Parameters for projected crystal

System size: $L_x = L_y = 32$.

A. Equations of lines

For **irrational slope**,

$$y_{\text{up}} = \frac{2}{1+\sqrt{5}}(x-1) + 8$$

$$y_{\text{down}} = \frac{2}{1+\sqrt{5}}(x-2) + 6$$

This particular set of line is chosen because the dislocation center is inside them. Also, the first line passes through (1,8), and the second passes through (2,6).

When there is dislocation, we use a 33x32 system, and remove a line of atoms at x = 17, from y = 1 to y = 16.

For **rational slope**,

$$y_{\text{up}} = \frac{2}{3}(x-1) + 8$$

$$y_{\text{down}} = \frac{2}{3}(x-2) + 6$$

The same dislocation center is still in the region enclosed by the two lines.

The number of sites in the projected crystal is tabulated.

Type	Number of Sites
Irrational slope, perfect lattice	83
Irrational slope, dislocation	84
Rational slope, perfect lattice	74
Rational slope, dislocation	77

TABLE I.

I. CHERN INSULATOR

Hamiltonian:

$$H_{\text{QAHI}} = t[\sin(k_x)\sigma_x + \sin(k_y)\sigma_y] + [m - t_0(\cos(k_x) + \cos(k_y))]\,\sigma_z,$$

with $t = t_0 = 1$.

II. WEYL SEMIMETAL

Hamiltonian:

$$H_{\text{WSM}} = t[\sin(k_x)\sigma_x + \sin(k_y)\sigma_y] + [2 - t_0(\cos(k_x) + \cos(k_y))]\,\sigma_z + (t_z\cos(k_z) - m_1)\sigma_z,$$

with $t = t_0 = t_z = 1$ and $m_1 = 0$.

III. WSM IN A MAGNETIC FIELD

Peierls substitution is used on H_{WSM}. We have set $e = 1 = \hbar$ (e is the electron charge).

The magnetic field is, $\boldsymbol{B} = (0, 0, B)$ with $B = \frac{1}{L_y}$.

We choose Landau gauge, $\boldsymbol{A} = (-By, 0, 0)$. We choose PBC along the x direction, and OBC along the y direction.