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$(g-2)_{e,\mu}$ and strongly interacting dark matter with collider implications

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The quest for new physics beyond the Standard Model is boosted by the recently observed deviation in the anomalous magnetic moments of muon and electron from their respective theoretical prediction. In the present work, we have proposed a suitable extension of the minimal $L_\mu - L_\tau$ model to address these two experimental results as the minimal model is unable to provide any realistic solution. In our model, a new Yukawa interaction involving first generation of leptons, a singlet vector like fermion ($\chi^\pm$) and a scalar (either an SU(2)$_L$ doublet Φ_2' or a complex singlet Φ_4') provides the additional one loop contribution to a_e only on top of the usual contribution coming from the $L_\mu - L_\tau$ gauge boson ($Z_{\mu\tau}$) to both electron and muon. The judicious choice of $L_\mu - L_\tau$ charges to these new fields results in a strongly interacting scalar dark matter in $\mathcal{O}(\mathrm{MeV})$ range after taking into account the bounds from relic density, unitarity and self interaction. The freeze-out dynamics of dark matter is greatly influenced by $3 \to 2$ scatterings while the kinetic equilibrium with the SM bath is ensured by $2 \to 2$ scatterings with neutrinos where $Z_{\mu\tau}$ plays a pivotal role. The detection of dark matter is possible directly through scatterings with nuclei mediated by the SM Z bosons. Moreover, our proposed model can also be tested in the upcoming e^+e^- colliders by searching opposite sign di-electron and missing energy signal i.e. $e^+e^- \to \chi^+\chi^- \to e^+e^-$
$cancel E_T$
at the final state.

In-person participation

No

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