Presentation Title

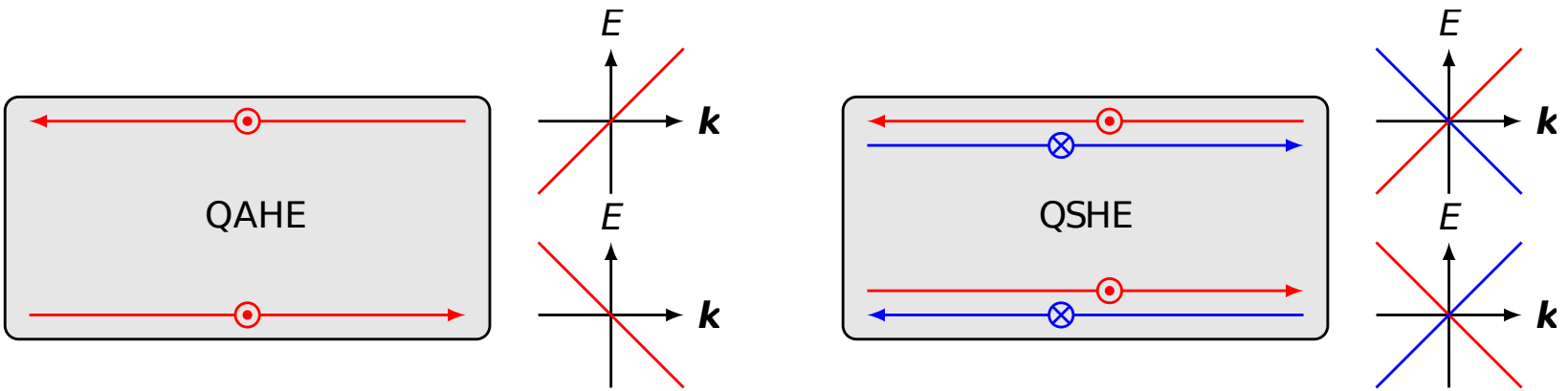
Author · 28. November 2017

Institute · University

Overview

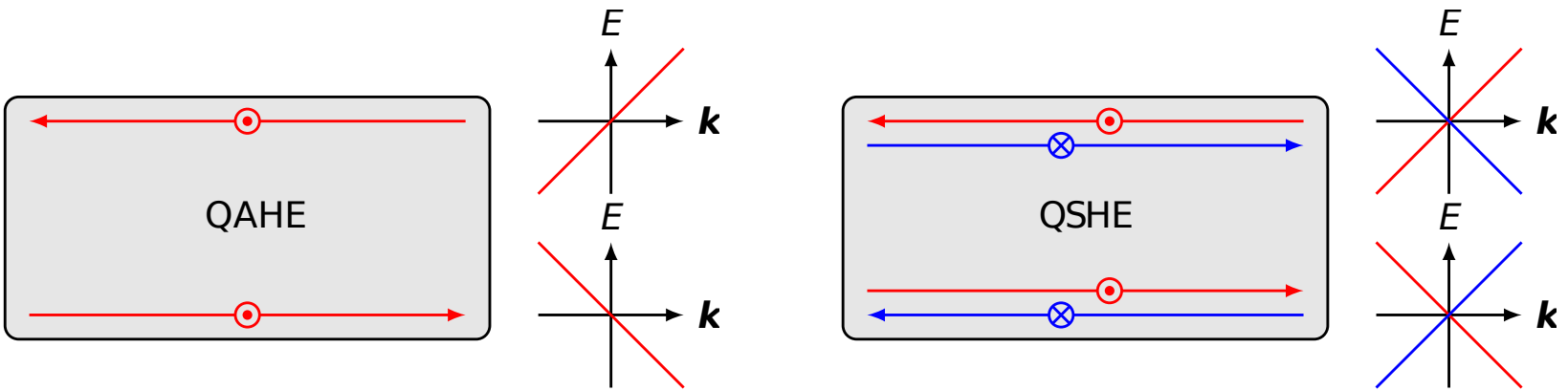
1. Topological phases
2. 1D p-wave superconductor

Topological Phases



Conducting edge channels $\longleftrightarrow$ Non-trivial bandstructure

Topological Phases

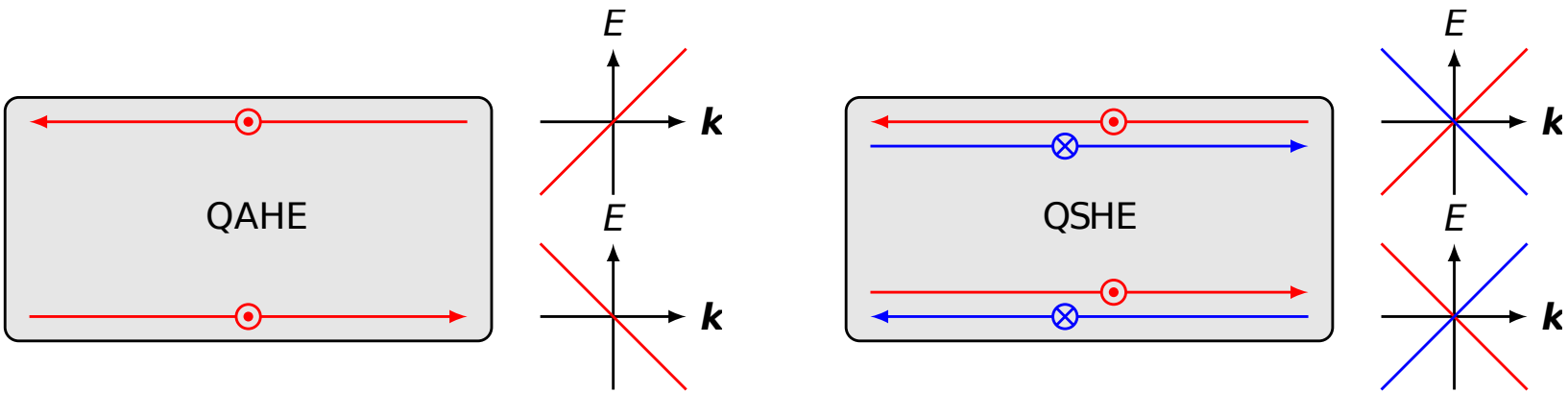


Conducting edge channels $\longleftrightarrow$ Non-trivial bandstructure

QAHE bulk Hamiltonian $\widehat{\mathcal{H}}(\boldsymbol{k}) = \boldsymbol{g}(\boldsymbol{k}) \cdot \boldsymbol{\sigma}$

$$\boldsymbol{g}(k_x, k_y) = (\sin k_x, \sin k_y, \cos k_x + \cos k_y - M)^\intercal$$

Topological Phases



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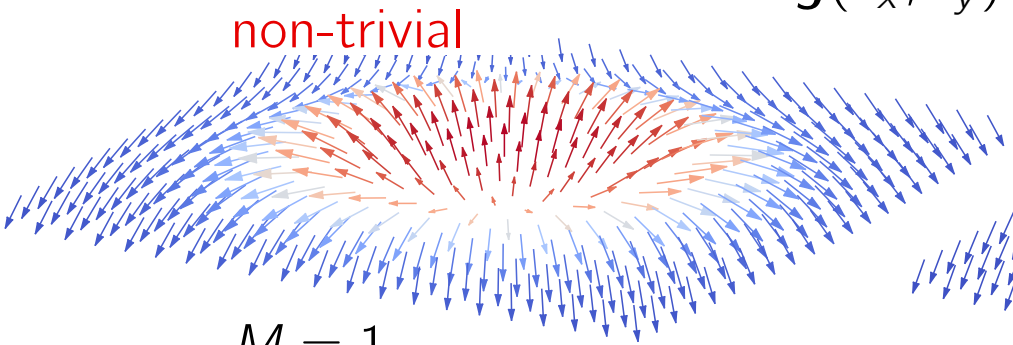
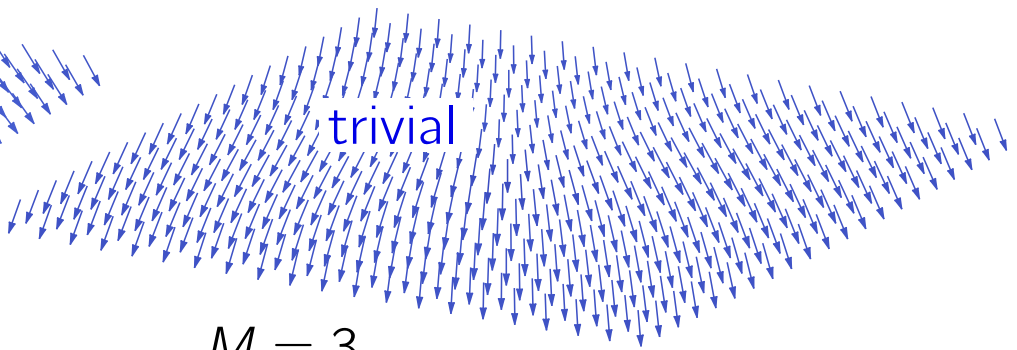
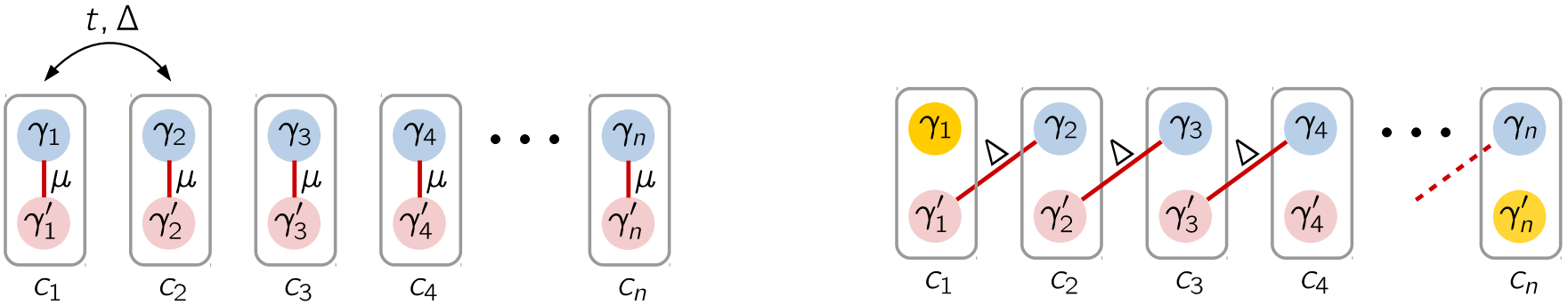


$M = 1$



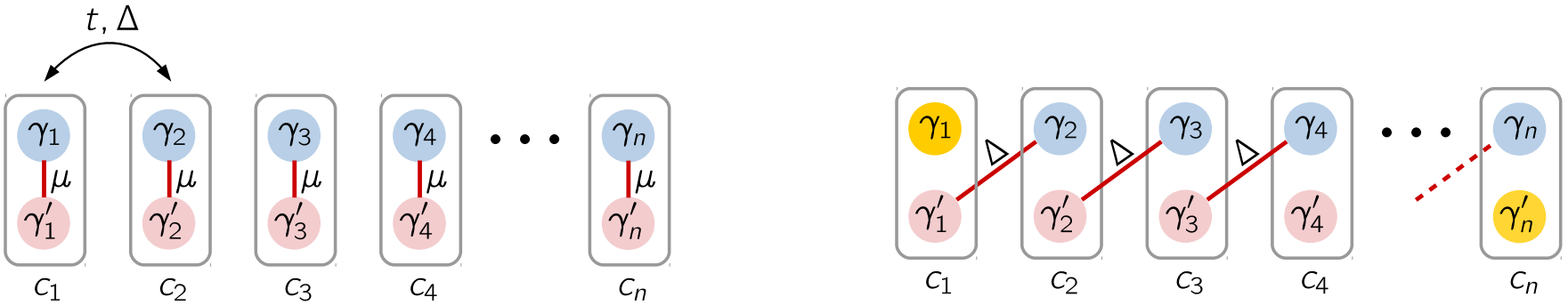
$M = 3$

1D p-wave superconductor



Lattice $$\mathcal{H} = \sum_{i=1}^{n-1} \left[t c_i^\dagger c_{i+1} + \Delta c_i \, c_{i+1} + \text{H.c.} \right] - \mu \sum_{i=1}^{n} c_i^\dagger c_i$$

1D p-wave superconductor



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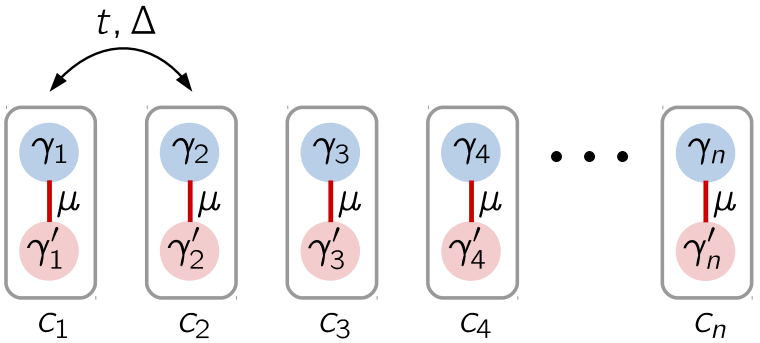
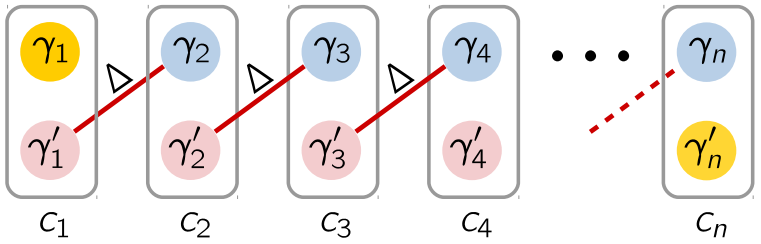
Majorana operators

$$\gamma_j = \frac{c_j + c_j^\dagger}{2}$$

$$\gamma_j' = \frac{c_j - c_j^\dagger}{2\imath}$$

1D p-wave superconductor





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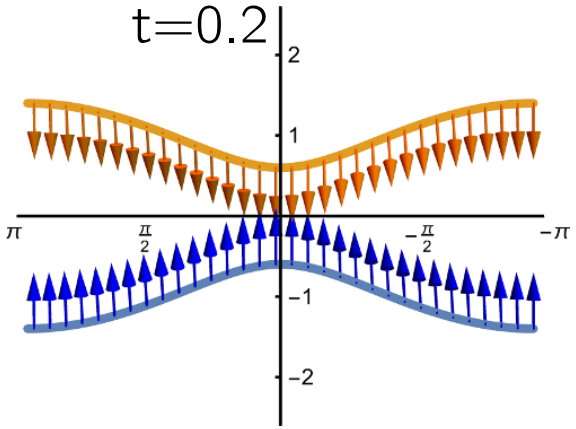
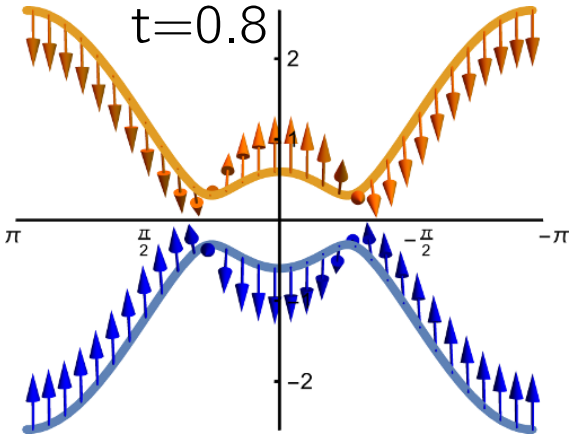
Majorana operators

$$\gamma_j = \frac{c_j + c_j^\dagger}{2}$$

$$\gamma_j' = \frac{c_j - c_j^\dagger}{2i}$$





Bulk $$\widehat{\mathcal{H}}(k) = (2t\cos k - \mu)\tau_z - 2\Delta \sin k \, \tau_y \qquad \boldsymbol{c}_k^\dagger = \left(c_k^\dagger, \; c_{-k} \right)$$