

Home Work PHY 554 #12.

Due April 15, 2020

HW 1 (4 points): For 3 GeV electron storage ring with circulating current of 500 mA and a bending radius of $\rho=8$ meters calculate the energy loss per turn, the critical photon energy, total synchrotron radiation power and the photon beam spectral brightness at critical photon energy. Assume horizontal geometrical emittance of 1 nm rad ($1e-9$ mrad), vertical emittance of 20 pm rad ($20e-12$ m rad, at the radiation point $\beta_x=0.5$ m; $\beta_y=1.5$ m.

HW 2 (6 points): For the 3 GeV storage ring described above, consider an undulator with 40 periods and with $K=1$ installed in the straight section. Assume horizontal geometrical emittance of 1 nm rad ($1e-9$ m rad), vertical emittance of 20 pm rad ($20e-12$ m.rad) at the radiation point $\beta_x=\beta_y=2.5$ m.

- (a) Find undulator period that fundamental wavelength will be 0.5 nm (5 \AA)
- (b) What will be spectral brightness at the fundamental wavelength?