5

**Azimuthal emission patterns of $K^+$ and $K^-$ mesons in Ni+Ni collisions near thresholds** — •Tae Im Kang for the FOPI-Collaboration — Physikalisches Institut, Heidelberg, Germany

Kaons, which are produced in nucleus-nucleus collisions at sub-threshold energies at SIS/GSI, are expected to be a very sensitive probe to investigate in-medium effects on hadrons. The microscopic transport models suggest that kaon properties are modified in dense nuclear matter. The modification can be understood as a consequence of a density dependent kaon-nucleon potential. Therefore, the measurement of charged kaon azimuthal emission patterns can provide important information on such an in-medium potential.

Here we are presenting results from measurements of sideward flow of $K^+$ and $K^-$ mesons in Ni+Ni collisions. Data are compared to transport models, Hadron String Dynamics and Isospin Quantum Dynamics, to investigate $KN$ potentials in the dense nuclear medium.

This work was supported by BMBF 06HD9121I

HK 60.6 Fr 12:15 P 5

**Shear Viscosity of Pion Gases** — •Robert Lang, Norbert Kaiser, and Wolfram Weise — Physik Department, Technische Universität München, D-85747 Garching, Germany

Experiments at RHIC suggest that the quark-gluon plasma created in heavy-ion collisions is an almost-perfect fluid. Furthermore, the $\eta/s$ ratio (shear viscosity per entropy density) turns out to be minimal at the phase transition. We discuss the formalism which connects quantum field theory at finite temperature and the macroscopic transport coefficients for dissipative hydrodynamical systems. Within the framework of ChPT we compute the shear viscosity of an interacting pion gas in the confined phase. The results are compared to the AdS/CFT bound of $1/4\pi$.

Work supported by BMBF, GSI and the Excellence Cluster "Origin and Structure of the Universe".

HK 60.7 Fr 12:30 P 5

**Computation of the 2nd order transport coefficient $\kappa$ in the gluon plasma** — Owe Philipsen and •Christian Schäfer — Goethe Universität, Frankfurt, Deutschland

From heavy-ion collision experiments we know that the quark-gluon plasma behaves almost like an ideal fluid and can be described by hydrodynamics. The dynamic properties of the quark-gluon plasma are determined by transport coefficients.

The second order transport coefficient $\kappa$ is related to a momentum expansion of the euclidean energy-momentum tensor correlator at vanishing Matsubara frequency. The computation of the Fourier-transformed correlator in lattice gauge theory allows the determination of $\kappa$ from first principles. We present the results obtained by pure Yang-Mills lattice simulations in comparison to a computation in quasi-free lattice perturbation theory.

HK 60.8 Fr 12:45 P 5

**Maximum entropy study of viscous coefficients in gauge theory plasmas** — •Michael Haas — Institut fuer theoretische Physik, Universitaet Heidelberg

The applicability of laws of fluid dynamics to high energy gauge theory matter as the quark-gluon plasma placed the focus on the calculation of viscous coefficients. Via Kubo relations these dynamic quantities are related to the static spectral functions. A maximum entropy (ME) approach allows to find the spectral functions from imaginary-time

correlation functions both at zero and finite temperature by inverting an integral transform. An important feature of ME is its independence on priori parametrizations of the spectral functions, by including the the broadest function space supported by the input data. Both accomplishments and future challenges will be discussed.