

Physics Seminar: Jaeha Lee  
Wednesday, October 11·2:00 – 3:00pm  
Location: 313

Title: Grey Galaxies: The Endpoint of Superradiant Instabilities in Rotating AdS Black Holes

Abstract: When fluctuations are introduced to a charged and rotating black hole under specific conditions, the black hole may respond with an amplified energy mode, a phenomenon termed as "superradiance". In the AdS space, it leads to instability. In this talk, I will introduce a new rotating solution, "Grey Galaxy", in AdS<sub>4</sub>. This solution could potentially represent the endpoint of the superradiant instability of Kerr-AdS<sub>4</sub> black hole. Consequently, we anticipate a microcanonical ensemble phase diagram for large N CFT<sub>3</sub> that features two distinct phases: the Kerr-AdS BH and the Grey Galaxy solution. The inception of the Grey Galaxy solution can be attributed to a careful consideration of the diverging 1-loop correction to the saddle point of Euclidean path integration. This solution is characterized by a black hole coupled with a rotating scalar field, and the scalar field has comparable energy and angular momentum to the BH at the center differently than usual. On the other hand, the presence of another diverging mode points us towards an alternative solution: the "Revolving Black Hole". Although the Revolving Black Hole is not entropically favored than the Grey Galaxy at subleading orders, it offers a simpler construction process and holds unique applications.