MP 10: AdS/CFT Correspondence II

Time: Thursday 14:00–15:20 Location: ZEU/0250

MP 10.1 Thu 14:00 ZEU/0250

Towards a Quantum Chaotic Dual of JT Gravity — •Fabian Haneder, Torsten Weber, Camilo Moreno, Juan Diego Urbina, and Klaus Richter — Universität Regensburg, Deutschland

Jackiw-Teitelboim (JT) quantum gravity is a two-dimensional model that has received a striking amount of attention in recent years as a simple example of holography, given its duality to the low-energy regime of the SYK model, as well as full perturbative equivalence to a matrix model found by Saad, Shenker and Stanford. We take first steps towards establishing a further duality between JT gravity and the chaotic quantum dynamics of a particle on a high dimensional compact manifold of constant negative curvature. The presence of a single system, instead of an ensemble, on the non-gravitational side of the duality allows us to identify possible degrees of freedom and corresponding mechanisms responsible for the quantum-chaotic features in JT gravity. We address key aspects of JT correlation functions by showing how the Schwarzian density of states, which bridges quantum gravity and disordered systems, such as SYK, is identical to the Weyl (smooth) term of the Selberg trace formula describing exactly the quantum spectrum on the compact manifold. Time permitting, we use periodic orbit theory to derive an effective trace formula over coarse-grained bundles of geodesics, and show that it admits a genus expansion structurally identical to the JT correlators.

MP 10.2 Thu 14:20 ZEU/0250

Aspects of Holography in Three-Dimensional Asymptotically Flat Spacetimes — •Michel Pannier — FSU Jena

A well-studied realisation of the Holographic Principle is provided by the AdS/CFT duality. However, Holography is expected to hold in rather general circumstances and should be extended to different examples, such as models containing asymptotically de Sitter or flat spacetimes. The latter is the idea of the talk, in particular focusing on the introduction of propagating, massive degrees of freedom to an otherwise purely topological three-dimensional theory of gravity. Particular emphasis is laid on the utilisation of techniques that are known from the study of higher-spin gravity as a Chern-Simons gauge theory.

MP 10.3 Thu 14:40 ZEU/0250

Geometric phases describing quantum systems with or without gravity — Souvik Banerjee[1,2], •Moritz Dorband[1,2], Johanna Erdmenger[1,2], and Anna-Lena Weigel[1,2] — [1]Institute for Theoretical Physics and Astrophysics, Julius-Maximilians-University Würzburg, 97074 Würzburg, Germany — [2]Würzburg-Dresden Cluster of Excellence ct.qmat

We discuss why the geometric phase is important to fully describe a quantum system, with or without gravity, by providing knowledge about the geometry and/or topology of its microscopic phase space. We illustrate this with several examples, ranging from a single spin in a magnetic field to Virasoro Berry phases and the geometric phase associated to the eternal black hole in AdS spacetime. We explain the relevance of this realisation with respect to the recent results on operator algebras in holography.

MP 10.4 Thu 15:00 ZEU/0250

On the Boundary Conformal Field Theory Approach to Symmetry-Resolved Entanglement — Giuseppe Di Giulio[1,2], René Meyer[1,2], Christian Northe[3,1,2], •Henri Scheppach[1,2], and Suting Zhao[1,2] — [1]Institute for Theoretical Physics and Astrophysics, Julius Maximilian University Würzburg, Am Hubland, 97074 Würzburg, Germany — [2]Würzburg-Dresden Cluster of Excellence on Complexity and Topology in Quantum Matter ct.qmat — [3]Department of Physics, Ben-Gurion University of the Negev, David Ben Gurion Boulevard 1, Be'er Sheva 84105, Israel

We study the symmetry resolution of the entanglement entropy of an interval in two-dimensional conformal field theories (CFTs), by studying the decomposition of the partition function into charge sectors of the respective symmetry in the presence of boundary conditions at the entangling points. Symmetry resolution provides a more refined entanglement measure and can therefore provide more information about the nature of quantum states in QFT. We demonstrate that the decomposition already provides the symmetry resolution of the entanglement spectrum of the corresponding bipartition. Considering the various terms of the partition function associated with the same charge sector the symmetry-resolved Rényi entropies can be derived to all orders in the UV cutoff expansion without the need to compute the charged moments. We apply this idea to the theory of a free massless boson with $U(1)$, $\mathbb{R}$ and $\mathbb{Z}_2$ symmetry. We find equipartition in the $U(1)$ and $\mathbb{R}$ cases to all orders in the cutoff expansion.