Mass Hierarchies in Strongly Warped KKLT Scenarios

Based on: R. Blumenhagen, A. Gligovic, S. Kaddachi
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KKLT: models proposed to give *de Sitter* vacua in 4D

Parametric control? Consistent with quantum gravity constraints?

Flux compactifications

Starting point: Type IIB string theory, compactified on Calabi-Yau three-fold

Spacetime: $M_{10} \rightarrow M_4 \times Y_3$

SUSY: $N = 2\ (D = 10) \rightarrow N = 1\ (D = 4)$

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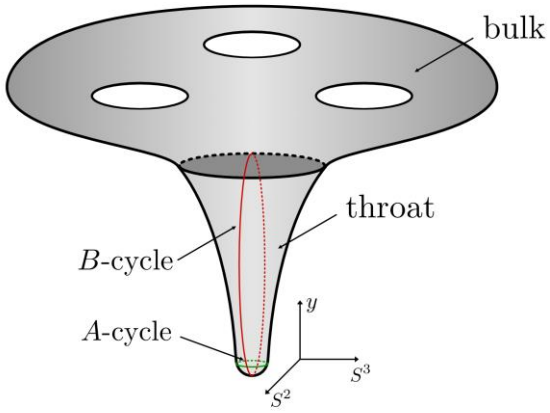
Internal geometry: Long, redshifted throat glued to compact bulk (UV region)



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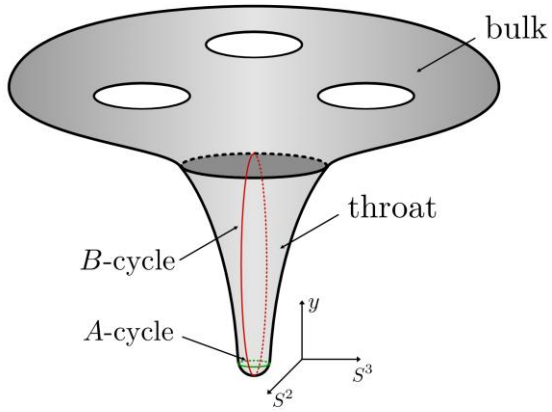
Tadpole cancellation: $N_{flux} + N_{D3} - \frac{1}{2} N_{O3} = 0$



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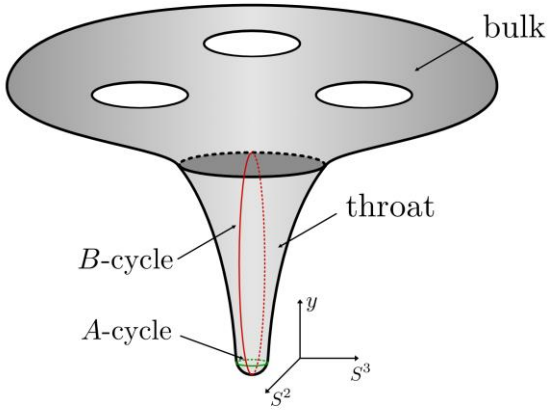

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EFT specified by: 1) Superpotential W 2) Kähler potential K

KKLT in three steps

Step 1: Stabilization of complex structure moduli (U^a, Z) & axio-dilaton S through fluxes

Refinement: *Racetrack* for axio-dilaton $\boxed{W = W_Z + a_1 e^{-c_1 S} + a_2 e^{-c_2 S}}$ $\rightarrow \quad |W_0| \ll 1$

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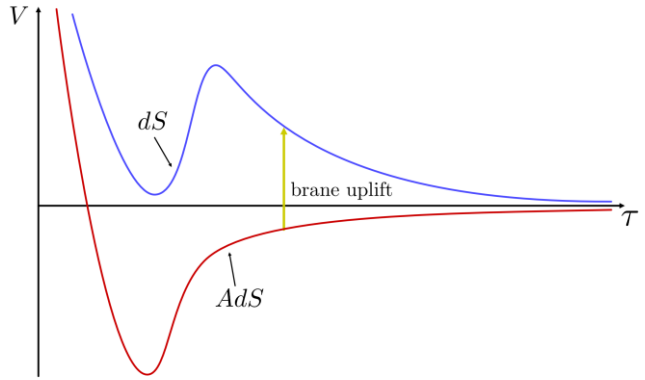

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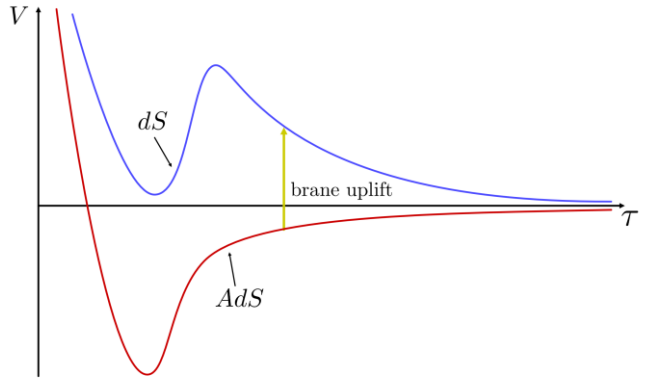
Objective: Collect all physical energy scales & compare!



Mass hierarchies and flux tadpole N

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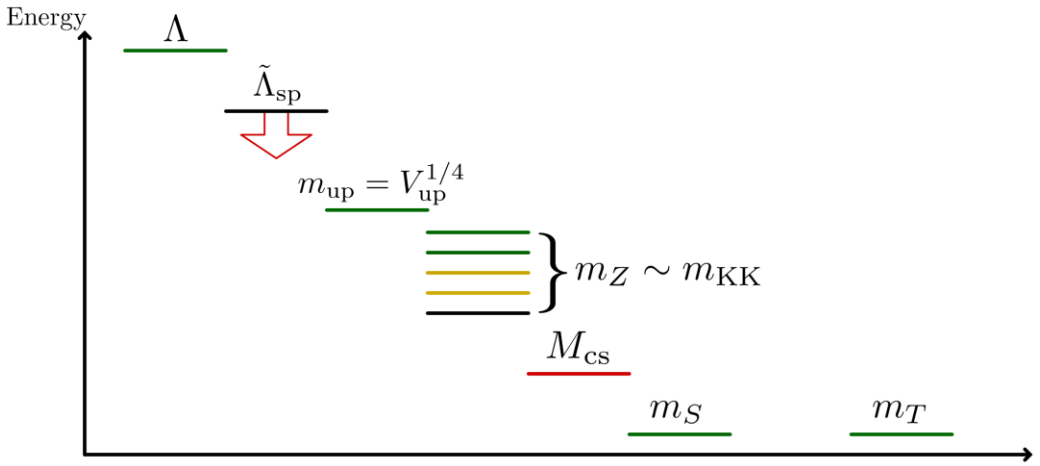

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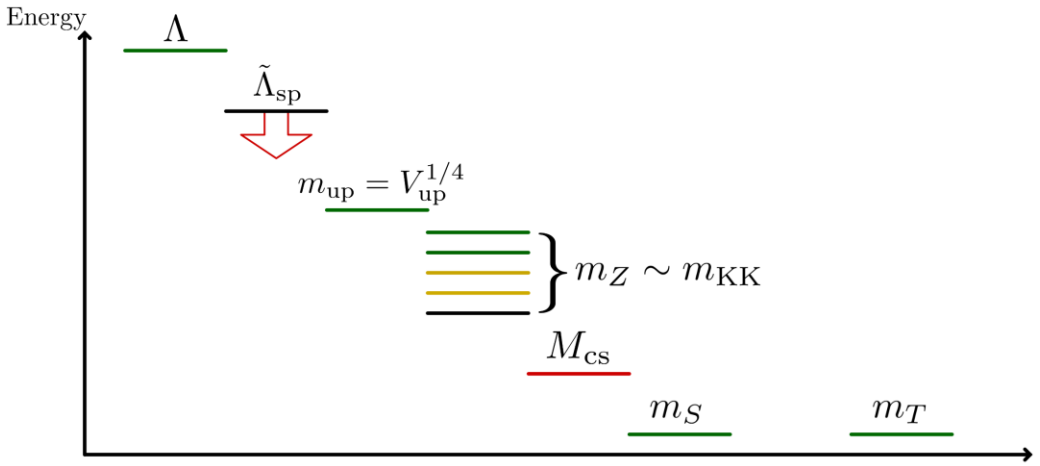

Tadpole: $N \gtrsim (\log|Z|)^4 |Z|^{-2/3}$

Theory: $N \gtrsim 10^{7-8}$ Num. example: $N \sim O(10^{19})$

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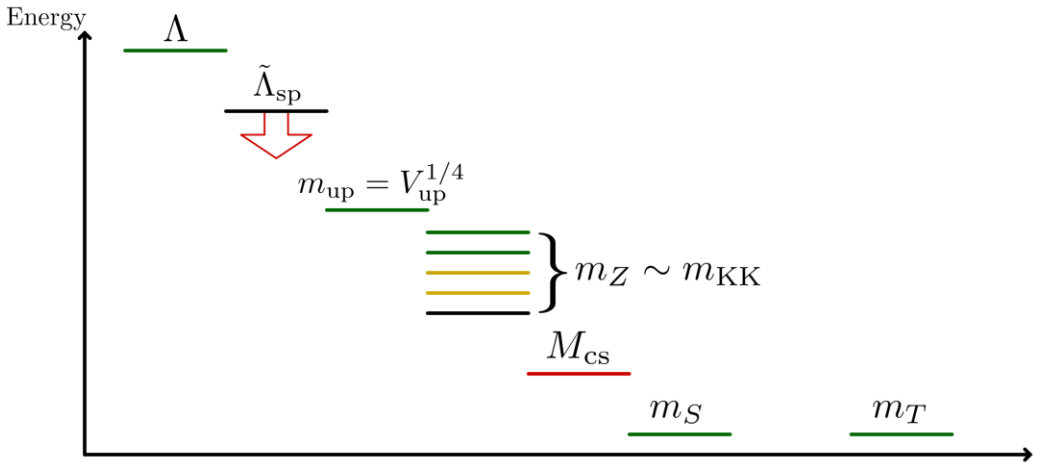
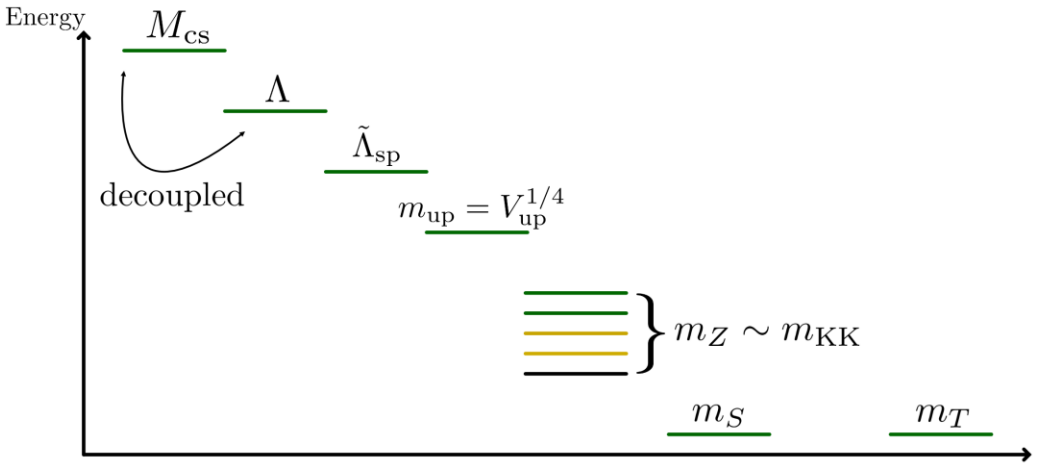


Scenario 2



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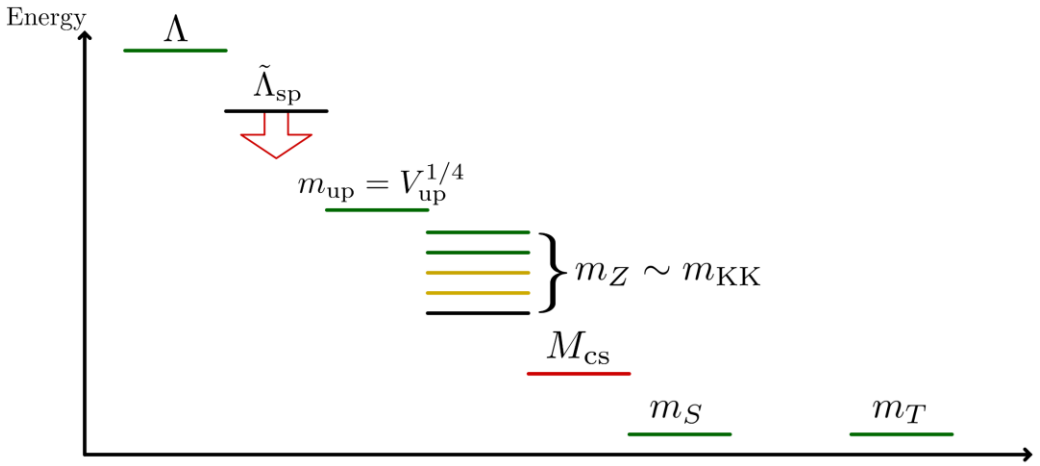

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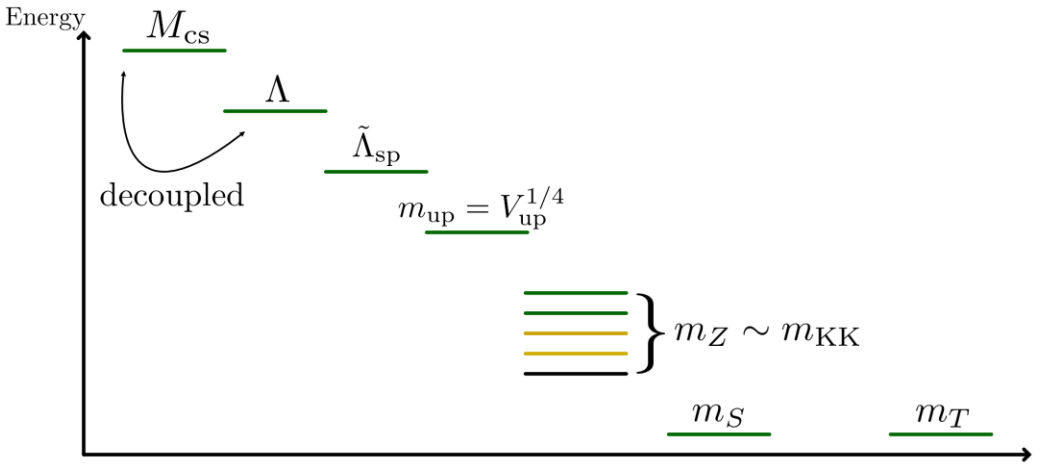

Tadpole: $N \gtrsim 10^{\#}\, c_1/g_s^2$

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