



Contribution ID: 4

Type: **contributed parallel talk**

Resummation and renormalization of kinematical effects in χ_c and χ_b hadroproduction

Thursday, 20 July 2023 14:20 (20 minutes)

We investigate the renormalization properties of the shape function formalism for inclusive production of P -wave heavy quarkonia, which arises from resumming a class of corrections coming from kinematical effects associated with the motion of the heavy quark and antiquark pair relative to the quarkonium. Such kinematical effects are encoded in the nonperturbative shape functions, which are normalized to the corresponding nonrelativistic QCD long-distance matrix elements. By using the known ultraviolet divergences in the matrix elements, we derive the large-momentum asymptotic behavior of the shape functions. This strongly constrains the form of the shape functions and significantly reduces the dependence on the nonperturbative model. Based on these results we show that the shape function formalism at loop level can be useful in taming the threshold logarithms at large transverse momentum, and at small transverse momentum the kinematical corrections reduce the sizes of χ_c and χ_b cross sections which may improve agreement with measurements.

Consent

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Session Classification: Parallel A

Track Classification: decays