

1st Endogamic Micro-Workshop on Gravity, Supergravity and Superstrings (GRASS)

IFT-UAM/CSIC, May 26th 2017, Aula Gris

Program

10:00 a.m. Eric Bergshoeff (U. Groningen), *Newton-Cartan Geometry and Torsion*: Although Élie Cartan constructed his Newton-Cartan gravity model originally for zero torsion, both in holography and condensed matter realizations of Newton-Cartan gravity with non-zero torsion appear. I will explain why this is the case and how to construct these torsionful gravity theories.

10:40 a.m. Pablo Bueno (K.U. Leuven), *Comments on Squashed-sphere Partition Functions*: We study the partition function of odd-dimensional conformal field theories placed on spheres with a squashed metric. We establish that the round sphere provides a local extremum for the free energy which, in general, is not a global extremum. In addition, we show that the leading quadratic correction to the free energy around this extremum is proportional to the coefficient, C_T , determining the two-point function of the energy-momentum tensor in the CFT. For three-dimensional CFTs, we compute explicitly this proportionality constant for a class of squashing deformations which preserve an $SU(2) \times U(1)$ isometry group on the sphere. In addition, we evaluate the free energy as a function of the squashing parameter for theories of free bosons, free fermions, as well as CFTs holographically dual to Einstein gravity with a negative cosmological constant. We observe that, after suitable normalization, the dependence of the free energy on the squashing parameter for all these theories is nearly universal for a large region of parameter space and is well approximated by a simple quadratic function arising from holography.

11:20 a.m. Coffee Break

11:40 a.m. Samuele Chimento (IFT-UAM/CSIC), *On timelike supersymmetric solutions of Abelian gauged 5-dimensional supergravity*: I will present a family of asymptotically anti-de Sitter timelike supersymmetric solutions of 5-dimensional Abelian gauged supergravity coupled to nv vector multiplets, with couplings determined by the special geometric model $ST[2, nv+1]$. The solutions are obtained under the assumption that the 4-dimensional Kaehler base space admits a holomorphic isometry, in which case its metric can be written in a simple form that generalizes the Gibbons-Hawking metrics. As special cases one recovers the black holes with

one independent angular momentum of Gutowski and Reall and the singular solutions of Behrndt, Chamseddine and Sabra.

12:20 p.m. Pablo Cano (IFT-UAM/CSIC), *Stable black holes in higher-curvature gravity:* We show that four-dimensional black holes become thermodynamically stable below certain mass when the Einstein-Hilbert action is supplemented with higher-curvature terms. The new black holes, which are non-hairy generalizations of Schwarzschild's solution, present a universal thermodynamic behavior for general values of the higher-order couplings. In particular, their temperature is bounded from above and they have infinite lifetimes. I will discuss the evaporation process of these black holes and its possible consequences.

13:00 p.m. Lunch

15:00 p.m. Fabio Riccioni (U. Roma "La Sapienza"), *On orientifold truncations and space-filling branes:* We consider in any dimension the supersymmetric Z_2 truncations of the maximal supergravity theories. These include all orientifold truncations together with additional truncations that can be formally interpreted as being generated by non-perturbative duals of the orientifolds. In each dimension and for each truncation we determine all the sets of space-filling branes that preserve the supersymmetry of the truncated theory. We show that in any dimension below eight these sets always contain exotic branes, that are objects that do not have a ten-dimensional origin. We repeat the same analysis for half-maximal theories and for the $N=2$ theory in four dimensions. In particular, we show the relevance of our analysis in the context of type-II Calabi-Yau orientifolds with fluxes.

15:40 p.m. Carlos Shahbazi (U. Hannover, soon U. Hamburg), *Twisted compactification backgrounds for Heterotic Supergravity:* I will present an infinite family of inequivalent compactification backgrounds of Heterotic Supergravity based on a primary complex Hopf surface X equipped with its canonical locally conformally structure and a flat principal G -bundle. Inequivalent solutions are then parametrized by the character variety $Hom(\pi_1(X), G)/G$. All of them evade the Maldacena-Nunez no-go theorem and have a very rigid behavior under deformations of their complex structure, implying that the corresponding effective theory will have a small number of moduli fields. Time permitting, I will comment on how to include non-flat gauge fields by considering the holomorphic tangent bundle of X as the gauge bundle of the theory.

16:20 p.m. Pedro F. Ramírez (IFT-UAM/CSIC, soon U. Milano), *Smooth geometries from supertubes:* The construction of explicit BPS smooth geometries in the STU model of 5-dimensional Supergravity is still a challenging problem, since the region of the parameter space that produces physically sensible solutions (i.e. without CTCs) is hard to localize. On the other hand, isolated *supertubes* are easy to find

and are known to be related to smooth geometries by simple coordinate transformations when the solutions are embedded in higher dimensional theories. I will summarize this relation and extend it to systems of 3 supertubes in Taub-NUT exploiting the mathematical nature of such transformations as the action of a subgroup of $Sp(8, \mathbb{R})$ on the vector of harmonic functions that characterize the solutions.

17:00 p.m. Óscar Lasso Andino (IFT-UAM/CSIC), *The Quest for the Non-Extremal Non-Abelian Black holes*: I will present some of the paths that we have followed in order to find Non-Extremal Non-Abelian Black hole solutions in 4- and 5- dimensional gauged supergravities. Mimicking the trick used in the abelian case I will show the inconveniences and the advantages of using it in the non abelian one, in both dimensions and for different models. Finally, I will discuss about the insights we are getting and the possible outcomes of our different approaches.

17:40 p.m. Tomás Ortín (IFT-UAM/CSIC), *Selfconsistency of higher-order gravities*: a (Fierz-Pauli) spin-2 field that interacts with matter through the matter energy-momentum tensor must necessarily interact with itself through its own energy-momentum tensor. The consistency of the self-interaction requires the introduction of an infinite series of corrections of higher order in the spin-2 field that has been argued to converge to General Relativity. I examine this problem for theories of higher order in derivatives of the spin-2 field which can be seen as the linearization of theories of higher order in curvature.