RESEARCH ACTIVITIES AT
MILANO BICOCCA

Dipartimento di Fisica, Universitá degli studi di Milano Bicocca
Piazza della scienza 3, I 20126 Milano, Italy

MILANO-BICOCCA UNIVERSITY

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3rd RTN Workshop - Valencia

MILANO-BICOCCA GROUP

- *PERMANENTS*

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- *PostDocs*

  Lorenzo Cornalba

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- *PhD Students*

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RESEARCH AND COLLABORATORS

RESEARCH

- AdS/CFT correspondence
- Supersymmetric gauge theories:
  * Perturbative aspects
  * Non perturbative aspects
- Supergravity

COLLABORATORS

- Paris, LPTHE
- Saclay, SPhT
- Ecole Polytechnique, CPHT
- Ecole Normale Superieure
- Perimeter Inst. Theor. Phys.
- MIT, LNS
- SISSA, Trieste

- Milan U., INFN, Milan
- Maryland U.
- Amsterdam U., Inst. Math.
- Rome U.,Tor Vergata
- Porto U.
- Lisbon, IST
- CERN

AdS/CFT correspondence

Toric CY's and dimer technology

- Properties of $\mathcal{N} = 1$ SCFT living on D3 brane at singularities: equivalence of the computation of R charges and central charges in the CFT and in the geometry (a-maximization=volume minimization)
- Partition function for BPS states in SCFT's dual to toric and non toric manifolds and relation with topological strings

Generalized complex geometry to study type IIB supergravity solutions in AdS/CFT

- Regular solution dual to the baryonic branch of Klebanov Strassler solution
- $SU(2)$ structure AdS_5 solutions (marginal and mass defs. of $\mathcal{N} = 4$ SYM)
- D-brane probes on $SU(2)$ structure manifolds

AdS/CFT correspondence

D-branes on β deformed background (susy and not)

- $D3$ Giant graviton solutions
- Adding $D7$ flavour branes, mesonic spectrum

String scattering amplitudes

1-loop analysys within Berkovits formulation via superspace techniques

Eikonal physics in AdS and applications to CFT

- Regge theory in CFT and graviton trajectory at large λ
- Relation to the BFKL Pomeron at small λ and relation to Amati-Ciafaloni-Veneziano string eikonal scattering

Dimer model, free fermions and super quantum mechanics

SUPERSYMMETRY AND SUPERGRAVITY

QUANTUM PROPERTIES OF β DEFORMED SYM

- Perturbative structure of the chiral ring, anomalous dimensions, effective superpotential
- Perturbative conditions for conformal invariance and finiteness

METASTABLE SUPERSYMMETRY BREAKING

- SQCD with adjoint matter without R-symmetry
- A_n quiver gauge theories (from type IIB string theory on CY singularities)
- Implementation of (direct) gauge mediation mechanism

SUPERGRAVITY

- 5D supergravity on spacetime with boundaries: supersymmetric/anomaly free action
- M theory compactification on hyperbolic spaces

METASTABLE VACUA IN A_n QUIVER GAUGE THEORIES

Based on arXiv:0706.3151 [hep-th] A.AMARITI, L.GIRARDELLO, A.M.

- Natural embedding in type *II* B string theory (ADE singularity CY)
- A_n with arbitrary $n \Rightarrow U(N_1) \times \cdots \times U(N_n)$ gauge groups
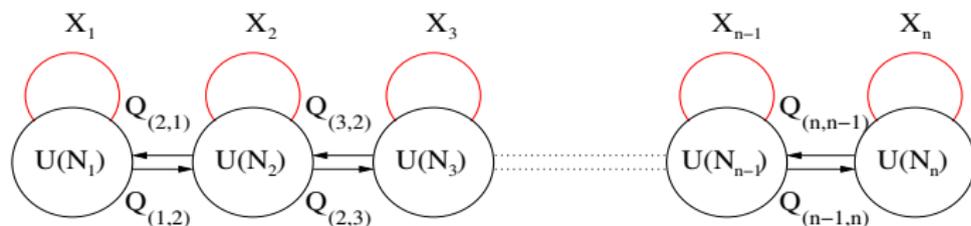
- Massive adjoint fields X_i integrated out
- Seiberg duality on the even nodes $\Rightarrow$ only macroscopic d.o.f.
- Dual magnetic superpotential neglecting $\sim 1/m_{ADJOINT}$
- $\Rightarrow$ Set of decoupled A_3

- Each A_3 has metastable supersymmetry breaking long living vacuum

METASTABLE VACUA IN A_n QUIVER GAUGE THEORIES

JUSTIFY GAUGE/FLAVOUR ROLES

- Control RG flow of different nodes
  (b_0 coefficients depend on A_5 patches in the A_n quiver)
- $\Rightarrow$ Hierarchy between strong coupling scales Λ_i of even/odd gauge groups

GAUGE MEDIATION IN THE A_n QUIVER
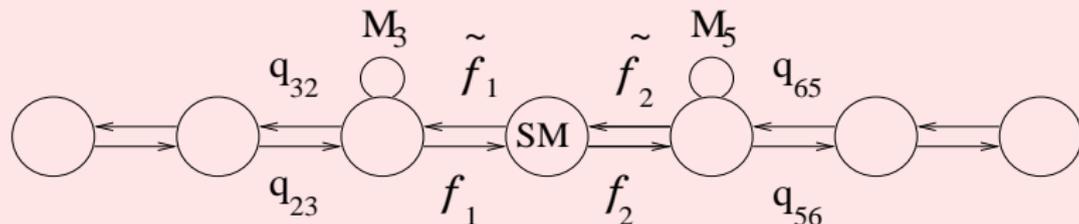
$\Rightarrow$ Gaugino mass

$$m_\lambda \sim \frac{F_{M3}}{m_{f1}} + \frac{F_{M5}}{m_{f2}}$$

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