Homework 7

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# 1D infinite potential well

## Introduction

In this project, we calculated the total number of electron using the Schrodinger's equation.

Energy can be calculated as $E_z = \frac{(\hbar^2)\left(\frac{\pi n}{L_z}\right)^2}{2m_{zz}m_0}$.

We use energy up to n = 10.

From this energy, Total number of electrons for a subband can be calculated

$$2\sum_{n=1}^{\infty}\frac{L_xL_y}{(2\pi)^2}(2\pi)\frac{m_d}{\hbar^2}k_BT\ln\left(1+\exp\left(\frac{-E_{z,n}}{k_BT}\right)\right)$$

Electron distribution can be calculated with wave function which gives as

$$\frac{2}{L_xL_yL_z}\sin^2\left(\frac{n\pi}{L_z}z\right)$$

We also calculated the electron density with respect to the fermi level.

## Result

Electron density distribution with respect to the z axis position is plotted below.

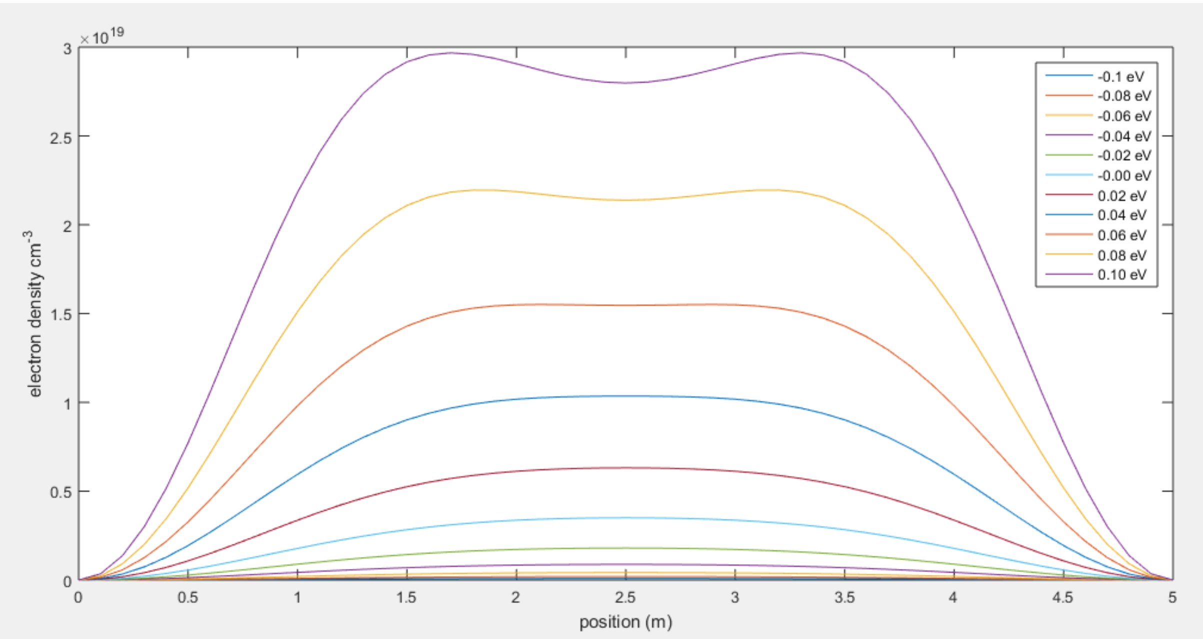


Figure 1. electron density

We can clearly see that electron density increases as fermi energy increases. And the shape changes with respect to the fermi energy.

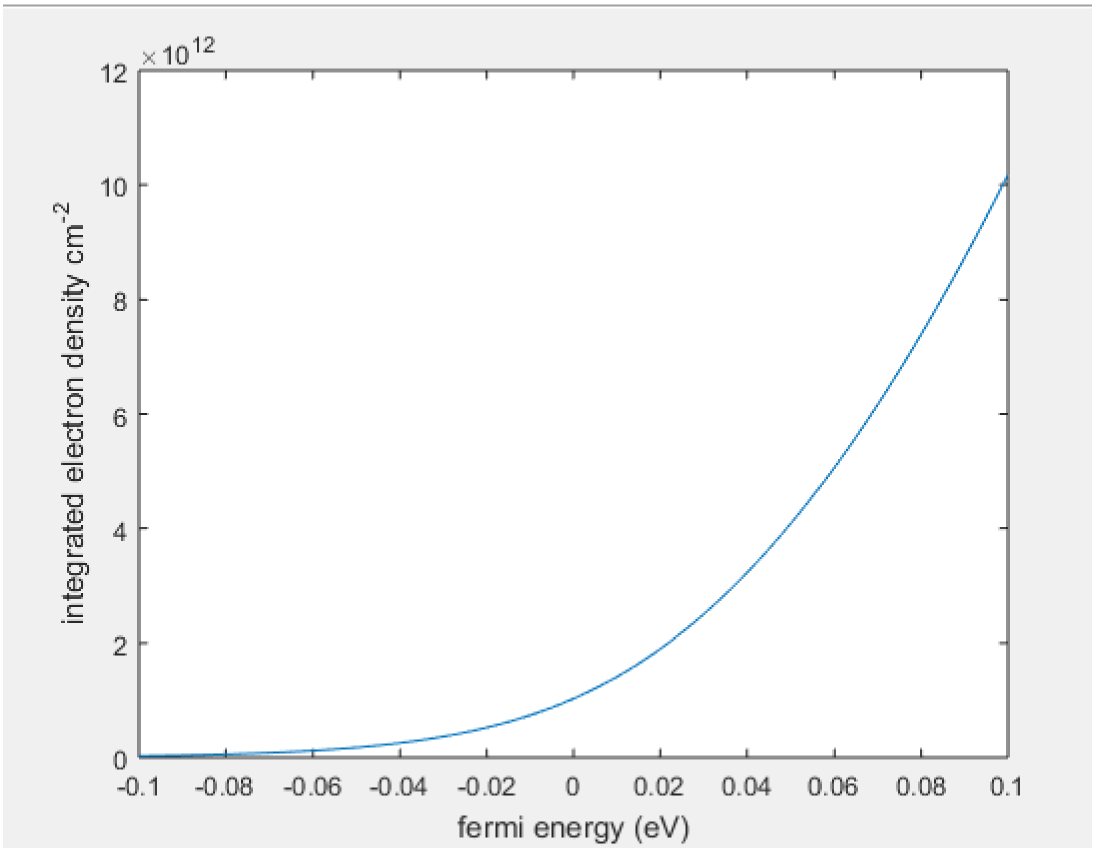


Figure 2. Integrated electron density

In figure 2, we also calculated integrated electron density which shows increasing trend.