$D \to e\nu_e, \mu\nu_\mu, \tau\nu_\tau$ and the branching fractions of semileptonic decays $D^+ \to \pi^0 e^+ \nu_e, \pi^0 \mu^+ \nu_\mu, K^0 e^+ \nu_e, K^0 \mu^+ \nu_\mu$, $D^0 \to \pi^- e^+ \nu_e, \pi^- \mu^+ \nu_\mu, K^- e^+ \nu_e, K^- \mu^+ \nu_\mu$, $D_s^+ \to K^0 e^+ \nu_e, K^0 \mu^+ \nu_\mu$. The results of calculations within the accuracy of the model are consistent with experimental data and estimates obtained in other theoretical approaches.

Is it possible matching higher-twist contributions with chiral perturbation theory?

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Using the example of the QCD analysis of the precise low-energy data on the polarized Bjorken sum rule, we show how it is possible to make a transition between two regimes of the QCD expansions down to low Q^2 scales. As it is well known, at low momentum transfer, $Q < 1$~GeV, the description of the perturbative part of the Bjorken integral in the framework of standard perturbation theory encounters serious difficulties due to unphysical features of the usual perturbative running coupling. To avoid this difficulty, we use an analytic running coupling which, without introducing additional parameters, eliminates the unphysical features of the perturbative coupling. Since the theoretical description of the Bjorken sum rule involves not only a series in powers of α_s but also a series in powers of $1/Q^2$ (higher twist contributions summing into an unknown function), we will use the technique of matching the function at large Q^2 and behavior at small Q^2 near zero by involving the Gerasimov--Drell--Hearn sum rule. The essence of the ``matching" method is that the sum rule is applied to the region of large values of Q^2, where it works well, and then continues to the region of small Q^2. This allows us to obtain information about the behavior of structural functions in the region where experimental data are not available. The region near $Q^2 = 0$ is of particular interest because it corresponds to small distances between interacting particles. In this region, the structural functions can experience significant changes associated with the manifestation of the inner degrees of freedom of hadrons. A qualitative description of the region near $Q^2 = 0$ can be obtained by analyzing the behavior of structural functions at small values of Q^2. This approach in different loop level of the perturbative part gives a stable good agreement with the experimental data in the whole region up to zero momentum transfer.

Ghost and Gluon Propagators at Finite Temperatures within a Rainbow Truncation of Dyson-Schwinger Equations

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The truncated Dyson-Schwinger and Bethe-Salpeter equations in Euclidean complex momentum domain are analysed within the ladder rainbow truncation. The approach is generalized to finite temperatures. Some critical phenomena in hot matter, such as behaviour of ghost and gluon propagators at high temperatures, relevant to possible signals of Quark Gluon Plasma, are considered.

Matter transport as fundamental property of solitons. Generalization of the Stokes drift mechanism to strongly nonlinear systems.

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A soliton is defined as a nonlinear solitary wave that propagates in environmen t with constant speed, shape and amplitude due to a balance of nonlinearity and dispersion. Solitary wave was first