ENTROPY OF ANALOGUE BLACK HOLE

Set-up (Graphene)

The emergent spacetime metric of tilted Dirac cone is

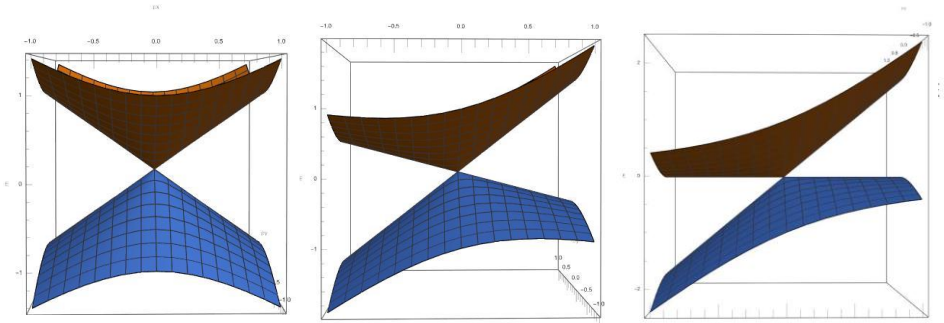
$$ds^2 = -v_F^2 dt^2 + (d\vec{r}^2 - \vec{\zeta} v_F dt)^2$$

The free Hamiltonian of tilted Dirac cone materials is

$$H_0 = v_F \psi^\dagger \begin{bmatrix} \vec{p}\cdot\vec{\zeta} & p_x - ip_y \\ p_x + ip_y & \vec{p}\cdot\vec{\zeta} \end{bmatrix} \psi$$

The dispersion relation is

$$E = s v_F |\vec{p}| + v_F \vec{p}\cdot\vec{\zeta}$$



Tilted Dirac Cone

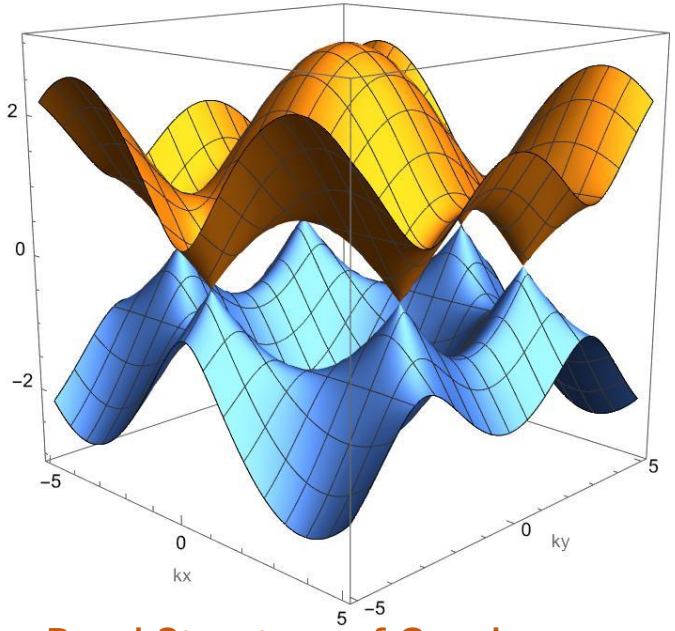
Results (Entropy)

Entropy for D=2 + 1 tilted Dirac cone material

$$S_{DC} = \frac{\pi L p_m}{3\kappa\beta}$$

Entropy of D=2 + 1 black hole

$$S_{BH} = \frac{2\pi r_+}{4G}$$



Band Structure of Graphene

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