2.5b

$$g(z) = \sin(K_u z)$$

$$\frac{d}{dt}\gamma m c \beta_x = -e \frac{dz}{dt} \sin(K_u z)$$

$$\gamma m c \beta_x = \frac{e}{K_u} \cos(K_u z)$$

$$V_x = \frac{e}{\gamma m K_u} \cos(K_u z) \qquad z = t \cdot c$$

$$\int_{x_1}^{x_2} dx = \frac{e}{\gamma m K_u} \int_0^{tc} \cos(K_u t c)\, dt$$

$$\theta = \text{Arctan}\left(\frac{V_x}{V_z}\right)$$

$$= \text{Arctan}\left(\frac{e\cos(K_u z)}{\gamma m K_u c}\right) \qquad \Delta x = \frac{e}{\gamma m K_u}\left(\frac{1}{K_u c}\right)\sin(K_u t c)$$

$$\Delta x = \frac{e}{\gamma m c K_u^2} \sin(K_u z)$$

$$K_u = \frac{2\pi}{\lambda_u}, \quad \lambda_u = L_u / N_u$$

$$K_u = 2\pi N_u / L_u \qquad \Delta x = \frac{e}{\gamma m c K_u^2} \sin\left(\frac{2\pi N_u z}{L_u}\right) \qquad z = ct$$

at $z = 0$, $\Delta x = 0$, $\Delta\theta \neq 0$

2.5c $\quad g(z) = \cos(K_u z)$

$$\frac{d}{dt}\gamma m c \beta_x = -e \frac{dz}{dt} \cos(K_u z)$$

$$\gamma m c \beta_x = \frac{-e}{K_u} \sin(K_u z)$$

$$V_x = \frac{-e \sin(K_u z)}{\gamma m K_u}$$

$$\int_{x_1}^{x_2} dx = \int_0^{ct} \frac{-e \sin(K_u c t)}{\gamma m K_u} dt$$

$$\Delta x = \frac{e \cos(K_u z)}{K_u^2 \gamma m c} - \frac{e}{K_u^2 \gamma m c}$$

$$\theta = \text{Arctan}\left(\frac{V_x}{V_z}\right)$$

at $z = 0$, $\Delta x = 0$, $\Delta\theta = 0$

$$\theta = \text{Arctan}\left(\frac{-e \sin(K_u z)}{\gamma m K_u V_z}\right)$$

B_y should be a cosine field