Contribution ID: **43** Type: **Parallel session talk**

A black hole-tower correspondence and the origin of species thermodynamics

Tuesday, 25 June 2024 14:45 (15 minutes)

We begin by studying configurations of particles at equilibrium at a temperature T inside a box in the presence of towers of species. By playing with the control parameters, we can obtain configurations that avoid gravitational collapse and fulfill the Covariant Entropy Bound (CEB). These interpolate between the usual dependence of the entropy with the volume (when T is low enough and the momentum modes available to massless particles dominate) and a dependence on the number of species that are "active"at a temperature T (when the T is high enough to "see" the towers of species). In the latter case, we recover the species entropy (and thus the area scaling of the entropy) in the limit in which the temperature approaches the maximum one, namely the species scale, which is also the point at which gravitational collapse and saturation of the CEB would occur for the smallest possible box. We then put this in the bigger picture of the black hole-tower correspondence, a generalization of the black hole-string correspondence that allows to qualitatively account for the scaling of the entropy of black holes with their area by adiabatically following them towards weak gravitational coupling regimes, up to the point where a transition to a system whose entropy is dominated by the towers of species should occur.

Presenter: HERRAEZ, Alvaro

Session Classification: Parallel session