

# Investigation of transport properties of graphene Dirac fluid by holographic two-current axion coupling model

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Recently, there has been great interest in the phenomenon of severe violation of the Wiedemann-Franz law in graphene Dirac fluids around 75 K, due to the strong coupling relativistic plasma near the neutral point, where traditional perturbation theory fails. To explain this phenomenon, this article proposes a holographic dual two-current axion coupling model, describing the interaction between electrons and holes in graphene near the charge neutrality point (CNP) and revealing the related physical mechanism. The study shows that the holographic two-current model aligns with experimental results at  $100\mu\text{m}^{-2}$ , and correctly predicts conductivity as temperature increases. Additionally, the article explores the behavior of  $\beta+\gamma$  and its impact on conductivity and thermal conductivity. The results suggest a frictional effect between electrons and holes. Consequently, this study provides us with a clearer understanding of the properties of graphene Dirac fluids and further confirms the reliability of the holographic duality method.

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