HK 57: Heavy Ion Collisions and QCD Phases X

Zeit: Freitag 14:00–15:30 Raum: HZO 80

Gruppenbericht HK 57.1 Fr 14:00 HZO 80

Collective flow and correlations measurements with HADES in Au+Au collisions at 1.23 AGeV — •Behruz Kardan — Goethe-Universität, Frankfurt am Main

HADES provides a large acceptance combined with a high mass-resolution and therefore 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, the investigation of collective effects and particle correlations is possible with so far unprecedented accuracy. At low energies v1 and v2, related to directed and elliptic flow, have been measured at the BEVALAC and SIS18, but so far high-order harmonics have not been studied. They allow to characterize the properties of the dense hadronic medium produced in these collisions, such as its viscosity, and provide thus an important reference to measurements at higher energies. We will present data on higher-order flow harmonics (v3 and v4) of protons and first results on multi-particle azimuthal correlation analyses. Furthermore, data on directed and elliptic flow of light nuclei will be shown. Information on radial flow can be obtained from the analysis of pion HBT-correlations, deuteron coalescence and transverse momentum spectra of identified particles. We will present new results on these observables extracted from the HADES data and discuss their correlations. From these a consistent picture emerges which provides strong evidence for a substantial radial expansion already at these low beam energies.

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HK 57.2 Fr 14:30 HZO 80

Performance for anisotropic flow measurements of the future CBM experiment at FAIR — •Viktor Klochkov[1,2] and Ilya Selyuzhenkov[1,3] for the CBM-Collaboration — [1]GSI Helmholtzzentrum für Schwerionenforschung, Planckstraße 1, Darmstadt, Germany — [2]Goethe University Frankfurt, Max-von-Laue-Straße 1, Frankfurt am Main, Germany — [3]National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Kashirskoe highway 31, Moscow, 115409, Russia

The Compressed Baryonic Matter experiment (CBM) at FAIR aims to study the area of the QCD phase diagram at high net baryon densities and moderate temperatures using collisions of heavy ions at center-of-mass energies of a few GeV per nucleon. Anisotropic transverse flow is among the key observables to study the properties of matter created in such collisions.

The CBM performance for anisotropic flow measurements is studied with Monte-Carlo simulations using gold ions at SIS-100 energies with lab momentum of 2-10 AGeV employing different heavy-ion event generators. Various combinations of CBM detector subsystems are used to investigate the possible systematic biases in flow measurement and to study effects of detector azimuthal non-uniformity. The resulting performance of CBM for flow measurements is demonstrated for different harmonics of identified charged hadron anisotropic flow as a function of rapidity and transverse momentum in different centrality classes.

HK 57.3 Fr 14:45 HZO 80

Magnetic fields and charm quarks in heavy-ion collisions — •Andrea Dubla for the ALICE-Collaboration — GSI Helmholtz Center for Heavy Ion Research

Under extreme conditions of high temperature and pressure, Quantum Chromodynamics predicts the formation of a new state of matter, the so-called Quark-Gluon Plasma (QGP). Heavy-ion collisions at ultra-relativistic energies at the Large Hadron Collider produce the optimal conditions to form the QGP in the laboratory. The hot QCD matter is produced within an unprecedented strong magnetic field, which properties and effects have not been yet fully explored. The magnetic field is early created in heavy-ion collisions by the charged spectator nucleons from the incident nuclei that do not participate in the collision. The charm quark is an ideal candidate to probe the properties of this magnetic field, because its formation time scale is comparable to the time scale when the magnetic field attains its maximum value and in addition the kinetic relaxation time of charm is similar to the QGP lifetime. Measuring the directed flow of D mesons will give access to early time dynamics, which are the least understood till now. The progress and status of the measurement of the D meson directed flow will be shown. This measurement could be the first observation of an effect of the magnetic fields produced in heavy-ion collisions, which will shed light on fundamental and unexplored proprieties of the QGP (e.g. conductivity and initial density) and it will allow to constrain theoretical models.

HK 57.4 Fr 15:00 HZO 80

Effects of late stage hadronic rescattering with SMASH — •Jean-Bernard Rose[1,2], Sangwook Ryu[1], Jan Staudenmaier[1,2], and Hannah Petersen[1,2,3] — [1]Frankfurt Institute for Advanced Studies, Ruth-Moufang-Strasse 1, Frankfurt am Main, 60438, Germany — [2]Institute for Theoretical Physics, Goethe University, Max-von-Laue-Strasse 1, 60438 Frankfurt am Main, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany

Transport models are often being used to simulate the hadronic rescattering (or so-called afterburners) that is thought to happen at late stages of heavy ion collisions at RHIC and the LHC. In this work we use a new transport model, SMASH (Simulating Many Accelerated Strongly interacting Hadrons), to investigate the specific effects of including such an afterburner on hadronic observables. Amongst others, we notably present results for yields, elliptic flow and mean-p_T, with and without SMASH. Effects of using Cooper-Frye sampling algorithms that conserve quantum numbers (strangeness, baryon number and charge, specifically) and energy-momentum on an event-by-event basis are also investigated.

HK 57.5 Fr 15:15 HZO 80

Two-Pion Intensity Interferometry for Imaging Collisions of Au+Au at 1.23A GeV with HADES — •Robert Greifenhagen[1,2] and Roland Kotte[1] for the HADES-Collaboration — [1]Helmholtz-Zentrum Dresden-Rossendorf — [2]Technische Universität Dresden

We present first results on identical pion intensity interferometry (HBT) to study space-time features of collisions of Au+Au at 1.23A GeV. The data are taken with the HADES set-up at SIS18/GSI Darmstadt. Our data allow access to the dependence of the pion emitting source on both the pair transverse momentum and the collision centrality. Comparing our femtoscopic results at $\sqrt(s_{NN}) = 2.4$ GeV to similar results achieved for heavy-ion collisions in a broad band of beam energies we see a very smooth evolution of the source parameters.