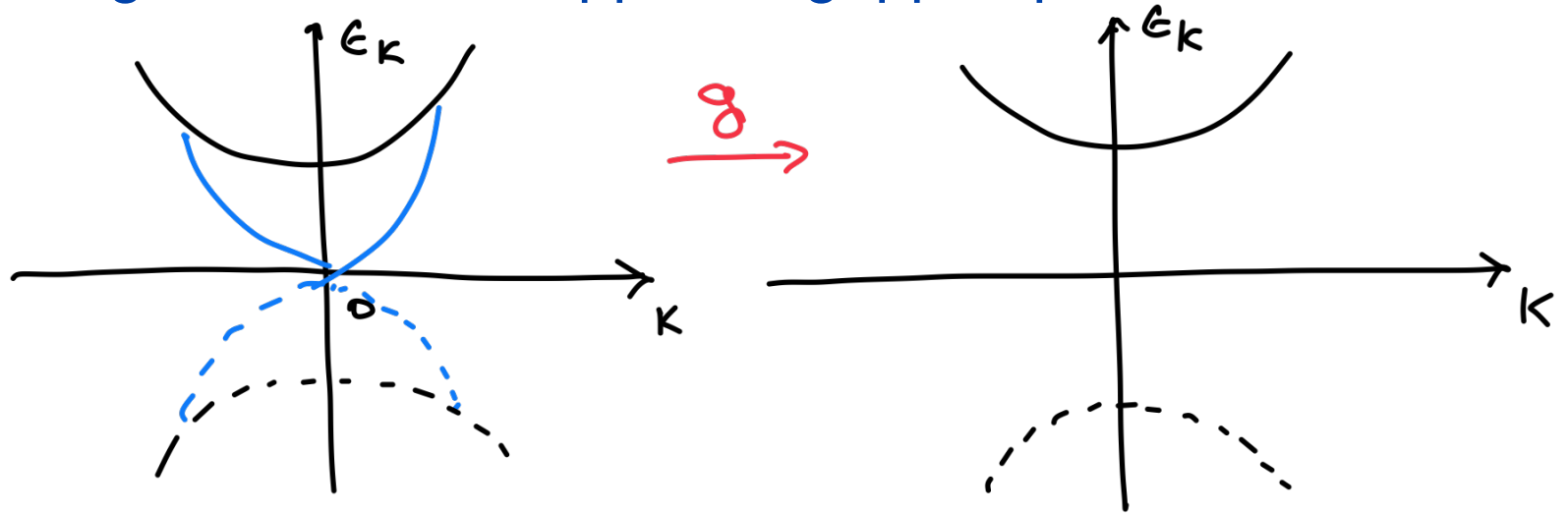


Phys525:
Quantum Condensed Matter Physics: Quantum Criticality
Basics, Dynamics and Topological criticality

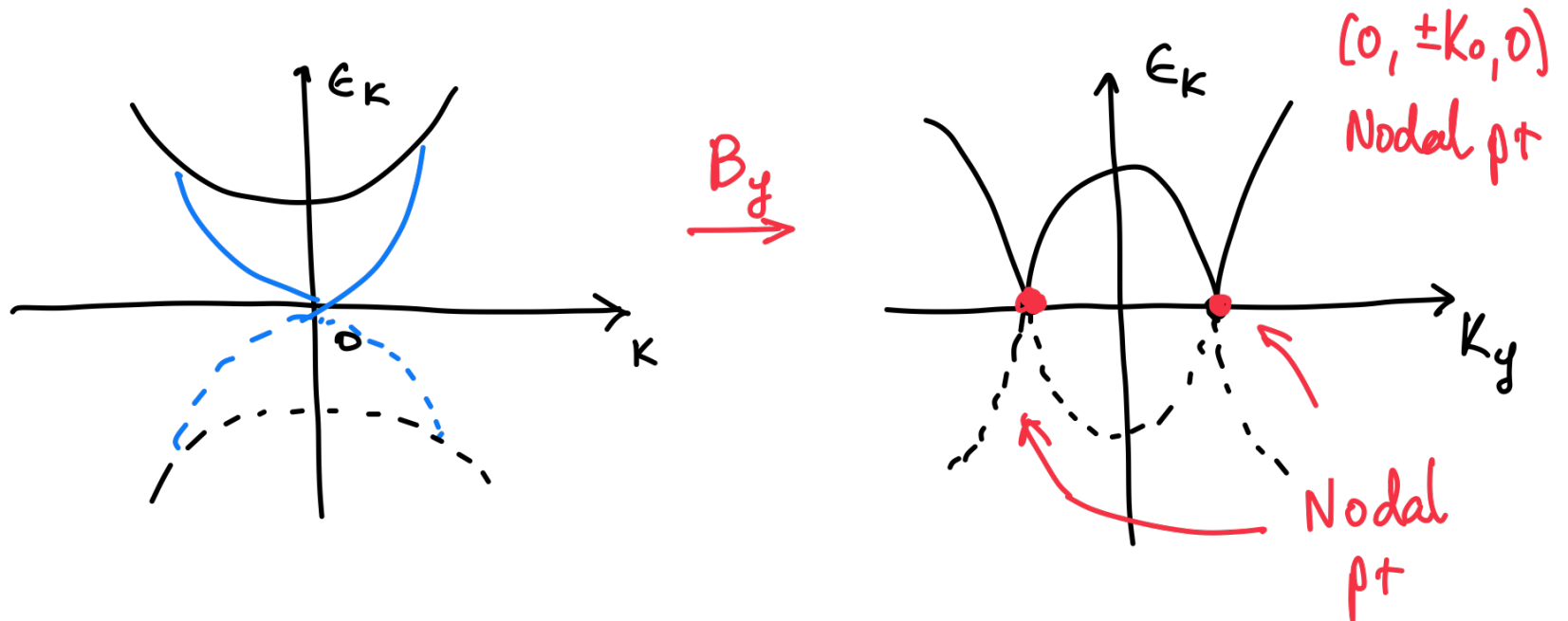
Episode 24 (and the last one!): QCPs in TSCs/TSFs III:
Bulk-boundary correspondence, K-theory etc

- Topological QCPs I (driven by interactions or chemical potentials that are T- and SO(n) rotation invariant)
- Topological QCPs II (driven by spin exchange field that break T-symmetry and SO(n) rotation symmetry etc).

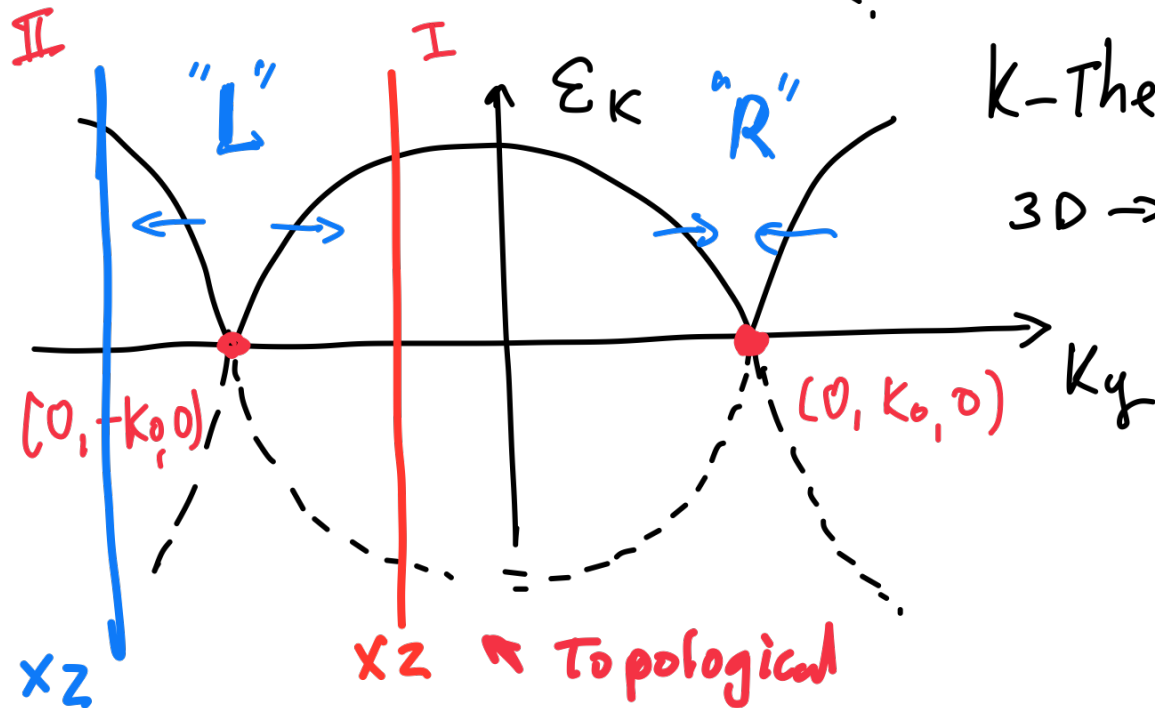
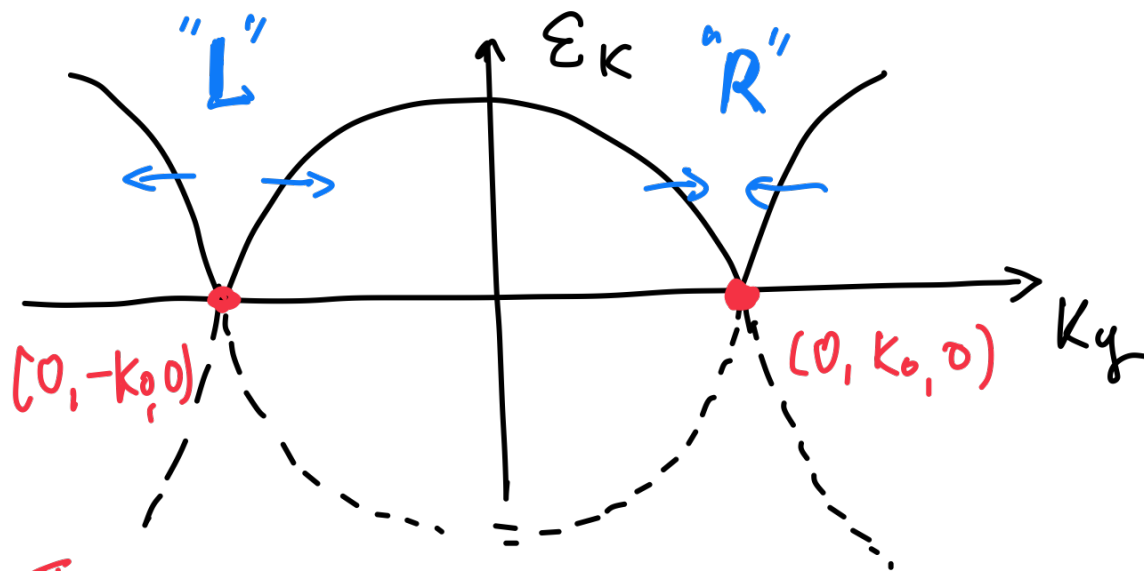
- Topological QCPs I: Gapped to gapped phases



- Topological QCPs II: Gapped to Nodal phases (3D)



"Zoom in" on a Nodal pt phase (3D)



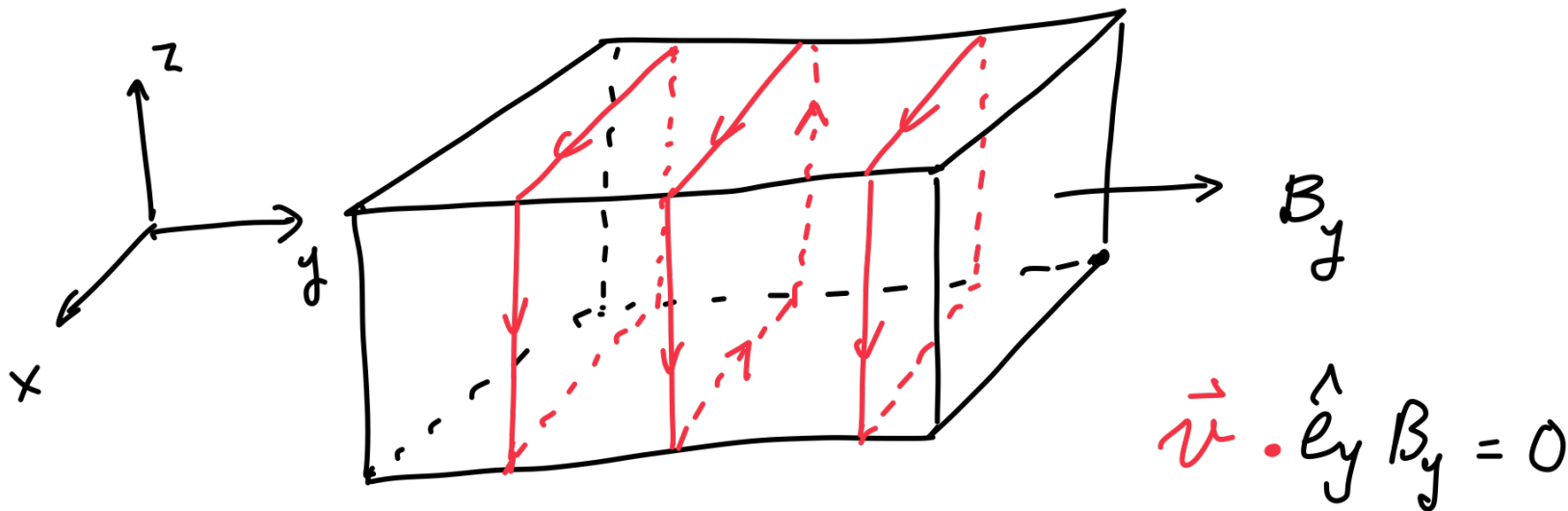
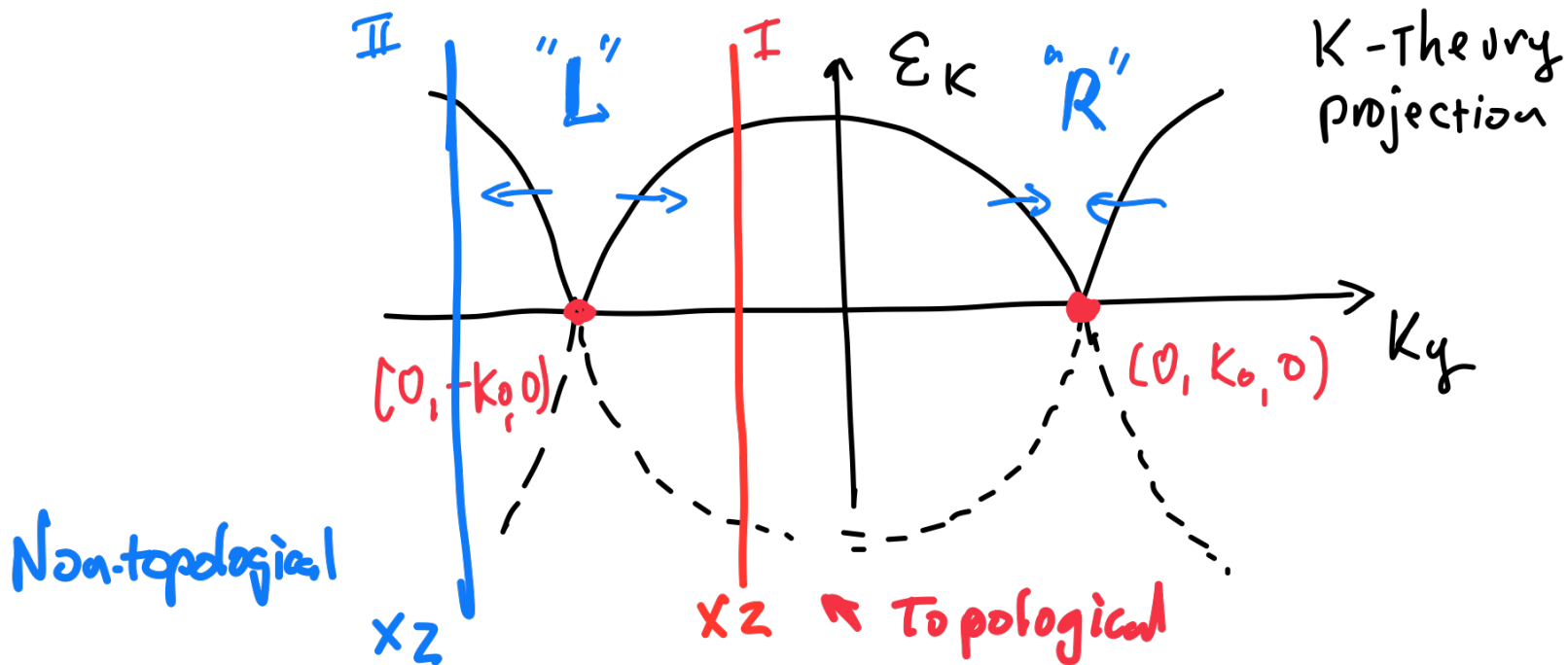
K-Theory Projection

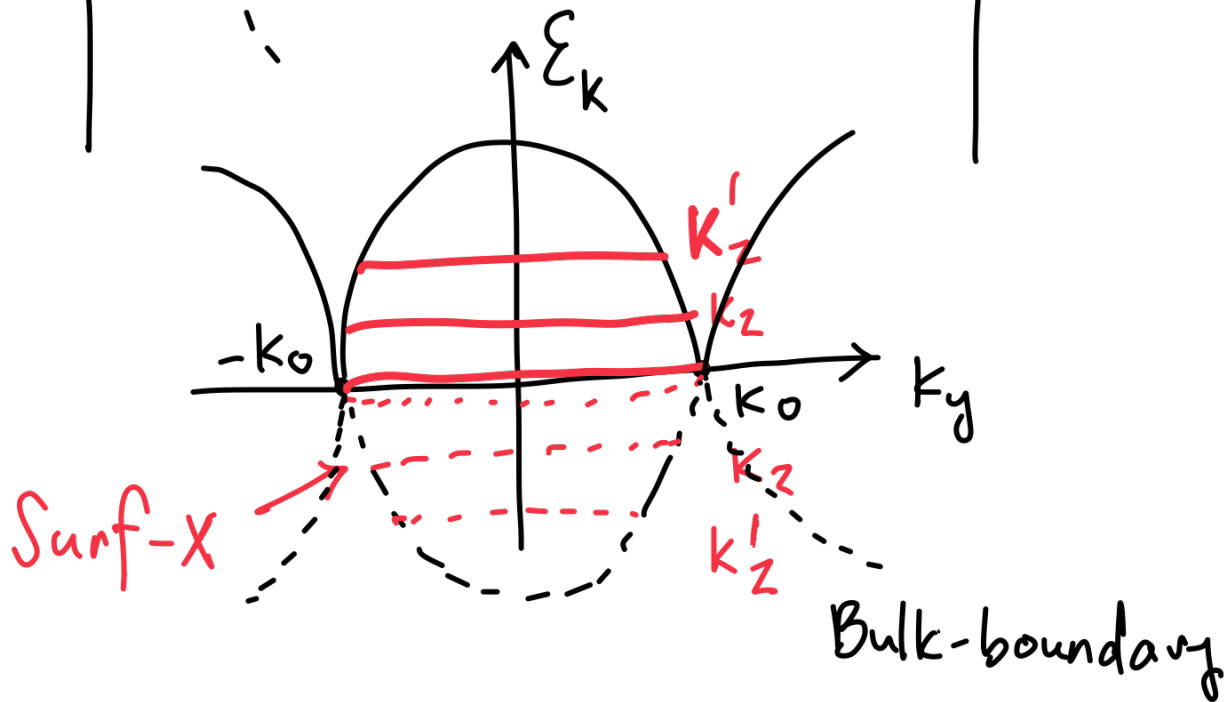
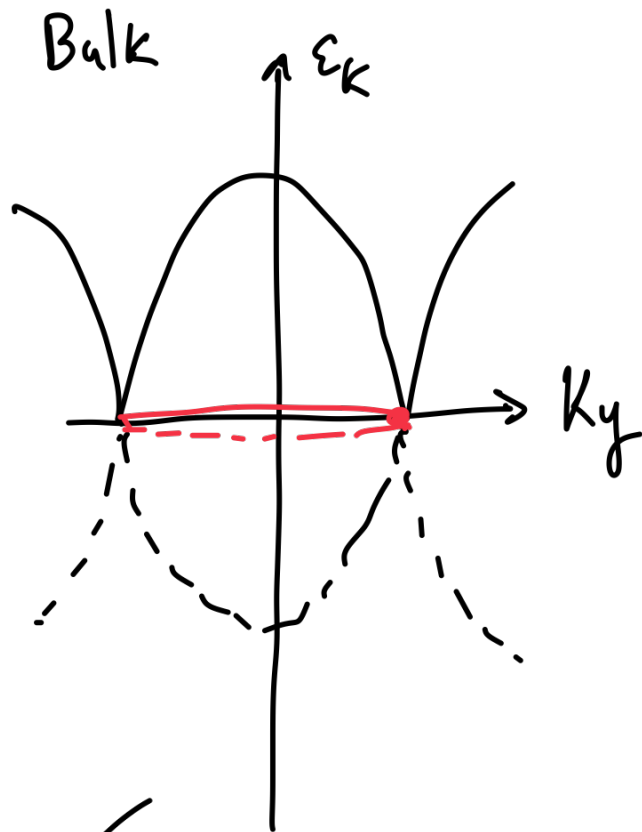
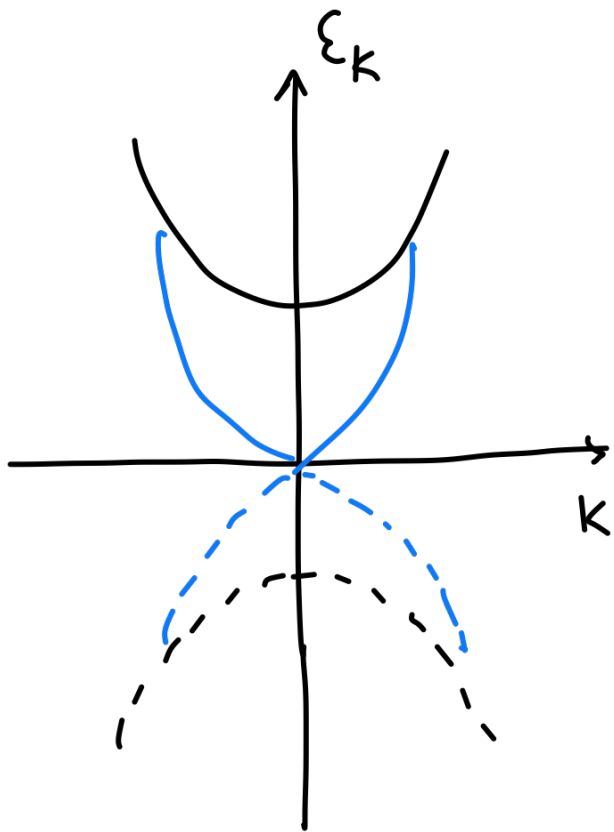
3D \rightarrow 2D

Non-topological

x_2

x_2 \leftarrow Topological

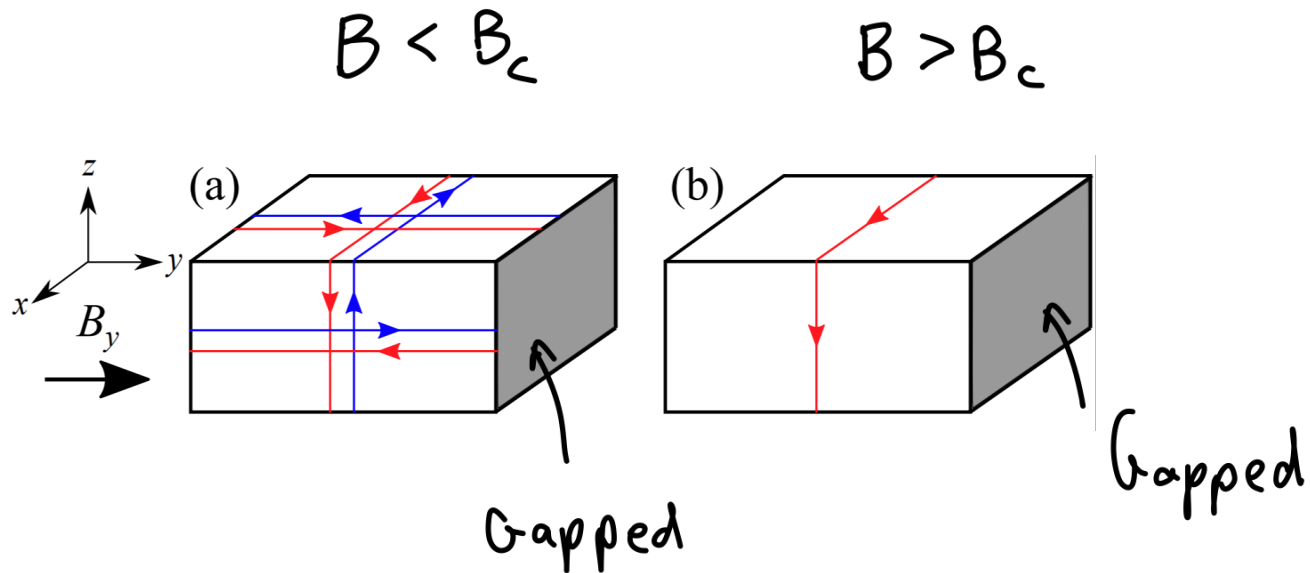




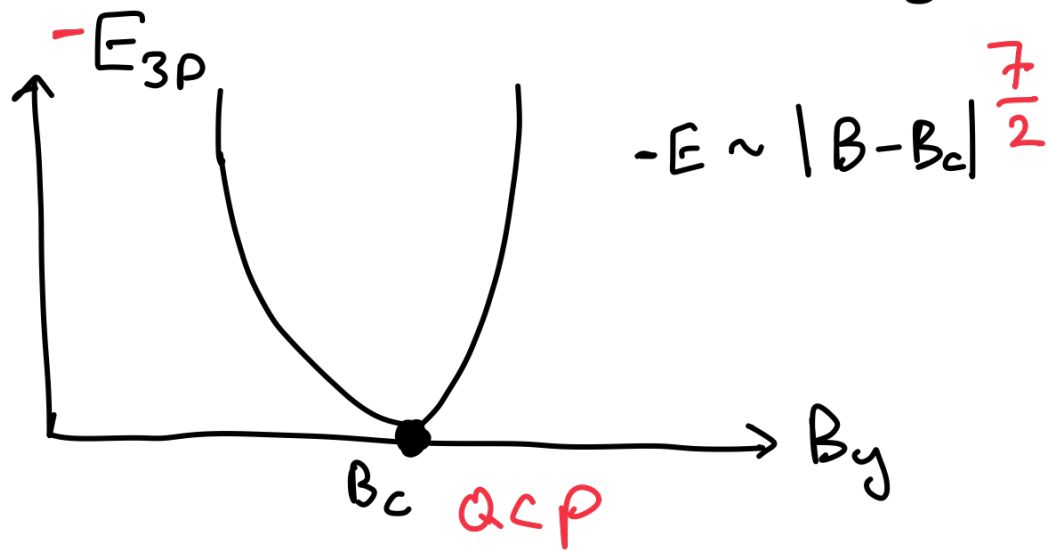
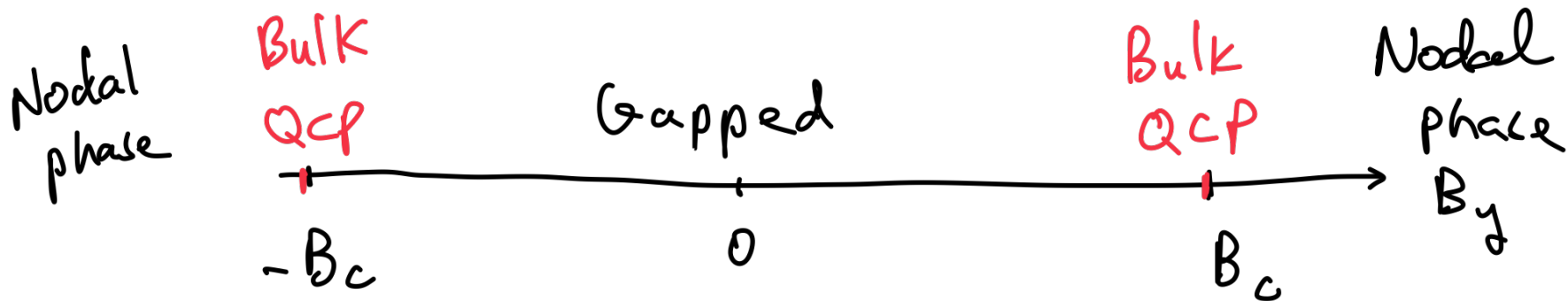
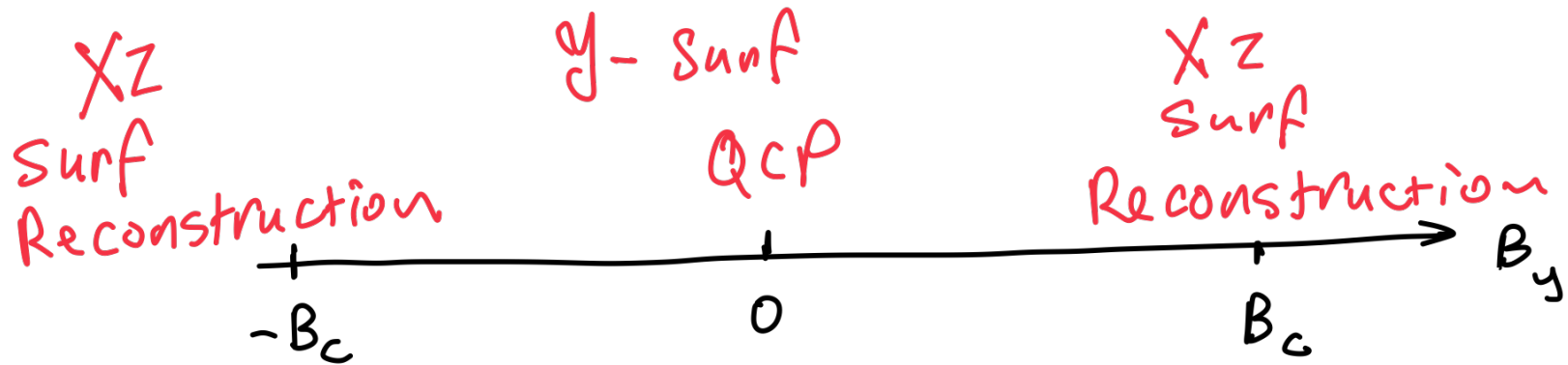
Surface states of TSC

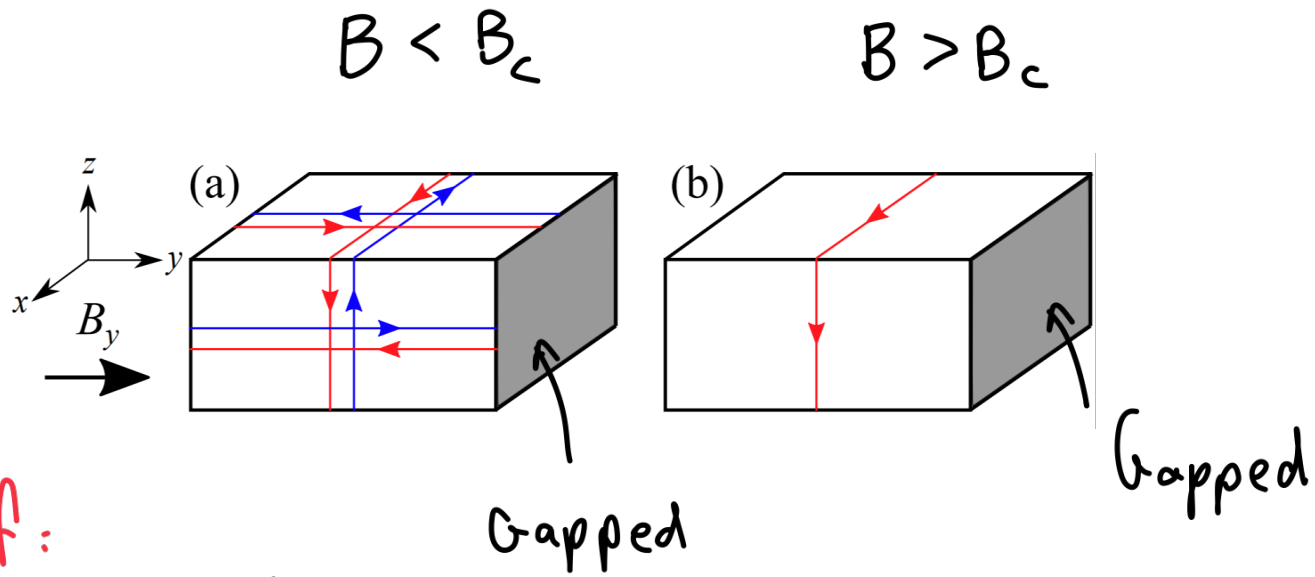
(3D)

TRI



- Yang and Zhou, 2020 on topological quantum criticality in TSCs





y-surf:

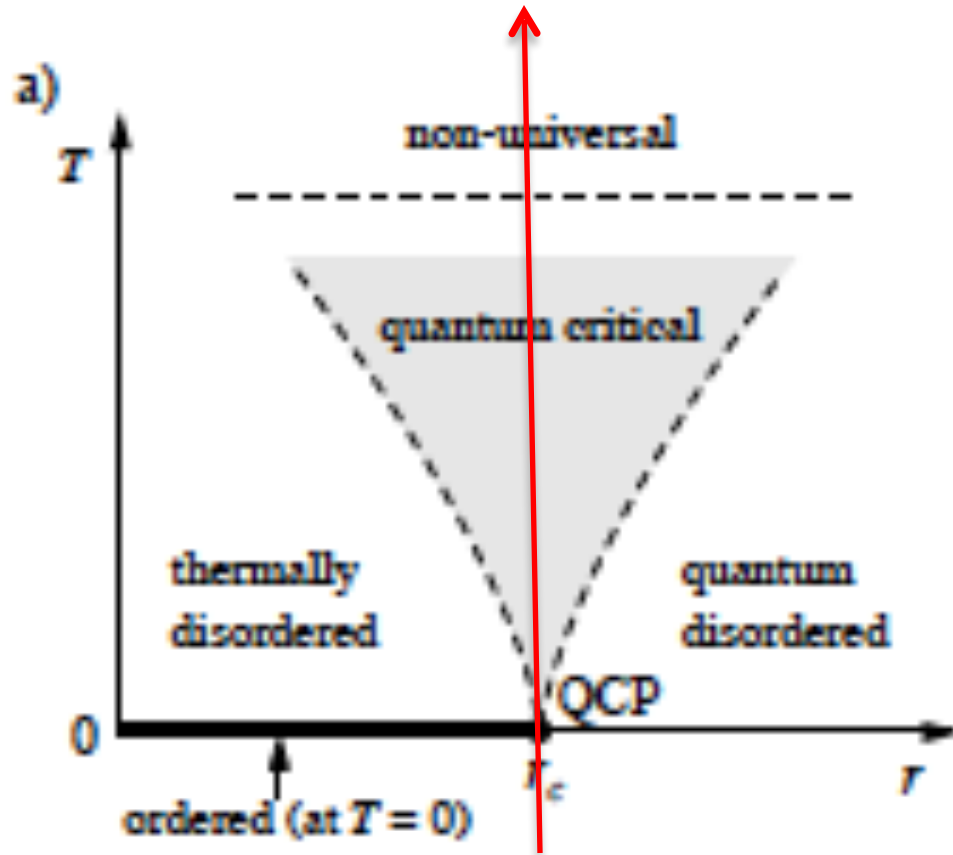
$$\chi^{\text{surf}} = \frac{\partial \vec{M} \cdot \vec{e}_y}{\partial B_y} = f(|B_y|)$$

Standard paradigm: $f(|B_y|) = f(0) + f'(0) B_y^2 + \dots$

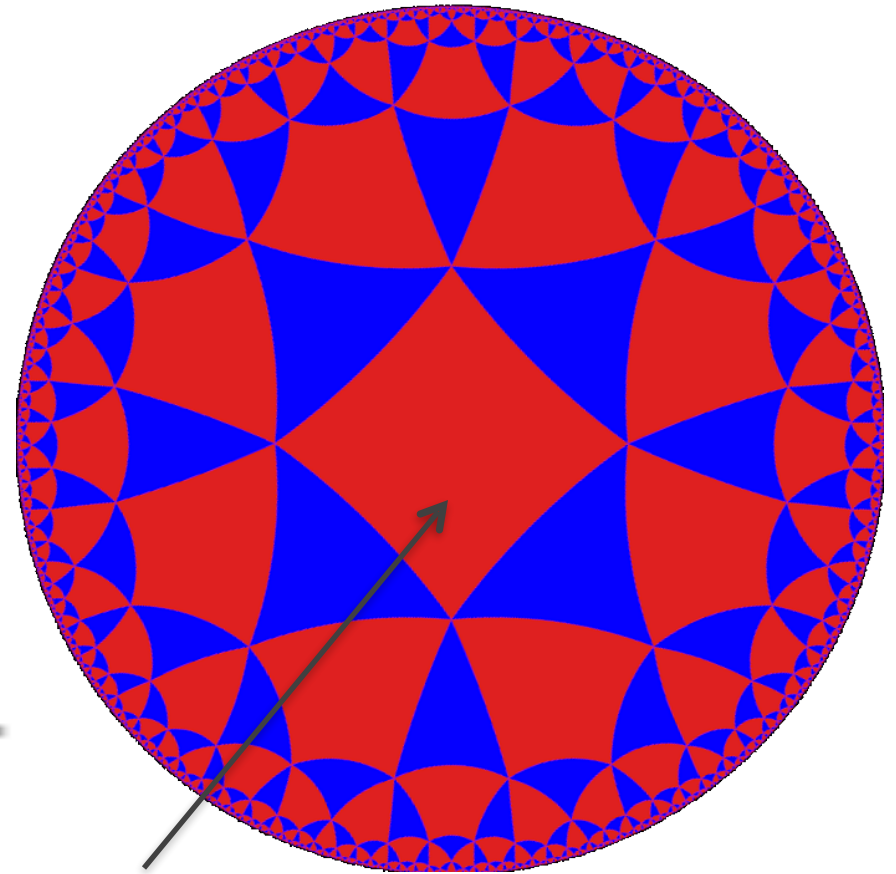
Surf Criticality: $f_{2cp}(|B_y|) \simeq c|B_y| + \dots$
 (Valid for strong coupling limit)

(equivalent to $E_{\text{surf}} \sim -|B_y|^3$)

Finite temperature CFT with
an emergent Lorentz symmetry.



Subir Sachdev, 1990s



Ads/Cft (Bulk/boundary)
Maldacena, 90s

The end