Structure Functions of the Nucleon in a Covariant Scalar Spectator Model

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Nucleon structure functions, as measured in deep-inelastic lepton scattering, are studied within a covariant scalar diquark spectator model. Regarding the nucleon as an approximate two-body bound state of a quark and diquark, the Bethe-Salpeter equation (BSE) for the bound state vertex function is solved in the ladder approximation. The valence quark distribution is discussed in terms of the solutions of the BSE.

Physically Motivated Approximation to a Parton Distribution Function in QCD

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It has been suggested that the parton distributions in coordinate space, so-called Ioffe-time distributions, provide a more natural object for non-perturbative methods compared to the usual momentum distributions. In this paper we argue that the shape of experimentally determined Ioffe-time distributions of quarks in a nucleon target clearly indicates separation of longitudinal scales, which is not easily recognizable in terms of conventional longitudinal momentum space considerations. We demonstrate how to use this observation to determine parton distributions, using non-perturbative information about the first few moments and the Regge asymptotics at small x.

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Effective Kaon Masses in Dense Nuclear and Neutron Matter $^{\diamond}$

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The effective mass and decay width of kaonic modes in baryonic matter are studied within a coupled-channel approach based on the Chiral $SU(3)$ Effective Lagrangian which describes all available low energy data of the coupled $\bar{K}N, \pi\Sigma, \pi\Lambda$ system. Including Pauli blocking and Fermi motion in the kaon dispersion relation, we find a strong nonlinear density dependence of the K^- effective mass and decay width in symmetric nuclear matter at densities around 0.1 times normal nuclear matter density ρ_0 due to the in-medium dynamics of the $\Lambda(1405)$ resonance. At higher densities the K^- effective mass decreases slowly but stays above 0.5 m_K at least up to densities below 3 ρ_0. In neutron matter the K^- effective mass decreases almost linearly with increasing density but remains relatively large ($m_K^* > 0.65\ m_K$) for $\rho_n \lesssim 3\ \rho_0$. The K^+ effective mass turns out to increase very slowly with rising density.

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