

The study divides the space of intermediate states into three sectors, which are illustrated in Fig. VI.29 and described here:

\mathcal{A} : $w \lesssim M^2$. This is the diagram of Fig. VI.26, involving diquark spectators, which the studies described in Secs. VI.A.1 and VI.A.2 computed as the sole process contributing to the valence-quark distribution function. It is represented by a probability density

$$\rho_{\mathcal{A}}(w, p^2, x; Q_0) = \sum_{D=0^+, 1^+} \delta(w - m_D^2) f_{Q/N}^D(p^2, x; Q_0), \quad (\text{VI.16})$$

with $f_{Q/N}^D(p^2, x; Q_0)$ identified as the probability distribution for finding a constituent-quark in the nucleon with invariant mass p^2 , proton light-cone momentum fraction x and partnered by a diquark with $J^P = D$. Faddeev equation models of nucleon structure provide an appropriate framework for its evaluation. (See, e.g., App. B.)

\mathcal{B} : $M^2 \lesssim w \lesssim w_0$, $w_0 \sim 2 M^2$. One model for the addition of $q\bar{q}$ pairs or correlations to the intermediate state is to dress constituent-quarks with pseudoscalar mesons.⁸ In (Kulagin *et al.*, 1996) the dressing sum is truncated at just one pion rung, depicted in the central image of Fig. VI.29. The remainder is shifted to sector \mathcal{C} .

\mathcal{C} : $w \geq w_0$. The large invariant mass spectator component is modeled via a Regge trajectory, with intercept $\alpha_R \approx 1/2$, to describe $q\bar{q}$ scattering from a constituent-quark. This piece provides a contribution to the valence-quark distribution function that behaves as $x^{-\alpha_R}$ for small- x . As we reported in Sec. VI.A.1, this is a desirable feature.

The model is elaborate and has numerous parameters. Their values are fixed through comparison with data and an eye to avoiding large discrepancies with legitimate theoretical constraints. Important amongst the parameters are: the constituent-quark mass, $m_Q = 0.45 \text{ GeV}$; the diquark masses, with the large values⁹ $m_{0^+} = 1.0 \text{ GeV}$ and $m_{1^+} =$

⁸ This can be sensible even when one unfolds and understands the structure of constituent-quarks (Blaschke *et al.*, 1996; Cloët and Roberts, 2008; Oertel *et al.*, 2001). Indeed, it is an integral step in a systematic truncation of QCD's Dyson-Schwinger equations.

⁹ These values are roughly 20% larger than extant computations of the mass-scales associated with diquark correlations, Eq. (B.1) (Burden *et al.*, 1997; Maris, 2002).