

QFT CORRECTION TO BLACK HOLES*

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To explore the QFT effects for black holes before activation of Quantum Gravity, we consider the back-reaction of QFT fluctuations reflected as trace anomaly for charged spherical stationary backgrounds. Using symmetries of BH solution, we extract necessary information from trace anomaly to find the correction to the classical geometry. We show that the inner horizon induced by QFT corrections for Schwarzschild BH [1] is the limit of $Q = 0$ for the inner horizon of RN corrected solution which is larger than the classical. It is also shown that the boundary of physical solutions and naked singularity ($Q = M$) gets the Planck scale correction (figure 1, top). Furthermore, we study the thermodynamics of modified BHs satisfying this relation and their evolution under the Hawking radiation (figure 1, bottom). We show that quantum corrections grant stable charged BHs. Note that the extremal curve in figure 1 (top) could be trusted only in the specified area as a result of non-analyticity of the inner horizon in terms of Q and M . The expected extremal curve in figure 1 (top) is obtained by combining perturbative calculations in two perturbation regimes, ($M, Q \gg \sqrt{C_A} l_P := c$) and ($M \gg c \gg Q$), where C_A is a constant specifying trace anomaly.

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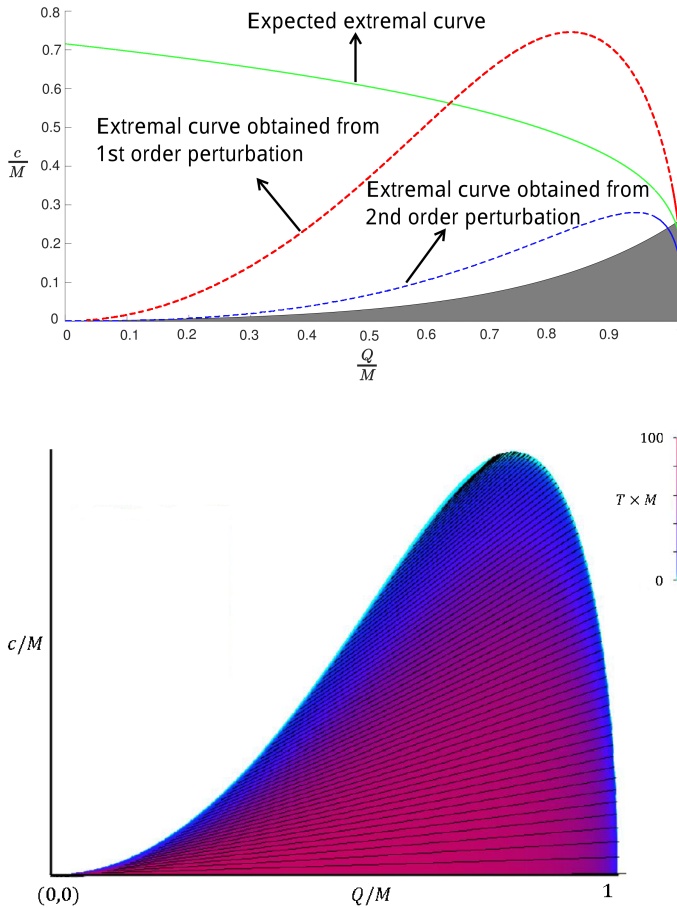


Fig. 1. The plot of corrected extremal curve. Top: Shaded area indicates the reliable perturbation region and the dotted lines show the unreliable parts of curves. Bottom: Solid lines show the evolution under the Hawking radiation dedicated to a charged particle in the temperature heatmap.

REFERENCES

- [1] J. Abedi, H. Arfaei, *J. High Energy Phys.* **1603**, 135 (2016).