Moduli Stabilization in Stringy ISS Models

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Introduction and motivation

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The goal of this talk

We want to solve moduli stabilization problem in ISS model (especially mass moduli). We consider compact CY, and gravity does not decouple.

The need for moduli stabilization

- SUSY broken with potential

$$\mathbf{V}|_{\text{ISS vac.}} = \mathbf{N_c}|\mathbf{m}|^2|\mathbf{\Lambda}|^2$$

where $\mathbf{m}$ is the mass parameter, $\mathbf{\Lambda}$ is the dynamical scale of electric theory, $\mathbf{N_c}$ is the number of colors in electric theory.

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$$\mathbf{V}|_{\text{ISS vac.}} = \mathbf{N_c}|\rho|^2|\Lambda|^2 \propto \rho^2$$

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Solution: gauge anomalous $\mathbf{U(1)_D}$ and use its D-term

Charge Assignment of $\mathbf{U(1)_D}$

ρ	$\varphi, \bar{\varphi}$	$\mathbf{M}$	$\mathbf{q}, \bar{\mathbf{q}}$	$\Lambda^{3N_c-2N_f}$	$\tilde{\Lambda}^{2N_f-3N_c}$
-2	$+1$	$+2$	-1	$2N_f$	$-2N_f$

$\varphi, \bar{\varphi}$: electric quarks, $\mathbf{q}, \bar{\mathbf{q}}$, magnetic quarks, M: mesons

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- we need to stabilize FI parameter $\boldsymbol{\xi}$

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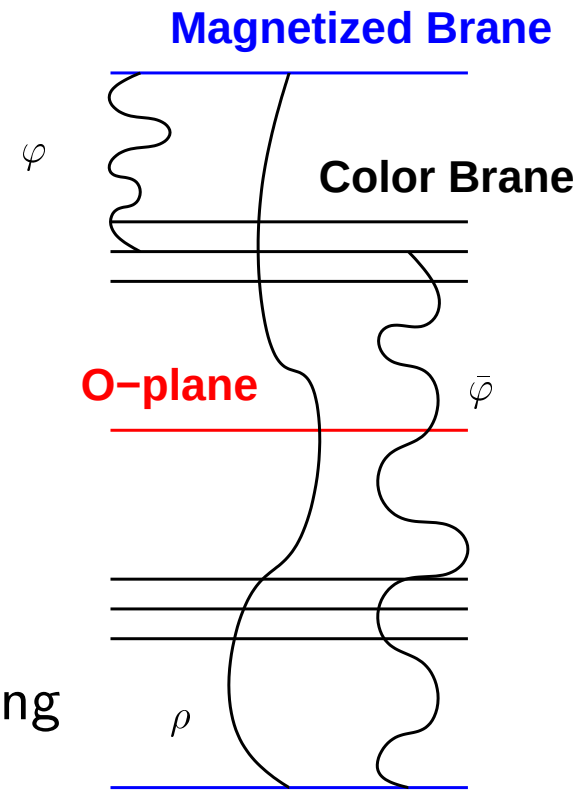
- $\mathbf{U(1)_D}$ is anomalous, but anomaly cancelled by 4d GS mechanism
- FI parameter $\boldsymbol{\xi}$ is generated dynamically

$\Rightarrow$ These problems are solved at once quite naturally in string theory!

Explicit string theory setup

- Explicit construction from string theory provided using type IIB CY flux compactification with D7-branes and O7-plane
- Kähler potential is given by construction
- we discuss stabilization of $\tau, \rho, \mathbf{q}, \bar{\mathbf{q}}, \mathbf{M}$ using SUGRA potential. (τ: Kähler modulus)



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- SUSY breaking scale $\sim$ Planck scale unless significant fine tuning.

  [Nakayama-M.Y-Yanagida, work in progress]

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- Application to D-term gauge mediation [Nakayama-Taki-Watari-Yanagida '07] with very light gravitino ($\sim$ 1eV)