

Towards the Automation of Quarkonium Production Cross Sections with MadGraph

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We introduce a forthcoming extension to MadGraph5_aMC@NLO, enabling the automated computation of cross sections for processes involving quarkonium particles within the non-relativistic QCD (NRQCD) factorization framework. To achieve next-to-leading order (NLO) accuracy in the strong coupling constant α_s , we have refined the FKS subtraction formalism. Our approach is applicable to the production of S- or P-wave quarkonium bound states in association with any number of elementary particles, thereby offering a comprehensive solution for a wide range of scenarios. Key contributions of our work include the derivation of local and integrated soft counterterms specifically designed for colour-singlet and colour-octet P-wave bound states. These advancements are crucial for accurately modeling heavy quarkonium inclusive and associated production processes, thereby enhancing our understanding of quarkonium dynamics in high-energy phenomena.

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