

(6)

- El valor de expectación de la posición en uno de los estados propios es:

$$\begin{aligned}
 \langle X \rangle_{nkykz} &= \int_{-b}^{+b} dx \int_{-L_y/2}^{+L_y/2} dy \int_{-L_z/2}^{+L_z/2} dz \cdot x \cdot |\psi_{nkykz}(x,y,z)|^2 \\
 &= \frac{1}{L_y L_z} \int_{-L_y/2}^{+L_y/2} dy \cdot \int_{-L_z/2}^{+L_z/2} dz \cdot \int_{-b}^{+b} dx \cdot x \cdot |f_n(x-x_0)|^2 \\
 &= \int_{-b}^{+b} dx \cdot x \cdot |f_n(x-x_0)|^2 \\
 &\quad \downarrow \quad x \rightarrow x+x_0 \\
 &= \int_{-b}^{+b} dx (x+x_0) |f_n(x)|^2 \\
 &= \underbrace{\langle X \rangle_n}_{=0} + x_0 = x_0 //
 \end{aligned}$$

- El valor de expectación del momento en la dirección y:

$$\langle \hat{p}_y \rangle_{nkykz} = \int_{-b}^{+b} dx \int_{-L_y/2}^{+L_y/2} dy \int_{-L_z/2}^{+L_z/2} dz \psi_{nkykz}^* \left(-i\hbar \frac{\partial}{\partial y} \right) \psi_{nkykz}$$