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Revisiting No-Scale Supergravity Inspired Scenarios : Updated Theoretical and Phenomenological Constraints

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We consider no-scale supergravity inspired scenarios, with emphasize on the possible dynamical determination of the gravitino mass and connected soft supersymmetry-breaking parameters, through radiative corrections to an essentially flat tree-level potential in the hidden sector.
We (re)emphasize the important role played by the scale-dependent vacuum energy contribution to the (renormalization group improved)
effective potential, for the occurrence of phenomenologically interesting no-scale minima.
As a consequence, a new set of input parameters is introduced, more relevant to the model : B_0 (soft breaking mixing Higgs parameter) and η_0 (the cosmological constant value at high energy) instead of
$mhalf$ and $\tan\beta$, the latter being determined consistently through EWSB conditions at low energy. We examine, for rather representative high scale boundary conditions, the theoretical and phenomenological viability of such a mechanism, when confronted with up-to-date calculations of the low energy
sparticle spectrum.
The outcome of our analysis is a more constrained mSUGRA parameter space, with particular consequences on high scale values of the supersymmetric, soft and vacuum energy parameters, and related phenomenological consequences at the LHC. Concerning the dark matter relic density constraints, considerably enlarged allowed parameter space emerges provided that a gravitino LSP is allowed.

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