HK 46: Hauptvorträge IV

Zeit: Donnerstag 11:00–12:45 Raum: Plenarsaal

Hauptvortrag HK 46.1 Do 11:00 Plenarsaal

Non-equilibrium dynamics in high-energy Heavy-Ion collisions — •Soeren Schlichting — Universität Bielefeld, Bielefeld, Germany

Heavy-ion collision experiments at the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC) have revealed exciting properties of the Quark-Gluon Plasma (QGP) – a new state of hot and dense strong-interaction matter created in high-energy collisions. Strong collective phenomena observed in these collisions, suggest that the QGP behaves as a nearly ideal fluid for a significant part of its space-time evolution. Despite a successful phenomenology based on fluid dynamical descriptions of the QGP beyond time scales 1 fm/c, a first principles understanding of the emergence of fluid dynamical behavior in nucleus-nucleus (AA) collisions remains an outstanding challenge. Based on a general introduction, I will discuss recent theoretical progress in understanding the microscopic and macroscopic features of the early time non-equilibrium dynamics of heavy-ion collisions, which eventually lead to the formation of a fluid dynamic QGP.Besides applications to the dynamical description of nucleus-nucleus (AA) collisions, I will also discuss how these theoretical advances can be used to characterise the conditions for the formation of a QGP in hadronic collisions and quantify the importance of the non-equilibrium stage in smaller collision systems created in proton-nucleus (pA) and proton-proton (pp) collisions.

Hauptvortrag HK 46.2 Do 11:35 Plenarsaal

Probing the Quark-Gluon Plasma with low-mass dileptons in heavy-ion collisions — •Raphaelle Bailhache — Institut für Kernphysik, Goethe-Universität Frankfurt

Ultrarelativistic heavy-ion collisions are used to study the physics of strongly interacting matter under extreme conditions, i.e. high temperature and density, similar to those of the early universe. In such collisions a deconfined state of quarks and gluons, the Quark-Gluon Plasma (QGP), is formed. Dileptons (e^+e^-, $\mu^+\mu^-$) provide an excellent probe of the QGP. Lepton pairs are emitted during all stages of the collision and carry information about the medium properties at the time of emission as they are unaffected by strong final-state interactions. The measurement of their invariant mass can be used to study the decay of massive particles, e.g. the in-medium modified spectral shape of ρ mesons related to the restoration of chiral symmetry. The latter is spontaneously broken in vacuum and accounts for most of the hadron masses. At the same time, thermal radiation from the medium, contributing over a broad mass range, gives insight into the temperature of the medium. Measurements of such signals are extremely challenging due to a large background from ordinary light- and heavy-flavour hadron decays.

This talk will review the low-mass dilepton measurements in heavy-ion collisions from SPS to LHC energies. In particular the latest results of ALICE at the LHC will be shown. Finally, future perspectives at the LHC and at facilities at lower energies will be shortly discussed.

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Hauptvortrag HK 46.3 Do 12:10 Plenarsaal

QCD correlation functions from lattice QCD and the bound-state approach to hadron physics — •Andre Sternbeck — Friedrich-Schiller-Universität Jena

Lattice QCD provides access to many hadronic quantities through Monte-Carlo calculations of gauge-invariant correlators. These calculations have become sufficiently mature to provide estimates for hadronic observables of immediate relevance for experimental programs. In recent years, also continuum functional methods have been improved and increasingly applied to problems of QCD. Their systematic error is however hard to control without lattice QCD results for the basic ingredients, the QCD n-point functions. In this talk I will review lattice results for these n-point functions in Landau gauge and compare the two approaches to QCD and hadron physics.