

R_K and R_{K^*} beyond the Standard Model

Measurements of the ratio of $B \rightarrow K^* \mu\mu$ to $B \rightarrow K^* ee$ branching fractions, R_{K^*} , by the LHCb collaboration strengthen the hints from previous studies with pseudoscalar kaons, R_K , for the breakdown of lepton universality, and therefore the Standard Model (SM), to $\sim 3.5\sigma$.

Complementarity between R_K and R_{K^*} allows to pin down the Dirac structure of the new contributions to be predominantly SM-like chiral, with possible admixture of chirality-flipped contributions of up to $\mathcal{O}(\text{few } 10\%)$. Scalar and vector leptoquark representations (S_3, V_1, V_3) plus possible (\tilde{S}_2, V_2) admixture can explain R_{K, K^*} via tree level exchange.

Flavor models naturally predict leptoquark masses not exceeding a few TeV, with couplings to third generation quarks at $\mathcal{O}(0.1)$, implying that this scenario can be directly tested at the LHC.

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