UNIVERSIDAD TECNICA FEDERICO SANTA MARIA

DEPARTAMENTO DE FÍSICA

EXAMEN DE GRADO
para el grado de
Magíster en Ciencias, mención Física

"Quantum-critical Tilted Non-Hermitian Dirac semimetals"

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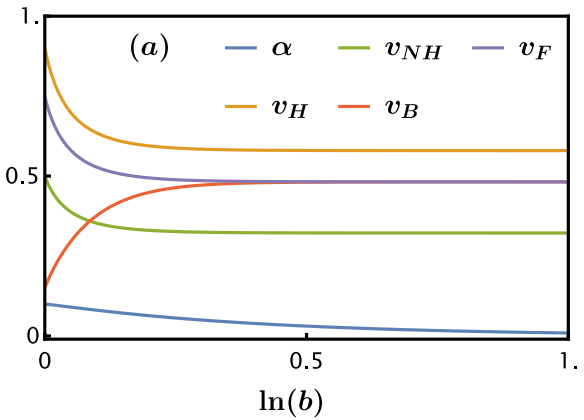

Resumen

Tilted Dirac semimetals have been intensely studied because of their nontrivial properties, particularly the breaking of the pseudo-Lorentz symmetry in the low-energy regime. Nevertheless, their interplay with non-Hermiticity has not been studied, which can arise from the coupling to the environment and dissipation. Here we propose a minimal model describing a non-Hermitian (NH) two-dimensional tilted Dirac semimetal (DSM) by introducing masslike anti-Hermitian Dirac operators to the tilted Dirac Hamiltonian. We calculate density of states and optical conductivity, where we show that tilt can be used as a probe for non-Hermiticity. We then analyze various interaction-driven instabilities described by mass order-parameters (OPs) by employing the Gross-Neveu-Yukawa theory at one-loop in the ϵ-expansion close to d=3 upper-critical dimensions. We perform a Renormalization Group analysis to examine the behaviour close to a quantum-critical point (QCP), showing that the Yukawa-Lorentz symmetry is restored by virtue of the tilt parameter becoming irrelevant in tilted NH DSMs. Depending on the commutation relation of the mass OP with the anti-Hermitian part of the free Hamiltonian, as we show, the tilted DSM remains coupled to the environment or completely decouples from it.

Miércoles 8 de enero 2025 – 14:30 horas

Sala de Conferencias Dr. Luciano Laroze (E300)
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