APR15-2015-020063

Abstract for an Invited Paper
for the APR15 Meeting of
the American Physical Society

Gravity from entanglement close to a quantum critical point

THOMAS FAULKNER, UIUC

Entanglement entropy (EE) in quantum many-body systems reveal interesting non-local aspects of the state or phase of the system. For example, topological order in gapped phases may be characterized in this way. We present calculations of entanglement close to a quantum critical point with relativistic invariance that reveal the existence of an emergent gravitational theory in one higher dimension. The gravitational theory encodes the entanglement of the quantum system in an efficient way. In this way calculations of EE, a usually notoriously difficult quantity to calculate, are reduced to a simple computation in classical gravity. The answer we find is in the spirit of the AdS/CFT duality but goes beyond it since our results apply to any relativistic quantum critical point and not just the known theories with classical gravity duals.