HK 39: Physik mit schweren Ionen

Zeit: Donnerstag 16:30–19:00 Raum: 2E

Gruppenbericht HK 39.1 Do 16:30 2E

Interaction of charmonia with pre-hadrons in heavy-ion collisions at relativistic energies — •Olena Linnyk[1], Elena Bratkovskaya[1], Wolfgang Cassing[2], and Horst Stöcker[1] — [1]Frankfurt Institute for Advanced Studies, 60438 Frankfurt am Main, Germany — [2]Institut für Theoretische Physik, Universität Giessen, 35392 Giessen, Germany

Applying the Hadron-String Dynamics (HSD) transport approach to charmonium dynamics, we show that the suppression pattern seen at RHIC is reproduced, if elastic interaction of the $c\bar{c}$ with the pre-hadronic medium is assumed. In particular, the ratio of forward to mid-rapidity nuclear modification factors of J/Ψ ($R_{AA}^{forward}(J/\Psi)/R_{AA}^{mid}(J/\Psi)$) and the strong elliptic flow of D-mesons, which could not be described by the interaction with comoving mesons or by color screening mechanism, are now explained. Predictions for the Ψ' survival probabilities and the ratio $\langle J/\Psi\rangle/\langle\pi\rangle$ at RHIC are performed in the different scenarios as independent observables. Additionally, we present excitation functions for several charmonium observables that show a dramatic change in case of a phase transition to a partonic medium. We further demonstrate that the elliptic flow v_2 of J/Ψ is sensitive to the mechanism and the strength of the interaction in the hot and dense (pre-hadronic) phase.

Gruppenbericht HK 39.2 Do 17:00 2E

Preparing for heavy flavour physics with ALICE at LHC — •Silvia Masciocchi for the ALICE-TRD-Collaboration — GSI, Planckstr. 1, 64291 Darmstadt

As we approach the startup of the Large Hadron Collider at CERN, the ALICE Collaboration is finalizing and testing its complex software and computing infrastructure for the analysis of the first data.

As a Tier-2 center, GSI has a central role in the GRID network, for the first data processing, calibration and monitoring. Efficient data transfer, storage and analysis are crucial issues in order to guarantee a timely understanding of the detector and produce physics results starting from the first days.

After a brief overview of the data analysis framework, we will focus on the heavy flavour physics program [1]. Heavy flavours are nowadays considered one of the most interesting probes to study properties of the dense matter produced in heavy ion collisions [2].

We introduced a new vertexing package based on Kalman filtering, for powerful and precise reconstruction of secondary decays. Our results on the search for charmed hadrons will be presented, both in proton-proton and in heavy ion collisions.

[1] "ALICE: Physics Performance Report, Volume II", ALICE Collaboration, 2006 J. Phys. G: Nucl. Part. Phys. 32 1295-2040

[2] "Proceedings of the 2nd International Conference on Hard and Electromagnetic Probes of High-Energy Nuclear Collisions", Nucl. Phys. A 783 (2007)

HK 39.3 Do 17:30 2E

Jet Propagation and Mach Cones in (3+1)d Ideal Hydrodynamics — •Barbara Betz[1,2], Miklos Gyulassy[3], Dirk Rischke[1,4], Horst Stöcker[1,4,5], and Giorgio Torrieri[1] — [1]Institut für Theoretische Physik, J.W. Goethe-Universität, Frankfurt am Main — [2]Helmholtz Research School, Universität Frankfurt, GSI and FIAS — [3]Department of Physics, Columbia University, New York — [4]Frankfurt Institute for Advanced Studies (FIAS), Frankfurt am Main — [5]Gesellschaft für Schwerionenforschung, GSI, Darmstadt

The observation of jet quenching and associated away–side Mach Cone–like correlations at RHIC provide powerful "external" probes of the sQGP produced in A+A reactions [1]. However, the details of the fluid response to jets are shown to depend critically on the energy, longitudinal, and transverse momentum deposition mechanisms. We solve numerically covariant 3–dimensional hydrodynamics [2] to compute the flow correlation patterns resulting from a variety of possible energy-momentum deposition models. Mach Cone correlations only survive the hydro decoupling freeze-out phase for a special limited class of energy–momentum loss models. We conclude that the correct interpretation of away–side jet correlations will require improved understanding of the jet energy–momentum loss to fluid couplings.

[1] M. Gyulassy, P. Levai and I. Vitev, Nucl. Phys. B **594**, 371 (2001); J. G. Ulery [for the STAR Collab.], arXiv:0704.0224 [nucl-ex]; N. N. Ajitanand [PHENIX Collab.], Nucl. Phys. A **783**, 519 (2007).

[2] D. H. Rischke, Y. Pürsün, J. A. Maruhn, H. Stöcker and W. Greiner, Heavy Ion Phys. **1** (1995) 309.

HK 39.4 Do 17:45 2E

Standalone tracking in the ALICE Transition Radiation Detector — •Markus Fasel and Alexandru Bercuci — GSI, Planckstr. 1, 64291 Darmstadt

We present a study of the reconstruction algorithms for the ALICE Transition Radiation Detector (TRD) using data measured at the CERN PS with a complete supermodule of TRD. We focus on the TRD standalone tracking algorithm, which is the backbone of track reconstruction and has an important role in TRD offline analysis as well as for the processing in the ALICE High Level Trigger. The efficiency, robustness and speed of the standalone tracker are prime requirements for the algorithm. Track reconstruction is essential for the particle identification with TRD, as well as for the algorithms for detector calibration. Results of the tracking obtained using measured data are presented.

HK 39.5 Do 18:00 2E

Jet propagation and QGP collective phenomena — •Björn Schenke[1], Adrian Dumitru[1], Yasushi Nara[2], and Michael Strickland[1] — [1]Institut für Theoretische Physik, Johann Wolfgang Goethe - Universität, Max-von-Laue-Straße 1, D-60438 Frankfurt am Main — [2]Akita International University, 193-2 Okutsubakidai, Yuwa-Tsubakigawa, Akita-City, Akita 010-1211, Japan

We study jet propagation in the quark-gluon-plasma using numerical simulations of the QCD Boltzmann-Vlasov equation including both hard elastic particle collisions and soft interactions mediated by classical Yang-Mills fields. We investigate jet-plasma interaction and particularly the deposition of energy in the plasma. Furthermore we consider a strongly anisotropic oblate momentum distribution in the local rest frame, caused by the expansion of the quark-gluon plasma in a heavy ion collision. In such a system the fields develop unstable modes, forming configurations of large-amplitude turbulent chromo-fields by which the jets are deflected preferentially in the longitudinal direction. This provides a possible explanation for the experimental observation that high-energy jets traversing the plasma perpendicular to the beam axis experience much stronger broadening in rapidity than in azimuth.

HK 39.6 Do 18:15 2E

Angular momentum correlations of D-$\overline{D}$pairs as a sensitive probe for thermalization — •Georgios Tsiledakis for the ALICE-TRD-Collaboration — Physiaklisches Institut, Heidelberg

In high-energy nuclear collisions at LHC, where a QGP might be created, the degree of thermalization is a key issue since it is closely related to the partonic equation of state. Due to their large mass, heavy quarks are a good probe for thermalization. Thus, we propose to measure azimuthal correlations of heavy-quark hadrons. Simulations with PYTHIA for p-p collisions at 14 TeV have been performed using the momentum covariance $\langle p_T^D, p_T^{\overline{D}}\rangle$ as a clean measure for angular correlations. Results show that initially D-$\overline{D}$ pairs are produced with a strong back-to-back correlation. A modification or even a complete abscence of these correlations in Pb-Pb collisions would indicate thermalization at the partonic level. Finally, the contribution of the elliptic and radial flow and predictions for the ALICE experiment at CERN are discussed.

HK 39.7 Do 18:30 2E

Partonic jet–quenching and high–p_T phenomena in transport simulations including inelastic interactions — •Oliver Fochler, Zhe Xu, and Carsten Greiner — Institut für Theoretische Physik, J. W. Goethe-Universität, Frankfurt am Main

We investigate partonic energy loss and jet–quenching within the framework of the Monte Carlo transport model BAMPS. The model consistently includes inelastic $gg \leftrightarrow ggg$ processes by means of a stochastic approach, leading to fast thermalization of the matter in simulated heavy–ion collisions. We present our latest results on the nuclear modification factor R_{AA} in fully dynamic simulations of central nucleus–nucleus collisions and on partonic energy loss in static media. We briefly touch on collective flow, v_2, and on the ratio of vis-

cosity to entropy density, η/s, which can be investigated within the same framework.

HK 39.8 Do 18:45 2E

Konstruktion und Qualitätskontrolle des ALICE-TRD — •Michael Kliemant für die ALICE-TRD-Kollaboration — IKF, UNI-Frankfurt

Der Uebergangsstrahlungszaehler (Transition-Radiation-Detektor, TRD) des ALICE Experiments am CERN-LHC dient zur Identifikation von Elektronen im zentralen Rapiditaetsbereich. Die Produktion von Elektronen und Positronen in Pb-Pb-Stoessen gilt als wichtige Observable zur Untersuchung des erzeugten Quark-Gluon-Plasmas (QGP).

Am Frankfurter Institut für Kernphysik (IKF) werden rund 80 der insgesamt 540 TRD-Drahtkammern gebaut, bei denen es sich um gasbetriebene Driftkammern mit Pad-Auslese handelt. Neben der Positionsbestimmung ermoeglicht der TRD die Identifikation von Elektronen, indem die Konversion von TR-Photonen im Zaehlgas (Xe-CO2) nachgewiesen wird.

Der einwandfreie Betrieb der Detektoren erfordert neben ausreichender Hochspannungsfestigkeit eine geringe Leckrate sowie ein raeumlich homogenes Ansprechverhalten. Die Ueberpruefung dieser Eigenschaften ist daher fester Bestandteil der regelmaessigen Qualitaetskontrolle, bevor die Auslesekammern mit Front-End Elektronik bestueckt und zum Einbau in den TRD freigegeben werden.

In diesem Vortrag sollen die Arbeitsschritte zum Bau der TRD-Auslesekammern sowie Ergebnisse aus Messungen im Labor und am Teststrahl vorgestellt werden. Gefoerdert durch BMBF,GSI und H-QM.