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Combined Constraints on First Generation Leptoquarks

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We present a combined analysis of low energy precision constraints and LHC searches for leptoquarks which couple to first generation fermions. Considering all ten leptoquark representations, five scalar and five vector ones, we study at the precision frontier the constraints from $K \rightarrow \pi\nu\nu$, $K \rightarrow \pi e^+ e^-$, $K^0 - \bar{K}^0$ and $D^0 - \bar{D}^0$ mixing, as well as from experiments searching for parity violation (APV and QWEAK). We include LHC searches for s -channel single resonant production, pair production and Drell-Yan-like signatures of leptoquarks. Particular emphasis is placed on the recent CMS analysis of lepton flavour universality violation in non-resonant di-lepton pairs. The excess in electron events could be explained by t -channel contributions of the leptoquark representations $\tilde{S}_1, S_2, S_3, \tilde{V}_1, V_2 (\kappa_2^{RL} \neq 0)$ and V_3 without violating other bounds. Regarding the so-called “Cabibbo angle anomaly”, we observe that the present constraints are too restrictive to allow for a resolution via direct leptoquark contributions to super-allowed beta decays.

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