Hydrodynamics in a Holographic model for Anisotropic Dirac Semimetals

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Abstract (Century Gothic 11)

In this work, we explore a strongly interacting system that undergoes a thermal phase transition from a semimetal to an insulator. The transition passes through a semi-Dirac quantum critical region, and we study it using the AdS/CFT
correspondence
To capture transport properties, we include backreaction in the bulk equations. This allows us to compute the shear viscosity on the boundary. Once we explicitly break rotational symmetry, we find something interesting: the ratio η/s violates the KSS bound in the quantum critical regime. We also observe that, as the temperature approaches zero, this ratio shows a monotonic behavior determined by a Lifshitz dynamical critical exponent.
Finally, we construct fully backreacted zero-temperature solutions and show that they are separated by a quantum critical point. This demonstrates that the thermal critical behavior seen in earlier studies actually stems from a quantum phase transition at zero temperature.

Figures

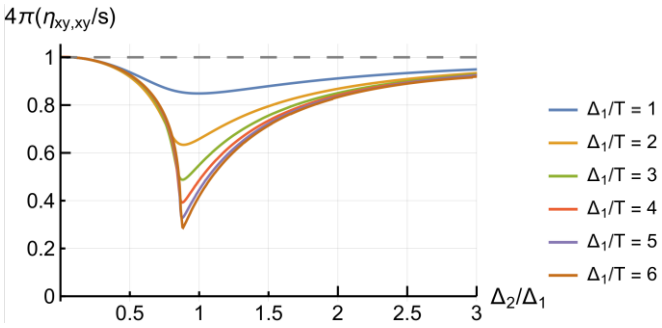

Figure 1: Violation of the KSS bound

References

[1] Sebastian Bahamondes, Ignacio Salazar-Landea and R. Soto-Garrido, arXiv:2507.13497