2 - 5 Study of Polarized Parton Distribution Functions with Nonlinear QCD Evolution Equations*

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In the framework of dynamical parton distribution model, we obtain the polarized parton distribution functions from a QCD global analysis of the worldwide polarized deep inelastic scattering data. In the analysis, we apply the DGLAP equations with parton-parton recombination corrections. All the sea quarks and gluons are dynamically generated from QCD radiations processes, with the nonperturbative input comprising only the polarized valence quark distributions. This analysis approach leads to a simple parametrization with seven free parameters. The parameterized nonperturbative input scale at an extremely low Q_0^2 reproduces well the spin-dependent structure functions measured at high Q^2. Figure 1 shows the comparisons of our determined polarized structure function $g_1^p(x,Q^2)$ as a function of x at different Q^2 with the polarized DIS data from E143 and SMC collaboration. Figure 2 (Left) shows our obtained polarized proton structure function $xg_1^p(x,Q^2)$ as a function of x at $Q^2 = 4.4$ GeV^2, compared with the JLAB17/CLAS experimental data. Figure 2 (Right) shows our predicted polarized deuteron structure function $xg_1^p(x,Q^2)$ as a function of x at $Q^2 = 2$ GeV^2, compared with the E143 experimental data at SLAC. Our results are consistent with the experimental data and in good agreement with some parameterized models. In addition, our analysis presents the positive polarized gluon distribution and it shows that the gluon distribution may plays an important role to the proton spin content. This analysis presents smaller statistical uncertainties for the polarized parton distributions, which is due to the fewer free parameters used for the parametrization of the initial polarized parton distribution functions. The obtained polarized polarized parton distribution functions of the proton from this analysis are suggested to be used in a lot of phenomenological applications.

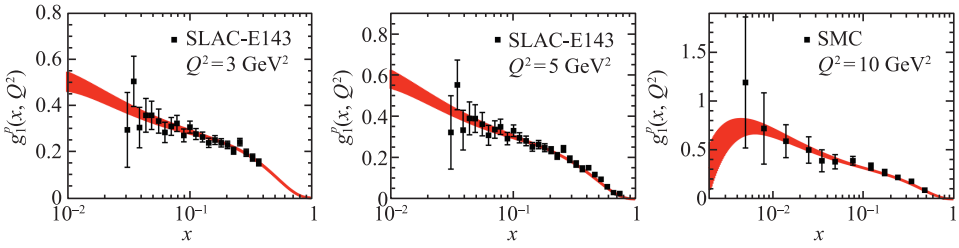

Fig. 1 (color online) Our predicted polarized structure function $g_1^p(x,Q^2)$ as a function of x at different Q^2 compared with the polarized DIS data from E143 and SMC collaboration.

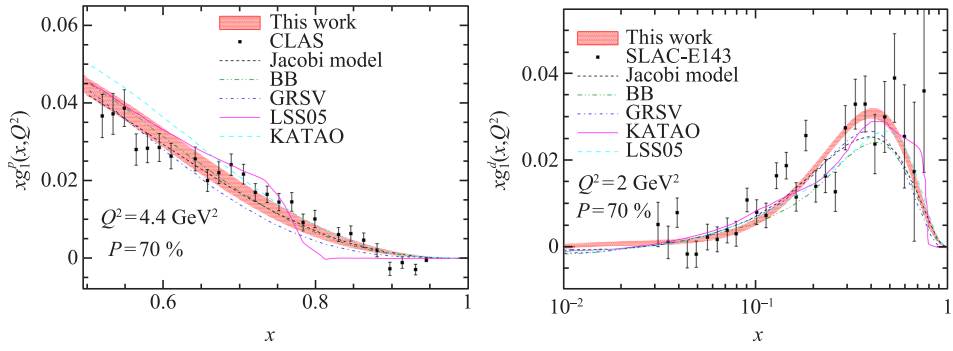

Fig. 2 (color online) Left: Comparisons of our predicted polarized proton structure function $xg_1^p(x,Q^2)$ as a function of x at $Q^2 = 4.4$ GeV^2 with the JLAB17/CLAS experimental data. Right: Comparisons of our predicted polarized deuteron structure function $xg_1^d(x,Q^2)$ as a function of x at $Q^2 = 2$ GeV^2 with E143 experimental data at SLAC.

Reference

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2 - 6 Search for Three Mesons Hidden Charm Bound State $K_{c\bar{c}(4180)}$ *

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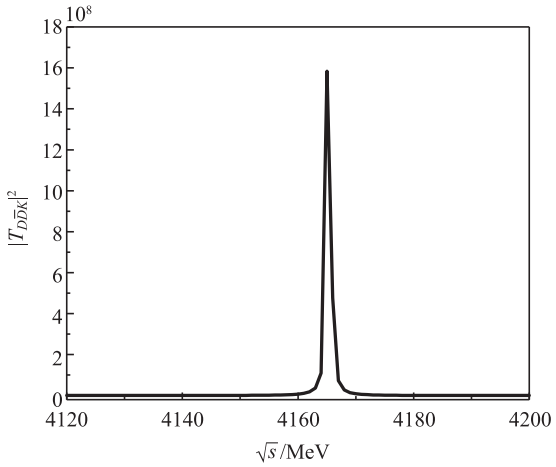

Fig. 1 Modulus squared of the total scattering amplitude of $D\bar{D}K$ three-body system in isospin $I=\frac{1}{2}$.

An important and fundamental issue about hadronic physics is their structure and nature. More and more exotic states have been observed by experiments since $X(3872)$ was found. Various new models about hadronic structure were proposed in theoretical side, such as tetraquark state, pentaquark state, glueball, hybrid state and molecular state. In particular, three mesons molecular also have attracted much interest.

Recently, three-meson $D\bar{D}K$ bound state $K_{c\bar{c}}(4180)$ is predicted by solving the Schröodinger equation with Gaussian Expansion Method[1]. We checked this result with a different method, Fixed-center approximation to Faddeev equations. The result is shown in Fig. 1, in which we viewed cluster $D\bar{D}$ as molecular $X(3720)$ and scattered K meson on D(or $\bar{D}$) in cluster[2]. Afterwards, its production in $e^+e^- \to c\bar{c}$ also was discussed[3]. We look forward to its observation by experiments in the future.

References

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