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Renormalization of the jet-quenching parameter

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In the context of the recently derived probabilistic picture of in-medium jet evolution, we study radiative corrections which yield potentially large double logarithms, $\alpha_s \ln^2 L$, for large enough medium length L .

We show in particular that, due to a large separation of time scales, these corrections can be reabsorbed in a renormalization of the quenching parameter in both the collision rate and radiative rate, preserving the probabilistic picture. As a major consequence of this analysis, the new renormalized jet-quenching parameter is enhanced compared to the standard perturbative estimate. This yields in particular an increase of radiative energy loss of a fast parton traversing a QCD medium, which scales as $L^{2+\gamma}$ where the anomalous dimension $\gamma = 2\sqrt{\alpha_s N_c}/\pi$, as compared to the standard estimate that yields a scaling in L^2 .

References: arXiv:1311.5823 [hep-ph] (To appear in JHEP),
arXiv:1403.2323 [hep-ph] (To appear in NPA)

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