HW 8 P. 2

Sunday, March 7, 2021 6:50 PM

i] $x(t) = a\cos(\omega_0 t)$

$$\dot{x}(t) = -a\omega_0 \sin(\omega_0 t)$$

$$\frac{dP}{d\Omega} = \frac{e^2}{16\pi^2 c} |\dot{\beta}|^2 \sin^2\theta$$

$$= \frac{e^2}{16\pi^2 c^3} a^2 \omega_0^3 \cos^2(\omega_0 t) \sin^2(\theta)$$

$$\int_0^t \frac{dP(t')}{d\Omega} dt' = \frac{e^2 a^2 \omega_0^2 \cos^2(\theta)}{16\pi^2 c^3} \int_0^t \sin^2(\omega_0 t') dt'$$

$$= \frac{e^2 a^2 \omega_0^2 \cos^2(\theta)}{16\pi^2 c^3} \left[\frac{t}{2} - \frac{\sin(2\omega_0 t)}{4\omega_0} \right]$$

$$\int dP = \frac{e^2 a^2 \omega_0^3}{16\pi^2 c^3}\left[\frac{t}{2} - \frac{\sin(2\omega_0 t)}{4\omega_0}\right]\int \cos^2(\theta)\, d\Omega$$

$$= \frac{e^2 a^2 \omega_0^3}{16\pi^2 c^3}\left[\frac{t}{2} - \frac{\sin(2\omega_0 t)}{4\omega_0}\right]\left[\frac{\theta}{2} - \frac{\sin(2\theta)}{4}\right]$$

ii) $\vec{r} = R\left(\cos(\omega_0 t)\hat{x} + \sin(\omega_0 t)\hat{y}\right)$

$$\vec{v} = \dot{\vec{r}} = R\omega_0\left(-\sin(\omega_0 t)\hat{x} + \cos(\omega_0 t)\hat{y}\right)$$

$$\beta = \frac{v}{c}$$

$$\dot{\beta} = \frac{R}{c}\omega_0^2\left(-\cos(\omega_0 t)\hat{x} - \sin(\omega_0 t)\hat{y}\right)$$

$$\frac{dP}{d\Omega} = \frac{e^2}{16\pi^2 c}|\dot{\beta}|^2 \sin^2\theta$$

$$= \frac{e^2}{16\pi^2 c^3} R^2 \omega_0^4 \sin^2\theta$$