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The minimal U(1)' extension of the MSSM DURMUSH DEMIR, Izmir Institute of Technology, GORDON KANE, TING WANG, University of Michigan — Motivated by the apparent need for extending the MSSM and perhaps mitigating naturalness problems associated with the μ parameter and fine-tuning of the soft masses, we augment the MSSM spectrum by a SM gauge singlet chiral superfield, and enlarge the gauge structure by an additional U(1)' invariance, so that the gauge and Higgs sectors are relatively secluded. One crucial aspect of U(1)' models is the existence of anomalies, cancellation of which may require the inclusion of exotic matter which in turn disrupts the unification of the gauge couplings. In this work we pursue the question of canceling the anomalies with a minimal matter spectrum and no exotics. This can indeed be realized provided that U(1)' charges are family-dependent and the soft-breaking sector includes non-holomorphic operators for generating the fermion masses. We provide the most general solutions for U(1)' charges by taking into account all constraints from gauge invariance and anomaly cancellation. We analyze various laboratory and astrophysical bounds ranging from fermion masses to relic density, for an illustrative set of parameters. The U(1)' charges admit patterns of values for which family nonuniversality resides solely in the lepton sector, though this does not generate leptonic FCNCs due to the U(1)' gauge invariance.

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