INPP Demokritos-APCTP meeting and HOCTOOLS-II mini-workshop

Report of Contributions

https://indico.global/e/8907

Contribution ID: **1** Type: **not specified**

OPP at two loops

Discuss OPP at two loops, for integrand level reduction within HELAC2LOOP.

Author: PAPADOPOULOS, Konstantinos (Nat. Cent. for Sci. Res. Demokritos (GR))

Presenter: PAPADOPOULOS, Konstantinos (Nat. Cent. for Sci. Res. Demokritos (GR))

Contribution ID: **2** Type: **not specified**

Dilaton-Einstein-Gauss-Bonnet Gravity and its Cosmological Implication

Tuesday 1 October 2024 14:00 (1 hour)

The dilaton-Einstein-Gauss-Bonnet(dEGB) Gravity is one of the simplest extensions of Einstein's gravity with the higher curvature term. After some motivation to go beyond Einstein's Gravity models, we briefly describe the dEGB model through the black holes. Unlike Einstein's gravity, we explain the existence of a minimum mass below which the black hole cannot be formed, which is the most prominent property. Then, we move on to the implication of this theory on the cosmological evolution. The major message is that it opens new possible phases: "Slow-roll", "fast-roll", and "kination"at the higher temperatures, in addition to the well-accepted radiation dominant, matter dominant, and cosmological constant dominant phases of the standard cosmological model. We also mention briefly the WIMP physics and gravitational waves to put the bounds on the parameters of dEGB gravity theory.

Presenter: Dr LEE, Bum-Hoon

Contribution ID: **4** Type: **not specified**

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Author: LEE, Bum-Hoon (Sogang University)

Presenter: LEE, Bum-Hoon (Sogang University)

Contribution ID: **5** Type: **not specified**

Predictions for dense matter and neutron stars from the gauge/gravity duality

The gauge/gravity duality, combined with information from lattice QCD, nuclear theory, and perturbative QCD, can be used to obtain predictions for the equation of state and transport in hot and dense QCD. I give an overview of an approach based on the holographic V-QCD model, which includes both nuclear and quark matter phases, separated by a first order phase transition. I demonstrate that the model includes an spatially modulated instability in the deconfined phase, which potentially extends to the region reachable in lattice and experimental studies in near future. By using the model in state-of-the-art simulations of neutron star binaries, I study the formation of quark matter during the merger process, and its effect on the threshold mass for prompt collapse into a black hole. I also discuss analysis of the bulk viscosity and predictions for neutrino transport in the quark matter phase.

Author: JARVINEN, Matti

Presenter: JARVINEN, Matti

Contribution ID: **6** Type: **not specified**

Dielectric top membranes in plane-wave backgrounds

We investigate the large-N limit of the BMN matrix model by means of classical bosonic membranes that have spherical topology and spin inside the 11-dimensional maximally supersymmetric plane-wave background. First, we classify all possible M2-brane configurations based on the distribution of their components inside the SO(3) × SO(6) symmetric plane-wave spacetime. We then formulate some simple but very representative ansatze of dielectric tops that rotate in this space. We examine the radial and angular/multipole stability for a wide range of these configurations, locating their regions of stability and instability. We also demonstrate a "cascade"phenomenon for the membrane instabilities by extending the analysis of fluctuations to higher orders of perturbation theory

Author: Dr LINARDOPOULOS, Georgios (Asia Pacific Center for Theoretical Physics)

Presenter: Dr LINARDOPOULOS, Georgios (Asia Pacific Center for Theoretical Physics)

Contribution ID: **7** Type: **not specified**

Schwarzschild Black Hole from Perturbation Theory to All Orders

Applying the quantum field theoretic perturbiner approach to Einstein gravity, we compute the metric of a Schwarzschild black hole order by order in perturbation theory. Using recursion, this perturbative calculation can be carried out in de Donder gauge to all orders in Newton's constant. The result is a geometric series which is convergent outside a disk of finite radius, and it agrees within its region of convergence with the known de Donder gauge metric of a Schwarzschild black hole. It thus provides a first all-order perturbative computation in Einstein gravity with a matter source. I'll also discuss the generalization to the binary black holes.

Author: LEE, Kanghoon (APCTP)

Presenter: LEE, Kanghoon (APCTP)

Contribution ID: **8** Type: **not specified**

Magnetic Defects in Conformal Field Theory

Magnetic solenoids in quantum systems can have lead to novel and interesting physics in the deep infrared, owing to the fact that they can be classified by a number, the magnetic flux of the solenoid. We review the general physics of co-dimension two defects with an eye towards studying magnetic defects, and discuss new central charges that arise in these mixed dimensional systems. We comment on holographic constructions of these defects and give some physical observables.

Author: ROBERTS, Matthew (APCTP)

Presenter: ROBERTS, Matthew (APCTP)

Contribution ID: **9** Type: **not specified**

Holographic Mean field theory and Kondo lattice.

Monday 30 September 2024 10:00 (1 hour)

Presenter: SIN, Sang-Jin

Contribution ID: **10** Type: **not specified**

Classification of Fermionic RCFTs and Topological Phases Revisited

Monday 30 September 2024 11:00 (1 hour)

Presenter: LEE, Sungjay

Contribution ID: **11** Type: **not specified**

Schwarzschild Black Hole from Perturbation Theory to All Orders

Monday 30 September 2024 14:00 (1 hour)

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Presenter: LEE, Kanghoon

Contribution ID: **12** Type: **not specified**

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Monday 30 September 2024 15:00 (1 hour)

The gauge/gravity duality, combined with information from lattice QCD, nuclear theory, and perturbative QCD, can be used to obtain predictions for the equation of state and transport in hot and dense QCD. I give an overview of an approach based on the holographic V-QCD model, which includes both nuclear and quark matter phases, separated by a first order phase transition. I demonstrate that the model includes an spatially modulated instability in the deconfined phase, which potentially extends to the region reachable in lattice and experimental studies in near future. By using the model in state-of-the-art simulations of neutron star binaries, I study the formation of quark matter during the merger process, and its effect on the threshold mass for prompt collapse into a black hole. I also discuss analysis of the bulk viscosity and predictions for neutrino transport in the quark matter phase.

Presenter: JARVINEN, Matti

Contribution ID: **13** Type: **not specified**

NNLO QCD phenomenology for 2-to-3 scattering process at the LHC: Wbb and photon+dijet final states

Thursday 3 October 2024 11:00 (1 hour)

Presenter: HARTANTO, Heribertus Bayu

Contribution ID: **14** Type: **not specified**

Finite Feynman Integrals

Tuesday 1 October 2024 10:00 (1 hour)

Classifying and organizing Feynman integrals according to their degree of divergence may be a useful tool in presenting scattering amplitudes. In this talk, I focus on the first step: systematically organizing and finding finite Feynman integrals. I will briefly discuss an approach based on Landau equations. I will then focus mostly on an approach based on Newton polytopes.

Presenter: KOSOWER, David

Contribution ID: **15** Type: **not specified**

Subleading effects in soft-gluon emission at one-loop in massless QCD

Tuesday 1 October 2024 11:00 (1 hour)

Presenter: CZAKON, Michal

Contribution ID: **16** Type: **not specified**

Two loop QCD corrections to multiscale amplitudes: Progress towards ttj, wγγ and hbb final states

Thursday 3 October 2024 10:00 (1 hour)

I will discuss the progress towards providing the missing double virtual corrections to the listed final states using modern computational tools.

Presenter: BADGER, Simon

Contribution ID: **17** Type: **not specified**

Landau singularities from Whitney stratifications

Monday 30 September 2024 17:30 (1 hour)

Presenter: PAPATHANASIOU, Georgios

Contribution ID: **18** Type: **not specified**

Intersection Theory for Fundamental Physics

Tuesday 1 October 2024 15:00 (1 hour)

Presenter: MASTROLIA, Pierpaolo

Contribution ID: **19** Type: **not specified**

OPP at two loops

Tuesday 1 October 2024 16:30 (1 hour)

Presenter: PAPADOPOULOS, Konstantinos (Nat. Cent. for Sci. Res. Demokritos (GR))

Contribution ID: **20** Type: **not specified**

Two-loop amplitude reduction in the HELAC framework

Thursday 3 October 2024 14:00 (1 hour)

I will present recent progress in constructing a generic two-loop amplitude reduction algorithm within the computational framework of HELAC. Following the well-known OPP reduction approach at one loop, a two loop amplitude approach is developed. I will also discuss the differences between the 4-2ε and pure 4 dimensional reduction fitting.

Presenter: SPOURDALAKIS, Aris

Contribution ID: **21** Type: **not specified**

Towards numerical computation of dimensionally regularised QCD helicity amplitudes

Tuesday 1 October 2024 17:30 (1 hour)

Presenter: BEVILACQUA, Giuseppe

Contribution ID: **22** Type: **not specified**

Analytic Continuation of Five-Point Two-Loop Master Integrals

Thursday 3 October 2024 15:00 (1 hour)

Presenter: DOKMETZOGLOU, Nikos

Contribution ID: **23** Type: **not specified**

Invariant tension in gravity

Monday 30 September 2024 16:30 (1 hour)

Presenter: BACHAS, Constantin

Contribution ID: **24** Type: **not specified**

Landscape of Yang Mills vacuum fields and condensation of magnetic fluxes in QCD

Friday 4 October 2024 10:00 (1 hour)

The moduli space of covariantly constant gauge fields is infinite-dimensional and describes non-perturbative solutions of the Yang-Mills equation of superposed chromomagnetic flux tubes (vortices) of opposite magnetic charges. These gauge field configurations are stretched along the potential valleys of a constant energy density and are separated by potential barriers between classically degenerate vacua that are forming a complicated potential landscape of the QCD vacuum. It is suggested that the solutions describe the condensate of dense chromomagnetic vortices representing a dual analog of the Cooper pairs condensate in a superconductor. The solutions represent exact non-perturbative solutions of the YM equation in the background chromomagnetic field.

Presenter: SAVVIDY, George

Contribution ID: **25** Type: **not specified**

Dielectric top membranes in plane-wave backgrounds

Friday 4 October 2024 11:00 (1 hour)

We investigate the large-N limit of the BMN matrix model by means of classical bosonic membranes that have spherical topology and spin inside the 11-dimensional maximally supersymmetric plane-wave background. First, we classify all possible M2-brane configurations based on the distribution of their components inside the SO(3) × SO(6) symmetric plane-wave spacetime. We then formulate some simple but very representative ansatze of dielectric tops that rotate in this space. We examine the radial and angular/multipole stability for a wide range of these configurations, locating their regions of stability and instability. We also demonstrate a ”cascade”phenomenon for the membrane instabilities by extending the analysis of fluctuations to higher orders of perturbation theory

Presenter: LINARDOPOULOS, Georgios

Contribution ID: **26** Type: **not specified**

How Arnol'd cat maps probe the properties of black holes

Friday 4 October 2024 14:00 (1 hour)

Presenter: NICOLIS, Stam

Contribution ID: **27** Type: **not specified**

Nested holography

Friday 4 October 2024 15:00 (1 hour)

Presenter: FILIPPAS, Kostas

Contribution ID: **28** Type: **not specified**

Magnetic Defects in Conformal Field Theory

Thursday 3 October 2024 16:30 (1 hour)

Magnetic solenoids in quantum systems can have lead to novel and interesting physics in the deep infrared, owing to the fact that they can be classified by a number, the magnetic flux of the solenoid. We review the general physics of co-dimension two defects with an eye towards studying magnetic defects, and discuss new central charges that arise in these mixed dimensional systems. We comment on holographic constructions of these defects and give some physical observables.

Presenter: ROBERTS, Matthew

Contribution ID: **29** Type: **not specified**

A (super)gravitational perspective on magnetic defects

Localized deformations of quantum field theories present interesting opportunities to enhance our understanding of the features of such theories at different length scales. This class of deformations is of particular interest in light of its applicability to inhomogeneities in cosmological settings, as well as interfaces and impurities in condensed matter systems.

Despite the inherent interest of these systems, they are comparatively difficult to study (especially at strong coupling). Recently, progress has been made in quantifying the properties of these systems by employing a "holographic" duality that rephrases these deformed quantum field theories in terms of the variables of a dual higher dimensional (super)gravity theory. I provide a brief introduction to this application of gauge/gravity duality, focusing on the gravitational dual of a magnetic superconformal defect. I further overview recent notable results in this direction.

Author: ROSEN, Christopher

Presenter: ROSEN, Christopher

Contribution ID: **30** Type: **not specified**

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Presenter: ROSEN, Christopher

Contribution ID: **31** Type: **not specified**

Welcome

Monday 30 September 2024 09:45 (15 minutes)

Presenter: MARKOU, Christos (Director of INPP)