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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Nuclear Structure Functions at Moderate Q^2: Relativistic Constituent Quarks and Spectator Mass Spectrum ◇

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We present a model description of the nucleon valence structure function applicable over the entire region of the Bjorken variable x, and above moderate values of $Q^2(\sim 1\ GeV^2)$. We stress the importance of describing the complete spectrum of intermediate states which are spectator to the deep-inelastic collision. At a scale of $1\ GeV^2$ the relevant degrees of freedom are constituent quarks and pions. The large-x region is then described in terms of scattering from constituent quarks in the nucleon, while the dressing of constituent quarks by pions plays an important role at intermediate x values. The correct small-x behaviour, which is necessary for the proper normalization of the valence distributions, is guaranteed by modeling the symptotic spectator mass spectrum according to Regge phenomenology.

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Low Energy $\bar{K}N$ Interaction in Nuclear Matter ◇

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We investigate the low-energy $\bar{K}N$ interaction in nuclear matter including Pauli blocking, Fermi motion and binding effects. We use a coupled-channel approach based on the Chiral $SU(3)$ Effective Lagrangian which describes all available low energy data of the coupled $K^-p, \pi\Sigma, \pi\Lambda$ system. Due to the dynamics of the $\Lambda(1405)$ resonance we find a strong non-linear density dependence of the K^-p scattering amplitude in nuclear mater. The real part of the $\bar{K}N$ scattering length changes sign already at a small fraction of nuclear matter density, less than 0.2 ρ_0. This may explain the striking behaviour of the K^--nuclear optical potential found in the analysis of kaonic atom data.

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