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Correlation between $R_{D^{(*)}}$ and top quark FCNC decays in leptoquark models

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Some interpretations of $R_{D^{(*)}}$ anomaly in B meson decay using leptoquark models can also generate top quark decays through flavor changing neutral current (FCNC). In this work we focus on two leptoquarks, i.e. scalar S_1 and vector U_1 which are both singlet under the $SU(2)_L$ gauge group in the Standard Model (SM). We investigate their implications on top FCNC decays $t \rightarrow c\ell\ell_j$ at tree level and $t \rightarrow cV$ at 1-loop level, with ℓ being the SM leptons and $V = \gamma, Z, g$ being the SM gauge bosons. We utilize the 2σ parameter fit ranges from existing literatures and find that the branching ratios $Br(t \rightarrow c\ell\ell_j)$ at tree level can reach $10^{-6} \sim 10^{-5}$ and 1-loop process $Br(t \rightarrow cg)$ can reach $10^{-9} \sim 10^{-8}$. Some quick collider search prospects are also analyzed.

Summary

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