Contribution ID: **34** Type: **not specified**

Flavour anomalies, Light Dark Matter and rare B decays with missing energy in $L_\mu - L_\tau$ model

Monday 25 July 2022 14:36 (18 minutes)

In recent times, several hints of lepton flavour universality violation have been observed in semileptonic B decays, which point towards the existence of New Physics beyond the Standard Model. In this context, we consider a new variant of $U(1)_{L_\mu - L_\tau}$ gauge extension of Standard Model, containing three additional neutral fermions N_e, N_μ, N_τ, along with a $(\bar{3}, 1, 1/3)$ scalar Leptoquark (SLQ) and an inert scalar doublet, to study the phenomenology of light dark matter, neutrino mass generation and flavour anomalies on a single platform. The lightest mass eigenstate of the N_μ, N_τ neutral fermions plays the role of dark matter. The light gauge boson associated with $U(1)_{L_\mu - L_\tau}$ gauge group mediates dark to visible sector and helps to obtain the correct relic density. The spin-dependent WIMP-nucleon cross section is obtained in leptoquark portal and is looked up for consistency with CDMSlight bound. Further, we constrain the new model parameters by using the branching ratios of various $b \to sll$ and $b \to s\gamma$ decay processes as well as the lepton flavour non-universality observables $R_{K^{(*)}}$ and then show the implication on the branching ratios of some rare semileptonic $B \to (K^{(*)}, \phi) +$ missing energy, processes. The light neutrino mass in this model framework can be generated at one-loop level through radiative mechanism.

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Session Classification: Parallel Session B

Track Classification: Particle Physics