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Renormalization of Soft Logarithms: Analysis in Dijet Processes with Large Rapidity Gaps

Content

This work analyzes gluon-gluon scattering processes with a focus on dijet production in large rapidity gaps. The study applies perturbative QCD techniques, emphasizing the resummation of soft logarithms $\log(Q/Q_0)$ and the incorporation of contributions from the BFKL approach. Through the use of color space factorization and renormalization methods, we investigate the evolution of scattering amplitudes, highlighting the dominant role of the octet color channel. The results validate the Double Leading Logarithmic Approximation (DLLA) while demonstrating the importance of including subleading corrections to achieve precise theoretical predictions in the high-energy limit relevant to LHC phenomenology.

Summary

In this work, we study gluon-gluon scattering with emphasis on dijet production in large rapidity gap events. In perturbative expansions, soft logarithms can grow large and challenge convergence. Additionally, gluon state non-diagonality and color charge interactions with other particles affect the analysis of scattering channels. To address this, the perturbative series is reorganized using renormalization techniques, resuming $\log\left(\frac{Q}{Q_0}\right)$ logarithms and BFKL terms. This improves the description of amplitude evolution, highlighting the octet channel's dominance. Our results validate the Double Leading Logarithmic Approximation (DLLA) and emphasize the importance of including subleading corrections for accurate predictions.

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