

An EFT approach to quarkonium at small transverse momentum

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In this work we apply effective field theory (EFT) to observables in quarkonium production and decay that are sensitive to soft gluon radiation, in particular measurement that are sensitive to small transverse momentum. Within the EFT framework we study χ_Q decay to light quarks followed by the fragmentation of those quarks to light hadrons and derive a factorization theorem that involves the un-subtracted transverse momentum distributions (TMDs) and quarkonium TMD shape functions. We derive renormalization group equations, both in rapidity and virtuality, which are used to evolve the different terms in the factorization theorem and resum large logarithms. This theoretical framework will provide a systematic treatment of quarkonium production and decay processes in TMD sensitive measurements

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