

Study of new physics effects in $\bar{B}_s \rightarrow D_s^{(*)} \tau^- \bar{\nu}_\tau$ semileptonic decays using Standard Model lattice QCD form factors and heavy quark effective theory

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We benefit from the lattice QCD determination of the Standard Model (SM) form factors for the $\bar{B}_s \rightarrow D_s^*$ and $\bar{B}_s \rightarrow D_s$ semileptonic decays carried out by the HPQCD collaboration in Refs. Phys. Rev. D 105, 094506 (2022) and Phys. Rev. D 101, 074513 (2020), and the heavy quark effective theory (HQET) relations for the analogous $B \rightarrow D^{(*)}$ decays obtained by F.U. Bernlochner et al. in Phys. Rev. D 95, 115008 (2017), to extract the leading and sub-leading Isgur-Wise functions for the $\bar{B}_s \rightarrow D_s^{(*)}$ decays. Further use of the HQET relations allows us to evaluate the corresponding form factors needed for a phenomenological study of new physics (NP) effects on the $\bar{B}_s \rightarrow D_s^{(*)}$ semileptonic decay. In this work, we conduct a study of NP effects on the $\bar{B}_s \rightarrow D_s^{(*)} \tau^- \bar{\nu}_\tau$ semileptonic decays by comparing tau spin, angular and spin-angular asymmetry distributions obtained within the SM and three different NP scenarios.

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