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Title:	New minimal supersymmetric GUT emergence and sub-Planckian renormalization group flow
Authors:	Aulakh, C.S. (/jspui/browse?type=author&value=Aulakh%2C+C.S.) Garg, I. (/jspui/browse?type=author&value=Garg%2C+I.) Khosa, C.K. (/jspui/browse?type=author&value=Khosa%2C+C.K.)
Keywords:	Grand Unified Theory Gauge Group Unification Supersymmetric models
Issue Date:	2018
Publisher:	American Physical Society
Citation:	Physical Review D. 98(7).
Abstract:	Consistency of trans-unification renormalization group (RG) evolution is used to discuss the domain of definition of the New Minimal Supersymmetric SO(10)GUT (NMSGUT). We define the 1-loop RGE β functions, simplifying generic formulae using constraints of gauge invariance and superpotential structure. We also calculate the 2 loop contributions to the gauge coupling and gaugino mass and indicate how to get full 2 loop results for all couplings. Our method overcomes combinatorial barriers that frustrate computer algebra based attempts to calculate SO(10) β functions involving large irreps. Use of the RGEs identifies a perturbative domain $Q < M_E$, where $M_E < M_{\text{Planck}}$ is the scale of emergence where the NMSGUT, with GUT compatible soft supersymmetry breaking terms emerges from the strong UV dynamics associated with the Landau poles in gauge and Yukawa couplings. Due to the strength of the RG flows the Landau poles for gauge and Yukawa couplings lie near a cutoff scale Λ_E for the perturbative dynamics of the NMSGUT which just above M_E . SO(10) RG flows into the IR are shown to facilitate small gaugino masses and generation of negative Non Universal Higgs masses squared needed by realistic NMSGUT fits of low energy data. Running the simple canonical theory emergent at M_E through M_X down to the electroweak scale enables tests of candidate scenarios such as supergravity based NMSGUT with canonical kinetic terms and NMSGUT based dynamical Yukawa unification.
URI:	https://journals.aps.org/prd/abstract/10.1103/PhysRevD.98.075006 (https://journals.aps.org/prd/abstract/10.1103/PhysRevD.98.075006) http://hdl.handle.net/123456789/1814 (http://hdl.handle.net/123456789/1814)
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