Avenues of Quantum Field Theory In Curved Spacetime 2025

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Weyl Geometry in Weyl Semimetals

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A novel oscillatory behaviour of the DC conductivity in Weyl semimetals with vacancies has recently been identified [1], occurring in the absence of external magnetic fields. Here, we argue that this effect has a geometric interpretation in terms of a magnetic-like field induced by an emergent Weyl connection. This geometric gauge field is related to the non-metricity of the underlying effective geometry, which is physically induced by vacancies in the lattice system. As a consequence of our geometric model, we postulate that the chiral magnetic effect in Weyl semimetals can be affected by the presence of dynamical vacancies.

[1] J. P. Santos Pires, S. M. Joao, A. Ferreira, B. Amorim, and J. M. Viana Parente Lopes, Anomalous transport signatures in weyl semimetals with point defects, Phys. Rev. Lett. 129, 196601 (2022).

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