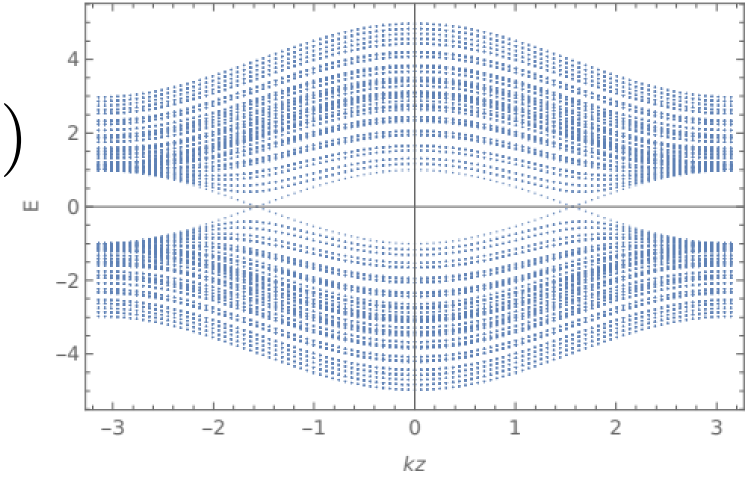
$$H = t(\sin k_x \sigma_x + \sin k_y \sigma_y) + (2 - t_0(\cos k_x + cos k_y))\,\sigma_z + (t_z \cos k_z - m)\sigma_z$$

Here we choose $t = t_0 = t_z = 1, m = 0$

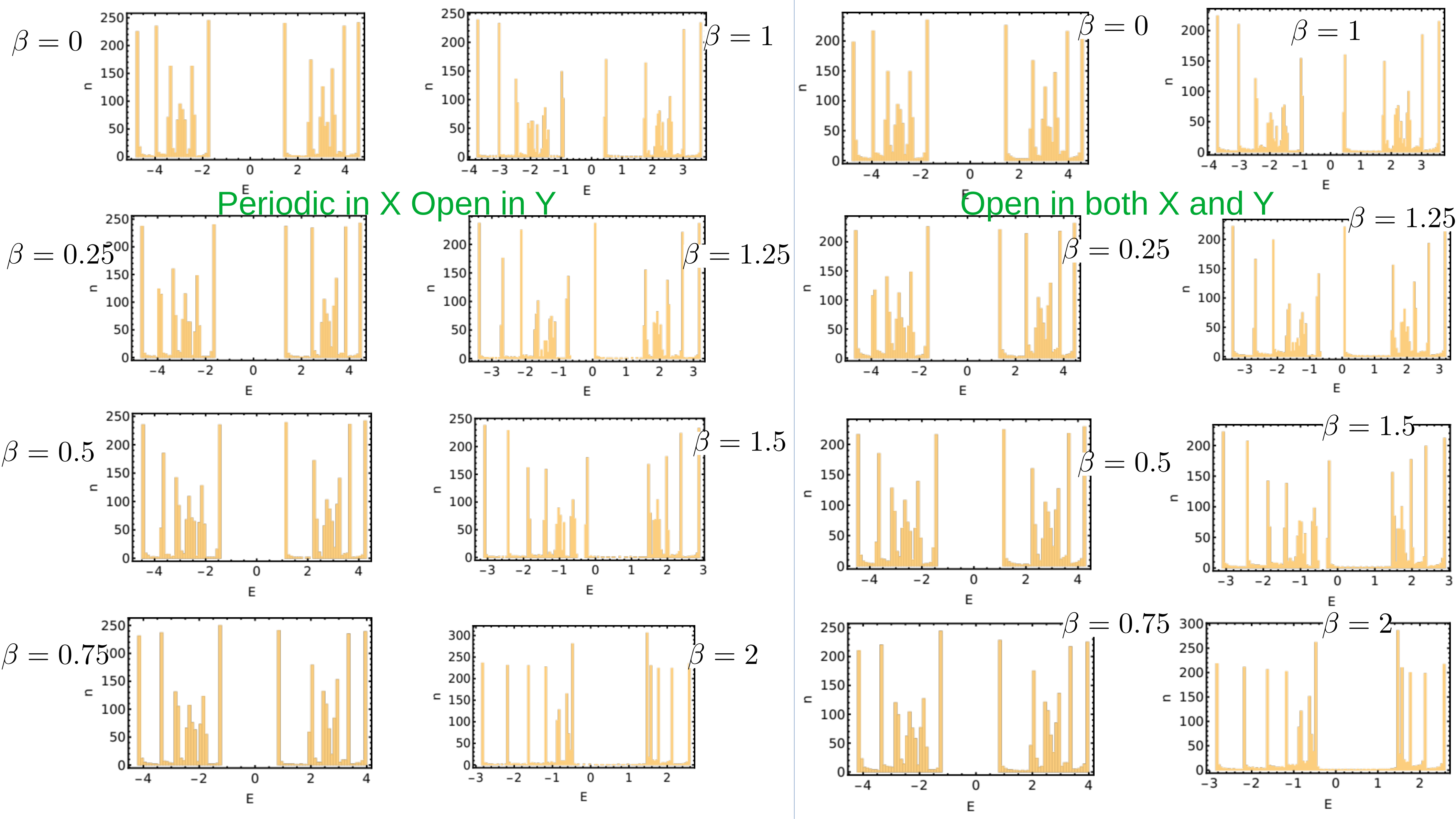
We put $k_z = \beta\frac{\pi}{2}$ and vary β between 0 to π (we don't need to consider negative values of β because $\cos(-k_z) = \cos(k_z)$) and the Density of States of energy eigenvalues are plotted in the next page.

Weyl points are found at $k_z = \pm\frac{\pi}{2}$, i.e. $(\beta = \pm 1)$



$$\text{Gauge choice } \vec{A} = (-By, 0, 0)$$

System size 40x40



Periodic in X Open in Y
Open in both X and Y
$\beta = 0$
$\beta = 0.25$
$\beta = 0.5$
$\beta = 0.75$
$\beta = 1$
$\beta = 1.25$
$\beta = 1.5$
$\beta = 2$
n
E

Summary of results

- Particle-hole symmetry is broken.
- A high density of states is obtained at zero energy for $\beta \approx 1.25$
- Removing the term $(2 - t_0(\cos k_x + cos k_y))\,\sigma_z$ restores particle-hole symmetry
- Qualitatively similar results are obtained for the Hamiltonian in PRL **117**, 086401 (2016).

$$H = 2t(\sin k_x \sigma_x + \sin k_y \sigma_y) + 2m\,(2 - (\cos k_x + cos k_y))\,\sigma_z + 2t \cos k_z \sigma_z$$

With $\frac{m}{t} = 3$. Here the Weyl points are still obtained at $k_z = \pm\frac{\pi}{2}$