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Muon g-2, Neutralino Dark Matter and Stau NLSP

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We explore the implications of resolving the muon $g-2$ anomaly in a $SU(4)_c \times SU(2)_L \times SU(2)_R$ model, where the soft supersymmetry breaking scalar and gaugino masses break the left-right (LR) symmetry. A 2 σ resolution of the anomaly requires relatively light sleptons, chargino and LSP neutralino. The stau turns out to be the NLSP of mass $m_{\tilde{\tau}} <\tilde{}$ 400 GeV, and the sleptons from the first two families can be as heavy as about 800 GeV. The chargino is also required to be lighter than about 600 GeV to accommodate the muon $g-2$ solutions consistent with the dark matter relic density constraint. The dominant right-handed nature of the light slepton states suppress the sensitivity of possible signals which can be probed in Run3 experiments at the LHC. We also discuss the impact of accomodating the Higgs boson mass and the vacuum stability of the scalar potential for these solutions. The Higgsinos are heavier than about 4 TeV, and the LSP neutralino has the correct relic density if it is Bino-like. We identify stau-neutralino coannihilation as the dominant mechanism for realizing the desired dark matter relic density, with sneutrino-neutralino coannihiliation playing a minor role. These bino-like dark matter solutions can yield a spin-independent scattering cross-section on the order of 10^{-13}pb which hopefully, can be expected to be tested in the near future.

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