A Hybrid Type I + III Inverse Seesaw Mechanism in $U(1)_{R-L}$-symmetric MSSM

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We show that, in a $U(1)_{R-L}$-symmetric supersymmetric model, the pseudo-Dirac bino and wino can give rise to three light neutrino masses through effective operators, generated at the messenger scale between a SUSY breaking hidden sector and the visible sector. The neutrino-bino/wino mixing follows a hybrid type I+III inverse seesaw pattern. The light neutrino masses are governed by the ratio of the $U(1)_{R-L}$-breaking gravitino mass, $m_{3/2}$, and the messenger scale Λ_M. The charged component of the $SU(2)_L$-triplet, here the lightest charginos, mix with the charged leptons and generate flavor-changing neutral currents at tree level. We find that resulting lepton flavor violating observables yield a lower bound on the messenger scale, $\Lambda_M > (500 - 1000)$ TeV for a simplified hybrid mixing scenario. We identify interesting mixing structures for certain $U(1)_{R-L}$-breaking singlino/tripletino Majorana masses. For example, in some parameter regimes, bino or wino has no mixing with the electron neutrino. We also describe the rich collider phenomenology expected in this neutrino-mass generation mechanism.

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