

Perturbation of the Vaidya metric in frequency domain: Quasi-normal modes and tidal response

Tuesday, 17 September 2024 15:20 (20 minutes)

The mass of a black hole can dynamically evolve due to various physical processes, such as for instance accretion, Hawking radiation, absorption of gravitational/electromagnetic waves, superradiance, etc. This evolution might have an impact on astrophysical observables like the ringdown gravitational signal. An effective description of a spherically symmetric black hole with evolving mass is provided by the Vaidya metric. In our investigation, we explore the dynamics of linear perturbations on this background, assuming a slow evolution (i.e. expanding at linear order also in the rate of change of the mass). Despite the time-dependent background, our approach allows for treating the perturbations in the frequency domain, and for computing explicitly the quasi-normal modes and the tidal Love number.

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Session Classification: Contributed Talks