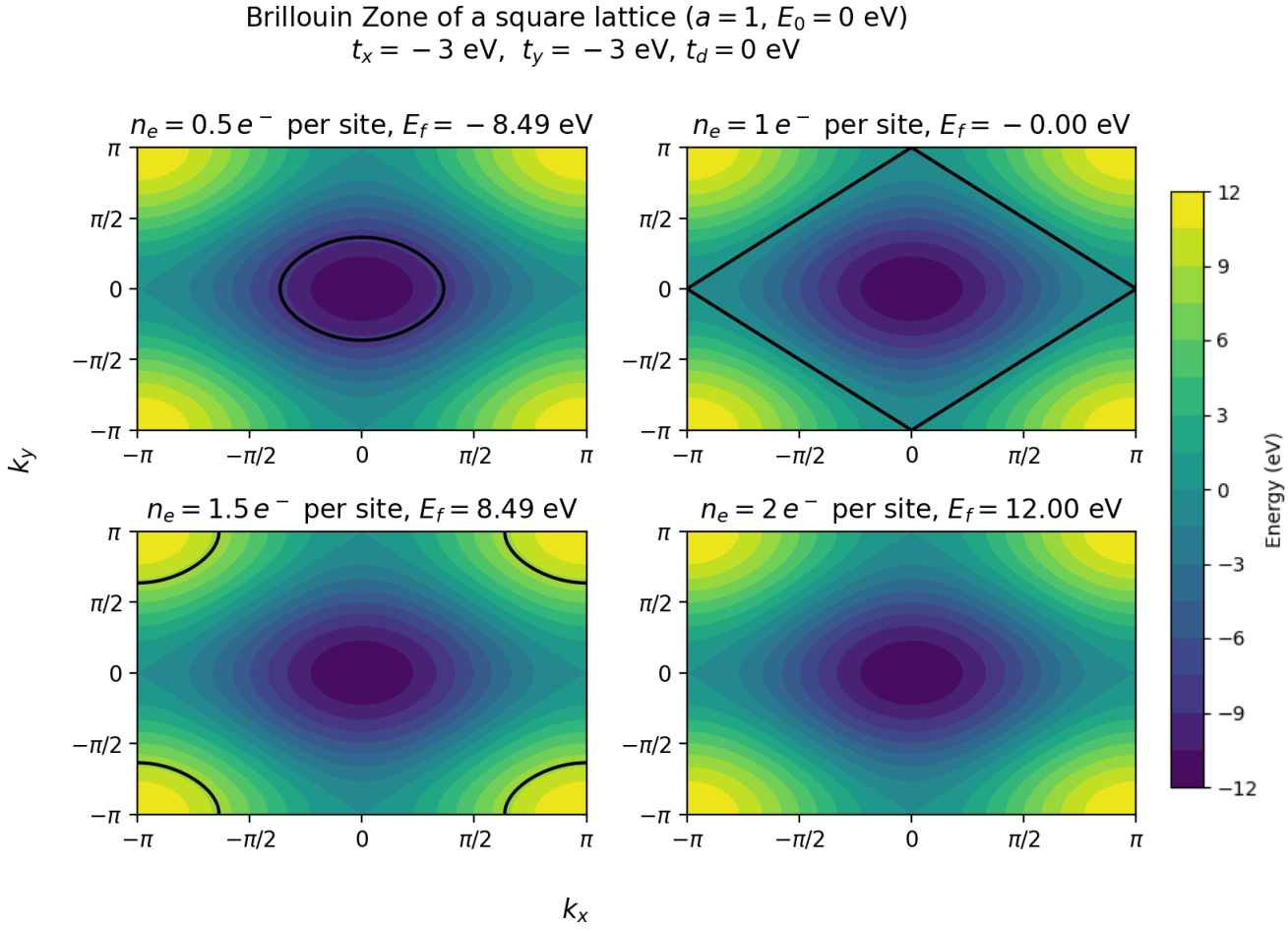
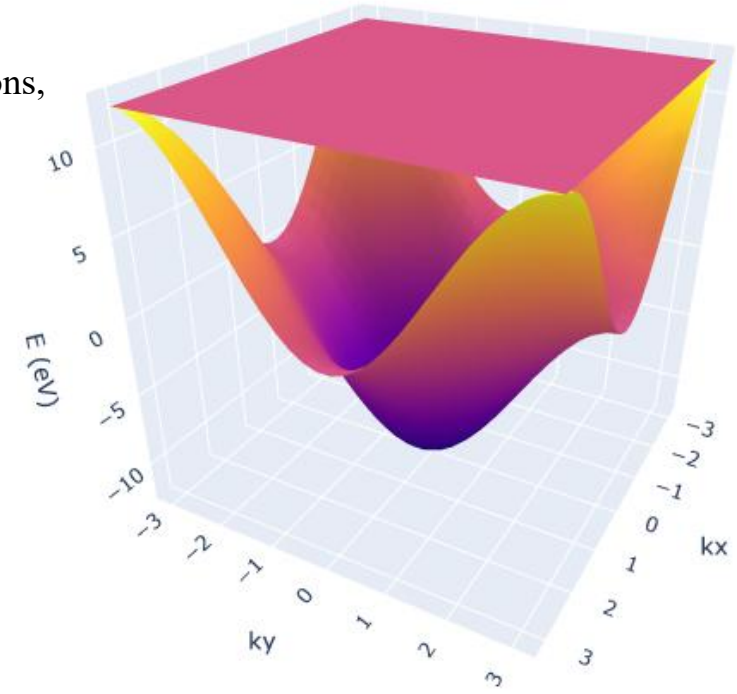
Case I:

(the Fermi Level is highlighted by the black solid line)

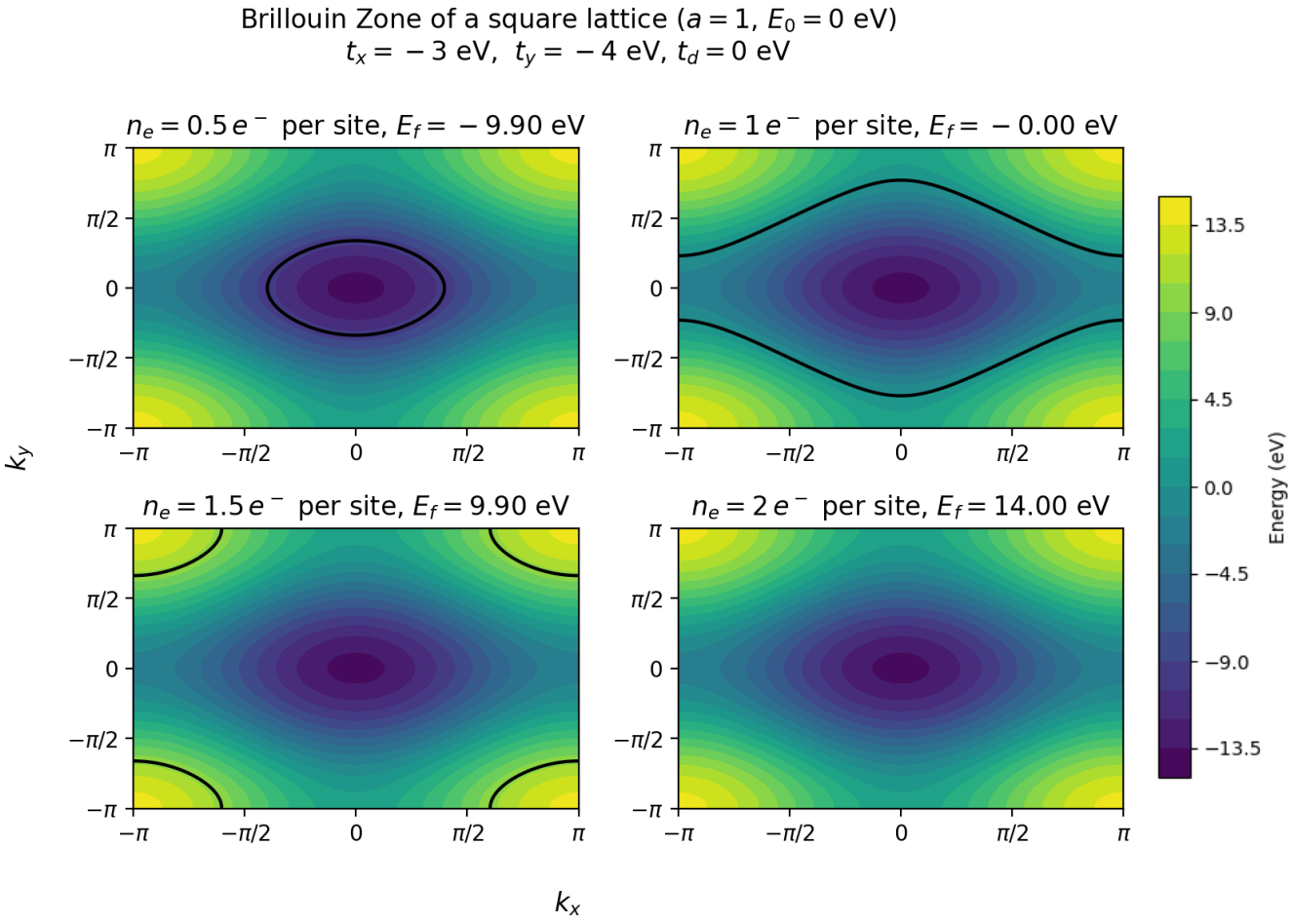


In the last plot, we don't see the Fermi Level because in that case, the entire band will be filled. A 3D plot for the same case is shown below. The horizonal plane represents the fermi-level.

According to the filling of electrons, the material will behave as a conductor in the first case and an insulator in the following 3 cases respectively.



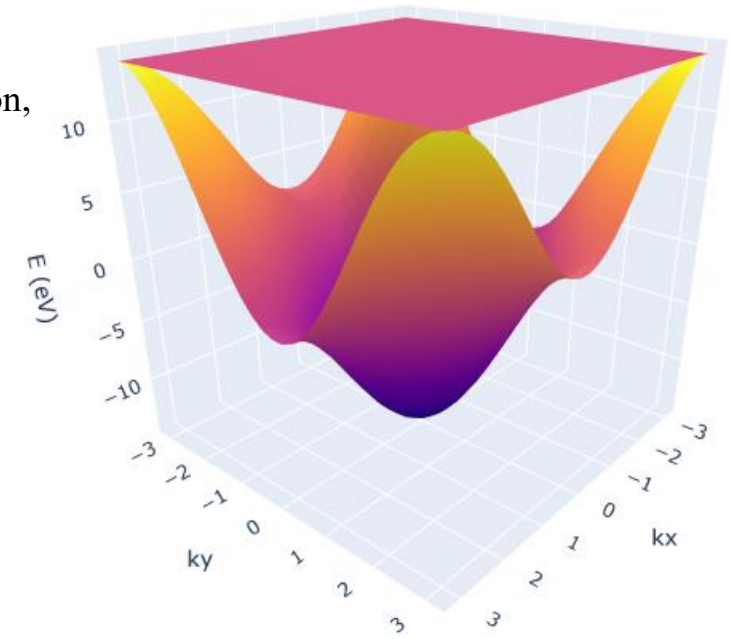
Case II:



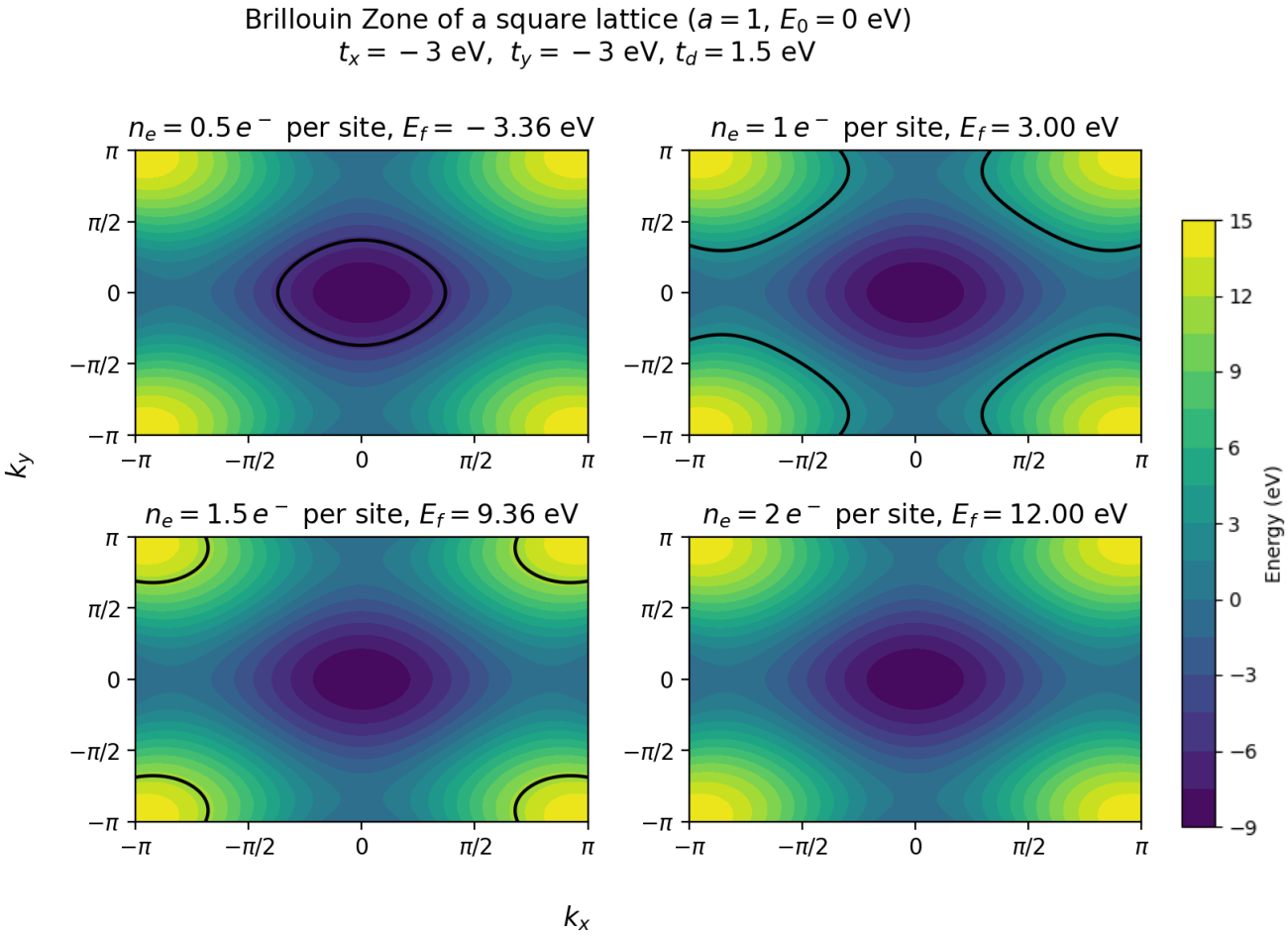
Similar to the last case, the entire band will be filled in the last plot shown above. A 3D plot for the same case is shown below. The horizonal plane represents the fermi-level.

Here, the energy gap in the ky-axis is lower than that of the kx-axis, which means that the material will behave exhibit the following properties (from left to right and top to bottom):

a) Conductor
b) Conductor in the y-direction, Insulator in the x-direction
c) Insulator
d) Insulator

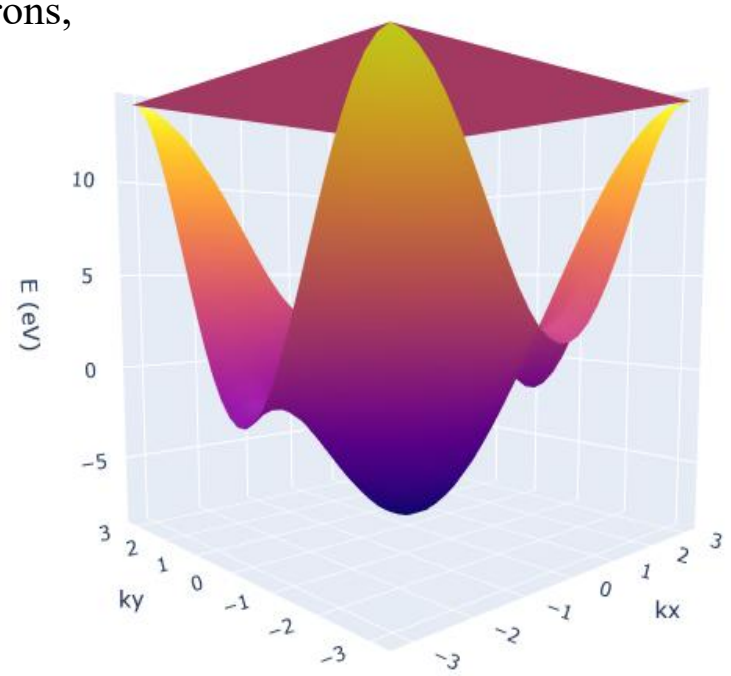


Case III:

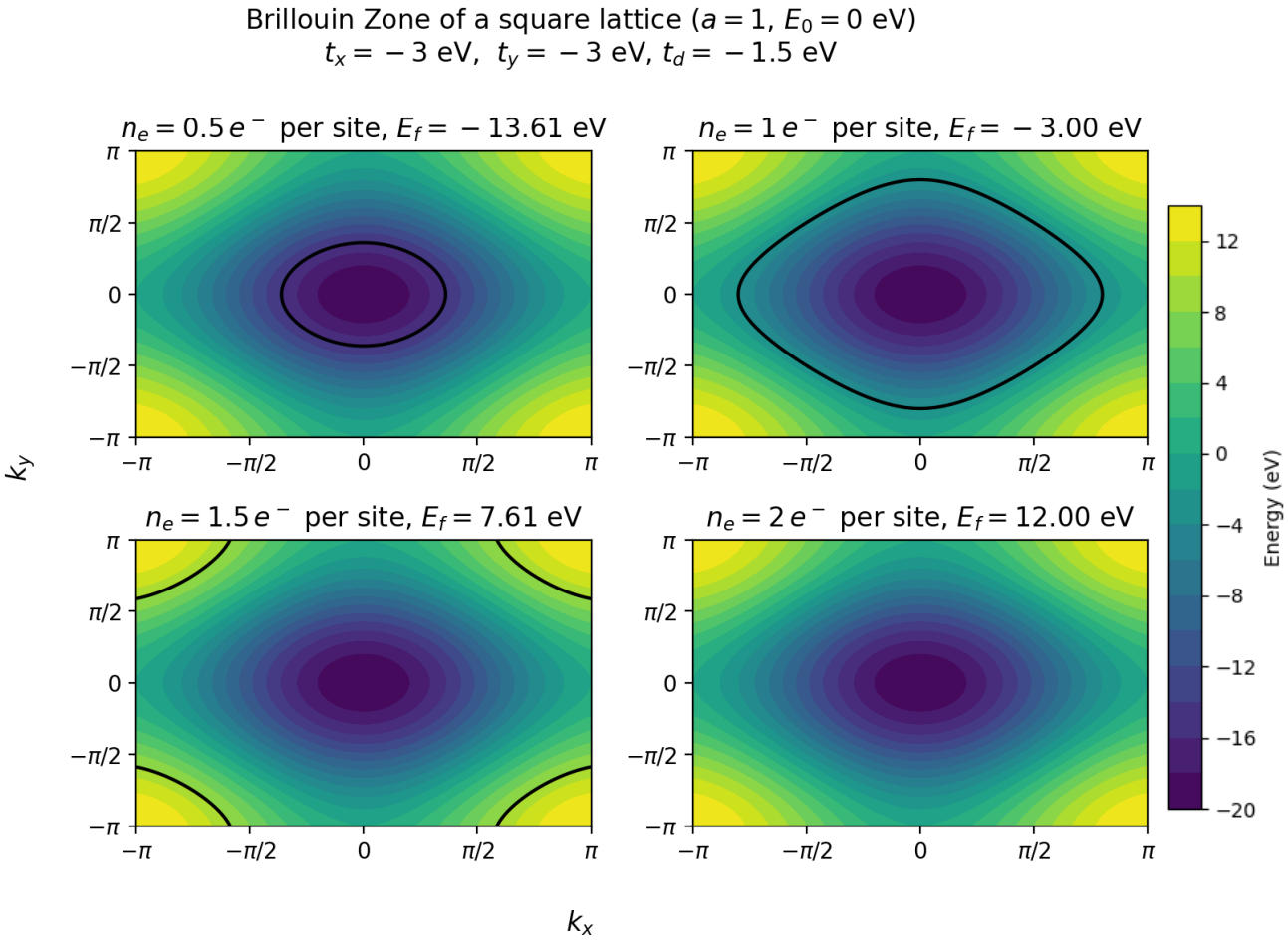


A 3D plot for the last case is shown below. The horizonal plane represents the fermi-level.

According to the filling of electrons, the material will behave as a conductor in the first case and an insulator in the following 3 cases respectively.



Case IV:



A 3D plot for the last case is shown below. The horizonal plane represents the fermi-level.

According to the filling of electrons, the material will behave as a conductor in the first two cases and an insulator in the following 2 cases respectively.