

Running coupling corrections to high energy inclusive gluon production

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We calculate running coupling corrections for the lowest-order gluon production cross section in high energy hadronic and nuclear scattering using the BLM scale-setting prescription. In the final answer for the cross section the three powers of fixed coupling are replaced by seven factors of running coupling, five in the numerator and two in the denominator, forming a 'septumvirate' of running couplings, analogous to the 'triumvirate' of running couplings found earlier for the small- x BFKL/BK/JIMWLK evolution equations. We use our lowest-order result to conjecture how running coupling corrections may enter the full fixed-coupling k_T -factorization formula for gluon production which includes non-linear small- x evolution. This work is the latest theoretical improvement on the approach used recently by Albacete and Dumitru in arXiv:1011.5161 [hep-ph] to accurately predict the centrality dependence of the charged particle multiplicity density measured by ALICE collaboration.

Primary authors: Prof. HOROWITZ, William (University of Cape Town); Prof. KOVCHEGOV, Yuri (The Ohio State University)

Presenter: Prof. KOVCHEGOV, Yuri (The Ohio State University)

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