

Thermodynamics of higher dimensional topological charged AdS black branes in dilaton gravity

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Abstract

In this paper, we study topological AdS black branes of $(n + 1)$ -dimensional Einstein-Maxwell-dilaton theory and investigate their properties. We use the area law, surface gravity and Gauss law interpretations to find entropy, temperature and electrical charge, respectively. We also employ the modified Brown and York subtraction method to calculate the quasilocal mass of the solutions. We obtain a Smarr-type formula for the mass as a function of the entropy and the charge, compute the temperature and the electric potential through the Smarr-type formula and show that these thermodynamic quantities coincide with their values which are calculated through using the geometry. Finally, we perform a stability analysis in the canonical ensemble and investigate the effects of the dilaton field and the size of black brane on the thermal stability of the solutions. We find that large black branes are stable but for small black brane, depending on the value of dilaton field and type of horizon, we encounter with some unstable phases.

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