HK 55: Hauptvorträge III

Zeit: Freitag 8:30–10:30 Raum: F 1

Hauptvortrag HK 55.1 Fr 8:30 F 1

Heavy-ion collisions at the LHC - theory overview — •Urs Achim Wiedemann — CERN TH, Geneva, Switzerland

The standard model of ultra-relativistic heavy ion collisions is based on the picture that viscous relativistic fluid dynamics can account for the time evolution of the dense QCD matter produced in the nuclear overlap area of nucleus-nucleus collisions. This transient QCD fluid attenuates the production of high momentum-transfer processes. Based on the experimental evidence supporting this picture, my talk will review the current theoretical understanding and open challenges.

Hauptvortrag HK 55.2 Fr 9:10 F 1

The BESII and PANDA experiments — •Cristina Morales — Helmholtz-Institut Mainz, Staudingerweg 18, 55128 Mainz

The Standard Model of particle physics leaves open questions related to Quantum Chromodynamics in the non-perturbative regime, like the formation of hadronic matter, the spectrum of hadronic states, etc. Low energy accelerators like the Beijing Electron Positron Collider (BEPCII) with the BESIII spectrometer and the Facility for Antiproton and Ion Research (FAIR) with the $\overline{\mathrm{P}}$ANDA detector in Darmstadt, can address these questions. BEPCII operates at $\sqrt{s}$ between 2 to 4.6 GeV/c^2 and achieved the design luminosity of $1.0\times10^{33}\mathrm{cm}^{-2}\mathrm{s}^{-1}$. BESIII is a multi-purpose cylindrical detector with 93% of 4π geometrical acceptance and has collected, e.g. the largest exclusive charmonium data sets. These data allow to address a broad range of physics topics with high precision, like charmonium and charm physics, hadron studies, determination of the tau mass, R measurements, and investigations of the XYZ particles. FAIR will provide $\overline{\mathrm{P}}$ANDA with antiproton beams of unprecedented intensity (luminosities up to $2\times10^{32}\mathrm{cm}^{-2}\mathrm{s}^{-1}$) and momentum resolution ($\Delta p/p = 10^{-5}$), corresponding to $\sqrt{s} = 2.25$ to 5.47 GeV/c^2. $\overline{\mathrm{P}}$ANDA will be a state-of-the-art, fixed proton targed experiment with a detector designed for a wide physics program including spectroscopy of QCD bound states, hadron structure measurements, production of hyperons and the study of the properties of hadrons in medium. In this talk, the BESIII and $\overline{\mathrm{P}}$ANDA experiments will be described together with aspects of their physics programs and a selection of their results and expectations.

Hauptvortrag HK 55.3 Fr 9:50 F 1

Baryons as bound states of quarks — •Gernot Eichmann — Justus-Liebig-Universität Giessen

Hadrons are bound states of the strong interaction, with mesons as quark-antiquark states and baryons made of three valence quarks. Since most of what we know about the quarks and gluons inside hadrons comes from our knowledge of the nucleon, a combined understanding of the nucleon and its resonances within Quantum Chromodynamics (QCD) is a major goal in studying the strong interaction. In the past years much progress has been made in the description of hadrons from first principles using functional methods. The basic ingredients are QCD's n-point functions which are solved self-consistently and enter in the subsequent calculation of hadron masses, form factors and scattering amplitudes. This allows for a combined description of baryons, light and heavy mesons, tetraquarks and other observables from the same underlying building blocks.

In this talk I will focus on baryons and review recent results for the light baryon spectrum, obtained from solving the genuine three-body equation as well as its quark-diquark simplification. Both approaches yield similar results, which underlines the role of diquark correlations within baryons. The resulting baryons carry a rich structure with relativistically induced orbital angular momentum that would be forbidden in the non-relativistic quark model. I will conclude with a brief survey of other recent applications, including meson and baryon form factors, the light scalar mesons as tetraquarks, and the muon anomalous magnetic moment.