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F. Corelli: Fate of Radiating Black Holes With Minimum Mass in Einstein-dilaton-Gauss-Bonnet Theory of Gravity (WP2)

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Einstein-dilaton-Gauss-Bonnet (EdGB) is a theory of modified gravity in which a dilaton-type scalar field is nonminimally coupled to quadratic curvature terms via an exponential function. Black holes (BHs) in this theory are particularly interesting since they possess a critical configuration with minimum mass and finite Hawking temperature. This means that a critical BH loses mass due to Hawking's radiation, but it is not clear what is its fate after this process, since it cannot reach a final configuration with lower mass. In a recent work we studied this problem by means of fully nonlinear numerical evolutions of spherically symmetric BH spacetimes. Specifically, by simulating the collapse of wave packets of a phantom scalar field we have been able to dynamically reduce the BH mass, reproducing the effect of Hawking's evaporation.
In this talk I will present our results with a particular focus on the case in which the BH mass falls below the critical value. In particular, I will show that a high-curvature elliptic region emerges from the apparent horizon, and I will discuss how this could hint to an incompatibility between EdGB gravity and Hawking evaporation. I will also mention some alternative scenarios for a stable evolution, and future possible research directions.

References:
Corelli, De Amicis, Ikeda, and Pani, Phys. Rev. Lett. 130, 091501 and Phys. Rev. D 107, 044061