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Three loop QCD corrections to quarkonium electroweak decays

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In the framework of nonrelativistic QCD (NRQCD) factorization and thanks to AMflow method, we take finite charm mass and light-by-light effects on Upsilon decay into consideration at three loop level on the base that we confirm the existing three-loop results in literature with high numerical accuracy. In addition, we obtain a new piece of 3-loop contribution to the anomalous dimension related to the composite NRQCD bilinear of vector current that arises from the nonzero charm quark mass. Then we extend this method to quarkonium consisting of different flavor quark such as Bc and reconstruct the analytical expressions for the three-loop renormalization constant of corresponding NRQCD operator as well as its anomalous dimension. Phenomenological analysis of the above two cases are presented at the end of each sections.

Summary

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