

## **Hairy black holes, scalar charges and extended thermodynamics**

We explore the use of the recently defined scalar charge which satisfies a Gauss law in stationary spacetimes, in the context of theories with a scalar potential. We find new conditions that this potential has to satisfy in order to allow for static, asymptotically-flat black-hole solutions with regular horizons and non-trivial scalar field. These conditions are equivalent to some of the known “no-hair” theorems (such as Bekenstein’s). We study the extended thermodynamics of these systems, deriving a first law and a Smarr formula. As an example, we study the Anabalón-Oliva hairy black hole.

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