



ICTS String Seminar (HYBRID)

Title : The endpoint of the Kerr-AdS super-radiant Instability

Speaker : Shiraz Minwalla (TIFR Mumbai)

Date : Friday, 19th May 2023

Time : 11:30 am (IST)

Abstract : Kerr-AdS _{$d+1$} black holes for $d \geq 3$ suffer from classical super radiant instabilities over a range of masses above extremality. We conjecture that these instabilities settle down into Grey Galaxies (GGs) - a new class of coarse-grained solutions to Einstein's equations which we construct in $d=3$. Grey Galaxies are made up of a black hole with critical angular velocity $\omega=1$ in the 'centre' of AdS, surrounded by a large flat disk of thermal bulk gas that revolves around the centre of AdS at the speed of light. The gas carries a finite fraction of the total energy, as its parametrically low energy density and large radius are inversely related. GGs exist at masses that extend all the way down to the unitarity bound. Their thermodynamics is that of a weakly interacting mix of Kerr-AdS black holes and the bulk gas. Their boundary stress tensor is the sum of a smooth 'black hole' contribution and a peaked gas contribution that is delta function localized around the equator of the boundary sphere in the large N limit. We also construct another class of solutions with the same charges; 'Revolving Black Holes (RBHs)'. RBHs are macroscopically charged $SO(d,2)$ descendants of AdS-Kerr solutions, and consist of $\omega=1$ black holes revolving around the centre of AdS at a fixed radial location but in a quantum wave function in the angular directions. RBH solutions are marginally entropically subdominant to GG solutions and do not constitute the endpoint of the super radiant instability. Nonetheless, we argue that supersymmetric versions of these solutions have interesting implications for the spectrum of supersymmetric states in, e.g. $\mathcal{N}=4$ Yang-Mills theory.

Venue : **Offline:** Madhava Lecture Hall

Online: Please click the below link to join the seminar.

<https://icts-res-in.zoom.us/j/88092766911?pwd=R3ZrVk9yeW96ZmQ4ZG9KRzVhenRKZz09>

Meeting ID: 880 9276 6911

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