HK 74: Heavy Ion Collisions and QCD Phases 11

Time: Friday 14:30–16:15 Location: T/SR14

Group Report HK 74.1 Fri 14:30 T/SR14

Transport study on gluon Bose-Einstein condensation in Heavy-Ion Collisions — •Kai Zhou — Max-von-Laue-Str. 1, 60438 Frankfurt am Main, Germany

We investigate with transport approach the thermalization process of gluons with possible Bose-Einstein condensate under CGC(Color Glass condensate) inspired initial condition. We consider here a static gluonic matter with only homegeneous elastic collisions. By developing a new stochastic scheme for the boson*s transport treatment,the Boltzmann equation is solved numerically in cascade simulation. We see that under a over-populated initial condition, the gluon Bose-Einstein condensation indeed would occur to accommodate the gluons and balance the whole distribution to approach thermal equilibrium.

HK 74.2 Fri 15:00 T/SR14

The quark-gluon plasma within a partonic transport approach — •Florian Senzel[1], Oliver Fochler[1], Jan Uphoff[1], Zhe Xu[2], and Carsten Greiner[1] — [1]Goethe-Universität, Max-von-Laue-Str. 1, 60438 Frankfurt am Main, Germany — [2]Tsinghua University, Beijing 100084, China

Aiming for the simultaneous description of the hard and the soft regime of ultra-relativistic heavy-ion collisions, the partonic transport approach BAMPS (Boltzmann Approach to Multi-Parton Scatterings) simulates microscopically the quark-gluon plasma by perturbative quantum chromodynamics. To this end, it numerically solves the 3+1D Boltzmann equation by allowing interactions among all parton species: both elastic $2 \to 2$ and inelastic $2 \leftrightarrow 3$ processes for gluons as well as quarks. For the inelastic collisions, we employ the improved Gunion-Bertsch matrix element, which cures problems of the original Gunion-Bertsch result in characteristic regions of the phase space. Based on extensive numerical calculations, the improved matrix element agrees well with the exact pQCD calculation. By employing the improved GB matrix element together with a running coupling evaluated at the microscopic scale, we present results for the suppression of high p_t particles as well as the collectivity of the bulk medium and compare them to LHC data of the nuclear modification factor R_{AA} and the elliptic flow v_2. Furthermore, we present studies of R_{AA} for different hadron species, the elliptic flow v_2 at high transverse momentum and the momentum loss of reconstructed jets.

HK 74.3 Fri 15:15 T/SR14

Photons in a partonic transport approach — •Moritz Greif, Florian Senzel, and Carsten Greiner — Goethe Universität Frankfurt, Max-von-Laue-Str. 1 60438 Frankfurt am Main, Germany

Partonic transport approaches have proved to be valuable tools in describing the quark-gluon plasma, created in heavy-ion collisions. In this work, first steps towards a dynamical understanding of photonproduction in expanding heavy-ion collisions are presented. Several photon production processes are included in the partonic cascade BAMPS (Boltzmann Approach to Multi-Parton Scatterings). BAMPS provides a microscopic tool to study expanding fireballs, employing a stochastic method to solve the relativistic 3+1d Boltzmann equation. Subsequently, photon spectra can be investigated, and in particular, the influence of the quark-gluon plasma phase for the elliptic flow of photons will be studied.

HK 74.4 Fri 15:30 T/SR14

Measurement of electrons from charm and beauty-hadron decays in p-Pb collisions at $\sqrt{s_{\rm NN}}$ = 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

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 the Quark-Gluon Plasma (QGP), a deconfined state of strongly-interacting matter created in heavy-ion collisions. In addition to the QGP, the presence of cold nuclear matter in the initial state may affect the production of heavy-flavour hadrons through shadowing/saturation effects. A contribution to the suppression observed in Pb-Pb collisions is investigated by analyzing p-Pb collisions.

The $p_{\rm T}$-differential production cross section of electrons from heavy-flavour hadron decays and beauty-hadron decays in the rapidity range $-1.06 < y_{\rm cms} < 0.14$ in p-Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV has been measured with ALICE. The cross section of electrons from beauty-hadron decays, isolated based on their larger average displacement from the interaction vertex, are presented as well as the nuclear modification factor $R_{\rm pPb}$ of inclusive heavy-flavour and beauty-hadron decay electrons. Theoretical predictions including the effects due to the nuclear modification of the parton distribution functions will be discussed with the results.

HK 74.5 Fri 15:45 T/SR14

Study of the Applicability of Markov Chain Monte Carlo Methods to the Statistical Separation of Electron Sources via the Impact Parameter for ALICE — •Manuel Wittner for the ALICE-Collaboration — Physikalisches Institut, Universität Heidelberg, Heidelberg

One particularly interesting measurement detected by the ALICE setup at the LHC are electrons from charm and beauty hadron decays. Heavy quarks originate from initial hard scattering processes and thus experience the whole history of a heavy ion collision. Therefore, they are valuable probes to study the mechanisms of energy loss and hadronization in the hot and dense state of matter, that is expected to be formed in a heavy-ion collision at LHC. One important task is the distinction of the different electron sources, for which a method was developed. Hereby, the impact parameter distribution of the measurement data is compared with impact parameter distributions for the individual sources, which are created through Monte Carlo simulations. Afterwards, a maximum likelihood fit is applied. However, creating a posterior distribution of the likelihood according to Bayes' theorem and sampling it with Markov Chain Monte Carlo algorithms provides several advantages, e.g. a mathematically correct estimation of the uncertainties or the usage of prior knowledge. Hence for the first time in this particular problem, a Markov Chain Monte Carlo algorithm, namely the Metropolis algorithm, was implemented and investigated for its applicability in heavy flavor physics. First studies indicate its great usefulness in this field of physics.

HK 74.6 Fri 16:00 T/SR14

Performance of the upgraded ALICE inner tracker in full kinematic reconstruction of B^+ mesons — •Johannes Stiller for the ALICE-Collaboration — PI Heidelberg

A new high-granularity silicon pixel inner tracker will be installed in the central barrel of the ALICE experiment during the second long shutdown of the LHC in 2018. New and unique measurements in the heavy-quark sector will be possible through the detectors single-hit resolution of 4 μm close to the interaction point and a readout rate capability of 50 kHz in Pb-Pb collisions. Within the scope of this upgrade, we studied the performance of full kinematic reconstruction down to lowest p_T in the channel $B^+ \to \overline{D}^0\pi^+$ and $\overline{D}^0 \to K^+\pi^-$ with branching ratios of 0.5 % and 3.9 % respectively, using detailed Monte Carlo simulations of high-multiplicity Pb–Pb collisions. Topologic and kinematic criteria are used to select the rare signal against the large combinatorial background. Furthermore, the track rotation method is used to improve the residual background statistics estimate in order to give a first outlook on the expected signal-to-background ratio and statistical significance. In order to improve this estimate on the residual combinatorial background a dedicated fast simulation tool is being developed. Further, the effect of correlated background sources, i.e. from other beauty meson decays, is evaluated in the upgrade environment.