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Anomaly mediated SUSY breaking model retrofitted for naturalness

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Anomaly-mediated supersymmetry breaking (AMSB) models seem to have become increasingly implausible due to 1. difficulty in generating a Higgs mass $m_h \sim 125$ GeV, 2. typically unnatural superparticle spectra characterized by a large superpotential μ term and 3. the possibility of a wino-like lightest SUSY particle (LSP) as dark matter now seems to be excluded. In the present paper we propose some minor modifications to the paradigm model which solve these three issues. Instead of adding a universal bulk scalar mass to avoid tachyonic sleptons, we add distinct Higgs and matter scalar soft masses which then allow for light higgsinos. To gain accord with the measured Higgs mass, we also include a bulk trilinear soft term. The ensuing natural generalized AMSB (nAMSB) model then has a set of light higgsinos with mass nearby the weak scale $m(W, Z, h) \sim 100$ GeV as required by naturalness while the winos populate the several hundred GeV range and gluinos and squarks occupy the multi-TeV range. For LHC searches, the wino pair production followed by decay to same-sign diboson signature channel offers excellent prospects for discovery at high luminosity LHC along with higgsino pair production leading to soft dileptons plus jet(s)+MET. A linear e^+e^- collider operating above higgsino pair production threshold should be able to distinguish the AMSB gaugino spectra from unified or mirage unified scenarios. Dark matter is expected to occur as a higgsino-like WIMP plus axion admixture.

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