

Strongly Disordered Conductors and Insulators in Holography

Authors : Matthew Stephenson

Abstract : We study the electrical conductivity of strongly disordered, strongly coupled quantum field theories, holographically dual to non-perturbatively disordered uncharged black holes. The computation reduces to solving a diffusive hydrostatic equation for an emergent horizon fluid. We demonstrate that a large class of theories in two spatial dimensions have a universal conductivity independent of disorder strength, and rigorously rule out disorder-driven conductor-insulator transitions in many theories. We present a (fine-tuned) axion-dilaton bulk theory which realizes the conductor-insulator transition, interpreted as a classical percolation transition in the horizon fluid. We address aspects of strongly disordered holography that can and cannot be addressed via mean-field modeling, such as massive gravity.

Keywords : theoretical physics, black holes, holography, high energy

Conference Title : ICQMBH 2023 : International Conference on Quantum Mechanical Black Holes

Conference Location : Rome, Italy

Conference Dates : August 24-25, 2023