Holoday: A short journey into the holographic correspondence

Department of Physics, University of Perugia

November 20, 2014

Schedule

9:30 - 10:30	**Troels Harmark**	Spin matrix theory: A quantum mechanical model for the AdS/CFT correspondence
10:30 - 11:00		*Coffee break*
11:00 - 12:00	**Agnese Bissi**	What can we learn from crossing symmetry at large N?
12:00 - 13:00	**Silvia Penati**	BPS Wilson loops and Bremsstrahlung function in ABJM: An exact prediction
13:00 - 14:30		*Lunch*
14:30 - 15:30	**Jelle Hartong**	Field Theory on Torsional Newton-Cartan Geometry
15:30 - 16:00		*Coffee break*
16:00 - 17:00	**Niels Obers**	Lifshitz spacetimes for Schroedinger holography

Abstracts

Troels Harmark

NBI, Copenhagen, harmark@nbi.dk

9:30 - 10:30

Spin matrix theory: A quantum mechanical model for the AdS/CFT correspondence

We introduce a new quantum mechanical theory called Spin Matrix theory (SMT). SMT describes $\mathcal{N} = 4$ super-Yang-Mills theory near zero-temperature critical points in the grand canonical phase diagram. Even though SMT is a non-relativistic quantum mechanical theory it contains a variety of phases mimicking the AdS/CFT correspondence.

Agnese Bissi

Oxford University, agnese.bissi@gmail.com

11:00 - 12:00

What can we learn from crossing symmetry at large N?

In this talk I will discuss how to construct all solutions consistent with crossing symmetry in the limit of large central charge $c \sim N^2$, starting from the four-point correlator of the stress tensor multiplet in $\mathcal{N}$ =4 SYM. Unitarity forces the introduction of a scale Δ_{gap} and these solutions organize as a double expansion in $1/c$ and $1/\Delta_{gap}$. These solutions are valid to leading order in $1/c$ and to all orders in $1/\Delta_{gap}$ and reproduce, in particular, instanton corrections previously found. Comparison with such instanton computations allows to fix Δ_{gap}. Using this gap scale one can explain the upper bounds for the scaling dimension of unprotected operators observed in the numerical superconformal bootstrap at large central charge. Furthermore, I will present connections between such upper bounds and positivity constraints arising from causality in flat space and I will discuss how certain relations derived from causality constraints for scattering in AdS follow from crossing symmetry.

Silvia Penati

University of Milano Bicocca, silvia.penati@mib.infn.it

12:00 - 13:00

BPS Wilson loops and Bremsstrahlung function in ABJM: An exact prediction

We study the vacuum expectation value of a generalized class of bosonic and fermionic BPS Wilson loops in ABJM theory. Exploiting the relation between BPS Wilson loops, cusp anomalous dimension and Bremsstrahlung function we conjecture an exact expression for the latter in the $\frac{1}{2}$-BPS case. Using results from localization, we show that in the weak-coupling limit our proposal agrees with the perturbative result, while at strong coupling it matches the leading term of the string prediction.

Jelle Hartong

ULB, Bruxelles, hartong@nbi.ku.dk

14:30 - 15:30

Field Theory on Torsional Newton-Cartan Geometry

I will introduce the concept of Newton-Cartan geometry. This was introduced by Cartan to find a diffeomorphism invariant description of Newtonian gravity, but as a geometrical framework it is much more general than that. I will explain the basic geometric properties of Newton-Cartan geometry and then discuss field theory on such backgrounds. These field theories can be Galilean invariant and they play an important role in recent development in condensed matter physics most notably in relation to the quantum Hall effect. In order to compute quantities such as the energy density and energy flux it will prove crucial to introduce a specific torsion tensor. Hence the name torsional Newton-Cartan geometry. This kind of geometries also play a crucial role in holography for Lifshitz space-times where they appear as boundary geometries of asymptotically locally Lifshitz space-times. This will be explained in the talk by Niels.

Niels Obers

NBI, Copenhagen, obers@nbi.dk

16:00 - 17:00

Lifshitz spacetimes for Schroedinger holography