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Conformal Journey through SUSY GUTs: From Finiteness to SUGRA Models

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The Reduction of Couplings (RoC) method is a powerful theoretical tool for reducing free parameters in field theories. In Supersymmetric Grand Unified Theories (SUSY GUTs), it is critical for constructing all-loop finite models where beta functions vanish at every order. While previous applications successfully predicted the Higgs and third-generation quark masses by linking gauge and Yukawa sectors, the deeper symmetries of these models remain largely unexplored. This talk demonstrates how all-loop finite models exhibit a conformal regime driven by superpotential operators compatible with the RoC framework. Extending this to the soft-breaking sector, we assume the finite GUT is embedded within an effective $N = 1, d = 4$ Weyl-invariant SUGRA theory. Under this framework, we establish a direct connection between the RoC in the dimensionful SSB sector and the emergence of an anomaly-mediated (AMSB-like) pattern. This theoretical structure naturally leads to a specific formulation of the Kähler potential, aligning perfectly with the geometries studied in no-scale supergravity.

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