Moduli stabilization and flavor structure in 5D SUGRA with multi moduli

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One of the simplest setup for the extra-dimensional model with supersymmetry (SUSY) is five-dimensional (5D) supergravity compactified on S^1/Z_2, which is extensively studied in a large number of papers. Most of such works assume or consider a situation that the radius of the extra dimension R is determined by the vacuum expectation value (VEV) of only one chiral multiplet T (the Radion multiplet), that is, $\pi R = \mathrm{Re}\,\langle T\rangle$. In general, however, there are also cases where R is determined by VEVs of more than one chiral multiplets, such as

$$\pi R = \mathcal{F}(\mathrm{Re}\,\langle T^1\rangle, \mathrm{Re}\,\langle T^2\rangle, \cdots), \tag{1}$$

where $\mathcal{F}$ is some function, and T^I $(I = 1, 2, \cdots, n)$ are chiral multiplets which we call the moduli in this talk. Here we consider the multi moduli case ($n \geq 2$) and see the difference from the single modulus case from the viewpoint of the 4D effective theory, especially focusing on the flavor structure of the soft SUSY breaking masses [1].

The multi moduli case has not been studied very much just because of a technical reason. In this case the derivation of the 4D effective theory becomes much more complicated than that in the single modulus case. In our previous work [2], we developed a systematic method to derive the 4D effective theory for general 5D supergravity model. We analysed the 4D effective theory obtained by this method, and found that there exists additional contribution to the soft SUSY breaking masses. It can make the tree-level soft masses non-tachyonic, which are always tachyonic in the single modulus case. Furthermore they are almost flavor-universal when the additional contribution is dominant, and thus the SUSY flavor problem can be solved.

Here we comment that there are no problematic flavor-violating effects coming from intrinsic contact terms between the matter superfields Q_i and the SUSY-breaking superfield X in the Kähler potentials introduced on the orbifold boundaries, which is queried about by Watari-san at the end of the talk. Such effects are negligible because Q_i and X are localized around the opposite boundaries when the additional contribution to the soft masses becomes dominant, and thus the flavor-violating terms from each boundary are exponentially suppressed.

References

[1] H. Abe and Y. Sakamura, arXiv:0807.3725.

[2] H. Abe and Y. Sakamura, Phys. Rev. **D75** (2007) 025018.