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Sneutrino Dark Matter in the BLSSM

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Content :

In the framework of the $B-L$ Supersymmetric Standard Model (BLSSM), we assess the ability of ground and space based experiments to establish the nature of its prevalent Dark Matter (DM) candidate, the sneutrino, which could either be CP-even or -odd. Firstly, by benchmarking this theory construct against the results obtained by the Planck spacecraft, we extract the portions of the BLSSM parameter space compliant with relic density data. Secondly, we show that, based on current sensitivities of the Fermi Large Area Telescope (FermiLAT) and their future projections, the study of high-energy gamma-ray spectra will eventually enable us to extract evidence of this DM candidate through its annihilations into W^+W^- pairs (in turn emitting photons), in the form of both an integrated flux and a differential energy spectrum which cannot be reconciled with the assumption of DM being fermionic (like, e.g., a neutralino), although it should not be possible to distinguish between the scalar and pseudoscalar hypotheses. Thirdly, we show that, while underground direct detection experiments will have little scope in testing sneutrino DM, the Large Hadron Collider (LHC) may be able to do so in
the well-studied tri-lepton (plus missing transverse energy) signal following data collection during Run 2 and 3.

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