Home Work PHY 554 #12. Due November 5, 2018

HW 1 (3 points):

Consider an electron storage ring at an energy of 1 GeV, a circulating current of 200 mA and a bending radius of ρ=2.22 meters. Calculate the energy loss per turn, the critical photon energy, and the total synchrotron radiation power.

HW 2 (2 points): Make a short argument about why the trajectory of a charged particle can not intersect with light cone more than once (see slide #8 from the lecture 17)

HW 3 (5 points):
As shown in slide #15, the angular distribution of radiation power is given by

$$\frac{dP(t_r)}{d\Omega} = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{4\pi c}\frac{\dot{\beta}^2}{(1-\beta\cos)^3}\left[1-\frac{\sin^2\theta\cos^2\phi}{\gamma^2(1-\beta\cos\theta)^2}\right]$$

Show that for $\gamma^{-4} << \theta << 1$ and $\gamma >> 1$, the angular spread of the radiation power is in the order of γ^{-1}.