HK 54: Heavy Ion Collisions and QCD Phases 7

Time: Thursday 14:30–16:30 Location: T/SR14

Group Report HK 54.1 Thu 14:30 T/SR14

Transport coefficients and spectral functions from the functional renormalization group — •Ralf-Arno Tripolt[1], Lorenz von Smekal[1,2], Jochen Wambach[1,3], Christopher Jung[1], and Alexander Stegemann[1] — [1]TU Darmstadt — [2]Justus-Liebig-Universität Gießen — [3]GSI Helmholtzzentrum für Schwerionenforschung

We present a method to obtain spectral functions and transport coefficients like the shear viscosity from the functional renormalization group approach. Our nonperturbative method is thermodynamically consistent, symmetry preserving and based on an analytic continuation from imaginary to real time on the level of the flow equations for two-point functions. We present results for mesonic spectral functions at finite temperature, density and external momentum, in particular near the critical endpoint in the phase diagram of the quark-meson model. Moreover, first results on the shear viscosity over entropy ratio are shown.

[1] Ralf-Arno Tripolt, Lorenz von Smekal, and Jochen Wambach, Phys. Rev. D 90, 074031 (2014).

[2] Ralf-Arno Tripolt, Nils Strodthoff, Lorenz von Smekal, and Jochen Wambach, Phys. Rev. D 89, 034010 (2014).

HK 54.2 Thu 15:00 T/SR14

Directed flow in heavy-ion collisions from PHSD transport approach — Wolfgang Cassing, Volodya Konchakovski, and •Alessia Palmese — Institute for Theoretical Physics, Justus-Liebig-Universität, Gießen, Germany

We study the proton and kaon directed and elliptic flows for Au+Au collisions at AGS energies (E_{Lab}=2-8 AGeV) and low SPS energies up to $\sqrt{s_{NN}}$=7.7 GeV within the Parton-Hadron-String-Dynamics (PHSD/HSD) transport models. PHSD is a microscopic off-shell transport approach, which successfully describes heavy-ion collisions in a wide range of energies, and HSD represents the hadronic sector of PHSD. We compare our results with data from the E895 and STAR Collaborations and we investigate the sensitivity of the flow observables with respect to momentum-dependent hadronic potentials. This analysis can provide important information on these potentials, since they are known from the G-matrix theory approximately up to twice nuclear matter density and consequently extrapolations at higher baryon densities and large momenta have to been probed. We also explore the possibility that the flow observables are influenced by chiral symmetry restoration, that is expected to occur at high density and/or temperature.

HK 54.3 Thu 15:15 T/SR14

Local thermalization in a coarse-grained transport approach — •Dmytro Oliinychenko[1,3] and Hannah Petersen[1,2] — [1]Frankfurt Institute for Advanced Studies, D-60438 Frankfurt am Main, Germany — [2]Institut für Theoretische Physik, Goethe-Universität, D-60438 Frankfurt am Main, Germany — [3]Bogolyubov Institute for Theoretical Physics, Kiev 03680, Ukraine

State of the art simulations of heavy ion collisions employ so-called hybrid models, which involve relativistic (possibly viscous) hydrodynamics coupled to a transport model. Switching between these two approaches should be done in the region, where the system is approaching thermodynamical equilibrium. In practice, when the initial state of hydrodynamics is generated from transport, pressure anisotropies can be present and non-diagonal components of energy-momentum tensor can be significant. In this talk, the energy-momentum tensor is explored in a coarse-grained transport and the hypersurface is found, where local equilibrium is reached.

HK 54.4 Thu 15:30 T/SR14

Elliptischer und Triangulärer Fluss bei ultrarelativistischen A+A- und p+A-Stößen mittels BAMPS — •Kai Gallmeister und Carsten Greiner — Institut für Theoretische Physik, Goethe-Universität Frankfurt, Max-von-Laue-Straße 1, D-60438 Frankfurt, Germany

Mithilfe des mikroskopischen Transportmodells BAMPS untersuchen wir die Ausbildung von Ekzentrizität und Triangularität in ultrarelativistischen A+A- und p+A-Stößen in verschiedenen Glauber Formulierungen. Desweiteren untersuchen wir, wie sich diese in einen elliptischen und tringulären Fluss im Laufe der Zeitpropagation übersetzen. Hierduch wird ein Zugang zu der Frage geschaffen, ob und wie weit eine hydrodynamische Beschreibung, speziell für den Fall der Proton-induzierten Stöße, gültig ist.

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HK 54.5 Thu 15:45 T/SR14

Elliptic Flow Measurement of Heavy-Flavour Decay Electrons in Pb-Pb Collisions at 2.76TeV with ALICE — •Theodor Rascanu for the ALICE-Collaboration — Goethe-Universität Frankfurt, Institut für Kernphysik, Max-von-Laue-Str. 1, 60438 Frankfurt am Main

In heavy-ion collisions, charm and beauty quarks are produced in initial hard scattering processes. They then propagate and interact strongly with the created medium, the Quark Gluon Plasma (QGP), and thus allow to probe its properties.

One way to measure heavy-quarks is via electrons from the semileptonic decays of open charm and beauty hadrons. At low transverse momentum, the level of thermalization of heavy quarks can be studied via the azimuthal anisotropy of the heavy flavour electron emission in the transverse plane, the elliptic flow v_2. At high p_T, v_2 provides insight on the path length dependence of parton energy-loss.

In this talk we present v_2 measurements of electrons from heavy flavour decays with the central barrel of ALICE at mid rapidity in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV as function of the centrality of the collision. The electrons are identified using the Inner Tracking System, the Time-Of-Flight detector and Time Projection Chamber at low momenta, as well as the Electromagnetic Calorimeter at higher momenta.

We report on the performance of the electron identification and explain how the non-heavy flavour electron background is subtracted. Finally the results are compared to different theoretical models.

HK 54.6 Thu 16:00 T/SR14

Particle flow with the HADES detector — •Christina Deveaux for the HADES-Collaboration — Justus-Liebig-Universität Gießen

The high densities and pressures of the nuclear fireball created in heavy ion collisions modify the momenta of the emitted particles. Particle azimuthal anisotropies (flow) form therefore one of the most sensitive observables to the equation of state of the matter created in such collisions. We studied the flow of protons and pions in Au+Au collisions at 1.23 GeV/u beam energy based on data which was recorded with the High Acceptance Di-Electron Spectrometer (HADES) in 2012. First and preliminary results of the study will be shown and the option to extend the study to the flow of direct photons will be discussed.

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HK 54.7 Thu 16:15 T/SR14

Event characterization and high order flow components of Au-Au collisions at 1.23 AGeV with HADES — •Behruz Kardan, Christoph Blume, and Maja Subotic for the HADES-Collaboration — Goethe-Universiät, Frankfurt am Main

HADES provides a large acceptance combined with a high mass resolution and therefor allows to study dielectron and hadron production in heavy-ion collisions with unprecedented precision. With the high statistics of seven billion Au-Au collisions at 1.23 AGeV recorded in April/May 2012 also the investigation of higher order flow harmonics is possible.

Collective flow is a sensitive probe for the properties of extreme QCD matter. However, its interpretation relies on the understanding of the initial conditions e.g. the eccentricity of the fireball created in the nuclear overlap region.

Based on Glauber Monte Carlo calculations the initial conditions of nuclear collisions, with special emphasis on the correlations between participating nucleons, were examined. Observables of event-by-event flow fluctuations with respect to the reaction centrality are deduced from geometrical properties of the initial state and compared to the measured data.

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