HK 37 Elektromagnetische und Hadronische Proben

Zeit: Mittwoch 14:00–16:00 Raum: TU MA001

HK 37.1 Mi 14:00 TU MA001

Electromagnetic form factors of the nucleon in the perturbative chiral quark model — •Kem Pumsa-ard, V.E. Lyubovitskij, Th. Gutsche, and Amand Faessler — Institut für Theoretische Physik, Universität Tübingen, D-72076 Tübingen, Germany

We study the electromagnetic form factors of the nucleon in a manifestly Lorentz invariant quark model. In addition, we also include chiral corrections up to fourth order on the quark level as deduced from relativistic baryon chiral perturbation theory. The current approach is an improved version of our previous model, the perturbative chiral quark model (PCQM) [1].

[1] V. E. Lyubovitskij, Th. Gutsche and A. Faessler, Phys. Rev. C **64** (2001) 065203; V. E. Lyubovitskij et al., Phys. Rev. C **65** (2002) 025202; C **66** (2002) 055204; C **68** (2003) 015205; Phys. Lett. B **520** (2001) 204

HK 37.2 Mi 14:15 TU MA001

Form factors of the energy-momentum tensor in the Skyrme model — •Christoph Cebulla[1], Jens Ossmann[1], Peter Schweitzer[1], K. Goeke[1], and M. Polyakov[2,3] — [1]Institute for Theoretical Physics II, Ruhr-University Bochum, 44801 Bochum,Germany — [2]Petersburg Nuclear Physics Institute, Gatchina, St. Petersburg 188300, Russia — [3]Institute de Physique, B5a, Université de Liège au Sant Tilman, B-4000 Liège 1 Belgium

We study the nucleon form factors of the energy-momentum tensor in the framework of the Skyrme model[1]. Based on work done by M.V. Polyakov[2] we obtain model expressions for the form factors as well as for what can be interpreted as radial distributions of "pressure"and "shear"forces and calculate them numerically. We verify the internal consistency of the model and compare with results obtained within other models or methods. The results for the so-called D-term are of interest for phenomenology related to generalized parton distribution functions.

[1] T.H.R. Skyrme. A nonlinear field theory. *Proc. Roy. Soc. Lond.*, A260:127-138,1961
[2] M.V. Polyakov. Generalized parton distributions and strong forces inside nucleons and nuclei. *Phys. Lett.*, B555:57-62, 2003

HK 37.3 Mi 14:30 TU MA001

Polarisationsobservablen in der $2\pi^0$ Photoproduktion am Proton — •Dirk Krambrich für die CrystalBall@MAMI-Kollaboration — Institut für Kernphysik, Universität Mainz

Mit dem neu aufgebauten 4π Photonenspektrometer am Mainzer Mikrotron MAMI, bestehend aus dem Crystal Ball Detektor (672 NaI Kristalle) und dem TAPS Detektor als Vorwärtswand (510 BaF_2 Kristalle), wurden Daten zur $2\pi^0$ Photoproduktion am Proton von der Erzeugungsschwelle 307 MeV bis 820 MeV genommen. Durch den Einsatz von linear und zirkular polarisierten Photonen konnte neben dem differentiellen Wirkungsquerschnitt auch die Photonasymmetrie und die Helizitätsasymmetrie gemessen werden. Speziell diese Polarisationsobservablen sind über Interferenzterme auf Details des Produktionsmechanismus empfindlich. Erste vorläufige Ergebnisse werden mit verschiedenen Modellvorhersagen verglichen.

HK 37.4 Mi 14:45 TU MA001

Linearly polarised photons at ELSA and Σ beam asymmetry for the η photoproduction off the proton* — •Daniel Elsner for the CBELSA/TAPS collaboration — Physikalisches Institut, Universität Bonn

Using coherent bremsstrahlung on a thin diamond crystal from the electron beam of the ELSA accelerator a tagged photon beam with a high degree of linear polarisation is produced. The required precise alignment of the crystal axis with respect to the beam direction is realised by a commercial goniometer. The coherent bremsstrahlung itself can be used for the calibration of the crystal orientation based upon the Stonehenge technique. From comparison of measured photon spectra with a calculation of bremsstrahlung production including collimation and other experimental constraints, we gain the degree of linear polarisation within a relativ uncertainty of 5%. During the CBELSA/TAPS beamtimes different data sets with maximum polarisation at photon energies between 1.2 and 2.0 GeV were measured. The reaction $\vec{\gamma} + p \to \eta + p$ was analysed in the two dominant neutral decay modes of the η. The status of the analysis of the photon beam asymmetry, Σ, and the unpolarized cross section will be reported. The comparison to existing data of Σ at photon energies around 1 GeV serves as an independent check of the polarisation determination.

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HK 37.5 Mi 15:00 TU MA001

Neutrino Scattering on Nucleons and Nuclei — •Tina Leitner, André Peshier und Ulrich Mosel — Institut für Theoretische Physik, Universität Giessen, Germany

We investigate neutrino scattering on nucleons and nuclei for neutrino energies up to 2 GeV. The two main processes in this energy region are quasielastic scattering and resonance production. Here we concentrate on processes mediated by charged current weak interactions. Quasielastic reactions on nucleons ($\nu + n \to l^- + p$ and $\bar{\nu} + p \to l^+ + n$) can be related to electron scattering. Using recent electron scattering data for the parametrization of the vector form factors leads to a more reliable prediction of the neutrino cross section and of the other form factors which contain information on the axial content of the nucleon. Extensions to neutrino reactions on nuclei are calculated in the framework of the BUU transport model [1]. Resonance production is also first calculated for the nucleon and then within the BUU transport model to simulate nuclear effects. The main contribution to the single-pion production cross section at neutrino energies of a few GeV comes from the production and the subsequent decay of the $\Delta(1232)$, but also other low-energy resonances give non-negligible contributions e. g. the N(1440).

[1] M. Effenberger, E. Bratkovskaya and U. Mosel, Phys. Rev. C 60, 044614 (1999)

HK 37.6 Mi 15:15 TU MA001

Simulationsstudien zur Optimierung des PANDA-Detektors — •Bertram Kopf für die Panda-Kollaboration — Ruhr-Universität Bochum

Das PANDA–Experiment, das einen wesentlichen Bestandteil des GSI–Zukunftsprojektes darstellt, soll Antiproton–Annihilationsprozesse am Proton sowie an schweren Kernen bei Strahlimpulsen zwischen etwa 1.5 GeV/c und 15 GeV/c untersuchen.
Ziel ist es, neue Erkenntnisse in der Spektroskopie der Mesonen, in der Hyperonenphysik und auch über Charmonium–Zustände in Kernmaterie zu sammeln.
Die Untersuchung dieses breiten Spektrums der Physik erfordert einen Detektor, der komplexe Anforderungen erfüllen muß. So ist ein präziser Nachweis von neutralen und auch geladenen Teilchen über ein großes Impulsspektrum und über den nahezu gesamten Raumwinkel zwingend notwendig. Hierfür in Betracht kommende alternative Detektorkonfigurationen werden vorgestellt und anhand von Simulationsstudien geeigneter Zerfallskanäle verglichen.

HK 37.7 Mi 15:30 TU MA001

Physics of Hypernuclei - from FINUDA to PANDA — •O.N. Hartmann[1], P. Gianotti[1], J. Pochodzalla[2], A. Sanchez Lorente[2], T. Saito[3], and C. Sfienti[3,4] for the FINUDA and the PANDA collaboration — [1]INFN–LNF, Frascati, Italy — [2]U Mainz, Germany — [3]GSI, Darmstadt, Germany — [4]U Catania, Italy

The FINUDA [1] experiment at the DAΦNE e^+e^--collider („ϕ-factory“, [2]) has completed its first data taking on hypernuclei produced by stopping K^--mesons from the ϕ decay in various target nuclei. The FINUDA apparatus performs studies on hypernuclear spectroscopy and the decay of hypernuclei.

The hypernuclei physics part of the PANDA [3] program at FAIR [4] will be an extension of this type of physics to double hypernuclei. This experiment uses the antiproton beam of HESR [4,3] on a primary heavy target producing a $\Xi\overline{\Xi}$ pair. The Ξ^--hyperon is stopped in a secondary target, captured into the atomic shell of the target nucleus and finally absorbed in the nucleus producing a $\Lambda\Lambda$ pair. This will make the study of the strong interaction strength between Λ-hyperons possible, as well as the investigation of a possibly existing double strange six quark state (H-dibaryon).

In this contribution first results from FINUDA will be presented as well as an overview on the future plans in PANDA.

[1] P. Gianotti *et al.*, NPA691(2001), 483c
[2] C. Milardi *et al.*, hep-ph/0408073

[3] Letter of Intent, PANDA collaboration, 2004
[4] http://www.gsi.de/zukunftsprojekt/index_e.html

HK 37.8 Mi 15:45 TU MA001

Timelike compton scattering and related exclusive processes in proton-antiproton annihilation at PANDA — •Michael Düren, Matthias Hartig, Björn Seitz, George Catalin Serbanut, and Hasko Stenzel for the PANDA collaboration — II. Physikalisches Institut, Uni Giessen, 35392 Giessen

Exclusive proton-antiproton annihilation into two photons at large s and t can be described in terms of the handbag diagram: The process is separated into a 'soft' part (i.e. the formation of a single quark-antiquark pair) and a 'hard' part (i.e. the subsequent annihilation into two photons). The latter can be treated in pertubative QCD. The process is of special interest due to its relation to the timelike formfactor and to Generalized Parton Distributions as measured in electron scattering experiments. It is proposed to measure this and related exclusive annihilation processes with a scalar meson, a vector meson or a lepton pair in the final state at the PANDA experiment at GSI.