



Contribution ID: 144

Type: **Poster**

Berry phases, wormholes and factorization in AdS/CFT and quantum mechanics

The AdS/CFT correspondence states that certain CFTs admit a description in terms of a gravitational theory in asymptotically AdS geometries of one dimension more. One of the most fascinating examples of this correspondence is the ER = EPR proposal that relates entanglement in the boundary gauge theory to a gravitational wormhole connecting two asymptotic regions of an eternal black hole in its bulk AdS dual. This gives rise to a puzzle questioning the apparently factorized structure of the boundary Hilbert space. We attempt to probe deeper into this puzzle using a particular topological tool, namely the Berry phase. In their most general form, Berry phases are geometric phases acquired by states due to the presence of holonomies when parallel transported around a closed loop in parameter space. Wormholes in the bulk AdS spacetime, which are geometric duals of two identical CFTs maximally entangled with each other, can be associated with a holonomy, giving rise to the Berry phase. We show that these Berry phases also find their natural description in terms of symmetries of the dual boundary CFT. While this correspondence plays a pivotal role in understanding the origin of the factorization puzzle, this also encompasses the dynamics of entanglement in a generic quantum system following a fascinating, still mathematically robust group theoretical description. We establish this using quantum mechanical systems, as simple as two coupled spins in a magnetic field.

Authors: WEIGEL, Anna-Lena (Julius-Maximilians University Würzburg); Dr NOGUIERA, Flavio (IFW Dresden); Prof. VAN DEN BRINK, Jeroen (IFW Dresden); Prof. ERDMENGER, Johanna (Julius-Maximilians University Würzburg); DORBAND, Moritz (Julius-Maximilians University Würzburg); Dr MEYER, René (Julius-Maximilians University Würzburg); Dr BANERJEE, Souvik (Julius-Maximilians University Würzburg)

Presenter: DORBAND, Moritz (Julius-Maximilians University Würzburg)

Session Classification: Reception & Poster session