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Strong cosmic censorship in charged black holes with a positive cosmological constant

The strong cosmic censorship conjecture has recently regained a lot of attention in charged and rotating black holes immersed in de Sitter space. Such spacetimes possess Cauchy horizons in the internal region of the black hole. The stability of Cauchy horizons is intrinsically connected to the decay of small perturbations exterior to the event horizon. As such, the validity of strong cosmic censorship is tied to how effectively the exterior damps fluctuations.

Recent studies have shown that charged cosmological black holes, such as the Reissner-Nordstr\"{o}m-de Sitter solution, appear to be serious counter-examples of strong cosmic censorship. In this talk, we will present the first consistent test of strong cosmic censorship in Reissner-Nordstr\"{o}m-de~Sitter black holes under minimally coupled scalar-field fluctuations and conclude that the conjecture is violated for near-extremal black-hole charges.

We will also present another test to the conjecture by utilizing a scalar field fluctuation non-minimally coupled to the Einstein tensor propagating on Reissner-Nordstr\"{o}m-de Sitter black holes. Such non-minimal derivative coupling is characteristic of Horndeski scalar-tensor theories. Although the introduction of higher-order derivative terms in the energy-momentum tensor increases the regularity requirements for the stability of the Cauchy horizon, we are still able to find a small, but finite, region in the black hole's parameter space where strong cosmic censorship is violated.

The talk will be based on:

1. V. Cardoso, J. L. Costa, K. Destounis, P. Hintz and A. Jansen, "Quasinormal modes and Strong Cosmic Censorship", Phys. Rev. Lett. 120, no. 3, 031103 (2018), \[1711.10502\],
2. K. Destounis, R. D. B. Fontana, F. C. Mena and E. Papantonopoulos, "Strong Cosmic Censorship in Horndeski Theory", JHEP 10 (2019) 280, \[1908.09842\].

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