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Minimal scalar leptoquark model for RD(*)

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Motivated by the long-standing discrepancy in lepton flavor universality ratios R_D and R_{D^*} we assess the status of scalar leptoquark states R_2, $\widetilde{R}_2$ and S_1 which can in principle provide a desired enhancement of $\mathcal{B}(B \to D^{(*)}\tau\nu)$ in a minimal setup with two Yukawa couplings only. We consider unavoidable low-energy constraints, Z-pole measurements as well as high-p_T constraints. After setting mass of each leptoquark to 1.5 TeV we find that of all considered states only S_1 leptoquark, coupled to both chiralities of leptons and quarks, is still a completely viable solution. On the other hand, the scenario with R_2 is in growing tension with $\Gamma(Z \to \tau\tau)$ and with the LHC constraints on the di-tau tails at high-p_T while the $\widetilde{R}_2$ scenario is in tension with the $\mathcal{B}(B \to K^{(*)}\nu\nu)$ observable. We comment on the future experimental tests of S_1 scenario. Furthermore, a scenario of the S_1 leptoquark coupled exclusively to right-handed SM fermions and a right-handed neutrino N_R is also investigated as a potential solution for the $R_{D^{(*)}}$ with possible effects also in $\mathcal{B}(B \to K^{(*)}\nu\nu)$.

Secondary track

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