Lepton flavor violating decays lj → liγ in the U(1)XSSM model within the Mass Insertion Approximation

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Result One:

Three singlet new Higgs superfields and right-handed neutrinos are added to MSSM to obtain U(1)X SSM model. In the framework of U(1)X SSM, we study muon anomalous magnetic moment and lepton flavor violating decays $l_j \rightarrow l_i\gamma$ (j = 2, 3; i = 1, 2) within the mass insertion approximation (MIA). Through the MIA method, we can find the parameters that directly affect the analytical result of the lepton flavor violating decays $l_j \rightarrow l_i\gamma$, According to the accuracy of the numerical results which the influence of different sensitive parameters, we come to the

conclusion that the non-diagonal elements which correspond

to the generations of the initial lepton and final lepton are main sensitive parameters and lepton flavor violation (LFV)

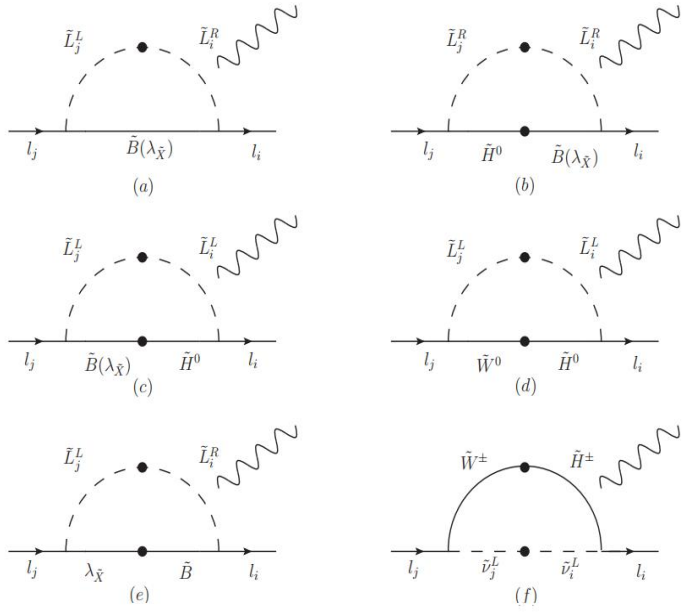sources. This work can provide a clear signal of new physics (NP).

FIG. 1: Feynman diagrams for $l_j \rightarrow l_i\gamma$ in the MIA.

Result Two

We take into account the constraints from the upper limits on LFV branching ratios of $l_j \rightarrow l_i\gamma$. In the numerical calculation, we take many parameters as variables including $\tan\beta$, g_X, g_{YX}, $M_{\tilde{L}}^2$, $M_{\tilde{L}ij}^2$, $M_{\tilde{E}}^2$, $M_{\tilde{E}ij}^2$, δ_{ij}^{AB}, $m_{\tilde{L}}$, $m_{\tilde{\nu}_L}$ and T_{eij}. Through the analysis of the numerical results, we find that $M_{\tilde{L}ij}^2$, $M_{\tilde{E}ij}^2$, g_{YX}, δ_{ij}^{AB}, $m_{\tilde{L}}$, $m_{\tilde{\nu}_L}$ and T_{eij} are sensitive parameters. $Br(l_j \rightarrow l_i\gamma)$ is an increasing function of $M_{\tilde{L}ij}^2$, $M_{\tilde{E}ij}^2$, T_{eij}, g_{YX}, δ_{ij}^{AB}, and decreasing function of $m_{\tilde{L}}$ and $m_{\tilde{\nu}_L}$. g_X can also give influence on the numerical results but not very large. That is to say they give mild influences on the numerical results. Finally, we come to the conclusion that the non-diagonal elements which correspond to the generations of the initial lepton and final lepton are main sensitive parameters and LFV sources.
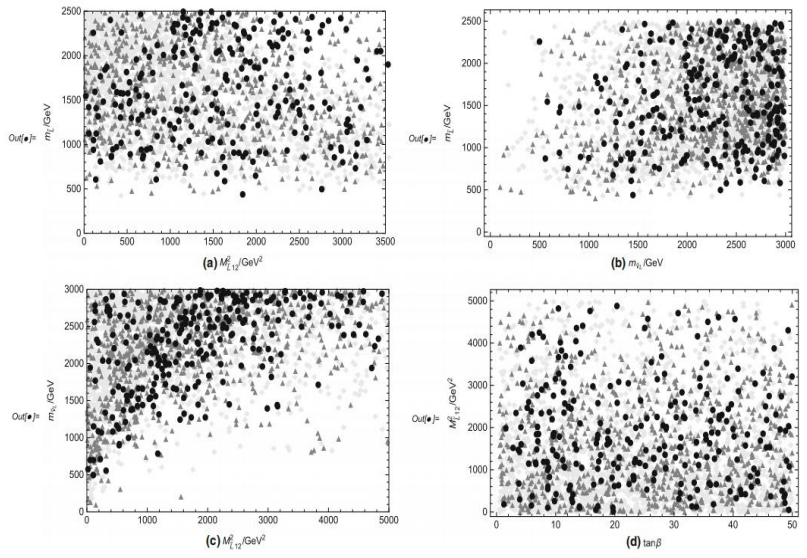

Fig. 8 Under the premise of lower current limit on lepton flavor violating decay $\mu \rightarrow e\gamma$, reasonable parameter space is selected to scatter points, where ♦ mean the value of $Br(\mu \rightarrow e\gamma)$ less than 1.5×10^{-13}, ▲ mean $Br(\mu \rightarrow e\gamma)$ in the range of 1.5×10^{-13} to 3.5×10^{-13}, ● show $3.5 \times 10^{-13} \leq Br(\mu \rightarrow e\gamma) < 4.2 \times 10^{-13}$

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