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U(1)_{Lμ-Lτ} charged fermionic dark matter at weak scale

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The existence of dark matter is widely accepted, with a well motivated theoretical candidate being a class of particles known as WIMPs (weakly interacting massive particles), which appear in the spectra of many extensions to the standard model.

We explore a particular WIMP-like model in which fermionic dark matter weakly couples to the muon/tau sectors of the standard model through a new vector boson Z', in addition to electrically charged particles through kinetic mixing of the Z' with the SM photon. As well as the model providing a candidate dark matter particle, the hypothetical Z'could potentially aid in explaining the discrepancy between the predicted and observed value of the anomalous magnetic dipole moment of the muon.

Cosmological observations of the dark matter relic density along with findings from direct detection attempts allow us to tightly constrain the parameter space of the model. By initially assuming a momentum independent kinetic mixing parameter, it is difficult for the resulting parameter space to satisfy the restrictions imposed by both sets of experimental results. In this talk, we focus on the work done to remedy this disagreement. Our work involves an attempt at softening the direct detection constraint by considering the general case in which the mixing parameter is momentum dependent. We construct it in such a way that it vanishes in the zero-momentum transfer limit, which results in a viable parameter space. Our goal is then to compare model derived quantities including interaction cross sections and early universe annihilation rates to well established experimental bounds to determine if the resulting parameter space is consistent with the constraints imposed by both direct detection and relic abundance.

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