QCD factorization approach and final state interactions in $B^+ \to K^+\phi$ decay

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The study of the two body non-leptonic weak decay of $B^+ \to K^+\phi$ may be useful in the search for new physics beyond the standard model, as B^+ can decay to $K^+\phi$ through both penguin and annihilation processes. Several useful methods have been created to calculate the $B^+ \to K^+\phi$ decay such as the perturbative QCD approach [1], QCDF by Babar collaboration [2], QCD improved factorization [3] and measurements of NLO perturbative QCD have reported by the [4]. The central branching ratios values of $B^+ \to K^+\phi$ decay in Refs. [1-4] are 9.3, 10.0, 7.3 and 8.1 (in units of 10^{-6}) respectively. We used mainly the same framework by using the a_3, a_4, b_2 and b_3 coefficients with taking additional annihilation contribution such as b_1 into our account and obtained 7.46×10^{-6} for branching ratio. Motivated by this study we contributed the FSI corrections in the $B^+ \to K^+\phi$ decay mode. Since in B decays, resonant FSI is expected to be suppressed due to the absence of resonances at energies close to the mass of the B meson, we considered only t-channel and estimated via the one particle exchange processes at the hadronic loop level. In this decay mode the contributions of the FSI effects can be considered as a sizable correction. In this approach for the FSI effects only the contributions of the $K^0\rho^+$, $K^+\rho^0$ and $D_s^{+(*)}\bar{D}^{0(*)}$ intermediate state mesons were used. Taken the FSI corrections into account the branching ratio of $B^+ \to K^+\phi$ becomes 8.63×10^{-6}, while the experimental result of this decay is $(8.3 \pm 0.7) \times 10^{-6}$[5]. In this paper we have shown that the new annihilation contribution and FSI effects can actually play important role in $B^+ \to K^+\phi$ decay.

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