HK 36: Hauptvorträge III

Zeit: Donnerstag 11:00–13:00 Raum: HZ 1+2

Hauptvortrag HK 36.1 Do 11:00 HZ 1+2

Testing the Standard Model at the precision frontier: The anomalous magnetic moment of the muon — •Andreas Hafner — Johannes Gutenberg Universität Mainz, Institut für Kernphysik

The anomalous magnetic moment of the muon $(g-2)_\mu$ is one of the most precisely measured quantities in particle physics (0.54 ppm). There is a long-standing discrepancy of 3-4 standard deviations between the direct measurement of $(g-2)_\mu$ and its theoretical evaluation.

This theoretical prediction is subdivided into three contributions: QED, weak and hadronic. The QED and weak parts can be determined in perturbative approaches with very high precision. Thus, the hadronic uncertainty dominates the total theoretical uncertainty. Within the hadronic uncertainty, the largest contribution stems from the vacuum polarization term, which can be evaluated with the measurement of the inclusive hadronic cross section in e^+e^- annihilation. The second largest contribution to the hadronic uncertainty stems from the so-called light-by-light amplitudes. They have to be evaluated via theoretical models. These models can be tested, optimized and the corresponding uncertainties can be estimated by transition form factor measurements.

Existing and future measurements of the relevant hadronic cross sections and form factors are presented.

Hauptvortrag HK 36.2 Do 11:30 HZ 1+2

The muon g-2 and the Adler function from lattice QCD — •Gregorio Herdoiza — Institute of Nuclear Physics Johannes Gutenberg-Universität Mainz Johann-Joachim-Becher-Weg 45 D-55099 Mainz, Germany

The anomalous magnetic moment of the muon, $g-2$, is one of the most promising observables to identify the signs for physics beyond the Standard Model. QCD contributions are currently responsible for a large fraction of the overall theoretical uncertainty in the determination of the muon $g-2$, and in the running of the QED coupling constant. The recent progress in determining these hadronic contributions from first principles by means of lattice QCD calculations will be reviewed. Studies of the vacuum polarisation function and of the Adler function in the low-energy regime which is essential for current phenomenological studies, as well as in a region of large momentum transfer will be considered. The latter energy regime can be used to match lattice QCD calculations to perturbation theory, thereby providing a way to determine the strong coupling constant.

Hauptvortrag HK 36.3 Do 12:00 HZ 1+2

Reviewing hadron production in the SIS energy regime using new HADES Au+Au data — •Manuel Lorenz for the HADES-Collaboration — Goethe-Universität, Frankfurt am Main — ExtreMe Matter Institute EMMI, Darmstadt

Data on particle production in heavy ion collisions in the energy regime of 1-2 A GeV have been collected over almost three decades now. As most of the newly created hadrons are produced below or slightly above their free NN-thresholds, data are usually interpreted with the help of phenomenological models, rather than comparing to elementary reference measurements. Driven by advance in detector technology, more and more rare and penetrating probes have become accessible, and still keep challenging our knowledge about the properties of the created system and its dynamical evolution.

The recently collected HADES data from Au+Au collisions at 1.23 A GeV represents in this energy regime the most advanced sample of heavy ion collisions in terms of precision and statistics (7*10^9 collected events). Using the yields and spectra of reconstructed hadrons $(\pi^{+-}, K^{+-}, K^0_s, \Lambda)$ provides therefore the optimal bases to test state of the art models and to question the extent of our present understanding of hadron production. This work has been supported by BMBF (05P12RFGHJ), Helmholtz Alliance EMMI, HIC for FAIR, HGS-HIRe.

Hauptvortrag HK 36.4 Do 12:30 HZ 1+2

Encounters with Di-Baryons – from the ABC Effect to a Resonance in the Neutron-Proton System*. — •Mikhail Bashkanov for the WASA-at-COSY-Collaboration — Physikalisches Institut der Universität Tübingen

Despite their long painful history dibaryon searches have recently received new interest, in particular by the recognition that there are more complex quark configurations than just the familiar $q\bar{q}$ and qqq systems. The "hidden color" aspect makes dibaryons a particularly interesting object in QCD.

Within our two-pion production program we recently started to investigate the intriguing ABC effect, which denotes a low-mass enhancement in the $\pi\pi$-invariant mass spectrum produced in double-pionic fusion. We observe that this phenomenon is correlated with a resonance structure at $\sqrt{s} = 2.37$ GeV with $\Gamma \approx 70$ MeV and $I(J^P) = 0(3^+)$. In order to reveal the nature of this structure we measured its possible decay channels $d\pi^0\pi^0, d\pi^+\pi^-, pp\pi^0\pi^-, np\pi^0\pi^0, NN\pi$ and pn by pd collisions in the quasi-free reaction mode utilizing WASA at COSY.

The pn decay channel of the resonance, the *experimentum crucis*, was measured by use of polarized deuterons in inverse kinematics. First preliminary results for the np analyzing power exhibit a pronounced resonance effect in the $^3G_3$ partial wave.

The observed ρ channel $\pi^+\pi^-$ production is capable to explain the missing strength in pn induced e^+e^- production providing thus a possible explanation of the DLS puzzle.

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