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New approach to QCD Factorization

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Factorization is the fundamental concept in order to apply QCD calculations to description of hadronic reactions. According to Factorization, theoretical study of any hadronic process includes both parton scattering and parton distributions. The partonic sub-processes are calculated with the use of regular methods of perturbative QCD. In contrast, the parton distributions are introduced purely phenomenologically, without any theoretical grounds. There are two popular kinds of Factorization in the literature: Collinear and k_T - factorizations. They were introduced independently of each other. We show that both the k_T - and collinear factorization can be obtained by consecutive reductions of some more general (Basic) factorization. Each of these reductions is an approximation valid under certain assumptions.

First, the transitions from Basic to k_T - factorization assumes that the momenta of the partons connecting the perturbative and non-perturbative blobs are mostly transverse. This assumption fairly agrees both with the DGLAP and BFKL.

Second, if the unintegrated parton distributions in k_T -factorization have a maximum(s) in k_T , then k_T - factorization can be reduced to collinear factorization. The sharper the maximum is, the better is accuracy of the transition. This assumption can be checked with analysis of available experimental data. Integration over momenta of the connecting partons in the Basic factorization for amplitudes of the forward Compton scattering of hadrons must yield a finite result. This obvious requirement allowed us to deduce theoretical constraints on the parton distributions both in k_T - and Collinear factorizations.

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