

# NNLO QCD corrections to $J/\psi$ plus $\eta_c$ production at the B factories

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In this work, we calculate the next-to-next-to-leading-order (NNLO) QCD corrections to  $e^+e^- \rightarrow J/\psi + \eta_c$  at the  $B$  factories. After including the NNLO corrections, the cross section of  $e^+e^- \rightarrow J/\psi + \eta_c$  is enhanced by about 17%, and the perturbative series of the prediction shows the convergent behavior. It is also found that the contributions from bottom quark starts at the  $\alpha_s^3$ -order, which is about 2.4% of the total prediction. The renormalization scale  $\mu_R$  dependence of the cross section is reduced at the NNLO level, but the prediction is sensitive to the charm quark mass  $m_c$ . By considering the uncertainties caused by renormalization scale  $\mu_R$ , charm quark mass  $m_c$  and the NRQCD factorization scale  $\mu_\Lambda$ , our prediction shows agreement with the BaBar and Belle measurements within errors.

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