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# Exact black holes in string-inspired Euler-Heisenberg theory

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We consider higher-order derivative gauge field corrections that arise in the fundamental context of dimensional reduction of String Theory and Lovelock-inspired gravities and obtain an exact and asymptotically flat black-hole solution, in the presence of non-trivial dilaton configurations. Specifically, by considering the gravitational theory of Euler-Heisenberg non-linear electrodynamics coupled to a dilaton field with specific coupling

functions, we perform an extensive analysis of the characteristics of the black hole, including its geodesics for massive particles, the energy conditions, thermodynamical and stability analysis. The inclusion of a dilaton scalar potential in the action can also give rise to asymptotically (A)dS spacetimes and an effective cosmological constant. Moreover, we find that the black hole can be thermodynamically favored when compared to the Gibbons-Maeda-Garfinkle-Horowitz-Strominger (GMGHS) black hole for those parameters of the model that lead to a larger black-hole horizon for the same mass. Finally, it is observed that the energy conditions of the obtained black hole are indeed satisfied, further validating the robustness of the solution within the theoretical

framework, but also implying that this self-gravitating dilaton-non-linear-electrodynamics system constitutes another explicit example of bypassing modern versions of the no-hair theorem without any violation of the energy conditions.

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