Non-Abelian $(2,0)$ Superconformal Field Theories

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Current Research Interests

My current research interests comprise three different topics

1. BPS Saturated Objects in String Theory
   - Work with: I. Antoniadis, I. Florakis, K.S. Narain, E. Sokatchev, T. Taylor, A. Zein Assi

2. Amplitudes and Correlators in Superconformal Field Theories
   - Work with: A. Belitsky, G. Korchemsky, E. Sokatchev, A. Zhiboedov

3. Effective Description of $(2,0)$ Superconformal Theories
   - Work with: Federico Bonetti, Thomas Grimm
   - Based on: 1206:1600, 1209.3017

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Today I will only talk about point (3)

Non-Abelian Six-Dimensional Theories with $\mathcal{N} = (2, 0)$

Class of interacting superconformal field theories in six dimensions

- propagate tensor multiplets
- non-abelian gauge group $\mathcal{G}$
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Strong motivations to study such theories:

- world-volume theory of multiple M5-branes
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Difficult to describe directly

- no Lagrangian description known (no vector degrees of freedom)
- no perturbative approach (lack of parameter)

Lower Dimensional Description

Propose five dimensional action by compactification on S^1 and keep infinite tower of KK-modes for all fields

Bonetti, Grimm, SH 2012

$$\mathcal{L}_{\text{5-dim}} = \mathcal{L}_0 + \sum_{n=1}^{\infty} \mathcal{L}_n^{\text{KK}}$$

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Properties of the proposed action

- $\mathcal{N} = (1,0)$ supersymmetry (8 supercharges; $SU(2)_R$ R-symmetry) Mechanism to enhance to $USp(4)_R$ compatible with $\mathcal{N} = (2,0)$
- six-dimensional conformal symmetry broken: can restore Weyl rescalings through compensating multiplets
- Action for zero mode alone $=$ maximally supersymmetric Yang-Mills

Future Directions

Several questions are currently under consideration

- Can more symmetries (*e.g.* Lorentz) of the six-dimensional theory be made visible in the five-dimensional approach?
- What quantities of the six-dimensional theory can be computed from five dimensions?
- Can we make closer contact to M-theory? Can we learn more about the geometry of string moduli spaces from this theory?
- Can we learn more about recently discovered relations between supersymmetric gauge theories in various dimensions (*e.g.* AGT relations)?