Semi-Inclusive Jet Functions and Jet Substructure in $J_{E_T}^{(I)}$ and $J_{E_T}^{(II)}$ Algorithms

Within the framework of Soft Collinear Effective Theory, we present calculations of semi-inclusive jet functions and fragmenting jet functions at next-to-leading order (NLO) for both quark- and gluon-initiated jets, for jet algorithms of $J_{E_T}^{(I)}$ and $J_{E_T}^{(II)}$ where one maximizes a suitable jet function. We demonstrate the consistency of the obtained results with the standard perturbative QCD calculations for $J_{E_T}^{(I)}$ algorithm, while the results for fragmenting jet functions with the $J_{E_T}^{(II)}$ algorithm are new. The renormalization group (RG) equation for both semi-inclusive jet functions and fragmenting jet functions are derived and shown to follow the time-like DGLAP evolution equations, independent of specific jet algorithms. The RG equation can be used to resum single logarithms of the jet size parameter β for highly collimated jets in these algorithms where $\beta \gg 1$.

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