Chiral $SU(3)$ Dynamics with Coupled Channels: Inclusion of P-Wave Multipoles $^\diamond$

J. Caro Ramon, N. Kaiser, S. Wetzel, and W. Weise

We extend our recent non-perturbative chiral $SU(3)$ coupled-channel approach to pion- and photon-induced η- and K-meson production off protons by including all strong and electromagnetic p-wave multipoles. We identify the p-wave amplitudes of the next-to-leading order $SU(3)$ chiral meson-baryon Lagrangian with a coupled channel potential which is iterated to infinite orders in a separable Lippmann-Schwinger equation. Our approach to η- and K-photoproduction introduces no additional free parameters. By adjusting a few finite range parameters and the unknown parameters in the Lagrangian, we are able to simultaneously describe a very large amount of low-energy data. These include the total and differential cross sections of the π-induced reactions $\pi^- p \to \eta n$, $K^0\Lambda$, $K^0\Sigma^0$, $K^+\Sigma^-$ and $\pi^+ p \to K^+\Sigma^+$ as well as those of the photoproduction $\gamma p \to \eta p$, $K^+\Lambda$, $K^+\Sigma^+$, $K^0\Sigma^+$. The polarization observables measured in η- and K- photoproduction are particularly sensitive to interference terms between the s- and p-wave multipoles. The total cross section data are remarkably well reproduced in all channels. There remain, however, some open questions concerning details of angular distributions and polarization observables.

Nucl. Phys. **A**, in print

$^\diamond$ Supported by BMBF project 06 TM 876 and DFG project We 655/14–1

Nuclear Deep-Inelastic Lepton Scattering and Coherence Phenomena $^\diamond$

G. Piller and W. Weise

This review outlines our present experimental knowledge and theoretical understanding of deep-inelastic scattering on nuclear targets. The emphasis is primarily on nuclear coherence phenomena, such as shadowing, where the key physics issue is the exploration of hadronic and quark-gluon fluctuations of a high-energy virtual photon and their passage through the nuclear medium. New developments in polarized deep-inelastic scattering on nuclei are also discussed, and more conventional binding and Fermi motion effects are summarized. The report closes with brief outlooks on vector meson electroproduction, nuclear shadowing at very large Q^2 and the physics of high parton densities in QCD.

to appear in Physics Reports

$^\diamond$ Supported by BMBF project 06 TM 876

The η' in Baryon Chiral Perturbation Theory $^\diamond$

B. Borasoy

We include in a systematic way the η' in baryon chiral perturbation theory. The most general relativistic effective Lagrangian describing the interaction of the lowest lying baryon octet with the Goldstone boson octet and the η' is presented up to linear order in the derivative expansion and its heavy baryon limit is derived. As explicit examples, we calculate the baryon masses and the $\pi N\sigma$-term up to one-loop order in the heavy baryon formulation. A systematic expansion in the meson masses is possible, and appearing divergences are renormalized.

Phys. Rev. **D**, in print

$^\diamond$ Supported by BMBF project 06 TM 876