

Batoul Banihashemi - Gravitational ensembles with conformal boundaries

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We study thermodynamics of gravitational systems with conformal boundary conditions, where the conformal class of the boundary metric and the trace of the extrinsic curvature K are held fixed. In the high temperature limit the series of subextensive terms in the free energy are compared to predictions from thermal effective field theory. In all considered cases there is agreement in the structure of the high temperature expansion. Interestingly, the first subextensive correction to the free energy is negative, violating a conjectured bound on this coefficient in quantum field theory. We interpret this as a signal that gravity does not fully decouple in the putative boundary dual. Ensembles with negative K are tied to solutions with cosmic-type horizons, where the system boundary is smaller than the horizon. In some cases, these solutions dominate the phase diagram and are necessary for consistency with thermal effective field theory.

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