PHASE TRANSITIONS, QUASINORMAL MODES, AND HOLOGRAPHIC $Q\bar{Q}$ POTENTIAL OF REGULAR BLACK HOLES IN AdS

Julio **OLIVA**

Department of Physics, University of Concepción
Casilla 160-C, Concepción, Chile
Orcid number:0000-0002-0692-4744
julioolivazapata@gmail.com

Abstract

In this talk, I will show that the purely gravitational $\alpha'^3\text{Weyl}^4$ correction of Type IIB supergravity on $\text{AdS}_5 \times S^5$ can, via a field redefinition, be recast as a series of higher-curvature terms up to order Riem^4, with the following key properties:

1. The graviton propagator in AdS matches that of General Relativity, up to an effective Newton's constant;
2. The field equations on spherically symmetric backgrounds avoid the propagation of the scalar mode that typically plagues higher-curvature theories, thereby admitting a version of Birkhoff's theorem;
3. They allow for the construction of a holographic c-function.

These terms are known as quasitopological Lagrangians. While strong evidence for the existence of such a field redefinition already exists in the literature, here we present its explicit form and explore its consequences. Next, by supplementing the α'^3-corrected theory with an infinite series of higher-curvature terms sharing the above properties, we construct an AdS extension of a family of asymptotically flat regular black holes recently developed in [1]. We then study the phase structure of these black holes in the canonical ensemble, compute the fundamental quasinormal mode of a massless scalar probe, and evaluate the holographic $q\bar{q}$ potential. If time permits, I will also discuss the extended thermodynamics of these black holes.

References

[1] P. Bueno, P. A. Cano, R. A. Hennigar, Phys. Lett. B **861**, 139260 (2025).