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Theoretical study of semileptonic decay $B^+ \to K^+\mu^+\mu^-$ in non-universal Z model

In recent years, semileptonic decays of bottom hadrons are in the focus of many theoretical as well as experimental studies due to increasing experimental evidences of new physics (NP). One of the most important ways for searching NP is to analyse rare B meson decays which are induced by flavour changing neutral current (FCNC) transition. Generally FCNC processes are forbidden at the tree level in standard model (SM) and will arise from loop diagrams which are supressed in comparison to tree diagrams. This provides an excellent testing ground for NP. Recently the hadronic semileptonic rare B meson decay modes which are induced by the quark level transition $b \to s$ achieve a great attention in both experimentally and theoretically.Here, we would like to study such a type of semileptonic rare B decay mode $B^+ \to K^+\mu^+\mu^-$ involving the quark level transition $b \to sl^+l^-(l = \mu)$. FCNC coupling of Z boson can be generated at the tree level in various scenarios [1, 2]. We analyse the effect of non-universal Z boson in the differential decay rate of the decay mode $B^+ \to K^+\mu^+\mu^-$ and predict the value of branching ratio in the SM and in non-universal Z model. To evaluate the branching ratio in non-universal Z model we have fixed the numerical value of the coupling parameter U_{sb} which is strictly constrained from $B_s^0 - \bar{B}_s^0$ mixing. Considering $|U_{sb}| \leq 0.0015$ [3] and the whole range of U_{sb} as 02Π we can predict the value of branching ratio in SM and in non-universal Z model as $(Br(B^+ \to K^+\mu^+\mu^-))_{SM} = 1.92^{+0.33}_{-0.3} \times 10^{-7}$ and $(Br(B^+ \to K^+\mu^+\mu^-))_Z = 5.58^{+0.29}_{-0.27} \times 10^{-7}$ respectively whereas from LHCb data it is found that the branching ratio of this decay is $(Br(B^+ \to K^+\mu^+\mu^-))_{exp} = 4.37 \pm 0.15 \pm 0.23 \times 10^{-7}$ [4]. From this we can conclude (i) the experimental value of branching ratio is found to be higher than the corresponding SM prediction. This deviation of branching ratio can be considered as an smoking gun signal for NP and (ii) our predicted value of the differential decay rate as well as the branching ratio for this decay in FCNC mediated Z model is larger than the SM value and also than from the experimental value. This indicates that the non-universal Z model is very sensitive to this decay $B^+ \to K^+\mu^+\mu^-$. \linebreak

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