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Probing a five dimensional Lmu-Ltau model through elastic electron-neutrino scattering: the scope of the DUNE near detector

The extension of the Standard Model (SM) by a $U(1)_{L_\mu-L_\tau}$ gauge group is well studied in the literature to address the discrepancy in the muon anomalous magnetic moment. In this study we consider the $U(1)_{L_\mu-L_\tau}$ gauge group is five dimensional where multiple associated massive gauge bosons appear and these bosons contribute to the muon ($g-2$) with other processes. We focus on the elastic electron-neutrino scattering to probe our model in the MeV-scale regions with the help of CHARM-II, BOREXINO and upcoming DUNE near detector (DUNE ND) experiment. We find even with small kinetic mixing parameters, much of the parameter space, including those satisfying muon ($g-2$), can be probed using several years of data from DUNE ND experiment. In our scenario, interference effects among intermediate-state gauge bosons play an important role. Our results show the comparisons between flat and warped extra dimensions as the sensitivity from the experiments can substantially depend on the geometry of the compactification. In continuation of this work, we are studying the constraints from high energy colliders, and if feasible, will present some of these results.

Field of contribution

Phenomenology

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