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Exploring hadronic quarkonium production in QCD factorization formalism

Understanding heavy quarkonium production in hadronic collisions has attracted much interest and remains an exciting challenge in QCD studies. QCD factorization is a powerful approach for studying hadronic heavy quarkonium production at high transverse momentum (p_T) by implementing heavy quarkonium fragmentation functions (FFs). These FFs contain rich information on how a physical quarkonium bound state emerges from partons produced at short distances in high-energy scatterings. The scale evolution of quarkonium FFs is capable of resumming logarithmically enhanced corrections to the hadronic quarkonium production cross-section. Within the QCD factorization formalism, incorporating both leading-power and next-to-leading-power contributions at short distances in $1/p_T$ with the evolved quarkonium FFs allows for a description of the p_T spectrum of hadronic quarkonium production over a broad range of p_T.

This talk will present that the QCD factorization approach at leading power in $1/p_T$ with single-parton FFs describes recent LHC data on the prompt J/ψ production cross section in pp collisions at high p_T even larger than 100GeV. In contrast, the next-to-leading-power contributions with double-parton FFs are essential for describing the J/ψ p_T spectrum at low p_T, where the QCD factorization should be matched to NRQCD fixed-order calculations. We will also remark quarkonium's polarization in hadronic collisions.

Author: WATANABE, Kazuhiro (Tohoku University)

Presenter: WATANABE, Kazuhiro (Tohoku University)