Department of Theoretical Physics

THE QUANTUM SPACETIME SEMINAR SERIES

Constraining spectral densities in conformal field theories

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We derive constraints on spectral density of the shear correlators of conformal field theories at finite temperature in general d>3 dimensions. The resulting sum rules are due to conformal invariance and low energy hydrodynamic behaviour. The sum rule states that a weighted integral of the spectral density over frequencies is proportional to the energy density of the theory. We show that the proportionality constant can be written in terms of the Hofman-Maldacena variables t_2 and t_4 which determine the three point function of the stress tensor. For theories which admit a two derivative gravity dual this proportionality constant is given by $d/(2(d+1))$. We also compute corrections to the holographic shear sum rule in presence of higher derivative corrections to the Einstein-Hilbert action. We find agreement between the sum rule obtained from a general CFT analysis and holographic computation. We then use causality constraints and obtain bounds on the sum rule which are valid in any conformal field theory. Finally we demonstrate that the high frequency behavior of the spectral function in the vector and the tensor channel are also determined by the Hofman-Maldacena variables.