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**High Energy Physics - Phenomenology** 

## **NMSGUT-III: Grand Unification upended**

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We show that matter yukawa couplings of the New Minimal Supersymmetric (SO(10)) GUT(NMSGUT) are subject to very significant GUT scale threshold corrections. Including these threshold effects relaxes the constraint \$ y\_b-y\_\tau\simeq y\_s-y\_\mu\$ operative in \$\textbf{10} -\textbf{120} \$plet generated tree level MSSM matter fermion yukawas \$y\_f\$. We find accurate fits of the MSSM fermion mass-mixing data in terms of NMSGUT superpotential couplings and 5 independent soft Susy breaking parameters \$M 0, M {1/2}, A 0, M^2 {H,\bar{H}}\$ at \$M X\$. The fits generally have elevated unification scale \$M X\$ near \$M {Planck}\$, viable values of \$\alpha 3(M Z)\$, and are consistent with current limits on B violation, \$b\rightarrow s\gamma\$, muon magnetic moment anomaly and Standard Model \$\rho\$ parameter. The associated novel and distinctive soft Susy spectra have light gauginos, a \emph{normal} s-hierarchy and Bino LSP. The Bino LSP is accompanied by second and first generation right chiral sfermions light enough to mediate a consistent WIMP dark matter co-annihilation cosmology and to be discoverable at LHC, while third generation sfermions are in the LHC undiscoverable range of 3-50 TeV. The fits found require \$|\mu|,|A\_0|\sim 100\$ TeV which imply both deep CCB/UFB minimae and stability of the MSSM standard vacuum on cosmological time scales. Our results indicate that a consistent realistic phenomenology may be specifiable in terms of SO(10) (NMS)GUT parameters at \$M\_X\$ alone and that a new viable sector of the soft supersymmetry parameter space may exist if flavour violation constraints can be satisfied in the 43 dimensional parameter space.

Comments: 88 pages, Latex, 70 Tables, 7 figures. Appendix C contains 27 pages of supplementary tables. Extensively updated papers NMSGUT (hep-ph/0612021v2), NMSGUT-II(arXiv:0807.0917v2) uploaded to form 3 part coherent set
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