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Soft matrix elements in the non-local chiral quark model

In presence of the hard scale amplitudes for high energy processes factorize into perturbative and soft part. While the former can be calculated within QCD, the latter has to be either obtained from experiment or treated by non-perturbative methods. One of the possibilities is to use low energy effective models, which incorporate dynamical chiral symmetry breaking, as a one of the most important phenomena at this scale. Moreover, realistic models have to take into account the non-local interactions. In the present talk we consider semibosonized Nambu-Jona-Lasinio model, where the non-locality emerges as a momentum dependence of constituent quark mass. Technically, it serves as a natural way of Lorentz covariant regulator of the loop integrals at high momenta, which is needed in order to make the calculations finite. On the other hand, momentum dependence of the mass forces us to replace standard local currents by the non-local ones. Their precise form is in general not restricted, therefore they have to be modelled. In order to demonstrate simple choice of the non-local vector current, we use the photon distribution amplitudes and an ansatz for the momentum dependence of mass allowing for analytic calculations.

As an example of the more advanced applications of the non-local chiral quark model (NCQM), we consider recently proposed pion-photon transition distribution amplitudes (TDA). They are in some sense similar to the ordinary generalized parton distribution functions, however they are non diagonal in the states - instead of transition between two hadrons with different momenta we deal with the hadron and the real photon. TDA's appear as a universal non perturbative input in backward Compton scattering or hadron-antihadron anihilation into two photons. From the point of view of the NCQM's TDA's are very interesting objects to study, because they have to satisfy several properties originating from Lorentz invariance (so called polynomiality), Ward identities and axial anomaly.

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