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Differentiating $U(1)'$ Supersymmetric Models With Right Sneutrino & Neutralino Dark Matter

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%\section*{Abstract}

We performed a detailed analysis of the mass spectrum of $U(1)'$ extended MSSM models for both right-handed scalar neutrino and neutralino dark matter candidates. The analysis aims to differentiate among the anomaly free solutions of $U(1)'$ models obtained from supersymmetric $SO(10)$ breaking. We impose standard unification conditions at GUT scale and include all recent experimental constraints, such as Higgs signal strengths, B-physics restrictions, and supersymmetric particle mass limits. Within these constraints, we analysed the validity of parameter space by using the muon anomalous magnetic moment and relic abundance constraints. The analysis of the spectrum leads to neutralino and sneutrino dark matter candidates, with the former naturally satisfying the relic conditions in a large portion of the parameter space, while the latter can be consistent with these conditions, but with much more strictly restricted parameter space. Differences among the models, and between the two candidates using cosmological constraints, occur in relic abundance and spin-independent cross section predictions. We also discuss the possibility of detecting these scenarios in future collider experiments.

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