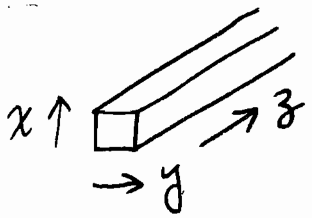
1-D Density of States (Quantum Wire)



$$E_{nx} = \frac{\hbar^2}{2m^*}\left(\frac{n_x \pi}{L_x}\right)^2$$

$$E_{ny} = \frac{\hbar^2}{2m^*}\left(\frac{n_y \pi}{L_y}\right)^2$$

$$E = E_{nx} + E_{ny} + \frac{\hbar^2}{2m^*} k_z^2$$

states from $k_z \to k_z + dk_z$

$$\frac{2}{V}\int \frac{dk}{\left(\frac{2\pi}{L_z}\right)} = \frac{2}{L_x L_y}\int_{-\infty}^{\infty}\frac{dk}{2\pi} = \frac{1}{\pi L_x L_y}\cdot 2\cdot\int_0^{\infty} dk$$

$$k_z = \sqrt{\frac{2m^*}{\hbar^2}(E - E_{nx} - E_{ny})}$$

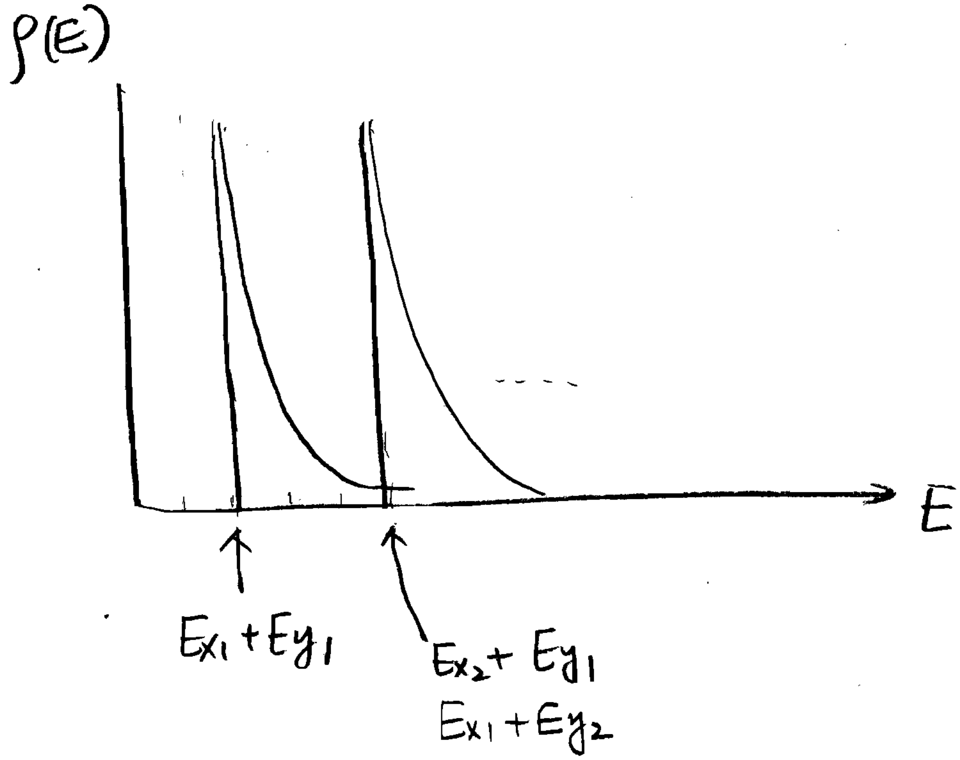
$$dk_z = \sqrt{\frac{2m^*}{\hbar^2}}\cdot\frac{1}{2}\,\frac{1}{\sqrt{E - E_{nx} - E_{ny}}}$$

$$= \frac{1}{\pi L_x L_y}\cdot\sqrt{\frac{2m^*}{\hbar^2}}\cdot\int\frac{1}{\sqrt{E - E_{nx} - E_{ny}}}\cdot dE$$

$$\rho_{1D}(E) = \frac{1}{\pi L_x L_y}\sqrt{\frac{2m^*}{\hbar^2}}\cdot\sum_{n_x}\sum_{n_y}\frac{1}{\sqrt{E - E_{nx} - E_{ny}}}$$

for n_x and n_y such that

$$E_{nx} + E_{ny} < E$$


ρ(E)
E
Ex1 + Ey1
Ex2 + Ey1
Ex1 + Ey2