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The three-loop jet function for boosted heavy quarks

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Previous studies have shown that a class of observables for massless e^+e^- colliders producing primary top quarks can be used to measure the top quark mass with a precision smaller than $\Lambda_{\rm QCD}$. The maximal sensitivity to the top mass is attained in the peak of the distribution, where several Effective Field Theories (EFTs) are applicable. The use of EFTs allows for the factorization of the differential cross section for various observables, separating contributions from different physical scales. The jet function —previously known at two loops emerges as a common ingredient in many factorization theorems, which motivates the need for computing this matrix element at higher perturbative orders.

In this talk I will outline the workflow for a fixed-order calculation and present our analytic result for the three-loop jet function for boosted heavy quarks. This result can be used to improve the calibration of the top quark mass parameter in parton-shower Monte Carlo generators and contributes to enhance the accuracy of jet invariant-mass distributions for reconstructed top quarks, which can be employed for a precise top mass determination at future lepton colliders.

Secondary track

T05 - QCD and Hadronic Physics

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