ICTP LASS 2015

Poster Session

1. Title: Seiberg-Witten duality
Author: José Luis Alejo Alvarez (Instituto de Física Teórica-UNESP)
Summary:
I will present a short description of the Electric-magnetic duality at quantum level worked by Seiberg and Witten for N=2 SYM SU(2) theory. I describe first the classical aspects of the electric-magnetic duality to see later how it is modified at the quantum level and how supersymmetry help us in order to obtain a effective field theory that preserves the electric-magnetic duality.

2. Tithe: The Equation of Motion in Field Theory and Topological Field Theory
Author: Sair Arquez (Departamento de Física, CINVESTAV)
Summary:
In this work a description of the dynamics of a particle in a topological field such as the type of Donaldson-Witten theory is performed. We start by reviewing the problem of motion in general relativity, Yang-Mills theories and also in some string theories such as the motion of a closed string on an external gravitational field. The open string case in an external Yang-Mills field is also considered. We compute the energy-momentum tensor of the theory. Finally we obtain the equations of motion of the particle directly from the non-linear field equations and a generalization of Wong's equations are obtained.

3. Title : Ads/CFT Correspondence and Holographic entropy
Author: Martin Dionisio Arteaga Tupia (Instituto de Física da Universidade de Sao Paulo)
Summary:

We give the introductory basics of Holographic entropy, and compute it for the particular case of conformal theories, then we use the AdS/CFT correspondence to calculate the same magnitudes. At the end we compare both results.

4. Title: Non-relativistic Conformal Field Theory: Path Integrals and the Scale Anomaly
Authors: Wilder Daza, Chris Lin, Carlos Ordonez (University of Houston)
Summary:
The anomaly is a general feature of quantum field theory. The applications of the anomaly are enormous, spanning several branches of physics, from atomic to condensed matter to particle to gravitational. In our work we are focused on the scale anomaly for systems that transform under the Schrodinger group, which is the non-relativistic analog of the conformal group.

One of the most exciting applications of anomalies has been realized only in this decade in the study of ultracold gases, where the measurement of various manifestations of the anomaly has only now become experimentally accessible to atomic physicists.

We are applying tools borrowed from high-energy physics, such as Fujikawa's method, and modifying them so that they can be of use to atomic physicists. We hope we can do the same for the techniques learned in this school.

5. Title: Antisymmetric and Vector Part of the Torsion in a Lorentz-Chern-Simons Massive Gravity.
Author: Simon Cristobal del Pino Moreno (Instituto de Física PUCV)
Summary:
We explore a model of gravity that arises from the consideration of the Chern-Simons form in 2+1 dimensions for a spin connection that consider both, antisymmetric and vector irreducible parts of the contortion 2-form. Due to the symmetries of the CS form, that we study in detail, we show that the scalar mode of the theory can me gauged to a constant value which allow to conjecture an interpretation for the vector part as a gauge field. The dynamics of the model suggest that when the scalar mode acquire a constant value, we met a theory that accept all the physical interpretation of Topologically Massive Gravity coupled to Topologically Massive Electrodynamics, both unified as an effective theory for a Riemann-Cartan manifold.

6. Title: Pure Spinor Formalism of the Superstring
Author: Vilson Fabricio dos Santos Juliatto (Instituto de Física Teórica-UNESP)
Summary:
A review of the fundamental aspects of the pure spinor formalism.

7. Title: Pure Spinor Formalism.
Author: Luis Max Guillen Quiroz
Summary:
Until 2000, two formalisms for describing the perturbative superstring had been developed: The Ramond-Neveu-Schwarz (RNS) and the Green-Schwarz (GS) formalisms. The former exhibits a beautiful N=1 SUSY on the worldsheet and we can see the spacetime SUSY only after doing the GSO projection. Although this framework gives us a consistent description of the theory, certain complications arise when computing scattering amplitudes involving fermions (and also when we try to work in R-R backgrounds), because of the intricate form of the vertex operators. On the other hand, the GS formalism possesses a manifest spacetime SUSY, but because of the complicated nature of its fermionic constraints, we cannot separate (up to now) the first class constraints from the second class ones in a Lorentz covariant way; this fact lead us to break the SO(10) symmetry to a SO(8) symmetry (by using the light-cone gauge), and for this reason this formalism is inconvenient to compute scattering amplitudes in a Lorentz covariant way. A new formalism, the Pure Spinor formalism, which was proposed in 2000 by Berkovits, possesses the advantages of the previous two ones, but not their disadvantages. It has a manifest spacetime SUSY and allow us compute covariantly scattering amplitudes (and also working in R-R backgrounds), as well as to reduce a great amount of computations with respect to the corresponding ones in the RNS framework. This poster will try to introduce this formalism in a systematic way.

8. Title: Quarkonium potential and photon production rate in a strongly coupled anisotropic plasma with higher derivative corrections.
Author: Viktor Jahnke (Instituto de Física da Universidade de São Paulo)
Summary:
We consider the effects of anisotropy and higher derivative corrections in a strongly coupled plasma by considering an anisotropic black brane solution of an AdS-axion-dilaton system with a Gauss-Bonnet (GB) term. We compute the quarkonium potential and the photon production rate in this plasma. We find that the anisotropy decrease the screening length of the plasma and increase the photon production rate. The GB term can increase or decrease the above observables, depending on the sign of the GB coupling.

9. Title : "Towards 1/N corrections to deep inelastic scattering from the gauge/string duality",
Authors: D. Jorrin, N. Kovensky, M. Schvellinger (Instituto de Física de La Plata)

Summary:
We investigate 1/N corrections to deep inelastic scattering of charged leptons off glueballs in ${\cal {N}}=1^*$ SYM theory at strong coupling by using the gauge/string duality. The relevant cubic and quartic interaction vertices are derived from the type IIB supergravity action. The hadronic tensor is computed within the framework of the gauge/gravity duality, by considering two particles in the final state, which gives the sub-leading contribution in the 1/N expansion. For large momentum transfer, i.e. $q^2 \to \infty$ we calculate the structure functions F_1 and F_2 at sub-leading order in the 1/N expansion and obtain a non-vanishing longitudinal structure function F_L with a q^{-2} dependence as the leading contribution in the power expansion in q^{-2}. We conclude that the large-N and large-q limits do not commute.

10. Title: Hadron structure functions from string theory.
Author: Nicolas Kovensky (Instituto de Física de La Plata)
Summary
Deep inelastic scattering of leptons from hadrons at small values of the Bjorken parameter x is studied from superstring theory. In particular, we focus on single-flavored scalar and vector mesons in the large N limit. This is studied in terms of different holographic dual models with flavor Dp-branes in type IIA and type IIB superstring theories, in the strong coupling limit of the corresponding dual gauge theories. We derive the hadronic tensor and the structure functions for scalar and polarized vector mesons. In particular, for polarized vector mesons we obtain the eight structure functions at small values of the Bjorken parameter. The main result is that we obtain new relations of the Callan-Gross type for several structure functions. These relations have similarities for all different Dp-brane models that we consider. This would suggest their universal character, and therefore, it is possible that they hold for strongly coupled QCD in the large N limit.

11. Title: Worldline Conformal Mechanics
Author: Nicolaus Linneu de Holanda (Centro Brasileiro de Pesquisas Físicas)
Summary:
We present d-module representations of the 1D superconformal algebra induced by parabolic and hyperbolic/trigonometric transformations. These can be either homogeneous or inhomogeneous, depending on the presence of a massive inhomogeneous term in the transformations. The corresponding sigma-models are also presented. At N=4 supersymmetries, different values of the scaling dimension of the fields yield different symmetry algebras.

12. Title: Hypercomplex structures in field theory
Author: Oscar Meza Aldama (BUAP, Puebla)
Summary:
We propose the use of hyperbolic and bicomplex numbers, as an extension to the usual real and complex numbers, in the \lambda\phi^4 model. We study the vacuum manifold structure and spontaneous symmetry breaking of such a theory.

13. Title: Basic aspects on beta deformations of N=4 SYM
Autor: Segundo Parra Milian (IFT-UNESP)
Summary:

14. Title: Strings and particle physics
Author: Ricardo Pérez Martínez (Universidad Autonóma de Coahuila y UNAM)
Summary:
I present a general description and some characteristics of strings and particle physics. I also discuss the importance of relating string theory with our four dimensional world, especially with particle physics, through the compactification process of extra dimensions. Some comments of the heterotic string compactifications with N=1 and N=0 are presented.

15. Title: Q$\bar{Q}$ Potential from Supergravity: Review of the Classical Result.
Author: Diego Rodrigues (Federal University of Rio de Janeiro - Physics Institute)
Summary:
We review the remarkable calculation of the energy of a quark-anti-quark pair at zero temperature via AdS/CFT Correspondence, proposed by Maldacena in 1997. We show the 1/L dependence in the energy (L is the quark-anti-quark separation) as a result of conformal invariance. We also show the most important feature of this calculation, which is its non-perturbative aspect.

16. Title: "Drag force and jet quenching parameter in a strongly coupled anisotropic plasma from higher curvature gravity ".
Author: Anderson Seigo Misobuchi (University of São Paulo, Institute of Physics, Department of Mathematical Physics)
Summary:
The AdS/CFT correspondence represents a remarkable tool in the study of strongly coupled gauge theories which can be mapped to a dual, weakly coupled gravitational description. In this work, we consider five-dimensional AdS-axion-dilaton gravity with a Gauss-Bonnet term and use a black brane solution displaying spatial anisotropy as the gravity dual of a

strongly coupled anisotropic plasma. We compute the drag force and the jet quenching parameter for this plasma. The effects of the Gauss -Bonnet term and of the anisotropy are discussed and compared with previous results."

17. Title: Quantum Computing and String Theories.
Author: Hugo Solís (Universidad de Costa Rica)
Summary:
The Quantum Computer Foundations can be used to define the String Theory.Some mathematics from the relations between String Theories and Black Holes are similar to the qubit entanglement. In this research, we are evaluating the aspect of quantum computer simulators in the mathematics of these relations as an insight of the experiments that can be used in the test of these theories.

18. Title: Holographic RG flows, entanglement entropy and the sum rule
Author: Eduardo Testé Lino (Instituto Balseiro)

Summary:
We calculate the two-point function of the trace of the stress tensor in holographic renormalization group flows between pairs of conformal field theories. We show that the term proportional to the momentum squared in this correlator gives the change of the central charge between fixed points in d = 2 (Zamolodchikov's c-theorem) and in d > 2 it gives the holographic entanglement entropy for a planar region. This can be seen as a holographic realization of the Adler-Zee formula for the renormalization of Newton's constant.

19. Title: From Lorentz Chern-Simons to Massive Gravity.
Author: Adolfo Sócrates Toloza Díaz (Instituto de Física, Pontificia Universidad Católica de Valparaíso)
Summary:
We propose a generalization of Chiral Gravity, which follows from considering a Chern-Simons action for the spin connection with anti-symmetric contorsion. The theory corresponds to Topologically Massive Gravity at the chiral point non-minimally coupled to an additional scalar mode that gathers the torsion degree of freedom. In this setup, the effective cosmological constant (the inverse of the curvature radius of maximally symmetric solutions) is either negative or zero, and it enters as an integration constant associated to the value of the contorsion at infinity. We study the classical theory both at the linear and non-linear level. In particular, we show how Chiral Gravity is included as a special sector. In addition, the theory has other sectors, which we explore; we exhibit analytic exact solutions that are not solutions of Topologically Massive Gravity (and, consequently, neither of General Relativity) and still satisfy Brown-Henneaux asymptotically AdS3 boundary conditions.

20. Title: Covariant Quantization of the Superparticle using Pure Spinors
Author: Dennis Eduardo Zavaleta Ferro ((Instituto de Física da Universidade de Sao Paulo)
Summary:
The superparticle is covariantly quantized, and it is shown that describes ten-dimensional super-Yang-Mills Theory. The BRST operator is constructed taking as reference the one from the worldline description of the Chern-Simons Theory.