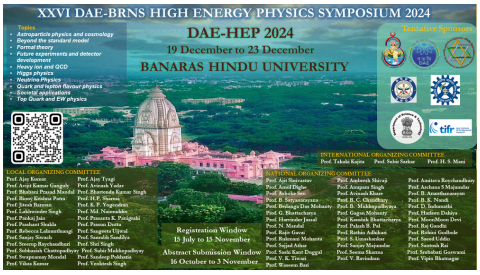

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Implication of lepton flavour universal and non-universal new physics couplings on $B_s \to (\eta, \eta')\mu^+\mu^-$ decay

Recent collider's results in B meson decays introduce some disagreement with the SM predictions. The LHCb results for the total branching fractions $Br(B \to K\mu^+\mu^-)$, $Br(B_s \to \phi\mu^+\mu^-)$ and the angular observable P_5' of $B_s \to K^\star\mu^+\mu^-$ decay, which are governed by the flavour changing neutral current (FCNC) $b \to s\mu^+\mu^-$ transition, show inconsistencies with the SM predictions [1]. Another important parameter is lepton flavour universality (LFU) ratio $R_{K^{(\star)}}$. The previous experimental results [2, 3] of R_K and $R_{K^\star}$ differed from the SM prediction, indicating the violation of flavour universality. But the recent LHCb results [4] of $R_{K^{(\star)}}$ supersede their previous measurements and coincide with the SM predictions. Despite these new results, lepton flavour non-universality cannot be ruled out completely, since only R_K measurement does not provide the complete picture, measurement of CP asymmetries in $B \to K\mu^+\mu^-$ and $B \to Ke^+e^-$ is also essential [5]. The authors of Ref. [5] have constrained the Wilson coefficient C_{9e} using the new R_K measurement, keeping $C_{9\mu}$ fixed. As per this recent experimental context of $R_{K^{(\star)}}$, we will consider four possible NP scenarios [6, 7] to study $B_s \to (\eta, \eta')\mu^+\mu^-$ decay. The first scenario involves universal NP couplings, the second and third scenarios have both universal and non-universal NP couplings while the fourth scenario incorporates only non-universal NP couplings. We will examine the sensitivities of the scenarios for the branching fraction and LFU ratio $R_{\eta^{(\prime)}}$. Finally, the outcome from these NP scenarios will be compared with the SM predictions to recognize which scenario will be more reliable to study $b \to s\mu^+\mu^-$ transition.

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Field of contribution

Phenomenology

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