

# **Iberian Strings 2020**

## **Report of Contributions**

Contribution ID: 1

Type: **not specified**

## Bootstrapping Quantum Field Theories

*Wednesday, 15 January 2020 09:00 (1 hour)*

I will review the recent revival of the S-matrix Bootstrap approach to QFT. I will also present a new method that relies on unitarity formulated as positive semi-definiteness of the matrix of inner products between asymptotic states (in and out) and states created by the action of local operators on the vacuum. The corresponding matrix elements involve scattering amplitudes, form factors and spectral densities of local operators. We test this method in two-dimensional QFTs by setting up a linear optimization problem that gives a lower bound on the central charge of the UV CFT associated to a QFT with a given mass spectrum of stable particles (and couplings between them).

**Presenter:** PENEDONES, João (EPFL)

**Session Classification:** Plenary

Contribution ID: 2

Type: **not specified**

## **New results in AdS3/CFT2**

*Thursday, 16 January 2020 11:00 (30 minutes)*

**Presenter:** LOZANO, Yolanda

**Session Classification:** Talk

Contribution ID: 3

Type: **not specified**

## **Lorentzian CFT correlators in momentum space**

*Wednesday, 15 January 2020 11:30 (30 minutes)*

**Presenter:** Dr BAUTISTA SOLANS, Teresa (AIE)

**Session Classification:** Talk

Contribution ID: 4

Type: **not specified**

## **Integrable asymmetric lambda-deformations**

*Wednesday, 15 January 2020 12:00 (30 minutes)*

**Presenter:** DRIEZEN, Sibylle

**Session Classification:** Talk

Contribution ID: 5

Type: **not specified**

## Stringy extremal black holes

*Wednesday, 15 January 2020 12:30 (30 minutes)*

**Presenter:** RAMIREZ, Pedro F. (IFT Madrid)

**Session Classification:** Talk

Contribution ID: 6

Type: **not specified**

## **Radiation at strong coupling**

*Wednesday, 15 January 2020 10:00 (30 minutes)*

**Presenter:** FIOL, Bartomeu (University of Barcelona)

**Session Classification:** Talk

Contribution ID: 7

Type: **not specified**

## The Swampland program in String Theory

*Wednesday, 15 January 2020 15:00 (1 hour)*

In this talk I will review the most important Swampland Conjectures and their string theoretical motivation. This includes the Weak Gravity and the Distance Conjectures among others. I will discuss the evidence that we have gathered in the past in support of these conjectures, as well as recent developments based on the asymptotic structure of moduli spaces of string compactifications. I will also comment on the phenomenological implications and the relation between the different conjectures.

**Presenter:** VALENZUELA, Irene**Session Classification:** Plenary



Contribution ID: 8

Type: **not specified**

## **S-folds and supersymmetric Janus solutions**

*Wednesday, 15 January 2020 16:00 (30 minutes)*

**Presenter:** GUARINO, Adolfo

**Session Classification:** Talk

Contribution ID: 9

Type: **not specified**

## **Holographic and composite axions**

*Thursday, 16 January 2020 09:00 (1 hour)*

**Presenter:** KIRITSIS, Elias

**Session Classification:** Plenary

Contribution ID: 10

Type: **not specified**

## Real-Time Dynamics of Plasma Balls in a Confining Background

*Thursday, 16 January 2020 10:00 (30 minutes)*

Plasma balls are droplets of deconfined plasma surrounded by a confining vacuum. We present the first holographic simulation of their real-time dynamics via the dynamics of localised, finite-energy black holes in the AdS soliton background. We consider horizonless initial data sourced by a massless scalar field. Upon time evolution, prompt scalar field collapse produces an excited black hole that eventually settles down to equilibrium at the bottom of the AdS soliton. The radiation emitted in the process can be described as a superposition of the gapped and discrete set of asymptotic states of the confining phase. We discuss the applicability of hydrodynamics to describe the evolution of the system.

**Presenter:** MATEOS, David (ICREA & U. Barcelona)

**Session Classification:** Talk

Contribution ID: 11

Type: **not specified**

## **Anisotropic states from smeared branes**

*Wednesday, 15 January 2020 11:00 (30 minutes)*

**Presenter:** HOYOS, Carlos

**Session Classification:** Talk

Contribution ID: 12

Type: **not specified**

## **Flowing to N=3 Chern–Simons-matter theory**

*Thursday, 16 January 2020 11:30 (30 minutes)*

**Presenter:** TARRÍO, Javier

**Session Classification:** Talk

Contribution ID: 13

Type: **not specified**

# Supersymmetric RG Flows from Spatially Varying Couplings

*Thursday, 16 January 2020 12:00 (30 minutes)*

**Presenter:** ROSEN, Christopher

**Session Classification:** Talk

Contribution ID: 15

Type: **not specified**

## **SYK-inspired approach to flat space holography**

*Thursday, 16 January 2020 15:00 (30 minutes)*

**Presenter:** GRUMILLER, Daniel (TU Wien)

**Session Classification:** Talk

Contribution ID: 16

Type: **not specified**

## Holographic Complex CFTs

*Thursday, 16 January 2020 15:30 (30 minutes)*

**Presenter:** FAEDO, Antón (Universitat de Barcelona)

**Session Classification:** Talk



Contribution ID: 17

Type: **not specified**

## **Complexity measures in QFT and constrained geometric actions.**

*Thursday, 16 January 2020 16:00 (30 minutes)*

**Presenter:** Dr BUENO, Pablo (Centro Atómico Bariloche)

**Session Classification:** Talk

Contribution ID: **18**

Type: **not specified**

## **Near Horizon Symmetries**

*Thursday, 16 January 2020 17:00 (30 minutes)*

**Presenter:** ZWICKEL, Celine

**Session Classification:** Talk

Contribution ID: 19

Type: **not specified**

## Operator Complexity beyond Scrambling

*Friday, 17 January 2020 09:00 (1 hour)*

I review aspects of quantum complexity and its holographic counterpart, applied to operator growth in chaotic systems. At time scales longer than the scrambling time, the size of the operator ceases to be a good characterization of its complexity growth. I will show that a new notion of operator complexity, called Krylov-complexity, satisfies the expected linear growth at long times as a result of the ETH hypothesis in chaotic systems. Second, a holographic understanding of this linear growth follows in a holographic setting from the properties of extremal-volume surfaces in the interior of a black hole.

**Presenter:** FERNANDEZ BARBON, Jose (Unknown)

**Session Classification:** Plenary

Contribution ID: 20

Type: **not specified**

## **Weyl metrics and Wiener-Hopf factorization**

*Friday, 17 January 2020 10:00 (30 minutes)*

**Presenter:** CARDOSO, Gabriel

**Session Classification:** Talk

Contribution ID: 21

Type: **not specified**

## Homotopy transfer of $L_\infty$ algebras

*Friday, 17 January 2020 11:00 (30 minutes)*

**Presenter:** LEKEU, Victor (Imperial College London)

**Session Classification:** Talk

Contribution ID: 22

Type: **not specified**

## **Backreacted D3-D5 intersections**

*Friday, 17 January 2020 12:00 (30 minutes)*

**Presenter:** MANUEL PENÍN, José

**Session Classification:** Talk

Contribution ID: 23

Type: **not specified**

## **Alpha' corrections of Reissner-Nordstrom black holes**

*Friday, 17 January 2020 11:30 (30 minutes)*

**Presenter:** CANO MOLINA-NIÑIROLA, Pablo Antonio

**Session Classification:** Talk

Contribution ID: 24

Type: **not specified**

## **Anomalies in F-theory**

*Friday, 17 January 2020 15:00 (30 minutes)*

**Presenter:** CORVILAIN, Pierre (IFT)

**Session Classification:** Talk



Contribution ID: 25

Type: **not specified**

## **Holographic Collisions and the QCD Critical Point**

*Friday, 17 January 2020 15:30 (30 minutes)*

**Presenter:** BEA, Yago (Queen Mary University of London)

**Session Classification:** Talk

Contribution ID: 26

Type: **not specified**

## **Strings are (visco)-elastic**

*Friday, 17 January 2020 16:00 (30 minutes)*

**Presenter:** BAGGIOLI, Matteo

**Session Classification:** Talk

Contribution ID: 27

Type: **not specified**

## T-duality equivalences beyond string theory

*Thursday, 16 January 2020 12:30 (15 minutes)*

The leading order low-energy effective action of string theory is symmetric under T-duality transformations, and although these are such that geometric properties of solutions may change substantially, they still preserve the Hawking temperature and entropy of black holes. The question naturally arises whether this fact holds when one includes higher-order corrections. In this work we present a two-parameter family of actions which contains the alpha prime corrected actions of string theories for some values of the parameters and derive the corrected T-duality rules. Then we show that temperature and entropy of solutions with black hole horizons are preserved under the corrected rules, and this is so even for values of the parameters which do not correspond to effective string theory actions, indicating that T-duality might also provide physical equivalences in cases which do not have a known sigma model.

**Presenter:** VILAR LÓPEZ, Alejandro (University of Santiago de Compostela)

**Session Classification:** short talk

Contribution ID: 28

Type: **not specified**

## Discrete symmetries in dimer diagrams

*Wednesday, 15 January 2020 18:00 (15 minutes)*

Following the paper called Discrete Symmetries in Dimer Diagrams (<https://arxiv.org/abs/1907.06938>), we apply dimer diagram techniques to uncover discrete global symmetries in the fields theories on D3-branes at singularities given by general orbifolds of general toric Calabi-Yau threefold singularities. The discrete symmetries are discrete Heisenberg groups, with two generators  $A, B$  with commutation  $AB=BAC$ , with  $C$  a central element. These generators depend on the abelian orbifold. This fully generalizes observations in particular orbifolds of the flat space, the conifold and other toric Sasaki-Einstein manifolds. The generator  $A$  is realized as a shift in the dimer diagram, associated to the orbifold quantum symmetry; the action of  $B$  is determined by equations describing a 1-form in the dimer graph in the unit cell of the parent theory with twisted boundary conditions; finally,  $C$  is an element of the (mesonic and baryonic) non-anomalous  $U(1)$  symmetries, determined by geometric identities involving the elements of the dimer graph of the parent theory. These discrete global symmetries of the quiver gauge theories are holographically dual to discrete gauge symmetries from torsion cycles in the horizon. Our findings allow to easily construct the discrete symmetries for infinite classes of orbifolds.

**Presenter:** Mr MININNO, Alessandro (Instituto de Física Teórica UAM-CSIC)

**Session Classification:** short talk

Contribution ID: 29

Type: **not specified**

## All higher-curvature gravities as Generalized quasi-topological gravities

*Friday, 17 January 2020 12:30 (15 minutes)*

Generalized quasi-topological gravities (GQTGs) are higher-curvature extensions of Einstein gravity characterized by the existence of non-hairy generalizations of the Schwarzschild black hole which satisfy  $g_{\{t\}g_{\{rr\}} = -1$ , as well as for having second-order linearized equations around maximally symmetric backgrounds. In this talk I will provide strong evidence that any gravitational effective action involving higher-curvature corrections is equivalent, via metric redefinitions, to some GQTG. This suggests that the physics of generic higher-curvature gravity black holes is captured by their GQTG counterparts, dramatically easier to characterize and universal. The talk is based in the preprint <https://arxiv.org/abs/1906.00987> (already accepted in JHEP).

**Presenter:** MURCIA, Angel (Instituto de Física Teórica)

**Session Classification:** short talk

Contribution ID: 30

Type: **not specified**

## Extremal Rotating Black Holes in Einsteinian Cubic Gravity

*Thursday, 16 January 2020 12:45 (15 minutes)*

New solutions of Einsteinian cubic gravity coupled to a Maxwell field that describe the near-horizon geometry of charged and rotating black holes are presented. We show that the  $\text{AdS}_2 \times \mathbb{S}^2$  near-horizon geometry of Reissner-Nordström black holes receives no corrections, but deviations with respect to the extremal Kerr-Newman solution appear as we turn on the angular momentum. We provide analytic slowly-spinning approximations, as well as numeric solutions for these corrected geometries, but we also find additional solutions that do not reduce to  $\text{AdS}_2 \times \mathbb{S}^2$  geometries in any limit and that do not have a counterpart in Einstein gravity. Remarkably, we are able to obtain closed-form exact expressions for the area and Wald's entropy of all of these black holes. To the best of our knowledge, this is the first time the entropy of a rotating black hole in higher-order gravity has been exactly computed. Using this result, we analyze the phase space of extremal black holes, which turns out to be considerably more involved than the situation in Einstein gravity.

**Presenter:** PEREÑÍGUEZ RODRÍGUEZ, David

**Session Classification:** short talk

Contribution ID: 31

Type: **not specified**

## Universal properties of Kaluza-Klein gravitons

*Wednesday, 15 January 2020 17:00 (15 minutes)*

Vacua of different gaugings of  $D = 4, \mathcal{N} = 8$  supergravity that preserve the same supersymmetries and bosonic symmetry tend to exhibit the same universal mass spectrum within their respective supergravities. For  $\text{AdS}_4$  vacua in gauged supergravities that arise upon consistent truncation of string/M-theory, we will show in this talk that this universality is lost at higher Kaluza-Klein levels, but still present in a milder form, as certain sums over a finite number of states remain universal. Further, we propose an  $\text{SL}(8)$ -covariant mass matrix for Kaluza-Klein gravitons which is valid for all the  $\text{AdS}_4$  vacua considered and resembles those for the supergravity fields at level zero. The universality of mass sums is related to the trace of this mass matrix.

**Presenter:** Mr LARIOS, Gabriel (IFT UAM-CSIC and Universidad Autónoma de Madrid)

**Session Classification:** short talk

Contribution ID: 32

Type: **not specified**

## ” Supersymmetry Breaking Warped Throats and the Weak Gravity Conjecture

*Thursday, 16 January 2020 17:45 (15 minutes)*

The proposal for a new Swampland conjecture forbidding stable non-supersymmetric “locally AdS” warped throats, which generalizes the Swampland criterion forbidding stable non-supersymmetric AdS vacua, is discussed. The conjecture is motivated by the properties of systems of fractional D3-branes at singularities, and can be used to rule out large classes of warped throats with supersymmetry breaking ingredients, and their possible application to de Sitter uplift. In particular, this allows to reinterpret the runaway instabilities of the gravity dual of fractional branes in the dP1 theory, and to rule out warped throats with Dynamical Supersymmetry Breaking D-brane sectors at their bottom. Another example are warped throats with supersymmetry broken by the introduction of anti-orientifold planes. These examples lead to novel decay mechanisms in explicit non-supersymmetric examples of locally AdS warped throats, and also of pure AdS backgrounds. Based on arXiv:1810.07673

**Presenter:** BURATTI, Ginevra (Instituto de Fisica Teorica (IFT) UAM-CSIC)

**Session Classification:** short talk



Contribution ID: 33

Type: **not specified**

## Twisted $N=1$ SCFTs and their AdS3 duals

*Wednesday, 15 January 2020 17:15 (15 minutes)*

We study compactifications of an infinite family of four-dimensional  $N=1$  SCFTs on a Riemann surface in the presence of arbitrary background fluxes of global symmetries. The four-dimensional parent theories have holographic Sasaki–Einstein duals in type IIB string theory. Central charges and R-charges of baryonic operators in the resulting two-dimensional  $N=(0,2)$  theories are computed in three distinct ways: from the field theory side utilizing the  $c$ -extremization principle, its recently discovered geometric dual formulation, and holographically using new AdS3 duals of two-dimensional field theories.

**Presenter:** HET LAM, Huibert**Session Classification:** short talk

Contribution ID: 34

Type: **not specified**

## Shape Dependence of Renormalized Holographic Entanglement Entropy

*Thursday, 16 January 2020 18:00 (15 minutes)*

We show some results concerning the holographic entanglement entropy of deformed entangling regions in three-dimensional CFTs dual to Einstein-AdS gravity, using the extrinsic counterterms renormalization scheme. In this prescription, valid for arbitrary dimension, entanglement entropy is given by the sum of a topological term and a geometrical part that explicitly describes the deformation of the entangling surface. Then, we will discuss the relation of the geometrical part to the Willmore energy, stressing on the link between the strong subadditivity property and the AdS curvature.

**Presenter:** MORENO, Javier (Pontificia Universidad Católica de Valparaíso)

**Session Classification:** short talk

Contribution ID: 35

Type: **not specified**

## Non-perturbative Mellin Amplitudes

*Wednesday, 15 January 2020 17:30 (15 minutes)*

We argue that nonperturbative CFT correlation functions admit Mellin amplitude representation. Perturbative Mellin representation readily follows. We derive main properties of nonperturbative CFT Mellin amplitudes: analyticity, unitarity and polynomial boundedness at infinity. We consider dispersion relations for Mellin amplitudes and use them to derive bootstrap bounds and constrain AdS effective actions. We analyze the bootstrap bounds in the case of the 3d Ising model. Mellin amplitudes are particularly simple for large N CFTs and 2D rational CFTs. We discuss these special cases to illustrate general ideas on concrete examples.

**Presenter:** ALVES DA SILVA, Joao Pedro (EPFL - EPF Lausanne)

**Session Classification:** short talk

Contribution ID: 36

Type: **not specified**

## Momentum/Complexity Duality and the Black Hole Interior

*Wednesday, 15 January 2020 18:15 (15 minutes)*

Notions of operator complexity characterize how fast information scrambles in a many body quantum system. For holographic systems, it has recently been conjectured that the ‘size’ of an operator can be interpreted in terms of the mechanical momentum of an effective particle in the bulk. In this talk, I will first introduce a different notion of operator complexity for holographic systems by using the VC prescription. I will then show that an exact formulation of the momentum/complexity duality holds for the particular case of spherical thin shell operators. In this picture, the late time linear growth of the operator complexity is due to an exponential time freeze in the black hole interior. I will comment on the precise duality, and on possible generalizations.

**Presenter:** SASIETA, Martin (IFT UAM-CSIC)

**Session Classification:** short talk

Contribution ID: 37

Type: **not specified**

## Instanton Corrections and Emergent Strings

*Wednesday, 15 January 2020 17:45 (15 minutes)*

We study limits of infinite distance in the moduli space of 4d  $N = 2$  string compactifications, in which instanton effects dominate. We first consider trajectories in the hypermultiplet moduli space of type IIB Calabi-Yau compactifications. We observe a correspondence between towers of D-brane instantons and D-brane 4d strings, such that the lighter the string the more relevant the instanton effects are. The dominant instantons modify the classical trajectory such that the lightest D-brane string is boosted to a tensionless regime, while the other strings are prevented to go below the fundamental string tension. This tensionless string is dual to a weakly-coupled fundamental type IIB string, and realises the Emergent String Conjecture in this setup. We also consider the vector multiplet moduli space of type I string theory on  $K3 \times T^2$ . We find that quantum corrections may turn a decompactification limit to an emergent string limit, consistently with existing results in dual setups.

**Presenter:** WIESNER, Max (IFT UAM-CSIC)

**Session Classification:** short talk

Contribution ID: 38

Type: **not specified**

## The many paths across a phase transition

*Thursday, 16 January 2020 17:30 (15 minutes)*

We use holography to study the complete set of inhomogenous static solutions of a four-dimensional gauge theory with a first order thermal phase transition. We numerically solve Einstein's equations using both static and dynamical methods, finding perfect agreement between the results. We analyze their thermodynamic properties and study their local stability, finding unstable solutions. For these solutions, we perform the time evolution and determine the endpoint of the dynamical evolution. As the size of the box is increased, we find solutions that tend to a phase separated configuration in which the high and low energy phases coexist at the critical temperature.

**Presenter:** SÁNCHEZ GARITAONANDIA, Mikel (Universitat de Barcelona)

**Session Classification:** short talk

Contribution ID: 39

Type: **not specified**

## **From COST to GenHET: Initiatives in gender in HET**

*Thursday, 16 January 2020 18:15 (15 minutes)*

talk + open discussion

**Presenter:** LOZANO, Yolanda

**Session Classification:** short talk

Contribution ID: 40

Type: **not specified**

## Leading higher-derivative corrections to the Kerr geometry

*Friday, 17 January 2020 12:45 (15 minutes)*

I will talk about a recent paper JHEP 1905 (2019) 189, where we compute the most general leading-order correction to the Kerr solution when the Einstein-Hilbert action is supplemented with higher-derivative terms, including the possibility of dynamical couplings controlled by scalars. The model we present depends on five parameters and it contains, as particular cases, Einstein-dilaton-Gauss-Bonnet gravity, dynamical Chern-Simons gravity and the effective action coming from Heterotic Superstring theory. We study several properties of the corrected black holes, such as geometry of the horizon, ergosphere, light rings and scalar hair.

**Presenter:** RUIPÉREZ VICENTE, Alejandro (Instituto de Física Teórica UAM/CSIC)

**Session Classification:** short talk



Contribution ID: 41

Type: **not specified**

## Registration

*Wednesday, 15 January 2020 08:30 (20 minutes)*

Contribution ID: 42

Type: **not specified**

## Welcome

*Wednesday, 15 January 2020 08:50 (10 minutes)*