CIDMA CENTRO DE I&D EM MATEMÁTICA E APLICAÇÕES
CENTER FOR R&D IN MATHEMATICS AND APPLICATIONS

universidade de aveiro

Gravitational Geometry and Dynamics Group Seminar

Tue., April 21, 2026, at 14h00.

Room: 11.2.21 and **Teams ID:** 395 216 248 464 197

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On the Thermodynamics of Deformed Black Holes

Inspired by noncommutative geometry in string theory, we introduce extended derivatives in black hole physics by incorporating a real antisymmetric rank-2 tensor, exhibiting similarities with certain string-theoretic fields. Within the gauge-theoretic formulation of gravity based on the de Sitter group, we first derive the corresponding black hole solutions by solving the Einstein field equations. We then investigate their thermodynamic properties, focusing on stability analysis, critical behavior, and phase transitions. In particular, we analyze the P–V criticality of the obtained solutions and compute the Gibbs free energy, which reveals behavior analogous to Van der Waals phase transitions. Furthermore, by combining analytical and numerical results, supported by CUDA-based computational techniques commonly used in machine learning, we establish constraints on the deformation parameter (B) and the charge (Q). Specifically, we identify parameter ranges for which the black hole system exhibits thermodynamic behavior similar to that of a Van der Waals fluid.

More about Gr@v at: gravitation.web.ua.pt

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