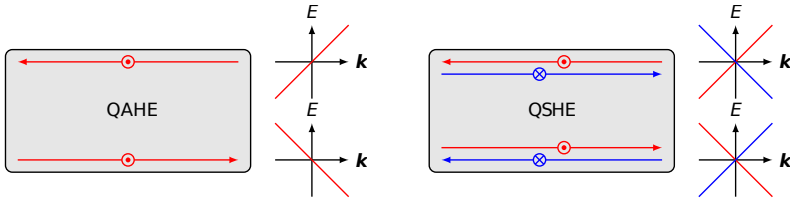# Presentation Title

Author · 16. November 2017

Institute · University

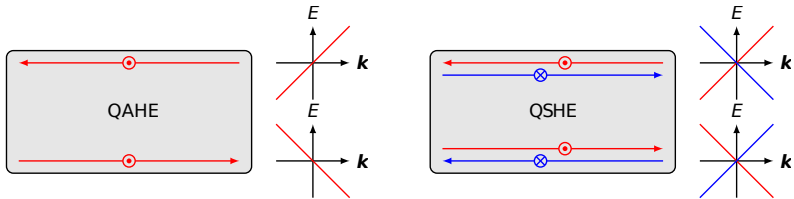# Overview

1. Topological phases

2. 1D p-wave superconductor

# Topological Phases

T<sub>E</sub>X



Conducting edge channels ⟷ Non-trivial bandstructure

# Topological Phases
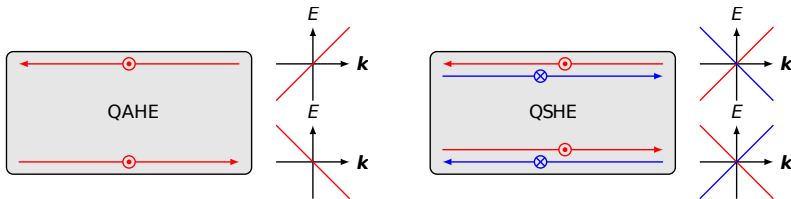
Conducting edge channels $\longleftrightarrow$ Non-trivial bandstructure

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

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

# Topological Phases
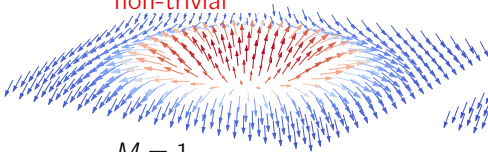
Conducting edge channels $\longleftrightarrow$ Non-trivial bandstructure

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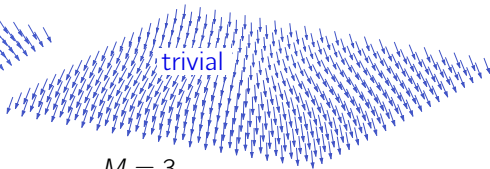
$$\boldsymbol{g}(k_x, k_y) = (\sin k_x, \sin k_y, \cos k_x + \cos k_y - M)^{\mathsf{T}}$$
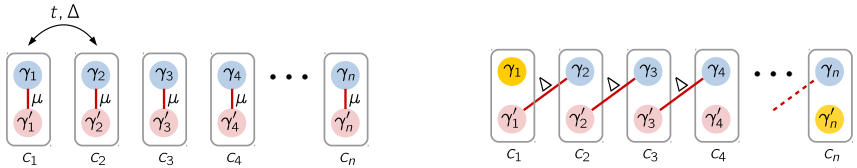


non-trivial

$M = 1$

trivial

$M = 3$

# 1D p-wave superconductor

Lattice $\qquad \mathcal{H} = \sum_{i=1}^{n-1} \left[ tc_i^\dagger c_{i+1} + \Delta c_i\, c_{i+1} + \text{H.c.} \right] - \mu \sum_{i=1}^{n} c_i^\dagger c_i$
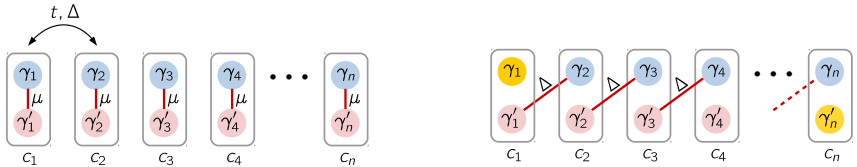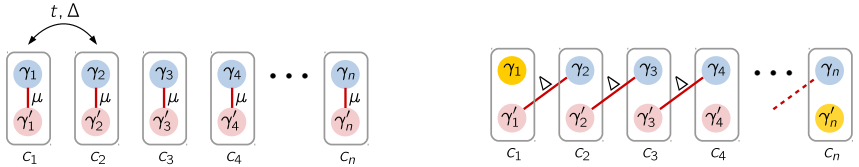
# 1D p-wave superconductor

Lattice

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

Majorana operators

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

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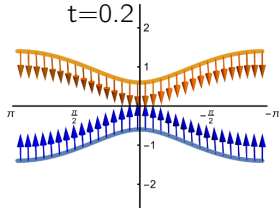
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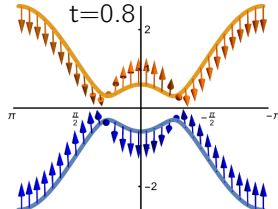
Majorana
operators

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Bulk

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