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Prompt double J/ψ production in proton-proton collisions at the LHC

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We provide a detailed study of prompt double J/ψ production within the non-relativistic QCD (NRQCD) framework in proton-proton collisions at the LHC. We confront the recent LHC data with the results obtained at leading-order (LO) in the NRQCD framework within two approaches of the collinear factorization and the k_T -factorization. We show that the LHCb data can be fairly described within the k_T -factorized LO NRQCD, while the collinearly factorized LO NRQCD significantly overshoots the LHCb data at low J/ψ -pair invariant mass. We show that the LO NRQCD formalism cannot describe the recent CMS data, with about one order of magnitude discrepancy. If the CMS data are confirmed, this indicates rather large higher-order corrections for prompt double J/ψ production. We provide various predictions which can further test the NRQCD-based approach at the LHC in a kinematic region that LO contributions dominate.

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