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Title: Thermodynamics of axionic black strings in dynamical Chern-Simons modified gravity

Abstract: We study thermodynamics and conserved charges of analytic rotating anti-de Sitter black holes with extended horizon topology—also known as black strings—in dynamical Chern-Simons modified gravity. The solution is supported by a scalar field with an axionic profile that depend linearly on the coordinates that span the string. We compute conserved charges associated to the mass, entropy, and angular momentum using three different approaches: the Noether-Wald formalism, the renormalized boundary stress-energy tensor, and the Hamiltonian approach. We show explicitly that all of them coincide and yield a consistent first law of thermodynamics. Additionally, we derive a Smarr formula using a radial conservation law associated to the scale invariance of the reduced action. We find analytic solitons with nontrivial scalar fields and show that the black string can develop a phase transition below a critical temperature, where the soliton is thermodynamically favored.