HK 49: Hadron Structure and Spectroscopy VI

Time: Thursday 15:45–17:00 Location: HS 3 Physik

Group Report HK 49.1 Thu 15:45 HS 3 Physik

The ePIC experiment at the Electron-Ion Collider: Exploring the mysteries of the building blocks of matter — •Stefan Diehl for the ePIC-Collaboration — Justus Liebig Universität Gießen and University of Connecticut

The Electron-Ion Collider (EIC) is an advanced, new accelerator facility under development at Brookhaven National Laboratory (USA), expected to start operation in the early 2030s. It will collide polarized electrons with high-energy beams, ranging from heavy ions to polarized light ions and protons, at a center-of-mass energy between 20 and 140 GeV and peak luminosities up to $10^{34}\mathrm{cm}^{-2}\mathrm{s}^{-1}$. These unique characteristics provide the basis for answering fundamental questions about the strong force and how it holds matter together, by taking three-dimensional precision snapshots of the inner structure of protons and atomic nuclei. It is expected to make important contributions to the proton spin puzzle, the understanding of quark- and gluon-confinement, the origin of the nucleon mass, the behavior of quarks and gluons in nuclei, and many more aspects. To achieve these physics goals, up to two detectors will be built. One such detector, which is in an advanced design phase, is the Electron-Proton and Ion Collider detector (ePIC). It applies a compact detector concept able to achieve fine track reconstruction resolution, combined with high-performance electromagnetic and hadronic calorimetry and particle identification over a wide kinematic range. This talk will present an overview of the EIC, the ePIC detector concept, and its physics program, with a special focus on the discovery potentials in the field of nucleon structure.

HK 49.2 Thu 16:15 HS 3 Physik

A new formalism for calculating CP asymmetries in nonleptonic multibody B decays — •Leon Heuser[1], Bastian Kubis[1], Christoph Hanhart[2], José R. Peláez[3], Alba R. Torrecilla[3], and Patrícia Magalhães[4] — [1]HISKP Universität Bonn, Bonn, Germany — [2]FSZ Jülich, Jülich, Germany — [3]Departamento de Física Teórica, Universidad Complutense de Madrid, Madrid, SPAIN — [4]IFGW Universidade Estadual de Campinas, Sao Paulo, Brazil

We present a new method to construct the amplitude for hadronic multibody B decays that exploits the universality of pairwise hadronic final state interactions for small invariant masses between two of the final-state particles. This allows us to import the very accurate knowledge of such two-particle systems at low energies into the description of kinematic distributions for bottom hadrons in specific kinematic regions. We demonstrate the validity of this method by computing the CP asymmetry distributions and comparing to data.

HK 49.3 Thu 16:30 HS 3 Physik

Precision Tests of the Chiral Anomaly at the COMPASS Experiment — •Andrii Maltsev — Technische Universität München

Quantum chromodynamics (QCD) has been extremely successful in describing hadron interactions at high energies. At low energies, it becomes challenging to obtain quantitative predictions from first principles. However, one can exploit the chiral symmetry, a fundamental property of QCD, to build phenomenological models, such as the chiral perturbation theory, which give a perturbative framework for describing low-energy processes. Verification of the predictions of these models is crucial for understanding the low-energy interactions of hadrons.

This talk will give an overview of the processes that can be predicted using chiral perturbation theory, such as the $\pi\gamma \to \pi\pi$, $\pi\gamma \to \pi\eta$, $\mathrm{K}\gamma \to \mathrm{K}\pi$ processes, with special emphasis on the status of the measurement of the $\pi\gamma \to \pi\pi$ coupling constant, $F_{3\pi}$.

HK 49.4 Thu 16:45 HS 3 Physik

Measurement of the π^0 transition form factor at MAMI — •Luigi Capozza[1,2], Frank Maas[1,2,3], Oliver Noll[1,2], Christoph Rosner[1,2], Paul Schöner[1,2], and Sahra Wolff[1,2] — [1]Helmholtz-Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA Cluster of Excellence, Mainz, Germany

An important uncertainty on the hadronic corrections to the anomalous magnetic moment of the muon comes from the so-called "light-by-light scattering" contributions. To estimate such contributions in data driven approaches, measurements of the π^0 electromagnetic transition form factor, parametrising the effective coupling of the neutral pion to the electromagnetic field, are needed. One way to access this form factor is measuring the π^0 electroproduction cross section in the Primakoff kinematical regime. Such a measurement has been set up at MAMI featuring a modified version of the PANDA backward calorimeter, installed at forward angles in the A1 electron scattering facility. A status report on this experiment will be presented.