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 asymptotic 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 matter. The real part of the $\bar{K}N$ scattering length changes sign already at a small fraction of nuclear matter density, less than $0.2\rho_0$. This may explain the striking behaviour of the K^--nuclear optical potential found in the analysis of kaonic atom data.

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Inclusive Heavy-Flavor Production from Nuclei ◇

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We describe a light-cone wave-function formulation for hadroproduction of heavy-flavors at high energies. At moderate values of x_F heavy-flavor production can be viewed as a diffractive excitation of heavy quark-antiquark Fock states, present in the interacting gluon from the projectile. The approach developed here is well suited to address coherence effets in heavy-quark production from nuclei at small values of $x_t \lesssim 0.1 \cdot A^{-1/3}$.

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