HK 17: Hadronenstruktur und -spektroskopie

Zeit: Dienstag 14:00–15:45 Raum: HZ 1+2

HK 17.1 Di 14:00 HZ 1+2

Strategies for Analysis of the Time-Like Form Factor of the Neutron — •Paul Larin, Cristina Morales, Dexu Lin, and Alaa Dbeyssi for the BESIII-Collaboration — Helmholtz-Institut Mainz

The first measurements of baryonic form factors were performed six decades ago by Robert Hofstadter for the proton via electron scattering in atomic nuclei and led to many breakthough results for undestanding the structure of nuclei. Since then the space-like domain was examined over a large energy range by many different experiments for both protons and neutrons. In contrast, the time-like region is almost unknown until now, especially in case of the neutron. The Beijing Electron Positron Collider II (BEPCII) is designed for center of mass energies between 2 and 5 GeV and therefore offers with the included Beijing Electron Spectrometer III (BESIII) experiment a unique possibility to measure nucleon form factors in the time-like domain with high precision. In particular measurement of the time-like form factors of the neutron would offer a significant improvement to existing results. We report on the use of modern approaches like initial state radiation (ISR) and multivariate analysis methods as a general strategy in the analysis of the channel $e^+e^- \to n\overline{n}\gamma_{ISR}$.

HK 17.2 Di 14:15 HZ 1+2

Measurements of Proton Electromagnetic Form Factors in Time-like Region at BESIII — •Dexu Lin[1,2,3], Cristina Morales[1,2,4], Frank Maas[1,2,4], and Paul Larin[1,2] — [1]Helmholtz-Institut Mainz, 55128 Mainz, Germany — [2]Institut für Kernphysik, JGU Mainz, 55099 Mainz, Germany — [3]HGS-HIRe for FAIR, 60438 Frankfurt am Mainz, Germay — [4]GSI, 64291 Darmstadt, Germay

The proton is the lightest baryon and its internal structure and dynamics can be better understood through the study of its electromagnetic(EM) form factors. In the space-like region there are plenty of statistics already collected by previous experiments and the form factors are very well known. This is not the case of the time-like(TL) region. In the TL region, the ratio of the EM form factors is only known to 11-24% level and the form factors have never been extracted without previous assumption.

BESIII (Beijing Spectrometer III) at BEPCII (Beijing Electron Positron Collider II) is collecting large data samples at J/Ψ, Ψ′′ and XYZ energy range. These data can be used to measure proton EM form factors with ISR (Initial-State-Radiation) method $e^+e^- \to p\overline{p}\gamma_{ISR}$. In addition, an energy scan between 2.0 and 3.1 GeV is currently being considered by BESIII. This would make possible the measurement of the proton EM form factors using the process $e^+e^- \to p\overline{p}$. Both methods will be summarized in this talk.

HK 17.3 Di 14:30 HZ 1+2

Feasibility study: proton time-like electromagnetic form factors with the $\bar{\mathrm{P}}$ANDA experiment — •Dmitry Khaneft for the PANDA-Collaboration — Helmholtz-Institut Mainz, Mainz, Germany

Perspectives of measuring the proton electromagnetic form factors in the time-like region at FAIR with the $\bar{\mathrm{P}}$ANDA detector are presented. A number of simulations with $\bar{\mathrm{P}}$ANDAroot framework on the signal $\bar{p}p \to e^+e^-$ efficieny as well as for the most important background $\bar{p}p \to \pi^+\pi^-$ have been performed. All three hypotheses for the $G_E/G_M = 0, 1, 3$ have been taken into account for signal simulation. A set of cuts were implemented into analysis procedure signal and background separation. Preliminary results of statistical error analysis are shown.

HK 17.4 Di 14:45 HZ 1+2

Beam-spin asymmetry of pion, kaon, proton and antiproton production in semi-inclusive deep-inelastic scattering — •Vitaly Zagrebelnyy — DESY Hamburg Notkestrasse 85

Beam-spin asymmetries in the azimuthal distribution of pions, kaons, protons and antiprotons in semi-inclusive deep inelastic scattering (SIDIS) extracted from 2000-2007 HERMES data are presented. The asymmetries were measured in the kinematic region $Q^2 > 1$ GeV^2, $W^2 > 10$ GeV^2, $0.1 < y < 0.85$. The x_B, z and $p_{h\perp}$ dependencies of the $\sin(\phi)$ modulation of the asymmetries for pions, kaons, protons and antiprotons are shown. Assuming that the SIDIS cross section factorizes to distribution (DF) and fragmentation (FF) functions that dependent on transverse quark momentum (TMD functions), one can obtain novel information about the spin-orbit correlations inside the nucleon and orbital angular momentum of quarks.

HK 17.5 Di 15:00 HZ 1+2

Status Report of K_s^0 Multiplicities from 2006 at COMPASS* — •Daniel Hahne — Universität Bonn

To describe the hadronization process of quarks into hadrons in deep inelastic scattering knowledge of parton distribution functions and fragmentation functions is necessary. Parton distribution functions can be extracted from inclusive deep inelastic scattering. To extract fragmentation functions from data taken by the COMPASS experiment final state hadrons are analyzed in addition to the incoming and scattered muon.

I will give a status report of K_s^0 multiplicities from data taken in 2006 by the COMPASS experiment which can be used to parameterize K_s^0 fragmentation functions.

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HK 17.6 Di 15:15 HZ 1+2

Hadron Multiplicities at COMPASS — •Nicolas du Fresne von Hohenesche — For the COMPASS collaboration — Institut für Kernphysik, Universität Mainz, Johann-Joachim-Becher-Weg 45, 55128 Mainz

Quark fragmentation functions (FF) $D_q^h(z, Q^2)$ describe final-state hadronization of quarks q into hadrons h. The FFs can be extracted from hadron multiplicities produced in semi-inclusive deep inelastic scattering. The COMPASS collaboration has recently measured charged hadron multiplicities for identified pions and kaons using a 160 GeV/c muon beam impinging on an isoscalar target. The data cover a large kinematical range and provide an important input for global QCD analyses of world data at NLO, aiming at the determination of FFs in particular in the strange quark sector. The newest results from COMPASS on pion and kaon multiplicities will be presented.

Supported by BMBF

HK 17.7 Di 15:30 HZ 1+2

The pion scalar radius from two-flavor Wilson Lattice QCD — •Vera Gülpers — Helmholtz-Institut Mainz, Johann-Joachim-Becherweg 36, 55128 Mainz

We calculate the scalar charge radius of the pion using $N_f = 2$ dynamical flavors of non-perturbatively $O(a)$-improved Wilson fermions in a wide range of pion masses. We find that the disconnected contribution to the scalar radius is not negligible especially for smaller pion masses, and is required in order to obtain the behavior expected from next-to-leading order (NLO) Chiral Perturbation Theory (χPT). The low energy constant $\bar{\ell}_4$ is determined from a fit to NLO χPT.