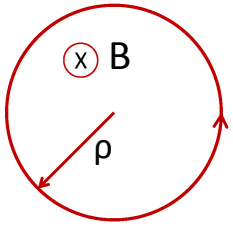
Homework problems for Undulators

1.



Show that in the uniform magnetic field B electron with the energy E rotates on the circle with the radius ρ, and these three parameters satisfy simple equation:

$$0.3 \bullet B(T) \bullet \rho(m) = E(GeV)$$

2. Assuming that the undulator field $B_0 \sin(k_u z)$ could be treated as a wave in the Thomson scattering process, estimate number of photons emitted by one electron passing an undulator with N periods.

3. Using analytical expressions for the undulator parameter (slide 12), undulator wavelength (slide 17) and undulator on axis field (slide 26) design an undulator that generates $1A^0$ on axis radiation for electrons of 5 GeV and 10 GeV energies. Keep in mind that the undulator parameter should be at least equal to 1, undulator gap is not smaller than 1 cm, and parameters for the field are: a=3.5T, b=-5, and c=1.5.