Chiral Dynamics and the Low Energy Kaon-Nucleon Interaction ◇

N. Kaiser, P. B. Siegel, and W. Weise

We examine the meson-baryon interaction in the strangeness $S = -1$ sector using an effective chiral Lagrangian. Potentials are derived from this Lagrangian and used in a coupled-channel calculation of the low energy observables. The potentials are constructed such that in the Born approximation the s-wave scattering amplitude is the same as that given by the effective chiral Lagrangian, up to order q^2. Comparison is made with the available low energy hadronic data of the coupled $K^-p, \Sigma\pi, \Lambda\pi$ system, which includes the $Lambda(1405)$ resonance, K^-p decay. Good fits to the experimental data and estimates of previously unknown Lagrangian parameters are obtained.

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J/ψ Production as a Probe of Charge Symmetry Violations and Nuclear Corrections in Parton Distributions ◇

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We investigate the sensitivity of J/ψ production in proton-neutron and proton-deuteron collisions to charge symmetry violations in the parton distributions as well as to nuclear corrections. It is found that the effects of charge symmetry violations in the quark distributions are confined to large x_F and difficult to measure in experiments currently being planned. However, from proton-deuteron experiments it should be possible to isolate nuclear corrections to the gluon distribution.

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Chiral Dynamics and the S_{11}(1535) Nucleon Resonance ◇

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The SU(3) chiral effective Lagrangian at next-to-leading order is applied to the S-wave meson-baryon interaction in the energy range around the ηN threshold. Potentials are derived from this Lagrangian and used in a coupled channel calculation of the $\pi N, \eta N, K\Lambda, K\Sigma$ system in the isospin-1/2, $l = 0$ partial wave. Using the same parameters as obtained from a fit to the low energy $\bar{K}N$ data it is found that a quasi-bound $K\Sigma$-state is formed, with properties remarkably similar to the $S_{11}(1535)$ nucleon resonance. In particular, we find a large partial decay width into ηN consistent with the empirical data.

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