Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Multipoint correlators of conformal field theories: implications for quantum critical transport PHILIPP STRACK, DEBANJAN CHOWDHURY, Harvard, SUVRAT RAJU, Bangalore, SUBIR SACHDEV, Harvard, AJAY SINGH, Waterloo — We relate three-point correlators between the stress-energy tensor and conserved currents of conformal field theories (CFTs) in 2+1 dimensions to observables of quantum critical transport. We first compute the correlators in the large-flavor-number expansion of conformal gauge theories and then do the computation using holography. In the holographic approach, the correlators are computed from an effective action on 3+1 dimensional anti-de Sitter space (AdS_4), and depend upon the co-efficient, γ, of a four-derivative term in the action. We find a precise match between the CFT and the holographic results, thus fixing the values of γ. The CFTs of free fermions and bosons take the values $\gamma = 1/12, -1/12$ respectively, and so saturate the bound $|\gamma| \leq 1/12$ obtained earlier from the holographic theory; the correlator of the conserved gauge flux of U(1) gauge theories takes intermediate values of γ. The value of γ also controls the frequency dependence of the conductivity, and other properties of quantum-critical transport at non-zero temperatures. Our results for the values of γ lead to an appealing physical interpretation of particle-like or vortex-like transport near quantum phase transitions of interest in condensed matter physics.

Philipp Strack
Harvard

Date submitted: 10 Nov 2012 Electronic form version 1.4