

**Publications of the ERC Advanced grant 669228**

**Gravity, Holography and the Standard Model**

July 17, 2020

## The outline of the project

1. **E. Kiritsis**,  
*“Gravity and axions from a random UV QFT,”*  
Published in EPJ Web Conf. **71** (2014), 00068  
[ArXiv:1408.3541][hep-ph].

## Central papers of the project

2. **C. Charmousis, E. Kiritsis and F. Nitti**,  
*“Holographic self-tuning of the cosmological constant,”*  
Published in JHEP **09** (2017), 031  
[ArXiv:1704.05075] [hep-th].
3. **D. Arean, I. Iatrakis, M. Jarvinen and E. Kiritsis**,  
*“CP-odd sector and  $\theta$  dynamics in holographic QCD,”*  
Published in Phys. Rev. D **96** (2017) no.2, 026001  
[ArXiv:1609.08922][hep-ph].
4. **E. Kiritsis, F. Nitti** and L. Silva Pimenta,  
*“Exotic RG Flows from Holography,”*  
Published in Fortsch. Phys. **65** (2017) no.2, 1600120  
[ArXiv:1611.05493] [hep-th].
5. **A. Hebecker, P. Henkenjohann and L. T. Witkowski**,  
*“What is the Magnetic Weak Gravity Conjecture for Axions?,”*  
Published in Fortsch. Phys. **65** (2017) no.3-4, 1700011  
[ArXiv:1701.06553] [hep-th].
6. **V. Domcke, F. Muia, M. Pieroni and L. T. Witkowski**,  
*“PBH dark matter from axion inflation,”*  
Published in JCAP **07** (2017), 048  
[ArXiv:1704.03464] [astro-ph.CO].
7. **F. Nitti, L. Silva Pimenta and D. A. Steer**,  
*“On multi-field flows in gravity and holography,”*  
Published in JHEP **07** (2018), 022  
[ArXiv:1711.10969][hep-th].
8. **J. K. Ghosh, E. Kiritsis, F. Nitti and L. T. Witkowski**,  
*“Holographic RG flows on curved manifolds and quantum phase transitions,”*  
Published in JHEP **05** (2018), 034  
[ArXiv:1711.08462] [hep-th].

9. U. Gursöy, **E. Kiritsis**, **F. Nitti** and L. Silva Pimenta,  
“*Exotic holographic RG flows at finite temperature,*”  
Published in JHEP **10** (2018), 173  
[ArXiv:1805.01769] [hep-th].
10. **J. K. Ghosh**, **E. Kiritsis**, **F. Nitti** and **L. T. Witkowski**,  
“*De Sitter and Anti-de Sitter branes in self-tuning models,*”  
Published in JHEP **11** (2018), 128  
[ArXiv:1807.09794] [hep-th].
11. **J. K. Ghosh**, **E. Kiritsis**, **F. Nitti** and **L. T. Witkowski**,  
“*Holographic RG flows on curved manifolds and the F-theorem,*”  
Published in JHEP **02** (2019), 055  
[ArXiv:1810.12318] [hep-th].
12. **P. Anastasopoulos**, **P. Betzios**, **M. Bianchi**, D. Consoli and **E. Kiritsis**,  
“*Emergent/Composite axions,*”  
Published in JHEP **19** (2020), 113  
[ArXiv:1811.05940] [hep-ph].
13. **E. Kiritsis** and A. Tsouros,  
“*de Sitter versus Anti de Sitter flows and the (super)gravity landscape,*”  
[ArXiv:1901.04546][hep-th].
14. **P. Betzios**, **E. Kiritsis** and O. Papadoulaki,  
“*Euclidean Wormholes and Holography,*”  
Published in JHEP **06** (2019), 042  
[ArXiv:1903.05658 ] [hep-th].
15. A. Amariti, **C. Charmousis**, **D. Forcella**, **E. Kiritsis** and **F. Nitti**,  
“*Brane cosmology and the self-tuning of the cosmological constant,*”  
Published in JCAP **10** (2019), 007  
[ArXiv:1904.02727] [hep-th].
16. **Y. Hamada**, **E. Kiritsis**, **F. Nitti** and **L. T. Witkowski**,  
“*Axion RG flows and the holographic dynamics of instanton densities,*”  
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[ArXiv:1905.03663] [hep-th].
17. F. Bigazzi, A. L. Cotrone, **M. Jarvinen** and **E. Kiritsis**,  
“*Non-derivative Axionic Couplings to Nucleons at large and small N,*”  
Published in JHEP **01** (2020), 100  
[ArXiv:1906.12132] [hep-ph].
18. **Y. Hamada**, **E. Kiritsis**, **F. Nitti** and **L. T. Witkowski**,  
“*The self-tuning of the cosmological constant and the holographic relaxation,*”  
[ArXiv:2001.05510][hep-th].

19. **J. K. Ghosh, E. Kiritsis, F. Nitti and L. T. Witkowski,**  
*“Back-reaction in massless de Sitter QFTs: holography, gravitational DBI action and  $f(R)$  gravity,”*  
 [ArXiv:2003.09435] [hep-th].
20. **P. Betzios** and O. Papadoulaki,  
*“Brane Cosmology and the self-tuning of the cosmological constant in the presence of bulk black holes,”*  
 [ArXiv:2003.05767] [hep-th].
21. **E. Kiritsis, F. Nitti** and E. Préau,  
*“Holographic QFTs on  $S^2 \times S^2$ , spontaneous symmetry breaking and Efimov saddle points,”*  
 [ArXiv:2005.09054][hep-th].
22. **P. Betzios, E. Kiritsis, V. Niarchos** and O. Papadoulaki,  
*“Global symmetries, hidden sectors and emergent (dark) vector interactions,”*  
 [ArXiv:2006.01840][hep-ph].

### Other papers by the researchers of the project

23. B. Goutéraux, **E. Kiritsis** and W. J. Li,  
*“Effective holographic theories of momentum relaxation and violation of conductivity bound,”*  
 Published in JHEP **04** (2016), 122  
 [ArXiv:1602.01067] [hep-th].
24. D. J. Brooker, **N. C. Tsamis** and R. P. Woodard,  
*“Improving the Single Scalar Consistency Relation,”*  
 Published in Phys. Lett. B **773** (2017), 225-230  
 [ArXiv:1603.06399] [astro-ph.CO].
25. F. Aprile and **V. Niarchos,**  
*“ $\mathcal{N} = 2$  supersymmetric field theories on 3-manifolds with A-type boundaries,”*  
 Published in JHEP **07** (2016), 126  
 [ArXiv:1604.01561] [hep-th].
26. D. J. Brooker, **N. C. Tsamis** and R. P. Woodard,  
*“Effect of features on the functional form of the scalar power spectrum,”*  
 Published in Phys. Rev. D **94** (2016) no.4, 044020  
 [ArXiv:1605.02729] [gr-qc].
27. J. Armas, J. Gath, **V. Niarchos,** N. A. Obers and A. V. Pedersen,  
*“Forced Fluid Dynamics from Blackfolds in General Supergravity Backgrounds,”*

- Published in JHEP **10** (2016), 154  
[ArXiv:1606.09644] [hep-th].
28. **N. C. Tsamis** and R. P. Woodard,  
“*Improved cosmological model,*”  
Published in Phys. Rev. D **94** (2016) no.4, 043508  
[ArXiv:1606.06967] [gr-qc].
29. **E. Kiritsis** and L. Li,  
“*Quantum Criticality and DBI Magneto-resistance,*”  
Published in J. Phys. A **50** (2017) no.11, 115402  
[ArXiv:1608.02598][cond-mat.str-el].
30. I. Iatrakis, **E. Kiritsis**, C. Shen and D. L. Yang,  
“*Holographic Photon Production in Heavy Ion Collisions,*”  
Published in JHEP **04** (2017), 035  
[ArXiv:1609.07208] [hep-ph].
31. M. Baggio, **V. Niarchos**, **K. Papadodimas** and G. Vos,  
“*Large- $N$  correlation functions in  $\mathcal{N} = 2$  superconformal QCD,*”  
Published in JHEP **01** (2017), 101  
[ArXiv:1610.07612] [hep-th].
32. **E. Kiritsis** and Y. Matsuo,  
“*Hyperscaling-Violating Lifshitz hydrodynamics from black-holes: Part II,*”  
Published in JHEP **03** (2017), 041  
[ArXiv:1611.04773] [hep-th].
33. I. Iatrakis, **E. Kiritsis**, C. Shen and D. L. Yang,  
“*Direct-Photon Spectra and Anisotropic Flow in Heavy Ion Collisions from Holography,*”  
Published in EPJ Web Conf. **137** (2017), 07029  
[ArXiv:1611.04848][hep-ph].
34. I. Iatrakis, **E. Kiritsis**, C. Shen and D. L. Yang,  
“*Holographic Photon Production and Anisotropic Flow,*”  
Published in Nucl. Part. Phys. Proc. **289-290** (2017), 177-180  
[ArXiv:1612.05114] [nucl-th].
35. S. Basu, **N. C. Tsamis** and R. P. Woodard,  
“*Causality Implies Inflationary Back-Reaction,*”  
Published in JHEP **07** (2017), 037  
[ArXiv:1612.07406] [gr-qc].
36. **M. Baggioli**, B. Goutéraux, **E. Kiritsis** and W. J. Li,  
“*Higher derivative corrections to incoherent metallic transport in holography,*”  
Published in JHEP **03** (2017), 170  
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37. **V. Niarchos**,  
*“Holographic entanglement entropy in open-closed string duality,”*  
 [ArXiv:1701.03113] [hep-th].
38. M. Baggio, **V. Niarchos** and **K. Papadodimas**,  
*“Aspects of Berry phase in QFT,”*  
 Published in JHEP **04** (2017), 062  
 [ArXiv:1701.05587] [hep-th].
39. S. P. Miao, **N. C. Tsamis** and R. P. Woodard,  
*“Invariant measure of the one-loop quantum gravitational backreaction on inflation,”*  
 Published in Phys. Rev. D **95** (2017) no.12, 125008  
 [ArXiv:1702.05694] [gr-qc].
40. **M. Baggioli** and W. J. Li,  
*“Diffusivities bounds and chaos in holographic Horndeski theories,”*  
 Published in JHEP **07** (2017), 055  
 [ArXiv:1705.01766][hep-th].
41. T. Andrade, **M. Baggioli**, A. Krikun and N. Poovuttikul,  
*“Pinning of longitudinal phonons in holographic spontaneous helices,”*  
 Published in JHEP **02** (2018), 085  
 [ArXiv:1708.08306] [hep-th].
42. D. J. Brooker, **N. C. Tsamis** and R. P. Woodard,  
*“Analytic approximation for the primordial spectra of single scalar potential models and its use in their reconstruction,”*  
 Published in Phys. Rev. D **96** (2017) no.10, 103531  
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43. A. Hebecker, P. Henkenjohann and **L. T. Witkowski**,  
*“Flat Monodromies and a Moduli Space Size Conjecture,”*  
 Published in JHEP **12** (2017), 033  
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44. L. Alberte, M. Ammon, **M. Baggioli**, A. Jimenez and O. Pujolas,  
*“Black hole elasticity and gapped transverse phonons in holography,”*  
 Published in JHEP **01** (2018), 129  
 [ArXiv:1708.08477] [hep-th].
45. A. Armoni and **V. Niarchos**,  
*“Phases of  $QCD_3$  from Non-SUSY Seiberg Duality and Brane Dynamics,”*  
 Published in Phys. Rev. D **97** (2018) no.10, 106001  
 [ArXiv:1711.04832][hep-th].
46. **P. Betzios**, N. Gaddam and O. Papadoulaki, *“Antipodal correlation on the meron wormhole and a bang-crunch universe,”*  
 Published in Phys. Rev. D **97** (2018) no.12, 126006  
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47. L. Alberte, M. Ammon, A. Jimenez-Alba, **M. Baggioli** and O. Pujolas,  
*“Holographic Phonons,”* Published in Phys. Rev. Lett. **120** (2018) no.17, 171602  
[ArXiv:1711.03100] [hep-th].
48. **P. Betzios** and O. Papadoulaki,  
*“FZZT branes and non-singlets of Matrix Quantum Mechanics,”*  
[ArXiv:1711.04369][hep-th].
49. D. J. Brooker, **N. C. Tsamis** and R. P. Woodard,  
*“From Non-trivial Geometries to Power Spectra and Vice Versa,”* Published in  
JCAP **04** (2018), 003 [ArXiv:1712.03462] [gr-qc].
50. M. Ammon, **M. Baggioli**, A. Jimenez-Alba and S. Moeckel,  
*“A smeared quantum phase transition in disordered holography,”*  
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51. **M. Baggioli**, B. Padhi, P. W. Phillips and C. Setty,  
*“Conjecture on the Butterfly Velocity across a Quantum Phase Transition,”*  
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52. **M. Baggioli** and A. Buchel,  
*“Holographic Viscoelastic Hydrodynamics,”* Published in JHEP **03** (2019), 146  
[ArXiv:1805.06756] [hep-th].
53. **V. Niarchos**,  
*“Geometry of Higgs-branch superconformal primary bundles,”*  
Published in Phys. Rev. D **98** (2018) no.6, 065012  
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54. L. Alberte, **M. Baggioli**, V. C. Castillo and O. Pujolas,  
*“Elasticity bounds from Effective Field Theory,”*  
Published in Phys. Rev. D **100** (2019) no.6, 065015  
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55. **P. Betzios**, U. Gursoy, **M. Jarvinen** and G. Policastro,  
*“Fluctuations in a nonconformal holographic plasma at criticality,”*  
Published in Phys. Rev. D **101** (2020) no.8, 086026  
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56. **M. Baggioli** and K. Trachenko,  
*“Low frequency propagating shear waves in holographic liquids,”*  
Published in JHEP **03** (2019), 093  
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57. A. Armoni and **V. Niarchos**,  
*“QCD<sub>3</sub> with two-index quarks, mirror symmetry, and fivebrane anti-BIons near orientifolds,”*

- Published in Phys. Rev. D **98** (2018) no.11, 114009  
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58. **M. Baggioli** and K. Trachenko,  
*“Maxwell interpolation and close similarities between liquids and holographic models,”*  
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59. J. Hayling, **V. Niarchos** and C. Papageorgakis, *“Deconstructing Defects,”*  
Published in JHEP **02** (2019), 067  
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60. **Y. Hamada**, T. Noumi and G. Shiu,  
*“Weak Gravity Conjecture from Unitarity and Causality,”*  
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*“Meta-stable non-extremal anti-branes,”*  
Published in Phys. Rev. Lett. **122** (2019) no.18, 181601  
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62. **Y. Hamada**, A. Hebecker, G. Shiu and P. Soler,  
*“On brane gaugino condensates in 10d,”*  
Published in JHEP **04** (2019), 008  
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63. **Y. Hamada**, A. Hebecker, G. Shiu and P. Soler,  
*“Understanding KKLT from a 10d perspective,”*  
Published in JHEP **06** (2019), 019  
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64. J. Armas, N. Nguyen, **V. Niarchos** and N. A. Obers,  
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65. G. P. De Brito, **Y. Hamada**, A. D. Pereira and M. Yamada,  
*“On the impact of Majorana masses in gravity-matter systems,”*  
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[ArXiv:1905.11114] [hep-th].
66. S. Basu, D. J. Brooker, **N. C. Tsamis** and R. P. Woodard,  
*“Non-Gaussianity from features in the power spectrum,”*  
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67. **Y. Hamada**, M. Ibe, Y. Muramatsu, K. y. Oda and N. Yokozaki,  
“*Proton decay and axion dark matter in  $SO(10)$  grand unification via minimal left-right symmetry,*”  
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68. **P. Betzios** and O. Papadoulaki,  
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69. **P. Betzios**, N. Gaddam and O. Papadoulaki,  
“*Black holes, quantum chaos, and the Riemann hypothesis,*”  
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70. **Y. Hamada**, K. Kawana and A. Scherlis,  
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71. N. Angelinos, **E. Kiritsis** and F. Pena-Benitez,  
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[ArXiv:2007.04763] [cond-mat.str-el].
72. A. Kyriazis, S. P. Miao, **N. C. Tsamis** and R. P. Woodard,  
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