$$\langle \hat{p}_y \rangle_{nk_yk_z} = \underbrace{\int_{-\infty}^{+\infty} dx\, |\varphi_n(x)|^2}_{=1} \cdot \underbrace{\frac{1}{L_z}\int_{-L_z/2}^{L_z/2} dz}_{=1} \cdot \frac{1}{L_y}\int_{-L_y/2}^{L_y/2} e^{-ik_y y}\left(-i\hbar\frac{\partial}{\partial y}\right) e^{ik_y y} \quad (7)$$

$$= \frac{1}{L_y}\int_{-L_y/2}^{+L_y/2} dy\, e^{-ik_y y}\,(\hbar k_y)\, e^{ik_y y} = \hbar k_y$$

- El valor de expectación de la componente-y de la velocidad:

$$\langle v_y \rangle \equiv \frac{\langle p_y \rangle}{m} = \frac{\hbar k_y}{m}$$

Análogamente, se demuestra

$$\langle \hat{p}_z \rangle_{nk_yk_z} = \hbar k_z \;, \; y \quad \langle v_z \rangle = \frac{\hbar k_z}{m}.$$