

THERMODYNAMICS OF REGULAR BLACK HOLES IN ANTI-DE SITTER SPACE

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Abstract

Black hole thermodynamics is usually studied using solutions with singular interiors. In this talk, I will discuss what changes when the singularity is replaced by a regular core, focusing on asymptotically anti-de Sitter black holes in higher-curvature gravity. I will explain how these solutions can be constructed in $D \geq 5$ dimensions with minimally coupled matter, and compare the cases of Maxwell and nonlinear electrodynamics. In the nonlinear electrodynamics case, both the spacetime geometry and the electromagnetic field can be made regular. I will present the thermodynamic properties of these solutions, including the extended first law, the Smarr relation, the equation of state, and the role of the regularization parameter. For spherical black holes, the equation of state exhibits features analogous to those of a fluid with finite molecular volume, revealing how singularity resolution leaves an imprint on black hole thermodynamics.

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