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Exploring Flavor Anomalies and Dark Matter in $U(1)_{Le-L_\mu}$ model with a scalar leptoquark

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We explore $U(1)_{L_e-L_\mu}$ gauge extension of the Standard model with particle content enlarged by three neutral fermions, of which the lightest one contributes to dark matter content of the Universe. The scalar sector is enriched with a $\tilde{R}_2$ scalar leptoquark doublet to investigate flavor anomalies in B-meson sector, an additional inert scalar doublet to realize neutrino mass at one loop and a scalar singlet to spontaneously break the new $U(1)$. We discuss dark matter relic density and direct detection cross section in scalar and gauge portals. New physics contribution for $b \to s$ transition comes from penguin diagrams with Z', leptquark and new fermions. We analyze the constraints on the model parameters from the established observables such as P_5', Br($B_s \to \phi, K^{(*)}\mu\mu$), and Br($B_s \to \mu\mu$) processes. Utilizing the permissible parameter space consistent with both flavor and dark sectors, we discuss the impact on various observables such as branching ratio, forward-backward asymmetry, polarisation asymmetry and also lepton non-universality of $\Lambda_b \to \Lambda^*(1520)(\to pK)\ell\ell$ decay channel.

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