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SMEFT analysis of charged lepton flavor violating B-meson decays

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Charged lepton flavor violation (cLFV) processes, potentially important for various Beyond the Standard Model Physics scenarios, are analyzed in the Standard Model Effective Field Theory (SMEFT) framework. We consider the most relevant 2 quark-2 lepton $(2q2\ell)$ operators for the leptonic and semi-leptonic LFV B-decay (LFVBD) processes $B_s \to \mu^+ e^-$, $B^+ \to K^+ \mu^+ e^-$, $B^0 \to K^{*0} \mu^+ e^-$, and $B_s \to \phi \mu^- e^+$. We analyse the interplay among the Wilson coefficients responsible for these LFVBDs and other cLFV processes like $\mathrm{CR}(\mu \to \mathrm{e})$, $\ell_i \to \ell_j \gamma$, $\ell_i \to \ell_j \ell_k \ell_m$ and $Z \to \ell_i \ell_j$, to find the maximal possible LFV effects in B-meson decays. We probe the scale of new physics in relation to the constraints imposed by both classes of the LFV decays while considering both the present bounds and future expectations. In view of proposed experiments at LHCb-II and Belle II to study charged LFV processes, we have also provided the upper limits on the indirect constraints on such LFVBDs. For the processes where B meson is decaying to $\mu^{\pm}$ and $e^{\mp}$, we show that new physics can be constrained by an enhancement of 2-4 orders of magnitude on the current sensitivities of the BRs of $B^+ \to K^+ \mu^+ e^-$, $B^0 \to K^{*0} \mu^+ e^-$ and $B_s \to \phi \mu^{\pm} e^{\mp}$.

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