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Computing one-loop corrections to quarkonium production impact-factors with Lipatov's EFT

The formalism of gauge-invariant EFT for Multi-Regge processes in QCD is used to compute impact-factors relevant for processes of production of heavy quarkonia within Non-Relativistic QCD Factorisation formalism and High-Energy Factorisation at one-loop accuracy. The examples of $\gamma + R \rightarrow c\bar{c} \left[{}^1S_0^{[8]} \right]$ and $g + R \rightarrow c\bar{c} \left[{}^1S_0^{[1]} \right]$ impact factors will be considered, with R being the Reggeized gluon and the final-state $c\bar{c}$ pair is projected on a specified state ${}^{2S+1}L_J^{[1,8]}$. In the process of computation, the one-loop integrals with rapidity divergences and massive internal lines have been encountered and procedure for their computation has been developed. The results for the impact-factor in the EFT has been cross-checked against the Regge limit of an exact one-loop QCD amplitude $\gamma + g \rightarrow c\bar{c} \left[{}^1S_0^{[8]} \right] + g$, which is another highly nontrivial check of the EFT formalism. The results will be applied to computation of p_T -integrated cross sections of inclusive J/ψ photoproduction and η_c hadroproduction in the matching approach of Refs.[1,2].

[1] <https://arxiv.org/abs/2306.02425>

[2] <https://arxiv.org/abs/2112.06789> [JHEP 05 (2022) 083]

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