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A non-universal $U(1)_X$ gauge extension to the MSSM

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We propose a supersymmetric extension of the anomaly-free and three families nonuniversal $U(1)$ model, with the inclusion of four Higgs doublets and four Higgs singlets. The quark sector is extended by adding three exotic quark singlets, while the lepton sector includes two exotic charged lepton singlets, three right-handed neutrinos and three sterile Majorana neutrinos to obtain the fermionic mass spectrum. By implementing an additional \mathbb{Z}_2 symmetry, the Yukawa coupling terms are suited in such a way that the fermion mass hierarchy is obtained without fine-tuning. The effective mass matrix for SM neutrinos is fitted to current neutrino oscillation data to check the consistency of the model with experimental evidence, obtaining that the normal-ordering scheme is preferred over the inverse ones. The electron and up, down and strange quarks are massless at tree level, but they get masses through radiative correction at one loop level coming from the sleptons and Higgsinos contributions. We show that the model predicts a like-Higgs SM mass at electroweak scale by using the VEV according to the symmetry breaking and fermion masses.

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