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Large A_t without the Desert

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Even if the unification and supersymmetry breaking scales are around 10^6 to 10^9 TeV, a large A_t coupling may be entirely generated at low energies through RGE evolution in the 5D MSSM. Independent of the precise details of supersymmetry breaking, we take advantage of power law running in five dimensions and a compactification scale in the 10 – 10^3 TeV range to show how the gluino mass may drive a large enough A_t to achieve the required 125.5 GeV Higgs mass. This also allows for sub-TeV stops, possibly observable at the LHC, and preserving GUT unification, thereby resulting in improved naturalness properties with respect to the four dimensional MSSM. The results apply also to models of "split families" in which the first and second generation matter fields are in the bulk and the third is on the boundary, which may assist in the generation of light stops whilst satisfying collider constraints on the first two generations of squarks.

Summary

In the MSSM there are two ways of reaching the experimental value of
the Higgs mass.
1- By a superheavy stop sector (m_t ~ 10 TeV)
2- Or by a large mixing in the stop sector A_t ~$\sqrt{6}m_t$.
The first option is disfavored by fine-tuning arguments while the second
one allows for lighter stops m_t 1 TeV and it is thus prefered by
naturalness arguments. The solution advocated in this work is to resolve the previous issue by introducing an extra (fifth) dimension and taking advantage of the power low running to generate a sizable value of A_t starting from a very small value to achieve the required 125.5 GeV Higgs mass.

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