# The study of $B_{s}^{\circ} \rightarrow \eta_{c} \phi$ decay with the calculation of its branching ratio 

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#### Abstract

In this paper, the decay of the $B_{s}^{\circ}$ meson into two vector mesons $\eta_{c}$ and $\phi$ is investigated.The first observation of the decay was reported in 2017 by LHCb collaboration, they have obtained the value of $\mathrm{B}\left(B_{s}^{\circ} \rightarrow \eta_{c} \phi\right)=(5.01 \pm 053 \pm 0.27 \pm$ $0.06) \times 10^{-4}$. In this study, the Feynman diagram of $B_{s}^{\circ} \rightarrow \eta_{c} \phi$ decay is drawn based on the standard model. In particular this diagram shows that the decay consists of tree-exchange internal w-emission graph and penguin- suppressed graph. The coefficients of $a_{2}, a_{3}, a_{5}$ and $a_{7}$ are calculated in the NLO scale. The branching ratio is calculated using the QCD factorization method, numerical values in the NLO (at $\mathrm{m}_{\mathrm{b}}$ scale) scheme is $5.33 \times 10^{-4}$, for which are in good agreement with the experimental results. The more calculations accuracy increases, the b quark mass scales come down corresponding to that. The best answer close to the experimental value is in NLO scheme at $\mathrm{m}_{\mathrm{b}}$ scale of QCDF approach.


keywords: B meson decay, factorization method, Feynman diagram, form factor, decay rate, branching ratio

