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Renormalon-based Resummation of the Bjorken Sum Rule in Holomorphic QCD

We evaluate the polarised Bjorken sum rule (BSR) $\overline{\Gamma}_1^{p-n}(Q^2)$ with truncated Operator Product Expansion (OPE) up to the D = 4 term [1]. Due to the knowledge of the renormalon structure of the BSR, the leading-twist term of dimension D = 0 is evaluated using a recently developed renormalon-based resummation [2], in this case with two variants of holomorphic QCD couplings $[a(Q^2) \mapsto \mathcal{A}(Q^2)]$ which have no Landau singularities and thus require, in contrast to the perturbative QCD (pQCD) case [3], no regularisation of the resummation formula. The D = 2 and D = 4 terms are then included in the OPE of the inelastic BSR, and fits are performed to the available experimental data.

In comparison to applying the renormal on-based resummation method using the pQCD coupling, further advantages we note in our approach are that the Q^2 -interval in the fit can be significantly extended to lower Q^2 -values and the extracted residue parameter values are more stable, this being reflected in the significantly reduced experimental uncertainties of these values.

References:

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