Black Hole-Tower Correspondence and Species Backreaction

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Abstract

The microscopic origin of black hole entropy is a key open problem in quantum gravity. While string theory offers partial answers through the Black Hole-String Correspondence, this is specific to the limit where a weakly coupled string becomes light. The recently proposed {Black Hole-Tower Correspondence} extends this idea to decompactification limits, where the minimal black hole microstates can be accounted for by a tower of light KK modes. In this paper we extend this correspondence beyond the free limit by including the gravitational backreaction of the KK gas, in analogy with the Horowitz-Polchinski solution. We find that the winding tachyon condensation picture has no analogue for a dominant KK tower. Instead, we compute the one loop energy-momentum tensor of the tower and show that its effective action on ${R}^{d-1} \times S1_\beta$reorganizesasa$(d+1)$ − dimensionalradiationgas.Correctionstotheentropyduetothegra

Keywords: Swampland, Cosmology, Inflation

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