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Soft anomalous dimension structure at five loops

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The multi-particle scattering amplitudes in gauge theories are plagued with infrared singularities. A basic understanding of these singularities is essential and has been the focal point for many decades of theoretical study. The soft function collects all the soft singularities of the multi-parton amplitude. As a result of factorization, the soft function can be isolated from the entire amplitude and studied separately. The renormalization properties of the soft function allow us to write it in terms of the finite soft anomalous dimension as $S = \exp\left[-\frac{1}{2}\int_{\mu^2}^{\infty}\frac{d\lambda^2}{\lambda^2}\,\Gamma^s(\alpha_s(\lambda^2,\epsilon))\right]$. The diagrammatic approach involves the concept of Webs which are the set of Feynman diagrams that enter the soft function's exponent. Webs can be used to unravel the structure of the soft anomalous dimension at different orders of the perturbation theory. The kinematic and the corresponding color factors of webs mix via the web mixing matrix. In this talk, we extend the earlier studies done at four loops in JHEP05(2020)128 to five loops. We present our results at five loops to help understand the structure of soft anomalous dimension appearing at five loops. We have computed the mixing matrices and the exponentiated color factors of all the cwebs appearing at five loops and six lines. Our study will form an essential step toward understanding the structure of soft anomalous dimension.

Session

Heavy Ions and QCD

Primary author: MISHRA, Shubham

Co-authors: DANISH, Abhinava; Dr TRIPATHI, Anurag (IIT Hyderabad); AGARWAL, Neelima (CBIT Hyderabad); PAL, Sourav; SRIVASTAV, aditya

Presenter: MISHRA, Shubham

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