Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Marginal Deformations of Gauge Theories and their dual description

By

Manuela Kulaxizi

Holography and its realization in string theory as the AdS/CFT correspondence, offers an equivalence between gauge theories and gravity that provides a means to explore the, otherwise inaccessible, large N and strong coupling region of SU(N) gauge theories. While considerable progress has been made in this area, a concrete method for specifying the gravitational background dual to a given gauge theory is still lacking. This is the question addressed in this thesis in the context of exactly marginal deformations of N=4 SYM.

At first, a precise relation between the deformation of the superpotential and transverse space noncommutativity is established. In particular, the appropriate noncommutativity matrix Θ is determined, relying solely on data from the gauge theory lagrangian and basic notions of the AdS/CFT correspondence. The set (G, Θ) of open string parameters, with G the metric of the transverse space, is then understood as a way to encode information pertaining to the moduli space of the gauge theory. It seems thus natural to expect that it may be possible to obtain the corresponding gravitational solution by mapping the open string fields (G, Θ) to the closed string ones (g, B). This hints at a purely algebraic method for constructing gravity duals to given conformal gauge theories. The idea is tested within the context of the β-deformed theory where the dual gravity description is known and then used to construct the background for the ρ-deformed theory up to third order in the deformation parameter ρ. Discrepancy of the higher order in ρ terms in the latter case is traced to the nonassociativity of the noncommutative matrix Θ.

In the other part of the thesis, exactly marginal deformations of N=4 SYM are explored within the framework of Twistor String Theory which, in its original form, relates perturbative N=4 SU(N) SYM with the topological B-model on CP(3|4). The deformation is now achieved by turning on a closed string mode that modifies the action of the B-model and can be interpreted as the result of non-anticommutativity in three out of the four odd directions of the target space CP(3|4).

Date: April 30, 2007
Time: 3:00 p.m.
Place: MT6-125, Y.I.T.P Common Room

Program: Physic and Astronomy
Dissertation Advisor: Martin Rocek